

FRONT AXLE (ISO 10-STUDS TYPE)

AX02-001

FRONT AXLE (ISO 10-STUDS TYPE) AX02-2

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FRONT AXLE (ISO 10-STUDS TYPE)

DATA AND SPECIFICATIONS

EN0861902I200001

Specifications

Model	FR, FS, FY, SH, SS	ZS
Front axle series No.	MF78I	MFM08I
Axle beam type	Reversed Elliot "I" beam	
Axle beam material	Heat-treated carbon	
Brake drum location	Outboard mounted	
Wheel bearing	Two tapered roller bearings	
King pin thrust bearing	Ball bearing	
Amount of grease in a hub	600 g {21.2 oz} at one wheel	

Wheel alignment

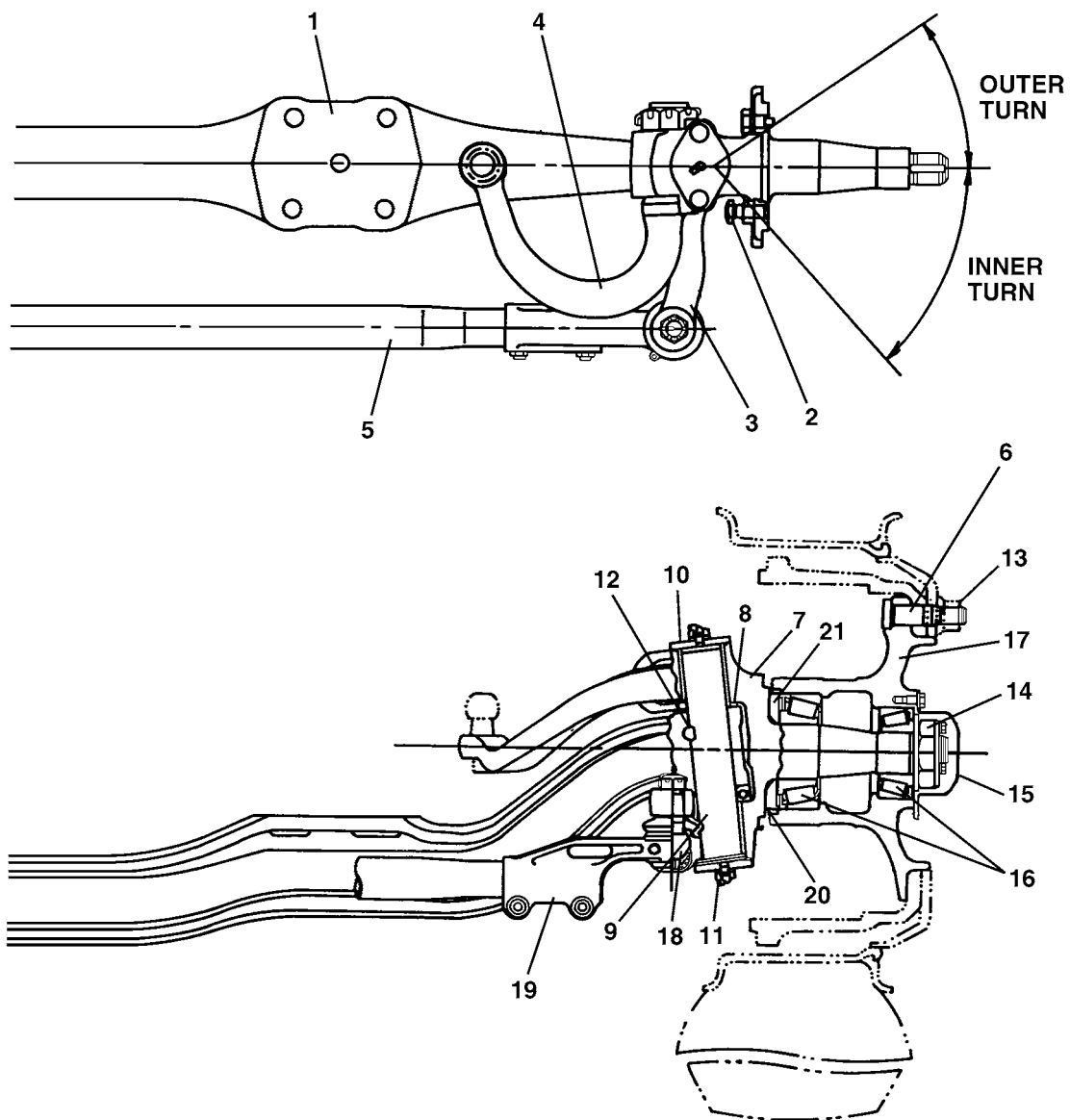
Camber		0°-2°
King pin angle		6°-8°
Caster		1°30'
Toe-in	Diagonal tires	1-3 mm {0.0394-0.1181 in.}
	Radial tires	0-2 mm {0-0.0787 in.}

Knuckle turning angle

Models		Tire size	Inner turn	Outer turn
FR, FS, SH, SS		295/80R 22.5	48°-50°	39°
		315/80R 22.5	45°-47°	39°
ZS		385/80R 22.5	41°	34°
FY	Front forward axle	295/80R 22.5	44°-46°	34.5°
		315/80R 22.5	39°-41°	34°
	Front rearward axle	295/80R 22.5	34°-36°	30°
		315/80R 22.5	29.5°-31.5°	27.5°

DESCRIPTION

EN0861902C100001



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- | | |
|----|---------------------|
| 1 | Axle beam |
| 2 | Stopper bolt |
| 3 | Tie-rod arm |
| 4 | Knuckle arm |
| 5 | Tie rod |
| 6 | Hub bolt |
| 7 | Knuckle |
| 8 | Thrust washer |
| 9 | King pin |
| 10 | King pin cover |
| 11 | Lubrication fitting |

- | | |
|----|-------------------|
| 12 | Lock pin |
| 13 | Wheel nut |
| 14 | Lock nut |
| 15 | Hub cap |
| 16 | Wheel hub bearing |
| 17 | Wheel hub |
| 18 | Ball stud |
| 19 | Tie-rod end |
| 20 | Oil seal |
| 21 | Oil seal guide |

TROUBLESHOOTING

EN0861902F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster or king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheels.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter STEERING EQUIPMENT.
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap bolts are not tightened properly	Tighten the bolts properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0861902K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

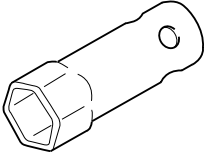
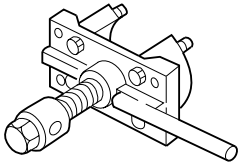
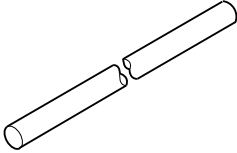
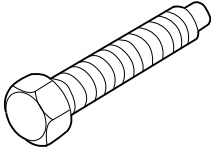
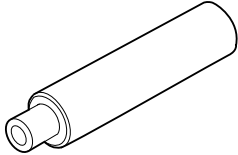
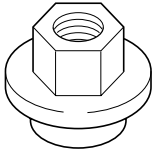
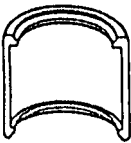
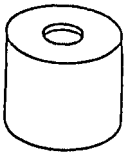
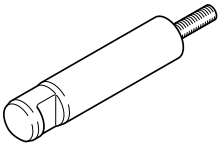
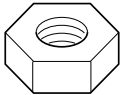
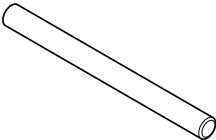
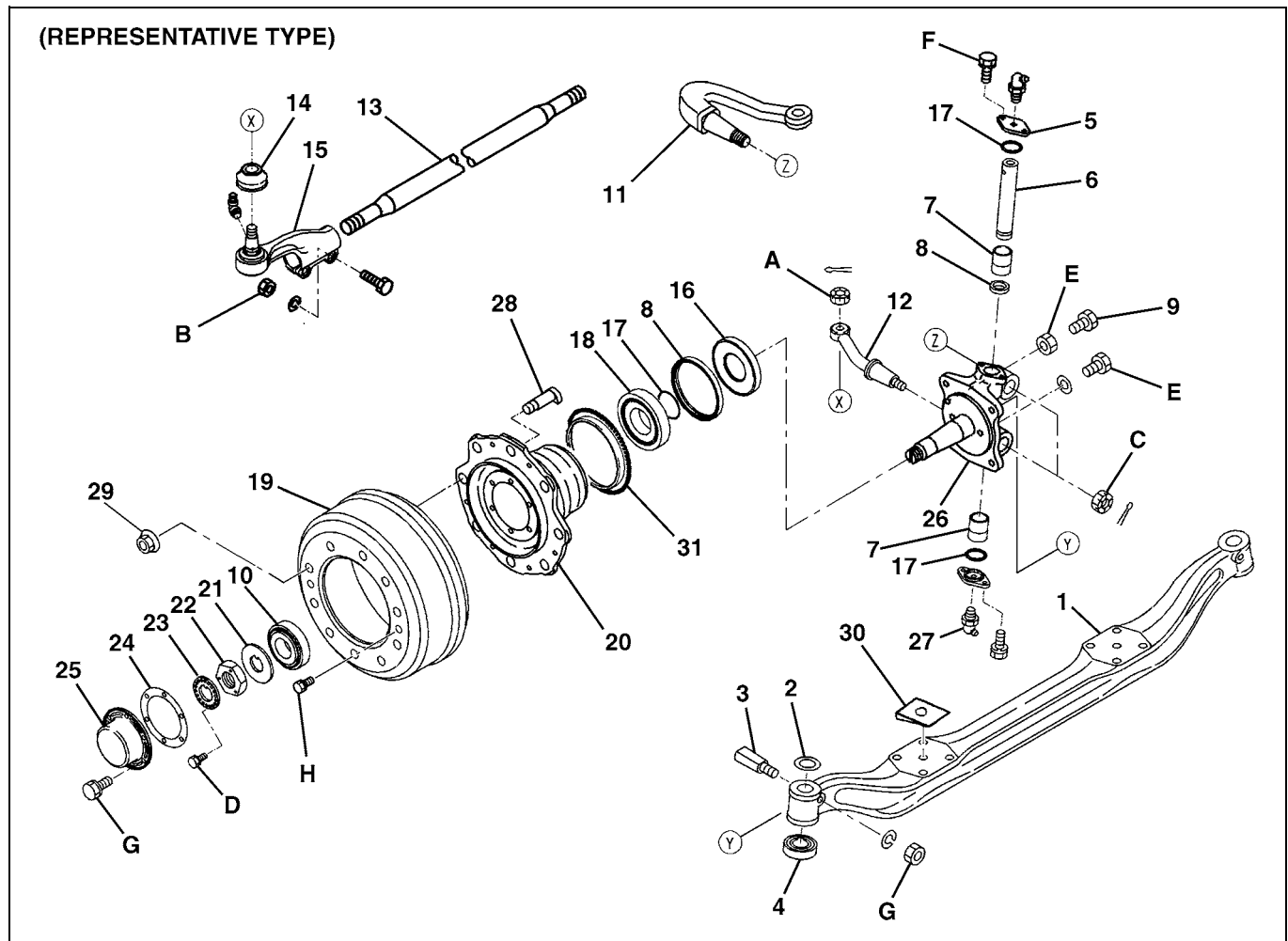
Illustration	Part number	Tool name	Remarks
	09839-7001	SOCKET WRENCH	
	09650-1790	WHEEL HUB PULLER	
	09849-2001	HANDLE	
	09652-1210	SCREW PULLER	2 PIECES
	09659-1010	ADAPTER	
	9209-20120	DUST COVER GUIDE NUT	
	09657-1790	DUST COVER GUIDE (INNER)	2 PIECES

Illustration	Part number	Tool name	Remarks
	09657-1800	DUST COVER GUIDE (OUTER)	
	09657-1350	KING PIN GUIDE	
	09654-1300	PLATE	
	9201-16130	NUT	
	09712-1100	BAR	

COMPONENT LOCATOR

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FOR RIGHT-HAND DRIVE MODELS



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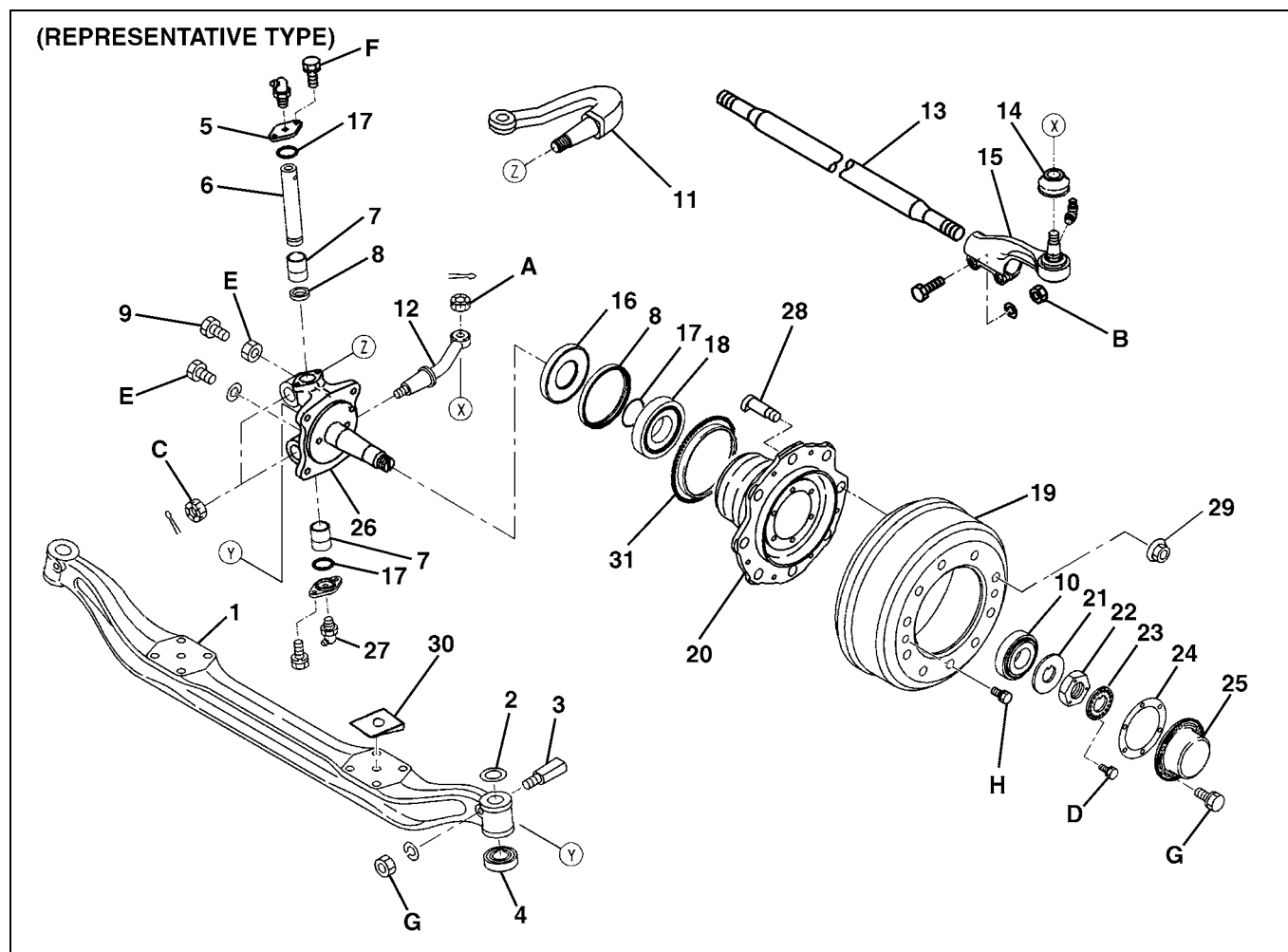
1 Axle beam	12 Tie-rod arm	23 Lock plate
2 Thrust washer	13 Tie rod	24 Gasket
3 Lock pin	14 Dust cover	25 Wheel hub cap
4 Thrust bearing	15 Tie-rod end assembly	26 Knuckle
5 King pin cover	16 Oil seal guide	27 Lubrication fitting
6 King pin	17 O-ring	28 Hub bolt
7 Bushing	18 Inner wheel hub bearing	29 Wheel nut
8 Oil seal	19 Brake drum	30 Caster shim
9 Stopper bolt	20 Wheel hub	31 ABS sensor ring (If so equipped)
10 Outer wheel hub bearing	21 Washer	
11 Knuckle arm	22 Wheel hub bearing lock nut	

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

A 147-343 {1,499-3,497, 109-252}	E 96-144 {979-1,468, 71-106}
B 85.5-114.5 {872-1,167, 64-84}	F 105.5-144.5 {1,076-1,473, 78-106}
C 685-1,175 {6,986-11,981, 506-866}	G 37.5-48.5 {383-494, 28-35}
D 8.5-10.5 {87-107, 6.3-7.7}	H 20.5-39.5 {210-402, 16-29}

FOR LEFT-HAND DRIVE MODELS



SHTS086190200015

1 Axle beam	12 Tie-rod arm	23 Lock plate
2 Thrust washer	13 Tie rod	24 Gasket
3 Lock pin	14 Dust cover	25 Wheel hub cap
4 Thrust bearing	15 Tie-rod end assembly	26 Knuckle
5 King pin cover	16 Oil seal guide	27 Lubrication fitting
6 King pin	17 O-ring	28 Hub bolt
7 Bushing	18 Inner wheel hub bearing	29 Wheel nut
8 Oil seal	19 Brake drum	30 Caster shim
9 Stopper bolt	20 Wheel hub	31 ABS sensor ring (If so equipped)
10 Outer wheel hub bearing	21 Washer	
11 Knuckle arm	22 Wheel hub bearing lock nut	

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

A 147-343 {1,499-3,497, 109-252}	E 96-144 {979-1,468, 71-106}
B 85.5-114.5 {872-1,167, 64-84}	F 105.5-144.5 {1,076-1,473, 78-106}
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D 8.5-10.5 {87-107, 6.3-7.7}	H 20.5-39.5 {210-402, 16-29}

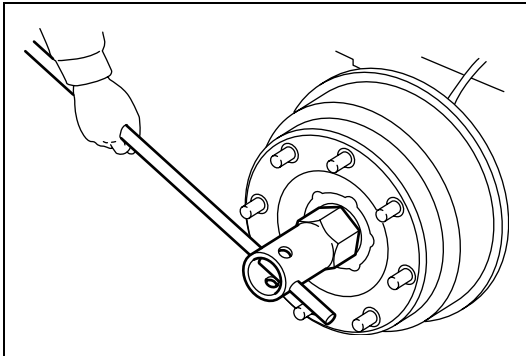
OVERHAUL

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IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF THE WHEELS

- (1) Refer to chapter WHEEL & TIRE.



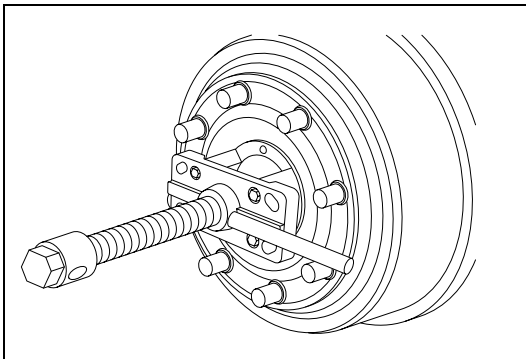
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2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT

SST:

Socket Wrench (09839-7001)

Handle (09849-2001)



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3. REMOVAL OF THE WHEEL HUB ASSEMBLY AND THE INNER RACE OF OUTER WHEEL HUB BEARING

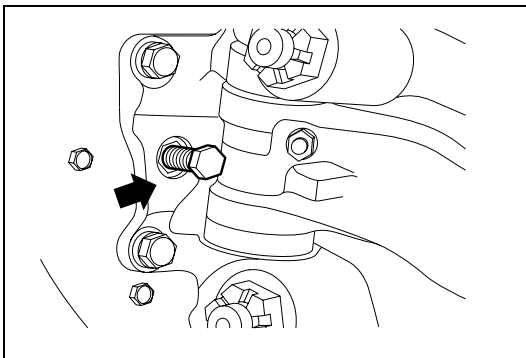
SST:

Wheel Hub Puller (09650-1790)

Handle (09849-2001)

NOTICE

Wheel hub assembly is heavy, therefore be careful when handling it.



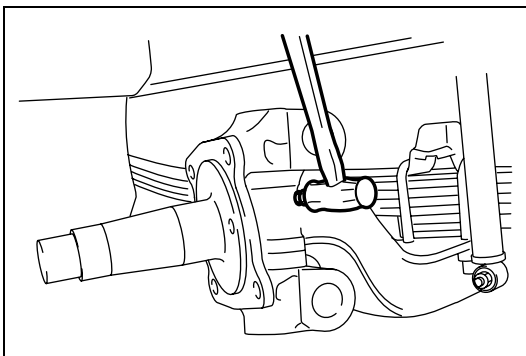
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4. REMOVAL OF THE INNER RACE OF INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE

SST: Screw Puller (09652-1210)

5. REMOVAL OF THE WHEEL BRAKE

- (1) Refer to chapter SERVICE BRAKE.



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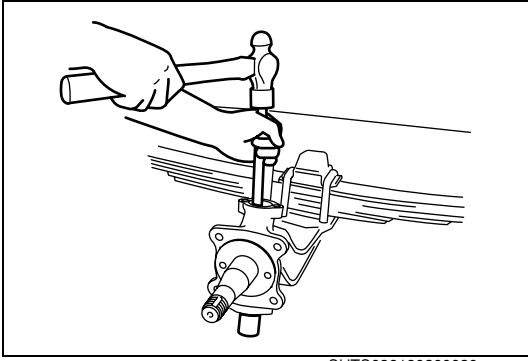
6. REMOVAL OF THE LOCK PIN

- (1) Remove the lock nut.
- (2) Drive out the lock pin, using a special tool and a hammer.

SST: Adapter (09659-1010)

NOTICE

Be careful not to bend the thread part.



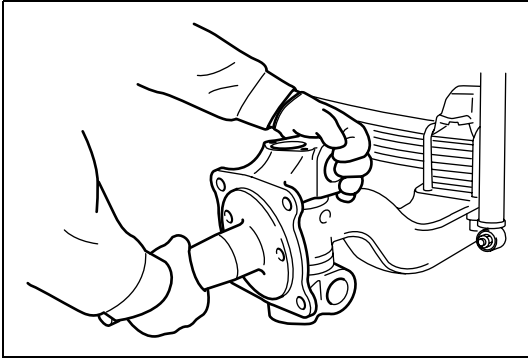
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7. REMOVAL OF THE KING PIN

- (1) Drive out the king pin, using a brass bar and a hammer.

NOTICE

- Be careful not to damage the inner surface of bush of knuckle and insert part of king pin of axle beam.
- Be careful not to drop the king pin.



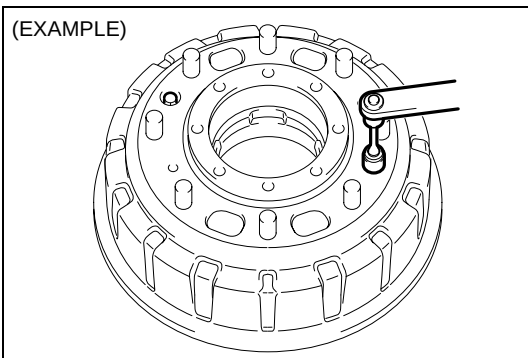
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8. REMOVAL OF THE KNUCKLE

- (1) Remove the knuckle, thrust washer and thrust bearings.

NOTICE

Be careful not to drop the thrust washer and thrust bearings.

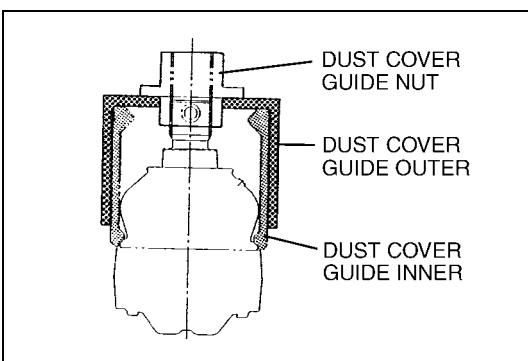


(EXAMPLE)

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9. SEPARATION OF THE BRAKE DRUM AND WHEEL HUB

- (1) Remove the bolts, and separate the brake drum and wheel hub.



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IMPORTANT POINTS - ASSEMBLY**1. REPLACEMENT OF THE DUST COVER****NOTICE**

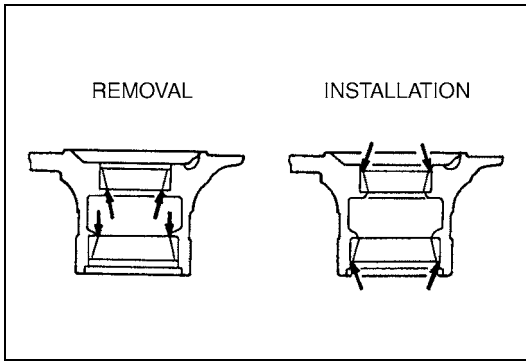
Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST:

Dust Cover Guide Nut (9209-20120)

Dust Cover Guide Inner (09657-1790)

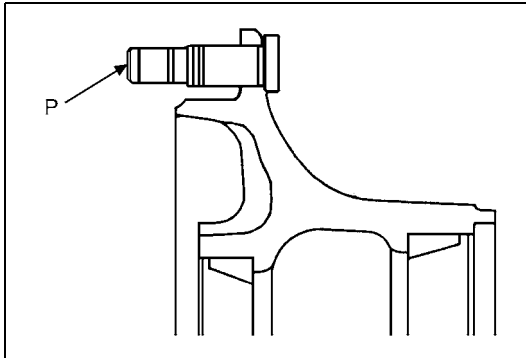
Dust Cover Guide Outer (09657-1800)



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2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

- (1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.
- (2) To install the outer race, use a tapping rod and a hammer, or a press.



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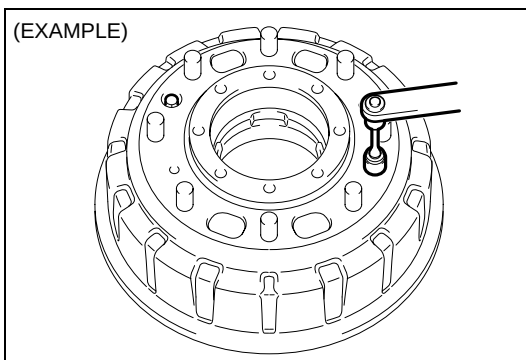
3. REPLACEMENT OF THE HUB BOLTS

- (1) Remove the hub bolts from the wheel hub.
- (2) Install the new hub bolts.

NOTICE

The right and left hub bolts differ, so install them according to the chart below.

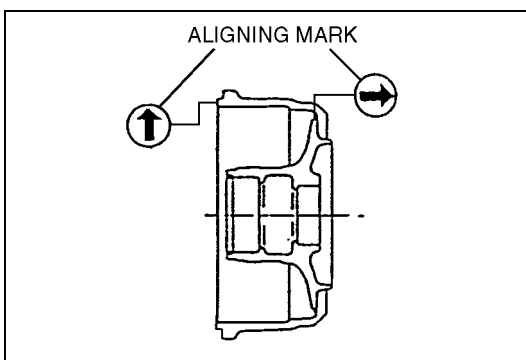
	Marks at "P"	Color
RIGHT	R	Gold
LEFT	L	Silver



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4. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB

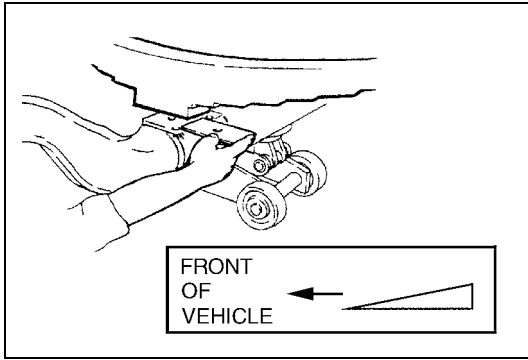
- (1) Assemble the brake drum and wheel hub, and tighten the bolts.



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NOTICE

When assembling the brake drum and wheel hub, make sure that their aligning marks are oriented as closely to each other as possible.



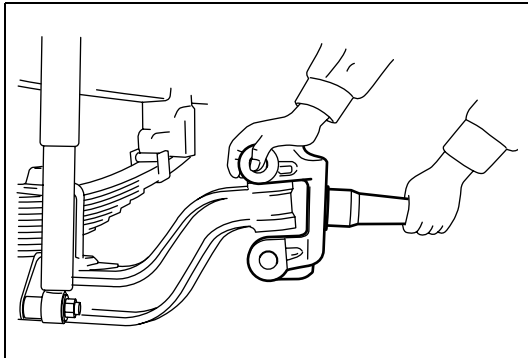
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5. INSTALLATION OF THE AXLE BEAM

- (1) Secure the axle to the leaf springs with U-bolts.

NOTICE

Confirm the direction of caster shim.

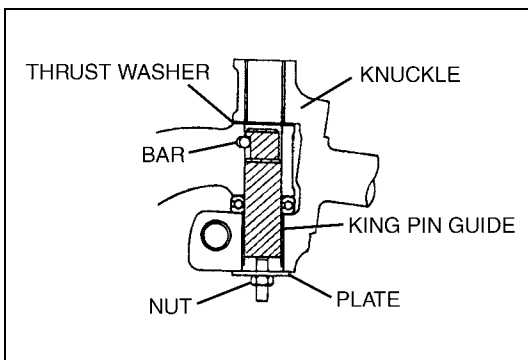


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6. INSTALLATION OF THE KNUCKLE

NOTICE

Before installation, apply chassis grease to the king pin bush, the rip part of the oil seal and the sliding surfaces of axle beam and knuckle.



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7. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE

- (1) Adjust the clearance with the correct thickness thrust washer.

Assembly Standard: Less than 0.1 mm {0.004 in.}

Thickness of Thrust Washer: mm {in.}

3.2 {0.126}	3.3 {0.130}	3.4 {0.134}	3.5 {0.138}
3.6 {0.142}	3.7 {0.146}	3.8 {0.150}	

SST:

King Pin Guide (09657-1350)

Plate (09654-1300)

Nut (9201-16130)

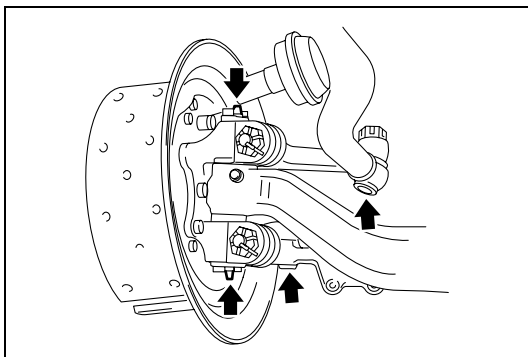
Bar (09712-1100)

8. ASSEMBLY OF THE WHEEL BRAKE

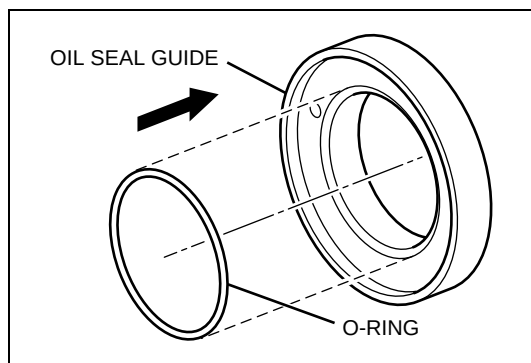
- (1) Refer to chapter SERVICE BRAKE.

9. LUBRICATION

- (1) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.
- (2) Lubricate the ball joint of the drag link and the tie rod with the chassis grease, using the lubrication fittings.



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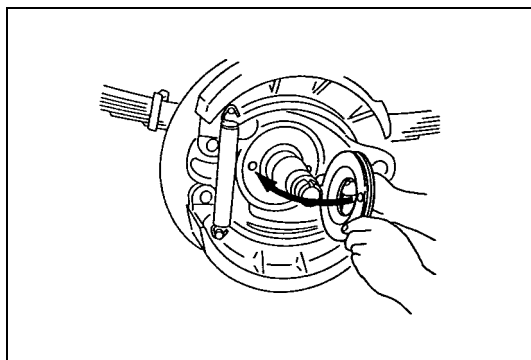


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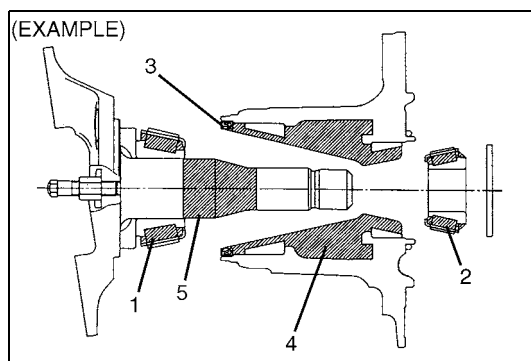
10. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

- Install the O-ring to bore side of oil seal guide as shown in the figure.
- Align the stopper bolt hole of the knuckle and oil seal guide hole.
- If oil seal guide is warmed up with hot water, it can easily be installed.



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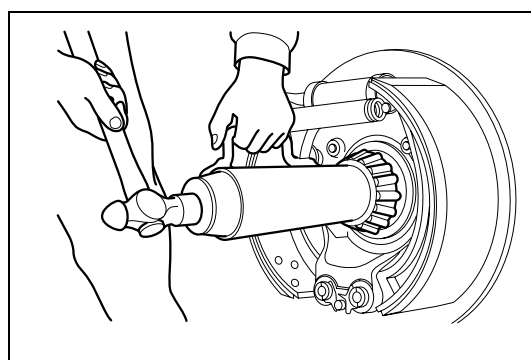
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11. GREASING

- (1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

- (2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.



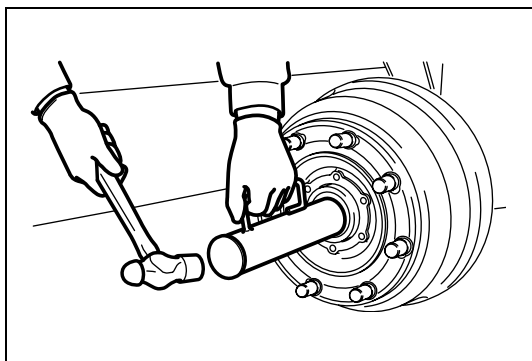
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12. INSTALLATION OF THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

- (1) Install the inner race of inner wheel hub bearing.

NOTICE

Using a tool as shown, simplifies installation.



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- (2) Install the oil seal in the wheel hub.
- (3) Install the wheel hub assembly and the inner race of outer wheel hub bearing.

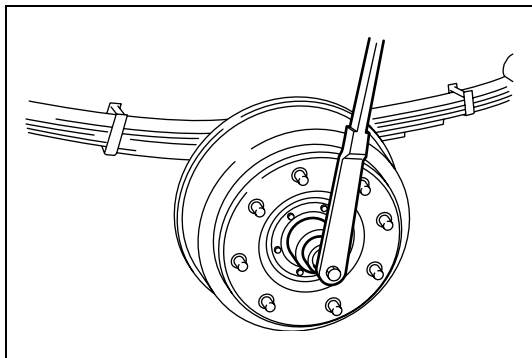
NOTICE

- Using a tool as shown, simplifies installation.
- The wheel hub assembly is heavy, therefore be careful when handling it.

- (4) Install the lock washer.

NOTICE

Apply bearing grease to the space between outer wheel hub bearing and lock washer.



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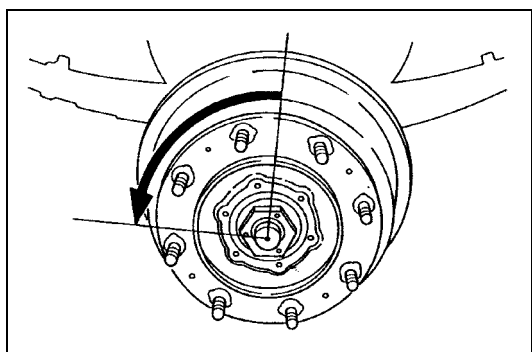
13. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

- (1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.

Tightening Torque:

Approx. 343 N·m {3,500 kgf·cm, 253 lbf·ft}

SST: Socket Wrench (09839-7001)

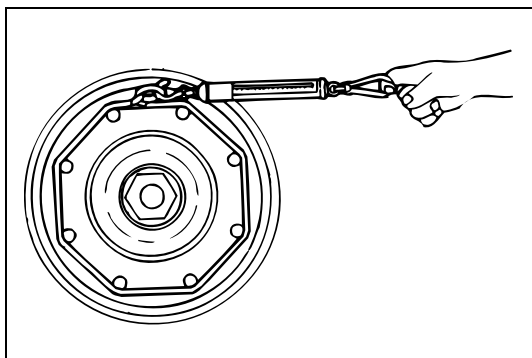


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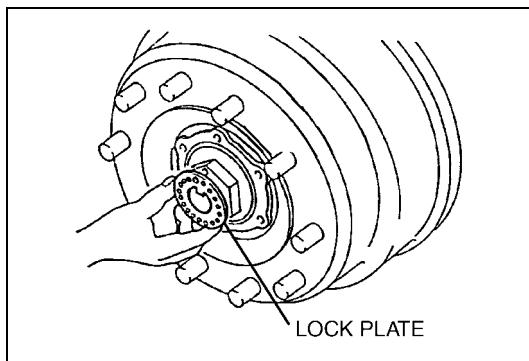
- (2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)
- (3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, and adjust the preload with the lock nut.

Assembly Standard:

	New bearing	Re-used bearing
Turning Torque N·m {kgf·cm, lbf·ft}	3.14-5.10 {33-35, 2.4-3.7}	2.94-5.10 {30-35, 2.2-3.7}
Spring balancer reading N {kgf, lbf}	18.7-30.4 {2.0-3.0, 4.3-6.8}	17.6-30.4 {1.8-3.0, 4.0-6.8}



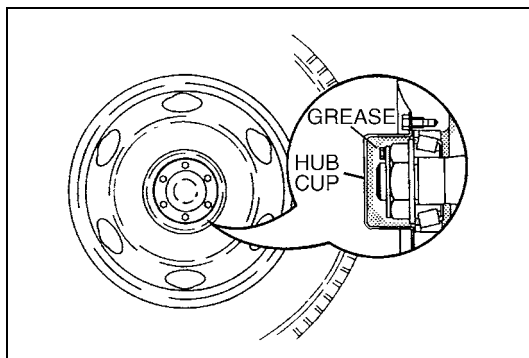
SHTS086190200038



SHTS086190200039

14. INSTALLATION OF THE LOCK PLATE**NOTICE**

- If the holes of the plate are not aligned with the screw holes of the nut, turn over the plate.
- If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.



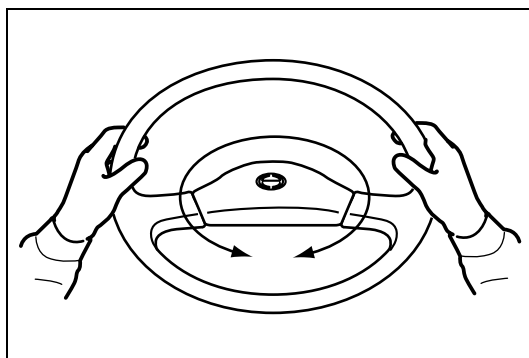
SHTS086190200040

15. INSTALLATION OF THE HUB CAP**NOTICE**

Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.

16. INSTALLATION OF THE WHEELS

- (1) Refer to chapter WHEEL & TIRE.



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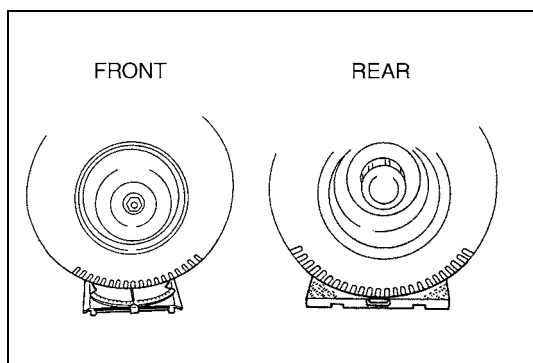
17. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

18. THE BRAKE SHOE CLEARANCE AND THE BRAKE CHAMBER ROD STROKE ADJUSTMENT

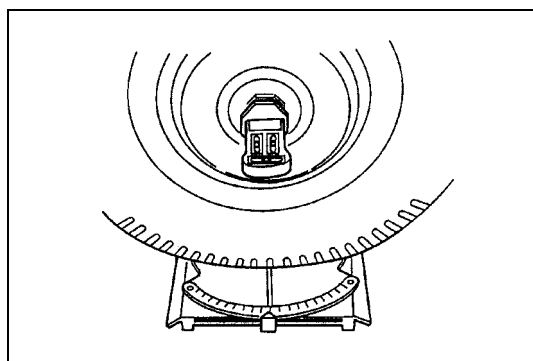
- (1) On completion of the wheel hub and related parts reassembly, conduct the followings:
 - Adjust the brake shoe clearance according to the section WHEEL BRAKE in the chapter SERVICE BRAKE.

INSPECTION AND ADJUSTMENT

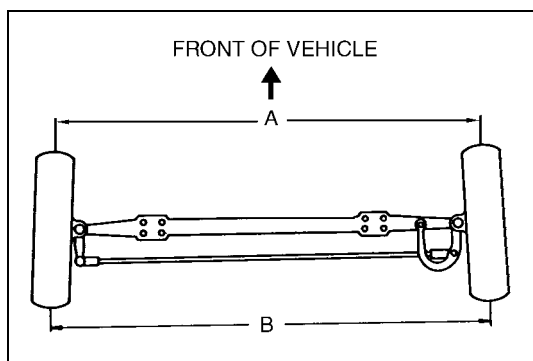
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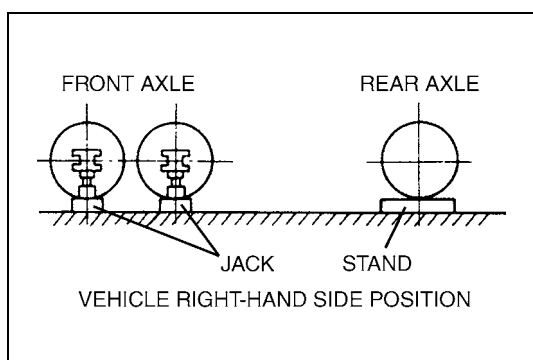
SHTS086190200042



SHTS086190200043



SHTS086190200044



SHTS086190200045

1. INSPECTION OF THE WHEEL ALIGNMENT

- (1) Park the vehicle on a level surface and check the tire pressure.

- (2) Adjust the king pin inclination, caster, and camber. Refer to section DATA AND SPECIFICATIONS.

- (3) Check the toe-in.

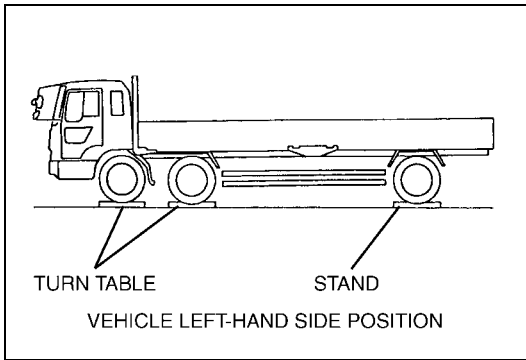
- $B - A = \text{Toe-in}$

2. ADJUSTMENT OF ALIGNMENT BETWEEN FRONT FOWERD AXLE AND FRONT REARWARD AXLE (MODEL: FY)

NOTICE

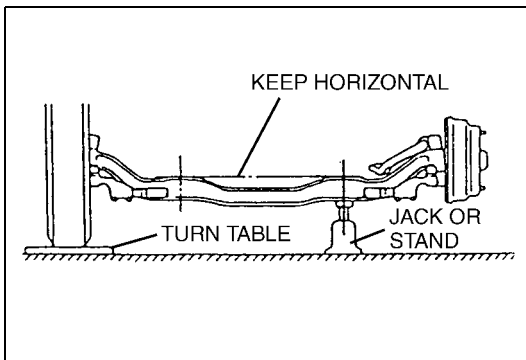
Following procedures to Right-hand drive models.

- (1) Toe-in must be adjusted within the specified value for both forward and rearward front axles.
- (2) Park the unloaded vehicle on a level surface.
- (3) Remove the right side tires from front axles with placing a stand or a jack under the front axle beams at the right-hand side.



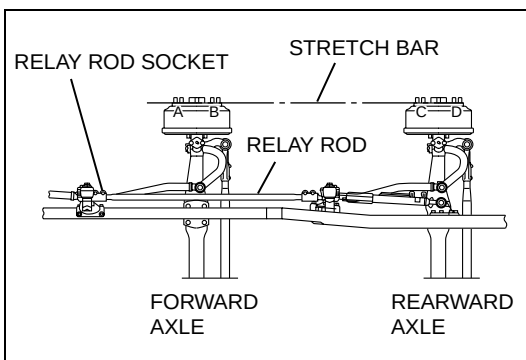
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- (4) Place the turn table under the left side tires of the both front axes.



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- (5) Adjust the height of the stand or jack so that the front axle beams are level.

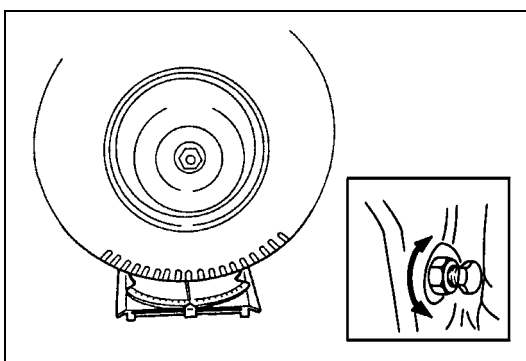


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- (6) Set the brake drum surface of first axle and frame for parallel.
- (7) Set the stretch bar on the sides of the hub at the right-hand side of the forward and rearward front axes.
- (8) Make proper adjustment by mean of the relay rod so that the four points, "A", "B", "C" and "D" may be on the same line.
- Clearance between front rearward axle hub side face and the stretch bar:**
0.4 mm {0.016 in.} or less
- (9) Check the toe-in after the tire has been installed.

NOTICE

At this time, if adjusted the tie rod, confirm above item 7 and 8.



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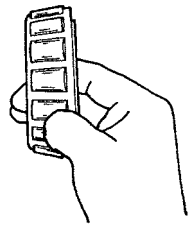
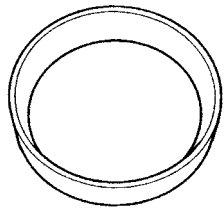
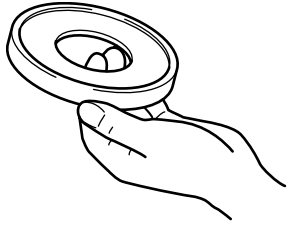
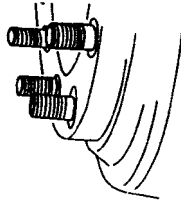
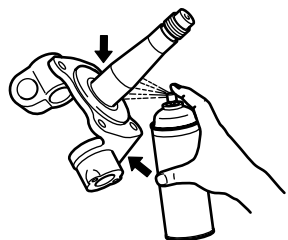
3. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

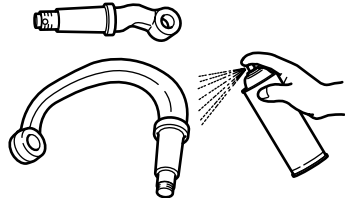
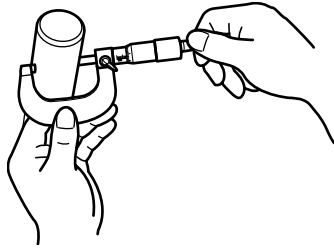
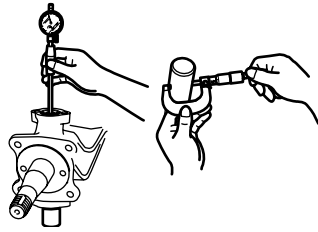
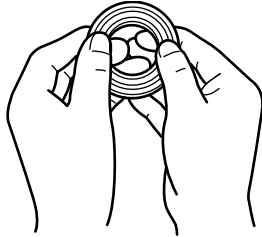
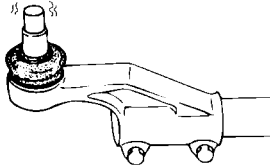
- (1) Refer to section DATA AND SPECIFICATIONS.

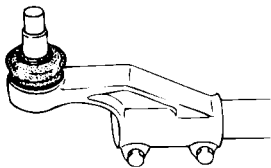
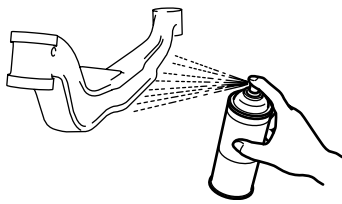
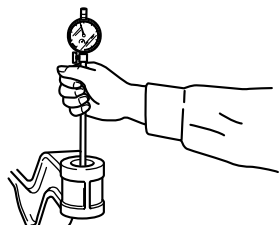
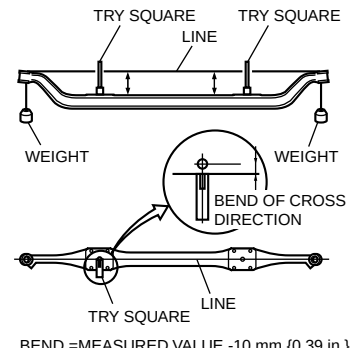
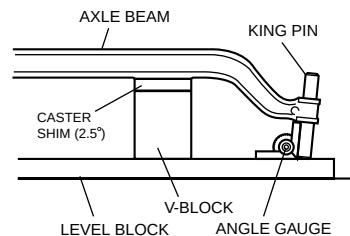
INSPECTION AND REPAIR

EN0861902H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Bearing and race: Burns and pitting	—	—	Replace, if necessary.	Visual check 
			Replace, if necessary.	Visual check 
Oil seal guide: Wear	—	—	Replace, if necessary.	Visual check 
Hub bolts: Threads wear and damage	—	—	Replace, if necessary.	Visual check 
Knuckle: Wear and damage	—	—	Replace, if necessary.	Use the magnetic flaw detector or color checking instrument. 
King pin: Wear and damage	—	—	Replace, if necessary.	Use the magnetic flaw detector or color checking instrument. 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Knuckle arm and tie-rod arm: Crack and damage	—	—	Replace, if necessary.	Use the magnetic flaw detector or color checking instrument. 
King pin diameter	50 {1.969}	49.85 {1.9626}	Replace.	Measure 
King pin clearance	0.025-0.080 {0.0010-0.0031}	0.35 {0.0138}	Replace.	Measure 
Thrust bearing: Burns and pitting	—	—	Replace, if necessary.	Visual check 
Tie rod: Distortion	—	—	Replace, if necessary.	Visual check 
Tie-rod end ball stud: Threads wear and damage	—	—	Replace the tie-rod end assembly.	Visual check 
Tie-rod end ball joint: Gutter	—	—		

Inspection item	Standard	Limit	Remedy	Inspection procedure
Tie-rod end and dust cover: Crack	—	—	Replace, if necessary.	Visual check 
Muddy water in the cover (Sealed type ball stud)	—	—	Replace the tie-rod end assembly.	
Axle beam: Crack and damage	—	—	Replace, if necessary.	Use the magnetic flaw detector or color checking instrument. 
Clearance between king pin and axle beam	0-0.036 {0-0.0014}	0.1 {0.0039}	Replace.	Measure 
Axle beam: Bend of cross direction	—	1.0 {0.039}	Repair or replace. NOTICE Never heat repair.	Measure 
King pin mounting angle	7°30'	6°30'-8°30'	Replace.	Measure 
Thrust washer: wear (Clearance between knuckle and axle beam)	—	0.5 {0.0197}	Replace the thrust washer.	Measure 