SECTION 18 - CLUTCH

BOOK 1 - 87059381

Chapter 1 - Clutch

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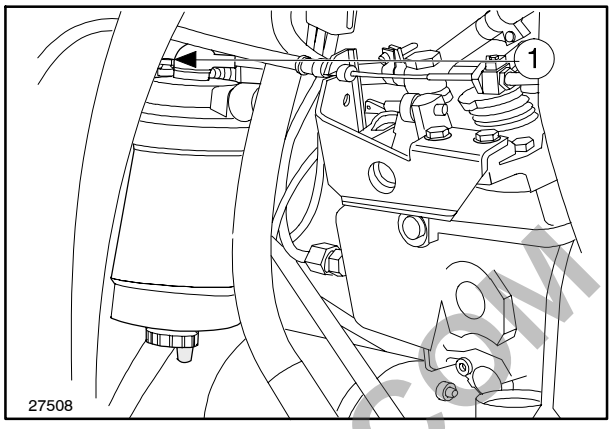
ROCKER ARM - VALVE DATA	mm (inches)
Diameter of shaft bores in rocker arms	18.016 to 18.034 (0.7093 to 0.7100)
Diameter of rocker arm shaft	17.982 to 18.000 (0.7080 to 0.7087)
Rocker shaft to rocker arm bore clearance	0.016 to 0.052 (0.0006 to 0.0020)
Wear limit endfloat	0.15 (0.0059)
Rocker arm spacing springs:	
- free length	59.5 (2.3425)
- length under load of 46 to 52 N (4.7 to 5.3 kg)	44 (1.7323)
Valve clearance for timing check	0.45 (0.0177)
Valve clearance for normal running (engine cold):	
- inlet valve	0.30 ± 0.05 (0.0118 ± 0.0020)
- exhaust valve	0.30 ± 0.05 (0.0118 ± 0.0020)
Cam lift:	
- inlet valve	5.67 (0.2232)
- exhaust valve	5.95 (0.2343)

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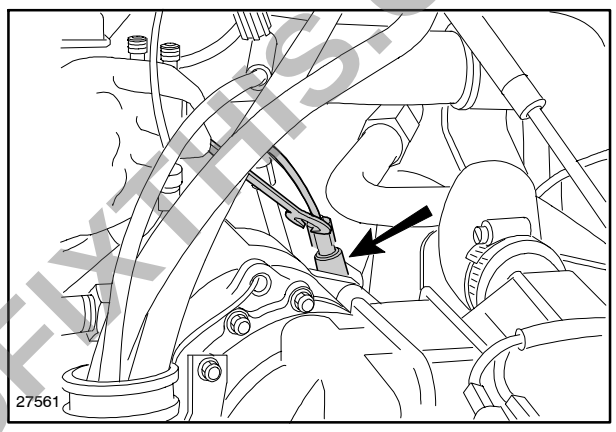
FUEL CIRCUIT AIR BLEEDING

1. Unscrew the bleeder plug (1) by approx. 2 turns.
2. Operate the priming lever (1, fig. 150) until the fuel coming out of the hole in the plug is free of air bubbles.
3. Tighten the plug (1).



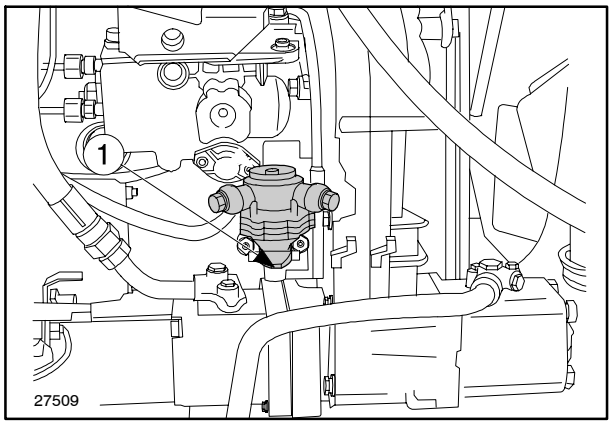
155

4. Loosen the fuel supply lines unions on the three injectors.



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5. Operate the priming lever (1) again, until the fuel coming out of the injectors is free of air bubbles, then tighten the injector unions.
6. Start the engine and check that it runs evenly.



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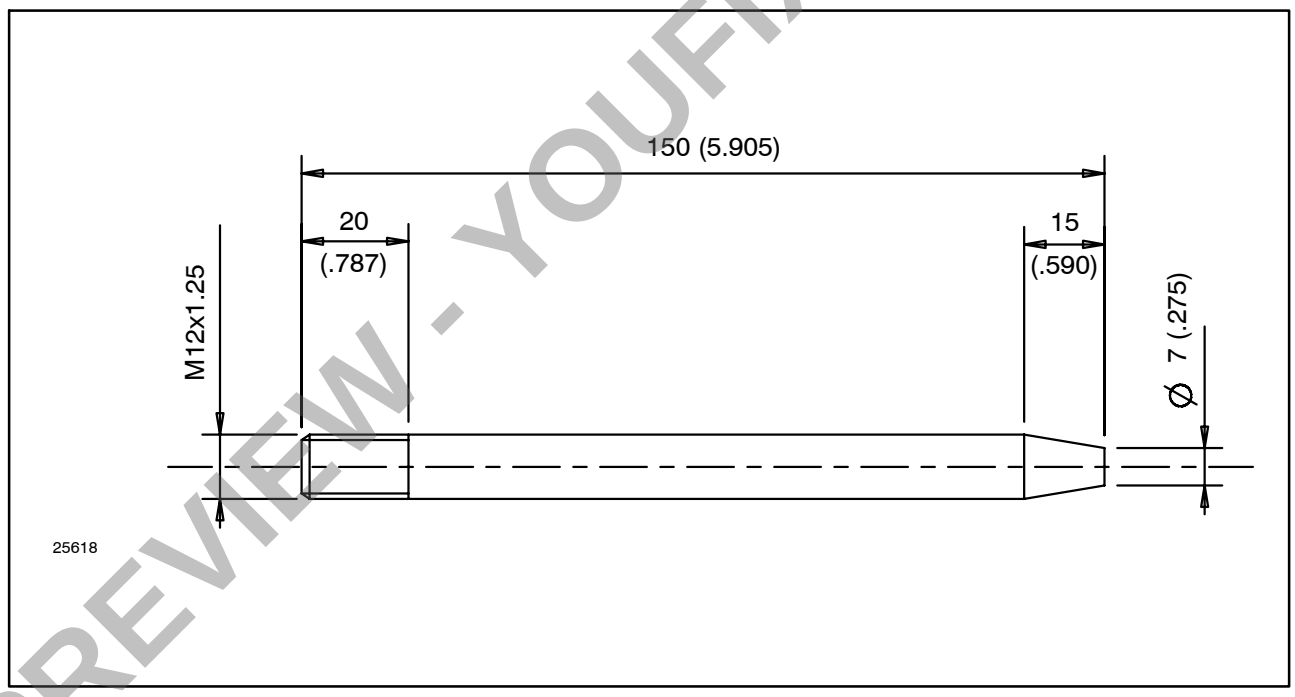
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SPECIAL TOOLS

Warning - The operations described in this section can only be carried out with **ESSENTIAL** tools indicated by an **(X)**.
To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this section.

291517	Clutch casing lift hook.
290090	Rotating stand for overhaul operations.
X 294074	Tool for gearbox driving and driven shafts adjustment.
X 294086	Driving shaft rod for lifting unit.
X 294075	Driven shaft retaining tool.
X 294099	Adjuster handle (with **294100** and **294145**).
X 294100	Power take-off drive shaft seal splining tool (with **294099**).
X 294145	Power take-off drive shaft roller bearings splining tool (with **294099**).
X 294076	Pliers for gearbox shafts circlips.
X 294090	Driving shaft assembly guide.
X 294091	Driven shaft fitting guides.
50091	Tool for removal-refitting side gears (see Section 27).
X 294077	Adapter (with **295021**).
X 295021	Tool for hydraulic clutch piston springs (with **294077**).
X 292870	Hydraulic pressure testing kit.
X 294035	Hydraulic pressure testing kit.



2

Guide pin for re-fitting the gearbox in the casing.
(Mark part with no. 50158 - Measurement in mm [ins])
Make in C 40 material.

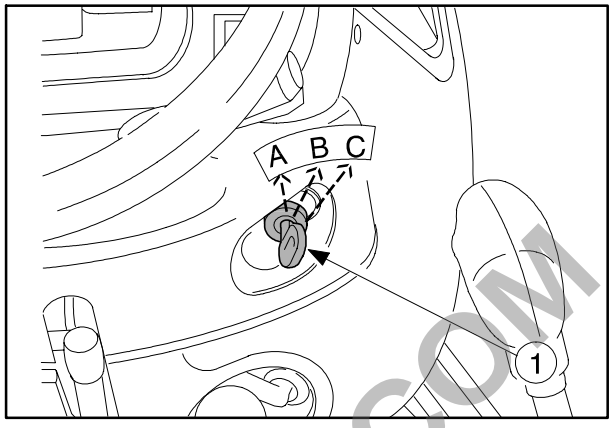
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ECM - FIRST START-UP (Self Configuration)

The ECM will require configuration when any one of the following circumstances has occurred.

- At the end of the production line.
- Following ECM replacement.
- Following erasure of the Non-Volatile memory (NVM) (see H8 MENU).
- Following manual configuration **NONE** (see H3 MENU).

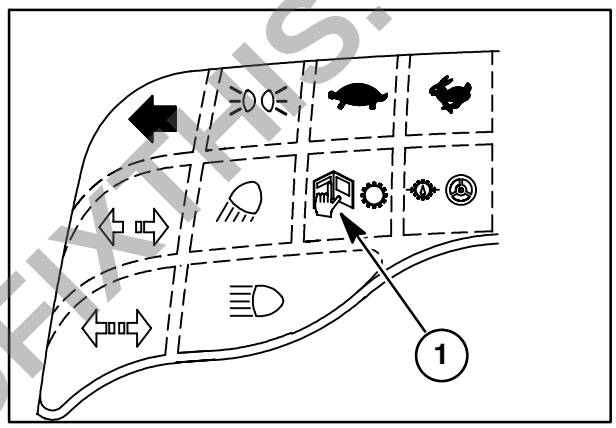


75

Turn switch (1) to B (ON) without switching on the engine.

Indicator (1) (fig. 76) will be illuminated (non-flashing), after a while the indicator will flash to repeat the recognised configuration code - i.e.: rapid flashing, followed by 1 flash.

- Turn the key (1, fig. 75) to OFF for a few seconds: the configuration is now saved in the Non-Volatile memory (NVM).

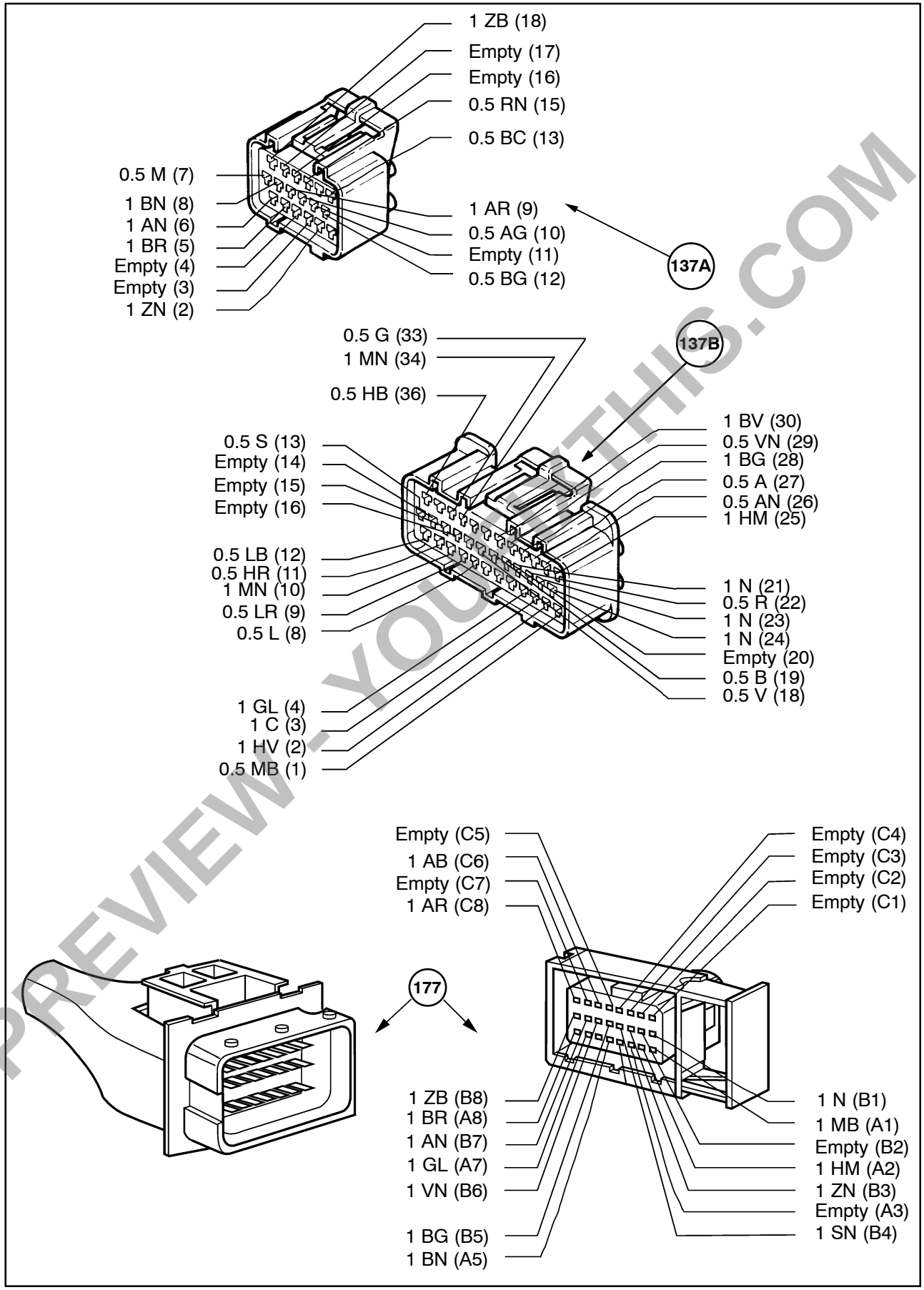


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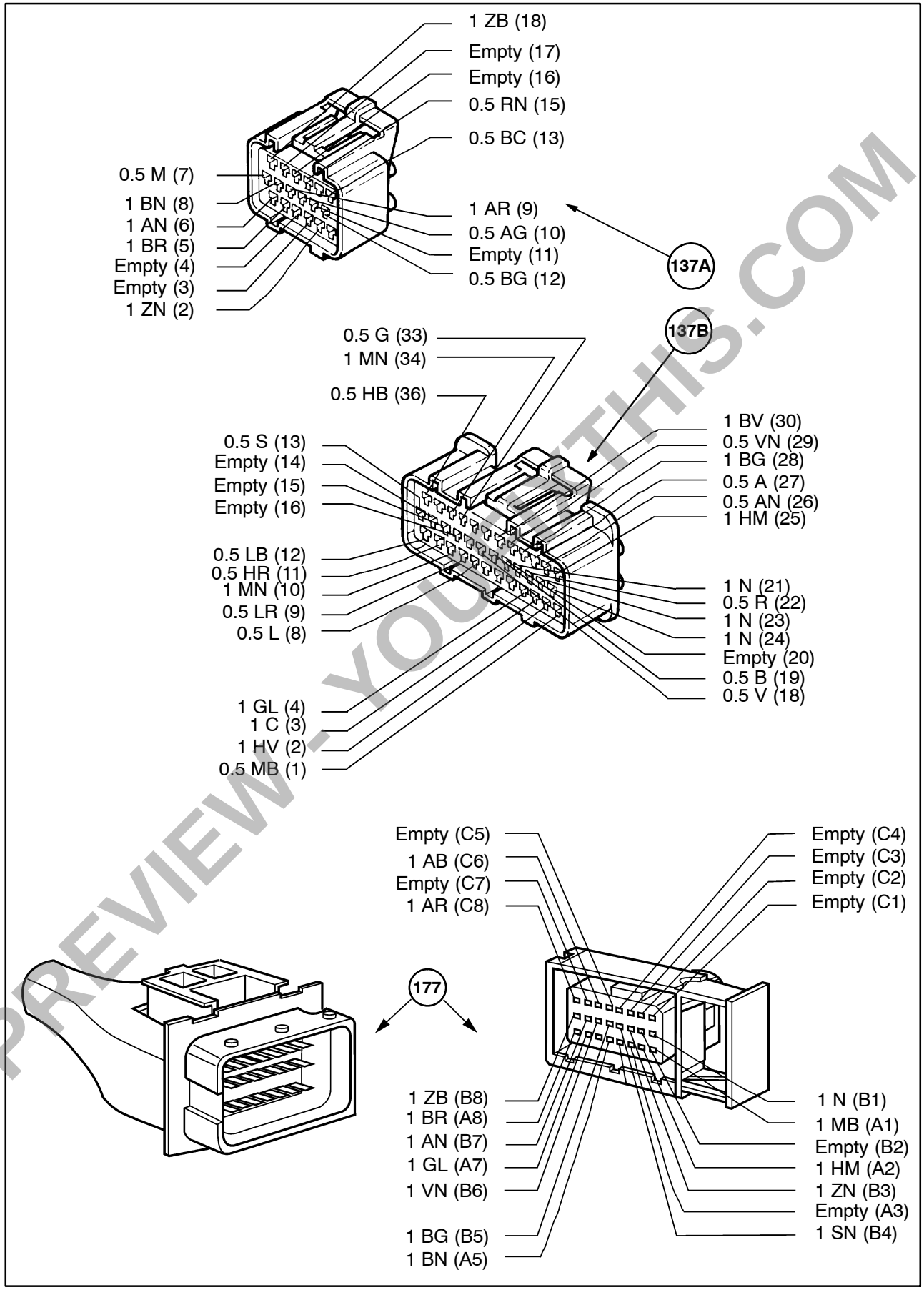
FAULT CODE 16



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FAULT CODE 41



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FAULT CODE 66

Check the wiring and eliminate the cause of the open circuit.

Turn the starter key to the OFF position.
Remove the rear left-hand wheel and the solenoid valves unit guard.
Is connection (65) on the solenoid valve of the Shuttle reverse synchroniser position control connected?

NO → Connect connection.

YES

Disconnect connection (65) on the solenoid valve.
Using a digital tester, measure the electrical resistance on the pushbutton.
Is the resistance ~ 7.5 Ω?

NO → Replace the solenoid valve if interrupted.

YES

Disconnect the control panel and the connections (137) on the ECU.
Is wire (SN) on pin CN1-17 on connections (137) or Wire (SG) on pin CN1-3 in short to ground?

NO → Is there electrical continuity between pin CN1-17 (SN) on connections (137) and connection (65) on the solenoid valve?

NO → Check the wiring and eliminate the cause of the open circuit.

YES

Is there electrical continuity between pin CN1-3 (GS) on connections (137) and connection (65) on the solenoid valve?

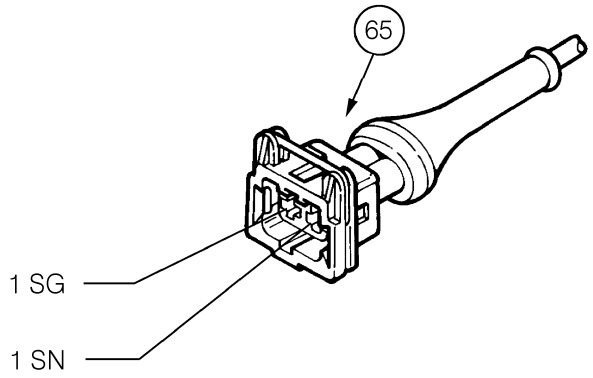
NO → Check the wiring and eliminate the cause of the open circuit.

YES

Replace the ECU.

YES

Check the wiring between connection (65) on the solenoid valve, pins (B4) (SN) and (C4) (GS) on connection (177) and pins CN1-17 (SN) and CN1-3 (GS) on connections (137).
Eliminate the cause of the short to ground.



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ERROR CODE 12 – FWD SOLENOID OR ECM DRIVER SHORT CIRCUIT TO 12 VOLTS.

Conditions:

- When the front axle is engaged, (FWD Solenoid de-energized), the FWD Solenoid becomes energized by a short to 12 volts.

Causes:

- Faulty wiring; circuit is shorted to 12 volts between ECM connector, pin 8 (prior to s/n 1232544 pin 27) and solenoid coil terminal. May also be, across solenoid coil terminals, or between solenoid coil terminal and ECM connector, pin 7 (prior to s/n 1232544 pin 4).
- Faulty FWD Solenoid Coil.
- Faulty ECM; internal ECM Driver is shorted to 12 volts.

Tests:

- H9, Channel 13 value is below 750 counts.

Effects:

- FWD control is operational; appears to engage as normal, because the protection driver will be switched off; therefore not supplying the driver with 12 volts.

Recovery:

- Cause must be resolved and error must be cleared using the CDU, HF Menu.

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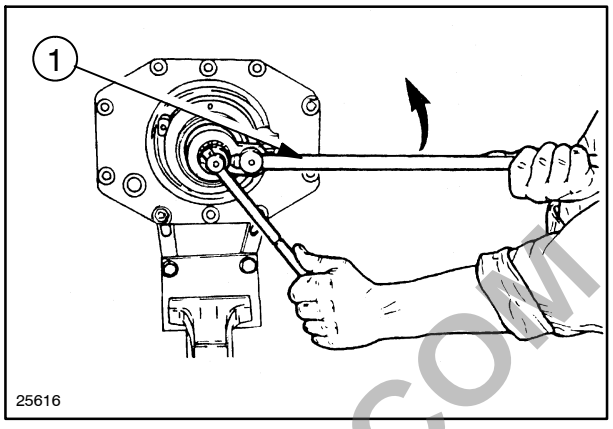
PTO AND FWD ELECTRONIC CONTROL UNIT INPUT/OUTPUT WIRING DIAGRAM

1 Starter switch.
2 FWD in automatic selection ON indicator signal.
3 FWD alarm indicator signal.
4 FWD ON indicator signal.
5 FWD pressure switch sensor ON.
6 FWD solenoid valve.
7 Bodywork ground.
8 Sensors ground.
9 Power ground.
10 Troubleshooting unit **294084** connection.
11 Pushbutton ▲.
12 Pushbutton ▼.
13 HMENU selection pushbutton.
14 Troubleshooting unit **294084**.
15 Front wheels speed sensor (VAA).
16 Rear wheels speed sensor (VAP).
17 Slope sensor.
18 Steering sensor.
19 RH brake pressure switch.
20 LH brake pressure switch.
21 To fuse 9 (control unit power supply).
22 Mechanical shuttle in reverse gears sensor switch.
23 FWD switch (automatic).
24 FWD switch (manual).
25 Shuttle reverse gears signal from Power Shuttle control unit.
26 Battery.

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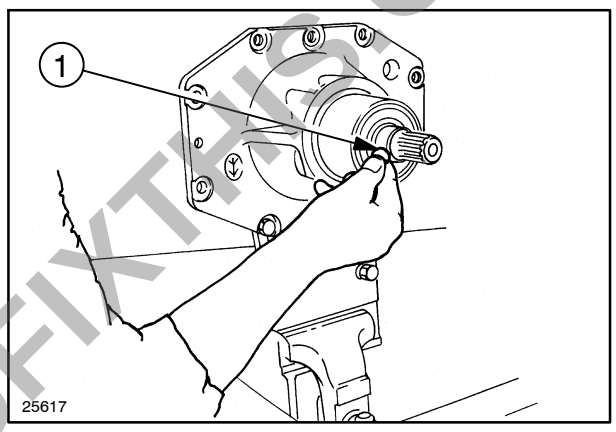
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30. Unscrew the nut, using wrench **293878** (1), holding the bevel pinion shaft in position with wrench **293782**.



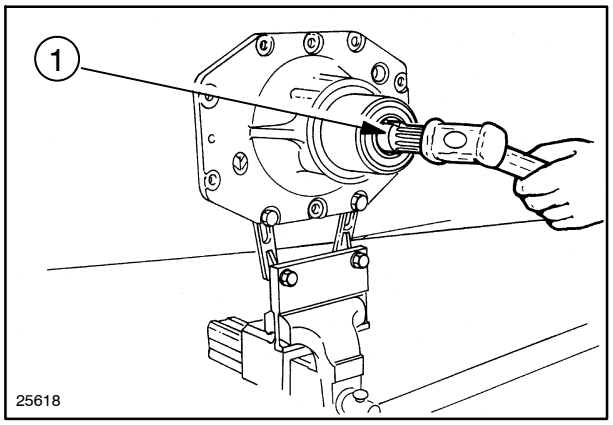
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31. Remove the splined shaft stop ball (1).



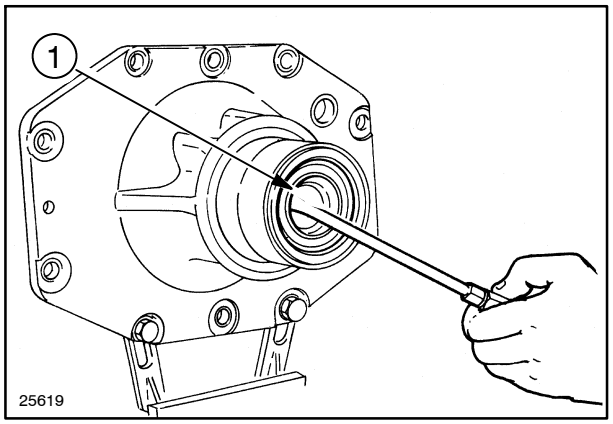
48

32. Acting on the rear part, extract the bevel pinion shaft (1) and recover the spacer, adjusting shims and the bearing.



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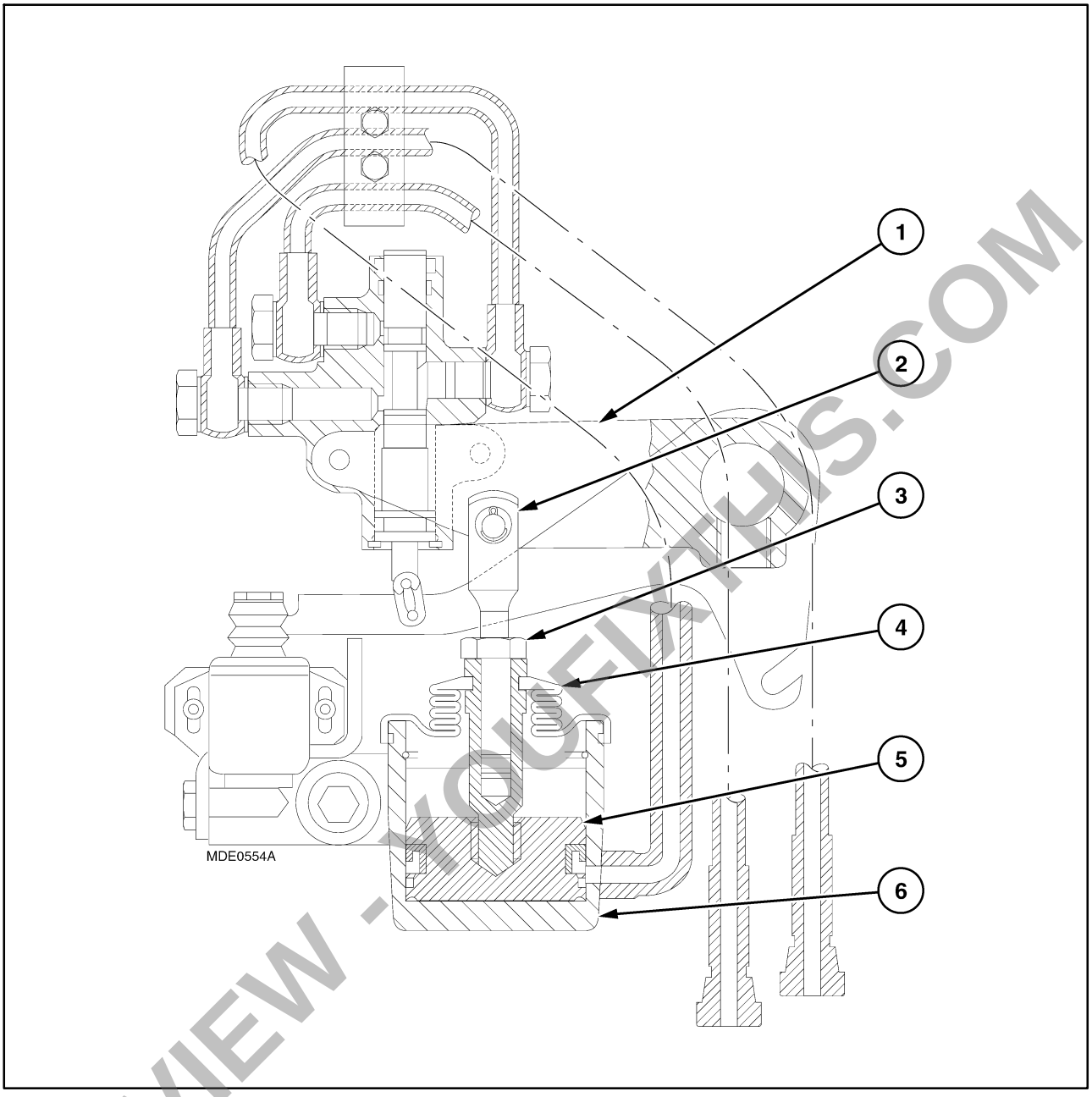
33. Using a screwdriver, detach and remove the dust seal, seal (1) and rear bearing.



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4

ADJUSTMENTS

PTO CLUTCH SERVO CONTROL

⚠ WARNING ⚠

Always use appropriate tools to align fixing holes. NEVER USE YOUR FINGERS OR HANDS.

1. Detach the boot (4) from the pin on the fork (2) and unscrew the locknut (3).
2. Move the clutch lever (1) upwards.
3. Turn the pin on the fork (2) so that the piston (5) makes contact with the bottom of the cylinder. Connect the fork (2) to the lever (1).
4. Turn the fork (2) by one turn 1.25 mm (0.0492 in.) so that there is an internal clearance between the sleeve and the clutch levers.
5. Tighten the locknut (3) and attach the boot (4) to the fork pin (2).

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Assembly

⚠ ATTENTION ⚠

Always use appropriate tools to align fixing holes. NEVER USE YOUR FINGERS OR HANDS.

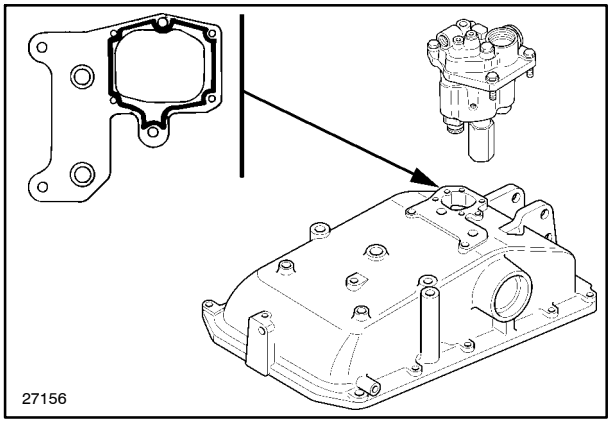
To re-fit the hydraulic lift internal controls, proceed as follows.

- Study the illustrations in figs. 16, 17, 18, 19 and 20 for the positioning of the various parts.
- Apply the torque settings listed on page 7.
- Fit the position and draft control internal levers, complete with: shafts, keys, clutch disks, external levers, washers and circlip.
- Tighten the draft control internal lever pivot eccentric pin.
- Fit the spring and cover on the position and draft control axis and secure the cover with the lock nuts.
- Fit the control valve block control lever unit.
- Assemble the cylinder.
- Fit the Lift-O-Matic device spring.
- Fit the oil delivery pipe to the lift control cylinder.
- Fit the control valve pin contact ball.

Carry out the adjustments described below.

NOTE: *the adjustments must be carried out in the order specified.*

- Carefully clean and degrease the mating surfaces, then apply sealing compound (approx. 2 mm) along the marked line shown in the drawing.
  The types of sealing compound are listed on page 2, Section 00.
  Fit the hydraulic lift on the lift box and secure in position with the relative retaining bolts.
- Fit the auxiliary control valve block, the O ring seals and the connecting pipe to the lift hydraulic control valve block.



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Op. 35 130 30
ELECTRONIC CONTROL CENTER

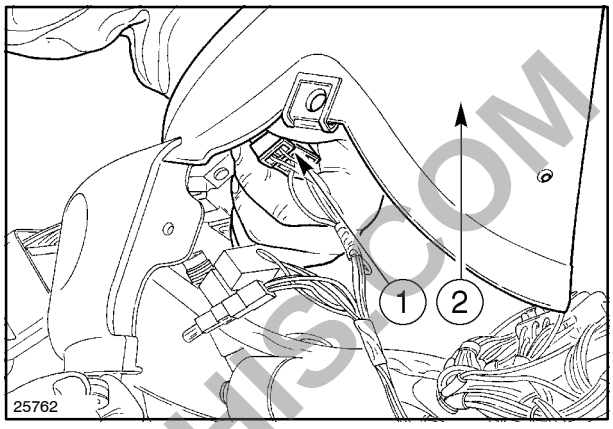
Removal

WARNING

Handle all parts carefully.
Do not put your hands or fingers between parts Wear suitable safety clothing - safety goggles, gloves and shoes.

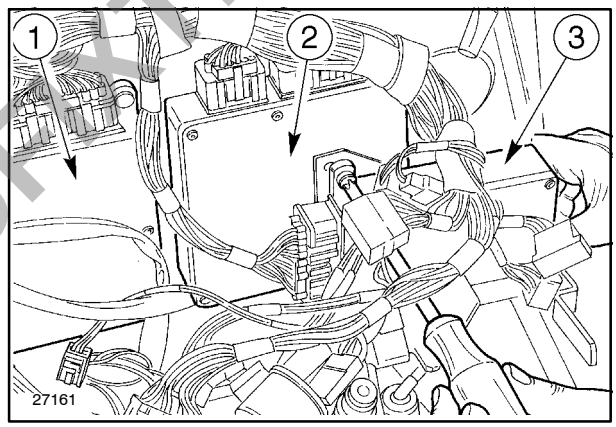
To remove the control centre, proceed as follows.

1. Carry out operation **55 404 14** Direction indicator switch, only removal (see Section 55).
2. Disconnect the electrical connections (1) and remove the dashboard (2).



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3. Remove the lift control centre (1) retaining bolts from the support and disconnect the electrical connections.



33

Installation

To refit the control centre, proceed as follows.

WARNING

Always use appropriate tools to align fixing holes. NEVER USE YOUR FINGERS OR HANDS.

- Connect the electrical connections to the control centre and secure to the support using the bolts.
- Connect the electrical connections to the dashboard and fit the dashboard.
- Carry out operation **55 404 14** Direction indicator switch**,** only installation (see Section 55).

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FAULT CODE 37

The mixed control potentiometer (4) is not turned fully clockwise. This fault can be displayed during lift arms calibration (FAULT 24).

The rear lift (EDC) does not work, therefore the lift arms mechanical stroke cannot be calibrated.

Is the mixed control potentiometer turned fully counter-clockwise?

NO → Turn the mixed control potentiometer fully counter-clockwise.

YES

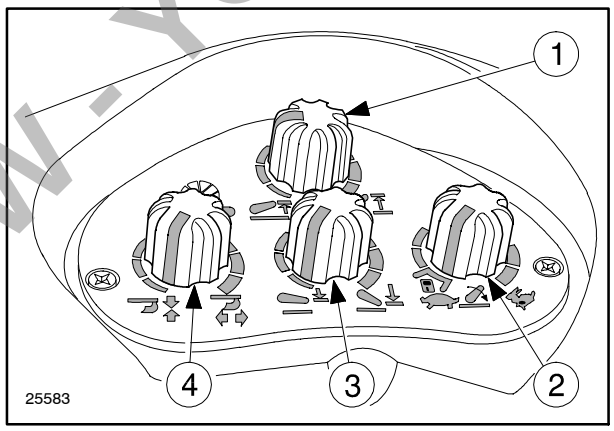
Turn the starter key to the OFF position.
Turn the starter key to the ON position.
Does the fault persist?

YES

Replace the lift control panel.
Does the fault persist?

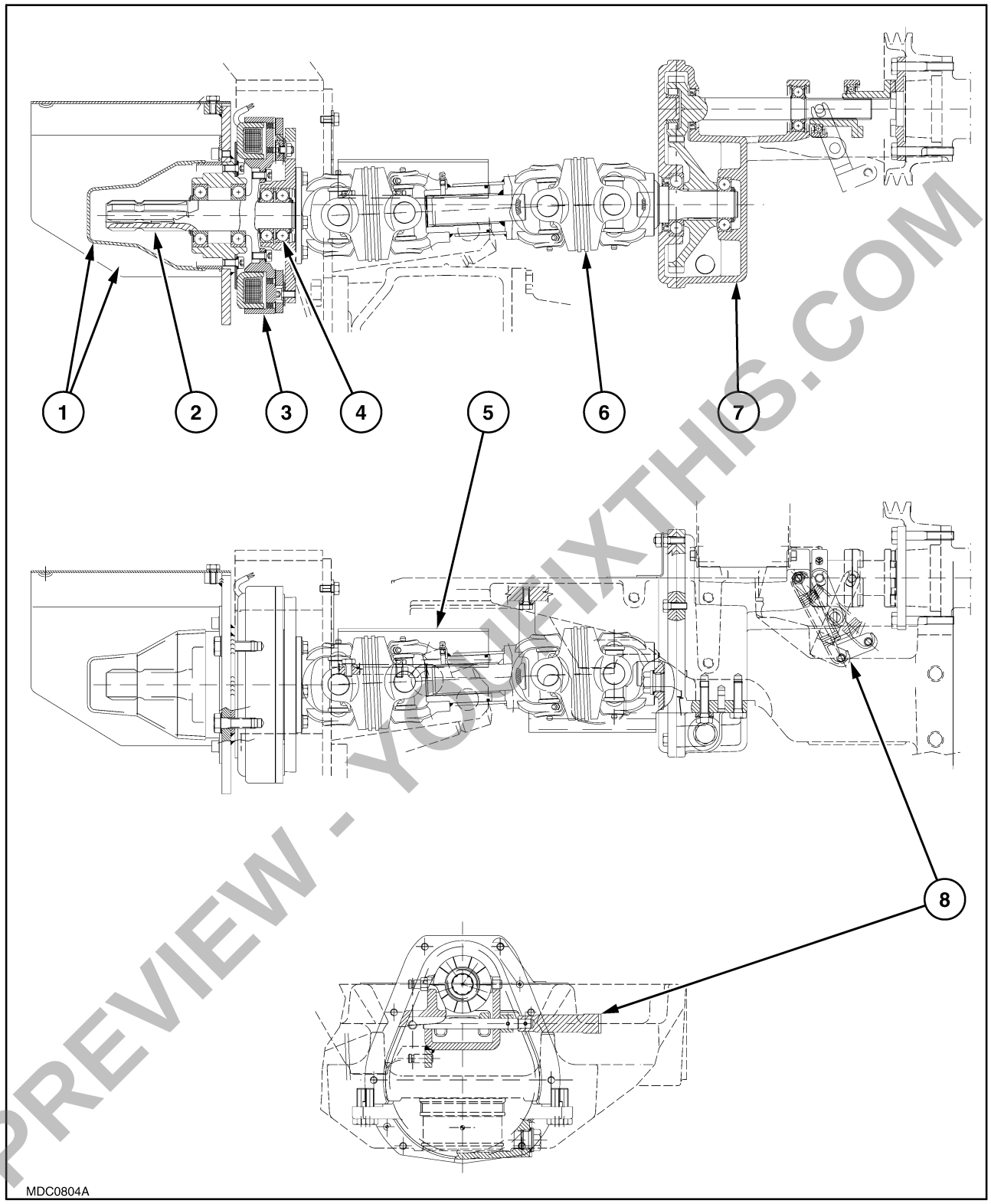
YES

Replace the ECU.



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5

Longitudinal and cross-sectional views of front power take-off

1. Power take-off shaft guard.
2. Power take-off shaft.
3. Electromagnetic clutch.
4. Electromagnetic clutch bearings.
5. Constant velocity joint guard.
6. Constant velocity joint.
7. PTO gears casing.
8. Mechanical power take-off.

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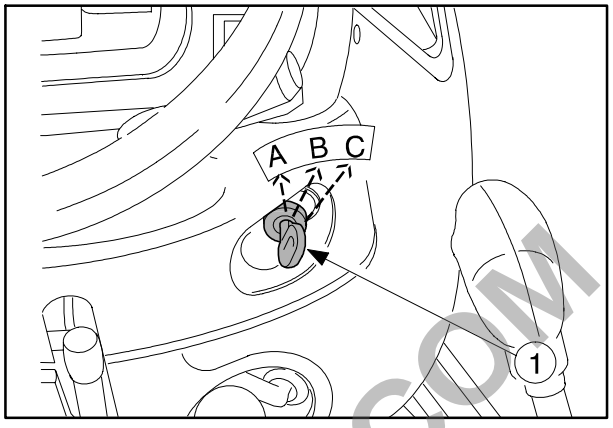
FIRST START-UP

The first start-up procedure must be carried out in the following cases.

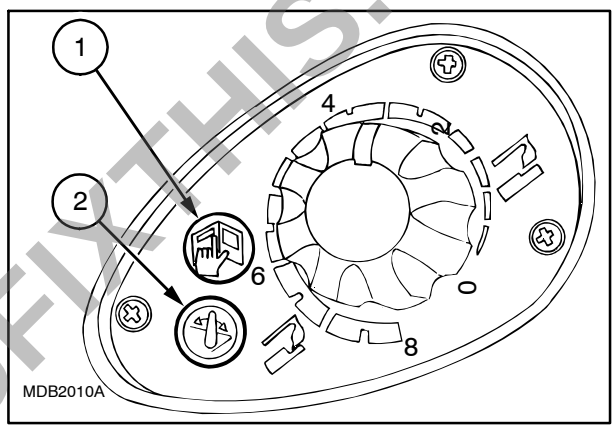
- At the end of the production line.
- Following ECU replacement.
- Following erasure of the Non-Volatile memory (NVM) (see H8 MENU).
- Following manual configuration (see H3 MENU).
- Turn switch (1) to B (ON) without switching on the engine.
- Indicator (1) will be illuminated (non-flashing), after a while indicator (1) will flash to repeat the recognised configuration code - i.e.: rapid flashing, followed by:

1 flash	Only front lift present.
2 flashes	Both rear lift and differential lock present.
3 flashes	Rear lift, front lift and differential lock present.

- Turn the key (1, fig. 88) to OFF for a few seconds: the configuration is now saved in the Non-Volatile memory (NVM).



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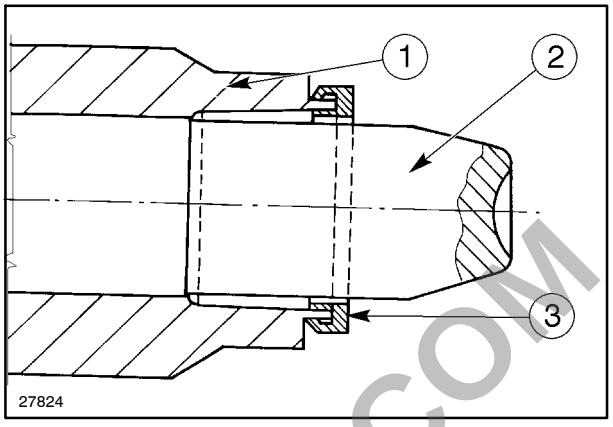
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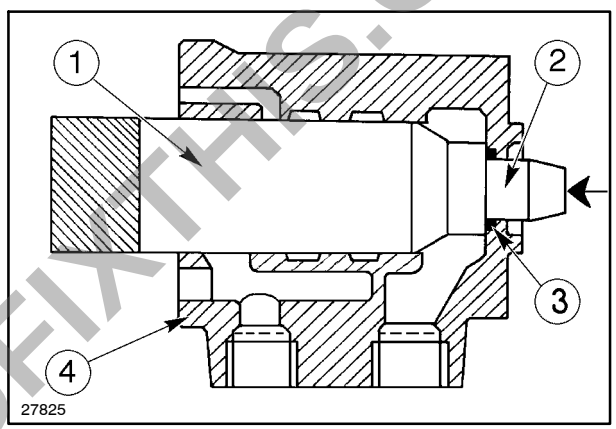
7. Position the control valve body so that the housing seat on the rotating valve sleeve is positioned horizontally.

8. Lubricate the VARISEL seal (3) with grease and fit on the outer edge of the guide bushing (1) of tool **293955**.



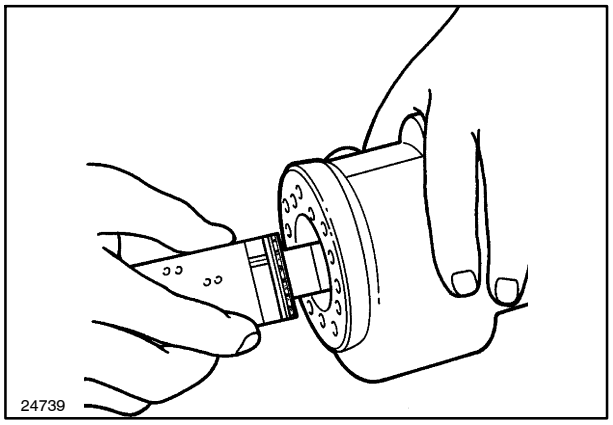
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9. Position the tool **293955** complete with components (1) and (2) and the VARISEL seal (3) on the hydrostatic steering control valve body (4).
10. Press fully down, whilst simultaneously rotating the outer bushing (1) on the tool, in order to facilitate the entry of the VARISEL seal (3) in the control valve body seat.
11. Using the bushing (1), press on the shaft (2), in the direction indicated by the arrow, in order to overcome the pressure exerted by the inner spring. Extract the tool from the control valve body when the tapered part of the shaft (2) is released from the seal (3).



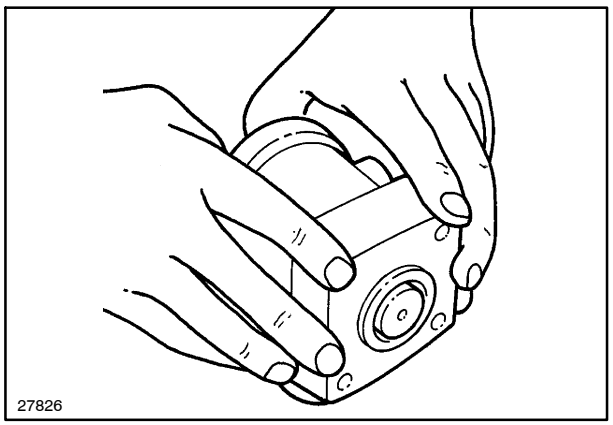
47

12. Insert the parts that were previously fitted in operations 26 to 31, on the control valve body, holding the sleeve – rotor drive shaft trim pin in a horizontal position, to prevent it from slipping out and jamming in the slots inside the control valve body.



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13. Press the rotating valve so as to bring the thrust bearing into contact with the control valve body.

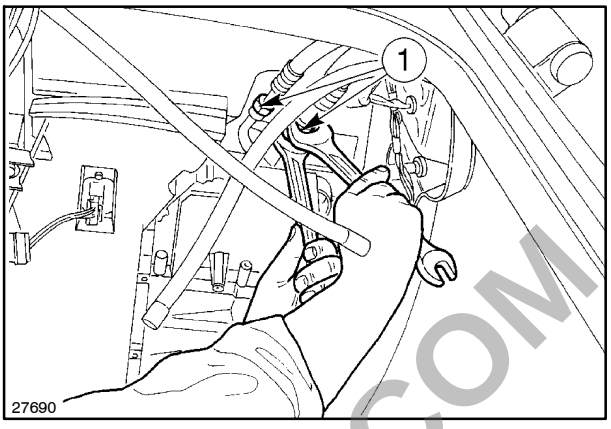


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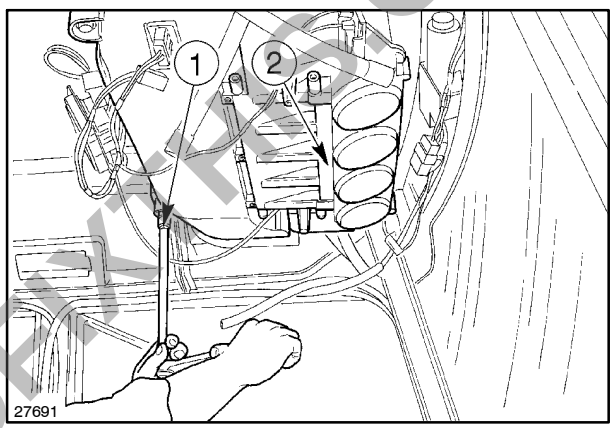
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5. Remove the two air conditioning system pipes (1) from the compressor, that are connected to the expansion unit radiator.



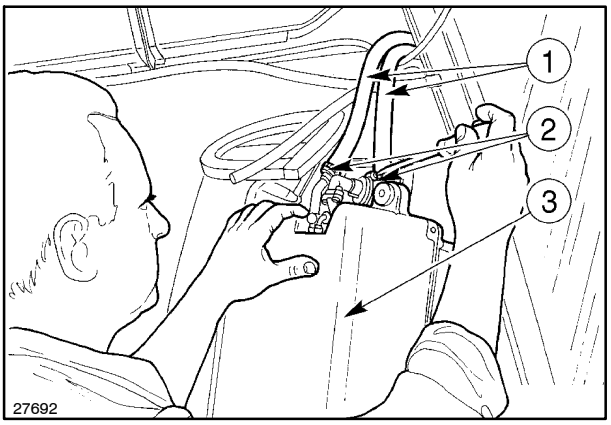
31

6. Remove the four retaining bolts (1) on the heater radiator support of the conditioning unit expansion device (2).



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7. Remove the clamps (2) and piping (1) connected to the heater radiator, then remove the support containing the heater radiator and conditioning unit expansion device (3).



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Installation (Op. 50 206 51)

⚠ WARNING ⚠

Always use appropriate tools to align hardware holes. NEVER USE YOUR FINGERS OR HANDS.

- Proceed as follows.
- Fit the two pipes connected to the heater radiator and the two securing clamps.
- Fit the support, containing the heater radiator and conditioning unit expansion device, to the cab ceiling by means of the four screws.
- Connect the two air conditioning pipes from the compressor to the expansion unit radiator.
- Connect the four condensate drainage pipes.
- Connect the heater-air conditioner unit electrical connections.
- **Carry out operation 9016060-Cab ceiling fittings R.I.** (Proceed with installation).
- **Using operation 5020004 (Filter/drying, recharging and cooling control),** only carry out operations 32 to 68 with regard to system emptying and charging, using station no. **294030**.
- Reconnect the battery negative lead.
- **Carry out operation 5020003-Air conditioning system functional testing.**
- (If necessary), **Carry out operation 5020006-Air conditioning system checks and eventual elimination of gas leaks.**

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SECTION 55 – ELECTRICAL SYSTEM

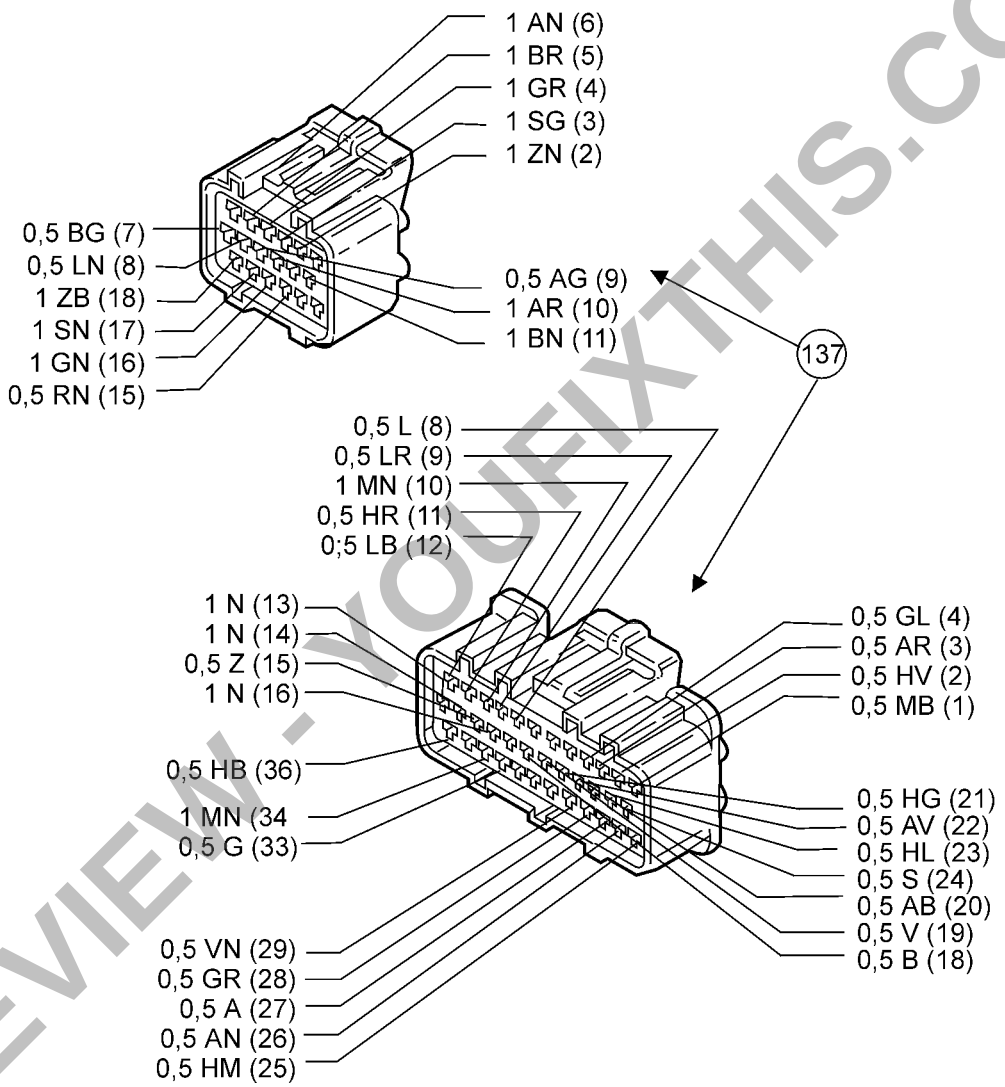
Chapter 8 – Switches and Controls (Before Serial Number 1269072)

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AUTO 4WD / MECHANICAL LIFT / HYDRAULIC DIFF LOCK / WITH CAB

Harness Diagrams

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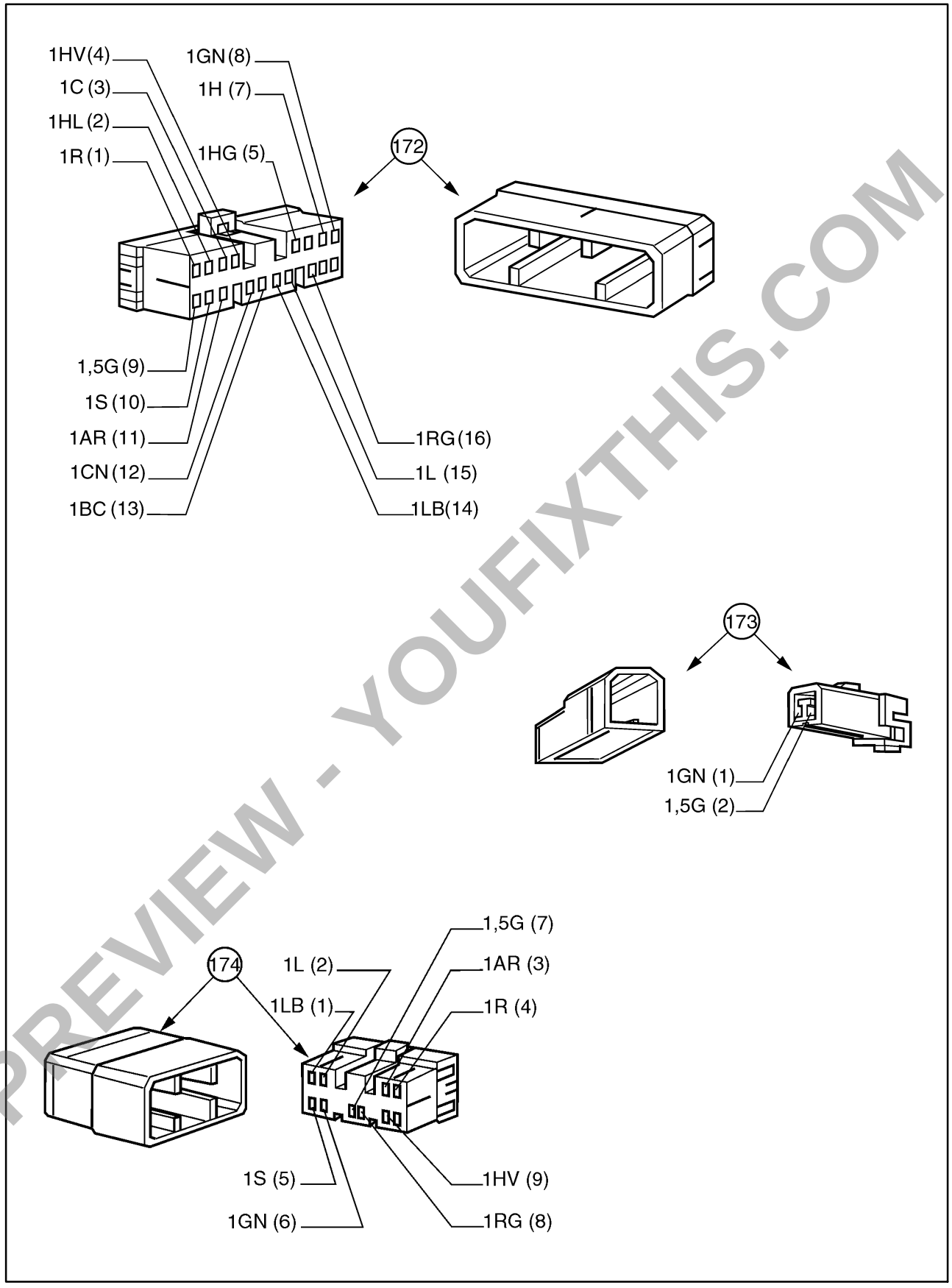
COMPONENTS

ELECTRICAL CIRCUIT COMPONENTS

1 Battery
2 Steering sensor
3 Air conditioner dehydrating filter
4 Right headlight
5 Right side corner headlight
6 Trailer brake emergency switch
7 Horn
8 Air conditioner compressor (version with cab only)
9 Air conditioner joint connector
10 Starter motor
11 Engine stopping solenoid valve
12 Thermostart
13 Brake light switch
14 Engine compartment ground
15 Brake oil level switch
16 Front right side taillight and indicator
17 POWER SHUTTLE system connector (4 PINS-BLACK)
18 POWER SHUTTLE system connector (4 PINS-BLACK)
19 POWER SHUTTLE system connector (8 PINS-RED)
20 POWER SHUTTLE system connector (8 PINS-BLACK)
21 Speed signal connector
22 Transmission side system connector
23 Front side system connector (PIN12)
24 Starter motor connector
25 Electric and hydraulic dual drive connector
26 Corner headlight connector
27 Front side light connector
28 Digger depth adjuster control panel and rear electronic lift warning lights
29 Front right auxiliary work light
30 Air conditioner control relay
31 Heater resistance unit
32 Cab ceiling light
33 Cab roof ground
34 Right hand speaker
35 Ventilation-heater unit connector
36 Radio antenna connector
37 Radio connectors
38 Windscreen wiper motor
39 Fan-conditioner control unit
40 Rear right auxiliary work light
41 Rear window wiper motor
42 Front left auxiliary work light
43 Left hand speaker
44 Rear left auxiliary work light

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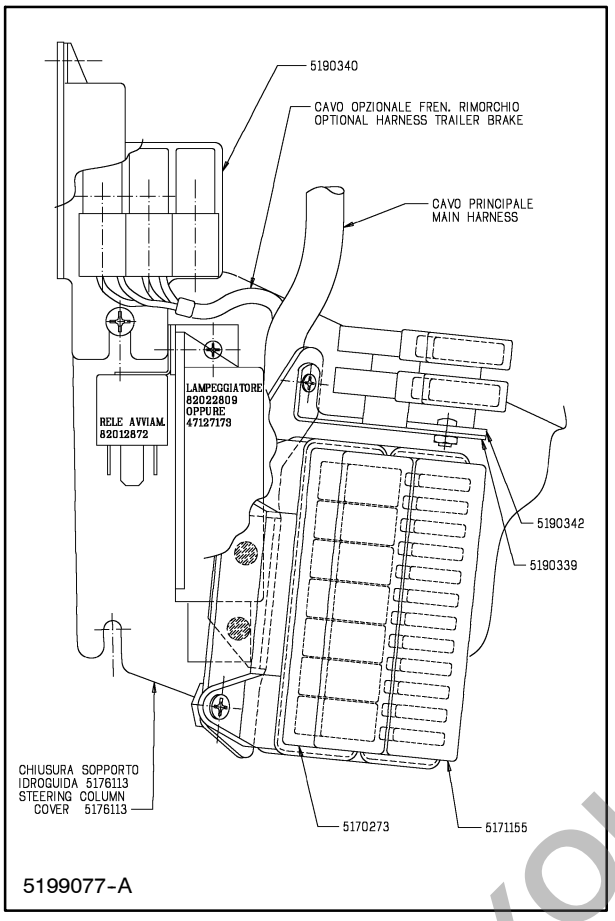
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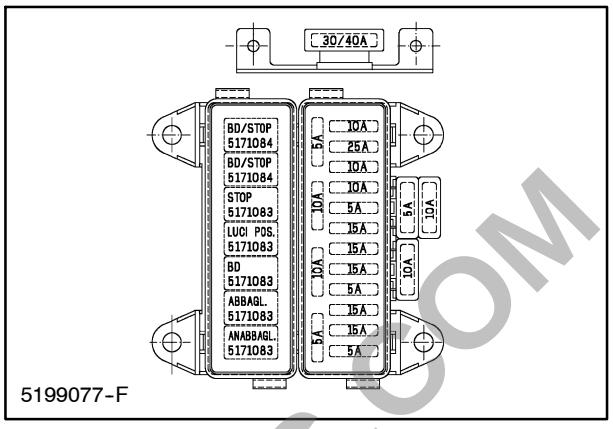
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Fuse and Relay Locations



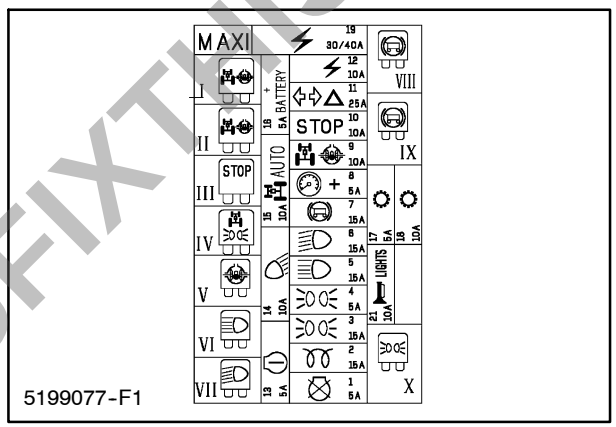
1

Located under left side steering column panel.



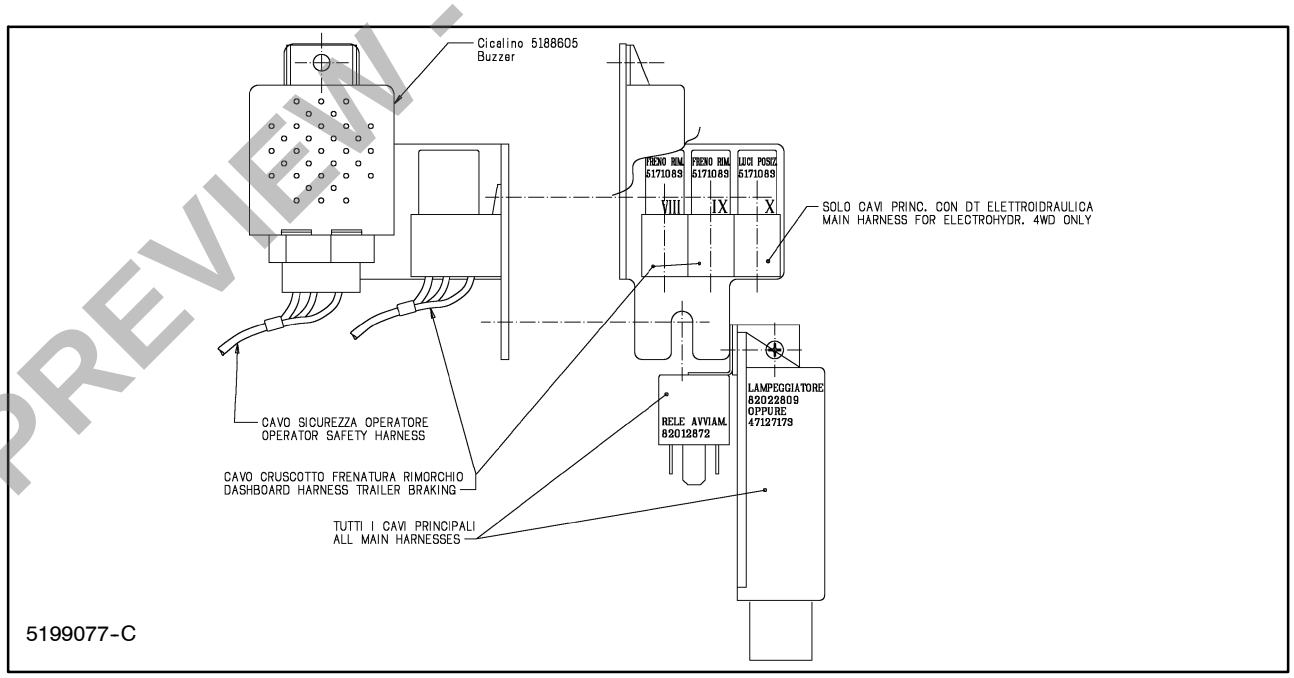
2

Located under left side steering column panel.



3

Located under left side steering column panel.



4

Located under left side steering column panel.

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