

**DONGFENG DFA1063DJ10(14)-301/303**

**SERVICE MANUAL**



**DONGFENG AUTOMOBILE CO., LTD.**

**September. 2006**

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# General Principles

**GL**

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# General Principles

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## General Principles

This manual mainly states maintenance and service methods of DONGFENG DFA1063DJ10(14)-301/303 light commercial truck.

To use vehicles safely and efficiently, you need to read the manual thoroughly and make sure that you are familiar with the items that mark "Note". This is very important.

Due to continuous improvements on our vehicles, maybe there are some instructions in the manual that do not accord with the actual vehicles.

Maintenance method varies with different skill level, methods, tools and available parts that serviceman adopts. Any serviceman should firstly take into consideration no harm personal safety and vehicle safety when working.

As for the maintenance of engine, please refer to service documents offered by Dongfeng Cummins Engine Co., Ltd.

# General Principles

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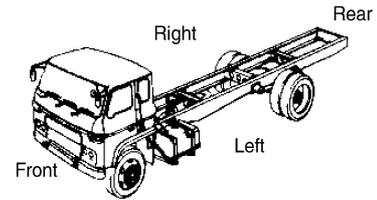
## Operational Instruction

You can neglect the structural differences between the part in the manual and the corresponding one of your vehicle, because the manual is just teaching you principles for your operation.

## Standard Terms

### Vehicle direction

Vehicle direction referred in the manual is marked as the right picture.



### Maintenance standard

The matching clearance or standard performance parameter of components while assembled.

### Reparation limit

It means that the component size or component clearance after repairing must satisfy the specified repair limit;

### Wear limit

It means that if a component is overworn or exceeds its wear limit, it must be replaced;

### Unit

Legal measure units are used in this manual.

## Standard Tightening Torque

To assure the safety and reliability of key vehicle parts, this manual makes specific prescriptions to the tightening torque of the bolts and other fasteners on those parts. As for the bolts and other fasteners not mentioned, the structures and the sizes of them have been standardized and they should be fastened with screwing torques prescribed in the following table.

	M6	M8	M10	M12	M14	M16	M18	M20
Ordinary carbon steel	5~8	16~23	29~42	50~70	80~110	130~170	160~200	260~320
High-strength alloy steel	9~12	18~26	34~48	67~95	120~170	165~220	200~250	320~400

# General Principles

## Maintenance Rule

### Maintenance Schedule

It's necessary for periodical inspection and maintenance of truck to prolong its service life, improve its power performance and fuel economy, so periodical inspection and maintenance should be carefully carried out according to the following items. Then it will achieve the max economic and social benefits.

The following schedule is not only for maintenance items of 80,000km, but also for normal maintenance items after 80,000Km.

△—maintenance mileage at running-in period (1,500~2,500km)

☆—maintenance items at running-in period

★—maintenance items at regular driving period

**Note:**

Customers should carry out the inspection and maintenance intervals according to the different area condition. Properly shorten the maintenance intervals can ensure the truck to get the reasonable maintenance and move reliability. Never prolong the intervals.

### Dongfeng Cummins Diesel Engine

Maintenance Item	Maintenance Mileage Interval( × 1,000km)														
	△	4	8	12	16	20	24	28	32	36	40	44	48	80	
Clean engine assembly		★	★	★	★	★	★	★	★	★	★	★	★		
Check acceleration capability and decelerability	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check exhaust status	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check the leakage of engine lubricant	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check the cleanness and reserves of lubricant		★	★	★	★	★	★	★	★	★	★	★	★		
Check the leakage of fuel	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check the leakage in cooling system	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check the damage of fan belt	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Remove the deposit in fuel prefilter	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check and clean air filter element	☆		★		★		★		★		★		★		
Replace engine lubricant	☆		★		★		★		★		★		★		
Replace oil filter	☆		★		★		★		★		★		★		
Check and adjust valve clearance	☆			★			★			★			★		
Replace fuel filter and oil & water separator				★			★			★			★		
Replace air filter element							★							★	
Check the compression pressure in cylinder														★	
Check the injection pressure of injector														★	
Check injection timing														★	
Check the injection volume of injection pump														★	
Check the working conditions of delivery pump														★	
Check the working conditions of thermostat														★	
Check the working conditions of radiator														★	
Clean the cooling system of engine														★	
Check the working conditions of supercharger, replace while necessary														★ ★	

# General Principles

## Clutch

Maintenance Item	Maintenance Mileage Interval( × 1,000km)													
	△	4	8	12	16	20	24	28	32	36	40	44	48	80
Check the working conditions of clutch	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check the free travel of clutch pedal	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check the leakage of the hydraulic pipeline and clutch pump	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check the air leakage of clutch booster	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check the reserve of braking fluid in oil reservoir	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Replace clutch braking fluid														★

## Propeller Shaft

Maintenance Item	Maintenance Mileage Interval( × 1,000km)													
	△	4	8	12	16	20	24	28	32	36	40	44	48	80
Check the looseness of the linking parts of propeller shaft	☆			★			★			★				★
Check the looseness of spider bearing	☆													★
Check the looseness of middle bearing	☆													★
Check the wearing conditions of spline														★

## Gearbox

Maintenance Item	Maintenance Mileage Interval( × 1,000km)													
	△	4	8	12	16	20	24	28	32	36	40	44	48	80
Clean gearbox and vent plug	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check the oil reserves in gearbox	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check oil leakage of gearbox	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Replace gearbox lubricant	☆						★							★
Check the looseness of the linking parts of the control mechanism	☆						★							★
Check the working conditions of the bearings in gearbox														★
Disassemble and check gearbox														★

## Suspension System

Maintenance Item	Maintenance Mileage Interval( × 1,000km)													
	△	4	8	12	16	20	24	28	32	36	40	44	48	80
Check the leakage of shock absorber and fasten the bolts of brackets	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Clean front and rear leaf spring and shock absorber		★	★	★	★	★	★	★	★	★	★	★	★	
Fasten U bolt of leaf spring when fully loaded	☆			★			★			★				★
Check the damage and looseness of shock absorber				★			★			★				★
Check the wearing of pin sleeve of rear leaf spring, replace while necessary														★
Check if shock absorber is out of service														★
Disassemble leaf spring, replace spring pin and pin sleeve														★

# General Principles

## Axle and Wheel

Maintenance Item	Maintenance Mileage Interval( × 1,000km)														
	△	4	8	12	16	20	24	28	32	36	40	44	48	80	
Clean axles and wheels		★	★	★	★	★	★	★	★	★	★	★	★		
Check the oil leakage of final drive	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check the fastening conditions of important bolts	☆	★	★	★	★	★	★	★	★						
Check the pressure in tyres	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check the abnormal wearing of wheels		★	★	★	★	★	★	★	★	★	★	★	★		
Check lubricant reserves of final drive, clean vent plug				★			★			★			★		
Clean and adjust hub bearings				★			★			★			★		
Replace the lubricant of final drive	☆						★						★		
Wheel changing				★			★			★			★		
Check the working conditions of final drive and the bearings													★		
Disassemble and check final drive and adjust it														★	
Make magnetic examination for axle shaft tube														★	

## Steering system

Maintenance Item	Maintenance Mileage Interval( × 1,000km)														
	△	4	8	12	16	20	24	28	32	36	40	44	48	80	
Check the oil leakage of steering gear	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Clean steering gear		★	★	★	★	★	★	★	★	★	★	★	★		
Check free travel and working conditions of hand wheel	☆			★			★			★			★		
Check the fastening conditions of the ball heads of steering cross rod and tie rod	☆			★			★			★			★		
Check fastening conditions of steering mechanism and its brackets	☆			★			★			★			★		
Check fastening conditions of steering arm and steering knuckle arm	☆			★			★			★			★		
Check and adjust front wheel toe-in	☆			★			★			★			★		
Check front wheel alignment													★		
Check and adjust steering gear													★		
Disassemble and check the connectors of steering cross rod and tie rod														★	
Make magnetic examinations for steering knuckle														★	
Replace the ball head pins in steering system													★		
Check power steering oil reserves, add while necessary	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Replace power steering transmission oil							★						★		

## Braking System

Maintenance Item	Maintenance Mileage Interval( × 1,000km)														
	△	4	8	12	16	20	24	28	32	36	40	44	48	80	
Check the free travel of brake pedal	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check parking brake and its efficiency	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check the air leakage of braking pipeline	☆	★	★	★	★	★	★	★	★	★	★	★	★		
Check and adjust the clearance between brake drum and friction disc	☆	★	★	★	★	★	★	★	★	★	★	★	★	★	

# General Principles

## Braking System

Maintenance Item	Maintenance Mileage Interval( × 1,000km)													
	△	4	8	12	16	20	24	28	32	36	40	44	48	80
Check the fastening conditions of brake back plate	☆			★			★			★			★	
Check the wearing of brake drum and shoe, replace while necessary							★							★
Check the working conditions of air compressor														★

## Other

Maintenance Item	Maintenance Mileage Interval( × 1,000km)													
	△	4	8	12	16	20	24	28	32	36	40	44	48	80
Check battery liquid reserves, add while necessary	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check the proportion of battery liquid				★			★			★				★
Check the looseness of the rivets in chassis frame							★							★
Check the efficiency of locking device of titing mechanism							★							★
Check the looseness of linking parts of cabin	☆	★	★	★	★	★	★	★	★	★	★	★	★	★
Check and adjust latches of cargo body	☆	★	★	★	★	★	★	★	★	★	★	★	★	
Check the looseness and damage of cross and side members of cargo body and the linking parts							★							★
Check the wearing of latches, replace while necessary														★

## Recommended Fuel and Lubricant

The quality of fuel and lubricant can effect the performances, quality and even life of vehicles. Therefore, to ensure normal operations of vehicles, suitable oil products should be used according to relative prescriptions.

DongFeng Automobile Co., Ltd. prescribes the most suitable fuel and lubricants for its products. The following are the fuel and lubricants that should be used in our products.

### Fuel

Qualified light diesel in accord with GB252—87 Standard should be used. Users can choose specific class of light diesel according to the specific temperature in his region.

Recommended temperature scope:

Class	Recommended Temperature
0# light diesel	above 4 °C
10# light diesel	above -5 °C
20# light diesel	between -5 °C ~ -14 °C
35# light diesel	between -14 °C ~ -29 °C
50# light diesel	between -29 °C ~ -44 °C

### Engine lubricant

High-quality lubricant meeting following standards must be used for Dongfeng Cummins engines:

Lowest standard: CF-4/SG 15W-40

Recommended Standard: CG-4/SH 15W-40

Ideal standard: CH-4/SJ 15W-40

# General Principles

Note:

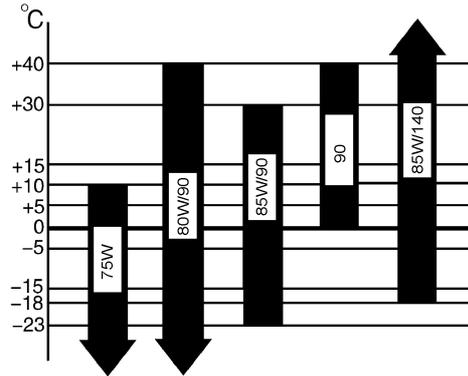
Engine damages for using lubricants below CD15W-40 or CE15W-40 or even lower are not in our warranty scope.

Suitable temperature scope:

For 15W-40: -10 °C ~-15 °C; For 10W: -5 °C ~-20 °C ; For 5W-30: below -25 °C

## Lubricant for gears in driving axle

Recommend to use sulfur-phosphor API GL-5 gear lubricant for heavy duty vehicle. Applicable environment temperatures for different classes are as follow:



## Gearbox oil

Recommend to use sulfur-phosphor 85W/90 GL-4 gear lubricant for middle duty vehicle.

## Lubricating grease

Recommend to use generally-used lithium grease for the lubricating points on hubs and chassis frame.

## Shock absorber oil

Recommend to use specially-used shock absorber oil.

## Clutch boosting liquid

Recommend to use DOT 4 compounded braking liquid. Different classes of braking liquid can not be used together.

Note:

Braking liquid made by different manufacturers can not be used together.

## Engine antifreeze liquid (coolant)

Recommend to use long-term antirust & antifreeze liquid. The freeze point of the antifreeze liquid used should be 8 °C lower than the minimum local temperature. Different classes of antifreeze liquid can not be used together.

## Volume Data

Part	Volume (L)
Fuel tank	120
Engine lubrication system	9
Engine cooling system	14.5

# General Principles

## Volume Data

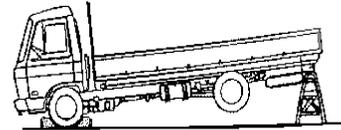
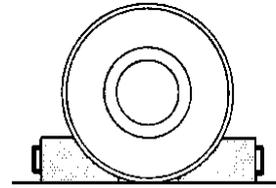
Part	Volume (L)
Gearbox	4.2
Rear axle	Add till the oil overflow from the inspection hole
Clutch	Add to the scale of "MAX" of clutch oil reservoir
Power steering gear	Add between the upper and lower scale of oil tank

## Protective Measures while Repairing

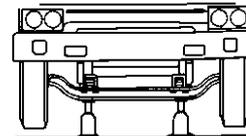
To assure safety in repairing, the following protective measures should be taken all the way:

- 1) Before reparation, you should ensure that the wheels can not turn. The measure to lock wheels is as the sketch map.
- 2) Ensure that the gearbox is at neutral position.
- 3) Ensure that the ignition switch is at "off" postion.
- 4) When repairing electric circuit, the negative pole should be disconnected.
- 5) The jacks and brackets used should be strong enough for the load acting on them.

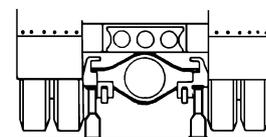
Method of mounting brackets is as the sketch map.



The supporting points of front axle for mounting jacks is as the sketch map.



The supporting points of rear axle for mounting jacks is as the sketch map.



# General Principles

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6) When disassemble or assemble the assemblies that have been taken down, you should ensure that they are on a solid worktable to avoid they would drop or turn over.

## Cleaning

Because the parts may be covered by dirty oil and mud, cleaning is compulsive.

Applicable cleaning methods include steam cleaning, pressure cleaning, light oil cleaning, acid or alkali cleaning, neutral medium cleaning, trichlorethylene steam cleaning, Magnus solution cleaning, etc. Part damages may be revealed during the cleaning, so great attention should be paid while cleaning.

### Metal parts

Light oil: in contrast with other solutions, light oil can't penetrate or dissolve mud. Therefore, except for finished surface, mud should be removed by wire brush or other tools and should be cleaned in this way for two times.

Alkali solution: if the parts are made of alloy, don't use alkali solutions for the cleaning. Instead, alkali solutions are very effective for the cleaning of steel and cast iron.

Note:

If alkali solutions are being used, you should make some correctives such as boric acid solution. Once your eyes or skin touch the alkali solution, you should use the corrective to clean.

### Rubber parts

Don't use mineral oil for the cleaning. Use alcohol or clean cloth to remove the mud.

### Oil duct

Make a metal wire to get through the oil duct to ensure it is not jammed. Wash the oil duct with cleaning solution with high-pressure nozzle.

### Antirust

After removing the oil grease on the parts, clean grease should be applied to prevent the rusting of the parts.

## General Inspection

Check parts and components with special gauges or tools. Decide whether a component can continue to serve according to specified maintenance standards. Damaged components should be repaired or replaced as required. If one of a pair of components fitted together is worn so much that the fit clearance exceeds the specified range, replace the pair of components together.

Out of consideration of preventive maintenance, some components should be replaced before them reaching service limit.

Carefully inspect the surface of components by outlook or red check method. Repair or replace the component if its surface has the following abnormal signs: uneven wear, biased wear, scratch, crack, distortion, malfunction or becoming weak (spring), bended, loose, abnormal noise (bearing), distortion, malfunction or becoming weak (spring), bended, loose, abnormal noise (bearing), discolored, seized, eroded, deteriorate (friction lining), etc.

All the rubber pieces, such as O-rings, oil seals and washers cannot be further used after disassembled.

# General Principles

## Trouble Analysis

In a vehicle, a part is made up of many components. Some parts like clutch, transmission and rear axle are interactive functioning. Therefore, in order to find and examine trouble exactly, it is necessary to know the structure of each part as well as the functional connection between various parts.

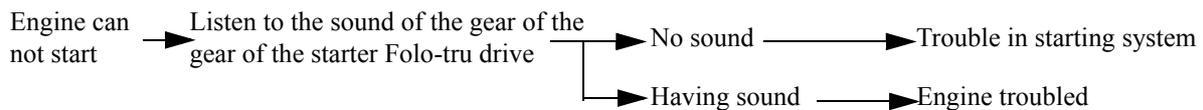
To resolve a problem of the vehicle, you must first know the nature of the trouble. To achieve this, you must get some exact knowledge of the trouble from the customer, including the parts that effect using conditions and the date of the happening of the trouble.

A trouble may be caused by one or many reasons in most cases. Therefore, to examine and repair requires the ability of systematic thinking and resolving problems step by step. For example, when the steering wheel turns unstable, you should first examine the connection mechanism of the pitman arm instead of disassembling the steering gear rashly, then decide whether the trouble belongs to the steering gear or to the connection mechanism.

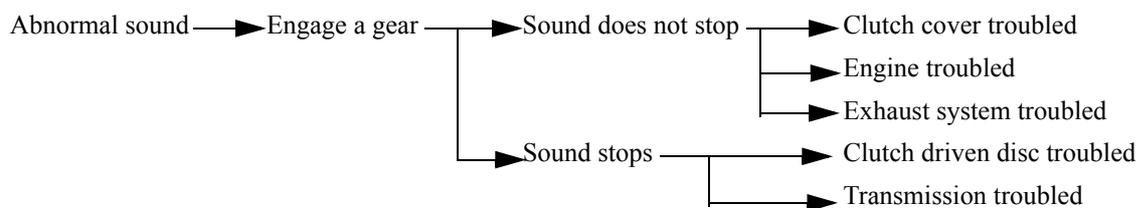
When disassembling the part to find the cause of the trouble, proceed systematically and start from easy problem.

It is a very important way to find out the cause of the trouble according to the manifestation of the trouble such as abnormal noise, vibration and failure. Listed below are some common trouble signs and their reasons. As for the detailed trouble analysis, please refer to chapter of each assembly.

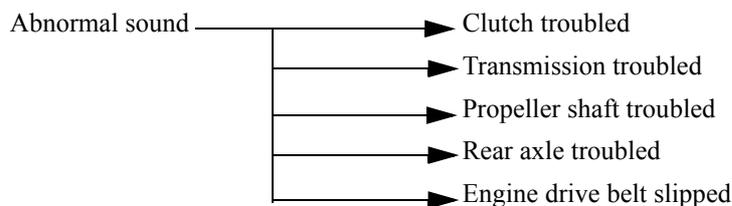
### 1. During starting of the engine (neutral position)



### 2. After engine started

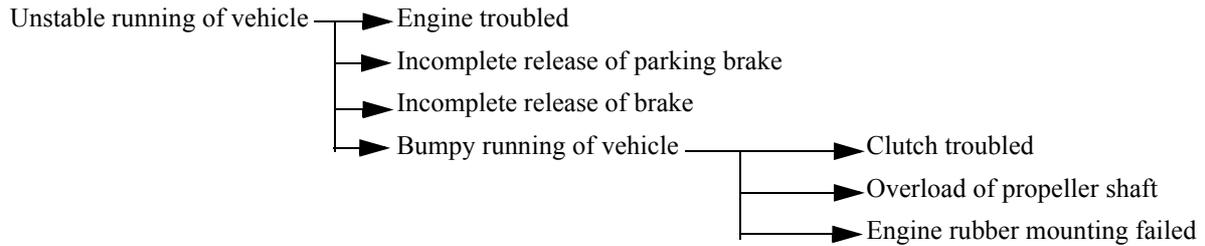


### 3. During starting of vehicle

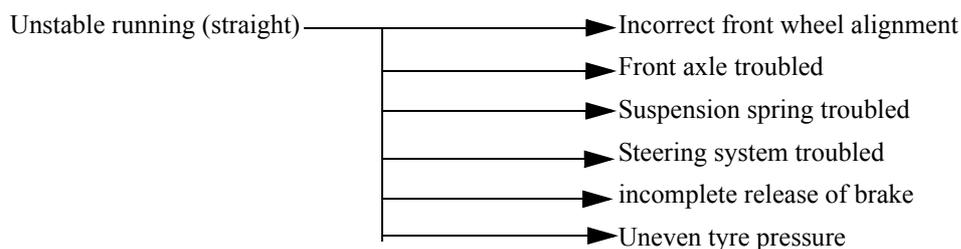
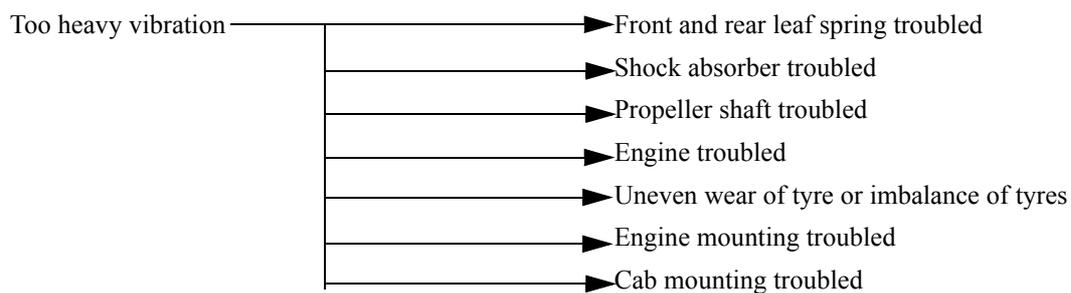
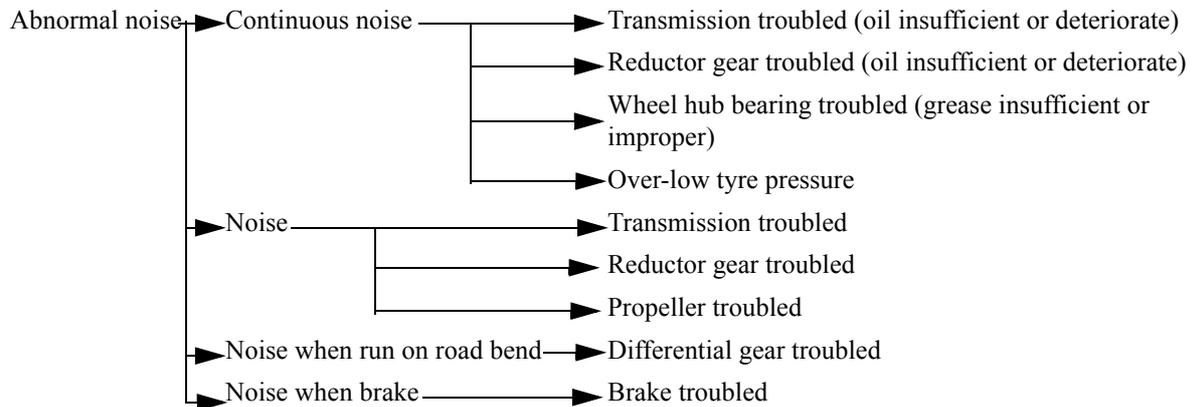
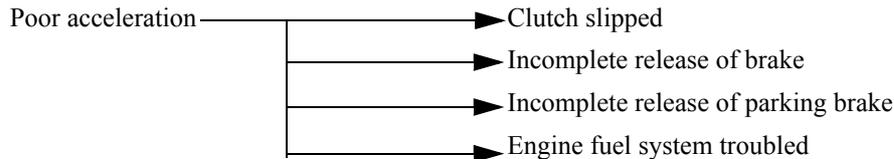


# General Principles

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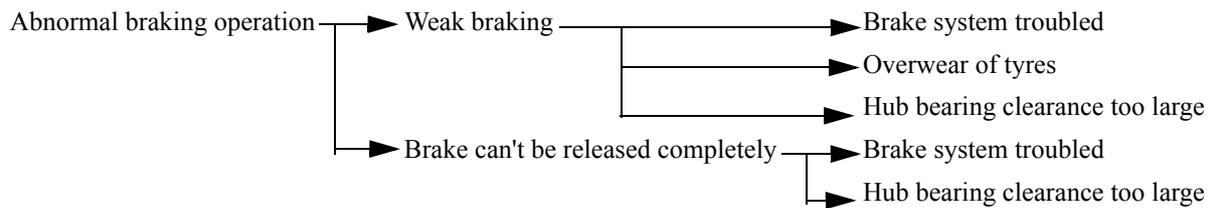
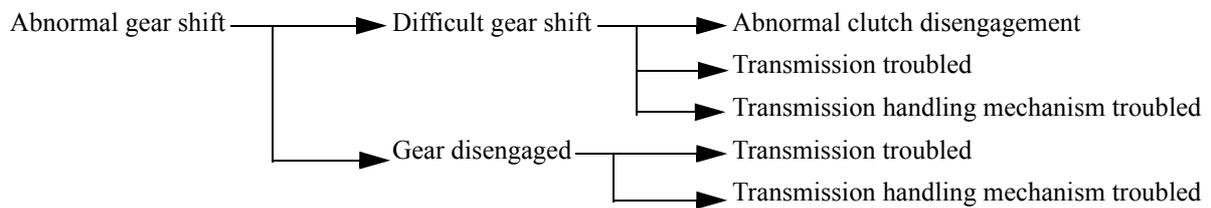
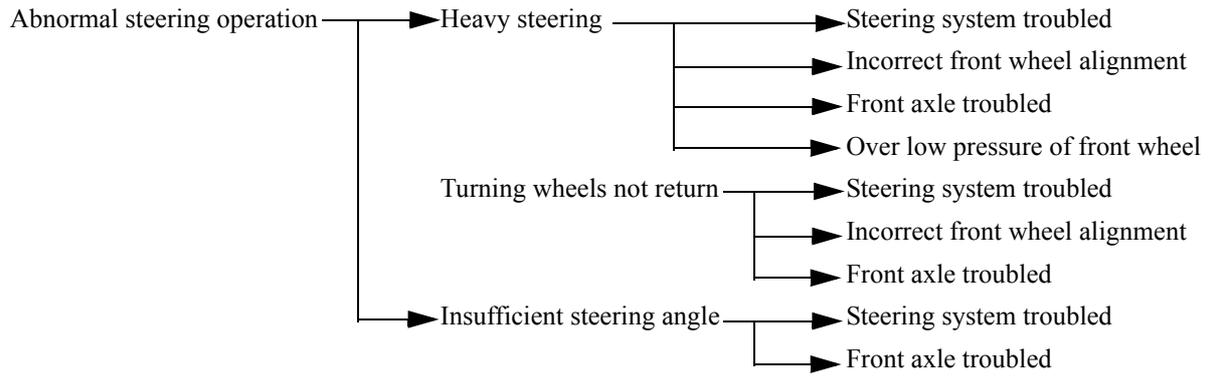


## 4. During vehicle running



# General Principles

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# Clutch

**CL**

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# Clutch

## Clutch

### Main Parameter

Bolt install hole size	Distributing diameter (mm)	$\Phi$ 379
	Aperture (mm)	$\Phi$ 10.5 (+0.27)
	Number of holes	8 (4 pairs)
Positioning pin hole size	Distributing diameter (mm)	$\Phi$ 384
	Aperture (mm)	$\Phi$ 9.5 (+0.061, +0.025) $\Phi$ 7.9 (+0.061, +0.025)
	Number of holes	2
Angle between positioning hole and installing bolt hole		10°
Friction lining size	D×d	$\Phi$ 325× $\Phi$ 200
Working pressure force		11300±13500
Release bearing stroke (mm)		10~11.5
Pressure plate lift range (mm)		≥ 1.5
Height of release finger (mm)		56±1.6
Unbalance static of the cover assembly (g.cm)		≤ 70
Unbalance static of the driven disc assembly (g.cm)		≤ 35
Torque (N.m)		Mmax=1087

Note:

The DOT4 compound brake fluid is recommended to the clutch.

Unclean or dirty brake fluid is forbidden to use.

Do not splash the brake fluid down to the paint. (It may erode the paint.)

You must make use of the tools to disassemble and assemble the clutch pipeline system.

Make use of the clean brake fluid to clean the master cylinder, booster and the fluid reservoir.

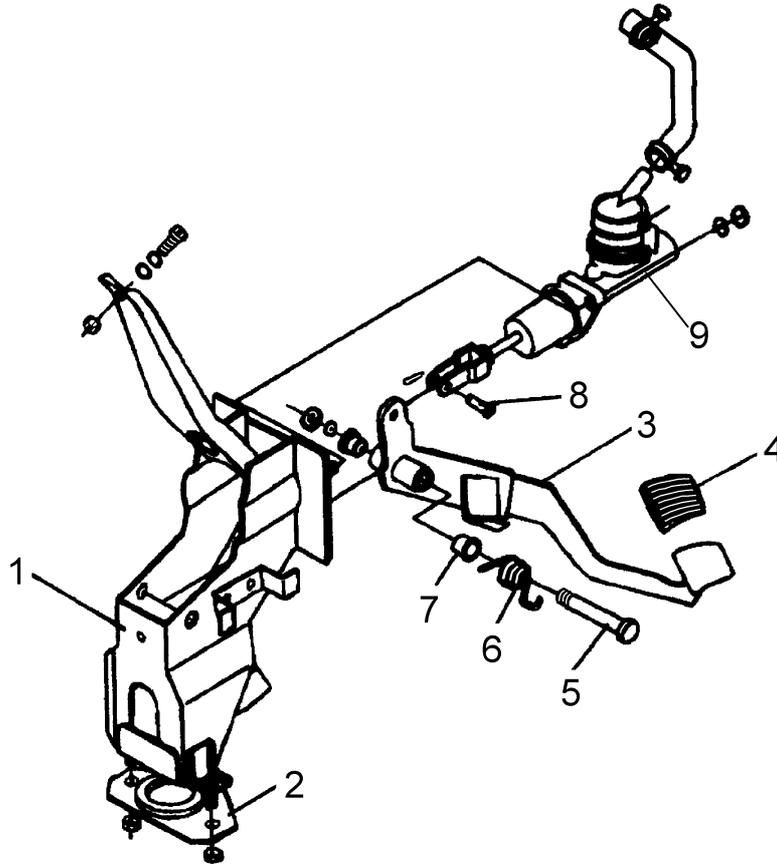
The mining oil such as gasoline, kerosene, etc., it will erode the rubber parts in the hydraulic pressure system.

After clean the clutch pressure plate, dry it with the suction cleaner, not the compression air.

# Clutch

## Clutch Mechanical System

### Clutch Control Mechanism

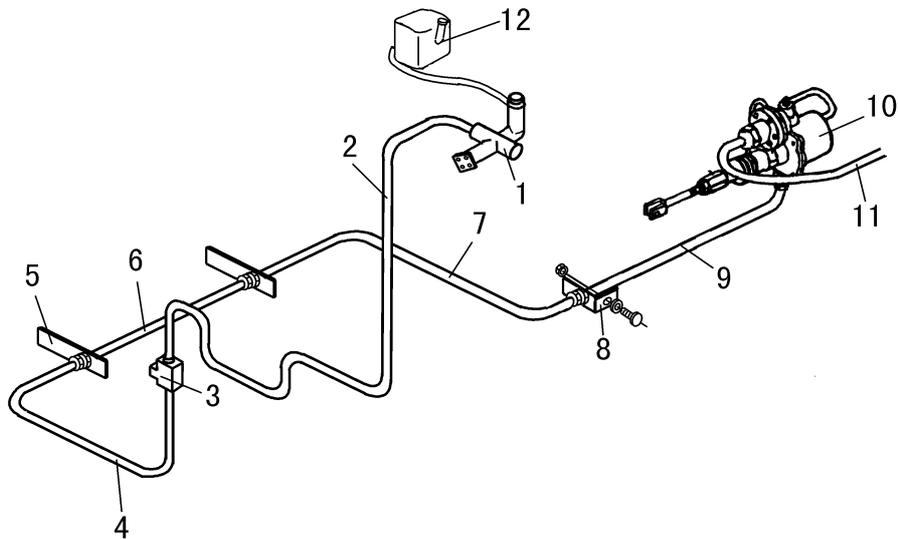


- 1.Clutch pedal bracket assy
- 2.Lower fixed plate--pedal bracket
- 3.Clutch pedal welding assy
- 4.Protective sheath--pedal
- 5.Clutch pedal shaft

- 6.Return spring--clutch pedal
- 7.Bush--pedal assy
- 8.Pin
- 9.Clutch master pump assy

# Clutch

## Clutch Control Pipeline



- |  |   |
|--|---|
| 1.Clutch master pump assy                                | 7.Rear oil pipe assy--clutch master pump to booster |
| 2.Front oil pipe assy--clutch master pump to slave pump  | 8.Clutch rear oil pipe bracket                      |
| 3.Straight joint   | 9.Rear hose assy--clutch                            |
| 4.2nd front oil pipe assy--clutch master pump to booster | 10.Booster assy                                     |
| 5.Hose bracket   | 11.Nylon hose assy                                  |
| 6.Front hose assy--clutch                                | 12.Oil reservoir assy                               |

## Adjustment of Clutch Pedal

- 1.Adjust the height of the clutch pedal by adjusting the pedal setting bolt. The height of clutch pedal is about 160~170mm.
- 2.Adjust the free stroke of the clutch pedal.

## Release bearing

Check the release bearing for any crack or wear. The release bearing must be smooth and turn without noise. Replace it if necessary.

Check the release sleeve and release fork for wear, damage or erode, and replace if necessary.

## Bearing lubricating

Make use of the recommended lubricant for the connecting surface and the attrition surface of bearing and fork.

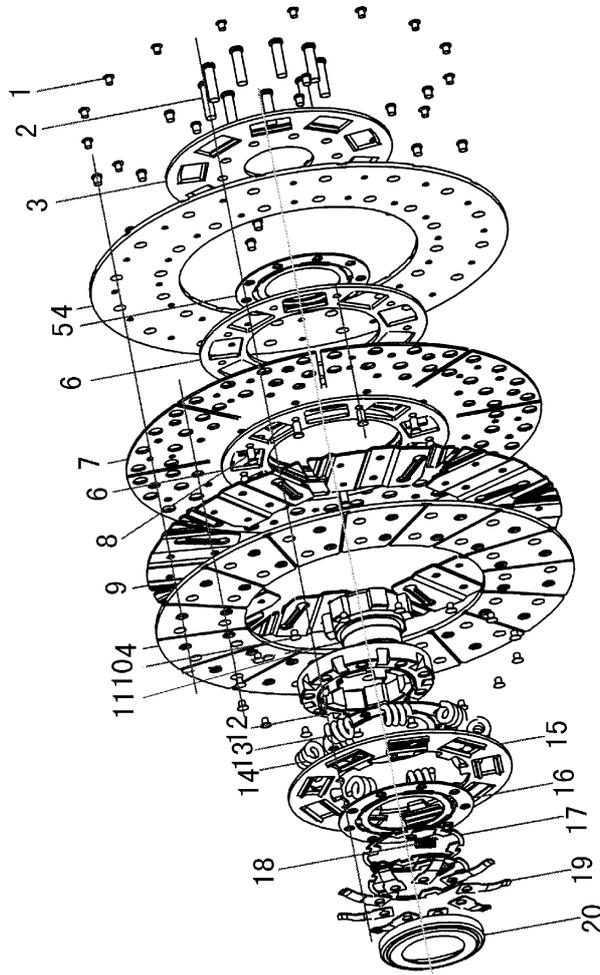
Note:

Overmuch lubricant may cause clutch driven disc damaged.

# Clutch

## Clutch driven disc and pressure plate

### Clutch driven disc



1.Rivet--friction disc

2.Rivet--catch plate

3.front damping disc

4.Friction disc

5.Damping fin

6.Driven disc clamping plate

7.Driven disc

8.Driven disc rivet

9.Wave spacer

10.Wave spacer rivet

11.Disc hub set

12.Spline disc

13.Damping spring1

14.Damping spring2

15.Rear damping disc

16.Half ring pressure board

17.Catch plate

18.Damping spring--idle speed

19.Spring spacer

20.Guard shield

# Clutch

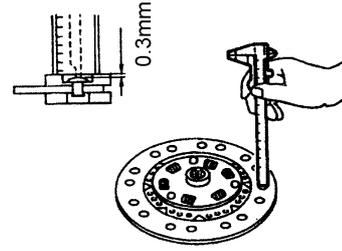
## Check

Check the degree of wear of the driven disc surface.

Wear limit: (from friction surface to the rivet head) 0.3mm.

Check the spline tooth clearance and the run out tolerance of driven disc.

Check the driven disc for ablation, color changed, or contaminated by oil or grease. Replace if necessary.



## Installation

Smear some grease on the connecting surface and the spring.

Over much grease may damage the surface of the driven disc.

## Clutch pressure plate

### Check and adjust

Check the height and plainness of the diaphragm.

When checking the height of the diaphragm, set a clearance gauge (T=0.2mm) on the distance bushing.

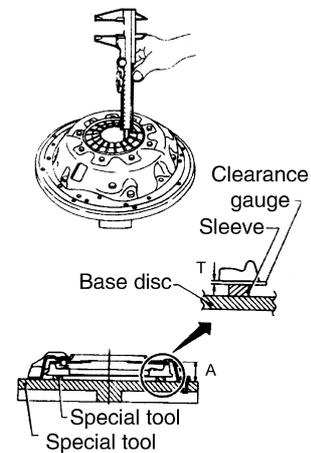
Height of the diaphragm: 41~43mm (base disc to the top of the diaphragm)

If the height is not in the range of the specific range, you need to replace the pressure plate.

Shake the pressure plate gently, listening and check the wear or damage of the diaphragm supporting ring. Or you can knock the rivet head gently to find if there is cracks. Replace the pressure plate if necessary.

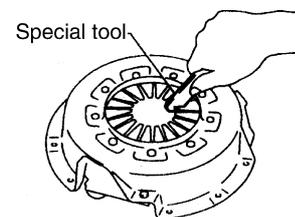
Check the surface of the pressure plate for any ablation or dirt, make use of the corundum paper to get rid of them if necessary.

Check the connecting side of the pressure plate and the driven disc for any distortion or damage, and replace them if necessary.



Adjust the plainness of the diaphragm by tools.

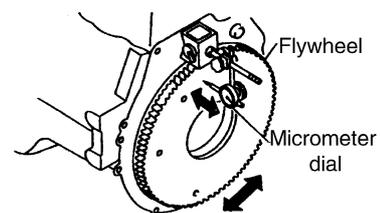
Plainness: <0.7mm



## Flywheel check

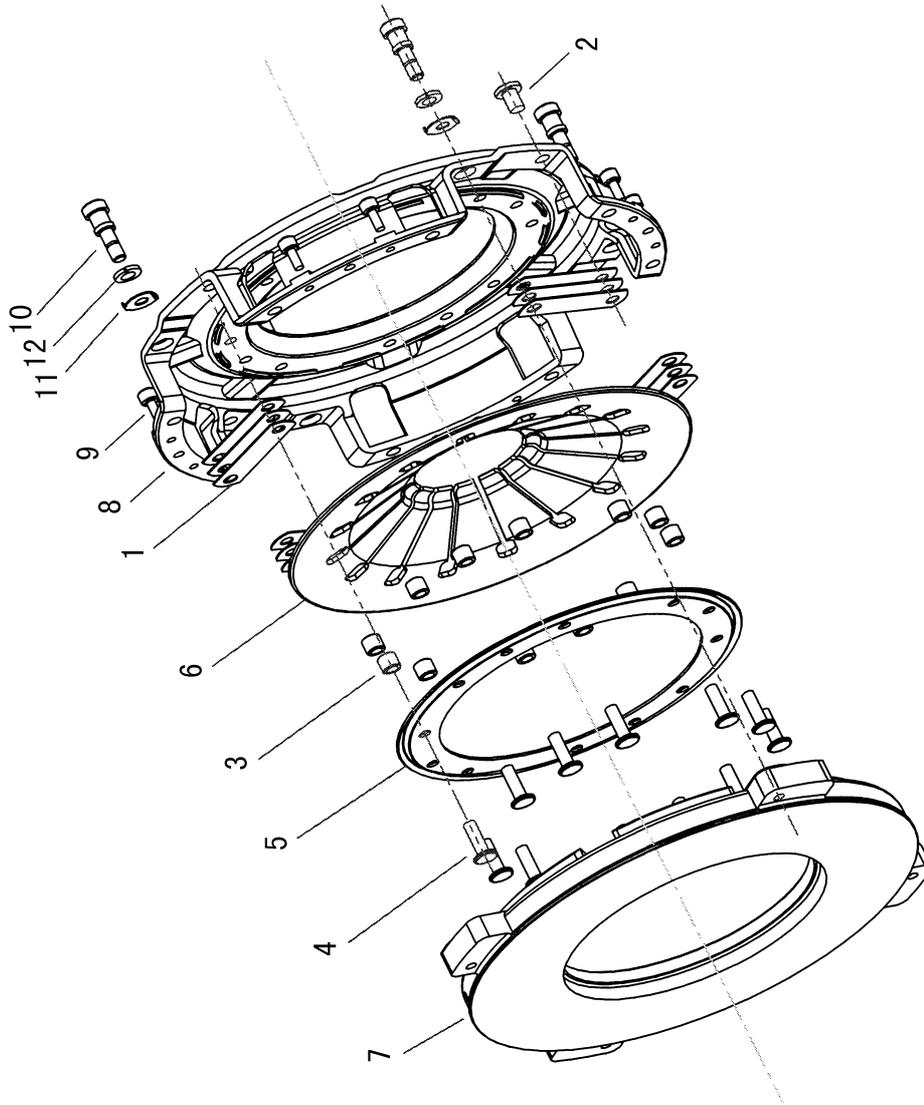
Check the working face of the flywheel for ablation or color changed, make use of the corundum paper to get rid of them if necessary.

Check the plainness of the flywheel surface: <0.1mm



# Clutch

## Clutch Cover and Flywheel



- 1. Drive spacer
- 2. Rivet--cover
- 3. Spacer sleeve
- 4. Rivet--diaphragm spring
- 5. Supporting disc
- 6. Diaphragm spring

- 7. Clutch pressure plate
- 8. Cover
- 9. Balance rivet
- 10. Rivet
- 11. Stop spacer
- 12. Spring washer

# Clutch

---

When install the clutch pressure plate and driven disc, insert the special tool into the clutch driven disc spline (used to align and orient).

Screw down the fixing bolt of the clutch cover.

Screw down the bolt in an crossed sequence, following two steps.

## 1. Installation and adjustment

Check the type of the clutch to make sure if it is accord to the vehicle model before installation, then find out if the size of installation screw hole, locating pin hole or locating exicrcle match the flywheel. The thickness of the driven disc also has to accord the requirements.

During the installation, first insert the locating mandrel into the spline hole of the driven disc and set it on the flywheel end. Then install the cover assembly to the flywheel and tighten the 8 installation bolts equably. When tightening the bolts, do remember to make the locating pin into the locating hole correctly.

When adjust the control mechanism, you have to make sure that the travel of the release bearing is 2~3mm, and the efficient travel of the release bearing should be not less than 10mm.

## 2. Notice

Pay attention to match the proper torque of the engine during using, which is to assure the certain repertory coefficient.

The friction plate mustn't be contaminated with oil stain during using.

The vehicle should not be over loaded during using to avoid skid and cause wear.

Never make the driven disc in a half engaging situation during using to avoid too much wear earlier.

## 3. Maintenance

If the driven disc has been a little bit worn, you must adjust the control mechanism periodically to assure the proper free travel.

When the friction plate is worn too much like the distance between its surface to the rivet head is not more than 0.5mm, you have to change a new one.

When maintaining the engine, you must clean up the surrounding place of the inner support disc and ring of the cover assembly.

If you need to disassemble the pressure plate to do the clean, do remember to assemble it to its original place to assure its balance.

# Transmission

**MT**

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# Transmission

## Maintenance Standard

### Technical Parameter

Assembly Name		DONGFENG 17G1A2-DJ10
Transmission Model		A121J
Transmission Type		Mechanical type, 5 forward gears, 1 reverse gear; 2nd~5th gear with synchronizer
Control System		Double flexible shaft cable, remote control
Center Distance (mm)		121.125
Output Torque (N.m)		1820
Gear Type	1st, reverse gear	Straight tooth
	2nd~5th gear	Skewed tooth
Speed Ratio	1st gear	4.763
	2nd gear	2.808
	3rd gear	1.594
	4th gear	1.00
	5th gear	0.756
	Reverse gear	4.99
Capacity of lubricant (L)		5.5
Lubricant type		Sulfur-phosphor middle loaded 85W/90 API GL-4 gear oil

### Maintenance Standard

Item		Nominal Dimension (mm)	Sevice Standard (mm)	Repair Limit (mm)	Wear Limit (mm)
Trans- mission top cover	Clearance between gear select rocker block and gear shift lever block slot	0.1~0.4	--	0.8	
	Tooth space between control shaft and gear shift lever spline	0.05~0.11	--	0.5	
Trans- mission upper cover	Clearance between transmission fork shaft and transmission fork hole	0.140~0.101	--	0.25	
	Clearance between end face of the reverse gear fork and ring groove	0.5~0.8	--	Not drop	
	Clearance between end faces of other gears and ring groove	0.2~0.5	--	Not drop	
Trans- mission body	Axial clearance of output shaft 2nd gear	0.1~0.37	--	0.4	
	Axial clearance of output shaft 4th gear	0.1~0.35	--	0.4	
	Side play between output shaft and 1st, reverse gear soline	0.055~0.175	--	0.3	
	meshing play of running gear	0.15~0.26	--	0.5	
Synchro- nizer	Max. turning quantity of balking ring end face	--	--	1.0	
	Max. wearing of balking ring bevel	--	--	0.1	Bevel groove
	Clearance between balking ring end face and cone disc end face	3	--	--	Single side

# Transmission

## Tightening Torque

Item	Tightening Torque (Nm)
Clutch housing connecting bolt	137~167
Fasten nut of propeller shaft connecting flange	200~220
Transmission upper cover fixed bolt and nut	33~44
Transmission cover fasten bolt	20~26
Reversing lamp switch and neutral position switch	20
Countershaft rear bearing locking nut	200~300
Reverse gear shaft locking plate bolt	20~26
Oil drain scew and filler port screw	120~140
Propeller shaft connecting bolt and nut	215~245
Midship mounting bolt and nut	160~220

## Trouble Shooting

### Abnormal noise

Check the abnormal noise from transmission to determine if it happens during driving or gear shifting, which is one of the factor to the trouble shooting. Also, find out this abnormal noise comes from gear or bearing.

Trouble	Cause	Correction
Abnormal sound or noise	<ul style="list-style-type: none"> <li>· Viscosity of lubricating oil too low</li> <li>· Lubricating oil insufficient</li> <li>· Gear teeth cracked or worn out (clearance too large)</li> <li>· Bearing worn out or broken</li> <li>· Engaging position of shift fork and gear incorrect</li> <li>· Synchronizer worn out or damaged</li> <li>· Some gears broken</li> </ul>	<ul style="list-style-type: none"> <li>· Use suitable lubricating oil</li> <li>· Add it to required level</li> <li>· Repair or replace the part</li> <li>· Replace the bearing</li> <li>· Check shift fork, replace it if its twist</li> <li>· Replace</li> <li>· Clean, replace</li> </ul>

### Gear engagement is difficult

When gears of transmission are difficult or tend to disengaged, you must consider that is failure of control system that the transmission inside mechanism is isolated from the gear shift lever to gear shift fork.

When there is failure of transmission engagement, the problem maybe caused by malfunctioning synchronizer and this kind of problems normally occur at the certain speed, as 2<sup>nd</sup> speed or 3<sup>rd</sup> speed.

Trouble	Cause	Correction
Difficulty in shifting	Control system <ul style="list-style-type: none"> <li>· Operating level deformed</li> <li>· Gear select or shift flexible shaft length incorrect</li> </ul>	<ul style="list-style-type: none"> <li>· Adjust operating lever</li> <li>· Adjust flexible shaft length</li> </ul>
	Transmission <ul style="list-style-type: none"> <li>· Bearing worn out or damaged</li> <li>· Malfunctioning of synchronizer</li> <li>· Gear select and shift rocker welding point loosened</li> <li>· Fork deformed or damaged</li> <li>· Shift lever come out from groove</li> <li>· Malfunctioning of gear shift rocker bolt</li> <li>· Fork stopping screw loosened</li> </ul>	<ul style="list-style-type: none"> <li>· Replace bearing</li> <li>· Replace synchronizer</li> <li>· Weld, repair</li> <li>· Check, adjust or replace</li> <li>· Assemble or replace parts</li> <li>· Replace bolt</li> <li>· Tighten, lock</li> </ul>

# Transmission

Difficulty in shifting	Others · Abnormal disengagement of clutch · Viscosity of lubricating oil too large	· Adjust clutch · Use suitable lubricating oil
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## Gear throw out of mesh in operation

Trouble	Cause	Correction
Transmission gear jump automatically	Control system · Incorrect adjustment of control system · Mobile shift lever moved caused by the vibration of truck	· Check and correct the control hinge · Check the engine and cab rubber mount for damage, replace faulty parts
	· Gear shift fork deformed or worn out · Self lock ball or ball groove of gear shift fork shaft worn out · Self lock spring broken or fatigue · The clearance of gear too large · Connecting teeth or sleeve back taper failure · Sliding part or end face of sliding sleeve worn · Bearing worn cause the axial running · Flange locking nut loosened	· Check and adjust or replace it if it is twist · Disassemble and replace worn parts  · Replace · Adjust the clearance or replace gear · Check, replace · Replace shaft sleeve · Replace bearing · Tighten the nut as required
Shift disorder	· Inter lock steel ball or inter lock pin worn out or forgotten assemble	· Disassemble to check or assemble

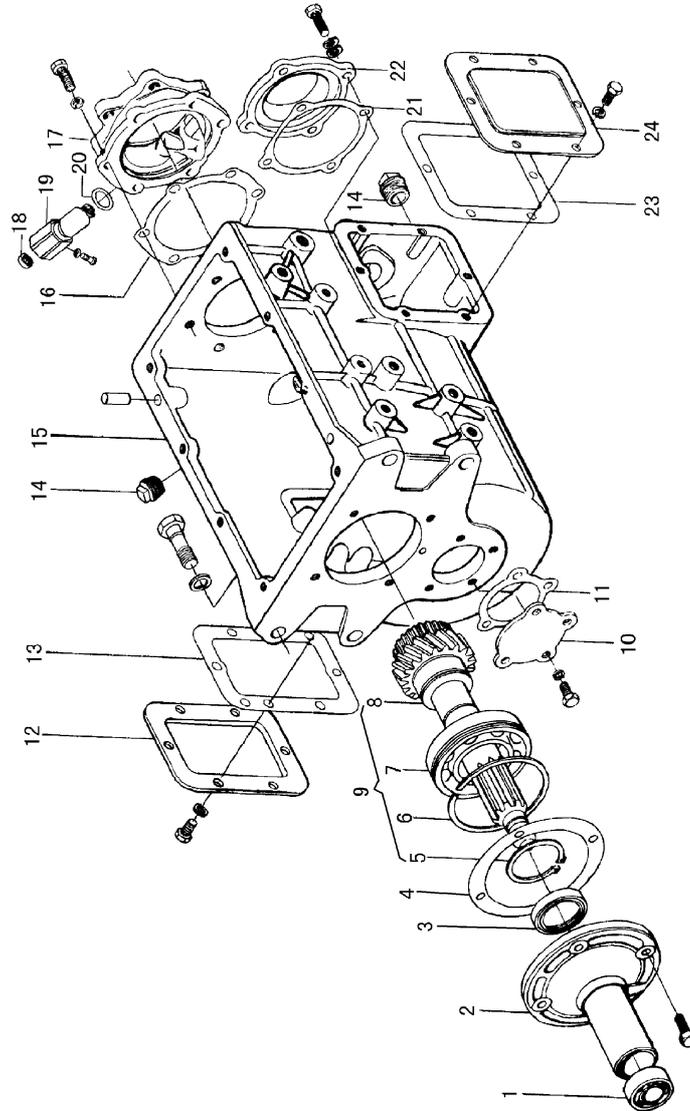
## Oil leak

Trouble	Cause	Correction
Oil leak	· Excessive lubrication oil · Sealing element worn out or failed · Fastening part loosened · Vent plug plugged · Forget to spread on bolt sealing glue	· Drain some lubricating oil · Replace · Tighten · Unplug · Spread on sealing glue and assemble

# Transmission

## Construction

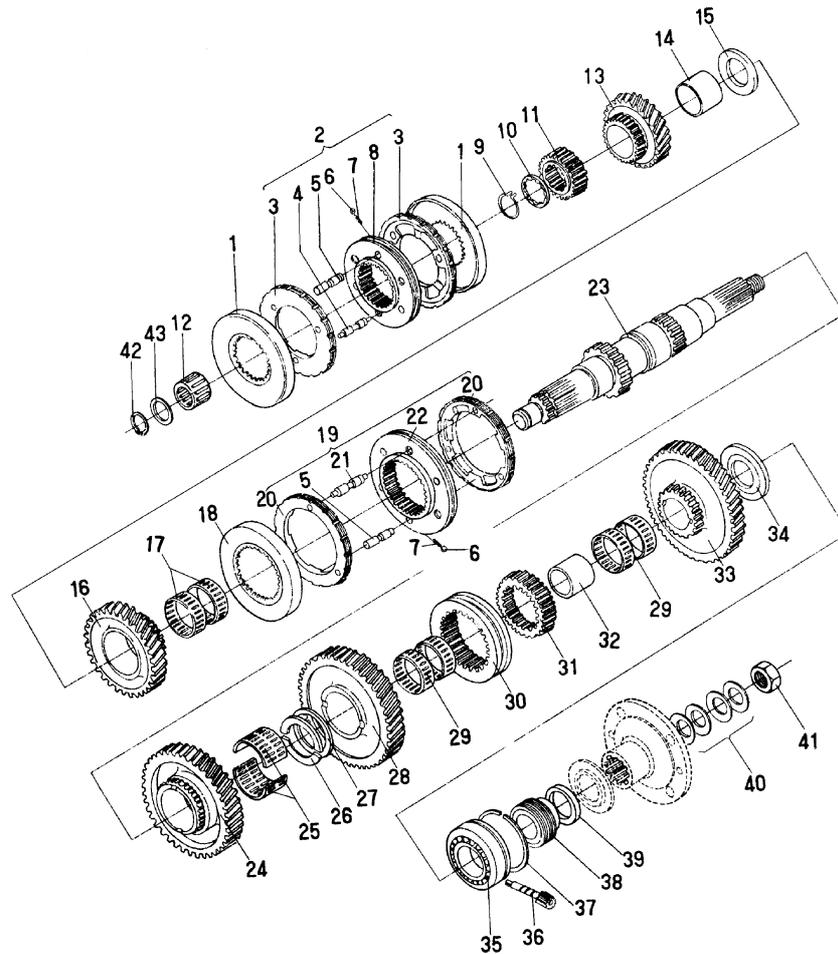
### Transmission housing and input shaft



1. Front bearing--input shaft
2. Bearing cover--input shaft
3. Oil seal--transmission input shaft
4. Gasket spacer--input shaft bearing cover
5. Circlip for shaft
6. Steel snap ring for shaft
7. Rear ball bearing--input shaft
8. Transmission input shaft
9. Transmission input shaft and ball bearing assy
10. Front bearing cover--intermediate shaft
11. Sealing ring--intermediate shaft front bearing cover
12. Cover board--power take-off hole
13. Cover board gasket spacer--power take-off hole
14. Square end conical screw plug
15. Transmission housing
16. Rear bearing cover gasket spacer--output shaft
17. Rear bearing cover--output shaft
18. Oil sealing--odometer driven gear
19. Flexible shaft joint--odometer
20. O-sealing ring--flexible shaft joint
21. Gasket spacer--intermediate shaft rear bearing
22. Rear bearing cover--intermediate shaft
23. Gasket spacer--reverse gear checking hole cap
24. Cap--reverse gear checking hole

# Transmission

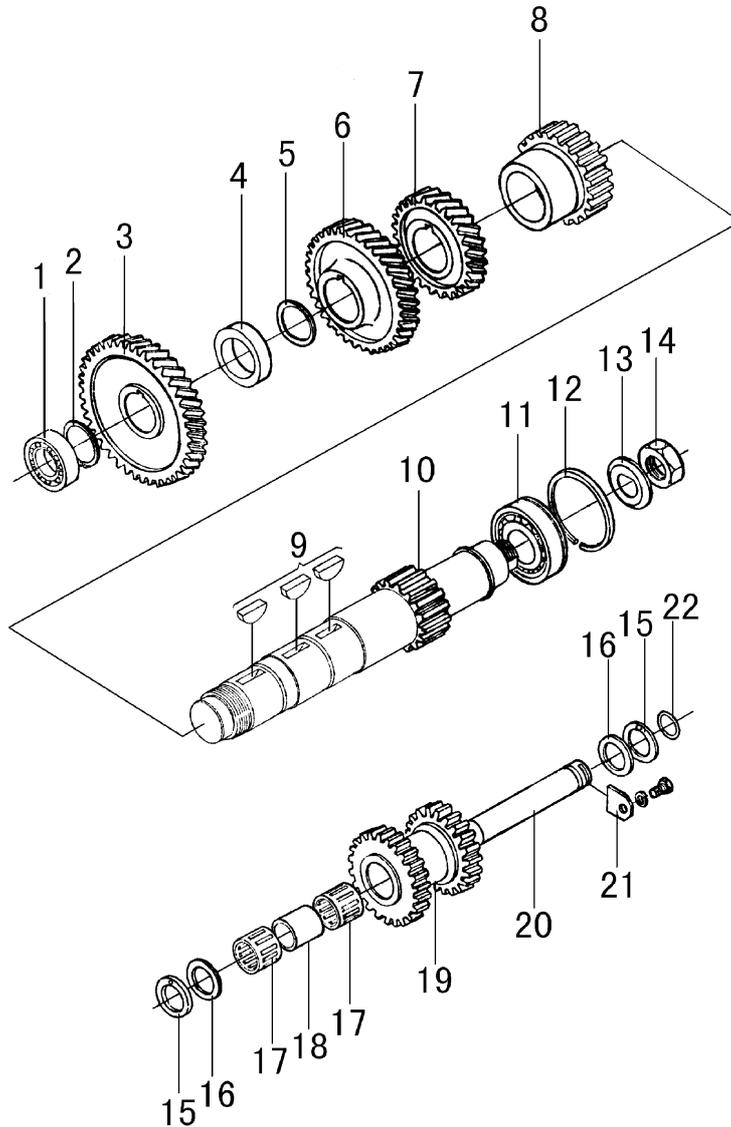
## Transmission output shaft and gear



1. Conical disc--4th, 5th gear synchronizer
2. Balking ring assy--4th, 5th gear synchronizer
3. Balking ring--4th, 5th gear synchronizer
4. Lockpin--4th, 5th gear synchronizer
5. Locating pin--synchronizer
6. Steel ball
7. Lockpin spring
8. Slide gear sleeve--4th, 5th gear
9. Fixed toothholder lock ring
10. Fixed toothholder thrust ring
11. Fixed toothholder--4th, 5th gear
12. Needle bearing
13. 4th gear
14. 4th gear shaft sleeve
15. 4th gear thrust ring
16. 3rd gear
17. 3rd gear needle bearing
18. Conical disc--3rd gear synchronizer
19. Balking ring assy--2nd, 3rd gear synchronizer
20. Balking ring--2nd, 3rd gear synchronizer
21. Lockpin--2nd, 3rd gear synchronizer
22. Slide gear sleeve--2nd, 3rd gear
23. Transmission output shaft
24. 2nd gear
25. Needle bearing--2nd gear
26. Thrust clip--1st gear
27. Thimble
28. 1st gear
29. Needle bearing--1st, reverse gear
30. Slide gear sleeve--1st, reverse gear
31. Fixed tooth holder--1st, reverse gear
32. Reverse gear shaft bush
33. Driven gear--reverse gear
34. Thrust ring--output shaft rear bearing
35. Rear roller bearing--output shaft
36. Driven gear--odometer
37. Steel snap ring for shaft
38. Drive gear--odometer
39. Spacer sleeve--output shaft rear bearing
40. Saucer spring
41. Lock nut--transmission flange
42. Circlip for shaft
43. Spacer

# Transmission

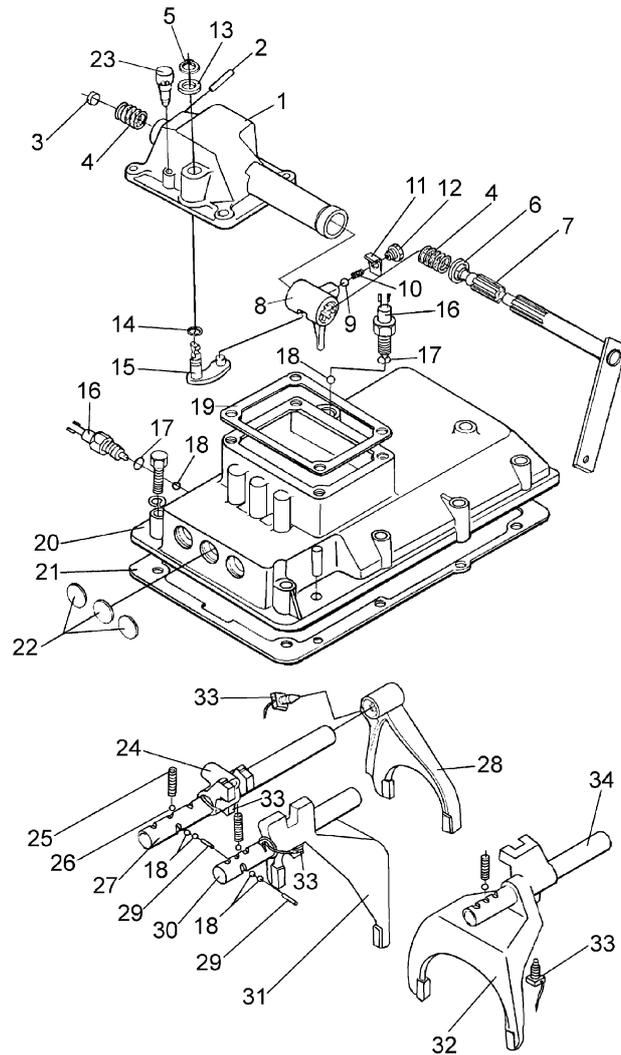
## Transmission intermediate shaft, reverse shaft and gear



- |   |  |
|---|--|
| 1. Front roller bearing--intermediate shaft   | 12. Snap ring                                  |
| 2. Circlip for shaft                          | 13. Nut lockpin                                |
| 3. Constant mesh gear--intermediate shaft     | 14. Round nut                                  |
| 4. 4th gear spacer sleeve--intermediate shaft | 15. Outside thrust shim--reverse gear          |
| 5. 4th gear lock ring--intermediate shaft     | 16. Inside thrust shim--reverse gear           |
| 6. 4th gear--intermediate shaft               | 17. Vehicle bearing                            |
| 7. 3rd gear--intermediate shaft               | 18. Needle bearing spacer sleeve--reverse gear |
| 8. 2nd gear--intermediate shaft               | 19. Reverse gear                               |
| 9. Half-round key                             | 20. Reverse gear shaft                         |
| 10. Transmission intermediate shaft           | 21. Reverse gear shaft lock shim               |
| 11. Vehicle bearing                           | 22. Sealing ring--reverse gear shaft           |

# Transmission

## Transmission cover



- |   |  |
|---|--|
| 1.Cover                                 | 18.Steel ball                                |
| 2.Straight pin                          | 19.Gasket spacer--cover                      |
| 3.Bell cap                              | 20.Transmission upper cover                  |
| 4.Balancing spring--selecting shaft     | 21.Gasket spacer--upper cover                |
| 5.Circlip for shaft                     | 22.Spacer                                    |
| 6.Oil seal--transmission cover          | 23.Vent plug assy                            |
| 7.Control shaft and gear shift arm assy | 24.Guide block--1st, reverse gear            |
| 8.Transmission shift lever              | 25.Locking gear shift fork shaft spring      |
| 9.Steel ball                            | 26.Steel ball                                |
| 10.Damping spring--reverse gear         | 27.Gear shift fork shaft --1st, reverse gear |
| 11.Lock shim--spring seat               | 28.Gear shift fork --1st, reverse gear       |
| 12.Damping spring seat--reverse gear    | 29.Straight pin--interlock                   |
| 13.Washer                               | 30.Gear shift fork shaft--2nd, 3rd gear      |
| 14.O-ring                               | 31.Gear shift fork--2nd, 3rd gear            |
| 15.Gear selecting rotating arm assy     | 32.Gear shift fork--4th, 5th gear            |
| 16.Switch assy                          | 33.Locking bolt--gear shift fork             |
| 17.Sealing ring                         | 34.Gear shift fork shaft--4th, 5th gear      |

# Transmission

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## Transmission Disassembly

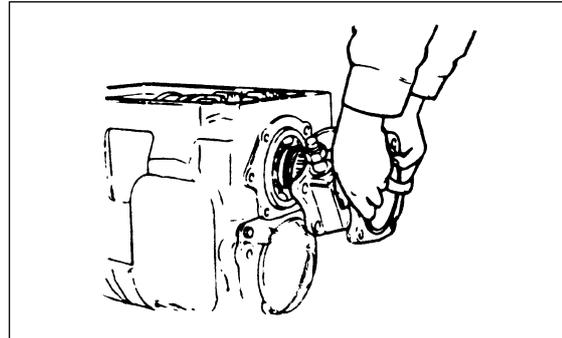
### Disassembly procedure

Before disassemble assembly, park the truck on the flat ground, shift the transmission in neutral position, switch off the power and wedge up the front and rear wheel to ensure the safety.

1. Tilt the cab.
2. Screw off the drain plug screw, drain off the lubricant oil from transmission when the vehicle is warm.
3. Disassemble the propeller shaft assembly and intermediate support bearing.
4. Screw off four tightening bolts of transmission and clutch housing.
5. Remove speedometer flexible shaft, reverse speed switch, and separate the parking brake steel wire and rocker.
6. Disassemble transmission control system.
7. Remove the return spring and dowel pin of the clutch's slave cylinder then put the clutch's slave cylinder assembly onto frame safety.
8. Remove wire and tube.
9. Disassemble transmission with transmission jack and steel wire.

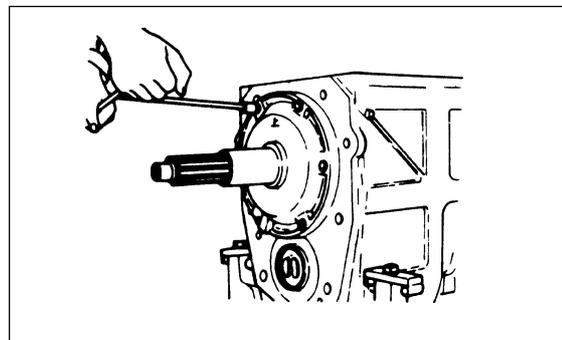
### Disassembly

1. Remove transmission upper cover assembly, gasket, power-take-off hole cover, reverse gear inspect hole cover and output shaft rear bearing cover.



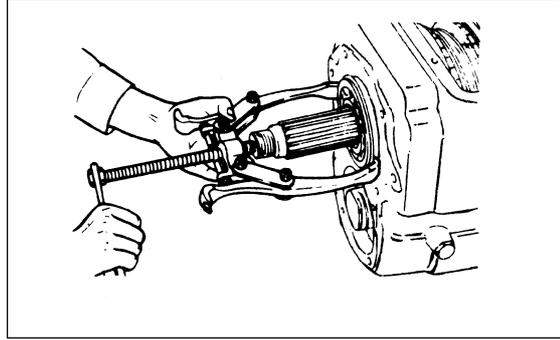
2. Disassemble input shaft bearing cover and gasket from front end of transmission, tap input shaft slightly from right to left with copper bar, take out the input shaft with bearing from front end.

Take out main shaft front bearing and input shaft rear bearing.



# Transmission

3. Take off speedometer drive gear and spacer, hold up and sway up and down the front end of mainshaft with hands, tap the rear end of mainshaft from right to left with copper bar to move it backward out of the rear. Take off mainshaft rear bearing snap ring, remove the rear bearing from mainshaft with puller.

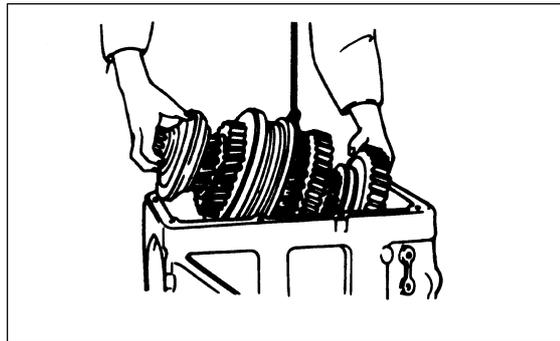


4. Slope the front end of mainshaft assembly upward to take out the mainshaft assembly from transmission casing.

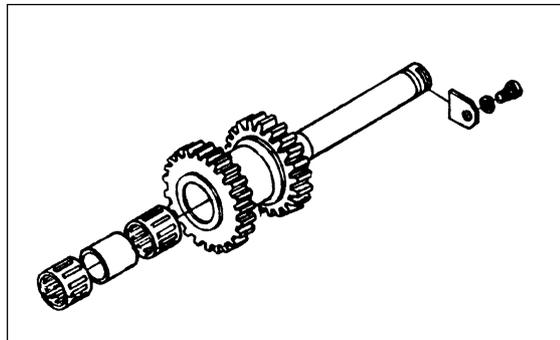
Take out the 4th and 5th speed synchronizer assembly locating tooth seat lock loop and thrust ring. Take off the 2nd and 3rd speed synchronizer assembly and all the parts in front of synchronizer in turn from mainshaft.

Take off 1st and reverse speed gear from rear end of mainshaft, depress the thrust ring locking pin with screwdriver, turn the thrust ring and remove it.

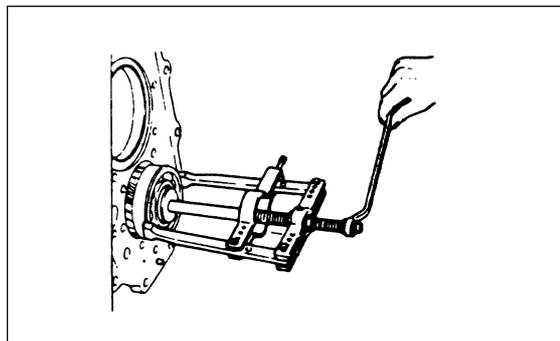
Note: When removing the thrust ring avoid the rebound of the locking pin by the spring.



5. Remove reverse speed gear shaft lock plate, pull out the reverse speed gear shaft with extractor, and take out the reverse speed gear, bearing and spacer through inspection hole of reverse speed.



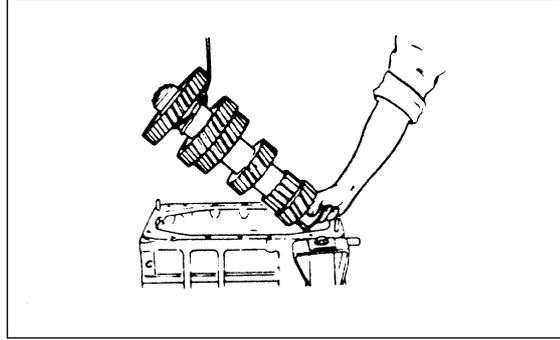
6. Take off the countershaft front and rear bearing cover, countershaft lock plate and nut, put the copper rod against the front end of the countershaft and knock the copper rod to move out the countershaft assembly a little, remove the rear bearing from countershaft with extractor.



# Transmission

7. Stop the front end of countershaft assembly upward to take out the countershaft assembly from transmission casing.

Put a copper rod against the countershaft front bearing outer ring and then tap the copper rod to take out the bearing outer ring. Remove the bearing inner ring and snap ring from countershaft, press the engagement gear out with press machine, then take off another snap ring, press the other gears and spacers out with press machine in turn.

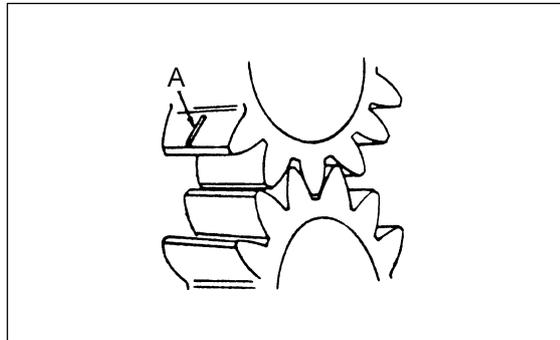


## Check

1. Check the backlash of each pair of gears.

Standard dimension 0.15~0.26mm

Service limit 0.50mm



2. Check the axial clearance of each gear.

The axial clearance of mainshaft 2nd speed gear:

Standard dimension 0.05~0.37mm

Service limit 0.40mm

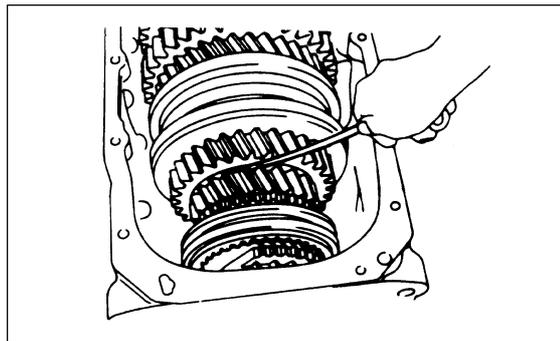
The axial clearance of mainshaft 4th speed gear:

Standard dimension 0.10~0.35mm

Service limit 0.40mm

The axial clearance of mainshaft and input shaft gears:

Standard dimension <0.30mm



# Transmission

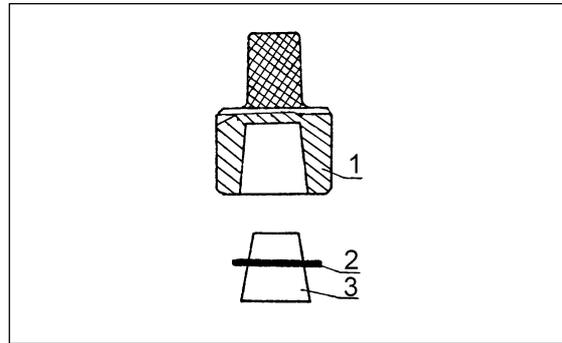
## Assembly Point

### Countershaft assembly

Press on gear and spacer according to the counter procedure of disassembly, assemble snap ring with simple taper tool.

Note: Before press on gear, the gear key groove must align with key on the shaft to avoid damaging. Make sure that the axial clearances of each gear correspond to standard axial clearance.

- (1)Upper taper sleeve
- (2)Snap ring
- (3)Down taper sleeve

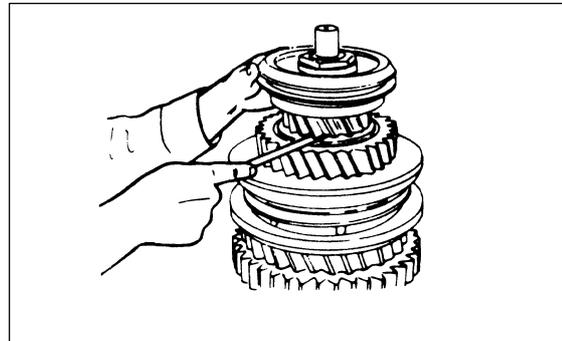


### Mainshaft assembly

Assemble each gear synchronizer from front and rear end according to the counter procedure of disassembly.

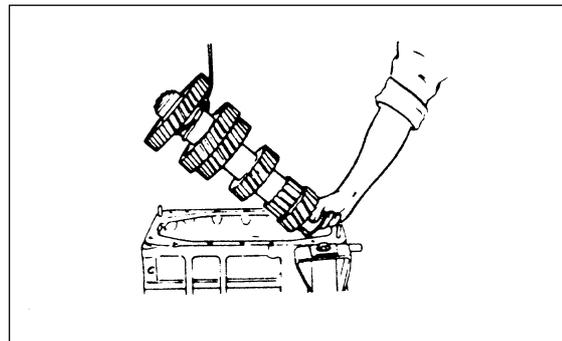
Note: when assemble 2nd and 3rd synchronizer; make sure that the bulging part of sliding sleeve face forward.

Make sure that the axial clearances of each gear correspond to standard axial clearance.

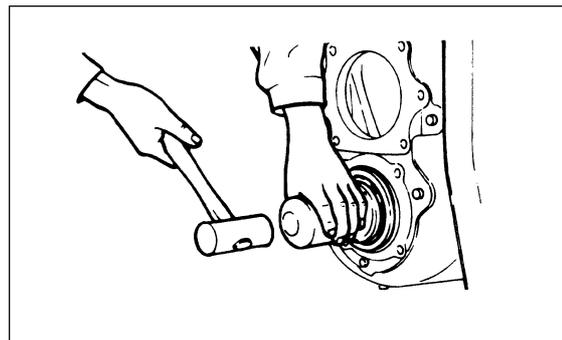


### Sub assembly assemble

1. Mount the countershaft assembly into countershaft hole of transmission assembly in correct direction.



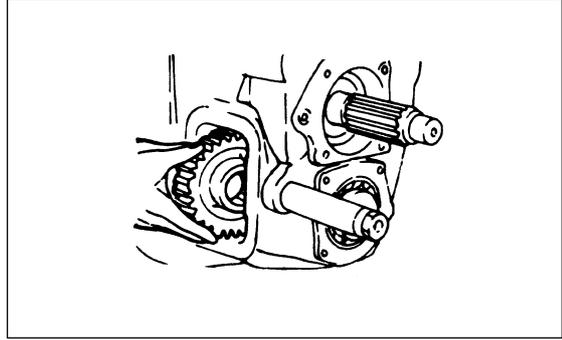
2. Align the countershaft at countershaft front bearing hole of front end of casing, cover the front bearing, tap the bearing outer ring regularly with copper rod until the bearing get close to axle journal pedestal sit, cover the rear bearing from body rear end, tap the bearing outer ring regularly with copper rod until the bearing get close to axle journal pedestal sit, cover the lock plate, tighten the locking nut with the tightening torque of 146Nm, turn over the lock plate to lock the nut, put on the snap ring at the bearing outer ring.



# Transmission

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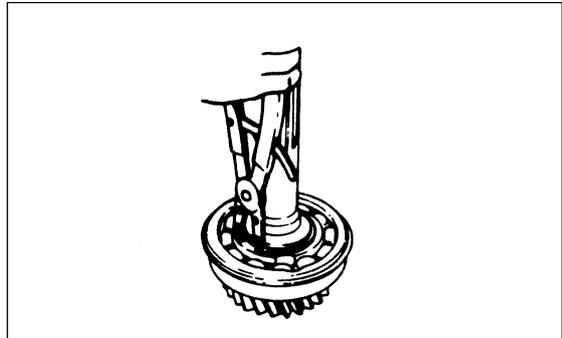
3. Put the needle bearing and spacer into reverse speed gear inner hole, put the reverse speed gear through the reverse speed gear inspecting hole, insert the reverse speed gear shaft from the transmission casing rear end, seize the lock plate with the bolt to fix it.



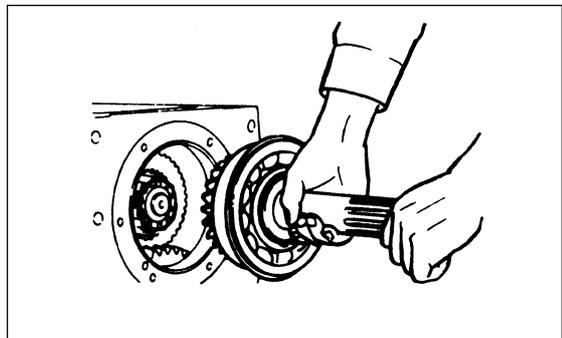
4. Put the main shaft into casing, cover the rear bearing from mainshaft rear end, tap the bearing with copper rod to make the bearing get close the shoulder of mainshaft spline, cover the drive gear of speedometer and spacer, then put the snap ring at bearing outer ring.



5. Press the rear bearing into input shaft, assemble the snap ring and the steel ring of bearing outer ring, put the mainshaft front bearing into inner hole.



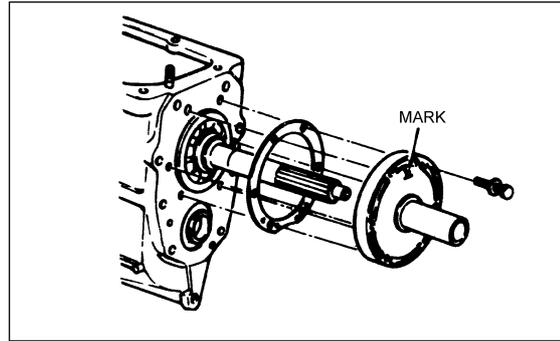
6. Put the input shaft into casing front end bearing hole, align the mainshaft front end axle journal with the front bearing hole, tap the input shaft rear bearing slightly with copper rod, rotate the input shaft with had, put the bearing into casing seating hole smoothly.



# Transmission

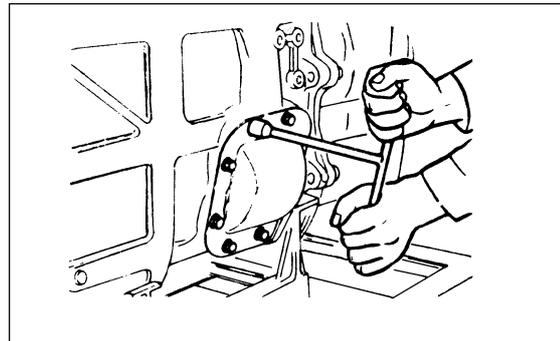
7. Put the sealing gasket with sealing glue from input shaft front end to the positing place of bearing cover, cover the bearing cap and tighten it with bolt.

Note: Install the clutch release sleeve return spring bracket at the upper left bolt or the bearing cap.



8. Install each sealing gasket with sealing glue onto countershaft front and rear bearing cap, power-take-off cover, reverse speed inspecting hole cover and mainshaft rear bearing cap, tighten them with bolts.

Note: Spread or sealing glue at the thread of bolt.



9. Install oil ring, fix the parking brake assembly onto mainshaft rear bearing cap, then cover the parking brake flange onto mainshaft, install disk like washer, tighten the locking nut.

Tightening torque            196~245Nm

## Assemble of the assembly

Before assemble transmission onto truck, make sure that the corresponding parts is tightened.

1. Install transmission and bracket as a assembly into truck with transmission jack and steel wire, make sure that input key into clutch driven disc hub spline.

2. Install clutch booster or clutch slave cylinder, return spring and dowel pin. Adjust free running for clutch outer pull rod.

Free running for clutch outer pull rod            2~3mm

3. Install transmission operating tie rod.

4. Install propeller shaft and central supporter.

Propeller shaft tightening torque            215~245Nm

Central supporter tightening torque            160~220Nm

5. Connect all the circuits and pipe lines.

6. Made sure that drain plug screw is tightened, and gear oil, then tighten plug screw of oil filler.

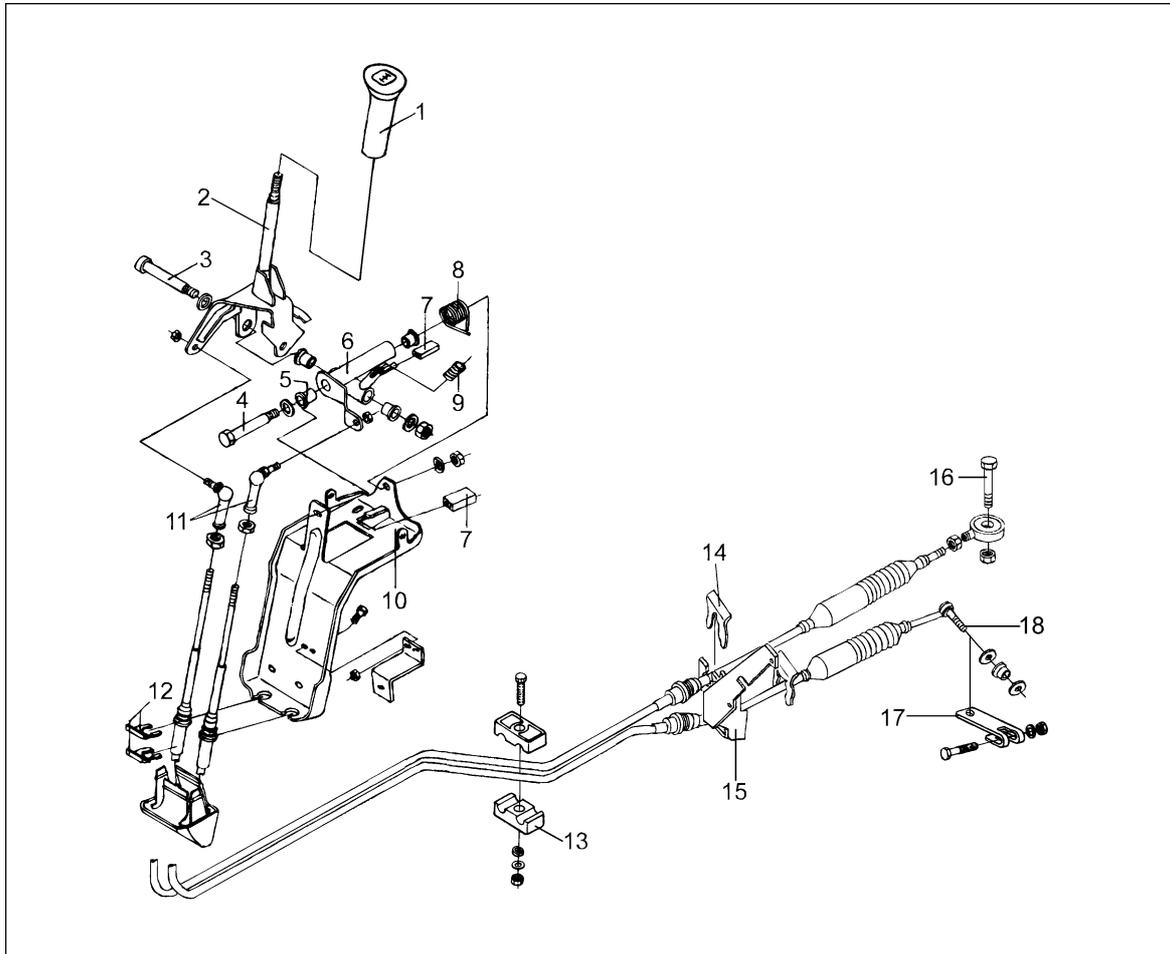
Tightening torque            120~140Nm

# Transmission

## Transmission Control System

### General Construction

#### Transmission control mechanism



- |  |  |
|--|--|
| 1. Gear shift knob assy                          | 11. Shift and selector flexible shaft with ball joint assy |
| 2. shift lever assy                              | 12. Flexible shaft clip board                              |
| 3. Shift rocker shaft                            | 13. Upper bracket, double hose clip                        |
| 4. Selector rocker shaft                         | 14. Shift, selector flrxible shaft clip board              |
| 5. Bushing                                       | 15. Flexible shaft bracket assy                            |
| 6. Selector rocker and shift sleeve sets         | 16. Pin  |
| 7. Sheathing                                     | 17. Selector rocker  |
| 8. Selector return spring                        | 18. Pin needle, bushing                                    |
| 9. Buffer shell                                  |  |
| 10. Flexible shaft and rocker shaft bracket sets |  |

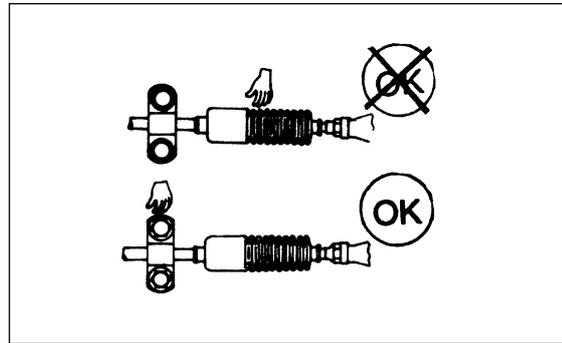
# Transmission

## Check and Adjustment

### Note for installation of flexible shaft

1.Ensure the adjustment for flexible shaft is making in clear environment. If the dirt goes into the tie rod, it will goes into the flexible shaft interior when tie rod move, and cause the damage for flexible shaft core.

2.When adjusting the flexible shaft, do not hold dirt boot by hand to avoid the damage for interior parts. Do not tap the dirt boot with tool.



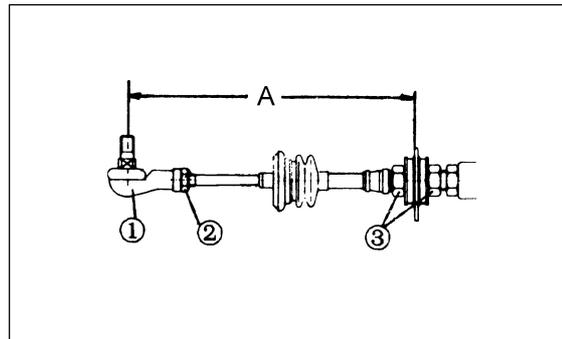
3.Do not damage the exteriors of flexible shaft and any sealing parts.

### Adjustment of selective shift flexible shaft

1.Fit the ball joint assembly at the connecting end of selective shift flexible shaft and gear shift, then push the flexible shaft to the bottom to adjust the ball joint and big nut, the dimension of A should meet the requirement.

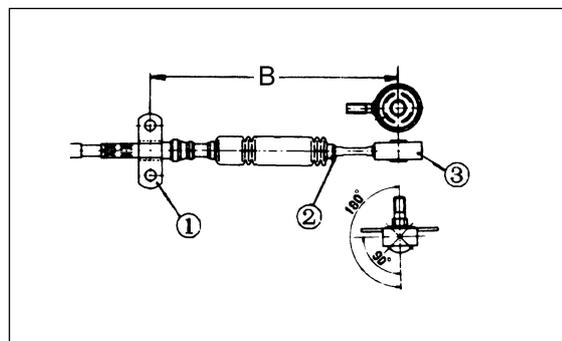
$$A=185\pm 1\text{mm}$$

- (1)Ball joint
- (2)Adjusting nut
- (3)Locking nut



2.Install the rubber, push the rear end of flexible shaft to the bottom to adjust the adjusting nut the length of B should be 205mm. Ensure the relative angle of flexible shaft clip and rubber connector is 90 degree.

- (1)Flexible shaft clip
- (2)Adjusting nut
- (3)Rubber connector



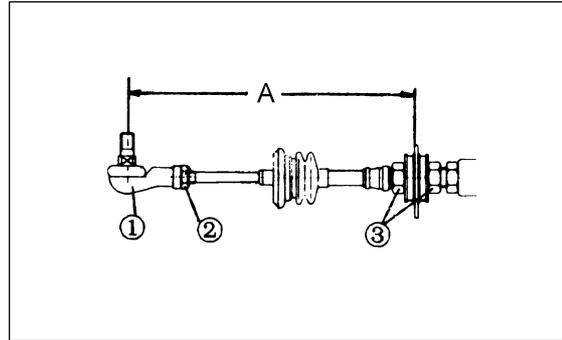
# Transmission

## Adjustment of selective shift flexible shaft

1. Fit the ball joint assembly at the connecting end of selective shift flexible shaft and gear shift, then push the flexible shaft to the bottom to adjust the ball joint and big nut, the dimension of A should meet the requirement.

$$A=193\pm 1\text{mm}$$

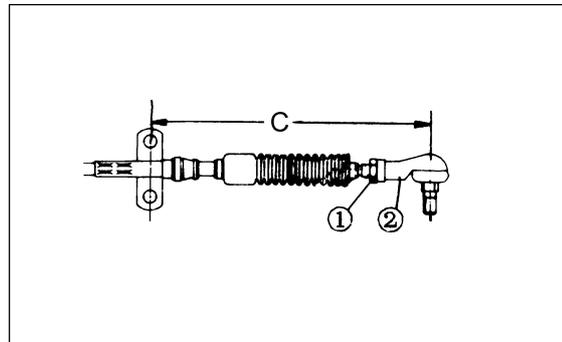
- (1) Ball joint
- (2) Adjusting nut
- (3) Locking nut



2. Push the rear end of flexible shift to the bottom, screw the adjusting nut to make the length of C is  $214\pm 1\text{mm}$ , and ensure the angle relationship of two ball joints and the angle relationship of ball joints and flexible shaft clip.

After finished the adjustment, tighten the adjusting nut.

- (1) Ball joint
- (2) Adjusting nut



## Installation of flexible shaft

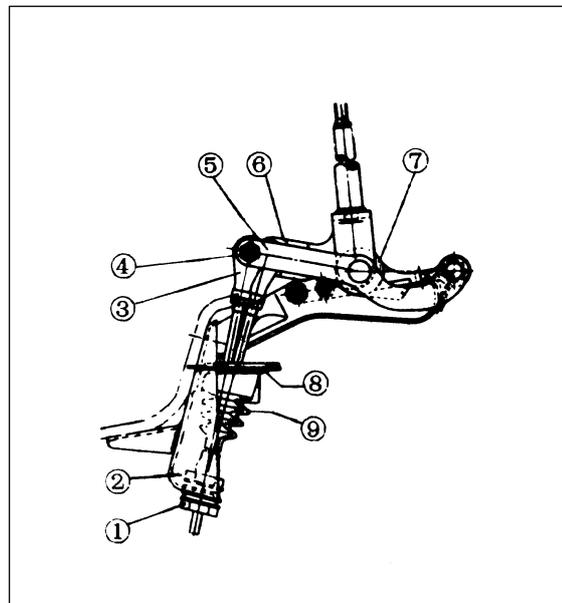
The selective shift flexible shaft assembly adjusted according to the above way can be assembled on the truck.

1. Loosen the big nut of front end, let the flexible shaft go through the bracket and the dirt boot plate, and then tighten the big nut.

2. Connect the ball joint assembly with selective arm together with self-locked nut. The flexible shaft dirt boot must be fitted on the fixed plate.

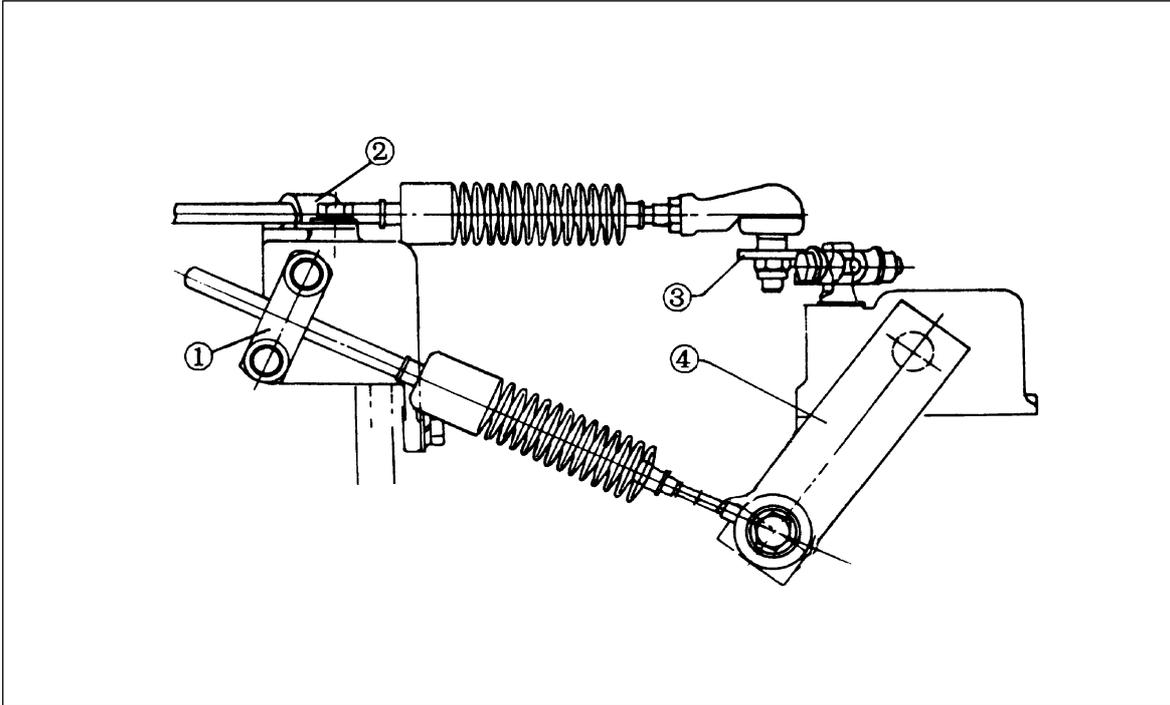
- |                       |                    |
|-----------------------|--------------------|
| 1. Adjusting nut      | 2. Supporter       |
| 3. Ball joint         | 4. Locking nut     |
| 5. Selective arm      | 6. Operating shift |
| 7. Floating supporter | 8. Fixed plate     |
| 9. Dirt boot          |                    |

3. Fit the front end of flexible shaft, then fit the rear end, connect it with the transmission assembly, first fit the



# Transmission

flexible shaft clip on the bracket, then connect the flexible shaft with shift rock arm, the transmission should be in neutral position.

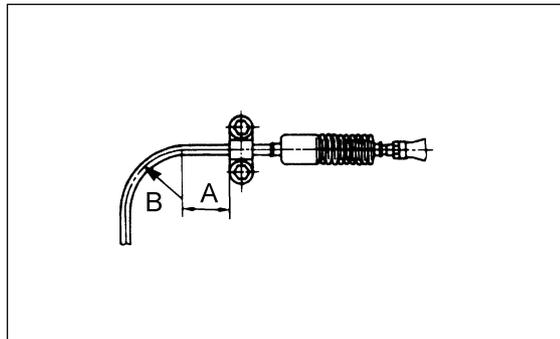


- 1.Shift flexible shaft clip
- 2.Selective shift flexible shaft

- 3.Selective flexible shaft bracket
- 4.Shift rock arm

When assembling, the flexible shaft core must not be twisted. When connecting the flexible shaft with gear-box, the end section of flexible shaft should be about 100mm line, then it can be bent, the bending radius is not less than 200mm.

When connecting the flexible shaft two end with other parts, pay attention to assemble direction, it should not be crooked.



## Lubrication normally

Lubricating grease need not be used in flexible shaft control system. If the noise is found in operating the flexible shaft control system or it is difficult to operate the control system, it is necessary to turn over the cab to check whether the lubricating grease is sufficient in dirt boot of shift level support ball knob and in dirt boot of flexible shaft ball joint assembly. If necessary, add the No.2 industrial Li base lubricating grease.

# Propeller Shaft

**PR**

## Table of Contents

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Maintenance Standard .....	PR-1
Tightening Torque .....	PR-1
Trouble Analysis.....	PR-1
Propeller Shaft .....	PR-2
Intermediate Propeller and Center Bearing .....	PR-3
Propeller Shaft Maintenance .....	PR-3

# Propeller Shaft

## Propeller Shaft

### Technical Parameter

Type	Open type, tubular propeller shaft, two segments. The front segment is midship shaft with bearing, the rear is double universal joints with flange inner slide
Universal joint type	Spider type
Center bearing	Slide a little along lengthways in the center bearing seat
Universal joint max oscillatory angle	$\pm 20^\circ$
Max spline slippage (mm)	54

### Maintenance Standard

Unit: mm

Item	Standard dimension	Service limit	Remark
Radial motion of propeller shaft	0~0.75	1.5	
Slip spline backlash	0.025~0.115	0.4	
Clearance of universal joint and needle bearing	-	0.1	
Axial clearance of center bearing	-	0.5	
Center bearing bearing seat inside hole surface worn	-	0.05	

### Tightening Torque

Unit:N.m

Item	Tightening Torque
Propeller shaft flange fork connecting nut	90~110
Center bearing locking bolt and nut	901~10

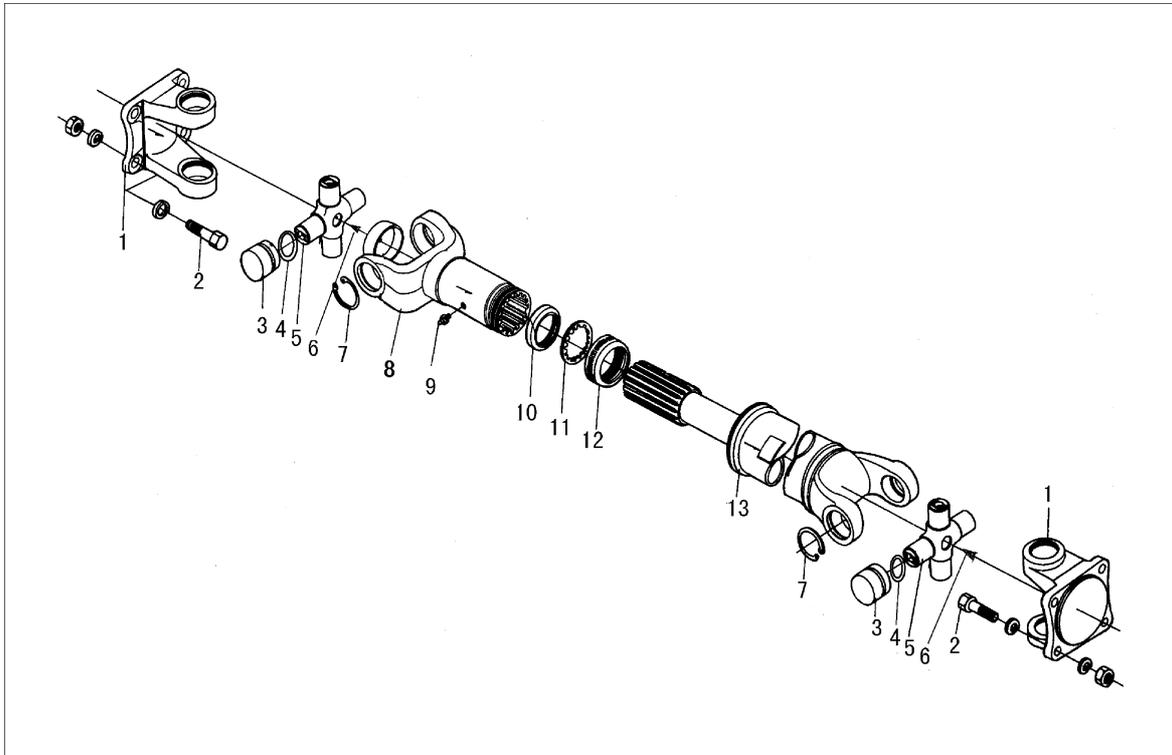
### Trouble Analysis

Trouble	Cause	Method
Abnormal vibration in the running	Connecting bolts on the propeller shaft loosely	Tighten bolts or nuts
Propeller shaft vibration	Propeller shaft has not been reassembled in accordance with the mark on it Propeller shaft tube is bent Renewed major components without dynamic balance	Reassemble it in accordance with the mark Check or renew Dynamic balance correct
	Center bearing rubber washer slacken or failed	Tighten or replace
Universal joint or slip yoke worn out early	Oil seal failed Not fill grease regularly or not fill enough oil	Replace Fill with enough lubricating grease periodically

# Propeller Shaft

## Propeller Shaft

### Structure



1.Flange fork

2.Bolt

3.Cross shaft needle bearing assy

4.Dust collar

5.Cross shaft

6.Grease nipple

7.Snap ring for holes

8.Slip yolk assy

9.Grease fitting

10.Slip yolk oil seal

11.Oil seal spacer

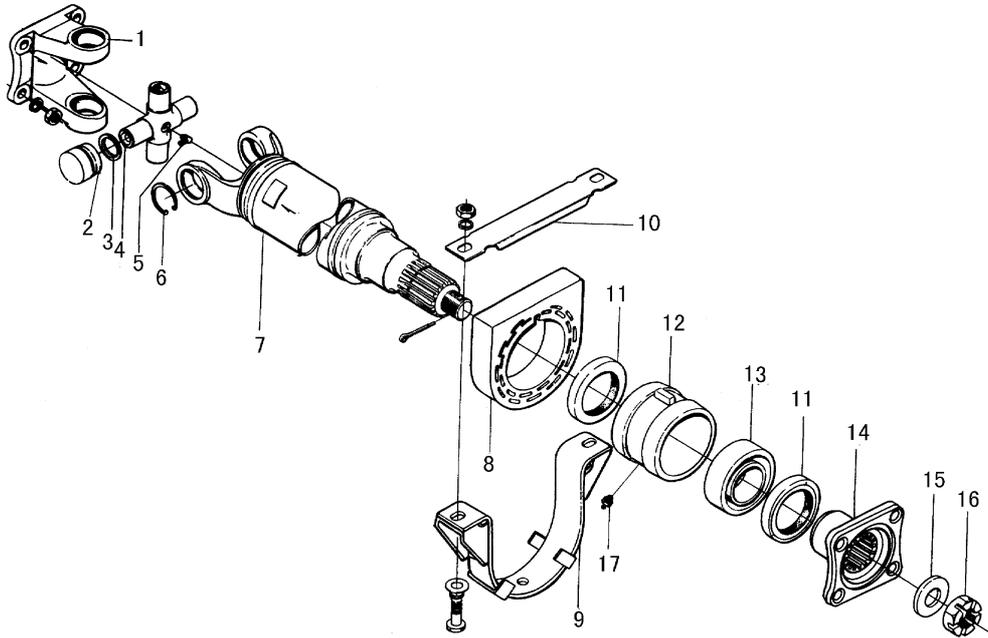
12.Oil seal cover

13.Propeller shaft assy

# Propeller Shaft

## Intermediate Propeller and Center Bearing

### Structure



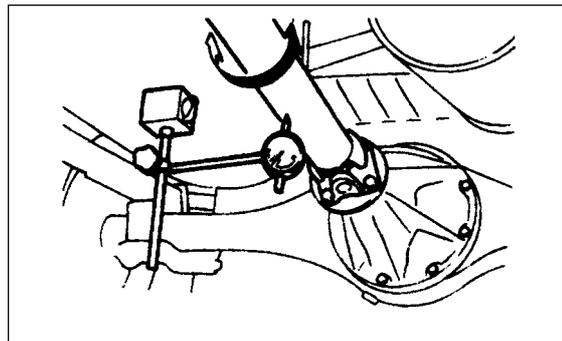
- |                                   |                                      |                                   |
|-----------------------------------|--------------------------------------|-----------------------------------|
| 1.Flange fork                     | 7.Intermediate propeller shaft       | 12.Bearing seat--center bearing   |
| 2.Cross shaft needle bearing assy | 8.Washer--center bearing seat        | 13.Bearing--center bearing        |
| 3.Dust collar                     | 9.Center bearing bracket assy        | 14.Flange--driving conic gear     |
| 4.Cross shaft                     | 10.Upper cover board--center bearing | 15.Washer--driving conic gear nut |
| 5.Grease elbow                    | 11.Oil seal--center bearing          | 16.Hex slotted flat nut           |
| 6.Snap ring for holes             |                                      | 17.Grease fitting                 |

## Propeller Shaft Maintenance

### Propeller shaft vibration

If the propeller shaft vibrates during high speed, please first check its radial runout.

- 1.Support the rear axle up.
- 2.Turn the propeller shaft, and check one point of the propeller shaft for its radial runout.



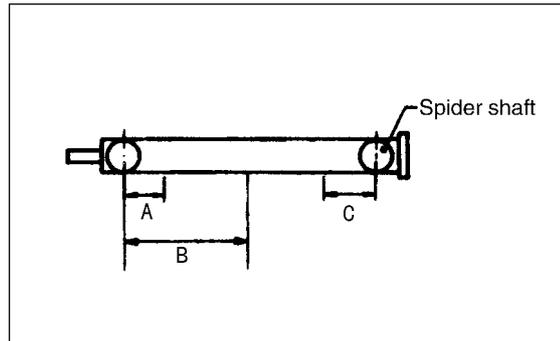
# Propeller Shaft

Measure point of the propeller shaft (mm):

A=155

B=165

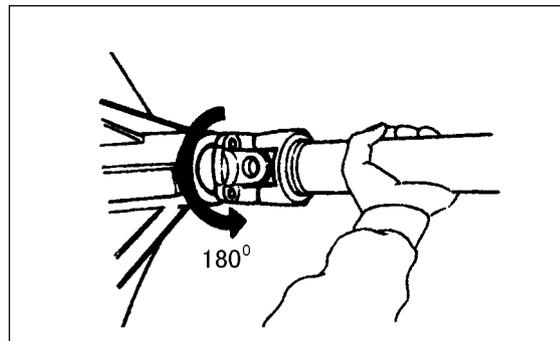
C=185



3.If the radial runout is above the limit value, remove the connecting flange of one end of the rear axle, and turn it for 180° then install the propeller shaft.

4.Check the radial runout again, if it still beyond the limit value, replace the propeller shaft.

5.Road tests.

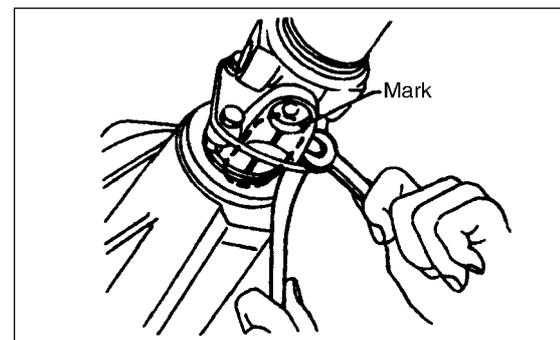


## Appearance check

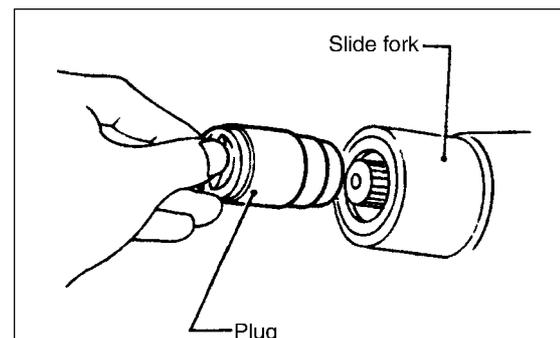
Check the surface of the propeller shaft for any cracks or pit. If there were, replace the propeller shaft.

## Disassembly and assembly

Make marks on the flange disc and remove the propeller shaft from the end of the rear axle.



Pull the propeller shaft out from the power train, and plug the protruded part of the power train with plug.

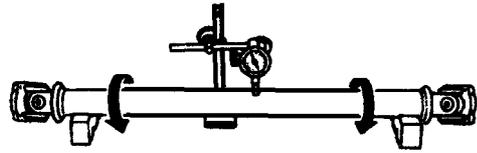


# Propeller Shaft

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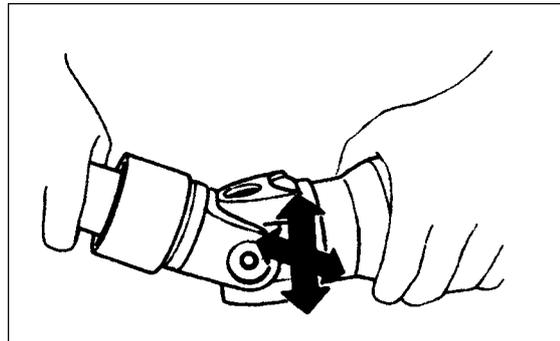
## Check

Check the radial runout of the propeller shaft, and if it is beyond the limit value, replace the propeller shaft.



## Check the axial freedom of the spider shaft

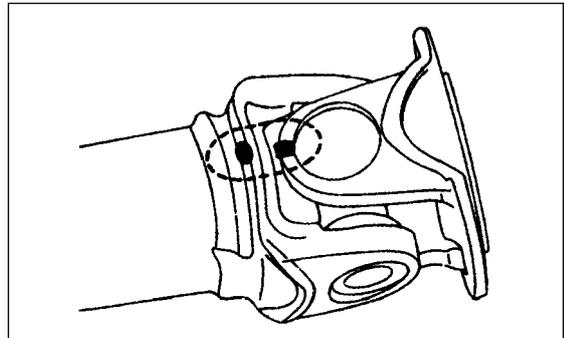
If the axial freedom of the spider shaft is beyond the limit value, you have to replace the spider shaft assembly.



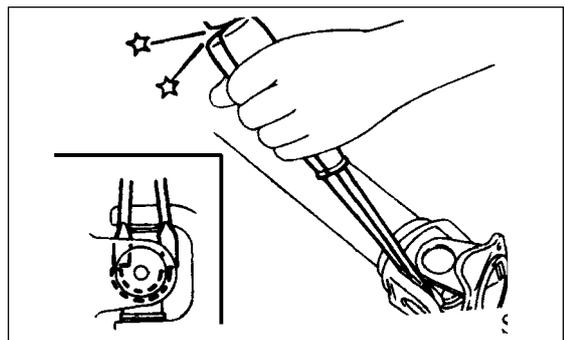
## Disassembly

Disassemble the spider shaft.

1. Make marks on the propeller shaft and flange fork.

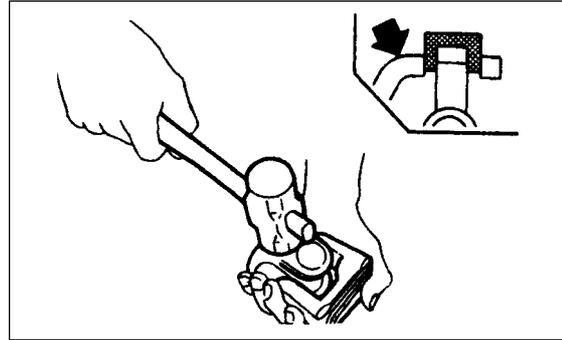


2. Remove the snap ring.

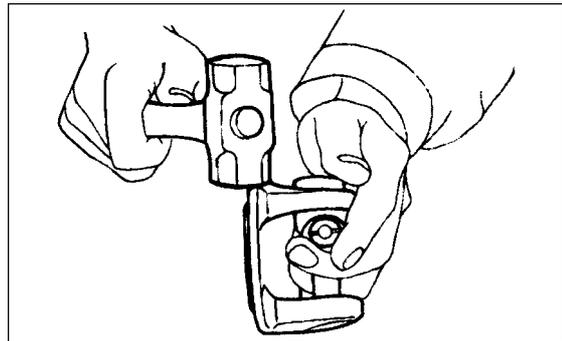


# Propeller Shaft

3. Knock the flange fork with a hammer, and don't damage the holes of the spider shaft and flange fork when disassembling the spider shaft.



4. Disassemble the spider shaft bearing of the other end in the same way. Make marks on the dismantled parts, and you may not change their original position when reassembling.

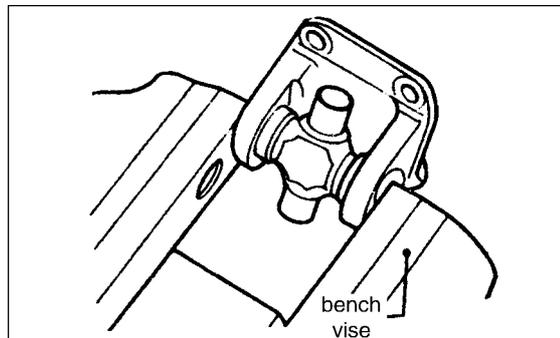


## Assembly

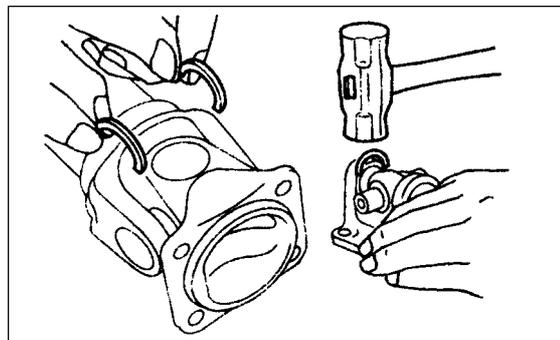
### Spider shaft

1. Install the spider shaft bearing, apply some grease on the surface of the bearing inside face.

Never miss the needle of the needle bearing when assembling.

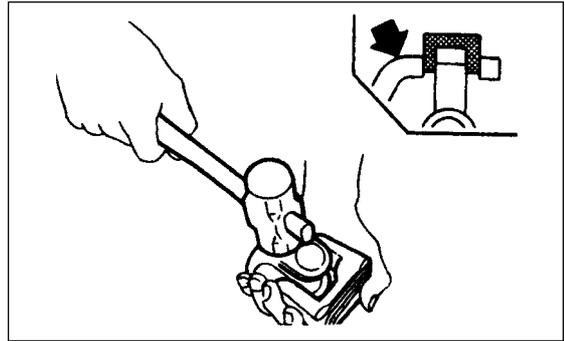


2. Select a snap ring to make the spider shaft among the required axial clearance and install it. The thickness of the selected snap ring should be below 0.06mm.

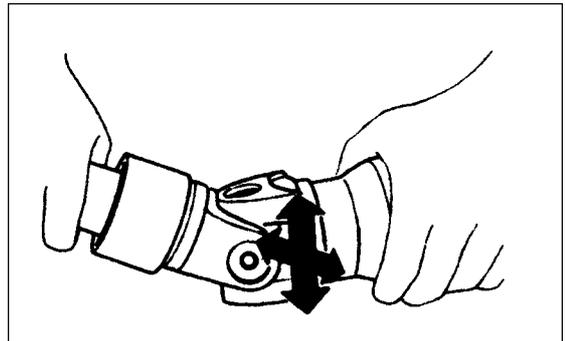


# Propeller Shaft

3. Eliminate the clearance between bearing and snap ring by knocking flange fork.



4. Check the flexibility and axial freedom of the spider shaft.

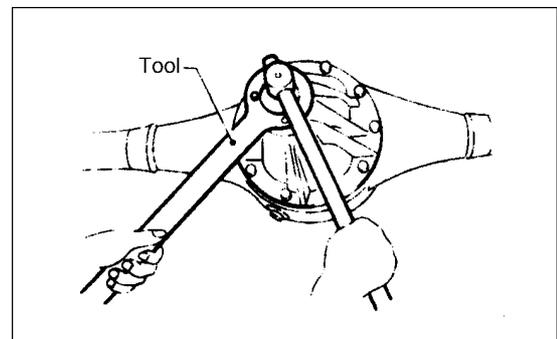


## Maintain

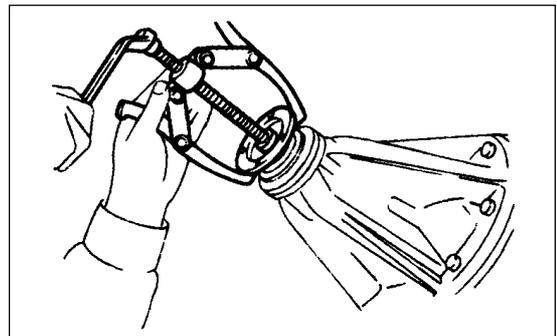
### Replace of the front oil seal

Note:

The adjusted spacer is used for the driveline. After the disassembly of the flange, it is necessary to adjust the pretightening force of the bearing, so the main retarder needs to be repaired.



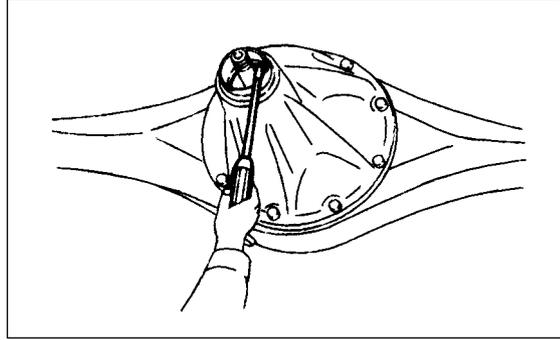
1. Remove the propeller shaft.
2. Loose the end face nut.
3. Remove the connecting flange.
4. Remove the front oil seal.



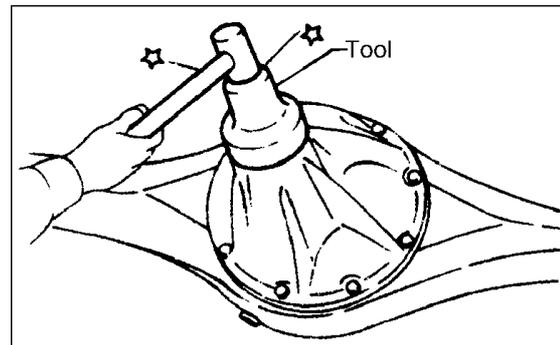
# Propeller Shaft

5. Apply some grease on the lip cavity of the oil seal and then press it into the oil seal seat.

6. Assemble the flange disc and drive gear nut.



7. Assembly the propeller shaft.



## Disassembly and Assembly

### Disassemble

Remove the propeller shaft.

After removing the propeller shaft, plug the output port of the transmission by plug.

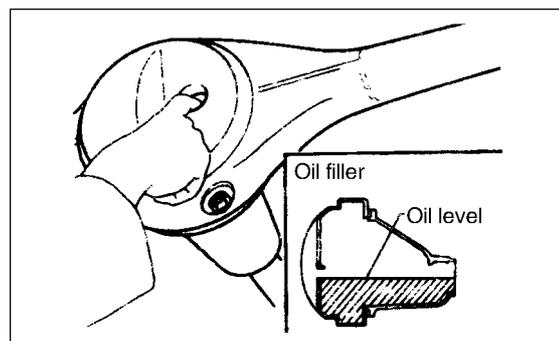
Remove the axle housing half axle.

### Note:

Don't damage the spline, sleeve flange fork and front oil seal when removing the propeller shaft.

### Assemble

Fill with recommended gear lubricant.



# Steering System

**ST**

## Table of Contents

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Steering Wheel and Steering Column .....	ST-2
Power Steering Hydraulic pressure System.....	ST-5
Steering gear .....	ST-6
Trouble Analysis.....	ST-7

# Steering System

## Steering System

Note:

Before disassembly, carefully clean the surface of the parts.

Please do the disassembly in a cleaning environment to avoid dust or any other filth enter the parts.

Put the removed parts in order and it may be convenient to reassemble.

Clean the parts with nylon or soft paper.

Before checking or assembling, clean all the parts with liquid carefully.

You'd better apply a layer of transmission lubricant on the surface of the parts before assembly. Apply a layer of vaseline on the surface of hydraulic pressure parts and O-type oil seal.

Replace all of the oil seal, spacer and O-ring. Avoid using the used spacer, oil seal and O-ring when assembling. After assembly, you must have a test run.

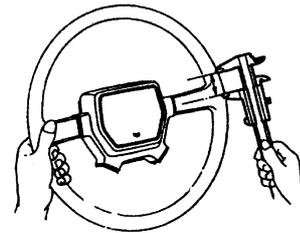
## Check

### Check the free travel of the steering wheel

Measure the free travel of the steering wheel when it is set on the center.

Free travel  $\leq 35\text{mm}$

If the measured value isn't in this range, check the steering gear clearance and the ball pin.



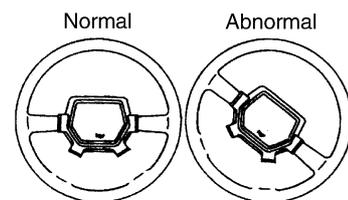
### Check the center position of the steering wheel

Correct the center position of the steering wheel before dismantling.

#### Check

When the vehicle is running straight, check to see if the steering wheel is in the center position.

If not, disassemble the steering wheel and reassemble it.

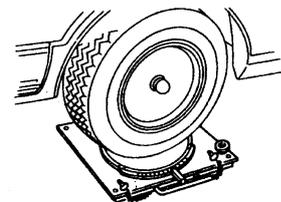


### Check the turning angle of the front wheel

Turn the steering wheel left and right to measure its maximum turning angle.

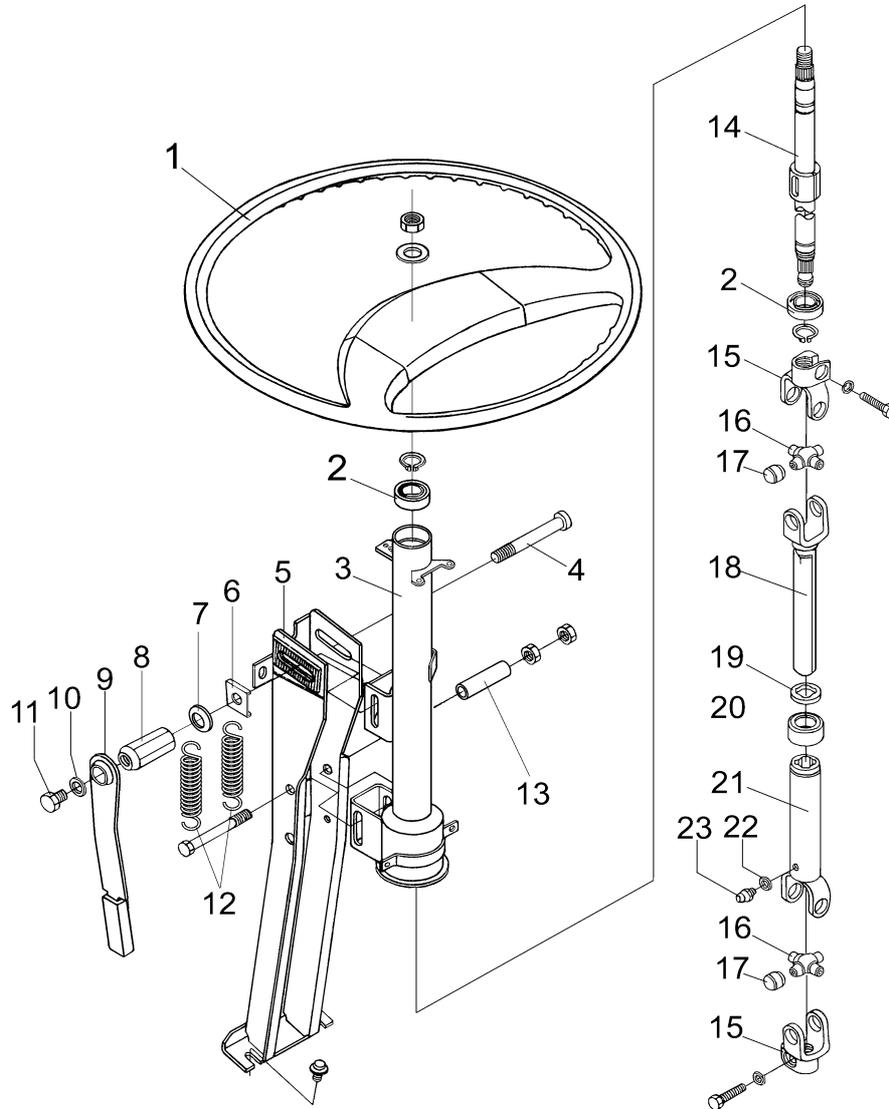
Inner wheel  $38.5^\circ \pm 30'$

Outer wheel  $29.5^\circ$



# Steering System

## Steering Wheel and Steering Column



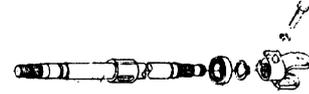
- |   |   |
|---|---|
| 1. Steering wheel assy                                  | 12. Return spring                                   |
| 2. Annular ball bearing with doubled sided sealing ring | 13. Distance limit spacer sleeve                    |
| 3. Steering column welding assy                         | 14. Steering shaft                                  |
| 4. Adjusting screw                                      | 15. Steering universal joint fork                   |
| 5. Steering column bracket welding assy                 | 16. Spider  |
| 6. Guiding fin  | 17. Spider needle bearing assy                      |
| 7. Saucer spring washer                                 | 18. Steering universal joint fork with spline shaft |
| 8. Pressed nut  | 19. Oil sealing--sliding fork                       |
| 9. Adjustor wrench assy                                 | 20. Oil sealing cap--sliding fork                   |
| 10. Washer--fix wrench                                  | 21. Steering sliding fork assy                      |
| 11. Bolt--fix wrench                                    | 22. Grease nipple shim--straight                    |
|   | 23. Grease nipple--straight                         |

# Steering System

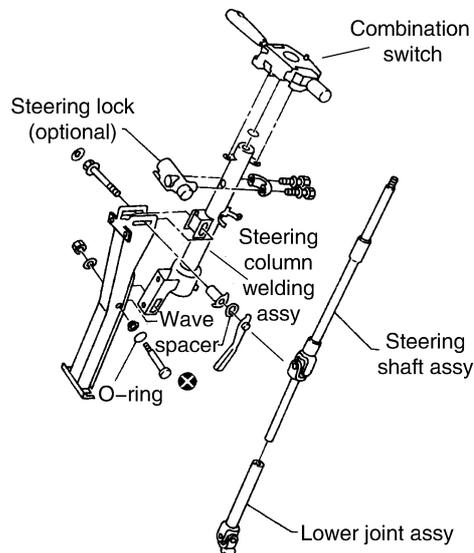
## Steering column

When assembling the steering column, tighten the bolt and clip of the lower supporter by hand first. then tighten the steering column under the condition that the steering column is out of force.

When assemble the steering cross shaft, you must check if the locking bolt and the sunk part is aligned.



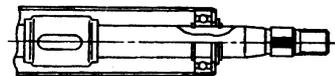
## Disassembly and Assembly



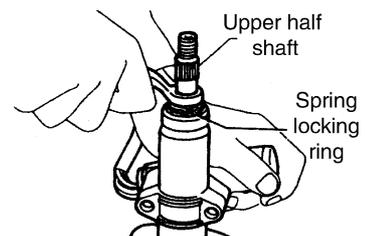
When do the disassembly and assembly, you have to unlock the steering lock by key.

Assure the surface of the spring lock ring is under the shaft.

Before insert the shaft into the sleeve, first install the spring lock ring.



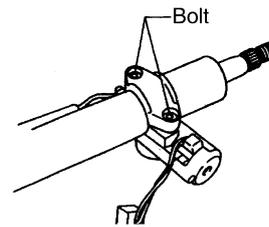
Assemble the spring lock ring on the upper half shaft by special tool.



# Steering System

## Turning lock

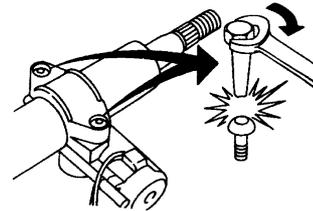
Remove the fixed bolt of the clip.



Tighten the fixed bolt.

Note:

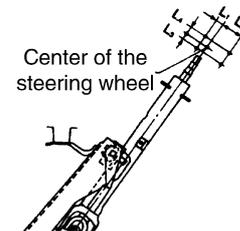
Take a look if the installing position of the steering lock is correct.



## Adjusting mechanism

After assembling the steering shaft adjusting mechanism, check its moving condition.

Front, rear	$\pm 6^\circ$
Up, down	L3: $\pm 15\text{mm}$

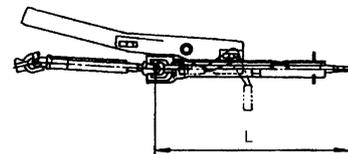


## Check

If the steering wheel can't be turned flexibly, please check the steering column by the following steps and replace the corresponding wearing parts.

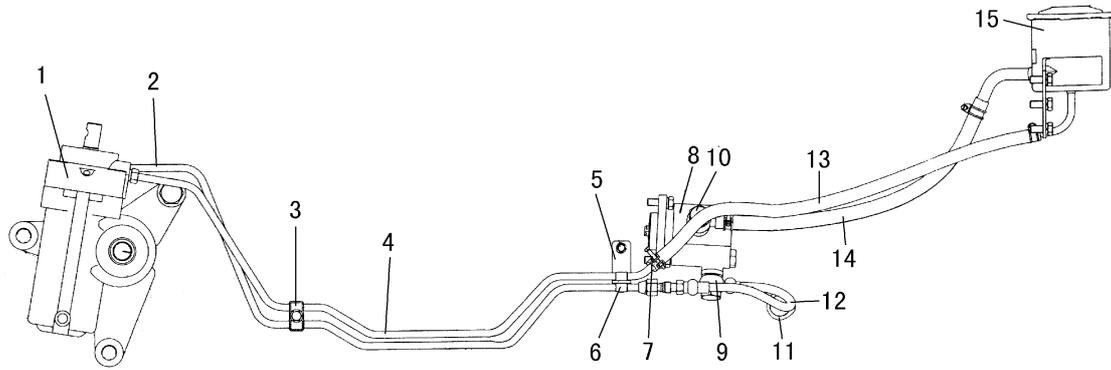
Check the steering column bearing for any damage or weariness, and lubricate the bearing with proper grease. Replace the total steering column if necessary.

Check the steering column sleeve for distortion or damage, and replace it if necessary.



# Steering System

## Power Steering Hydraulic Pressure System



- 1. Power steering gear assembly
- 2. Elbow assembly, inlet oil
- 3. Upper bracket
- 4. Elbow assembly, outlet oil,
- 5. Bracket
- 6. Clip

- 7. Clip
- 8. Oil pump
- 9. Bolt--joint of the oil pump
- 10. Joint--inlet oil tubing
- 11. Jacket
- 12. High pressure hose assembly

- 13. Hose
- 14. Hose--steering gear to oil reservoir
- 15. Oil reservoir assembly, steering

# Steering System

## Steering Gear

### Basic parameter

Basic parameter	M11-3411010
Appropriate maximum load of front axle (kg)	3500
Max. output torque (N.m)	2150
Max. oil pressure (MPa)	13
Recommended oil pump flow (L/min)	10
Drive ratio	18: 1
Number of total turns	4.78
Pitman arm shaft turning angle	$\pm 45^\circ$
Temperature range ( $^\circ$ C)	-40~120
Diameter of the piston (mm)	80

### Maintenance

1. After 2,500km, the new power steering gear need to replace its hydraulic pressure oil, and wash the filter in the oil reservoir. Replace the hydraulic pressure oil and wash the filter ever 50,000km or every year after that.
2. Check the oil quantity every month to see whether it reduced, deteriorated or too much impurities. If there is any badness, you have to refill or replace the oil immediately.
3. Check and keep the tire pressure accord with the requirement.
4. Procedure of replace or fill oil
  - (1) Support the front axle.
  - (2) Open the oil reservoir, screw down the oil outer bolt of the steering gear, drain off the remain oil in the oil pump and the oil reservoir(idle the engine), and turn the steering wheel left and right to the limit for several times, till there is not oil flowing out.
  - (3) Tighten the oil outer bolt (keep it clean and avoid dirt entered)
  - (4) Fill with new hydraulic pressure oil.
  - (5) Idle the engine, turn the steering wheel left and right to its limit for several times until there is no bubbles appeared in the oil reservoir and the oil level stop dropping.
  - (6) Refill the oil reservoir to its maximum.
  - (7) Tighten the upper cover of the oil reservoir.

# Steering System

## Trouble Analysis

Trouble	Cause	Method
Bothway heavy steering	1.Oil level in steering gear is not sufficient	Add oil to the upper mark
	2..The connecting part between the oil outlet and the engine, and between the oil inlet of the steering oil pump and the engine, and between the oil pump and the engine sucked air.	Tighten oil pipe fitting or replace the sealing part
	3.Too small flow of the steering oil pump (flow control valve blocked)	Disassemble and wash the flow control valve
	4.Strainer screen of the oil reservoir damaged or blocked	Replace the filter cartridge and wash the oil suction pipeline between oil reservoir and oil pump
	5.The movement between steering drive shaft and universal joint connecting with the steering gear is not flexible.	Move repeatedly until it becomes flexible, otherwise you have to replace the universal joint
	6.Rotary valve blocked	Repair the steering gear
	7.Improper oil pressure in the oil pump	Replace oil pump
	8.Vehicle overload too much	Reduce load
One-way heavy steering	1.Tire pressure of one side isn't enough.	Inflating
	2.Only one direction of the steering gear leak out too much.	Repair the steering gear
	3.The rotary valve isn't in the neutral position.	
	4.The fixed pressure of left or right can't be set up.	Replace sealing part
Heavy steering when quickly turning bothway	1.The connecting part between the oil outlet of the steering oil reservoir and the engine, and between the oil inlet of the steering oil pump and the engine sucked air.	
	2.Too small flow capacity of the steering oil pump	Replace the steering oil pump
Too large free travel of the steering wheel	1.Steering wheel and steering shaft fit is loose	Tighten
	2.Connecting part of the steering drive device loosed	
	3.Fixed bolt of the steering gear and its bracket loosed	
	4.Too big clearance between steering screw arbor and nut	Repair the steering gear
	5.Leaf spring bolt loosed	Tighten
	6.Steering universal joint locking bolt loosed	Tighten
	7.Improper adjustment of the steering gear	Adjust side cover adjusting bolt

# Steering System

Steering gear overheat (its temperature is over 65° C of the environ- ment temperature)	1. Too much flow of the oil pump	Replace the oil pump
	2. The bending radius of the oil pipe is too small or the inner part is blocked and cause oil flowing difficult and heated	Replace the oil pump
	3. Steering to the limit position need more than 5 seconds.	Avoid to turn to the limited position
Steering control is not flexible	1. Parts of steering system loose or wear	Tighten or replace
	2. Steering gear is loose	Tighten
	3. Improper adjusting of the steering gear	Adjust the side cover bolt
	4. Oil level of the oil reservoir is lower than the lowest mark	Add oil
	5. Front axle leaf spring fixed bolt loosed	Tighten
	6. Steering universal joint locking bolt loosed	Tighten
Steering wheel return failed	1. Insufficient tyre pressure	Inflating
	2. Too tight fit of the front axle parts	Adjust
	3. Improper alignment of the front wheel	
Steering wheel return too quick	1. Insufficient oil in the steering oil reservoir	Add oil
	2. Air in the steering oil pipe	Exhaust
	3. Clearance between steering drive shaft and the steering universal joint	Replace the steering universal joint
	4. The input torque of the steering gear when idling is smaller than 40~60N.cm that the mesh of the nut and arm shaft loosed.	Adjust clearance

# Front Axle

**FA**

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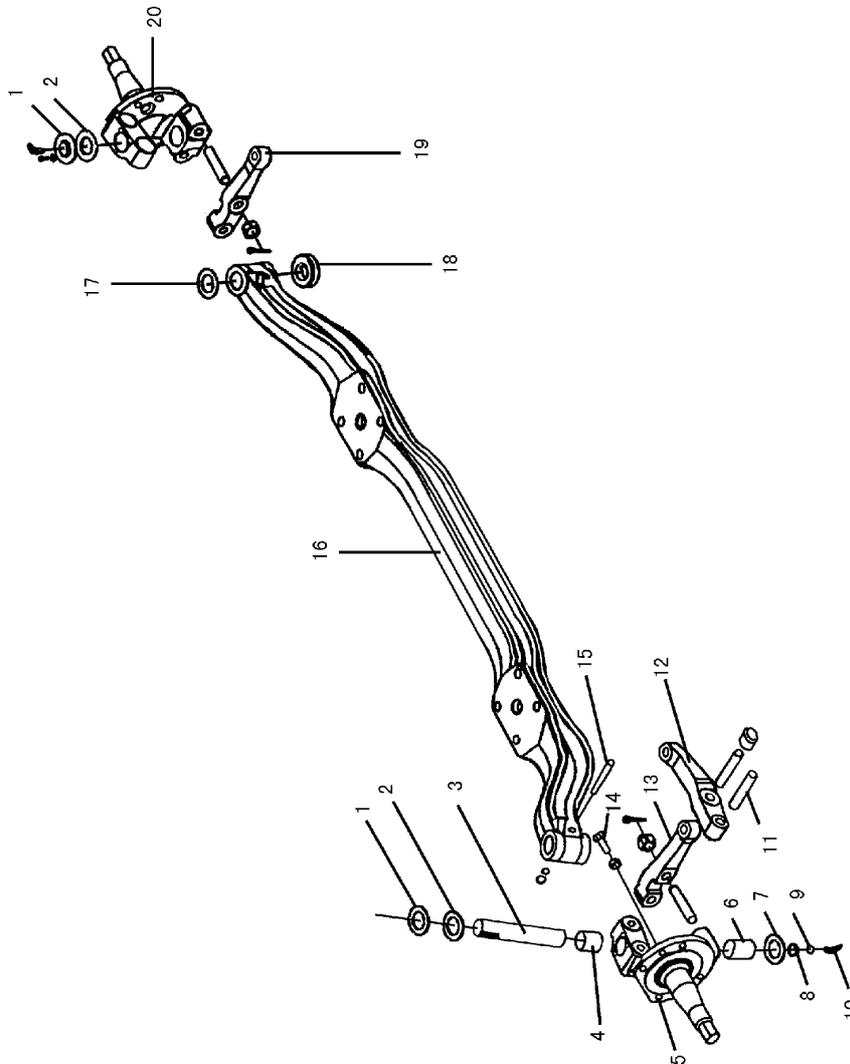
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# Front Axle

## Front Axle

### Construction

Front axle, steering knuckle

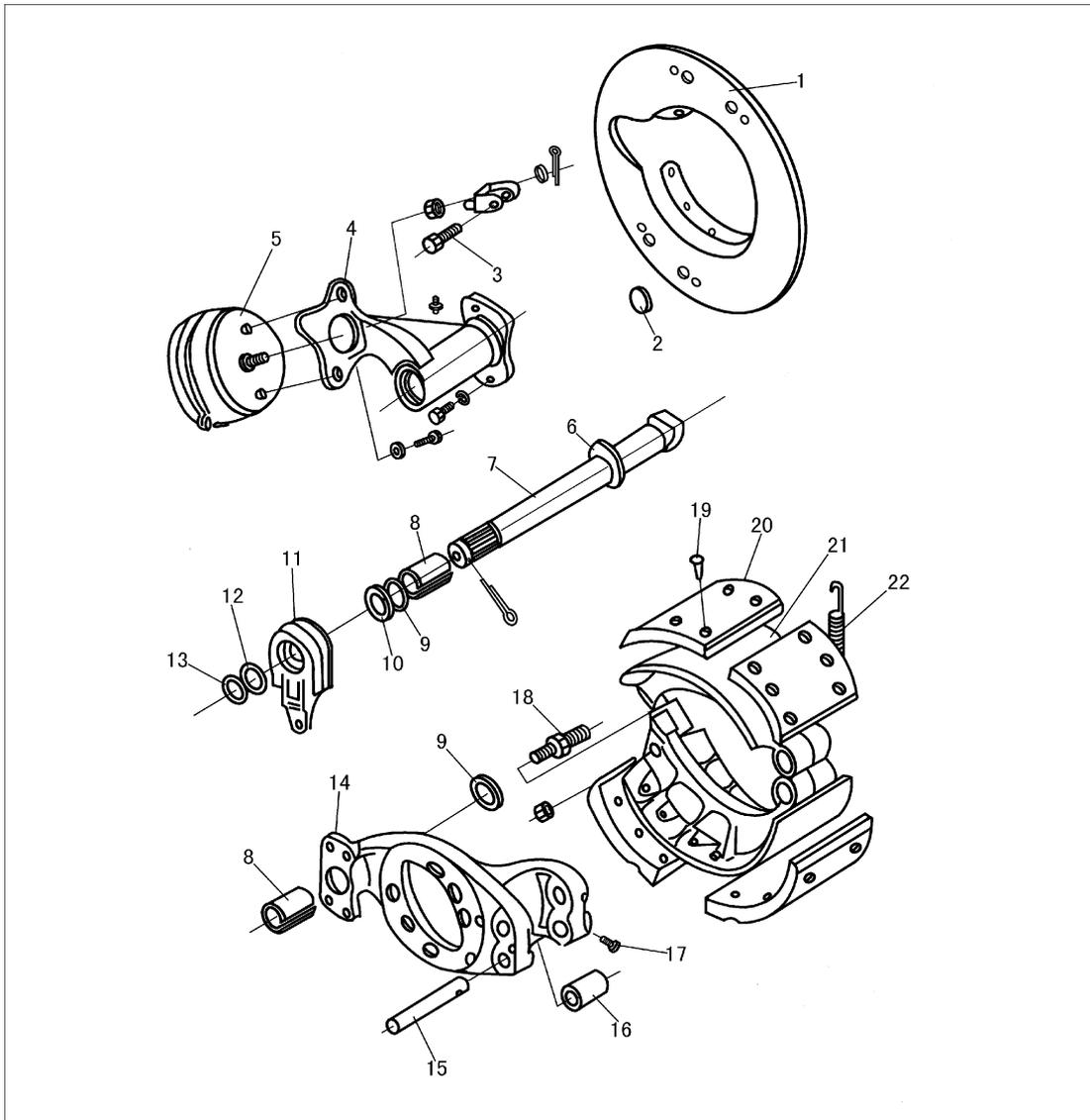


- 1.Upper cover--steering knuckle
- 2.Gasket--steering knuckle upper cover
- 3.King pin--steering knuckle
- 4.Upper bush
- 5.Left steering knuckle
- 6.Lower bush
- 7.King pin blanking cover assy
- 8.Washer
- 9.Screw--king pin blanking cover
- 10.Grease nipple--neck

- 11.Double head bolt--steering knuckle arm
- 12.Upper arm--left steering knuckle
- 13.Left steering knuckle arm
- 14.Steering limit bolt
- 15.Dovetail form lockpin--king pin
- 16.Front axle
- 17.Adjusting spacer (2.1mm~2.8mm)
- 18.Thrust bearing assy
- 19.Right steering knuckle arm
- 20.Right steering knuckle

# Front Axle

## Disassembly of the Front Brake



- |                                     |                                    |                          |
|-------------------------------------|------------------------------------|--------------------------|
| 1. Front dustproof shield           | 8. Bush--air chamber bracket       | 16. Bush                 |
| 2. Rubber plug                      | 9. O-ring                          | 17. Screw                |
| 3. Column pin--air chamber push-rod | 10. Adjusting spacer               | 18. Pin                  |
| 4. Front brake bracket assy         | 11. Front brake adjusting arm assy | 19. Rivet                |
| 5. Front brake air chamber assy     | 12. Washer--brake cam              | 20. Brake friction plate |
| 6. O-ring                           | 13. Adjusting washer               | 21. Front brake shoe     |
| 7. Front brake cam                  | 14. Front brake bottom plate assy  | 22. Return spring        |
|                                     | 15. Shaft--brake shoe              |                          |

# Front Axle

## Maintenance

Before using new axle, apply enough 2# lithium grease into every grease fitting.

### First maintain

To assure the safe running of your vehicle and obtain a long service life, you have to do the first maintain after the first 1,500~2,500kmafter leaving factory. Please note the following items:

- 1.Dismantle and check the wheel hub for any abnormal wear (please go to the Assembly and Adjustment to see the reference)
- 2.Check the fastening piece.

### Periodical maintain

Do the periodical maintain for the vehicle is a good way to prolong the service life and assure the safe running of the vehicle. If you follow the maintenance schedule to do the maintain, your vehicle may obtain the best economic benefit.

The items of the periodical maintain are as following:

- 1.Add some grease to the grease nipple
- 2.Avoid important nut loosed
- 3.Adjust wheel hub bearing pretightening force and toe-in
- 4.Adjust the brake clearance

### Periodical Maintain Schedule

Item	Maintenance Interval Mileage ( × 1000km)													
	First maintain	4	8	12	16	20	24	28	32	36	40	44	48	80
Clean the axle assy		●	●	●	●	●	●	●	●	●	●	●	●	
Check the important nut for its tightness	●	●	●	●	●	●	●	●	●					
Clean and adjust wheel hub bearing				●			●			●			●	
Check service brake and park brake efficiency	●	●	●	●	●	●	●	●	●	●	●	●	●	
Check the brake bottom plate for tightness	●	●		●			●			●				
Clean the brake air chamber													●	
Check brake pipeline for leakage	●	●	●	●	●	●	●	●	●	●	●	●	●	

# Front Axle

## Assembly and Adjustment

### Disassemble and assemble of the assembly

#### Front wheel hub brake drum assembly

1. Fix the front axle and remove the wheel hub end cover;
2. Take off the cotter pin, adjusting nut and spacer;
3. Turn the wheel hub brake drum a little and pull it, gently knock at the brake drum at the same time to loose the inner ring of the outer bearing, then take down the wheel hub brake drum, but you need to pay attention that the assembly is so heavy that may be fallen down or hurt someone, and the inner ring of the outer bearing need to care at the same time, don't fall it.

The assembling sequence of the front wheel hub brake drum assembly is opposite to the above sequence, and you must to pay attention to the tightening torque of the thread connecting parts and the adjustment of the bearing pretightening force.

### Adjustment of axle

#### Adjustment of axial clearance between front axle and steering knuckle

1. Install the steering knuckle and thrust bearing on the front axle, select the proper adjusting spacer (Note: only use one) to adjust the clearance and assure the clearance is  $\leq 0.1\text{mm}$ ;
2. Apply a layer of grease on the surface of the kingpin, align the lock pin slot of the kingpin to the lock pin hole of the front axle, then insert the kingpin and tighten the lock pin;
3. Before add the grease, measure both left and right of the starting force at cotter pin of steering knuckle journal, and the starting force should be  $\leq 10\text{N}$ .

#### Adjustment of front wheel hub pretightening force

1. Apply some 2# lithium grease on the thread of the steering knuckle shaft end and the wearproof spacer;
2. Tighten the locking nut by a torque of 120~150N.m;
3. Turn the wheel hub for 2~3 circles to correct the alignment of the bearing;
4. Tighten the locking nut by a torque of 120~150N.m;
5. Unscrew the locking nut for 1/3 circle, install the locking washer and limit spacer, and make the limit spacer align to the steering knuckle key slot and the adjusting nut limit pin;
6. Install the outer nut, tighten it with a torque of 120~150N.m;
7. Make sure if the pretightening force is correct. First, turn the wheel hub for 2~3 circles, then confirm the tangential force of the wheel hub bolt;

The tangential force of the wheel hub is 20~50N.

#### Adjustment of the toe-in

1. First, loose the locking bolt of the tie rod;
2. Turn the tie rod and make the toe-in is 0~4mm at the external diameter of the tire;
3. Tighten the fixed nut of the tie rod, and make the angle between left and right joint is not larger than  $4^\circ$ , and the angle of oscillation of the tie rod joint during the largest turning angle must have some over measure.

#### Adjustment of the steering angle

1. Adjust the limit screw of the turning angle, and make the max. turning angle of the inner wheel is  $40^\circ$ ;
2. After adjusting the limit screw, tighten the locking nut.

# Front Axle

---

## Adjustment of the brake clearance

Turn the worm shaft and shoe shaft of the brake adjusting arm, made the surface of the brake shoe totally connected with the inner face of the brake drum, then loose 3~4 circles of the worm shaft, and adjust the clearance between brake drum inner face and brake shoe:

Shoe shaft end: 0.25~0.45mm;

Cam shaft end: 0.40~0.70mm, the clearance should be corresponding and the clearance difference between the upper and lower shoe is  $\leq 0.1$ mm.

## Trouble Analysis

Trouble	Cause	Method
Wheel hub bearing is stugnant	Big pretightening force of the wheel hub bearing	Adjust pretightening force
	Bearing lack of lubricating or improper grease	Add or replace the grease
	Dust on the bearing	Clean and add some grease
Insufficient brake force	Cam shaft turns inflexibly	Check the cam for its working condition
	Improper adjustment of the brake air chamber push rod travel	Adjust travel
	Friction plate overheated or deterioration	Replace friction plate
	Improper conncting condition of the friction plate	Correct the joint position of friction plate
	Water entered the brake drum	Press down the brake pedal during running to exhaust the water
	Grease on the connecting face of the friction plate or the brake drum	Cleanup the grease or replace friction plate
Abnormal noise while braking	Friction plate worn and rivet appeared	Replace friction plate
	Friction plate surface hardening or deterioration	Replace friction plate
	Brake drum uneven worn or loose installed	Correct brake drum or tighten the bolt
	Brake shoe and friction plate connected loosely	Replace rivet
	Brake shoe fixed pin loosed	Tighten fixed pin locking screw
	Wheel hub bearing worn	Replace wheel hub bearing
	Brake drum distortion	Replace brake drum
Wheel unsmooth	Cam shaft lack of lubricating or adjusting arm doesn't return	Add grease or correct troubled parts
	Return spring of the brake shoe or air chamber broken or fatigue	Replace troubled parts

# Front Axle

Steering wheel heavily manipulated	Improper adjustment of the wheel alignment	(too big caster) Check and adjust
	Too big clearance between kingpin and bush	Check and adjust the clearance
	Thrust bearing installed on the contrary	Correct the installation
	Front axle lacks of lubricating	Add some grease
	Ball connecting overtighten or too loose	Check and lubricate ball head pin
Pendulate	Front wheel hub bearing worn	Replace wheel hub bearing
	Kingpin and bush overworn	Correct or replace troubled parts
	Steering knuckle distortion	Replace
	Improper wheel alignment	Check and adjust
Pulling to one side	Improper wheel alignment	Check and adjust
	Front axle bent	Correct or replace
	Brake unsmooth	See the relative brake items
	Front wheel hub bearing nut loosed	Tighten accord to the required torque
Tire unevenly worn or earlier worn	Improper wheel alignment	Check and adjust
	Wheel hub bearing worn or damaged	Replace wheel hub bearing
	Bearing nut loosed	Tighten accord to the required torque
	Ball pin, kingpin and bush overtightened or slackened	Correct or replace the troubled parts

# Front Axle

## Appendix 1 Lubricating Parts and Lubricant

### Lubricating parts

Item	Maintenance Interval Mileage ( × 1000km)												
	First maintain	4	8	12	16	20	24	28	32	36	40	44	48
Steering knuckle kingpin	●	●	●	●	●	●	●	●	●	●	●	●	●
Tie rod ball pin	●	●	●	●	●	●	●	●	●	●	●	●	●
Wheel hub bearing	●			●			●			●			●
Adjusting arm	●			●			●						●
Cam bracket	●						●						

### Lubricant

Part	Lubricant	Type
Steering knuckle kingpin	lithium grease	2#
Tie rod ball pin	lithium grease	2#
Wheel hub bearing	lithium grease	2#
Adjusting arm	lithium grease	2#
Cam bracket	lithium grease	2#

## Appendix 2 Tightening Torque of the Bolts and Nuts

Part	Tighten Torque (N.m)
Steering draglink arm nut	120~140
Nut of the left and right steering knuckle arm	120~140
Front brake bottom plate bolt	140~170
Air chamber bracket fixed bolt	55~70
Air chamber fixed bolt	55~70
Pin lock nut	55~70
Steering limit bolt locking nut	80~100
Steering ball pin nut	130~160
Tie rod clamp nut	40~60
Front adjusting nut	120~150
Kingpin plug cover screw	40~60

# Front Axle

## Appendix 3 Main Adjusting Data and Maintaining Standard

### Main adjusting data

Adjusting Item	Adjusting Data
Toe-in	0~4mm
Turning angle of the inside wheel	40°
Clearance between front axle fist surface and the steering knuckle	≤ 0.1mm
Clearance between front fiction plate and brake drum	Shoe shaft end 0.25~0.45mm Cam shaft end 0.40~0.70mm Clearance difference between two shoes of the same side is < 0.1mm

### Maintaining Standard

Item	Maintaining Standard	Wear Limit	Remark
Outside diameter of kingpin	31.9~32mm	31.9mm	
Clearance between kingpin and steering knuckle bush	0.025~0.077mm	0.20mm	
Clearance between kingpin and front axle hole	0.01~0.052mm	0.10mm	
Clearance between steering knuckle and front axle	≤ 0.05mm	0.15spacer adjustment	
Starting force of steering knuckle	≤ 10N		Measure at cotter pin of shaft head
Starting force of front wheel hub	20~50N		Measure at the bolt of wheel

# Rear Axle

**RA**

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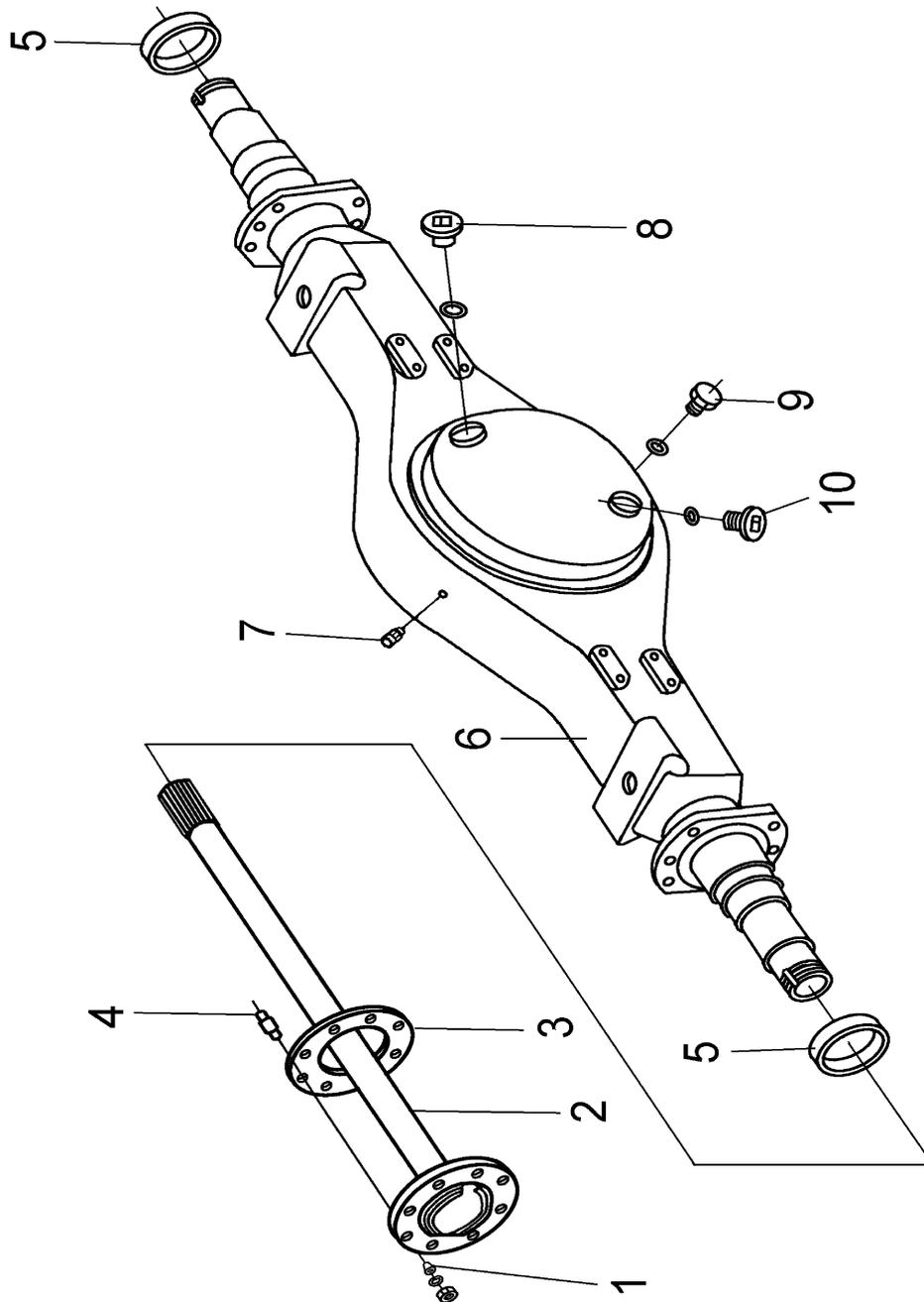
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# Rear Axle

## Rear Axle

### Structure

#### Rear axle housing and half axle

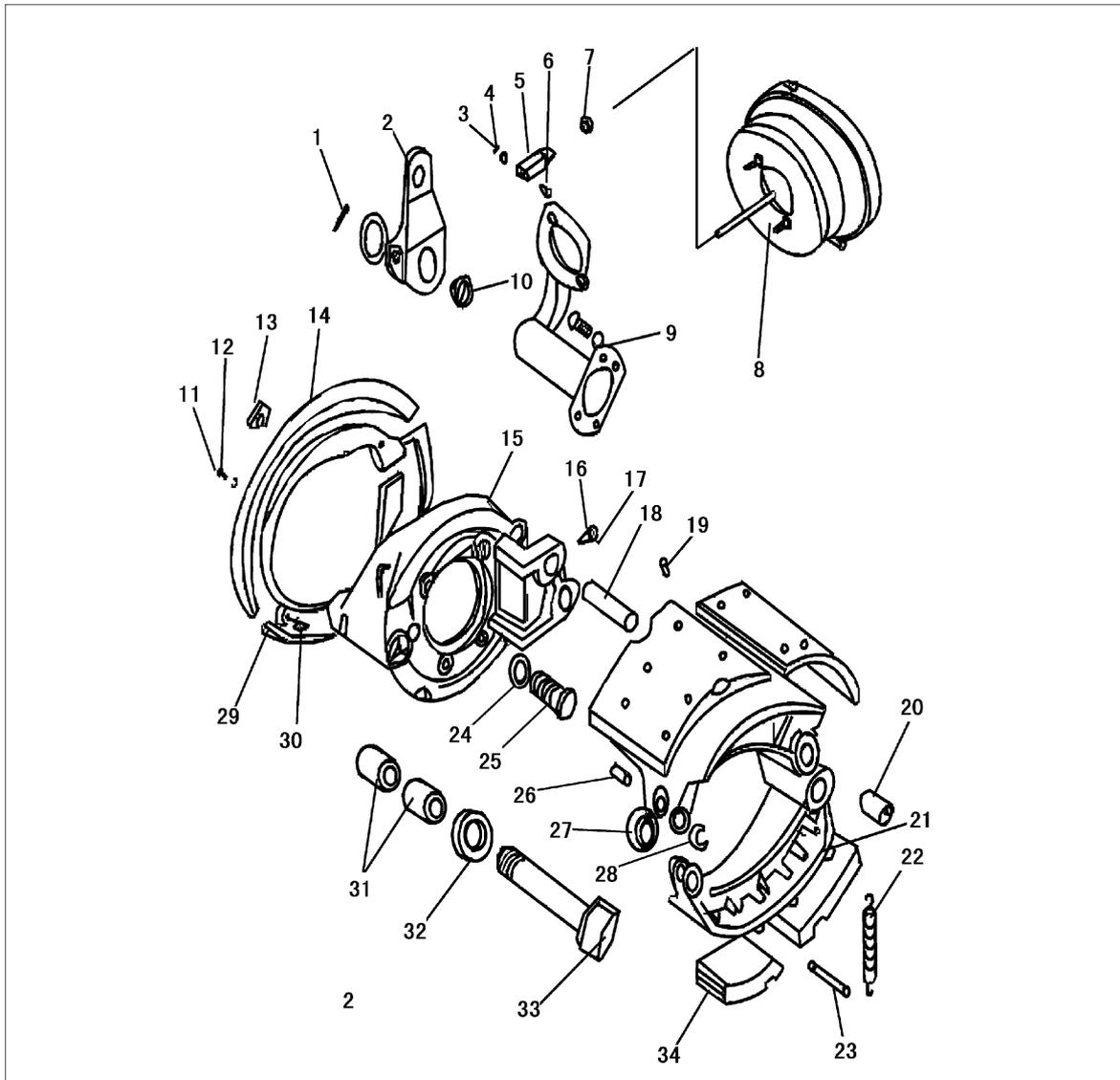


1. Conical bush--axle shaft bolt
2. Axle shaft--rear axle
3. Gasket--axle shaft
4. Double head bolt (small teeth)
5. Inner oil seal support ring--rear axle

6. Housing assembly--rear axle (include NO.5)
7. Ventilator plug assembly
8. Oil filling plug
9. Oil level indicating plug
10. Oil drain plug assembly

# Rear Axle

## Disassembly of the brake



1. Cotter pin
2. Brake adjusting arm
3. Cotter pin
4. Plain washer
5. U-fork
6. Flat pin
7. Locking nut
8. Spring air chamber
9. Air chamber bracket
10. Cam ring cage ring
11. Bolt
12. Spring washer

13. Rubber plug
14. Dustproof shield
15. Brake bottom plate
16. Set screw
17. Steel lock wire
18. Supporting pin
19. Rivet
20. Brake bush
21. Brake shoe
22. Return spring
23. Return spring pin
24. Spring washer

25. Screw
26. Roller pin shaft
27. Roller
28. Clamp ring
29. Dustproof shield
30. Grease nipple
31. Bush
32. Oil seal
33. Cam shaft
34. Brake friction plate

# Rear Axle

## Maintenance

Before using new axle, apply enough 2# lithium grease into every grease fitting.

### First maintain

To assure the safe running of your vehicle and obtain a long service life, you have to do the first maintain after the first 1,500~2,500km after leaving factory. Please note the following items:

1. Add or replace the gear oil for the reductor;
2. Dismantle and check the wheel hub brake drum assembly for any abnormal wear (please go to the Assembly and Adjustment to see the reference)
3. Check the fastening piece.

### Periodical maintain

Do the periodical maintain for the vehicle is a good way to prolong the service life and assure the safe running of the vehicle. If you follow the maintenance schedule to do the maintain, your vehicle may obtain the best economic benefit.

The items of the periodical maintain are as following:

1. Add some grease to the grease nipple
2. Avoid important nut loosed
3. Adjust wheel hub bearing pretightening force and brake clearance
4. Add and replace the gear oil for the reductor

### Periodical Maintain Schedule

Item	Maintenance Interval Mileage ( × 1000km)													
	First maintain	4	8	12	16	20	24	28	32	36	40	44	48	80
Clean the axle assy		●	●	●	●	●	●	●	●	●	●	●	●	
Check main reductor for leakage	●	●	●	●	●	●	●	●	●	●	●	●	●	
Replace grease of main reductor	●			●			●						●	
Check lubricant level of the main reductor and clean the vent plug				●			●			●			●	
Check tightness of the important bolts	●	●	●	●	●	●	●	●	●					
Clean and adjust wheel hub bearing				●			●			●			●	
Do the magnetic particle test to half axle sleeve														●
Check service brake and parking brake efficiency	●	●	●	●	●	●	●	●	●	●	●	●	●	
Check the tightness of the brake bottom plate	●			●			●			●				
Clean brake air chamber													●	
Check brake pipeline for leakage	●	●	●	●	●	●	●	●	●	●	●	●	●	

# Rear Axle

---

## Assembly and Adjustment

### Disassemble and assemble of the assembly

#### Rear wheel hub brake drum assembly

1. Fix the rear axle and remove the half axle bolt by a spanner;
2. Pull out the half axle gently and when the spline passing the oil seal, turn the half axle slowly to avoid damage the half axle oil seal;
3. Take down three screws of the stop spacer by a screwdriver, then remove the stop spacer and dismantle the adjusting nut by a spanner;
4. Turn the wheel hub brake drum a little and pull it, gently knock at the brake drum at the same time to loose the inner ring of the outer bearing, then take down the wheel hub brake drum, but you need to pay attention that the assembly is so heavy that may be fallen down or hurt someone, and the inner ring of the outer bearing need to care at the same time, don't fall it.

The assembling sequence of the rear wheel hub brake drum assembly is opposite to the above sequence, and you must to pay attention to the tightening torque of the thread connecting parts and the adjustment of the bearing pretightening force.

### Assembly of the main reductor assembly

#### 1) Assembly of the drive gear

1. Press the outer ring of the front inner and outer bearing into the bearing seat;
2. Press the oil seal on the oil seal seat;
3. Press the inner ring of the front inner bearing onto the drive gear, and install the spacer sleeve, adjusting spacer, bearing seat assembly and front outer bearing inner ring in sequence at the spline end of the gear;
4. Measure the pretightening load of the drive gear bearing: install the oil seal assembly, thrust washer, flange fork and washer, then tighten the castle nut with a torque 350~500N.m and measure the pretightening force at this time, the starting force of pulling the flange hole of the bearing seat should be 12~30N;
5. If the pretightening force is disqualified, you need to replace the adjusting spacer, reassemble to qualified;
6. Make use of a cotter pin to lock the castle nut.

#### 2) Assembly of the differential

1. Install the bearing to the left and right differential housing;
2. Install planet gear, half axle gear, cross shaft, planet gear supporting washer, and half axle gear supporting washer;
3. Measure the tooth space of the planet gear of the differential, check the clearance between half axle gear supporting end face and the supporting washer with a clearance gauge, it should be  $\leq 0.8$  mm;
4. Align the marks of left and right differential housing and then assemble.

Tightening torque: 140~160N.m

#### 3) Assembly of the main reductor assembly

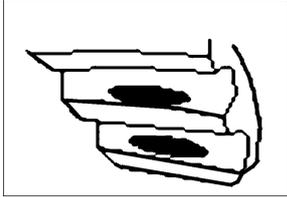
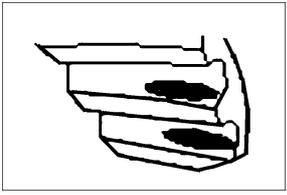
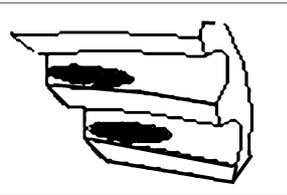
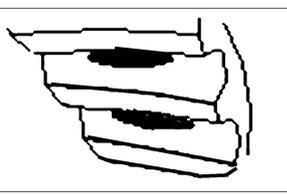
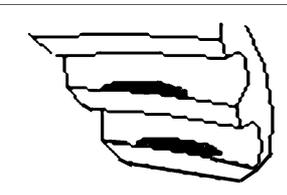
1. After assembled the bearing outer ring of the differential, install it onto the main reductor housing;
2. Install the adjusting nut and the bearing cover, then fasten with bolts;
3. Equally tighten the adjusting nut to pretighten the load until the pretightening load is between 16.4~24.3N;
4. Install the adjusting spacer of main cone to the bearing seat and assemble the drive conical gear assembly;
5. Adjust the gear tooth space to 0.20~0.40mm:

The change value of the tooth space  $\leq 0.15$  mm

# Rear Axle

6. Paint two or three engaged teeth of driven gear red to check the contact zone, if the contact area is improper, increase or reduce the thickness of the adjusting spacer until it is proper;

Sketch map of the contact zone is as follows:

	Gear contact zone		Adjusting method
1		Proper contact zone	No need to adjust
2		The drive gear & the driven gear is too far	The drive gear and the driven gear is too far (reduce the thickness of the spacer)
3		The drive gear & the driven gear is too near	The drive gear and the driven gear is too near (increase the thickness of the spacer)
4		The contacting area of the driven tapered gear is too low	The drive gear and the driven gear is too near (increase the thickness of the spacer)
5		The contacting area of the driven tapered gear is too high	The drive gear and the driven gear is too far (reduce the thickness of the spacer)

7. Tighten the bearing cover fixed bolt, reassemble the stop spacer.

## Adjustment of the axle

### Adjustment of the brake clearance

No matter if the brake clearance is too big or too small, it will effect the brake efficiency of the vehicle. Please adjust the worm shaft hex-head of the adjusting arm by a spanner. Firstly, turn it with the clockwise until you can't turn to make the clearance become zero, then turn with the counter clockwise until you hear two sounds of steel ball, and the middle part clearance of the brake friction plate is 0.4~0.7mm.

# Rear Axle

## Adjustment of the rear wheel bearing pretightening force

1. Remove the stop spacer first;
2. Tighten the adjusting nut by a special spanner with a torque of 150~180N.m;
3. Turn the wheel hub 2~3 circles, and make the bearing aligned correctly;
4. Fasten the adjusting nut with a tightening torque of 150~180N.m;
5. Reverse the adjusting nut for 1/8~1/6circle;
6. Make sure if the pretightening force is correct. First, turn the wheel hub for 2~3 circles, then confirm the tangential force of the wheel hub bolt;

The tangential force of the wheel hub bolt is 30~ 60 N.

## Trouble Analysis

Trouble	Cause	Method
Wheel hub bearing is stugnant	Big pretightening force of the wheel hub bearing	Adjust pretightening force
	Bearing lack of lubricating or improper grease	Add or replace the grease
	Dust on the bearing	Clean and add some grease
Insufficient brake force	Cam shaft turns inflexibly	Check the cam for its working condition
	Improper adjustment of the brake air chamber push rod travel	Adjust travel
	Friction plate overheated or deterioration	Replace friction plate
	Improper connecting condition of the friction plate	Correct the joint position of friction plate
	Water entered the brake drum	Press down the brake pedal during running to exhaust the water
	Grease on the connecting face of the friction plate or the brake drum	Cleanup the grease or replace friction plate
Abnormal noise while braking	Friction plate worn and rivet appeared	Replace friction plate
	Friction plate surface hardening or deterioration	Replace friction plate
	Brake drum uneven worn or loose installed	Correct brake drum or tighten the bolt
	Brake shoe and friction plate connected loosely	Replace rivet
	Brake shoe fixed pin loosed	Tighten fixed pin locking screw
	Wheel hub bearing worn	Replace wheel hub bearing
	Brake drum distortion	Replace brake drum
Wheel unsmooth	Cam shaft lack of lubricating or adjusting arm doesn't return	Add grease or correct troubled parts
	Return spring of the brake shoe or air chamber broken or fatigue	Replace troubled parts

## Rear Axle

Abnormal noise while driving	Improper gear space of the differential	Replace spacer or gear
	Too big clearance between drive gear and driven gear	Replace spacer or gear
	Drive gear bearing pretightening force too small	Adjust pretightening force
	Half axle gear, planet gear, and cross shaft worn or damaged	Correct or replace troubled parts
	Oil level too low	Add enough lubricant
Lubricant leaks	Oil seal worn, loosed or damaged	Replace oil seal
	Fasten bolt loosed or sealant failed	Tighten bolt or smear the sealant again
	Bearing seat fasten bolt loosed	Tighten bolt by the required torque
	Oil drain screw plug loosed or the gasket is damaged	Tighten screw plug or replace gasket
	Axle housing distorted because of over-load	Correct or replace axle housing
	Vent is blocked or damaged	Clean or replace vent plug
Brake unstably	Improper installation of the brake shoe or return spring is broken	Tighten fixed pin lock screw or replace return spring
	Oil on brake friction plate or deterioration	Clean or replace friction plate
	Brake bottom damaged	Replace brake bottom plate

## Lubricating Parts and Lubricant

### Lubricating parts

Item	Maintenance Interval Mileage ( × 1000km)												
	First maintain	4	8	12	16	20	24	28	32	36	40	44	48
Reductor assy	●			●			●			●			●
Wheel hub bearing	●			●			●			●			●
Adjusting arm	●			●			●			●			●
Cam bracket	●						●						●

### Lubricant

Part	Lubricant	Type
Reductor assy	gear oil	GL-5 double curve gear oil
Wheel hub bearing	lithium grease	2#
Adjusting arm	lithium grease	2#
Cam bracket	lithium grease	2#

# Rear Axle

## Tightening Torque of Important Bolts and Nuts

Part	Tighten Torque (N.m)
Oil drain screw plug	130 ~ 150
Big nut of the drive gear	350 ~ 500
Rear brake bottom plate bolt	156 ~ 206
Air chamber bracket fixed bolt	55 ~ 70
Air chamber fixed bolt	50 ~ 75
Bearing seat bolt	50 ~ 70
Driven gear bolt	140 ~ 160
Differential housing bolt	140 ~ 160
Half axle nut	70 ~ 95
Rear adjusting nut	150 ~ 180
Reductor housing and axle housing connecting bolt	140 ~ 170
Axle housing rear cover and axle housing connecting bolt	90 ~ 120

## Main Adjusting Data and Maintaining Standard

### Main adjusting data

Adjusting Item	Adjusting Data
Tooth space	0.2~0.4mm
Clearance between rear fiction plate and brake drum	0.4~0.7mm

### Maintaining Standard

Item	Maintaining Standard	Wear Limit	Remark
Feedhole of the rear axle leaf spring worn	$\Phi$ 27mm	$\Phi$ 28mm	
Radial runout of left and right half axle sleeve outer bearing journal	0.03mm	0.1mm	
Radial runout of the middle part rough surface of half axle	1mm	1.5mm	Repair limit: 1.5mm
Face runout of the wheel hub and half axle flange connecting face	0.1mm	0.15mm	

# Suspension System

**FA**

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# Suspension

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## Suspension

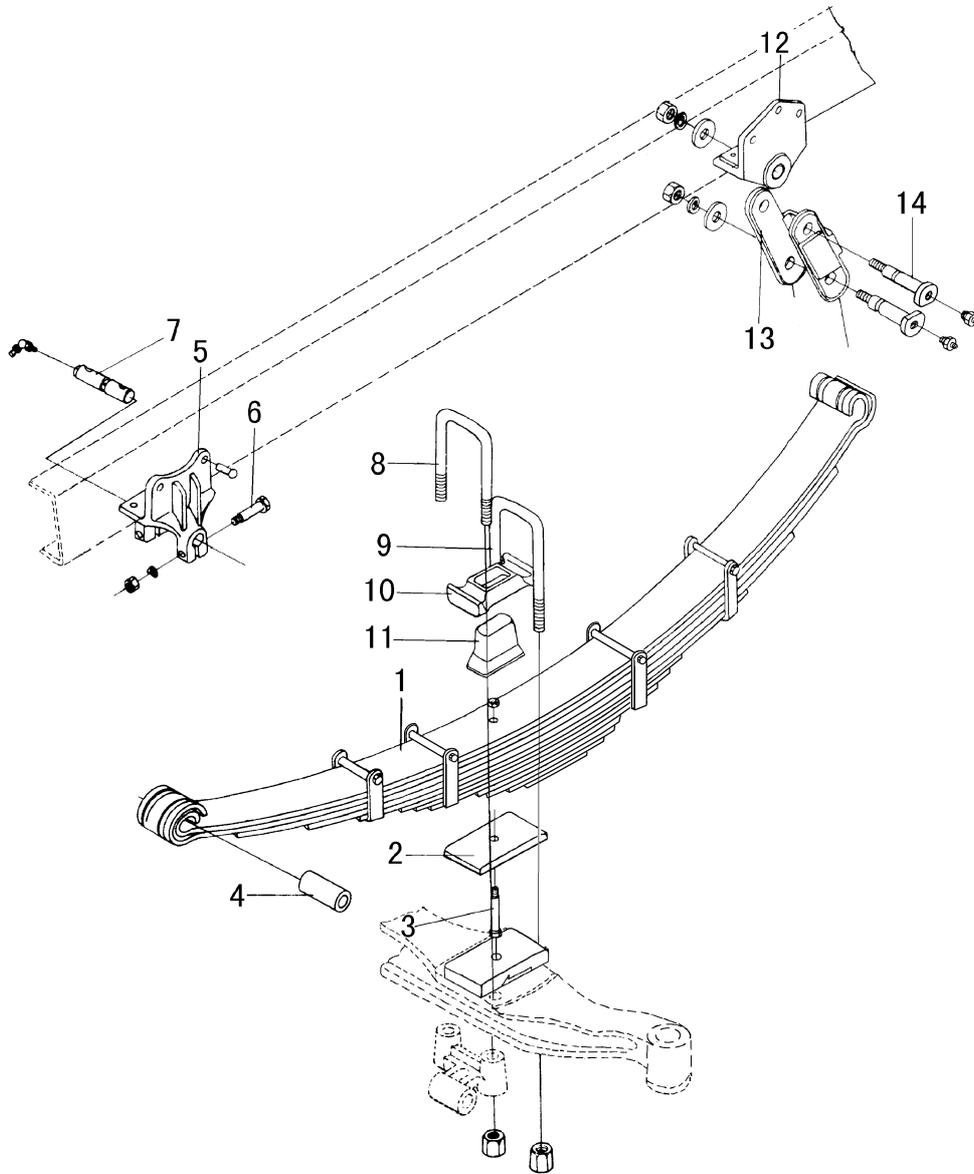
### Trouble Analysis

Trouble	Cause	Repair
Bumpy ride	Spring leaf damaged Overload	Replace the spring leaf Load as required
Vehicle rocked severely	Damper failed	Replace the damper
Spring leaf center bolt is broken	U-bolt and nut loosed	Replace center bolt
Spring leaf is broken at the center hole	U-bolt and nut loosed	Replace spring leaf

# Suspension

## Structure

### Front leaf spring

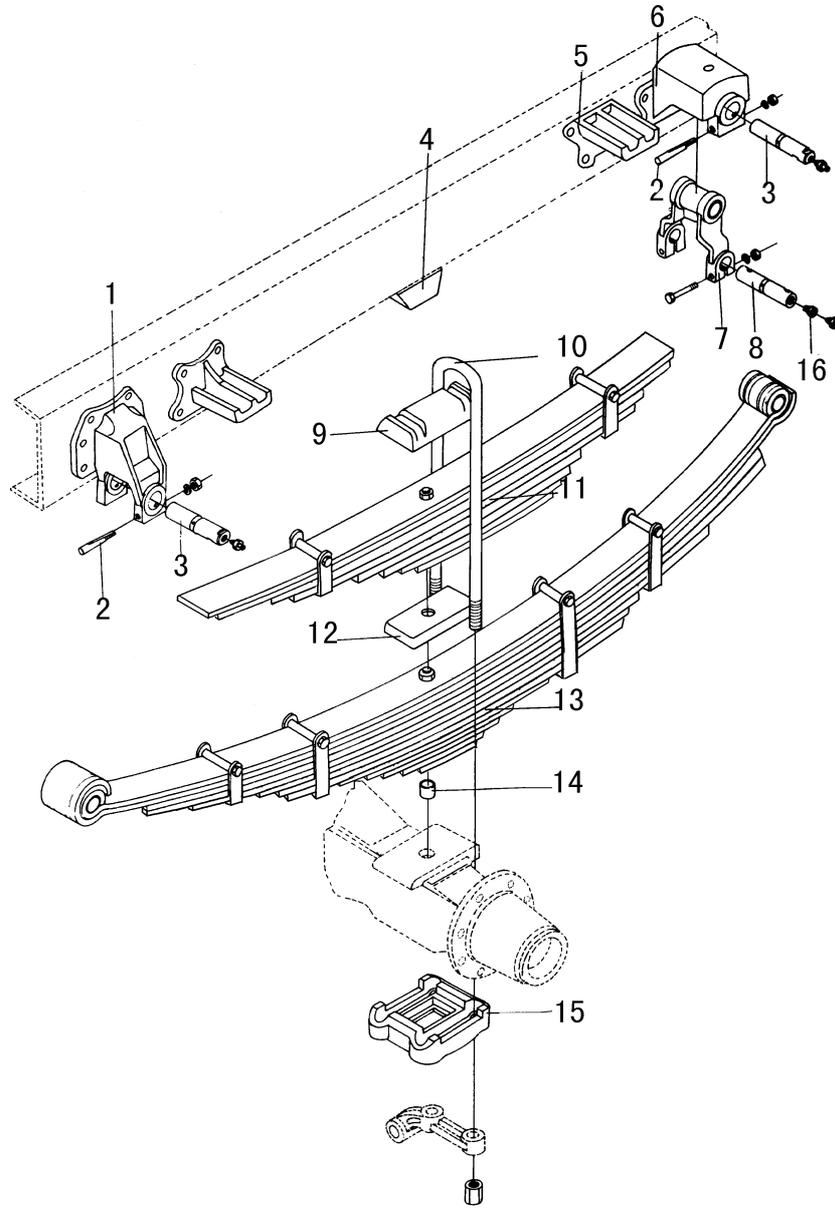


1. Front spring leaf assy
2. Inclined underplate with set sleeve assy
3. Center bolt
4. Bush
5. Fixed end bracket
6. Spring pin set bolt
7. Spring leaf pin--front suspension

8. U-bolt
9. U-bolt
10. Cover board--front suspension
11. Limit block--front suspension
12. Lifting eye bracket
13. Front lifting eye
14. Lifting eye pin set

# Suspension

## Rear leaf spring



- 1.Fixed end bracket
- 2.Wedge lock pin
- 3.Leaf spring pin
- 4.Limit block assy
- 5.Sub-leaf spring bracket
- 6.Bracket--lifting eye end
- 7.Lifting eye with bush assy
- 8.Leaf spring pin

- 9.Cover board
- 10.U-bolt
- 11.Sub-leaf spring assy
- 12.Sub-leaf spring underplate
- 13.Rear leaf spring assy
- 14.Set pin sleeve
- 15.U-bolt underplate

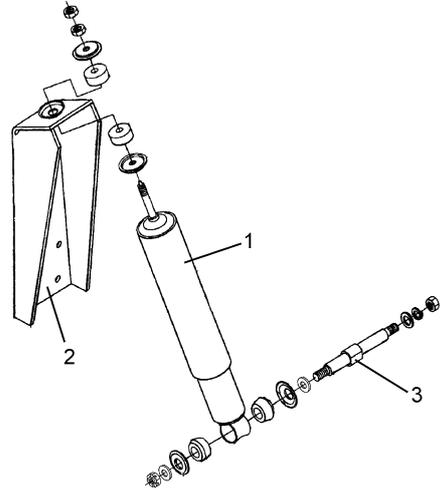
# Suspension

## Disassembly

Clean the suspension system before disassembling. Set the truck in brake state, and block up the front and rear wheel with wooden stand.

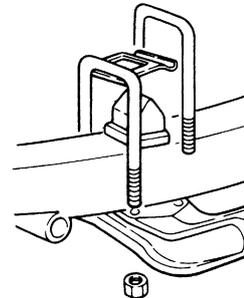
### Dismounting of front suspension

1. Wedge the rear wheel, lift the front axle and front part of the frame with a jack and the safety support, then take down the front wheel;
2. Unscrew the set nut from the lower end of the front damper, dismantle the front damper lower end, and take off the related parts.
3. Loosen the set nut from the upper end of the damper, dismantle the front damper upper end, and take off the front damper.

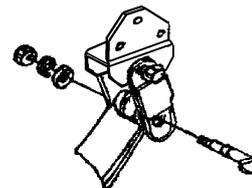


1. Front damper assy      3. Damper lower pin  
2. Damper bracket assy

4. After loose U-bolts and nuts, remove the U-bolt, cover board and limit block;



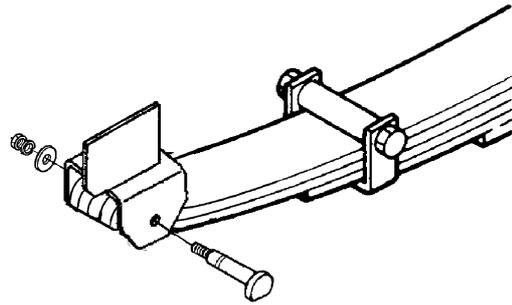
5. Down the front axle by loose the jack and then the leaf spring is in a free condition;;
6. Remove the spring rear end, loose the lifting pin fasten nut at the lower end, take down the lifting pin and the leaf spring rear end can be removed;



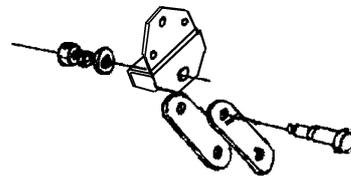
# Suspension

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7. Remove the fixed bolt of the leaf spring front end spring pin, then take down the leaf spring pin and let down the jack and take out the leaf spring;



8. Loosen the lifting eye locking nut, and take down the lifting eye pin and you can remove the lifting eye.

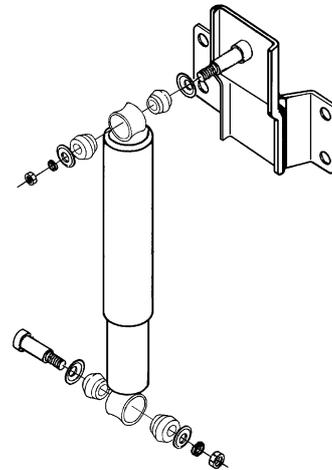


## Disassembly of the rear suspension

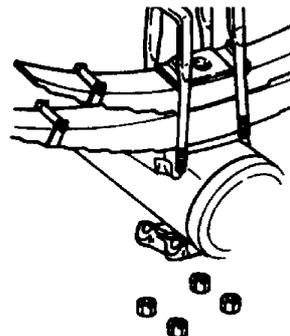
1. Wedge the front wheel, lift the rear axle and rear part of the frame with a jack and the safety support, then take down the rear wheel;

2. Unscrew the set nut from the lower end of the damper, and take off the related parts;

3. Loosen the set nut of the damper pin from the upper end of the damper, remove the related parts, and take down the damper;



4. Loosen the U-bolts and nuts, remove U-bolt underplate, U-bolt and cover board;



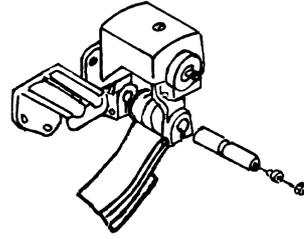
# Suspension

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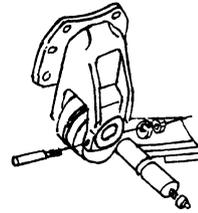
5. Slowly down the jack to fall the rear axle to the ground, and remove the sub leaf spring assembly and sub-leaf spring underplate;

6. Disassemble the the rear end of the the leaf spring. Remove the fasten bolt of the leaf spring pin and pull the spring pin out then you can disassemble the rear end of the leaf spring rear end;

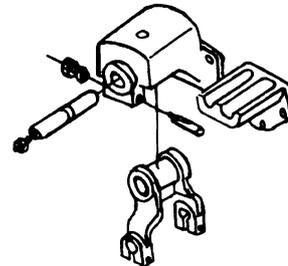
Note: When pulling the spring pin, you must use the the threaded sleeve of the spring pin. Before remove the lock bolt of the leaf spring pin, screw the threaded sleeve off a little then pull, or you can use the pin puller with thread.



7. Remove the cotter pin used to fix the front pin of the rear leaf spring, then take down the front pin of the rear leaf spring, down the jack then remove the rear leaf spring finally;



8. Take down the cotter pin of the lifting eye pin, and make use of an iron rod(diameter=15mm) went through the special hole used to remove the lifting eye pin, then push the pin out to take down the lifting eye.



## Disassembly of the front and rear leaf spring

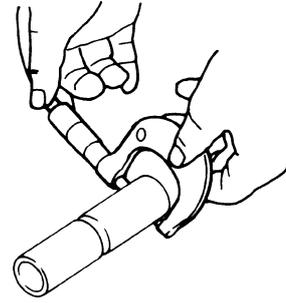
1. Take down the clamp;
2. Clamp the center part of the leaf spring by a C-shape clip;
3. Take down the center bolt;
4. Loose the C-shape clip slowly and detach the spring leaf.

# Suspension

## Check

1. Measure the outer diameter of the spring pin and lifting eye pin

Wear limit	Front suspension	17.5mm
	Rear suspension	29.5mm



2. Inner diameter of the spring bush and lifting eye bush

Wear limit	Front suspension	19mm
	Rear suspension	31mm



3. Clearance between spring pin, lifting pin and bush:

Spring pin and bush:

Repair standard            0~0.302mm

Wear limit                    1.0mm

Lifting pin and bush

Repair standard            0.08~0.252mm

Wear limit                    1.0mm

4. Check the spring leaf for any cracks or wear condition;

5. Measure the wear condition of the spring leaf, if the wear value is over 15% of the standard thickness, please replace the spring leaf.

Standard thickness of the front leaf spring is 9mm, wear limit is 7.65mm;

Standard thickness of the rear leaf spring is 10mm, wear limit is 8.5mm;

Standard thickness of the sub-leaf spring is 8mm, wear limit is 6.8mm.

Note: If one of the leaf spring is broken, you'd better replace the whole leaf spring assembly. Only replace the broken one may cause others damaged very soon.

# Suspension

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## Assembly

### Assembly of the sub-assembly

Assemble the leaf spring by center bolt accord the sequence of the spring leaf;

Note: Smear some black lead lime grease on the relative friction surface of the spring leaf.

Clamp the leaf spring by a C-shape clip, and tighten the center bolt and nut;

Take down the C-shape clip from the leaf spring;

After tightening the center bolt, rivet the connecting thread of the bolt and nut to lock;

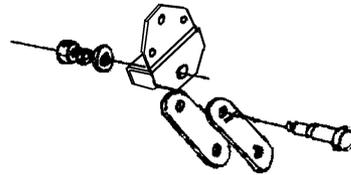
Install sleeve and bolt on the clamp and tighten the nut;

After tightening the clamp bolt, rivet the connecting thread of the bolt and nut to lock.

### Assembly of the front suspension

1. Smear a layer of grease on the spring bush and lifting eye bush before assembling;

2. Install the lifting eye to its bracket and insert the pin, then tighten the locking nut;

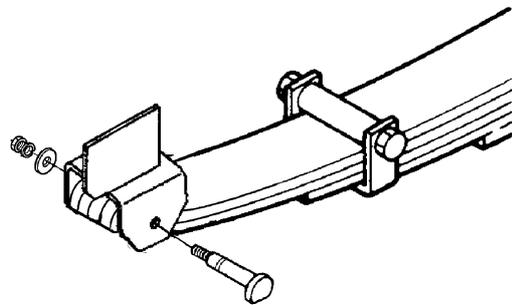


3. Install the front leaf spring assembly, cover board, limit block to the front axle and lift the front axle with a jack;

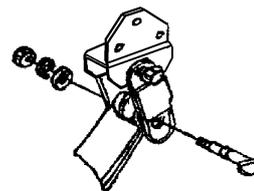
4. Align the bracket hole of the fixed end to the spring eye, then insert the spring pin;

Note: Make the spring pin slot align to the set bolt.

5. Install the set bolt;



6. Install the rear end of the spring, align the lifting eye and spring eye, then insert the lifting eye pin;



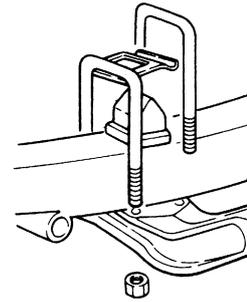
# Suspension

7. Assemble the U-bolt;

8. Lift the front axle by the jack, and then take down the support of the frame then own the jack;

9. Tighten the U-bolts and nuts;

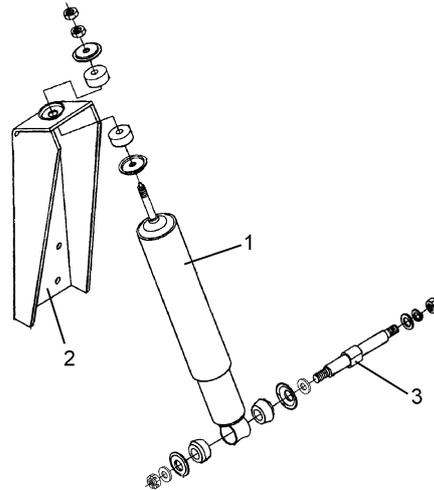
Tightening torque            200~250N • m



10. Install the damper to the bracket, then the plain washer, spring washer and nut, then tighten them;

Tightening torque            140~170N • m

11. Add grease to the leaf spring pin and lifting eye pin as required;

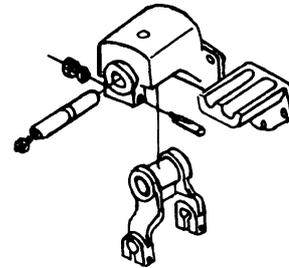


## Assembly of the rear suspension

1. Smear a layer of grease on the spring bush and lifting eye bush, and install the lifting eye to its bracket, then insert lifting eye pin, then the cotter pin and tighten its lock nut;

Tightening torque            90~110N • m

Note: When inserting the cotter pin, make the inclined face contact to the face of lifting eye pin.

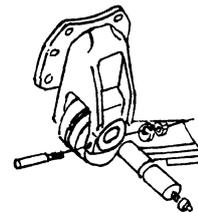


2. Set the rear spring to the rear axle, and lift the rear axle by the jack;

3. Align the fixed end bracket hole to the spring eye, insert the spring pin, then the cotter pin and tighten the nut;

Tightening torque            32~42N • m

Note: When inserting the cotter pin, make the inclined face contact to the face of lifting eye pin.



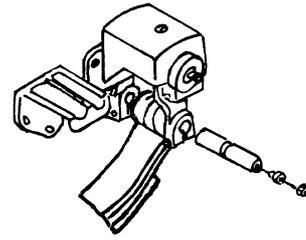
# Suspension

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4. Install the rear end of the spring, align the lifting eye hole to the spring eye, insert the spring pin, then install the lock nut;

Tightening torque             $32\sim 42\text{N} \cdot \text{m}$

Note: When inserting the cotter pin, make the inclined face contact to the face of lifting eye pin.



5. Install the underplate, sub-spring and cover board to the upper of the rear spring, then install the U-bolt;

6. Lift the rear end of the vehicle by a jack, take down the support under the frame then down the jack;

7. Install the U-bolt underplate and damper lower bracket;

8. Install the U-bolts and nuts and tighten;

Tightening torque:  $300\sim 350\text{N} \cdot \text{m}$

9. Add grease to the leaf spring pin and lifting eye pin;

10. Install the rear damper by referring to the assembling method of the front damper.

# Brake System

**BR**

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# Brake System

## Brake System

### Technical Parameter

Structure type		Air-pressure, with shoe, drum type
Brake type		S type cam roller type
Brake bottom plate	Front	Pressing bottom plate
	Rear	Foundry bottom plate
Brake specification	Front	$\Phi 310 \times 120\text{mm}$
	Rear	$\Phi 310 \times 150\text{mm}$
Brake cam type	Front	Rectangle cam
	Rear	S type cam (involute)

### Tightening Torque

Item	Tightening Torque
Fasten bolt of the front brake air chamber and its bracket	55~70
Fasten bolt and nut of the front air chamber and brake bottom plate	55~70
Fasten bolt of front brake bottom plate and steering knuckle	160~220
Lock nut of front brake anchor pin with conical sleeve	128~167
Fasten bolt of the rear brake air chamber and its bracket	55~70
Fasten bolt and nut of the rear air chamber and brake bottom plate	80~110
Flange bolt of rear brake bottom plate and two end of rear axle housing	130~160
Fasten nut of brake air chamber clamp	15~20

# Brake System

## Trouble Analysis of Wheel Brake

The trouble of brake system including insufficient braking effectiveness, brake being seized, or only one brake shoe expanded, and having abnormal sounding. The worn-out brake shoe lining and the overlarge clearance between the lining and brake drum cause the insufficient braking effectiveness. If you cannot find any causes in the whole brake system, you should consider the brake's condition.

When the brake is seized, it is necessary to check and make sure whether one brake is seized or all the brakes are seized. If only one brake is seized, it may this brake down; if all the brakes are seized, the problem may be in the control mechanism.

In case of only one brake shoe expands the condition of tires and brake unit should be considered.

The abnormal sounding of brake is caused by the worn out brake shoe lining.

### Abnormal sound

Trouble	Cause	Repair
Abnormal sound when press down the brake pedal	The rivet or bolt protrude due to the wear of the brake lining	Replace brake lining
	The brake lining surface is harden	Replace brake lining
	The brake lining surface deteriorated	Replace brake lining
	Bad contact of brake shoe and brake lining	Rivet up the rivet or screw up the bolt
	Uneven wear of brake drum inner surface or incorrect installation	Adjust a screw up brake drum
	Brake shoe supporting pin loosed	Adjust the clearance and tighten the lock nut
	The wheel hub bearing worn out	Replace the wheel hub bearing
	The brake drum deformed	Adjust or replace the brake drum

### Unsteady brake

Trouble	Cause	Repair
Unsteady brake	The pressure in the tires are uneven or the dimension of tires are not the same	See regulations
	Improper installation of the brake shoe or return spring damaged	Tighten the lock nut and replace the return spring
	Incorrect joint of brake lining	Adjust the joint of brake lining
	Incorrect adjustment of left or right brake	Adjust
	The brake lining deteriorate	Replace brake lining
	The brake lining have oil	Clean with petrol, eliminate the oil leakage of wheel hub
	The brake bottom plate is damaged	Replace brake bottom plate
	The U bolt of the spring is loosen	Screw up U bolt

# Brake System

## Insufficient brake

Trouble	Cause	Repair
Insufficient brake under any conditions	Normal air pressure Brake valve travel is too short  Cam shaft doesn't run (bush lacks lubricant) Improper push rod travel of the brake air chamber Bad contact of relay valve Brake shoe lining is overheat or deteriorate Incorrect engaging of brake shoe lining There is lubricant on brake shoe lining or brake drum	Check and replace the brake valve if necessary Check and replace cam shaft if necessary Adjust the travel  Disassemble and repair Replace friction lining  Correct the engaging position Clean with proper cleanser or replace the friction lining
	Abnormal air pressure Air pipes leak air Air compressor doesn't work  Improper adjustment of the unloader valve or it failed because of impurities Brake valve leaks air	Repair Disassemble and repair the air compressor Adjust or clean Disassemble and repair the brake valve

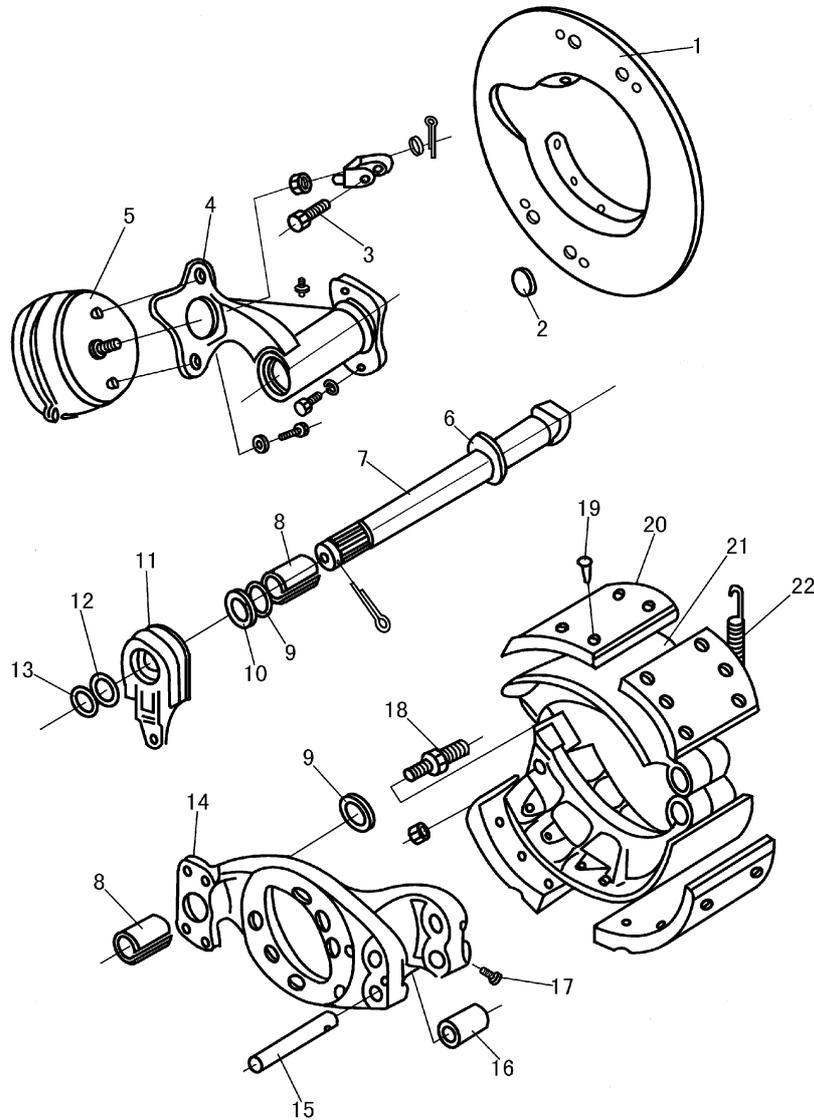
## All the wheel is seized

Trouble	Cause	Repair
Wheel seized	Air in brake air chamber  Improper lubricant of cam shaft or adjusting arm return incorrect Return spring of brake shoe or air chamber is broken or fatigue Spring brake is in use  Vent of relay valve or quick-release valve blocked Primary or secondary piston of brake valve return failed	Check and correct the exhaust valve of relay valve and quick-release valve Correct  Replace  Release the spring brake and eliminate the question Disassemble and clean troubled parts  Disassemble and clean brake valve, replace troubled parts if necessary

# Brake System

## Structure

### Front wheel brake



1.Rear dust cap

2.Rubber plug

3.Axis pin

4.Left bracket--front brake chamber

5.Front brake chamber

6.Supporting washer--front brake shoe

7.Front brake cam, left

8.Bush--front bracket

9.O-sealing ring

10.Adjusting spacer

11.Front adjusting arm assy

12.Adjusting spacer

13.Adjusting spacer

14.Front brake bottom plate

15.Shoe plate shaft--front brake

16.Bush--front brake shoe plate shaft

17.Screw--fix shoe plate

18.Spring--axis pin

19.Rivet

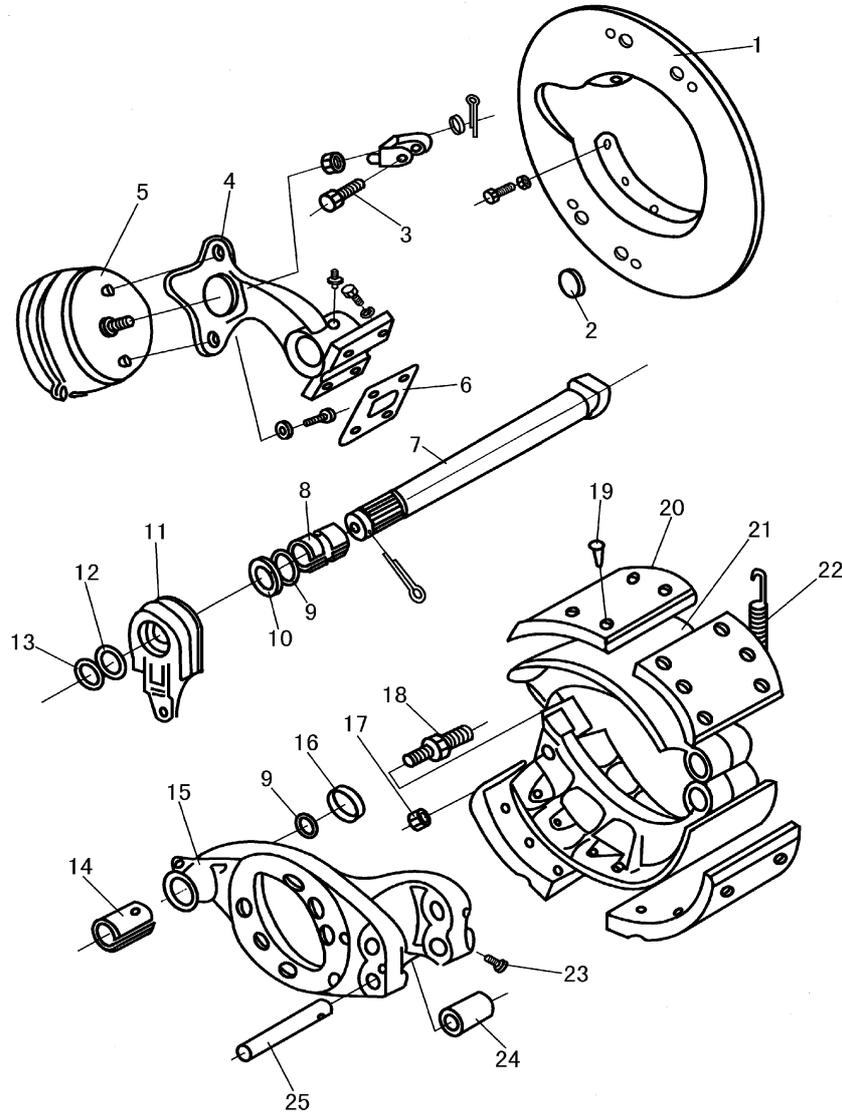
20.Brake friction wafer

21.Brake shoe

22.Return spring

# Brake System

## Rear wheel brake



1.Front dust boot

2.Rubber plug

3.Axis pin

4.Front brake air chamber bracket (left)

5.Front left brake chamber assy

6.Spring air chamber bracket spacer  
(thickness=0.05)

7.Front left brake cam

8.Bush--rear bracket

9.O--sealing ring

10.Adjusting washer

11.Front adjusting arm assy

12.Adjusting washer

13.Adjusting washer

14.Bush--front bracket

15.Rear brake bottom plate

16.Supporting washer--front brake shoe

17.Nut

18.Sprung axis pin

19.Rivet

20.Brake friction plate

21.Brake shoe

22.Return spring

23.Screw--fix shoe plate shaft

24.Bush--front brake shoe plate shaft

25.Brake shoe plate--front brake

# Brake System

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## Front Brake

### Disassembly

Remove the brake drum and wheel hub assembly, take down the return spring, brake shoe, brake cam, air chamber bracket and brake bottom plate in sequence.

### Check

1. Make sure whether the brake drum is damaged or distorted, replace in necessary.
2. When the brake drum is worn out and becomes out of round, it is allowed to bore, but the accumulative machining quantity should not exceed 4mm for the diameter direction.
3. When the brake drum assembly has been bored:
  - The run-out of the drum inside surface to the bearing axis (mm)  $<0.25$
  - The difference of the inside diameters of left and right drums on one vehicle (mm)  $<1\text{mm}$
4. The wear allowance of the lining thickness is 7mm. The distance from the lining surface to the rivet head should not be less than 1mm. The lining surface should not be cracked and broken away. Otherwise, it should be replaced.
5. The wear allowance of the shoe flat face at one end should not exceed 0.30mm.
6. Check carefully. There should not be any crack (especially at the two end hooks).
7. The diaphragm of the brake chamber should be in good condition. It should not have any ageing crazing or crack. It is not allowed to use the same size diaphragms of different hardness on one truck.
8. Check clearance of all fitting surface.

### Assembly

1. Install the assembled brake backing plate assembly on the front axle steering knuckle.
  - Tighten bolts with the specified torque  $160\sim 220\text{N}\cdot\text{m}$
2. Put the tightening bolts with the locking wires into the holes around the brake camshaft seat from the inside. Install anchor pin into its seating holes and make two eccentric journals of the anchor pins opposite each other.
3. Assemble brake chamber brackets (with brake chamber assembly) in turn and tighten them. Put in the brake camshaft and the adjusting washer. Then assemble the front brake slack adjuster on the brake camshaft and lock it with the cotter pin. The brake air chamber push rod will be connected with the brake adjust arm by a pin.
4. Fit the brake shoes inside the brake backing plate. At anchor pin ends lock brake shoes with lock plate and cotter pins.
5. The return spring is hooked between two brake shoes.



# Brake System

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## Rear Brake

### Disassembly

After remove the rear axle half axle, take down the brake drum and wheel hub assembly, then dismount rear brake adjust arm, brake cam, air chamber bracket, brake shoe with bottom plate assembly, and dust shield in sequence.

### Check

1. Make sure whether the brake drum is damaged or distorted, replace if necessary.
2. Make sure whether the brake shoe with linings is cracked, replace if necessary.
3. Check the roller surface for any cracks and damages, replace if necessary.
4. Check the return springs.

Note:

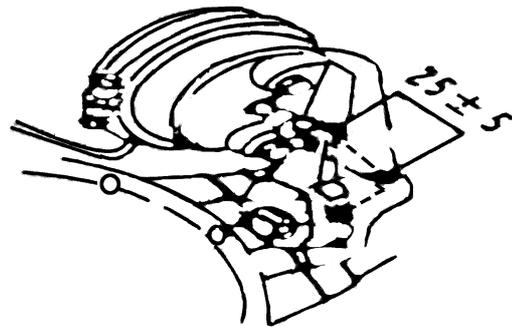
After replace the friction plate, the excircle of the friction plate needs to be wholly machined. That is to install the brake shoe and brake bottom plate together, and make use of the bottom plate to position to machine the excircle of the friction plate.

### Assembly

1. Install the brake to the bottom plate, screw on the screw and fasten with steel wire, then machine the excircle of the brake shoe friction plate.
2. Install the brake shoe and brake bottom plate to the two ends of the rear axle housing, the tightening torque of the bolt is 130~160N.m, and then install the pressing dust shield.
3. Install the air chamber bracket and fasten, then set to the brake cam and assemble the adjusting spacer. After that, install the brake adjust arm to the brake cam and lock with a clamp ring, connecting the air chamber push rod to the brake adjust arm with flat pin.
4. The return spring is hooked between two brake shoes.

### Adjust

Disassemble the rubber dust shield of the inspection hole and the adjust arm. Make use of a double offset ring spanner to press the lock bush of the worm shaft head, turn the worm shaft to let the friction plate surface and inner surface of brake drum contact, then turn worm shaft loose for 1/2~2/3 circle. At this time, the clearance between center of two brake shoe friction wafers and brake drum is about 0.7mm, and the brake drum can turn freely without interfere with other parts.



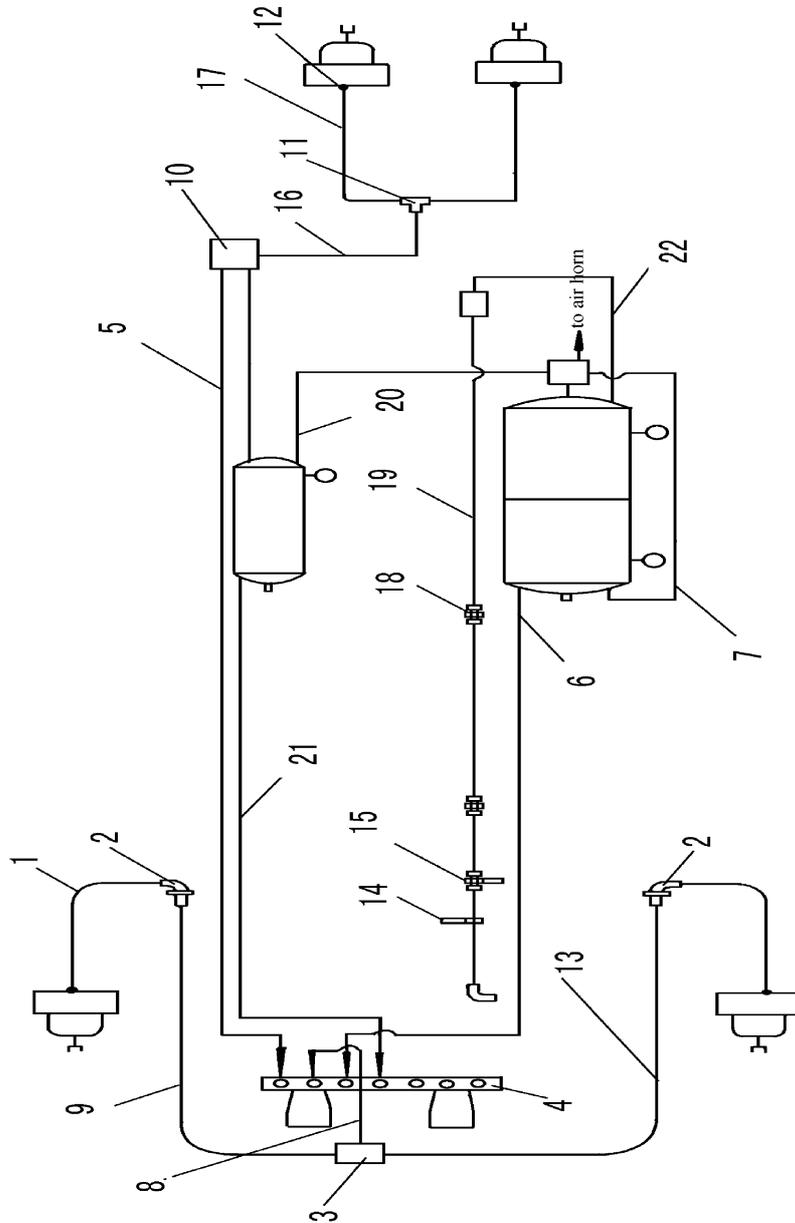
After air entered the chamber, the push rod must be out immediately, and after exhaust, it can return without block. The travel of the air chamber push rod is between  $25 \pm 5$ mm.

### Lubricate

1. Brake shoe roller shaft
2. Roller hole
3. Roller surface
4. Other parts refer to the front brake

# Brake System

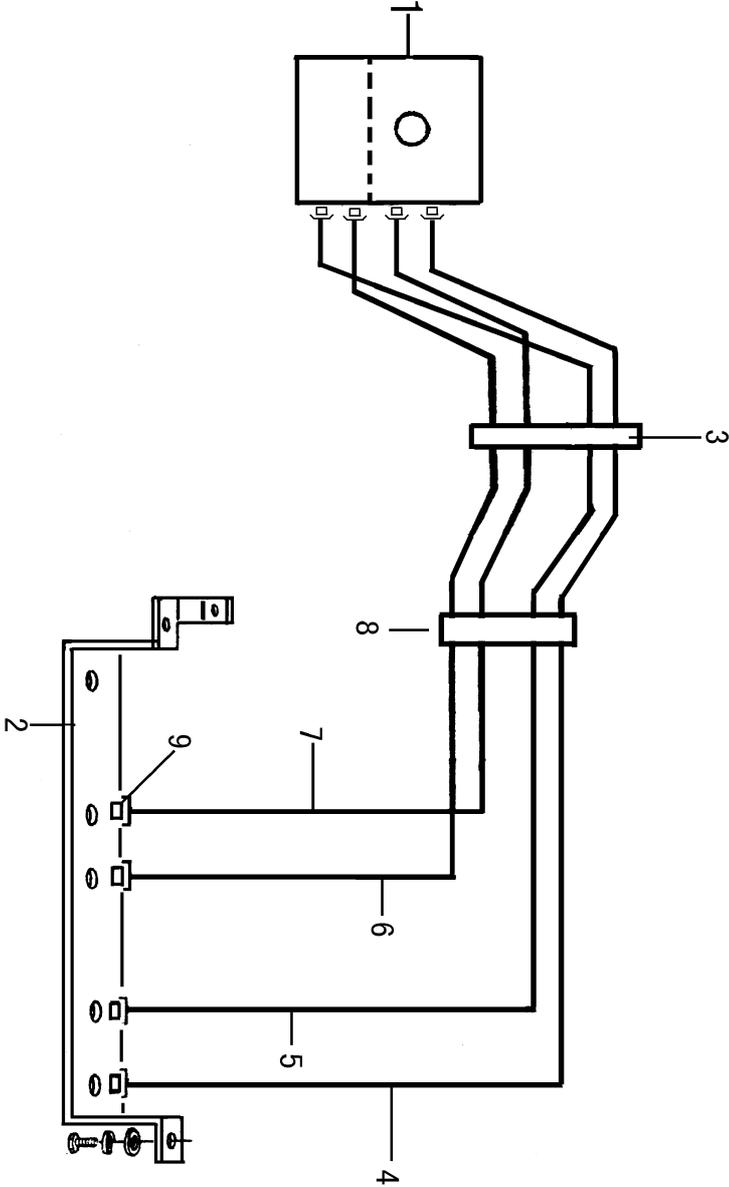
## Frame Brake Pipeline



- |   |  |
|---|--|
| 1. Pipe joint                           | 13. Nylon pipe assy--four circuit protective valve                 |
| 2. Lock washer with inner tooth         | 14. All metal lock nut   |
| 3. Quick release valve set              | 15. Lock washer with inner tooth                                   |
| 4. Spring washer                        | 16. Brake hose assy  |
| 5. Nylon pipe assy                      | 17. Air pipe assy--three way tube joint to right brake air chamber |
| 6. Nylon pipe assy                      | 18. Tube joint--straight   |
| 7. Nylon pipe assy                      | 19. 2nd air pipe assy--air compressor to unloader valve            |
| 8. Nylon pipe assy                      | 20. Nylon pipe assy  |
| 9. Nylon pipe assy                      | 21. Brake hose assy  |
| 10. Relay valve assembly technique sets | 22. Air pipe assy--unloader valve to wet air tank                  |
| 11. Lock washer with inner tooth        |  |
| 12. Pipe joint                          |  |

# Brake System

## Cab Brake Pipeline

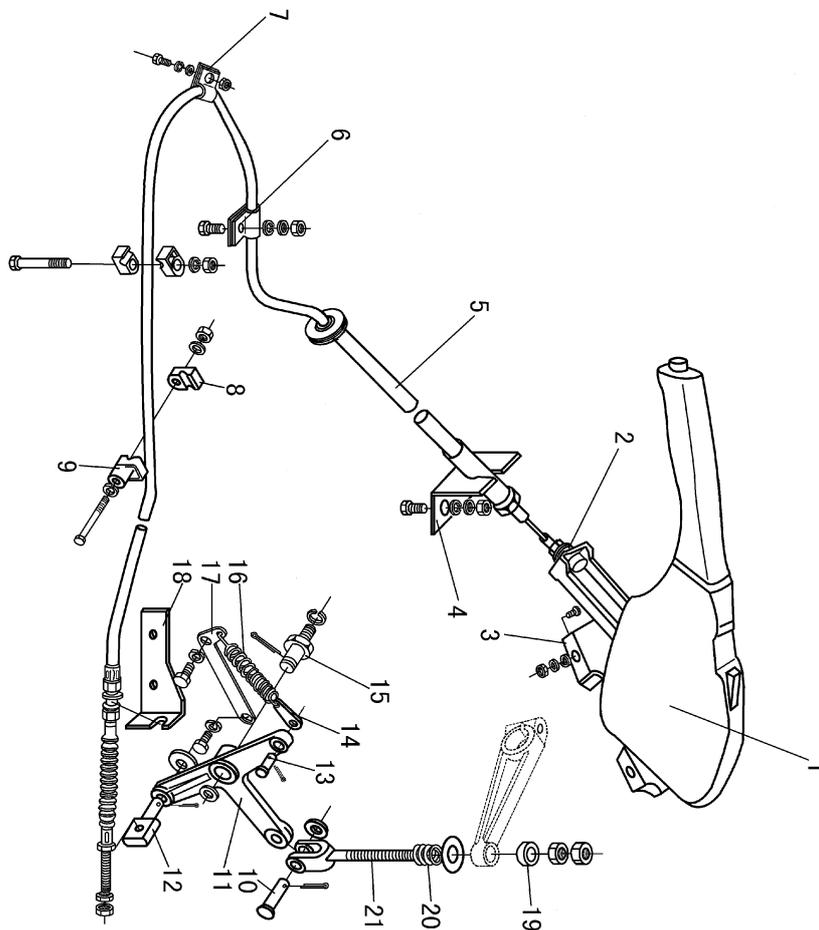


- 1.Brake Valve Assy
- 2.Hose Bracket
- 3.Upper bracket--4 pipes bracket
- 4.Nylon pipe assy--brake valve 21 to hose bracket
- 5.Nylon pipe assy--brake valve 22 to hose bracket

- 6.Nylon pipe assy--brake valve 12 to hose bracket
- 7.Nylon pipe assy--brake valve 11 to hose bracket
- 8.Jacket sleeve
- 9.Transition joint

# Brake System

## Parking Brake Control Mechanism



- |                                      |                                     |
|--------------------------------------|-------------------------------------|
| 1. Parking brake control device assy | 12. Axis pin                        |
| 2. Adjusting nut seat--wiredrawing   | 13. Cotter pin                      |
| 3. Spring washer                     | 14. Shackle                         |
| 4. Bracket                           | 15. Axis pin--parking brake rocker  |
| 5. Parking brake steel wire assy     | 16. Return spring                   |
| 6. Clip--single tube                 | 17. Bracket--spring                 |
| 7. Clamping piece                    | 18. Bracket                         |
| 8. Upper bracket--single tube clip   | 19. Spherical washer                |
| 9. Lower bracket--single tube clip   | 20. Release pull rod spring--clutch |
| 10. Axis pin                         | 21. Parking brake puller lever assy |
| 11. Rocker and bush assy             |                                     |

# Cab

**BF**

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Instrument Panel .....	BF-4
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Seat .....	BF-11
Cab Mounting .....	BF-12
Cab and Cargo Body .....	BF-13
Chassis Frame .....	BF-15
Construction of the Heater .....	BF-16

# Cab

# Cab

## Precautions

When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.

Disassemble or assemble the handle device, molding parts, instrument, inner trims and so on carefully not to soil or damage them.

Apply seal glue on necessary place when assembling.

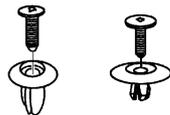
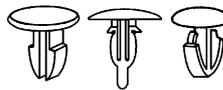
Be careful not let the glue flow out of the parts when applying.

When replacing the metal parts external plate of the body, be sure to take rust prevention measures.

## Clip and Fastener

The following codes and pictures and symbols are subject of the clip and fastener in the BF section. The clip and fastener must be replaced if damaged during assembling or disassembling.

### Shapes



### Removal&Installation

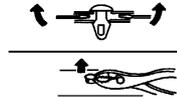
#### Removal:

Removal by bending up with flat-bladed screwdrivers.



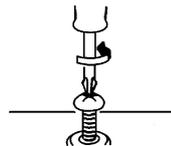
#### Removal:

Removal with a flat-bladed screwdriver or pliers.



#### Removal:

Screw out with a Phillips screwdriver.



#### Removal:

Holder portion of clip must be spread out to remove rod.



#### Removal

Rotate 45° to remove.



#### Installation

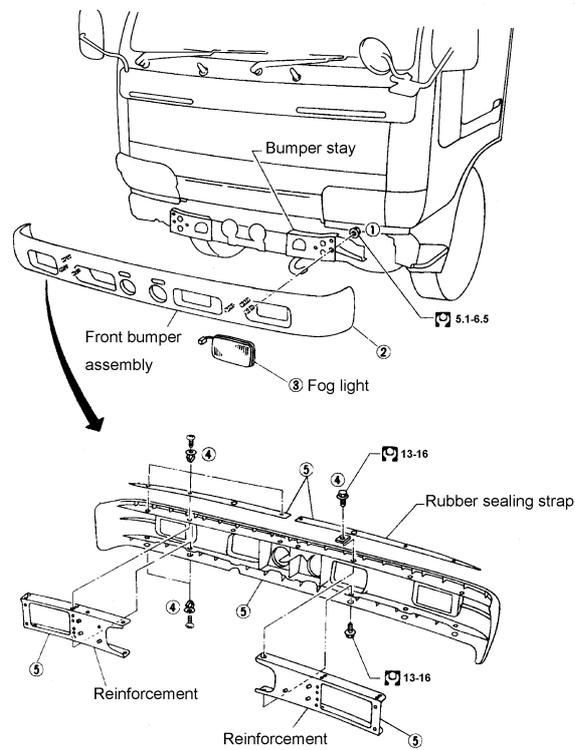


# Cab

## Cab Front Panel

### Disassembling the front bumper ass'y:

1. Release off the six fixed nuts from the front bumper (each three on left and right side).
2. Release off the bumper ass'y.
3. Disassemble the connection device for right and left fog light.
4. Disassemble the clip and bolt.
5. Disassemble reinforcement, seal washer and i
6. nstallation board for the lights



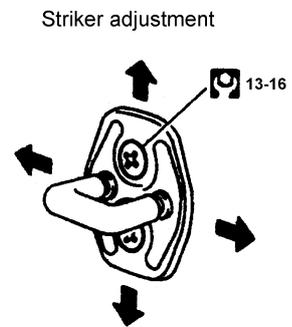
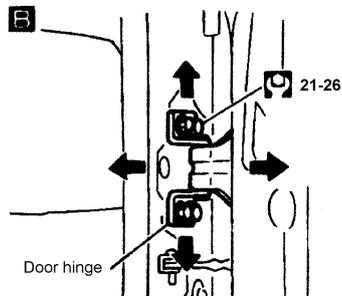
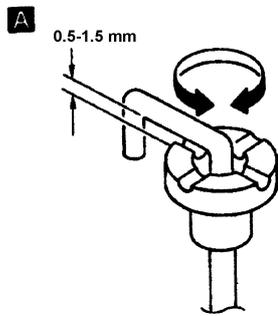
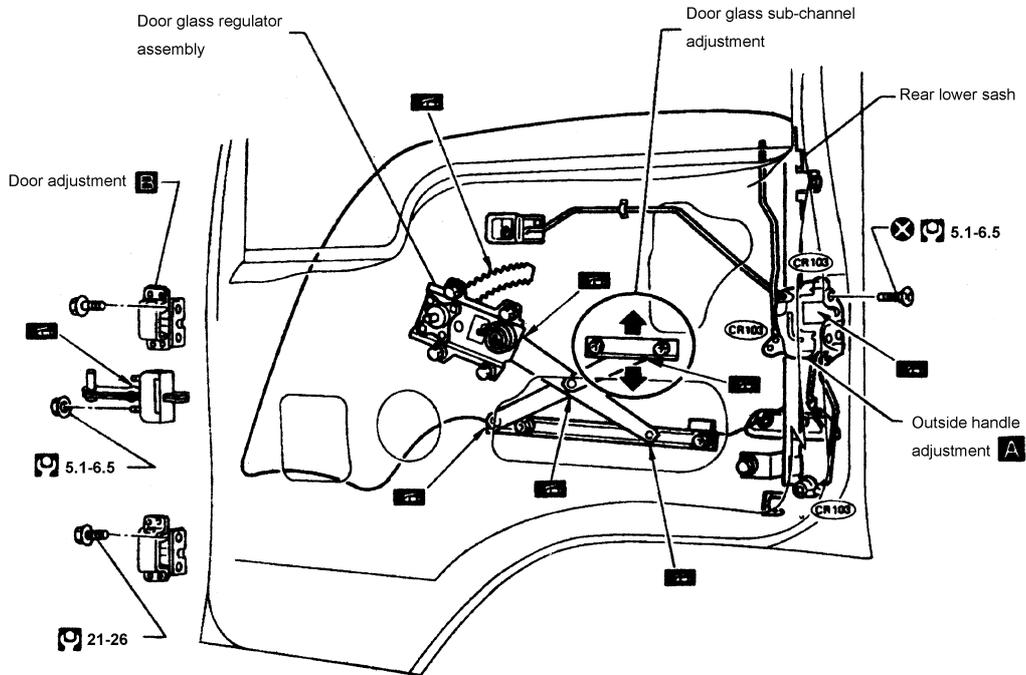
□ : Nm

# Cab

## Door

### Front Door

When disassembling the front door, it is better to disassemble the cover at front side first.  
After adjusting the door or door lock, check the door lock open and lock condition



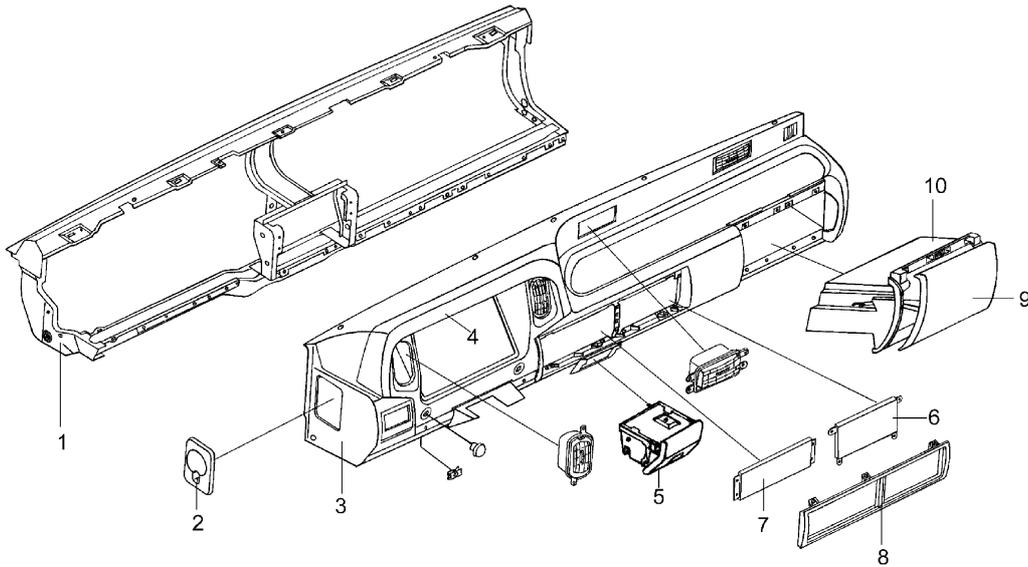
:N.m

# Cab

## Instrument Panel

### Caution:

Before disassembling the instrument panel, switch off the power-supply.  
Be careful not to scratch pad and other parts.  
These parts are made of plastic. Excessive force will damage them.  
The structure of the instrument panel is shown as below:



- 1.Instrument frame welding ass'y.
- 2.Oil can cap
- 3.Instrument frame welding ass'y.
- 4.Instrument panel upper cover ass'y.
- 5.Ashtray assy.
- 6.Block cover, Small glove box ass'y.

- 7.Block cover, warm air control
- 8.Lower trim grille ass'y.
- 9.Glove box cover
- 10.Glove box ass'y.

## Cab Internal Trims and External Trims

### Internal trims

#### Side and floor trims-Passenger area

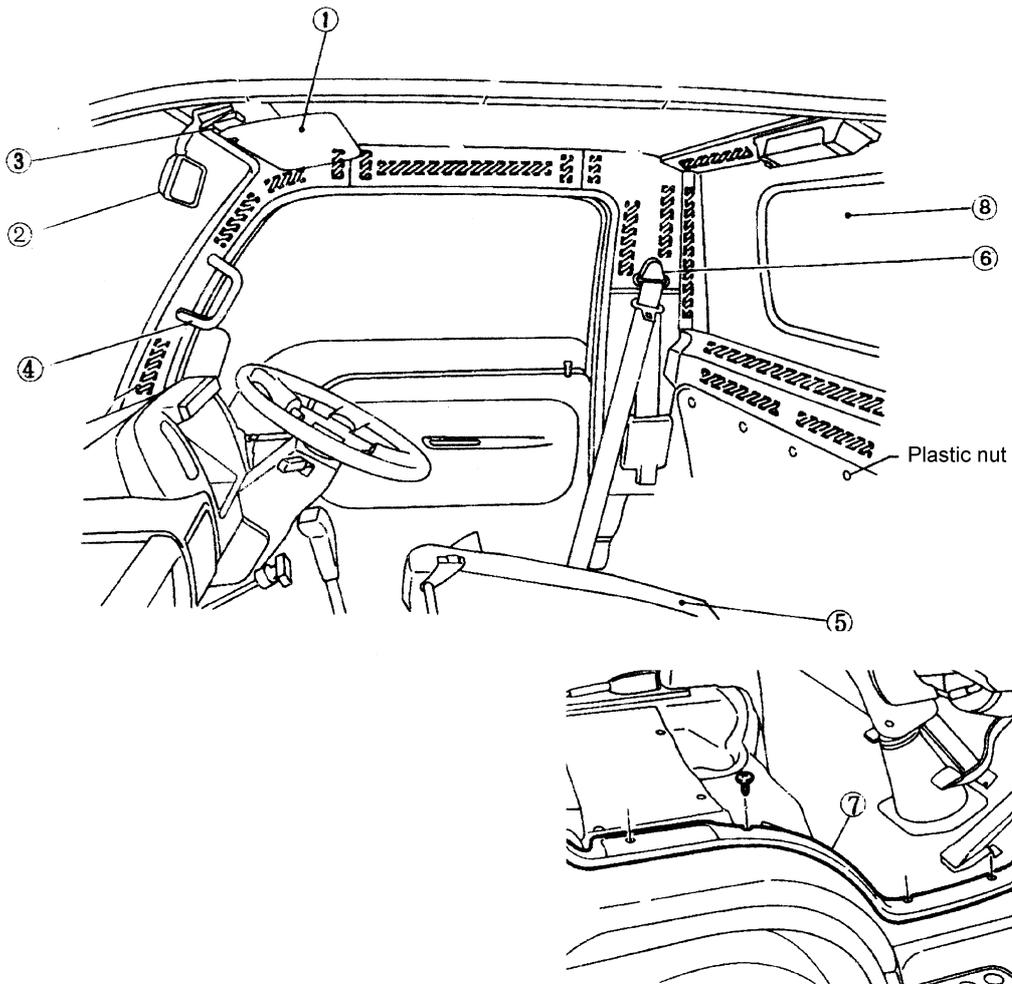
### Caution:

Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.  
Disassembly of the side inner trims:

- ① Disassemble the sun visor.
- ② Disassemble the rearview mirror.

# Cab

- ③ Disassemble the roof lamp ass'y.
- ④ Disassemble the handrail.
- ⑤ Disassemble the seats.
- ⑥ Disassemble the safely belt.
- ⑦ Disassemble the door guardrail.
- ⑧ Disassemble the rear window glass.



## Door trims

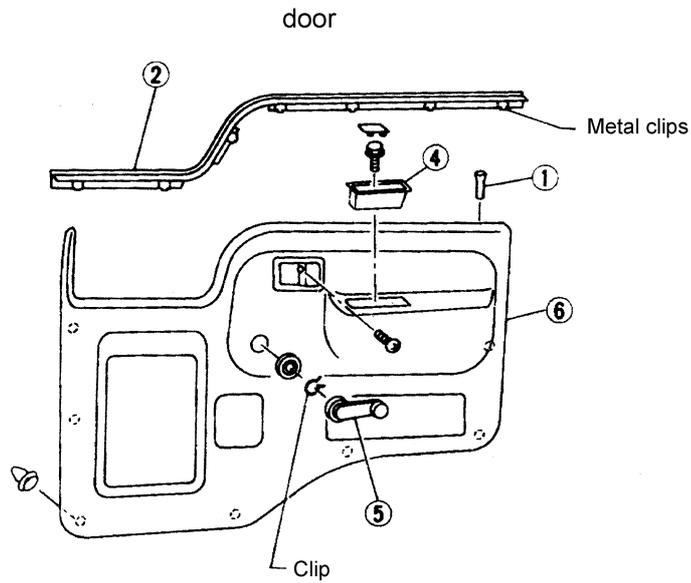
Disassembly of the door trims:

- ① Disassemble lock knob.
- ② Disassemble inside seal.
- ③ Disassemble inside handle escutcheon rear door).
- ④ Disassemble pull handle.
- ⑤ Pull out regulator handle.

# Cab

---

- ⑥ Disassemble inner guard board of door (front door).
- ⑦ Disassemble inner guard board of door (rear door)



## Roof trims

Disassembly of the roof trims

Single seater cab

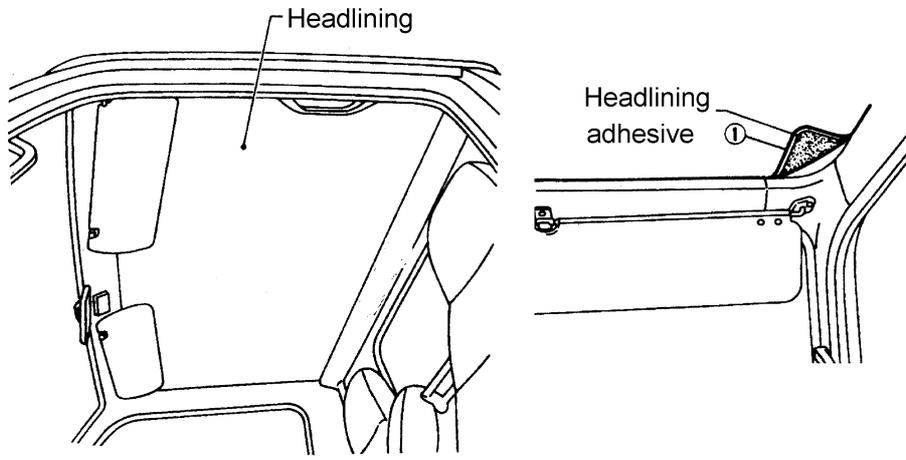
- ① Remove part of headlining from corner and gradually peel headlining off.

Double seater cab

- ① Disassemble the screw and roof bow.
- ② Remove headlining by peeling it off, starting with middle portion

# Cab

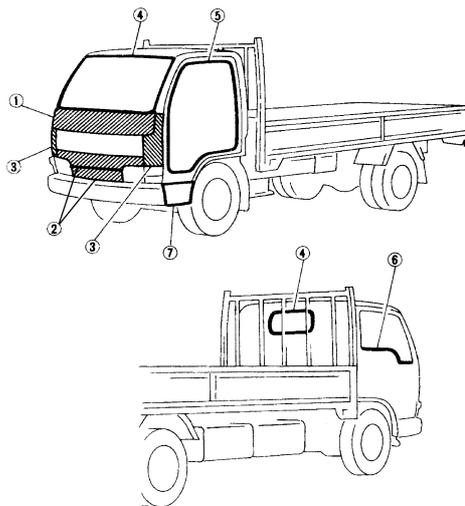
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Single seater cab

## Cab External Trims

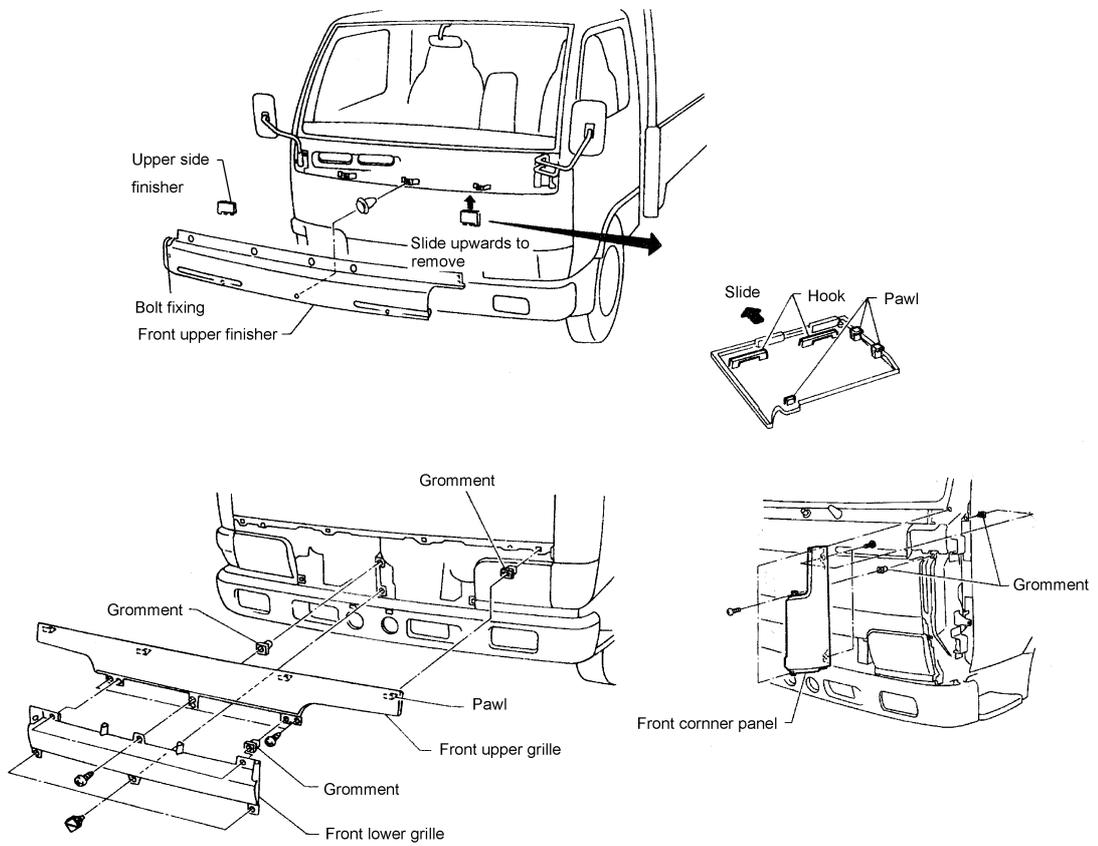
Single seat cab



# Cab

- ① Front upper cover
- ② Front lower cover and lower cover board
- ③ Side external cover board
- ④ Front and rear windows
- ⑤ Cab door seal strips
- ⑥ Door and window seal strips
- ⑦ Front pedal cover and pedal mat (option).

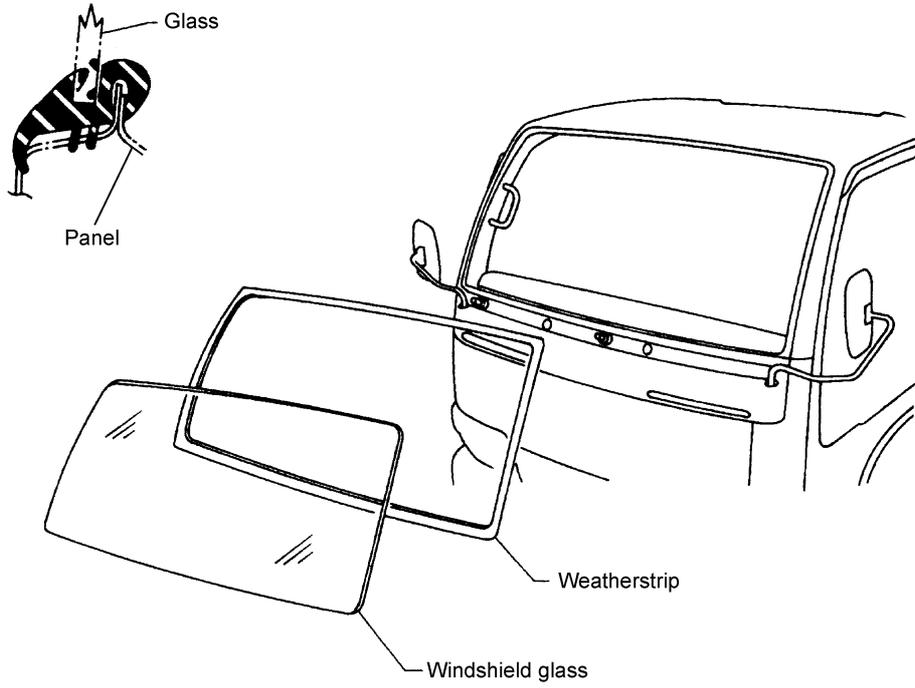
## Front upper finisher, Front grille, Front corner panel



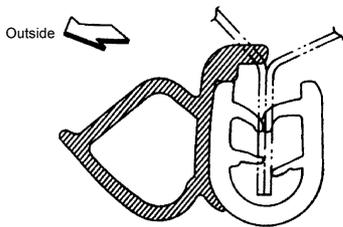
# Cab

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## Front and rear window



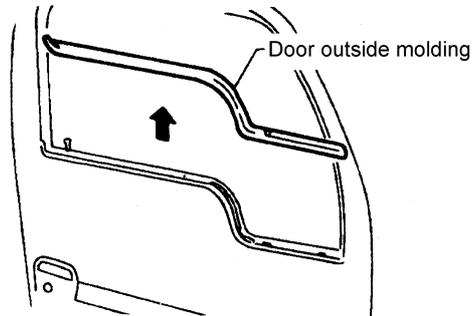
## Cab door seal strip



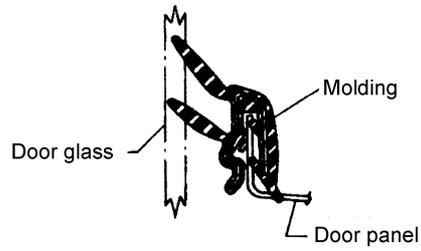
# Cab

## Door outside molding

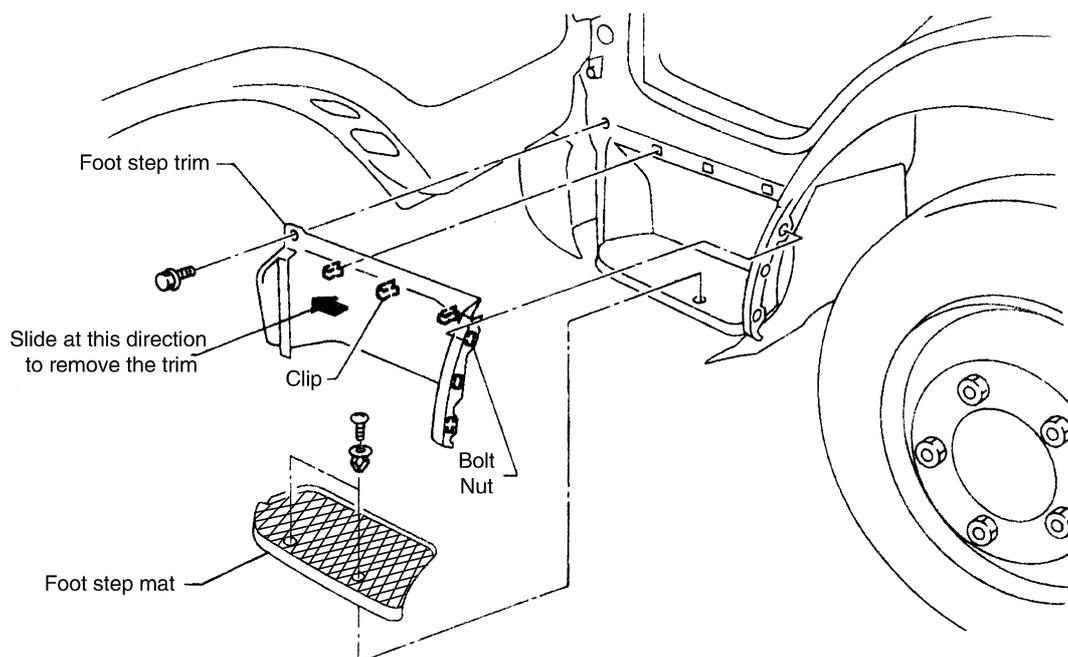
door



Section



## Foot step shield and mat



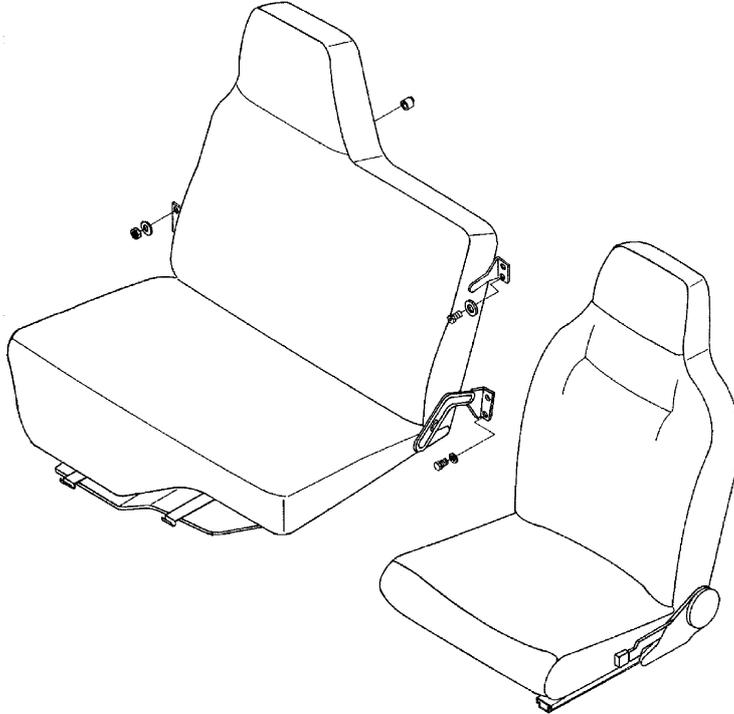
# Cab

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## Seat

When assemble or disassemble the seat, it should be maintained clean and well.

### Front seat



### Cab Safety Belt

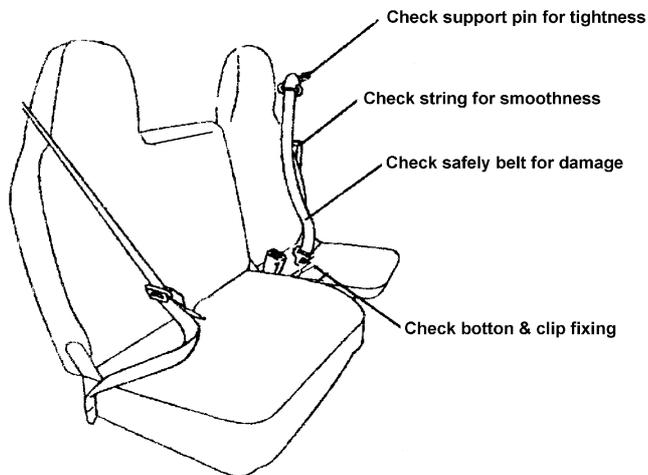
Notes:

If the vehicle is severely dished in an accident, whatever the nature of the accident is, the belt assembly must be replaced.

If any part of the belt has quality problems, it must be replaced instead of repairing it.

If there is any cut, looseness or damage on the texture, etc., replace the assembly.

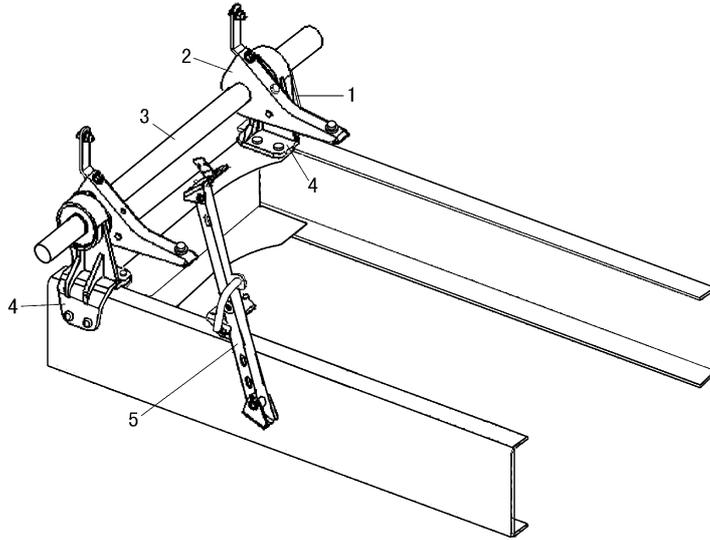
Wine, oil or other material should not be sprayed into the buckle hole lock, so does not the buckle and the knob.



# Cab

## Cab Mounting

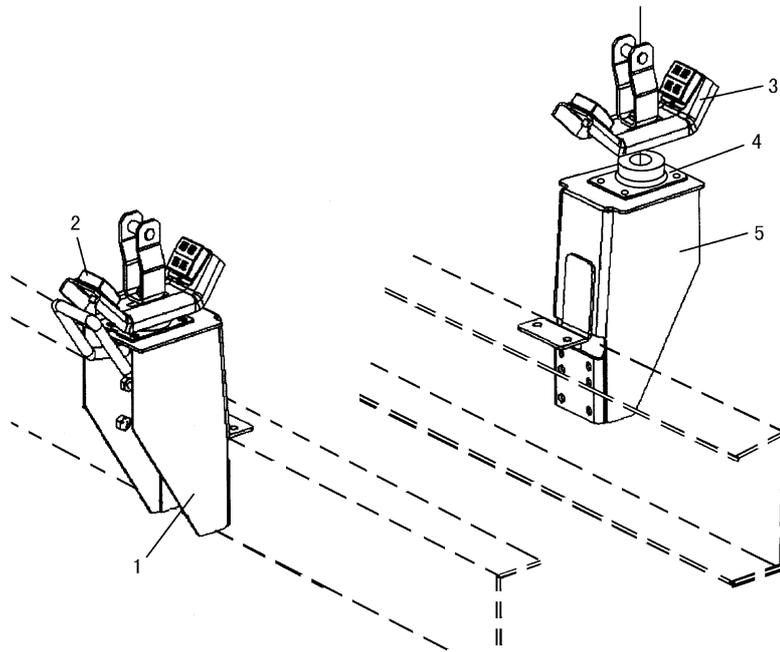
### Cab front mounting



- 1. Torsion bar arm assy
- 2. Tilting bracket assy
- 3. Torsion bar

- 4. Left bracket--front mounting
- 5. Retainer lower assy

### Cab rear mounting



- 1. Left connecting bracket assy--rear mounting
- 2. Upper cushion assy
- 3. U-suppot welding assy

- 4. Rear mounting lower cushion assy
- 5. Right connecting bracket assy--rear mounting

# Cab

## Cab and Cargo Body

### Cab

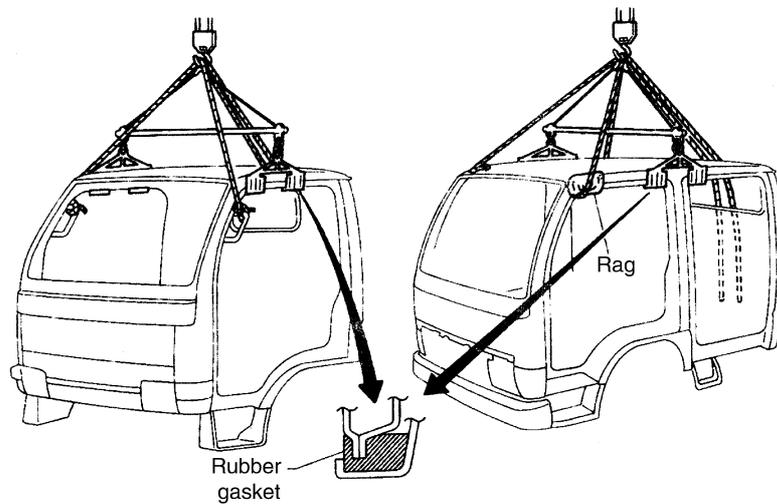
The following parts at least should be disassembled in the area of cab engine:

Main electric system and wire harness.

Sparate the engine part from steering transminion device, brake system and clutch operation system.

The following parts at least should be disassembled in the area of cab:

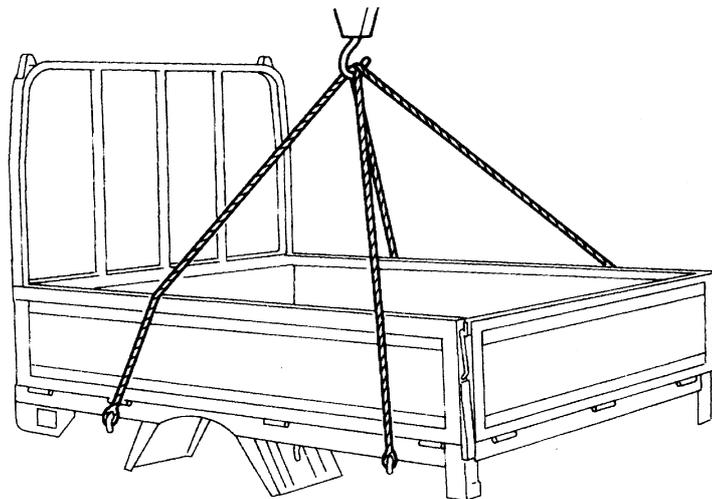
1. Transmission system and steering control system.
2. Hand brake operation and brake drag wire.
3. Electric system, wire harness and tube



### Cargo body

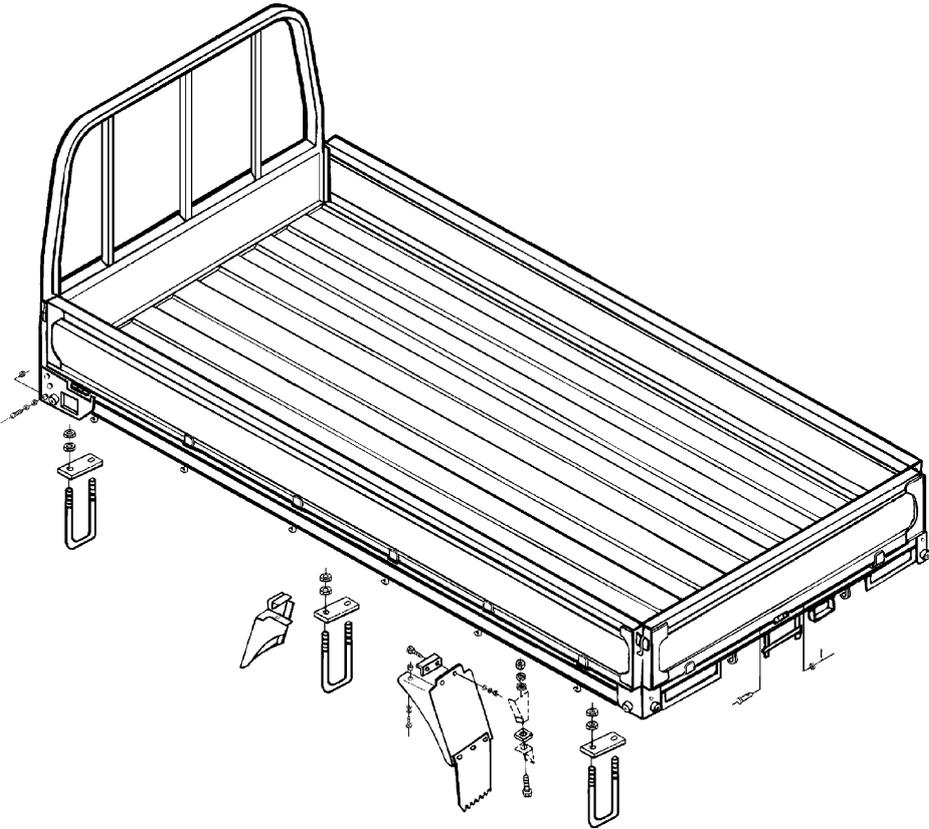
First disassemble the following part:

Rear combination light system and license lamp



# Cab

## Cab body mounting

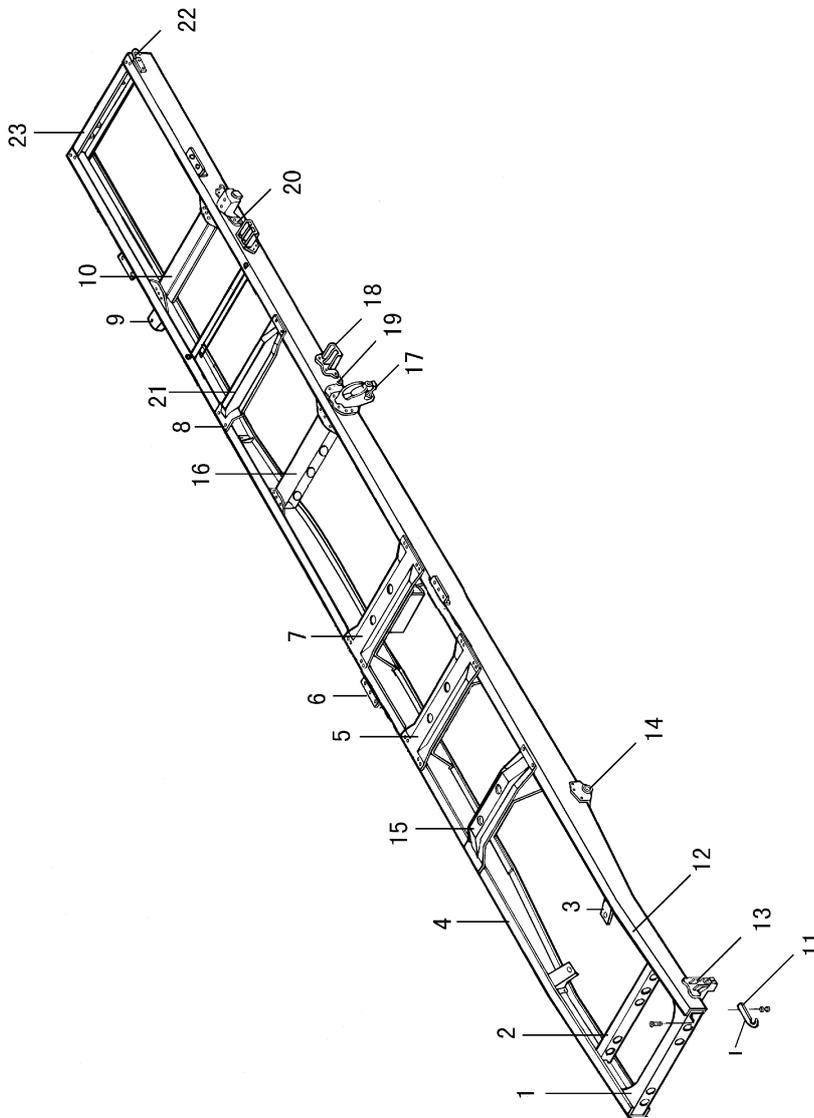


Note:  
Different model has different shape of cargo body.

# Chassis Frame

## Chassis Frame

### Chassis Frame



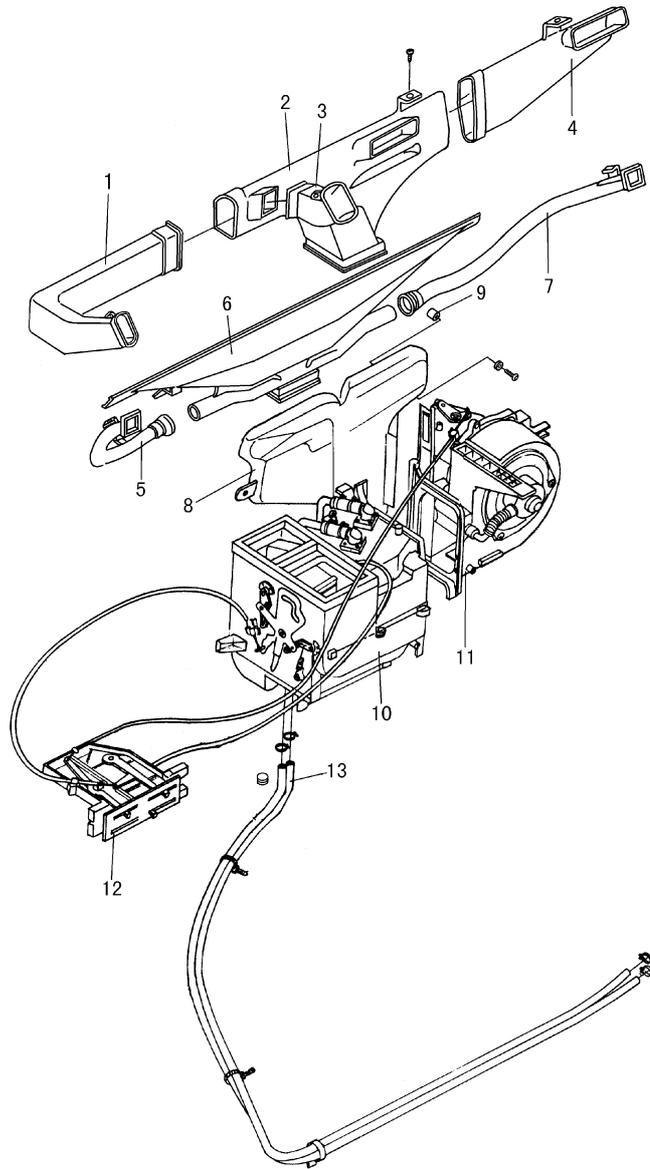
- 1. Front cross member assy
- 2. 2nd cross member
- 3. Right bracket of rear mounting
- 4. Left side member
- 5. 4th cross member
- 6. Lower angle iron for fixing chassis frame
- 7. Propeller midship mounting cross member
- 8. Damper cross member

- 9. Lifting eye end bracket
- 10. Rear leaf spring cross member
- 11. Hook bracket
- 12. Right side member
- 13. Fixed end bracket
- 14. Lifting eye end bracket
- 15. Engine rear mounting cross member
- 16. Rear leaf spring cross member
- 17. Fixed end bracket

- 18. Sub-spring bracket
- 19. Stiffening plate--rear bracket of rear spring
- 20. Stiffening plate--rear bracket of front spring
- 21. Bolt
- 22. Rear hook set
- 23. Rear cross member

# Chassis Frame

## Construction of the Heater



- 1.Left air pipe
- 2.Wind channel assy
- 3.Middle air pipe
- 4.Right air pipe assy
- 5.Left door defroster hose assy
- 6.Defroster nozzle assy
- 7.Right door defroster hose assy

- 8.Wind inlet channel assy
- 9.Plastic nut assy
- 10.Heater assy
- 11.Air blower assy
- 12.Heater control mechanism assy
- 13.Water inlet tube--heater

# Electric System

**EL**

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# Electric System

## Electric System

### Specification

Vehicle Model		DFA1064DH01-985
Wire system		24V, Single lead type, negative earth
Starter	Nominal Voltage (V)	24
	Nominal Power (kW)	3.7
Alternator	Specified voltage (V)	28
	Specified current (A)	45
Battery (A · h)		90

### Bulb Type

Light name	Bulb specification	Bulb type	Remark
Front headlamp	H4 75/70P	P43t-38	
Fog light	H3 70	PK22s	
Front combination light	PY21W	BAV15s	Turning light
	R10W	BA15s(BA15d)	Front light
Side turning light	R10	BA15s(BA15d)	
Doom light	QT24-5SV	SV8.5	
Inspection light	QT24-21	BA15s/19	
Rear combination light	P21W	BA15s(BA15d)	Reverse light
	PY21W	BAU15s	Turning light
	P21/5W	BAY15d	Brake light, rear light
License plate light	R10W	BA15s(BA15d)	

# Electric System

## Trouble Analysis

The trouble in the electric system is divided into line trouble, which caused by wire crack or circuit short, and parts trouble, which caused by parts wear or fire. On the other hand, according to the service and maintenance, the system that approaches the final life car easily has trouble.

When check the circuit, first check the harness for wearing earth or cracking if exist please wrap up or connect and continue to check.

If the circuit has no problems, check the parts associated with the system to find out causes.

If the fuse burns out frequently during the operation, please check the harness for wearing earth and the output voltage of generator to see if over loaded.

### No electricity

Trouble	Cause	Remedy
No electricity	Battery capacity insufficient Earth line contact not good Main supply switch failed One-position failed Fusible wire and fuse burnt When turn on the one-position switch the switch has not good contact	Recharge or replace Make earth line steady Make line steady Replace one-position switch Replace fusible wire Replace or repair main supply switch

### Engine cannot start

Trouble	Cause	Remedy
Engine can not start and starter runs abnormally	Fuel cutoff solenoid fuse burnt Fuel cutoff solenoid failed Fuel lacks or fuel line jammed Battery capacity insufficient or contact abnormally Starter damages	Replace fuse Repair or replace Add fuel or clear the line Replace battery or tighten  Repair or replace
Engine can not start and starter car run	Starter one-way ditch damages Fork and starter driving have trouble	Repair or replace Repair or replace
Starter can't run	Starter relay has not good contact Breaker damages Ignition lock damages	Repair or replace Repair or replace
	Starter solenoid switch hasn't good contact Solenoid switch damages Starter relay damages	Repair or replace Repair or replace

# Electric System

## Front headlamp

Trouble	Cause	Remedy
The headlamp doesn't light when turn on the switch	Fuse burnt Circuit breaks Earth line hasn't good contact Lamp wire burnt Lamp switch has trouble Dimmer switch has trouble	Check cause and replace Check and repair Get off rust and restring then the joint Replace bulb Repair or replace switch Repair or replace switch

## Turning signal light

Trouble	Cause	Remedy
When turning the switch, the turning signal light doesn't run	When turning "left" or "right", turn on signal light, light goes on Flasher has trouble	Replace flasher
	When turning "left" or "right", turn on signal light, light goes on Fuse burnt Flasher joint or others are not good, circuit breaks	Find out cause to solve and replace fuse Check and repair
Right (left) turning signal light goes on, but left (right) turning signal light doesn't go on	Left turning light (right turning light)'s joint doesn't contact well	Check the circuit, from turning signal light switch to lamp
When turn on the switch, the light continues to go on, but does not flash	Flasher failed (contact maintains engage)	Replace flasher
	Front/rear bulb failed	Replace bulb
Turning signal light flashes too quickly	Flasher failed Reduce overall kW to specified value Check and repair	Replace flasher Bulb's overall kW exceeds the specified value Contact or joint has not good contact
Turning signal light flashes too slowly	Flasher failed Bulb's power is over low	Replace flasher Check bulb's power according to specified value

## Horn doesn't sound

Trouble	Cause	Remedy
Horn doesn't sound	Brake light doesn't go on, fuse burnt Harness looses or wears Electric brush contacts not well Horn relay damages Horn damages	Replace Connect or strap up Adjust brush's height Replace Replace

## Brake light doesn't go on

Trouble	Cause	Remedy
Brake light doesn't go on	Horn doesn't sound, fuse burnt Brake light bulb burns out	Replace Replace

# Electric System

## Fog light doesn't go on

Trouble	Cause	Remedy
Fog light doesn't go on	Fuse burnt Earth line contacts not well Bulb burns out Fog light switch damages	Replace Tighten Replace Replace

## Position light doesn't go on

Trouble	Cause	Remedy
Position light doesn't go on when turn on the fog light	Fog light switch damages Bulb burns out	Replace Replace
Position light doesn't go on when turn on the signal light	Harness connecting is not firm Combination switch circuit contacts not well Combination switch damages	Check the connection Connect Repair or replace

## Windshield and wiper

Trouble	Cause	Remedy
Wiper doesn't operate	Fuse burnt Circuit breaks or contacts not well Wiper switch failed or contacts not well Synchronous connecting board breaks away Wiper arm's tightening bolt loosens Wiper motor assembly failed 1. Internal coil burns out 2. Wiper motor overlade because of current over-powering (The rectifier is polluted, carbon, rotary bearing is seized, wiper arm connect not well, motor wears, constant speed gear fails)	Find out cause and replace fuse Check and repair Replace wiper switch Check and repair Tighten bolt Check and repair wiper motor assembly if necessary replace parts
Motor creaks	The lube grease in the gearbox qualitative change	Replace lube grease
Wiping picture is not correct	Wiper arm spring fatigue (pull force descends) Wiper blade rubber damages	Replace wiper arm Replace blade
The wiper can't return to its original position when turn off the switch	Main guideline and contactor Wilding is not good The contactor has not good contact	Repair Repair
	Cam switch The joint is not good	Repair or replace switch
Wiper doesn't stop	The contact is not good	Repair or replace switch

# Electric System

## General Instruction

### Constitution

- Power supply division: Alternator, battery
- Starting system
- Power supply warning system
- Instrument indicator system
- Lighting system
- Others: Wiper, horn, cigar lighter, radio cassette player

### Features

- Using integrated alternator
- Using electromagnetic main power switch
- Two fusible wires at starter
- 22-way fuse box

### The complete truck wiring

The wires of 22-way fuse box of the complete truck are connected as follow

Radiator relay		Heater relay		Ignition relay		A/C relay		Horn relay		Flasher												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Right headlamp	Left headlamp	Position lamp Fog lamp	Dome lamp	Quartz clock Hazard warn		Brake lamp	Horn				Standby	Washer motor wiper motor	Cigar lighter	Heater A/C	Radio cassette	Instrument Reverse		Exhaust brake	Assist start	Standby		Standby
15A	15A	25A	5A	10A		5A					5A	15A	10A	10A	10A	10A		15A	15A			10A

In the normal conditions, the output of alternator reaches ignition switch, lighting and instruments by the way of two fusible wires. If the alternator fusible wires are burnt, the above systems will continue to operate using the battery power. But if the engine stops at the time, the systems can't start until replace the fusible wires. The fusible wire must be replaced immediately to prevent the battery from over discharging.

Besides the safety control described above, there are another 6 small relays: start relay, ignition relay, heater relay, A/C relay, radiator relay, and horn relay.

# Electric System

## Battery

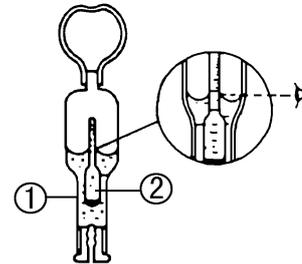
### Specifications

Battery	Two batteries 6-QW-90DF are in series
Type	Less maintenance
Nominal voltage (V)	12
Nominal capacity (A · h)	165

### Check

1. Electrolyte density when fully charged: 1.26~1.285g/cm<sup>3</sup>

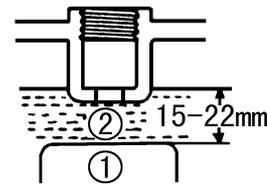
- ① Density meter
- ② Floater



2. Fill distilled water in time if the electrolyte is found insufficient. Charging for over half an hour after filling in order to let the filled distilled water fully fix with the former electrolyte.

Electrolyte level (above the top of the battery plate)  
15~20mm

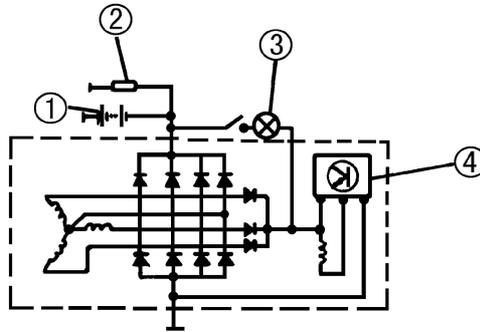
- ① Battery plate
- ② Electrolyte



# Electric System

## Alternator

Alternator operation principle diagram



- 1. Battery
- 2. Electric using equipment

- 3. Charging indicator
- 4. Regulator

### Specification

Vehicle model	EQ1074T/G5AD-666		
Nominal voltage (V)	28	Adjusting voltage (V)	$28 \pm 0.3$
Nominal current (A)	45	Nominal revolution (r/min)	6000
Starting revolution (r/min)	$< 1150$	Output current (A)	18-20

### Construction Principle

#### Features

- Improve the magnetic circuit and use 8-diode rectifier to increase the output power.
- Construction without brush to make it simplified, and ease of servicing
- Use the alternator with built-in rectifier and electric regulator.

#### Operation principle

The alternator produces self-excitation field and operates normally when the charging indicator lamp is extinguished.

# Electric System

## Trouble analysis

Trouble	Cause	Method
Charging indicator does not extinguish and the truck starts difficultly during operation	Short circuit or too large contact resistance	Check the circuit and repair or replace the damaged parts
	Short circuit between the 3 phases and rotor winding and casing	
	Diode damaged	
	Regulator failed	
Charging current is too small, the battery is insufficient. No charging at low speed.	Output voltage is over low.	Exclude the trouble and replace the damaged parts
	Diode is partly damaged	
	The rotor winding has 1 phase or 3 phases bad contact	
	Slipping belt	
The instrument indicator sometimes charges and sometimes not	Belt is too loose and slippery.	Tighten the contactors, and replace the instrument if it is damaged.
	Built-in regulator works abnormally	
	The contact from engine fire wire connector to battery connector is loose	
	Alternator interior connection is loose.	
	Instrument failed	
Engine has abnormal noise during running.	Belt is loose or worn, shaken during running	Adjust the belt, replace bearing
	Bearing damaged or too large clearance	
	Too large clearance of bearing caused interference	

Note:

The self-excitation speed is very low (about 1000r/min) with battery operation. So be sure to see if the charging indicator is perfect or not during the operation.

Alternator negative earthing.

Be sure to use the original factory's parts as possible if it has to replace the diode.

During the alternator operation, if the temperature of the casing reaches to  $105^{\circ}\text{C}$  + ambient temperature, and the output of the alternator is normal, the alternator is not burnt down.

# Electric System

## Starting Division

### Starter

Vehicle model	DFA1064DH01-985
Nominal voltage (V)	24
Nominal power (kW)	3.7
Pinion teeth	10
Pinion module	2.54/2.1167
Brake torque (N · m)	40
Brake current (A)	800
Brake voltage (V)	12

### Starting relay

Operating voltage (V)	18~32
Operating current (A)	50
Pull-in voltage (V)	9~17
Drop-off voltage (V)	1~8

### Assistant start button

The assistant start button is located at the right side of cab rear support. When the engine need to be repaired under the truck, put the ignition switch to "ON" position and make the ignition relay's contactor pull-in. Let the transmission in idle position and join up the idle switch. Press the sub-starting button under the truck to start the starter.

## Electromagnetic Main Power Switch

### Operation principle

When this switch is turned on, the current passes through the coil and the contactor closed to connect the battery cathode and chassis frame.

As soon as fuse is burnt the electromagnetic main supply switch will automatically cut off the battery negative earthed circuit. So there will be no electricity in the complete truck.

### Specification

Mode	Nominal voltage	Operating voltage	Operating current	Main contacts current in operation
DK238	24V	20~30V	≤ 0.5A	300A

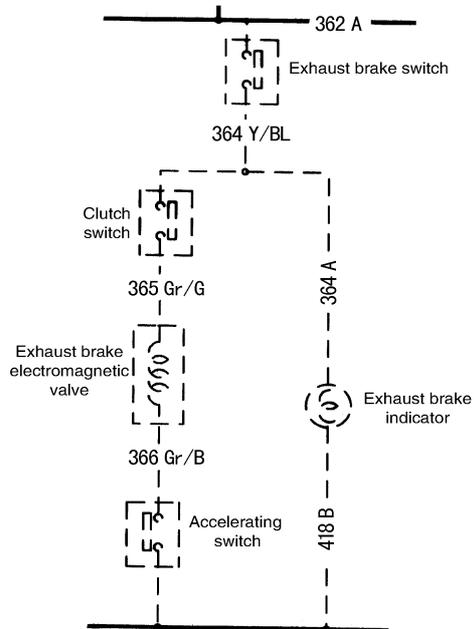
### Trouble analysis

Trouble	Cause	Remedy
Jamming	The electromagnetic main supply switch is jammed	Slap the housing gently or repair
Not working	The electromagnetic main supply switch's interior trouble	Repair or replace

# Electric System

## Exhaust Brake System

The exhaust brake is operative when the foot is removed from both the clutch pedal and the accelerator pedal; and the exhaust brake switch, clutch switch, accelerator switch and electromagnetic solenoid are all on. But the exhaust brake will be released when either the clutch pedal or the accelerator pedal is depressed.



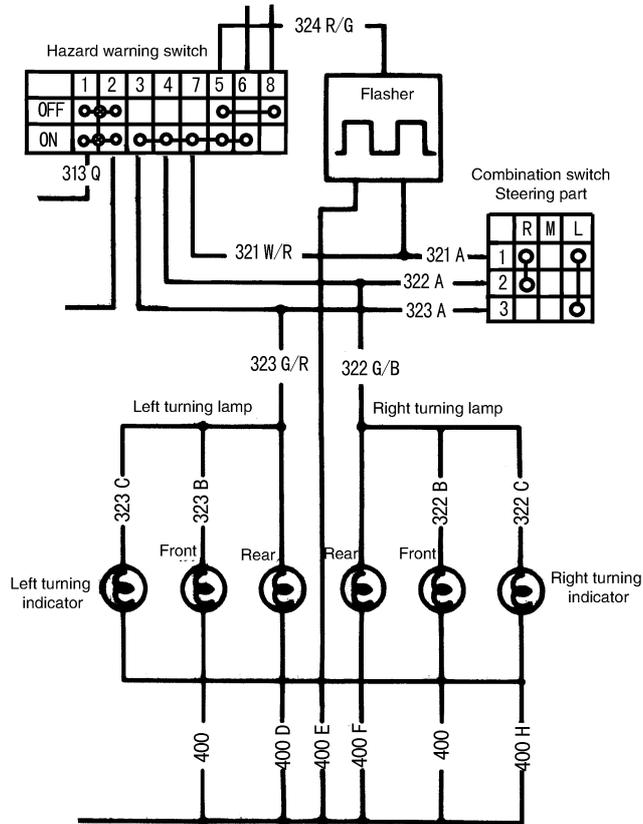
**Note:**

The exhaust brake indicator lamp comes on, which only indicates the exhaust brake switch is ready for operation, not indicates the exhaust brake is operative.

# Electric System

## Hazard Warning System

When the hazard warning switch is in the alarm position, the left and right turning signal lamps will flash simultaneously.

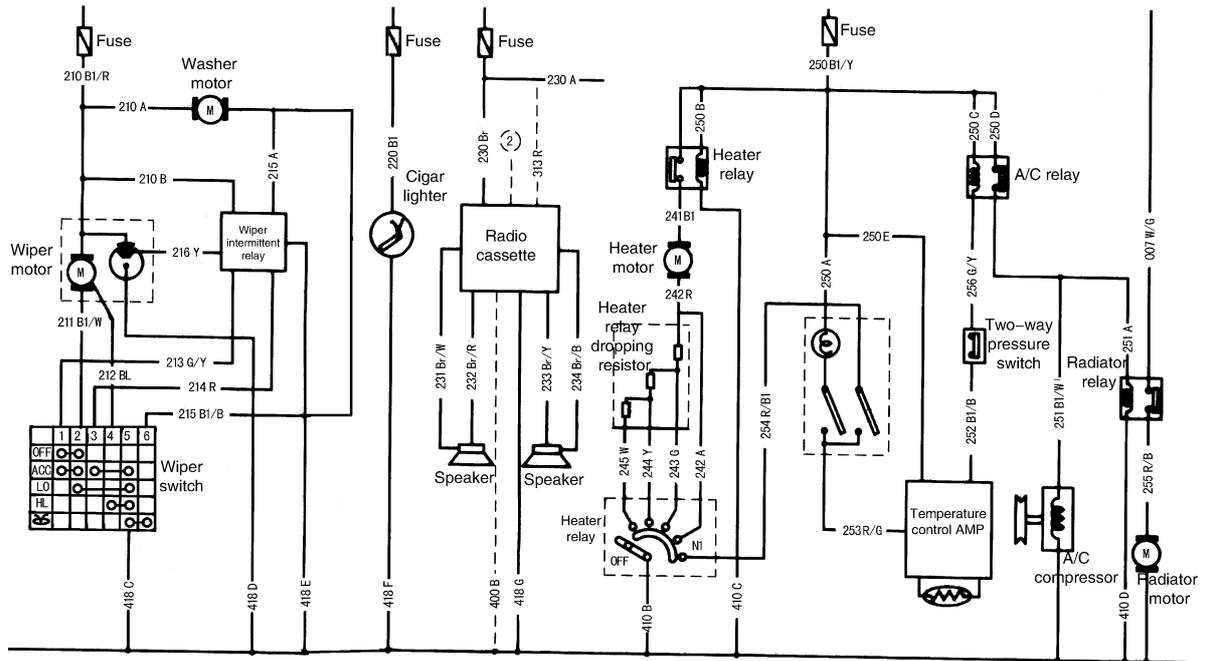


# Electric System

## Accessories

### Wiper motor

Power		50
Revolution	Low speed	$40 \begin{smallmatrix} -2 \\ +3 \end{smallmatrix}$
	High speed	$60 \pm 6$



# Electric System

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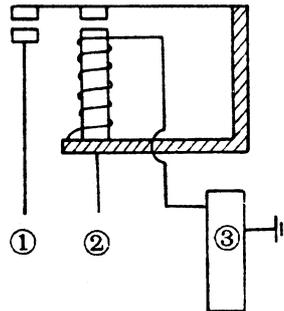
## Horn

### Horn

Press the horn button, the normal-open contact of the horn relay is connected and make the electric horn work.

### Horn relay

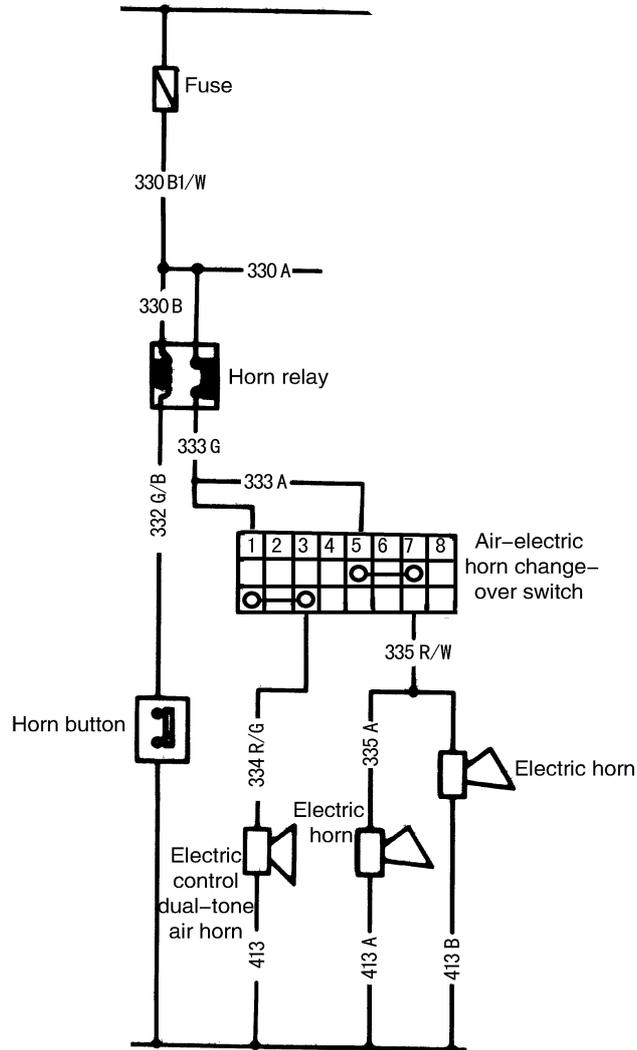
Decrease the current flowing through horn button via an iron core with high resistance so as to prevent the horn button from burning out.



- 1.To horn
- 2.To power supply
- 3.To horn button

# Electric System

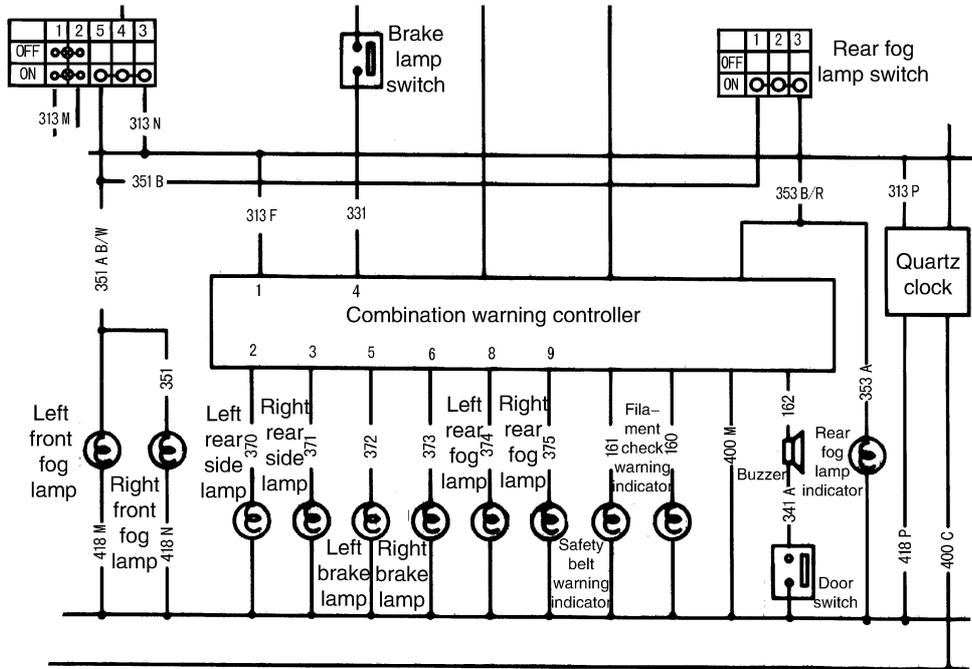
## Electric wiring diagram



# Electric System

## Fog Lamps

Double rocker switch in parallel is used as a fog switch. That is because when the front lamps go on, the tail lamps, license lamp, instrument and quartz clock illuminators should be all lighted simultaneously, while the foglamp is not included, but when the foglamp goes on, the front lamps, tail lamps, license lamp, instrument and quartz clock illuminator should be all lighted.

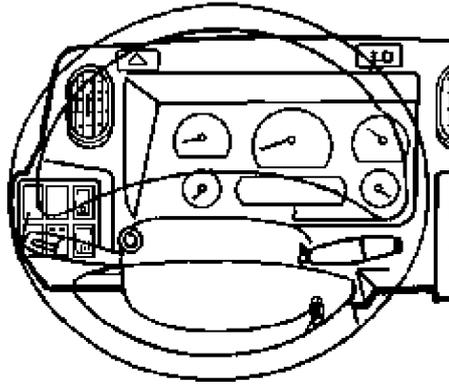


# Electric System

## Instruments

### Structure

This part consists of air pressure meter, fuel meter, water temperature meter, tachometer and speedometer.



### Name of the indicators and warning lights

 Taillight warning indicator	 Parking brake warning light	 Oil pressure warning light
 Exhaust brake indicator	 Safety belt indicator light	 Brake-down warning light
 High beam indicator	 Fuel level warning light	 Air-filter block warning light
 Charge warning light	 Rear fog indicator	 Direction signal indicator
 Fuel-water separator warning light	 Water temperature warning light	

# Electric System

## Instrument Panel

### Technical parameter and function

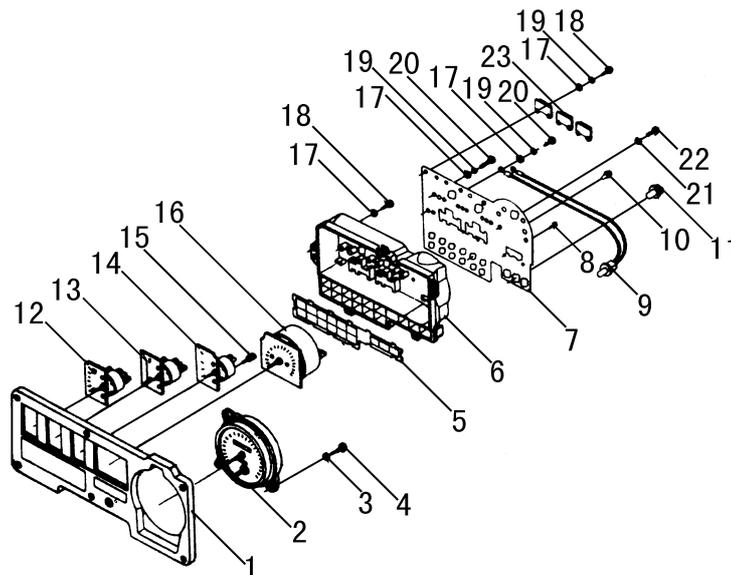
#### Technical parameter

Speedometer (km/h)	0~140
Tachometer (r/min)	0~5000
Fuel meter	0-1/2-1
Water temperature meter ( °C )	40-80-100-120
Nominal voltage (V)	24

#### Constitution and function

The instrument panel assembly is consisted by speedometer, tachometer, water temperature meter, fuel meter, warning system (14 warning indicator), and matched with the sensor and warner.

#### Disassembly



- |                              |   |                                      |
|------------------------------|---|--------------------------------------|
| 1.Panel assembly             | 9.Speedometer lighting bulb holder                | 16.Electronic tachometer             |
| 2.Speedometer                | 10.Small warning signal lamp bulb holder assembly | 17.Washer                            |
| 3.Washer                     | 11.Big warning signal lamp holder                 | 18.Self-tapping screw                |
| 4.Self-tapping screw         | 12.Oil pressure gauge assembly                    | 19.Spring washer                     |
| 5.Warning lamp pattern piece | 13.Fuel level gauge                               | 20.Screw                             |
| 6.Big case                   | 14.Water temperature gauge                        | 21.Spring washer                     |
| 7.Soft printed circuit board | 15.Small gauge transition connector               | 22.Screw                             |
| 8.Nylon rivet                |   | 23.Small gauge voltage drop resistor |

# Electric System

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## Disassembly

Pull out connectors and the flexible shaft, and then detach wires connected with the electronic tachometer before removing the instrument panel assembly.

1. Remove the speedometer after detaching 3 tapping screw.
2. Pull out bulb when turning the bulb holder counter clockwise to make it aligned with the notch.
3. The voltage drop resistors of small meters are also tightened by tapping screws so that they can be removed.
4. The wire connectors of the speedometer are connected to the big case by the tapping screws and they can be pulled out after removing the bulb holder and loosening screws. When assembling, fit lamps by passing through the circuit board or by removing all the warning lamps first, connect wires and fit the lamps.
5. The circuit board is riveted to the case, so pull it out by force when detaching.
6. After removing the big case, the pattern pieces can be removed because they are stuck with glue which will not dry. But they should be put in appropriate positions when assembling.
7. Remove meters after loosening screws at the back of the big case. Fit it carefully when assembling to avoid the bad fit between transition connecting parts and the big case.
8. Take out the circuit board only after all the bulbs and screws are removed.

## Instruments replacing

The speedometer and tachometer can be replaced directly after disassembling according to the above method. The three small meters can be replaced after the transition connecting parts have been removed which should be fit and tightened after the meters are replaced.

## Reassembly and check

Reassemble the removed parts in the reverse order of removal and tighten screws when reassembling. Check if there is any part assembled wrongly or any scratches, damages and so on. Then attach the connectors, the tachometer wires and the flexible shaft of the speedometer. Assemble the instrument panel assembly and operate it for a while to see if the meters work normally.

### Notice

Attach connectors A and B appropriately and note if the voltage of the electric system is connected.

Stop the vehicle to check immediately if the warning indicator illuminated and something troubled happened.

The light spring washer and washer of the small meters should be copper plated or galvanized.

Meters on the instrument panel should be matched with appropriately specified sensors.

The speedometer assembly and the big case are connected with panel by tapping screws, so please be careful when assembling and disassembling in order to avoid damages of the tapping thread and result in loose connecting.

## Trouble analysis

Trouble	Cause	Method
Warning lamps does not go on	Bulb holder slackened	Tighten the holder
	Bulb damaged	Replace bulb
	Wire slackened	Connect wire or tighten
	Warning sensor damaged	Replace
Illuminator does not go on or in bad condition	Power of the bulb is over sufficient, insufficient or the bulb is aging.	Replace
	Holder is not tightened or bulb is damaged.	Tighten or replace
	Wire slackened or broken	Tighten, connect

# Electric System

## Speedometer

### Dial description



The speedometer needle indicates the vehicle speed in kilometers per hour. The odometer indicates the accumulated driving distance in kilometers.

The trip odometer indicates the distance driven per day or driving distance between specified regions. Firmly press the reset knob to reset the meter indicator to zero and then release it before using this speedometer. The red figure at the far right with the white background indicates readings in units of 0.1km.

Note:

Do not press the reset button during the driving period.

Do not pull or turn the reset button when press it.

### Technical parameter

Type		Magnetic inductive
Speed indicator range (km/h)		0~140
Mileage counting figures (km)	Total	99999
	Sum	999.9
Speed ratio		1: 625
Connector thread		M18 × 1.5
The inner square hole of drive (mm)		$2.6C_{11}^{+0.12}$ × $2.6C_{11}^{+0.12}$

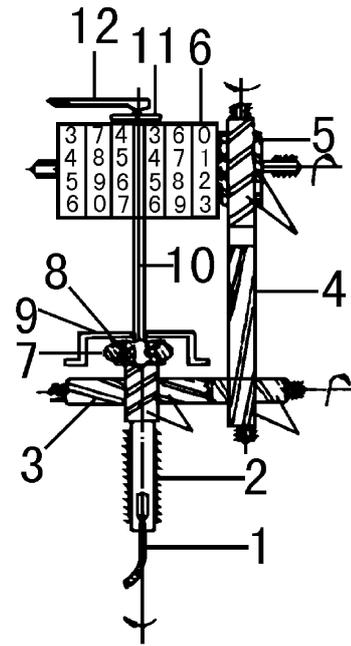
# Electric System

## Structure

The speedometer is used to indicate the vehicle driving speed and the accumulated driving distance. It comprises a speed and a mileage unit which records vehicle driving mileage. These two units are integrated into one body and driven by the flexible shaft which is connected with transmission output shaft.

The mileage unit records the driven mileage of the vehicle in order to do necessary maintenance on mileage. The counter is divided into an accumulated counter and a day counter. The speed unit indicates the transient speed of the vehicle. It is convenient to control the vehicle speed so as to obtain safety, economy and high efficiency.

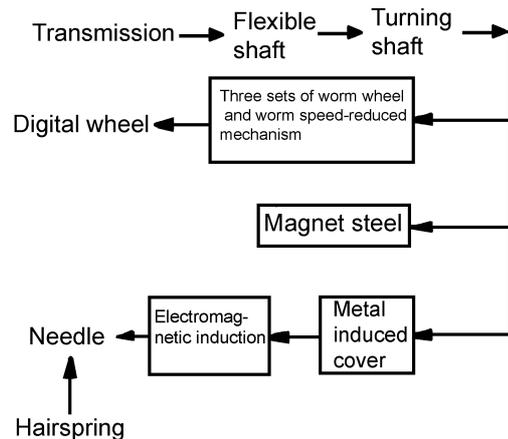
- 1. Flexible shaft    2. Drive shaft    3. Worm and lateral shaft
- 4. Worm and vertical shaft    5. Worm wheel    6. Digital wheel
- 7. Magnetic ring    8. Temperature compensated ring
- 9. Inductive aluminum cover    10. Needle shaft
- 11. Hairspring    12. Needle



## Working principle

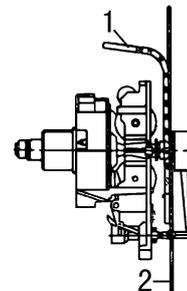
### Drive of speedometer

The flexible shaft (driven by transmission main shaft) mounted on the back of the transmission is driven by pulling the square connector into the square hole at the outside of the speedometer turning shaft which drives the digital wheel through three sets of worm wheel and worm.



### Indication of odometer

When the flexible shaft drives the speedometer turning shaft to rotate, the magnetic steel on the drive shaft rotates simultaneously, causing the eddy current within the inductive cover, which also produce magnetic field. Both fields interact on each other to produce deflecting torque. The higher the vehicle speed is, the larger the deflecting torque is, which can be indicated by the needle deflection. When the needle deflecting torque of the hairspring, the needle will stay at the appropriate speed value. The needle deflecting angle is proportional to the speed of the speedometer turning shaft, that is, the vehicle speed, causing the needle to indicate various speed.



- 1. Light transmitting glass
- 2. Dial

# Electric System

## Trouble analysis

Trouble	Cause	Method
Both the speed division and the distance counting division of the speedometer do not work	Flexible shaft core broken	Replace
	Odometer rotating shaft seized	Replace the odometer
	Square connector nut slackened	Tighten again
Only the speed division of the speedometer does not work	Needle deformed and seized with dial or glass	Correct
	Drive worm wheel and worm, and inductive plate seized, broken, or dirtied	Replace or clean
The needle and the accumulated machine do not run simultaneously	Drive gear or driven gear of the speedometer damaged	Replace meter
	Meter failed	Replace meter
The deflection indication of the needle is too high.	Speedometer flexible shaft deformed or radius area bent	Correct the flexible shaft
	Input shaft or gear worn	Replace meter
The speedometer indication is on the low side	Transmission output shaft slipped	Tighten the flange fork under the recommended torque
	The magnetic effect of the magnetic steel reduced	Replace
Needle indication error	Hairspring deformed or deviate from the original position	Move the hairspring to one side to adjust the indication of the needle
	Magnetic body cracked	Replace meter
	Dimension of tyre is wrong	Replace and use the recommended tyre
	Speed gear worn or damaged	Replace meter
The needle deflection exceeds the dial	Grease on the magnet	Clean out the grease
The speed needle of the speedometer works unsteadily	Hairspring broken	Replace meter
	At the constant velocity of the vehicle when the speed needle's indication unsteadily reaches to 3km/h, it is in trouble. Check the curvature of the flexible shaft to see if it is too small.	Adjust
	Flexible shaft core seized	Clean and lubricate
Speedometer needle oscillates severely	The axial clearance of the flexible shaft is too big causes the flexible shaft and speedometer's rotating shaft sometimes engaged, sometimes separated.	Replace shaft core

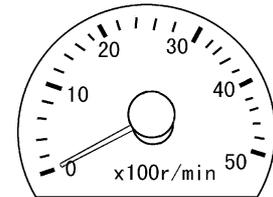
# Electric System

Trouble	Cause	Method
The needle seized or failed that can not return to zero	Grease on the magnet	Clean out the grease
	Hairspring deformed	Replace meter
	Wrong assembling of the needle (needle slackened)	Tighten
	There are impurities absorbed on the magnet of the indication board.	Clean
The day distance counter does not work or can not return to zero	Odometer drive pinion damaged	Repair or replace
	Return zero button damaged	Repair or replace
Speedometer noise	Speedometer bearing worn and damaged	Replace meter
	Speedometer gear lacks of lubricating and causing worn	Fill with grease
	Speedometer flexible shaft lacks of lubricating and causing worn	Fill with grease

## Tachometer

### Dial description

The needle of the electronic tachometer indicates the engine speed in revolutions per minute. The red zone indicates the range of the critical engine speed. Strictly be sure to always keep the indicator below this critical zone. The green zone indicates the most economical engine operation. Driving within this green zone will save fuel and extend the engine life.



### Technical specification

Type	Moving coil
Range(r/min)	0~5000
Deflecting angle(°)	245
Min. graduation (r/min)	100
Accuracy level	1.5
Connector	DJ7043-6.3-20 type, 4-cable combined socket

### Constructional description

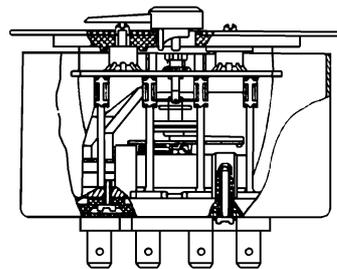
The electronic tachometer construction including:

The indication division: comprise of needle, dial and so on.

The signal processing division: comprise of printed-circuit plate and electronic parts.

The measuring mechanism: comprise of magnetic steel, pole plate, pole ring, and needle shaft coil assembly, bracket assembly, upper and lower bearing and so on.

Auxiliary part: Base, housing, screws and electrical connectors.



# Electric System

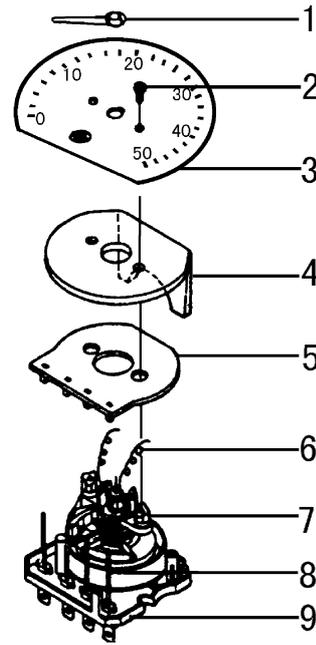
## Instrument assembly and disassembly

Before disassembling the instrument, pull out needle 1, and then loosen two screws 2.

When disassembling the printed-circuit board; pull it out directly after welding off two wires 9(the printed board and blade connector are directly connected together through a spring blade socket on the board).

Generally, do not disassemble the unit core. If it has to be disassembled, weld off both the upper and the lower hairsprings, and the conductive blade at first so as not to damage the hairsprings. In addition, do not break the coil output wire.

- 1.Needle 2.Screw 3.Dial 4.Light guiding glass
- 5.Printed circuit-board 6.Connection wire 7.Bracket
- 8.Blade connector 9.Base



## Trouble analysis

Trouble	Case	Repair
The instrument doesn't work	Circuit broke	Check wire connection and connector with socket's contact
	Sensor damaged	Replace sensor
	Instrument burnt out	Replace instrument
Needle shakes abnormally	Wire connection is not good	Check wire connection
	Integrated body damaged	Replace integrated body
Needle clicked	There's foreign objects in the core	Remove foreign objects
Needle doesn't return to zero	Needle slacked	Press the needle firmly and turn to zero
	Core is clicked by foreign objects	Remove foreign objects

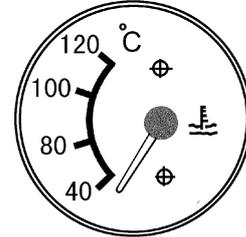
# Electric System

## Water Temperature Meter and Fuel Meter

### Dial description

#### Water temperature meter

The water temperature meter is used to indicate the temperature of the engine coolant. The temperature of the coolant will change because of the temperature of the atmosphere and vehicle running condition. If the indication of the meter is over its normal range, stop the vehicle as soon as possible. Under the condition of too hot engine, continuously drive the vehicle will cause the damages of the engine.



#### Fuel meter

The fuel meter is used to indicate the fuel level in the tank. The indication may change slightly because of braking, turning, or accelerating of the vehicle. Please fill the fuel tank in time before the fuel is used up.



### Technical parameter

Water temperature meter	Type	Moving magnet
	Indicating range ( °C )	40 ~ 80 ~ 100 ~ 120
	Meter seat connection	3-M3-6g screw
Fuel meter	Type	Moving magnet
	Indicating range	0 ~ 1/2 ~ 1
	Meter seat connection	3-M3-6g

### Trouble analysis

Trouble	Cause	Method
Fuel meter does not work	Open circuit of the sensor resistance wire	Replace
	Open circuit of the sensor and meter electric wire	Connect
Wrong indication of the fuel meter	Sensor floater cracked and does not float	Replace
	Wrong connection between meter and sensor	Check and connect
	Floater lever deformed or seized	Repair or replace
Water temperature meter does not work	Sensor does not match with fuel meter	Replace
	Instrument power supply opened	Check and connect
	Open circuit of the sensor	Replace
Water temperature meter indication stays at 40 °C	Open circuit of the water temperature meter	Repair or replace
	Sensor damaged	Replace
Water temperature meter indication increase to 120 °C suddenly	Short circuit of the circuit or induced plug	Check or replace