



KING LONG
B U S E S

OPERATION MANUAL

User's Guide



King-Long XMQ6127 series tourist bus

Xiamen King Long United Automotive Industry Co., Ltd.

FOREWORD

King-Long XMQ6127 series tourist bus keeps features of superior economy, security and comfort. It has stable performance, strong power, luxury interior trimming and high speed, which could meet applications of passenger inter-city transportation, touring and business affairs, etc.

As for the specifications introduced in relate to information of the driving and operation, service and maintenance of the XMQ6127 series tourist bus, please read them carefully and make proper operation, maintenance and repair so as to ensure it in good condition. Special hint: without authorization of Xiamen King Long United Automotive Industry Co., Ltd, never modify the electrical deployment of the whole vehicle, and should not lap the power supply line in disorder. Improper usage and repair may have a strong impact on service performance of the complete vehicle, and thus the manufacturer , Xiamen King Long United Automotive Industry Co., Ltd. will not takes the responsibility for the damages caused by them.

Any problem in service, please contact our special maintenance network or after-sales department. We will ensure timely and complete maintenance as well as original parts supply.

In order to satisfy all kinds of different demand of the consumers, we strive to improve the quality of the product continuously to optimize our products. We should not give any further notice for any modification of the product in advance . The contents on the instruction book can only be used as reference. If there are facts not comply with the manual, will be subject to the actual state of the products because for some device and items, the vehicle will be finally equipped only if they have been taken as optional configurations.

Final interpretive right of the instruction book belongs to the engineering academy of Xiamen King Long United Automotive Industry Co., Ltd.

Xiamen King Long United Automotive Industry Co., Ltd.

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Contents

Vehicle picture-----	1
Foreword-----	2
Contents	
Contents-----	3-6
Technical parameters and complete vehicle description	
Technical parameters -----	7
Introduction to data plate-----	8
Product quality assurance -----	9
Technical document -----	9
Vehicle body structure-----	10
Schematic illustration of the driver zone-----	11
Operation Instruction	
Instrument instruction-----	CI-1
Illustration of switch and indicator s-----	SI-1-3
Air conditioner control panel-----	P-A-1
Heating Operation-----	P-H-1-3
Gearbox operation -----	O-G-1
ABS instruction-----	O-AB-1
ECAS instruction-----	O-EC-1
Toilet operation-----	O-T-1-4
Open or close the passenger door-----	O-K-1-2
Adjustment of the driver's seat-----	OI-1
Horn button-----	OI-2
Adjustment of the steering wheel-----	OI-3
Ignition switch-----	OI-4
Lamplight operating handles-----	OI-5
Wiper operating handle-----	OI-6
Passenger control panel-----	OI-8
Safety hatch-----	OI-9

Safety hammer-----	OI-10
CAN module location & function description-----	O-E-1-2
Switch control box-----	O-E-3
Vehicle starting and driving	
Check oil level of the engine-----	S-1
Check level of the coolant-----	S-2
Check fuel pre-filter with water separator-----	S-3
Check fuel level-----	S-4
Check vehicle lighting, intermittent lights and brake lights-----	S-5
Check the level of AdBlue and the daily maintenance of SCR system-----	S-7
Drain water in air tank-----	S-8
Check engine oil pressure-----	S-9
Check Pneumatic pressure-----	S-10
Check Tachometer working order-----	S-11
Steering wheel play-----	S-12
Check tire for abrasion and pressure and tire nut for fixture-----	S-13
Air cleaner-----	S-14
General leakages (water, oil, fluids and fuel) -----	S-15
Fastening and state of seat belts-----	S-16
Check emergency devices and driver's tools (fire extinguisher) -----	S-17
Windshield wipers and conditions of wiper blades and arms-----	S-18
Electrical rearview mirror-----	S-19
Power steering system-----	S-20
General state and tension of drive belts-----	S-22
Check level of battery electrolyte-----	S-24
Procedures for engine start up-----	S-25
Engine shut down-----	S-26
Engine start up and shut down in the engine compartment-----	S-27
Starting the vehicle-----	S-28
Parking the vehicle-----	S-29

Vehicle maintenance and service

General knowledge-----	M-1
Maintenance of engine and chassis subassembly-----	M-1
Body maintenance -----	M-1
ABS/EBS system maintenance and service -----	M-1
Electrical system maintenance and notices -----	M-2
Tire transposition-----	M-2
Adjustment of the brake pedal freeplay-----	M-3
Bus cleaning-----	M-3
Cleaning air filter -----	M-4
Cleaning outside of radiator -----	M-5
Coolant specification -----	M-5
Oil specification recommendation of the fuel and the lubricant-----	M-6
Breaking-in of a new vehicle-----	M-9-10
Daily Maintenance Operation-----	M-11
Maintenance per 5000km-----	M12-M14
Maintenance per 10000km-----	M-15
Maintenance per 20000km-----	M-16-18
Maintenance per 40000km -----	M-19
Maintenance per 80000km -----	M-19
Maintenance more than 80000km-----	M-20
Maintenance period chart-----	M-21-28
 Common trouble and its eliminating method	
Engine Common trouble and elimination -----	C-1
Propeller shaft-----	C-8
Transmission-----	C-9
Rear axle-----	C-10
Front axle and steering system-----	C-11
Braking system-----	C-14
Electrical equipment and the starting system -----	C-16

Air conditioner system-----C-18

Appendix

Driver's tool table ----- A-1

Tightening moment of the bolts and the nuts in major position -----A-2

The table of Lubricant, Power steering oil and Grease-----A-3

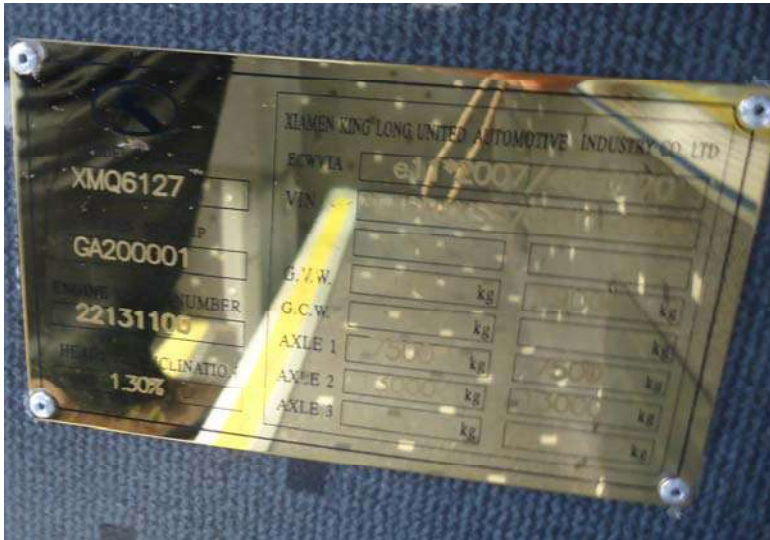
Air braking schematic diagram (with air suspension) ----- A-4

Electrical elementary diagram of vehicle -----A-5-8

**Technical parameters of the complete vehicle
 (vehicle No. GA200001)**

Product model		6127	
Engine model		ISL8.9E5 400	
Engine type		In-line six-cylinder water-cooling electrically controlled common rail direct-injection diesel engine	
Cylinder diameter × stroke (mm)		114 × 145	
Displacement (ml)		8900	
Compression ratio		16.6:1	
Rated capacity / rotation speed (kw/rpm)		294/2100	
Max. torque / rotation speed (N · m/rpm)		1700/1300	
Dimensions	Overall length (mm)		12000
	Overall width (mm)		2490
	Overall height (mm)	Air spring	3800
	Wheelbase (mm)		6350
	Wheel track	front (mm)	2020
		rear (mm)	1860
	Minimum lift-off clearance (mm)		240
	Approach angle/ departure angle (°)		10/9
Front overhang / rear overhang (mm)		2380/3270	
Rated passenger (driver included)	(person)	49+1+1	
Mass parameter	Technically permissible maximum laden mass (kg)		19000
	Technically permissible maximum mass of combination (kg)		--
	Technically permissible maximum laden mass for front axle (kg)		7500
	Technically permissible maximum laden mass for rear axle (kg)		13000
Wheel	Tire size		295/80R22.5
	Tire inflation (MPa)		900
Performance parameter	Max. speed (km/h)		100
	Fuel consumption (L)		--
	Maximum gradeability (%)		≥20
	Min. turning diameter (m)		≤24
	Parking slope (20%)		Parking for 5 minutes
Capacity data	Fuel tank (L)		300
	Engine oil (L)		27.6
	Transmission lubricant (L)		20(service oil change), 30(dry oil fill)
	Main reducing gear lubricant (L)		16
	Power steering hydraulic oil (L)		8
	clutch lubricant (L)		0

Introduction to specification data plate



Bus data plate

The bus data plate may be affixed to either the upside of the front passenger door frame or to the side of the front passenger door step (the position may vary with vehicle model). There are many parameters on the plate, such as vehicle model, gross mass, vehicle serial number, vehicle capacity, VIN (short for vehicle identification number), chassis serial number, engine serial number, engine model, rated power, production data and etc..

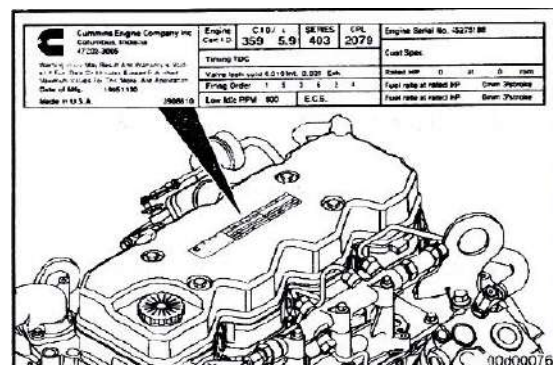
Chassis data plate

The chassis data plate is on right (or left) lateral surface of the front wheel position of the main sill with vehicle identification number (VIN) on the frame.

Engine data plate

The engine data plate is on top surface or salient top position of the engine, whose position may be various according to different engine manufacturing plant.

The engine number is stamped on the left or right block of the engine, whose position may be various according to different engine manufacturing plant.



Product quality assurance

We insist that the end user must make breaking-in maintenance of the rolling-out new vehicles in their initial driving mileage of 5000 km. The end user should make proper operation and maintenance strictly according to relevant regulations in the instruction book. Please refer to “workshop manual” for product quality assurance and strictly abide by the related specification.

Technical document

The instruction book is used combined to the following specification:

Engine operation instruction or service manual

Note: the instruction book should be modified according to specific configuration of vehicle.

Body Structure

1. Structural style

Semi-integral body structure

2. Structure

The bodywork structure adopts closed girder construction of six major assembly parts, which are combined welded by rectangle steel pipes with advantages of strong structural stiffness, torsion resistance and bending resistance as well as relatively simple craftwork. Whole vehicle skeleton has been fully electro-coating operated and anticorrosion treated to ensure steady adhesion of coating and strong capacity of antirust and corrosion-proof.

3. Interior trim

The interior adopts flexible design and the floor adopts steel plate/wood block composite construction, and covered with anti-slip and antifriction leather with favorable sound insulation value.

4. Windows

The front windshield is the hyperboloid triplex glass fixed by the gluing; the rear windshield is fixed by harden glass; the side windows are sealing style , which are all made of hardened glass. The driver's window is fixed with sliding window.

5. Baggage compartment

The baggage compartment adopts transverse run-through design, and they are all made of aluminum.

6. Seat

Driver's seat: Q15-2 adjustable seat with high backrest and three-point belt

Passenger seats: 2+2 layout, KE-1 seats with armrest, foot pedal and transverse movement function , 49+1+1, all seats are mounted by 3 points seat belt.

7. Interior accessory device

The vehicle is equipped with electronic clock, electric single pieces front windshield sunshade, driver side sunshade, electric driver window, safety hammer, double emergency escaping windows, curtain and luxury bilateral C type luggage rack , icebox, middle passenger door, toilet, combination reading lamp, electric mirrors, DVD player, front and middle flip LCD TV ,reversal monitor , .etc.

8. Air-conditioning system

Cooling /heating A/C system: KING LONG top mounted dependent air-conditioning system, WEBASTO heating system.

Defroster: cooling /heating defrosting device.

9. Door

The door adopts the full aluminum remote control out-swing single-wing pneumatic passenger doors.

The out-swing door adopts the advanced electrically aerodynamic theory design, with the motion of opening and closing placidly、agilely、 safely , further, keeping credible locking and anti-clamp function.

A. Basic function

a. There are two electrically switches, the interior one is trigger touch-tone, which located on the dashboard of the front right side of the driver, the outside one is a remote control switch. , both switches can control the door.

b. When the circuit is in OFF position , the emergency switch can be used in the interior and exterior, the emergency switch of the door is located inwardly upon the entrance of the door and outwardly under of the door steps , Please rotate the switch and throw open the door in emergency.

c. Commonly the door is closed, when touch off any electrically switch, the door would move placidly at a certain velocity, along with it, the step-lamp lights .when touch off the switch again , the door would return placidly at a certain velocity, after the door returned , the step-lamp goes out.

B. Hint:

- a. The door remote control acts only when the parking brake is on the parking gear.
- b. The door could only be opened when the external mechanical lock isn't locked up.
- c. In order to avoid impact, make sure that the door is completely closed or opened, before you make the next door switch operation.

Note: Deployment on the vehicle may be different with the above description because of different deploying requirement of the clients.

Schematic illustration of the driver zone



- | | |
|--------------------------------|-----------------------------|
| 1 Fire extinguisher pushbutton | 14 Light control handle |
| 2 Parking brake handle | 15 Back guide monitor |
| 3 Rocker switch | 16 MP3 player |
| 4 WEBASTO heater panel | 17 Travelling data recorder |
| 5 A/C operation panel | |
| 6 Radiator panel | |
| 7 Gearbox operation panel | |
| 8 Wiper operation handle | |
| 9 Rocker switch | |
| 10 Power charging socket | |
| 11 Mirrors pushbutton | |
| 12 Steering wheel | |
| 13 Combination instrument | |

Instruction of instrument (VITI EDITION)

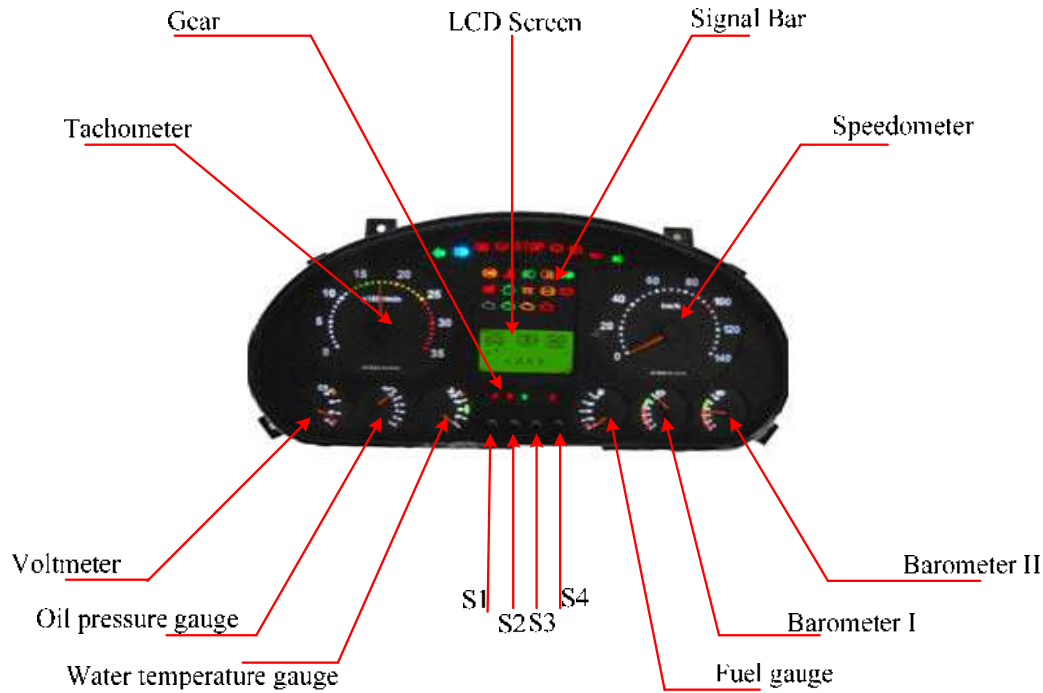


Figure-1 The Outline of ZB271M

The appearance of the ZB271M dashboard as shown in Figure-1 , it mainly contains eight indicator type measuring instruments, 29 icons which were lighted by the light-emitting diodes, one LCD screen and four buttons, dashboard pin definition go to **Appendix A**

2.1 Display Part.

- 1.Gear P—Brake gear, R—Reverse gear, N—Neutral gear, D—Drive gear, S—Safety belt.
- 2.Signal Bar. Go to **Appendix B**.
- 3.Speedometer .Display speed of bus. Units :Km/h.
- 4.BarometerI and Barometer II. Display air pressure of bus. Units: 0.1MPa .
- 5.Fuel gauge. Display amount of fuel. Units: Percentage.
- 6.Water temperature gauge .Display engine temperature of bus. Units: °C.
- 7.Oil pressure gauge. Display oil pressure gauge of bus. Units : 0.1MPa.
- 8.Voltmeter .Display Voltage of car. Unit: V.
- 9.Tachometer .Display rotate speed of bus. Units: r/min.
- 10.LCD Screen. Display interface information, engine information and so on. Go to **Appendix C**.

2.2 Button part

ZB271M dashboard has four buttons,S1、 S2、 S3、 S4.

S1—Set Button. S2—Up Button. S3—Down Button. S4—Return Button.

S1 could set some information of dashboard, for example ,times, backlight, VehPPK and so on.

S2 and S3 could flip the screen up or down.

S4 Return main interface.

Remarks: Do not press S1 when flip the screen up or down.

3 Instructions

3.1 LCD Display

3.1.1 After power on as shown in Figure-2: Total Mileage, Trip Mileage A and Trip Mileage B

2012 08-07	12:20	
Total:	000 000	Km
TripA:	000.0	Km
TripB:	000.0	Km

Figure-2 Main interface

3.1.2The second interface display engine information, as shown in Figure -3.

Accumulated rotates and Engine running time.

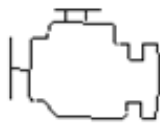
2012 08-07	12:20
	RV: 000 000 K*10 Tt : 000 000 Hr TA: 00 : 00 HM

Figure-3 Engine information

3.1.3 The third and the fourth interface display information of Fuel and Mileage as shown in Figure -4 and

Figure -5.


2012 08-07	12:20	
	00 00	L(%)
	00 00	Km
	00 . 0	L/100

Figure-4 Fuel and Mileage information


2012 08-07	12:20	
	0000000000 .0	L
	0000000000 .0	L

Figure-5 Fuel and Mileage information

3.1.4 The fifth interface display CNG and Catalyst. as shown in Figure-6

2012 08-07	12:20	
C N G	0000	Bar
CATALYST	000	%

Figure-6 CNG and CATALYST

3.1.5 The sixth display inside temperature, outside temperature and engine compartment temperature. as shown in Figure-7

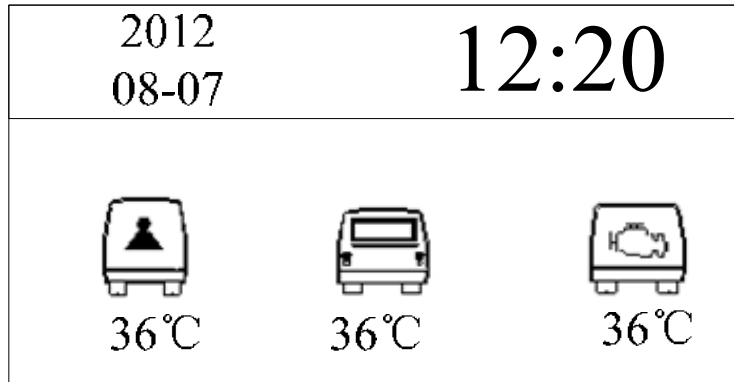


Figure-7 Car and Engine compartment temperature

3.1.6 The seventh, eighth, ninth, tenth and eleventh interface display ECM, TCM, ABS, AIR, Retarded information. as shown in Figure-8, 9, 10, 11, 12.

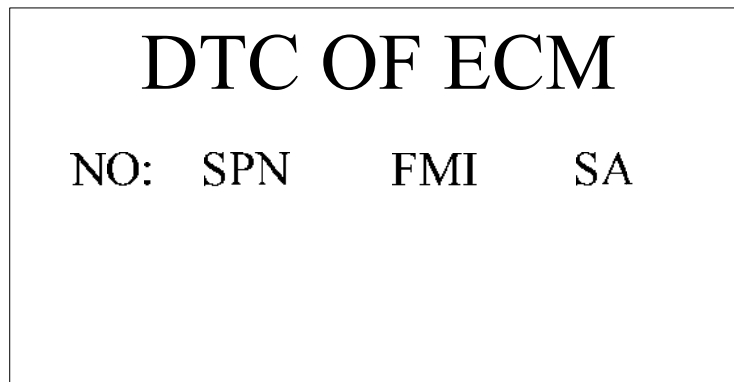


Figure-8 ECM Code

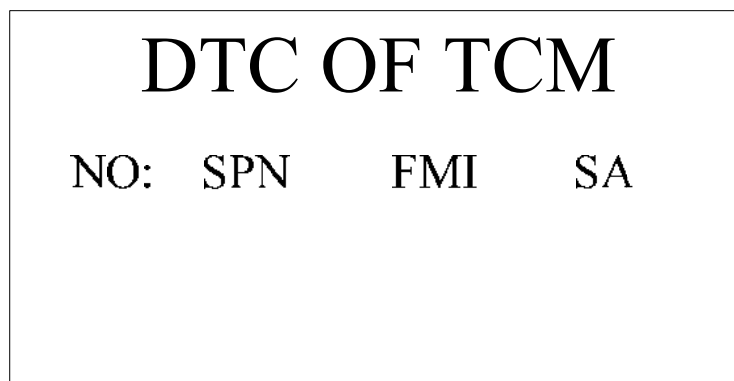


Figure-9 TCM Code

DTC OF ABS

NO: SPN FMI SA

Figure-10 ABS Code

DTC OF AIR

NO: SPN FMI SA

Figure-11 AIR Code

DTC OF RETARDER

NO: SPN FMI SA

Figure-12 Retarded Code

3.1.7 The thirteenth interface display online module. as shown in Figure-13.

MODULE

- | | | |
|---------------------------|---------------------------|--------------------------------------|
| <input type="radio"/> QKM | <input type="radio"/> ZKM | <input type="radio"/> DKM |
| <input type="radio"/> QDM | <input type="radio"/> HDM | <input checked="" type="radio"/> HKM |
| <input type="radio"/> QM | <input type="radio"/> HDK | <input type="radio"/> CGM |
| <input type="radio"/> TY1 | <input type="radio"/> TY2 | <input type="radio"/> TY3 |

Figure-13 Online Module

3.2 Dashboard Set

3.2.1 First, Press S1 go to set interface, Second, Press S2 and S3 flip the interface up or down.

Could Set Time、Set Backlight、Set VehPPK、Set MotPPR、Clear Trip A、Clear Trip B、ClearTA、Clear Oneway OC. as shown in Figure-14、15、16、17、18、19、20、21



Figure-14 Set Time

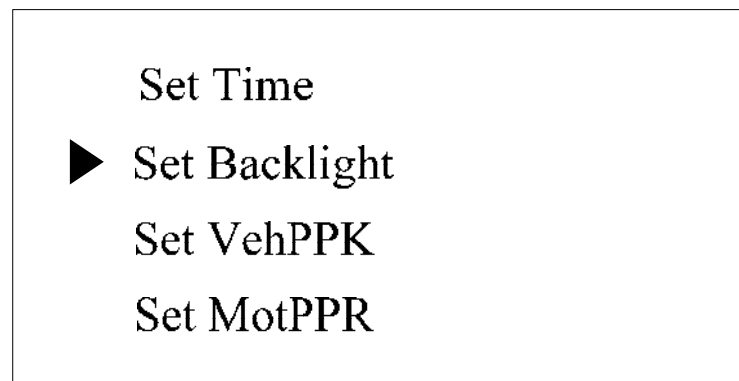


Figure-15 Set Backlight

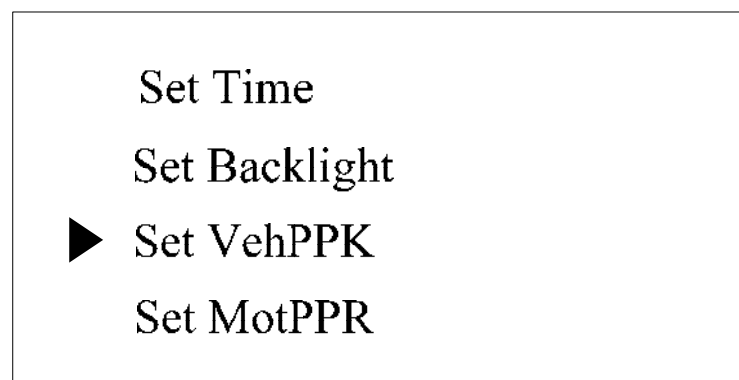


Figure-16 Set VehPPK

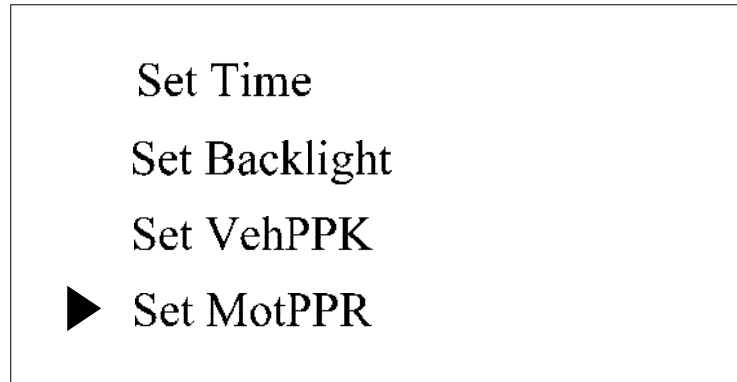


Figure-17 Set MotPPR



Figure-18 Clear Trip A

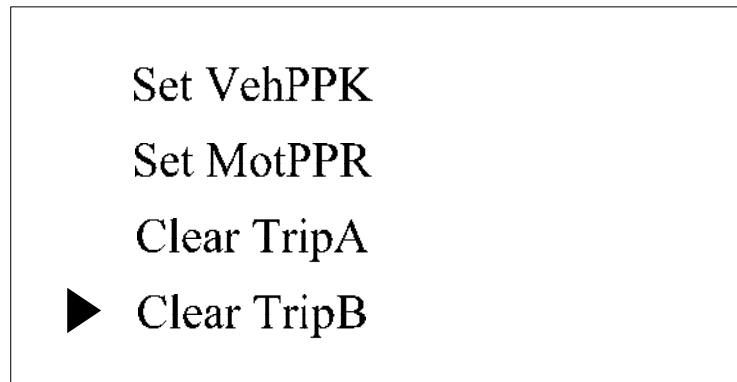


Figure-19 Clear Trip B

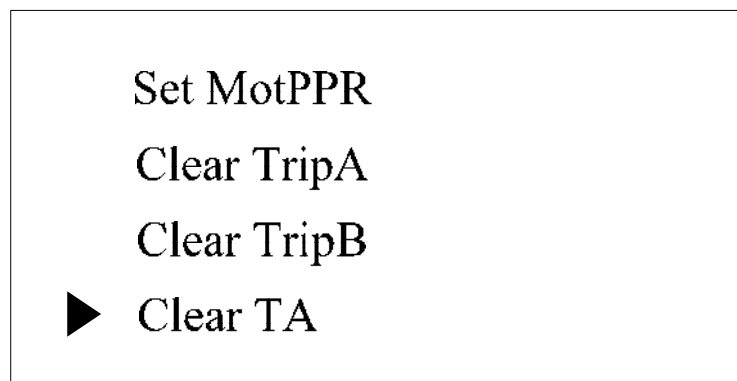


Figure-20 ClearTA

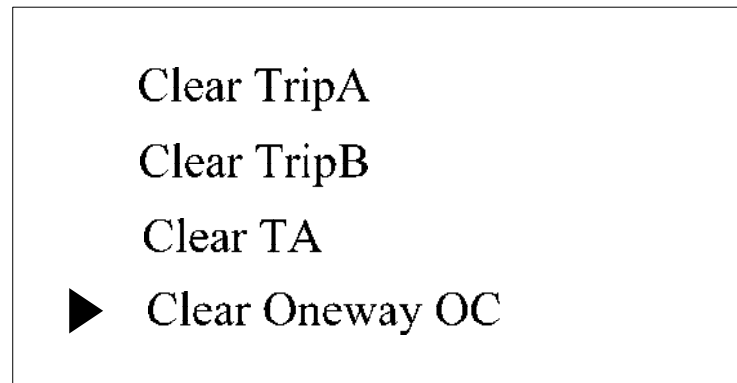


Figure-21 Clear Oneway OC

3.2.2 Set Time .First press S1 go to set interface, Second press S2 or S3 choose Set Time position as shown in Figure-14, Third press S1 go to Figure-22.

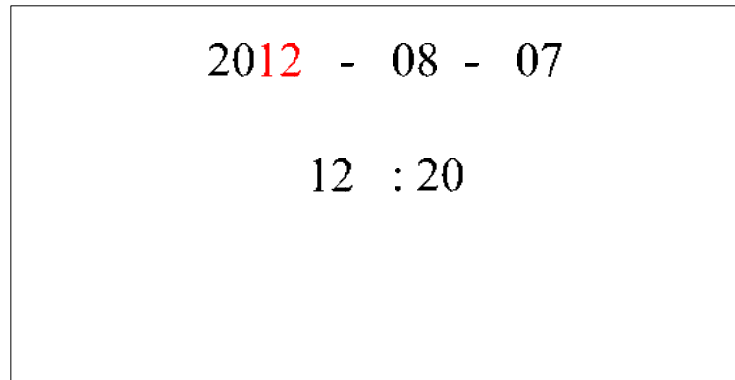


Figure-22 Set Year

Finally press S2 and S3 could increase or decrease years. After set year, could press S1 choose Month、Day、 Hour、 Minute as shown in Figure-23、 24、 25、 26.And press S2 and S3 could set Month、 Day、 Hour、 Minute. After Set press S4 two times return main interface.

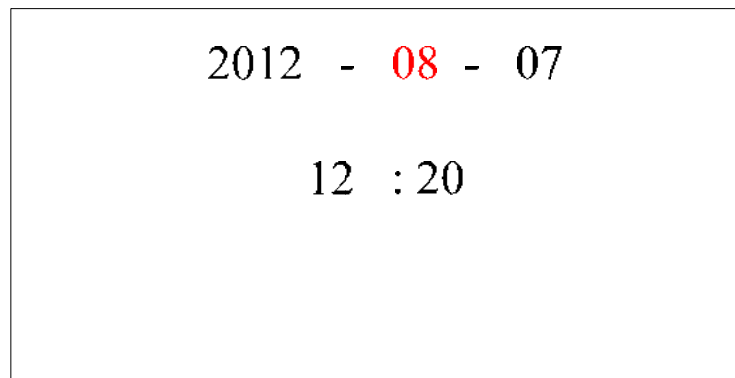


Figure-23 Set Month

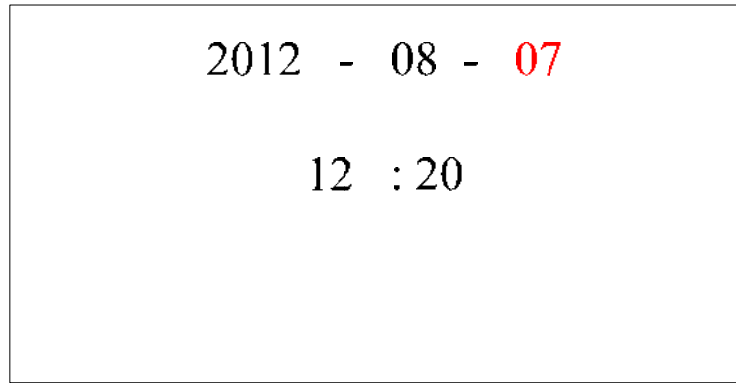


Figure-24 Set Day



Figure-25 Set Hour



Figure-26 Set Minute

3.2.3 Set Backlight. First press S1 go to set interface, Second press S2 or S3 choose Set Backlight position as shown in Figure-15, Third press S1 go to Figure-27.

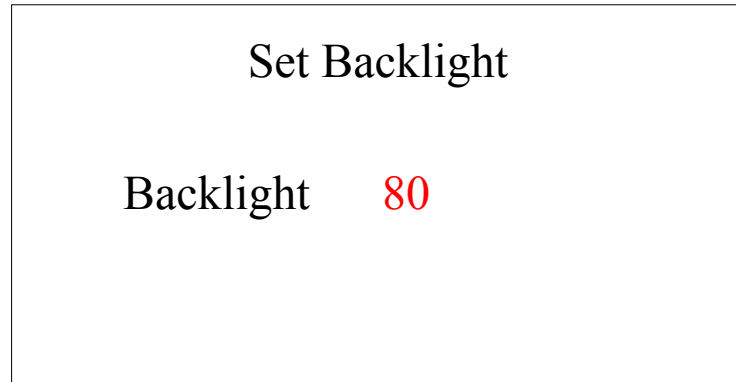


Figure-27 Set Backlight

Finally press S2 and S3 could increase or decrease backlight. After set backlight, press S4 two times return main interface.

3.2.4 Set VehPPK. First press S1 go to set interface, Second press S2 or S3 choose Set VehPPK position as shown in Figure-16, Third press S1 go to Figure-28.

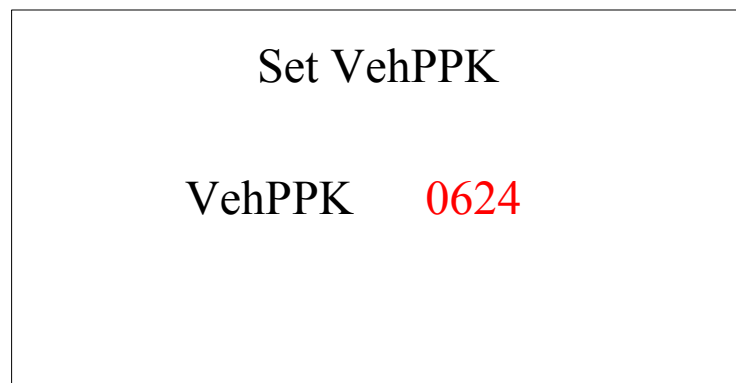


Figure-28 Set VehPPK

Finally press S2 and S3 could increase or decrease VehPPK. After set VehPPK, press S4 two times return main interface.

3.2.5 Set MotPPR. First press S1 go to set interface, Second press S2 or S3 choose Set MotPPR position as shown in Figure-17, Third press S1 go to Figure-29.

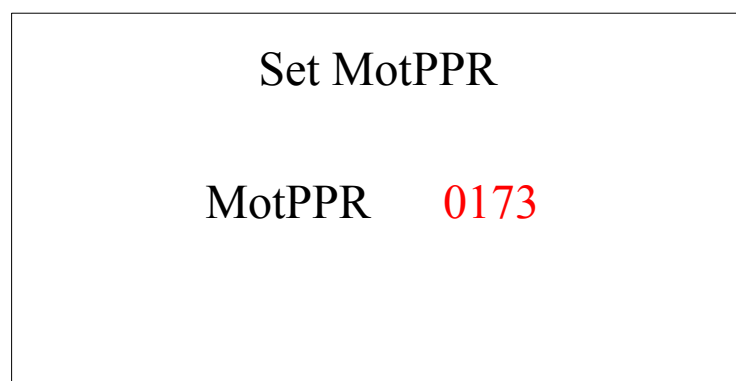


Figure-29 Set MotPPR

Finally press S2 and S3 could increase or decrease MotPPR. After set MotPPR, press S4 two times return main interface.

3.2.6 Clear Trip A. First press S1 go to set interface, Second press S2 or S3 choose Clear Trip A position as shown in Figure-18. Third press S1 clear Trip A and auto return main interface.

3.2.7 Clear Trip B. First press S1 go to set interface, Second press S2 or S3 choose Clear Trip B position as shown in Figure-19. Third press S1 clear Trip B and auto return main interface.

3.2.8 Clear TA. First press S1 go to set interface, Second press S2 or S3 choose Clear TA position as shown in Figure-20. Third press S1 clear TA and auto return main interface.











3.2.9 Clear One way OC. First press S1 go to set interface, Second press S2 or S3 choose Clear One way OC position as shown in Figure-21. Third press S1 clear One way OC and auto return main interface.







Appendix A ZB271M Dashboard Pin Definition

Table A Pin Definition			
Pin	Name	Color	Remark
1	VPP	Red	
2	GND	Black	
3	WAKE_UP1	Red	Connected to WAKE_UP2 inside
4	CANH1	Yellow	Connected to CANH2 inside
5	CANH2	Yellow	
6	CANL1	Green	Connected to CANL2 inside
7	CANL2	Green	
8	Empty		
9	Empty		
10	Empty		
11	WAKE_UP2	Red	
12	Empty		
13	Empty		



















14	Empty		
15	Empty		
16	Empty		
17	Empty		
18	Empty		
19	Empty		
20	Empty		
21	Empty		

Appendix B ZB271M Signal Bar instructions

Icon	Name	Color
	Left turn light	Green
	Right turn light	Green
	Front fog light	Green
	ABS	Yellow
	Rear fog light	Yellow
	Pre-heater	Yellow
	Alarm of oil pressure	Red
	Engine fault	Yellow
	High beam	Blue
R	Reverse	Red
	Alarm of gas pressure	Red

	Clearance Lamp	Green
ASR	Avoid side slide	Red
	Charge	Red
	Parking light	Red
	Low beam	Green
	Alarm of water temperature	Red
	Alarm of Fuel Low	Red

Appendix C ZB271M LCD Alarm instructions

Icon	Icon Name	Icon	Icon Name
	Front Door		Low Power
	Middle Door		Alarm of water level
	ECAS Fault		Concentrate lubrication
	Engine cabin temperature too high		Alarm of oil filter
	Lack water alarm of W.C		Alarm of oil filter
	Rear cabin door		Rear Door
	Left cabin door		Alarm of Retarded temperature
	Right cabin door		Fault of turn light
	Alarm of Oil Temperature		Alarm of ECAS





















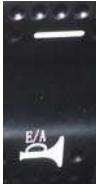






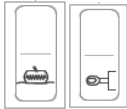

	Brake Light Fault	CRUISE	Cruise
	Safety Door		Brake Light
	Break Wear		Antifreeze controller









Illustration of switch and indicator

















Number of switches , indicators and their own positions may vary with the vehicle model and configuration state, please refer to the flowing sheet :

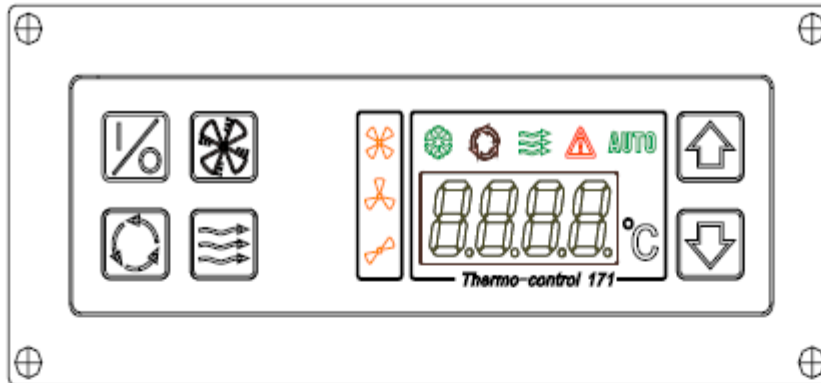
Switch	Name	Color	Function	Notes
	Retarder foot control function release switch	White	Pressed on up: foot control function is turned ON Pressed on bottom: foot control function is turned OFF	
	Daylight lamp	White	Pressed on top: interior lighting OFF Pressed on bottom: interior lighting ON	
	Hazard alarm lamp	Red	Pressed on bottom: all turning indication lamps will turn on	
	Luggage compartment lamp	White	Pressed on top: the luggage cabin lamp OFF Pressed on bottom: the luggage cabin lamp ON	
	Ventilator	White	Pressed on top: the ventilator is turned off Pressed on bottom: the ventilator is turned on	
	Front fog lamp	White	Pressed on top: the front fog lamp OFF Pressed on bottom: the front fog lamp ON	
	Rear fog lamp	White	Pressed on top: the rear fog lamp OFF Pressed on bottom: the rear fog lamp ON	
	Reading lamp	White	Pressed on top: the reading lamp OFF Pressed on bottom: the reading lamp ON	
	Front windshield defrosting switch	White	Pressed on top: turn off defrosting function Pressed on bottom: turn on defrosting function	

	<p style="text-align: center;">Vehicle body raise/lower switch</p>	<p style="text-align: center;">White</p>	<p>Pressed on top: the vehicle body raise Pressed on bottom: the vehicle body descend</p>	<p>only use this button when vehicle is stopping</p>
	<p style="text-align: center;">Kneeling/Restoration switch</p>	<p style="text-align: center;">White</p>	<p>Pressed on top: the vehicle will return to the normal height Pressed on bottom: the vehicle will kneel</p>	<p>Pressed the switch down only when the passengers get on or get off the vehicle</p>
	<p style="text-align: center;">ECAS 2th height switch</p>	<p style="text-align: center;">White</p>	<p>Pressed on top: the airbags will return to the standard height (I height) Pressed on bottom: the airbags will return to the second height (II height)</p>	<p>The switch should be pressed down only at bad road condition.</p>
	<p style="text-align: center;">Heating valve (water heating circulation solenoid valve) switch</p>	<p style="text-align: center;">White</p>	<p>Pressed on top: the valve is switched off Pressed on bottom: the valve is switched on</p>	
	<p style="text-align: center;">Heating radiator switch</p>	<p style="text-align: center;">White</p>	<p>Pressed on top: the radiator is switched off Pressed on bottom: the radiator is switched on</p>	
	<p style="text-align: center;">Fresh air ventilating switch</p>	<p style="text-align: center;">White</p>	<p>Pressed on top: the ventilation function is switched off Pressed on bottom: the ventilation function is switched on</p>	

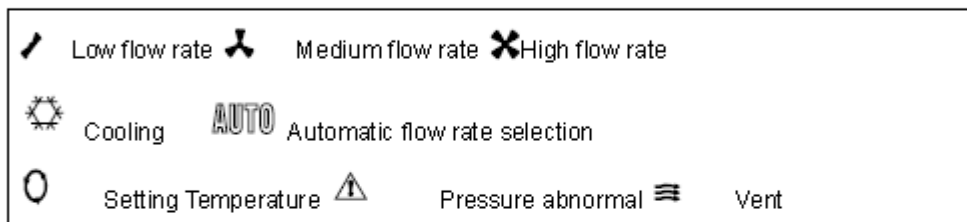
Switch	Name	Color	Function	Notes
	Horn	White	Pressed on top: the electric horn is turned on Pressed on bottom: the air horn is turned on	
	Emergency power switch	Red	Pressed on top: turn off the vehicle power Pressed on bottom: turn on the vehicle power	1) While only turn on the switch, could supply power only for 2 minutes; 2) Meanwhile, if also rotate the ignition key to ACC or ON shift, thus could supply power for long.
	Driver window defrosting switch	White	Pressed on top: the defrosting is turned off Pressed on bottom: the defrosting is turned on	
	Driver window raise/lower switch	White	Pressed on top: the window will raise Pressed on bottom: the window will descend	
	Front windshield sunshade switch	White	Pressed on top: the sunshade will be raised Pressed on bottom: the sunshade will be descended down	
	Disinfection function switch	White	Pressed on top: switch off the disinfection function Pressed on bottom: switch on the disinfection function	
	Rearview mirror defrosting switch	White	Pressed on top: turn off defrosting function; Pressed on bottom: turn on the defrosting function.	
	Front passenger door switch	White	Pressed on top: close the door Pressed on bottom: open the door	

	Rear passenger door switch	White	Pressed on top: close the door Pressed on bottom: open the door	
	Flip TV switch	White	Pressed on top: turned off the power, folded the TV Pressed on bottom: turned on the power, unfolded the TV	
	Engine cabin fire extinguisher switch	Red	Pressed down : extinguisher will be activated	The powder will be burst out and coated on engine cylinder block so as to block up flame and combustion. Don't test to press this button down at normal condition
	Reversal monitor switch	White	Pressed on top: turned off the reversal monitor power Pressed on bottom: turned on the reversal monitor power	
	Toilet power switch	White	Pressed on top: turned off the toilet power Pressed on bottom: turned on the toilet power	
	Engine Diagnose function switch	White	Pressed on top: turned off the engine diagnose function Pressed on bottom: turned on the engine diagnose function	
	Engine cruise function switch	White	Pressed on top: turned off the engine cruise function Pressed on bottom: turned on the engine cruise function	we advise clients not to use this switch
	Cruise set switch	White	Pressed on top: turned off the engine cruise set Pressed on bottom: turned on the engine cruise set	we advise clients not to use this switch

Indicator lamp	Color	Function
 	Red	Front passenger door opening alarm
	Red	Rear passenger door opening alarm
 	Yellow	Kneeling working indication
	Green	The 2th height state indication
 	Yellow	ECAS alarm indication
	Red	ECAS fault indication
 	White	Engine start indication
	Yellow	Exceeding emission standard indication
 	Yellow	Engine slight fault alarm
	White	Engine serious fault, engine stopped
 	Red	Transmission oil temperature too high alarm
	Red	Gearbox fault alarm
 	Green	Toilet water level two low indication
	Red	Toilet fault alarm
 	Green	Toilet occupancy indication
	Red	Request emergency help alarm

Air Conditioner (KING LONG A/C KL-XB3)
The introduction of control panel SK-17-1 (SK-17-1Y)
1. Control panel and functions



Introduction for the indicator





Button description


 Cooling switch



 Venting switch






 VENT/SET ——controlling the temperature inside the bus, and the ON/OFF of the fresh air venting.

 Flow rate switch——for high, medium and low speed of the blower. Press button

 for 2 seconds can switch ventilation or refrigeration.If switch ventilation, flow rate indicator light will glitter.

 UP and DOWN switch——adjust the temperature inside the bus, adjust the


 ON/OFF time for fresh air ventilation. Press  and , the LCD screen will display the

defrosting temperature. Press both  and  for 2 seconds, switch to automatic airflow rate function, press both  and  for 2 seconds again, stop automatic airflow rate function.
 LCD display —displaying the inside temperature of the bus.


2. Control panel operation

1) How to use the air conditioner

(1) Start the engine

(2) turn ON the cooling switch, push 

(3) set the suitable temperature—the setting temperature will be held automatically

(4) turn OFF the cooling switch, push  for one second.

(5) stop the unit

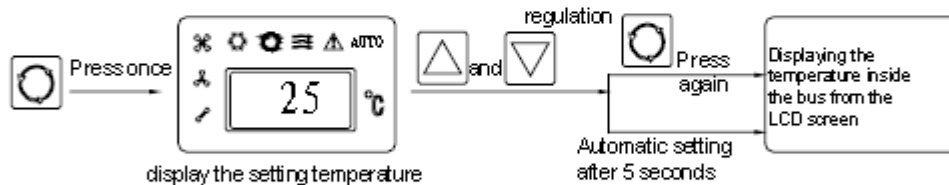
2) Temperature setting





COOLING—The system begins to cool if the set temperature is lower than the temperature inside the bus

—The system stops cooling if the set temperature is higher than (or equal to) the temperature inside the bus

3) Temperature controlling

For example: adjust the set temperature from 25°C to 20°C



The lamp of setting the temperature will light up when pressing the button of . The setting temperature will be displayed on the LCD screen. Adjust the temperature with the button of  and  to 20°C. Press the button of  after setting the temperature, the setting temperature light is off. Otherwise, the LCD screen will display the temperature inside the bus 5 seconds later.

Note:

the scope of setting temperature is from 15.0°C to 40.0°C



the scope of displayed temperature is from -40.0°C to 40.0°C

4) Flow rate selection



8) Strong cooling

This function of maintenance is used in the season which the air conditioner does not use (over 2°C inside of bus) . The goal is provide the lubricant to the shaft sealing ring by the pressure of the working compressor. Normally it works 10 minutes and once or twice every month.

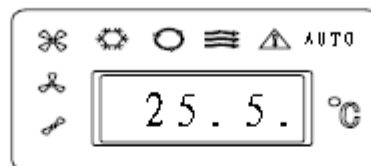
9) Operation of strong cooling

When the temperature setting is 15°C and press the button  for 5 seconds, the temperature setting indicator 2°C. After the strong cooling work for few seconds, the cooling  light up. The temperature setting turn back to 22°C when one cooling cycle finish.

10) Defrosting temperature

The LCD screen will display the defrosting temperature 1 or defrosting temperature 2 by pressing the button of  or .

11) The part below the LCD screen will flash when the defrosting function working.



Display the defrosting temperature

Note:


(1) The compressor (COMP) and the condenser (COND) fan will stop working and the evaporate (EVA) fan will run normally when the system defrosting.

(2) The operation of the defrosting is automatically Controlled. the defrosting operation begins to work when the temperature of the sensor is (ON) at -1°C and stops working (OFF) at 8°C.






12) Set the fresh air vent function



The LCD screen will display the Vent open (Vn) and the

setting time when the button  pressed for 5 seconds. The button pressed again to




show VF and the setting time. Adjust the setting time by pressing the button of  and

 to the setting time within 1—60min. (Generally the setting time is 10 minutes) . Press the button  for the confirming of the time setting, or the system will confirm the setting time automatically in 5 seconds. Adjust the setting time by the button  and  within 1—60min when the LCD screen display VF and the setting time. (Generally the setting time is 30 minutes) . Press the button  for the confirming of the time setting or the system will confirm the setting time automatically after 5 seconds.




Note:

Restart the (VENT) switch to carry out the new procedures after the setting. Otherwise, the previous setting will be carried out again. Only one parameter can be set for each time.

13). check the power.

Press the  10 seconds, it shows the air conditioner voltage. Press the , it shows the red line voltage of control panel. Press the , it shows the voltage of air conditioner generator (when the air conditioner is without generator, it only shows the red line voltage of control panel i.e. the voltage of vehicle generator.) If it isn't operation during this process, it will show the air return temperature after 5 seconds.

14). check and cleanup time

Press the  for 12 seconds, it shows the working time of air conditioner. During this process it isn't operation. After 5 seconds, it shows the air return inlet temperature. When the air conditioner is working, press the  and  for 2 seconds at the same time. It can be cleanup the time as 0.

Note:

the working time of air conditioner ,it can be calculated the time as hours since the low flow rate is beginning. That can be added up every working time of turn off the unit and control panel power off . It also can check and cleanup the working time at any alarm condition.

ERROR Information displayed on the LCD screen

Item	Display	Working Conditions
Returning air Temperature sensor	Sensor disconnection circuit : OPE.1 Sensor Short Circuit: SHr.1	The compressor and condensation blower stop Air conditioner continues to

		work
Defrosting Temperature Sensor	Sensor Open Circuit: OPE.2 Sensor Short Circuit: SHr.2 Sensor Open Circuit: OPE.3 Sensor Short Circuit: SHr.3	The compressor and condensation blower stop The compressor and condensation blower stop The compressor and condensation blower stop The compressor and condensation blower stop
COMPRESSOR	High Pressure Error: HPE.r Low Pressure Error: LPE.r	The compressor and condensation blower stop The compressor and condensation blower stop
POWER VOLTAGE	Voltage lower than DC 21V: L-E.r control power L = E.r generator electricity Voltage lower than DC 16V: L-E.r control power L = E.r generator electricity Voltage higher than DC 30V: L-E.r control power L = E.r generator electricity	Air conditioner stops cooling Air conditioner stops cooling Air conditioner stops working Air conditioner stops working Air conditioner stops working Air conditioner stops working

Notes of supply voltage alarm:

There are two power input of control panel and voltage detection.

The first one is control power red line of panel, it's running from provide power by the vehicle. Other one is the pink line of panel and power by the air conditioner generator. When the voltage is not normal work, the control panel will stop all the output. (high voltage alarm is $\geq 30V$ 、recover $28V$; low voltage alarm is $\leq 21V$ 、recover $23V$; low voltage alarm is $\leq 16V$ 、recover $18V$). The voltage alarm coefficient is $\pm 0.25V$.

Pre-heater Operation (Webasto)

1. General

The standard digital timer enables you to preset the start of the heater operation up to 7 days in advance.

It is possible to program 3 different starting times, only one of which can be activated.

The standard digital timer features a wakeup alarm function.

When the ignition switched on, the timer displays the current time and the day of the week.

When the heater is switched on, the display and the buttons are illuminated.

After the power supply has been connected, all symbols on the display will flash.

The current time and weekday must be set.

2. Operation

The timer can be operated in that all flashing symbols can be adjusted by means of the 10 and 9 buttons.

If the buttons are not pressed within 5 seconds, the time displayed will be stored.

If the 10 and 9 buttons are pressed for more than 2 seconds, the fast time-setting mode is activated.

If the ignition is switched off while the heater is operating in the continuous mode, the remaining operating time of 15 minutes is displayed and the heater continues to operate for this period of time.

3. Switch the heater on

Manually: by pressing the button 8 (continuous heating mode)

Automatically: by programming the heater starting time

4. Switch the heater off

Manually: by pressing the button 8

Automatically: after the programmed operating time has elapsed.

With the heater running: by programming the remaining operating time

5. Setting time/day of the week

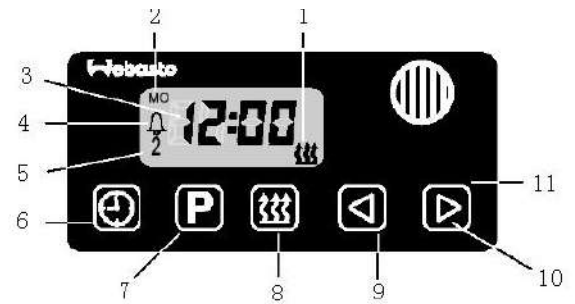
Press the 6 button for more than 2 seconds-time of the day if flashing-and set the clock using the 9 and 10 buttons. Day of the week is flashing – adjust the day of the week.

6. Viewing the time

With the ignition switched off: press the 6 button.

7. Programming heater starting time:

Standard Timer



heater “on” indicator
 day of the week
 time display
 memory location
 alarm indicator
 time
 program selection
 instant heating
 reverse
 forward
 panel

Press the 7 button – the memory location is flashing – using the 9 and 10 buttons set start of the heater operating time. Day of the week is flashing- set the day of the week. By repeatedly pressing the 6 button, memory locations 2 and 3 can be programmed or the time display mode can be reached.

8. Recalling/erasing preset times

Repeatedly press the 6 button until the desired memory location is displayed. To erase the preset time, press the 7 button several times until the time of the day is displayed instead of the memory.


9. Programming duration of operating time The heater must be switched off. Press the 9 button for 3 seconds – operating time is flashing – and set the desired operating time (10 to 120 minutes) using the 9 and 10 buttons.

10. Setting the remaining operating time



Set the desired remaining operating time (1 to 120 minutes) using the 9 and 10 buttons. The remaining operating time refers to the time the heater still continues to remain in operation and the ignition switched off.

11. Setting the wakeup time

A wakeup time can only be programmed on the standard digital timer. The wakeup time is not bound to a specific day of the week.

Repeatedly press the 7 button until the bell symbol  appears on the display. Set the desired wakeup time using the 9 and 10 buttons. The alarm clock turns off after 5 minutes or when one of the buttons is pressed.

12. Recalling/erasing the wakeup time

Repeatedly press the 7 button until the bell symbol  appears on the display – read off wakeup time. To erase the wakeup time: press the 7 button until the bell symbol  is no longer visible on the display.

13. remote control

Possible by means of an optional external “instant heating” button

14. Vehicles with ADR equipment

On ADR vehicles it is not possible to program a preset starting time. The remaining time is shown on the display while the heater is in operation. The clock can be set. The alarm clock function can be programmed on the standard digital timer.

NANFENG Panel Operation Description:



1 2 3 4 5

1. Heating panel power switch: while pressing the button 1, the panel lamps are turning on or turning off, meanwhile, the heating opened or closed.
2. MANUAL/AUTO mode setting : while pressing on the button 2, may change over different mode state, once in AUTO mode, the water valve would open automatically and keep heating for room as far as the room temperature is below the temperature value which the system was already pre-established in advance; once in MANUAL mode, the WATER VALVE lamp lit on, the water valve keep opening all the time..
3. Temperature setting : In MANUAL mode state, if intend to adjust the room temperature, may press button 4 or button 5 until your desirable temperature value, but your operation should be pressed on the button 3 simultaneously.

ZF GEARBOX 6HP604C OPERATION

1.1 Pushbutton

The vehicle is either equipped with a digital pushbutton or a CAN speed range selector switch.

Installation variants with 3, 4, 5 or 6 pushbuttons, installed horizontally or vertically:

- R** = Reverse
- N** = Neutral
- D** = Automatic forwards driving range (Drive)
- 1, 2, 3** = Limited forward driving ranges

1.1.1 Digital Speed Range Selector

- The button pressed is illuminated (continuously lit).
- The button pushed flashes if it is not accepted by the transmission control unit.



005624

Digital speed range selector, installed horizontally

1.1.2 CAN Speed Range Selector

Distinguishing features between CAN pushbutton and digital pushbutton speed range selector switches:

- Convex keys
- Neutral button does not lock
- ZF logo located on side of Neutral button



027768

027769

CAN speed range selector, installed horizontally

1.1.2.1 Lighting of the CAN Speed Range Selector

Button lighting colors:

- Neutral button: bernstein
- 1, 2, 3, D and R: yellow

All buttons light up **for approx. 1.2 s:**

- Lighting test at system startup

All keys **light up dimly:**

- Search lighting: To make it easier to find the buttons in the dark.

Individual buttons **light up brightly:**

- Function lighting: Identifies the active, pressed push-button.

Individual buttons **flashes:**

- The active (pushed) button flashes if it is not accepted by the transmission control unit.

All buttons **flash:**

- Serious internal fault in pushbutton
- Malfunction in CAN communication. Once this defect has been remedied, the light stops flashing.

Exceptions:

- If the transmission control unit is not providing the information required for lighting purposes, the lamps only light up in search mode. Nevertheless, the vehicle can still be driven in this status.
- The lighting is also deactivated if the pushbutton position can no longer be correctly established as a result of a hardware defect and the buttons only light up with search lighting.

NOTE

The brightness settings for search and function lighting can, if required, be adjusted independently. They are corrected as a function of operating voltage.

1.1.2.2 Pushbutton Settings

NOTE

If several buttons are selected at the same time, the smallest gear inhibit button selected is chosen.
e.g. if buttons 1, 2, 3 and D are selected at the same time, button 1 is activated.

1.2 Starting the Engine

Engine can only be started if:

- Vehicle is stationary (brake applied).
- Speed range selector is in Neutral position ("N")

NOTE

Starter inhibit: If the speed range selector is not in Neutral, the engine cannot be started.

CAUTION

**Only jump-start on the battery, never on the starter!
Ignition OFF/ON but not while vehicle is in motion!**

1.3 Selecting the Gear**Standard:**

- Speed range selector in Neutral
- Accelerator pedal at idle setting and $n_{eng} < 900$ rpm
- Select desired driving range or direction of travel.

CAUTION

Never actuate speed range selector and throttle at the same time!

Transmission with additional “gear release” function

(Additional installation by vehicle manufacturer, recommended by ZF)

- Speed range selector in Neutral
- Accelerator pedal at idle setting and $n_{eng} < 900$ rpm
- Select desired driving range and apply the brake. System only engages the appropriate gear while the brake is being applied.

Operator errors when engaging gear

- Accelerator pedal actuated or $n_{eng} > 900$ rpm
- If “gear enable” is installed, but brake not applied
- “R” direction of travel selected at a vehicle speed of $>$ approx. 3 km/h

After selecting the desired driving range, the system does not engage a gear.

Transmission with auxiliary function “2nd Reverse gear button”

- To reverse the vehicle, press the R button on the speed range selector and also the R button on the dashboard.

1.4 Setting Off

After selecting the appropriate speed range, wait for approx. 1 to 2 seconds, release brake (if applied) and accelerate.



DANGER!

On steep uphill gradients, always accelerate as soon as you release the brake! RISK OF ACCIDENT from vehicle rolling backwards!

CAUTION

Do not set off immediately at temperatures below -15 °C. Instead, allow engine to warm up for approx. 5 minutes. Speed range selector in Neutral.

1.5 Driving Ranges

Please refer to the vehicle's Operating Instructions for precise information about the gears engaged in each of the speed ranges.

A defined range of gears / ratios is assigned to each speed range. Shifts are only executed at shift points defined by the electronic shift control unit.

Manual intervention in the automatic shift sequence (shifting right through the speed ranges) is not advisable.

**DANGER!**

If the transmission is shifted into "N" while the vehicle is in motion, the powerflow between engine and output is interrupted. This prevents the engine brake and retarder from being able to operate.

Risk of accident! – Apply the brake!

For safety reasons, when faults occur in the electronic shift control unit or whenever there is a power failure, the transmission automatically selects "N".

1.5.1 Downhill Travel

When driving down steep gradients, depending on requirements, you should select setting 1, 2 or 3 on the speed range selector. This restricts upshifts.

**DANGER!**

In extreme cases, to protect the engine, the upshift inhibit is cancelled.

When this happens, it is possible for the transmission to shift up independently from the selected driving range to the highest gear. RISK OF ACCIDENT!

Note tachometer!

1.5.2 Downhill Travel

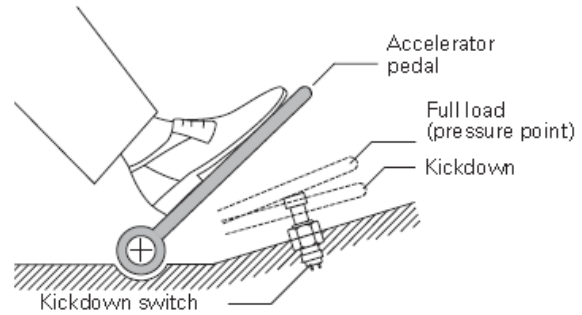
Before changing from Forwards to Reverse or vice versa:

- Vehicle stationary
- Accelerator pedal at idle setting and $n_{eng} < 900$ rpm
- Speed range selector in Neutral position, depress brake pedal if necessary
- Move speed range selector to D, 1, 2, 3 or R

1.5.3 Kickdown

To utilize max. engine power, higher shift points can be called up using the kick-down switch (see illustration) or the CAN system (to accelerate or to use the accelerator pedal on uphill gradients).

- Depress accelerator pedal beyond its full throttle pressure point (kickdown setting)



1.5.4 Retarder Operating Mode

The retarder is a ratio-dependent hydrodynamic brake which operates without mechanical wear. The retarder should be employed every time the brakes are applied. This extends the life of the service brake. The retarder can be activated by hand and/or using the foot controls.

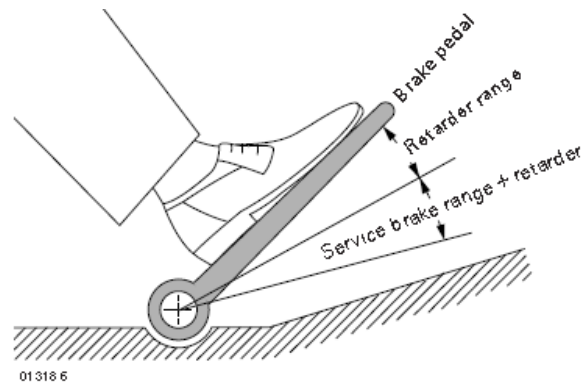
Conditions for retarder operation (retarder engaged/actuated)

- Accelerator pedal in idle speed setting
- A forwards gear must be engaged
- Vehicle speed > approx. 3 km/h

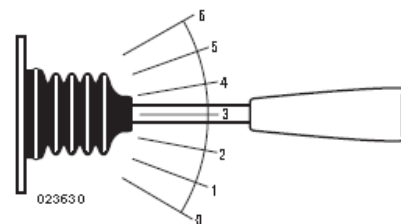
If these conditions are met, the system prevents upshifts (upshift inhibit).

CAUTION

If the accelerator pedal is actuated, the retarder disengages. The upshift inhibit is cancelled.



01318 6



The retarder is disengaged automatically by the electronic shift controller:

- When "ABS is active".
- Whenever the permitted oil temperature is exceeded, as

Defined in Section 1.9

If a retarder ON-OFF switch is fitted, the retarder must be switched off:

- On icy roads.
- Whenever the permitted oil temperature is exceeded, as

Defined in Section 1.9

The max. permitted oil temperature for retarder operation is 150 °C (max. 5 mins).

Note temperature indicator or temperature warning,

Refer to Section 1.8 or vehicle manufacturer's Operating Instructions

- Retarder activation using foot pedal, de-activation using toggle switch on dashboard.
- Switch off hand lever whenever the brake has been applied!

**DANGER!**

The retarder is feedback-controlled by a specified temperature characteristics curve.

Risk of accident due to reduced braking power!

1.6 Stopping, Parking

NOTE

Only apply the parking brake when vehicle is stationary.

Stopping

The vehicle can be stopped at any time, regardless of the setting of the speed range selector. The electronic shift control unit then engages the appropriate gear for setting off.

With short stops:

- Speed range can remain selected
- Apply brake

At extended stops:

- Speed range selector in Neutral
- Apply brake

Transmission with special “Bus Stop Neutral” (NBS) feature

The transmission automatically selects Neutral when the following conditions are in place simultaneously:

- Vehicle stationary
- Brake applied
- Accelerator pedal in idle speed setting

The range selected with the speed range selector is then retained.

As soon as one of the three conditions ceases to apply, 1st gear is selected immediately and automatically.

Parking

- Speed range selector in Neutral
- Apply parking brake

**DANGER !**

Before leaving the vehicle, always apply the parking brake. When the engine is switched off, there is no direct connection between engine and axle. The vehicle can therefore start to roll!

1.7 Towing**1.7.1 Towing Away Vehicle with Operational Transmission**

- Speed range selector in Neutral
- Max. towing time: 2 hours
- Max. towing speed:
City and intercity buses: 25 km/h
Coaches: 35 km/h

NOTE

At an ambient temperature of less than -15 °C the towing speed is 5 km/h.

1.7.2 Towing a Vehicle with Suspected Transmission Damage

CAUTION

If transmission damage is suspected, the propshaft flange between transmission and drive shaft needs to be disconnected.

Exception: In a dangerous situation, towing is permitted until the vehicle leaves the immediate danger area (e.g. road junction/intersection, tunnel etc.), without first disconnecting the driveline.

1.8 Temperature Monitoring

Monitoring of transmission temperature is performed by the ECU 146/147 electronic shift controller. The oil sump temperature and oil temperature at the retarder outlet are transmitted by CAN to the vehicle control unit.

For customers with no access to these CAN messages, temperature sensor A6 and temperature indicator A5 deliver the corresponding retarder outlet temperature

The switch point for the warning contact on the temperature display unit is 145 °C.

1.9 Limit Values for Oil Temperature

1.9.1 Transmission Oil Temperature Before Heat Exchanger

During retarder operation:

- In exceptional cases, short periods of operation (max. 5 mins. within a 1 hour period) at 150 °C are permissible.

During torque converter operation:

- The temperature limit for continuous operation is 110 °C.
- In exceptional cases, short periods of operation (max. 5 mins. within a 1 hour period) at 130 °C are permissible.

During normal driving:

- The permitted temperature range is between 90 - 100 °C.

1.9.2 Oil Temperature in Transmission Oil Sump

The following sump temperatures must not be exceeded (not even at high ambient temperatures):

Transmission oil sump temperatures Ecomat 4

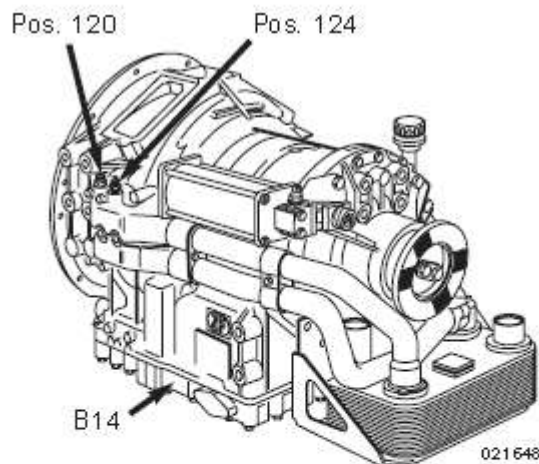
Operating temperature or endurance temperature	① max 100 °C	② max 105 °C
--	--------------------	--------------------

Exception: max. 5 mins. within 1 hour	105 °C	115 °C
--	--------	--------

- ① with oil acc. to List of Lubricants: TE-ML 14A / B / C / E
- ② with oil acc. to List of Lubricants: TE-ML 14 E

NOTE

80° angle drive with axial offset is not approved for endurance sump temperatures of 105 °C!



B14: Temperature sensor in transmission sump

Pos 120/124: Temperature sensor on retarder outlet (B4) or temperature sensor (A6) for temperature indicator (A5) see Section 1.2 ZF-Ecomat 4 System Solution

1.9.3 Actions to be Taken When the Relevant Permissible Oil Temperature is Exceeded

- Driving at partial load
- Switch off retarder

If this does NOT cause the oil temperature to drop:

- Stop the vehicle
- Speed range selector in Neutral
- Run engine at raised idle speed

NOTE

If the temperature does not drop back into its permitted range within a few minutes, **the possible causes are:**

- Oil level too low or too high
- Contaminated heat exchange in vehicle
- Coolant circuit defective
- Transmission damage

Inform ZF Service Center without delay!

1.10 Status Monitoring/Warning Lamps

The diagnostics system of the electronic shift control unit ECU 146/147 monitors the transmission status every time the vehicle circuit is switched on and continuously while the vehicle is in motion.

Warning lamps

Faults are displayed by warning lamps lighting up (red or yellow) and by warning messages which appear on the driver's display panel (refer to the vehicle manufacturer's Operating Instructions).

If a selected gear or speed range is not accepted by the ECU, the button pressed on the speed range selector starts to flash.

1.11 Transmission Response to a Malfunction

To protect the transmission in the event of a malfunction, the following responses are provided:

Shift into Neutral:

In the event of major malfunctions in the power supply to the transmission, e.g. short circuit.

Shift into Limp-Home Mode:

If there is an interruption to CAN communication or a loss of shaft speed information.

**DANGER!**

If a malfunction occurs in the transmission system, the following applies:

- **Greatest danger of transmission damage**
- **Restricted system monitoring**

RISK OF ACCIDENT!

1.11.1 Limp-Home Mode

The ECU is set up with specific time and pressure settings for pressure control in limp-home mode. Please also note that:

- The retarder function is not available
- The "Bus Stop Neutral" (NBS) function is not available
- The engine brake cannot be activated
- "Torque converter lock-up clutch" (WK) is open
- Engine torque is limited to protect the transmission (no engine management)

1.12 Auxiliary Control Unit

This auxiliary control unit was developed to help with moving the vehicle during the production process and to act as a limp-home facility in the event of ECU failure.

Auxiliary control unit HST 46

The HST 46 auxiliary control unit is fitted to the 68-pin connector instead of the ECU 145/147-pin connector. This allows the driver to select one forwards and one reverse gear. Gear shifts whilst driving are no longer possible.

NOTE

Auxiliary control unit not available with the ECU 146/147 and CAN pushbutton combination.

1.12.1 Operating Instructions for the Auxiliary Control Unit

- Apply parking brake to prevent vehicle from rolling accidentally.
- Speed range selector is in "N" position.
- Switch off engine and ignition.
- Remove connector from electronic shift controller.
- Connect plug to HST 46 auxiliary control unit and secure.
- Start engine.
- Engage gear on pushbutton:

Shift setting "N" = Neutral

Shift setting "D" = Drive (forwards gear is engaged, no upshifts or downshifts occur)

Shift setting "R" = Reverse

**DANGER!**

When operating via the auxiliary control unit, none of the safety functions are enabled.

RISK OF ACCIDENT!

The following points must therefore be taken into account at all times:

- **Shifting from "N" to "D" or from "N" to "R" only ever at idle speed and with the vehicle stationary. The transmission can also change gear at higher shaft speeds – but this can lead to transmission damage.**
 - **Before every change from forwards to reverse travel or vice versa, always ensure that the vehicle is completely stationary.**
 - **After shifting into "D" or "R", always wait for 2 seconds to enable the transmission to engage before starting to accelerate.**
-

WABCO ABS BASIC INTRODUCTION

1. Introduction

Anti-lock Braking Systems (ABS) or - to use another common term - automatic anti-lock systems - are used to prevent a vehicle's wheel from locking as a result of excessive operation of the service brake, especially on a slippery road surface. Thus lateral control on the wheels being braked is maintained even at full brake application or in panic braking situations to ensure the cornering stability and steerability of a vehicle or a tractor-trailer combination to the greatest possible physical extent.

At the same time, the objective is to optimize the utilization of the available adhesion coefficient between tyres and the road surface and thus vehicle retardation and stopping distance.

High-performance ABS for commercial vehicles was first introduced at the end of 1981 by Mercedes-Benz and WABCO after elementary systems had been used in the USA from the mid 70s.

System design and control principles of this 4-channel system with individual wheel control (4 sensors - 4 modulators, called **4S/4M** below) were subsequently highly successful in the European market for commercial vehicles and became the basis for a world-wide standard for all commercial vehicles with power brakes.

ABS and ASR have proved their value as 4- and 6-channel systems in commercial vehicles. The reliability of systems and components from series production is excellent, in spite of their complexity. The de-

mand is rising not only in Germany and Europe or Israel and Australia, but also in the USA and in Japan.

As is generally known, the EEC and other legal requirements demand automatic anti-lock braking systems for certain types of commercial vehicles.

It is these provisions and measures which have resulted in the even more widespread use of ABS and in greater numbers being produced; this in turn has allowed cost reductions to be implemented, in spite of keen competition. WABCO has now developed the 4th generation of ABS and ABS/ASR. The D-generation offers different variants in the form of modular system designs.

These are based on state-of-the-art electronics technology with high-performance micro computers, including data storage, and take into account recent diagnostic principles. The 4- and 6-channel ABS/ASR systems for commercial vehicles offer various interfaces for working together with electronic engine control systems and the optimal use of an integrated speed limiting facility. Special functions for both ABS and ASR operation are available for selection in off-road operations.

This document describes the basic elements and the operation, the design and the system configurations of these anti-lock systems for commercial vehicles. The subject of drive-slip control (ASR) is mentioned only briefly in the section on system functions.

2. System functions

2.1 Description of an ABS control cycle

In case of impending wheel lock, the brake pressure of the corresponding wheel will be decreased, held during expected or measured wheel re-acceleration and subsequently increased in steps after re-acceleration. The cycle is started again if the brake force is still too high for the actual friction level (adhesion).

Rear axle wheels are subject to individual control (IR), front axle wheels are subject to **Modified Individual Regulation (MIR)**.

of the wheel. For this reason the brake pressure is quickly reduced and so wheel deceleration decreases. The time taken for wheel deceleration is determined by the hysteresis of the wheel brake and by the characteristic of the $\mu-\lambda$ slip curve in the unstable region.

Only after the wheel brake hysteresis has been overcome a continued reduction in pressure leads to a decrease in wheel deceleration.

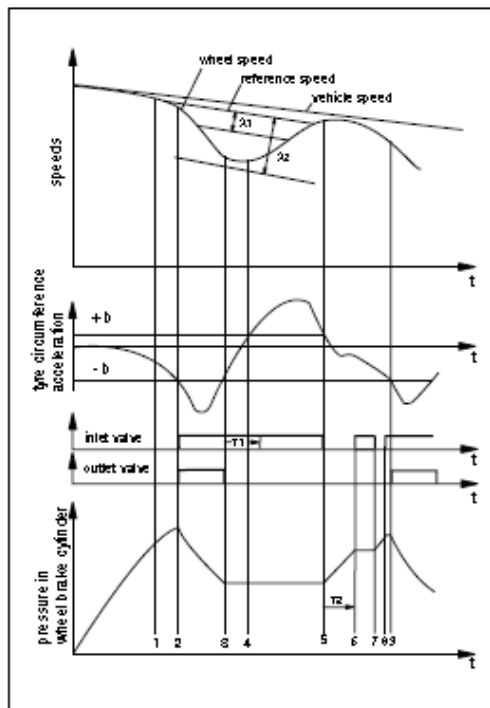


Fig. 1

The deceleration threshold $-b$ is exceeded at point 2. The wheel now moves into the unstable region of the $\mu-\lambda$ slip curve at which point the wheel has reached its maximum braking force and any further increase in braking torque does not achieve any further deceleration of the vehicle but merely deceleration

Fig. 1 shows an example of a control cycle with the most important control variables, wheel deceleration threshold $-b$, wheel acceleration threshold $+b$ and slip thresholds λ_1 and λ_2 .

As the brake pressure increases, the wheel is progressively decelerated. At point 1 wheel deceleration exceeds a value that can not physically be exceeded by vehicle deceleration. The reference speed, which up to this point had been the same as the wheel speed, now diverges and is reduced according to a fictitious vehicle retardation from point 2 (exceeding the $-b$ threshold) with a slower deceleration.

At point 3 the wheel deceleration signal $-b$ drops below the threshold and the brake pressure is held at a constant level for a set time T_1 .

Normally, wheel acceleration will exceed the acceleration threshold $+b$ within this set time (point 4). As long as this threshold is exceeded, the brake pressure is kept constant. If (for example on a low-friction surface) the $+b$ signal is not generated within time T_1 , the brake pressure is further decreased by slip signal λ_1 . During this control phase the higher slip threshold λ_2 is not reached.

At point 5, the curve falls below the threshold $+b$. The wheel is now in the stable region of the $\mu-\lambda$ slip curve.

Brake pressure is now rapidly applied for time T_2 to overcome the brake hysteresis. The time T_2 is fixed for the first control cycle and then recalculated for each subsequent control cycle. After the initial rapid phase, brake pressure is then increased more gradually by "pulses", by alternating pressure hold and pressure increase.

The basic logic demonstrated in this example is not fixed at all; it adapts to the corresponding dynamic response of the wheel to varying coefficients of friction, i.e. it implements an adaptive type of system control.

All threshold values depend on several different parameters, such as driving speed, vehicle deceleration, etc.

The number of control cycles results from the dynamic response of the overall control system composed of the ABS-control - the wheel brake - the wheel - the road. Here, the frictional connection is of vital importance. In general, 3 to 5 cycles per second are performed, but significantly fewer on wet ice.

If an engine brake / retarder is used during an ABS control cycle, it is switched on or off by the ECU. For the purpose of front axle Modified Individual Control (MIR), the system compares the front wheel signals and modulates the pressure for both front wheel brakes. If, for example, control is activated on a front wheel

on a road surface with partially lower adhesion, the other wheel channel regulates the brake pressure so that pressure differences are built up (slowly, in graduated steps) to a limited maximum value.

In the event of a 4S/3M -or 6S/3M configuration being used, there is only one modulator on the front axle. The wheel locking first takes over ABS control of this axle. This results in a control process similar to Select Low which is called Modified Axle Control (**MAR**).

On 6x4 or 6x2 vehicles with a 6S/4M system, the same philosophy is used on the two rear wheels of one side which are controlled by one modulator. This type of system is called Modified Side Control (**MSR**).

2.1.1 Off-road ABS

The off-road mode can be used to allow more brake slip (temporary wheel lock) for braking on special surfaces. ECE R13 Supplement No.7 requires the off-road ABS function to be reset as soon as the ignition is switched on again.

The vehicle manufacturer decides, according to vehicle type and application, whether this switch is fitted or not. Off-Road ABS disables ABS control at vehicle speeds of less than 15 km/h and allows greater brake slip up to 40 km/h. At speeds above 40 km/h there is no modification to ABS control.

The mode selected is indicated to the driver by the warning lamp (WV) which will flash slowly unless other events result in a permanently lit warning lamp. The speed ranges and the warning light function can be altered via parameter settings. The vehicle manufacturer has to record in the driver's handbook that the off-road mode may not be used in ordinary road traffic because the vehicle might not meet the requirements of ECE 13 Cat.1 in these circumstances.

2.2 ASR

In addition to ABS control, trucks and buses can be equipped with an Anti Spin Regulation ASR, also known as drive-slip control. ASR reduces the amount of wheel spin (drive slip). The philosophy of ASR is based on keeping the slip of spinning drive wheels compared to the non-driven front wheels within a range providing the best possible traction and stability.

Depending on the road conditions ASR will start engine and/or brake control, if excessive wheel slip has been detected. On a homogeneous road surface, control is mainly achieved by reducing the speed of the engine, and differential brake control will be limited to synchronizing the wheels. If μ -split conditions apply, differential brake control will put pressure only to the brake cylinders of the wheel which is spinning. The engine torque is thus transferred to the other wheel.

Engine control will not commence until both wheels spin or the slip of the spinning wheel exceeds a certain threshold. During differential brake control, the pressure is supplied by way of actuation of the differential brake valve. The brake

pressure of the wheel which is spinning is controlled by the corresponding ABS solenoid control valve.

To prevent pressure building up in the brake chamber for the driving wheel which is not spinning, the ABS solenoid control valve of this wheel will cut off brake pressure. This cut-off function is also available for the Z-axis modulators of a 6-channel system or optionally for a separate solenoid valve in case of a 4-channel system on a 6x2 vehicle. To prevent the foundation brake from overheating, the differential brake threshold is subject to a linear increase at vehicle speeds over 35 km/h, thus increasingly controlling slip by means of slowing the engine speed. When the vehicle's speed exceeds 50 km/h, differential brake control will not commence although any brake control in process will continue.

ASR for 6x4 vehicles with a 6S/4M or 6S/6M system takes the speeds and accelerations of both wheels of one side into account. In comparison to a 4S/4M system, this system is able to avoid spinning or locking of the driving wheels which have no sensors.

2.2.1 Traction mode

In deep snow or comparable conditions the traction can be increased by activating a special mode. By temporarily pushing the traction mode button for at least 150 milliseconds, the ECU switches to a type of ASR control with different thresholds and different engine/differential

brake distribution to allow higher slip ratios. Depending on the parameters set on the ECU, an ordinary switch may be used for this purpose. Activation of the ASR traction mode is confirmed by slow flashing of the ASR lamp to inform the driver that vehicle's stability might be impaired.

2.3 Speed limiter with proportional valve

The auxiliary output can be used for limiting the speed using a proportional valve and an ASR operating cylinder. These components actuate an injection pump and consequently modulate the speed of the vehicle.

An idle stop cylinder is needed for certain single-lever injection pumps.

The speed limiter meets ECE requirements. The speed limiting value is part of the parameter record and is stored in the EEPROM. The standard parameter record has a default speed limiting value set to 160 km/h

This value can be changed via the diagnostic interface. The minimum

value is 20 km/h For vehicles with non-synchronized gearboxes, the neutral position has to be allocated to the related input or additional equipment is necessary.

A second speed limiting value can be defined as part of the procedure for setting the parameters (lowest speed setting). When the speed setting switch is actuated, the current speed is stored and compared to the parameter value for the speed setting. The vehicle's speed is limited to the higher of the two values as long as the speed setting switch is actuated.

The signal from a tachograph which is connected to the C3/B7 input port

is required to give off between 2,400 and 24,000 pulses per kilometre. Suitable appliances are, for instance, the KIENZLE tachographs 1314 or 1318.

The ECU checks the input signal for plausibility and signalling errors. Any error is indicated by the warning lamp or ASR lamp if the vehicle is moving at a speed faster than 3 km/h

If no C3 signal is available, the wheel speed signals from the ABS/ASR system are used to limit the speed (does not comply with EC regulations!).

ECAS System Introduction

1. System introduction

The name ECAS stands for Electronically Controlled Air Suspension.

ECAS is an electronically controlled air suspension system with a large number of functions.

Air suspension systems have been used in motor vehicles since the mid 50s especially in buses. Air suspension systems are used in them as a standard and are increasingly being used in trucks and trailers. The advantages of air suspension over mechanical suspension (steel springs) are listed below:

- Increase in ride comfort due to lower spring rate and low natural frequency
- constant vehicle height irrespective of the load
- precise load-dependent activation of the brakes through use of the air bellows pressure as control pressure for the proportioning valve
- Kneeling function (lowering of one side of the vehicle to facilitate entry and exit)

The control system was initially designed with pure mechanically operating leveling valves, soon afterwards electromechanical control systems were developed. This served to enhance ease of operation and to facilitate raising/lowering processes.

ECAS is the most advanced development in this direction. Using electronic control units enabled decisive improvements in the conventional system; it enabled many functions for the first time ever:

- Reduction of the air consumption none while the vehicle is moving. Air savings of approximately 25 % were determined using ECAS compared to a conventional air suspension system in low-floor buses for scheduled route services.
- High speed of all control processes due to large valve cross-sections (nominal size 7 per air bellows).
- Easy installation. Only one air line is required from the solenoid valve block to each bellows and one to the storage tank.
- Raising/ lowering function and kneeling conform to the legal requirements
- High system flexibility for different kneeling types
- Extensive safety concept, error storage and diagnostics capabilities.

In mechanically controlled air suspension systems, the device that measures the level also controls the air spring. With ECAS, an electronic system takes over

control, regulating the air springs by means of solenoid valves informed by measured values from sensors.

Apart from controlling the normal level, the electronic unit also covers control of the other functions: working together with control switches and sensors for the tyre deflection compensation, the ECU achieve this without the need for numerous additional valves required by conventional air suspension control.

ECAS at different configuration levels can be fitted in various bus types.

The ECAS system in a bus consists of the following components:

- an ECAS electronic unit (ECU)
- a solenoid valve (solo vehicle)
- 3 distance sensors
- optionally 1 pressure sensor
- Operating switches
- Sidewalk detector

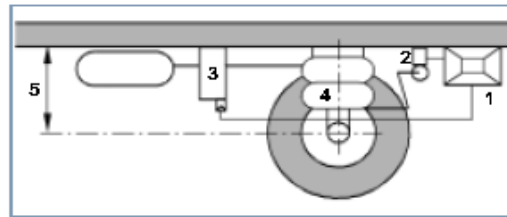


Abb. Example ECAS base system

- 1 ECU (electronics)
- 2 Distance sensor
- 3 Solenoid valve
- 4 Air-suspension bellows
- 5 Distance body/axle

ECAS with CAN bus

The most recent generation of the ECAS systems has CAN bus capability. Here the electronic systems are networked by means of a CAN bus and information is transmitted via SAE-CAN identifiers.

The CAN Bus (Controller Area Network) is a serial databus system, which was developed for networking controllers in automobiles with the aim to reduce cable harnesses. Instead of using an electrical circuit for each transmitted signal, the 'bus' is based on a communication platform which regulates the relaying of messages between several devices.

The Flexibly Programmable Controls serve as an interface to provide each individual system a precise process I/O image, i.e. information on the inputs and outputs in the overall system, via a CAN data bus.

One of these SUB-CAN BUS systems is the CAN-BUS 'IES'. The ENR (ECAS) and various other systems, such as the electronic brake system EBS, are currently connected to it.

The systems are connected to their sub-systems via a system bus. The ECAS system is integrated in a vehicle system based on the CAN-BUS to ISO 11898.

The electronics provide the connection with the vehicle electrics via a CAN data bus and via separate inputs and outputs.

When this highly standardised technology was introduced, the vehicle manufacturers specified that the system suppliers are responsible for the systems.

2.1 System configuration

ECAS has a modular structure to ensure that different vehicle types can be equipped with the system. The choice of system components to be used is determined by what is required of the system.

With the most basic configuration level, only one axle is equipped with the ECAS air suspension and only one height sensor monitors the body height. With this configuration, the support bellows of a tandem axle can be interconnected.

However, if the body is to be kept parallel to the axle even when the load is distributed unevenly in the vehicle, it is necessary to arrange distance sensors on both sides and to control the support bellows of the axle or tandem axle by separate solenoid valves.

A vehicle with full air suspension is usually equipped with three distance sensors. The front axle, for example, has one distance sensor and the rear axle has two in this configuration.

Vehicles are also equipped with four distance sensors however. This applies mainly to vehicles with independent wheel suspension. With two front distance sensors it is possible to implement cornering detection and ESAC. The mean value from the two distance sensor signals is used for ECAS control.

The two bellows of the axes with only one distance sensor are interconnected by a restrictor to enable pressure equalisation. During brief changes in the direction of travel however, this restrictor prevents rapid pressure equalisation. This prevents exhaust of the bellows on the outermost side of the curve, thereby reducing tilt of the vehicle against the curve direction. If cornering is detected, automatic level correction is interrupted or is not started. This prevents correction of any rolling movements of the vehicle body occurring at this moment. The transverse restrictor is deactivated analogous to deactivation during kneeling. Calculation of this lateral acceleration is based on the front wheel speed information that is transmitted from the EBS to the ECAS-ECU via the CAN-BUS.

In an articulated bus the axle of the trailer section is equipped with two additional distance sensors and its own control electronics.

A further breakdown of possible system configurations, illustrated by a circuit diagram and part numbers, is provided in the appendix.

Pressure test connections

The support bellows should be fitted with pressure test connections so that the control pressure of the LSV can be measured when testing the braking system.

These test connections also provide a makeshift solution for filling the support bellows in the event of a fault in the air suspension system. With the assistance of a tyre inflation hose, the vehicle can usually be driven to the workshop under its own power.

3. System function

Although ECAS offers a wide range of functions, not all of them need to be implemented in any given system. The respective vehicle manufacturer is responsible for the system configuration and for setting all the parameters, both of which must never be changed without prior consent from the manufacturer.

3.1 Functions of the ECAS-ECU

3.1.1 Controlling the nominal level

Nominal level control is the basic function of ECAS. The continuous comparison of the actual values supplied by the distance sensors with the nominal values stored in the ECU keeps ECAS permanently informed of the vehicle's current ride height. If deviations exceed a certain tolerance range, solenoid valves are triggered and the actual level is adjusted to the nominal level by means of air intake or air exhaust of the air suspension bellows.

Unlike with conventional air suspension, the ride height is not only adjusted to the vehicle's normal level but any other preselected level. This means any level level that was set is maintained regardless of the number of passengers who get on or off the bus.

In the event of greater level changes, the solenoid valves are pulsed (CAN II), shortly before the nominal level is reached, relative to the lifting speed and the distance to nominal level in order to prevent overshooting.

All control processes can be executed in parallel on the different axles (front and rear axle simultaneously) within the tolerance limits.

3.1.2 Normal level 1/2/3

Normal level 1 is the level that was defined by the vehicle manufacturer for normal driving. The normal level 1 determines the ride comfort, road safety and body height, which must comply with the legally prescribed limits.

Normal level 2 is level that deviates from normal level 1 as an adjustment to special driving conditions. Speed-dependent adjustment to this level is also possible. The height of normal level 2 is permanently defined by a set value (parameter) in the electronic unit. A switch is used to choose between normal level 1 and normal level 2.

For safety reasons, it is possible to automatically adjust the level to normal level 1 as soon as the vehicle exceeds a certain speed threshold (20 km/h for example); the level is then readjusted to the previous level once the speed drops below a lower speed threshold (10 km/h for

example).

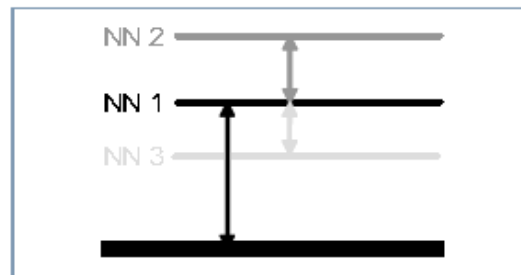


Abb. Illustration of the ride height

Special aspects with regard to CAN II electronic systems

- CAN II electronic systems also permit setting parameters for normal level 3 as a speed-dependent level
- Customer Level: Independent parameters can be set for levels on rear axle left and rear axle right.
- All levels are obtained via CAN identifier ASC2 ...

Manual level adjustment using switches/ pushbuttons

In certain cases it may be necessary to set a certain level which differs from normal levels 1/2. Pushbuttons can be used for lifting and lowering. When these are actuated, the bus is raised or lowered at the selected axle(s) by means of a preselector switch.

Height limitation

The electronic unit automatically discontinues height limitation when programmed (calibrated) values for the upper or lower limit positions are reached.

3.1.3 Kneeling

Kneeling is a special function for buses. The regulations for kneeling systems are described in section 35d of the StVZO (road traffic regulations). Kneeling describes a process whereby the bus is lowered to make it easier for passengers to get on and off. Depending on the parameter settings of the electronic control unit, this can take place towards on one side on both axles at the axle with one distance sensor (usually the front axle). ECAS provides the option to take the door position into account and to safeguard the lowering process by means of a contact strip that is monitored by ECAS. If the contact strip reads during a kneeling process, the bus reverts to normal level.

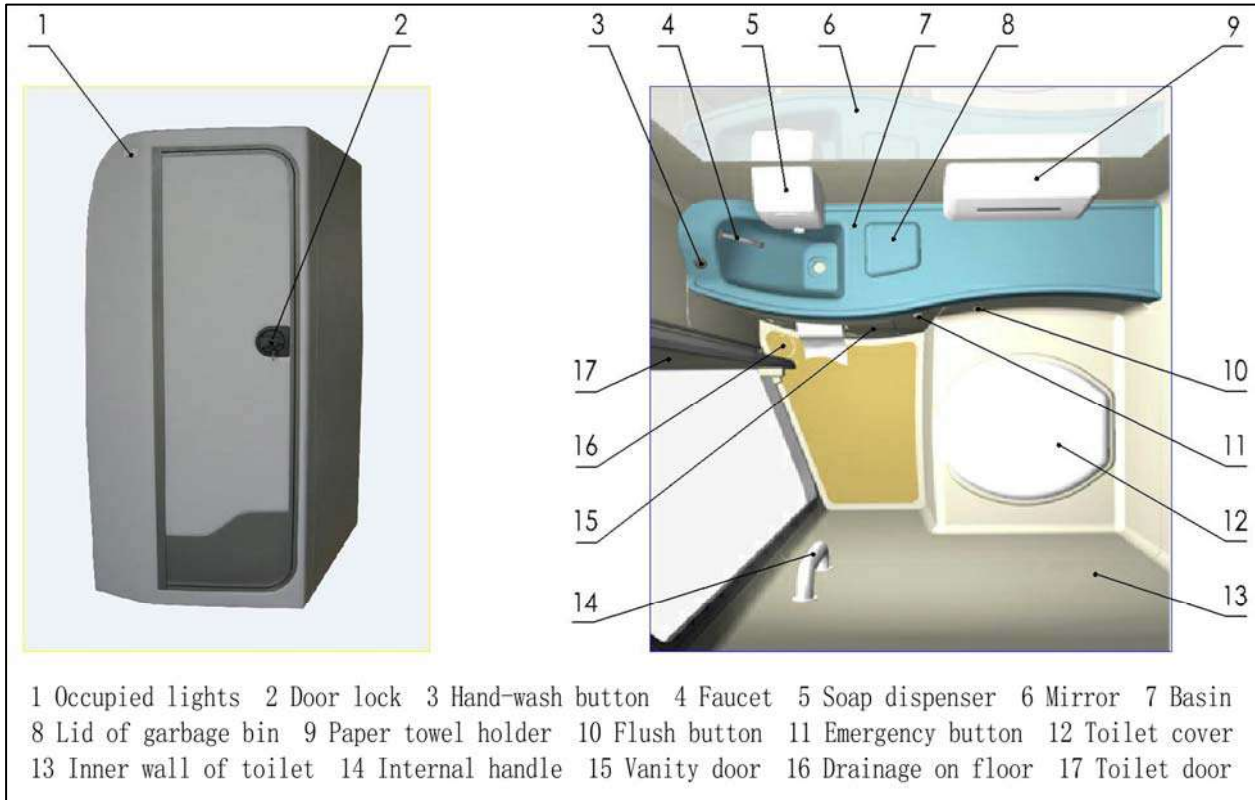
Diverse kneeling function actuation types are possible depending on the electric wiring and the parameter settings of the electronic unit.

Supply pressure monitoring

One precondition for kneeling is the availability of sufficient supply pressure to quickly raise a lowered and fully laden vehicle back to normal level. If the supply pressure has dropped below a value monitored by a pressure switch, ECAS will not permit kneeling in order not to prolong the time spent at bus stops.

TOILET OPERATION

(1). Functions and Operations

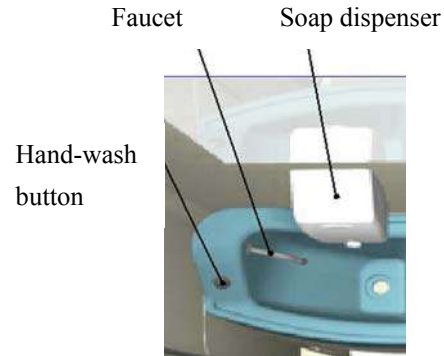


①. When using the toilet, please lock the door to ensure the system is functioning properly.

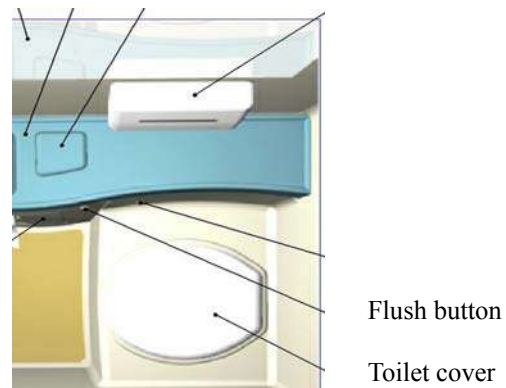
②. Occupied Light: This indication light is controller by the toilet door lock. It can probably be installed on the door of the toilet module, or be located at the front of the Coach. The passengers can be aware of the status of the toilet. If the toilet module is vacant, the light indicator will not be on (or will show green light.) if someone is using the toilet, the light indicator ill be on (or will show red light.)

③. Internal Illuminating System: The dome light inside the toilet has two status. One light is always on and is a low wattage light so long as toilet module's power supply is on. The other one, which is a high wattage light, will only be turned on when a passenger enters the toilet module, closes and locks the door. At that time, It has just been turned on by the door lock which triggers a micro-switch.

④. Hand Wash System: The toilet is equipped with a water pump for the hand wash faucet. When the button is pushed, the water pump is turned on for a certain period of time (normally 3-5 seconds). The water will keep running until the time is up. The waste water is drained to a holding tank. One can push the soap dispenser for the hand wash soap.

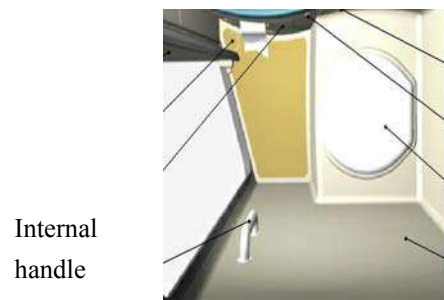


⑤. Toilet Flush System: Push the flush button, produce stream (about 300-500ml), the drain valve will open in a short time and the waste in the toilet will be flushed into the waster-water holding tank.



⑥. Door Seal and Ventilation System: The door of the toilet module has a seal strip, which prevents any odor from getting into the bus; The toilet module is equipped with a fan (a dual fan with inner and outer two different uses, the fan will be operated in a low speed to vent the air constantly, when the toilet is vacant, however, it will be operated in high speed for ventilation, when the toilet is occupied. The outer fan operates in a normal speed), keeping Fresh air in the bus with automatically ventilation.

⑦. Handles: For the safety and convenience of the passengers, the toilet module has installed safety handles inside or also outside of the toilet module.



⑧. The dashboard indication: in the signal area of dashboard, it can indicate in time: vacant or occupied, the water state of fresh-water and waste-water holding tank, and emergency (Alarm button is installed in toilet) and so on, which makes drivers know the usage status of the toilet.

⑨. Fresh -Water Holding Tank System: The holding tank is to store the fresh water for toilet flush and hand wash, please check the water level before use. Make sure water is full. If the Water Level Warning System indicates lack of water, please watering in time. Before watering, taking out overflow pipe, watering overflow pipe until fresh water tank is full.

⑩. Waste-Water Holding Tank System: The holding tank is to store the waste water after toilet flush and hand wash. When the Warning System indicates that the holding tank is full, one should stop using the toilet immediately. After the coach arrives at the tank evacuating area, turning the handle of the evacuation valve will open the valve to drain the holding tank. Turning the handle back after evacuation will close the evacuation valve.

(2). Caution in Use

①. Main Power: The usage of toilet should be in the condition of power supply state, the main power is controlled by the driver by operating the switch of power which is on the dashboard. In case, the toilet is not functioning properly (such as malfunction of some components, running out of clean water, or the waste water tank is full, etc.), the driver can switch off the main power and lock the door temporarily and put the toilet out of service. If the toilet is nonuse in a long time period, please switch off the main power of the toilet.

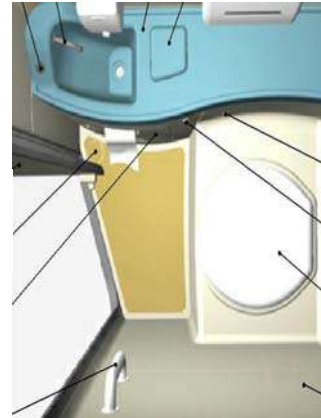
②. Initialization (aim at inducing system toilet): There is a requirement of 50s for the system initiation after electrify of toilet, both the act of deduce and the self inspection of controlling function are natural during the process.

③. Please check Fresh-Water and Waste-Water Holding Tanks before driving, top up fresh water tank, drain waste water tank, and have a browse to the whole module to find if somewhere is abnormal obviously. Waste water tank should be drained in time and the garbage bin should be cleaned up during driving.

④. Toilet paper, paper towel and other wastes should be thrown into waste basket, rather than left anywhere in toilet module or even thrown into toilet bowl or basin.

⑤. When clean the inside of the toilet module, remove the cover of the floor drainage. The water can be drained directly out of the coach through the floor drain. Please do not spray water at the electrical junction box, the fan, and other electrical equipment to avoid wetting them and resulting in damage. It's favourable to use a damped cloth to wipe the surface of toilet, but not to have any hard object to contact with it for avoiding any damage of the surface finish. Sliding valve should be cleansed regularly to keep the drain valve operating smoothly always.

Drainage
on floor



⑥. When shut down the toilet module under the sub-zero temperature environment, please drain all the water in the holding tanks, then press the button of hand wash or toilet flush for several times, drain the water in the pump, turn on the cover of filter, and drain the water in the filter as well to avoid freezing to build up water or damaging electrical parts. If the sliding valve is frozen or water components are frozen, toilet can not be put in use until they are all unfrozen. You never try to open the frozen valve by force. The valve needs to be defrosted by warm water before use.

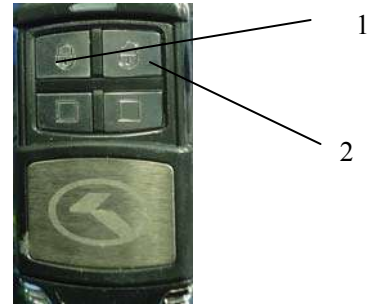
⑦. Please push/ touch the faucet button moderately, do not hold on to longer or turn on by great force to avoid wasting water or shortening the use life-span of electrical parts.

⑧. Do not insert or pull out casually during any electrical part working.

⑨. When use the toilet, do not change inside circuitry or exchange any disqualification electrical parts; In case any malfunction occurring, follow instructions to solve it before the toilet module is put in use renewedly.

⑩. Toilet needs to be cleaned and maintained regularly.

Open/close the passage door.



1. Before leaving the vehicle, press the button 1 of the door remote controller to close the door.

2. Use the key to lock the door. First insert key into the hole 3 and clockwise rotate key about 90°, then anticlockwise rotate handle 4, after that the door would be locked.



3. If need open the passage door, insert key into the hole 3 and clockwise rotate it about 90°, then clockwise rotate handle 4, follow press the button 2, after that the door would be opened.

Appendix:

The following are all type of door lock and door remote controller of King-Long.



Lock1



Lock 2



Lock 3

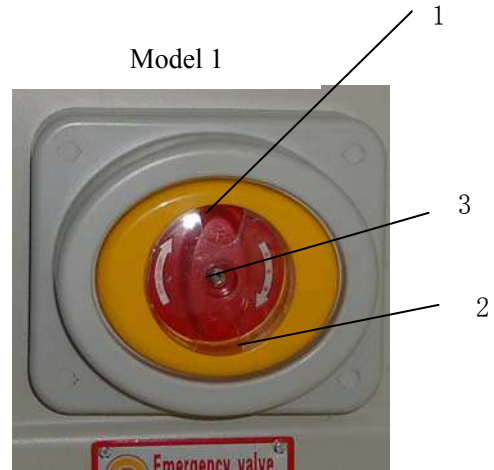


Door remote controller 2



Door remote controller 1

Door emergency switch

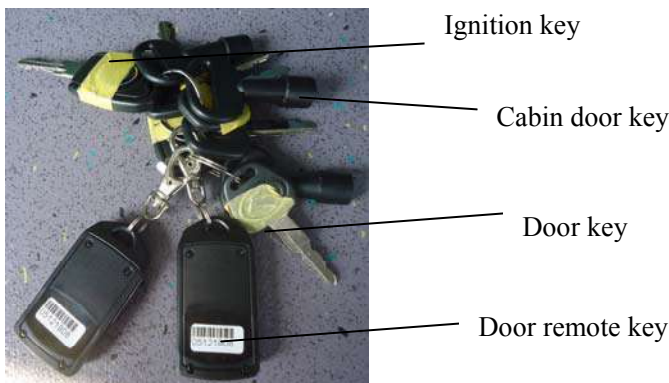


The model 1 door emergency switch is located on upside of the gate ingress.

- Operation tips:
- 1) Please press the red button 1 and flick open the valve cover 2.
 - 2) Please rotate the red handle switch 3 clockwise up to 90 degree.
 - 3) The air valve begin to deflate , and next step may pull the door opened accordingly.

Special attention: The door emergency switch is only used in the emergency state. Please don't rotate the door emergency switch in driving for fear of danger.

The vehicle uses the keys as follows:



Adjustment of the driver's seat

The driver's seat may be made proper adjustment for the back and forth as well as the backrest angle according to requirement of the driver.

Handle 1 and Handle 2: cushion height adjustment

Handle 4: back and forth adjustment

Handle 3: adjustment of the driver's weight

Left handle: backrest angle adjustment

Note: Number of handles varies with vehicle model

Attention!

The seat should not be adjusted during driving to ensure driving safety.

Adjust the driver seat only when the vehicle is stopped and the parking brake is on.



Horn button

It is on the steering wheel. The horn is hooting when pressing the button 1.

The type of steering wheel may vary with vehicle model. Please use the horn only when strictly necessary to warn other drivers and pedestrians.

Model 1



Model 2



Adjustment of the steering wheel

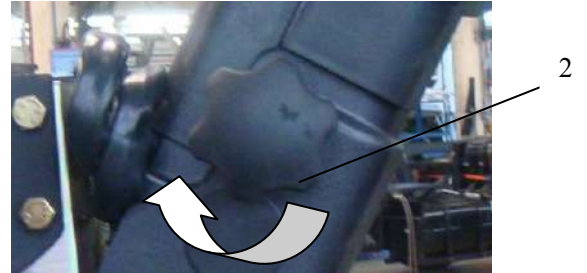
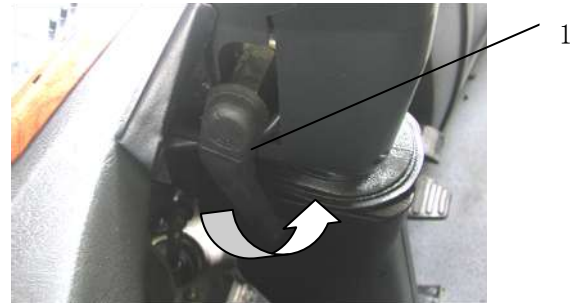
Pull-up the loosening handle 1 or rotate the loosening button 2. Adjust the height and the inclination of the steering wheel to the desired position. After adjusting, press the regulating handle or button down to lock the steering column.

Note: Number of handles varies with vehicle model

Attention!

Adjust the steering wheel only when the vehicle is stopped and the parking brake is on.

After adjusting, press the regulating handle or button down to lock the steering column.

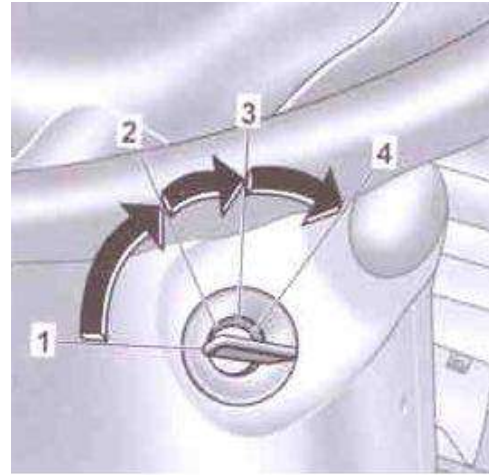


Ignition switch

Position of the ignition key is shown in fig.1.

- 1."L" LOCK: Insert or remove the key in this position.
- 2."A" ACC: Power supply of the instrument is switched on
- 3."O" ON: Normal driving position
- 4."S" START: Initiating position of the engine, and the key may rebound to the "ON" position automatically after the startup.

Before starting the engine, turn the key to the "ACC" position and then to the "ON" position. At this point, three lights (red, yellow and green) on the dashboard will come on. Wait for the lights to go out completely before you start the engine. Please make sure that all of the self-check lights have gone out completely before starting the engine. Allow the engine to run at idle speed for three to five minutes after it has been started; but never let it run for more than 10 minutes at idle speed. If the vehicle does not move, press accelerator modestly to increase the rotational speed of the engine a little; this will also prevent the early wear and tear of the engine.

**Note:**

1. Turn the ignition key to the OFF position after the engine has been turned off and the vehicle has stopped .
2. If the first attempt to start the engine is not successful, please wait two minutes before trying again.
3. If the engine fails to start after three attempts, check the fuel supply system. If the vehicle runs on natural gas, check the gas supply system.


Attention!


1. Do not remove the ignition key while the vehicle is in movement. And the ignition key should be turned to the LOCK position only after the engine shut down.
2. When leaving the vehicle, even for a short period, take the key out to avoid operation of the vehicle by children or unauthorized persons.


Lamplight operating handles


The lamplight operating handle is located on left underside of the steering wheel, which control the front small light, headlamp, headlamp dimming ,etc.

OFF Indicating that the headlamp and the small lamp are all off.

 Is the small lamp indication. The small lamp, the instrument light and the side indicator lamp will all be turned on when anti-clockwise rotating the handle to position of this identification.

: Is the headlamp indication. The headlamp, small lamp, meter lamp and width lamp will all be turned on when continuously anti-clockwise rotating the handle to position of this identification.

 Is the turning indication. By up and down motions of the operating handle may control the left and right turning lamp and that on the dashboard.

 Is dimming indication. Back and forth the operating handle gently may actuate the headlamp dimming.

Note:

It's important to dip the lights promptly when approaching an upcoming vehicle in order to avoid dazzling its driver with the high beam of the headlight.

Model 1



Model 2



Wiper operating handle

The wiper operating handle is located on right underside of the steering wheel. (model 1~2)

OFF Out of work

INT interval wiper operation step

LO Slow wiping

HI Quick wiping

Model 1 (with retarder)



Model 2 (with exhaust brake)



The wiper may spray water by pressing the end of the handle.

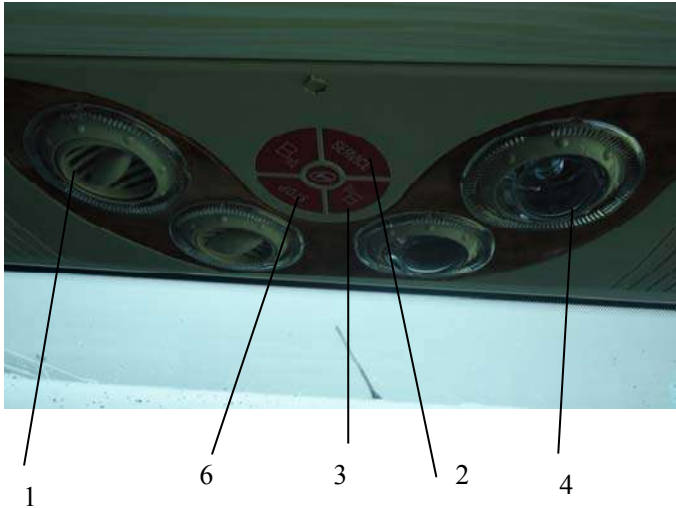
The shifts of the retarder may be converted by up and down motion of the handle.

Note: do not actuate the wiper without water; press the washer button as needed, then actuate the wiper.

Passenger control panel instruction

1. air outlet
2. service button
3. reading lamp button
4. lamp
5. loudhailer
6. stop button

When the passenger require to read something, may press the button 3 for turning on the reading lamp; may press the cover 1 for cooling air; may press the button 6 for requiring stop the vehicle accordingly.



Model 1

Safety hatch

The safety hatch is located on scaffold of the vehicle. Please open the safety hatch according to the above diagrammatic representation and illustration for escaping in case of danger.

Model 1



When in emergency and dangerous condition, should

- 1) push upward with hands and make the hatch open
- 2) pull down the plastic cover and rotate red handle
- 3) push dome open
- 4) exit through hatch

Safety hammer

The safety hammer is located on the side window.
Please take down the safety hammer and break open
the side window for escaping in case of danger.



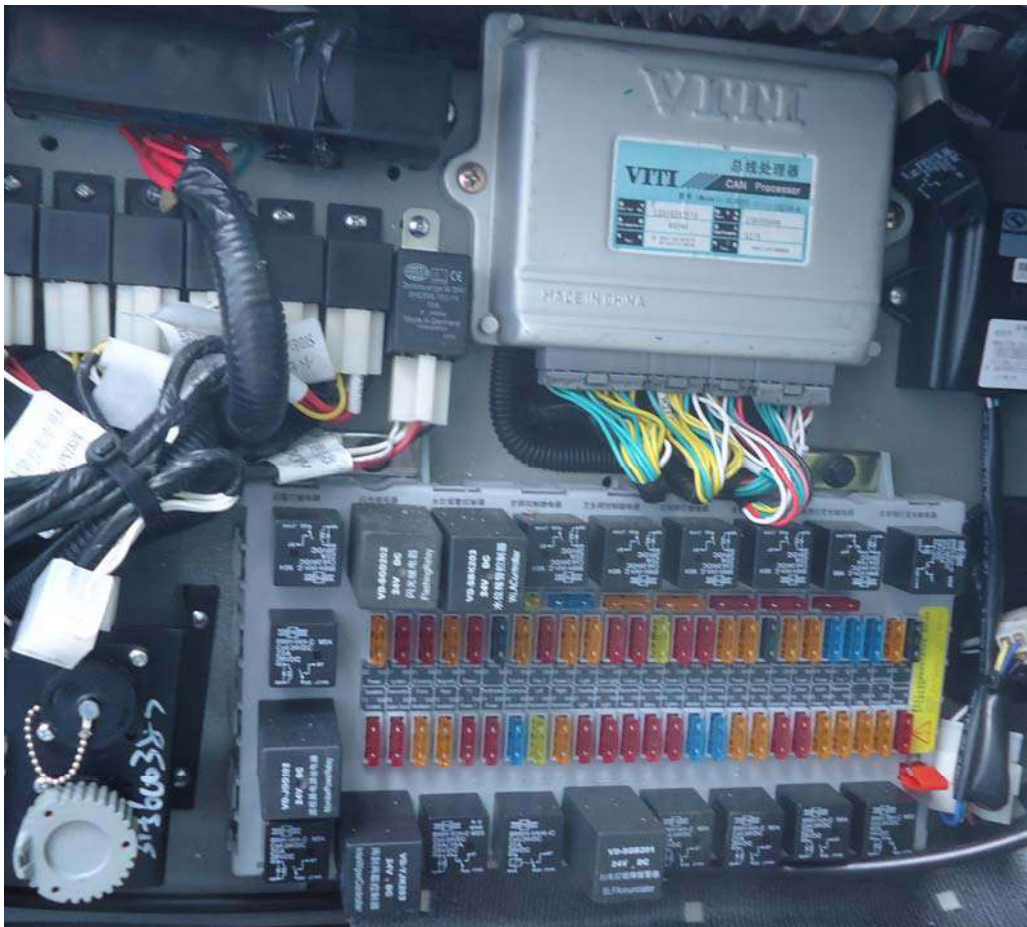
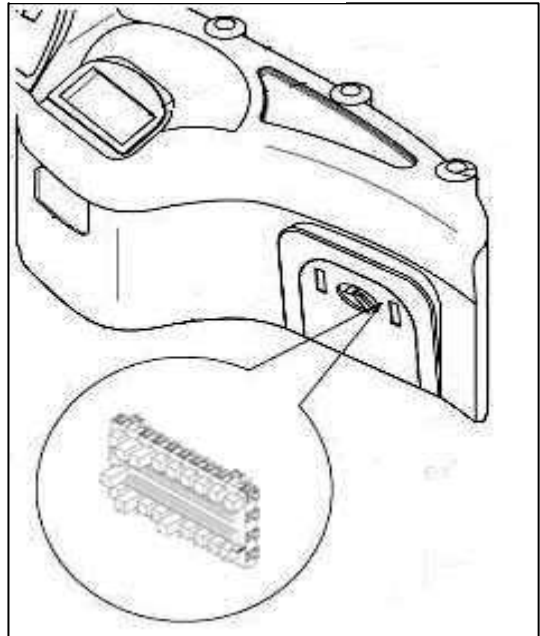
Model 1

Central Electricity Distributor (VITI)

The central electricity distributor always installed in the compartment of the instrument desk or located in front-left side cabin door box under the driving area.

The box integrates 50 chip-type fuses, 20 general and special relays, and has 8 standby chip type fuses, one fuse clip, which makes its construction more compact and function more powerful. It improves design of the past central electrical box, therefore it avoids weakness such as unreliability and short service life, it applies integrated circuit and designs 5 special relays: intermittent wiper relay, turning flasher relay, lower water level warning controller relay, monitor power relay, brake light failure warning relay (when power supply voltage is lower than 23V, power supply of acoustic set and monitor is cut off and will be begin to work again after power supply voltage resumes to normal).

Installation position

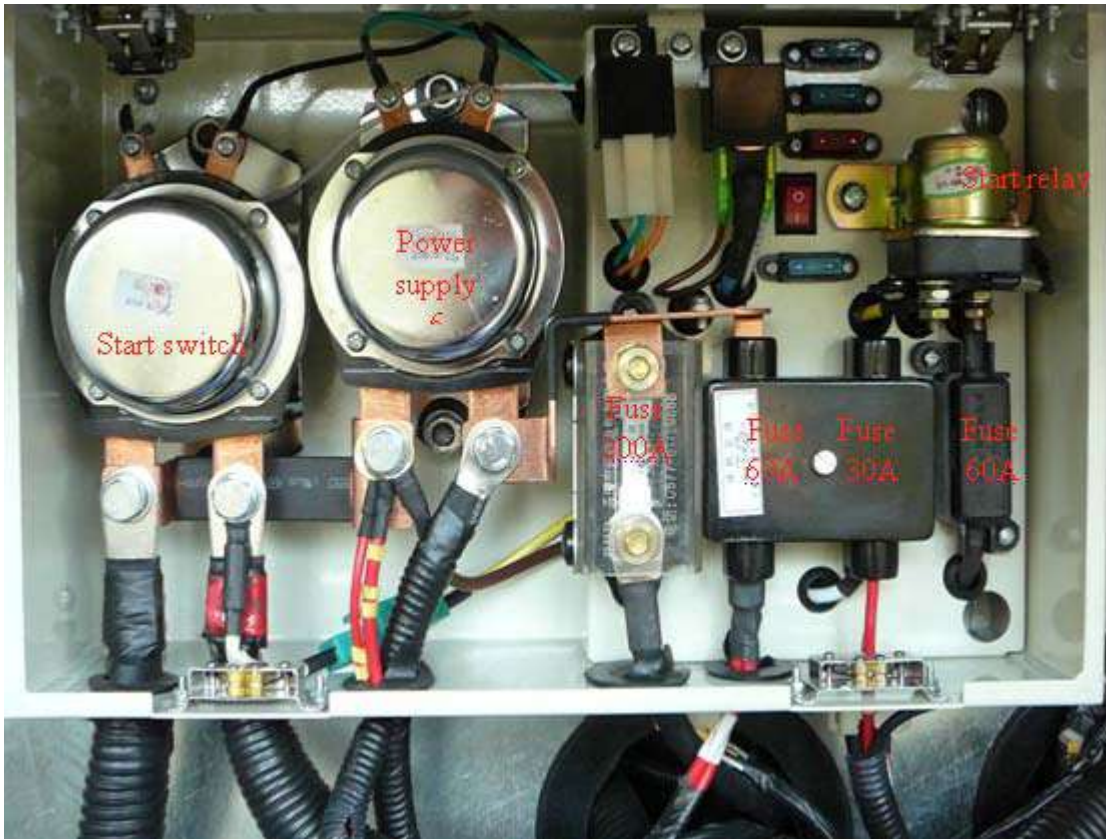




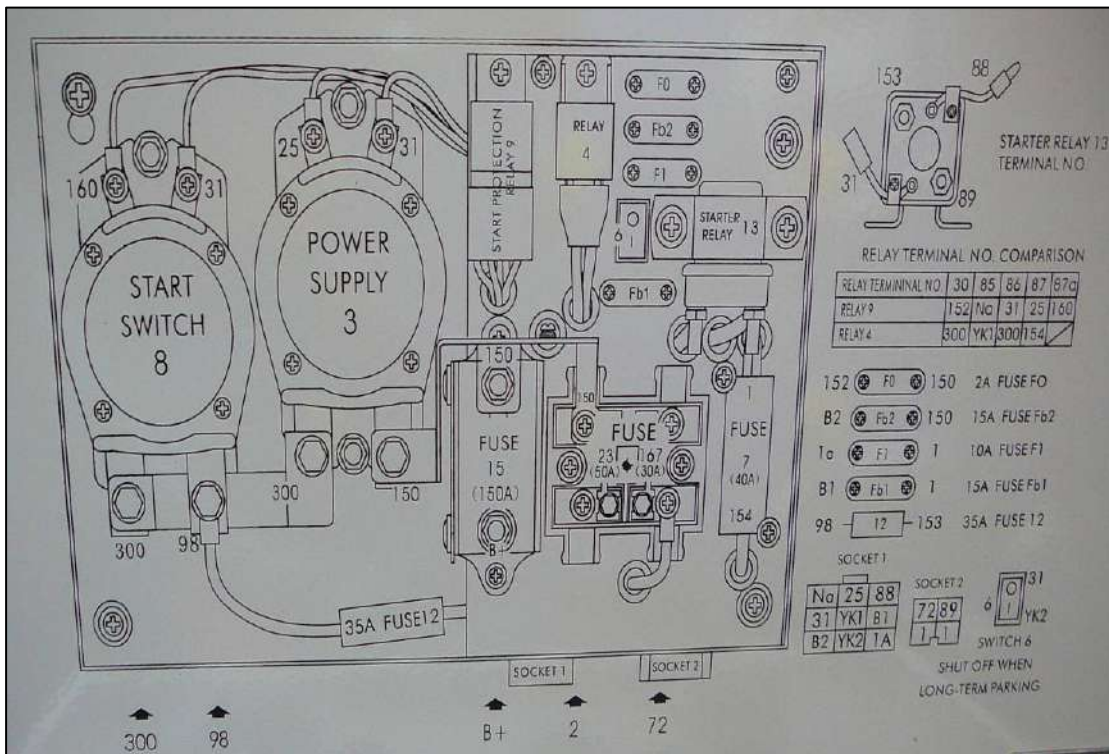
CAN bus module:



Switch control box (Model: JKH2025A)



CQ2025 A wiring diagram (Printed on opposite cover of the switch control box)



Preparatives for vehicle operation start up:

Check daily, before turning engine on:

1. Check oil level of the engine

The warning “Engine oil pressure” is displayed as a signal item on the combination instrument when the oil pressure is too low, the alarm buzzer sounds, the warning light STOP comes on, stop the engine and check engine oil level at the dipstick. Provide immediately for the oil replenishment to its correct level.

The oil level should always be checked with the vehicle parked on level ground, before starting the engine up, or at least 5 minutes after having shut it down.

Open the engine compartment hood.

Take out the oil dipstick, and clean it with a clean cloth without loose threads, and put it back into its place fitting it in completely.

Once again pull out the dipstick and check the oil level.

- a. The oil should not exceed the maximum level.. drain the excess.
- b. If the oil is at operational level, do not add more oil to the crankcase.
- c. If the oil is at or below the minimum level, add the same type and brand of oil to the crankcase as that already there, until reaching the maximum level..

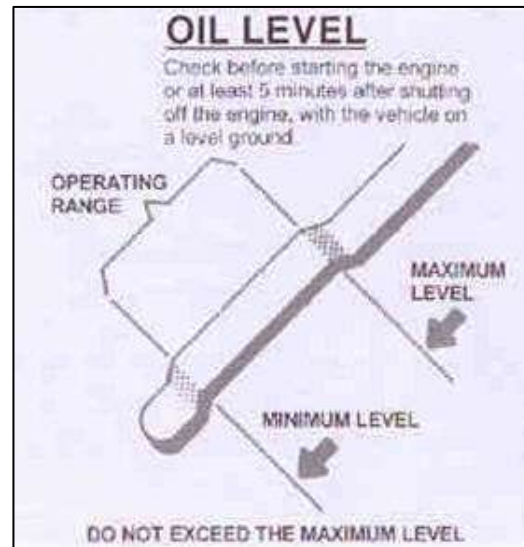
After the checking, replace and fit the dipstick completely back into its place.

If the oil level is checked after the engine has been run for a period of time, then it should take at least five minutes before the measure to ensure the oil back flow to the oil sump in full.

Oil level dipstick



Oil inlet



2 Check level of the coolant

The coolant level is automatically monitored.

If coolant level gets too low, the digital indicator displays a driver information on the combination instrument. In this case, park vehicle in a safe place as traffic conditions permit, stop engine and visually check the coolant level.

Check the coolant level only when the engine doesn't work and its temperature is below 50°C.

The anti-freezing rust-inhibiting engine coolant level can be observed from the observe pipe.

The coolant level should be between the maximum level (MAX.) and minimum (MIN.) level indicators in the compensation tank.

If it is necessary to add coolant to the system:

- a. Place the heating system command in the position of maximum heating potency.
- b. Add the coolant to the system up until the maximum level indication. Only use coolant which is recommended.
- c. The compensation tank cover should not be opened when temperature of the coolant is still high to avoid being scalded Place the lid on the system and turn it to the limit.
- d. Pressure valve of the compensation tank should be opened when adding the coolant to eliminate air in coolant pipeline of the diesel engine.
- e. Run the engine for a short time at varied rotations.
- f. Stop the engine and check the coolant level.

If necessary add more coolant to the system

Anti-freeze and antirust solution (mixture of glycol and water) should be added to cooling system from time to time to avoid sediment, frost, oxidation and increase boiling point.

Note: When adding coolant, please choose the same model to avoid sediment. If coolant is degenerative, replace it immediately.

Coolant specification as shown below: users should choose products produced by normal factories according to requirement



Observe pipe



Observe pipe



3 Fuel pre-filter with water separator (drain accumulated water)

Draining accumulated water

On a daily basis, check the lower cup of the water separator. If there is water in the cup, unscrew the draining plug one or two turns, to drain the accumulated water.

After draining the water, tighten the draining plug correctly.

When the accumulation of impurities in the lower cup is noticed, take the vehicle to a workshop to carry out its cleaning.

Changing the fuel pre-filtering element

The fuel filtering element should be changed periodically, at the intervals recommended in the maintenance manual. If however, the filtering element is easily saturated needing substitution at very short intervals, this is an indication of the accumulation of impurities in the interior of the fuel tank, and the cleaning of the latter should be carried out.

In order to change the fuel filter element, take the vehicle to a Dealer or a King-Long Workshop.

Fuel system discharge

Activate the manual pump until feeling resistance on pumping.

Start up the engine without accelerating. If the engine does not start running in 20 seconds, interrupt the startup and wait at least one minute before trying again.

If the engine insists on not working, repeat the discharge operation.

Leave the engine running for about a minute to completely eliminate the air from the system by way of the auto-discharge system.

In order to reduce environment pollution problems, do not drain the residues accumulated in the water separator directly into Nature (rivers, lakes or soil). The drained residues should be collected in appropriate containers and taken to receiving centers to have proper final destination (see local legislation).

Model for Euro II



Release valve



Manual pump

Model for Euro III IV



4. Fuel level

Turn the ignition key to drive position (on).

Check the fuel level on the indicator. If necessary, fill up the fuel tank. (but direct viewing by open the tank cover is preferred).

Eliminate deposited water in diesel filter in time and check fuel pipe for no leakage. Ensure sealing performance of fuel tank and before opening fuel tank, wipe up clay and dirt.

Before filling up, shut down engine.

Do not drive vehicle to empty tank. When the level indicator is on the red bar, refuel the vehicle to avoid air from entering the fuel system.

Fill the tank only with good quality fuel free of contaminants. The fuel might as well be filled up when running in the humid area to avoid inner rustiness.



5. Vehicle lighting, intermittent lights and brake lights

Check all instruments and indicator lamps for normal, especially the head lamp, the turning lamp, the brake lamp, the reversing lamp and the danger alarm lamp.

Check the bulb and the switch for their damage. To carry out the lamp substitution, hands should be very clean. If possible handle new lamps with tissue paper.

Clean the external of all instruments and indicator lamps to ensure clear indication.

Attention!

The traffic laws regulate the location, lighting intensity, and color of the lenses and the quantity of lanterns for each type of vehicle. The King-Long vehicles leave the factory in strict obedience of these specifications. Traffic safety depends on these factors; therefore do not change the place of the lanterns. Substitute the damaged lanterns only for other original ones. Remember that a change of lantern colors can confuse other motorists and result in serious accidents. Avoid unnecessary lantern adaptations. When substituting lamps, use the same type and potency as the original lamps. Do not carry out any lamp adaptation in the headlights, as this will affect their adjustment and performance, putting the vehicle traffic safety at risk.

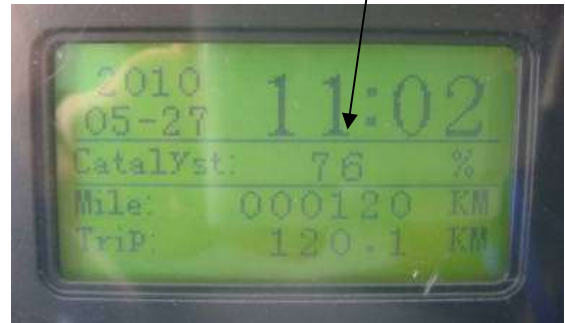
On a regular basis revise the illumination system, keeping it always in perfect working conditions.

6. Check the level of AdBlue and the daily maintenance of SCR system

(1) Check the level of AdBlue.

When the vehicle key rotate the ON position, the LED screen of combination instrument will display the remain volume of the AdBlue, please see the right diagram.

The volume of AdBlue



The AdBlue consumption is 5 percent of the fuel consumption. If the remain volume of AdBlue is less than 12%, the lamp 1 will flash and you need add AdBlue. If the remain volume of AdBlue is less than 6%, this lamp will light and the power of engine will be declined forcibly. This will cause the emission substandard and it is not good to engine.



(2) The daily maintenance of SCR system



Please add the AdBlue when it is insufficiency. Ensure the AdBlue meet the requirement. Check the SCR system is well enough and has no leaking before driving. There is obvious add mark in AdBlue tank. If add substandard AdBlue, must stop the vehicle right now and clean the AdBlue tank, re-filling the qualified AdBlue. The air filter should be clean and replace regularly.

Special attention:

If the AdBlue spill in skin, mild irritation may occur. Wash off with soap and water. If the AdBlue spill in eye, irrigate eyes with large amount of water. The AdBlue is Non-combustible, if heated water evaporates and ammonia will be released.

7. Drain water in air tank

Open the water drain valve of air tank to drain oily water fully. If too much oily water is bled, check to see if desiccant needs to be replaced in air drier. (This may be avoided when adopting the automatic drain valve but it should be checked every two weeks)

Check daily after turning engine on:

1. engine oil pressure

Run the engine.

The information on engine oil pressure can be requested through the driver information digital display.

If the oil pressure is too low, the oil pressure is automatically shown on the combination instrument.

Indication of the oil gauge will show a high value after the cold start of the engine and then it should be kept within the range of 0.3-0.5Mpa (3- 5kg/cm²) along with the increment of the oil temperature as well as the normal engine speed.

2. Pneumatic pressure

The air pressure gauge indicates the reserve pressure individually for the front and rear service brake circuits.

The reserve air pressure in each brake circuit must be sufficient for the correct operation of the brake system.

The STOP warning light comes on in case of low brake pressure in the service brake or parking brake circuits.

Attention!

If the driver information indicator displays the warning “brake pressure” and the STOP warning light comes on with the engine running, it will be an indication that the air pressure is excessively low. Do not drive the vehicle if the air pressure gauge displays low air pressure in one or both brake circuits, as the service brake could fail resulting in serious accident.

3. Tachometer working order

Indications on tachometer scale:

- Green zone – operating range of maximum performance
- Yellow zone – a little high speed range (warning of engine fault)
- Red zone – engine overspeed range (risk of immediate engine damage)



Always observe tachometer while driving the vehicle.

Whenever possible keep engine running within the economical range.

On downgrade, select an adequate gearbox speed ratio and monitor vehicle speed to avoid engine operating in the danger range (red zone).

When the exhaust-brake is being operated on down grades, select an adequate gearbox speed ratio to keep engine speed within efficient exhaust-brake operation (yellow) .

Always avoid engine over revving (red zone), as engine operation in this speed range can end up the engine damage immediately or will seriously jeopardize its durability.

The yellow range with red reticle can be used occasionally when the exhaust-brake needs to be used at its efficiency limit, however, at risk of engine durability. Therefore, do not operate in this range in a normal or usual way.

4. Steering play

Steering wheel play

Run the engine at idle gear and straighten the front wheels forwards.

Turn the steering wheel alternatively to the right and to the left.

The steering play (free movement of the steering wheel) is measured on the perimeter of the steering wheel and should be between 20 and 30 mm.



Control periodically, at least once a week:

1. Check tire for abrasion and pressure and tire nut for fixture

The vehicle's safety and performance depend considerably on the state of the tires, reason why they should be checked daily.

Before driving a vehicle, check charging pressure of tire for normal, tire for damage, tire nut for fixture.

Note: At initial 50km, please tighten tire nuts of new vehicle to specified torque in appendix.

Tire pressure

Keep the tires always correctly calibrated. The inflation pressure should be checked with the tires cold at least once a week.

After driving the vehicle for some time, the tires heat and in consequence of the heat, the inflation pressure increases. Never, under any circumstance, empty heated tires to reestablish the recommended inflation pressure.

The pressure difference between the assemble tires on the same axle should not be superior to 0.1 bar.

Wheel hubs

Keep them always clean, eliminating eventual mud or other dirt adherence. Substitute the damaged and/or deformed hubs. The utilization of refurbished hubs is not recommended.

Wheel nut

Without fail re-tighten the wheel fastening nuts of new vehicles after running 50km.

The wheel fastening nuts should be retightened, crosswise, in turns, observing the recommended tightening torque according to the type of fastening nut. If a torque meter is not available, tighten the nuts strongly, using the vehicle tools without additional levers.

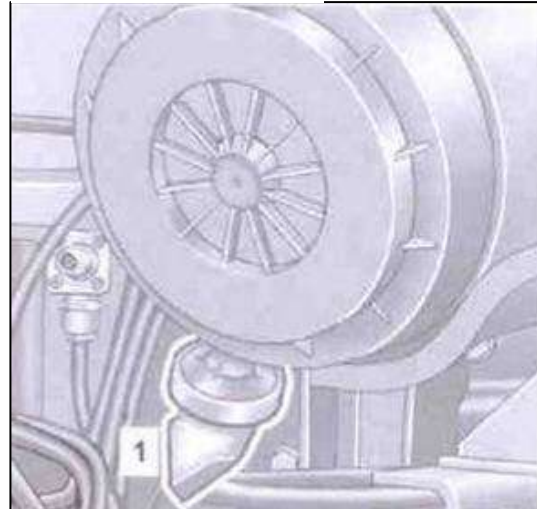
2. Air cleaner (activate the dust discharge valve to loosen accumulated dust)

The maintenance of the air cleaner is made up of the substitution of the filtering elements and should be done only when the maintenance indicator indicates the saturation of the element.

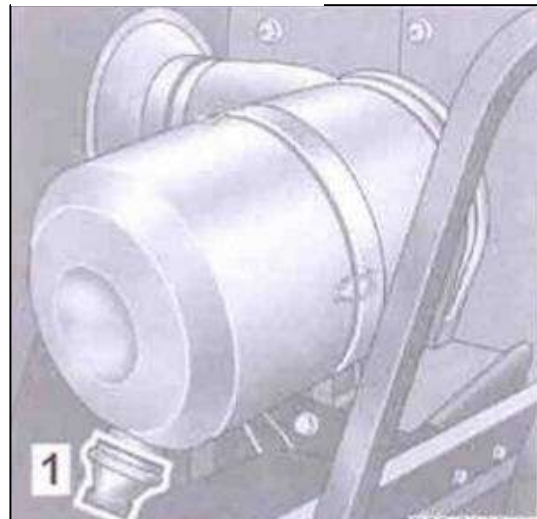
The cleaning of the main and safety filtering elements is not recommended. The re-utilization of the filtering elements can result in deficient filtering of the air and cause serious damage to the engine.

When washing the engine, conveniently protect the air inlet with a plastic or similar material to avoid the infiltration of water to the air filtering element. After washing the engine, remove the protection from the air inlet.

Model I



Model II



1 automatic dust discharge valve

Periodically press the dust discharge valve with your hand, in order to incomplete the dust which possibly be caught in the internal part maintaining them clear. At the same time, check clip connecting rubber hose of air intake system with steel tube in case of dust entering air intake system due to looseness and decrease in engine life.

The air cleaner restriction is electronically controlled. If the indication of saturated air cleaner appears in the display of digital indicator in combination instrument, send the vehicle to a King-Long Dealer or authorized workshop to inspect and clean the air intake system and substitute the main filtering element.

Indication

The main filtering element of the air filter should be substitutes after maximum 2 years use.

The safety filtering element (optional) should be changed at every third main filtering element substitution, or after maximum 2 years of use.

3. General leakages (water, oil, fluids and fuel)

Check the engine, the transmission, the driving axle, the steering system, the cooling system and the oil pipeline, the air pipeline of the complete vehicle for their leakage.

4. Fastening and state of seat belts

Check buckle of the safety belt of the driver seat for normal and ensure for its lockup under the following situations when fastening the safety belt.

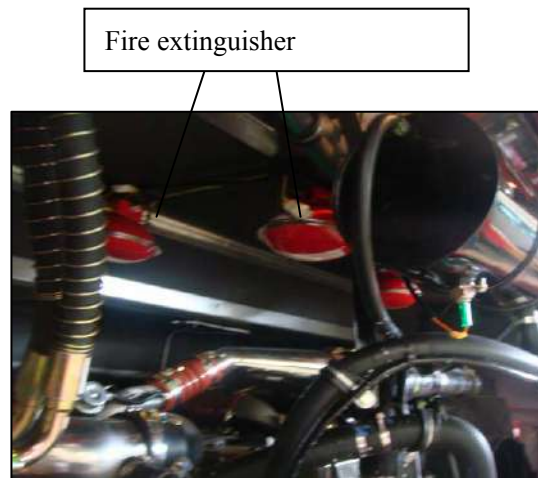
- The body dashes forward all of a sudden;
- The vehicle makes an emergency braking or an abrupt acceleration;

5. Check emergency devices and driver's tools

Such as extinguisher, crosstie for blocking vehicle, emergency hammer, jack and etc..

Fire extinguisher:

The pulse super-micro powder fire extinguisher is fixed in the engine compartment, when the compartment is on fire, the fire extinguisher activate automatically or is active by manual work to eradicate the fire



The fire button is usually located at auxiliary instrument desk in the driver compartment where people could operate it easily.

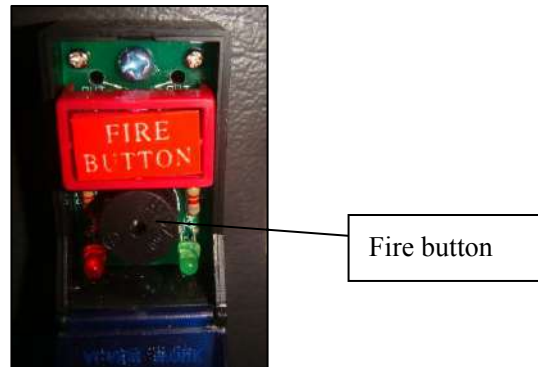
Operation: 1. When the engine compartment caught fire, the driver should stop vehicle and switch off engine immediately, open the fire button cover, and press the fire button, start-up fire extinguisher



2. Fire extinguisher may start-up automatically when it catches fire or its temperature arrives at **170°C**.

Important hint:

1. Fire extinguisher can be used for one time only, DO NOT press the fire button except for emergency condition.
2. The fire extinguisher can not start-up by press the fire button manually if the vehicle battery is dead or power turn off.
3. If the vehicle needs to be repaired, you could take away the anode and the cathode. And put them back after the reparation completed.



Inner fire extinguisher is fixed under the passenger's chair, when vehicle caught fire, stop vehicle and use the fire extinguisher.



6. Working order of windshield wipers and conditions of wiper blades and arms

Regularly check the windshield wiper blades for dirt or damage.
Press the lever to activate the windshield washer

Caution: Do not use the windshield wipers when the windshield is dry. Before activating the wipers, push the head of the wiper lever inward to spray detergent onto the windshield.

Check surplus of detergent

Stop vehicle on a flat road, open side cover of instrument desk.
Container of detergent is located inside instrument desk. If detergent is insufficient, add.

Add the clean water into the tank for windshield washer.

There are 2 kinds of water tank.

Model 1



Model 2



7. Electrical rearview mirror

Check, adjust and clean the rearview mirror.

Rearview mirror control button

Model 1

L: adjusting left rearview mirror.

R: adjusting right rearview mirror.

Mirror button: push down the arrow headed button to adjust the mirror for 4 directions.

Model 1



Model 2

L: adjusting left rearview mirror.

R: adjusting right rearview mirror.

Mirror button: rotate the handle to adjust the mirror for 4 directions.

Model 2



Model 3



Inspection every two weeks before and after driving

1. Power steering

Ensure that all the maintenance service jobs on the steering system be carried out at the intervals recommended in the maintenance manual to guaranty total efficiency and safety.

If any working abnormality in the steering is noticed, immediately supply the necessary repairs.

The habits of forcing the steering too far against wheel obstacles and of activating the steering while the vehicle is stopped are harmful to the steering system and should be avoided.

In emergencies, in the case of damage to the power steering system, the steering may be used without hydraulic help, however, in this condition there will be more steering wheel play and the steering will become noticeably “heavier”. Drive the vehicle very carefully and take it to an authorized King-Long Dealer or Workshop to re-establish the correct working order of the steering system.

Important: In the case of damage to the hydraulic steering pump or of the total loss of fluid from the hydraulic system, we recommend that the vehicle is not driven further than 50KM in order to avoid further damage to the steering system components.

Power steering fluid level

The power steering fluid level should be checked while the engine is running at idle and the fluid is hot. Run the engine at idle gear and turn the steering from side to side various times to heat the steering system fluid.

Check the level through the inspect window of the container.

Model 1



Model 2



Model 3



3. General state and tension of drive belts

Check the tension of engine belt, fan belt and compressor belt, if loose, tension it; if damaged, replace it. Do not start up the engine without the drive belts. In the case of one of the belts breaking, immediately stop the engine and have a new belt put in.

The checking, adjustment or substitution of the drive belts should be carried out with the engine shut down.

Check cross plane of the belt for no cracks. Crackle in the transverse direction (along the belt width direction) is acceptable while that in longitudinal direction and transverse crack cross is unacceptable. Please replace the strap in case of abrasion or chip dropping off.

Too tight or too loose belt would make against proper operation of engine. Press belt to check tension. Please refer to the manual book of engine assembly for detailed adjusting method and tension of belt.

The poli-V belts demand technical knowledge, therefore we recommend that this job, when necessary, be carried out at a King-Long authorized Dealer or Workshop.

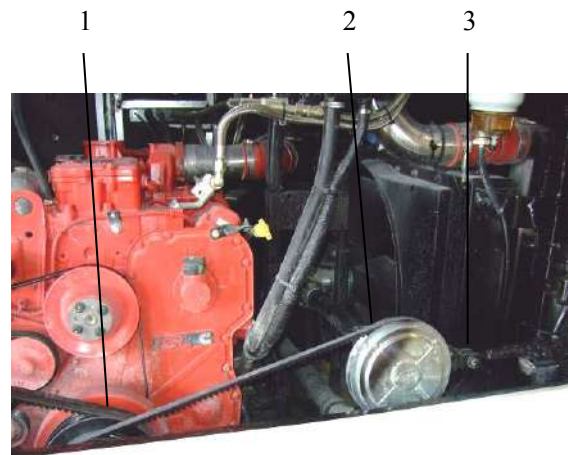
Ventilator drive belts

If it is necessary to replace the ventilator drive belts in emergency situations, adjust their tension in such a way that upon pressing them with one's thumb in the middle of the distance between the pulleys, a deflection of approximately 20mm is observed. Loosen fastening nut of intermediary pulley before turning the adjusting bolt. After adjusting ventilator belt tension, tighten the fastening nut of intermediary pulley firmly.

Model 1:

Adjusting method of the single belt driving fan belt is shown in the figure

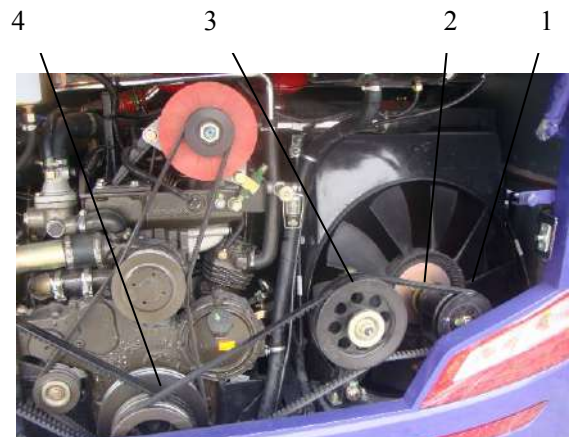
1. Check tension of belt
Apply force of 98N by the finger.
Strap sinkage between the crank pulley 1 and the fan pulley 2 should be 25 ~ 31mm.
2. Adjust tension of cone belt
Adjust bolt 3 until the tension is proper.
The max offset angle of the fan pully shaft should not exceed 5° , or else please replace it.



Model 2:

Adjusting method of the fan belt is shown in the figure

1. Check tension of belt
Apply force of 98N by the finger.
Strap sinkage between the crank pulley 4 and the counter pulley 2 should be 25 ~ 31mm.
Strap sinkage between the counter pulley 2 and the fan pulley 1 should be 7 ~ 8mm.
2. Adjust tension of cone belt
Adjust bolt 3 and counter pulley 2 up and down until the tension is proper.



Air conditioning compressor drive belt

The pneumatic tensioning system keeps the tension of air conditioning compressor drive belt correctly adjusted and do not need to be adjusted periodically.

Adjusting method of the air conditioner belt is shown in the figure

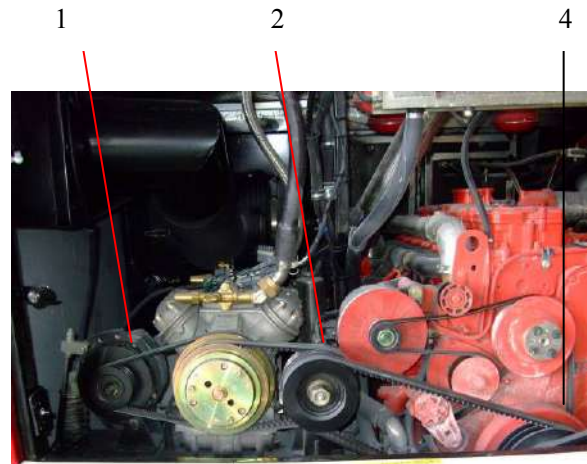
1 Check tension of belt

Apply 98N force to belt with finger

Belt crank pulley 4 and middle pulley 2 should lower 10~15mm

2. Adjust tension of cone belt

Adjust nut 1 until tension of belt is proper



4. Check level of battery electrolyte

Open the battery cover to check level of electrolyte, if the level is lower than scale marked on the battery, please add it in time.

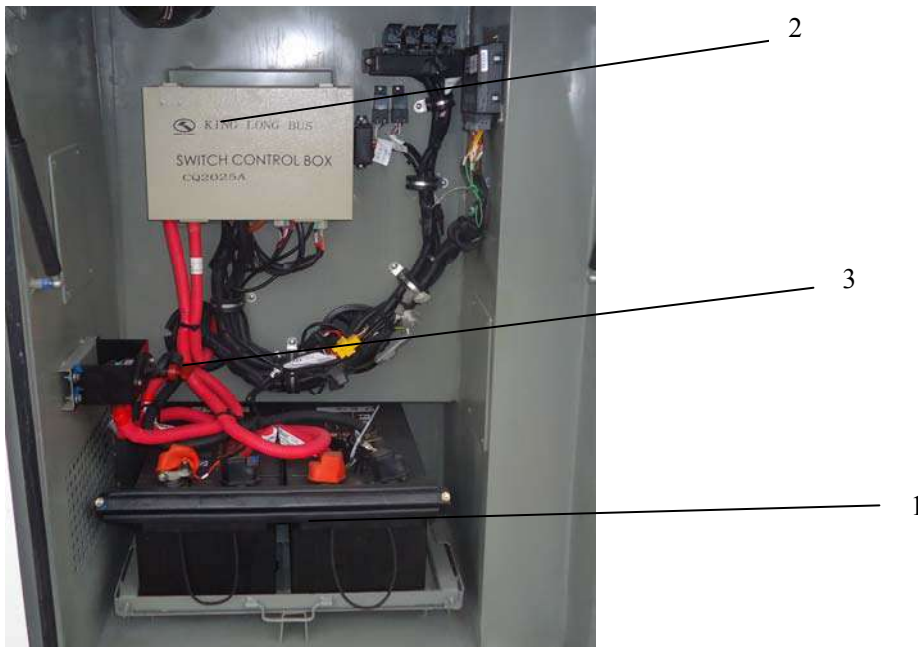
Note: During adding electrolyte, never start engine.

Battery

The battery compartment is located at the second compartment of left or right rear side.

- 1 battery
- 2 switch control box
- 3 Main power switch

To access the battery, open the switch control box panel.



After the vehicle has been parked for the day, the main power switch should be turned off.

Cleaning

Keep the batteries always externally clean and the air vent unobstructed. Avoid battery contact with petroleum derived products.

Charge

Do not allow batteries to maintain a charge inferior to 75% of the total charge.

Do not submit the batteries to excessive overcharges or discharges.

Engine start up and shut down

Procedures for engine start up

Don't release parking brake and keep to place the gear box lever in neutral. The vehicle is not possible to move in the gear position.

Turn the ignition key into "start" position.

Start up without stepping on the accelerator. If the engine does not work after about 20 seconds, interrupt the start up process and wait at least 15 seconds before activating start again. To repeat start up, it is necessary to turn the key back to the off position.

Let the ignition key loose as soon as the engine starts running.

The motor rotation adjusts itself automatically in function of the coolant temperature.

Indication:

The start up process is automatically interrupted after 90 seconds of continuous activation. In this case, in order to repeat the start up activation, turn the ignition key back to the off position and wait at least 2 minutes.

After engine start up, the vehicle can be put immediately into operation.

Note:

- a. The engine should be running at low middle speed for 3-5 minutes on every day's first starting before the driving.
- b. Never race the engine without warming up. During cold start, increase engine speed slowly and do not make engine run at maximum speed until water temperature of engine reaches to 70°C. At any time, do not make engine run at high speed under no load.
- c. Never make engine run at idle speed for more than 10 minutes.
- d. The oil pressure should be displayed on the dashboard in 15 seconds after the engine is started, otherwise, stop engine to check..
- e. If parking brake indicator lights, indicating that parking brake has not be released.

Attention!

If on starting up the engine, the engine oil pressure indicator continues indicating low pressure, this means that the engine running order is in danger. Immediately shut down engine, find and correct the failure.

Engine shut down

Loosen accelerator pedal.

Place the gear box lever in neutral position and apply the parking brake.

Turn the ignition key to the off position, without accelerating.

Note: After engine runs at heavy loading, temperature of cooling water is higher than 90°C, so do not stop engine at once. The stalling should be made only after the engine has been running for a period of time and the water temperature lowed to the normal range. The parking brake is achieved by setting the hand brake handle on the control position after the stalling. The shift should be switched to the neutral position and power supply shut down. Please make necessary inspection of engine and then troubleshoot.

Cautions

Cautions during the winter operation

- ① Please add long life coolant to cooling system.
- ② After parking, please drain exhaust water in air tank in time.
- ③ Before winter comes, please check level of battery electrolyte, specific gravity and voltage.

Water used in the radiator must be soften.

Never make engine start without preheating or run with trouble. In the cold climate, do not start engine until preheat it with hot water or vapor to more than 30-40°C.

During driving downhill, do not place gearshift lever in neutral position to slip. Please apply exhaust brake or retarder.

Do not start vehicle until parking brake has been released

Engine start up and shut down in the engine compartment

Park the vehicle and activate the parking brake.
 Put the gear box lever or the automatic transmission selector in neutral (dead point).
 If the transmission is in gear position, the start up with in the engine compartment will not work.
 Turn the ignition key to gear position, without activating engine start up.

Engine start up

Press the start up switch (start) and activate the back cover course end switch bar in the engine compartment.
 Loosen the switches immediately the engine begins running.

When the engine is turned on by way of the start up switch in the engine compartment, this switch should be used as a manual accelerator.
 With the engine compartment cover open, the start up by way of the ignition key is impossible.

Engine shut down:

Press the shut down switch (STOP).

To make the engine turn without starting up:

Press the engine start up and shut down buttons simultaneously.

Note: the final placement of the switches in the engine compartment is the responsibility of the vehicle body manufacturer.

Model 1



Model 2



Model 3



Starting the vehicle

The vehicle could only be started when braking system pressure has reached 5kg/cm^2 above and each instrument and indicator lamp is on the proper condition, and water outlet temperature exceeds 60°C as well as the parking brake has been released after the engine is started. Please make the startup in shift I.

On normal running condition:

- Pointer of oil gauge should be between 0.3 and 0.5Mpa ($3\text{-}5\text{kg/cm}^2$) .
- Pointer of water temperature gauge should be between 83°C and 95°C .
- Pointer of double-pointer barometer should be between 0.55 and 0.8 Mpa ($5.5\text{-}8\text{kg/cm}^2$)

After the vehicle starting, gear shifting should be made step by step and timely. The clutch pedal should not be released abruptly to impulse the starting when the vehicle is stuck in the mud or can not start on a spoil road.

The following problems should also be paid attention to during the driving

- ① If abnormal noise or odor occurs, please stop vehicle to check.
- ② Abrupt acceleration or emergency braking should be avoided as might.
- ③ Don't put foot on the clutch pedal during the driving.
- ④ Avoid engine overspeed. When driving long downhill, engine may overspeed easily after gearshift, at this time, pay attention to apply exhaust brake or retarder and driving brake to ensure engine run at specified speed.
- ⑤ During driving downhill, never stop engine, otherwise, resulting in de-pressure in brake pipeline and power steering gear failure.

During normal running condition, if the pointer of water temperature gauge is under the red sign that indicated the vehicle is on normal condition. if the pointer is on "H"

Parking the vehicle

The parking brake should be always applied when the vehicle is parked.

Additionally, in some countries, it is determined by law that a vehicle parked on a slope must have at least one of its wheels wedged, to prevent its accidental moving.

In this case, always keep an appropriate wedge available for this purpose aboard the vehicle.

When parking on public highways, obey the legal determinations as far as the use of parking lights or reflecting panels.

Parking brake handle

Pushing forward the brake handle is of driving state.

Pushing backward the brake handle is of parking state.

Always activate the parking brake when the vehicle is parked.

Besides activating the parking brake, when parking on upward or downward slopes, wedge one of the vehicle wheels to avoid the accidental moving of the vehicle.

Application

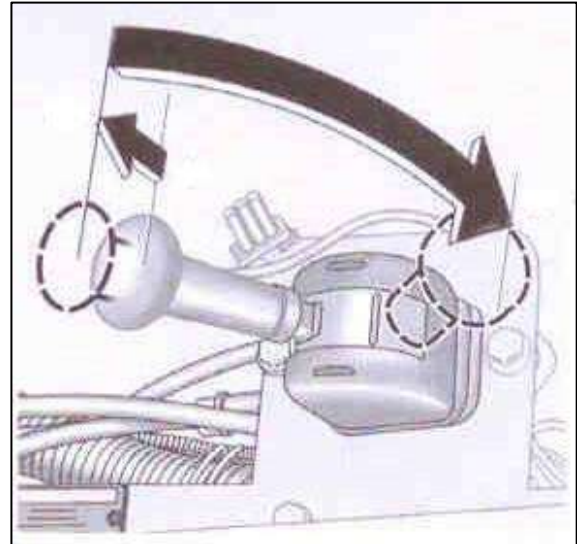
Attention!

On applying the parking brake, always check the locking of the lever in the total braking position, on the contrary, the lever may return automatically to the brake off position.

Pull back the parking brake valve lever in such a way that the lever is locked in total braking position. The parking brake warning light should light up.

Note:

In emergencies, with the possible failure of the service brake, the parking brake can be used as an emergency brake. In this case, slowly pull the parking brake lever allowing for a progressive braking without abruptly locking the wheels.



General knowledge

King Long recommends that the bus be maintained according to the Maintenance Schedule in this section. Perform maintenance at whichever interval occurs first. At each scheduled maintenance interval, perform all previous maintenance checks they are due for scheduled maintenance.

King-long Bus General Maintenance

Please make periodic inspection and maintenance of bus according to **KING LONG BUS MAINTENANCE & SERVICE GUIDE (2014) -EN** to ensure good status. During service, stop bus on a horizontal road and ensure bus steady and engine stopping. Make functional inspection and running test after each service.

Important Notice: If bus often runs under poor conditions (such as poor road surface, high dust concentration, frequent bump etc.), maintenance interval should be shortened. During adding lubricant, before replacing filter or repairing, clean the place around related parts carefully. Please add lubricant with clean containers.

Maintenance of engine and chassis assembly

- For the usage and maintenance of the engine, refer to relevant engine operation and maintenance manual.
- For maintenance of transmission and front-rear axle, please refer to relative users' guide.
- For use and maintenance of other parts of chassis, if without special user's guide or maintenance period, please refer to this manual for maintenance information.

Body maintenance

1. Keep body clean .Timely clean should be made after daily running and don't scrape body with tool in order to avoid paint scratch and damage of roll covering.
2. Sealing strips of doors and windows should be kept integrated and seamless. Make timely replacement if damaged.
3. Prohibit washing body paint with hot water, kerosene and other liquid which has damage to surface paint.
4. Check connections between body and frame frequently. If find something abnormal, repair it in time.
5. Frequently check fasteners inside vehicle and tighten them in time.
6. Frequently check conditions of passenger door. If find something abnormal, do adjustment in time.
7. Frequently check conditions of all lamps. If find any damage, replace it in time.

ABS or EBS system maintenance and service:

1. Please cut off ECU control box to avoid the high voltage from outside to make damage to the ECU, when use the outer power supply to charge the battery.
2. When the vehicle need electric welding, cut off the ECU .never use the multimeter to measure the ECU box.
3. Inspect the engine voltage for stabilization periodically.

4. When maintain the brake shoe ,do not damage the ring gear and sensor, clean the ring gear and sensor at the same time. after maintenance ,do remember to put the sensor to the limited position along the ring gear direction.
5. Make sure that the power is in off position when remove and install the components, keep the components clean and dry.
6. Never change the fuse capability or connect the fuse in disorder.
7. Change the indicator in time when it doesn't work.
8. Do not brush the ECU with water when cleaning it.

Note: for details about the working theory of ABS or EBS and maintenance, please refer to the relevant instruction book which is offered by maker.

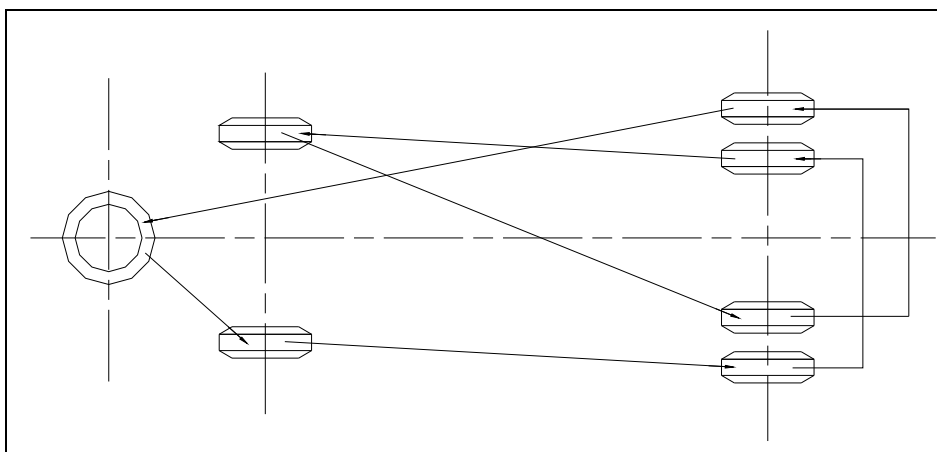
Because of different allocation requirements, some of the vehicle model may not be equipped with ABS or EBS system, please use correctly according to actual condition of vehicle.

Electrical system maintenance and service:

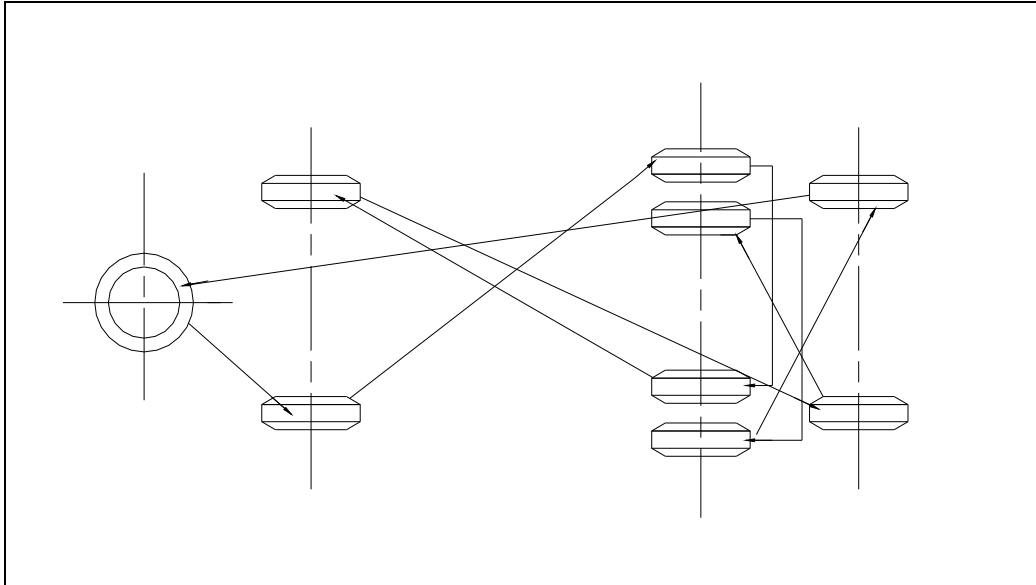
- (1) When battery is charged by external power supply, disconnect ECU control box to prevent outer high voltage damage ECU (electric control unit).
- (2) When vehicle needs to weld, disconnect ECU. Don't use multimeter to measure ECU control box.
- (3) Monitor voltage stability of generator regularly.
- (4) Parts dismantling must be carried out after electric has been shut off and should keep parts' cleanness and dry.
- (5) Don't change fuse capacity casually or bestride connect fuse.
- (6) When indicator doesn't work, replace it timely.
- (7) Don't use water to scour ECU when doing ECU cleanness.
- (8) Don't use multimeter to measure ECU.

Tire transposition

The tire may appear certain abrasion after period of running. The tire should be made transposition as the drawing below after every 8000 km to 10000 km running for proper use and prolonged tire life. Four-wheel locating condition should be checked, dynamic balance and tire transposition be made at once if there shows early and irregular abrasion of the tire.



Tire transposition diagram (two axles)



Tire transposition diagram(three axles)

Adjustment of the brake pedal free play

Loosen locknut of brake pedal push rod and adjust adjusting nut, and then measure the vertical distance from pedal free position to the position where pressing resistance increases apparently when depressing pedal. The value should be between 8mm and 12mm. After adjustment, lock the locknut.

Bus cleaning

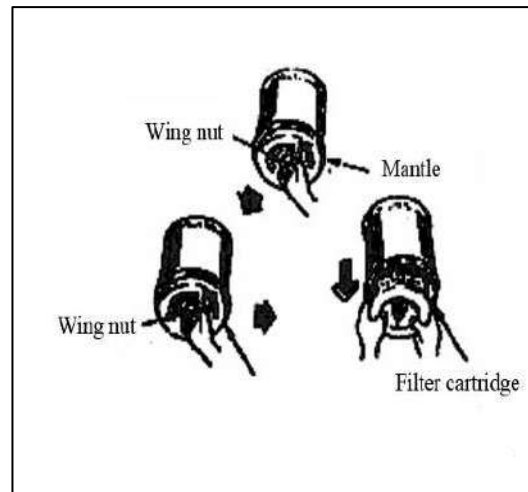
- Don't pollute the environment when washing vehicle at washing shop.
- Be careful to use the high strength dissolve fluid.
- Don't damage paint layer.
- Do not directly inject the water into radiator grill on right (left) back of the bus to prevent the water from entering engine through the air filter.
- Don't pour water onto electrical equipment in order not to damage it.

Cleaning the air filter

Hint: Please replace filter element under such conditions: it has been washed 5 times; filter element has been damaged; filter element is clogged excessively; after changing the engine oil. When air filter indicator on combination instrument lights, clean the air filter or replace the element.

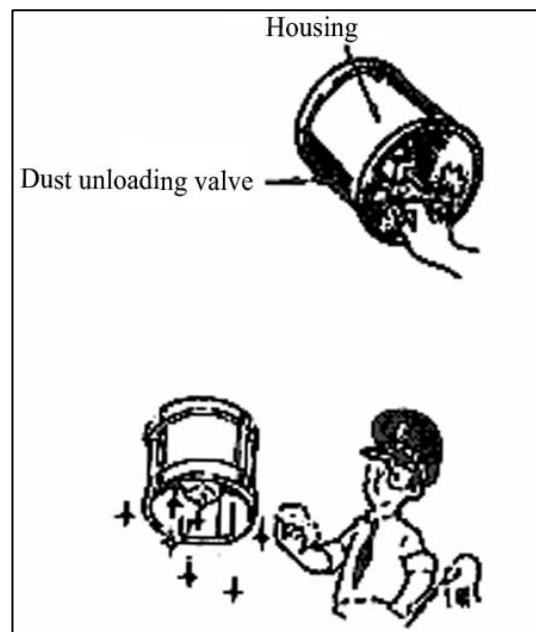
Dirty air filter would lead to deficient power and engine worn. In order to assure the life and normal operation of engine, please perform periodic maintenance on air filter. Check and maintain air filter every 2000km. Under some conditions, such as heavy dust and etc., interval time should be shortened.

The engine must be stalled during the air intake system maintaining and the engine should not be started after withdrawing the filter.



- (1) Remove butterfly nut on cover cap and take down cover cap and then take out filter element
- (2) Clean interior of the cover and the housing with a clean and dry napery. when cleaning the filter cartridge. prevent the water from entering the air filter.
- (3) Exclude dust in unloading valve.
- (4) The filter element may be cleaned by hand or by tapping the end surface with a wood bar or blowed by compressed air . Also wash with lotion. But take care not to break element.

Blow with compressed air: blow the filter element from inside to the outside with the dry compressed air of the pressure not exceeding 5bar until there has no dust blown out.



Caution: Outside surface of the filter cartridge should be cleaned with cloth instead of blown with compressed air.

Wet washing: Put filter element in lukewarm containing general cleaning agent and swing it and then clean with fresh water and dry it after dehydration.

Hint: Before wet washing, blow filter element clean.

Caution: Vapor spray gun, solution, gasoline or equivalent should not be used during the cleaning.

- Before reinstalling air filter element, check element from inside to outside with check lamp for damage;
- Check sealing ring for damage or cracks.

Caution: Do not start the engine without mounting the air filter.

Clean outside of the radiator

Keep outside of radiator clean. Compressed air current can eliminate all the dirt blocking air flow.

For vehicle equipped with intercooler, please keep air radiator fin clean. If there is hard dirt in radiator fin, blow fan side and then the other side with compressed vapor current. In order to avoid damage to air radiator fin or water radiator fin, ensure spray of air, water or vapor perpendicular to radiator surface. It should be sent to the king-long special maintenance station to make decontamination and final disposal if there has much dirt in the water radiator and the air radiator.

1. Clean water radiator fin and air radiator fin termly and eliminate dirt blocking air flow, which is important for ensuring the engine cooling.
2. For zone with many winged insect, please clean radiator fin frequently.
3. If users do not operate according to requirement, resulting in poor engine cooling and grave damage to components.
4. If don't comply with this requirement, it may cause poor engine cooling and bad damage to components.
5. Anti-freeze and antirust solution (mixture of glycol and water) should be added to cooling system perennially to avoid sediment, frost, oxidation and increase boiling point.

Note: When adding coolant, please choose the same model as much as possible in case of sediment. If coolant is degenerative, replace it entirely and immediately.

- 6 . Never use water to replace coolant for a long period.

After long running of engine, scale will come into being in cooling system. It should be eliminated in time. Methods as follows: mix 700-800g caustic soda with 150g kerosene and then inject the mixed liquid into cooling water and make engine run at middle speed for 5-10 minutes. 10-12 hours later, make engine run again for 10-15 minutes and then drain aqueous solution and clean cooling system with clean water.

Charging-up the coolant

Anti-freeze and antirust solution (mixture of glycol and water) should be added to cooling system perennially to avoid sediment, frost, oxidation and increase in boiling point.

NOTE: When adding coolant, please choose the same brand as much as possible in case of sediment. If coolant is degenerative, replace entirely.

After long operation of engine, please eliminate scale in cooling system in time. Methods as shown

below: mix 700-800g caustic soda with 150g kerosene and then inject the miscible liquids into water, at this time, make engine run at middle speed for 5-10 minutes. 10-12 hours later, make engine run again for 10-15 minutes and then drain aqueous solution and clean cooling system with fresh water. Coolant specification as shown below: the users should choose proper brand according to requirement:

Specs °C	Max. boiling point °C	Content of glycol	Pure water	Additive
-45 °C	108.00 °C	58%	32%	10%
-40 °C	107.50 °C	54%	36%	10%
-35 °C	107.00 °C	50%	40%	10%
-30 °C	106.50 °C	46%	44%	10%
-25 °C	106.00 °C	42%	48%	10%
-20 °C	105.50 °C	38%	52%	10%
-15 °C	105.00 °C	34%	56%	10%
-10 °C	104.50 °C	30%	60%	10%

Antifreeze Performance Requirement

Item		Quality Index	Test Way
Appearance		striking colour, clear, inclusion-free	visual inspection
odour		without special odour	smell of sense
density (20°C) (kg/m ³)		1073-1095	SH/T 0068
boiling point		» 108	SH/T 0089
freezing point		«-45	SH/T 0090
reserve alkalinity		---	SH/T 0091
PH value		7.5-9.0	SH/T 0069
ash content (Quality Score)		3.0	SH/T 0067
effect of vehicle paint		no influence	SH/T 0084
foam tendency	foam volume (ml)	«100	SH/T 0066
	time of foam losses (s)	«5.0	
(grade) aluminum pump air hole corrode		» 8	SH/T 0087
(cast aluminum alloy) Corrosion of heat transfer (mg/cm ²)		«1.0	SH/T 0620
Element Content	Silicon	«10	ICP
	Phosphorus	«10	
	Nitrite	«10	ICP
	Sulfate radical	«50	
	Chloridion	«40	
			SH/T 0621

- 3) This item is a quality index of -45 degree dilute antifreeze.
- 4) To measure freezing point, should be done in special lab according to SH/T 0090; In emergency, may adopts portable refractometer to check and the test result is for reference. While existing disputes to two measuring results, is subject to the SH/T 0090.
- 5) To measure PH value, as usual, should be done in special lab according to SH/T 0069.

Fuel recommendation

1. Diesel oil (only apply to diesel vehicle) : only diesel oil of which cetane value is not less than 45 according to GB252 standard can be used. Sulfur content should not be more than 0.2%.
2. No. 0 light diesel oil: Suitable for the zone where venture rate is 10% and minimum temperature is higher than 4°C.
3. No.-10 light diesel oil: Suitable for the zone where venture rate is 10 percent and minimum temperature is more than -5°C.
4. No.-20 light diesel oil: Suitable for the zone where venture rate is 10 percent and minimum temperature is more than -14°C.
5. No.-35 light diesel oil: Suitable for the zone where venture rate is 10 percent and minimum temperature is more than -29°C.
6. Natural gas (only apply to Natural Gas Vehicle):use natural gas of which methane value is low to 65.

Oil quality and specification recommendation

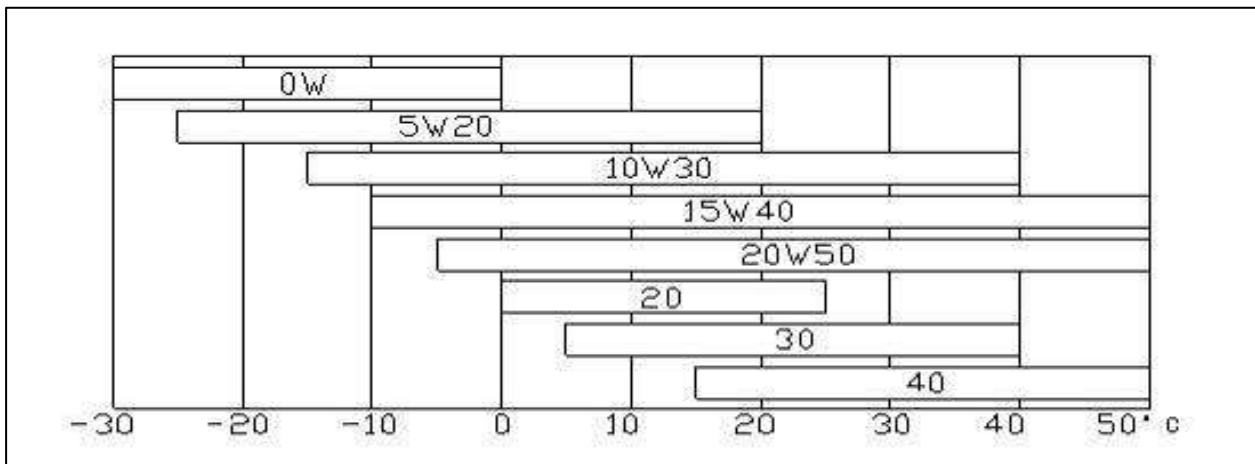
Engine oil

- Prefer using the engine oil whose quality is equivalent to or higher than level CH-4 of American Petroleum Institute API, or refer to the engine specification.
- Part of engine oil used for lubricating the piston will be burnt out (consumed) during the engine running. Engine oil must be replaced in certain period because of high temperature effect and the oil combustion product interfusing in the oil, especially the chemical additive in the oil will cause "abrasion" of the oil. This kind of abrasion depends on working condition of engine, quality of fuel and engine oil; therefore there has different oil changing interval. (Recommended oil changing interval is 12000km.)

Engine oil viscosity

- Since oil viscosity fluctuated with temperature, so the ambient temperature of engine working area is very important to select viscosity grade (as shown in the figure). When temperature exceed lower limit, it may decrease cold start capacity of the engine but will not make any damage to the engine.
- Higher sticky engine oil may cause the engine difficult to start, so the ambient temperature of the engine starting is the main reference for selecting viscosity of the winter engine oil. Selecting multifunctional engine oil may avoid oil changing caused by temperature fluctuation.

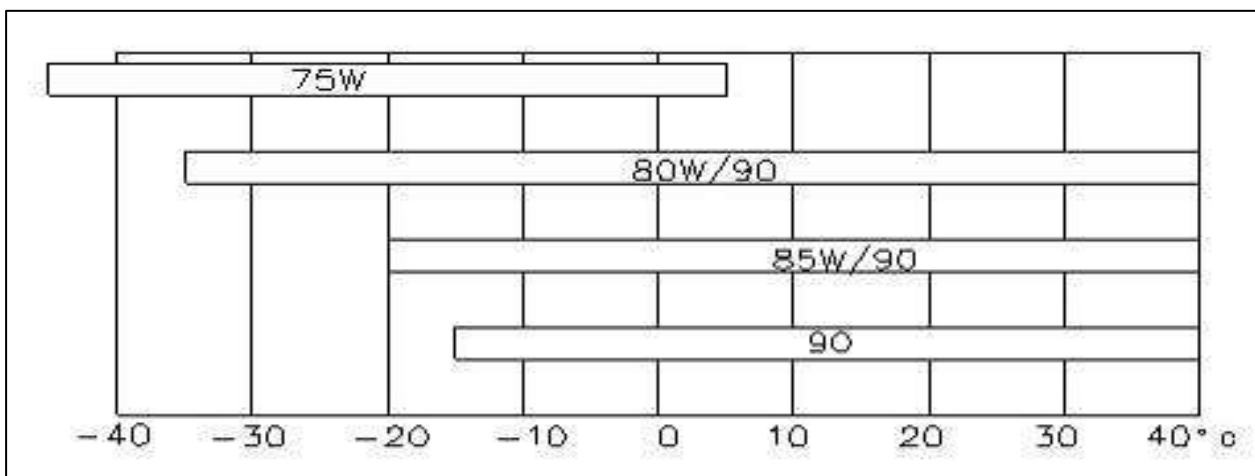
HINT: Never add any additive to above engine oil and different kinds of oil should be avoided using at the same time (oil mixture must be the same grade oil and it is recommended to replace in time).



Gear oil:

Recommended gear oil is ZF Ecolife Fluid.

Apply gear oil in accord with SAE90 API GL-5 grade. Recommended gear oil viscosity grade is related to ambient temperature, as shown in figure.



Power steering hydraulic oil:

Fulfill standard: General Allison C-3. When ambient temperature is low than 10°C, please apply DEXRON-II hydraulic fluid to steering gear; when ambient temperature is higher than 10°C, please apply C-3/10W hydraulic fluid. C-3/10W grade oil can be used in most area .all-year generally. C-3/30 grade oil can be used in non-cold area all-year generally.

Final drive lubricant:

Meet the using condition of GL-5(SAE90) grade heavy duty hyperboloid gear oil defined by API and the ambient temperature requirement.

Chassis grease:

- Grease added in each part should use 2# lithium base lubricant (suitable for temperature within the range of -30~ +120°C).
- Vehicle with centralized lubrication should use 0# lithium base lubricant.

Water tank coolant:

- Long life anti-freezing and antirust fluid should be added to water tank. The coolant could be general used both in winter and summer without adding and draining water in winter and it can prevent forming scale and corroding cooling system. Freezing point of the coolant should be noticed to 5°C lower than the lowest environment temperature. Different type of coolant should not be mixed using.
- Replacing period of the coolant is 2 years.
For specification of the coolant please see the section "filling up coolant" in the chapter "maintenance and service ".

Breaking-in of New Vehicle

Engine of new vehicle should be sure not to operate at the maximum power output during the breaking-in period to keep best performance and superior efficiency as well as guarantee durable service life. Please drive cautiously and pay more attention to abnormal phenomenon occurred during breaking-in period. Given break-in mileage of the new vehicle is 5,000 km., please run at the speed under 100 km/h in breaking-in period.

Preparation before breaking-in of the new vehicle

1. Wash the vehicle and check connection and tight situation of each place.
2. Check coolant storage in radiator and check each place of cooling system for leakage.
3. Check oil level of engine, clutch control system, transmission, drive axle, steering gear and clutch oil storage tank. If deficient, add and then check each place for leakage.
4. Check and see if braking system works properly and leakage phenomenon exists at connections of all valves and pipelines.
5. Check and see if phenomenon of loosening or clogging exists at each place of steering system.
6. Check and see if electric equipments, lamps and the instruments work properly and check battery electrolyte level.
7. Check whether tire pressure has meet requirement.
8. Check and see if each transmission gear can engage properly.

Maintenance during breaking-in period

1. Running on smooth and good road surface.
2. Drive properly and engage the clutch smoothly. Gear shifting smoothly and impact is not allowed. Neutral gear sliding is forbidden while engine stop. Emergency brake should occur as few as possible.
3. Speed limitation during breaking-in period: first gear \leq 10km/h, second gear \leq 20km/h, third gear \leq 30km/h, fourth gear \leq 50km/h, fifth gear \leq 60km/h, overspeed gear using can not be permitted during breaking-in period .
4. Load limit: No load within 250km and never overload after 250km.
5. Often pay attention to the temperature of transmission, drive axle, wheel hub and brake drum. If overheating severely, find out causes and eliminate in time .
6. Pay more attention to keep the pressure of engine oil and the temperature of engine coolant within the normal range.

Maintenance after breaking-in period

1. Tighten cylinder head and bolts (inc suspension). Tighten torque please refer to corresponding instruction. Tighten torques please refer to corresponding instructions.
2. Check valve clearance.
3. Check lubricant level of final drive and clean ventilation plug.
4. Replace engine oil、 axle oil and oil filter element.
5. Replace hydraulic oil and oil tank filter of power steering hydraulic system.

6. Check connection of transmission control mechanism for looseness.
7. Check connections of steering gear for looseness and damage.
8. Tighten bolts and nuts of front and rear suspension (carry out when full load)
9. Check connections of chassis and driving system according to specified torques. Tighten torques please refer to corresponding instructions.
10. Check hydraulic system components of steering mechanism for fixing and tightness
11. Lubricate and maintain vehicle according to maintain items at 5,000km.
12. Check complete vehicle for oil, water and air leakage.

Daily Maintenance Operation

System	Item	Operation	Technical requirement
Engine	Air cleaner	Check	No leakage, damage, and crack.
			Clips without looseness.
	Fuel-water separator	Drain	Release the water and fouling
	Cooling fan	Inspect	Do not pull or lever the cooling fan for starting the engine.
			No crack, looseness, bend or damage.
	air inlet/ outlet piping	Maintenance check	Pipes without wear and damage, clips without looseness prevent the air leakage.
	Coolant level	Check	Do not remove the water tank cover, unless the temperature is less than 50°C, otherwise, it's dangerous for operator
			Do not add the cold coolant into the hot engine, unless the engine temperature is less than 50°C
	Engine oil level	Check / correct	Do not start engine when oil level less than “L” or more than “H”.
Vehicle parking level, check the oil after engine stops for 5 minutes			
Drive belt	Check / correct	No across crack, wear or material break off	
Crankcase breather tube	Check	Check the breather tube in cold winter, cleanup the ice blocking.	
Engine and Accessories	Check	No damage and crack	
Clutch	Clutch pedal free stroke	Not applicable	Clutch release bearing clearance
			Free stroke: 30 ~ 40 mm
	Clutch system	Not applicable	Check if clutch separated completely, connection stable and not skidding
	Clutch brake fluid level	Not applicable	Compound brake fluid
Brake chamber stroke	Not applicable		
Air suspension	Vehicle body	Check	Observe the vehicle body whether tilt or not, the air spring (or piping) of one side is leaky if this side is lower.
	The air springs	Check	If hear the sound of leaking obviously, we can deal with the problem after confirming the specific leaky location
Training	1. Correct operation: no neutral speed skidding; no idle speed running of engine for a long time		
	2. Correct maintenance: replace oil, oil filter element, diesel filter element, transmission, axle, angle transmission system periodically, clean and replace air filter element periodically		

Periodical maintenance and operation items and regulations

Periodical maintenance of each class: do maintenance during each interval or certain miles .

Special instruction: if assembly instruction requires different oil replace period, please follow the instruction's requirement on maintenance period and operation. If else please refer to this manual for maintenance requirement.

Maintenance operation and regulation every 5000km or 1 month depend on whichever occurs first.

Maintenance operation and regulation every 5000km

System	Item	Operation	Technical requirement
Steering system	Working condition	Check	Steering wheel max free rotation at middle 10 degrees
	redirector auxiliary oil and filter element	Check	Below 10°C use DEXRON-II; above 10°C use C-3/10W
	Fix bolts of each place	Fasten	Each fastening bolts not loosening, steering arm not loosening, steering wheel swift,
	Ball head	Lubricate	Each turning ball head not loosening, no clogging, clearance normal
	ZF series		Maintenance Free, refer to ZF TE-ML09
	GX85, GX 100, ZJ 100C	Check	N32 which manufactured by Shanghai oil refining factory or ATF or related products which produced.
	IPS40-SB8575D series	Check	Environment temperature >10°C, adopt CD level 15W/40 oil; Environment temperature <10°C, adopt No.8 hydraulic drive fluid.
Transmission (QJ series mechanism or automatic gearbox)	Transmission fix bolt	Fasten	
	Transmission and Accessories	Check	No leakage, operation organization effective, no abnormal sound, wrong gear engagement.
	Lubricant oil	Change	Refer to ZF TE-ML 20, oil change rely on 180,000KM or 3 years whichever comes first.

System	Item	Operation	Technical requirement
Front axle (DF & F S series)	Brake clearance	Not applicable	
Rear axle(DF & FS series)	Brake clearance	Not applicable	
Air suspension	Fasteners	Check/tighten	Check and tighten the bolts, rods, height control valves, air springs, shock absorbers, anti-roll bars.
	The top covers of air springs, height control valves and the joints of the air course	Check	Listening and wiping the liquid soap. If find any place is leaky, please either tighten the joints or change the seal tape and clean the accumulated water, oil in the piping and the dirt in the joints
Air suspension	The exterior surface of air springs	Check	Find out the places which are abraded, distended, bumped or cut
	The air spring	Change	The surface of the air spring is damaged and appears the cord fabric
	The air spring	Adjust/check	If air spring interfere and knock with the components around it, please adjust it in time.
	The air spring surface	Check/clean	Clean the lubricant grease on the surface, the dirt on the piston, the abnormal things placed between the piston and air spring.
	The air spring	Check	If there is leakage in the joints of the air springs and the top cover, the air springs should be taken apart, then check whether the edges of the air springs and the top cover or the tapered sealing zone are distorted. Change it if it is distorted.
	The bumper	Check	It's damage maybe the root damage of the tapered sealing zone
	The height control valve	Check	If a height control valve controls two air springs and one air springs is leaky, the other air springs has not air too.
Air suspension shock absorber	Shock absorber	Check	The external damage, the welding damage and the sealing damage result to the leakage of the shock absorber.
	The rod	Check	Check the rubber of the rod ball head and the rivet of the sleeve pipe and the ball head. Check the clamp and the tighten bolts if the it is the adjustable rod
	The rubber liner	Check	Check the ball joints of the anti-roll bar and the rubber liner bushing of the boom

System	Item	Operation	Technical requirement
Brake System	The brake pedal free stroke	Check & adjust	10 - 15mm
	The braking condition	Check	Shoe drum clearance: 0.30mm ~ 0.50mm, in complete braking, pedal stroke not surpass 1/2 of the whole stroke, check in the dry condition
	The brake pressure	Check	Check whole vehicle brake pressure as required or not. Above 0.6MPa
	The brake nuts	Inspect	Inspect fastening of rear brake board's nut 7.7 - 9 (m): 150-180 Nm, 9m above: front; 160-205 Nm, rear: 196-245 Nm
	The pipe and joint sealing	Check	Check brake pipe and joint sealing, No leakage
Chassis	Fastening body and chassis connective bolts, nuts	Check	
	The whole vehicle body butter nozzle	Lubricate	Grease nozzle complete and effective, lubrication good
Electrical equipment	The whole vehicle light and instrument	Check	
	The battery fluid surface	Check	Add distilled water,
	The wire joint firmness, no rust	Check	No rust
	Air-con radiator filtration net	Clean	

Maintenance operation and regulation every 10000km or 3 months depend on whichever occurs first.

Every 10000km include every 5000km maintenance operation

System	Item	Operation	Technical requirement
Engine	Oil	Replace	Check oil surface within required range
			Check engine and oil seal without apparent leakage
			Replace oil when engine water temperature is over 60°C, for removing the impurity
			Oil level more than CF
	Oil filter	Replace	Before installation add 1/2—3/4 to filter
	Air filter	Check	Clean air filter element
	Air inlet/ outlet system	Check	No air leakage, no damage, each clip fastening good
	Cooling system and Intercooler	Check	No leakage, each clip without damage or loosen
			Water tank without leakage, damage, fouling
	Coolant filter	Replace	Before re-install the coolant filter, daubs the 15W-40 lubricate oil on the interface of the sealing ring.
	Fuel pump installation	Check	No leakage
Air compressor	Check	No air, oil, coolant leakage, lock nut and bolt no loosen or damage	
		No carbon deposit	
Brake system	Check	No leakage	
Propeller shaft	fastening bolt	Check and fasten	Propeller shaft flange fastening bolts not loosening
	universal joint	Check and fasten	Universal joint each bearing no loosening or damage
Front axle (DF or FS series)	Brake bottom board	Not applicable	No loosening
	Hub bear	Not applicable	No loosening
	Brake plate	Not applicable	Change the brake plate when plate abrasion more than limit pit.
Rear axle (DF or FS series)	Brake bottom board	Not applicable	No loosening
	Hub bear	Not applicable	No loosening
	Brake plate	Not applicable	Change the brake plate when plate abrasion more than limit pit.
The leaf Suspension	Leaf spring	Not applicable	Each fastening bolt not loosening, leaf spring no broken piece, no apparent change of elasticity
Brake system	Rear braking system	Check	Check brake friction piece thickness within required range by check port, visual check brake adjust arm working condition, running and stop brake good, each brake pipeline and air line no leakage

Maintenance operation and regulation every 20000km or 5 months depend on whichever occurs first. Every 20000km include every 10000km maintenance operation

System	Item	Operation	Technical requirement
Engine	Fuel filter	Replace	Replace fuel filter element accordingly
	Engine oil	Replace	Replace and fill oil level within required range
	Coolant system – anti-freezing	Check	Check the density of anti-freezing
Propeller shaft	Dust-proof cover	Check	Dust-proof cover without crack, damage, clip reliable, bracket no loosening
	Universal joint condition	Check	Universal joint without loosening, no block abnormal sound
	Propeller shaft bracket	Check	Propeller shaft bracket no loosening, screw torque 120 ~ 140Nm
	Middle bearing clearance	Check	Middle bearing clearance no more than 3mm
	Lubricate	Lubricate	Lubricate each butter nozzle with 2# lithium lubricant grease
Steering system	GX85, GX 100, ZJ 100C	Change oil and filter core of oil tank	N32 which manufactured by Shanghai oil refining factory or ATF or related products which produced.
	IPS40-SB8575D series	Change oil and filter core of oil tank	Environment temperature >10°C, adopt CD level 15W/40 oil; Environment temperature <10°C, adopt No. hydraulic drive fluid
Front axle	Toe-in of front wheel	Not applicable	Radial-ply tire: 0 ~ +2mm
Rear axle (DF & FS series)	Final drive	Not applicable	From injection hole into final drive filling Parathion-type 90 heavy-duty gear oil (GL-5) to the face. (for first 1500km, than change for every 24,000km)
The leaf suspension		Not applicable	Not loosening, crack, fracture, misplacement, screw U bolt, front 196 ~ 294Nm, rear 343 ~ 392Nm
The air suspension	The liner bushing of the rod assembly	Change	The liner bushing is relative sliding with the ball head
		Change	The liner bushing is knocked to bend and the tighten bolts of the adjustable rod are becoming invalid which result to the threads of the ball head and the steel pipe damaged.
	The rubber ball joints	Change	The crack on the surface of the rubber is very serious. The depth of the crack is up to 2mm and the length of it is up to 8mm

System	Item	Operation	Technical requirement
The air suspension	The rubber ball joints	Change	There are gaps on the surface of the rubber
			The surface of the rubber become adhesive, brittle and the rubber drop off seriously
			The connection of the metal and the rubber is damaged. The partial depth is up to 6mm
			The rubber ball joint rotates in the inner hole of the ball head and will
	The height control valve.	Check adjust	Check the equilibrium position of the adjustment bar of the height control valve.
	The rubber of the link rod	Change	Change it if the rubber of link rod becomes ageing, brittle, adhesive and lose its elasticity
	The connecting members of the shock absorber	Check change	Check the connecting members of the shock absorber if they are damaged please adjust or change them.
the rubber	Check change	If the rubber is crack, brittle, adhesive and loses its elasticity please adjust or change them.	
The height	Check adjust	Charge the air springs and adjust to the design height, then check the wheel base, the height of the vehicle body and the two side wheels' locations which are relative to the frame. If it is necessary please adjust the height of the air springs and the length of the rod in order to arrive to the design request	
Brake system	Brake pedal free stroke	Check	Break pedal free stroke 12 ~ 15mm
	Brake valve and pipe joint	Check and fasten	Break valve and pipe joint connection reliable and without air leakage
	ABS system	Check	ABS working properly
	Auxiliary brake, stop brake free stroke	Check	Effective, 20% dual direction stopping at slop reliable
	Retarder	Check	Retarder working properly
	Engine exhaust brake	Check	Exhaust brake working properly
Body, frame	door lock function	Check	Lock function good Sealing good
	cabin door sustain pole or air spring	Check	Cabin door lock function good, sustain pole or air spring effective
	inside and outside mirror	Check	Complete, no crack, effective, mirror clean, installation firm and reliable

System	Item	Operation	Technical requirement
Body, frame	front rear wind shield and side window glass	Check , clean	Clean, no crack, sealing good
	body with paint	Check	Body paint no crack or peeling, re-paint color the same as original
	pattern, character, company mark	Check	Pattern, character, company mark clear, complete
	Body and frame	Check	Function reliable, working properly, no distortion, crack, fracture, welding split, connective bolts and rivet fix firm and reliable
Inside establishment	Driver seat	Check	Fix firm, front rear up down lock function reliable Installation firm, backrest angle adjust lock function reliable
	Safety set	Check	Safety belt function good, connection reliable, fire extinguisher, urgency hammer complete and effective
	seat cover, carpet, curtain and armrest	Check	Clean, complete and firm
Compressor, air reservoir, safety valve	Compressor, air reservoir, safety valve	Clean, screw	Clean, connection reliable, no air leakage, safety valve normal, pressure at 8Mpa, check air reservoir, if with seeper, replace air drier filter element
Electrical equipment	Front lamp, horn, meters and signal	Check	set complete and effective
	Wiper generator	Check	Effective
	Wiper connection rod	Check, adjust	Reliable
	Whole vehicle wiring	Check, adjust	complete, reliable, insulation good
Air-conditioner	Air-con passage and read lamp control panel	Check	Air-con passage installation reliable, functional and effective
	Air vent set	Check	Installation firm , working properly
	Air-con strap tension and surface condition	Check	Tension proper, strap without crack, scuffing or distortion
	Magnetic clutch, fill lubricant	Check	Work properly, lubricant: 2# lithium grease
	Air-con pipe	Check	No leakage or interference
	Condenser, evaporator	Check	Clean, no dirt
	Coolant and fuel qty	Check	Up to requirement, fill if necessary
	Control switch	Check	Installation firm, operation normal and reliable
Heating system	Fuel, water heat pipelines	Check	No crack, oil, air or water leakage, joint not loosening, oil and water pipelines smooth
	Heating device	Check	Pipeline connection reliable, operation good

Maintenance operation and regulation every 40000km or 8 months depend on whichever occurs first.

Every 40000km include every 20000km maintenance operation

System	Item	Operation	Technical requirement
Engine	Drive belt, Cooling fan belt tension	Check/adjust	Check each belt without loosening or damage
	Cooling fan bearing and bolt	Check/adjust	No damage, fouling, loosening
	Belt tension pulley bearing	Check/adjust	No damage, fouling, loosening
	Cylinder cover bolt	Check/adjust	No damage, loosening
	Air dryer	Replace	Replace air dryer
Suspension	Leaf spring bushing	Not applicable	Clearance between leaf spring bush and pin normal, no abnormal abrasion, bush not crack, lubrication normal

Maintenance operation and regulation every 80000km or 12 months depend on whichever occurs first.

Every 80000km include every 40000km maintenance operation

System	Item	Operation	Technical requirement
Engine	Thermostats	Replace	
	Fuel roughing filter	Replace	
	Cooling system	Release/ clean/ add	
	Radiator	Check	Radiator without leakage, damage, fouling. Hose without damage, clips without loosen or damage.
	Engine suspending	Check/fasten	Connection reliable, firm, soft mat no distortion layer or crack
	Overhead set- valves and injectors	Measure	Valve clearance within required range
Clutch	Clutch brake fluid level	Not applicable	Compound brake fluid
The leaf suspension	leaf spring bushing	Not applicable	Clearance between leaf spring bushing and pin normal, no abnormal abrasion, bushing without crack, lubrication normal

Maintenance operation and regulation more than 80000km or corresponding time interval.

ZF Series axle

Oil or Grease change required, depending on whichever occurs first.

Assembly Name	Model	Maintenance Operation	Maintenance Interval	Oil Classes	Remark (Table for Lubricant)
Front Axle	Wheel heads RL series	Filling-up (general greasing point)	80,000KM or 1 year	ZF-Ecofluid 12G	TE-ML 12
		Oil change	150,000~180,000KM 3 years	ZF-Ecofluid X/12B/12C/12D/12E/12M	TE-ML 12
Rear Axle	A series, AV series	Oil change	150,000~180,000KM 3 years	ZF-Ecofluid X/12B/12C/12D/12E/12M	TE-ML 12
		Filling-up (general greasing point)	80,000KM or 1 year	ZF-Ecofluid 12G	TE-ML 12
Rear Axle	AVE 130	Oil change	60,000 km / 1 years	ZF-Ecofluid 12L	TE-ML 12
		Filling-up (general greasing point)	80,000KM or 1 years	ZF-Ecofluid 12G	TE-ML 12
Wheel bearings with individual mounts at the front and rear axles			500.000 km / 2 years	ZF-Ecofluid 12G	TE-ML 12
Compact bearings (hub unit) in the wheel heads at the front and rear axles			800,000 km / 6 years	ZF-Ecofluid 12H	TE-ML 12

ZF Manual Gearbox Products

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF Ecolite Series (Manual) (6S890 , S6-85/A)	- Scheduled routes - Average speed from 20to 60km/h	360,000 km or 3 years	ZF-Ecofluid M 02B(1)/02E/
	- Long-distance coach journeys - Average speed as of 60 km/h	540,000 km or 3 years	02H/02L

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF Ecolite Series without Intarder (Manual)(6S1650BO)	- Scheduled routes - Average speed from 20to 60km/h	360,000 km or 3 years	ZF-Ecofluid M 02B(1)/02E/02H/02L
	- Long-distance coach journeys - Average speed as of 60 km/h	540,000 km or 3 years	

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF Ecolite Series with Intarder (Manual)(6S1701BO)	- Scheduled routes - Average speed from 20to 60km/h	360,000 km or years	ZF-Ecofluid M 02E/ 02H/02L
	- Long-distance coach journeys - Average speed as of 60 km/h	540,000 km or 3 years	

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF Ecolite /AS Tronic lite Series (Manual)(6S1010BO)	- Scheduled routes - Average speed from 20to 60km/h	360,000 km or 3 years	ZF-Ecofluid M 02B(1)/ 02E/02L
	- Long-distance coach journeys - Average speed as of 60 km/h	540,000 km or 3 years	

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF AS Tronic lite Series (Manual)(6AS1010BO)	- Scheduled routes - Average speed from 20to 60km/h	360,000 km or years	ZF-Ecofluid M 02K
	- Long-distance coach journeys - Average speed as of 60 km/h	540,000 km or years	

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF AS Tronic without intarder Series (Manual) (12AS2300BO)	- Scheduled routes - Average speed from 20to 60km/h	360,000 km or 3 years	ZF-Ecofluid M 02B/02E/02L
	- Long-distance coach journeys - Average speed as of 60 km/h	540,000 km or 3 years	

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF AS Tronic with intarder Series (Manual) (12AS2301BO)	- Scheduled routes - Average speed from 20to 60km/h	360,000 km or 3 years	ZF-Ecofluid M 02E/02L
	- Long-distance coach journeys - Average speed as of 60 km/h	540,000 km or 3 years	

ZF Automatic Gearbox Products

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF Ecomat Series (automatic) (HP502C/592C/602C/604C)	oil sump temperature below 100 centigrade	120,000km or 3years	Automatic Transmission Fluids (ATF) 14A/14B/14C/14E
	oil sump temperature below 105 centigrade	150,000km or 3years	ZF Ecofluid A PLUS 14E

Assembly & System Name	Application Range	Oil Change Interval	Oil Classes
Transmission ZF Ecolife Series (automatic) (6AP1000B/1200B/ 1400B/1700B/2000B)	oil sump temperature below 100 centigrade	240,000 km or 3 years	ZF-Ecolife 20E/20F
	oil sump temperature below 105 centigrade	180,000 km or 3 years	

Maintenance period chart																		
1、1st line is the item of break-in of new vehicle (prescript items completed after driving 5000KM or the days of registration vehicle)																		
2、Other items are compulsion maintenance program (the circulation is 80000KM/12 months)																		
3、For engine、axle、transmission please refer to producer's maintenance manual, if without special maintenance period, please refer to this manual for maintenance information.																		
4、“R” meaning: Replacement ; “I” meaning: Inspection & adjusting; “C” meaning: Cleaning																		
Maintenance item	Maintenance period																	
	*1000km	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Month	1		3		5		7		8		9		10		11		12
Engine																		
Engine oil	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I
Oil filter	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I
Fuel filter element	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I
Air filter element	C	C	C	C	C	C	R	C	C	C	C	C	R	C	C	C	C	
Check& adjust belt	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Check & adjust engine idle speed	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Fixing every bolt and connection on engine	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Checking seal of pipe & connector	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Coolant	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	R
Fuel system	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Oil & water separator	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Lubricating oil in gearbox of fan angle steering gear	R		I		R		I		R		I		R		I		R	
Air compressor, air reservoir & pipe	I&C				I&C				I&C				I&C				I&C	
Radiator & expand water tank	I				I				I				I				I	
Fuel tank & oil pipe	I				I				I				I				I	
Fuel pump	I				I				I				I				I	
Water & oil separator core	I				R				R				R				R	
Handle fuel pump	C				C				C				C				C	
Water pump	I				I				I				I				I	
Intake & exhaust manifold, muffle, exhaust pipe	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Turbocharger	I&C				I&C				I&C				I&C				I&C	
Intercooler	I&C				I&C				I&C				I&C				I&C	
Engine suspension device	I				I				I				I				I	
Valve clearance									I									I
Thermostat									I									I

Maintenance period chart																		
1、1st line is the item of break-in of new vehicle (prescript items completed after driving 5000KM or the days of registration vehicle) 2、Other items are compulsion maintenance program (the circulation is 80000KM/12 months) 3、For engine、axle、transmission please refer to producer's maintenance manual, if without special maintenance period, please refer to this manual for maintenance information. 4、“R” meaning: Replacement ; “I” meaning: Inspection & adjusting; “C” meaning: Cleaning																		
Maintenance item	Maintenance period																	
	*1000km	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Month	1		3		5		7		8		9		10		11		12
Clutch (not applicable)																		
Release or meshing if not smoothly	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Oil pipe system	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Clutch plate abrasion	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Free stroke of clutch pedal	I		I		I		I		I		I		I		I		I	
Clutch oil	I		I		I		I		I		I		I		I		I	R
Clutch cylinder & stroke	I		I		I		I		I		I		I		I		I	
Transmission																		
Transmission if not leaking oil	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Selector mechanism	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Lubricant oil	I		I		I		I		I		I		R		I		I	
Venthole	C	I	I	I	C	I	I	I	C	I	I	I	C	I	I	I	C	
Propeller shaft																		
Drive shaft connecting parts	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Add lubricating oil in drive shaft	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Universal joint cross & bearing	I		I		I		I		I		I		I		I		I	
Fixing the bolt	I		I		I		I		I		I		I		I		I	
Middle bearing bracket & clearance	I				I				I				I				I	
Brake system																		
Brake pedal free stroke adjustment	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Driving brake , parking brake	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake pipe & connector seal	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Air dryer	I	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	I	R
Brake air pressure	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
ABS system checking	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake board fixing	I		I		I		I		I		I		I		I		I	
Retarder	C		C		C		C		C		C		C		C		C	

Maintenance period chart																		
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Maintenance item	Maintenance period																	
	*1000km	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Month	1		3		5		7		8		9		10		11		12
Brake system																		
Brake drum & wearing plate abrasion	I		I		I		I		I		I		I		I		I	
Brake shoe plate clearance	I				I					I				I				I
FR & RR brake checking	I				I					I				I				I
Engine exhaust brake	I				I					I				I				I
ABS unit checking	I									I								I
Brake valve & other valves	I									I								I
Axle & Tire																		
Tire& steel ring	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Checking & fixing RR axle housing & differential housing , RR cover half shaft bolt nut	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Lubricant steering main pin & brake adjusting arm & cam shaft	I		I		I		I			I		I		I		I		I
Fixing wheel nut	I		I		I		I			I		I		I		I		I
Tire transposition			I							I								I
Four-wheel maintenance , clean bearing	I				I					I				I				I
Checking & fixing front axle bolts ,nuts, bearings	I				I					I				I				I
Checking & fixing rear axle bolts, nuts, bearings	I				I					I				I				I
Clearance final drive vent hole	C				C					C				C				C
Rear axle gear oil	I				I					I				R				I
Front wheel alignment	I									I								I
Tires air pressure	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Wheel rim, flange, spoke	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Suspension system																		
Thrust pole , connecting pole installation	I		I		I		I			I		I		I		I		I
Air bag height, seal, integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Suspension system fixing piece	I				I					I				I				I

Maintenance period chart																		
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	*1000km	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Month	1		3		5		7		8		9		10		11		12
Suspension system																		
Suspension system lubricate oil	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Absorber working condition	I									I								I
Steel plate suspension bush	I									I								I
Left & right steel plate suspension flexibility	I									I								I
Fixing suspension U type bolt	I		I			I			I			I		I			I	I
Valves function	I									I								I
Bracket & lifting lug installation & wearing state	I									I								I
Steering system																		
Checking steering system working condition, oil leakage	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Steering wheel free stroke & working condition	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Checking power steering hydraulic pressure system	I		I			I			I			I		I			I	I
Steering booster oil & filter core	R		I			I			I		R		I		I		I	R
Fixing bolts	I		I			I			I			I		I			I	I
Lubricating steering ball	I		I			I			I			I		I			I	I
Oil pump working condition	I									I								I
Steering angle checking & adjusting	I									I								I
Checking the crack of steering framework, steering knuckle & knuckle arm, vertical arm & axle										I								I
Main pin clearance										I								I
drive steering hydraulic oil	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Toe-in of front wheel	I					I				I				I				I

Maintenance period chart																		
1、 1st line is the item of break-in of new vehicle (prescript items completed after driving 5000KM or the days of registration vehicle) 2、 Other items are compulsion maintenance program (the circulation is 80000KM/12 months) 3、 For engine、 axle、 transmission please refer to producer’s maintenance manual, if without special maintenance period, please refer to this manual for maintenance information. 4、 “R” meaning: Replacement ; “I” meaning: Inspection & adjusting; “C” meaning: Cleaning																		
Maintenance item	Maintenance period																	
	*1000km	5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
	Month	1		3		5		7		8		9		10		11		12
Electrical system																		
All lights	I		I		I		I		I		I		I		I		I	
Battery electrolyte surface , connector	I		I		I		I		I		I		I		I		I	
Wire box installation	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
All wires , circuitry, connectors	I		I		I		I		I		I		I		I		I	
A/C system & pre-heater system																		
Air conditioner system refrigeration working condition	I		I		I		I		I		I		I		I		I	
A/C compressor belt rate of tension	I				I				I				I				I	
A/C system pressure, compressor freeze oil quantity	I				I				I				I				I	
Autonomous water heat system-fuel supply system	I				I				I				I				I	
Autonomous water heat system-water supply system	I				I				I				I				I	
Vehicle body, framework																		
Luggage bin door air spring, stay bar	I				I				I				I				I	
Engine bin door air spring, stay bar	I				I				I				I				I	
Rearview mirror fixing	I				I				I				I				I	
Vehicle body, framework checking	I								I									I

Engine common trouble and its elimination (suitable for diesel engine)

Diesel engine can not start

Possible causes	Remedies
1) Too low starting speed	1) Check the starting system and assure the starting speed is not lower than 110rpm.
2) Air exists in the injection system	2) Check the looseness of the joints of the feed line. Unscrew the de-aeration bolt on the fuel cleaner and oil water separator assembly, then press fuel with hand priming pump until the fuel overflows without air bubbles.
3) Fuel pipe clogged	3) Determine the location of the clog and clear it.
4) Fuel filter choked	4) Replace the screw-on filter element of the fuel filter/oil-water separator assembly.
5) Fuel supply pump does not apply fuel or applies fuel irregularly	5) Check for leakage in the fuel inlet pipe Clogging of the fuel supply pump filters and fix or replace.
6) Insufficient fuel injection, without fuel injection or low injection pressure	6) Check the injector atomization situations and replace a new one if it doesn't work.
7) Starting system problems:	7) Check the connection to be correct and reliable.
Incorrect terminals connection or bad contact;	
Insufficient battery charge;	Charge the battery.
Bad contact between the brush and commutator of the starter	Repair or replace the brush and clean the surface of the commutator with soft sand paper and blow off.
8) Insufficient compression pressure;	8) Replace the piston ring and press in the cylinder sleeve if necessary.
Piston ring worn-out	
9) The fuel cut off solenoid valve joint is loose, dirty or corroded smudginess canker	9) Check the valve clearance, valve spring, valve stem, and valve seat. Grind the valve seat if necessary. Tighten and wash or replace.
10) Mounting timing incorrect	10) Check and adjust it.

Diesel engine power deficient

Possible causes	Remedies
1) Intake blocked	1) Check the air cleaner, intake pipe, and clean or replace the air cleaner filter elements.
2) high exhaust back pressure	2) Check the valve timing, adjust it if necessary; Clean the exhaust pipe.
3) Insufficient boost pressure of turbocharged system	3) Check and eliminate the leakage in the pipe and joints.
4) Turbocharger is out of order; Compressor and turbine passages are polluted, clogged or damaged;	4) Dean or replace the compressor casing and turbine housing.
Bearing failure;	Replace it.
Carbon deposit and sludge in the back of turbine and compressor impellers.	Clean it.
5) middle cooler mangle ,leave out	5) Check and replace it.
6) Fuel line blocked or leaky	6) Check the seal of fuel line and fuel filter choking, or replace screw-on filter element.
7) Poor atomization of injector	7) Check the inject pressure, remove carbon, adjust and repair
8) Incorrect distribution phase	8) Check and adjust the distribution timing and valve lash
9) Cylinder gasket leakage	9) Tighten the cylinder head bolts according to the stated torque and order, or replace the cylinder gasket.
10) Bad valve sealing	10) Grind or replace it.
11) Overheat engine or too high coolant temperature	11) Check and repair the radiator, thermostat, and adjust fan belt tension.
12) Piston ring worn-out or broken	12) replace it
13) Sensor doesn't work	13) Check and replace it.

Abnormal noise during engine operation

Possible causes	Remedies
1) Connecting rod bearing bushing and main bearing bushing are worn-out and clash voice appears in the crankcase.	1) Dismantle and check the bushing and, if necessary, replace it and keep the reasonable clearance as required.
2) The Damper is damaged and invalid.	2) Change components to keep regulated axial clearance
3) The shock absorber is damaged and ineffective	3) Check and see if the joint bolts are in good conditions, and change new ones if necessary.
4) The valve knocks on the piston	4) Check and adjust the valve timing.
5) The driving gear is abraded and get too large gap. There is knocking sound at the timing gear box cover.	5) Check the gear side clearance and change the gear or not according to the abrasion situations.
6) Too big clearance between piston and cylinder and there is knocking sound at the cylinder wall.	6) Change the piston and use the repairing cylinder liner. Keep the proper clearance between piston and cylinder.
7) Puff vibration of supercharger	7) Remove the carbon and waste in the compressor channel and the exhaust channel.
8) The bearing of supercharger is damaged and the rotor knocks on the shell	8) Change the supercharger assembly
9) The valve clearance is too large and there is big noise at the cylinder head.	9) Adjust the valve clearance.

Exhaust with black smoke

Possible causes	Remedies
1) Intake clogged	1) Check and clean the air cleaner and intake passage.
2) Poor fuel quality	2) Use prescribed fuel.
3) Incorrect distribution timing	3) Adjust the distribution timing according to the instruction.
4) Bad atomization of injector	4) Check and repair or replace
5) The injector spray too much fuel	5) Check and adjust it according to the instruction.
6) Check and repair or replace	6) Check and repair leak in the pipe line and joints.
7) Faulty turbocharger	7) Check and replace the assembly.
8) middle cooler damaged and leaked	8) Repair or replace it

Exhaust with white and blue smoke

Possible causes	Remedies
1) Poor quality fuel and too much water in fuel	1) Replace the fuel.
2) Too low coolant temperature	2) Check the working temperature of the thermostat, replace it if necessary.
3) Incorrect distribution	3) Check and adjust it.
4) Too low Pressure	4) Check the working temperature of the thermostat, replace it if necessary.
5) Incorrect installing orientation of piston rings	5) Check and reinstall correctly.
6) Running at low load for long time	6) Operate at proper speed and load
7) Seal ring of turbocharger worn-out	7) Check and replace it.
8) thrust bearing of turbocharger worn-out	8) Check and replace it.
9) Oil return pipe of turbocharger	9) Clean or repair it.

Too low oil pressure

Possible causes	Remedies
1) Diluted or incorrectly selected	1) Select the proper oil.
2) Inner and outer rotors of oil pump worn-out or too large	2) Replace the oil pump.
3) Oil filter choked	3) Replace the whirling type filter element.
4) Failure of oil filter pressure control	4) Repair it.
5) Gear of oil pump damage	5) Replace it.
6) Inlet oil tube of fuel pump crack	6) Repair or replace it.
7) Fixing bolt of oil pump inlet oil tube loose	7) Tighten the bolt to the required torque.
8) Too large bearing bushings clearance.	8) Check and replace it.

Too high oil pressure

Possible causes	Remedies
1) Too low ambient temperature and too high oil viscosity	1) Use the required grade engine oil. Operate at low speed after starting, and then check it when the oil temperature is normal.
2) Over-flow valve clogged	2) Check and clean it

Too high oil temperature and oil consumption

Possible causes	Remedies
1) Leakage in the exterior oil line	1) Check and repair it.
2) Too high diesel engine load	2) Decrease the load.
3) Use improper oil	3) Use the oil as required.
4) Piston ring stuck or seriously worn	4) Check and repair, if necessary, replace it.
5) Too much worn out of Cylinder bore	5) Bore the cylinder and use the oversized piston rings or press in a repair –used cylinder sleeve.
6) Valve guide seriously worn out and failed seal of valve stem	6) Check and replace.

Chassis constant fault and elimination

Propeller shaft

Fault symptom	Possible cause	Eliminating method
<p>Propeller shaft jogging (vehicle vibrates during driving)</p>	<ol style="list-style-type: none"> 1. Propeller shaft sliding yoke assembled incorrectly 2. The propeller shaft is distortion or bending 3. The universal-joint journal or the needle bearing has been worn out or damaged 4. The propeller shaft loose 5. The propeller shaft is imbalance 6. The intermediate supporting bearing is worn out or damaged 7. Bracket of the intermediate supporting bearing is loose or the rubber damp piece material is aging 	<ol style="list-style-type: none"> 1. Remove and let the sliding yoke and the fixing yoke on the same plane 2. Adjust or replace the propeller shaft 3. Replace the bearing 4. Tighten propeller shaft to specified torque 5. Adjust or replace the propeller shaft 6. Replace the intermediate supporting bearing 7. Make adjustment or replacement
<p>Abnormal sound from the propeller shaft (during the starting and the running)</p>	<ol style="list-style-type: none"> 1. Abrasion or damage of the universal joint 2. Abrasion or damage of the sliding yoke 3. Looseness of the propeller shaft 4. Inadequate lubrication to the needle bearing, the sliding yoke and the intermediate bearing 	<ol style="list-style-type: none"> 1. Replace the universal joint 2. Replace the sliding yoke 3. Tighten it to specified torque 4. Make the lubrication

Transmission

Fault symptom	Possible cause	Eliminating method
<p>Difficult gear shift (Difficult gear engagement)</p>	<p>1. Control mechanism 1) Improper height of the control hinge 2) There has clearance between the control hinge connection 3) The control hinge bend 2. Transmission 1) Abrasion or damage of the bearing 2) Synchronizer operates abnormally 3) The shaft or the gear is wore or damaged 4) Abnormal slip of the gear shifter shaft 3. Others 1) Clutch can not disengage normally 2) The lubrication viscosity is too high</p>	<p>1) Adjust the control hinge 2) Correct or replace the parts 3) Correct or replace the control hinge 1) Replace the bearing 2) Correct or replace the parts 3) Correct or replace the parts 4) Correct 1) See " Clutch does not disengage smoothly or can not disengage " 2) Use the lubrication of given grade</p>
<p>The transmission gear is off the engaging position</p>	<p>Transmission 1) Shift fork distorted or worn 2) Abrasion of lthe lockup ball or the ball on the gear shifter shaft 3) Breakdown or fatigue of the lock spring 4) Excessive clearance of the gear engagement 5) Excessive clearance along the gearing axial direction 6) Abrasion of the sliding bearing slipper or its end surface 7) Abrasion of the main bearing Control mechanism 1) The control mechanism is out of work 2) Movement of the shifter lever causes vibration of the vehicle</p>	<p>1) Check the gear-shifter fork and make adjustment or replacement in case of bending 2) Disassemble and replace the worn-out parts 3) Replace the spring 4) Adjust the gear clearance or replace the gear 5) Measure the axial clearance and replace the thrust washer if necessary 6) Replace the bushing 7) Replace the main bearing 1) Check and correct the control hinge 2) Check damage of the engine rubber suspension and replace the faulted parts</p>

Rear axle

Fault symptom	Possible cause	Eliminating method
Abnormal sound from the rear axle (abnormal sound)	<p>When the vehicle is starting</p> <ol style="list-style-type: none"> 1) Excessive clearance between the differential gear 2) Excessive clearance between the driving and the driven gear 3) Looseness of the connecting flange and the propeller shaft 4) Too small pretightening force of the drive gear bearing 5) Looseness of the fixing bolt and nut of the driving gear <p>When the vehicle turning</p> <ol style="list-style-type: none"> 1) There has abrasion or damage to the axle shaft gear, driving gear, spider, thrust shim and the axle shaft bearing and etc 2) Too low oil level 	<ol style="list-style-type: none"> 1) Adjust the clearance 2) Adjust the clearance 3) Tighten it to specified torque 4) Adjust the pretightening force 5) Tighten it to specified torque <ol style="list-style-type: none"> 1) Adjust or replace the faulted parts 2) Fill up the lubrication
Abnormal sound of the rear axle (improper sound)	<p>When the vehicle is running:</p> <ol style="list-style-type: none"> 1) Excessive clearance between the driving and the driven gear 2) Abrasion or damage of the bearing 3) Abrasion or damage of the gear 4) Too low oil level <p>When running with inertance</p> <ol style="list-style-type: none"> 1) Too small clearance between the driving and the driven gear 2) Abrasion or damage of the bearing 3) Incorrect gear engaging position 4) Too low oil level 	<ol style="list-style-type: none"> 1) Adjust the clearance 2) Replace the bearing 3) Make adjustment or replacement 4) Fill up the lubrication <ol style="list-style-type: none"> 1) Adjust the clearance 2) Replace the bearing 3) Adjust or replace the faulted parts 4) Fill up the lubrication
Leakage of the rear axle lubrication	<ol style="list-style-type: none"> 1. Abrasion, looseness or damage of the oil seal 2. Looseness of the differential lock bolt or damage of the gasket 3. Damage of the differential carrier mating surface <p>Looseness of the oil draining plug or damage of the gasket</p>	<ol style="list-style-type: none"> 1. Replace the oil seal 2. Tighten to specified torque and replace gasket 3. Make trimming and replace the differential housing if necessary 4. Replace the gasket and tighten screw plug to specified torque

Fault symptom	Possible cause	Eliminating method
Leakage of the rear axle lubrication	4. Blocking or damage of the ventilation plug 5. Axle housing cracks 6. Damage or distortion of the coupling flange sealing surface 7. Malfunction of bearing leads to radial run out of coupling flange 8. Axle housing distortion caused by overloading	5. Clean or replace the ventilation plug 6. Repair or replace the axle housing 7. Adjust or replace the coupling flange 8. Replace the bearing 9. Adjust or replace the axle housing
Hub bearing jamming	1. Excessive pre-tightening force of the hub bearing 2. Inadequate lubrication of the bearing or incorrect usage of the grease 3. The bearing is defiled by the dust 4. Water entering bearing due to malfunction of sealing ring	1. Adjust the pre-tightening force 2. Intensify the lubrication or replace the grease 3. Clean and intensify the lubrication 4. Replace the sealing ring

Front axle and steering system

Fault symptom	Possible cause	Eliminating method
Steering wheel shimmy	1. The steering system 1) Steering gear housing bolt or steering column supporting loose 2) Looseness of the steering connection point 3) Excessive clearance of the steering gear housing 2. The front axle 1) Unbalance or abrasion of the rim, the spoke and the wheel 2) Abrasion of the front wheel bearing 3) Excessive abrasion of the king pin or the bushing 4) Deformation of the knuckle 5) Improper wheel alignment	1) Tighten to specified torque 2) Adjust the junction 3) Adjust the clearance 1) Balance all the components and replace faulted components. 2) Replace the bearing 3) Adjust or replace the faulted parts 4) Replace the knuckle 5) Check and adjust the wheel alignment

Fault symptom	Possible cause	Eliminating method
	6) Fatigue of the front leaf spring, looseness of the "U" -bolt or damage of the central bolt	6) Replace the faulted parts
Failure of steering wheel return to center	<ol style="list-style-type: none"> 1. The steering system <ol style="list-style-type: none"> 1) Difficulty in the gear engagement 2) Malfunction of power steering system 3) Improper contact with the power piston 4) Fatigue of the return spring 5) Malfunction of slide valve 2. The front axle <ol style="list-style-type: none"> 1) Excessive caster angle of the king pin 	<ol style="list-style-type: none"> 1) Adjust the gear engagement 2) Overhaul and eliminate trouble 3) Adjust or replace the power piston 4) Replace the spring 5) Check diameter of the slide valve and the housing and replace them if necessary 1) Check and adjust the front wheel alignment
Disalignment of the steering wheel	<ol style="list-style-type: none"> 1. The alignment of front wheel incorrect 2. There has fatigue and damage in the front plate spring 3. Bending of the front axle 4. Unsmooth of the braking 5. Looseness of the front hub bearing nut 6. Inequality of the tire pressure 7. Tires with different dimension applied 	<ol style="list-style-type: none"> 1. Check and adjust the front wheel alignment 2. Replace the faulted spring 3. Adjust or replace the front axle 4. Please refer to the chapter "braking" 5. Tighten to specified torque 6. Inflate to the given pressure 7. Replace the tire by the correct type
Misproportion or untimely tire wear	<ol style="list-style-type: none"> 1. The front axle <ol style="list-style-type: none"> 1) Incorrectness of the wheel alignment 2) Abrasion or wreckage of the hub bearing and looseness of the bearing nut 3) Over looseness or tightness of the ball stud, the king pin and the bushing 2. Tire <ol style="list-style-type: none"> 1) Tire pressure incorrect 2) Disalignment between the tire and the wheel 	<ol style="list-style-type: none"> 1) Check and adjust the front wheel alignment 2) Replace the bearing or tighten nut to specified torque. 3) Make an adjustment and replace the faulted parts as needed 1) Supply to the given air pressure 2) Replace the tire or the wheel

Fault symptom	Possible cause	Eliminating method
Misproportion or untimely tire wear	3. Others 1) Breakdown caused by the abrupt starting or the emergent braking 2) Overloading	1) Correct the driving pattern 2) Make the loading according to the specified capacity
Heavy operation of the steering wheel (the steering system breakdown)	1. Too low oil level 2. Lubricant deterioration or impurity in it 3. Abrasion of the steering junction 4. Fault of the power steering system 5. Excessive lubricant resistance caused by the pipeline sunken 6. Too low oil pressure caused by the ineffective hydraulic pump 7. There has air in the hydraulic pipeline 8. Malfunction of rotary valve 9. Abrasion or damage of the power cylinder and damage of the piston O -ring 10. Too much leakage of the oil inside the steering gear housing	1. Add the lubricant to the given level 2. Replace the lubricant 3. Replace the ball stud 4. Overhaul and eliminate trouble. 5. Measure the backpressure and repair or replace the pipeline in case of the set value exceeded 6. Measure the oil pressure and the flow volume; disassemble and repair the hydraulic pump if the set value belowed 7. Bleed air and add oil. 8. Disassemble and repair rotary valve. 9. Disassemble and repair. 10. Disassmeble and repair steering housing.
Heavy operation of the steering wheel (breakdown of the front axle)	1. Improper adjustment of the wheel alignment (excessive caster angle) 2. Too little clearance between the king pin and bushing 3. Inverse installation of the thrust bearing 4. Inadequate lubrication of the front axle parts 5. Over tight or loose connection of the bull 6. Too low tire pressure 7. Excessive abrasion of the tire	1. Check and adjust the wheel alignment 2. Check and adjust the clearance 3. Adjust the installation 4. Add the grease to the front axle 5. Check and lubricate the bulb stud 6. Inflate to the rated pressure 7. Replace the tire

There has oil spillage in the steering oil tank	<ol style="list-style-type: none"> 1. Clogging of the strainer or the filter element 2. There has air in the pipeline 	<ol style="list-style-type: none"> 1. Clean the filter strainer or replace the filter element 2. Add the oil and make the exhaustion
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Braking system

Fault symptom	Possible cause	Eliminating method
Unsmooth of the wheel	<ol style="list-style-type: none"> 1. There has compressed air inside the braking chamber 2. Improper lubrication of the camshaft or improper return of the adjusting arm 3. Brake shoe or chamber return spring fatigued or broken 4. The spring braking takes effect 5. Clogging of the exhaust port in the quick release valve 6. Brake valve primary or secondary piston return failure 	<ol style="list-style-type: none"> 1. Check and adjust the exhaust valve of the quick releasing valve 2. Adjust the faulted parts 3. Replace the faulted parts 4. Eliminate causes of the spring braking unreleased 5. Disassemble and clean the faulted parts 6. Disassemble and clean the braking valve and replace the faulted parts as needed
There has abnormal sound when troddening the brake pedal	<ol style="list-style-type: none"> 1. The clincher or the bolt is projected because of abrasion of the braking friction lining 2. Surface hardening of the friction lining 3. Deterioration of the friction lining 4. Improperly contact between the brake shoe and the friction lining 5. Uneven abrasion of the brake drum internal surface or weak installation 6. Looseness of the brake shoe supporting 7. Abrasion of the hub bearing 8. Deformation of the brake drum 	<ol style="list-style-type: none"> 1. Replace the friction lining 2. Replace the friction lining 3. Replace the friction lining 4. Rivet the rivet or tighten bolt 5. Adjust or tighten the brake drum 6. Adjust the clearance between the brake shoes and tighten the supporting pin locknut 7. Replace the hub bearing 8. Adjust or replace the brake drum

Fault symptom	Possible cause	Eliminating method
Unsteady braking	<ol style="list-style-type: none"> 1. Tire pressure uneven or tire dimension different 2. Improper installation of the brake shoe or damage of the return spring 3. Improper engagement of the braking friction lining 4. Improper adjustment of the left and right brake 5. Deterioration of the braking friction lining 6. Oil on the braking friction lining 7. Damage of the brake backing plate 8. Looseness of the leaf spring U-bolt 	<ol style="list-style-type: none"> 1. Operate as required 2. Tighten the locknut of the brake shoe supporting pin and replace the return spring 3. Adjust the friction lining 4. Adjust the brake 5. Replace the friction lining 6. Clean with the gasoline to eliminate the effect of the leakage at the hub oil seal, oil cylinder cover and the rubber cap 7. Replace it 8. Tighten the U-bolt
The braking can't be applied under all conditions	<p>When compressed air pressure is normal:</p> <ol style="list-style-type: none"> 1. Too short of the brake valve travel 2. The camshaft doesn't rotate (the bushing is lack of lubricant) 3. Improper adjustment of the braking chamber pusher stroke 4. Improper sliding contact of the relay valve 5. Overheat or deterioration of the braking friction lining 6. Improper engagement of the braking friction lining 7. There has lubricant on the friction lining or the brake drum 8. Water entering brake drum 	<ol style="list-style-type: none"> 1. Check ,and replace the braking valve if necessary 2. Check working condition of the camshaft and replace it as needed 3. Adjust the travel 4. Disassemble and repair 5. Replace the friction lining 6. Adjust engagement position of the friction lining 7. Clean the oil trace with proper cleanser or replace the friction lining 8. Drying out the water by pressing the pedal gently during the running

Fault symptom	Possible cause	Eliminating method
	When compressed air pressure is abnormal: 1. There has air leakage inside the air pipeline 2. The air compressor doesn't work 3. The pressure regulator is improper adjusted or failed because of the impurity entering Air leakage in the brake valve	1. Repair the leakage point 2. Disassemble and repair air compressor 3. Adjust or wash 4. Disassemble and repair the brake valve

Common trouble and troubleshooting of electrical equipment and starting system

Fault symptom	Possible cause	Eliminating method
There has abnormal sound during the generator rotates	1. The belt is of over loose or excessive abrasion with the shaking during the running 2. Bearing failure or oversize clearance 3. Too much bearing clearance	Adjust the belt and replace the bearing
The charging indicator light doesn't go off during the running and the vehicle is difficult to start	1. The battery is lack of power 2. The generator is damaged 3. Charging indicator lamp loop short 4. The belt is slipping	1. Charge the battery 2. Replace the generator 3. Check the circuit 4. Adjust the belt
The battery is lack of power excessively and incapable of charging at low speed	1. The battery is damaged 2. The generator is damaged 3. The belt is slipping	1. Replace the battery 2. Replace the generator 3. Adjust the belt

Fault symptom	Possible cause	Eliminating method
Difficult in starting	<ol style="list-style-type: none"> 1. The battery has no power, or is lack of power or terminal loose 2. Poor contact of the starter switch, short circuit of the connector lug or bad of the solenoid 3. Starter pinion is clogged in the flywheel ring gear. Furthermore, engine bearing is burnt ,water on external of the combustion chamber and the consumption frozen may also caused the breakdown 	<ol style="list-style-type: none"> 1. Charge and clean the joint and screw it 2. Repair or replace it 3. Repair or replace it <p>Found out the reason and eliminate it</p>
Starting gear of the starter can not engage with the flywheel teeth	<ol style="list-style-type: none"> 1. Poor contact of the ignition switch or socket loose 2. Unsteady connection of the relay device or the solenoid switch 3. Turnoff of the starter solenoid switch 4. Damage of the starting gear or the gear ring of starter 5. Malfunction of engage switch 6. Starter armature shaft bent 	<ol style="list-style-type: none"> 1. Clean and tighten 2. tighten it 3. Replace it 4. Repair the teeth or replace it 5. Found out the reason and eliminate it 6. Replace it
Starting gear of the starter can not disengage completely	<ol style="list-style-type: none"> 1. Starter starting gear sleeve too tight or stuck 2. Too little clearance between the starting gear and the flywheel ring gear or the starter gear damage 3. Magnetic coil dirty 4. Clogging of the transmission fork shaft 5. Locking of the engage switch 	<ol style="list-style-type: none"> 1. Replace the shaft sleeve or clean and amend it 2. Adjust the clearance or replace the starting gear 3. Clean it 4. Clean and adjust it 5. Replace it

Common trouble and troubleshooting of air conditioner system

The remedy and trouble analysis under abnormal pressure

No.	Pressure	Description	Analysis	Remedy
1	The high and low pressure is lower than normal.	There is bubble in the inspection glass ; the cold air in the bus insufficient ; high pressure pipe a little bit warm and the low pressure pipe a little bit cold, the temperature difference is not too much;	The refrigerant filling is not enough and the system is leaking	Check the system for the leakage and find out the leaking point And make the maintenance Fill in refrigerant
	The high and low pressure are higher Than normal		The refrigerant is too much	Drain some part of the refrigerant or refrigerant oil
2	The high and low pressure are much lower than normal .	No liquid flow seen from the inspection glass; Almost no refrigeration Almost no temperature difference between high and low pressure pipe	Air conditioner system has serious leakage	Check the system and find out the leakage and fill the enough refrigerant
3	The low pressure is nearly to zero or even the negative value; The high pressure is lower than the normal value	No refrigerate in the system The front or the rear part of the expansion valve has fog	expansion valve blocked; expansion valve temperature sensor damaged or packing error	Changed the expanding valve Change the expanding valve temperature sensor Make good package for the expanding valve
	The high pressure and the low pressure are abnormal; The pressures are higher than the normal values	The temperature of the sucking pipe is lower than the normal value and the frosting appeared	expansion valve opened too much	Change the expanding valve Readjust the expanding valve
	The high pressure is higher than the normal value and the low pressure is lower than normal	The surface for the air suction pipe of the compressor has frost or condensate	Expanding valve damaged	Change the expanding valve

No.	Pressure	Description	Analysis	Remedy
4	The high and low pressure are much higher than the normal value and the needle of the gauge swing obviously	The cooling capability is insufficient and the system has air and the bubbles seen in the inspection glass	Air mixed in the refrigerant The vacuum is not good for the first time filling refrigerant or after the maintenance	Discharge the refrigerant in the system and change the desiccators and also make the vacuum repeatedly for filling the refrigerant
5	The high pressure is higher than the normal value and the low pressure is nearly to zero or negative value and the gauge swing seriously	The air sent to the bus sometime cold and sometimes warm and the inspection glass looks yellow	Too much water in the system desiccators reaching the saturation the frosting water blocked the expanding valve	Change the desiccators and make the vacuum repeatedly and then re-fill the refrigerant
6	The low pressure is much higher than the normal value and the high pressure is a little bit higher than the normal value	Cold is in sufficient	The condenser blower doesn't work normally or there is blockage in the condenser radiator	Check the electric circuit diagram or cleaning the condenser
7	The high and low pressure are higher than the normal values	The cold air is insufficient	Compressor interior failure	Repair or change the compressor
8	The high and low pressure are lower than the normal value	Evaporator wind flow is insufficient	Evaporator blower not running or low in efficiently or the radiator of the evaporator blocked	Check the electric circuit diagram or clean the evaporator radiator

Electric system trouble and remedy

Fault symptom	Possible cause	Eliminating method
the power lamp on the control panel not light	<ol style="list-style-type: none"> 1. + no power supply; 2. D+ not connected well; 3. harness not tight; 4. control unit failure; 	<ol style="list-style-type: none"> 1. generator D+ no output, exchange the generator and repair 2. reconnect the cable D+; 3. reconnect the harness; 4. change the control panel or repair;
malfunction light on the control panel light up	<ol style="list-style-type: none"> 1. system pressure error; 2. pressure switch defective; 3. pressure switch harness not connected well; 4. harness connection not well; 5. control panel failure; 	<ol style="list-style-type: none"> 1. to connect the manifold gauge and eliminate the malfunction; 2. change the pressure switch and repair; 3. reconnect the pressure switch; 4. harness connection; 5. change the control panel or repair;
refrigerant lamp is not lighted up	<ol style="list-style-type: none"> 1. defrost sensor failure or connection problem; 2. temperature control sensor failure or connection problem; 3. temperature control sensor installation position not good ; 4. temperature control switch defective; 5. harness connection not reliable; 6. Control panel defective 	<ol style="list-style-type: none"> 1. change the defrost sensor or connect the cable again; 2. change the temperature control or connect the harness again; 3. re-install the temperature control into the correct position; 4. change the temperature control switch or repair; 5. harness connection again; 6. change the control panel or repair;
condenser fan not working	<ol style="list-style-type: none"> 1. malfunction lamp light up; 2. sensor failure; 3. relay failure; 4. fuse burnt; 5. battery not charge or connection loose; 6. harness connection not tight; 7. air blower connection loose; 8. air blower failure; 9. control panel failure; 	<ol style="list-style-type: none"> 1. check the problem according to the item 2; 2. change sensor or sensor connection cable; 3. change the relay or repair the relay of the connecting harness; 4. change the fuse; 5. change the battery or recharge the battery ,make the connection; 6. re-connect the harness; 7. connecting to the venting cable; 8. change the blower or repair; 9. change the control panel or repair;

Fault symptom	Possible cause	Eliminating method
compressor not working	<ol style="list-style-type: none"> 1. compressor clutch connecting cable not connected well; 2. clutch damaged; 3. malfunction lamp light up; 4. refrigerant light not lighting up; 5. relay out of work; 6. no harness connection to the battery; 	<ol style="list-style-type: none"> 1. reconnect the cable; 2. change the clutch or repair; 3. refer to the above-mentioned items;
evaporator blower not working	<ol style="list-style-type: none"> 1. relay not working; 2. battery no charge; 3. battery cable connected; 4. air blower harness not connected well; 5. harness connection not good; 6. venting blower cable not connecting well; 7. air blower or blower speed adjustable resistor failure; 8. control panel out of work; 	<ol style="list-style-type: none"> 1. change relay or repair or connect the relay connecting cable; 2. change the battery or recharge; 3. reconnect the battery cable; 4. change the fuse; 5. reconnect the harness; 6. reconnect the blower motor connecting cable; 7. change the air blower or change the resistor for repair; 8. change the control panel or repair

Driver tools table (one each)

No.	Part name	No.	Part name
1	Tool box	21	Flat-tip screwdriver 6*100MM
2	Combination wrench 8	22	Hammer 1 pound
3	Combination wrench 10	23	Slip joint pliers 8"
4	Combination wrench 12	24	Nipper pliers 6"
5	Combination wrench 13	25	Tire pressure gauge 0-1.4MPa
6	Combination wrench 14	26	Valve core wrench
7	Combination wrench 15	27	Filter wrench
8	Combination wrench 16	28	Pry bar also used as rocker lever 55cm
9	Combination wrench 17	29	Pry bar also used as handle 50cm
10	Combination wrench 18	30	Grease gun 400cm ³
11	Combination wrench 19	31	Socket wrench for wheel nut 32(hexagon)
12	Combination wrench 21	32	Torque bar 315 X 25 X 25
13	Combination wrench 22	33	Wrench for front wheel hub bearing nut 70 mm (hexagon)
14	Combination wrench 24	34	Wrench for rear wheel hub bearing nut 110 mm (hexagon)
15	Combination wrench 27	35	Final drive locknut 55mm
16	Combination wrench 30	36	Spare wheel lifter 22X550
17	S-double box wrench 13x15	37	Wrench for drive axle drain plug 10x10
18	Adjustable wrench 8"	38	Jack 16t J1601
19	Adjustable wrench 12"	39	Special tool box
20	Cross-head screwdriver 6"		

The tools above are the state when choose Dongfeng Dena axle, when other axles are applied, driver tools may vary as below

name	cancel	number	add	Axle manufacturer
Wrench for front wheel hub bearing nut	70mm (hexagon)	1	60 X72 mm foursquare	ZF Front axle
		1	2.25''or 57 mm hexagon	MeiChi Front axle
		1	58 mm	North Benz Front axle
Wrench for rear wheel hub bearing nut	110 mm (hexagon)	1	115 mm hexagon	DONG FENG DENA13T
		1	4.03''or102 mm	MeiChi Rear axle
Final drive locknut	55 mm(hexagon)	1	51 mm hexagon	Fangsheng rear axle or Dongfeng Dena or Hangzhou sanhua 9.5T
Socket wrench for wheel nut	32 mm(hexagon)	1	41 mm hexagon	Dongfeng Dena or Hangzhou sanhua 9.5T
		1	21 mm foursquare	Dongfeng Dena or Hangzhou sanhua 9.5T

Note: The tool box may vary according to different axle condition, for details, please refer to the encasement bill.

Tightening torque of main bolts and nuts

Position	Tightening torque (N·m)
Front tyre nut	412~480
Rear tyre nut	294~421
Bolt, connecting lower knuckle and ball pin	245~304
Steering kingpin lockpin nut	60~70
Fixing nut, upper steering knuckle	274~343
Binding nut, tie rod	90~110
Locked bolt and nut between pitman arm and pitman arm shaft	407~434
Fixing nut, ball pin on both ends of drag rod	240~300
Steering gear fixing bolt	294~333
Steering gear lock nut	137~217
Upper fixing bolt and nut between steering bracket and frame	137~167
Lower fixing bolt and nut between steering bracket and frame	275~330
Final drive bevel gear flange nut	395~539
Fixing nut, Front brake backing plate	160~205
Fixing nut, Rear brake backing plate	196~245
Fixing bolt, between driven gear and differential	588~686
Differential housing nut	216~275
Fixing bolt, Front brake chamber bracket	59~79
Fixing bolt, Front brake chamber	40~59
Fixing bolt, Rear brake chamber	167~196
Fixing bolt, retarder housing	128~157
Fixing bolt, axle shaft	137~176
Drive gear bearing cap bolt	120~137
Rear axle oil level check plug	127~157
Lock bolt, front shoe axle	49~69
U bolt, front axle	196~294
U bolt, rear axle	343~392
Lower slotted nut, damper	134~167
Fixing nut, between damper and damper bracket (M20)	88~118
Leaf spring pin locknut	54~69
Front engine mounting bracket bolt	90~110
Coupling bolt, between flywheel housing and frame bracket	80~100
Fixing bolt, between clutch and flywheel	90~100
Fixing bolt, between flywheel housing and clutch housing	60~75
Fixing bolt, between transmission and clutch housing	142~186
drive shaft coupling bolt	215~240
Fixing nut, transmission output shaft rear connecting panel	333~549

Bolts torque table

Torques for bolts with metric unified threads			
Dimension of bolt	Torques N.m*(ft-lb)		
	8.8	10.9	12.9
M4	3(2)	5(3)	5(4)
M5	6(4)	9(7)	10(7)
M6	10(7)	15(11)	18(13)
M8	25(18)	35(26)	45(33)
M10	50(37)	75(55)	83(61)
M12	88(65)	123(91)	147(108)
M14	137(101)	196(145)	235(173)
M16	211(156)	300(221)	358(264)
M18	290(213)	412(303)	490(361)
M20	412(304)	578(426)	696(513)
M22	560(413)	785(559)	942(695)
M24	711(524)	1000(738)	1200(885)
M27	1050(774)	1480(1092)	1774(1308)
M30	1420(1047)	2010(1482)	2400(1770)
Torques for bolts with metric fine threads			
Dimension of bolt	Torques N.m*(ft-lb)		
	8.8	10.9	12.9
M8×1	26(19)	37(27)	48(35)
M10×1.25	52(38)	76(56)	88(65)
M12×1.25	98(72)	137(101)	126(119)
M12×1.5	93(69)	127(94)	152(112)
M14×1.5	152(112)	216(159)	255(188)
M16×1.5	225(166)	318(235)	383(282)
M18×1.5	324(239)	466(344)	554(409)
M20×1.5	461(340)	628(463)	775(572)
M22×1.5	618(456)	863(636)	1058(780)
M24×2	780(575)	1096(808)	1294(954)
M27×2	1147(846)	1578(1164)	1920(1416)
M30×2	1568(1156)	2254(1662)	2695(1988)

The torque values allow bolt yield strength up to 90%, assuming a friction coefficient of μ

The table of Lubricant, Power steering oil and Grease

1 Main assembly lubricant

Oil site	Lubricant	Type	Level
Engine	Diesel engine oil	15W/40	API CH/H – 4/SG
Transmission	Gear oil	SAE 85W-90	ZF TE-ML20 or API GL – 4/5
Main reducer	Gear oil	SAE 85W-90	API GL – 5

Explanation : 1) Diesel engine oil--API CH -4/SG ,15W/40 , be used upwards -10°C
 10W API CH – 4/SG be used between -5°C ~ -20°C
 5W/30 API CH – 4/SG be used upwards -25°C
 2) Gear oil – could be used between -20°C ~ 50°C

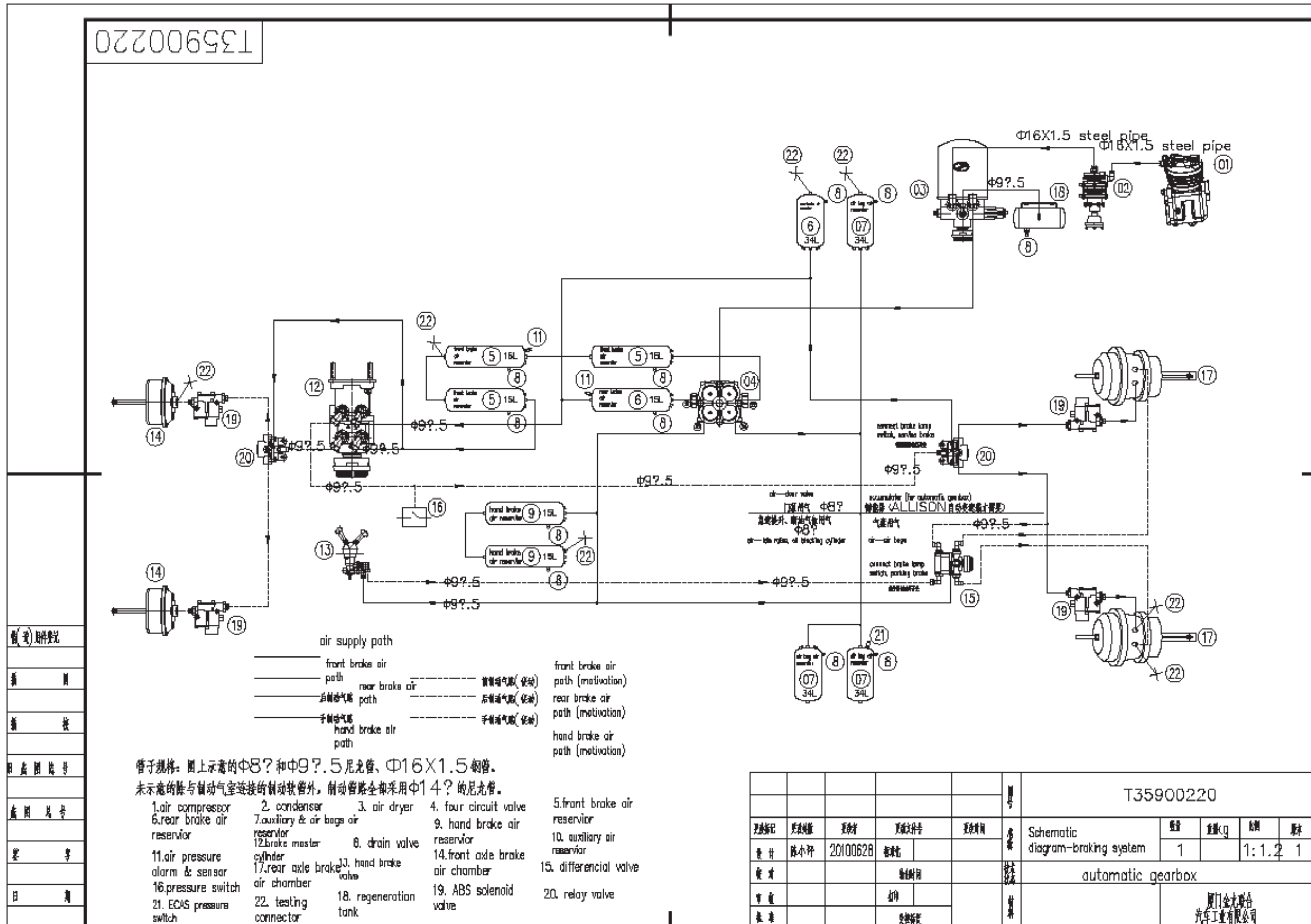
2 Power steering oil

Fulfill standard: please apply ZF TE-ML09 or DEXRON-II D/III hydraulic fluid to steering gear.

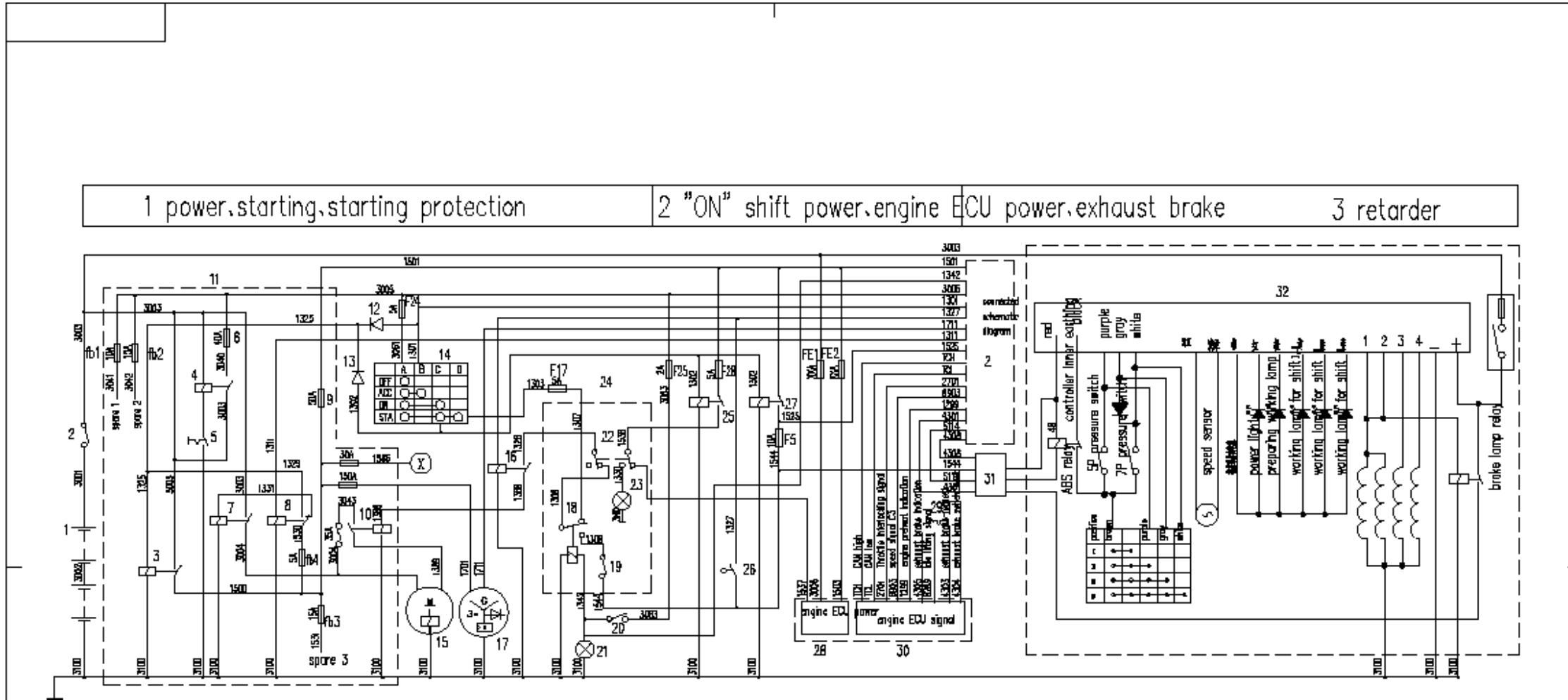
3 Others

Oil Site	Oil used	Nominate
Clutch	Synthesize grade oil (not applicable)	Nominate to use DOT3,DOT 4, etc., can't mix to use in different type grade oil
Brake system	Synthesize grade oil	DOT3,DOT4,DOT5, etc.,
Bearing and ball pin	Li - grease	2#
Coolant	Nominate to use SINOPEC brand, YF-2A (upward -45°C centigrade) coolant, can't mix to use different type coolant	

Air braking schematic diagram



Electric schematic diagram of the complete vehicle (1)

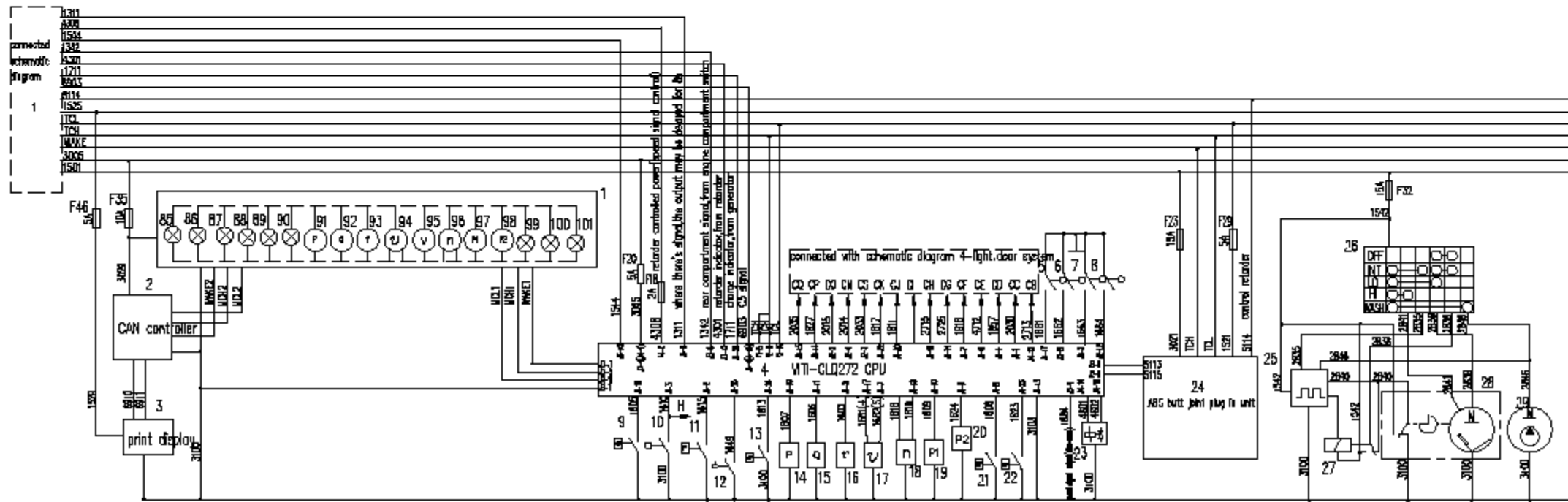


1	battery	7	main switch/starter	13	diode	19	rear starting switch	25	engine ON shift relay	31	retarder butt joint wire	37
2	handle main power switch optional	8	starting protective relay	14	starting key switch	20	engine compartment switch	26	neutral switch	32	retarder	38
3	main power switch	9	50A fuse	15	starter	21	engine compartment warning light	27	ON shift relay	33		39
4	power relay	10	starting relay	16	neutral relay	22	rear cutoff switch	28	engine ECU power	34		40
5	power cutoff switch	11	switch box	17	Alternator	23	prohibited starting indicator	29	exhaust brake switch	35		41
6	40A fuse	12	diode	18	starting change-over relay	24	rear starting switch box	30	ECU signal butt joint Assembly	36		42

6128Y-0000-3700001									
图号	图名	日期	设计	审核	比例	1:1			
图号	图名	20110215	设计	审核	比例	1:1			
YC6L330-30-S6-90									

Electric schematic diagram of the complete vehicle (2)

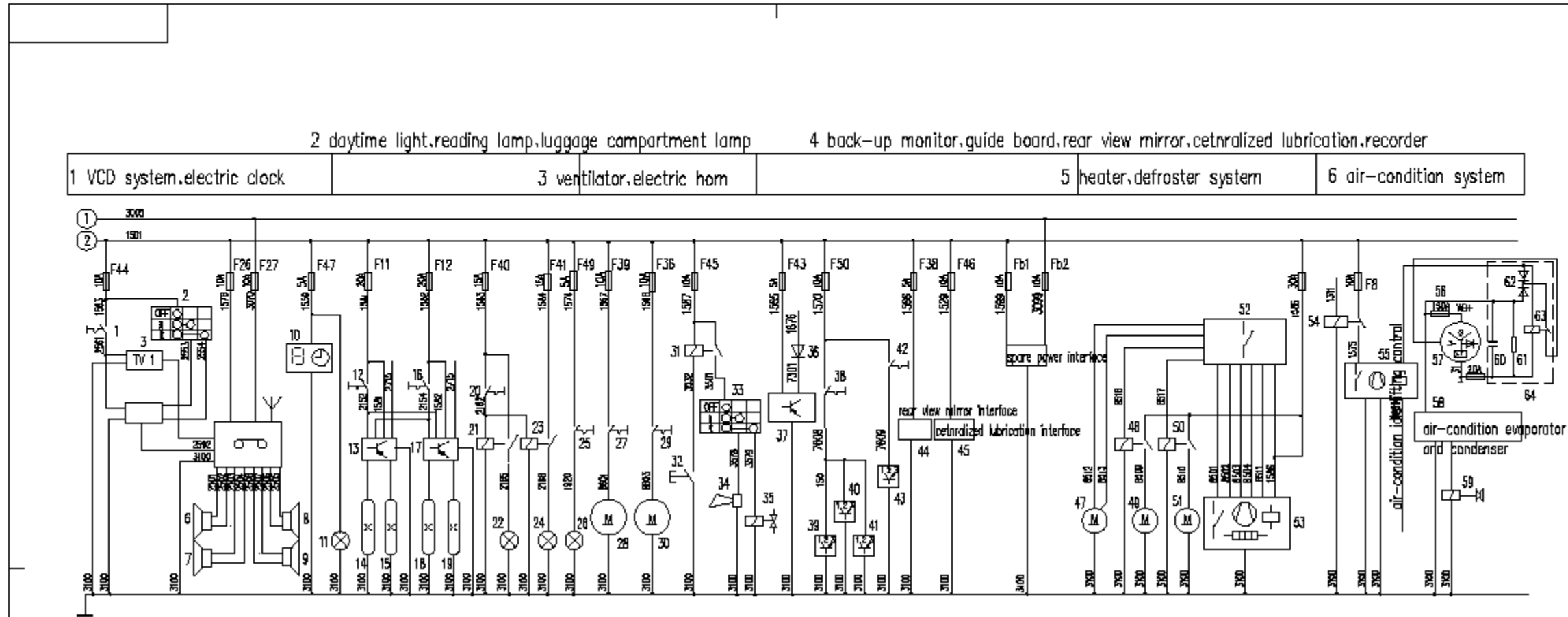
ZB 271 instrument, CAN controller (with running recorder) VITI-CLQ272 CPU 2 ABS 3 wiper washer



1	ZB271 instrument	7	rear left brake shoe	13	switch of oil filter blocking	19	sensor, air pressure 1	25	wiper intermittent controller	85	change indicator	91	oil pressure indicator	97	Barometer
2	CAN controller with vehicle data record	8	rear right brake shoe	14	oil pressure sensor	20	sensor, air pressure 2	26	wiper switch	86	oil pressure warning indicator	92	fuel gauge	98	Barometer
3	print display	9	oil pressure warning switch	15	fuel sensor	21	oil pressure warning switch 1	27	wiper relay	87	handbrake indicator	93	thermometer	99	oil pressure warning indicator
4	VITI-CLQ272 CPU	10	handbrake lamp switch	16	water temperature sensor	22	oil pressure warning switch 2	28	wiper motor	88	Warning lamp of air filter blocking	94	speedometer	100	oil pressure warning indicator
5	left front brake shoe	11	compartment temperature sensor	17	speedometer sensor	23	3 speed starter-magnetic clutch	29	washer motor	89	cooling water level warning indicator	95	voltmeter	101	power indicator
6	right front brake shoe	12	cooling water level switch	18	speedometer sensor	24	ABS built joint plug in unit	30		90	water temperature warning indicator	96	tachometer		

6128Y-0000-3700002									
图号	图名	日期	比例	张数	张次	材料	重量	数量	备注
主图	电气原理图	20110215	60%					1:1	1
图号	YC6L330-30-S6-90								
图名	电喷发动机								
图号	电喷发动机								

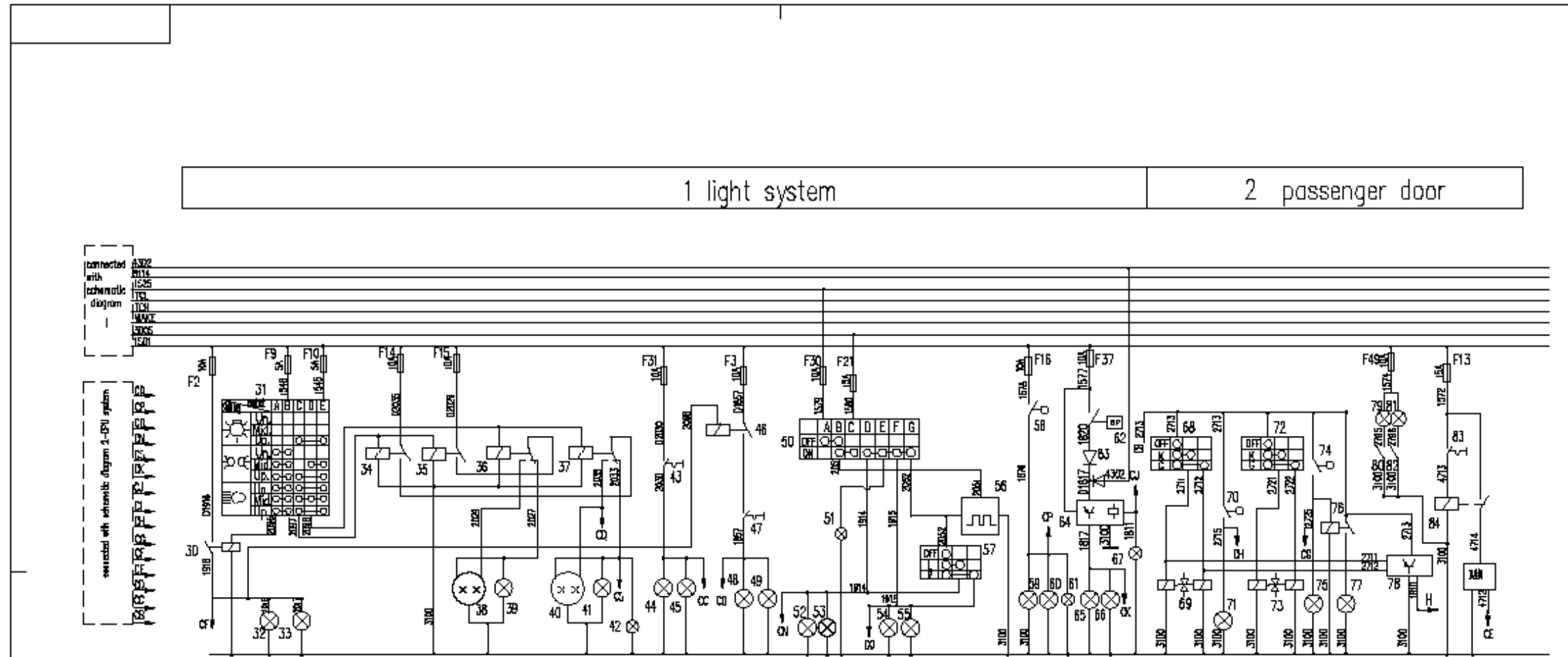
Electric schematic diagram of the complete vehicle (3)



1 TV power switch	11 driver lamp	21 reading lamp relay(l)	31 horn relay	41 rear guide board	51 high speed compulsory radiator	61 resistance	71
2 switch, tilt TV	12 left daylight lamp switch	22 reading lamp(r)	32 horn button	42 inner display switch	52 heater switch panel	62 diode	72
3 TV1	13 daylight lamp controller	23 reading lamp relay(r)	33 electric/air horn change-over switch	43 inner display	53 heater	63 control relay	73
4 TV2	14 front left daylight lamp	24 reading lamp(l)	34 electronic horn	44 rear view mirror power interface	54 air-condition power relay	64 Capacitance bus	74
5 media player	15 rear left daylight lamp	25 luggage compartment lamp switch	35 air horn solenoid valve	45 centralized lubrication power interface	55 air-condition panel	65	75
6 front left speaker	16 right daylight lamp switch	26 luggage compartment lamp	36 diode	46	56 air-condition fuse(150A)	66	76
7 rear left speaker	17 daylight lamp controller	27 front sky-light window switch	37 back-up monitor	47 defroster motor	57 air-condition generator	67	77
8 front right speaker	18 front right daylight lamp	28 front sky-light window motor	38 outer guide board switch	48 defroster low speed relay	58 air-condition evaporator and condenser	68	78
9 rear right speaker	19 rear right daylight lamp	29 rear sky-light window switch	39 front guide board	49 low speed compulsory radiator	59 air-condition compressor	69	79
10 electronic clock	20 reading lamp switch	30 rear sky-light window motor	40 side guide board	50 high speed radiator relay	60 Capacitor	70	80

				6128Y-0000-3700003			
图号	图名	日期	比例	图号	图名	日期	比例
主图	电气原理图	20110215	1:1	1	1	1	1
				Y06L330-30-S6-90			
				厦门金龙客车 汽车工程研究所			

Electric schematic diagram of the complete vehicle (4)



30	Relay, miniature lamp	36	Dimming relay, left front lamp	42	High beam indicator	48	left rear fog lamp	54	right turning lamp	60	right back-up lamp	66	right brake lamp	72	middle door switch	78	passenger door remote controller	84	tail relay
31	Light switch	37	Dimming relay, right front lamp	43	front fog lamp switch	49	rear right fog lamp	55	right turning indicator	61	back-up indicator	67	brake indicator	73	Magnet valve, middle door	79	warning lamp door emergency valve cover open		
32	left miniature lamp	38	Front headlamp(L)	44	front left fog lamp	50	warning lamp switch	56	flasher relay	62	brake lamp switch	68	front door switch	74	middle door cylinder microswitch	80	door emergency valve cover open		
33	miniature lamp(r)	39	Front headlamp(R)	45	front right fog lamp	51	warning indicator	57	turning lamp switch	63	diode	69	front door magnet valve	75	indicator for middle door open	81	warning lamp door emergency relaying		
34	Front headlamp relay(R)	40	front headlamp(R)	46	rear fog lamp relay	52	left turning lamp	58	back-up lamp switch	64	brake lamp controller	70	microswitch, front door cylinder	76	relay, middle door lamp	82	door emergency valve relaying		
35	Front headlamp relay(L)	41	front headlamp(L)	47	rear fog lamp switch	53	left turning indicator	59	left back-up lamp	65	left brake lamp	71	indicator for front door open	77	middle door lamp	83	lock switch		

6128Y-0000-3700004									
图号	图名	日期	设计	审核	制图	校对	电气	比例	张数
		20110215	666				YC6L330-30-S6-90	1:1	1
YC6L330-30-S6-90									
厦门金龙汽车集团股份有限公司									