MASSEY FERGUSON

MF 4600M

Series Tractors

Models: 4607M / 4609M / 4610M / 4610M HC

SERVICE MANUAL

FROM MASSEY FERGUSON

1.2.3 Transmission specifications

	4607M	4609M	4610M / 4610M HC
Primary transmission	Six speed synchronized		
Range transmission	Two speed sliding mesh		
Creeper gearbox, if equipped	Gear reduction sliding mesh		
Mechanical shuttle	Electro-hydraulic control with multiple plate wet disc, 95% reverse reduction		
Gear number	Without creep gearbox, 12 forward, 12 reverse		
	With creep gearbox, 18 forward, 18 reverse		
Power shuttle clutch	Multiple stage wet with 128 mm (5 in) disc		

1.2.4 Power take-off specifications

	4607M	4609M	4610M	4610M HC
Type	Independent, engine driven			
Control	Electro-hydraulic control			
Clutch	Hydraulically engaged, multiple plate wet disc			
Output	Clockwise rotation from the rear of the tractor			
Horsepower	41.8 kW (56 hp at 540 rpm	53.7 kW (72 hp at 540 rpm	59.7 kW (80 hp at 540 rpm	
Shaft				
540 rpm / 540E rpm	35 mm (1.4 in) diameter, 6 spline, ISO type 1			
1000 rpm	35 mm (1.4 in) diameter, 21 spline, ISO type 2			
Engine speed				
540 rpm	1933 rpm			
540E rpm	1533 rpm			
1000 rpm	2178 rpm			

1.2.5 Front axle specifications

	4607M	4609M	4610M	4610M HC
Engagement	Mechanical			
Joint on axle	Bevel gear			
Oscillation angle	6 to 8 degrees			7 degrees
Steering	Hydrostatic			
Rear wheel to front wheel drive ratio	1:1.4			1:1.054

1.2.6 Rear axle specifications

	4607M	4609M	4610M / 4610M HC
Final reduction	Planetary		

1.4 Lubrication / fill points

1.4.1 Lubrication and maintenance chart

Severe conditions or conditions that are not normal will require more frequent lubrication.

See the machine specifications for correct type and quantity of lubricant.

Daily	100 hours	200 hours	Other	
X				Check the engine oil level, fill if necessary.
X				Check the transmission oil level, fill if necessary.
X				Clean the air cleaner element.
X				Check the radiator coolant level, fill if necessary.
X				Inspect and clean the radiator fins.
X				Inspect and clean the fuel filter sediment bowl.
X				Lubricate the lubrication fittings.
		X		Inspect the windscreen wiper, replace if necessary.
			Weekly	Check the windscreen washer fluid reservoir, fill if necessary.
X		X		Inspect the air conditioner belt, replace if necessary.
X	X			Inspect the engine belt, replace if necessary.
X	X		Yearly	Inspect the radiator hoses, replace if necessary.
	X			Inspect all engine air hoses and engine air pipes.
	X			Inspect and tighten all engine hose clamps.
X		X		Inspect and correct the tire air pressure.
X	X			Inspect and tighten wheel bolts and nuts.
			Weekly	Drain water from the fuel prefilter.
	X			Drain moisture from the clutch housing.
	X		Yearly	Inspect the power steering hoses, replace if necessary.
	X		Yearly	Inspect air conditioning hoses, replace if necessary.
	X		Yearly	Inspect the fuel hoses, replace if necessary.
		X		Check the front axle oil level, fill if necessary.
		X		Inspect and adjust the brake pedal free play.
		X		Inspect the steering joint. If adjustment or service is necessary, see your dealer.

Do not dismount from moving machinery.

Stay off slopes too steep for operation.

Be aware of the size of the machine and have enough space available to allow for operation.

Do not operate near the edge of banks. Setback distance from the bank must equal or exceed, the overall height of the bank.

Whenever possible, travel directly up or down slopes, keeping the heavy end of the tractor on the uphill side. If necessary to cross a steep slope, avoid turning uphill. Slow down and make a wide turn.

Do not operate on steep slopes as overturn may result.

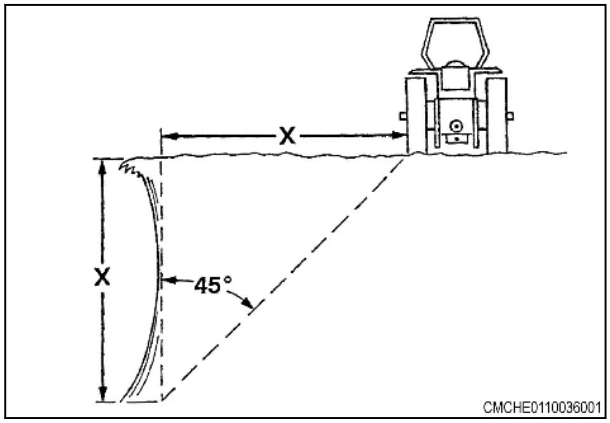


Fig. 14

On models with independent brake pedals, keep the brake pedals latched together at all times unless independent braking is required. Never use independent braking during transport.

Always drive at a proper speed relative to local conditions and ensure your speed is low enough for an emergency stop.

Reduce speed prior to turns to avoid the risk of overturning.

Keep speed to a minimum.

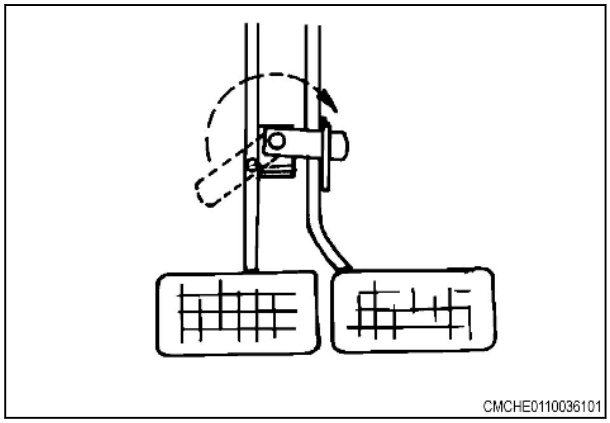


Fig. 15

Always keep the tractor in gear to provide engine braking when going downhill. Do not coast.

Avoid sudden or heavy brake applications when operating in wet, muddy, or icy ground conditions, or on loose surfaces, such as sand or gravel.

Sudden or heavy braking during turns increases the tendency to over steer. This effect is more pronounced with trailed equipment.

Keep a firm grip on the steering wheel at all times, with the thumbs clear of the spokes when driving the tractor.

Remain seated in operator's seat.

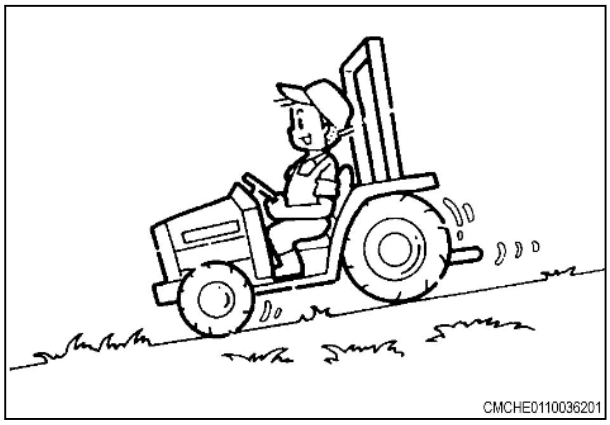


Fig. 16

If fire occurs, move upwind and away from smoke from the fire.

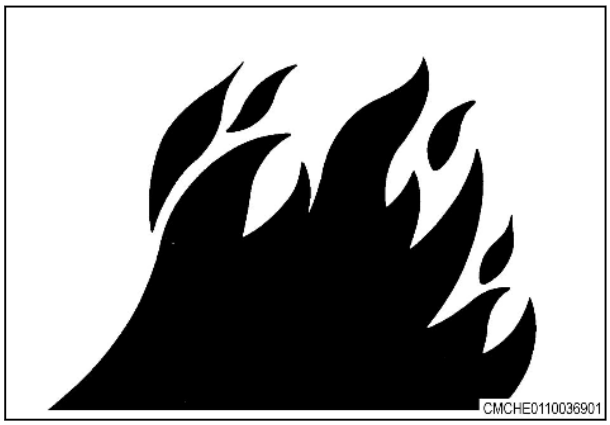


Fig. 38

1.9.3 High pressure leaks

Fluid that leaks from the hydraulic system or the fuel injection system is high pressure and is not easily seen. The fluid can go into the skin causing injury.

Fluid that is injected into the skin must be surgically removed immediately. If not removed immediately, infection and reaction can occur. Go immediately to a physician who knows about this type of injury.

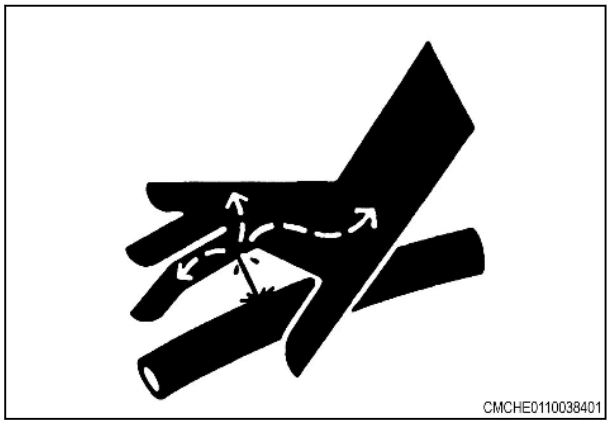


Fig. 39

Use a piece of cardboard or wood to look for possible leaks. Do not use your bare hand. Wear leather gloves for hand protection and safety goggles for eye protection.

Remove all pressure before you loosen hydraulic lines. Lower equipment in the up position, close the accumulator valve, and stop the engine. Tighten all connections before applying pressure.

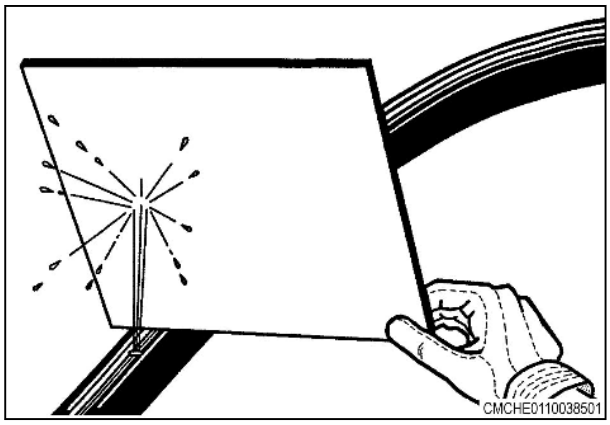


Fig. 40

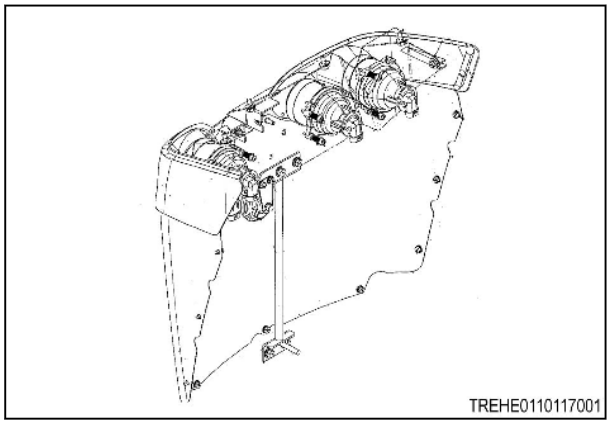


Fig. 9

2.2.6 Side cover

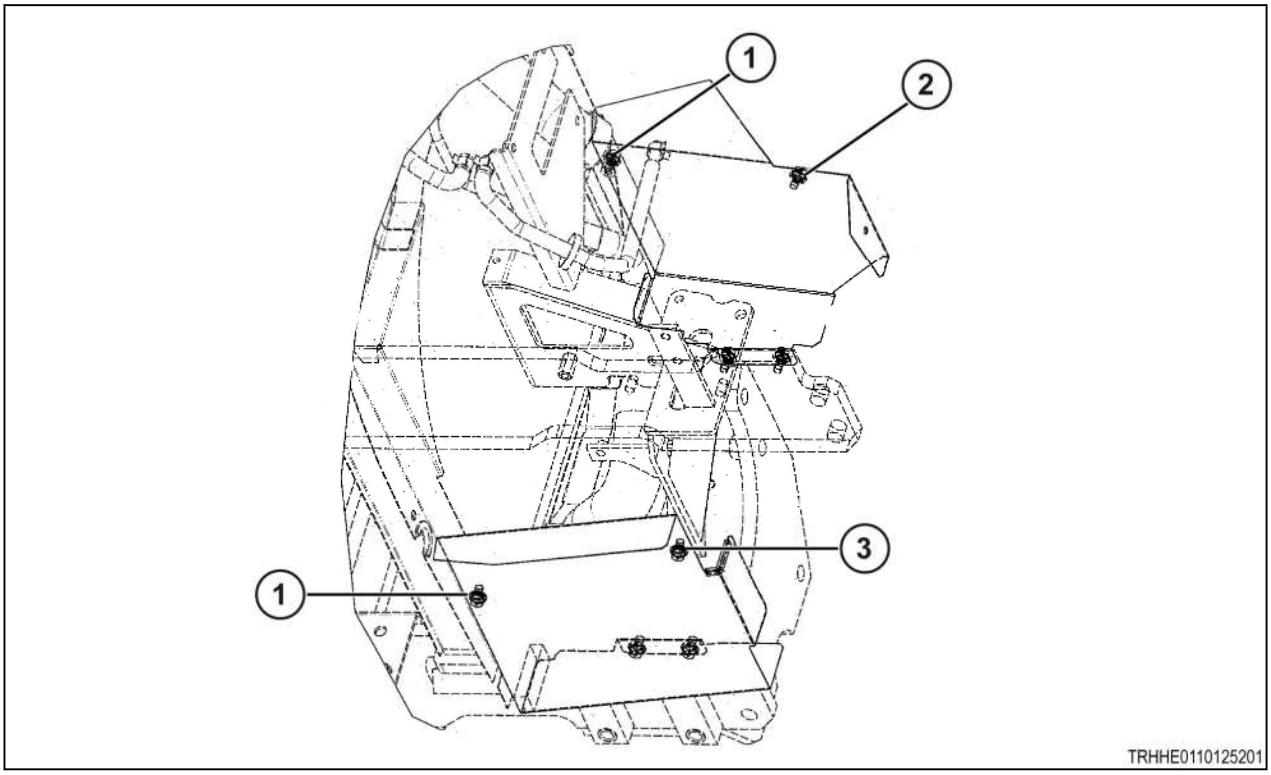
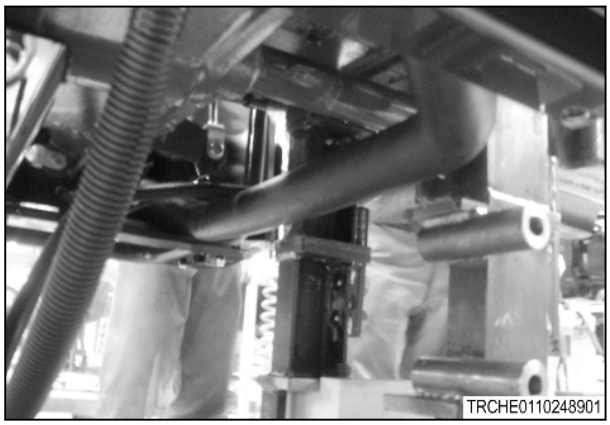


Fig. 10

(1) Fasten to shroud.
(2) Fasten to alternator bracket.
(3) Fasten to air compressor bracket.

2. Disconnect the fuel gauge coupler and the fuel hose.



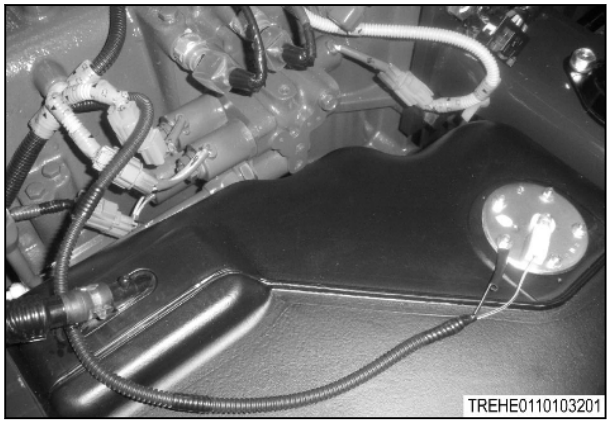


Fig. 32

3. Use a correct lifting device under the tank to support the tank.

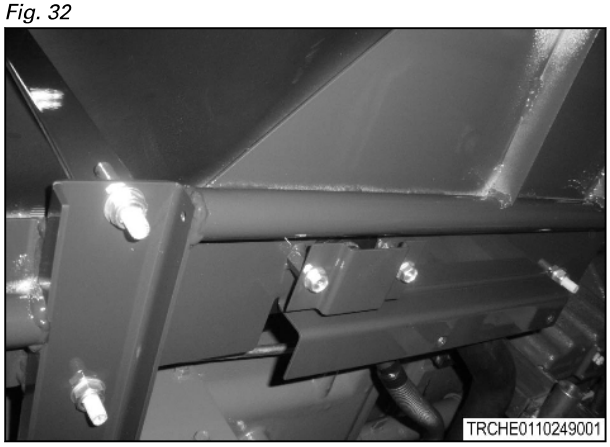


Fig. 33

4. Remove the mount bracket bolts and the nuts from the left-hand and right-hand side.

Fig. 34

2.10 Engine service manual

2.10.1 Insert the engine service manual here

23. Insert wedges between the front axle and the front frame to keep the tractor from tipping.

24. Put a splitting stand under the tractor.

25. Support the transmission housing with a correct floor jack and the engine with a correct overhead hoist.

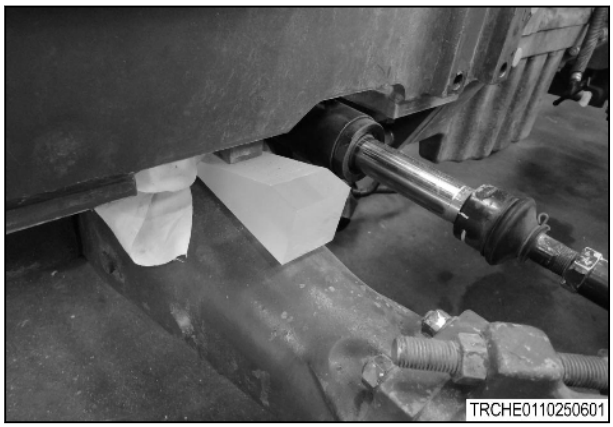


Fig. 11

4. Disconnect the brake rod at the turnbuckle.

Fig. 30

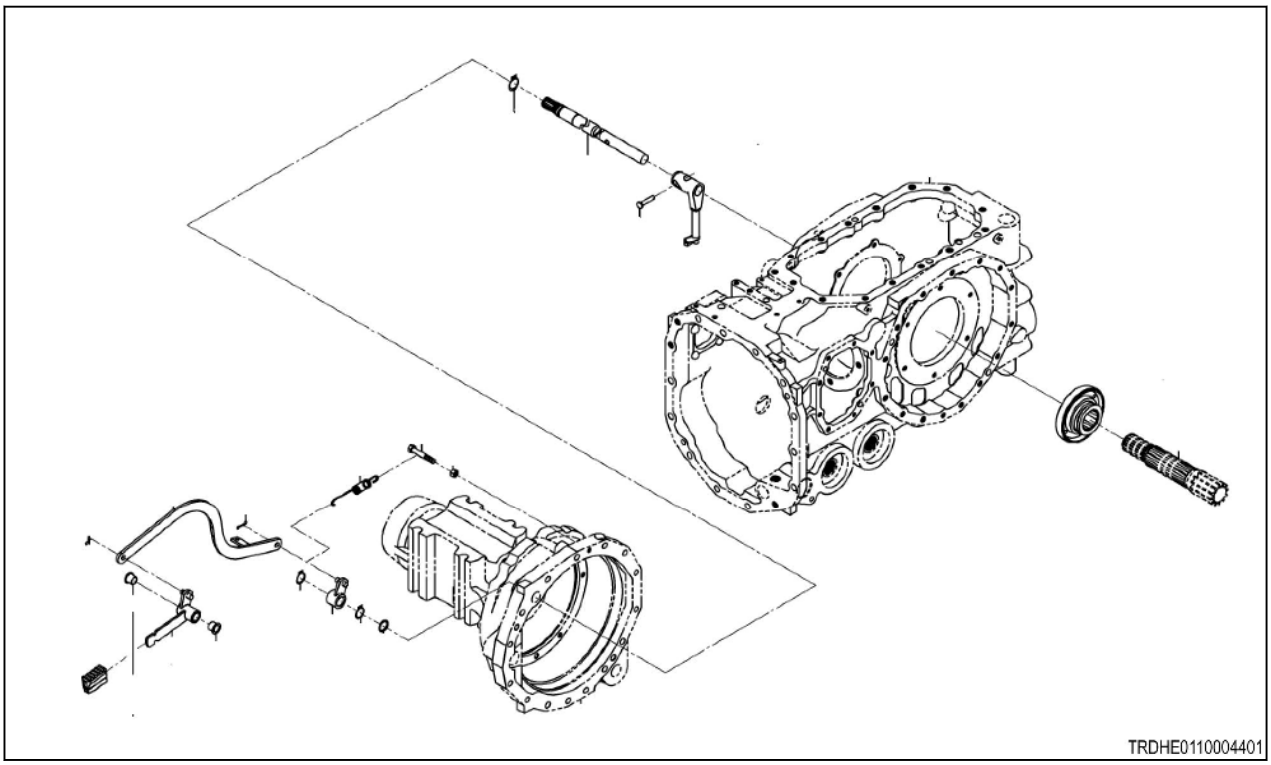


Fig. 31

5. Remove the differential lock pedal on the right-hand side only. Remove the bolt that connects to the mount bracket M8 bolt.

6. Remove the bracket (1) from the axle housing and remove the mount bolt when removing the cab.

NOTE: *Insert the lifting straps at the rear upper corners of the cab and support the rear of the cab with a correct overhead hoist if both axles are being removed at the same time.*

Fig. 32

3.1.9 Gear ratios

12 x 12 power shuttle

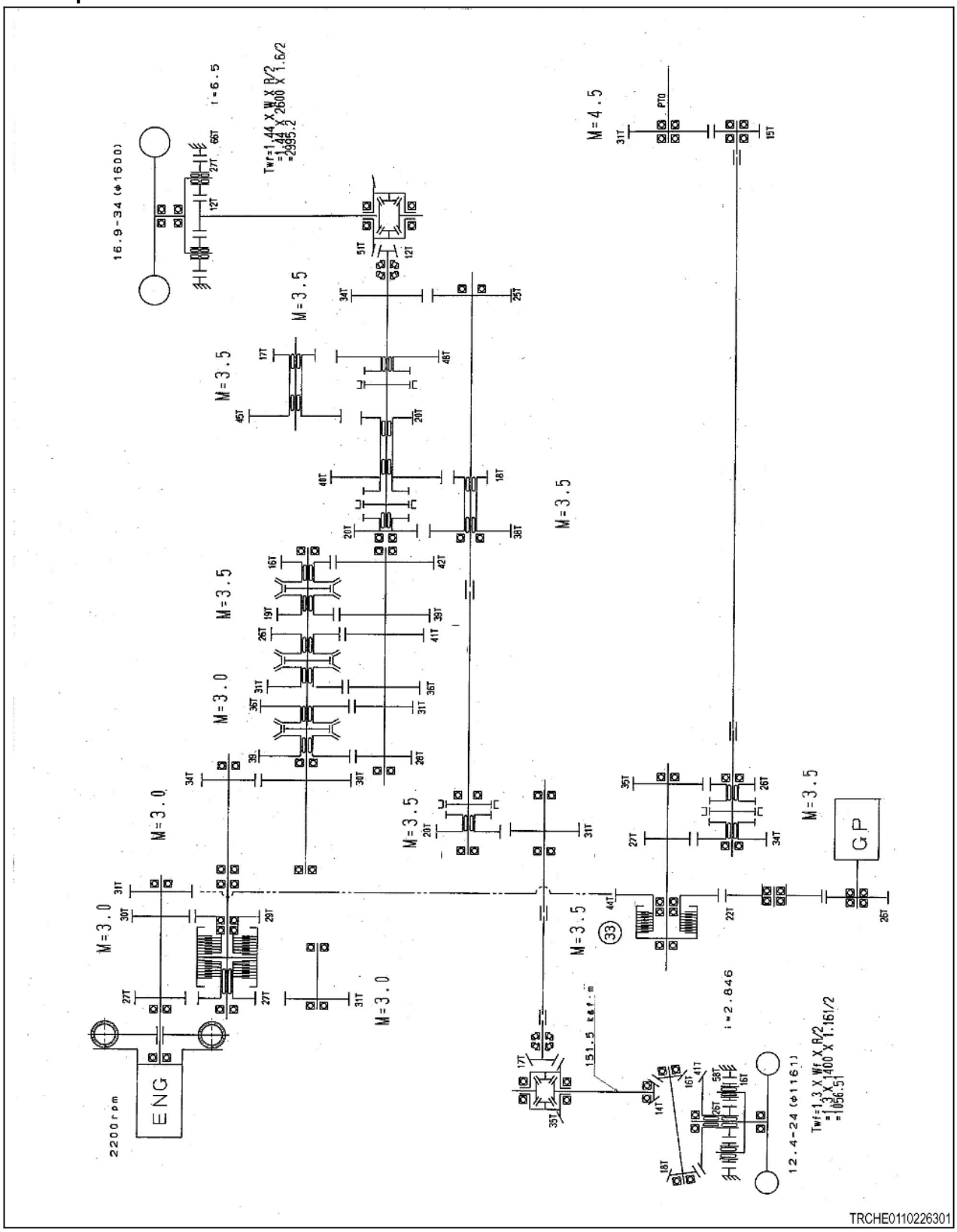


Fig. 46

2. Remove the sub change gear from the rear transmission housing side.

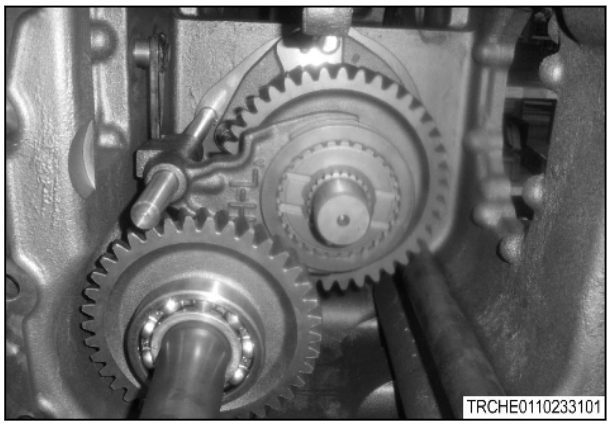


Fig. 62

3. Remove the spacer from the front transmission housing.

4. Put the 4WD in neutral.

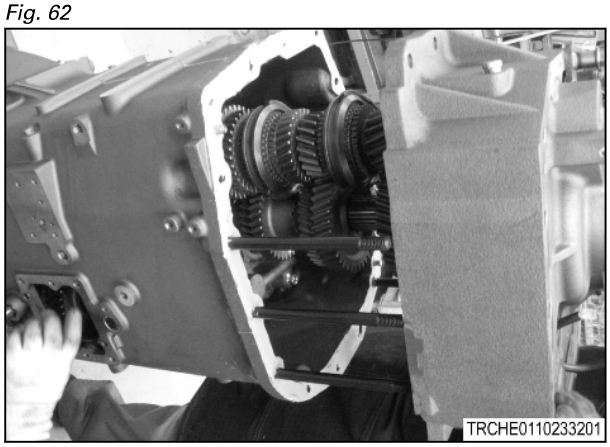


Fig. 63

5. Pull out the main change gear assembly.

6. Remove the bracket from the main change gear.

7. Align the high/low gear with the collar cut out.

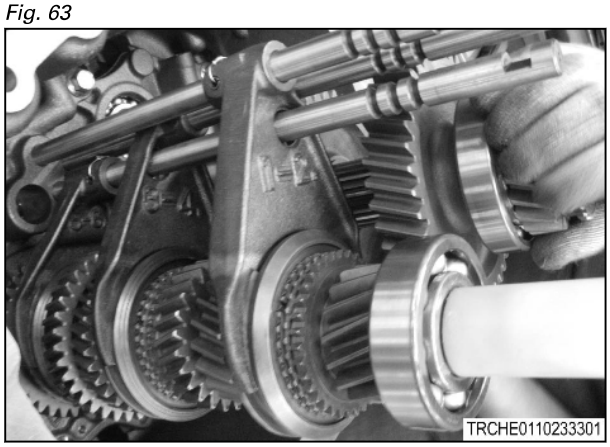


Fig. 64

8. Pull out the power take-off (PTO) change gear and the PTO clutch.

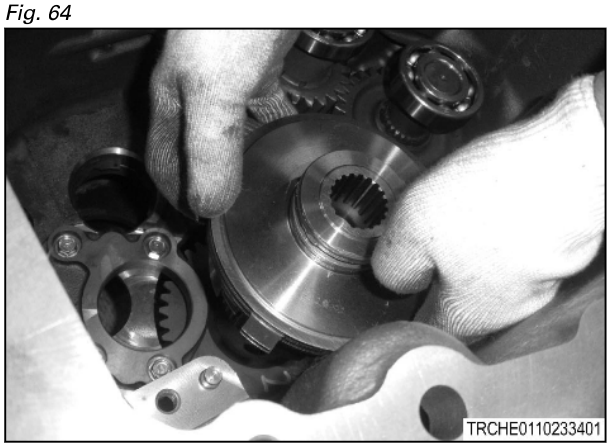


Fig. 65

3.5 Creep gear

3.5.1 Creeper gear components

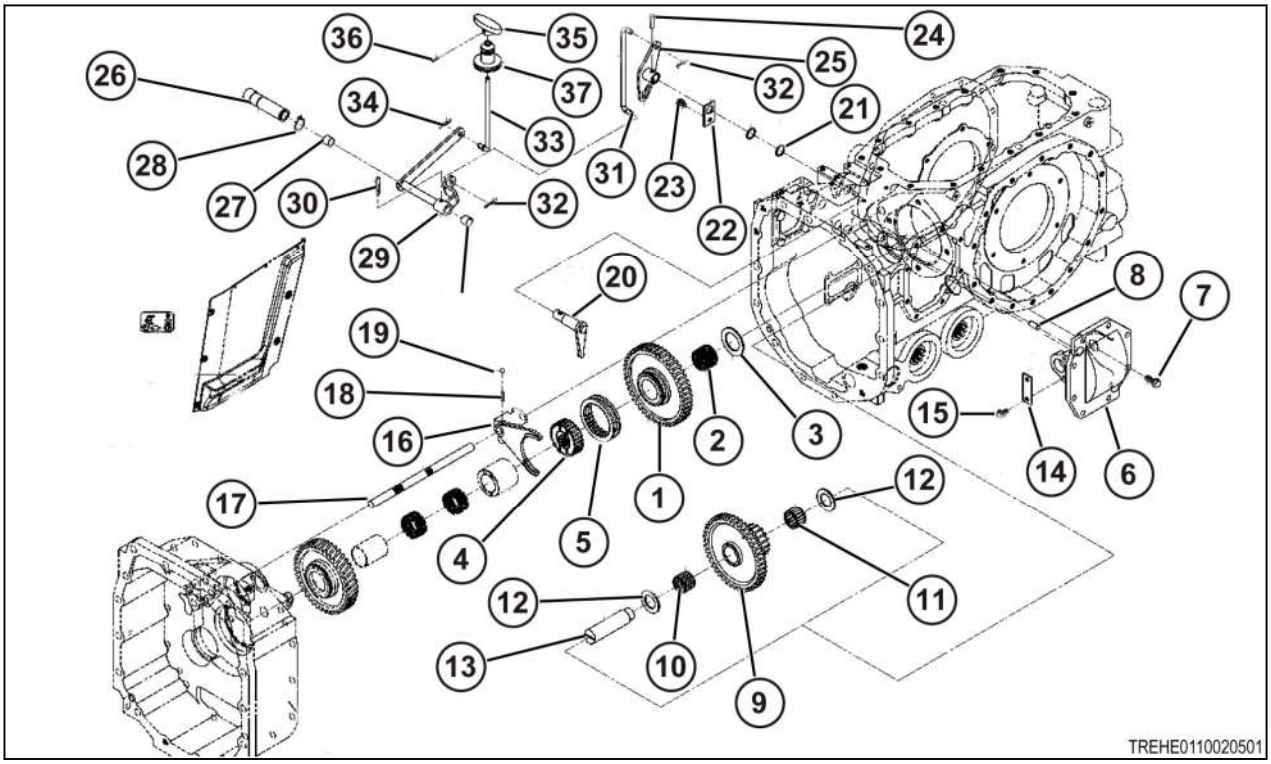


Fig. 78

Creeper gear set

(1) Spur gear
(2) Needle bearing
(3) Washer
(4) Hub
(5) Coupling
(6) Cover
(7) Flange bolt
(8) Pin
(9) Spur gear
(10) Needle bearing
(11) Needle bearing
(12) Washer
(13) Idol shift
(14) Plate
(15) Flange bolt
(16) Sub shift fork
(17) Sub shift stay
(18) Spring
(19) Ball
(20) Sub shift arm
(21) O-ring
(22) Plate
(23) Flange bolt
(24) Spring pin
(25) Sub arm
(26) Hub
(27) Bushing
(28) Retaining ring
(29) Sub arm
(30) Taper pin
(31) Sub rod
(32) Retaining ring
(33) Sub rod
(34) Retaining ring
(35) four wheel-drive grip
(36) Spring pin
(37) Boot

3.5.2 Disassembling the creeper gear

Procedure

1. Make sure the transmission oil is cool before working on the transmission.

3.6.5 Power take-off clutch

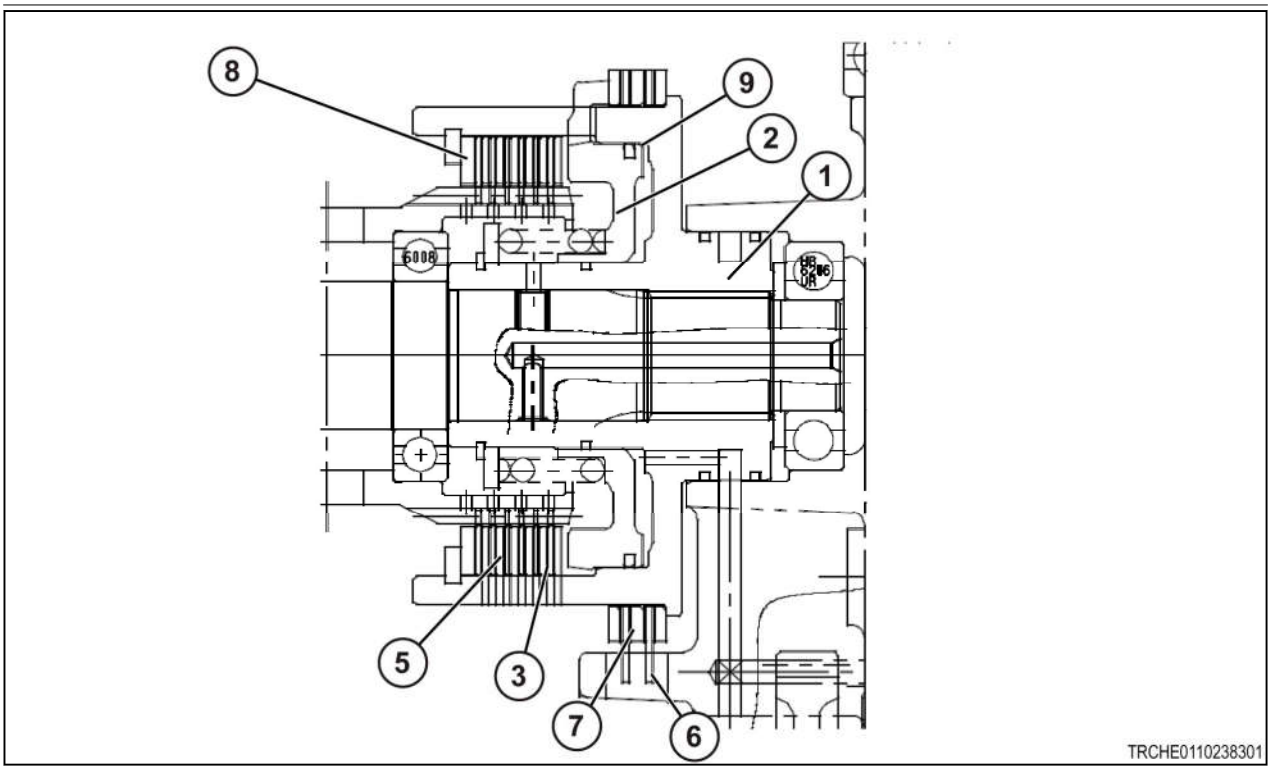


Fig. 97

Power take-off (PTO) clutch pack

(1) Clutch case
(2) Piston
(3) Separate plate
(4) Spring
(5) Friction plate, quantity - 7
(6) Brake disk
(7) Brake pressure
(8) Back plate
(9) Wave spring

NOTE: *The clutch cases have the following identification markings:*
Two 5 mm (0.20 in) wide grooves.
The PTO clutch case is made of die-cast aluminum.
Handle the clutch case with care. Do not damage or deform the clutch case.

The PTO clutch retainer ring jig compresses the PTO clutch. The PTO clutch retainer ring jig can be fabricated.

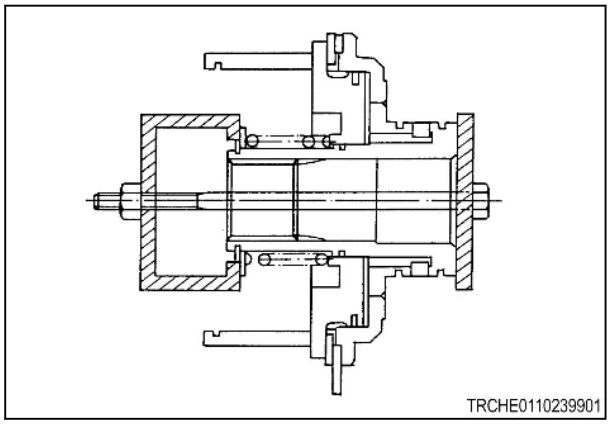


Fig. 98

5. Remove the engine cover support belt.

6. Remove the bolts and the engine cover.

Fig. 4

7. Remove the differential lock pedal (1), the slow return knob.

8. Remove the locking bolt on the tube. Remove the tube and shaft (2).

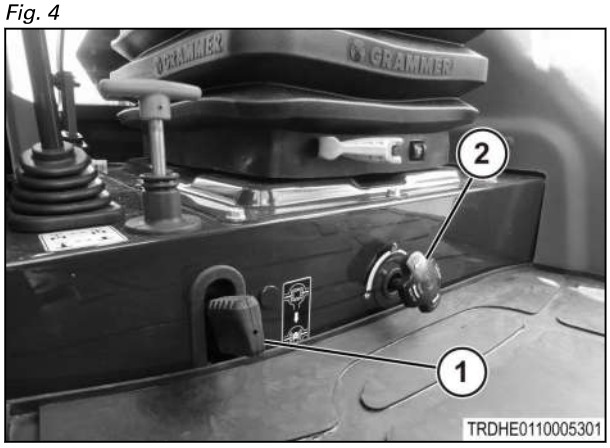


Fig. 5

9. Disconnect the turnbuckle on the right-hand brake rod. Set the pedal free play between 35 to 45 mm (1.4 to 1.8 in) when assembling.

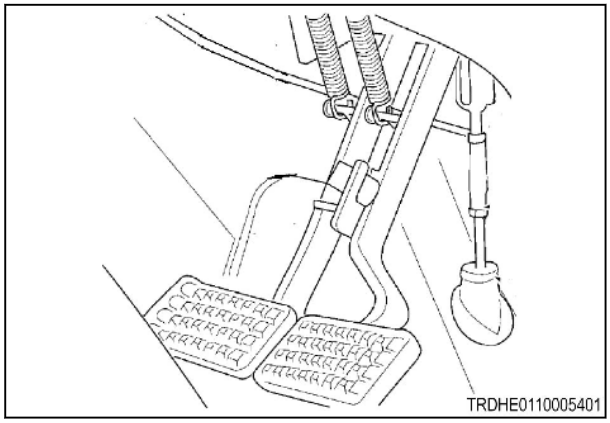


Fig. 6

4. Remove the hardware that connects the fender.
5. Remove the fender.

4.2.2 Installing the fender

Procedure

1. Install the fender in the reverse order of removal.
2. Install all the M6 and M8 loosely..
3. Tighten the M6 bolts on top.
4. Tighten the M8 bolts on the left and right-hand side.

31. Put straps at each of the four corners of the cab.

32. Slowly lift the cab with a correct hoist. Be sure that all the wire harnesses and the linkages are free.

Fig. 15

5.1.2 Install the cab

Install the cab in reverse order of removal.

Description	Torque
Cab mount bolt.	98 Nm (72 lbf ft)
Air conditioner compressor bolts.	27 Nm (20 lbf ft)
Air conditioner compressor discharge hose M6x25 bolt.	5.5 Nm (4 lbf ft)
Air conditioner compressor discharge hose M6x45 bolt.	9 Nm (6.6 lbf ft)
Air conditioner idler pulley nut.	51 Nm (38 lbf ft)

Procedure

1. Do not crimp electrical wires or the fuel lines. Make sure the electrical wires and the fuel lines will not rub against other parts.
2. Align the steering column, the brake pedal linkage, and the clutch linkage. Align the hydraulic control levers and all other shift linkage while lowering the cab.
3. Use thread sealant on the steering column retaining bolt.
4. Apply adhesive to the existing strip in the center of the cab roof or replace the strip.
5. Adjust the brake pedal adjustment.

Model	Distance
All models except high clearance	35 mm to 45 mm (1.38 in to 1.77 in)
High clearance models	30 mm to 35 mm (1.18 in to 1.38 in)

6. Tighten the cab mount bolts to 98 Nm (72 lbf ft).

5.1.16 Cab wire harness

The cab wire harness is supplied from the engine running through the dash panel, under the left floor into the left fender of the cab.

The cab wire harness runs from the left fender through the left pillar to both sides of the upper cab frame

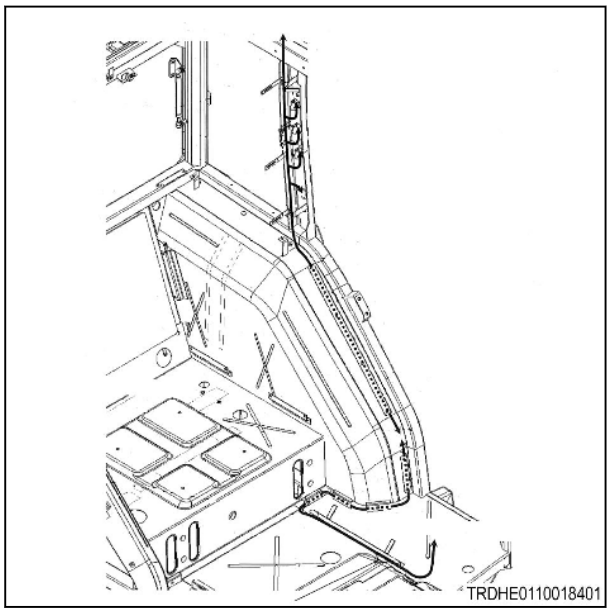


Fig. 39

5.1.17 Installing the speaker system

Procedure

1. Open the rear window.
2. Remove the nine rivets fastening the inner roof.

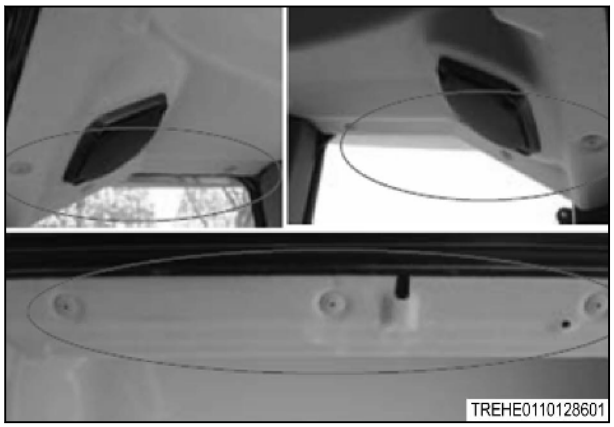


Fig. 40

5.4 Steering column

5.4.1 Removing the steering column

Procedure

1. Remove the front and the rear steering column covers.
2. Remove the console.
3. Remove the retaining plate (2), that attaches the column to the fire wall. Remove the retaining bolt (3) from the upper U-joint. Remove the column assembly (1).
4. Remove the retaining bolts form the appropriate U-joint to disconnect the steering shafts.

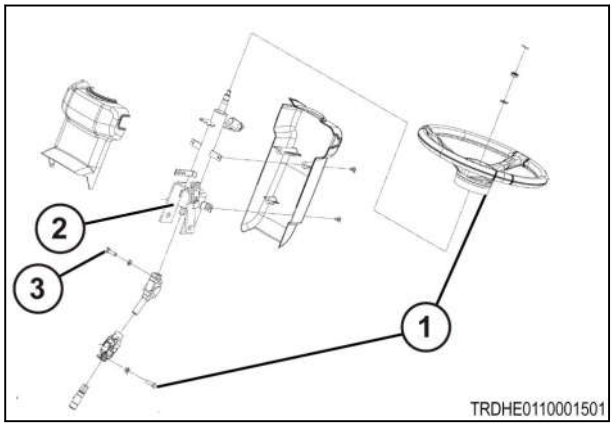


Fig. 60

5.4.2 Installing the steering column

Procedure

Install the steering column in the reverse order of removal.

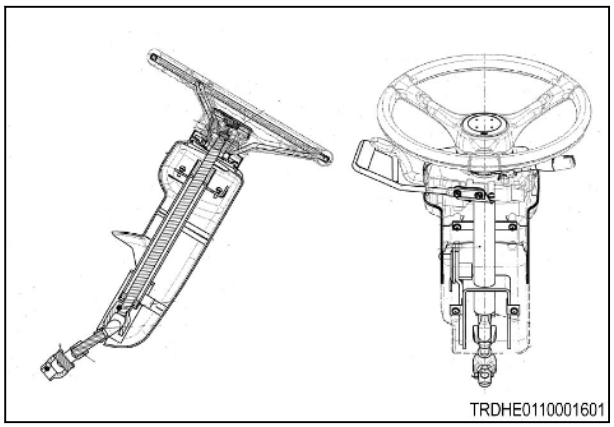


Fig. 61

5.7.7 Compressor

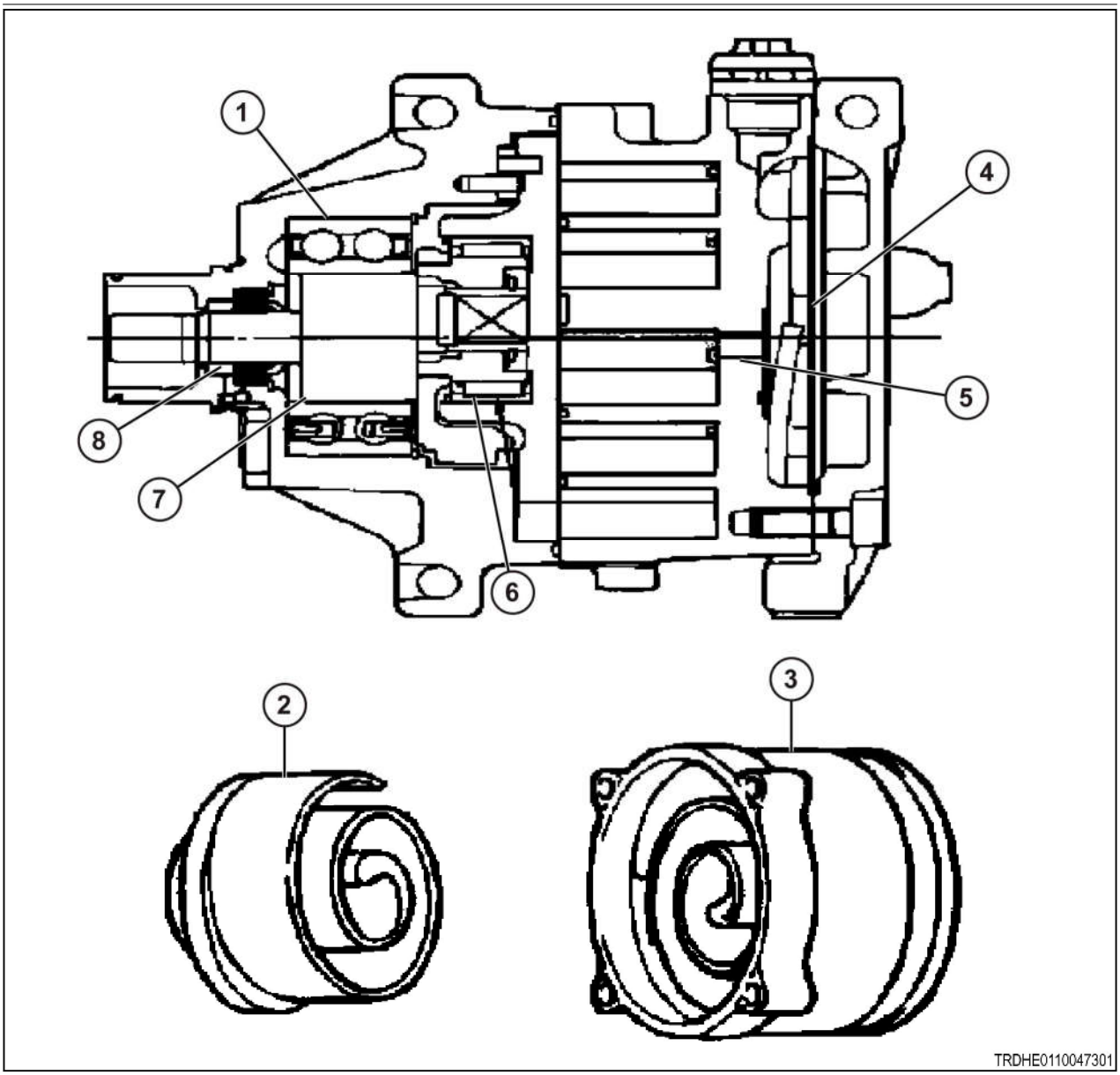


Fig. 74

The compressor pressurizes the gas refrigerant that has evaporated depriving the indoor heat in the evaporator and delivers the refridgerant to the high-pressure circuit again.

The scroll type compressor is composed of a fixed scroll and a movable scroll. The movable scroll turns inside the fixed scroll and the capacity of the space partitioned by both scrolls change, and thus, refrigerant is inhaled and compressed. The lubrication of the compressor is done with the compressor oil contained in the gas refrigerant. Therefore, a pressure switch is provided in the circuit to shut off the magnetic clutch when refrigerant decreases in order to protect the compressor from seizure.

(1) Ball bearing
(2) Movable scroll
(3) Fixed scroll
(4) Delivery valve
(5) Delivery port
(6) Needle roller bearing
(7) Shaft
(8) Shaft seal

NOTE: *Neglected cleaning of the air filter will cause deteriorated airflow rate, along with problems with the air conditioner unit.*

Procedure

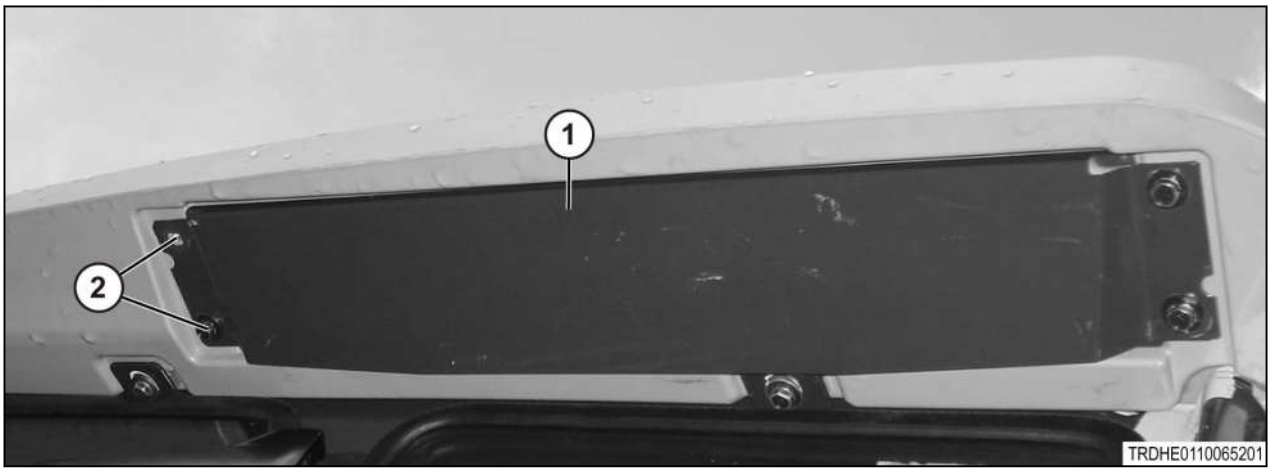


Fig. 87

1. Remove the four screws (2), and open the filter cover (1).

2. Remove the air conditioner filter (1).

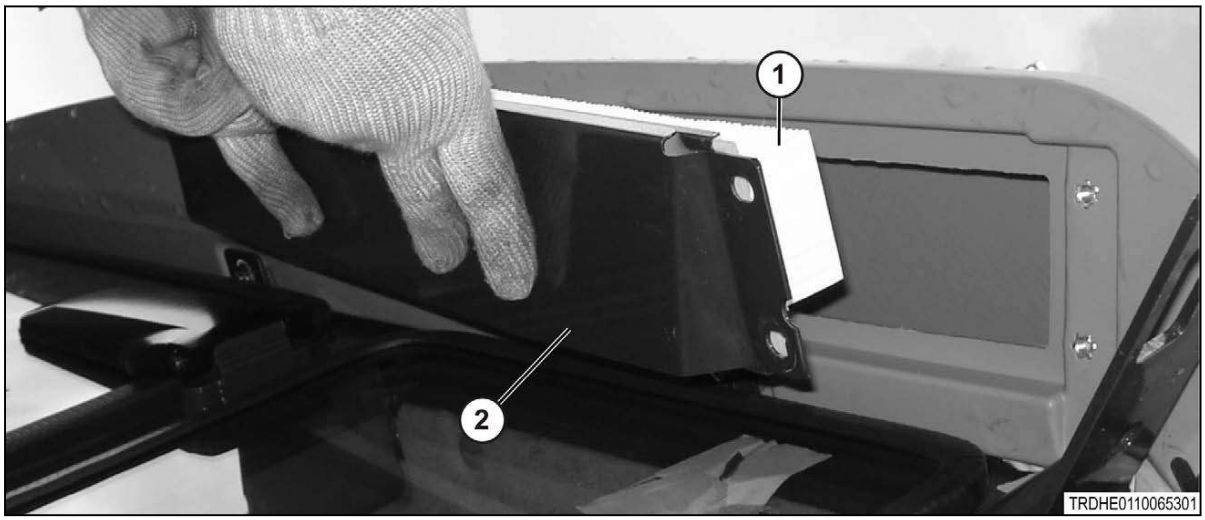


Fig. 88

NOTE: *The air conditioner filter and filter cover (2) can be removed at the same time.*

When refrigerant enters eye.

- Do not rub eyes with hands, towels, and so on
- Clean the eye for 15 minutes with clean running water, and then get medical aid.

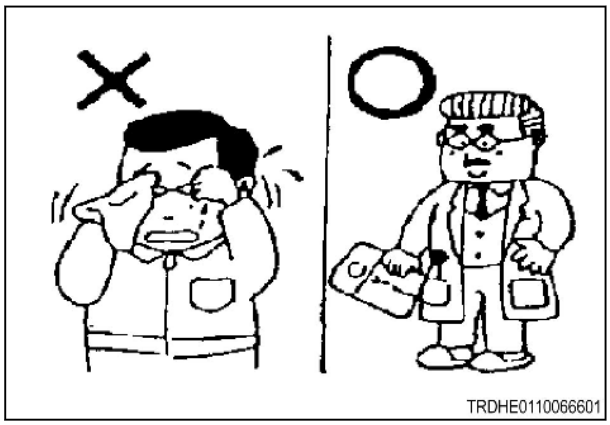


Fig. 104

Caution when handling the high pressure valve.

- Do not open the high pressure valve on the manifold gauge set, when charging the air conditioner while the engine is operating. The high pressure refrigerant will back flow into the charging container when the high pressure valve is opened. The increase pressure will cause an explosion of the refrigerant container.

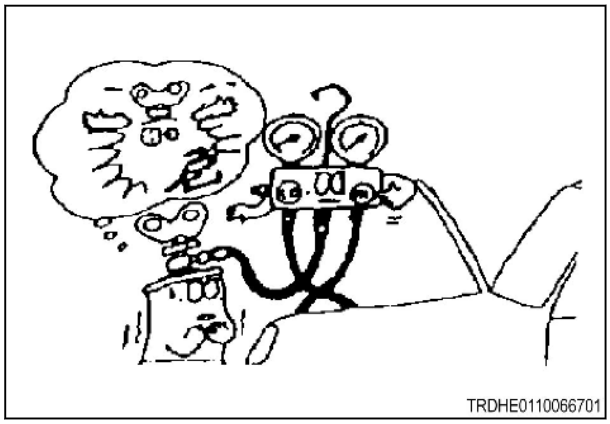


Fig. 105

Do not apply direct heat to the charging refrigerant container.

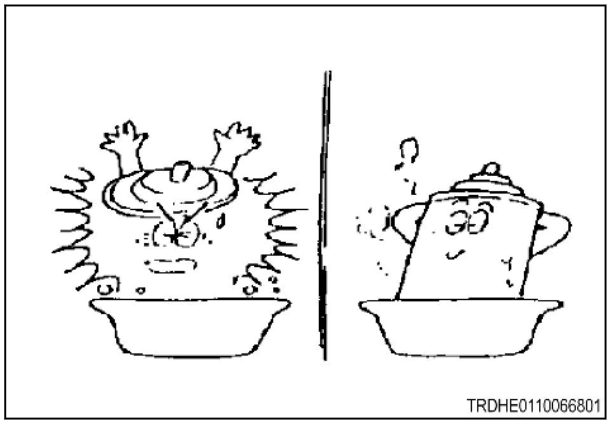


Fig. 106

Fig. 107

5. Remove the line clamp.

Fig. 17

6. Remove the hardware that is attaching the left and right lift linkage to the lift arms.
7. Remove the nuts (1) and the bolts (2,3) attaching the three point linkage bracket to the cylinder case housing.
8. Remove the three point linkage control assembly.
9. Remove the bolts attaching the cylinder case to the rear housing.
10. Remove the lift cylinder case assembly.

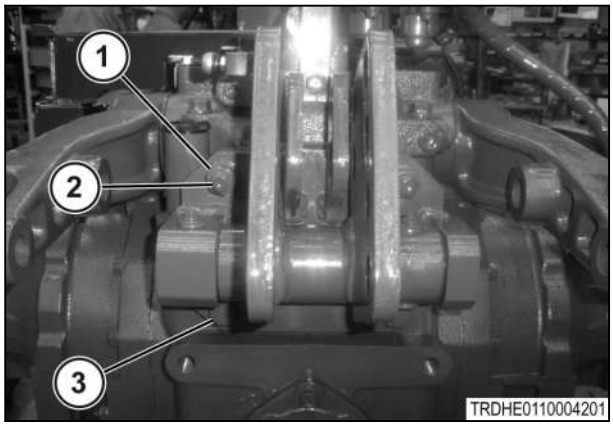


Fig. 18

6.1.5 Install lift cylinder case

Procedure

1. Install the lift cylinder case assembly.
2. Install and tighten the bolts attaching the cylinder case to the rear housing.

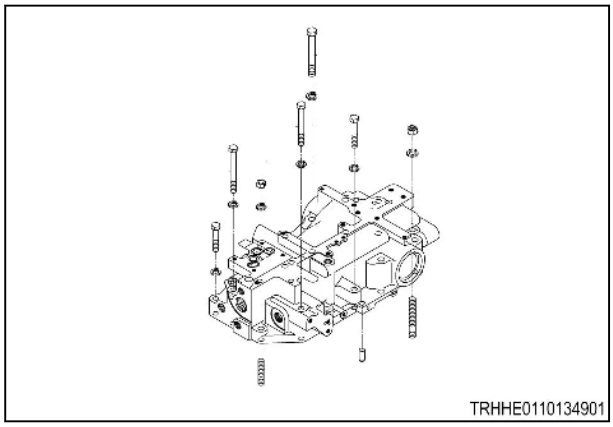


Fig. 19

Item	Identification	Quantity	Torque
(1)	Bolt M12x45 7T	6	134.8 Nm (99.4 lbf ft)
(2)	Nut M14 7T	4	134.8 Nm (99.4 lbf ft)
(3)	Pin 12x18	2	-

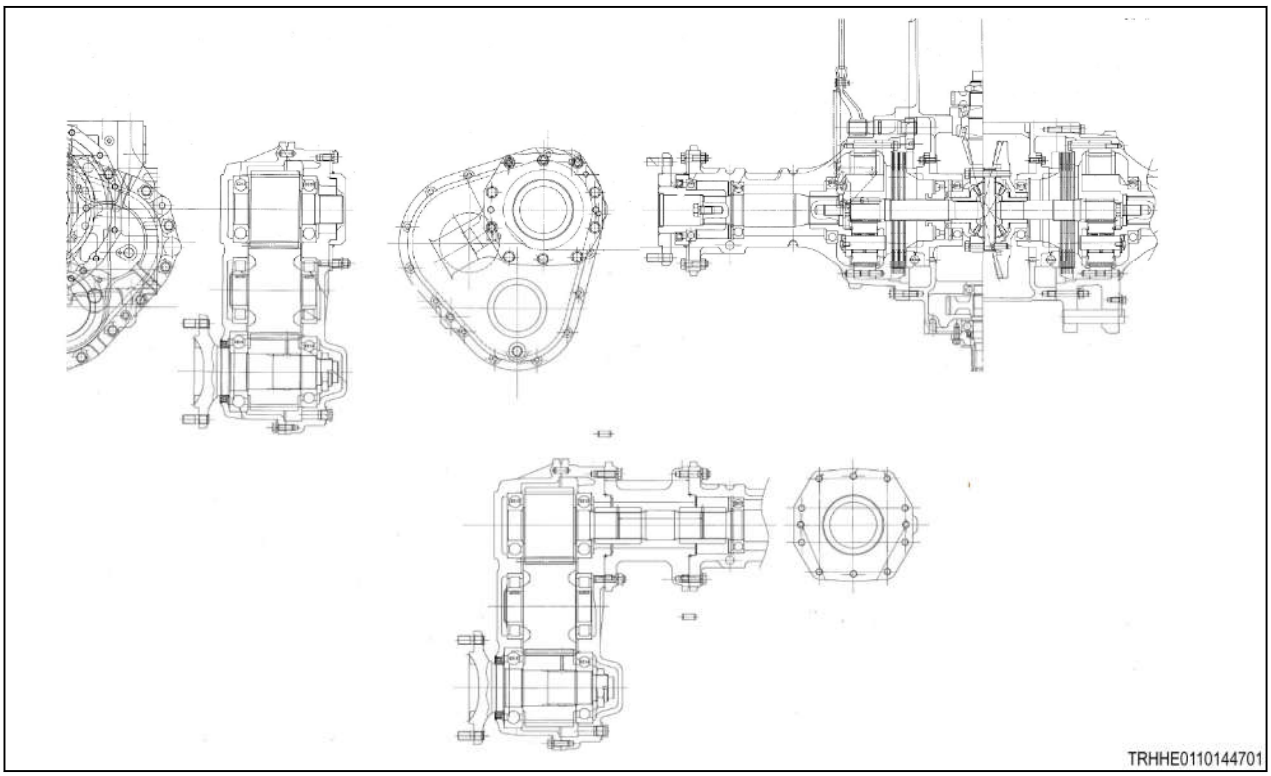


Fig. 36

Rear axle assemble - 80 inch

Procedure

1. Apply oil to the drive pinion and the related parts.
2. Assemble the ring gear and the pinion in the reverse order of disassembly.
3. Tighten the assembly to 30 Nm (22.29 lbf ft).
4. Make sure the drive pinion starting torque is 2.8 Nm to 3.2 Nm (24.9 lbf in to 28.4 lbf in).

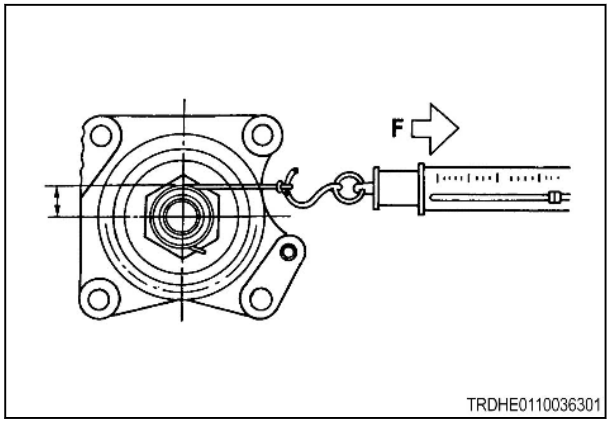


Fig. 56

5. Make sure the drive pinion starting torque meets the specified torque.

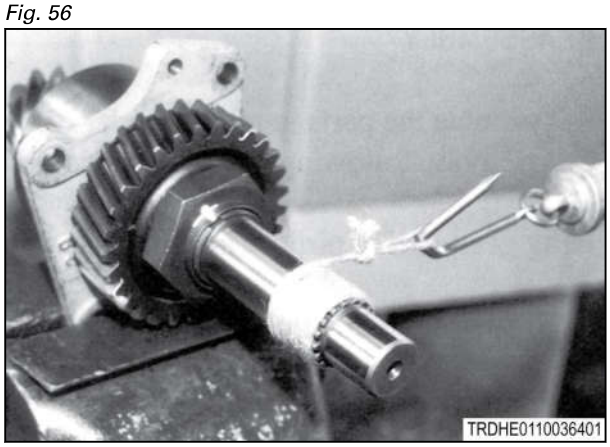


Fig. 57

6. Crimp the nut (1) until the crimp contacts the bottom of the groove as shown.

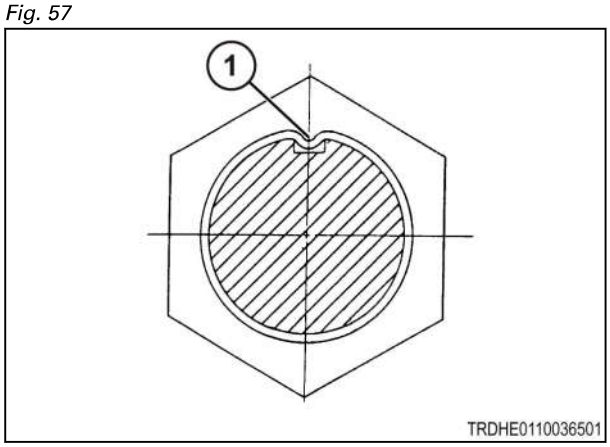


Fig. 58

Bevel housing bushing bore

Check the diameter of the pivot support bushing. The standard value is 85.1 mm (3.350 in). If the measured value is greater than 85.2 mm (3.354 in), replace the bushing.

The standard value for the 2WD is 55.1 mm (2.169 in).

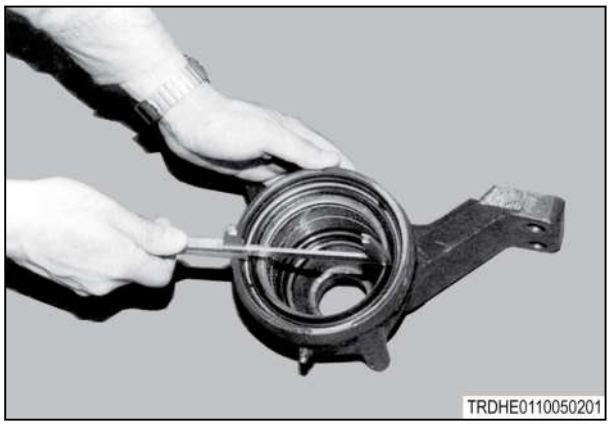


Fig. 79

Center pivot housing diameter

Check the diameter of the axle shaft at a bushing contact point. The standard value for the 4609 and 4610 model is 65 mm (2.559 in). If the measure value is less than 64.9 mm (2.555 in), replace the center section.

The standard value for the 4608 model is 55 mm (2.165 in). If the measured value is less than 54.9 mm (2.161 in), replace the center section.

The standard value for the 2WD is 55 mm (2.165 in).

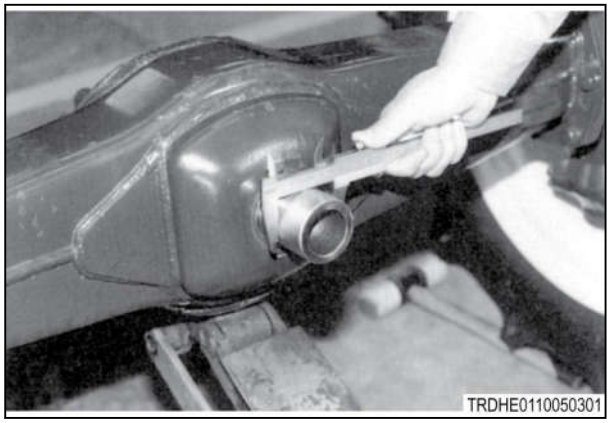


Fig. 80

Front axle bushing bore diameter

Check the diameter of the bushing pivot support. The standard value for the 4609 and 4610 model is 65.1 mm (2.563 in). If the measured value is greater than 65.2 mm (2.566 in), replace the bushing.

The standard value for the 4608 model is 55.1 mm (2.169 in). If the measured value is greater than 55.2 mm (2.173 in), replace the bushing.

The standard value for the 2WD is 55.1 mm (2.169 in).

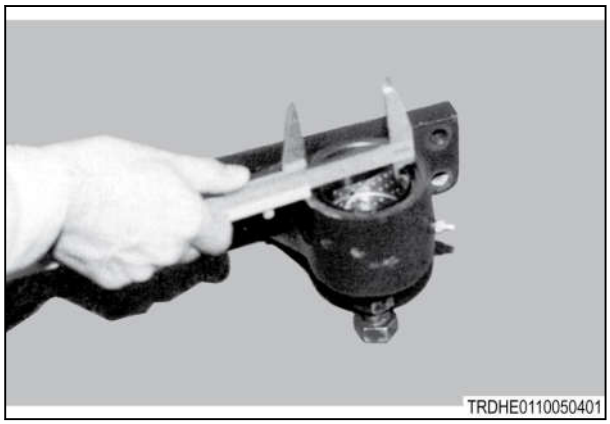


Fig. 81

Worn or damaged oil seals, O-rings, and bearings must be replaced.

6.6.10 Front axle assembly - high clearance

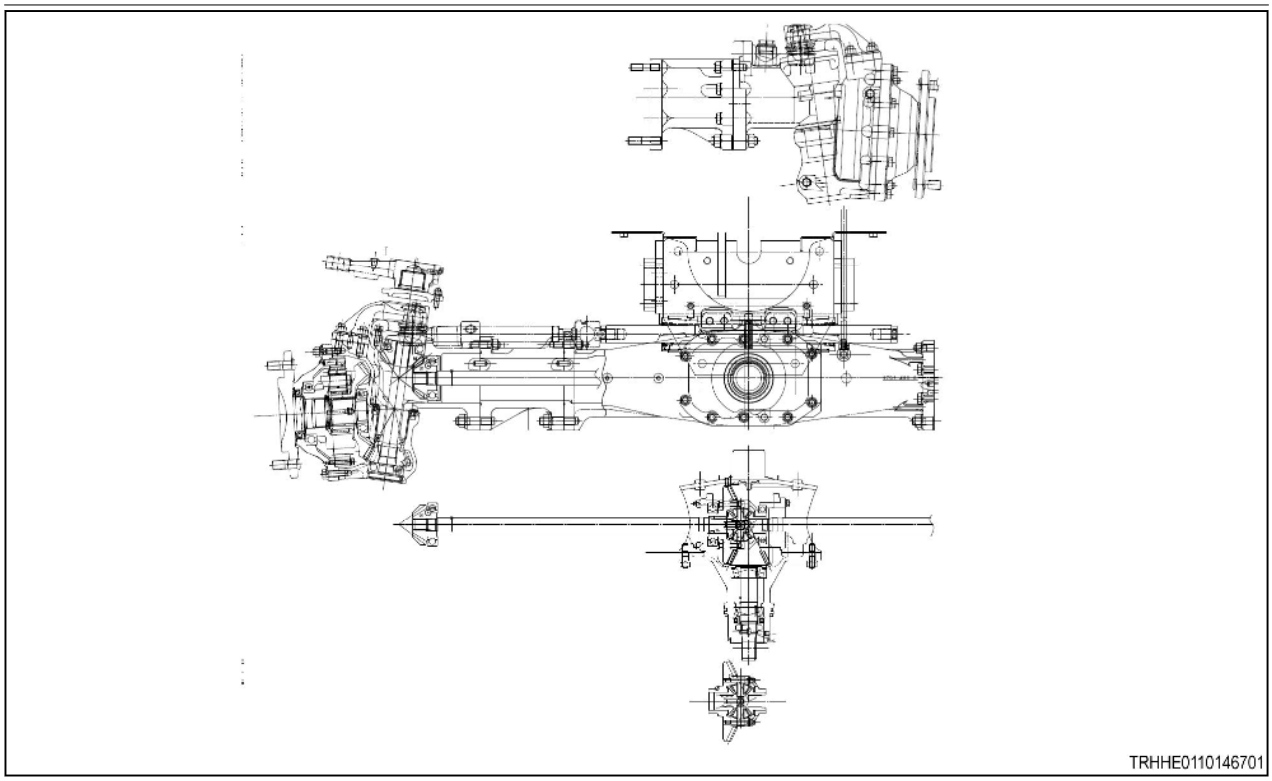


Fig. 95

Front axle assembly 60 in

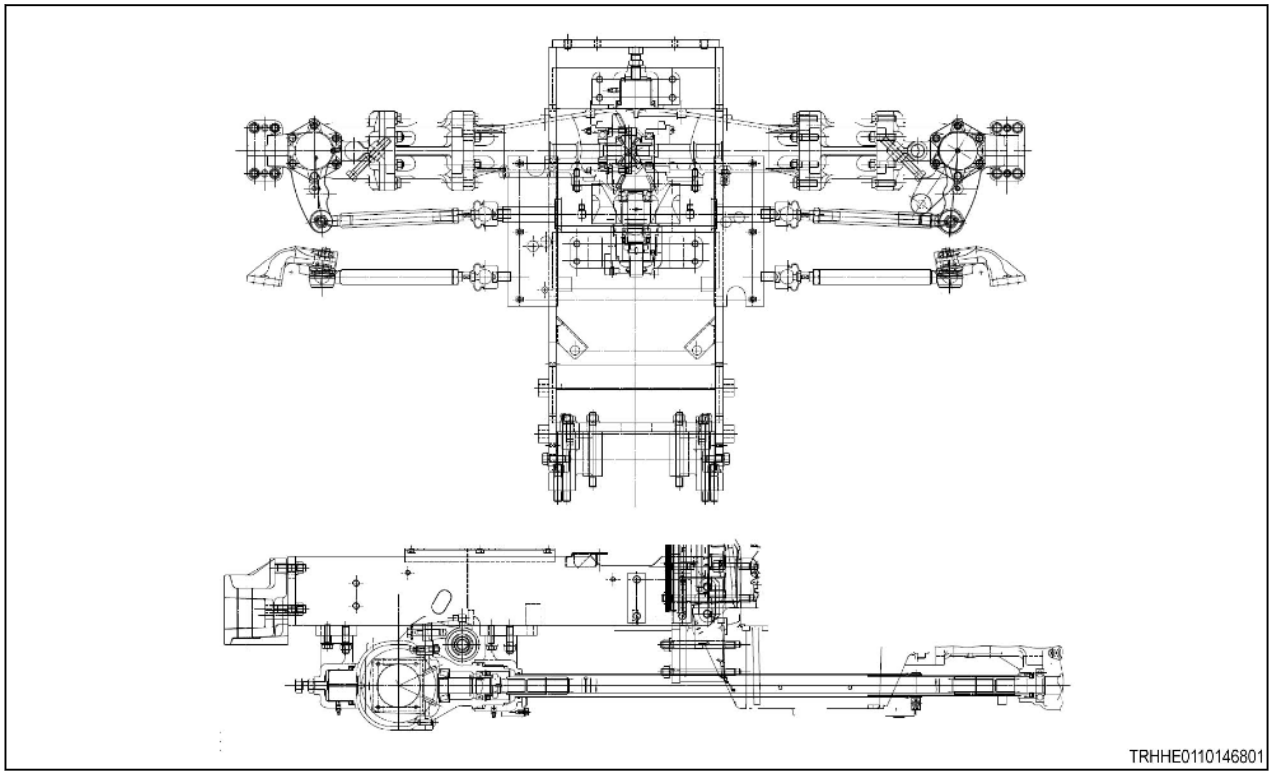


Fig. 96

Front axle assembly 60 in

6.7.7 Assemble the differential gears

Procedure

1. Cover the friction surfaces with grease.
2. Install new pins (1).
3. Index the ring gear.

   IMPORTANT: *The ring gear must be indexed correctly or failure of the spider gears will result.*
4. Put thread sealant on the nuts (2) and tighten to 26 Nm to 30 Nm (18.8 lbf ft to 21.7 lbf ft).
5. Put thread sealant on the nuts (3) and tighten to 24 Nm to 30 Nm (17.4 lbf ft to 21.7 lbf ft).
6. Put thread sealant on the nuts (4) and tighten to 24 Nm to 30 Nm (17.4 lbf ft to 21.7 lbf ft).
7. Install the carrier bolts.
8. Make sure the backlash between the differential pinions and the side gears is 0.1 mm to 0.2 mm (0.004 in to 0.008 in).

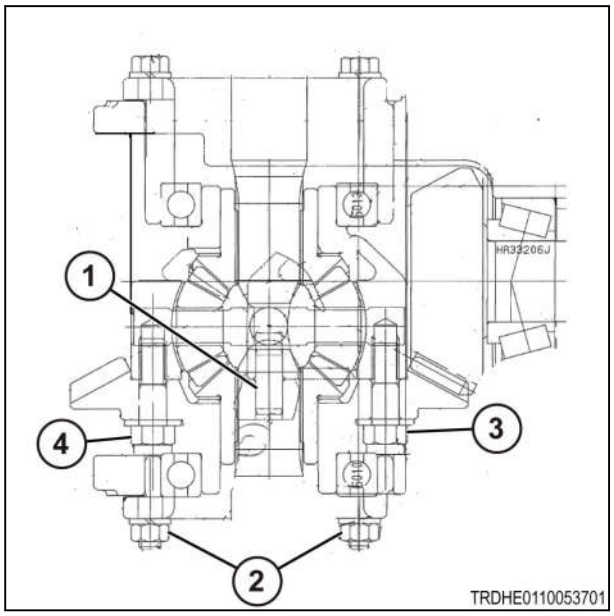


Fig. 116

9. Install the carrier in the bevel gear housing.
10. Replace the thrust washer and the gears as required.
11. Set the ring gear and pinion backlash to 0.1 mm to 0.2 mm (0.004 in to 0.008 in). Move the shims from one side of the carrier to the other as required to adjust the backlash.
12. After installing the ring gear and pinion, tap both sides of the ring gear with a copper hammer. Check the backlash at four different points, 90 degrees from each other.

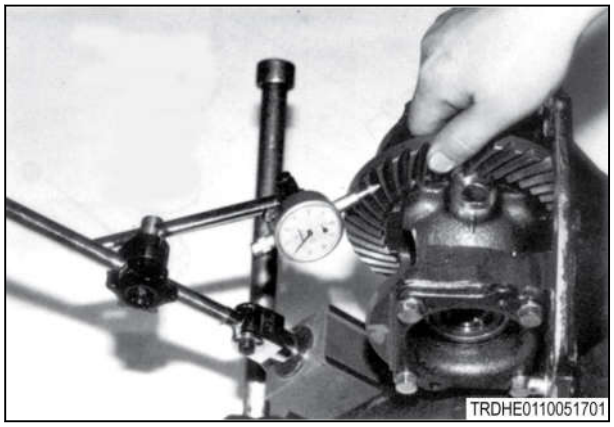


Fig. 117

5. Measure the diameter of the housing that makes contact with the bushing. The standard value is 55 mm (2.165 in).
6. If the measured value is less than 54.9 mm (2.161 in), replace the housing.

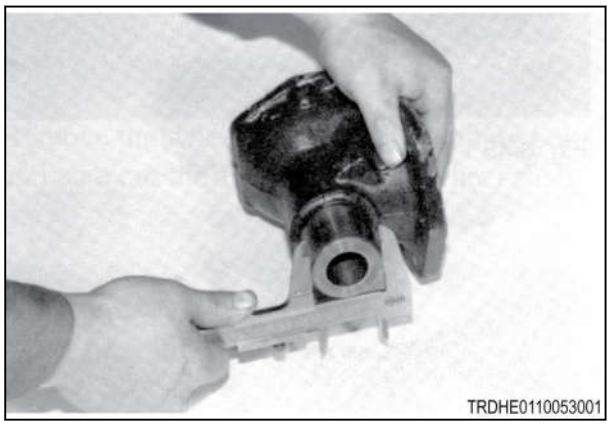


Fig. 137 Final housing shaft

7. Measure the diameter of the bushing in the final housing. The standard value is 55.1 mm (2.169 in).
8. If the measured value is greater than 55.2 mm (2.173 in), replace the bushing
9. Inspect all of the bearings, oil seals, O-rings, shafts, and remaining parts for wear or damage. Replace the parts as needed.

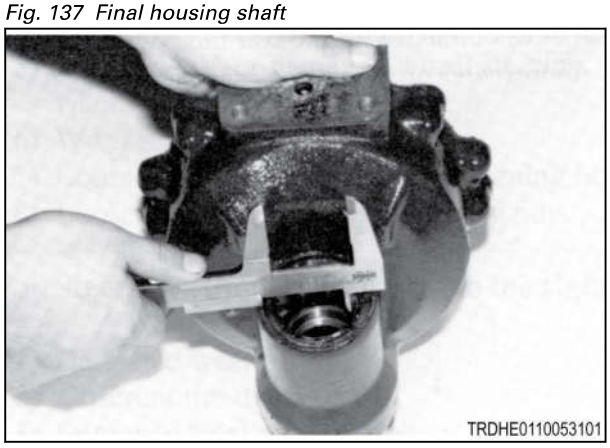


Fig. 138 Final housing bushing

6.8.3 Assembling the final drive housing

1. When installing unitized seals, apply force to the outer circumference of the seal (1) as shown. Do not apply force to the outer surface.
2. The flat-seat thrust bearing must be installed with the larger bore side turned downwards.

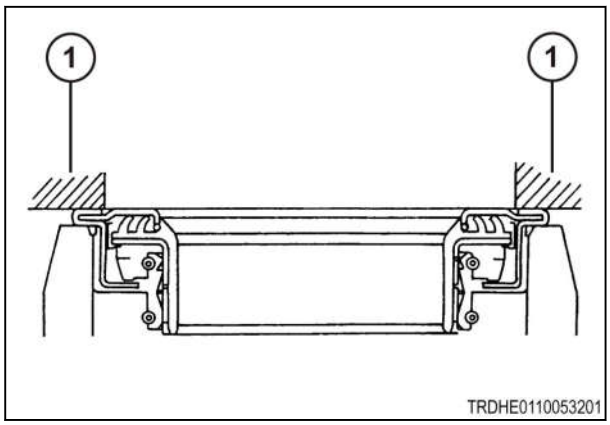


Fig. 139

Procedure

1. Release the brake pedal latch.
2. Put a measuring device at the bottom of the brake pedal.
3. Push the brake pedal down by hand.
4. Measure the brake pedal free play.
5. Examine the other brake pedal.

7.1.4 Adjusting the brakes

CAUTION:
Adjust the brakes evenly to permit equal braking action at both rear wheels when brake pedals are latched together.

1. Loosen the right-hand thread lock nut (1) and the left-hand thread lock nut (2).
2. Adjust the pedal turnbuckle (3) so the free play is correct for the brake pedal.

   If the brake cannot be adjusted by the pedal turnbuckle, loosen the locknut (4) on the brake rod on the side of the transmission case. Turn the brake rod turnbuckle (5) to adjust. Tighten the locknut.

   NOTE: *Check the for contact between the brake arm and the transmission case boss when only the brake turnbuckle (3) is adjusted.*
3. Repeat the procedure for the other brake. The free play in both pedals must be equal.
4. Tighten the lock nuts against the turnbuckles.
5. Latch the pedals together.
6. Operate the tractor at low speed.
7. Press the brake pedals.

   Result

   If the tractor pulls to one side, adjust one brake. Make sure all lock nuts are tight. Check the operation of the brakes.

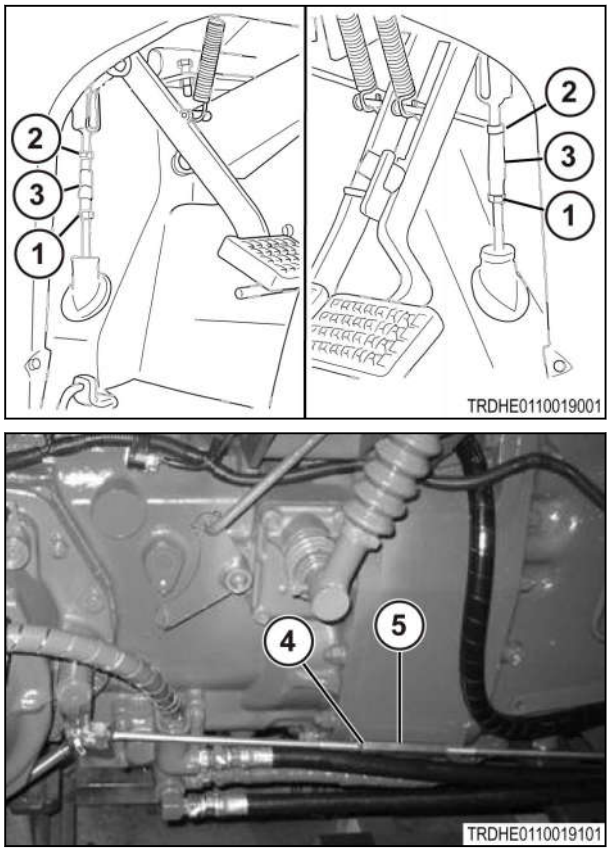


Fig. 6

Controller diagram

Abbreviation	Description
AUX, SWITCH	Auxiliary switch
AXLE SENSOR/LEVER	Throttle lever sensor
AXLE SENSOR/MEMORY(+/-)	Stored engine speed switch
AXLE SENSOR/MEMORY(A/B)	Stored engine speed adjustment switch
AXLE SNSOR/FOOT	Foot throttle sensor
CHECKER	Checker
CLUTCH SENSOR	Clutch sensor
DEPTH DIAL	Depth dial
DRAFT SENSOR	Draft sensor
EARTH	Ground
ECU	ECU
FUEL SENSOR	Fuel sensor
GND	Ground
HI/LO SWITCH	High/low switch
HIGH SPEED DETECTION	High speed detection
Hi-Lo_SOL	High/low solenoid
HYDRUALIC SWITCH/L	Hydraulic switch, left
HYDRUALIC SWITCH/R	Hydraulic switch, right
INPUT SHAFT SENSOR	Input shaft sensor
LIFT ARM SENSOR	Lift arm sensor
LINEAR SHIFT	Linear shift
MAIN SOL	Main solenoid
OIL TEMPERATURE SENSOR	Oil temperature sensor
POSITION SENSOR	Position sensor
PRESSURE SWITCH/HI	Pressure switch, high
PRESSURE SWITCH/LO	Pressure switch, low
PTO CASE SW	Power take-off case switch
PTO LEVER SWITCH	Power take-off lever switch
PTO SHAFT SENSOR	Power take-off shaft sensor
PTO SWITCH	Power take-off switch
PTO_SOL	Power take-off solenoid
REVERSE SOLENOID	Reverse solenoid

8.2.9 Lamp - platform tractor (North America)

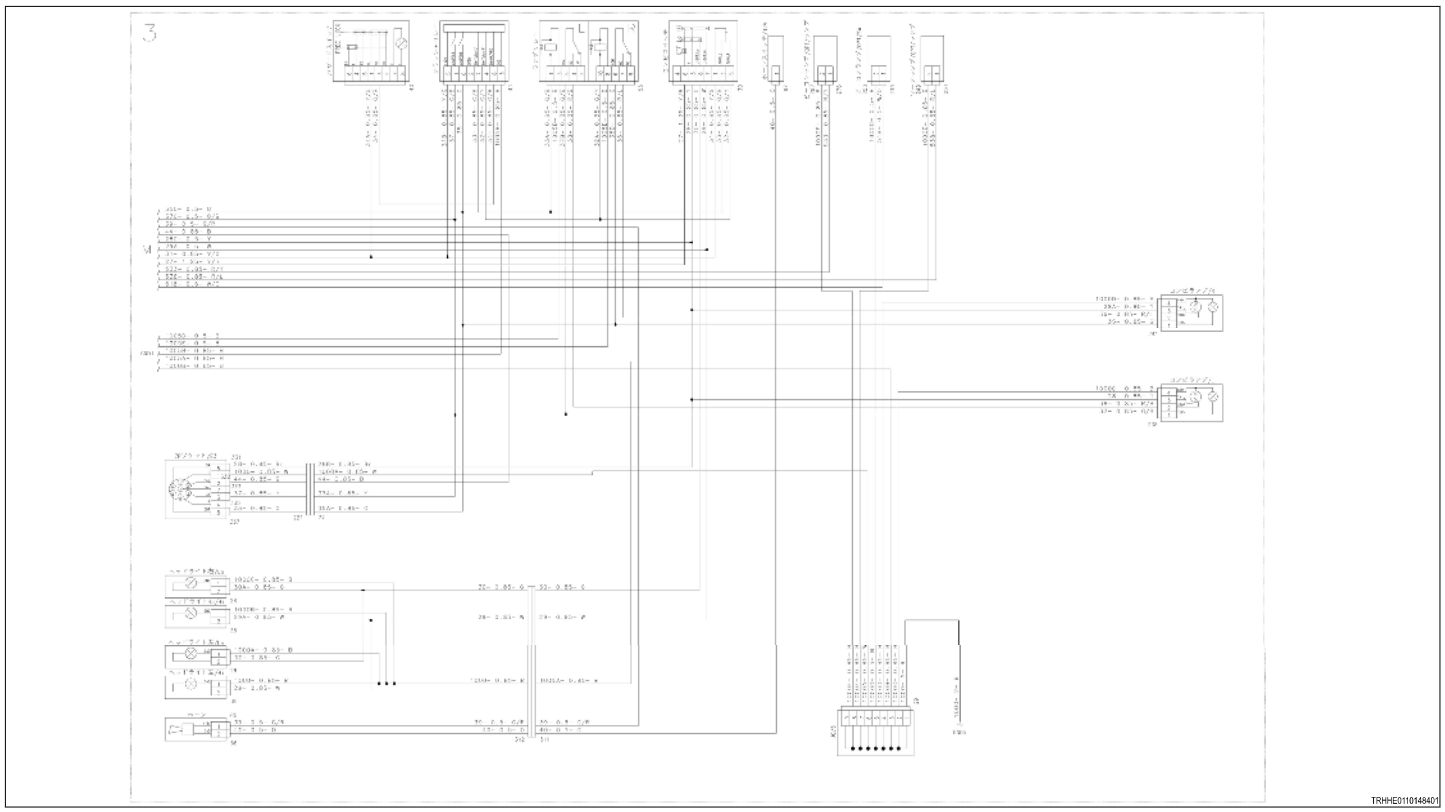


Fig. 8

8.2.19 Controller - platform tractor (North America)

Prior to 2017 model year changes

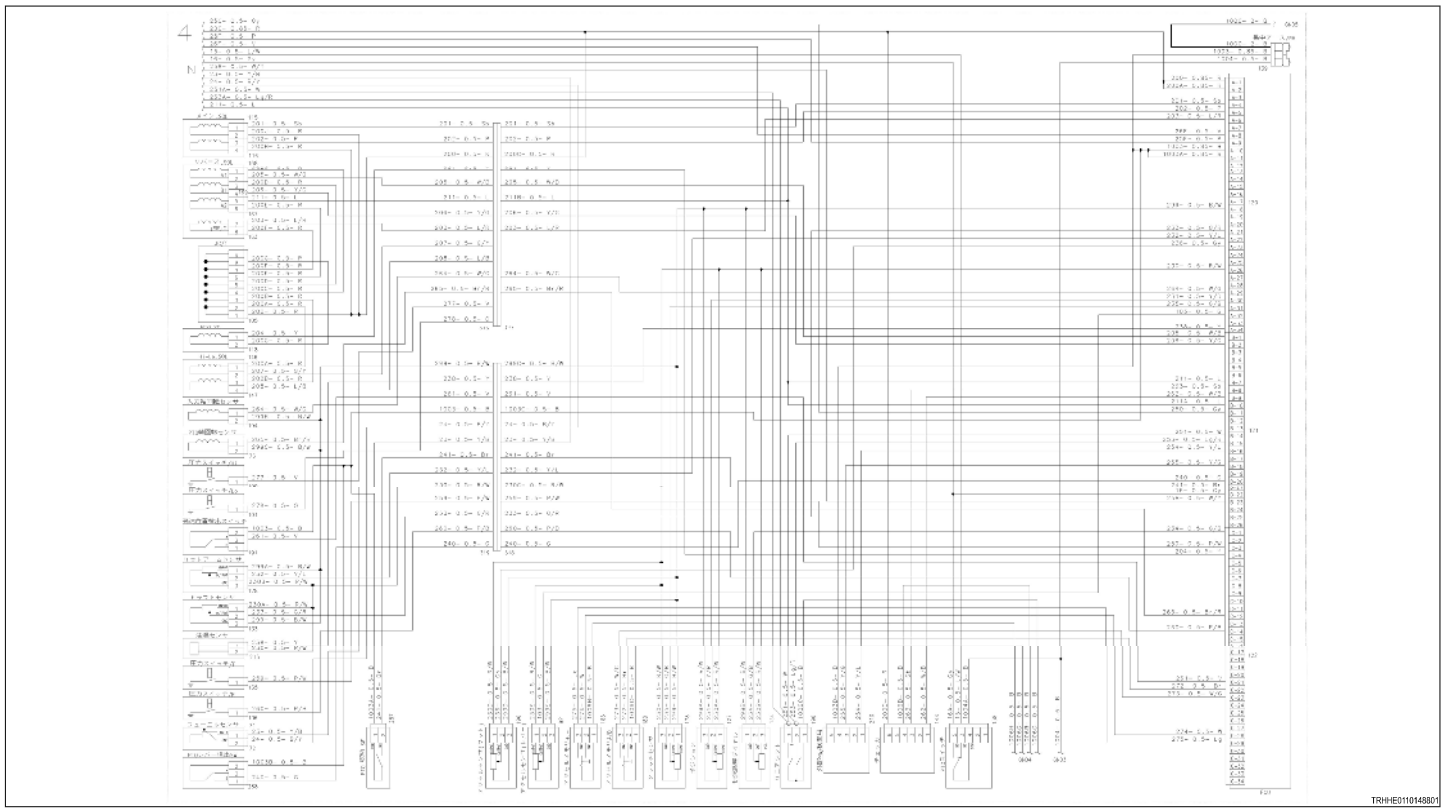


Fig. 18

Immediately after forward gear change

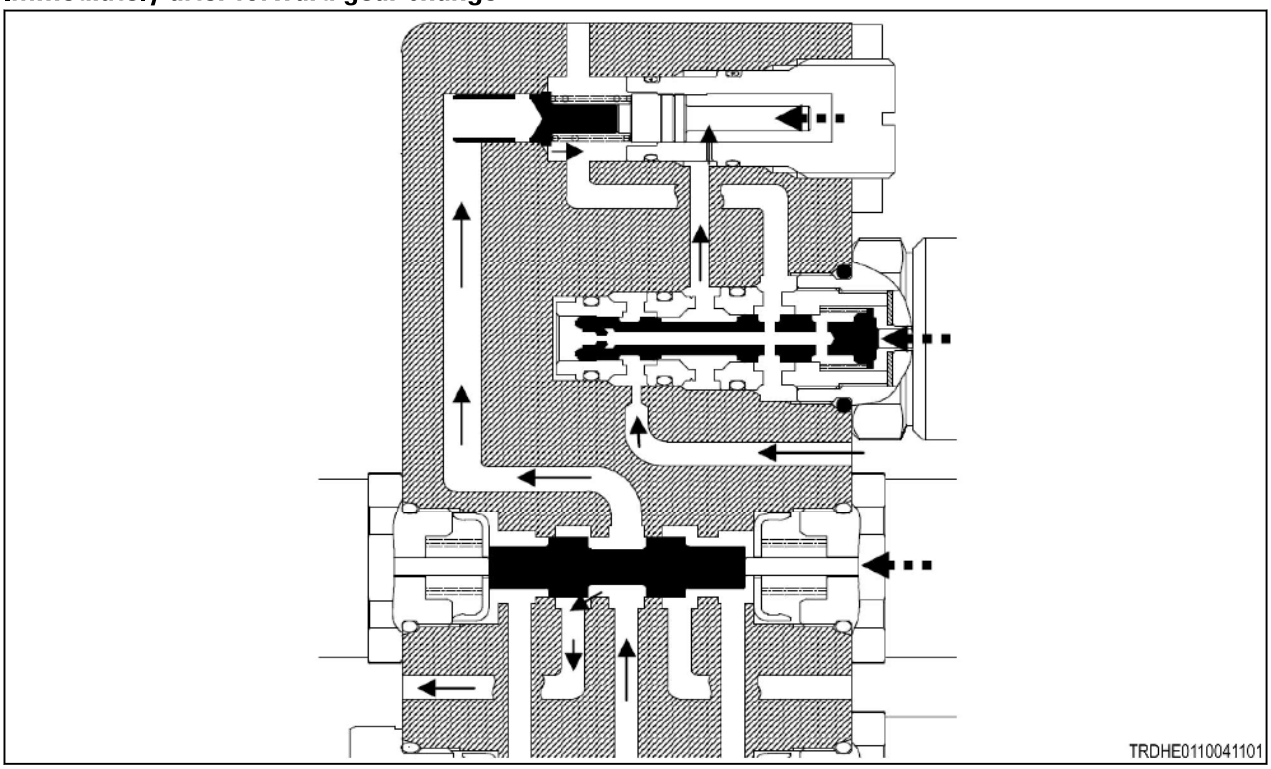


Fig. 39

When the power shuttle lever is shifted to the forward side, the forward solenoid immediately actuates and oil supplies to the forward side of the power shuttle clutch.

During this time, the pressure control valve continuously receives the amount of current (1.4A) equivalent to the maximum pressure. Therefore the passage from the relief valve to the tank remains closed.

Because the relief valve is closed, the maximum amount of flow drives the clutch piston.

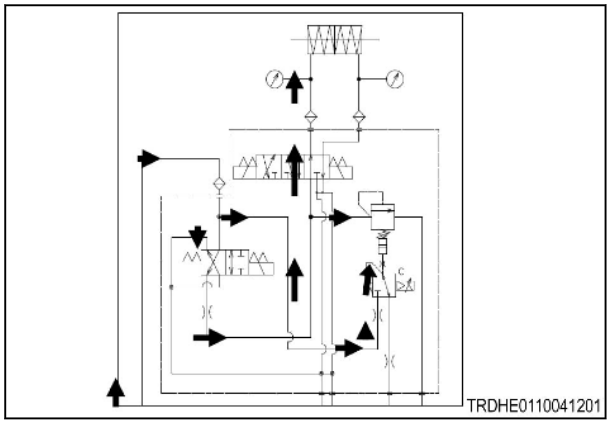


Fig. 40

Solenoid current

Solenoid	Current	Temperature
High/low and clutch pedal solenoid	7.04 to 8.96 Ohms	20° C (68°F)
PTO and forward/reverse proportional solenoid	3.23 to 3.57 Ohms	20° C (68°F)
Forward/reverse solenoid	7.04 to 8.96 Ohms	20° C (68°F)
3-Point linkage solenoid	3.1 Ohms	20° C (68°F)

10. Complete the following within ten seconds.

a) Turn the main switch from "STOP" to "ON".

b) Turn the depth dial clockwise until the depth dial stops.

c) Turn the depth dial counterclockwise until the depth dial stops.

d) Turn the depth dial clockwise until the depth dial stops.

Result

If the adjustment is correct, the lift lamp will illuminate one time. If the lift lamp flashes continuously, the adjustment has failed.

Fig. 77

11. Turn the main switch to "STOP".

12. Repeat the procedure if the adjustment fails.

13. Install the check fuse when the adjustment is correct.

8.6.4 Lift arm and draft sensor

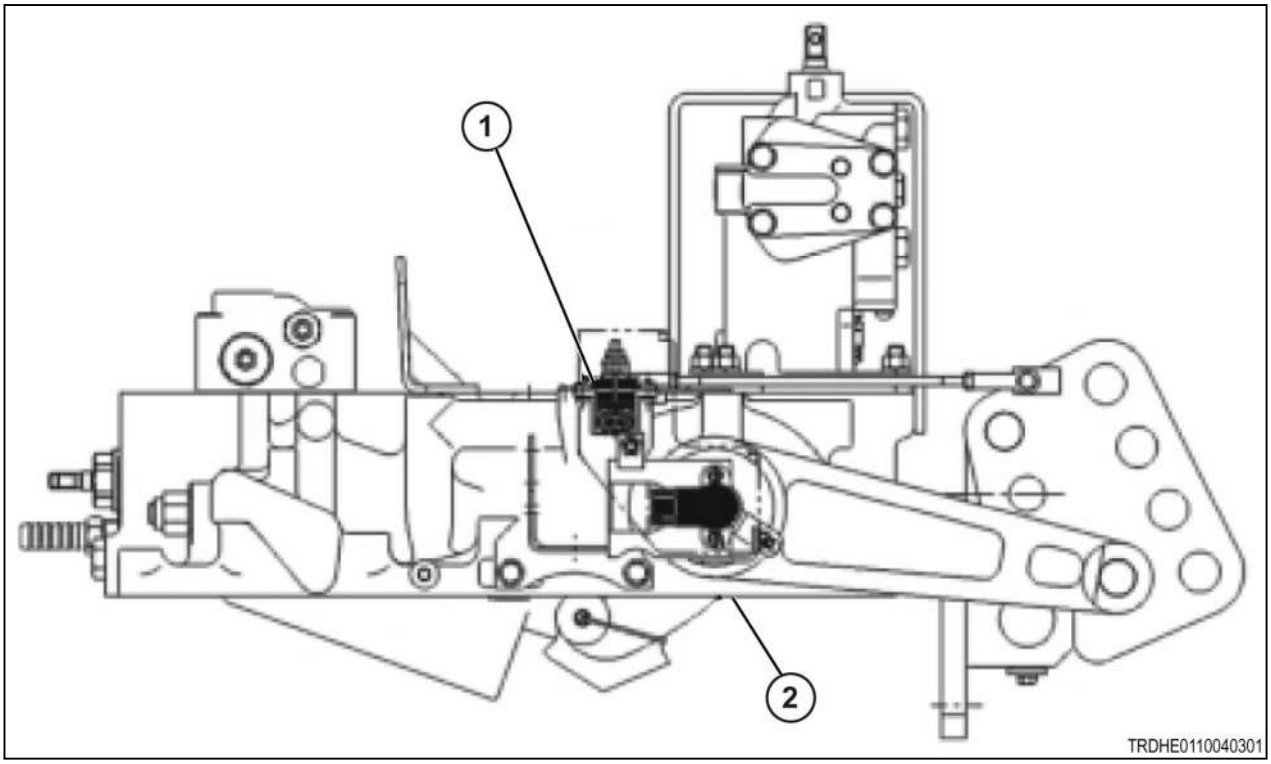


Fig. 78

(1) Draft sensor

(2) Lift arm sensor

8.6.16 Power take-off shaft safety switch

(1) Power take-off shaft safety switch

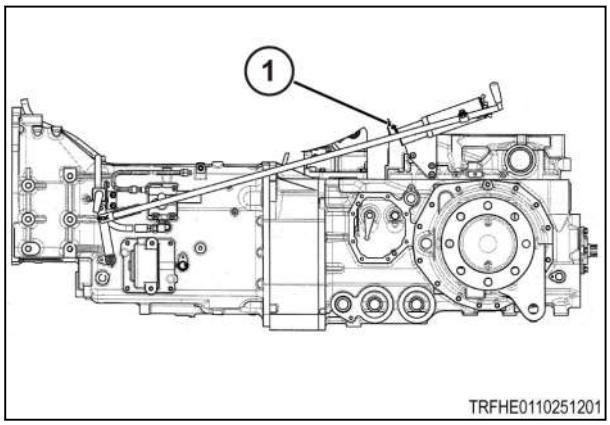


Fig. 95

(1) Power take-off lever safety switch

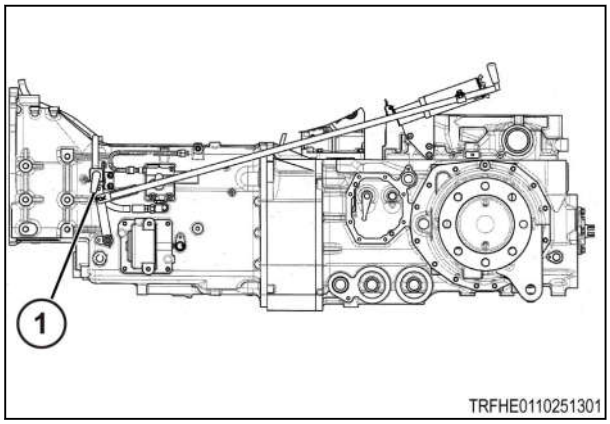


Fig. 96

Diagram

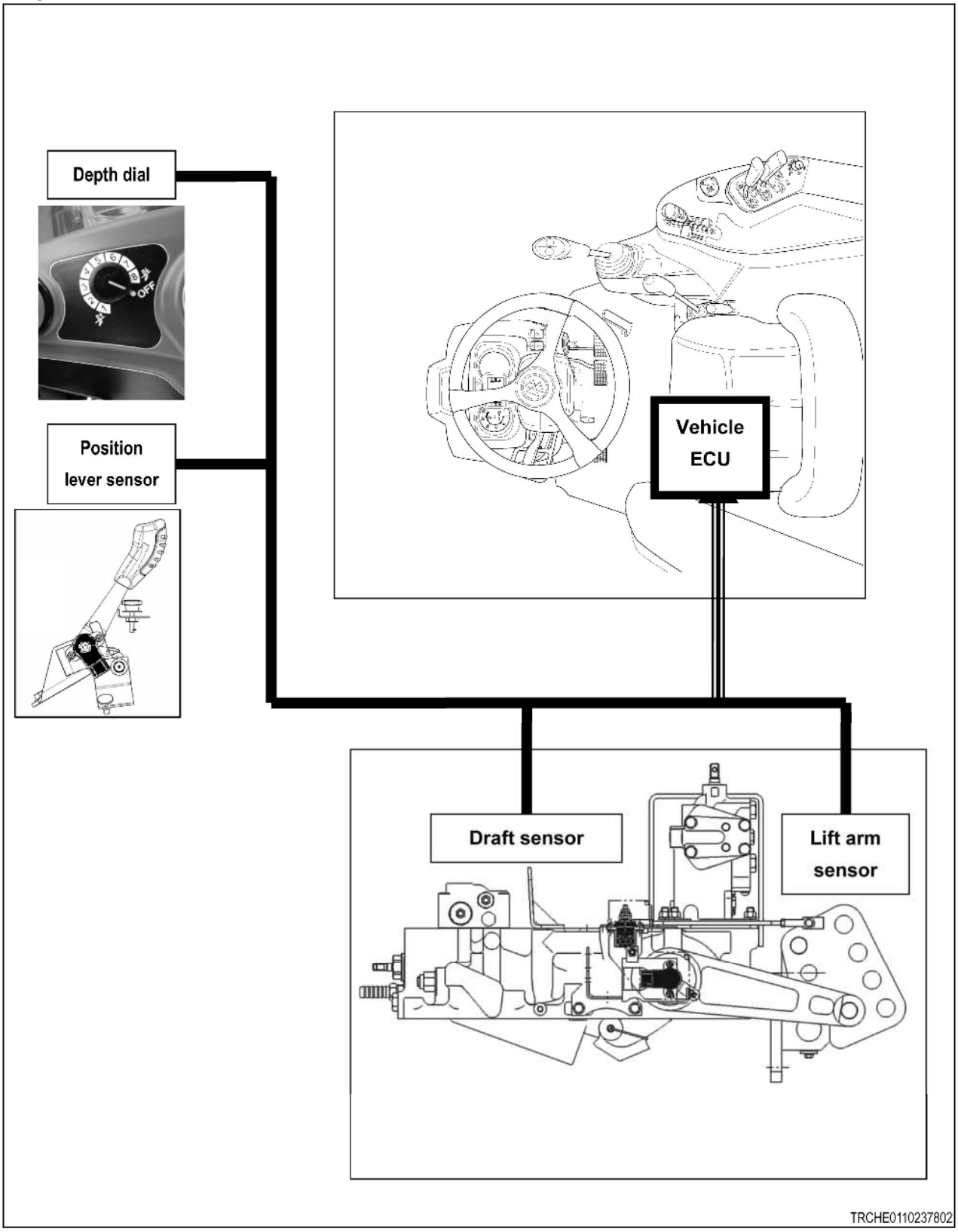


Fig. 101

Position lever sensor, lift arm sensor and draft sensor

Diagram

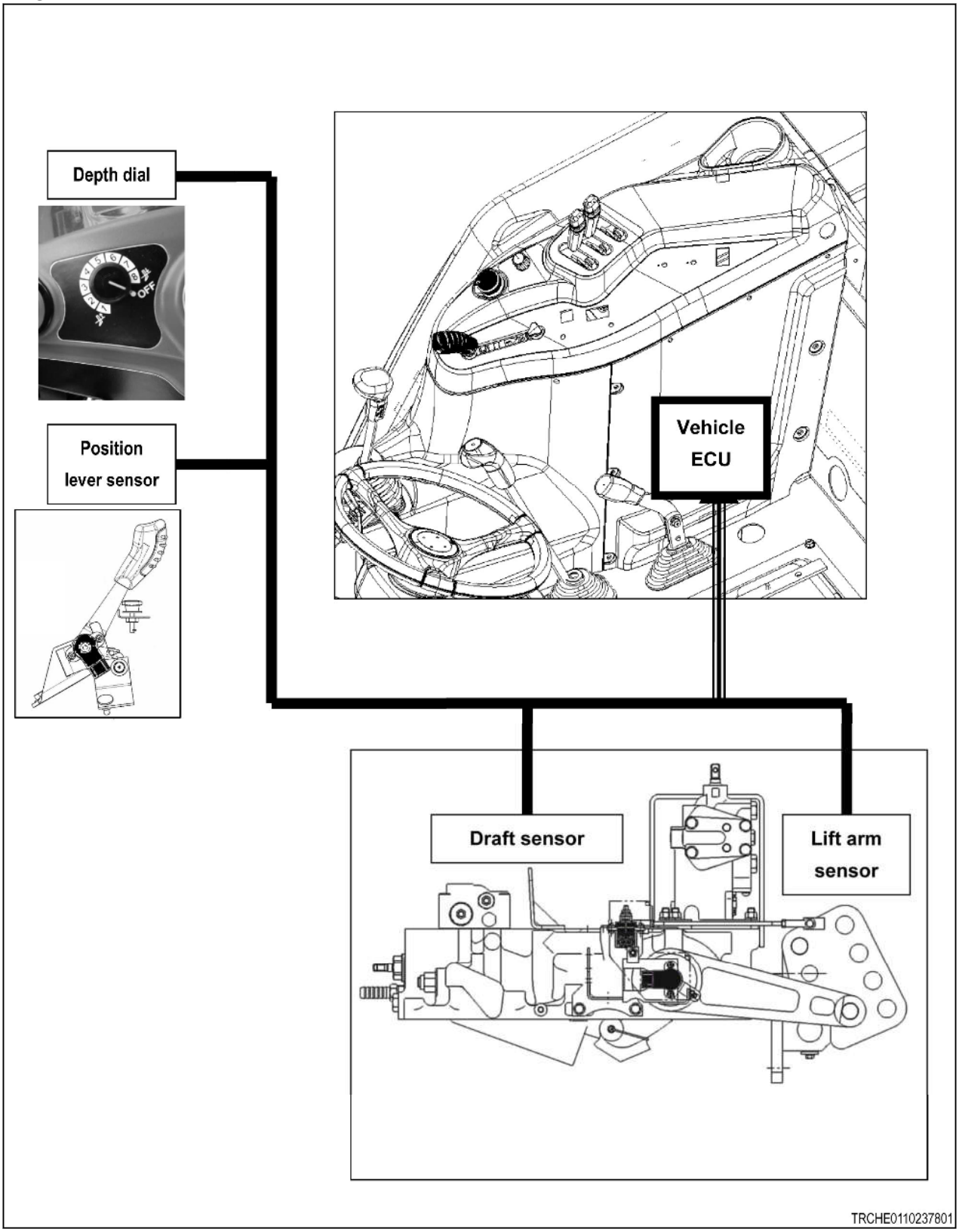


Fig. 104

Position lever sensor, lift arm sensor and draft sensor

Diagram

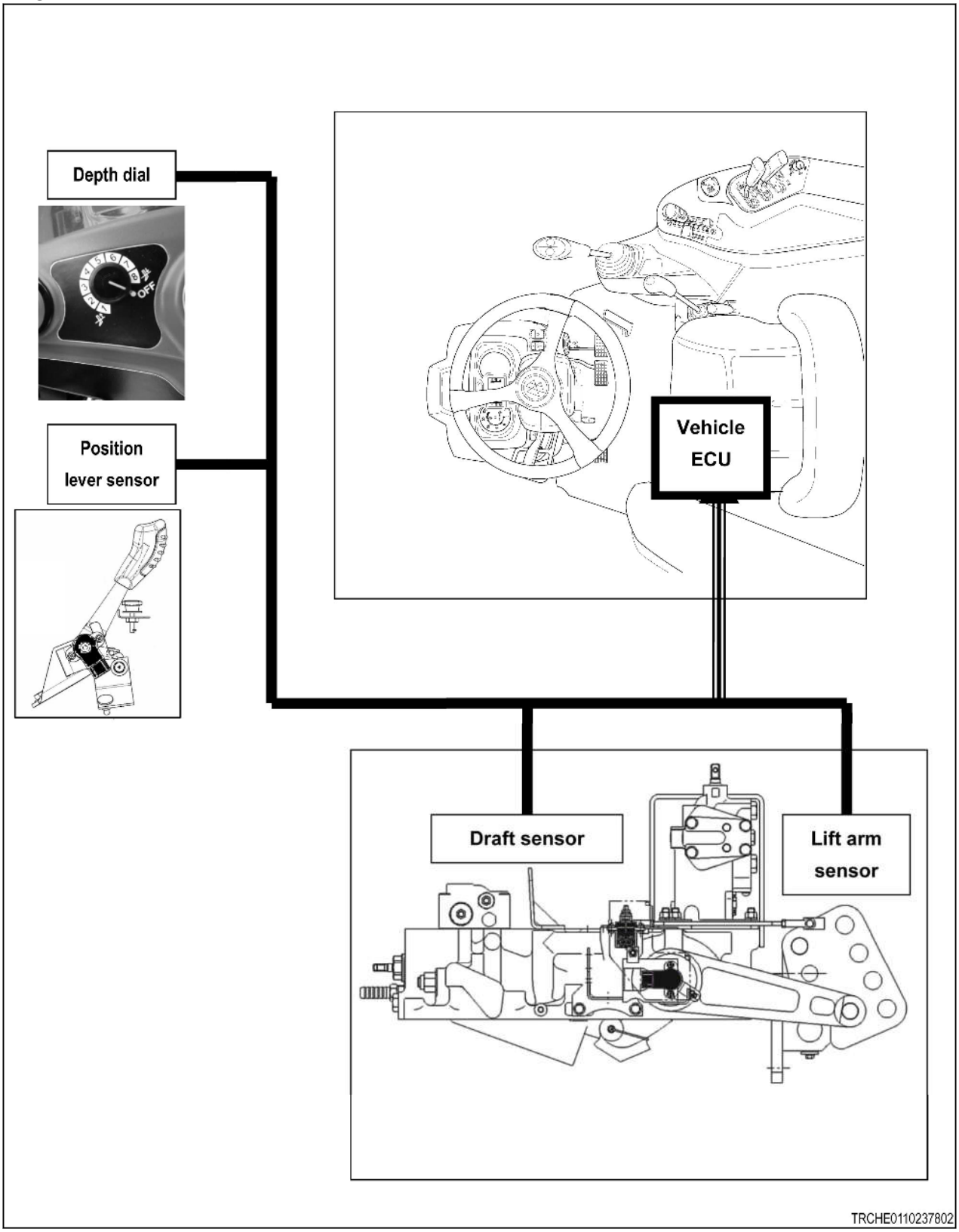


Fig. 107

Position lever sensor, lift arm sensor and draft sensor

- No - the accelerator sensor adjustment is not complete.

  Complete the accelerator sensor adjustment.

  Stop.

7. Check if the diagnostic code remains.

a) Inspect the contacts of the harness connectors and clean the connectors.
b) Connect all harness connectors.
c) Turn the battery disconnect switch and the key start switch to the on position.
d) Operate the machine.
e) Check the status of the diagnostic code.

Result

Expected result: The diagnostic code is not active.

Result:

- Yes - the diagnostic code is not active. The diagnostic code does not exist.

  The initial diagnostic code was most likely caused by a poor electrical connection or a short at one of the harness connectors. Resume normal machine operation.
- No - the diagnostic code is active. The diagnostic code has not been corrected. Failure of the ECM is possible but not common.

  Exit the procedure and perform the procedure again. If the cause of the diagnostic code is not found, replace the ECM.

  Stop.

8.11.11 SPN 3053 FMI 2

The accelerator sensor is above the normal operating range. Fault value is 981 to 1023. Standard Value 220 to 804.

Common failures

- Open circuit in the signal line.
- Short circuit in the ground line and the signal line.
- Sensor failure.
- Vehicle electronic control unit (ECU) failure.
- Sensor mounting bracket requires adjustment.
- Sensor adjustment is not complete.

Diagnosis and solution

Use a digital multimeter for measurements in the test procedures.

1. Check for power at the sensor.

a) Turn the key start switch and the battery disconnect switch to the on position.
b) Measure for the correct signal at the signal line.

Result

Expected result: The signal is correct.

Result:

- Yes - the signal is correct.

  see step 2, page 8-121

Clutch pedal switch and sensor

NOTE: *The clutch switch is off when the pedal (at the bottom end) is 15 to 20 mm 0.59 to 0.79 in from the fully depressed position.*

Schematic legend	
Callout	**Term description**
1	Clutch pedal
2	Clutch sensor
3	Clutch switch

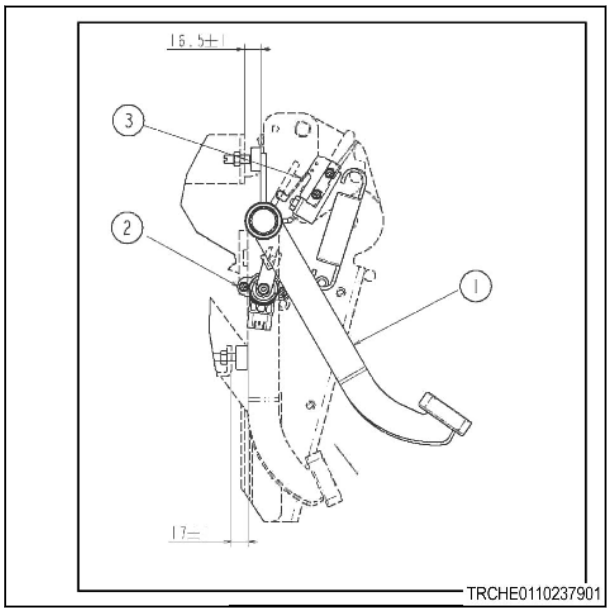


Fig. 111

8.11.15 SPN 3055 FMI 3

The clutch pedal sensor is above the normal operating range. Fault value is greater than 1022.

Common failures

- Short circuit in the 12V power supply line and signal line.
- Short circuit in the 5V power supply line and signal line.
- Sensor failure.
- Vehicle electronic control unit (ECU) failure.
- Sensor mounting bracket requires adjustment.
- Sensor adjustment is not complete.

Diagnosis and solution

Use a digital multimeter for measurements in the test procedures.

1. Check sensor adjustment.

a) Adjust the sensor to the correct setting.

Result

Expected result: The setting is correct.

Result:

- Yes - the setting is correct.

  see step 2, page 8-130
- No - the setting is not correct.

  Adjust the sensor as required.

  Stop.

2. Check the signal wire for a short to 12V supply line.

a) Remove the connector from the sensor

b) Check for continuity between the 12V supply line and the signal wire.

1. Check the clutch pedal switch adjustment.
   a. Check the clutch pedal switch for the correct setting.

   Expected result: The signal is correct.

   Result:
   - Yes - the switch adjustment is correct.

     see *step 2*
   - No - the switch adjustment is not correct.

     Adjust the switch to the correct setting.

     Stop.
2. Check for short circuit between the ground line and the signal line.
   a. Remove the connector from the sensor.
   b. Check for continuity between the ground line and the signal line.

   Expected result: No continuity is found.

   Result:
   - Yes - no continuity is found. The circuit is correct.

     see *step 3*
   - No - continuity is found.

     Repair or replace the machine harness.

     Stop.
3. Check the sensor.
   a. Check the sensor for correct operation.

   Expected result: The sensor is correct.

   Result:
   - Yes - the sensor is correct.

     see *step 4*
   - No - the sensor has failed.

     Replace the sensor.

     Stop.
4. Check the sensor mounting bracket/arm.
   a. Make sure the sensor mounting bracket/arm is not damaged or bent.

   Expected result: The sensor mounting bracket/arm is correct.

   Result:
   - Yes - the sensor mounting bracket/arm is correct.

     see *step 5*
   - No - the sensor mounting bracket/arm has failed.

     Repair or replace the sensor mounting bracket/arm as needed.

     Stop.

Diagram

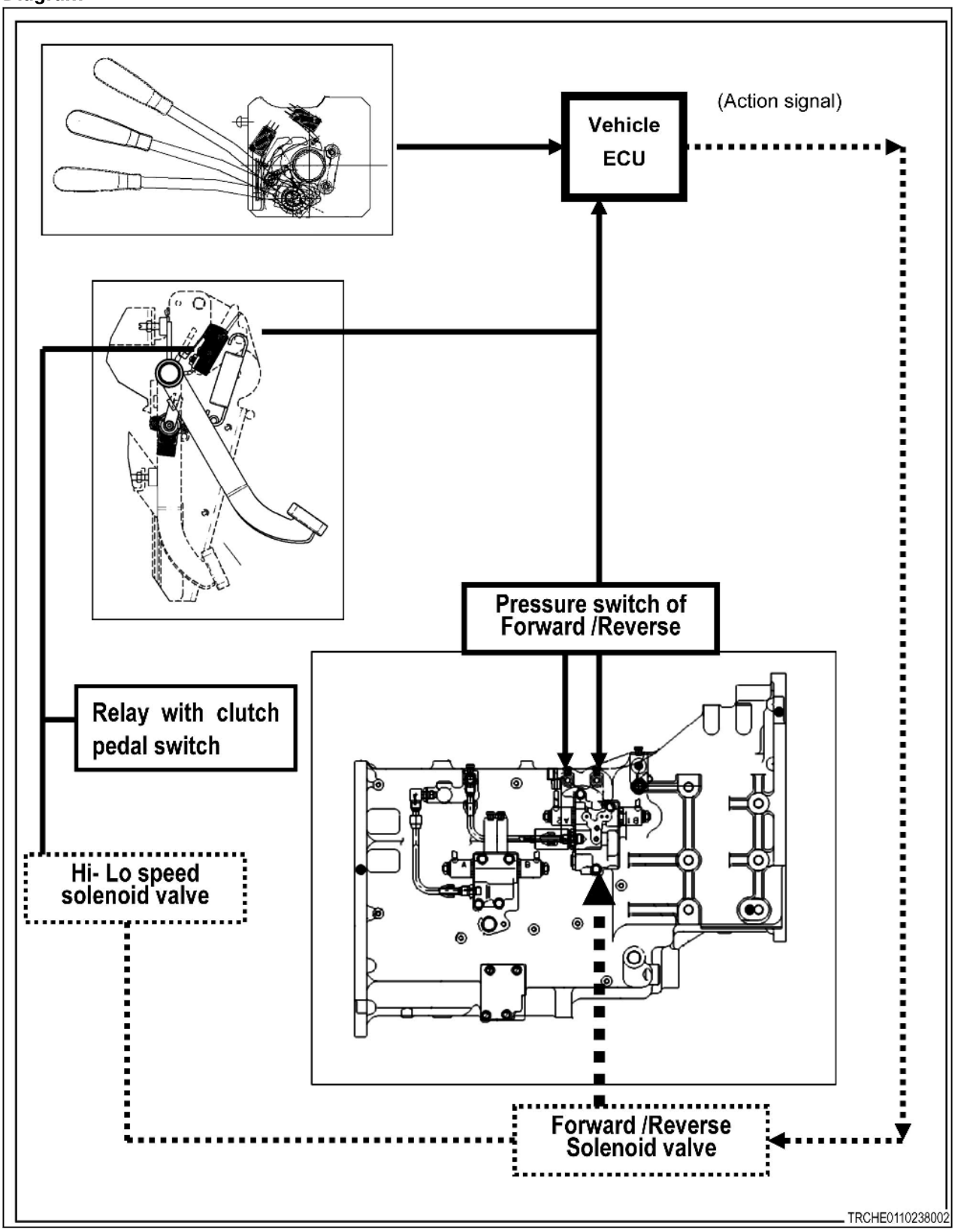


Fig. 118

Pressure switch relay, solenoid valve function; clutch pedal switch function

3. Check the forward and reverse change over valve.
   a) Check the forward and reverse change over valve for correct operation.

   Result

   Expected result: The forward and reverse change over valve is correct.

   Result:

   - Yes - the forward and reverse change over valve is correct.

     see step 4, page 8-160
   - No - the forward and reverse change over valve has failed.

     Replace the forward and reverse change over valve.

     Stop.

4. Check the forward and reverse shuttle clutch.
   a) Check the forward and reverse shuttle clutch for correct operation.

   Result

   Expected result: The forward and reverse shuttle clutch is correct.

   Result:

   - Yes - the forward and reverse shuttle clutch is correct.

     see step 5, page 8-160
   - No - the forward and reverse shuttle clutch has failed.

     Replace the forward and reverse shuttle clutch.

     Stop.

5. Check the vehicle controller output line.
   a) Check the vehicle controller output line for correct operation.

   Result

   Expected result: The vehicle controller output line is correct.

   Result:

   - Yes - the vehicle controller output line is correct.

     see step 6, page 8-160
   - No - the vehicle controller output line has failed.

     Replace the vehicle controller output line.

     Stop.

6. Check clutch pin torque adjustment.
   a) Adjust the clutch pin torque to the correct setting.

   Result

   Expected result: The setting is correct.

   Result:

   - Yes - the setting is correct. see step 7, page 8-160
   - No - the setting is not correct.

     Adjust the clutch pin torque as required.

     Stop.

7. Check if the diagnostic code remains.
   a) Inspect the contacts of the harness connectors and clean the connectors.

7. Check if the diagnostic code remains.
   a) Inspect the contacts of the harness connectors and clean the connectors.
   b) Connect all harness connectors.
   c) Turn the battery disconnect switch and the key start switch to the on position.
   d) Operate the machine.
   e) Check the status of the diagnostic code.

   Result

   Expected result: The diagnostic code is not active.

   Result:

   - Yes - the diagnostic code is not active. The diagnostic code does not exist.

     The initial diagnostic code was most likely caused by a poor electrical connection or a short at one of the harness connectors. Resume normal machine operation.
   - No - the diagnostic code is active. The diagnostic code has not been corrected. Failure of the ECM is possible but not common.

     Exit the procedure and perform the procedure again. If the cause of the diagnostic code is not found, replace the ECM.

     Stop.

8.11.30 SPN 3352 FMI 21

The reverse pressure switch is off when the ECM outputs an on signal.

Common failures

- The pressure control solenoid coupler on the forward and reverse valve is disconnected.
- The pressure control solenoid wiring is disconnected from the forward and reverse valve.
- Forward and reverse valve failure.
- Forward and reverse clutch failure.
- ECM output line failure.

Diagnosis and solution

Use a digital multimeter for measurements in the test procedures.

1. Check for output signal from the ECM.
   a. Check for a correct ECM output signal.

   Expected result: The signal is correct.

   Result:

   - Yes - the signal is correct.

     see *step 2*
   - No - the signal is not correct.

     Repair or replace the machine harness.

     Stop.

- Yes - the diagnostic code is not active. The diagnostic code does not exist.

  The initial diagnostic code was most likely caused by a poor electrical connection or a short at one of the harness connectors. Resume normal machine operation.
- No - the diagnostic code is active. The diagnostic code has not been corrected. Failure of the ECM is possible but not common.

  Exit the procedure and perform the procedure again. If the cause of the diagnostic code is not found, replace the ECM.

  Stop.

8.11.34 SPN 3357 FMI 22

The high-low clutch pressure cannot be decreased and continues more than two seconds after the high clutch output has stopped.

Common failures

- Short circuit in the ground line and the signal line.
- High-low valve failure.
- high clutch failure.
- Vehicle controller output line failure.

Diagnosis and solution

Use a digital multimeter for measurements in the test procedures.

1. Check the high solenoid signal line for a short to the ground line.

a) Remove the connector from the high solenoid.

b) Check for continuity between the signal line and the ground line.

Result

Expected result: No continuity is found.

Result:

- Yes - no continuity is found. The circuit is correct.

  see step 2, page 8-180
- No - continuity is found.

  Repair or replace the machine harness.

  Stop.

2. Check the high-low valve.

a) Check the high-low valve for correct operation.

Result

Expected result: The high-low valve is correct.

Result:

- Yes - the high-low valve is correct.

  see step 3, page 8-180
- No - the high-low valve has failed.

  Replace the high-low valve.

  Stop.

3. Check the low clutch.

a) Check the hig clutch for correct operation.

Operation

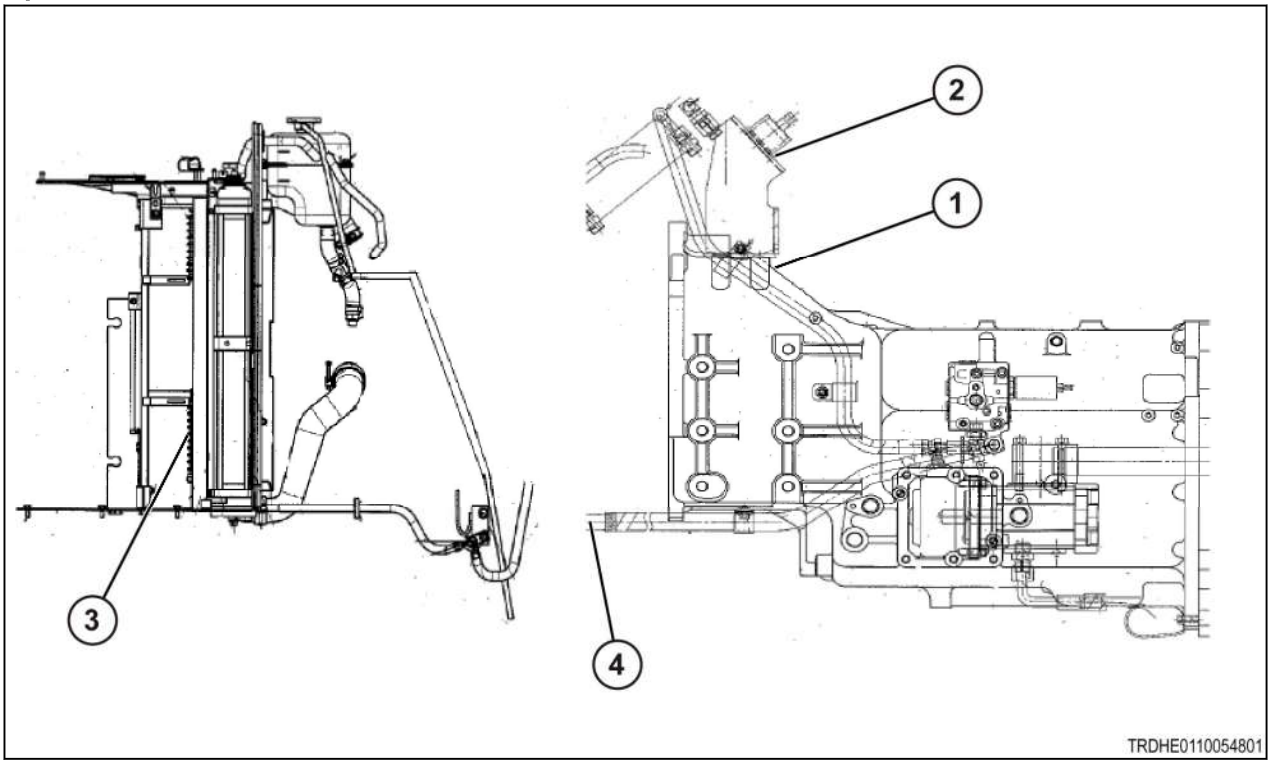


Fig. 3

(1) Relief valve
(2) Orbit roll assembly
(3) Oil cooler
(4) From oil cooler

Oil flows from the main cylinder housing to the oil cooler.

Oil is cooled down in the oil cooler. The oil then flows to the power take-off (PTO) clutch and the syncro gear of the main change.

Oil flows from the orbit roll to the reverse clutch and the hydraulic clutch.

If the pressure is more than the setting pressure, the oil flows to the tank by the relief valve.

The main cylinder circuit

(1) Safety valve
(2) lift assist cylinders, if equipped
(3) Main cylinder
(4) Slow return valve
(5) Main control valve

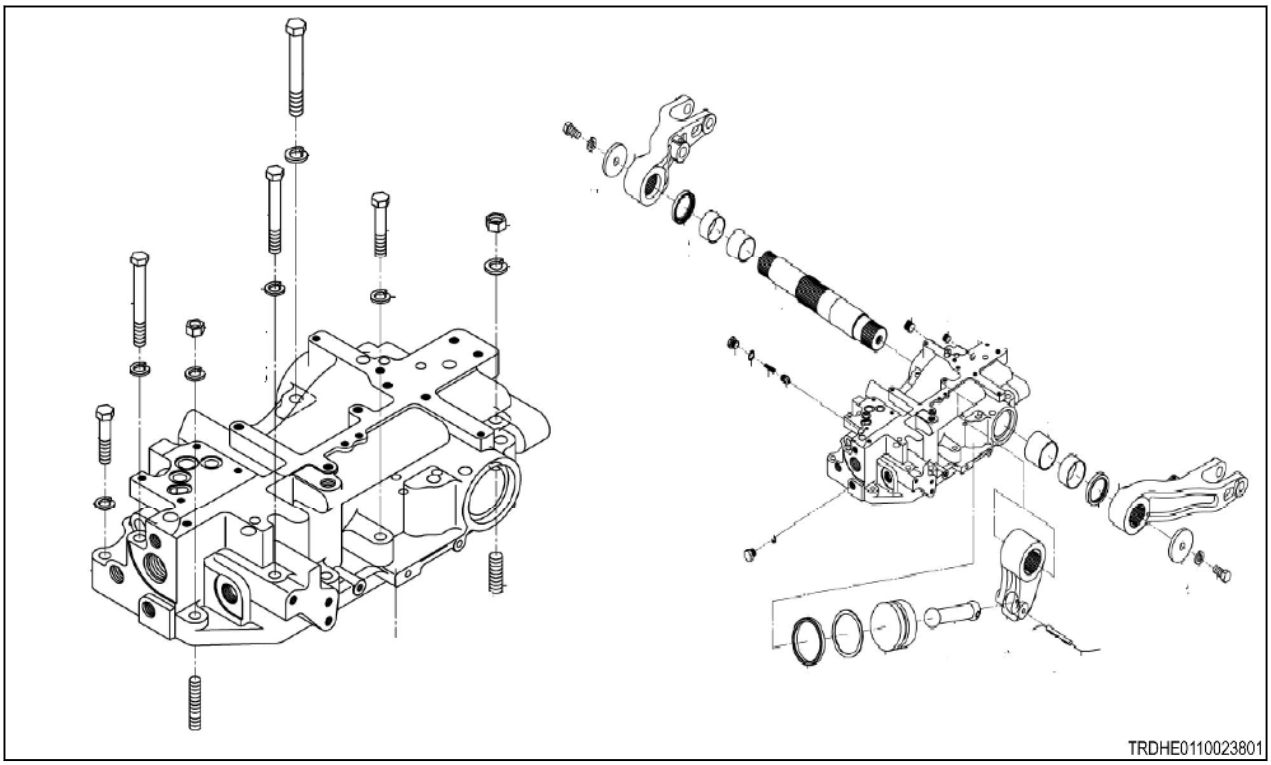


Fig. 22

Main cylinder housing assembly

Operation

The main cylinder fluid is controlled by the main control valve.

When the control lever is rearward, fluid goes from the main control valve to the main cylinder.

The three-point linkage lifts by pushing the piston through the piston rod, lift crank, and the lift arm.

When the control lever is forward, fluid goes from the main cylinder to the main control valve.

The lift arm can also be raised manually if required.

9.7.3 Main cylinder specifications

Maximum output	60 L/min (15.9 gal/min)
Maximum working pressure	19.6 MPa (2264.3 psi)
External leakage	Less than 1 to 5 cc/min at C port with 19.6 MPa (2264.3 psi)
Bore x stroke	100 (diameter) x 121.6 (stroke)
Capacity	955cc
Cylinder system	Single-acting cylinder

PTO control valve circuit

(1) PTO clutch
(2) L/C filter
(3) Priority valve for the steering
(4) Pressure proportional valve of the PTO
(5) Reduce valve

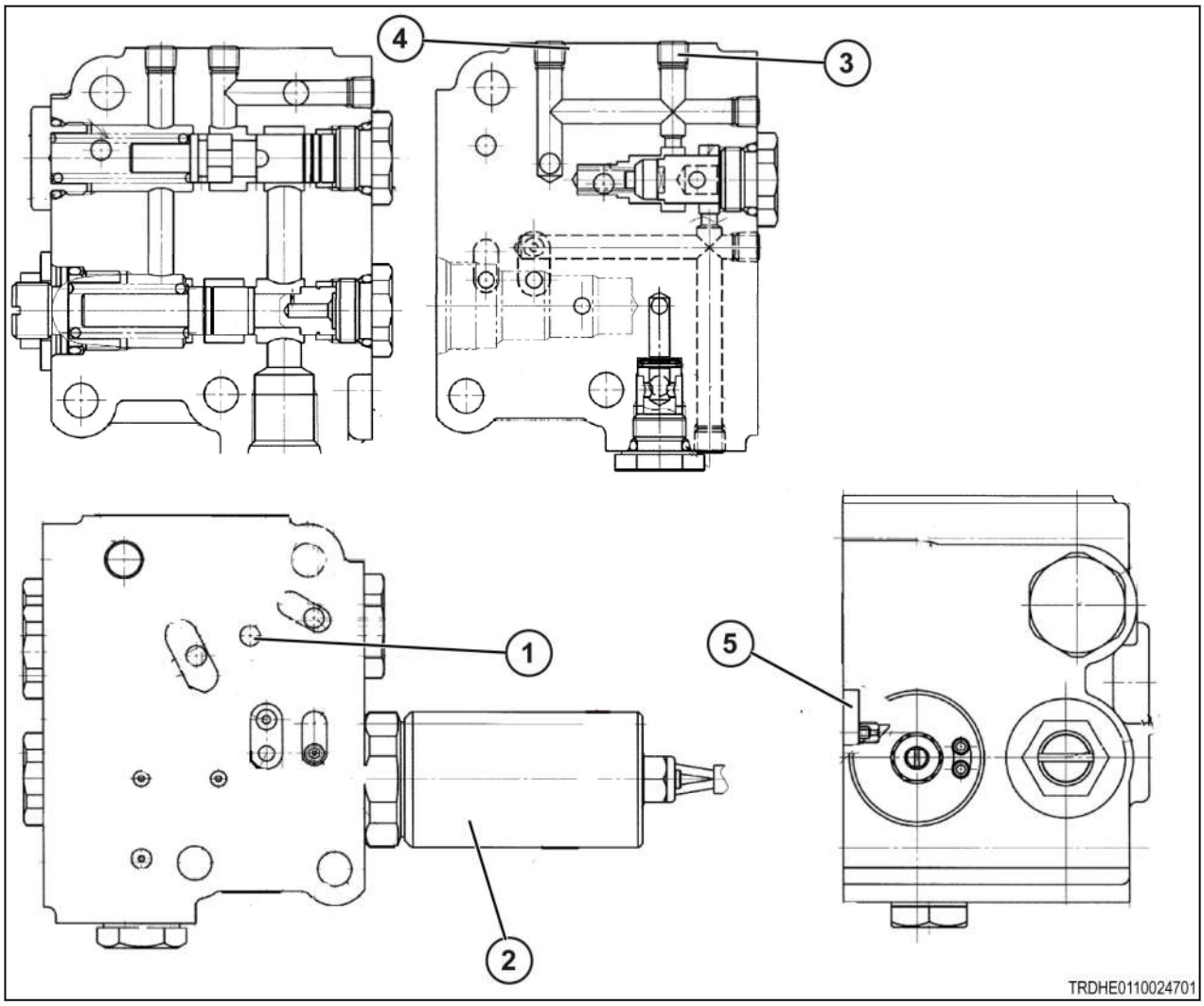


Fig. 37

(1) To PTO clutch
(2) Pressure proportional valve of the PTO
(3) To tank
(4) From the reduce valve

9.8.13 Assembling precautions for the power take-off control valve

Procedure

Tighten the power take-off control valve to 39.5 to 49.5 Nm (29.13 to 36.51 lbf ft).

NOTE: *During disassembly, clean the adapter with the filter.*

9.8.14 Power take-off control valve specifications

Control flow at 50° C (122° F)	4.5 L/min (1.18 gal/min)
Control pressure at 50° C (122° F)	2.06 MPa (299 psi)

Control current

9.8.22 Joystick valve (J type only)

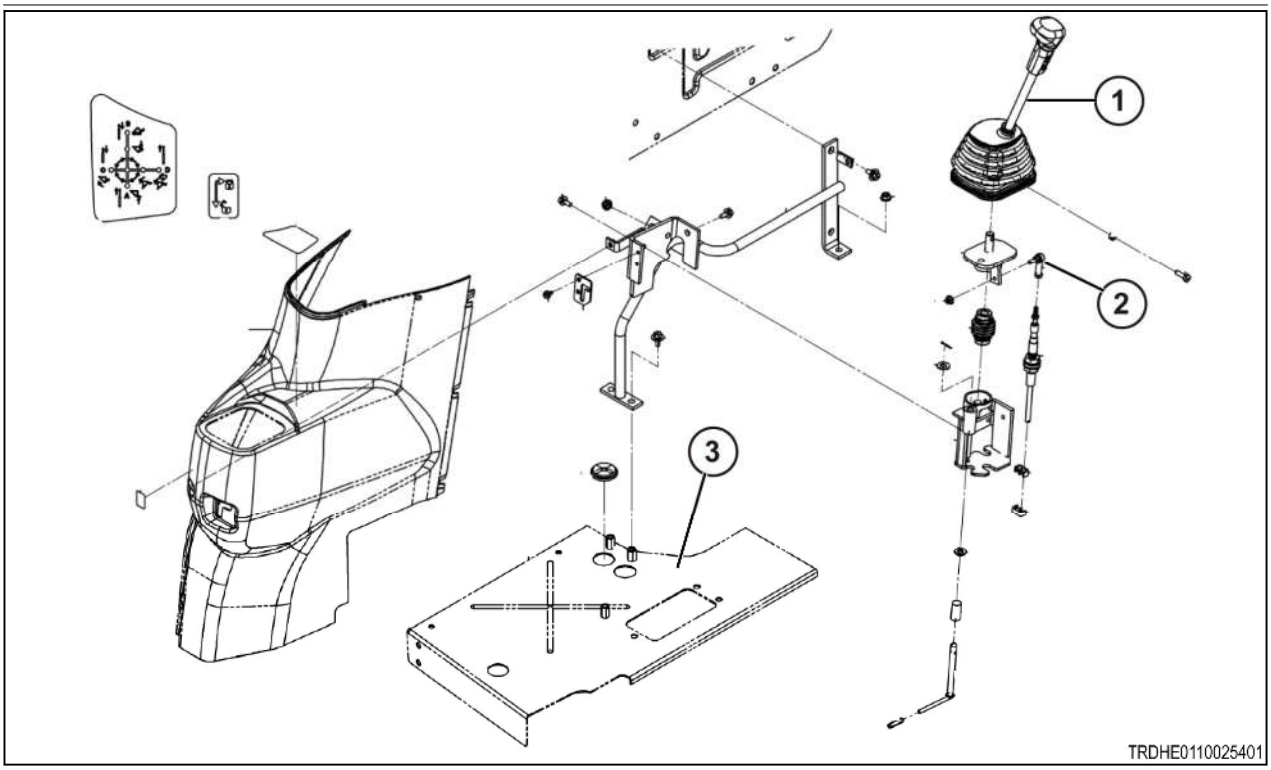


Fig. 50

Joystick linkage

(1) Joystick lever
(2) Linkage of joystick
(3) Sheet metal

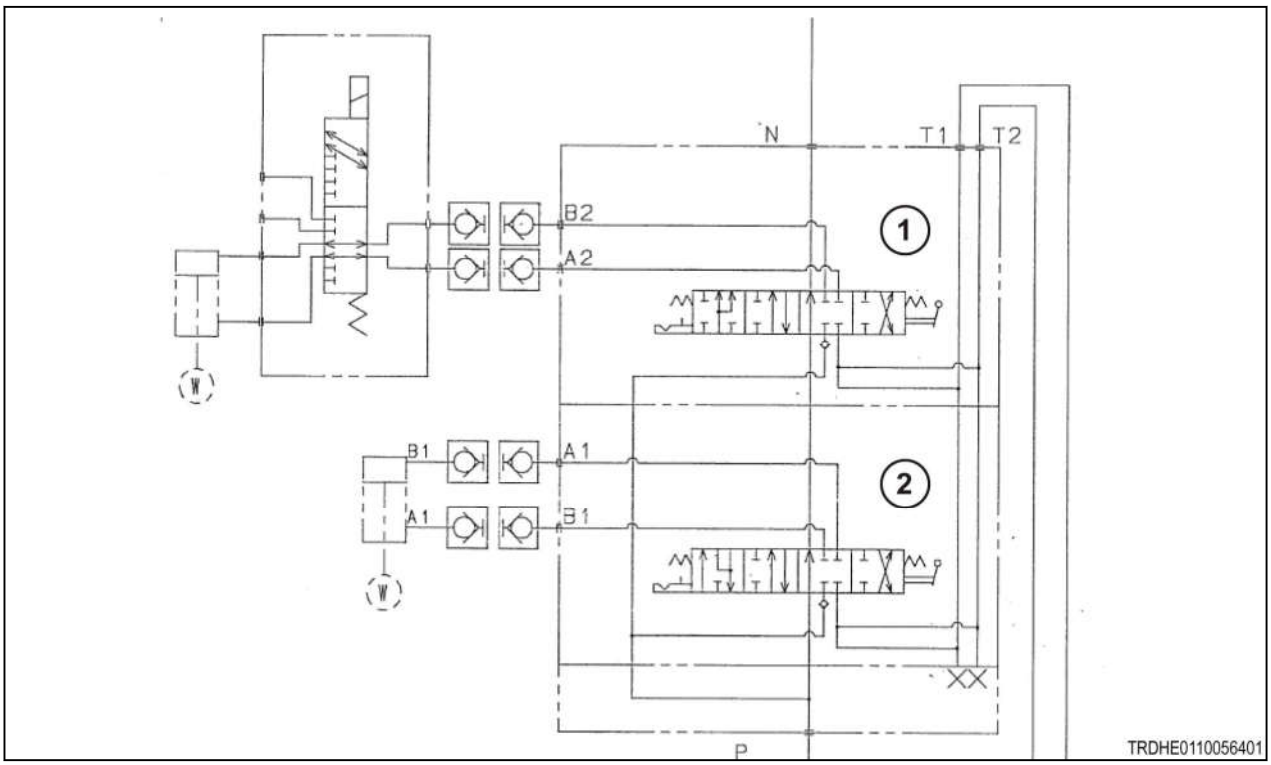


Fig. 51

Joystick valve circuit

9.8.25 Bucket valve operation

When the spool is in neutral position, the hydraulic circuit between port (P) and port (N) is open constantly.

Port (P2) of the hydraulic circuit does not connect with port (C) and (D).

(1) N
(2) P
(3) A
(4) P2
(5) B

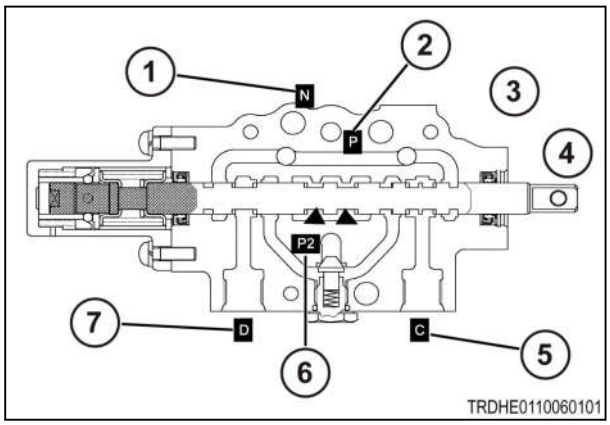


Fig. 66 Neutral

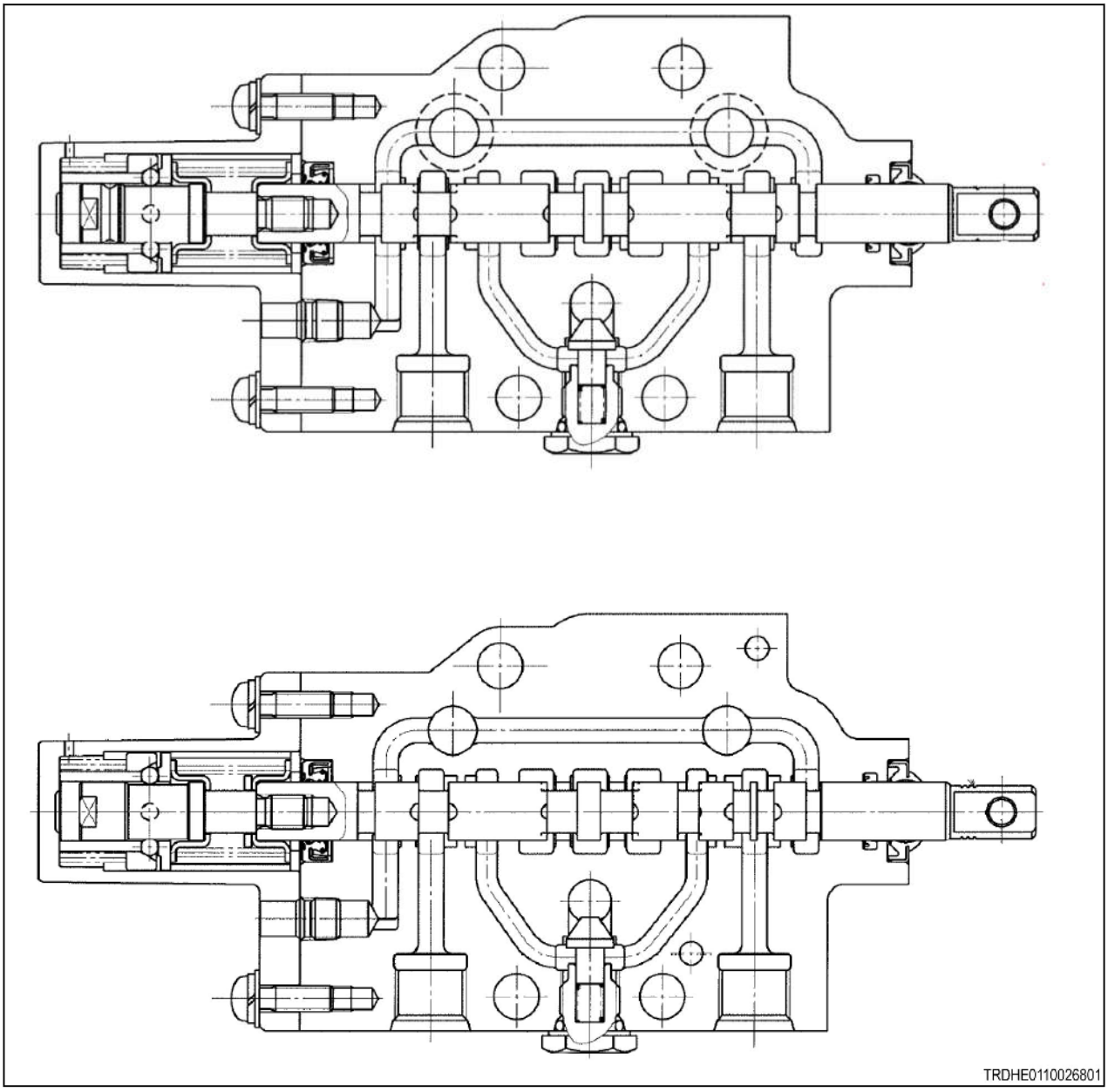


Fig. 67

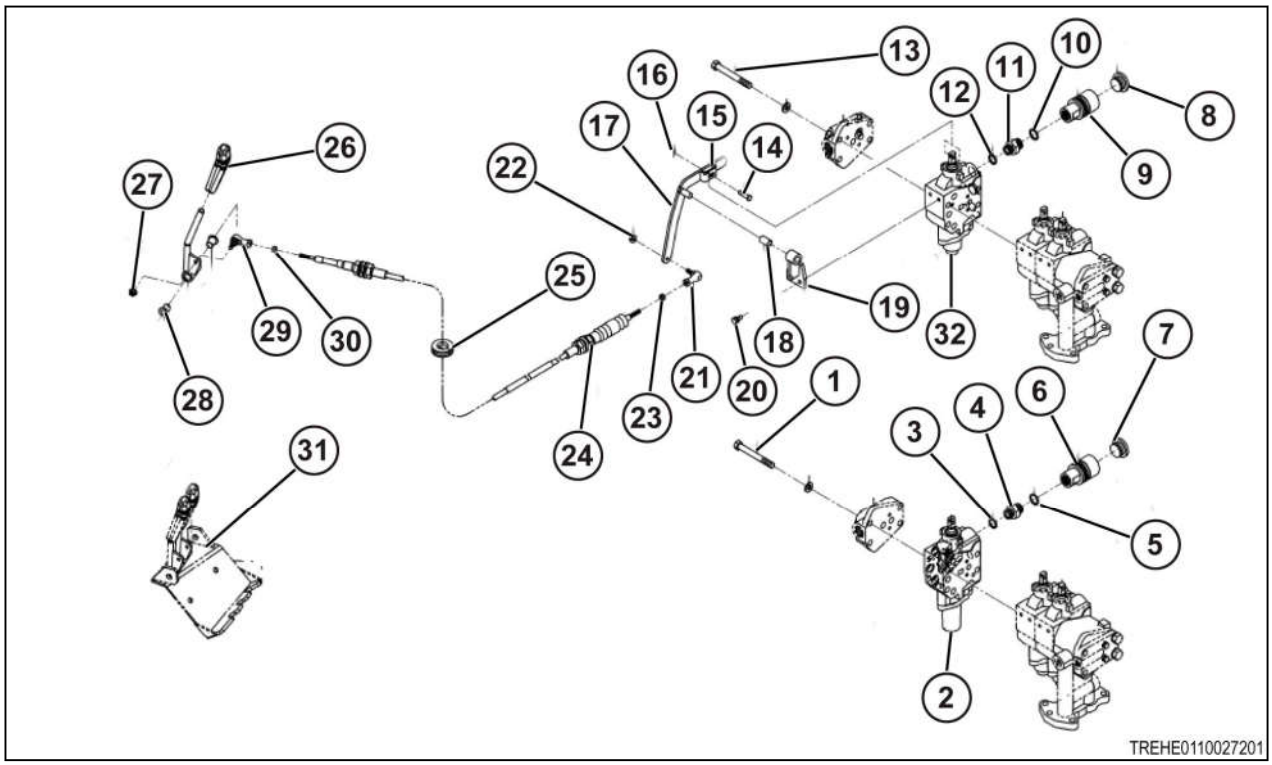


Fig. 81

Four wheel-drive external auxiliary hydraulics link and lever, if equipped.

(1) Bolt
(2) Control valve
(3) O-ring
(4) Adapter
(5) O-ring
(6) Quick coupler
(7) Plug
(8) Plug
(9) Quick coupler
(10) O-ring
(11) Adapter
(12) O-ring
(13) Bolt
(14) Pin
(15) Spool arm
(16) Cotter pin
(17) Spool arm
(18) Bushing
(19) Arm holder
(20) Bolts
(21) Ball joint
(22) Washer nut
(23) Nut
(24) Sub control cable
(25) Boot
(26) Throttle grip
(27) Washer nut
(28) Bushing
(29) Ball joint
(30) Nut
(31) Sub control lever

Bucket (neutral)

When the joystick lever is in the neutral position, the main spool is in the neutral position.

Bucket will stop.

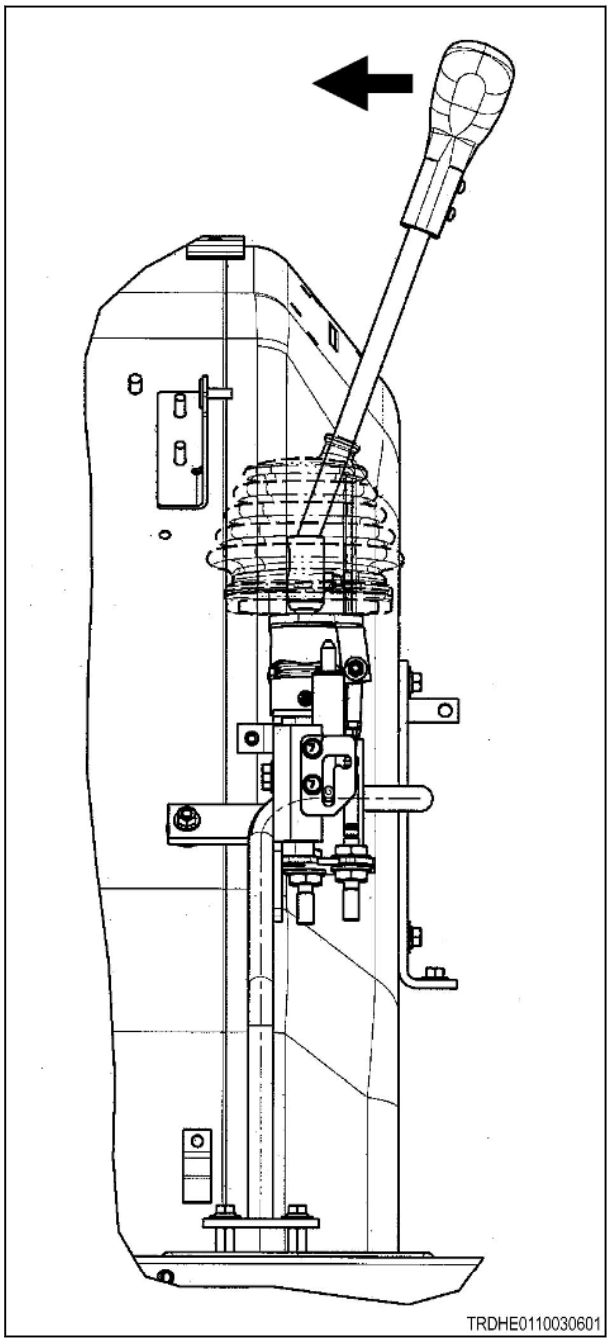


Fig. 90

Problem	Possible cause	Correction
Spinning but the clutch slips.	Damage in the components inside the PTO control valve.	Replace the pressure control solenoid valve.
		Replace the spring inside the relief valve. Check pressure.
Take time to start spinning.		Replace the flow priority valve assembly.
		Check the driving member and replace its components as necessary.
		Search the portion where air is being sucked in and seal. Check the O-ring between the connecting member.
Jolts are felt.		Replace the pressure control valve assembly.
		Replace the flow priority valve assembly.
General hydraulic troubleshooting		
Lift does not rise.	Insufficient engine speed.	Raise engine speed slightly.
	Insufficient transmission oil.	Maintain proper oil level.
	Air taken in through suction piping.	Tighten securely or replace broken parts.
	Clogged suction filter.	Clean the suction filter.
	Broken hydraulic pump.	Inspect pump, and repair or replace.
	Poor link mechanism.	Inspect, adjust, repair, or replace.
	Excessive load on lift.	Decrease load.
	Broken cylinder.	Replace.
	Oil leaks internally.	Replace with gear oil of viscosity SAE 80.
	Relief valve out of adjustment.	Adjust.
	Excessive internal leaks due to damaged seal.	Inspect cylinders and valves, replace damaged seals.
	Broken control valve.	Repair or replace control
Slow lift speed.	Above causes can be possible.	Repair according to the above instructions.
	Spool stroke in control valve is too small.	Inspect, adjust, or replace link mechanism.
	Broken compensator spring in control valve.	Replace spring.
Lift lowers when the adjusting knob is fully closed.	Flow control valve	Check poppet, poppet seat, and O-ring repair or replace valve.
	Safety valve.	Check for oil leak, inspect and tighten each joint.

11. Remove the pin.

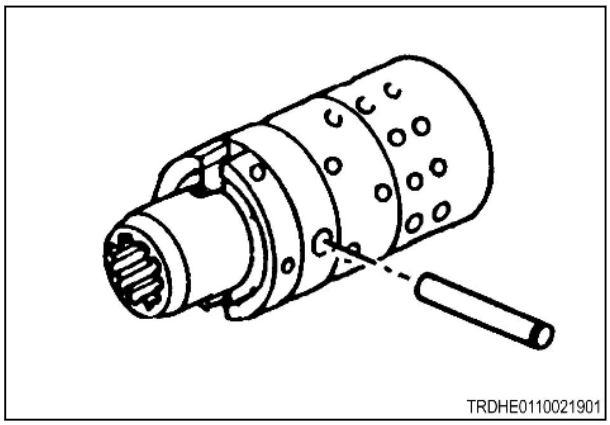


Fig. 12

12. Push out the spool slightly.

13. Remove the centering springs and the flat springs.

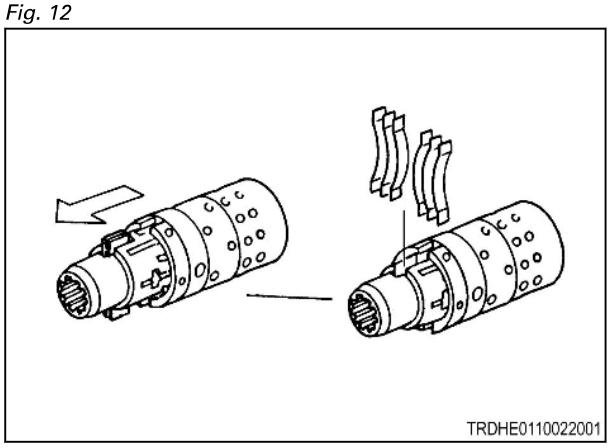


Fig. 13

14. Remove the spool out of the sleeve.

15. Remove the spool in the direction shown while turning it right and left.

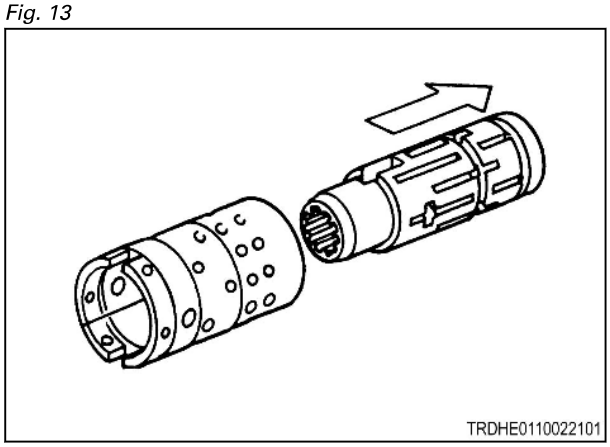


Fig. 14