TL80A, TL90A, TL100A
REPAIR MANUAL
COMPLETE CONTENTS

The following pages are the collation of the contents pages from each section and chapter of the TLA Series Repair manual. Complete Repair part # 87580875.

The sections used through out all New Holland product Repair manuals may not be used for each product. Each Repair manual will be made up of one or several books. Each book will be labeled as to which sections are in the overall Repair manual and which sections are in each book.

The sections listed above are the sections utilized for the TLA Series Tractors.

87580879 8/06
Replaces 87053398

SECTION 33 – BRAKES

BOOK 3 - 87580877

Chapter 1 – Brakes

CONTENTS

SECTION 55 – ELECTRICAL SYSTEMS

BOOK 4 - 87580878

Chapter 4 – Charging System

CONTENTS

DO NOTS

Do Not mix chemical materials except under the manufacturers instructions; some chemicals can form other toxic or harmful chemicals; give off toxic or harmful fumes; be explosive when mixed together.

Do Not spray chemical materials, particularly those based on solvents, in confined spaces e.g. when people are inside a vehicle.

Do Not apply heat or flame to chemical materials except under the manufacturers' instructions. Some are highly inflammable and some may release toxic or harmful fumes.

Do Not leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas, pits etc.

Do Not transfer chemical materials to unlabeled containers.

Do Not clean hands or clothing with chemical materials. Chemicals, particularly solvents and fuels will dry the skin and may cause irritation with dermatitis. Some can be absorbed through the skin in toxic or harmful quantities.

Do Not use emptied containers for other materials, except when they have been cleaned under supervised conditions.

Do Not sniff or smell chemical materials. Brief exposure to high concentrations of fumes can be toxic or harmful.

Clutch Fluids - see Brake and Clutch Fluids.

Clutch Linings and Pads - see Brake and Clutch Linings and Pads.

CORROSION PROTECTION MATERIALS - see Solvents, Fire.

Highly flammable, flammable.

These materials are varied and the manufacturers instructions should be followed. They may contain solvents, resins, petroleum products etc. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation and not in confined spaces.

Cutting - see Welding.

De-Waxing - see Solvents and Fuels (Kerosene).

DUSTS

Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

ELECTRIC SHOCK

Electric shocks can result from the use of faulty electrical equipment or from the misuse of equipment even in good condition.

Ensure that electrical equipment is maintained in good condition and frequently tested.

Ensure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged.

Ensure that electric equipment is protected by the correct rated fuse.

Never misuse electrical equipment and never use equipment which is in any way faulty. The results could be fatal.

Use reduced voltage equipment (110 volt) for inspection and working lights where possible.

Ensure that the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.

Use air operated mobile equipment where possible in preference to electrical equipment.

In cases of electrocution:-

- switch off electricity before approaching victim

- if this is not possible, push or drag victim from source of electricity using dry non-conductive material

- commence resuscitation if trained to do so

- SUMMON MEDICAL ASSISTANCE

CALIFORNIA EMISSION CONTROL WARRANTY STATEMENT

(North America Only)
(California Only)

Your Warranty Rights and Obligations

The California Air Resources Board and CNH UK LTD are pleased to explain the emission control system warranty on your engine. In California, new 2004 and later heavy-duty off-road engines from 50 to 750 HP must be designed, built and equipped to meet the State's stringent anti-smog standards. CNH UK LTD must warrant the emission control system on your engine for the periods of time listed below, provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system includes parts such as the fuel injection system and the air induction system.

Where a warrantable condition exists, CNH UK LTD will repair your heavy-duty off-road engine at no cost to you including diagnosis, parts and labor.

Manufacturer's Warranty Coverage:

The 2004 and later heavy-duty off-road engines are warranted from the original date of delivery for five years or 3000 hours of operation, whichever occurs first. If any emission-related part on your engine is defective, the part will be repaired or replaced by CNH UK LTD.

Owner's Warranty Responsibilities:

- As the heavy-duty off-road engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. CNH UK LTD recommends that you retain all receipts covering maintenance on your heavy-duty off-road engine, but CNH UK LTD cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.
- As the heavy-duty off-road engine owner, you should, however, be aware that CNH UK LTD may deny you warranty coverage if your heavy-duty off-road engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.
- Your engine is designed to operate on commercially available diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.
- You are responsible for initiating the warranty process. The ARB suggests that you present your heavy-duty off-road engine to a CNH dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.
- If you have any questions regarding your warranty rights and responsibilities, you should contact your nearest CNH Office at the address and telephone number listed on the Owner Assistance page of your equipment's operator manual.
- Prior to the expiration of the warranty, you must give notice of any failure of an emission control warranted part. Such notice must be given to CNH UK LTD or an authorized CNH dealer, and you must deliver the engine to the repair location.
- You, the owner, are responsible for incidental costs incurred by yourself or your employees as a result of an unwarrantable failure. Examples of such costs are communication expenses, meals and lodging.
- The owner is responsible for any business costs or losses, any "downtime" expenses and any "cargo" damage which result from the failure of a warranted part. CNH UK LTD is not responsible for other incidental or consequential damages, including, but not limited to fines, theft, vandalism or collisions.

Parts covered:

This emission control system warranty applies to the following emission control parts:

Electronic Control Unit	Intake Manifold
Fuel Injection Pump	Charge Air Cooler
Fuel Injectors	Exhaust Manifold
Turbocharger	Boost Pressure Tubing (connection to Aneroid Device on F.I.P.)

Any replacement part, equivalent in performance and durability, may be used in the performance of any maintenance or repairs and must be provided without charge to the owner. The use of these parts does not reduce the warranty obligations of CNH UK LTD. However, CNH UK LTD recommends the use of new, genuine CNH service parts or CNH approved rebuilt parts and assemblies. CNH UK LTD also recommends that the engine be serviced by a CNH authorized dealer.

CNH UK LTD Responsibilities:

Warranty work will be provided at no charge to the owner at any authorized dealer, using genuine CNH service parts or CNH approved rebuilt parts or assemblies.

The owner will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, if the diagnostic work was performed at a warranty station.

CNH UK LTD is liable for damages to other engine components caused by the failure under warranty of any warranted part.

Warranty Limitations

CNH UK LTD is not responsible for failures resulting from abuse or neglect by owner or operator.

CNH UK LTD warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board, and that it is free from defects in materials and workmanship which cause the failure of a warranted part.

Any warranted part which is not scheduled for replacement as required maintenance, or which is scheduled only for regular inspection to the effect of "repair or replace as necessary" is warranted for the warranty period.

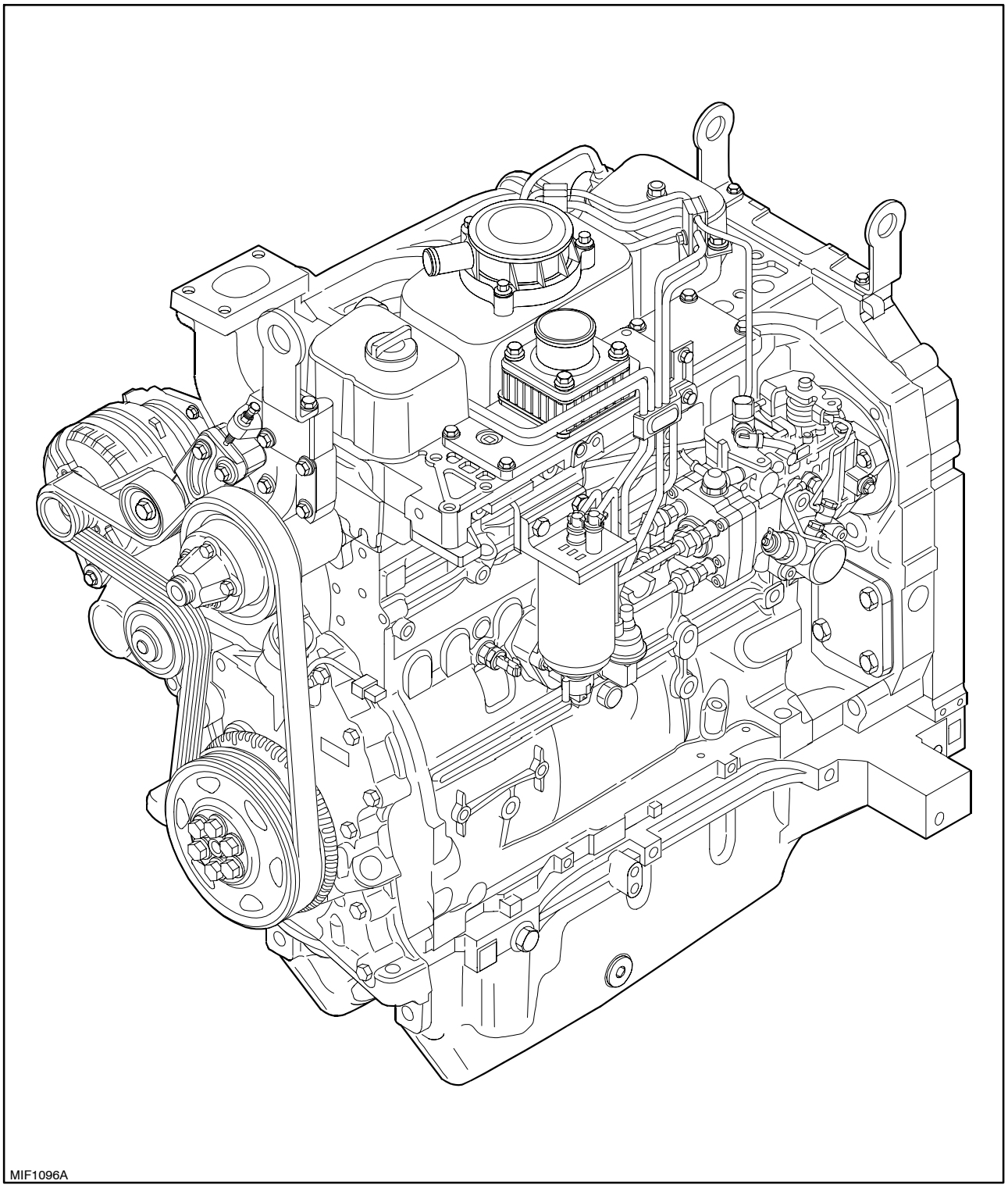
Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time prior to the first scheduled replacement point of that part.

CNH UK LTD is not liable to warrant failures caused by the use of add-on or modified parts.

CNH UK LTD is concerned to ensure proper maintenance of the engine to maximise emissions performance. Information on care and replacement of engine air cleaner, and all other aspects of engine maintenance is provided in a manual supplied to the owner. A maintenance schedule chart is provided in the manual.

DESCRIPTION AND OPERATION

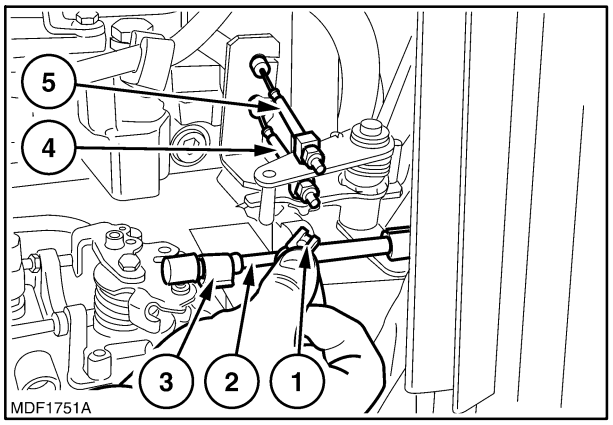
SECTIONAL VIEWS



1

View of IVECO (NEF) Four-Cylinder Engine (TL80A)
(Additional fuel filter to injection pump – not shown)

26. Remove the retaining clips (1) and detach the flexible cables governing the hand throttle (5) and pedal throttle (4).
27. Remove the retaining clip (3) and detach the throttle control tie-rod (2) connected to the injection pump.



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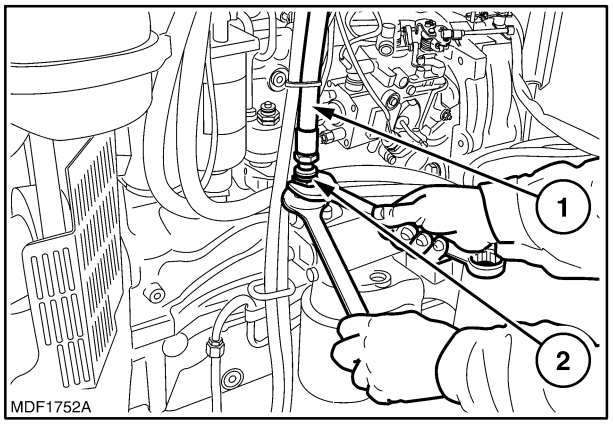
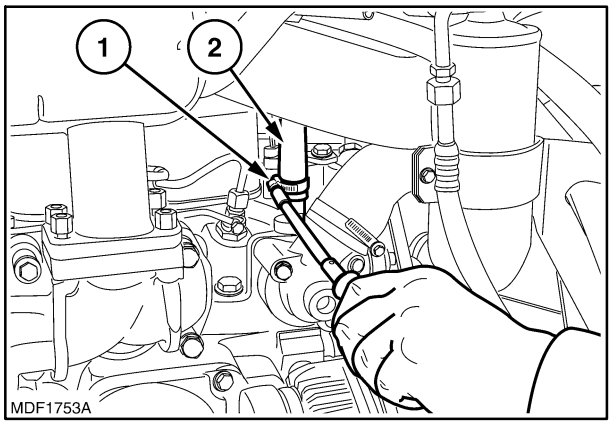
28. Detach the fitting (2) and the hose (1) delivering power steering oil to the hydraulic steering cylinders.



30

29. On models with cab, detach the clamp (1) and the cab heater delivery pipe (2).



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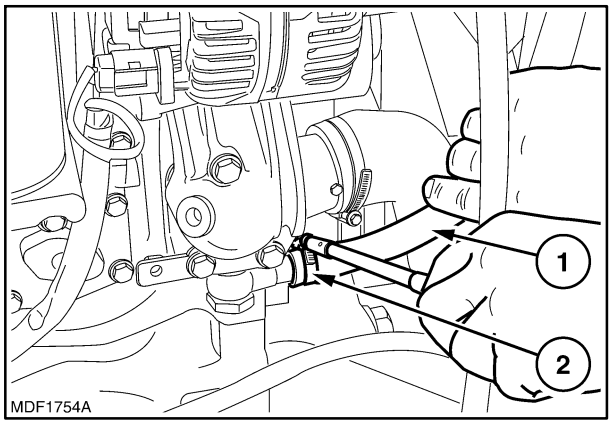
30. On models with cab, detach the clamp (2) and the cab heater return pipe (1).



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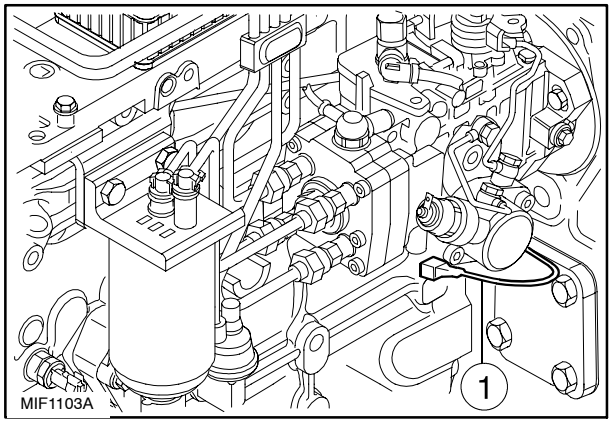
Disassembly

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear the prescribed safety clothing, including goggles, gloves and safety footwear.

1. Remove the engine as described in operation **10 001 10**.
2. Drain off the engine oil by removing the plug from the sump and the oil filler plug.
3. Detach the fan unit from the fan pulley.
4. To facilitate installing the bracket 380000661 (for fixing the engine to the overhaul stand) to the crankcase, it is necessary to remove the wiring (1) from the left-hand side of the engine.



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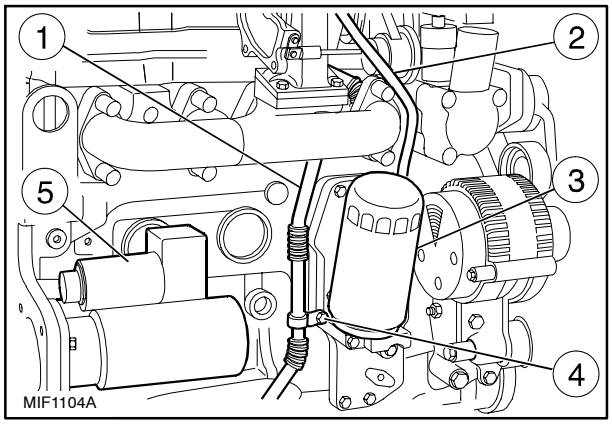
5. To facilitate installing the bracket 380000661 to the crankcase on the right-hand side, remove the starter motor (5), oil filter (3), clamp (4), and turbine oil return pipe (1).
6. Secure the engine to the rotary stand 380000301. Remove the oil delivery pipe (2).



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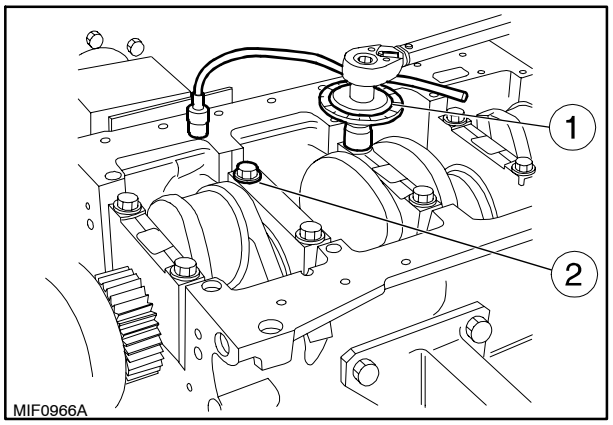
- 3rd phase with tool 380000304 (1) positioned as in the figure. Further tighten the screws (2) with an angle of 90° ± 5°.



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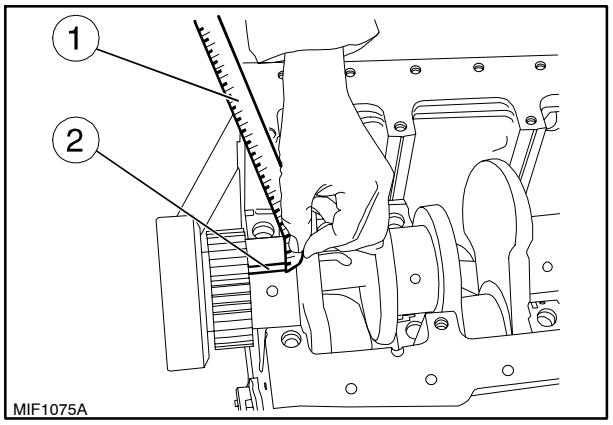
- Remove the support caps.

The clearance between the main bearings and the relevant journals is measured by comparing the width of the calibrated wire (2), at the point of greatest crushing, with the graduation of the scale on the case (1) containing the calibrated wire.

The numbers shown on the scale indicate the mating clearance in millimeters.

Check that the clearance is the one prescribed in the specifications, then lubricate the main bearings and permanently mount the supports, tightening the retaining bolts as described above.



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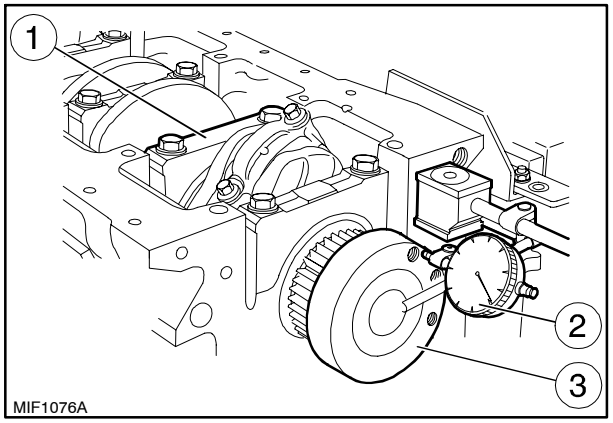
The crankshaft assembly end float is checked by setting a dial gauge (2) with a magnetic base on the crankshaft (3) as shown in the figure. The normal assembly clearance must come within the tolerance prescribed in the specifications.

If the clearance is found to be any greater, change the main half bearings of the penultimate rear thrust bearing support (1) and check the clearance again between the crankshaft journals and main half bearings.



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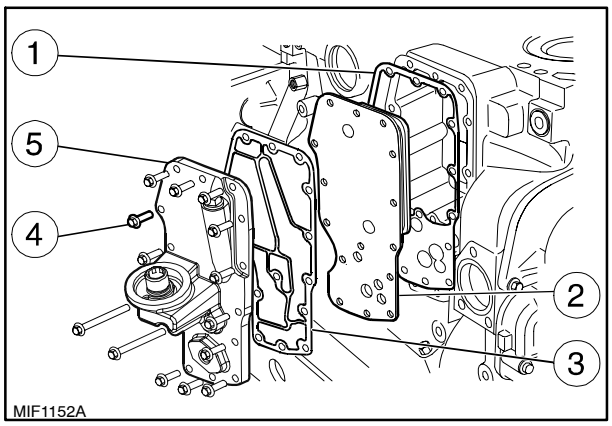
– Install a new gasket (1) on the crankcase, and a new gasket (3) on the cooler (2), and the oil filter mounting (5).
– Insert the screws (4) and tighten them to the torque prescribed. See “Tightening Torques.”



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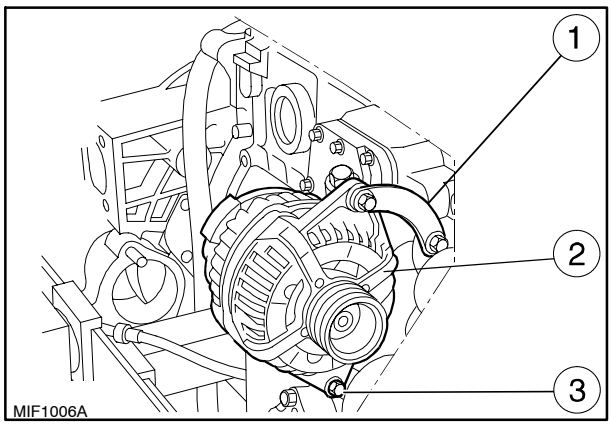
– Install the bracket (1) to secure the alternator (2) to the crankcase. Tighten the alternator fixing screws (3) to the torque specified. See “Tightening Torques.”



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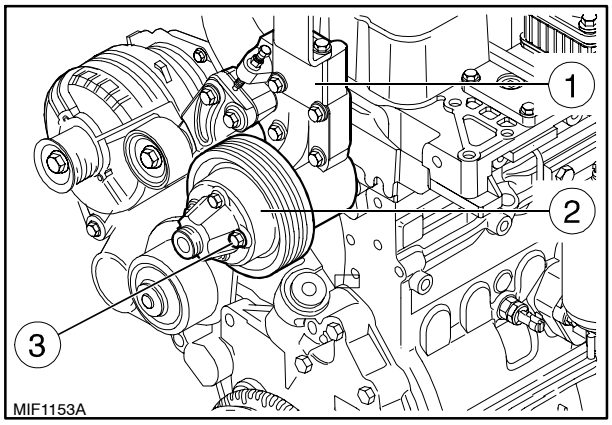
– Install the fan pulley (2) on the support (1) with the screws (3), tightening them to torque.



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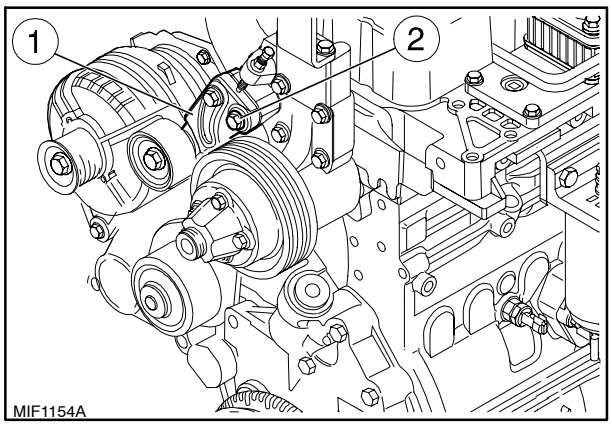
– Install the tightener (1), tightening the bolts (2) and the tightener nut to a torque of 55 Nm (40 lb-ft.)



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Camshaft and Valves

⚠ WARNING ⚠

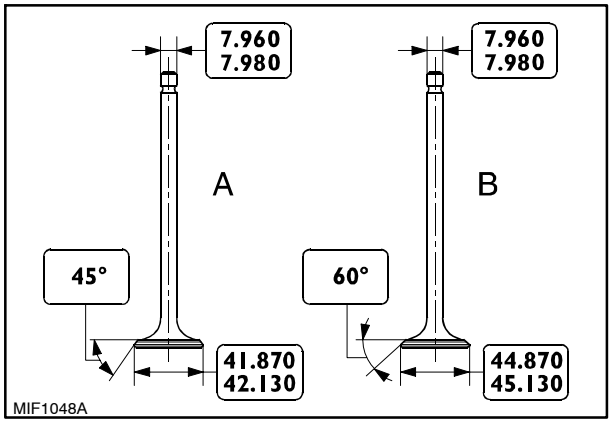
Handle all parts carefully.
Do not put your hands or fingers between parts.
Wear the prescribed safety clothing, including goggles, gloves and safety footwear.

Clean all parts carefully before proceeding with the operations described below.

Dimensions (mm) of valves and valve guides.

A = Exhaust valve.

B = Inlet valve.



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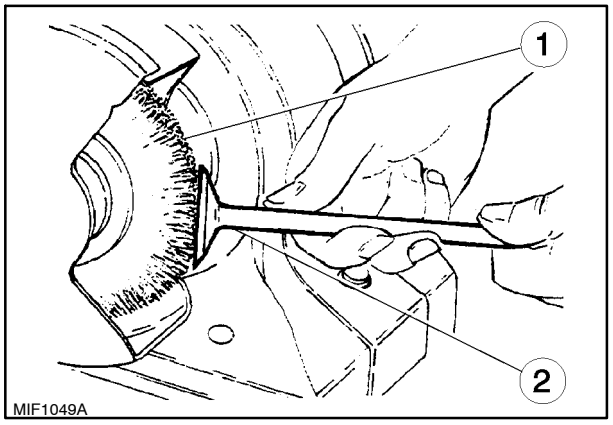
Decarbonizing and grinding valves

Remove all carbon deposits from the valves (2) using a wire brush (1).

Check the valves for signs of seizure, cracking or burning.

If necessary, grind the bevels on the valve heads using a grinding machine, removing as little material as possible.



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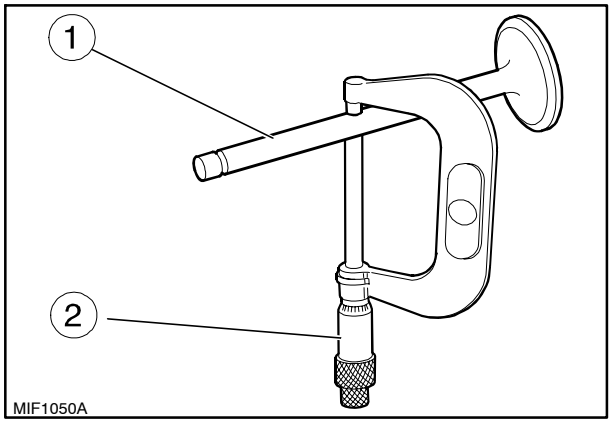
Using a micrometer (2) to measure the valve stem (1) and compare to the range of tolerance given. See “Specifications”.



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SPECIFICATIONS

Radiator on Models TL80A - TL90A - TL100A	4 rows of vertical pipes with copper fins
Fan, attached to the pulley	intake, in plastic with 11 blades
Coolant pump	centrifugal vane-type
Engine speed/coolant pump speed ratio	1:1.977
Coolant thermometer	coloured scale divided into 3 sections
Temperature ranges corresponding to each section:	
- Initial blue section	104 to 140°F (40° to 60°C)
- Middle green section (normal working conditions)	140 to 230°F (60° to 110°C)
- Final red section	230 to 248°F (110° to 120°C)
Temperature control	via thermostat valve
- initial opening	177.0 ± 35.6°F (81 ± 2°C)

SECTION 10 – ENGINE

Chapter 3 – Lubrication System

CONTENTS

OVERHAUL

Op. 10 218 30

FUEL INJECTORS

Removal

⚠ WARNING ⚠

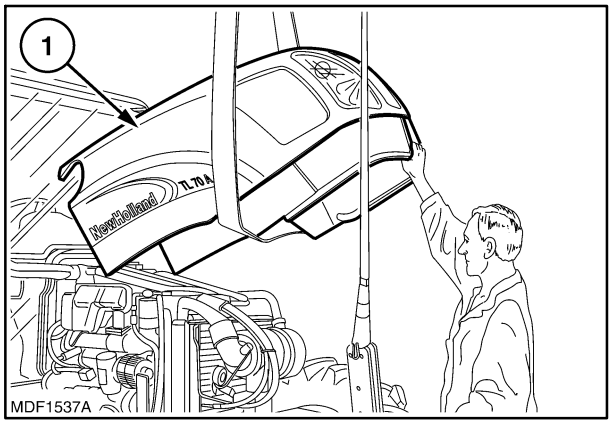
Handle all parts carefully. Do not put your hands or fingers between parts. Wear the prescribed safety clothing, including goggles, gloves and safety footwear.

⚠ WARNING ⚠

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

Proceed as follows:

1. Lift the hood and disconnect the battery negative cable.
2. Remove the hood (1).



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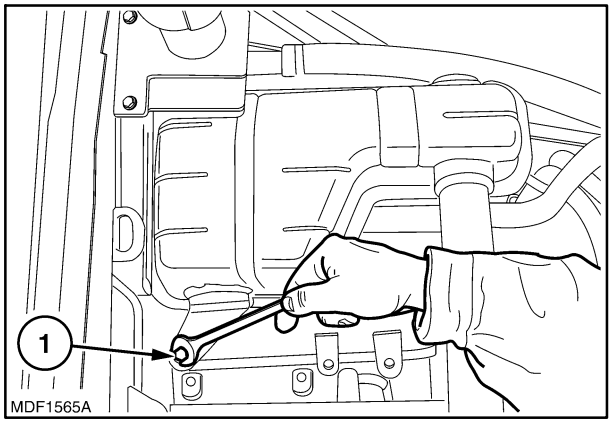
3. Remove the exhaust muffler rear retaining bolts (1).



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SECTION 18 - CLUTCH

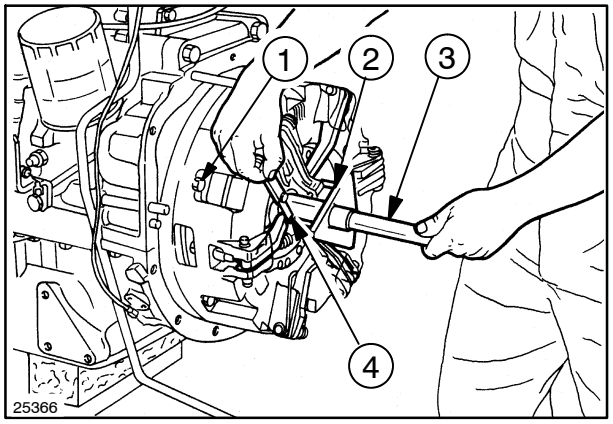
Chapter 1 - Clutch

CONTENTS

Adjust Release Levers

1. After overhauling the clutch, install centering pin **380000292** (3) and fit the entire clutch assembly with PTO disk to the flywheel, then tighten the bolts (1) to the torque value given on page 3.

   Fit gauge **380000293** (2) and, using a feeler gauge, adjust the clutch release levers (4) to obtain a clearance of 0.0393 in. (0.1 mm).



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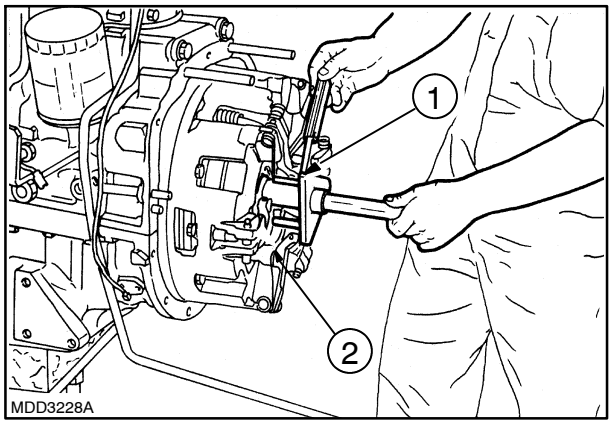
2. Rotate the gauge **380000293** (1) and, using a feeler gauge, adjust the PTO clutch release levers (2) to obtain a clearance of 0.0393 in. (0.1 mm).

   Remove tools no. **380000293** and **380000292**.



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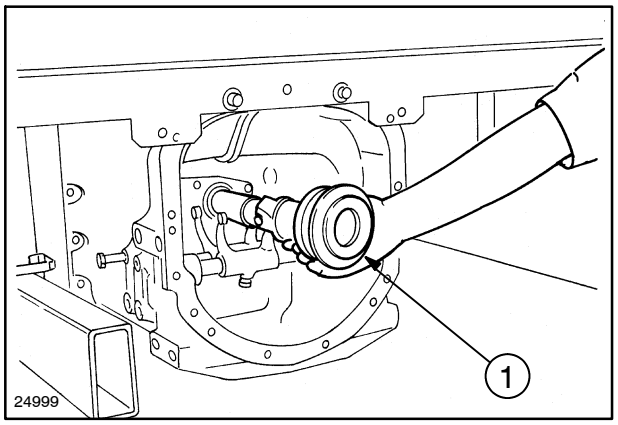
10. Release the retaining clips and extract the sliding sleeves (1).



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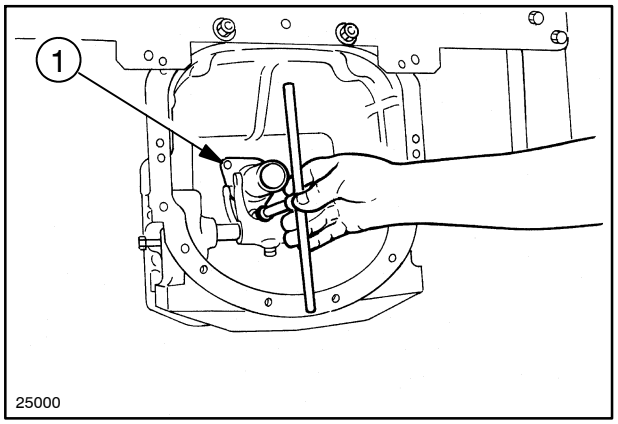
11. Remove the nuts and washers then remove the sleeve support cover (1).



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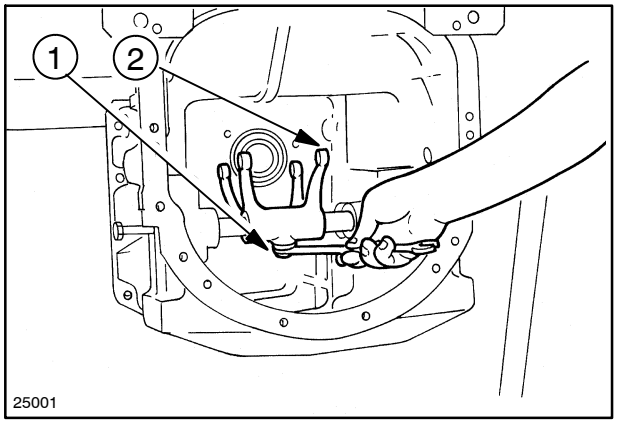
12. Remove the two bolts (1) retaining the sliding sleeve forks (2).



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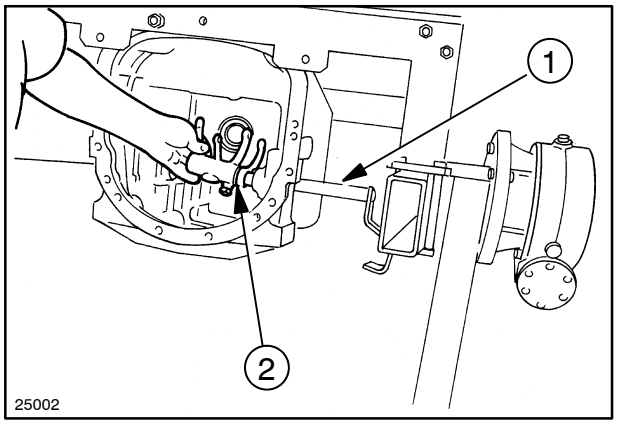
13. Extract the two clutch external levers (1) and remove the relative forks (2).



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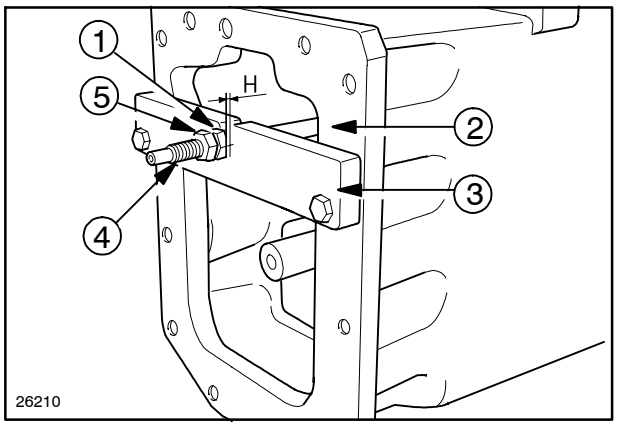
Installing the Seal

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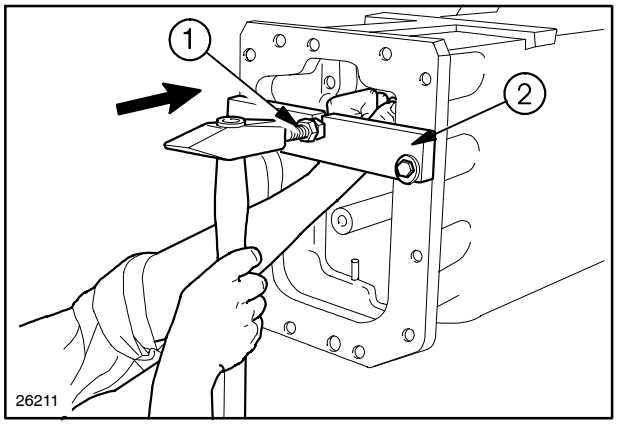
5. Extract the striker (1), remove the bracket (2) and the circlip (1, fig. 19).
6. Insert a new seal (2, fig. 4), in its seat, install the bracket (2, fig. 22) back on the clutch casing and insert the striker (1) on the bracket.
7. Force the seal in until the nut (1, fig. 21) is fully up against the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



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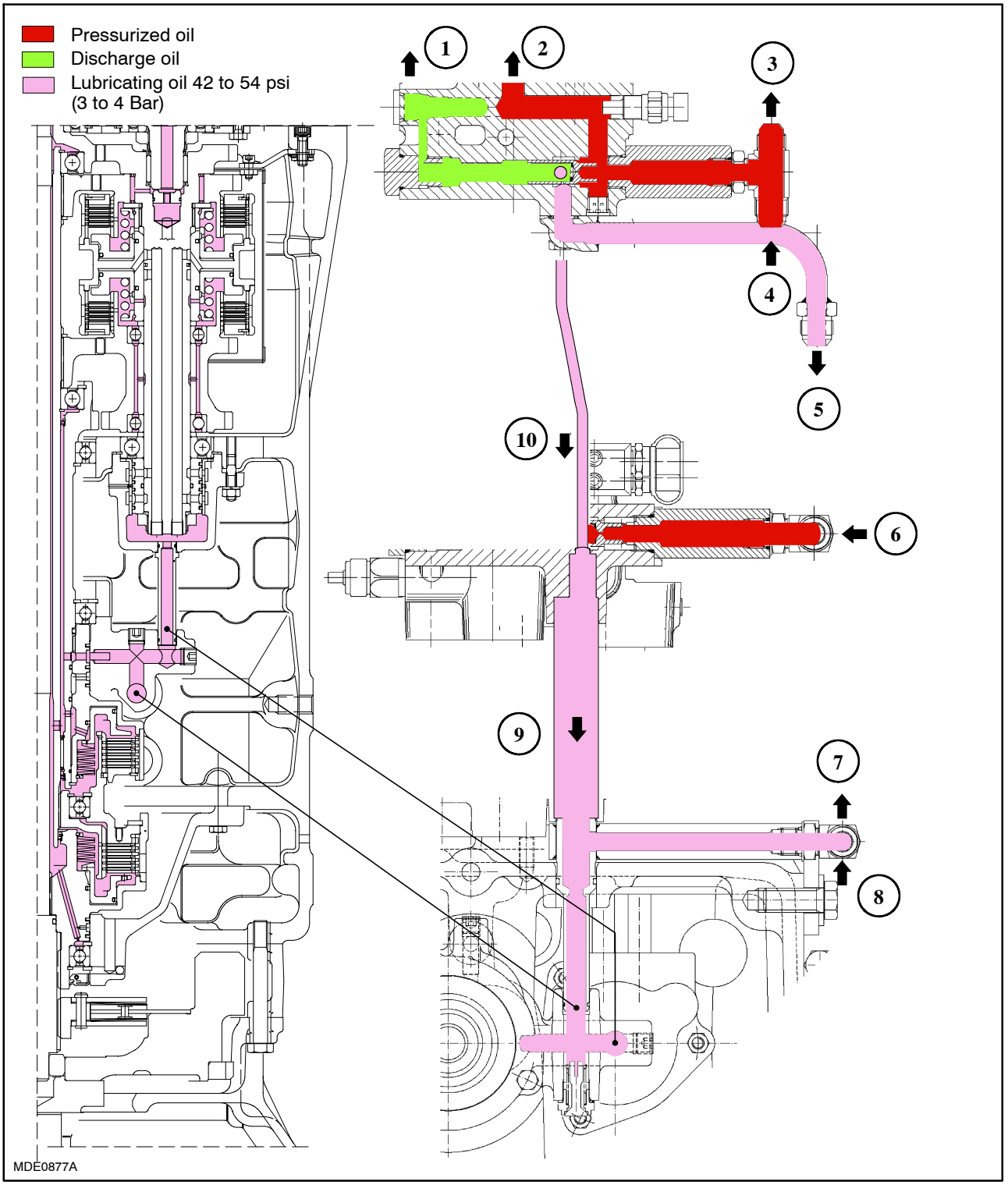
NOTE: *Leave the striker (1) and nut in this position even when replacement operations are terminated.*

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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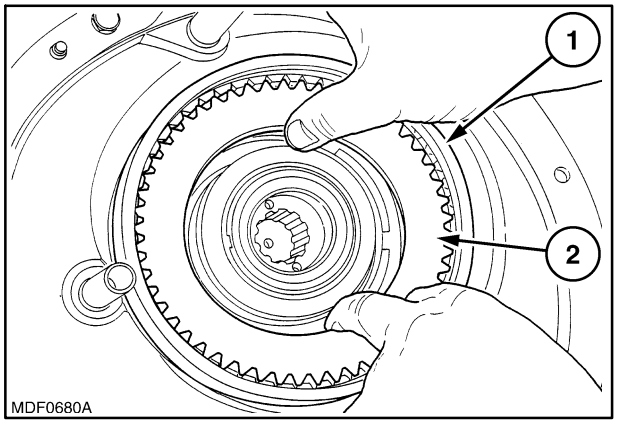
Power Shuttle Transmission with Dual Command - Lubrication Circuit

1. Discharge oil
2. Oil to solenoid valves
3. Oil to the differential lock, four-wheel drive, power take-off and p.t.o. brake
4. Pressurized oil from the pump
5. Hot oil to the heat exchanger
6. Pressurized oil from the pump
7. Power take-off lubrication
8. Cold oil from the heat exchanger
9. Cold oil to lubrication
10. Cold oil to the by-pass valve

Installing on Clutch Casing

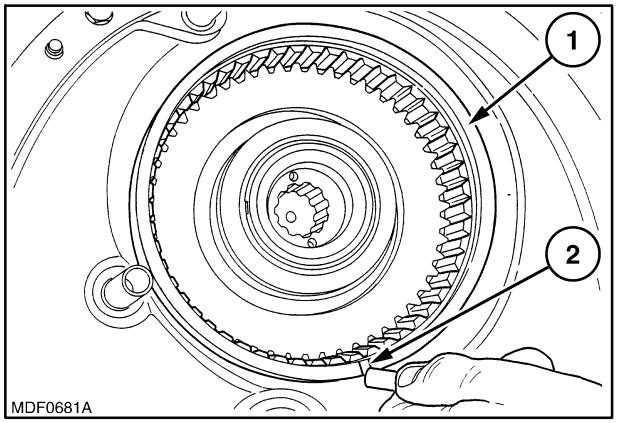
Install the clutch disk assembly on the clutch casing as follows:

1. Insert the first metal disk (2) on the clutch casing (1).



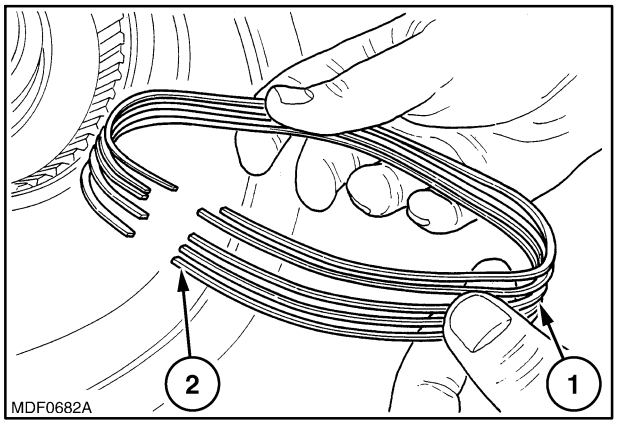
51

2. On the clutch casing (1) mark a reference point (2) for orientation of the splits in the spring washers during the assembly operation.



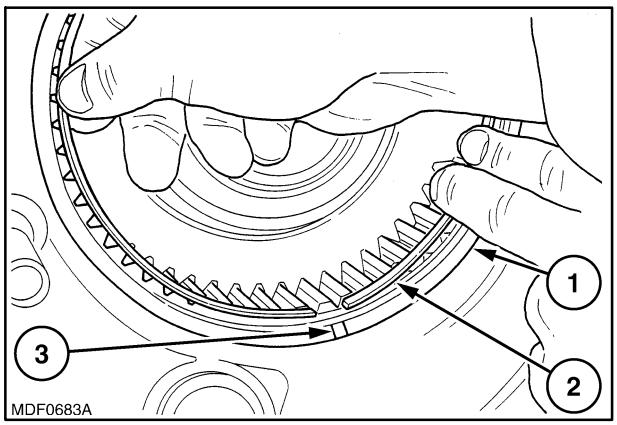
52

3. Correct orientation of the waves (1) and splits (2) in the spring washer are shown in the figure.



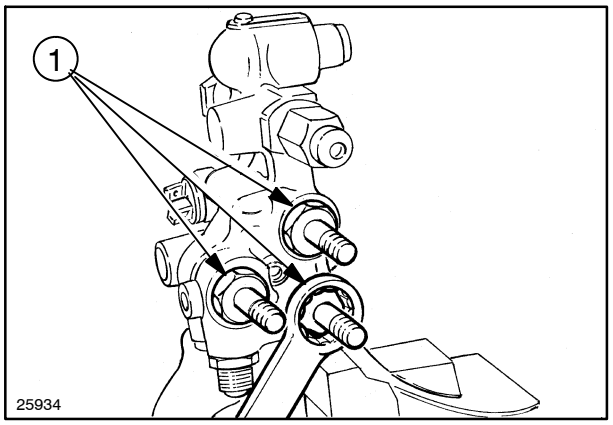
53

4. Insert the first spring washer on the clutch casing (1), keeping the split of the spring (2) aligned with the reference mark (3) previously made.



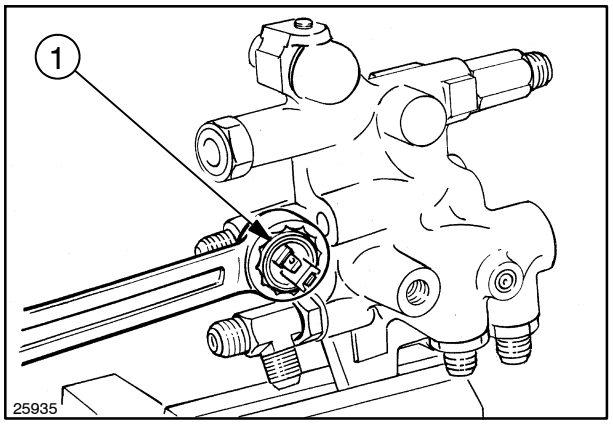
54

7. Remove the three pins (1) on the solenoid valves. Inspect the seals and replace if necessary.



15

8. Remove the FWD pressure gauge (1); and check its condition.



16

Assembly

To assemble the Services control valve, proceed as follows:

1. Check all the seals and replace if necessary.
2. Check and clean all mechanical parts.
3. Install the FWD pressure gauge (1, fig.16).
4. Install the three pins on the solenoid valves and tighten the nuts (1, fig.15) to a torque value of (4.8 to 5.5 kgm).
5. Install the coils (1, fig.14) on the solenoid valves, tighten the nuts (2).
6. Install the plug (1, fig.12).
7. Assemble the pressure regulating valve parts as shown in fig.13.
8. Install the differential lock delivery union (7).

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.

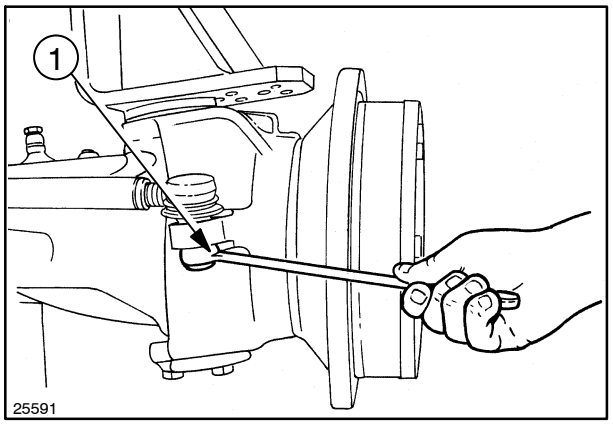
	380000251	Front axle overhaul stand.
	380000227	Front differential unit removal-installation hook.
	380000255	Front axle differential casing overhaul support.
X	**380000268**(3)	Wrench for front pinion ring nut.
X	**380000248**(3)	Pinion bearing adjustment tool.
X	**380000257**(3)	Front pinion retaining wrench.
	380000249	Universal gauge for positioning of front pinion.
X	**380000253**(3)	Wrench for front differential case bearing adjustment ring nut.
X	**380000269**(3)	Wrench for front axle wheel hub bearing retaining ring nut.
	380000270	Pair of grips for front axle hub bearing extraction.
	380000265(1,2)	Front axle pivot pin removal tool.
	380000234	Front axle pivot bearing outer ring removal tool.
	380000235	Tool for measurement of rolling drag torque of front axle bearings.
	380000240	Universal kit for testing oil pressure for front axle differential lock engagement.
X	**380000284**(2)	Cassette seal installer.

NOTE(1): *Tool is part of tool Kit 380040100.*

NOTE(2): *Tool is part of tool Kit NH01322.*

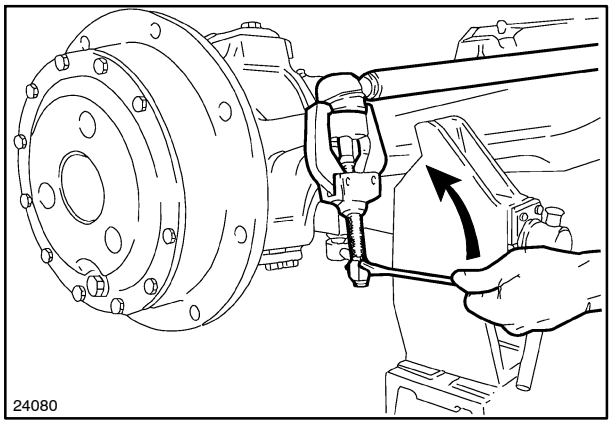
NOTE(3): *Tools are part of tool Kit NH01324.*

4. Unscrew the two nuts (1) locking the track rod.



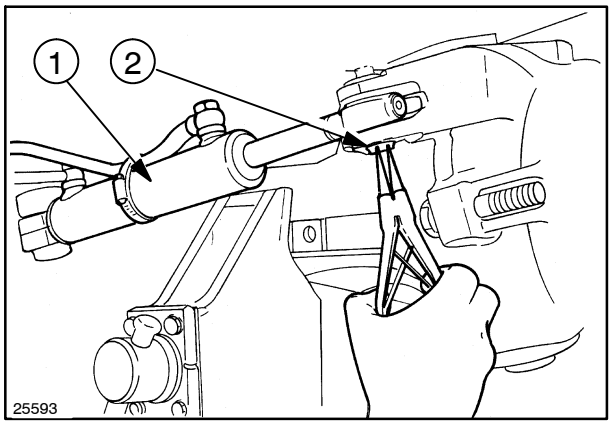
26

5. Using an extractor, extract the pins from the seats on the stub axle housing, removing the track rod.



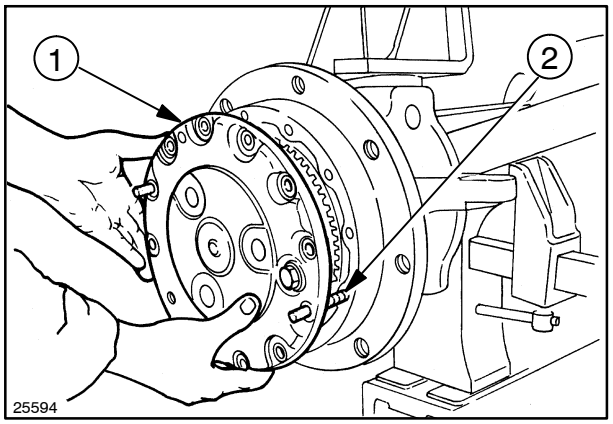
27

6. Remove the circlips (2) from the cylinder rod pivot pins, unscrew the cylinder (1) pin retaining bolts, extract the pins and remove the two cylinders. Remove the four pins, washers, spacers and cylinders, complete with pipes.



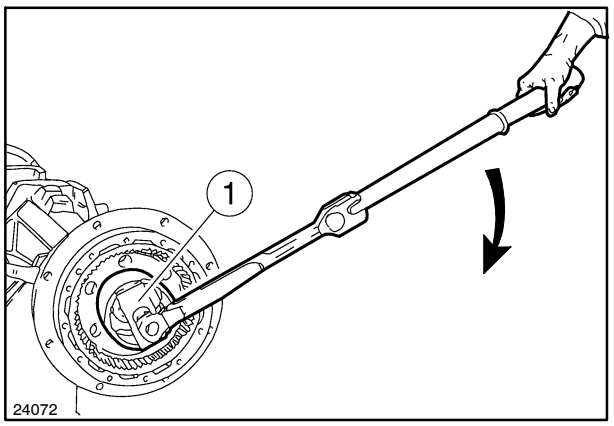
28

7. Take out the bolts (1) securing the left-hand final drive cover. Tighten two pins (2) and, using an extracting tool screwed into the oil drainage plug hole, remove the cover (1).



29

4. Progressively tighten the ring nut, using the torque wrench and wrench **380000269** (1) to obtain a torque value of 392 Nm (289 ft.-lbs.) at the same time, rotate the wheel hub to ensure that the bearings are correctly seated.
5. Measure the rolling resistance (Rt) of the wheel hub using the relative torque wrench, or a spring scale and cord positioned on the base of the wheel disk flange.



72

6. Loosen the ring nut by **half a turn** and measure the rolling resistance (R) as described previously. The difference between the two measurements is the rolling torque value of the wheel hub bearings (Rc):
7. Rc = Rt - R = 5.9 to 14.7 Nm (4 to 11 ft.-lbs.) or if measured with a torque meter.
8. Rc = Rt - R = 10.58 to 26.45 lbs. (4.8 to 12 kg)
9. If the value is less than a 5.9 Nm (4 ft.-lbs.) or, with the spring scale, 10.58 lbs. (4.8 kg) replace the relevant parts and repeat the test.
10. Progressively tighten the ring nut, using the torque wrench and wrench **380000269** (1) to obtain a torque value of 392 Nm (289 ft.-lbs.); at the same time, rotate the wheel hub to ensure that the bearings are correctly seated.
11. Carefully secure the ring nut.
12. Before reassembling the epicyclic final drive casing, carefully clean and degrease the mating surfaces, then apply sealing compound [approx. 0.0787 in. (2 mm)] along the marked line shown in fig. 96.
13. Assemble the epicyclic final drive casing, complete with gears.
14. Fill up the front epicyclic final drive (for recommended products and quantities see Section 00).
15. Install the track rods.

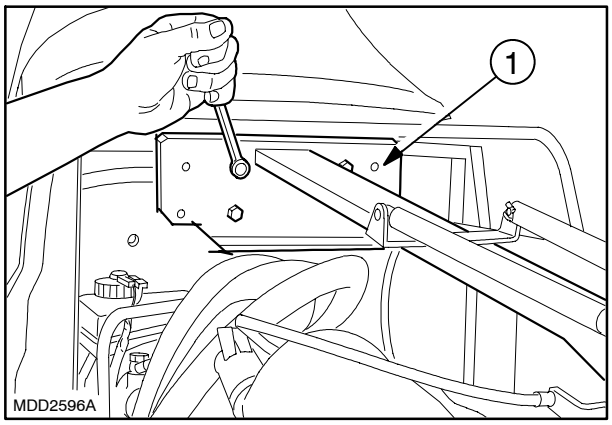
FINAL DRIVE DATA

		TL80A TL90A TL100A
Type		epicyclic with three planetary gears with straight toothing
Gear ratio		13:(13+65)= 1:6
Thickness of planetary gear adjustment rings (8, figs. 12 and 13)	in. (mm)	0.0015 (0.0393) (1)
Adjusting end float of planetary gear casing		see page 64
Thickness of planetary gear casing end float adjustment rings (10, figs. 12 and 13)	in. (mm)	0.1771 - 0.1811 - 0.1850 - 0.1889 - 0.1929 - 0.1968 - 0.2007 - 0.2047 - 0.2086 - 0.2125 - 0.2165 - 0.2204 - 0.2244 - 0.2283 (4.5 - 4.6 - 4.7 - 4.8 - 4.9 - 5.0 - 5.1 - 5.2 - 5.3 - 5.4 - 5.5 - 5.6 - 5.7 - 5.8)

TIGHTENING TORQUES

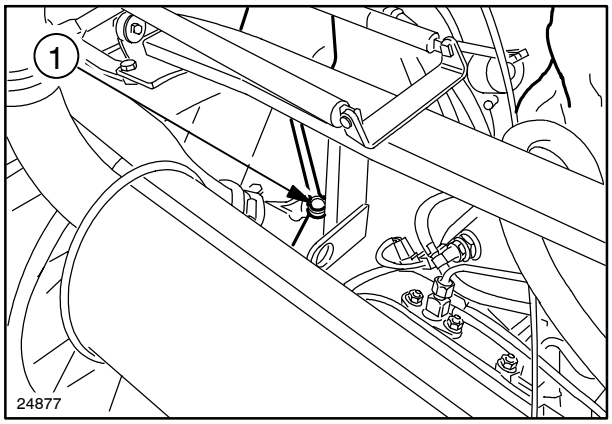
PARTS TO BE TIGHTENED	Thread	Tightening torque	
		Nm	ft-lbs
Gearbox-transmission casing upper cover retaining bolts (C_1, fig. 1)	M 10 x 1.25	59	44
Bolts securing lift to rear transmission casing (C_2)	M 12 x 1.25	98	72
Retaining bolts securing power take-off casing to gearbox-transmission casing (C_3)	M 16 x 1.5	221	163
Bolts securing flex bar to the gearbox-transmission casing (C_4)	M 16 x 1.5	221	163
Nuts for stud bolts securing final drive casing to gearbox-transmission casing (C_5)	M 14 x 1.5	176	130
Nuts for drive wheel ballast ring retaining bolts (C_6)	M 14 x 1.5	98	72
Locknuts for drive wheel hub plate disk (C_7)	M 18 x 1.5	255	188
Nuts for bolts securing steel plate disc to drive wheel rim (C_8)	M 16 x 1.5	245	181
Drive wheel axle retaining bolt (C_9)	M 16 x 1.5	250	184
Drive retaining bolts (C_{10})	M 12 x 1.25	123	91
Drive support retaining bolts (C_{11})	M 10 x 1.25	61	45
Driven gear shaft locknut (C_{12})	M 32 x 1.5	294	216
Retaining bolts securing clutch casing to gearbox-transmission casing	M 12 x 1.25	98	72
Retaining bolts securing drive casing to gearbox-transmission casing	M 12 x 1.25	98	72
Nuts for drive wheel rim - RAIL disk retaining bolts	M 20 x 1.5	245	181
Nuts for drive wheel hub - fixed disk retaining bolts	M 18 x 1.5	314	232

5. Remove the hood support rear bracket (1) retaining bolts.



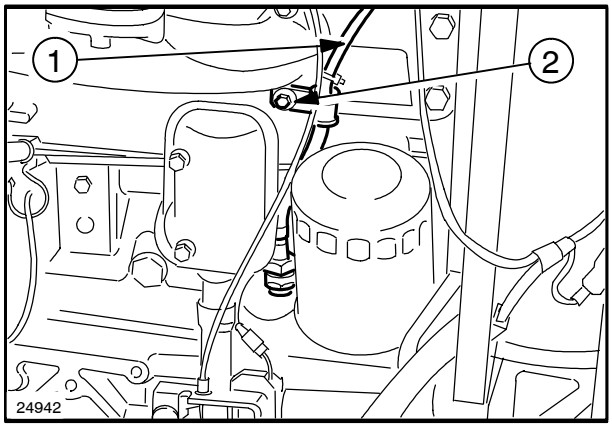
18

6. Remove the hood support front bracket retaining bolts (1).
7. Disconnect the main electrical connections.



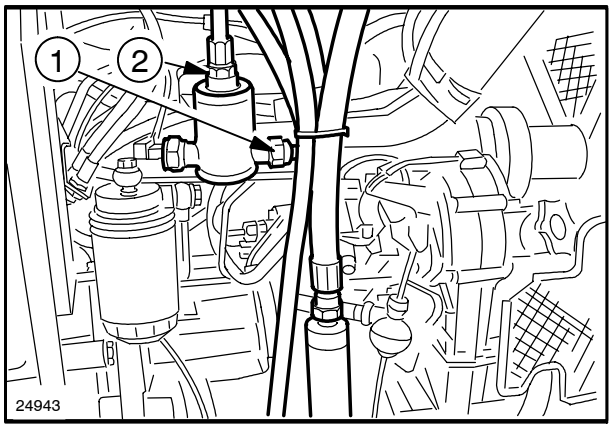
19

8. Disconnect the rev counter (1) cable on the engine and unscrew the bracket retaining bolt (2).



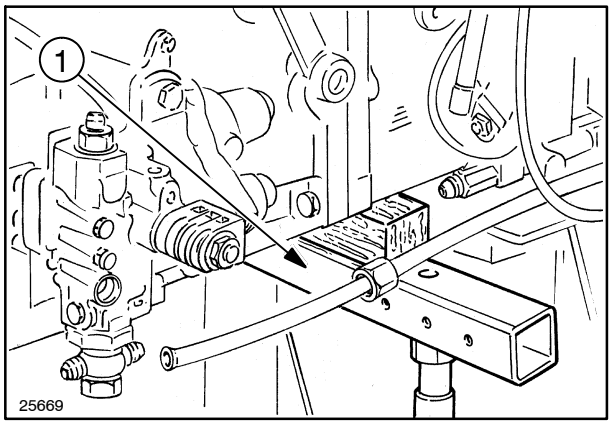
20

9. Disconnect the piping (1 and 2) on the anticavitation tank.



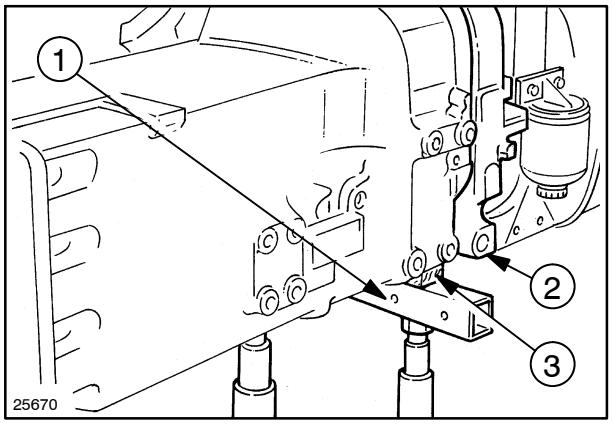
21

72. Position one mobile stand (1) of tool **380000569** under the front part of the transmission-gearbox casing and the other mobile stand under the rear part of the casing.



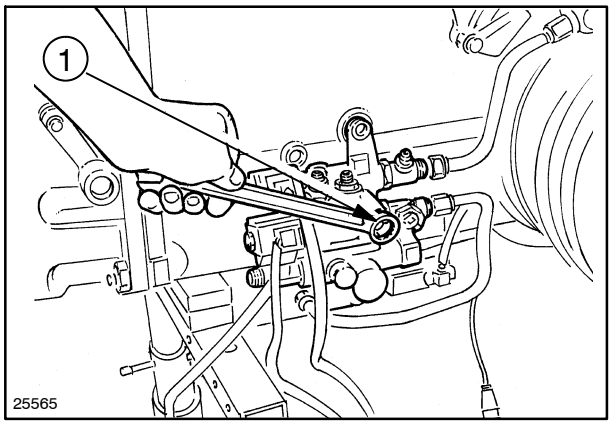
77

73. Position the fixed carriage (1) of tool **380000569** under the clutch casing and insert a wooden block (3) in between. Unscrew the retaining bolts and remove the rear wheels; if necessary, position two fixed stands under the final drives.



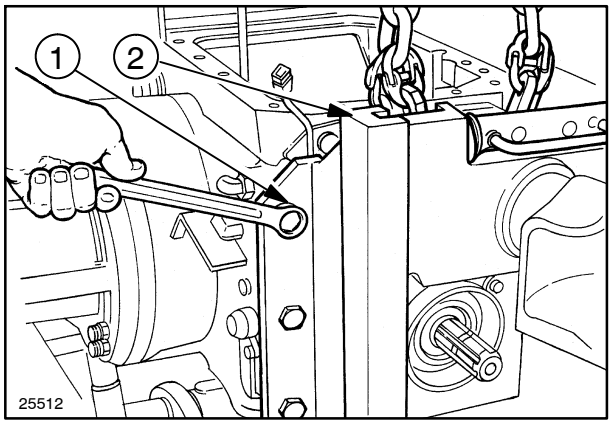
78

74. Remove the bolts (1) securing the services solenoid valve support to the gearbox-transmission casing and remove it.



79

75. Using a chain, hitch the towbar to the hoist, unscrew the six retaining bolts (1) and detach the towbar (2).



80

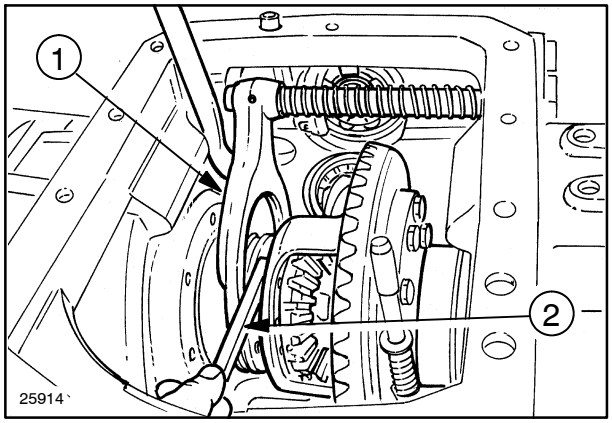
Differential lock engagement sleeve

CAUTION

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

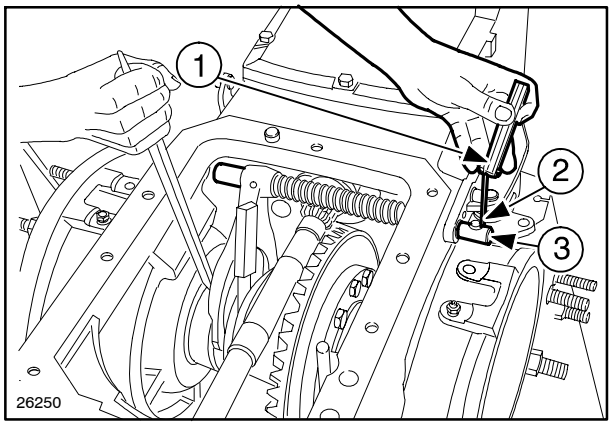
Proceed as follows.

43. Assemble the differential lock release device (mechanically operated model) or the plate (version with hydraulic control) without the adjusting shim.
44. Insert gauge **50041** (2, fig. 2) with the 0.3188 to 0.3228 in. (8.1 to 8.2 mm) shim between the sleeve and the differential casing, so that it makes contact with the sliding surfaces of the sleeve on the casing.
45. Using a crowbar, bring the sleeve into contact with gauge **50041** and the differential casing, adjusting the fork (1) to the position of the gauge.



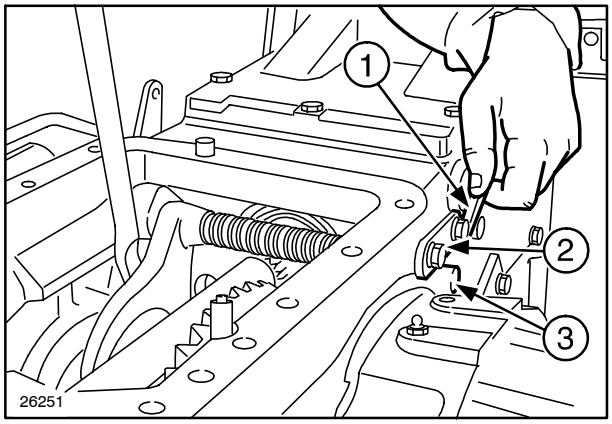
120

46. Using a feeler gauge (1), measure the clearance between the control pin (2) and the seat on the rod (3) (mechanically operated model).



121

47. Using a feeler gauge (1), measure the clearance between the plate (2) and the seat on the rod (3) (hydraulically operated model).
48. Position the required shim under the differential lock release control device (mechanically operated model) or under the plate (2) (hydraulically operated model) and secure in position using the bolts.



122

Op. 27 120 34
DRIVE WHEEL SHAFT

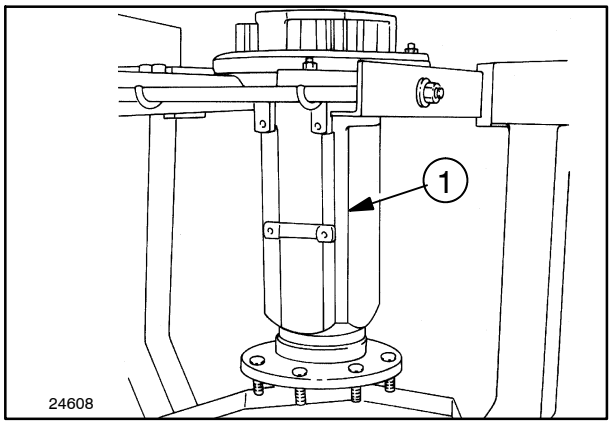
Disassembly

CAUTION

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

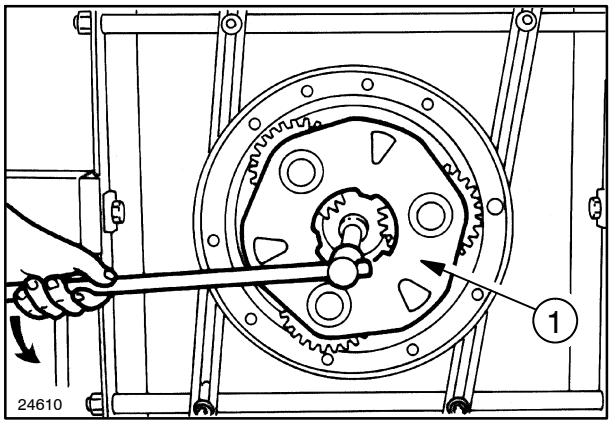
With the final drive casing removed from the rear transmission, proceed as follows.

1. Position the final drive casing (1) on a rotating stand.



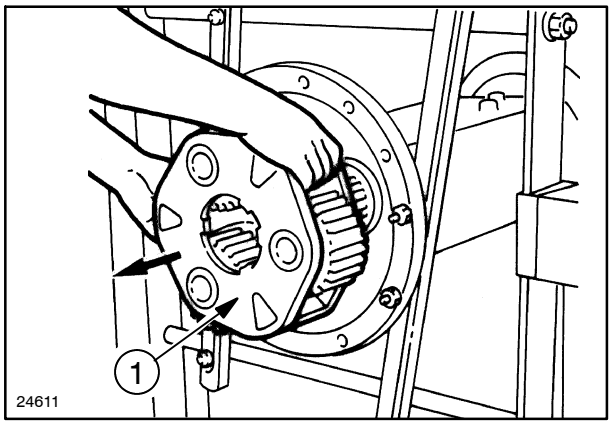
153

2. Remove the bolt (1) securing the driven gear support on the drive wheel shaft and remove the safety plate.



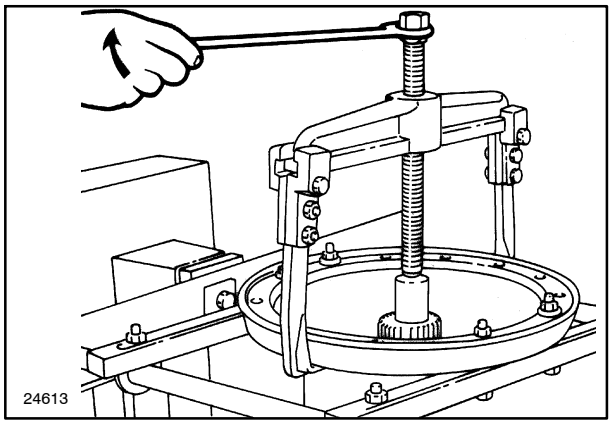
154

3. Extract the support (1) from the driven gears and remove the end float adjuster shim from the support.



155

4. Using an extractor, extract the drive wheel shaft (1).



156

Op. 31 112 45 e 31 112 48
POWER TAKE-OFF SHAFTS

Disassembly

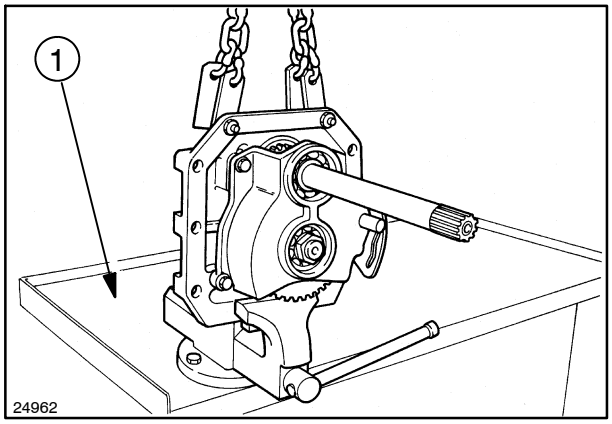
CAUTION

Handle all parts carefully.

Do not put your hands or fingers between parts.

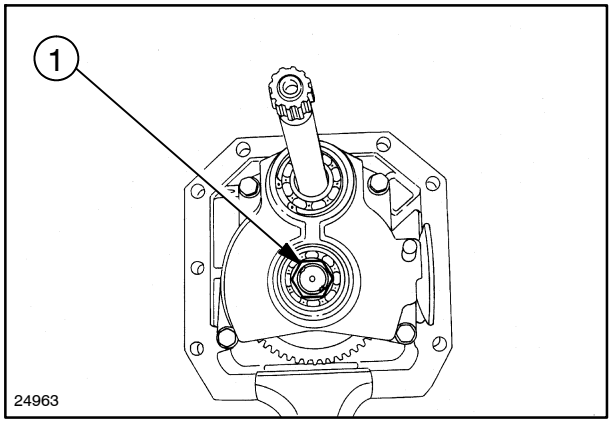
Wear suitable safety clothing – safety goggles, gloves and shoes.

1. Position the PTO unit in a vice on a workbench (1).



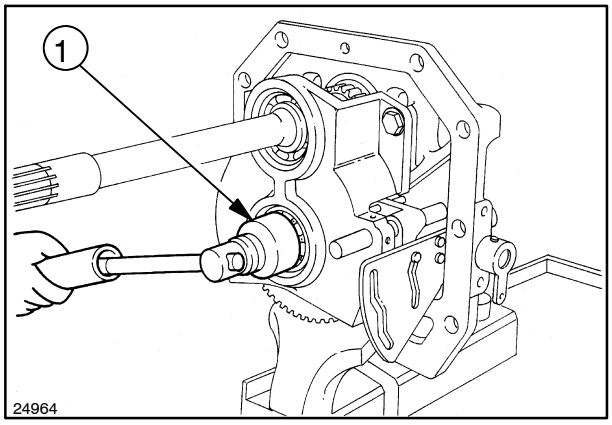
20

2. Using a punch, release the securing ring (1) on the driven shaft ring nut.



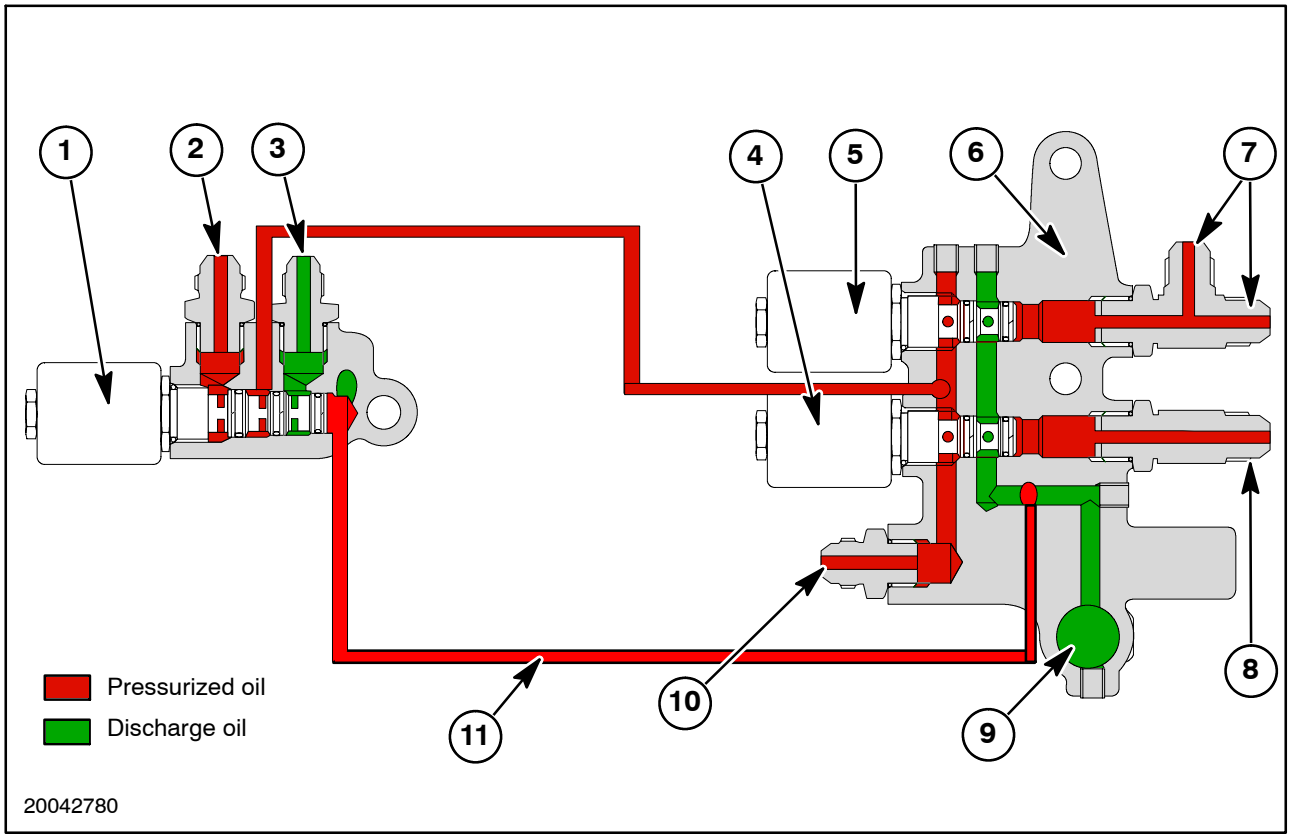
21

3. Remove the driven shaft ring nut (1).



22

PTO On / PTO Brake Off

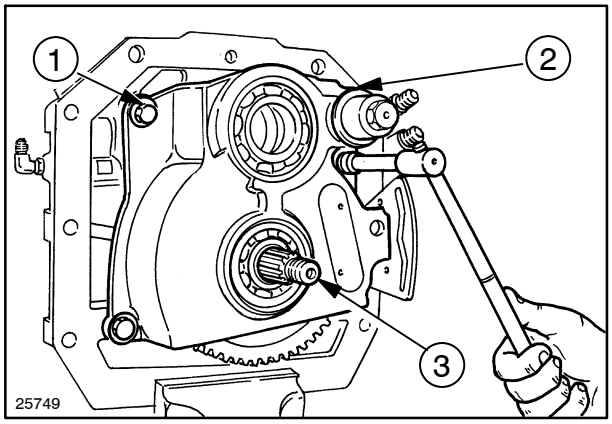


9

(Models with Power Shuttle Transmission)

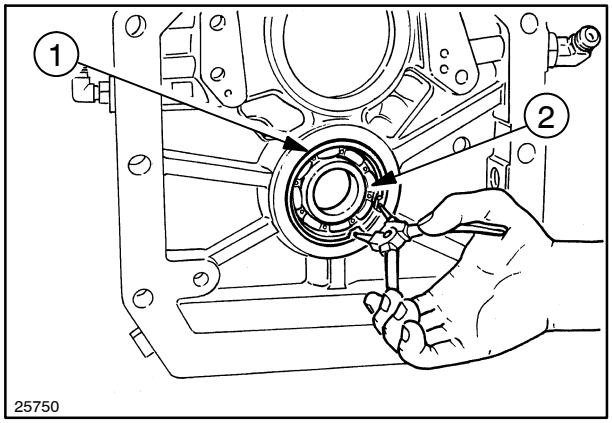
1. PTO Clutch/brake solenoid
2. PTO Clutch oil delivery
3. PTO Brake oil delivery
4. FWD solenoid
5. Diff-Lock solenoid
6. Service control valve
7. Front / Rear Diff-Lock oil delivery
8. FWD oil delivery
9. Discharge
10. Oil inlet from pump
11. PTO return oil

8. Remove the four bolts (1) securing the gear support (2). With the pliers compress the terminal parts of the PTO terminal shaft, remove the snap ring and extract the shaft (3) from the rear part. Remove all parts, including the thrust washers.



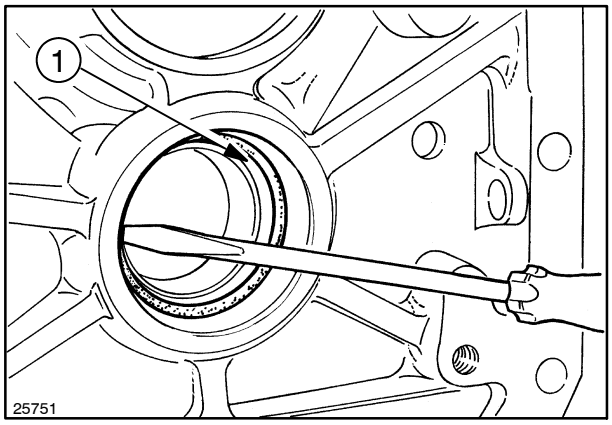
41

9. Remove the retaining circlip (1) and extract the bearing (2) from the PTO cover.



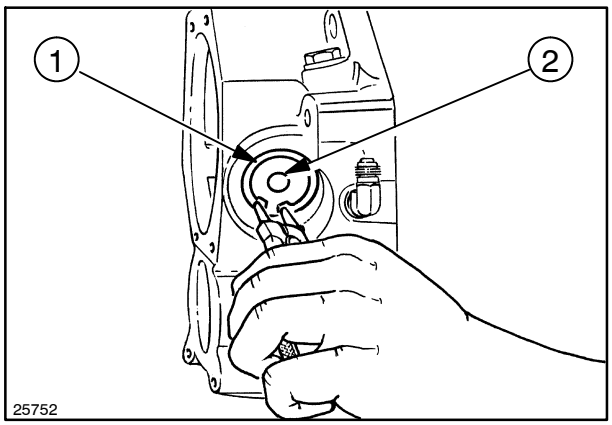
42

10. Using a screwdriver extract the oil seal (1) from the PTO cover.



43

11. With pliers, remove the snap ring (1) and the cover (2).



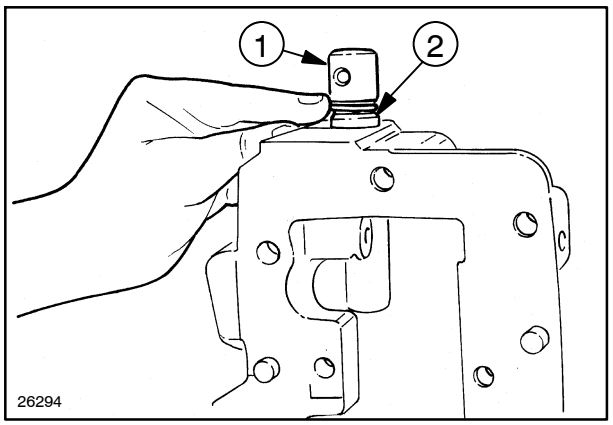
44

Assembly

CAUTION

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

1. Refer to the illustrations of fig. 2 for the correct orientation of the various parts.
2. Before reassembling the parking brake support on the rear transmission casing, carefully clean and degrease the mating surfaces, then apply sealing compound (approx. 0.0787 in. (2 mm)) along the marked line shown in the drawing below.
3. Apply the torque settings listed on page 3.
4. Insert the internal lever (1), without O-ring, on the support until the O-ring seat is fully visible. Place the O-ring (2) in the seat and push the internal lever (1) into position, securing with the screw.

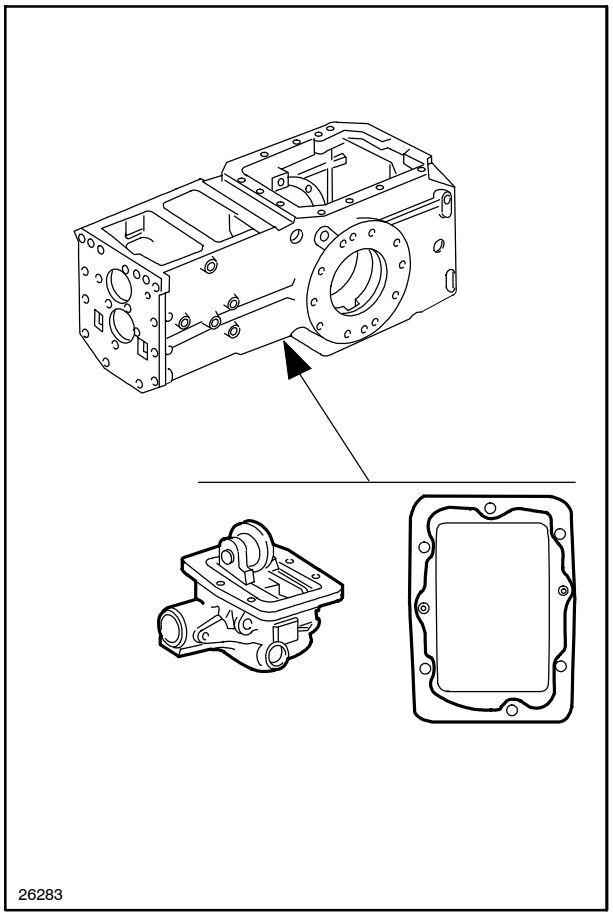


12

5. Assemble the parking brake external lever, securing it on the shaft with the bolt.
6. Fit the brake sectors and relative support screws.
7. Fit the pin, brake disk and gear unit.

Installation

1. Position and secure the brake sectors support to the transmission-gearbox casing.
2. Apply suitable sealant to transmission casing.
3. Refit the services solenoid valves support.
4. Connect the return spring, control wire.
5. Fill up the rear transmission-gearbox casing. for products and quantities see Section 00.
6. Connect the negative cable to the battery.



13

HYDRAULIC SYSTEM – GENERAL DESCRIPTION

The TLA series tractor is equipped with a dual pump, low-pressure and high-pressure, open-center hydraulic system. Both systems share a main hydraulic filter, a main relief valve, and the rear axle housing as a reservoir.

Low Pressure, Steering and Lubrication System

For a description of the Low-pressure hydraulic system, refer to the following Chapters:

Chapter 6 – Low-pressure Hydraulic System

Chapter 7 – Low-pressure Hydraulic System Overhaul

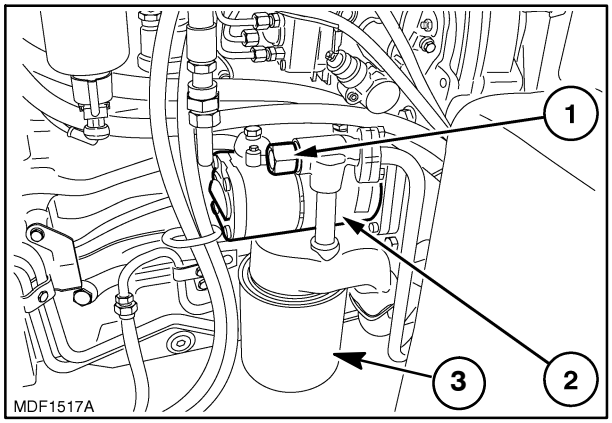
High Pressure System Description and Operation

The high-pressure system supplies oil for the operation of the hydraulic lift, remote control valves, and external equipment. In addition, the high-pressure system in combination with the 3-point hitch provides accurate and sensitive control of implements over a wide range of operating conditions.

The high-pressure system is an open-center type, which allows for the continuous flow of oil through the system and back to return. This type of system reduces wear on the control valve seals, and prevents damage to components caused by prolonged static pressure.

A filter assembly (3), located on the left-hand side of the engine under the tandem pumps (2), cleans the oil before it enters the high-pressure system. A relief valve (1) installed in the top of the filter housing on models with BOSCH valves, and in the rear remote valve stack on models with KONTAK valves protects the system from overload conditions.

In the high-pressure system, the rear remote valves have oil priority over the hydraulic power lift (HPL). When operating a remote valve(s), oil flows from the remote valve to the actuated cylinder. Return oil from the cylinder flows back through the remote valve assembly to sump. The hydraulic lift is not operable during operation of a remote control valve.



2

Oil Flow Priority

Oil flow for tractors configured with the following components	Unload Valve	Auxiliary Control Valve	Mid-mount Valve	HPL Control Valve
Rear Remote Valve(s)	N/A	#1	N/A	#2
Rear Remote Valve(s) & Mid-mount Valve	N/A	#1	#2	#3
Rear Remote Valve(s) & Unload Valve	#1	#2	N/A	#3
Rear Remote Valve(s) & Unload Valve & Mid-mount Valve	#1	#2	#3	#4

SECTION 35 - HYDRAULIC SYSTEMS

Chapter 2 - Mechanically Operated Hydraulic Power Lift (HPL)

CONTENTS

OVERHAUL

Op. 35 110 30

HPL COVER

Removal

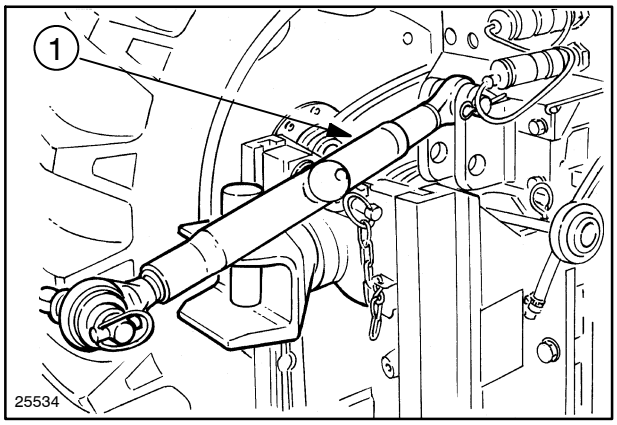
DANGER

Lift and handle all heavy parts using suitable lifting equipment.

Make sure that the load is supported by means of suitable slings and hooks. Check that no one is in the vicinity of the load to be lifted.

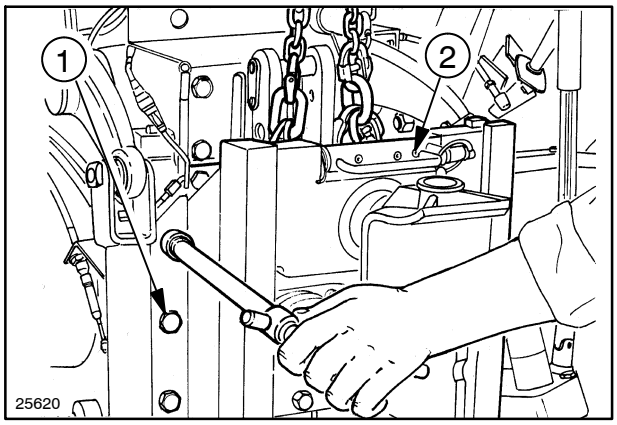
To detach the hydraulic lift from the rear transmission casing, proceed as follows.

1. Remove the cab or platform. Refer to Section 90.
2. Remove the top link (1) of the three-point linkage.



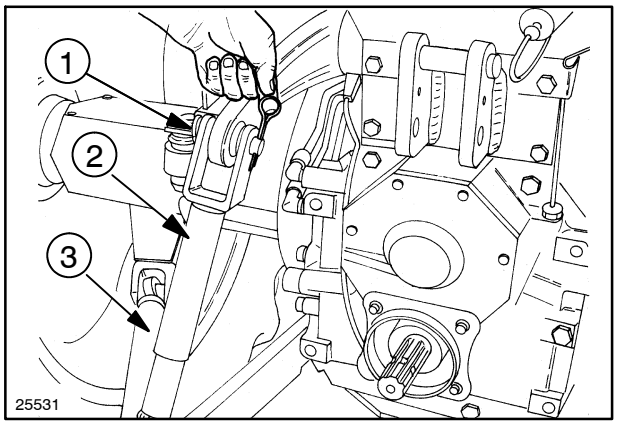
8

3. Remove the bolts (1) and, using a chain and hoist, remove the hitch hook unit (2) from the PTO housing.



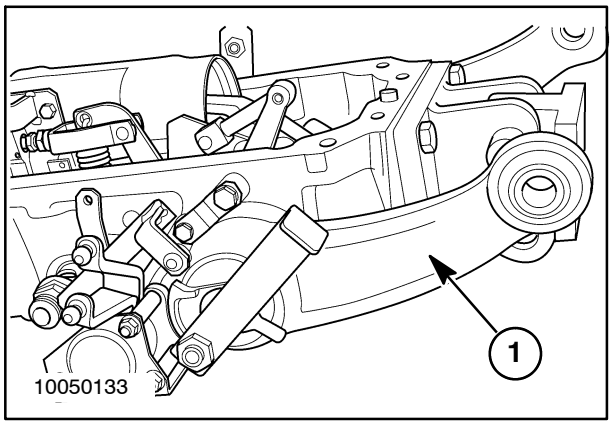
9

4. Remove the pins (1), vertical tie-rods (2), and anti-swing rods (3).



10

11. Position the lift arms in the fully lowered position (arms (1) are parallel with the lift cover and the cross-shaft crank is away from the rear of the lift cover).



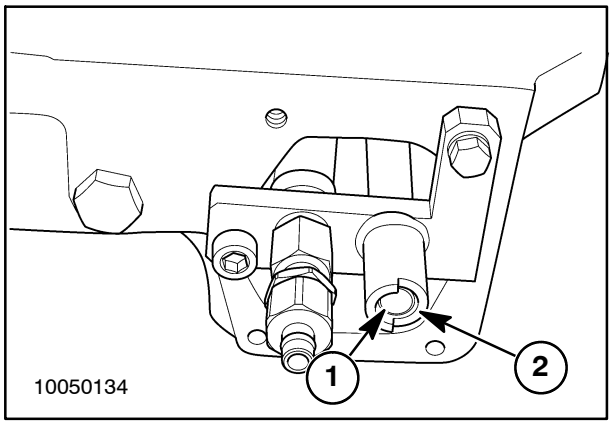
53

12. Ensure the spring loaded plunger (1) is flush or withdrawn from the inner reference surface (2) of tool 380000264

Special Tool 380000264

1. Spring Loaded Plunger

2. Inner Reference Surface



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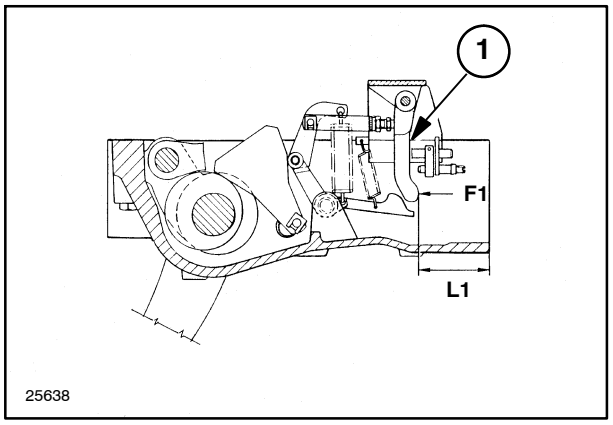
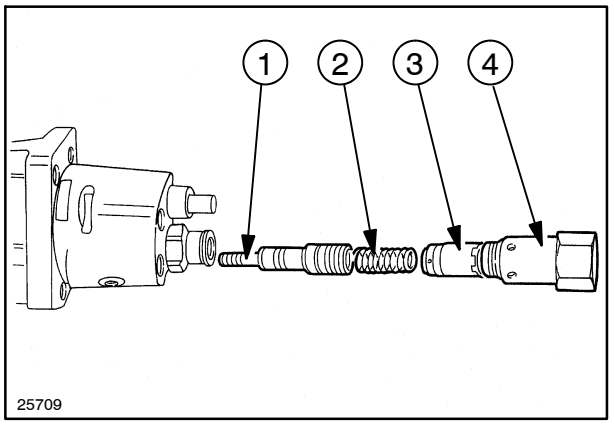
NOTE: *This corresponds to a distance greater than 86.5 mm (3.4055 in) between the end of the control lever (1) and the front plane of the lift body, which is represented by measurement (L1) with a force applied of 40 to 45 N (9 to 10 lb) on the end of the lever (F1).*



55

4. Remove the cylinder safety valve (4) and recover the arm lowering speed adjustment valve (3), the spring (2) and the pin (1).



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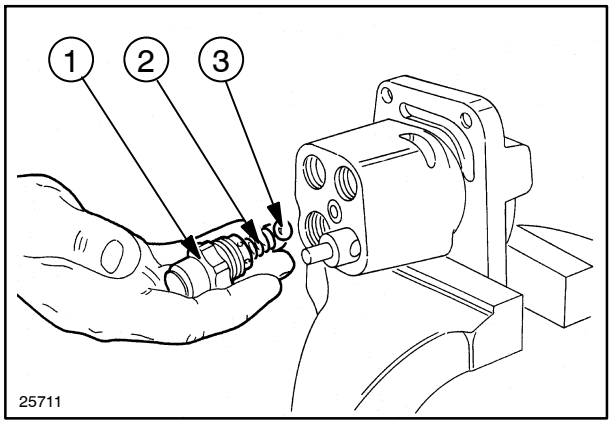
5. Remove the check valve: union (1), spring (2) and ball (3).



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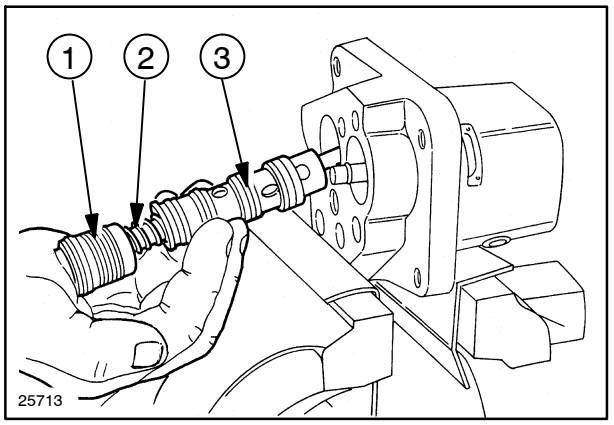
6. Extract the control valve pin (1) its seat (3) and the spring (2).



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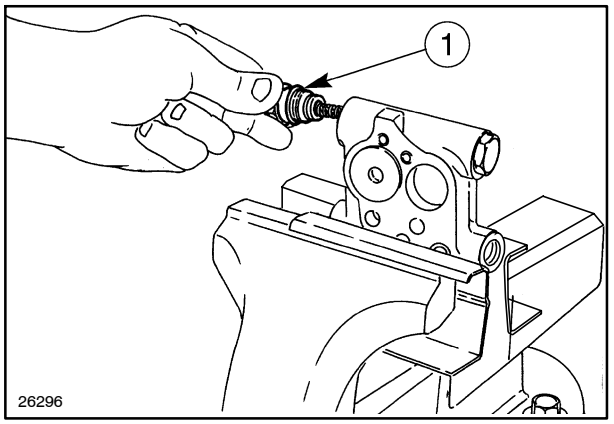
7. Remove the cap (1) and spring and the delivery control valve shutter.



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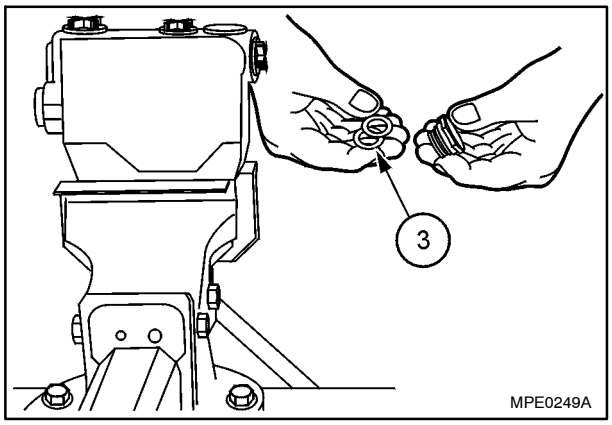
SECTION 35 - HYDRAULIC SYSTEMS

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

CONTENTS

3. Remove the adjustment shims (3).



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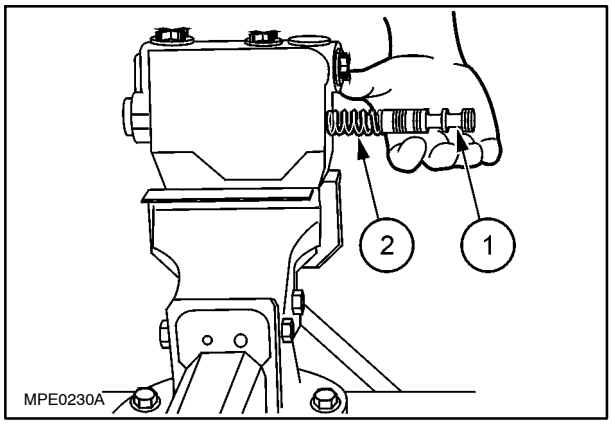
4. Extract the pin (1) and spring (2).



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SECTION 35 – HYDRAULIC SYSTEMS

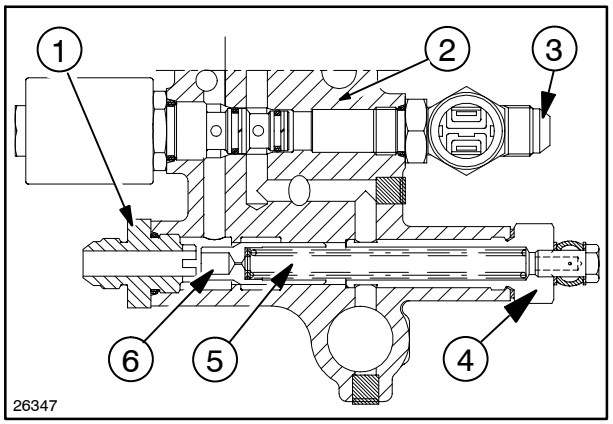
Chapter 6 – Low Pressure Hydraulic System

CONTENTS

2. Remove the differential lock delivery union (3).
3. Remove the pump delivery union (1) on the solenoid valve support (2).

On models with Mechanical Shuttle:

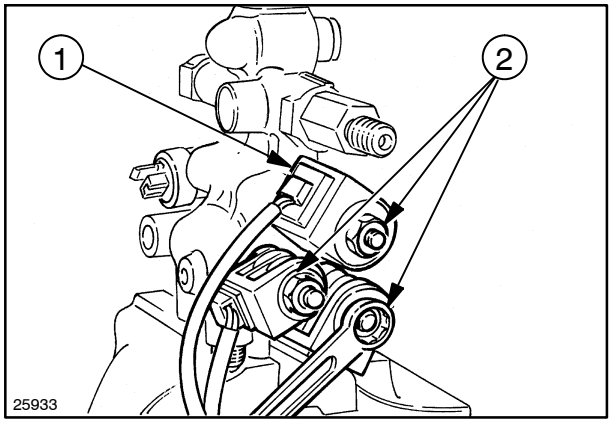
4. Remove the union connecting the pressure regulating valve to the drainage line (4).
5. Remove the spring (5) and the pressure regulating valve (6).



12

On all models:

6. Position the Services control valve support in a vice, unscrew the nuts (2) and detach the solenoid valve coils (1). (Mark the detached coils to facilitate reinstallation).



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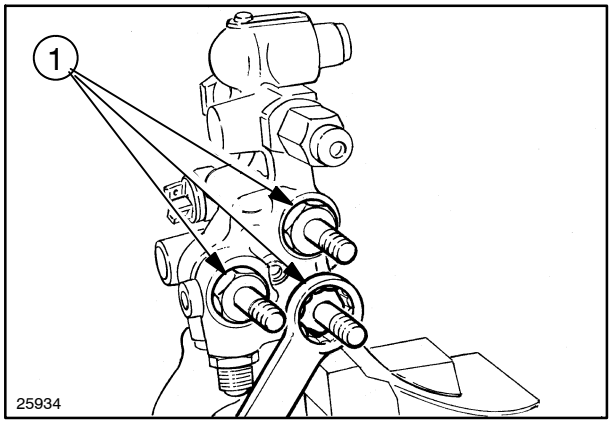
7. Remove the three pins (1) on the solenoid valves. Inspect the seals and replace if necessary.



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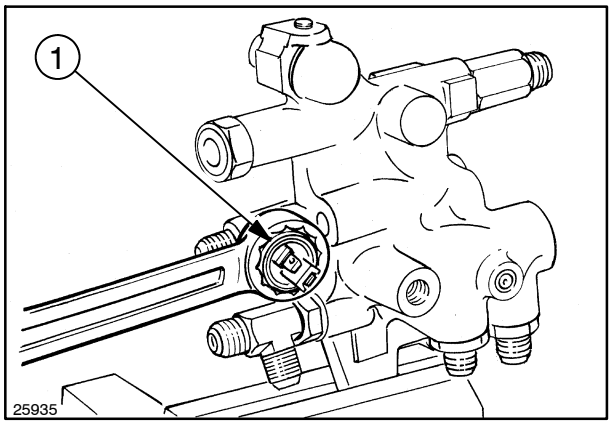
8. Remove the FWD pressure gauge (1); and check its condition.



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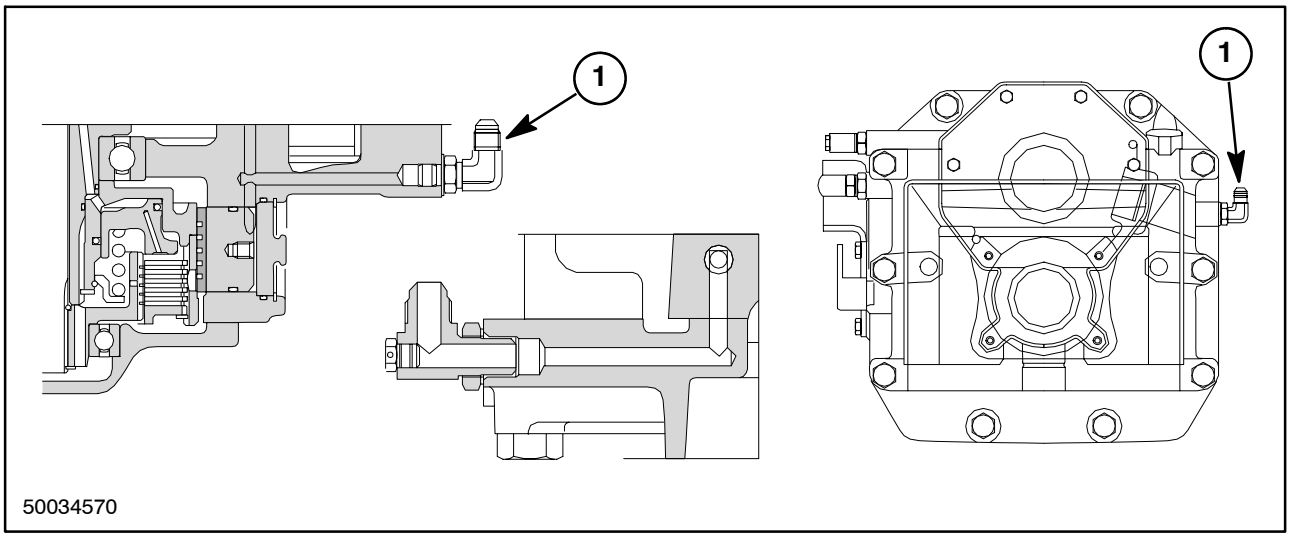

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PTO CLUTCH BRAKE OPERATING PRESSURE

1. Place a suitable container under the rear transmission housing to catch residual oil when installing test equipment.
2. Connect a 0-40 bar (0-600 psi) gauge with adapter 380001867 to the PTO brake supply port (1), located in the rear transmission housing on the right-hand side.

NOTE: *Tool Kit 380000240 contains the required pressure gauge for this operation.*

⚠ CAUTION ⚠

Ensure all the connections are tight before starting the engine.

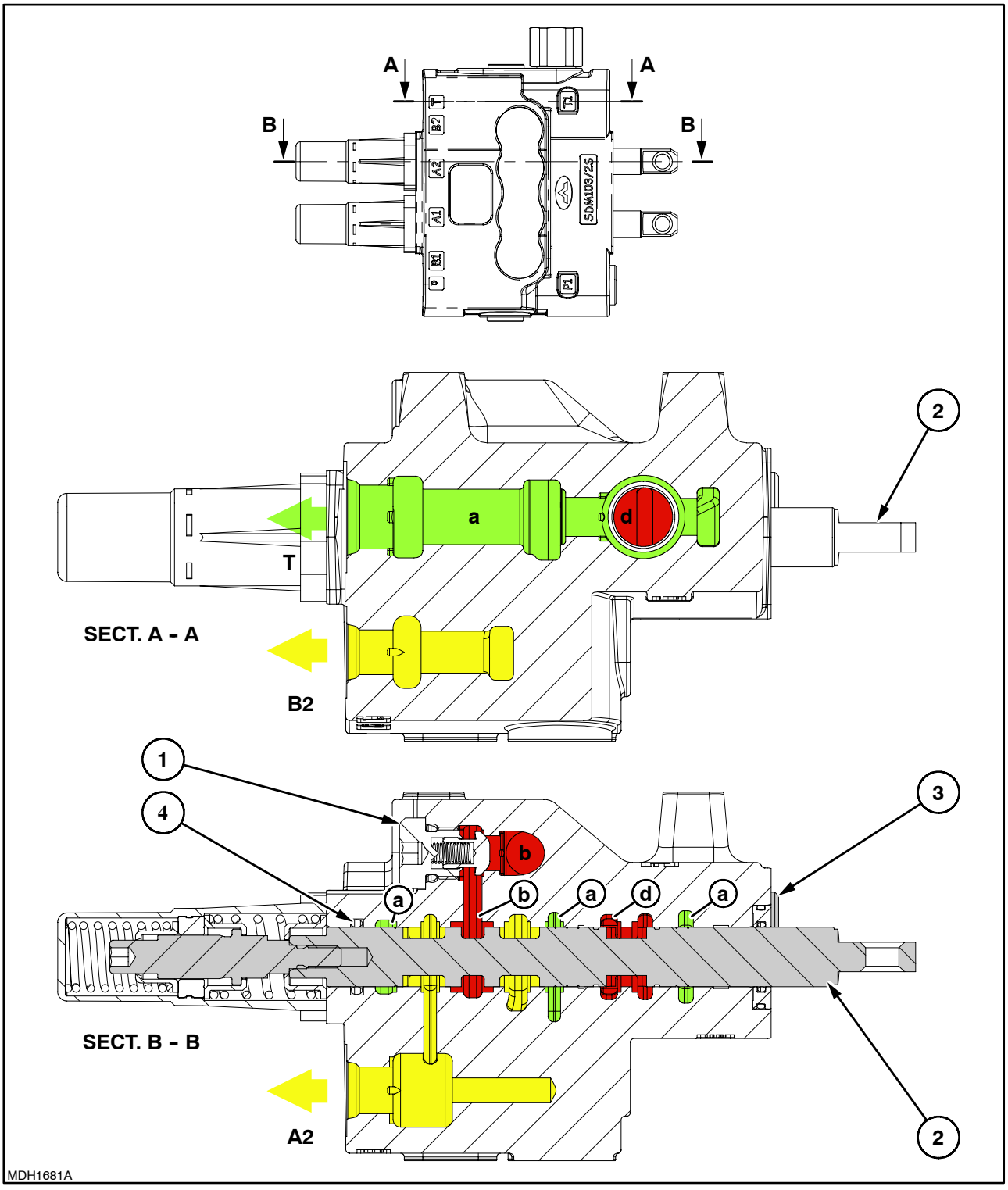
3. Start the engine and warm the oil to a temperature of 50° C (122° F).
4. Engage the PTO. The brake is OFF and the gauge should read 15.7 to 16.7 bar (228 to 242 psi).

If the pressure is not within specifications, suspect a faulty pressure regulator valve in the services control valve (Mechanical Shuttle Transmission) or in the Power Shuttle Control Valve.

5. Remove test equipment.

NOTE: *For more information on the PTO, refer to Section 31.*

2ND CONTROL VALVE



11

Oil at static rest.

Discharge oil.

Pressurized oil.

TROUBLESHOOTING (CONT.)

(cont)

Problems	Possible Causes	Solutions
Steering wheel jolts, steering uncontrollable, wheels steering in the opposite direction to the desired direction.	1. Incorrect synchronization of hydrostatic steering.	Synchronise correctly.
	2. Pipes to cylinder inverted.	Connect correctly.
The wheels do not maintain the desired alignment and continual correction with the steering wheel is necessary.	1. Hydraulic cylinder piston seal worn.	Replace the seal.
	2. Backflow valve held open by foreign bodies or damaged.	Eliminate foreign bodies and clean filter or replace the control valve.
	3. Control valve mechanical wear.	Replace the control valve.
Neutral phase of hydrostatic steering unobtainable. During manual control, operation is normal; when stopping manual control the steering wheel tends to move on its own, or remain stationary, but steering continues slowly in the direction that was initially selected ("motoring"), therefore steering must be continually corrected with the steering wheel.	1. Leaf springs, for sleeve return to neutral position, damaged or fatigued.	Replace the leaf springs assembly.
	2. Sleeve and rotating valve locked in delivery position because of the presence of foreign bodies.	Eliminate foreign bodies and clean filter.
	3. Sleeve crushed on the rotating valve due to excessive pressure.	Check the pressure relief valve calibration.
Vibrations on front wheels (shimmy).	1. Air pockets in the hydraulic cylinder.	Bleed the air and eliminate the causes of possible infiltration.
	2. Wear on mechanical joints on steering rods.	Replace the worn parts.
	3. Backflow valve held open by foreign bodies or damaged.	Eliminate foreign bodies and clean filter or replace the control valve.
Difficulty in steering in general, or in one direction.	1. Insufficient pressure.	Check the hydraulic pump and the pressure relief valve calibration.
	2. Excessive leakage inside the control valve.	Replace the control valve.

SPECIAL TOOLS

WARNING

The operations described in this section can only be carried out with the **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.

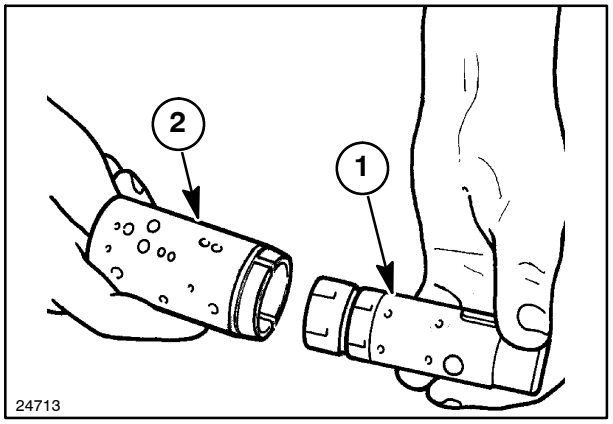
List of specific tools required for the various operations described in this Section.

	380000210	Tool for installing dust ring on control valve body.
X	**380000281**[2]	Tool for installing **ROTOGLYD** seal on rotating valve.
X	**380000305**[2]	Tool for installing **KIN-RING** seal on rotating valve.
	380000306	Plug for installing the hydrostatic steering rotating valve return springs.
	380000307	Hydrostatic steering rotor retaining lever.
	380000613[1]	Steering adapter fitting
	380000618[1]	Steering adapter fitting

NOTE[1]: *Tools **380000613** and **380000618** are part of tool kit **380040092**.*

NOTE[2]: *Tools **380000281** and **380000305** are part of tool kit **380040100**.*

14. Extract the rotary valve (1) from the valve seat sleeve (2).



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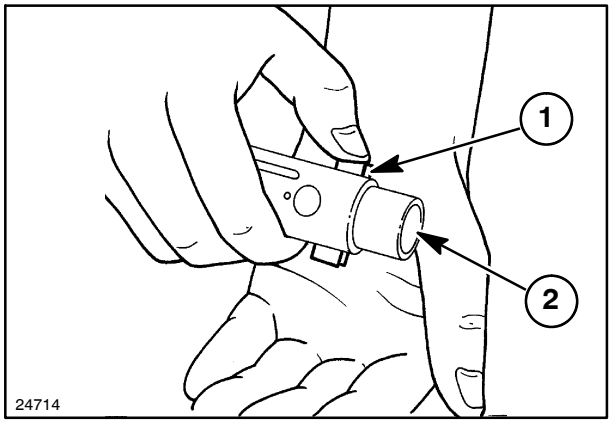
15. Remove the springs (1) from the rotary valve (2).



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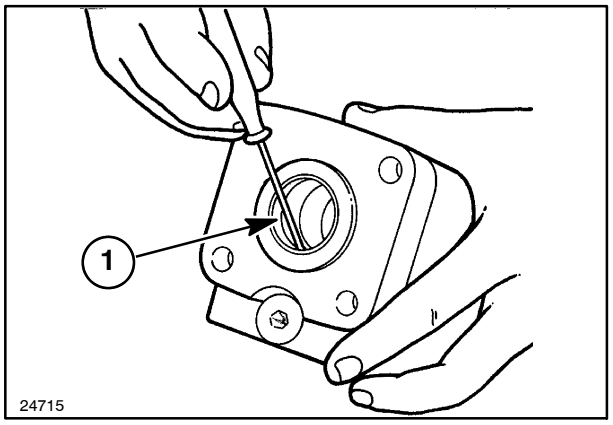
16. Remove the dust seal and the O-ring seal (1) from the control valve body.



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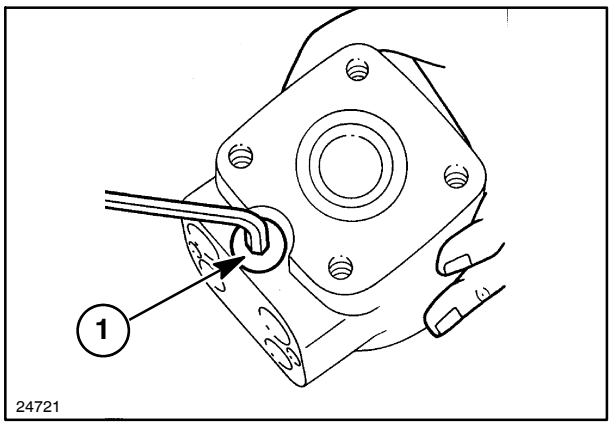
17. Remove the threaded plug (1) on the pressure relief valve and extract the washer.



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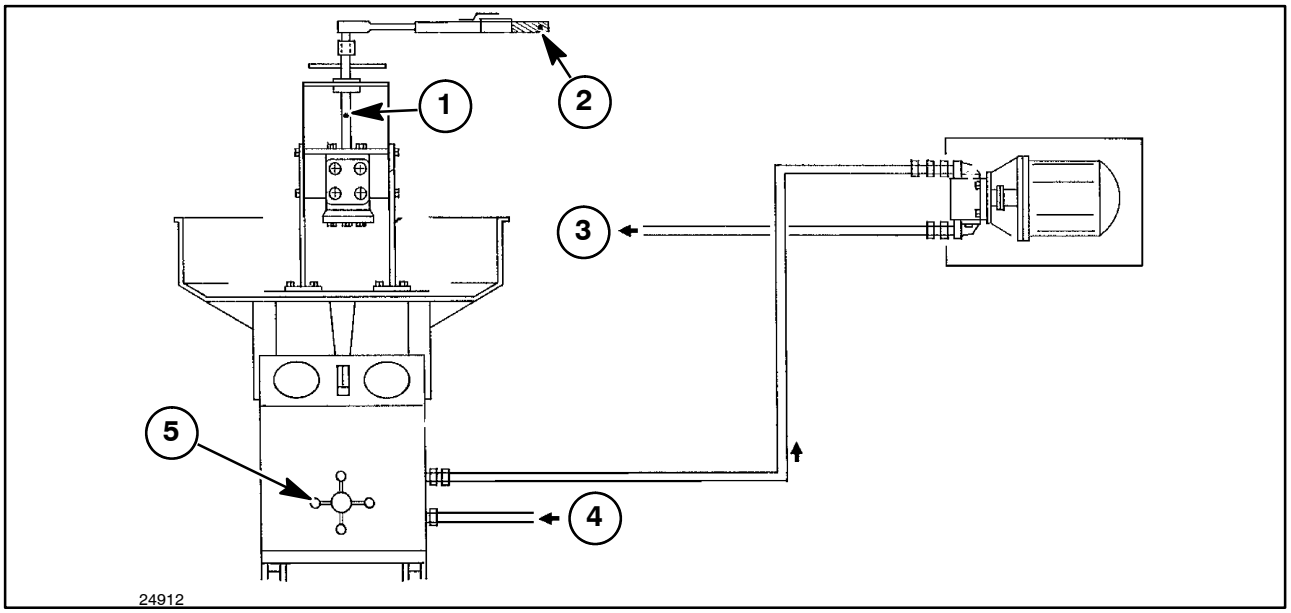
TESTING THE STEERING SYSTEM



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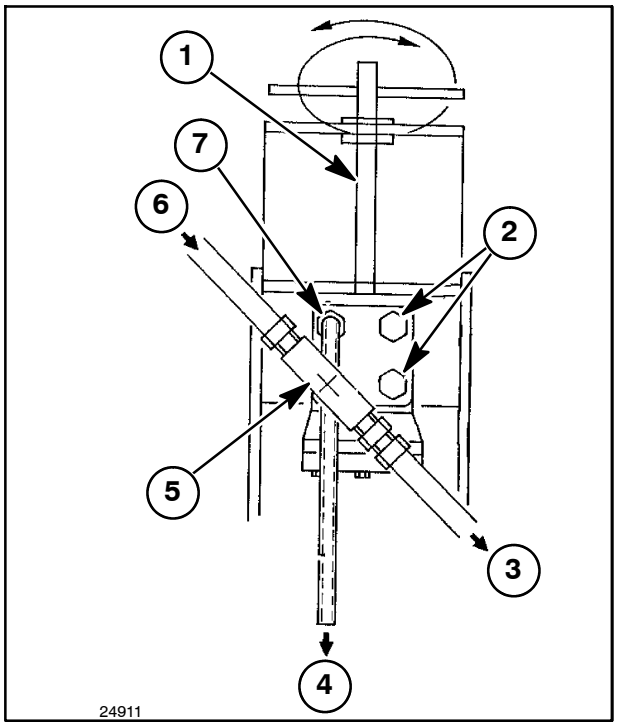
1. Control Valve Drive Shaft
2. Torque Wrench
3. Delivery Lines
4. Restriction Line
5. Hand wheel (pressure adjustment)

STEERING CONTROL VALVE

Checking Rotating Valve Wear

1. Connect the steering control valve to a test bench (where available) or to a similar set-up using figures 81 and 82 as a guide.
2. Rotate and hold the control valve drive shaft (1) completely to either the left or right steering position.
3. Increase pressure to just below 140 bar (2031 psi) for 2WD models, or 165 bar (2393 psi) for FWD models so as not to allow the relief valve to intervene.
4. Apply a torque wrench (2) to the drive shaft of the control valve and tighten to a setting of 34 Nm (25 lb-ft). Check that the rotating valve completes one full rotation in more than 10 seconds. Replace the rotating valve and sleeve within the control valve if rotation is less than 10 seconds. Refer to Power Steering Control Valve Disassembly in this chapter if needed.



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1. Control Valve Drive Shaft
2. Plugs
3. To restriction
4. To exhaust
5. Three-way Coupling
6. From Delivery
7. Discharge Coupling

Op. 44 101 46
STUB AXLE

Removal

CAUTION

Handle all parts carefully.

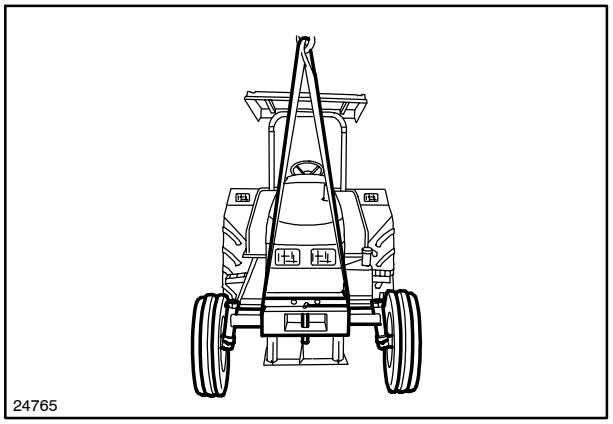
Do not put your hands or fingers between parts.

Wear suitable safety clothing – safety goggles, gloves and shoes.

The stub axles can be removed without removing the axle from the tractor, proceeding as follows for each individual wheel:

1. Lock the rear wheels using suitable chocks.

2. Lift the front of the tractor.



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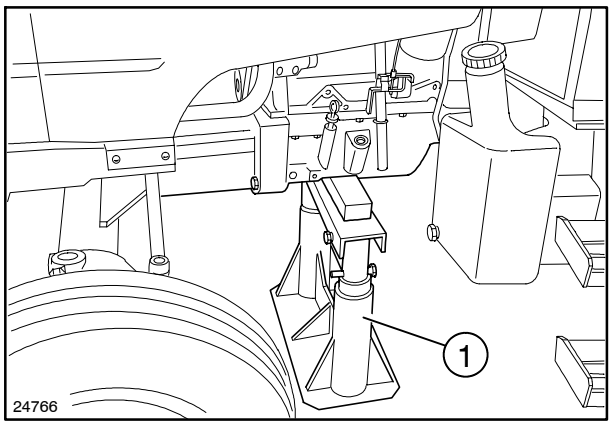
3. Place a mechanical stand (1) under the engine sump and insert a wooden block between the engine sump and the stand.



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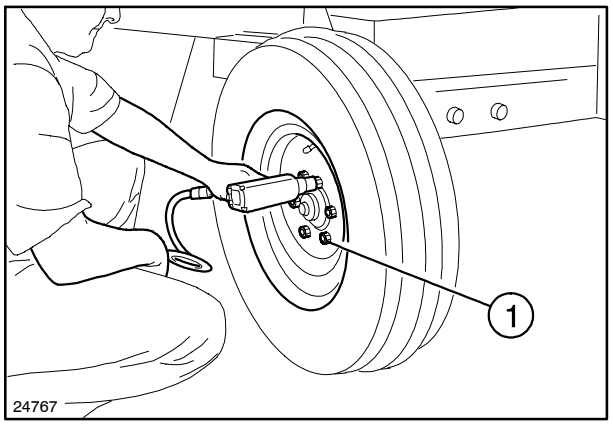
4. Remove the front wheel retaining bolts (1).



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Thermostatic Expansion Valve

This valve serves to reduce the pressure of the liquid refrigerant from the condenser so that the refrigerant entering the evaporator can evaporate and thus take heat from the air which is to be cooled.

The expansion valve has two main functions:

- dosage: the calibrated bore (6, fig. 5) inside the valve body creates a difference in the pressure of the refrigerant between the inlet (4) (liquid state) and the outlet (7) (mixed liquid/vapor state); the calibrated bore (6) also serves to atomize the refrigerant to facilitate subsequent evaporation;
- modulation: inside the valve body a thermostatic sensor controls the valve aperture so that the right quantity of refrigerant enters the evaporator to ensure complete evaporation.

If the thermostatic sensor (2, fig. 5) detects an increase in the temperature of the refrigerant at the evaporator outlet, the flow of refrigerant is increased.

If the temperature in the cab drops or the compressor starts to operate at a higher capacity (due to an increase in engine speed), the flow rate into the evaporator is reduced.

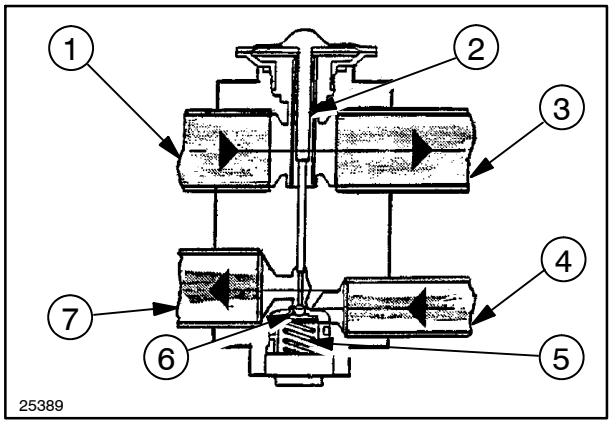
The expansion valve is installed on the evaporator inlet fitting (7), and as the internal refrigerant flow control system is completely automatic, it requires no special maintenance.

To perform functional testing, with the system is fully charged, check that the system operating pressures are those indicated on page 4.

NOTE: *In the event of malfunction, replace the valve.*

Expansion valve block

1. From the evaporator outlet.
2. Thermostatic sensor.
3. To compressor suction inlet.
4. From filter/dryer.
5. Spring.
6. Calibrated bore and ball.
7. To evaporator inlet.



5

Op. 50 200 06
Checking For Gas Leaks (With Detector 380000314)

DANGER

Perform functional testing on the system following the safety regulations described on page 3.

With the system charged, proceed as follows:

1. Start the engine.

2. Set the cab ventilation fan to maximum speed.

3. Turn the knob (2, fig. 12) to switch on the air conditioning.

4. Bring the engine up to a speed of 1500 rpm.

5. Operate the electronic detector as described on page 17.

6. Move the probe around all pipe connections and all possible points of leakage:

- leaks are indicated by an increase in the frequency of the acoustic signal.

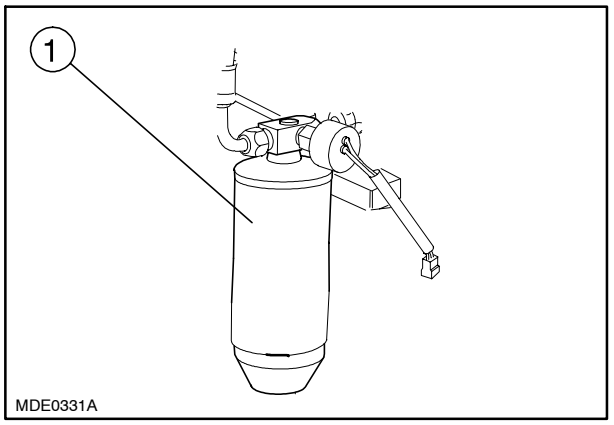
NOTE: *The refrigerant is heavier than air, therefore it will be easier to detect the leak point from below rather than from above.*

7. If leaks are found in the pipe connections, tighten the fittings in order to eliminate the leak.

CAUTION

If any of the system components need to be replaced, always follow the recovery, recycling and charging operations, using control unit **380000315**.

8. Remove the filter/dryer assembly (1).



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Installation

To install, proceed as follows:

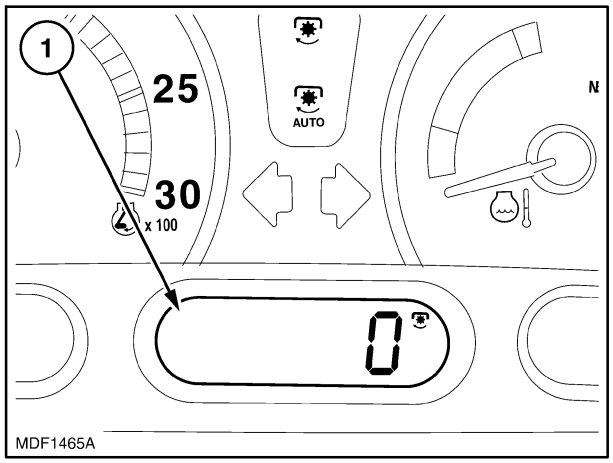
CAUTION

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

1. Refit the filter/dryer on the bracket and tighten the filter clamp with the retaining bolt.
2. Reconnect the hose connecting the filter/dryer to the vaporizer.
3. Reconnect the hose connecting the condenser to the filter/dryer.
4. Reconnect the electrical connection on the filter/dryer.
5. Empty and charge the air conditioning system with HFC 134a gas, using control unit **380000315**.
6. Reconnect the battery negative cable and close the hood.

Power take-off speed (Fig. 11)

When the rear power take-off is engaged, the central display (1) can be used to control the speed of rotation of the output shaft. Use the advanced keypad (if installed) to select the speed of the power take-off.



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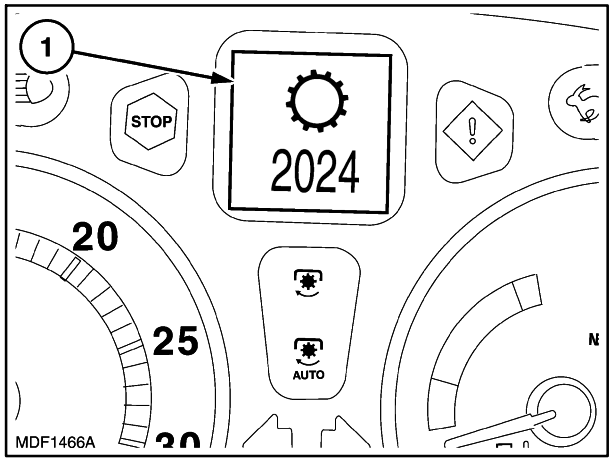
Information display (Fig. 12)

The display (1) may present various tractor setting and operating functions. Use the advanced keypad (if installed) to select a function. The relevant symbol appears, as illustrated in the figure, to confirm the selected function.



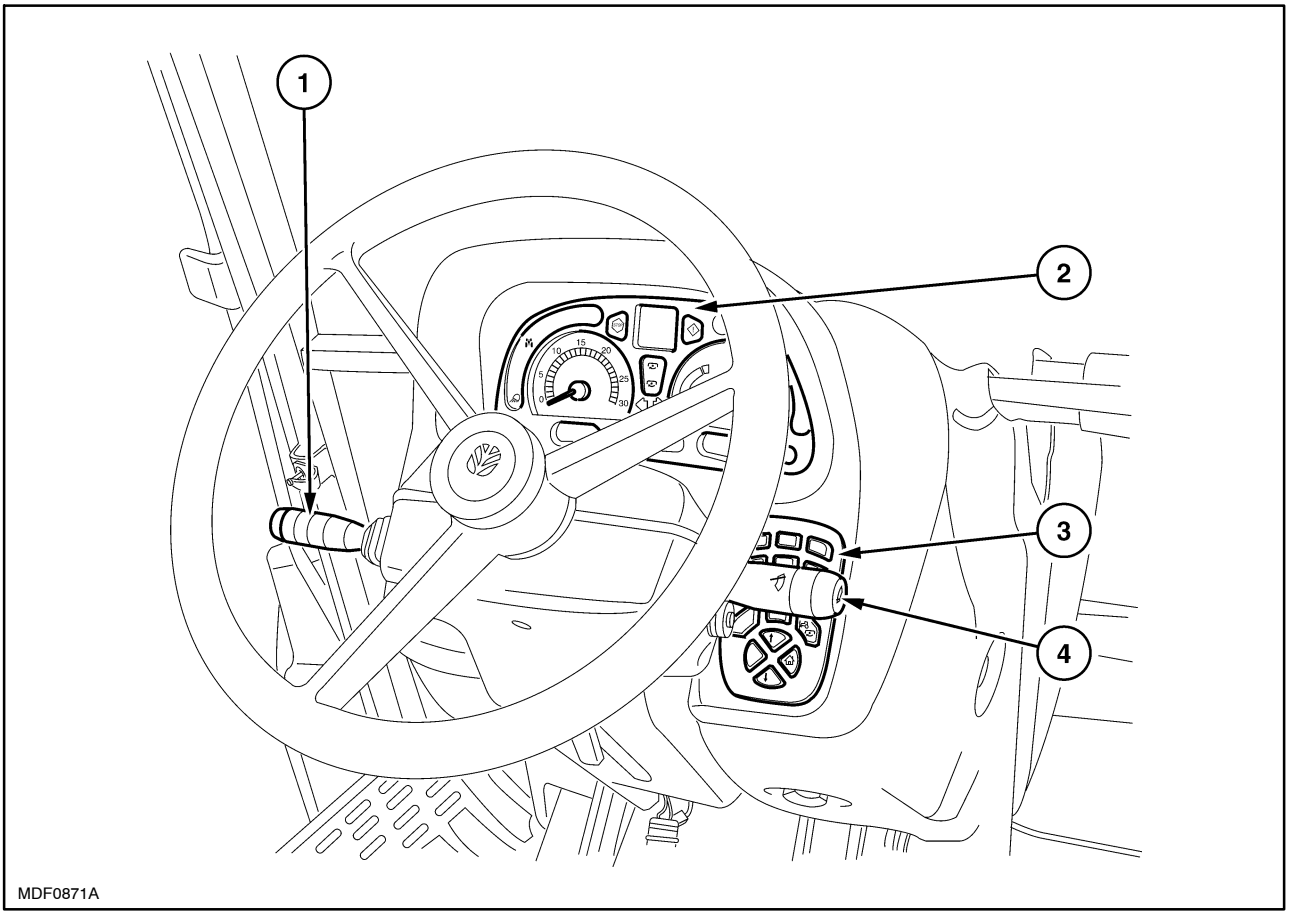
12

GENERAL INFORMATION

The components described in this section are grouped in control-types, as described below:

1. Dashboard controls.
2. Operating controls, right-hand side.
3. Cab controls.
4. Control on right-hand cab upright.
5. External controls.

DESCRIPTION AND OPERATION



1

DASHBOARD CONTROLS

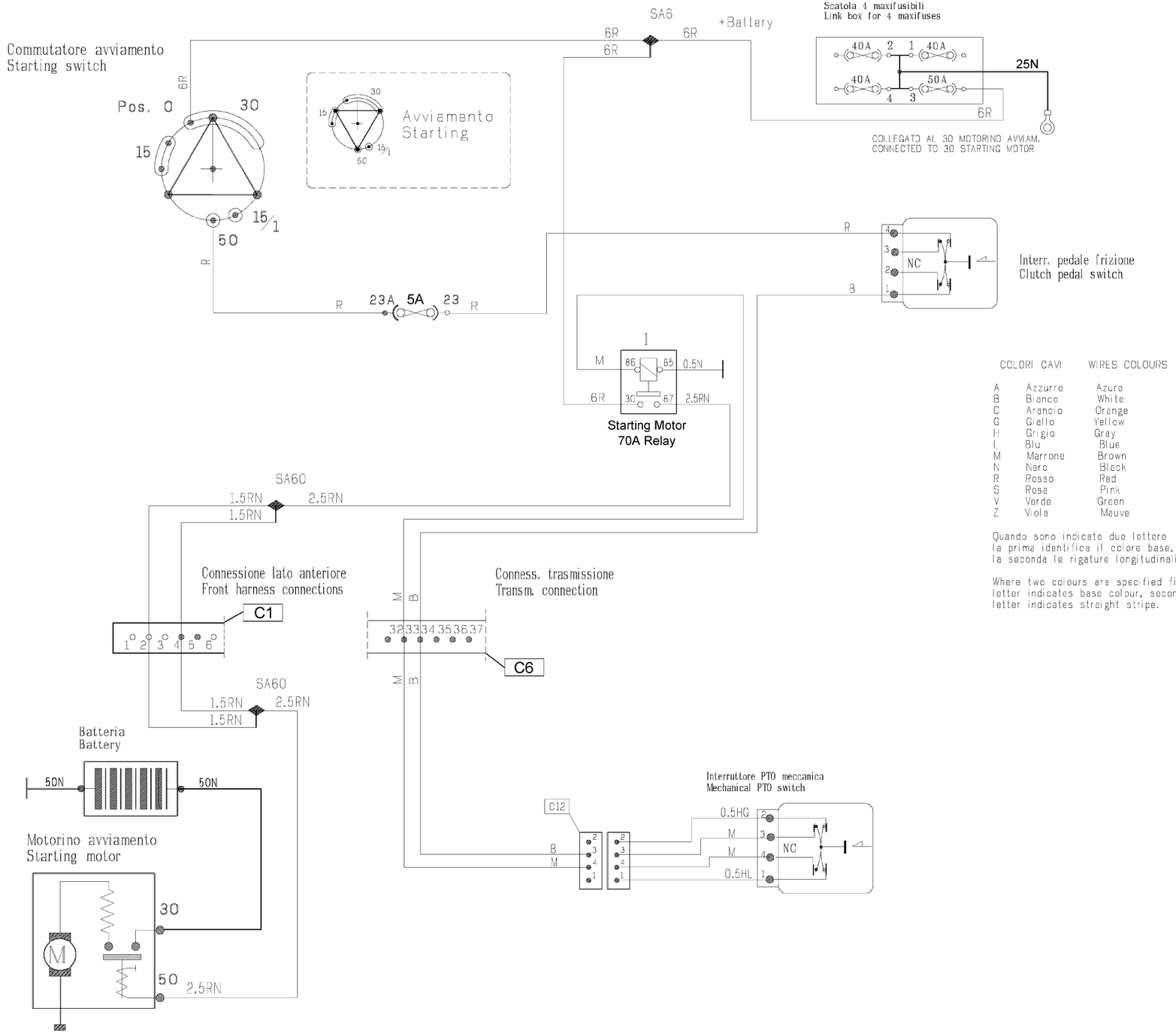
1. Lights/horn switch.

2. Instrument Panel.

3. Advanced Keypad (if installed).

4. Windscreen wiper control lever.

MECHANICAL SHUTTLE TRANSMISSION



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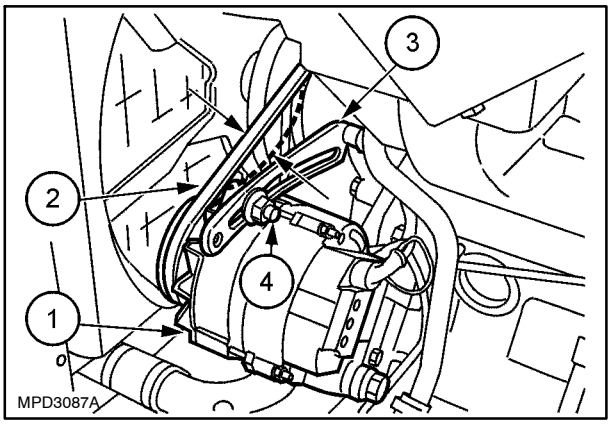
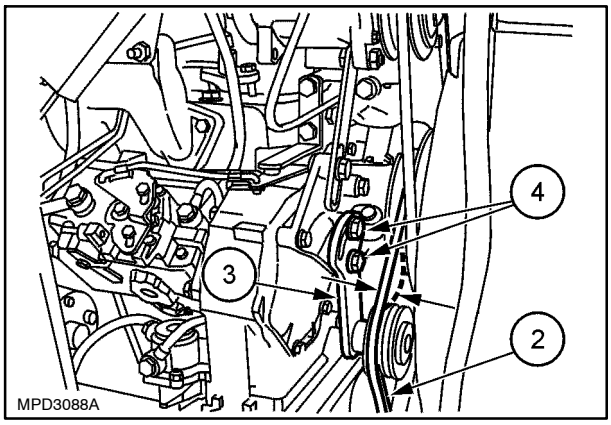


3



4

Fan belt tensioner

Fig. 3. Belt for models without air conditioning

1. Alternator
2. Belt

Fig. 4. Belt for models with air conditioning

3. Belt tensioner
4. Belt tensioner securing nut

CHARGING SYSTEM TESTING

PRECAUTIONS

To avoid damaging alternator charging system components, take the following precautions:

- **NEVER MAKE OR BREAK** any charging circuit connection, including the battery, when the engine is running.
- **NEVER SHORT CIRCUIT** the alternator positive terminal to check if it is working.
- **ALWAYS DISCONNECT** battery cables when re-charging the battery on the tractor with a battery charger.
- **ALWAYS CHECK** battery polarity when installing a battery or using a supplementary battery to start the engine.
- **DO NOT SHORT CIRCUIT** regulator input/output terminals while the alternator is working.
- **CONNECT POSITIVE TO POSITIVE AND NEGATIVE TO NEGATIVE.**

PRELIMINARY CHECKS

Before carrying out electrical tests, carefully inspect the charging system and the electrical system in general.

Check continuity in all conductors and connections, making sure they are correctly tightened.

BATTERY CHECK

Check all battery elements with a densimeter. The battery must be at least 70% charged and efficient.

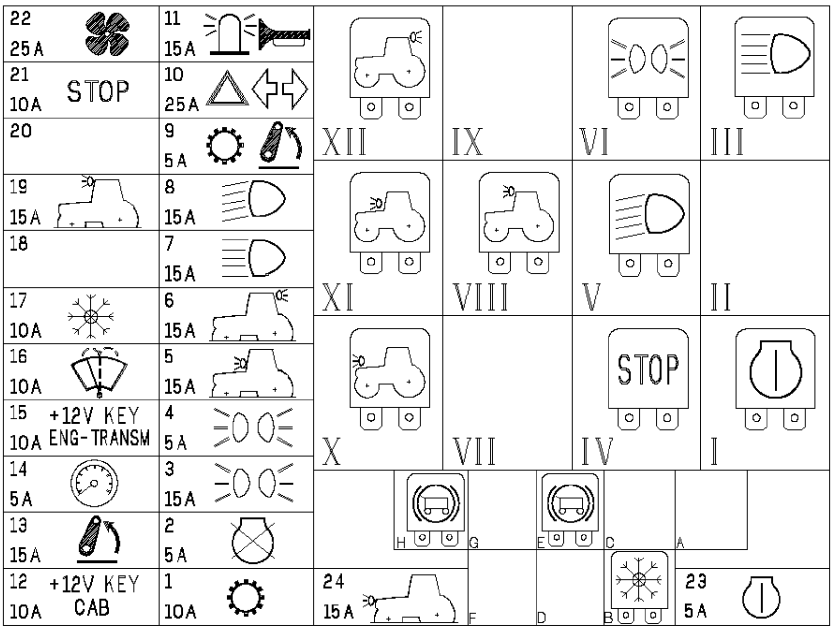
SECTION 55 - ELECTRICAL SYSTEMS

Chapter 5 - Battery

CONTENTS

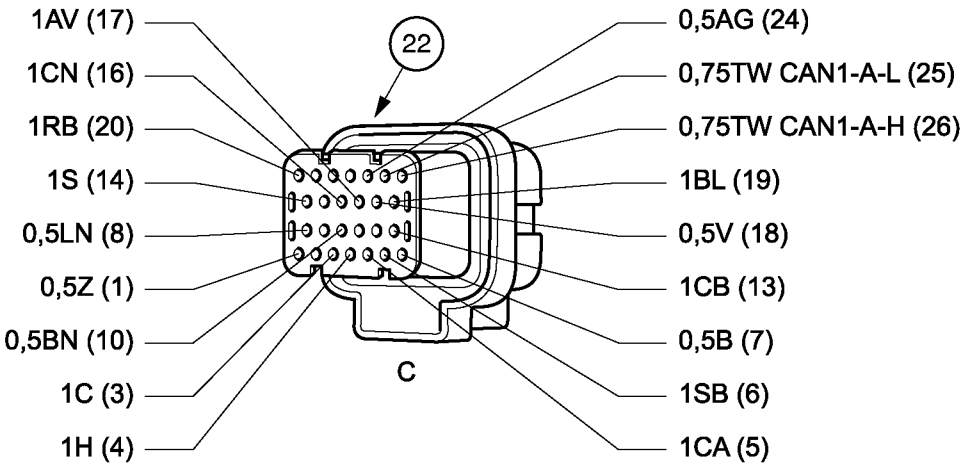
ELECTRICAL CIRCUIT COMPONENTS (Continued)

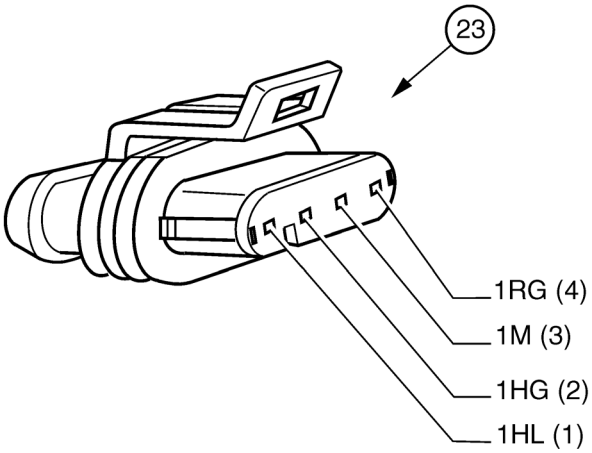
143	Lift raise solenoid valve
144	Lift lower solenoid valve
145	Electronic lift position sensor
146	Maxi fuse box
147	Handbrake status switch
148	Power Shuttle control unit
149	Power Shuttle circuit diagnosis connection
150	Cigar lighter on cab right-hand upright
151	Rear PTO switch
152	Rear work light (version without cab)
153	LH two-faced headlight (North America version)
154	RH two-faced headlight (North America version)
155	Front main connection (51 PIN – PURPLE)
156	Transmission system connection (51 PIN – GREEN)
157	Grille LH front work light
158	Grid heater (pre-heater) relay
159	Connection for battery cut-out circuit on engine (3 PIN)
160	Starting advance thermometric cut-out switch
161	Solenoid valve to cut out starting advance, depending on temperature
162	Bosch lift circuit speed sensor
163	Front loader system connection
164	Grid heater control module
165	Keypad
167	Diodes
168	Instrument cluster diagnosis connection (ADIC)
169 (A and B)	Power shuttle control module (ECM)
170	Connection for battery cut-out circuit on dashboard (4 PIN)
171	Power shuttle control module (ECM) diagnosis connection
172	Front work lamp control switch
173	Rear work lamp control switch
174	Battery cut-out circuit relay
175	Power relay for battery cut-out circuit
176	Battery cut-out circuit indicator light
177	Grille RH front work light
178	Synchronized power take-off switch


22
25A
21
10A
STOP
20
19
15A
18
17
10A
16
10A
15
10A
+12V KEY
ENG-TRANSM
14
5A
13
15A
12
10A
+12V KEY
CAB
11
15A
10
25A
9
5A
8
15A
7
15A
6
15A
5
15A
4
5A
3
15A
2
5A
1
10A
XII
IX
VI
III
XI
VIII
V
II
X
VII
IV
STOP
I
H
G
E
C
A
24
15A
F
D
B
23
5A

47135533

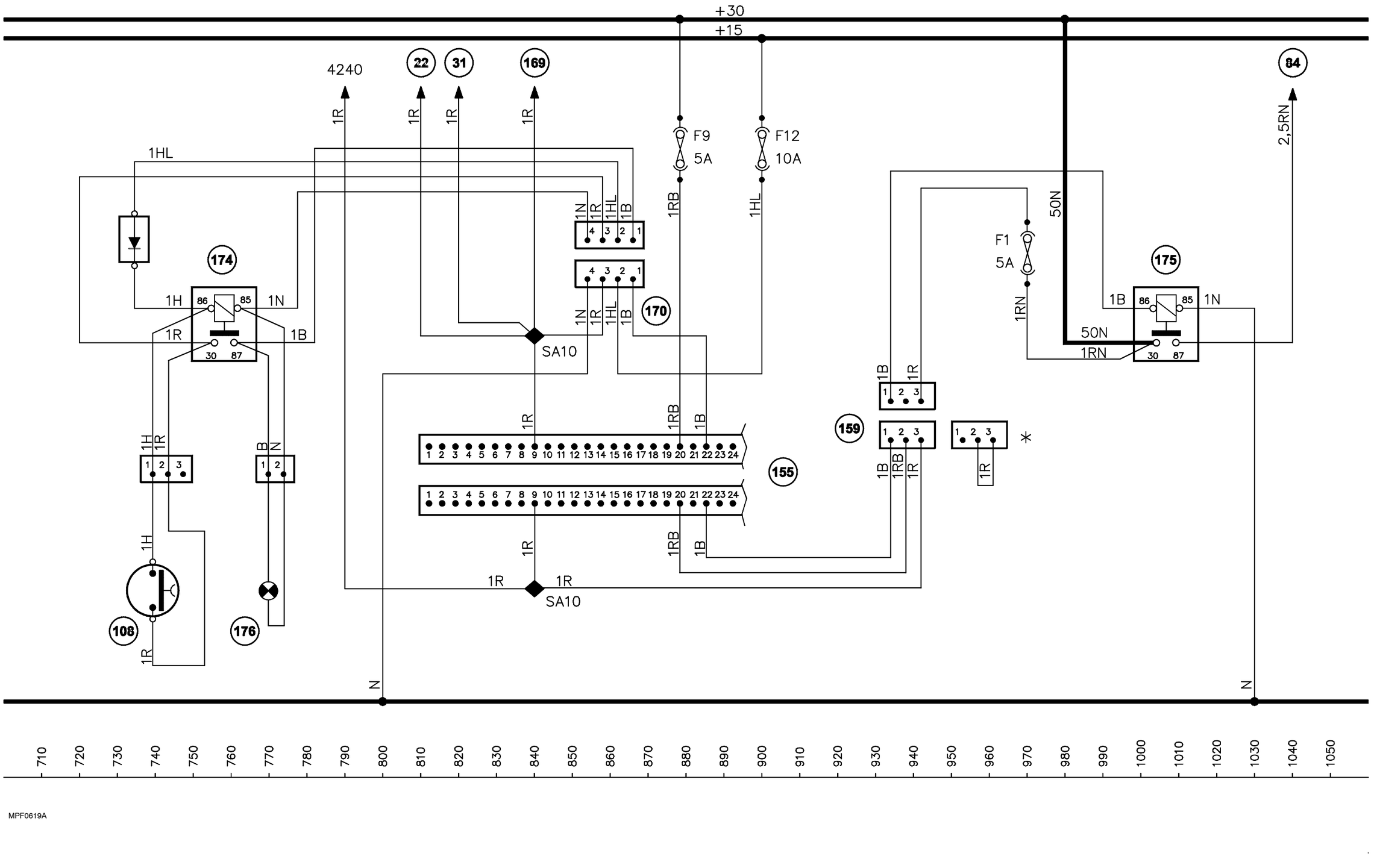
15


1AV (17)
1CN (16)
1RB (20)
1S (14)
0,5LN (8)
0,5Z (1)
0,5BN (10)
1C (3)
1H (4)
22
C
0,5AG (24)
0,75TW CAN1-A-L (25)
0,75TW CAN1-A-H (26)
1BL (19)
0,5V (18)
1CB (13)
0,5B (7)
1SB (6)
1CA (5)


23
1RG (4)
1M (3)
1HG (2)
1HL (1)

MPF0650A

BATTERY CUT-OUT CIRCUIT - DIAGRAM B

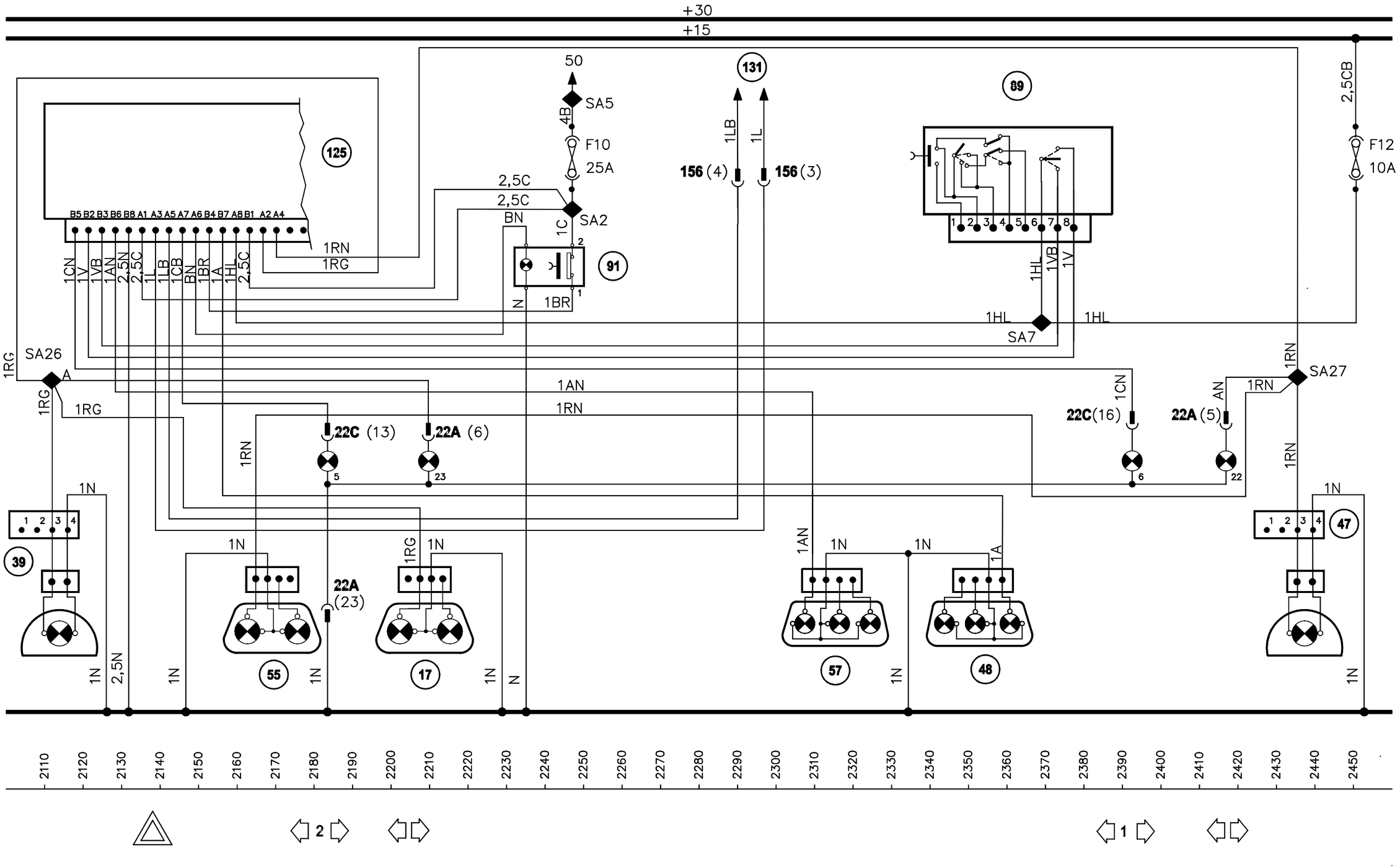


MPF0619A

SIDE LIGHTS, FULL BEAM, DIPPED BEAM, NUMBER PLATE AND INSTRUMENT LIGHTING CIRCUIT
(Version without cab - ISO)
(Diagram D)

6 Front LH headlamp
7 Front RH headlamp
14 Front lights connection
15 Fuses and relay control unit
F3
F4
F7
F8
F15
III
V
17 RH front turn indicator and side light
22 Instrument cluster (ADIC)
1 Work light
7 Side lights
8 Full beam headlights
41 RH number plate light (USA version)
48 RH tail light
55 LH front turn indicator and side light
56 Number plate light
57 LH tail light
89 External lights control switch
152 Rear work light (version without cab)
155 Front main connection (51 PIN - PURPLE)

TURN INDICATOR AND HAZARD LIGHTS CIRCUIT - DIAGRAM F

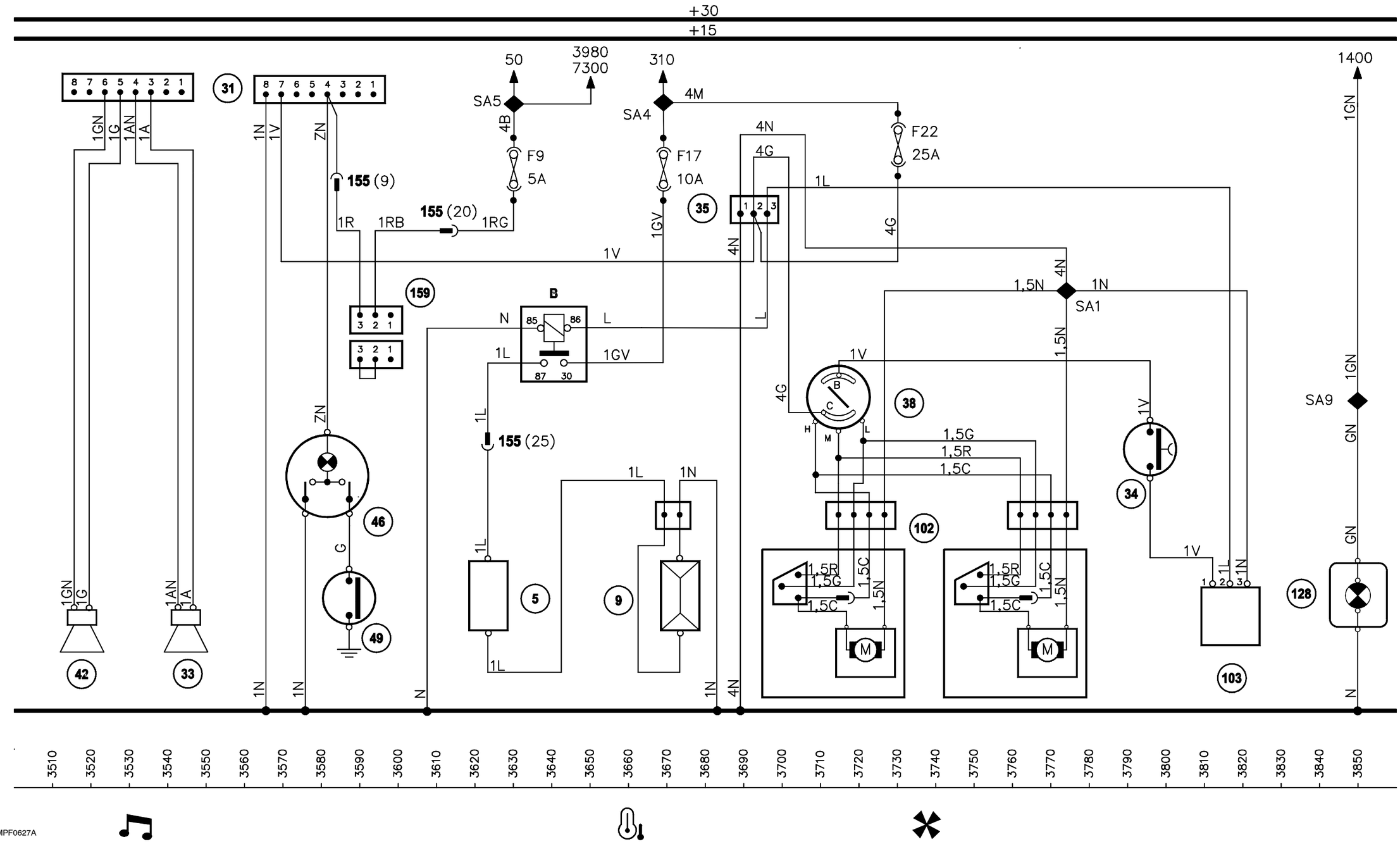


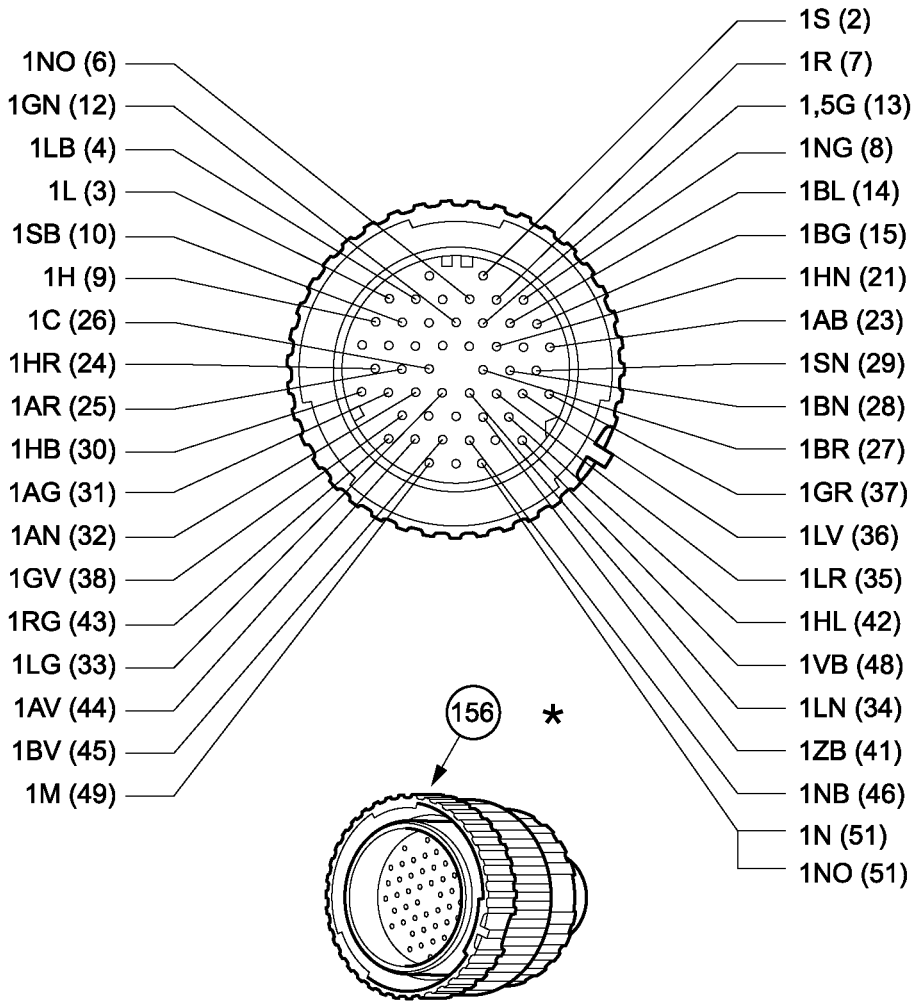
MPF0623A

TURN INDICATOR AND HAZARD LIGHTS CIRCUIT (Version without cab - ISO)
(Diagram H)

15 Fuses and relay control unit
F10
F22
VIII
17 RH front turn indicator and side light
22 Instrument cluster (ADIC)
5 Second trailer turn indicator
6 First trailer turn indicator
22 Indicator Left
23 Indicator Right
48 RH tail light
55 LH front turn indicator and side light
57 LH tail light
89 External lights control switch
91 Hazard lights switch

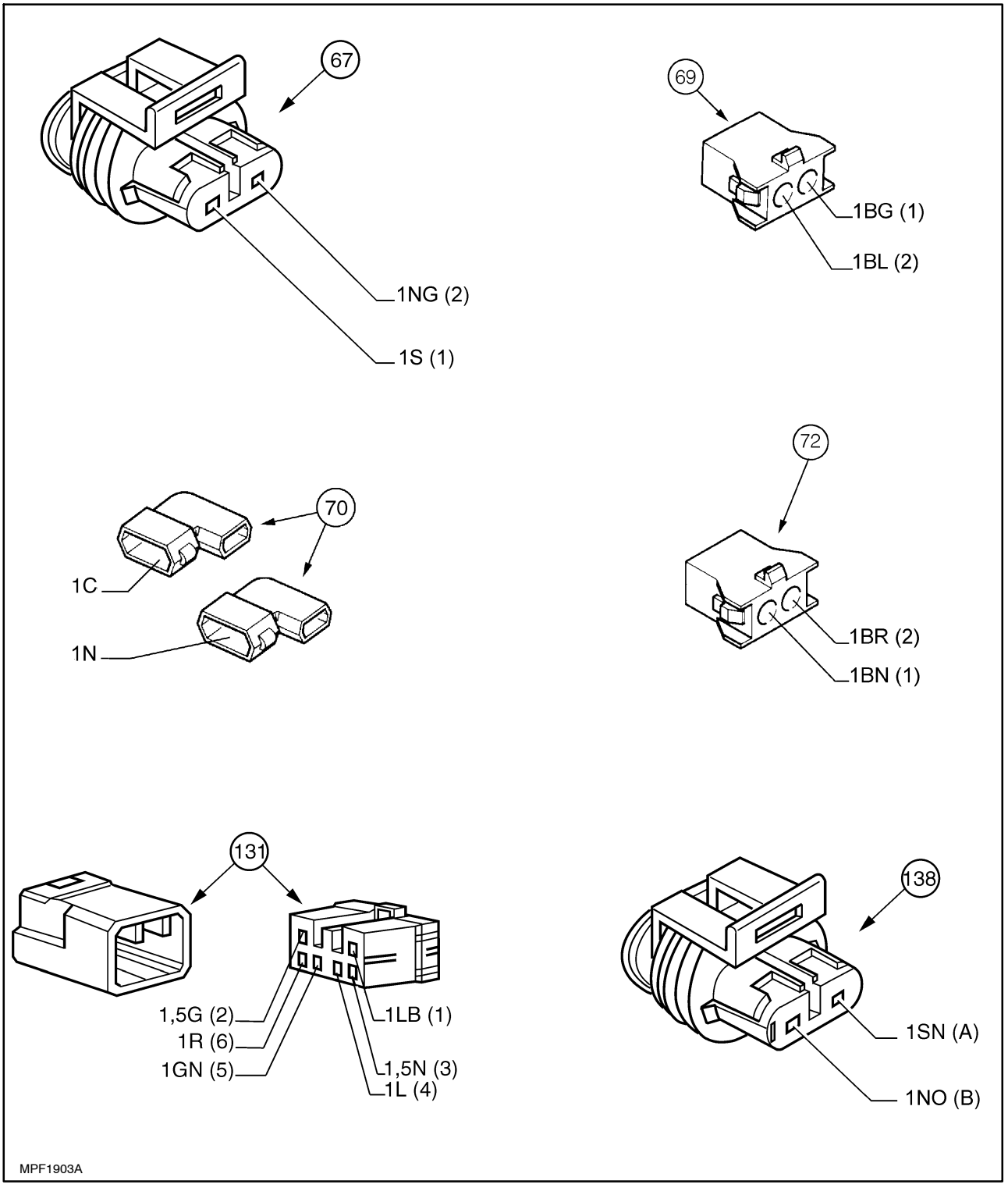
CAB VENTILATION AND AIR-CONDITIONING SYSTEM, RADIO AND INTERNAL LIGHTING CIRCUIT - DIAGRAM L

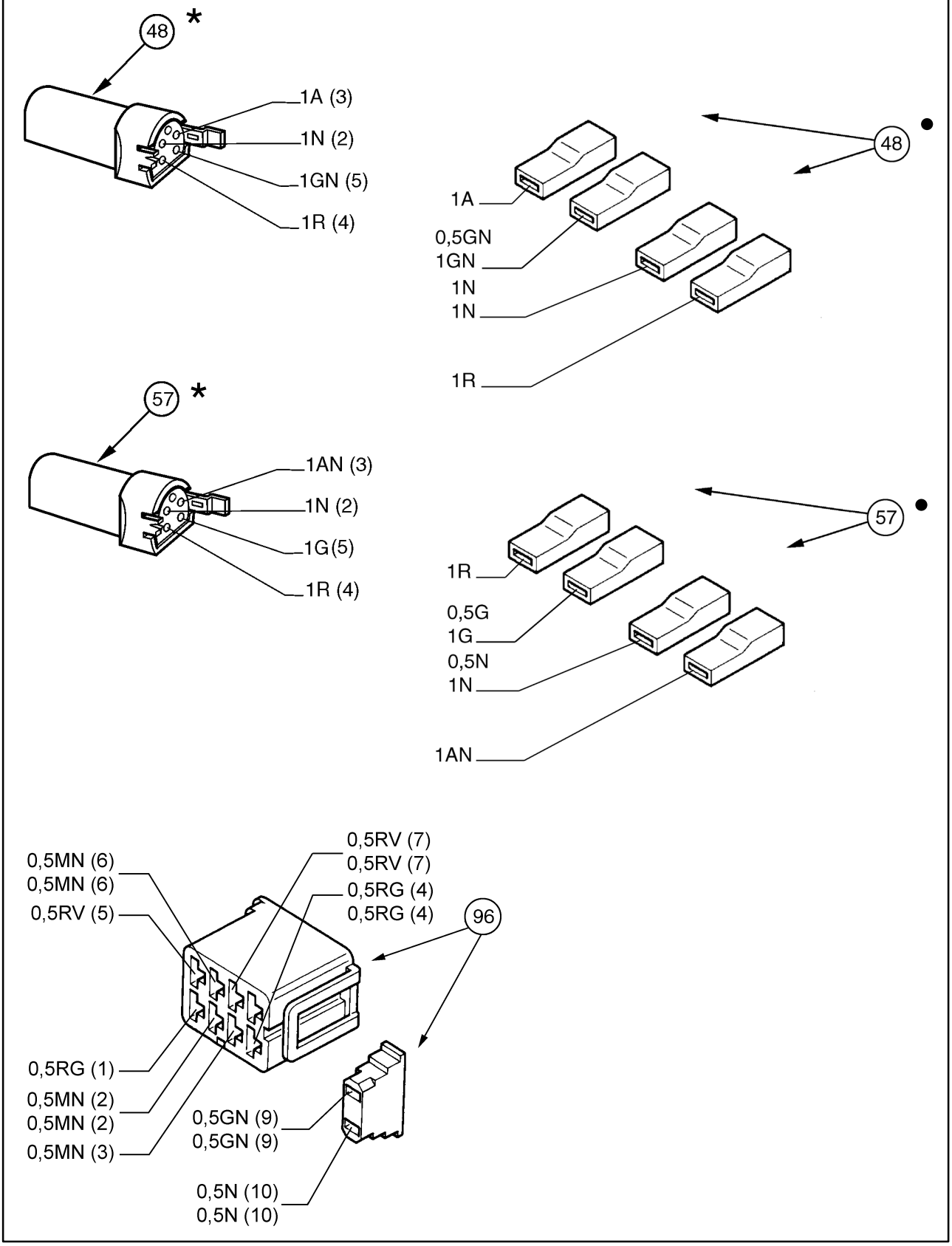




88

* Cab version with Power Shuttle

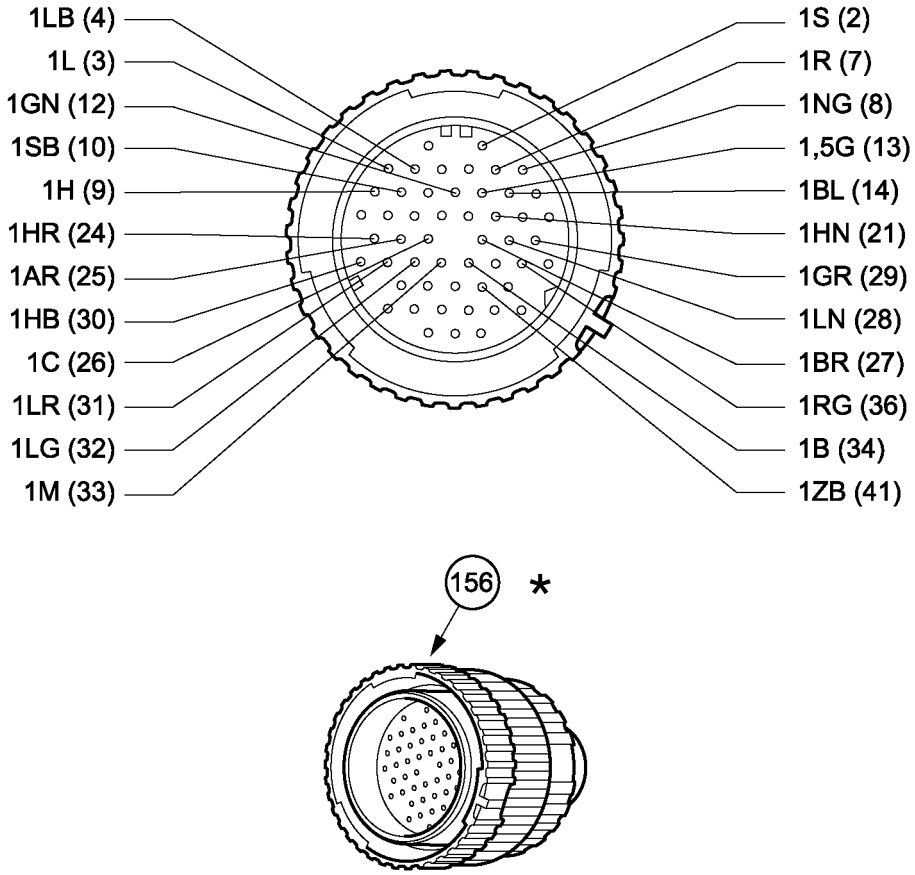

67
1NG (2)
1S (1)
69
1BG (1)
1BL (2)
70
1C
1N
72
1BR (2)
1BN (1)
131
1,5G (2)
1R (6)
1GN (5)
1LB (1)
1,5N (3)
1L (4)
138
1SN (A)
1NO (B)
MPF1903A



109

* Version with cab

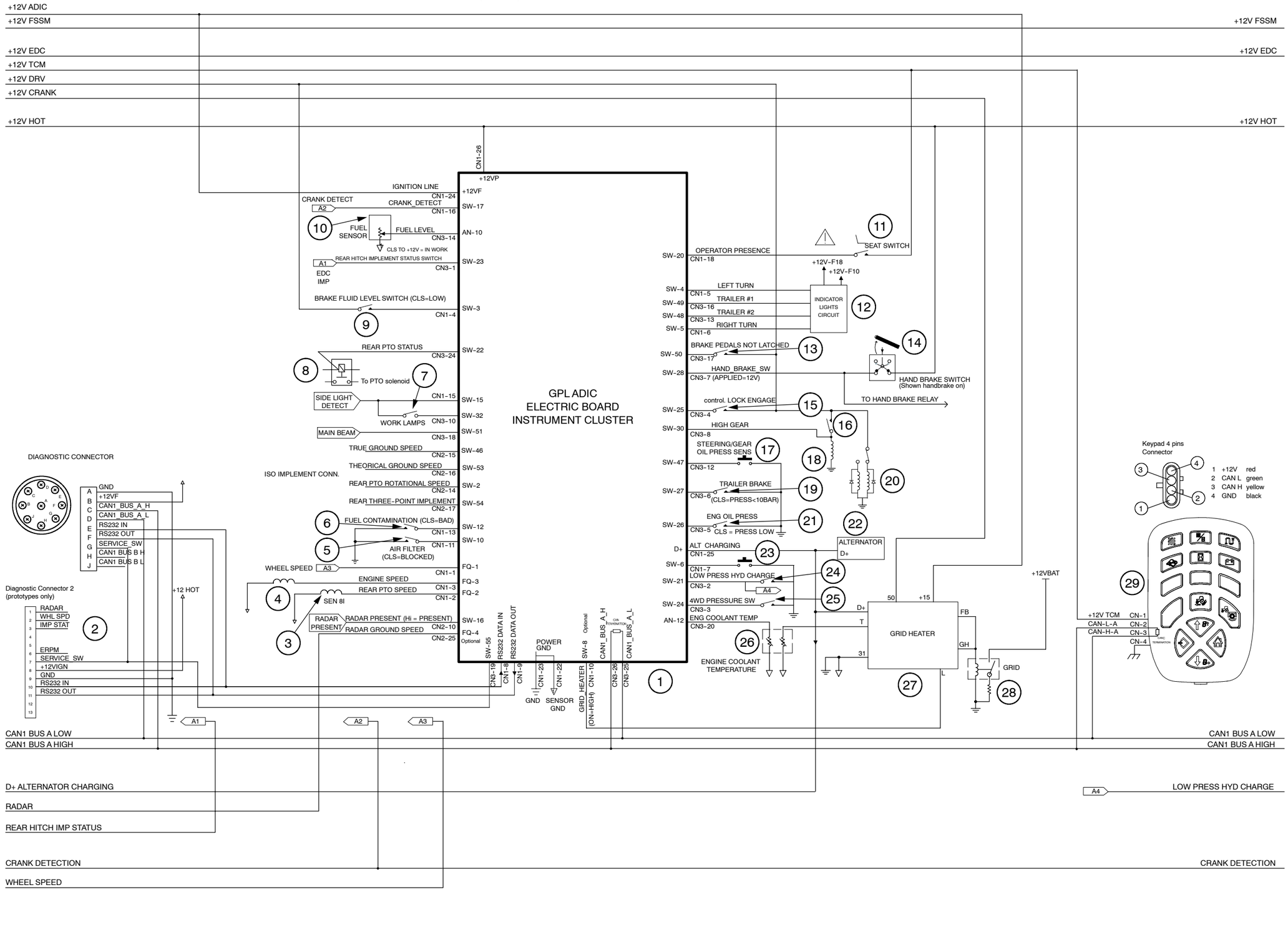
• Version without cab



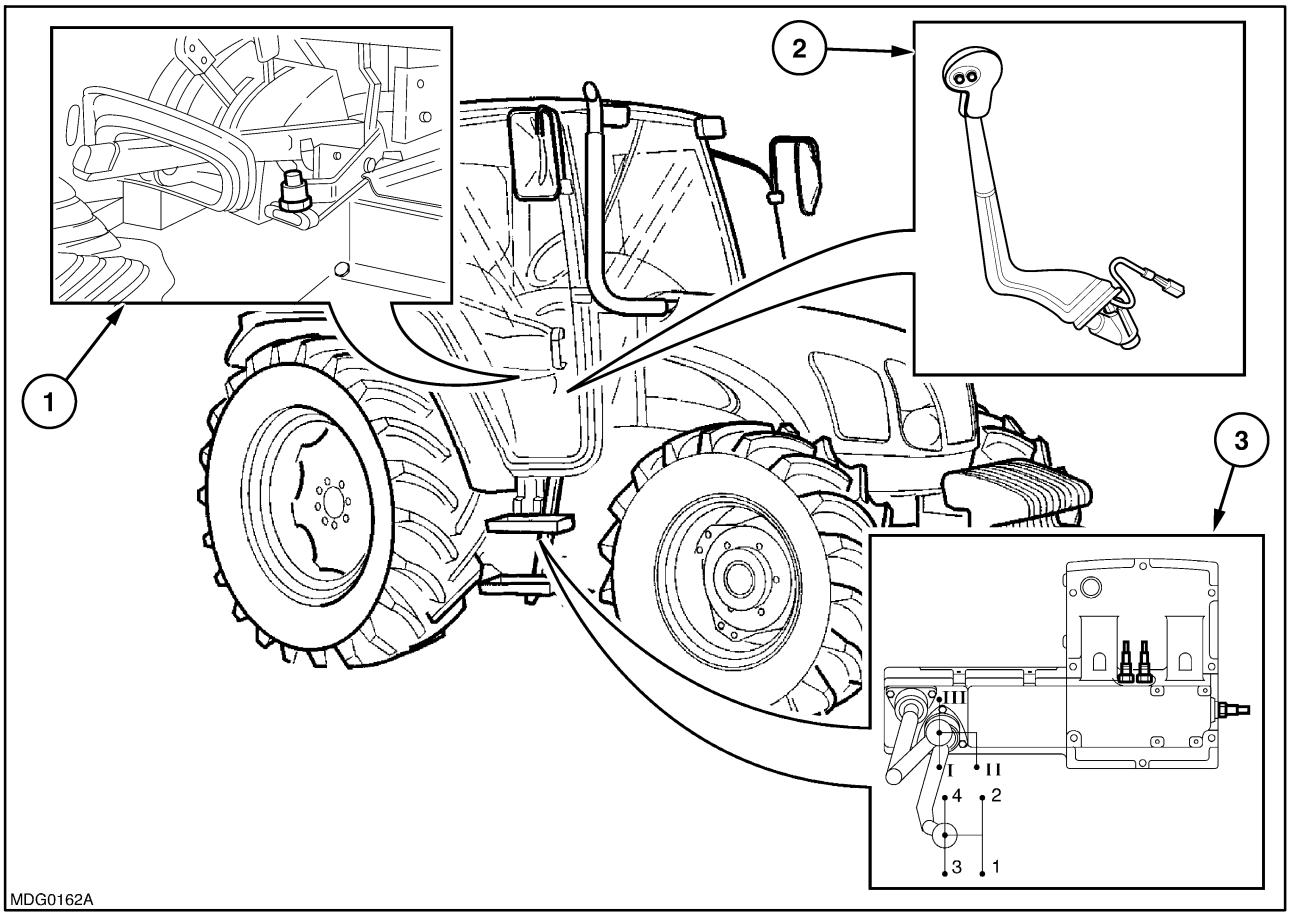
129

* Standard cab version

INSTRUMENT CLUSTER INPUT/OUTPUT CIRCUIT (ADIC) - DIAGRAM V



MPF0476A



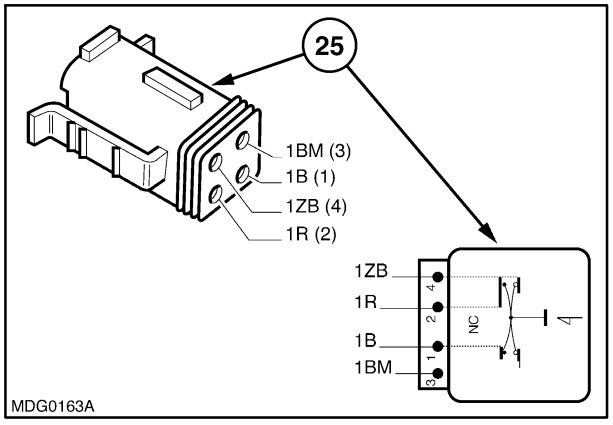
13

1. Handbrake status switch (25).
2. Dual Command (2 Speed Power Shift) switch (76).
3. Gear/Range lever position sensors (139-140-141).

Handbrake Status Switch (25)

Switch normally on with brake disengaged (PIN 1 and PIN 2).

When the switch is on, it receives 12 volts from the fuse (9) and sends them to PIN 7 of connection (22C), the handbrake indicator light comes on.



14

SPECIAL TOOLS

Description	Tool No.
Harness Repair Kit (Except North America)	380030042 (294070)
Test Probe Kit (Except North America)	380050010 (297448)

WIRING HARNESS REPAIRS

TEMPORARY WIRING HARNESS REPAIR

WARNING

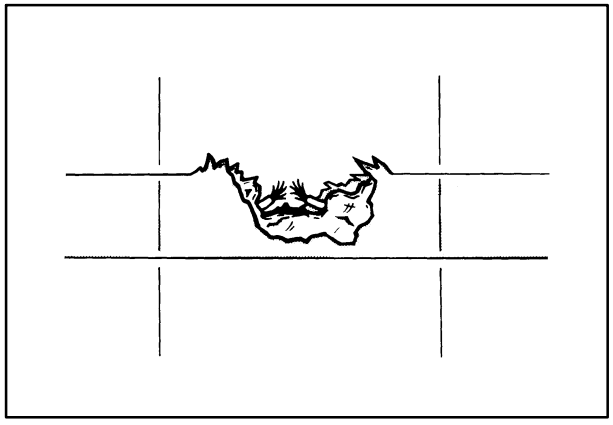
It is acceptable to use the following repair procedure on the controller area network (CAN) BUS wiring. It is important though to ensure that the wire lengths are not altered from the original as this will affect the performance of the CAN BUS system.

The following method to repair wiring is a temporary expedient only. Wiring should be replaced as soon as possible. Do not attempt to repair the wire on any system sensors as these are sealed and should only be replaced with a new component.

NOTE: *When conducting a cable repair it is important that only RESIN CORED SOLDER is used. Use of other types of solder may result in further cable damage.*

To carry out a temporary repair, proceed as follows:-

1. Locate damaged portion of cable then cut away outer protective cover on both sides of the damaged area, Figure 1.



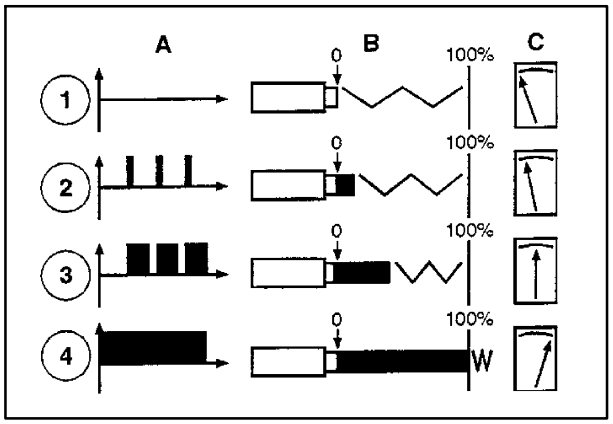
1

2. Using a suitable solvent, clean about 2 inches (50 mm) from each cover end. Clean the grey cable cover and the individual leads.

The processors contain transistors that are supplied with a constant input voltage which is switched on and off to achieve the variable input range. In this way the control module is able to limit the armature movement, so the hydraulic output flow of the solenoid is proportional to the average DC voltage. The lower voltage also allows the solenoid to operate with less residual magnetism and so the entire circuit will operate smoother.

The variable DC voltage signal level is determined by varying the duration of the ON pulse relative to the OFF pulse (see Fig. 32). The ratio between the ON time and the cycle time is called duty cycle and is stated as a percentage of one complete cycle.

With reference to Fig. 32, diagrams 1 to 3 show the normal operating range of the PWM valve, and diagram 4 shows the initial 12V programming and fill time only. The diagrams in column A show the voltage signal that is sent to the valve, whereas column B shows the relevant spring pressure and column C the reading on a voltmeter connected to the solenoid valve.



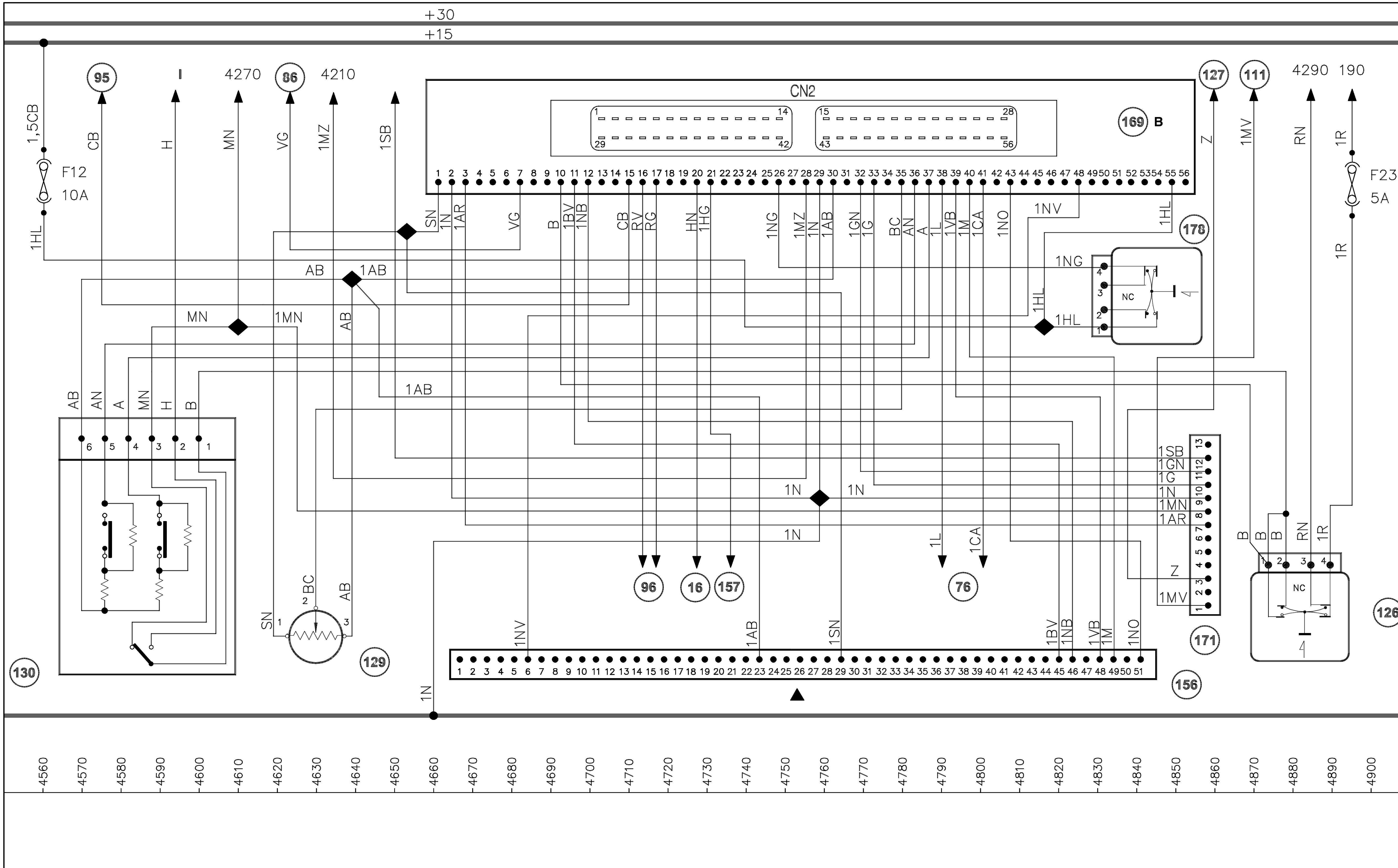
32

Diagram 1 shows the OFF position: no signal is directed to the valve, which means no spring pressure in the valve at all and results in a zero voltage reading. Increasing the duty cycle causes some pressure to be made on the circuit (Diagram 2), which results in a voltmeter reading increase. Diagram 3 shows the maximum signal that is used during the normal activity of the valve: its duty cycle is around 0.5, which results in a spring pressure for the half of its run and in an indication of a 6 volt average DC current.

The electrical circuit to the solenoids can be checked by using a digital or analogue DC voltmeter, which will indicate the average voltage readings.

Calibration U-Codes

Error code	Error description
U19	Transmission oil temperature is below 10°C (50°F)
U20	Incorrect sequence, cycle shuttle lever and clutch pedal
U21	Engine speed is too low, increase engine speed
U22	Engine speed is too high, reduce engine speed
U23	Shuttle lever is in neutral, shift lever to forward
U24	Incorrect range selected
U25	Main gear lever is in neutral
U26	Clutch pedal depressed, release clutch pedal
U31	Wheel speed sensed
U33	Parking brake is not applied
U34	Operator present seat switch open
U36	Calibration value too high
U37	Calibration value too low
U38	Range lever is in neutral


+30
+15
95
I
4270
86
4210
CN2
169 B
127
111
4290
190
1,5CB
F12
10A
1HL
F23
5A
1R
178
NC
1NG
1HL
AB
1AB
MN
1MN
1N
1SB
1GN
1G
1MN
1AR
Z
1MV
171
126
96
16
157
76
130
129
156
1NV
1AB
1SN
1BV
1NB
1VB
1M
1NO
4560
4570
4580
4590
4600
4610
4620
4630
4640
4650
4660
4670
4680
4690
4700
4710
4720
4730
4740
4750
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4770
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4800
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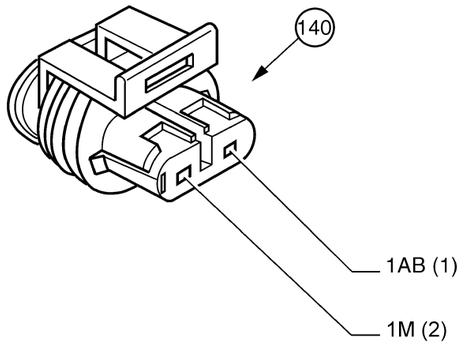
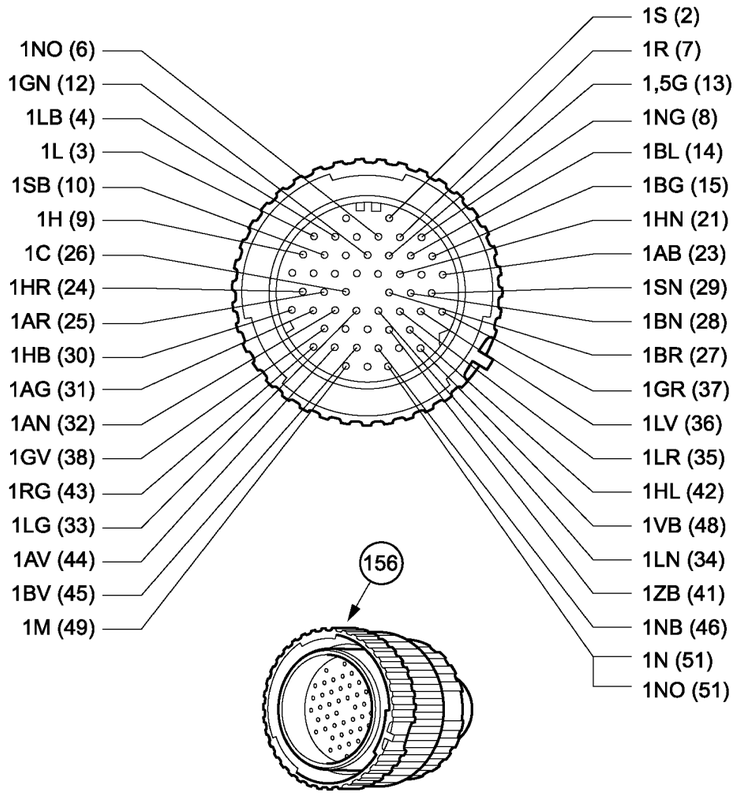
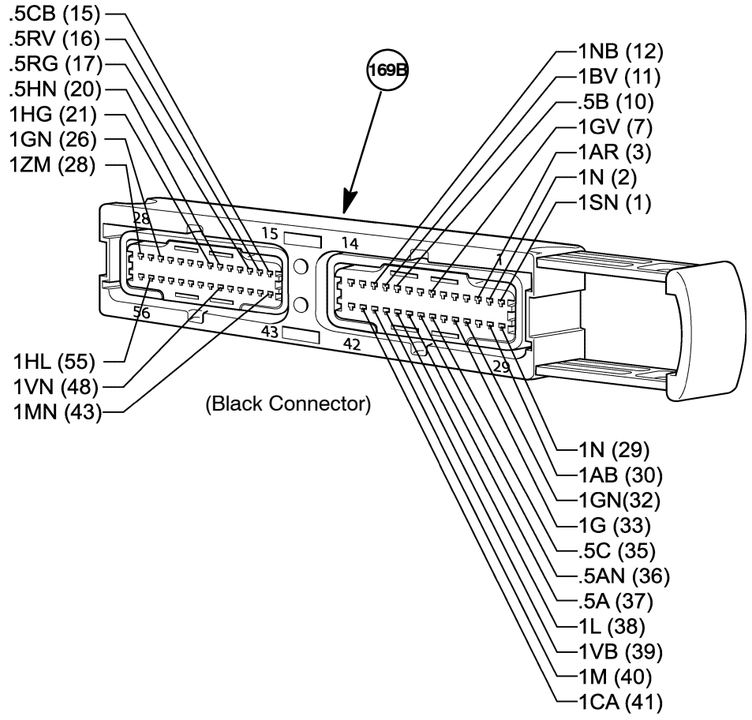
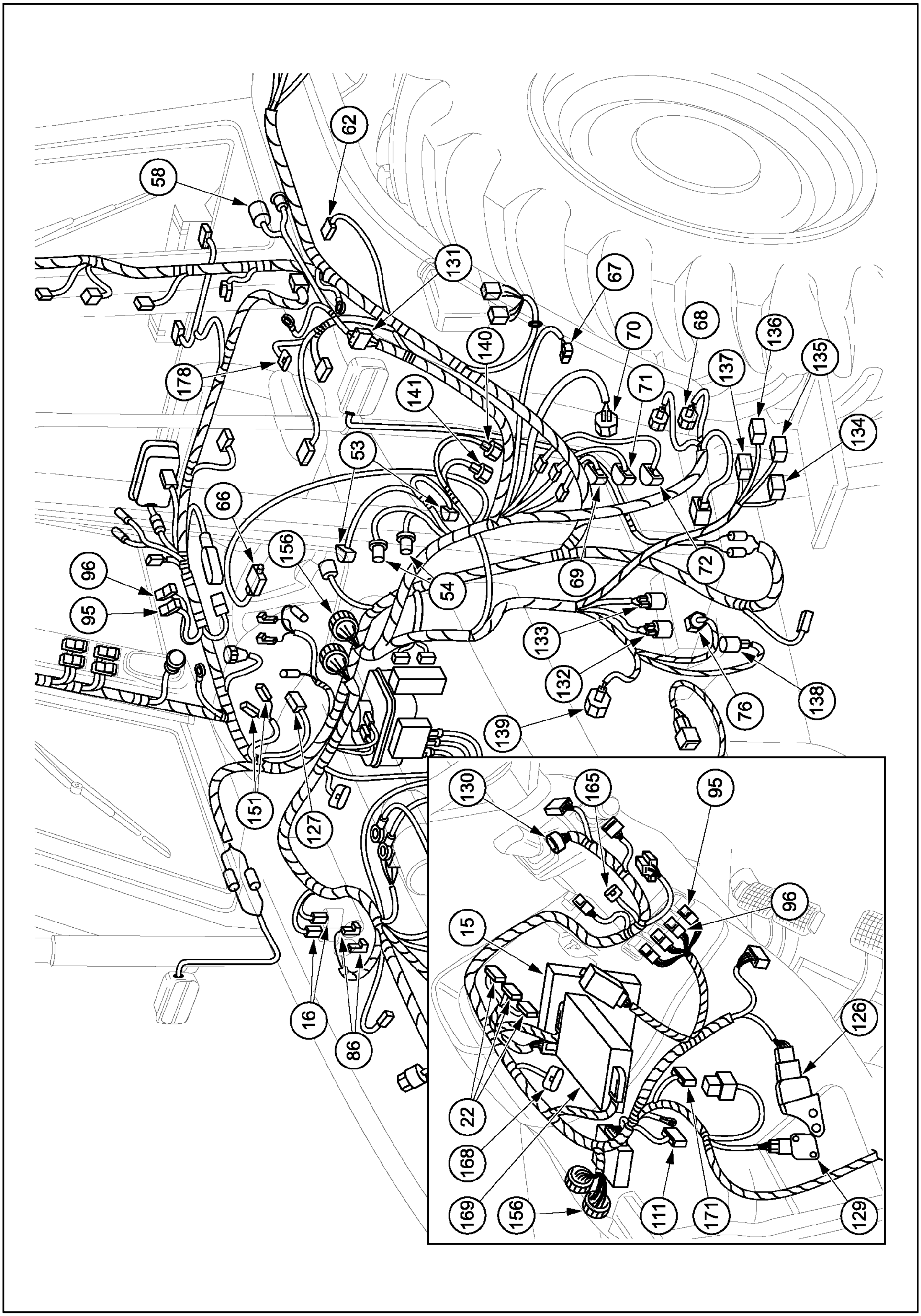
4820
4830
4840
4850
4860
4870
4880
4890
4900


140
1AB (1)
1M (2)


1NO (6)
1GN (12)
1LB (4)
1L (3)
1SB (10)
1H (9)
1C (26)
1HR (24)
1AR (25)
1HB (30)
1AG (31)
1AN (32)
1GV (38)
1RG (43)
1LG (33)
1AV (44)
1BV (45)
1M (49)
1S (2)
1R (7)
1,5G (13)
1NG (8)
1BL (14)
1BG (15)
1HN (21)
1AB (23)
1SN (29)
1BN (28)
1BR (27)
1GR (37)
1LV (36)
1LR (35)
1HL (42)
1VB (48)
1LN (34)
1ZB (41)
1NB (46)
1N (51)
1NO (51)
156


.5CB (15)
.5RV (16)
.5RG (17)
.5HN (20)
1HG (21)
1GN (26)
1ZM (28)
169B
1HL (55)
1VN (48)
1MN (43)
(Black Connector)
1NB (12)
1BV (11)
.5B (10)
1GV (7)
1AR (3)
1N (2)
1SN (1)
1N (29)
1AB (30)
1GN(32)
1G (33)
.5C (35)
.5AN (36)
.5A (37)
1L (38)
1VB (39)
1M (40)
1CA (41)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178
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69
72
133
132
76
138
139
151
127
16
86
130
165
95
96
15
126
22
168
169
156
111
171
129

ERROR CODE 2028 - CLUTCH B NOT CALIBRATED

Effects:

Poor clutch performance of the uncalibrated clutch.

Possible failure modes:

1. Transmission not calibrated
2. Faulty clutch B solenoid
3. Faulty hydraulic circuit
4. Mechanical fault

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 if the transmission was calibrated.

   A. If the transmission was not calibrated after a replacement of the controller, or after using H8, clear the Electrical Erasable Programmable Read Only Memory (EEPROM), and perform the transmission calibration procedure.

   B. If the transmission was calibrated, download the correct level of software and re-perform the calibration procedure. If the fault re-occurs again, continue to step 2.
2. Check for other error codes being displayed.

   A. If any other error codes are being displayed, continue to these tests.

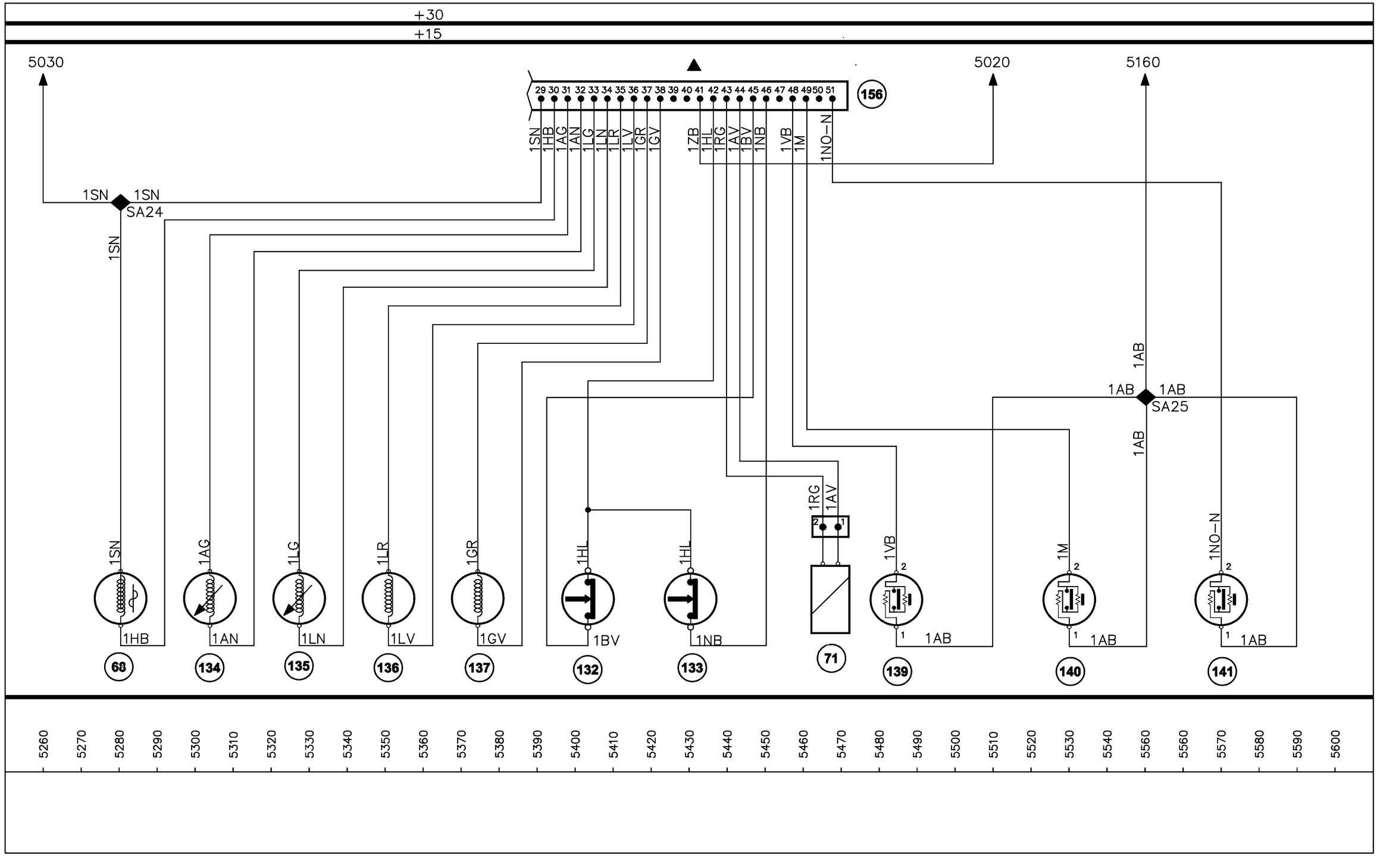
   B. If no other error codes are displayed, continue to step 3.
3. Check the solenoid of the faulty clutch.

   A. Remove the solenoid, clean or replace as required.

   B. If the error code is still displayed, continue to step 4.
4. Check the clutch pack pressures.

   A. If the pressures indicated are approximately 16 bar (232 psi), possible mechanical fault within the transmission. If the pressures are low on all of the clutches, continue to hydraulic troubleshooting procedures.

   B. If the pressures indicated are not approximately 16 bar (232 psi) on one or more of the clutches. Suspect possible transmission internal leakage.


+30
+15
5030
5020
5160
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
156
1SN 1HB 1AG 1AN 1LG 1LN 1LR 1LV 1GR 1GV
1ZB 1HL 1RG 1AV 1BV 1NB 1VB 1M 1NO–N
1SN 1SN
SA24
1AB 1AB
SA25
1SN
1AB
1SN
1AG
1LG
1LR
1GR
1HL
1HL
1RG
1AV
1VB
1M
1NO–N
1HB
1AN
1LN
1LV
1GV
1BV
1NB
1AB
1AB
1AB
1AB
68
134
135
136
137
132
133
71
139
140
141
5260 5270 5280 5290 5300 5310 5320 5330 5340 5350 5360 5370 5380 5390 5400 5410 5420 5430 5440 5450 5460 5470 5480 5490 5500 5510 5520 5530 5540 5560 5560 5570 5580 5590 5600

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.

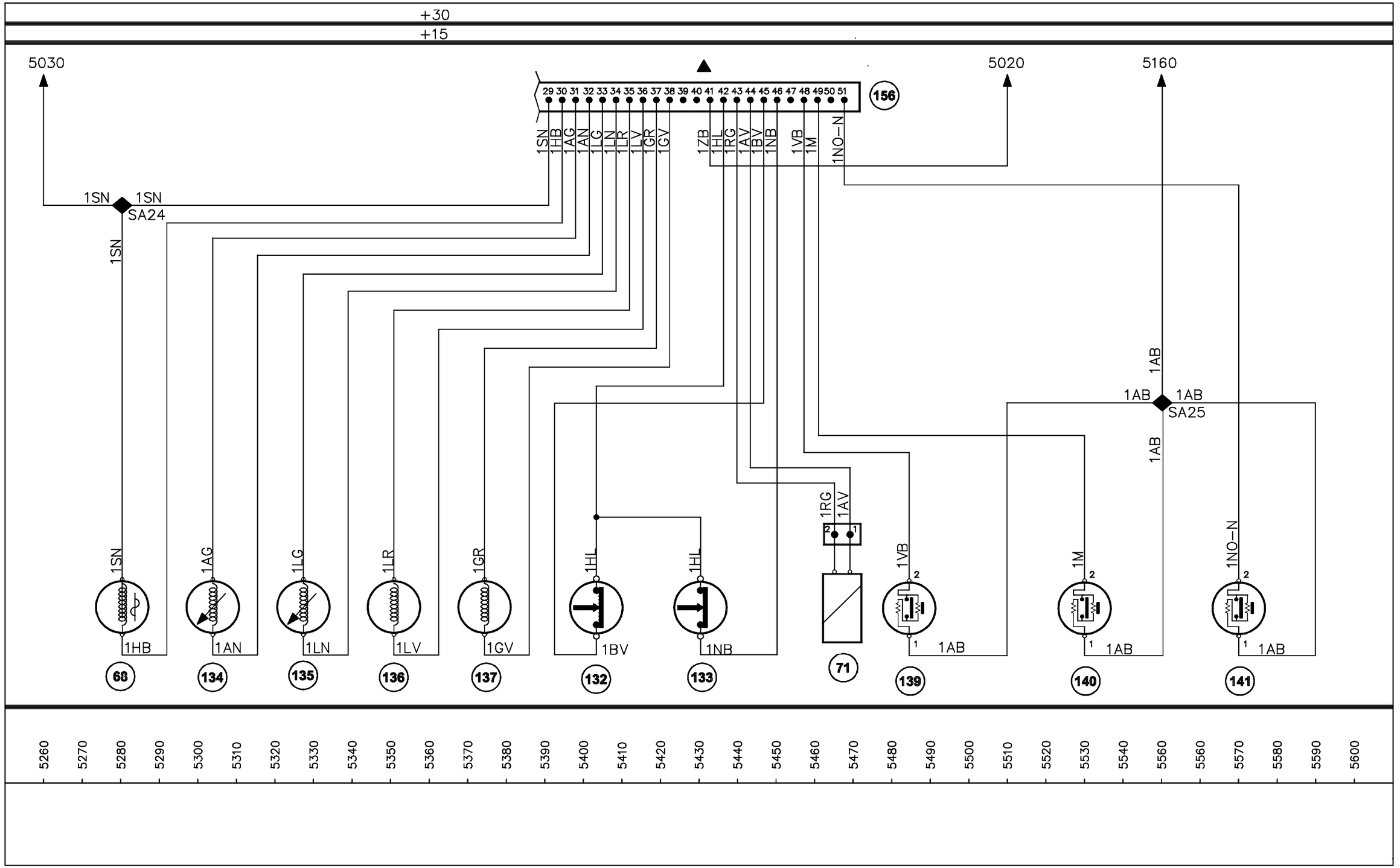
   A. Disconnect connector **C135**. Turn the keystart ON. Measure the voltage between connector:

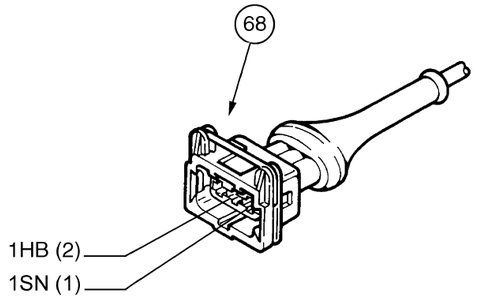
   C135 pin **A**, wire 1.0 **(LN)** and **ground**

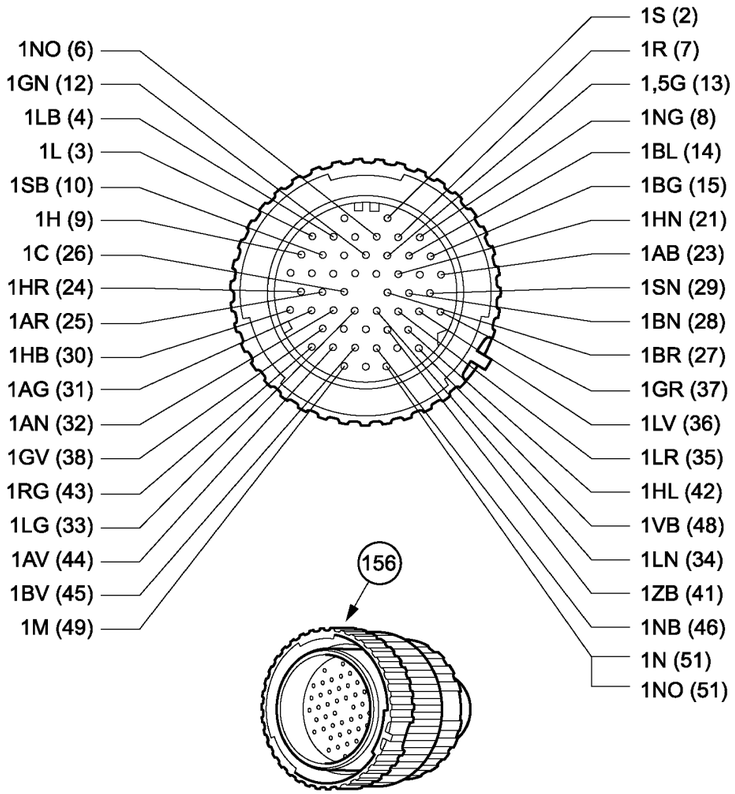
   C135 pin **B**, wire 1.0 **(LG)** and **ground**

   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.


+30
+15
5030
5020
5160
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
156
1SN
1HB
1AG
1AN
1LG
1LN
1LR
1LV
1GR
1GV
1ZB
1HL
1RG
1AV
1BV
1NB
1VB
1M
1NO–N
1SN 1SN
SA24
1AB 1AB
SA25
1HB
1AN
1LN
1LV
1GV
1BV
1NB
1AB
68
134
135
136
137
132
133
71
139
140
141
5260 5270 5280 5290 5300 5310 5320 5330 5340 5350 5360 5370 5380 5390 5400 5410 5420 5430 5440 5450 5460 5470 5480 5490 5500 5510 5520 5530 5540 5560 5560 5570 5580 5590 5600


68
1HB (2)
1SN (1)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1LB (4)
1L (3)
1SB (10)
1H (9)
1C (26)
1HR (24)
1AR (25)
1HB (30)
1AG (31)
1AN (32)
1GV (38)
1RG (43)
1LG (33)
1AV (44)
1BV (45)
1M (49)
1S (2)
1R (7)
1,5G (13)
1NG (8)
1BL (14)
1BG (15)
1HN (21)
1AB (23)
1SN (29)
1BN (28)
1BR (27)
1GR (37)
1LV (36)
1LR (35)
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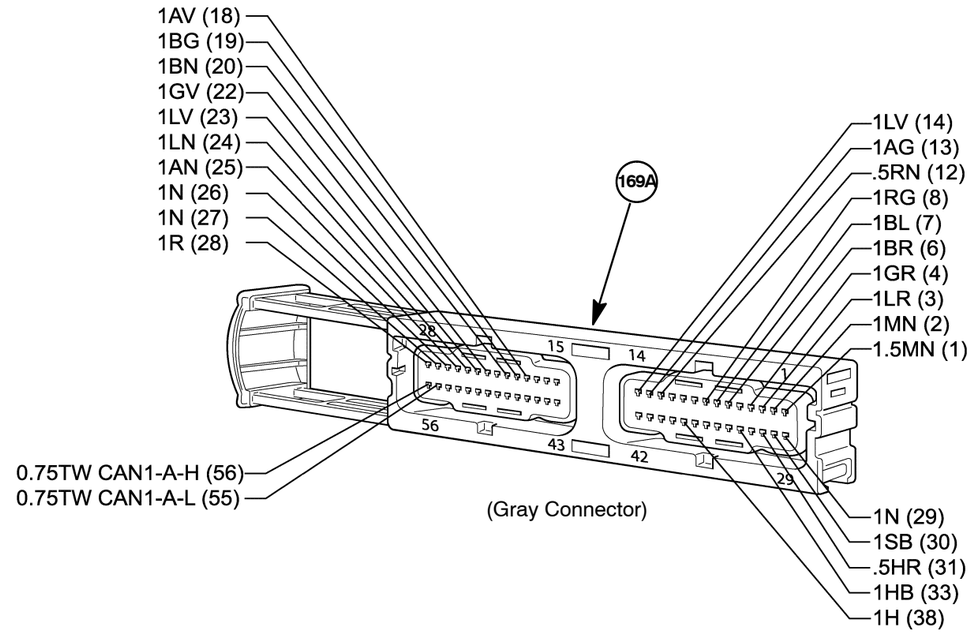
1VB (48)
1LN (34)
1ZB (41)
1NB (46)
1N (51)
1NO (51)
156


1AV (18)
1BG (19)
1BN (20)
1GV (22)
1LV (23)
1LN (24)
1AN (25)
1N (26)
1N (27)
1R (28)
169A
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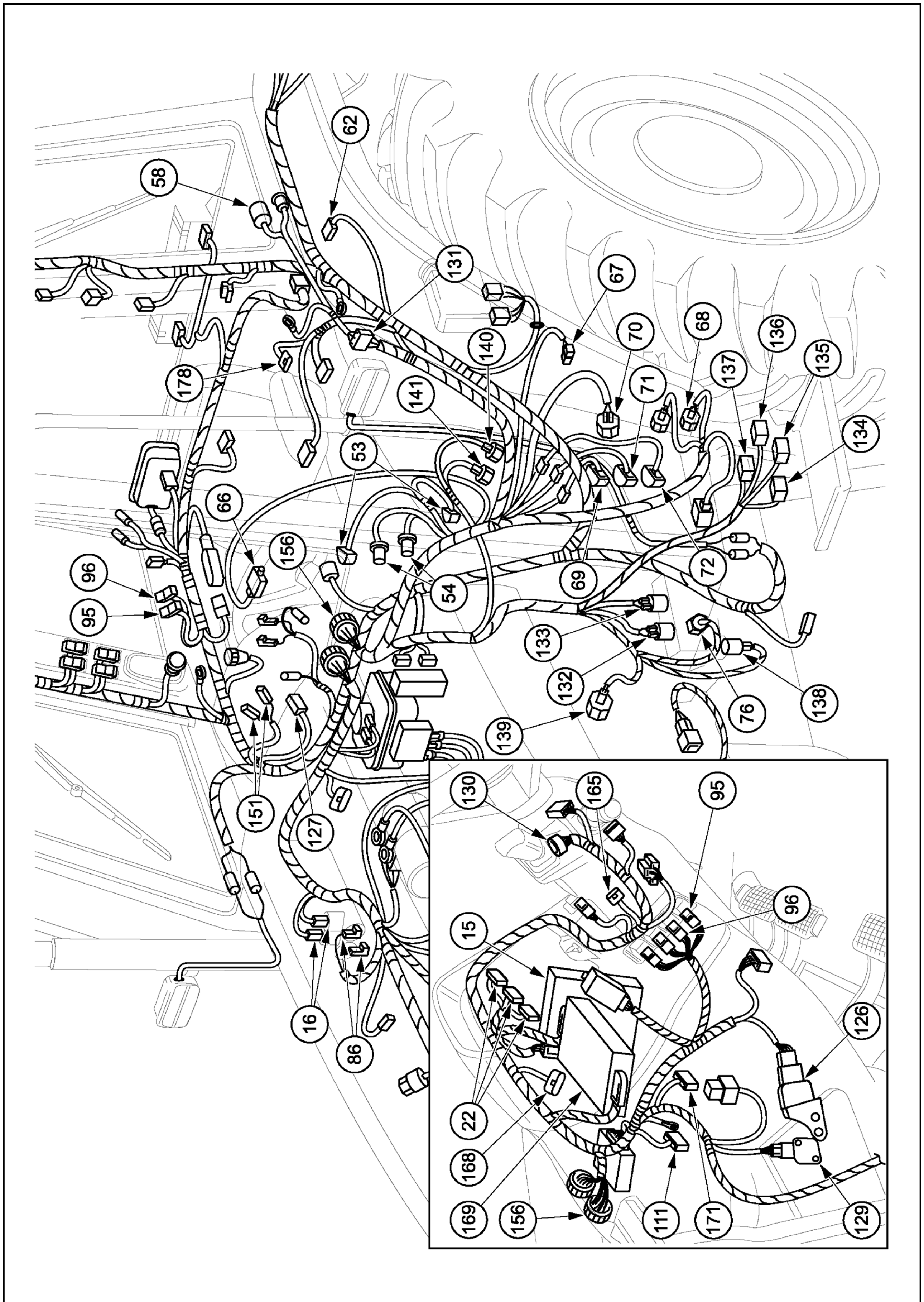
43
42
29
0.75TW CAN1-A-H (56)
0.75TW CAN1-A-L (55)
(Gray Connector)
1LV (14)
1AG (13)
.5RN (12)
1RG (8)
1BL (7)
1BR (6)
1GR (4)
1LR (3)
1MN (2)
1.5MN (1)
1N (29)
1SB (30)
.5HR (31)
1HB (33)
1H (38)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151
127
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86
130
165
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126
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168
169
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111
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129

ERROR CODE 2058 - SHUTTLE LEVER REVERSE SWITCH VOLTAGE LOW

Cause:

Open circuit or short to ground between the shuttle lever reverse switch and the controller, or the shuttle lever assembly is faulty.

Effects:

There will be a short delay recognising that forward has been selected.

Possible failure modes:

1. Faulty connector
1. Faulty shuttle lever assembly
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 shuttle lever reverse switch in H5.

   A. Turn the keystart ON. Move the shuttle lever into forward. If the display does not change to d23, continue to step 2.

   B. If the display does change to d23, while still in H5 wiggle the harness and the connectors to check for an intermittent circuit. The display will change if an intermittent circuit is detected, repair or replace as required.
2. Check the shuttle lever reverse switch.

   A. Disconnect the shuttle lever connector **C130**. Move the shuttle lever to reverse and measure the resistance between the component side of connector **C130** pin **4**, wire 0.5 **(A)** and **C130** pin **6**, wire 0.5 **(AB)**, if the resistance indicated is not approximately 0.56K Ohms, and then in neutral approximately 2.76K Ohms, remove and replace the shuttle lever assembly.

   B. If the shuttle lever switch is okay, continue to step 3.
3. Check for +5 Volts.

   A. Turn the keystart ON. Measure the voltage between connector **C130** pin **6**, wire 0.5 **(AB)** and **ground**. If approximately +5 Volts is not indicated, repair or replace the harness as required.

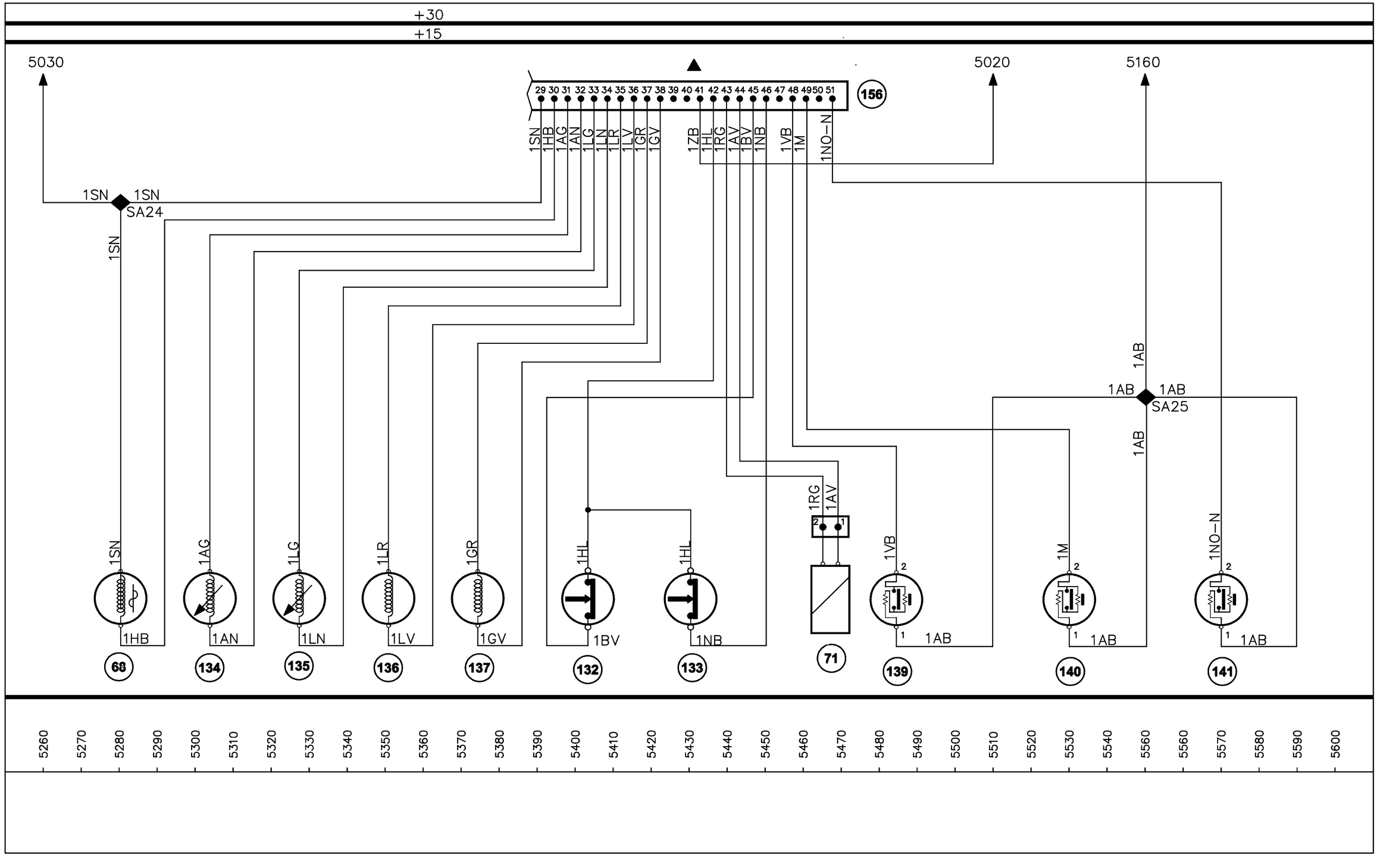
   B. If approximately +5 Volts is indicated, continue to step 4.
4. Check for an open circuit.

   A. Turn the keystart OFF. Disconnect the controller connector **C169B_CN2**. Check between connector **C169B_CN2** pin **37**, wire 0.5 **(A)** and **C130** pin **4**, wire 0.5 **(A)**. If an open circuit is indicated, repair or replace the harness as required.

   B. If an open circuit is not indicated, continue to step 5.
5. Check for a short to ground.

   A. Check between connector **C169B_CN2** pin **37**, wire 0.5 **(A)** 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.


+30
+15
5030
5020
5160
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
156
1SN 1HB 1AG 1AN 1LG 1LN 1LR 1LV 1GR 1GV
1ZB 1HL 1RG 1AV 1BV 1NB 1VB 1M 1NO–N
1SN 1SN
SA24
1AB 1AB
SA25
1SN
1AB
1SN
1AG
1LG
1LR
1GR
1HL
1HL
1RG
1AV
1VB
1M
1NO–N
1HB
1AN
1LN
1LV
1GV
1BV
1NB
1AB
1AB
1AB
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141
5260 5270 5280 5290 5300 5310 5320 5330 5340 5350 5360 5370 5380 5390 5400 5410 5420 5430 5440 5450 5460 5470 5480 5490 5500 5510 5520 5530 5540 5560 5560 5570 5580 5590 5600

ERROR CODE 2074 - 12VF SUPPLY VOLTAGE IS TOO LOW

Cause:

The 12VF supply voltage to the controller is less than +9 Volts.

Effects:

Transmission is critically disabled.

Possible failure modes:

1. Faulty connector
2. Faulty charging system
3. Faulty fuse 1
4. Faulty harness
5. 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 controller connector **C169A_CN1**.

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

   B. If the connector is okay, continue to step 2.
2. Check fuse 1.

   A. If a fault is indicated with fuse 1, continue to step 3.

   B. If the fuse is okay, continue to step 4.
3. Check for a short to ground.

   A. Disconnect connector **C169A_CN1**. Check between connector **C169A_CN1** pin **1**, wire 1.5 **(MN)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

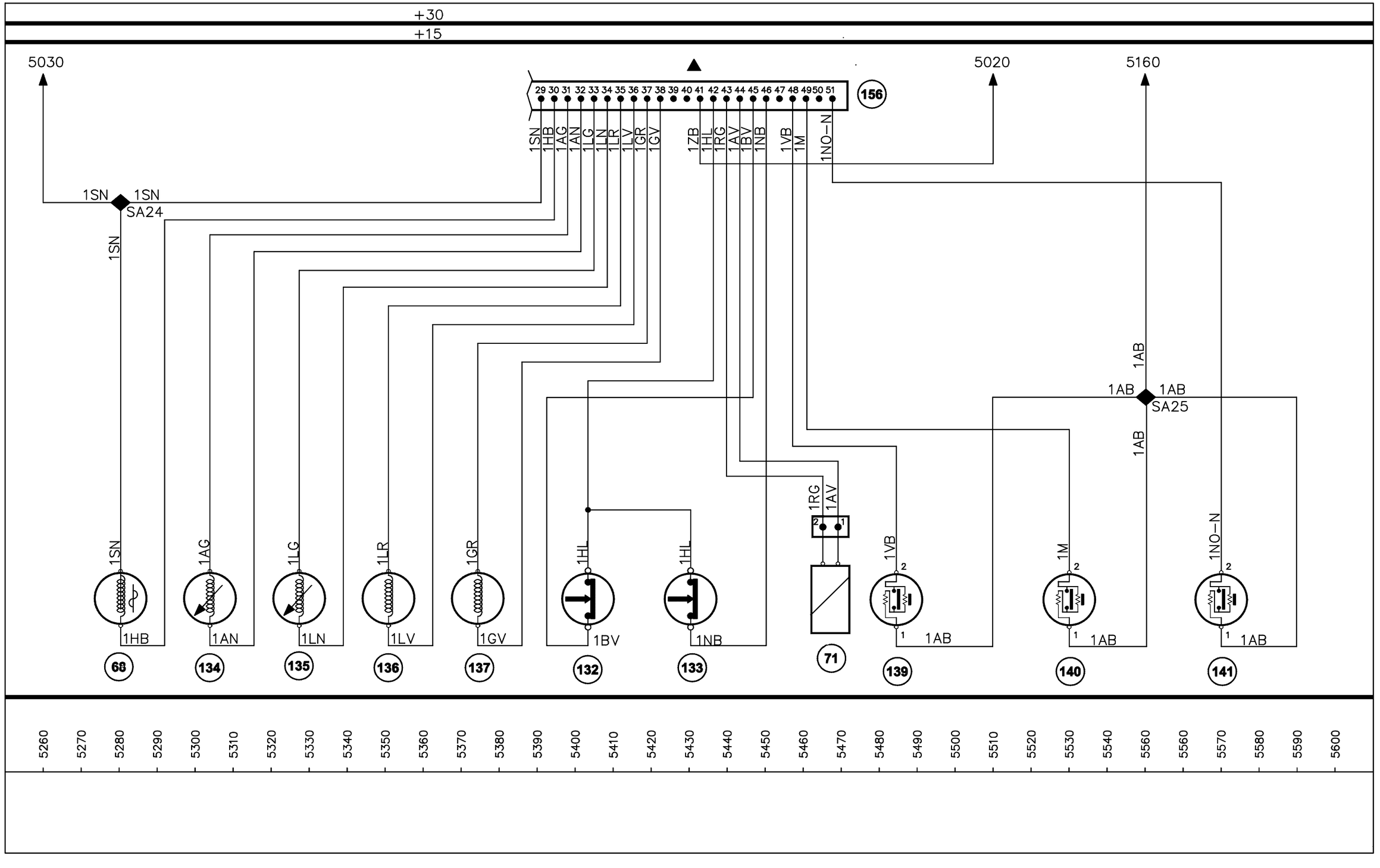
   B. If the harness is okay, download the correct level of software. If the fault re-occurs, remove and replace the controller.
4. Check the battery voltage.

   A. Start the engine and run at 2000 rev/min. Measure the battery voltage. If the voltage indicated is less than approximately +9 Volts, continue to test for a fault in the charging system.

   B. If the voltage indicated is between +10 Volts and +15 Volts, continue to step 5.
5. Check for +12 Volts.

   A. Turn the keystart OFF. Disconnect connector **C169A_CN1**. Turn the keystart ON. Measure the voltage between connector **C169A_CN1** pin **1**, wire 1.5 **(MN)** and **ground**. If approximately +12 Volts is not indicated repair or replace the harness as required.

   B. If approximately +12 Volts is indicated, download the correct level of software. If the fault re-occurs, remove and replace the controller.


+30
+15
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5020
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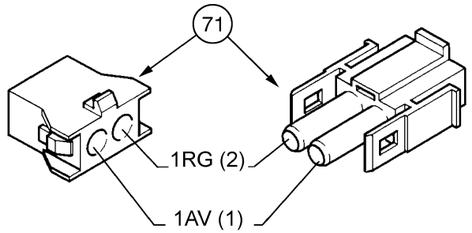
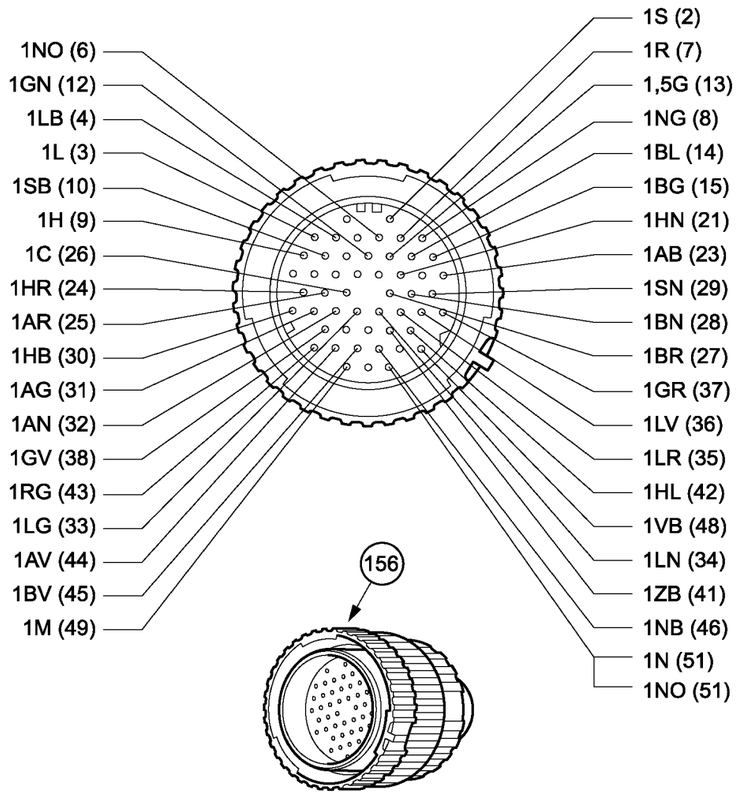
156
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
1SN 1HB 1AG 1AN 1LG 1LN 1LR 1LV 1GR 1GV
1ZB 1HL 1RG 1AV 1BV 1NB 1VB 1M 1NO–N
1SN 1SN
SA24
1AB 1AB
SA25
1AB
1SN
1SN 1HB 68
1AG 1AN 134
1LG 1LN 135
1LR 1LV 136
1GR 1GV 137
1HL 1BV 132
1HL 1NB 133
1RG 1AV 71
1VB 1AB 139
1M 1AB 140
1NO–N 1AB 141
5260 5270 5280 5290 5300 5310 5320 5330 5340 5350 5360 5370 5380 5390 5400 5410 5420 5430 5440 5450 5460 5470 5480 5490 5500 5510 5520 5530 5540 5560 5560 5570 5580 5590 5600


71
1RG (2)
1AV (1)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1LB (4)
1L (3)
1SB (10)
1H (9)
1C (26)
1HR (24)
1AR (25)
1HB (30)
1AG (31)
1AN (32)
1GV (38)
1RG (43)
1LG (33)
1AV (44)
1BV (45)
1M (49)
1S (2)
1R (7)
1,5G (13)
1NG (8)
1BL (14)
1BG (15)
1HN (21)
1AB (23)
1SN (29)
1BN (28)
1BR (27)
1GR (37)
1LV (36)
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1ZB (41)
1NB (46)
1N (51)
1NO (51)
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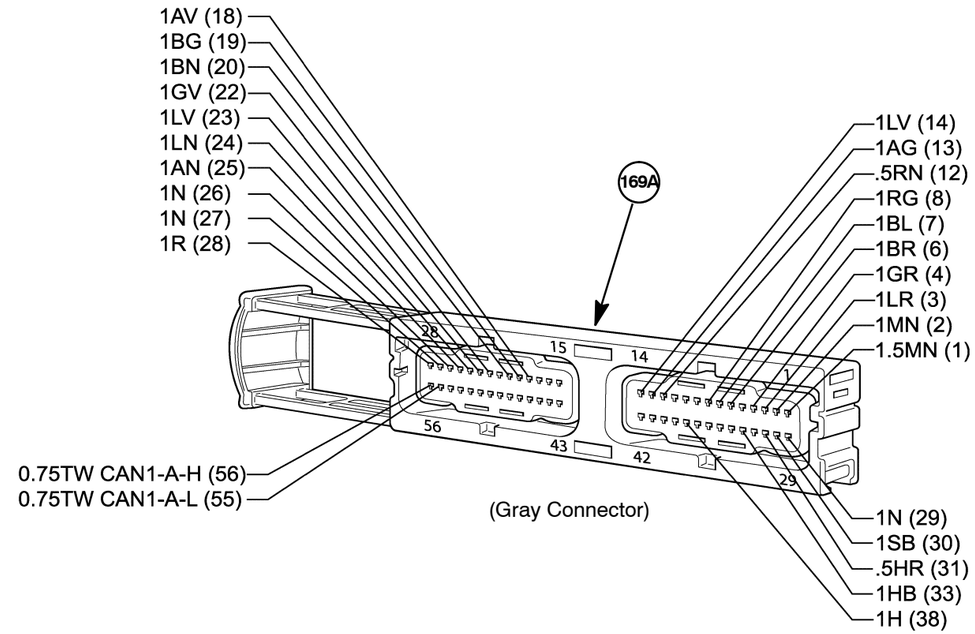
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1GV (22)
1LV (23)
1LN (24)
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1N (26)
1N (27)
1R (28)
169A
1LV (14)
1AG (13)
.5RN (12)
1RG (8)
1BL (7)
1BR (6)
1GR (4)
1LR (3)
1MN (2)
1.5MN (1)
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0.75TW CAN1-A-H (56)
0.75TW CAN1-A-L (55)
1N (29)
1SB (30)
.5HR (31)
1HB (33)
1H (38)
(Gray Connector)

NOTES

ERROR CODE 7017 - DIFFERENTIAL LOCK SOLENOID OPEN CIRCUIT OR SHORT TO GROUND

Cause:

Open circuit or short to ground between the differential lock solenoid and the controller, or the solenoid is faulty.

Possible failure modes:

1. Faulty connector
2. Faulty differential lock solenoid
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 differential lock solenoid connector **C69**, 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 the differential lock solenoid.

   A. Disconnect connector **C69**. Measure the resistance between the component side of connector **C69** pins **1** and **2**. If the resistance indicated is not approximately 8 Ohms, remove and replace the solenoid.

   B. If the resistance is okay, continue to to step 3.
3. Check the differential lock solenoid for a short to ground.

   A. Check between the component side of connector:

   C69 pin **1** and **ground**

   C69 pin **2** and **ground**

   If a short to ground is indicated, remove and replace the solenoid.

   B. If a short to ground is not indicated, continue to step 4.
4. Check for a short to ground.

   A. Disconnect connector **C169A_CN1**. Check between connector:

   C69 pin **1**, wire 1.0 **(BG)** and **ground**

   C69 pin **2**, wire 1.0 **(BL)** and **ground**

   If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 5.
5. Check for an open circuit.

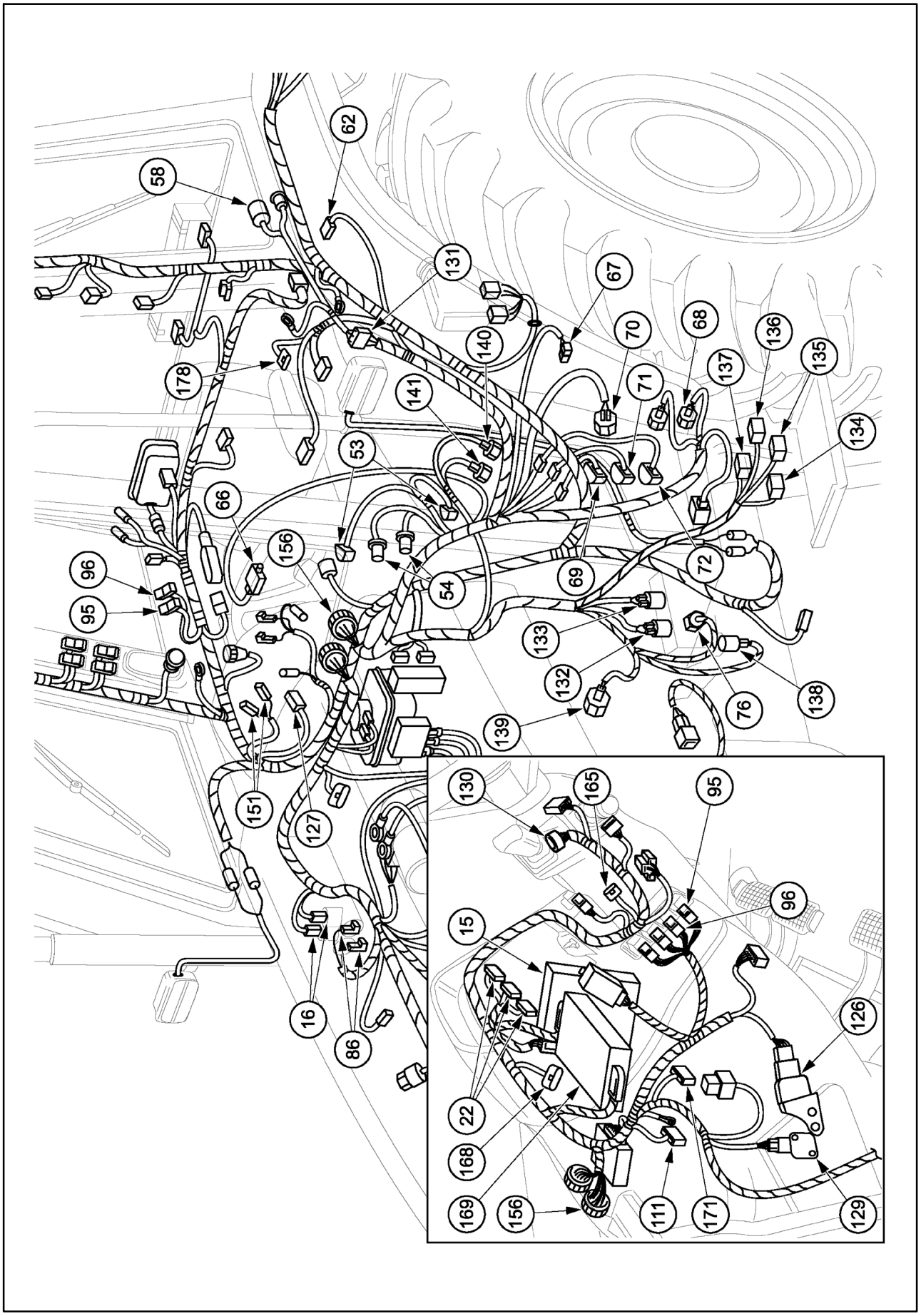
   A. Check between connector:

   C69 pin **1**, wire 1.0 **(BG)** and **C169A_CN1** pin **19**, wire 1.0 **(BG)**

   C69 pin **2**, wire 1.0 **(BL)** and **C169A_CN1** pin **7**, wire 1.0 **(BL)**

   If an open circuit 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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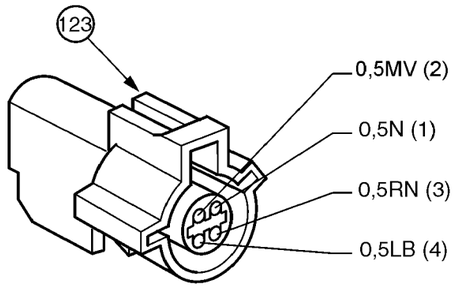
129


123
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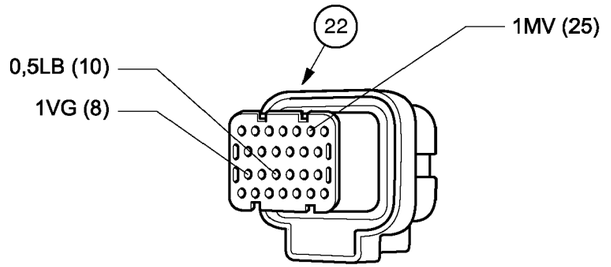
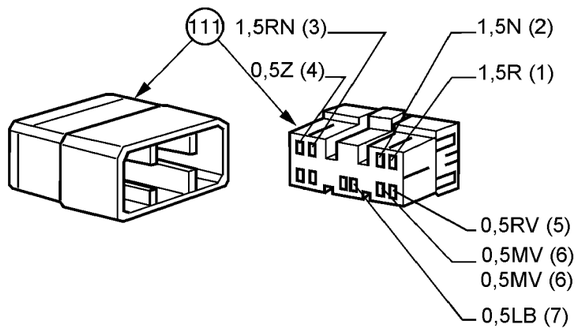
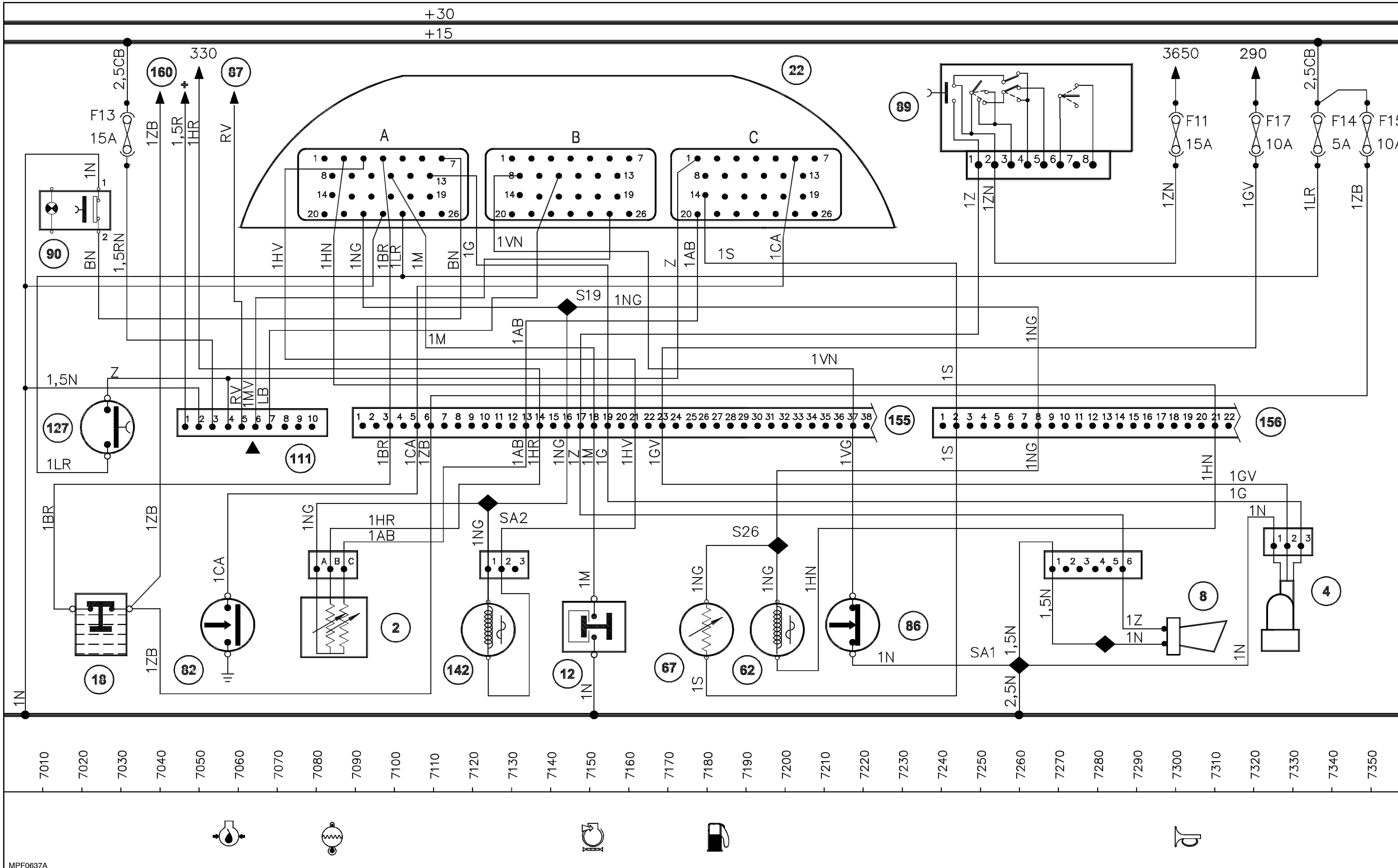
0,5N (1)
0,5RN (3)
0,5LB (4)


22
1MV (25)
0,5LB (10)
1VG (8)

B


111
1,5RN (3)
0,5Z (4)
1,5N (2)
1,5R (1)
0,5RV (5)
0,5MV (6)
0,5MV (6)
0,5LB (7)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F17
10A
F14
5A
F15
10A
A
B
C
S19
S26
SA1
SA2
7010
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7030
7040
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7090
7100
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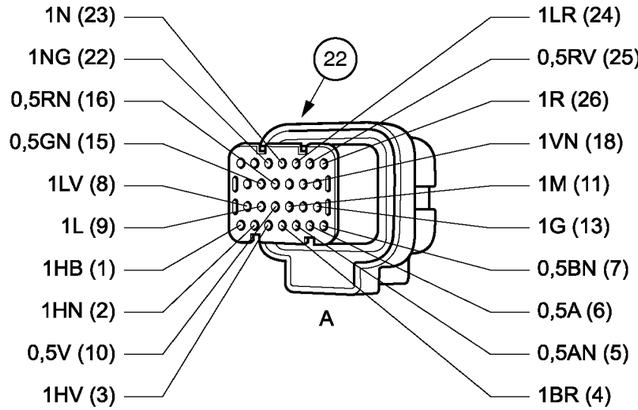
MPF0637A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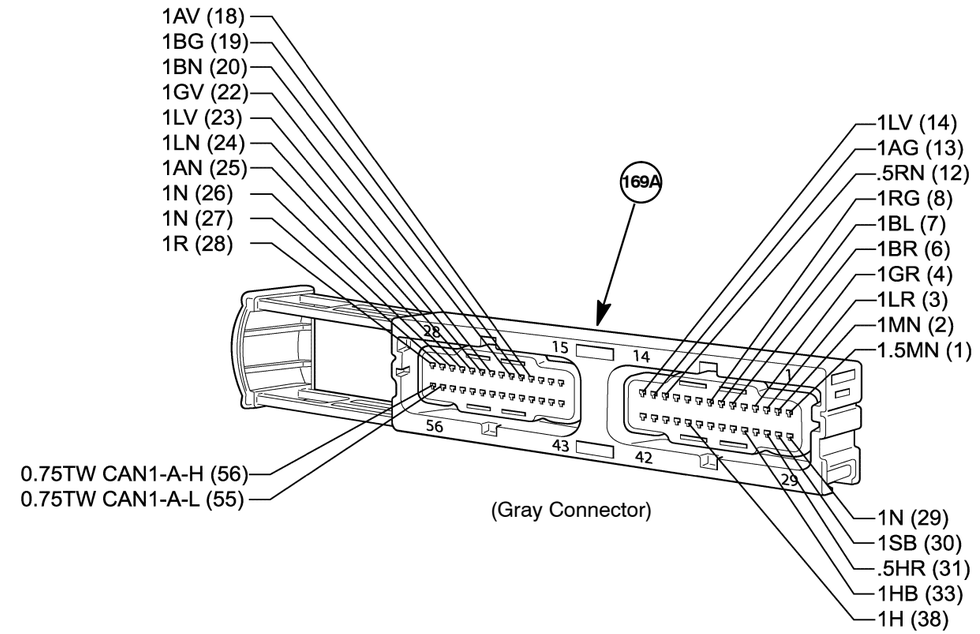
1NG (22)
0,5RN (16)
0,5GN (15)
1LV (8)
1L (9)
1HB (1)
1HN (2)
0,5V (10)
1HV (3)
22
A
1LR (24)
0,5RV (25)
1R (26)
1VN (18)
1M (11)
1G (13)
0,5BN (7)
0,5A (6)
0,5AN (5)
1BR (4)


1AV (18)
1BG (19)
1BN (20)
1GV (22)
1LV (23)
1LN (24)
1AN (25)
1N (26)
1N (27)
1R (28)
169A
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0.75TW CAN1-A-H (56)
0.75TW CAN1-A-L (55)
(Gray Connector)
1LV (14)
1AG (13)
.5RN (12)
1RG (8)
1BL (7)
1BR (6)
1GR (4)
1LR (3)
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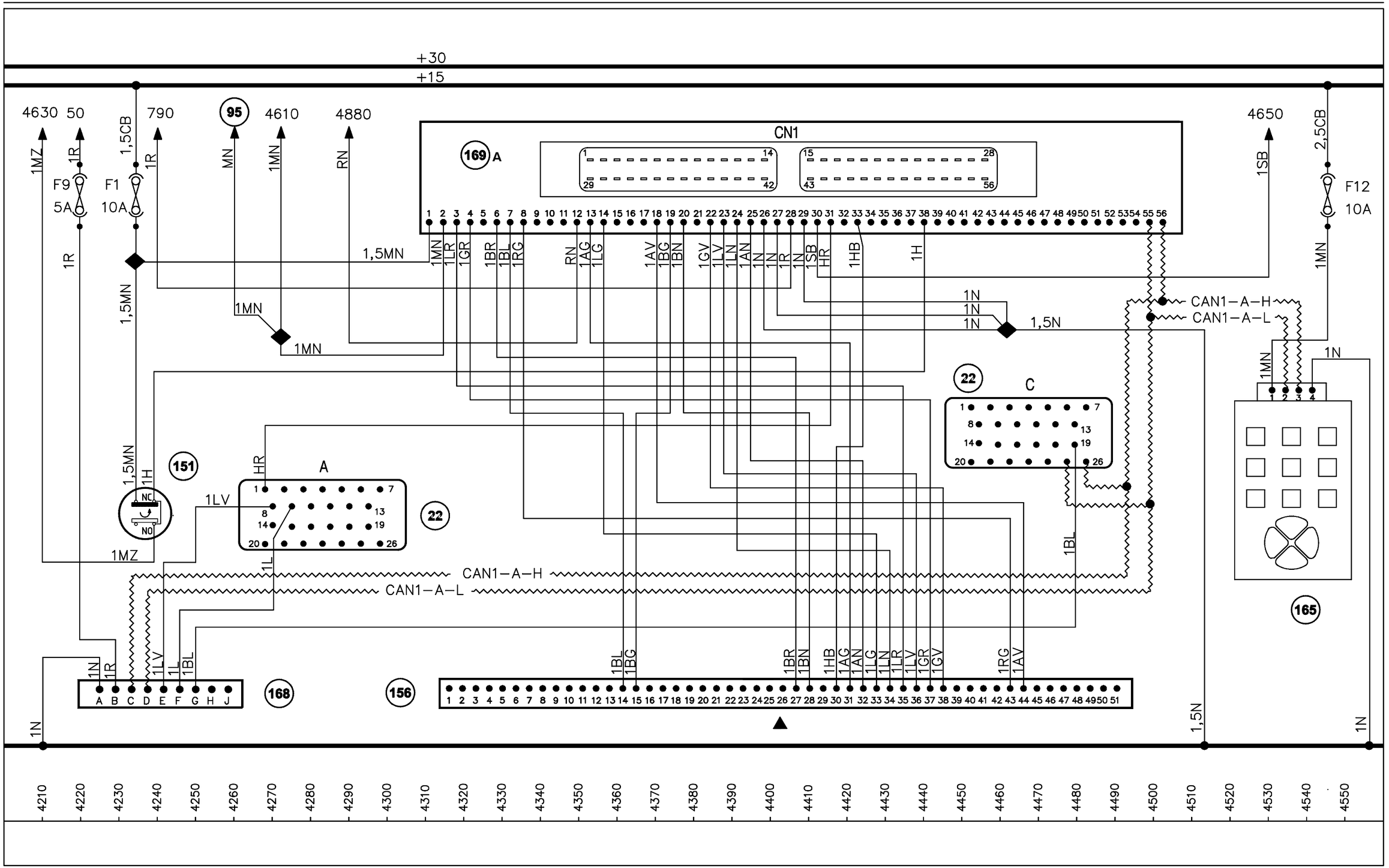
1.5MN (1)
1N (29)
1SB (30)
.5HR (31)
1HB (33)
1H (38)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+15
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50
1MZ
1R
F9
5A
1R
1,5CB
F1
10A
1R
790
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1,5MN
95
MN
1MN
1MN
4610
1MN
4880
RN
CN1
169 A
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
1MN 1LR 1GR 1BR 1BL 1RG RN 1AG 1LG 1AV 1BG 1BN 1GV 1LV 1LN 1AN 1N 1N 1R 1N 1SB HR 1HB 1H
1N
1N
1N
1,5N
4650
1SB
2,5CB
F12
10A
1MN
CAN1−A−H
CAN1−A−L
1MN
1N
22
C
1 7 8 13 14 19 20 26
1BL
1,5MN
1H
NC
C
NO
151
HR
A
1LV
1 7 8 13 14 19 20 26
22
1MZ
1L
CAN1−A−H
CAN1−A−L
1N
1R
1LV
1L
1BL
A B C D E F G H J
168
156
1BL 1BG 1BR 1BN 1HB 1AG 1AN 1LG 1LN 1LR 1LV 1GR 1GV 1RG 1AV
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
165
1N
1,5N
1N
4210 4220 4230 4240 4250 4260 4270 4280 4290 4300 4310 4320 4330 4340 4350 4360 4370 4380 4390 4400 4410 4420 4430 4440 4450 4460 4470 4480 4490 4500 4510 4520 4530 4540 4550

ERROR CODE 14 - LIFT/LOWER SOLENOID VALVES OPEN CIRCUIT

Effects:

The rear lift does not work.

Possible failure modes:

1. Faulty connector
2. Faulty solenoid
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 lift solenoid valve connector **C144**, the lower solenoid valve connector **C143**, the inline harness connector **C118** and the controller connector **C124**.

   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 lift solenoid valve.

   A. Disconnect the lift control solenoid connector **C143**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 1.6 Ohms, remove and replace the lift control solenoid.

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

3. Check the lower solenoid valve.

   A. Disconnect the lower control solenoid connector **C144**. Measure the resistance between the solenoid terminals. If the resistance indicated is not approximately 1.6 Ohms, remove and replace the lower control solenoid.

   B. If the solenoid is okay, continue to step 4.

4. Check for an open circuit.

   A. Disconnect connector **C124**. Check between connector:

   C143 pin **2**, wire 1.0 **(LN)** and **C124** pin **37**, wire 1.0 **(LN)**

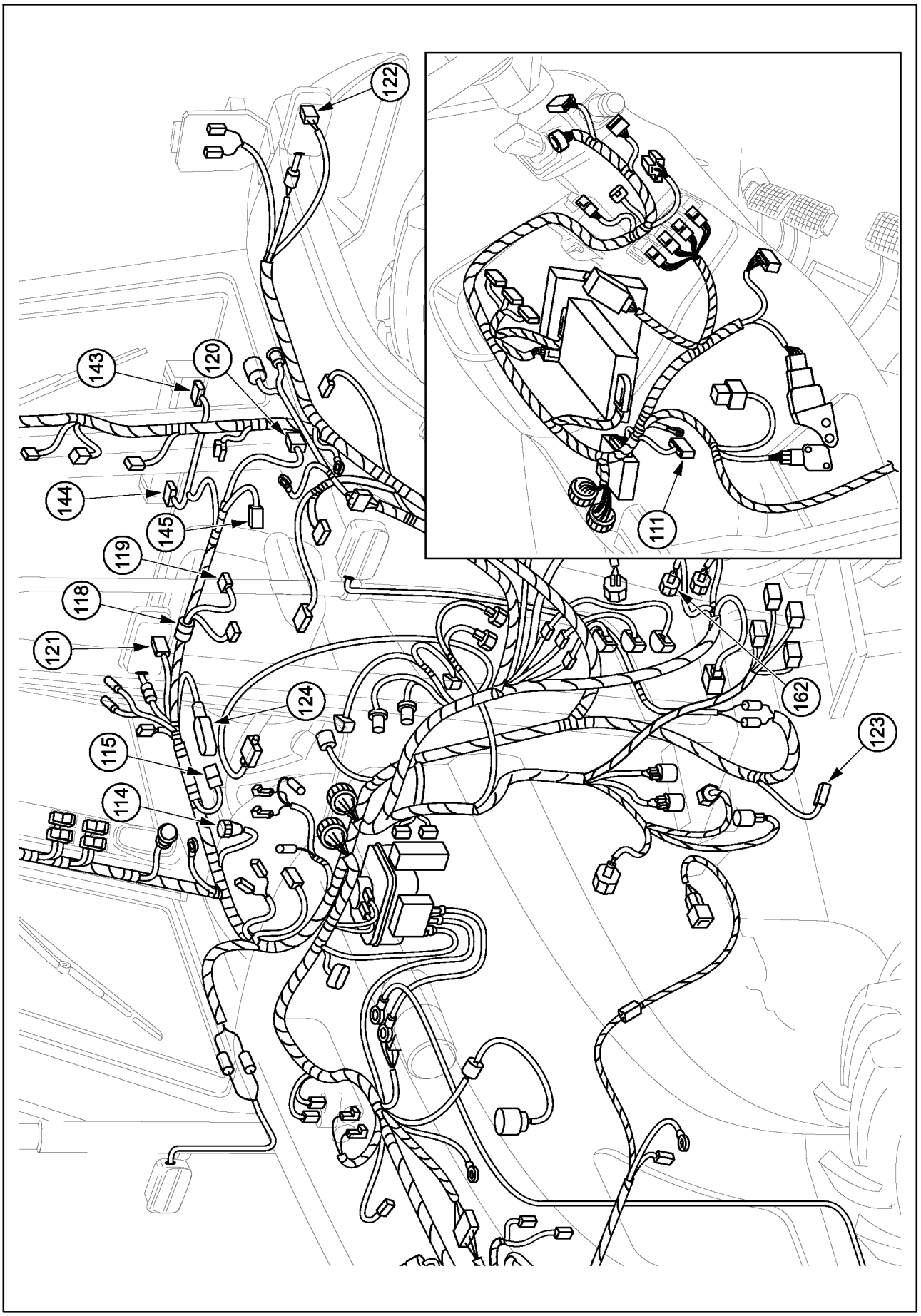
   C143 pin **1**, wire 1.0 **(L)** and **C124** pin **35**, wire 1.0 **(L)**

   C144 pin **1**, wire 1.0 **(L)** and **C124** pin **35**, wire 1.0 **(L)**

   C144 pin **2**, wire 1.0 **(LB)** and **C124** pin **19**, wire 1.0 **(LB)**

   If an open circuit 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.


122
143
120
144
145
119
118
121
124
115
114
111
162
123

ERROR CODE 31 - DRAFT RIGHT-HAND SENSOR VOLTAGE LOW

Effects:

The rear lift works, but in controlled draft selection operation is not correct.

Possible failure modes:

1. Faulty connector
2. Faulty harness
3. Faulty draft sensor
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 draft sensor connector **C119**, inline harness connector **C118** and the controller connector **C124**.

   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 ground.

   A. Disconnect connector **C119** and **C124**. Check between connector **C119** pin **2**, wire 0.5 **(HV)** and **ground**. If a short to ground is indicated, repair or replace the harness as required.

   B. If a short to ground is not indicated, continue to step 3.
3. Check for an open circuit.

   A. Check between connector:

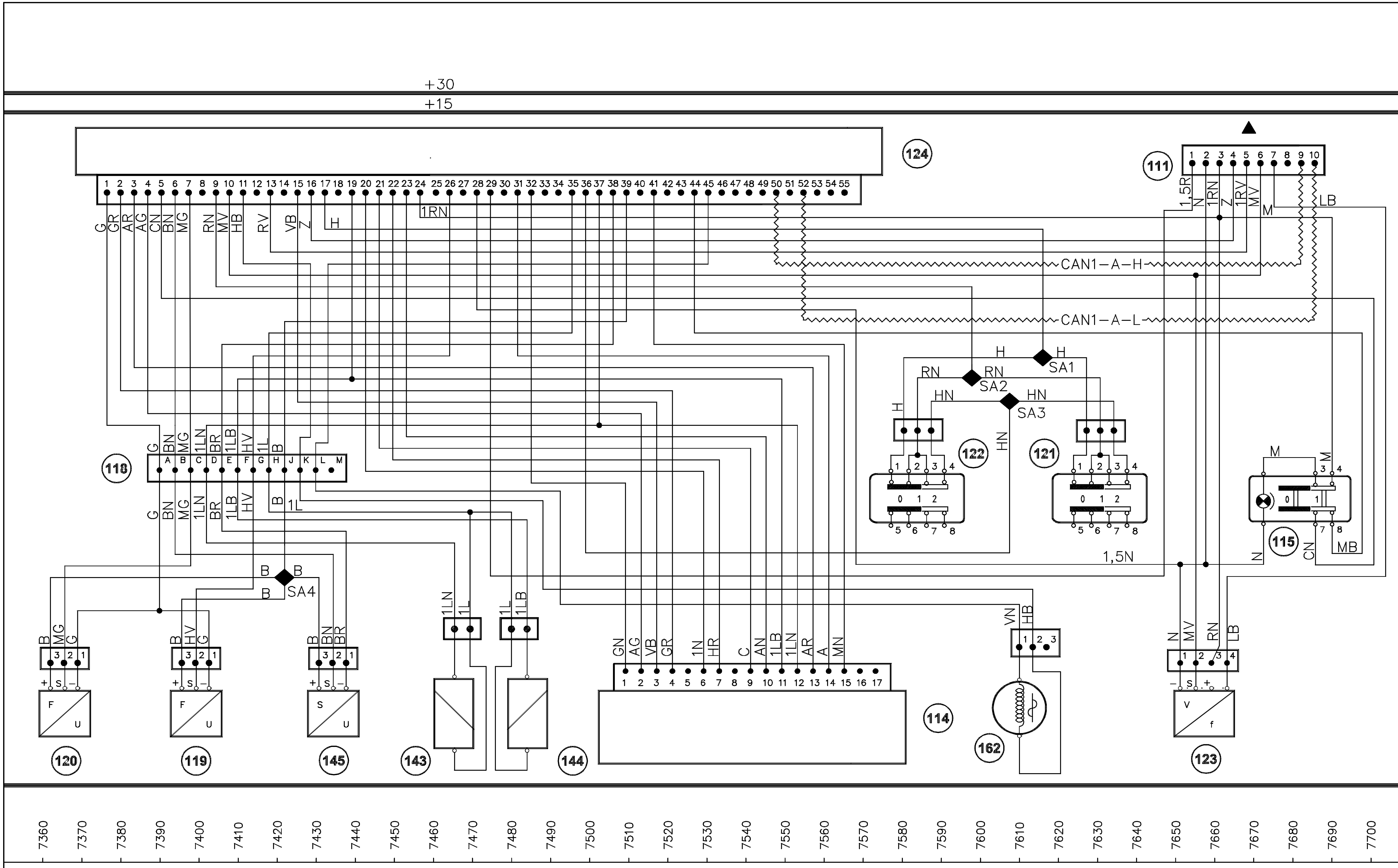
   C119 pin **1**, wire 0.5 **(G)** and **C124** pin **1**, wire 0.5 **(G)**

   C119 pin **2**, wire 0.5 **(HV)** and **C124** pin **26**, wire 0.5 **(HV)**

   C119 pin **3**, wire 0.5 **(B)** and **C124** pin **39**, wire 0.5 **(B)**

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

   B. If the harness is okay, remove and replace the draft right-hand sensor. If the fault persists, download the correct level software. If the fault re-occurs, remove and replace the controller.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