

SUSPENSION (HENDRICKSON HAS 250, HAS 460)

SU02-004

SUSPENSION ASSEMBLY.....SU02-2

DATA AND SPECIFICATIONS.....	SU02-2
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OVERHAUL	SU02-11
INSPECTION AND REPAIR	SU02-17

SUSPENSION ASSEMBLY

DATA AND SPECIFICATIONS

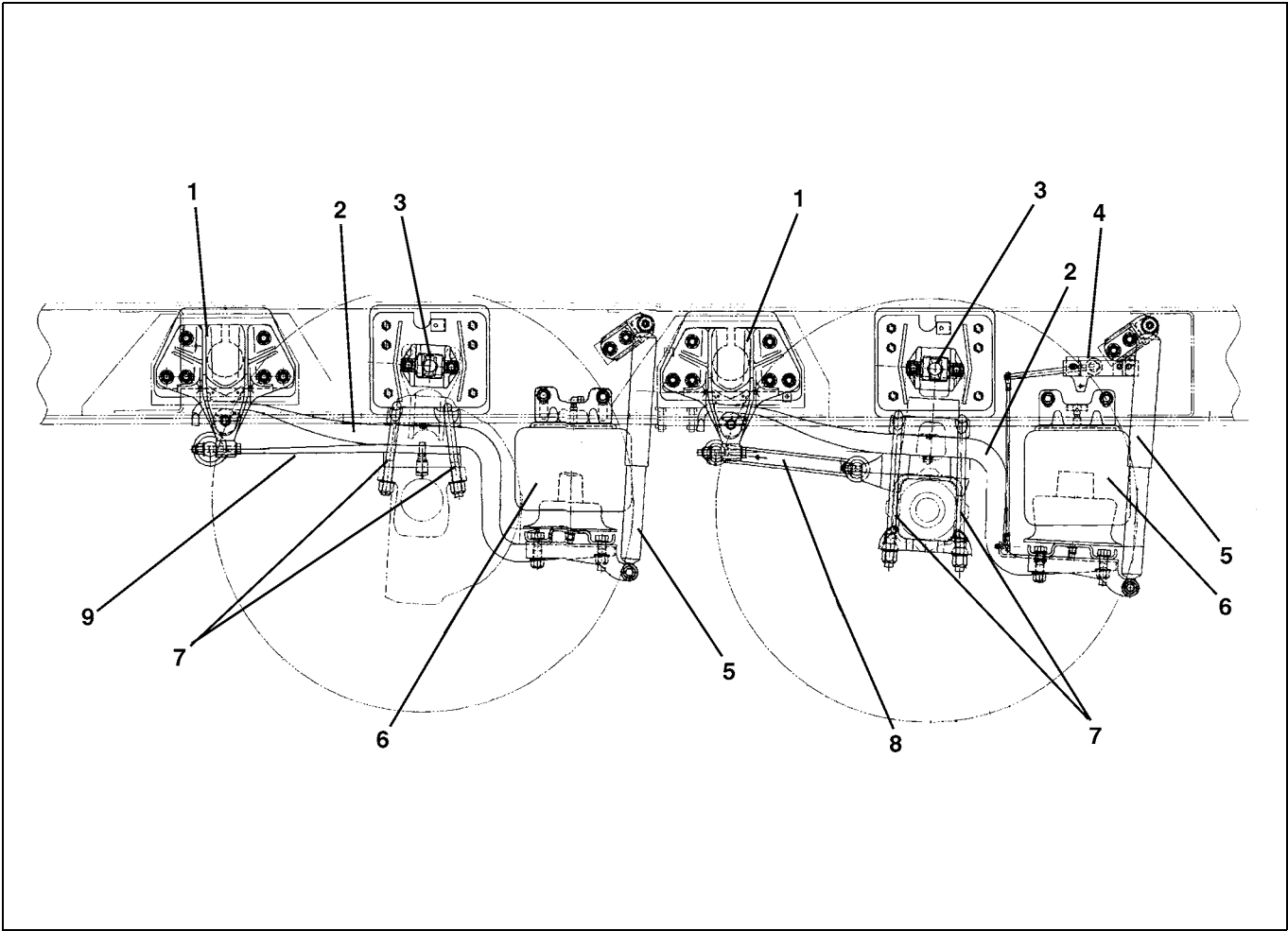
EN09A0702I200001

MODEL	FR, FS, FY, SS	SH
TYPE	HENDRICKSON HAS 460	HENDRICKSON HAS 250

DESCRIPTION

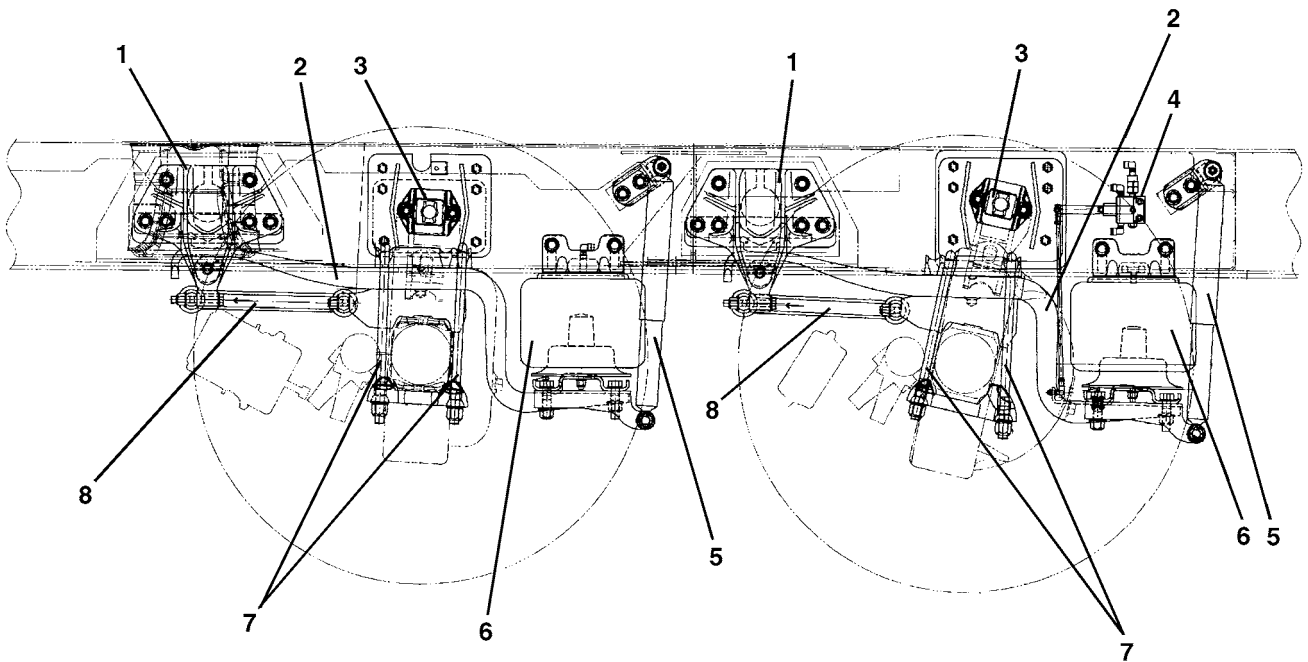
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MODEL: FR



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1	Frame hanger	6	Air spring
2	Leaf spring	7	U-bolt
3	Transverse rod	8	Torque rod
4	Height sensor	9	Tension leaf
5	Shock absorber		

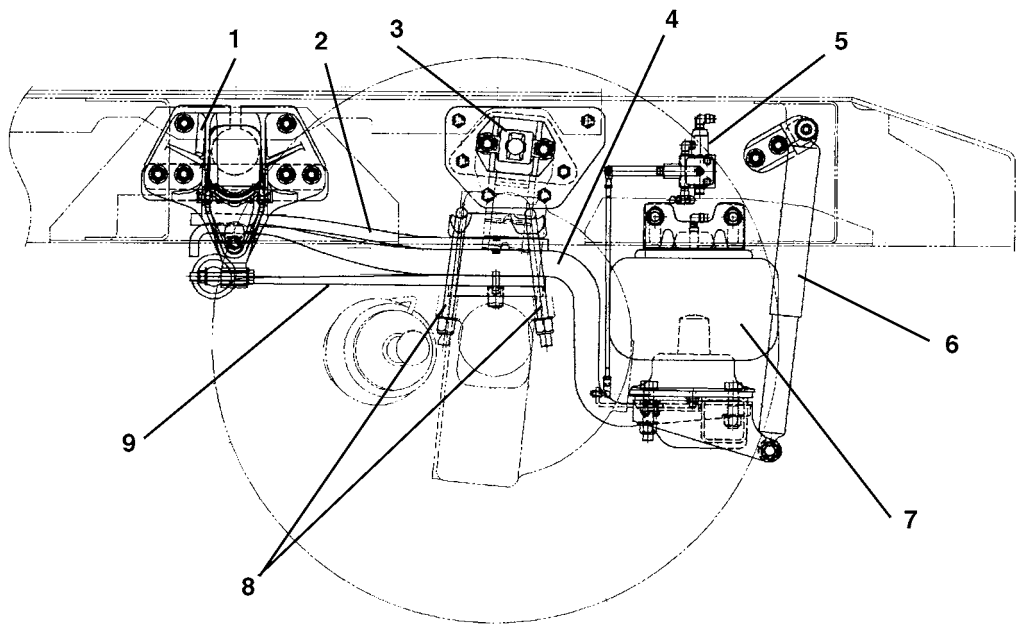
**MODELS: FS, FY, SS
(FOR AUSTRALIA AND CHILE)****(REPRESENTATIVE TYPE)**

SHTS09A070200002

1	Frame hanger	5	Shock absorber
2	Leaf spring	6	Air spring
3	Transverse rod	7	U-bolt
4	Leveling valve	8	Torque rod

MODEL: SH

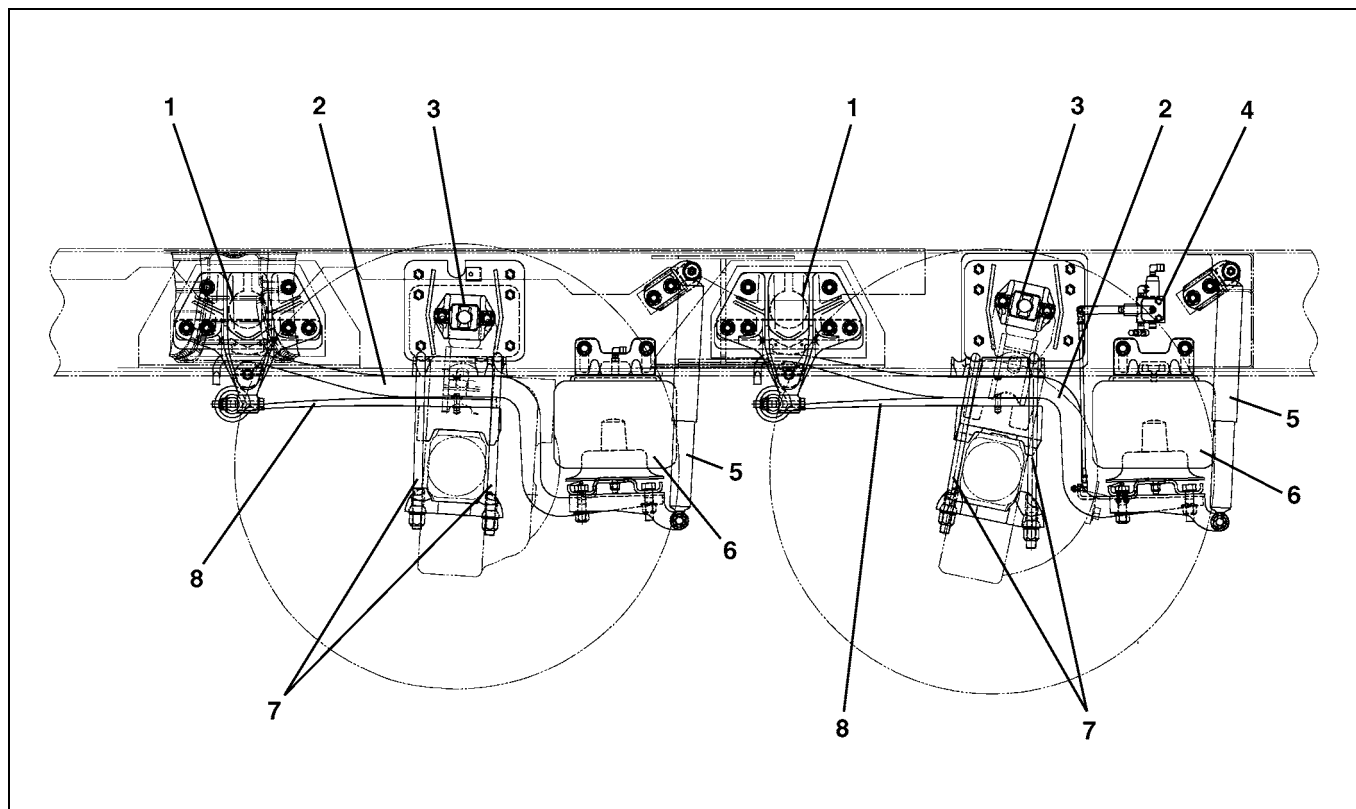
(REPRESENTATIVE TYPE)



SHTS09A070200003

1	Frame hanger	6	Shock absorber
2	Leaf spring No. 2	7	Air spring
3	Transverse rod	8	U-bolt
4	Leaf spring No.1	9	Tension leaf
5	Leveling valve		

MODEL: SS (FOR SOUTH AFRICA)



SHTS09A070200004

1	Frame hanger	5	Shock absorber
2	Leaf spring	6	Air spring
3	Transverse rod	7	U-bolt
4	Leveling valve	8	Tension leaf

TROUBLESHOOTING

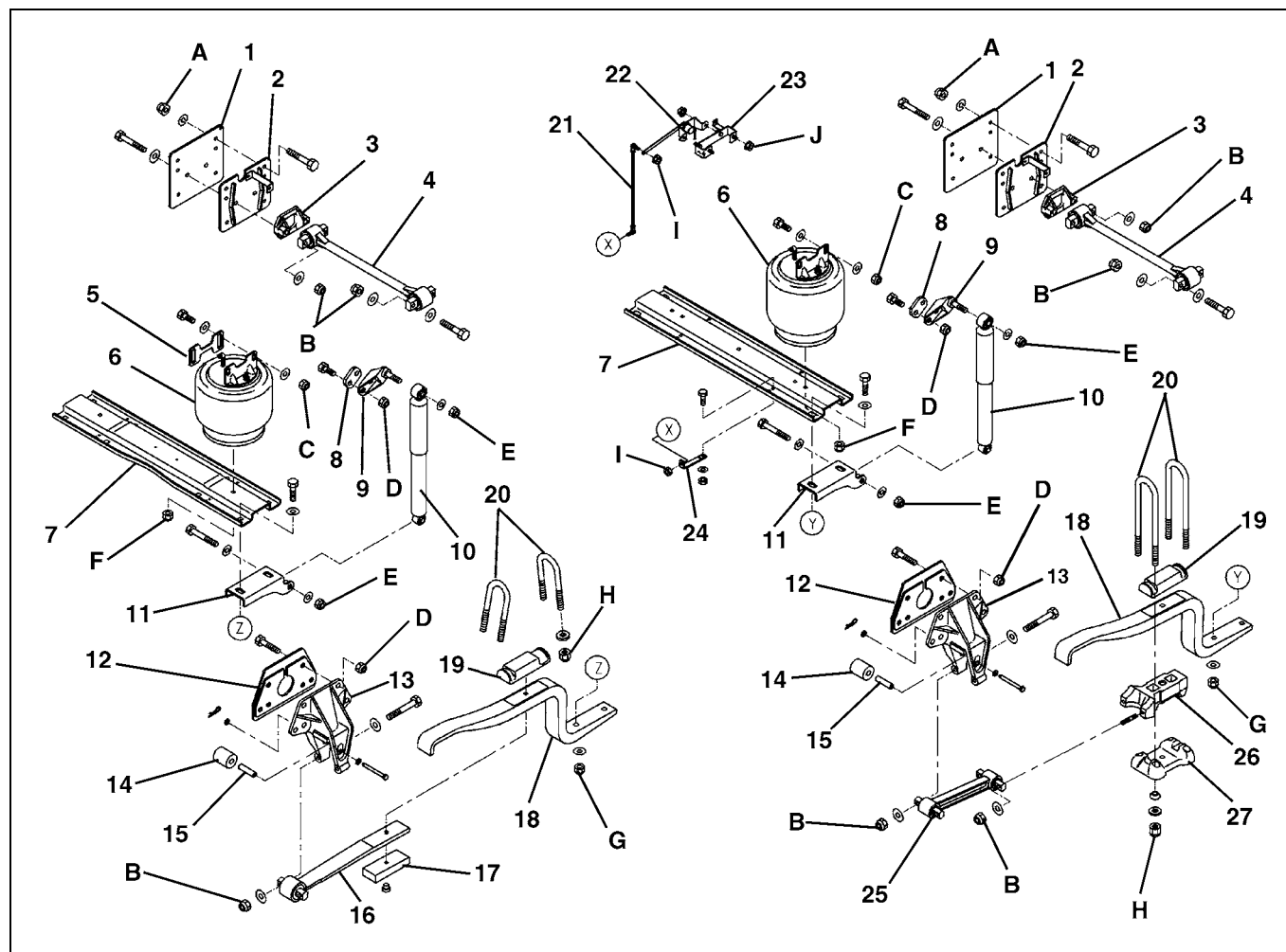
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Symptom	Possible cause	Remedy/Prevention
Abnormal sound occurs from the spring while driving.	Eccentric wear of the shock absorber fitting pin	Replace the pin and/or rubber bushing.
	Wear and deflection of the rebound roller	Remove the rebound roller and/or rebound bolt spacer.
Uncomfortably (Rolling and pitching)	Deflection and damage of the bushings of the torque rod and the transverse rod	Replace the bushings.
	Faulty of the shock absorber	Replace the shock absorber.
	Faulty of the leveling valve	Repair the leveling valve.
Vibration of the steering wheel, and the car shake	Deflection of the bushing in the torque rod and the transverse rod	Replace the bushings.
	Looseness of the torque rod and the transverse rod bracket bolt	Replace the lock nut and tighten with the specified torque.
Vehicle height is not adjusted correctly.	Faulty of the leveling valve	Repair the parts.

COMPONENT LOCATOR

EN09A0702D100001

MODEL: FR



SHTS09A070200005

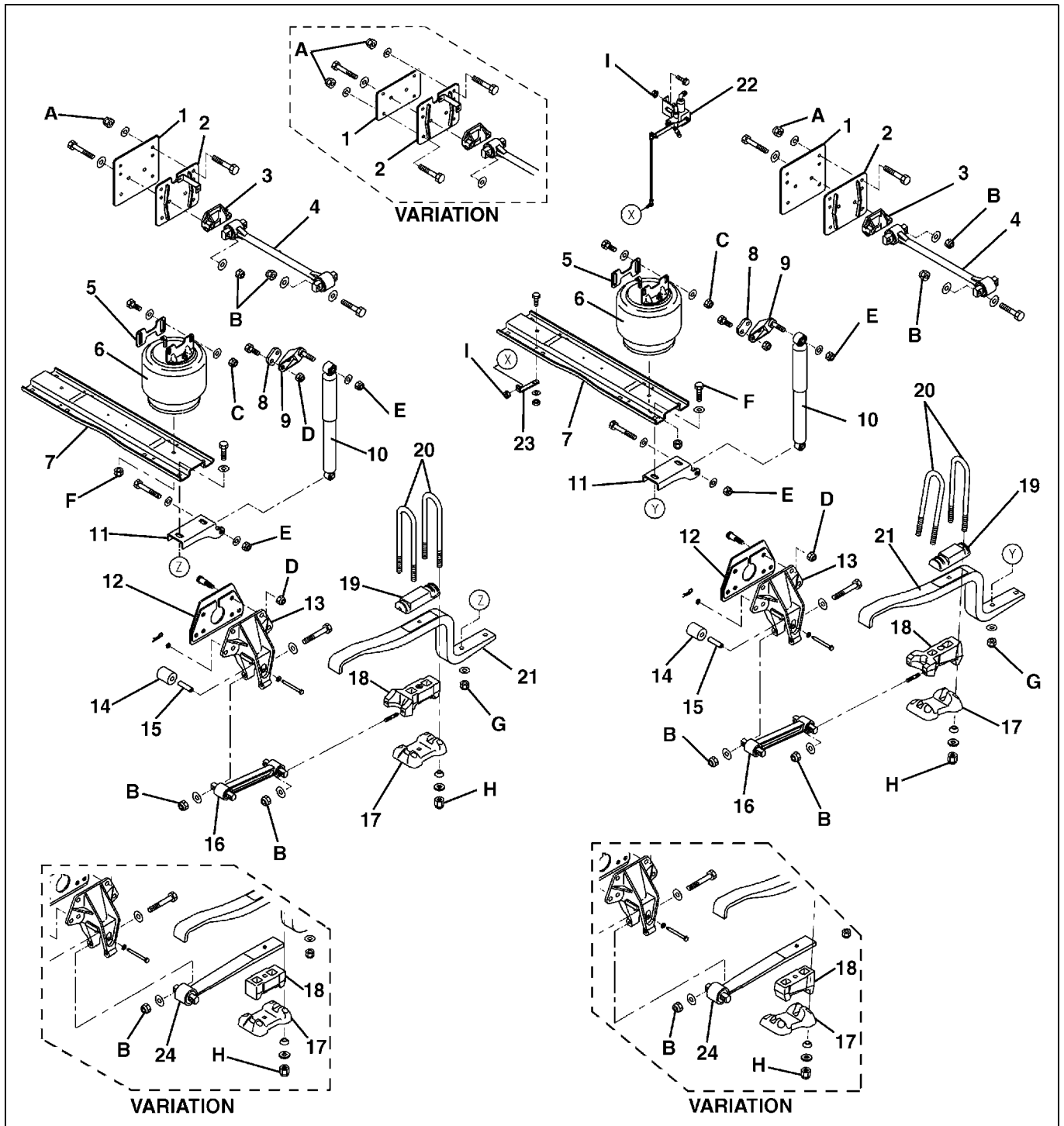
1	Spacer	15	Spacer tube
2	Plate	16	Tension leaf
3	Transverse rod bracket	17	Caster wedge
4	Transverse rod	18	Leaf spring
5	Spacer	19	Spring pad
6	Air spring	20	U-bolt
7	Cross channel	21	Adjusting rod
8	Spacer	22	Height sensor
9	Shock absorber upper bracket	23	Sensor bracket
10	Shock absorber	24	Lever
11	Shock absorber lower bracket	25	Torque rod
12	Back plate	26	Torque rod bracket
13	Frame hanger	27	Spring seat
14	Rebound roller		

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

A	104-156 {1,061-1,590, 77-115}	F	27-41 {276-418, 20-30}
B	203-277 {2,070-2,824, 150-204}	G	352-434 {3,590-4,425, 260-319}
C	237-305 {2,417-3,110, 175-224}	H	460-520 {4,691-5,302, 340-383}
D	212-318 {2,162-3,242, 157-234}	I	11-17 {113-173, 9-12}
E	70-98 {714-999, 52-72}	J	41-61 {418-622, 31-44}

MODELS: FS, FY, SS (FOR AUSTRALIA AND CHILE)



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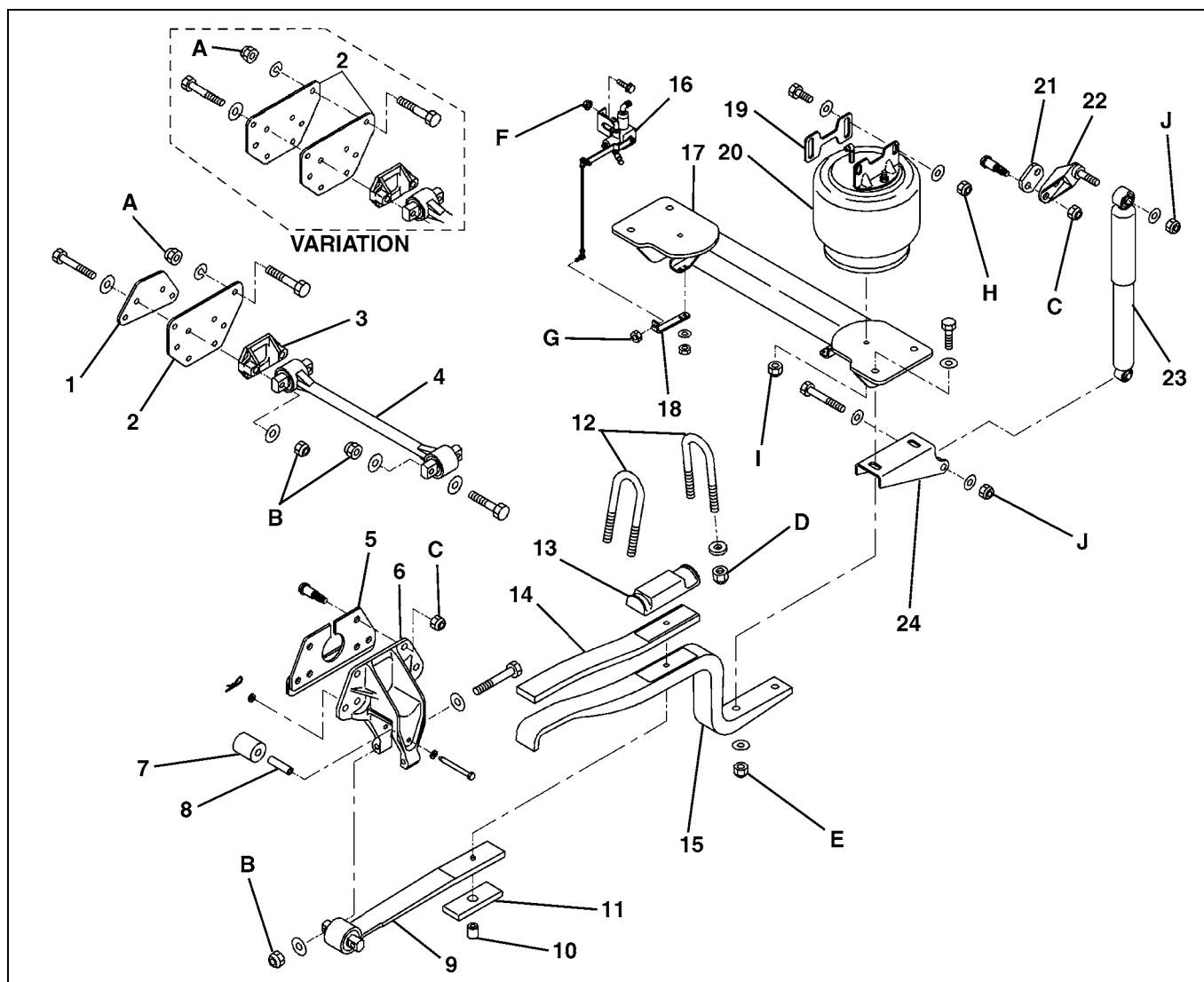
1	Spacer	13	Frame hanger
2	Plate	14	Rebound roller
3	Transverse rod bracket	15	Spacer tube
4	Transverse rod	16	Torque rod
5	Spacer	17	Spring seat
6	Air spring	18	Torque rod bracket
7	Cross channel	19	Spring pad
8	Spacer	20	U-bolt
9	Shock absorber upper bracket	21	Leaf spring
10	Shock absorber	22	Leveling valve
11	Shock absorber lower bracket	23	Lever
12	Back plate	24	Tension leaf

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

A	104-156 {1,061-1,590, 77-115}	F	27-41 {276-418, 20-30}
B	203-277 {2,070-2,824, 150-204}	G	352-434 {3,590-4,425, 260-319}
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MODEL: SH



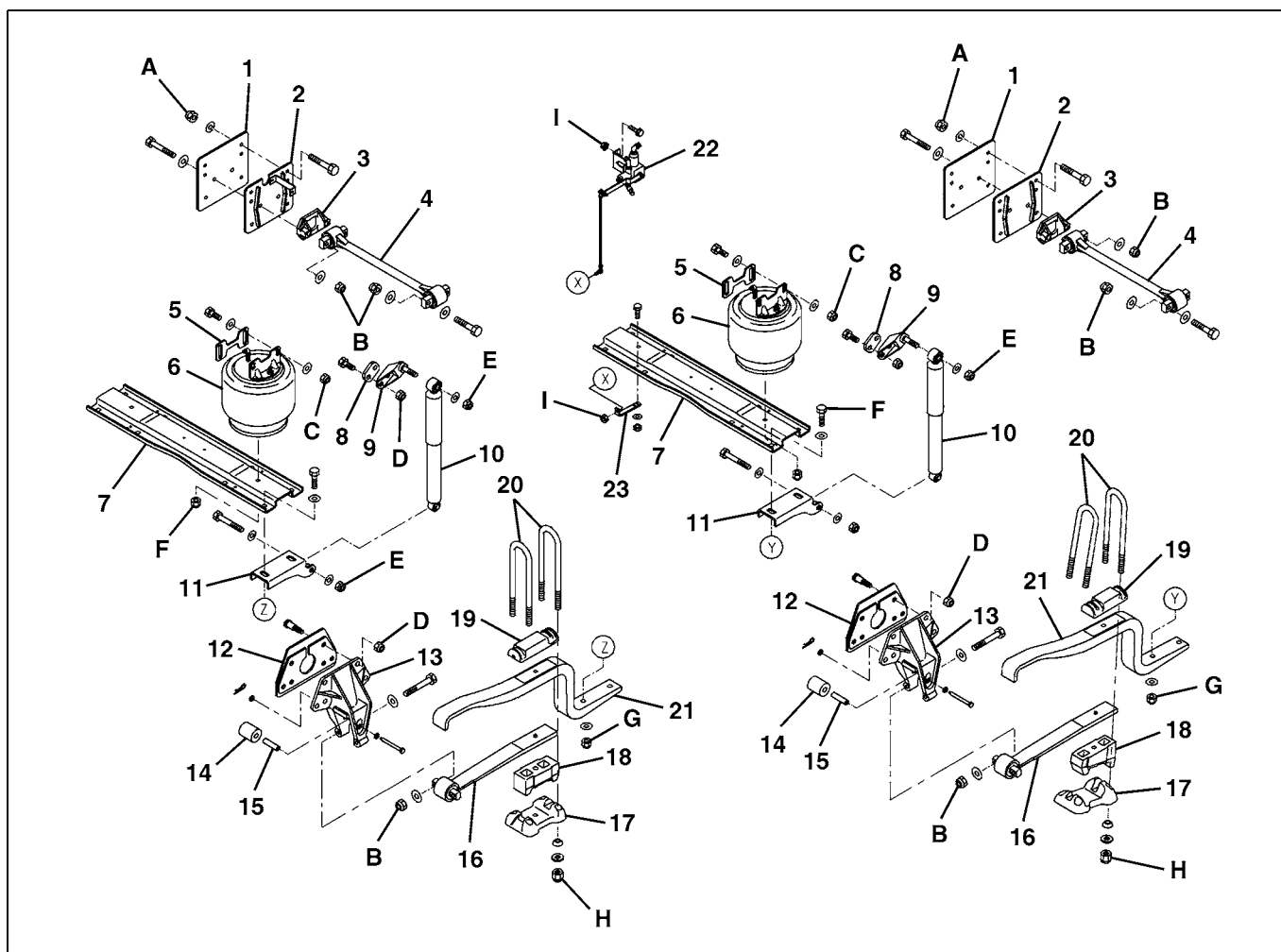
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1	Spacer (If so equipped)	13	Spring pad
2	Plate	14	Leaf spring No. 2
3	Transverse rod bracket	15	Leaf spring No. 1
4	Transverse rod	16	Leveling valve
5	Back plate	17	Cross channel
6	Frame hanger	18	Lever
7	Rebound roller	19	Spacer
8	Spacer tube	20	Air spring
9	Tension leaf	21	Spacer
10	Dowel	22	Shock absorber upper bracket
11	Caster wedge	23	Shock absorber
12	U-bolt	24	Shock absorber lower bracket

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

A	160-240 {1,632-2,447, 117-176}	F	41-61 {418-622, 31-44}
B	203-277 {2,070-2,824, 150-204}	G	11-17 {113-173, 9-12}
C	212-318 {2,162-3,242, 157-234}	H	237-305 {2,417-3,110, 175-224}
D	460-520 {4,691-5,302, 340-383}	I	27-41 {276-418, 20-30}
E	352-434 {3,590-4,425, 260-319}	J	70-98 {714-999, 52-72}

MODEL: SS (FOR SOUTH AFRICA)

SHTS09A070200008

1	Spacer	13	Frame hanger
2	Plate	14	Rebound roller
3	Transverse rod bracket	15	Spacer tube
4	Transverse rod	16	Tension leaf
5	Spacer	17	Spring seat
6	Air spring	18	Caster wedge
7	Cross channel	19	Spring pad
8	Spacer	20	U-bolt
9	Shock absorber upper bracket	21	Leaf spring
10	Shock absorber	22	Leveling valve
11	Shock absorber lower bracket	23	Lever
12	Back plate		

Tightening torque

Unit: N·m {kgf·cm, lbf·ft}

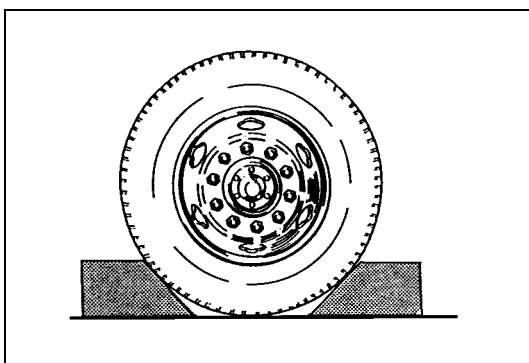
A	104-156 {1,061-1,590, 77-115}	F	27-41 {276-418, 20-30}
B	203-277 {2,070-2,824, 150-204}	G	352-434 {3,590-4,425, 260-319}
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D	212-318 {2,162-3,242, 157-234}	I	11-17 {113-173, 9-12}
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OVERHAUL

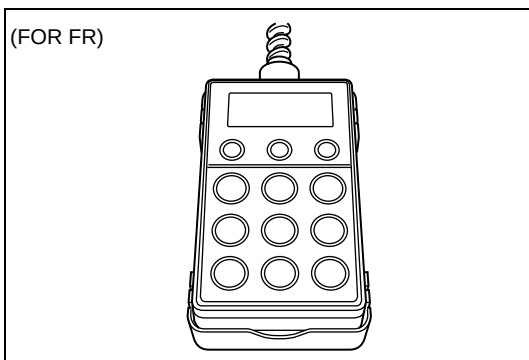
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IMPORTANT POINTS - DISASSEMBLY

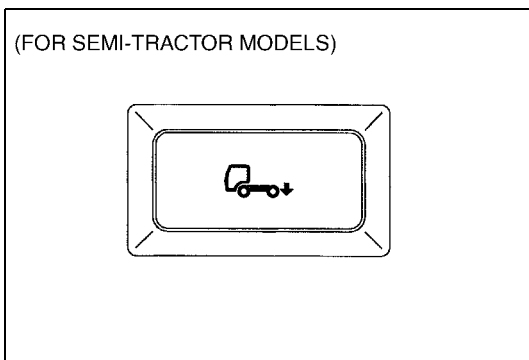
1. **SUPPORT THE FRAME WITH THE STAND.**
 - (1) Park the vehicle on level ground.
 - (2) Be sure to block the wheels before dismounting.



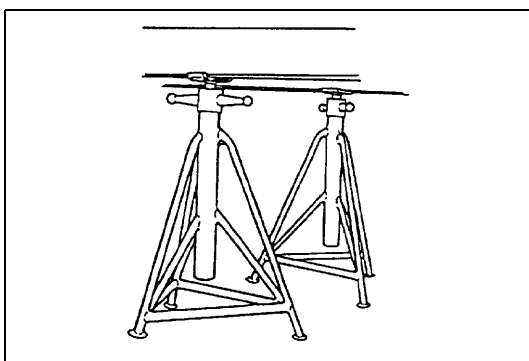
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SHTS09A070200011



SHTS09A070200010



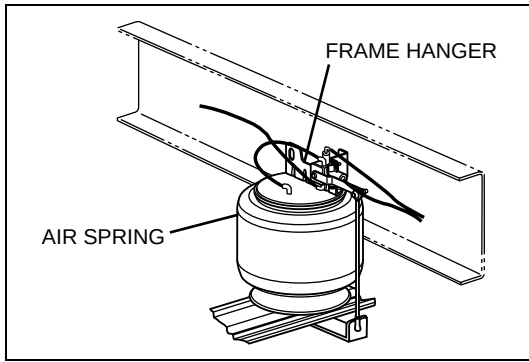
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- (3) Release air pressure from the air springs.

NOTICE

Before release air pressure, turn down vehicle height by the remote controller or the dump control switch. (Models: FR and semi-tractors)

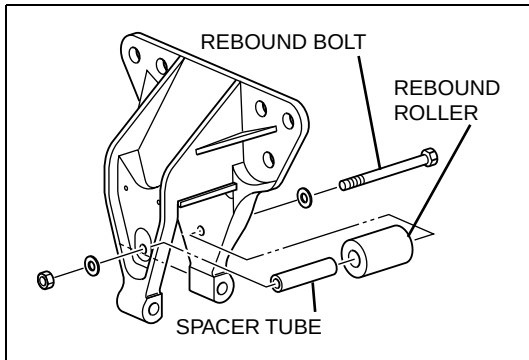
- (4) Turn the starter switch to "LOCK" position. (Model: FR)
- (5) Jack up the axle, and support the frame with the stand.



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2. REMOVAL OF LEAF SPRINGS

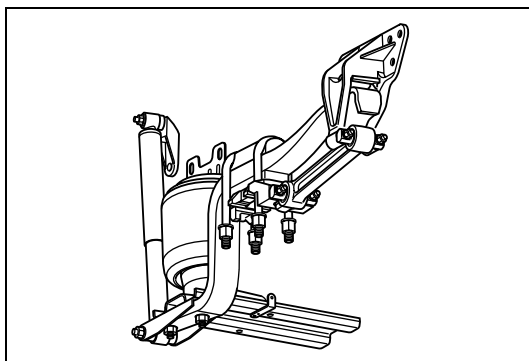
- (1) Remove the leveling valve or height sensor link from the valve by removing the nut and the lock washer.



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- (2) Remove the rebound bolts, lock nuts, washers, spacer tube, and rebound roller from the frame hanger.

- (3) Jack up the axle then support it to remove the load from leaf spring.



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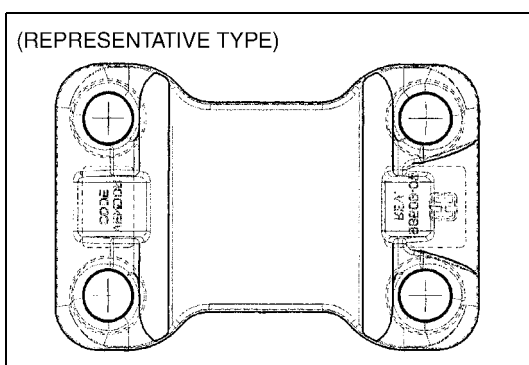
- (4) Remove the U-bolt lock nuts and washers.

- (5) Remove the U-bolts, bottom cap, and top pad.

- (6) Remove both the lock nuts and washers which connect the cross channel to both the leaf springs.

- (7) Lift cross channel off the leaf spring with jacks.

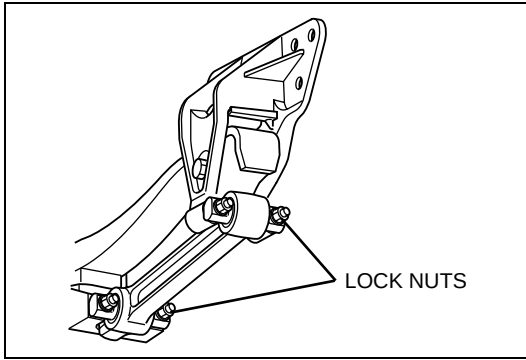
- (8) Remove the leaf spring assembly.



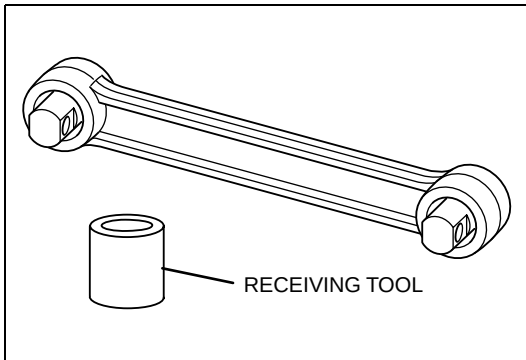
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3. REPLACEMENT OF THE SPRING SEAT

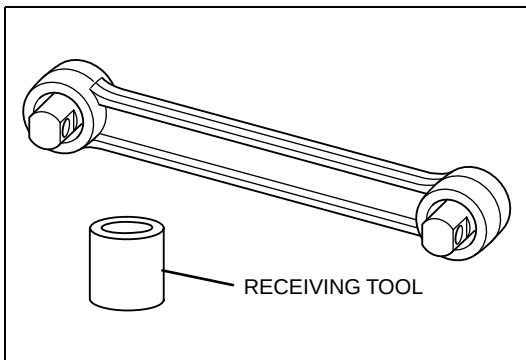
- (1) Remove the spring seat.



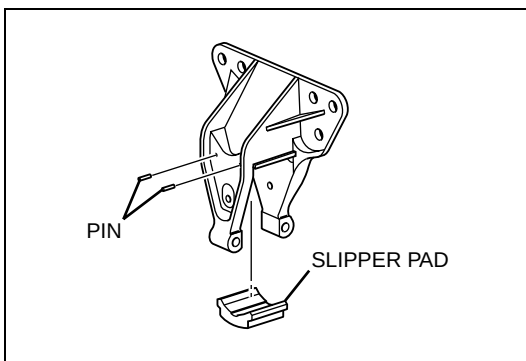
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4. REPLACEMENT OF THE TORQUE ROD (TENSION LEAF) BUSHINGS

- (1) Remove the straddle mount bar pin lock nuts and washers at the axle end of the torque rod.
- (2) Loosen the rebound bolt lock nut in the frame hanger.
- (3) Remove the straddle mount bar pin lock nuts, bolts, and washers at the frame hanger ends of the torque rod.

- (4) Push out oil bushings. Use a vertical shock press with a capacity of at least 10 tons. Steel tube receiving tool is required. These bushings are not cartridge type bushings. They do not have outer metals. Support the torque rod end on receiving tool with the end tube of torque rod centered on tool. Push directly on the bushing straddle mount bar pin until the bushing clears the torque rod end tube.

⚠ WARNING

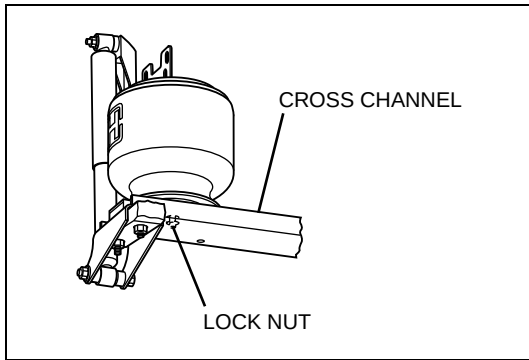
Be sure the torque rod is securely supported on the press bed for safety.

Do not use heat or cutting torch to remove the bushings from the torque rod. The use of heat will adversely affect a strength of the torque rod.

- (5) Clean and inspect the torque rod ends, removing any nick with emery cloth.
- (6) Lubricate the torque rod ends and the new rubber bushings with a vegetable base oil (cooking oil or lard). Do not use a petroleum or soap base lubricant.
- (7) Press in new bushings. Support the torque rod end on receiving tool with end tube of torque rod centered on receiving tool. Straddle mount bar pin bushing must have mounting flats positioned zero degrees to shank of torque rod as shown in the figure. Press directly straddle mount bar pin of bushing. Bushing must be centered within torque rod end tubes. When pressing in new bushings, overshoot desired final position by approximately 3/16 and press bushing again from opposite side to center bushing within torque rod end.

5. REPLACEMENT OF THE FRAME HANGER SLIPPER PADS

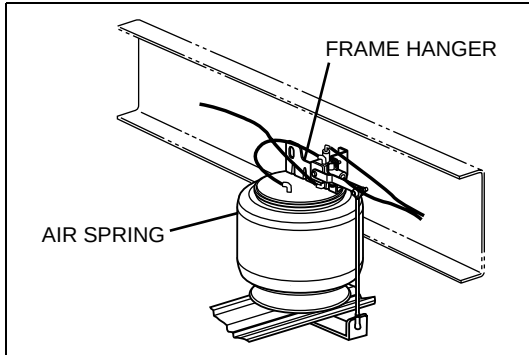
- (1) In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound bolt lock nut, washer bolt rebound roller and spacer.
- (2) Procure the slipper pad locally from Hendrickson's Agent.



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6. REMOVAL OF CROSS CHANNEL

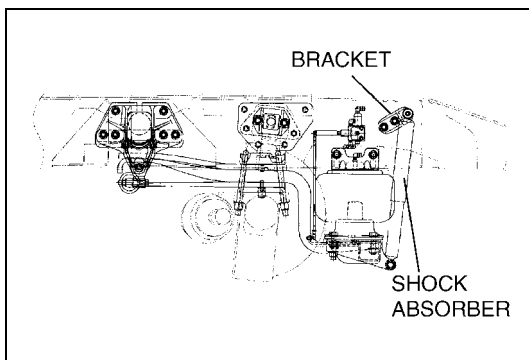
- (1) Remove the lock nuts and washers which connect the air spring to cross channel.
- (2) Raise the cross channel by using jack if required.



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7. REMOVAL OF AIR SPRING

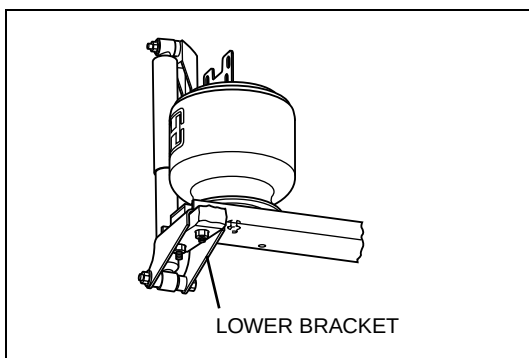
- (1) Remove the air line to the air spring seat.
- (2) Remove the brass air fittings from the air spring.
- (3) Remove the lock nuts and washers which connect the air spring to the upper air spring frame hanger.
- (4) Remove the air spring.
- (5) Remove the air spring frame hanger.



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8. REMOVAL OF SHOCK ABSORBER UPPER BRACKET

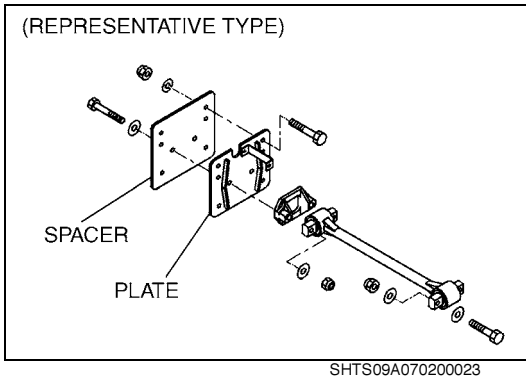
- (1) Remove the lock nuts and washers at both ends of the shock absorber.
- (2) Remove the shock absorber completely from the chassis.
- (3) Remove the lock nuts and washers which connect the shock absorber upper bracket to the frame.
- (4) Remove the shock absorber upper bracket.



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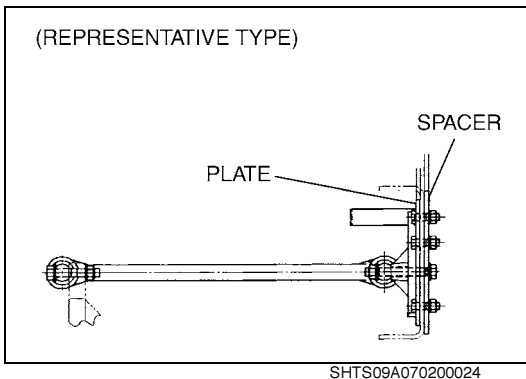
9. REMOVAL OF SHOCK ABSORBER LOWER BRACKET

- (1) Remove the shock absorber completely from the chassis.
- (2) Remove the lock nuts and washers which connect the cross channel to the leaf spring.
- (3) Remove the shock absorber lower bracket by sliding the bracket to rear.



10. REMOVAL OF TRANSVERSE ROD

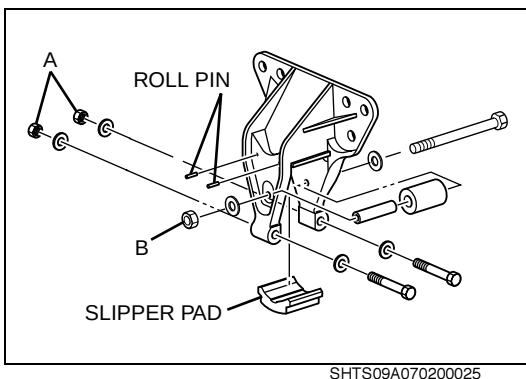
- (1) Remove the lock nuts and washers which connect the transverse rod to the frame.
- (2) Remove the lock nuts and washers which connect to the axle bracket.
- (3) Use Owatonna Tool Company's tool set to remove and install the transverse rod bushings. Follow their instructions.



IMPORTANT POINTS - ASSEMBLY

1. INSTALLATION OF TRANSVERSE ROD

- (1) Assemble the washer and lock nut to the bolt. Tighten the lock nut to specified torque.
- (2) Install the spacer and plate.
Thickness: 8 mm {0.315 in.}
- (3) Position the straddle mount end of torque rod at the transverse rod to the frame, tighten the lock nuts to specified torque.



2. INSTALLATION OF FRAME HANGER

- (1) Install new slipper pad.
- (2) Raise the main support member to secure slipper pad in place.
- (3) Drive new roll pin in place with punch until flush with the front of frame hanger.
- (4) Tighten fasteners to specified torque.

3. CHECK THE AIR LEAKAGE.

- (1) Apply soapy water for each joint of air line and charge the compressed air of 780 kPa {8.0 kgf/cm², 113 lbf/in.²} then check the leakage.

4. ADJUSTMENT OF THE VEHICLE HEIGHT

NOTICE

- Adjustment should be done only after assembling.
- Adjustment should be done with the air pressure of 687-833 kPa {7.0-8.5 kgf/cm², 100-120 lbf/in.²}, keeping on supplying the air while rotating the engine at the idle speed.

(1) Measure the shock absorber length between upper and lower pins.

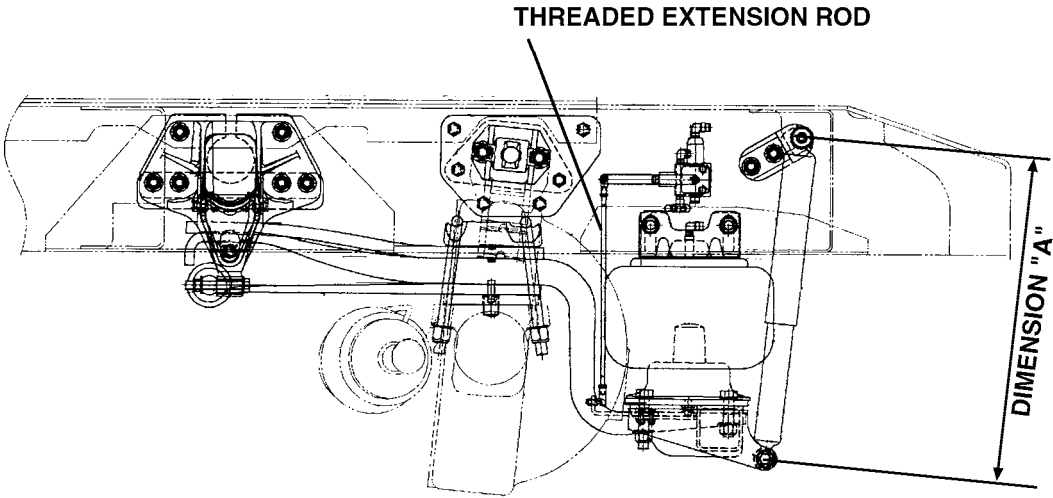
Assembly standard:

Unit: mm {in.}

Model	Dimension "A"
FR	642-688 {25.28-27.08}
FS, FY	582-628 {22.92-24.72}
SH	611-657 {24.06-25.86}
SS (For Australia, Chile)	584-630 {23.00-24.80}
SS (For South Africa)	592-638 {23.31-25.11}

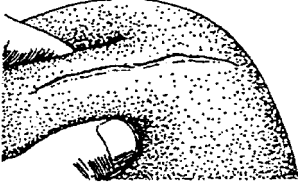
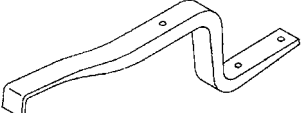
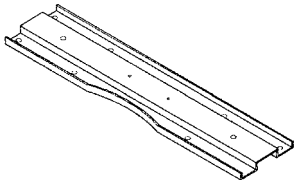
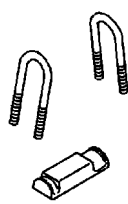
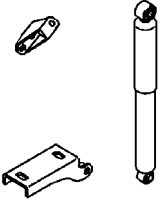
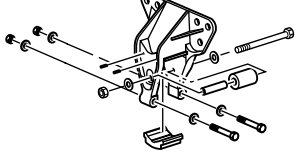
(2) If the shock absorber length is not the assembly standard, adjust the extension rod length, so that the shock absorber length is the assembly standard.

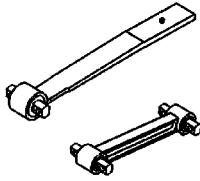
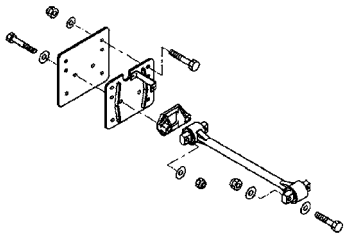
(REPRESENTATIVE TYPE)



INSPECTION AND REPAIR

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Inspection item	Standard	Limit	Remedy	Inspection procedure
Air spring: Wear, damage and crack	—	—	Replace, if necessary.	Visual check 
Leaf spring: Crack and damage	—	—	Replace, if necessary.	Visual check 
Cross channel: Crack and damage	—	—	Replace, if necessary.	Visual check 
Spring seat: Wear, damage and crack	—	—	Replace, if necessary.	Visual check 
U-Bolt: Damage	—	—	Replace, if necessary.	Visual check 
Pad: Wear, damage and crack	—	—		
Shock absorber: Operation, oil leak and damage	—	—	Replace, if necessary.	Visual check 
Upper and lower brackets: Crack and damage	—	—		
Rebound roller: Wear, damage and crack	—	—	Replace, if necessary.	Visual check 
Slipper pad: Wear, damage and crack	—	—		

Inspection item	Standard	Limit	Remedy	Inspection procedure
Torque rod (Tension leaf): Crack and damage	—	—	Replace, if necessary.	Visual check 
Torque rod (Tension leaf) bushings: Wear, damage and crack	—	—		
Transverse rod: Crack and damage	—	—	Replace, if necessary.	Visual check 
Transverse rod bushings: Wear, damage and crack	—	—		
Spacer: Crack and damage	—	—		
Plate: Crack and damage	—	—		

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