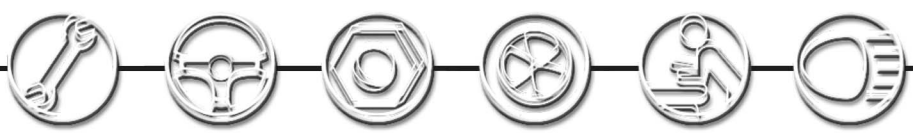
GREAT WALL

SERVICE MANUAL



GREAT WALL MOTOR

HOVER

Preface

Since the Great Wall Hover is put into the market, it has won the favor from the customers for its elegant appearance, excellent performance&price ratio,concept of double area and eternal safety.The car is furnished with Mitsubishi 4G64 engine.It has both the type of five shifts manual transmission and the type of automatic transmission as an option. At the same time, there are also options of ABS and safety airbag, etc. Before of its complex structure, high technical intervention and difficulty of maintenance, its maintenance needs the reference of related documents. Upon the request of the after-sale maintenance technical personnel of Great Wall, we have prepared this Hover Maintenance Manual. The manual is oriented towards the after-sale maintenance technical personnel of the Great Wall, and mainly introduces the disassembly of the various systems of Hover (refer to the maintenance manual of motor for the introduction of the motor), the troubleshooting, matters needing attention for maintenance and the related technical parameters.

During the preparation of this book, a lot of professional personnel have given support and help, here we would like to express our sincere thanks.

Though we have made efforts to prepare this manual earnestly, we cannot guarantee that the content in the manual is totally accurate and without error. The user cannot raise improper request to the Great Wall Company with the manual as legal basis. We cannot bear any responsibility for the losses caused by using this manual. Confined to the knowledge of the editor, the fault and errors are inevitable, your advice and comment are appreciated.

The final authority for the interpretation of this manual belongs to the Great Wall Motor Co., Ltd.

Instrodution

Maintenance procedure

Most part of the maintenance operation can be started from referencing the illustration. These illustrations help you recognize the parts and show the mutual coordination.

How to use this manual

In order to help you to use this manual, the chapter name and main topics are given at the upper side of each page.

To introduce to you the maintenance items, there is an index on the first page of each chapter.

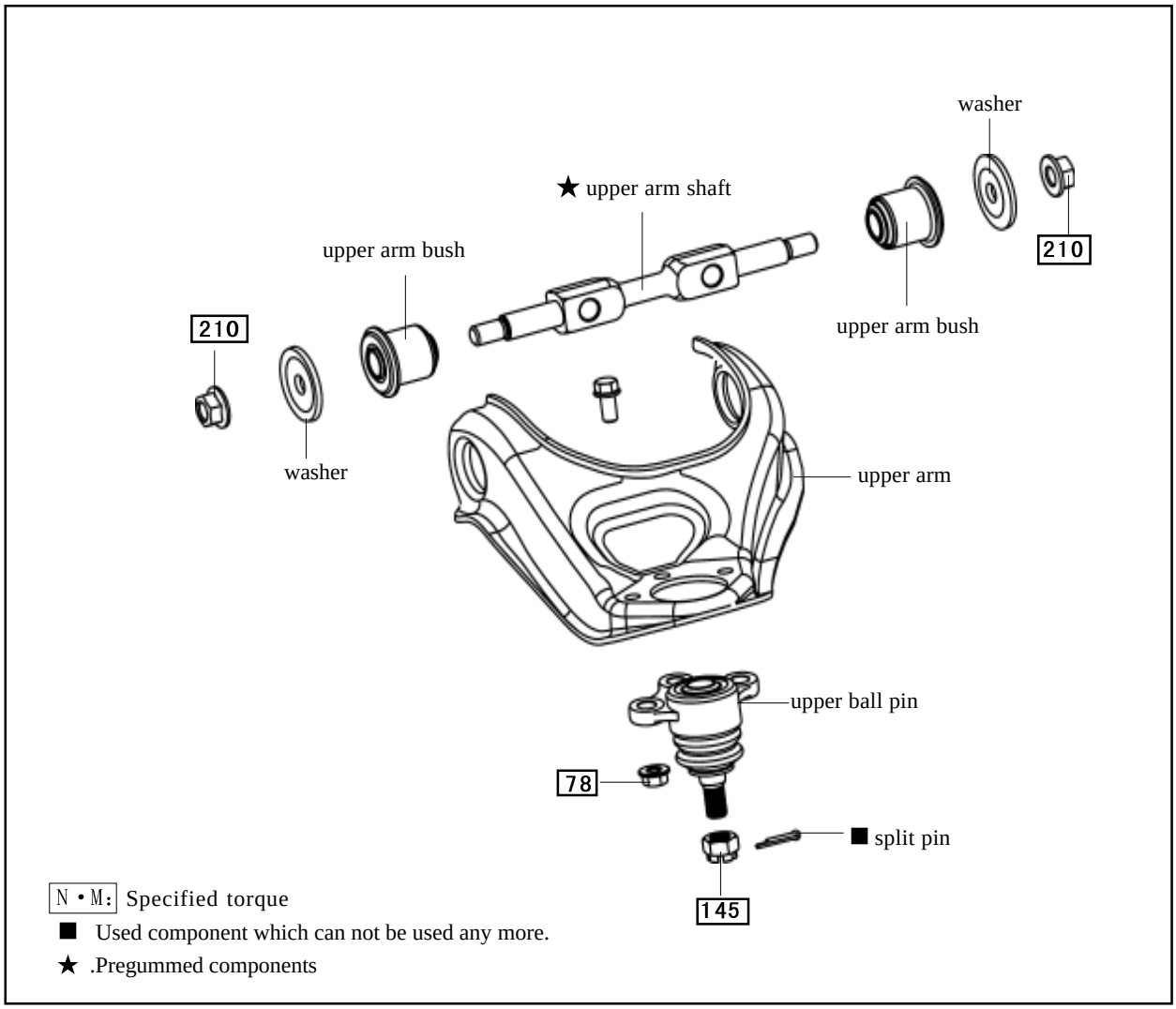
At the beginning of each chapter, there are also the matters needing attention of all the maintenance operations.

Please read the following matters needing attention before starting the maintenance work.

The failure diagnostic list of each system can help you to diagnose the failure of the system and find out the causes of failure.

The maintenance method with regard to the possible causes is given in the column of maintenance method to facilitate you to acquire the method of solving the problem quickly.

For example:



The maintenance procedure is explained in the form step by step:

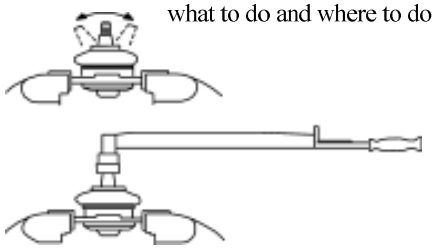
- The illustration shows what to do and where to do.
- The topic of maintenance work tells you what to do.
- The detailed instruction tells you how to finish the maintenance work and introduce other related issues, such as specification and warning, etc.

For example：

Work topics: what to do

Detailed instruction: How to do

illustration : what to do and where to do



3. Check the drive of ball pin

a. Remove the ball pin.

b. As shown in the Figure, shake the ball pin back and forth for several times before mounting the cap nut,

c. Turn the but with torque meter continuously, turn one cycle every 2 to 4 seconds, read the torque meter at the fifth cycle.

Specification

Tightening torque (for rotary):

Upper ball pin 0.1 — 4N • m

Lower ball pin 0.1 — 4N • m

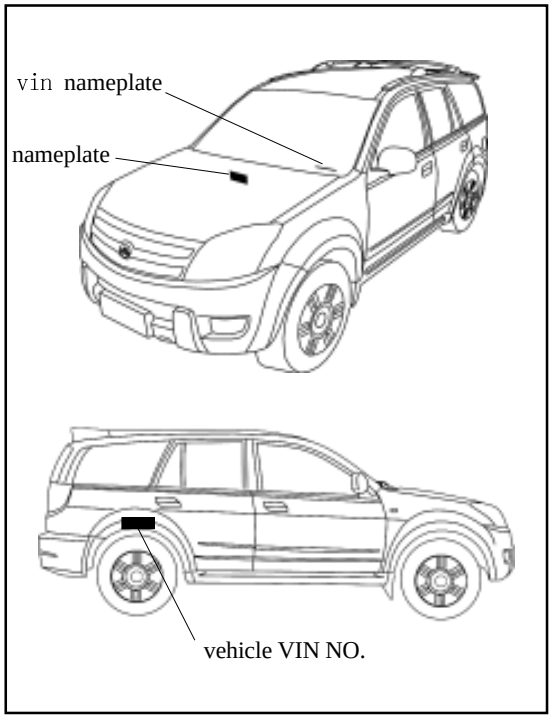
This format can help the experienced technical personnel to locate the causes of failure quickly. The maintenance personnel can browse the work topics, and reference the detailed explanation below it only when necessary. The important specification and warnings are given in bold face letter.

Specification

In the whole manual, each maintenance step is given with corresponding specification in bold face letter, so there is no need to stop working to look at the specification. All the specification can be located quickly in Annex A.

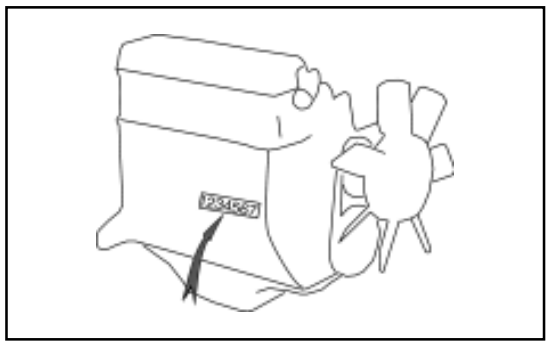
Warning, Attention, Remarks:

- The Warning is given in bold face letter, which means there is the possibility of harming both the person himself and others.
- The Attention is written in bold face letter, which means there is the possibility of damaging the parts under maintenance.
- The Remarks is written separately in the instruction, it is also in bold face letter. Its main function is to make some additional explaining to help you to finish the repair work more efficiently.



Identification mark

The identification code of the car is a unique code of 17 bits to identify the car. Besides appearing on the label plate of the entire car, it is also inscripted on the external right side of the right stringer (chassis number) and on the VIN nameplate at the upper left part of the panel.



Motor serial number

The manufacture number of motor is inscripted on the right side of the cylinder .

Comprehensive maintenance instruction

1. Use the protection plate, seat and floor covering cloth to make the car clean and prevent it from being damaged.

2. During the disassembling, place the components in order for the convenience of assembly.

3. Observe the following issues:

a. Before conducting the electrical work, remove the negative pole of the cable from the accumulator terminal.

b. When it is necessary to remove the accumulator for checking or maintenance, the cable shall be removed from the negative pole (－) connected to the car body.

c. In order to avoid the damage of accumulator terminal, when removing the cable, loosen the terminal nut, then pull the cable upwards vertically, do not twist or pry it.

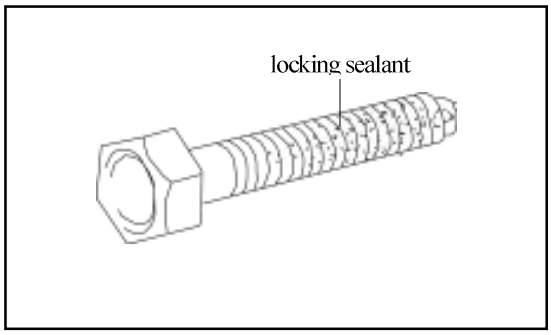
d. Please use cleaning cloth to clean the accumulator terminal. Do not use file or other similar tools, which may scuff them.

e. Mount the cable terminal onto the binding post of the loosened nut, then tighten the nut. Does not use hammer to knock at the terminal onto the post.

f. Do remember to check whether the positive pole (＋) terminal cap is in its position.

4. Check all the soft tubes and wire terminal, check to see whether they are connected correctly and firmly.

5. Used component which can not be used any more.



a. The following spare parts needs always to be renewed: split pin, seal gasket, O ring and oil seal, etc.

b. For the used component which can not be used any more, it is indicated by symbol "¦" in elements diagram.

6. Precoated component

The precoated component includes the bolt and nut which is precoated with the locking sealant in factory.

a. If the precoated component is tightened, loosed or moved by any reason, it must be recoated with the specified sealant.

b. Coating procedure of precoated component

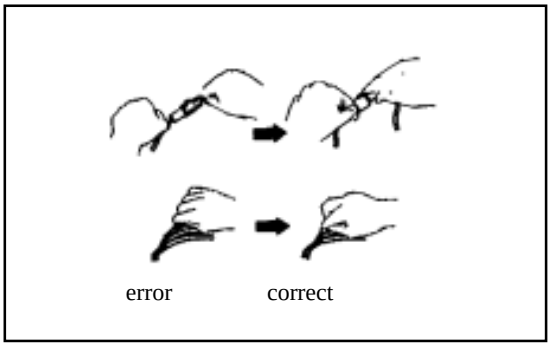
Remove the old sealant from the screw of component by washing. Dry it by compressed air.

Coat the screw of components with the specified locking sealant.

c. The precoated component is indicated by symbol "?" in elements diagram.

7. It can use the sealant or seal ring to prevent the leakage if necessary.

8. Abide by all specifications for bolt torque strictly. It should use the torque wrench.



9. Determine the necessity of using special maintenance tools and special maintenance material according to the practical situation of maintenance. Use them on the necessary position, and go on with the maintenance according to proper procedures.

10. To replace the fuse, check to see whether the rated current of new fuse is correct. Do not exceed the rated current of the fuse, or do not use the fuse with low rated current.

11. When jacking up or supporting the car, lift or support the car on proper position with care.

a. If only jacking up the car in the front part or rear part, choke up the wheel to ensure the safety.

b. After the car is jacked up, use frame to support it. It is dangerous to conduct maintenance on the car that is only jacked up with one screw jack, even for the minor maintenance that can be finished quickly.

12. Paying attention to the following matters to avoid the damage of components:

a. If it is not absolutely necessary, do not open the housing of the ECU and the computers (if the IC terminals are touched, the IC may have electrostatic damage).

b. When removing the vacuum tube, pull the end of the tube instead of the central part of the tube.

c. When pulling the wire terminal, pull the terminal itself instead of the wire.

d. Take care to not make the electrical components fallen, such as the sensor or relay.
If they fall to the hard ground, they must be replaced.

e. Never use the striking wrench to remove or install the electric thermostat or thermostat sensor.

f. When checking the conducting state of the wire connector, insert the multimeter with care, do not bend the terminal.

g. When using the vacuum meter, do not insert the soft tube onto large connector. Use the stepped terminal. Once the soft tube is swelled and tightened, there may be leakage.

Chapter 1

Overview of the entire car

Basic parameter

The basic parameters of the complete vehicle of CC6460K and CC6460KY estate car should be in accordance with the regulation in Table 1.

Basic parameters of the complete vehicle of CC6460K and CC6460KY

Item	CC6460K	CC6460KY
Dimension parameter(no-load)(mm)		
L	4620	
W	1800	
H	1710(car body)/1755(with tail fin and luggage carrier)	1700(car body)/1765(with tail fin and luggage carrier)
Axle tread	2700	
Wheel tread: front/rear	1515/1520	
Front suspension	850	
Rear suspension	1070	
weight parameter:		
Loading weight(kg)	5 person × 65kg/person ＋ 150kg	
Complete weight(kg)	1720	1830
Max. total weight(kg)	2195	2305
No-load axial load distribution: front/rear(kg)	890/830	980/850
full-load axial load distribution: front/rear(kg)	980/1215	1070/1235
Traffic ability parameter		
Min. turning diameter(m)	≤13	
Min. ground clearance (mm)	≥180	≥175
Approach angle(°)	≥28(no-load)	
departure angle(°)	≥27.5(no-load)	
Dynamic parameter:		
Min. stable speed of direct step(km/h)	≤25	
30km/h～100km/h acceleration time of direct step(s)	≤32	
acceleration time from 1 step starting to 100km/h(s)	≤20	
Max. speed(km/h)	≥160	
Max. Climbing capability(%)	≥35	
Economical character:		
Slipping distance in initial speed of 50km/h(m)	≥500	
Traveling fuel consumption in 90km/h constant speed (L/100km)	≤10.19	
Traveling fuel consumption in 120km/h constant speed (L/100km)	≤13.24	
Under simulated urban and suburb comprehensive operating condition(L/100km)	≤11.9	≤12.5
Braking characteristics:		
Traveling braking distance in 50km/h braking initial speed (m)	≤19(no-load), ≤20(full-load)	
Emergency braking distance in 50km/h braking initial speed(m)	≤38	
Slope stop braking(%)	≥20(no-load), ≥18(full-load)	

Stability:	
Max. side rotary stable angle in no-load and static(°)	≥35
Operating stability(miniture0	Na_n≥60 and N_Z≥60
Smooth characteristic:	
Weighted mean square value of acceleration σ_w(m/s^2)	≤0.6883
Equivalent mean value L_{eq}(dB)	≤116.5
Decreased comfortable limitation T_{CD}(h)	≥1.2

Basic parameters of the complete vehicle of CC6460K and CC6460KY (continued)

Item	CC6460K	CC6460KY
Tightness:		
Dust-proof tightness M(%)	≥95	
Rain-proof tightness(miniature)	≥93	
Noise:		
Exterior noise of accelerating travel dB(A)	≤74	
Interior noise of 50km/h constant speed travel dB(A)	≤79	
Noise around ear of diver dB(A)	≤90	
Emission:		
Meet Europe II emission standard	CO≤2.2g/km, (HC＋NOx)≤0.5 g/km	
Low idle-speed emission of pollutant: (750±50)r/min	CO≤0.1%, HC≤50ppm	
High idle-speed emission of pollutant: (2000±50)r/min	CO≤0.07%, HC≤50ppm	

Engine

For the structure and main technical parameter of engine see Table 2.

Table 2 Structure and main technical parameter of engine

Serial No.	Item	Specification and parameter
1	model	4G64S4M
2	style	4-cylinder, straight-line, water-cooling, single top cam shaft, 4-stroke engine
3	Fuel oil supply method	Multi-point fuel oil injection(MPI)
4	Measuring method of inlet capacity	Speed compact style
5	Combustion room style	Single-slope roof
6	Cylinder diameter × stroke(mm)	86.5×100
7	Total displacement (L)	2.351
8	Compression ratio	9.5:1
9	Max. power and corresponding speed (kW/r/min)	93/5250
10	Max. torque and corresponding speed (N • m/rpm)	190/2500
11	Min. fuel consumption (g/kW • h)	≤254
12	Idle stable speed(r/min)	750±30
13	Idle-speed control	Electronic closed loop control
14	Mean piston speed(m/s)	17.5
15	Mean effective pressure (kPa)	1036
16	Cylinder compression pressure: in 250r/min (kPa)	1320
17	Ignition sequence and control	1-3-4-2; without distributor block, electronic controlled direct ignition
18	Spark plug gap(mm)	1.0～1.1
19	Spark plug model	BKR5E-11 or K16PR-U11 or RC10YC4 BKR6E-11 or K20PR-U11 or RC8
20	Manufacturer of spark plug	NGK or DENSO or Xiang huo ju
21	Valve clearance(mm)	0(hydraulic column)
22	Port timing: Opened inlet/closed inlet Opened outlet/closed outlet	18 ° before upper stop point/ 53 ° after lower stop point 50° before lower stop point/ 18 ° after upper stop point
23	Lubrication method	Combined method of pressure and splash
24	Pressure of engine oil of main oil channel, in idle speed of 3000rpm (kPa)	(≥78.5)/(245-490)
25	Max. engine oil temperature(℃)	130
26	Consumption ratio of engine oil(g/kW • h)	2

Table 2 Structure and main technical parameter of engine(continued)

Serial No.	Item	Specification and parameter
27	Consumption ratio of engine oil and fuel oil (%)	≤0.8
28	Cooling method	Closed forced water cooling
29	Starting method	Electric motor
30	Net weight(kg)	167
31	Outline dimension: L×W×H(mm)	730×653×667
32	Idle-speed emission CO(%)/HC(ppm)	≤0.5/≤100
33	Emission control degree of operating condition regulation	With three unique catalytic converter, air-fuel ratio closed loop control, the equipped light car meets the standard of GB 18352.2－2001

Air inlet system

Dry-type air cleaner.

Exhaust air system

Primary muffler, with two-stage three-way catalyst device.

Fuel supply system

Adjustment of accelerator pedal

The stroke of accelerator pedal is 155mm; adjust the adjusting nut on wire bracket if it does not consist with the standard.

The fuel tank is plastic tank with capacity of 67L; the oil supply control is the mechanical pedal oil control and internal-type electric fuel pump; the type of fuel evaporation is the activated carbon can and electric valve control.

Cooling system

Forced circulation water cooling, electric fan and aluminum tube radiator.

Clutch

The friction, disc, single-diaphragm spring clutch, hydraulic control mechanism. The external diameter of friction disc D=225mm, internal diameter d=150mm, material is F810.

Adjustment of clutch pedal:

1. Measure the height of clutch pedal (from pedal pad surface to floor) and free stroke of clutch pedal (fork bar pin clearance). Standard height of clutch pedal: flush with the brake pedal, free stroke of clutch pedal is 5-15mm;
2. Readjust the free stroke of pedal after adjust the height of pedal; rotate the push bar to the standard value, then fix the bolt and nut;
3. If the free stroke of clutch pedal is not within standard value, it should rotate the adjusting bolt to standard value, then fix the bolt and nut. Do not move the push bar to main cylinder when adjust the free stroke of pedal;
4. If the free stroke of clutch pedal and clearance between the clutch pedal and floor when the clutch is disengaged de not consist with the standard, this may by caused by the air in hydraulic system and failure of main cylinder or clutch. It can discharge the air of system or dissemble and inspect the main cylinder or clutch.

Transmission

For the structure and main technical parameter of transmission see Table 3.

Table 3 Structure and main technical parameter

Serial No.	Item	Specification and parameter							
1	Model	SC5M2D-C				SC5M4D-C			
2	style	manual mechanical step transmission of full synch, 5 forward steps, 1 reverse step, direct manipulation				manual mechanical step transmission with torque divider of full synch, 5 forward steps, 1 reverse step, direct manipulation			
3	Center distance(mm)	72				72(transmission), 222.25 (torque divider)			
4	Max. input torque (N. m)	196				196			
5	Max. input torque (r/min)	5500							
6	Speed ratio	Step I	Step II	Step III	Step IV	Step V	Step R(Reverse)	Step H(high)	Step L(low)
7	Gear pair of speedometer	8:25							
8	Total net weight(kg)	38				68(include torque divider)			
9	Outline dimension: L×W×H	1070mm×466mm×399mm(not include height of steering level)				1070mm×460mm×380mm(not include height of steering level)			

Drive shaft

The structure of rear drive shaft assembly of CC6460K wagon is the three cross-axle universal joints, two drive shafts with extens intermediate support free-maintenance segmental structure. The front and rear drive shaft assembly of CC6460KY wagon has the universal joints, one drive shaft with extension spline, free-maintenance integral structure respectively.

Front shaft/axle

CC6460K wagon has the two-cross arm, independent suspension, breakaway front axle.

CC6460KY wagon has the two-cross arm, independent suspension, breakaway steering drive axle , hyperbolic gear single-stage main reducer, plain bevel gear differential mechanism, universal drive semiaxle, Birfield ball-joint, main reduction ratio i_0=4.55, Max. input torque is 900N • m.

Rear axle

Non-breakaway drive axle, integral stamping-welded axle housing, hyperbolic gear single-stage main reducer, plain bevel gear differential mechanism, semi-floating semiaxle, main reduction ratio i_0=4.55, Max. input torque is 900N • m.

Wheel and tyre

The type, specification and main parameter of wheel and tyre see Table 4.

Table 4 Type, specification and main parameter of wheel and tyre

Suspension

The front suspension is the torsion bar spring, double-cylinder inflatable hydraulic damper, transverse stabilizer rod, double cross-arm independent suspension. The distance between the center of front shaft of lower arm fixing nut and level ground is 295mm±1mm.

The rear suspension is the four-connecting rod, coil spring, double-cylinder inflatable hydraulic damper, transverse stabilizer rod, no independent suspension.

Carriage

Peripheral trapezoidal structure; welded by two box section longitudinal beams and several box or tube section cross beams.

Steering system

Pinion-and-rack power steering-gear, hydraulic assists steering. Breakaway front steering trapezoidal structure. Diameter of quadriradistus steering disc Φ380mm, adjustable angle, power-absorbing steering pipe. For main technical parameters of steering system refer to Table 5.

Table 5 Main technical parameter of steering system

Serial No.	Item	Parameter	Serial No.	Item	Parameter
1	wheel camber	0° ±30′	6	Rotary round of steering disc n	3.64
2	kingpin inclination	12° 30′ ±30′	7	Angle drive ratio of steering system $i_{0\omega}$	18.2
3	kingpin castor	3° 30′ ±30′	8	Force drive ratio of steering system i_{0p}	198.0
4	toe (mm)	0～2	9	Normal efficiency of steering gear η_+	≥75%
5	Steering angle of internal and external wheel (°)	32/28	10	Reverse efficiency of steering gear η_-	≥60%

1. Adjustment of .4-Wheel Alignment

Test and adjust the front wheel alignment value and adjust the toe on the 4-Wheel Alignment meter.

a. Adjustment of kingpin castor: The standard value is 3° 30′ ±30′ (adjust the difference of left and right kingpin castor to within 30′);

b. Adjustment of toe: The toe with standard value of 0～2mm is adjusted by rotating the steering cross rod. When adjust the toe, it should rotate the cross brace in left and right side evenly. Tighten the lock nut after adjustment, the torque is 55 - 65N • m.

c. Centering and fix of steering wheel: according to the display of the alignment gauge, turn the front wheel to right ahead, after removing the steering wheel without changing the position of steering lever, mount the steering wheel with center aligned, the radials of the steering wheel shall be in the bilateral symmetry position, and the symbol of Great wall on the steering wheel shall be in the confrontation position of the driver, tighten the nut, with a tightening torque of 25 - 35N • m.

Left wheel left steering: ≥32°, right wheel left steering: ≥28°;

Left wheel right steering: ≥28°, right wheel right steering: ≥32°;

b. Under the light condition of the car, the height between the center of front axis fixed bolt of the lower suspension arm to the ground is 295 ± 1mm, if the dimension is not within this scope, reach it through adjusting the torsion bar adjustment arm bolt;

c. The reference dimension of the height of the car is : the left and right deviation is less than 10mm;

3. Checking the free gap of steering wheel:

Turn the orientation of the car to front, stop the engine, exert a force of about 4.9N on the steering wheel along the circumferential direction to make the it turning to the left, there is resistance force, stop turning when the resistance force is growing; then turn the steering wheel to the right, stop turning when the resistance force is felt to be growing; the radian value that the external edge of steering wheel runs is the free gap of the steering wheel, its standard value shall be less than or equal to 20°, and the corner from the central position to the left or right shall be no larger than 10.

Brake system

The front wheel brake is ventilation coil type, the rear wheel brake is disk and drum type. The service brake type is that the double-loop vacuum assist hydraulic brake is applied on the front and rear disc brake. The parking brake is mechanical dragline acting on the drum brake of the rear wheel.

The free stroke of brake pedal is 20mm～30mm, and the operating stroke of the pedal is 120mm. The operating stroke of the brake handle is 17° (3 teeth)～30° (8 teeth).

1. The adjustment of brake pedal

Measure the operating stroke of the brake pedal, the standard value is 120mm. When the eighth is no in compliance with the requirement, make adjustment according to the following procedures:

a. Separate the brake lamp switch wire connector, loosen the blocking nut, and turn the brake lamp switch to the position that the stopper is not touched;

b. Unscrew the blocking nut of the operation connecting rod, use the thinnose pliers to turn the operation connecting rod, adjust the brake pedal height to standard value, after reaching the standard value, tighten the lock nut;

c. Turn the brake lamp switch to the position that the stopper of brake pedal is just touched, continue the turning for 1/2～1 circle, and tighten the blocking nut;

d. Connect the brake lamp switch wire connector;

e. The brake lamp should not be light when the brake pedal is in release status.

2. Standard value of brake pedal free stroke: 20-30 mm

a. Under the stopping status of the engine, step on the brake pedal for 2～3 times, clear the influence of brake assistor, then use hand to push the brake pedal to the position that there is resistance, measure the amount of movement (free stroke). It shall be in compliance with the regulation of standard value;

b. If the gap is less than the regulation value, check to see whether the gap between the carrier rod of brake lamp switch and the brake pedal is in compliance with the regulation. If this gap is exceeding the regulation, it means that the gap between the drive rod clevis pin and the brake pedal arm is exceeding the regulated value.

3. Start the engine, step down the brake pedal with a force of about 700N,ehck the main brake pump, whether there is oil leakage on the connection positions of the brake pipeline. If there is, maintain it.

4. Operating status test of brake assistor

Conduct the operation status test of the brake assistor according to the following methods:

a. Start the engine, stop if after operating for 1～2 minutes. Step on the brake pedal for several times with normal force. Expect that the pedal can be fully stepped down a the first stepping, the height of the brake pedal shall be raised on and on with the stepping, thus means that the brake assistor operates normally, if the height of the pedal is not changed, it means that the brake assistor is damaged;

b. Under the stopping status of the engine, step on the brake pedal for several times, confirms that the height of brake pedal is elevated on and on, under the status that the brake pedal is stepped down, start the engine. At this time, the brake pedal will move down a bit, it means that the brake assistor is working normally. If the brake pedal is moving upwards, it means that the brake assistor is damaged;

c. Under the operation status of the engine, step down the brake pedal to stop the operation of the engine. AT this time, the there shall be no change of the height of brake pedal within 30 seconds, it means that the brake assistor is working normally. If the brake pedal is moving upwards, it means that the brake pedal assistor is damaged.

5. Adjustment of the parking brake system:

a.For positioning, pull the brake bar to the limit position for over 3 times, use a force of about 400N to pull the brake parking lever, count the number of knocking teeth. The standard value of stroke of parking brake : 17° (3 teeth) ～30° (8 teeth);

b.If the stroke of brake parking lever is too big and not in compliance with the requirement, adjust it with the following methods:

Loosen the brake parking lever, unscrew the adjusting nut.

Remove the adjuster hole cap from the brake assembly, use screwdriver to turn the adjustor in the arrow direction to the limit that the brake drum cannot turn.

Rotate 5 teeth in the counter arrow direction.

Rotate the adjusting nut, adjust the brake parking lever stroke to the standard value.

c. If the stroke is less than the standard value, unscrew the adjusting nut to make it reach the standard value.

d. Check to see whether the adjusting nut and the rod are loosened, whether the adjusting nut is fixed in the fixed seat.

e. After adjustment, jack up the rear part of the car. Loosen the brake parking lever, the brake disc shall not be dragged when checking the rear wheel.

f. The breaking in of the parking brake: use the force of about 200-250N to pull the brake parking lever,drive the car for about 400m with a speed of about 60km/h, repeat for 2-3 times, then test on the slope of 30%, the car shall be able to be parked.

Car body

The structure shape and parameters of the car body is shown in table 6.

Table 6 The structure shape and parameters of the car body

Serial No.	Item	structure and parameter
1	Car body	
1.1	Structure shape of car body	Long head two boxes five doors five seats totally metal enclosed type hard top no carrier type car body
1.2	White car body	Punching, welding, totally metal enclosed type structure
1.3	Door assembly	Frame type, card plate type door lock, hinge type hinges, with side protection rod, four side doors open outwards by turns, rear door open upwards. Centralized controlled door lock, electric drive glass frame riser
1.4	Engine bonnet	Opening upwards and backwards, single arm hinge
2	Internal and external decoration and auxiliary components of car body	
2.1	Internal decoration	Softening design, in compliance with the man-machine engineering and comfort ability requirement
2.2	Meter board	Injection molding type structure, metallic framework
2.3	A, B, C pole and inter door protection plate	Injection molding, set with sundries box on the door protection plate
2.4	Cab handle	Metallic frame, PVC surface, PUR foaming layer in the middle
2.5	Windscreen	Panorama curved surface windscreen. Front wind window: triplex glass, with a thickness of 4.76mm. Rear wind window: toughened glass, with electrical heating defrosting resistance wire, with thickness of 3.5mm. Other windows: toughened glass, with thickness of 3.5mm
2.6	Rearview mirror	External rearview mirror: electric drive, electrical heating defrosting, anti dazzle type, the left and right side are all convex mirror, with a radius of curvature of 1400mm. The internal rearview mirror: manual, anti dazzle type, plane endoscope.
2.7	Seat	Pilot and co pilot seat: independent seat, front and back position, the backrest angle and seat headrest, etc. can be adjusted. Back seat: independent seat, the backrest angle and seat headrest, etc. can be adjusted.
2.8	Safety belt	Back seat middle seat two points fixed type, three pointes fixed emergency blocking mechanical safety belt for other seats.
2.9	Sun visor	Luxurious type, with lamp and cosmetic mirror
2.10	Skylight	Electric drive skylight
2.11	Front and rear bumper	Overall design type, PP injection molding

Checking and commissioning of the auxiliary components of car body:

Stop the car stably, check the doors, engine cover, fuel filling port cover, meter and tools box cover, front and rear ash tray cover, floor center console sundries box cover, CD disc conveyer (VCD disc conveyer), power socket cover, etc. they shall be reliable and flexible during starting, opening and closing, without blocking and insufficient closing and abnormal sound;

Electrical system

The structure and parameter of the electrical system are shown in table 7.

Table 7 Structure And Parameter of Electrical System

No.	Item	Structure and Parameter
1	Power, starting and charging system	
1.1	Lines	Singe line system, voltage DC 12V, negative earth
1.2	Accumulator	55D26R maintenance free type, voltage 12V, 20 hours capacity 60Ah, storage capacity 101min, low temperature starting current 475A
1.3	Starter	12V, 1.2kW
1.4	generator	Internally furnished with adjustor type generator. 14V, 90A
2	Illumination and signal system	
2.1	Front illumination light	white, major high beam 60W,1 on the left and right respectively, auxiliary high beam 55W,1 on the left and right respectively, passing lamp 55W,1 on the left and right respectively. Head light base center height H: 920mm±20mm
2.2	Position light	Front position lamp: white, 5W,1 on the left and right respectively. Rear parking lights: red, 5W,1 on the left and right respectively.
2.3	turn light	Amber。Front and rear turn light: 21W,1 on the left and right respectively. Side turn light: 5W,1 on the left and right respectively,
2.4	Fog light	Front fog light: white, 55W, 1 on the left and right respectively. Rear fog light: red, LED,1 on the left and right respectively.
2.5	Brake light	Red, 21W, 1 on the left and right respectively, high position brake light, 10W, 2 in the middle
2.6	License light	White, 5W, 1 on the left and right respectively.
2.7	Backup light	White, 21W, 1 on the left and right respectively.
2.8	Danger warning signal light	All the turning signal lights, danger alarm switch control
2.9	Back repeating reflector	Red, none triangle shape, forming combination light with the rear fog light
2.10	Front, middle and back ceiling light in the room	White. Front indoor ceiling light: 10W, 2 pieces. Middle indoor ceiling light: 10W, 1 piece. Back indoor ceiling lights: 5W, 1 piece
2.11	Cigar lighter illumination	Blue, 3W, 1 piece
2.12	Ash tray illumination	White, 3W, 1 piece
3	Meter system	
3.1	Combined instrument	Car speed odometer, engine speed indicator, water temperature meter, fuel gage
3.2	Indicator lamp	Refer to the drawing
4	Auxiliary electrical system	
4.1	Rain wiper system	Front and rear rain wiper DC motor. Front rain wiper: four rods type, electric drive three gears (high and low speed + adjustable interval), scraper 2 pieces, 55W. Rear rain wiper: single arm type, electric drive one gear, with 1 scraper plate, 21W
4.2	Defogging, defrosting device	Front wind window hearing type, back wind window heating type glass, switch control
4.3	Electric drive glass frame riser	Drive side general control, independent control oh other windows and doors
4.4	Central control lock	With remote control
4.5	Camborne power socket	12V, 2 pieces
4.6	Radio, CD and loudspeaker	Stereo radio, six discs CD, four sound channels

4.7	Cigar lighter	12V, 1 piece
4.8	Horn	Treble and bass
4.9	Safety airbag	Electric main and auxiliary airbag

Checking and commissioning of the auxiliary components of car body:

1. Stop the car stably, check the doors, engine cover, fuel filling port cover, meter and tools box cover, front and rear ash tray cover, floor center console sundries box cover, CD disc conveyer (VCD disc conveyer), power socket cover, etc. they shall be reliable and flexible during starting, opening and closing, without blocking and insufficient closing and abnormal sound;

2. The major lamp high beam and city beam, the alternating light, taillight, turn light, brake light, front and rear mist light, malfunction alarm light, indoor light, instrument panel light, ignition switch light, etc. shall operate normally, without the failure of no lighting,constant lighting and error lighting , etc;

3. Checking the performance of front head light

a. The high beam luminous intensity of each head light ≥20000 cd/ piece

b. Beam center left and right deviation (when the beam is irradiating on the screen of 10 m away):

Left light high beam: left 17 cm right 35 cm

Right light high beam: left 35 cm right 35 cm

Left light city beam: left 17 cm right 35 cm

Right light city beam: left 17 cm right 35 cm

c. Beam center height (when the beam is irradiating on the screen of 10 m away):

Head light city beam 0.7～0.9 H; head light high beam 0.9～1.0 H

H means the head light center height 920±20mm.

4. The adjustment of multi functional meter:

a. Drive the car onto the trench, insert the car speed transducer, drive the car to open places, press the ADJ switch for no less than 3 seconds, the orientation indicator begins to flash. Drive the car slowly for one circle within 2 minutes, the orientation indicator will stop flashing, it shall points to the practical normal direction.

Note: E — east, W — west, S — south, N — north.

b. The adjustment of time:

Press the “MODE” switch for over 2 seconds, the time can be adjusted, press the MODE switch to adjust the minute, then press the MODE again to adjust the hour, adjust the time through pressing the “▼”and “▲” key. After the time is adjusted, press the ”MODE” switch for over 2 seconds to quit the time adjustment mode.

c. Check to see whether the absolute altitude meter and the car speed response display are working normally.

d. Drive the car onto the trench again, pull off the car speed transducer plug.

5. The adjustment of rain wiper nozzle cleaning mixture ejection height:

a. Put the ignition switch to the ”ON” position, open the rain wiper nozzle switch, the position of front cleaning mixture nozzle shall be evenly distributed along the middle height of the front windshield glass from left to right.

b. The position of the rear cleaning mixture nozzle is deviated to right of the center of rear windshield glass for about 20mm-120mm, and the height is within the scope of 50mm at the center of the glass. If the deviation is large, the nozzle needs to be adjusted.

Air-conditioning system

The structure and parameter of the air-conditioning system is shown in table 8.

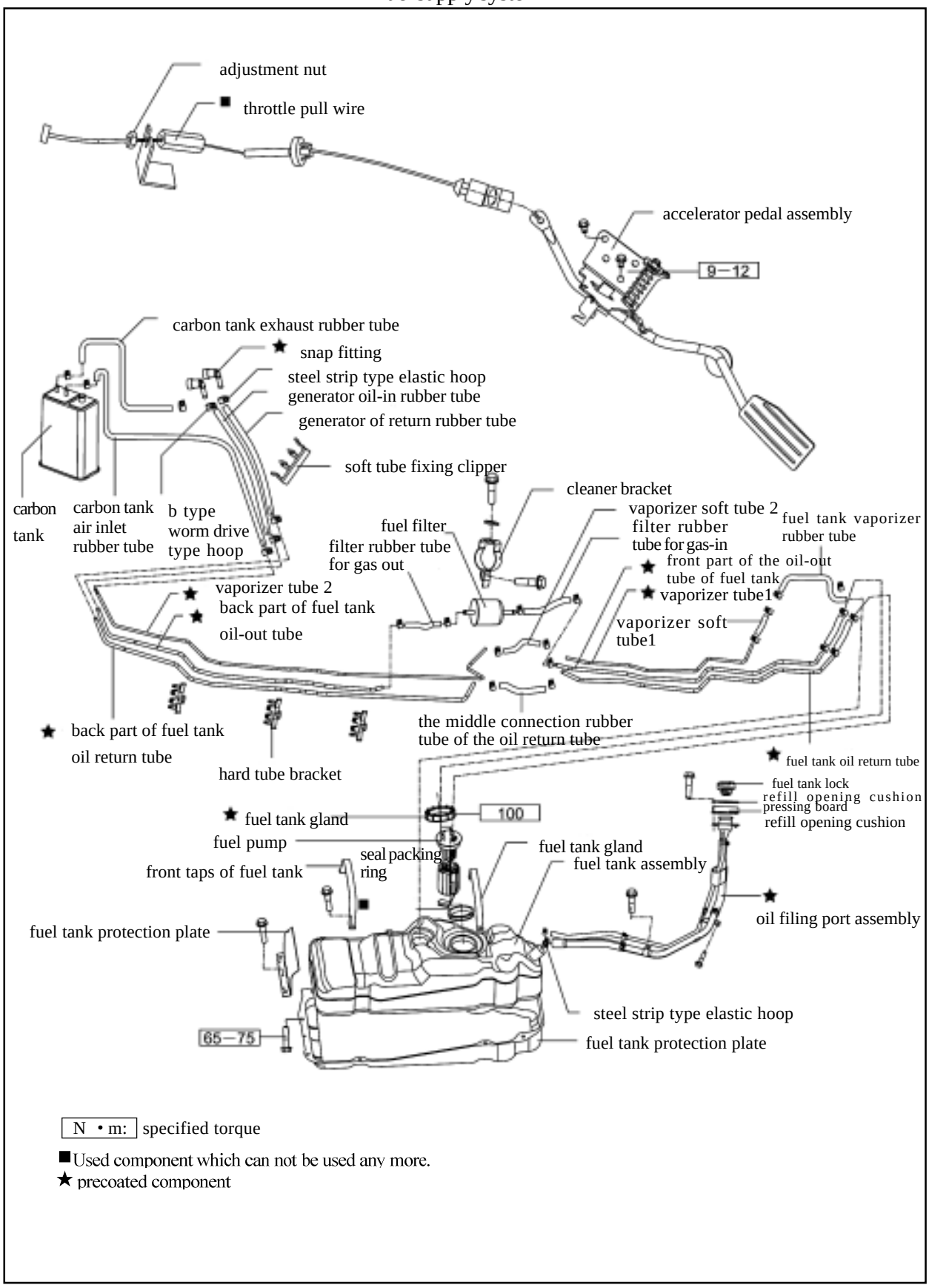
Table 8 The structure and parameter of the air-conditioning system

Serial No.	Item	Structure and Parameter
1	Structure and shape	Front and rear heating and cooling air conditioner, vapor compression type cooling, hot-water heating
2	Performance and parameters	Refrigerating capacity 3.5kW, heat exchange capacity 3.5kW, fan capacity 350m^3/h
3	Operation	Control board button type operation, temperature auto control, air door micro motor drive, the temperature in the car can be controlled automatically, the fanning position mode, heating/cooling mode, air intern/external cycling mode and wind speed and temperature can be selected and adjusted
4	Refrigerant	R134a
5	Compressor	SD7V16 variable capacity compressor, with a maximum capacity of 160ml
6	Condenser	Parallel stream mode structure, flat pipe thickness of 26mm
7	Evaporator	Two boxes structure, cascading evaporator, F expansion valve, centrifugal blower
8	Drying fluid collector	External diameter Φ60.5mm
9	Refrigerating pipe and warm water pipe	Refrigerating pipe: complex structure of rubber refrigeration soft tube and aluminum tube. The warm water pipe: rubber molding pipe
10	Transducer	Outdoor temperature sensor, indoor temperature sensor, evaporator temperature sensor
11	pressure switch	Three-state pressure switch

Chapter 2

Fuel supply system and exhaust system

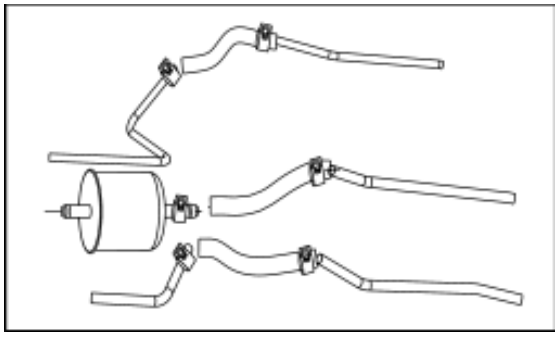
Fuel supply system



N • m: specified torque

■ Used component which can not be used any more.

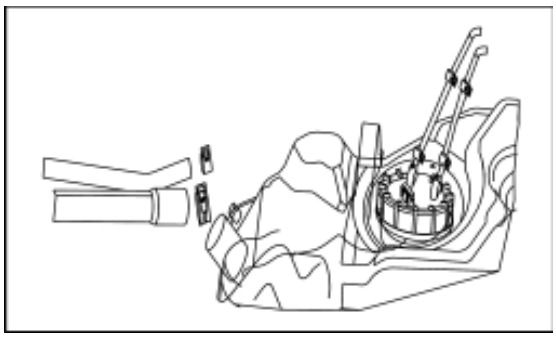
★ precoated component



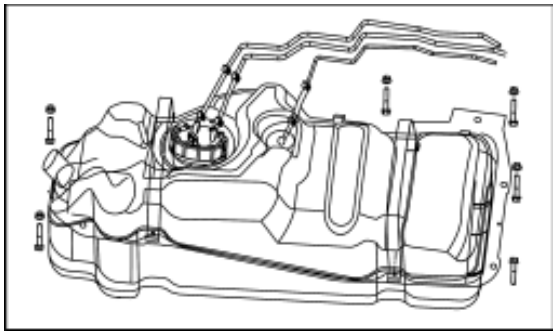
Caution: When maintaining the fuel supply system, if the oil path needs to be removed, the pressure of the fuel system must be released to avoid the ejection of high pressure fuel.

Disassembly of the fuel tank

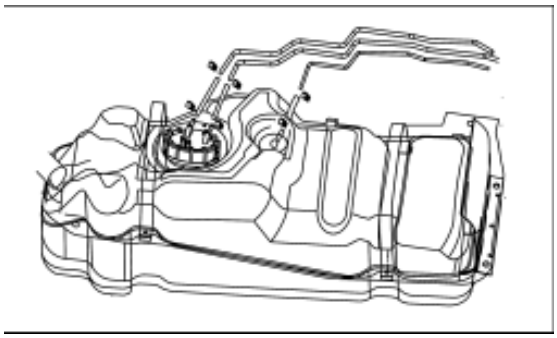
1. First remove the oil-in and oil return hard tube of the generator, the oil return hard tube of fuel tank, and the connection rubber tube between the back parts of hard vaporizer tube. Release the pressure of oil path system slowly, block the joints with cotton cloth, lest there is ejection of high pressure oil.



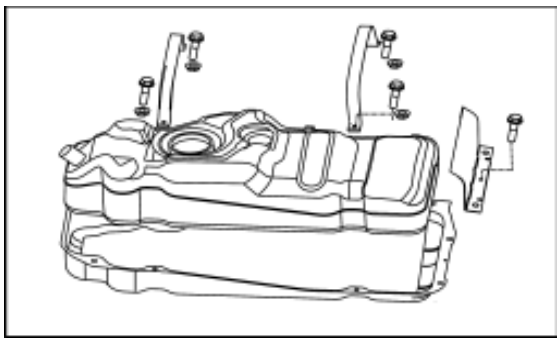
2. Remove the oil filling port at the back of the fuel tank and the clip of the connection rubber tube of ventilation tube, there are two clips altogether.



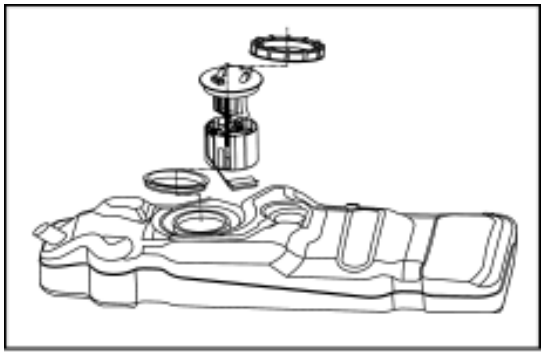
3. Remove the bolts fixing the fuel tank, there are 6 bolts altogether;



4. Remove the oil-in and oil-out tube from the fuel tank, remove the vaporizer tube joints and line bundle connector;



5. If necessary, remove 2 fuel tank fixing pull strips, there are four bolts totally, one bolt on the fuel tank protection plate, remove the sealing rubber along the fuel tank, the fuel tank, fuel tank support board and the fuel tank protection plate can be removed.



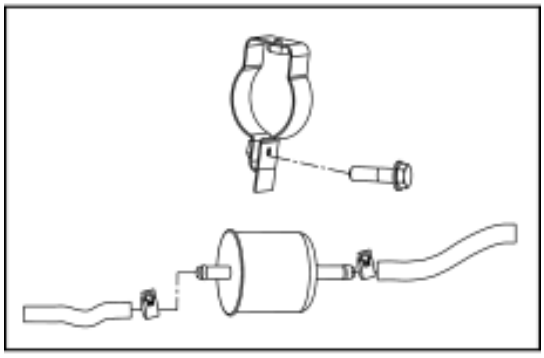
The disassembly and installation of the fuel pump

1.The disassembly of the fuel pump

a. Clear the dirt around the connection flange of the fuel pump
b. Use special tools to rotate the fuel pump gland nut counter clockwise to remove the fuel pump gland nut.
c. Remove the fuel pump and frame assembly, do not damage the fuel transducer.
d. Remove the sealing ring and discard it.

2. Installation of the fuel pump

a. Clean the installation flange of the fuel pump, the fitting surface of fuel tank and sealing;
b. Install the fuel pump and frame assembly, ensure that the fuel transducer is not damaged;
c. Keep the pump assembly in proper position, the arrow on the pump and the ledge of the nearest position on the fuel tank shall be parallel;
d. Use tools to tighten the fuel pump gland, with tightening torque of 100N • m.

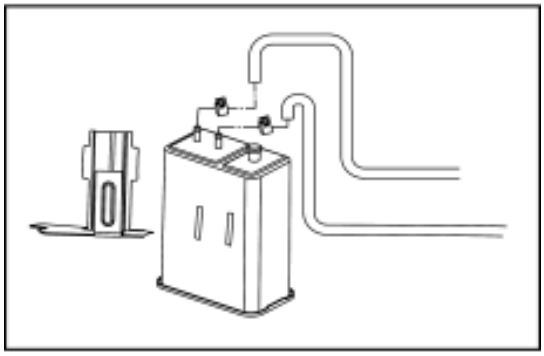


Removal of components of fuel supply system

Gasoline filter disassembly

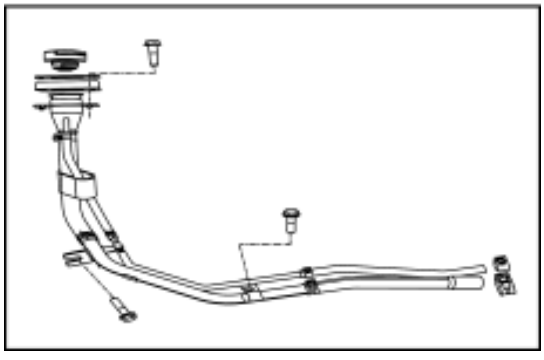
1. Firstly, use the straight screwdriver to remove the hose clamp and remove the connecting rubber hose on both sides of gasoline filter;

2. Loose the bolt on the gasoline filter bracket, then remove the gasoline filter for complete replacement.



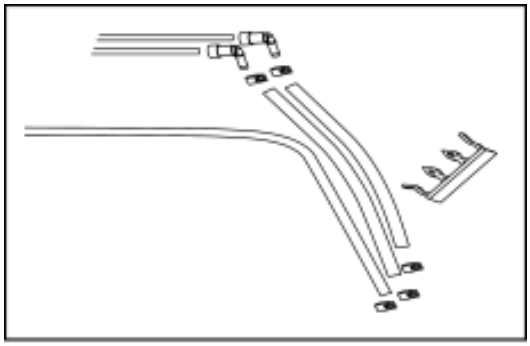
Removal of carbon tank

1. Firstly, use the piers to remove the elastic hoop and two connecting rubber hoses on carbon tank;
2. Pull out the carbon tank along the direction of the carbon tank.



The disassembly of the fuel filler pipe

1. Remove the bolt 1 on lock of fuel filling port, 3 totally;
2. Remove the fixed bolt 3 between the fuel filling pipe and carriage, 1totally;
3. Remove the fixed bolt 2 between the fuel filling pipe and carriage beam; 1 totally;
4. Remove the elastic hoop between the fuel filling pipe and fuel tank connecting rubber hose; 2 totally.



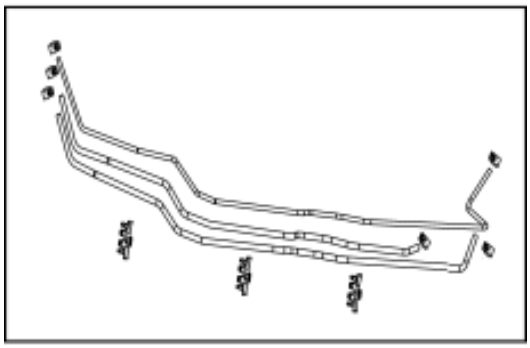
Removal of fuel pipe

1. Remove the connection between the in/return fuel connector of engine fuel track and the fuel supply pipe:

a. Remove the elastic hoop firstly;

b. Remove the package connector; press down the button of package connector by hand, then pull it out outwardly.

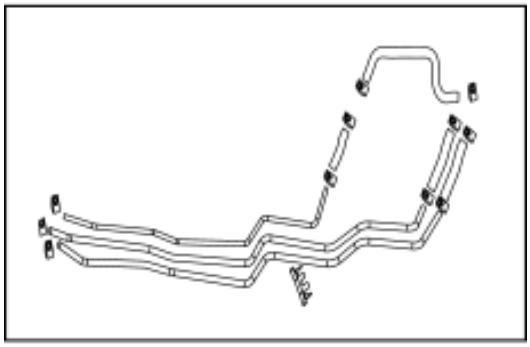
c. Remove the three-line plastic clip.



2. Removal of front section of fuel hard pipe

b. Pull out the fuel pipe form the clip fixing base, then remove the hard pipe;

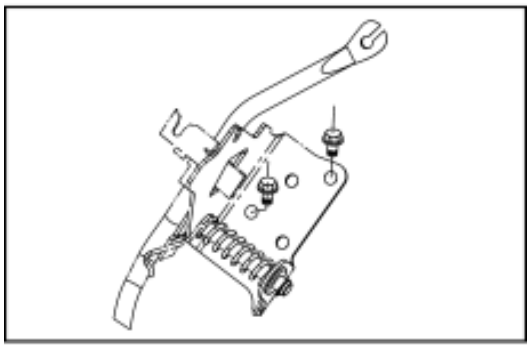
c. Remove the fixing base on the longitudinal beam if necessary rotate the fixing base for 90 degree in clockwise or anticlockwise, the take out it.



3. Removal of rear section of fuel hard pipe

a. Remove the connecting elastic hoop of two ends of rear section of fuel hard pipe;

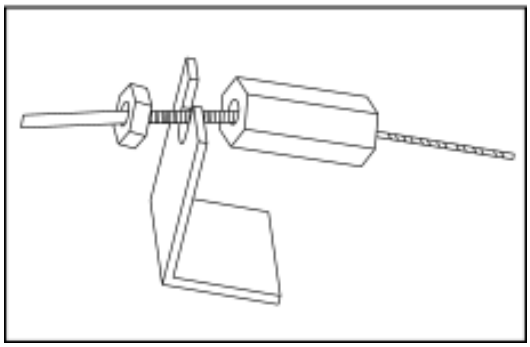
b. Pull out the fuel pipe form the clip fixing base, then remove the hard pipe ;



Removal and adjustment of throttle control system

1. Removal of accelerator pedal

Remove the two fixed bolts which fix the pedal ;

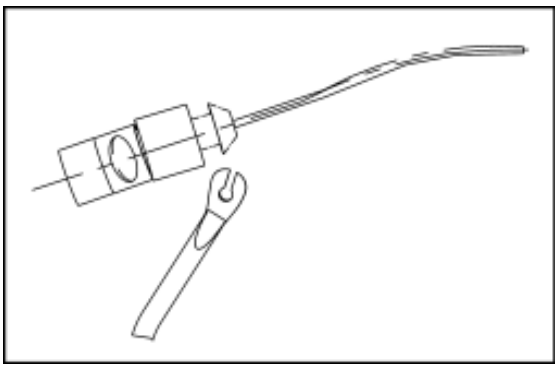


2. Removal of throttle pull-wire

a. Firstly, disconnect the connection on motor, then loose the fixed bolt ;

b. Remove the plastic clip of throttle pull-wire on pedal, remove the end of throttle pull-wire;

c. Use the pliers to clamp the clip on the side of engine compartment to remove the fixing base of pull-wire on the façade of engine compartment.

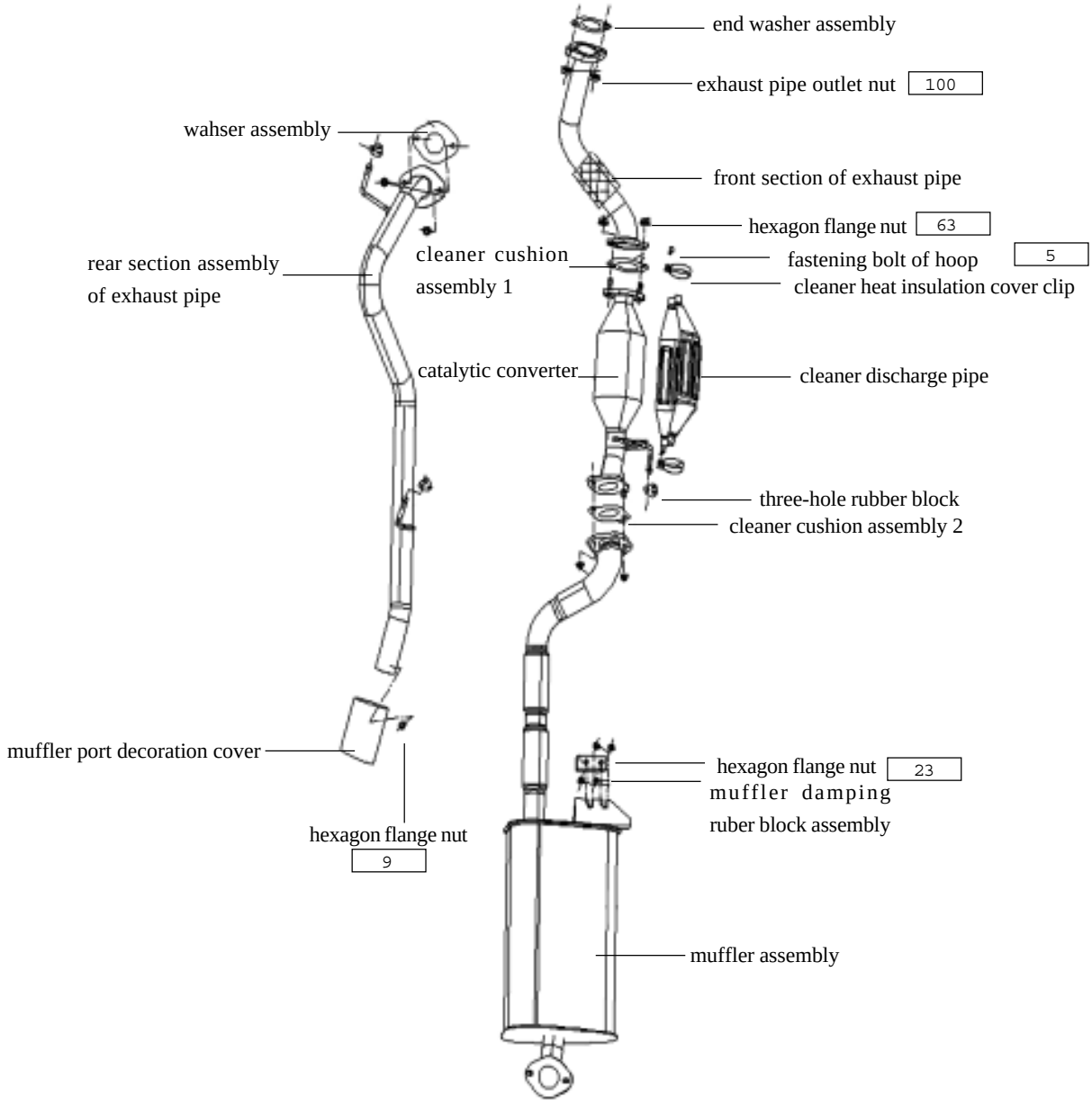


3. Adjustment of accelerator pedal

a. The pedal stroke of accelerator pedal is 155mm. Adjust the adjusting nut on the pull-wire bracket if doest not meet the requirement.

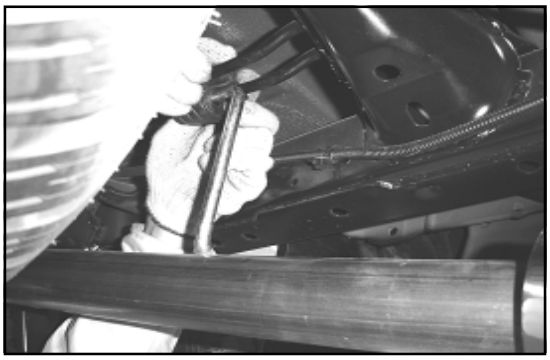
b. The difference in height between the accelerator pedal, brake pedal and front apron is 45 ± 5mm. when assemble the accelerator pedal assembly.

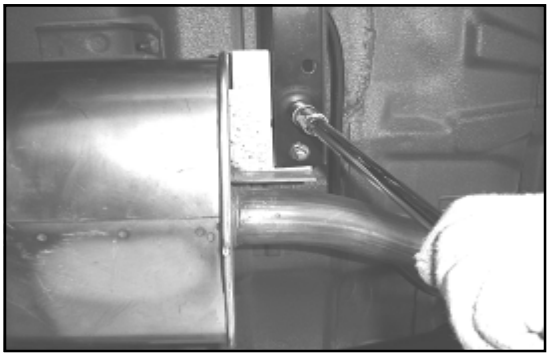
Exhaust system



N.m Specific torque

■ Used component which can not be used any more.





Warning : All components of the exhaust air system should be disassembled 30 minutes after shut down to avoid the human injury caused by hot parts.

Removal of exhaust pipe assembly

Removal of exhaust tail tube

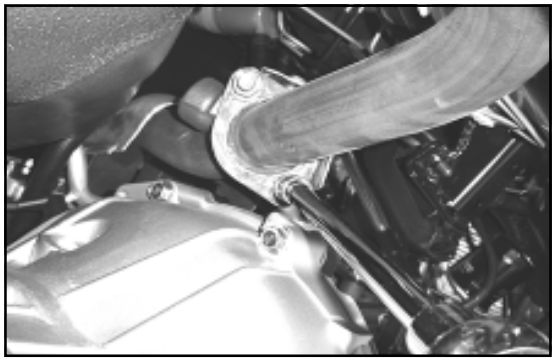
1. **Firstly, use the M15 box spanner, ratchet wrench and extension bar to remove the connecting nut of the rear flange of muffler assembly and rear section flange of exhaust pipe, take out the seal bush between the flanges.**
2. **Remove the three-hole rubber block on the back of the rear section of exhaust pipe.**
3. **Remove the three-hole rubber block on the front of the rear section of exhaust pipe.**

   Caution: The bush between the rear flange of muffler and rear section flange mainly has the function of sealing; it may cause the great pressure and distortion after one installation, the sealing effect is worse, and the bush cannot be used repeatedly.

Removal of the muffler

1. **If necessary, dismantle the back section of exhaust pipe according to the method of dismantling the exhaust pipe, if not necessary, only remove the coupling nut between the muffler and back flange of the exhaust pipe;**
2. **Use the M15 sleeve, ratchet wrench or open-end (box) spanner to remove the coupling nut between the front flange of muffler assembly and the rear flange of the cleaner; when implementing this operation, there must be somebody to pull the muffler to prevent it from falling only to cause damage; brick of the muffler;**
3. **Use the M13 sleeve, ratchet wrench to loosen the four nuts fixing the shock absorption rubber**
4. **Then the muffler assembly can be removed.**

   Caution: The cleaner cushion assembly 2 between the cleaner and the front section of the exhaust pipe mainly plays a role of sealing; there may be great pressure and distortion after one installation and the sealing effect is worse, this bush cannot be used repeatedly.



Removal of cleaner

1. If necessary, remove the rear section of the exhaust pipe and the muffler according to the dismantling methods of the exhaust pipe and muffler; if not necessary, just loosen the two nuts fixing the shock absorption rubber brick of the muffler;
2. Remove the coupling nut between the front flange and the rear flange of the front section of exhaust pipe;
3. If the muffler has been removed, the cleaner can be taken out directly; if the muffler is not removed, push the cleaner backwards tenderly, keep certain space between the cleaner and the muffler to make the welding bolt of the cleaner to quit;
4. At this time, the cleaner can be removed.

   Caution: The cleaner cushion assembly 1 between the cleaner and the front section of the exhaust pipe mainly plays a role of sealing there may be great pressure and distortion after one installation, and the sealing effect is worse, this bush cannot be used repeatedly.

Disassembly of front section of exhaust pipe

1. Remove the cleaner according to method of removal of cleaner;
2. Use the M18 box spanner, heavy-duty extension bar, ratchet wrench to loose and remove the nut of exhaust pipe outlet, then takes off the front section of exhaust pipe;

   Caution: The two flat flanges use the interface cushion to ensure the sealing, which is stainless steel punching unit, and can be used for only once.

Installation of exhaust pipe assembly

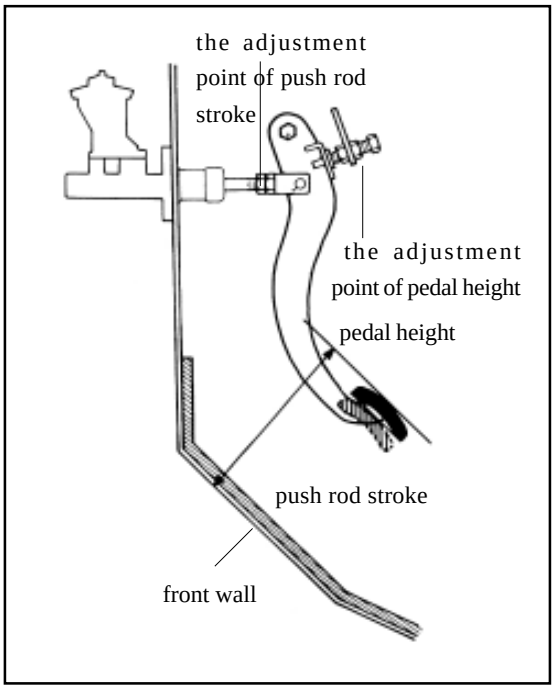
1. The clearance between the both sides of exhaust pipe assembly and each part should be more than 15mm.
2. Coat the installation hole of three-hole rubber block with proper silicon grease; the three-hole rubber block bears the even force after installation.
3. The tighten torque of nut of the front section of exhaust pipe and manifold is 85 ± 5N • m.
4. The vibration damper should be in the uniform force status after the installation of the damping slab rubber assembly of muffler and muffler assembly.

Chapter 3

Clutch

Troubleshooting

failure	cause	inspection content
Shift difficulty or can not shift	Large free stroke of clutch pedal clutch Pipe has air Failure of clutch cylinder Failure of clutch master cylinder The installation position of clutch disc is not in position; large deviation; oil on the friction lining or broken The clutch disc is dirty or with foreign material Failure of clutch cover	Adjust the free stroke of pedal Discharge the air in clutch system Replace replace Inspect the clutch disc; replace Repair if necessary Replace
Disengagement of transmission	The clutch guide bearing is worn.	Replace the guide bearing
Slide of clutch	insufficient free stroke of clutch pedal oil on the clutch disc friction lining or broken failure of press disc separation rocker arm assembly is blocked	Adjust the free stroke of pedal Inspect the clutch disc and replace it Replace the clutch cover Check the separation rocker arm assembly
clutch clamping stagnation/vibration	oil on the clutch disc friction lining or broken failure of press disc clutch membrane spring is bend loose of engine bracket	Inspect the clutch disc and replace Replace the clutch cover Correct the clutch membrane Repair if necessary
Soft of clutch pedal	clutch pipe has air failure of clutch cylinder failure of clutch master cylinder	Discharge the air in clutch replace replace
Loud noise of clutch	Component in clutch housing is loose Throw-out bearing is worn or dirty guide bearing is worn separation rocker arm assembly or pull-rod is blocked	Repair if necessary replace replace Repair if necessary



Inspection and adjustment of clutch pedal

1. Check the correctness of pedal height and stroke of push rod

The pedal height starting from the meter: LHD 157.5mm

The push pole travel at the top of the pedal: RHD 151.0mm

If not correct, adjust the pedal height and push rod stroke.

2. Adjust the pedal height and stroke of push bar if necessary

a. Screw off the locknut, rotate the locking bolt until to the correct height.

Screw on the locknut.

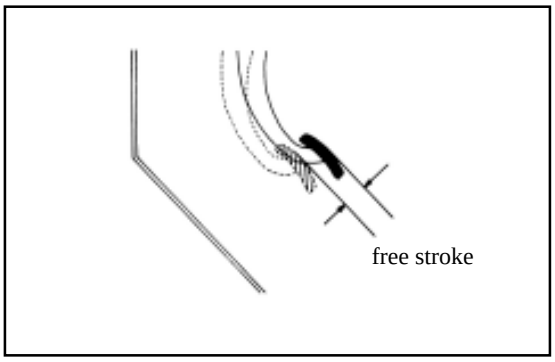
b. Screw off the locknut, rotate the push rod until the stroke of push rod is correct.

Screw on the locknut.

3. Check the correctness of free stroke of pedal

Step on the pedal lightly until fell the clutch start to generate the resistance.

Free stroke of pedal: 5－15mm



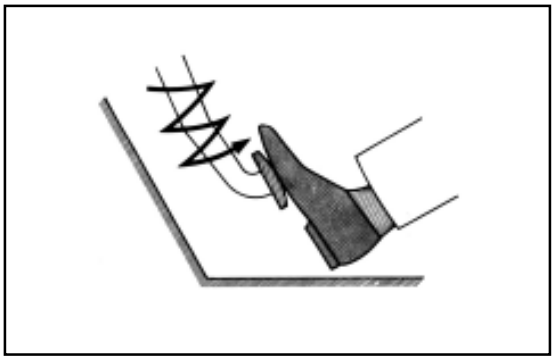
4. Adjust the free stroke of pedal if necessary

a. Screw off the locknut, rotate the push rod until the free stroke is correct.

b. Tighten the lock nut

c. Check the height of the pedal after adjusts the free stroke of pedal.

d. On the condition that ensure the free stroke of clutch pedal assembly: The height difference between the brake pedal, clutch pedal and the front apron is 0～8mm.



Air discharge of clutch

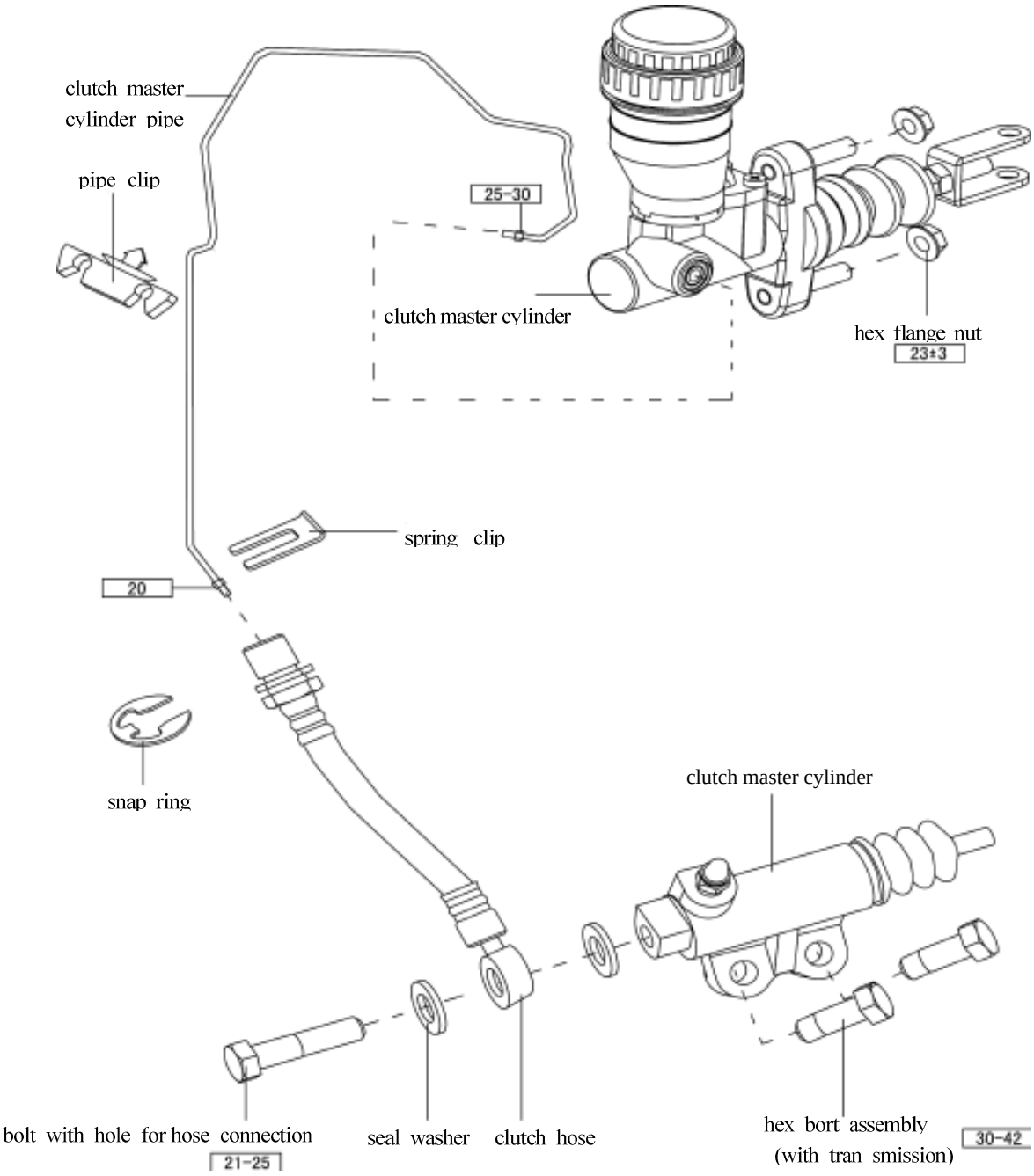
Remarks: It should discharge the air if there is residual air in the clutch system.

Caution: Do not leave the clutch liquid on the painted surface, otherwise it should be washed off immediately.

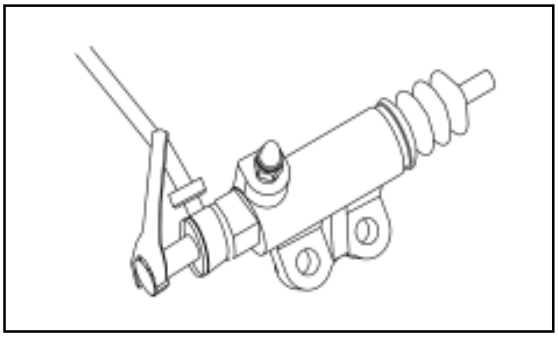
Fill the brake fluid in the clutch storage tank

Check the liquid tank frequently. Filling if necessary.

Cluch control mechanism

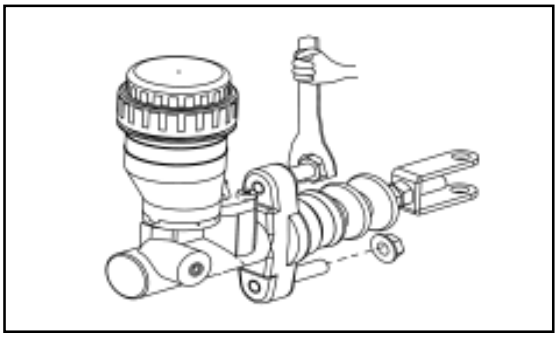


N • m: specified torque

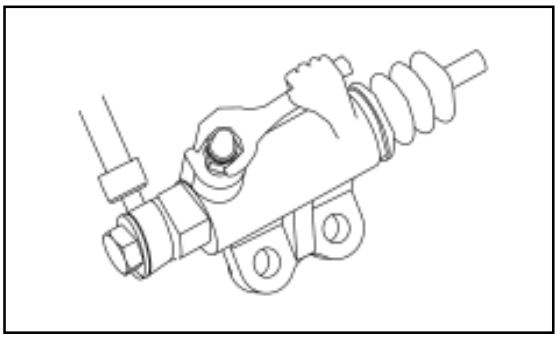


Removal of clutch master cylinder, clutch cylinder

1. **Use the No. 16 open-end wrench to remove the hose connecting bleed bolt, use the cloth to cover the oil outlet of auxiliary pump to avoid the splash of 0brake fluid; step on the clutch pedal for several times to drain the clutch.**



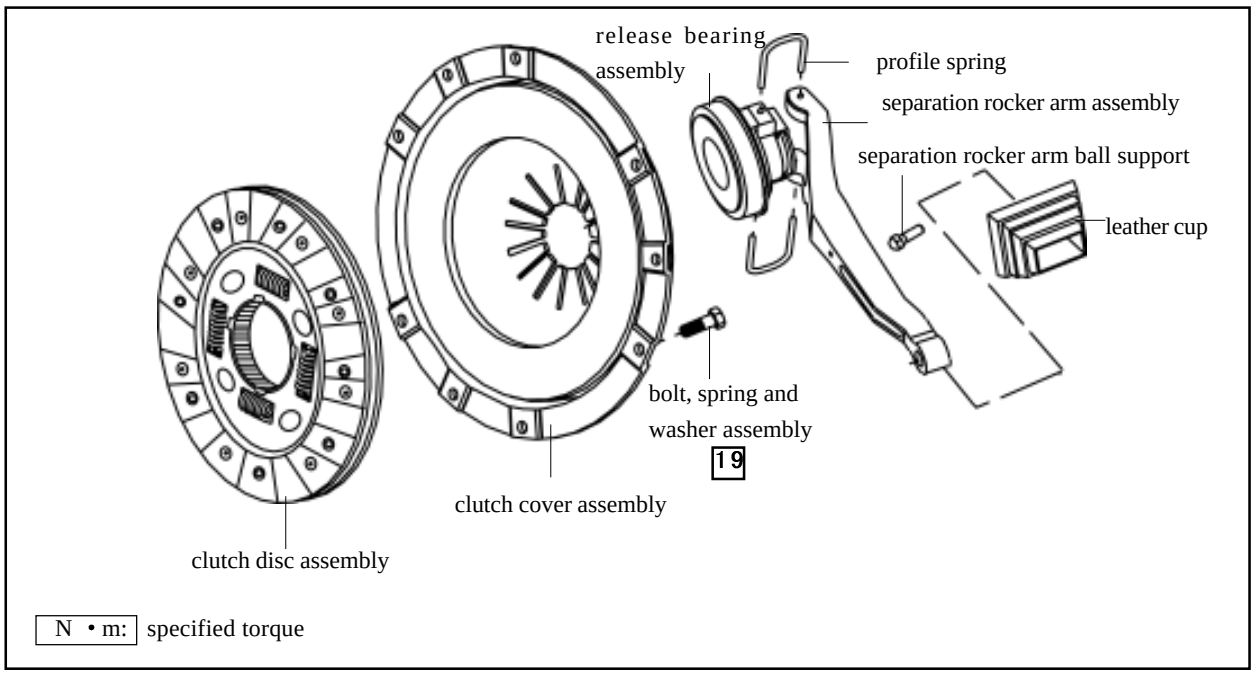
2. **Remove the split pin and cylinder pin connected the master pump connecting fork to the pedal; use the No. 13 socket spanner to remove two nuts Q32008 which is used to install the master pump. Check the clutch master cylinder, replace the complete master pump if the internal of master pump has the abnormal noise and damage of leakage etc.**

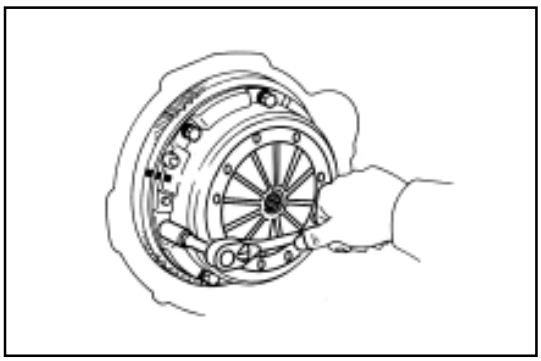


Cautions for installation of clutch operation device:

1. **Installation of clutch hard pipe : Check the hard pipe for deformation, check to see whether the curling at the port of connection pipe is complete and without damage, if there is no problem after confirmation, it can be installed and fixed in the front wall clip and hard-tube clip.**
2. **Coat each rotary parts of peal with the lithium base grease.**
3. **Check the surface of clutch hoes, no surface cracking, oil leakage and dog leg is allowed, use the split washer and spring clip to fix the clutch hose on the support frame of car body.**
4. **Connect the joints of the general pump oil pipe and the general pump and sub pump according to the required tightening torque.**
5. **The air in the clutch oil path needs to be exhausted after filling oil (except the vacuum filling): step on the clutch pedal after filling the oil tank, when feeling difficult in stepping, use the open-end wrench with specification of 11 to loosen the air bleed plug screw to exhaust the air, then tighten the plug screw, repeat the operation for several times. Tighten the air bleed plug screw of the sub pump when there is no foam in the flowing oil liquid. Supplement the oil of the oil tank to the level between the Max and the Min.**

Clutch





Removal of clutch assembly

1.Remove the transmission

Remarks: Do not dry the transmission oil.

2.Remove the clutch cover and clutch disc

a. Make the alignment mark on the clutch cover and flywheel

b. Remove the fixed bolt gradually, until release the tension of spring

c. Remove the fixed bolt, pull out the clutch cover and clutch disc.

3. Remove the bearing and separation fork form the transmission

a. Remove the clip and pull out the bearing .

b. Remove the separation rocker arm assembly and leather cup.

4. Disassembly procedure:

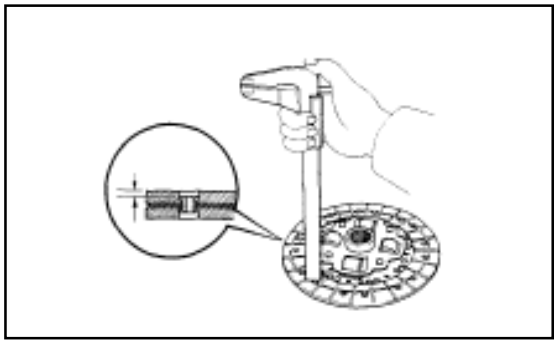
a. Clutch cover assembly, clutch disc assembly

b. Profile spring, throwout bearing assembly

c. Dustproof cover, separation rocker arm assembly

d. Separation rocker arm ball support

Warning: When maintaining the clutch assembly, it is now allowed to use the sand mill or dry brush and compressed air for cleaning, lest there is powder (use wet cloth). The clutch disc has the "asbestos fiber", if there is powder scrap during maintaining, the asbestos fiber in the powder scrap will floats in the air, when human inhales the air containing the asbestos fiber, it will cause great damage to human health.

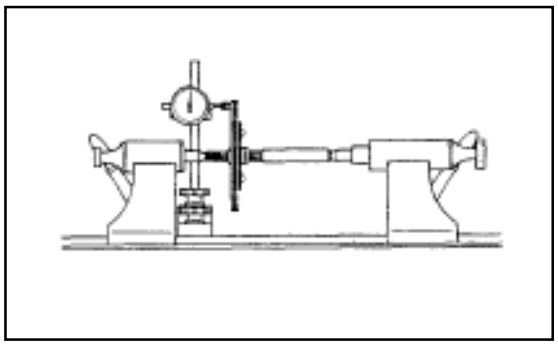


Checking the clutch components

1. Whether there is breakage of the clutch disc

The maximum of the rivet head: 0.3mm

If there is problem, the clutch disc needs to be replaced.

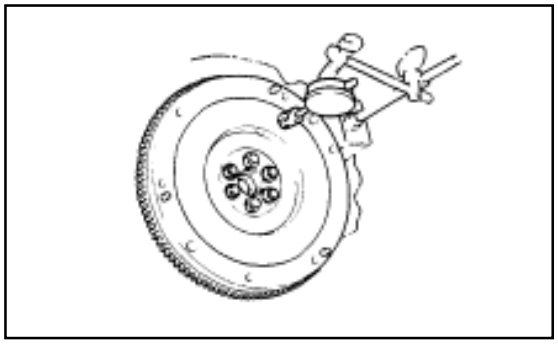


2. Check the radial run-out tolerance of the clutch disc

Use dial gauge to check the radial run-out tolerance of the clutch disc.

The maximum radial run-out tolerance: 0.8mm

If the radial run-out tolerance exceeds the maximum value, the clutch disc needs to be replaced.

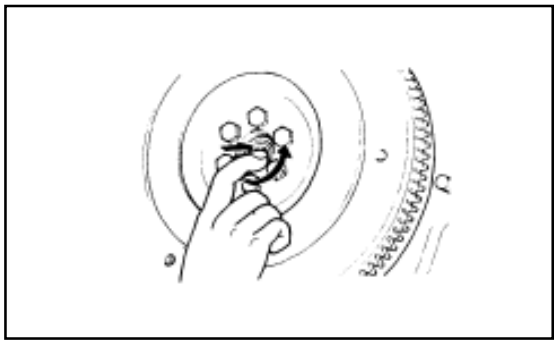


3. Measure the radial run-out tolerance of the flywheel

Use the dial gauge to measure the radial run-out tolerance of the flywheel.

Maximum radial run-out tolerance: 0.2mm

If the radial run-out tolerance exceeds the maximum value, the flywheel needs to be replaced.

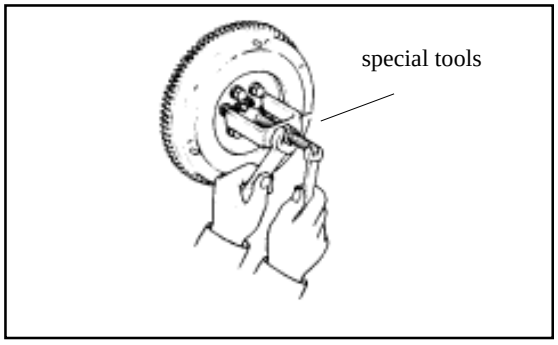


4.Check the guide bearing

Rotate the bearing with hand along the direction of the axis.

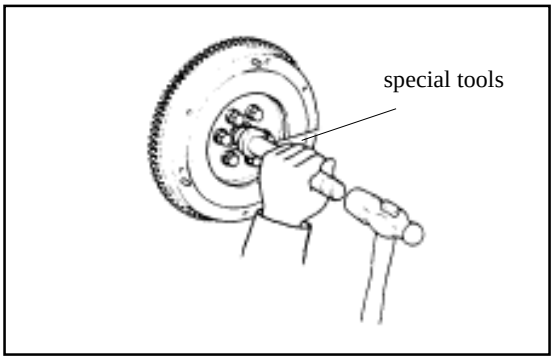
If the bearing cannot be rotated or there is great resistance, the guide bearing needs to be replaced.

Remarks: The bearing is lubricated eternally, so there is no need for cleaning and lubrication.



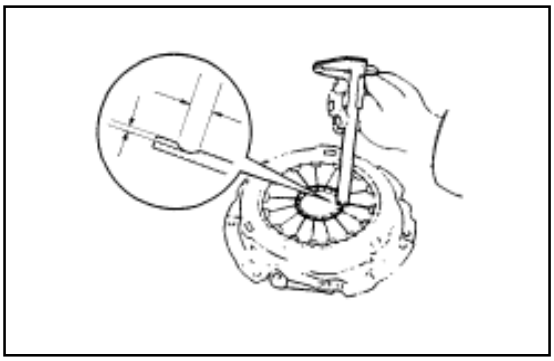
5. If necessary, replace the guide bearing.

a. Use the special tools to remove the guide bearing.



b. Use special tools to install the guide bearing

Remarks: Install the guide bearing into the flywheel, make sure that the bearing can rotate well.

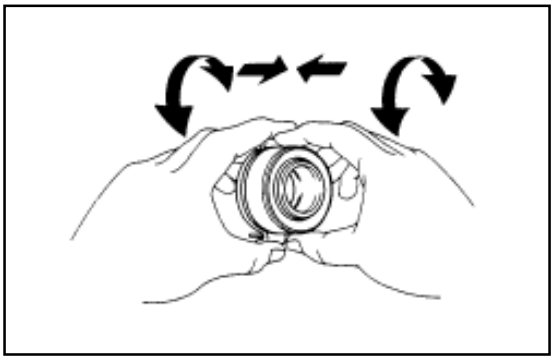


6. Check to see whether there is wearing of the diaphragm spring

Use caliper to check the wearing depth and width of the diaphragm spring

Limit value: maximum depth 0.6mm

Maximum width 5.0mm

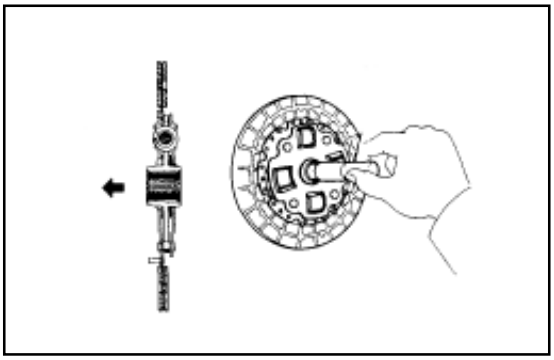


7. Check the throwout bearing

Rotate the bearing with hand along the axis direction.

If the bearing can not rotate or the resistance is too large, it is necessary to replace the throwout bearing.

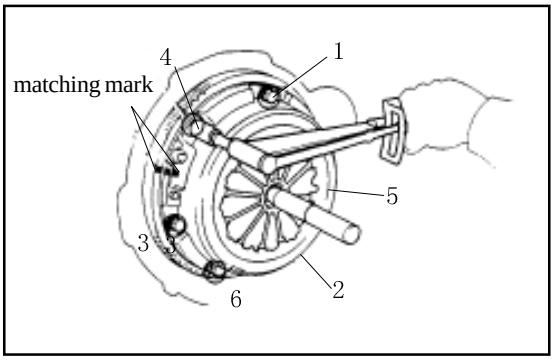
Remarks: The bearing is permanent lubricated, so cleaning and lubricating is unnecessary.



Installation of clutch

1.Install the clutch disc on the flywheel

Use the special tools to install the clutch disc on the flywheel.



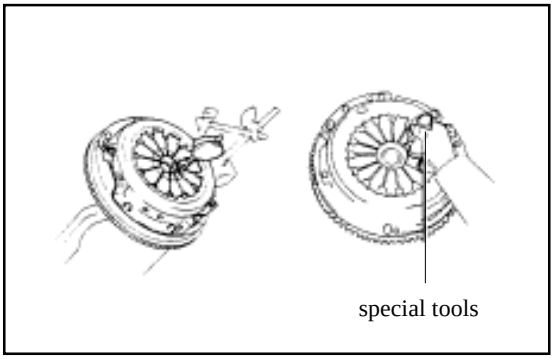
2.Installtion of clutch cover

a. Align the matching mark of clutch shell with that of flywheel .

b. Tighten the bolt evenly. Exert force along the edge of the clutch cover repeatedly until binding tightly. Tighten the bolt.

Tightening force: 19N • m

Remarks: First tighten the upper most bolt of the 3 bolts near the location pin.

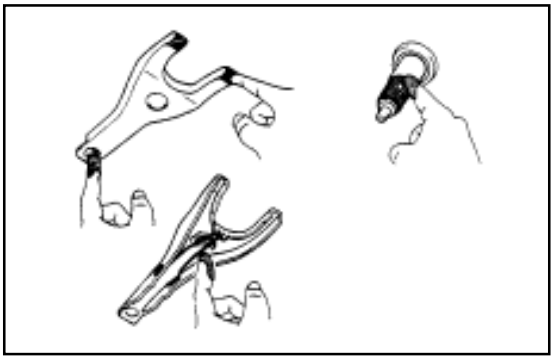


3. Check the end surface runout of diaphragm spring clutch finger.

Use the special tools to check the alignment of diaphragm spring.

Maximum displacement: 0.5mm

If the displacement is greater than the specified value, use the special tools to adjust the face runout amount of the diaphragm spring clutch finger.



4. Coat the following components with the molybdenum disulfide lithium base grease (NLGI NO.2) or multi-purpose grease :

- contacting point of separation rocker arm assembly and bearing bush
- contacting point of separation rocker arm assembly and subcylinder push bar
- separation rocker arm assembly supporting point
- gear box 1st axle spline

5. Install the leather cup, separation rocker arm assembly, clutch cover assembly and throwout bearing in the transmission.

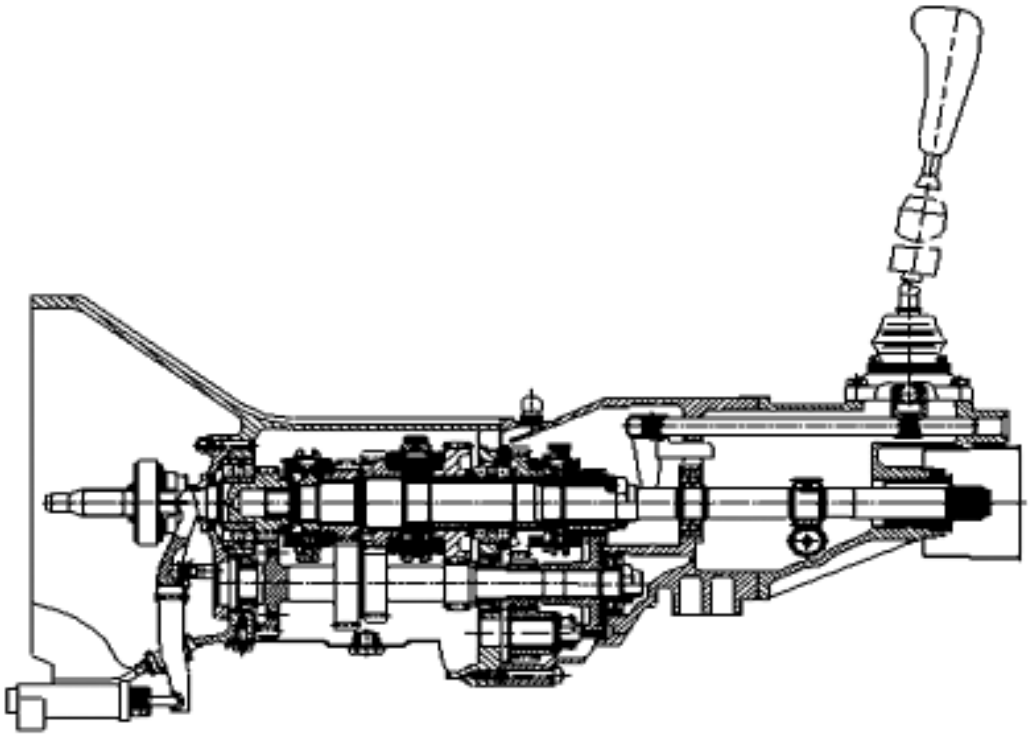
6. Install the transmission

Chapter 4

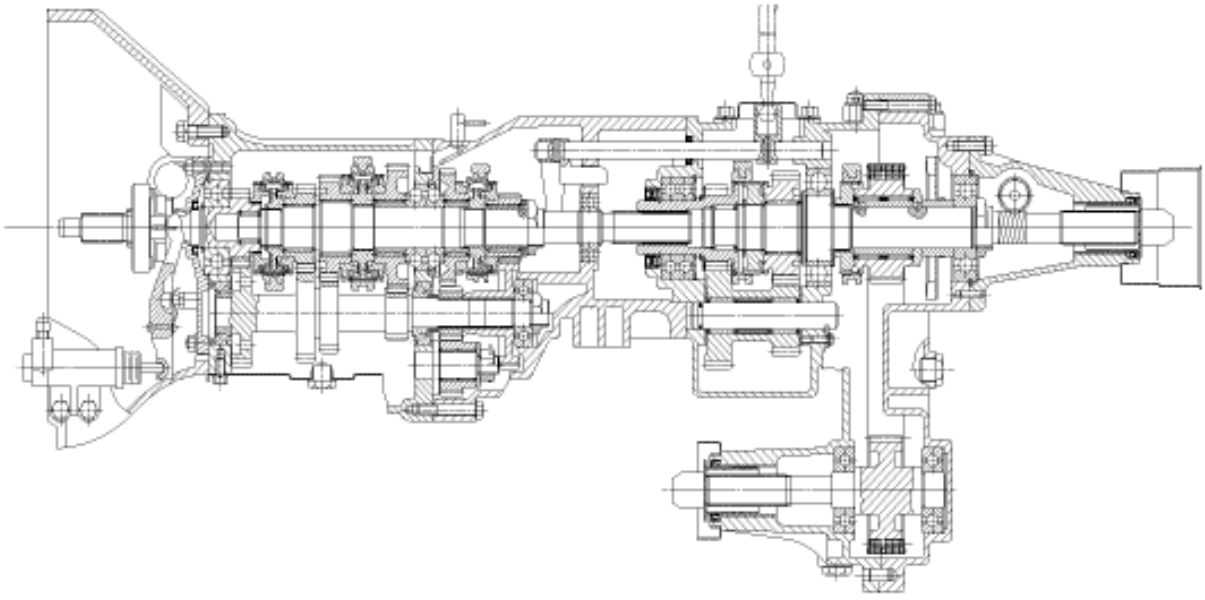
Transmission

Specification of transmission

Structure diagram of SC5M2D-C and SC5M4D-C transmission: shown in figure



Structure diagram of SC5M2D-C transmission



Structure diagram of SC5M4D-C transmission

1. Speed ratio of transmissio

Gear	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ	R
Speed ratio	3.967	2.136	1.360	1.000	0.856	3.578

2. Speed ratio of transfer case SC5M4D-C

Gear synchronizer	H	L
Speed ratio	1.000	1.925

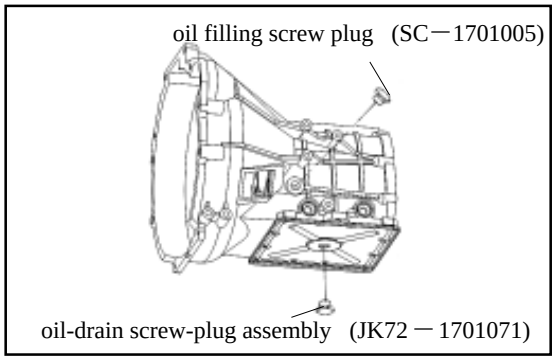
3. Central distance of main shaft

transmission 72 mm

transfer case 222.25 mm

4. Instruction for repair specification of transmission

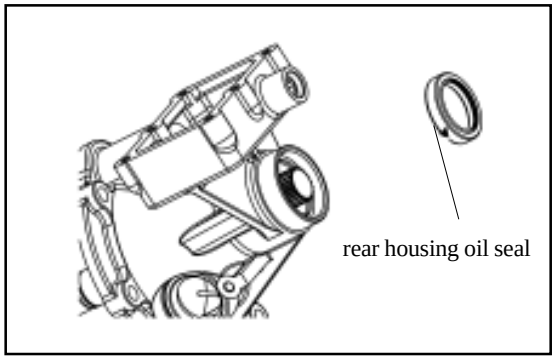
Inspection item	Repair specification
End clearance of gear of Axle 1 (mm)	0～0.06 Adjusted by axial retainer.
Clearance between bearing block and bearing of Axle 1 (mm)	0～0.1 Adjusted by adjusting shim.
End clearance of gear hub of Gear 3/ 4 synchronizer (mm)	0～0.08 Adjusted by axial retainer.
Clearance of rear end cone bearing of intermediate shaft (mm)	0～0.05 Adjusted by adjusting shim.
End clearance of gear hub of high and low gear (mm) SC5M4D-C	0～0.08 Adjusted by axial retainer.
Clearance between the rear output shaft rear bearing and back cover (mm) SC5M4D-C	0～0.1 Adjusted by adjusting shim.
Clearance of rear input shaft bearing (mm) SC5M4D-C	0～0.06 Adjusted by adjusting shim.



Inspection of SC5M2D-C transmission:

1.Check the oil level of transmission:

Screw off the oil discharge plug of the transmission; discharge all lubricate oil; screw on the oil discharge plug to the specified torque; the torque is: 30～35N • m. Fill the transmission with the transmission oil through the oil filling port, oil number is hyperbolic gear oil SAE80W/90, which meet API GL-4, oil capacity are 2.2L. Tighten the oil-filling plug to the specified torque of 30～35N • m. (for area with high or low temperature refer to the maintenance specification)

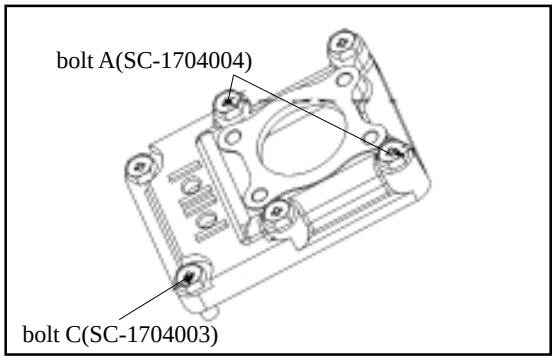


2. Replacement of oil seal of rear hosing:

The replacement of the oil seal of rear housing is shown in figure. Disconnect the drive shaft from the rear housing; remove the oil seal by the flat screwdriver, then use the special tools to knock the rear housing oil seal in the rear housing. It should pay attention to the installation of oil seal, shown as figure. Coat the lip of oil seal with the specified transmission oil.

3. Removal, installation and inspection of transmission

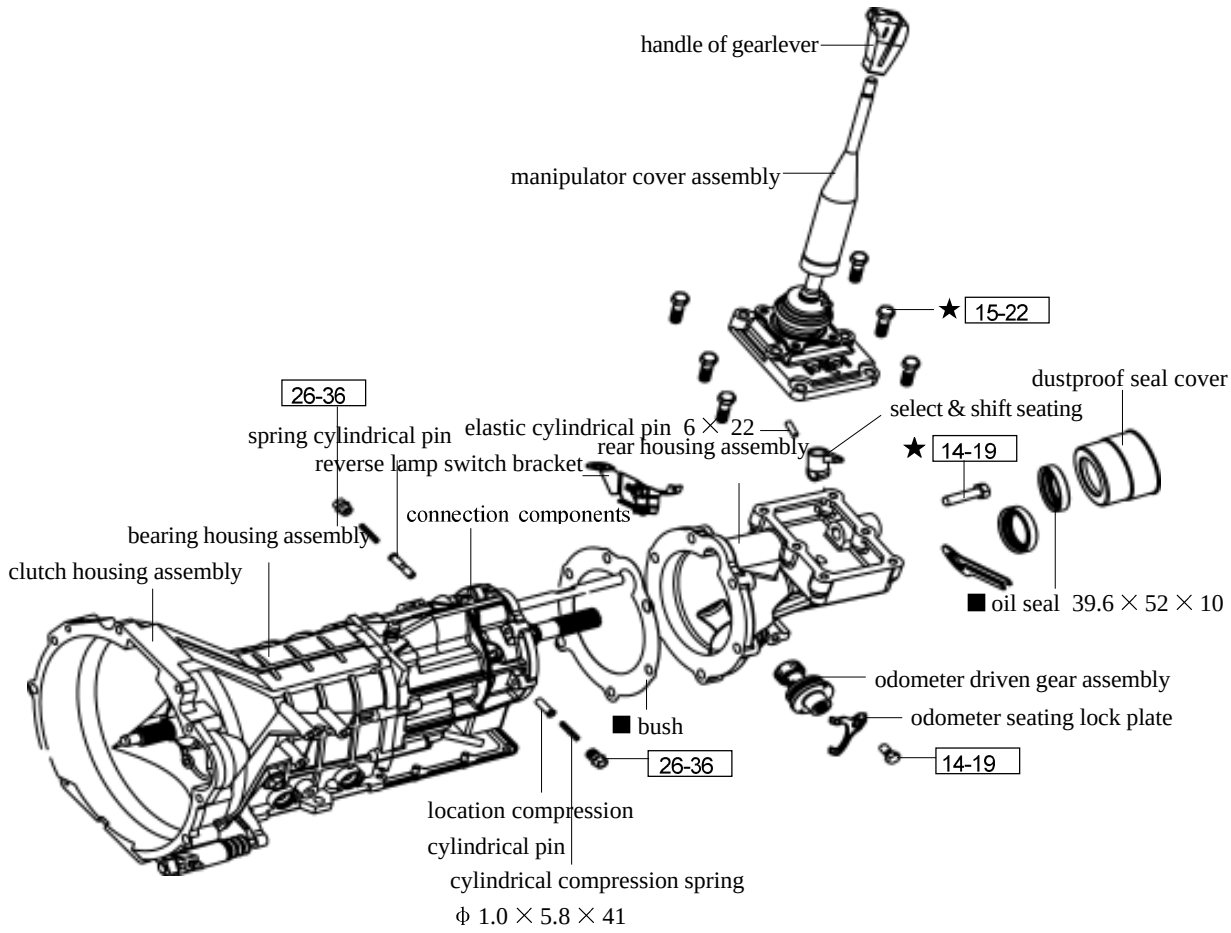
The preoperation before removal and after installation of transmission is: Remove and install the manipulator cover assembly, drain and fill the transmission oil accordance with the regulation; after remove and install the drive shaft. Separate each plug-in part from the vehicle transmission .



4. Inspection of manipulator cover assembly

Shown as figure, remove the adhesive on the surface before installation, use the screwdriver(M8 × 1.25) to clean the adhesive in the screw hole; coat the installed part of bolt screw with the specified screw adhesive. Firstly, install two positioning bolts A, then install other two bolt A and bolt C respectively. The tightening torque of all bolts is 15～22N • m.

SC5M2D-C transmission assembly



N • m: specified torque

■ Used component which can not be used any more.

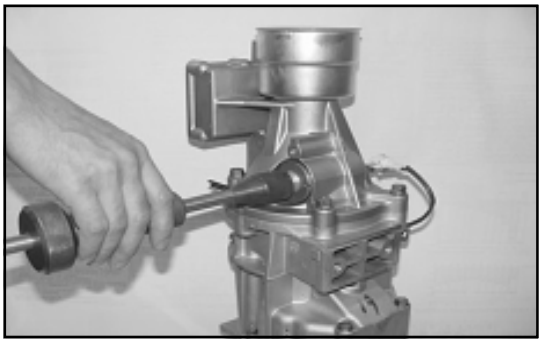
★ Pregummed component

※ Use the special tools

Disassembly of transmission (SC5M2D-C)

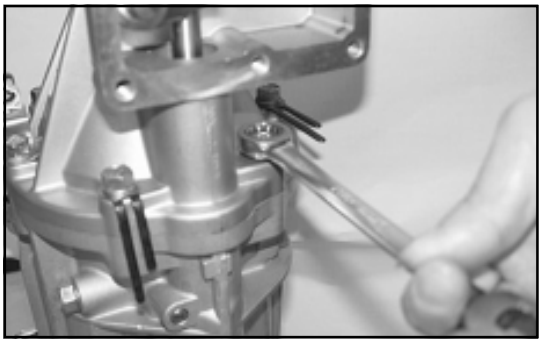
1.Remove the hexagon bolt M8 × 18 and lock plate.

Caution: The tightening torque is 14-19N • m when install the hexagon bolt;



2.Remove the odometer driven gear assembly

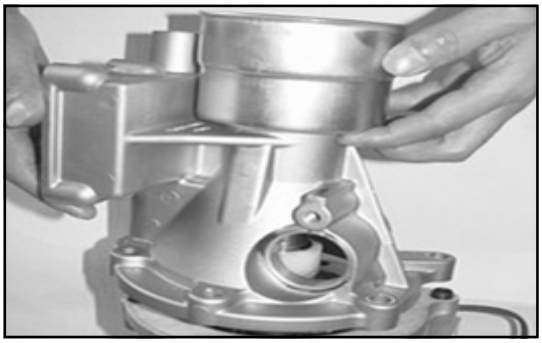
Use the special tools to remove the odometer driven gear assembly



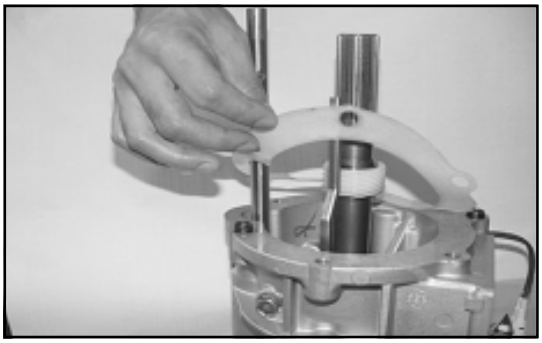
3.Remove the rear housing assembly

a. Remove 6 M10 × 1.25 × 30 hexagon bolts

Caution: The tightening torque is 14-19N • m when installs 6 M10 × 1.25 × 30 hexagon bolts.

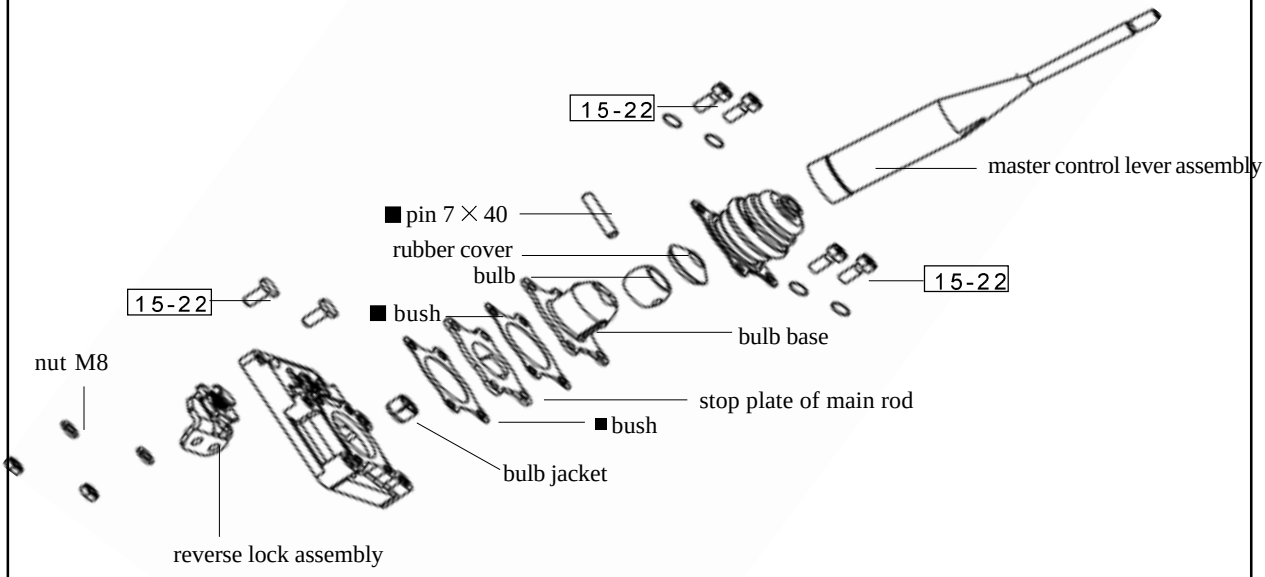


b. Use the rubber hammer to knock the rear housing and take out the rear housing assembly.



4. Remove 2 location pins and bushes.

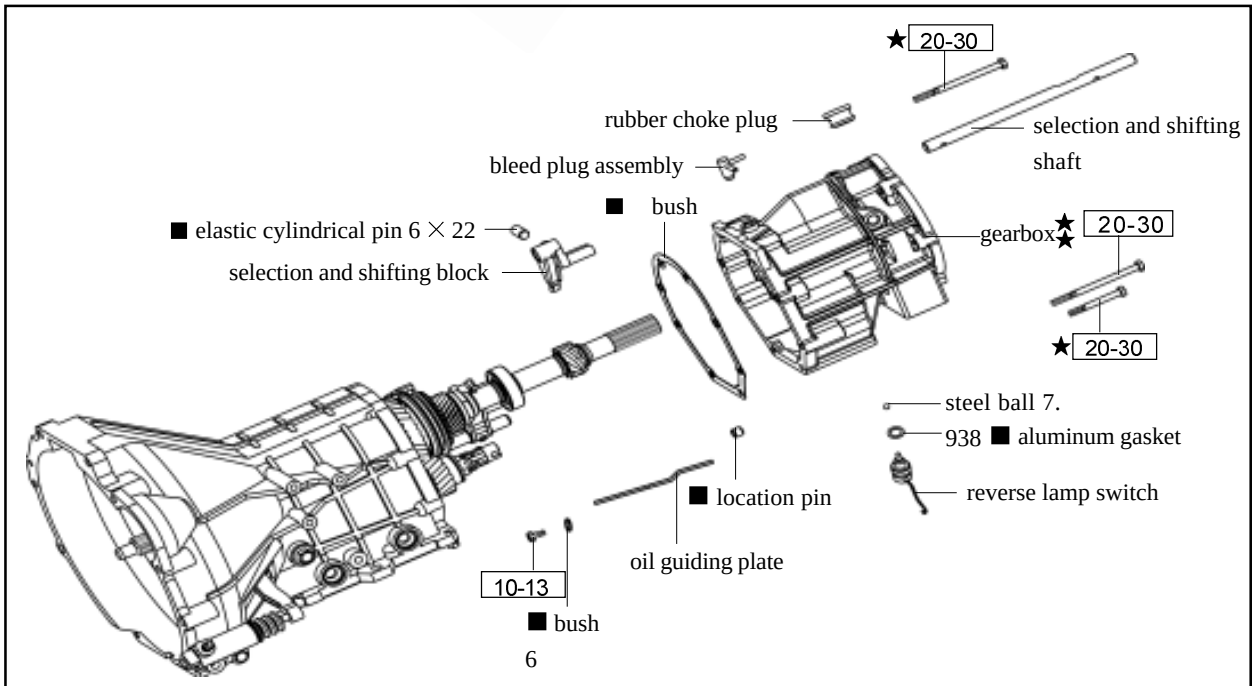
Manipulator cover assembly



N • m: specified torque

■ Used component which can not be used any more.

gearbox assembly (one)

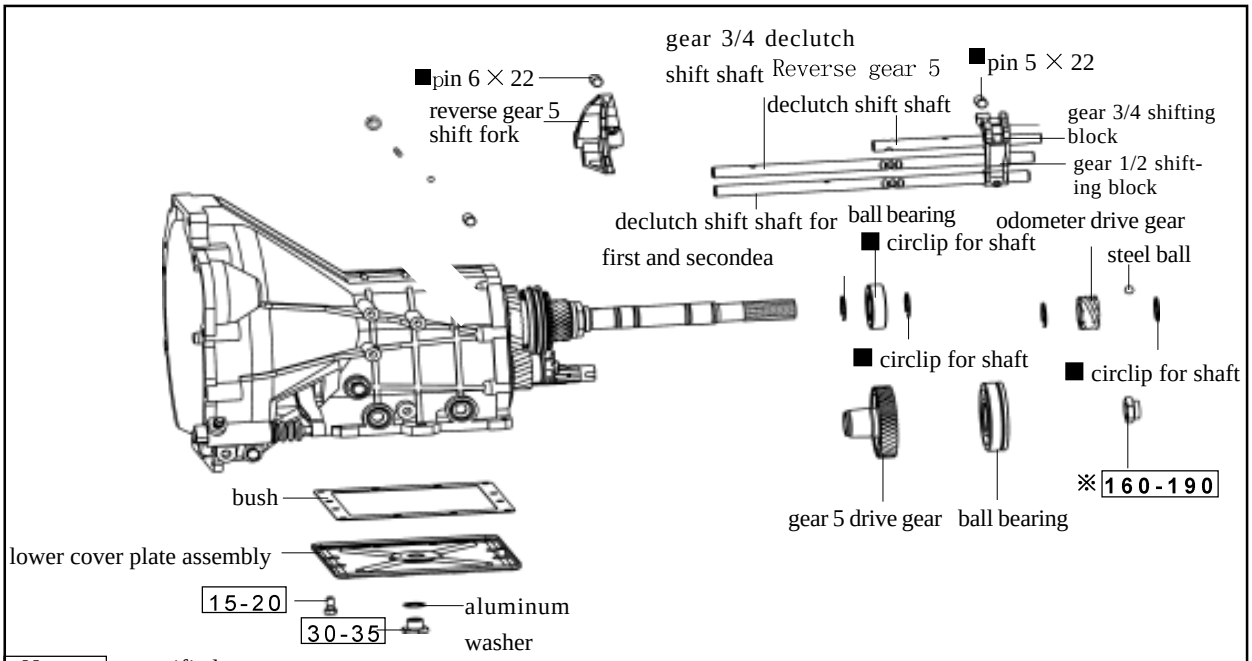


N • m: specified torque

■ Used component which can not be used any more.

★ Pregummed component

gearbox assembly (two)



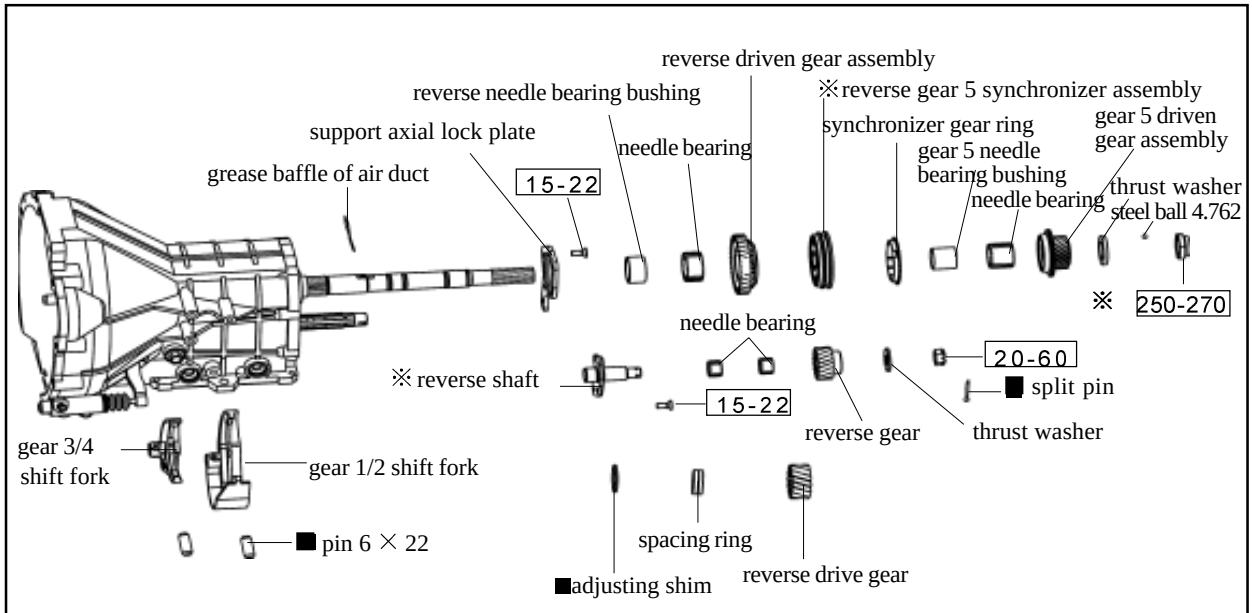
N • m: specified torque

■ Used component which can not be used any more.

★ Pregummed component

※ Use the special tools

Gearbox assembly (three)

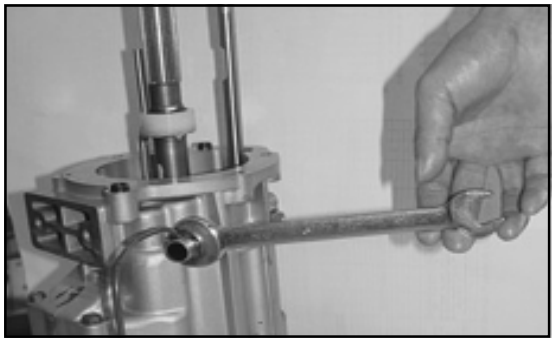


N • m: specified torque

■ Used component which can not be used any more.

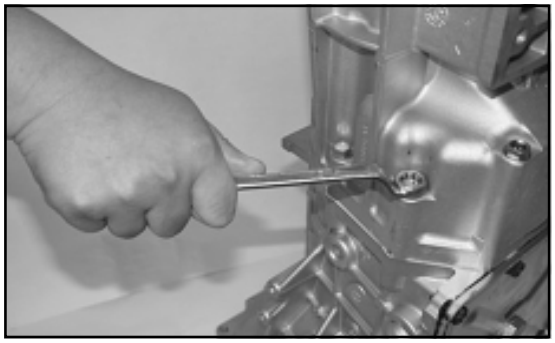
★ Pregummed component

※ Use the special tools



5. Remove the reverse lamp switch M12×1.25

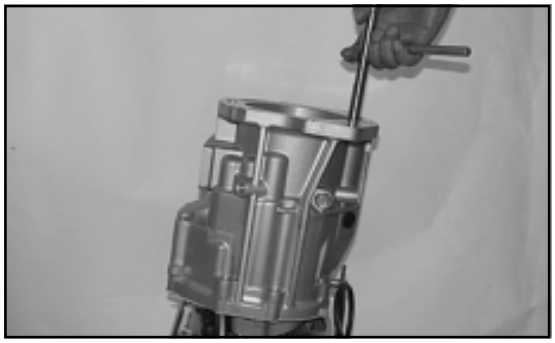
Caution: When install the reverse lamp switch M12×1.25, the tightening torque is 26-36 N·m



6. Remove the gearbox

a.Use the wrench to remove the 5 M8×55 bolts, 1 M8×6 bolt and 2 M8×110 bolts

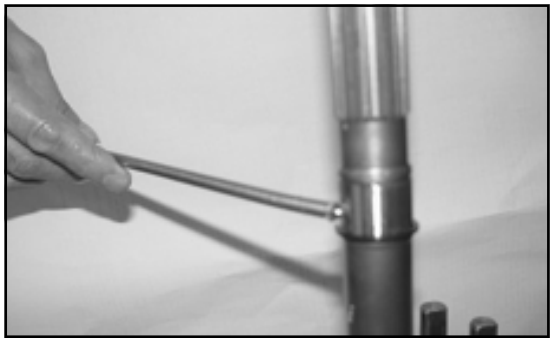
Caution: When install 5 M8×55 bolts, 1 M8×6 bolt and 2 M8×110 bolts. tightening torque is



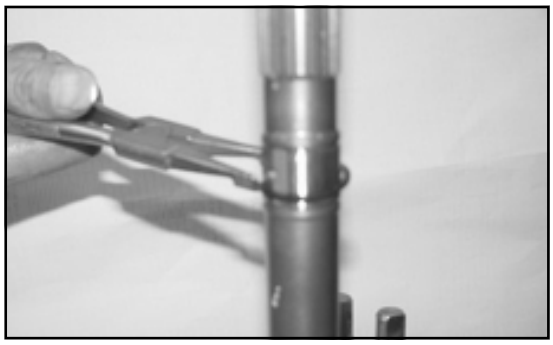
b. Remove the gearbox assembly

7. Use the circlip pliers to remove the circlip for shaft

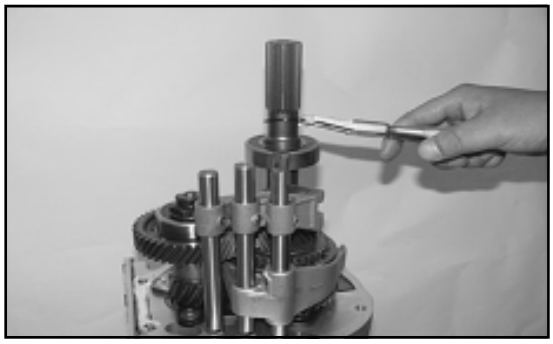
8. Remove the odometer drive gear



9. Use the magnetic rod to take out the steel ball



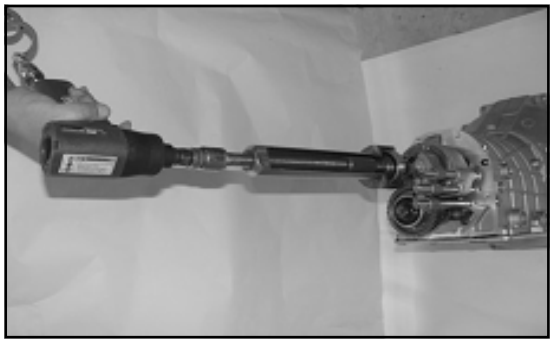
10. Use the circlip pliers to remove the circlip for shaft



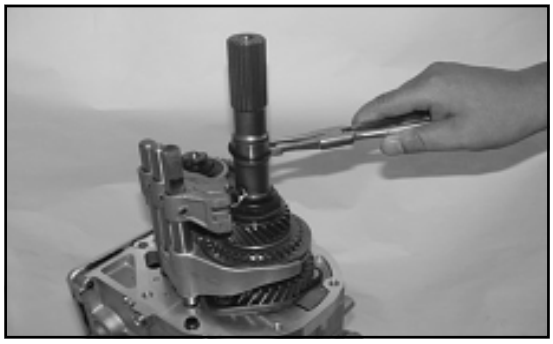
11. Use the circlip pliers to remove the circlip for shaft

Caution: It is necessary to circlip for shaft when install the circlip for shaft

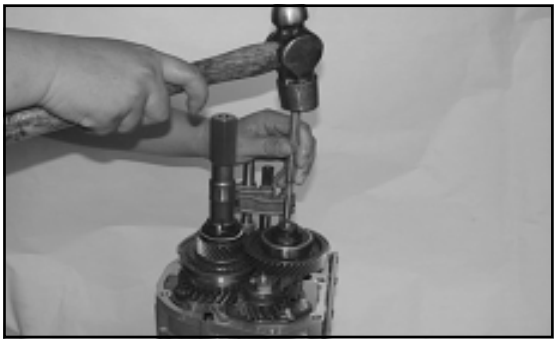
Mark	Thickness（mm）
White	1.44 ± 0.01
Blue	1.52 ± 0.01
Black	1.60 ± 0.01



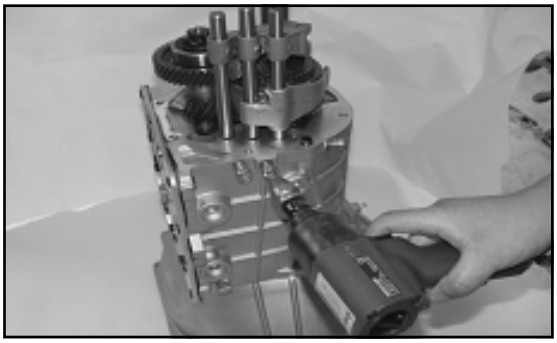
12. Use the drawing die to remove the axle 2 ball bearing



13. Use the circlip pliers to remove the circlip for shaft



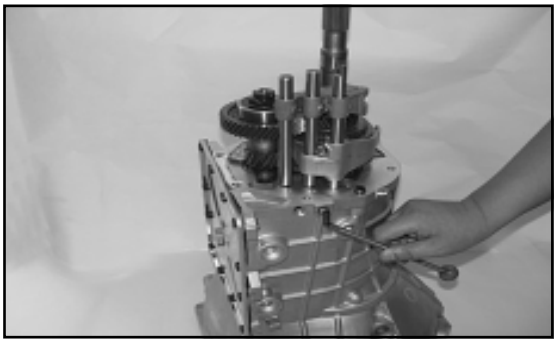
14. Use the opener to pry out the riveted place of lock nut of intermedi ate shaft



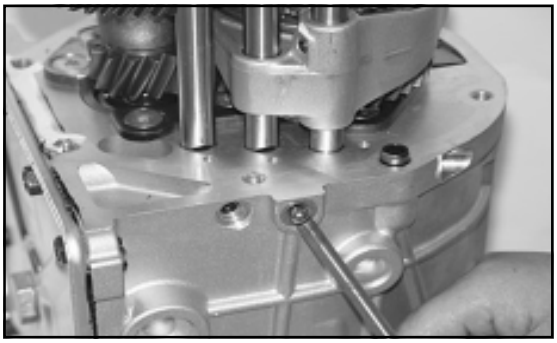
15.Remove the self-locking screw plug, spring, steel ball

a. Use the special tools to remove 3 locking screw plugs M10× 1.25×19

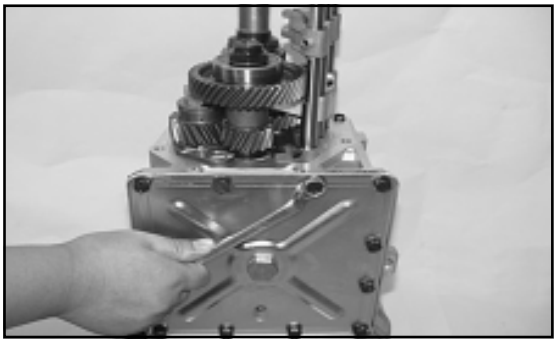
Caution: The tightening torque is 14-19N·m when install the locking screw plug M10×1.25×19.



b. Use the magnetic rod to remove 3 springs



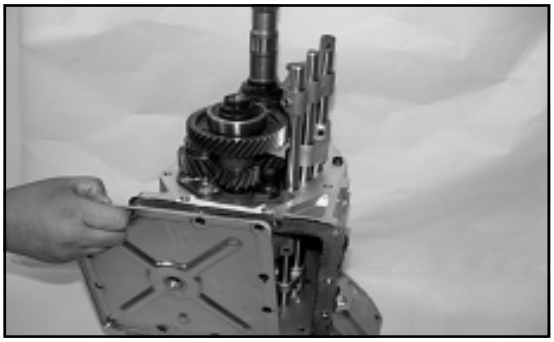
c. Use the magnetic rod to remove 3 steel balls



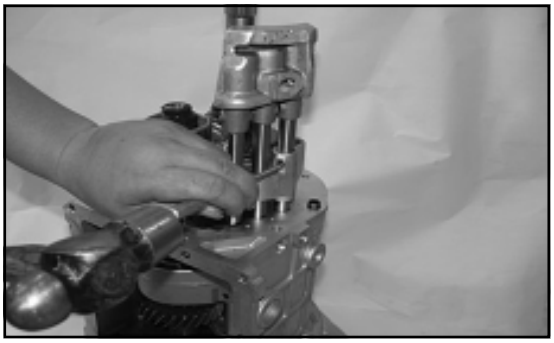
16. Remove the lower cover plate assembly

a. Use the wrench to remove the 12 个 bolt M8×16

Caution: When install 12 bolts M8×16, the tightening torque is 15-20N·m

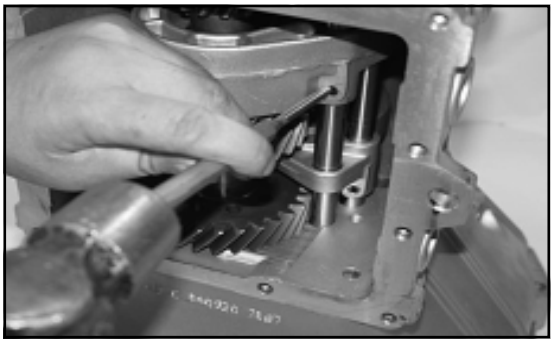


b. Remove the lower cover plate assembly

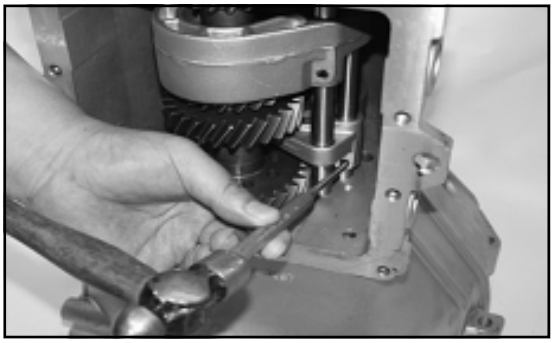


17. Remove the declutch shift shaft assembly

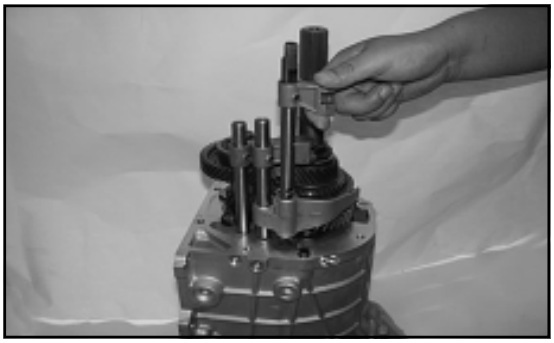
a. Use the punch to remove the reverse gear 5 shift fork elastic cylindrical pin



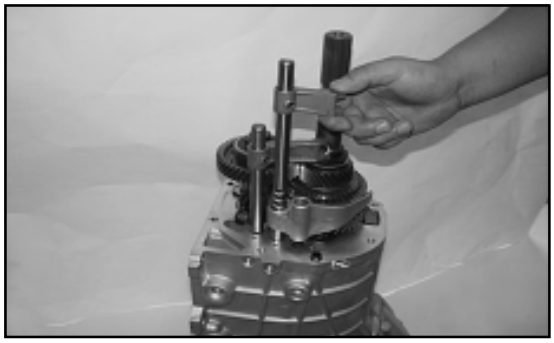
b. Use the punch to remove the Gear 1/2 shift fork elastic cylindrical pin



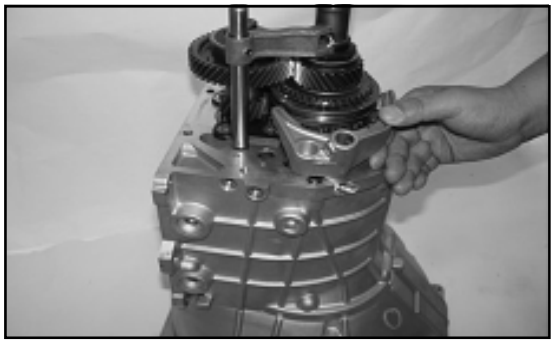
c. Use the punch to remove the Gear 3/4 shift fork cylinder pin.



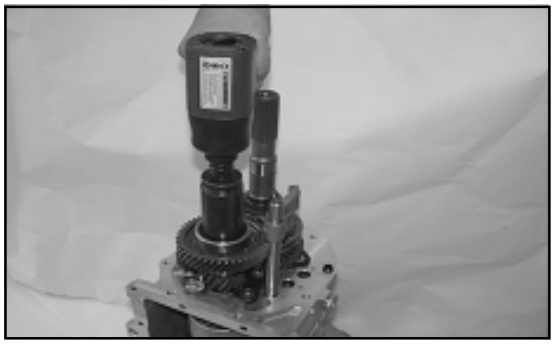
d. Remove the reverse gear 5 declutch shift shaft assembly



e. Remove the gear 3/4 declutch shift shaft assembly



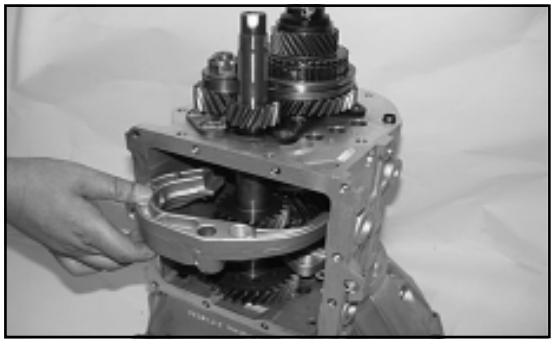
f. Remove the reverse gear 5 shift fork



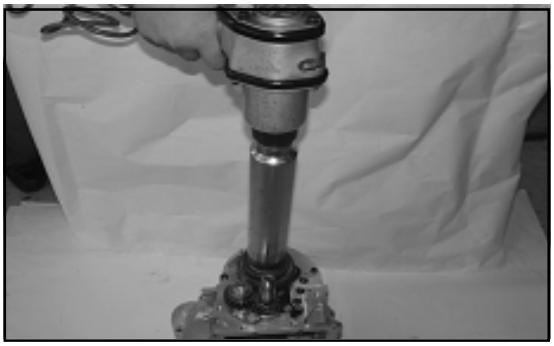
18. Remove the lock nut of intermediate shaft

Caution: When install the lock nut of intermediate shaft , the tightening torque is 160-190N·m

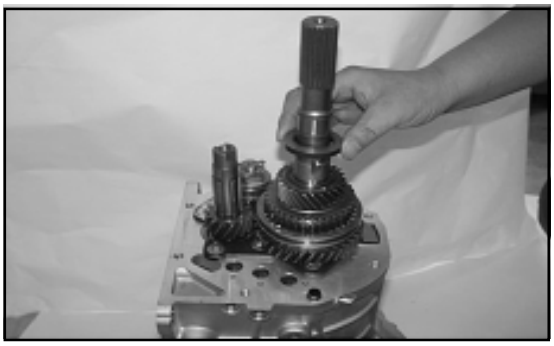
19.Remove the Gear 1/2 declutch shift shaft assembly, intermediate shaft rear ball bearing, 5th-Gear drive gear



20. Remove the Gear 1/2 shift fork

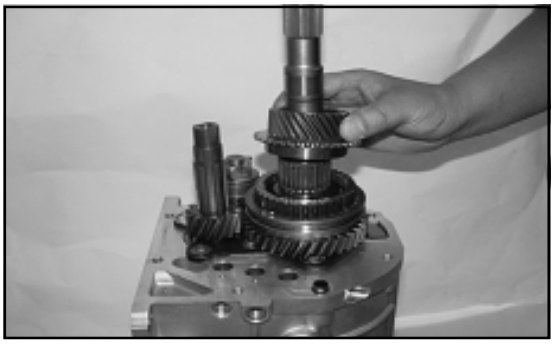


21.Use the special tools to remove the second shaft lock nut
Caution: When install the second shaft lock nut, the tightening torque is : 250-270N·m

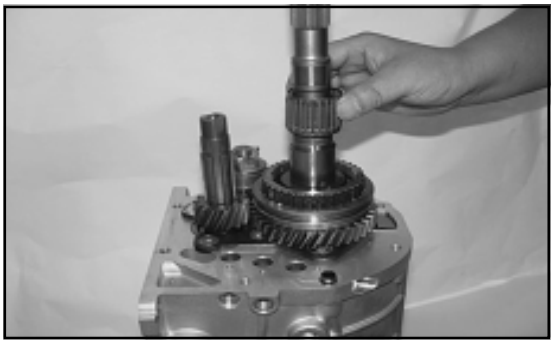


22.Remove the thrust plate

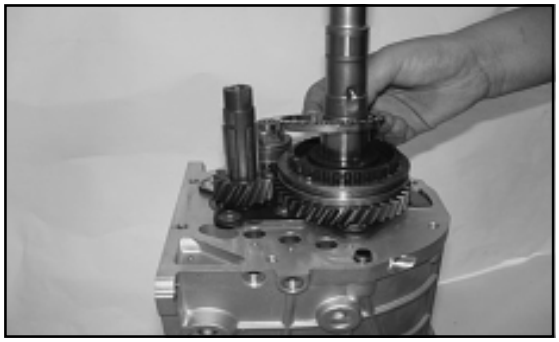
23.Use the magnetic rod to remove the steel ball.



24.Remove the 5th-Gear driven gear assembly
Caution: When install the 5th-Gear driven gear assembly, it should use the plug gage to test the 5th-Gear driven gear assembly axial clearance, ensure the axial clearance is within 0.170-0.284mm

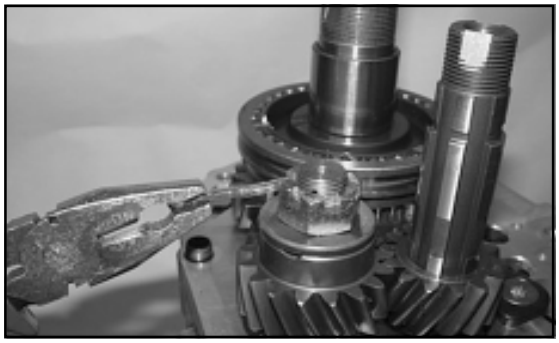


25.Remove the 5th-Gear driven gear needle bearing

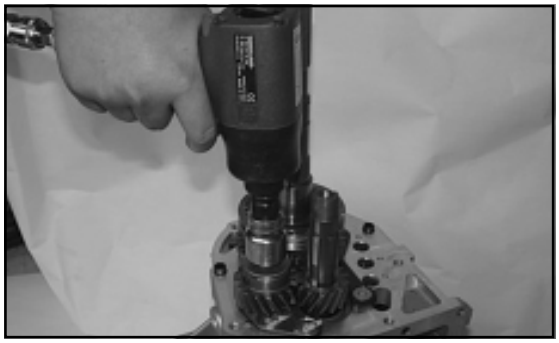


26. Remove the synchronizer gear ring

Caution: When install the synchronizer gear, it should use the plug gage to test the synchronizer gear ring axial clearance, ensure the axial clearance is within 1.25-1.65mm

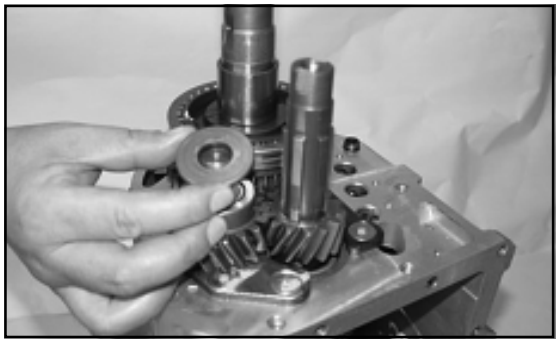


27. Use the pliers to remove the split pin on the reverse shaft lock nut.

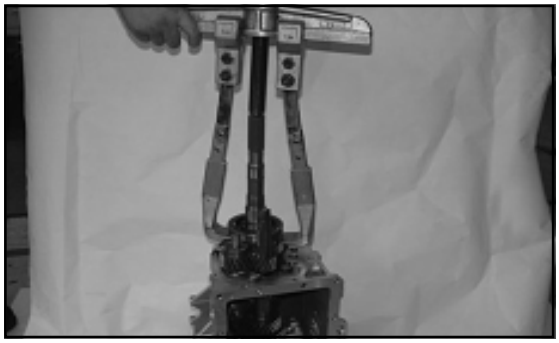


28. Use the special tools to remove the reverse lock nut

Caution: when install the reverse lock nut, the tightening torque is within 20-60N·m



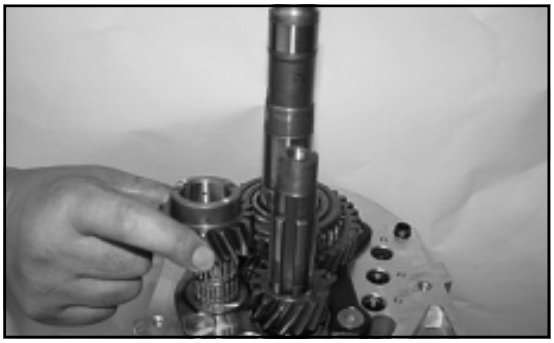
29. Remove the thrust plate



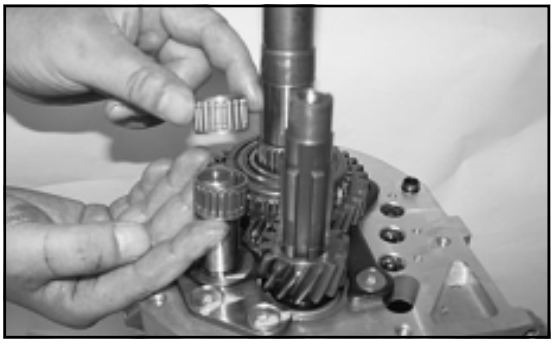
30. Remove the 5th/reverse -Gear synchronizer assembly

a. Use the special tools to remove the 5th/reverse -Gear synchronizer assembly

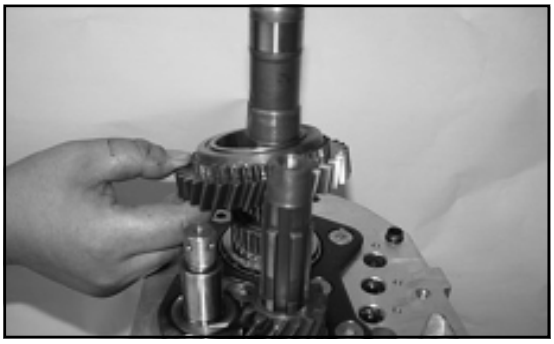
b. Remove the sleeve and 5th/reverse -Gear synchronizer assembly



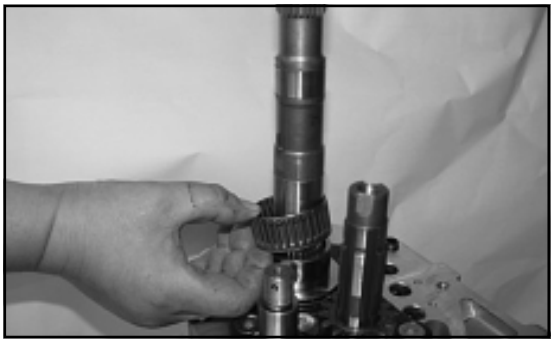
31. Remove the reverse gear



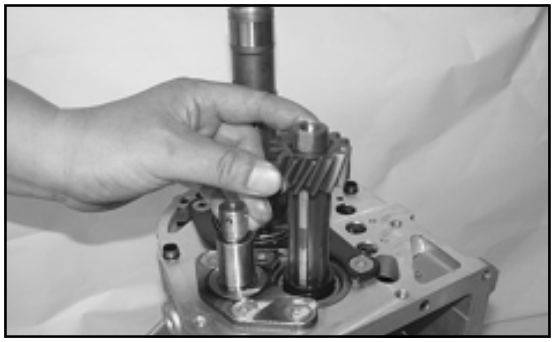
32. Remove 2 needle bearings of reverse gear



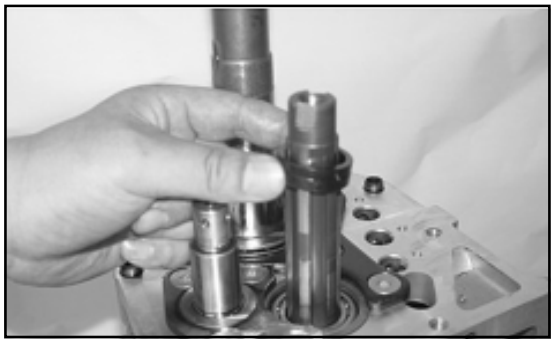
33. Remove the reverse driven gear



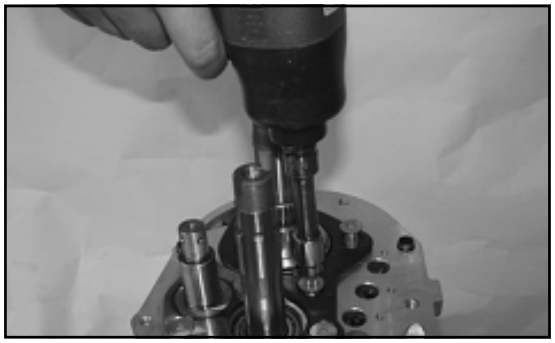
34. Remove the needle bearing of reverse driven gear



35. Remove the reverse drive gear

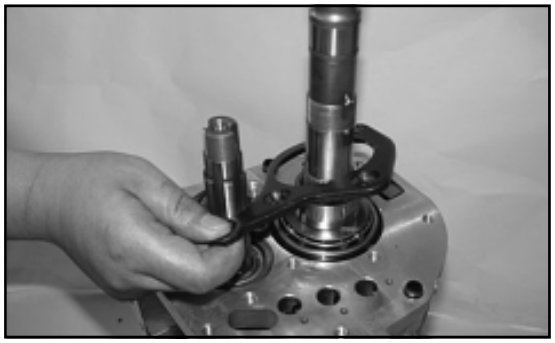


36. Remove the intermediate shaft spacing ring

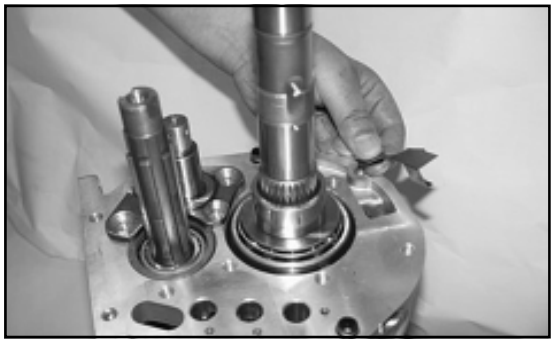


37. Remove 8 countersunk screws

Caution: when install the countersunk screw, the tightening torque is within 15-22N·m

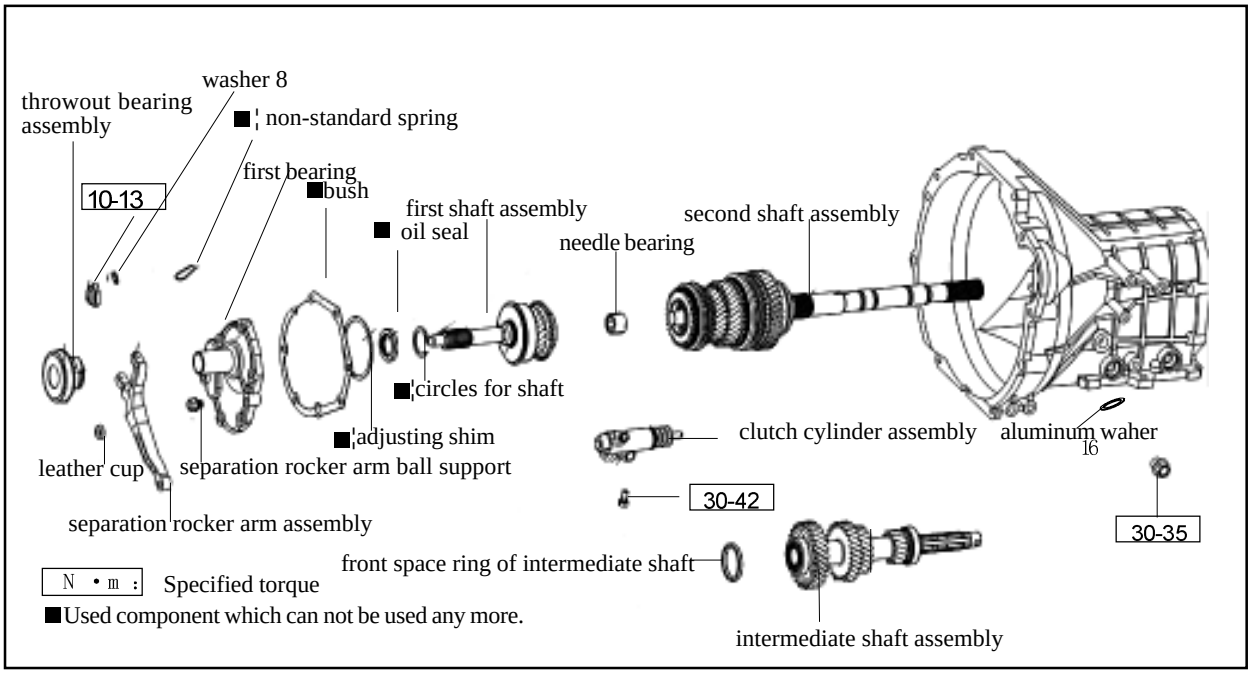


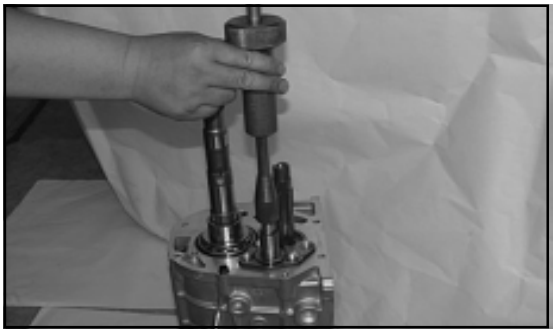
38. Remove the support axial lock plate



39. Remove the air duct grease baffle

Clutch housing assembly / Bearing housing assembly

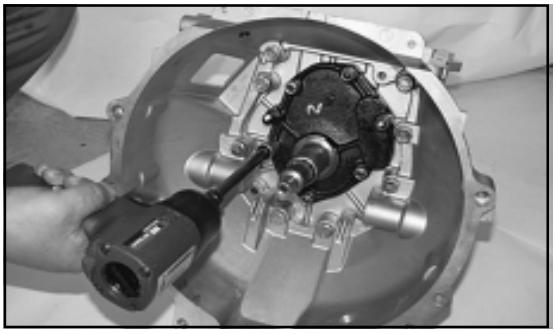




Disassembly of clutch housing assembly /bearing housing assembly

40. Use the special tools to remove the reverse shaft

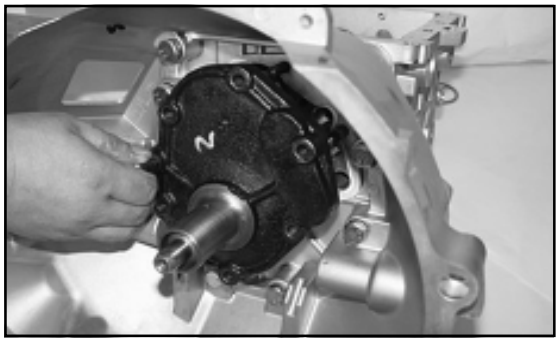
41. Use the magnetic rod to take out 2 interlocking pins



42. Remove the first bearing block assembly

a. Use the special tools to install 6 M8 bolts.

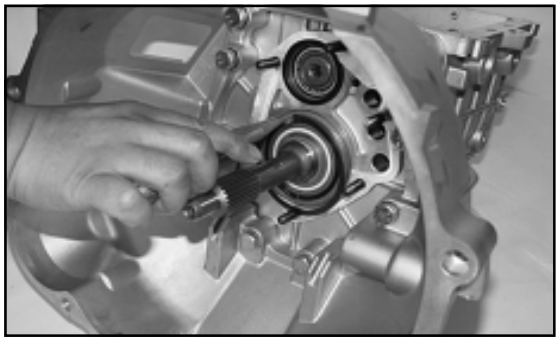
Caution: When install 6 M8 bolts, the tightening torque is 10-13N·m



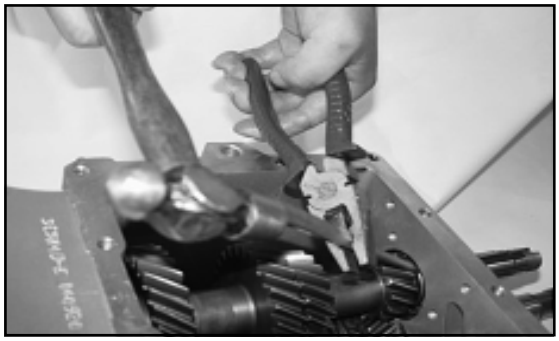
b. Remove the first bearing blocks assembly ; take out the adjusting shim

Caution: It should select the adjusting shim when install the adjusting shim

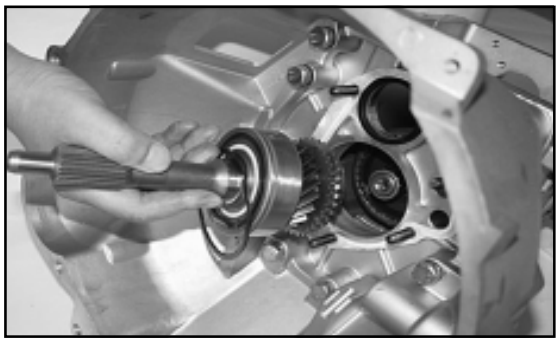
Mark	Thickness(mm)
White	0.88 ± 0.01
Blue	0.98 ± 0.01
Black	1.08 ± 0.01



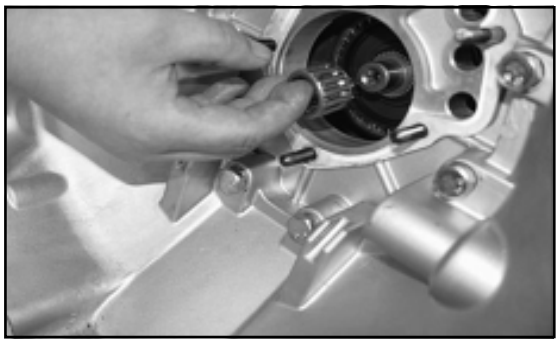
43. Remove the bearing snap ring



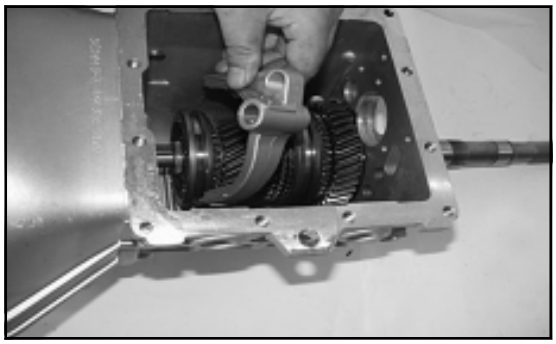
44. Remove the intermediate shaft assembly



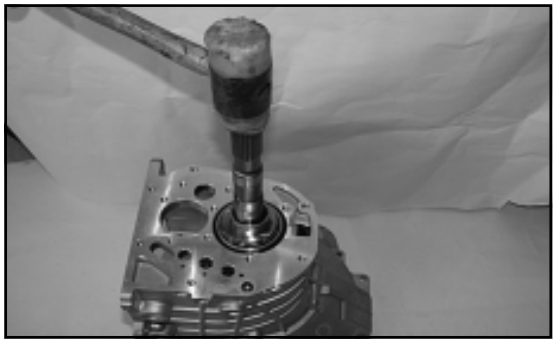
45. Remove the first shaft assembly



46. Remove the needle bearing

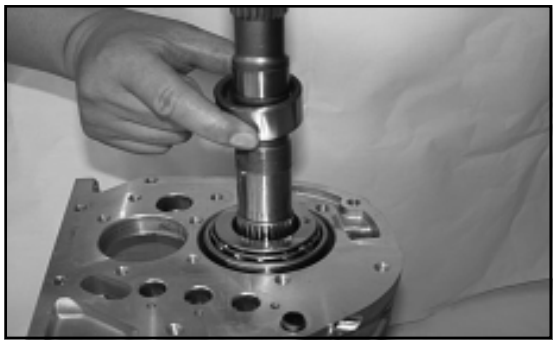


47. Remove the 3rd/4th-Gear shift fork

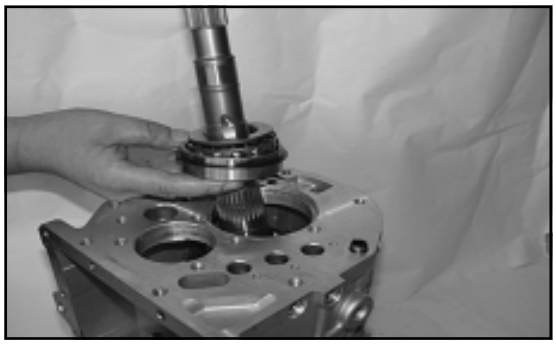


48. Remove the second shaft assembly

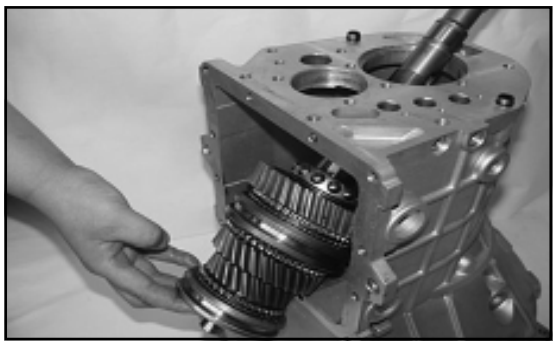
a. Use the rubber hammer to knock the second shaft



b. Remove the needle bearing bushing of reverse driven gear

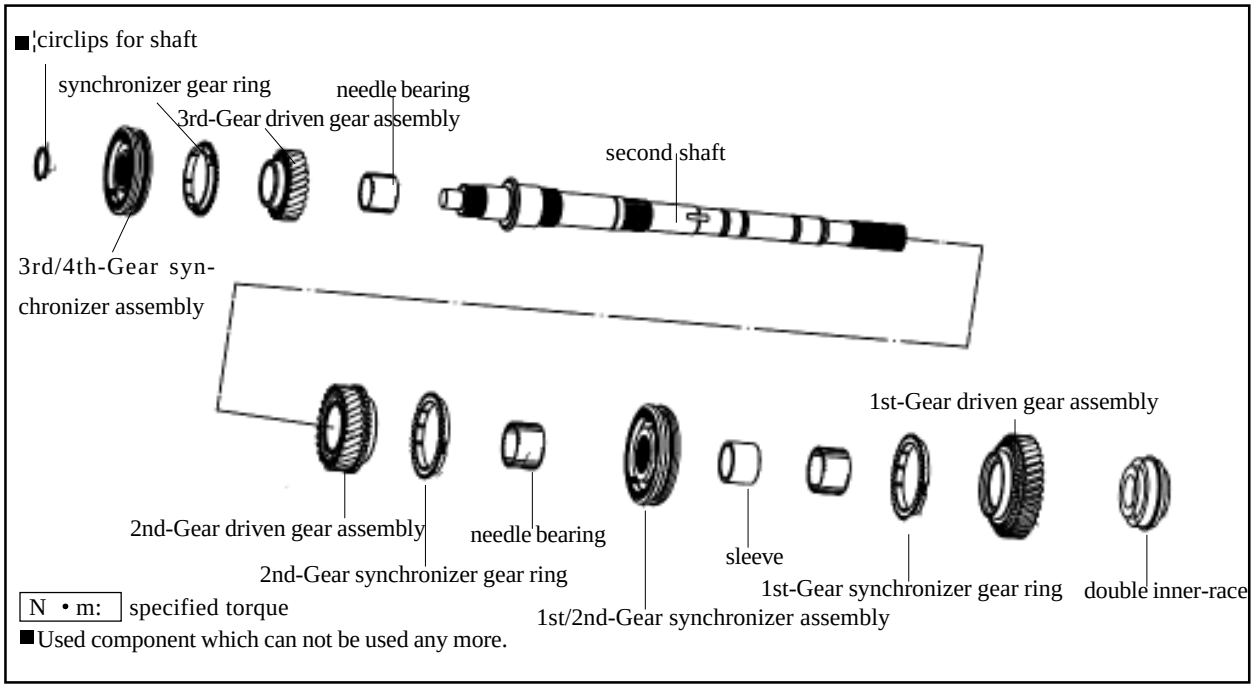


c. Remove the double inner-race ball bearing assembly



d. Remove the second shaft assembly

Secondary shaft assembly



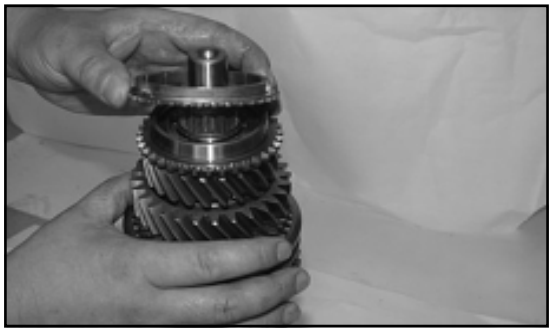
49. Disassembly of second shaft assembly

a. Remove the second shaft rear retainer

Caution: It should select the circlip for shaft when install the circlip for shaft.

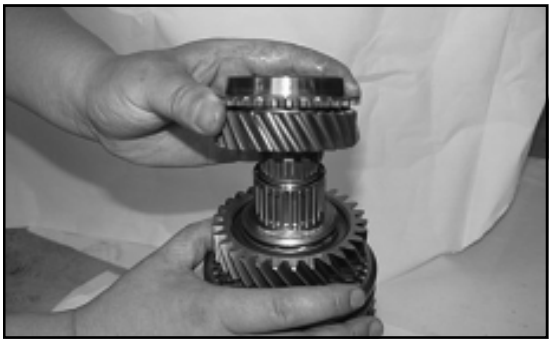
Mark	Thickness (mm)
White	2.18 ± 0.01
Blue	2.26 ± 0.01
Green	2.34 ± 0.01

b. Remove the 3rd/4th-Gear synchronizer assembly



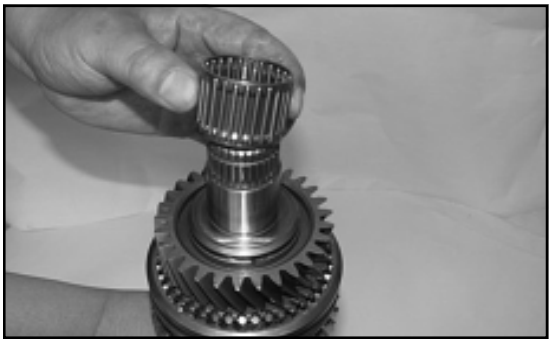
c. Remove the 3rd/4th-Gear synchronizer gear ring

Caution: When install the 3rd/4th-Gear synchronizer gear ring, it should use the plug gage to measure the end surface clearance of gear ring to ensure it is within 1.25-1.65mm

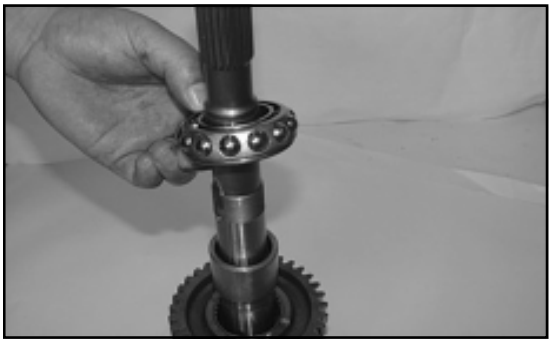


d. Remove the 3rd-Gear driven gear assembly

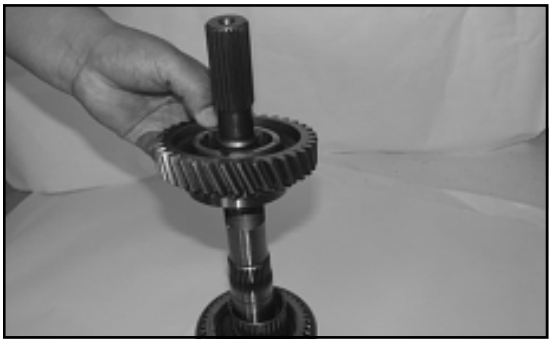
Caution: When install the 3rd-Gear driven gear assembly, it should use the plug gage to measure the 3rd-Gear driven gear assembly axial clearance to ensure it is within 0.17-0.284mm



e. Remove the 3rd-Gear driven gear needle bearing



f. Use the special tools to press the second shaft to remove the inner race of double inner-race ball bearing.



g. Remove the 1st-Gear driven gear

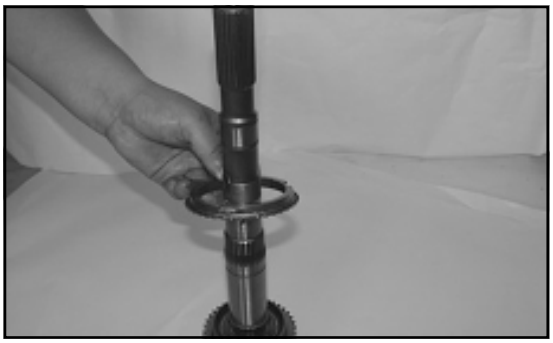
Caution: When install the 1st-Gear driven gear, it should use the plug gage to measure the 1st-Gear driven gear axial clearance to ensure it is within 0.17-0.284mm.

h. Remove the 1st-Gear driven gear needle bearing

i. Remove the sleeve

j. Remove the 1st-Gear synchronizer gear ring

k. Remove the 1st/2nd-Gear synchronizer assembly



l. Remove the 2nd-Gear synchronizer gear ring , 2nd-Gear driven gear and second shaft

Caution: When install the 2nd-Gear driven gear, it should use the plug gage to measure the 2nd-Gear driven gear axial clearance to ensure it is within 0.17-0.284mm

hand hall of main steering column

hand ball of auxiliary steering column

Operating instruction of transmission SC5M4D-C

1.The schematic diagram of transmission operating gear position is on the handle of steering column.

During the process after vehicle is started and in traveling, it must step the clutch pedal to bottom before the shifting. If need shift from 5th-Gear to reverse-Gear, it should move the shifting bar to the neutral position of 3rd/4th-Gear. Shift to R-Gear after stop the vehicle stably, otherwise, it can not shift.

During the traveling process. It should always pay attention to the shifting to make the vehicle matches to the speed of engine. The correct shifting can improve the economical efficiency and prolong the service life of engine. Do not shift from high-Gear to low-Gear on the condition that the pointer of tachometer may enter into red area, otherwise, the engine will be damaged.

Warning: Do not shift to reverse-Gear when the vehicle moves forwardly, otherwise the transmission will be damaged.

2. Operation of 4WD

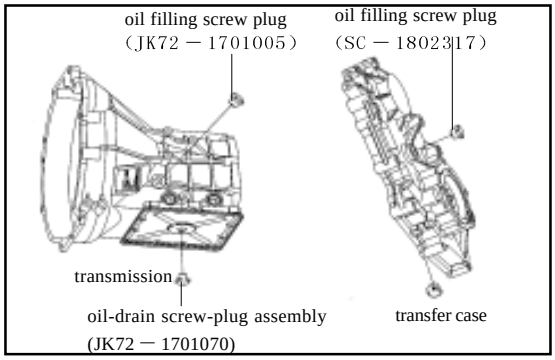
The operating auxiliary steering column can be shifted to 4WD status. For position of auxiliary steering column and corresponding operating condition refer to table.

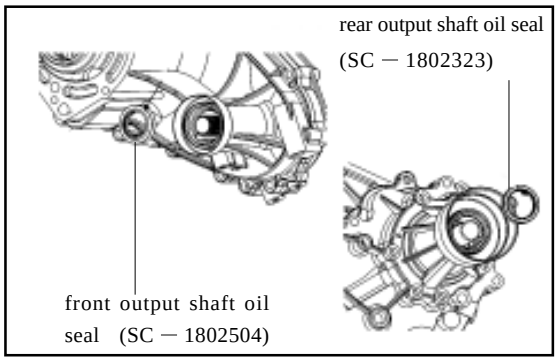
Auxiliary steering column position	drive	Operating condition
2H	2WD	Use this gear position when run in the general railway and high speed highway.
4H	High speed 4WD	Use this gear position when run in the deep snowland, sand ground or uneven road in normal speed.
N	Neutral gear	When use the gear position during using of winch, it could not drive the vehicle.
4L	Low speed 4WD	Use this gear-position when run in uneven road such as mud land or climbing or downward （especially when need increase the power）.

3. Caution for operation:

a. Do not use 4WD in good surface, otherwise the tyre and components of drive system will be damaged easily and increase the consumption of fuel, and cause the noise of drive system.

b. Please run in 1st-Gear under “4L” gear position when run in very low speed in field.





Repair of transmission SC5M4D-C

1. Inspection of oil level of transmission and transfer case:

Screw off the oil drainage screw plug of main box and transfer case; drain all lubrication oil, tighten the oil drain plug to specified torque. The torque is: 30～35N•m. Fill the main box and transfer case with the transmission oil through the oil filling port. The number is hyperbolic gear oil SAE80W/90, comply with API GL-4. The oil quantities are main box : 2.2 L, transfer case : 2.7 L. (for high and low temperature environment refer to maintenance specification). Tighten the oil filling screw plug to specified torque. The torque is: 30～35N • m.

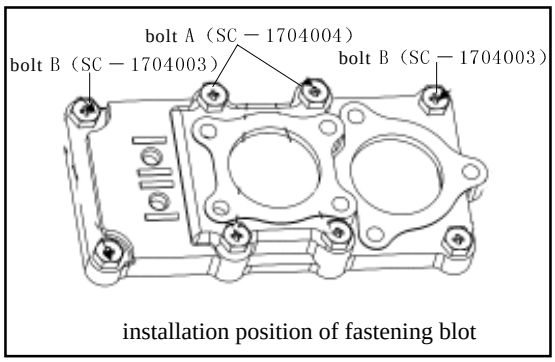
2.Replacement of oil-seal of transfer case

The replacement of transfer case oil seal is shown as figure. Disconnect the drive shaft from the transfer case, use the flat head screwer to remove the oil seal

Caution: Do not damage the housing hole during the disassembly. Then use the special tools to knock the transfer case oil seal into the transfer case. It should pay attention to the installation dire tion of oil seal. The oil seal is flush with the port of transfer case. Shown as figure. Coat the lip of oil seal with the specified general synthetic gear oil.

3. Disassembly and check of transmission

The preoperation before the removal and after installation of transmission is : When remove and install the manipulator cover assembly, drain and fill with the specified transmission and transfer case lubrication oil. When remove and install the front and rear drive shaft, separate each plug-in part of transmission from the vehicle.



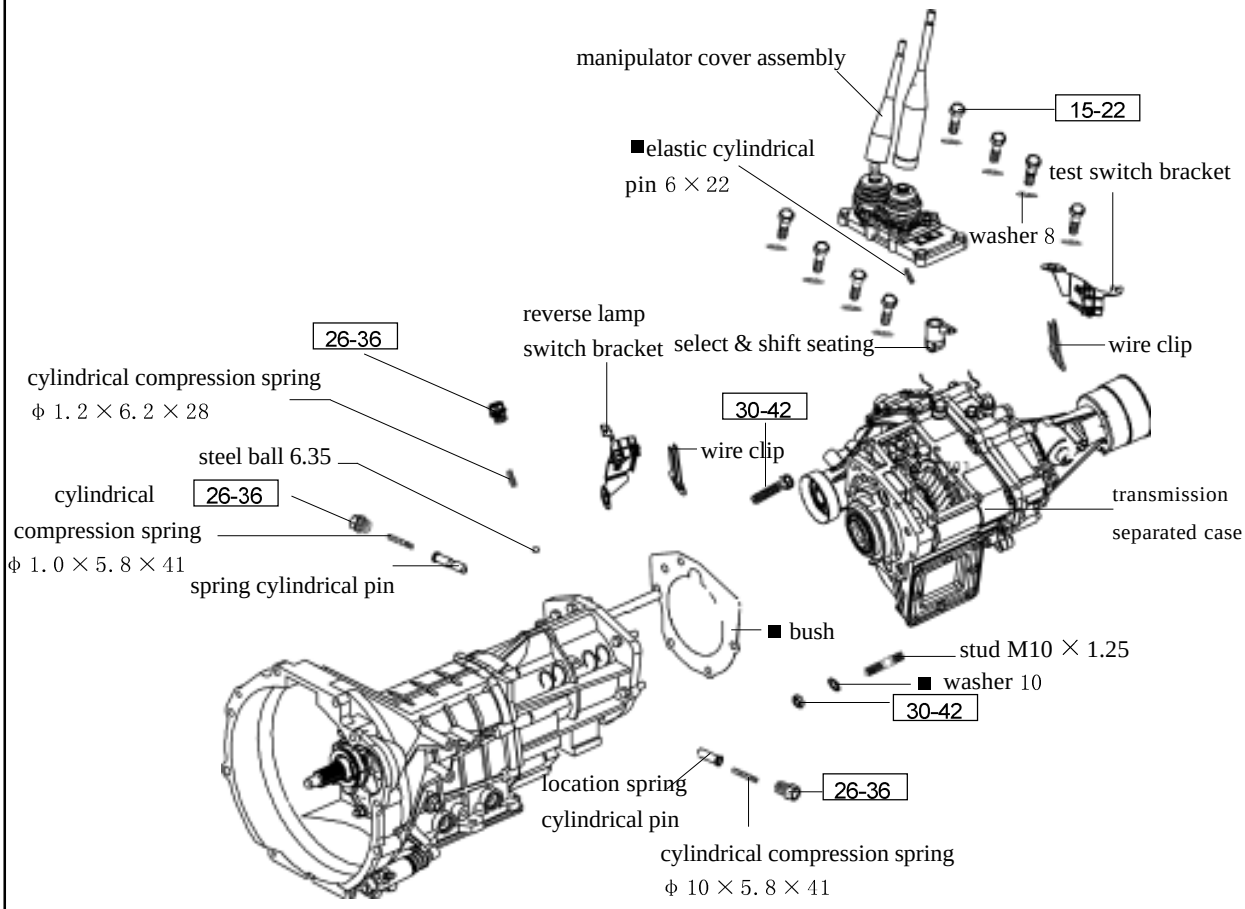
installation position of fastening blot

Inspection of manipulator cover assembly:

The bolt dimension is different for different installation position. Do not confuse it during the installation. It should install the fixing bolt A firstly.

The tightening torque of bolt A and B bolt is 15～22N • m.

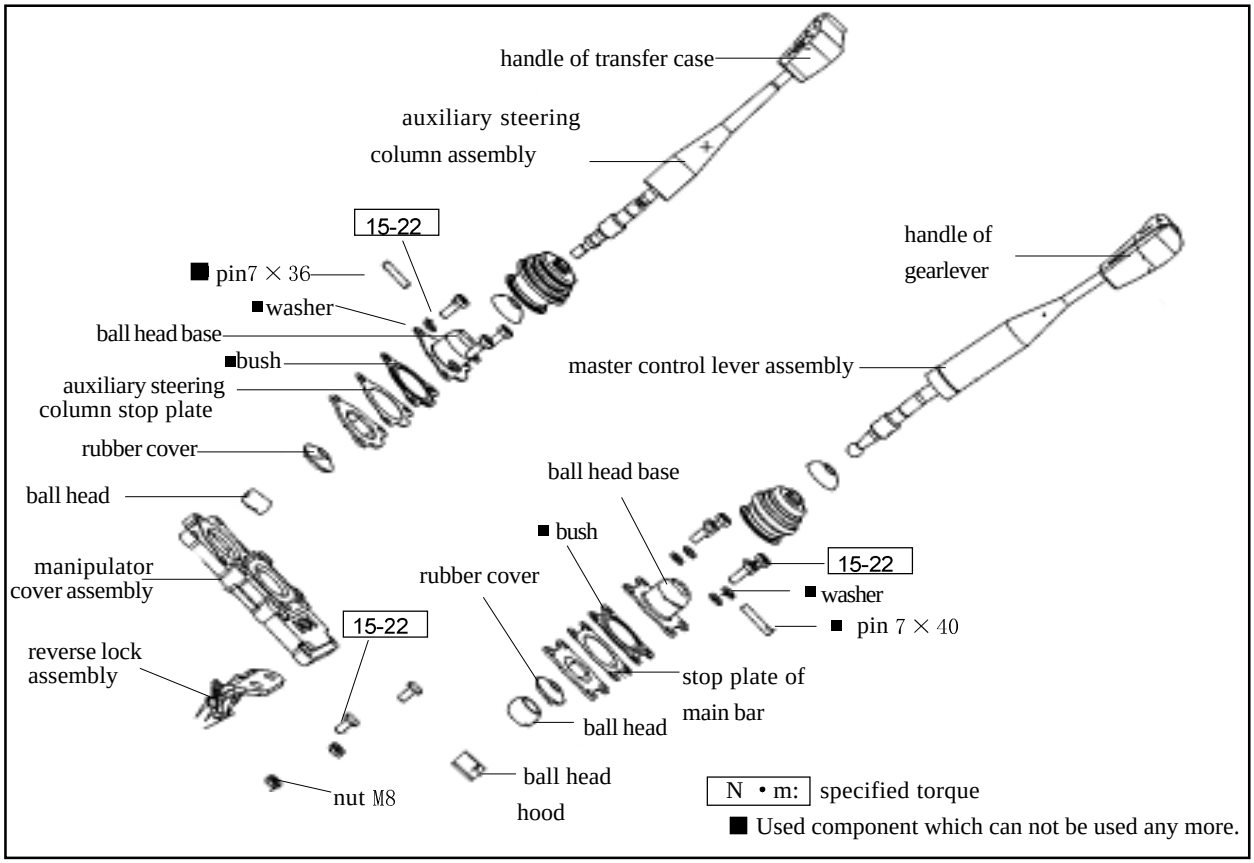
Transmission SC5M4D－C assembly



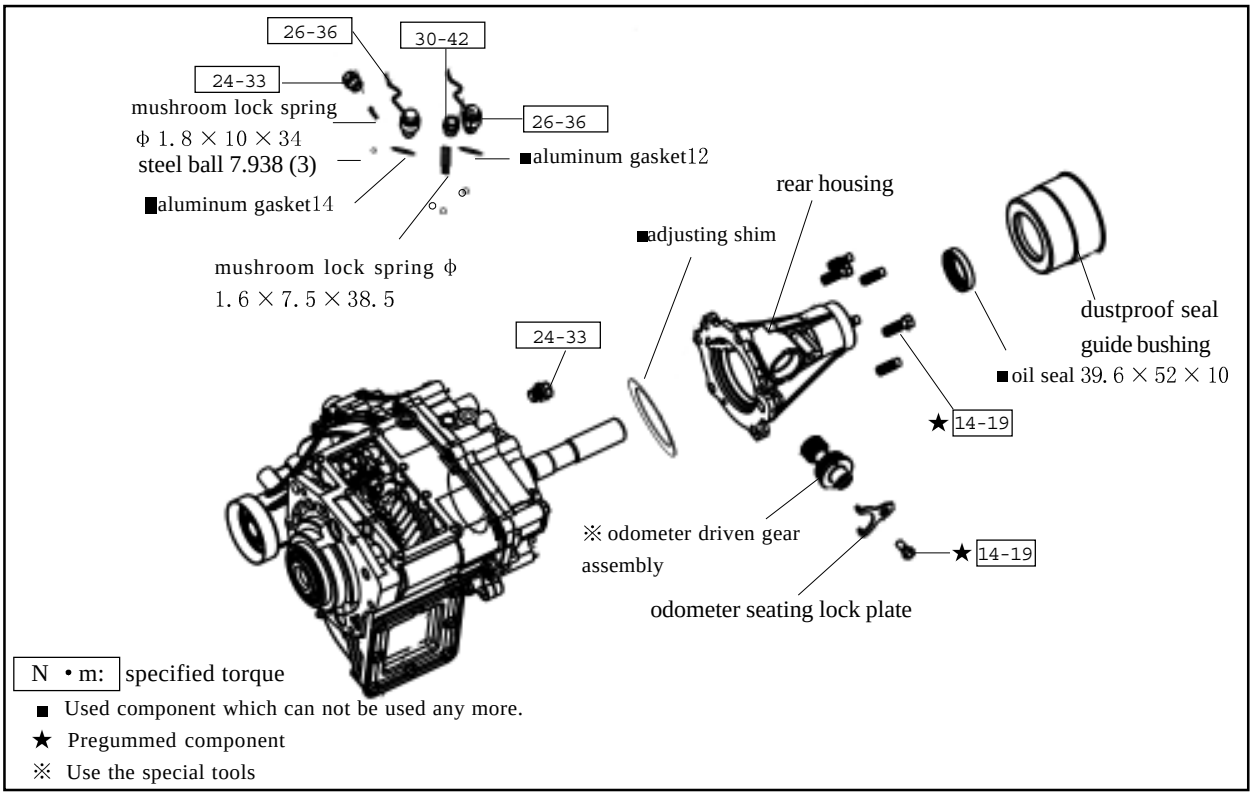
N • m: specified torque

■ Used component which can not be used any more.

Manipulator cover assembly



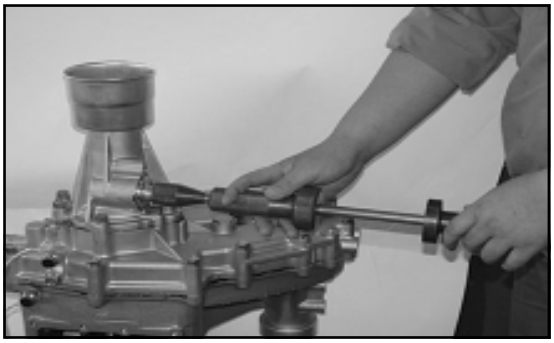
Rear housing assembly



Disassembly of rear housing assembly

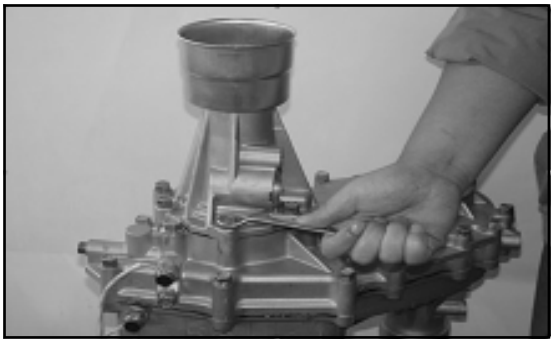
1.Remove the M8 × 18 hexagon bolt and the lock plate

Caution: When install the M8 × 18 hexagon bolt, the tightening torque is 14-19N • m



2.Remove the odometer driven gear assembly

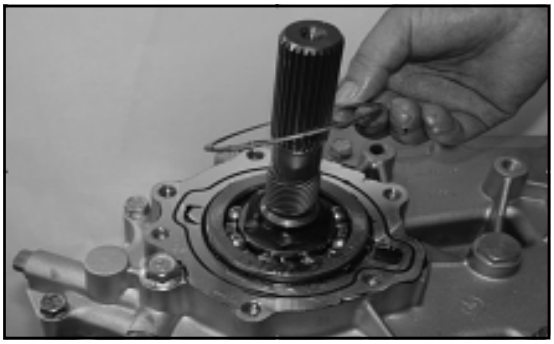
Use the special tools to remove the odometer driven gear assembly



3.Remove the rear cover assembly

Caution: When install 6 M10×1.25×30 hexagon bolts, the tightening torque is 14-19N • m

b.Use the plastic hammer to knock the rear cover slightly and take out the rear cover

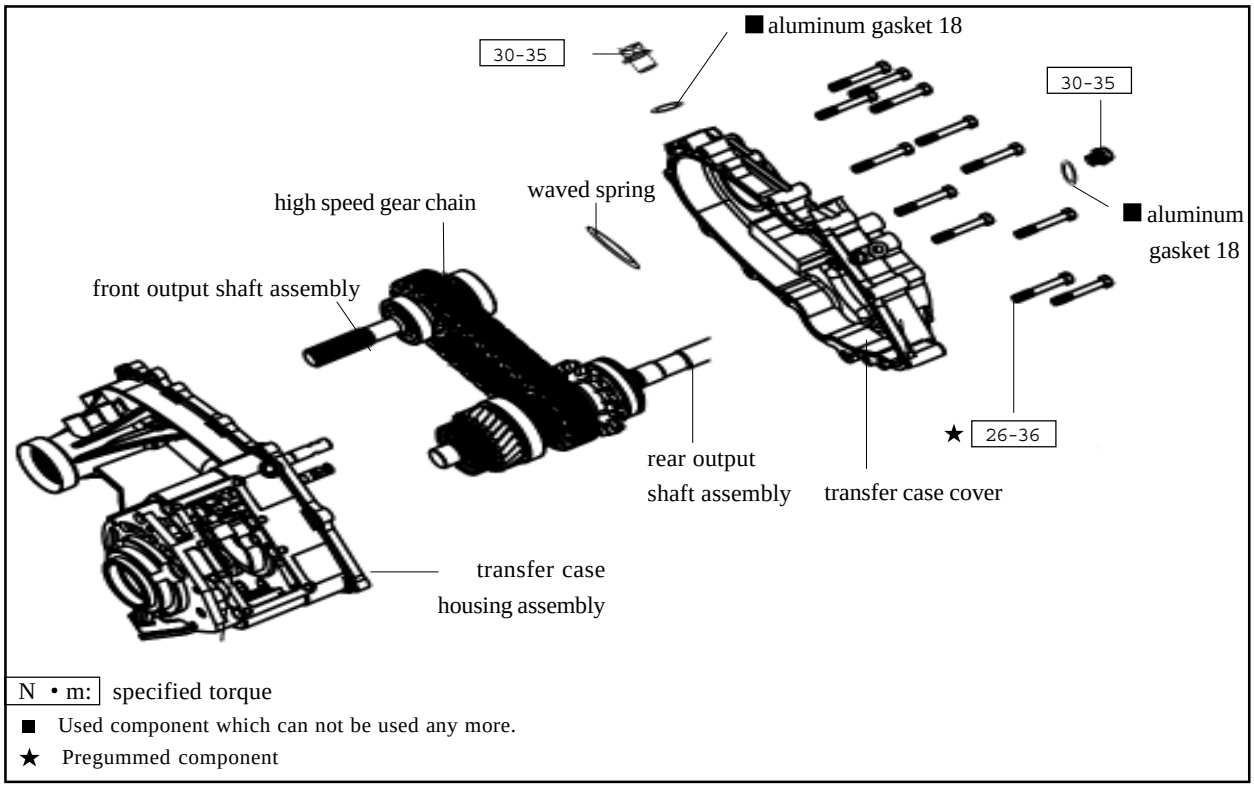


c.Take out the adjusting shim

Caution: It should select the adjusting shim as follows when install it.

mark	thickness（mm）
white	1.58 ± 0.01
green	1.68 ± 0.01

Transfer case assembly (one)

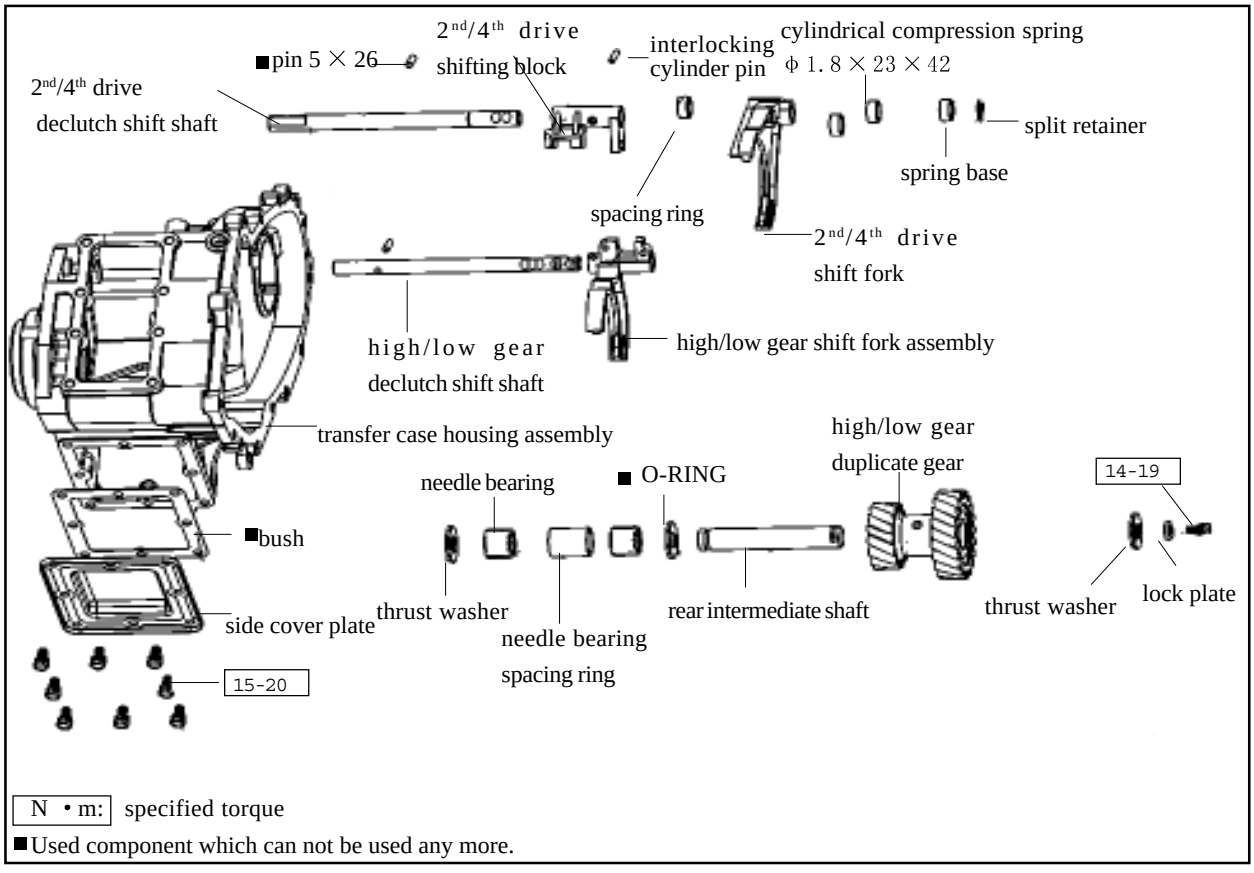


N • m: specified torque

■ Used component which can not be used any more.

★ Pregummed component

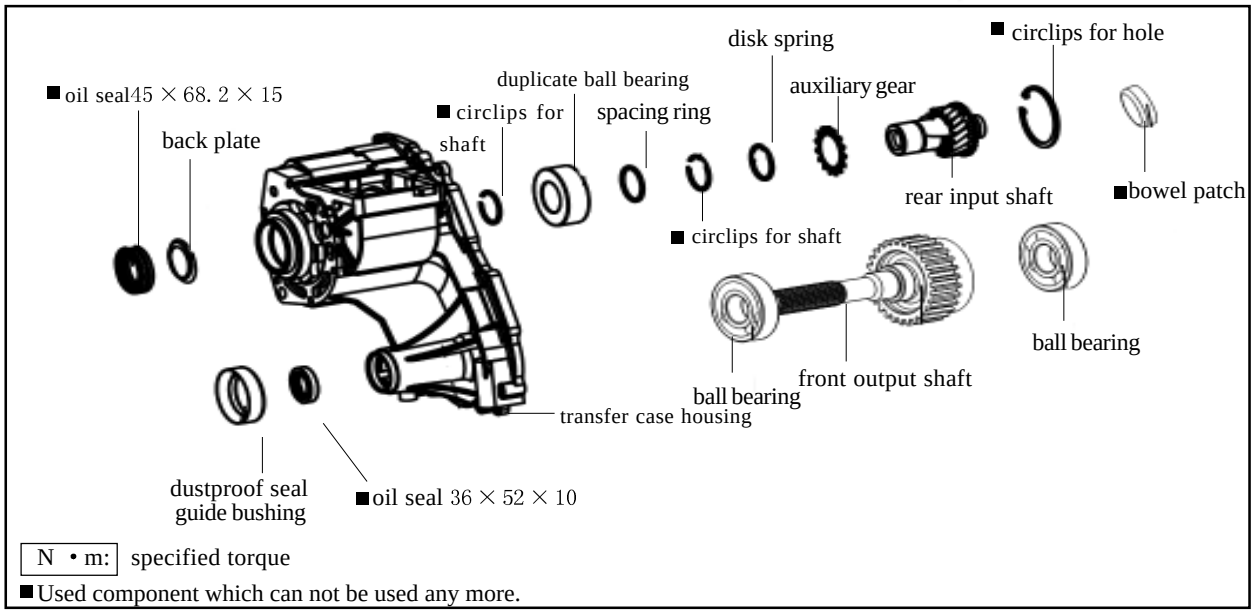
Transfer case assembly （Two）

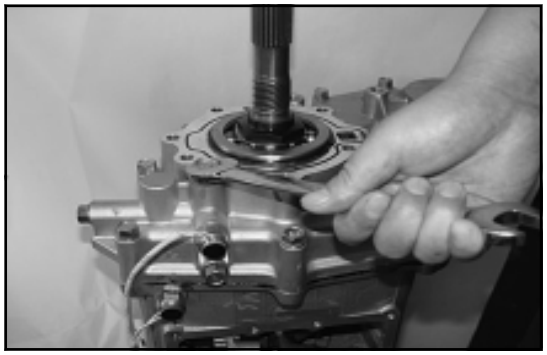


N • m: specified torque

■Used component which can not be used any more.

Transfer case assembly (three)



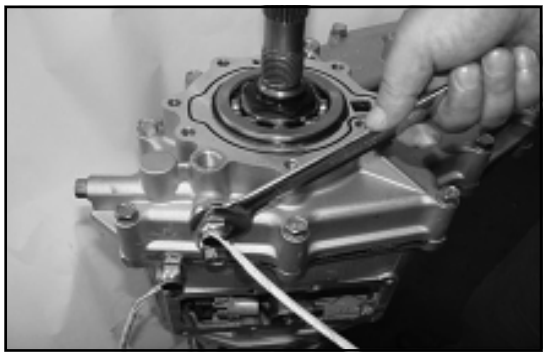


Disassembly of transfer case assembly

4.Remove the shouldered lock screw plug

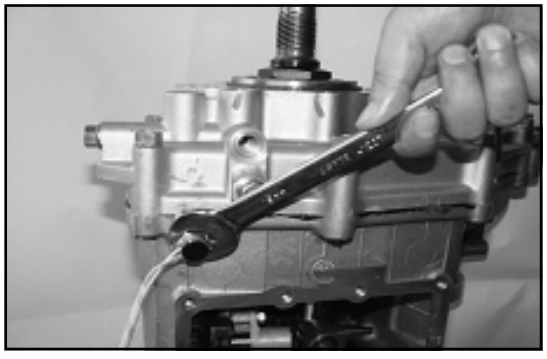
Use the wrench to remove the shouldered lock screw plug M16 × 1.5 × 12

Caution: The tightening torque is 26-36N • m when install the shouldered lock screw plug M16 × 1.5 × 12.



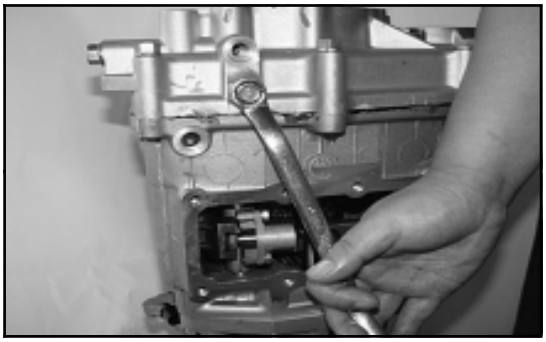
5.Remove the upper and lower drive switch M12 × 1.25

Caution: When install the upper and lower drive switch M12 × 1. 25, the tightening torque is within 26-36N • m



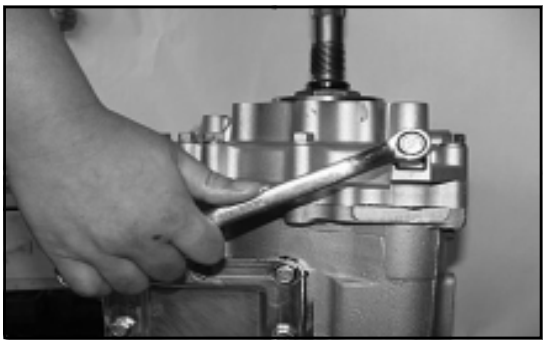
6.Remove the 2nd/4th drive switch M14 × 1.25

Caution: When install the 2nd/4th drive switch M14 × 1.25, the tightening torque is with in 26-36N • m



7.Remove the shouldered lock screw plug M14 × 1.5 × 10

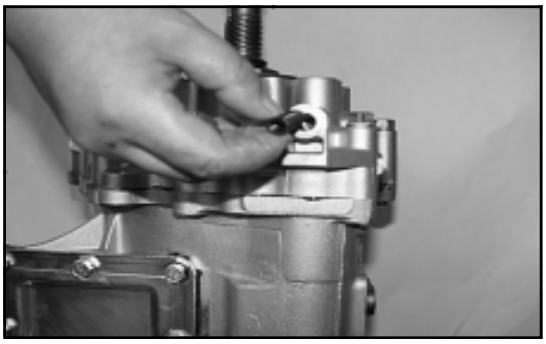
Caution: When install the shouldered lock screw plug M14 × 1.5 × 10, the tightening torque is within 26-36N • m



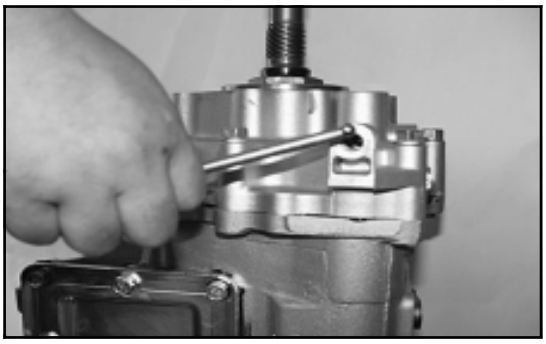
8.Remove the shouldered lock screw plug

a. Use the wrench to remove the shouldered lock screw plug M12 × 1.25 × 10

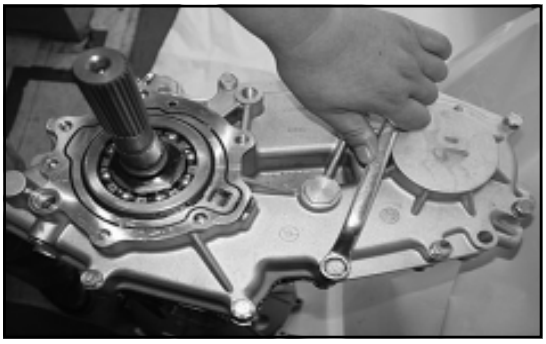
Caution: When install the shouldered lock screw plug M14 × 1.5 × 10, the tightening torque is within 26-36N • m



b.Takeout mushroom lock spring



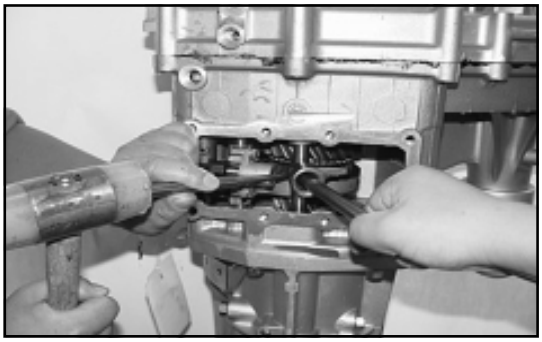
c. Use the magnetic rod to take out the steel ball.



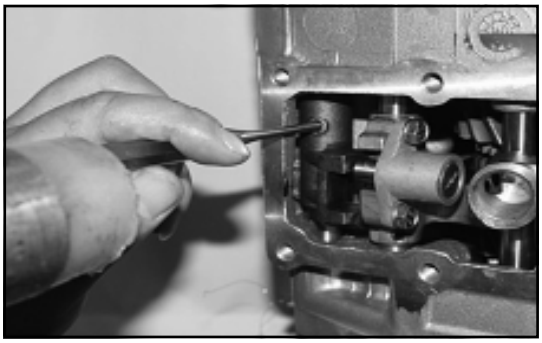
9.Remove the transfer case cover

a. Use the wrench to remove 12 connecting bolts M10 × 1.25 × 65 between the transfer case cover and tranafer case housing.

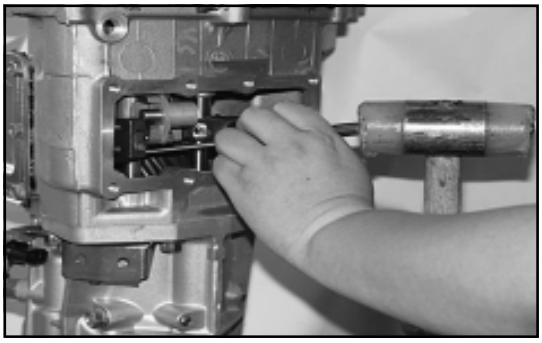
Caution: The tightening torque is 26-36N • m when install the bolt M10 × 1.25 × 65.



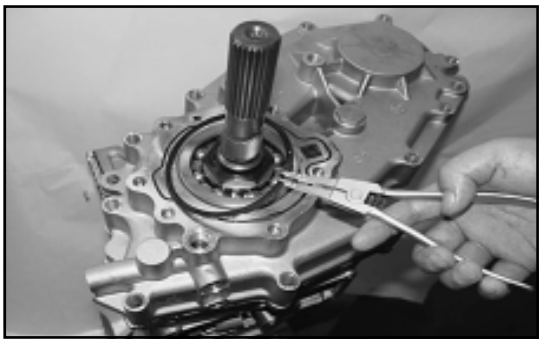
b. Remove the select & shift seating elastic cylindrical pin



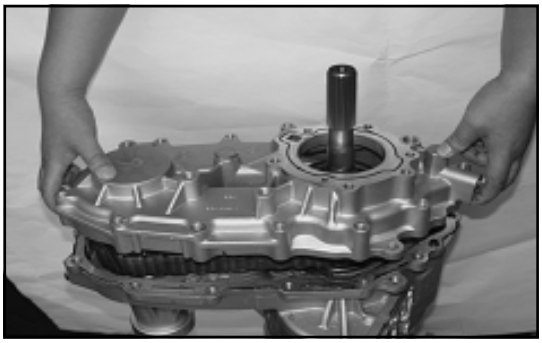
c. Remove the high/low drive declutch shift shaft elastic cylindrical pin



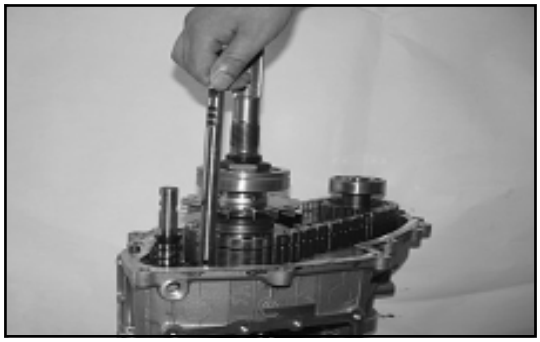
d. Remove the 2nd/4th declutch shift shaft elastic cylindrical pin



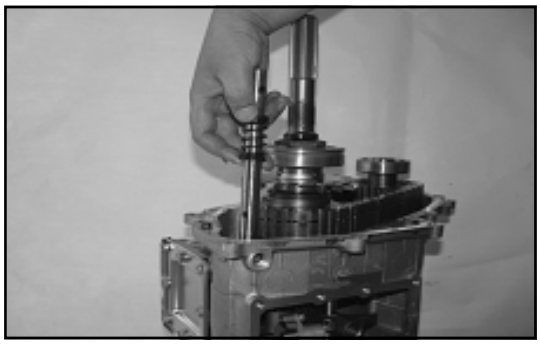
e. Use the circlip pliers to remove the bearing snap ring



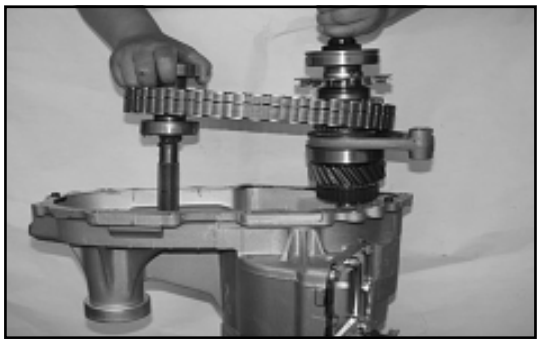
f. Use the rubber hammer to knock out the transfer case cover assembly slightly and remove the transfer case cover assembly.



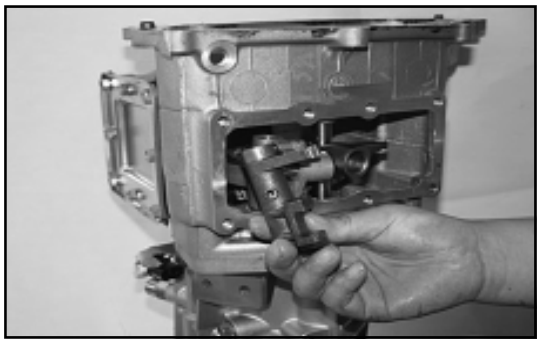
10. Remove the high and low gear drive declutch shift shaft



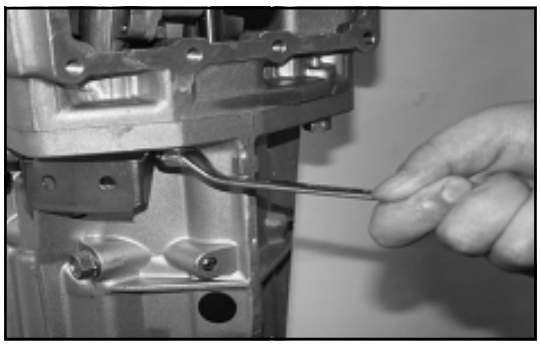
11.Remove the second and fourth drive declutch shift shaft



12. Use the plastic hammer to knock out the rear output shaft assembly, front output shaft assembly and chain out slightly



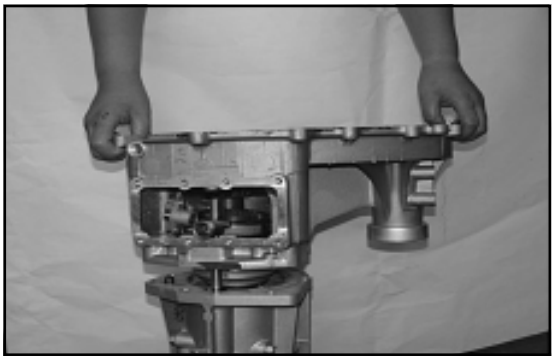
13. Remove the second/fourth shift block and high and low gear shift fork



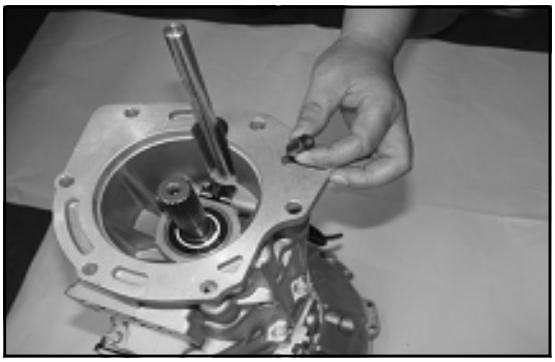
14. Remove the housing of transfer case

a. Use the wrench to remove 4 bolts M10 × 1.25 × 35 and 2 nuts M10×1.25 connected the gearbox and tranafer case housing

Caution: The tightening torque is 30 － 42 N•m when install the connecting bolt of gearbox and housing of transfer case



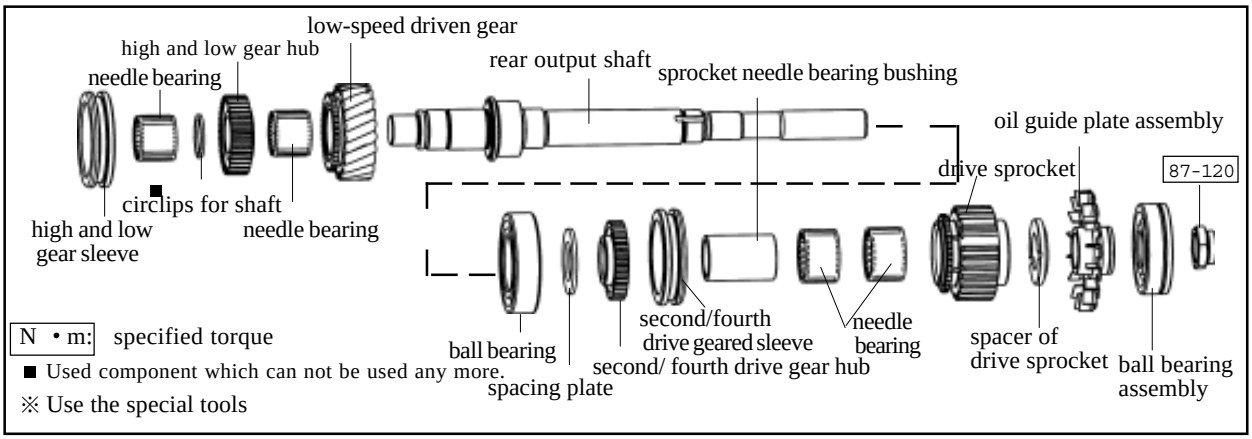
b. Remove the housing of transfer case

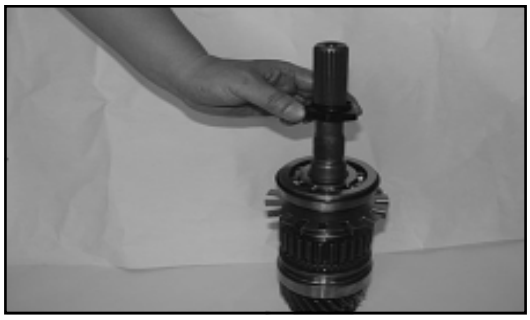


15.Remove a location pin

For the disassembly of gearbox refer to “Disassembly of gearbox in SC5M2D － C”

Rear output shaft assembly





Disassembly of rear output shaft assembly

a. Use the special tools to remove the lock nut

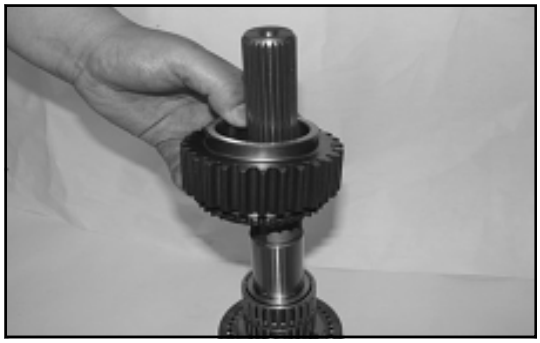
Caution: The tightening torque is 87-120N • m when install the lock nut.

b. Remove the ball bearing

c. Remove the oil guide plate

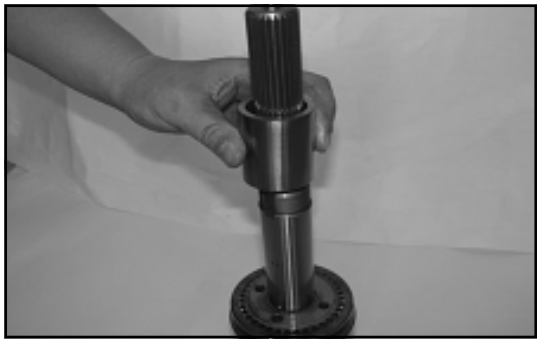
d. Remove the spacing ring

e. Use the magnetic rod to remove the steel ball.



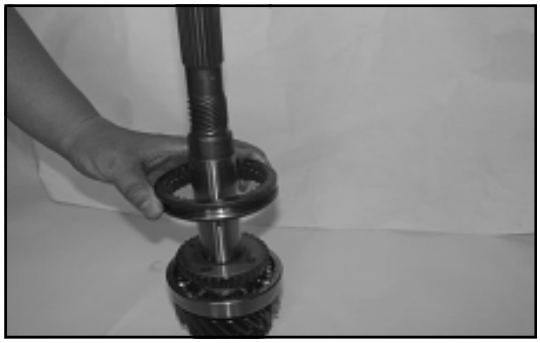
f. Remove the drive sprocket and needle bearing

Caution: When install the drive sprocket, it should use the plug gage to measure the drive sprocket axial clearance and ensure within 0.19-0.338mmg.

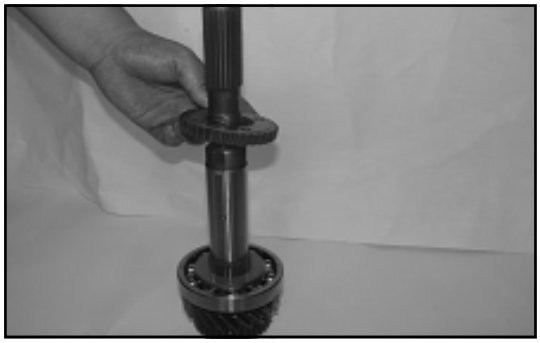


g Remove the drive geared sleeve

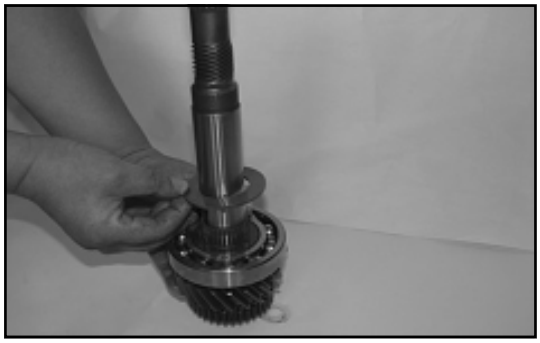
h. Use the magnetic rod to remove the steel ball.



i. Dismantle the drive gear sleeve.



j. Remove the gear hub

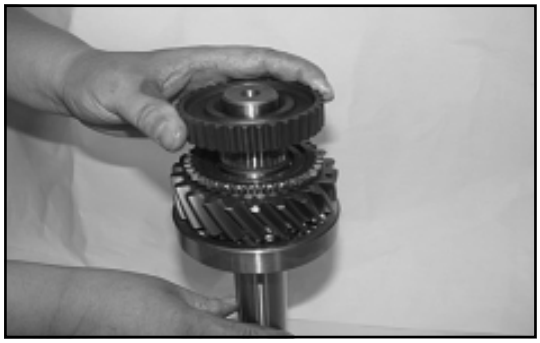


k. Remove the spacing plate

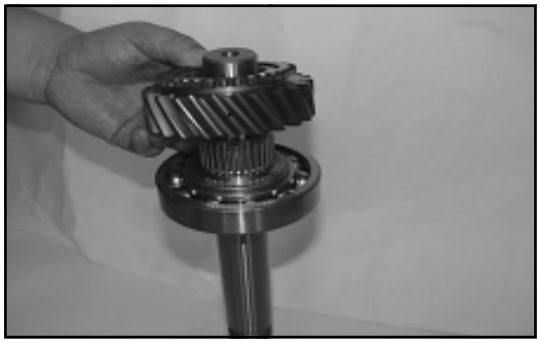
l. Use the circlip pliers to remove the circlip.

Caution: It should select the circlip for shaft according the angle when install it.

Mark	Thickness (mm)
White	2.36 ± 0.01
Blue	2.44 ± 0.01
Green	2.52 ± 0.01



m.Remove the high and low geared sleeve and gear hub



n. Remove the low-speed driven gear, needle bearing and rear output shaft

Caution: When install the low-speed driven gear, it should use the plug gage to measure the axial clearance of low-speed driven gear axial clearance to ensure the axial clearance is 0.17-0.284 mm

Chapter 5

Automatic transmission (M88)

Instruction for automatic transmission

1. M88 4-speed automatic transmission is equipped with the hydraulic torque converter and electric control system with locking. When keep the stable forward status, the hydraulic torque converter can be locked automatically when the engine operates in low speed, then reduce the unnecessary slide.
2. The main advantage of the transmission is the application of transmission control unit (TCU). The control unit is the control system based on the microprocessor system.. TCU control the shifting sensing and realize the Gear position shifting through the signal of opening degree of throttle position, opening frequency of throttle position, engine speed, vehicle speed, transmission oil temperature, gear position, mode selection and forced Gear reduction application.
3. TCU drives a variable pressure regulating solenoid valve to control three regulation valves and control the feeling of shifting. Different transmission fluid temperatures are taken as one the main parameters to control the output pressure of the solenoid valve, so as to keep consistent feeling of shifting within the normal operation scope.
4. The planning of shifting is very flexible. According to the car model, the different shifting plan is stored in the same TCU. Generally speaking, the "economical mode" can increase the economical efficiency of the fuel and the driving performance of the car to the maximum limit. The "dynamic mode" can bring into full play the drive performance of the car to the maximum limit. The "winter mode" can make the car starting from shift 2.

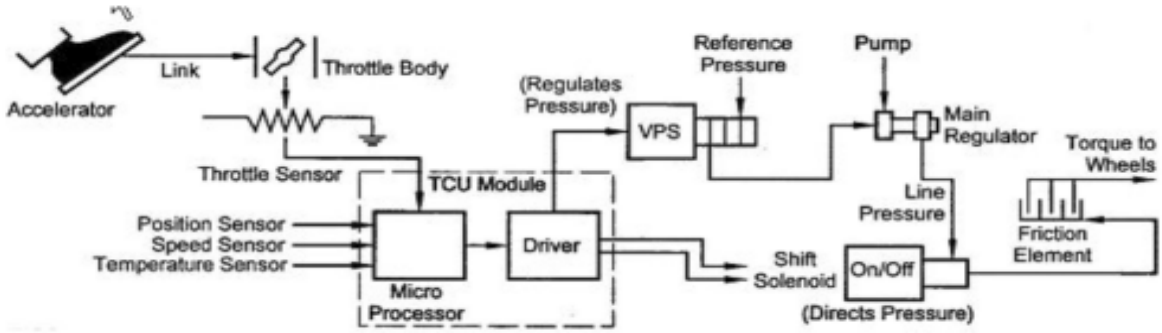


Figure 1.1 Electric automatic transmission control system

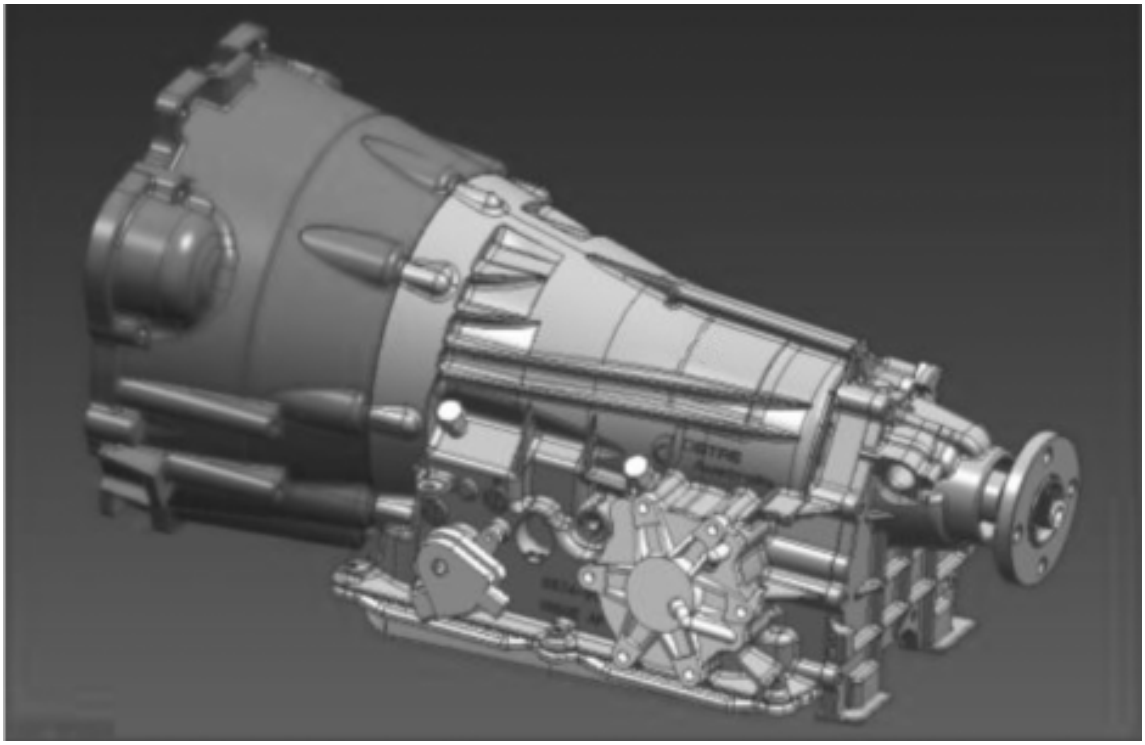


Figure 1.2 M88 4 speeds automatic transmission appearance figure (applied to 2 wheels driving)

Cautions for installation and removal of M88 automatic transmission

1. If improperly handled, the hydraulic torque converter may fall. Once the goods rack is removed, the hydraulic torque converter cannot get orientation. If the torque converter leans forwards, the oil will leak from the torque converter and transmission pump. It will be difficult to replace the hydraulic torque converter, because the oil quantity needs to be adjusted again after the re-installation of the torque converter. It needs training and technology to replace the torque converter correctly. After re-installation of the torque converter, the oil quantity needs to be adjusted, and the external surplus oil shall be cleaned.
   a. During shipment, the torque converter is located inside the transmission, when the transmission and the motor is butt jointing, the torque converter needs to be moved out. Only after the motor is linked with the transmission, and after the torque converter case bolt is linked with the motor, the torque converter can be moved forwards to the drive board easily.
   b. Be careful when installing the bolt between the torque converter and the drive board. The six bolts shall be installed with hand tenderly, and then be tightened. First ensure that the bolt has a natural position, and then lock it. The torque converter bolt needs to be installed with hand. Then rotate the torque converter and motor for 120˘ăcomparatively, install the next set of bolt.
   c. The length of the bolt is important; it cannot be too long. If it is too long, there will be interference at the end, which will make the hydraulic torque converter unable to joint with the drive board tightly. This will lead to the abnormal operation of the torque converter, and the severe noise during idling of engine and driving.
2. Do not damage the black disable switch during operation. This switch will transfer the position signal of control lever to the transmission control unit, if the signal is absent or error; it will be a hidden danger of safety. If the switch is damaged, it shall be replaced by professional technician. The car body wire harness connection plug can be linked with the switch socket easily. The switch joint cannot be contaminated, or the switch will loose effect. Use electric spray cleaner to clean the dirty or wet switch interface.
3. The 10 pins socket at one side of the transmission links the internal and external wire harness. The socket is injection molded; it may be damaged if greater force is used during the installation of wire harness. The car body wire harness joint can be installed into the switch joint easily. This 10 pins pin type interface cannot be contaminated, or the electrical circuit will lose effect. Use electric spray cleaner to clean the dirty or wet switch interface.
4. Two cooler interfaces link the cooling tube with the transmission. These cooling tubes are inlet and outlet oil way of the cooler The front interface is the inlet oil way of the cooler, or it is called the heat side, the back interface is the oil return way (cool oil way) of the cooler. These interfaces are never allowed to be contaminated, or the contaminant may get into the cooling oil way when the dustproof cover is moved away. Caution that, the cooler oil way is also the lubrication oil way, the adhesive substance may get into the transmission bearing, bushing and other places. If the cooling oil way is stuck or there is contaminant, the transmission will be damaged.
5. The odometer transducer is installed at the end of the transmission housing. The signal from the transducer is sent to the transmission control unit (TCU). TCU use this signal to estimate the car speed. Be cautious to install the transducer.
6. The back end flange is furnished with threading connection. Paying attention when install the drive shaft onto the back end flange of the transmission, it needs medium strength threading bold. Because there is needle bearing on the extended case to ensure the installation of back end flange, and the impact of installation, the violent using the flange will lead the needle bearing to lose effect. It shall be guaranteed that the flange will not be handled violently during the installation operation and assembly.
7. The control shaft is one side of the transmission, and link the steering column to the transmission. The roller on the control shaft is installed on the end of the steering column on the control shaft. The installation torque of the nut must be correct, or the roller will distort.
8. Use two bolts to install the back device on the extended case of the transmission, these lengths are important. If it is too long, it will hinder the end of the bolt and affect the threads on the case. Ensure the proper length and special torque of the bolt.
9. Pay attention that the height of the oil has been determined before delivery from the ION Company. The oil height needs not checking or correction, except that improper oil is suspected to be used, or additional oil is needed because of leakage.

10. The gross weight of the transmission is 76kg; mostly weight is on the front of the transmission (side of torque converter). This should be considered when design the handling/assembly tools.
11. The crankshaft speed/position sensor is installed on the top of transmission torque converter housing which must be installed after the transmission is installed on the engine. The sensor will be damaged if it is installed before the installation of transmission.
12. The transmission use the breathing tube connected to rear end of transmission. The tube must not be restricted or blocked otherwise the air pressure in transmission will be increased. It is unallowable that the water/dirty/dust enters into the breathing tube; otherwise the transmission will be damaged.

Removal of transmission

If the transmission needs removing for any reasons, following is the preventive measure to help the remove.

1. Must not only support the oil pan in middle of transmission for it will be deformed and leaked. The oil pan will not be deformed when supports its external edge.
2. It must not allow the transmission to connect to the engine when the rear end is without connection, otherwise the exhaust system of vehicle will be damaged.
3. Remove all torque converter bolts and push back the torque converter before remove the bolt connected the torque converter housing to engine. Once all bolts connected the torque converter housing to engine are removed, use the torque converter the push the transmission from the location pin, then ensure the torque converter is on the transmission and the transmission is separated form location pin.
4. Install the dustproof cover on the cooler connector rapidly after open the oil cooler pipe; otherwise the oil leakage from the torque converter will be 2L. The odometer dustproof cover can prevent the dirty from entering into the transmission and avoids the leakage of oil form transmission.
5. The engine speed sensor is installed on the top of transmission and should be removed before the transmission is removed form the engine, for the sensor will be damaged during the removal process of the transmission.

Operation and display interface

The four-speed automatic transmission has three types of operation display interface which are shown as follows:

Gear selection

The transmission uses the traditional gear selection shifting handle, which is shown in figure. The gear rod can be moved on the gear slide way according to the requirement. The relationship between the related gear and its function.

Figure 2.1 Gear selection interface

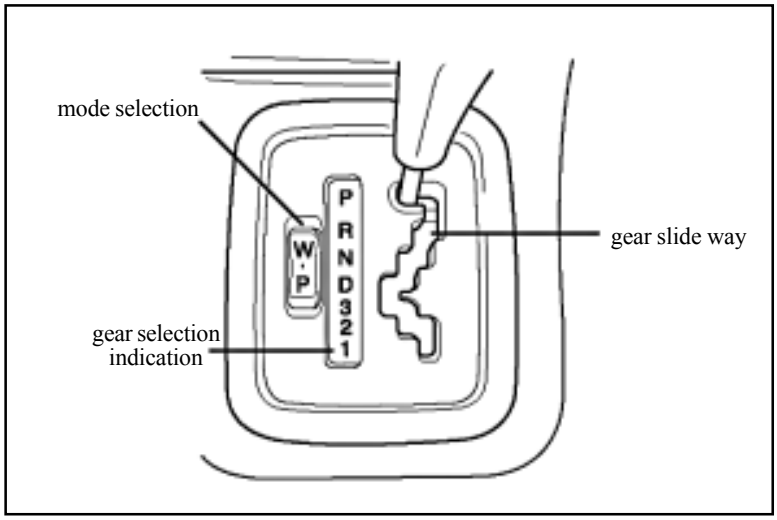


Table 2.1 Gear selection and its function

Gear selection	function
1st-Gear (manual 1st-Gear)	The first gear is using for climbing and braking. It is a function which limits the speed of the car. The speed limitation by engine is realized by reduce the opening degree of throttle position.
2nd-Gear (automatic, manual 2nd-Gear)	In economic mode, it can process the 1st and 2nd shifting operation when engage the 2nd –Gear. The limitation of vehicle speed by engine is realized through reducing the opening of throttle position. in 4WD 4 high, , the transmission will maintain 2nd-Gear position The manual mode and winter-Mode will only maintain 2nd-Gear 。
3rd-Gear (automatic, manual 3rd-Gea)	In economic mode and dynamic mode, it can process the shifting operation of 1st, 2nd and 3rd-Gear when engage the 3rd-Gear, and can reaches the very high vehicle speed. At this time the locking clutch can process the locking action, refer to vehicle user manual. The limitation of vehicle speed by engine is realized by reduce the opening of throttle position. In 4WD 4 low, the transmission should be maintained in 3rd –Gear position. Under manual mode, the transmission will be kept in 3rd-Gear.
D-gear (drive)	It can process the 1st, 2nd, 3rd and 4th –Gear position operation and gear-shifting operation of (1-2), (1-3), (2-3), (2-4), (3-4), (4-3), (4-2), (3-1) and (2-1). This shifting operation is processed by taking the vehicle speed, throttle position, throttle position switching frequency (or forced Gear-decreasing) as the parameter. The locking clutch can process the locking action in 3rd –Gear, 4th-Gear according to the type of vehicle. Refer to user manual of vehicle.
N-Gear (neutral gear)	Only the rear brake belt is engaged at this time. It determines whether the function can be realized according to the vehicle speed, engine speed and throttle position. But the gear-position sensor allows the starting of engine. Allow the slide of N-Gear.
R-Gear (reverse gear)	Set the anti-misoperation in forward function according to the vehicle speed, engine speed and throttle position opening to realize the reverse operation. The gear-position sensor can start the reverse lamp.
P-gear (parking gear)	Only the rear brake belt is engaged at this time. The function can be determined according to the vehicle speed, engine speed and throttle position. The output shaft of transmission is locked. The gear-position sensor can start the engine.

Operation instruction

Serial No.	Mode	position	Gear scope	Shifting method	function
1	Economic mode	Between W and P	D：1-2-3-4 3：1-2-3 2：1-2 1：1	automatic	Fuel saving
2	dynamic mode	P	D：1-2-3-4 3：1-2-3 2：1-2 1：1	automatic	Improve the dynamic performance
3	snowland mode	W	D：1-2-3-4	automatic	Having anti-slide function
4	Manual-automatic integrated mode	W	D：1-2-3-4 3：3 2：2 1：1	automatic Manual Manual Manual	It is allowable that the D-Gear in "W" mode is used in snowland and M-A integration mode.
Function					
5	Brake function	Can decrease the gear-position in slope to improve the brake effect and increase the vehicle safety.			
6	Speed-up function	It can select the manual shifting to increase the vehicle speed completely during the speed-up.			
cautions					
7	It must place the transmission in the P-Gear or N-Gear when start the engine.				
8	It must place the transmission in P-Gear during the parking.				
9	It must place the transmission in N-Gear when trail the car.				
10	It must be powered off when remove the transmission.				
11	It must be powered off when install the transmission.				
The transmission processes the communication and calculation with the engine electronic control computer by the precision central on-line computer. It not only save the fuel, but also provide the maximum mode function, including field, winter and manual selection. It provides the two conditions, manual and electric for the fast race of racing player. It has racing capacity which can compete the speed increasing with the manual transmission.					

Selection of drive mode

The selection of drive mode includes a mode selection switch and indicator lamp. The drive mode selection switch is located on the operating panel. It can provide the different mode selection according to the different type of car.

It has the optimal fuel economy when select the "normal" mode. At this time, the indicator lamp is not light. When select the "dynamic" mode, the car will have the maximum dynamic performance and the "dynamic" mode indicator lamp is light. When select the "snowland" mode, it will realize the starting of "2nd-Gear", the "snowland" mode indicator lamp is light, meanwhile the "dynamic" mode indicator lamp will be closed. When select the manual mode, press down the "snowland" switch firstly, the "manual" light will be light when the gear is in 3, 2, 1. When in manual mode, 1-2, 2-3, 3-4, 3-2, 2-1, 1-3, 3-1 is shifted by driver manually and can not be shifted automatically. It can be used in car-racing etc. for the special mode of each model of car refers to operation manual of user.

Figure 2.2

Indicator lamp

The indicator lamp is on the instrument panel.

The instrument panel includes:

- snowland mode
- dynamic mode
- manual mode. When the transmission is in the manual mode, the manual mode indicator lamp will flash.

control system

General

The transmission has two sets of control system, a electric control system and a hydraulic control system. The electric control system monitors the vehicle parameter and adjusts the transmission performance; the hydraulic control system executes the command of electric control system.

Electric control system

The electric control system consists of the sensor, TCU and 7 solenoid valves. TCU read in the data and make the output under the control of software based on the value stored in Read Only Memory (ROM).

TCU controls the hydraulic control system and the control is realized through the valve and pump assembly. The system includes 7 solenoid valves, in which 6 valves are used to control the line pressure, operate the shift valve and hydraulic torque converter lock clutch and switch on and off two regulating valves (Two regulating valves control the shift feel). The seventh solenoid valve is the pressure regulating solenoid valve (VPS) which controls the shift feel with other three regulating valves. Figure 3.1 is the typical TCU control system plan.

The figure includes all elements of electric control system involved in the section.

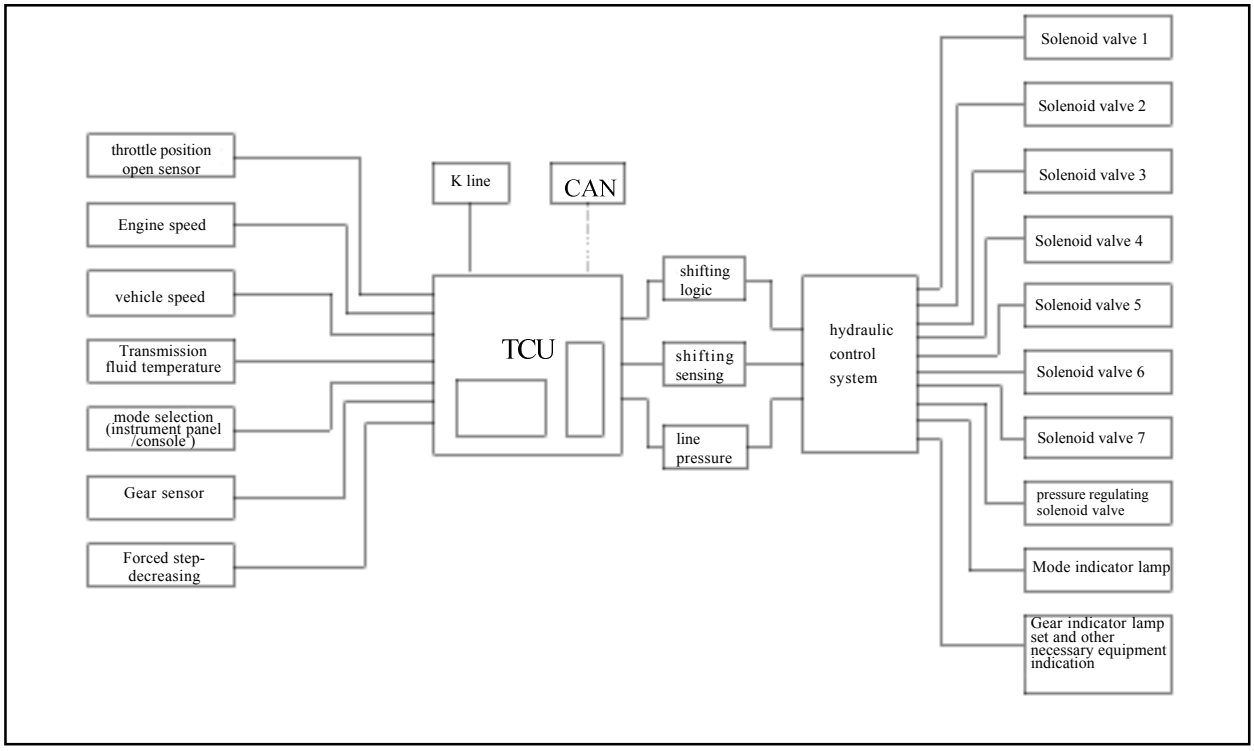


Figure 3.1

1.Transmission control unit (TCU)

TCU is the carborne microprocessor unit based on transmission management system.

TCU part includes:

Logic processing circuit; including a CPU and standby system.

Input circuit.

output circuit is used to control the indication of peripheral equipment, such as the pressure regulating solenoid valve, switch solenoid valve drive circuit, a diagnose output port and drive mode indicator lamp.

Following is the description of each part.

TCU must be dry always. The entry of water or other liquid may affect the TCU performance and safety.

a. Logic processing circuit

The shifting plan and calibration information is stored in the erasable programmable read-only memory (EPROM). The calibration content and diagnose information throttle position input is stored in the electronic erasable programmable read-only memory (E^2PROM) which can not lose the stored information even the TCU is powered off.

During the operation process, the software monitors the input value continuously and uses the input value to select the necessary gear status through the shifting logic. At the same time, it determines the current gear through controlling the status of solenoid valve. When the input status is changed, for example the required gear is different form the condition of current gear TCU will determine the shifting through changing the status of solenoid valve.

Once the TCU determines to process the shifting, the software will access the shifting logic module, then calculate the torque output of engine. It changes the oil pipe pressure for shifting by adjusting the pressure regulating valve based on the calculated engine torque

TCU monitors each input and output circuit, detects short-circuit, break-circuit and operation scope continuously. When the TCU detects a failure or abnormal operation, it will store its failure code in the diagnosis storage unit and executes the limping mode. The selection of limping mode depends on the type of detected failure, and the selection should maintain the driveability and could not damage the transmission. Generally speaking, the failure input will be correct by the presetting default value. It will cause the output failure which can damage the transmission. The mode only output the 3rd –Gear or R-Gear. For details of limp mode and storage condition refer to diagnosis part.

TCU's design operating ambient temperature is －40 to 85℃. Its design can prevent the damage of electronic noise and voltage peak. But it should pay attention to the general cautions, such as the effect of arc welding or voltage leap.

b. TCU input adjustment

To use the function correctly, TCU needs the signal of engine speed, vehicle speed, transmission fluid temperature, throttle position opening degree and Gear-position sensor. Based on these parameter, it can determine the opening degree of variable pressure solenoid valve and status of on/off solenoid valve to ensure the correct gear-position selection and shifting sensor under all drive condition. The input parameters TCU required are shown as follows:

Engine speed

The engine speed signal is form the speed sensor signal wire, special sensor or controller local area network (CAN).

Vehicle speed

2WD － The vehicle speed sensor signal is form the odometer sensor located on the transmission rear housing. It signal is send to the TCU directly.

4WD － same as 2WD, the difference is in that the odometer sensor is located on transfer case .

Transmission fluid temperature

The transmission fluid temperature sensor is a thermal sensitive temperature sensor which is located in internal electromagnetic insulation wire bunch of transmission. The oil temperature sensor is a typical NTC resistance sensor, which has high resistance in low temperature and low resistance in high temperature.

If the transmission temperature is beyond the 135℃, TCU will process the locking action in the low vehicle speed. In some vehicle model, it will have the flash of indicator lamp. In this condition, it will use the maximum oil flow to the external oil cooler to eliminate the slide of hydraulic torque converter. The two functions will decrease the oil temperature of transmission.

Table 3.1 Feature parameter of temperature /resistance

Temperature (℃)	Resistanc	
	Min.	Max
-20	13,638	17,287
0	5,177	6,616
20	2,278	2,723
100	177	196
135(over heat mode limite)	75	85

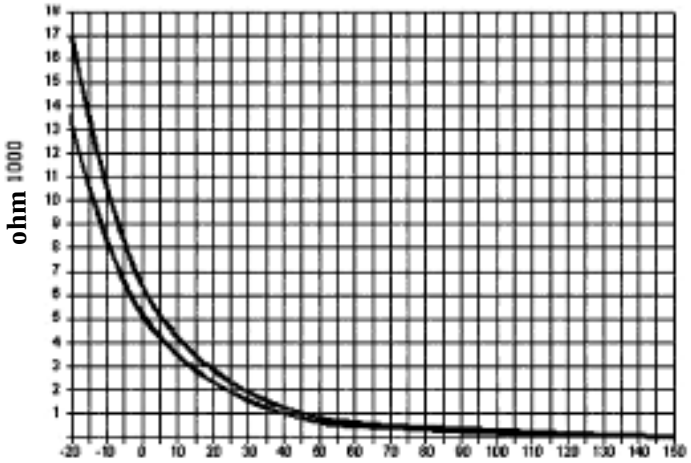


Figure 3.2 Pin number of temperature /resistance

Pin No.	Wire color	Connected solenoid valve
1	Red	solenoid valve 1
2	Blue	solenoid valve 2
3	yellow	solenoid valve 3
4	orange	solenoid valve 4
5	green	solenoid valve 5
6	violet	solenoid valve 6
7	brown	solenoid valve 7
8	green	solenoid valve 5
9	white	temperature sensor
10	white	temperature sensor

Table 3.2 Corresponding relation of pin, wire color and solenoid valve

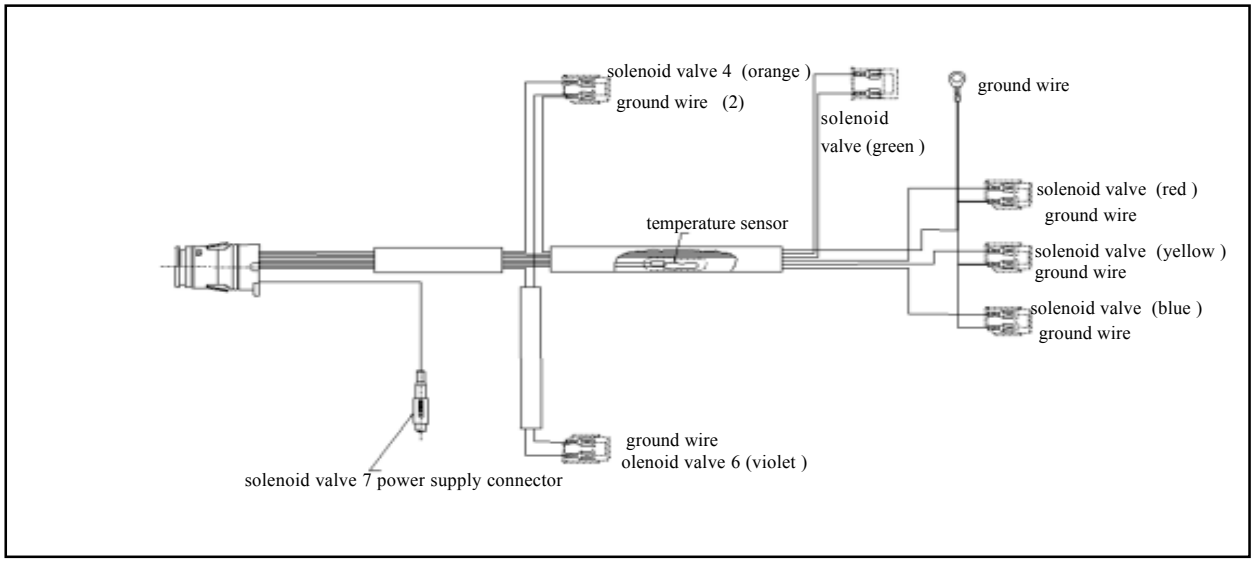


Figure 3.3 Schematic diagram of temperature sensor position and solenoid valve wiring

2.Throttle position sensor

Throttle position sensor (TPS) is a resistance instrument which is installed on the engine throttle . It sends the opening degree signal of throttle to the ECU, then ECU sends it to the TCU. The connection of throttle position sensor is the three-wire or four wire system, i.e. the 5V power supply voltage; ground wire and signal wire are determined by the engine electric control system. The change range of voltage of throttle position sensor is shown as follows:

- When the throttle position is closed, the voltage range is 0.5V～1.0V
- When the throttle position is opened, the voltage range is 3V～4.5V

At present, the opening degree signal of throttle is from the CAN bus.

During the service lift of transmission, its sound shifting sensing depends on the accurate measuring for the opening degree of engine throttle. To acquire the accurate measuring value, TCU will monitor the max. and min. value of throttle position sensor Once the value is changed, TCU will save the value. When install a new TCU or delete the calibrated data of throttle by a special operation, the limiting value will be lost or learned again.

Gear sensor

The gear sensor is installed on the side of transmission case (Refer to Figure 3.4). The gear sensor is a multi-function switch and mainly includes the following three functions:

- It will prevent the car from starting when the gear is not in the parking gear and neutral gear.
- Light the reversing light when the gear is in reverse gear.
- Provide the position information of current gear to TCU through the different resistance value.

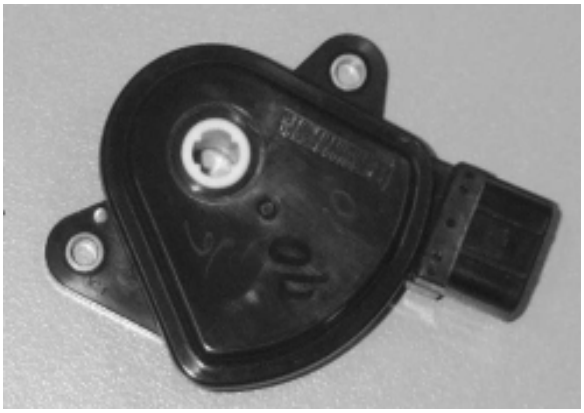


Figure 3.4 gear sensor

Gear position of vehicle	Resistance (Ω)
Manual 1	1k － 1.4k
Manual 2	1.8k － 2.2k
Manual 3	3k － 3.4k
D-Gear	4.5k － 4.9k
N-Gear	6.8k － 7.2k
R-Gear	10.8k － 11.2k
P-Gear	18.6k － 19k

Table 3.3

Diagnosis input

The diagnosis for the automatic transmission is that sent the diagnosis data stored in TCU to the diagnosis instrument through the diagnosis control input equipment or K－line. The diagnosis input also can clear the history failure record stored in TCU. It can be connected to the TCU diagnosis input end through the vehicle wire bunch or computer interface. For detailed position, refer to user manual of vehicle.

3. TCU output

The output action of TCU is descried as follows: Solenoid valve

TCU controls 7 solenoid valve. The solenoid valve 1 to 6 (S1 to S6) is installed on the interior of valve; the solenoid valve 7 is installed in the pump cover. The general status and function of solenoid valve is shown as Table 3.4. Table 3.5 describes the logical value of static gear-position status (on/off) of S1 and S2. The logic of S1 to S4 and S7 during the shifting period is shown as follows.

solenoid valve 1and 2	S1 and S2 is the normal open solenoid valve, which is used to set the gear-position with other switch solenoid valve. It determines the static gear-position by operating the gear shift valve. Refer to Table 3.5, S1 and S2 also send the pressure single to allow or prohibit the engagement with rear brake belt.
solenoid valve 3and 4	S3 and S4 are the normal-opened solenoid valve which is used to control the shifting quality and sequence in combination. S3 control the open or close of the clutch. S4 is used to control the on and off of the front brake belt regulating valve.
solenoid valve 5	S5 is the variable pressure solenoid valve which can release the pressure of gear-position shifting. It provides the pressure signal to the clutch and brake belt regulator and controls the shifting pressure. S5 also provides the pressure single to the torque converter clutch regulating valve.
solenoid valve 6	S6 is the normal-opened solenoid valve, which is used to the set the H/L level of pipeline pressure. The pipeline pressure is high when the solenoid valve is closed.
solenoid valve 7	S7 is the normal-opened solenoid valve which is used to control the engagement status of torque converter licking clutch. It makes the clutch to generate the action when the S7 is in opened status.

Table 3.4 Status and function of solenoid valve

Gear-position	S1	S2
1st-Gear	On	On
2nd-Gear	Off	On
3rd-Gear	Off	Off
4th-Gear	On	Off
R-Gear	One of them is in On position at least.	
N-Gear	Off	Off
P-Gear	Off	Off

Table 3.5 Logic status of solenoid valve in static gear-position

Shifting	Initial shifting status	Current variation of S5	Finished shifting status
1－2	S1 Off S4 On	950mA－650mA	S4 Off
1－3	S1 Off S2 Off S3 On S4 On	900mA－400mA	S3 Off S4 Off
1－4	S2 Off S3 On S4 On	850mA－750mA	S3 Off S4 Off
2－3	S2 Off S3 On S4 On	700mA－200mA	S3 Off S4 Off
3－4	S1 On S4 On	950mA－550mA	S4 Off
4－3	S4 On	950mA－700mA	S1 Off S4 Off
4－2	S3 On	800mA－500mA	S1 Off S2 On S3 Off
4－1	S3 On S4 On	1000mA－600mA	S2 On S3 Off S4 Off
3－2	S2 On S4 On	550mA－400mA @ 20kph 800mA－600mA@60kph 1000mA－800mA@100kph	S4 Off
3－1	S3 On S4 On	1000mA－750mA	S1 On S2 On S3 Off S4 Off
2－1	S4 On	1000mA－500mA	S1 On S4 Off
Torque converter clutch On Off	S7 On	1000mA－500mA 900mA－600mA	S7 Off

Table 3.6 Operation of solenoid valve during shifting period

Symbol of solenoid valve (On/off solenoid valve)

The symbol of solenoid valve is related to the hydraulic system. It means the status of transmission fluid flowing through the solenoid valve when the power supply is on or off.

For on/off details of normal open solenoid valve refer to Figure 3.5.

Normal-opened solenoid valve

Power on

The line 500 port is closed. The output port is opened and connected to drainage port.

Power off

The drainage port is closed; the output port is opened and connected to the line 500 port.

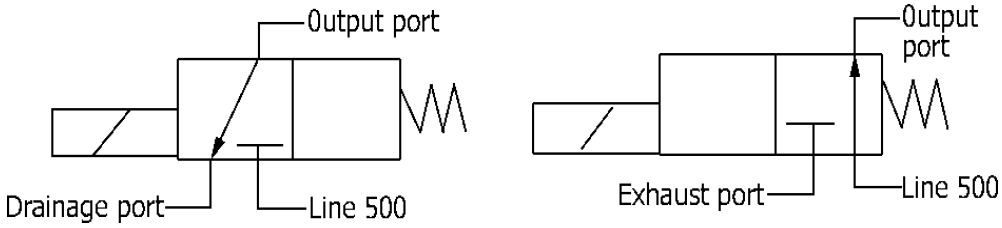


Figure 3.5 Normal-opened type

1.Variable pressure regulating valve regulating system

The shifting pressure of abrasion unit is controlled by the variable pressure regulating valve.

The line pressure is independent of the shifting pressure and determined by the thro

position, shifting status and engine speed.

S5 is a proportional or variable pressure regulating valve which provides the pressure signal control shifting pressure for the clutch and brake belt regulating valve.

In automatic shifting period, it process the integral times enlarging and contracting

regulation for the clutch regulating valve, brake belt regulating valve, torque converter regulating valve and VPS.

The hydraulic pressure generated by variable pressure regulating valve is in inverse ratio with current. During the shifting, TCU will increase or decrease the current of solenoid valve according to the program. The current is variable in the range of 200mA to 1000mA. The increasing of the current will decrease the S5 output pressure; the decreasing of current will increase the output pressure of S5.

Lin 500 pressure (about 440 to 560kPa) is the reference pressure of VPS, meanwhile, the VPS output pressure equals to the pressure on line 500 always.

When the VPS is in waiting status, it means there is not the generation of shifting action. VPS current is 200mA. At this time, it gives the maximum output pressure.

In stable status, the brake belt and clutch regulating solenoid valve is in closed status. In this condition, the pressure of line 500 is applied on the piston. For the line 500 pressure is more than S5 pressure always, so it pushed the oil in S5 to the place between the regulating valve and piston. At this time, oil pressure applied on the friction unit equals to the product of pressure on line 500 and magnification factor.

During the starting of shifting, the used on/off solenoid valve is in opened status which cut off the oil loop supply from line 500 to piston.

At the same time, VPS pressure is decreased to starting pressure valve, pressure set by regulating valve and pressure setting value required by execution of VPS by pushing the piston from the valve. The shifting is finished through the on/off solenoid valve, VPS returns to the waiting status

Pointed to each gear-position, the system can make the brake belt; clutch or both realize

the electronic control.

Mode indicator lamp: the mode indicator lamp can be used to indicate the current selected and whether the overpeed status exists. The mode indicator lamp is located in instrument panel generally. (Refer to Part 2.3)

2. Communication system CAN

The controller local area network (CAN) is connected to the different control module through the twisted pair line to share the information and reduce the quantity of sensor and wire bunch greatly. The typical application includes the acquiring the real time engine speed and throttle position by using the engine control unit, and send the information to the network. It also can use the ABS (if has) to acquire the vehicle speed signal. These information can be acquired by the TCU and need not moresensor additionally.

K—line

K-ine is used to acquire the diagnosis information in the TCU. The computer has a special interface which can be connected to the TCU to acquire all current failure, store the failure and real time parameter. The saved error code can be erased.

K—line also can code the different vehicle mode in the car manufacturer or workshop. It canÖâallow a TCU with the program of different vehicle type. Through K-line, pointing to different vehicle type, select the different parameter to send to the microprocessor to make the software can select the correct shifting and VPS parameter.

Hydraulic control system

The hydraulic control system is located in the valve, pump and main box.

The valve includes the following types:

- Manual-operated valve
- sequence valve
- line pressure control valve
- clutch connection regulating valve
- brake belt connection regulating valve
- solenoid valve 1 to solenoid valve 6
- reverse lock valve
- Three shift valves
- electromagnetic pressure control valve

The pump includes the following types:

- primary regulating valve (control line pressure)
- torque converter clutch regulating valve
- torque converter clutch control valve
- solenoid valve 7

The main box includes:

- BIR blow-off valve

The plan of hydraulic control system is shown as Figure 3.6.

All increasing-position operations is finished with the opening of a gear shift valve. Transfer the VPS pressure to the brake belt regulating valve or clutch regulating valve, and send a graded current to the VPS. The shifting action is finished b closing the regulating valve and make the VPS to generate the maximum pressure at the same time.

The completion of all decreasing-position will also transfer the VPS pressure to the brake belt regulating valve or clutch regulating valve, and send a graded current to the VPS. It make the VPS to the reach the minimum waiting pressure by opening the regulating valve when finish the shifting action.

The primary regulating valve is in the pump cover and provides four line pressures, i.e. High and low line pressure in forward gear and high and low line pressure of reverse gear. The pressure has not any effect for shift quality. It only provide the static clutch load when in stable status operation. It can acquire the low pressure status through the action of On/Off type solenoid valve. The normal status of line pressure is high .

1. Valve

Figure 3.7 shows the valve unit in the view of transmission fluid tank. Figure 3.8 illustrates the pump cover.

2. Manual-operated valve

The manual-operated valve (refer to Figure 3.9) is connected to the car gear selection mechanism. It controls the transmission fluid flow to the forward or reverse loop. Except in manual 1st-Gear position, the function of manual-operated valve is same in all forward gear. In manual 1st-Gear, the transmission fluid will enter into the shift valve 1—2 to make the rear brake belt and C4 overspeed gear clutch is engaged respectively.

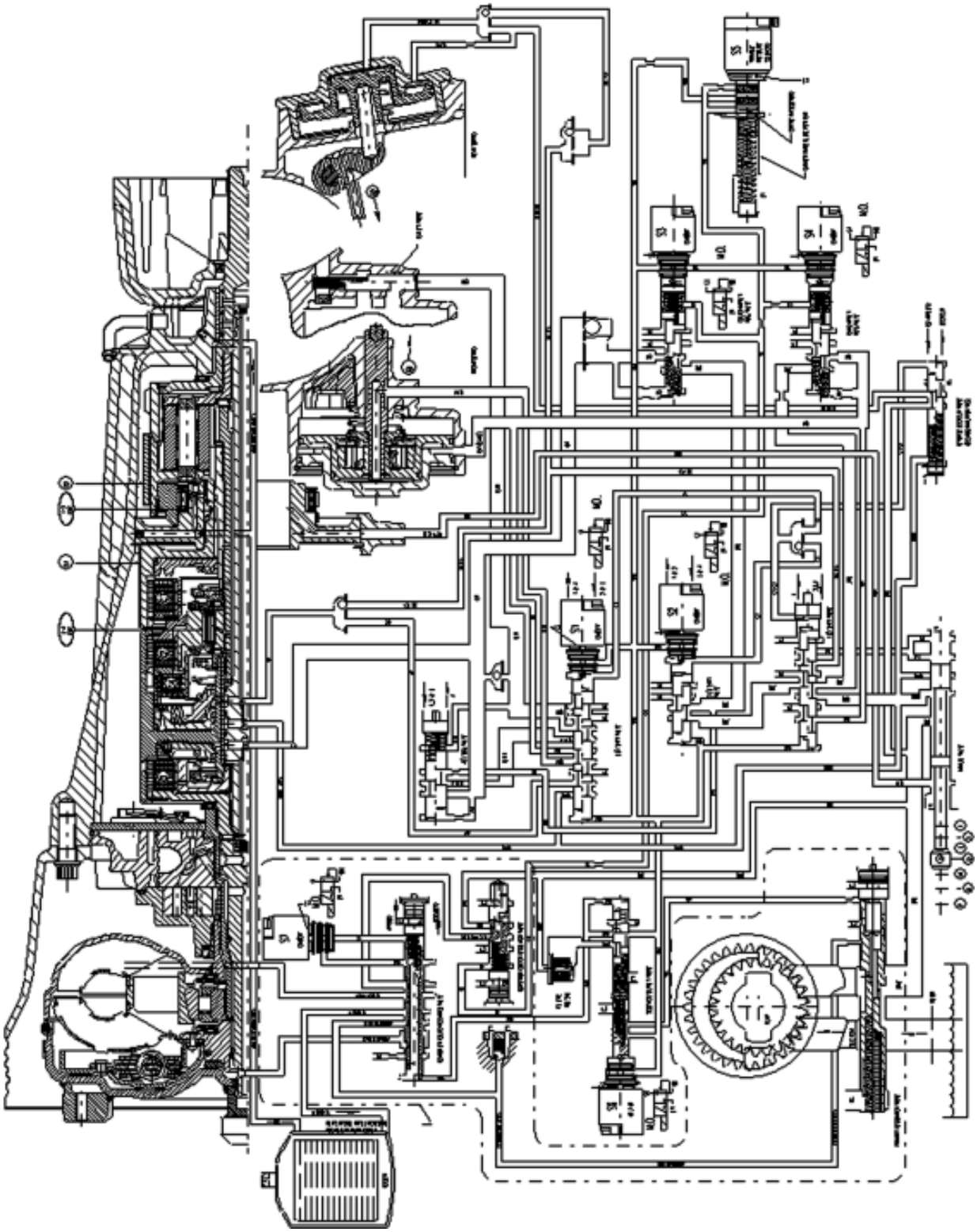


Figure 3.6 — Hydraulic control circulation flow

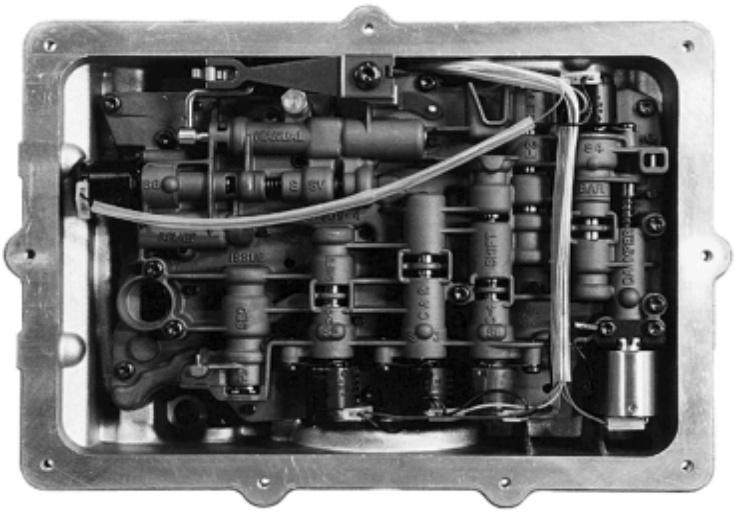


Figure 3.7 Valve

Figure 3.8 HP pump cover

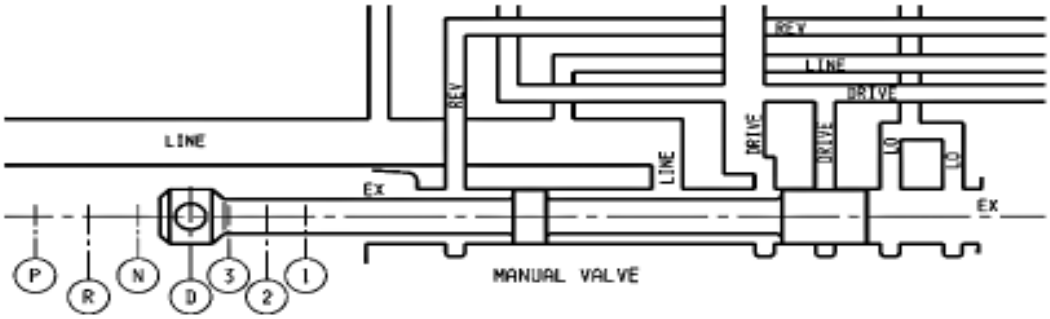


Figure 3.9 manual-operated valve 3.

3. 1-2 shift valve

1-2 shift valve (refer to Figure 3.10) has two position status. It must be in the position (2, 3, 4) for the convenience of raising gear in 1st-Gear. It is using for all 1-2 and 2-1 shift.

Through the power supply of S1 and (or) S2, the 1-2 shift valve can acquire its On/Off status.

During 1-2 shift period, drive the transmission fluid from manual-operated valve to the 2nd-Gear loop. During the shifting form 2 to 1, the brake belt is engaged and drain the oil through the 1-2 Gear shift valve.

When in 1st-gear position, the 1-2 gear shift valve operates with the 3-4gear shift valve (described as follows) combinedly to separate the clutch C4; if in 2nd-Gear position, engage the clutch C4. When select the manual Gear-1, the clutch C4 engages with the rear brake belt (B2).

4. 2-3 gear shift valve

2-3 gear shift valve (Refer to Figure 3.11) has two position status and is used to shift the gear position from 2 to 3 and from 3 to 2.

2-3 gear shift valve can finish the on/off action by the action of S2 on the end of valve shaft line.

When in position (1, 2), the transmission fluid from the 1-2 gear shift valve will not enter into the 3rd-Gear loop; when the valv is in position (3, 4), the transmission fluid form the 2nd-Gear loop enters into the 3rd-Gear loop; the transmission is shifted to 3rd Gear.

5. 3-4 gear shift valve

3-4 gear shift valve (refer to figure 3.12) has two kinds of position status and is used to shift the Gear position from 3 to 4 and from 4 to 3.

The on/off action of the valve is realized by action of S1 which is on the end of shaft line of valve.

During the shifting of 3-4, the 3-4 gear shift valve completed the following actions:

- Drain the brake belt release loop; allow the attachment for brake belt (B1).
- Connect the internal area of front servo device to the brake belt attachment feed loop (BAF), allow the brake belt to endure the strong force.
- Drain the overspeed clutch loop (OC), allow the separation of clutch C4.

During the shifting of 4-3 gear, the clutch C4 is attached, the brake belt (B1) is released. The action is realized by the action of 4-3 sequence valve (refer to following description).

3-4 gear shift valve also can process the on/off action during the 1-2 and 2-1 shifting period (refer to previous 1-2 gear shift valve). Its function is to attach the overspeed gear clutch C4 in 2nd-Gear and separate in 1st-gear position. Using the manual-operated valve and 1-2gear shift valve (like the description of 1-2 gear shift valve part), clutch C4 also can be using for the manual 1st-Gear.

6. 4-3 sequence valve

4-3 sequence valve (refer to Figure 3.13) has two kinds of position status and is applied with certain load by the spring. During the 4-3shifting period, execute the on/off action. But it has not action during 3Ł-4 shifting period.

During 4-3 shifting period, 4-3 sequence valve stays the connection for the clutch attachment feed loop (CAF) to B1R loop clutch until use the 3rd-Gear to press the B1R loop all around.

7. Electromagnetic pressure regulating valve

The electromagnetic pressure regulating valve (refer to Figure 3.14) provide the constant pressure for all solenoid valves (S1Ł-S5 The line pressure is used to supply the oil to the regulation valve. Its output is called as line 500.

8. Line pressure impelling valve

The line pressure is controlled by the S6, its action is controlled by the line pressure impelling valve (refer to Figure 3.14). When the pressure S6 applies on the end of PRV, its has the back action of spring force and generate the micro-open of throttle position or low line pressure status of patrol status.

When the throttle position is opened in rather large, the normal opened S6 will be in open status (powered off) then close the line 500 and open the S6 for drainage. Remove the pressure in PRV from S6, generate the high line-pressure status.

9. Clutch combination regulating valve

Clutch combination regulating valve (refer to Figure 3.15) is a constant ratio regulating valve which provide the regulating pressure of clutch C1 to control the change ratio of shifting quality clutch status. The ratio is about 2.25:1.

When the S3 is opened, the oil of 3rd-Gear is provided to the valve and adjust the pressure (CAF) to 2.25 times of S5 signal pressure. When S3 is in closed status, the output pressure is 2.25 times of pressure of line 500.

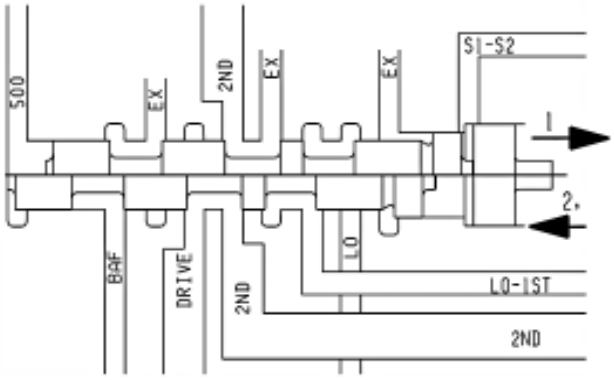


Figure 3.10 1-2 gear shift valve

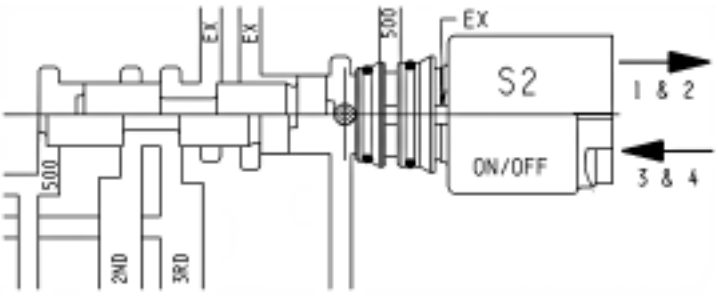


Figure 3.11 2-3gear shift valve

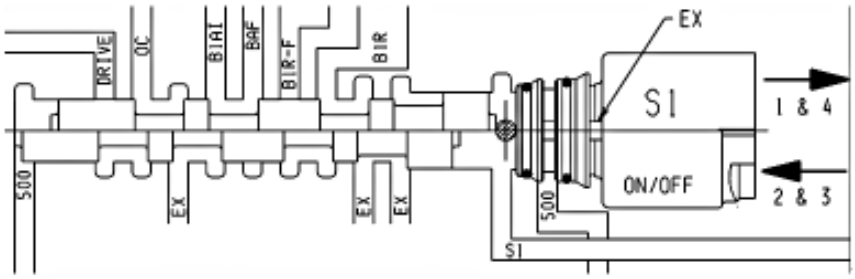


Figure 3.12 3-4gear shift valve

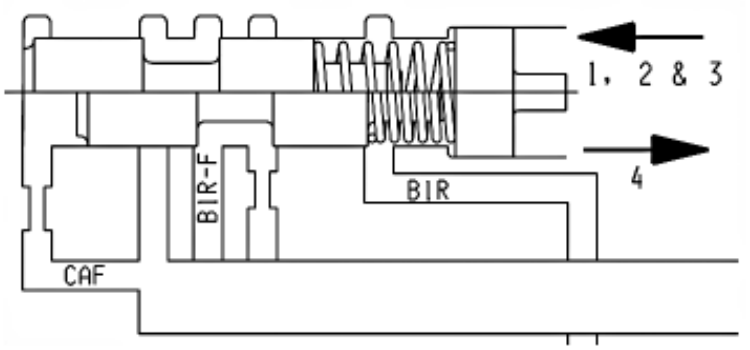


Figure 3.13 4-3sequence valve

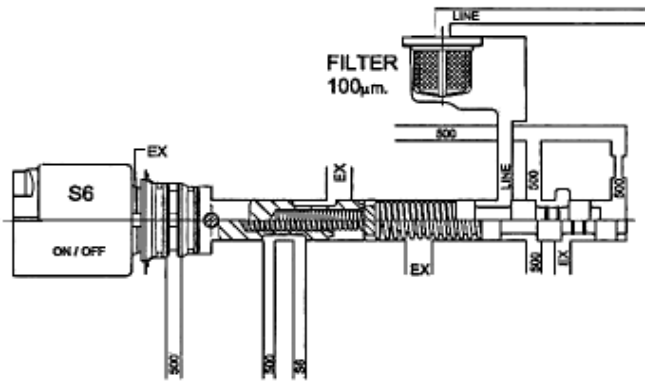


Figure 3.14 Electromagnetic pressure regulating valve and line pressure impelling valve

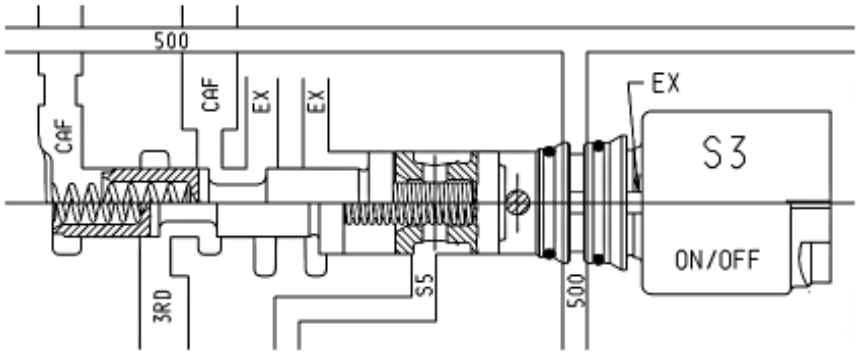


Figure 3.15 clutch combination regulating valve

10. Brake belt combination regulating valve

Brake belt combination regulating valve (refer to Figure 3.16) is a constant ratio valve which provide the regulating pressure to the front servo and control the brake belt (B1) status change ratio of shifting quality. The ratio is 1.4:1.

When the S4 is opened, 2nd-Gear transmission fluid is acted on the valve and adjust the supply output pressure (BAF) to 1.4 times of S5 signal pressure. When the S4 is closed, the output pressure is 1.4 times of pressure of line 500.

11. Reverse lock valve

Reverse lock valve (refer to Figure 3.17) has two position statuses and is located on upper valve. The valve use the pressure S1 S2 as the signal pressure and control the attachment of rear brake belt (B2).

When the manual-operated valve is position of D-Gear, 3rd-Gear, 2nd-Gear or 1st-Gear, the transmission fluid flows into the end of valve spring. Ignore the signal pressure and keep the

valve in lock position. It will stop the attachment of B2 in any forward Gear position.

When manual-operated valve is in position of P-Gear, R-Gear or N-Gear, the transmission fluid is drained and the reverse lock valve maybe affected by pressure S1-S2 at the same time.

B2 brake belt is used for P-gear, R-Gear and N-Gear when meets the following conditions.

a. P-Gear or N-Gear, vehicle speed ≤ 3km/h

b. R-Gear , speed ≤ 10km/h

c. Speed of engine : ≤ 1250rpm

d. Diesel vehicle , Opening degree of throttle position: ≤ 25%

e. Gasoline vehicle, opening degree of throttle position: ≤ 12%

In this condition, the TCU control solenoid valve S1 and S2 are closed. The reverse lock valve is affected by the pressure form S1-S2 transmission fluid; connect the line pressure to loop B2. The transmission fluid flows to servo internal and external attachment area, the B2 is engaged.

When none of above condition is met, TCU control the solenoid valve S1 and S2 to be opened. The pressure of S1-S2 is released and the spring control valve body is in locking status at the same. In this condition, the B2 attachment is prohibited. The feature can realize the protection for transmission by controlling the B2 in high speed and providing the reverse-gear locking.

If the transmission is in failure mode, then the rear brake belt will be attached in P-Gear, R-Gear and N-Gear.

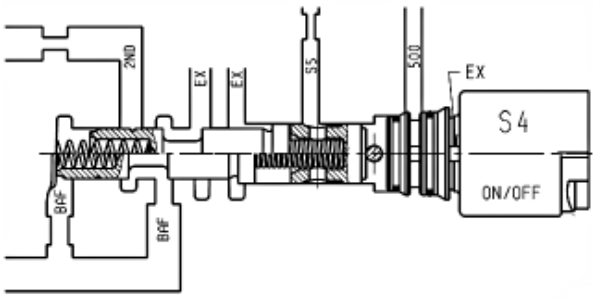


Figure 3.16 brake belt combination regulating valve

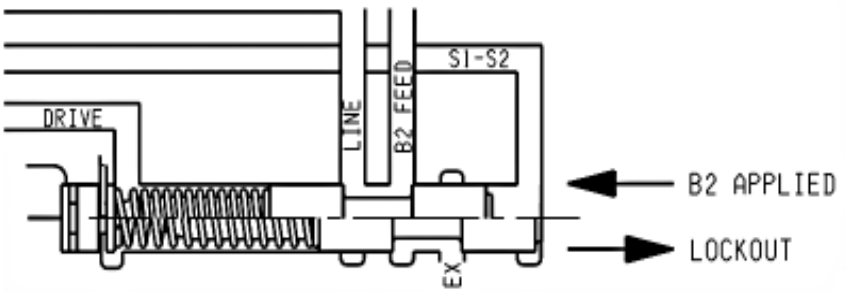


Figure 3.17 reverse lock valve

12. Primary regulating valve

Primary regulating valve (PRV) (refer to Figure 3.18) can regulate the line pressure of transmission (or pump output pressure). The valve can give the high or low line pressure according to the on/off status of S6. When S6 is in on or off status, the pressure S6 is applied on PRV, move it and has the action of spring force. Open the line pressure loop to turn on the inlet of pump to reduce the line pressure. Generally, the line pressure is small when the throttle position is opened lightly and in patrol status. It will cause the closing of S6 when the opening degree of throttle position is large and because the high line pressure valve

For all shifting pressures are controlled by output of separation brake belt , clutch regulating valve and S5, so all step control of line pressure has not affect on effect of shifting sensing.

By the oil inlet of torque converter, PRV also adjust the oil supply of hydraulic torque converter. The level effect of PRV should ensure the priority of valve, i.e. it can keep the line pressure in low engine speed condition. When the speed of engine is increased and the pump supplies excess oil, the PRV acts to open the torque converter oil inlet cover to increase the pressure of torque converter. If the oil amount is beyond the requirement of transmission, PRV will act further to allow the oil return to the suction inlet.

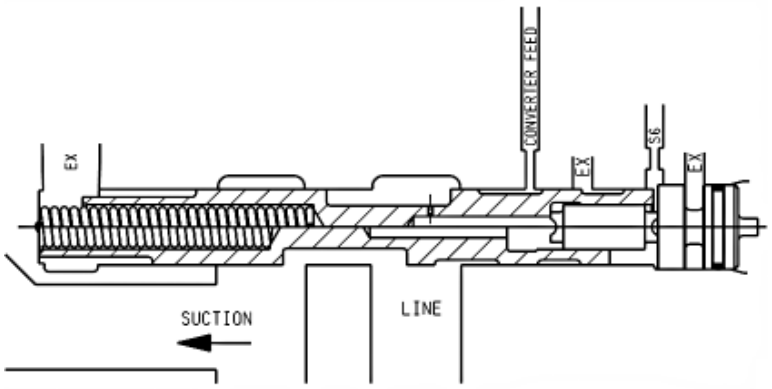


Figure 3.18 Primary regulating valve

13. Torque converter on/off regulating valve

The torque converter regulating valve (refer to Figure 3.19) adjusts the pressure applied on torque converter clutch oil. According to the signal pressure form loop S5, adjust the oil flow status from line pressure loop in valve. With the change of pressure signal of loop S5, the engagement and disengagement of torque converter clutch can be finished by electric control.

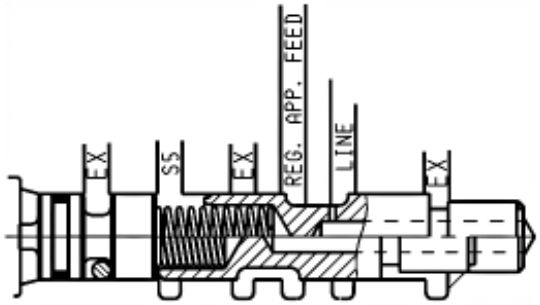


Figure 3.19 Torque converter on/off regulating valve

14.Torque converter clutch control valve

The torque converter clutch control valve (refer to Figure 3.20) has two kinds of position status; it engages or disengages the torque converter.

The switch action of the valve is determined by the pressure signal form S7.

When the valve is in closed or release position, the oil from the primary regulating valve enters into the disengagement side of torque converter clutch. After through the torque converter, the transmission fluid returns to the torque converter clutch control valve, finally enters into the oil cooler directly.

When the valve is in opened or engagement position, the regulating oil enters into the torque converter clutch combination side form the torque converter on/off regulating valve directly. For the torque converter on/off piston will be sealed by the torque converter abrasion surface. The oil will be reserved in the torque converter. To make the transmission fluid enters into the oil cooler, the torque converter on/off regulating valve will make the oil enters into the oil cooling loop from PRV valve directly.

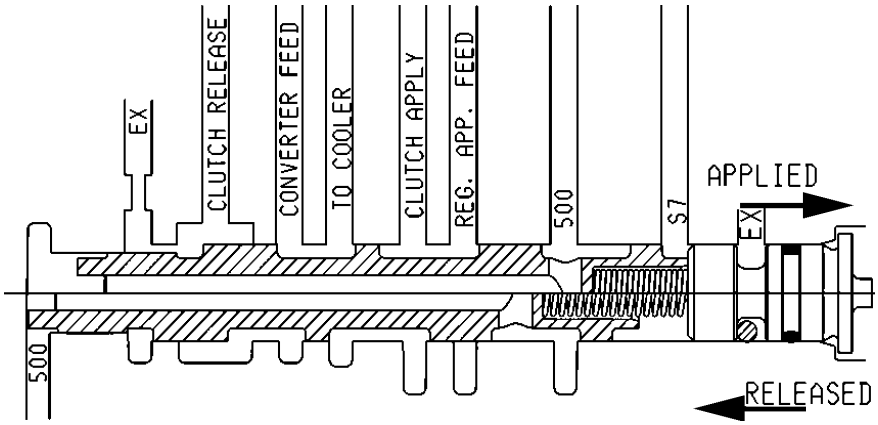


Figure 3.20 torque converter clutch control valve

15.C1 eccentrically arranged valve

C1 eccentrically arranged valve (refer to Figure 3.21) is not very important in the operation of transmission, so it is deleted with the introduction of HP pump case.

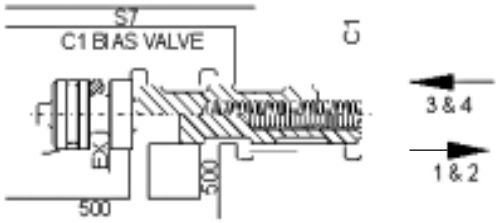


Figure 3.21 C1 eccentrically arranged valve

16.B1R blow-off valve

BIR blow-off valve (refer to Figure 3.22) has two kinds of position status and has the spring pretighting. It is located in transmission case and release the oil with the front servo to the transmission case directly. The characteristic can prevent the oil from through the valve and 3－4 gear shift valve to back flow form the front servo. When the oil pressure of IR blow-off valve reaches to about 100Kpa, the spring position of loop will stop the oil to enter into the release position of servo.

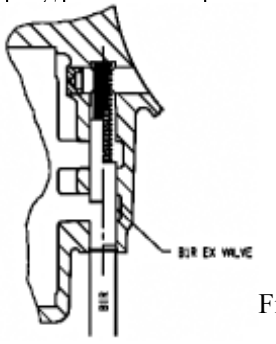


Figure 3.22 BIR blow-off valve

Power transmission system

The power transmission system includes:

- Torque converter equipped with single lock clutch.
- 4 multi-plate clutch assemblies
- 2 brake belts
- 2 one-way clutches
- Planetary gear assembly
- parking mechanism

A traditional planetary gear assembly composed by six pinions is used in four-speed transmission. It realizes the 4 Gear power transmission through the drive gear bracket.

So, the cross arrangement is the main arranging method. In the box, there are four subassemblies, shown as follows:

- Gear bank central support
- C1-C2-C3-clutch C4 subassembly
- Pump assembly
- Valve assembly

One piece or one set of optional shim is located between the input shaft flange and center of stator support shaft axle of and used to control the end flotation of transmission. The structure arrangement allows the inspection for the subassembly during the product manufacturing period.

For description of power transmission system refer to table 4.1 and Figure 4.1:

When the clutch C2 is engaged and 1-2 one-way clutch is engaged, the gear is in 2nd-Gear at this time. During the 1-2 shifting process, B1 brake belt is combined and the 1-2 one-way clutch is separated (OWC). During the 2-3 shifting period, the clutch C1 is engaged and the B1brake belt is released. During the 3-4 shifting period, B1brake belt is engaged and 3-4 one-way clutch is released. For reverse gear, the clutch C3 and B2brake belt is engaged.

When the gear position is in manual 1st, 2nd and 3rd gear position, the engagement of the clutch C4 can provide the brake of engine. Additionally, in the drive scope of 2nd and 3rd Gear, the engagement of clutch C4 can eliminate the unfavorable freewheel inertia. In the scope of manual 1st-Gear, the low speed shifting is realized by the engagement of B2brake belt.

The front and rear servo has the figure surface design which requires the accurate friction and need not the secondary regulating valve. When use the transmission fluid with new static factor, the design of the friction unit can meet the requirement that need low shifting energy and high static holding force. The transmission uses the non-asbestos friction material.

		Name of participated unit								
Gear position	Gear ratio	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	LU
1st-Gear	2.393		X					X	X	
2nd-Gear	1.450		X		X	X			X	
3rd-Gear	1.000	X	X		X				X	X*
4th-Gear	0.677	X	X			X				X
R-Gear	2.093						X			
Manual 1	2.393		X	X	X		X		X	

* For operation of specified vehicle refer to user'operation manual.

LU: hydraulic torque converter lock clutch

Table 4.1 Participated unit and gear ratio in different gear position

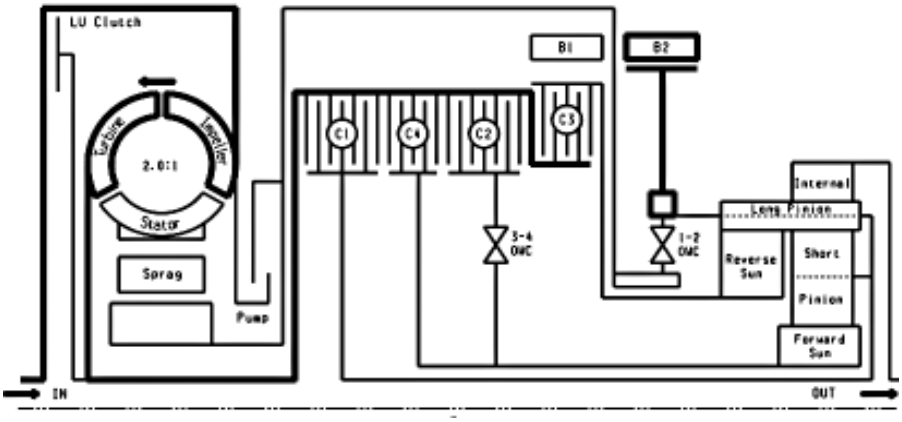


Figure 4.1 Power flow chart

Torque converter

The torque converter (refer to Figure 4.2) consists of the turbine, stator, impeller and a lock throttle brake and piston assembly. Same as that of the traditional torque converter, the impeller is connected to the end cover of the torque converter. The turbine is connected to the input shaft through the spline. The stator is installed on the pump housing through the one-way clutch .

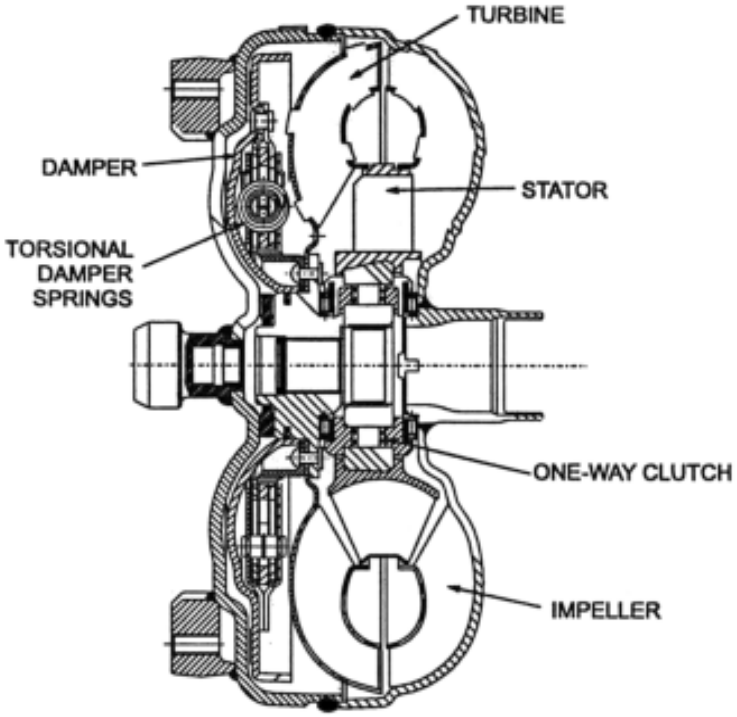


Figure 4.2 Section of torque converter

The buffer and piston assembly can make the torque converter is locked in proper condition. The locking action only occurs in the condition of specified throttle position opening and vehicle speed. When the hydraulic force makes the buffer and piston assembly is coupled on the cover of torque converter, it can acquire the locking status. In this status, it can eliminate the unnecessary sliding. It can increase the economical efficiency of fuel oil when the locking action is generated. When in locking status, the torque buffer spring in the buffer and piston can absorb the torque fluctuation of engine.

Clutch assembly

It has four types of clutch assembly (refer to Figure 4.3). All clutch assemblies are composed of several layers of steel plate and friction disk.

Clutch C1 When it is engaged, the drive shaft drive the planet carrier. The condition occurs in 3rd and 4th Gear.

Clutch C2 When it is engaged, the drive shaft drive the forward central gear through the 3-4 one-way clutch. The conditio occurs in 1st, 2nd and 3rd-Gear condition.

Clutch C3 When it is engaged, the drive shaft drive the backward central gear. The condition occurs in R-Gear position.

Clutch C4 It can provide the brake of engine during overspeed when is engaged, The condition occurs in manual 1st, 2nd and 3rd –Gear, also in automatic 2nd and 3rd-Gear to avoid the unfavorable inertia rotation of freewheel.

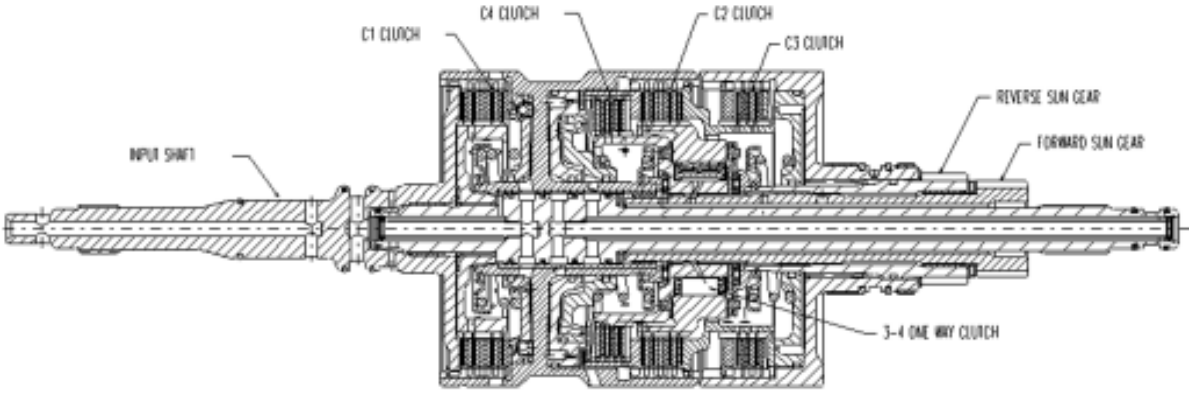


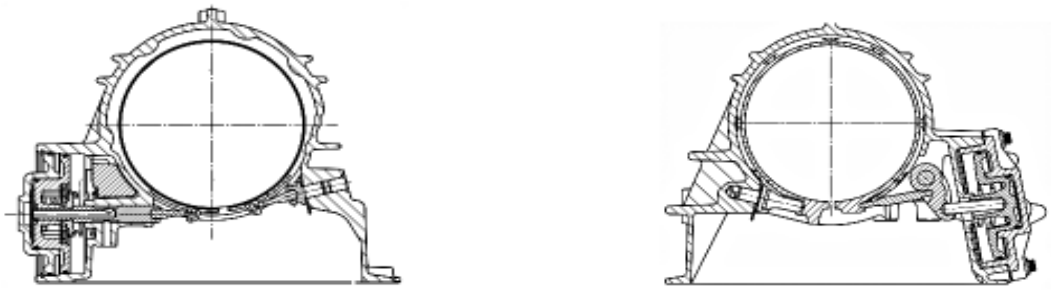
Figure 4.3 Clutch assembly

Brake belt

The transmission has two brake belts, brake belt B1 (named as 2-4 brake belt sometimes) and brake belt B2 (named as low-speed – reverse gear brake belt) refer to Figure 4.4.

The brake belt B1 is a flexible brake belt which is engaged with front servo piston. When it is in 2nd and 4th –Gear, the brake belt B1 starts to act. When the brake belt acts, it can prevent the rotation of reverse central gear by maintaining the clutch C3 assembly is in static. In 2nd –Gear, only the external surface of piston is used. In 4thGear, both sides are used to acquire more clamping force.

The brake belt B2 is a solid brake belt which is meshed with the rear servo piston. When the B2 acts, it prevents the rotation of planet carrier assembly. When in manual 1st-Gear, only the external surface of piston is used. In reverse-Gear, both sides are used to acquire more clamping force.



Front servo and brake belt Rear servo and brake belt

Figure 4.4 brake belt

One-way clutch

The transmission has two one-way clutches, 1-2 one-way clutch and 3-4 one-way clutch (notice that the third one-way clutch is located on torque converter, also called as retainer)

1-2 one-way clutch is located between the planet carrier assembly and central shaft. The structure makes the planet carrier only can rotate in single direction around the central shaft. The one-way clutch is only engaged in automatic 1st-Gear.

3-4 one-way clutch is located between the clutch C4 and clutch C2.The structure makes the clutch C2 drive the front planetary gear in 1st, 2nd and 3rd –Gear, but is disengaged in 4th-Gear and overspeed.

Planetary gear assembly

The planetary gear block used in transmission is the traditional lavena gear block consisted of6 pinions.

Parking mechanism

When select the parking-Gear, the steering column will move the parking lever backwardly to engage with the parking ratch (refer to Figure 4.5). The ratchet is engaged with the tooth of external gear ring fear to lock the output shaft axle in the transmission. When it is not in parking-gear, the return spring will release the parking ratchet and unlock the output shaft to prevent the occurrence of accident parking action.

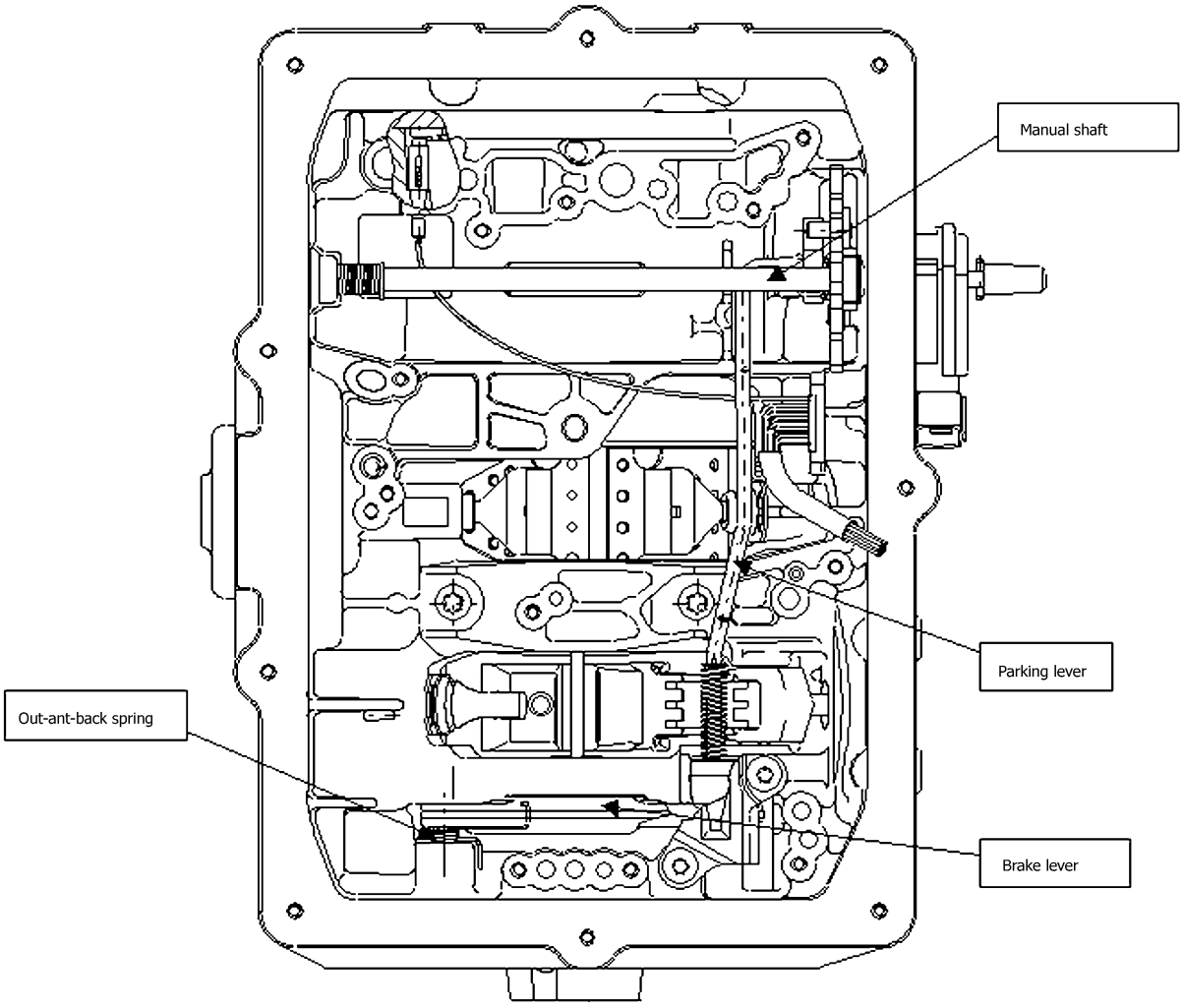


Figure 4.5 Parking mechanism

Power transmission

Introduction

It has the following power transmission pointed to different Gear-position:

- power transmission － N-Gear and P-Gear
- power transmission － R-Gear
- power transmission － manual 1
- power transmission － Automatic 1st-Gear
- power transmission － Automatic 2nd -Gear
- power transmission － Automatic 3rd -Gear
- power transmission － Automatic 3rd-Gear locking
- power transmission － Automatic 4th -Gear (overspeed -gear)
- power transmission － Automatic 4th -Gear locking

For description of each kind of power transmission condition, refer to following parts.

Table 5.1 describe the on-off condition of each unit in all gear condition.

	Name of participated unit								
Position	C1	C2	C3	C4	B1	B2	1-2 OWC	3-4 OWC	LU clutch
Parking and neutral position	－	－	－	－	－	X	－	－	－
Reverse	－	－	X	－		X	－	－	－
Manual 1st -Gear	－	X	－	X	－	X	－	X	
Automatic 1st- Gear	－	X	－	－	－	－		X	－
Auto 2nd-Gear and manual 2nd -Gear	－	X	－	X	X	－	－	X	－
Automatic 3rd –Gear and manual 3rd-Gear	X	X	－	X	－	－	－	X	－
Automatic 3rd-Gear locking and manual 3rd-Gear locking	X	X	－	X	－	－	－	X	X
Automatic 4th -Gear (overspeed -gear)	X	X	－	－	X	－	－	－	－
Automatic 4th -Gear locking	X	X	－	－	X	－	－	－	X

power transmission －neutral position and parking position

In P-Gear or N-Gear, the planetary gear assembly has not the drive. The rear brake belt is used to eliminate the voice generated in engagement with reverse gear and increase the application of 4WD. It is without the engagement of clutch and brake belt.

In parking-Gear, the locking of mechanism is realized through the engagement of brake lever installed on housing and tooth of output shaft gear ring.

Control

In stable status, to maintain the arrangement, the status of solenoid valve and valve is shown as follows:

- solenoid valve S1 and S2 is powered off.
- The line (pump) pressure is applied on the primary regulating valve (PRV) and electromagnetic supply valve.
- The torque converter, oil cooler and lubrication loop are filled up with the transmission fluid from the primary regulating valve.
- The line pressure 500 loop is filled up with the transmission fluid from the electromagnetic supply valve.
- S5 will be filled up with the transmission fluid through the variable pressure \regulating valve (S5) .
- The line pressure is prohibited form entering into the drive loop through the manual-operated valve .
- B1 loop and all clutch loop are opened to drainage port.

Refer to Figure 5.1and table 5.2.

	Name of participated unit								
Gear-position	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	clutch LU
Parking and neutral position	—	—	—	—	—	X	—	—	—

Table 5.2 The participation status of each unit in parking and neutral position

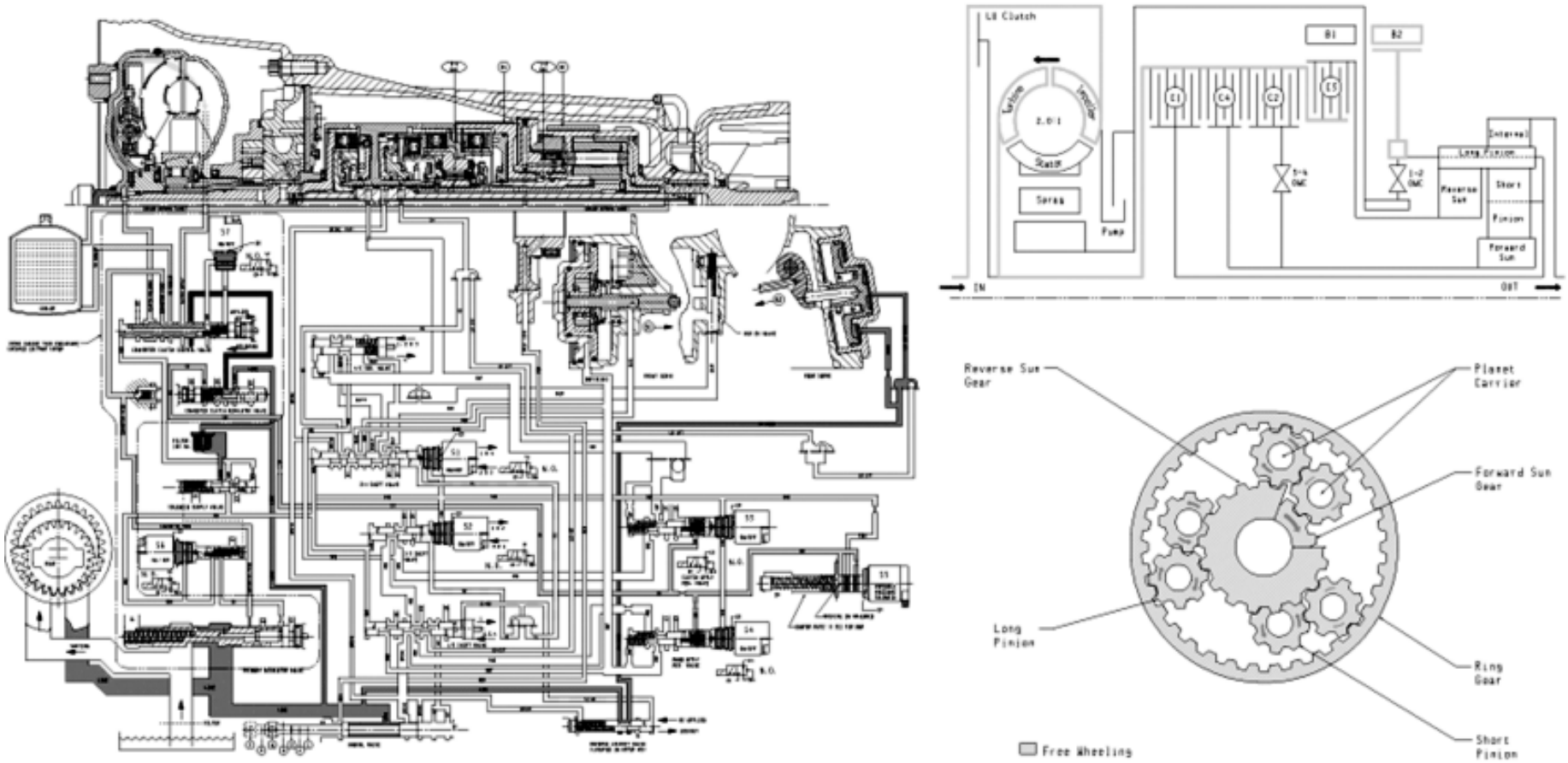


Figure 5.1 - PARK AND NEUTRAL

Figure 5.1 parking and neutral position

Power transmission-reverse gear

In reverse-Gear position, the drive of transmission is sent to the clutch hub through the input shaft and rear clutch piston. In this condition, the description of each function unit of transmission is shown as follows:

- The clutch C3 is engaged and drive the reverse central gear to rotate in clockwise.
- The engagement of B2 brake belt cause the rest of the planetary gear carrier, then make the long planetary gear rotates around its shaft anticlockwise.
- The long planetary gear drives the internal gear ring rotates anticlockwise .
- Use the spline to connect the inner gear ring to the output shaft and drive the gear ring rotate anticlockwise or in reverse.

Control:

In stable status, to maintain the arrangement, the action of solenoid valve and valve is shown as follows:

- A solenoid valve S1 or S2 is closed at least. (Refer to the part in section 3.3.11, related to condition when S1 and S2 is closed.)
- The line pressure reaches the internal surface and external surface of rear servo piston through the reverse lock valve directly.
- The line pressure urges the reverse-Gear loop oil pass through the manual-operated valve.
- The reverse-Gear loop oil is circuited to clutch C3 through the manual-operated valve.
- In the transmission whiteout HP pump shell, the reverse-Gear loop also can reaches the spring end of the primary regulating valve to support the spring and push the line-pressure regulating valve.
- The oil loop of execution line of all other clutches and brake belts is opened to leaking port.

Refer to Figure 5.2 and Table 5.3**.**

Table 5.3 The participating condition of each unit in reverse-Gear position

	Name of participated unit								
Gear-position	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	clutch LU
Reverse gear	—	—	X	—	—	X	—	—	—

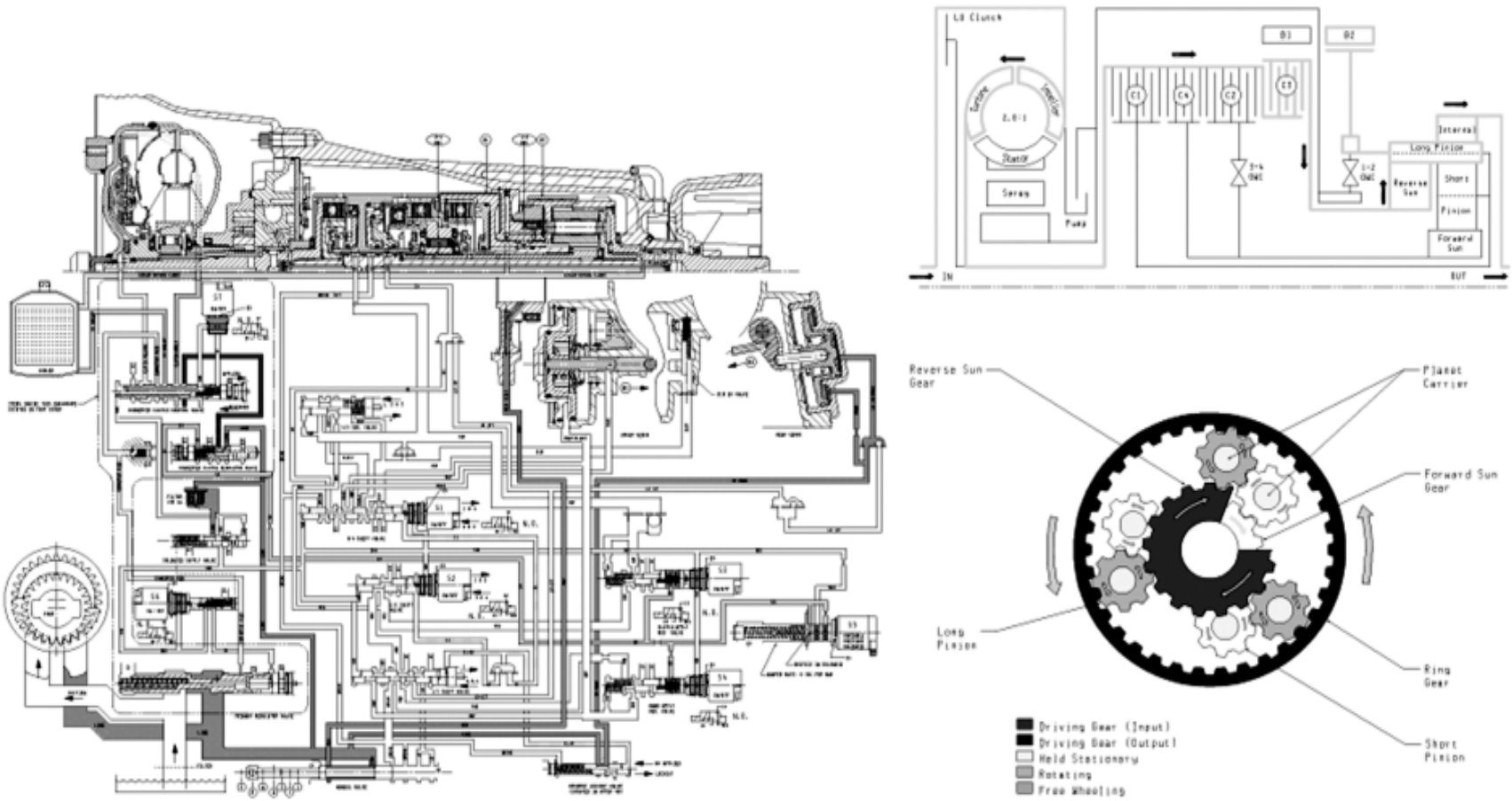


Figure 5.2 - REVERSE

Figure 5.2 Reverse-Gear

Power transmission － manual 1st-Gear

In manual 1st –Gear, the drive of transmission is send to the rear clutch cylinder through the input shaft. In this condition, each function unit of transmission is shown as follows:

- The clutch C2 is engaged through the 3-4 one-way clutch (OWC) to drive the front sun gear.
- The engagement of B2 brake belt make the planetary gear carrier to stop.
- The front sun gear drive the short planetary gear to rotate in anticlockwise.
- The short planetary gear drive the long planetary gear to rotate in clockwise.
- The long planetary gear rotate around its axial to drive the internal gear ring and output
- shaft to rotate in clockwise to realize the movement in forward direction.
- In overspeed, clutch C4 can provides certain brake force through 3-4 one-way clutch .

Control:

In stable status, the action of solenoid valve and valve is shown as follows:

- The solenoid valve S1 and S2 is powered on.
- In the action of pressure of line 500, the gear shift valve of 1-2, 2-3, 3-4 gear are kept in position of 1st-Gear.
- The manual-operated valve transmission fluid (line pressure) makes the clutch C2 to engagement.
- LO-1st (line pressure) oil flows to the clutch C4 through the 1-2 Gear switching valve to engage the B2 brake belt.

Refer to Figure 5.3 and Table 5.4.

Table 5.4 －－ The participating condition of each unit in manual 1st-Gear

	Name of participated unit								
Gear-position	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	LU clutch
Manual 1st Gear	—	—	X	—	—	X	—	X	—

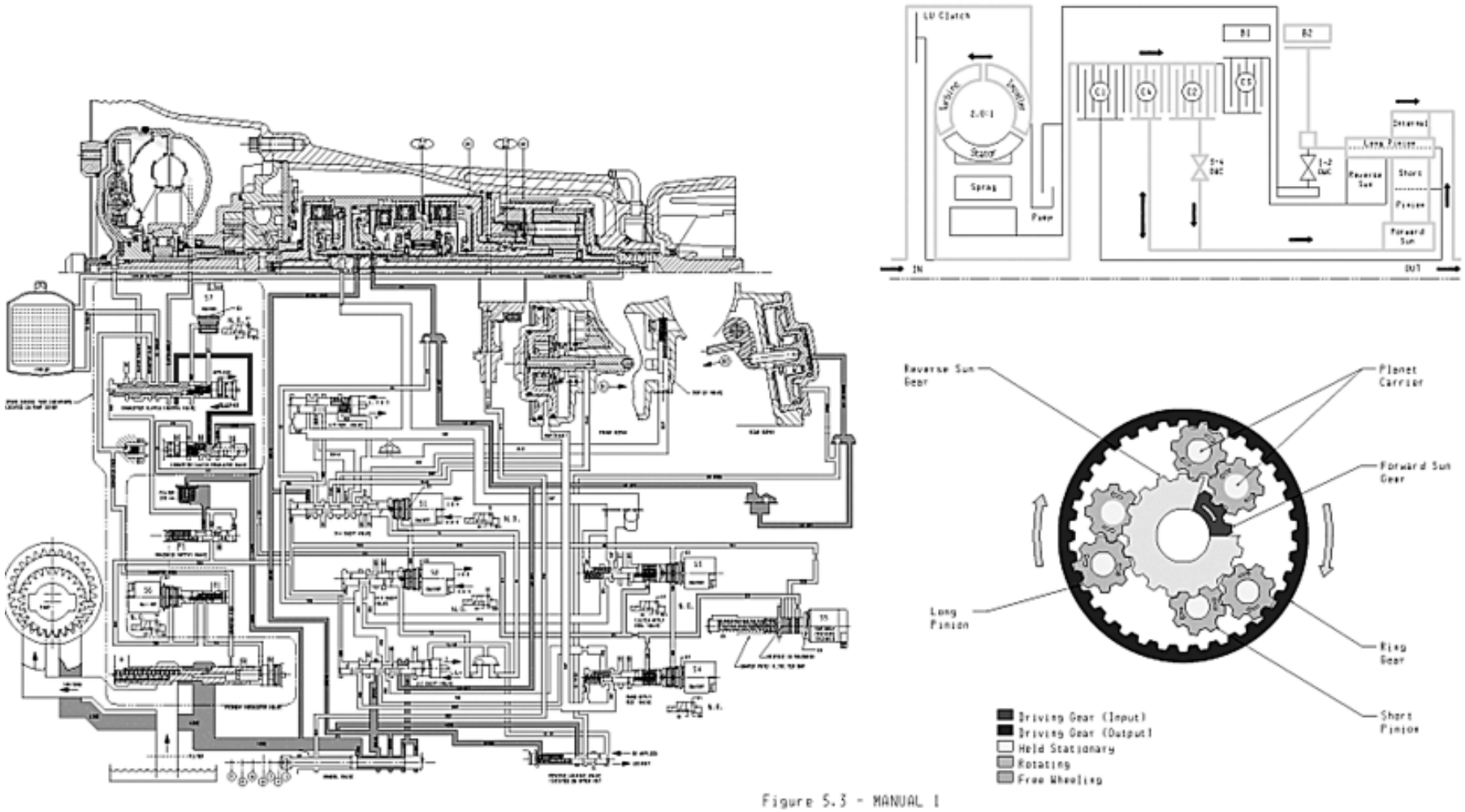


Figure 5.3 - MANUAL 1

Figure 5.2 Reverse-Gear

Power transmission－ automatic 1st-Gear

In automatic 1st -Gear, the drive of transmission reaches the reaches the front clutch cylinder through the input shaft. In this condition, the operating principle of each function unit of transmission is shown as follows:

- The engagement of clutch C2 drives the front sun gear
- The front sun gear drive the short planetary gear to rotate in anticlockwise.
- The short planetary gear drives the long planetary gear to rotates in clockwise.
- 1-2 one-way clutch (OWC) stops the rotation of planetary gear carrier in counteracting force. At the same time, the long planetary gear rotates around its axial to drive the ring gear and output shaft to rotate in clockwise to realize the forward movement.

Control:

In stable status, the status of solenoid valve and valve is shown as follows:

- Solenoid valve S1and S2 is powered on
- In the action of line 500 pressure, the gear shift valve of 1-2, 2-3, 3-4 Gear is maintained in 1st-gear position.
- The transmission drive oil (line pressure) from the manual-operated valve makes the engagement of clutch C2.

Refer to Figure 5.4and Table 5.5.

Table 5.5—participating condition of each unit in automatic 1st-Gear

	Name of participation unit								
Gear position	**C1**	**C2**	**C3**	**C4**	**B1**	**B2**	1–2 OWC	3–4 OWC	LU Clutch
Automatic 1st-Gear	—	X	—	—	—	—	X	X	—

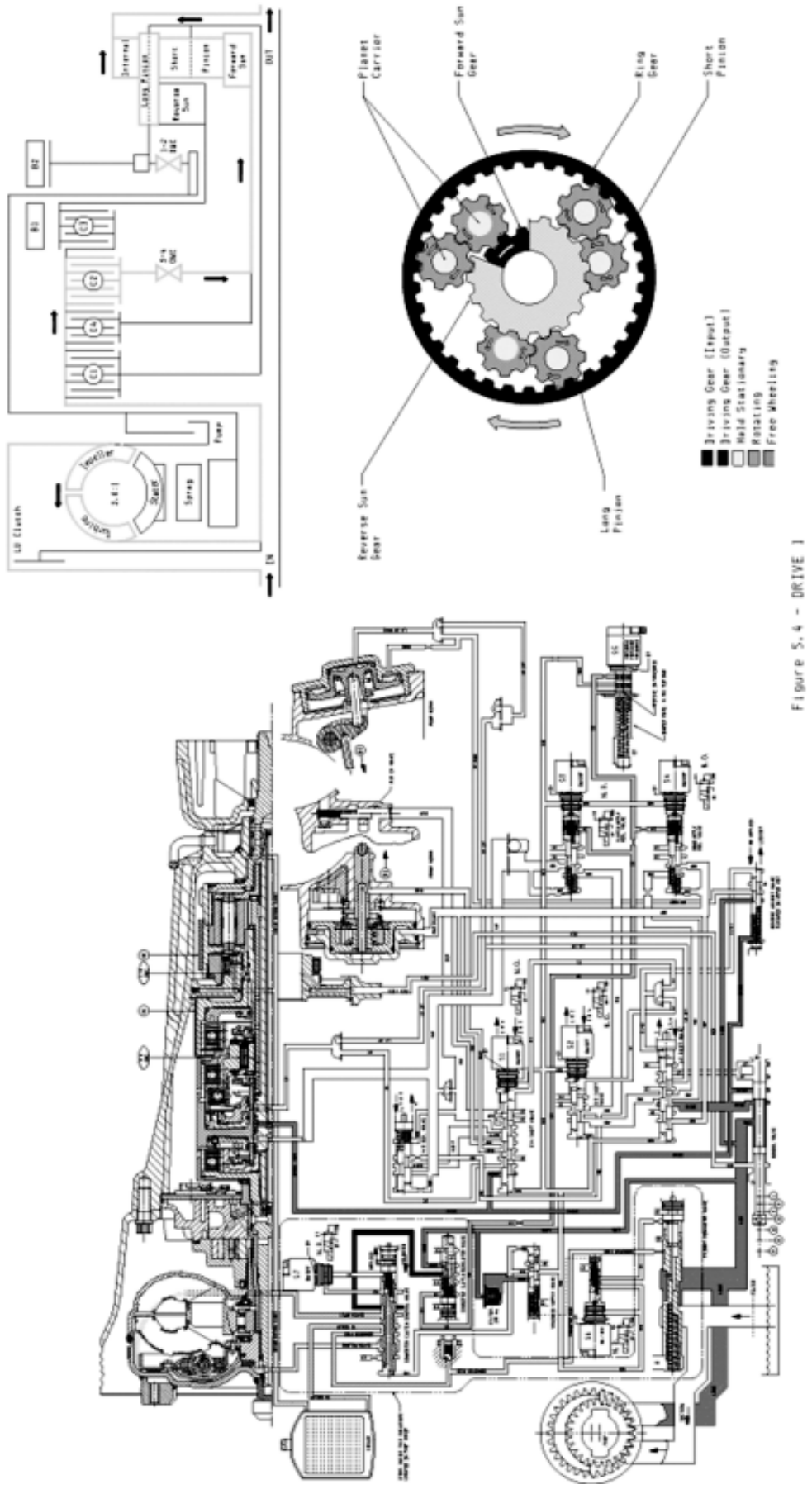


Figure 5 — 4 Automatic 1st –Gear

Power transmission －automatic 2nd-Gear and manual 2

In automatic 1st and manual 2nd-Gear, the drive of transmission reaches the front clutch cylinder through the input shaft. In this condition, the operating principle of each functional unit of transmission is shown as follows:

- The engagement of clutch C2 drives the forward central gear.
- The forward central gear drives the short planetary gear to rotate in anticlockwise.
- The short planetary gear drives the long planetary gear to rotate clockwise.
- The engagement of brake belt B1 makes the stop of reverse central gear to make the long planetary gear rotates around the reverse central gear, then make the internal gear and output shaft rotates in clockwise to make the vehicle moves forwardly.
- The clutch C4 is engaged through the 3-4 one-way clutch (OWC) and provides the brake force of engine during overspeed.

Control:

In stable status, the status action of solenoid valve and valve is shown as follows:

- The solenoid valve S1 is powered off ; The solenoid valve S2 is powered on.
- The drive oil (line pressure) from the manual-operated valve makes the engagement of clutch C2.
- When the solenoid valve S1 is powered off, the S1 oil pressure form line pressure 500 pushes the 3-4 Gear shifting valve moves to left. At the same time, the S1 oil flows into the 1-2 Gear shifting valve to push the 1-2 Gear shifting valve to the 2nd –Gear.
- The line pressure oil from the 1-2 Gear shifting valve flows into the brake belt combination regulating valve, and 2-3 Gar shifting valve.
- The brake belt engagement regulator valve provides the 2nd-Gear oil (controlled by product of line pressure and valve rate) to brake belt feed loop (BAF).
- The brake belt engagement feed loop directly provides the oil to:
- External engagement part of front servo piston.
- 1-2 Gear shifting valve can provide a oil drainage port when the transmission is shifted to 1st-Gear.
  Use the 3-4 Gear shifting valve when the transmission is in 4th-Gear position.
- The drive force (line pressure) is sent to the clutch C4 through the 3-4 Gear shifting valve to realize the engagement of clutch C4.

Refer to Figure 5.5 and table 5.6

Table 5.6 －－ The participating condition of each unit in automatic 2nd-Gear and manual 2nd-Gear

	Name of participation unit								
Gear position	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	LU Clutch
Automatic 2nd-Gear and manual 2nd-Gear	—	X	—	X	X	—	—	X	—

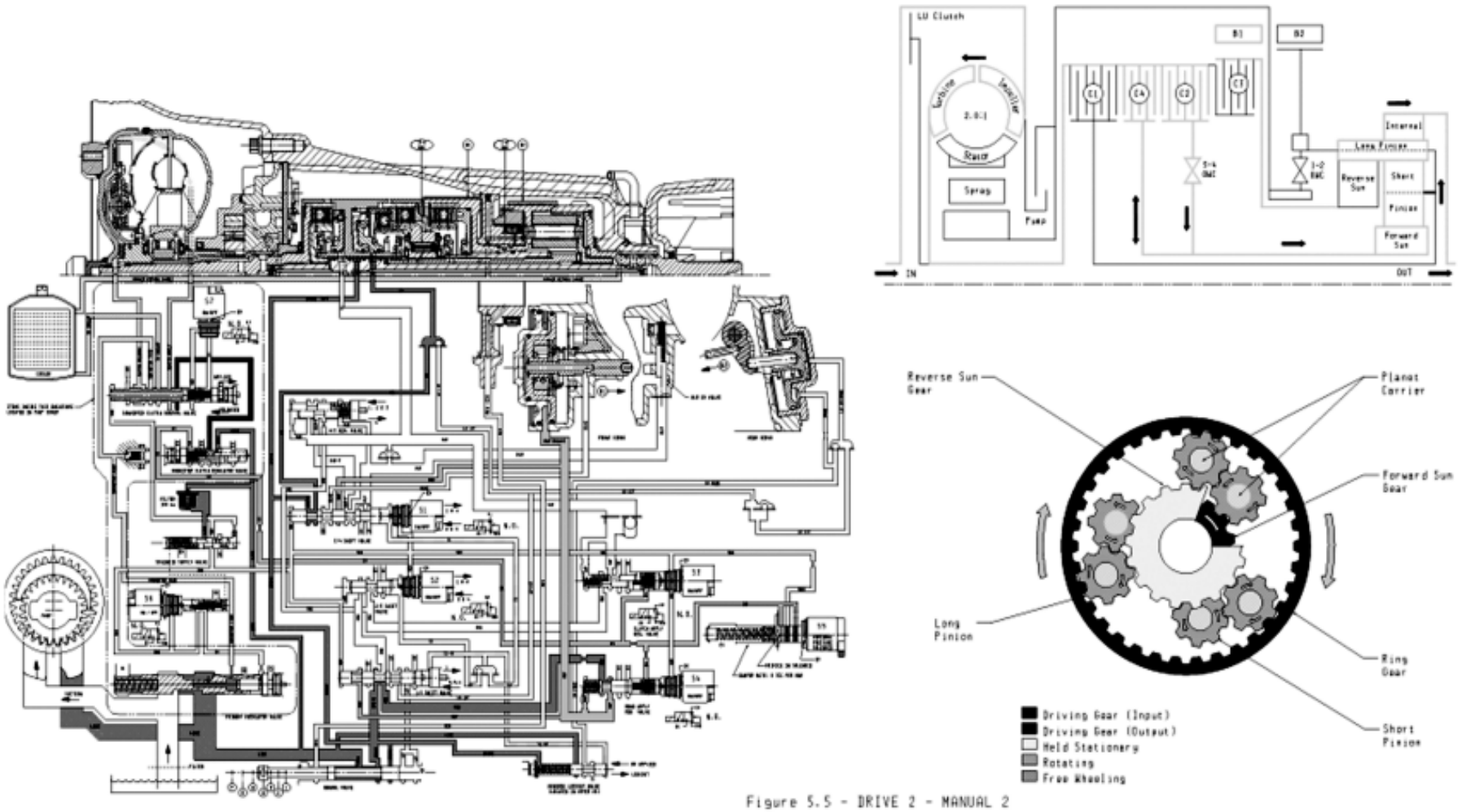


Figure 5.5 - DRIVE 2 - MANUAL 2

Figure 5.5 Automatic 2nd-Gear — manual 2nd-Gear

power transmission －Automatic 3rd-Gear and manual 3rd-Gear

In automatic and manual 3rd-Gear, the drive of transmission reaches the front cylinder through the input shaft. In this condition, the operating principle of the transmission is shown as follows:

- The engagement of clutch C2 drives the front sun gear
- The engagement of clutch C1 drives the planetary gear carrier
- The forward central gear and planetary gear carrier rotate in the same speed clockwise. So, there is not relative motion between the forward central gear and planetary gear.
- The gear ring and output shaft rotate in the speed of output shaft, and makes the moves forwardly.
- The engagement of clutch C4 is through the 3-4 one-way clutch (OWC) and make the engine to provide the brake force in overspeed.

Control:

In stable status, the status of solenoid valve and valve is shown as follows:

- The solenoid valve S1 is powered off; Solenoid valve S2 is powered off
- When the solenoid valve S1 and S2 is powered off, 2-3 and 3-4 shift valve are kept in 3rd-Gear position through the line pressure 500.
- 1-2 Gear shifting valve is kept in 3rd-Gear position by the oil pressure of S1 and S2.
- The (line pressure)oil form the 1-2 Gear shifting valve flows into the brake belt combination regulating valve directly and flows into the 2-3 Gear shifting valve.
- The brake belt combination regulating valve provides the 2nd-Gear oil (controlled by the product of line pressure and valve) to the brake belt feed loop(BAF).
- The brake belt feed loop directly provides the oil to:
- External combination part of front servo
- When the transmission is shifted to 1st-Gear, the 1-2 Gear shifting valve provides the oil drainage port.
- When the transmission is in 4th –Gear position, it will use the 3-4 Gear shifting valve.
- The 2nd-Gear oil of 2-3 Gear shifting valve flows into the 3rd-gear loop directly .
- The 3rd-Gear oil from the 2-3 Gear shifting valve flows into the clutch combination regulating valve and sequence valve of 4-3 Gear directly.
- The clutch combination regulating valve provides the oil of clutch attachment feed loop (controlled by the product of line pressure of 500 and valve ratio) (CAF).
- CAF directly provides the oil to :
- clutch C1
- Sequence valve of 4-3 Gear
- In 4-3 Gear shifting valve, the CAF oil is changed to the release fluid of B1 (B1R-F), it cause the closing of brake belt 1 through the 3-4 Gear shifting valve to spring bottom of 4-3 gear sequence valve and release side of front servo.
- The drive force (line pressure) is sent to the clutch C4 through the 3-4 Gear shifting valve to engage the clutch C4 .

Refer to Figure 5.6 and Table 5.7.

	Name of participation unit								
Gear position	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	LU Clutch
Automatic and manual 3rd –Gear	X	X	—	X	—	—	—	X	—

Table 5.7 — Table of participating condition of each unit in automatic and manual 3rd –Gear

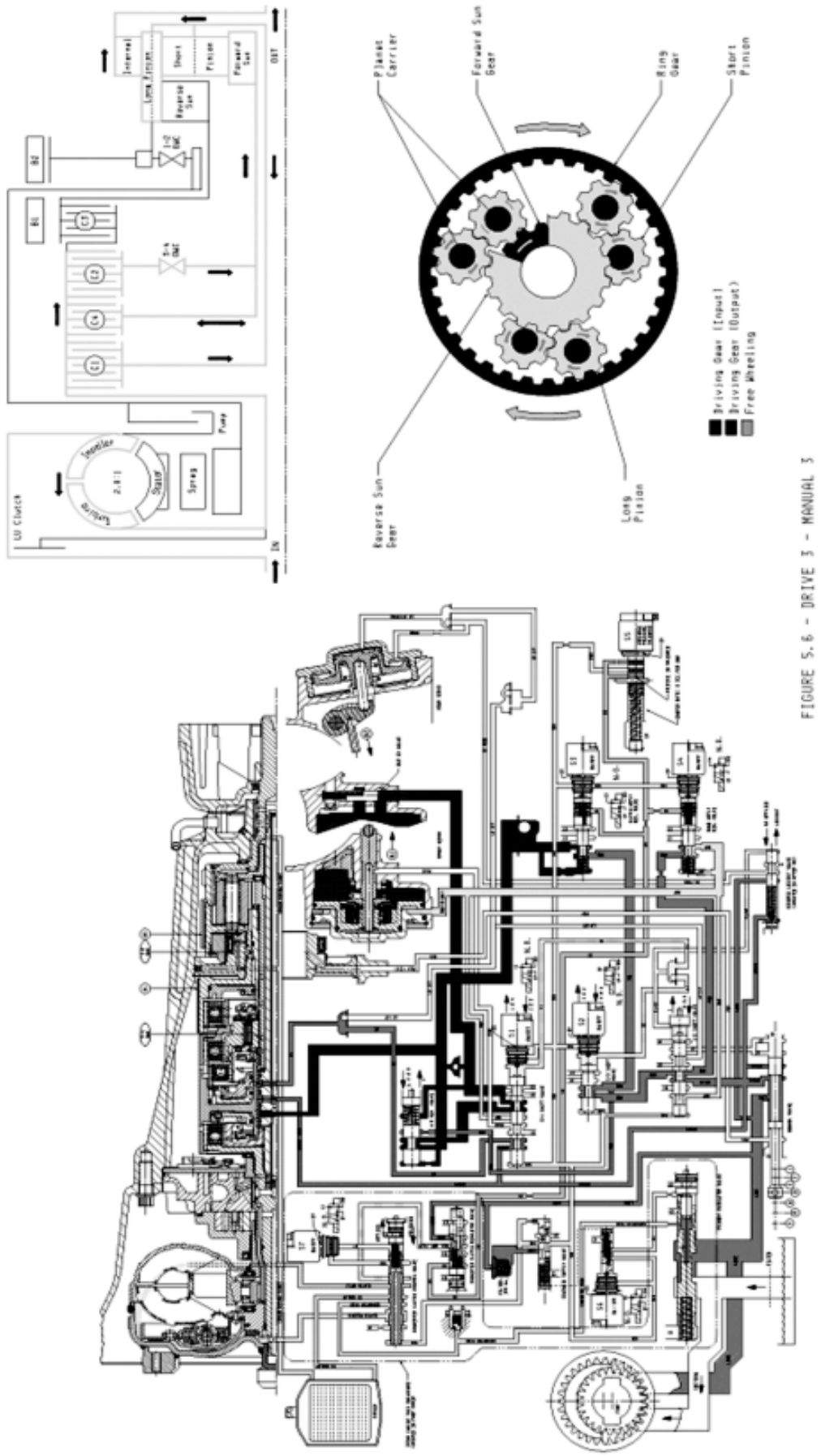


Figure 5.6 Automatic 3rd –Gear-manual 3rd-gear

Power transmission — locking of automatic and manual 3rd-Gear

When the automatic 3rd-Gear and manual 3rd-Gear is locked, the drive of transmission is basically same as that in automatic 3rd-Gear. But it provide the variable torque drive without slide for the application of torque converter locking clutch.

Control:

The control for the automatic 3rd-Gear locking and manual 3rd-Gear locking is basically same as that for automatic 3rd –Gear. But it should be described additionally that the automatic 3rd-Gear and manual 3rd-gear locking needs the action for variable torque clutch loop by solenoid valve S7.

- When the solenoid valve S7 is opened, the variable torque clutch control valve is closed and allow the oil feed of S7 loop pass through the solenoid valve S7 to drainage port. It makes the control valve moves to the clutch combination position.
- The loop oil from the line 500 flows into the combination part of variable torque clutch through the converter clutch control valve through the action of variable torque clutch control valve.
- The variable torque clutch release oil is drained from the variable torque clutch control valve.
- The torque converter loop oil flows into the oil cooler and lubrication loop through the variable clutch control valve.

Refer to Figure 5.7 and table 5.8.

	Name of participation unit								
Gear position	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	LU Clutch
Automatic 3rd-Gear locking and manual 3rd-gear locking	X	X	—	X	—	—	—	X	X

Table 5.8 — Participating condition of each unit in automatic and manual 3rd-Gear locking

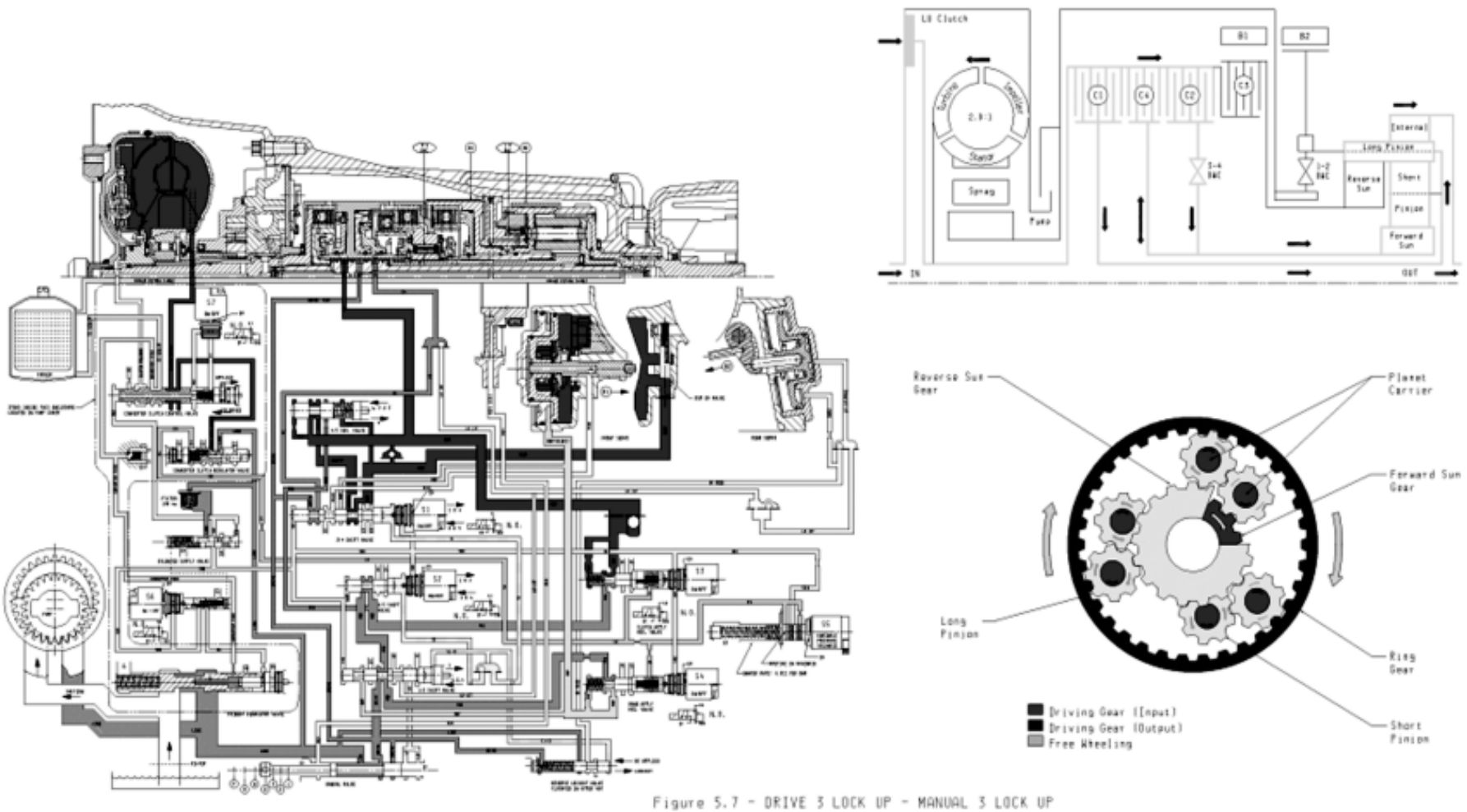


Figure 5.7 - DRIVE 3 LOCK UP - MANUAL 3 LOCK UP

Figure 5.7 Automatic 3rd –Gear locking and manual 3rd-Gear locking

Power transmission-automatic 4th-Gear (overspeed gear)

In automatic 4th-Gear (overspeed gear), the drive of transmission is sent to the front clutch cylinder through the input shaft. The operation principle of each function assembly of transmission is shown as follows:

- The engagement of clutch C1 drives the planetary gear carrier rotates in clockwise rotation.
- The engagement of B1 brake belt makes the reverse sun gear to stop.
- When the planetary gear carrier rotates, the long planetary gear rotates around the static reverse sun gear, at the same time, it rotates around its axial line to drive the gear ring and output shaft to generate the forward movement in the speed higher than that of input shaft (i.e. overspeed) clockwise.
- The forward central gear rotates in the speed higher than input shaft and is more than the speed when 3-4 one-way clutch (OWC) is engaged.
- The engagement of clutch C2 is used to reduce the speed difference generated by 3-4 one-way clutch (OWC).

Control:

In the stable status, the status of solenoid valve and valve is shown as follows:

- The solenoid valve S1 is powered on ; S2 is powered off.
- When the solenoid valve S1 is powered on, the small end of 3-4 shift valve is in 4th-Gear position for the pressure of line 500.
- When the solenoid valve S2 is powered off, the large opening of 2-3 shifting valve is in 4th- Gear position for the pressure of line 500.
- The 1-2 Gear shifting valve is kept in 4th-Gear position for the pressure of S2 oil loop.
- The 2nd-Gear loop oil (line pressure) from the 1-2 shift valve flows into the brake belt combination regulating valve and 2-3 shift valve directly.
- The brake belt combination regulating valve provides the 2nd-Gear loop oil for the brake belt attachment loop (BAF) (adjusted by product of line pressure and valve ratio)
- The brake belt combination lip oil is directly supplied to:
- External combination part of front servo
- Enter into the internal combination part of front servo piston through 3-4 shift valve
- The 1st-Gear-2 switch valve provides a oil-drain port when the transmission is switched to 1st-Gear.
- The 2nd-Gear loop oil in 2-3shift valve flows into the 3rd-Gear loop directly.
- The 3rd-Gear loop oil from the 2-3 shift valve flows into the clutch combination regulating valve and 4th-Gear-3 sequence valve directly
- The clutch combination regulator valve supplies the oil for the clutch combination loop (CAF) (Regulated by the product of line pressure and valve rate)
- CAF oil is directly supplied to:
- clutch C1
- 4th-Gear-3 sequence valve
- The drive oil(line pressure) form the manual-operated valve forces the engagement of clutch C2

Refer to Figure 5.8 and Table 5.9.

Table 5.9 — Participating condition of each unit in automatic 4th –Gear (overspeed Gear)

	Name of participation unit								
Gear	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	LU clutch
Automatic 4th-Gear (overspeed Gear)	X	X	—	—	X	—	—	—	—

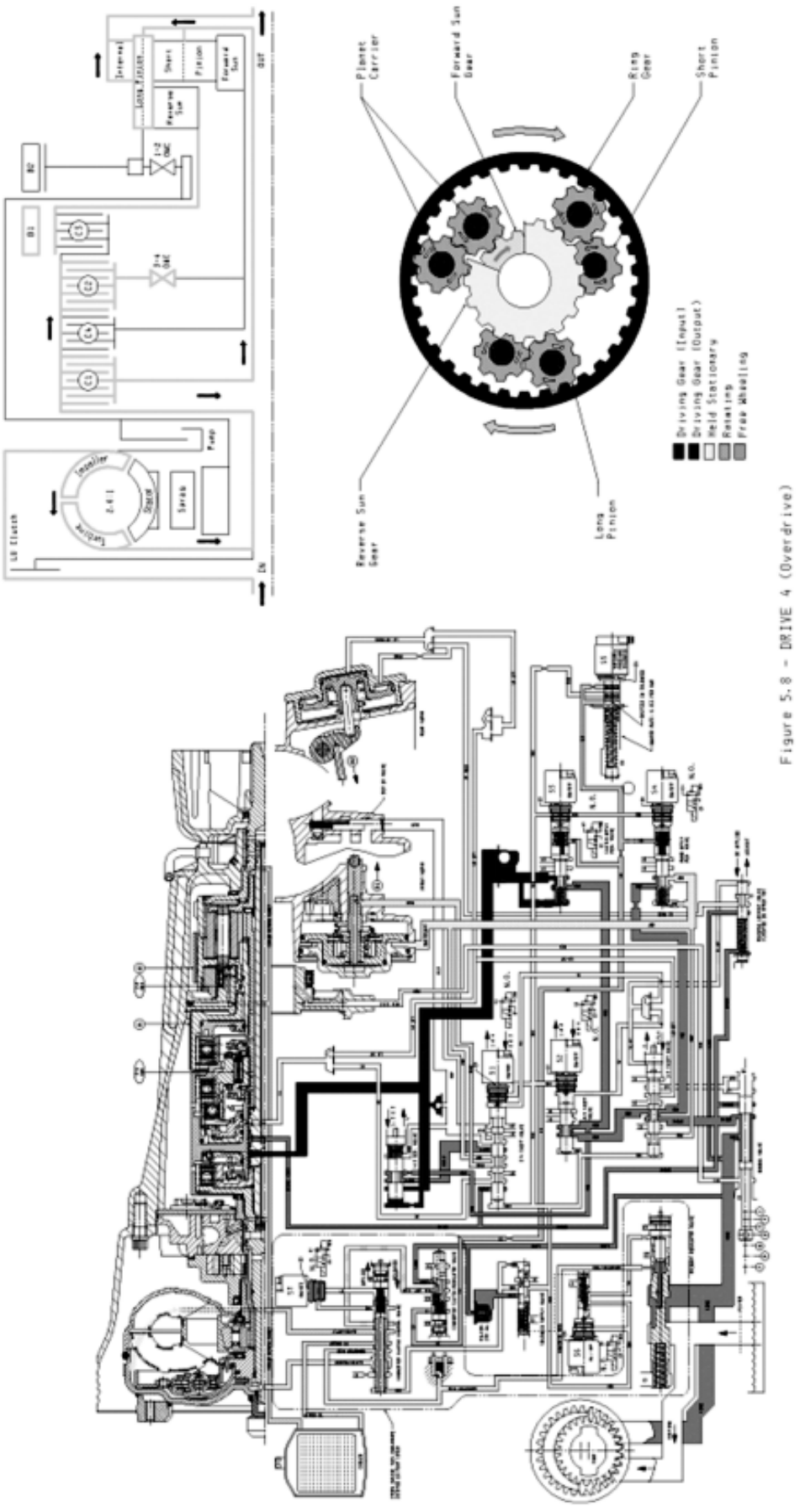


Figure 5.8 Automatic 4th-Gear (overspeed Gear)

Power transmission－Automatic 4th-Gear locking

In automatic 4th –gear locking, the drive of transmission is same as that in automatic 4th –gear basically. But for the application of variable torque locking clutch, it provides the variable torque drive without slide.

Control:

The automatic 4th –Gear locking is same as that in automatic 4th-Gear basically. But it should be described that when the automatic 4th-Gear is locked, it has the action for variable torque loop by solenoid valve S7.

- When the solenoid valve S7 is opened, the variable torque clutch control valve is closed and allow the S7 loop oil flows to the drainage port through the solenoid valve S7, then control the valve to move to the clutch engagement position.
- The line pressure loop regulating oil from the torque converter clutch regulating valve flows into the combination side of torque converter clutch directly.
- The release oil of torque converter clutch is drained from the control valve of torque converter clutch..
- The torque converter loop oil flows into the oil cooler and lubrication loop directly through the control valve of torque converter clutch..

Refer to Figure 5.9 and Table 5.10.

	Name of participation unit								
Gear-position	C1	C2	C3	C4	B1	B2	1–2 OWC	3–4 OWC	LU Clutch
Automatic 4th –Gear locking	X	X	—	—	X	—	—	—	X

Table 5.10 －－ The participating condition of each unit in automatic 4th-gear locking

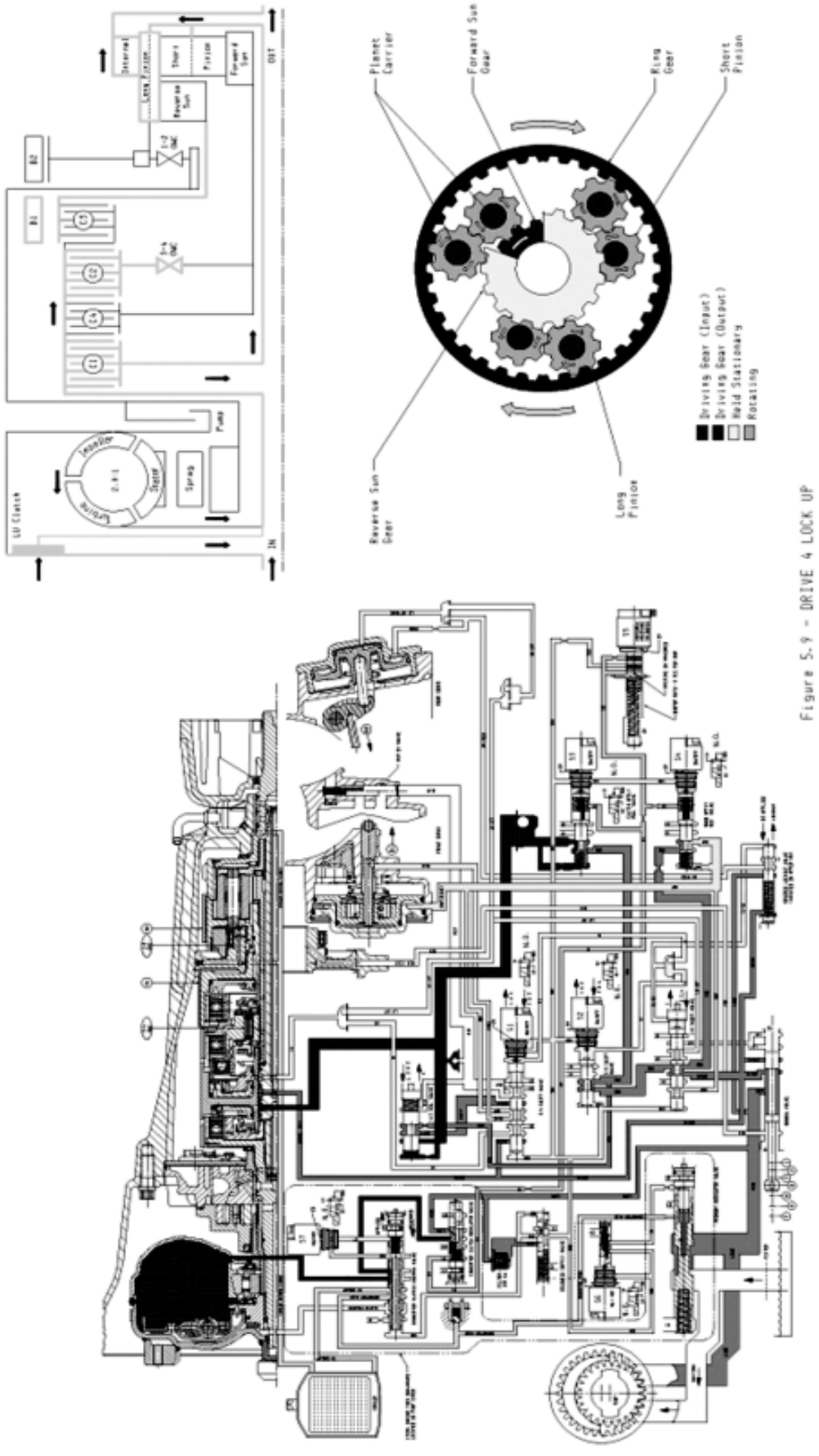


Figure 5.9 Automatic 4th –Gear locking

Diagnosis and test

Test system

1. Recommended test equipment and program

The test equipment and control unit for design will be used for the test of all vehicles. The parts for transmission test includes:

- Tester for service after sales
- Special vehicle for test

2. Tester for service after sales

After the special programming, the tester equipped with special car test software can be used to test the specified system and unit. The program allows the normal communication between the transmission control units (TCUs) .

The computer needs the required information from the customer and select the necessary data through the manual. For example: view the code, clear the error code and make the real-time operation. For detailed operating instruction refer to user's manual.

The equipment can be used by the trained specialized persons, such as technician, machinist to test the electronic and loop problem related to transmission. The testable information includes: the engine speed, rode (shaft speed), transmission fluid temperature, position of throttle position, status of solenoid valve and gear and position of operating lever. Additionally, it can be used to detect the current and stored problem.

3. Description of TCU pin

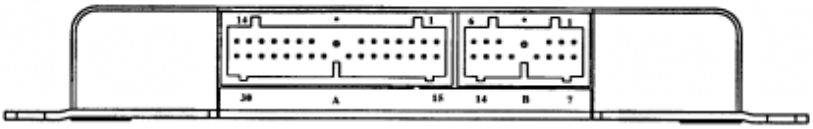
The description of TCU pin code had been listed in Table 6.1.1

For description of wire bunch refer to Figure 6.1.1

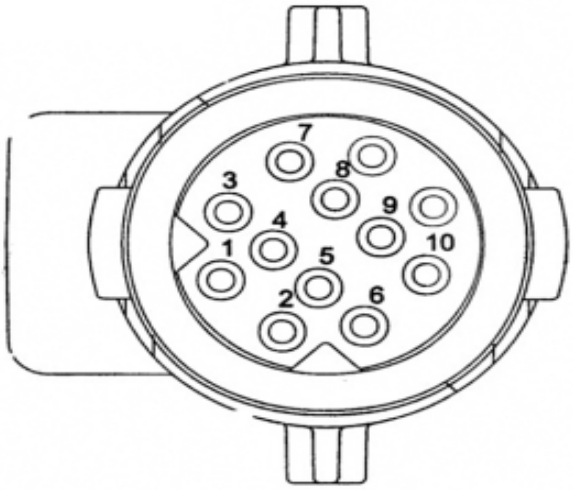
Pin No.	Function	Type	2WD	description
A14	Public grounding	GND	●	Negative pole of TCU supply, connected to negative pole of battery.
A13	Nonuse	－－	○	－－－－－
A12	Mode indicator lamp Snowland mode	OP	●	Indicate that select the "Snowland Mode" operating method.
A11	Parking-Gear indicator lamp	OP	●	The drive instrument panel indicator lamp indicates that is in the "Parking Gear"
A10	Reverse-Gear indicator lamp	OP	●	The drive instrument panel indicator lamp indicates that is in "Reverse Gear"
A9	N-Gear indicator lamp	OP	●	The drive instrument panel indicator lamp indicates that is in "Idle N Gear"
A8	Nonuse	－－	○	－－－－－
A7	Nonuse	－－	○	－－－－－
A6	Mode indicator lamp dynamic mode	OP	●	Indicate that select the "dynamic mode" operating method.
A5	Nonuse	——	○	－－－——
A4	Nonuse	——	○	－－－－－
A3	Nonuse	——	○	－－－－－
A2	Mode switch	IP	●	The switch is used to select the "economic mode", "dynamic mode" and "snowland mode". The voltage is variable in range of 0 V－2V .
A1	Nonuse	——	○	－－－－－
A30	Power supply	PWR	●	Power supply for TCU; is the main power source of drive unit and solenoid valve.
A29	Nonuse	——	○	－－－－－
A28	1^{st}-Gear indicator lamp /1^{st}-Gear position *	OP	●	Drive the instrument panel indicator lamp indication, indicate that the gear-position is in "1^{st}-Gear"
A27	2nd-Gear indicator lamp /2nd-Gear position	OP	●	Drive the instrument panel indicator lamp indication, indicate that the gear-position is in "2^{nd}-Gear"
A26	3^{rd}-Gear indicator lamp /3^{rd}-Gear position *	OP	●	Drive the instrument panel indicator lamp indication, indicate that the gear-position is in "3^{rd}-Gear"
A25	Automatic gear indicator lamp /4^{th} –Gear position	OP	●	Drive the instrument panel indicator lamp indication, indicate that the gear-position is in "automatic-Gear"

Pin No.		Type	2WD	Description
A24	CAN (-ve)	I/O	○	CAN hidden communication end
A23	CAN (+ve)	I/O	○	CAN exposed communication end
A22	K line communication connection	I/O	●	Diagnosis information and car code
A21	Nonuse	— —	○	— — — — —
A20	Nonuse	— —	○	— — — — —
A19	Shaft speed sensor signal	IP	○	The sensor sends the shaft speed signal to TCU
A18	Nonuse	— —	○	— — — — —
A17	Nonuse	— —	○	— — — — —
A16	Nonuse	— —	○	— — — — —
A15	Nonuse	— —	○	— — — — —
B6	Gear-position	IP	●	The switch has the variable-voltage; indicate the gear-position steering column selected (PRND321). The voltage is variable in the range of 0V--5V.
B5	transmission fluid temperature	IP	●	The sensor indicates the transmission fluid temperature. High R=Low temperature Low R= High temperature The voltage is variable in the range of 0V to 5V
B4	solenoid valve 4	OP	●	N/OFF normal-opened solenoid valve, combined with the ON/OFF witch of solenoid valve 3; ensure the shifting quality and sequence
B3	solenoid valve 1	OP	●	ON/OFF normal-opened solenoid valve; combined with other solenoid valve; used to determine the selected gear-position.
B2	Nonuse	— —	○	— — — — —
B1	Return solenoid valve 5	IP	●	Using for grounding of VPS and current of circuit can be detected, then process the feedback control for the VPS.
B14	Gear-position — grounding	GND	●	PRND321 Gear-position switch grounding
B13	transmission fluid temperature — grounding	GND	●	Connected to grounding pin of temperature sensor.
B12	solenoid valve 6	OP	●	ON/OFF normal-opened solenoid valve, determine the high or low of line pressure
B11	solenoid valve 2	OP	●	ON/OFF normal-opened solenoid valve, combined with other solenoid valves; used to determine the selected gear-position.
B10	solenoid valve 3	OP	●	ON/OFF normal-opened solenoid valve, combined with the ON/OFF switch of solenoid valve 4; ensure the shifting quality and sequence
B9	solenoid valve 7	OP	●	ON/OFF normal-opened solenoid valve, hydraulic torque converter locking; increase the efficiency of medium speed run.
B8	Nonuse	— —	○	— — — — —
B7	solenoid valve 5(+ve)	OP	●	It is the solenoid valve which can change the pressure during the shifting and on/off of solenoid valve.
● = connected line			○ = unconnected line	∗ =only
OP= output			IP=input	I/O=input/output
GND=grounding			REF=reference	PWR=power

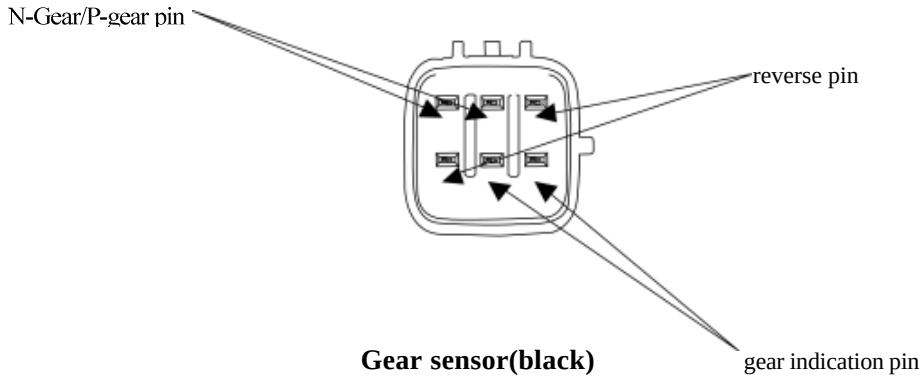
Table 6.1.1 Description of TCU pin



TRANSMISSION CONTROL UNIT (TCU) PIN NUMBERS



TRANSMISSION WIRING PLUG



Gear sensor(black)

Figure 6.1.1 Description for wire bundle pin

4. Operating mode of transmission

TCU realizes the effective control for the transmission according to the accurate information acquired form the input data and complete control for the output data. To ensure the input and output of TCU is actual and effective, TCU executes the data sense command for hardware and software. For the failure information found in the following operating mode described in detail, TCU will give the corresponding response.

Similarly, it exists the possibility that could not find out the failure cause. If encounter the condition, the operation for transmis sion is determined difficultly.

Following condition will effect the operation of transmission, but will not appear the detection failure information.

a. Power supply failure

The transmission adopts the 3-Gear lame Home Mode (LHM) irrelevant to car speed.

If occur the intermittent power supply, then TCU will start form 4-Gear and is switched to the proper gear to meet the requirement of current work. At this time, it will not monitor the power supply status.

b. The transmission fluid temperature is higher than 135℃

If found the transmission temperature is high:

●The torque converter lock clutch will start in low speed and the car will have the vibration.

●Some cars will have the condition that the mode indicator lamp is flash.

The reason for the condition may be the transmission fluid temperature is high or acquire the inaccurate single form the temperature sensor. If occurs the temperature failure, it may find the high temperature operating condition.

c. Failure of ON/OFF solenoid valve

If one of the solenoid valves has the mechanical failure, TCU will not find the failure. At this time, the failure operation of transmission will be determined according to the solenoid valve with failure. The characteristic of different solenoid valve failure is listed in Table 6.1.2.

solenoid valve	Condition	Transmission operation
1	Opened always	1st-Gear replaces 2nd-Gear; 4th-Gear replaces 3rd-Gear. It causes the car form the Gear shift of 1→1→4→4 when accelerate form static. The transmission stay longer time in Gear; worse 1→4 shift feeling.
	Closed always	2nd-Gear replaces 1st-Gear; 3rd-Gear replaces 4th-Gear. It causes the car form the Gear shift of 2→2→3→3 when accelerate form static. It is said that starts form 2nd-Gear.
2	Closed always	4th-Gear replaces 1st-Gear; 3rd-Gear replaces 2nd-Gear. It causes the car form the Gear shift of 2→2→3→3 when accelerate form static. That is saying that start form 4th-Gear.
	Opened always	2nd-Gear replaces 3rd-Gear; 1st-Gear replace 4th-Gear. It cause the car is shifted form 1st-Gear to 2nd-Gear, then from 2nd-Gear to Gear when accelerate form static. It will feel the transmission is in free gear position after 2→1 Gear shift.
1&2	Opened always	Can not realize the reverse gear; only has 1st-Gear operation.
3	Closed always	Following shifts are bad. (2→3 is worst):1→3, 1→4, 2→3, 2→4, 4→2, 4→1
	Opened always	Following gear shifts are worse: 3→4, 4→3, 3→2。 It may cause the gear slide when the hydraulic torque converter is locked.
4	Closed always	Following gear shifts are worse: 1→2, 1→3, 1→4, 2→3, 2→4, 3→1, 3→2, (including manual) 3→4, 4→1, 4→3
	Opened always	Following gear shifts are worse: (1→2 is worst) 2→4, 3→2 It may cause the gear slide when the hydraulic torque converter is locked.
6	Closed always	The line pressure is high always.
	Opened always	The line pressure is low always. So it cause the slide between gears. The clutch C1 and brake belt B1 will be burned.
7	Closed always	The hydraulic torque converter is without lock.
	Opened always	The hydraulic torque converter is locked in 3rd-Gear and 4th-Gear. It cause the car generates the vibration in low-speed status.

Table 6.1.2 Operation of transmission when ON/OFF solenoid valve is faulty

Mechanical detection

1.Inspection of transmission on car

It should process the following detections before disassemble the transmission:

- process the on-road drive test to determine the failure cause .(according to requirement)
- Detect the standard of transmission fluid. (refer to 7.2.1)
- Ensure the transmission fluid in not overheated. (Normal color and smell)
- Detect the failure information.
- Check the battery terminal and grounding for corrosion or loose.
- The engine speed is within the specified value in manual.
- Check the cooling system for normal operation.
- All power supply and plug wires is tight and not loose.
- Check the transmission fluid, ensure the oil pan is without other martial material or pollutant.

2. Oil leakage detection

It should wash the polluted part of the transmission before select the oil leakage part, then drive the car.

- When detect the leakage part of the rear servo system, it should lift the car by lifter firstly, then switch the gear to reverse gear within 10s.
- When detect the leakage part of front servo system, it should lift the car by lifter firstly, then switch the gear to gear-2 (winter mode).

  The time switched to 2nd-Gear should be no more than 10s to avoid the oil in the torque converter is overheated.

3. FAQ table

The distribution of FAQ table is shown as follows:

- Table 6.2.1 Drive failure
- Table 6.2.3 Shift quality failure
- Table 6.2.2 Shift mode failure
- Table 6.2.4 Disassembly failure

failure	Possible reason	Corresponding measure
"D"-Gear operation has not drive	The automatic transmission fluid is insufficient. The oil-entering of C1/C2 piston is blocked. The "Z" is assembled incorrectly. The primary regulating valve plug is opened. The overspeed shaft or input shaft sealing ring is failure. 3→4, 1→2 single-way clutch is installed in reverse or failure.	Check the liquid level. Fill it up if necessary. Check and wash the C1/C2 oil inlet device. Reinstall the "Z" connection. Remove, wash and reinstall the primary regulating valve. Check and replace it if necessary. Check and replace it if necessary.
The reverse shifting operation is without drive. The manual 1st-Gear has not engine brake. The engine brake is normal in manual 1st-Gear.	The input shaft oil seal ring is damaged. The rear brake belt or servo system is faulty. C3, C3 wheel shaft or C1/C2 cylinder are out of work.	Check and replace it if necessary. Test the servo system or replace the rear brake belt according to the requirement. Test the failure C3, C3 wheel axle or C1/C2 cylinder. Repair it in time if necessary.
"D" –Gear and reverse –Gear operation is without drive.	The primary regulating valve is blocked. The pump gear is damaged. Take out the output shaft clasp.	Detect and clean the primary regulating valve. Check and replace the pump gear if necessary. Check and repair it if necessary.
Only can 2→3 shifting (can not realize the 4th-Gear and 1st-Gear)	S1 is closed always.	Test the S1. Repair or replace it if necessary. Test the failure of S1 12V power supply voltage or wire bundle.
Only can 1→4 shifting 1→3→4 shifting (1→2 shifting delay).	S1 is opened always	Test the S1. Repair or replace it if necessary. Test the failure of S1 12V power supply voltage or wire bundle.
Only can 4→3 shifting	S2 is closed always.	Test the S2. Repair or replace it if necessary. Test the failure of circuit break or wire bundle.
1→2→neutral position shifting (1st-Gear transition)	S2 is opened always	Test the S2. Repair or replace it if necessary. Test the failure of circuit break or wire bundle.
Only can 1→3 shifting	B1 is out of work The brake belt is loose. The front servo piston or oil seal is out of work. S1/S2 ball spool is reinstalled in wrong place.	Test and adjust it according to the requirement. Test and maintain it according to the requirement. Test and replace or reinstall it according to the requirement.
Only can 1→3→4 shifting	The small O-ring of front servo piston is invalid or lost. 2→3 Gear position shifting valve is blocked.	Detect the O-ring. Process the replacement or reinstallation if necessary. Detect the 2→3 Gear shifting valve; Process the maintenance or replacement according to the requirement.
Only can 1→2→1 shifting	C1 is invalid or 3rd-Gear and 4th-Gear is loose. (give to 1st-Gear in 3rd-gear; give to 2nd-Gear in 4th-Gear)	Detect the clutch C1. Repair or replace it if necessary.
Can not realize the manual 4→3, 3→2, 2→1	Overspeed clutch /ball spool has displacement. C4 is invalid.	Detect the ball spool. Process the replacement or reinstallation according to the requirement. Detect the C4. Repair C4 or replace the C4 wave pan according to the necessary.

Only can 1→3→4 shifting	The small O-ring of front servo piston is invalid or lost. 2→3 Gear psition shifting valve is blocked.	Detect the O-ring. Process the replacement or reinstallation if necessary. Detect the 2→3 Gear shifting valve; Process the maintenance or replacement according to the requirement.
Only can 1→2→1 shifting	C1 is invalid or 3rd-Gear and 4th-Gear is loose. (give to 1st-Gear in 3rd-gear; give to 2nd-Gear in 4th-Gear)	Detect the clutch C1. Repair or replace it if necessary.
Can not realize the manual 4→3, 3→2, 2→1	Overspeed clutch /ball spool has displacement. C4 is invalid.	Detect the ball spool. Process the replacement or reinstallation according to the requirement. Detect the C4. Repair C4 or replace the C4 wave pan according to the necessary.
Without manual 1st-Gear	The rear brake belt is loose when the temperature is high. The R-Gear/Low speed 1st-Gear ball spool has displacement. The internal "O" –ring of rear servo is lost. C4 is invalid.	Detect the rear brake belt, adjust id necessary. Detect the ball spool, Reinstall or replace it if necessary. Detect the O-ring, Reinstall or replace it if necessary. Detect the C4. Repair or replace it if necessary.
Only can 1→2→2→4 gear.	The dimension of socket of front servo is large. Has the possibility of loose of plug. It has the trend that can not realize the reverse-Gear if drive the vehicle in this condition continuously.	Repair or replace it if necessary. Detect the C3 piston O-ring, replace it if necessary.
Only an 1st-gear, 2nd-Gear, 4th-Gear or 1st-Gear, 2nd-Gear and 3rd-Gear.(3rd-Gear is tightened)	The gear sensor has failure, only can1→2→3 shifting. 3→4 Gear shifting valve is blocked.	Detect the gear-position sensor. Repair or replace it if necessary. Detect the 3→4 gear shifting valve. Repair or replace it if necessary.

Bad 1→2 Gear shifting quality	The throttle position sensor has failure. The brake belt is adjusted incorrectly. The front servo piston O-ring is damaged. The variable pressure solenoid valve (S5) is damaged or has failure. S1, S4 has the failure. The brake belt combination regulating valve (BAR) has the failure. The front servo release spring is installed incorrectly.	Detect the resistance, replace the sensor if necessary. Detect and replace the rake belt if necessary. Detect and replace the O-ring if necessary. Detect, repair or replace the S5 if necessary. Detect, repair or replace the S1, S4 if necessary. Detect, repair or replace the BAR if necessary. Detect and repair it if necessary.
Bad 2→3 Gear shifting quality	B1brake belt release valve is blocked. S3, S2 has the failure. The clutch combination regulating valve has failure. The clutch combination oil feed ball spool is lost or damaged. The input shaft oil seal is damaged. C1 piston O-ring is damaged. C1 piston oil feed ball spool is damaged.	Detect the blow-off valve. Replace or maintain it if necessary. Detect the S3, S2.Replace or maintain it if necessary. Detect the regulating valve. Replace or maintain it if necessary. Detect the ball spool .Reinstall or replace it if necessary. Detect the sealing ring. Reinstall or replace it if necessary. Detect the O-ring .Reinstall or replace it if necessary. Detect the ball spool .Reinstall or replace it if necessary.
Bad 3→4 Gear shifting quality	S1, S4 has failure. B1brake belt release valve is blocked. The brake belt is adjusted incorrectly. The front servo piston O-ring is damaged. The variable pressure solenoid valve (S5) is damaged or has failure. The brake belt combination regulating valve has failure.	Detect the S1, S4.Reinstall or replace it if necessary. Detect the blow-off valve. Replace or repair it if necessary. Detect the brake belt. Adjust it if necessary. Detect the O-ring .Replace or maintain it if necessary. Detect the S5.Replace or maintain it if necessary. Detect the regulating valve. Replace or maintain it if necessary.
The engine has the extinguishing condition when select the automatic gear or R-gear.	The torque converter clutch control valve is blocked or solenoid valve 7 has failure.	Detect and clean the torque converter clutch valve (CCCV)
Has unstable vibration condition.	S7 has the failure.	Process the necessary detection, maintenance and replacement according to the requirement.

Table 6.2.3 Shifting quality failure

Failure	Reason	Corresponding measures
C2 is burnt.	T operation lever linkage is beyond the normal adjusting scope. S6 is invalid.-Operating lever is hard. The over speed Gear/output shaft sealing ring is damaged.	Monitor and repair the C2 if necessary and adjust the linkage device. Repair the C2; detect, repair or replace the S6 if necessary. Repair the C2; detect and replace the sealing ring or shaft if necessary.
C4 is burnt.	The clutch C4 assembly clearance is incorrect. The over speed Gear/output shaft sealing ring is damaged. 3→4 one-way clutch is in rear position. The over speed clutch (OC) /1st-Gear low speed ball spool has displacement.	Detect the C4. Detect and adjust the clutch C4 assembly clearance if necessary. Repair the C4; detect and replace the oil seal or shaft. Repair the C4, detect or modify the OWC if necessary. Repair the C4, detect or modify the ball spool if necessary.
B1 is burnt.	B1R spring is damaged. The dimension of oil inlet hole of front servo is large and has the possibility of loose. The input shaft sealing ring is damaged. C1/B1R ball spool has displacement.	Detect and repair the or replace the spring if necessary. Replace the socket if necessary and detect the C3 piston O-ring. Replace the sealing ring. Repair the B1; modify the ball spool if necessary.
C1 is burnt.	B1Rspring / plug is lost. The over speed Gear/input shaft sealing ring is damaged 4→3 sequence valve is in rear position. Clutch attachment oil feed inlet (CAF). B1Rball spool is lost.	Detect and repair C1 or replace the spring if necessary. Repair the C1; detect and replace the sealing ring or shaft if necessary. Repair the C1; detect and modify the valve if necessary. Repair the C1; detect and replace the ball spool if necessary.
B2 brake belt is burnt. In R-Gear- without manual 1st-Gear.	The rear brake belt is adjusted incorrectly or damaged. The low speed R-Gear /1st-Gear ball spool has displacement.	Detect and adjust the brake belt if necessary. Detect and reinstall the ball spool if necessary.
The torque converter is locked hardly or is not locked.	The torque converter combination regulator is in rear position.	Detect and modify the valve if necessary.

Table 6.2.4--Dismantel failures

Adjustment

Hydraulic system

Following parts is the detailed description for self-detection procedure pointed to the condition occurred in chapter 6. including the condition indicated the failure, to point the problem existed in the hydraulic system.

It should select the proper procedure from the following primary detection when adjust the transmission.

- Detection process of transmission fluid
- Detect the manual linkage adjusting system(refer to factory manual of car)
- Detect the engine idle speed
- Anchoring test (beyond the scope of the maintenance manual)
- On-road test (beyond the scope of the maintenance manual)

Detection procedure of transmission fluid level

1. General

The process is used to detect the level of vehicle transmission fluid. It will cause the failure or delay of transmission shifting if the level is low than required value and the vehicle does not reach the drive temperature.

Firstly, process the transmission diagnosis information detection for vehicle (refer to chapter 6). If found the failure of sensor, then it maybe caused by transmission fluid level is less than specified value.

It should detect whether has the abnormal delay and Gear-position condition when select the forward or reverse-gear by driving the vehicle. One feature of oil level less than normal value is that the vehicle has the gear-position delay and lack condition when the vehicle is in steering. The previous problem will occur when the transmission fluid temperature is low.

When the oil temperature is medium and vehicle speed failure is recorded, the gear-position lose condition will not occurs any longer, it means that needs to fill the transmission with the transmission fluid.

2. Detection of transmission fluid level

When fill up or replace the transmission fluid, it must use the Castrol TQ95 automatic transmission fluid (ATF) or other permissive oil. It will damage the performance and service life of transmission if use the unpermissive transmission fluid. Please ensure the transmission fluid level is correct. The transmission also can be damaged if the transmission fluid level is incorrect.

The setting procedure of transmission fluid level is shown as follows:

Caution:

When the transmission is in operating temperature, the hot transmission fluid may flow out form the housing if remove the filling plug.

a. **If the vehicle is in operating temperature, allow two hours time for cooling before add the transmission fluid, but it must not more than 4 hours (this will make the transmission locate in the correct temperature range). When the temperature is overheating, the transmission fluid level will higher than the plug port. Removal of plug will cause the transmission fluid flows out from the oil filling port, then cause the low level of transmission fluid.**
b. **The gear-position of transmission is in parking-Gear (P-Gear), shut off the engine.**
c. **Lifting the vehicle (or parking above the trench).**
d. **Clean the around of plug when remove it. Then remove and clean the plug and check the O-ring for damage. Install the oil filling pump in the oil filling hole.**
e. **Lower the vehicle; the oil filling pump will be connected to the vehicle at this time. Fill the transmission with the oil partially. Then start the vehicle in P-Gear to rotate the engine in idle speed. Step down the foot brake, pull the shifting lever in each gear-position in circulation and add the transmission fluid until the action of each gear-position can be sensed.**
f. **Shut down the engine; lift the vehicle; ensure the vehicle is always in horizontal.**
g. **Remove the filling plug 3 minutes after the engine is shut off, but must not be no more than1 hour. At this time, the correct level position should be in the bottom of oil filling hole. If does not reach the liquid level position, then fill with few transmission fluid to make it reach the correct level.**
h. **Replace the transmission; clean the residual transmission fluid on the transmission and vehicle.**
i. **Tighten the transmission plug to the specified torque of 30 － 35N • m.**

3. Oil filling of service after sales

Set the liquid level position correctly; the procedure is shown as follows:

a. Shut down the engine; place the gear-position in the P-Gear.

b . Lift the vehicle (or place it above the trench).

c. Clean the around of plug before remove it. Remove the oil plug and check the O-ring for damage, finally connect the oil filling pump to the oil filling hole.

d. Lower the vehicle and oil filling pump to the ground; fill with the transmission fluid partially. The general oil filling amount is shown as follows:

If in the status of transmission hydraulic torque converter is empty: 8.0 L

If in the status of transmission hydraulic torque converter is full: 3.8 L

e. When start the vehicle in P-Gear, rotate the engine in idle speed. Step down the foot brake, pull the shifting lever in each gear-position in circulation and add the transmission fluid until the action of each gear-position can be sensed.

f. Then fill with 0.5L transmission fluid (ATF) additionally.

g. Shut off the engine, lift the vehicle; take off the pump and replace the plug. Ensure the plug is tightened according to the specification.

h. Then pull the vehicle throttle position for slight opening to make the vehicle runs for 3.5～4.5km; the rotary speed of engine is no more than 2500r/min; then the transmission fluid temperature will in the scope of 50℃～60℃.

i. The engine is in idle-speed; pull the hand brake to make the shifting lever circuits in each gear-position horizontal status.

j. Shut off the engine, lift the vehicle to the operating height; ensure the vehicle is in horizontal status

k. Remove the filling plug 3 minutes after the engine is shut off, but must be no more than1 hour. At this time, the correct level position should be in the bottom of oil filling hole. If does not reach the liquid level position, then fill with few transmission fluid (ATF) to meet the requirement.

l. Reinsert the transmission fluid plug, remove the residual transmission fluid around the vehicle and transmission; tighten the plug to the specified torque.

4. Replace the ATF

Please notice that the color of TQ95 automatic transmission oil will be faded in the normal operation of transmission; it will be turn into the deep brown or even in black. It will not affect the performance of ATF. It means that the fading of transmission fluid not always means to replace the transmission fluid.

If the transmission temperature is raised, the ATF will be burnt. In this condition, ATF will change into black and with special sulfur smell. The smell of the ATF means the oil is burnt.

If the ATF is burnt, it will cause the damage of transmission (the clutch assembly is damaged at least).At this time, it should disassembly the transmission and process the necessary detection.

Electronic calibration

1. Idle-speed calibration

The idle-speed calibration is introduced in detail in the vehicle factory manual.

2 Calibration of position of throttle position

If the throttle position information stored in TCU is lost or not in application scope. It can be reestablished according to the following program as the diagnosis error information.

a. Check whether the engine idle speed is in required range.

b. In the status of shutting off of air-condition, make the engine is in “D” –Gear for 60s,then the reference point with opening degree of 0％ of throttle position is reset in TCU.

Shut off the engine; switch on the ignition device, step the accelerator pedal to bottom for 60s, then the reference point with opening degree of 100％ of throttle position is reset in TCU.

3. Clear of throttle position

The clear process set by learning throttle position is necessary for M88 transmission TCU.

4. Car code

For M88 transmission, the car code is unnecessary.

Disassembly /assembly

Cautions for assembly

It should notice the following items before reassemble the transmission system:

1. **Ensure the cooler pipeline is washed and all chip is removed when replace the transmission. It can be realized by using the compressed air to enter into the rear cooler pipeline to remove the oil and all foreign material in the front cooler.**
2. **It should check the cooler after the transmission is installed. Ensure the front and rear cooler pipeline is connected to the proper container. Rotate the vehicle in P-Gear in idle-speed, measure the flow rate within 15s.**
3. **The flow within 15s should be more than 1L.**
4. **It should avoid any water entering into the transmission. This will cause the transmission fluid to generate the foam or make the transmission fluid flows out form the respirator.**
5. **Ensure that two grounding wires in vehicle (one end to battery, one end to vehicle) are connected before the installation of the anode of battery.**
6. **If the power control module and transmission control unit is exchanged, then calibrate the program refer to related throttle position in Part**

Removal

1. Transmission

Caution:

It should remove the gear-position sensor before wash the transmission in solvent or hot abluent.

When need to remove the transmission from the vehicle, it should drainage the transmission fluid,

and use the special removal tools.

The removal of the transmission should be processed in module method, the details of removal of each module is described in following section in detail. Refer to details of special tools listed in table 9.10 and 9.6 when remove it.

The technician needs a set of quality tools when inspect the transmission, especially for dual hexagon spanner of model 30, 40, 50 and 8mm, 10mm, 12mm.

It should abide by the following procedure when disassemble the transmission:

a. Remove the shell of torque converter and torque converter.
b. Place the transmission on the saddle platform.
c. Remove the oil pan and oil pan sealing.
d. Remove the filter retainer of each valve and remove the filter.
e. Remove the wire on solenoid valve, place it in side.
f. Remove the protection screw in the valve and remove the valve from the main housing (remove the model Z connecting bar).
g. Remove the front servo circlip, cover and piston.

Caution:

The plastic servo block on used for piston return spring.

h. Remove the flange shaft fork, then remove the transmission housing (2WD and Chairman).
Use the 8mm hexagon wrench to move the pump to the housing bolt.

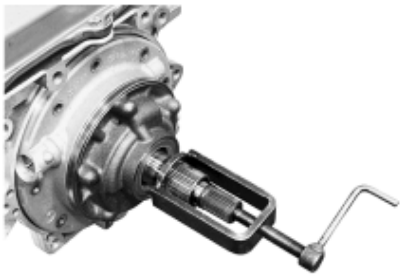


Figure 8.1 Removal of typical pump

i. Use the pump remover to remove the pump, refer to Figure 8.1.

g. Remove the input shaft , front clutch cylinder and overspeed –Gear shaft as an integral. Take it out from the front of housing.

k. Remove the clutch C3 cylinder and central gear .

l. Remove the brake belt support and brake belt.

m. Use the 50 special tools to remove two central support connecting bolts.

n. Remove the central support retainer, refer to Figure 8.2.

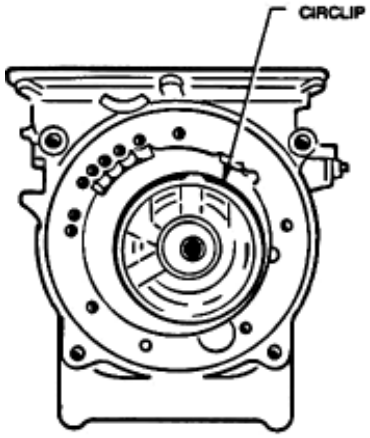


Figure 8.2 central support retainer

Caution:

Do not take out the central support by knocking the output shaft , otherwise, it will damage the surface of thrust bearing permanently

o. Remove the central support, 1-2 one-way clutch and planetary gear block.

p. Use the T40 special tools to remove the parking lever cum disc.

q. Remove the rear brake belt support and rear brake belt.

r. Remove the output shaft assembly.

2. Transmission case

It should follow the following procedure when remove the transmission:

a. Use the tools to take out the fixed pin from one side of cross shaft gear sensor (2WD and 4WD mode).

b. Remove the gear sensor from the case. Use the special tools to take out the cross shaft seal.

c. Take out the circlip from the cross shaft. Pull up the cross shaft and take out the drive pin from the sector gear-position selection plate.

d. Use the tools, press down the cross-shaft pin and take out the shaft , reset spring and bolt from the housing. Refer to Figure 8.3.

Figure 8.3 Installation and disassembly of cross-axle pin

e. Take out the manual-operated valve operating lever and parking operating lever.
f. Take out the 10 pin socket connector form the wire bunch bracket adjacent gear sensor.
g. Press down the raised part of 10-pin plug and take out the 10-pin connecting plug from the box.
h. Separate the NO.7 solenoid valve wire bunch form the front end of housing.
i. Remove the brake bar pivot, brake shaft and spring.
j. Remove the shaft and rear servo operating lever.
k. Remove the rear servo cover and piston assembly.
l. Remove the BIR circlip, valve and spring.
m. Remove two brake belt adjusting shims.
n. Check the output shaft bush in box, replace it if necessary.
o. Check the cooler pipeline, replace it if necessary.
p. Check the box for damage.

Caution:

It must not remove the operating lever of parking gear in normal condition.

q. It needs to remove the P-Gear operating lever: take out the circlip from the pivot, knock the external of shaft until it can move freely in box. Then use a width and thin object to table out the bolt form the box, operating lever and spring.

3. Front clutch cylinder

When take out the front clutch cylinder, please refer to Figure 8.4. The procedure is shown as follows:

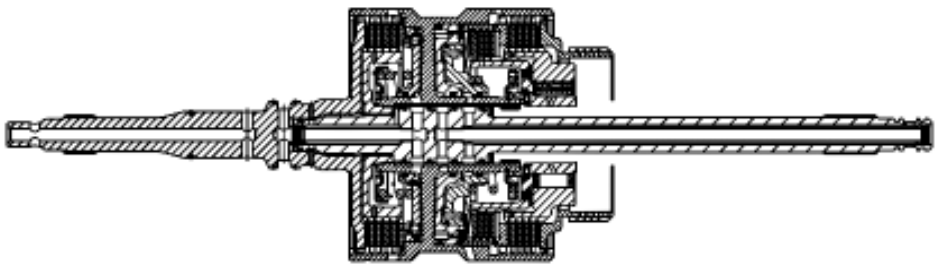


Figure 8.4 Assembly of front clutch cylinder

a. Place the assembly on a level surface.
b. Remove the thrust bearing and adjusting shim from the input shaft .
c. Remove the retainer and input shaft form the front end of clutch .
d. Remove the overspeed gear shaft and clutch C1 hub assembly from the clutch cylinder.
e. Take out the clutch disk C1 form the cylinder.
f. Take out the retainer which fix the clutch C3 hub on the rear end of clutch cylinder, then take out the hub.
g. Take out the C2\clutch C4 hub assembly and remove the thrust bearing form the C4 hub.
h. Take out the clutch C2 disc.
i. Reverse the clutch cylinder and take out the clutch C4 sleeve, clutch disk and two wave washers. The 3-4 one-way clutches is located between the C2 and clutch C4 hub. The other wheel axle can be taken out by rotating a wheel axle in clockwise.
j. Remove the thrust block form the clutch C4 cylinder hub.

Caution

Ensure the spring keeping device does not be clamped in the spring groove and all spring pressure is released.

k. Put end surface of C2\clutch C4 upwardly, connect the clutch cylinder with the tools. Pressed down the piston reset spring, take out the spring fixing retainer (Refer to Figure 8.5). Remove the tools and take out the ring spring, fixing part and spring.

Figure 8.5 Impressed clutch reset spring

Figure 8.6 Removal of C1, C2 and clutch C4 piston

l. Reverse the clutch cylinder on the pressure machine; and remove the clutch C1 reset spring with same method.

m. Send the compressed air into the cylinder through the cylinder hole, remove the clutch piston from the clutch cylinder. Refer to Figure 8.6.

4.clutch C3 cylinder

The procedure of removal of clutch C3 cylinder is shown as follows:

a. Remove the front sun gear assembly, thrust bearing and thrust washer from the clutch C3 cylinder asse bly , shown as Figure 8.7.

b. Remove the nylon thrust bearing, bearing block, needle thrust bearing and thrust bearing . From the clutch cylinder hub.

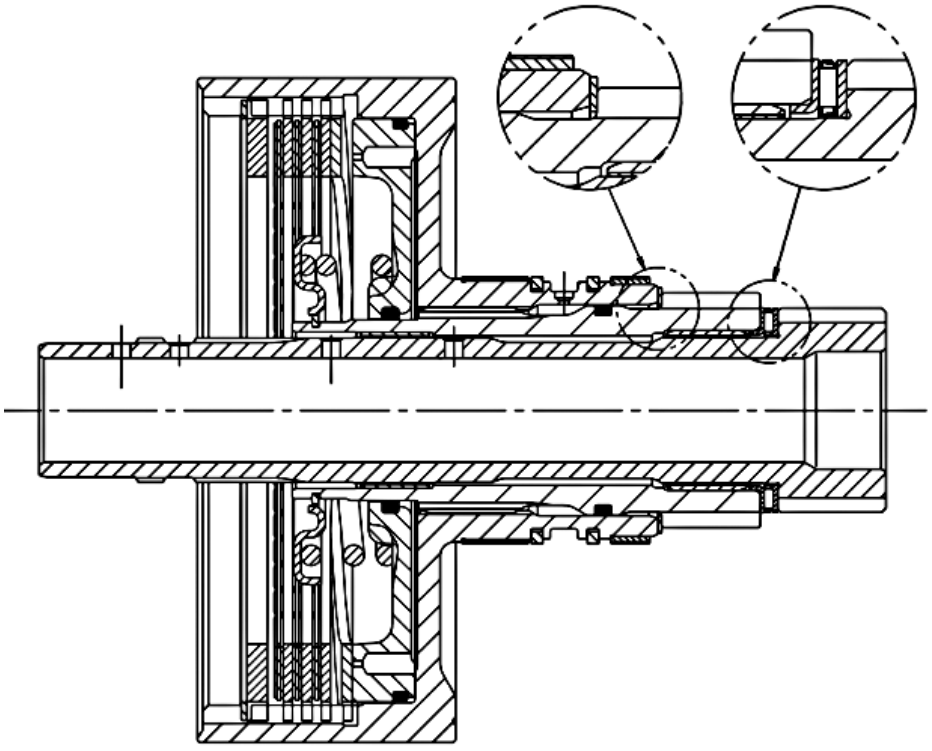


Figure 8.7 Clutch C3 and central gear assembly

Figure 8.8 Removal of clutch C3 piston

c. Install the clutch assembly on the special tools, press down the piston out-back spring; take out the retainer and release spring.

Caution:

Ensure the spring keeping device does not be clamped in the spring groove and all spring pressure is released.

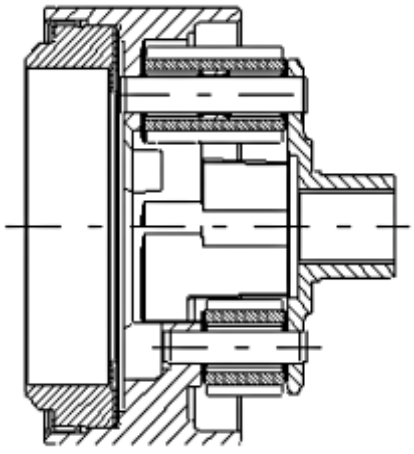
d. Take out the tools, retainer, retainer and spring.
e. Take out the gasket from the clutch C3 cylinder.
f. Take out the clutch disk fixed spring ring and take out the clutch disk.
g. Send the compressed air into the hole between the iron sealing ring and support shaft neck of cylinder; remove the clutch piston from the clutch cylinder. Refer to Figure 8.8.
h. Take out the cylinder forms the reverse sun gear and C3 washer.

5. Planet carrier and central support

The disassembly procedure of planet carrier and central support, the procedure is shown as follows:

a. Separate the planet carrier and central support from the output shaft; remove the thrust bearing and planet carrier form the output shaft.
b. Rotate the planet carrier in anticlockwise and separate the central bracket.
c. Raise the one-way clutch form the planet carrier
d. Remove the spring ring on the planet carrier; maintain the periphery of one-way clutch on the planet carrier and take it out. Refer to Figure 8.9.
e. Remove the one-way clutch fixed mount form the planet carrier.

Figure 8.9 Planet carrier and external race way



6. Pump

Cautions: the following valves are installed in the pump cover:

- solenoid valve 7
- C1 eccentric valve (only for early stage mode, no valve in M88)
- torque converter control valve
- torque converter regulating valve
- primary regulating valve

The disassembly procedure of pump is shown as follows:

a. Remove the wire bunch fixing disc and use the special tools T30 to remove the solenoid valve 7.
b. Use the 8mm sleeve to remove 5 bolts and washers.
c. Use the tool NO.30 to remove 5 screws form the cover plate. It should notice that the odd number screw has the function of connecting the pump body to the pump cover plate.

Caution:

Do not release the pump by the method of knocking the torque converter support.

d. Separate the pump body from the pump cover.
e. Lift the pump cover disc form the pump cover.
f. Remove two ball spool detection valves and a spring from the pump cover.

Caution:

Some valves and plugs are connected by the spring and may fall down form the housing when remove the pin.

g. Press down the socket inwardly to remove the fixed pin of 4 valves.
h. Take out 4 valves, plugs and springs.
i. Take out the pump gear form the gear.
j. Remove the edge sealing from front of pump when replace it.

7. Valve

The removal procedure of valve is shown as follows:

a. Use the special tools T40 T orxbit to remove the ratchet spring and retainer plate.

Caution:

The manual-operated valve may fall down form the valve.

b. Slide the manual-operated valve to out of lower valve.
c. Pay attention to the angle relationship between the electromagnetic end and valve, remove the solenoid valve and valve assembly according to the following procedure :
   - Solenoid valve 1
   - Solenoid valve 2
   - Solenoid valve 3
   - Solenoid valve 4
   - Solenoid valve 5
   - Solenoid valve 6
d. Place the valve on the platform with the top upwardly.
e. Use the model NO.30 Special tools to remove the 24 fixing screw. Lift the upper valve and separating disk to separate the upper valve form the lower valve
f. Reverse the upper part, place the separating disk on the platform upwardly.
g. Lift the separating disk and washer from the upper valve.
h. Remove 5 exposed nylon detection ball spools of valve.
i. Remove the locking nut disc, spring and reverse lock valve.
j. Remove two cleaners (and large nylon detection ball spool) from the lower valve.

Caution:

Once the pin is removed, the disc in the valve may be loose and slid form the valve when reverse the valve.

k. Remove the locking nut disc and bolt form 1-2, 2-3, 3-4, BAR,CAR valve; the bolt can be removed by the bolt.
l. Remove the 1-2, 2-3 and 3-4 shift valve.

Caution:

Some valves are pulled by the spring and may fall down form the valve.

m. Press down the plug of 4-3 sequence valve and take out the locking nut disc.

n. Take out the plug, valve and spring.

o. Press down the solenoid valve 5 gate. Remove the fixed pin, valve and spring.

Caution:

The valve is pulled by the spring and may fall down form the valve.

p. Press down the line pressure blow-off valve , then remove the fixed pin, disc (if proper) spring and valve.

q. Take out the roller pin and remove the spring and ball spool detection valve adjacent BAR.

Assembly

The transmission is assembled in the method of module. The detailed assembly process of each module is described in the following chapter in detail.

Refer to Table 8.1 (end of section 8.3) for the description of used torque specification. The Table 9.10 in section 9.6 describes the necessary special tools for assembly.

The technician also needs to select the quality Torx tools, especially for the two-screw socket wrench with code of 40, 50, 8mm,10mm and 12mm to detect the transmission completely.

1.Transmission

Caution:

Ensure the BIR retainer is proper for the case (otherwise, the valve will damage the separation disk).

Ensure the E clip is installed on the cross shaft.

Ensure all parts of parking machine can operate normally.

The assembly procedure of transmission is shown as follows:

a. Place the upper transmission on the platform upwardly and place it on the transmission bracket.

b. Install all accessories, bolts and bleed devices. Paint the sealant on the sealing place. Tighten all components according to the specification. Ensure the cleanness of all bleed devices. Ensure the rear oil filling nozzle of housing is correct and without blocking material. Refer to Figure 8.19.

c. Assemble the BIR valve and spring; ensure the retainer is installed correctly, refer to Figure **8**.10. Ensure the retainer is fixed in the groove completely.

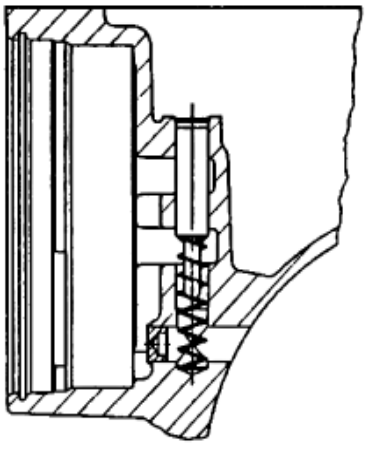


Figure 8.10 B1R valve

d. Install the rear servo bar and pin shaft. Refer to Figure 8.11.

Caution: Ensure the crown bar can rotates freely.

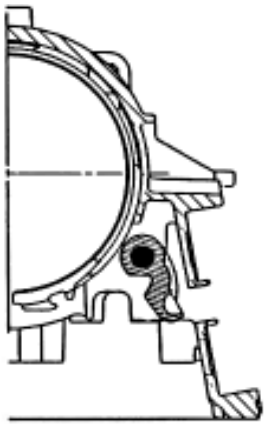


Figure 8.11 Rear servo bar

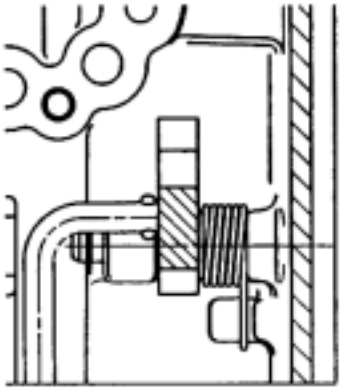


Figure 8.12 Parking operating lever

Caution:

Pay attention to do not coat the sealant between the bolt and crown bar.

e. Install the parking operating lever (as Figure 8.12), including the return spring and shaft pin. Coat the external end of shaft pin with small sealant.

f. Use the circlip to protect the shaft pin. Pay attention to ensure the operating lever can rotate around the shaft pin freely and the spring can make the parking operating lever returns to the correct position.

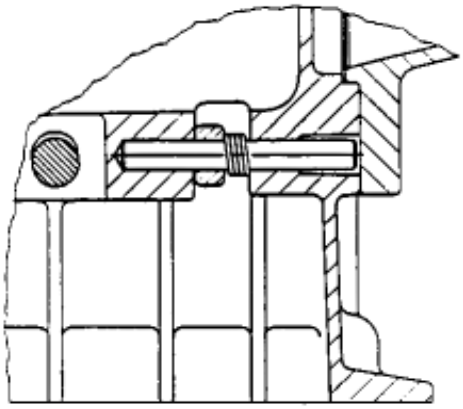


Figure 8.13 Typical parking brake shaft pin and spring

g. Install the parking brake lever pin and spring. Refer to Figure 8.13.Caution: ensure the rake lever can rotate freely.

h. Connect the parking brake lever to the manual-operated valve connecting rod. Shown as Figure 8.14. Ensure the spring and cam axle ring are installed on the connecting rod fixedly.

i. Check the cam axle ring for smooth sliding on rod.

j. Install the cross shaft in the box in reverse direction of Gear-position sensor, then install the concussion spring on the shaft.

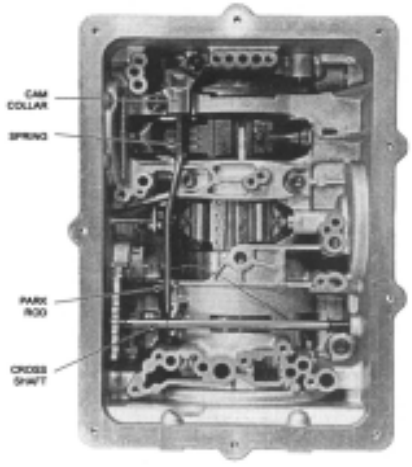


Figure 8.14 Parking lever and manual shaft

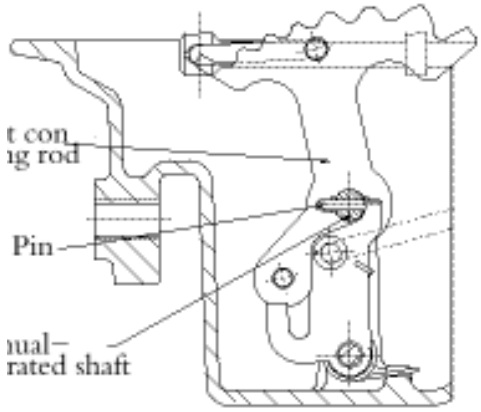


Figure 8.15 manual-operated valve brake lever

k. Install the manual-operated valve detent connecting rod (shown as Figure 8.15), align it with the cross shaft hole.
l. Push the shaft by the positioning operating lever, until start from one side of box operating lever.
m. Use the special tools to install the operating lever drive bolt on the shaft, and ensure the adaptor covers the bolt.
n. Press the bolt into the shaft until the tools reaches the bottom.
o. Take out the tools and install the spring fixing ring spring on the shaft
p. Use the tools to install the new cross shaft seal.
q. Install the Gear-position sensor on the box; install the screw according to the specified torque. Use the tools to press the bolt on the shaft.
r. Check the connection of wire bunch port completely to ensure the normal operation.
s. Install the wire bunch and install the connecting point of solenoid valve 7 and ring flange matched to the pump. Refer to Figure 8.16. The connecting wire of solenoid valve 7 is organized under the parking lever and in box cross shaft.
t. Install the 10-pin connecting socket in the box, ensure the flange of connecting socket matches to the notch on box.
u. Pull out the wire bunch part form the box and prohibition switches; install the 10-pin connecting socket on the wire bunch bracket (only for rear-wheel drive mode).

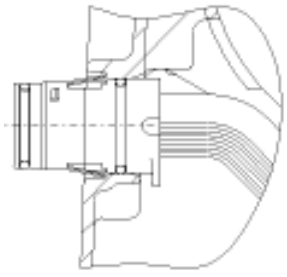


Figure 8.17 Installation of 10-pin connecting plug

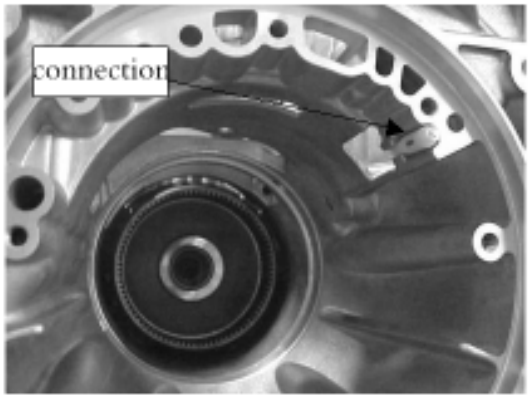


Figure 8.16 Connecting position of coil 7

2.output shaft and gear assembly

The assembly procedure of output shaft and gear assembly (Refer to Figure 8.19),is shown as follows:

a. Check the output shaft bush for damage, replace it if necessary.

b. Check the parking detent on the ring gear for damage ; replace it if necessary.

c. Check the sealing ring groove for damage.

d. Use the automatic transmission liquid to lubricate the gasket.

e. Place the scarfing notch upwardly and install the sealing ring on the output shaft.

f. If has been removed., it should use the ring spring for reinforcement when install the ring gear on the output shaft. Ensure the ring spring is fixed in the groove.

g. Use the Vaseline oil for lubrication; install the thrust bearing assembly NO.10 on the output shaft.

h. It should be carefully when install the output shaft on the box to avoid the damage of sealing ring.

3. Rear brake belt assembly

The assembly procedure of rear brake belt assembly (Refer to Figure 8.18) is shown as follows:

a. Check the rear brake belt for leakage or damage; check its corresponding bush and metal back .

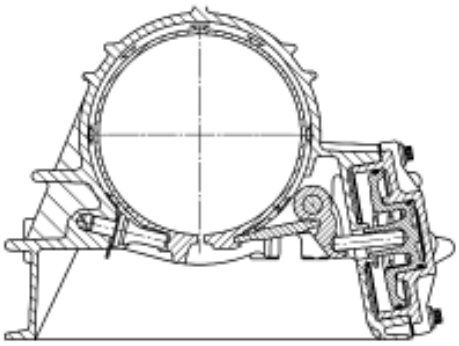


Figure 8.18 Rear servo and brake belt

b. Install the reaction reinforcement bar on the main box, need not shim.

Caution:

Place the new brake belt in the automatic transmission liquid for about 5 minutes before install it.

c. It should be careful when install the rear brake belt on the transmission. Ensure the brake belt is installed on the correct position.

d. Install the application support bar on the rear brake belt, then connect it to the servo motor bar.

e. Install the cam disc and tighten the screw according to the instruction.

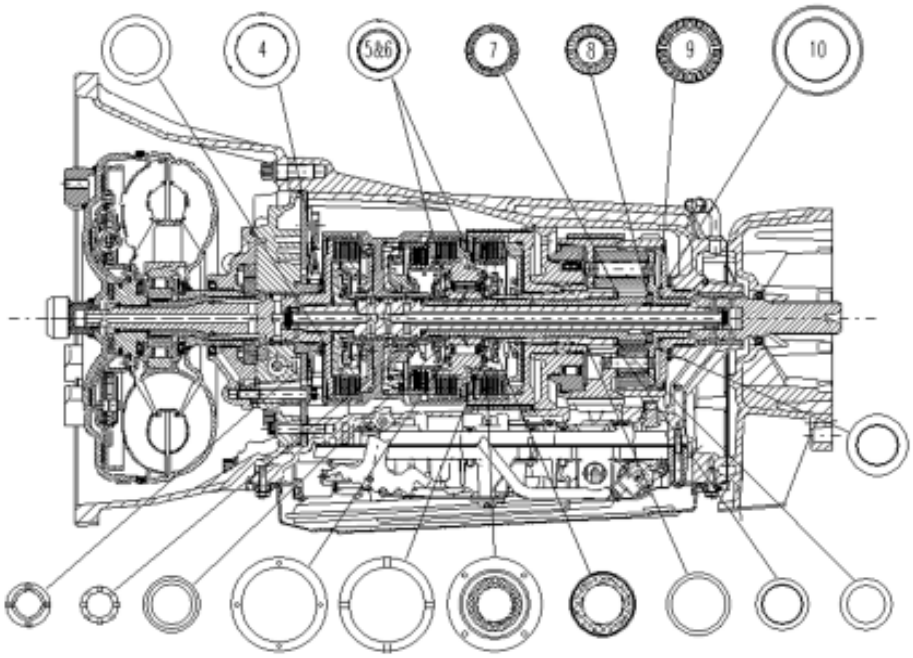


Figure 8.19 Position of thrust bearing and sealing pad

4. Rear servo assembly

Install the rear servo assembly (Refer to Figure 8.18), the procedure is shown as follows:

a. Check the servo piston O-ring and washer for damage.

b. Use the transmission fluid to lubricate the servo piston O-ring and install the O-ring on the piston groove.

c. Install the piston on the housing; ensure the O-ring is compressed to position, but do not excess.

d. Adjust the spring and piston sleeve; then install the rear servo brake bar on the sleeve.

Caution:

Do not coat the washer with the Vaseline.

e. Install the housing installed with washer on the case.

f. Provide the bolt with the Loctite567 sealant and install it; ensure the bolt is tightened according to the specification.

5. Planet carrier assembly and central support

The installation process of planet carrier assembly and central support is shown as follows:

a. Check the bracket and planet assembly for damage or abnormal and ensure all pinion rotates freely and the pinion axle end floats in the allowable range; described as 9.2.

b. Install the one-way clutch fixing plate on the planet carrier and ensure the internal edge points to the downwardly. Check the one-way clutch and brake accessory for damage; replace it according to the requirement.

c. Install the external race on the drum. Press sown the ring race to bottom of drum and install the fixing ring spring. Ensure the ring spring is installed in the groove stably. Refer to Figure 8.20.

d. Install the one-way brake on the external race with the lip upwardly. Use the automatic transmission liquid to lubricate the brake accessories. Refer to Figure 8.20.

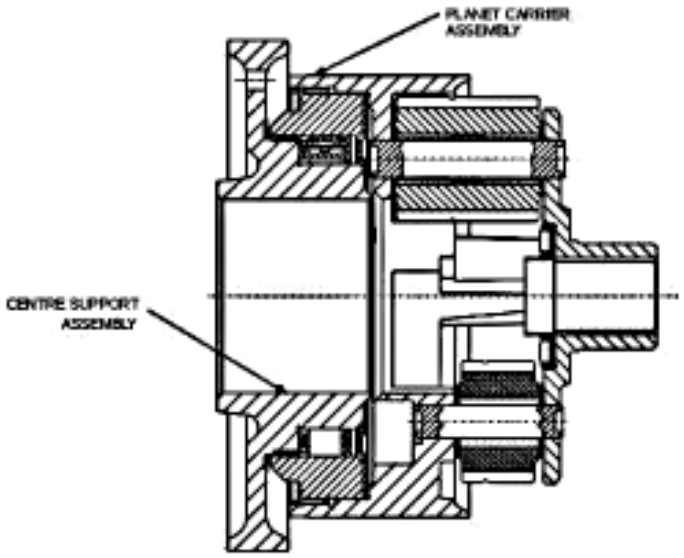


Figure 8.20 planet carrier assembly and central support

e. Check whether the socket has the proper central support, then install the central support on the one-way clutch, ensure the support can rotate in anticlockwise. Refer to Figure 8.20

f. Use the Vaseline to lubricate the NO.9 needle thrust bearing and thrust washer, and install it on the rear of planet carrier. Refer to Figure 8.19

g. Install the planet assembly and central support on the box and align the central support installation bolt hole.

h. Install and tighten the central support bolt.

i. Install the ring spring fixing plate; ensure the ring spring is installed in the box correctly.

j. Remove the central support bolt and provide the Loctite243 or similar material for screw; install and tighten the bolt to specified standard.

6.Ttransmission rear housing assembly

The installation procedure of transmission rear housing assembly is shown as follows:

a. Check the condition of transmission rear housing roller bearing (2WD and Chairman mode), replace it if necessary (rear drive mode). Install the new bearing form the end of transmission rear housing; only can press the bearing side with mark.

b. Install the new sealing material on the transmission rear housing or adaptor rear housing. Refer to Figure 8.21.

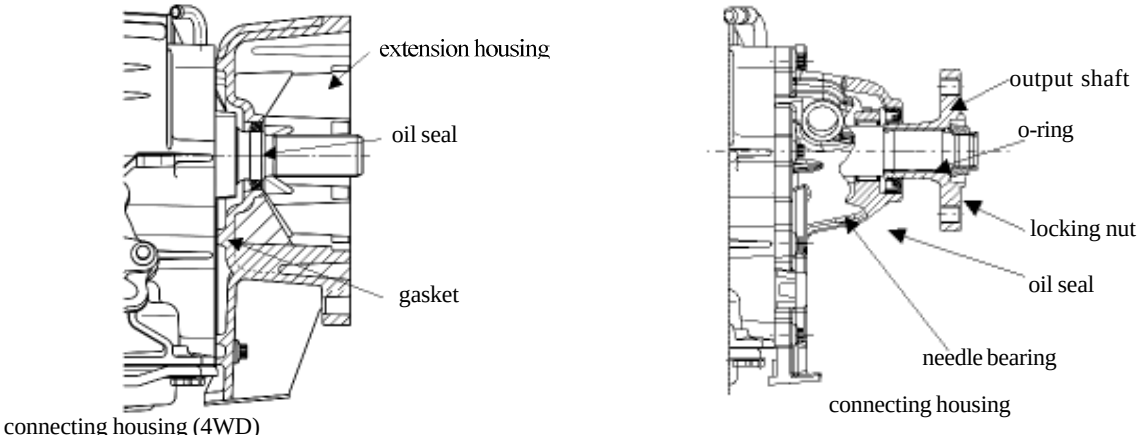


Figure 8.21 Connecting and extension housing

Caution:

Do not use the Vaseline to fix the washer.

c. Install the transmission rear housing or adaptor rear housing with the new washer.

Caution:

Refer to the description in section 8.3.17 related installation of output flange assembly (rear wheel drive).

d. Install the transmission rear housing (rear wheel drive) or adaptor rear housing (4WD) and tighten the bolt.

e. Provide the Loctite202 or equivalent sealant to the rear housing or connector and process the installation. Ensure the bolt is tightened according to the specification. (Refer to Figure 8.1)

7. Front servo assembly

Caution:

Ensure the front servo clamp ring is installed correctly; ensure the ring spring and spark gap points to the bottom. Refer to Figure 8.22.

The assembly procedure of front servo assembly (Refer to Figure 8.22) is shown as follows:

a. Use the automatic transmission liquid to lubricate the housing O-ring and install it on the housing.

b. Use the automatic transmission liquid to lubricate the housing O-ring and install it on the piston.

c. Install the piston, brake lever, spring, washer, base and fixing ring.

d. Install the piston brake lever assembly on the front servo housing.

e. Install the front servo plug and spring in the box.

f. Install the front servo assembly in the box.

g. Press down the servo housing and install the fixing ring spring of servo housing. Align the spark gap and coil track and ensure it is installed in the groove properly. Figure 8.22 front servo and brake belt

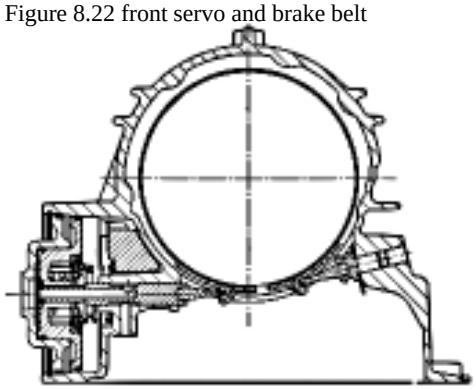


Figure 8.22 Front servo and brake belt

8. Brake belt assembly

The assembly process of brake belt assembly is shown as follows:

a. Install the reaction reinforcement lever on the housing.

b. Check the brake belt for crack or damage; check the bush and metal back.

c. Install the support retainer on the brake belt (Refer to Figure 8.23).Note that the later transmission modes will not adopt the support retainer.

Caution:

Place the new brake belt in the automatic transmission liquid for about 5 minutes before install it.

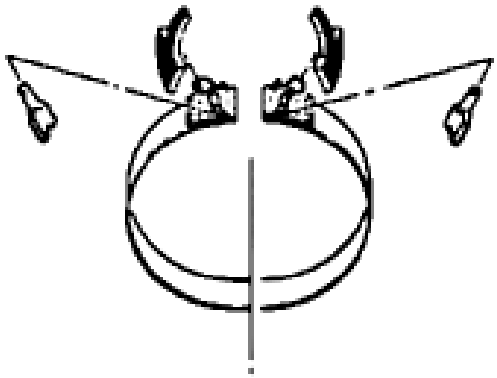


Figure 8.23 Installation of brake belt press lever

d. Install the brake belt on the transmission, ensure it is installed on the correct position.

e. Install the reaction support on the fixing plate and connect it to the brake belt and reinforcement lever. Install the application support on thea fixing plate and connect it to the brake belt and servo piston bar.

9.C2/clutch C4 assembly

Caution:

Check the piston for crack, especially for piston C2.

Must not mix the clutch piston out and back spring.

Ensure the correct installation of clip ring

The assembly procedure of C2/clutch C4 assembly (refer to 8.24) is shown as follows:

a. Ensure the cleanness of internal oil inlet of cylinder; check the discharge outlet of piston C2 for cleanness; use the transmission liquid to lubricate the O-ring.

Caution:

The O-ring must not be winded in groove.

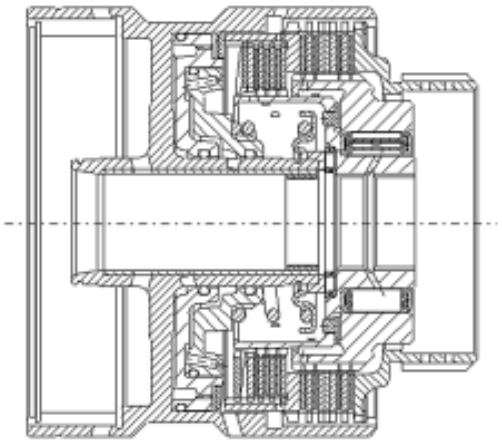


Figure 8.24 Typical C2/C4clutch assembly

b. Install the small O-ring in the inner groove; install the large O-ring in the external groove of piston; check the discharge outlet of C4 piston for cleanness.

c. Use the transmission liquid to lubricate the O-ring; install the small O-ring in the inner groove; install the large O-ring in the external groove of piston.

d. Make the C2/clutch C4 hole face upwardly; install the clutch cylinder; place the C4 piston in the original position proper for C2 piston during the calibration..

e. Install the C2/C4 piston assembly on the cylinder; ensure the external hole of cylinder align with the discharge outlet of piston, until the external diameter of C2 piston enters into the internal diameter of cylinder.

Caution:

The diameter of spring wire bunch is 4.3mm.

f. Install the piston out and back spring on the piston and install the spring fixing plate on the spring.

g. Use the special tools and press down the spring to ensure the installation for fixing ring spring. And ensure the spring is fixed in the groove tightly, then remove the tools.

h. Check the C1 piston detection valve for damage and free movement. Ensure the cleanness of cylinder oil inlet.

Caution:

Ensure the O-ring is not bent in the groove.

i. Use the automatic transmission liquid to lubricate the O-ring and install it in the respective groove.

j. with the clutch C1 hole upwardly, installs the cylinder. Install the piston into the cylinder until the external diameter of piston enters into the inner diameter of cylinder.

Caution:

The diameter of wire bunch of spring is 5.26mm.

k. Install the spring and spring fixing plate on the piston. Use the special tools and press down the spring to ensure the installation of fixing ring spring, then remove the tools.

l. Install the C2 wave washer on the cylinder; ensure one of wave washers cab cover the C2 piston drainage outlet.

m. Measure and record the thickness of C2 sleeve ring flange. Refer to Figure 8.25.

n. Install the clutch C4 disc and wave washer on the clutch C2 sleeve. Ensure the round edge steel disc is disassembled according to the following sequence:

friction disk
steel disc
friction disk
steel disc
friction disk
Wave washer

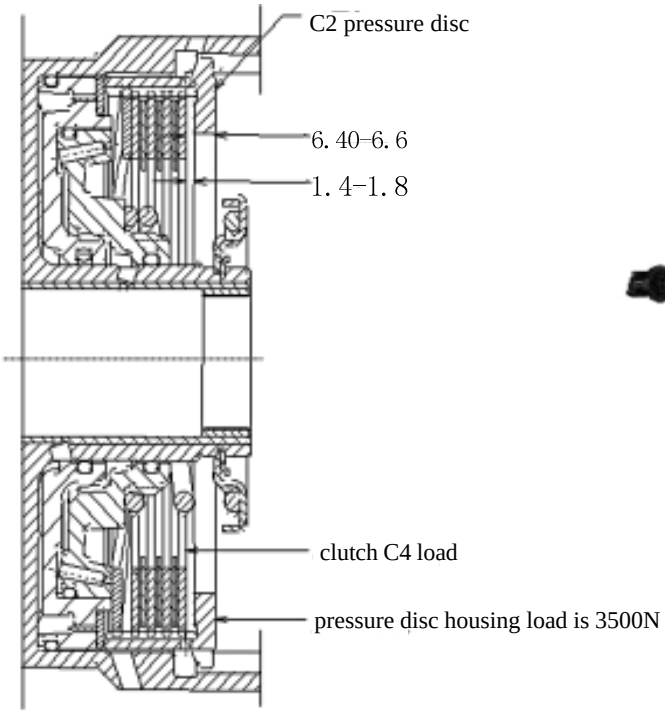


Figure 8.25 C4 clutch assembly

o. Maintain the horizontal position of cylinder , install the sleeve and clutch disk assembly on the cylinder; ensure the top of washer and external hole of cylinder are in order until the sleeve can contact the C2 wave plate.

Caution:

For the C2 wave spring is compressed and the clutch disk can endure the weight of 19.6N. The dimension form the lower side of C2 pressure disc to the gear selection steel plate is 1.4 — 1.8mm. if the clutch need to start the accuracy from the top of pressure plate, then the accurate value should be the actual size of pressure plate plus 1.4 — 1.8mm.

p. Use the special tools to check the C4 clutch assembly. Refer to Figure 8.25.

Caution:

It should take out the clutch clearance assembly before immerse the assembly into the automatic transmission fluid (ATF).

q. Use the gear selection plate to reach the correct specification. If need to install the new friction disk, it should remove the clutch assembly and immerse the friction disk in the automatic transmission fluid for 5 minutes at least before the installation. Reinstall the sleeve and clutch assembly and place it in the cylinder. Ensure the wave washer is arranged consisting with the cylinder hole.

Install the clutch C2 disk in the cylinder according to the following procedure:

- friction disk
- steel disc
- friction disk
- steel disc
- The steel disc transmission use the G32 model engine; the 5th friction disk should replace the steel disc (reference table 9.3).
- steel disc (optional)
- friction disk
- steel disc (optional)
- friction disk

Caution:

For the clutch assembly can endure the weight of 19.6N, the dimension from the clutch C3 wheel axle to the friction disk should be within 0.80-1.05mm.

r. Use the tool to test the clutch assembly; ensure the weight is in the acceptable range. Refer to Figure 8.26.

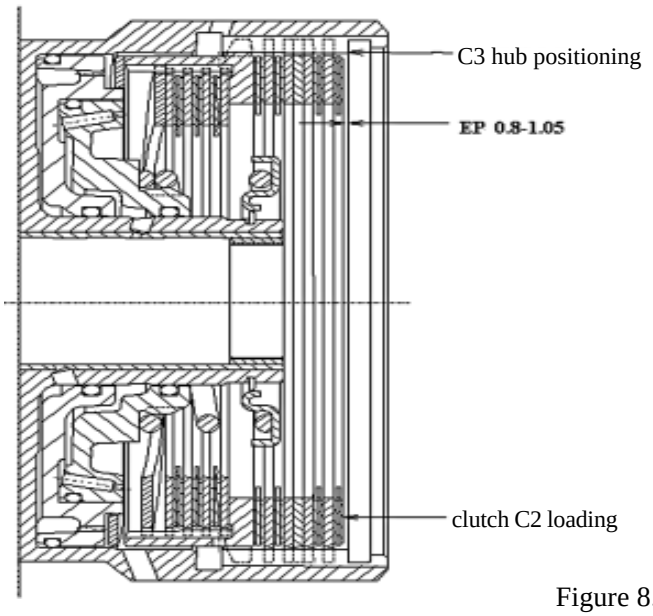


Figure 8.26 C2clutch assembly

Caution:

It should take out the clutch clearance assembly before immerse the assembly into the automatic transmission fluid (ATF).

s. Use the gear selection plate to reach the correct specification. It should remove the clutch assembly and immerse the friction disk in the automatic transmission fluid for 5 minutes at least before the installation if install the new friction disks. Lubricate and install the 3-4 one-way clutch and install the sleeve on the C2 wheel axle. Adjust the handle rear and install the nylon thrust washer on the C4 wheel axle. Refer to Figure 8.27.

t. Adjust and install the clutch C4 wheel axle on the clutch C2 and one-way clutch assembly. Check the rotary direction of clutch C2 wheel axle, when keep the C4 wheel axle in static, C2 wheel axle should rotate in clockwise and is locked in anticlockwise. Refer to Figure 8.27.

u. Use the Vaseline to lubricate the N0.5 thrust bearing and install it on the C4 gear wheel axle ,separate the clutch C2 disc form the clutch cylinder.

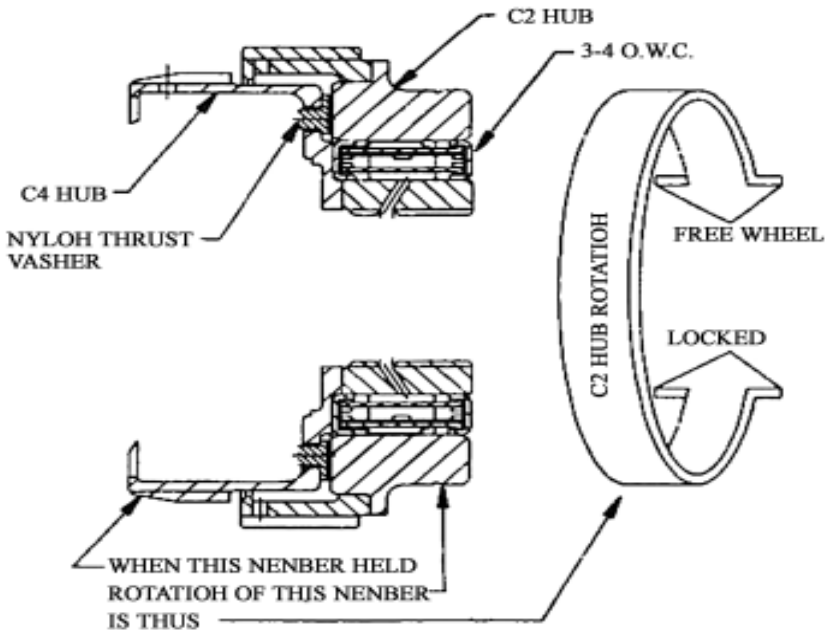


Figure 8.27 C2 hub rotation

v. Install the thrust disc on the cylinder internal wheel axle. Refer to Figure 8.24and 8.19.

w. Connect the C2 /clutch C4 wheel axle assembly in clutch C4 disc, install the clutch C2 disc. Install the C3 wheel axle and reinforce it by ring spring; ensure the ring spring is installed in the groove fixedly. Please refer to Figure 8.24.

10. Clutch C3 and reverse central gear system

The assembly procedure of clutch C3 and reverse central gear assembly (refer to Figure 8.28) is shown as follows:

a. Check the cleanness of hole on cylinder.

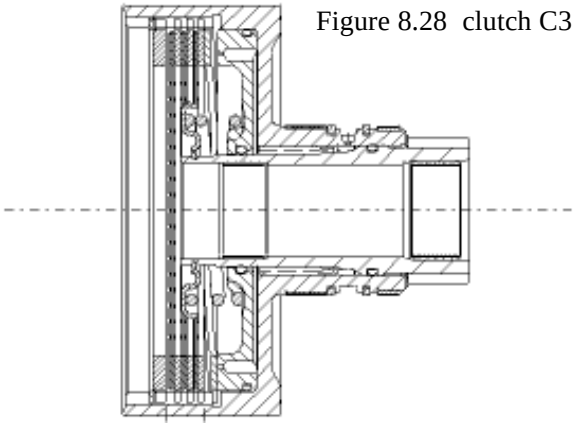


Figure 8.28 clutch C3 and reverse central gear

b. Check the damage of external diameter and central support diameter of C3 cylinder sleeve. Coat the sealing ring with the automatic transmission fluid and install it on the C3 cylinder groove.

c. Check the condition of reverse central gear spline, notch and thrust surface; coat the O-ring with transmission liquid and install it in the reverse sun gear groove. Use the Vaseline to lubricate the C3 washer and install it in the reverse sun gear.

d. Install the reverse central gear in the C3 cylinder; ensure the O-ring is compressed properly but not excess.

Caution:

The O-ring notch can not be bent.

e. Coat the C3 piston O-ring with the transmission liquid and install the small O-ring on the C3 piston inner ring; install the large O-ring on the C3 piston external ring.

f. Check the piston drainage hole for cleanness and block material.

Caution:

Must not remove the O-ring without permission.

g. Install the C3 piston on the cylinder until the external diameter of piston enters into the inner diameter of cylinder.

h. Install the spring and spring retainer on the piston. Use the tools to press down the spring to install the ring spring better. Ensure the ring spring is installed in the groove fixedly, then remove the tools.

i. Install the C3 wave plate on the C3 piston surface; ensure the a hole on wave disc of C3 piston surface is not in line with the piston hole.

j. Install the clutch disk and other disc in the following sequence:

- steel disc
- friction disk
- steel disc (optional)
- friction disk
- steel disc (optional)
- friction disk

k. Adjust and install the pressure disc; make its counterbore is opposite with the clutch disk.

l. Install the ring spring.

Caution:

For the clutch assembly can endure the weight of 19.6N. so the clearance between the screw and top of preset disc should be 1.20-1.45mm.

m. Use the tools to check the clearance of clutch C3, refer to Figure 8.29. The method is as follows (only use the weights):

- Place the weights on the pressure disc and measure the distance between the bottom of cylinder and top of pressure disc.
- Record the data.
- Remove the weights.
- Lift the weights plate and press down the ring spring; measure the distance between the bottom of cylinder and top of pressure disc
- Record the data.
- The clutch assembly clearance can be acquired by 1st record minus 2nd record.

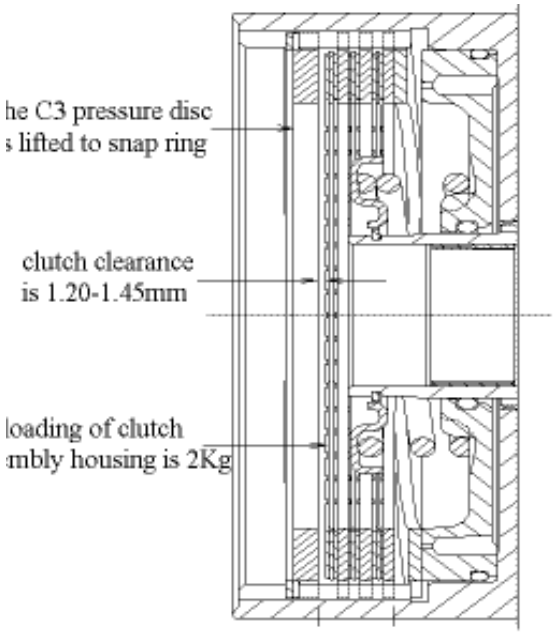


Figure 2.29 Typical cluth C3 assembly clearance

Caution:

It should take out the clutch assembly clearance before immerse the assembly into the transmission liquid.

n. It should remove the clutch and immerse the assembly into the transmission liquid for 5 miniatures at least before the reassembly.

11. front sun gear and clutch C3 assembly

The installation procedure of front sun gear and clutch C3 assembly (Refer to Figure 8.30) is shown as follows:

a. Install the N0.7 needle thrust bearing on the front sun gear ensure the thrust washer is between the bearing and central gear.

b. Use the Vaseline to lubricate the thrust plate and install it on the reverse sun gear. Refer to Figure 8.32.

c. Adjust and install the clutch C3 assembly on the front sun gear.

d. Use the Vaseline to lubricate the NO.6 needle thrust bearing and install it on the thrust disc. Ensure the wire connecting plate on the bearing external diameter is proper for the hole on the thrust bearing. Refer to Figure 8.33.

e. Adjust and use the Vaseline to install the plastic thrust washer on the thrust disc.

f. Install the assembly on the reverse sun gear in the position opposite to the NO.6 thrust bearing.

g. Install the assembly on the other side.

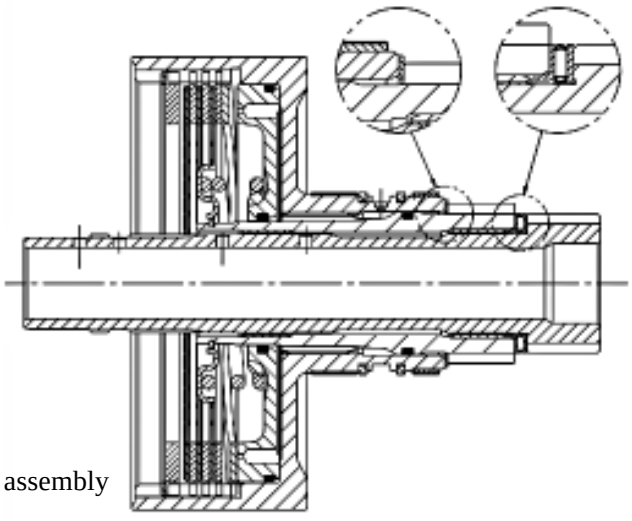


Figure 8.30 Forward-Gear central gear and C3clutch assembly

12. Clutch C1 overspeed shaft and input shaft assembly

Caution:

a. **Ensure the correct installation of snap ring.**

b. **Check the piston for crack.**

c. **Must not mix the clutch piston out and back spring.**

d. **If the connector of clutch C1/ C2 is disconnected form the clutch C3, ensure the NO.6 bearing can not slide down from the bearing retainer.**

The installation procedure of clutch C1 overspeed shaft and input shaft assembly is as follows:

a. Check the overspeed shaft groove for damage.

b. Coat the big and small sealing ring with the Vaseline and install it on the overspeed shaft. It can use few Vaseline to fix the sealing ring on its correct position.

c. Install the clutch disk and other disc on the cylinder according to the following sequence:

- steel plate
- abrasion plate
- steel plate
- abrasion plate
- steel plate
- steel plate
- steel plate (optional)
- friction disk
- steel plate (optional)
- friction disk

Caution:

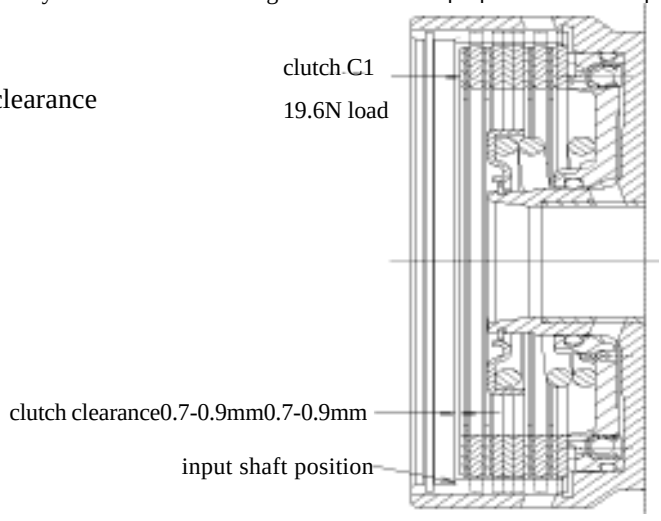
The clutch assembly can support the weight of 19.6N; the distance form the fixing point of input shaft to the friction disk is 0.70～0.90mm.

Caution:

It should take out the clutch assembly before immerse the assembly in the transmission fluid.

d. Use the tools to check the clutch assembly clearance. Refer to Figure 8.31. Use the proper selected disc plate to acquire the correct required clearance.

Figure 8.31 clutch C1 assembly clearance



e. If need to install the new friction disk, please remove the clutch assembly and immerse the friction assembly into the transmission fluid for 5 minutes at least before the installation.
f. Check whether the clutch C1 wheel axle is matched with the overspeed shaft. It should replace the wheel axle and wheel axle assembly if loose.
g. Coat the small nylon thrust insulation plate with the Vaseline and installs it on the overspeed shaft. Refer to Figure 8.19.
h. It should be carefully when install the overspeed shaft on the C1 cylinder to avoid the damage of sealing ring.
i. Use the Vaseline to install the small copper C1 wheel axle thrust washer, shown as Figure 8.19.
j. Check the input shaft for problem. Install the input shaft on the cylinder and use the ring spring to install the wire safety of input shaft and cylinder. Ensure the coil is in groove completely.
k. Use the petroleum jelly to install the gasket and place it on the input shaft.
l. Assemble the C1/C2/C4 clutch, clutch C3 and sun gear, shown as figure 8.24, 8.32
m. Install the assembly in the transmission case.

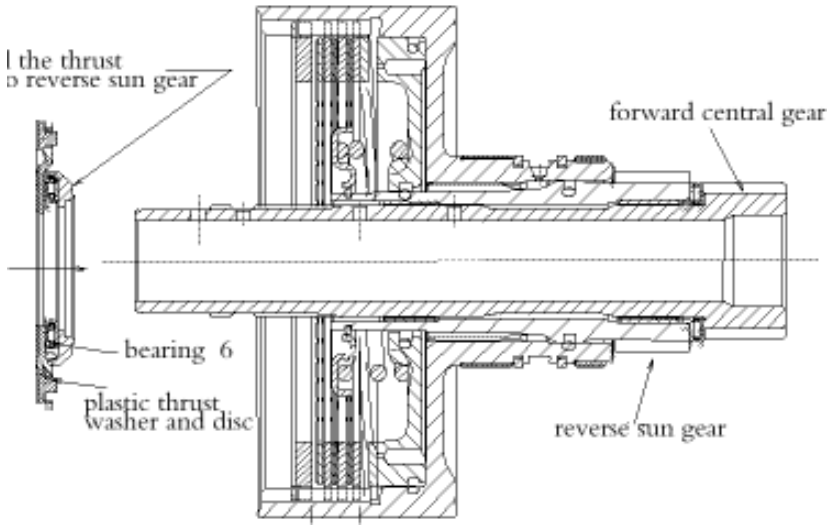


Figure 8.32 and 8.33 assembly number: 6 bearing and pressure disc to clutch C3 assembly

13. Pump housing and torque support

Caution:

a. Do not clean the solenoid valve by solvent.
b. Ensure the O-ring is installed in the correct position.
c. Do not blow off the first drop and mix it with the ball spring blowed off by the torque converter. (only for the condition of installing the transmission to STD pump housing)
d. Do not damage the line bearing on the assembly; avoid any impact for bearing during the loading.
e. Check the end floating of transmission; it is help for the lose and incorrect assembly of any assembly.

Caution: Figure 8.35 The orientation of crossing part is shown in Figure 8.36 to 8.42.

The assembly procedure of pump housing and torque converter is as follows:

a. Check the pump for damage, chip and abnormity; check whether the sleeve of drive gear is fixed.
b. Wash the pump and pump gear carefully; remove all redundant oil and dirt.
c. Install the pump gear and pump. Use the micrometer to measure the depth from the surface of pump to gear surface. The measured value is the side clearance of pump. The side clearance should be in the range of 0.020-0.040mm.
d. Remove the pump gear from the pump.
e. If had been removed, please replace the pump sealing. Ensure the cleanness of pump sealing.
f. Use the transmission liquid to lubricate the pump gear, pump, washer and sealing and install the pump gear on the pump.

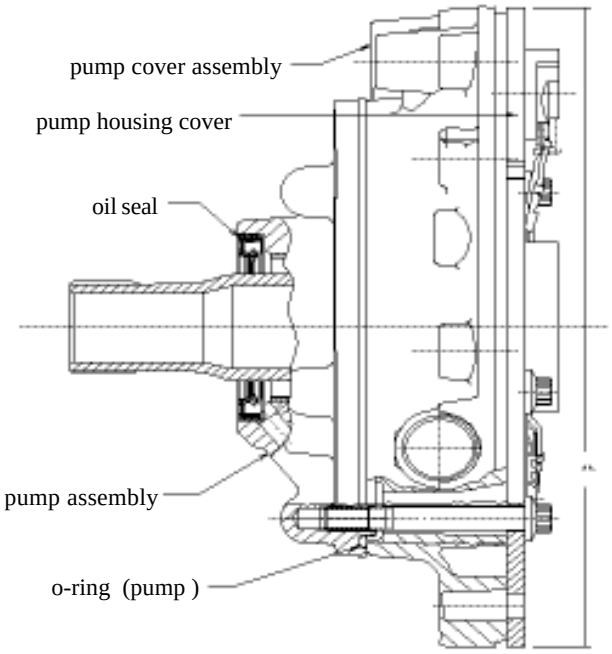


Figure 8.34 pump, cover and torque converter support

g. Use the automatic transmission liquid to lubricate the pump O-ring and install it on the pump. Place the pump on the other side.
h. Ensure the pump housing cavity and hole are not blocked.
i. Use the automatic transmission liquid to lubricate all loose part before the installation.
g. Install the primary regulating valve on the pump housing, ensure the valve slide freely; then install the plug of regulating valve and O-ring. Refer to Figure 8.36.
k. Install the fixed bolt, install the torque conversion clutch regulating valve, plug and O-ring. Refer to Figure 8.37
l. Install the fixed bolt. Refer to Figure 8.39
m. Install the torque conversion clutch control valve, spring and O-ring. Refer to Figure 8.38

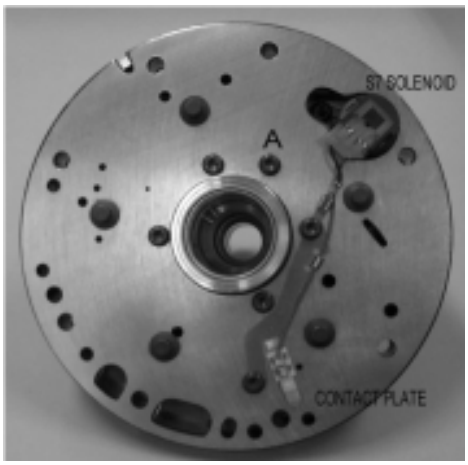


Figure 8.35 Assembly of pump cover

n. Install the fixed bolt, shown as Figure 8.39
o. Install the torque converter detection ball spool and spring, shown as Figure 8.41
p. Install the washer on the pump body. Install the housing disc and solenoid wire maintaining cover on the pump housing; ensure the edge of disc close to the pump housing.

Shown as Figure 8.34, Tighten the bolt according to the sequence of (1-5), shown as Figure 8.42.

Caution:

Check the smooth of wire and connector. To ensure whether the wire and connector have connection and abrasion on the input shaft or clutch C1/ C2 cylinder; check the wire and connector for over extension.

q. Tighten the screw of solenoid valve 7.Refer to Figure 8.39
r. Install the pump on the pump housing, tighten all bolts; ensure the pump can be washed without pump housing. Tighten the bolt in certain sequence; shown as figure 8.42.

s. Install the pump on the washer of transfer case of housing.

t. Make the O-ring is proper for the external diameter of pump.

u. Ensure the pump housing hole in main housing is clean and without dirt.

v. Ensure the plastic connector of solenoid valve 7 is installed on the correct position of main housing.

w. Install the pump and pump housing on the input shaft carefully and avoid the damage of gasket spring. Tighten the pump housing spring. Refer to Figure 8.43 Figure 8.44.

x. Check whether the transmission end float is fixed in the clearance of part 9.2. Refer to It the end float without filling metal plate is more than that in instruction, then the metal plate should be placed in surface of NO.4 bolt and input shaft bolt. Refer to Figure 8.19. if the end float is less than 0.5mm or more than 0.8mm; then the transmission can not be installed correctly and is beyond the specification partly.

Check the end floating by executing the following procedure:

① Connect the disc indicator to the front end of the transmission; place the pointer on the end of input shaft.

② Apply about 250N or 25kg force on the input shaft.

③ Zero the indicating pointer.

④ Install a small lever on rear of the front clutch cylinder.

⑤ The recorded measuring value is the end floating value or called as the clearance of No.4 bearing on torque converter tube support.

y. After the completion of the process, adjust the front and rear brake belt according to the specification of details in part 8.4.

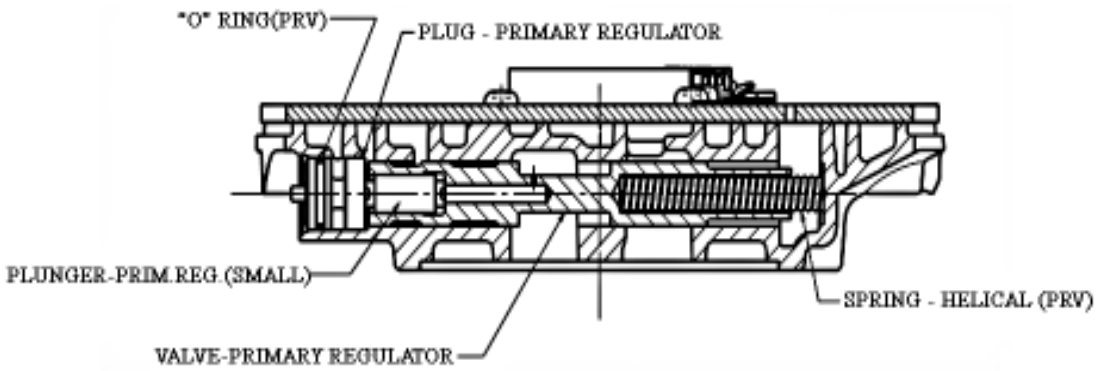


Figure 8.36 Primary regulating valve

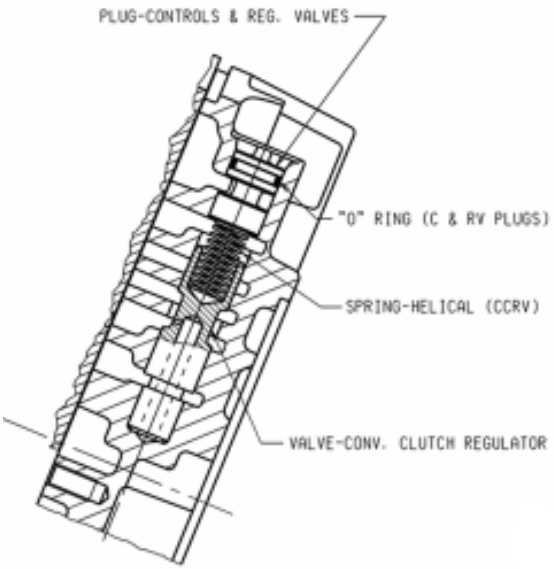


Figure 8.37 Torque converter clutch regulating valve

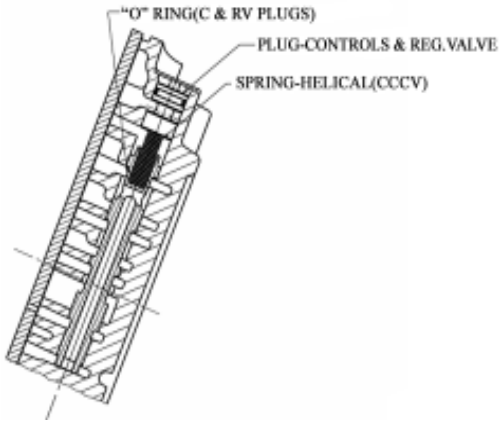


Figure 8.38 Torque converter clutch control valve

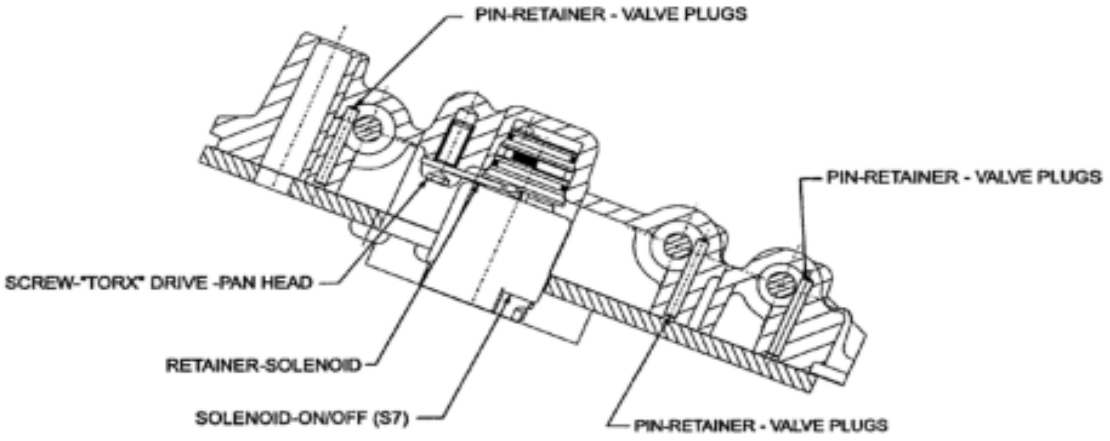


Figure 8.39 Valve fixing plug and pin

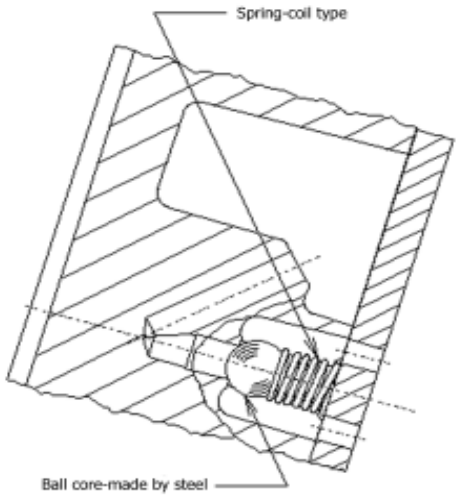


Figure 8.40 Torque converter release ball and spring

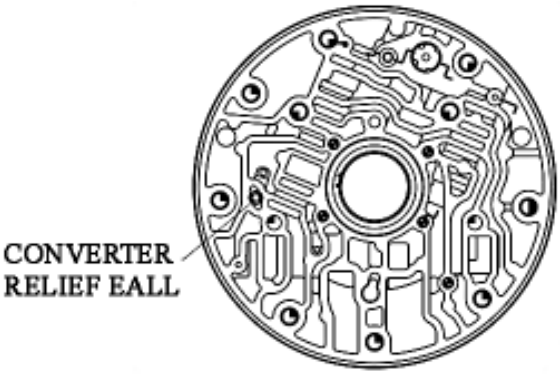


Figure 8.41 Position of test ball

Figure 8.42 Tighten the pump bolt in the sequence shown in figure

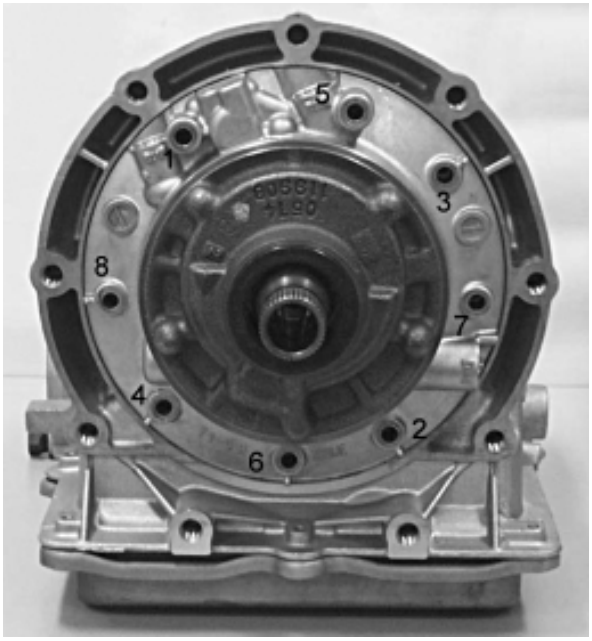


Figure 8.43 Connect the pump to the housing in the sequence shown in figure

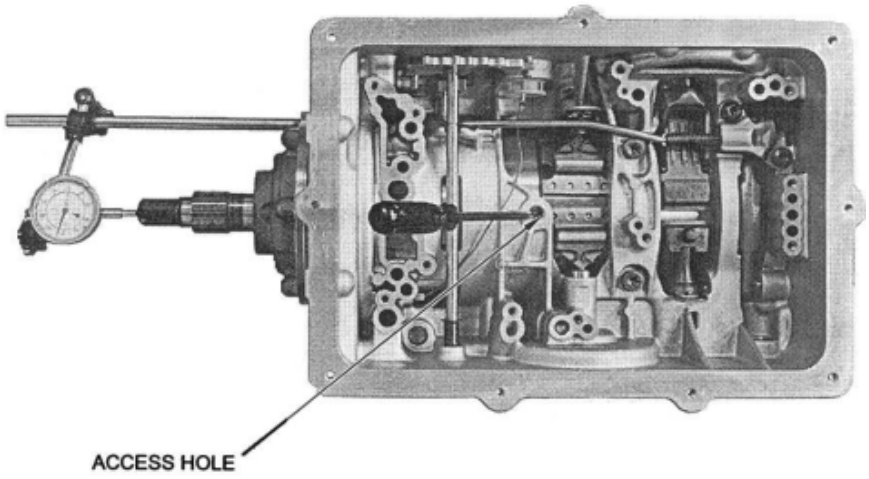


Figure 8.44 Inspection of end floating of gear assembly

14. Valve

Caution:

a. Must not clean the solenoid valve pipe port by solvent.

b. Pay attention to the position of ball on upper of valve.

c. Pay attention to the position of 1-2 Gear and 3-4 Gear gear shift valve which may be exchanged.

d. Check the 4-3 Gear sequence valve and spring for position.

e. Check the 12mm ball on the lower of valve.

f. It should ensure install the correct pump housing (HPPC). Please must not mix the 1st-Gearlow position ball spool with the torque converter ball spool .

g. Check the rag of line pressure relief valve and pay attention to replace the iron shim.

h. The hole on the valve is used for fixation and safety and could not be extended.

i. When repair the transmission, it should ensure the solenoid 5 damp coil spring is not broken.

The installation procedure of valve is shown as follows:

a. Use the cleaning solvent (refer to 8.45, 8.46) to wash the upper and lower valve completely and dry it by air; check the valve cavity, port and hole for damage or block.

b. Install the cushioning baffle positioning bolt and clean all loose parts completely.

c. Check all valves for smooth sliding on its position.

d. Install the proper pump housing, spring and ball. Check the valve and rolling bolt.

e. Install the 1-2 Gear gear shift valve, plug and fixed bolt. Refer to Figure 8.48. Install the 3-4 Gear gear shift valve and fixed bolt.

Refer to Figure 8.49.

Install the 2-3 Gear gear shift valve and fixed bolt. Refer to Figure 8.50. Install the 4-3 sequence valve, spring, plug and fixed disc.

Refer to Figure 8.51.

f. Install the brake belt action regulating valve (BAR) spring, piston and fixed bolt. Refer to Figure 8-52

g. Install the force and action regulation valve (CAR)spring, piston and fixed bolt. Refer to Figure 8-53

Caution: The aluminum valve is damaged easily.

h. Install the solenoid pressure-supply valve, spring and fixed disc. Refer to Figure 8.54.

i. Install the solenoid valve 6 bolt , spring and fixed bolt.

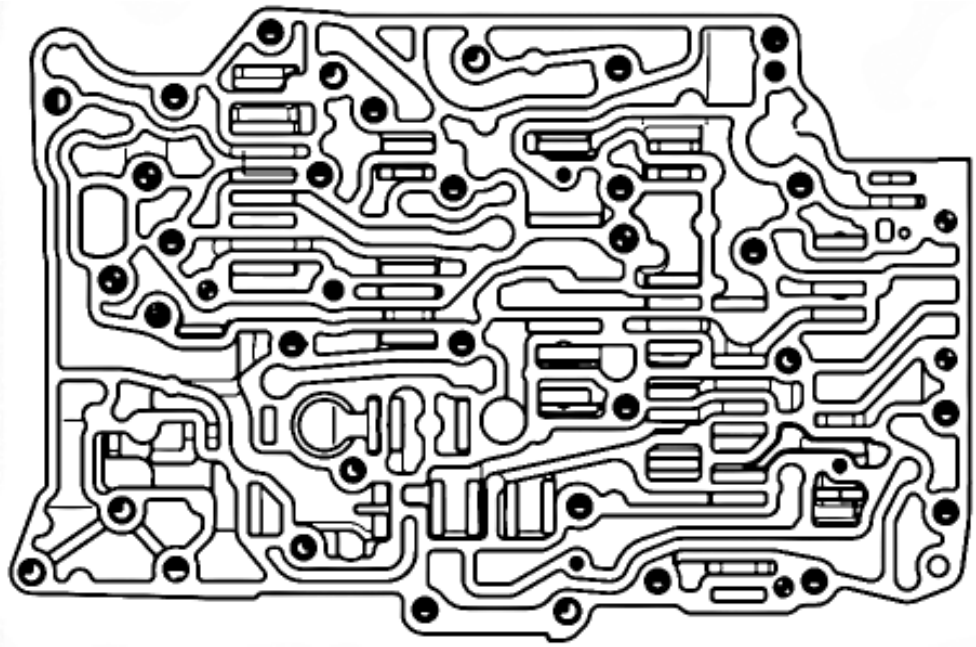


Figure 8.45 Lower valve

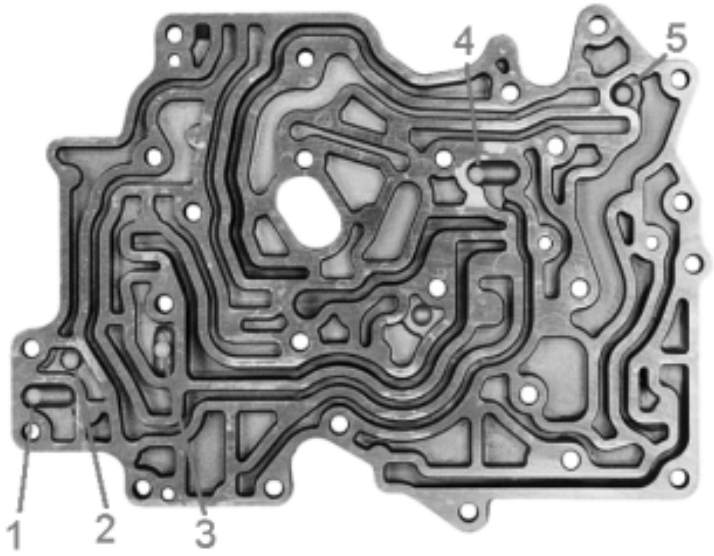


Figure 8.46 Position of upper valve and detection ball

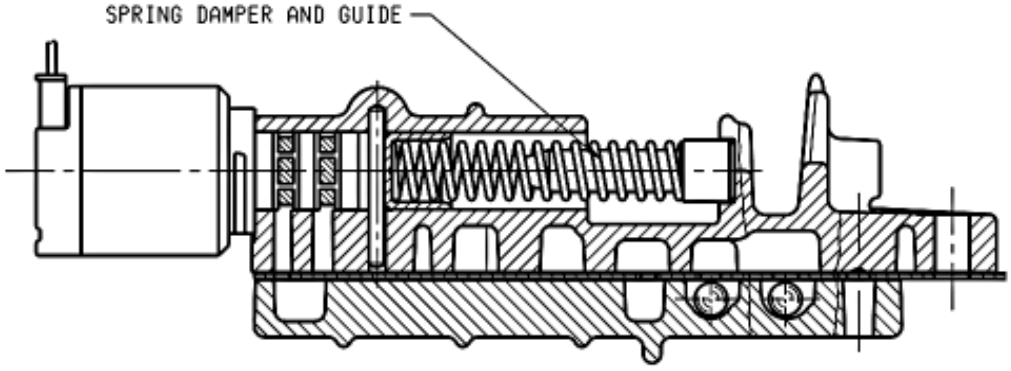


Figure 8.47 solenoid valve 5 and damper

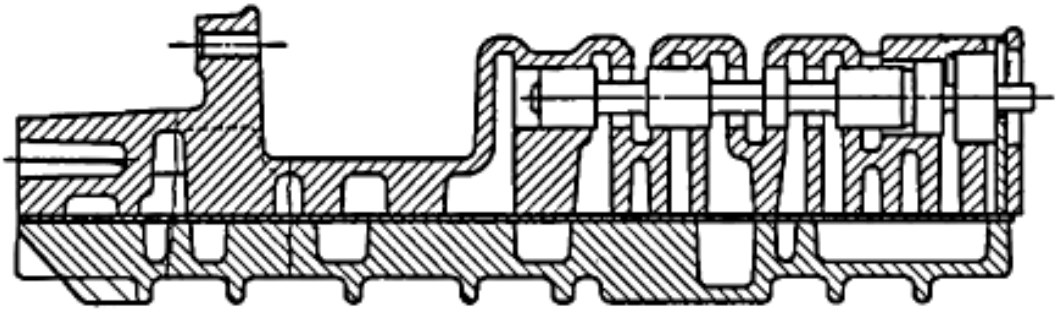


Figure 8.48 1 — 2gear shift valve

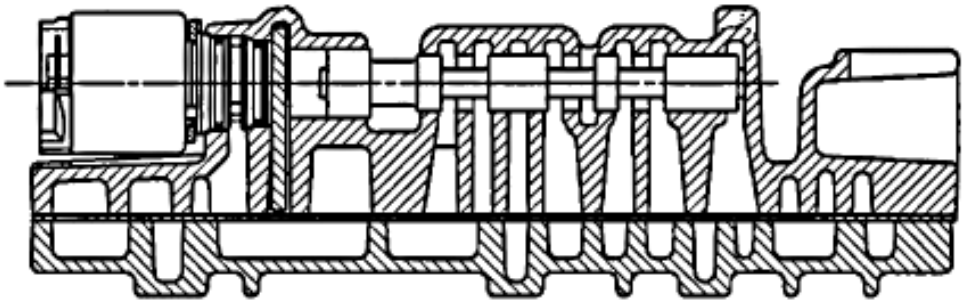


Figure 8.49 3 — 4 gear shift valve

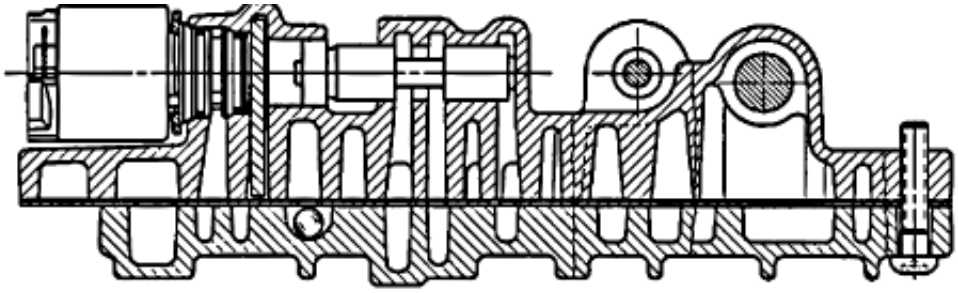


Figure 8.50 solenoid 2 and 2 — 3gear shift valve

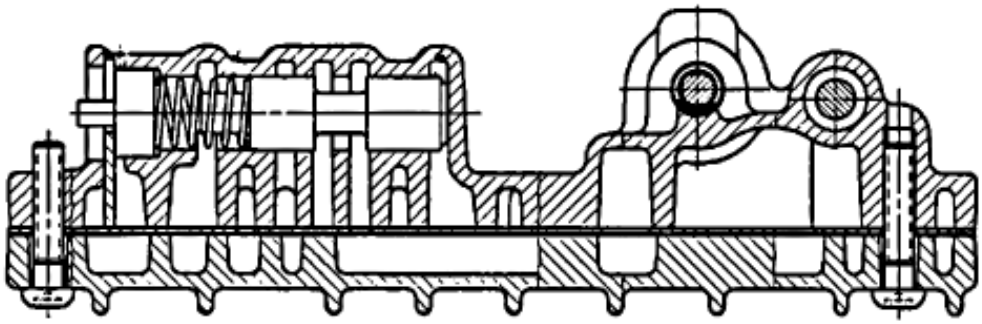


Figure 8.51 4 — 3sequence valve

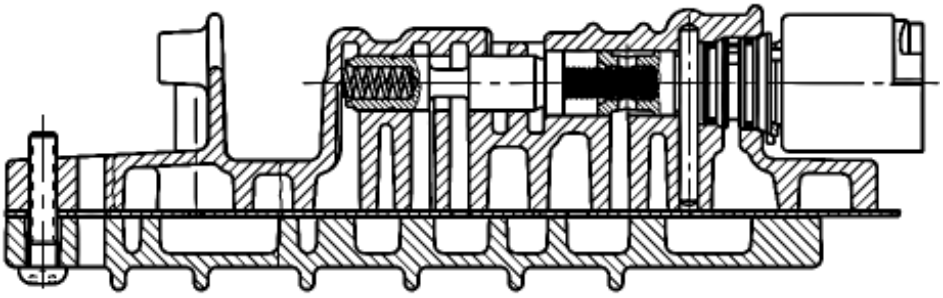


Figure 8.52 brake belt combination regulating valve and solenoid 4

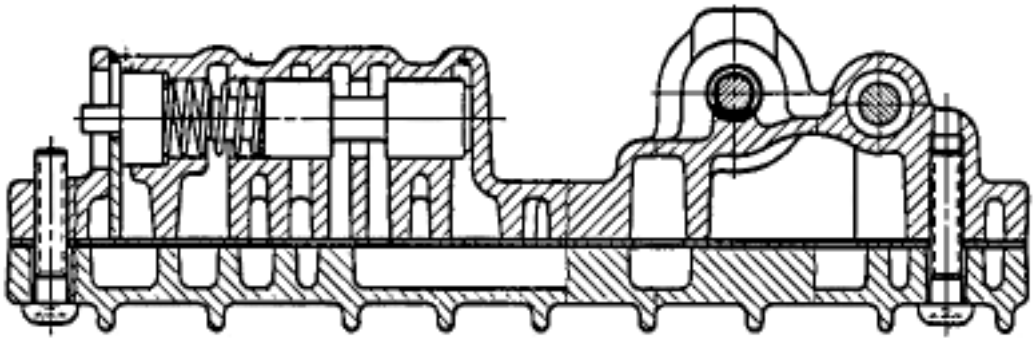


Figure 8.53 clutch combination regulating valve and solenoid 3

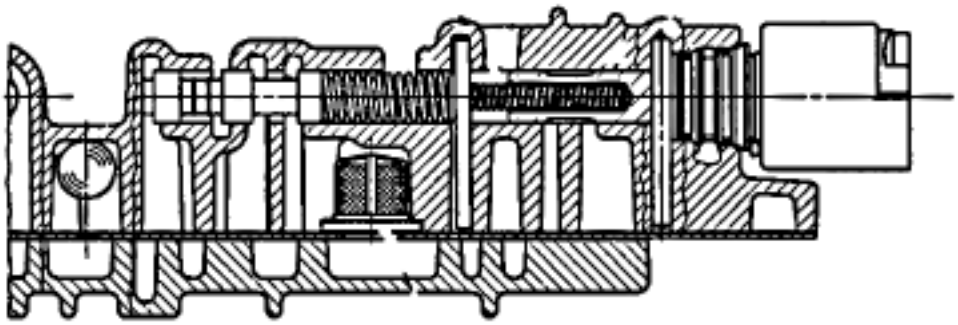


Figure 8.54 solenoid combination valve and solenoid 6

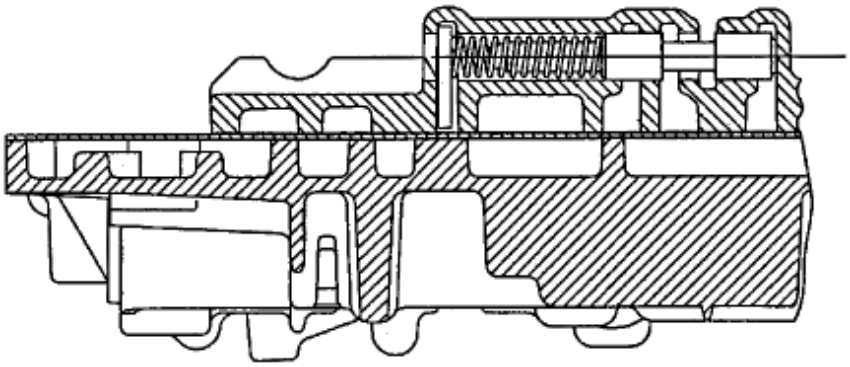


Figure 8.55 reverse lock valve

j. Position the 3rd feed ball (large nylon) on the valve and solenoid supply valve filter, shown as Figure 8.54.
k. Check the separating disk for abrasion, repair or replace if necessary.
l. Check the washer of upper and lower valve for damage, replace it if necessary
m. Install the upper shim of lower position valve.
n. Install the reverse lock valve, spring and fixed disc; ensure the correct installation of valve; shown as Figure 8.55.
o. Install 5 nylon balls on the upper valve, shown as Figure 8.46. Install the upper valve shim; install the separating disk on the upper valve.
p. Lift the separating disk to the upper valve; prevent the detection ball from falling ; install the upper valve on the low pressure valve. Tighten all screws. Refer to Figure 8.56.

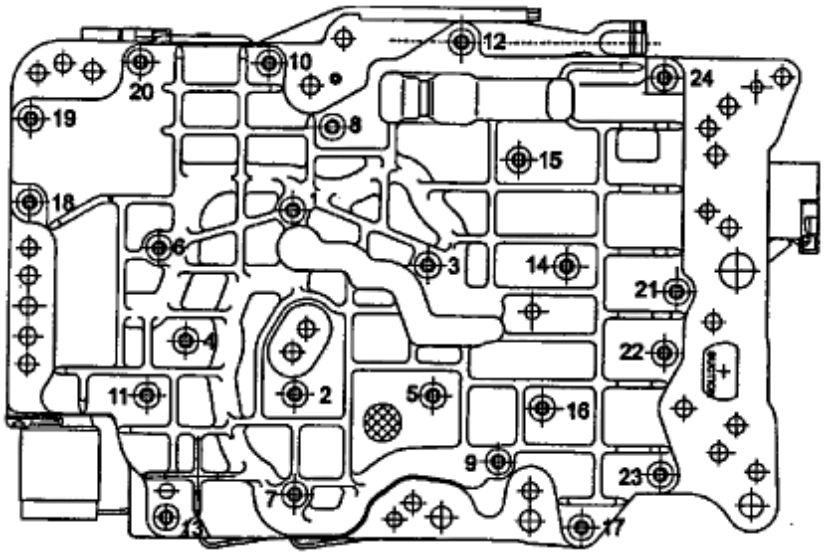


Figure 8.56 The tighten sequence of valve bolt from upper to lower

q. Install the solenoid valve 1, 2, 3, 4 and 6. Ensure the solenoid valve is clamped by the clip tightly and the bolt is tightened to the specified torque.

Caution:

The wire harness ground wire port is protected by the solenoid valve fixing plate

r. Install the solenoid valve 5. Ensure the solenoid valve close to valve through the clip.

s. When install the valve with line pressure relief valve, it should install the tapering port of line pressure relief valve, then install and fix the spring and disc.

t. Install the pin spring; ensure the screw is tightened to the specified torque. Check the damaged spring.

u. Install the manual gear shift valve .Refer to Figure 8.57.

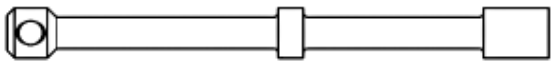


Figure 8.57 Manual gear shift valve

v. It should ensure the position lever is in the position of manual 1st-Gear before install the valve on the transmission.

w. Adjust the valve on the transfer case and install the connection of manual-operated valve steering column and manual-operated valve. Make the long end of connecting object is proper for the 1st manual-operated valve. Install the protecting spring and tighten it according to the specification. Refer to Figure 8.58.

x. Check the positioning drum and manual-operated valve .

Caution:

All hardware must be installed and meet the specification.

y. Connect the wire of connecting solenoid according to the following details:

Solenoid valve 1 ——red

Solenoid valve 2 ——blue

Solenoid valve 3 ——yellow

Solenoid valve 4 ——orange

Solenoid valve 5 ——green

Solenoid valve 6 ——purple

Refer to Figure 8.58.

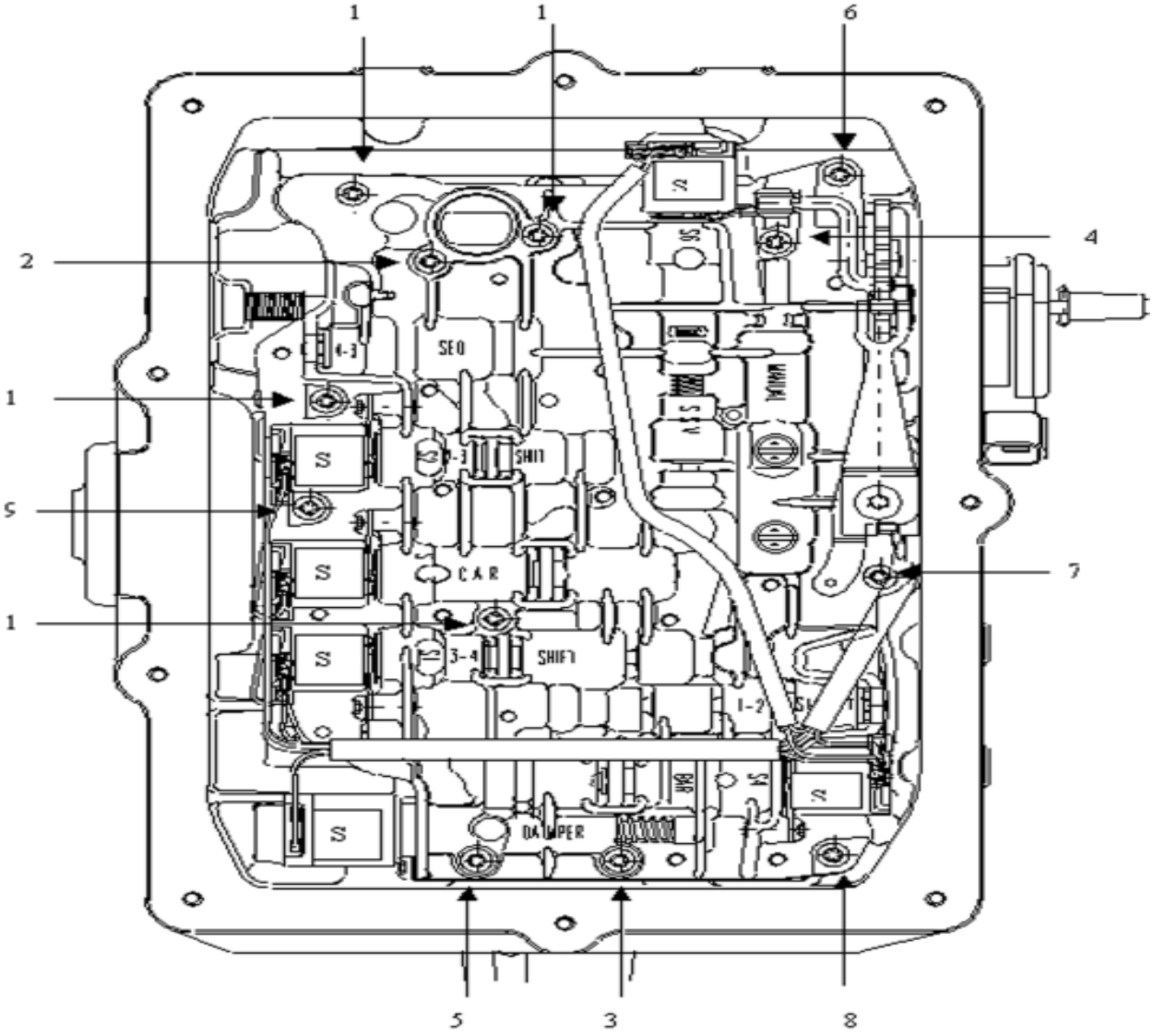


Figure 8.58 Tighten sequence of bolt form valve to box

15. Installation of oil filter and oil bottom shell

Caution:

a. It should replace the filter when a important mechanical component is damaged and assemble a transmission.

b. To assist the assembly of sealing gasket groove, please coat the surface of oil pan and washer with thin Vaseline to ensure the sealing gasket is in the groove. Do not rotate the washer, otherwise it will cause the distort or incline of groove.

c. Ensure the line pressure in the plug is proper in the valve.

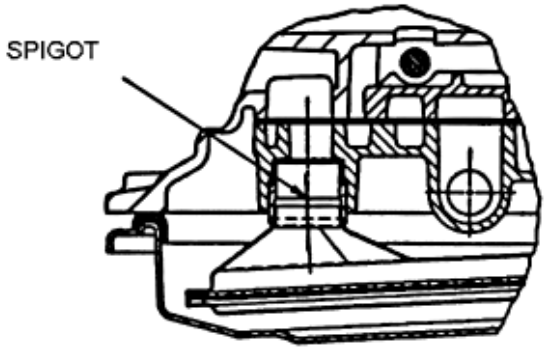


Figure 8.59 Bushing of engine oil filter

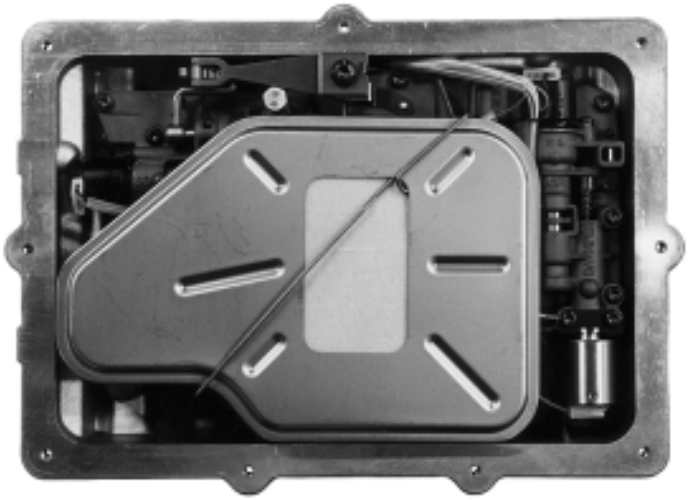


Figure 8.60 Installation of engine oil filter

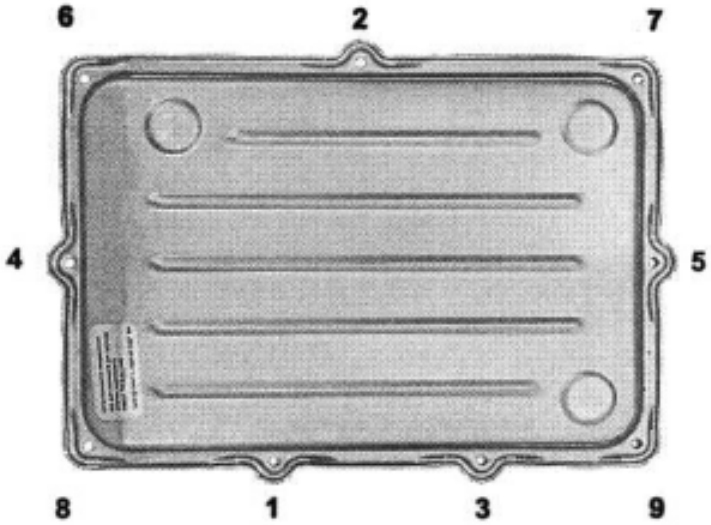


Figure 8.61 Tightening sequence of oil pan bolt

It should abide by follows when assemble the oil filter and oil sump tank (Refer to Figure 8.59and Figure 8.60):

a. Use the automatic transmission liquid to lubricate the spring ring of gasket of lubrication oil.
b. Install the oil filter on the valve carefully. During the installation, the socket must be inclined. Refer to Figure 8.59.
c. Fix the oil cleaner assembly.
d. Check whether the magnet is installed in the recess on the corner of oil bottom shell.
e. Assemble the groove on the oil bottom shell. The groove must be bent during the installation.

f. Make the installation of oil bottom shell is proper for transfer case and the tighten the safety valve according to the specification and sequence (Refer to Figure 8.61). do not distort it.

16.Torque converter and support sleeve assembly

Install the hydraulic torque converter and housing assembly, the procedure is shown as follows:

a. Install the hydraulic torque converter housing on the main case.

Caution:

All hardware should be installed correctly and comply with the specification.

b. Use the Loctite243 or equivalent to fix the torque converter housing; install and tighten it to standard specification.

c. Install the torque converter; ensure the pump gear sealing is installed correctly.

17. Rear wheel drive mode of output ring flange assembly

Assemble the output shaft assembly, the procedure is shown as follows:

a. Place the paw of transmission operating rod on the parking position and lock the output shaft.

b. Wash the output shaft upper line; use the loctite243 or equivalent.

c. Install and tighten the ring flange, O-ring and nut.

Caution: In the heavy steel slide plate, place the ring flange on the upper nut; avoid the damage of bearing.

d. Tighten the nut on the output shaft

Torque type	specification		N.m	Ft/lb
transmission assembly				
torque converter housing to housing	M12× 32	4, 8or 9	54-68	40-50
rear end housing to housing -Chairman	M12× 32	4	54-68	40-50
Connector housing to housing -4WD	M8× 25	10	35-40	26-30
rear end housing to housing -2WD	M8× 25	10	35-40	26-30
rear servo cover to housing	M8× 25	6	30-35	22-26
Oil pan to housing	M6× 16	9	4-6	3-4.5
Oil cooler pipe connection		2	40-45	29.5-33
Valve to housing	M6× 26	7	8-13	6-9.5
Valve to housing	M6× 45	5	8-13	6-9.5
Brake bar spring	M8× 16	1	20-22	15-16
central support to housing	M10× 34	2	20-27	15-20
Cam disc to housing	M8× 16	2	16-22	12-16
Gear-position sensor to housing	10-24× 13	2	4-6	3-4.5
Output shaft lock nut	M24× 1.5	1	100-110	74-81.5
oil filling plug	M20	1	30-35	22-26
Pump housing assembly				
Pump to pump cover	M8× 55	5	24-27	18-20
Pump cover to housing	M8× 40	6	24-34	18-25
Pump cover to housing	M8× 58	2	24-34	18-25
Pump cover disc to pump cover	M6× 16	5	13-16	9.5-12
Pump cover disc to crescent	M6× 54	1	13-16	9.5-12
Valve assembly				
Upper valve to lower valve	M6× 30	24or 25	11-16	8-12
Line socket	M6	1	4-7	3-5
solenoid valve (on/off type and VPS, including S7)	M6× 16	7	8-12	6-9

Table 8.1 Torque specification

Adjustment of front and rear brake belt

1. Setting procedure of brake belt

The setting procedure of brake belt is shown as follows:

a. For the calculating method of front servo mechanism thrust lever refer to Figure 8.62, dimension; standard A.

①.Allow the air pressure is in 650/700kPa in the operating area of front servo mechanism (external of B1), (refer to Figure 8.63).

②. The forward dimension of thrust lever minus 3mm.

Dimension requirement for selection of shim:

Caution:

The small shim requires that the shim size is 1mm always; the available thickness is listed in Table 8.2.

③. Release air.

b. Proper shim to end of thrust lever pole.

① Check the shim for damage, worn or corrosion; replace it if necessary.

② The shim is installed on the support surface between the transmission and pole flange, refer to Figure 8.62.

③ Install the shim by hand, and not the hammer or pressure.

④ Press the shim by hand until has the click the noise. The noise means the shim is clamped by the housing correctly.

c. Recheck the stroke of thrust lever 3mm ± 0.25mm.

2. Setting procedure of rear brake belt

The setting procedure of rear brake belt is shown as follows:

a. The setting of distance A is form the back surface of servo piston to inner surface of transmission, use the vernier caliper. Refer to Figure 8.64.

① A allows the air pressure of 650/700kPa is in the front servo mechanism operating area (external of B2), (refer to Figure 8.63).

② Deduct 3.75mm from the movement of piston and use the 2.5 mm shim to divide the rest distance.

Caution:

The small shim requires that the shim size is 1mm always; the available thickness is listed in Table 8.2.

③. Release air.

b. Select the proper shim for end of thrust lever pole.

① Check the shim for damage, worn or corrosion; replace it if necessary.

② The shim is installed on the support surface between the transmission and pole flange, refer to Figure 8.64.

③ Install the shim by hand, and not the hammer or pressure.

④ Press the shim by hand until has the click the noise. The noise means the shim is clamped by the housing correctly.

c. Recheck the stroke of piston for 3.75mm ± 0.625mm.

thickness	Component No.	thickness	Component No.
0.95/1.05	0574-037017	1.93/2.07	0574-037021
1.15/1.25	0574-037018	2.12/2.28	0574-037022
1.44/1.56	0574-037018	2.42/2.58	0574-037023
1.73/1.87	0574-037020	2.61/2.79	0574-037024

Table 8.2 Effective thickness of shim

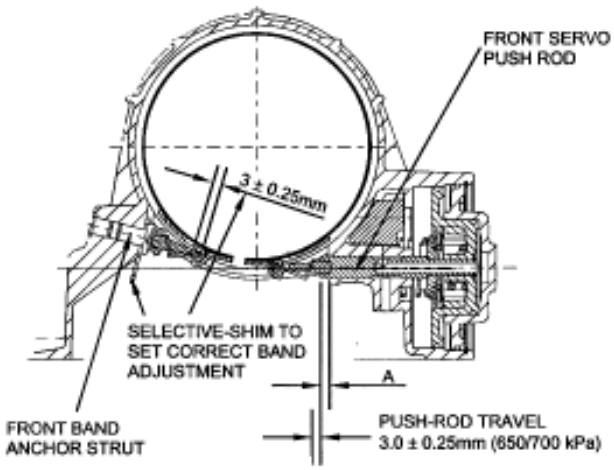


Figure 8.62 Setting of brake belt

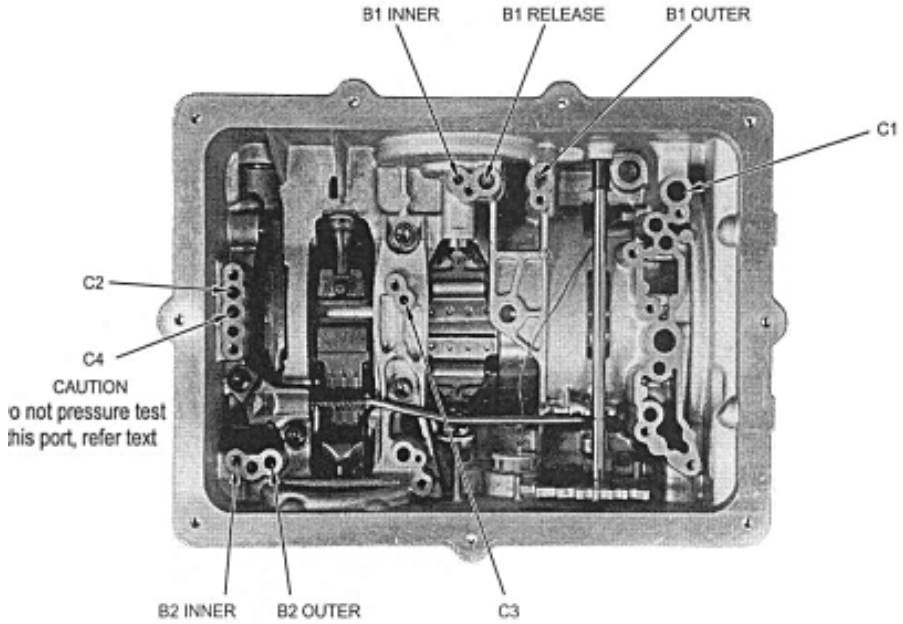


Figure 8.63 External port position of B1 and B2

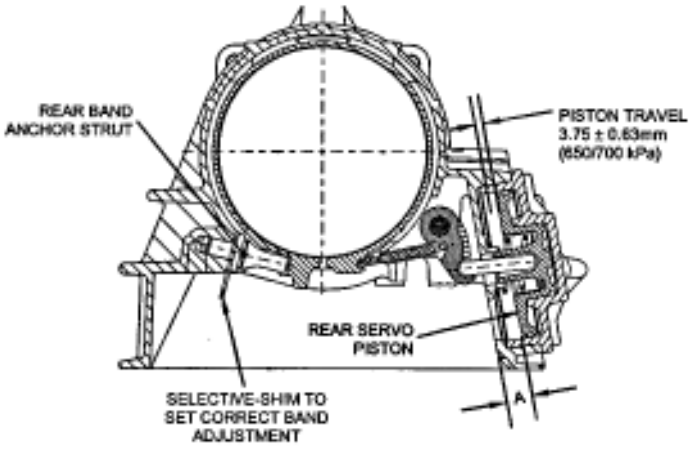


Figure 8.64 Setting of rear brake belt

Oil filling procedure

According to the procedure described in 7.2.

Specification and special tools

Type and specification

hydraulic torque converter maximum torque multiplier factor 179K stalled speed (80 to 100 ℃ rpm) (179K torque converter)	Specification 2.00: 1 2090
Gear ratio First gear Second gear Third gear Fourth gear Reverse gear	 2.393:1 1.450:1 1.000:1 0.677:1 2.093:1
Lubricant type dry system alternative of maintenance	Castrol TQ95 9.0 L (approximation) 4.5L (approximation)
Axial movement of gear assembly	0.50-0.65 mm
Fixed pinion axle movement	0.10-0.50 mm

Table 9.1－Type specification

Pressing factor of clutch

	0588-000001
C1 structure (friction disk) steel	5 5 (2)
C2 structure (friction disk) steel	5 4 (2)
C3 structure (friction disk) steel	4 4 (2)
C4 structure (friction disk) steel	3 4 (1)

Table 9.2 Shifting point of clutch assembly details

Shifting point

Opening degree of throttle position	Shifting 1/2	2/3	3/4	4L	Opening degree of throttle position	shifting 1/2	2/3	3/4	4L
0%	10	20	34	63	0%	14	26	41	87
40%	26	47	82	95	40%	30	56	76	113
100% (WOT)	53	93	126	150	100% (WOT)	53	94	127	152
decreasing	55	89	137	152	decreasing	55	96	137	152

Table 9.3- Shifting point-km/h

Maximum speed of typical Gear-decreasing of vehicle

The Gear-decreasing will be disabled when beyond the following speed.

Gear-decreasing type	Speed point for disable of Gear-decreasing
Manual 2-1	In 59 km/h
Manual 3-2	89 km/h
Manual 4-3	119 km/h
Manual 4-2 (4-2 direct)	68 km/h
Manual 4-2 (sequence of 4-3-2)	89 km/h

Figure 9.4 - Special tools for maximum disable speed of manual Gear-decreasing

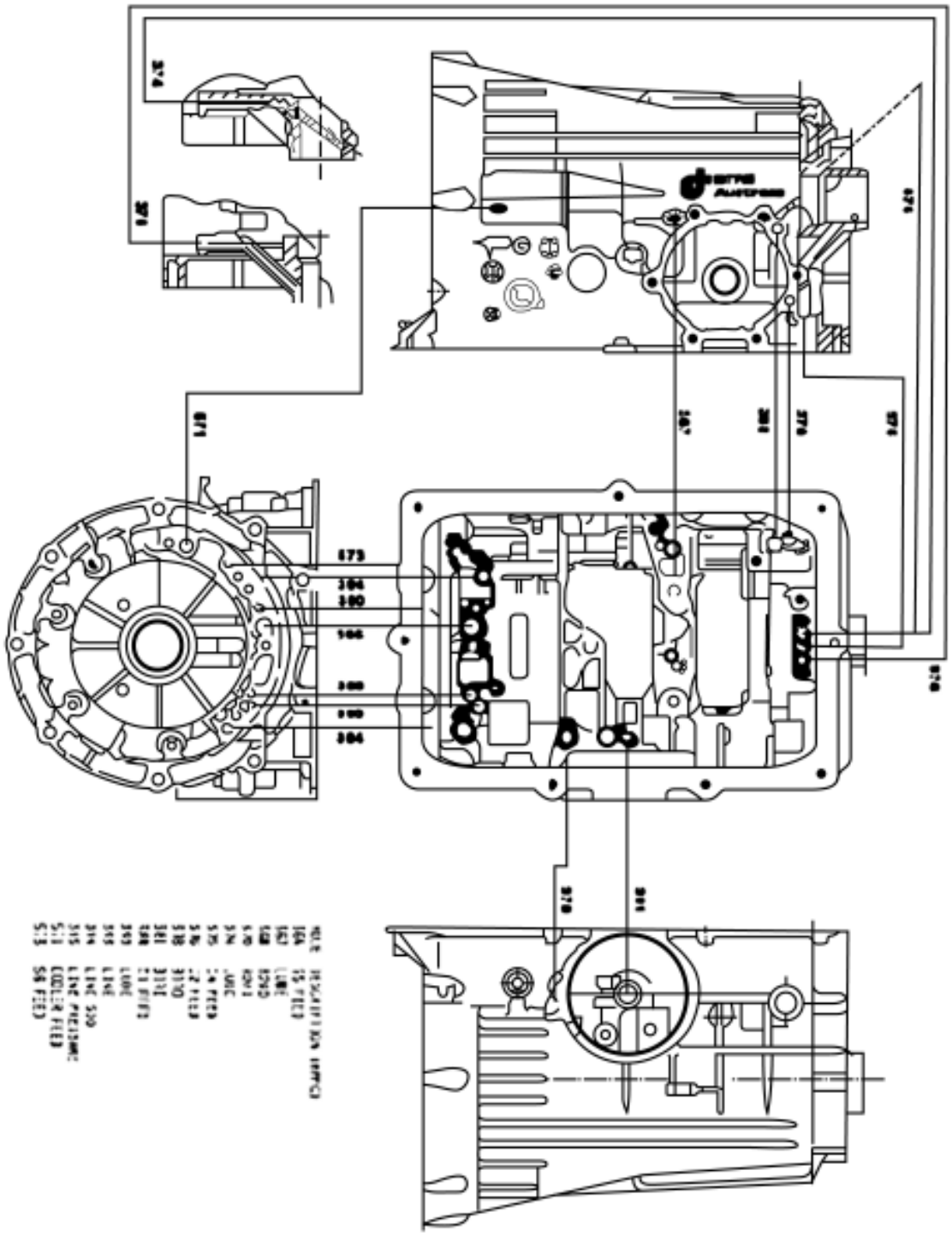
Special tools

tools	Part No.
Platform bracket of transmission	
oil pump remover	
Cross shaft disassembly /installation (brake lever)	
clutch spring compressing tools	
clutch assembly clearance positioning tools	
Shaft end floating connector	
Shaft end floating measuring tools	
cross shaft seal disassembly tools	
cross shaft seal installation tools	
Pump sealing installation tools	
Sealing ring expander extender /compressor	
Cross shaft lever disassembly /installation (disable switch)	
solenoid valve /electric heating regulator, electric meter	
solenoid valve, platform meter	
Assembly ball spool	
Sealing gasket disc	

Figure 9.5 Special tools

Annex

Description for oil inlet hole of main housing



Chapter 6

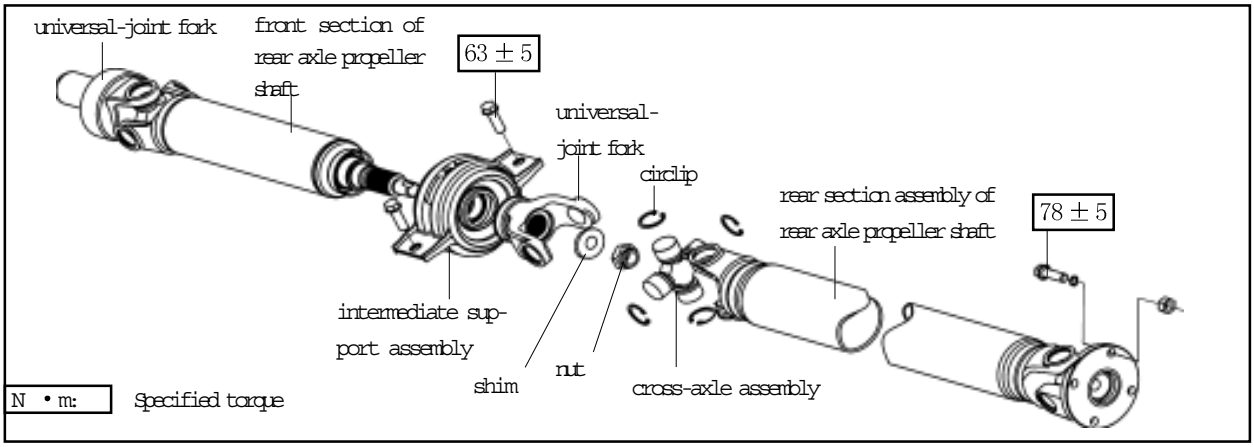
Drive shaft

Cautions

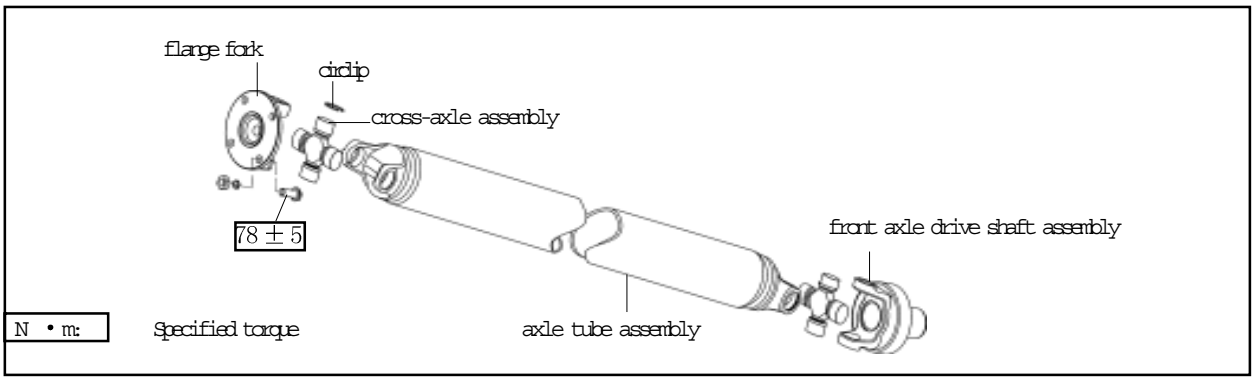
Do not clamp the drive shaft bushing too tightened by the bench vice to avoid the deformation.

failure	Possible causes	Method
Noise	The spline of universal-joint fork is worn The intermediate bearing is worn The cross-axle bearing is worn or jammed	Replace the universal-joint fork Replace the intermediate bearing Replace the cross-axle bearing
vibration	Runout of drive shaft Unbalance of drive shaft The rear bearing bushing of transmission extended housing is worn The spline of universal-joint fork is jammed	Replace the drive shaft Replace the drive shaft Replace the bushing Replace the universal-joint fork

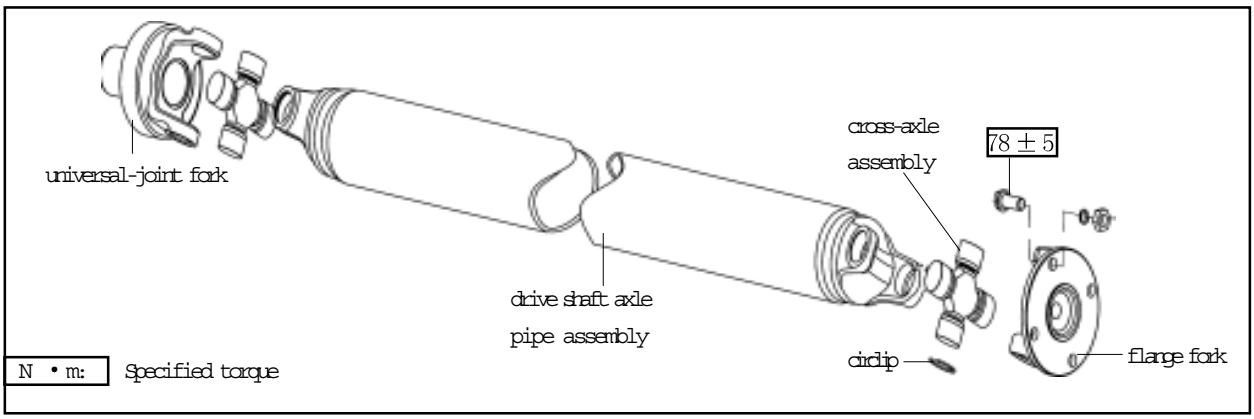
propeller shaft assembly(2WD)



Front axle propeller shaft (4WD) assembly

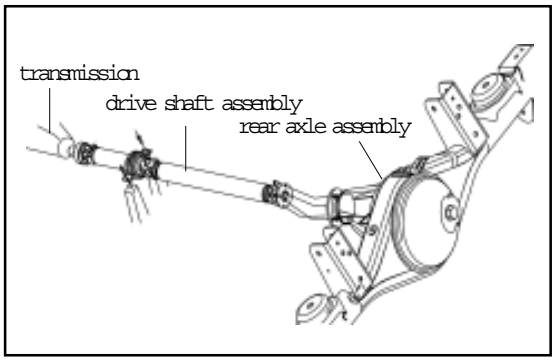


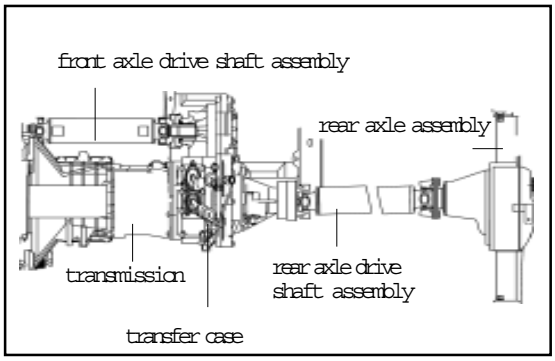
Rear axle propeller shaft (4WD) assembly



Disassembly of drive shaft:

Remove the intermediate support bolt of drive shaft firstly (CC6460KY is without intermediate support connecting bolt), then remove the connecting bolt between the drive shaft and rear axle , lastly, pull out the drive shaft assembly from the transmission output spline shaft and remove it in integral.





Installation of drive shaft:

1. Firstly, check the drive shaft for damage, spline for corrosion and connecting surface for deficiency of damage or sand hole by itself.
2. Install the connecting spline bushing of drive shaft on the transmission output spline shaft carefully; then install the drive shaft intermediate support on the intermediate support bracket of carriage.
3. Use the special drive shaft bolt, nut and spring shim to connect the drive shaft to the vehicle axle ring flange and tighten it. The tightening torque is 78 ± 5N • m
4. Tighten the drive shaft intermediate support nut, the tightening torque is 63 ± 5N • m (the front and rear drive shaft in CC6460KY model are the integral and has the installation content)

Chapter 7

Suspension and vehicle axle

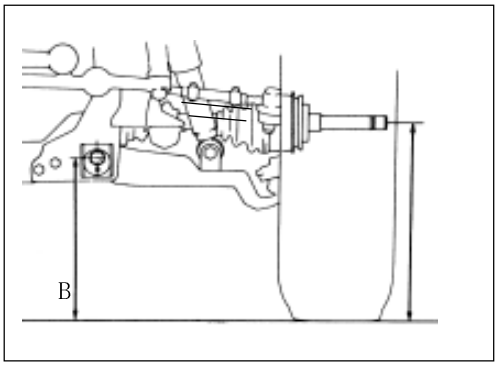
Troubleshooting

Failure	Cause	Repair content
Floating/pulling	The tyre is worn or charged improperly.	Charge the tyre to the proper pressure or replace the tyre.
	The front wheel alignment is incorrect.	Check the condition of front wheel alignment.
	The wheel bearing is adjusted too tightened.	Adjust the wheel bearing
	The front /rear suspension components is loose or damaged	Tighten or replace the suspension partTighten or replace the steering linkage
	The steering linkage is loose or worn	
	The steering device is connected unsound or worn.	Adjust or replace the steering device
Subsidence of vehicle body	Overload of vehicle	Check the load weight
	vibration damper is worn	Replace the vibration damper
	spring is weak	Replace the spring
Left-right swing/up-down bounce	The tyre is charged improperly	Charge the tyre to the proper pressure
	The stabilizer bar is bend or damaged	Replace the stabilizer bar
	The vibration damper is worn	Replace the vibration damper
Front wheel vibration	The tyre is worn or is charged improperly	Replace the tyre or charge it to the proper pressure.
	Unbalance of each wheel	Balance all wheels
	The vibration damper is worn	Replace the vibration damper
	The front wheel alignment is incorrect	Check the condition of front wheel alignment
	The wheel bearing is worn or adjusted badly	Replace or adjust the wheel bearing
	The ball joint or bushing is worn	Check the ball joint or bushing
	The steering system is loose or worn	Tighten or replace the steering linkage
	The steering mechanism is adjusted badly or damaged	Adjust or repair the steering device
Abnormal abrasion of tyre	The tyre is charged improperly	Charge the tyre to the proper pressure
	The vibration damper is worn	Replace the vibration damper
	The front wheel alignment is badly	Check the condition of front wheel alignment
	The suspension part is worn	Replace the suspension part
Oil leakage of differential	High oil level or incorrect oil grade	Drain the oil to the specified level or replace the oil
	The oil seal is worn or damaged	Replace the oil seal
	The matching flange is loose or damaged	Tighten or replace the flange
The axle has the noise	The oil grade is low or incorrect	Fill with the lubrication oil or replace the oil according to the specification
	The clearance of the pinion, ring gear or side gear is large.	Check the clearance
	The ring, pinion gear or side gear is worn or broken	Check each gear
	The pinion gear bearing is worn	Replace the bearing
	The bearing of rear axle half shaft is worn.	Replace the bearing
	The differential bearing is loose or worn	Tighten or replace the bearing

Front wheel alignment

1. Process the following inspection and eliminate all problems

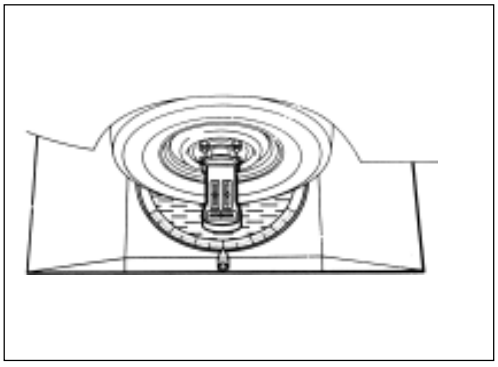
a. Check the wear condition of tyre and proper inflation.
   Tyre inflation pressure: 230kPa
b. Check the wheel bearing of front wheel for loose.
c. Check the front suspension for loose.
d. Check the steering drive device for loose.
e. Process the standard elastic test; check thefrontvibration damper for normal operation.



2. Adjust the height of car

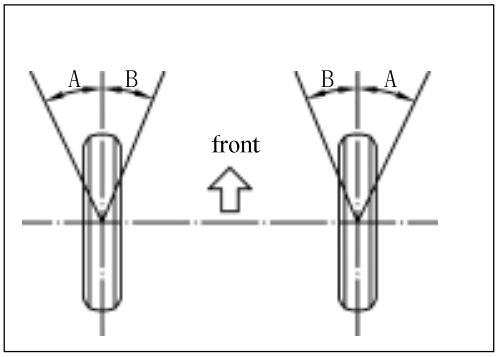
A:Adjust the height of car to the standard value for theconvenience of processing the front wheel alignmentinspection.

B: Front fixed bolt of lower suspension arm
The standard no-load height is: the center of front fixed boltof lower suspension arm is 295 ± 1mm away form theground.



3. Install the 4-Wheel alignment instrument

Processed according to the detailed description of equipment manufacturer.

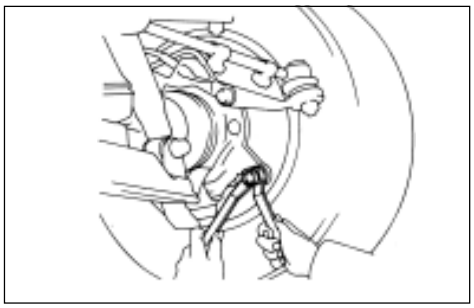


4. Adjust the wheel angle

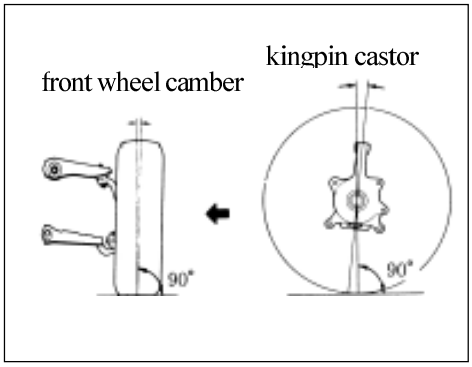
Remove the cover of spacing bolt of steering knuckle; check the internal wheel's steering angle A.

Internal wheel's steering angle: ⩾32°

Caution: The wheel should not touch the brake hose of car body when the steering wheel is rotated to limit.

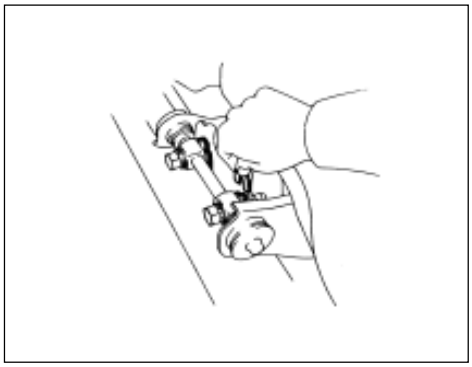


The wheel angle can be adjusted by spacing bolt of steering knuckle is the Max. steering angle does not consist with the standard value.
It should check and replace the damaged or worn steering mechanism parts if still can not adjust the wheel angle to within standard valuerange.

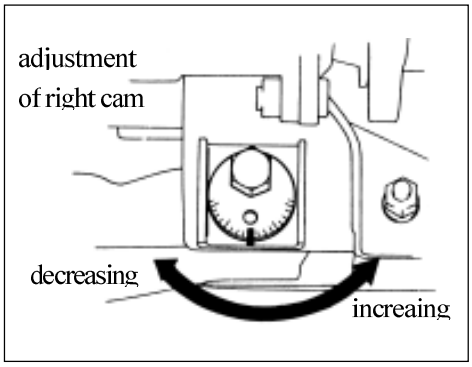


5. Adjust the front wheel camber and kingpin castor

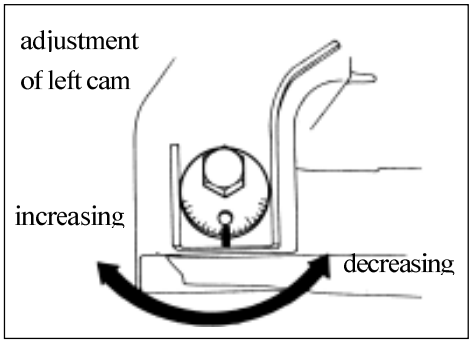
front wheel camber: 0° ±30′
kingpin castor : 3° 30′ ±45′

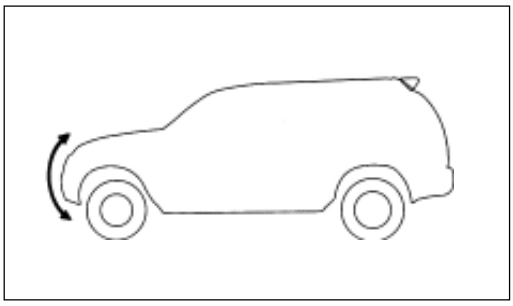


It can add or remove the shim on the upper arm for adjustment when the inclination is not within the specified value.
Shim thickness: 3.0, 1.5, 0.5mm
The Varity of wheel camber will be 7′ for adding 1mm of shim, 20′ for kingpin castor.
Adjust the difference of left and right kingpin castor within 30′ .
After the wheel camber and kingpin castor are adjusted, if the kingpin inclination still not reach the specified value, then check the steering knuckle and front wheel for curve or loose.



If the wheel camber or kingpin castor does not consist with the specified value, it can be adjusted through the rear adjusting cam shaft.



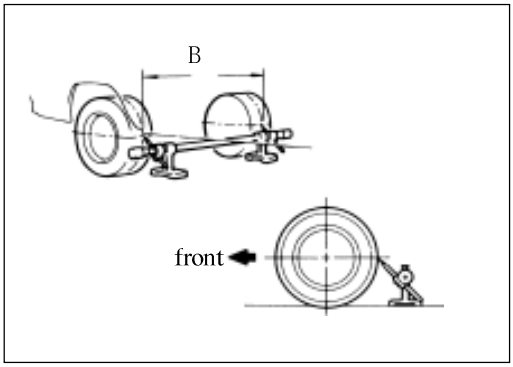


6. Adjust the wheel toe

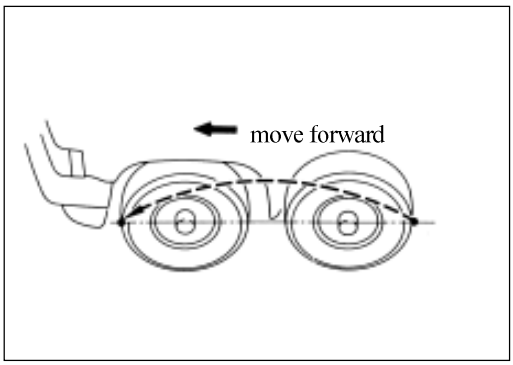
Adjust the wheel toe according to the following method

a. Shake the car upwardly and downwardly to make the suspension reach the stable status.

b. Push the car forwardly for 5m in flat ground when the front wheel is in the straight forward position.

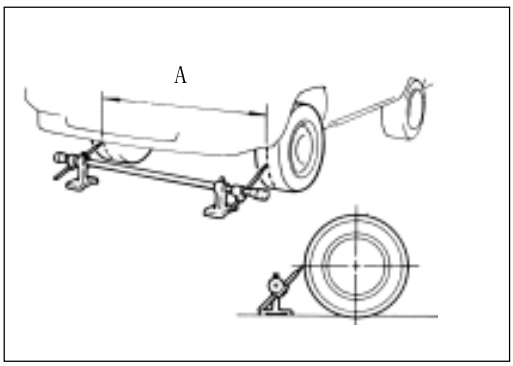


c. Mark the center of each rear wheel; measure the distance “B” between the marks of left and right tyre.



d. Push the car forwardly to move the mark on the back of tyre to the position of front instrument.

Remarks: if the tyre moves too far, repeat the procedure (b).



e. Measure the distance “A” ‘between the marks on front of tyre.

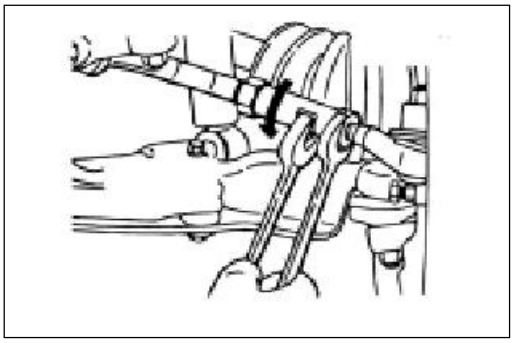
f. Measure the toe of wheel.

toe =B-A

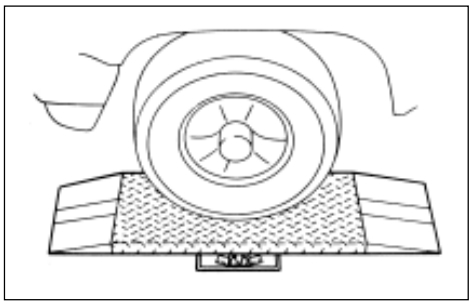
Inspection standard: 0-2mm

If the toe does not consist with the specified value, it can be adjusted by the left and right draw-bar.

Move the vehicle forwardly



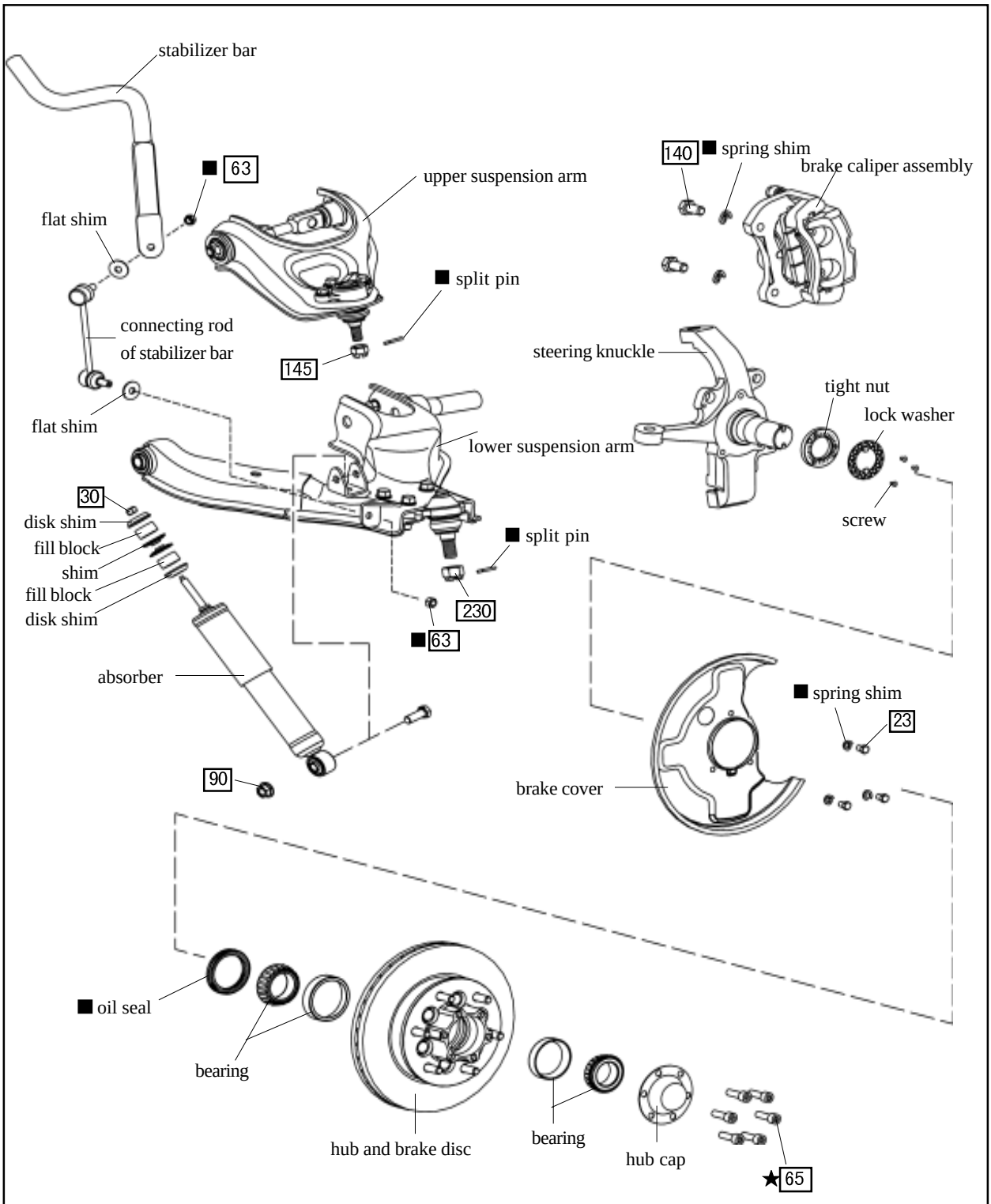
g. Adjustment of toe: the standard value is 0～2mm. The toe is adjusted by rotating the cross draw-bar. When adjust the toe, it should rotate the cross draw-bar on left and right side uniformly. After the adjustment, tighten the lock nut, the tightening torque is 55 － 65N • m.



h. Check the sideslip

Sideslip: Within ±5m/km

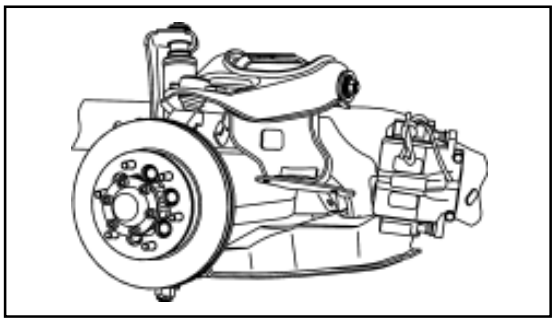
Front hub and steering knuckle (2WD)



N • m: specified torque

■ Used component which can not be used any more

★ precoated component



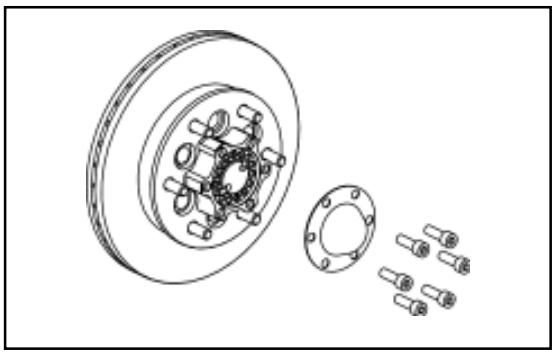
Front hub

Disassembly of front hub

1. Remove the disc brake

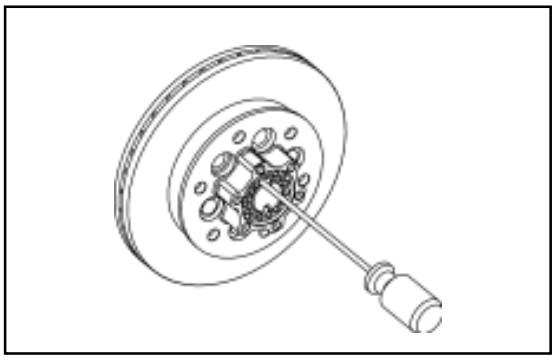
Remove the brake caliper and hang it by steel cable.

Remarks: Do not remove the brake pipe and brake hose.



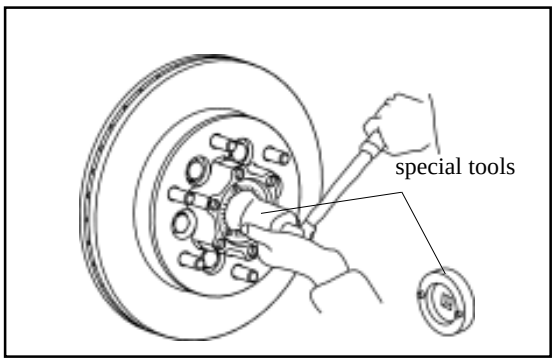
2. Remove the hub cap

Use the inner hexagon spanner to screw off the fastening blot and remove the hub cap.

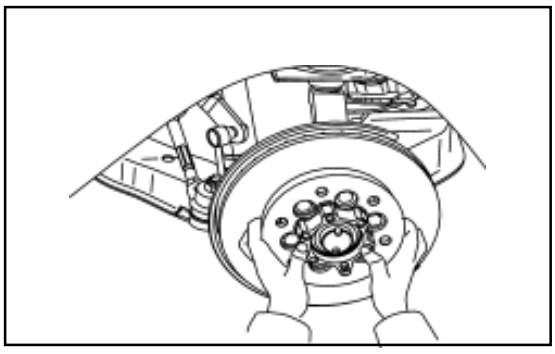


3. Remove the hub and brake disc

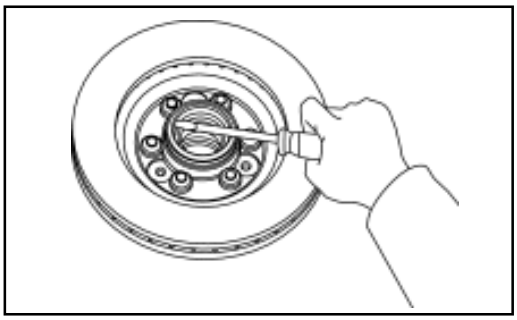
a. Use the Philips screwdriver to screw off the lock screw and remove the lock washer.



b. Use the special tools to remove the lock nut.



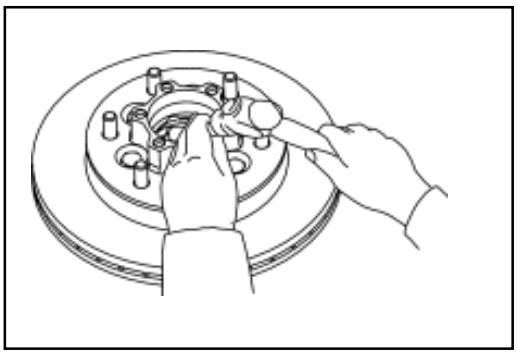
c. Remove the hub and brake disc with the external bearing.



4. Remove the oil seal and inner bearing

a. Use the screwdriver to pry out the oil seal.

b .Remove the inner race of inner bearing from the hub.



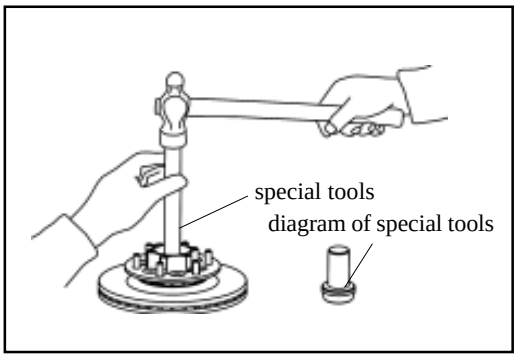
Check and repair of front hub

1. Check each bearing

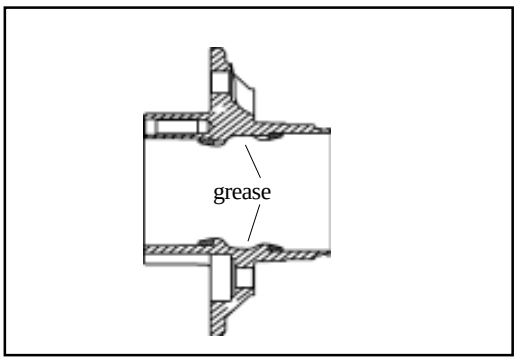
Wash the inner and outer race of each bearing and check them for damage or wear.

2. Replace the bearing outer race

a. Use the brass bar and hand hammer to knock out the bearing outer race.



b. Use the special tools to knock in the new bearing outer race.

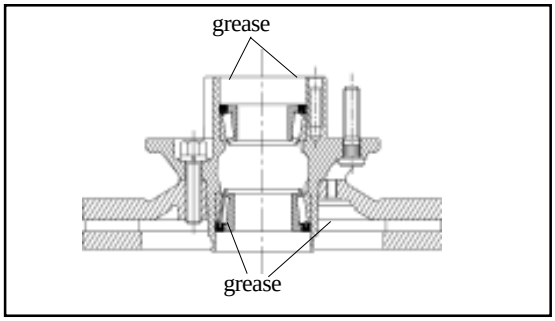


Assembly of front hub

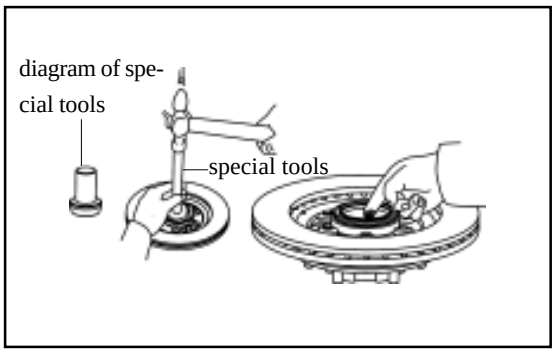
1. Coat the inner surface of hub and bearing outer race with the grease.

The grease is the Jin HP-R grease or the grease met the requirement in following table.

Item	Typical data
Dropping point, C	289
Leakage amount (104。C, 6h), g	0.48
EP performance OK value , N	178

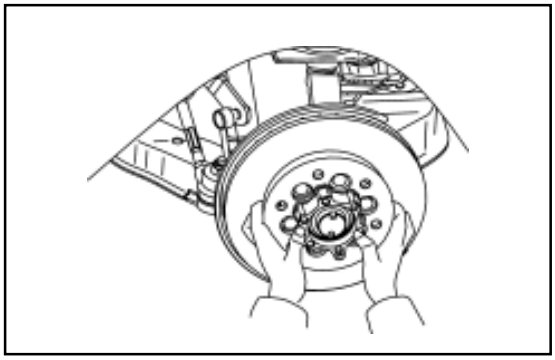


2. Place in the bearing inner race; use the fill the gap between the inner and outer race of the bearing up with the HP-R grease.



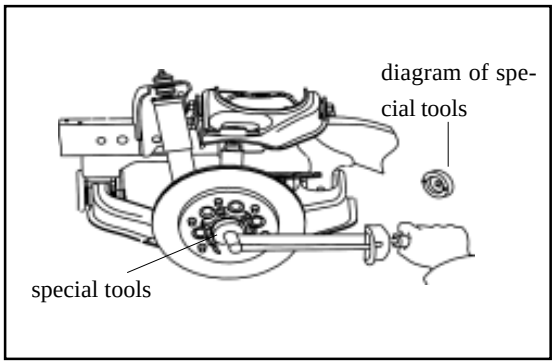
3. Install the inner bearing and oil seal

a. Place the inner bearing in the hub.
b. Use the special tools to knock the new oil seal into the hub.
c. Coat the oil seal lip with HP-R grease.



4. Install the hub on the steering knuckle

a. Install the hub on the steering knuckle.
b. Install the external bearing.



5. Adjust the pre-applied load

a. Use the special tools to screw on the locknut to specified torque.

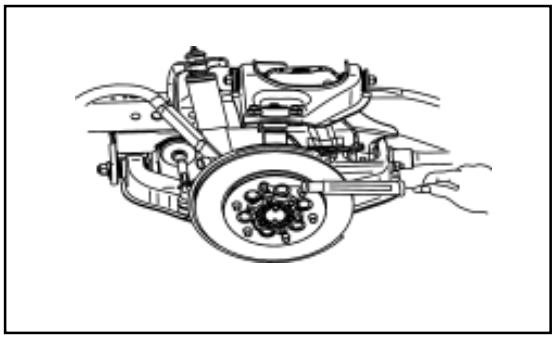
Tightening force: 80-100N • m

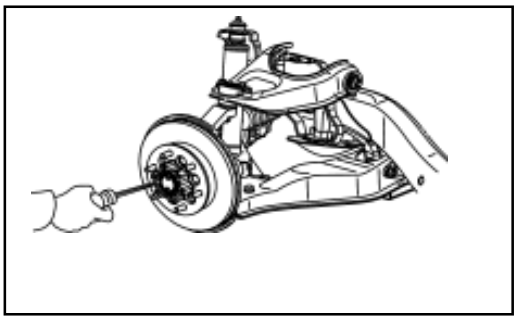
b. Rotate the hub to right and left 1/3～1/4 round respectively.
c. Screw off the nut until the nut can be loosed by hand.
d. Use the special tools to retighten the lock nut.

Tightening force: 28N • m

e. Use the spring tension meter to check the pre-applied load.

Pre-applied load (for starting): 28-56N

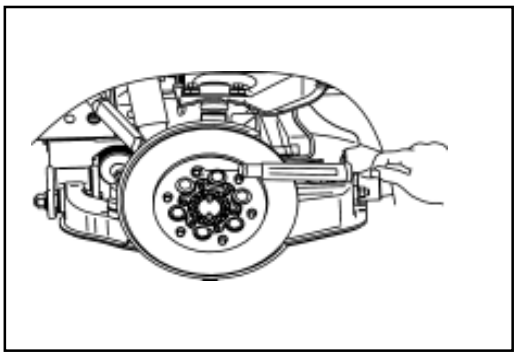




6. Install the lock washer

Install the lock washer with the surface with counterbore outwardly and fix it on the lock nut by screw.

Remarks: If the screw installation hole on the lock washer can not align with the screw hole on the lock nut, then it can remove the lock washer and adjust he lock nut slightly (rotate in the direction of Min. adjusting range); then install the lock washer.

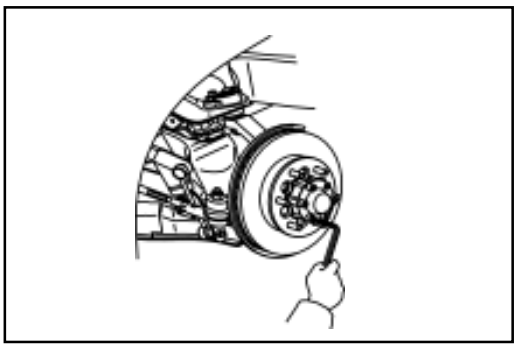


7. Recheck the pre-applied load

Use the spring tension meter to recheck the pre-applied load.

Pre-applied load (for starting): 28-56N

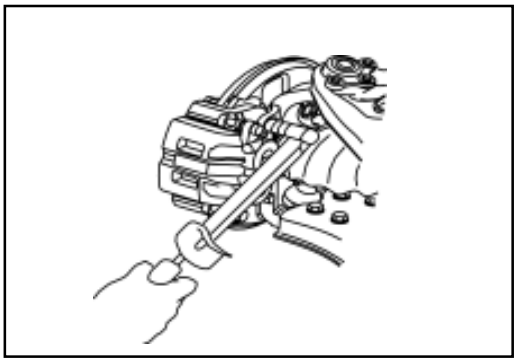
If the pre-applied load does not meet the specified value, it must remove the lock washer and adjust it by the adjusting nut.



8. Install the hub cap

a. Coat the silicon rubber surface sealant on the matching surface of hub and hub cap.
b. Coat the screw of the inner hexagon bolt with the screw lock sealant.
c. Use the inner hexagon bolt to fix the hub cap and ring flange on the hub; tighten the bolt to the specified torque.

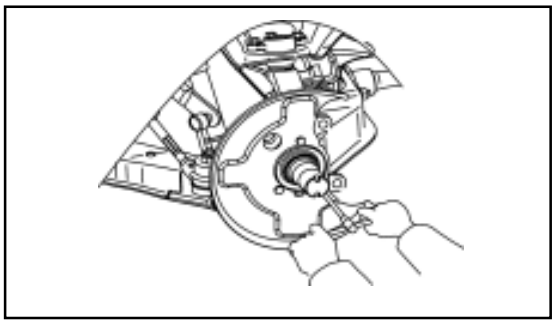
Tightening force: 45 ± 5N • m



9. Install the disc brake

Install the disc brake on the steering knuckle and tighten the bolt to the specified torque.

Tightening force: 140 ± 10N • m



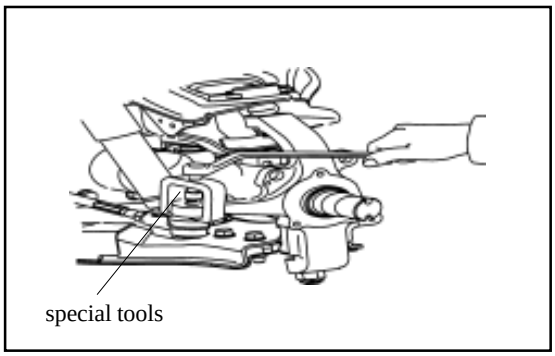
Steering knuckle

Disassembly of steering knuckle

1. Remove the disc brake and front hub

(Refer to section “Front Hub”)

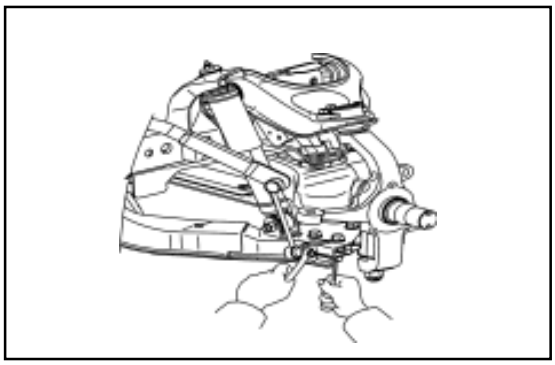
2. Remove the brake cover



3. Disconnect the steering cross rod from the steering knuckle arm

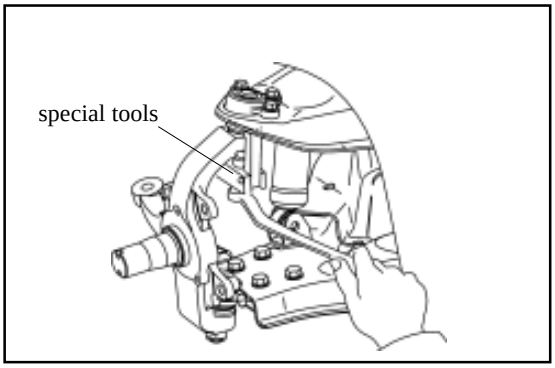
a. Remove the split pin and nut on the ball pin.

b. Use the special tools to disconnect the steering cross rod from the steering knuckle arm.



4. Disconnect the connecting rod of stabilizer bar from lower arm

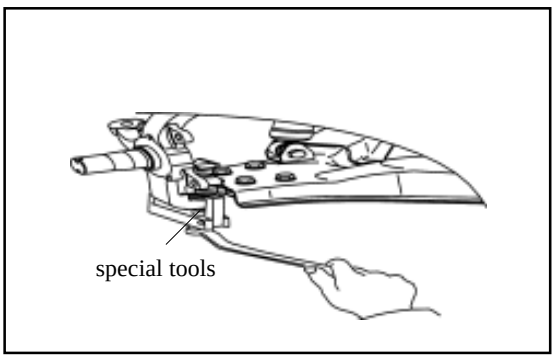
Use the inner hexagon spanner to fix the ball pin; remove the self-locking nut.



5. Remove the steering knuckle

a. Remove the split pin and nut on the upper ball pin

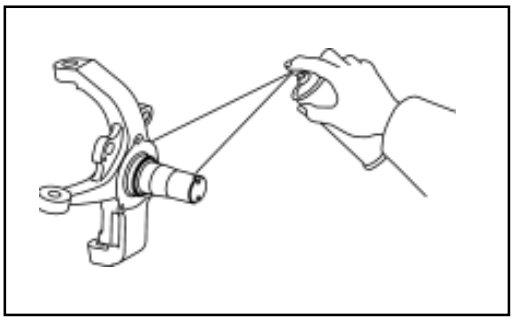
b. Use the special tools to disconnect the steering knuckle from the upper ball pin.



c. Remove the split pin and nut on the lower ball pin.

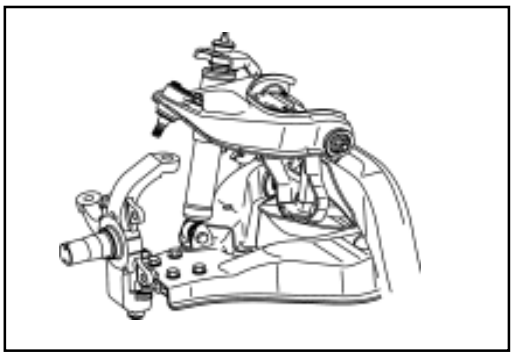
d. Use the special tools to disconnect the steering knuckle from the upper ball pin.

e. Remove the steering knuckle.



Check and replacement of steering knuckle

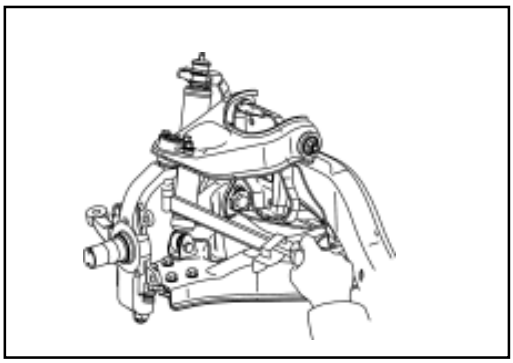
Use the dye penetrant to check the steering knuckle for crack.It should replace the steering knuckle if has crack.



Installation of steering knuckle

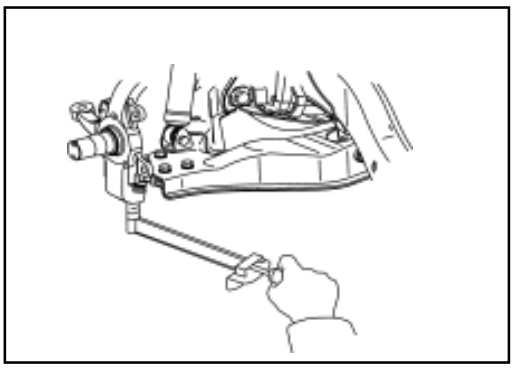
1. Install the steering knuckle

a. Install the lower ball pin on the steering knuckle and install the slotted nut temporarily.



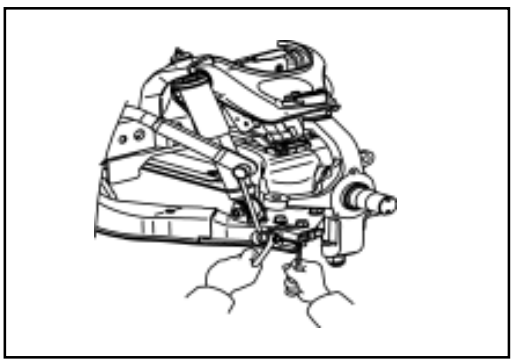
b. Press down the upper arm and connect the upper ball pin to the steering knuckle. Install and tighten the nut to the specified torque.
Tightening force: 145 ± 15N • m

c. Install the new split pin.
Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosed during the alignment.



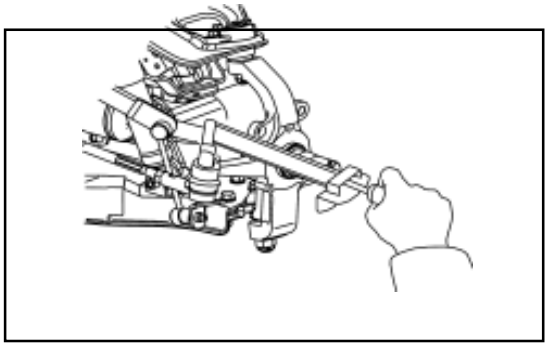
d. Install and tighten the lower ball pin nut to specified torque.
Tightening force: 230 ± 20N • m

e. Install the new split pin.
Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosed during the alignment.



2. Connect the stabilizer bar to the lower arm

Support the lower arm by jack; use the inner hexagon spanner to fix the ball pin and tighten the self-locking nut to specified torque.
Tightening force: 63 ± 5N • m

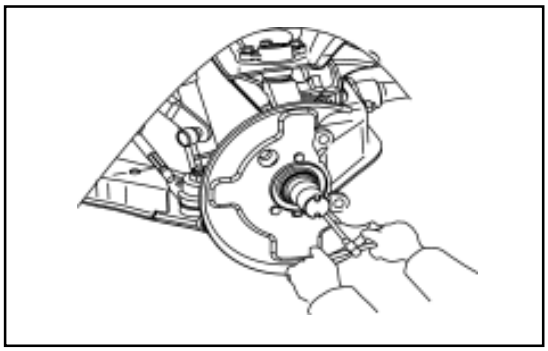


3. Connect the steering cross rod to the steering knuckle arm.

a. Tighten the slotted nut according to the specified torque.
Tightening force: 170 ± 15N • m

b. Install the new split pin.

Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosed during the alignment.



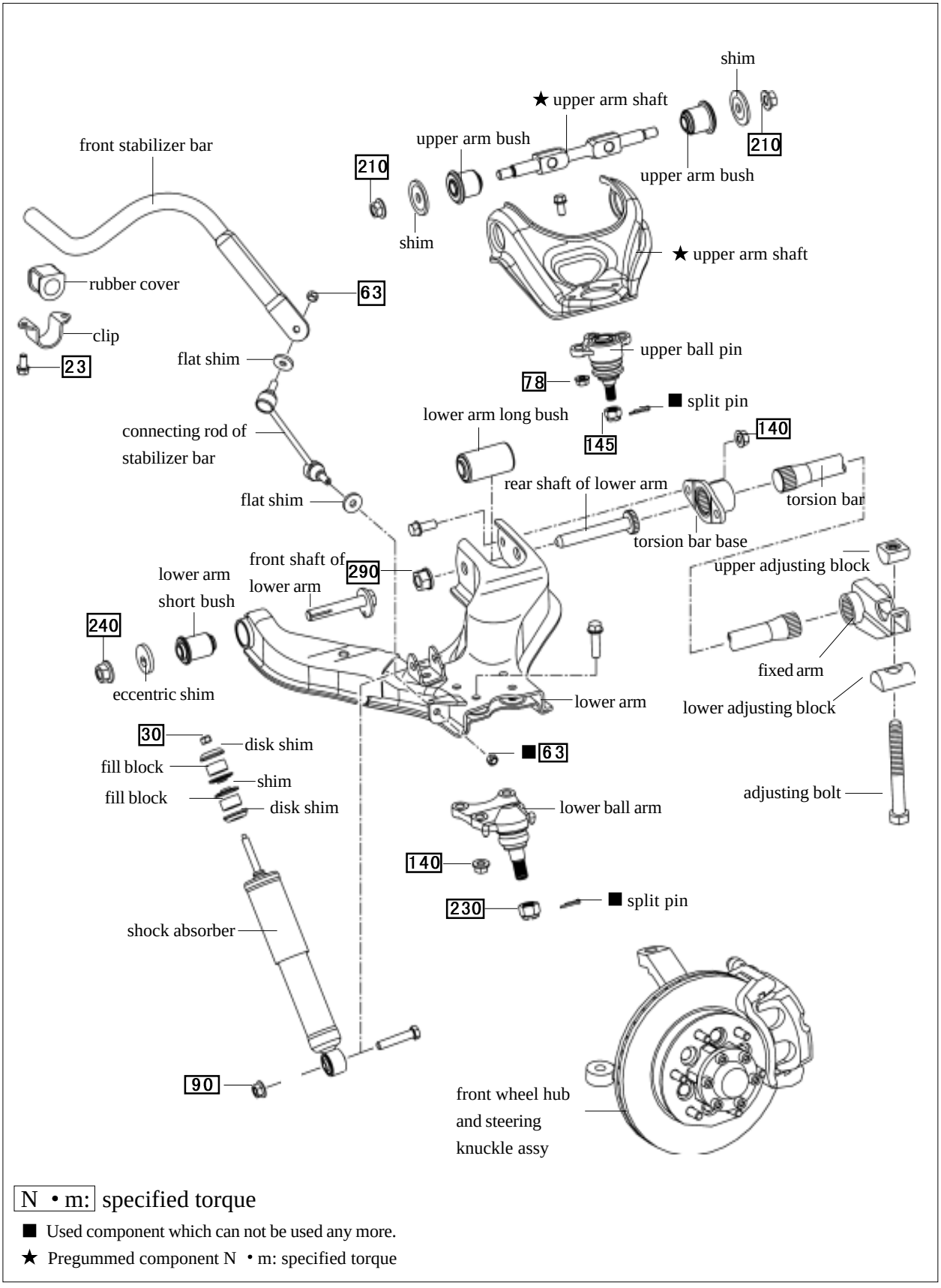
4. Install the brake cover

Tightening force: 23 ± 3N • m

5. Install the front hub and disc brake

(see section of front hub)

Front suspension (2WD)



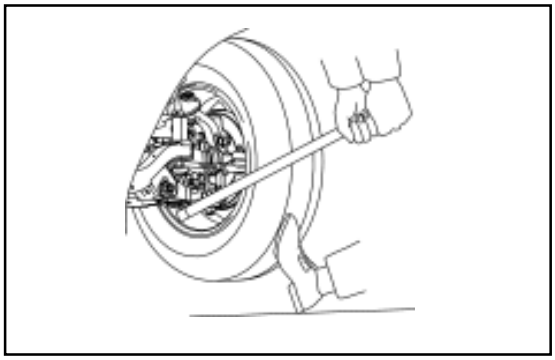
N • m: specified torque

■ Used component which can not be used any more.

★ Pregummed component N • m: specified torque

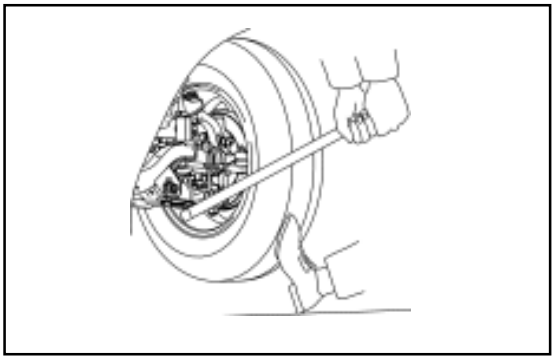
Ball pin

Inspection of ball pin



1. Check the lower ball pin for loose

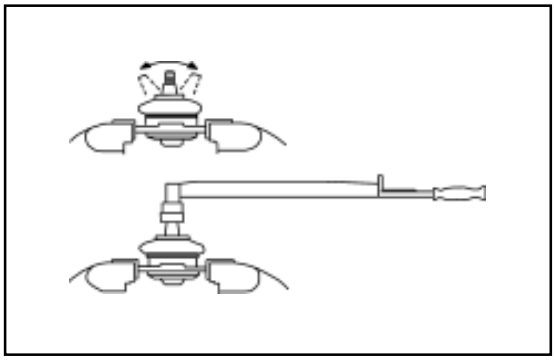
a. Raise the front of the car by jack and support it by the frame.
b. Ensure the front wheel is in straight advancing position and step down the brake pedal.
c. Move the arm upwardly and downwardly; check the clearance of lower ball pin.
Max. vertical clearance: 0mm



2. Check the upper ball pin for loose;

move the wheel upwardly and downwardly and check the gap of upper ball pin.

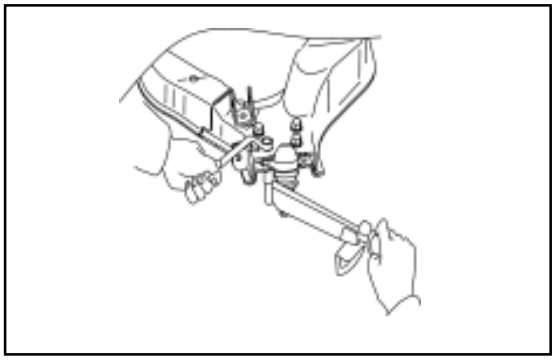
Max. vertical clearance: 0mm



3. Check the rotation of ball pin

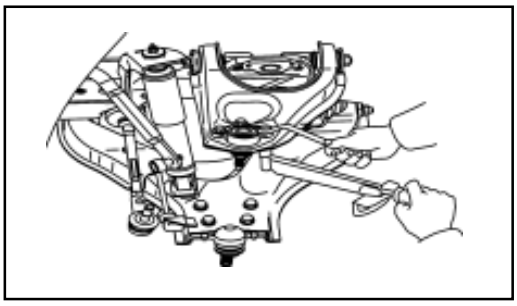
a. Remove the ball pin.
b. Shown as figure, shake the ball pin stud forwardly and backwardly for several times before install the nut.
c. Rotate the nut continuously by torsion meter and 2-4s for a cycle; record the readout of torsion meter in the fifth cycle.

tightening torque (for rotary):
lower ball pin 0.1 － 4N • m
upper ball pin 0.1 － 4N • m



Disassembly of ball pin

1.Take down the steering knuckle and front wheel hub assy.

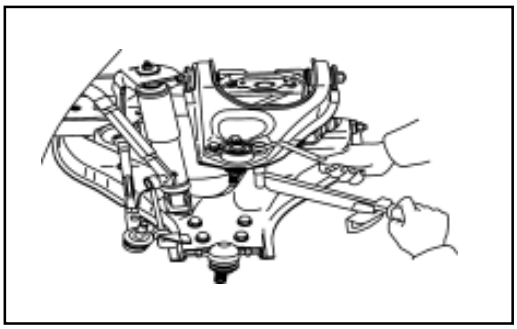


Disassembly of ball pin

(Refer to section “Front Hub and Steering Knuckle”)

2. Remove the lower ball pin form the lower arm

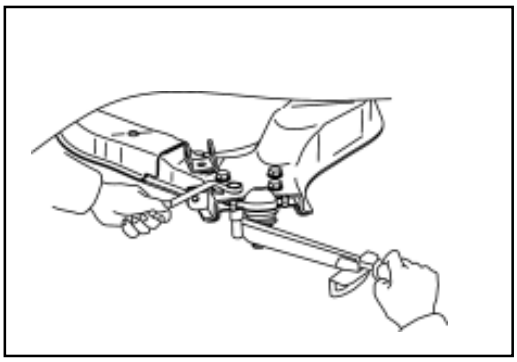
3. Remove the upper ball pin from the upper arm.



Installation of ball pin

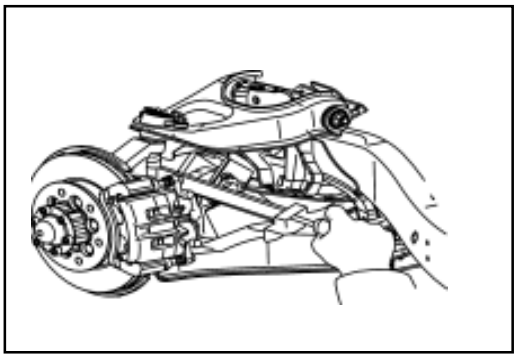
1. Install the upper ball pin on the upper arm

Tightening force: 78 ± 5N • m



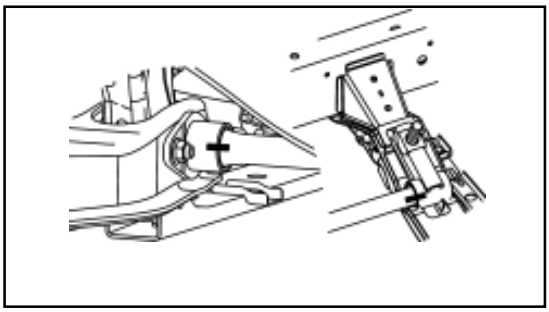
2. Install the lower ball pin on the lower arm

Tightening force: 140 ± 10N • m



3. Install the steering knuckle and front hub assembly

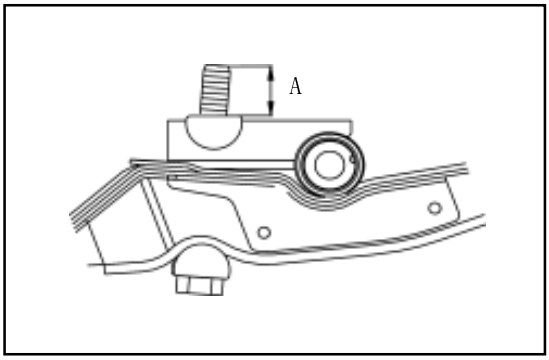
(Refer to section Front Hub and Steering Knuckle)



Torsion bar spring

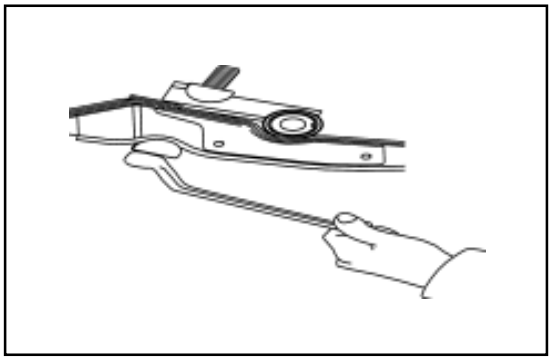
Disassembly of torsion bar spring

1. Use the jack to raise the carriage and support it by bracket.
2. Make the assembly mark on the torsion bar spring, bar base and adjusting arm.

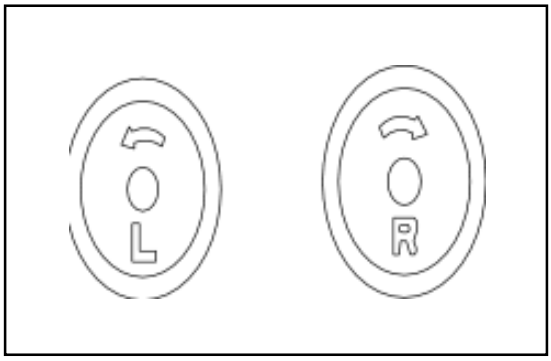


3. Shown as figure, measure the length A of exten sion section of bolt.

Remarks: The measuring value is for reference when adjust the ground clearance of chassis.

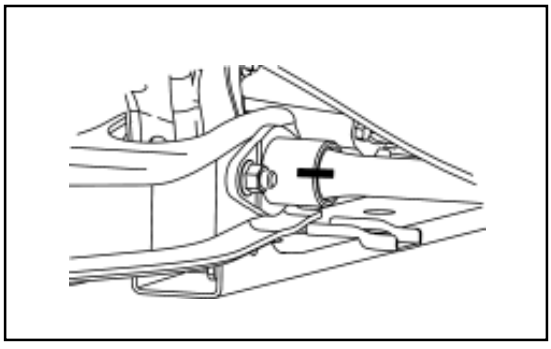


4. Loose the adjusting bolt until the torsion bar has not tension.
5. Remove the fixed arm and torsion bar spring



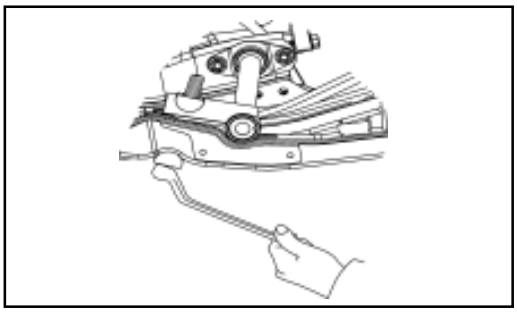
Installation of torsion bar spring

Caution: There are the L and R indication marks, which must not be exchanged on the read end of the torsion bar spring. Mark L means the left andRforright.

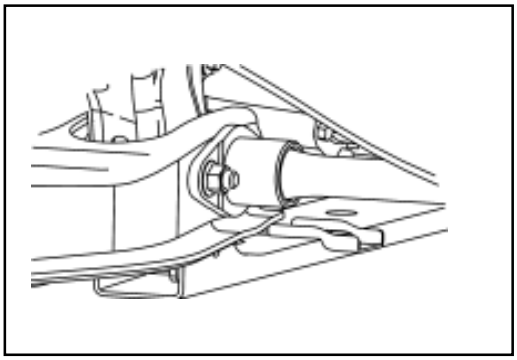


1. For reused torsion bar spring

a. Coat thin grease on the spline of torsion bar spring.
b. Align the assembly mark, install the torsion bar spring on the torsion bar.
c. Align the assembly mark; install the adjusting arm onthtorsion bar spring.



d. Tighten the adjusting bolt to make the extension length of the bolt equal to the length before remove.



2. For new torsion bar spring

a. Remove the wheel.

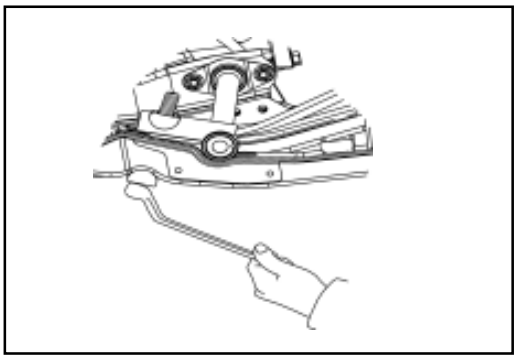
b. Coat thin grease on the spline of the torsion bar spring.

c. Install the torsion bar spring on the torsion bar base.

d. Lower the lower arm to the lower limitation position; install the adjusting arm in the torsion bar spring with the angle that the adjusting bolt just can be screwed on the upper adjusting block.

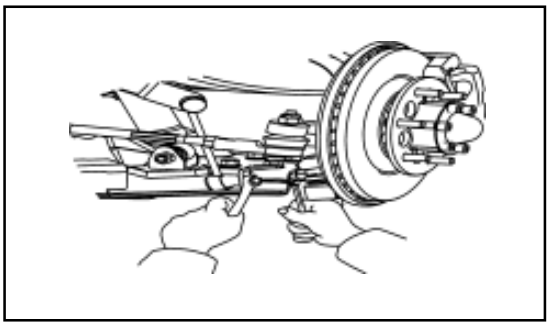
e. Tighten the adjusting bolt to the specified torque.

Nut tightening limitation: A is about 30-35mm; if A> 35mm, then it is adjusted through height of adjusting arm.



f. Install the wheel; remove the bracket; bounce the vehicle for several times to make the suspension enters into the stable status.

g. Rotate the adjusting bolt and adjust the ground clearance of chassis (Refer to 4-Wheel Alignment).



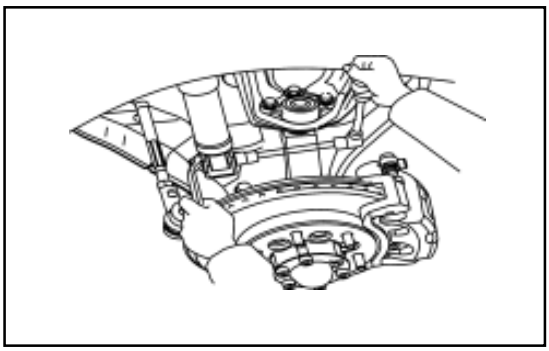
Lower suspension arm

Removal of lower suspension arm

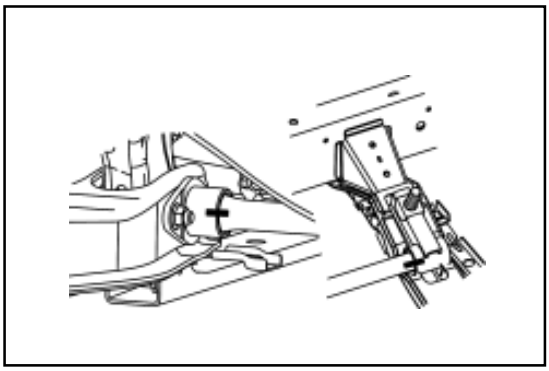
1. Disconnect the connecting rod of stabilizer bar from the lower arm

a. Use the jack to support the lower arm.

b. Remove the connecting nut; disconnect the connecting rod of sta bilizer bar form the lower arm.

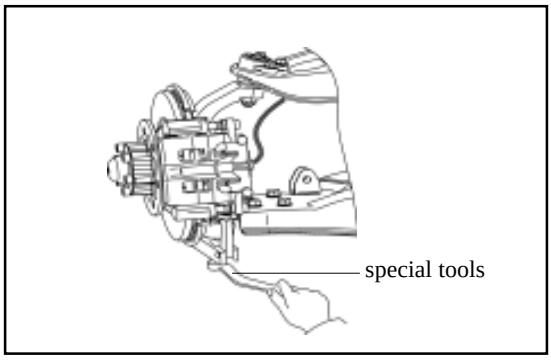


2. Disconnect the vibration damper from the lower arm.



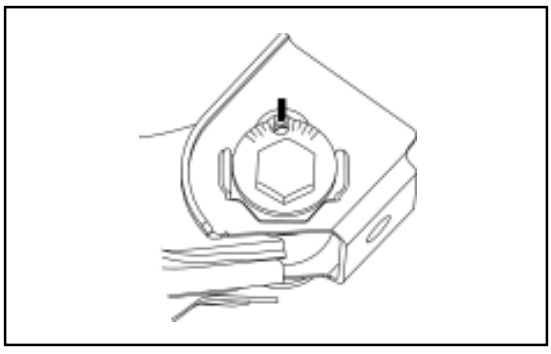
3. Disassembly of torsion bar spring

(Refer to Section “Torsion Bar Spring”)



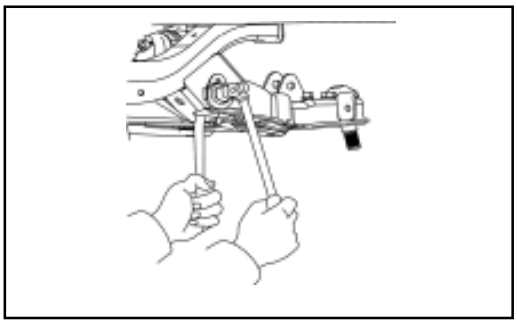
4. Disassembly of front hub and steering knuckle as sembly

(Refer to “Front Hub and Steering Knuckle”)

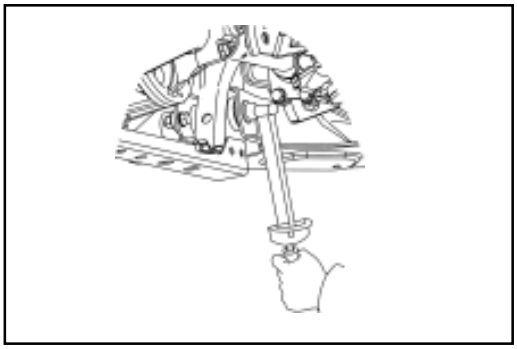


5. Remove the front shaft of lower arm

a. Make the mark on the adjusting cam.



b.Remove the nut and front shaft of lower arm.



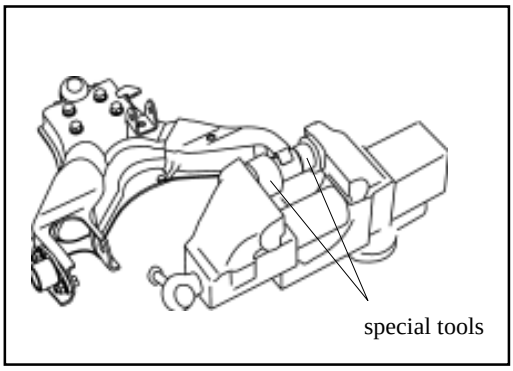
6. Remove the rear shaft of lower arm

Screw off the nut; remove the rear shaft of lower arm shaft; remove the lower suspension arm.

Replacement of lower suspension arm bush

1. Removal of short bush of lower suspension arm

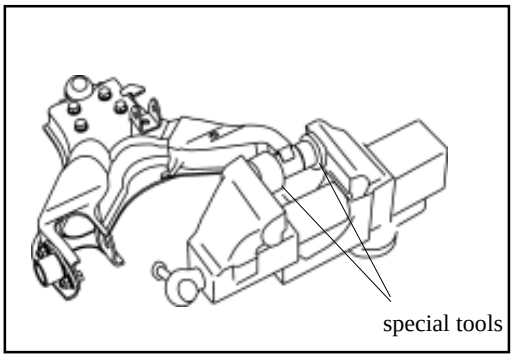
Use the special tools to press the short bush from the lower arm.



2. Installation of short bush of lower suspension arm

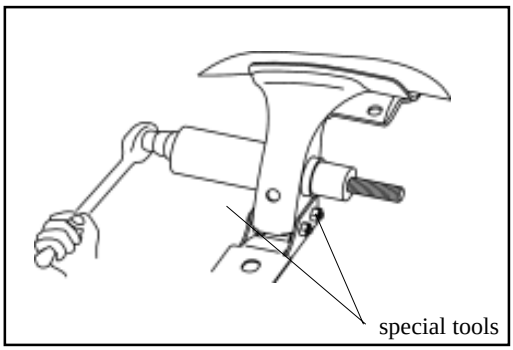
Use the special tools to press the new short bush in the lower arm.

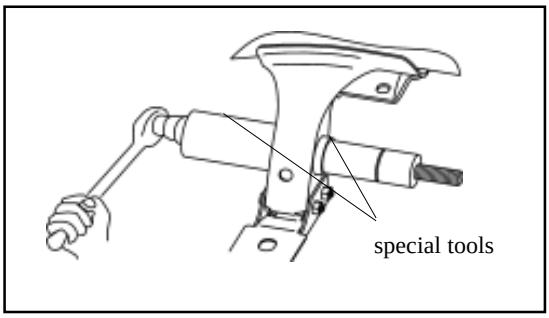
Remarks: Do not coat the bush with the grease.



3. Removal of long bush of lower suspension arm

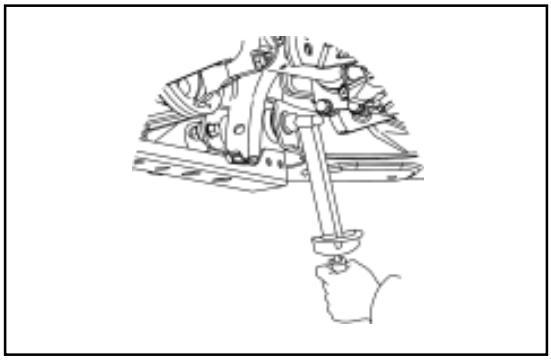
Use the special tools to remove the long bush.





4. Installation of longbushoflowersuspensionarmUse the special tools to install the new bush.

Remarks: Do not coat the bush with the grease.



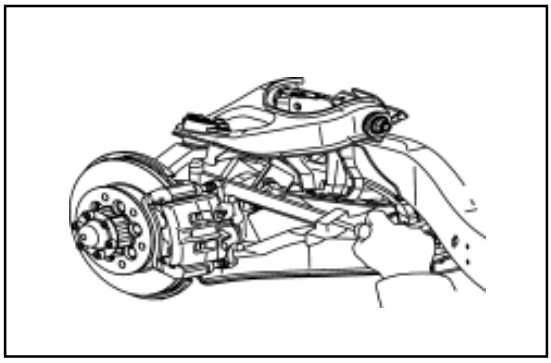
Installation of lower suspension arm

1. Installation of lower suspension arm

a. Install the rear shaft of lower arm and tighten the nut to the specified torque.

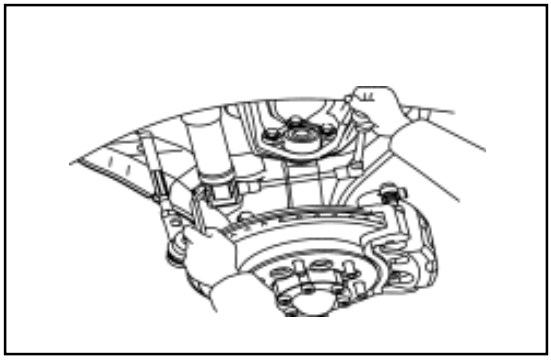
Tightening force: 290 ± 25N • m

b. Install the front shaft of lower arm and screw on the nut temporarily.



2. Installation of front hub and steering knuckle assem bly

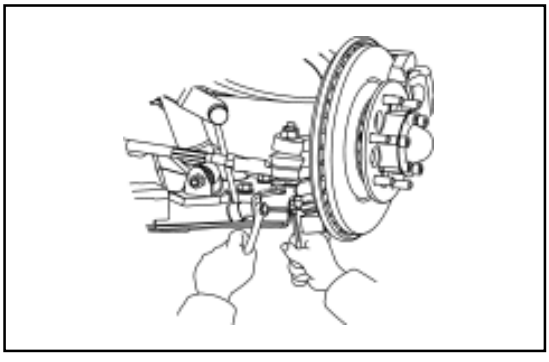
(Refer to section “Front Hub and Steering Knuckle”)



3. Install the vibration damper on the lower suspension arm.

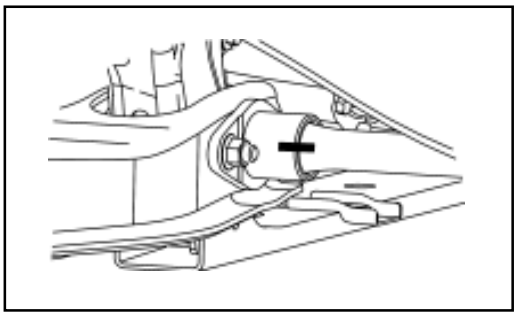
Install the vibration damper on the lowersuspensionarmbracket.

Tightening force: 90 ± 10N • m



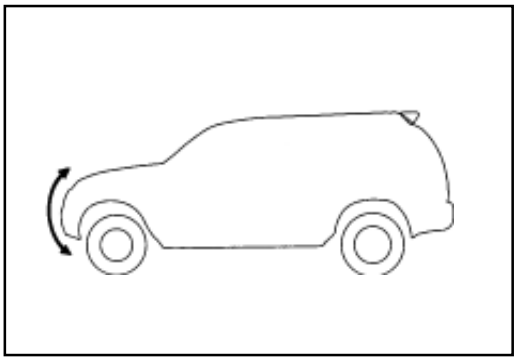
4. Connect the stabi lizerbar to the lower suspension arm

Tightening force: 63 ± 5N • m



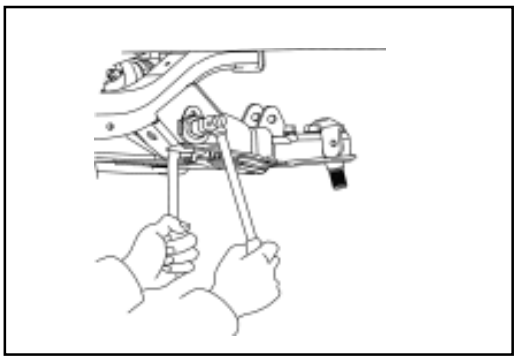
5. Install the torsion bar spring

(Refer to “Torsion Bar Spring”)



6. Tighten the nut of front shaft of lower arm to specified torque

a. Install the wheel, remove the bracket and bounce the vehicle for several times to make the vibration damper enters into the stable status.

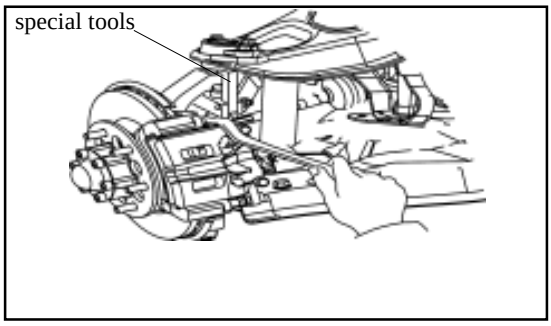


b. Align the assembly mark and tighten the nut to specified torque.

Tightening force: 240 ± 20N • m

7. Check the wheel alignment parameter

(Refer to 4-Wheel Alignment)

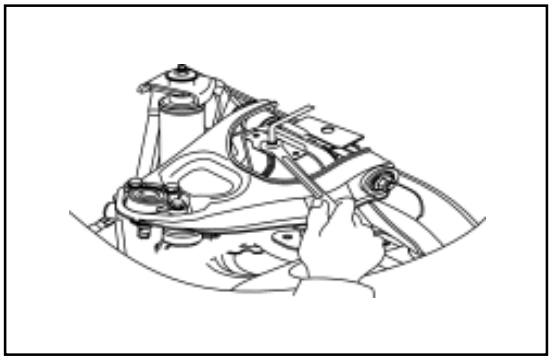


Upper suspension arm

Disassembly of upper suspension arm

1. Disconnect the upper ball pin from the steering knuckle

Remove the split pin and nut; use the special tools to disconnect the upper ball pin from the steering knuckle.

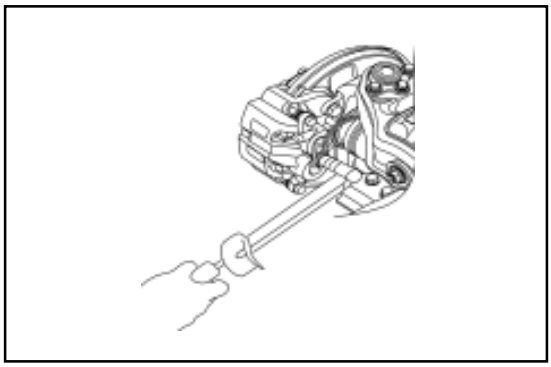


2. Remove the brake oil pipe on the upper arm shaft

a. Use the open-end wrench to screw off the oil pipe tight nut.

b. Pull out the brake oil pipe and plug it by the rubber plug.

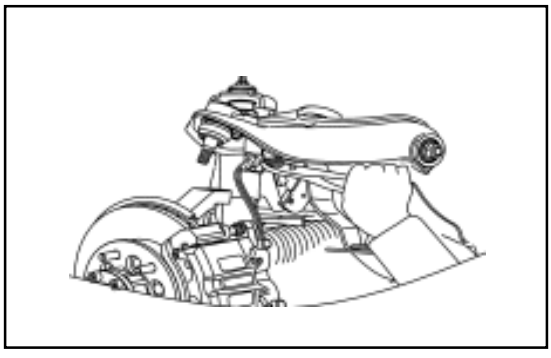
Remarks: There are two two-way valves for rear brake oil pipe beside the right upper arm shaft ; when remove the right upper suspension arm, it must remove four oil pipe tight nuts in the place and plug it by the rubber plug to prevent the brake fluid from overflowing.



3. Disconnect the brake hose form the brake caliper

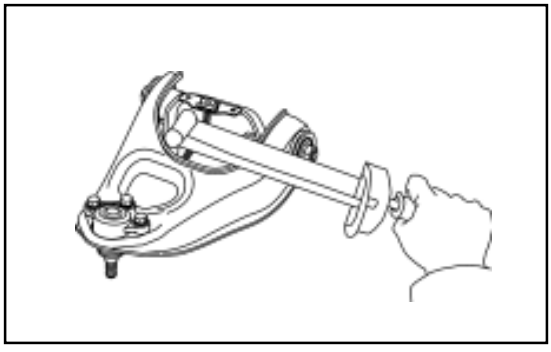
Remove the hollow bolt and disconnect the brake hose form the brake caliper

Remarks: Must not lose the copper gasket seal.



4. Disconnect the brake hose from the upper arm oil pipe bracket.

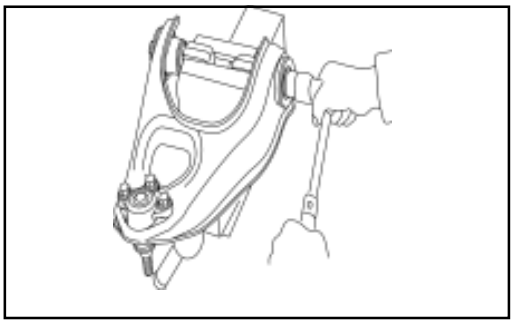
Use the pliers to pull out the sheet steel spring clip and disconnect the brake hose from the upper arm oil pipe bracket.



5. Remove the upper suspension arm

Remove two bolts and remove the upper suspension from the arm carriage.

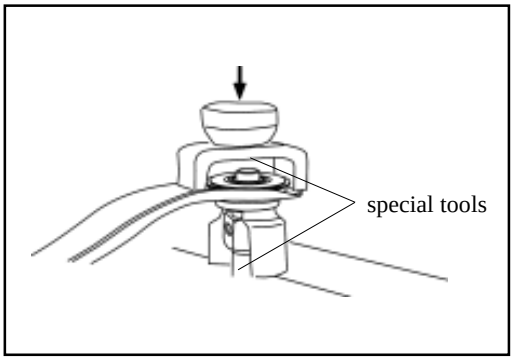
Remarks: Keep the adjusting shim and don't lose it. Record the thickness of front and rear adjusting shim for convenience of reinstalling them in the original position.



Replacement of upper arm bush

1. Remove the bush

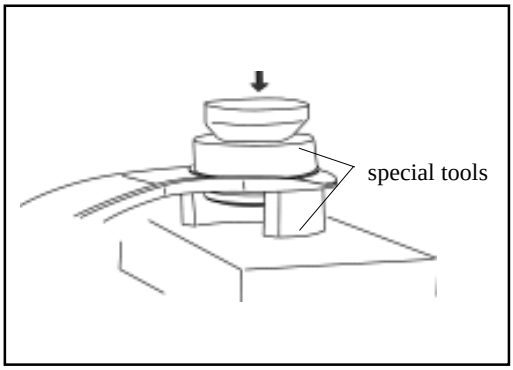
a. Remove the bolt and washer.



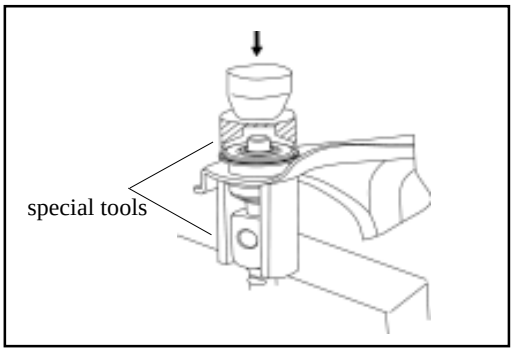
b. Use the special tools to push out the bush.

c. Remove the upper arm shaft; remove another bush in same procedure

2. Install the bush

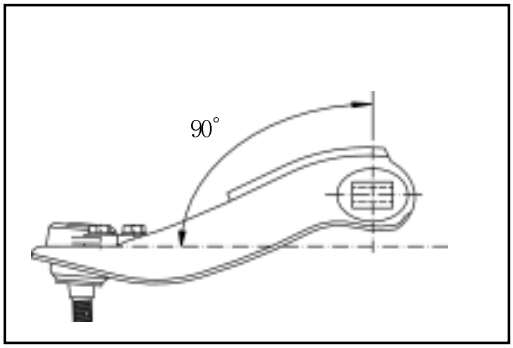


a. Use the special tools to press in the bush.



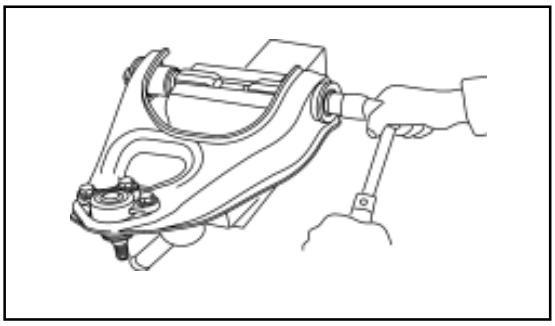
b. Install the upper arm shaft; use the special tools to press inanother bush.

3. Tighten the upper arm shaft to specified torque.



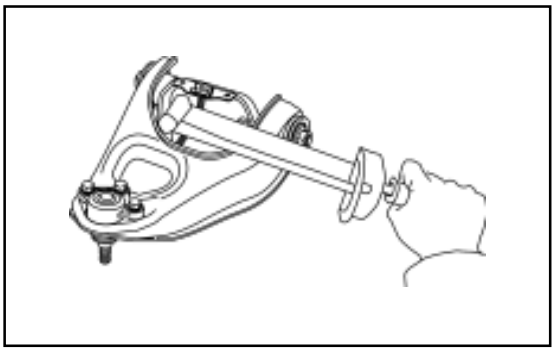
a. Coat the screw of both ends of upper arm shaft with the screw lock sealant; install the washer and nut.

Remarks: Adjust the position of upper lower; make the installation plane of ball pin is vertical to the installation plane of upper arm shaft.



b. Tighten the upper arm shaft nut to specified torque.

Tightening force: 210 ± 10N • m



Installation of upper suspension arm

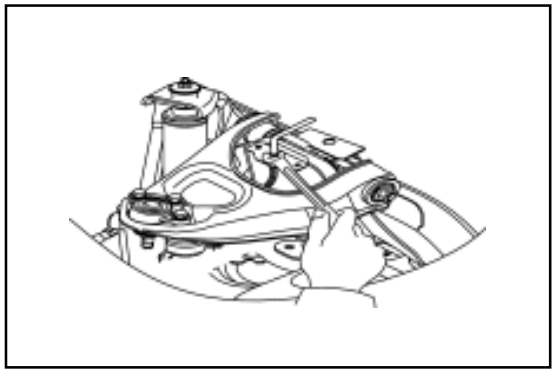
1. Install the upper suspension arm on the carriage

a. Install the upper suspension arm and camber adjusting shim.

b. Tighten all bolts to the specified torque.

Tightening force: 200 ± 10N • m

Remarks: Install the shim with same quantity and thickness to the original position.

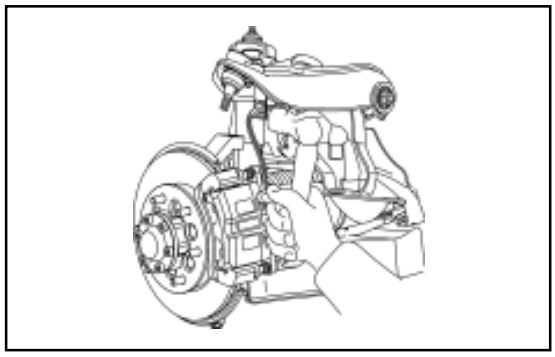


2. Connect the brake oil pipe of upper arm shaft

Tighten the oil pipe compression nut to specified torque.

Tightening force: 15-17N • m

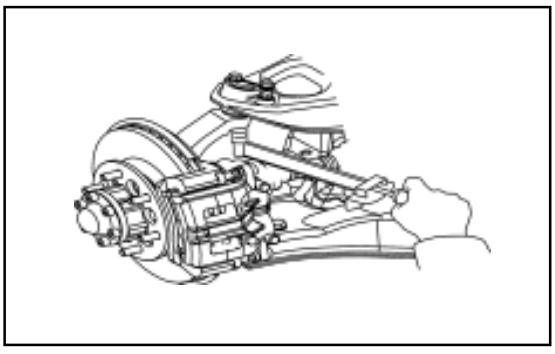
Remarks: It should tighten four connector of two two-way valves to the specified torque if disassemble the right upper arm.



3. Connect thebrakehosetotheupperarmoilpipebracket

a. Thread the brake hose from the hole on upper arm oil pipe bracket.

b. Use the hand hammer to knock in the sheet steel spring clip to fix the brake hose.



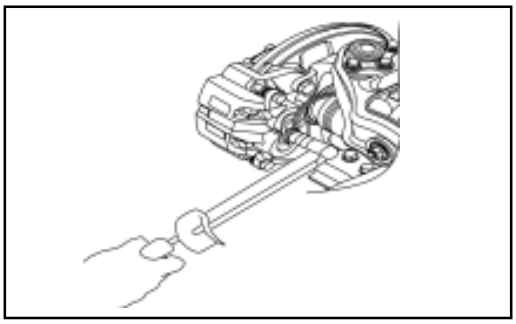
4. Connect the upper ball pin to the steering knuckle

a. Tighten the slotted nut according to the specified torque.

Tightening force: 145 ± 15N • m

b. Install the new split pin.

Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosed during the alignment.



5. Connect the brake hose on the brake caliper.

Connect the copper gasket seal and tighten the hollowbolttospecified torque.

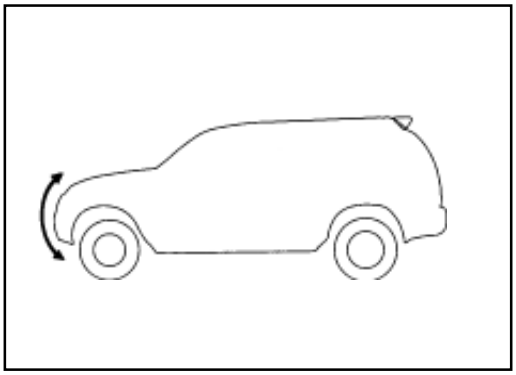
Tightening force: 50 ± 5N • m

6. Discharge the air in front brake system

(refer to relevant chapter)

Remarks: It must discharge the air in the rear brake system if disassemble the right upper arm.

7. Check the brake fluid for leakage

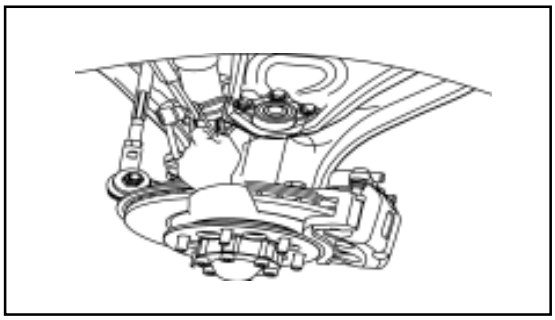


8. Tighten the upper arm front shaft nut to the specified torque

Install the wheel, remove the bracket and bounce the vehicle for several times to make the vibration damper enters into the stable status.

9. Check the wheel alignment parameter

(Refer to 4-Wheel Alignment)

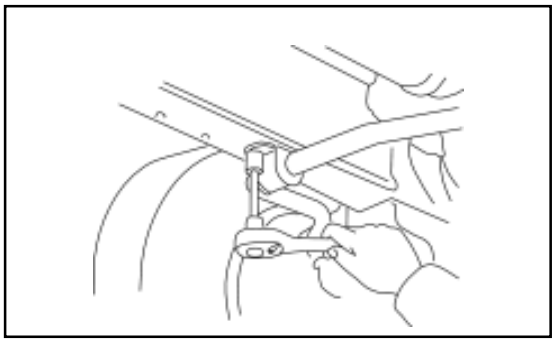


Stabilizer bar

Disassembly of stabilizer bar

1. Disconnect the connecting bar which supports both ends of the stabilizer bar form the stabilizer bar.

Use the inner hexagon spanner to fix the ball pin; remove the self-locking nut.

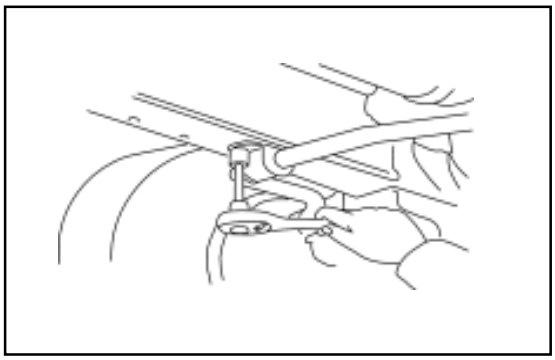


2. Remove the bush and clip of stabilizer bar; remove the stabilizer bar

Installation of stabilizer bar

1. Install the stabilizer bar on the carriage

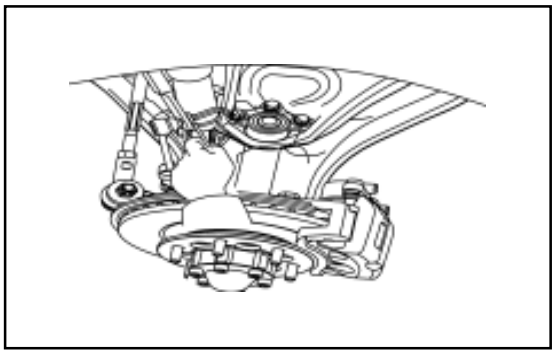
Place the stabilizer bar in position; install the stabilizer bar bush and clip on the carriage. Screw on and pretighten the bolt.



2. Connect the stabilizer bar to the connecting bar

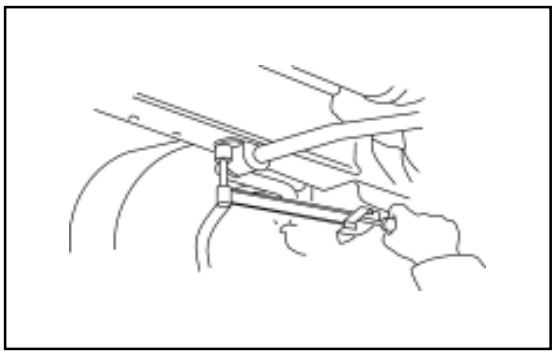
Installand tighten the new nut to the specified torque

Tightening force: 63 ± 5N • m

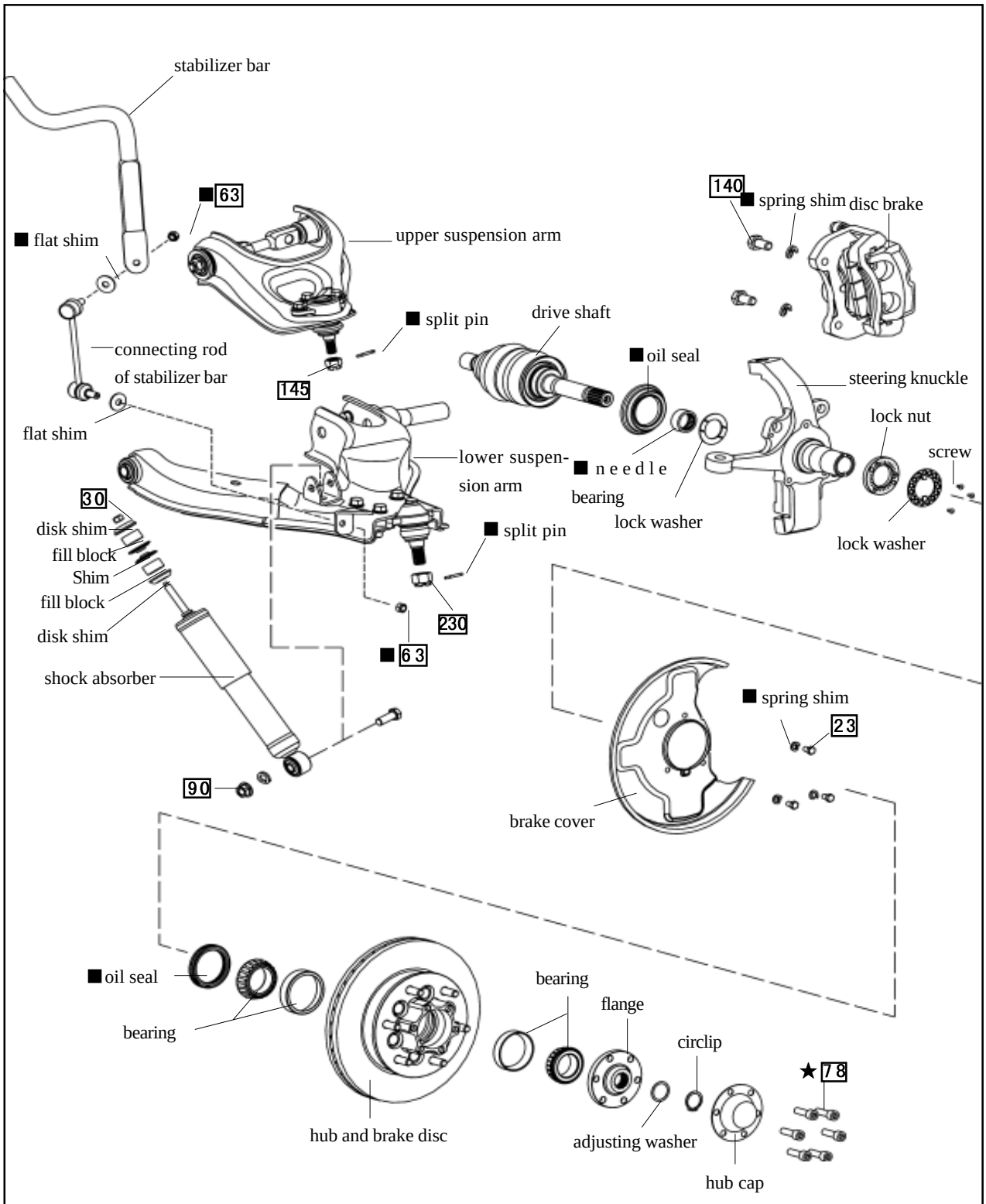


3. Tighten the clip position bolt to specified torque.

Tightening force: 23 ± 3N • m



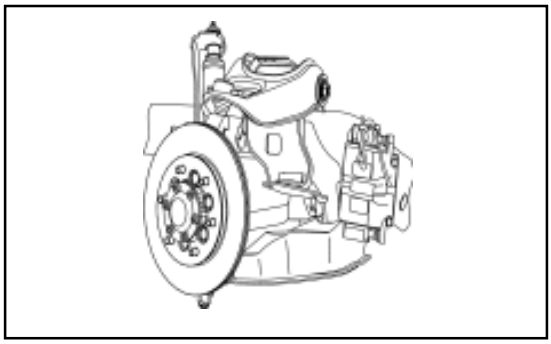
Front hub and steering knuckle (4WD)



N • m: specified torque

■ Used component which can not be used any more.

★ precoated component



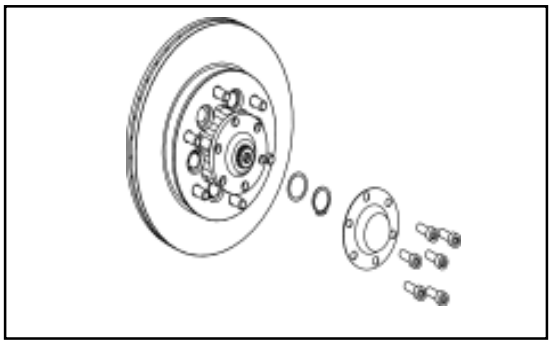
Front hub

Disassembly of front hub

1. Remove the disc brake

Remove the brake caliper and hang it by steel cable.

Remarks: Do not remove the brake pipe and brake hose.

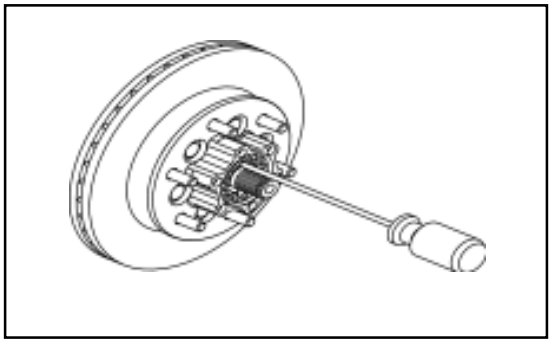


2. Remove the hub cap and flange

a. Use the inner hexagon spanner to screw off the fastening blot and remove the hub cap.

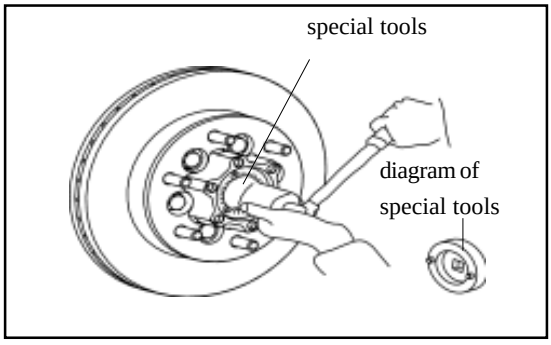
b. Use the pliers to remove the circlip and remove the adjusting washer.

c. Remove the flange.

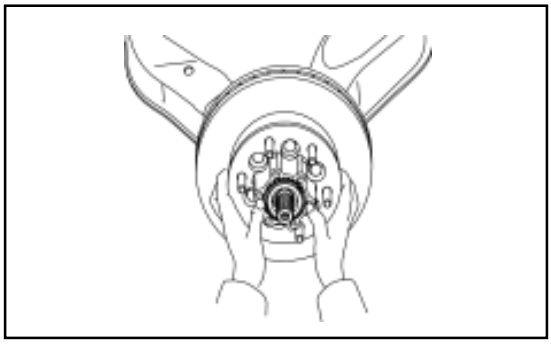


3. Remove the hub and brake disc

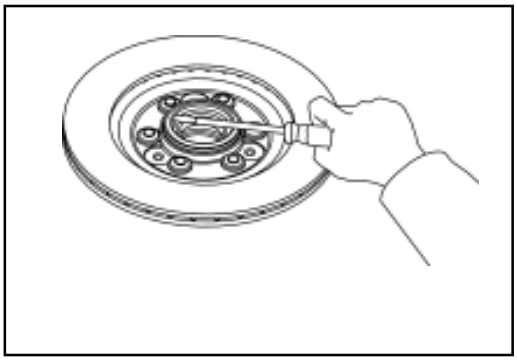
a. Use the Philips screwdriver to screw off the tight screw; remove the lock washer.



b. Use the special tools to remove the lock nut.



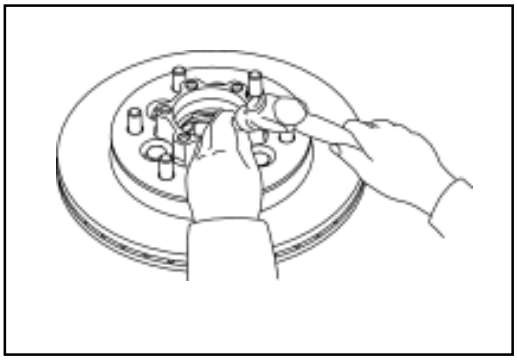
c. Remove the hub and brake disc with the outer bearing.



4. Remove the oil seal and inner bearing

a. Use the screwdriver to pry out the oil seal

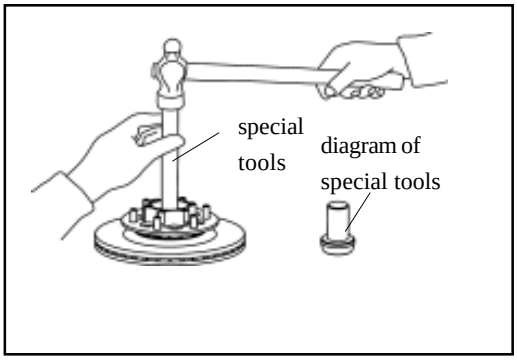
b. Remove the inner race of inner bearing form the hub.



Check and repair of front hub

1. Check all bearings

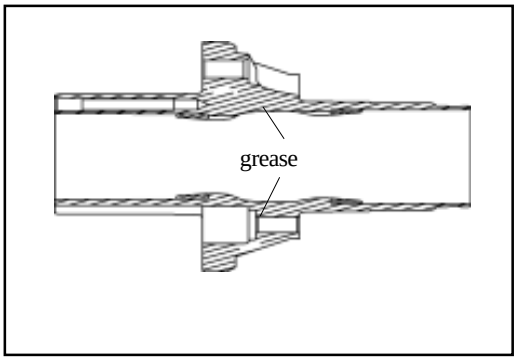
Wash the inner race and outer race of each bearing and check them for wear and damage.



2. Replace the bearing outer race

a. Use the brass bar and hand hammer to knock out the bearing outer race.

b. Use the special tools to knock in the new bearing outer race.

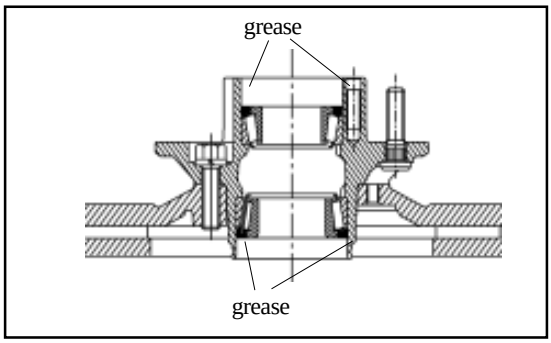


Assembly of front hub

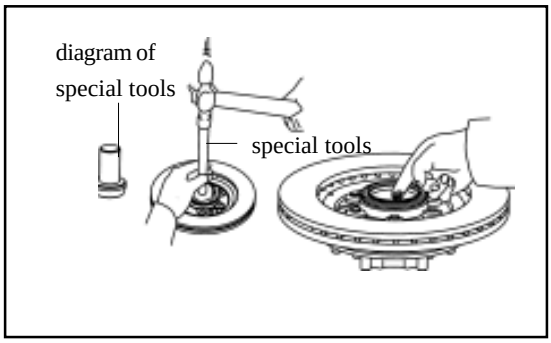
1. Coat the inner surface of hub and bearing outer race with the grease.

The grease is the Jin HP-R grease or the grease met the requirement in following table.

Item	Typical data
Dropping point, C	289
Leakage amount (104。C, 6h), g	0. 48
EP performance OK value , N	178

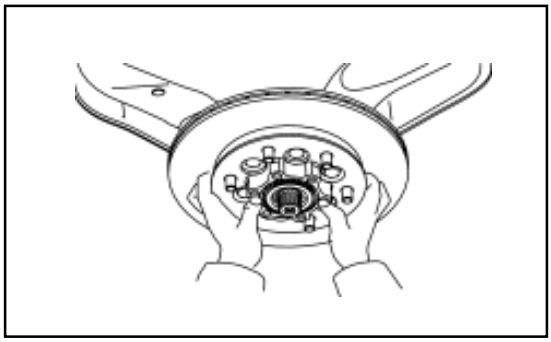


2. Place in the bearing inner race; use the fill the gap between the inner and outer race of the bearing up with the HP-R grease.



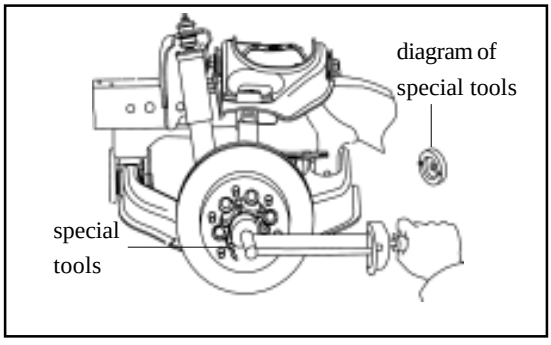
3. Install the inner bearing and oil seal

a. Place the inner bearing in the hub
b. Use the special tools to knock the new oil seal into the hub.
c. Coat the oil seal lip with HP-R grease.



4. Install the hub on the steering knuckle

a. Install the hub on the steering knuckle。
b. Install the outer bearing.



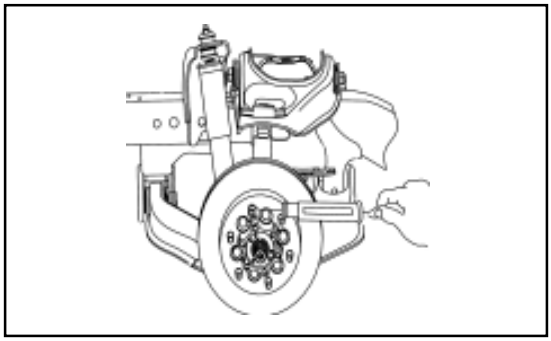
5. Adjust the pre-applied load

a. Use the special tools to screw on the locknut to specified torque.

Tightening force: 80-100N • m

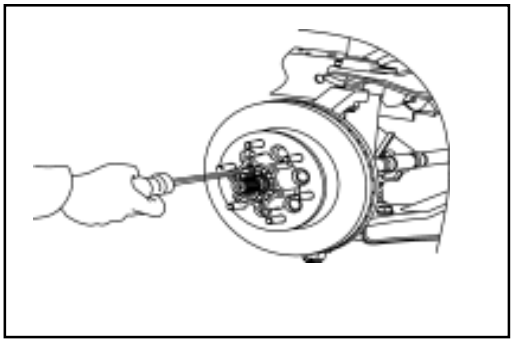
b. Rotate the hub to right and left 1/3～1/4 round respectively.
c. Screw off the nut until the nut can be loosed by hand.
d. Use the special tools to retighten the lock nut.

Tightening force: 28N • m



e. Use the spring tension meter to check the pre-applied load.

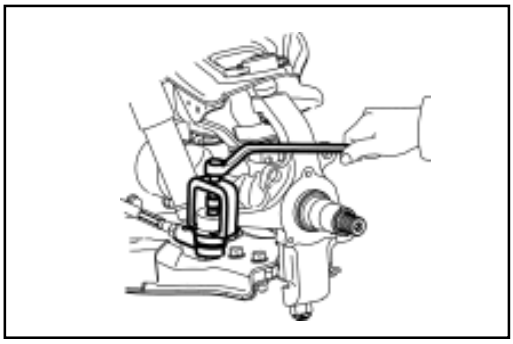
Pre-applied load (for starting): 28-56N



6. Install the lock washer

Install the lock washer with the surface with counterbore outwardly and fix it on the lock nut by screw.

Remarks: If the screw installation hole on the lock washer can not align with the screw hole on the lock nut, then it can remove the lock washer and adjust he lock nut slightly (rotate in the direction of Min. adjusting range); then install the lock washer.

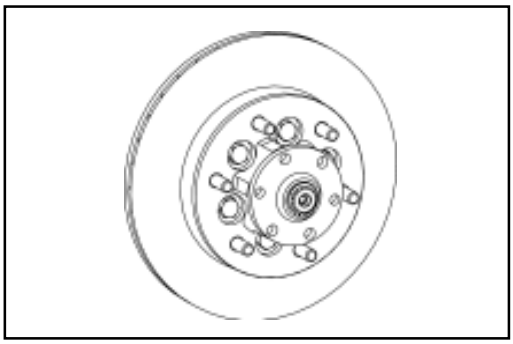


7. Recheck the pre-applied load

Use the spring tension meter to recheck the pre-applied load.

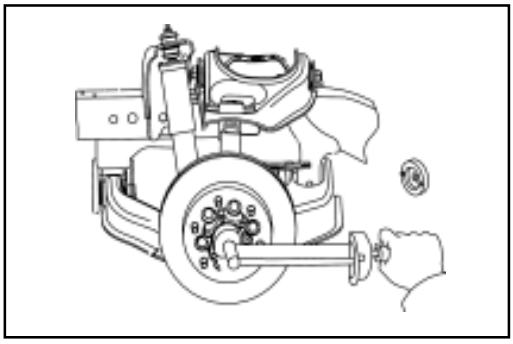
Pre-applied load (for starting): 28-56N

If the pre-applied load does not meet the specified value, it must remove the lock washer and adjust it by the adjusting nut.



8. Install the ring flange

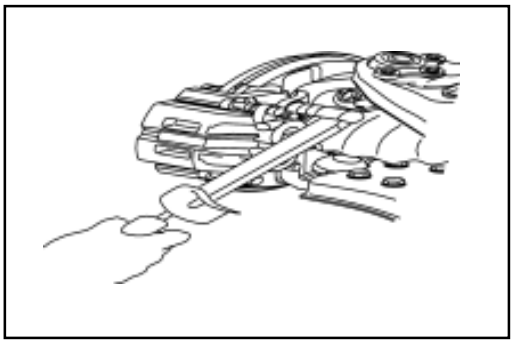
a. Install the ring flange on the hub.
b. Install the adjusting washer.
c. Install the circlip.



9. Install the hub cap

a. Coat the screw of the inner hexagon bolt with the screw lock sealant.
b. Use the inner hexagon bolt to fix the hub cap and ring flange on the hub; tighten the bolt to the specified torque.

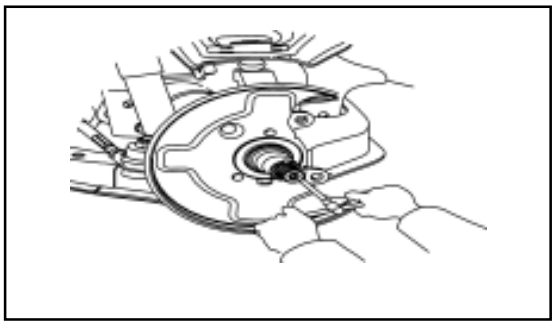
Tightening force: 78 ± 5N • m



10. Install the disc brake

Install the disc brake on the steering knuckle; tighten the bolt to the specified torque.

Tightening force: 140 ± 10N • m



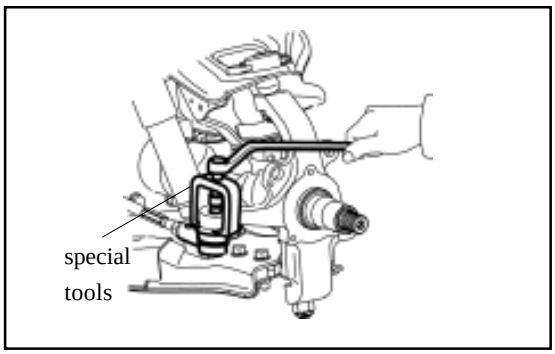
Steering knuckle

Disassembly of steering knuckle

1. Remove the disc brake and front hub

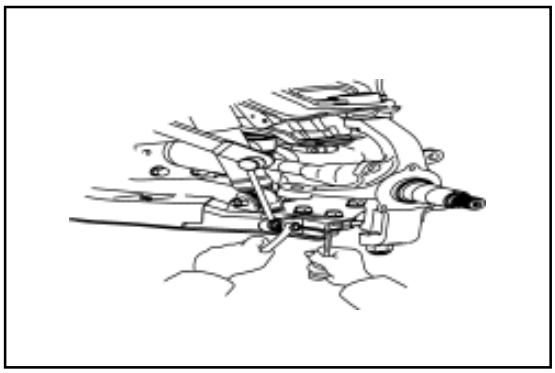
(Refer to section “Front Hub”)

2. Remove the brake cover



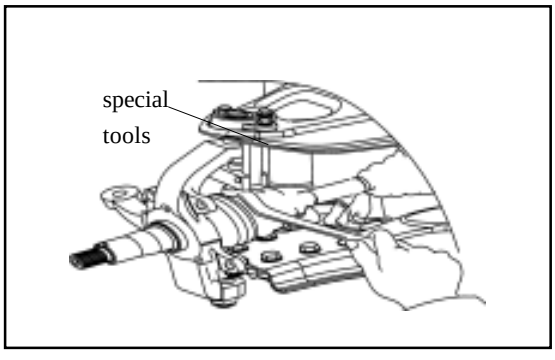
3. Disconnect the steering cross rod from the steering knuckle arm

a. Remove the split pin and nut on the ball pin.
b. Use the special tools to disconnect the steering cross rod from the steering knuckle arm.



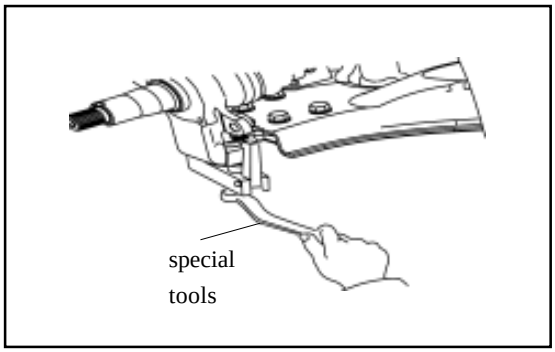
4. Disconnect the connecting rod of stabilizer bar from lower arm

Use the inner hexagon spanner to fix the ball pin; remove the self-locking nut.

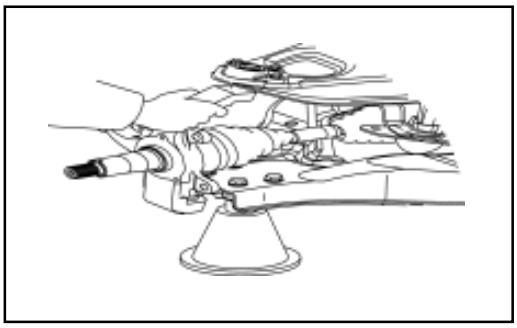


5. Remove the steering knuckle

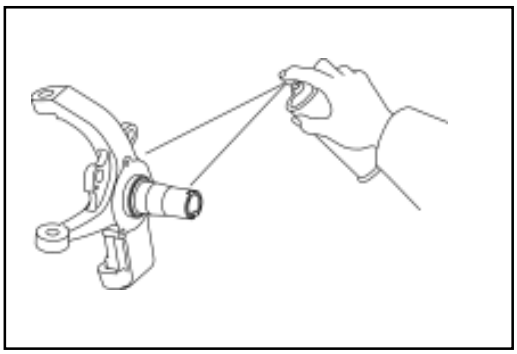
a. Remove the split pin and nut on the upper ball pin
b. Use the special tools to disconnect the upper ball pin from the steering knuckle.



c. Remove the split pin and nut on the lower ball pin.
d. Use the special tools to disconnect the upper ball pin from the steering knuckle.



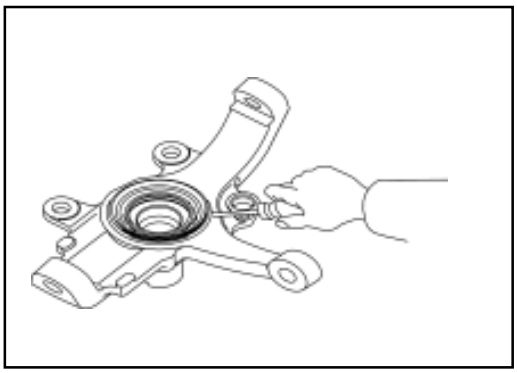
e. Use the jack to raise the lower arm; remove the steering knuckle.



Check and replacement of steering knuckle

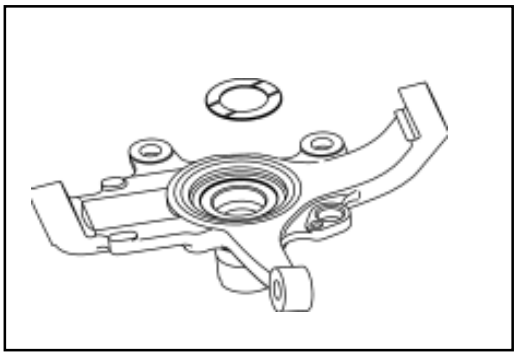
1. Check of steering knuckle

Use the dye penetrant to check the steering knuckle for crack.
It should replace the steering knuckle if has crack.

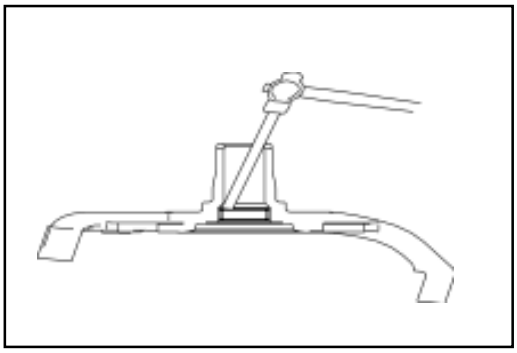


2. Remove the steering knuckle oil seal

Use the screwdriver to pry out the oil seal from the steering knuckle.

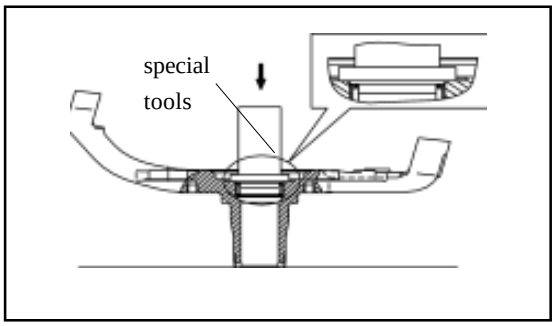


3. Take out the thrust plate



4. Remove the needle bearing

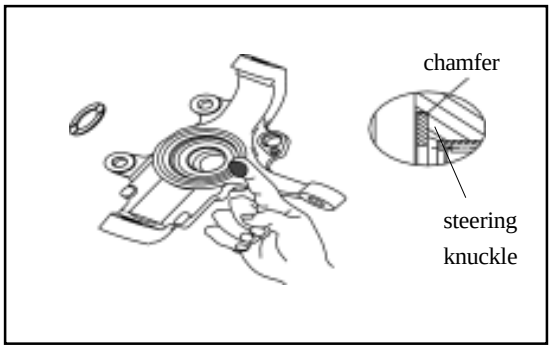
Use the copper bar and hand hammer to knock out the needle bearing.



5. Installation of needle bearing

Use the special tools and hand hammer to knock in the new needle bearing slightly.

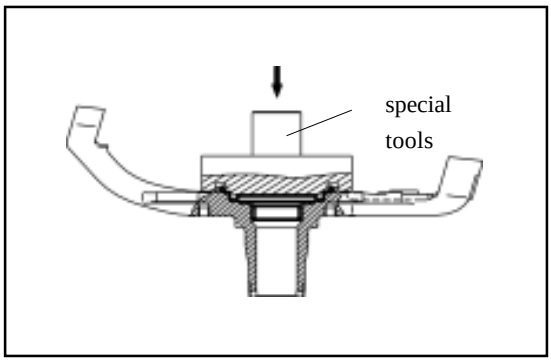
Remarks: The thicker end of needle bearing should be upwardly when knock in. with thicker end.



6. Installation of thrust plate

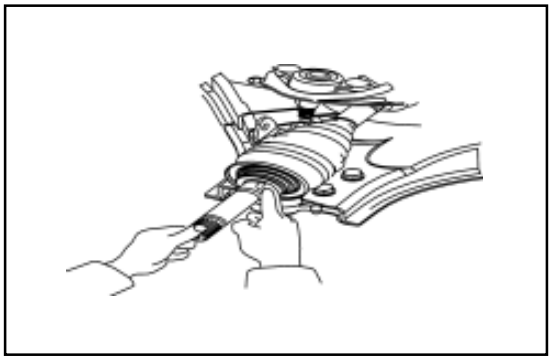
Coat the installation position of thrust plate of steering knuckle with the HP-R grease; place the thrust plate with the surface with chamfer facing the steering knuckle.

Remarks: It must measure the thickness of the thrust plate before the installation; it should install the new thrust plate if the thickness is less than 1.5mm. The nominal thickness of the new thrust plate is 2mm.



7. Installation of steering knuckle oil seal

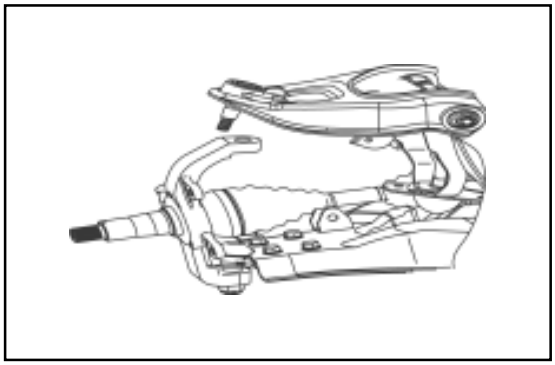
Use the special tools and hand hammer to knock in the new steering knuckle oil seal slightly.



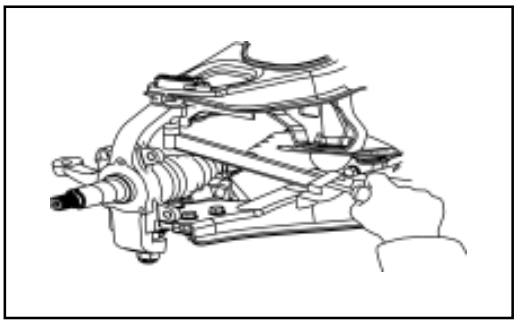
Installation of steering knuckle

1. Install the steering knuckle

a. Coat the drive shaft and inner of drive shaft dustproof cove with the lithium base grease.



b. Insert the drive shaft into the steering knuckle, meanwhile connect the lower ball pin to the steering knuckle and install the slotted nut temporarily.

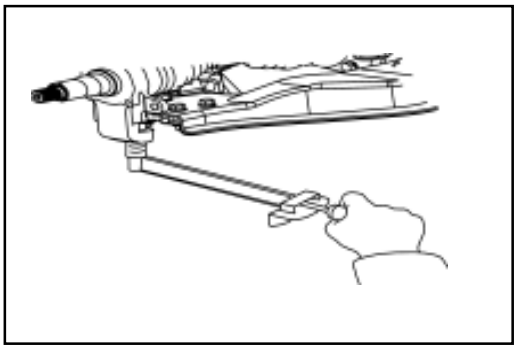


c. Press down the upper arm and connect the upper ball pin to the steering knuckle. Install and tighten the nut to the specified torque.

Tightening force: 145 ± 15N • m

d. Install the new split pin.

Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosedduringthealignment.

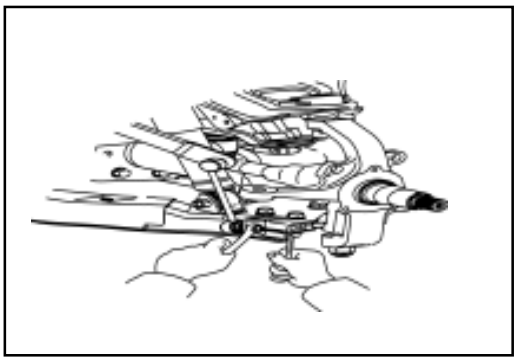


e. Install and tighten the lower ball pin nut to specified torque.

Tightening force: 230 ± 20N • m

f. Install the new split pin.

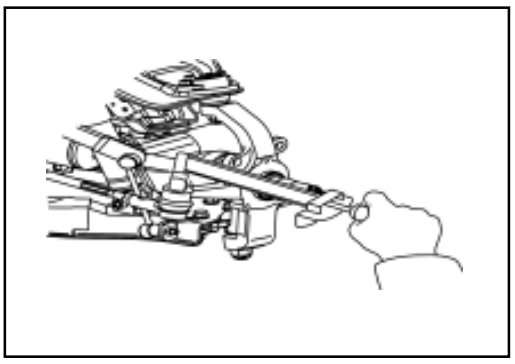
Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosedduringthealignment.



2. Connect the stabilizer bar to the lower arm

Support the lower arm by jack; use the inner hexagon spanner to fix the ball pin and tighten the self-locking nut to specified torque.

Tightening force: 63 ± 5N • m



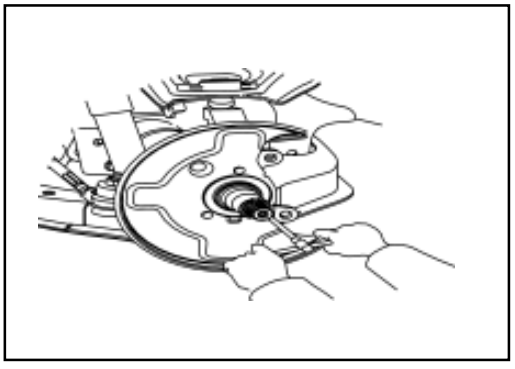
3. Connect the steering cross rod to the steering knuckle arm

a. Tighten the slotted nut according to the specified torque.

Tightening force: 170 ± 15N • m

b. Install the new split pin.

Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosedduringthealignment.



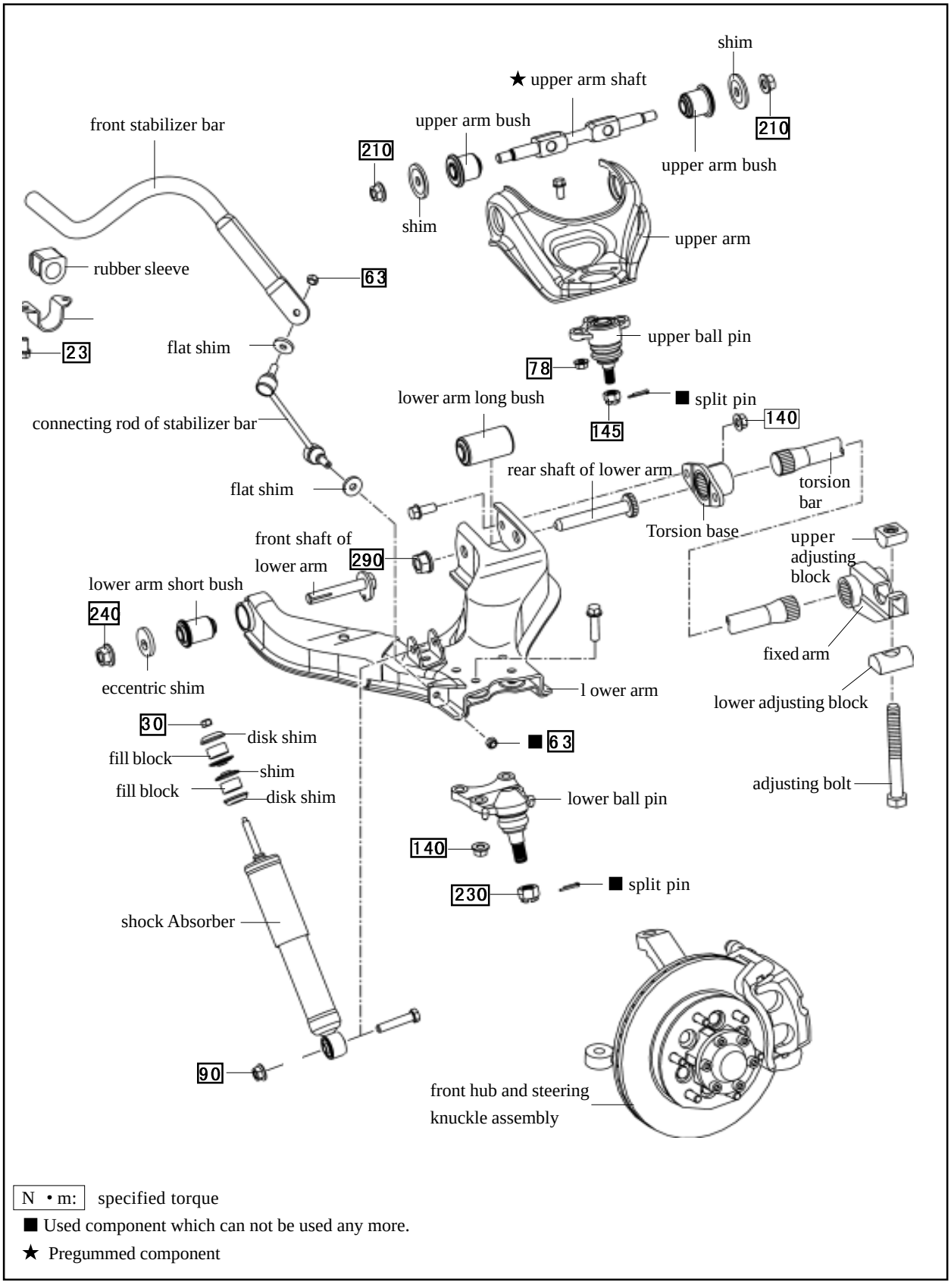
4. Install the brake cover

Tightening force: 23 ± 3N • m

5. Install the front hub and disc brake

(Refer to section “Front Hub”)

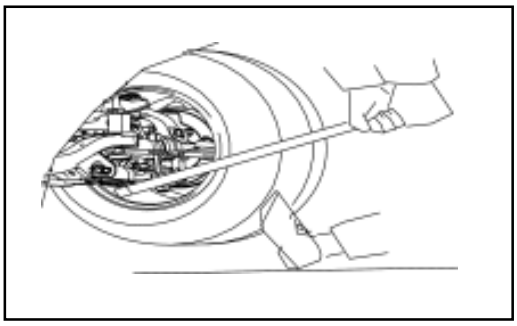
Front suspension (4WD)



N • m: specified torque

■ Used component which can not be used any more.

★ Pregummed component

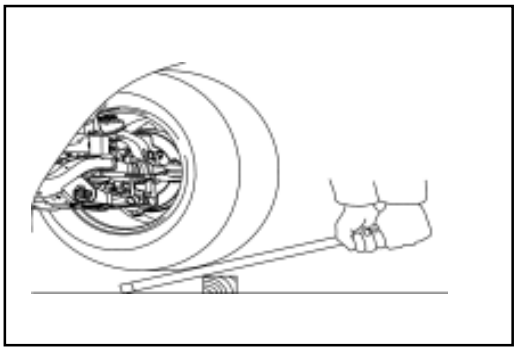


Ball pin

Check of ball pin

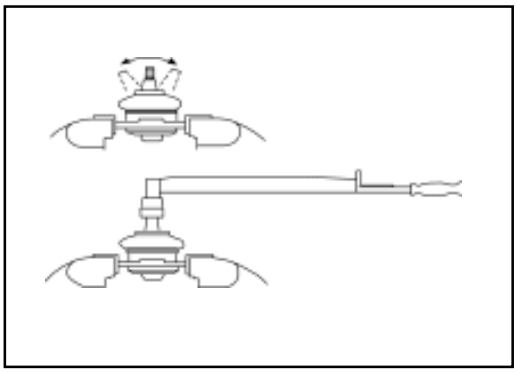
1. Check the lower ball pin for loose

a. Raise the front of the car by jack and support it by the frame.
b. Ensure the front wheel is in straight advancing position and step down the brake pedal.
c. Move the arm upwardly and downwardly; check the clearance of lower ball pin.
Max. vertical clearance: 0mm



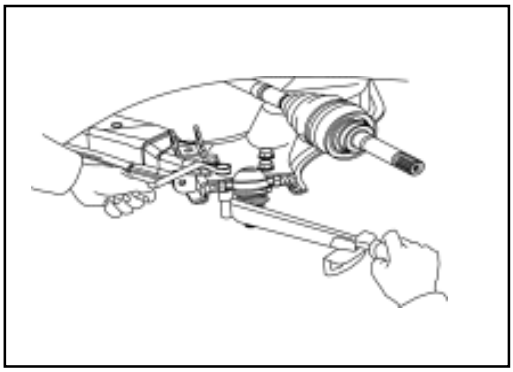
2. Check the upper ball pin for loose move the wheel upwardly and downwardly and check the gap of upper ball pin.

Max. vertical clearance: 0mm



3. Check the rotation of ball pin

a. Remove the ball pin.
b. Shown as figure, shake the ball pin stud forwardly and backwardly for several times before install the nut
c. Rotate the nut continuously by torsion meter and 2-4s for a cycle; record the readout of torsion meter in the fifth cycle.
Tightening torque (for rotary):
Lower ball pin 0.1 － 4N • m
Upper ball pin 0.1 － 4N • m

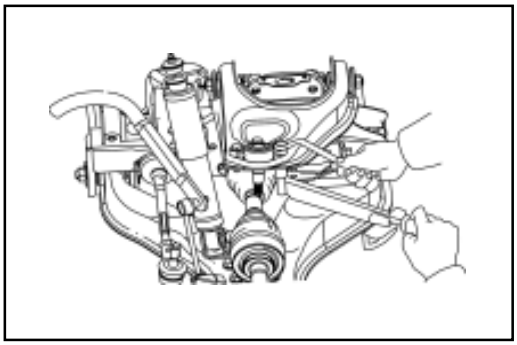


Disassembly of ball pin

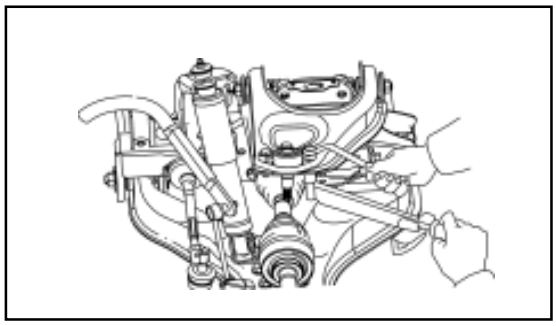
1. Remove the steering knuckle and front hub assembly

(Refer to section “Front Hub and Steering Knuckle”)

2. Remove the lower ball pin form the lower arm



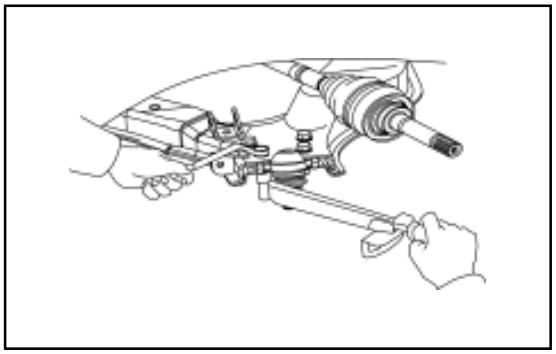
3. Remove the upper ball pin from the upper arm



Installation of ball pin

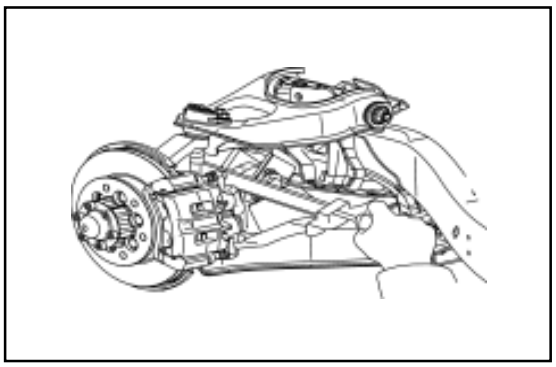
1. Install the upper ball pin on the upper arm

Tightening force: 78 ± 5N • m



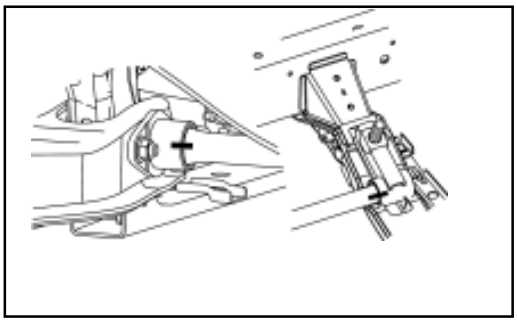
2. Install the lower ball pin on the lower arm

Tightening force: 140 ± 10N • m



3. Install the steering knuckle and front hub assembly

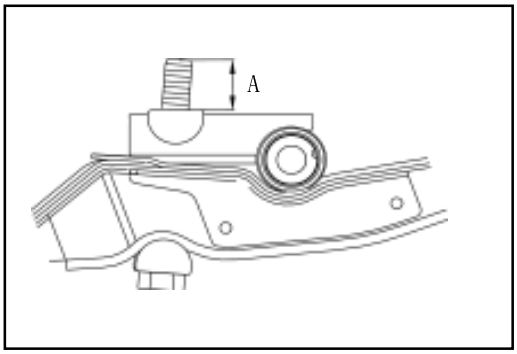
(Refer to section “Front Hub and Steering Knuckle”)



Torsion bar spring

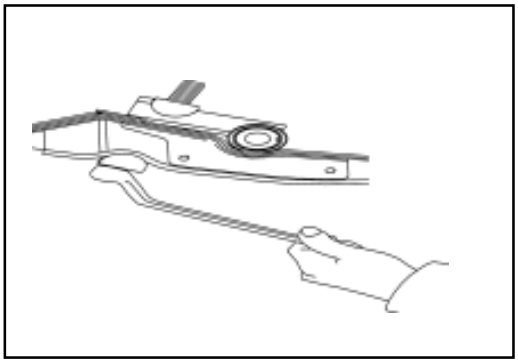
Disassembly of torsion bar spring

1. Make the assembly mark on the torsion bar spring, torsion base and adjusting arm



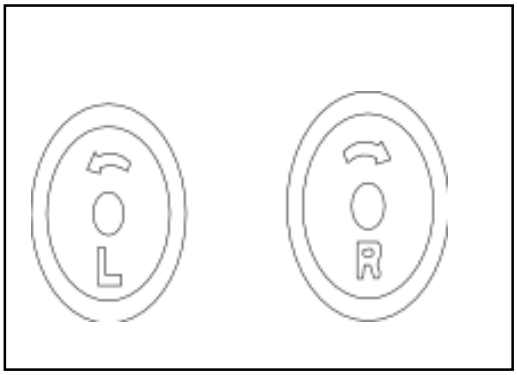
2. Measure the length A of extension section of bolt according to the length shown in figure.

Remarks: The measuring value is for reference when adjust the ground clearance of chassis.



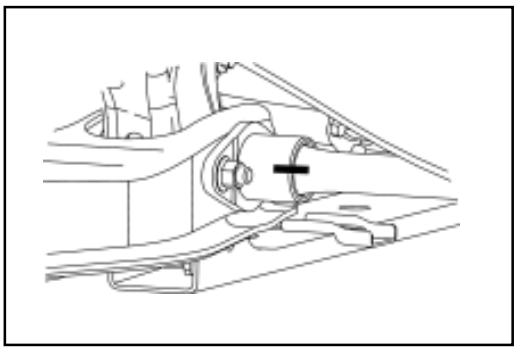
3. Loose the adjusting bolt until the torsion bar spring has not the tension.

4. Remove the fixed arm and torsion bar spring



Installation of torsion bar spring

Remarks: There are the L and R indication marks, which must not be exchanged on the rear end of the torsion bar spring. Mark L means the left while R for right

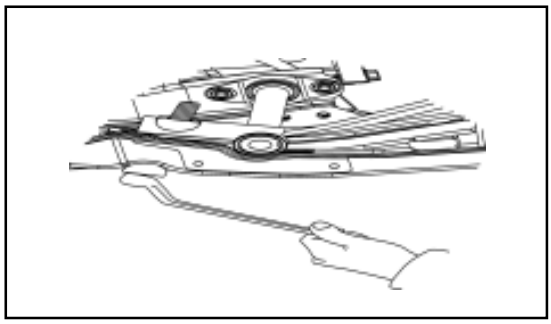


1. For reused torsion bar spring

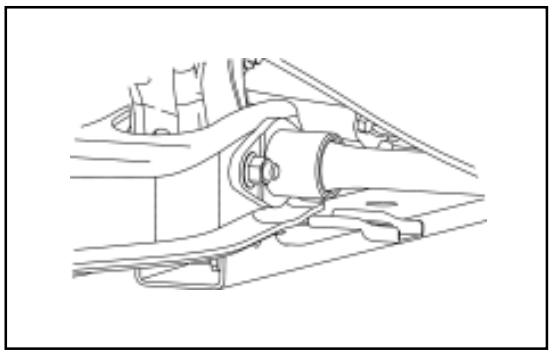
a. Cost the spline of torsion bar spring with grease thin.

b. Align the assembly mark and install the torsion bar spring on the torsion bar.

c. Align the assembly mark and install the adjusting arm on the torsion bar spring.



d. Tighten the adjusting bolt and make the extension length of the bolt equal to the value before disassembly.



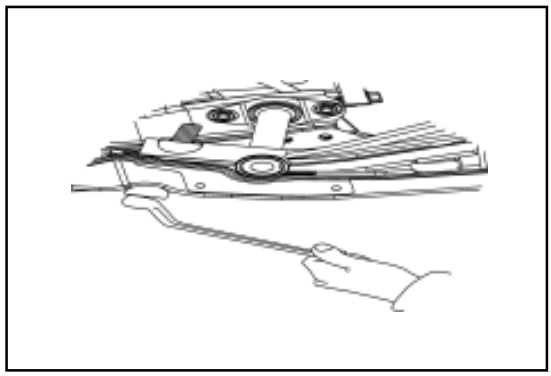
2. For new torsion bar spring

a. Remove the wheel.

b. Coat the spline of torsion bar spring with thin grease.

c. Install the torsion bar spring on the torsion bar base.

d. Lower the lower arm to the lower limitation position; install the adjusting arm in the torsion bar spring with the angle that the adjusting bolt just can be screwed on the upper adjusting block.



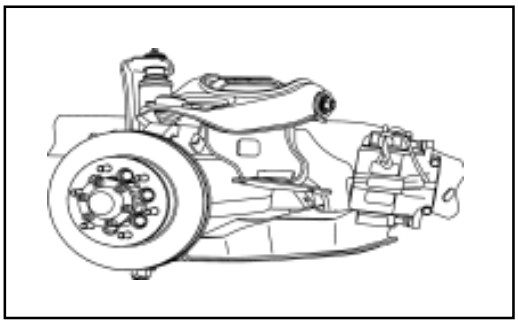
Remarks: It can repeat for several times until proper when adjust the angle.

e. Tighten the adjusting bolt to the specified torque.

Nut tightening limitation: A is about 20-35mm; if A>35mm, then it is adjusted through height of adjusting arm.

f. Install the wheel; remove the bracket; bounce the vehicle for several times to make the suspension enters into the stable status.

g. Rotate the adjusting bolt and adjust the ground clearance of chassis (Refer to 4-Wheel Alignment).

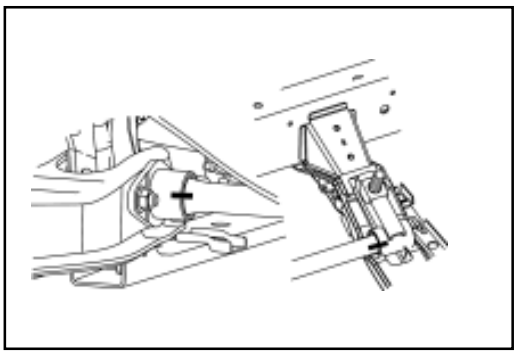


Lower suspension arm

Disassembly of lower suspension arm

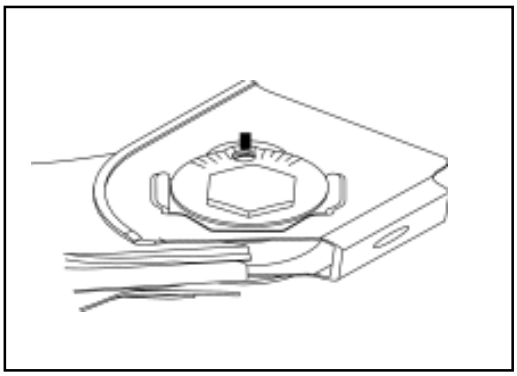
1.The disassembly of the front hub and steering knuckle assembly includes the removal of vibration damper, stabilizer bar and steering cross rod.

(Refer to the section “Front Hub and SteeringKnuckle”)



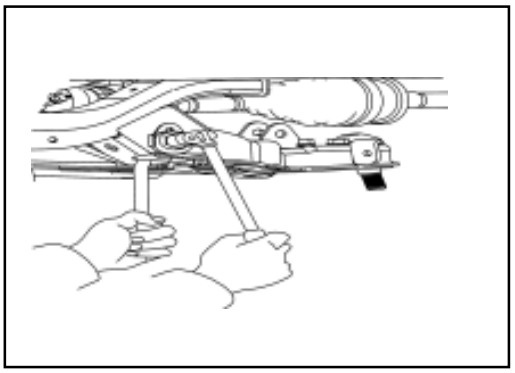
2. Disassembly of torsion bar spring

(Refer to section “Torsion Bar Spring”)

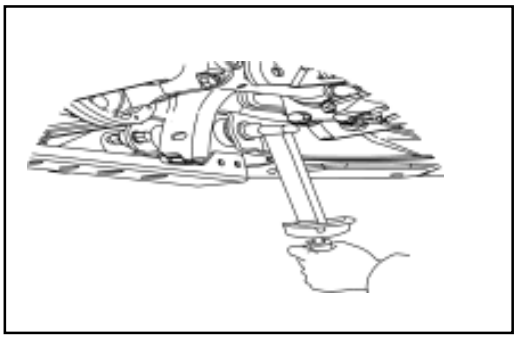


3. Remove the front shaft of lower arm

a. Make the assembly mark on the adjusting cam

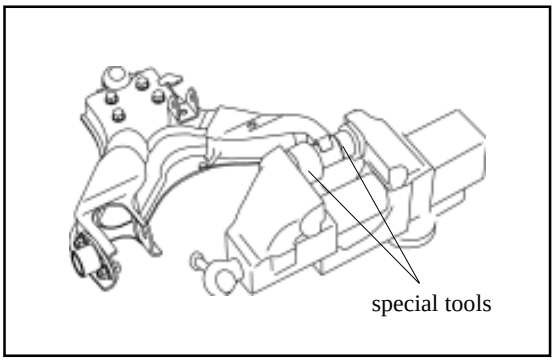


b. Remove the nut and front shaft of lower arm.



4. Screw off the rear shaft of lower arm

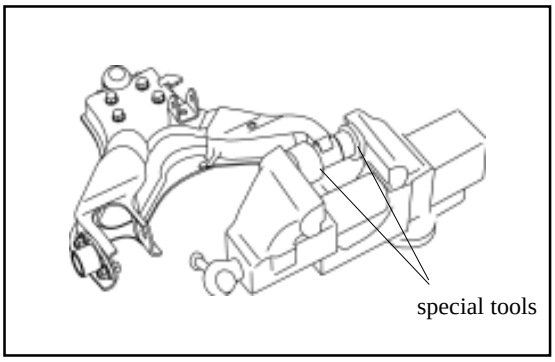
Screw off the nut; remove the rear shaft of lower arm shaft and remove the lower suspension arm.



Replacement of bush of lower suspension arm

1. Remove the short bush of lower suspension arm

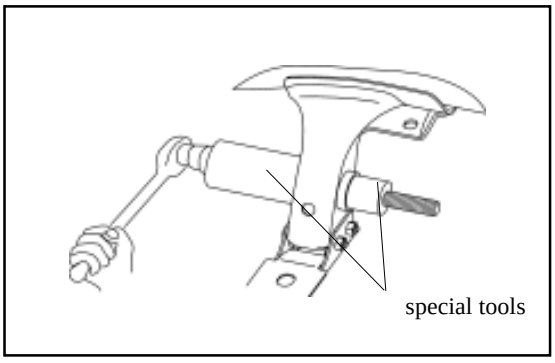
Use the special tools to press out the short bush form the lower arm.



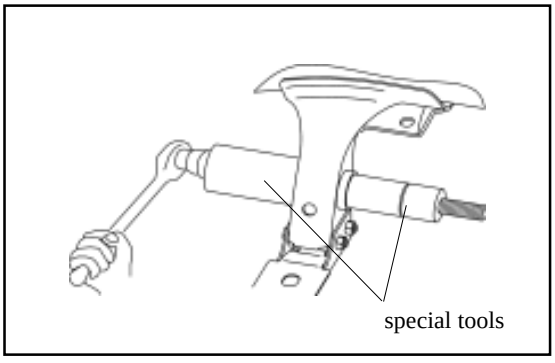
2. Installation of short bush of lower suspension arm

Use the special tools to press the new short bush into the lower arm

Remarks: Do not coat the bush with the grease.

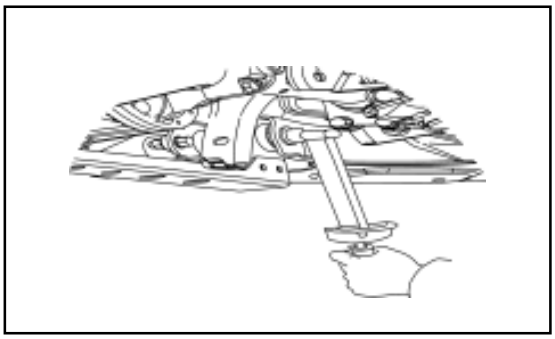


3. Removal of long bush of lower suspension arm Use the special tools to remove the long bush.



4. Install of long bush of lower suspension arm Use the special tools to install the new bush.

Remarks: Do not coat the bush with the grease.



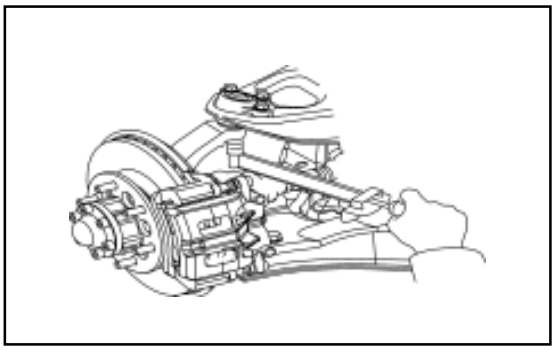
Installation of lower suspension arm

1. Installation of lower suspension arm

a. Install the rear shaft of lower arm and tighten the screw to the specified torque.

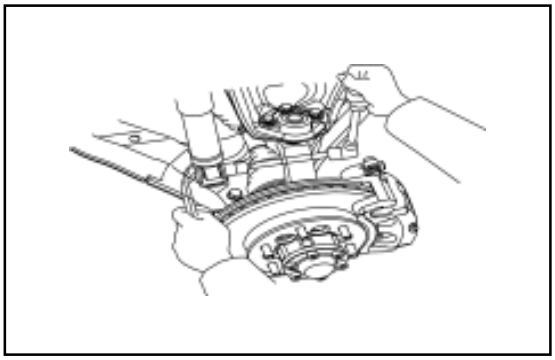
Tightening force: 290 ± 25N • m

b. Install the front shaft of lower arm and pretighten the nut.



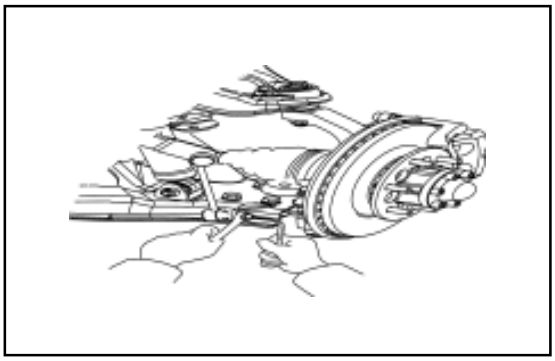
2. Installation of front hub and steering knuckle assembly

(Refer to section “Front Hub andSteeringKnuckle”)



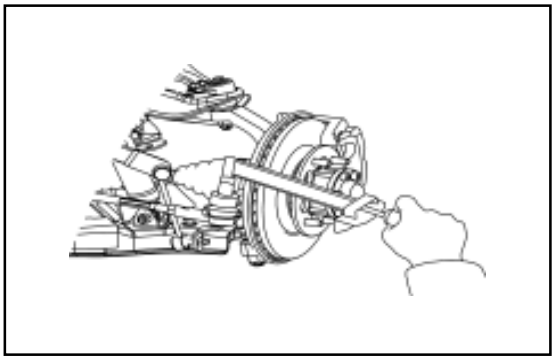
3. Install the vibration damper on the lower suspen sion arm Install the vibration damper on the lower suspension arm bracket.

Tightening force: 90 ± 10N • m



4. Connect the stabi lizer barto the lower susp ension arm.

Tightening force: 63 ± 5N • m



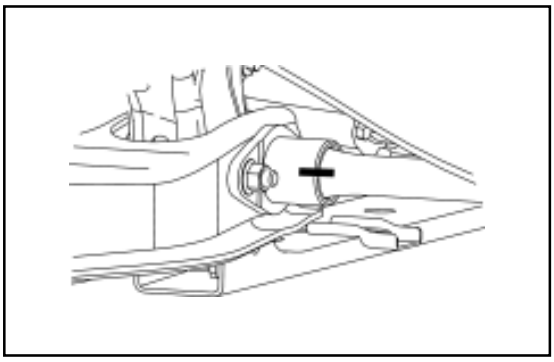
5. Connect the steering cross rod to the steering knuckle arm

a. Connect the steering cross rod to the steering knuckle arm.

Tightening force: 120 ± 10N • m

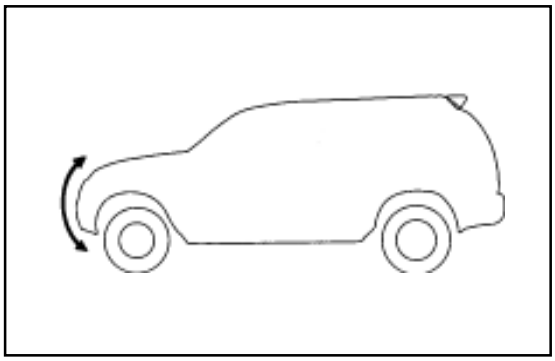
b. Install the new split pin.

Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosed during the alignment.



6. Install the torsion bar spring

(Refer to the section “Torsion Bar Spring”)

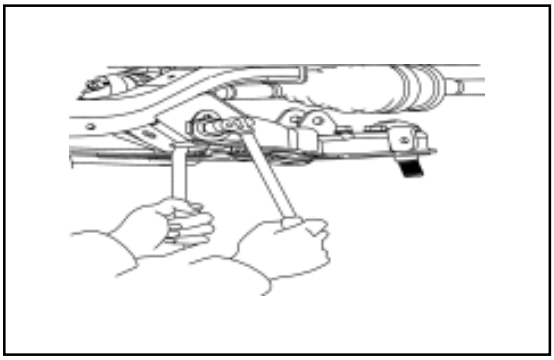


7. Tighten the nut of front shaft of lower arm to the specified torque

a. Install the wheel, remove the bracket and bounce the vehicle for several times to make the vibration damper enters into the stable status.

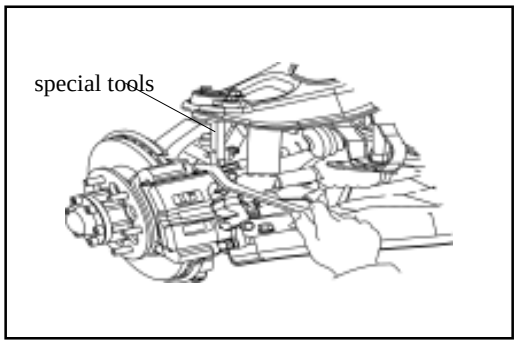
b. Align the assembly mark and tighten the nut to the specified torque.

Tightening force: 240 ± 20N • m



8. Check the wheel alignment parameter

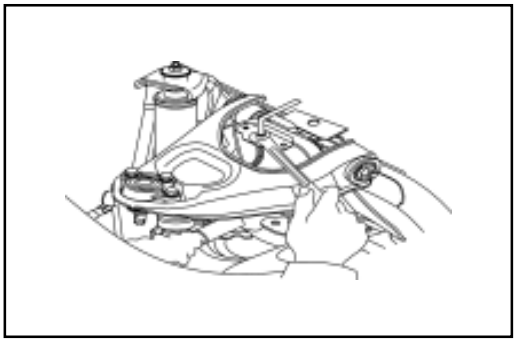
(Refer to 4-Wheel Alignment)



Upper suspension arm

Disassembly of upper suspension arm

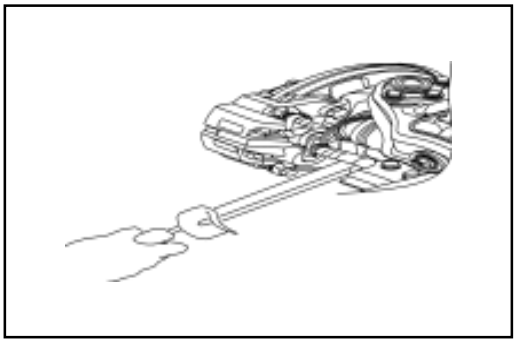
1. Disconnect the upper ball pin form the steering knuckleRemove the split pin and nut; use the special tools to disconnect the upper ball pin from the steering knuckle.



2. Remove the brake oil pipe on the upper arm shaft

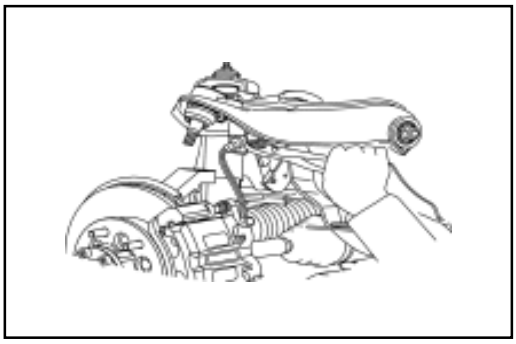
a. Use the open-end wrench to screw off the oil pipe tight nut.
b. Pull out the brake oil pipe and plug it by the rubber plug.

Remarks: There are two two-way valves for rear brake oil pipe beside the right upper arm shaft ; when remove the right upper suspension arm, it must remove four oil pipe tight nuts in the place and plug it by the rubber plug to prevent the brake fluid from overflowing.



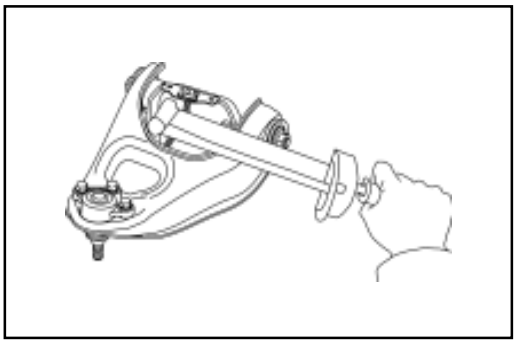
3. Disconnect the brake hose form the brake caliper Remove the hollow bolt and disconnect the brake hose form the brake caliper

Remarks: Must not lose the copper gasket seal.



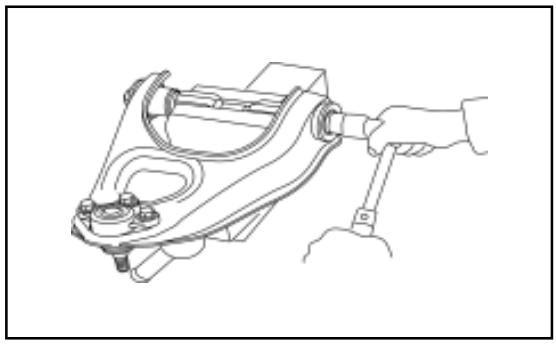
4. Disconnect the brake hose from the upper arm oil pipe bracket.

Use the pliers to pull out the sheet steel spring clip and disconnect the brake hose from the upper arm oil pipe bracket.



5. Remove the upper suspension armRemove two bolts and remove the upper suspension from the armcarriage.

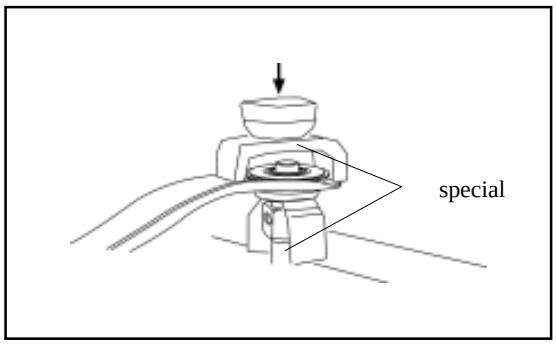
Remarks: Keep the adjusting shim and don't lose it. Record the thickness of front and rear adjusting shim for convenience of reinstalling them in the original position.



Replacement of upper arm bush

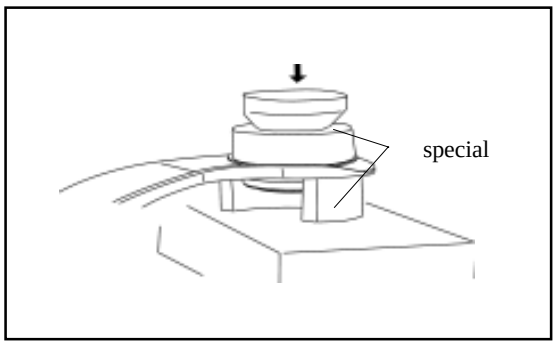
1. Remove the bush

a. Remove the bolt and washer.



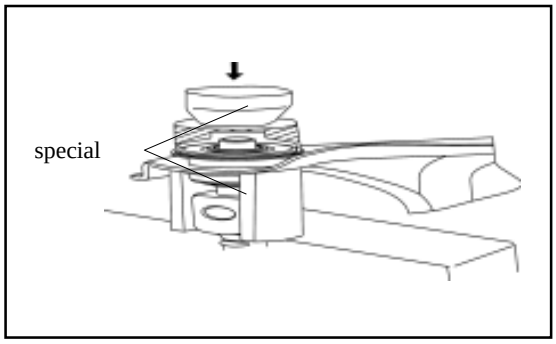
b. Use the special tools to push out the bush.

c. Remove the upper arm shaft; remove another bush in same procedure.

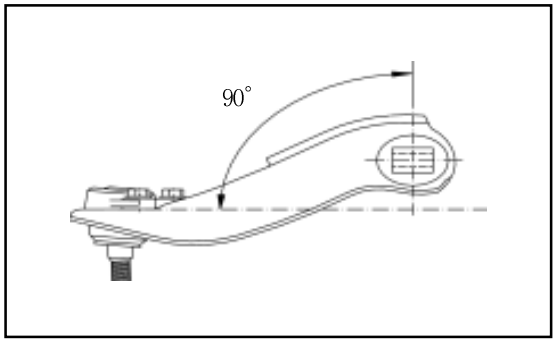


2. Install the bush

a. Use the special tools to press in the bush.



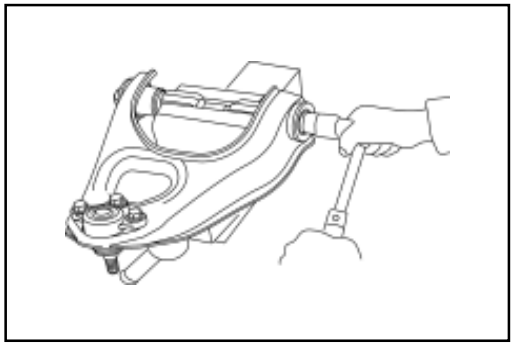
b. Install the upper arm shaft; use the special tools to press in another bush.



3. Tighten the upper arm shaft to specified torque.

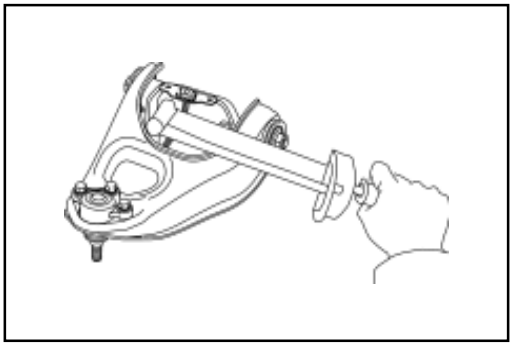
a. Coat the screw of both ends of upper arm shaft with the screw lock sealant; install the washer and nut.

Remarks: Adjust the position of upper lower; make the installation plane of ball pin is vertical to the installation plane of upper arm shaft.



b. Tighten the upper arm shaft nut to specified torque.

Tightening force: 210 ± 10N • m



Installation of upper suspension arm

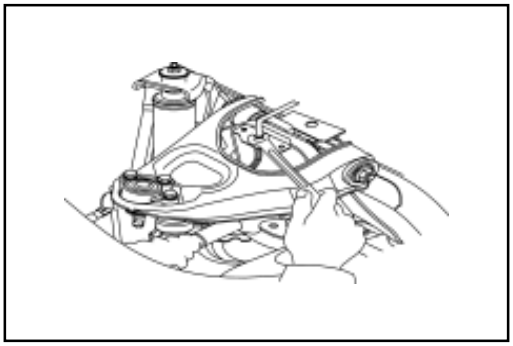
1. Install the upper suspension arm on the carriage

a. Install the upper suspension arm and camber adjusting shim.

b. Tighten all bolts to the specified torque.

Tightening force: 200 ± 10N • m

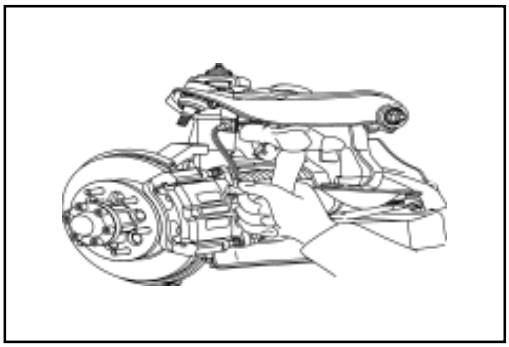
Remarks: Install the shim with same quantity and thickness to the original position.



2. Connect the brake oil pipe of upper arm shaft Tighten the oil pipe compression nut to specified torque.

Tightening force: 15-17N • m

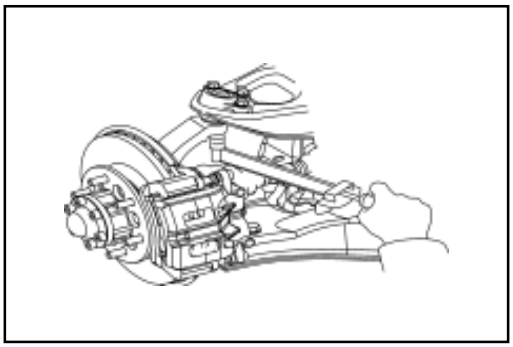
Remarks: It should tighten four connectors of two two-way valves to the specified torque if disassemble the right upper arm.



3. Connect the brake hose to the upper arm oil pipe bracket

a. Thread the brake hose through the hole on upper arm oil pipe bracket.

b. Insert the sheet steel spring clip by the hammer to fix the brake hose.



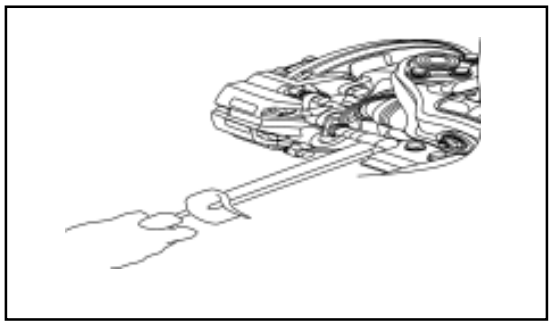
4. Connect the upper ball pin to the steering knuckle.

a. Tighten the slotted nut according to the specified torque.

Tightening force: 145 ± 15N • m

b. Install the new split pin.

Remarks: It should align the notch of nut with the pinhole when install the split pin; the nut can be tightened but not loosed during the alignment.



5. Connect the brake hose to the brake caliper.

Install the copper gasket seal and tighten the hollow bolt to the specified torque.

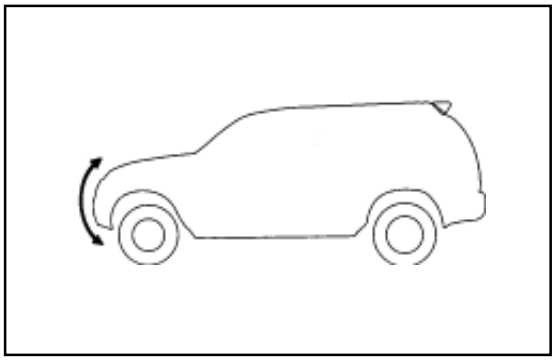
Tightening force: 50±5N·m

6. Discharge the air in front brake system

(Refer to relevant chapter)

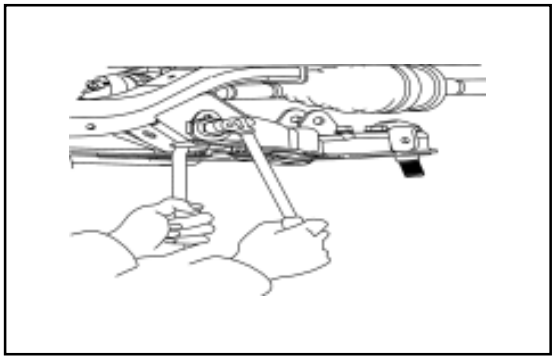
Remarks: It must discharge the air in the rear brake system if disassembly the right upper arm.

7. Check the brake fluid for leakage



8. Tighten the upper arm front shaft nut to the specified torque

a. Install the wheel, remove the bracket and bounce the vehicle for several times to make the vibration damper enters into the stable status.

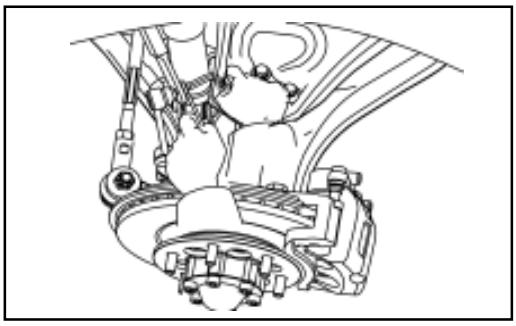


b.Align the assembly mark and tighten the nut to the specified torque.

Tightening force: 240±20N·m

9. Check the wheel alignment parameter

(Refer to 4-Wheel Alignment)

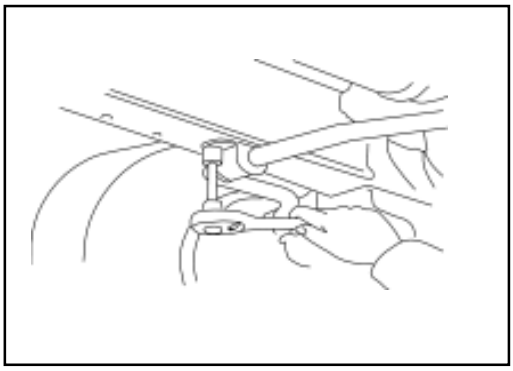


Stabilizer bar

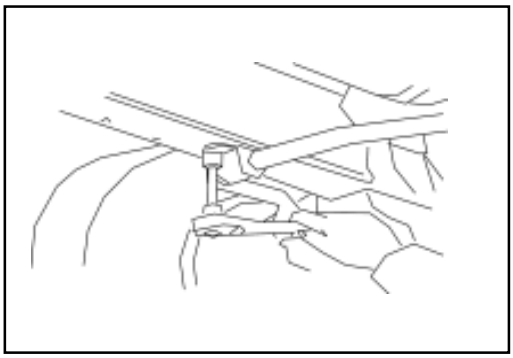
Disassembly of stabilizer bar

1. Disconnect the connecting bar which supports both ends of the stabilizer bar form the stabilizer bar.

Use the inner hexagon spanner to fix the ball pin; remove the self-locking nut.



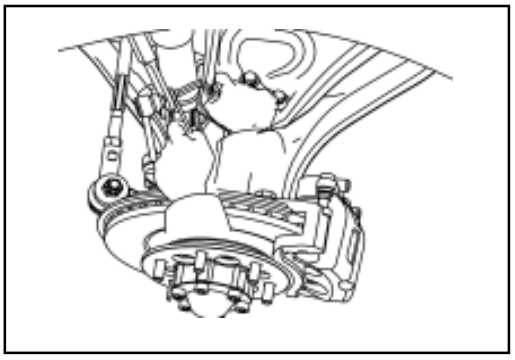
2. Remove the bush and clip of stabilizer bar; remove the stabilizer bar



Installation of stabilizer bar

1. Install the stabilizer bar on the carriage

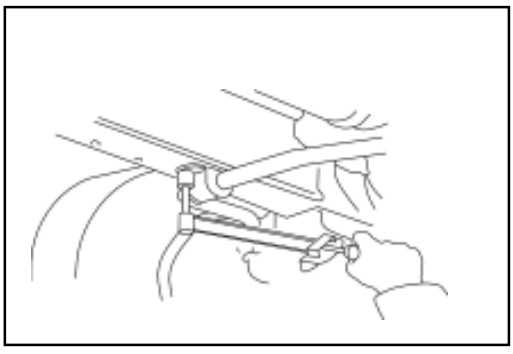
Place the stabilizer bar in position; install the stabilizer bar bush and clip on the carriage. Align the mark on the stabilizer bar to keep the left and right gap of stabilizer bar are same. Then install the bolt temporarily and pretighten it.



2. Connect the stabilizer bar to the connecting rod.

Install and tighten the new nut to the specified torque.

Tightening force: 63 ± 5N • m

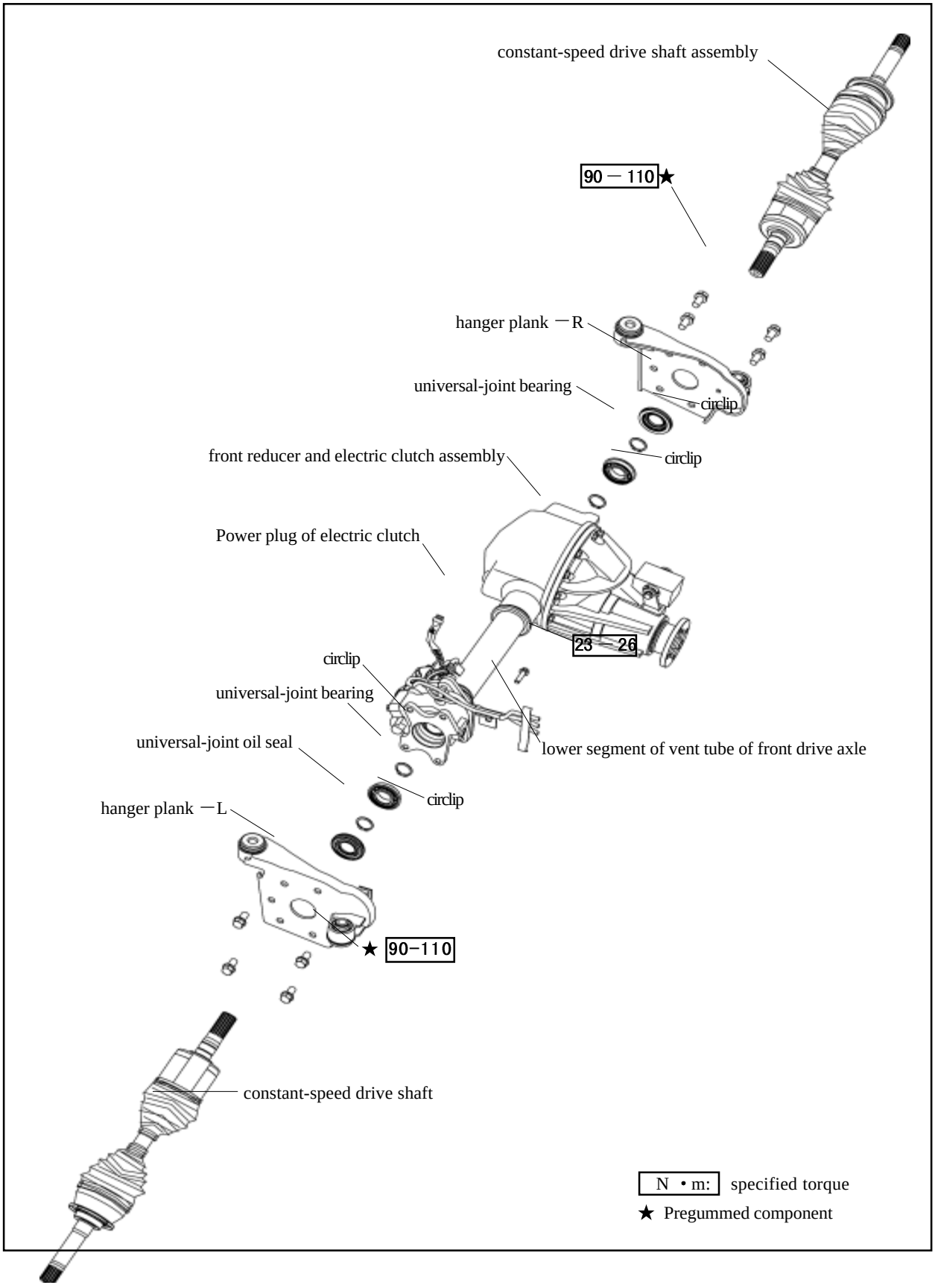


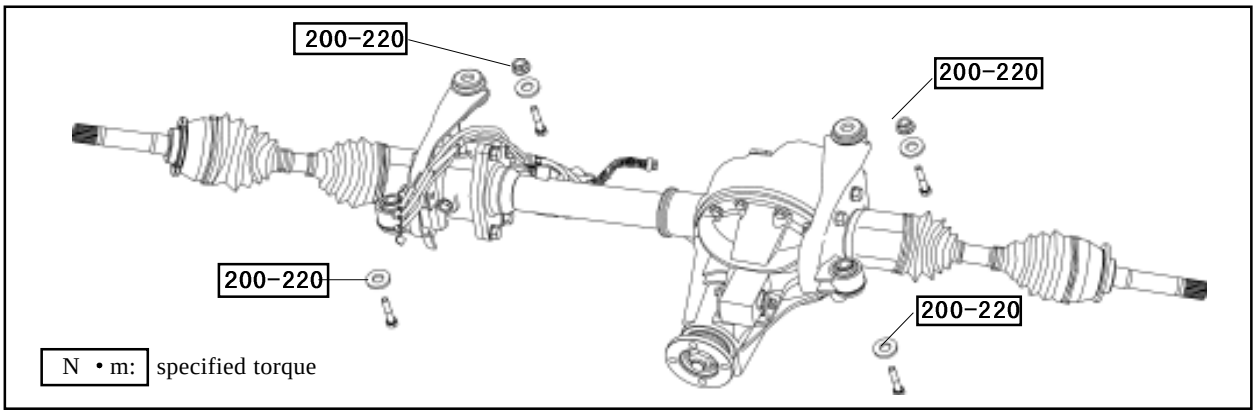
3. Tighten the clip position bolt to specified torque.

Tightening force: 23 ± 2N • m

Constant-speed drive shaft assembly

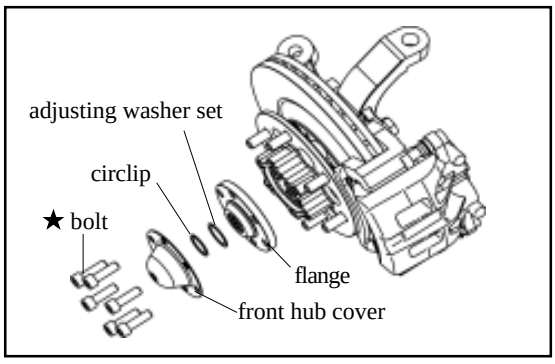
Installation and disassembly drawing of front drive shaft assembly on front drive axle





Disassembly of constant-speed drive shaft assembly

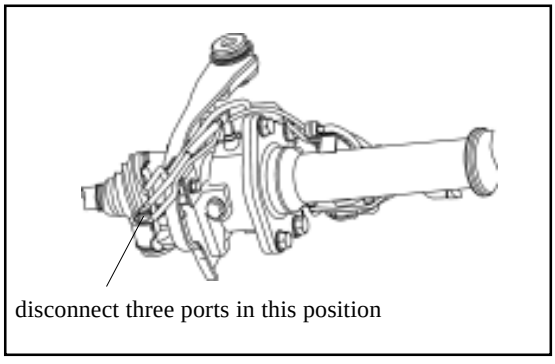
1. **Place the car in the middle of repair platform or trench, support the front of the car steadily(support on the carriage) then remove the left and right front wheel. (make the car in 2WD status before the disassembly)**
2. **Remove the beam on the lower of front drive axle assembly.**
3. **Disconnect the connection of front drive axle flange and drive shaft and make the assembly mark**
4. **Drain the lubrication oil in reducer.**



5. **Screw off the connecting bolt of front hub cover and remove the front hub cover.**

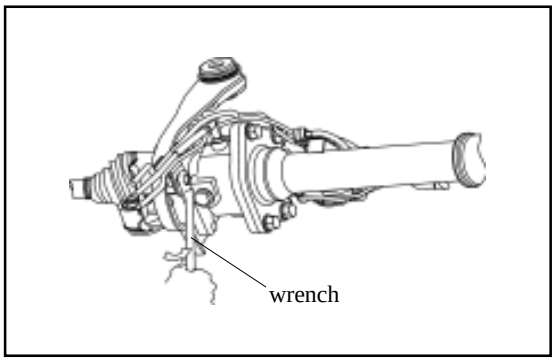
6. **Use the circlip pliers to remove the circlip from the drive shaft and remove the washer and steering knuckle of left and right end.**

(Refer to the "Disassembly of Steering Knuckle ssembly")

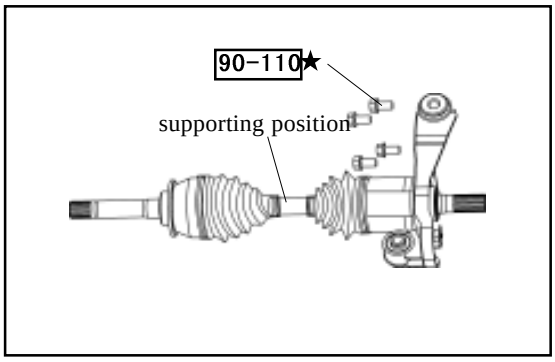


7. **Disconnect the power wire connector of electric clutch.**

8. **Disconnect the connecting place of front drive axle vent tube connector assembly and rubber tube in left hanger plank of front drive axle.**



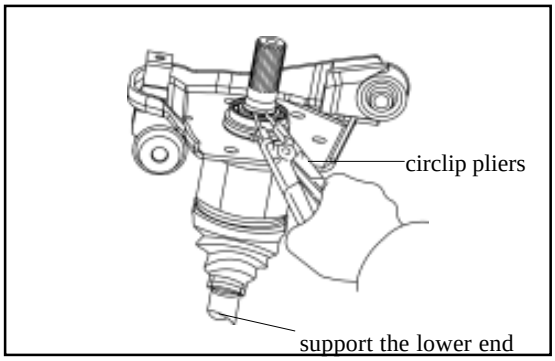
9. Use the wrench to screw off the bolt which fixes the lower segment assembly of front drive axle vent tube on the vent tube bracket.



10. Support the front drive axle by the jack; screw off the lifting bolt of hanger plank and carriage.

11. Remove the complete drive axle.

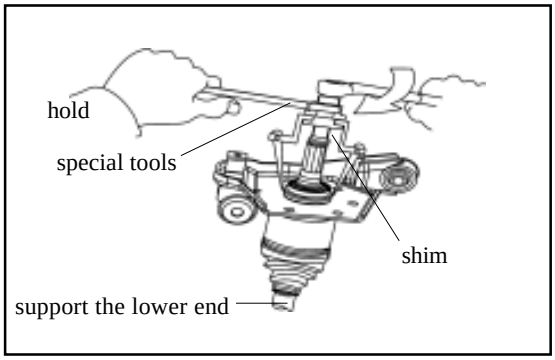
12. Screw off the connecting bolt of hanger plank and front drive axle assembly.



13. Pull out the left and right front drive shaft assembly with the oil seal, hanger plank and bearing.

14. Use the circlip pliers to remove the outside circlip of bearing.

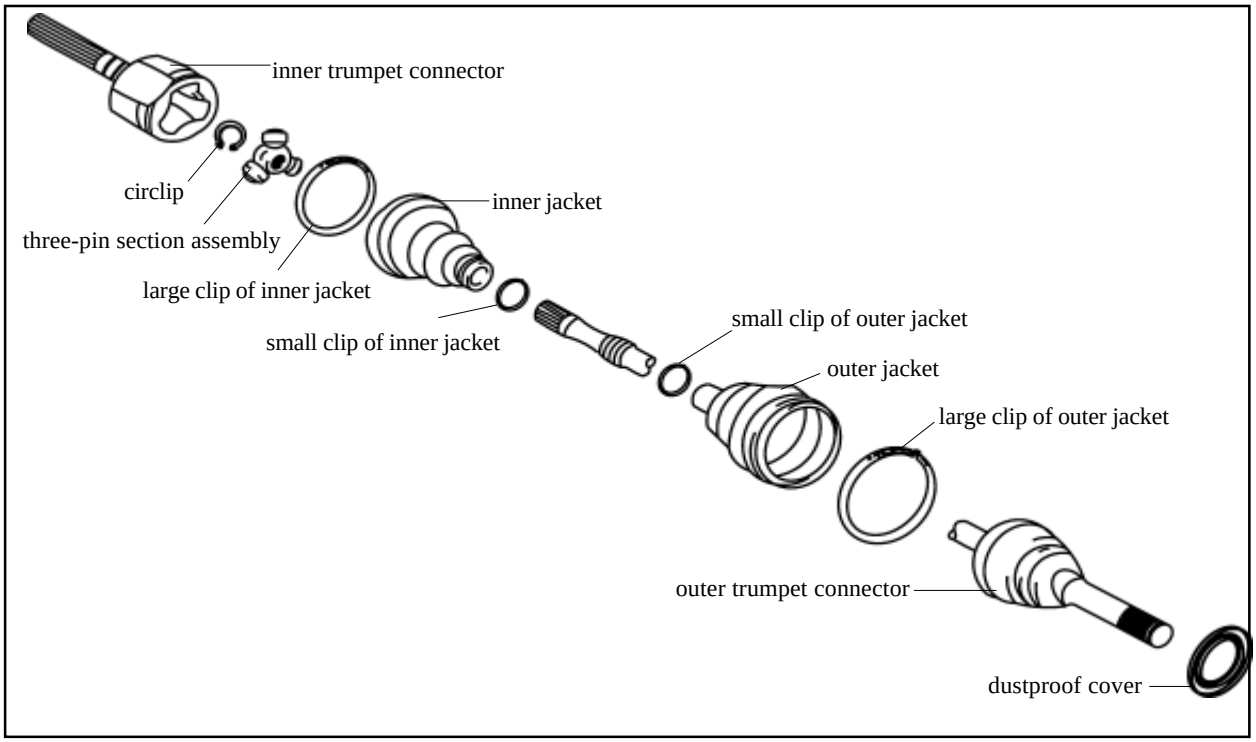
15. Use the special tools pull out the bearing.



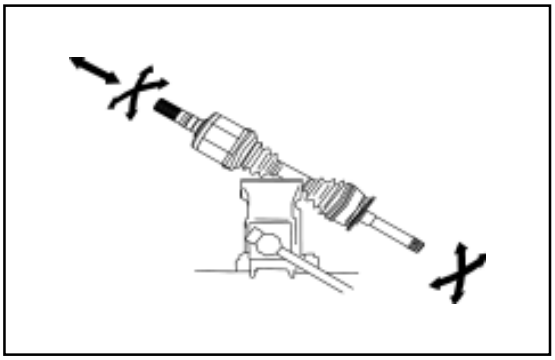
16. Use the circlip pliers to remove the circlip on another side of bearing.

Caution: During the disassembly, support the lower end of drive shaft and prevent the drive shaft from sliding out from the inner jacket, meanwhile, it could not damage the inner and outer jacket.

Constant-speed drive shaft assembly



Disassembly of constant-speed drive shaft assembly



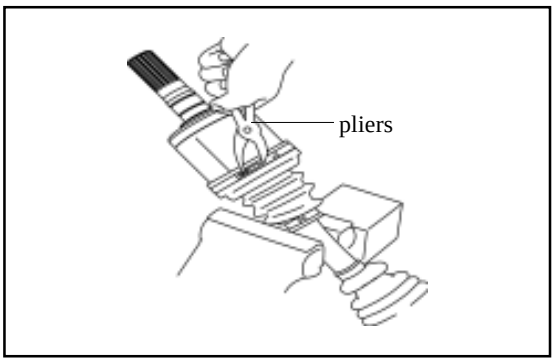
1. Check the front drive shaft assembly

a. Check the inner trumpet connector; it could slide in axial direction smoothly.

b. Check the universal-joint position; it should be without the clear clearance in radius direction.

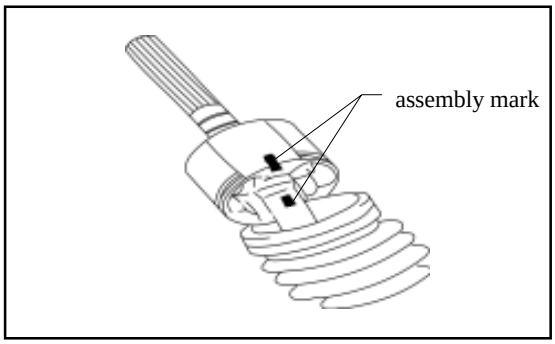
c. Check the inner and outer jacket for damage.

Caution: It should use the pad when clamp the front drive shaft to avoid the damage of it.



2. Remove the large clip of inner jacket

Caution: Do not damage the inner and outer jacket

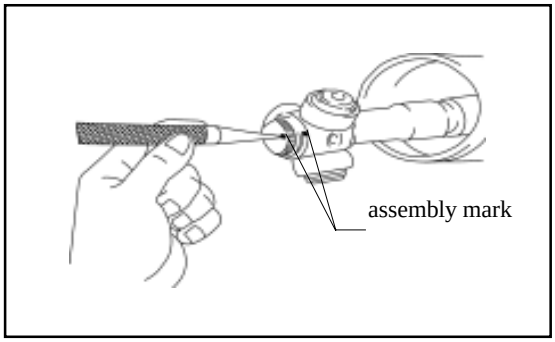


3. Disassembly of inner trumpet connector

a. Make the assembly mark on the inner trumpet connector and three-pin section assembly.

Caution: remove the grease in the connector before make the mark and don't make the mark by the hard object such as punch.

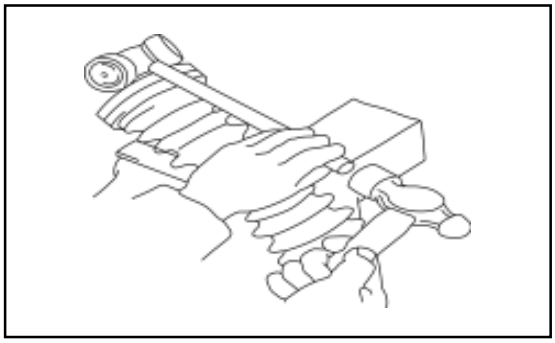
b. Remove the inner trumpet connector.



4. Disassembly of three-pin section assembly

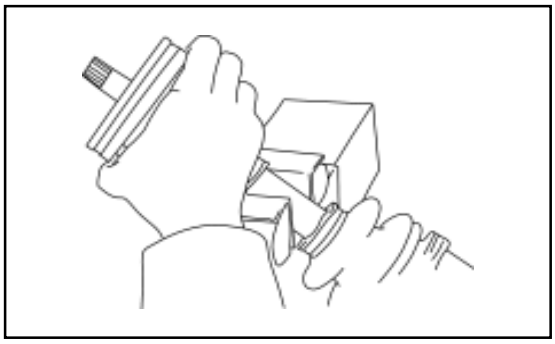
a. Use the circlip pliers to remove the circlip.

b. Use the adz and hand hammer to make the assembly mark on the shaft and three-pin section assembly.



c. Use the cooper bar and hand hammer to remove the three-pin section.

Caution: Remove the cooper chip on the shaft or three-pin section assembly if has.

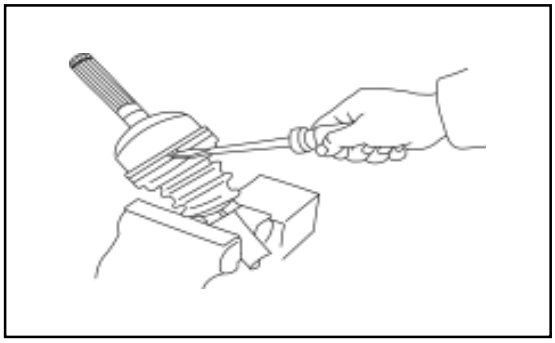


5. Remove the inner jacket

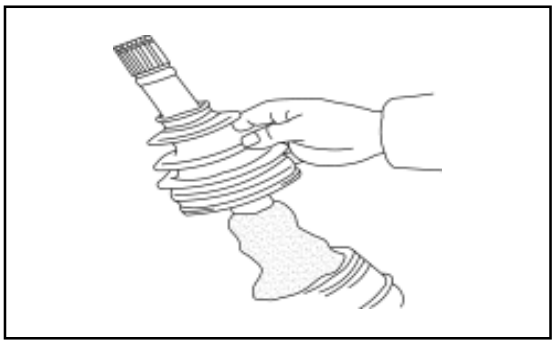
a. Use the pliers to disassemble the small clip of inner jacket.

b. Pull out the inner jacket.

Caution: Remove the grease in the jacket and maintain the clean field.

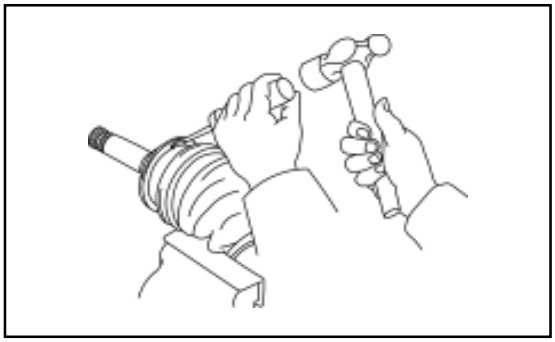


6. Use the straight screwdriver to disassemble the large and small clip of outer jacket.

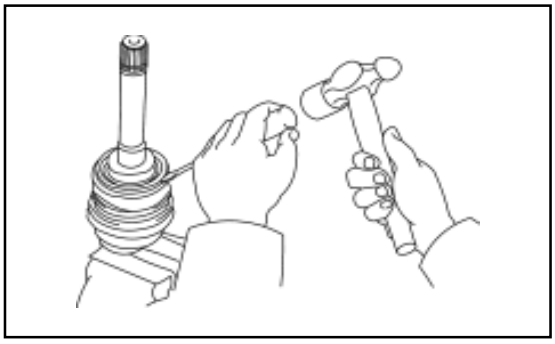


7. Remove the outer jacket

Caution: Clean the protective jacket and remove the grease on the outer trumpet connector. Do not disassemble the outer trumpet connector.



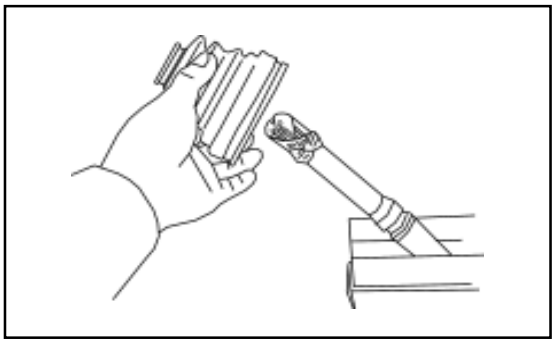
8. Use the screwdriver and hand hammer to remove the dustproof cover.



Assembly of constant-speed drive shaft assembly

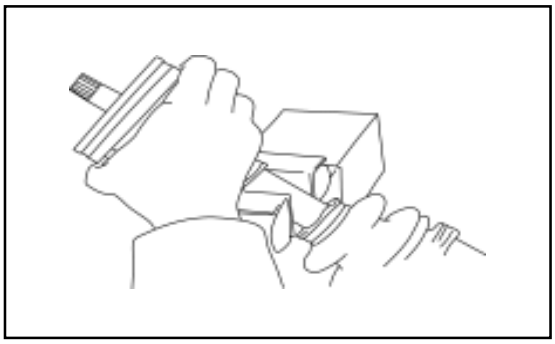
1. Use the hand hammer and screwdriver to install the dustproof cover

Caution: The dustproof cover should be replaces when itisdeformed heavily.



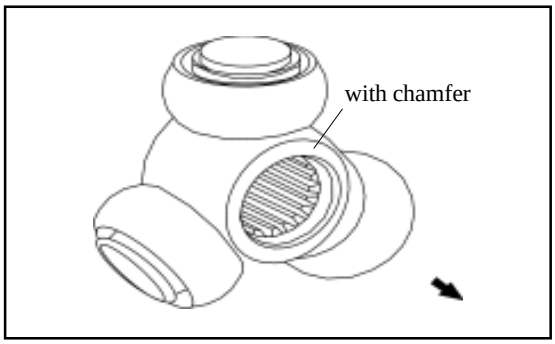
2. Install the large clip of outer jacket, outer jacket and small clip of outer jacket.

Caution: The outer jacket should be replaced when it is damaged or aged heavily and warp the end of the shaft with the plastic band and coat with small grease before insert it.



3. Insert the small clip of inner jacket, inner jacket and large clip of inner jacket.

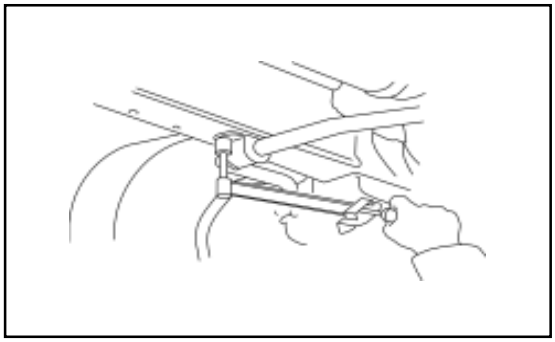
Caution: The inner jacket should be replaced when it is damaged or aged heavily.



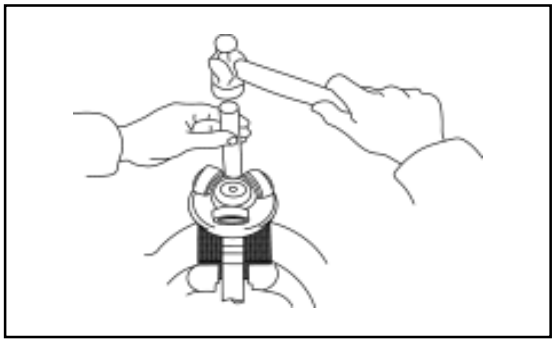
4. Install the three-pin section assembly on the front drive shaft.

a.Let the end of three-pin section assembly with chamfer faces the shaft inner direction.

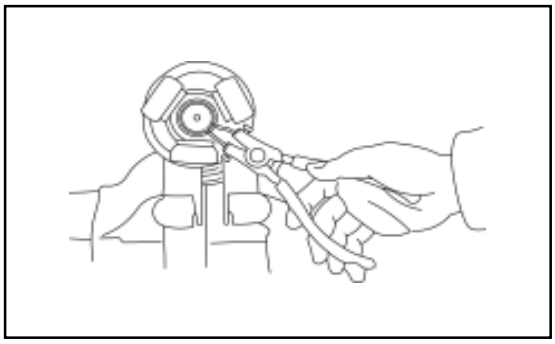
Caution: The three-pin section assembly should be replaced if its needle bearing position is damaged.



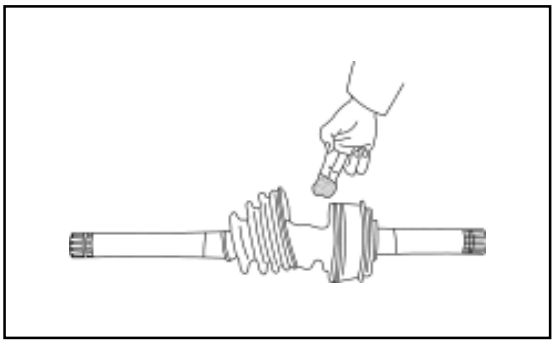
b.Align the assembly mark made before disassembly.



c. Use the hand hammer and copper bar to install the three-pin sec tion assembly to the front drive shaft.



d.Use the circlip pliers to install the new circlip.

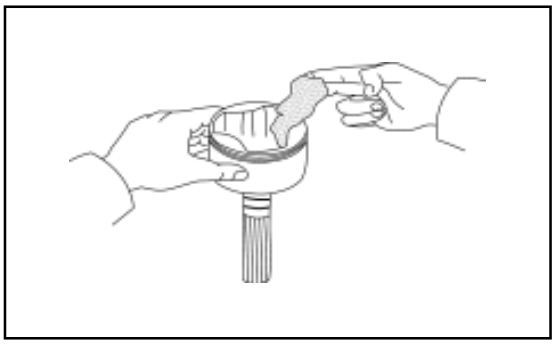


5. Install the outer jacket on the outertrump etconn ector.

Fill the jacket with the grease supplied with the jacket before install the jacket.

(Recommend used grease is CAPLEX or KY1)

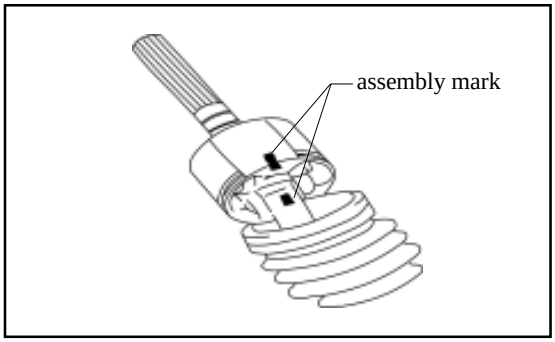
Grease using amount: About 110g



6. Install the inner trumpet connector on the front drive shaft

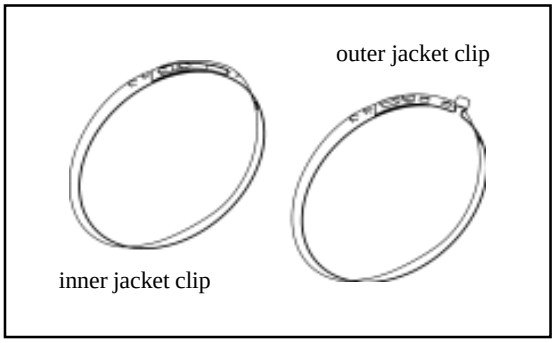
a. Fill the inner trumpet connector and inner jacket with the grease supplied with the jacket

(Recommend used grease is CAPLEX or KY1). Amount About140g

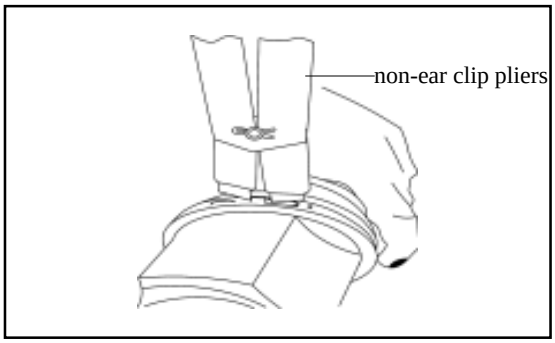


b. Align the assembly mark made during disassembly; covered with inner trumpet connector.

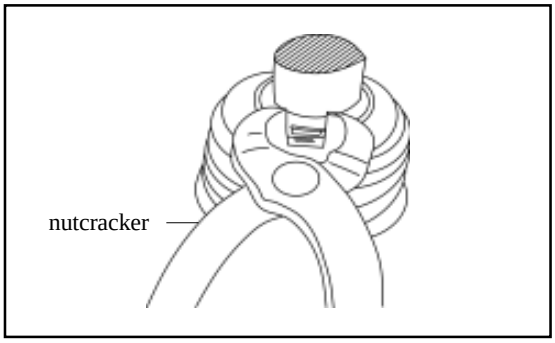
c. Cover the inner jacket on the inner trumpet connector.



7. Use the inner and outer jacket clip pliers to clamp the inner and outer jacket.

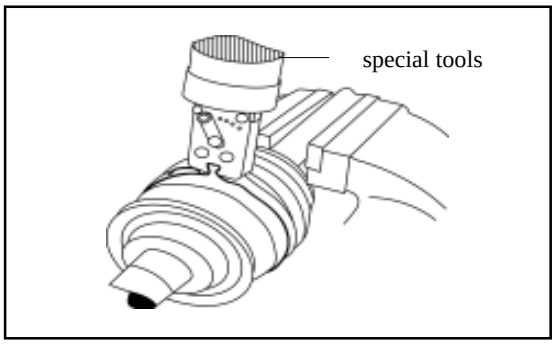


a. Use the special non-ear clip pliers to lock the large clip of inner jacket.

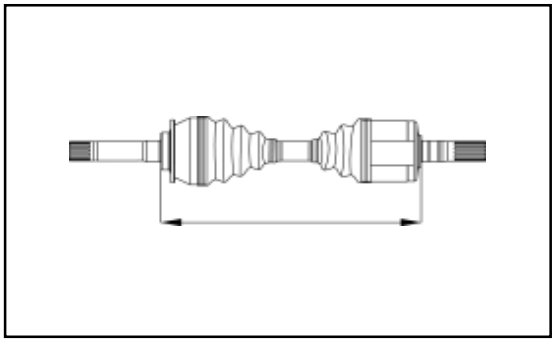


b. Use the nutcracker to lock the small clip of inner jacket.

Caution: Ensure the large and small connecting place of jacket is in the corresponding groove of trumpet connector and shaft.

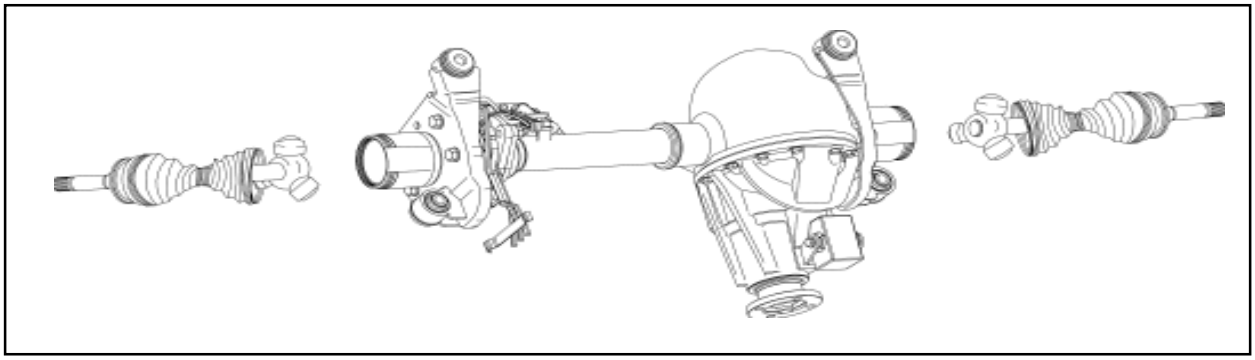


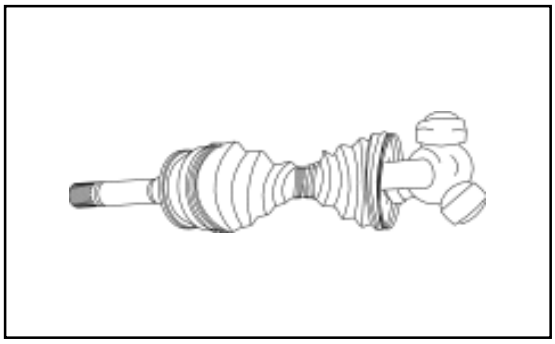
c.Use the special pneumatic pliers to lock the large and small clip of outer jacket.



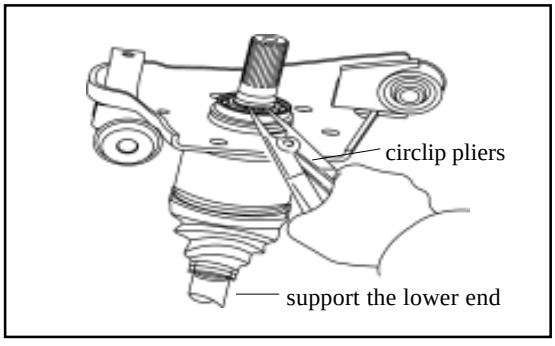
d.Ensure the jacket of both sides does not be prolonged or shortened when the front drive shaft has the standard length.

Standard length: 400.5mm





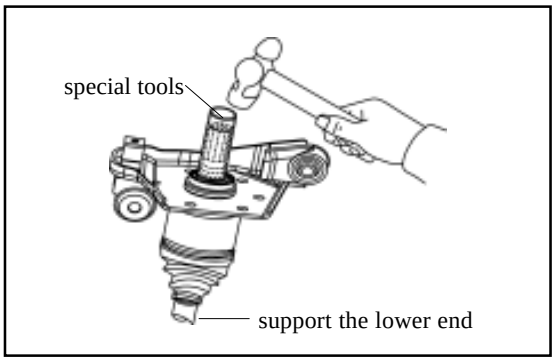
If only need to replace the outer components of front drive shaft assembly on car, it can remove the left and right steering knuckle of car, then disconnect the inner trumpet connector of front drive shaft assembly, then take out the three-pin section assembly and shaft from the inner trumpet connector for replacement.



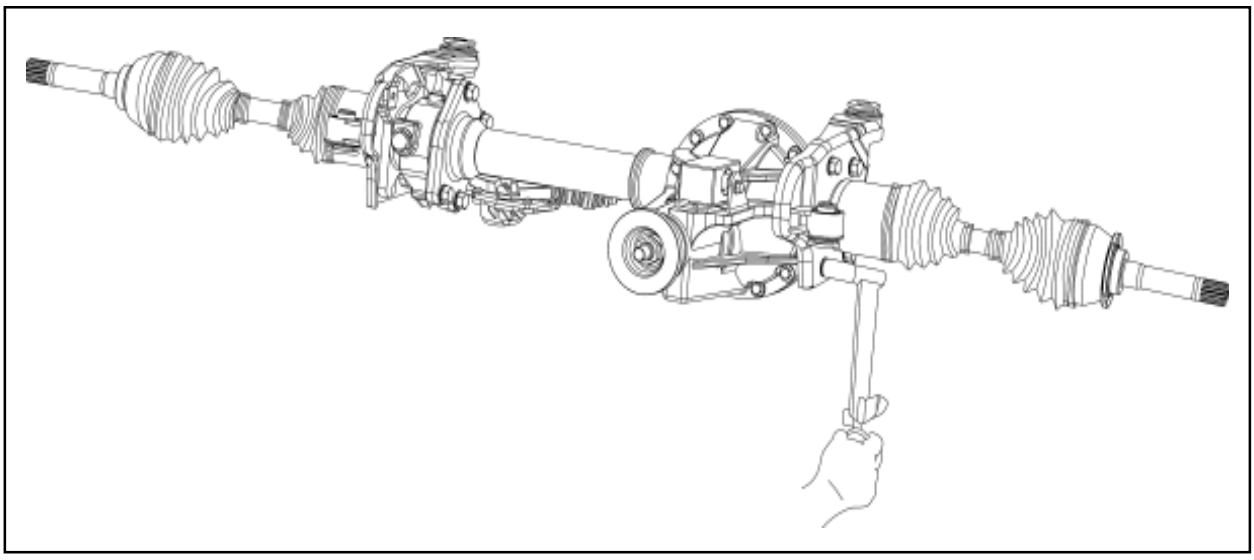
Installation of constant-speed drive shaft assembly on front drive axle

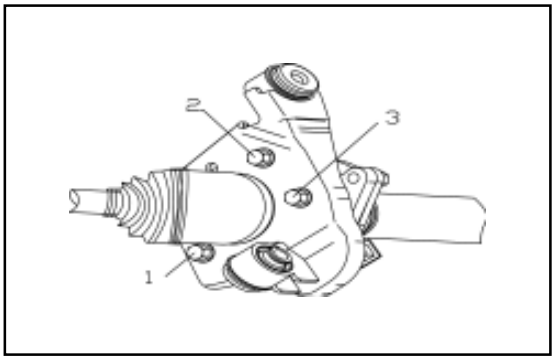
1. Insert the hanger plank into the drive shaft, inserted with oil seal; use the circlip pliers to install the inner circlip.

Caution: It should replace the oil seal if damaged.

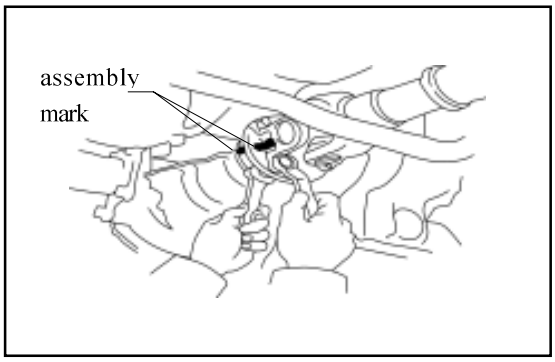


2. Use the special tools to knock bearing in slightly.
Caution: Support the lower end of the drive shaft assembly when knock the bearing in. The lower end must not slide out.
3. Use the circlip pliers to install the outer circlip on the front drive shaft assembly.
4. Repeat the previous method to install the hanger plank, oil seal, circlip, bearing and circlip on another end.
5. Insert the spline of connecting end of drive shaft and reducer into the differential halfaxle gear spline hole of electric clutch and reducer slowly.
6. Drip 1-2 drop of screw lock agent on the middle of screw of connecting bolt of hanger plank andreducer.





7. Use the wrench to tighten the connecting bolt of hanger plank and drive axle to specified torque.
specified torque : 90-110N • m
Caution: It should screw on all bolts before tighten them, then tighten them in diagonal direction.
Check the hanger plank for levelness after tightened the bolt to the specified torque. Remove the hanger plank and reinstall it if is not planished.
8. Install the vent tube connector assembly; connect all ports to front drive axle.
(Refer to “Assembly of Front Reducer Assembly”)



9. Use the jack to support the complete drive axle; use the hangerplank to lift the drive axle and tighten the lifting bolt to the specified torque; install steer ing knuckle both sides and upper and lower ball pin; connect the connecting port of front axle vent tube assembly and carriage; recon nect the connector of electric clutch.

Specified torque : 200-220N • m

Caution: Drip 1-2 drop of screw lock agent on the middle front part of the lifting bolt

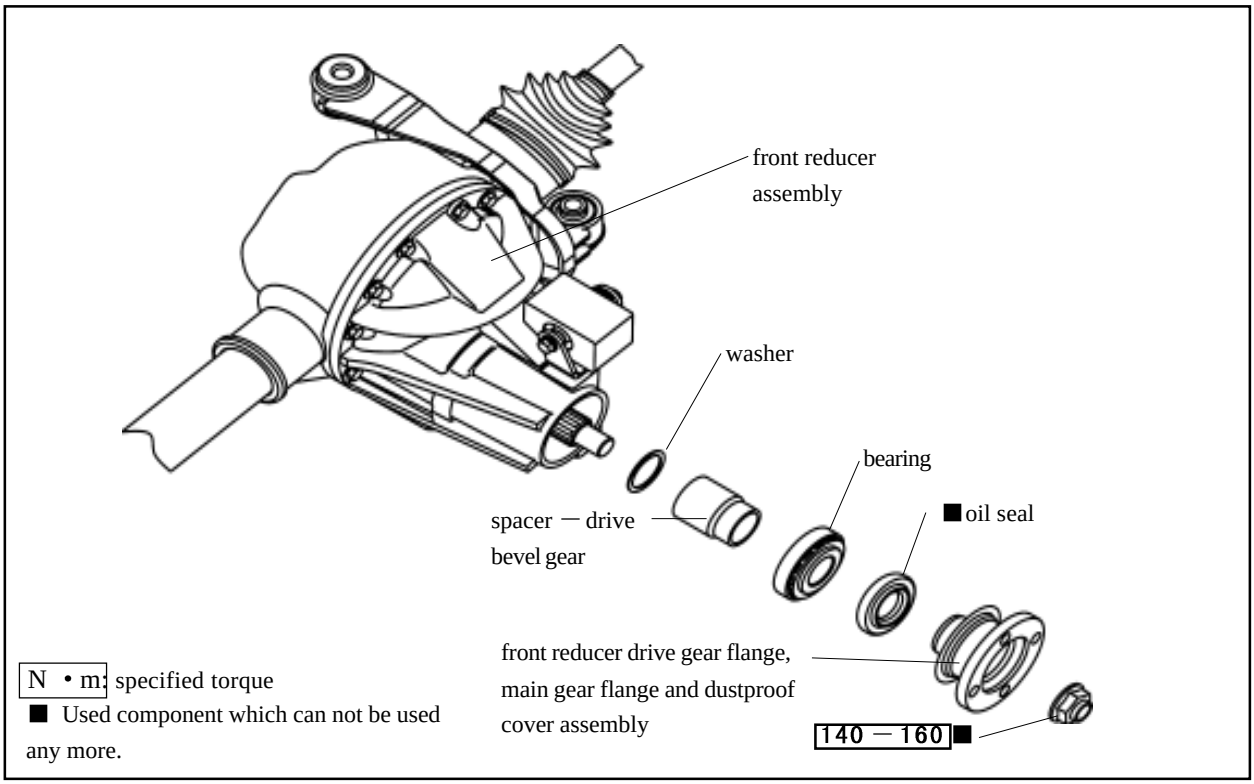
10. Use the bolt to connect the front drive axle flange and drive shaft according to the mark mage before disassembly and tighten it to the specified torque.

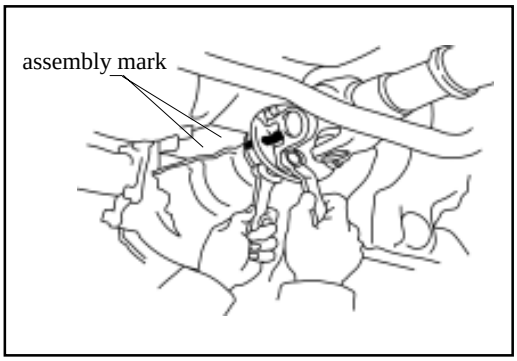
specified torque: 73-83N.m

11. Install the beam under the front drive axle. Tighten the beam connecting bolt to the specified torque.

specified torque: 73-83N.m

Replacement of drive gear oil seal of front reducer assembly





1. Support the front of car; remove the left and right front wheel and the beam under the reducer.

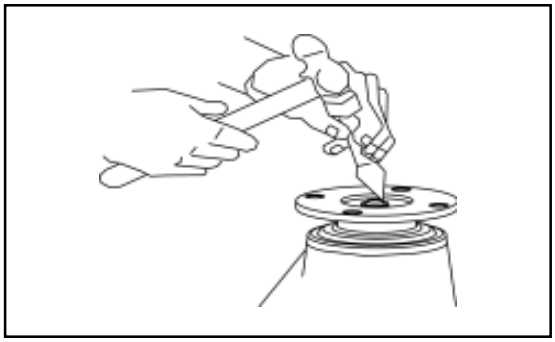
2. Drain the lubricant oil in the front reducer; remove the left and right steering knuckle

3. Disconnect the front reducer assembly flange from the drive shaft and use the jack to remove the front drive axle

Caution: Make the assembly mark on the reducer and drive shaft before separate them.

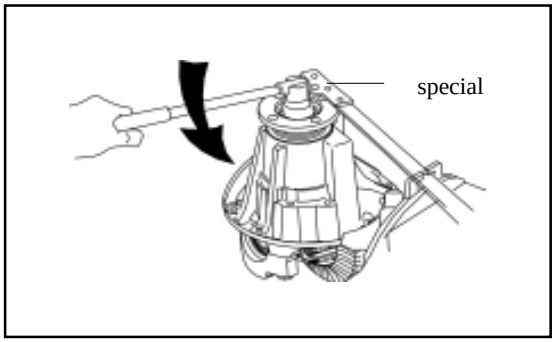
4. Remove the front differential assembly

(Caution: Drain the oil in front differential before the disassembly)

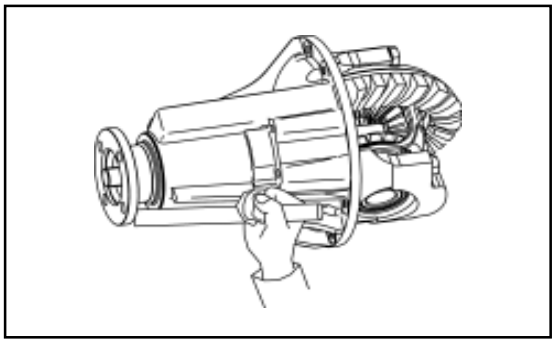


5. Remove the drive gear flange and dustproof cover assembly

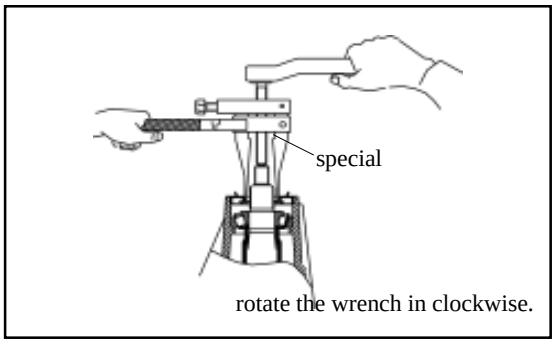
a. Use the hand hammer and chisel to loose the riveted part on nut.



b. Use the special tools to clamp the drive gear flangeandremove the drive gear nut.

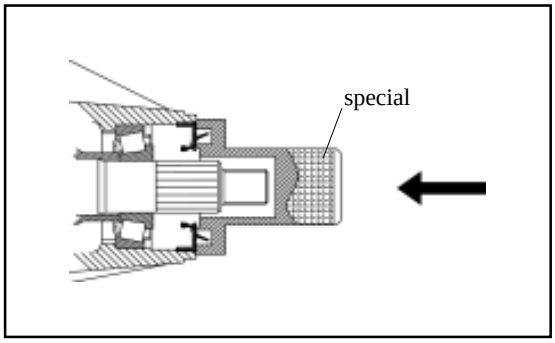


c. Use the cooper bar to knock down the drive gear flange and dustproof cover assembly.



6. Remove the drive gear oil seal

Use the special tools to remove the oil seal; do not damage the inner wall of reducer housing.

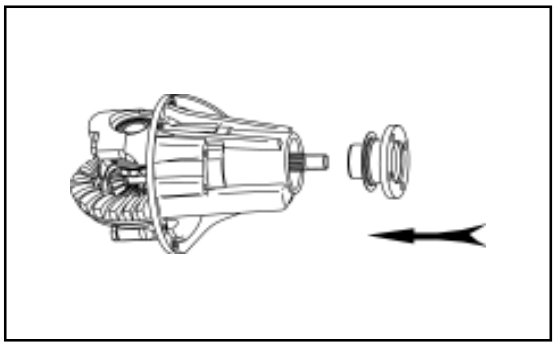


7. Install the new drive gear oil seal

a. Use the special tools to knock into the new oil seal.

b. The top of the oil seal is level to the top of reducer housing.

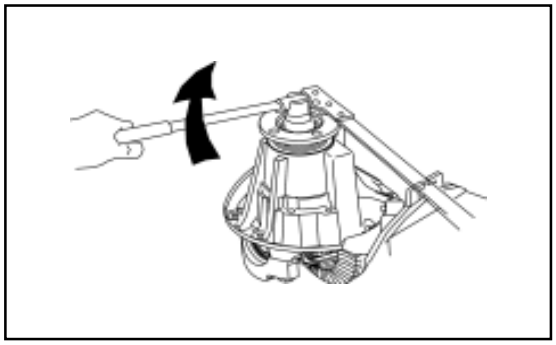
Caution: Coat the oil seal lip with the lithium base grease and the oil seal should be in correct position.



8. Install the drive gear flange and dustproof cover assembly

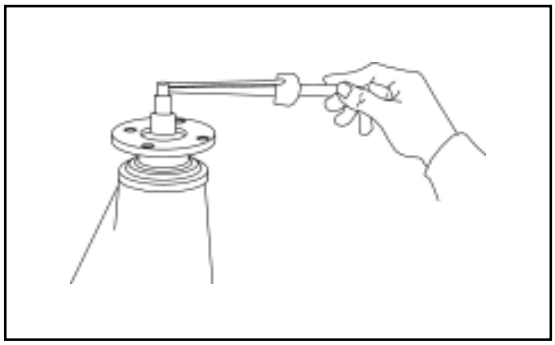
a. Match the drive gear flange and dustproof cover assembly on the front drive gear.

b. Coat the new nut with the lithium base grease.



c. Use the special tools to clamp the flange and tighten the nut to the specified torque.

Tighten torque:140-160N.m



9. Adjust the pre-applied load of the drive bevelgear bearing

a. Use the torque meter to measure the pre-applied load of the gap between the drive bevel gear and driven bevel gear.

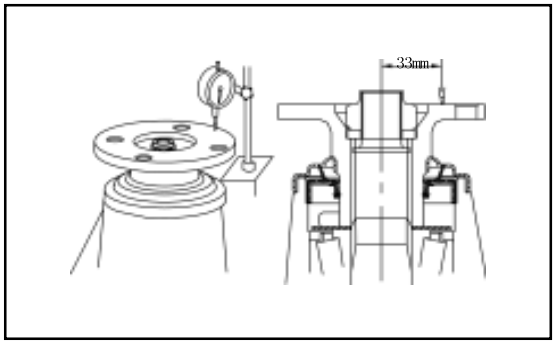
pre-applied load: 1.2-1.7N.m

b. Is should be replaced by the thicker washer if the pre-ap plied load is more than specified value

(The step of thickness of washer is 0.03mm)

c. Is should be replaced by the thinner washer if the pre-applied load is less than specified value. Repeat the previous operation until meet the requirement.

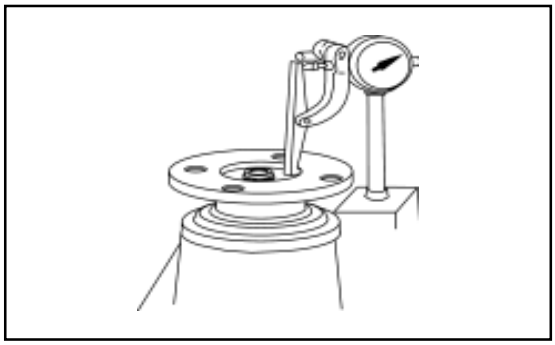
Caution: Do not reduce the load by loosing the nut.



10. Check the axial and radial run-out tolerance offlange.

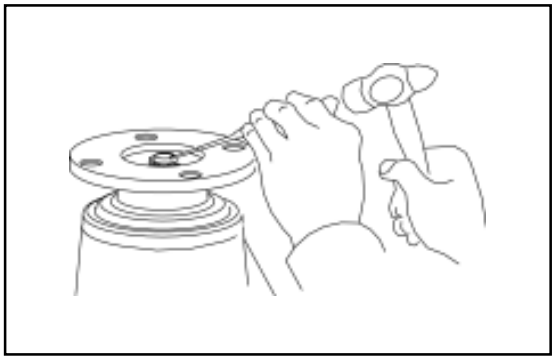
a. Use the dial indicator to measure the axial runout of flange.

Max. axial runout: 0.1mm



b. The max. radial run-out tolerance is 0.1mm

It should check the bearing if the radial run-out tolerance is large.



11．Rivet the drive gear nut after meet the previous requirements.

12．Install the reducer assembly on the front drive axle assembly and assemble the front drive shaft assembly (refer to Assembly of Front Reducer Assembly and Assembly of Front Drive Shaft Assembly)

13．Install the oil drain plug; screw off the oil filling plug and filled with the hypoid gear oil.

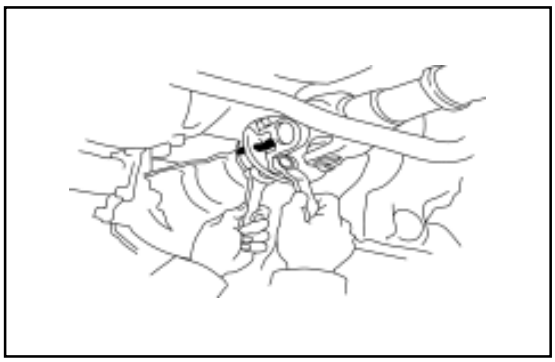
Tightening force of oil drain plug: 30-35N • m

Model of lubrication oil: GL-5

Filling amount: Flush to the lower edge of oil filling open

14．Insert the oil filling plug washer and tighten the oil filling plug to the specified torque.

Specified torque : 140-150N • m



15．Install the front drive axle assembly on the carriage.

16．Connect the drive shaft to the flange

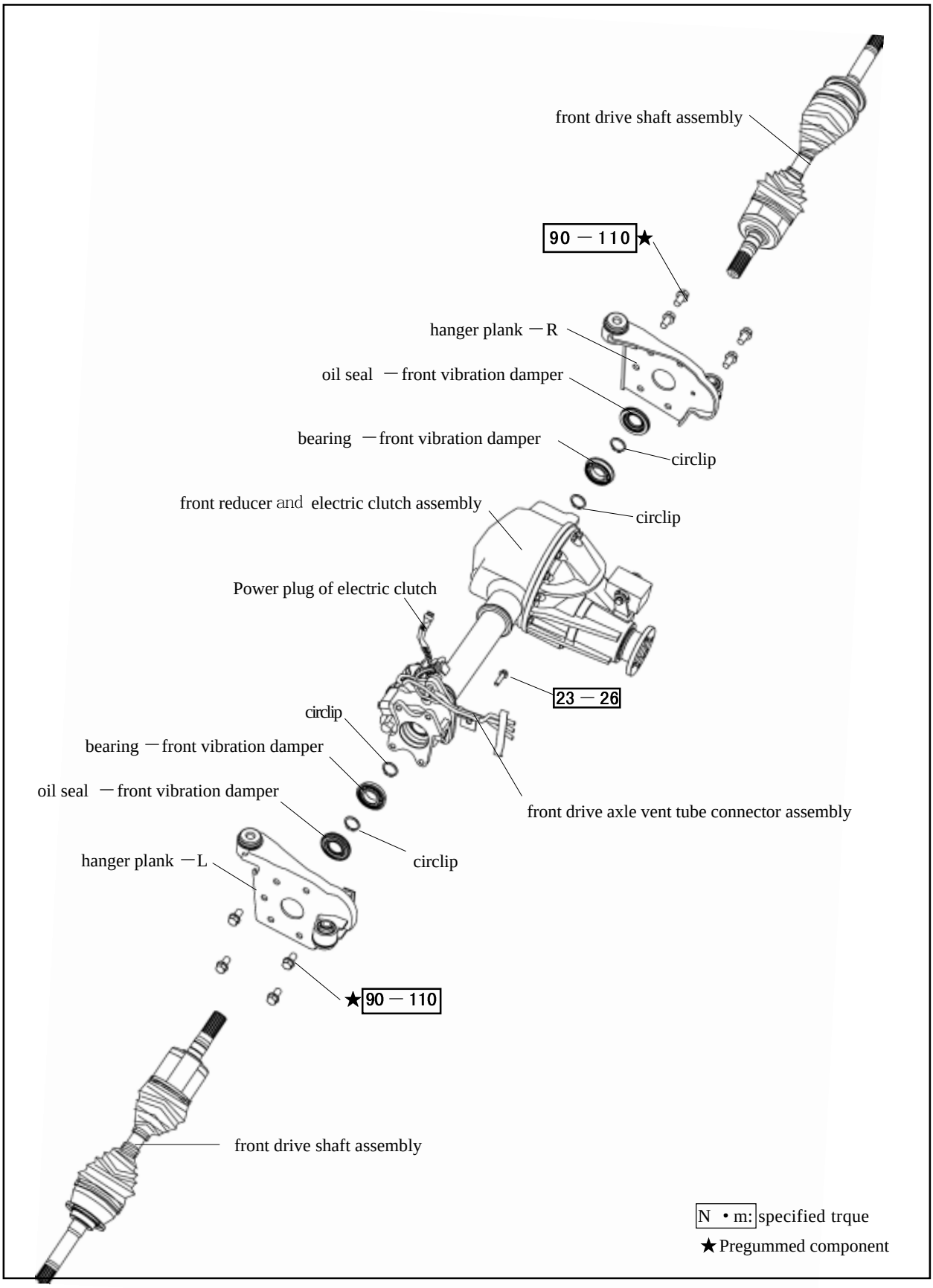
a. Align the assembly mark; use four bolts and nuts to connect the flange of drive shaft and front drive axle.

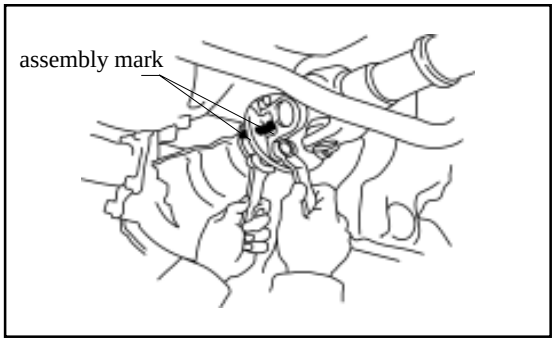
b.Tighten the nut to the specified torque.

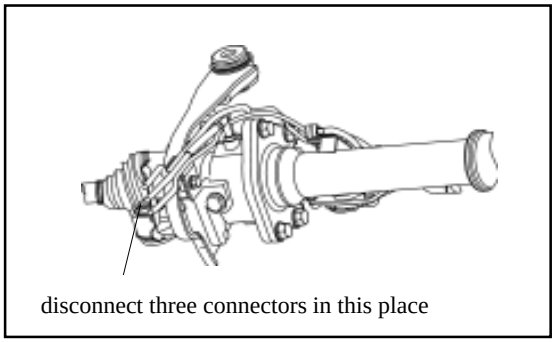
specified torque: 73-83N • m

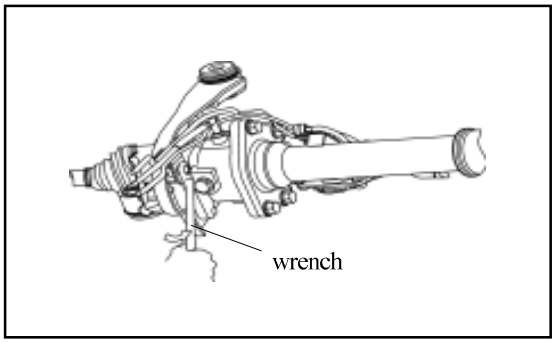
Remarks: Keep the clean of the field during the maintenance.

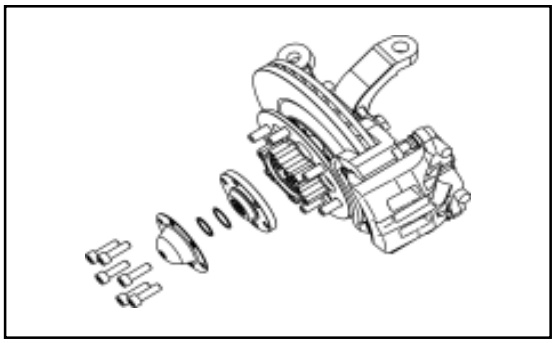
Front reducer assembly

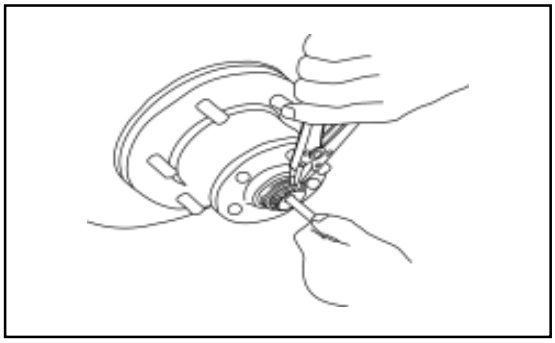












1. Support the front of the car; remove two front wheels and the beam under the front reducer assembly.

2. Drain the lubrication oil in the front reducer assembly.

3. Remove the flange of front reducer assembly from the drive shaft

Caution: Make the assembly mark on the flange of front reducer assembly and drive shaft before disconnect them.

4. Disconnect the connector of power wire of electric clutch

5. Disconnect three rubber connectors on the front drive axle vent tube connector assembly.

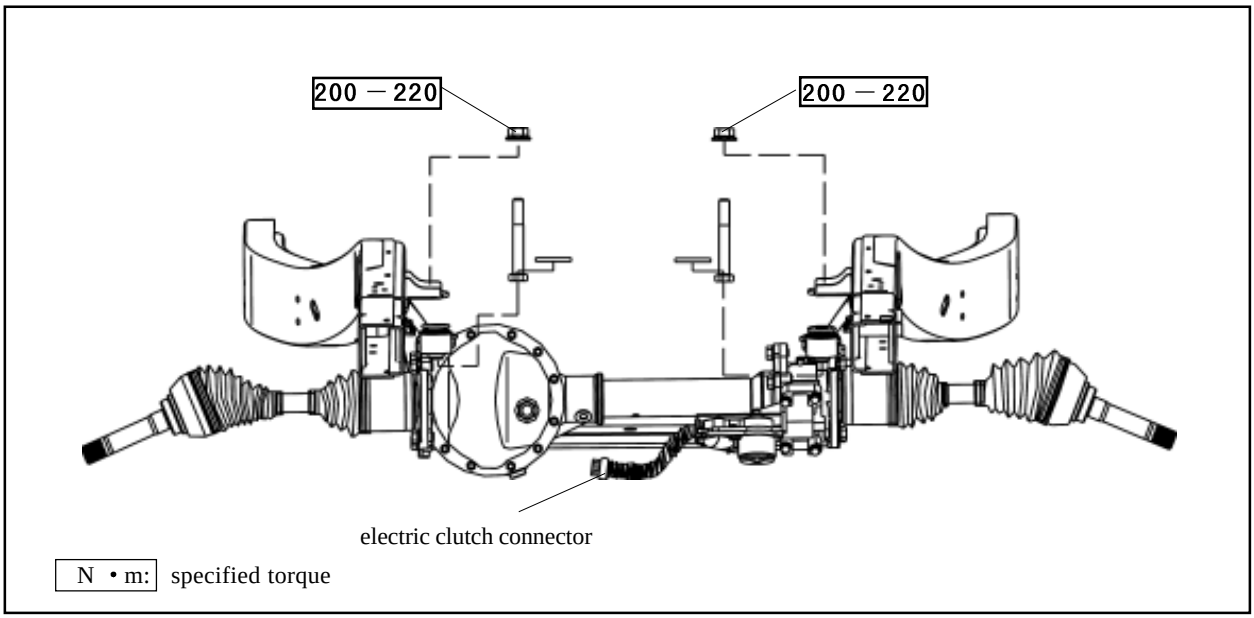
6. Use the wrench to screw off the bolt on the vent tube bracket, which is used to fix the vent tube connector.

7. Disconnect the connection between the front drive shaft assembly and steering knuckle front hub assembly.

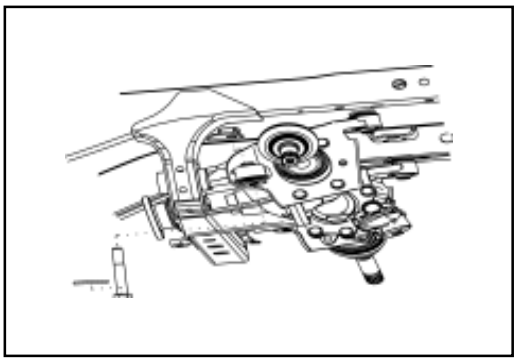
a. Screw off the connecting bolt which is used to fix the front hub cover; remove the front hub cover.

b. Use the circlip pliers to remove the circlip from the front drive shaft and remove the adjusting washer.

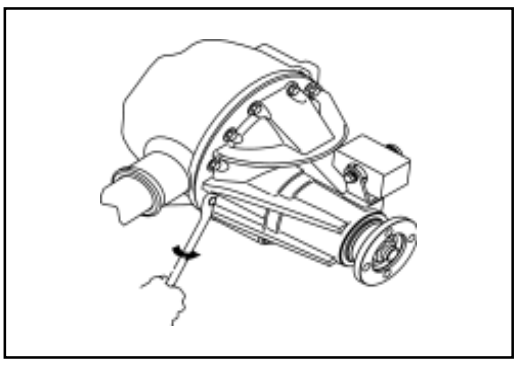
c. Remove the steering knuckle of both sides and separate it form the front drive shaft assembly.



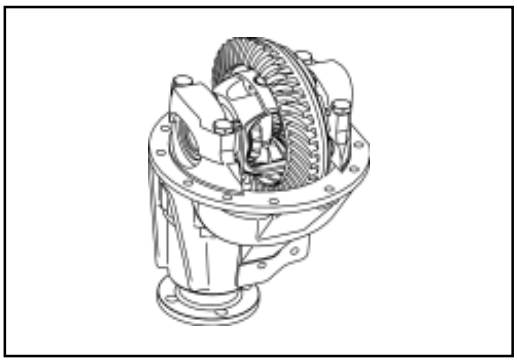
N • m: specified torque



8. Use the jack to support the front reducer assembly
9. Remove the lifting bolt of front drive axle hanger plank and carriage.
10. Remove the front drive axle assembly
Caution: Do not damage the drive shaft and front drive shaft jacket
11. Remove the front drive shaft assembly of both sides from the front drive axle assembly.

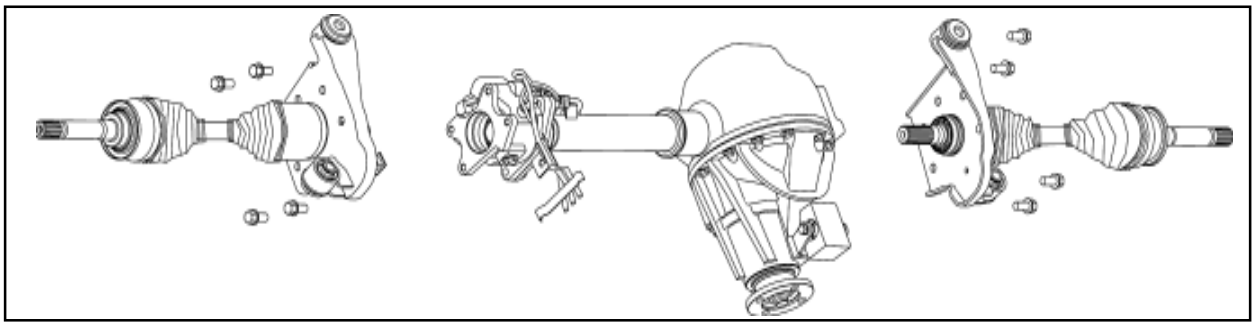


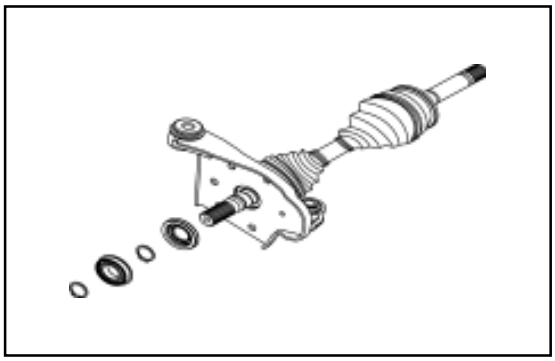
12. Use the wrench to remove the bolt and nut which is used to fix the front reducer housing.



13. Remove the clump weight assembly and clump weight bracket welded assembly
(Refer to “Disassembly of Front Reducer Assembly”)

Replacement of oil seal and major semiaxle oil seal of front reducer assembly





Replacement of front reducer assembly oil seal

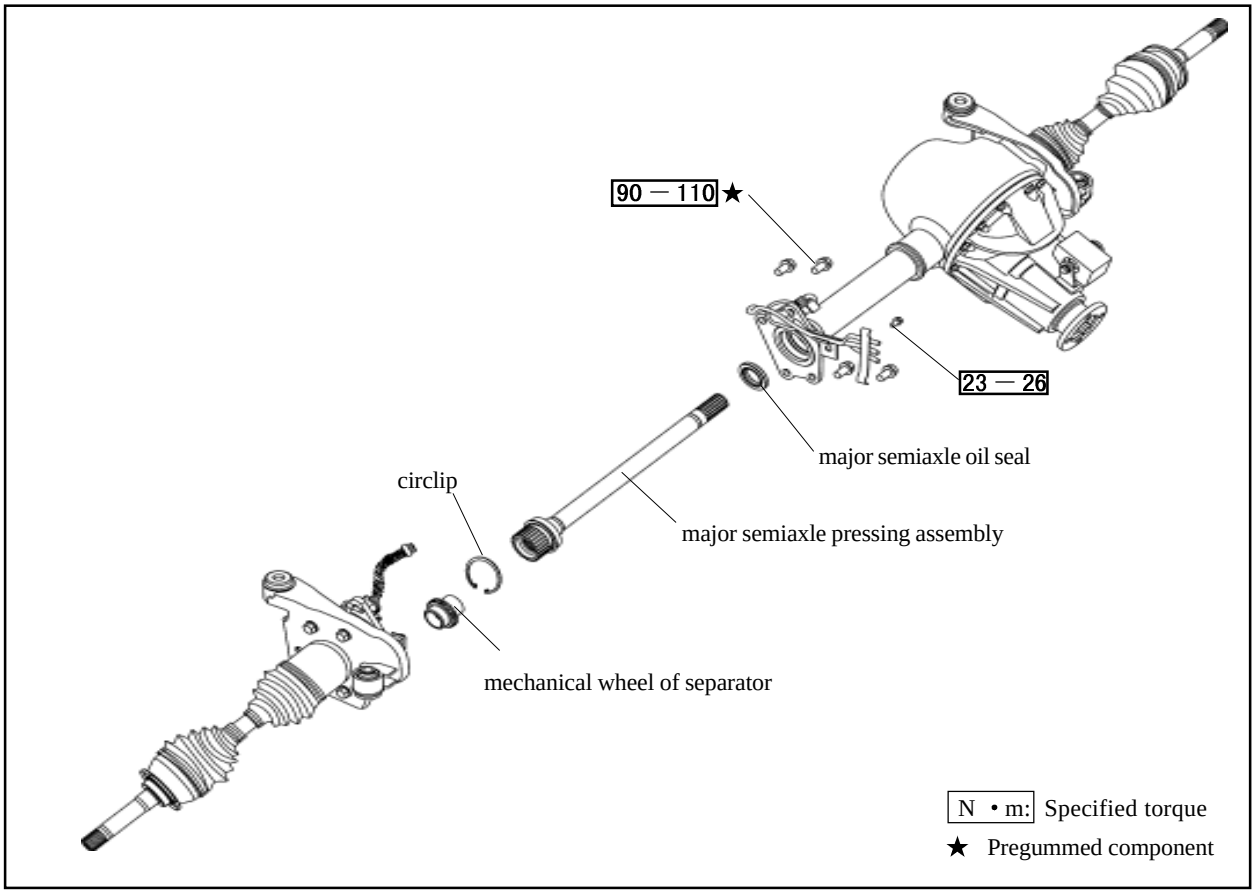
1. Remove the front drive axle assembly

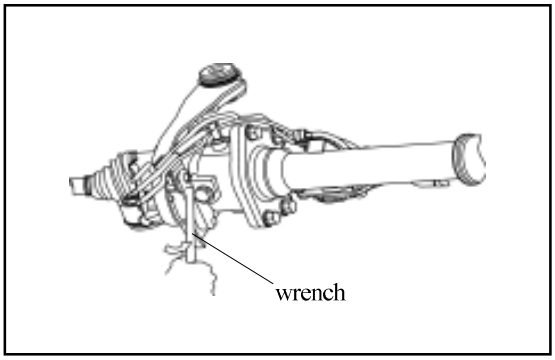
(Refer to “Removal of Front Reducer Assembly”)

2. Remove the left and right front drive shaft assembly from the front drive axle assembly.

3. Remove and replace the lower oil seal according to the removal and installation procedure of front drive shaft assembly and install the new side oil seal on the front drive shaft, then install them in the front reducer assembly.

(Refer to “Removal and Installation of Front Drive Shaft Assembly”)

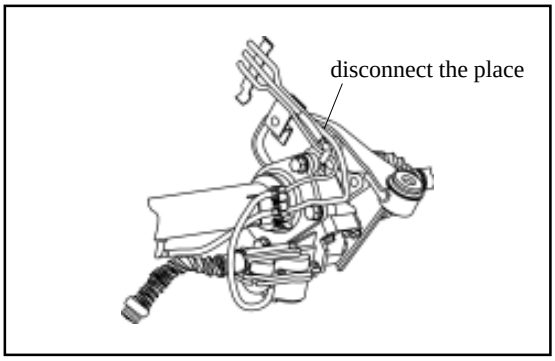




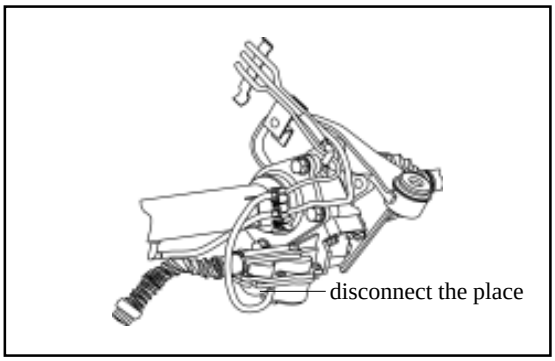
Replacement of major semiaxle oil seal

1. Make the electric clutch is in the 4WD status, them stop the engine and remove the front drive axle assembly (see the disassembly of front reducer assembly)

2. Use the wrench to screw off the bolt which fix the front axle vent tube connectorassemblyonventtubeb racket bolt



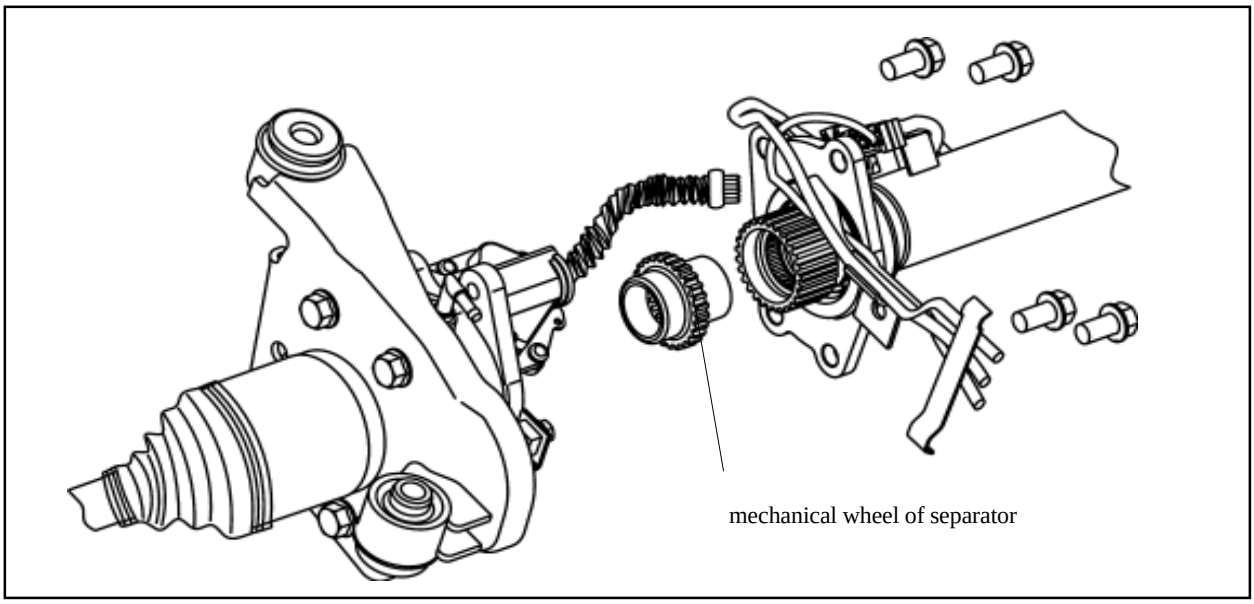
3. Disconnect the connector between vent tube of electric clutch housing and front drive axle vent tube connector assembly

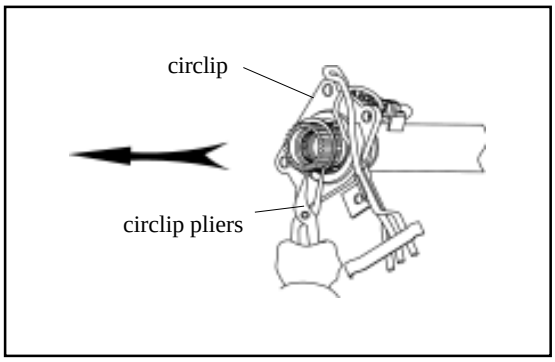


4. Disconnect the connector between the vent tubes on the electric clutch and vent tube connector assembly.

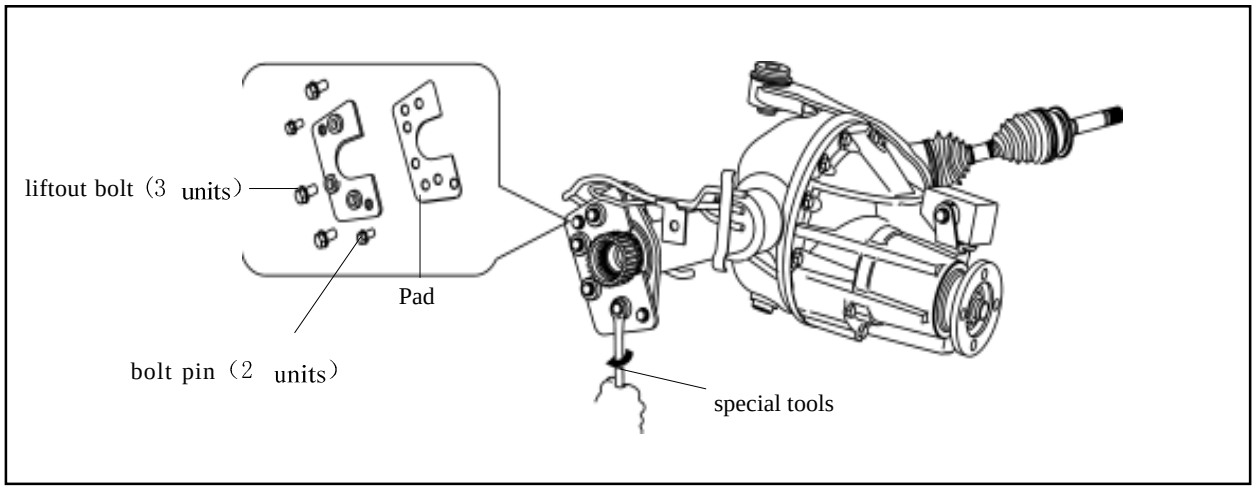
5. Remove the bolt which is used to fix the electric clutch housing and front axle tube flange; use the brass bar to open the electric clutch housing and take out the mechanical wheel of separator.

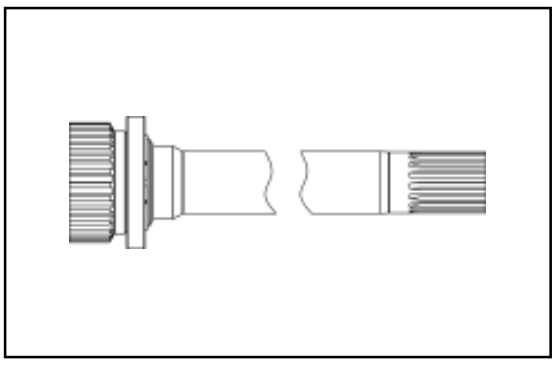
Caution: The lubrication oil will flow out when separate the electric clutch housing from the front axle flange. It should use the container to hold it.



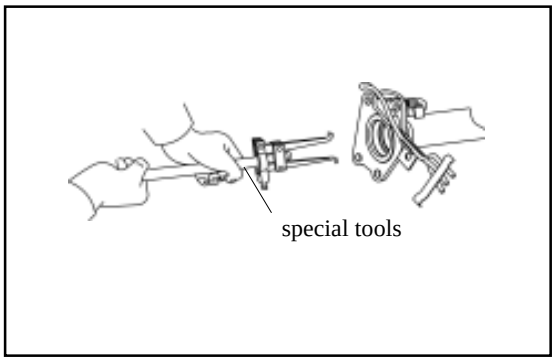


6. Use the circlip pliers to remove the circlip which clamp the major semiaxle bearing outer race.



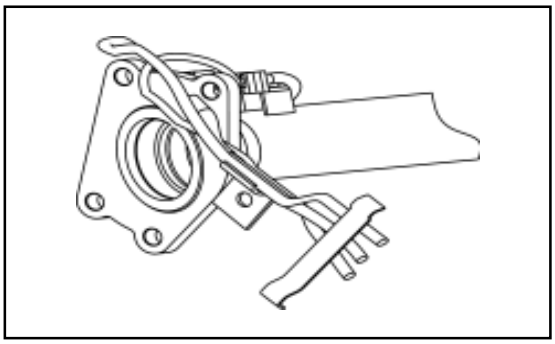


7. Use the special tools to remove the major semiaxle and bearing, circlip assembly.



8. Use the special tools to remove the major semiaxle oil seal.

Caution: Do not scratch the inner surface of flange.

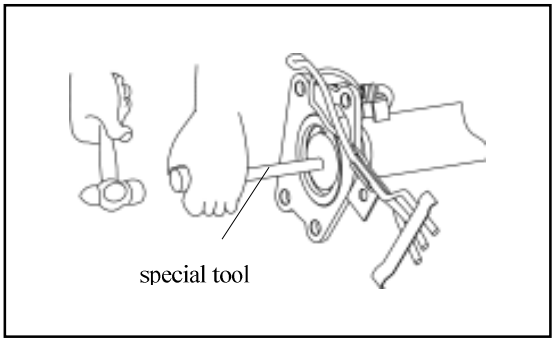


9. Remove the sealant on the matching surface between the flange and electric clutch housing by knife.

Caution: Do not scratch the matching surface.

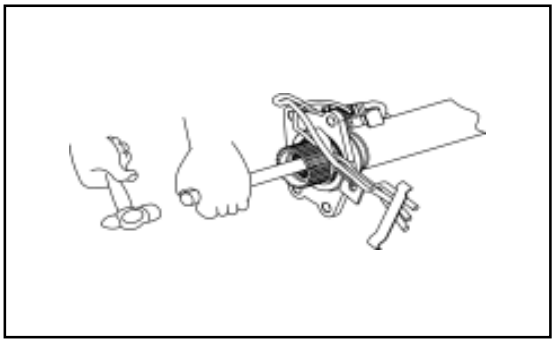
10. Use the special tools to knock the new seal in the oil seal position in flange.

Caution: Before install the new oil seal, it should coat the lip with thin lithium base grease, and the oil seal should be in alignment position.



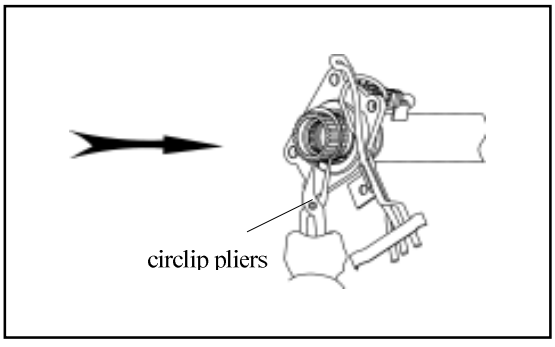
11. Insert the spline of small end of major semiaxle in the spline of front reducer half axle gear slightly, then use the brass bar and hand hammer to knock it in.

Caution: When knock in the major semiaxle, must not damage the inside needle bearing of large end spline of major semiaxle.

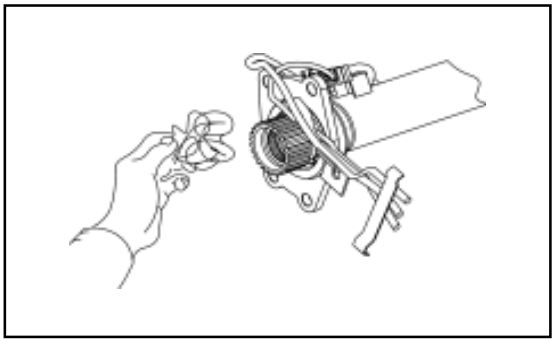


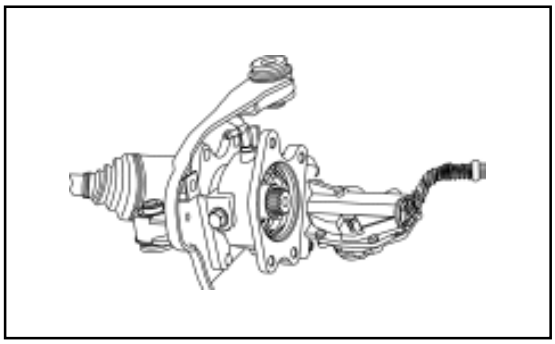
12. Use the circlip pliers to install the circlip in the flange and clamp the bearing outer race.

Caution: The circlip should be replaced if it has serious deformation.

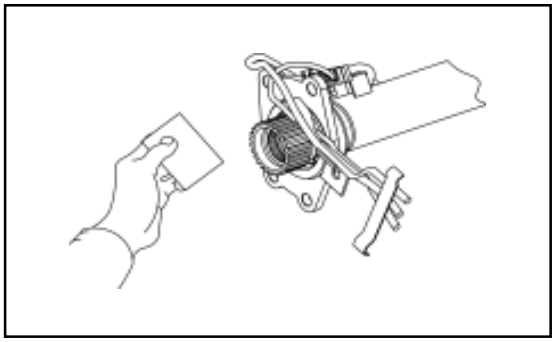


13. Use the clean cloth to wipe the matching surface of flange and electric clutch housing respectively.



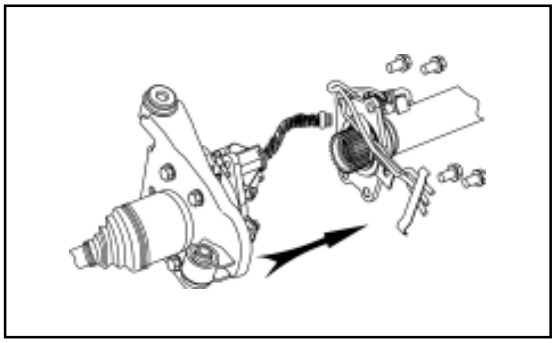


14. Align the spline of mechanical wheel of separator with the spline in front drive shaft and separator shift fork sleeve, and install it in the front drive shaft and separator shift fork sleeve.



15. Coat the flange matching surface with the 1596 silicon rubber plane sealant uniformly and level it by plate.

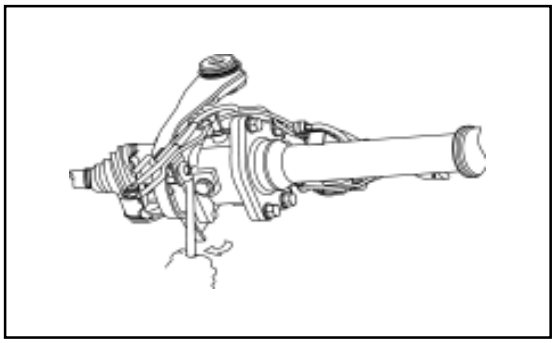
Caution: Ensure the continuity of sealant and avoid the sealant enter into the screw hole.



16. Align the shift fork bush with the spline on the major semiaxle to make the mechanical wheel of separator enters into the major semiaxle, then use the bolt to connect the electric clutch housing and front axle pipe flange and tighten it to the specified torque. In which the bolt should be precoated with the screw locking agent (drip one or two drops on the middle of screw).

specified torque : 90-110N • m

Caution: Prevent the foreign material from entering into the front drive axle during assembly.

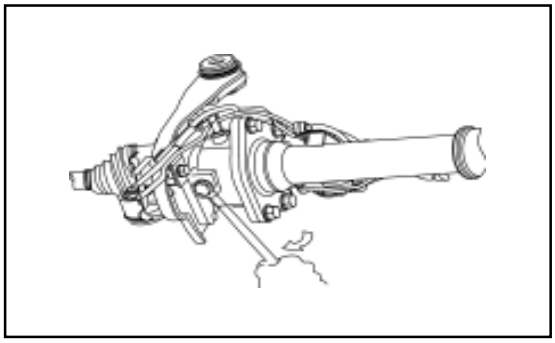


17. Use the wrench to tighten the bolt of vent tube bracket to tightening torque.

Tightening force: 23-26N • m

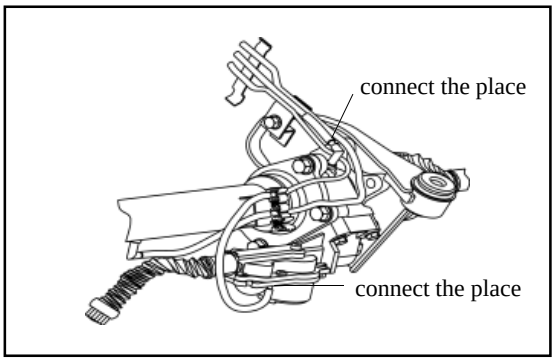
18. Screw off the oil filling plug on the electric clutch housing, remove the washer and fill it with the gear lubrication oil until flush with the bottom of oil filling port.

Number of lubrication oil: GL-5



19. Place the washer of oil filling plug, tighten the oil filling plug to specified torque.

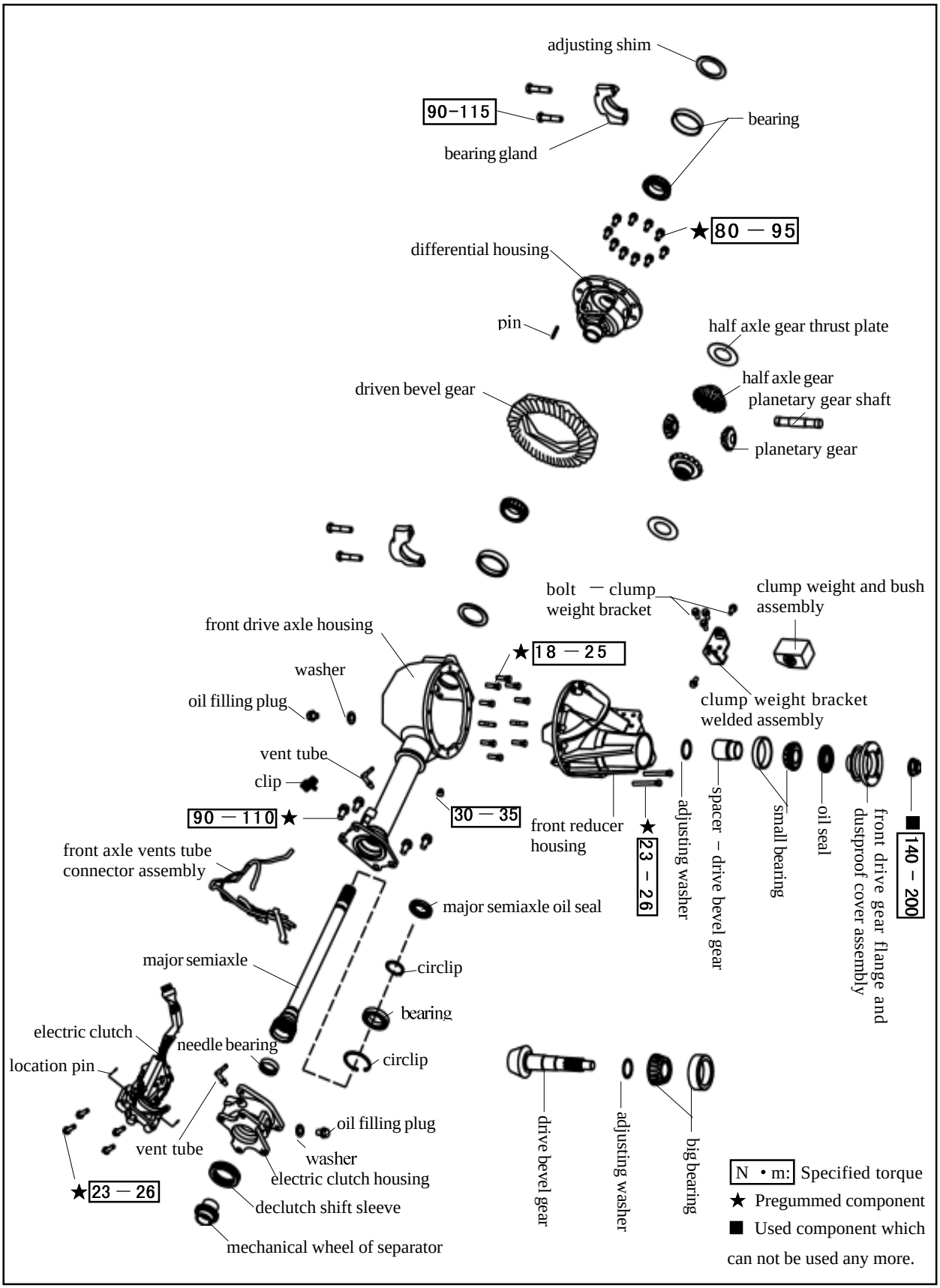
Specified torque: 140-150N.m

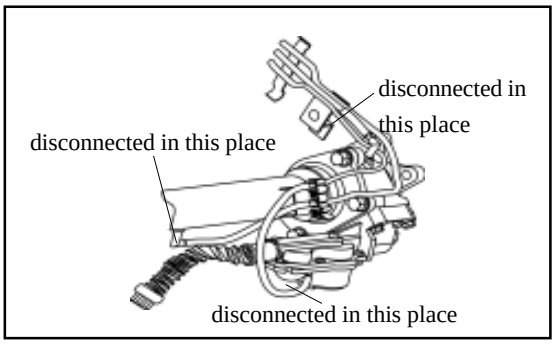


20. Connect the vent tube on the electric clutch housing to the front axle vent tube connector assembly.

21. Connect the electric clutch vent tube to the front axle vent tube connector assembly.

Disassembly and assembly of front reducer assembly and electric clutch



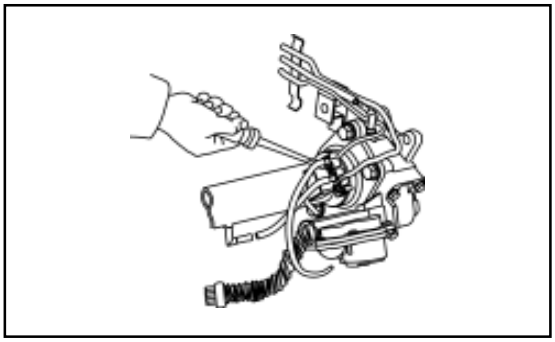


Disassembly of front reducer assembly

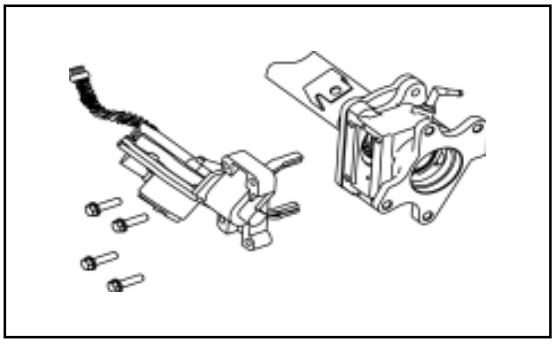
1. Remove the front drive axle and left and right front drive shaft assembly.

(Refer to “Removal of Front Reducer Assembly” and “Removal of Front Drive Shaft Assembly”)

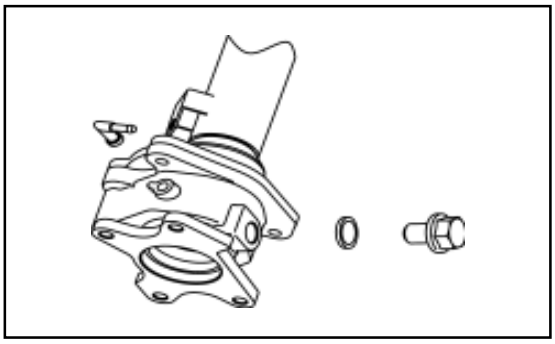
2. Disconnect three interface positions of front drive axle vent tube connector assembly.



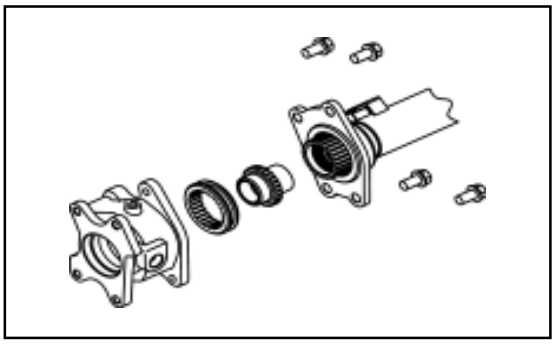
3. Use the flat screwdriver to pry off the clip fixed the vent tube connector assembly and take out the vent tube connector assembly.



4. Screw off the bolt fixed the electric clutch and use the brass bar to knock down the electric clutch.

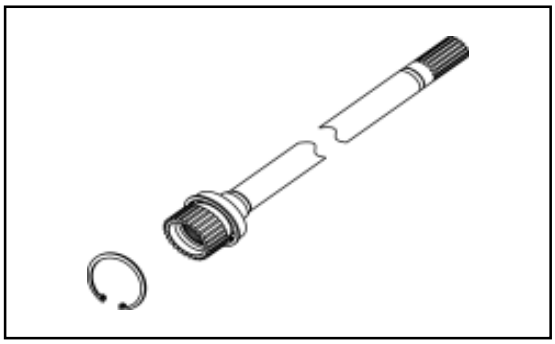


5. Use the wrench to remove the oil filling plug; remove the washer and pull out the vent tube.

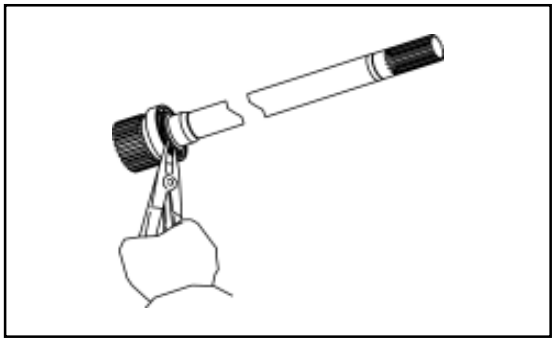


6. Use the wrench to remove the bolt connected to the electric clutch housing and front axle tubeflange; take out the shift fork sleeve and mechanical wheel of separator.

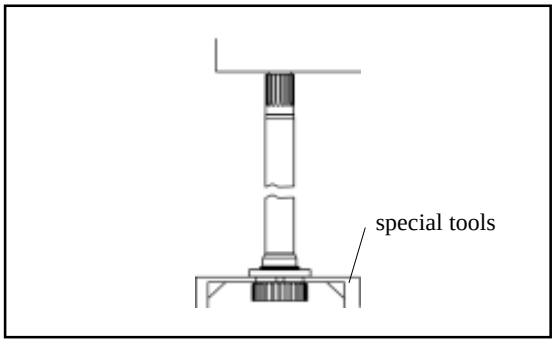
Caution: The leaked gear oil during disassembly should be stored in the container to avoid the pollution for environment.



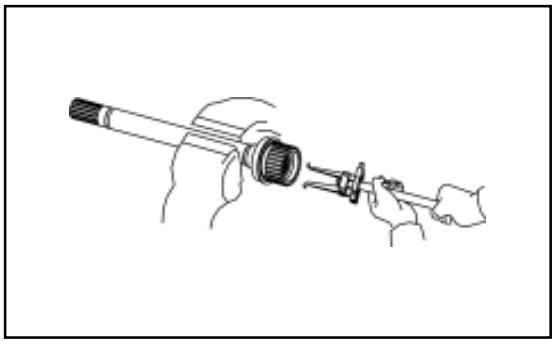
7. Use the circlip pliers to remove the circlip fixed the major semiaxle bearing outer race.
8. Use the special tools to pull out the major semiaxle and major semiaxle bearing with the major semiaxle inner race circlip.
(Refer to “Replacement of Major Semiaxle Oil Seal”)



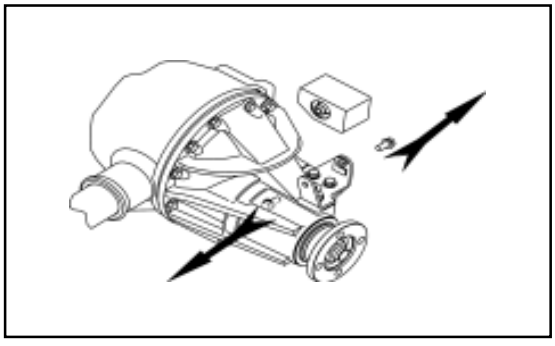
9. Use the special tools to remove the major semiaxle oil seal.
(Refer to “Replacement of Major Semiaxle Oil Seal”)
10. Pull out the vent tube on the front axle tube.
11. Use the circlip pliers to remove the circlip. Fasten the major semiaxle bearing inner race.



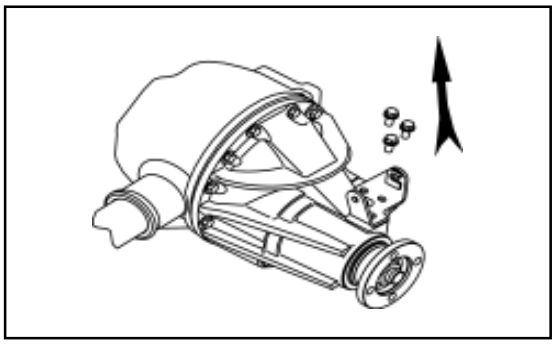
12. Press out the major semiaxle bearing on press machine. (Or knocked out by hand hammer)
Caution: Don’t damage the end spline of major semiaxle.



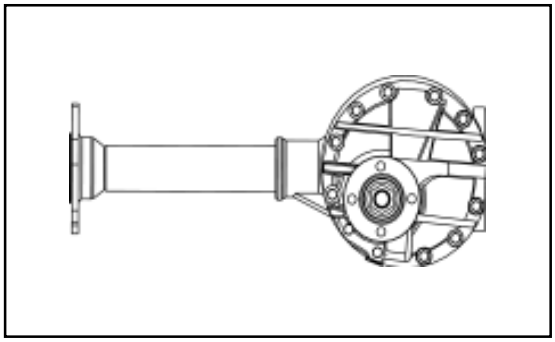
13. Use the special tools to pull out the needle bearing in major semiaxle.
Caution: It should use the pad when use the vise to clamp the major semiaxle.



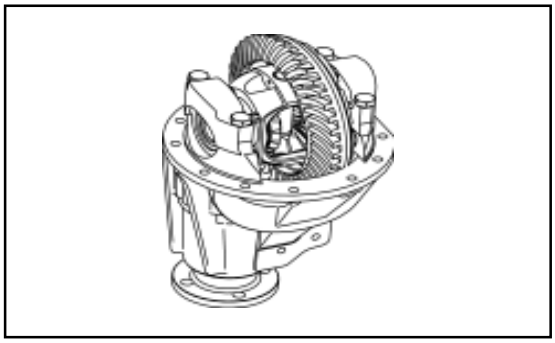
14. Use the wrench to remove the bolt which is used to fix the clump weight and axle bush assembly, take off the clump weight and axle bush assembly.



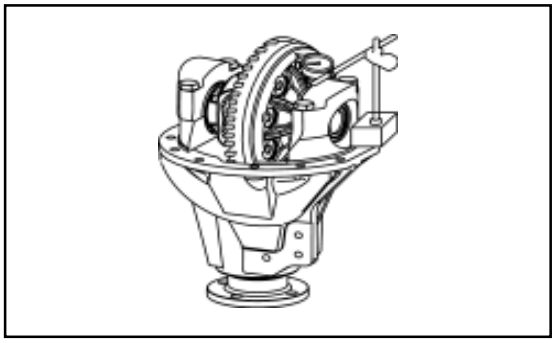
15. Use the wrench to remove the bolt fixed the clump weight bracket welded assembly.



16. Use the wrench to remove the bolt and nut used to fix the front reducer assembly and front axle housing.



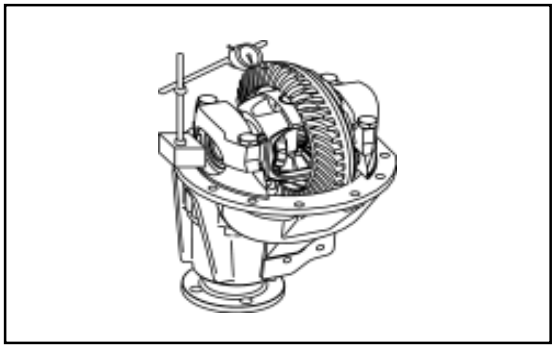
17. Use the brass rod or hand hammer to knock the front reducer housing to separate it from the front drive axle housing.



18. Check the run-out of driven bevel gear.
Rotate the flange; use the dial indicator to measure the run-out of driven bel gear.

Max. Runout: 0.07mm

It should replace the drive and driven bevel gear totally if the run-out is more than 0.07mm.



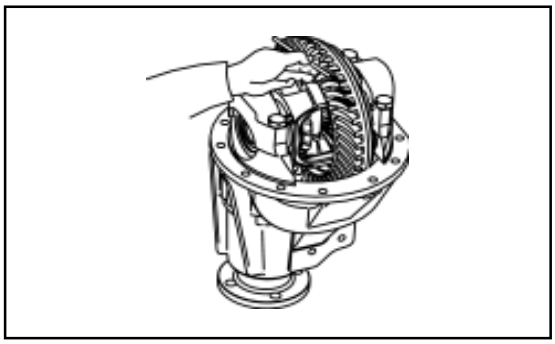
19. Check the running clearance of drive and driven bevel gear.

a. Install the dial indicator and ensure the side axis is vertical to contact tooth surface.

b. Hold the drive gear flange and rotate the driven bevel gear in clockwise and anticlockwise to measure the clearance.

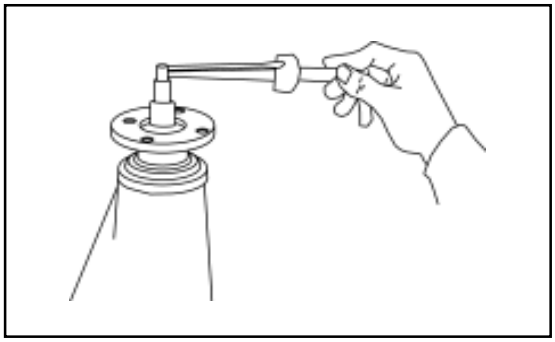
Specified range of clearance: 0.15-0.25mm

Remarks: Check three average points on circumference of driven bevel gear at least.



20. Check the engaging mark of drive and driven bevel gear.

(Refer to "Assembly of Front Reducer Assembly")

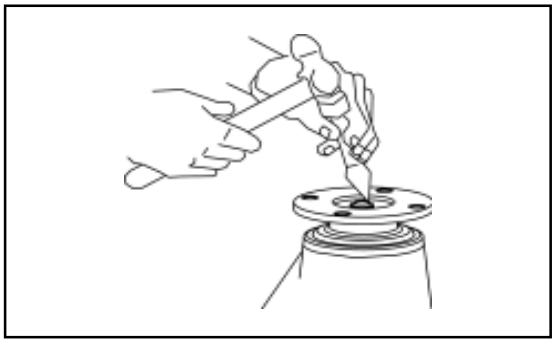


21. Measure the pre-applied load of drive bevel gear bearing.

Use the torque measuring meter to measure the preapplied load on the gap between the drive and drivenbevel gear.

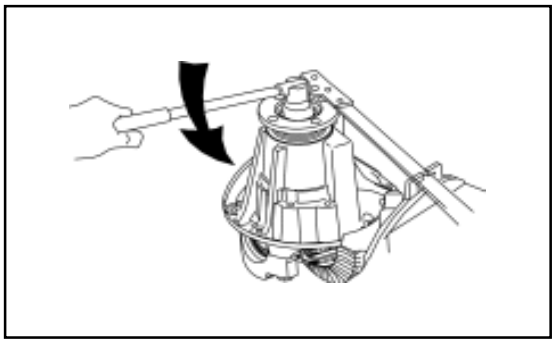
Range of pre-applied load: 1.2-1.7N.m

22. Measure the total pre-applied load of drive bevel gear.

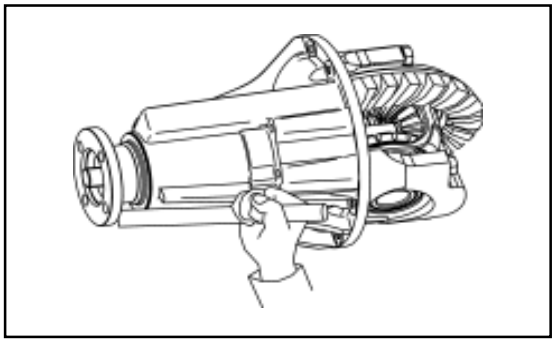


23 Remove the drive gear flange and dustproof cover assembly.

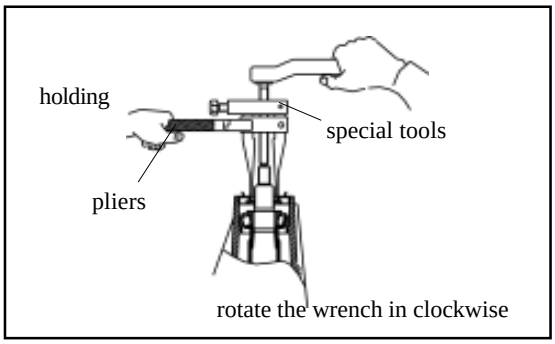
a. Use the hand hammer and chisel to loose the riveted part of drive gear nut.



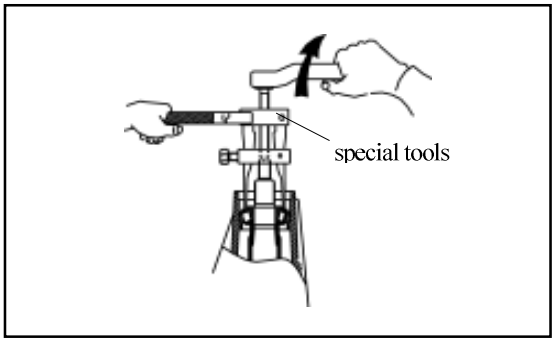
b. Use the special tools to clamp the drive gear flange and remove the drive gear nut.



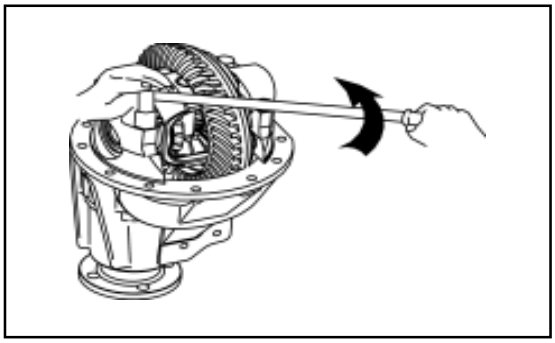
c. Use the brass rod to knock down the drive gear flange and dustproof cover assembly.



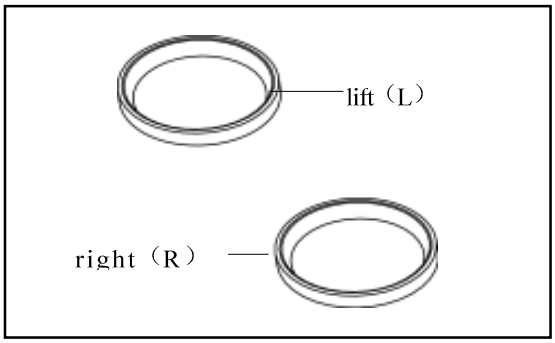
24. Use the special tools to remove the drive gear oil seal.



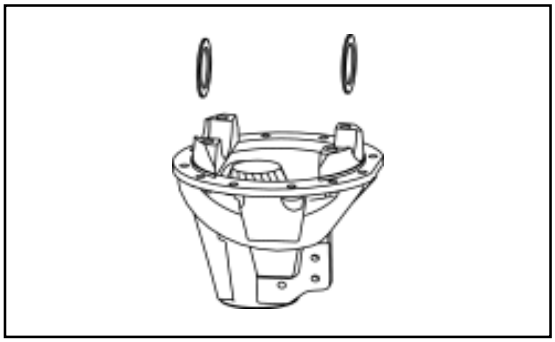
25. Use the special tools to remove the small bearing inner race, and then reverse the reducer to slide out the spacer.
Remarks: The bearing should be replaced by new one if damaged.



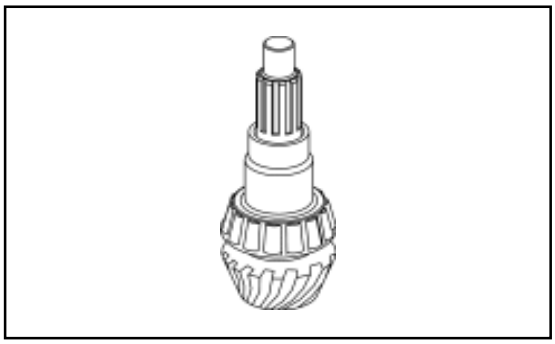
26. Use the wrench to remove two bearing glands.
Remarks: It should distinguish the left and right of the bearing gland when remove it to avoid the confusion.
27. Use the brass rod to vibrate the differential assembly upwardly, then take out the differential assembly.



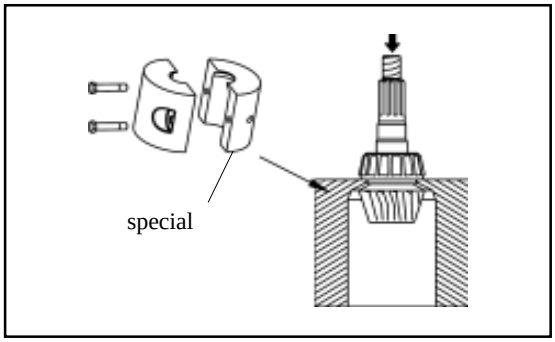
28. Remove the side bearing outer race and marked with L and R.



29. Remove the left and right adjusting washer; measure its thickness; marked with left and right.



30. Remove the drive bevel gear, then take out the adjusting washer under spacer.

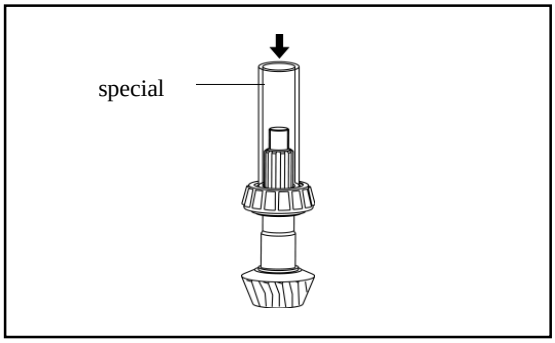


Check and replacement of reducer

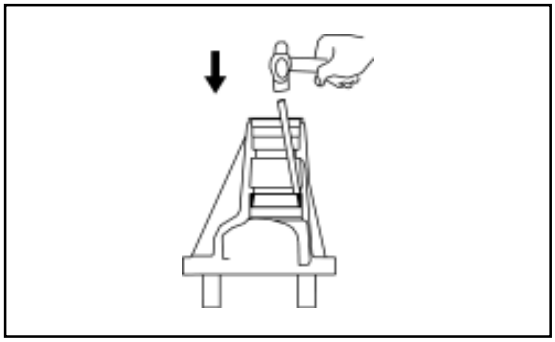
1. Replace the big bearing of drive bevel gear .

a. Use the special tools to press out the big bearing of drive bevel gear.

Caution: It should replace the drive and driven bevel gear in pair before replace the big bearing if the drive bevel gear is damaged.

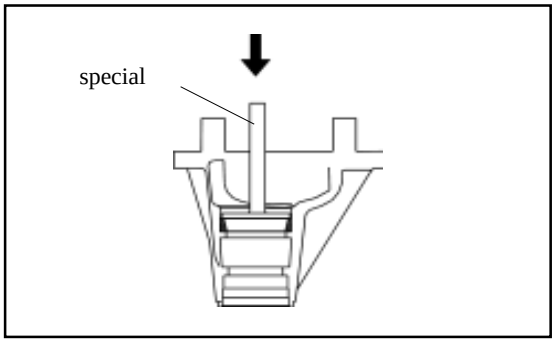


b. Install the washer on the drive bevel gear, Use the special tools to install the new big bearing .

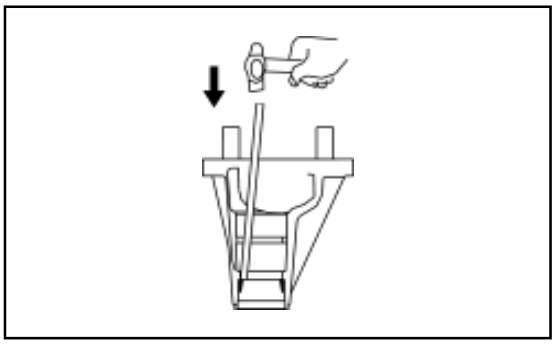


2. Replace the big bearing outer race of drive bevel gear.

a. Use the brass bar and hand hammer to knock down the big bearing outer race.

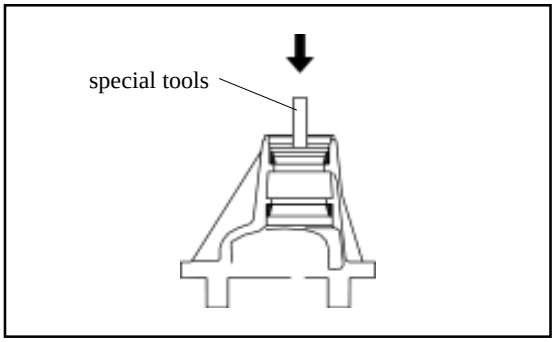


b. Use the special tools to press in the new big bearingouter race.
Special tools

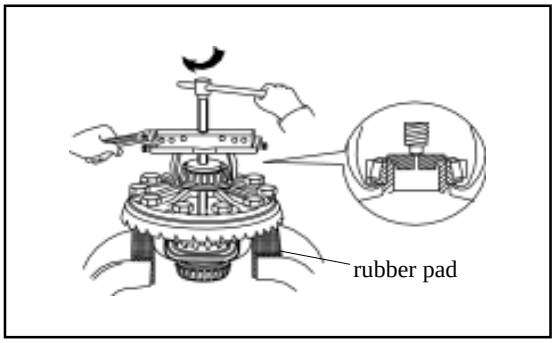


3. Replace the small bearing of drive bevel gear.

a. Use the brass rod and hand hammer to knock down the small bearing outer race of drive bevel gear.

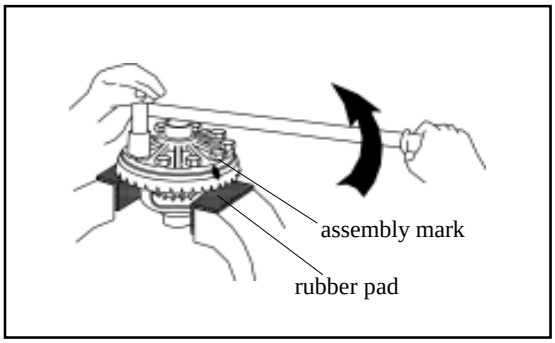


b. Use the special tools to press in the new bearing outer race.
c. Replace it by the new bearing inner race when installs the small bearing..



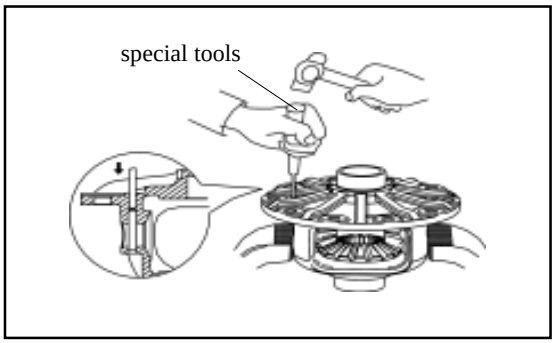
4. Remove two side bearing inner races from the differential housing.

a Use the special tools to remove the side bearing inner race on the side of differential assembly with bolt.
b. It should pay attention to does not damage the driven bevel gear when use the vice for clamping to remove the bearing inner race on another side.



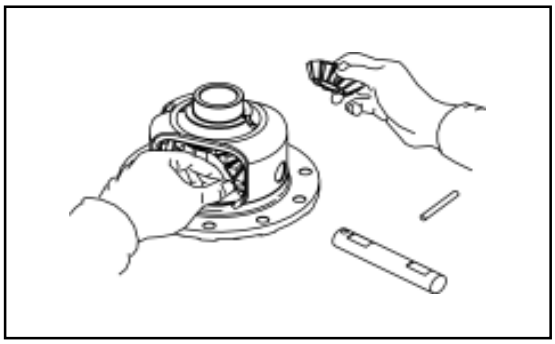
5. Use the wrench to remove the bolt fastened the driven bevel gear

Caution: It should make the assembly mark on the driven bevel gear and differential housing before disassembly.

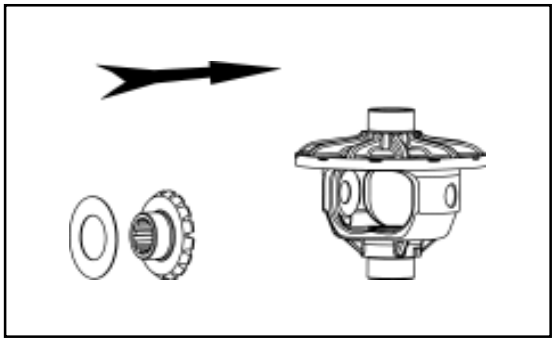


6. Disassembly of differential assembly

a. Use the hand hammer and special tools to knock out the pin after remove the driven bevel gear.



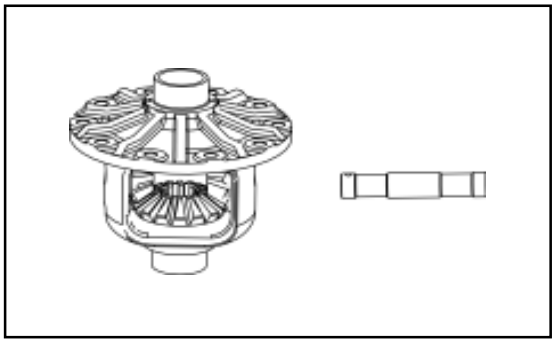
b. Knock out the planetary gear shaft, rotate the half axle gear to take out the planetary gear, then take out the half axle gear and thrust plate.



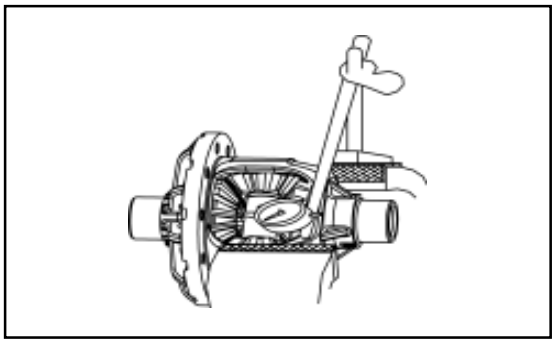
7. Assembly of differential assembly.

a. Wash the differential housing.

b. Cover the half axle gear thrust plate with the half axle gear, then installs it in the differential housing.



c. Rotate the half axle gear; install the planetary gear in rolling and insert the planetary gear shaft.

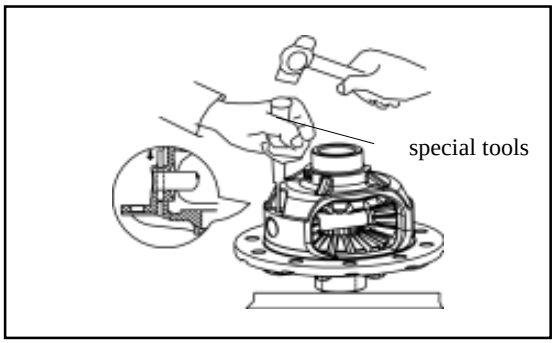


d. Use the special tools to hit the pin to fix the planetary gear shaft, and rivet the inserted hole to prevent the loose of pin.

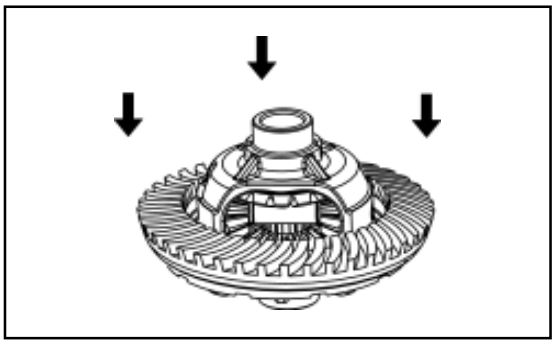
Remarks: The rotation of half axle gear and planetary gear should be smooth and without block; push the planetary gear to inside, then use the dial indicator to measure the clearance between the half axle gear thrust plate and differential housing.

Rational clearance range: 0.4-0.75mm

It is necessary to replace the half axle gear thrust plate if the clearance is beyond the previous range, at the same time ensure the thrust plate in left and right side has the same thickness.

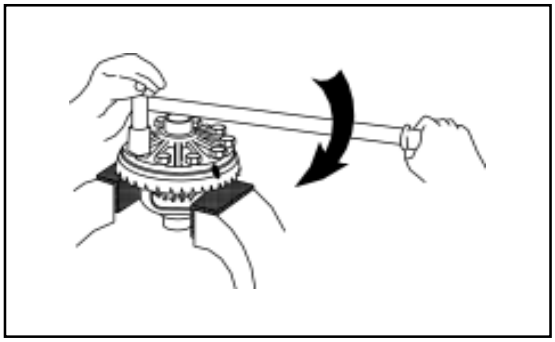


e. Check the clearance between the half axle gear thrust plate and differential housing.



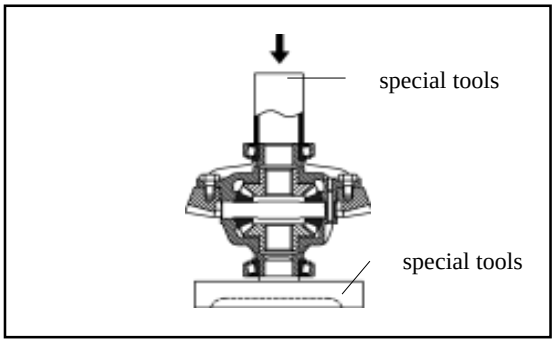
f. Clean the surface of differential housing; use the brass rod to install the driven bevel gear on the differential housing.

Caution: It should align the marked assembly mark when install the driven bevel gear and knock it in uniformly in circumference ; it should remove the cooper chip in time if it is adhered on the driven bevel gear.

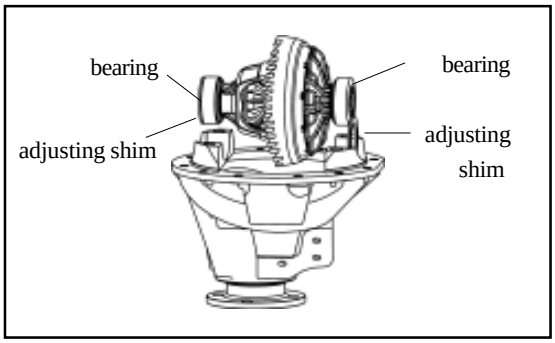


g. Coat the fastening bolt of driven bevel gear with the screw lock agent, then tighten it to the specified torque.
Specified tightening force: 80-95N • m

Caution: It should be in the diagonal sequence to tighten the bolt and tighten it for little, then tighten it to the specified torque uniformly.

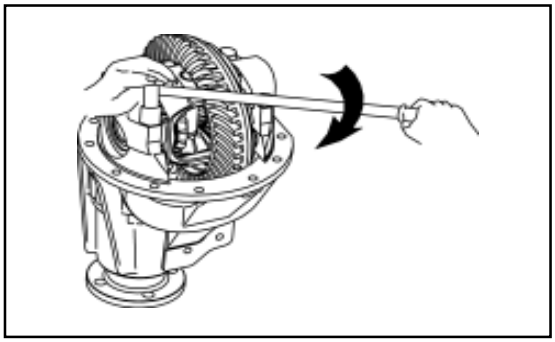


h. On press machine, use the special tools to press the inner race of bearing into the bearing position on both sides of differential housing.

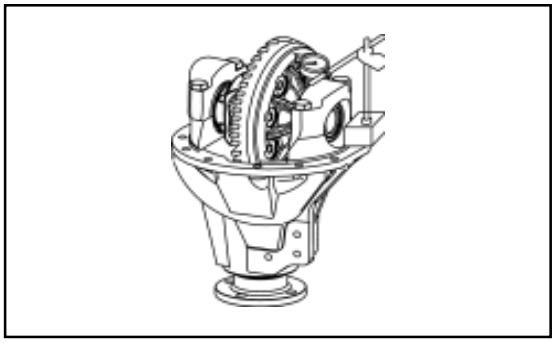


i. Place an adjusting shim in the position of front reducer housing side bearing near exterior.

j. Install another adjusting shim and the other side bearing outer race in the front reducer housing with thedifferentialassembly

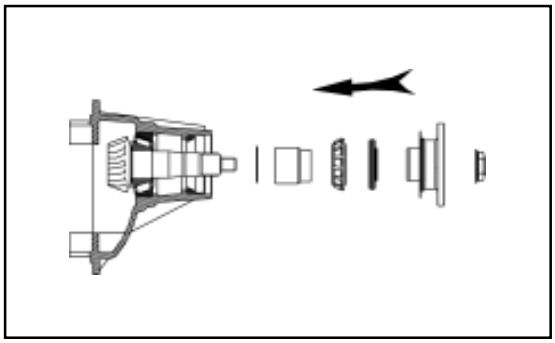


k. Install two bearing glands, left and right and use the wrench to tighten the bolt to the specified torque.
Specified torque : 90-115N.m



1.Rotate the driven bevel gear, check the runout of driven bevel gear.

Max. Runout: 0.07mm

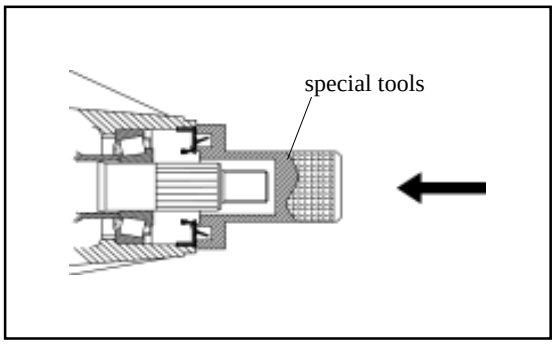


Assembly of front reducer assembly

1.Install the adjusting washer in the drive bevel gear, install the big bearing inner race of drive bevel gear by press.

2. Clean the front reducer housing, install the outer race of big and small bearing on the reducer housing by press..

3. Install the drive bevel gear into the front reducer housing, then install the washer, spacer and small bearing inner race.

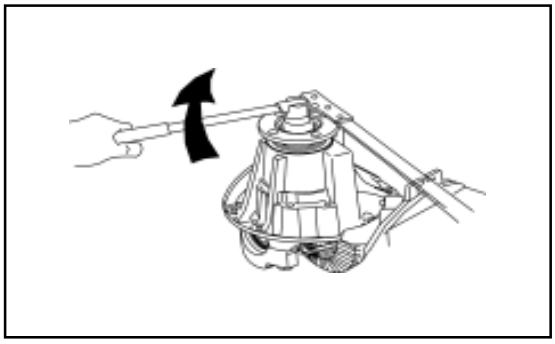


4.Use the special tools to install the drive bevel gear oil seal.

Caution: It should coat the lip with the oil seal lithium base grease before install it and the rear surface of rear oil seal should flush with the top of front reducer housing after knocked in.

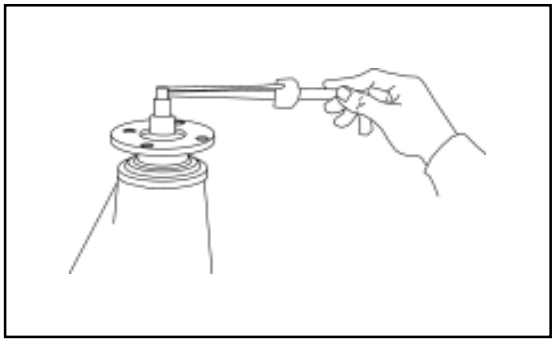
5. Install the drive gear flange and dustproof cover assembly.

(Refer to “Replacement of Drive Bevel Gear Oil Seal”)



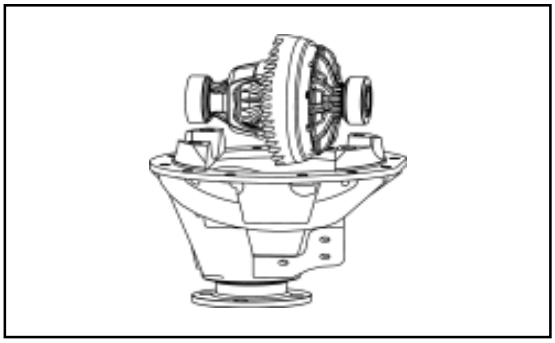
6.Use the special tools to tighten the drive gear nut to the specified torque; the nut should be precoated with the lithium base grease.

specified torque : 140-200N • m

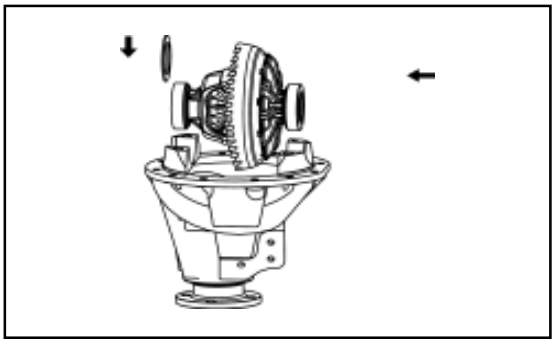


7. Use the torque measuring meter to measure the pre-applied load of big and small bearing of drive bevel gear.

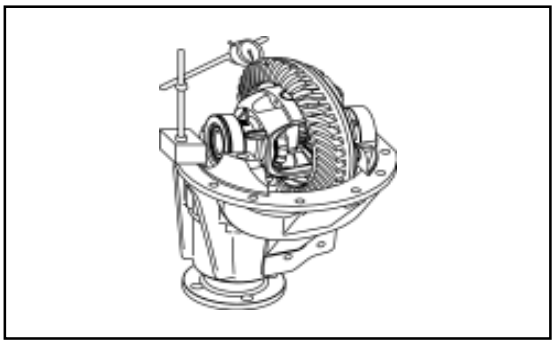
Range of pre-applied load: 1.2-1.7N • m



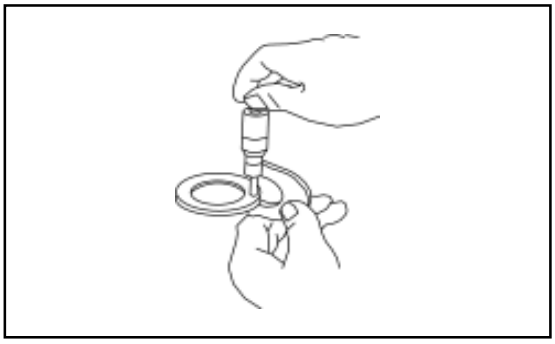
8. Place the differential assembly on the corresponding position of front reducer housing.



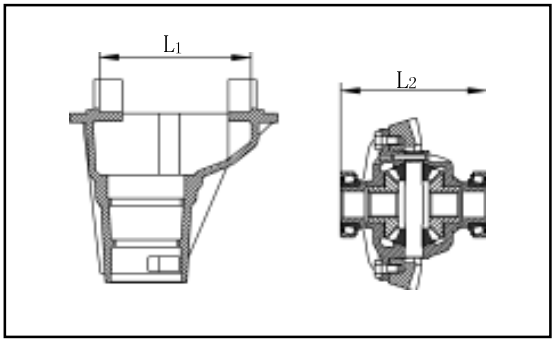
9.Select an adjusting shim and insert it in a side of side bearing outer race; push the differential assembly to the side with adjusting shim.



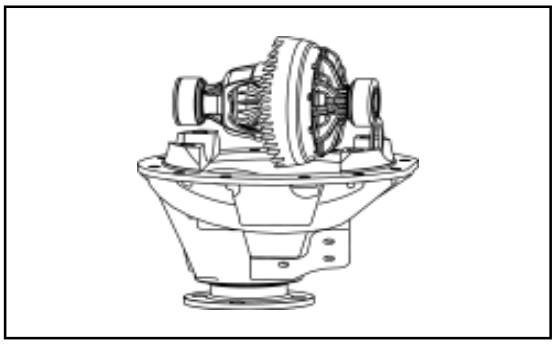
10. Use the dial indicator to measure the gear side clearance of driven bevel gear and drive bevel gear; select out the adjusting shim in the side which meets the rational clearance of 0.15mm.



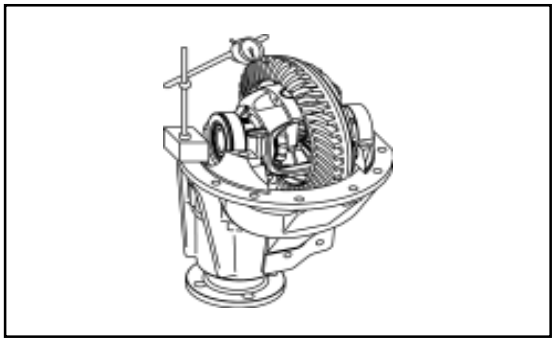
11.Measure the thickness of the adjusting shim.



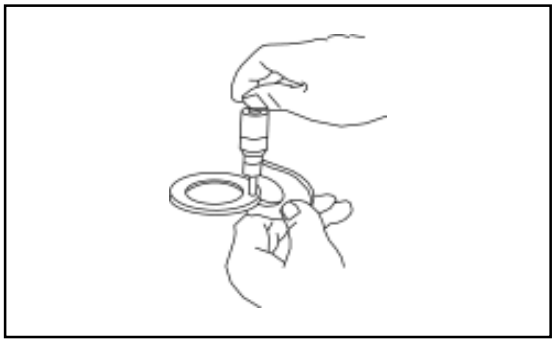
12. After select out one side adjusting shim, then select theadjusting of another side according to that the theoreticthickness of the adjusting shimofanother side equals to subtracting the thickness of selected shim and oppositiondistance L2 between outer race of two side bearings of differential assembly from the opposition distance L1 between two side bearings of front reducer housing.



13. Place an adjusting shim in the position of front reducer housing side bearing and close to exterior.
14. Install the other adjusting shim and the bearing outer race of another side with the differential assembly into the front reducer housing.
Remarks: Ensure the selected adjusting shim has not gap with front reducer housing.



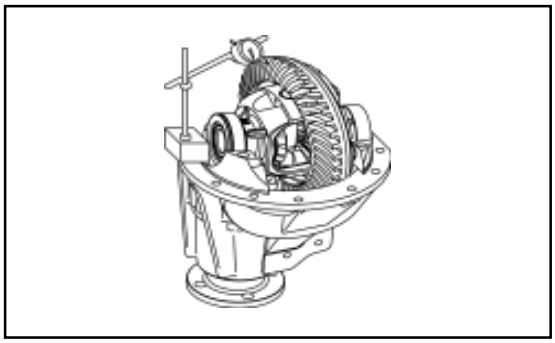
15. Rotate the driven bevel gear to make the differential assembly closed to the front reducer housing.
16. Use the dial indicator to measure the tooth side gap between the drive and driven bevel gear.
The rational range of gap is: 0.15-0.25mm.
If the measured gap is beyond the range, then adjust it by adding or reducing the thickness of shim. (When add in one side, the other side should be reduced with same thickness)
Caution: Ensure the selected adjusting shim is without clearance form front reducer housing.

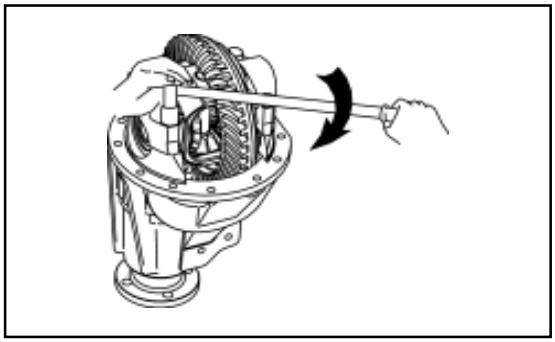


17. Adjust the pre-applled axial load of side bearing.

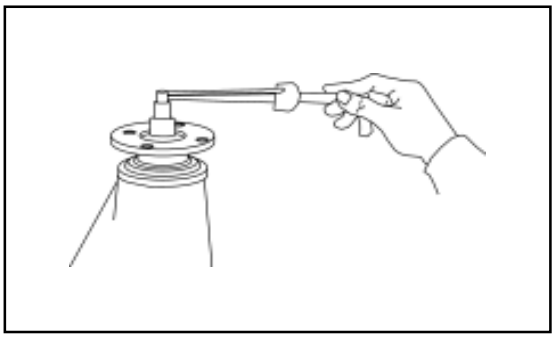
a. Remove two adjusting shim, remeasure the thickness of two adjusting shims.
b. Install the new adjusting shim with thickness 0.06-0.09mm more than that of removed adjusting shim, then install it with the differential in the reducer housing.
c. Remeasure the tooth side clearance between the drive bevel gear and driven bevel gear.

Rational range of clearance: 0.15-0.25mm
Remarks: If the measured gap is beyond the range, then adjust it by adding or reducing the thickness of shim. (When add in one side, the other side should be reduced with same thickness)
Caution: Ensure the selected adjusting shim has not the clearance with the front reducer housing.



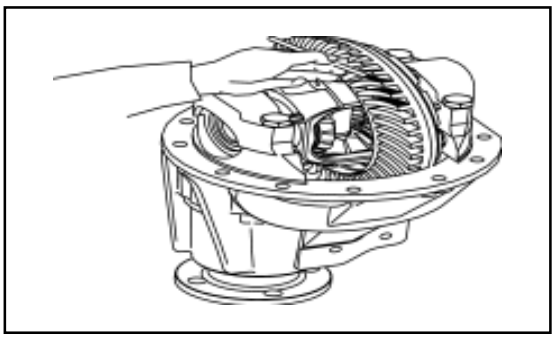


18. Install the bearing gland of both sides and use the wrench to tighten it to the specified torque.
specified torque : 90-115N • m
Remarks: Distinguish the left and right during assembly.



19. Use the torque measuring meter to measure the total pre-applied load of front reducer.

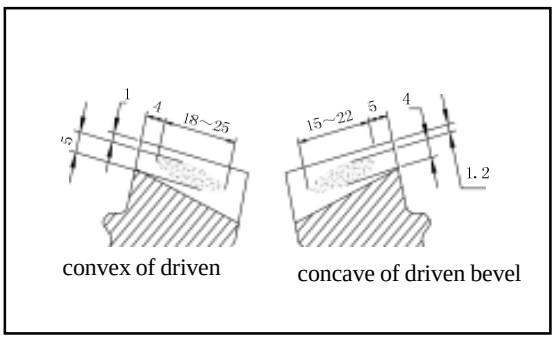
specified torque : 1.8-2.4N • m



20. Check the meshing mark of drive and driven bevel gear.

a. Paint 3-4 teeth with the red lead in three different positions of driven bevel gear.

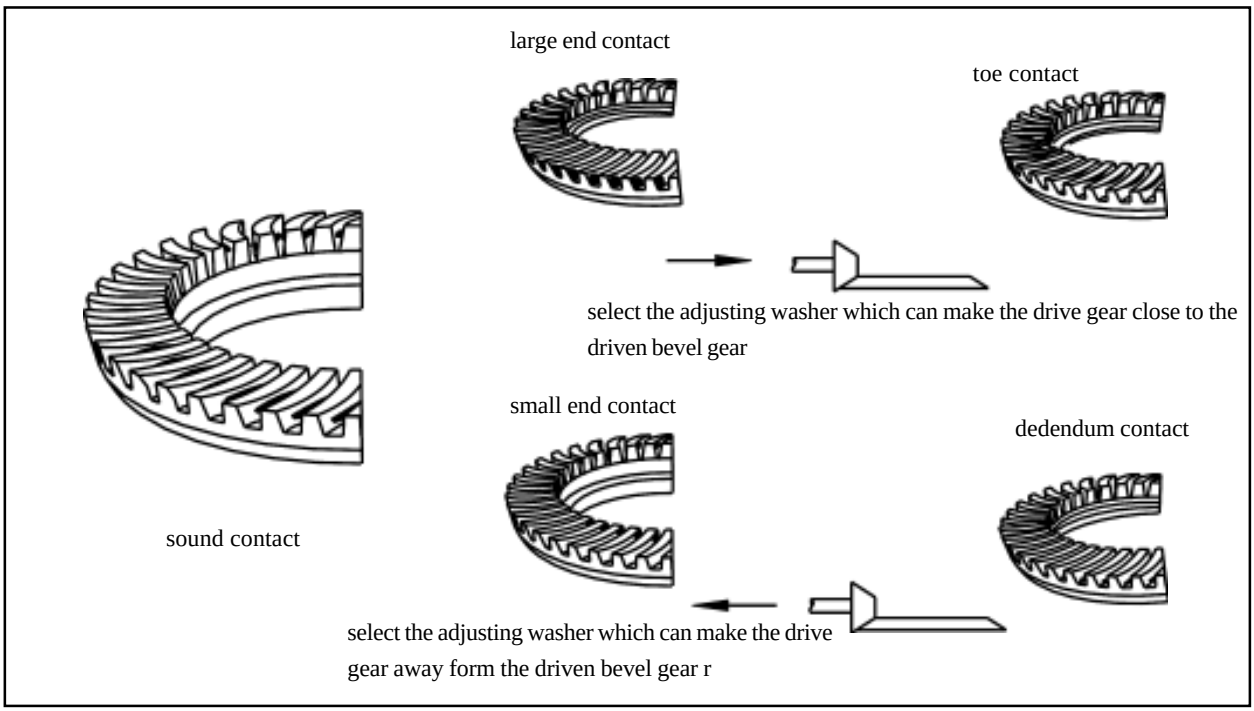
b. Hold the flange of drive gear; rotate the driven bevel gear in clockwise and anticlockwise.

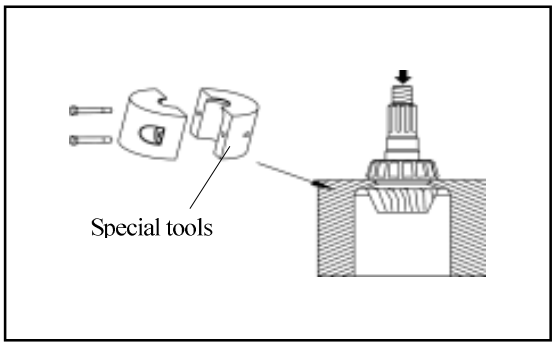


convex of driven

concave of driven bevel

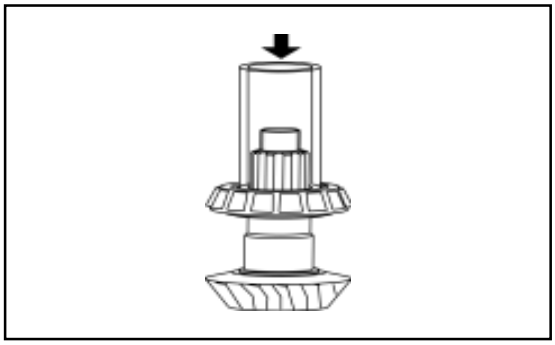
c. Check the contacting condition of gear tooth.If the meshing mark of drive and driven bevel gear does not consist with thatshown in figure, it should select the proper adjusting washer for modification according to the detailed form of meshing mark.





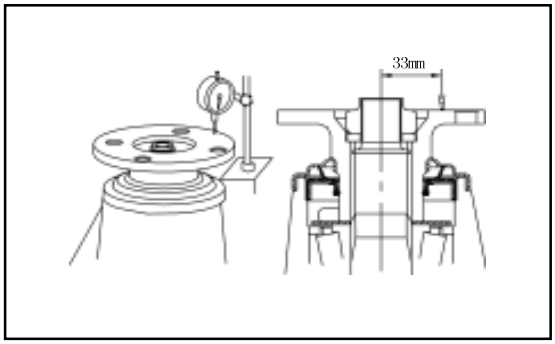
d. Remove the drive bevel gear and use the special toolsto remove the large bearing of drive bevel gear beforereplacethe adjusting washer.

e. Insert the new adjusting washer and usethespecial tools to press in the large bearing of drivebevel gear.



f. Place the adjusting washer above the large bearing on the drive bevel gear, install the spacer in the reducer housing; install the drive gear flange andtighten the nut to the specified torque.

g. Remeasure the pre-applied load of drive gear bearing clearance and the total pre-applied load of reducer; ensure it meets the requirement.

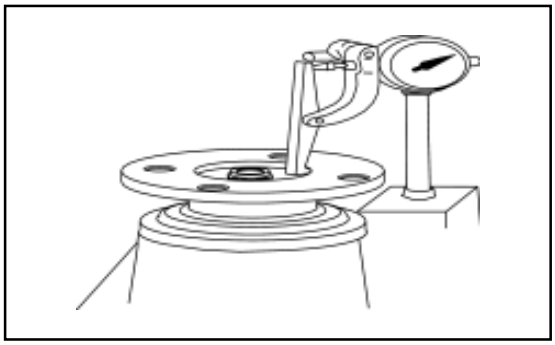


21. Use the dial indicator to measure the axial and radial run-out tolerance of . Drive bevel gear flange.

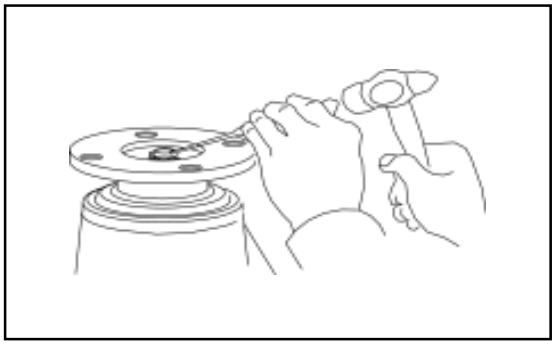
Max. Axial runout : 0.1mm

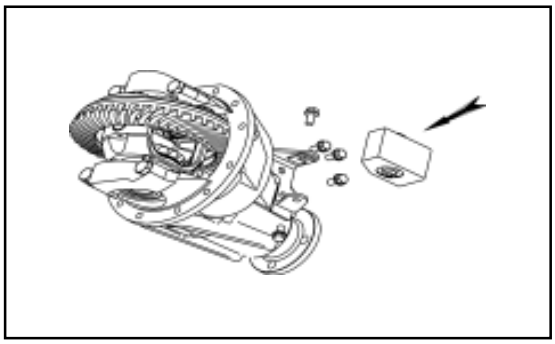
Max. Radial run-out tolerance: 0.1mm

Remarks: It should check the big and small bearing of drive bevel gear when the runout is more than 0.1mm.



22. Rivet the nut of drive bevel gear.





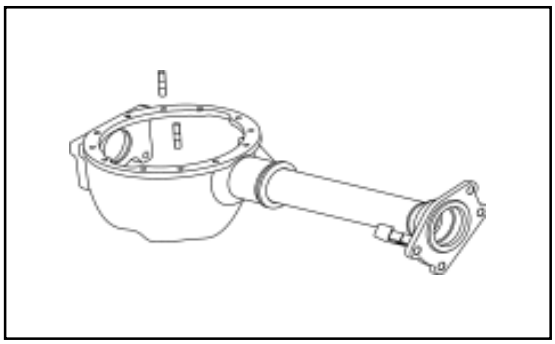
23. Use the bolt coated with screw lock agent toconnect the clump weight bracket welded assembly to the front reducer housing and tighten it to the specified torque.

Specified torque : 20-26N • m

24.Use the bolt coated with screw lock agent to connect the clump weight assembly to the clump weight bracket assembly and tighten it to the specified torque.

Specified torque : 20-26N • m

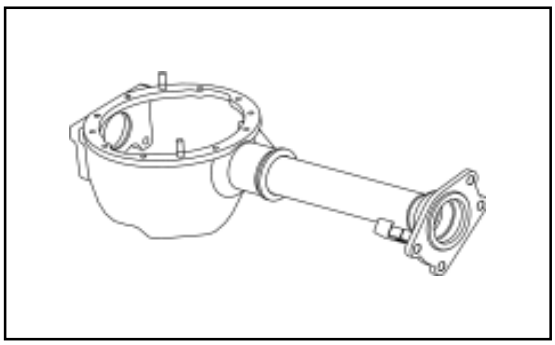
The amount of screw lock agent could cover the screw.



25.Use the pneumaticto screw two studs on the correspon ding screw hole on the front axle housing until the limitation.

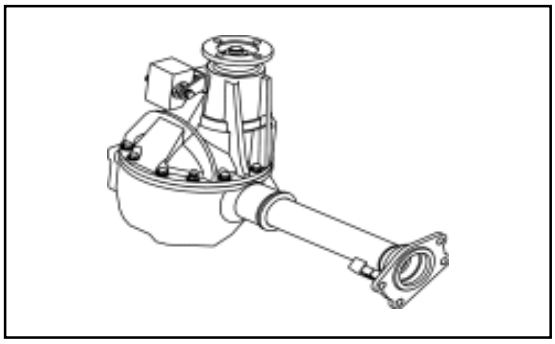
(It should coat the screw of the stud which is screwed in the front axle housing with the screw lock agent, and the amount should be just can cover the screw which is screw in the front axle housing)

Caution: The position of stud should consist with that before disassembly.



26. Coat the plane of front axle housing with the continuous 1596 silicon rubber plane sealant, scrape it to level by plate.

Caution: Avoid the screw hole when paint the sealant; prevent the sealant enters into the screw hole.

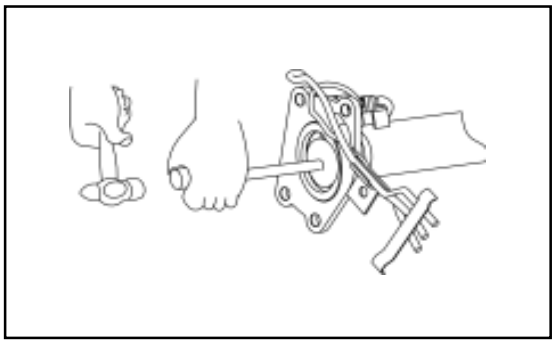


27. Install the front reducer assembly on the front drive axle housing and screw on the hexagon bolt and spring washer combination; cap the spring washer on the stud, tighten the nut to the specified torque.

(The screw of all bolts should be precoated with screw lock agent)

The specified tightening force of hexagon bolt and spring washer **combination, stud and nut should be: 18-25N • m**

Caution: The bolt should be tightened in diagonal sequence evenly; check the reducer housing and axle housing contacting surface for gap; check the sealant from break. It should remove the reducer for reinstallation if has the gap or break.



28. Screw the oil filling plug with washer on the front drive axle.

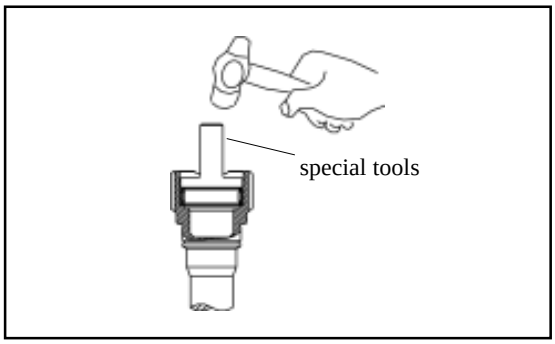
Caution: Do not tighten it.

29. Screw the oil drain plug on the front drive axle.

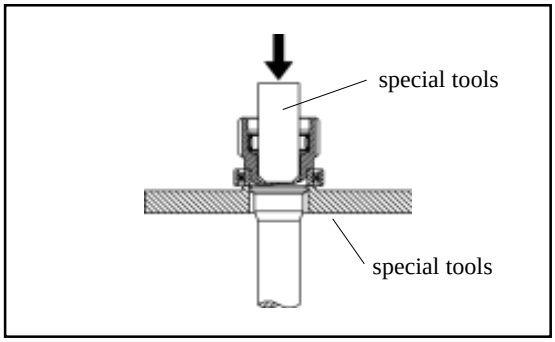
Specified torque : 30-35N • m

30. Use the special tools to install the major semiaxle oil seal in the front axle tube.

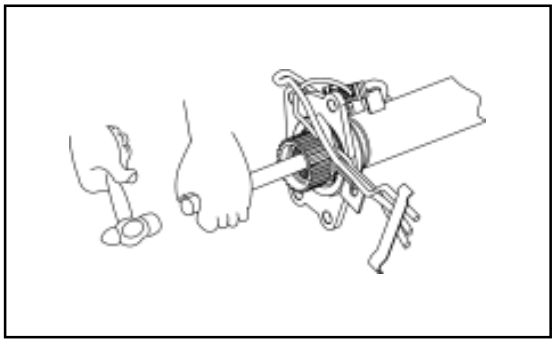
Caution: Precoat the lip of oil seal with thin lithium base grease and the oil seal should be installed in position.



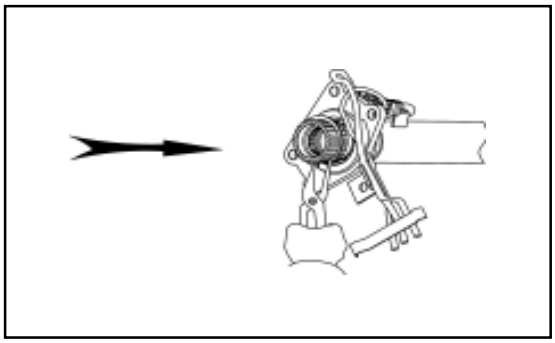
31.Use the special tools to install the needle bearing in the major semiaxle.



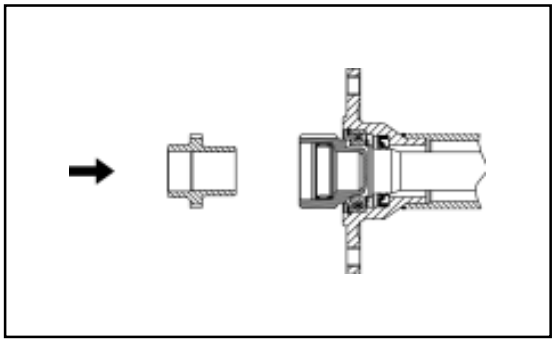
32.Use the special tools to install the major semiaxle bearing by press..
33. Use the circlip pliers to install the circlip to clamp the bearing inner race of major semiaxle.



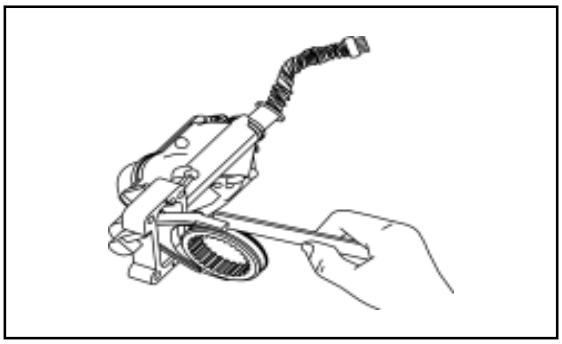
34.Insert the spline on small end of major semiaxle into the spline of front reducer half axle gear; use the brass rod and hand hammer to knock the major semiaxle into the front reducer.
Caution: Does not damage the inside needle bearing. On spline of large end of major semiaxle when knock in the major semiaxle.

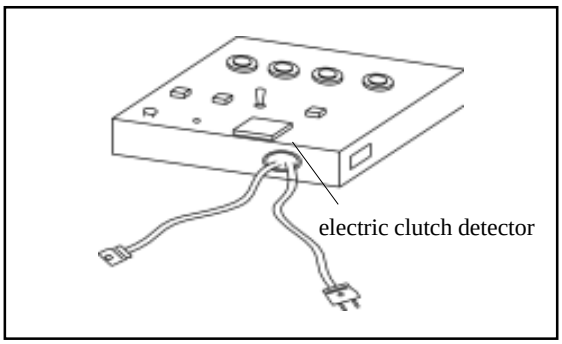


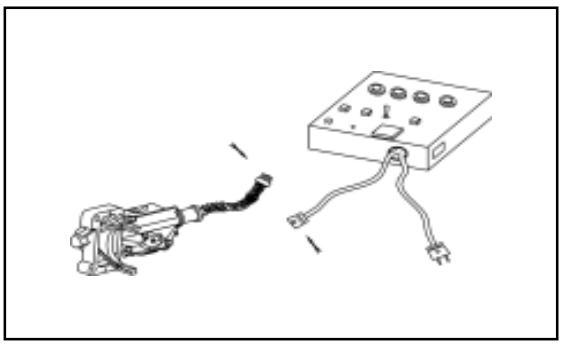
35.Use the circlip pliers to install the circlip in the flange and clamp the major semiaxle bearing outer race.

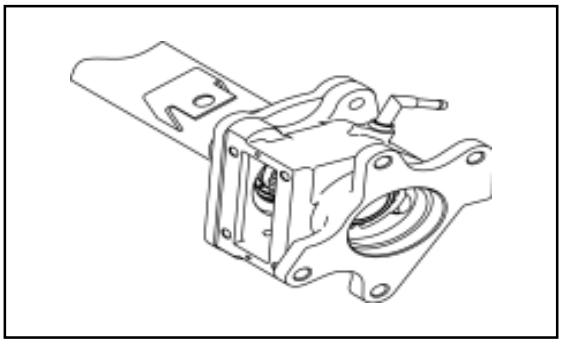


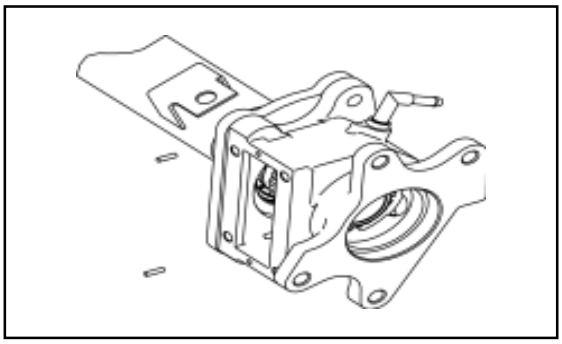
36. Push the mechanical wheel of separator into theneedle bearing inner race in major semiaxle until can not move.











37. Detect the electric clutch assembly .

a. Measure the clearance between the shift fork and shift fork sleeve.

Range of clearance : 0.2-0.4mm

It should replace the electric clutch assembly and shift fork sleeve when the clearance is not in the range.

b. Connect the electric clutch assembly to the electric clutch detector and power the electric clutch detector with 220V power supply to test the electric clutch (Before the test, adjustthe test controller status to make the motor starting time is 3s ,the time form found the actuator is not in position to restartingis 2.5s and the time of controller to redrive the electric clutch is2s) The motor starts for 3s when the gear switch is shifted form 2WD to 4WD, the lamp flashes at the same time, the clutch is in 4WD status, the indicator lamp is light always. If does not reach the 4WD status in the first time, then the controller restarts it for 2s after 2.5s delay, the lamp flashes at the same time; if it is still not in position, then the indicator lamp flashes twice continuously, the indicator lamp is extinguished for 1s, the motor is stopped. That means the electric clutch is unqualified and should be replaced by the qualified product. The motor starts for 3s normally when the clutch is shifted form 4WD to 2WD, the lamp flashes at the same time, when the clutch is in 2WD status, the indicator lamp is extinguished always. If does not reach the 2WD status in the first time, then the controller restarts it for 2s after 2.5s delay, the lamp flashes at the same time; if it is still not in 2WD status, then the indicator lamp flashes twice continuously, the indicator lamp is extinguished for 1s, the motor is stopped.

That means the electric clutch is unqualified and should be replaced by the qualified product.

38. Cover the shift fork sleeve on the major semiaxle spline.

39. Install the separator housing on the front axle tube flange and use the bolt to tighten it to the specified torque 。 (The bolt should be precoated with the screw lock agent and the amount should be just can cover the complete screw)

specified torque : 90-110N • m

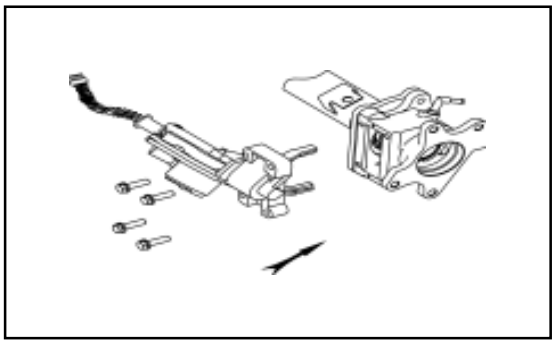
Caution: Before installation, remove the foreign material on two matching surfaces of separator housing and front axle tube flange; and precoat the 1596 silicon rubber plane sealant on the front axle tube flange. Caution: Prevent the sealant from entering into the screw hole.

40. Press in the plastic vent tube on the electric clutch housing and front axle tube.

41. Install two location pins in the location pin hole of electric clutch housing respectively.

42. Coat the connecting surface of electric clutch housing and electric clutch with 1596 silicon rubber sealant uniformly; level it by plate.

Caution: The connecting surface should be cleaned and must not have the oil and other foreign matters. The sealant must not enter into the electric clutch housing and screw hole.

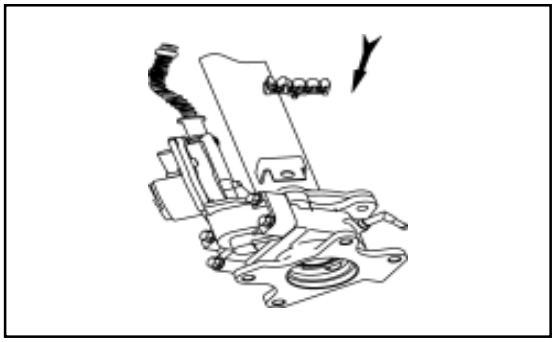


43. Install the electric clutch assembly on the electric clutch housing.

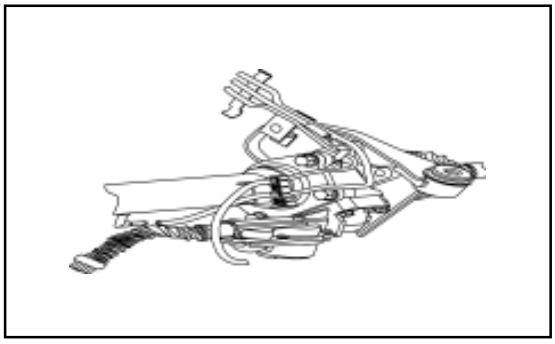
a. Make the shift fork cross on the shift fork sleeve.

b. Align the location pin hole of electric clutch with two location pins, and tighten it by bolt; tighten the bolt to the specified torque. (Precoat the medium screw of bolt with one or two drop of screw lock agent)

Specified torque : 23-26N • m

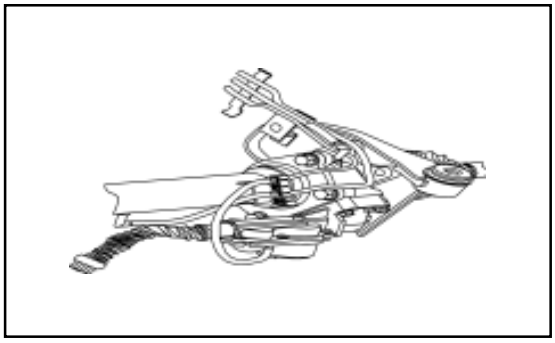


44.Insert the clip into the vent tube bracket.



45. Clamp the vent tube clip on the front drive axle vent tube connecting tube assembly.

46. Connect the front drive axle vent tube connecting tube assembly to three ports, the front axle tube, electric clutch and electric clutch housing.

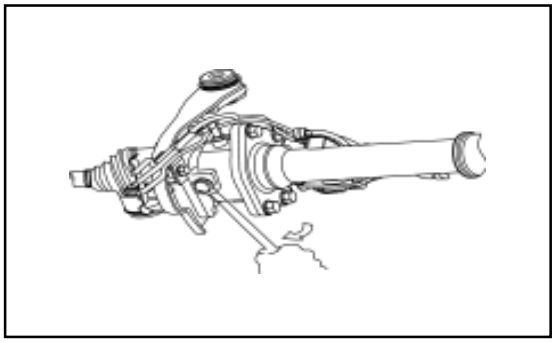


47. Screw off the oil filling plug of front drive axle housing, then fill the axle housing with the hypoid gear oil; then tighten the oil filling plug to the specified torque.

Gear oil number: GL-5

Filling amount: The oil level is flush with the lower edge of oil filling port.

specified torque : 140-150N • m



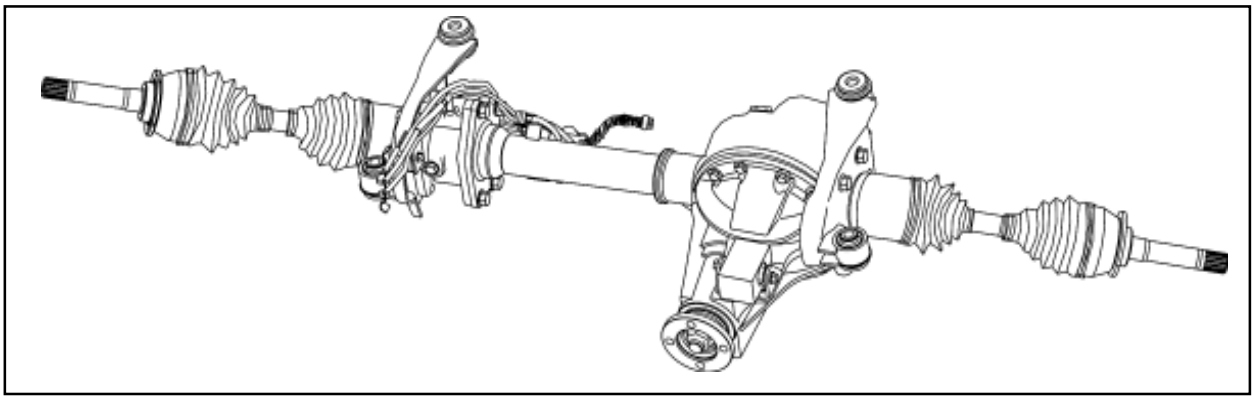
48. Fill the electric clutch housing with the gear oil ; then tighten the oil filling plug to the specified torque.

Gear oil number: GL-5

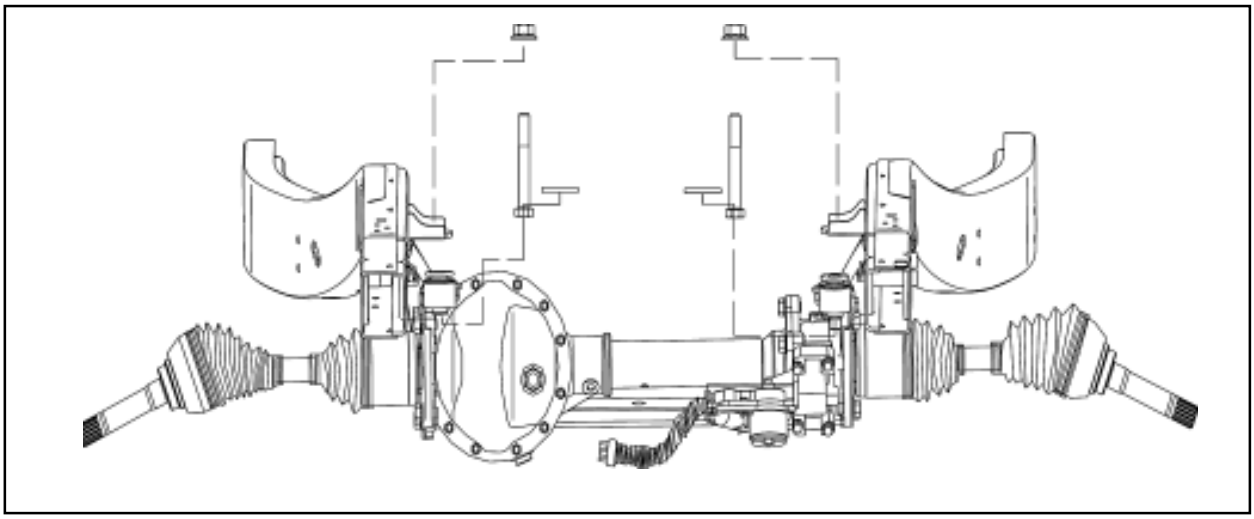
Filling amount: The oil level is flush with the lower edge of oil filling port.

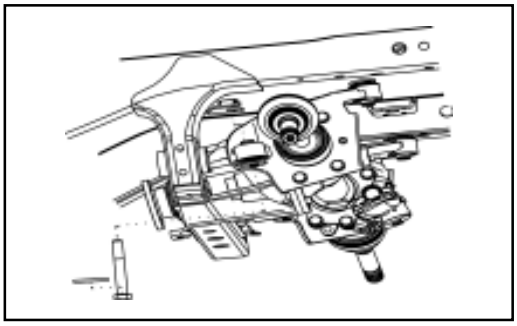
Specified torque: 140-150N • m

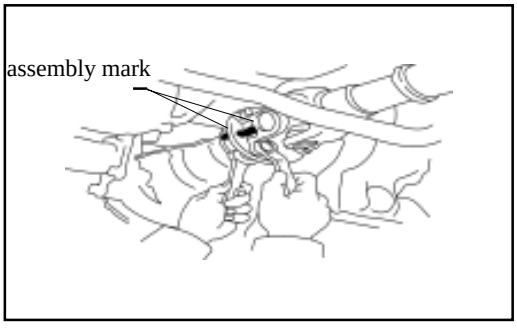
Installation of front reducer assembly



1. Install the front drive shaft assembly on the reducer assembly (Refer to "Assembly of Front Drive Shaft")







2. Use the jack to support the front drive axle, insert the hanger plank bolt with washer and tighten it to the specified torque.

Remarks: Do not insert the previous two bolts in reverse direction.

Specified torque : 200-220N • m

3. Use the bolt to connect the front drive axle flange to the drive shaft according to the mark made before disassembly, and tightens it to the specified torque.

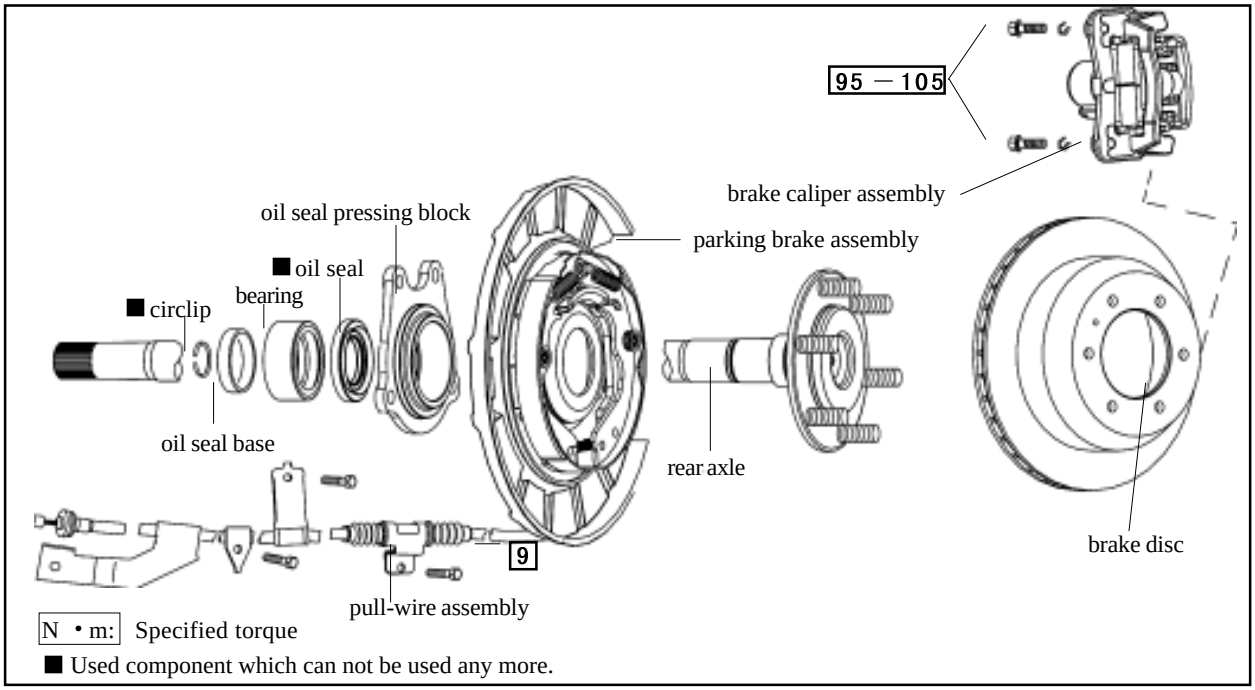
Specified torque : 73-83N • m

4. Install the beam under the front drive axle; tighten the connecting bolt of the beam to the specified torque.

Specified torque : 73-83N • m

5. Connect the power sire connector of the electric clutch to the power output wire of the car.

Axle drving assembly



N • m: Specified torque

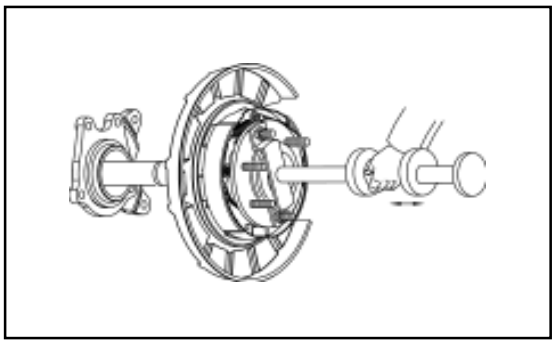
■ Used component which can not be used any more.

Removal of semiaxle

1. Remove the wheel.

2. Disconnect the manual brake pull-wire from the carriage; loose the small bracket.

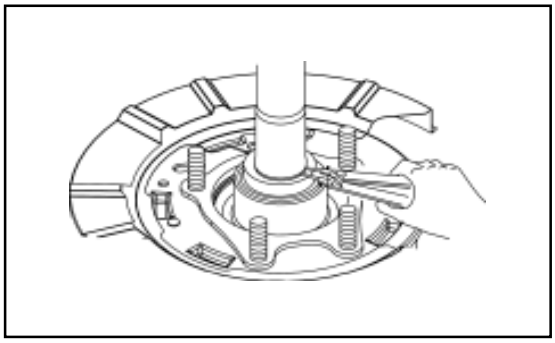
3. Remove the brake caliper; remove the brake disc .



4. Remove the rear halfaxle assembly from the rear axle housing

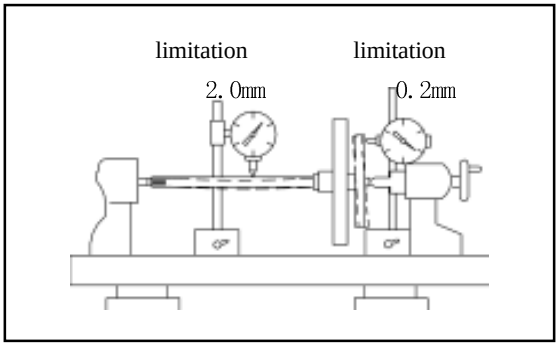
a. Use the bolt to connect the special tools to the semiaxle flange surface.

b. Use the hammer of special tools to remove the rear axle.



5. Remove the circlip from the halfaxle assembly.

Use the circlip pliers to remove the circlip.



Check and repair of rear axle components

1. Check the rear axle and flange for wear, damage and run-out.

Max. Run-out of axle: 2mm

Max. Run-out of flange: 0.2mm

It should replace the rear axle if the rear axle or flange is worn or damaged, or the measured run-out is beyond the specified value.

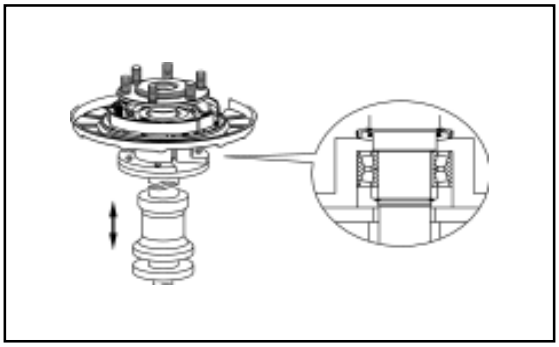
2. Check the external oil seal

a. Check for the wear or damage; especially for the lip of oil seal.

b. Replace it if necessary.

3. Check the bearing and oil seal holder

Check for wear and damage, replace it if necessary.



4. Remove the bearing and oil seal holder

a. Move the brake and oil seal pressing block to the limit position along flange direction; move the external oil seal to the limit position of oil seal.

b. Place the hook of the special tools in sequence, the position is shown as figure; make the hook holds the bearing tightly; then use the bolt to connect the hook to the hammer fixedly; at last, place it on the pad with halfaxle spline end facing ground.

c. Hold the hammer to beat downwardly with force for several times to remove the bearing and oil seal holder.

Caution: Do not damage the oil seal .

5. Install the new external oil seal

a. Clean the semiaxle.

b. Coat the lip of external oil seal with proper HP-R grease.

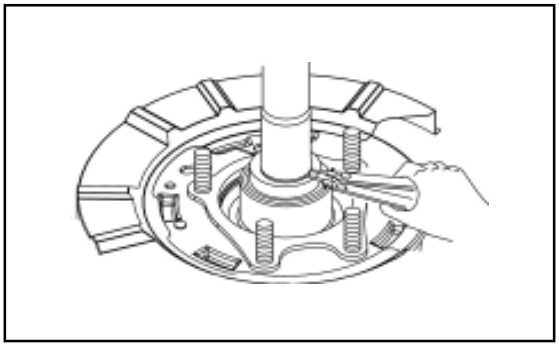
Caution: When install the oil seal, the lip of oil seal must not contact the semishaft to avoid scratching the oil seal .

6. Replace the bearing and oil seal holder

a. Heat the oil seal pressing block in 22# engine oil to 100℃.

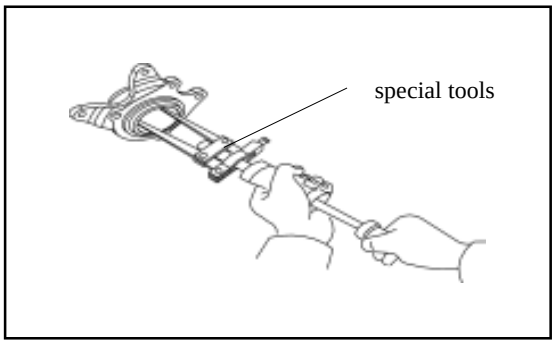
Caution: The end of oil seal pressing block with larger chamfer faces the halfaxle spline. Install it immediately after taken out.

b. Use the hydraulic press to install the new bearing and new oil seal pressing block by press.



7. Install the circlip

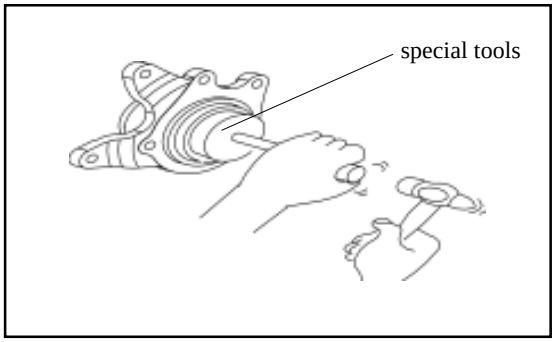
Use the circlip pliers to install the new circlip in the slot of semiaxle.



8. Check the inner oil seal for wear or damage.

9. Remove the inner oil seal

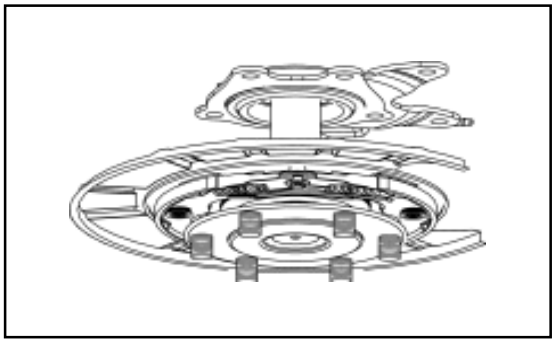
Use the special tools to remove the inner oil seal.



10. Install the new inner oil seal

a. Coat the lip of oil seal with proper HP-R grease.

b. Use the special tools to knock in the new oil seal.



Installation of rear axle

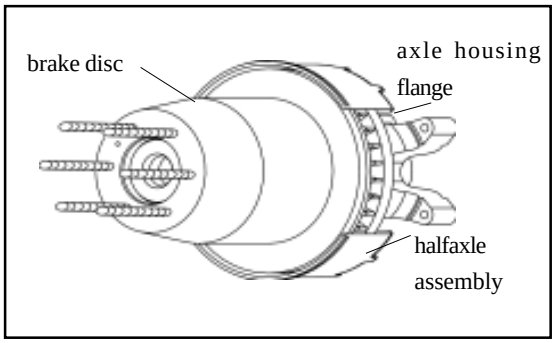
1. Install the halfaxle assembly in the axle housing

a. Use the kerosene to clean the semiaxle and inner oil seal holder.

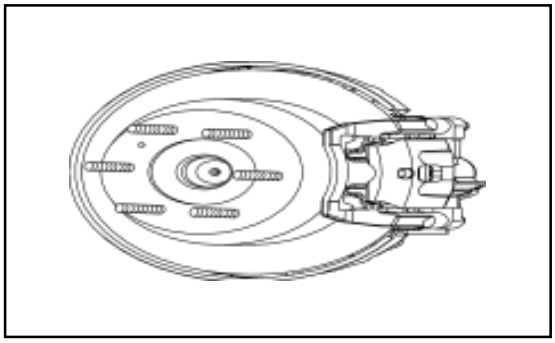
b. Assemble the halfaxle spline and halfaxle gear spline firstly, then use the brass rod to beat knock the halfaxle assembly into the axle housing.

Caution: Protect the lip of inner external oil seal and pull-wire assembly during assembly; do not damage the oil sleeve assembly; align the brake bolt with the flange bolt of rear axle.

Tightening force: 95-105N • m



2. Install the rear brake disc



3. Install the brake caliper

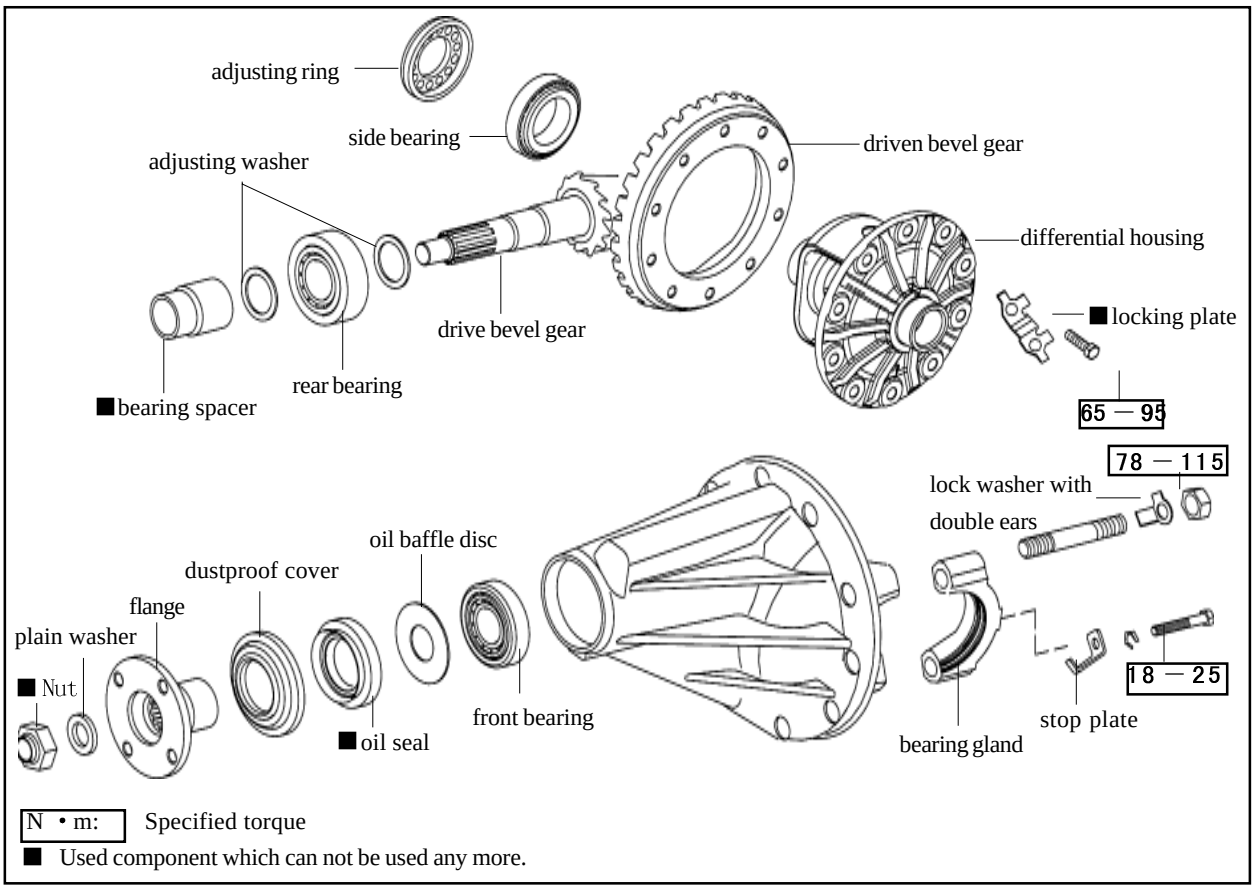
Tightening force: 95-105N • m

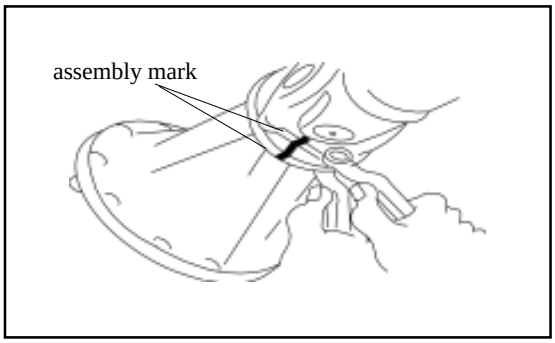
4. Connect the manual brake wire.

5. Install the wheel.

6. Discharge the air of brake system by test.

Reducer



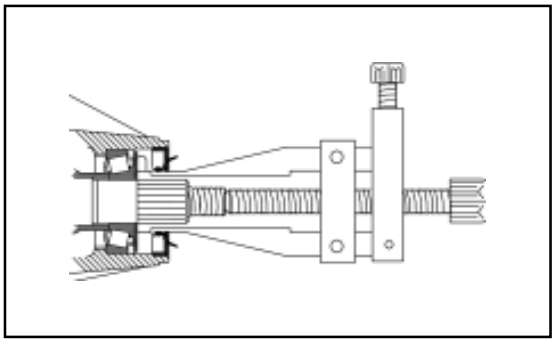


Replace the oil seal on the car

1. Disconnect the reducer from the drive shaft.

a. Make the assembly mark on two flanges.

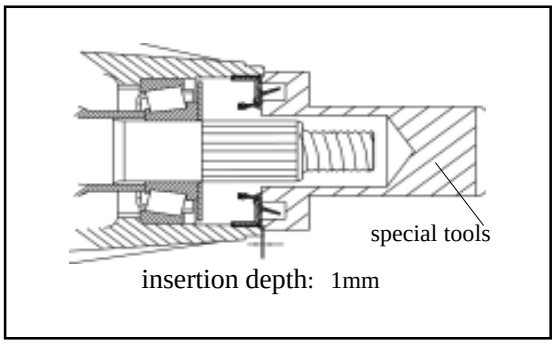
b. Remove four bolts and nuts.



2. Remove the flange and dustproof cover assembly

3. Remove the oil seal

Use the special tools to remove the oil seal.



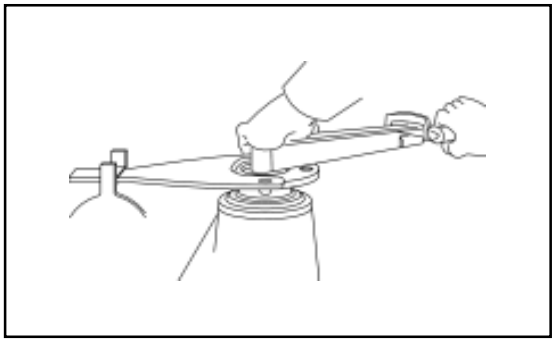
4. Install the new oil seal

a. Coat the lip of oil seal with the HP-R grease.

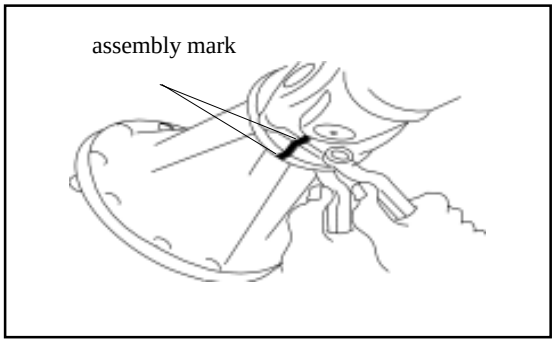
b. Use the special tools to knock in the new oil seal.

Insertion depth of oil seal: 1.0mm

5. Install the flange and dustproof cover assembly

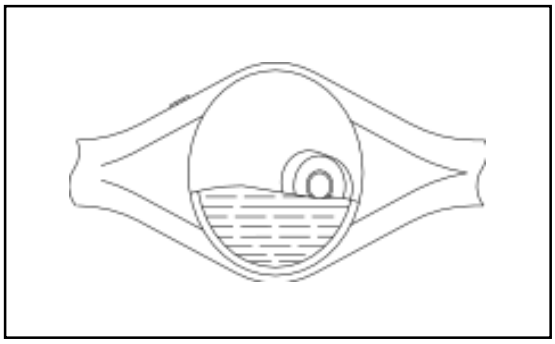


6. Rivet the drive bevel gear nut.



7. Connect the drive shaft flange to the reducer flange Align the assembly mark ; then connect them by bolt.

Tightening force: 78 ± 5N • m

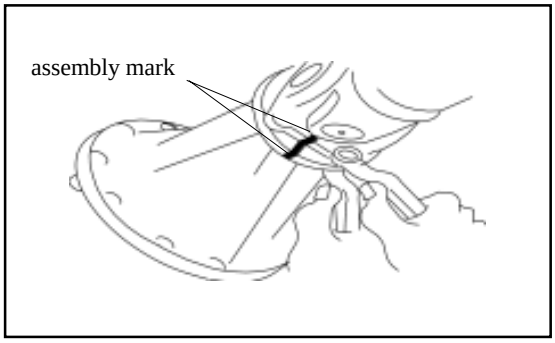


8. Check the oil level of reducerReplace the hyperbolic gear oil if necessary.

Oil number : GL-5 hyperbolic gear

Viscosity : SAE80W/90

Amount: Filled with oil until the oil flows out form oil filling port.



Removal of reducer

1.Remove the oil drain plug; drain the oil from the reducer

2. Remove the rear axle

(Refer to Step 2 in “Disassembly of Rear Axle”)

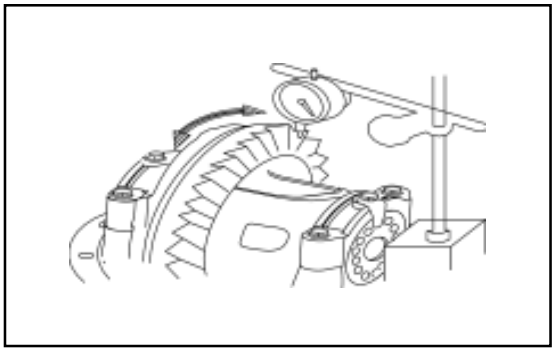
3. Disconnect the drive shaft from the reducer

(Refer to step 1 in “Replace the Oil Seal on Car”)

4. Remove the assembly of reducer.

Disassembly of reducer

Remarks: If the noise of differential is loud, process the following inspection before disassembles the differential to determine its reason. When the differential has serious problems, it can be disassembled for repair if necessary.



1. Check the internal clearance of driven bevel gear.

If the clearance is beyond the specified range; adjust the preapplied load of bearing or repair if necessary.

(Refer to step 13 “Assembly of Reducer”)

Standard internal clearance: 0.15-0.25mm

2. Check the intertooth contact of drive bevel gear and driven bevel gear.

(Refer to Step 14 in “Assembly of Reducer”)

Record the contact position of tooth.

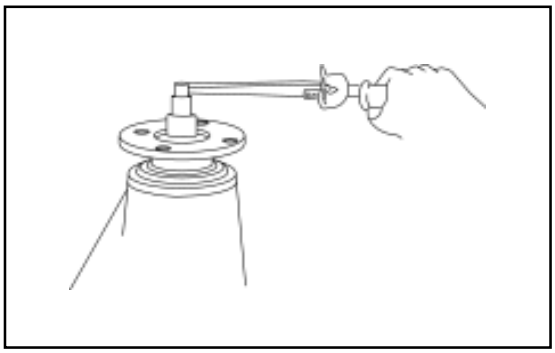
3. Check the clearance between the thrust plate of axle shaft gear and differential housing.

Use the feeler to measure the clearance between the thrust plate of axle shaft gear and differential housing.

Standard clearance: 0.45-0.75mm

It should be replaced by the proper thrust washer if the clearance is beyond the specified range.

(Refer to Step 2 in “Replacement of Differential Components”)



4. Measure the pre-applied load of drive bevel gear

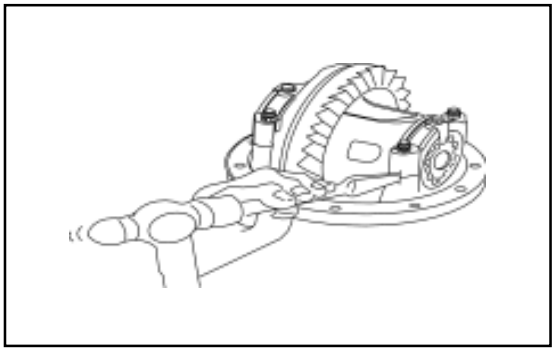
Use the torsion meter to measure the pre-applied load on the internal clearance between the drive small gear and driven bevel gear.

Pre-applied load: 0.4-0.6N • m

5. Total pre-applied load

Use the torsion meter to measure the total pre-applied load.

Pre-applied load : 0.9-1.3N • m



6. Remove the differential and driven bevel gear

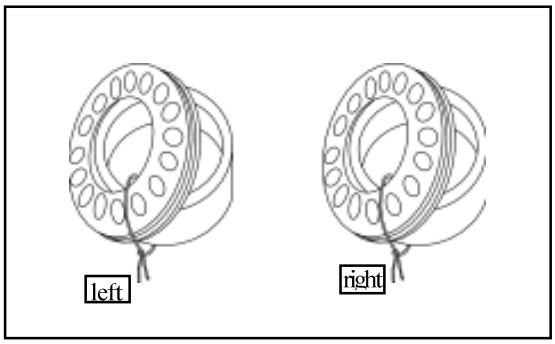
a. Make the assembly mark on the differential bearing gland and reducer housing.

b.Remove two stop plates.

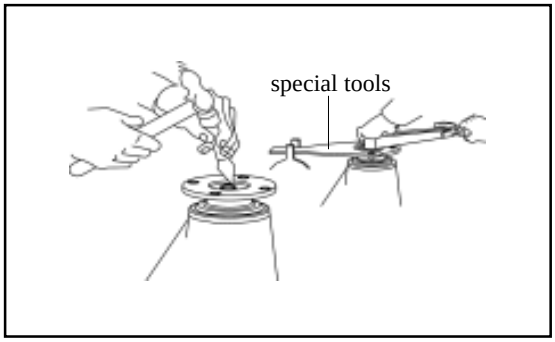
c.Remove two bearing glands and two adjusting rings.

d.Remove the bearing outer race.

e.Remove the differential form the reducer housing.



Remarks: Mark the label on the removed components to indicate the position of reassembly.



7. Remove the flange and dustproof cover assembly

a.Use the hammer and chisel to loose the riveted part of nut.

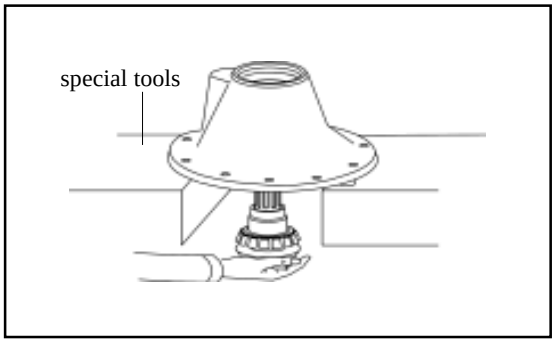
b.Use the special tools to clamps the flange; then remove the nut.

Caution: The used nut can not be used any more.

c.Remove the flange and dustproof cover assembly.

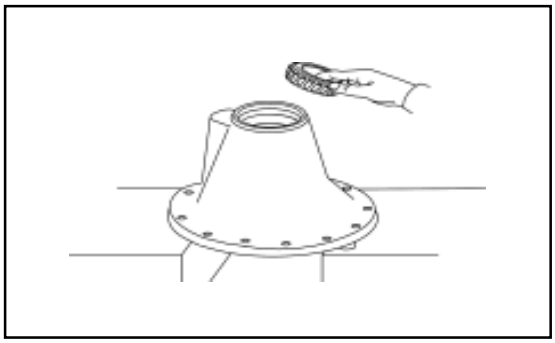
8. Remove the oil seal

Use the tools to pry out the oil seal.

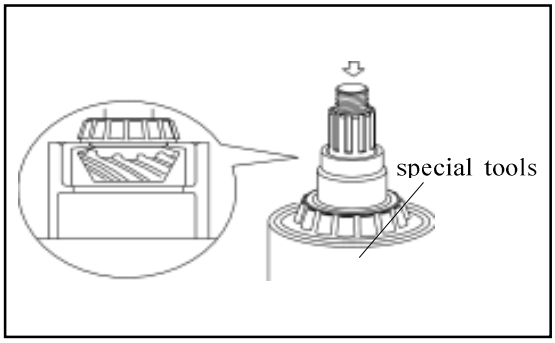


9. Remove the drive bevel gear and spacer

Remove the drive bevel gear, bearing and spacer from the reducer housing.

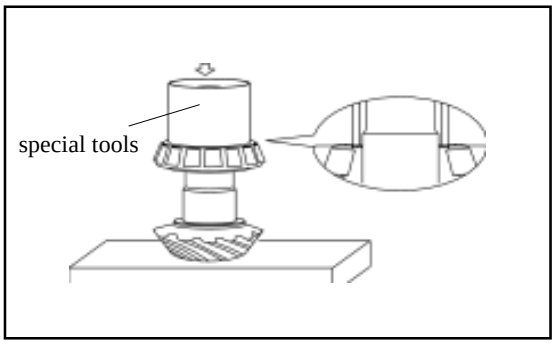


10. Remove the oil baffle disc and front bearing inner race

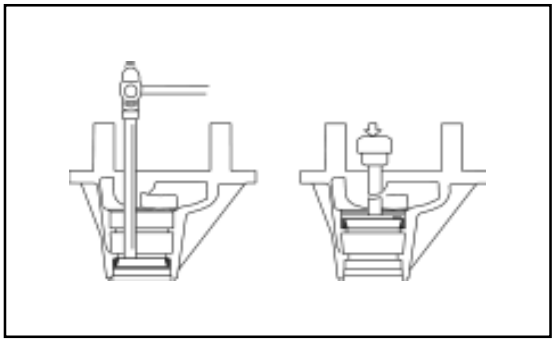


11. Replace the rear bearing of drive bevel gear

a. Use the press machine and special tools to pull out the rear bearing from the drive bevel gear.



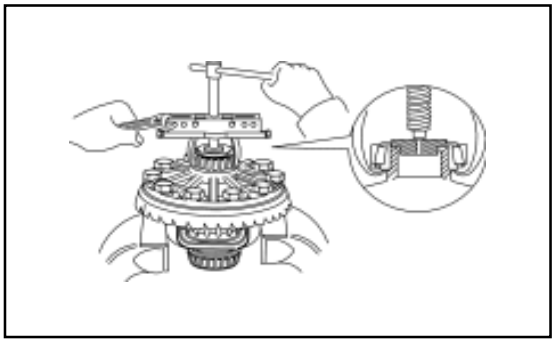
b.Use the press machine and special tools to install the reused adjusting washer and new rear bearing on the drive bevel gear.



12. Replacement of front and rear bearing outer race of drive bevel gear.

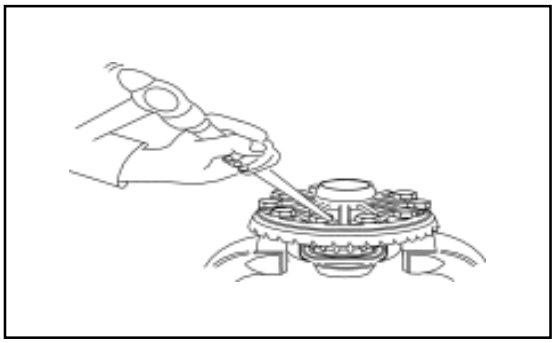
a. Use the hammer and brass bar to knock out the front and rear bearing.

b. Use the press machine and special tools to install the new bearing outer race by press.



13. Remove the side bearing form the differential housing.

Use the special tools to pull out the side bearing from the differ ential housing.

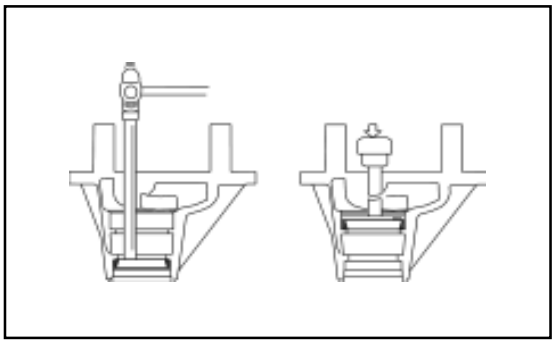


14. Remove the driven bevel gear

a.Remove the connecting bolt and lock plate of driven bevel gear.

b.Make the assembly mark on the driven bevel gear and differen tial housing.

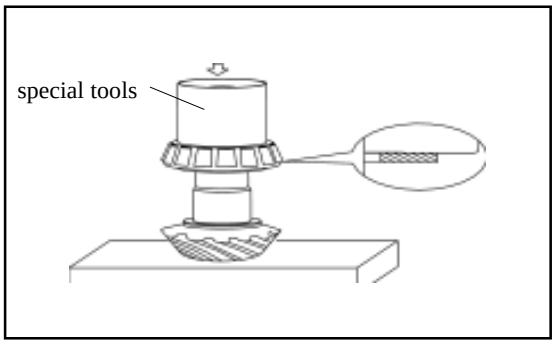
c.Use the rubber hammer or brass rod to knock down the driven bevel gear.



Assembly of reducer

1. Install the bearing outer race of drive bevel gear.

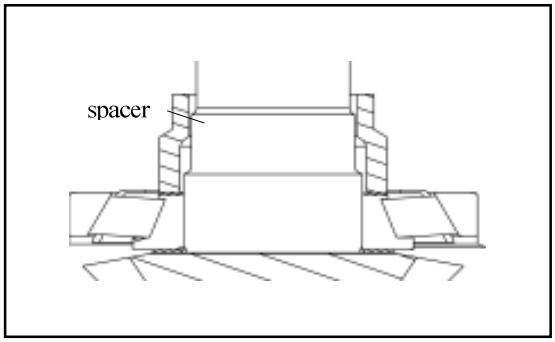
(Refer to Step 12 in “Disassembly of Reducer”)



2. Install the rear bearing of drive bevel gear and ad justing washer

a. Select the proper adjusting washer according to “Meshing Condi tion of Drive Bevel Gear and Driven Bevel Gear”.

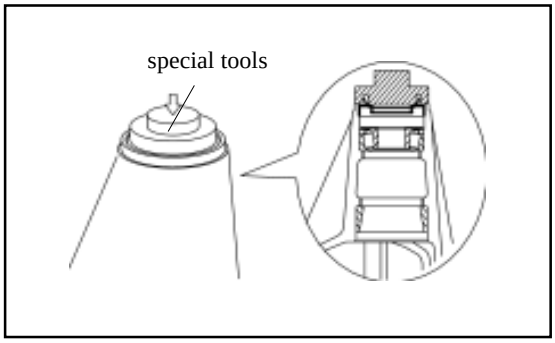
b. Install the rear bearing and selected adjusting washer by press machine.



3. Install the spacer.

a.Select the adjusting washer between the rear bearing and spacer based on the experience.

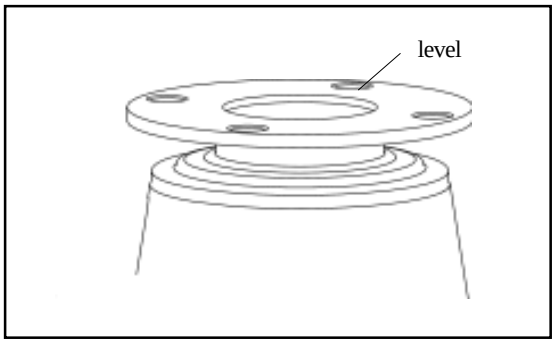
b.Install the spacer.



4. Install the front bearing inner race, oil baffle disc and oil seal of drive bevel gear

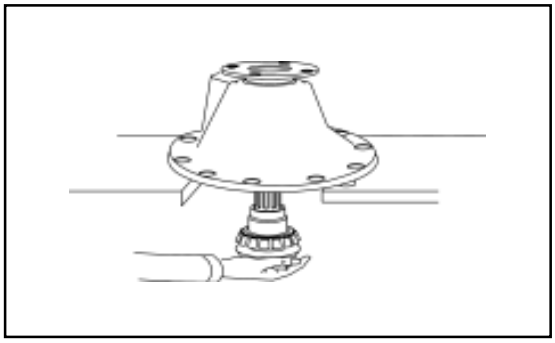
a. Place the front bearing inner race in the reducer housing; place the oil baffle disc.

b. Coat the position of reducer housing oil seal and lip of oilseal with grease uniformly; place the oil seal in position. Start the press machine for installation.



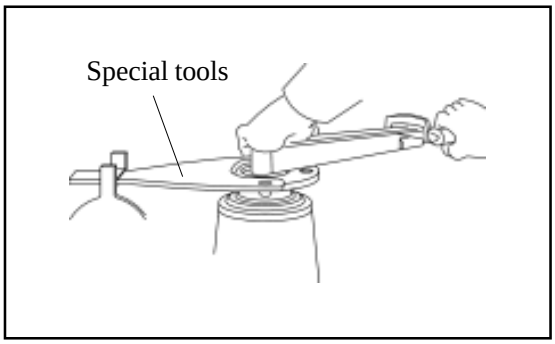
5. Install the drive bevel gear, flange and dustproof cover assembly

a. Install the flange and dustproof cover assembly in the reducer housing, Press it to level by hand.



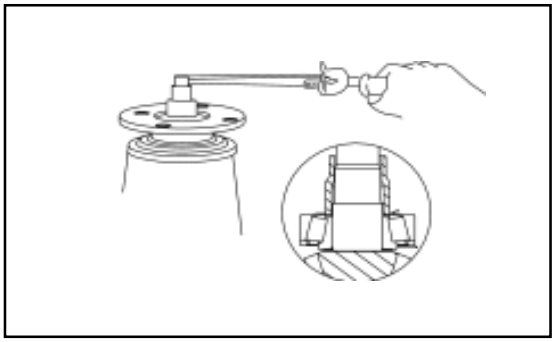
b. Insert the drive bevel gear installed with the spacer, rear bearing and adjusting washer into the flange through the spline; screw on the nut.

c. Use the nut to tighten the flange, plain washer and drive gear.



6. Use the special tools to clamp the flange; use the torque wrench to tighten the nut.

Tightening force: 140～160N • m



7. Measure the rotation pretightening force of bearing

For new bearing : 1.2～1.7N • m

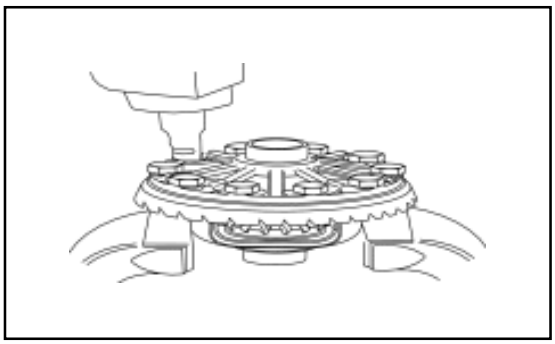
For reused bearing : 0.4～0.6N • m

If does not meet the requirement, replace the adjusting washer under the spacer until meet the requirement.

Tightening torque : 0-3.5N • m

a. Reduce the thickness of adjusting washer if the measured value is less than standard value;

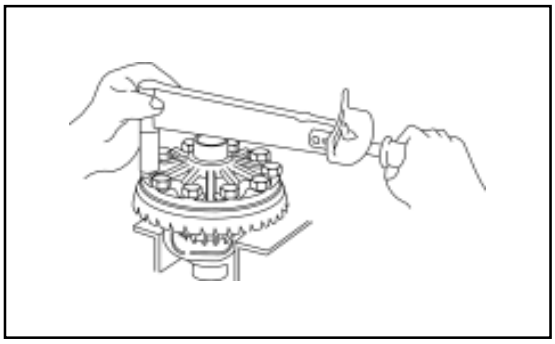
b. Increase the thickness of adjusting washer if the measured value is more than standard value.



8. Install the driven bevel gear on the differential housing.

a. Use the bolt and lock plate to connect the driven bevel gear to the differential housing.

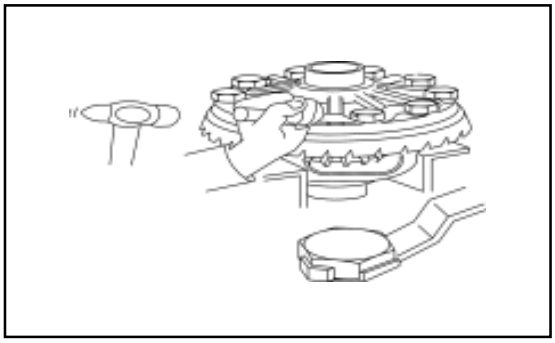
b. Screw on for three rounds at least by hand; then use the pneu matic wrench to tighten it properly.



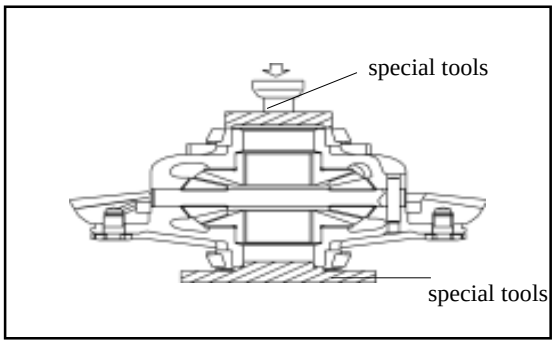
c. Use the torque wrench to tighten it.

Tightening force: 65-95N • m

Caution: Tighten the bolt in diagonal .

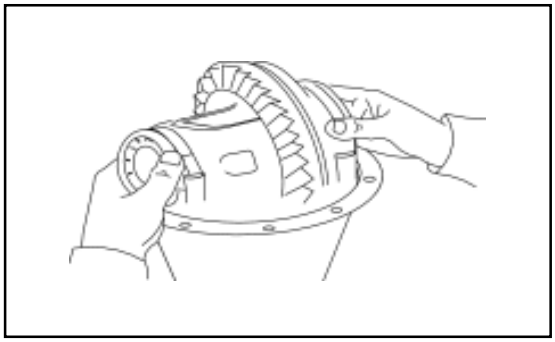


Use the hand hammer and flat head punch to lock the lock plate.



9. Install the differential side bearing by press.

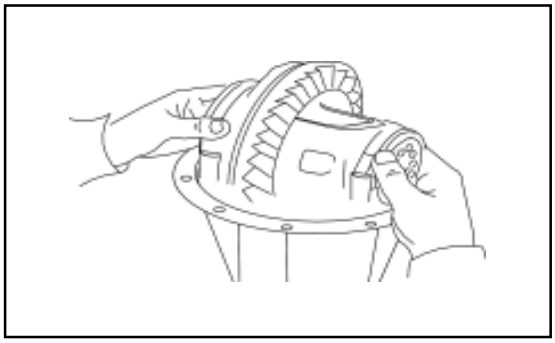
Use the press machine and special tools to install the side bearing on the differential housing by press.



10. Install the differential assembly

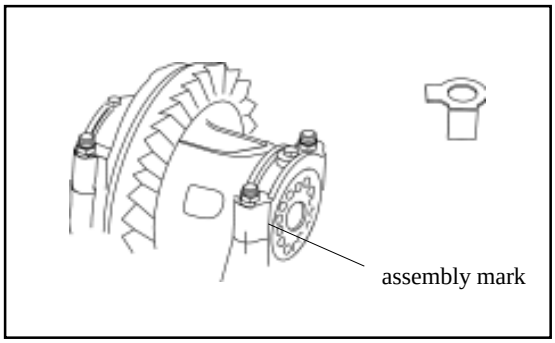
a.Remove the bearing gland. Do not mix the left up with right.

b.Install the differential assembly in the reducer housing.



11.Install the adjusting ring

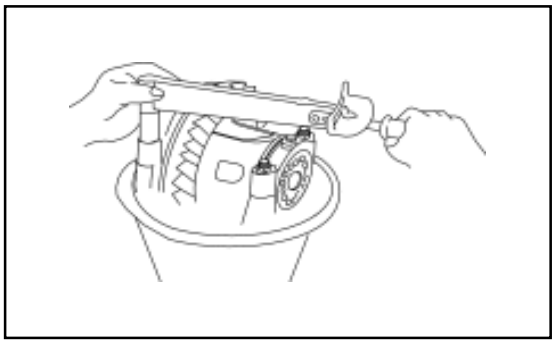
Use the adjusting ring to press the bearing outer race in position; tighten it properly. Adjust the clearance between the drive and driven gear to the proper dimension.



12. Install the bearing gland

a. Align the assembly mark on the bearing cover with that on re ducer housing; Press down the press cover by hand.

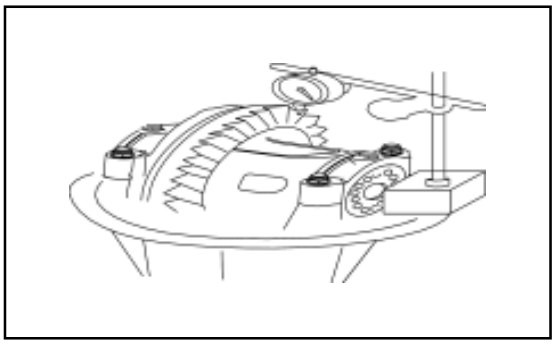
b. Install the lock washer with double ears and nut; tighten the hexagon nut by pneumatic wrench properly.



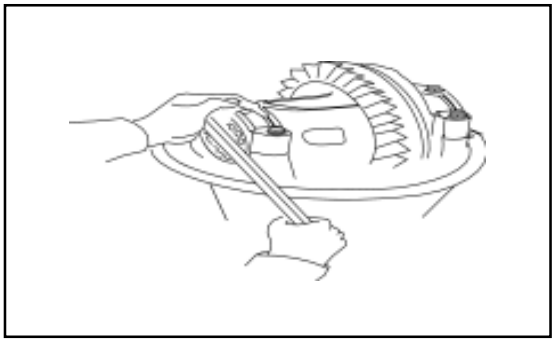
13. Adjust the engagement clearance between the drive and driven gear.

a. Use the torque wrench to tighten four bolts on bearing cover by torque wrench.

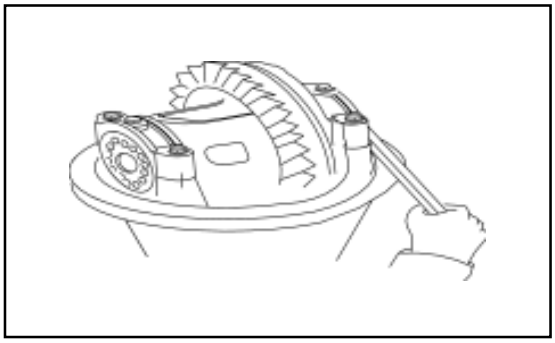
Tightening force: 78-115N • m

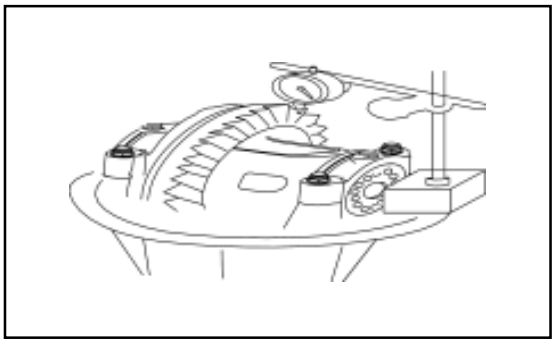


b. Adhere the measuring meter base on the end surface of reducer housing; the measuring head contacts the tooth surface; rotate the driven gear by hand and measure the engagement clearance be tween the drive and driven gear.



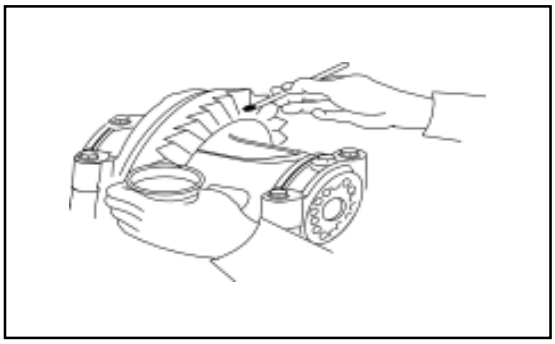
c. If the engagement clearance does not meet the requirement, use the special tools to adjust the left and right adjusting ring until it meets the requirement.





d. Recheck the engagement clearance between the drive and driven gear.

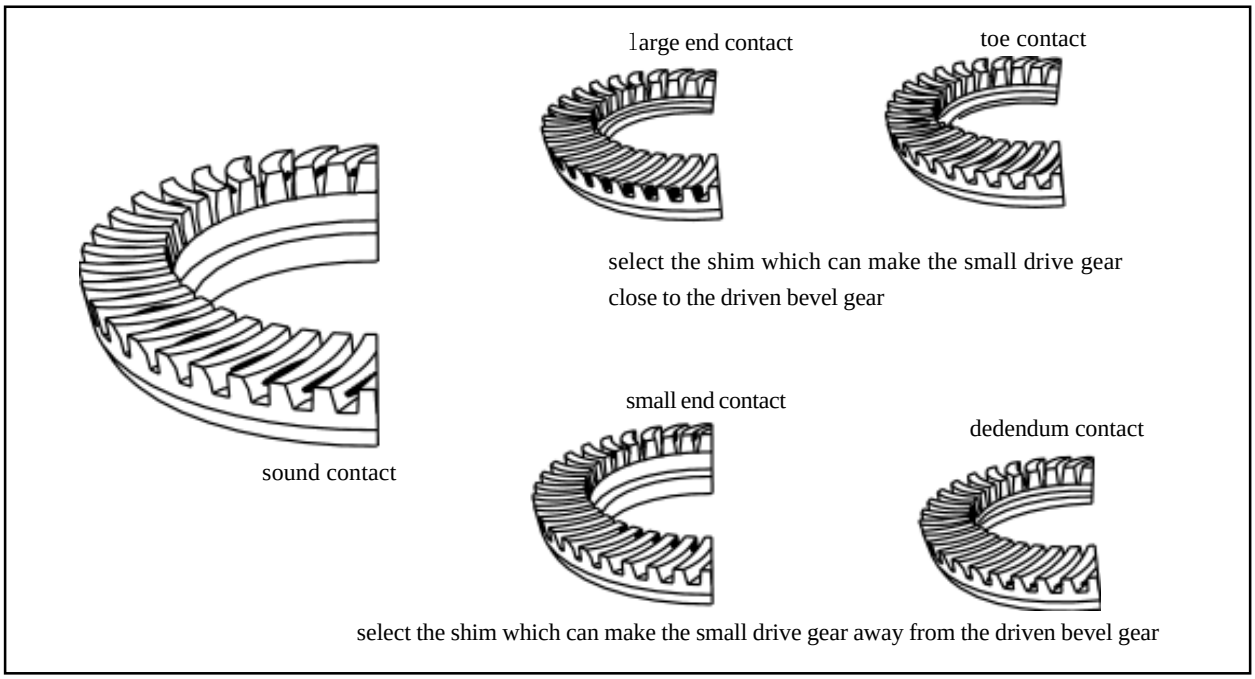
Engagement clearance: 0.13-0.18mm



14. Check the meshing mark of drive and driven bevel gear.

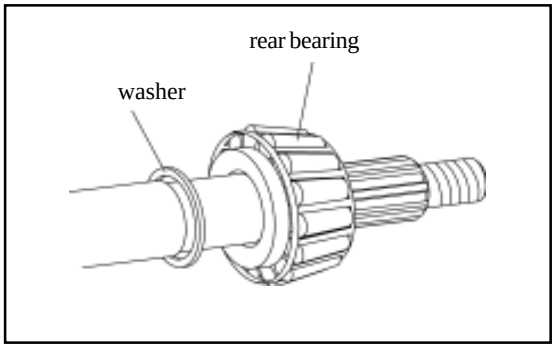
a. Paint 3-4 teeth with the red lead in three different positions of driven bevel gear.

b. Rotate the driven bevel gear in clockwise and anticlockwise by hand.Check the engagement of gear.



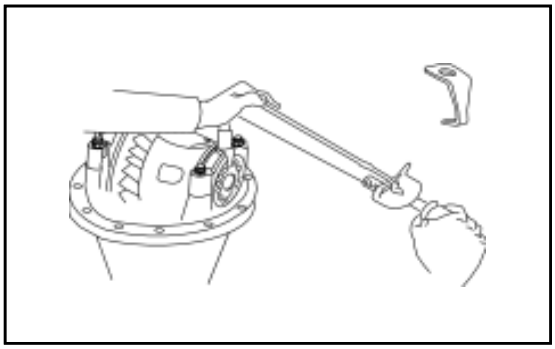
select the shim which can make the small drive gear close to the driven bevel gear

select the shim which can make the small drive gear away from the driven bevel gear



Select the proper washer from the table for correction if the intertooth contacting status is bad. The thickness tolerance of washer is ±0.01mm.

Set NO.	Thickness	Set NO.	Thickness
1	1.60	7	1.90
2	1.65	8	1.95
3	1.70	9	2.00
4	1.75	10	2.05
5	1.80	11	2.10
6	1.85	12	2.15



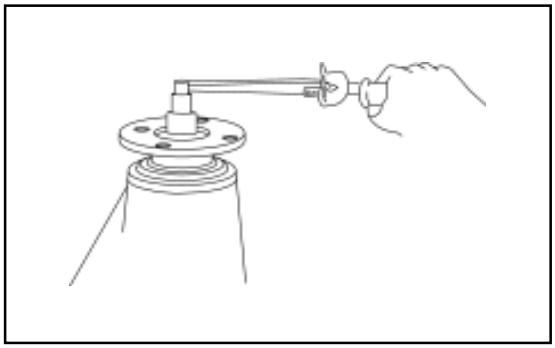
15. Install the stop washer and stop plate

a. If the drive and driven gear engagement mark meets the requirement, then use the hand hammer and punch to lock the stop washer.

b. Install the stop plate, spring shim and bolt; tighten the bolt.

Tightening force: 18-25N • m

c. Use the punch and hand hammer to knock the lower end of stop plate in the adjusting ring hole.



16. Measure the total pre-applied load

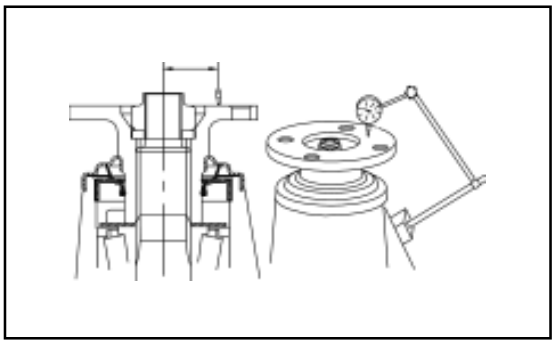
Pre-applied load : 1.8-2.4N • m

If the pre-applied load is beyond the specified; it should replace the shim between the spacer and rear bearing until meet the requirement.

a. It should replace the adjusting washer if the pre-applied load is more than specified value.

b. If the pre-applied load is less than specified value, it can retighten the nut slowly and the torque should be no more than 160N • m.

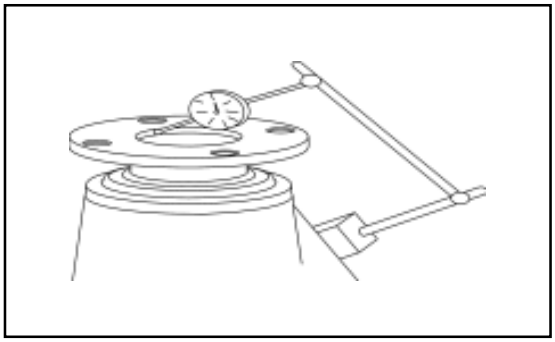
Caution: When tighten the nut, if is beyond the Max. torque, replace the adjusting washer and repeat the pre-applied load process. Do not reduce the pre-applied load by the method of screw off the drive gear nut to loose.



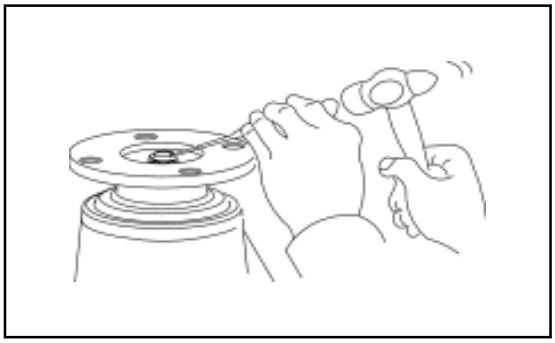
17. Check and adjust the run-out of flange.

a.Adhere the dial indicator base on the reducer housing; make the probe of dial indicator contact with the end surface of flange; rotate the flange and watch the rotation range of the dial.

Full run-out tolerance of end surface: 0.10mm



b.Adhere the dial indicator base on the reducer housing; make the probe of the dial indicator contact with the inner diameter of flange; rotate the flange by hand , and watch the rotation range of the dial.Radial full run-out tolerance: 0.10mm



18. Rivet the nut of drive bevel gear

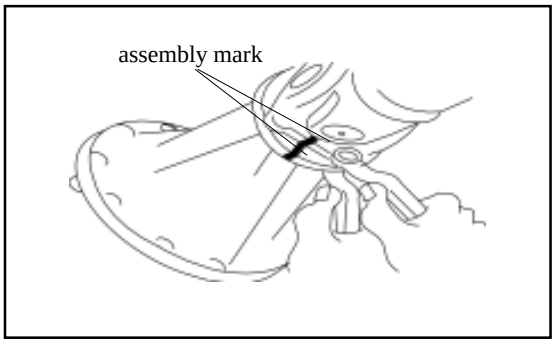
Installation of reducer and differential assembly

1.Install the new stiffening ring

2.Install the reducer and differential assembly

Install the reducer and differential assembly in the rear axle housing; place the washer and nut. Tighten the nut to the specified torque.

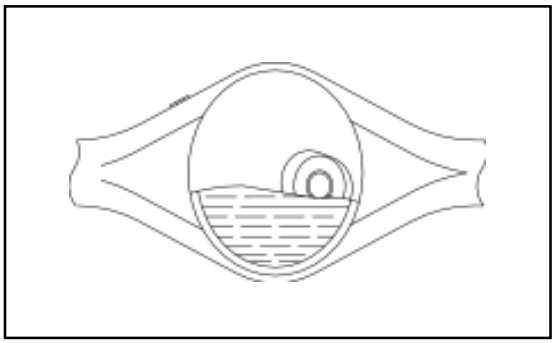
Tightening force: 18-25N • m



3.Install the reducer and differential assembly flange on the drive shaft flange and align the assembly mark; use four bolts and nuts to connect them.

Tighten the bolt and nut to the specified torque.

Tightening force: 78 ± 5N • m



4.Install the oil drain plug; fill the differential with the gear oil

oil number : GL-5 hyperbolic gear oil

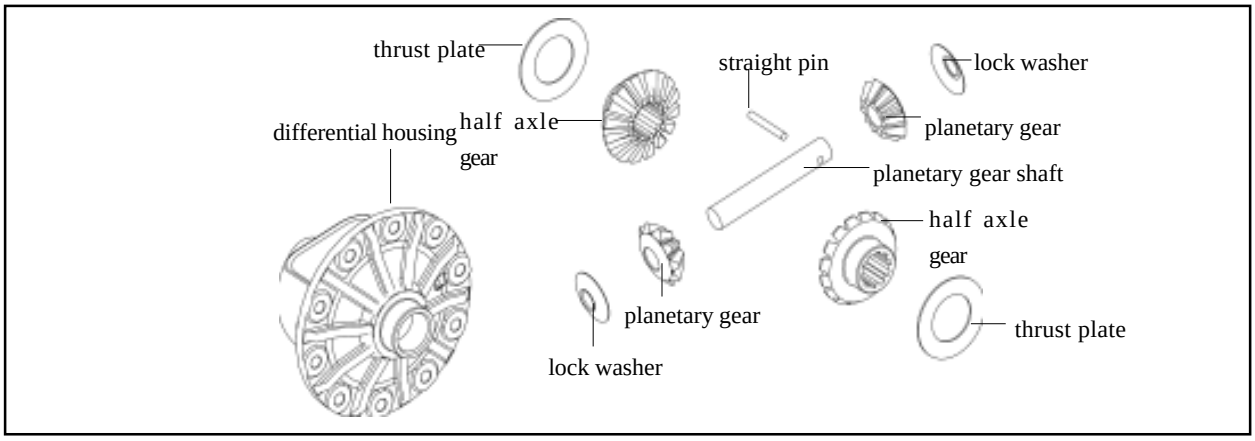
Viscosity: SAE80W/90

Amount: Filled with oil until the oil flow out from the oil filling port.

Tighten the oil filling plug.

Tightening force: 140-150N • m

Differential



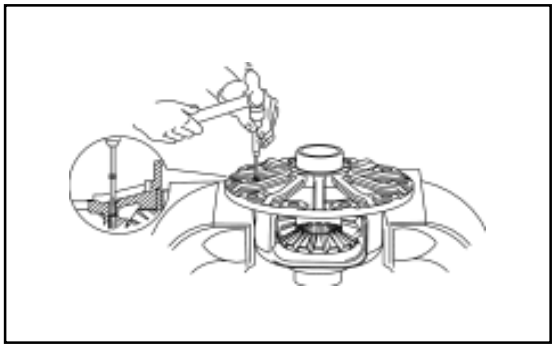
Differential

1. Remove the reducer and differential assembly

(Refer to “Removal of reducer”)

2. Remove the differential from the reducer and dif ferential assembly.

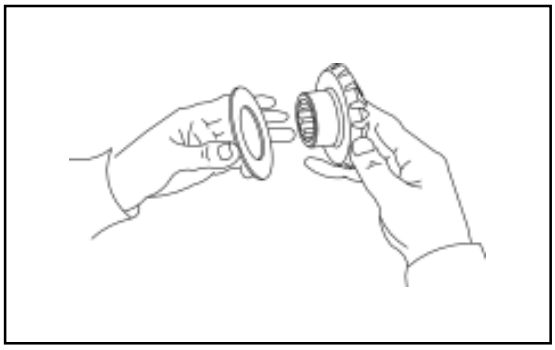
(Refer to “Disassembly of reducer”)



Replacement of differential components

1.Disassembly of differential

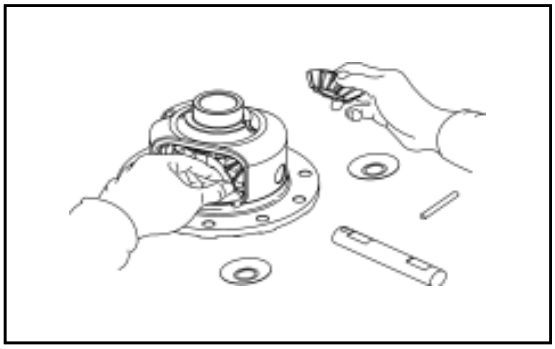
Use the hammer and punch to knock out the pin. Remove the planetary gear shaft, two half axle gears, two planetary gears and two lock washers, two thrust plates.



2. Assembly of differential

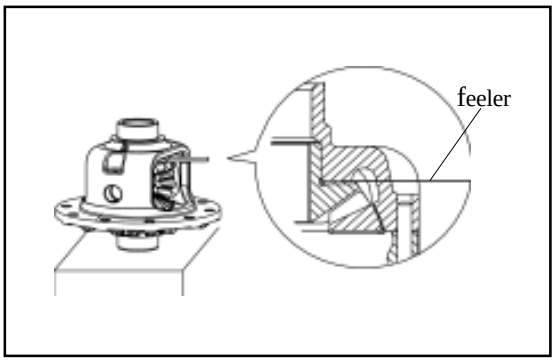
a.Install the half axle gear and thrust plate of axle shaft gear (Unit: mm)

Set NO.	1	2
Thickness	1.2	1.5



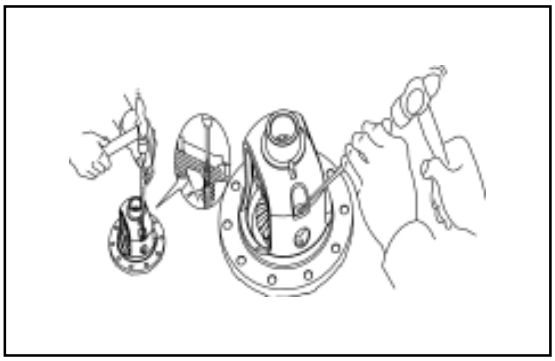
b.Install the planetary gear and planetary gear lock washer in the differential by rolling. (Unit: mm)

Set NO.	1	2
Thickness	0.8	1.0



c.Use the feeler to measure the clearance between the thrust plate and differential housing; it can be replaced by the thrust plate with different thickness if the clearance is beyond the specified range.

Standard clearance: 0.45-0.75mm



d.Install the straight pin

Use the hammer and punch to knock in the pin through the hole on the differential housing and planetary gear shaft. Rivet the pin with the differential housing.

Installation of differential

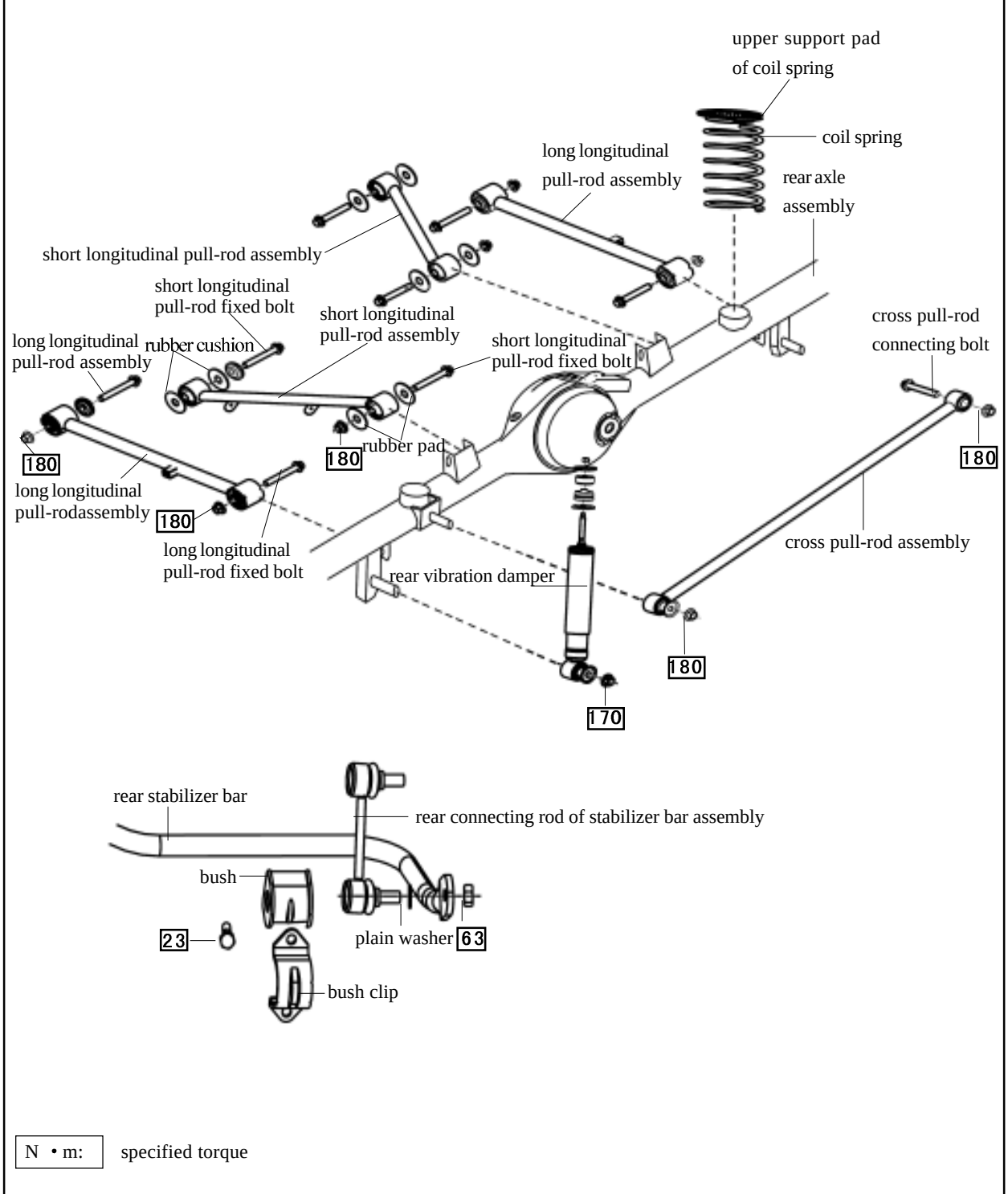
1. Install the differential assembly in the reducer housing

(Refer to “Assembly of Reducer”)

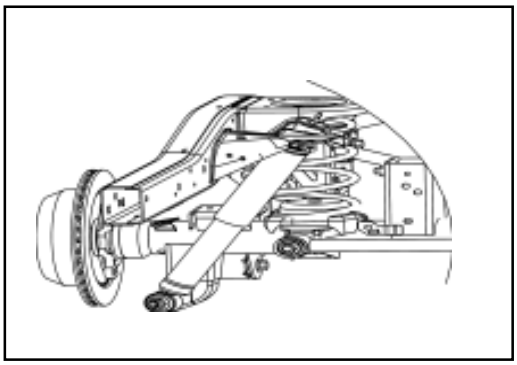
2. Install the differential

(Refer to “Installation of Reducer and Differential Assembly”)

Rear suspension



N • m: specified torque



Removal of vibration damper

1. Use the lifter to raise the car firstly, then support the rear axle by bracket.
2. Remove the upper and lower fixing nut which is used to fix the vibration damper; compress the vibration damper by hand. Remove the upper end firstly, then the lower end; take out the vibration damper .

Installation of vibration damper:

1. Lower tightening force of vibration damper:

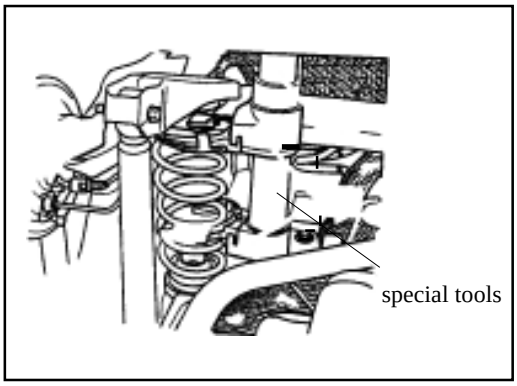
   170 ± 5N • m.

Upper tightening torque : Compress the rubber block to 2/3 of total height.

Caution: If the fixing nut of vibration damper is the lock nut, it should be replaced by the new lock nut after replace the vibration damper.

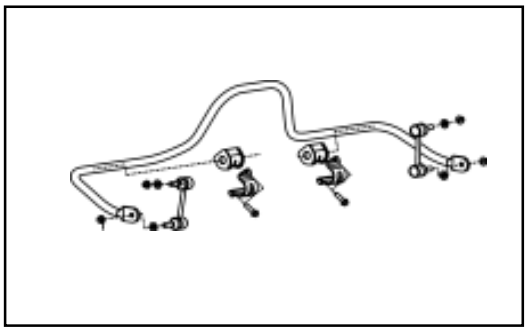
Removal of coil spring:

1. Remove the vibration damper (As previous)
2. Use the special tools to clamp the coil spring.
3. Place the car in the bounce status, take out the coilspring
4. Remove the special tools from the coil spring.



Installation of coil spring:

1. Firstly, use the special tools to clamp the coil spring to certain height (height when car is in bounce status).
2. Cautions for installation: Adjust the rubber gasket on the spring to ensure the spring in flat status.
3. Remove the special tools.



Removal of connecting rod of stabilizer bar:

1.Shown as figure, firstly screw off the nut in the con necting place between the connecting rod of stabi lizer bar and carriage. (Need the inner hexagon spanner).

2.Screw off the nut connected to stabilizer bar in same method; screw off the connecting rod.

Installation of connecting rod of stabilizer bar:

Tighten it to the specified torque during installation: 63 ± 5N • m

Chapter 8

Brake

Cautions

1. **It should be carefully when replace each part. For any mistake may affect the performance of brake system and cause the accident and danger during driving. The replaced components must be the component with same component number or equivalent.**
2. **It is very important that maintain the clean of component and each place when repair the brake system.**

Troubleshooting

Failure	cause	Inspection content
Pedal is low or soft	brake pad is worn	Replace the brake shoe
	brake block is worn	Replace the brake block
	brake system is leaked	Repair the leakage
	master pump has failure	Repair or replace the master pump
	Brake system has air	Drain the air from brake system
	Brake pump has failure	Replace the brake pump
	Auto adjuster of rear brake has failure	Repair or replace the adjuster
Lag of brake	Parking brake is adjusted badly.	Adjust the parking brake
	Pull wire of parking brake is locked	Repair if necessary
	Assist push rod is adjust badly	Adjust the push rod
	Extension spring or return spring has fault	Replace the extension spring
	Pipeline is blocked	Repair if necessary
	brake pad is broken or deformed	Replace the brake shoe
	brake block is broken or deformed	Replace the brake block
	Auto adjuster is damaged	Replace the adjuster
	Master pump has failure.	Replace the master pump
Brake is stagnant	Improper inflation of tyre	Charge the tyre to the proper pressure.
	There is grease spot or lubricant oil on the brake shoe or brake block.	Find out the cause. Replace the brake shoe or block.
		Replace the brake shoe
	The brake shoe is deformed ; the brake pad is worn or smoothed	Replace the brake block
		Replace the brake drum or brake disc
	The brake block is deformed, worn or smoothed	Replace the spring
		Repair the wheel pump
	The brake drum or brake disc is deformed	Replace
	Extension spring or return spring has failure	Replace the brake block
	Wheel pump has failure	
	Pump has failure	
	Brake block is blocked	
brake pedal is hard	There is the grease spot or lubrication oil on the brake disc or brake block.	Find out the cause .
		Replace the brake shoe or brake block
	The brake shoe is deformed; the brake pad is worn or smoothed	Replace the brake block
		Replace
	The brake block is deformed, worn or smoothed	Replace the assist
		Repair if necessary
	Brake pump has failure.	Repair if necessary
	Brake assist has failure	
	Improper vacuum degree	
	The brake pipeline is blocked.	

Troubleshooting (continued)

failure	cause	Inspection content
The brake generates the crack clatter during operation.	(drum brake) The brake shoe is blocked in the rear apron flange The rear apron flange is worn The brake shoe pull-out piece spring is loose or lost The fixed bolt of rear apron is loose (disc brake) Brake block support plate is loose or lost Installation bolt is loose	 Filled with lubricated oil Replace the lubricant flange Replace tighten replace tighten
It has the rustle or rattler when use the brake	The brake shoe gasket or brake block is worn The brake caliper and wheel or rotor are disturbed mutually The dustproof cover and rotor, rear apron and brake drum are disturbed mutually Failure of other brake system component Tyre generates the abrasion with the tyre and chassis	Replace, if the scratch is heavy, then fine machine the brake drum or rotor again Replace it according to requirement Correct or replace Repair or replace it according to requirement Check or maintain
It has the squeak, continuous scream, rattler or vibration noise when use the brake . **Caution: The abrasion material in the brake will generate the inherent noise and heat during the abrasion, then emit the heat. So it is normal that generate the squeak by accident. The condition will be serious in extreme environment, such as cold, hot, high humidity, snowing, saliferous and mud. The accident squeak will not cause the fatal failure of the brake, and will not reduce the effective performance of the brake.**	The brake drum and brake shoe gasket, rotor and brake block is worn or scratched. The brake pad or block is dirty, with oil or smoothed. The brake pedal or assistor push bar is adjusted incorrectly (disc brake) The brake block silencing plate is lost or damaged. The abrasion of the brake block makes the brake block abrasion indication plate contacts the rotor The brake caliper has burr or is corrosive (drum brake) The pull-out piece spring of brake shoe is soft, damaged or improper. The pull-out piece spring pin and spring of brake shoe is loose or damaged; and rear apron flange has crack	Check, repair or replace clean or replace check, replace check and adjust replace replace clean or remove the flash check, repair or replace

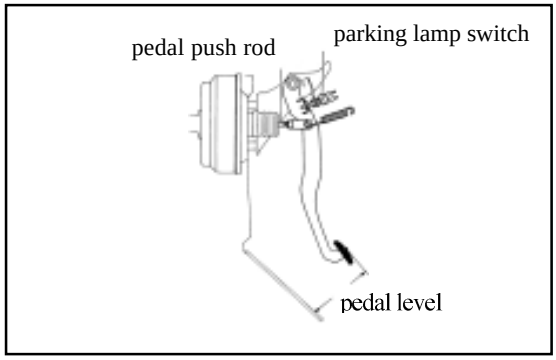
failure	cause	Inspection content
It has the continuous scream and squeak when does not use the brake	The brake pedal or assist push bar is adjusted incorrectly	Check and adjust
	The return of brake assist or master pump or wheel pump is bad	Check, repair or replace
	(disc brake)	
	The piston is corrosive or blocked	Check and fill with lubrication oil if necessary.
	The brake block in brake caliper is in improper position	Repair or replacement
	Shell abrasion of rotor and brake caliper	Repair or replacement
	The brake block support plate in disc brake is installed improperly	Repair or replacement
	The brake block abrasion indication plate contacts the rotor for the abrasion of brake block	Repair
	(drum brake)	
	The press spring of brake shoe is soft, damaged or improper.	Repair
	The flange of rear back rear apron is cracked	Repair or replacement
	The rear apron interfere with the brake drum mutually after bent or warp	Repair or replacement
	Improper machining of brake drum, cause the mutual interference of rear apron and brake shoe	Replace the brake drum
	components of other brake system:	
	Brake system has loose or redundant components	Check, maintain and replace if necessary.
	The brake pad is smoothed for the rear brake drum is adjusted too tight	
	The wheel bearing is worn damaged or under lubricated	
It still has the rattler, click or cackle noise when does not use the brake.	The stone or foreign enters into the inside of wheel protecting hood	Remove the foreign materials such as the stone
	The hub nut is loose	Tighten it to the specified torque, it should be replaced if the bolt hole is enlarged
	The brake pedal or assistor push bar is adjusted improperly	Check and adjust
	The wheel bearing is worn, damaged or lubricated insufficiently	Check, lubricate or replace
	(disc brake)	
	The muffler spring is soft or lost; the brake block support plate or external end of brake block is coiled silencing plate is unsound	Repair or replacement
	The slide bush is worn	Check and replace if necessary
	The installation bolt is loose	Check and replace if necessary
	Piston returns unsoundly	Check and tighten if necessary
	(drum brake)	Check , repair or replace
	Have loose or redundant component	Check, take out or repair

Check and adjustment

Check and adjustment of brake pedal

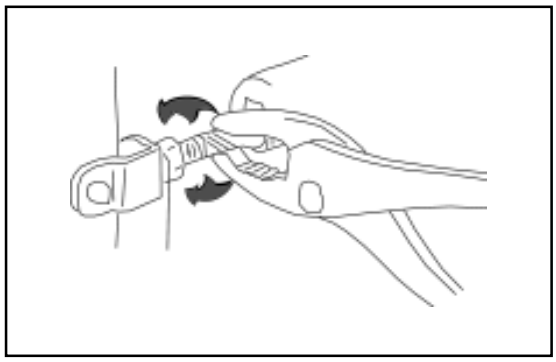
1. Check the correctness of height of pedal

Distance from pedal to lower front apron: 152mm, Operating stroke of pedal push bar is 1mm.

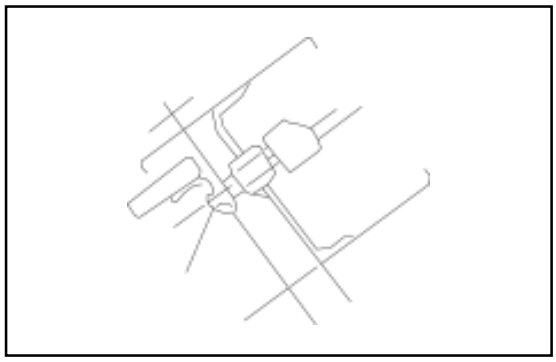


2. Adjust the pedal height if necessary

a. Disconnect the brake lamp switch wire connector; loose the tightened nut; rotate the brake switch to the position not contacted to limit block of brake pedal



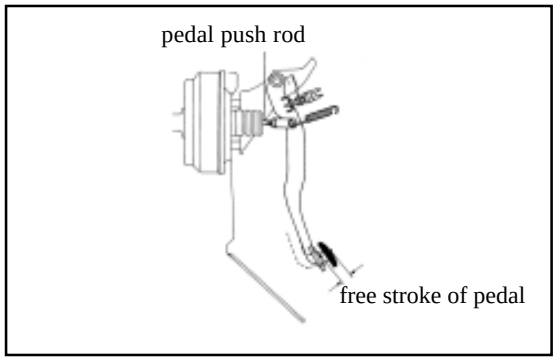
b. Loose the lock nut of operating connecting rod; use the thinnose pliers to rotate the operating connecting rod to adjust the height of brake pedal to the standard value; lock the block nut tightenedly when reach the standard value.



c. Rotate the brake lamp switch to contact with the limit block of brake pedal; then rotate 1/2～1 round continuously; tighten the block nut;

d. Connect the wire connector of brake lamp switch;

e. The brake lamp should not be light when the brake pedal is released.



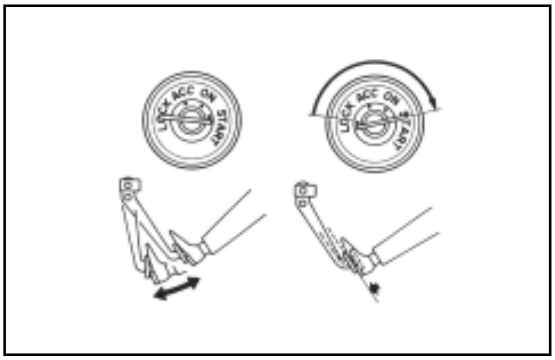
3. Check the free stroke of pedal

Free stroke of pedal: 4－6mm

In the status of engine is stop, step on the brake pedal for 2～3 times after eliminate effect of the brake assist, push down the brake pedal by hand to just with the resistance, then measure its displacement (free stroke). It should be in accordance with the standard value.

4. Adjust the stroke of pedal if necessary

a. Rotate the pedal push bar to adjust the free stroke if the stroke length is improper.
b. Start the engine to confirm the free stroke of pedal.
c. Check the height of pedal after adjusts the free stroke of pedal.
d. The height difference of brake pedal and clutch pedal to front apron is 0～8mm.
e. The height difference of brake pedal and accelerator pedal to the front apron is 45 ± 5mm.



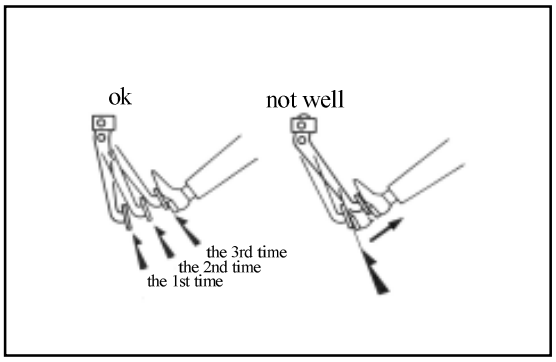
Vacuum assist

Remarks:

Use the vacuum assist tester to check the operation of vacuum assist if possible.

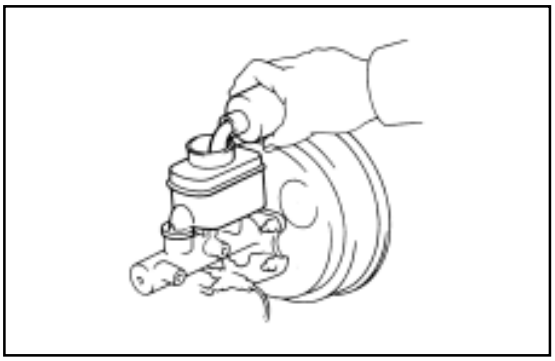
1. Operation inspection

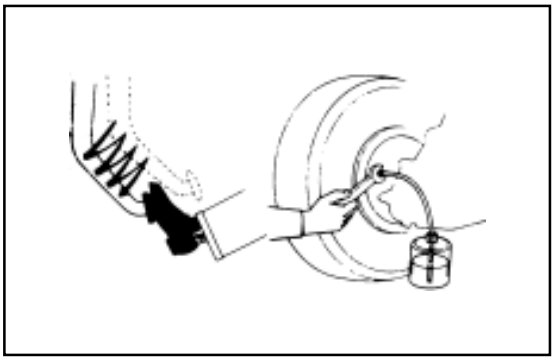
a. Step on the brake pedal for several times before start the engine and check the reserved distance which should not be changed.
b. Step down the brake pedal and start the engine. If the pedal moves downwardly a little, then it means the normal operation; if the brake pedal moves upwardly, then it means the brake assist is damaged.



2. Air tightness inspection

a. Start the engine and shut off it after 1－2 minutes. Step down the brake pedal slowly for several times. If the pedal moves downwardly all long at the first time, but moves upwardly little by little after second or third times, then it means the vacuum assist has the sound air tightness. If the pedal height is without variety, then it means the brake assist is damaged.
b. Step down the brake pedal when the engine is operating; then shut off the engine but step down the pedal, if the pedal keeps the stroke without variety within 30s, then it means the vacuum assist has the sound tightness; if the brake pedal moves upwardly, then it means the brake pedal assist is damaged.





Air discharge of brake system

Remarks:

It should discharge the air if operate on the brake system or assume the brake system pipeline has the air.

Caution:

Must not keep the brake fluid on the paint surface, wipe off it if has.

1. Fill the liquid reservoir up with the brake fluid.

Check the liquid level in liquid reservoir after discharge the air of each wheel pump. Filled with the brake fluid if necessary.

2. Connect the polyethylene resin pipe to the overflow hole plug of wheel pump;insert the other end of pipe into the container with half of brake fluid.

Remarks:

When discharge the air of wheel brake pump, it should begin from the longest pipeline.

3. Air discharge of brake system pipe

a. Step down the brake pedal slowly for several times.

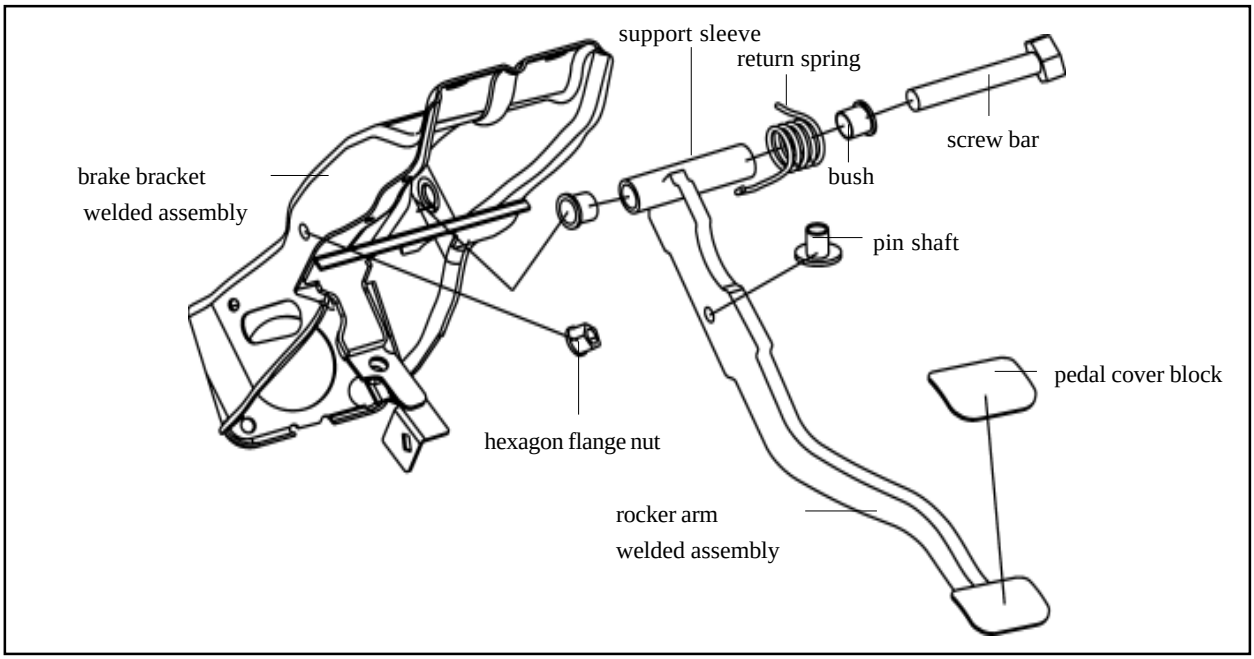
b. Let the assistant presses down the pedal, at the same time screw off the overflow hole plug until the brake fluid flows out. Then switch off the overflow hole plug.

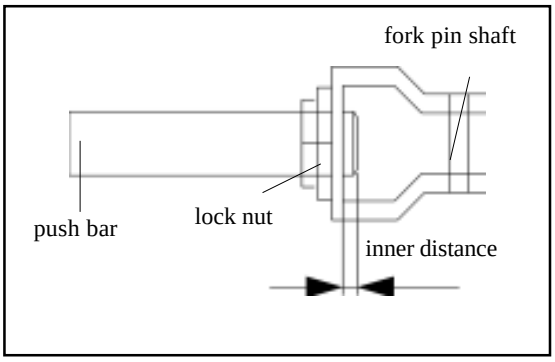
c. Repeat the procedure until the liquid is without air bubble.

Tightening torque of overflow hole plug: 11N • m

4. Process the same procedure for each wheel pump.

Brake pedal





Replacement of pin shaft

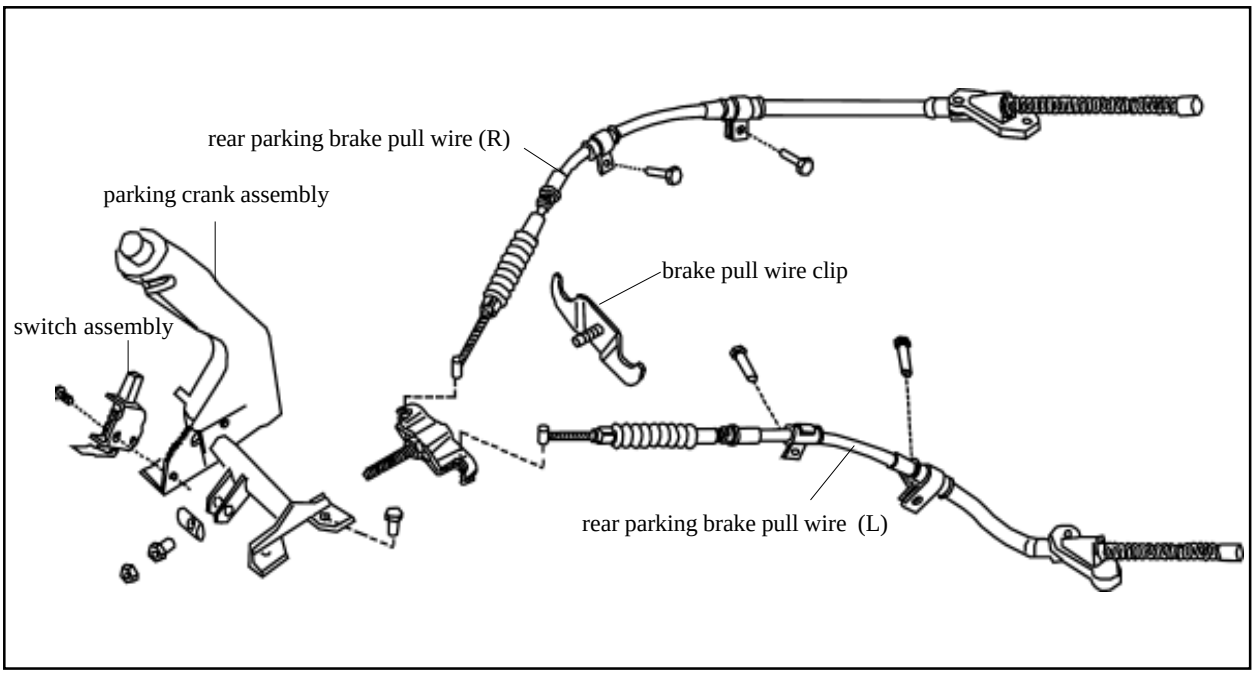
Remarks:

When the connecting fork pin shaft and pin hole is over worn, it should replace the pin shaft bush.

Remarks:

When the clearance between the brake pedal shaft and bush is large, it should remove the pedal and replace the bush.

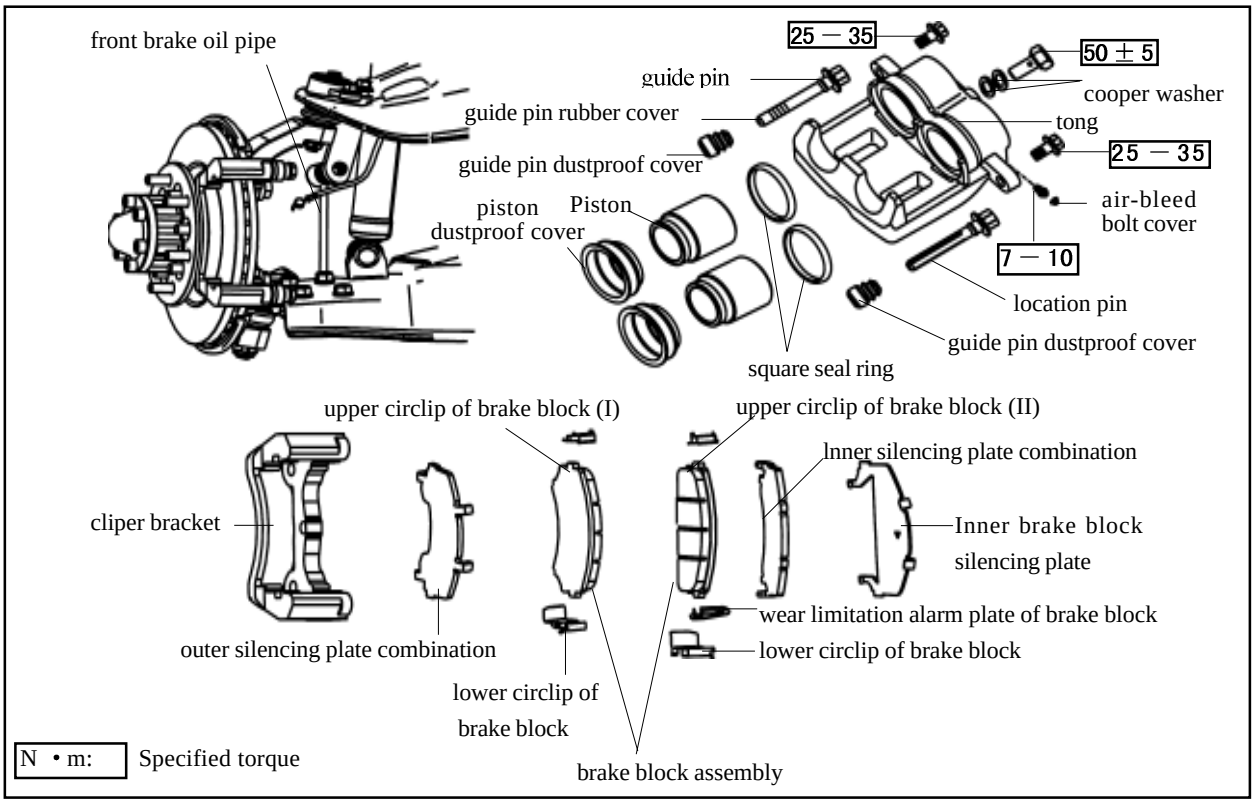
Parking brake

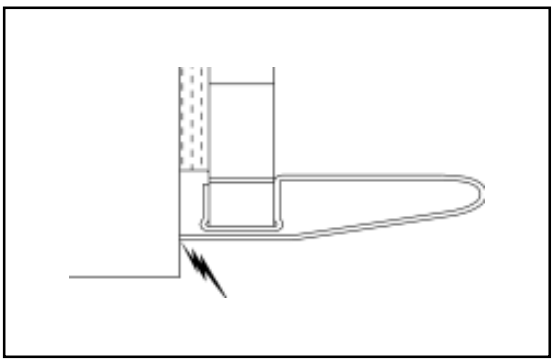


1. Adjust the parking crank assembly in position, 6～8 teeth.

2. When the parking brake pull wire is tightened, the torque should be no more than 400N • m.

Front brake



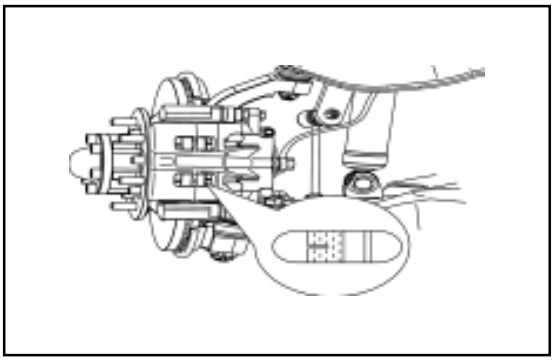


Replacement of brake block

Remarks:

When brake during the travel process, if the front wheel has the continuous screams noise, then it should check the wear limitation alarm plate of brake block. If the alarm plate has the abrasion mark with brake disc, then it should replace the brake block .

1. Remove the front wheel

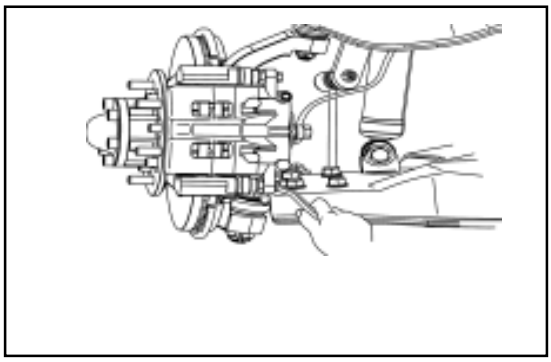


2. Check the thickness of abrasion material of brake block.

Check the thickness of abrasion material of brake block by the watch hole on the tong.

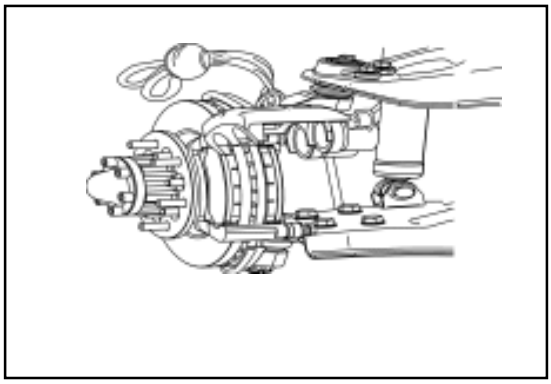
Replace it if is not within specified range.

Min. thickness : 2.0mm



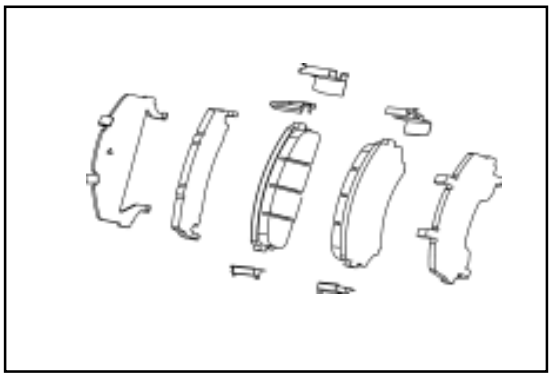
3. Lift the main body of brake caliper.

a. Remove the hexagon flange bolt.



b. Lift the brake pump and hang it by rope to protect the brake oil pipe.

Remarks: Do not screw off the brake oil pipe and bleed plug.



4. Remove the following components

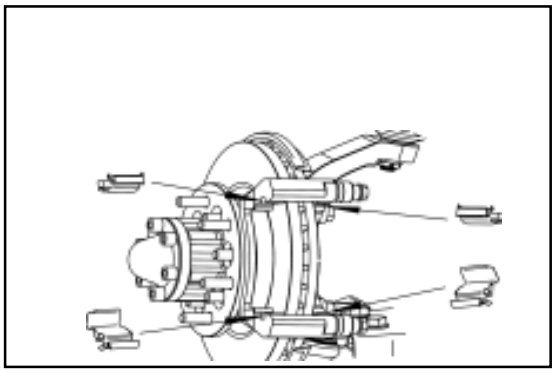
a. Two pieces of brake block
b. One piece of silencing plate
c. Two piece of silencing plate combination
d. One wear limitation alarm plate of brake block
e. Four brake block circlip plates

5. Measure the thickness of brake disc

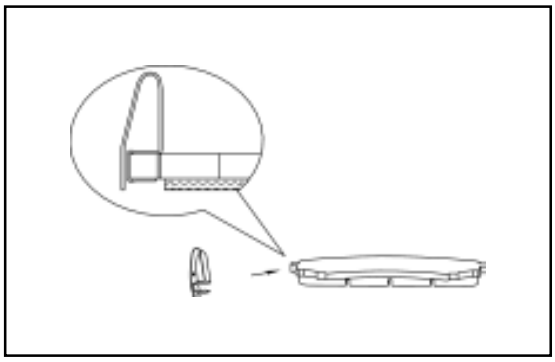
(Refer to step 2 of " Inspection of component of front brake")

6. Measure the circular runout of brake disc.

(Refer to step 3 of "Inspection of component of front brake")



7. Install the brake block circlip plate

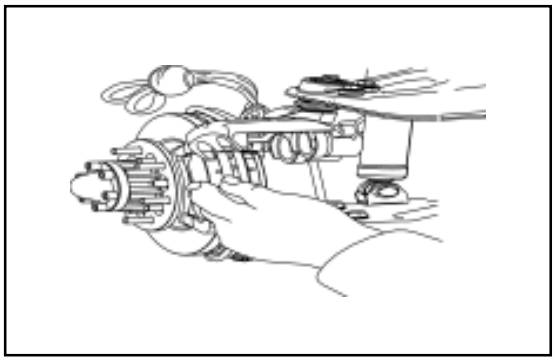


8. Install the new brake block

a. Install a wear limitation alarm plate of brake block on the inner brake block.

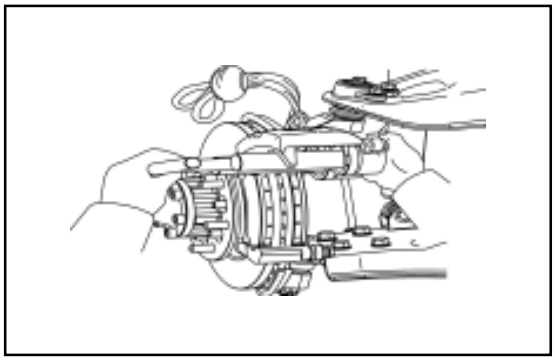
b. Install a silencing plate and a silencing plate combination on the inner brake block.

c. Install a silencing plate combination on the on the outer brake block.



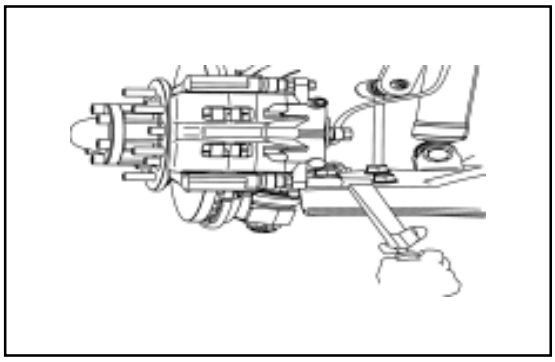
d. Install two brake blocks; let the wear limitation alarm plate is in the inside of brake caliper.

Caution: It is unallowable that the operating surface of brake block and brake disc is polluted by the grease and paint.



e. Suck a few of brake fluid form the liquid reservoir (prevent the brake fluid from overflowing from liquid reservoir).

f. Use the special tools to press the piston .



9. Install the brake pump

Install and tighten the hexagon flange bolt.

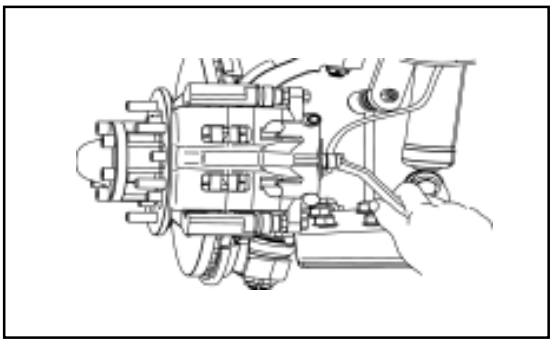
Tightening force: 25～35N • m

Remarks: Only can replace the brake block on a wheel in one time to avoid the piston on another wheel is pushed out.

10. Install the front wheel

Tightening force of the wheel fixing nut is 120N • m

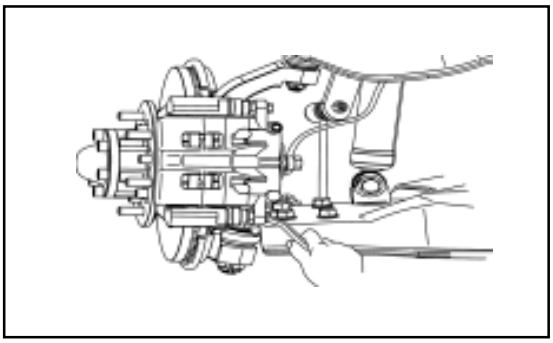
11. Check whether the brake fluid level is in the specified position.



Removal of brake pump

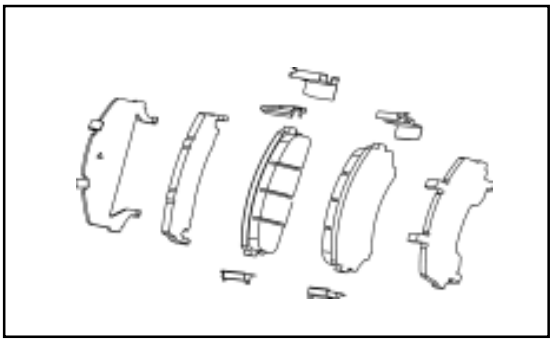
1. Remove the brake pipeline

Remove the brake pipeline. Use a container to contain the brake fluid.



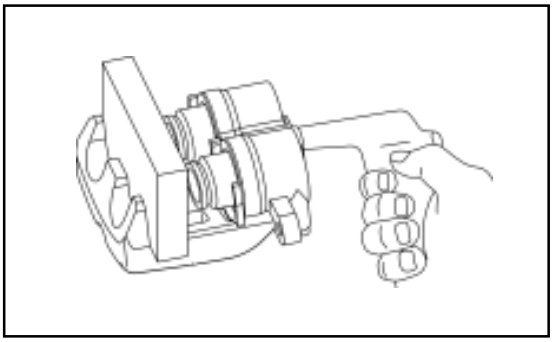
2. Remove the brake pump from the clamp bracket

a. Remove the hexagon flange bolt, location pin and guide pin.
b. Remove the brake pump.



3. Remove the brake block

a. Two brake blocks
b. One silencing plate
c. Two silencing plate combinations
d. One wear limitation alarm plate of brake block
e. Four brake block circlips

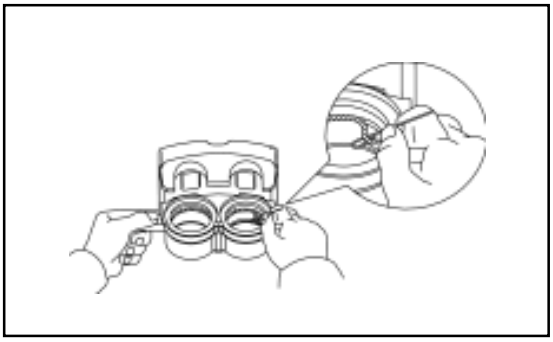


Disassembly of brake pump

1. Remove the piston form the tong

a. Place the wood block between the tong bracket and tong body .
b. Use the air gun or air pipe to aim at the brake oil pipe hole; remove the piston form the tong.
c. Use the clean rag or soft cloth to take out the piston.

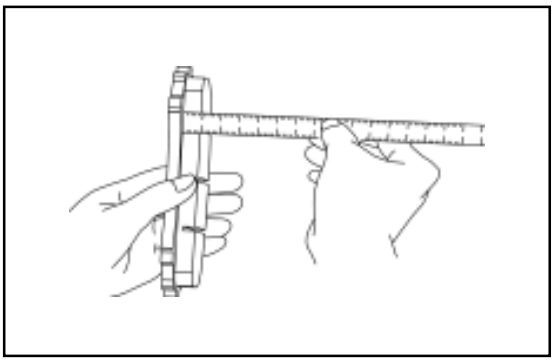
Warning: It must not place the finger in front of the piston when use the compressed air.



2. Remove the piston gasket from the tong body.

Use the paper clip to remove the piston gasket.

Caution: The used tools must not be sharp to prevent from scratching the piston gasket.



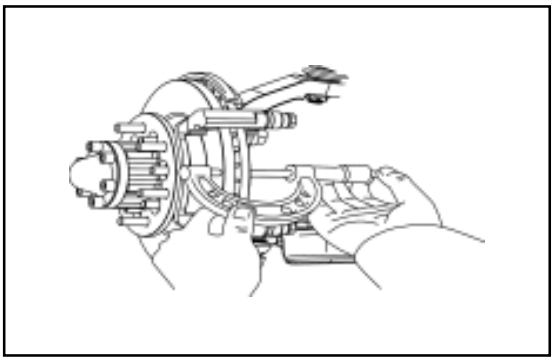
Check the component of front brake

1. Measure the thickness of the brake block bush.

standard thickness: 9.0mm

minimum thickness: 2.0mm

It should replace the brake block if less than minimum thickness or has uneven abrasion.



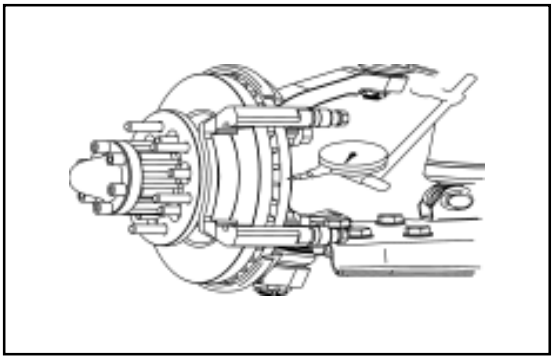
2. Measure the thickness of the brake disc.

standard thickness: 26.0mm

minimum thickness: 24.0mm

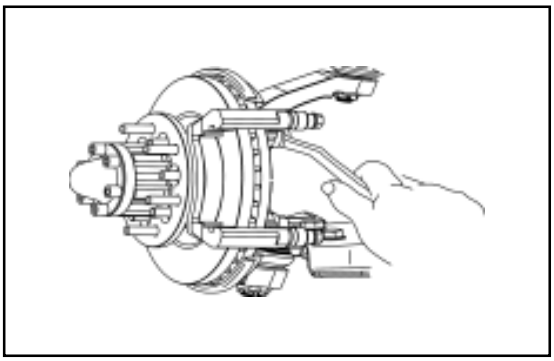
It should repair or replace the brake disc if the brake disc is damaged or worn or its thickness is

less than minimum thickness.



3. Measure the circular runout of the brake disc.

Remarks: It should ensure that the bearing is adjusted correctly before the measurement . maximum circular runout : 0.11mm



4. Replace the brake disc if necessary.

a. Remove the tong bracket form the steering knuckle.

b. Remove the hub and brake disc. (Refer to section “Front hub”)

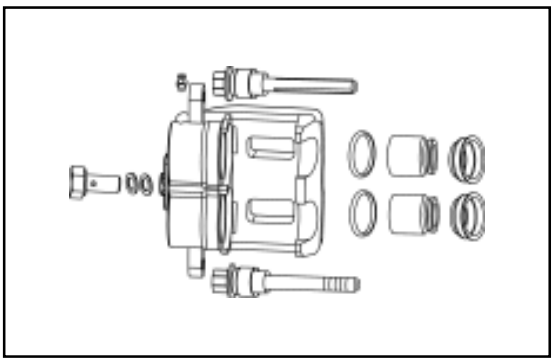
c. Install the new brake disc; tighten the connecting bolt to the specified torque.

Tightening force: 90～100N • m.

d. Install the hub and brake disassembly. (Refer to section “Front hub”)

e. Install the tong bracket on the steering knuckle; tighten the connecting bolt to the specified torque.

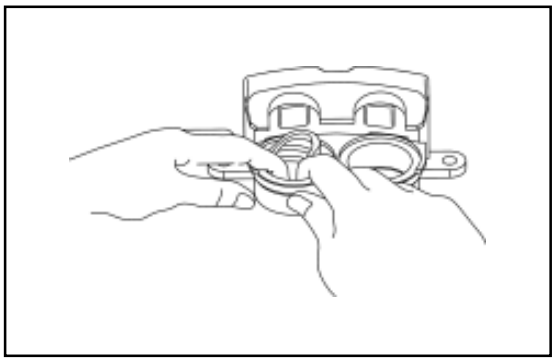
Tightening torque 140 ± 10N · m.



Assembly of brake pump

1. Preparation work

All components should be washed, dried by wind and without foreign material before the assembly. During the assembly, cost the guide pin and location pin with proper vacuum silicon based grease; coat the working surface of piston and square gasket with proper rubber lubricant.

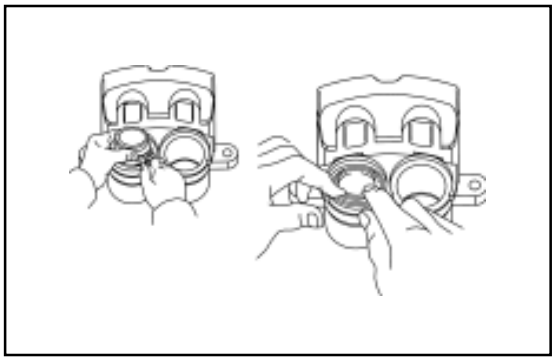


2. Install the piston gasket in the tong body.

a. Screw the bleed screw into the bleed hole;

tightening torque 7～10N • m.

b. Install the square gasket in the sealing groove of two cylinders of pump respectively after coat its working surface with proper rubber lubricant.



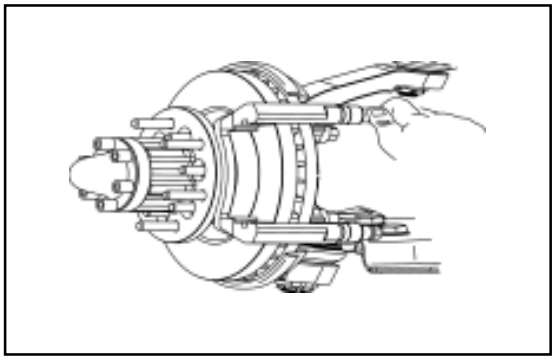
3. Install the piston with dustproof cover in the tong

a. Cover the dustproof cover on the piston.

b. Lengthen the dustproof cover to expose the bottom of piston from the dustproof cover clip ring; use the tool (for example: steel wire about Φ2mm) to assist insert the clip ring into the cylinder hole clip ring groove.

Caution: The used tools must not be sharp to prevent the damage of dustproof cover.

c. Press the piston to the bottom of cylinder hole by hand.

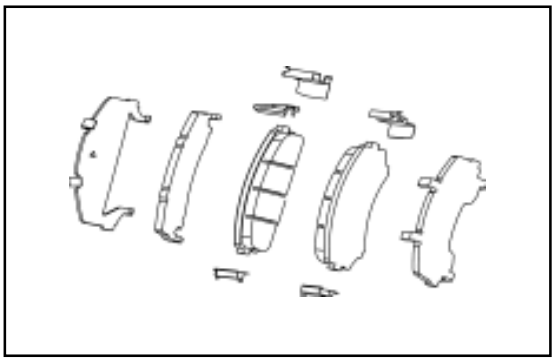


4. Pre Install the guide pin and location pin on the tong bracket.

a. Install the guide pin dustproof cover on the guide pin and location pin respectively.

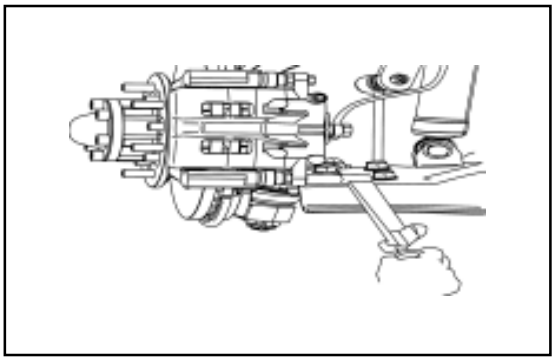
b. Screw the guide pin and location pin in the tong bracket respectively.

Caution: Do not damage the guide pin dustproof cover.



Installation of brake caliper

1. Install the brake block

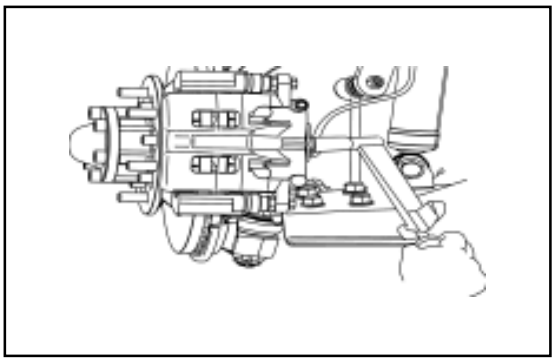


2. Install the brake pump

a. Install the brake pump.

b. Install and tighten the hexagon flange bolt.

Tightening force: 25～35N • m



3. Connect the brake pipeline

Connect the brake oil pipe to the tong body.

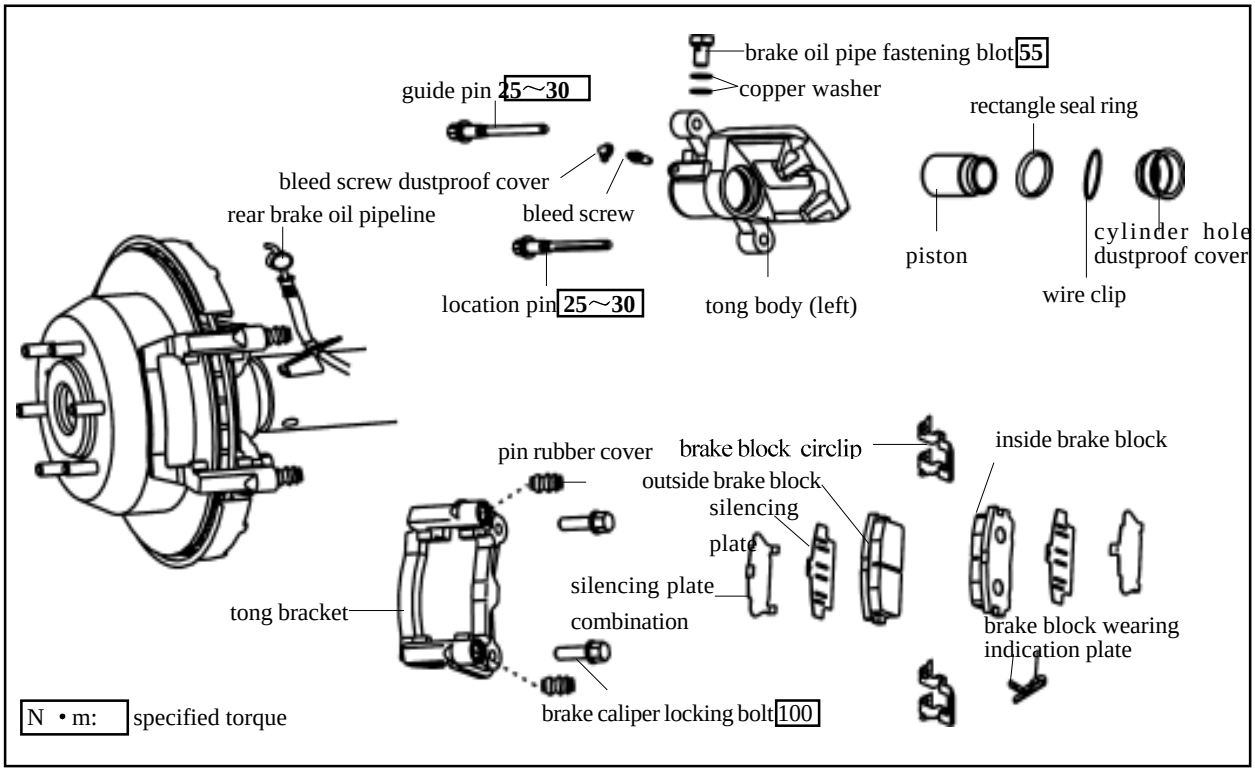
Tightening force: 50 ± 5N • m

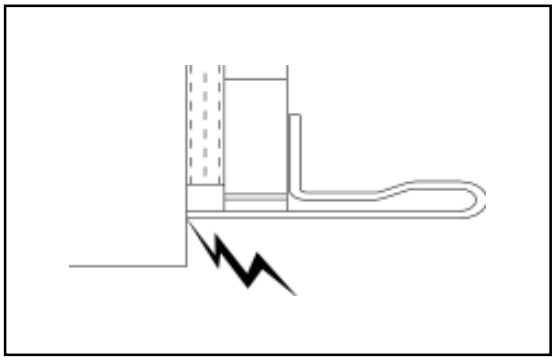
4. Fill up the brake liquid reservoir with the brake fluid and dis charge the air in brake system.

5. Check for the leakage of brake fluid.

Caution: Discharge the air after the completion of replacement.

Rear brake (Disk-and-drum type)

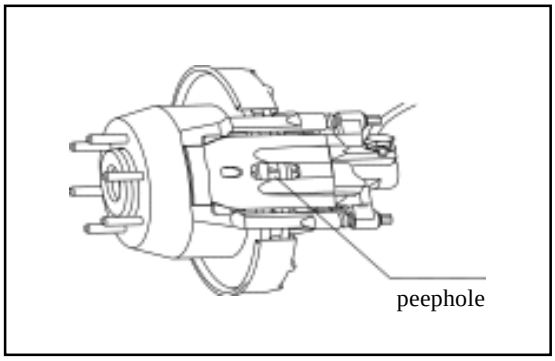




Replacement of brake block

Remarks: if the rear wheel generates the cheep during the braking, it should check the abrasion indication plate of brake block. If the indication plate has the abrasion mark with brake disc, then it should replace the brake block .

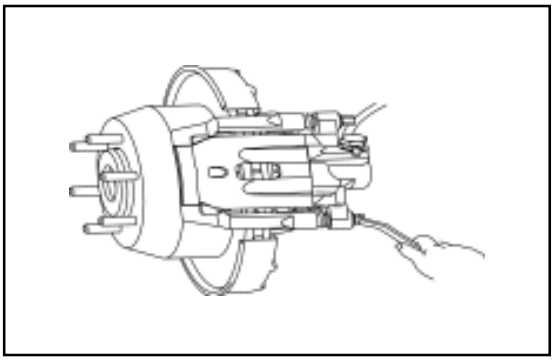
1. Remove the rear wheel



2. Check the thickness of brake block bush.

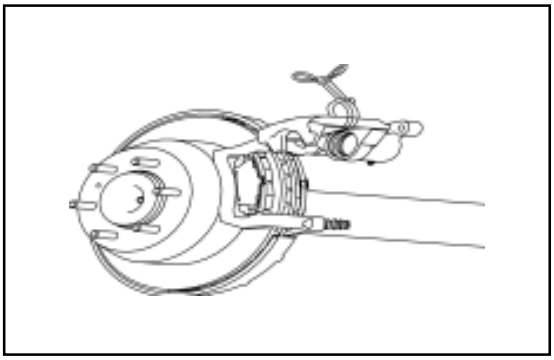
Measure the thickness of the brake block bush (abrasion material) from the eyehole of tong. If the thickness is not within the specified range, then it should replace the brake block.

minimum thickness: 2.0mm.



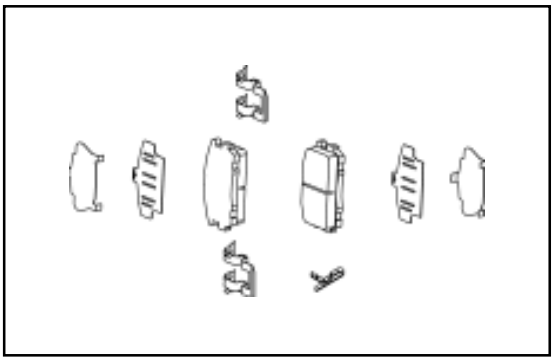
3. Uplift the brake pump

a. Remove the location pin.



b. Uplift the brake pump and hang it with a rope to protect the brake oil pipe.

Remarks: do not remove the brake oil pipe.



4. Remove the following components:

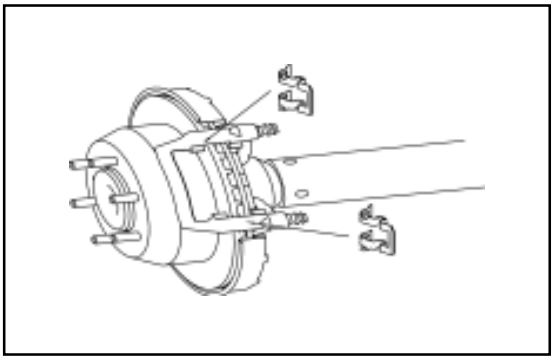
a. Two brake blocks
b. Two silencing plates
c. Two silencing plate combinations
d. One brake block bush wearing indication plate
e. Two brake block circlips

5. Measuring the depth of brake discs

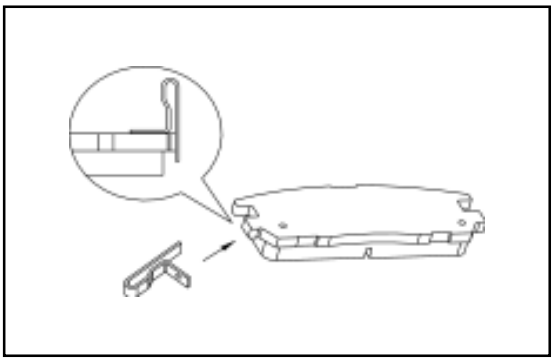
(refer to the step 2 of measuring the components of rear brake)

6. Measuring the brake disc circular runout

(Refer to step 3 of measuring the components of rear brake)



7. Install the brake block Circlip

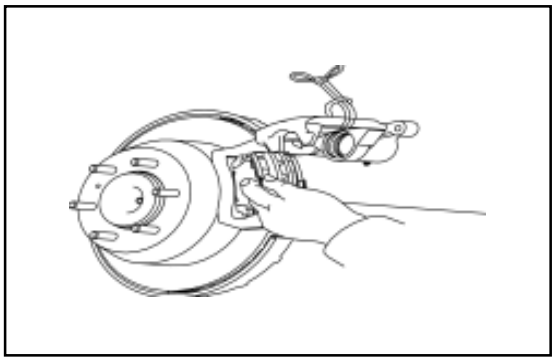


8. Install new brake block

a. Install a brake block bush wearing indication plate on the internal brake block.

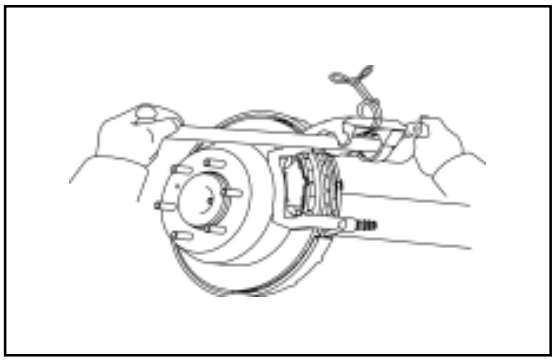
b. Install one silencing plate and one silencing plate combination on each brake block.

Remarks: Coat the two sides of silencing plate with disc brake oil (which cannot be replaced with oil of other models).



c. Install two brake blocks, make the wearing indication plate in the lower position (near the tank cylinder).

Remarks: The working surface of the brake block and brake disc are not allowed to be contaminated by grease and paint.



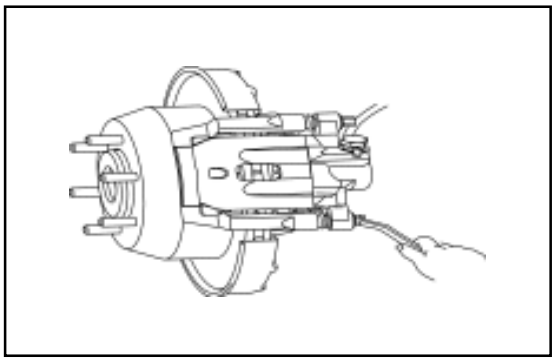
9. Install the sub pump

a. Unscrew the release screw, absorb some of the brake fluid.

b. Press the plunger with hammer beam or similar tools, and unscrew the release screw at the same time.

Tightening force: 8～13N • m

Remarks: Only the brake block of one wheel can be replaced for once, lest the plunger on the opposite side be bounced.



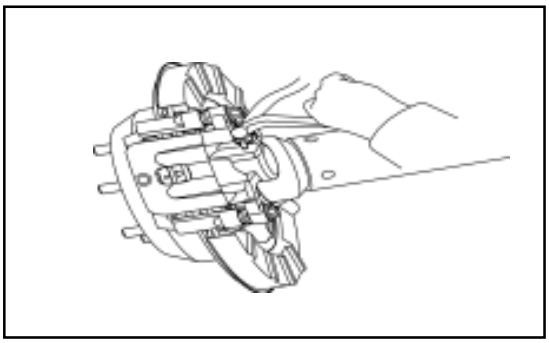
c. Install and tighten the location pin.

Tightening force: 25～30N • m

10. Install the rear wheel

Tightening force: 120N • m

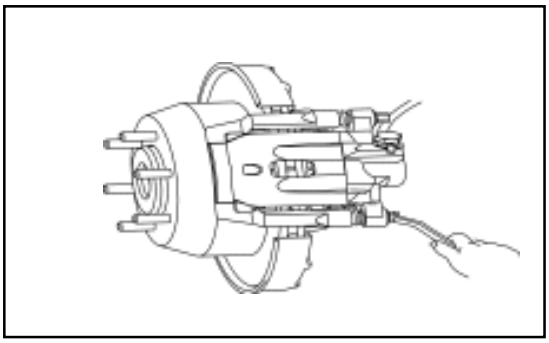
11. Fill up with the brake fluid and drain the air in the brake system after the completion of replacement.



Removal of brake pump

1.Remove the brake pipeline

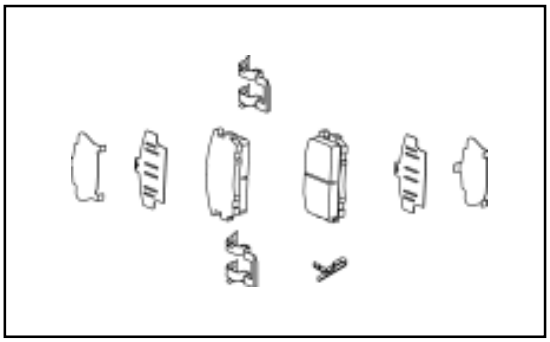
Remove the brake pipeline. Use a container to contain the brake fluid.



2. Remove the pump form the bracket

a. Remove the location pin and guide pin.

b. Remove the tong.



3. Remove the brake block

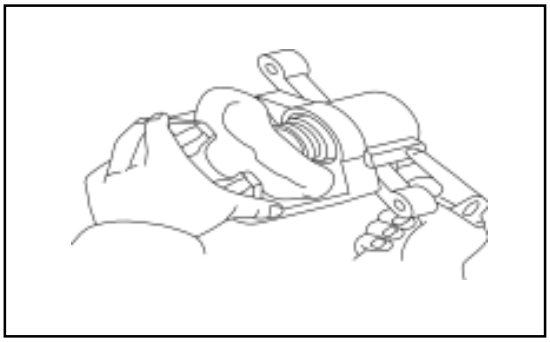
a. Two pieces of brake block

b. Two pieces of silencing plate

c. Two pieces of silencing plate combination

d. One piece of brake block bush abrasion indicating plate

e. Two brake block circlips



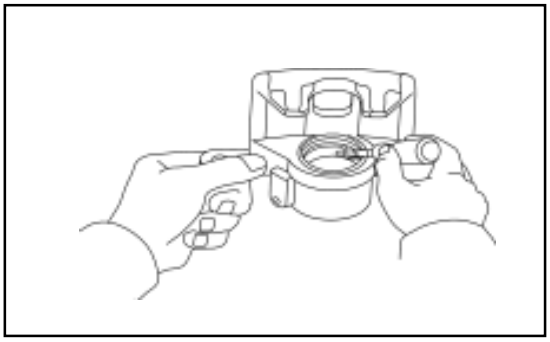
Disassembly of brake pump

1. Remove the piston form the tong

a. Insert the cleaning cloth or other soft cloth into the place between piston and tong.

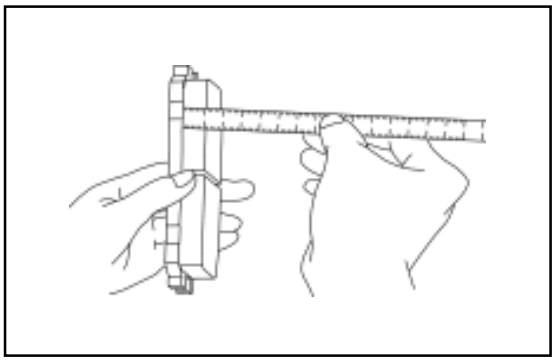
b. Use the compressed air to remove the piston and cylinder hole dustproof cover from the tong.

Warning: it must not place the finger in front of the piston when use the compressed air.



2. Remove the piston gasket form the tong

Use the screwer to remove the piston gasket.



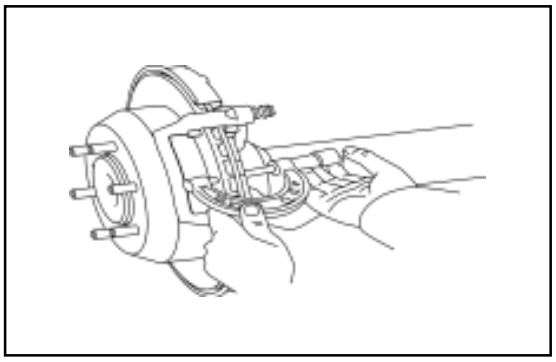
Check the components of rear brake

1. Measure the thickness of the brake block bush.

Standard thickness: 8.0mm

Minimum thickness: 2.0mm

It should replace the brake block if less than minimum thickness or has uneven abrasion.

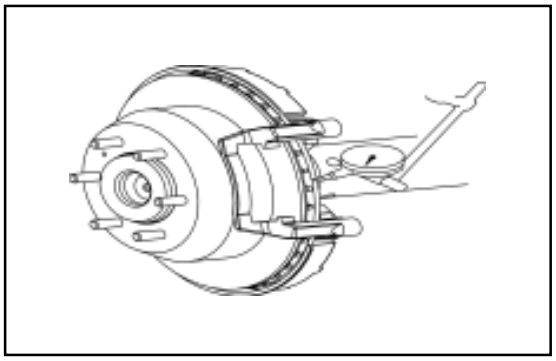


2. Measure the thickness of brake disc.

standard thickness: 18.0mm

minimum thickness: 16.0mm

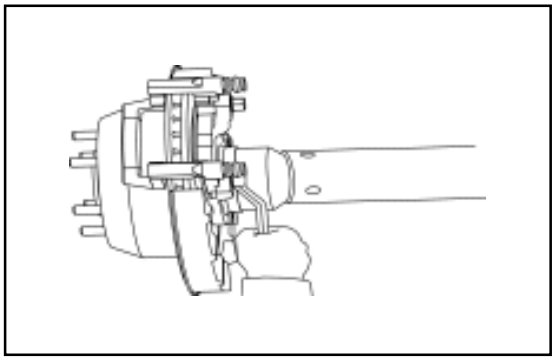
It should repair or replacement brake disc if it is scratched or worn or its thickness is less than minimum thickness.



3. Measure the circular runout of brake disc.

Remarks: It should ensure that the rear bearing is adjusted correctly before the measurement.

Maximum circular runout : 0.11mm



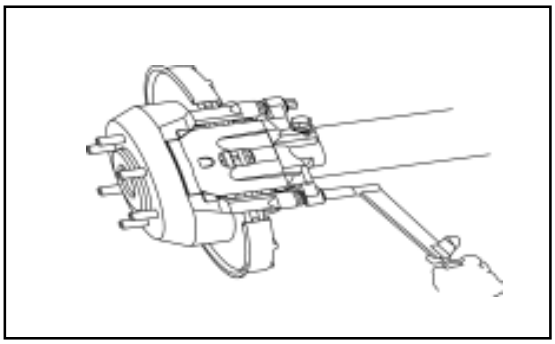
4. Replace the brake disc if necessary.

a. Remove the bracket form the rear axle flange.

b. Remove the rear brake disc and install the new brake disc .

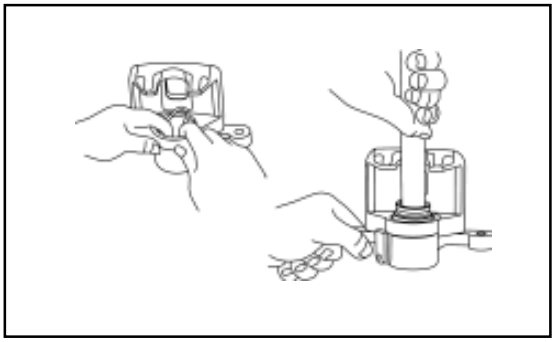
c. Install the bracket and tighten the fastening brake caliper bolt.

Tightening force: 100 ± 5N • m

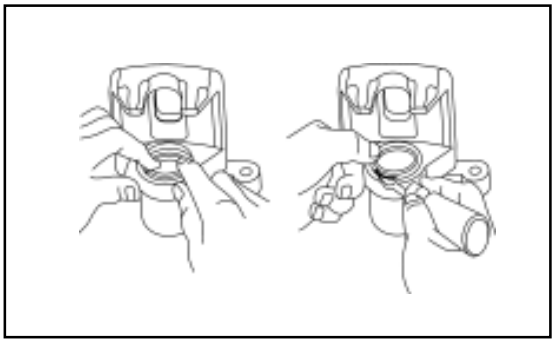


Assembly of pump

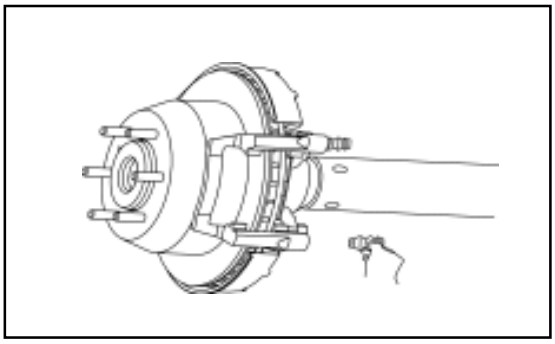
1. During the assembly, coat the guide pin with the proper vacuum sili con based grease; coat the operating surface of piston and square gasket with proper rubber lubricant.



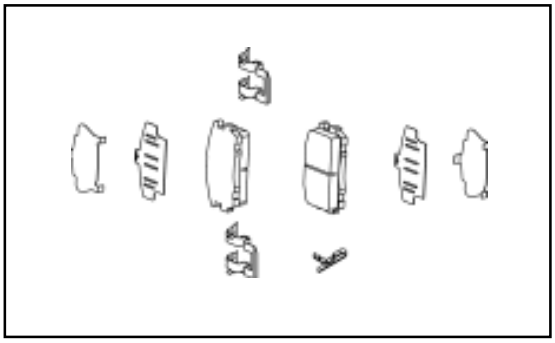
2. Install the piston gasket and piston in the tong



3. Install the cylinder hole dustproof cover and wire clip in the tong.

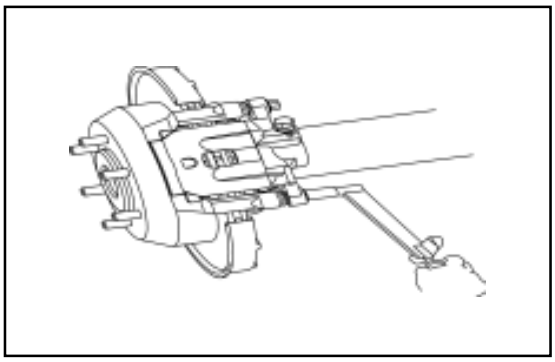


4. Install the rubber pin cover on the tong bracket.



Installation of brake caliper

1. Install the brake block

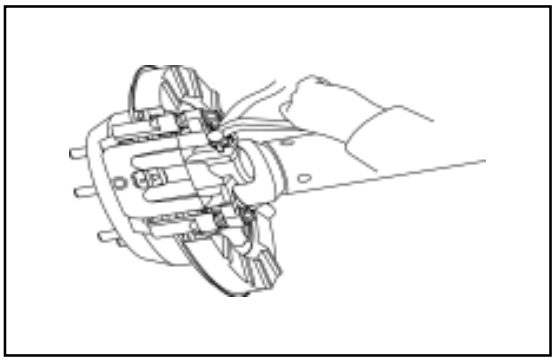


2. Install the piston gasket in the tong body.

a. Screw the bleed screw into the bleed hole;

b. Install the square gasket in the sealing groove of two cylinders of pump respectively after coat its working surface with proper rubber lubricant.

Tightening torque 7～10N • m.



3. Connect the brake pipeline

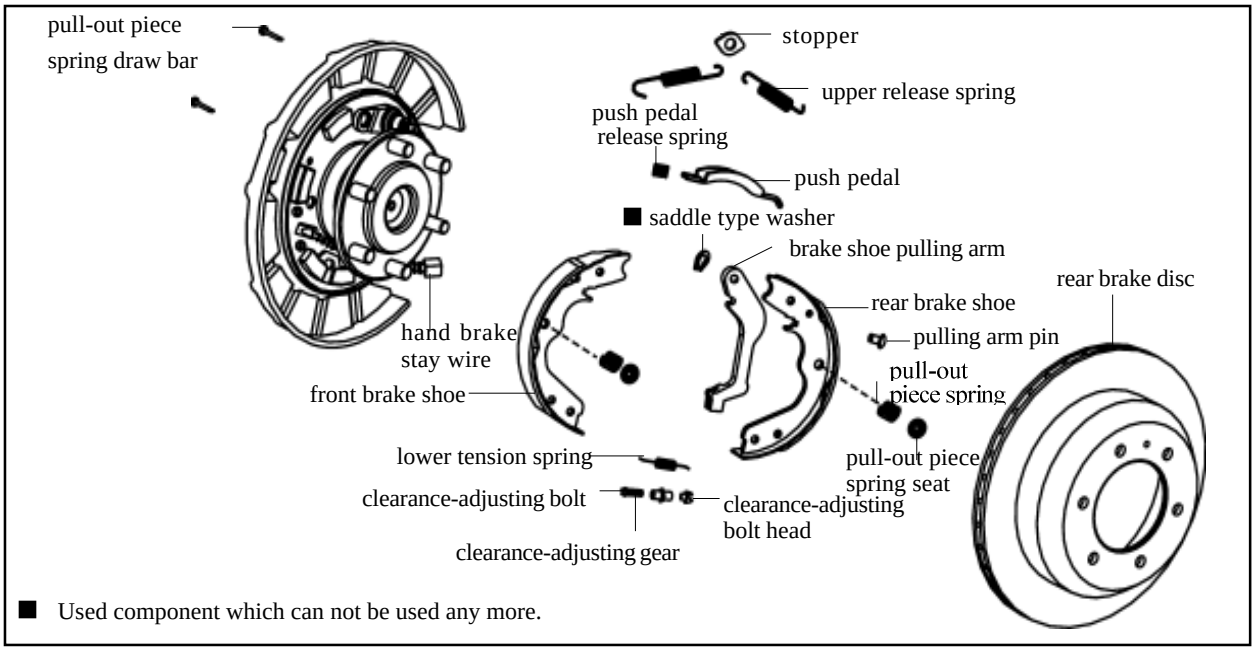
Connect the brake oil pipe to the tong.

Tightening force: 50 ± 5N • m

4. Fill up the brake system with the brake fluid and drain the air in the brake system.

5. Check for leakage of brake fluid.

Rear parking brake

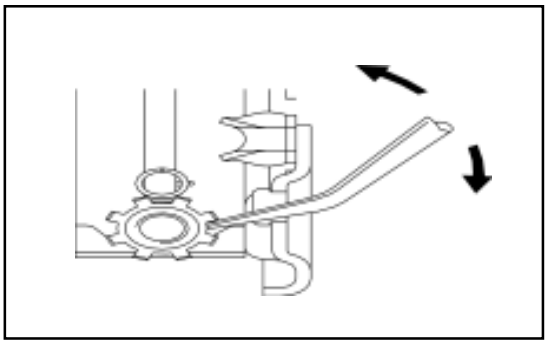


■ Used component which can not be used any more.

Removal of rear brake

Remarks: When the brake torque of the hand brake cannot meet the brake requirement, the thickness of the brake shoe gasket shall be tested. If it is less than the minimum value of brake show gasket, the brake shoe shall be replaced.

minimum thickness: 1.0mm

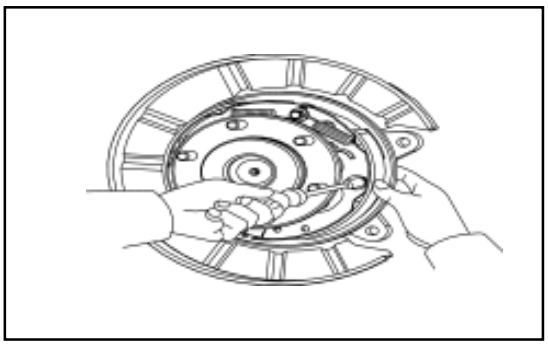


1. Remove the rear wheel

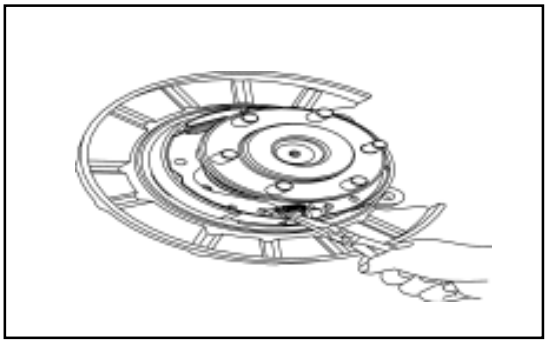
2. Remove the rear brake caliper

3. Remove the rear brake disc

Remarks: If the brake disc is difficult to remove, remove the adjust ment spout plug, insert the screwdriver into the adjust ment spout of the rear brake bedplate, Release the brake shoe adjustment device through twisting the clearance-adjusting gear.

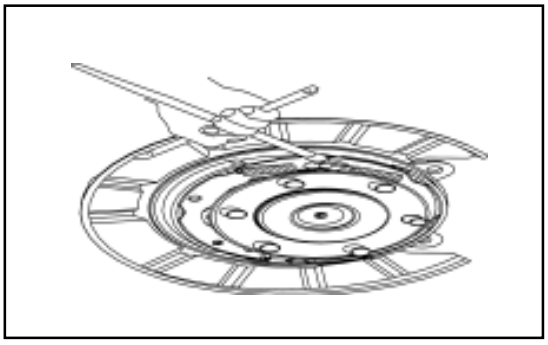


4. Remove the shoe plate, pull-out the piece spring , pull-out piece spring seat, pull-out piece spring draw bar

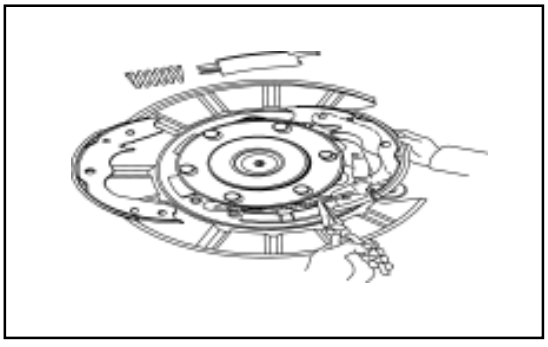


5. Remove the lower tension spring and clearance-adjusting device

Use clipper to remove the extension spring, release the clearance adjusting device and remove it.



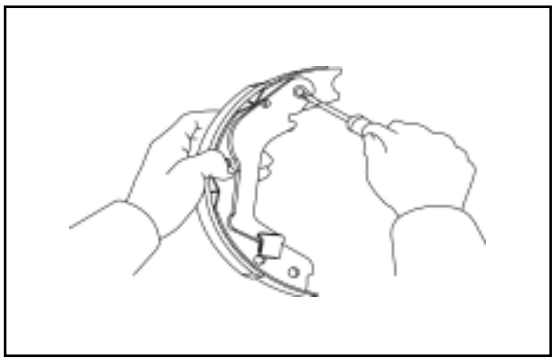
6. Remove the two upper extension springs



7. Remove the brake shoe

a. Remove the brake shoe, baffle, baffle return spring.

b. Remove the band brake stay wire from the stay and brake pulling arm.



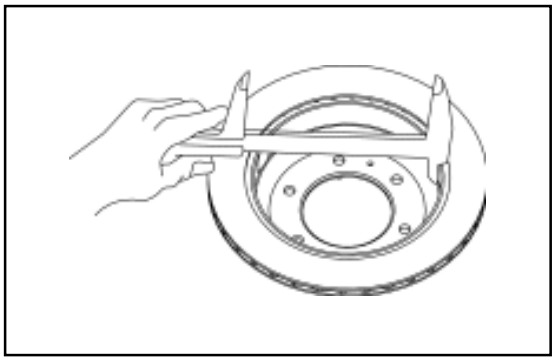
8. Remove the parking brake pulling arm

Use the screw driver to remove the parking brake pulling arm

Check and maintain the components of brake

1. Check the dismantled components

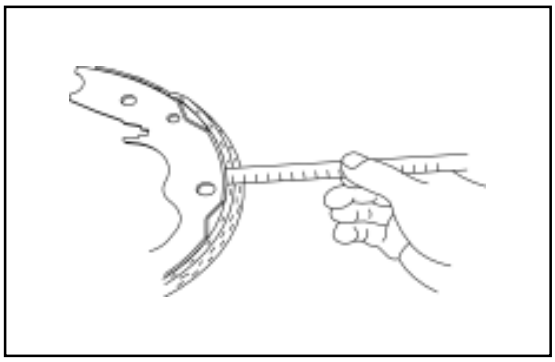
Check to se whether the dismantled components are wearing, rusted or damaged.



2. Measure the internal diameter of the brake disc

Standard inter diameter: 210mm

maximum internal diameter: 212mm



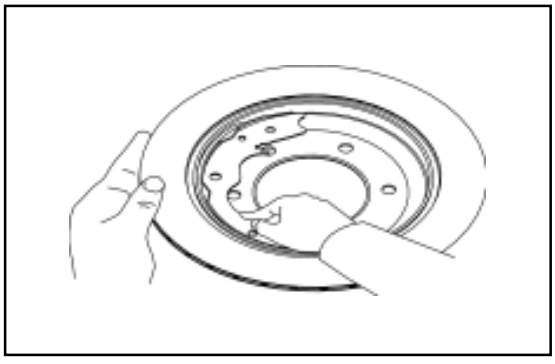
3. Measure the thickness of the brake shoe

standard thickness: 4.0mm

minimum thickness: 1.0mm

If the thickness of the brake shoe is less than the minimum value, or there is uneven wearing, the brake shoe shall be replaced.

Remarks: If any one of the brake shoes needs to be replaced, all the brake shoes need to be replaced to keep the even brake performance.



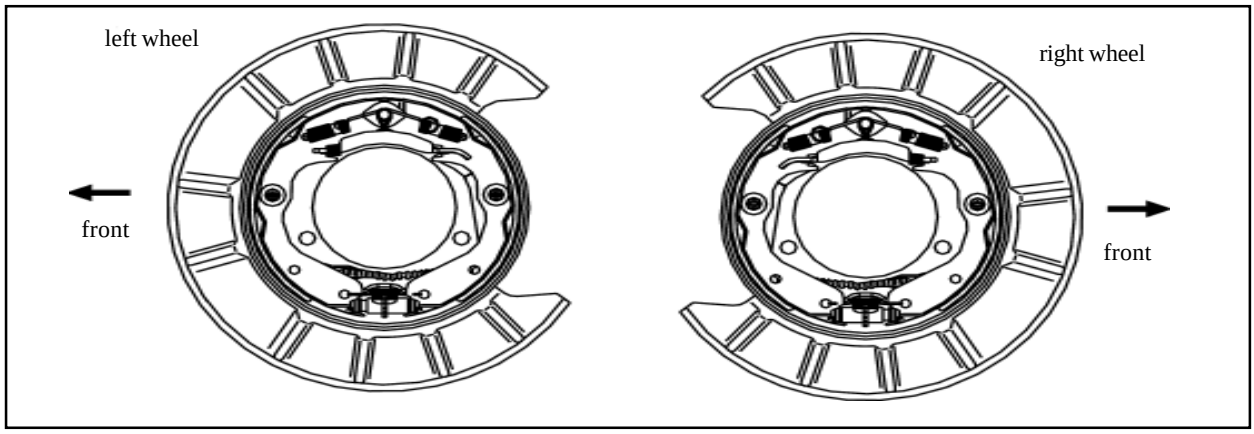
4. Check whether the contact between the brake shoe gasket and brake disc is sound.

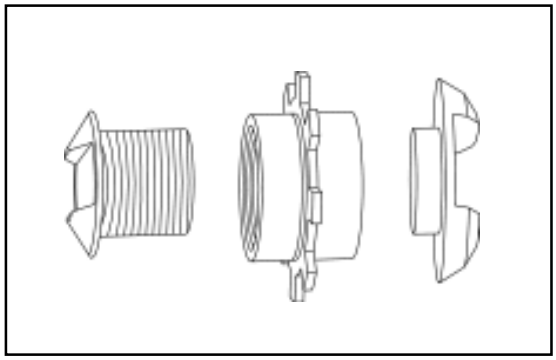
If the contact between the brake shoe gasket and brake disc is bad, it should use the brake shoe grinding device to repair or replace the brake shoe assembly.

Assembly of rear parking brake

Remarks: Assemble the component according to the direction shown in figure;

It is prohibited strictly that the working surface of brake drum and abrasion disk is polluted by the paint and grease. It should be removed by the fine abrasive paper if the abrasion disk has little dirty. The brake shoe should be replaced when the polluted area is large, otherwise it will cause the serious effect of insufficient brake force.



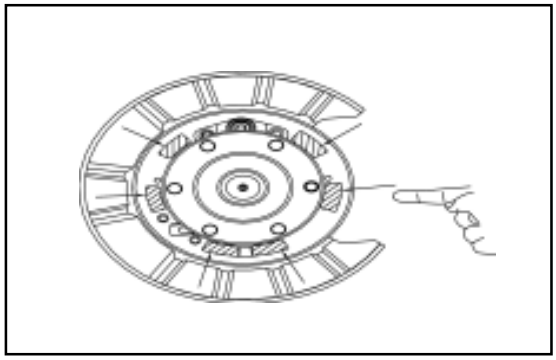


1. Install the clearance-adjusting device assembly

Insert the clearance-adjusting shaft head into the clearance-adjusting wheel; screw the clearance-adjusting screw rod into the clearance adjusting wheel.

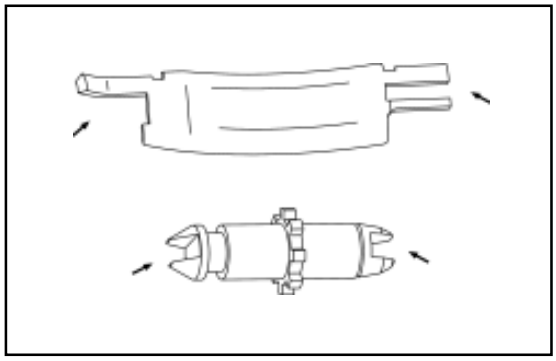
Remarks: The screw direction of left clearance-adjusting screw rod is the left hand.

The screw direction of right clearance-adjusting screw rod is the right hand.

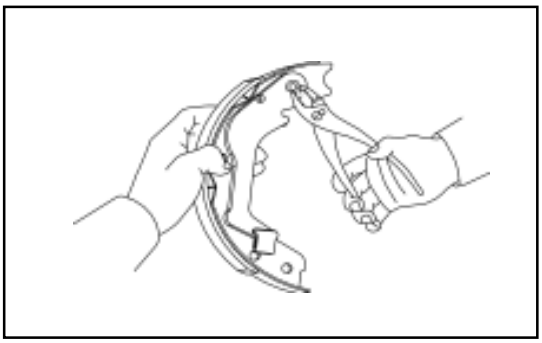


2. Coat the following components with the proper anti-high tem perature grease :

a. Contact position of brake soleplate and brake shoe.

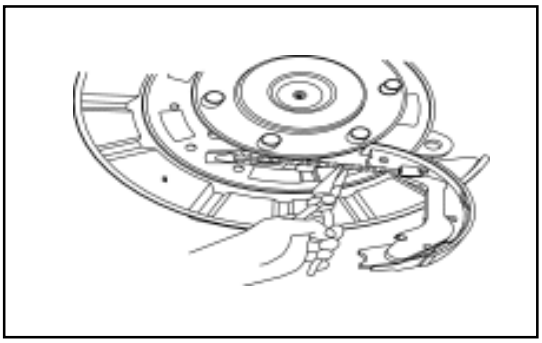


b. Contacting surface of push plate and shoe plate; contacting surface of clearance-adjusting device assembly and shoe plate.



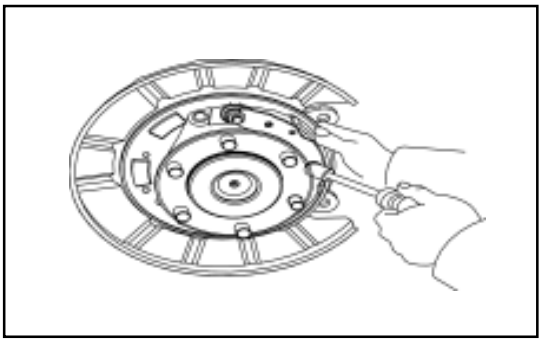
2. Install the parking brake pulling arm

Install the parking brake pulling arm and use a new saddle washer.



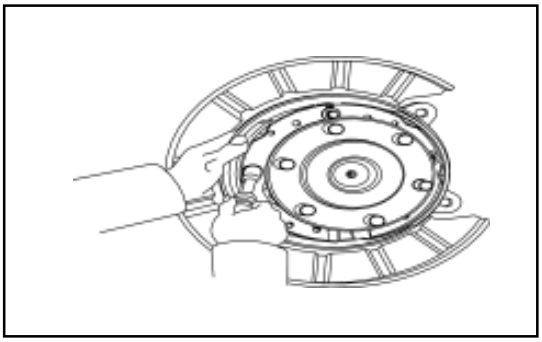
3. Install the rear brake shoe

a. Install the parking brake pull wire on the parking brake pulling arm.



b. Insert the end of rear brake shoe into the support pin of brake soleplate.

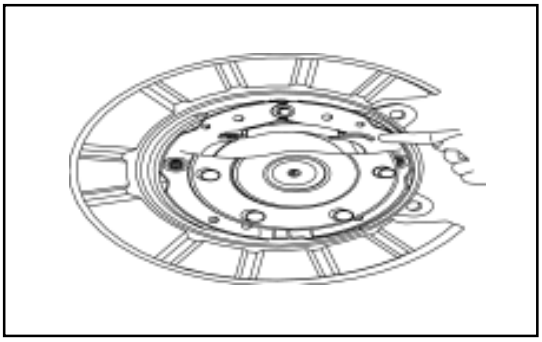
Insert the pull-out piece spring pull bar into the brake soleplate and brake shoe assembly, then insert the pull-out piece spring and pull-out piece spring base. Use the pull-out piece spring fork to rotate the pull-out piece spring base in position.



4. Install the front brake shoe

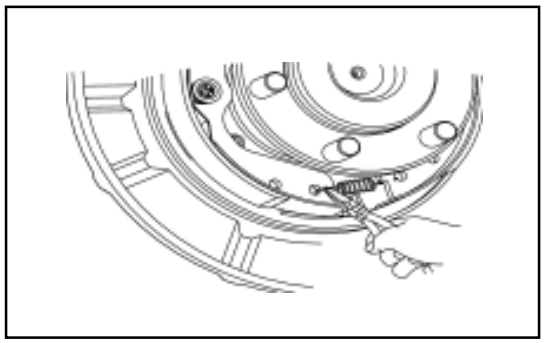
install the front shoe plate; insert one of its ends into the fixed pin of soleplate.

Insert the pull-out piece spring pull bar into the brake soleplate and brake shoe assembly, then insert the pull-out piece spring and pull-out piece spring base. Use the pull-out piece spring fork to rotate the pull-out piece spring base in position.



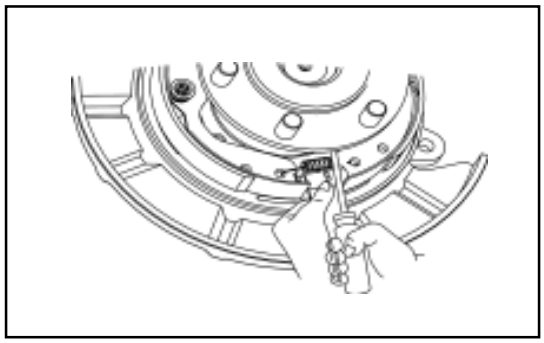
5. Install the brake push plate

Insert the push plate release spring into the push plate; then install the push plate on the place between the front and rear brake shoe assemblies.



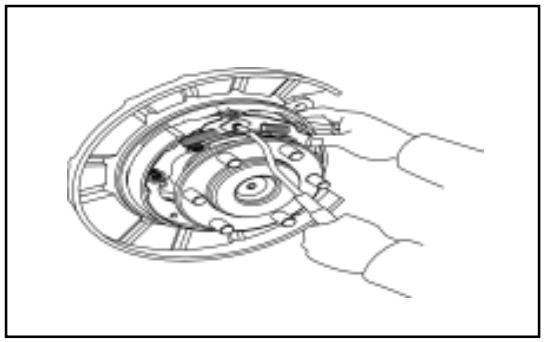
6. Install the lower tension spring

Install the lower tension spring between the front and rear shoe plate.



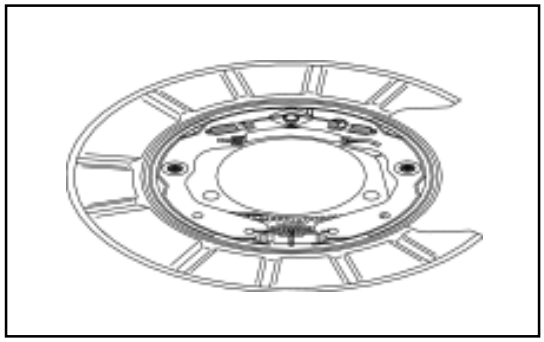
7. Install the clearance-adjusting device.

Install the clearance-adjusting device after poke the brake shoe by screwer.



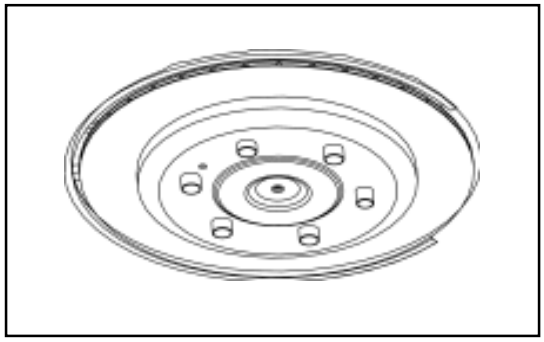
8. Install two upper release springs

Insert the block into the support pin, then install the upper release spring on the place between two brake assemblies.



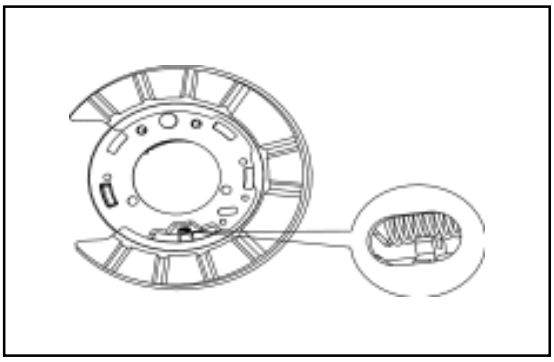
9. Check the operating process of automatic adjusting mechanism.

a. Pull the manual brake pill-wire, then release it. Check the clearance-adjusting gear for rotation. If can not rotate, check the rear brake and find the problem.



b. Adjust the clearance-adjuster to the length as short as possible.

c. Install the rear brake disc.



10. Adjust the clearance between the brake drum and brake shoe.

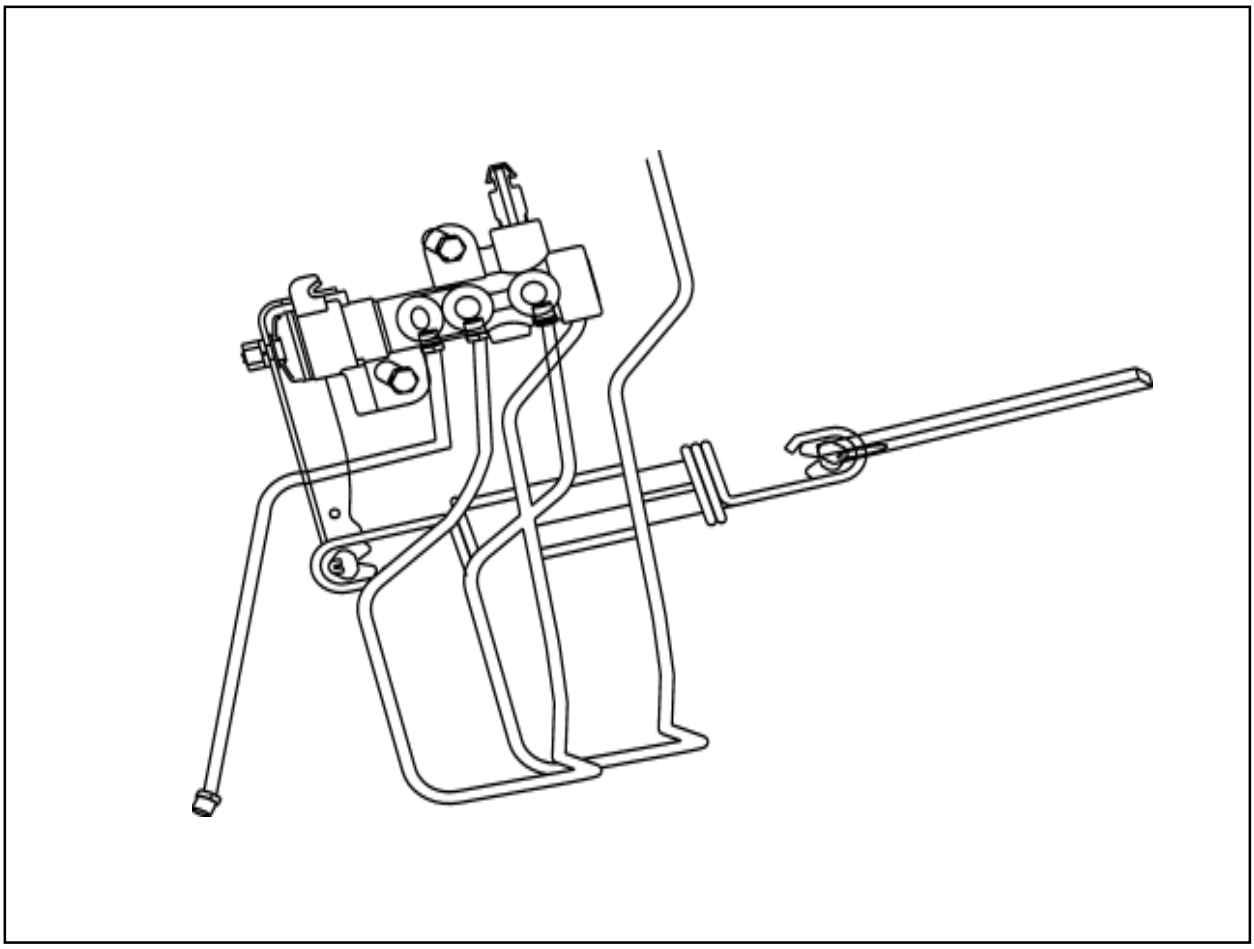
Poke the adjusting hole plug on the brake drum, insert the screwdriver into the clearance-adjusting hole; rotate the clearance-adjusting gear to expand the brake shoe until the brake disc can not be rotated by hand. Then rotate it for 3-5 teeth in anticlockwise, rotate the brake disc by hand at the same time, it is proper that it can rotate freely and without the contact between the abrasion and disc. It is allowable that the non-running-in brake shoe has the slight abrasion sensing. When adjust the clearance, the left and right wheel must be adjust at the same, install the adjusting hole plug after the completion of adjusting .

11.**Rear brake caliper assembly**

12.**Rear wheel assembly**

Tighten torque :120N.m

Adjustment load-sensing proportional valve



The action of load-sensing proportional valve is to prevent the rear wheel is braked before the front wheel is braked by adjusting the distribution of front and rear brake force according to the difference of vehicle rear shaft load, then avoid the risk of vehicle rotation. The adjustment of proportional valve is shown as follows:

a. The rear shaft load can be 820Kg after adjustment (including driver).
b. Install the brake pressure measuring meter and drain the air.
c. Increase the front brake pressure to 12Mpa, the rear brake pressure should be within 8～9 Mpa.
d. If necessary, adjust the hydraulic pressure.

1. **Move the sensing spring bracket on the rear axle, the right hook of sensing spring moves to right; the rear brake pressure is increased .**
2. **Vice versa, the rear brake pressure decreases, the adjustment scope of the frame is 20mm.**
3. **The extension amount of spring of load sensing proportional valve is controlled within 84～95mm.**

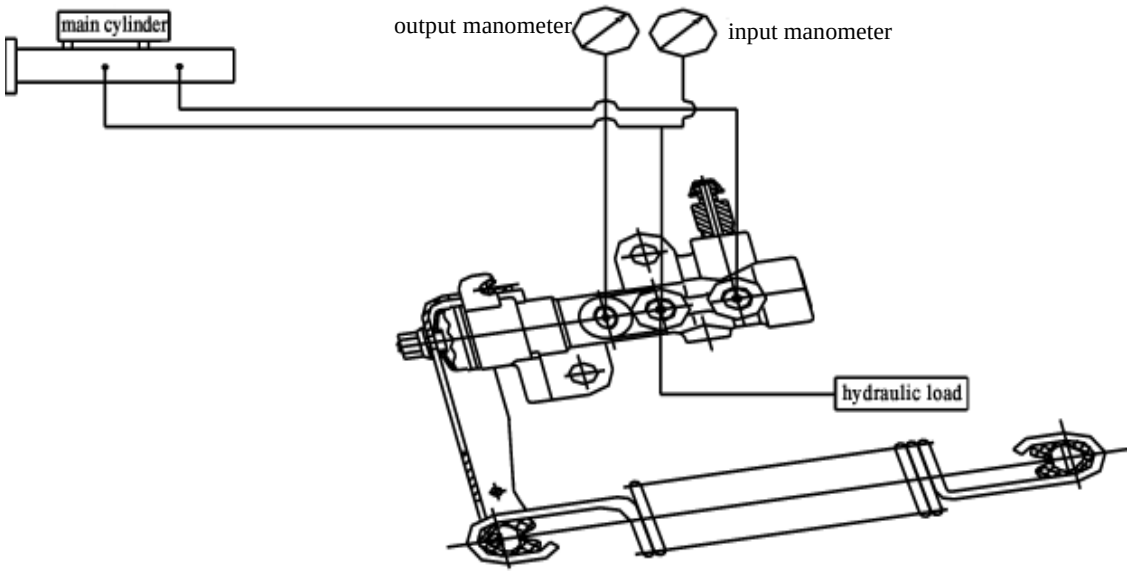


Figure (1)

Replace of load-sensing proportional valve

1. Removal

Disconnect the brake pipeline form the valve; remove the lock nut and remove the adjusting bolt from the suspension arm bracket; remove the installation bolt and take off the load-sensing proportional valve assembly.

2. Installation

a. Use two installation bolts to fix the load-sensing proportional valve.
The bolt tightening torque is 23N • m,

b. Tighten the adjusting bolt locking nut,

c. Connect each brake pipeline.
The tightening torque of the connector is 16N • m,

d. Filled with the brake fluid, discharge the air from the brake system; check the brake pressure and leakage.

Antilock Braking System (ABS)

Cautions

1. **It must not remove or install the electric elements and wire bunch plug when the ignition switch is in ON to avoid the damage of ECU. It should turn off the ignition switch if needs disassembly.**
2. **Pay attention to do not knock or impact the ABS ECU during the maintenance and repair, for it will damage the ABS ECU easily.**
3. **The wheel speed sensor and hydraulic unit (integrated with ECU) of BOSCH ABS8.0 can not be repaired, it should be replaced in integral if damaged.**
4. **After the brake system is maintained, the brake pedal maybe soft. Discharge the air according to the normal brake system.**
5. **It must use the brake fluid from original manufacturer; the brake fluid of different number cannot be used in mixed, otherwise it will cause the failure of brake system. Select the tyre of original type as most as possible**

Repair of Antilock Braking System (ABS)

1. **It should process the failure diagnosis for the brake system before process the ABS failure diagnosis. It can diagnose out the failure rapidly by using Table 1. In Table 1, the small number means the failure which occurs most possibly. Check each element according to the sequence and maintain or replace it if necessary.**
2. **Check the following elements for normal operation before the diagnosis:**
   - Brake fluid level and brake fluid quality
   - Pressure of tyre, size of tyre, shape and depth of tyre figure
   - Other brake component

   These components will affect the brake effect of the ABS. Check the system sensor, connecting wire and connector for correct installation, arrangement and connection. Ensure the completeness of fuse, repair or replace it if necessary.
3. **Process the analysis and diagnosis according to the ABS advanced by owner. Use the diagnosis instrument (Annex 1) for final check and confirmation. It must process the run inspection after the competition of all ABS maintenance. The test condition is shown as follows:**
   a. Confirm the tyre complies with the requirement, the tyre pressure is normal.
   b. The brake system (including brake light) is normal
   c. The brake system is without leakage.
   d. The position and installation of wheel speed sensor is correct.
   e. All fuses are normal.
4. **test method:**

   Run for 1 min at least when the vehicle speed is beyond 40Km/h, process a proper brake. Then read out the failure code to ensure the ABS is without failure code.

Table 1

Name of element (failure)	Brake is low or soft	Lag of brake	Block of brake	The brake is very hard but has bad effect	Brake noise
Brake system (leakage of brake fluid)	1			1	
Brake system (with air)	2			2	
brake shoe (worn)				3	
Piston oil seal (worn or damaged)	3				
brake pedal (small free stroke)		1			
Brake main pump (failure)	4	11			
parking brake (brake shoe is out of round)		4			
parking brake (improper adjustment)		2			
parking brake pull-wire (lag)		3			
Assist push bar (improper adjustment)	5	9		8	
Tension or release spring (failure)		8			8
brake shoe (crack or deformation)		5	5	4	1
Piston (lag)		6	1		
brake shoe (with oil)			2	5	
Piston (block)		7	3		
assist system (vacuum leakage)		10		9	
brake shoe support plate (loose)					4
fixed bolt (loose)					2
Slide pin (worn)					5
brake drum (crack)			4	7	3
brake shoe (with foreign material)				6	6
brake shoe (harden)					7
Noise reduction plate (worn)					9
Press spring (damaged)					10

Chapter 9

Steering

Precautions:

When replacing the parts, please carry out replacement carefully and correctly, any minor error may influence the performance of the steering system and result in the accidents and danger at the time of driving.

Trouble and Troubleshooting

Poor Returnability

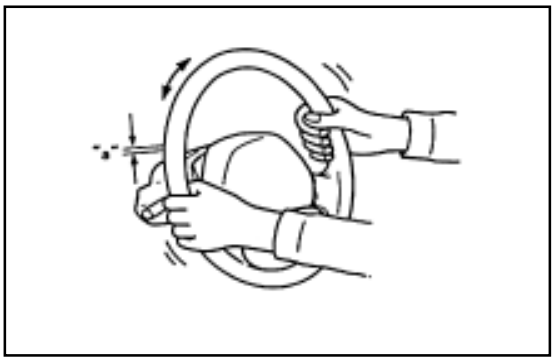
Causes of the trouble	Troubleshooting
1. Insufficient air pressure of the tire 2. Alternation of front wheel alignment 3. Jamming of the steering valve 4. Performance of steering valve's torsion-bar lowered down 5. Steering revolute pairs too tight	1. Inflate the tire 2. Re-measure and adjust the parameters of front wheel alignment 3. Examine components of the steering gear and replace them if necessary 4. Replace the steering gear 5. Replace the revolute pairs

Steering too heavy

Causes of the trouble	Troubleshooting
1. Lower air pressure of the tire 2. Steering knuckle too tight 3. Steering gear too tight 4. Inaccurate front wheel alignment 5. Hydraulic system lacking of oil 6. Air in the hydraulic system 7. Insufficient oil supply of the steering pump 8. Steering revolute pairs too tigh	1. Inflate the tire with the standard pressure 2. Check the adjusting gap between steering knuckles and lubricate these knuckles 3. Examine and adjust the clearance between the gear and the gear rack 4. Adjust the front wheel alignment 5. Check the liquid level of oil reservoir and fill in the steering fluid as specified 6. Examine the sealing ability of all joints of oil pipes, exhaust the gas and check the liquid level 7. If the wear of oil pump and interior leakage is serious, replace the steering fluid with qualified one 8. Examine and adjust the gear backlash Add the lubricant

One-way Steering too heavy

Causes of the trouble	Troubleshooting
1. Insufficient air pressure of the side tire 2. Valve of the steering gear not in the center 3. Left or right fixing pressure not formed	1. Inflate the tire 2. Repair or replace the steering gear 3. Replace the seals



Inspection on Vehicle

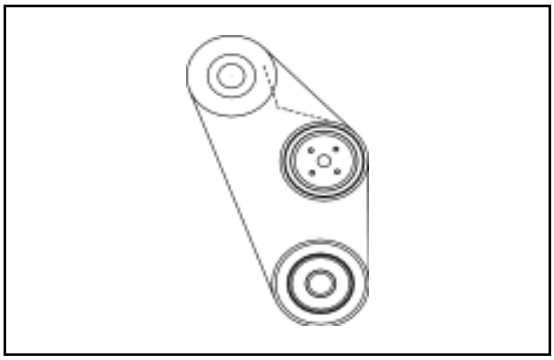
Inspection of the steering wheel

1.Check if the steering wheel has the clearance or click sound.

Backlash of the steering wheel "a": 0—30mm

2.Check if the screw bolts and nuts are secured.

Secure them if necessary. Please repair or replace the damaged parts wherever needed.



Inspection of the tension of the driving belt

When the driving belt is applied with the force of 98n:

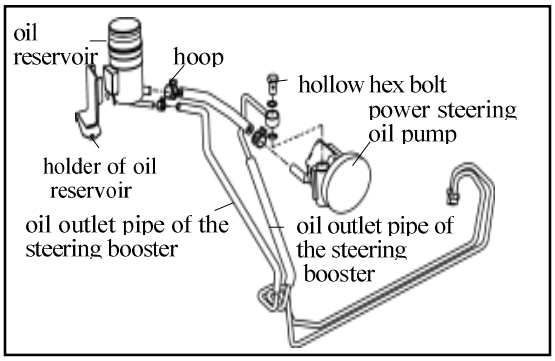
New belt: 5-7m

Old belt: 7-9m

Note:

"New belt" means such belt whose running time on the machine is not more than five minutes

"Old belt" means such belt whose running time on the machine is more than five minutes.



Inspection and Addition of Power Steering Fluid

1.Let the car stop at the horizontal level.

2.Examine the liquid level of oil reservoir, it shall be between the upper and lower scale.

3.Examine and add the hydraulic oil after the car runs 6,000km or every three months.

4.Replacement and air exhaust of the hydraulic oil:

a. open the cover of the oil reservoir, remove the oil return hose of the oil reservoir and discharge the oil into the container.

b. start the engine and let it run at the idle speed; discharge the oil for one thing and on the other hand rotate the steering wheel to the extremes for several times till the oil in the steering system is completely discharged out.

c. turn off the engine.

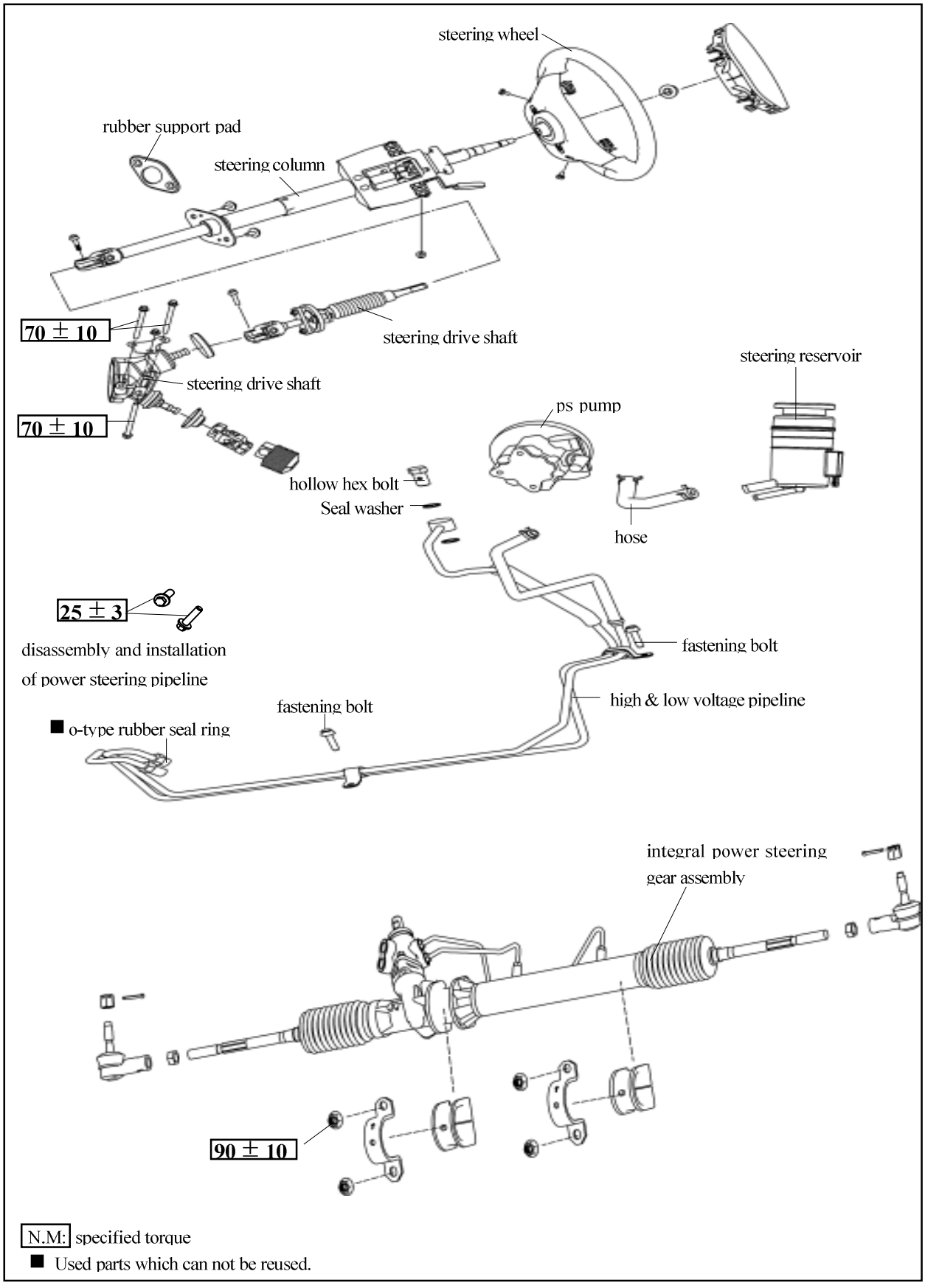
d. Connect back the oil return hose and add the new hydraulic oil into the oil reservoir.

e. restart the engine and let it run at the idle speed, rotate the steering wheel to the extremes for several times, and at the same time fill the oil reservoir with new hydraulic oil till there is no bubbles or turbidity in the oil reservoir; and further, when the engine is turned off, the liquid level inside the reservoir shall be between the upper and lower scale.

f. screw up the cover of the oil reservoir.

In the course of the steering or replacement of hydraulic oil, the time of the steering wheel being turned to the extreme positions shall not exceed 5 seconds so as to avoid the damage to the steering system.

Steering Linkage



N.M: specified torque

■ Used parts which can not be reused.

Technical requirements

1.The fastening torque of the mounting bolts of the integral power steering gear assembly is 90 ± 10N • m.

2.The fastening torque of the connecting bolts of the steering drive sub-assembly and the integral power steering gear assembly is 25 ± 3N.m.

3. The fastening torque of the connecting bolts of the steering drive assembly and the left horizontal beam of the frame is 70 ± 10N.m.

4. The fastening torque of the mounting bolts of the power steering pump is 40N.m.

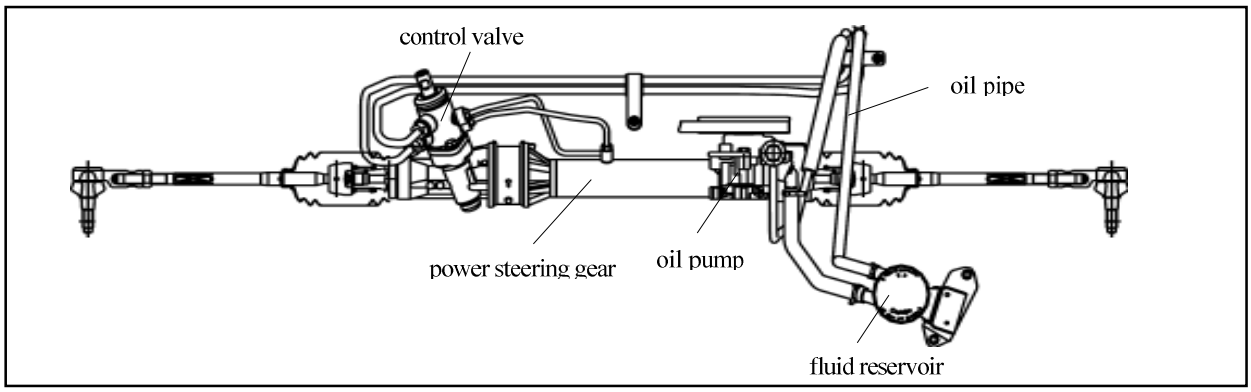
5. The tension force of multi-wedge belt 4PK1100 is 4PK1100.

6. Centering fastening of the handwheel: steer the front wheel to the right front and remove the handwheel without changing the position of the steering stem, install the handwheel aligning the center, the radials of the handwheel should be at the left & right centering state; the symbol of "the Great Wall" on the steering wheel shall be in driver's straight view position, secure the nut firmly with the fastening torque of 25 - 35N.m

7. Inspection of free clearance of the handwheel

Steer the car in a straight direction and stop the engine, apply a 5N force to the handwheel along the circumference, left turn the handwheel and stop the turning when the resistance is increasingly felt with each turn; then right turn the handwheel and stop the turning when the resistance is increasingly felt with each turn; the angle rotated along the circumference is the free clearance of the handwheel, whose standard value shall be below 20°, and the angle from the center to the right shall not be more than 10°.

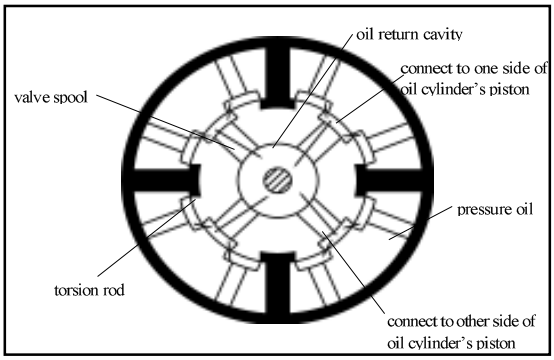
Hydraulic Power Steering System



Steering System and Principle of Power Steering

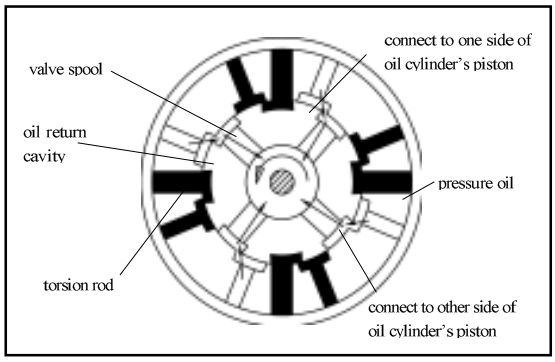
Power steering system consists of steering oil pump, oil reservoir, power steering gear and the oil pipe.

The engine through the belt's transmission drives the steering oil pump to produce the hydraulic pressure which functions to the piston of the power steering gear, and then the piston propels the gear rack of the steering gear and provides it with the auxiliary force, whose magnitude is associated with the pressure functioning on the piston. The change of the pressure is achieved by the control valve of the steering gear.



State of Straight Driving

At this state, the spool of the control valve in the power steering gear does not act and is at the central position. The hydraulic oil supplied from the oil pump does not flow into the oil cylinder, while flows back to the oil reservoir through the control valve via the loop. This is because that the pressure at both sides of the piston of the steering gear is the same and the piston does not move.



The Steering Process

When the handwheel is turned, the torsional deflection will happen to the torsion rod of the control valve, and the spool of the control valve which is connected with the torsion rod is alto turned to the position, oil passage at one end is opened while the oil passage at other end is closed at the same time, which conveys the hydraulic oil to the side of the oil cylinder's piston and push the piston to move, thus driving the gear rack and realizing the rotation of front wheels.

The Aligning Process

When the steering is finished, the force on the handwheel will disappear, the deflection of torsional rod will restore to the normal and the spool of control valve also rotate to the central position along with operation. The hydraulic oil supplied from the oil pump does not flow into the oil cylinder while flows back to the oil reservoir through the control valve via the loop. This is because that the pressure at both sides of the piston of the steering gear is the same. Under the functioning of front alignment parameters, the car will restore to its straight driving state. In the course of restoring to straight driving, the piston will move and the oil at one side of the piston will flow to the other side via the passage of the control valve.

Road Sense Effect

Road sense effect refers to the magnitude of the steering resistance which is produced by the road and felt by the driver when steering the car. When the driver applies the force to the handwheel, the deflection will happen to the torsion rod; the bigger the road steering resistance is, the more extensive the deflection of the torsion rod will be. In order to prevent the torsional rod from being damaged, the position limit mechanism is hereby designed. When the deflection of torsion rod reaches to certain extent, the position limit mechanism will function, then the torque of the handwheel is transferred to the gear not through the torsion rod but directly through the valve spool, and then to the gear rack. At this time, the road steering resistance is not passed to driver's hand via the torsion rod. Therefore, the driver can judge the change in the steering resistance based on the resistance on the handwheel.

Chapter 10

Electrical Appliances of the Vehicle

Note: Please check the Owner's Manual for the content about buzzer warner of seat and headlamp adjustment.

Repair of the Electrical System

As for the circuit sketch and decomposition diagram of HOVER CUV car, please see figure -4.1˜«-4.12 , wherein, diagram of electronic instruments is almost the same as that of SYING and SAFE. But time delay of the dome light is controlled by the central door lock and the door automatic lock device for five 5 doors is equipped when the car speed is above 15km/h. The headlight is changed with four high beam lights. 4WD is supplemented with the power clutch.

The optional devices include the power sunroof, the safety air bag and etc.

In order to let operators read the contents of this chapter in detail, besides provision of the circuit principle sketch of this car, the connecting diagram for carious kinds of wire bundle as well as the relevant connectors and terminal boxes are also illustrated here. Wherein, the terminal box in the engine compartment is defined as No. 2 and the box in the instrument panel is defined as No. 1.And further, the introduction is also launched to the electric circuit one by one in a break-down manner as per the system, especially illustrating as follows:

Operating Instructions

1. A dedicated connector symbol is added in the connecting diagram of the wire bundle, see Figure 8-1.1

2. In order to reduce the magnitude of the dedicated connector symbols, all connectors between the wire bundle and the load are illustrated in text.

3. As for the manner how the connectors of the conductive wire is displayed on the protective sleeve, please see Figure 8-1.2, wherein the upper number is the number of the wire and the lower letter indicates the color of the wire.

The letter indicating the color of conductive wire is listed in the following table

B-Black	Br- Brown	G- Green	Gr- Gray	L- Lake blue	Lg- Light green
Or- Orange	P- Pink	R- Red	V- Violet	W- White	Y- Yellow

Besides above, double-colored wire is indicated in a way that a diagonal (/) is inserted between the letters indicating two colors; the letter before "/"indicates the wire color and the letter after"/" indicates the color of other small line on the conductive wire. For instance, L/R is a blue conductive wire with a small red line; Br/Gr is a brown conductive wire with a small gray line.

4. The number of connector's lead is subject to the direction in which the conductive wire and connector is inserted into the protective sleeve. The connector inserts are numbered from the left to the right while the connector sockets from the right to the left; see Figure 8-1.3.

figure 8-1.1

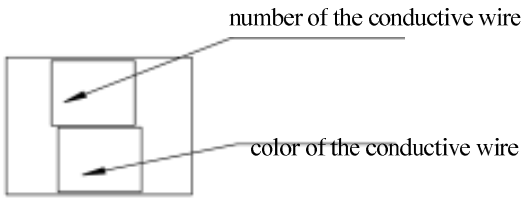


figure 8-1.2

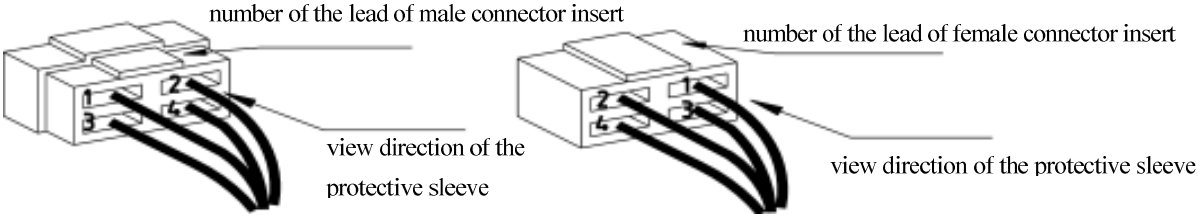
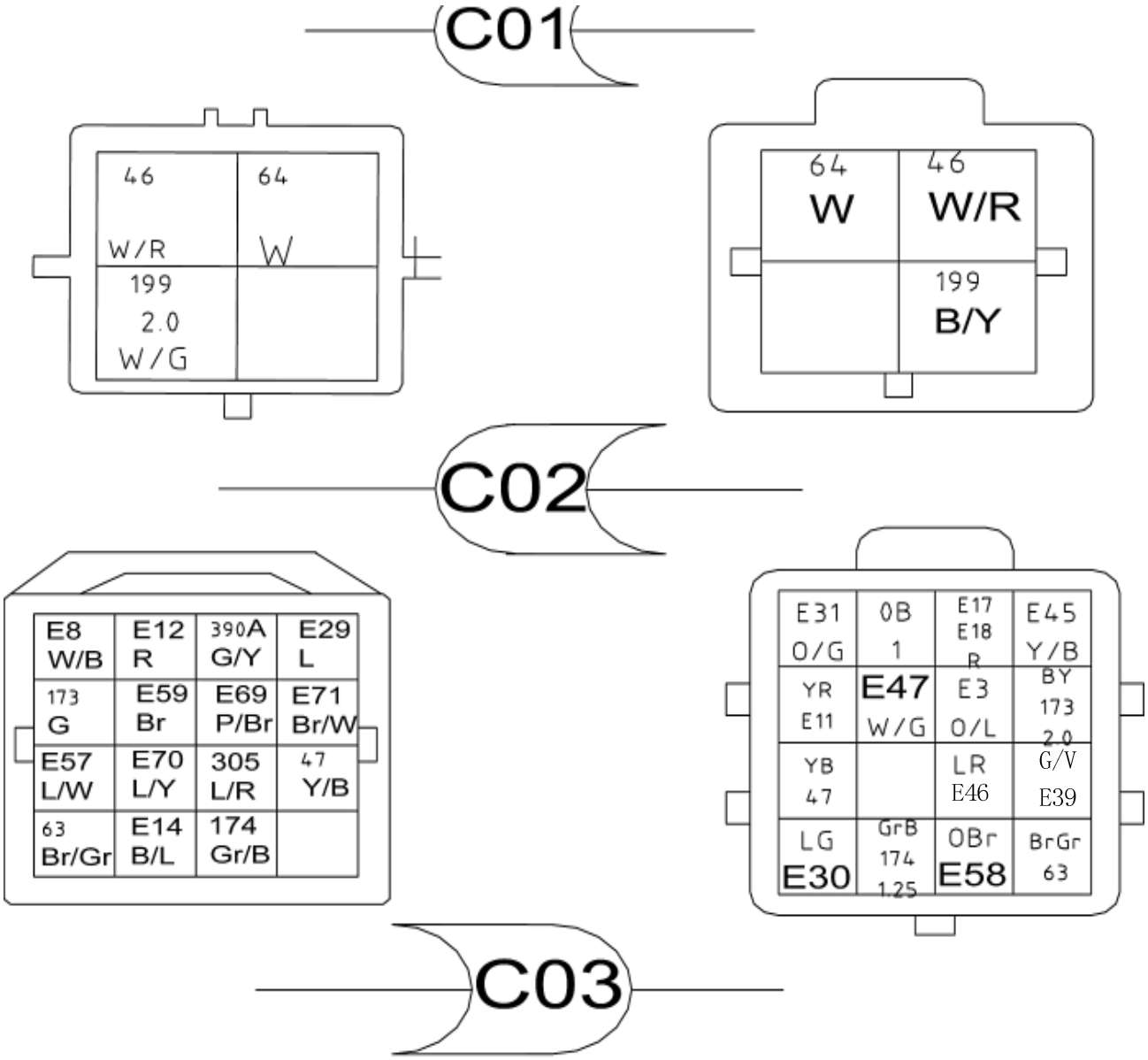
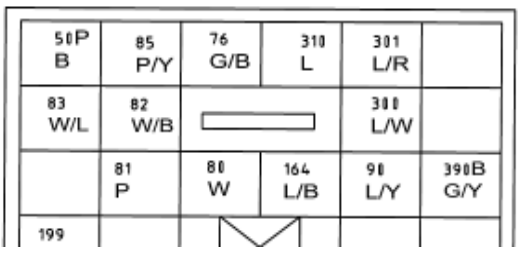


Figure 8-1.3

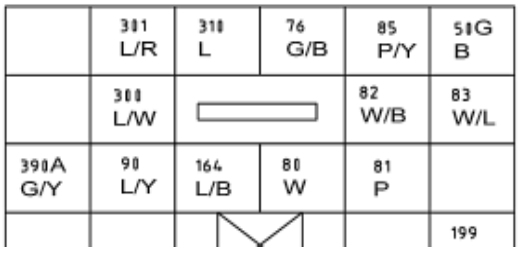
Wire Harness

Wire harness middle link number pin function diagram 1





linked to instrument wire harness 2



linked to engine bay 2

Figure VIII —2.2-1

wireharnessmiddlelinknumberpinfunctiondiagram2

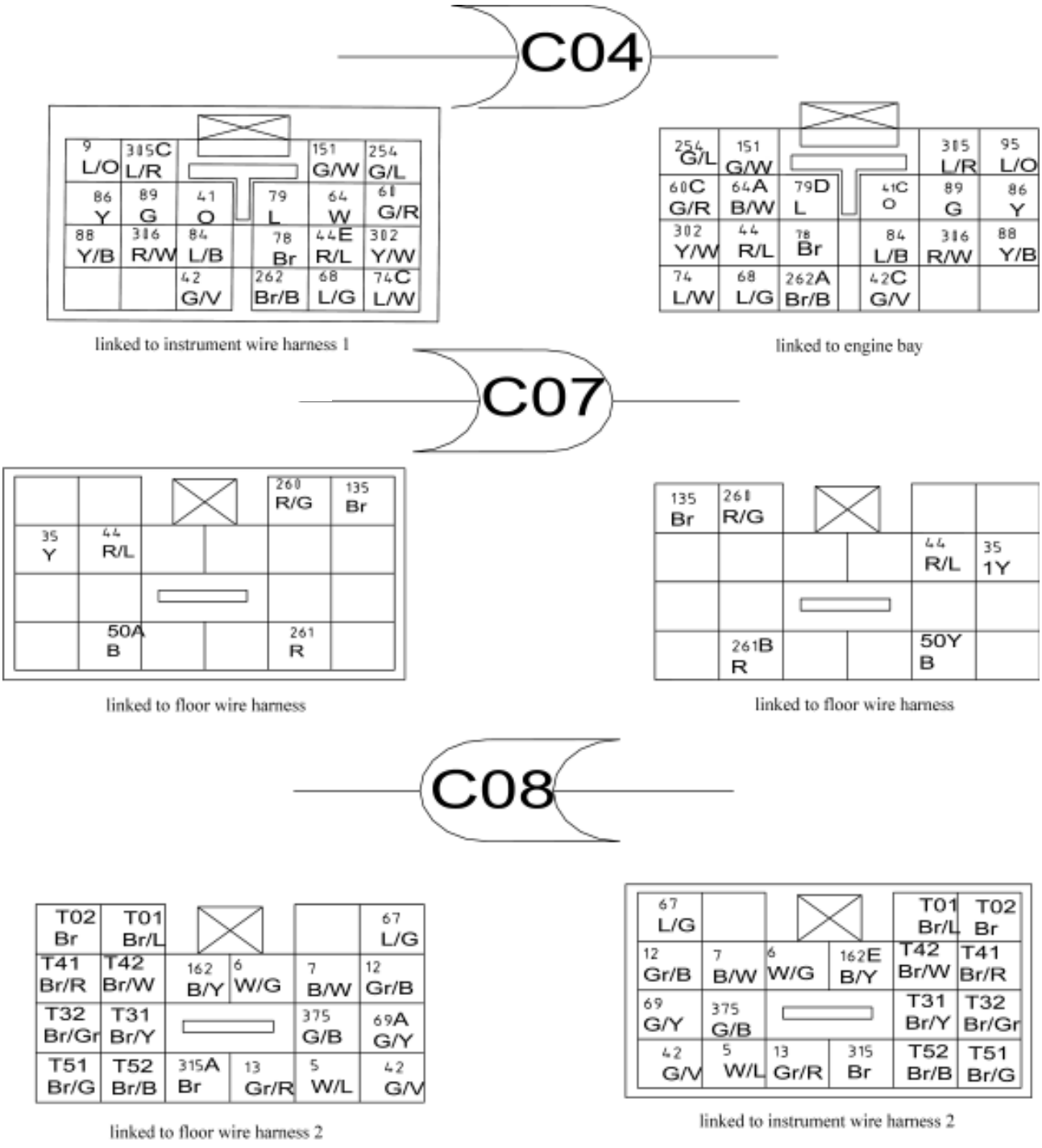
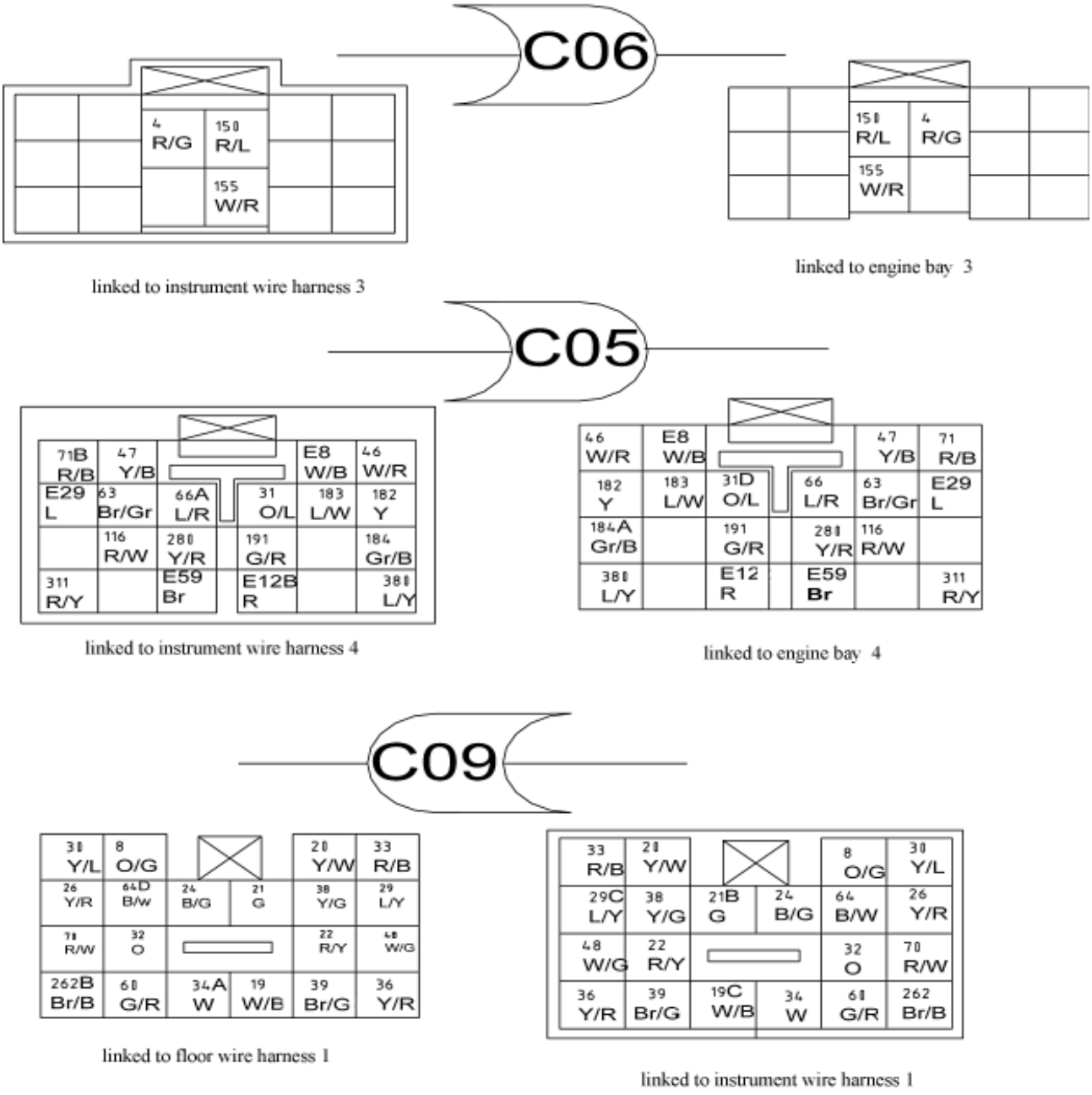


Figure Ⅷ 2.2-2

wire harness middle link number pin function diagram 3



linked to instrument wire harness 3

linked to engine bay 3

linked to instrument wire harness 4

linked to engine bay 4

linked to floor wire harness 1

linked to instrument wire harness 1

Figure VIII 2.2-3

wire harness middle link number pin function diagram 4

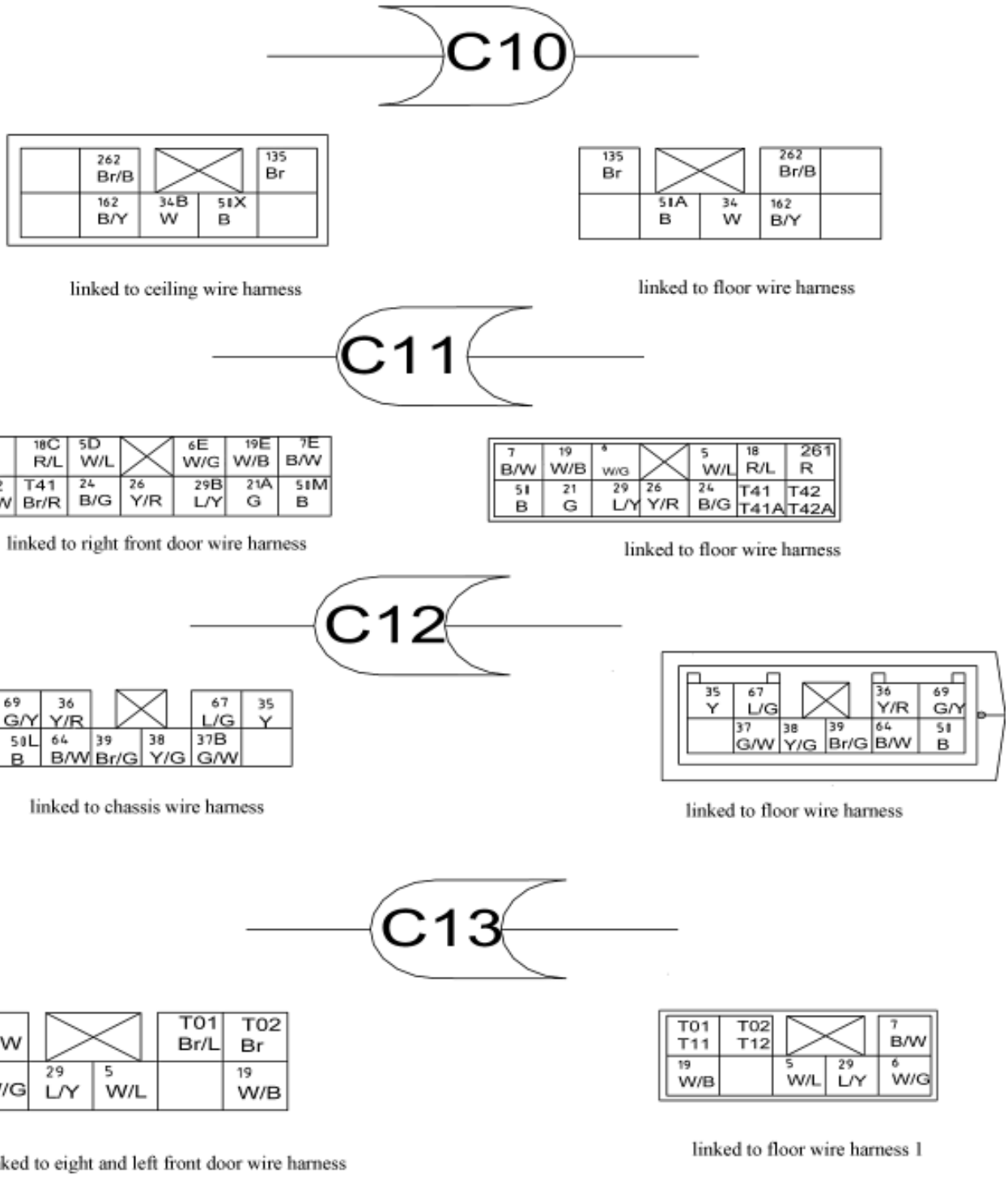


Figure VIII 2.2-4

wire harness middle link number pin function diagram 5

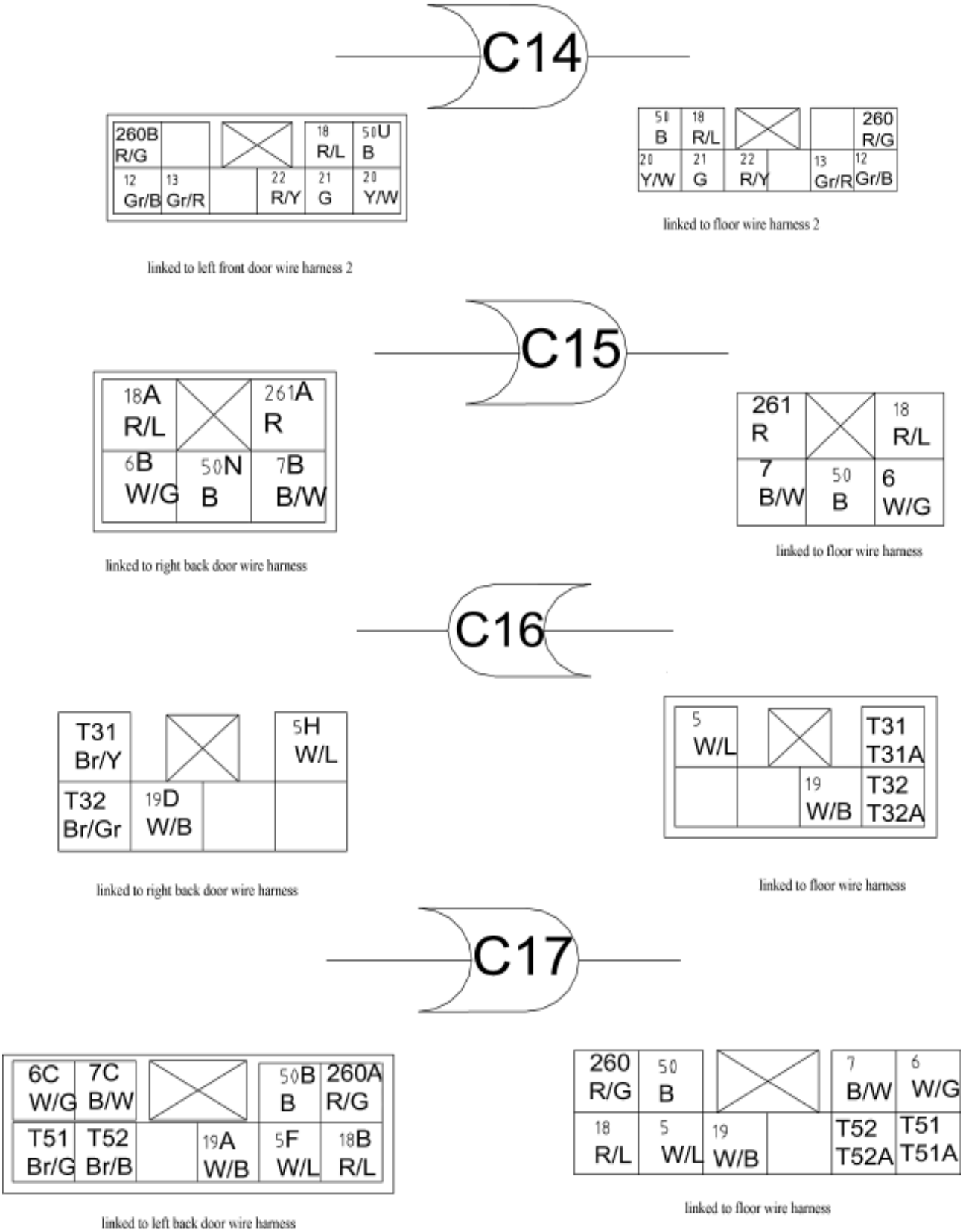


Figure VIII 2.2-5

wire harness middle link number pin function diagram 6

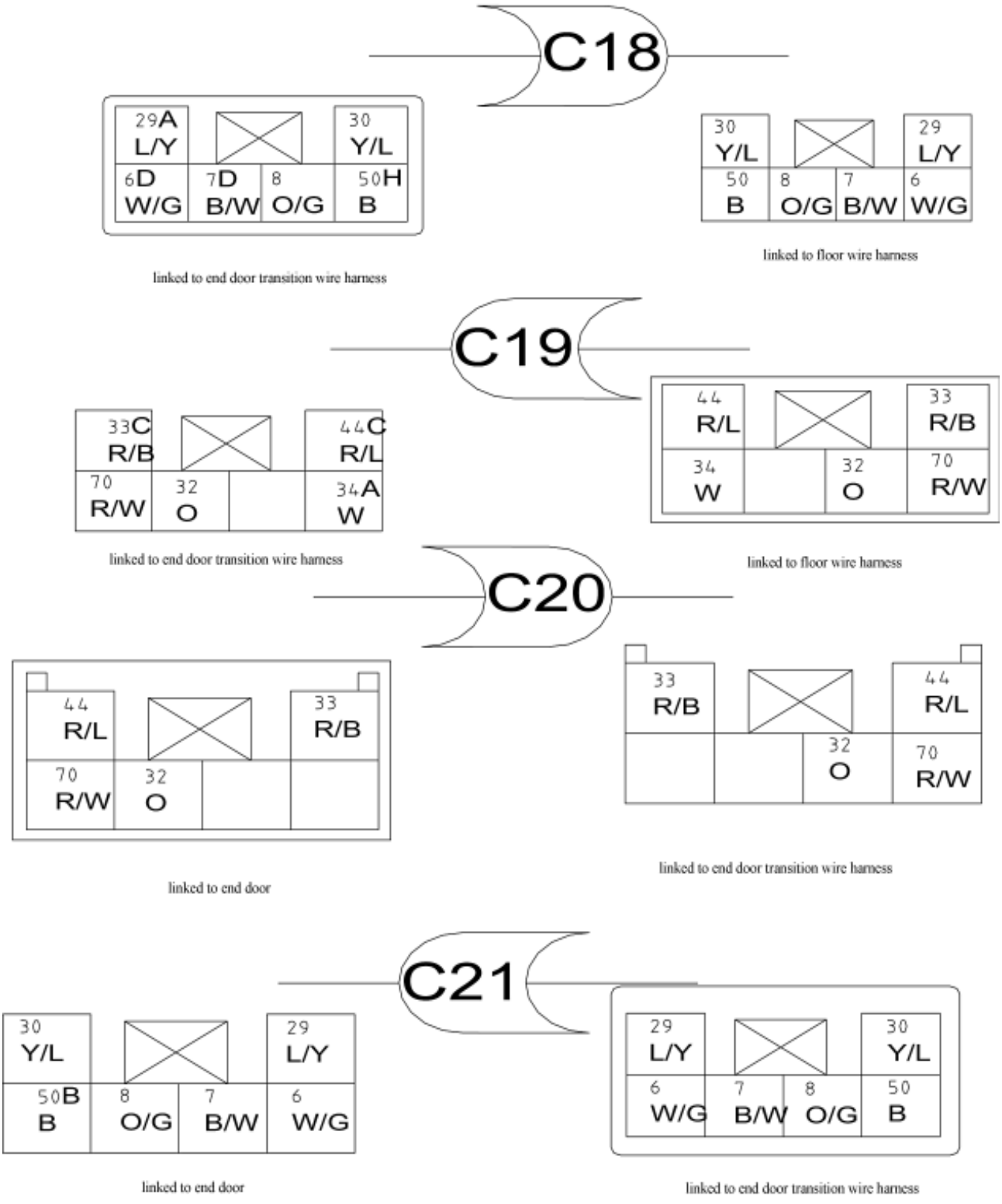


Figure VIII 2.2-6

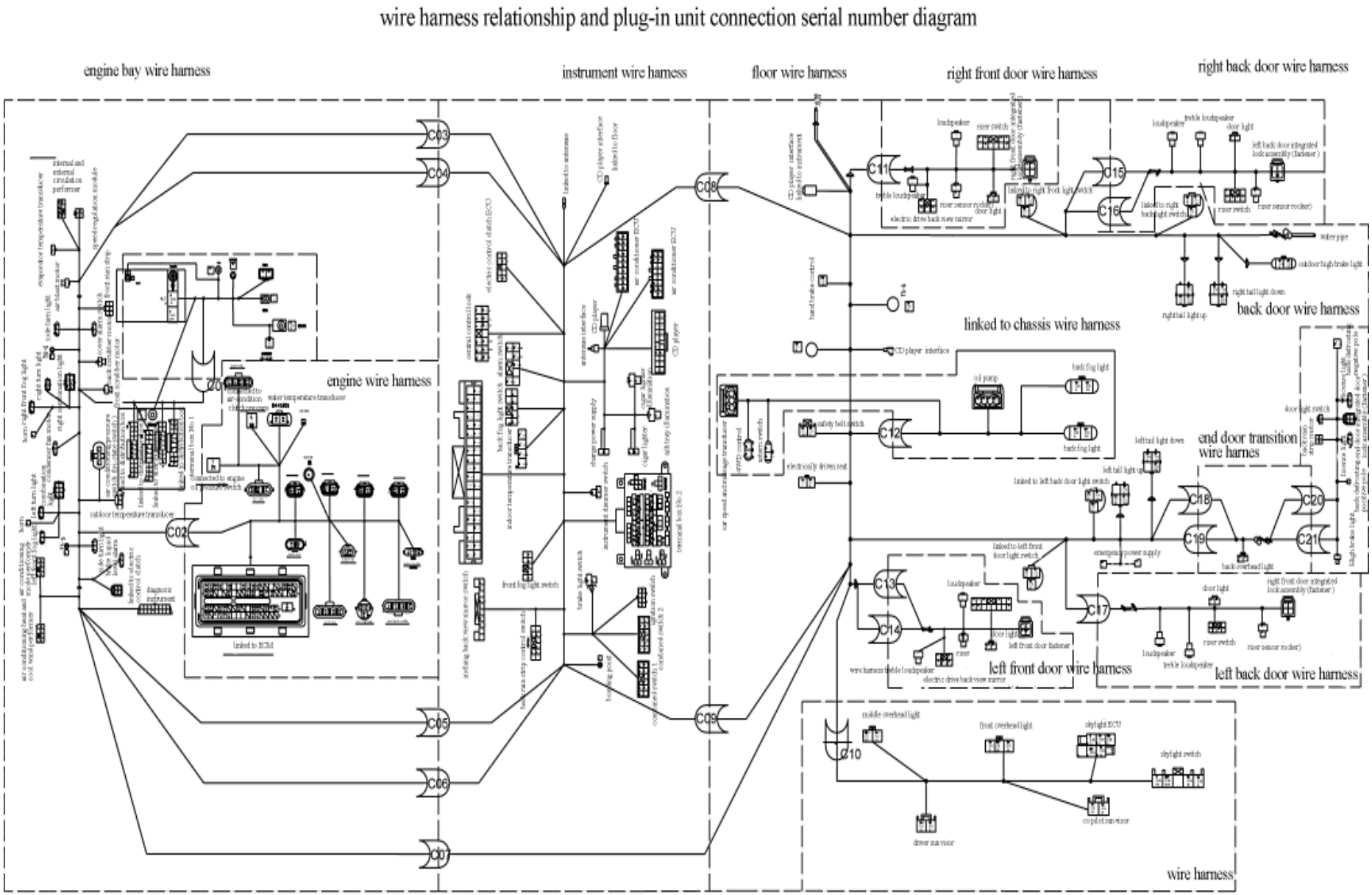
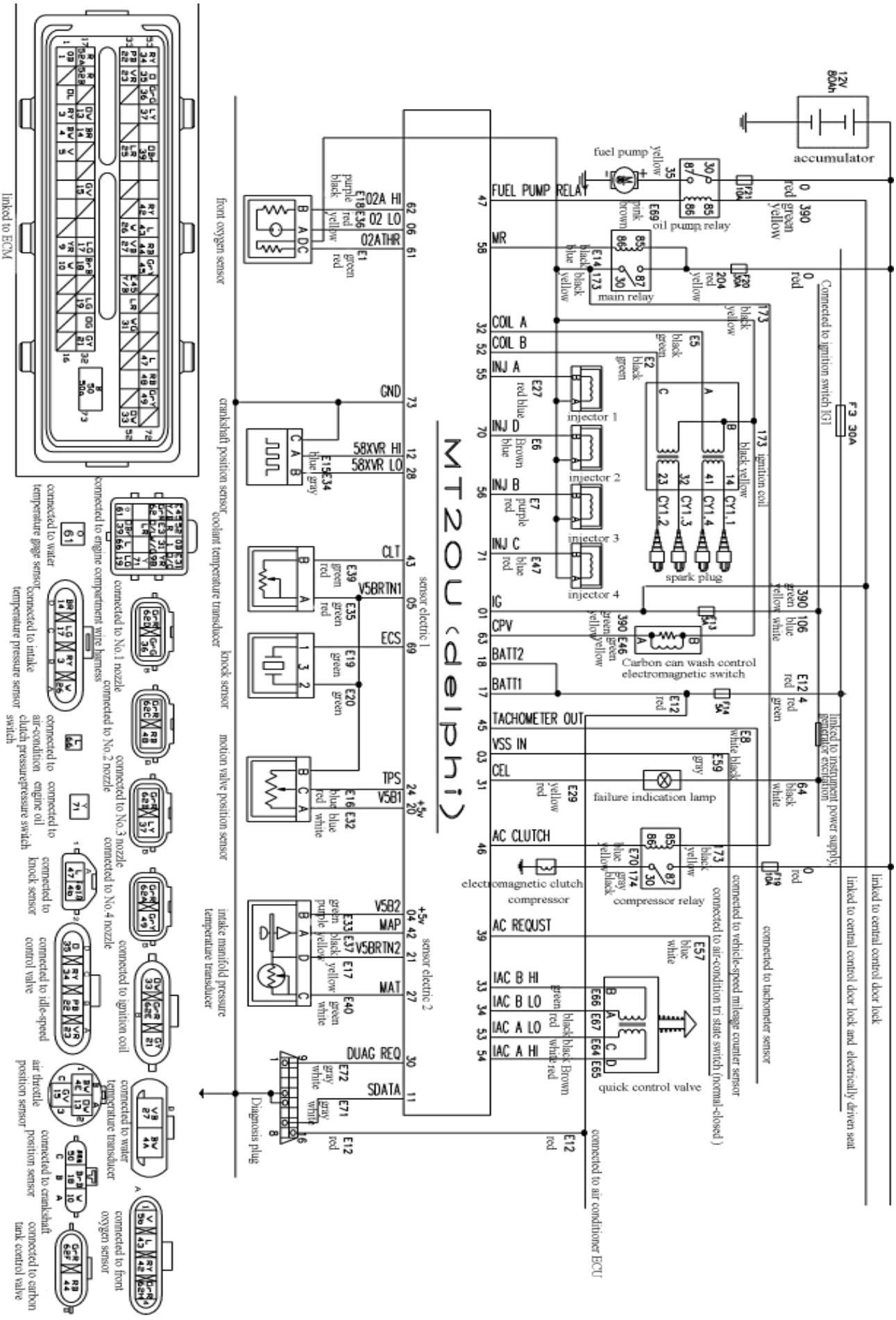


Figure VIII 2.1


MT20U (delphi)
accumulator
12V 80Ah
fuel pump
FUEL PUMP RELAY
oil pump relay
main relay
F3 30A
Connected to ignition switch IG1
linked to central control door lock
linked to central control door lock and electrically driven seat
linked to instrument power supply, generator excitation
connected to tachometer sensor
connected to vehicle-speed mileage counter sensor
connected to air-condition tri state switch (normal-closed)
connected to air conditioner ECU
COIL A
COIL B
INJ A
INJ B
INJ C
INJ D
injector 1
injector 2
injector 3
injector 4
spark plug
173 ignition coil
IG
CPV
Carbon can wash control electromagnetic switch
BATT2
BATT1
TACHOMETER OUT
VSS IN
CEL
failure indication lamp
AC CLUTCH
electromagnetic clutch compressor
compressor relay
AC REQUST
IAC B HI
IAC B LO
IAC A LO
IAC A HI
quick control valve
DUAG REQ
SDATA
Diagnosis plug
FUEL PUMP RELAY
MR
GND
02A HI
02 LO
02ATHR
58XVR HI
58XVR LO
CLT
V5BRTN1
ECS
TPS
V5B1
V5B2
MAP
V5BRTN2
MAT
sensor electric 1
sensor electric 2
front oxygen sensor
crankshaft position sensor
coolant temperature transducer
knock sensor
motion valve position sensor
intake manifold pressure temperature transducer
linked to ECM
connected to engine compartment wire harness
connected to No.1 nozzle
connected to No.2 nozzle
connected to No.3 nozzle
connected to No.4 nozzle
connected to ignition coil
connected to water temperature gage sensor
connected to intake temperature pressure sensor
connected to air-condition engine oil clutch pressure switch
connected to knock sensor
connected to idle-speed control valve
connected to water temperature transducer
connected to air throttle position sensor
connected to front oxygen sensor
connected to crankshaft position sensor
connected to carbon tank control valve

Front view and pin diagram of No.1 fuse box

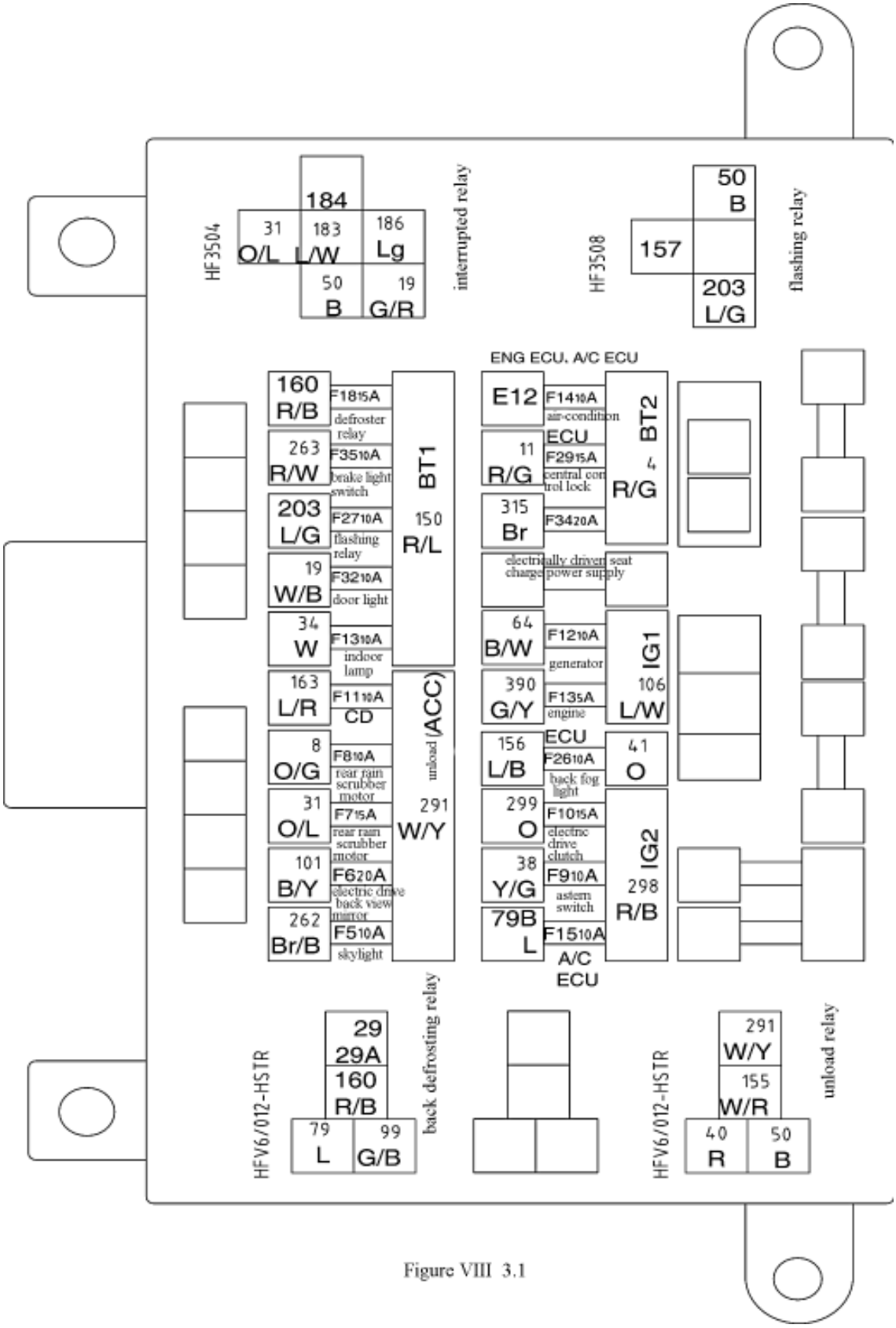


Figure VIII 3.1

Front and back pin diagram of No. 2 fuse box

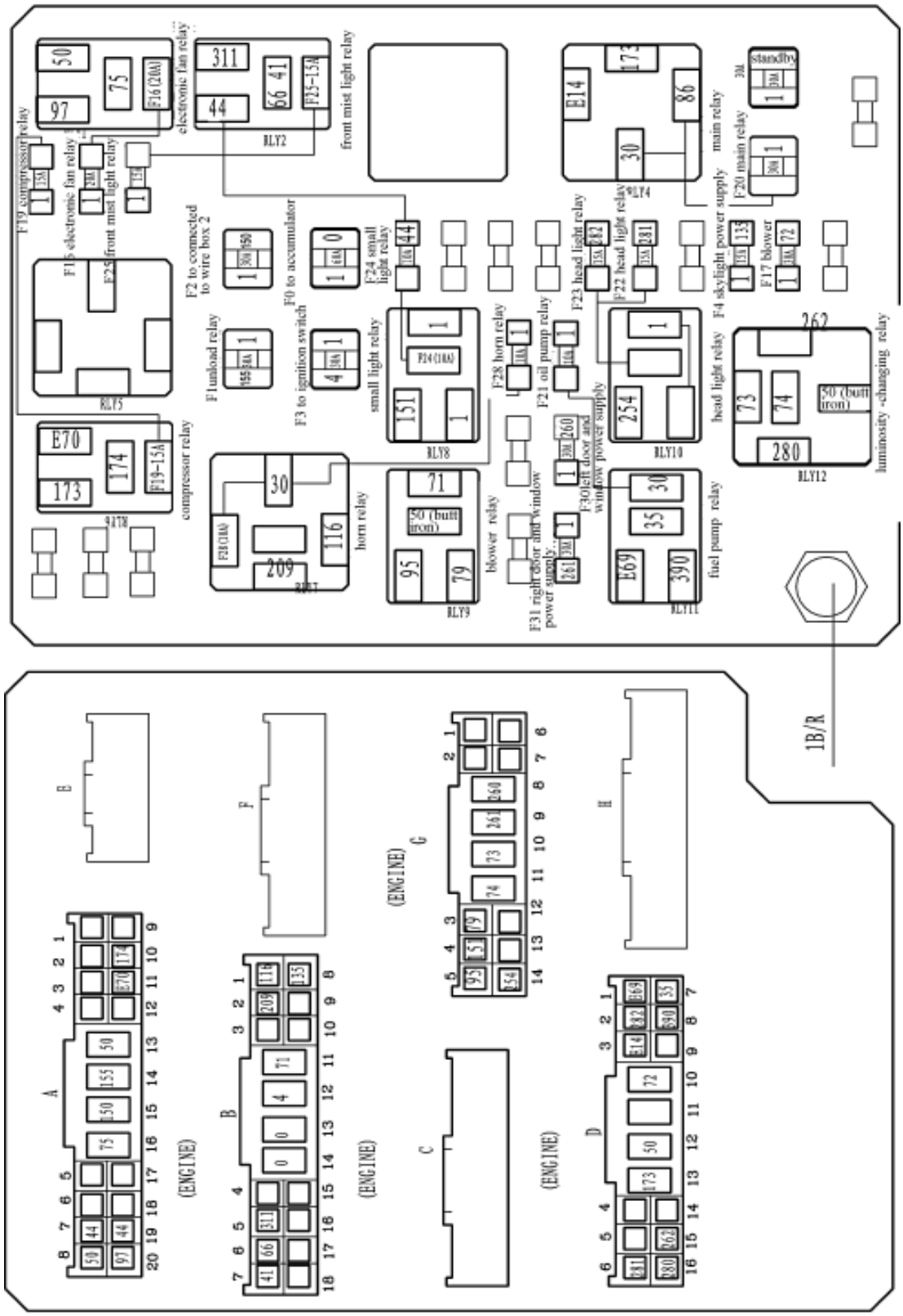


Figure VIII 3.2

Schematic diagram of complete electric appliance

power supply and engine peripheral circuit

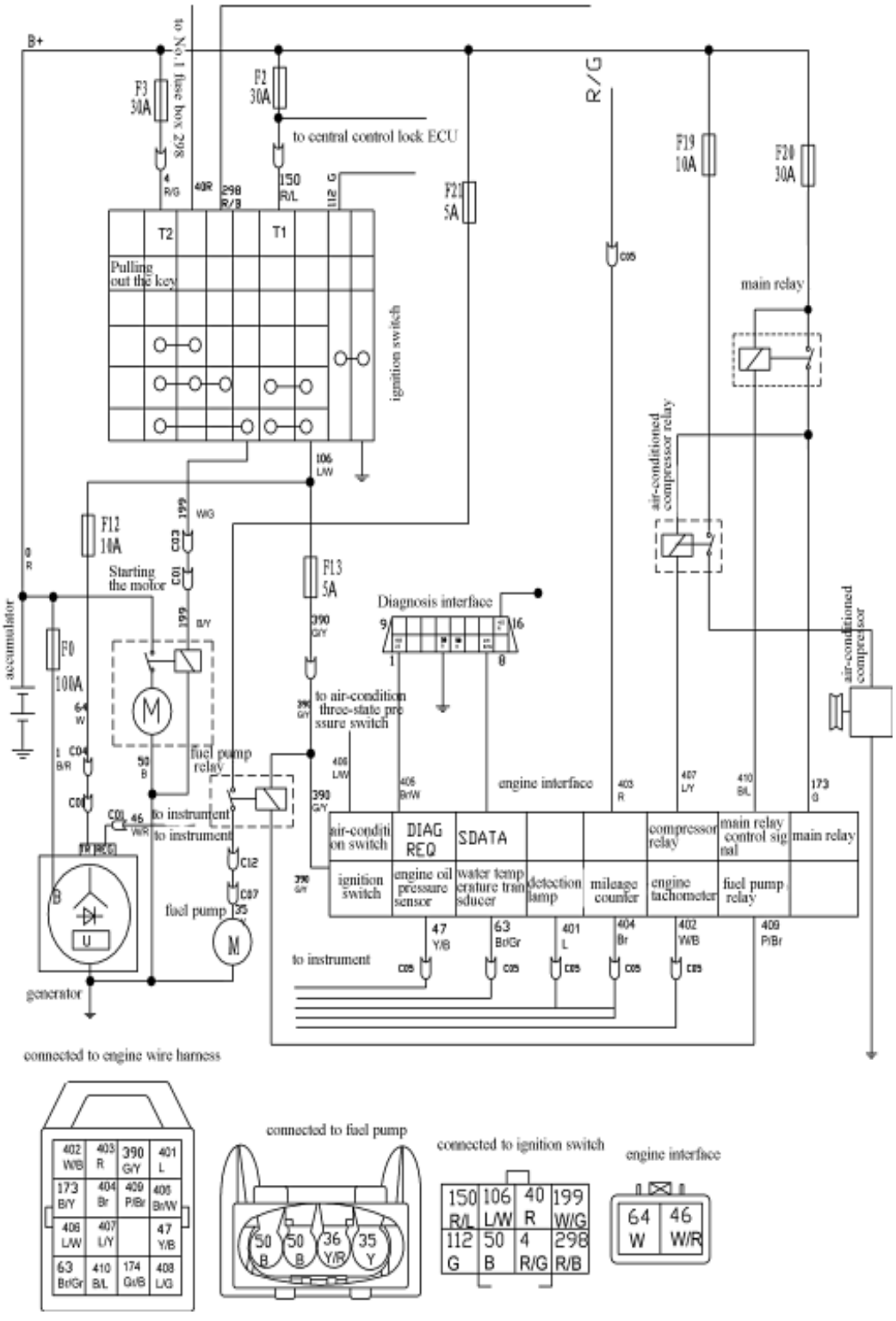


Figure VIII 4.1

Instrument system

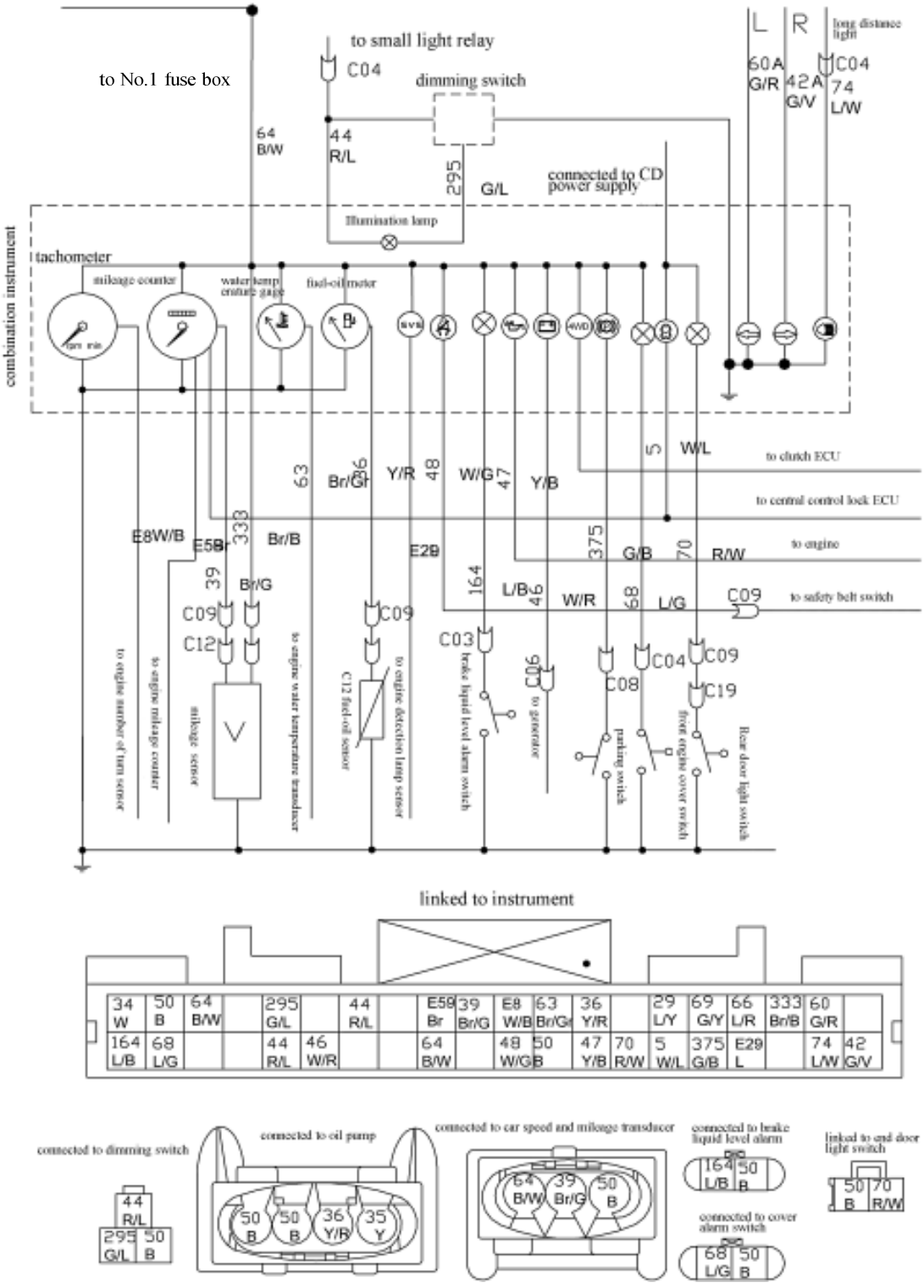


Figure VIII 4.2

Front illumination lamp system

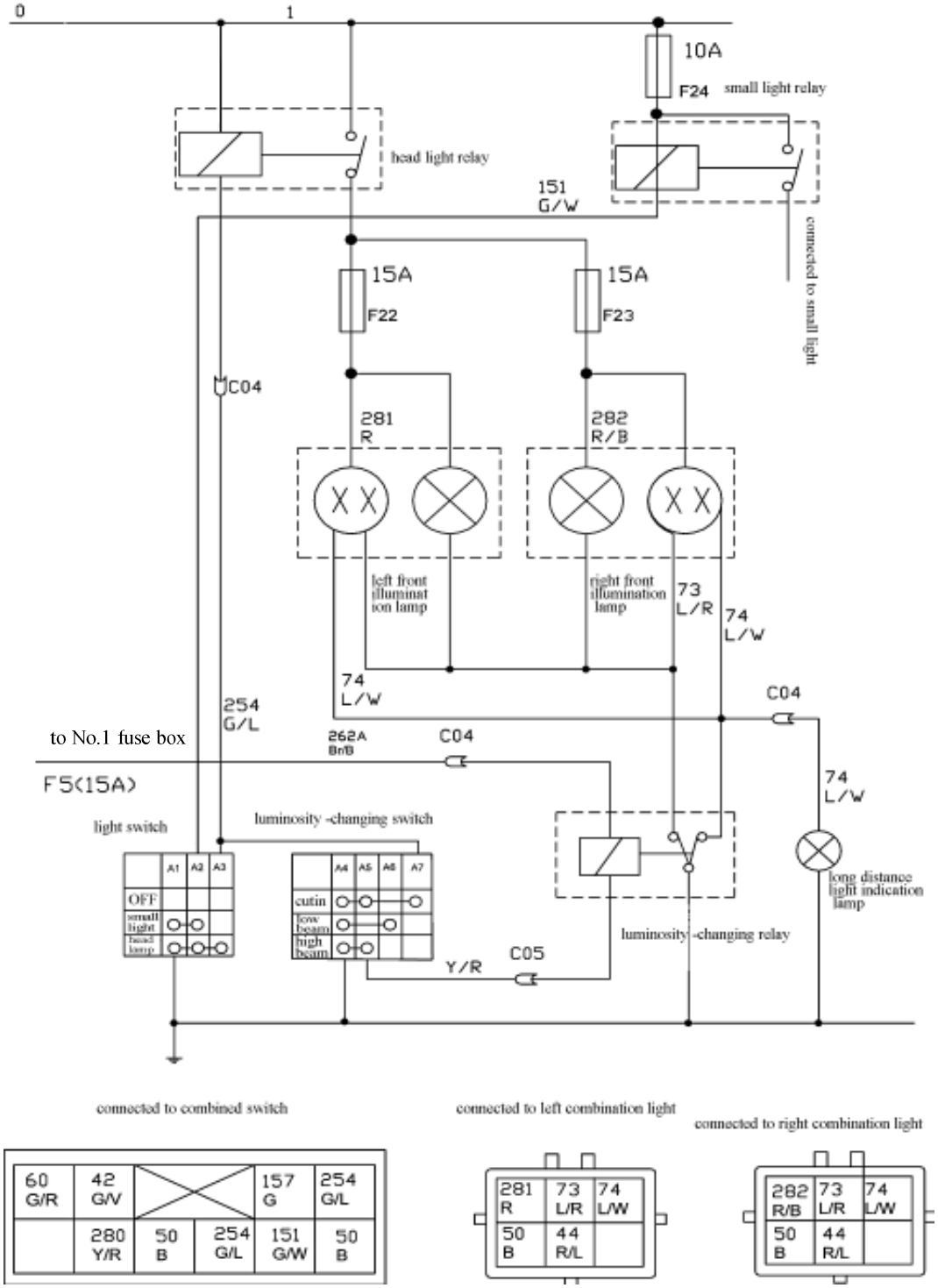
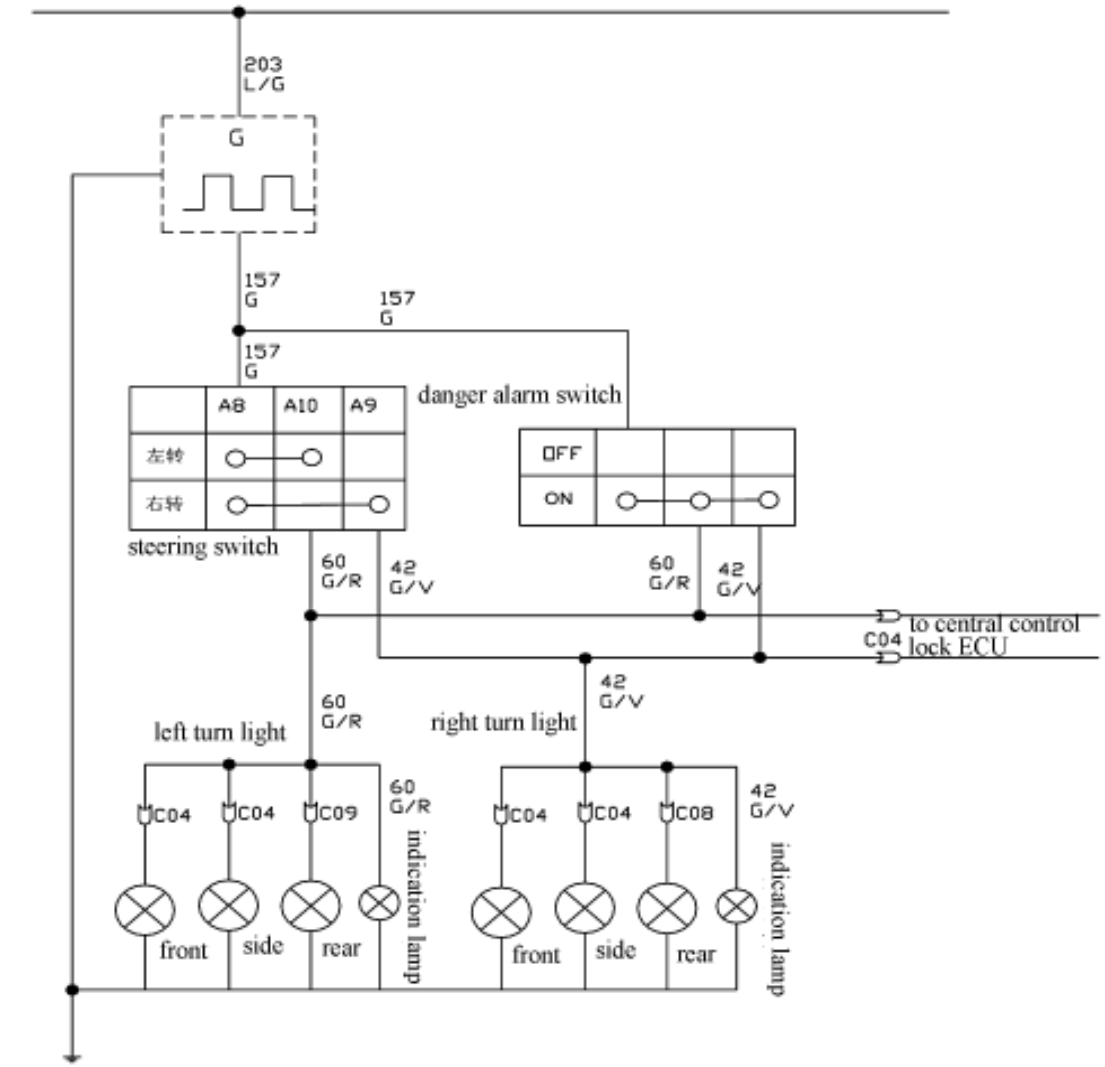


Figure VIII 4.3

steering , alarm system



connected to combined switch

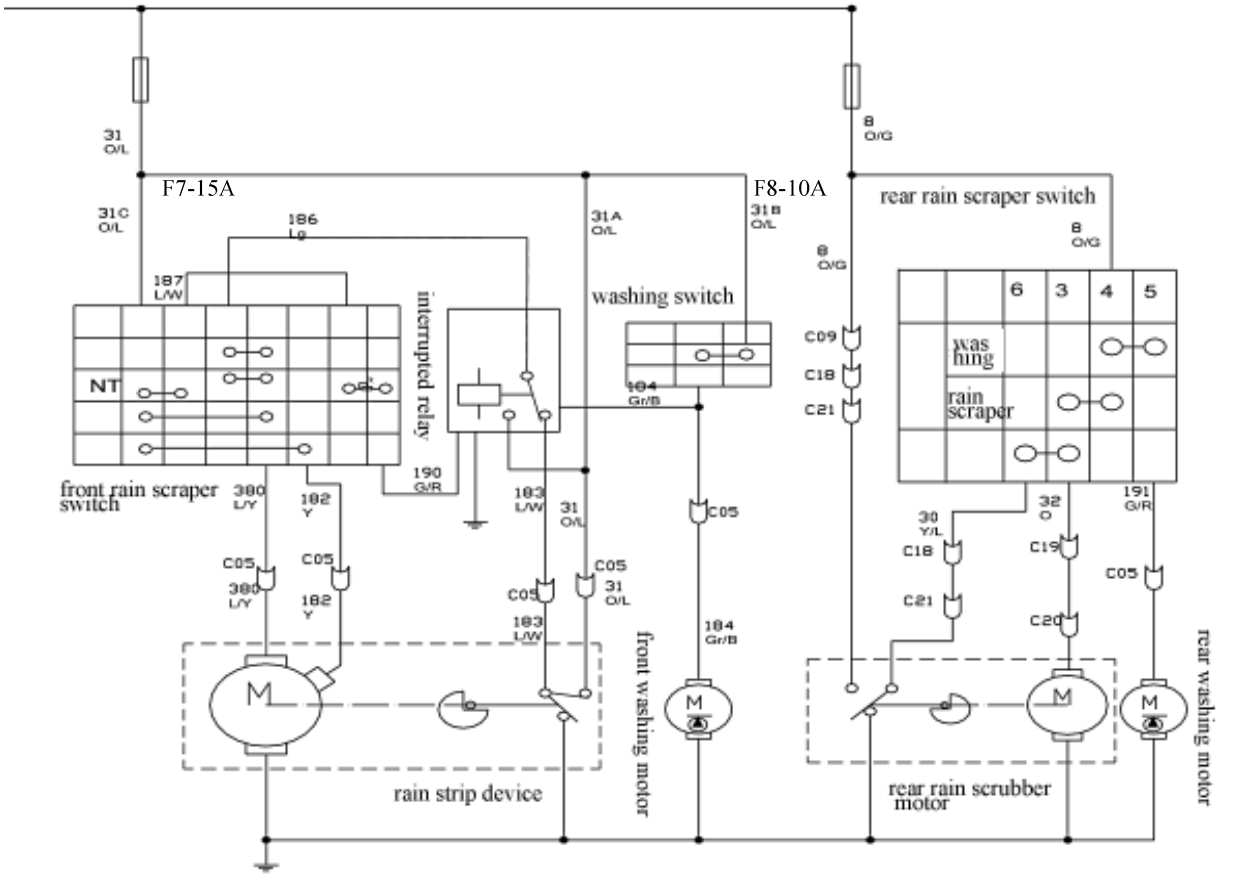
60 G/R	42 G/V			157 G	254 G/L
	280 Y/R	50 B	254 G/L	151 G/W	50 B

connected to alarm switch

44 R/L				50 B
		157 G	42 G/V	60 G/R

Figure VIII 4.4

front and rear rain scraper , washing system



connected to combined switch

116 R/W	190 G/R			187 L/W	31 O/L
184 Gr/B	182 Y	380 L/Y	186 Lg	187 L/W	31 O/L

connected to rear rain scraper switch

	44 R/L		50 B	
	30 Y/L	32 O	8 O/G	191 G/R

connected to front rain scrubber motor

50 B	380 L/Y	182 Y
31 O/L	183 L/W	

connected to front water-spray motor

184 Gr/B
50 B

connected to rear water-spray motor

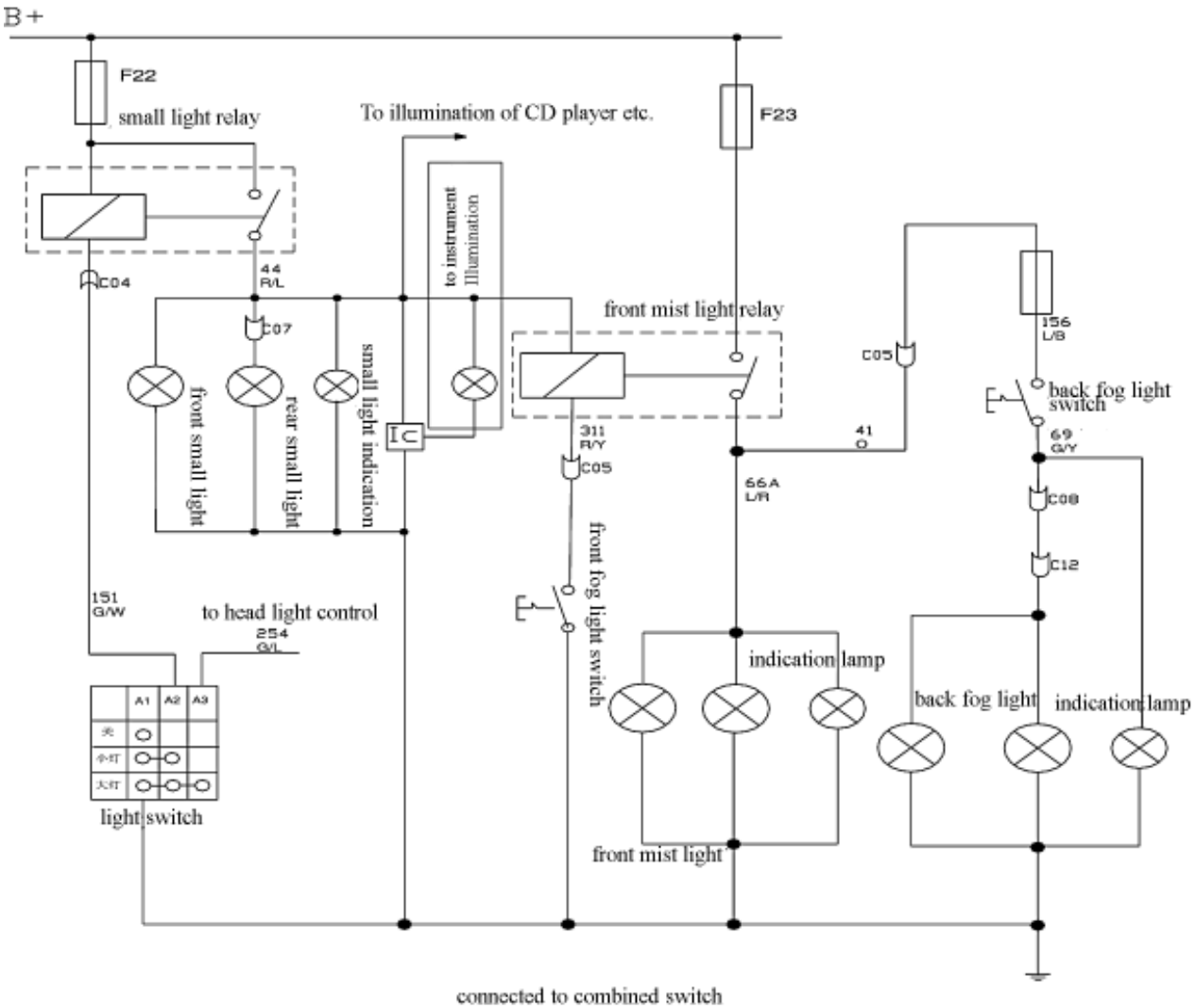
191 G/R
50 B

connected to rear rain scrubber motor

8 O/G	30 Y/L
32 O	50 B

Figure VIII 4.5

small light , mist light



connected to combined switch

60 G/R	42 G/V		157 G	254 G/L
	280 Y/R	50 B	254 G/L	151 G/W	50 B

connected to front fog light switch

44 R/L	311 R/Y	50 B	66 L/R	50 B

connected to back fog light switch

44 R/L	156 L/B	69 G/Y	50 B	50 B

Figure VIII 4.6

central control lock, glass riser system

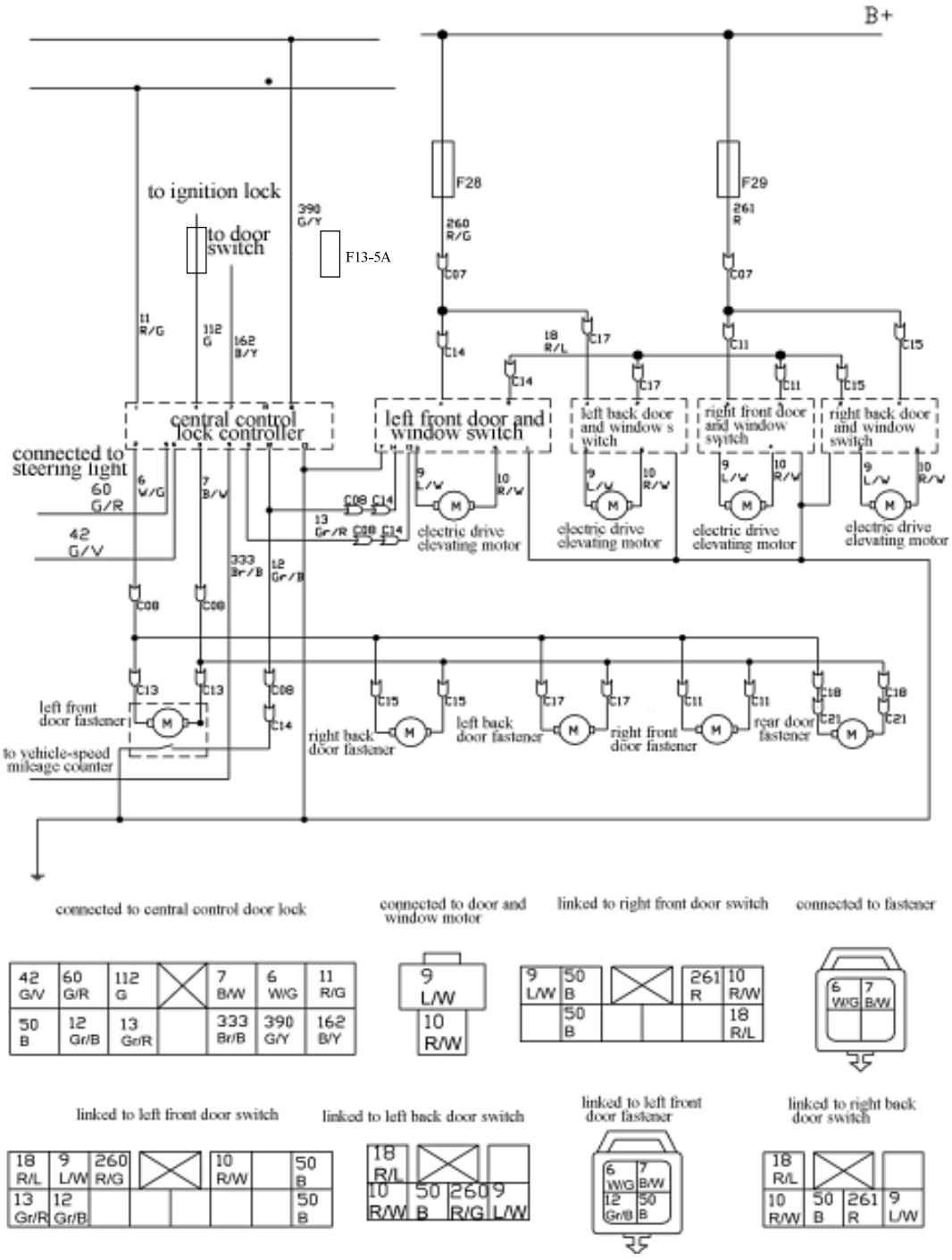


Figure VIII 4.7

air-condition system

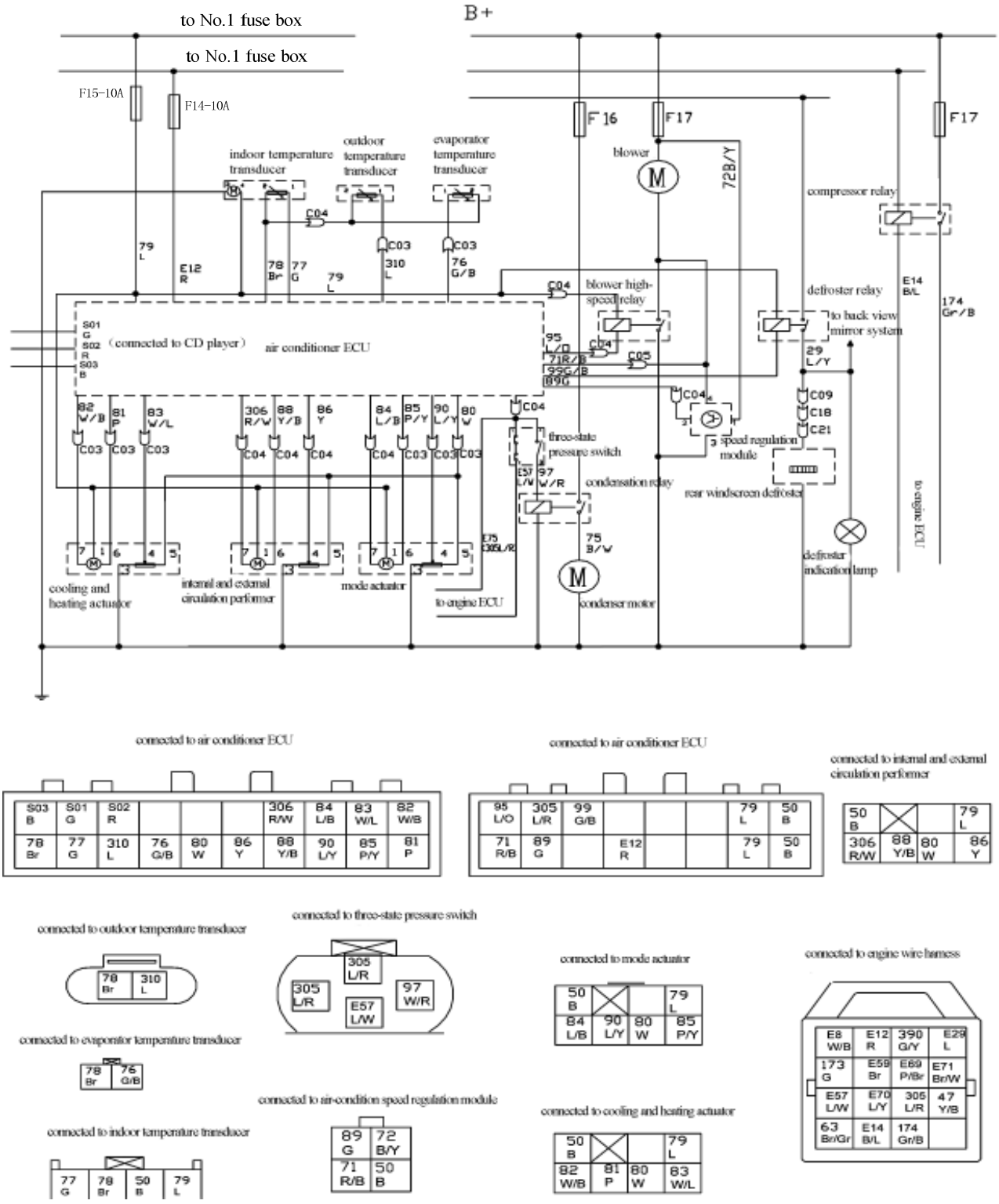


Figure VIII 4.8

sound box, skylight and electric drive clutch system

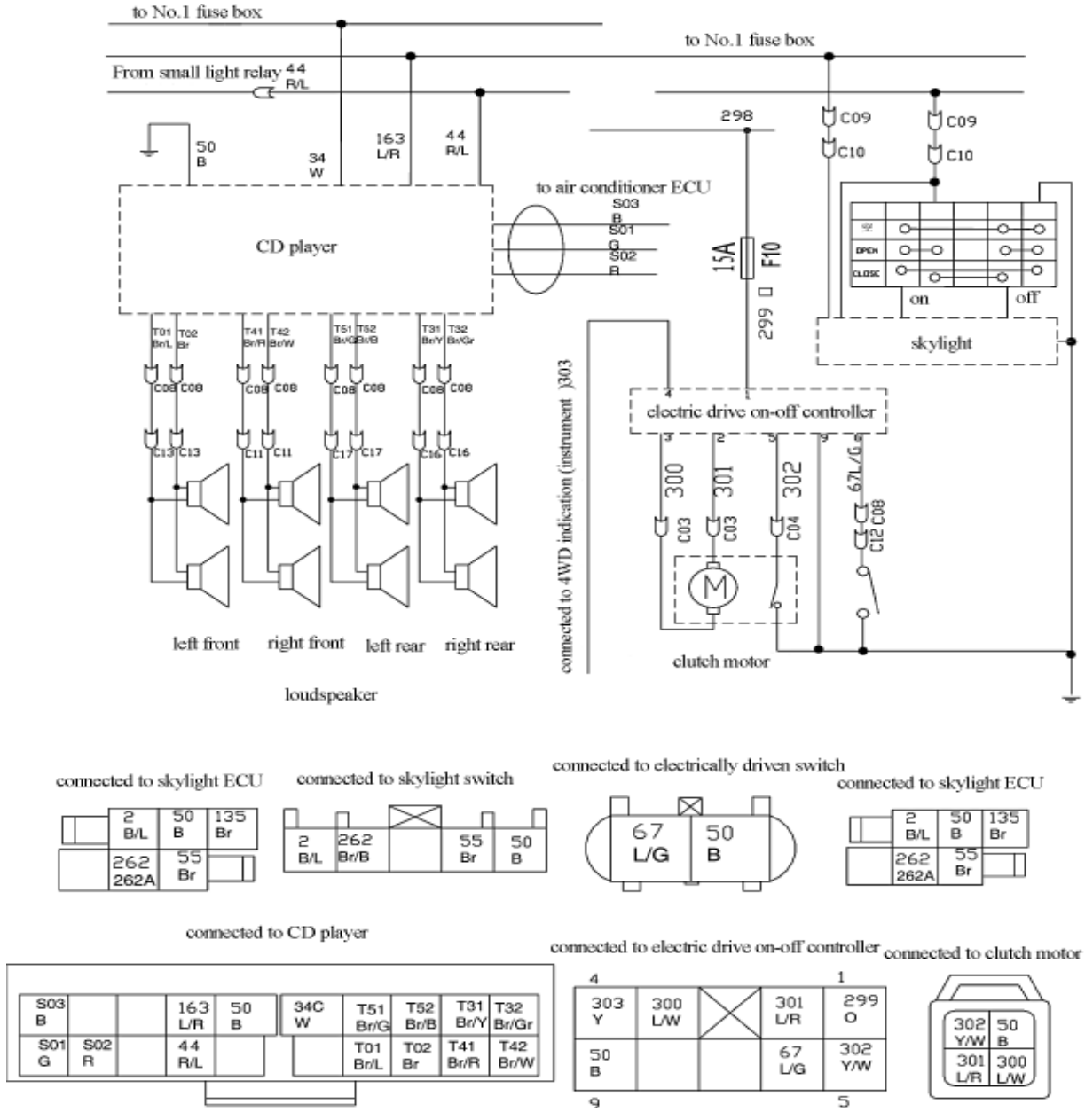


Figure VIII 4.9

indoor lamp system

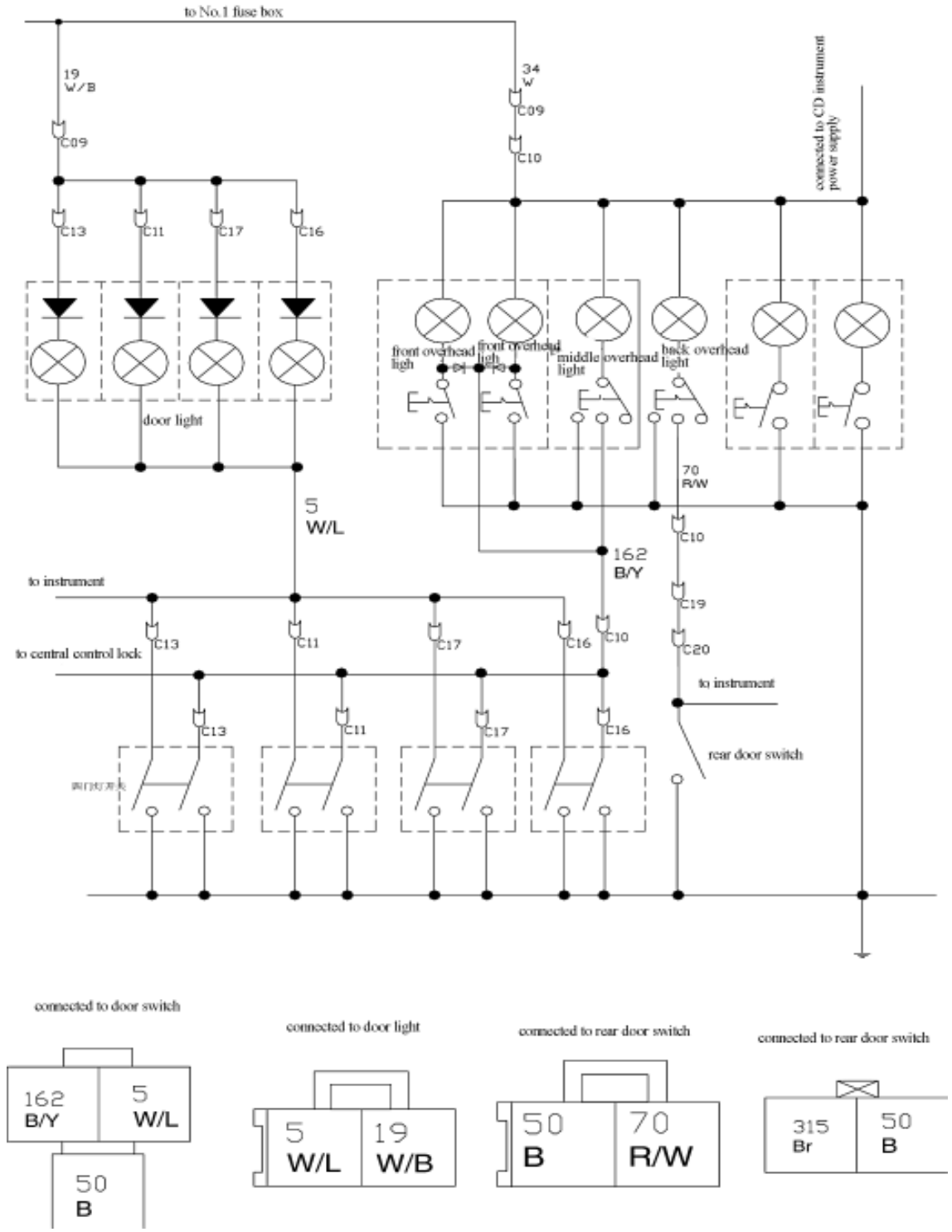
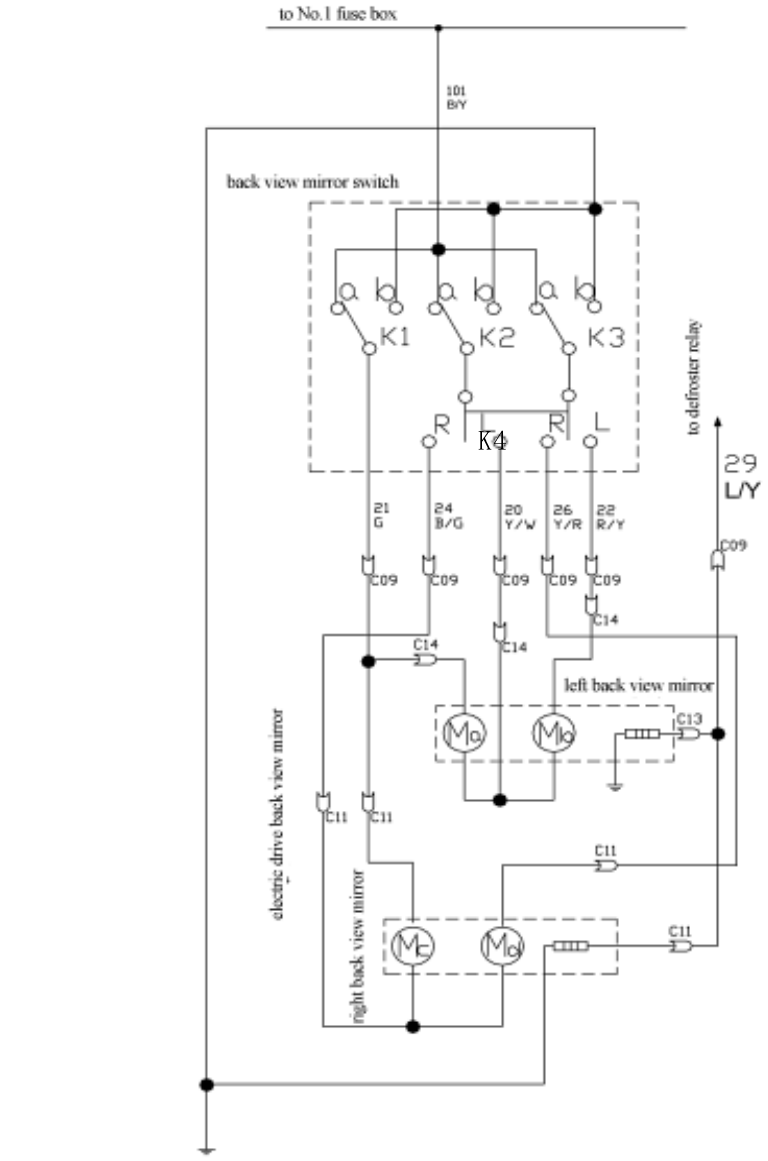


Figure VIII 4.10

electric drive back view mirror



Instruction of switch function

1.1 K1, K2, K3 is the back view mirror function switch. K4 is the back view mirror selector switch .

2.2 When the K4 select the right back view mirror (R) if the K1 is connected to b, then the positive pole current is connected to the power supply negative pole through the K2 (R), drive motor Mc and K1. The current is from up to down.

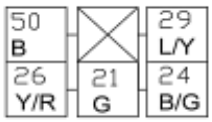
3.3 When the K4 selects the right back view mirror (R), if the K2 K3 are connected to b (K1 is connected to a), then the positive pole is connected to the power supply negative pole through the K1, drive motor Mc and 2. The current is from up to down.

4.4 When the K4 selects the right back view mirror (R), if the K3 is connected to b, then the positive pole is connected to the power supply negative pole through t he K2(R), drive motor M d and K3. The current is from down to up.

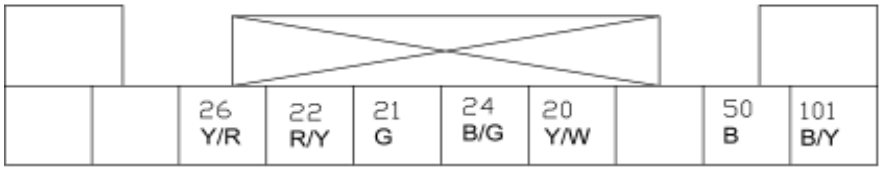
5.5 When K4 selects the right back view mirror (R), if the K1K2 are connected to b, then the positive pole current is connected to the power supply negative pole through the K3(R), drive motor M and K3. The current is from up to down.

6.6 When the K action 4 selects the left back view mirror (L), the action of drive motor Ma, Mb is same as that of Mc, M d.

linked to right front door back view mirror



connected to electric drive back view mirror switch



linked to left front door back view mirror

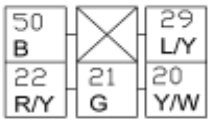


Figure VIII 4.11

reverse lamp , brake lamp and auxiliary system

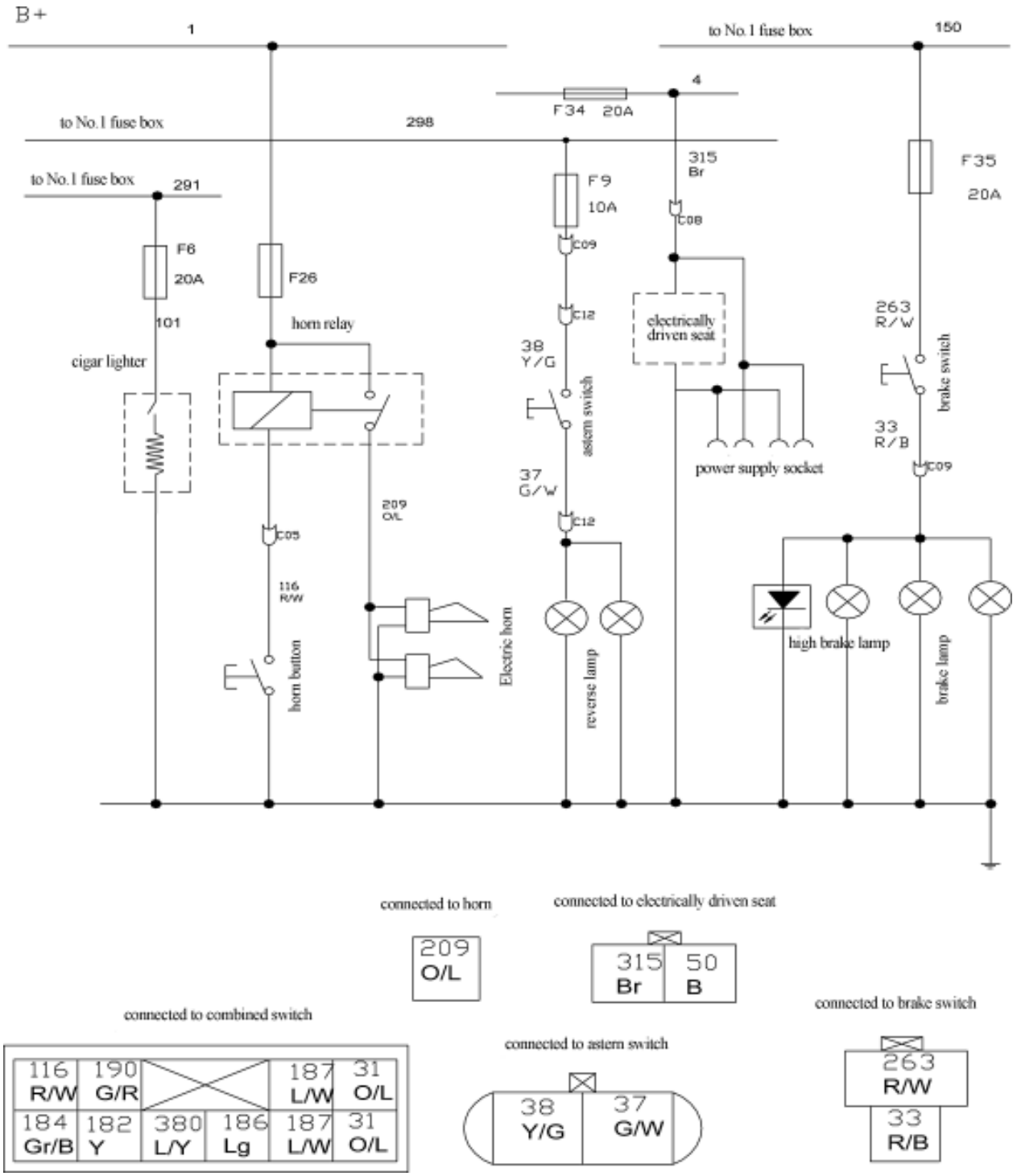


Figure VIII 4.12

Controller of the Central Door Lock

1. Positive pole of the power supply (12V) is connected to the positive pole of car's battery through a 15A fuse; when the engine is started, the voltage is not less than 10V.

2. Output of the central door lock. The unlock cable connected to the executor of the central door lock is usually grounded through the normally-closed contact of the internal relay; when the door is unlocked by the remote controller or unlocked manually, the public contact of the relay will get through with the normally-open contact, realizing an output of 12V voltage.

3. Output of the central door lock. The lock cable connected to the executor of the central door lock is usually grounded through the normally-closed contact of the internal relay; when the door is locked by the remote controller or locked manually, the public contact of the relay will get through the normally-open contact, realizing an output of 12V voltage.

4. Key detection cable. This cable is connected to the ignition lock of the car and will get through with the grounding wire when the key is inserted into. (negative input)

5. Right direction indicator. The cable is connected to the positive pole of the right direction indicator of the car; an output of 12V voltage will be available when this cable is at work.

6. Left direction indicator. The cable is connected to the positive pole of the right direction indicator of the car; an output of 12V voltage will be available when this cable is at work.

7. Negative input of door switch, which is connected to the door switch of the car; this cable will be earthed when the door is opened. (Interior lights will be on)

a. Open the door and then close it, the reading light will be on for 10 seconds; if during this period, it is detected that the key has been inserted into the ignition lock or the door closed, then the reading light will turn off.

b. When the key is pulled out of the ignition lock, then reading light will turn on, during this period, if the key is reinserted into the ignition lock or the door lock, the reading light will be off; if there is not any action when the door is closed within 1 minute, the reading light will automatically turn off.

8. ON power supply detection cable. A conductive wire connected to the ON gear of the ignition lock. (When the key is turned to the ON position, a 12V output will be available)

9. Car speedometer detection cable, which is connected to the detection cable of car's speedometer. (When the car is accelerated to the speed of 15km/h, the instruments unit will output a 500mS rectangular positive pulse to the central door lock controller, which will control the locking of the central door lock when this 500mS rectangular positive pulse signal is detected by the controller.)

10. Output of window closing signal. When the door is locked by the remote controller, this line will be available with an output of 12V positive current for one second and then be off. (No output)

11. Locking signal. The locking signal line connected to the central door lock of car's left front door is connected through with the grounding line when at work. (Earthing)

12. Unlocking signal. The unlocking signal line connected to the central door lock of car's left front door is connected through with the grounding line when at work. (Earthing)

13. Negative pole of the power supply, which is connected to the car body, (earthing) line shall be as short as possible, over-length will produce the interference.

Function of controller of the central door lock

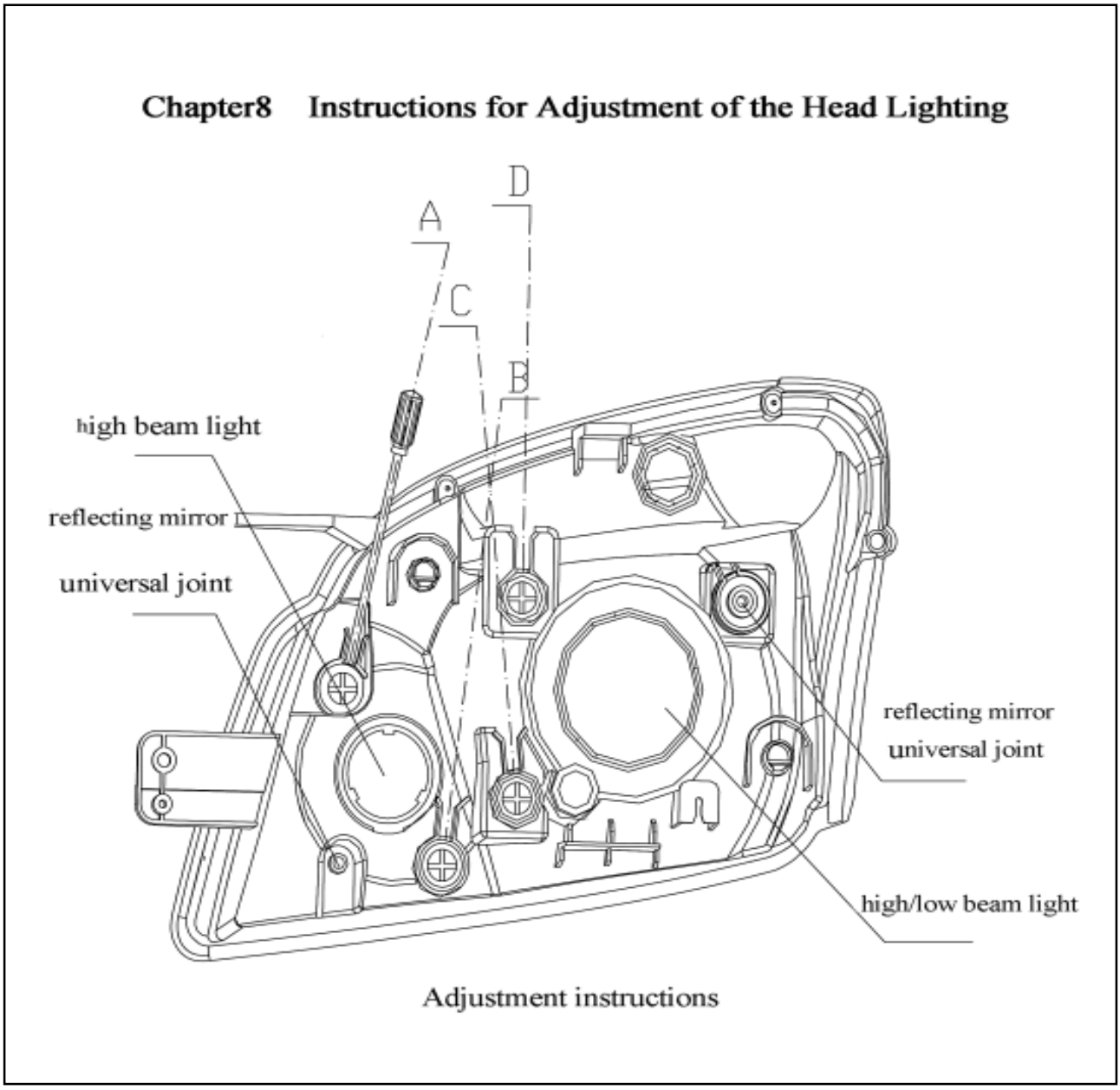
1. Locking. When all the car doors are closed, press LOCK button of the remote controller once, at this time, the direction indicator will flash once and the central door lock is closed.

2. Unlocking. At the locking state, press UNLOCK button of the remote controller once, at this time, the direction indicator will flash two times and the central door lock is opened.

3. Car-finding function. At the locking state, press LOCK bottom of the remote controller once, and at this time, the direction indicator will flash ten times quickly. Press UNLOCK button of the remote controller to quit the car-finding function.

4. Automatic prevention function. At the locking state, press UNLOCK button of the remote controller to open the lock; if the

Head Lighting Adjustment



Adjustment instructions

a. A is the upper and lower adjusting screw hole of the high beam light; use and turn the cross head driver clockwise to let the high beam go down, and vice versa.

b. B is the left and right adjusting screw hole of the high beam light; use and turn the cross head driver clockwise to let the high beam go left, and vice versa.

c. C is the upper and lower adjusting screw hole of the high/low beam light; use and turn the cross head driver clockwise to let the high beam go up, and vice versa.

d. D is the left and right adjusting screw hole of the high/low beam light; use and turn the cross head driver clockwise to let the high beam go right, and vice versa.

Chapter 11

CD Player and Air Conditioning System

CD Player

Function Overview

This product is a kind of car audio system with VFD multi-information integrated display screen with such functions as PLL electronic tuning radio, CD playing and operation & control of air conditioning system, it can receive AM, FM and FM stereo radio broadcast programs, play CDs, electronically operate and control the air conditioning system of the car. The integrated display screen can display the working state of the radio, CD player, air conditioning system, operating mode as well as information concerning the equalizer, clock and the temperature inside and outside.

Wiring Instructions(see the diagram)

1. **with the speakers: the amplifier of main unit of this system is designed with 4-channel BTL output, each speaker must be wired individually; the phase position and place of the speaker must be connected correctly; please disconnect the player from the power supply before connecting the speaker so as to avoid the short-circuit.**

2. Connecting main unit with the integrated display screen:

Use the specially-supplied 12-pin connector cable to connect the VFD integrated display screen and main unit.

3. Connection of power supply, output and communication line of main unit:

At first, connect the communication cable of the 20-pin connector plug to the air conditioner ECU, then connect the speaker output line to other lines, finally connect the yellow memory power supply cord (10A fuse tube) directly to the positive role of accumulator; when all the wiring is completed, connect the red power supply cord (1A fuse tube) to the positive power supply of the ignition lock.

4. Connecting main unit with the antenna

a. Typical antenna: insert the plug of coaxial cable of car's antenna into the antenna socket of main unit.

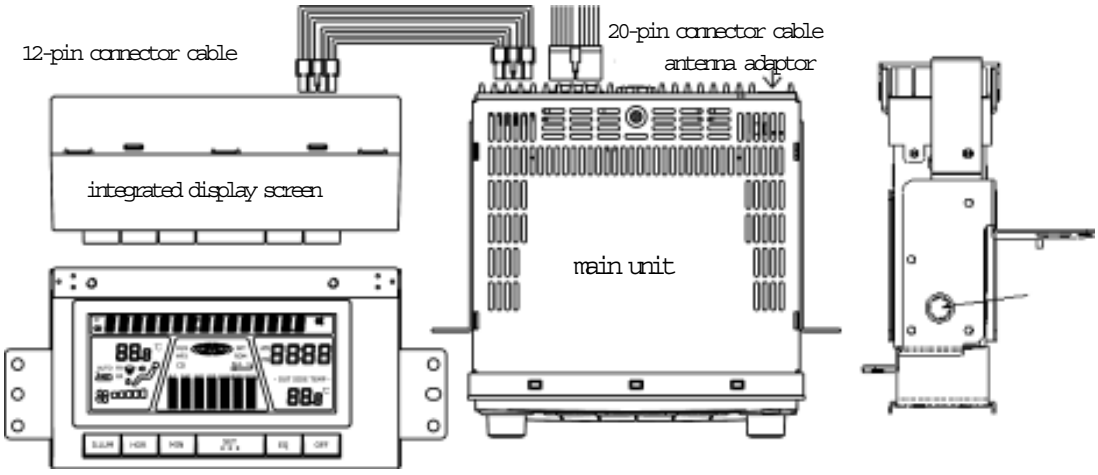
b. Automatic antenna: insert the plug of coaxial cable of car's antenna into the antenna socket of main unit, then connect the blue antenna control cable in the 20-pin connector to the automatic antenna control end, connect the positive pole line of power supply of automatic antenna to the positive pole of accumulator and the negative pole line to the earth.

5. Connecting main unit with CD-change box

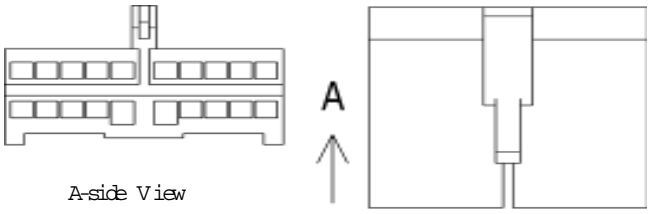
CD player and the CD-change box are connected with the signal cables.

6. **Prior to the installation, please be sure to remove three protective screws on the CD-change box and have it pasted with ant-dust paper. If the protective screws are not removed, CD can not be played normally.**

Attention: Improper wiring may result in the damage to the player!



(Figure 7-1) Wiring Diagram



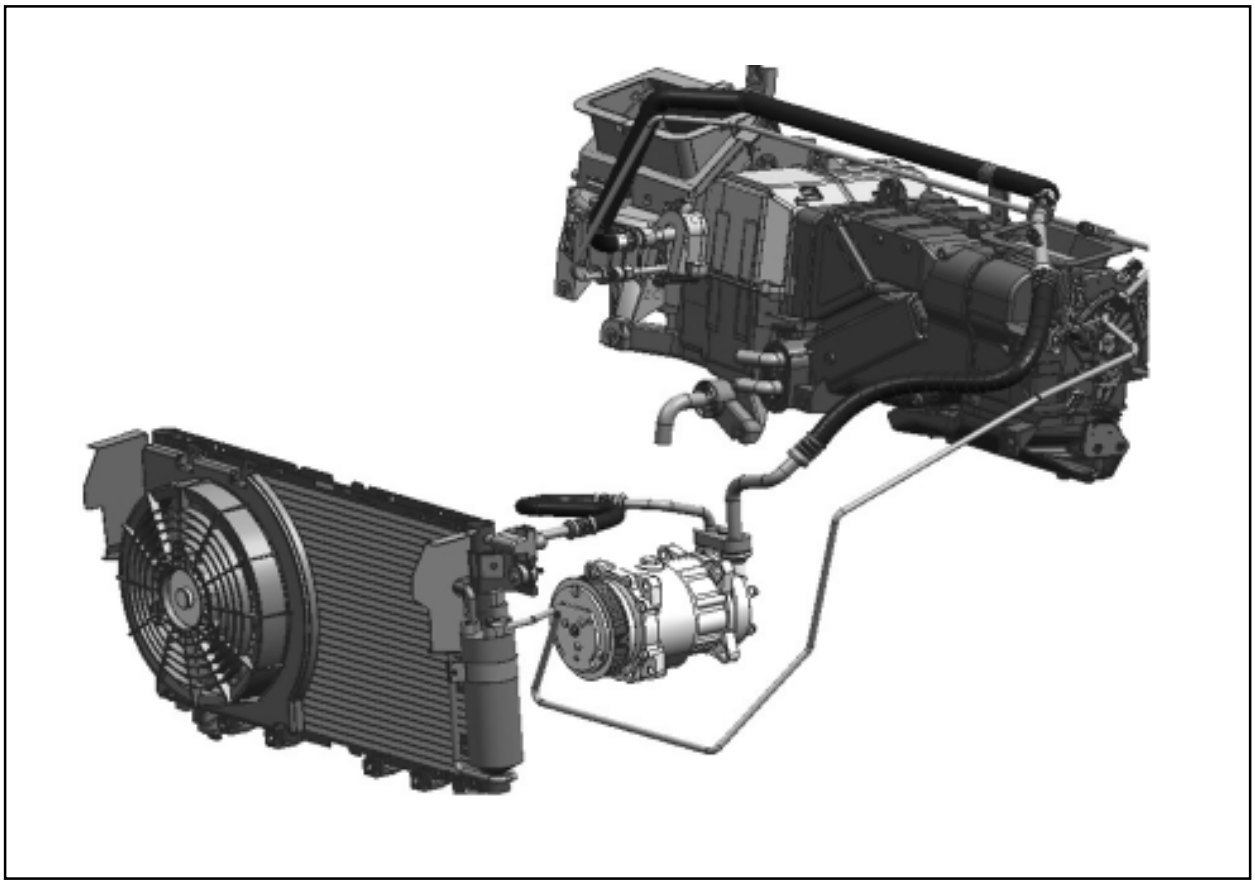
(Figure 7-2) cable position of 2-pin connector socket

Pos. No.	Color	Function	Pos. No.	Color	Function
1	White	Send the data (TX)	11	Shielded cable	Earthing of data cable
2	Red	Receive the data (RX)	12	—	—
3	Brown	Telephone mute (TEL)	13	Blue	Automatic antenna (ANT)
4	Orange	Lighting (LAMP)	14	Red	Ignition power supply (ACC)
5	—	—	15		Grounding wire
6	—	—	16	Yellow	Memory power supply B+
7	White and black	Front left speak (-FL-)	17	Green and black	Rear left speak (-RL-)
8	White	Front left speak (+FL+)	18	Green	Rear left speak (+RL+)
9	Gray and black	Front right speak (-FR-)	19	Violet and black	Rear right speak (-RR-)
10	Gray	Front right speak (-FR+)	20	Violet	Rear right speak (+RR+)

Possible Troubles of CD Player, Inspection and Analysis

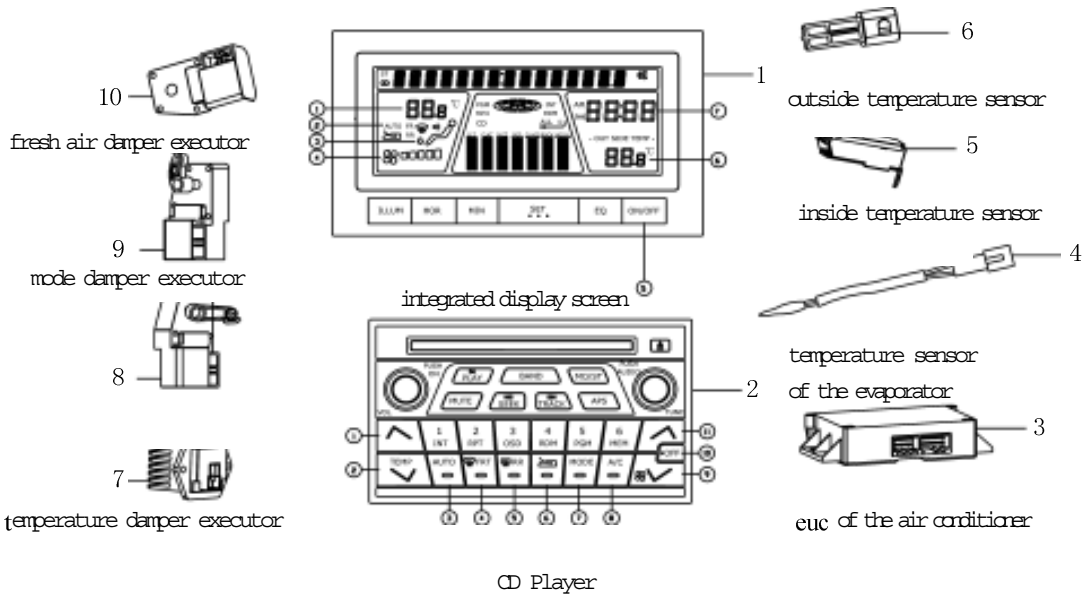
Trouble Descriptions	Possible causes, inspection and solutions
No programs received for AM and FM	Check if the antenna is pulled out and socket becomes loosened.
Impurity of sound after radio auto-searching	Tune to the correct radio station with manual tuning method
No sound of one speaker	Check the speaker and the socket or adjust the balance(front, back, left and right)
Refuse to work	Check the power supply, or disconnect and connect the power supply and restart the player.
No power supply	Check if the plug-in fuse and output plug is loosened and if the fuse is burned down.
Single channel when played	Check if the speaker is in open-circuit and examine its plug
Not read CD	Check the CD type and if it is placed in reverse or scratched.
Display screen displaying bad	Check the connecting wire of display screen or adjust the brightness level higher
Air conditioner refuses to start	Inspect the ECU of air conditioner and air conditioning system
Button failure of air conditioner	Inspect the ECU of air conditioner and air conditioning system

Air Conditioning System



Composition of Air Conditioning System

Air conditioning system mainly consists of air conditioner control unit, display unit, sensors and executor elements.



1. integrated display screen 2. CD player 3. Air conditioner ECU 4. Temperature sensor the evaporator 5. Outside temperature sensor
6. Outside temperature sensor 7. Speed-adjusting module 8. Temperature damper executor 9. Mode damper executor
10. Fresh air damper executor

Definition of each button on CD player of air conditioner panel

[1] Button to increase the temperature
[2] Button to decrease the temperature
[3] automatic operation button
[4] front-defrost button
[5] rear-defrost button
[6] external circulation button
[7] wind conveying mode button
[8] button to start air conditioner
[9] button to decrease the wind amount
[10] power-off button of air conditioner
[11] button to increase the wind amount

Definition of each button in air conditioning display zone of the integrated display screen

[1] display of inside temperature setting of air conditioner
[2] display of automatic operation of air conditioner
[3] display zone of wind conveying mode of air conditioner
[4] display zone of wind amount of air conditioner
[5] switch button of outside temperature display
[6] display zone of outside temperature
[7] clock display zone

a. Control and display unit:Control and display unit of the air conditioner mainly consists of:

Air conditioner ECU: The CC6460K model is designed with the individual air conditioner ECU to control the overall operation of air conditioning system; Air conditioner ECU is installed under the bottom of CD player .The control panel of air conditioner is designed with an integrated pattern with the control panel of CD player: to regulate, control and set the operation of the air conditioning system.

Integrated display screen: display the working condition of air conditioning system of the car; relevant functions of air conditioning system can be found to be displayed in different zone in the integrated display screen.

b. The sensor

Sensors of CC6460K Model automatic air conditioning system include: inside temperature sensor, outside temperature sensor, temperature sensor executor of the evaporator.

Executor components include: mode selection executor motor, cold & hot executor motor, internal & external circulation executor motor.

Trouble Diagnosis and Repair of Automatic Air Conditioning System

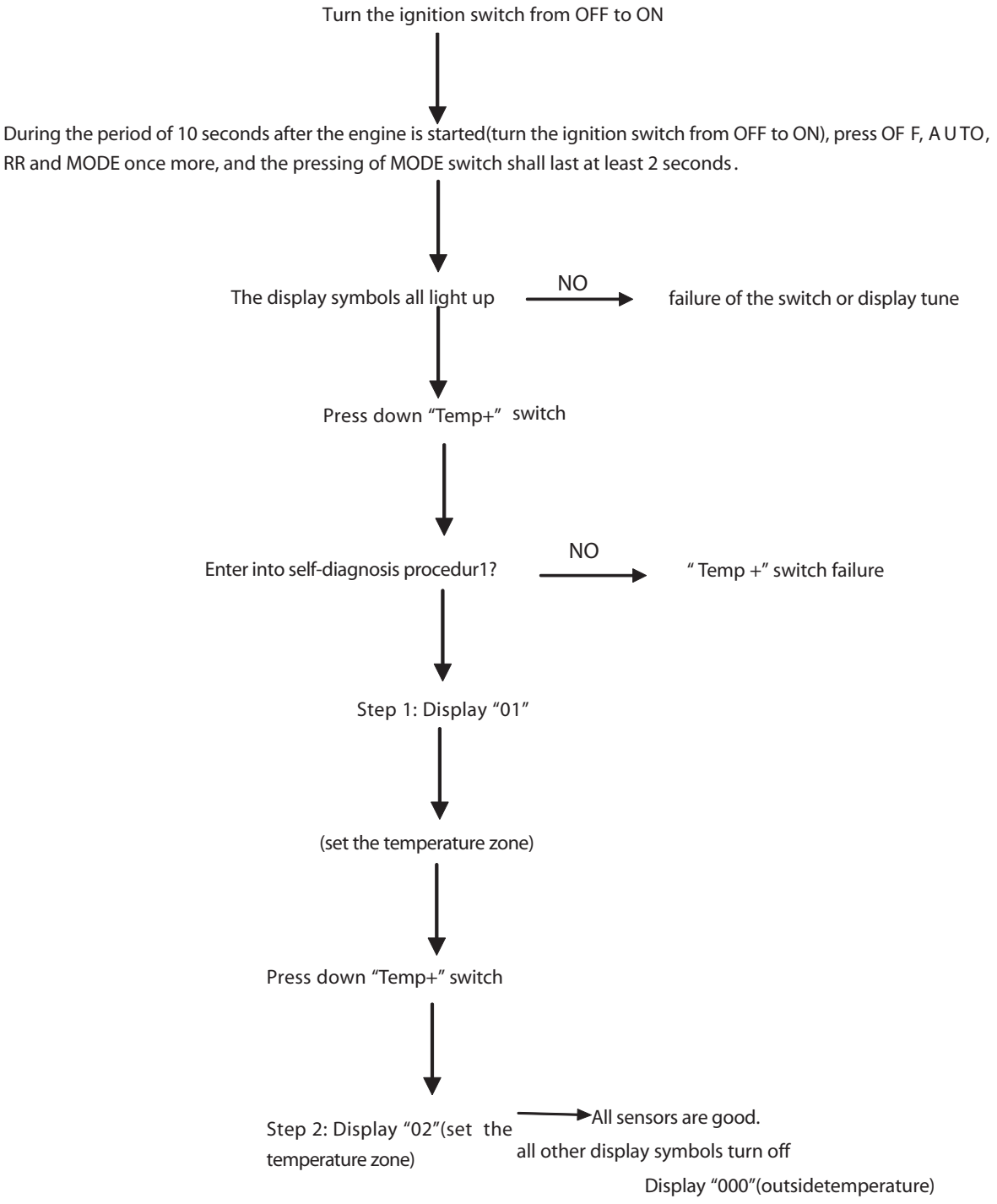
1. Self-diagnosis of the system

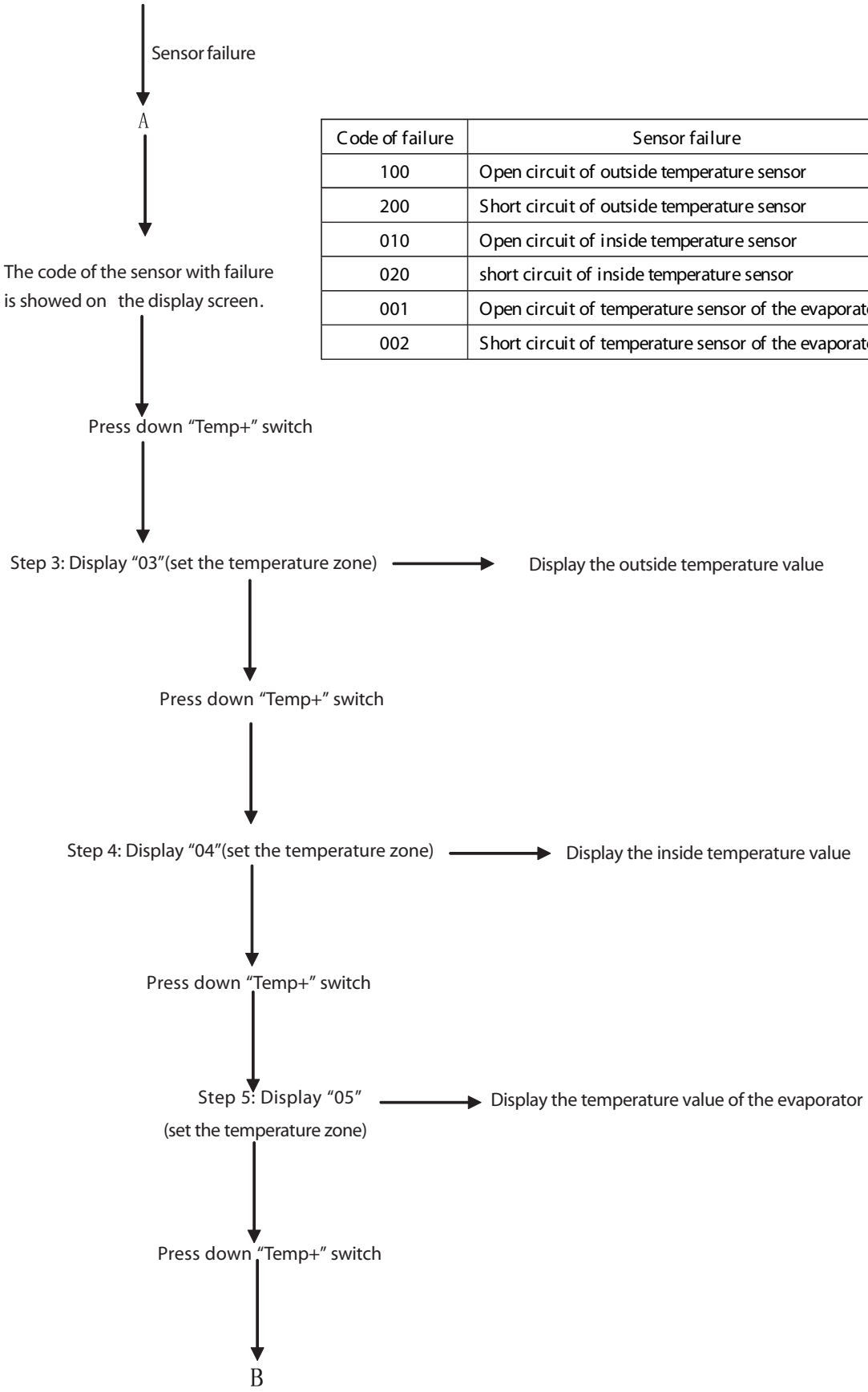
CC6460K air conditioning system is designed with the system self-diagnosis function. When the air conditioning system fails to work, the self-diagnosis function designed for the car can be activated for the initial trouble diagnosis.

Operating directions:

At first, start the engine (turn the ignition switch from OFF to ON) and press OFF,AUTO, RR and MODE successively and the pressing of MODE switch shall last at least 2 seconds. The button must be pressed down within 10 seconds when the engine is started (the ignition switch is turned to ON position).If the system is supposed to be released, then press AUTO switch or turn off the ignition switch (OFF) .If one step is supposed to switch to another step, then press TEMP (HOT) or TEMP (COLD) switch based on the needs.

The inspection procedures：





Code of failure	Sensor failure
100	Open circuit of outside temperature sensor
200	Short circuit of outside temperature sensor
010	Open circuit of inside temperature sensor
020	short circuit of inside temperature sensor
001	Open circuit of temperature sensor of the evaporator
002	Short circuit of temperature sensor of the evaporator

Step 6: Display "06"(set the temperature zone)

Display the detection code of mode/ temperature damper executor

Code number	Code Meaning
0x0	Temperature damper executor works normally
0x1	Detection for temperature damper executor is in progress.
0x2	Temperature damper executor failure
00x	Mode damper executor works normally
01x	Detection for mode damper executor is in progress.
02x	Mode damper executor failure

Press down "Temp+" switch

Note: X is a digital number without specific meaning; the code number is displayed in the outside temperature display zone.

Step 7: display "07"(set the temperature zone)

Action of the executor mechanism:
Mode damper: wind to the person
Circulation damper: internal circulation
Temperature damper: cold end
Wind amount: the maximum
Compressor: enabled

Press down "Temp+" switch

display "08"

C

Action of the executor mechanism:
Mode damper: wind to the person and the fee
Circulation damper: internal circulation
Temperature damper: in the middle
Wind amount: bigger
Compressor: enabled

Press down “Temp+” switch

Step 9: display “09”

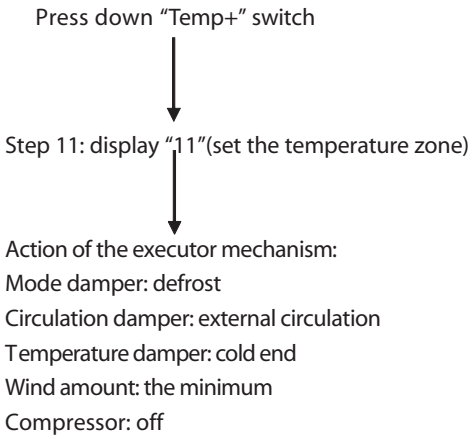
Action of the executor mechanism:
Mode damper: wind to the person and the feet
Circulation damper: external circulation
Temperature damper: hot end
Wind amount: medium
Compressor: enabled

Press down “Temp+” switch

display “10”(set the temperature zone)

D

Action of the executor mechanism:
Mode damper: wind to the feet and defrost
Circulation damper: external circulation
Temperature damper: in the middle Wind amount: small
Compressor: off



Attention: during the inspection period from step 7 to step 11, the controller will forcibly transit the output signal based on the code number displayed on the integrated display screen to the functioned executor; the inspection must be done with such methods as visual inspection, listening to abnormal sound or touching the air vent by hand so as to judge whether there is any improper operation.

Trouble Diagnosis and Troubleshooting of Air Conditioning System

Air cooling system

a. Refrigeration of air conditioner failed

Trouble	Descriptions	Analysis of the Cause
Refrigeration of air conditioning system failed	1.No pick-up of compressor	1. fuse burned down, compressor’s relay damaged 2. pressure switch contact disconnected, short circuit or open circuit of the routing 3. open circuit of clutch’s winding 4. switch burned down 5. master relay burned down 6. slide of the clutch 7. belt of the compressor broke or too loose 8. compressor failure 9. sensor failure(judged by reading the failure code) 10. insufficient cold media, lower system pressure(< 0.97MPa) 11. system pressure above 1.37MPa 12. water temperature of the engine too high 13.Voltage of the clutch below 7V
	2. Pick-up of Compressor	1. normally-open contact of the compressor’s relay stuck and serious leakage of system cold media, system running short of cold media 2. no wind from the blower
	3. no wind from the blower	1. fuse burned down 2. motor brush of the blower damaged 3. switch of the blower damaged 4. coming off of distribution wire connectors or circuit disconnected 5. speed-adjusting module damaged 6. no wind from the blower when at high speed, high-speed relay damaged

b .Insufficient refrigeration output

Trouble	Descriptions	Analysis of the Cause
Inadequate refrigeration	1. wind amount is normal	1. compressor works normally (1) low-level pressure at high-pressure and low-pressure sides a. block of expansion valve b. openness of expansion valve too narrow (2) high-level pressure at high-pressure and low-pressure sides a. failure to high-voltage pipeline, flow not smooth b. malfunction of thermo resistor c. openness of expansion valve too wide d. too much refrigeration oil e. too much refrigerant f. poor heat dissipation of the condenser (3) pressure at high-voltage side too low a. low-pressure pipeline damaged b. block of low-pressure pipeline (4)pressure at low-pressure side too low a. the evaporator frosted b. block of expansion valve c. low-pressure pipeline not smooth d. malfunction of thermo resistor (5)pressure at low-pressure side sometime normal, sometimes with negative pressure, moisture and ice block in air cooling system (6)negative pressure at low-pressure side, pressure at high-pressure side too low, block of air cooling system (7)pressure at low-pressure side too low, pressure at high-pressure side too high a. internal block of drier of fluid reservoir b. block of high-pressure pipeline (8)pressure at low-pressure side too high, pressure at high-pressure side too low a. leakage of the compressor b. damaged valve of compressor (9)poor heat radiation of condenser due to small wind amount from the condensing blower 2. compressor works improperly (1)internal malfunction of compressor (2)belt of compressor too loose or sliding (3)failure of electromagnetic clutch a. low voltage of power supply b. mutual interference of the stator and rotor c. malfunction of amplifier stabilizing the idle speed d. circuit disconnected, coming off of the joints e. poor operation of the switch and relay f. short circuit and open circuit of the routing g. poor earthing 3. other causes bad sealing of wagon

c. The cooling system sometimes works while sometimes refuses to work.

Trouble	Descriptions	Analysis of the Cause
The cooling system sometimes produces refrigeration effect while sometimes not.	1. compressor works normally	1. ice block in the cooling system 2. failure of thermal resistor or temperature sensing bulb 3. poor contact of A/C switch 4. condensing blower damaged
	compressor works improperly	1. slide of the clutch 2. coming off of the clutch's winding 3. poor earthing of clutch's winding

d. Noise of the air cooling system

Trouble	Descriptions	Analysis of the Cause
Noise of the air cooling system too loud	Noise too loud	(1) belt too loose or worn too much (2) fastening screw of mounting holder of the compressor loosened (3) mounting holder of the compressor damaged (4) internal parts of the compressor damaged (5) too much refrigeration oil or none (6). slide of the clutch (7). Bearing of the clutch running short of oil or damaged (8). motor bearing of the blower damaged (9) holder of the blower broken or loosened (10) blade of the blower broken or loosened (11). Friction of the blower's blade with other components

e . Precautions for the overhaul of air cooling system

When the air cooling system encounters the trouble, the cause for such trouble shall be analyzed inlightof trouble varieties, followed with the examination and report work.

2.air heating system

Trouble	Causes of the trouble
Heating not supplied or not sufficiently supplied	1. blower of air conditioner failure 2. relay of the blower damaged 3. heating water pipe blocked 4. cooling water pipe blocked 5. cold/hot damper executor damaged 6. insufficient cooling liquid
No rotation of blower	1. fuse burned down or poor contact of the switch 2. motor of the blower burned down 3. open circuit of high-speed relay of the blower 4. speed-adjusting module damaged 5. short circuit
leakage of water	Water pipe of air heating aged, insecure joint
Overheat	1. speed-adjusting resistor of the fan damaged 2. cold/hot damper executor damaged
Insufficient hot air volume for defrosting	1. mode executor damaged 2. falling off of the drive rod 3. damper not in position 4. air vent blocked 5. inadequate heating supply 6. installation of wind tunnel not fit 7. circuit disconnected

Volume of Refrigeration Oil Addition and its Methods

1. CC6460K air conditioning system is designed with SD7V16 compressor, whose refrigeration oil type as specified is SP-10PAG; hence application of other type of refrigeration oil may damage the parts and compo nents of the compressor. When the air conditioning system goes through maintenance and replacement of parts, it should be added with new refrigeration oil, whose volume is listed as follows: the evaporator and condenser: 30ml; the drier: 20ml; the pipeline: 10ml.

Addition of refrigeration oil can be available with two methods: The direct addition and the vacuum suction

2. Direct addition method

a. remove the oil filler plug and fill with the specified SP-10PAG refrigeration oil.

b. observe through the hole of oil filter plug and rotate front plate of clutch to make the piston connecting rod right position in the center of the hole of oil filter plug.

c. insert the dipstick along the right side of piston connecting rod till the top of dipstick touches the case of the compresso r

d. pull out the dipstick and examine the graduations (grooves) of refrigeration oil, the readings shall be within the range of 4-6 scales.

e. screw firmly the oil filter plug with the fastening torque of 14.7± 4.9N. m

3. Vacuum suction method:

Firstly pump out the refrigerating system to the vacuum of 0.2x105Pa, and then fill with the specified $0.2x10^5$Pa refrigeration oil; the detailed steps are as follows:

a. switch off the high-pressure manual valve and the auxiliary valve.

b. dismantle the high-pressure side hose from the manifold pressure gauge and insert it into the oil cup

c. open the auxiliary valve and have the refrigeration oil sucked into the refrigerating system from the oil cup.

d. when the refrigeration oil in the oil cup is almost pumped out to the vacuum, then immediately turn off the auxiliary valve to prevent the air from being sucked into the system.

e. secure the hose adapter at high-pressure side to the manifold pressure gauge, start the vacuum pump and turn on the high-pressure manual valve, then turn on the auxiliary valve to pump the system to the vacuum state of $0.2x10^5$Pa, keep such state for 15mins so as to discharge out the air flowing into the system along with the oil.

4. Attention:

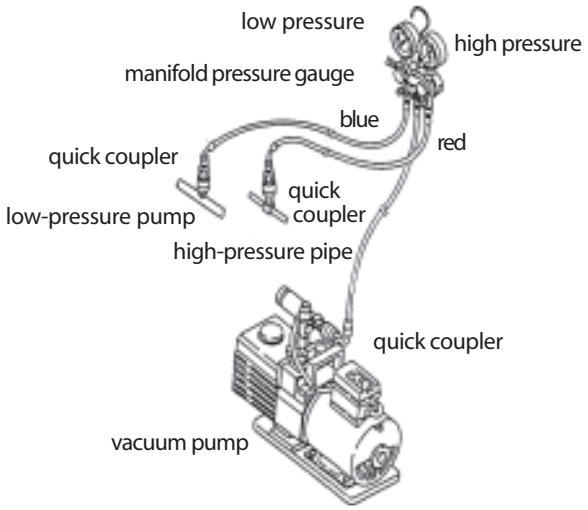
a. when a new compressor is used to substitute for the old one, the oil must be released to some extent that its oil volume is the same as that of old compressor so as to avoid the influence over the refrigeration effect due to too much oil.

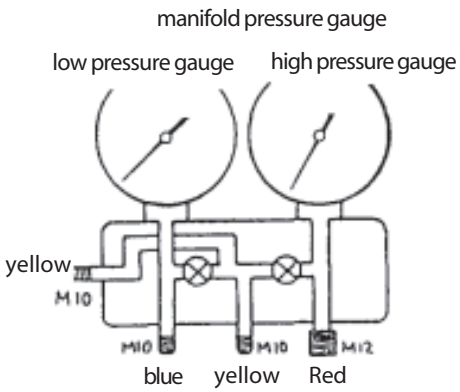
b. when an old or repaired compressor is employed, the volume of the refrigeration oil in the compressor must be kept the same as that of the replaced compressor.

Pumping Out of Air Conditioning System to the Vacuum and Addition of Refrigeration Oil

Connect the manifold pressure gauge with the pipe of air conditioner (compressor) and the multi-purpose adapter of the vacuum pump for the purpose of pumping out of the system to the vacuum state.

Before pumping out to the vacuum, turn on the high-pressure and low-pressure valve of the manifold pressure gauge and the end valve (if provided) of the vacuum pump, then press the button ON to start the vacuum pump, the duration shall be more than 20 minutes. When the reading of manifold pressure gauge is -760mmHg or below, turn off the high-pressure and low-pressure valve (if opened), and press the switch to turn off the vacuum pump.





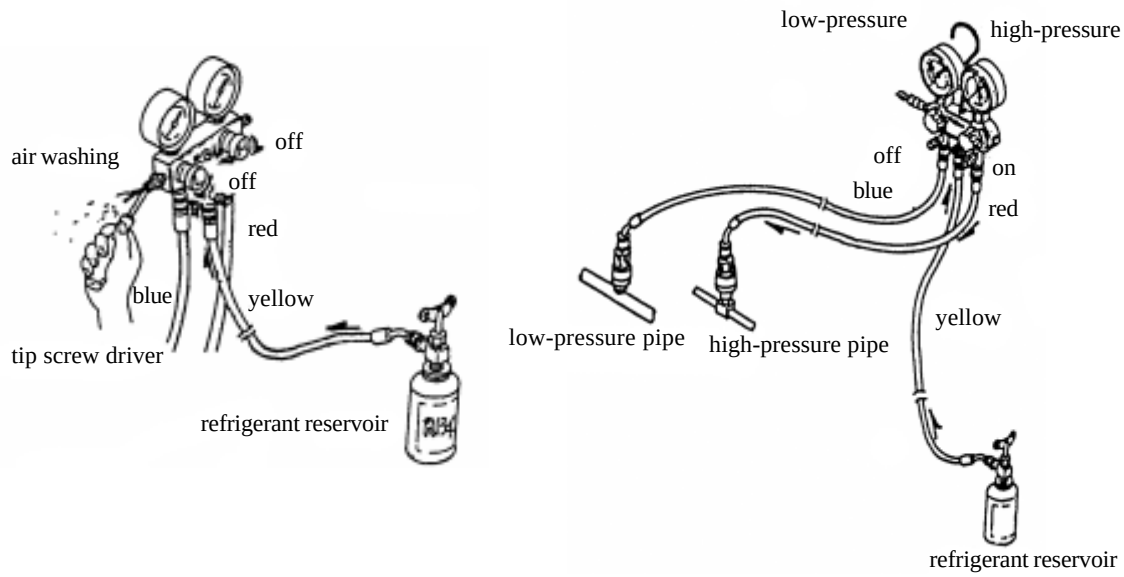
1. check the air tightness

Continue to check the pressure reading of the manifold pressure gauge after turning off the vacuum pump.

If the pressure reading remains unchanged within 20 minutes after the vacuum pump stops running, then it indicates that the refrigerating system has no leakage, the operator can proceed with next work; while change of the reading indicates that the system has the leakage. Launch the examination and pump out to the vacuum after the leakage is fixed.

2. Injection of the refrigerant

When the air tightness of the system is verified correct, connect the refrigerant reservoir (or gas bottle) with one end of the yellow air-charging hose, while other end of yellow air-charging hose is connected with the liquid injection port in the middle of the manifold pressure gauge. Ensure that the refrigerant reservoir is connected firmly with the nut of air-charging hose, then turn on the valve of refrigerant reservoir; at this time, the high-pressure and low-pressure is closed, use a tip screw driver or other similar tools and press the by-pass valve spool for 1~ 2 seconds to discharge out the air in the air-charging hose and the manifold pressure gauge.



Turn on the high-pressure valve on the manifold pressure gauge and inject the refrigerant to the system from high-pressure pipeline. At this time, the attention shall be given to the readings of high-pressure meter and low-pressure meter, and make sure that these two pressure all go up. If the refrigerant is being injected while the pressure does not go up, then the joints of the pipeline may be loosened or the seals damaged, inject the refrigerant once more after finding out the cause and the fixing. When the increase of pressure stops, turn off the high-pressure valve of the manifold pressure gauge and then start the engine.

Operate the switch in a way as follows:

Turn the switch of air conditioner to “ON”

Regulate the temperature controller to the coolest position,

Enable the air conveying to the maximum,

Select the internal air circulation between the internal/external air circulation,

During this process, the door and windows will be all opened.

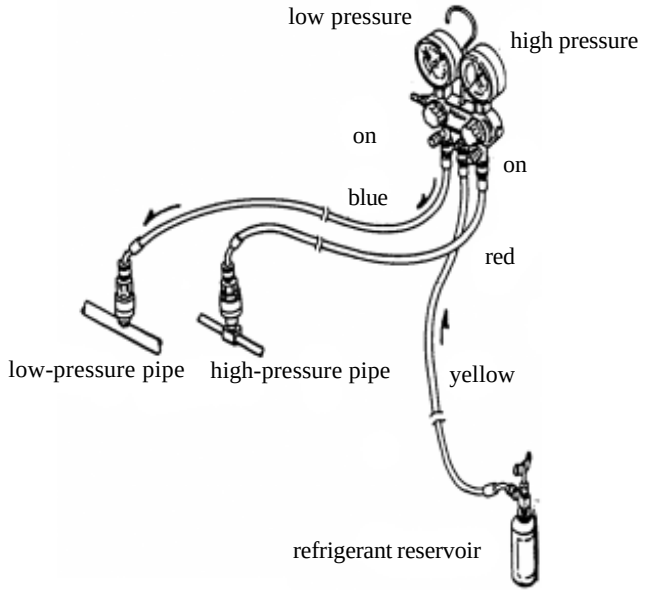
Adjust the engine’s speed to the specified free running speed.

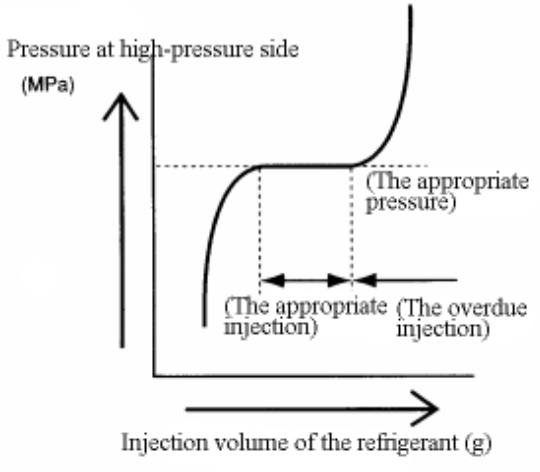
Erect the refrigerant reservoir or gas bottle (have the refrigerant injected into the refrigerating system in a gas state), turn on the low-pressure valve of the manifold pressure gauge.

When the compressor is at work, please do not turn on the high-pressure valve.

Before checking the refrigeration level, please confirm the injection volume of the refrigerant specified for air conditioning system.

When injecting the refrigerant, carefully observe the high-pressure side of the manifold pressure gauge and the flow condition of the refrigerant (clear, foaming or turbid), all these could be viewed through the inspection window, by which the moment of stop injecting the refrigerant can be reasonably judged(turning off the low-pressure valve).





When judging the injection volume of the refrigerant, please make the settings based on the following working conditions:

Water tank temperature of the engine: stable

Speed of the engine: normal free running speed

Switch of air conditioner: ON

Switch of the fan: “High” gear

Temperature controller: air return temperature inside the car is between 25℃ and 30℃.

Fresh air control: internal circulation

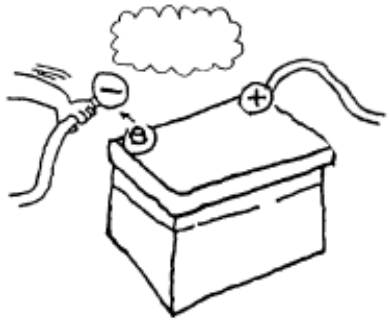
Door: all opened

Window: all opened

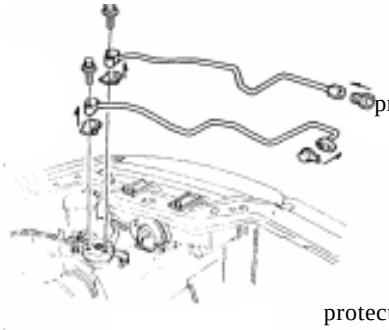
Repair and replacement of pipeline

a. Before installation of parts and components, the negative pole of the accumulator must be disconnected.

cut off

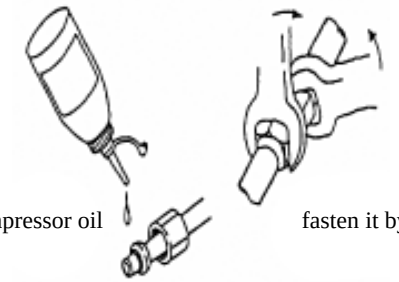


b. When the air entries of the refrigerating system, water tank of the engine and the air conditioner are opened, please make sure that all openings are capped to prevent the penetration of the dust, foreign matters or water.



protective cap must be installed.

c. At ends of each pipe the protective caps should be installed till the pipe is connected to the refrigerating system.



compressor oil fasten it by using two wrenches at the same time

d. When connecting the pipe, apply little compressor oil to the O-ring and fasten the nut with two wrenches. Attention: never spatter the compressor oil to the painted parts or the plastic components to avoid the corrosion. If these components are spattered with the oil, please clean it immediately.

e. When connecting the pipe, please follow the torque listed in the following table to fasten the screws or the nuts:

Diameter of Pipe	Fastening Torque (N・m)
¢8mm	12-15
¢16mm 30-35	30－35

Daily Maintenance of Air Conditioning System

In order to ensure normal operation of air conditioning system, maintenance and care services shall be frequently performed for the air conditioning system. The daily maintenance of air conditioning system is illustrated as follows:

1. Inspect, wash and clean the condenser of air conditioning system, requiring that radiator pins are clean and there is no dirt between the pins. After the car runs in the rain or on the muddy road, the fan of the condenser should be inspected to find whether it bears the earth, sand, stone and etc, and remove them if any.
2. Check the quantity of the working media of the refrigerating system; when the compressor set works normally, observe the liquid viewing glass, under the normal circumstance, there shall be not air bubbles in the glass.
3. Inspect the drive belt. The belt between the compressor and the engine should be tensioned.
4. Check if there is any abnormal noise or odor in the air conditioning system.
5. Check if the temperature difference between the air inlet and outlet of the compressor is normal.
6. Check if the hose of the refrigerating system is in an apparent good condition and connections of all joints are secure.
7. Check if the pipeline of the refrigerating system collides with other parts and components, and if there is any oil leakage trace left at each joint.
8. Check if the circuit connection of the refrigerating system is secure and if there is an occurrence of short circuit and falling off
9. Check if fastening bolts of the compressor are firmly secured or broken.

Chapter 12

Safety airbag

Instructions for maintenance

For your safe operation, please read the following instructions prior to your operation.

1. **The maintenance of SRS safety airbag must be operated under the procedure and directions instructed in this chapter.**
2. **The operation must be done with the test instruments and special tools designated by the chapter.**
3. **The following parts must be replaced by new ones providing something wrong with them.**
   a. SRS safety airbag control unit (SRS-ECU)
   b. Clock spring module
   c. The driver's side safety airbag module
   d. The passengers' side safety airbag module.
   e. Safety airbag wiring harness.
4. **The safety airbag electric principles figure and definitions of connector clips are in Figure 1,SRS-ECU stitch definition in Table 1 and the position and form of safety airbag failures indicator lamp in combined instrument in Figure 2.**

Table 1 SRS-ECU stitch description

No	Wire#	Name	Description
5	480	IGN	Battery voltage
6	50	GND	Grounding jumper
7	481	WL	Safety airbag alarm lamp
9	405	K	Diagnosis of serial data I/O (K-line)
10	484	DAB Hi	The driver's side safety airbag, high position
11	485	DAB Lo	The driver's side safety airbag, low position
13	486	PAB Hi	Passengers' side safety airbag, high position
14	487	PAB Lo	Passengers' side safety airbag, low position
37	488	DUAG REQ	Diagnosis request

5. **The maintenance operation must be started after 60 seconds following the removal of negative connection of accumulator, wrap the negative with insulating tape for insulation.**
   Due to the capacitance in SRS-ECU to maintain certain power to make the safety airbag release within a certain time after the power-off of accumulator, the operation must be started after a while to avoid any possible major damaging accident caused by the safety airbag's improper release.
6. **The parts such as SRS-ECU, safety airbag module as well as clock spring should be removed off and well preserved providing the temperature is high enough to cause any damage(above93¡æ) in the painting operation.**
   The failure codes must be debugged with the diagnostic scanner following the repairing of SRS safety airbag system so as to make alarm lamp work functionally.

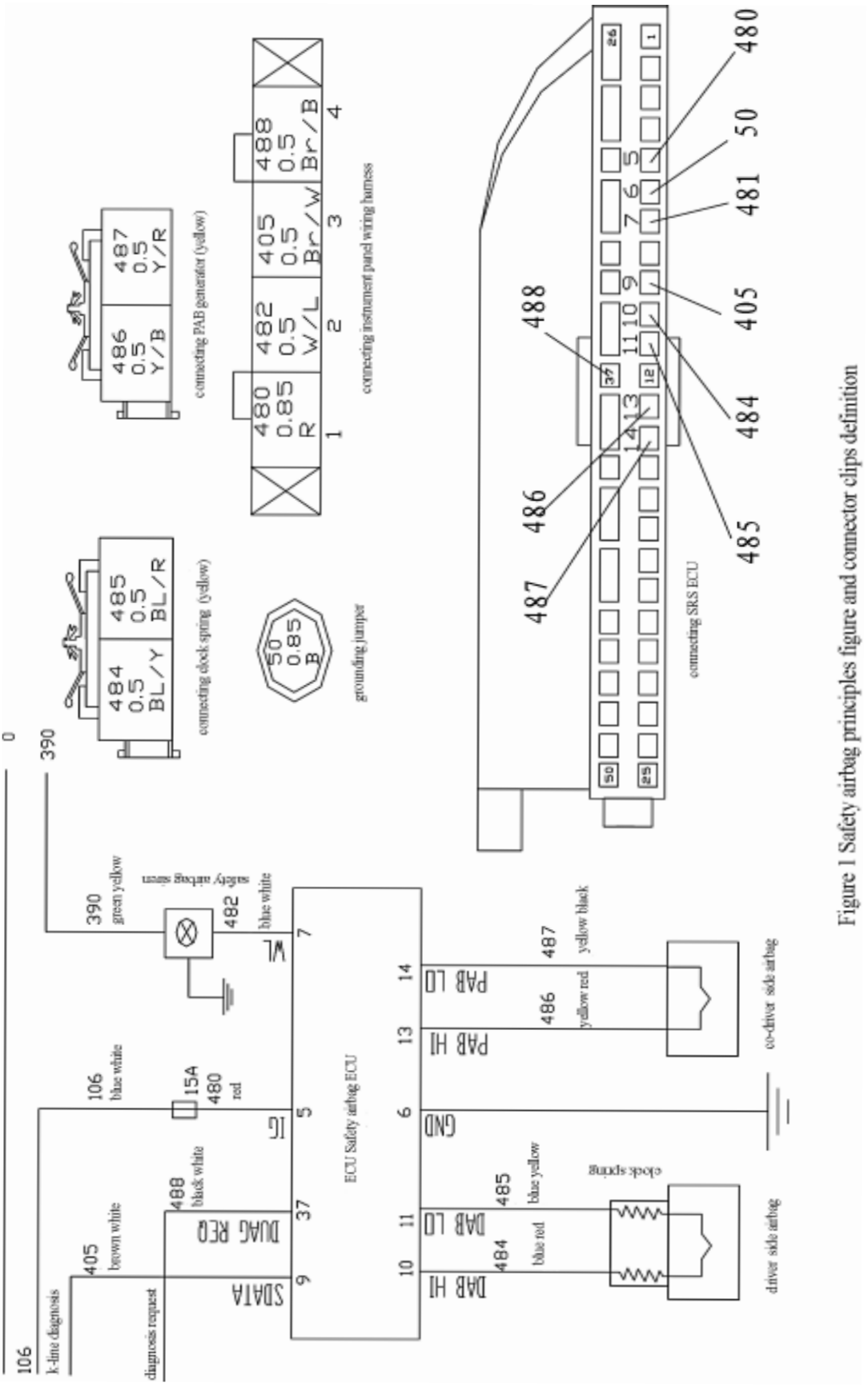


Figure 1 Safety airbag principles figure and connector clips definition

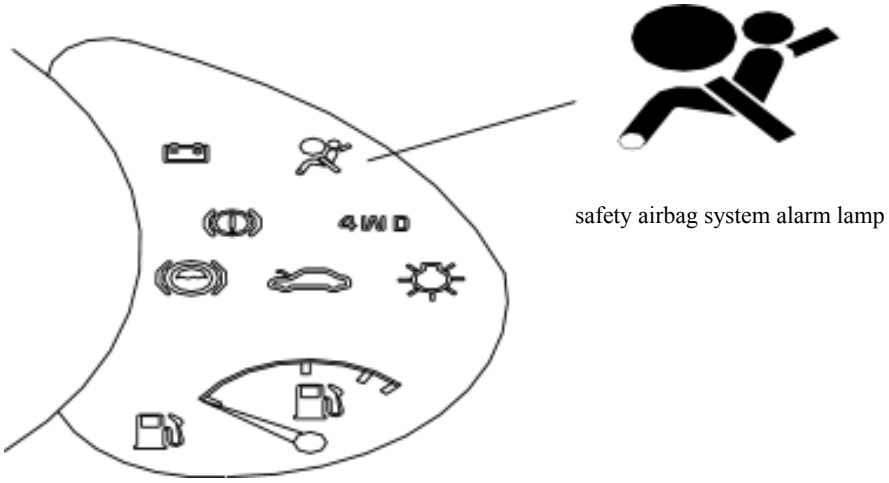
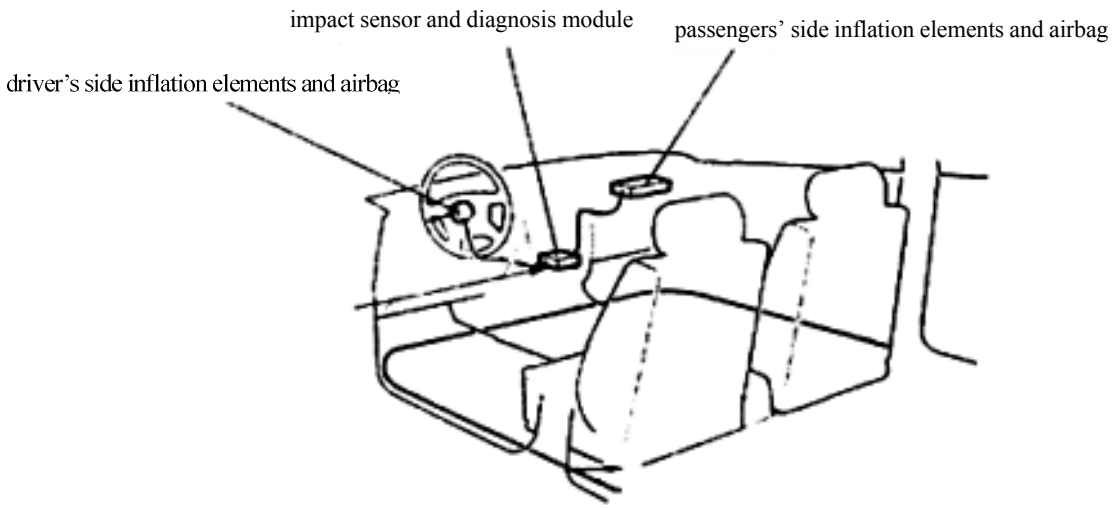
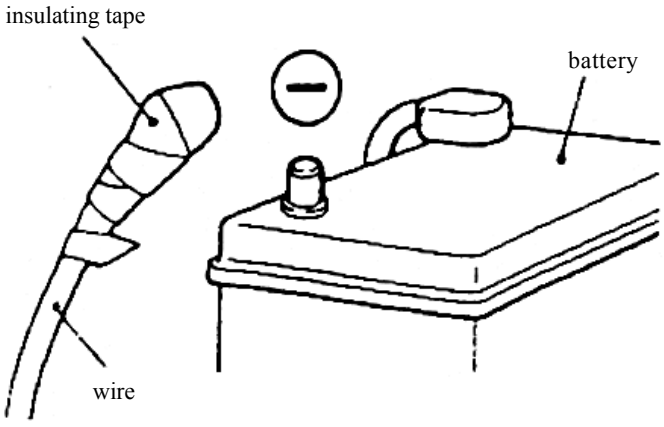

4WD
safety airbag system alarm lamp

Figure 2


impact sensor and diagnosis module
passengers' side inflation elements and airbag
driver's side inflation elements and airbag


insulating tape
battery
wire

Test instrument

Instrument	Name	Utility
	X-431diagnostic scanner	Test the systematic failures in SRS safety airbag system, debug ECU. failure codes.

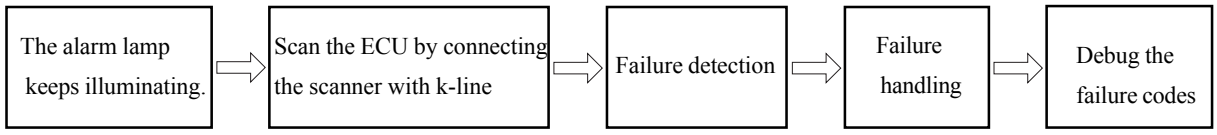
Failure handling

The basic failure diagnosis process

The failure code DTC of both present and history-accumulated failures may co-exist.

Caution

- **The safety airbag alarm lamp flashes for 6 times and then extinguishes when the ignition switch is in ON position after the installation of new safety airbag system electronic control unit, which demonstrates the normal function of SRS safety airbag system. In this case the system does not need to be tested, otherwise it should be diagnosed and repaired.**
- **If the alarm lamp does not illuminate when the ignition switch is in ON position, repair the alarm lamp relevant circuit and, then further operate to get it into work.**

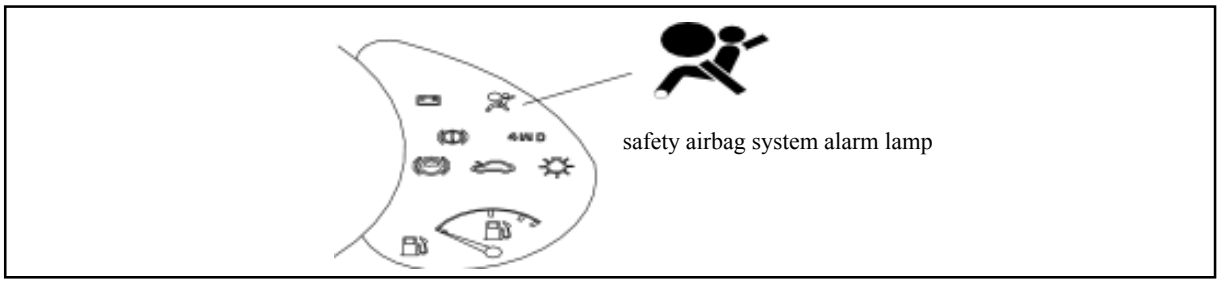


The test for SRS safety airbag alarm lamp

a. Place the ignition switch in ON position and confirm whether the alarm lamp is lighted.

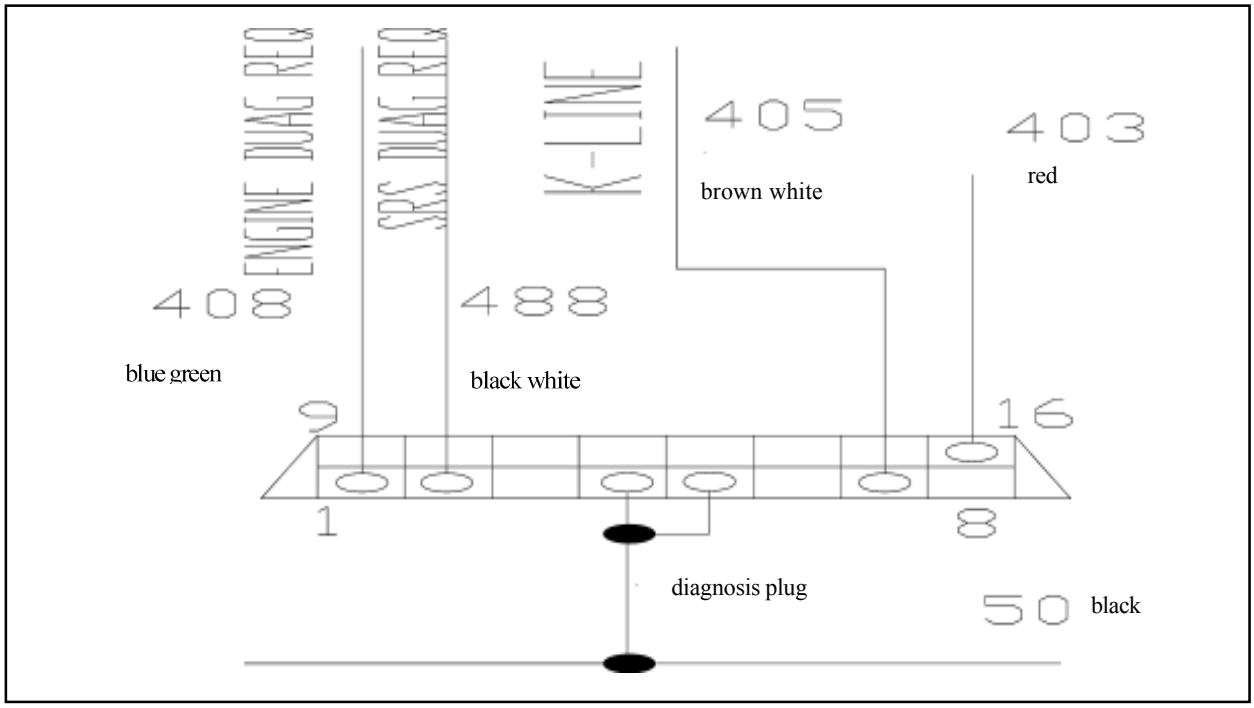
b. Check whether the alarm lamp permanently extinguishes after flashing for 6 times.

c. The diagnosis and test is also required besides the previous measures.



system diagnosis

SRS-ECU will execute a series of diagnosis and test to check whether the function of airbag system is prepares. The check can prevent the restriction system from mis-explosion and ensure the necessary explosion during collision. If found the failure, SRS-ECU will save a proper failure code and light the alarm lamp to indicate a failure status for the convenience of maintenance. If connect the pin 2# wire 488# (diagnosis request wire) on the diagnosis port to the ground (wire 50#) for more than 2s, the safety airbag alarm lamp will flash the code. For detailed position refer to following figure.



Failure judgment

1. Failure record (failure code storage)

When ECU determines the error through the cyclic diagnosis and test, SRS-ECU should saves the corresponding code, first judgment time, final judgment time and number of occurrence in EEPROM.

RS-ECU can stores 6 failures at most, under voltage failure and two collision records (front and side).

Failure code approved by SRS-ECU

Serial No.	Failure description	Debugging
1	Ignition loop 1 (driver's front airbag), resistance is too high or open-circuit.	Can
2	Ignition loop 1 (driver's side front airbag), resistance is too low or short-circuit	Can
3	Ignition loop 1 (driver's side front airbag), grounding	Can
4	Ignition loop 1 (driver's side front airbag), connected to power supply	Can
5	Ignition loop 2 (passenger side front airbag), resistance is too high or open-circuit.	Can
6	Ignition loop 2 (passenger side front airbag), resistance is too low or short-circuit	Can
7	Ignition loop 2 (passenger side front airbag), connected to power supply	Can
8	Ignition loop 2 (passenger side front airbag), connected to power supply	Can
9	Power voltage is high	Can
10	Power voltage is low	Can
11	Alarm light failure, connected to power supply or lamp is short-circuit	Can
12	Alarm lamp is failure- grounding or filament is open-circuit.	Can
13	Shortage/failure of algorithm parameter	Cannot (replace the SRS-ECU)
14	The front collision is recorded	Cannot (replace the SRS-ECU)
15	Communication failure	Can
16	Internal failure (refer to following table)	Cannot (replace the SRS-ECU)

The failure code transmission is completed by SRS-ECU's input to the defined diagnostic scanner through the maintenance system's serial data interface. (X-431 diagnostic scanner) Failure code of diagnosis

2.Failure code of diagnosis

Description of flash code

	Failure	Failure code	Flash code
1	No storage error		$12
2	Front airbag driver's, high resistance	$9,021	$21
3	Front airbag driver's , low resistance	$9,022	$22
4	Front airbag driver's, short-circuit of GND	$9,024	$24
5	front airbag driver's , short –circuit of VBATT	$9,025	$25
6	front airbag passenger, high resistance	$9,015	$15
7	front airbag passenger, low resistance	$9,016	$16
8	front airbag passenger , short-circuit of GND	$9,018	$18
9	Front airbag passenger , short-circuit of VBTT	$9,019	$19
10	High voltage of battery	$9,031	$31
11	Low voltage of battery	$9,032	$32
12	Failure of alarm lamp	$9,061	$61
13	Internal failure (replace SDM)	$9,071	$71
14	Front collision record	$9,051	$51
15	Side collision driver's record	$9,056	$56
16	Side collision passenger record	$9,057	$57
17	Retightened safety belt collision	$9,058	$58
18	Beyond the allowable repeat usage times	$9,054	$54

3. Interior failure

The micro controller can test the following items not only in starting detection but also in cyclic diagnosis detection.

a. Ignition circuit triggers the transistor: The high-side transistor is detected not only in the starting detection but also in the circulation diagnosis. But for the low-side transistor is opened when is connected to power supply directly, so the low-side transistor only can be detected in the starting detection to avoid the misexplosion.
b. The ignition voltage is provided by the booster transformer.
c. The acceleration sensor is detected by itself when start the detection.
d. Allowable deviation scope of acceleration sensor in circulation diagnosis.
e. Micro controller includes (AD converter, ROM, RAM etc.)
f. Status of safety sensor

Cautions:

Connector of explosion tube circuit has the short-circuit bar. When the connector is not connected, the end (+) of explosion tube is connected to end (-) directly to prevent the failure outspread caused by static. When the connector is bas and short-circuit bar is connected, the failure may not be eliminated.

An external watch dog can detect the operating status of micro controller. It can trigger the watchdog when the micro con troller has failure. The watch dog will reset the micro-controller and light the alarm lamp.

Internal failure determined by SRS-ECU

Serial No.	List of failure	Description of failure
1	Micro-controller	AD converter or EEPROM is faulty (the micro controller will be reset and alarm lamp is light when the RAM has failure.)
2	Driver's front airbag ignition loop	Enable the failure Measure the failure of loop
3	Passenger front airbag ignition loop (if realized)	Enable the failure Measure the failure of loop
4	Seat safety belt preloaded ignition loop (if realized)	Enable the failure Measure the failure of loop
5	Passenger side safety belt preloaded ignition loop (if realized)	Enable the failure Measure the failure of loop
6	Driver's side airbag ignition loop (if realized)	Enable the failure Measure the failure of loop
7	Passenger side airbag ignition loop (if realized)	Enable the failure Measure the failure of loop
8	Maximum times of explosion of safety belt pre-tightener	Reach the maximum value 6
9	Holding time of ECU energy (self-supply time)	Too short
10	Accelerometer	Deviation range Sensor not in constant, stable model Sensor tests the failure itself
11	The measurement of ignition loop is rejected continuously	No cycling diagnosis test (duplicated calculation)
12	Safety sensor	Calculate the safety sensor open-loop using the method that power-off for 2 or more than 2 seconds is considered as passing
13	Initial firing current	All initial firing current in normal status when the front airbag releases.
14	The ignition of side airbag is not determined.	Though SRS-ECU has received ignition information for 5 times during HSIS cycling ignition, the ignition can not be determined due to the side safety..

Debug the failure codes

Approach 1. The failure codes will be debugged following the ECU's receipt from the X-431 diagnostic tester of the debugging failure codes order through the serial interface, however, if an internal failure code is recorded or one impact is recorded, the debugging will not be executed.

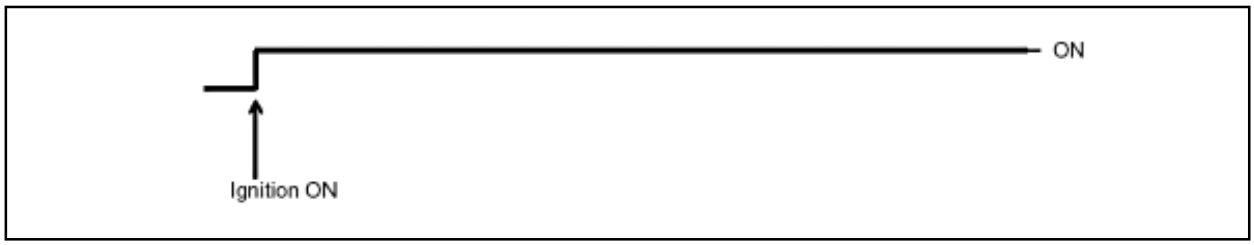
Approach 2. Ground 488# line for 5 times in 10 seconds to debug the failure codes.

Failure status display (alarm lamp keeps illuminating).

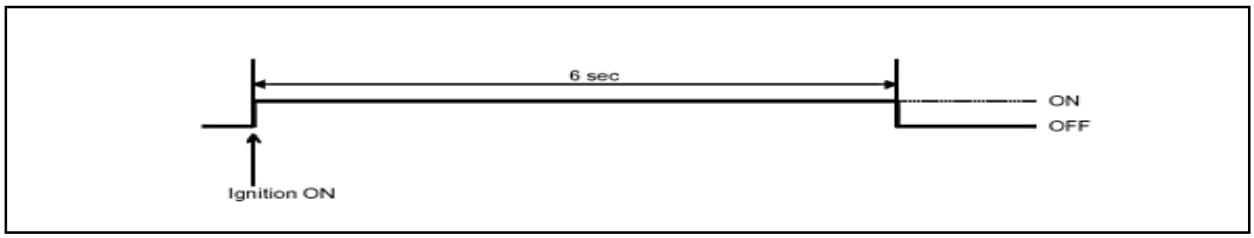
1. Bulb test

SRS-ECU will light the alarm lamp in order to test the bulb after working voltage is provided to it through the battery. The lamp will flash for 6 times and then extinguish at 1HZ in the initial phase. The alarm lamp will keep illuminating after the working voltage is provided in order to inform the driver's system failures. The alarm lamp will keep illuminating for 6 seconds after the ignition on and then be extinguished if the history-accumulated failures are less than five times. In the initial phase, SRS-ECU will not prepare to test impact and stop release till the circuit is stable. Therefore, alarm lamp's display manner will be one of following projects in the initial phase. (Table 4.9).

Project 1. If the impact is recorded or the number of history accumulated failures is or more than 5,the alarm lamp will keep illuminating, simultaneously, it will also keep illuminating if there is a possible explosion failure.



Project 2. The number of history- accumulated failures is or more than one and less than 5. (The case of low power is excluded)



Project 3 functional working (neither possible explosion failure or historical failure).

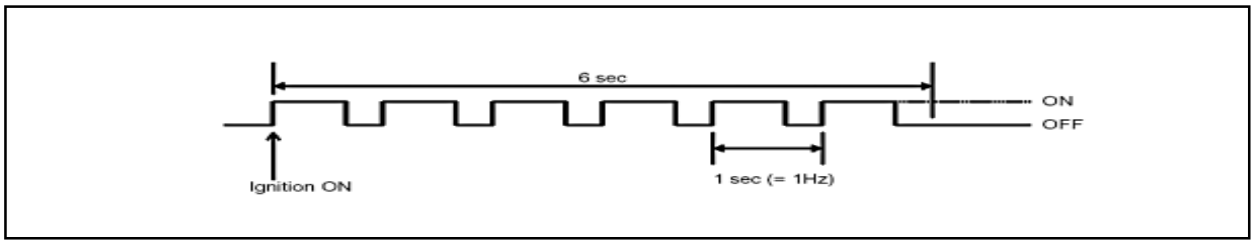


Table 4.9 indicator lamp's activities after ignition

2.Failure indication

The alarm lamp will indicate it in case any failure arises. If the external failure is a historical one, the indication will be called off. If the number of history-accumulated failures is or more than 5, the alarm lamp will keep illuminating albeit no failure emerges. The case of low power will be excluded.

A displayed or historical failure can but only be reconfigured by the service personnel. An internal failure or impact record can not be reconfigured, in these cases, SRS-ECU must be replaced.

3.Micro controller-independent alarm lamp illumination

The micro-controller in clear failure status can not work therefore can not control the alarm lamp. In this case, the alarm lamp will be directly lighted via suitable circuit despite of the micro-controller. As following,

a. The battery for SRS-ECU fails, the alarm lamp will be continuously lighted through the lamp drive function.

b. No internal working voltage, the alarm lamp keeps illuminating

c. Reconfiguration caused by watchdog's trigging failure, the alarm lamp flashes.

d. No work of micro-controller, the alarm lamp keeps illuminating

e. Incomplete plugging-in of SRS-ECU connector, the alarm lamp keeps illuminating via shoring bar Next explain the diagnostic procedure by taking some examples

If the alarm lamp is found keeping illuminating, please test it according to the following procedure even it extinguishes finally. First test the failure region with the scanner followed by the test in the failure region with the corresponding approaches and steps.

a If an internal failure or the explosion of safety airbag is scanned, replace the SRS-ECU

b.Troubleshooting

Troubleshooting

Extinguishments or normal-light of alarm lamp

NO.	Troubleshooting item	Description
1	The warning lamp of safety airbag system is not displayed.	Safety airbag system warns circuit failure
2	The warning lamp of safety airbag system is light normally.	Safety airbag system warns circuit failure or external failure.

1. Extinguishments of safety airbag system alarm lamp

1	Extinguishments of safety airbag system alarm lamp
Test status	Safety airbag system warns circuit failure.
Possible causes	No voltage (fuse shutoff) Combined instrument failure Failure of wiring harness between instrument cluster and ECU unit

Diagnostic procedure

When first carry out failure test, joggle the wiring harness and plug to test whether there is periodical bad contact in the circuit, if it so, please confirm whether the plug, terminal and wiring harness well connected and in good condition. If it is not any of previous cases, operate according to the following steps.

Procedure	Test		Operation
1	Test other wiring harness and instrument cluster indicator lamp • place the ignition switch in ON position • light other alarm and indicator lamps	Yes	Place the ignition switch in LOCK position followed by next step
		No	Test the instrument cluster power-supply system and grounding system (fuse), then go to step 5.
2	Bulb test	Yes	Next step
	Warning: Incorrect handling with the safety airbag system units will cause the safety airbag's improper release and pretension of safety belt, which will lead to serene accidents. Please read safety airbag service warning before handling the safety airbag units. • Place the ignition switch in LOCK position。 • shut off accumulator negative line and keep the status for at least 60 seconds. • Remove the combined instrument. Test the connection between the two corresponding stitches of safety airbag alarm lamp	No	Replace the bulb of alarm lamp.

Procedure	Test	Operation	
3	Test the wiring harness connection between ECU unit and instrument cluster. • Place the ignition switch in LOCK position。 • shut off accumulator negative line • shut off the instrument cluster plug • test the connection between alarm lamp circuit and its relative circuits	Yes	Next procedure.
		No	Replace the wiring harness and get into step 5

2. Normal-light of safety airbag system indicator lamp

2	Normal-light of safety airbag system alarm lamp
Test status	Normal-light of safety airbag system alarm lamp
Possible causes	Insufficient battery voltage ECU internal failure Combined instrument safety airbag alarm lamp failure ECU plug misconnects Combined instrument plug bad-contact ECU power-supply fuse shutoff or bad contact Misconnection of ECU plug terminal Bad contact between ECU plug terminal and grounding wiring harness. Driver's or passengers' side safety airbag circuit failure.

Diagnostic procedure

Begin the test with diagnostic communication with special diagnostic device (X-431 diagnostic tester) and ECU to find out the failure causes, do the next test providing communication is not successful.

Procedure	Test	Operation	
1	Test the battery Test the battery voltage Is the voltage higher 9V?	Yes	Next procedure
		No	Insufficient battery supply. Test the charging/discharging system, then go to step 5.
2	Test the wiring harness connection between ECU and combined instrument. Place the ignition switch in LOCK position。 Shut off the battery negative. Open the central channel guard plate. Shut off the instrument combined connector clip Connect the negative of battery Place the ignition switch in ON position. Check whether the instrument connector clip terminal voltage is 12V(power supply and instrument line)	Yes	Next step
		No	Check the circuit and continue the operation according to step 5.
3	Place the ignition switch in LOCK position。 Check the connection of corresponding terminals between instrument connector clip and diagnostic interface (diagnose the two ends of K-line)	Yes	Next step
		No	Repair or replace the wiring harness and continue according to step 5
3	Make sure the shutoff of accumulator negative line and keep the status for at least 1 minute. Shut off ECU connector clip Shut off the instrument cluster plug. Connect the ECU plug terminal 5,7,9 and instrument cluster plug?	Yes	Next step
		No	Replace the wiring harness and step 5
4	Remove ECU to check the condition of terminal and whether the shorting bar is broken.	Yes	Replace ECU
		No	Reconnect ECU connector clip and next step.
5	Make sure that the failure will never reoccur after repairing. Place the ignition switch in LOCK position。 Shut off accumulator negative line and keep the status for at least 1 minute. Connect all ECU plugs Connect the driver's side safety airbag combined instrument plug Connect the passengers' side safety airbag combined instrument plug Connect the driver and passengers' side pretension safety belts plugs. (Vehicles with pretension safety-belts) Connect clock spring plug Connect the accumulator negative line Place the ignition switch in ON position Does the safety airbag alarm lamp work functionally?	Yes	Troubleshooting followed by the explanations to customers upon the repairing procedure.
		No	Retest the failure symptoms; repeat from step 1 if the failure reoccurs.

Internal failure

Failure code $9071	SRS safety airbag system unit internal failure
Test condition	Warning The test condition of this failure is the failure code that may not emerge before the test, DTC conducts the test, and the preparatory work must be done before the test because the damage to working personnel or system may be caused by the incorrect operation during the test. SRS safety airbag system electronic-control unit internal circuit failure.
Possible causes	SRS safety airbag system unit internal failure
Operation	
With regard to replacing SRS safety airbag system unit, take references in the removal/installation of safety airbag system	

Power-supply

Failure code $9032	Low power-supply voltage for SRS safety airbag system electronic-control unit		
Test condition	Warning The test condition of this failure is the failure code that may not emerge before the test, DTC conducts the test, and the preparatory work must be done before the test because the damage to working personnel or system may be caused by the incorrect operation during the test. The voltage for SRS safety airbag system unit connector clip is stitch 5 and 6 is under 9V		
Possible causes	Accumulator low voltage Failure with the wiring harness between accumulator and SRS safety airbag system electronic-control unit		
Procedure	Test		Operation
1	Check accumulator Test accumulator voltage Is the voltage above 9V	Yes	Next step
		No	Accumulator low voltage, test the recharging/discharging system
2	Check the wiring harness between accumulator and fuse panel Remove fuse panel without releasing the connector clips Place the ignition switch in ON position Test the potential of two fuse corresponding contactors, the potential above 9V?	Yes	Next step
		No	Check the wiring harness
3	Check the wiring harness between fuse panel and SRS safety airbag system unit connector clip Warning: If not correctly handled, the safety airbag module as well as pretension safety belt may possibly be trigged, released and tensioned, thus make serene damage to people. Therefore, please carefully read the repairing warning before trouble handling. Please take references in safety airbag system repairing warning Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove steering pillar shell Release the clock spring connection clips Remove the PAB trim cover, glove box (passengers' side safety airbag is under the trim cover) Release passengers' side safety airbag module connector clips Release all SRS safety airbag system unit connector clips Install back the accumulator negative wire, Place the ignition switch in ON position Is the potential of SRS safety airbag system unit connector clips stitch 5,6(grounding) above 9V?	Yes	Next step
		No	Replace wiring harness

Drive side failure

Failure code $9021 $9022 $9024 $9025	Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove the left trim cover Shut off SRS safety airbag system unit translation connector clips Install back the accumulator negative wire, place the ignition switch in ON position		Present failure codes Replace SRS safety airbag system unit See he removal/installation of SRS safety airbag system unit History accumulated failure codes The end of failure diagnosis
Test condition	Driver's side safety airbag failure (high or low resistance, shorting or grounding, etc.) Warning If not correctly handled, the safety airbag module as well as pretension safety belt may possibly be trigged, released and tensioned, thus make serene damage to people. Therefore, please carefully read the repairing warning before trouble handling. Please take references in safety airbag system repairing warning Is the potential of SRS safety airbag system unit connector clips stitch 5,6(grounding) above 9V?	Yes No	Next step Replace wiring harness

Test condition	Driver's side safety airbag The resistance between the SRS safety airbag system connector clips connectors not within the designated scope SRS safety airbag system driver's side airbag relative wiring harness shorting or shutoff
Possible causes	Driver's side safety airbag module failure Clock spring internal failure Failure of circuit connector clips between clock spring and SRS safety airbag system electronic-control unit Shutoff or shorting of wiring harness between clock spring and SRS safety airbag system electronic-control unit. Misconnection of SRS safety airbag system driver's side airbag generator connector clip

Procedure	Test		Operation
1	Check the clock spring Warning If not correctly handled, the safety airbag module may possibly be trigged and released thus make serene damage to people. Therefore, please carefully read the repairing warning before trouble handling. Please take references in safety airbag system repairing warning. Are the relative parts of clock spring normal? (The relation between stitches, unnecessary shutoff or shorting?) if the present clock spring can be replaced by a better one.	Normal	Next step
		Abnormal	Replace the clock spring Take references in the removal/installation for safety airbag system and clock spring
	Confirm the failure in driver's side safety airbag module or other parts.		Replace the driver's side safety airbag module

4	Confirm the failure in clock spring or other parts configure the special tools fuel and temperature diagnostic instrument at 2Ω position Install back the accumulator negative wire Place the ignition switch in ON place Any failure code in display?	Yes	Next step
		No	Replace clock spring Take references in the removal and installation for safety airbag system and clock spring.
5	Check the wiring harness between clock spring and SRS safety airbag system electronic-control unit Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove PAB trim cover, glove box (passengers' side safety airbag is under the trim cover) Release the passengers' side safety airbag module connector clip Release all SRS safety airbag system unit connector clips Check whether the following troubles are with the harness between connector clips terminals of SRS safety airbag system unit and clock spring Grounding Power-supply shorting Shutoff Is the previous wiring harness normal?	Normal	Replace SRS safety airbag system unit; take references in removal/installation of SRS safety airbag system unit.
		Abnormal	Replace the wire harness
6	Check the clock spring connector clip Remove the steering pillar shell Release the clock spring connector clip Is the clock spring connector clip normal?	Normal	Next step
		Abnormal	Replace the wiring harness or connector clips
7	Check clock spring Remove clock spring Take references in removal/installation of safety airbag system as well as clock spring Check clock spring Take references in the test for safety airbag system and clock spring. Is the clock spring normal?	Normal	Next step
		Abnormal	Replace clock spring Take references in the removal/installation of safety airbag system and clock spring.
8	Check the wiring harness between clock spring and SRS safety airbag system electronic-control unit Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove PAB trim cover, glove box (passengers' side safety airbag is under the trim cover) Release the passengers' side safety airbag module connector clip Release all SRS safety airbag system unit connector clips. Check whether the following troubles are with the harness between connector clips terminals of SRS safety airbag system unit and spring clock. Grounding Power-supply shorting Shutoff Is the previous harness normal?	Normal	Next step
		Abnormal	Replace clock spring Take references in the removal/installation of safety airbag system, and clock spring

Passengers' side failure

Failure code $9015 $9016 $9018 $9019	Passengers' side safety airbag module (high or low resistance or shorting grounding)
Test condition	Warning If not correctly handled, the safety airbag module as well as pretension safety belt may possibly be trigged, released and tensioned, thus make serene damage to people. Therefore, please carefully read the repairing warning before trouble handling. Please take references in safety airbag system repairing warning If with passengers' side safety airbag failure The resistance between SRS safety airbag system unit connector clip stitch 13 and stitch 14 not within the designated scope. The wiring harness shorting between safety airbag system unit stitch 13 and stitch 14 Open loop between SRS safety airbag system unit connector clip stitch 13 and stitch 14,
Possible causes	Passengers' side safety airbag module failure The failure of connector clip between passengers' side safety airbag module and SRS safety airbag system electronic-control unit The failure of connector clip between SRS safety airbag system unit and grounding jumper. The circuit shutoff or shorting between passengers' side safety airbag module and SRS safety airbag system electronic-control unit The circuit shutoff or shorting between SRS safety airbag system unit and grounding jumper SRS safety airbag system unit failure

Procedure	Test	Operation
1	Is the vehicle with passengers' side safety airbag module	Yes: Next step No: Step 5
	Check passengers' side safety airbag connector clips Warning	Present failure code Next step

Impact-vehicle diagnosis

Test SRS-ECU diagnostic signals

1. **Connect the (X-431 diagnostic test's) diagnostic joint**
2. **Read the diagnostic results with X-431 diagnostic tester**

Repairing procedure

1.When safety airbag is released.

The following parts should be replaced with new ones

a. Passengers' side safety airbag module

b. SRS-ECU

c. Driver's side safety airbag module

2 Check the following parts; replace them with new ones providing something wrong with them.

a. Clock spring

b. Steering-wheel, steering column, bottom steering shaft module

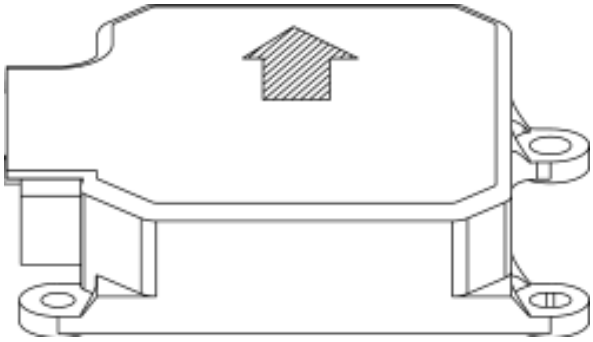
3.Driver's side safety airbag module's installation status towards the steering wheel.

a. Check whether abnormal knocking is with the steering wheel, its activity is in good condition and its clearance is normal.

b. Check whether the wiring harness joint is broken and its terminal is deformed.

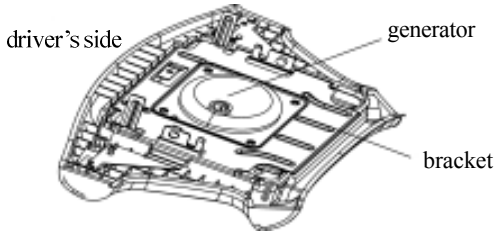
Caution: Due to the impact, the diagnostic instrument cannot communicate with SRS-ECU when accumulator is lack of power, in this case, check and maintain the instrument panel wiring harness or utilize the extension power supply.

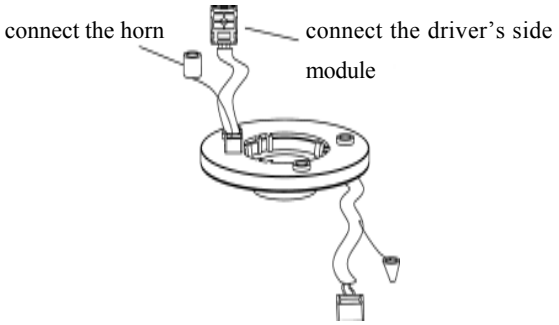
SRS-ECU



1. **Check whether depression, crack or deformation is with the SRS-ECU bracket.**
2. **Check whether the joint is broken and terminal is deformed**
3. **Check SRS-ECU bracket's installation status**
   a. Check whether depression, crack or deformation is with the shroud
   b. Check whether the joint is broken, terminal is deformed and wiring harness is meshed.
   c. Check whether depression, crack or deformation is with the gas generator shield.
   d. Make sure the direction of the arrow is straightforward
4. **Check the installation status of safety airbag module.**

Driver's side safety airbag module (the following Figure)





Clock spring (right Figure)

1. **Check whether the joint and protecting tube are broken and the terminal is deformed.**
2. **Check whether the shield is deformed.**

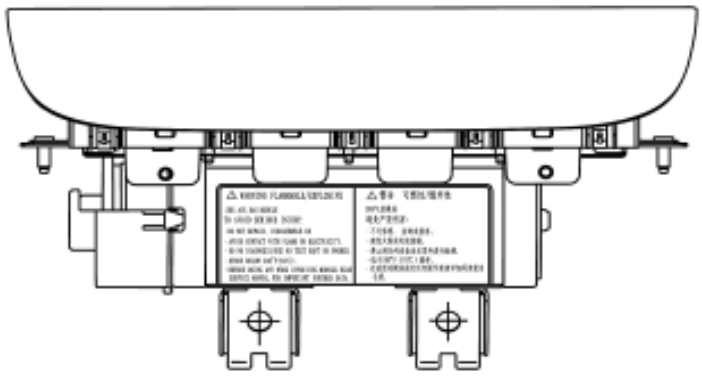
Steering wheel, steering column and bottom steering shaft module

1. **Check the installation status of driver's side safety airbag module**
2. **Check whether abnormal knocking is with the steering wheel and its clearance is normal**

Passengers' side safety airbag module (the following Figure)

1. **Check the installation status of passengers' side safety airbag module**
2. **Check whether the shield is deformed**

Passenger side airbag (PAB)



Wiring harness joint (instrument cluster wiring harness)

Check whether the wiring harness is well installed, the joint is broken and the terminal is deformed.

Warning

The attentions for use and maintenance for SRS safety airbag are displayed in the Figure. Operate according to the sign and, the destructed and dirty sign must be replaced with a new one steering

wheel in Figure6-1

Driver's side safety airbag module in Figure 6.2

Clock spring in Figure 6.3

SRS-ECU in Figure 6.4

Sun visor in Figure 6.5

Passengers' side safety airbag module in Figure 6.6

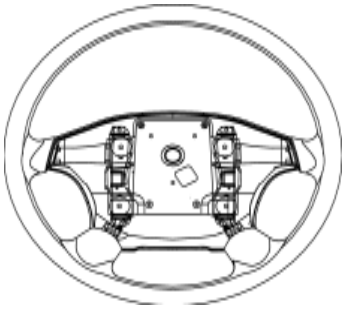


Figure 6－1

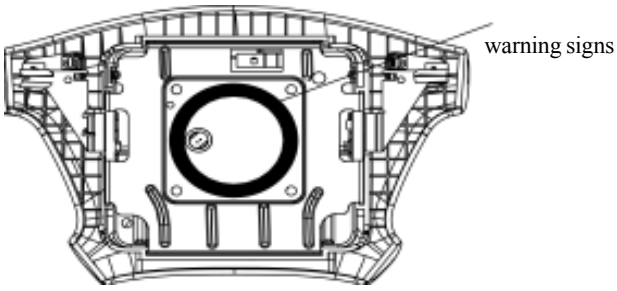


Figure 6－2

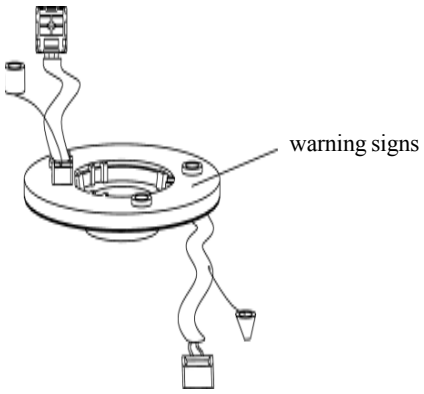


Figure 6－3

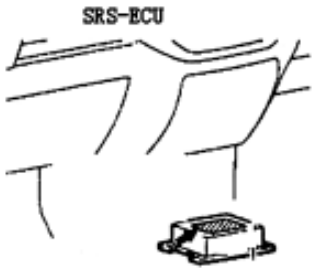


Figure 6－4

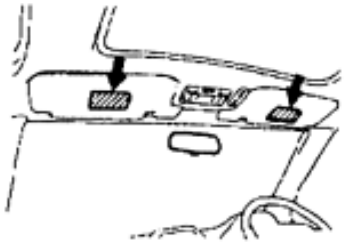


Figure 6－5

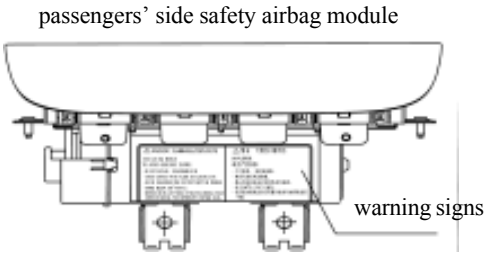


Figure 6－6

Removal methods for all the parts

Safety airbag electronic-control unit (SRS-ECU)

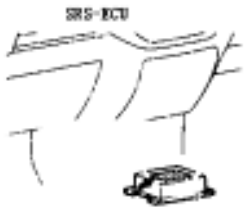
Caution

1. **Continue the operation 60 seconds after the removal of accumulator negative. Wrap the removed negative with insulating tape for insulation.**
2. **The SRS-ECU must not be separated nor repaired replace the failed SRS-ECU with a new one.**
3. **Prevent the SRS-ECU from shock and vibration, replace the SRS-ECU with depression, crack or deformation with a new one.**
4. **Do replace the SRS-ECU with a new one after the safety airbag is released.**
5. **Do not damage the SRS-ECU when removing or maintaining the parts next to it.**

1. Operations before removal

a. Place the ignition switch in OFF position.

b. Remove the accumulator negative and well preserve it somewhere or wrap it with tape.



2. Removal procedure.

a. Central channel's side panel (or remove the co-instrument panel)

b. Remove the connector clip connecting with the safety airbag ECU

c. remove the SRS-ECU

3. Installation sequence

a. SRS-ECU;

b. Install the connector clip connecting with the safety airbag ECU

c. Central channel's side panel (or remove the co instrument panel)

d. Connect the grounding jumper.

4. Some points for installation

a. SRS-ECU installation

b. Post-installation test

Place the ignition switch in ON position

- SRS alarm lamp flashes in 6 seconds and extinguishes.

c. If not extinguishes, the failure test and troubleshooting must be done.

5. Test

a. Whether the depression, crack or deformation is with the SRS-ECU shield.

b. Whether the terminal is broken or deformed.

Caution: The SRS-ECU safety airbag will not work normally if the SRS-ECU is not correctly installed.

Caution: The SRS-ECU with depression, crack or deformation must be replaced with a new one.

For the inspection of SRS-ECU besides the previous refer to related item of troubleshooting

Driver's and passengers' side safety airbag module (DAB, PAB), clock spring

Caution

1. **Continue the operation 60 seconds after the removal of accumulator negative. Wrap the negative with insulating tape for insulation.**
2. **Safety airbag module and clock spring must not be separated nor repaired, replace the failed ones with new ones.**
3. **Please pay high attention when using the safety airbag module and clock spring, do not let them fall on the ground nor fall into water or oil. Moreover, replace the depressed, crack or deformed ones with new ones.**
4. **After the safety airbag module is released, keep the released side up, store it somewhere flat and do not lay anything on it.**
5. **The safety airbag module must not be stored in a place with the temperature above 93℃.**
6. **The released safety airbag module must be replaced with a new one, at the same time test the clock spring, replace it with a new one if something unusual with it.**
7. **Use gloves and protection glasses during operating the released safety airbag.**
8. **The unreleased safety airbag must be abandoned after its release.**

Caution

During the removal, the wring harness connector clip must be removed before the removal of other wring harness connector clips in order to avoid the possible improper release caused by static interferences, which is reversal to the case of installation.

1. **Removal and installation**

   Driver's side safety airbag module, passengers' side safety airbag module, clock spring.

2. **Operations before removal.**

   a. Take out the ignition switch key after the steering wheel and front wheel in straightforward direction.

   b. Remove the connections of accumulator negative

3. **Driver's side safety airbag module removal procedure**

   a. Screw off the bolts of two sides, as showed in Figure 8-1

   b. Shut off the wiring harness connector clip

   c. Remove the safety airbag module assembly

   d. Remove the steering wheel

4. **Passengers' side safety airbag module removal procedure**

   a. Remove all the trim covers and glove boxes of instrument panel separate the PAB module's airbag wiring harness connector clip from the safety airbag's PAB side one.

   b. Remove M6 bolts and separate PAB module from instrument panel armed beam.

   c. Remove the instrument panel itself.

   d. Remove the M5bolts of two sides of four PAB modules.

5. **Clock spring removal procedure**

   a. Remove DAB module (shut off the connecting connector clip)

   b. Carefully remove the steer

   c. Open the combined switch upper shield, find and shut off the bottom wring harness connector clip

   d. Remove the clock spring from the steer

6. **Driver's side safety airbag module (DAB) and its installation procedure**

   a. Test before installation

   * Steering wheel

   * Connect wiring harness

   * Driver's side safety airbag module

   * Screw home the bolts of the two sides

   b. The connection of accumulator terminal

   c. Post-installation test

7. Passengers' side safety airbag module (PAB) and its installation procedure.

a. Test before installation

- Carefully take PAB module, justify both of them and plug four trim cover M5bolt into the mounting holes of the module's both sides
- Well install together the module with trim cover bracket and instrument panel mounting bracket with four M5 bolts. After the installation of the entire instrument assembly to the vehicle, tightly fix the PAB module to the vehicle transverse beam with 2 matted M6 bolts at the glove box site.
- Well mutually plug the PAB module airbag wiring harness connector clip and safety airbag wiring harness PAB side connector clip it is the end of PAB module installation.

b. Connection of accumulator terminal

c. Post-installation test

8. Clock spring installation procedure

a. Test before installation

- Cross the line of upper clock spring through the hole in steer.
- connect and fix the clock spring and steer
- install the combined switch upper cover
- install the steering wheel
- steering wheel and safety module assembly

b. Connect accumulator's terminal

c. Post-installation test

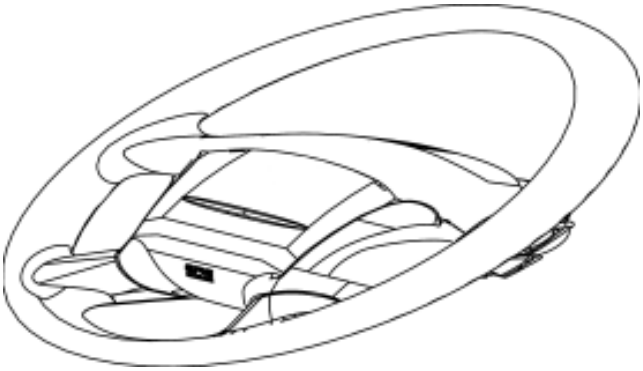


Figure 8－1

The removal of steering wheel (Figure 8.2)

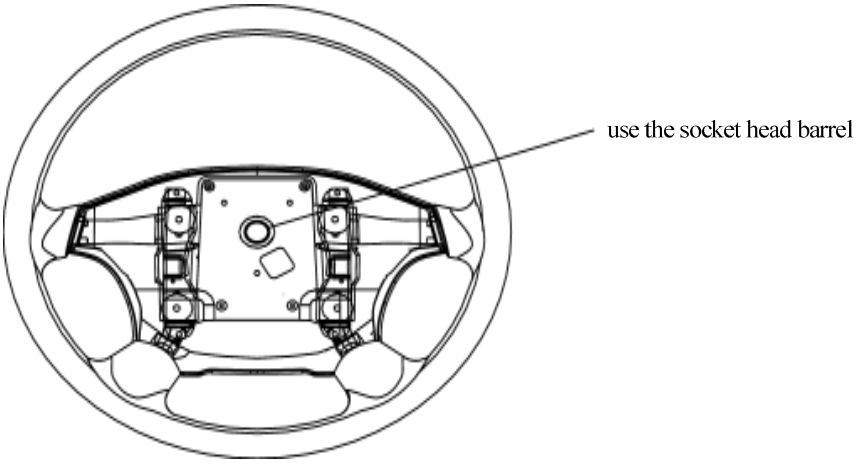


Figure 8－2

d. Remove the steering wheel by removing the mounting screw from the mid-position. (Shut off the horn connector)

Caution

It is difficult to separate the steer from steering column due to the over meshing between spline and steering column, in this case, do not forcibly remove the steer but screw off the bolt on the steering column and lift up the steer instead (the forced removal will damage the clock spring since the connection between the steer and the spring)

Caution

Diagnose the safety airbag module circuit with electric diagnostic instrument without separating it.

Let the removed driver's side safety airbag module bottom-side up and store it at a clean and dry place.

Store the clock spring in a clean and dry place.

9. Installation operation instructions

a. The test before installation

- The new safety airbag or clock spring must be tested before installation.

Caution

The safety airbag module must be abandoned after its release according to the procedure

- Connect the accumulator negative
- Connect the K-431 diagnostic instrument with the diagnostic interface (16 plug)

Caution

Place the ignition switch in OFF place when connect or shut off the K-431 diagnostic instrument.

- Place the ignition switch in ON position
- Read the diagnostic circuit, check whether the safety airbag module is in normal condition except the failure regions.
- Place the ignition switch in OFF position

Remove accumulator negative and wrap it with the tape for insulation.

Caution

Continue the operation 60 seconds after the removal of accumulator negative

Install the clock spring to the steer after its involution

b. Clock spring's central involution, clockwise screw the clock spring to the end, then turn it for 3 circles anticlockwise and make the involution with the marked sites

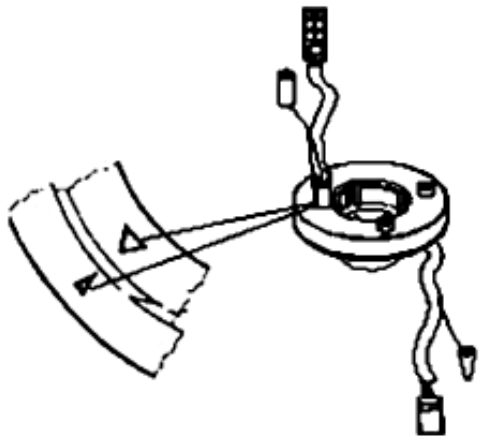


Figure 8.3

Caution

If without the clock spring central involution, the steering wheel will not be able to rotate at midway, or the clock spring circuit will be damaged so that jeopardize SRS safety airbag's normal activities.

The spacer must be removed after replacing a clock spring with a new one, otherwise it will damage the clock spring.

c. Steering wheel and safety airbag module assembly installation.

Install the steering wheel and safety airbag module assembly after clock spring's central involution.

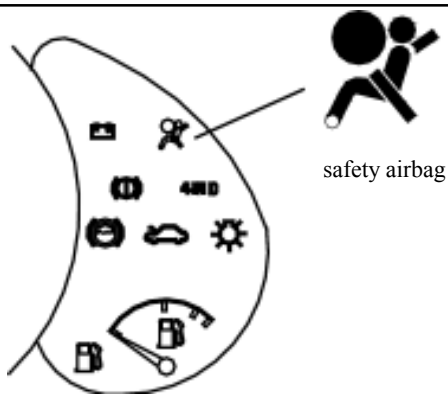
Caution

Do not jam the clock spring wiring harness during the steering wheel and safety airbag module assembly installation.

- After the installation, rotate the steering wheel to left and right positions as enough as possible to confirm whether something abnormal is with it.

d. Post-installation test.

- lightly rotate the steering wheel to the left and right to confirm whether something abnormal and noises will arise.(Driver's side safety airbag module, clock spring)
- Place the ignition switch in ON place.
- SRS alarm lamp flashes in 6 seconds and then extinguishes.



safety airbag system failure alarm lamp

Figure8-4

- Do the troubleshooting if the alarm lamp re-illuminates after its extinguishments following the 6-second-flashing (or it keeps illuminating from the very beginning)

10. Test

a. Driver's side airbag module test (Figure8-3)

Check the following items and replace the corresponding safety airbag module part with anything abnormal with a new one.

Abandon the safety airbag's old parts after its release according to the instructed procedure.

Caution

The safety airbag module (squib) circuit resistance can even not be tested by the designated tester.

When testing the resistance with an experimental instrument, sometimes the improper release will be caused by the static interference because of the current in explosion pipe and cause some major damaging accidents.

- Whether depression, crack or deformation is with the shroud.
- Whether the joint is broken and the terminal is deformed.
- Whether depression, crack or deformation is with the gas generator shield.
- Safety airbag module. Installation status.

Caution

Replace the safety airbag with depression, crack or deformation with a new one. Its old parts must be abandoned after its release.

b. Clock spring test (figure 8.5,figure 8.6)

Check the following items and replace the clock spring with anything abnormal (even it is quite tiny) with a new one

- Whether the joint and protection tube are broken and the terminal is deformed.
- Whether the shield is damaged.
- Check the connection between clock spring's upper joint terminal and it's corresponding bottom terminal.
- Plug in a thin probe from the 3# joint of clock spring.

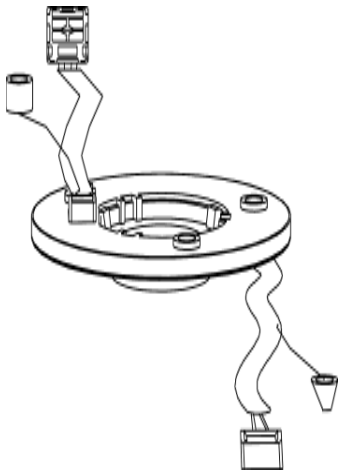


Figure8-5

Caution

Do not directly plug in the probe from the bottom of the joint.

- Figure 8 — 5 As showed in Figure 8.5,Plug a thin probe into the current tester to check the connection of the terminal.

Safety airbag module abandoning instruction

Carry out the operation according to the following procedure to abandon a safety airbag module or a vehicle with the SRS safety airbag. First of all, release the safety airbag.

Unreleased safety airbag module abandoning

Caution

First release the SRS safety airbag when abdbdon it.

Release the safety airbag outside the vehicle to replace the safety airbag module.

Conduct the operation somewhere next to a smoke tester due to the smoke during the safety airbag's release.

Tell the people to cover their ears and try to conduct the operation somewhere far away from the residential area due to the big noise during the safety airbag's release.

Remove the accumulator positive and negative and remove the accumulator off the vehicle.

Caution

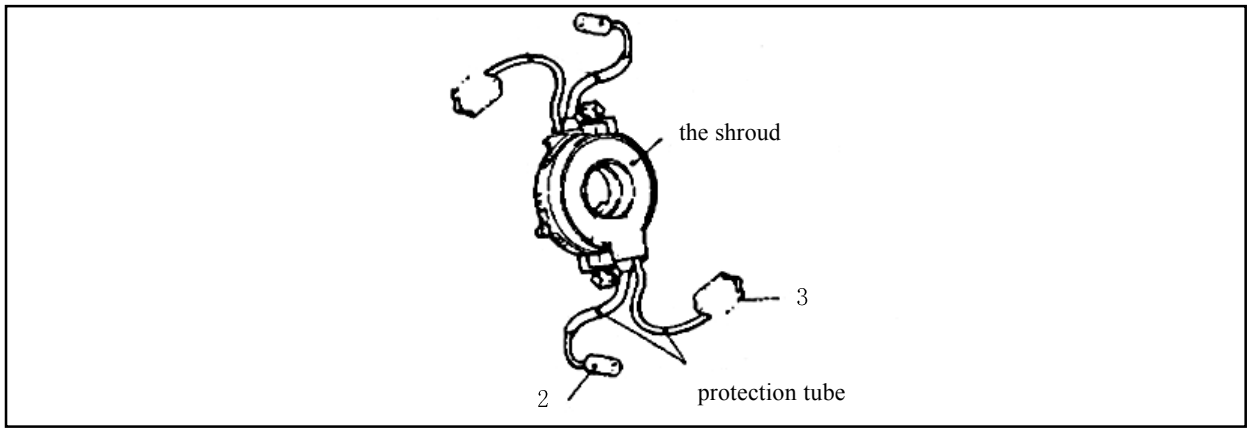
Continue the operation 60 seconds after the removal of accumulator positive and negative.

Release the safety airbag module according to the following procedure.

1. **Driver's side safety airbag module**

   a. Remove the blocking lever

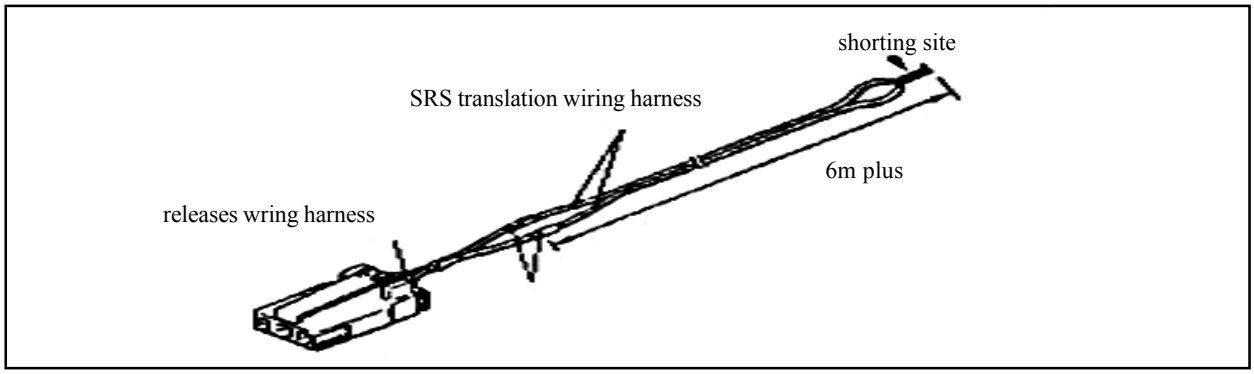
   b. Remove the clock spring 2# joint and instrument panel wiring harness joint (yellow)(figure 8.6)



Caution

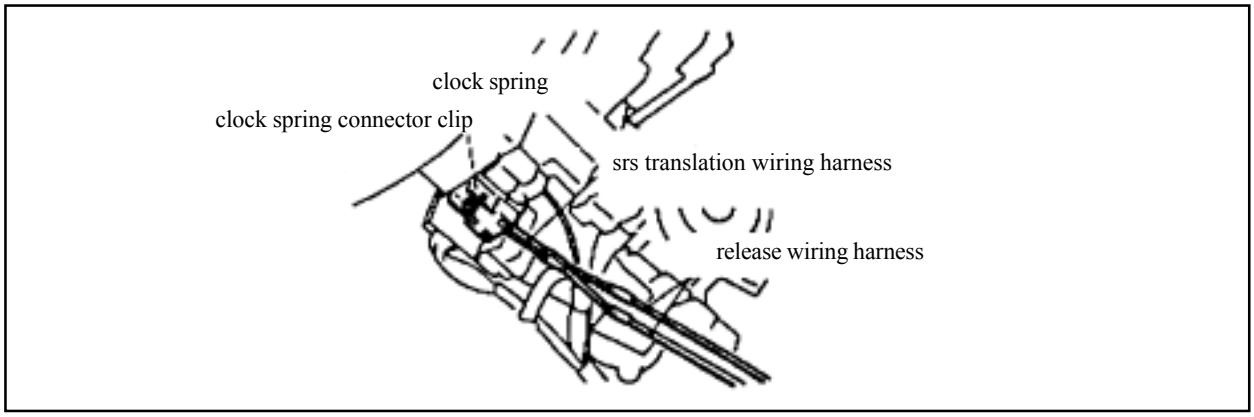
The clock spring joint will short automatically after the removal of clock spring from the instrument wiring harness, which can prevent any possible major accident caused by the incorrect release of driver's side safety airbag module duo to the static interference from happening.

c. Connect the SRS safety airbag translation wring harness with 2 6m plus release wiring harnesses, wrap the joint part with insulating tape for insulation.



Mutually connect (short) the other end of release wring harness to avoid the possible incorrect release caused by the static interference.

d. At the clock spring's 2# joint, tract the translation wiring harness out of the vehicle with the release wiring harness (Figure 9.2)

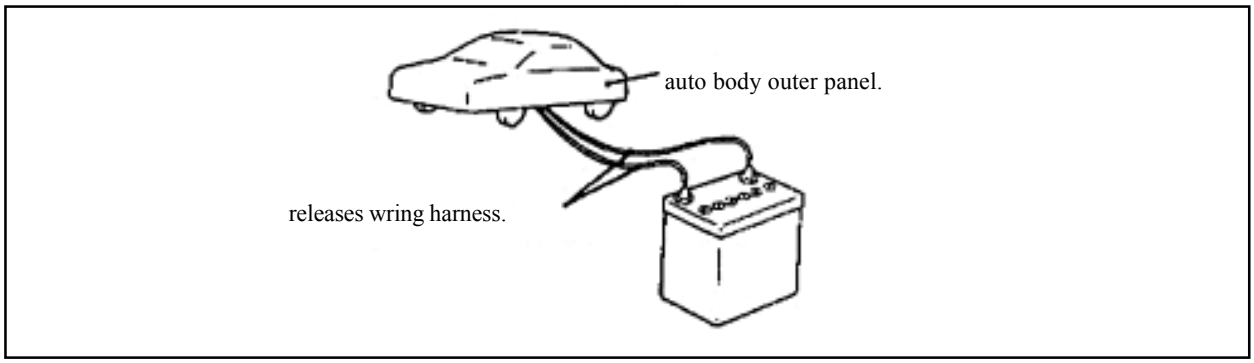


e. Close all the windows and doors and wear the guard to reduce the noises.

Caution

The guard should be worn because the glass with cracks is very fragile.

f. Shut off the joint of driver's side safety airbag release wiring harness somewhere far from the vehicle, and connects the joint with the accumulator and makes the safety airbag release.



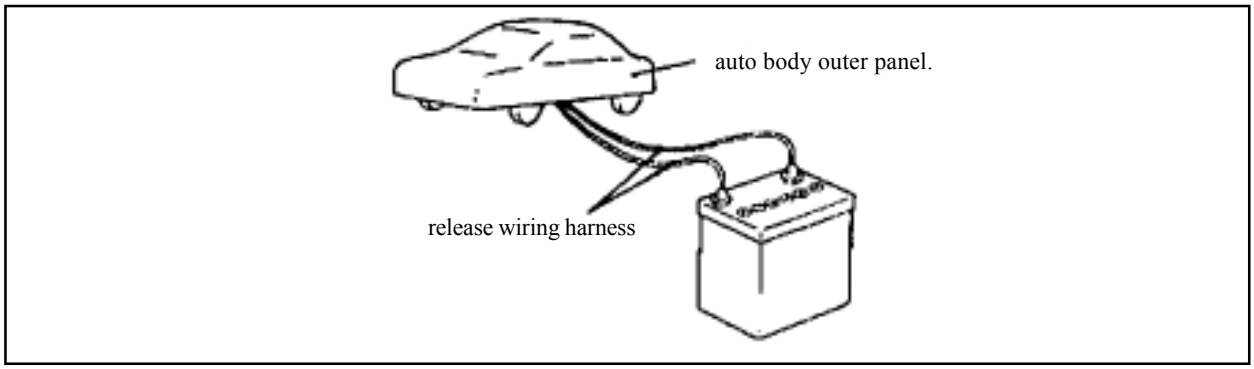
Caution

Continue the operation after the confirmation of nobody is in or next to the vehicle.

Its gas generator is quite hot after the driver's side safety airbag's release, it can be used after its cooling down for more than 30 minutes.

Contact with the local service station of the Great Wall Auto Stock Corporation if the driver's side safety airbag module cannot be released.

g. Abandon the released driver's side safety airbag module according to the instructions.



2. Release outside the vehicle

Caution

Release the safety airbag somewhere open and plain as well as 6m plus from the obstacles and people

When release the safety airbag outdoors, try to avoid the strong wind and ignite windward in the breeze.

a. Remove the accumulator negative and positive and remove the accumulator.

Caution

Continue the operation 60 seconds after the removal of the accumulator.

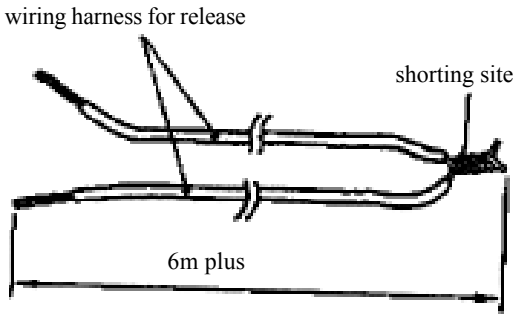
b. Release the safety airbag module according to following procedure

- driver's side safety airbag module
- remove the driver's side safety airbag module off the vehicle.

Caution

The two ends of the terminal will short automatically without the joint connection of driver's safety airbag module, therefore the possible improper release caused by static interference can be avoided; if it improperly releases, keep the released side up and store it somewhere plain, do not lay anything on it.

- Prepare 2 6m plus release wiring harnesses and mutually connect the other ends(short-circuit) of them to avoid the possible improper release caused by static interference.(refer to figure 9-4)

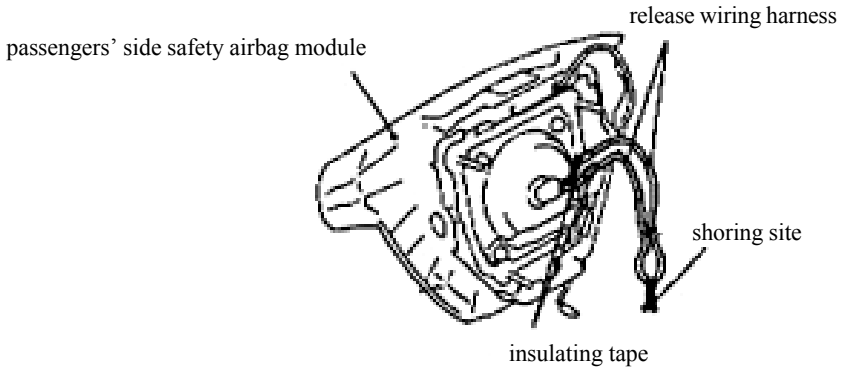


- Touch the vehicle with your hands to eliminate the static electricity.

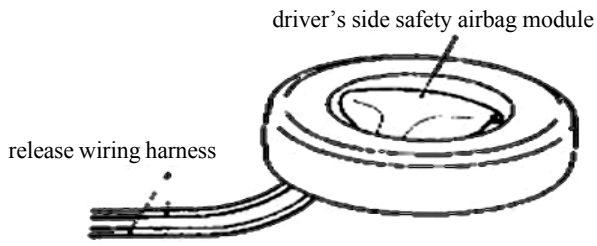
Caution

Strictly execute the previous procedure for it can prevent the possible incorrect release caused by the static interference from happening.

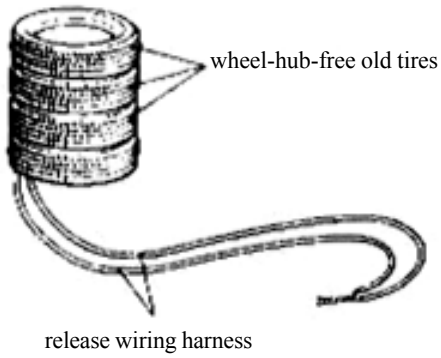
- Shut off the driver's side safety airbag module wiring harness and connect it with two release wiring harnesses(refer to figure 9-5)



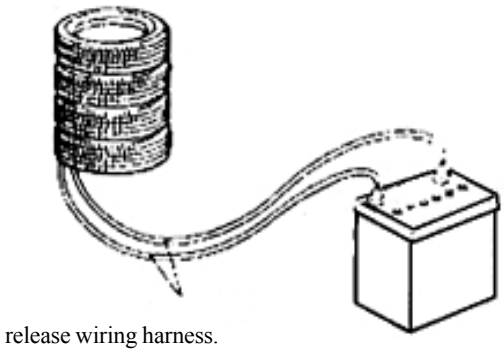
- Installed the stand-by bolts on the driver's side safety airbag module's inside bolt and fasten a thick wire to the wheel rim to fix it.
- Connect the release wiring harness connecting with the driver's side safety airbag module with the low part of an old tire loading the wheel rim. (refer to figure 9-6)



Lay three wheel-hub-free old tires on the tire fixing the driver's side safety airbag module (Figure 9-7).



Shut off the joint of driver's side safety airbag release wiring harness somewhere far from the vehicle, and connect the joint with the accumulator and make the safety airbag release (Figure9-8).



Caution

Release the driver's side safety airbag module after the confirmation of nobody close to it.

Its gas generator is quite hot after the driver's side safety airbag's release, it can be used after its cooling down for more than 30 minutes.

- Contact with the local service station of the Great Wall Auto Stock Corporation if the driver's side safety

4	Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove the left trim cover Shut off SRS safety airbag system unit translation connector clips Install back the accumulator negative wire, place the ignition switch in ON position Is the potential of SRS safety airbag system unit connector clips stitch 5,6(grounding) above 9V ?	Yes	Present failure codes Replace SRS safety airbag system unit See he removal/installation of SRS safety airbag system unit History accumulated failure codes The end of failure diagnosis
		No	Replace wiring harness

Drive side failure

Failure code $9021 $9022 $9024 $9025	Driver's side safety airbag failure (high or low resistance, shorting grounding, etc.)		
Test condition	Warning If not correctly handled, the safety airbag module as well as pretension safety belt may possibly be trigged, released and tensioned, thus make serene damage to people. Therefore, please carefully read the repairing warning before trouble handling. Please take references in safety airbag system repairing warning Driver's side safety airbag The resistance between the SRS safety airbag system connector clips connectors not within the designated scope SRS safety airbag system driver's side airbag relative wiring harness shorting or shutoff		
Possible causes	Driver's side safety airbag module failure Clock spring internal failure Failure of circuit connector clips between clock spring and SRS safety airbag system electronic-control unit Shutoff or shorting of wiring harness between clock spring and SRS safety airbag system electronic-control unit. Misconnection of SRS safety airbag system driver's side airbag generator connector clip		
Procedure	Test		Operation
1	Check the clock spring Warning If not correctly handled, the safety airbag module may possibly be trigged and released thus make serene damage to people. Therefore, please carefully read the repairing warning before trouble handling. Please take references in safety airbag system repairing warning. Are the relative parts of clock spring normal? (The relation between stitches, unnecessary shutoff or shorting?) if the present clock spring can be replaced by a better one.	Normal	Next step
		Abnormal	Replace the clock spring Take references in th removal/installation fo safety airbag system an clock spring
2	Confirm the failure in driver's side safety airbag module or other parts. Replace the DAB module with a better one Install back accumulator negative wire Place the ignition switch in ON position Is the failure code still in display or can be debugged?	Can	Replace the driver's sid safety airbag module Take references in th removal/installation f driver's side safety airba in safety airbag system
		No	Next step
3	Check clock spring wiring harness connector clip Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove steering pillar shell Release the clock spring connector clip, is it in normal condition?	Normal	Next step
		Abnorm	Replace the wiri harness

4	Confirm the failure in clock spring or other parts configure the special tools fuel and temperature diagnostic instrument at 2Ω position Install back the accumulator negative wire Place the ignition switch in ON place Any failure code in display?	Yes	Next step
		No	Replace clock spring Take references in the removal and installation for safety airbag system and clock spring.
5	Check the wiring harness between clock spring and SRS safety airbag system electronic-control unit Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove PAB trim cover, glove box (passengers' side safety airbag is under the trim cover) Release the passengers' side safety airbag module connector clip Release all SRS safety airbag system unit connector clips Check whether the following troubles are with the harness between connector clips terminals of SRS safety airbag system unit and clock spring Grounding Power-supply shorting Shutoff Is the previous wiring harness normal?	Normal	Replace SRS safety airbag system unit; take references in removal/installation of SRS safety airbag system unit.
		Abnormal	Replace the wire harness
6	Check the clock spring connector clip Remove the steering pillar shell Release the clock spring connector clip Is the clock spring connector clip normal?	Normal	Next step
		Abnormal	Replace the wiring harness or connector clips
7	Check clock spring Remove clock spring Take references in removal/installation of safety airbag system as well as clock spring Check clock spring Take references in the test for safety airbag system and clock spring. Is the clock spring normal?	Normal	Next step
		Abnormal	Replace clock spring Take references in the removal/installation of safety airbag system and clock spring.
8	Check the wiring harness between clock spring and SRS safety airbag system electronic-control unit Place the ignition switch in LOCK position Release accumulator negative wire and wait for 1 minute plus Remove PAB trim cover, glove box (passengers' side safety airbag is under the trim cover) Release the passengers' side safety airbag module connector clip Release all SRS safety airbag system unit connector clips. Check whether the following troubles are with the harness between connector clips terminals of SRS safety airbag system unit and spring clock. Grounding Power-supply shorting Shutoff Is the previous harness normal?	Normal	Next step
		Abnormal	Replace clock spring Take references in the removal/installation of safety airbag system, and clock spring

Passengers' side failure

Failure code $9015 $9016 $9018 $9019	Passengers' side safety airbag module (high or low resistance or shorting grounding)
Test condition	Warning If not correctly handled, the safety airbag module as well as pretension safety belt may possibly be trigged, released and tensioned, thus make serene damage to people. Therefore, please carefully read the repairing warning before trouble handling. Please take references in safety airbag system repairing warning If with passengers' side safety airbag failure The resistance between SRS safety airbag system unit connector clip stitch 13 and stitch 14 not within the designated scope. The wiring harness shorting between safety airbag system unit stitch 13 and stitch 14 Open loop between SRS safety airbag system unit connector clip stitch 13 and stitch 14,
Possible causes	Passengers' side safety airbag module failure The failure of connector clip between passengers' side safety airbag module and SRS safety airbag system electronic-control unit The failure of connector clip between SRS safety airbag system unit and grounding jumper. The circuit shutoff or shorting between passengers' side safety airbag module and SRS safety airbag system electronic-control unit The circuit shutoff or shorting between SRS safety airbag system unit and grounding jumper SRS safety airbag system unit failure
Procedure	Test / Operation

1	Is the vehicle with passengers' side safety airbag module	Yes	Next step
		No	Step 5
2	Check passengers' side safety airbag connector clips Warning If not correctly handled, the safety airbag module may possibly be trigged and released thus cause serene damage to people, therefore, please carefully read the maintenance warning. Take references in safety airbag maintenance warning. Place the ignition switch in LOCK position Release accumulator negative wire and wait for about 1 minute plus Remove the PAB trim cover, glove box (passengers' side safety airbag is under the trim cover) Release passengers' side safety airbag module connector clip Is the previous connector clip normal?	Yes	Present failure code Next step History- accumulated failure codes Next step
		No	Replace the wiring harness
3	Confirm whether the failure cause is with passengers' side safety airbag module or some other parts Connect a better module to the terminal A and B of passengers' side safety airbag connector clip Connect the accumulator negative wire Place the ignition switch in ON position Any failure code in display?	Yes	Next step
		No	Replace passengers' side safety airbag module Take references in the removal/installation of passengers' side safety airbag module in safety airbag system.

4	Check the wiring harness between passengers' side safety airbag module and SRS safety airbag system electronic-control unit Place the ignition switch in LOCK position Release accumulator negative wire and then wait for about 1 minute plus Remove steering pillar shell Release clock spring connector clip Release driver's and passengers' side safety airbag module connector clips Release all SRS safety airbag system unit connector clips Check whether the following troubles are with the circuit of the connector clips terminals between SRS safety airbag system electronic-control unit and passengers' side safety airbag module Grounding Power-supply shorting Shutoff Is the previous circuit normal?	Normal	Present failure code Replace SRS safety airbag system unit Take references in removal/installation of SRS safety airbag system unit in safety airbag system. History-accumulated failure codes The end of failure diagnosis
		Abnormal	Replace the relative wiring harness

Impact-vehicle diagnosis

Test SRS-ECU diagnostic signals

1. **Connect the (X-431 diagnostic test's) diagnostic joint**
2. **Read the diagnostic results with X-431 diagnostic tester**

Repairing procedure

1.When safety airbag is released.

The following parts should be replaced with new ones

a. Passengers' side safety airbag module

b. SRS-ECU

c. Driver's side safety airbag module

2 Check the following parts; replace them with new ones providing something wrong with them.

a. Clock spring

b. Steering-wheel, steering column, bottom steering shaft module

3.Driver's side safety airbag module's installation status towards the steering wheel.

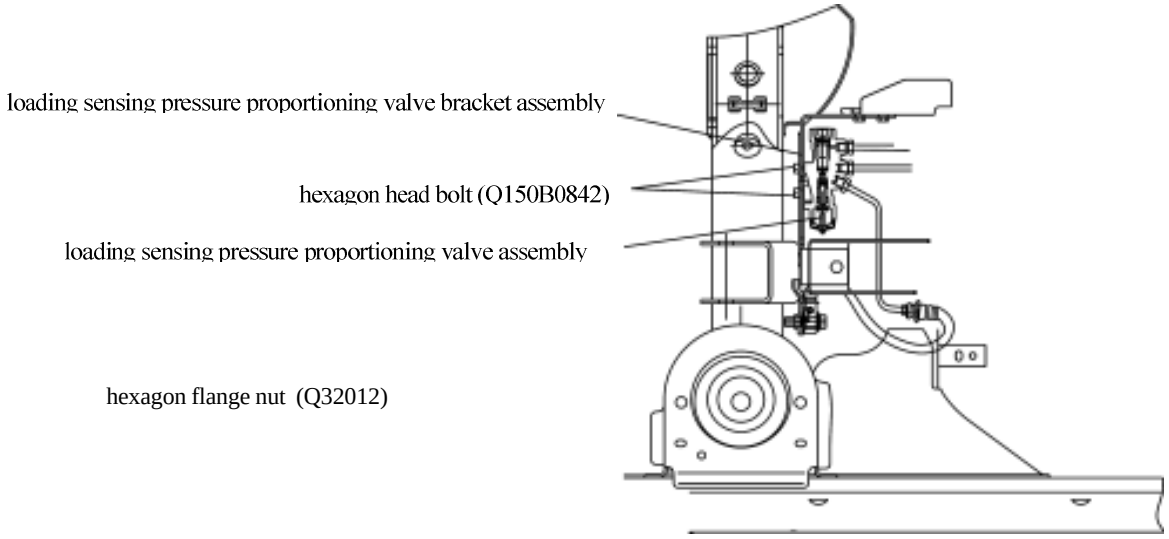
a. Check whether abnormal knocking is with the steering wheel, its activity is in good condition and its clearance is normal.

b. Check whether the wiring harness joint is broken and its terminal is deformed.

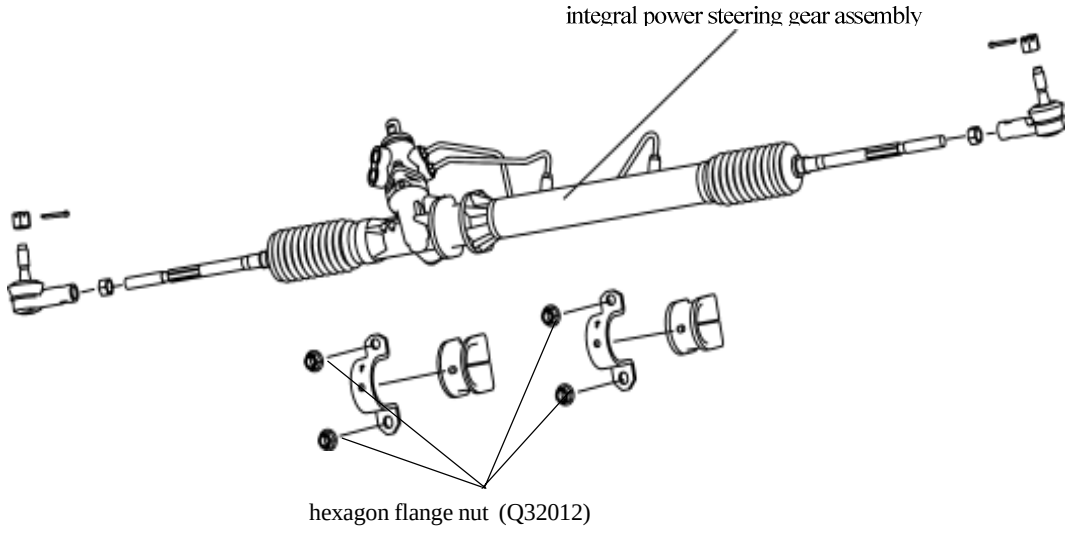
Caution: Due to the impact, the diagnostic instrument cannot communicate with SRS-ECU when accumulator is lack of power, in this case, check and maintain the instrument panel wiring harness or utilize the extension power supply.

Appendix

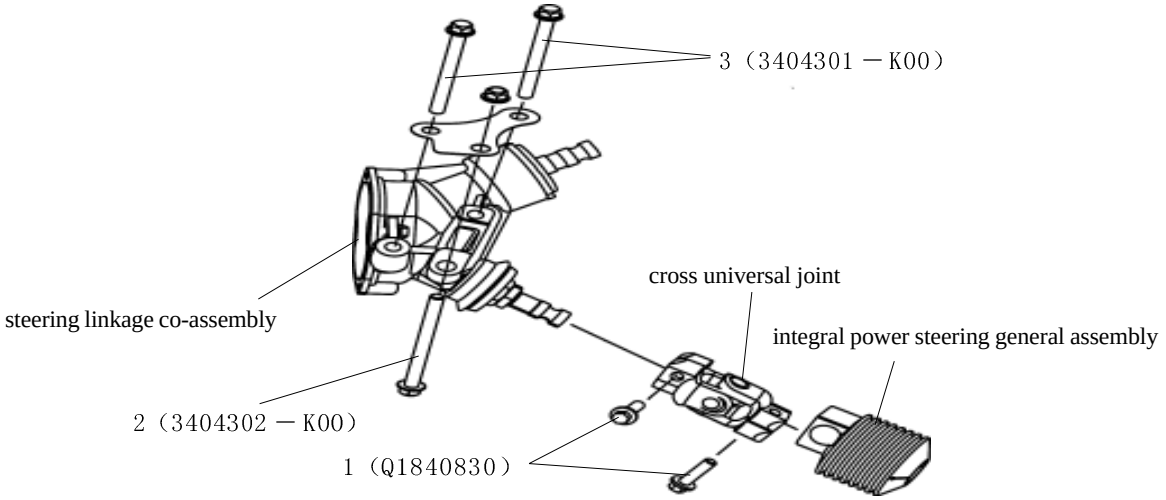
Control item	Request	Control measure
Tightening torque of loading sensing pressure proportioning valve assembly's fixing to the loading sensing pressure proportioning valve bracket assembly bolt	fixing to the loading sensing pressure proportioning valve bracket, Tightening torque of hexagon head bolt(Q150B0842) is 23 ± 2N • m	Torque wrench
Loading sensing pressur proportioning valve spring elongation	Loading sensing pressure proportioning valve spring elongation within 84-95mm	Steel plate gauge 100mm



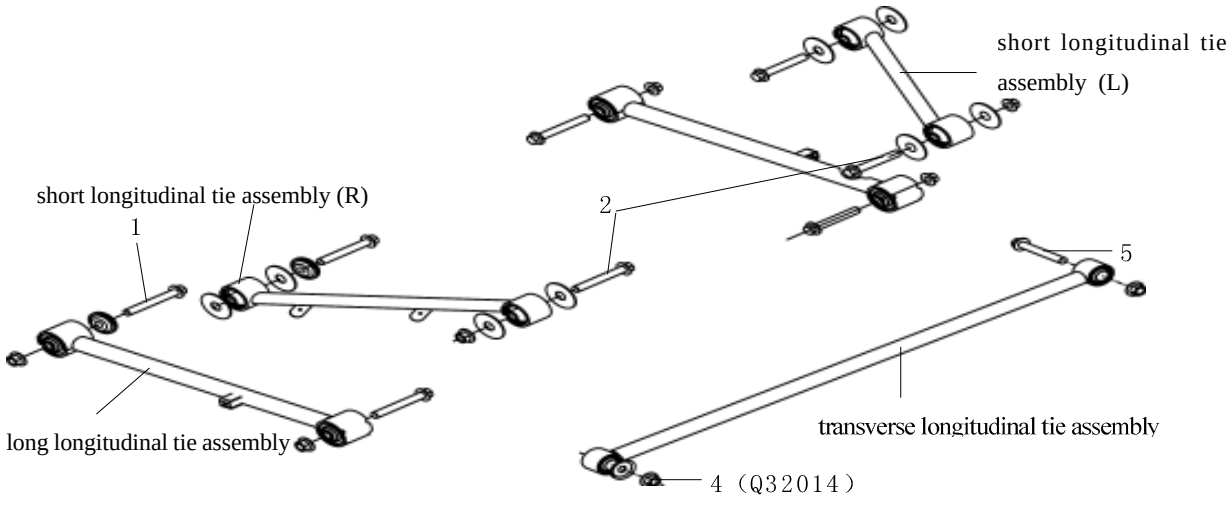
Control item	Request	Control measure
Integral power steering gear assembly mounting bolt tightening torque	locate the integral power steering gear assembly in the corresponding position of the carriage and fix it with some bolts(Q32012), Tightening torque is 90± 10N • m.	Torque wrench



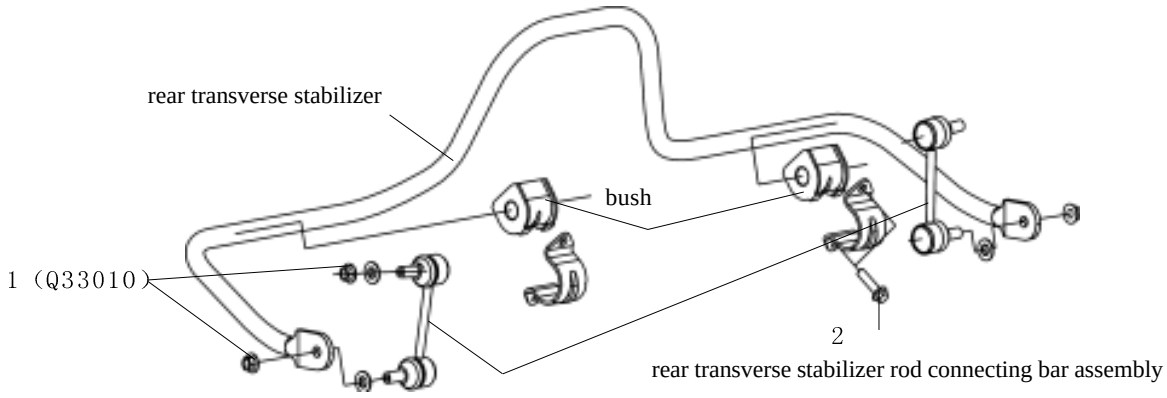
Constrol items	request	control measure
Connection of steering linkage co-assembly and integral power	fixed torque of nut 1 in the Figure is 25±	Torque wrench
connection of steering linkage co-assembly and left carriage	the fixed torque of nut 2 in the Figure is 70 ± 10N • m the torque is: 70 ± 10N • m the fixed	Torque wrench Torque wrench



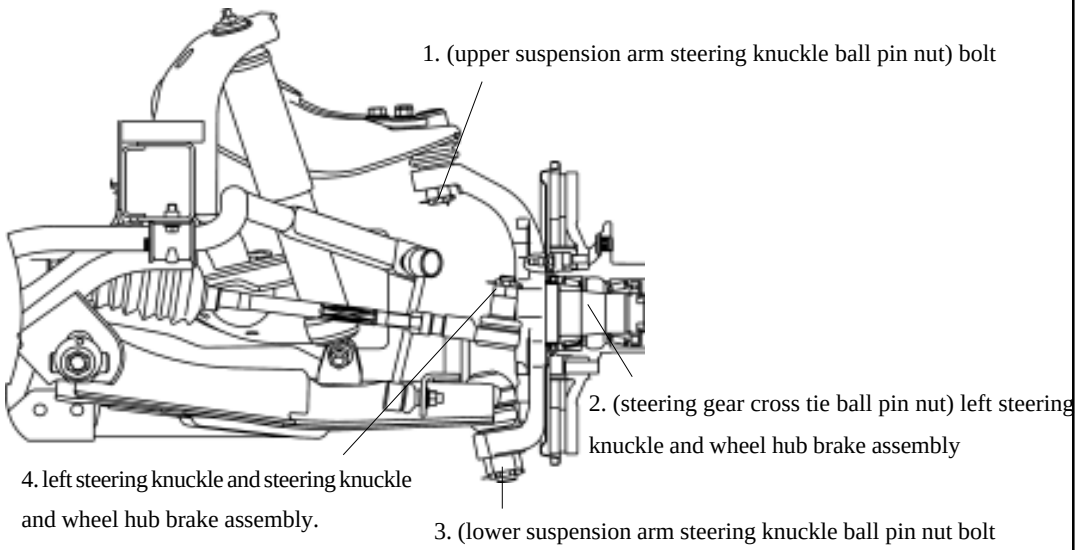
Control items	Request	control measure
Connection of left right long longitudinal tie assembly and carriage and rear axle	the fixed torque of nut 1 in the Figure is：200	Torque wrench
Connection of left right short longitudinal tie assembly and rear axle assembly.	the fixed torque of nut 2 in the Figure is：200 ± 20N • m	Torque wrench
Connection of left right short longitudinal tie assembly and carriage	the fixed torque of nut 3 in the Figure is： 180 ± 15N • m	Torque wrench
Connection of cross tie assembly and rear axle assembly	the fixed torque of nut 1 in the Figure is：180 ± 15N • m	Torque wrench
Connection of cross tie assembly and carriage.	the fixed torque of nut 1 in the Figure is： 200 ± 20N • m	Torque wrench



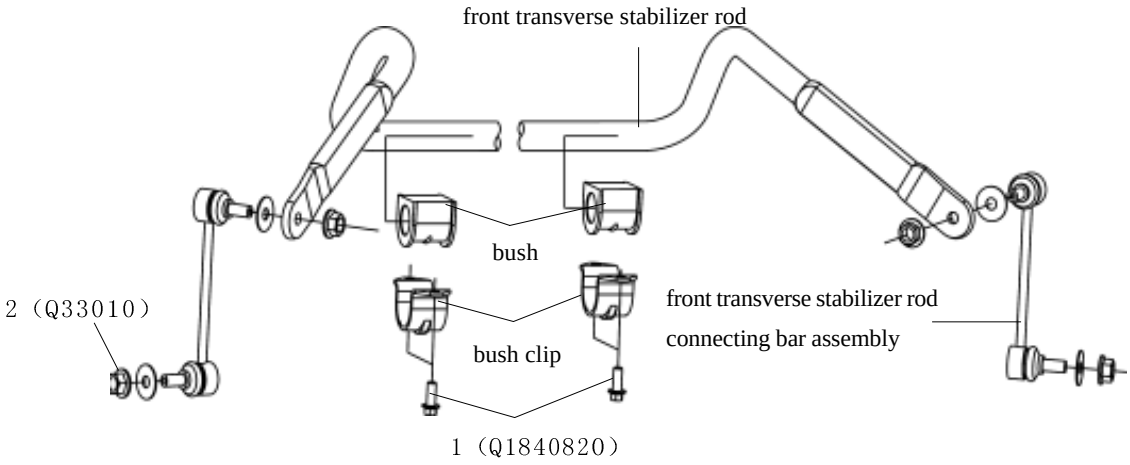
control items	request	control measure
Installation procedure	Locate the rear transverse stabilizer rob in the corresponding position of carriage, symmetries the left and right during installation.	Viewing confirmation
Connection of rear transverse stabilizer rod and rear axle	the fixed torque of nut 2 in the Figure is 23 ± 3N • m	Torque wrench
Connection of rear transverse stabilizer rod and rear transverse stabilizer robs connecting bar assembly.	the fixed torque of nut 1 in the Figure is 63 ± 5N • m	Torque wrench



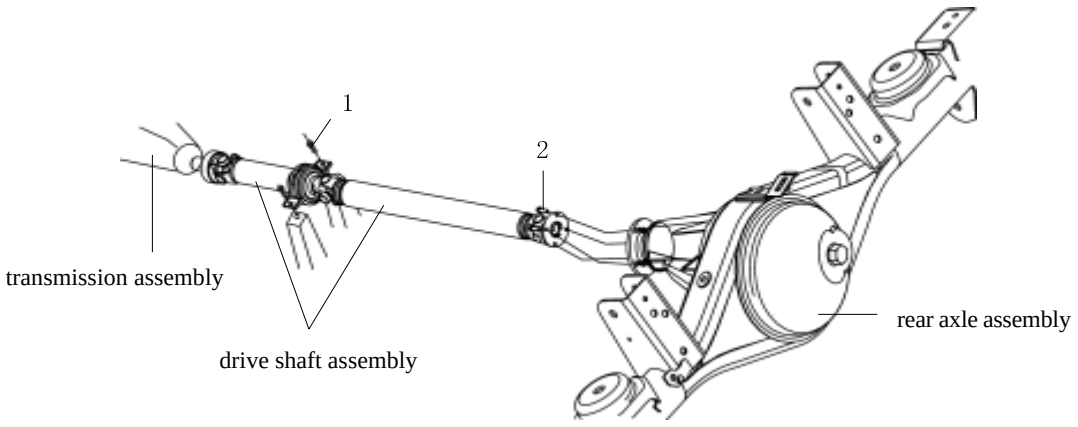
Control items	Request	Control measure
Upper suspension arm and upper suspension arm steering knuckle ball pin	the fixed torque of nut 1 in the Figure is 145 ± 15N • m	Torque wrench
Steering gear cross tie ball pin	the fixed torque of nut 2 in the Figure is120 ± 10N • m	Torque wrench
Lower suspension arm and lower suspension arm steering knuckle ball pin	the fixed torque of nut 3 in the Figure is 230 ± 20N • m	Torque wrench



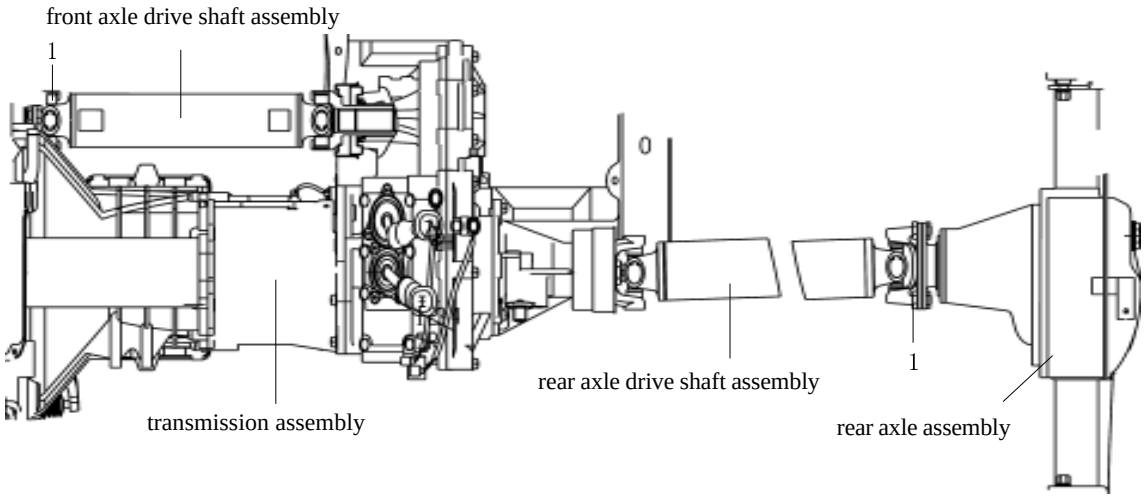
Control items	request	control measure
Connection of front transverse stabilizer rod and carriage.	the fixed torque of nut 1in the Figure is 25 ± 3N • m	Torque wrench
Connection of front transverse stabilizer rob and front transverse stabilizer rod connecting bar assembly	the fixed torque of nut 2in the Figure is 63 ± 5N • m	Torque wrench



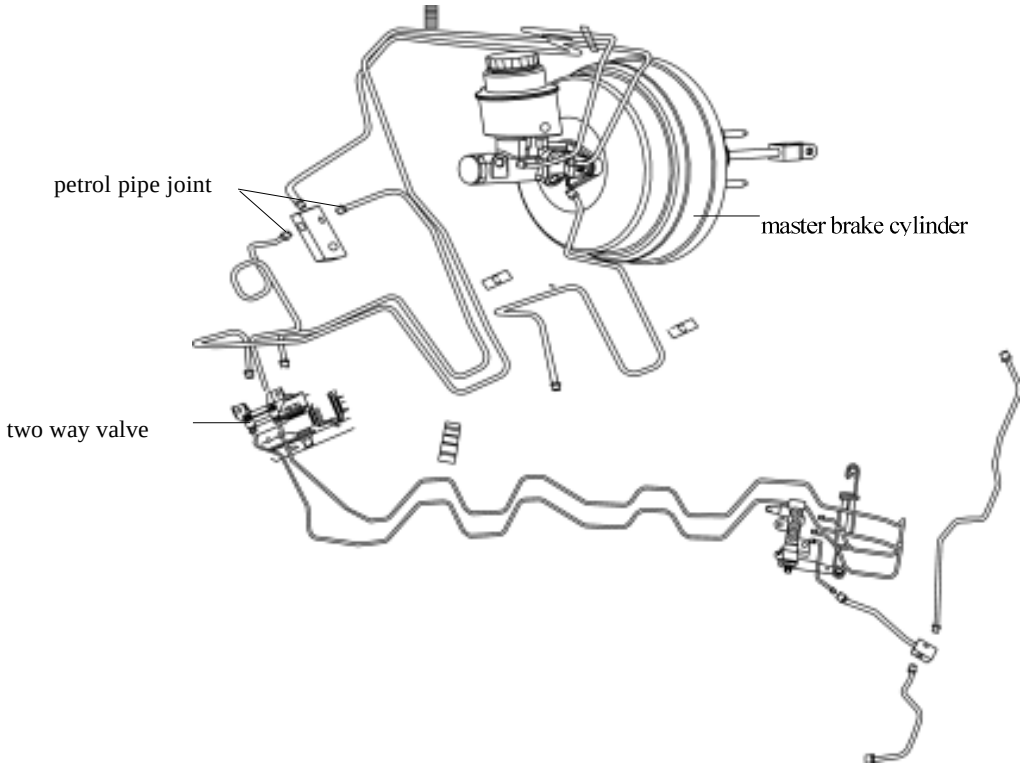
control item	Request	Control mean
Drive shaft assembly installation	Plug the front part of drive shaft into transmission assembly splinded shaft, after their good meshing, screw the central bearing hexagon bolt into the corresponding screw hole of the carriage	Viewing and handle confirmation
Center bearing connecting bolt	the fixed torque of bolt 1 in the Figure is 65 ± 5N • m	Torque wrench
Drive shaft bolt	the fixed torque of bolt 2in the Figure is 65 ± 5N • m	Torque wrench



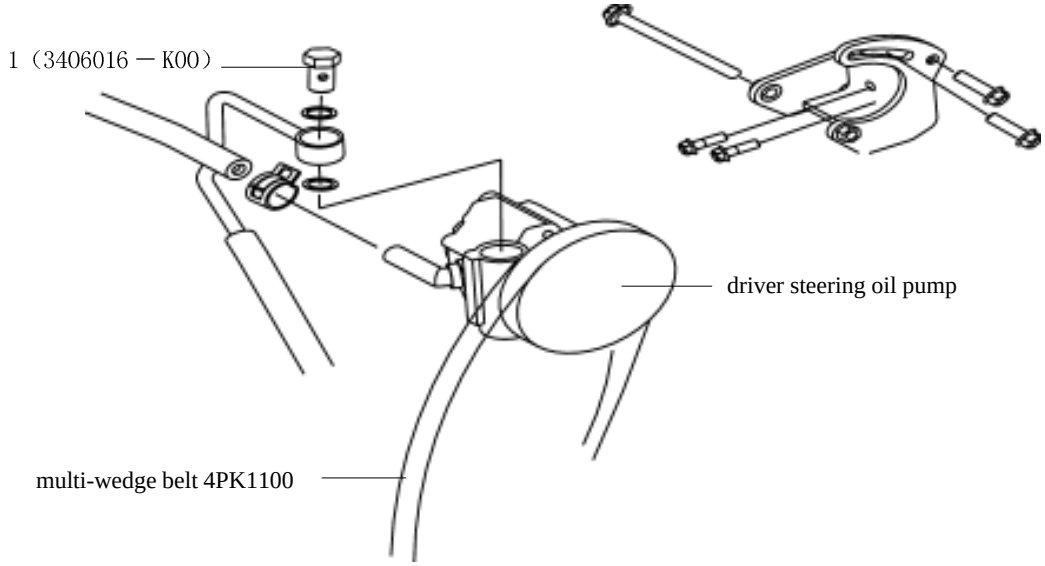
Control item	Request	Control mean
drive shaft bolt	the fixed torque of bolt 1 in the Figure is 78 ± 5N • m	torque wrentch



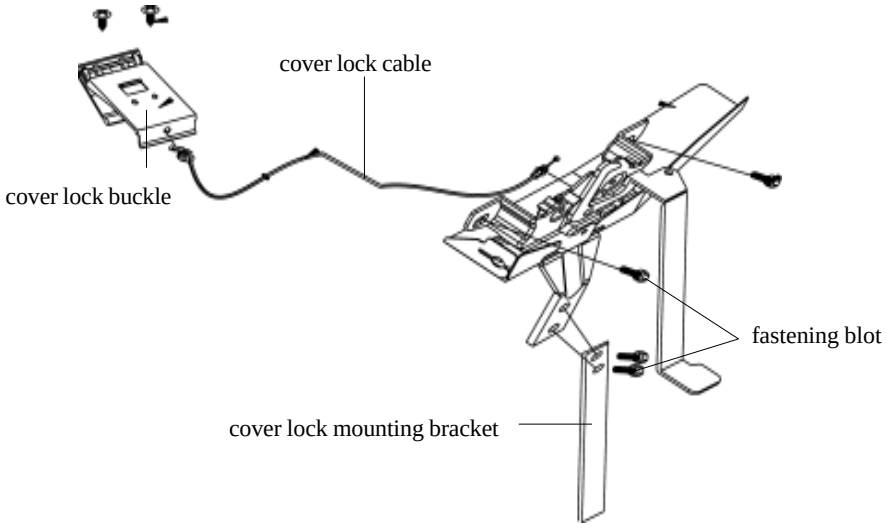
Control item	Request	Control mean
petrol lien joint Tightening torque	petrol line joint tightening torque is 16 ± 2 N	torque wrench



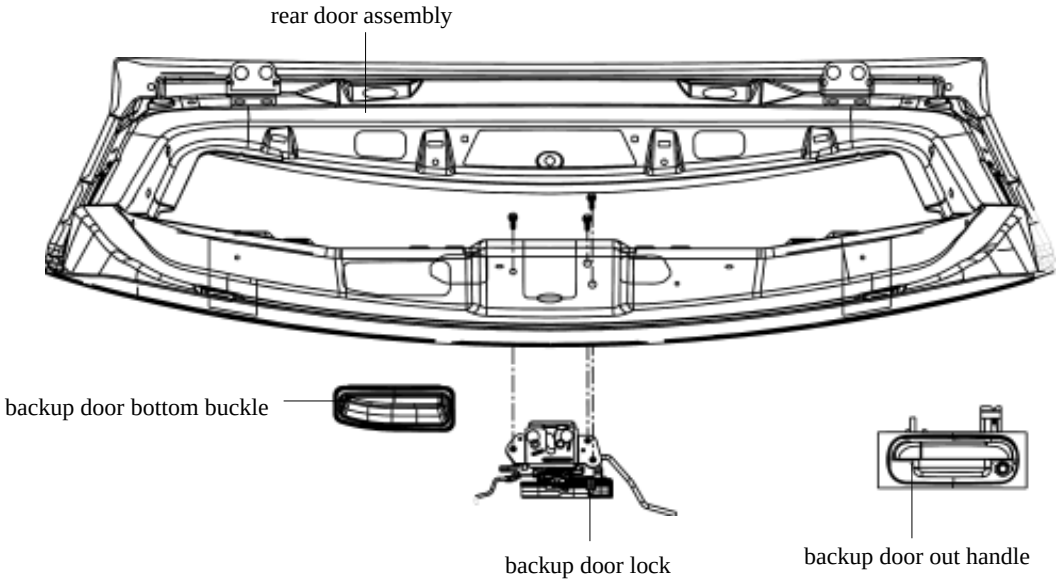
Control item	Request	Control mean
Driver steering oil pump installation	Fixed torque of tubular hexagon bolt 1 in the Figure is 40N • m	Torque
Multi-wedge belt	Multi-wedge belt 4PK1100 tension is 500 ± 50N	Torque



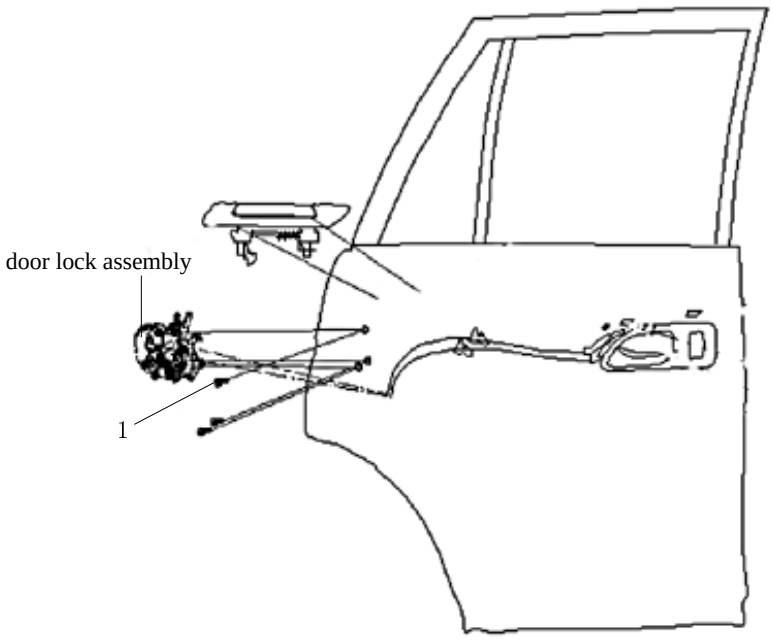
Control item	Request	Control mean
cover lock mounting bolt	Cover lock mounting bolt's torque is 9 ± 2N • m	torque wrench
effect	the cover lock can be opened freely, the position is reliable without any jam.	



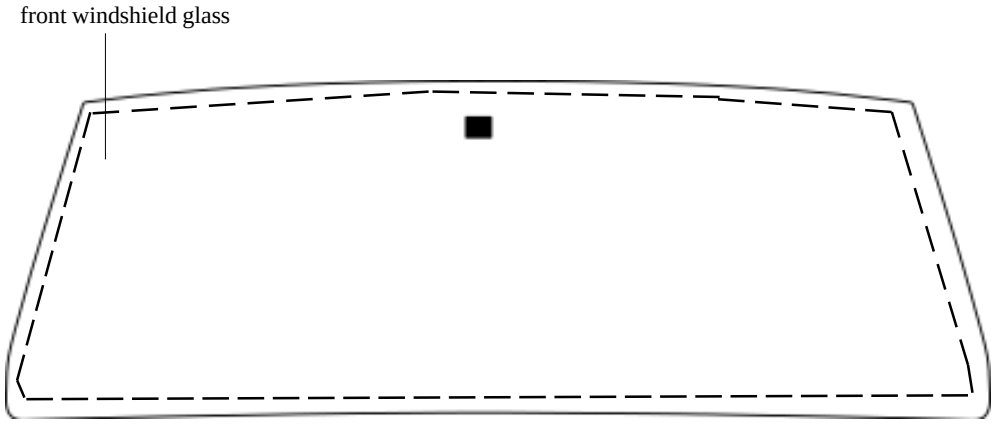
Control item	Request	Control mean
Effect	Out handle can be normally and efficiently used, no linkage falling off, the backup door can be opened and closed freely without any jam nor unlocking.	Handle confirmation



Control item	Request	Control mean
Lock installation	The fixed torque of bolt 1 in the Figure is 6 ± 1N • m	Torque wrench
Effect	The door can be opened and closed smoothly without any jam nor unlocking.	Handle confirmation

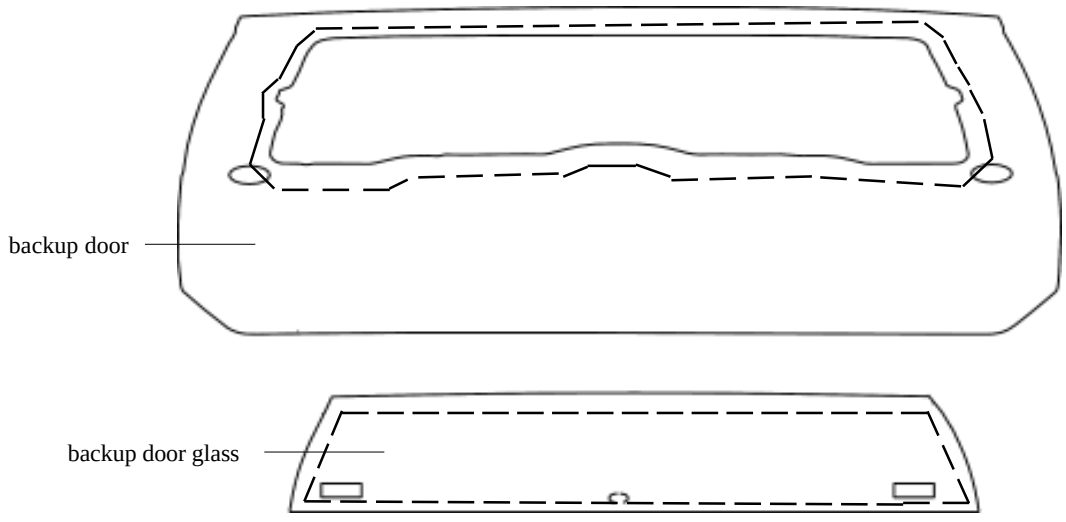


Control item	Request	Control mean
Apply washer on the front windshield glass-sticking region	Evenly apply it on the sticking region with the width of about 25mm and completely volatilize it.	Viewing confirmation
Apply base-coater on the front windshield glass-sticking region	Shake the base-coater to be sufficiently even followed by the even application on the sticking region with the width of about 20mm and dry it for 2-15 minutes	Viewing confirmation
Apply washer on front windshield glass	Wash the glass frame with the width of about 25mm, instantly clean it and volatilize the washer completely.	Viewing confirmation
Apply base-coater on front windshield glass	Shake the glass base-coater to be sufficiently even followed by the even application on the glass frame with the width of about 20 and dry it for 2-15 minutes	Viewing confirmation
Apply adhesive on front windshield glass	Vertically apply the glass adhesive on the glass frame and make it even and continuous. Height: 18mm, width: 12mm	Viewing confirmation
Front windshield glass fixing	Instantly install and fix the glass after the glass adhesive application. Set the left and right clearance between front windshield glass and the glass frame to be 12mm	Viewing confirmation



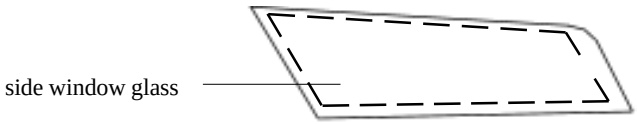
Wash, base-coat and stick according to the corresponding positions showed by the broken line in the Figure

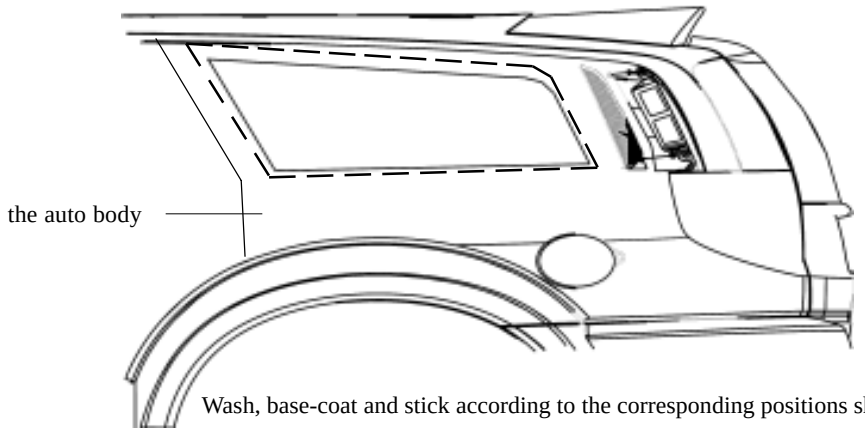
Control item	Request	Control mean
Apply washer on the glass-sticking region of the backup door	Evenly apply it on the sticking region with the width of about 25mm and volatilize it completely.	Viewing confirmation
Apply base-coater on the glass-sticking region of the backup door	Shake the base-coater to be sufficiently even followed by the even application on the sticking region with the width of about 20mm and dry it for 2-15 minutes	Viewing confirmation
Apply washer on the backup door glass frame	Wash the glass frame with the width of about 25mm and volatilize the washer	Viewing confirmation
Apply base-coater on the backup door glass frame	Shake the glass base-coater to be sufficiently even followed by the even application on the glass frame with the width of about 20 and dry it for 2-15 minutes	Viewing confirmation
Apply adhesive on the backup door glass frame	Vertically apply the glass adhesive on the glass frame and make it even, continuous. Height: 12mm, width: 8mm	Viewing confirmation
Backup door glass fixing	Instantly install and fix the glass after the glass adhesive application	Viewing/handle confirmation



Wash, base-coat and stick according to the corresponding positions showed by the broken line in the Figure

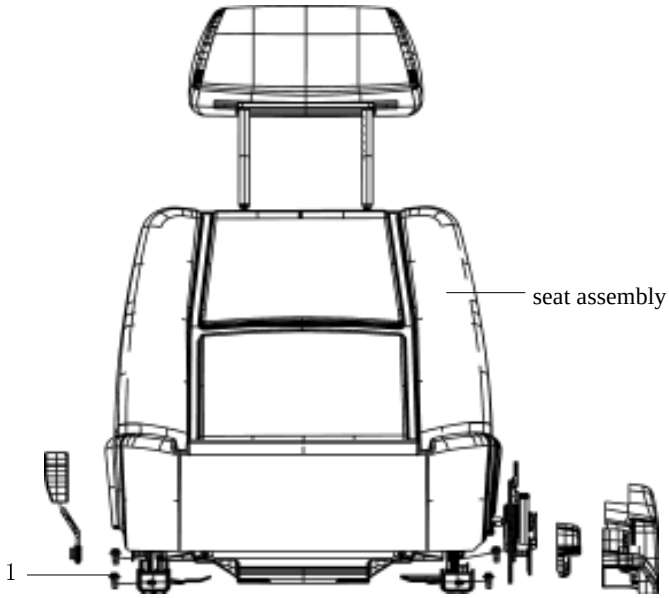
Control item	Request	Control mean
Apply washer on side window sticking region	Evenly apply it on the sticking region with the width of about 25mm and completely volatilize it.	Viewing confirmation
Apply base-coater on side window sticking region	Shake the base-coater to be sufficiently even (for at least 1 minute) followed by the even application on the sticking region with the width of about 20mm and dry it for 2-15minutes	Viewing confirmation
Apply washer on side window glass frame	Wash the glass frame with the width of about 25mm and volatilize the washer completely.	Viewing confirmation
Apply base coater on side window glass frame	Shake the base-coater to be sufficiently even followed by the even application on the glass frame with the width of about 2omm and dry it for 2-15 minutes.	Viewing confirmation
Apply adhesive on side window glass frame	Vertically apply the glass adhesive on the glass frame and make it even, continuous. Height: 12mm, width 8mm	Viewing confirmation
Side window fixing	Instantly install and fix the glass after the glass adhesive application.	Viewing /handle confirmation



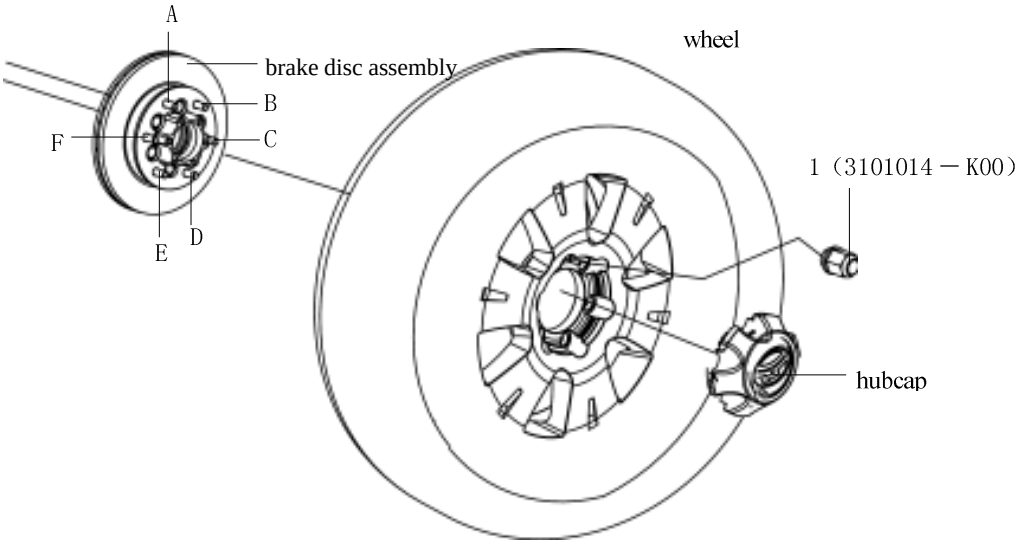


Wash, base-coat and stick according to the corresponding positions showed by the broken line in the Figure

Control item	Request	Control mean
Driver seat assembly installation	bolt 1 in the Figure tightening torque:is 33 — 43N • m	Torque wrench
Effect	The headrest can be up and down smoothly, angle-adjuster handle can be normally used, driver, co-driver seat can move freely and transmission trim cover can be freely opened.	Viewing and handle confirmation



Control item	Request	Control mean
Wheel nut fixing procedure	Installation order is A-C-E-B-D-F as showed in the Figure	Viewing confirmation
Wheel nut fixed torque	the fixed torque of nut 1 in the Figure is 135 ± 15N • m	torque wrench



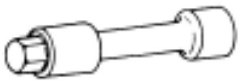
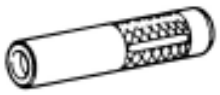
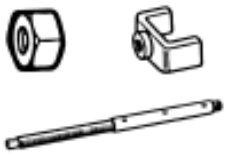
Non-metal materials consumption table

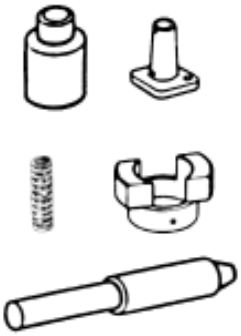
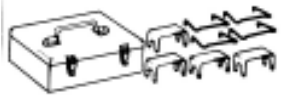
Name	Brand, specification and technical condition	Utility	Measuring unit	Suitable	Note
Silicon oil		Transmission lever. Three-hole rubber block	Kg	Suitable	
Thread block sealing agent	1271	Short, longitudinal front fixed bolt, hub cap bolt, transmission lever bolt, carriage fixing	L	Suitable	
Silicone rubber surface sealing agent	1596 (super gray)	Installing ring flange	L	Suitable	
Anti-freeze liquid	vinyl-EG --35℃ antifreeze liquid	Radiator and co-tank -	Kg	7	
Molybdenum disulfide pressed lithium base grease	3#	Twisted bar spline, speed shaft	L	Suitable	
Glass base coater	5001TF	Glass base coat	m	0.03	
Butyl tape	6×2×700	Air-filtering suction tube, door seal film	L	Suitable	
Attraction steering fluid	DEXRON3 (ATF-3)	Steering fuel cup assembly	L	1	
Clutch oil	DOT4	Clutch master cylinder	L	0.15	
Brake fluid	DOT4	Vacuum assist fluid reservoir	L	0.525	
Auto gear oil	GL-4 75W/90	Transmission	L	2.2	For the exported vehicle for extremely cold areas
Auto gear oil	GL-4 75W/90	Transfer case	L	2.7	For the exported vehicle for extremely cold areas
Auto gear oil	GL-4 80W/90	Transmission	L	1.4	
Auto gear oil	GL-4 80W/90	Transfer case	L	2.5	
Auto gear oil	GL-5 75W/90	Rear axle	L	2.9	For the exported vehicle for extremely cold areas 2.9L=5.14PTS
Auto gear oil	GL-5 80W/90	Rear axle	L	2.9	2.9L=5.14PTS

Auto gear oil	GL-5 140	Transmission	L	1.4	For the exported vehicle for extremely hot areas
Auto gear oil	GL-5 140	Transfer case	L	2.7	For the exported vehicle for extremely hot areas
Auto gear oil	GL-5 140	Rear axle	L	2.9	For the exported vehicle for extremely hot areas 2.9L=5.14PTS
Auto gear oil	GL-5 140	Front axle	L	1.4	For the exported vehicle for extremely hot areas 1.4L=2.46PTS
Auto gear oil	GL-5 75W/90	Front axle	L	1.4	
Auto gear oil	GL-5 80W/90	Front axle	L	1.4	1.4L=2.46PTS
Glass adhesive	HV3	Front windshield glass	L	0.6	
Glass adhesive	7120	Backup door glass, side window glass	L	0.9	
Clearance adhesive	LY-22	Luggage rack	Kg	Suitable	
Liquid adhesive	LY-609	Warming pipe, speed lever	L	0.02	
Windshield washer	Q35	Front and rear windows	L	3	
Refrigerant	R134a	Air-conditioning system	Kg	0.73	

Non-metal Materials Consumption Table.

Name	Brand, specification and technical condition	Utility	Measuring unit	Quantity	Note
Engine lubricating oil	SL 10W-40	Oil pan	L	4.3	Available for 4G64S4M engine
Engine lubricating oil	SL 5W-30	Oil pan	L	Suitable	Available for 4G64S4M engine and exported vehicles for extremely cold areas.
Glass activator	VP04604	Glass	L	Suitable	
Lithium base grease	Grease HP-R	Front axle, chassis parts	Kg	Suitable	
Industrial Vaseline		Seat support, accumulator points	Kg	Suitable	

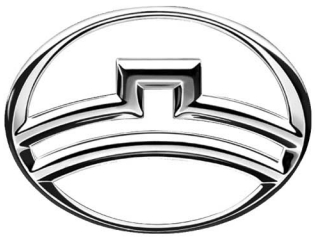
No.	Simple figure	Name	Note
1		oil pan oil seal cutter	
2		8mm hexagon nut wrench	
3		valve lever oil seal replacing tool	only for 1.4kw starter front bearing
4		valve guide bush removing or repairing tool	
5		valve spring presser	
6		crankshaft pulley remover	
7		crankshaft pulley fixing tool	
8		camshaft bearing removing and repairing tools	
9		plugging plate A bolt nut	
10		shaft A pin removing and replacement removing and replacement	

No.	Simple figure	Name	Note
11		belt tension gauge	
12		belt tension wire	
13		piston pin removing and replacing tool	
14		the auto body spring socket A guide A guide B	
15		crankshaft front oil seal replacing tool	
16		crankshaft oil seal replacing tool	
17		oil filter wrench	
18		radiator repairing tools assembly	only YT, YX provided
19		wire gauge assembly	except YK, YN, YU
20		idle adjusting thread wrench	SST
21		rocker arm pedestal tool	

Serial No.	Simple figure	Name	Note
22		valve tappet tool	
23		injection pump crankshaft bearing cone tool	*1. only for 1.0kw starter front bearing *2. only for high-speed, small rotor front bearing
24		injection pump spline shaft remover	*1. starter bearing *2. high-speed, small rotor front bearing assembly
25		oil seal remover	
26		mated flange fixing tool	crankshaft pulley
27		alternator rear bearing remover	only for high-speed, small ones
28		alternator pulley assembly nut wrench assembly	only for high-speed, small ones
29		5 × 12 mm wrench	except YK, YN, YU
30		universal remover	

Serial No.	Working region and specification	Torque N • m	Serial No.	Working region and specification	Torque N • m
1	upper arm shaft fixed bolt M14×1.5-10.9	200	25	engine suspension connecting bolt M10×1.25-10.9	78±10
2	front shaft of lower arm connecting bolt M16×1.5-10.9	270±25	26	transmission suspension connecting bolt M10×1.25-10.9	78±10
3	rear shaft of lower arm connecting bolt M18×1.5-10.9	320±30	27	transmission-engine connecting bolt M10×1.25-10.9	50±5
4	bottom arm limiting stopper fixed bolt M10×1.25-8.8	63±5	28	drive shaft connecting bolt M10×1.25-10.9	78±5
5	upper arm ball pin pedestal connecting bolt M10×1.25-10.9	78±10	29	drive shaft bearing fixed bolt M10×1.25-8.8	65±5
6	bottom arm ball pin pedestal connecting bolt M12×1.25-10.9	140±10	30	wheel nut M12×1.25	135±15
7	front twisted bar pedestal connecting bolt M12×1.25-10.9	140±10	31	steering wheel lock nut M12×1.25-8	30±5
8	upper arm ball channel fixing nut M16×1.5-10	145±15	32	steering gear-carriage fixing nut M12×1.25-8	90±10
9	front vibration damper upper fixing nut M10×1.25-8	Bush compressed by 1/3	33		70±10
				steering angle drive co-carriage bolt M10×1.5-9.8	50±5
10	bottom arm ball pin channel fixing nut M18×1.5-10	230±20	34	steering system universal-joint lock bolt M8×1.25-8.8	25±3
11	front vibration damper bottom connecting bolt M12×1.25-8.8	90±10	35	steering linkage ball fixing nut M14×1.5-8	120±10
12	rear vibration damper upper fixing nut M10×1.25-8	Bush compressed by 1/3	36	steering linkage adjustment lock nut M14×1.5-8	60±5
13	rear vibration damper bottom fixing nut M14×1.5-8	170±15	37	front axle front shackle connecting bolt M14×1.5-10.9	180±20
14	front cross stabilizer rod -carriage fixed bolt M8×1.25-8.8	23±3	38	front axle rear shackle connecting bolt M14×1.5-10.9	180±20

15	front cross stabilizer rod -connecting bar bottom arm bolt M10×1.25-8	63±5	39	brake petrol pipe joint M10×1.25	16
16	long longitudinal tie connecting bolt M14×1.5-10.9	200±20	40	safety belt body connecting bolt 7/16″ -8.8	40±2
17	short longitudinal tie front connecting bolt M14×1.5-10.9	180±15	41	safety belt seat connecting bolt 7/16″ -8.8	40±2
18	short longitudinal tie rear connecting bolt M14×1.5-10.9	200±20	42	body suspension connecting bolt M10×1.25-9.8	63±5
19	cross tie -carriage connecting bolt M14×1.5-10.9	200±20	43	Engine oil pan drain bolt	40±5
20	cross tie -rear axle fixing nut M14×1.5-8	180±15	44	Transmission/transfer case refueling/drain bolt	30～35
21	rear cross stabilizer rod -rear axle fixed bolt M8×1.25-8.8	23±3	45	front drive axle refueling bolt M20×1.5	145±5
22	rear cross stabilizer rod -connecting bar -carriage bolt M10×1.25-8	63±5	46	Front drive axle drain bolt Rc1/2	30～35
23	standby tire bracket fixed bolt 10×1.25-8.8	63±5	47	rear drive axle refueling/drain bolt M20×1.5	145±5
24	standby tire lifter fixed bolt M8×1.25-8.8	25±3	48	Starter and wheel box connecting bolt	30±3



improving little by little everyday

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