SECTION 10 – ENGINE

BOOK 1 - 87580876

Chapter 1 – Engine (Continued)

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SPECIFICATIONS

	4 Cylinders
Engine, type:	
– model TL80A (Naturally Aspirated)	F4CE0404C D681
– model TL90A (Turbocharged)	F4CE0454E D681
– model TL100A (Turbocharged)	F4CE0454D D681
Cycle	diesel, 4-stroke
Fuel injection	direct
Number of cylinders in line	4
Piston diameter (bore)	104 mm (4.0944 in.)
Piston stroke	132 mm (5.1968 in.)
Total displacement:	4.5L (274 $in.^3$)
Compression ratio	17.5:1
Low Idle Speed	750 ± 50 rpm
High Idle Speed	2700 ± 50 rpm
Maximum power (gross)	
– model TL80A	80 HP (60 kW)
– model TL90A	90 HP (67 kW)
– model TL100A	98 HP (74 kW)
Rated speed	2500 rev/min
Maximum Torque @ 1400 rev/min	
– model TL80A	320 Nm (236 lb.-ft.)
– model TL90A	350 Nm (258 lb.-ft.)
– model TL100A	370 Nm (272 lb.-ft.)
Number of main bearings	5
Sump	structural, cast iron

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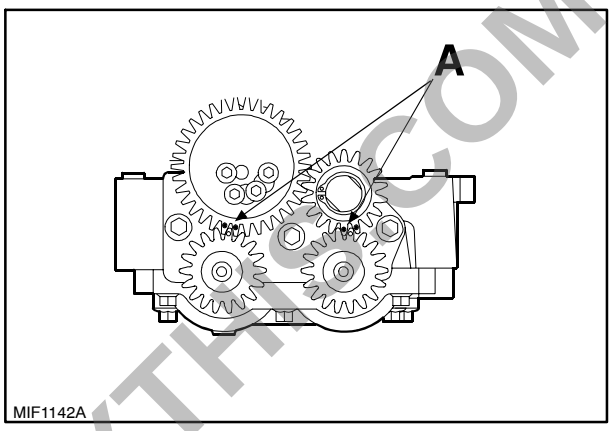
Injection Pump

– Removing, installing, replacing and timing the Bosch fuel injection pump requires critical procedures that most be followed in sequence. Refer to Section 10, Chapter 4 whenever any of these operations are performed.

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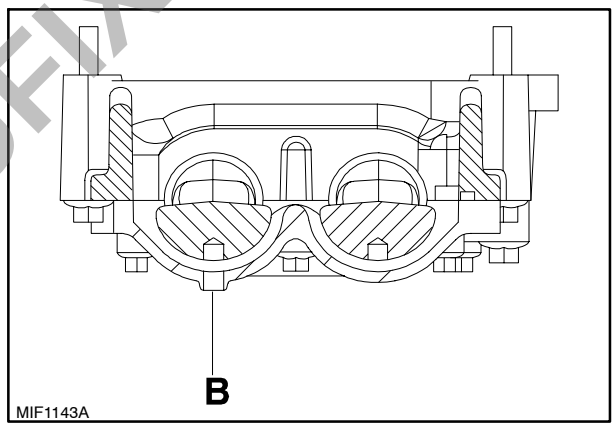
Counterweight And Balancer

– After positioning the first cylinder at top dead center and timing the gear as described above, do the timing of the counterweights, making the marks (A) stamped on the gears coincide as shown in the figure.



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– Insert the retaining pin in hole (B) on the counterweight assembly to block rotation during the subsequent installation phase.



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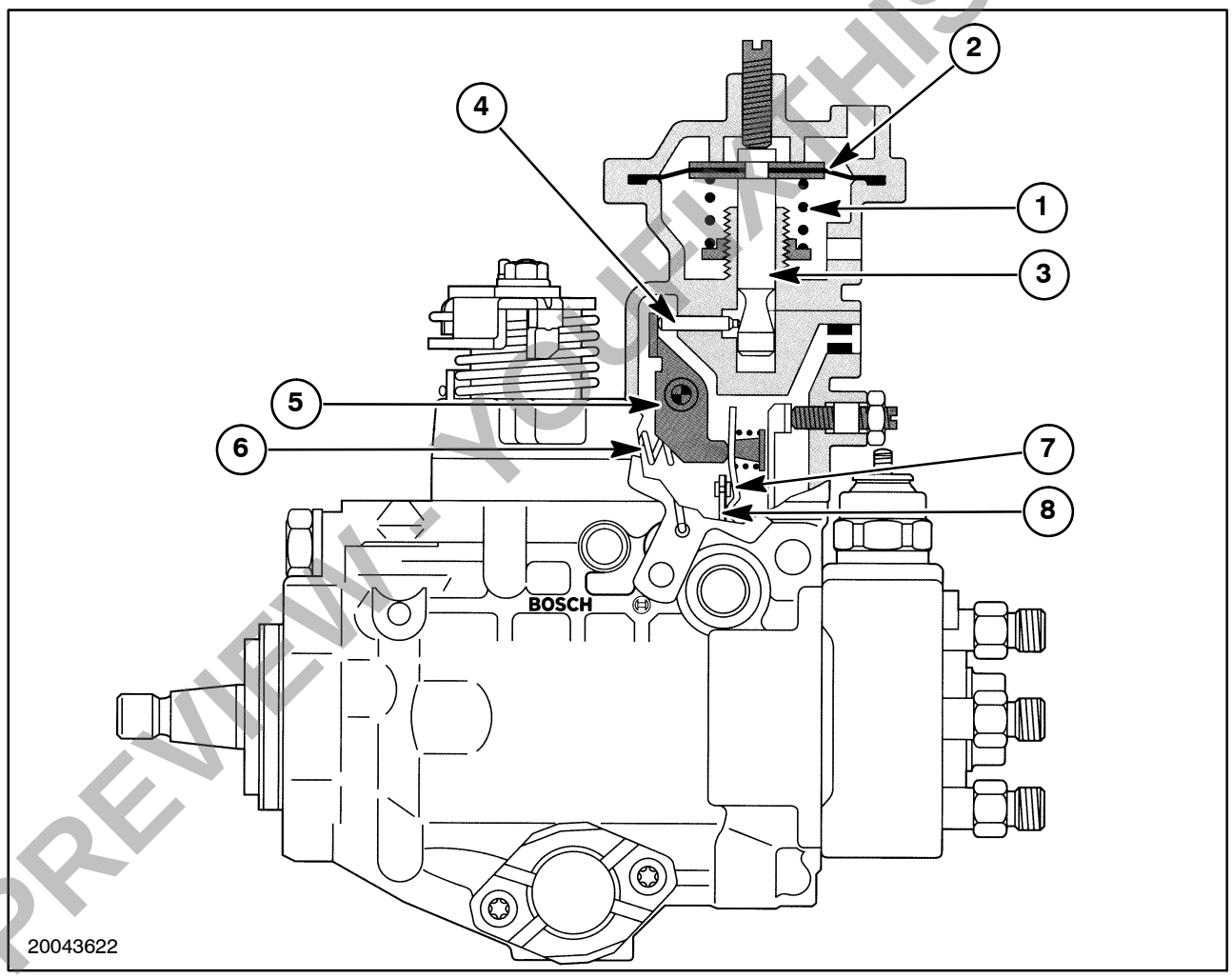
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Operation

In the lower speed range of the engine, the air pressure generated by the turbocharger is insufficient to overcome the pressure of the compression spring (1) under the diaphragm (2). Therefore, the diaphragm remains in the initial position. When the air pressure becomes sufficient to overcome spring force, the diaphragm and sliding pin (3) shift against the force of the compression spring. The guide pin (4) changes position and causes the reverse lever (5) to swivel around a pivot. Due to the force exerted by the governor spring (6), a non-positive connection between the tensioning lever (7), reverse lever (5), guide pin (4) and sliding pin (3) exists. This action results in the tensioning lever following the swivel movement of the reverse lever, causing the starting lever (8) and tensioning lever to swivel around pivots to shift the control collar in the direction of increased fuel delivery. Fuel delivery adapts in response to increased air mass in the combustion chamber.

When air mass decreases, the compression spring pushes the diaphragm upward with the sliding pin. The compensation of the governor lever mechanism reverses direction, which adapts the fuel quantity to the change in air pressure.

In case of turbocharger failure, the LDA reverts to the initial position, and the engine operates normally without developing smoke.



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Manifold Pressure Compensator (LDA) TL100A Models Only

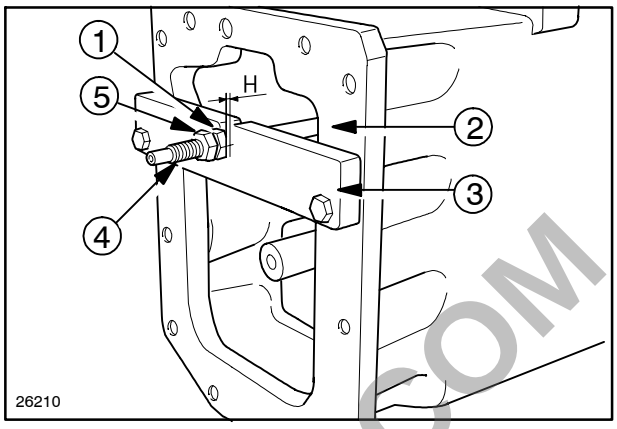
1. Compression Spring
2. Diaphram
3. Sliding Pin
4. Guide Pin
5. Reverse Lever
6. Governor Spring
7. Tensioning Lever
8. Starting Lever

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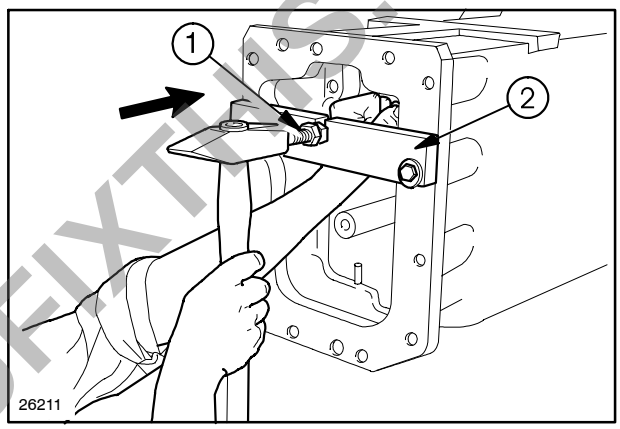
Installing the Seal

1. Install the circlip, seal side (1, fig. 19), in its seat.
2. Make the bracket for tool **50043** (3, fig. 21) and striker **50137** (4, also see figs. 2 and 3).
3. Install the bracket (3) on the clutch casing (2), insert the striker (4, see fig. 3) in the seal seat touching the circlip (1, fig. 19).
4. Tighten the nut (1, fig. 21) until the distance (H) between the bracket and the nut is 0.1299 to 0.1417 in. (3.3 to 3.6 mm) then secure the nut with a locknut (5).



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5. Extract the striker (1), remove the bracket (2) and the circlip (1, fig. 19).
6. Insert a new seal (2, fig. 4), in its seat, install the bracket (2, fig. 22) back on the clutch casing and insert the striker (1) on the bracket.
7. Force the seal in until the nut (1, fig. 21) is fully up against the bracket (2).
8. Remove the bracket (2), extract the striker (1) and then proceed to assemble the other parts.



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NOTE: *Leave the striker (1) and nut in this position even when replacement operations are terminated.*

For future replacements just check that the distance (H, fig. 21) is as prescribed.

Installation

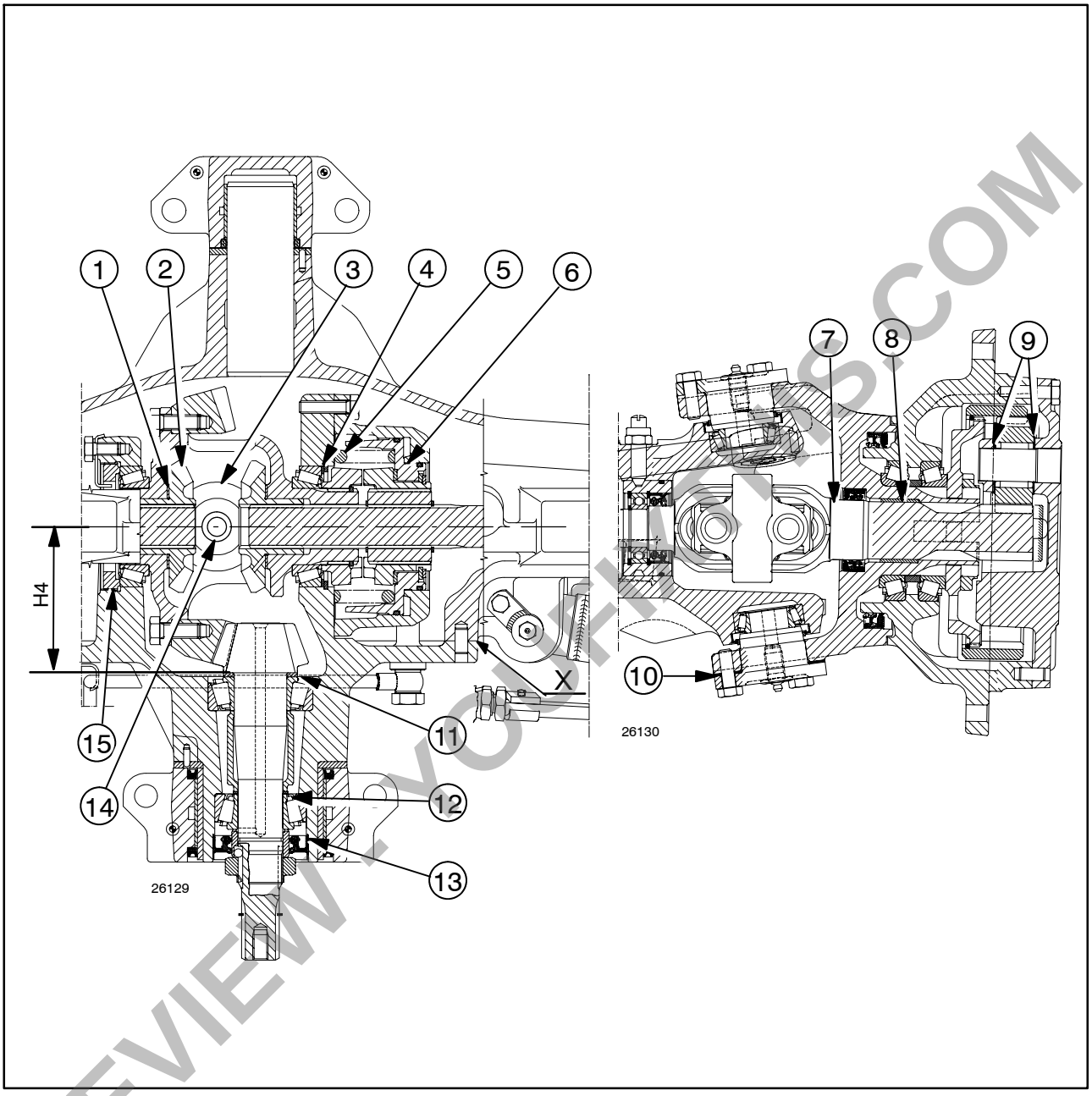
1. Install the clutch casing as described in Section 18.
2. Install the cab (where removed) and/or the platform as described in Section 90.

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DESCRIPTION AND OPERATION

CROSS-SECTIONAL VIEWS



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Cross-sectional views of front axle (TLA Deluxe Models)

H_4 = 4.5275 in. (115 mm). Nominal distance between ring gear axis and greater diameter of the pinion.

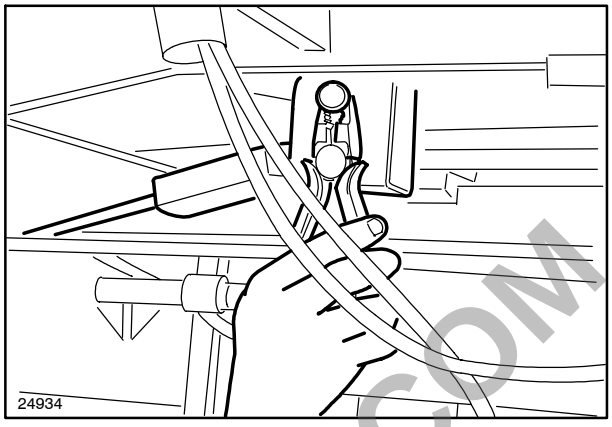
1. Thickness of side pinion thrust washers.
2. Side pinions.
3. Planetary pinions.
4. Ring gear bearing adjustment shims.
5. Differential lock disengagement spring.
6. Differential lock control piston.
7. Axle shaft.
8. Axle-shaft bushing (7).
9. Epicyclic reduction unit driven gear shims.
10. Steering knuckle adjustment plates.
11. Thickness of pinion position adjustment spacer.
12. Thickness of pinion adjustment spacer.
13. Seal.
14. Cross pin for planetary pinions.
15. Ring gear bearing adjustment ring nut.

NOTE: *During assembly apply sealing compound on surfaces marked with an* ***X*** *as shown in fig. 96.*

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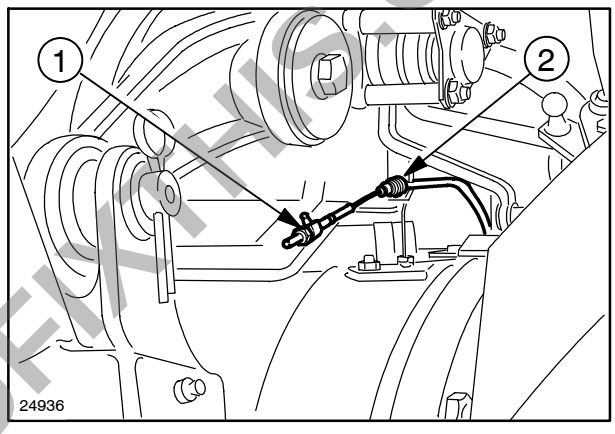
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36. If a rear mechanical lock is fitted, remove the front and rear split pins and pivot pins from the drive lever and remove.



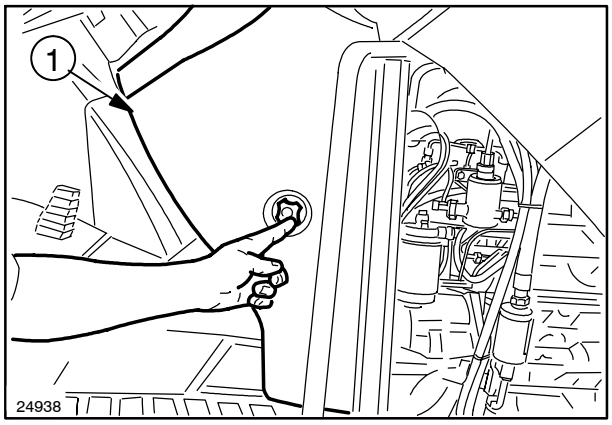
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37. Remove the Lift-O-Matic control cable (1) from the lever on the lift body and extract it from the bracket (2).



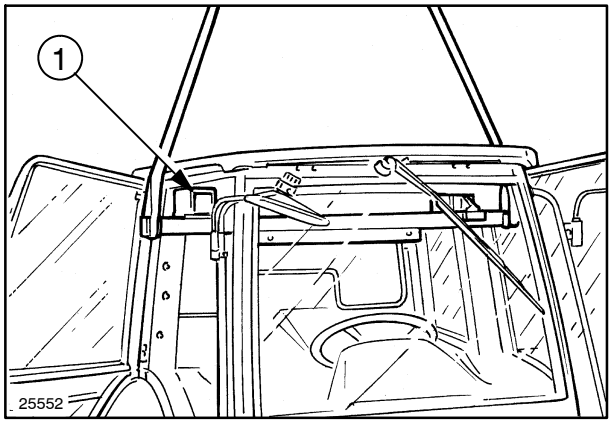
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38. Remove the knobs and detach the right-hand guard (1); if necessary, detach the accelerator cable from the pedal and remove.



44

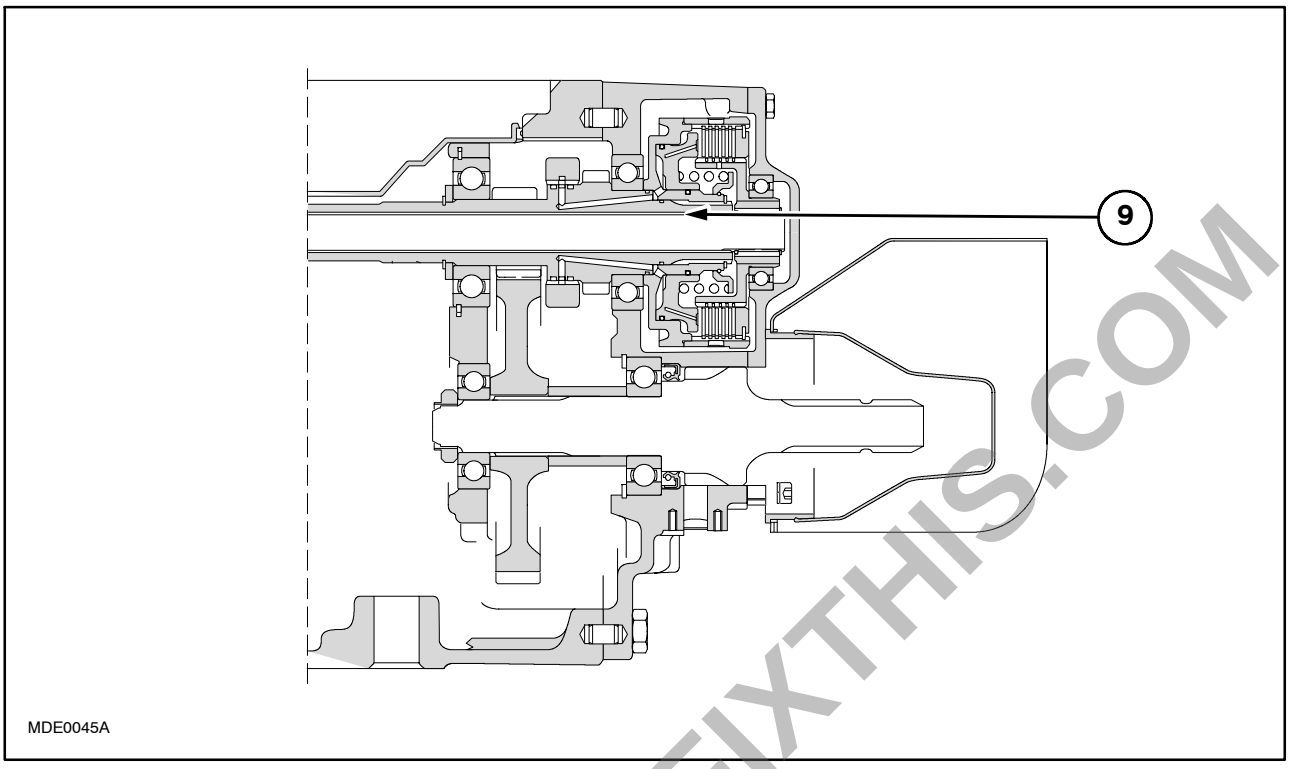
39. Position tool **380000294** (1) inside the cab, hitch to a hoist using 2 nylon slings and take up the slack.



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4

540 rpm PTO

1. Gearbox drive shaft.
2. Retaining snap ring.
3. Bearing thrust ring.
4. Flywheel drive shaft.
5. Drive engagement clutch commanded by shaft (4).
6. PTO grooved terminal.
7. Spacer.
8. Driven gear.
9. Shaft with driving gears.

NOTE: *During assembly apply sealing compound on surfaces marked with an* ***X*** *following the instructions and diagrams on page 25.*

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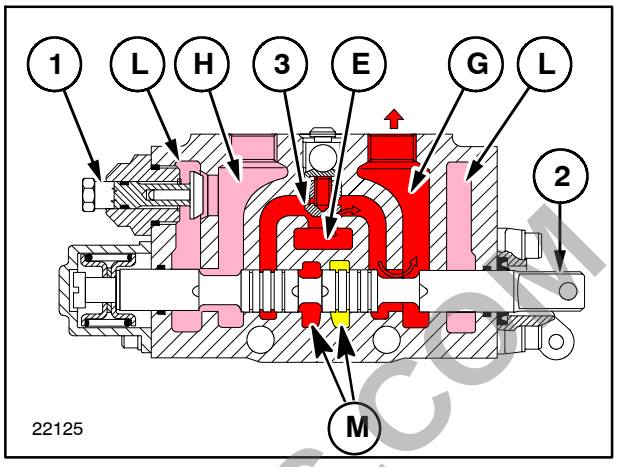
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Single-Acting Valve without Automatic Detent Release

Lift Phase

Movement of the control lever rearward transmits to the auxiliary control valve spool (2) via mechanical linkage. The position of the spool allows oil pressure in port (E) to exit through port (G) by way of the check valve (3) to the lift cylinder. In the single-acting actuator, exhaust port (H) permanently connects to port (L) by the open position of the switching valve (1). The switching valve converts a single-acting actuator to a double-acting actuator when necessary.

Keeping the control lever pulled back extends the cylinder through a full stroke. On releasing the lever, the spool return spring automatically returns the spool to the neutral position, which allows all oil from the pump to flow through port (M) and on to the lift control valve.



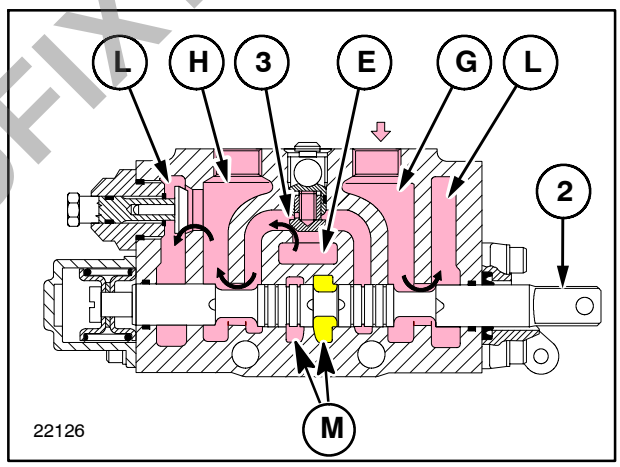
17

Pressurized oil
Oil in suction, delivery or exhaust
Static oil

Lower Phase

Movement of the control lever forward transmits to the auxiliary control valve spool (2) via mechanical linkage. The position of the spool allows oil pressure in ports (E), (G) and (H) to exit through ports (L). In the lowering position, the weight of the implement forces the oil through the control valve.

Keeping the control lever pushed forward retracts the cylinder through a full stroke. On releasing the lever, the spool return spring automatically returns the spool to the neutral position, which allows all oil from the pump to flow through port (M) and on to the lift control valve.



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Pressurized oil
Oil in suction, delivery or exhaust
Static oil

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SECTION 35 – HYDRAULIC SYSTEMS

Chapter 4 – BOSCH Auxiliary Control Valves (TLA Deluxe Models)

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35 204 40	BOSCH Remote Valves	9
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PRECAUTIONARY STATEMENTS

⚠ WARNING ⚠

Only use recommended equipment in good working condition when testing systems under pressure. Severe injury or death may occur from malfunctioning equipment.

DO NOT USE FINGERS OR HANDS to check for leaks. Pressurized oil will escape through tiny orifices in an almost invisible state with enough force to slice or penetrate the skin. Use a piece of cardboard or wood instead. Oil penetrating the skin may cause severe injury, infection, inflammation, or death.

Stand clear of all moving parts when starting the engine or pressurizing the hydraulic system.

Never stand under a raised load at any time. A sudden loss of pressure during operation of the hydraulic system may cause the equipment to drop, causing severe injury or death. Never leave a load raised with the hydraulic system shut down as pressure bleed-off may cause the load to drop.

Always shut down the engine and bleed off remaining hydraulic pressure before connecting or disconnecting equipment. Ensure the tightness of all hydraulic connections before starting the engine or pressurizing the system. Escaping hydraulic oil under pressure may cause severe injury or death.

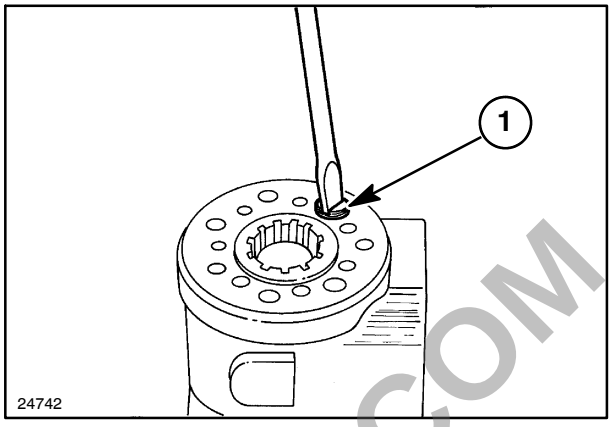
IMPORTANT:

- *The hydraulic system operates within a normal temperature range of 50 to 82 °C (122 to 180 °F) at 85 ° F ambient temperature, with a maximum temperature of 115 ° C (240 ° F).*
- *Operating the hydraulic system above recommended temperature will cause the destruction of O-rings, and will break down the lubricating properties of hydraulic oil. This will result in internal corrosion, leakage, and component or system failure.*
- *Contamination of the hydraulic oil will lead to premature failure of components, or catastrophic failure of the entire system. Use protective closures, and keep work areas clean before, during and after maintenance on the hydraulic system.*

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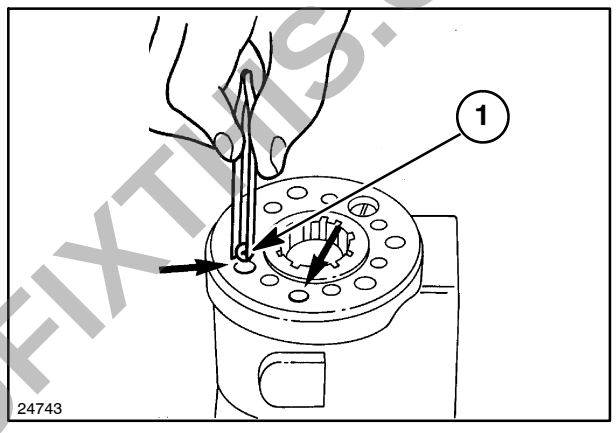
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15. Screw the threaded plug (1) into the check valve seat until the upper surface is below the coupling surface of the control valve body.



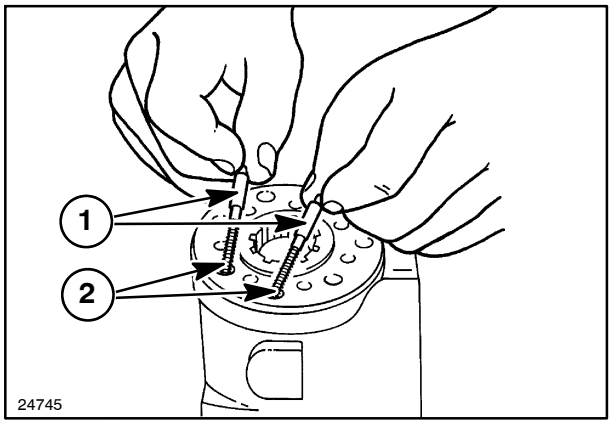
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16. Insert the non-return valve balls (1) into the two seats indicated by the arrows.



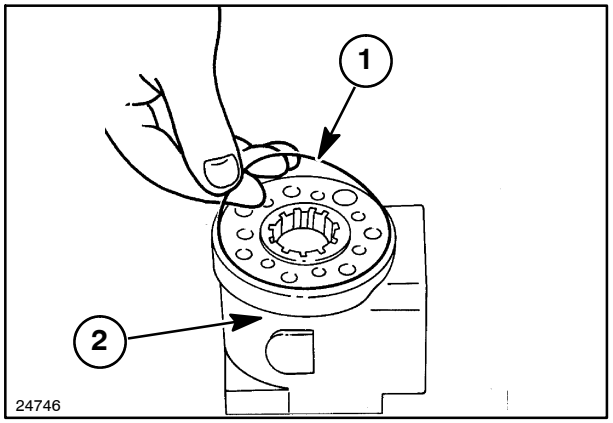
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17. Position the pins (1), complete with springs (2), in the backflow valve seats.



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18. Lubricate the O-ring (1) and install in the seat on the control valve body (2).

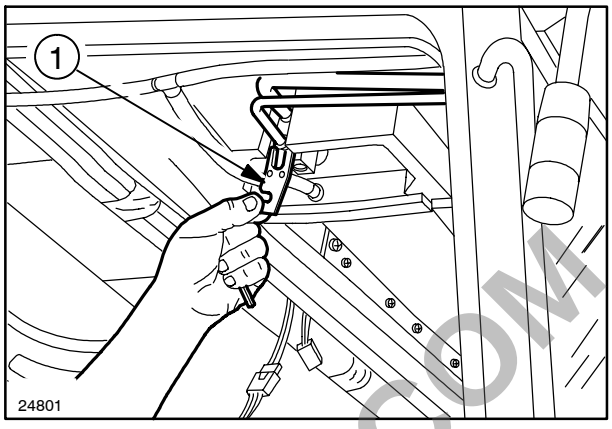


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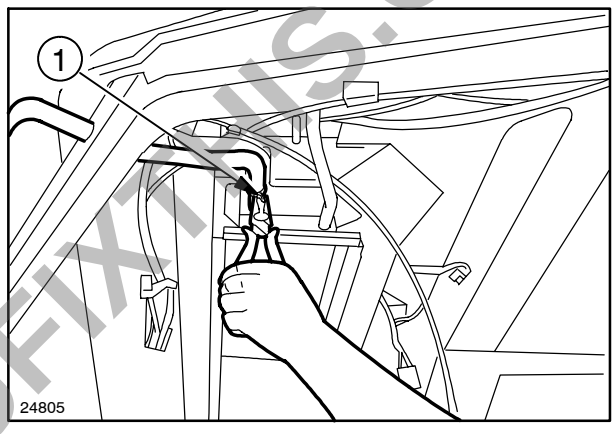
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10. Remove the clamp (1) and extract the pipes.



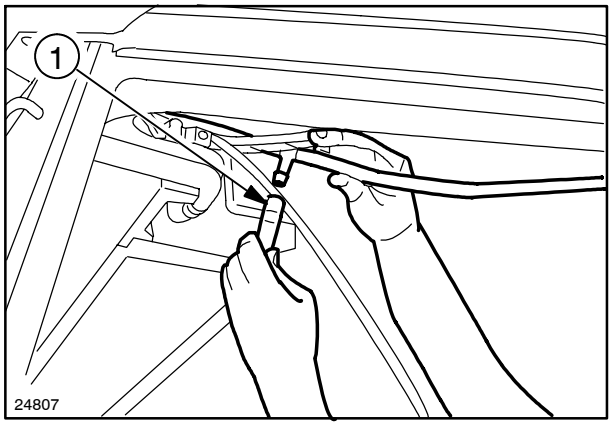
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11. Detach the two clips (1) holding the hoses and extract the hoses from the heater.



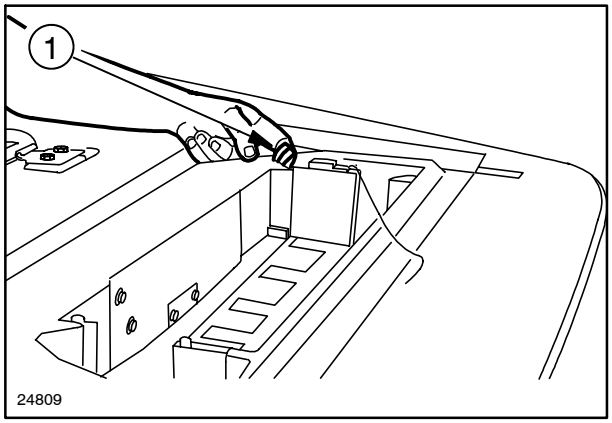
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12. Detach the two condensate drainage hoses (1).



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13. Disconnect the electrical connections (1) on the temperature sensor.



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SECTION 55 - ELECTRICAL SYSTEMS

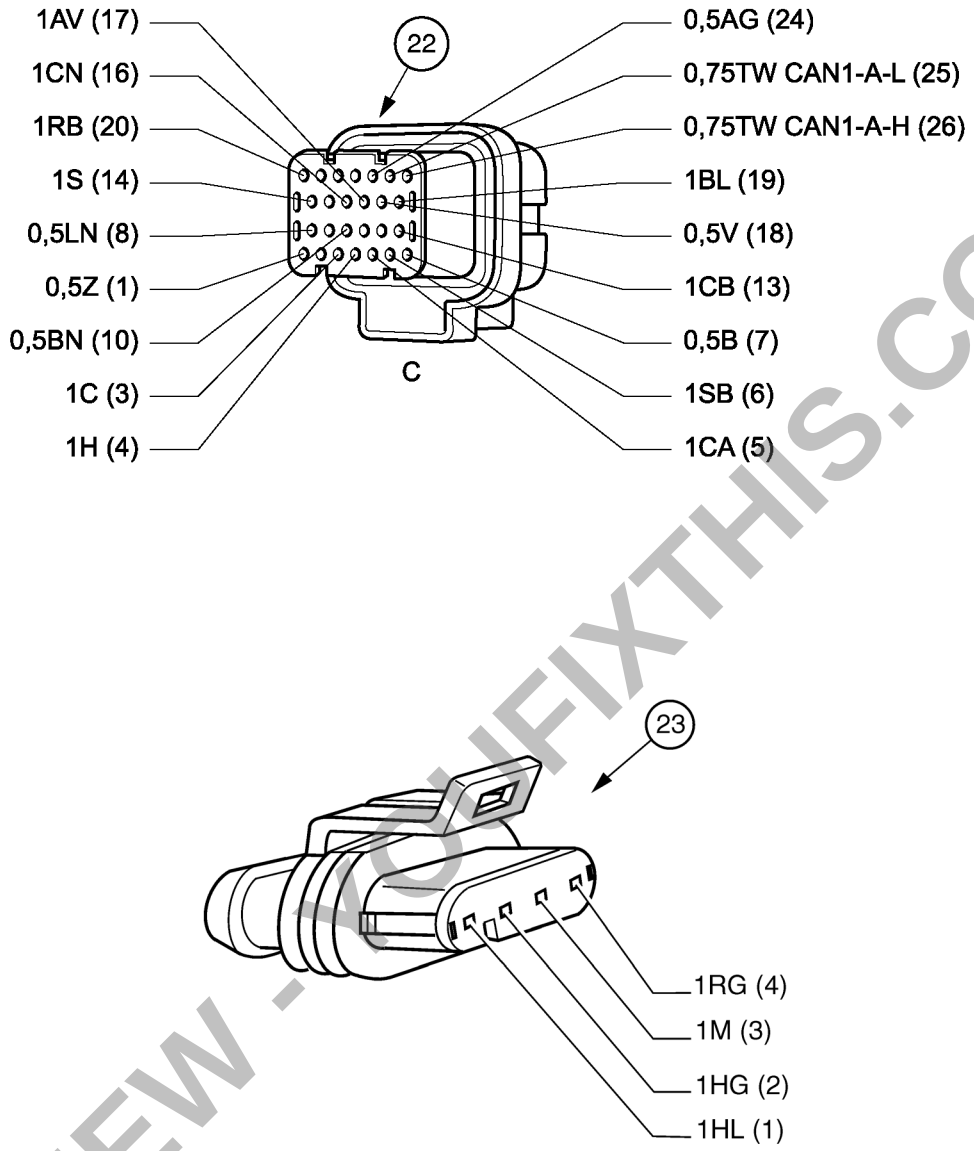
Chapter 4 - Charging System

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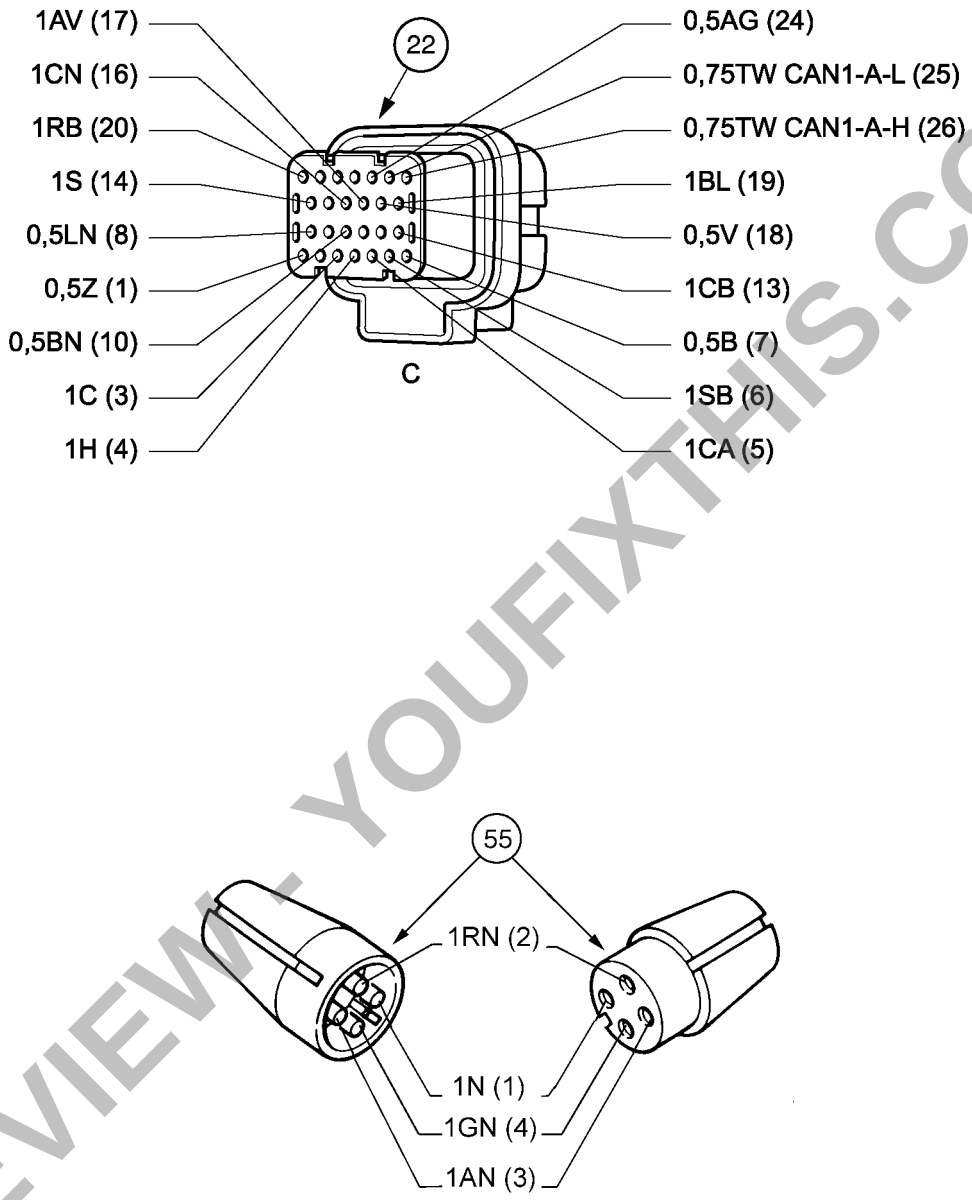
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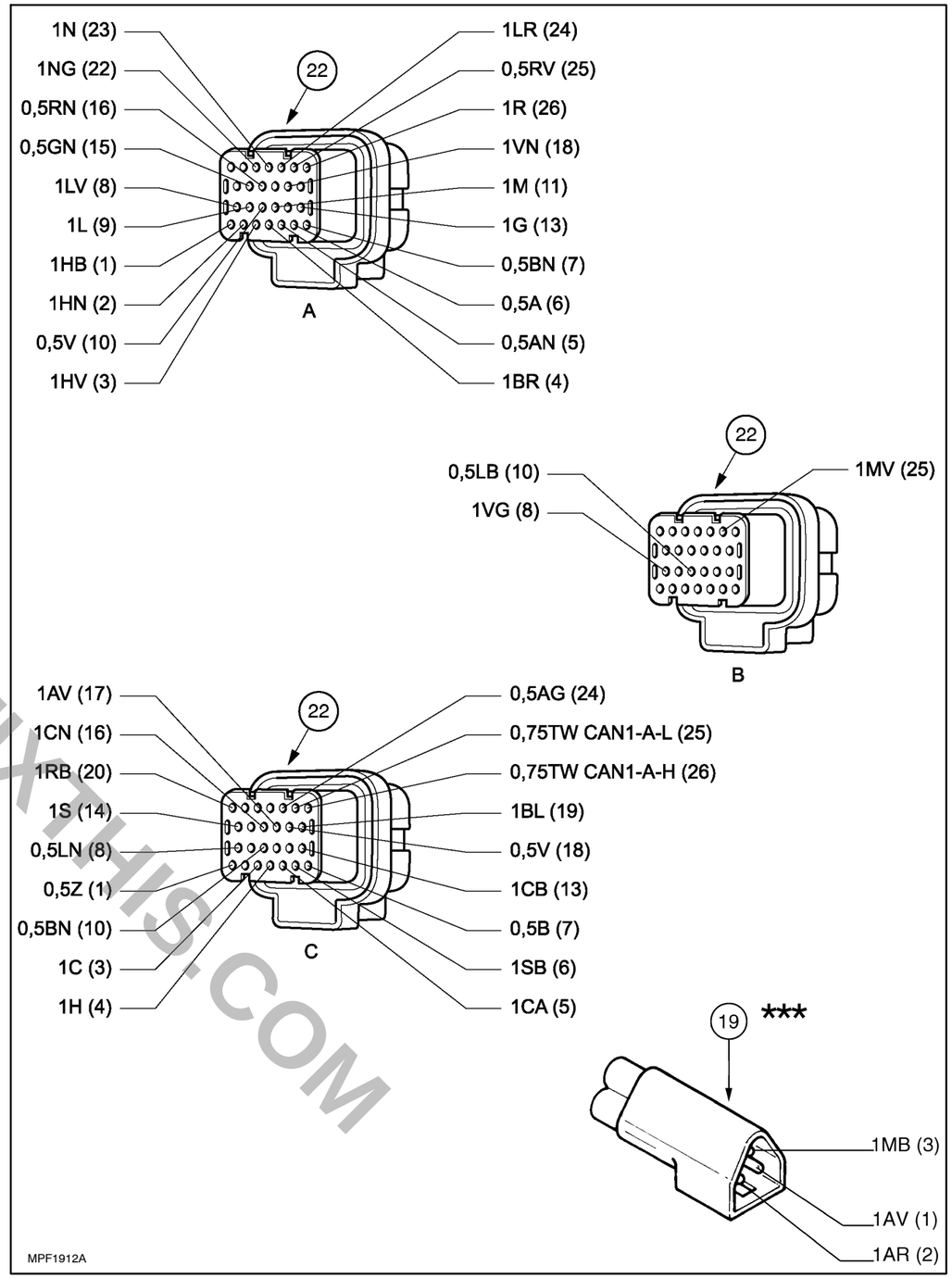
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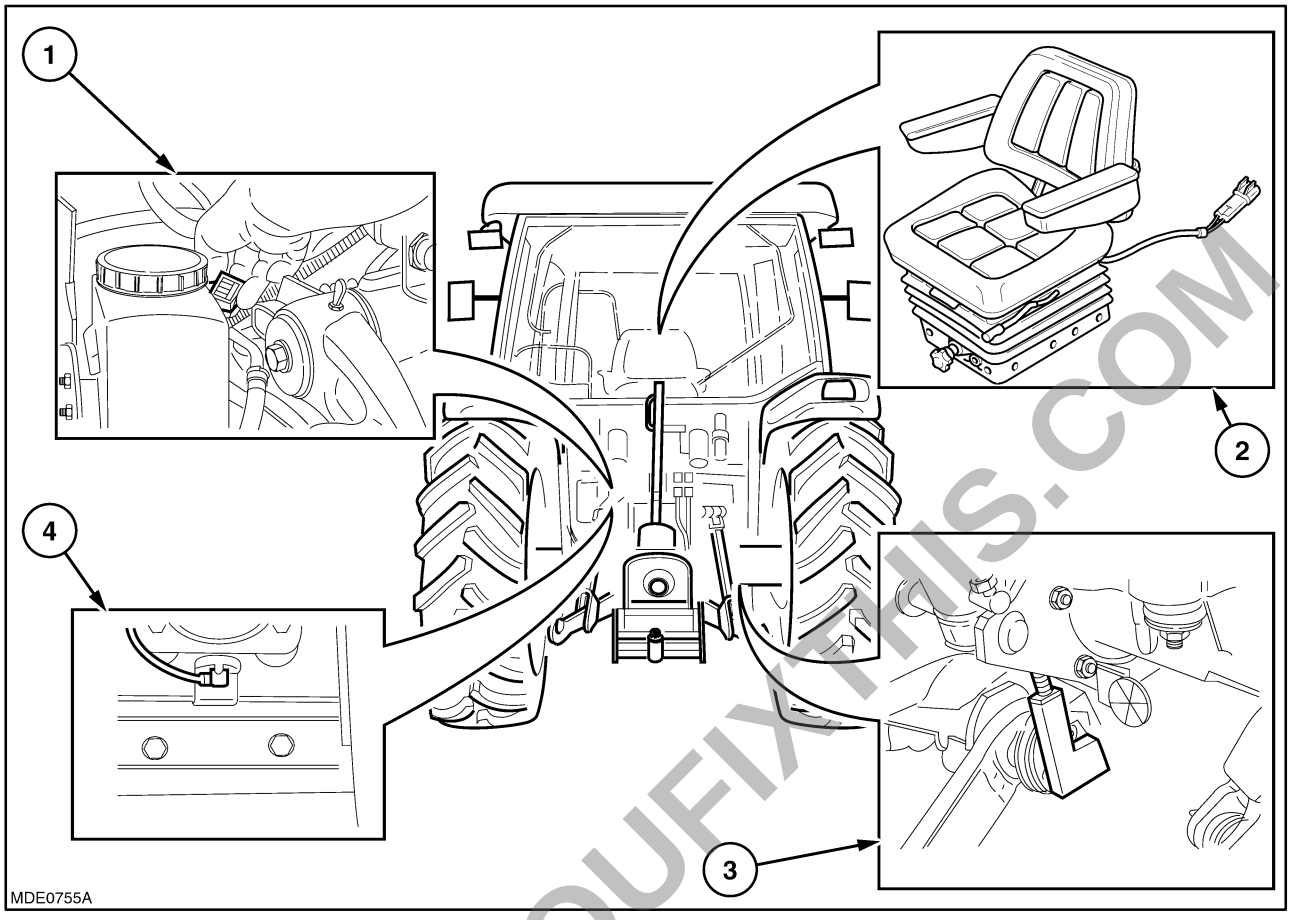


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*** Power Shuttle version

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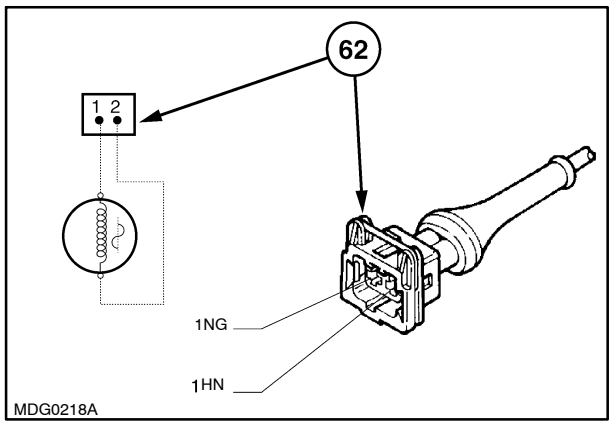
35

1. Electronic lift arm position potentiometer (145). (Not available NASO market)
2. Seat safety switch (97).
3. Draft pin sensors (119-120). (Not available NASO market)
4. PTO speed sensor (62).

PTO Speed Sensor (62)

It receives a ground signal from PIN 22 of connection 22A of the dashboard, via PIN 9 of connection 156 of the transmission.

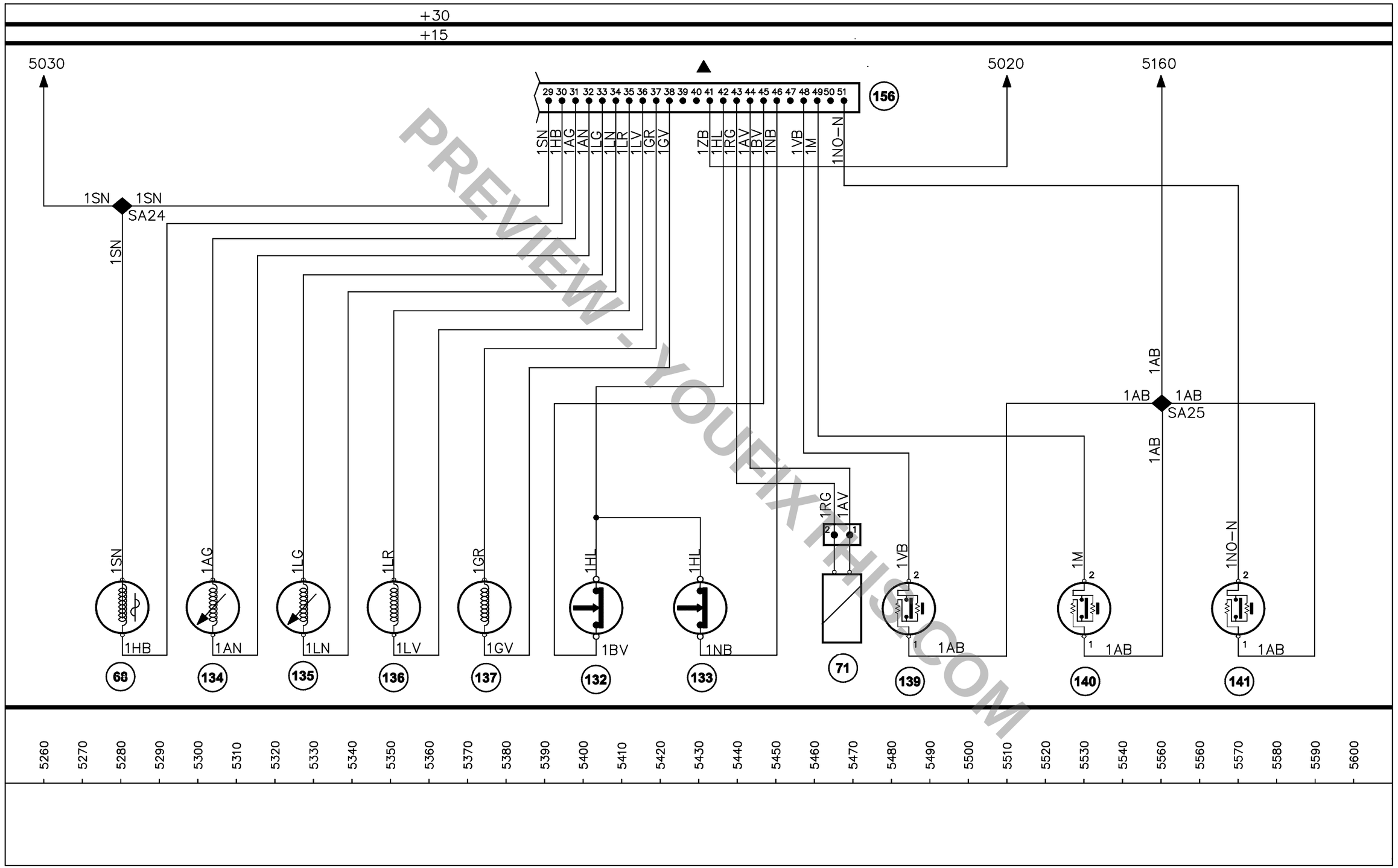
It sends a signal to PIN 2 of connection 22A, via PIN 21 of connection 156 so that the advanced dashboard displays the speed of the power take-off.



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ERROR CODE 2038 - CLUTCH B SOLENOID SHORT TO +12 VOLTS

Cause:

Short to +12 Volts between the clutch B solenoid and the controller, or the controller is faulty.

Effects:

The transmission is critically disabled. The tractor is not operative.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the clutch B solenoid connector **C135**, inline harness connector **C156**, and the controller connector **C169A_CN1**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check for a short to +12 Volts.

   A. Disconnect connector **C135**. Turn the keystart ON. Measure the voltage between connector:

   C135 pin **A**, wire 1.0 **(LN)** and **ground**

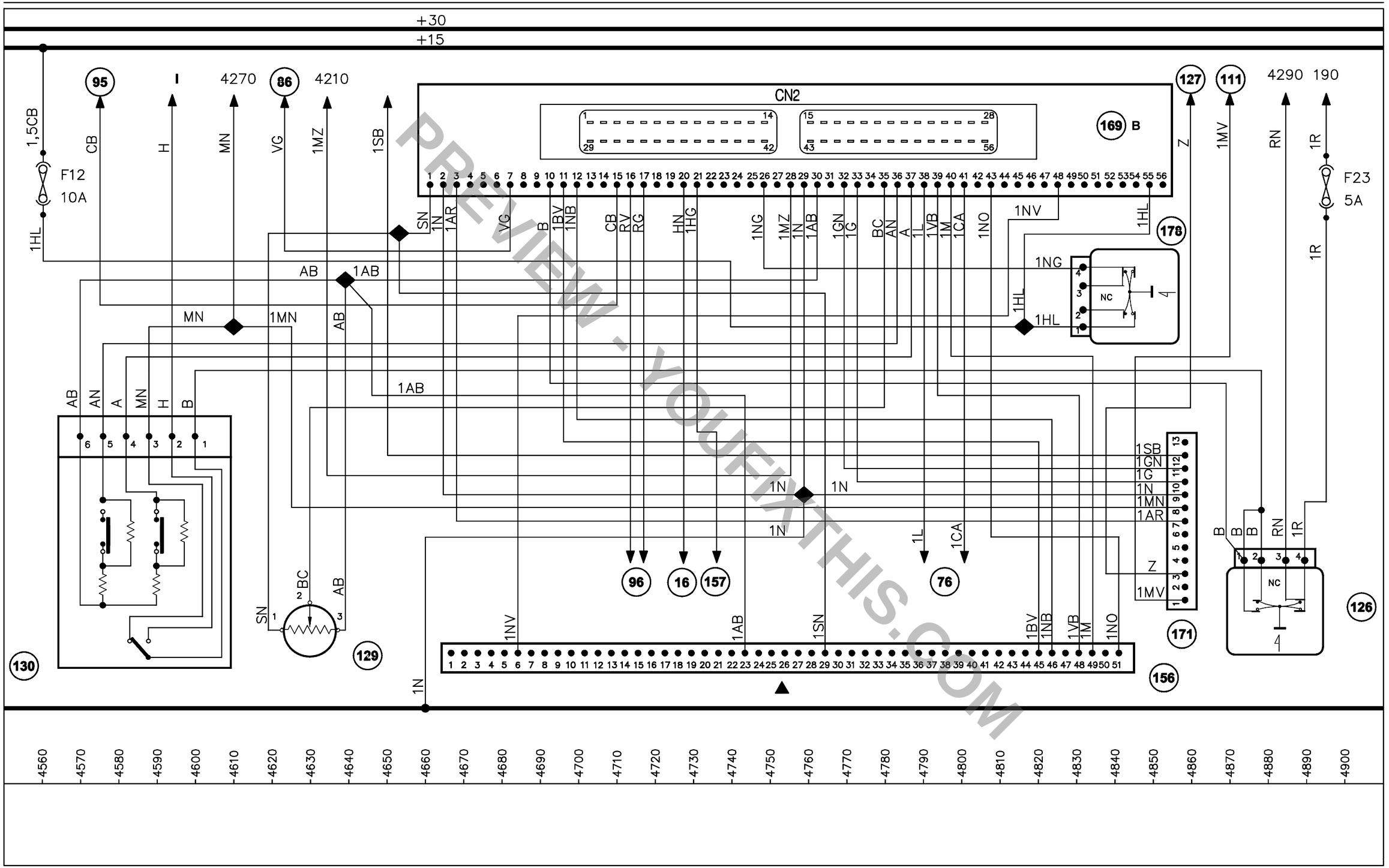
   C135 pin **B**, wire 1.0 **(LG)** and **ground**

   If a voltage is indicated, turn the keystart OFF. Disconnect connector **C169A_CN1**. Turn the keystart ON. If a voltage is still indicated, repair or replace the harness as required.

   B. If a voltage is not indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.

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ERROR CODE 5033 - REAR PTO CAB NORMALLY CLOSED SWITCH OPEN CIRCUIT

Effects:

PTO disabled.

Possible failure modes:

1. Faulty connector
2. Faulty PTO switch
3. Faulty harness
4. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check the rear PTO cab switch connector **C151** and the controller connectors **C169A_CN1** and **C169B_CN2**.

   A. Ensure the connectors are connected, not damaged, the pins are in the correct position and that the fit is tight. Repair or replace as required.

   B. If the connectors are okay, continue to step 2.

2. Check the rear PTO cab switch.

   A. Disconnect the rear PTO cab switch connector **C151**. While operating the switch, check between the component side of connector:

   C151 pin **1**, wire 1.0 **(MN)** and **C151** pin **2**, wire 1.0 **(H)**. Should indicate a closed circuit when disengaged, an open circuit when engaged and an open circuit with the yellow button only pressed.

   C151 pin **1**, wire 1.0 **(MN)** and **C151** pin **3**, wire 1.0 **(MZ)**. Should indicate an open circuit when disengaged, a closed circuit when engaged and an open circuit with the yellow button only pressed.

   C151 pin **2**, wire 1.0 **(H)** and **C151** pin **3**, wire 1.0 **(MZ)**. Should indicate an open circuit when disengaged, engaged or with the yellow button only pressed.

   If the switch operation is not as indicated, remove and replace the PTO switch.

   B. If the switch is okay, continue to step 3.

3. Check for a +12 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C151** pin **1**, wire 1.0 **(MN)** and **ground**. If +12 Volts is not indicated, repair or replace the harness as required.

   B. If +12 Volts is indicated, continue to step 4.

4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the controller connector **C169A_CN1**. Check between connector **C151** pin **2**, wire 1.0 **(H)** and **C169A_CN1** pin **38**, wire 1.0 **(H)**

   If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 4.

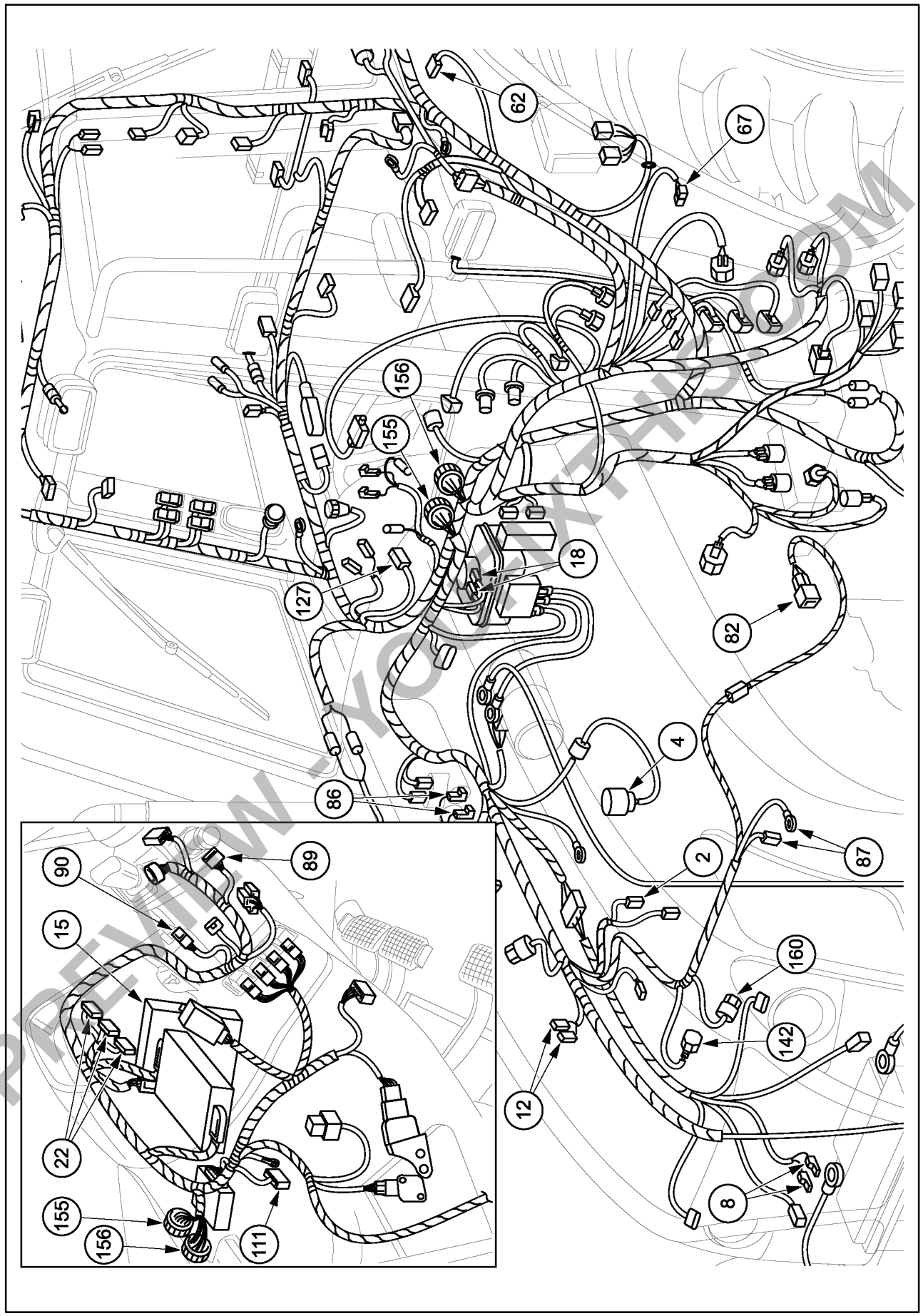
5. Check for a short to ground.

   A. Check between connector **C169A_CN1** pin **38** wire 1.0 **(H)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.

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ERROR CODE 17 - CONTROLLER POWER SUPPLY HIGH

Cause:

The controller power supply is greater than +18 Volts.

Effects:

The rear lift does not work.

Possible failure modes:

1. Faulty external power supply connected
2. Faulty charging system
3. Faulty controller

Solution:

NOTE: *When the cause of the error code has been rectified, clear the error code and test the system for normal operation.*

1. Check that the tractor battery power supply has not been connected to an external power supply.

   A. If an external power supply is connected to the tractor, disconnect and test the system for normal operation.

   B. If an external power supply is not connected to the tractor, continue with step 2.
2. Check the battery charge voltage.

   A. Start the engine and run at 2000 rev/min. Measure the battery voltage. If the voltage is greater than approximately +18 Volts, continue to test for a fault in the charging system.

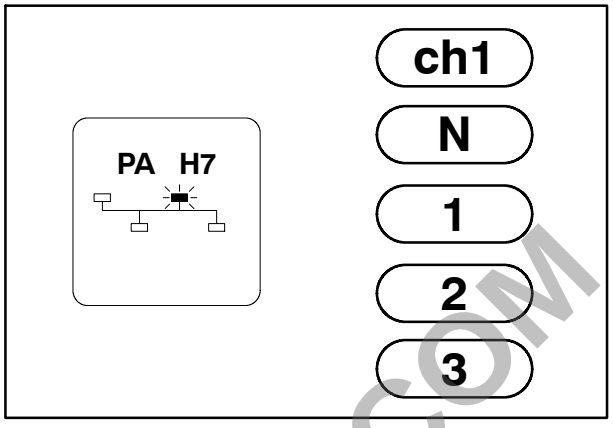
   B. If the battery voltage is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.

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ch1 - Range switch R1 and R2

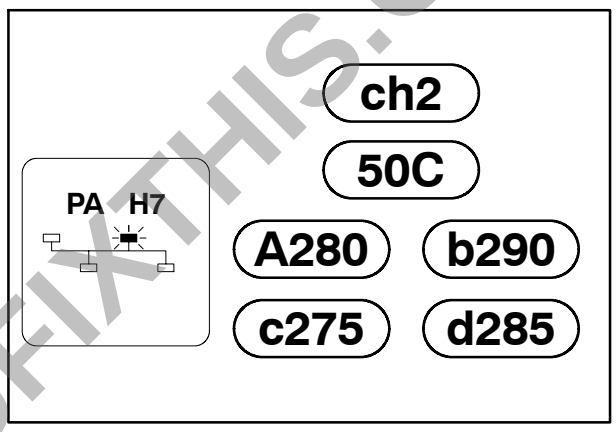
- Select the **channel (ch1)**, moving the range lever onto the various positions and the central display will show the corresponding range.
- Press the button (3, fig.47) to exit the H7 MENU.



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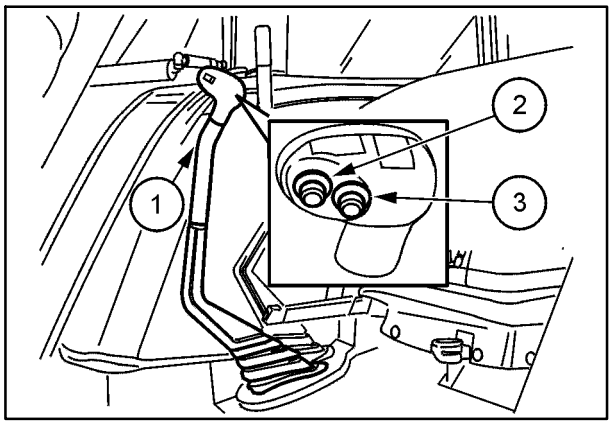
ch2 - Manual clutch calibration

- To calibrate the clutches the operator must be seated in the driving seat.
- Engage the 1st gear and III range.
- Select the **channel (ch2)**, the central display will show the oil temperature.
- Move the Power Shuttle lever forwards to select clutch A or backwards to select clutch B.
- Press the clutch pedal and, using buttons (1, fig.47) and (2, fig.47), select clutches A, C and D or B, C and D.



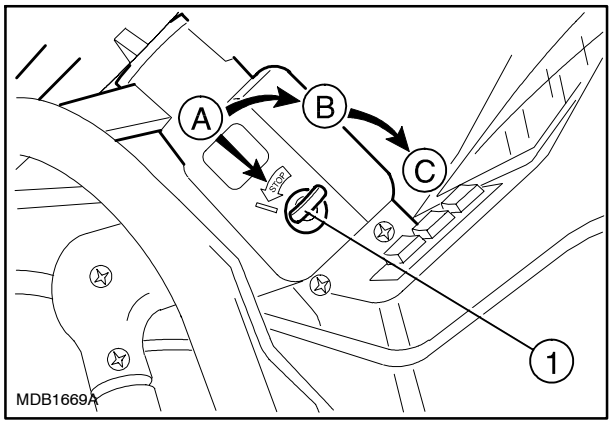
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- Release the clutch pedal and press the HI (2) or LO (3) buttons to increase or decrease the calibration of each clutch.



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- Turn the switch (1) to A (OFF) for at least 5 seconds to ensure changes are saved.



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