4 Frame and suspension

4.1 Split the machine

WARNING: Pressurized gases or fluids can be hazards.

Personal injury can result.

Relieve the pressure from the system or component before disconnecting components.

WARNING: Hydraulic fluid under pressure can penetrate the skin or eyes.

Serious personal injury, blindness, or death can occur.

Relieve the pressure from the system or component before disconnecting components. Wear personal protective gear while working on the machine or equipment. Use a piece of cardboard to check for leaks. Never use your hand.

WARNING:
The machine is extremely heavy and requires correct handling equipment to safely split it. Failures to use proper procedures and equipment may result in personal injury or death due to crushing. Machine weight can be as much as 27216 kg (60000 lb).

NOTE:
Put identification marks on the hoses, the hose assemblies, the wires, and the tube assemblies for installation purposes. Plug all the hose assemblies and all the tube assemblies. This aids in preventing fluid loss, and helps to keep the contaminants from entering the system.

NOTE:
Cleanliness is an important factor. Before beginning the splitting procedure, the exterior of the components should be thoroughly cleaned. Cleanleness prevents dirt from entering the internal mechanism.

Procedure

1. Park the machine on a flat and level surface.
2. Install the jack stand brackets (1) to both sides of the front frame with four bolts (2).
3. Install the jack stands (3)under the jack stand bracket.

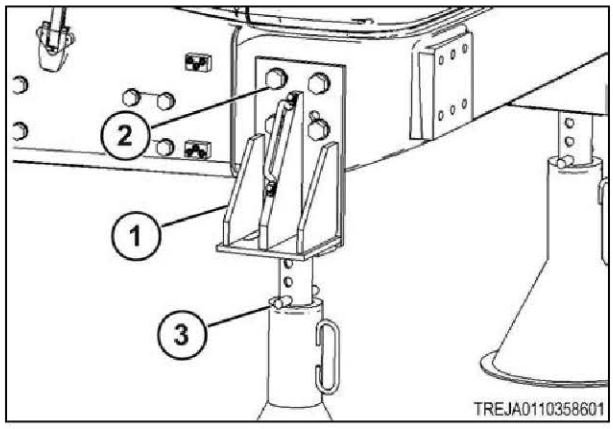

Fig. 1

4. Install the jack stands (1) to the rear frame. Make sure the jack stands are rated for the weight of the machine.

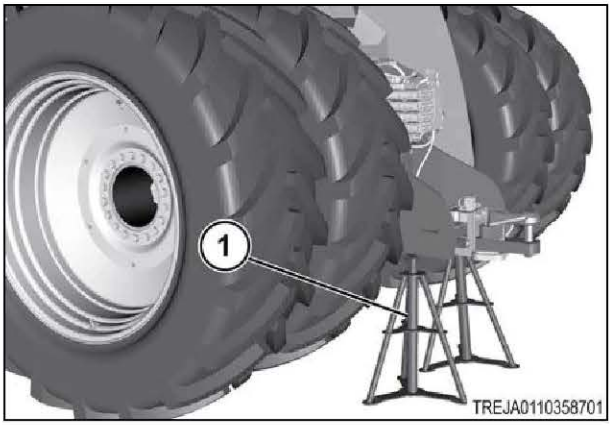

Fig. 2

5. Install the jack stands (1) under the frame in front of the atriculation point.

6. Install the jack stands (2) under the frame to the rear of the articulation point.

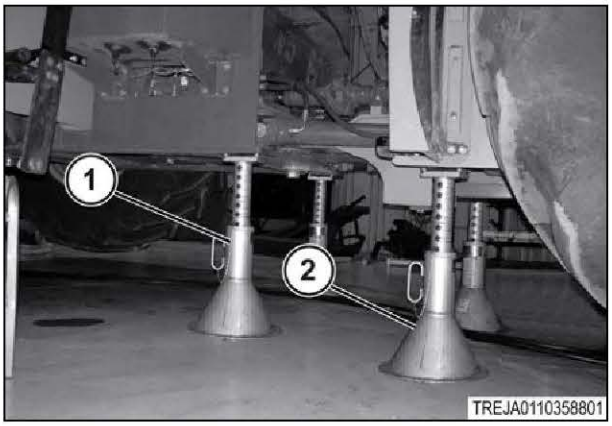

Fig. 3

7. Disconnect the steering cylinders (1) from the rear frame. Support the steering cylinders while splitting the machine.

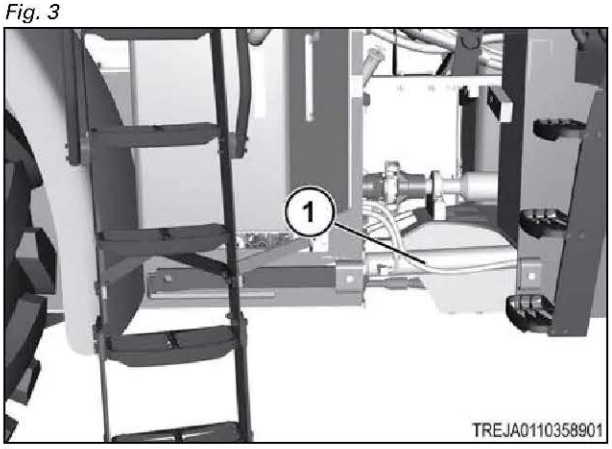

Fig. 4

8. If the machine is equipped with a PTO, then the PTO driveshaft (1) must be removed.

9. Remove the universal joint shield (2).

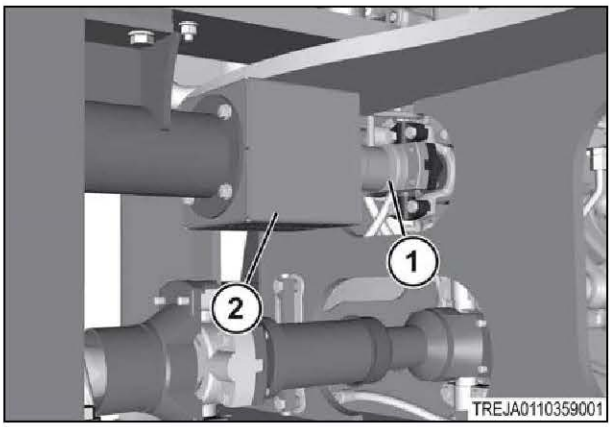

Fig. 5

10. Remove the four bolts and washers (1). Remove the front universal joint shield (2).

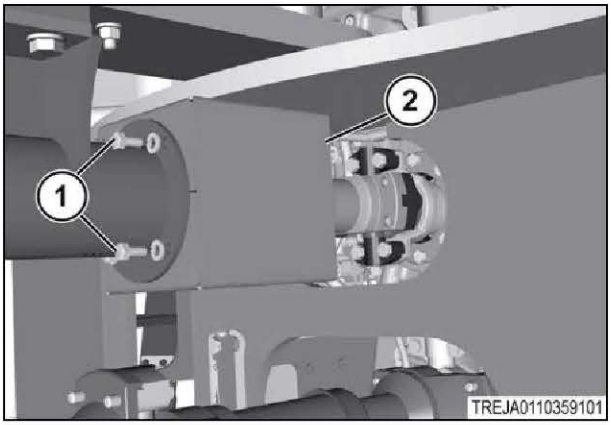

Fig. 6

11. Remove the four bolts (1) attaching the universal joint (2) to the PTO driveshaft (3).

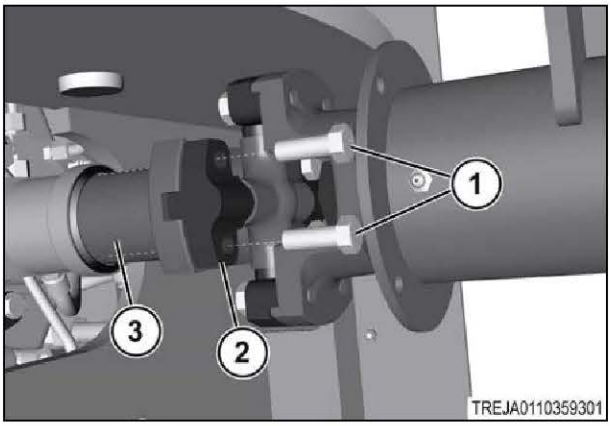

Fig. 7

12. Remove the four bolts (1) and remove the rear universal joint shield (2).

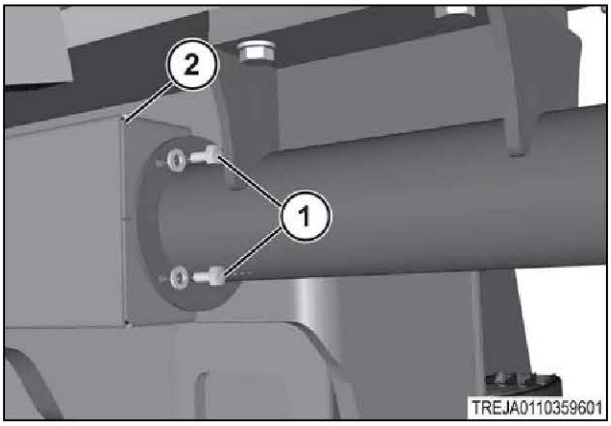

Fig. 8

13. Use a applicable lifting device to support the rear PTO driveshaft (1). Remove the four bolts (2) attaching the universal joint (3) to the rear PTO driveshaft.

IMPORTANT: *The approximate weight of the rear PTO driveshaft is 30 kg (67 lb).*

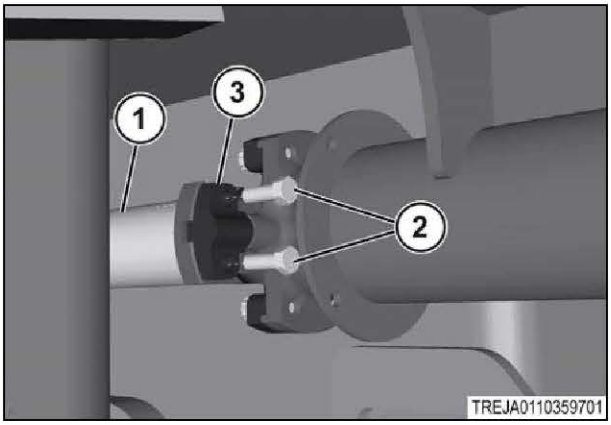

Fig. 9

14. Remove the four bolts and washers (2) attaching the PTO driveshaft (1) to the machine.

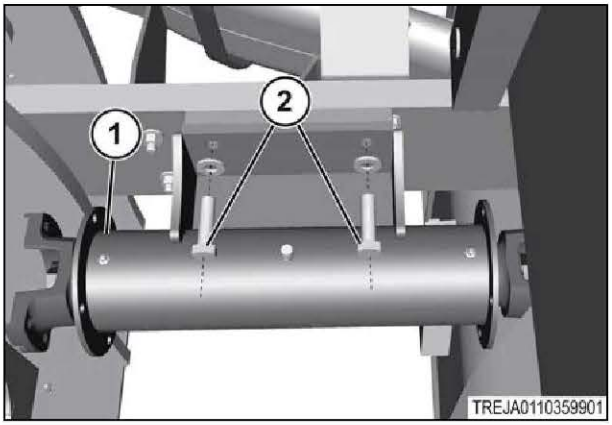

Fig. 10

15. Remove the PTO driveshaft (1) and the driveshaft spacer plates (2).

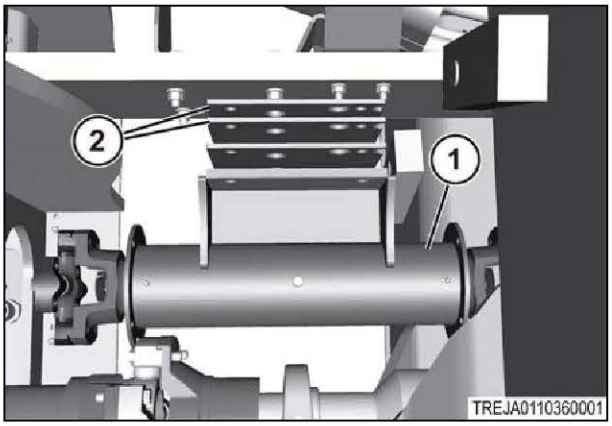

Fig. 11

16. Remove the bolts (1) from the rear axle driveshafts.

17. Disconnect the rear driveshaft from the articulation driveshaft. Compress the articulation driveshaft to the transmission.

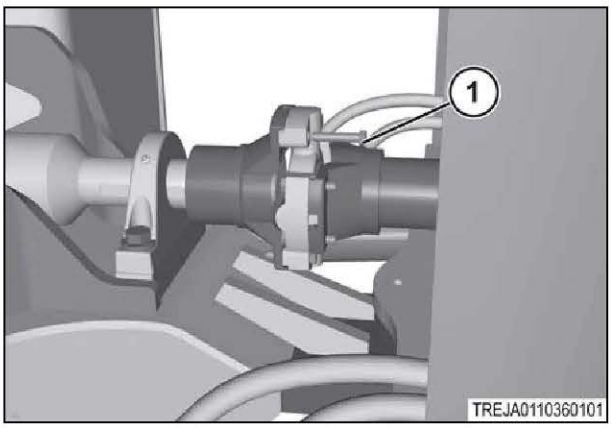

Fig. 12

18. Remove the four bolts (1) that mount the hose support bracket (2) to the top link.

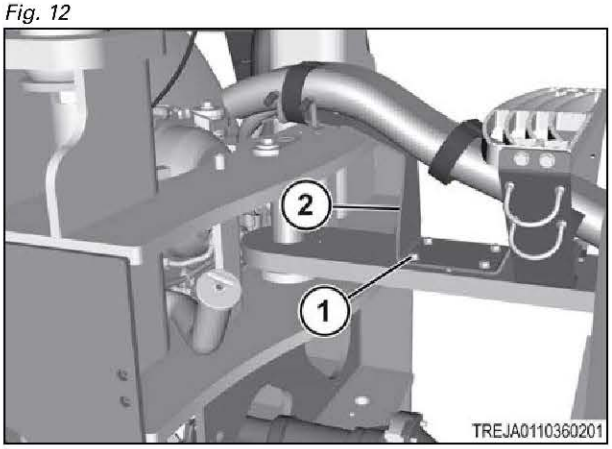

Fig. 13

19. Loosen the nuts (1) and the bolts (2) that support the step (3). Do not remove the step. Remove the nuts (4) and bolts (5) that secure the braces (6). Remove the step assembly.

20. Disconnect the hydraulic lines and the electrical harness that routes to the valve block on the rear of the machine.

21. Disconnect the fuel lines.

22. Pull the hydraulic lines, the fuel lines, and the electrical harness through the articulation joint.

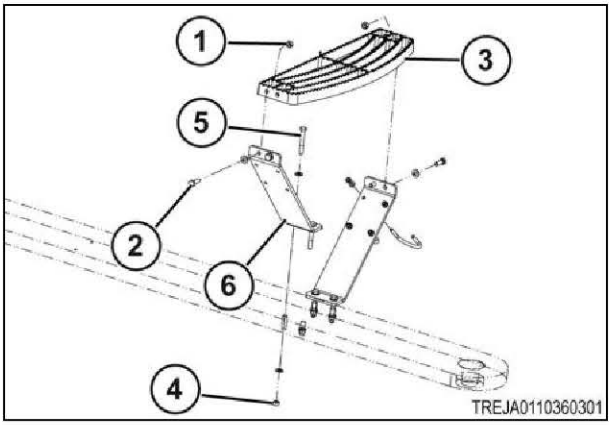

Fig. 14

23. Disconnect the axle lubricate supply line (1) from the rear axle.

24. Disconnect the axle lubricate return line (2) from the rear axle.

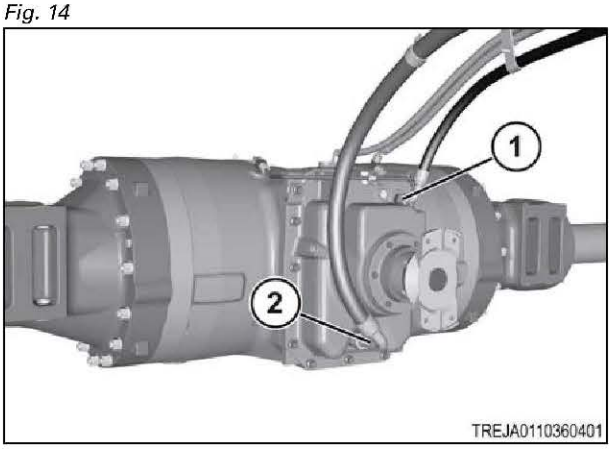

Fig. 15

25. Disconnect the differential lock line (1) from the rear axle.

26. Disconnect the service brake line (2) from the rear axle.

27. Pull the differential lock line and the service brake line through the articulation joint.

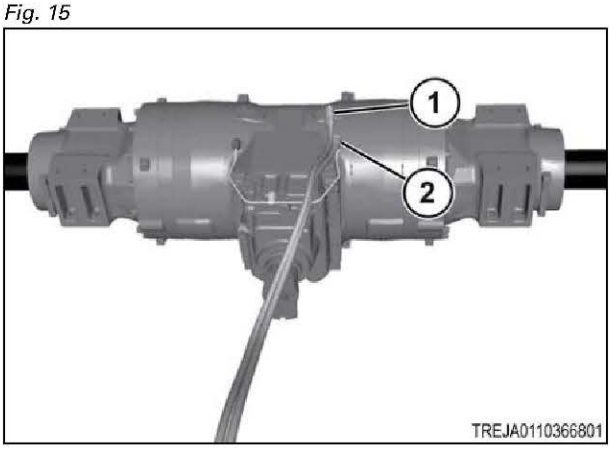

Fig. 16

28. Remove the nut (1) that attaches the turnbuckle (2) to the articulation arm (3). If the rod length (4) is not adjusted, the articulation sensor calibration is not required.

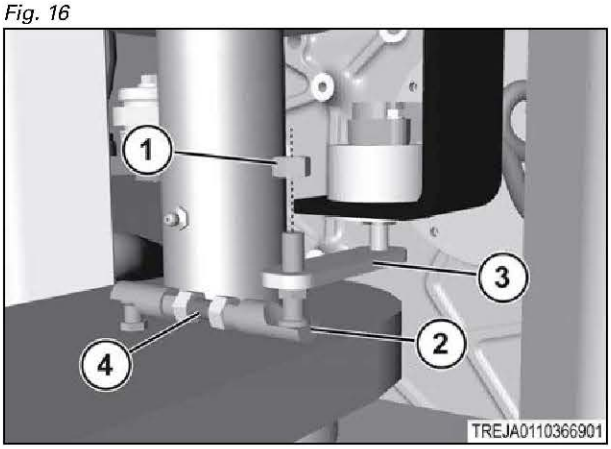

Fig. 17

29. Remove the sensor bracket (1) from the frame to be able to remove the sensor arm (2) off the turnbuckle, if necessary.

30. Remove the two nuts and washers (3) and remove the two bolts (4).

31. Adjust the sensor bracket to remove the sensor arm from the turnbuckle.

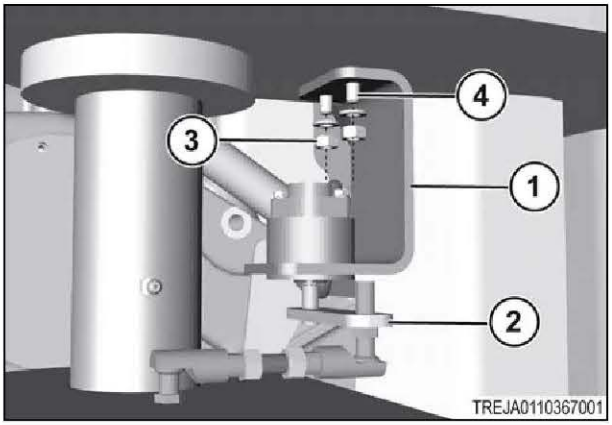

Fig. 18

32. Remove the bolt (1), washer (2), and spacer (3) that fasten the pin assembly (4).

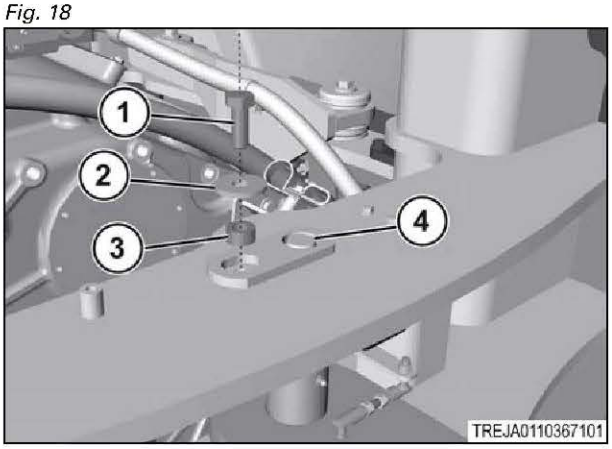

Fig. 19

33. Remove the pin assembly (1).

NOTE:
Lift the front or the rear of the rear frame to remove the pin, if necessary.

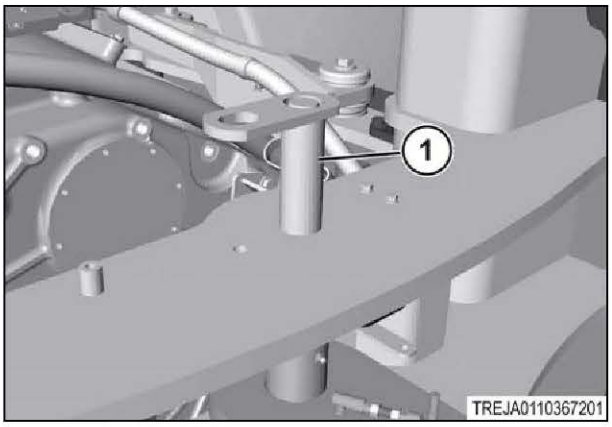

Fig. 20

34. Use the special tools to support the top link if when not removing the top link.

NOTE: *The top link support special tool part number is: 332297*

35. Inspect the outside dimension of the pin assembly. If the pin assembly has excessive wear, the pin assembly must be replaced.

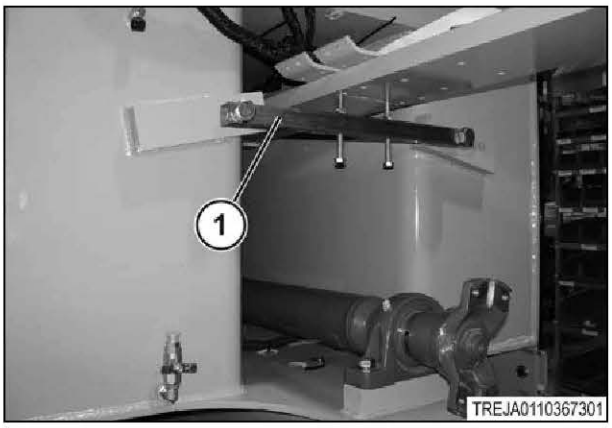

Fig. 21

36. Inspect the dimension on the front frame (1) for the upper articulation point.

37. Measure the bore diameter. The diameter must not be more than 82.66 mm (3.25 in) for the bottom bore and 100.25 mm (3.94 in) for the top bore. If the diameter is more than the specifications, the frame must be repaired.

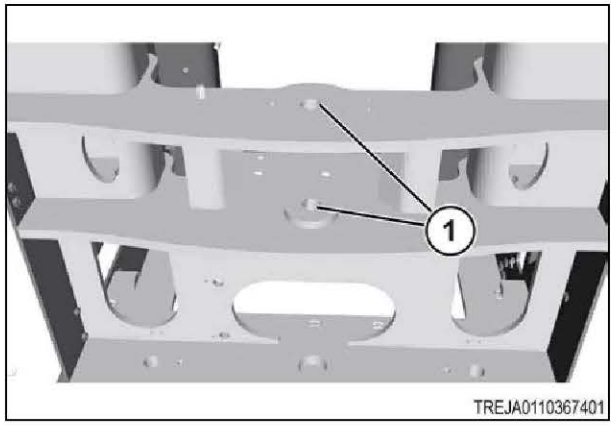

Fig. 22

Related Links

Remove the steering cylinders page 5-69
Repair the frame by adding weld material and machining page 4-34
Frame repair page 4-33

4.1.1 Disconnect the upper articulation front joint

Description	Part number	Vendor	Where used	Mandatory
Top link support	332297	K-line Industries	Chassis	Mandatory

Procedure

1. Remove the four bolts (1) holding the hose support bracket (2) to the top link.

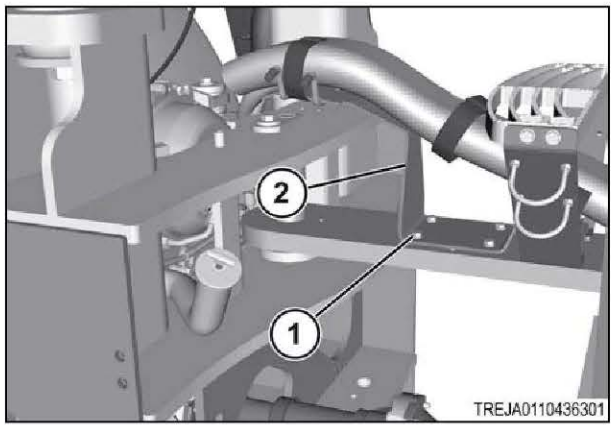

Fig. 23

2. Loosen the nuts (1) and the bolts (2) from the step (3). Loosen and remove the nuts (4) and the bolts (5) holding the braces (6).

3. Remove the step assembly.

4. Disconnect all the hydraulic lines and the electrical harness that go to the valve block on the rear of the machine.

5. Disconnect all the fuel lines.

6. Pull the hydraulic lines, the fuel lines, and the electrical harness through the articulation joint.

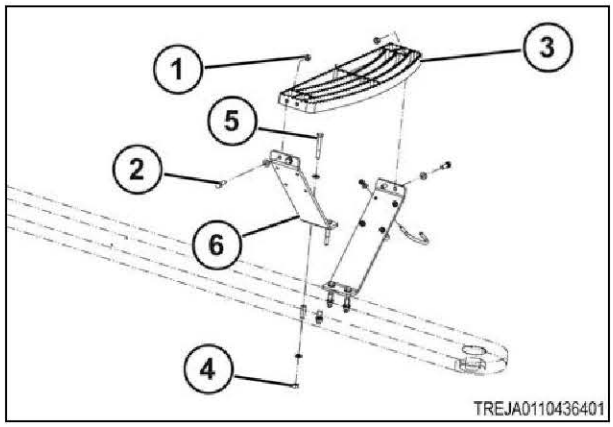

Fig. 24

7. Disconnect the axle lubrication supply line (1) and the axle lubrication return line (2) from the rear axle. Pull the lubrication lines through the articulation joint.

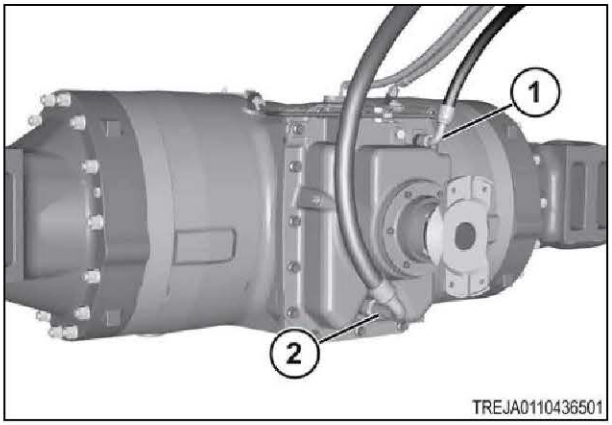

Fig. 25

8. Disconnect the differential lock line (1) and the service brake line (2) from the rear axle.

9. Pull the differential lock line and the service brake line through the articulation point.

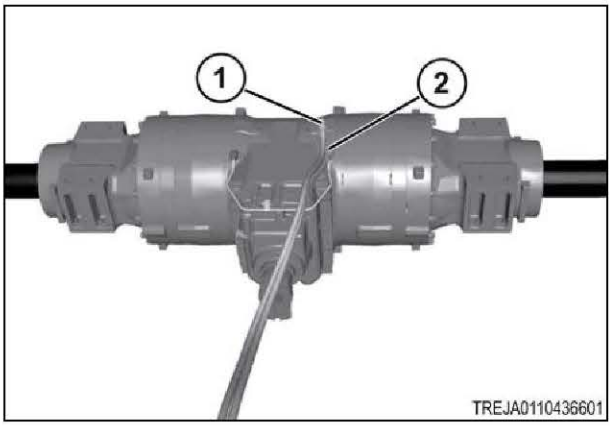

Fig. 26

10. Remove the nut (1) attaching the turnbuckle (2) to the articulation sensor arm (3). The articulation sensor does not need calibrated if the rod length (4) is not adjusted.

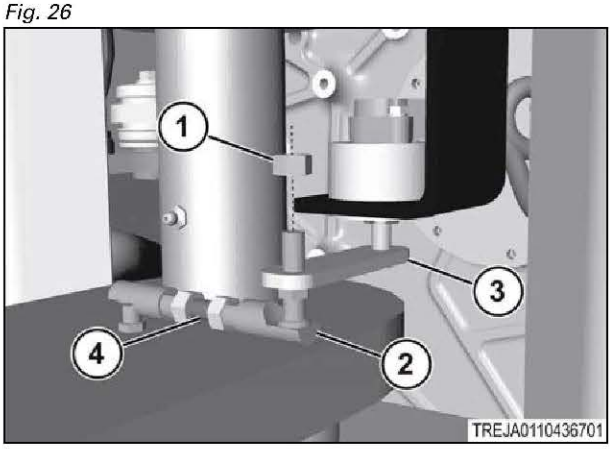

Fig. 27

11. Remove the sensor bracket (1) from the frame to gain clearance to remove the sensor arm (2) off the turnbuckle if necessary. Remove the two nuts with washer (3) and remove the two bolts (4). Adjust the sensor bracket as necessary to remove the sensor arm off the turnbuckle.

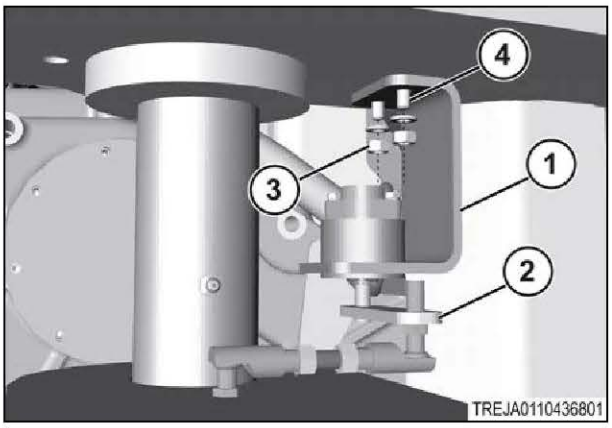

Fig. 28

12. Remove the bolt (1), the washer (2), and the spacer (3) holding the pin assembly (4).

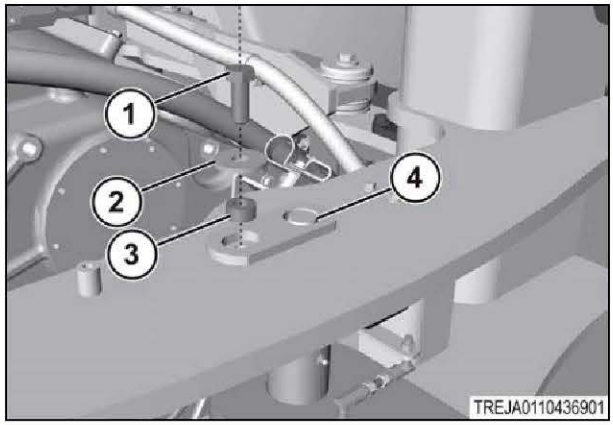

Fig. 29

13. Remove the pin assembly(1).

NOTE:
Lift the front or the rear of the frame to remove the side loading from the pin if necessary.

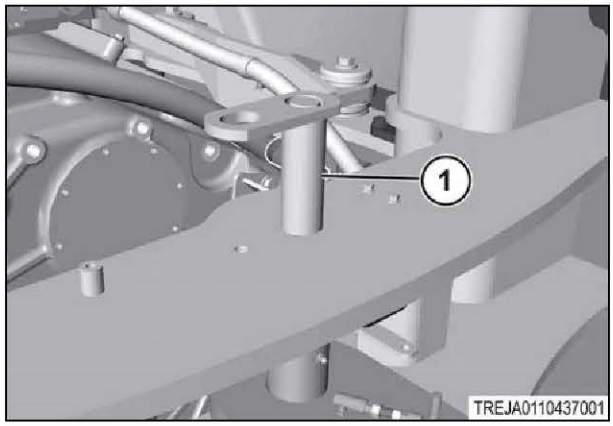

Fig. 30

14. Use the special tool (1) to support the top link if it is not necessary to remove the top link.

15. Inspect the outside dimension of the pin assembly. If the pin assembly shows excessive wear, the pin assembly must be replaced.

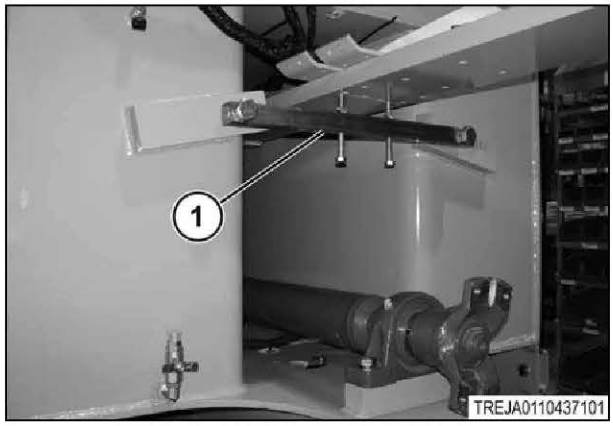

Fig. 31

16. Inspect the dimension of the front frame (1) for the upper articulation joint.

17. Measure the bore diameter. The diameter must not be more than 82.66 mm (3.25 in) for the bottom bore and 100.25 mm (3.94 in) for the top bore. The frame must be repaired if the bore is more than the specifications.

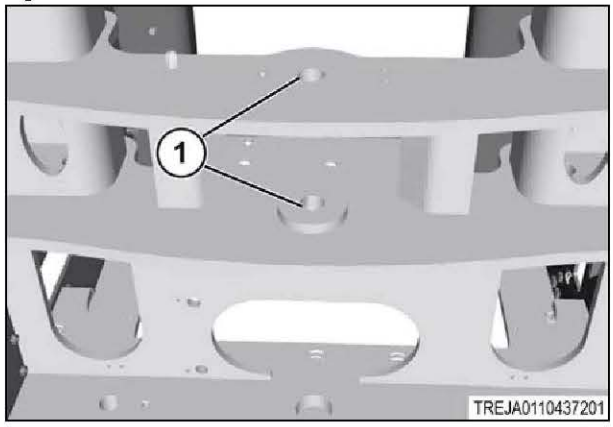

Fig. 32

Related Links

Frame repair page 4-33

Repair the frame by adding weld material and machining page 4-34

4.1.2 Disconnect the lower articulation joint

Procedure

1. Remove the bolts and the washers (1).
2. Remove the plate (2) from the lower articulation point.

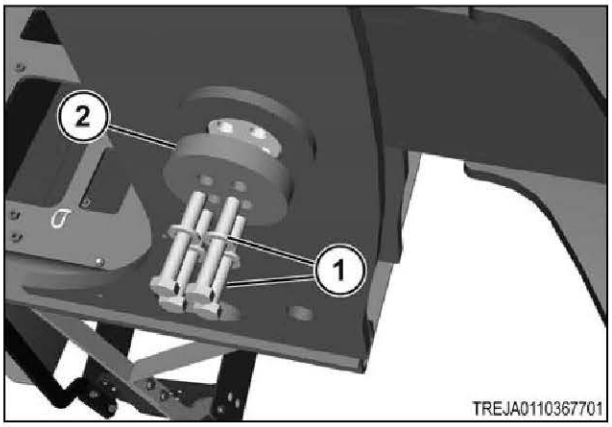

Fig. 33

3. Remove the bolt and the washer (1).

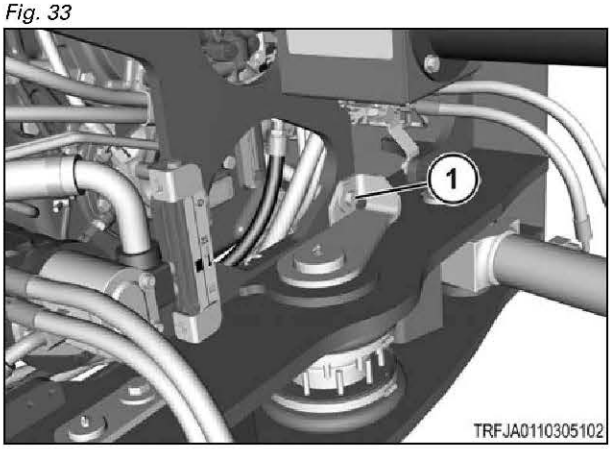

Fig. 34

4. Remove the pin assembly (1) from the lower articulation joint.
5. Split the machine.

   NOTE: *See the information for splitting the machine.*
6. Inspect the outside dimension of the pin assembly. If the pin assembly has excessive wear, the pin assembly must be replaced.
7. Inspect the dimension on the front frame lower articulation joint. If the frame has excessive wear, the frame must be repaired.

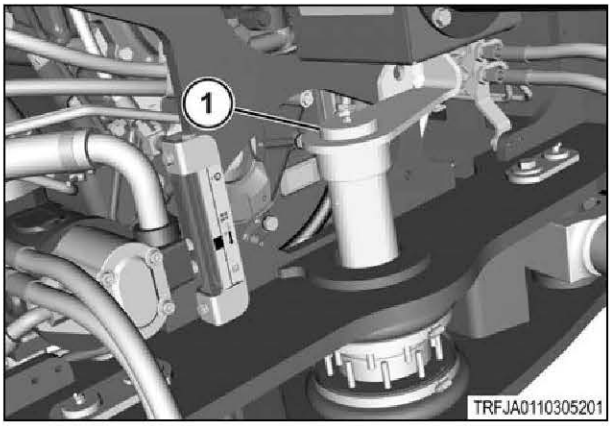

Fig. 35

Related Links

Frame repair page 4-33

Repair the frame by adding weld material and machining page 4-34

4.1.3 Remove the upper articulation top link

Procedure

1. Park the machine on a solid, level surface. Stop the engine, apply the parking brake, and take the key with you.
2. Use correct lifting equipment to remove the top link.

   IMPORTANT:

   The weight of the top link is 118.81 kg(261.94 lb).

   The weight of the special application top link is 191.22 kg (421.52 lb).

3. Remove the bolt (1), the washer (2), and the bushing (3) from the rear joint.

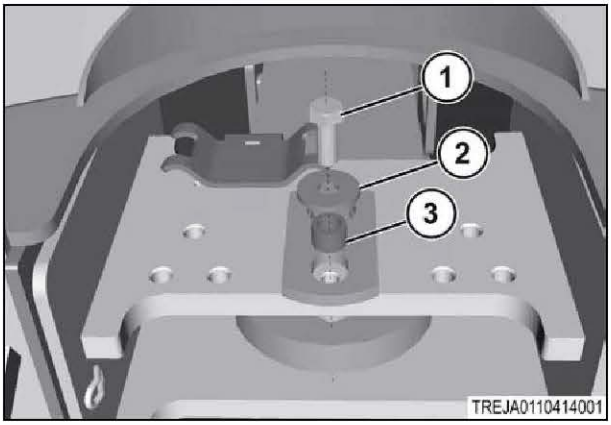

Fig. 36

4. Remove the pin assembly (1).
5. Remove the top link through the front of the rear frame.

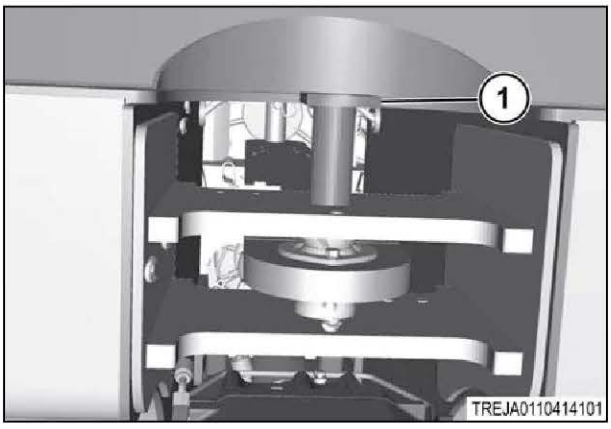

Fig. 37

6. Check the part for wear and damage of the pin assembly. The pin assembly must be replaced if the pin assembly shows excessive wear.

7. Inspect the bosses (1) on the rear frame for wear .

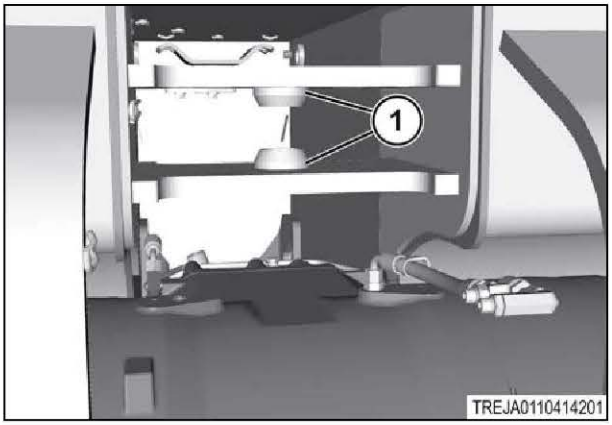

Fig. 38

4.1.4 Disassemble the top link

Procedure

1. Remove the two bolts with washers (1) that connect the bearing retainer (2).

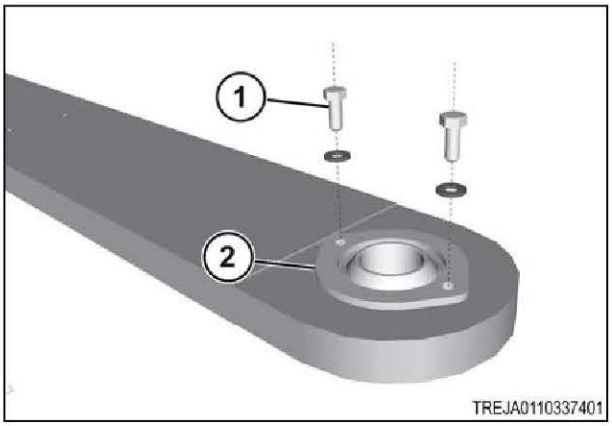

Fig. 39

2. Remove the bearing retainer (1).

3. Turn the top link over and repeat the procedure to remove the bearing retainer on the opposite side.

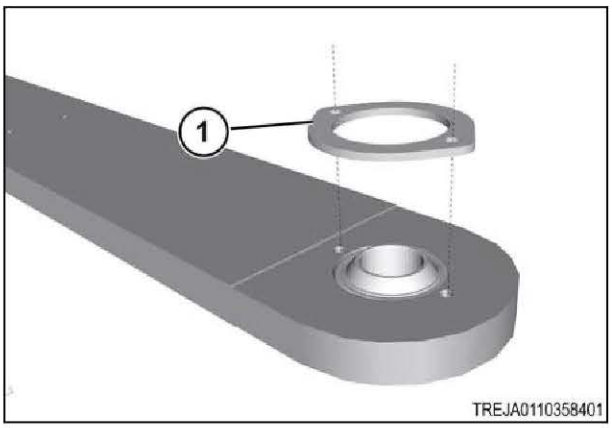

Fig. 40

4. Remove the 50 mm bearing (1). Use a correct device to press the bearing out of the top link. Do not apply force to the center ball of the bearing during the removal. If the hole (2) shows excessive wear or fails to hold a new bearing correctly , replace the top link .

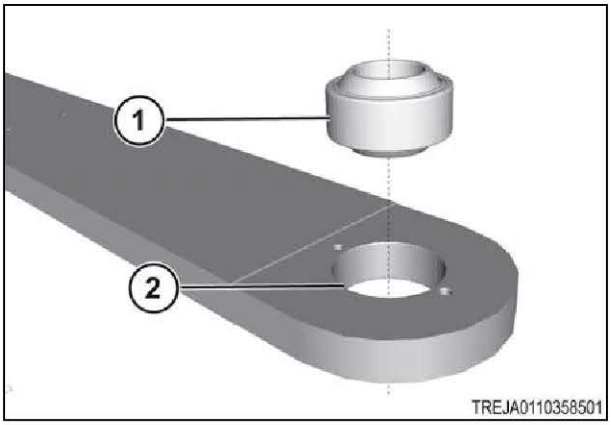

Fig. 41

4.2 Connect the machine

4.2.1 Assemble the top link

Procedure

1. Install the 50 mm bearing (1). Use a correct tool, press the bearing in the top link until the top of the bearing is flush with the link. If the hole (2)fails to give a tight install for the new bearing, then the top link must be replaced.

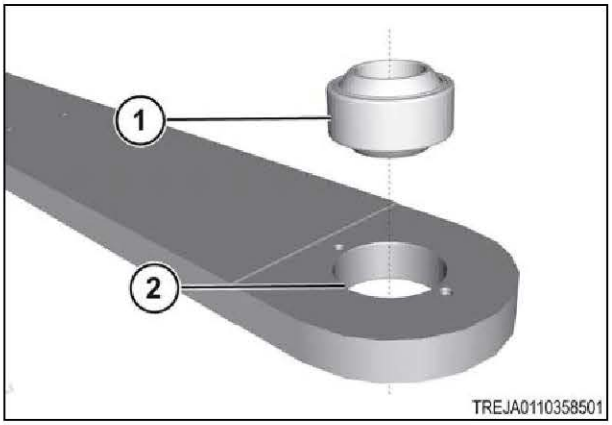

Fig. 42

2. Install the bearing retainer (1).

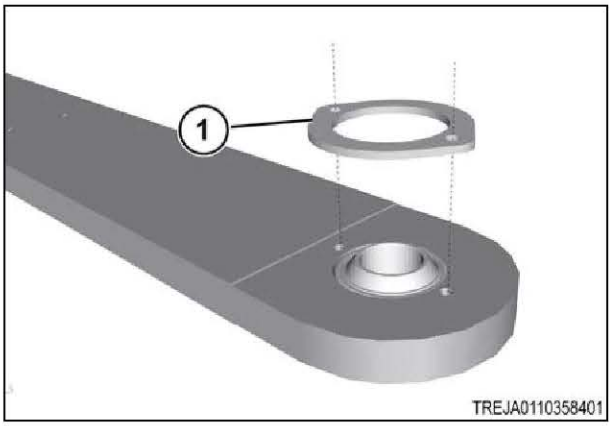

Fig. 43

3. Fasten the bearing retainer (1) with two bolts and washers (2). Tighten to 45 Nm (34 lbf ft) to 65 Nm (48 lbf ft). Turn the top link over and repeat the procedure to install the bearing retainer on the opposite side.

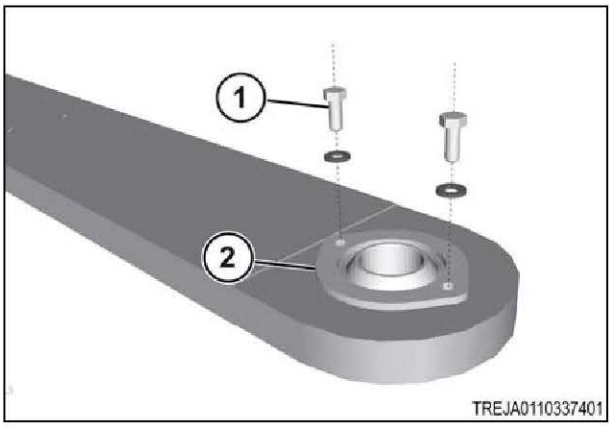

Fig. 44

4.2.2 Assemble the top link - scraper option

Procedure

1. Install the grease elbow (1).

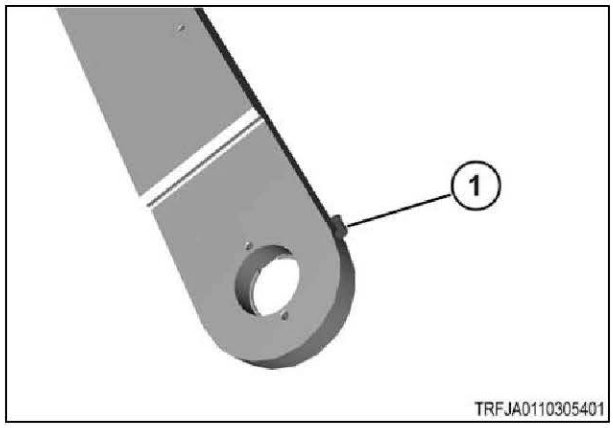

Fig. 45

2. Install the grease hose (1). Secure with P-clips (2).

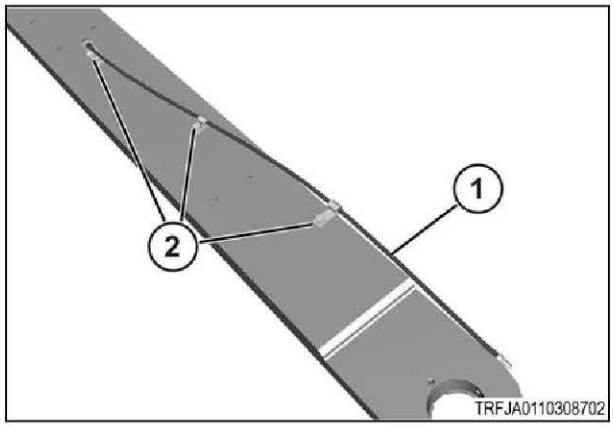

Fig. 46

3. Install the 50 mm bearing (1). Use a correct tool, press the bearing in the top link until the top of the bearing is flush with the link. If the hole fails to give a tight install for the new bearing, then the top link must be replaced.

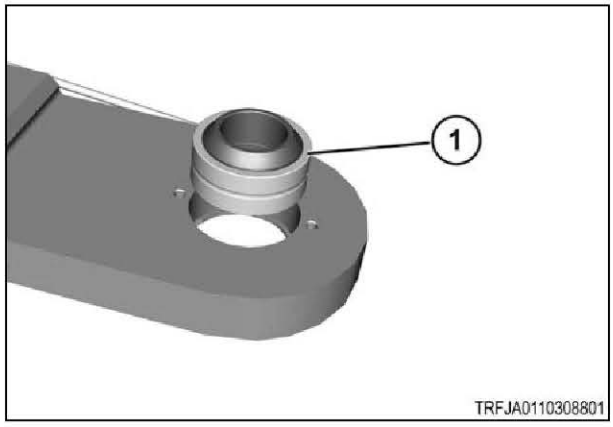

Fig. 47

4. Fasten the bearing retainer (1) with two bolts and washers (2). Tighten to 45 Nm (34 lbf ft) to 65 Nm (48 lbf ft).

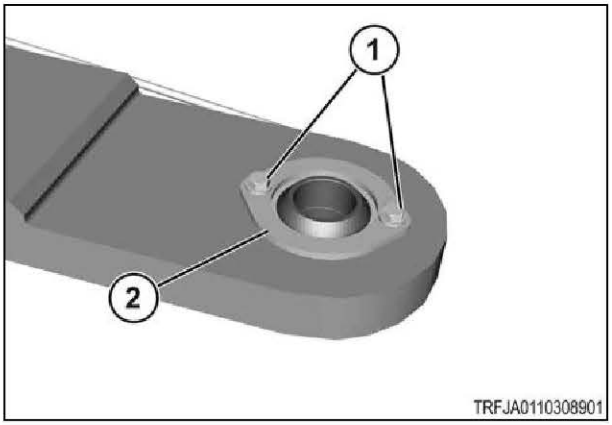

Fig. 48

4.2.3 Install the upper articulation top link

Procedure

1. Install the top link support (1) to the rear frame to support the top link (2).

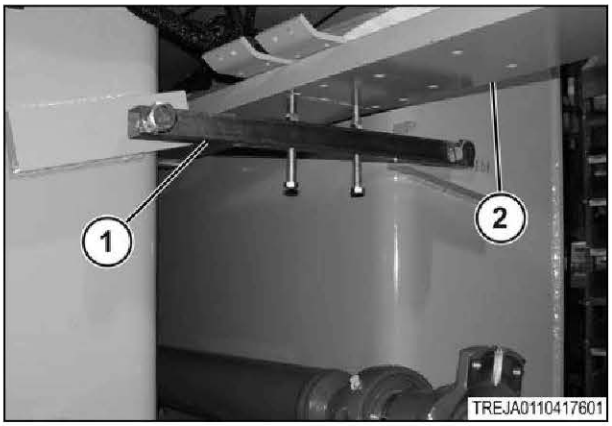

Fig. 49

2. Move the top link (1) into position on the rear frame. Install the pin assembly (2).

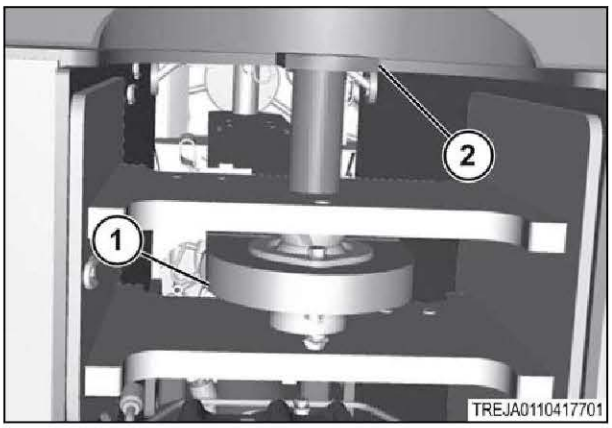

Fig. 50

3. Install the spacer (1), the washer (2), and the bolt (3). Tighten the bolt to 200 to 280 Nm(147 to 207 lbf ft).

4. Move the front frame and the rear frame into position to prepare to connect the machine.

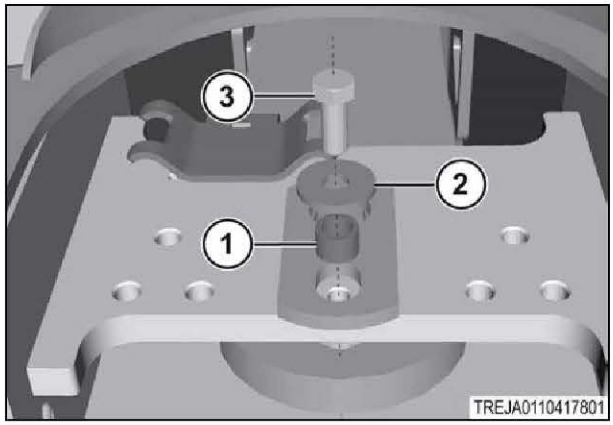

Fig. 51

Related Links

Connect the lower articulation joint page 4-19
Connect the upper articulation front joint page 4-20

4.2.4 Connect the lower articulation joint

Procedure

1. Insert the pin assembly (1)through the frame and the articulation joint bearing.

2. Adjust the frame to aid in the pin assembly installation.

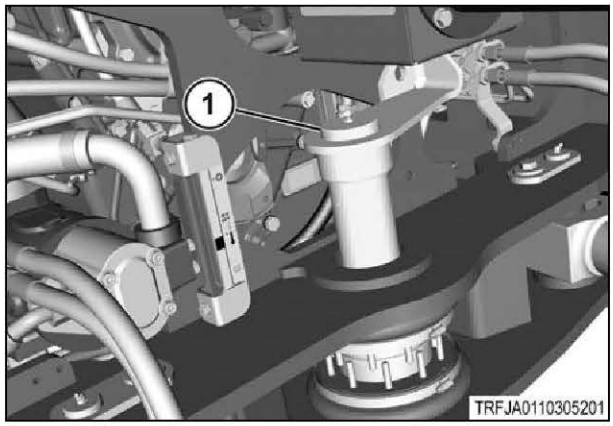

Fig. 52

3. Install the pin assembly (1) to the frame with the bolt and the washer (2.) Tighten the bolt to 240 Nm (177 lb ft).

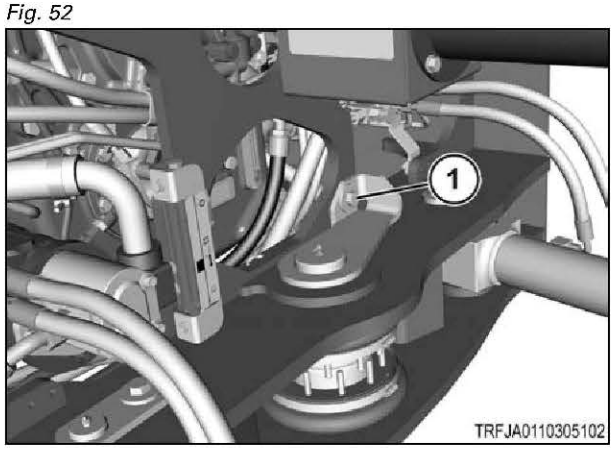

Fig. 53

4. Install the plate (2) with the bolts and the washers (1) to the lower articulation joint pin assembly. Tighten in a crossing pattern.
5. Grease the bearings using the top lubrication fitting and the side lubrication fitting.
6. Purge all of the air from the seals until grease is visible around the pin at the top and the bottom.

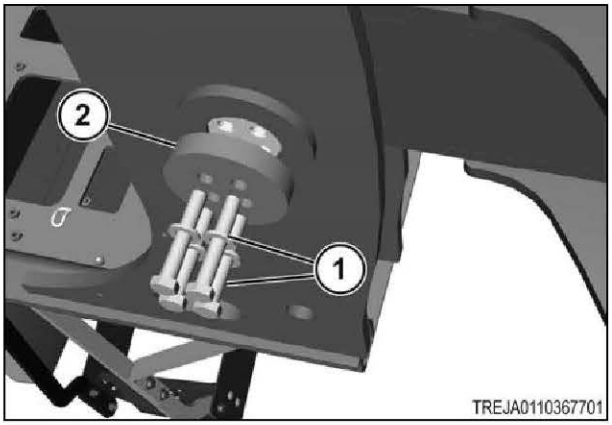

Fig. 54

4.2.5 Connect the upper articulation front joint

Procedure

1. Install the pin assembly (1).

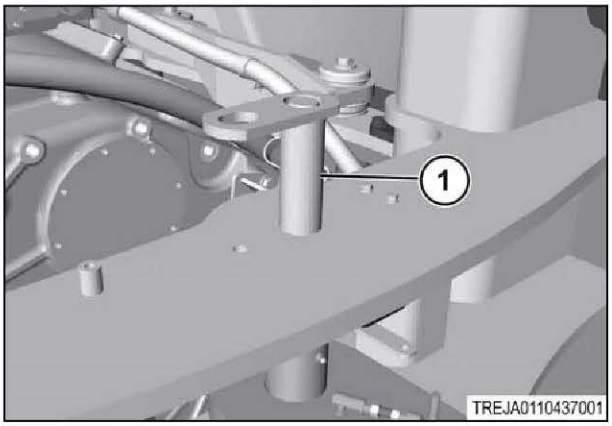

Fig. 55

2. Install the spacer (3), the washer (2), and the bolt (1) to fasten the pin assembly (4). Tighten to 200 to 280 Nm(147 to 207 lbf ft).
3. Remove the sensor bracket to get clearance to install the sensor arm to the turnbuckle if necessary.

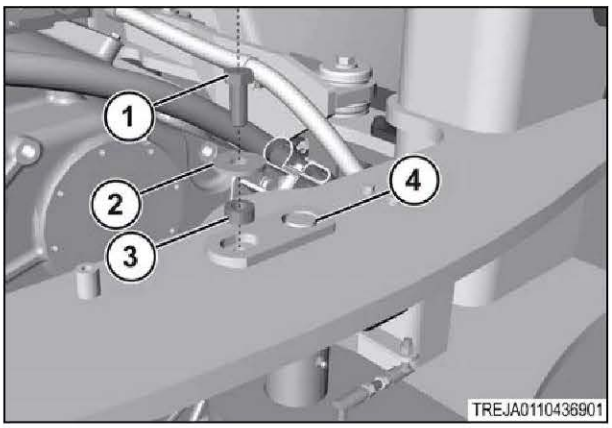

Fig. 56

4. Adjust the sensor bracket (1) to install the sensor arm (2) to the turnbuckle. Move the sensor bracket into position on the frame. Install the two bolts (4) and fasten with the two nuts and washers (3).

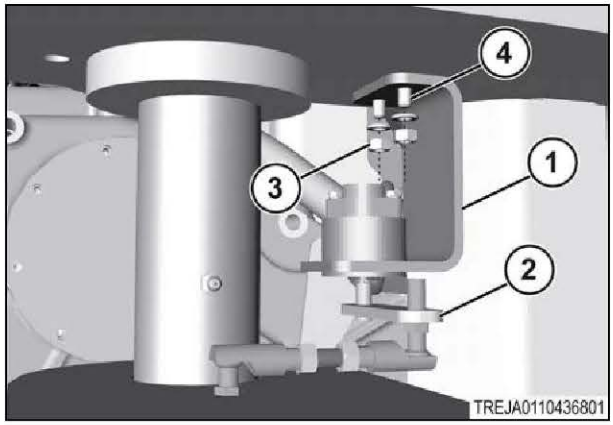

Fig. 57

5. Attach the sensor arm (3) to the turnbuckle (2) with the nut (1). If the rod length (4) is not adjusted the articulation sensor calibration is not required.

6. Add grease to the lubrication fitting until the grease is visible. Lubricate every 50 hours or every week.

7. Install all the hydraulic lines, the fuel lines, and the electrical harness to the rear of the machine.

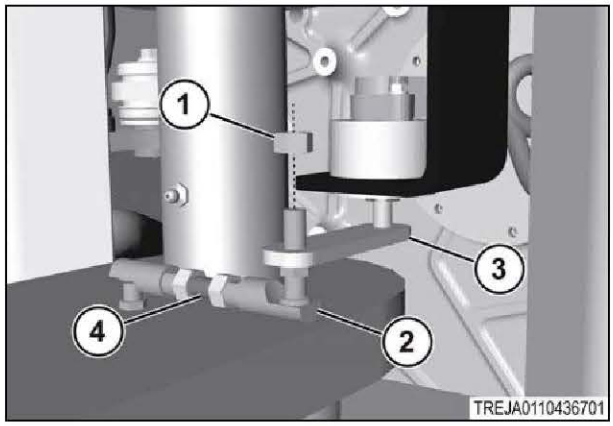

Fig. 58

8. Install the differential lock line (1) and the service brake line (2) to the rear axle.

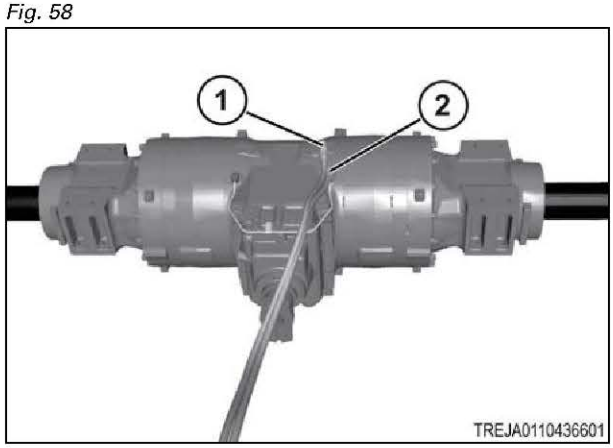

Fig. 59

9. Install the axle lubrication supply line (1) and the axle return line (2) to the rear axle.

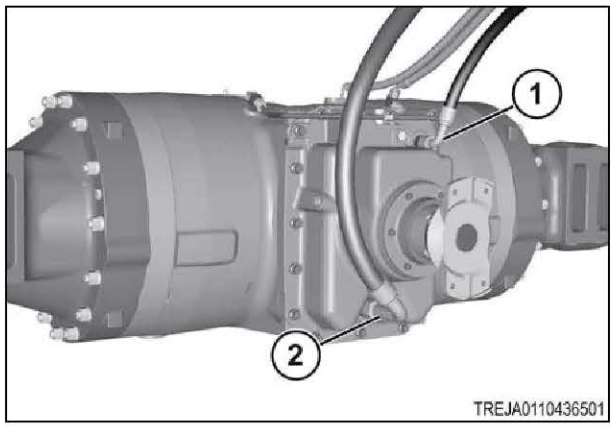

Fig. 60

10. Loosely assemble the step (1) to the braces (2) with bolts (3) and nuts (4). Install the braces to the top link and then mount with bolts (5) and nuts (6). Tighten the nuts (2) to 45 to 65 Nm(34 to 48 lbf ft). Tighten the step bolts to 45 to 65 Nm(34 to 48 lbf ft). Install the U-bolt (7) and the nuts (8). Tighten the nuts to 19 to 31 Nm(14 to 22 lbf ft).

11. Install all the hydraulic lines and the electrical harness to the valve block on the rear of the machine.

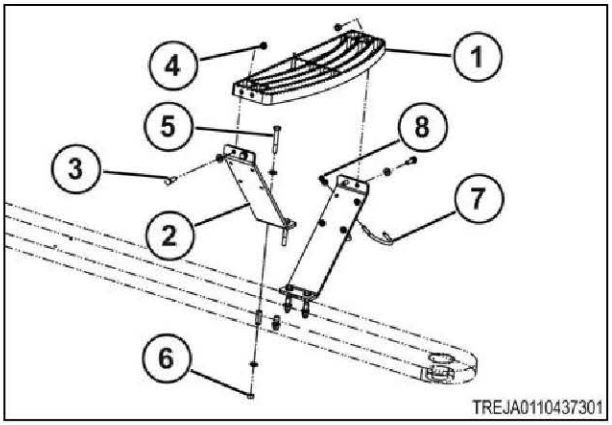

Fig. 61

12. Install the hose support bracket (1) to the top link with four bolts with washers (2). Tighten the bolts to 80 to 120 Nm(59 to 89 lbf ft).

13. Mount the hoses to the support brackets.

14. Install the PTO drive shaft if the machine has a PTO.

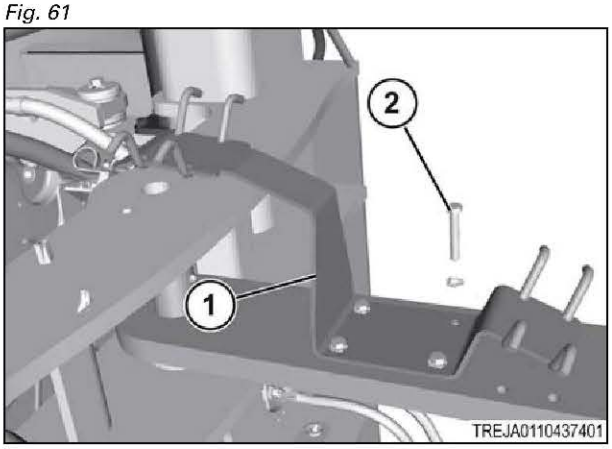

Fig. 62

15. Install the universal joint (1) to both ends of the PTO drive shaft (2). Mount the universal joint with four bolts (3). Tighten the bolts to 80 to 120 Nm(17.98 to 26.97 lbf ft).

16. Repeat the procedure for the opposite side.

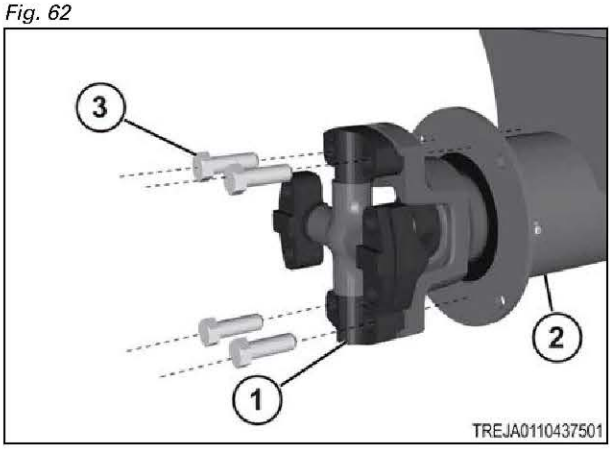

Fig. 63

17. Install the drive shaft spacer plates (1) into position on the PTO drive shaft (2). Use a correct lifting device to move the PTO drive shaft into position on the top link (3).

IMPORTANT: *The approximate weight of the PTO drive shaft is 30 Kg(67 lb).*

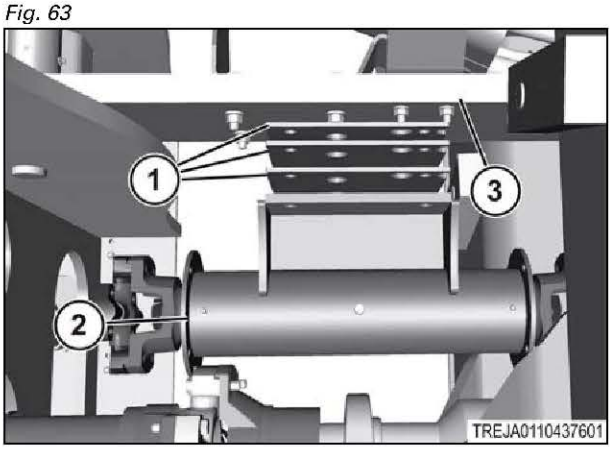

Fig. 64

18. Mount the drive shaft (1) with two bolts with washers (2).

19. Repeat the procedure for the opposite side of the PTO.

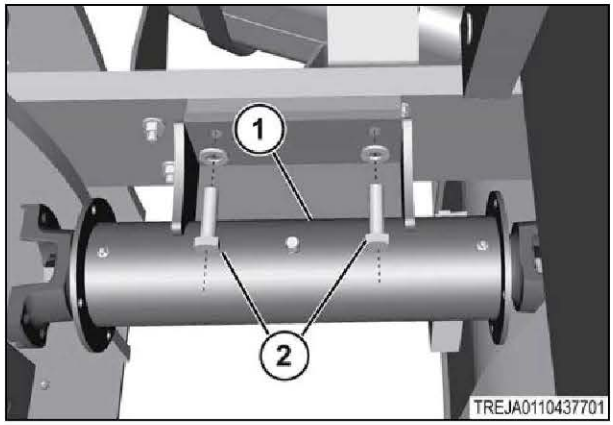

Fig. 65

20. Extend the PTO articulated drive shaft (1) to align with the universal joint (2) on the PTO (3). Install the PTO articulated drive shaft to the universal joint with four bolts (4). Tighten the bolts.

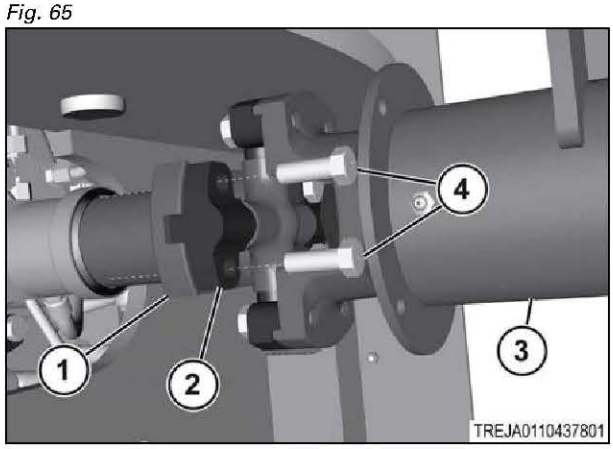

Fig. 66

21. Install the front universal joint shield (1) with two bolts with washers (2). Tighten the bolts.

22. Repeat the procedure for the opposite side of the machine.

23. Use a correct lifting device to align the rear PTO drive shaft (1) to the the universal joint (2) on the PTO drive shaft (3). Install the PTO drive shaft to the universal joint with four bolts (4). Tighten the bolts.

NOTE: *The approximate weight of the rear PTO drive shaft is 30 Kg(67 lb).*

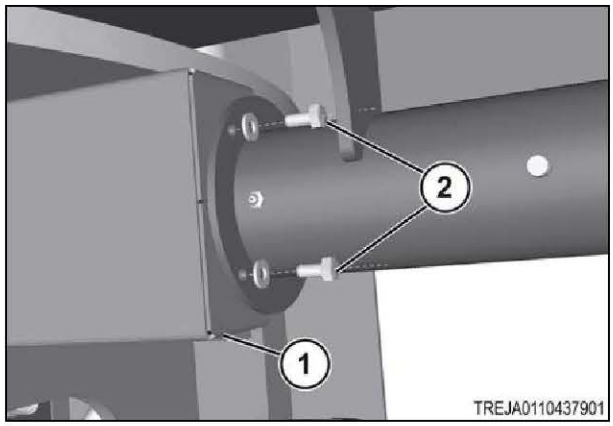

Fig. 67

24. Install the rear universal joint shield (1) with two bolts with washers (2). Tighten the bolts.

25. Repeat the procedure for the opposite side of the machine.

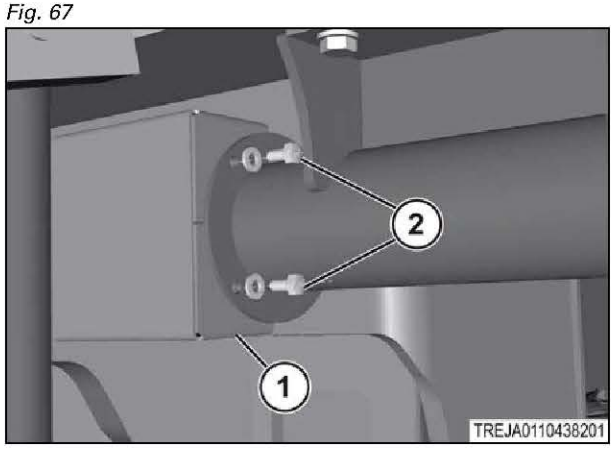

Fig. 68

26. Install the rear drive shaft (1).

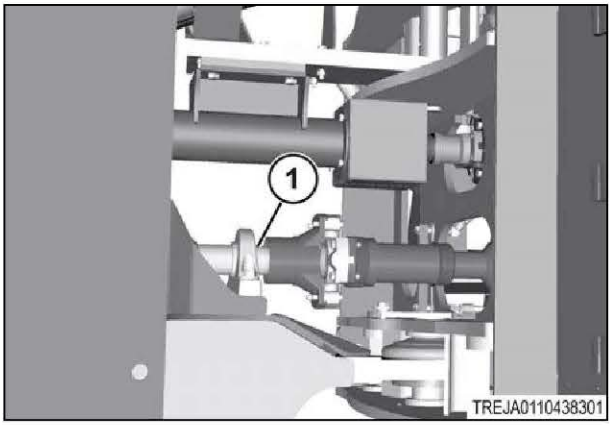

Fig. 69

27. Mount the rear drive shaft (1) to the articulation drive shaft (2) with the bolts (3). Tighten the bolts to 135 to 165 Nm(100 to 122 lbf ft).

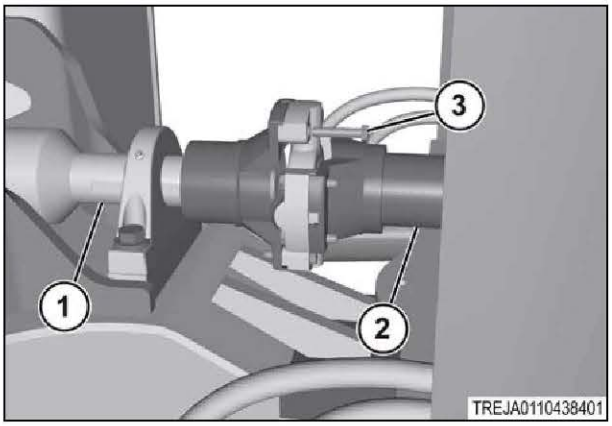

Fig. 70

28. Install the steering cylinders (1).

29. Check the hydraulic fluid level and fill to the correct level.

30. Remove the air from the brake system.

31. Lower the machine to the ground.

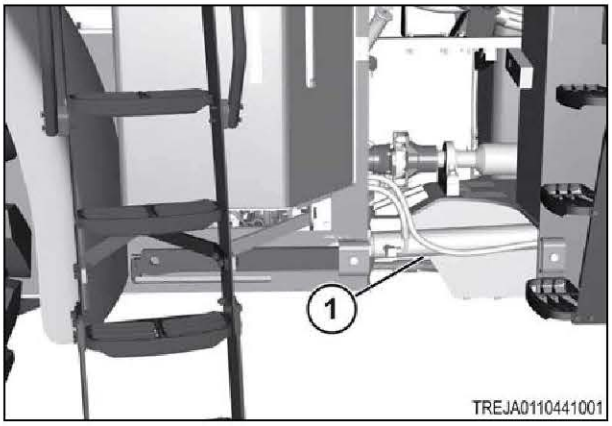

Fig. 71

Related Links

Install the steering cylinder page 5-73
Purge the service brake page 7-84
Bleed the brake system pressure page 7-86

4.3 Replace the articulation bearing

Before starting the procedure

WARNING: Crushing hazard.

Personal injury or death can occur.

Safely support the machine and implement on a hard level surface.

IMPORTANT: *The lubrication quantities in this procedure are for dry bearings only.*

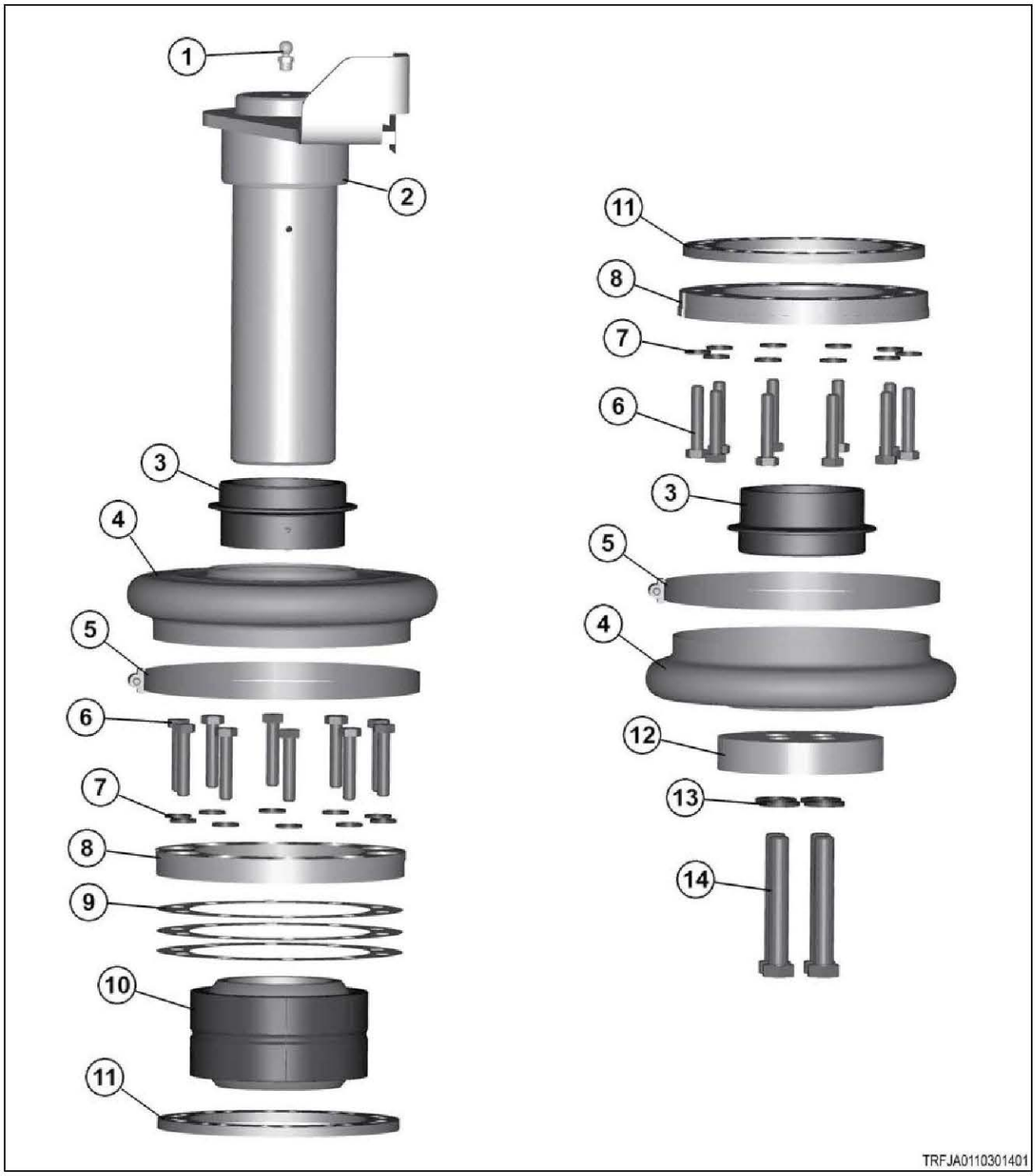

Fig. 72

Callout	Description
1	Lubricate fitting
2	Pin assembly
3	Spacer
4	Bearing seal
5	Clamp
6	Bolts
7	Washers
8	Bearing retainer
9	Shims
10	Bearing
11	Plate
12	Plate
13	Washers
14	Bolts

Description	Part number	Vendor	Where used	Mandatory
Support stand assembly	1U-7498	Caterpillar dealer network	Drive train system	Mandatory

Procedure

1. Park the machine on a solid, level surface.
2. Apply the parking brake, stop the engine, and take the key with you.
3. Disconnect the battery with the battery disconnect switch.
4. Remove the key from the battery disconnect switch.
5. Install a jack stand bracket (1) to the left and right side of the front frame with four bolts (2). Install a jack stand (3) under each jack stand bracket.

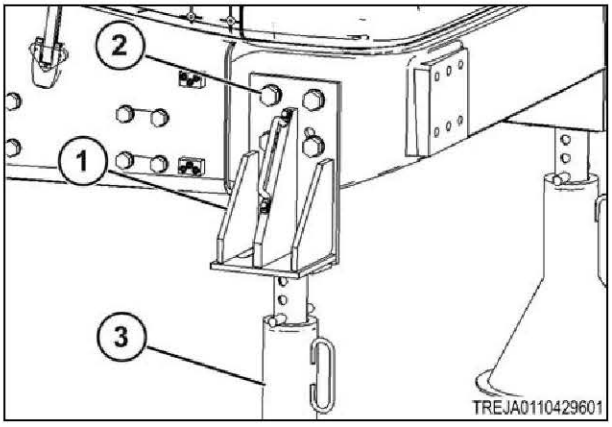

Fig. 73

6. Put jack stands under the rear of the front frame on the left and right side of the joint (1).

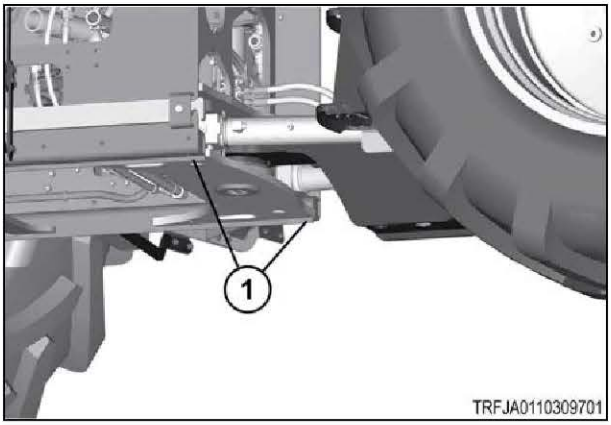

Fig. 74

7. Attach the correct lift equipment to the front of the rear frame (1).

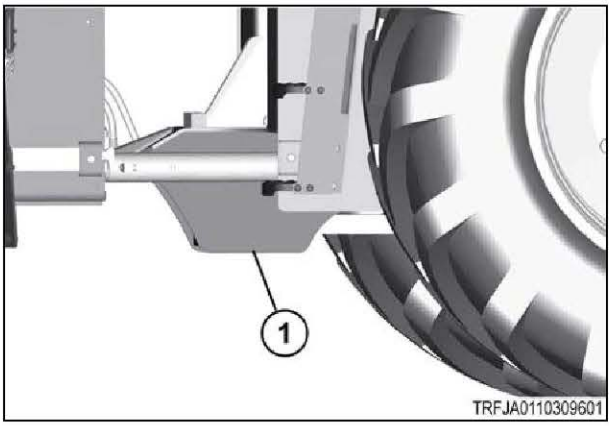

Fig. 75

8. Remove the bolt (1), and the pin (2).

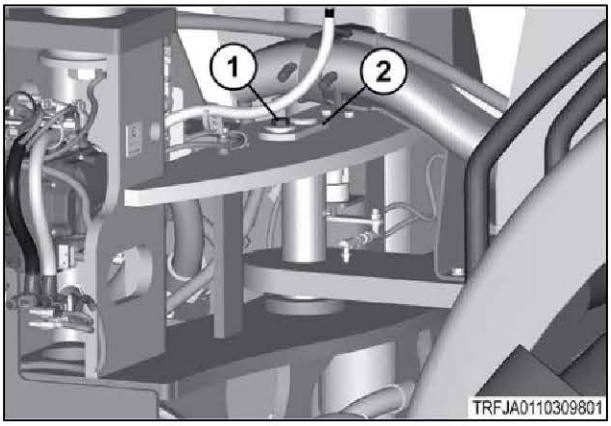

Fig. 76

9. Remove the bolts (1, 2), the plate (3), and the pin (4).

10. Lift the front of the rear frame and roll the rear unit back a short distance.

IMPORTANT: *Do not roll the rear unit to far, as machine damage can occur.*

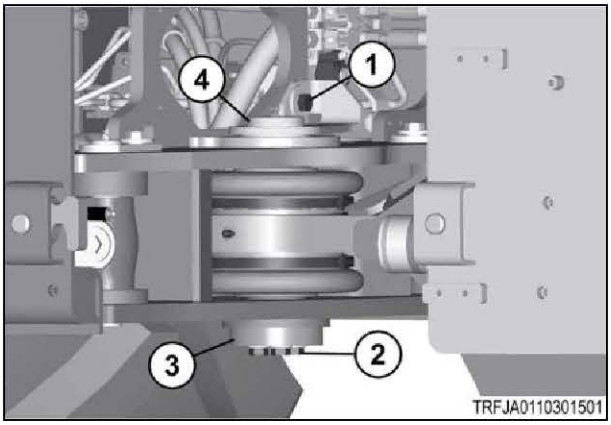

Fig. 77

11. Remove the tube clamps (1), the bearing seal (2), and the spacer (3).

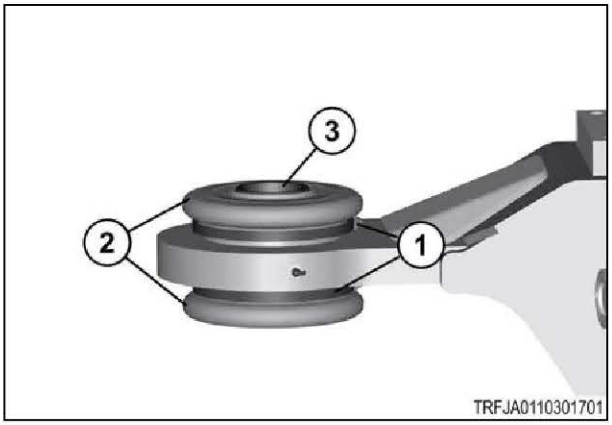

Fig. 78

12. Remove the bolts (1), the top bearing retainer (2), the shims (3), and the bearing (4).

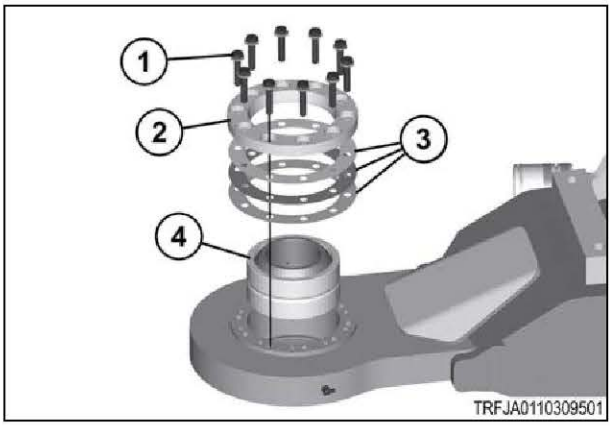

Fig. 79

13. Remove the bolts (1), and the bottom bearing retainer (2), from the frame tongue (3).

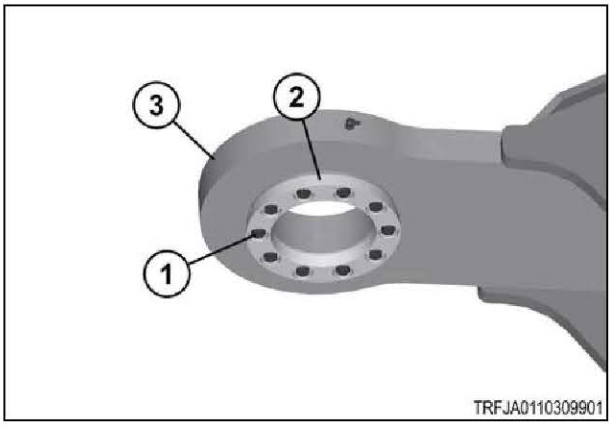

Fig. 80

14. Inspect the hole diameter (1) on the frame tongue. The hole diameter must not be more than 139.613 mm to 139.649 mm (5.4965 in to 5.4979 in).

IMPORTANT: *Repair the hole if the diameter measures larger than specified.*

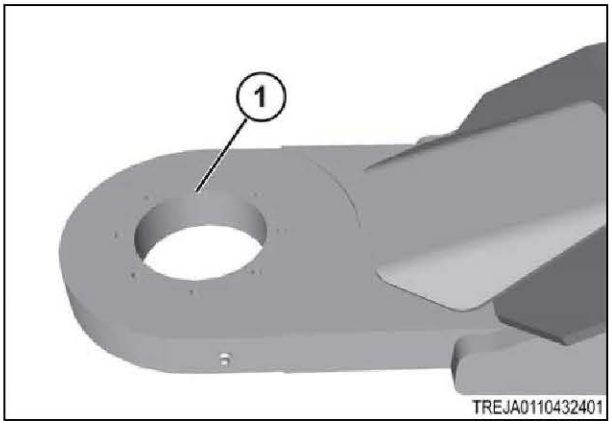

Fig. 81

15. Install the bearing (1) to the frame tongue (2).

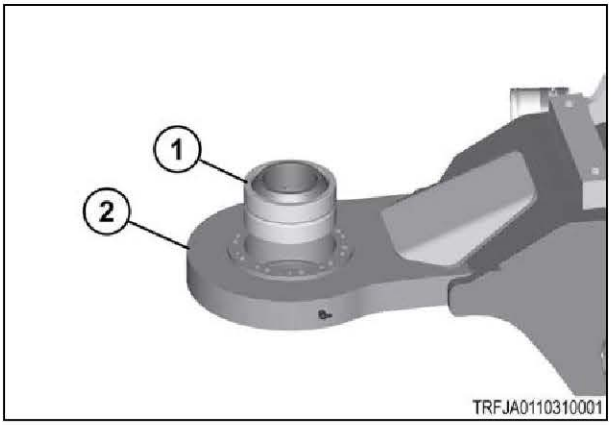

Fig. 82

16. Use the bolts and washers (1) to install the bottom bearing retainer (2) under the frame tongue (3).

Position the grease release notch to the rear of the machine.

Tighten the bolts to 55 Nm (41 lbf ft).

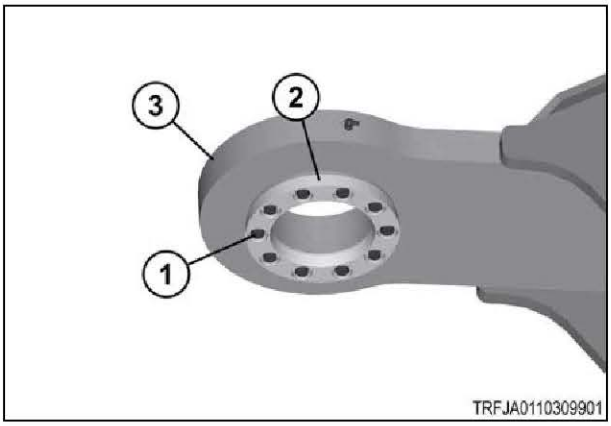

Fig. 83

17. Use the bolts and washers (1) to install the top bearing retainer (2) to the frame tongue (3).

Position the grease release notch to the rear of the machine.

Tighten to 55 Nm (41 lbf ft).

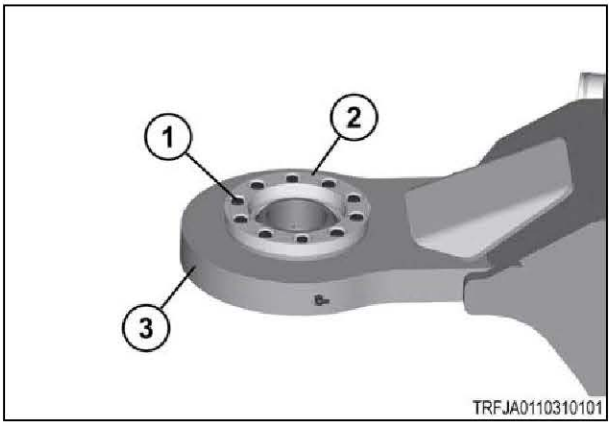

Fig. 84

18. Remove the top bearing retainer (1).

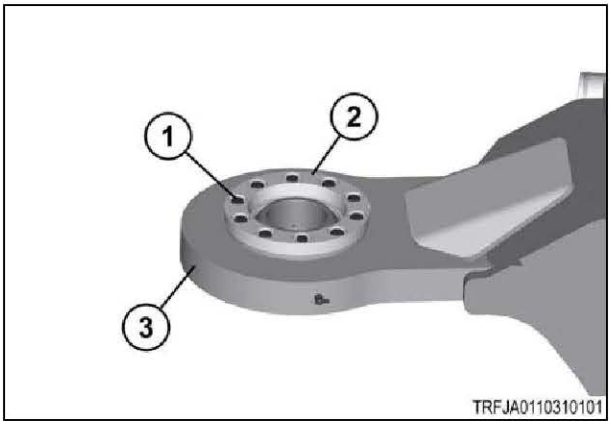

Fig. 85

19. Measure the stand height (1) of the bearing outer ring (2) above the frame (3) in three locations. Determine the average of the bearing stand height. Select a shim pack 0.0762 to 0.2032 mm (0.003 to 0.008 in) less than the calculated average.

IMPORTANT:
Use an accurate device to measure the shim thickness.

Nominal shim requirement:

Qty	Thickness
2	0.127 mm (0.005 in) shim

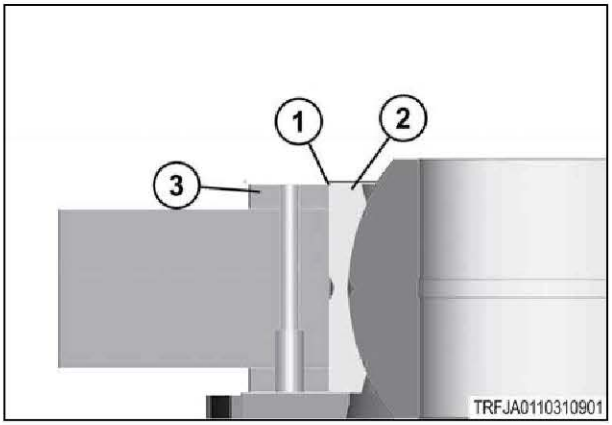

Fig. 86

Maximum shim requirement:

Qty	Thickness
3	0.127 mm (0.005 in) shim

20. Use the bolts (1) to install the shim pack (3) and the bearing retainer (2).

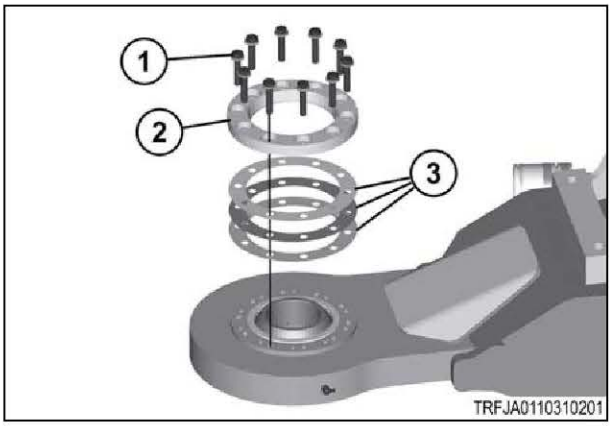

Fig. 87

21. Tighten the bolts twice to 55 Nm (41 lbf ft) in the sequence shown.

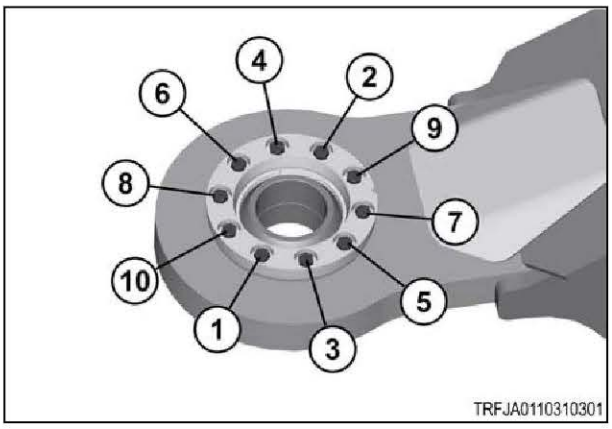

Fig. 88

22. Use the tube clamps (1) to install the bearing seal (2), and the spacers (3).

23. Lift the front of the rear frame and roll the rear unit forward.

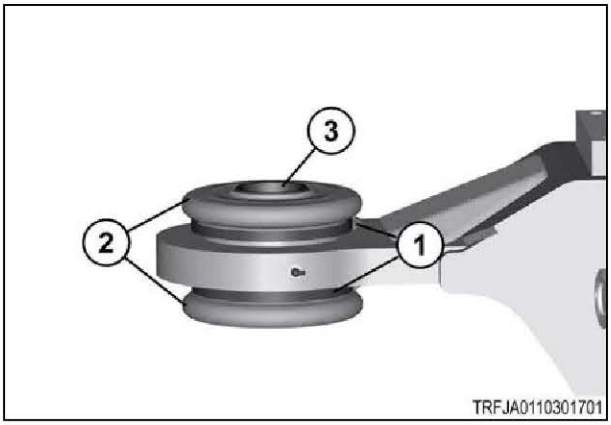

Fig. 89

24. Align the holes, and insert the pin (2) through the frame articulation joint, and install the bolt (1).

25. Fill the lubrication fitting (3) with 0.014 kg (0.5 oz) of national lubricating grease institute (NLGI), extreme pressure (EP), grade 2 lithium molybdenum disulfide (LI/MO) grease.

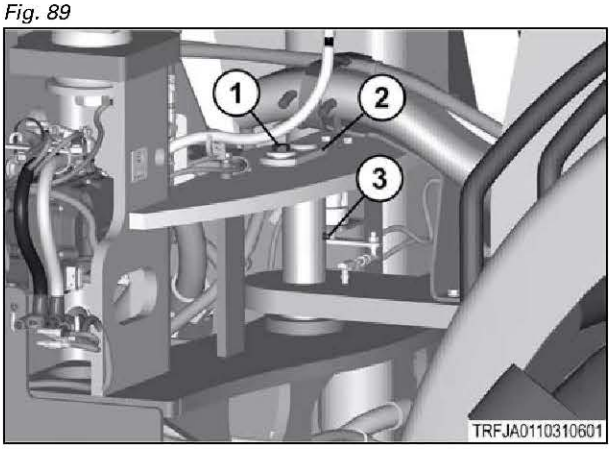

Fig. 90

26. Use the hardware (1) to install the pin (2).
Tighten the bolt to 240 Nm (177 lbf ft).

27. Fill the lubrication fitting (3) with 0.510 kg (18 oz) of national lubricating grease institute (NLGI), extreme pressure (EP), grade 2 lithium molybdenum disulfide (LI/MO) grease.

28. Fill the lubrication fitting (4) with 0.085 kg (3 oz) of national lubricating grease institute (NLGI), extreme pressure (EP), grade 2 lithium molybdenum disulfide (LI/MO) grease.

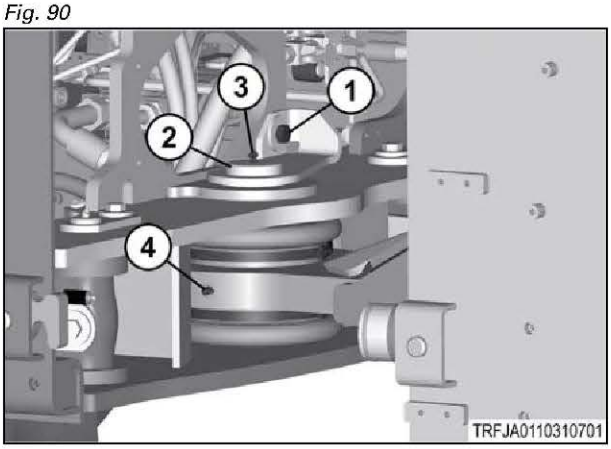

Fig. 91

29. Use the bolts (1) to install the plate (2).

30. Tighten the bolts (1) in a cross pattern 3 times.
Tighten the bolts to 240 Nm (177 lbf ft).

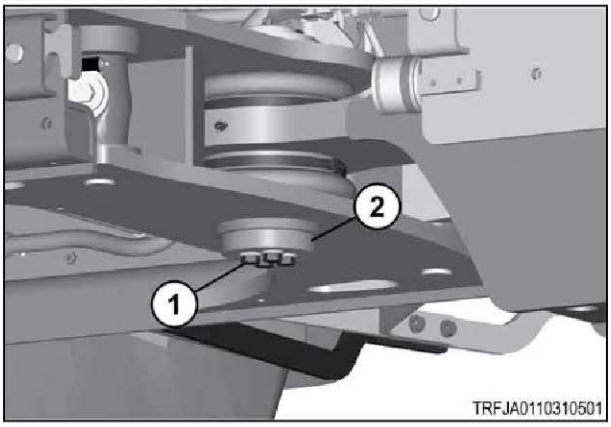

Fig. 92

31. Fill the lubrication fitting (1) with 0.019 kg (0.7 oz) of national lubricating grease institute (NLGI), extreme pressure (EP), grade 2 lithium molybdenum disulfide (LI/MO) grease.

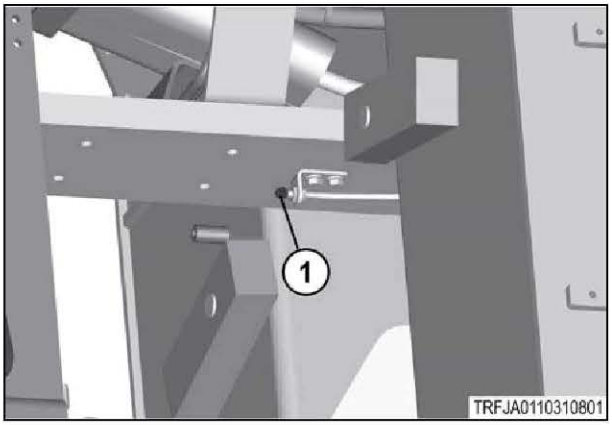

Fig. 93

4.4 Frame repair

The two approved methods for repairing the frame are:

1. Adding weld material to the bores that have exceeded the wear limit. Machine the material to the correct specification.
2. Install cutting templates. Remove the worn material and then weld in the new slugs that match the current specification.

4.5 Repair the frame by adding weld material and machining

IMPORTANT:
This procedure must only be performed by a certified welder.

IMPORTANT:
When repairing a bore that is installed to the fuel tank make sure to use all safety measures.

NOTE:
Both bores supporting a pin must be reworked at the same time to make sure correct pin alignment.

Bore location	Wear limit	Rework diameter	Tolerance
Lower articulation pin upper bore	81.15 mm (3.195 in)	80.82 mm (3.182 in)	-0.03 mm (-0.0012 in) to 0.03 mm (0.0012 in)
Lower articulation pin lower bore	69.97 mm (2.755 in)	69.65 mm (2.742 in)	-0.03 mm (-0.0012 in) to 0.03 mm (0.0012 in)
Upper articulation pin bores	44.80 mm (1.764 in)	44.55 mm (1.754 in)	-0.03 mm (-0.0012 in) to 0.03 mm (0.0012 in)
Rear articulation pin bores	50.29 mm (1.980 in)	50.04 mm (1.970 in)	-0.03 mm (-0.0012 in) to 0.03 mm (0.0012 in)
Steering pin bores	44.80 mm (1.764 in)	44.55 mm (1.754 in)	-0.03 mm (-0.0012 in) to 0.03 mm (0.0012 in)
Articulation bearing bore	120.001 mm (4.724 in)	119.983 mm (4.724 in)	-0.018 mm (-0.0007 in) to 0.018 mm (0.0007 in)

4.6 Articulation position sensor

4.6.1 Remove the articulation position sensor

Procedure

1. The articulation position sensor (1) is on the top link of the machine.

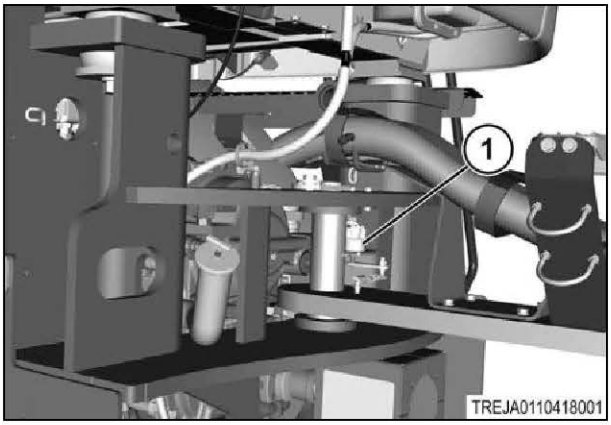

Fig. 94

2. Disconnect the harness (1) from the articulation position sensor (2).

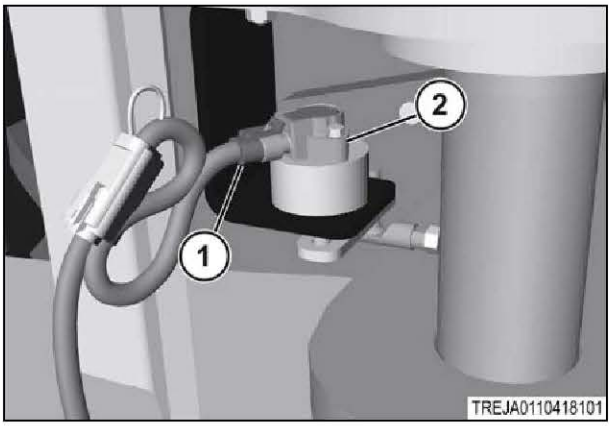

Fig. 95

3. Remove the bolts with washers (1) to remove the articulation position sensor.

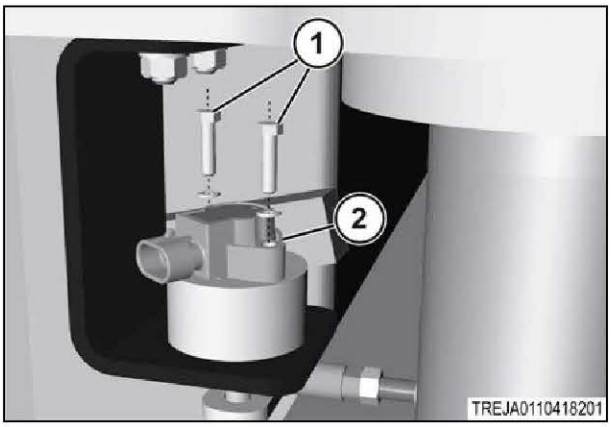

Fig. 96

4. Remove the E-clip (1) and the shoulder washer (2).

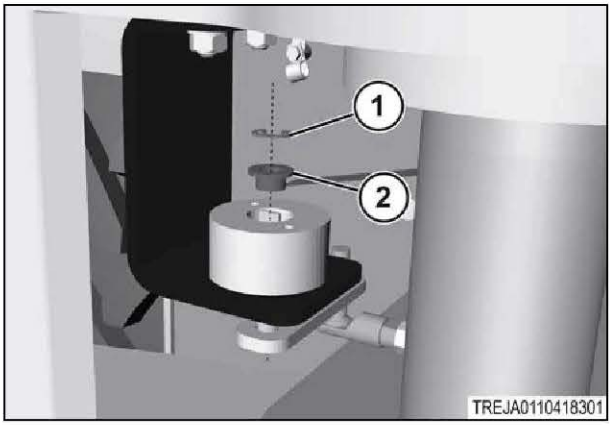

Fig. 97

5. Remove the E-clip (1) on the bottom of the articulation position sensor bracket.

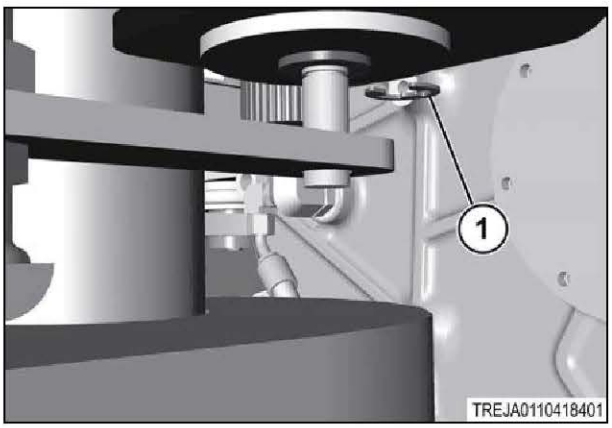

Fig. 98

6. Slide the shoulder washer (1) down.

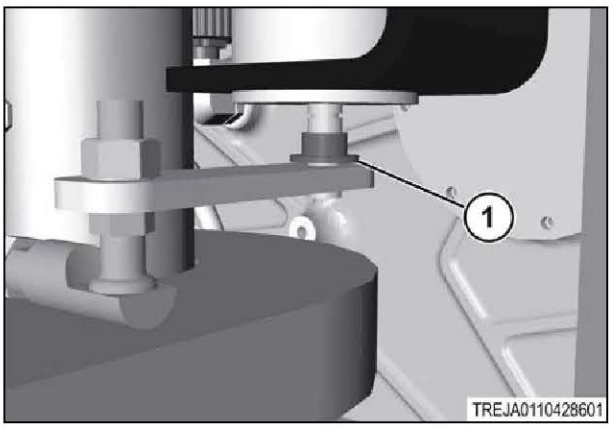

Fig. 99

7. Remove the nut (1) from the turnbuckle (2) to the articulation sensor weldment (3).

8. Remove the articulation sensor weldment.

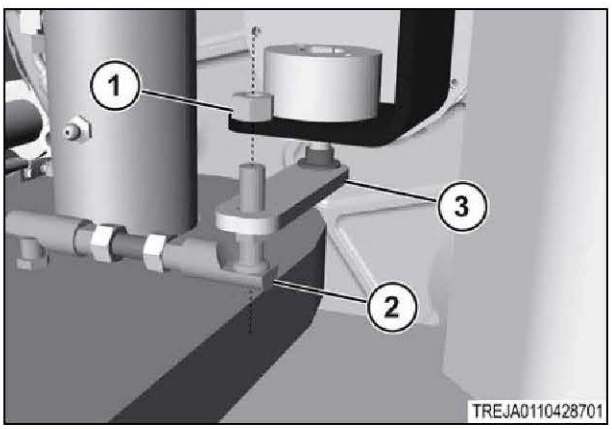

Fig. 100

9. Remove the shoulder washer (1) from the articulation sensor weldment (2).

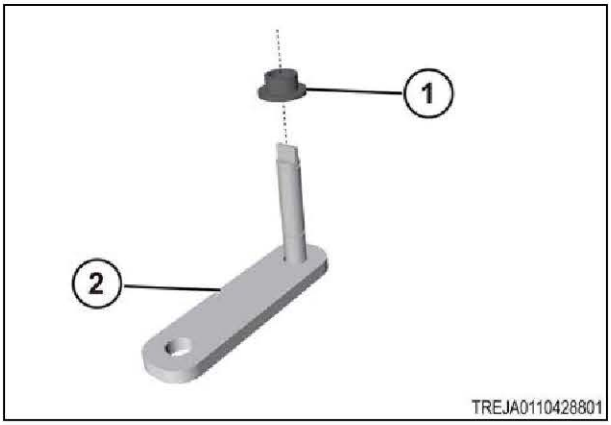

Fig. 101

10. Loosen the nuts (1).

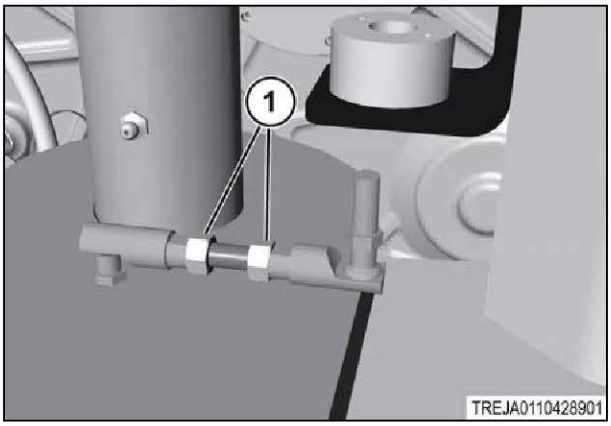

Fig. 102

11. Disassemble the turnbuckle (1), nut (2), rod (3), and the nut (4) from the turnbuckle (5).

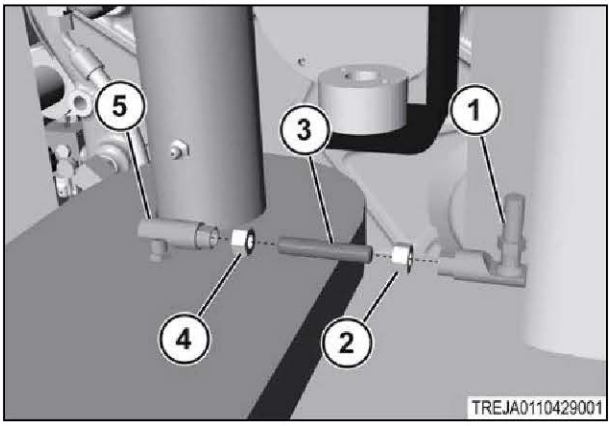

Fig. 103

12. Remove the two nuts and washers (1) and remove the bracket (2).

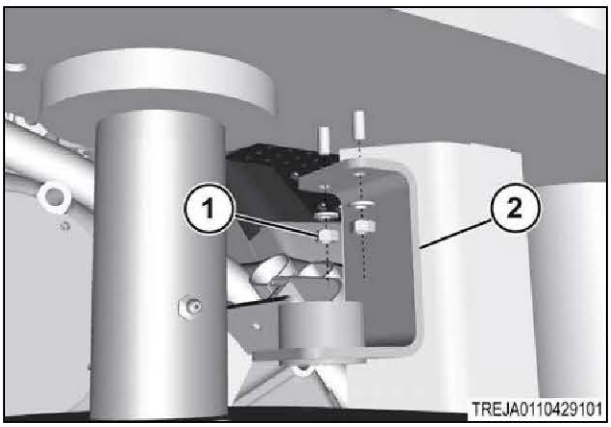

Fig. 104

13. Remove the two bolts with washers (2).

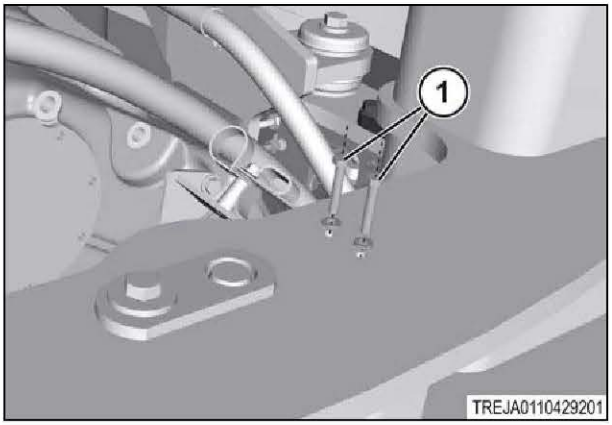

Fig. 105

4.6.2 Install the articulation position sensor

Procedure

1. Install the two bolts and washers (1) for the articulation sensor bracket.

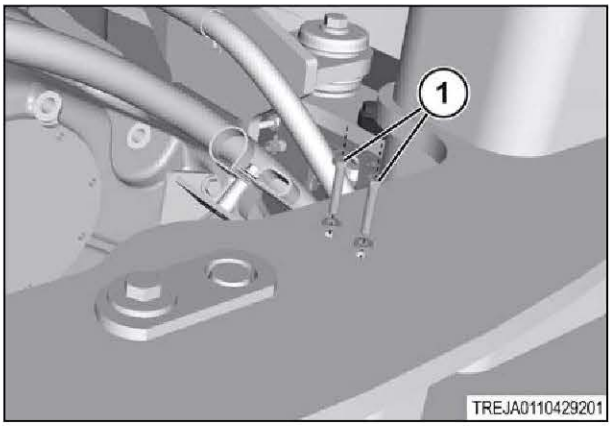

Fig. 106

2. Install the articulation bracket (2) with two nuts and washers (1).

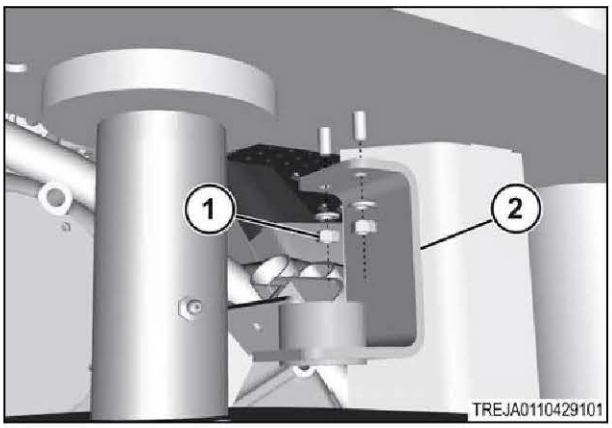

Fig. 107

3. Install the turnbuckle (5) to the top link. Install the nut (4) and nut (2) to the threaded rod (3). Install the turnbuckle (1) to the threaded rod.

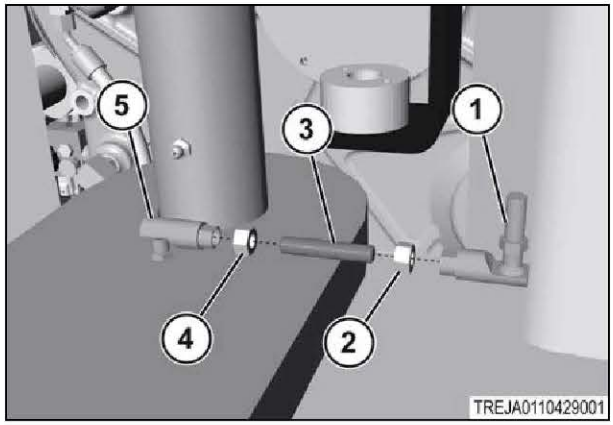

Fig. 108

4. Tighten the nuts (1).

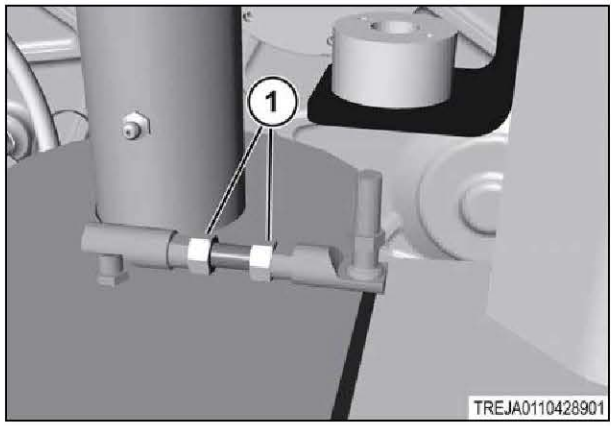

Fig. 109

5. Install the shoulder washer (1) to the articulation sensor weldment (2).

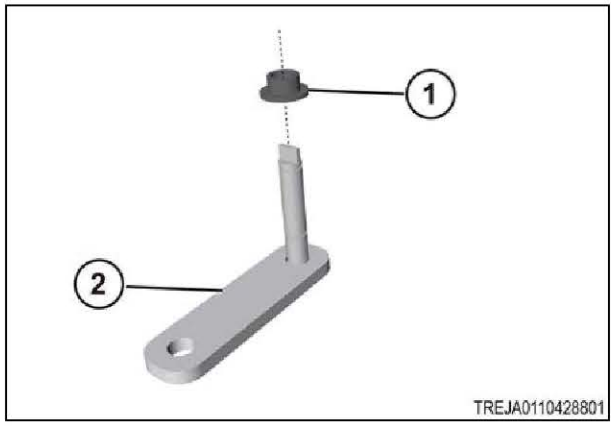

Fig. 110

6. Install the articulation sensor weldment (1) to the articulation sensor bracket (2) and the turnbuckle (3). Fasten with the nut (4).

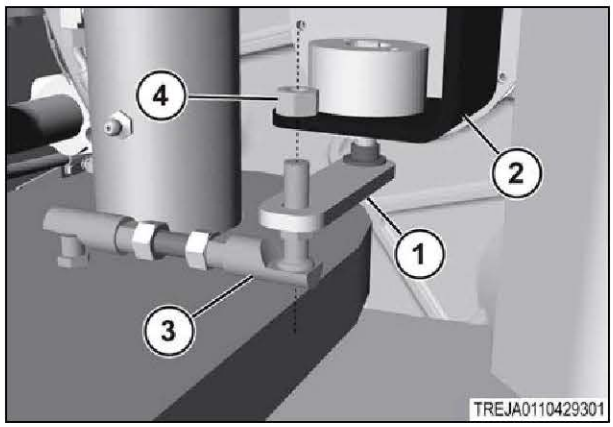

Fig. 111

7. Slide the shoulder washer (1) into the articulation sensor bracket.

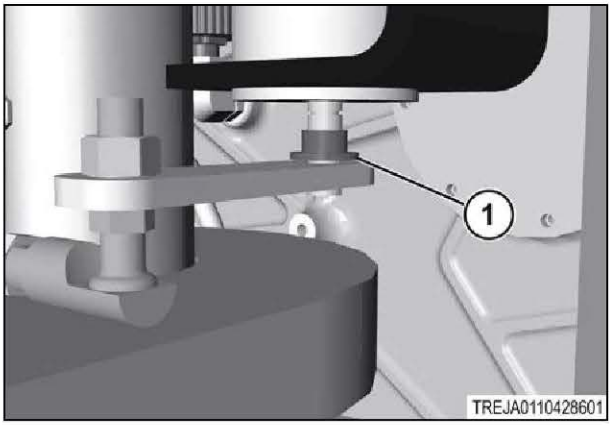

Fig. 112

8. Fasten the shoulder washer with the E-clip (1).

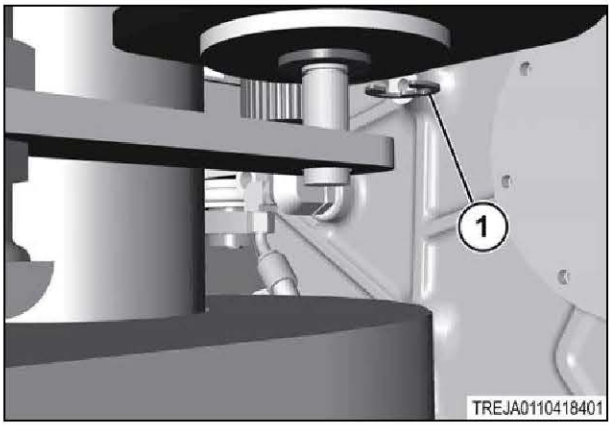

Fig. 113

9. Install the shoulder washer (2) and fasten with the E-clip (1).

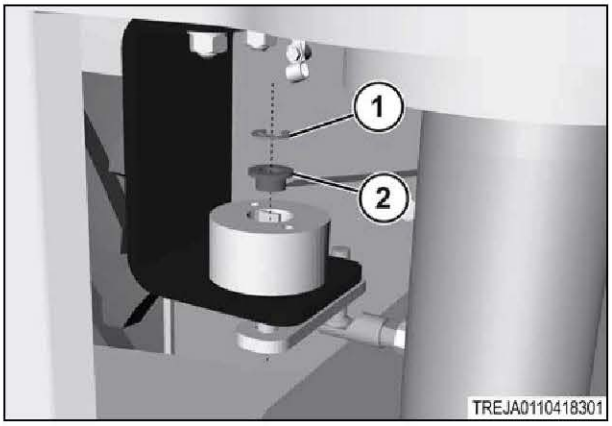

Fig. 114

10. Install the articulation sensor (2) and fasten with two bolts and washers (1).()

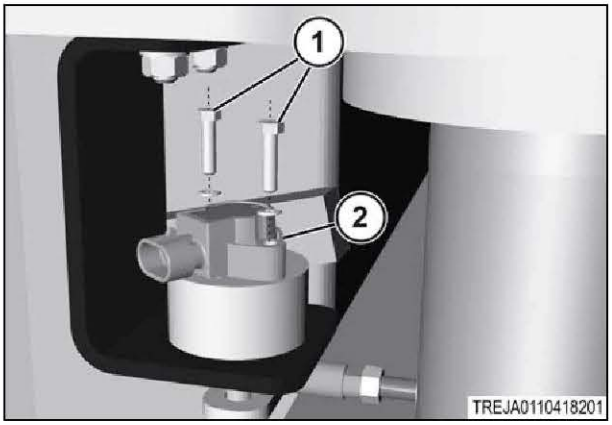

Fig. 115

11. Connect the harness (1) to the articulation sensor (2).

12. Calibrate the articulation sensor.

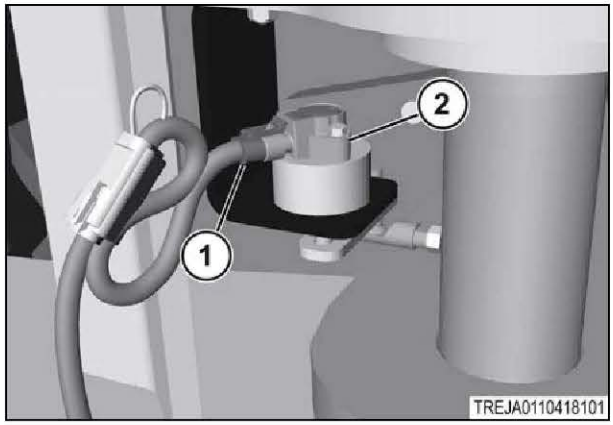

Fig. 116

Related Links

Calibrate the articulation position sensor page 4-41

4.6.3 Calibrate the articulation position sensor

Calibrate the sensor by loosening or tightening the turnbuckles (1). The output pin sensor (2) must read 2.5 v.

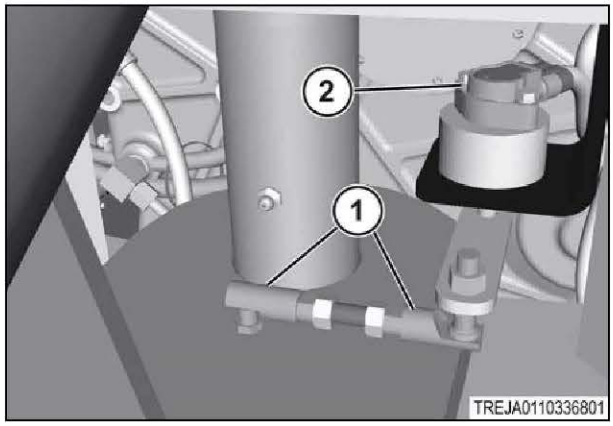

Fig. 117

The position of the sensor determines the output voltage of the middle pin (1). The sensor has a mechanical range of 0° to 120° (2). The sensor has an electrical range of 5° to 105°.

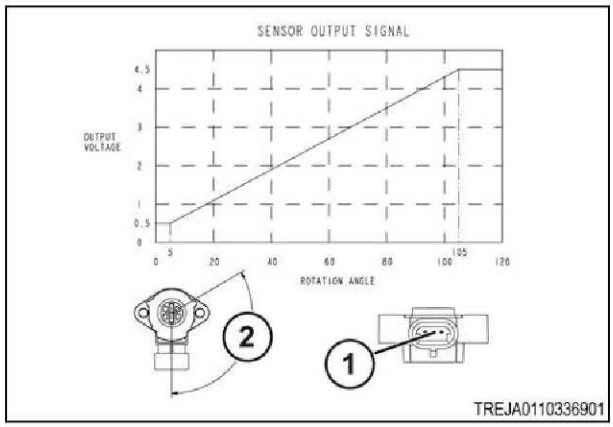

Fig. 118

4.7 Specifications

4.7.1 Articulation position sensor

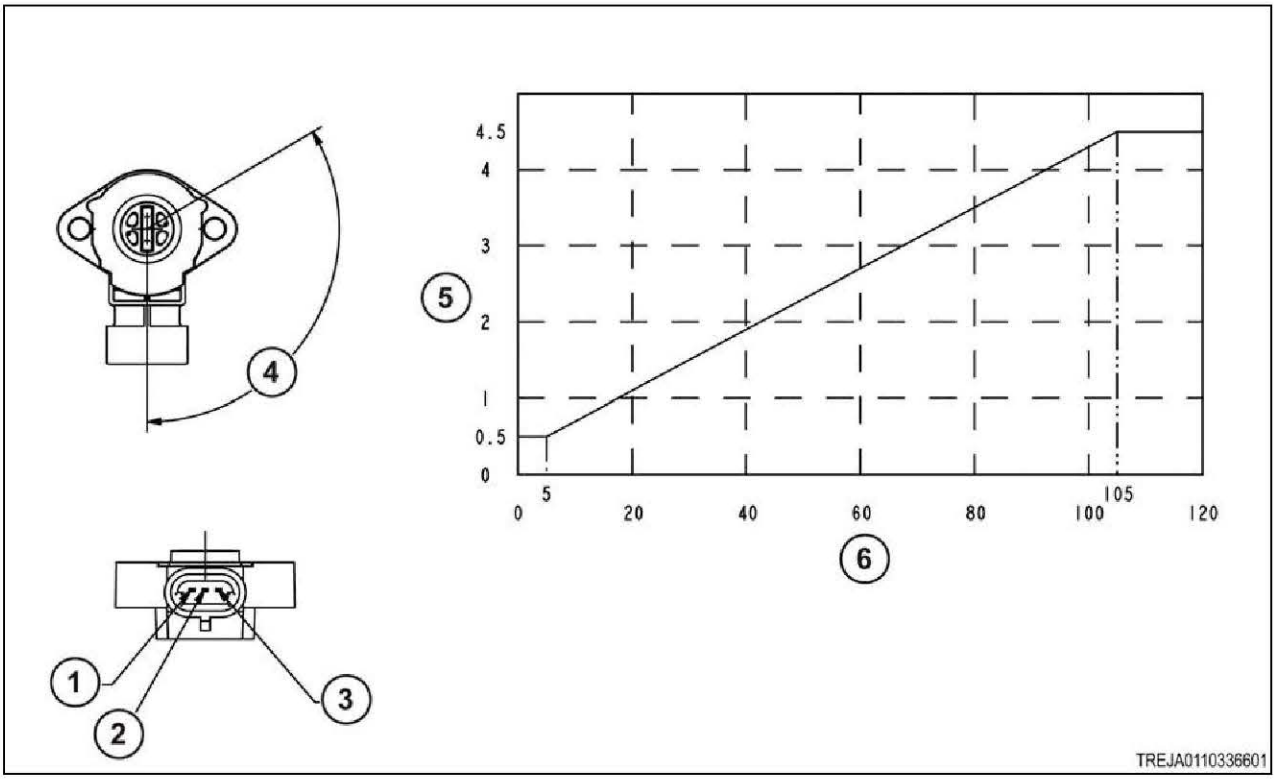

Fig. 119

Articulation position sensor pin out	
Callout	Description
1	Ground
2	Output
3	Supply
4	Mechanical

Sensor output signal	
Callout	Description
5	Output voltage
6	Rotation angle

Specifications	
Supply voltage	5 V
Angular range	
Mechanical	0 degrees to 120 degrees
Electrical	5 degrees to 105 degrees