DEUTZ FAHR

SAME DEUTZ-FAHR DEUTSCHLAND GmbH

WORKSHOP MANUAL

Agrotron

K90 K100 K110 K120

ProfiLine

WORKSHOP MANUAL

SAME DEUTZ-FAHR DEUTSCHLAND GmbH
Deutz-Fahr Strasse 1
D-89415 Lauingen
Tel.: (09072) 997-0 Fax: (09072) 997-300

Agrotron

K90 K100 K110 K120

ProfiLine

introduction

This publication is intended for the trained technician who must operate on our tractors.

It contains all general information relating to our tractor range, and in particular it highlights the inspection, overhauling and adjustment procedures as well as the main instructions for dismantling and reassembling operations.

The workshop manual is a natural summary for the mechanic who has attended the vocational training and specialization courses, which are held every year at our Service School, to permit him to perform a precise and qualified work on tractor.

Its contents are therefore an exhaustive reference book for the experienced mechanic who desires to refresh his memory on the sequence of the operations to be done. It is then good practice for every authorized dealer mechanic to have at his disposal this publication, so that it may be consulted quickly when necessary.

We wish to thank in advance for the cooperation all thos people, who will let us have their suggestions in order to make this publication more complete.

INTRODUCTION

The purpose of this workshop manual is to provide instruction for repair technicians and a practical guide to improving the quality of repairs.

This manual enables repair technicians to acquire a thorough knowledge of the machine, indicating the correct methods for fault diagnosis, for working in safety and for accurate dimensional checks and visual inspections. The instructions also indicate the products to use, the tightening torques and the adjustment data.

The technical material contained in this manual is reserved to Authorised Dealers and Service Centres who will be duly informed of any technical changes to the machines in question through the issue of documents regarding modifications, updates and supplements for optional equipment.

SAFETY NOTES

To ensure that machines entrusted to Authorised Service Centres for repair or overhaul continue to function correctly, it is very important that all repair work is carried out in the prescribed manner.

The procedures for checks and repairs indicated in this manual are safe and effective.

Some of the operations described require the use of special tools and equipment; these tools have been specifally designed for the intended purpose and may be ordered directly from the Manufacturers.

DO NOT USE MAKESHIFT TOOLS; not only is there a risk of personal injury, but such tools are rarely suited to the purpose for which they are used.

To prevent injury to operators, the symbols  and  are used in this manual to indicate the safety precautions required. The warnings accompanying these symbols must always be adhered to carefully.

In potentially hazardous situations, always give priority to personal safety and take the necessary actions to eliminate the danger.

GENERAL SAFETY RULES

1 - Even if you have a thorough knowledge of the machine as regards its components, operation and controls, always take particular care when carrying out the following operations; Remember that the machine you are working on is in need of repair or overhaul and consequently may not always behave as expected.

2 - Before starting work, clean the machine thoroughly to remove all mud, dust and road dirt. Also clean the cab to remove all traces of oil, snow and ice from the access steps and grab rails.

3 - When climbing up to or down from the cab, always ensure you maintain three points of contact at a time (foot or handholds) in order to keep your balance and prevent accidental falls.

4 - Always take special care when carrying out fault diagnosis operations; these operations often require two persons, who must never stand in front of the wheels when the engine is running.

5 - When carrying out checks and repairs, wear close-fitting clothing, safety goggles and protective gloves that are suitable for the task (cleaning, draining fluids, repairs).
When working near moving parts, long hair should be gathered up and secured safely under a cap to prevent the risk of entanglement and sever injury.

6 - Do not allow anyone who is not directly involved in the work to come near the machine; ensure that they remain at a safe distance.

7 - Keep well clear of moving parts; when the engine is running, some moving parts are not easily visible and therefore present a risk of entanglement, even if protected by safety guards.

8 - Ensure that the area is well ventilated before starting the engine in order to avoid the formation of dangerous concentrations of toxic gases; always connect suitable fume extraction equipment to the exhaust pipe.

9 - Under no circumstances start the engine with the safety guards removed; all repair and adjustment operations must be carried out with the engine stopped.

10 - Do not top up fuel, oil or coolant levels when the engine is running.

11 - Never smoke and ensure there are no naked flames nearby when topping up fuel or oil. Always remove the battery from the machine before recharging.

12 - Before checking or removing the battery, stop the engine and remove the key from the starter switch.

13 - Remove the battery and recharge in a well-ventilated area where the temperature exceeds 0°C.

14 - When checking or recharging the battery, do not smoke or allow naked flames in the vicinity as the hydrogen gas given off by the battery is highly explosive.

15 - The liquid (electrolyte) contained in the battery is very harmful if it comes into contact with the skin and the eyes; for this reason, always wear gloves and safety goggles with side shields when checking or topping up the battery.
Should any electrolyte accidentally come into contact with your skin, wash the affected parts immediately with plenty of water; if electrolyte comes into contact with your clothing, this should be removed as soon as possible.
In case of accidental ingestion of electrolyte, drink plenty of water, milk or vegetable oil and take antacids such as magnesium, bicarbonate, etc. and seek medical attention immediately.

16 - Before working on the electrical systems, always disconnect the battery terminals.

⚠ *IMPORTANT!*
Always disconnect the negative terminal (--) first and then the positive terminal (+); when re-connecting the battery on completion of the work, first connect the positive terminal (+) and then the negative(--).

17 - Before carrying out any arc welding (permitted only on implements attached to the machine) always disconnect the battery terminals and unplug all the connectors of the electronic control units and the alternator.

18 - When topping up lubricants, always wear suitable protective gloves.

19 - Do not wear clothing contaminated by engine or hydraulic oil; prolonged contact with the skin can be harmful and may cause allergic reactions.

20 - Used engine oil and hydraulic oil must be disposed of in a proper manner; recover used lubricants and dispose of them in accordance with the applicable regulations.

21 - Before carrying out any work on the hydraulic or pneumatic systems, discharge all residual pressure from the circuits.

22 - Before carrying out any work on the hydraulic system or engine, allow the oil and engine coolant to cool down.

23 - When removing and refitting certain assemblies, it will be necessary to support the machine; use stands, jacks or blocks capable of supporting the weight and arrange them in a triangular pattern to prevent the machine from overturning.

24 - To lift heavy components, use a hoist or crane. Check that wire ropes, chains or fibre slings are not worn and that hooks are not damaged.

25 - Always use lifting equipment of suitable capacity for the weight of the components to be removed. Ensure lifting equipment is attached correctly.

26 - When lifting or supporting an assembly or component, manoeuvre the parts slowly and carefully to avoid oscillation or collision with other components.

27 - Never work on components suspended from a hoist or crane.

28 - When removing the retaining bolts of a component that could fall, always leave two opposing bolts in place for safety; before removing these last two bolts, attach the component to suitable lifting equipment or position support blocks.

29 - Any oil or fuel spilled during removal or dismantling operations should be cleaned up as soon as possible to prevent the risk of slipping and fire.

30 - When refitting electrical wiring looms and wires, ensure that they are properly secured with their original retaining straps or brackets to prevent the possibility of damage caused by vibration.

31 - Never insert your fingers or hands to check the alignment between fixing holes in components; always use a suitable dowel of soft material.

32 - When refitting assemblies or components, always use the specified tightening torques; the tightening torques indicated in the paragraphs regarding assembly/refitting operations have been determined through experimentation and must be scrupulously adhered to.

33 - When refitting parts that are subject to vibration or that rotate at high speed, take particular care when carrying out final installation checks.

SAFETY PRECAUTIONS FOR REMOVAL AND REFITTING OPERATIONS

★ When removing or refitting parts, always take the following safety precautions.

1. PRECAUTIONS FOR REMOVAL OPERATIONS

- Unless otherwise indicated, lower the working equipment until it rests on the ground.
- After disconnecting hydraulic and fuel system pipes, always fit plugs to the open ends of the pipes to prevent ingress of impurities.
- Before removing a cylinder, fully retract the piston and secure it in this position using a retaining strap.
- Use containers of sufficient capacity when draining oil, coolant or fuel.
- Before removing a part from the machine, check for alignment markings indicating the correct assembly position. If necessary, make new markings to ensure correct assembly.
- When unplugging electrical connectors, always grip the connectors firmly to avoid pulling on the wires.
- Where necessary, label wires and pipes before removal to avoid confusion when reconnecting.
- Check the number and thickness of any shims removed and keep them together in a safe place.
- To lift the machine or any of its main components, use lifting equipment of suitable capacity.
- When using eyebolts for lifting components, first check that they are not bent or damaged; screw them fully home and then turn the bolt so that the eye is aligned with the lifting hook.
- Before removing a part, clean the surrounding area and, after removing the part, cover it to protect it from dirt and dust.

2. PRECAUTIONS FOR REFITTING OPERATIONS

- Tighten nuts and screws to the specified tightening torques.
- When refitting flexible pipes and wires, take care not to twist or tangle them.
- Always fit new seals, O-rings, cotter pins and safety stop rings; make sure that the ends of the cotter pins are separated and bent back so that the pin cannot be withdrawn from the hole.
- Ensure that circlips are correctly installed in their seatings.
- When applying threadlocking compound, first clean the part removing all oil and grease, then cover the thread evenly applying a few drops of the compound.

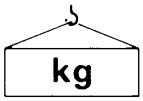
- When applying sealant, first clean the surface removing all traces of oil and grease and check for dirt or indentations, then apply the sealant evenly

  making sure that it forms a continuous film around any fixing holes.
- Clean all parts, removing dirt, oxidisation, carbon deposits, burrs and indentations.
- Coat all moving parts with a thin film of engine oil.
- When reconnecting electrical connectors, first remove all traces of oil, dust and water from the inside of the connector and then push the two halves together firmly; connectors with locking tabs should be pushed together until the tab engages the keeper..
- Bolt down flanged fittings evenly, tightening the screws gradually in a crosswise pattern.

3. PRECAUTIONS TO BE TAKEN ON COMPLETION OF REMOVAL/REFITTING OPERATIONS

- If coolant has been drained from the engine, refit the drain plug and add new coolant to the correct level. Start the engine to circulate the coolant and then check the level again and top up.
- After removing hydraulic components, top up the hydraulic oil to the specified level. Start the engine to circulate the oil in the hydraulic circuits and then recheck the level and top up as necessary.
- After having removed a variable displacement pump, connect the drain pipe and fill the pump casing with oil through the filler hole provided.
- Grease stub axle housings, cylinder pivot mountings and drive shafts thoroughly after assembly.

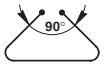
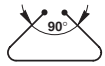
LIFTING INSTRUCTIONS



⚠ Components weighing over 25 kg or of significant size must be supported and removed using suitable lifting equipment with wire rope or polyester slings.
In the paragraphs regarding removal and refitting operations, the weight of the component or assembly to be lifted is indicated with the symbol 

WIRE ROPES - SLINGS

- Use wire ropes or polyester slings of suitable capacity for the parts to be lifted, referring to the following tables:

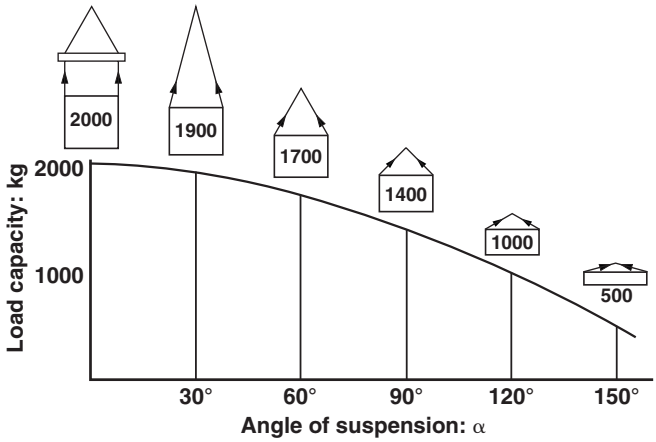
WIRE ROPES (standard twisted «S» or «Z» type)				*POLYESTER SLINGS (eye-and-eye - simple loop)*				
Ø rope mm	Capacity (kg)			Width mm	Capacity (kg)			
								
8	650	620	500	25	500	400	860	700
10	1000	1740	1420	50	1000	800	1730	1410
12	1450	2500	2050	62	1250	1000	2160	1760
14	2000	3460	2820	75	1400	1120	2420	1980
16	2600	4500	3670	100	2000	1600	3460	2820
18	3300	5710	4660	150	2500	2000	4330	3530

NOTE. Lifting capacities are calculated with a safety coefficient.

- The lifting hook should be attached to the central part of the rope or sling; if the hook is attached near the ends of the rope/sling, this could cause the load to slip during lifting.
- Never lift a heavy load using a single rope; always use two or more symmetrically arranged ropes.

⚠ Suspension of a load from a single rope could cause the load to start rotating and consequently cause the rope strands to untwist or the load to slip; this could lead to serious injury.

- Never lift a heavy load when the two legs of the ropes form a wide angle.
The permitted load (kg) decreases in inverse proportion to the angle of suspension; the table below indicates how the permitted load varies according to the angle of suspension for two Ø 10 mm ropes each with a load capacity of 1000 kg.



HOW THE MANUAL IS STRUCTURED

SECTION 00 Contains the general safety rules, information on how to use and update the manual, the symbols used, the products required, the standard tightening torques and a conversion table for units of measurement.

SECTION 10 Contains technical descriptions and information regarding the mechanical and hydraulic operation of machine components, the designations of the various components, hydraulic diagrams and general technical data.

SECTION 20 Contains the user guides for the software needed to configure the machine and the engine and to read any fault diagnosis.

SECTION 30 Contains the methods, checks and adjustments regarding the external components; the operations dealt with in this section do not require removal of the various assemblies that form the tractor frame and cab.

SECTION 40 Contains information and diagrams regarding the machine's electrical and electronic systems

CAUTION!

The manual does not contain information and instructions regarding the engine and transmission, which can be found in the following manuals:

Engine DEUTZ 2012	*0312 0361*	*Spanish* *English* *French* *German*
Gearbox ZF T7100KT	*5871 956 001*	*German*
	5871 956 002	*English*
Rear axle 7100	*0298 6877*	*German*
	0298 6878	*English*
	0298 6879	*French*
	0298 6880	*Spanish*

HOW TO CONSULT THE MANUAL

1. Removal and refitting of assembled units

(1) For the removal or refitting of assembled units, the sequence of operations and the methods to be applied are described in the removal procedure; if the refitting sequence of operations is the exact reverse of the removal procedure, it is not described.

(2) All special techniques that apply only to the refitting procedure are indicated by the symbol [1] ; this same symbol appears at the end of each major step in the removal procedure to indicate the parts for which special techniques are to be applied during refitting.

Example: *REMOVAL OF UNIT* :..... Operation heading

: ..... Safety rules to be observed when carrying out the procedure described.

1 - Remove part (1):..... Step of the procedure

★: ..... Technique or important information regarding the removal operation

2 - Disconnect (2)..... [1] : .....Indicates the existence of special information regarding refitting of the component in question

..... ,: ..... Recover oil, liquid or fuel and the quantity to be recovered

Example:*REFITTING UNIT:*..... Operation heading

- Refitting is the reverse of removal

[1] :.....Technique to be applied during refitting.

★: ..... Technique or important information regarding the refitting operation.

- ..... ,: ..... Filling with oil or liquid with quantity

2. During removal and refitting operations, in addition to the general safety rules, you must also observe the specific «SAFETY PRECAUTIONS FOR REMOVAL AND REFITTING OPERATIONS».
Always adhere to these precautions.

3. List of special tools

(1) For details regarding the type, code numbers and quantity of all the tools (T1, T2, etc.) specified in the operating procedures, see the heading «SPECIAL TOOLS».

4. Tightening torques

1 - In the operating procedures, the symbol Nm denotes a specific tightening torque that has been determined experimentally and that must be adhered to.

2 - If the symbol does not appear, the torque values to be used are those indicated in the table in Section 00 of this manual.

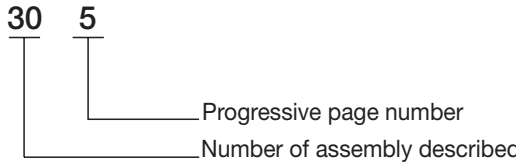
HOW TO USE AND UPDATE THE MANUAL

1. UPDATING THE MANUAL

All additions, corrections or amendments to the manual will be sent to the Authorised Service Centres.
Before starting any repair or overhaul operations, check that you have the most recent updates as these may contain supplementary data not present in previous issues.

2. INSERTING UPDATES

1- *Check* the number of the page and insert it in the appropriate section of the manual following the *consecutive order of the page* numbers. Example:



2 - *Supplementary pages:* indicated with a hyphen (-) and consecutive number after the page number. Example:

30-5
30-5-1
30-5-2 — Added pages
30-6

NOTE. The contents of supplementary pages are structured so that there is no overlap with existing pages.

3 - *Updated pages:* indicated by a consecutive number in a circle; this symbol appears below the page number. Example:

30-5
30-5-1 – Existing page
30-5-1 ① – Update page
30-5-2 – Existing page

NOTE. All supplementary and updated pages are indicated in the manual page list; a revised page list is sent with each update and supersedes the previous list.

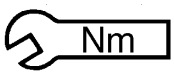
3. SYMBOLS USED IN THE MANUAL

For greater clarity, important information pertaining to operator safety and to critical stages in the working procedures is highlighted by the symbols shown in the following table.

Graphic symbols	*Meaning*	*Notes*
	Safety	Safety rules to be applied during operation
		Operation requiring special safety measures due to internal pressure
	Warning	Operations requiring special technical or other precautions to ensure compliance with standard values
	Weight	Weight of main assemblies. Choose lifting ropes/slings carefully; supports required, etc.

Graphic symbols	*Meaning*	*Notes*
	Greasing	Parts must be coated with adhesive, lubricant, etc.
	Oil, water	Points at which oil, water or fuel must be added and quantity required
	Drain	Points from which oil, water or fuel must be drained with quantity
	Tightening torque	Parts requiring special tightening torque during refitting or assembly

TIGHTENING TORQUES



1. BOLTS AND NUTS

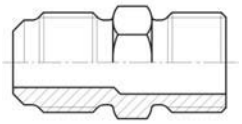
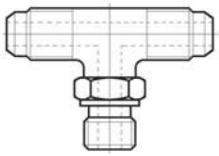
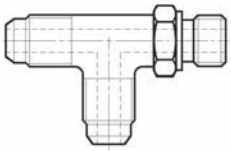
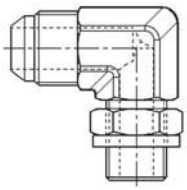
The tightening torques for certain specific components and special tightening methods are indicated in the relative assembly paragraphs.

★ The tightening torques indicated below refer to bolts and nuts assembled without lubrication and, where applicable, with anaerobic threadlocking compound.
The values apply to tightening on steel or cast iron components; for soft materials such as aluminium, copper, plastic, sheet metal or panels, the indicated tightening torques must be reduced by 50%.

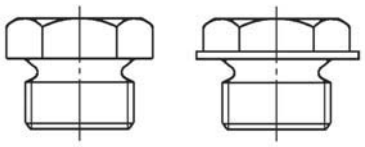
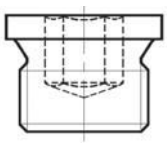
SCREW SIZE		SCREW CLASS					
		8.8		10.9		12.9	
		Nm	lb.ft.	Nm	lb.ft.	Nm	lb.ft.
COARSE THREAD	M6x1	8,0 –8,8	5.9 –6.5	11,8 – 13,0	8.7 –9.6	13,8 – 15,2	10.2 –11.2
	M8x1.25	19,4 –21,4	14.3 –15.8	28,5 – 31,5	21.0 – 23.2	33,3 – 36,9	24.5 – 27.2
	M10x1.5	38,4 – 42,4	28.3 – 31.2	56,4 – 62,4	41.6 – 46.0	67,4 – 74,4	49.7 – 54.8
	M12x1.75	66,5 – 73,5	49.0 – 54.2	96,9 – 107	71.4 – 78.9	115 – 128	84.8 – 94.3
	M14x2	106 – 117	78.1 – 86.2	156 – 172	115,0 – 126,8	184 – 204	135.6 – 150.3
	M16x2	164 – 182	120.9 – 134.1	241 – 267	117.6 – 196.8	282 – 312	207.8 – 229.9
	M18x2.5	228 – 252	168.0 – 185.7	334 – 370	246.2 – 272.7	391 – 432	288.2 – 318.4
	M20x2.5	321 – 355	236.6 – 261.6	472 – 522	347.9 – 384.7	553 – 611	407.6 – 450.3
	M22x2.5	441 – 487	325.0 – 358.9	647 – 715	476.8 – 527.0	751 – 830	553.5 – 611.7
	M24x3	553 – 611	407.6 – 450.3	812 – 898	598.4 – 661.8	950 – 1050	700.2 – 773.9
	M27x3	816 – 902	601.4 – 664.8	1198 – 1324	882.9 – 975.8	1419 – 1569	1045.8 – 1156.4
FINE THREAD	M8x1	20,8 – 23,0	15.3 – 17.0	30,6 – 33,8	22.6 – 24.9	35,8 – 39,6	26.4 – 29.2
	M10x1.25	40,6 – 44,8	29.9 – 33.0	59,7 – 65,9	44.0 – 48.6	71,2 – 78,6	52.5 – 57.9
	M12x1.25	72,2 – 79,8	53.2 – 58.8	106 – 118	78.1 – 87.0	126 – 140	92.9 – 103.2
	M12x1.5	69,4 – 76,7	51.1 – 56.5	102 – 112	75.2 – 82.5	121 – 134	89.2 – 98.8
	M14x1.5	114 – 126	84.0 – 92.9	168 – 186	123.8 – 137.1	199 – 220	146.7 – 162.1
	M16x1.5	175 – 194	129 – 143	257 – 285	189.4 – 210.0	301 – 333	221.8 – 245.4
	M18x1.5	256 – 282	188.7 – 207.8	375 – 415	276.4 – 305.9	439 – 485	323.5 – 357.4
	M20x1.5	355 – 393	261.6 – 289.6	523 – 578	385.5 – 426.0	611 – 676	450.3 – 498.2
	M22x1.5	482 – 532	355.2 – 392.1	708 – 782	521.8 – 576.3	821 – 908	605.1 – 669.2
	M24x2	602 – 666	443.7 – 490.8	884 – 978	651.5 – 720.8	1035 – 1143	762.8 – 842.4

2. FITTINGS

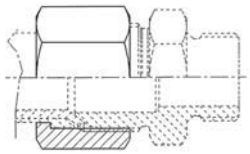
★ The tightening torques indicated below refer to fittings assembled on any material.

		End fittings straight		"T" end fittings		"L" end fittings		90° end fittings	
									
	Thread size	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%
METRIC THREADS	M10x1.25	17	14	14	14	14	14	14	14
		19	14	17	14	17	14		
	M12x1.25	19	30	17	30	17	30	17	30
	M14x1.5	19	40	19	40	19	40	19	40
	M16x1.5	22	48	22	48	22	48	22	48
	M18x1.5	24	58	24	58	24	58	24	58
	M20x1.5	27	65	27	65	27	65	27	65
	M22x1.5	30	73	30	73	30	73	30	73
	M26x1.5	36	95	36	95	36	95	36	95
	M27x2	36	100	36	100	36	100	36	100
	M33x2	41	160	41	160	41	160	41	160
	M42x2	50	250	50	250	50	250	50	250
	M48x2	60	305	60	305	60	305	60	305
THREADS IN INCHES	G 1/8"	17	13	14	13	14	13	14	13
		19	13						
	G 1/4"	19	37	19	37	19	37	19	37
		22	37						
	G 3/8"	24	53	24	53	24	53	24	53
	G 1/2"	27	73	27	73	27	73	27	73
		30	73						
	G 3/4"	36	100	36	100	36	100	36	100
	G 1"	41	160	41	160	41	160	41	160
		46	160						
	G 1 1/4"	50	250	50	250	50	250	50	250
	G 1 1/2"	60	305	60	305	60	305	60	305

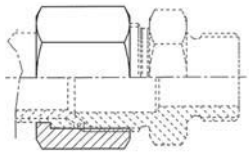
3. PLUGS

		Hex plugs		Threaded plugs with hex socket head	
					
	Thread size	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%
METRIC THREADS	M6x1	10	10	–	–
	M8x1	13	12	–	–
	M10x1	13	14	5	14
	M10x1.25	13	14	–	–
	M10x1.5	13	14	–	–
	M12x1.25	17	30	–	–
	M12x1.5	17	30	6	30
	M12x1.75	17	30	–	–
	M14x1.5	19	40	6	40
	M14x2	19	40	–	–
	M16x1.5	22	48	8	48
	M16x2	22	48	–	–
	M18x1.5	17	58	10	58
	M18x2.5	17	58	–	–
	M20x1.5	19	65	–	–
	M22x1.5	–	–	12	73
	M24x1.5	22	80	12	80
	M24x2	22	80	–	–
	M27x2	22	100	–	–
	M28x1.5	–	–	17	110
	M30x1.5	22	130	–	–
	M32x1.5	–	–	19	150
	M35x1.5	–	–	22	180
	M40x1.5	–	–	24	225
THREADS IN INCHES	G 1/8”	14	13	–	–
	G 1/4”	19	37	–	–
	G 3/8”	22	53	–	–
	G 1/2”	19	73	–	–
	G 5/8”	22	85	–	–
	G 3/4”	22	100	–	–
	G 1”	22	160	–	–

4. FITTINGS WITH SEAL AT 37°



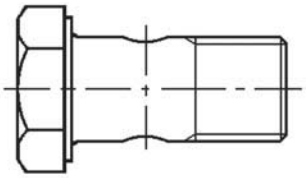
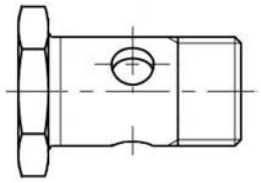
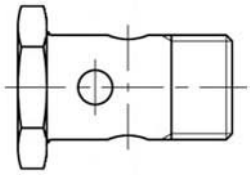
Thread size	Wrench	Torque Nm ±10%
7/16” - 20	14	13
1/2” - 20	16	19
9/16” - 18	17	28
3/4” - 16	22	47
7/8” - 14	27	76
1 1/16” - 12	32	110
	36	110



Thread size	Wrench	Torque Nm ±10%
1 3/16” - 12	36	138
1 5/16” - 12	38	155
1 5/8” - 12	50	215
1 7/8” - 12	60	290
2 1/2” - 12	75	345

5. FITTINGS FOR PIPES WITH BANJO UNION

★ These tightening torques refer to tightening the fitting with new copper sealing washers.

	Unions for one-way fittings		Unions for three-way fittings		Unions for four-way fittings	
						
Thread size	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%
M8x1	–	–	12	14	–	–
M8x1.25	13	14	–	–	–	–
M10x1	–	–	14	20	14	20
M10x1.25	13	20	–	–	–	–
M12x1.25	17	30	–	–	–	–
M12x1.5	–	–	17	30	17	30
M14x1.5	19	40	19	40	19	40
M16x1.5	22	48	22	48	22	48
M18x1.5	22	58	24	58	24	58
M20x1.5	27	65	–	–	–	–
M22x1.5	–	–	27	73	27	73
M24x1.5	32	80	–	–	–	–
M26x1.5	–	–	32	95	32	95
M28x1.5	36	110	–	–	–	–
M30x1.5	–	–	36	130	36	130
M35x2	41	180	–	–	–	–
M38x1.5			46	200	46	200
M42x2	50	250	–	–	–	–
M45x1.5	–	–	55	280	55	280
M50x2	60	320	–	–	–	–
M52x1.5	–	–	60	320	60	320
M65x2	–	–	75	450	75	450

THREADLOCKERS, ADHESIVES, SEALANTS AND LUBRICANTS

FUNCTION	DESIGNATION	DESCRIPTION
THREADLOCKER	Loctite 222 Colour: opaque fluorescent purple	Anaerobic product suitable for low-strength locking of retaining, adjustment and precision fasteners. All traces of lubricant must first be removed using the specific activator.
	Loctite 242 Colour: fluorescent blue	Anaerobic product that prevents loosening of all types of nut and bolt; used in place of conventional mechanical locking systems. Used for medium-strength locking. All traces of lubricant must first be removed using the specific activator.
	Loctite 243 Colour: opaque fluorescent blue	Alternative product to 242 ; oil tolerant and so can be used on lightly lubricated surfaces without prior use of activator.
	Loctite 270 Colour: fluorescent green	Anaerobic product for high-strength locking of bolts and studs that do not normally require disassembly. Parts must be heated to approximately 80°C for removal. All traces of lubricant must first be removed using the specific activator.
DEGREASERS AND ACTIVATORS	Loctite 703	Product used for degreasing and cleaning parts prior to application of Loctite anaerobic products; after drying, promotes uniform curing of threadlockers
	Loctite 747	Product used for specifically for treatment of passive metals prior to use of slow-cure anaerobic threadlockers (series 5 and 6). Can also be used to increase cure speed at low temperatures or in applications where there are large gaps between the parts.
SEALANTS (for faces and fittings)	Loctite 510 Colour: Red	Super-rapid anaerobic sealant for sealing between rigid metal faces; can eliminate the need for conventional gaskets as it can fill gaps up to 0.4 mm. Does not shrink and therefore fasteners do not need re-tightening to specified torque values after curing.
	Loctite 542 Colour: Brown	Anaerobic product used as a liquid sealant for threaded fittings up to 3/4” gas; rapid curing and parts may be disassembled with ordinary tools.
	Loctite 554 Colour: Red	Anaerobic sealant and locking compound used for sealing cooling and industrial fluid circuits. Slow curing, also suitable for use on non-ferrous alloys
	Loctite 572 Colour: White	Anaerobic sealant and locking compound used for sealing pipes and threaded fittings up to 2" in diameter. Very slow curing on most metal surfaces.
	Loctite 573 Colour: Green	Thixotropic anaerobic product used for sealing joints between metal faces. Ensures total contact between surfaces with maximum tolerance of 0.10 mm, filling microvoids caused by flatness errors. Very slow curing on most metal surfaces and requires prior application of an activator.
	Loctite 576 Colour: brown	Anaerobic product used as a liquid thread sealant for large diameter threaded fittings (up to 2"). Very slow curing; also suitable for non-ferrous alloys and parts requiring subsequent removal.

FUNCTION	DESIGNATION	DESCRIPTION
INSTANT ADHESIVES	*Loctite 401* Colour: colourless	Cyanoacrylate instant adhesive suitable for bonding a wide range of acidic and porous materials including, ceramics, wood, rubber and plastic (excluding polyolefin). Curing takes place in a few seconds as an effect of the condensed humidity present on the surfaces to be bonded, and is independent of environmental conditions.
	Loctite 495 Colour: colourless	Cyanoacrylate instant adhesive suitable for bonding a rubber, plastics and metal in any combination.
SILICONE SEALANTS	*Silastic 738 (Dow Corning)* Colour: milky white	One-part silicone adhesive/sealant, non dhrinking, ready for use. Cures on exposure to air to form a rubbery solid and obviates the need for conventional seals on flexible joints, filling gaps greater than 1 mm.
	Dirko Transparent Colour: transparent	One-part silicone adhesive/sealant, shrinking, ready for use. Cures rapidly when exposed to humidity in the air to form a rubbery solid; resistant to high temperatures.
POLYURETHANE SEALANTS	*Betaseal HV3 (Gurit Essex)* Colour: Black	Polyurethane prepolymer based adhesive/sealant, high viscosity, suitable for permanent, high-strength flexible bonding. Slow curing, used for bonding glass to frames, wire mesh, metal plates, etc. surfaces must be degreased with primer.
RETAINING COMPOUNDS	*Loctite 601* Colour: fluorescent green	Anaerobic, fast-curing, high-strength adhesive. Suitable for sealing and retaining cylindrical assemblies with gap clearances of up to 0.10 mm; used for retaining rotors, gears, bearings, pulleys, bushes etc. on shafts.
	Loctite 638 Colour: fluorescent green	Anaerobic structural adhesive, quick-curing, very high strength; suitable for bonding cylindrical parts in non-ferrous alloys.
	Loctite 648 Colour: fluorescent green	Anaerobic structural adhesive, quick-curing, high-strength; suitable for bonding cylindrical parts, permanent retention of threaded parts, sealing of refrigeration systems, retention of bearings, etc. Alternative to Loctite 601 in high-temperature applications.
	Loctite 986/AVX Colour: fluorescent red	Anaerobic sealant/retaining compound for metal cylindrical parts. Slow-curing, high-strength, heat-resistant and resistant to chemical pressure. Parts must be first treated with an activator.
LUBRICANTS	*Grease* (NLGI 2 EP ASTM D217: 265/295)	Multi-purpose Lithium grease used for lubrication of seals, to prevent oxidization and to facilitate assembly operations.
	Molikote (Dow Corning)	Anti-wear compound, contains Molybdenum bisulphate, used neat or diluted with engine oil for assembly of main engine bearings.
	Vaseline	Neutral pH compound used to protect battery terminals against oxidization and corrosion.
	Engine oil 10W - 30	Used to dilute Molikote anti-wear lubricant during assembly of main engine bearings.

CONVERSION FACTORS

CONVERSION FROM BRITISH TO METRIC UNITS

inch x 25.40	= mm
foot x 0.305	= m
yard x 0.914	
Eng.miles 1.609	= km
Sq.in. x 6.452	= cm^2
Sq.ft. x 0.093	= m^2
Sq.yard x 0.835	
Cu.in. x 16.39	= cm^3
Cu.ft. x 28.36	= m^3
Cu.yard x 0.763	
Imp.gall. x 4.547	= litres
US gall. x 3.785	
pint x 0.568	
quart x 1.137	
US.gpm x 3.785	= ,/min
oz. x 0.028	= kg
lb. x 0.454	
lb.ft. x 0.139	= kgm
lb.in. x 17.87	= kg/m
psi x 0.070	= kg/cm^2
lb./Imp.gall x 0.100	= kg/,
lb./US.gall x 0.120	
lb./cu.ft. x 16.21	= kg/m^3
lb.ft. x 1.356	= Nm
psi x 1.379	= bar

CONVERSION FROM METRIC TO BRITISH UNITS

mm x 0.0394	= inch
m x 3.281	= foot
m x 1.094	= yard
km x 0.622	= Brit.miles
cm^2 x 0.155	= Sq.in.
m^2 x 10.77	= Sq.ft.
m^2 x 1.197	= Sq.yard
cm^3 x 0.061	= Cu.in.
m^3 x 0.035	= Cu.ft
m^3 x 1.311	= Cu.yard
litres x 0.220	= Imp.gall.
litres x 0.264	= US gall.
litres x 1.762	= pint
litres x 0.880	= quart
,/min x 0.2642	= US.gpm
kg x 35.25	= oz.
kg x 2.203	= lb.
kgm x 7.233	= lb.ft.
kg/m x 0.056	= lb.in.
kg/cm^2 x 14.22	= psi
kg/, x 10.00	= lb./Imp.gal.
kg/, x 8.333	= lb./US.gal.
kg/m^3 x 0.062	= lb./cu.ft.
Nm x 0.737	= lb.ft.
bar x 14.503	= psi

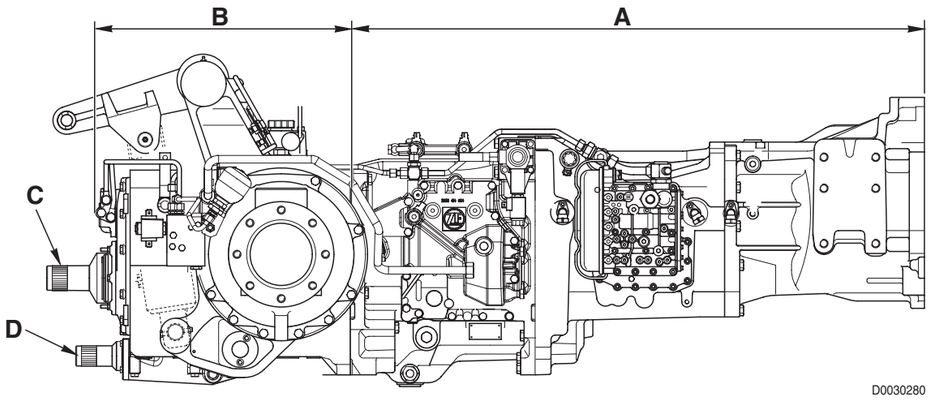
SECTION 10
CONTENTS

1. TRANSMISSION

INTRODUCTION

- The tractors in this series are equipped with a POWER SHUTTLE transmission.
  Shifting between forward and reverse is managed entirely by the electronic control unit without the operator having to use the clutch pedal.
  This managment is made possible by the presence of a proportional solenoid valve that directly controls the central clutch.

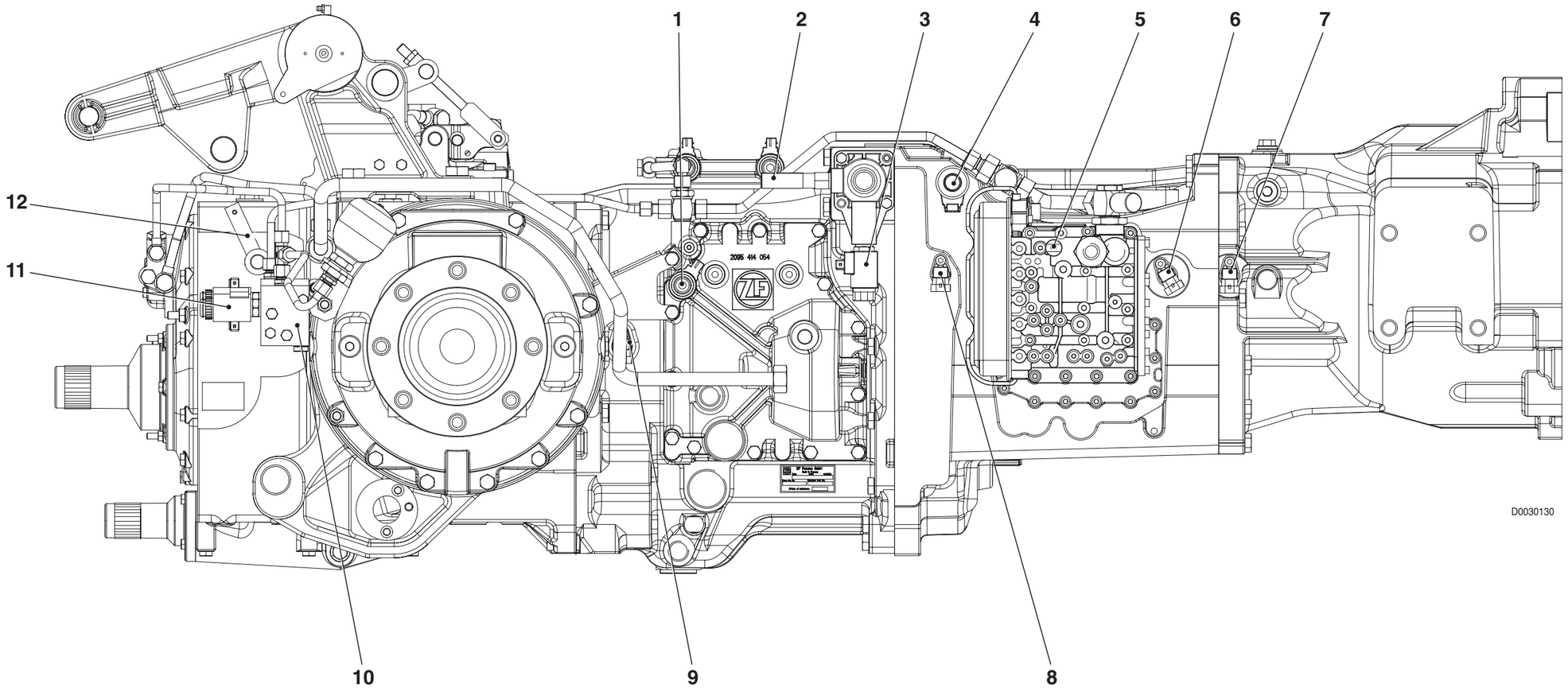
- The transmission can be divided into the following sections:
  A. Power Shuttle transmission
  B. Rear axle
  C. Rear PTO
  D- Grounspeed PTO



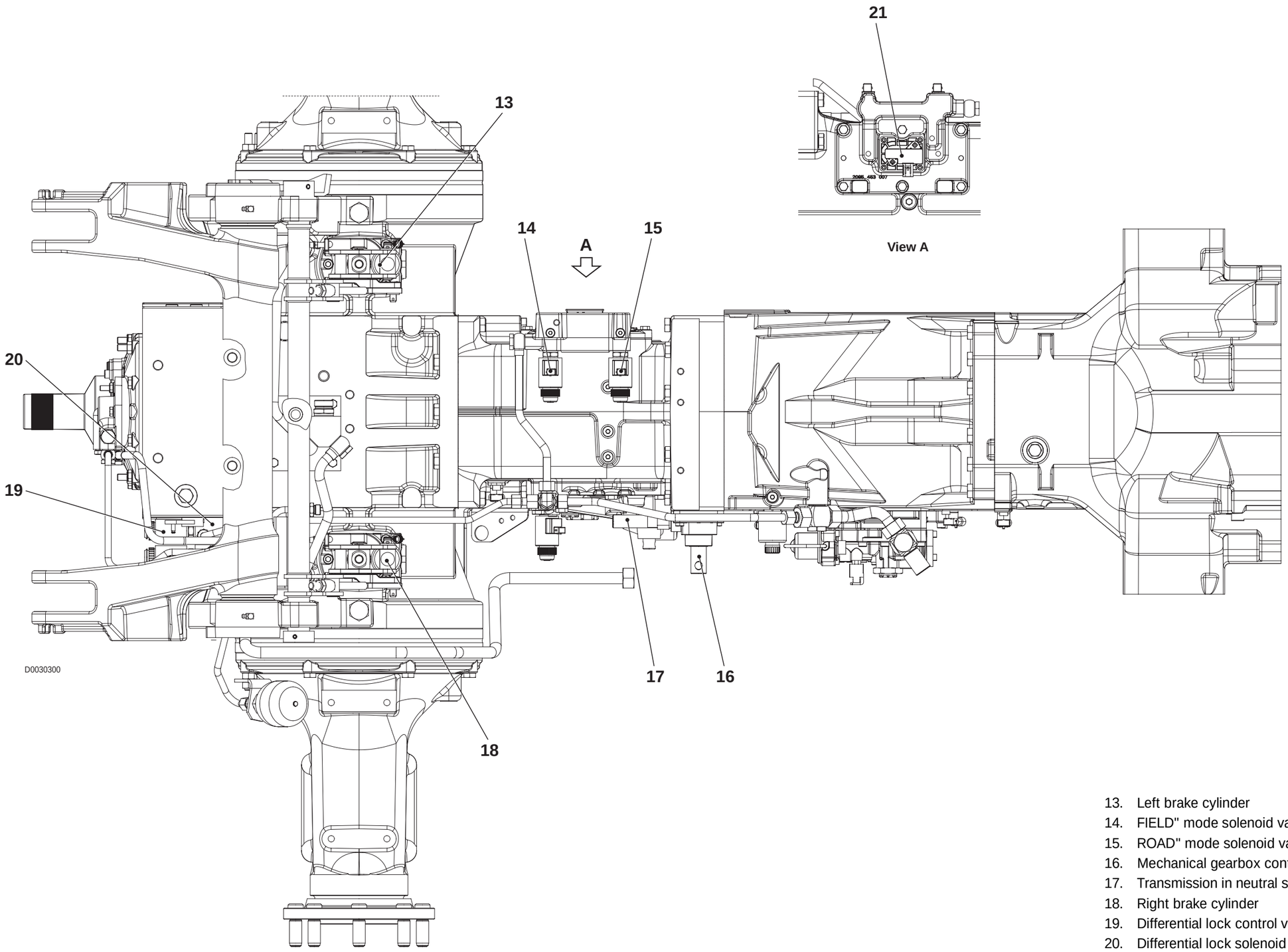
D0030280

1.1 POWER SHUTTLE TRANSMISSION

1.1.1 MAIN COMPONENTS

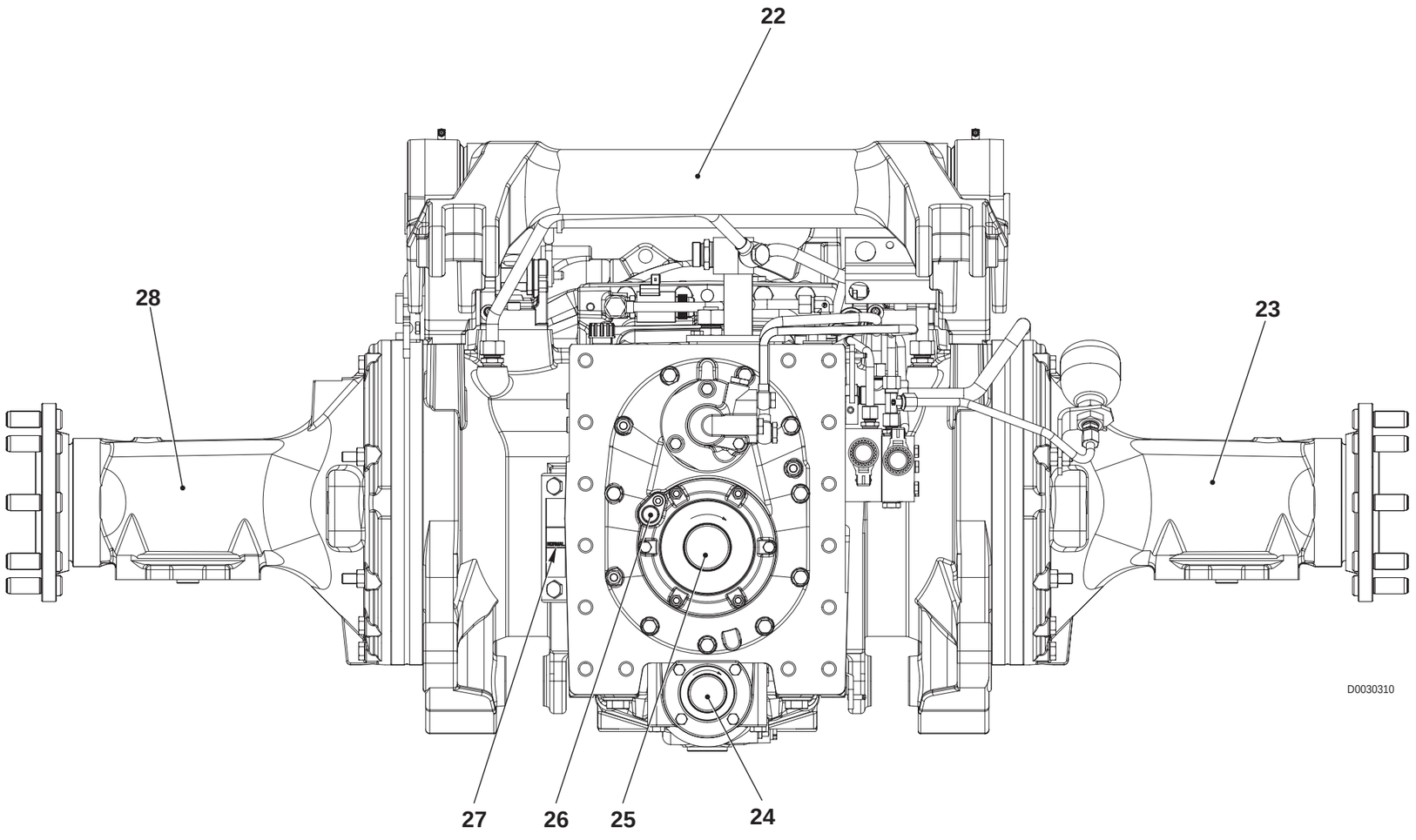


1. Four-wheel drive control solenoid valve
2. Transmission in neutral sensor
3. Gearbox in neutral locking solenoid valve
4. Proportional solenoid valve for clutch control
5. Transmission oil low pressure sensor
6. Engine speed sensor (nLse)
7. Gearbox output shaft speed sensor (nLsa)
8. Clutch revs sensor (nHK)
9. Speed sensor for odometer (nAb)
10. Rear PTO control valve
11. Rear PTO engagement solenoid valve
12. Rear PTO speed selector lever



View A

13. Left brake cylinder
14. FIELD" mode solenoid valve
15. ROAD" mode solenoid valve
16. Mechanical gearbox control rod
17. Transmission in neutral sensor
18. Right brake cylinder
19. Differential lock control valve
20. Differential lock solenoid valve
21. "FIELD/ROAD" position sensor

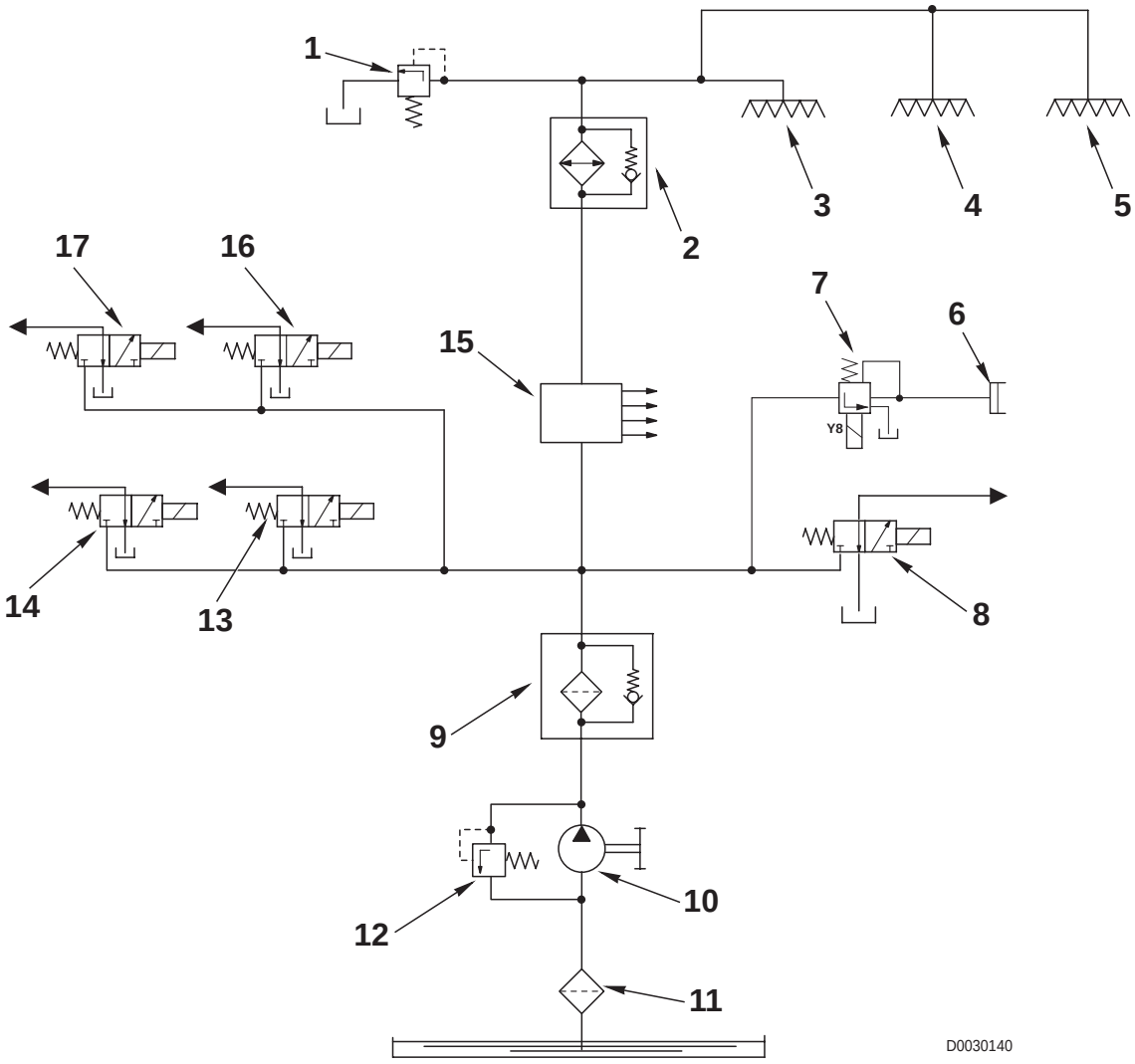


22. Power lift shaft
23. Right axle housing
24. REAR PTO
25. Groundspeed PTO
26. Rear PTO speed sensor
27. Gearbox oil level indicator
28. Left axle housing

1.1.2 TRANSMISSION HYDRAULIC SYSTEM

The transmission hydraulic system is supplied by a gear pump driven from a lateral power-take-off.
The gear pump supplies pressurised fluid for the following uses:

- hydraulic gearbox control valve
- 4WD control solenoid valve
- rear PTO control solenoid valve
- differential lock control solenoid valve
- FIELD/ROAD" mode solenoid valves
- lubrication of gearbox, differential, rear PTO

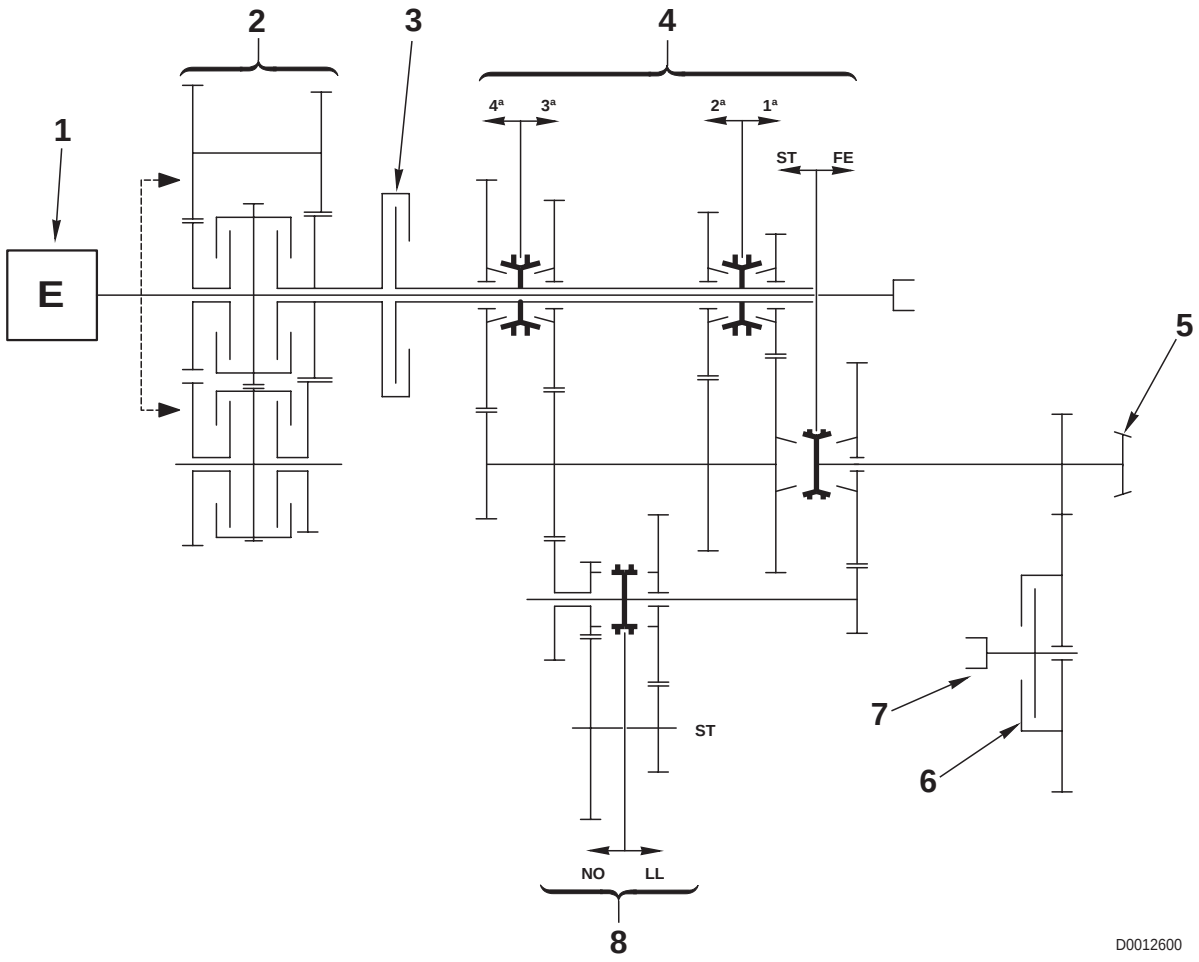


1 - Lubrication circuit pressure relief valve
2 - Cooler
3 - Gearbox lubrication
4 - Differential lubrication
5- Rear PTO lubrication
6 - Main clutch
7 - Proportional solenoid valve
8 - Four wheel drive clutch solenoid valve
9 - Pressurised filter
10- Gear pump
11 - Suction line filter
12 - Safety valve for cold starting
13 - PTO solenoid valve
14 - Differential lock solenoid valve
15 - Gearbox control valve
16 - ”FIELD” mode solenoid valve
17 - ”ROAD” mode solenoid valve

1.1.3 GEARBOX

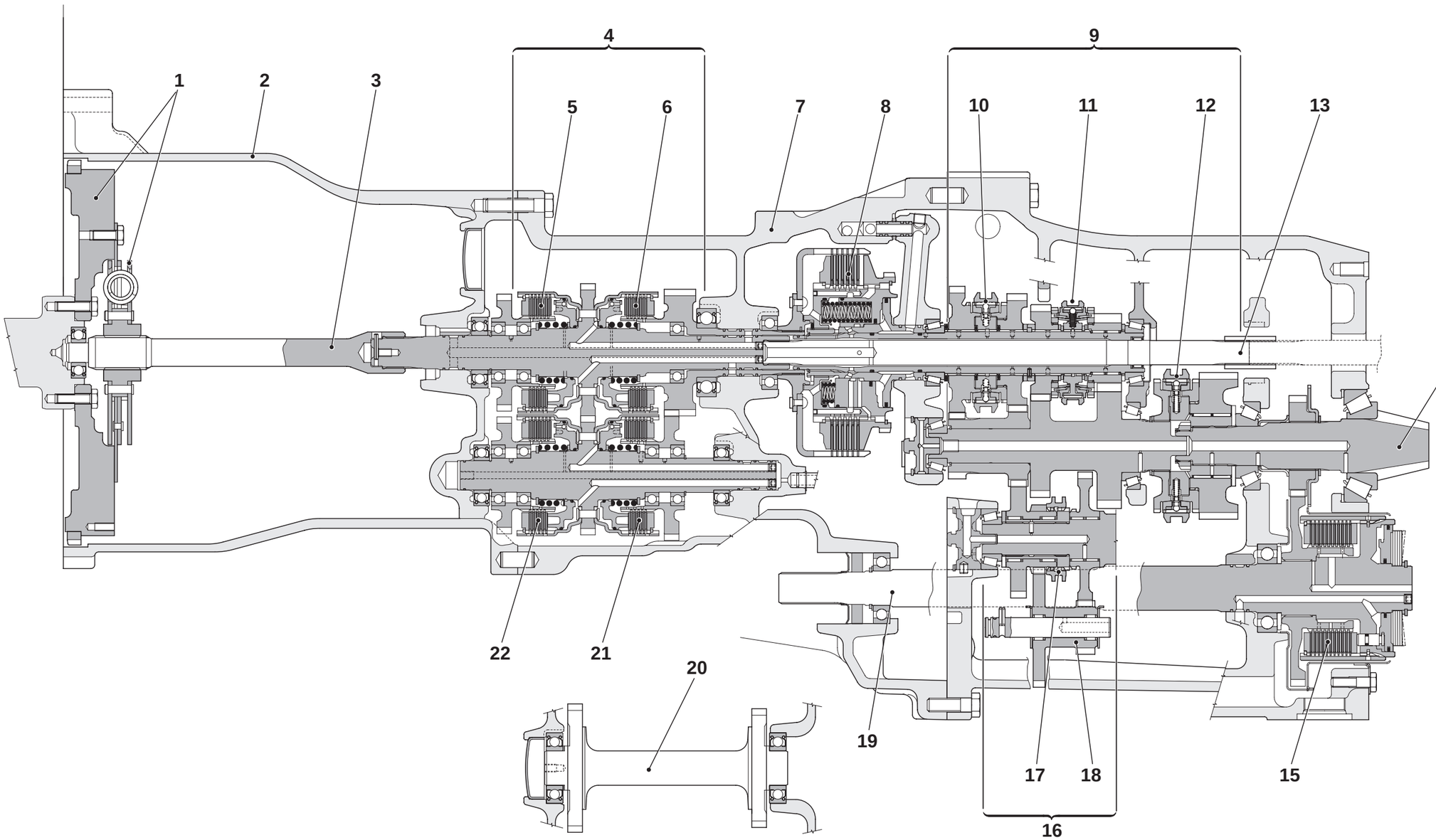
DESCRIPTION

- The drive from engine (1) is transmitted through hydraulically-controlled gearbox (2), main clutch (3), 4-speed mechanical gearbox (4) and creeper (8) to pinion (5) and power take-off (7), that transfers drive to the front axle.



COMPONENTS

1. Engine
2. Hydraulically-controlled 4-speed gearbox (3 forward and 1 reverse)
3. Main clutch
4. 8-speed mechanical gearbox (4 field and 4 road)
5. Pinion
6. 4WD engagement clutch
7. Power take-off for front axle drive
8. Creeper unit

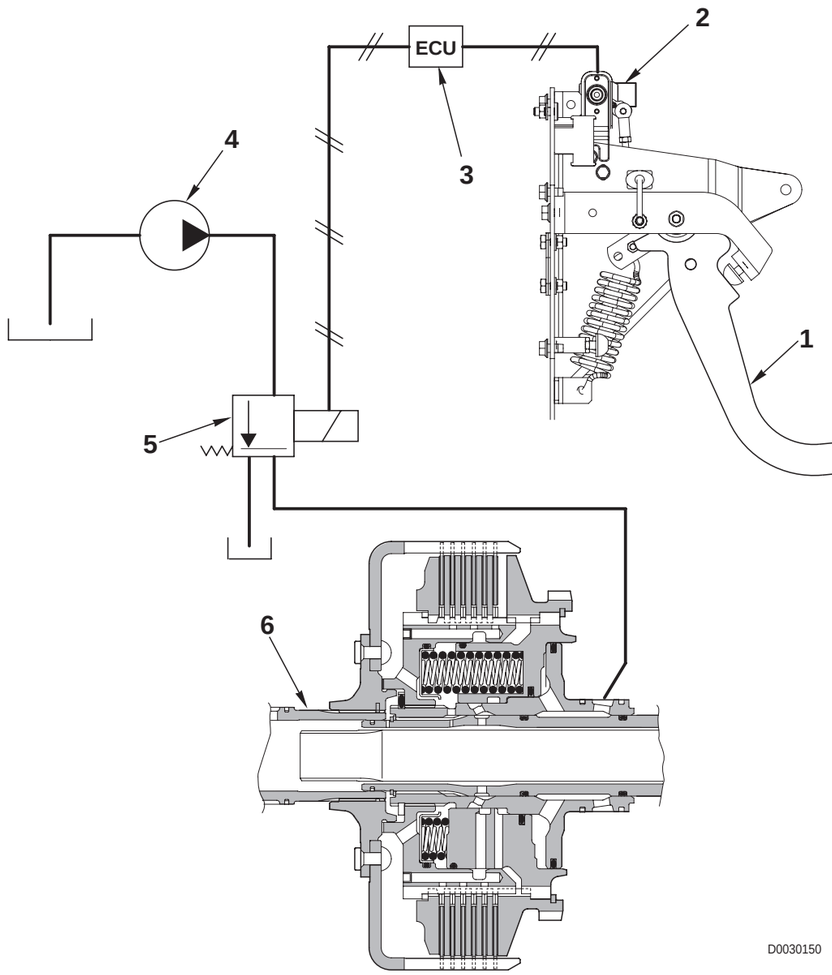


D0012661

1. Flywheel damper
2. Housing
3. Input shaft
4. Hydraulically-controlled gearbox
5. Clutch “*A*”
6. Clutch “*B*”
7. Clutch housing
8. Main clutch
9. Mechanical gearbox
10. 3rd and 4th speed synchronizer
11. 1st and 2nd speed synchronizer
12. Field/road synchronizer
13. Rear PTO drive shaft
14. Pinion
15. 4WD control clutch
16. Creeper unit
17. Creeper unit synchronizer
18. Creeper unit driven shaft
19. Four-wheel drive output shaft
20. Reverse gear driven shaft
21. Clutch “*C*”
22. Clutch “*D*”

1.1.4 MAIN CLUTCH

The main clutch of the POWER SHUTTLE transmission is an oil-bath multiplate unit with hydraulic control.
Clutch operation is entirely automatic and is controlled by an electronic control unit which receives signals from the clutch pedal position sensor.
The system has a clutch control solenoid valve that directs pressurised fluid to the clutch in accordance with the pedal position.

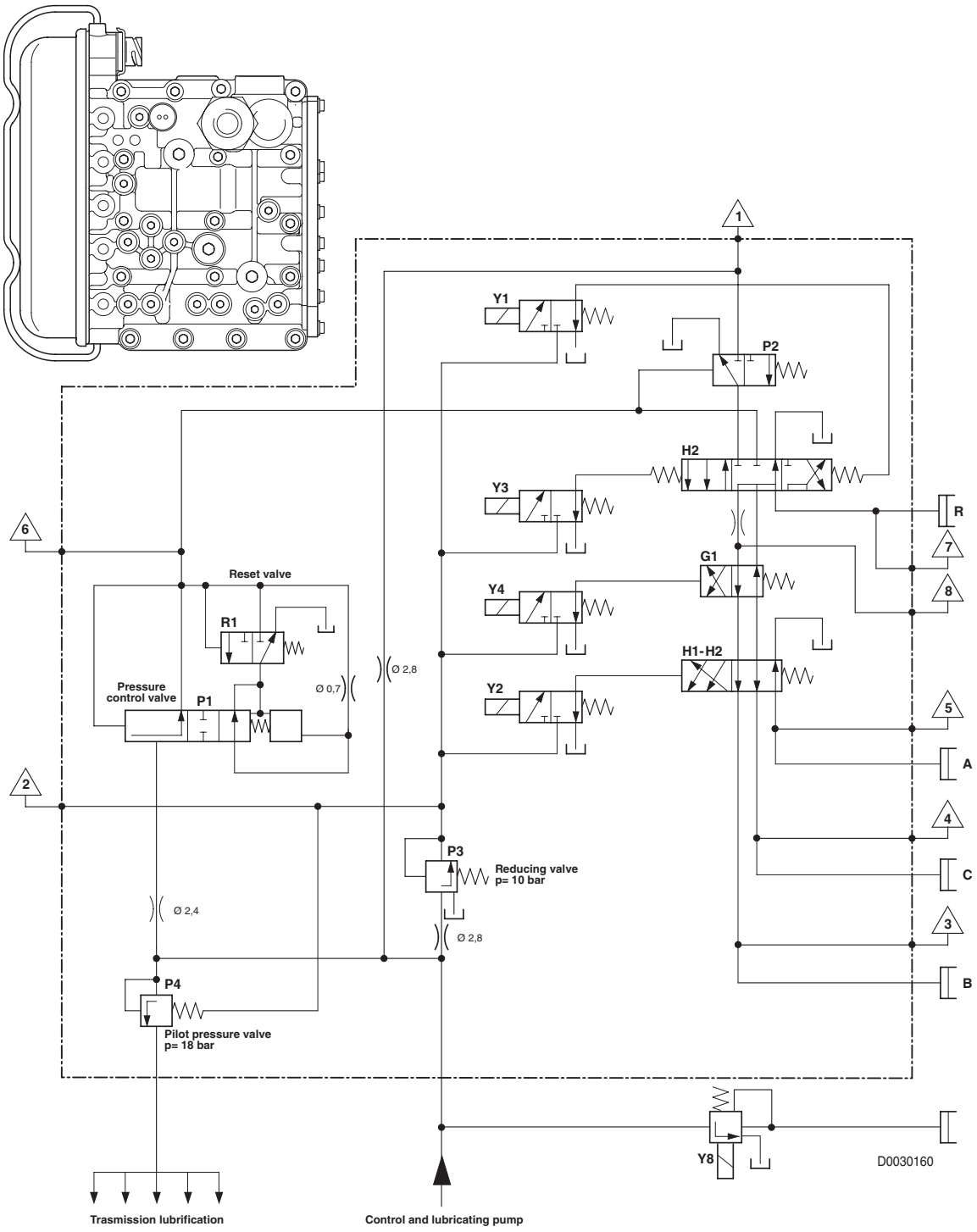


1. Clutch pedal
2. Clutch pedal position sensor
3. Electronic transmission control unit
4. Transmission gear pump
5. Proportional solenoid valve for clutch control
6. Main clutch

1.1.5 HYDRAULIC GEARBOX AND SHUTTLE CONTROL VALVE

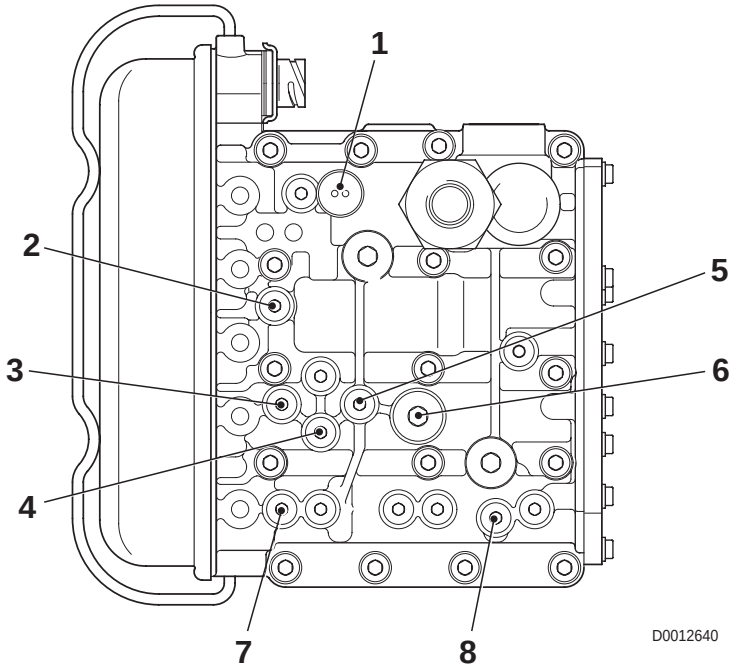
The function of the hydraulic gearbox control valve is to pilot and control the engagement of the gears in the hydraulically-controlled gearbox.
The hydraulic gearbox control valve controls the engagement of the *H*, *M* and *L* gears and the travel direction.

This control valve also supplies hydraulic fluid for lubrication of the mechanical gearbox, the rear differential and the rear PTO drive shaft.



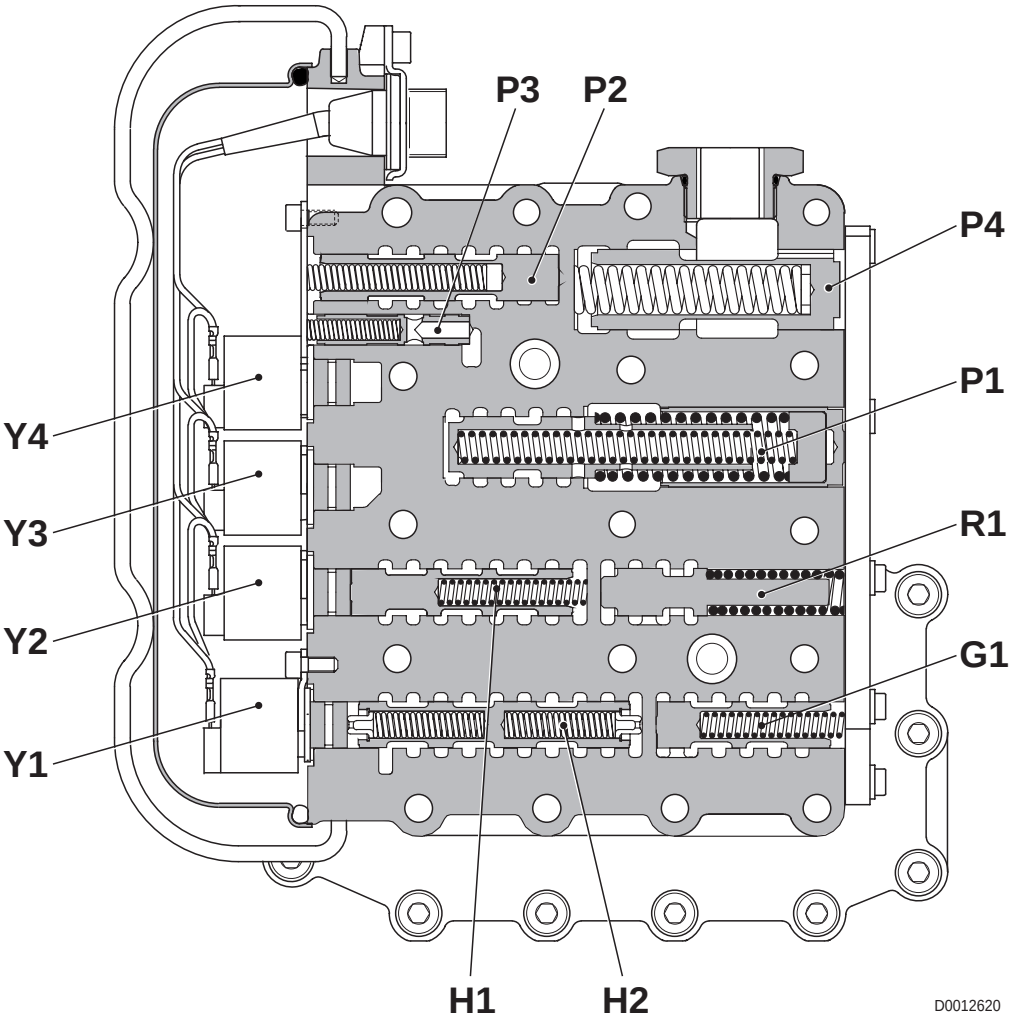
A. GEARBOX CONTROL VALVE

PRESSURE TEST POINTS



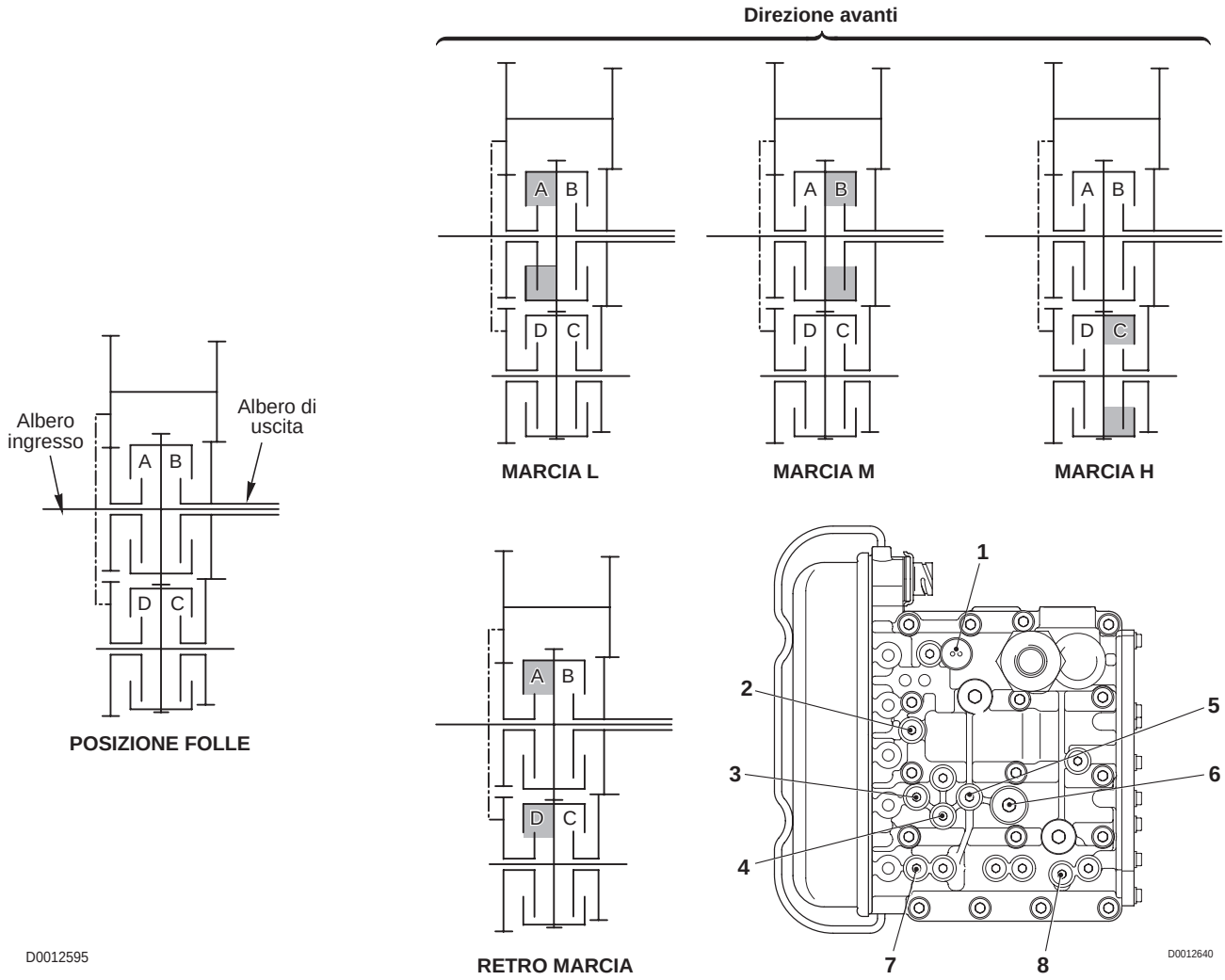
Range	Function	Thread size	Pressure
1	General pressure	M10x1	18 bar
2	Pilot pressure	M10x1	10 bar
3	Clutch pressure *B*	M10x1	18 bar
4	Clutch pressure *C*	M10x1	18 bar
5	Clutch pressure *A*	M10x1	18 bar
6	Pressure *Pg* to clutches	M18x1	18 bar
7	Clutch pressure *D*	M10x1	18 bar
8	Engagement pressure	M10x1	18 bar

MAIN COMPONENTS



G1 Clutch selection valve
H1 Engagement valve for *B/C* or *A/B clutches*
H2 Forward, reverse and neutral selection valve
P1 Pressure modulating valve
P2 Engagement valve
P3 Pilot pressure regulating valve (10 bar)
P4 General pressure regulating valve (18 bar)
R1 Null shift valve
Y1 Pilot solenoid valve for valve *H2* (MRV electr. REV)
Y2 Pilot solenoid valve for valve *H1* (GV1 valve TRANSM.1)
Y3 Pilot solenoid valve for valve *H2* (MVV electr. FWD)
Y4 Pilot solenoid valve for valve *G1* (GV2 valve TRANSM.2)

1.1.6 CLUTCH ENGAGEMENT AND SOLENOID VALVE OPERATION SCHEMATIC



Solenoid valve operation when shifting from L to H gear (L→ M→ H)

HML control	Forward travel			Reverse travel
	L	M	H	
Y1				●
Y2	●	●		
Y3	●	●	●	
Y4	●			
Clutch	A	B	C	D
Test point	5	3	4	7

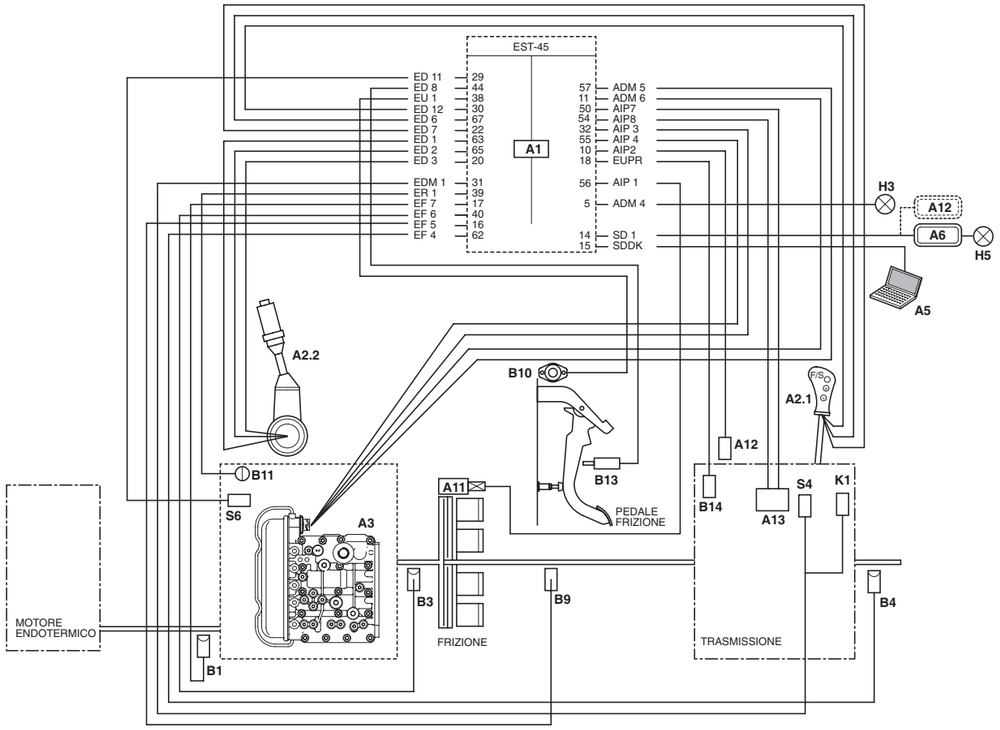
● = Solenoid valve energised

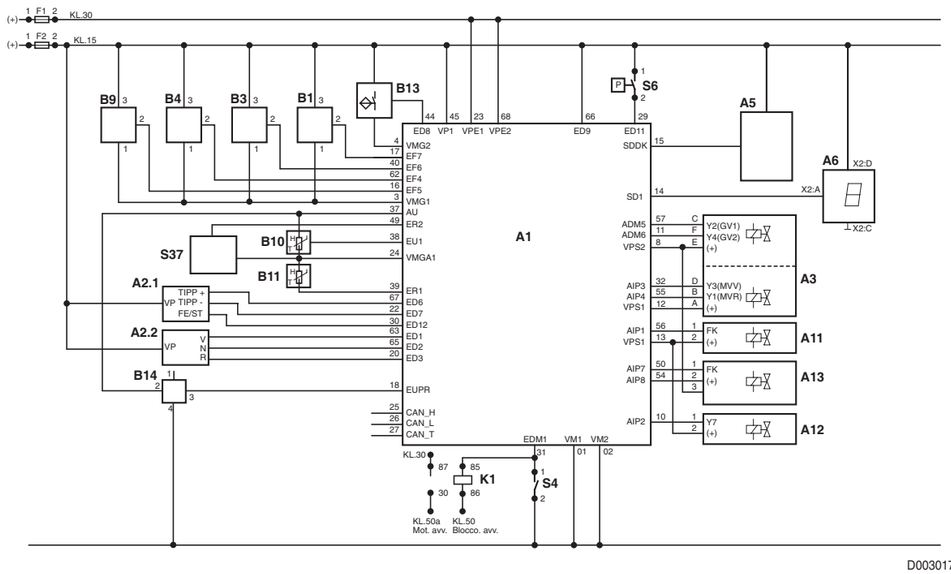
Solenoid valve operation when shifting from H to L gear (H→ M→ L)

Solenoid valve	Forward travel			Reverse travel
	H	M	L	
Y1				●
Y2			●	
Y3	●	●	●	
Y4		●	●	
Clutch	C	B	A	D
Test point	4	3	5	7

● = Solenoid valve energised

1.1.7 TRANSMISSION ELECTRONIC SYSTEM SCHEMATIC





D0030170

COMPONENTS

A1 Transmission electronic control unit (EST57)

A2.1 Range selector lever (L M H S)

A2.2 Shuttle control lever (FORWARD/REVERSE)

A3 Gearbox control valve

A5 Diagnostics

A6 Display

A11 Proportional solenoid valve for main clutch control

A12 Gearbox in neutral locking solenoid

A13 “FIELD/ROAD” selection solenoid valve

B1 Engine speed sensor (nLse)

B3 Hydraulic gearbox output speed sensor (nAb)

B4 Transmission input speed sensor (nLsa)

B9 Clutch speed sensor (nHk)

B10 Clutch pedal position sensor

B11 Temperature sensor

B13 Clutch proximity sensor

B14 “FIELD/ROAD” position sensor

F1 Fuse

F2 Fuse

K1 Interlock starter relay 70A

S4 Mechanical gearbox neutral sensor

S6 Transmission oil low pressure sensor (18 bar)

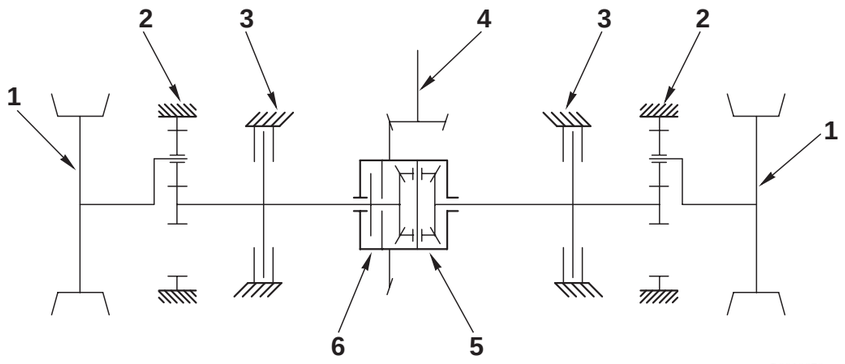
PAGE INTENTIONALLY
LEFT BLANK

1.2 REAR AXLE

DESCRIPTION

The rear axle receives drive from pinion (4) and transmits drive through differential (5) and final drive reduction units (2) to rear wheels (1).

The rear axle is equipped with an electro-hydraulically controlled differential lock (6) and two hydraulically operated brakes (3).

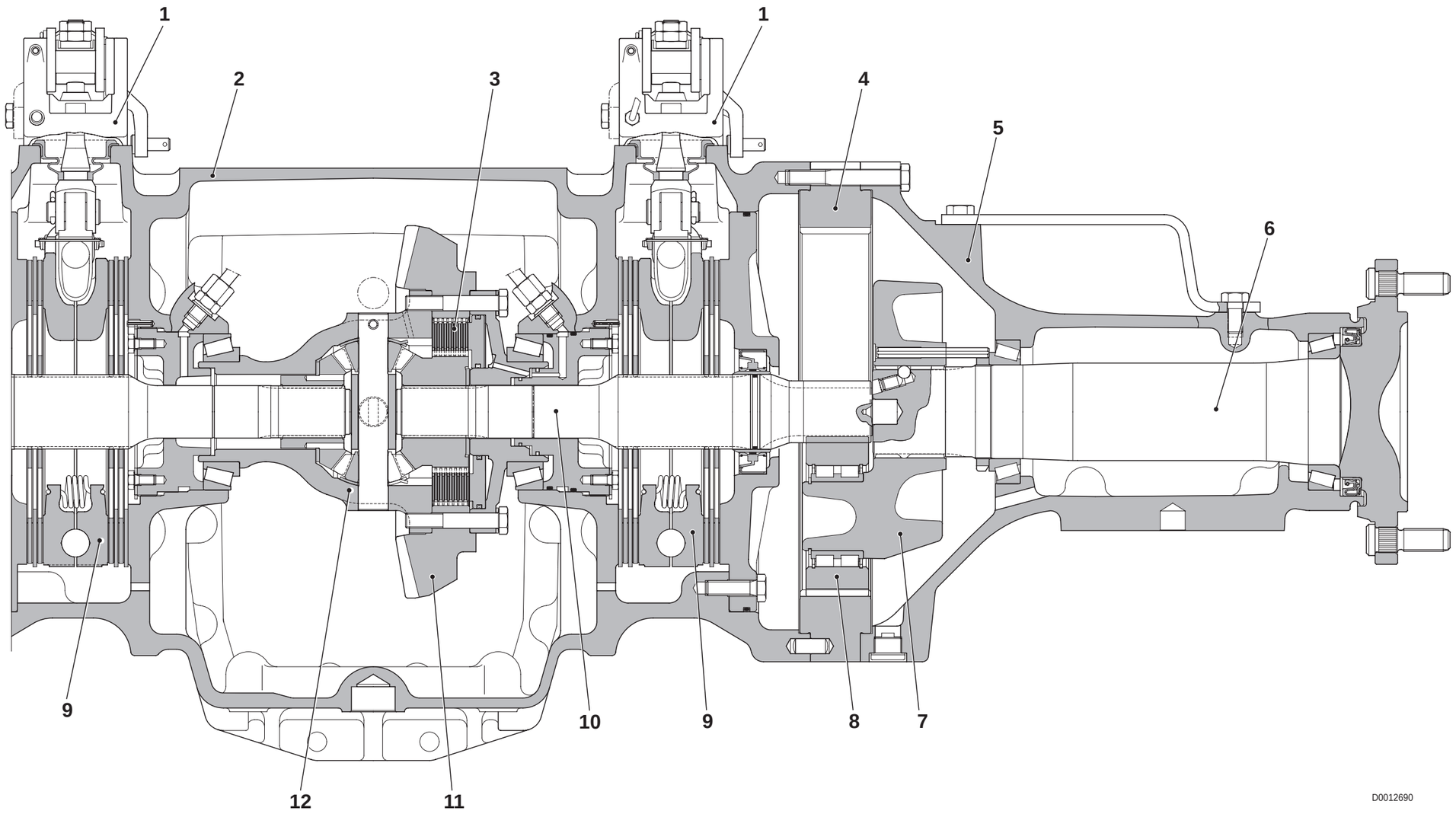


D0012670

COMPONENTS

1. Wheels
2. Final drive reduction unit
3. Brake
4. Pinion
5. Differential
6. Differential lock

COMPONENTS

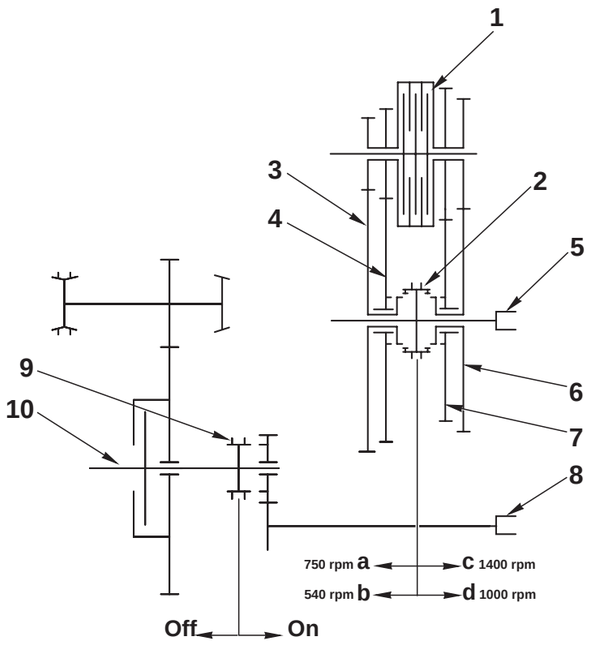


1. Brake control device
2. Central axle housing
3. Differential lock
4. Ring gear
5. Axle housing
6. Half-shaft
7. Planet carrier
8. Planet gear
9. Brake device
10. Half-shaft
11. Bevel crown wheel
12. Differential

1.3 REAR PTO

DESCRIPTION

The rear PTO provides drive for external implements at a preselected rotation speed.
The rotary drive is taken directly from the engine and then reduced through a 4-speed gearbox with manual speed selection.
The PTO is engaged by way of an electro-hydraulically controlled clutch and in addition also a Ground speed PTO can be supplied that turns at a speed directly proportional to the rotation speed of the rear wheels with a fixed ratio between the PTO shaft and rear wheel speeds.

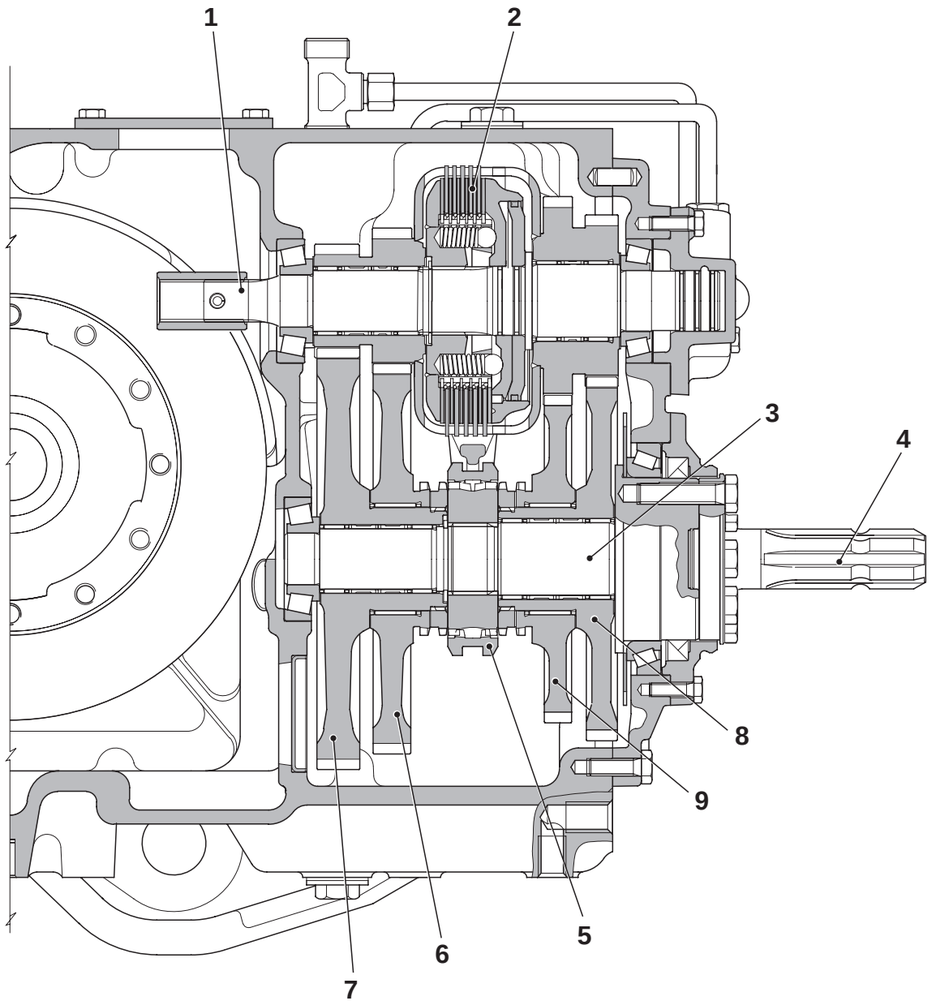


D00.30180

1. Clutch
2. Synchronizer
3. 540 rpm driven gear
4. 750 rpm driven gear
5. PTO shaft
6. 1000 rpm driven shaft
7. 1400 rpm driven gear
8. Groundspeed PTO shaft
9. Groundspeed PTO engagement
10. 4WD output shaft

COMPONENTS

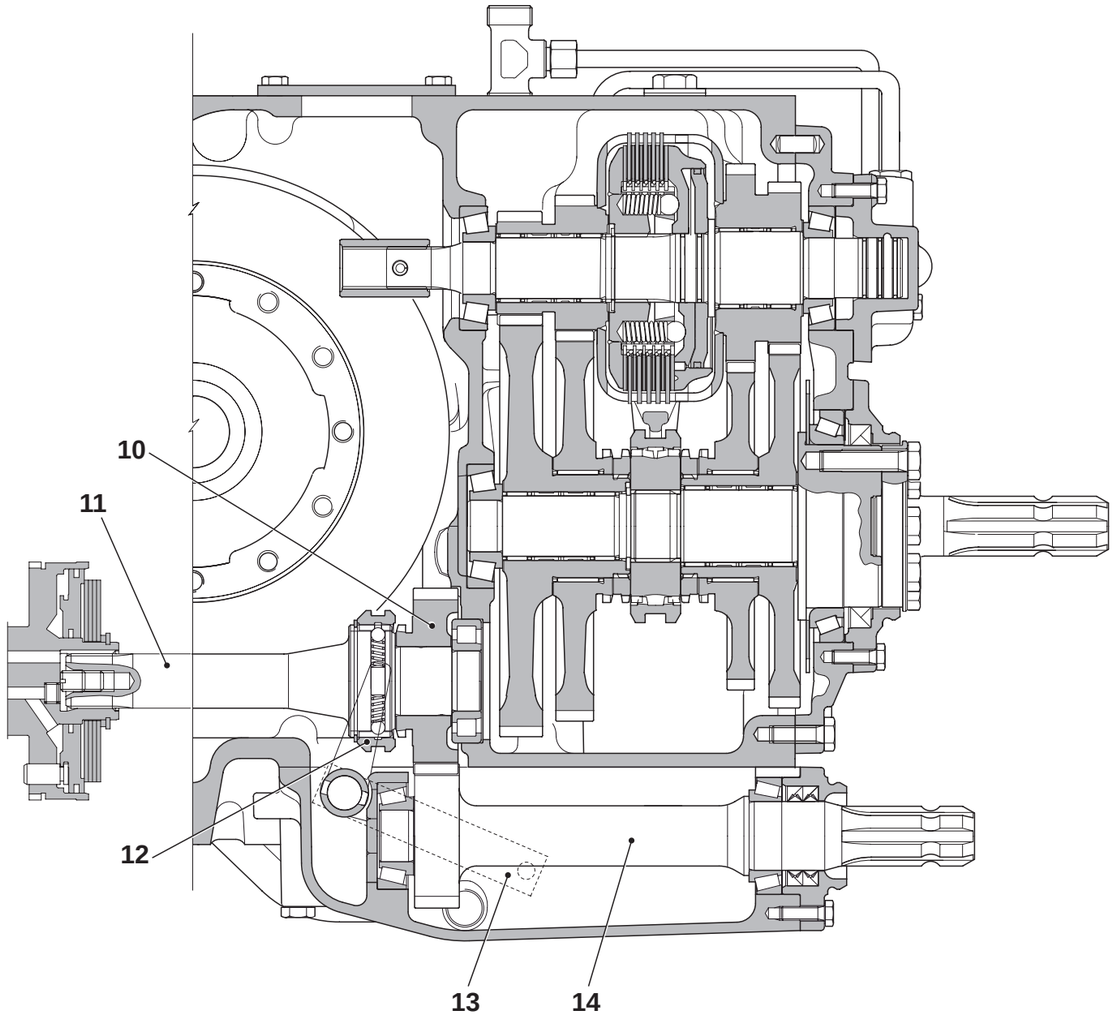
4-SPEED VERSION



D0030190

1. PTO input shaft
2. PTO clutch
3. PTO output shaft
4. Power take-off
5. Synchronizer
6. 750 rpm driven gear
7. 540 rpm driven gear

4-SPEED AND SYNCRO PTO VERSION

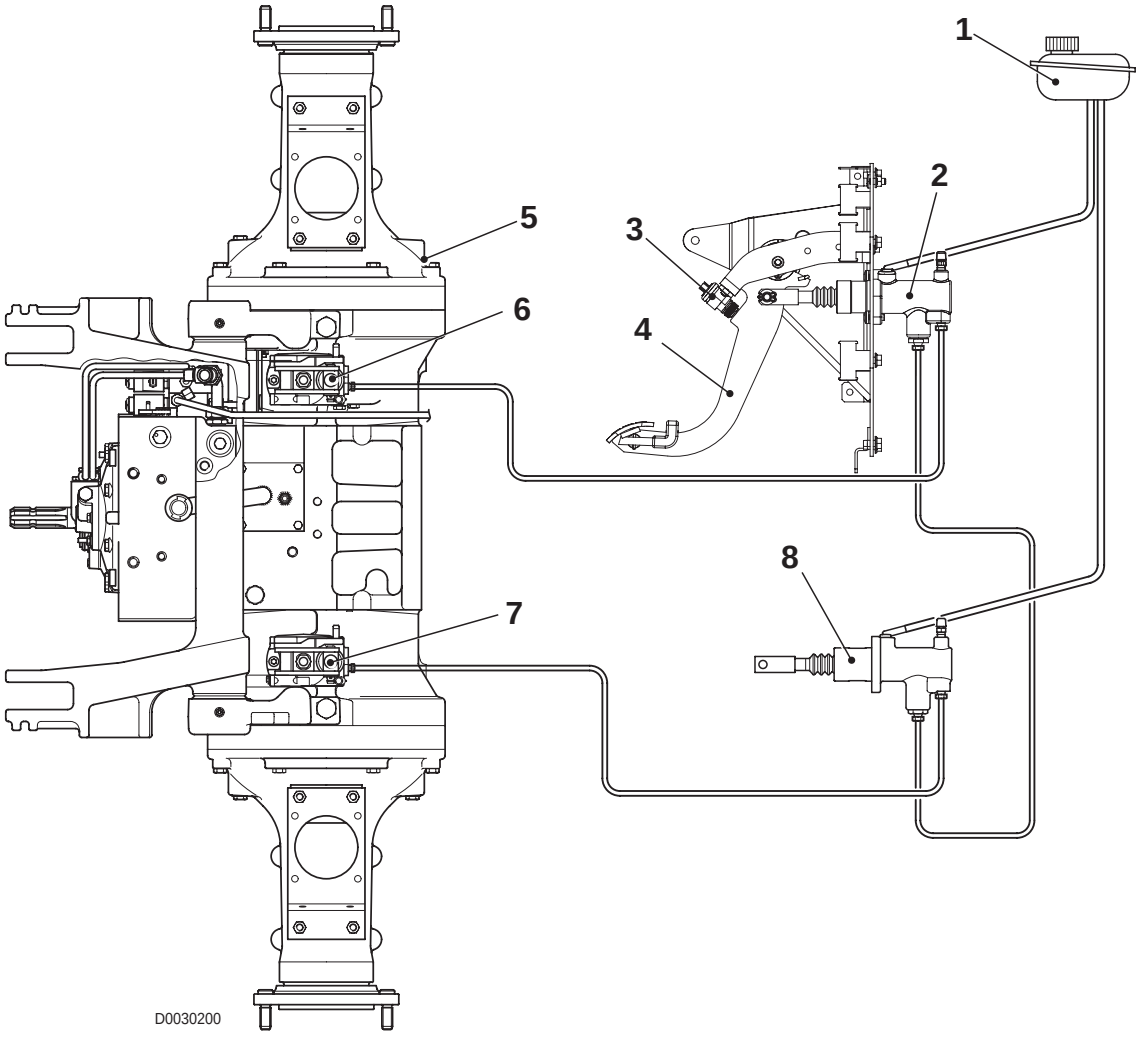


8. 1000 rpm driven gear
9. 1400 rpm driven gear
10 - Groundspeed PTO driving gear
11. Four-wheel drive output shaft
12. Groundspeed PTO engagement device
13. Engagement control lever
14. Groundspeed PTO output shaft

2. BRAKING SYSTEM

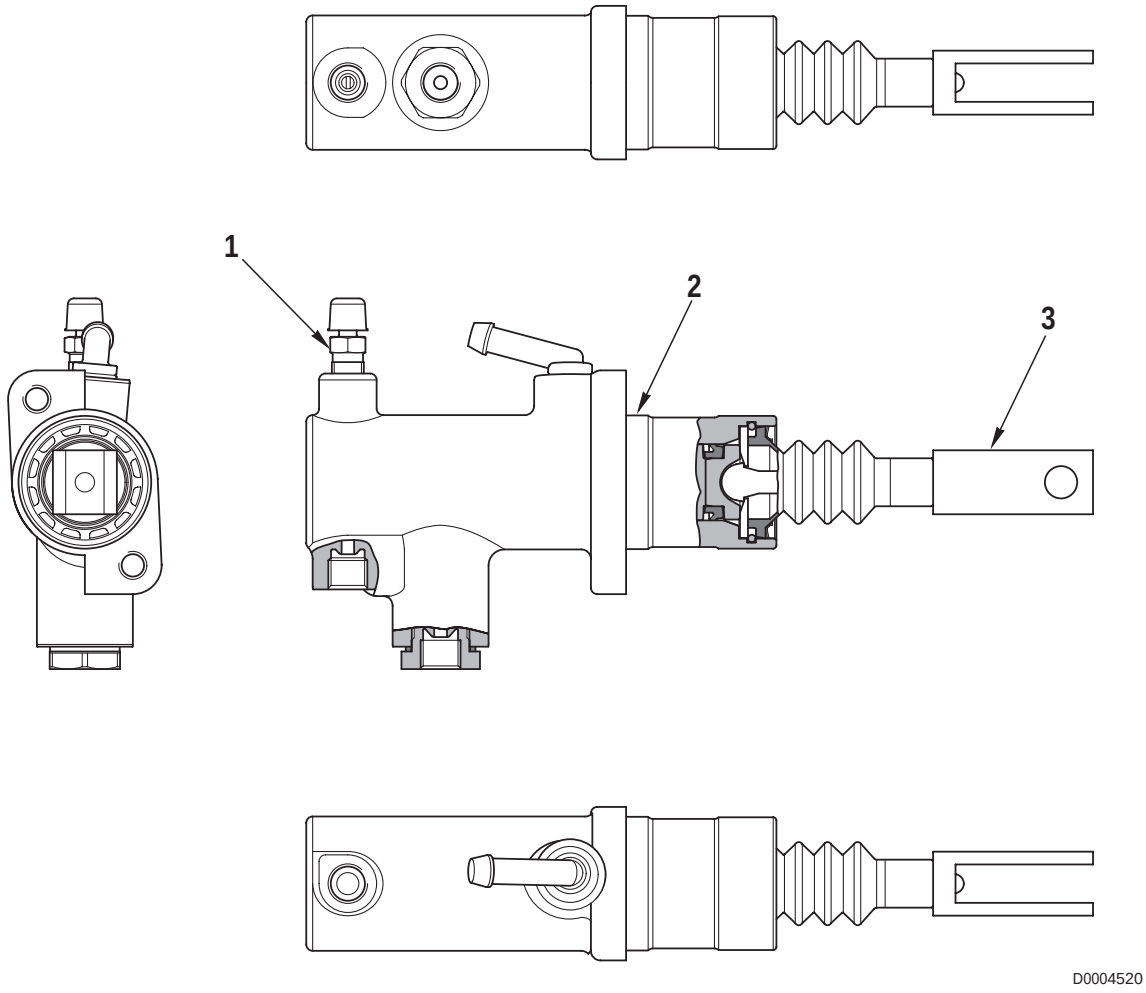
DESCRIPTION

The braking system is comprised of 2 braking devices (one for each rear wheel) operated by two hydraulic master cylinders by way of mechanical controls.
Each master cylinder supplies fluid to the brake on one side (left or right) thereby allowing the operator to brake on one side only and thus reduce the steering radius.



1. Brake fluid reservoir
2. Right master cylinder
3. Brake microswitches (no. 2)
4. Brake pedal
5. Rear axle
6. Right brake
7. Left brake
8. Left master cylinder

2.1 BRAKE MASTER CYLINDER

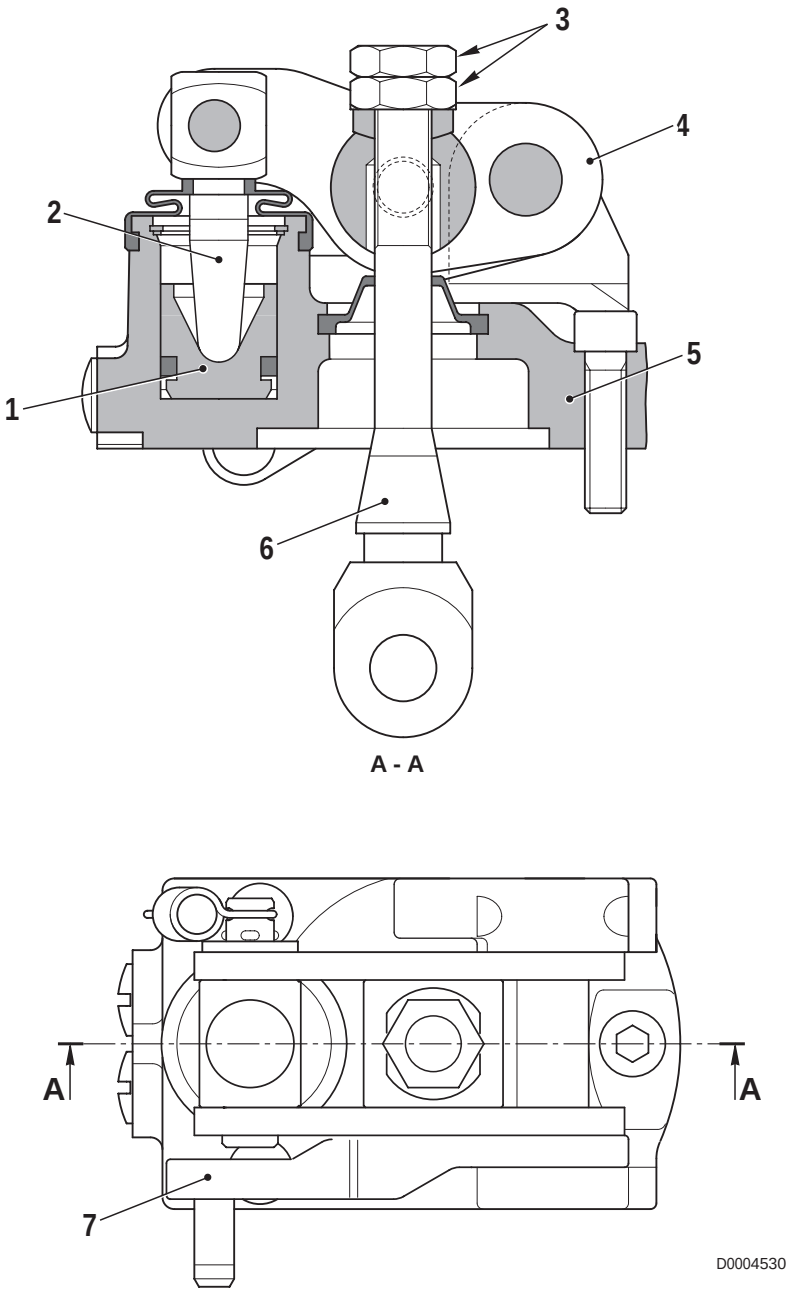


1. Bleed screw
2. Master cylinder casing
3. Push-rod

CHARACTERISTICS

Piston diameter: 23.81 mm (0.938 in.)
Piston stroke: 30 mm (1.182 in.)
Maximum operating pressure: 120 bar (1740 psi)

2.2 BRAKE



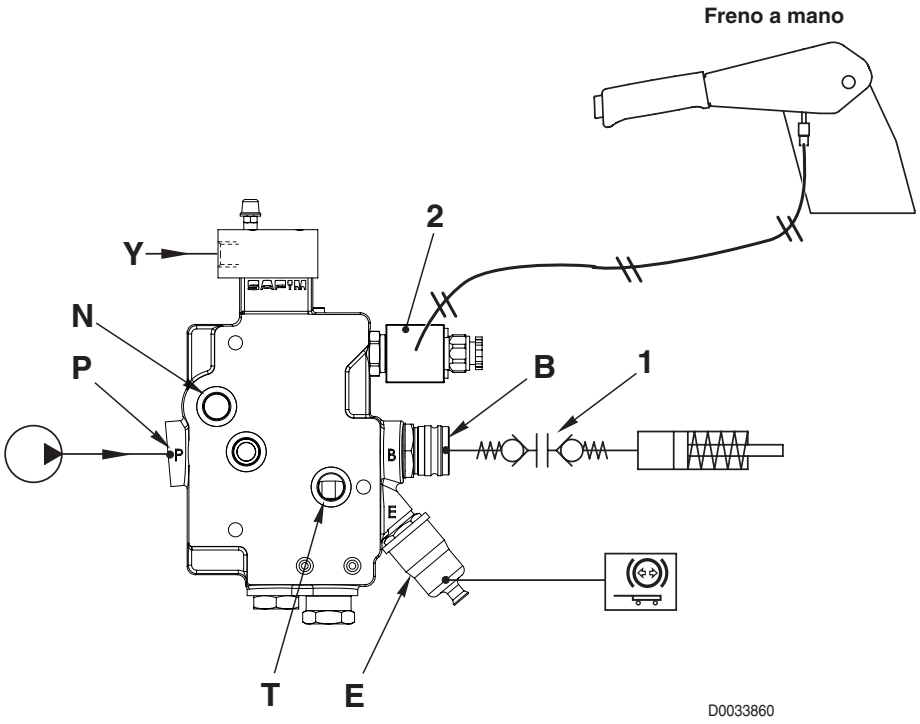
1. Piston
2. Plunger
3. Adjustment nuts
4. Lever
5. Support
6. Rod
7. Parking brake control lever

2.3 TRAILER BRAKING SYSTEM

The tractor may be equipped with one of the four following trailer braking systems:

1. hydraulic trailer braking (Italy version)
2. hydraulic trailer braking (Export version)
3. air trailer braking (Italy version)
4. air trailer braking (Export version)

2.3.1 HYDRAULIC TRAILER BRAKING (ITALY VERSION)

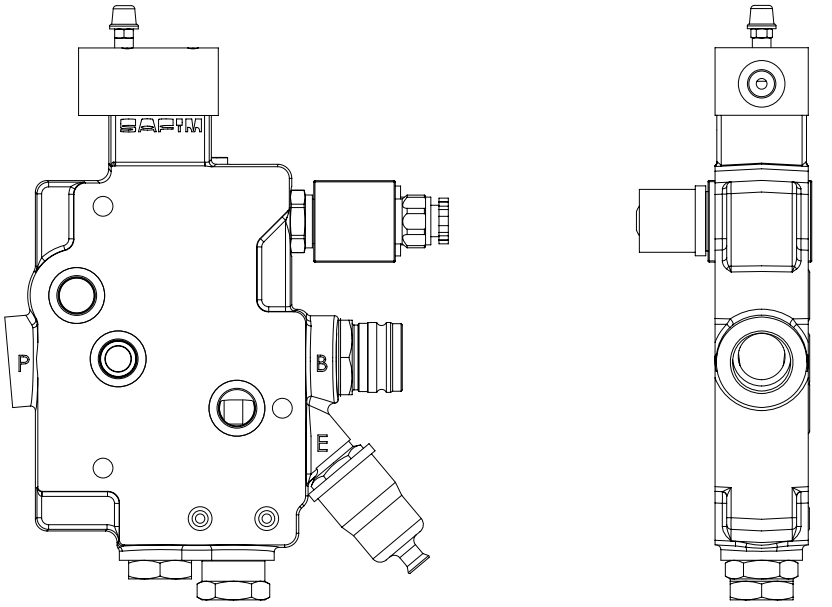


1. Trailer brake quick-coupler connected to the valve

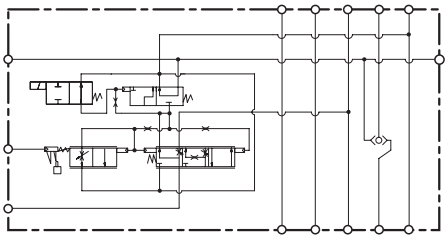
- When quick coupler (1) is connected to the valve and brake pedals are not pressed, pressure of 12.5 bar (181.3 psi) is available at port *B*.
- This pressure is supplied constantly to the trailer to release the parking brake.
- When the operator engages the parking brake, solenoid valve (2) is energised; this action cancels the pressure at port *B*.
- The pressure at port *B* is directly proportional to the pressure present in the tractor braking circuit (Y).

2. Quick coupler disconnected from valve.

- When quick coupler (1) is not connected to the valve there is no pressure at port *B*.
  In this condition, the pressure at port *B* remains null regardless of the pressure present in the tractor braking circuit.



HYDRAULIC DIAGRAM



D0033870

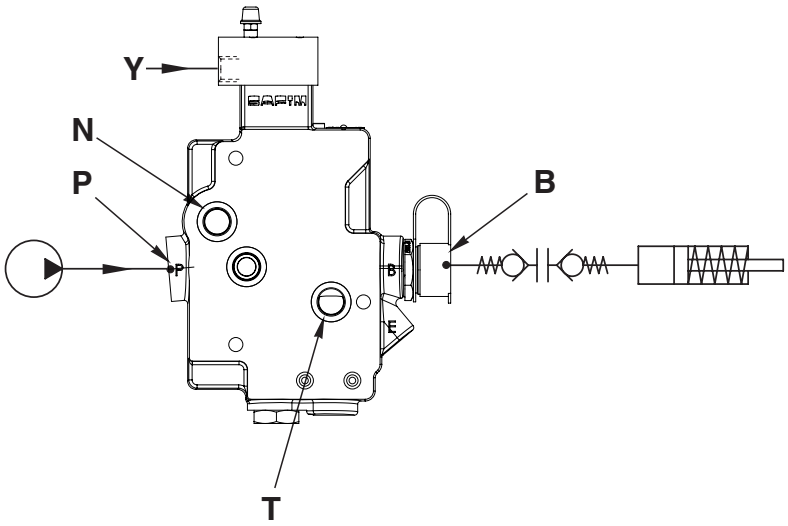
FUNCTION

Port P - Oil supply to valve
Port N - To auxiliary services control valves
Port B - To trailer brake
Port T - Return
Port Y - Connection to tractor braking system
Port LS - Load Sensing signal

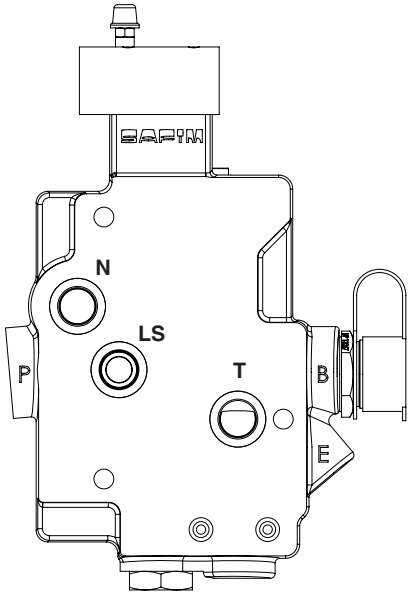
CHARACTERISTICS

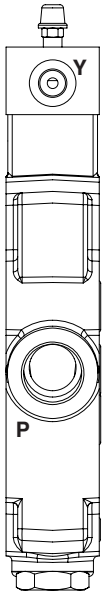
- Maximum operating pressure at port N: 200 bar (2900 psi)
- Minimum constant pressure at port B: 10.5÷14.5 bar
- Maximum pressure at port B: 120÷140 bar
- Oil delivery flow rate: 20÷80,/min (5.3 -- 21.14 US.gpm)

2.3.2 HYDRAULIC TRAILER BRAKING (EXPORT VERSION)

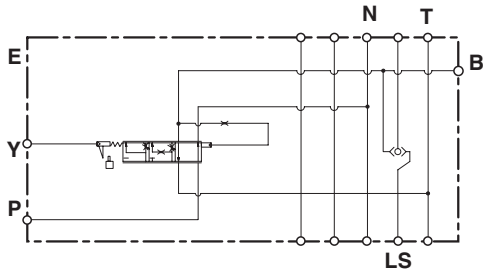


- When quick coupler (1) is connected to the valve and the brakes are not activated, there will be no pressure at port *B*.
- When the operator applies the tractor brakes, the pressure in the brake circuit *Y* drives the braking valve and the pressure at port *B* increases proportionally to the pressure in the tractor braking circuit.





HYDRAULIC DIAGRAM



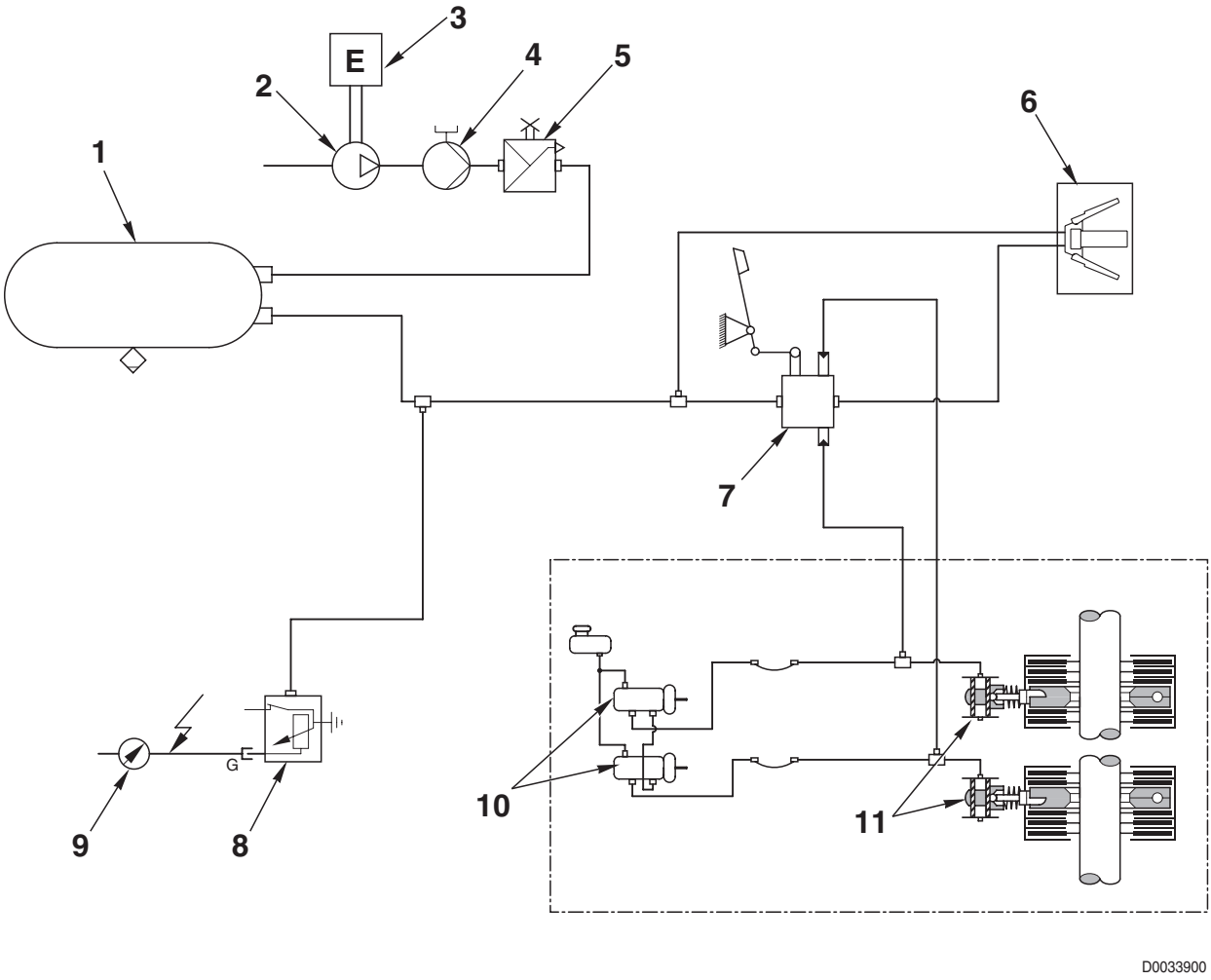
D0033890

Port P - Oil supply to valve
Port N - To lubrication line
Port B - To trailer brake
Port Y - Connection to tractor braking system
Port T - Return

CHARACTERISTICS

- Maximum operating pressure at port N: 200 bar (2900 psi)
- Minimum constant pressure at port B: 0 bar (0 psi)
- Maximum pressure at port B: 120÷140 bar
- Oil delivery flow rate: 20÷80,/min (5.3 – 21.14 US.gpm)

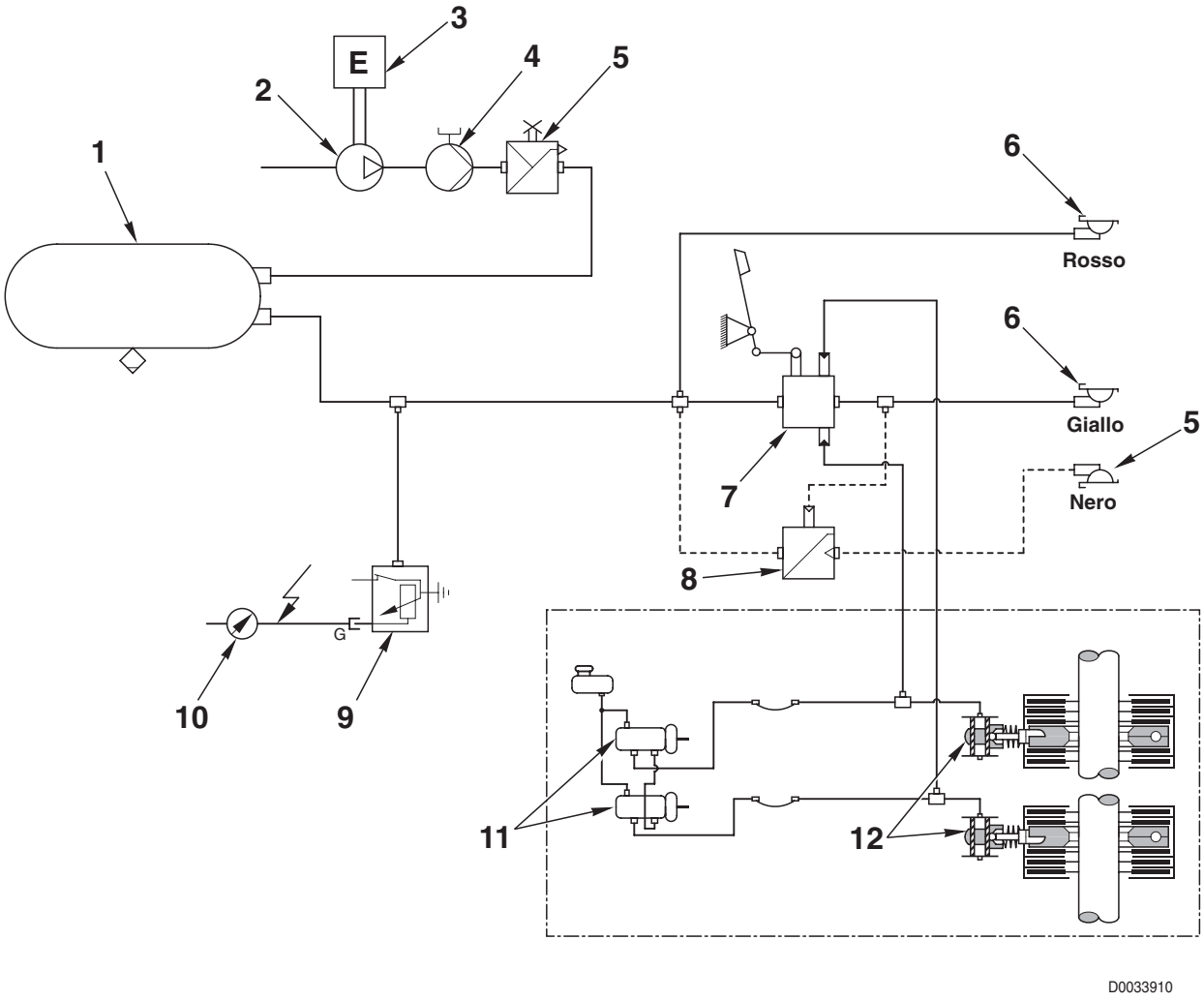
2.3.3 AIR TRAILER BRAKING (ITALY VERSION)



COMPONENTS

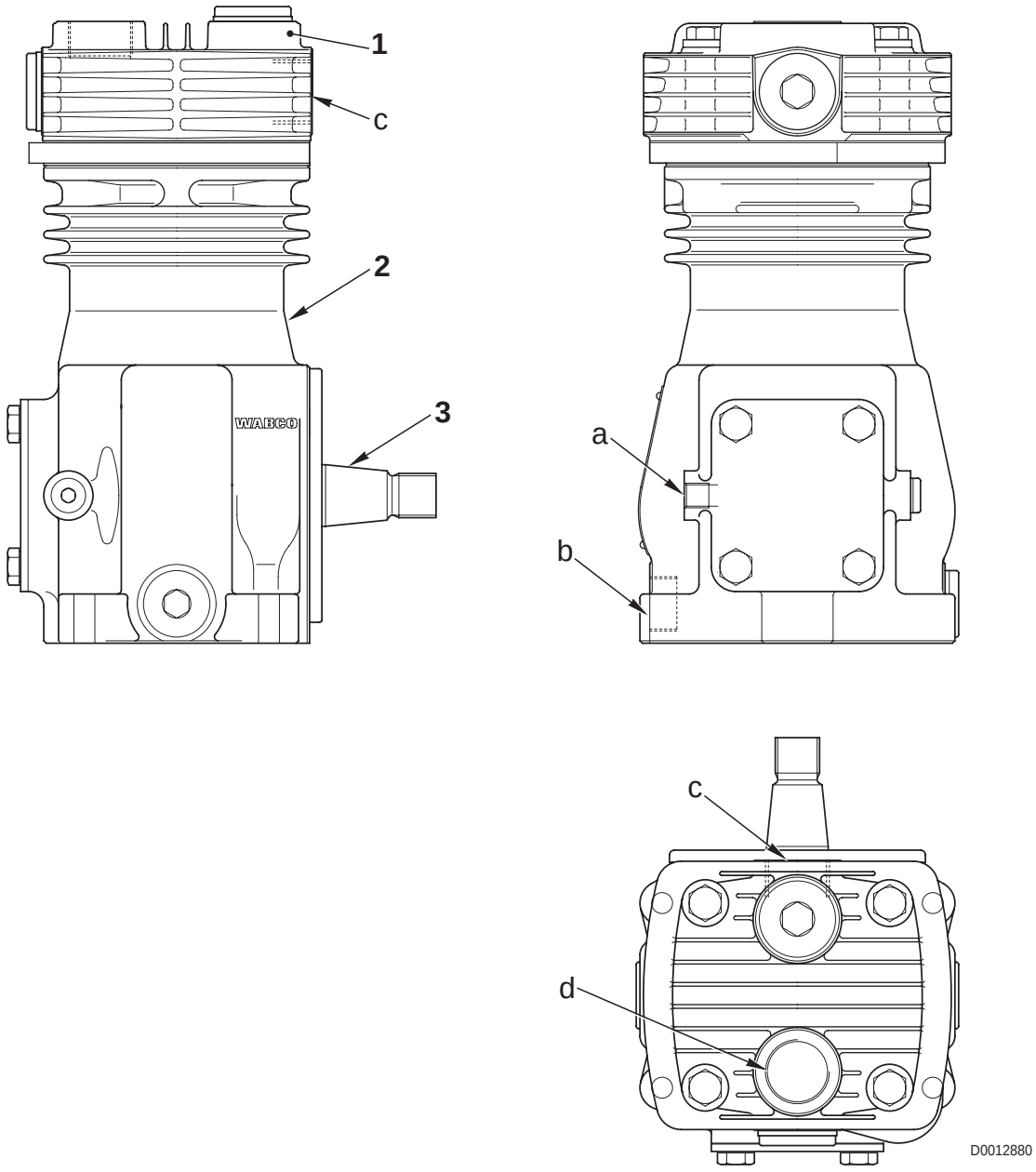
1. Compressed air accumulator
2. Air compressor
3. Engine
4. Antifreeze pump
5. Pressure limiting valve (7.8 bar (113 psi)
6. Quick-coupler for trailer
7. Trailer braking valve
8. Circuit pressure sensor
9. Circuit pressure indicator
10. Brake master cylinder
11. Brake

2.3.4 AIR TRAILER BRAKING (EXPORT VERSION)



1. Compressed air accumulator
2. Air compressor
3. Engine
4. Antifreeze pump
5. Pressure limiting valve (7.8 bar (113 psi)
6. Quick-coupler for trailer
7 - Trailer braking valve (2-way)
8. Trailer braking valve (1-way)
9. Circuit pressure sensor.
10. Circuit pressure indicator
11. Brake master cylinder
12. Brake

COMPRESSOR



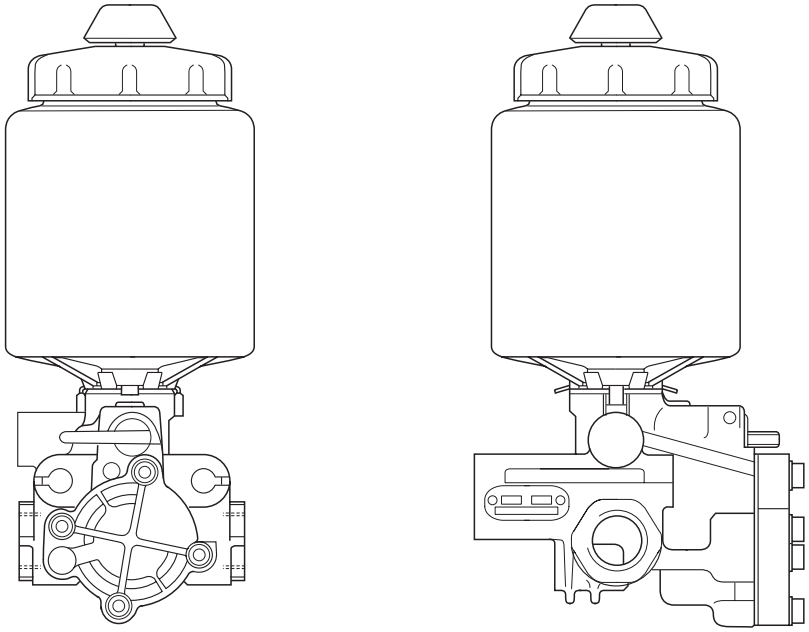
a. Compressor lubrication
b. Compressor lube oil return
c. Port 0 - Air inlet
d. Port 2 - Air discharge

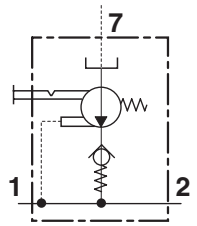
1. Cylinder head
2. Cylinder
3. Drive shaft

CHARACTERISTICS

Bore: 75 mm
Stroke: 36 mm
Displacement: 159 cm^3
Max. pressure.: 18 bar
Drive shaft end float: 0.2÷0.6 mm

ANTIFREEZE PUMP

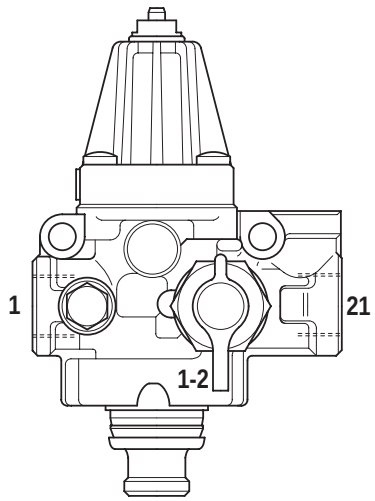


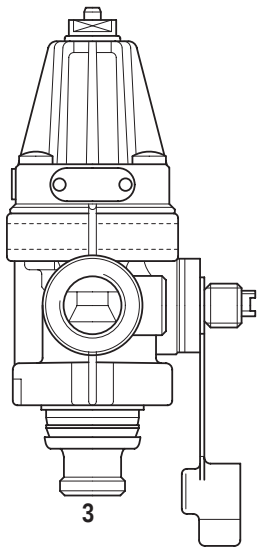


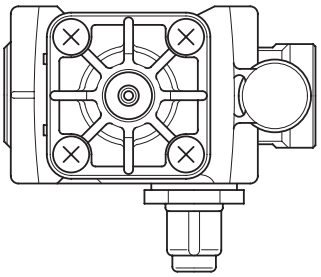
D0034030

Port 1 - From compressor
Port 2 - To limiting valve
Port 7 - From antifreeze reservoir

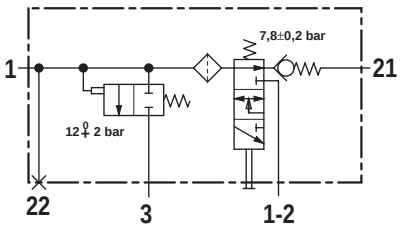
PRESSURE LIMITING VALVE







DIAGRAM



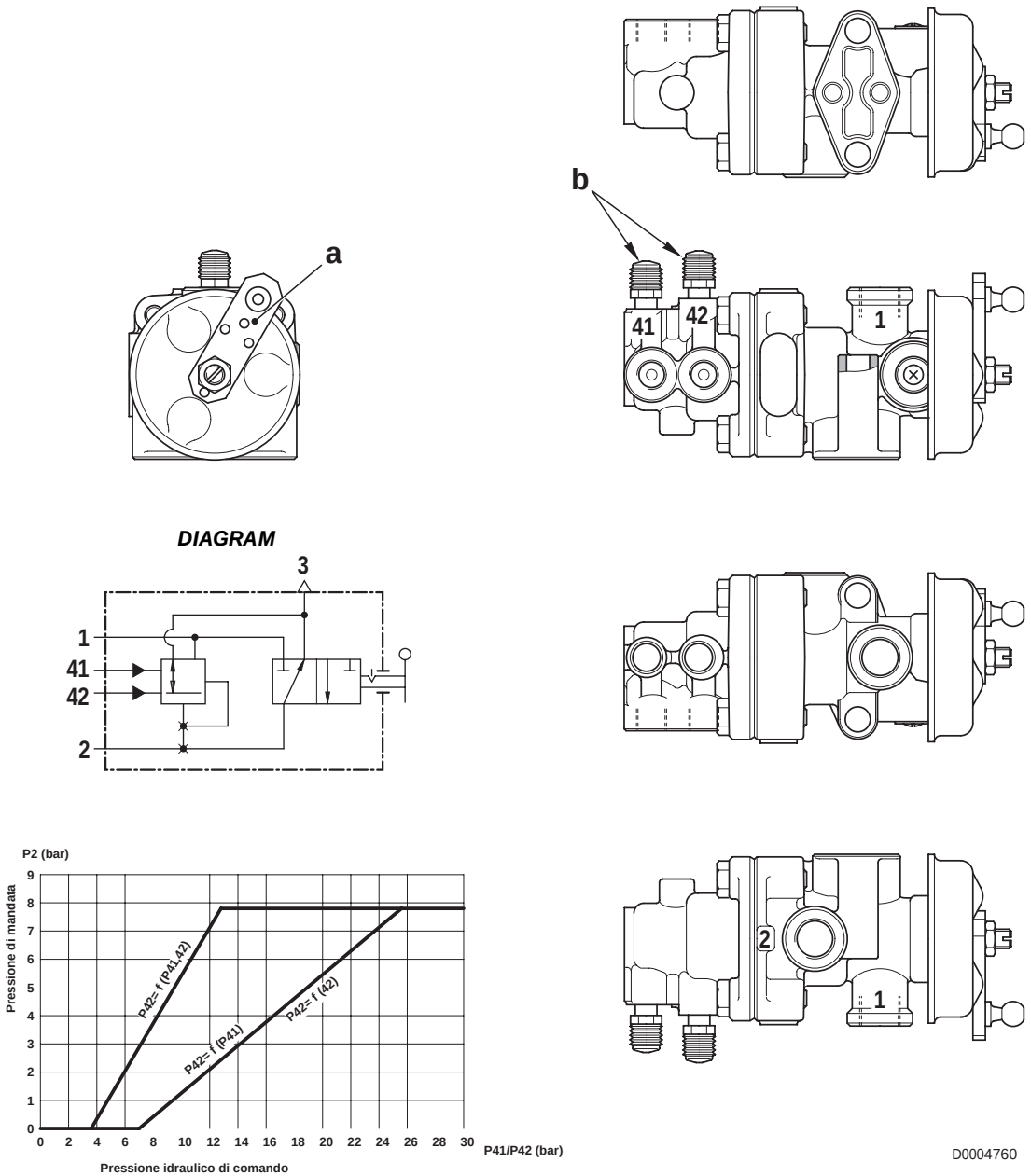
D0004690

Port 1 - From antifreeze pump
Port 3 - Excess pressure vent
Port 21 - To compressed air accumulator

CHARACTERISTICS

Cut-out pressure: 7.8±0.2 bar (113±2.9 psi)
Cut-in pressure: 0.6÷1 bar (8.7 – 14.5 psi)
Relief valve setting: 12♀2 bar (174♀29 psi)

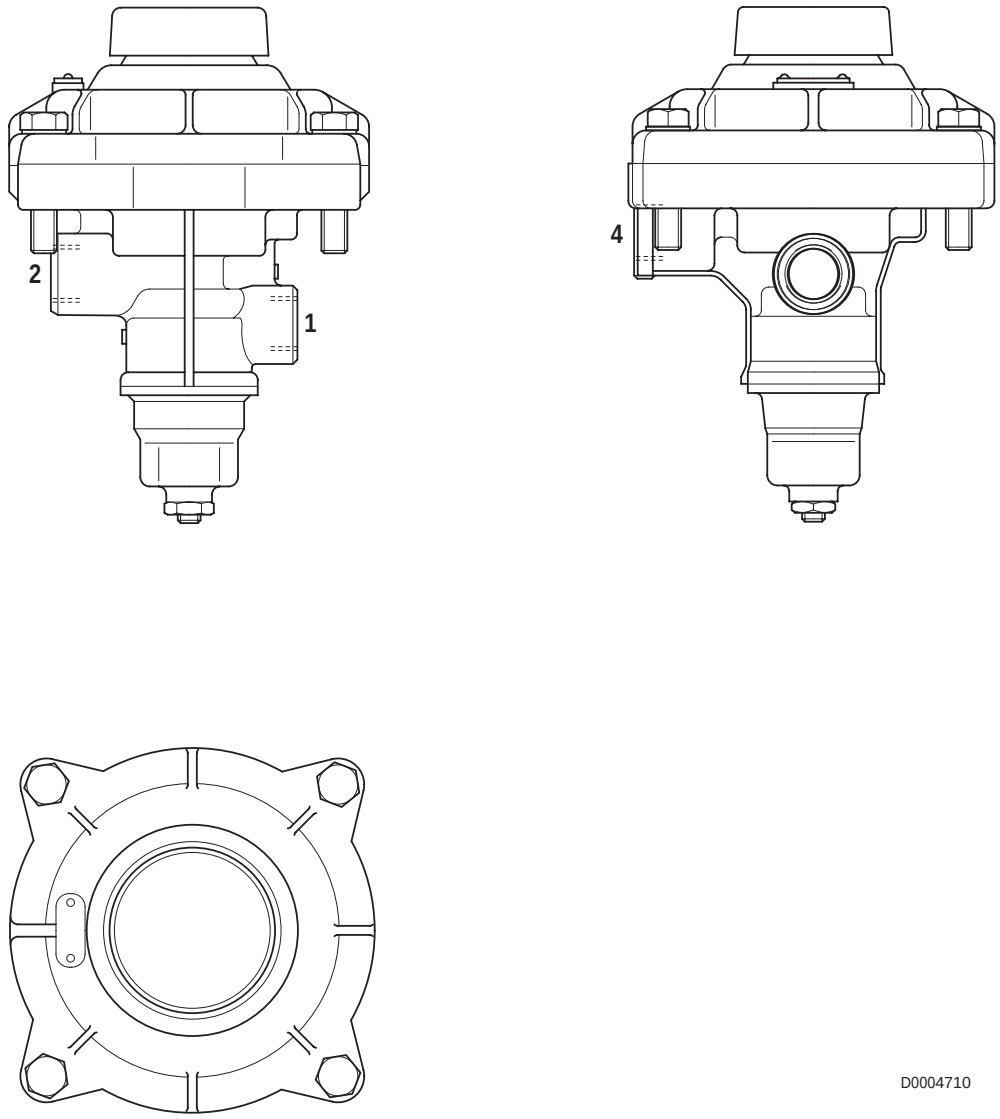
TRAILER BRAKING VALVE (2-WAY)



a. Parking brake control lever
b. Air vent screws

Port 1 - From compressed air accumulator
Port 2 - To trailer brake
Port 41 - From left brake
Port 42 - From right brake

TRAILER BRAKING VALVE (1-WAY)



Port 1 - From compressed air accumulator
Port 2 - To trailer brake
Port 4 - Pilot from delivery line to trailer (2-way braking)

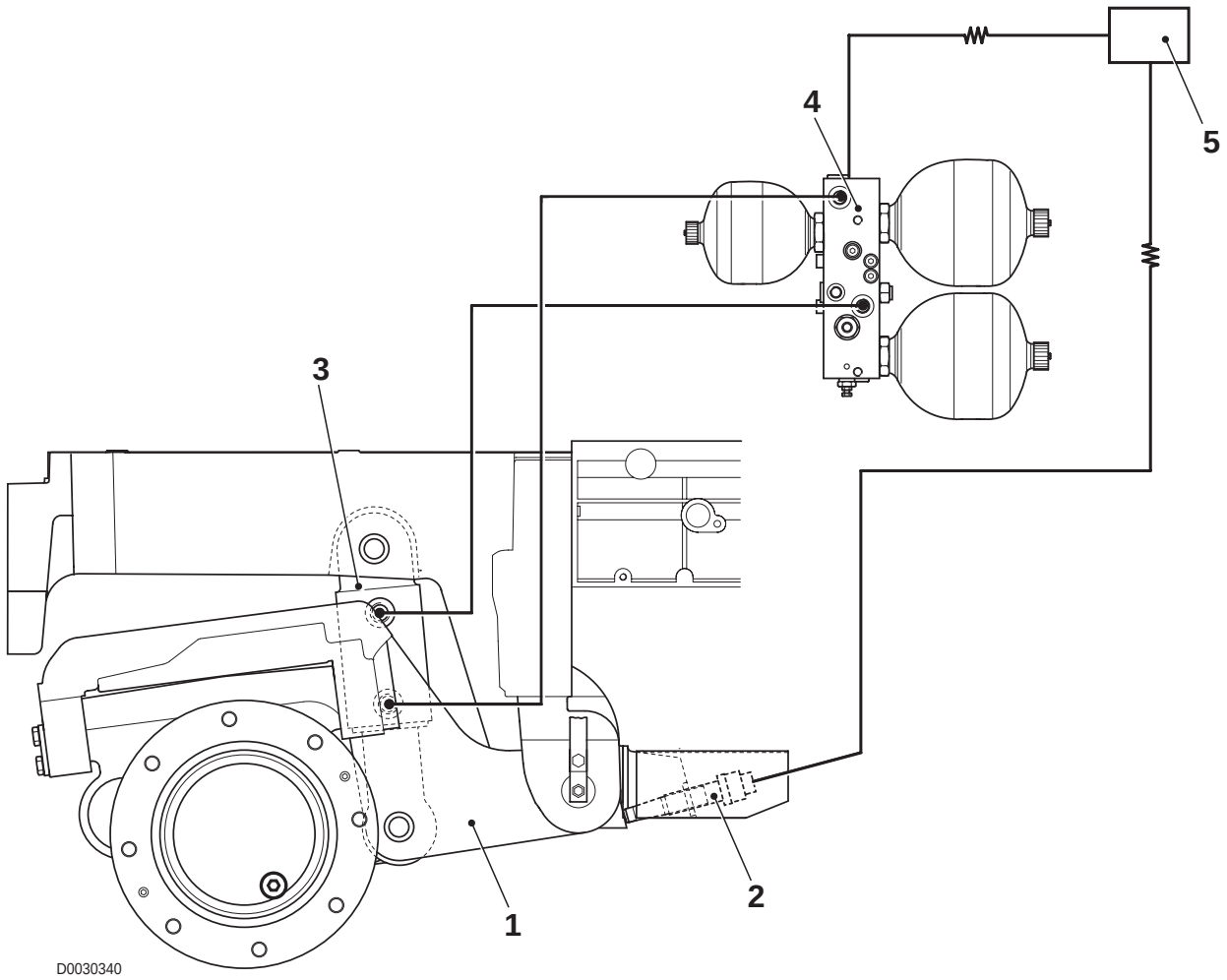
3. HYDRAULIC FRONT AXLE SUSPENSION

DESCRIPTION

The function of the hydraulic front suspension system is to absorb impacts when travelling over rough terrain and to keep the tractor body on an even keel on the road.

The system comprises:

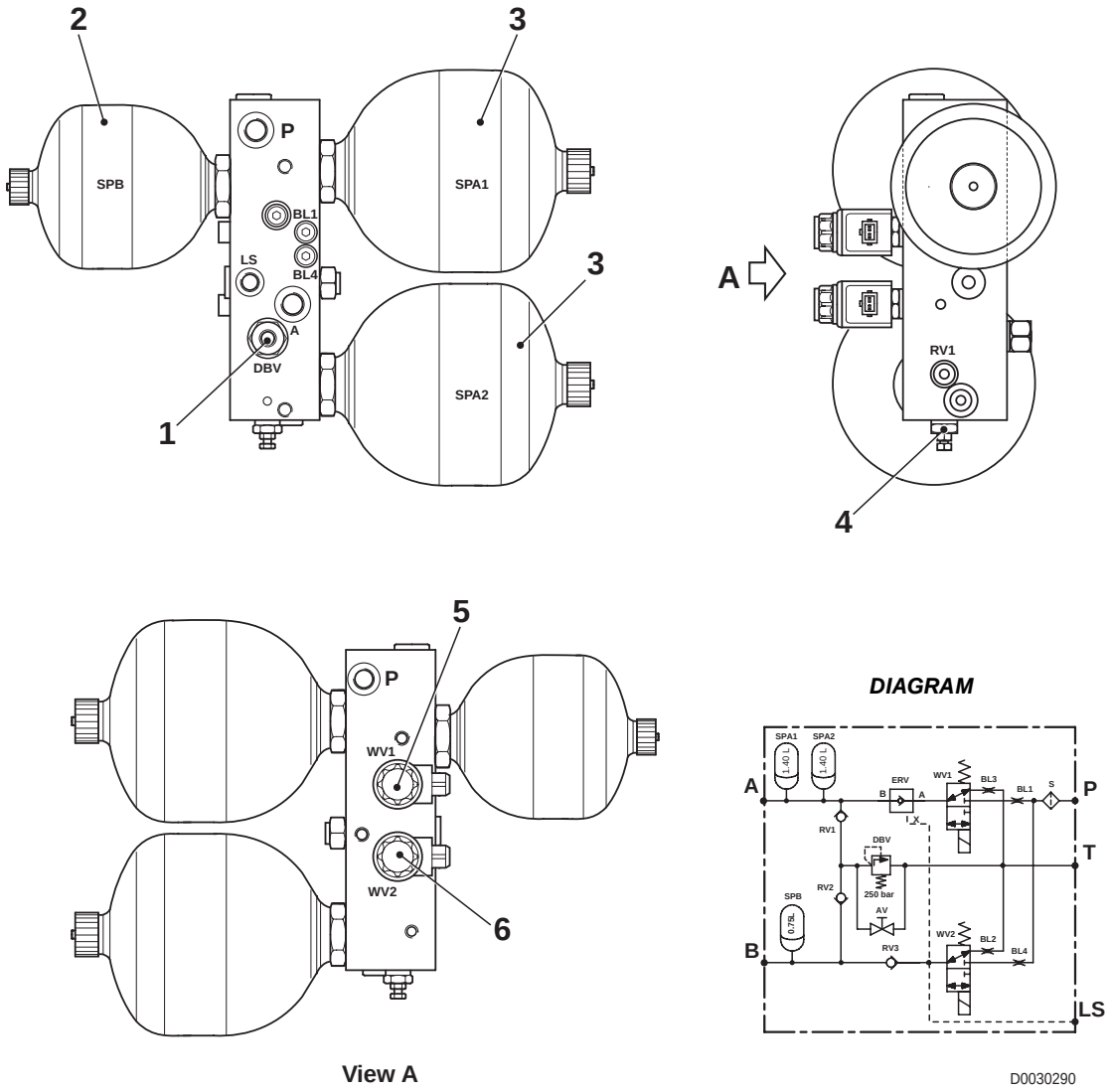
- swinging axle support arm (1)
- position sensor (2)
- 2 suspension cylinders (3)
- front suspension control valve (4)
- electronic control unit (5)



3.1 FRONT SUSPENSION CONTROL VALVE

FUNCTION

In addition to the primary function of enabling front axle suspension by charging the hydraulic-pneumatic accumulators that constitute the elastic elements of the system, the front suspension control valve also serves to control raising and lowering of the front axle.

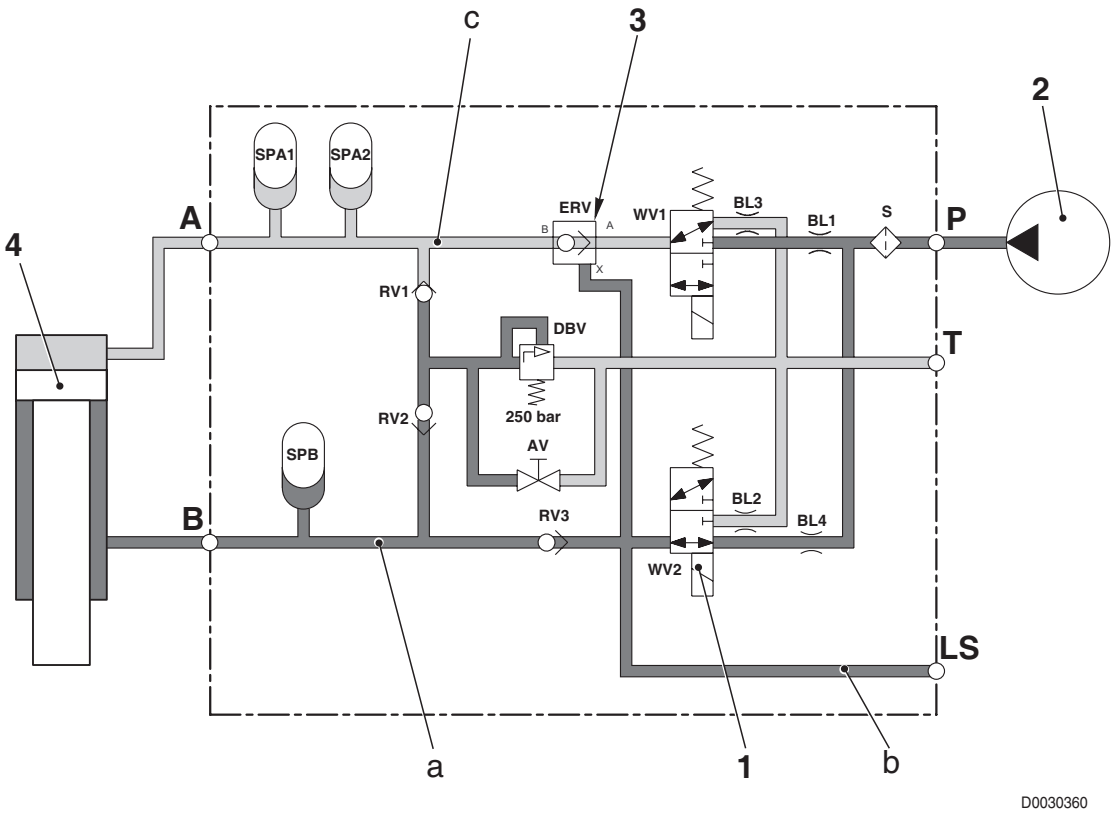


View A

1. Relief valve (setting 250 bar)
2. Accumulator
3. Accumulator
4. Pressure discharge valve
5. Cylinder extension control solenoid valve
6. Cylinder retraction control solenoid valve

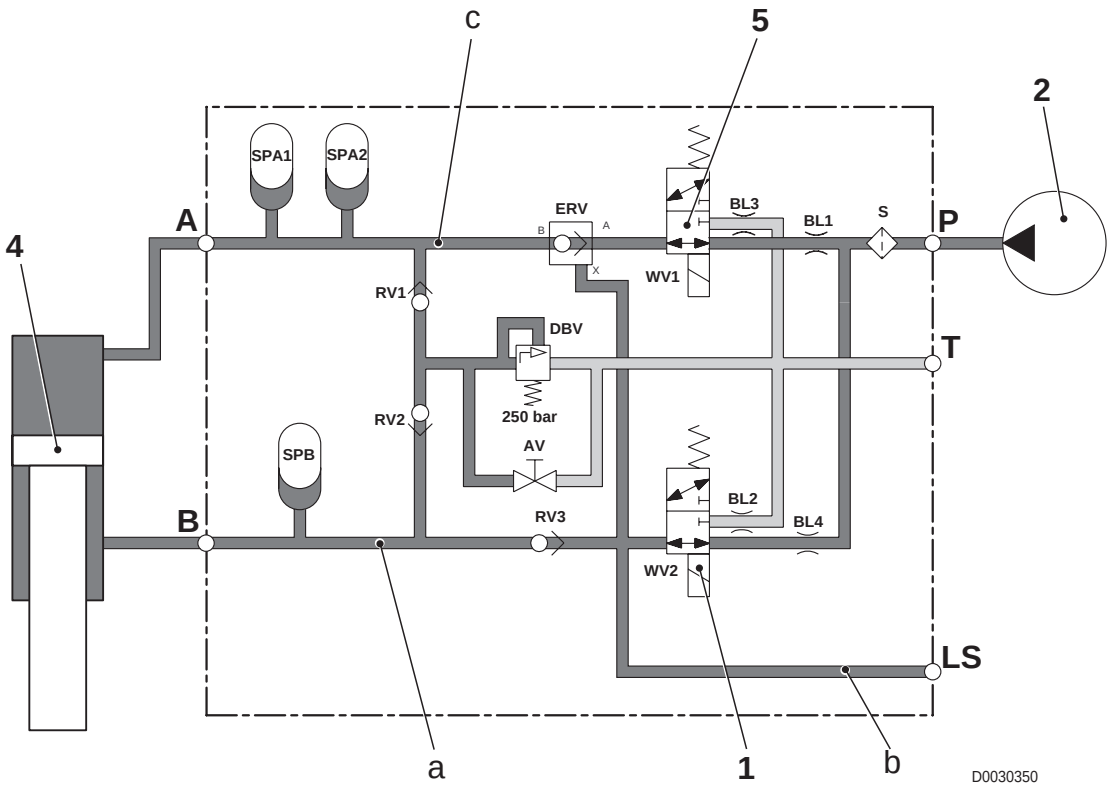
OPERATION

1. When the suspension is deactivated



- When the suspension is deactivated, the electronic control unit energises solenoid valve (1), sending signal *LS* to the priority valve via port *LS*.
- This allows the pressurised oil from pump (2) to flow to lines *a* and *b* and one-way valve (3) opens allowing oil in line *c* to be returned to tank.
- Piston (4) is consequently pushed upwards to its stroke-end position, thereby returning the system to fixed axle condition.
- The suspension is deactivated by the operator by means of a switch.

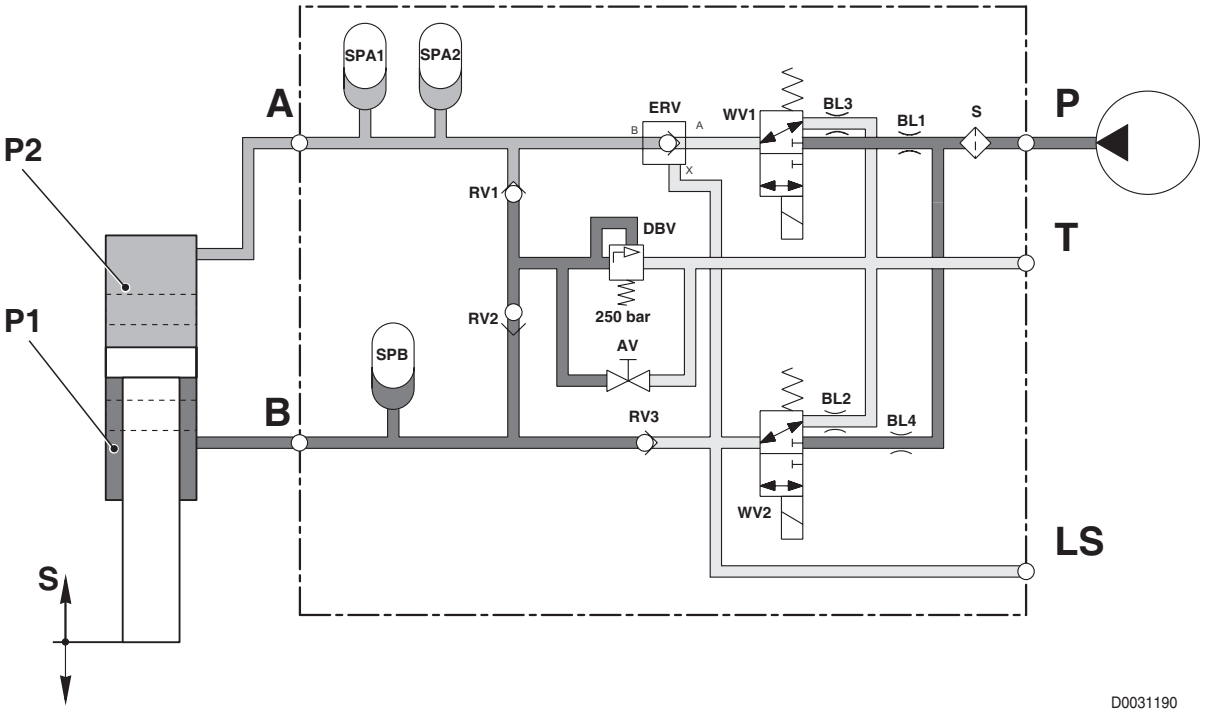
2. When the operator activates the system

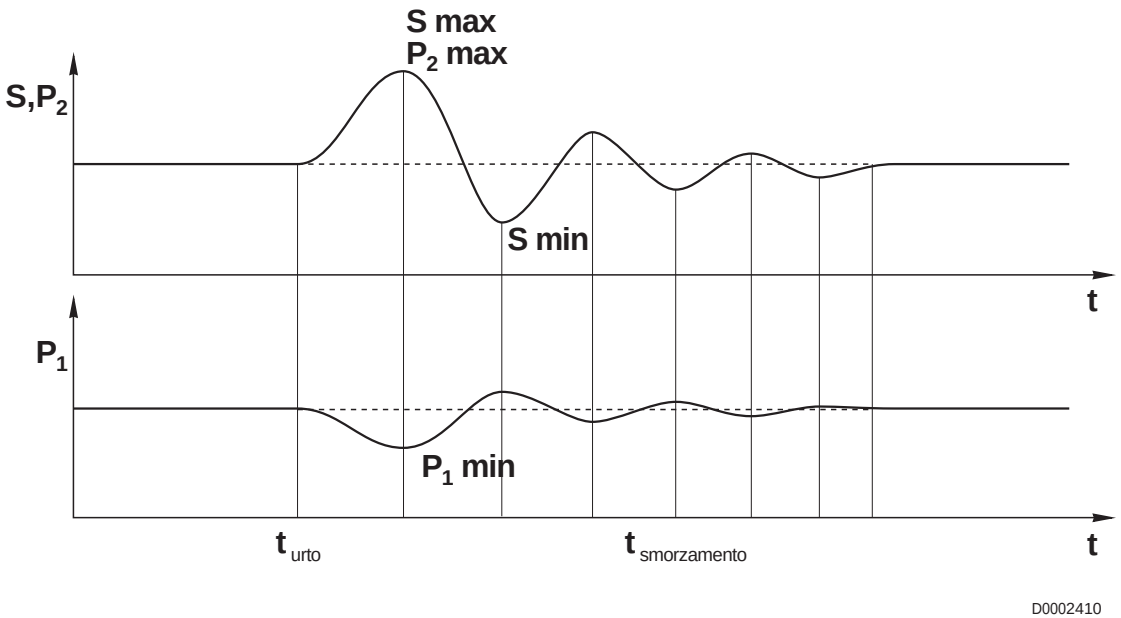


- When the operator presses the switch to activate the suspension, the electronic control unit energises solenoid valves (1) and (5).
- This allows pressurised oil from pump (2) to flow to lines *a* and *c* and, because of the section difference between the two sides of piston (4) against which the same pressure is imparted, piston (4) starts to extend.
- At the same time, the oil compresses the membranes of the accumulators and the pressure in lines *a* and *b* increases.
- When the position sensor detects that the suspension has attained the levelling position, the electronic control unit de-activates solenoid valves (1) and (5) and the part of the system containing the precharged accumulators is isolated from the rest of the system.

3. When the system is active

- When the tractor is in motion and the wheels encounter an obstacle, the front axle is pushed upwards.
- This causes the pressure P2 to increase (accumulators 6 are compressed) while pressure P1 decreases (accumulator 3 is decompressed).
- The pressure balance is thus altered and the system (which is closed) acts to restore the original condition

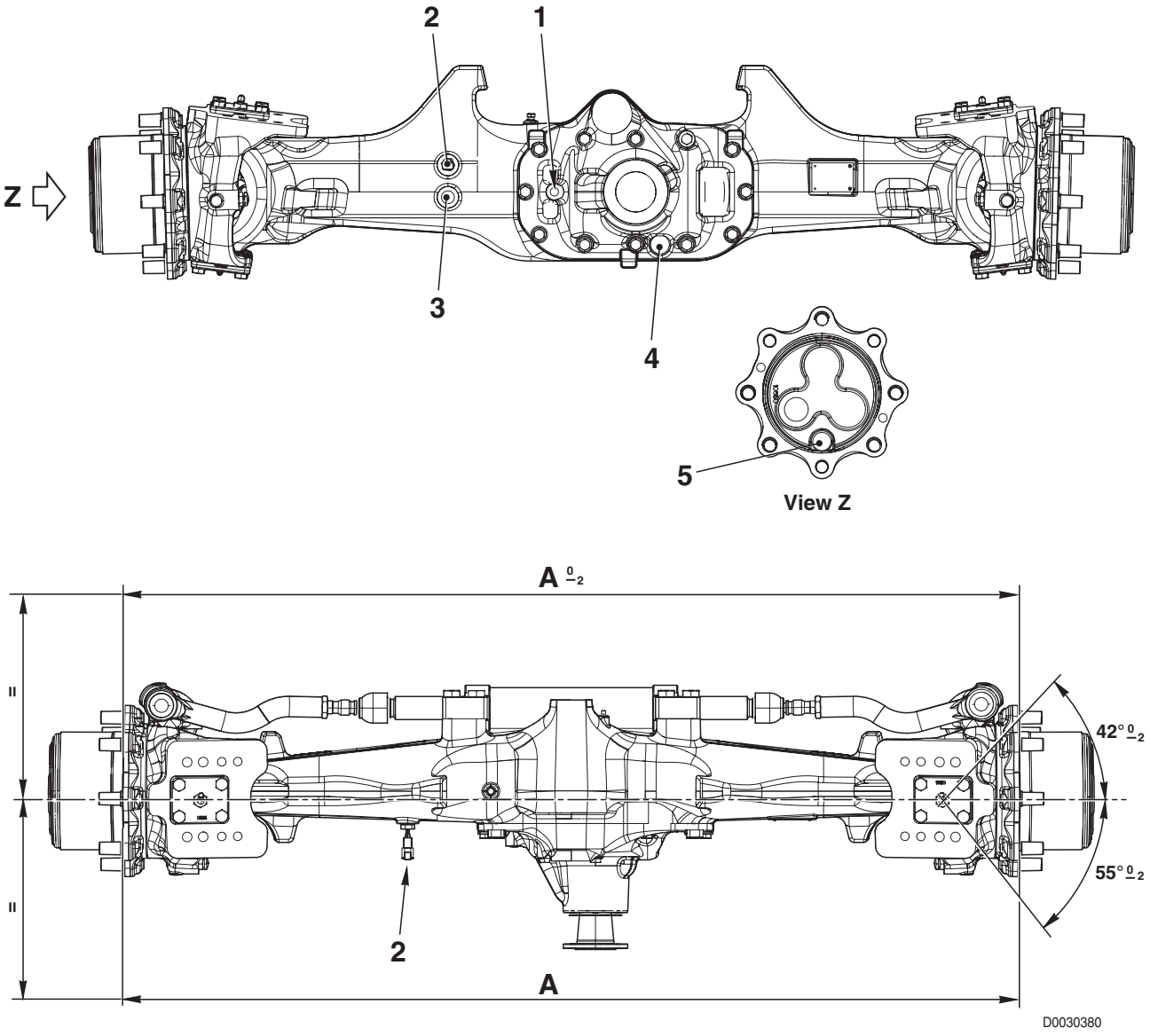




PAGE INTENTIONALLY
LEFT BLANK

4. FRONT AXLE

★ *The figure shows the suspended axle version*



CHARACTERISTICS

Track (A): 1660 mm

Toe-in: A 0 -2

Total ratio (pinion revs/wheel revs): 15,857/1

COMPONENTS

1. Differential lock engagement connection
2. Steering angle sensor connector.
3. Filler and oil level plug for differential
4. Differential drain plug
5. Filler, level and drain plug for final drive

5. HYDRAULIC SYSTEM

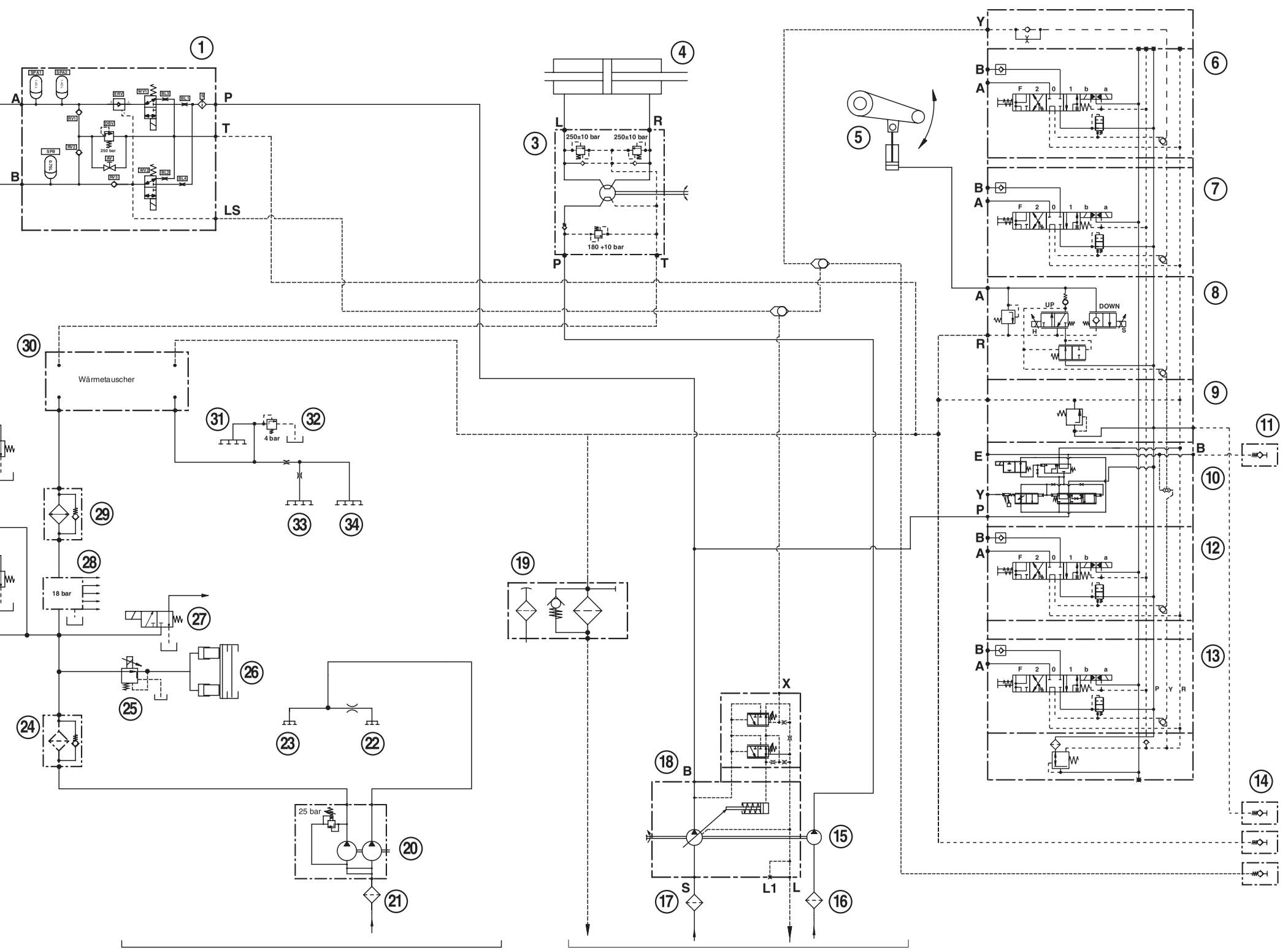
DESCRIPTION

The tractors in this series are equipped with LS hydraulic system, with variable displacement pump for services (auxiliary control valves, trailer hydraulic braking system, etc.) and fixed displacement hydraulic system for the steering circuit.

The LS hydraulic circuit utilizes a variable displacement piston pump capable of supplying oil for services in response to the effective demand.

In this system, when the engine is running at maximum speed and no hydraulic actuators are in operation, the pump effectively only circulates the oil that is dispersed through internal leakage in the devices connected to the system (just a few litres per minute), thus saving energy and fuel.

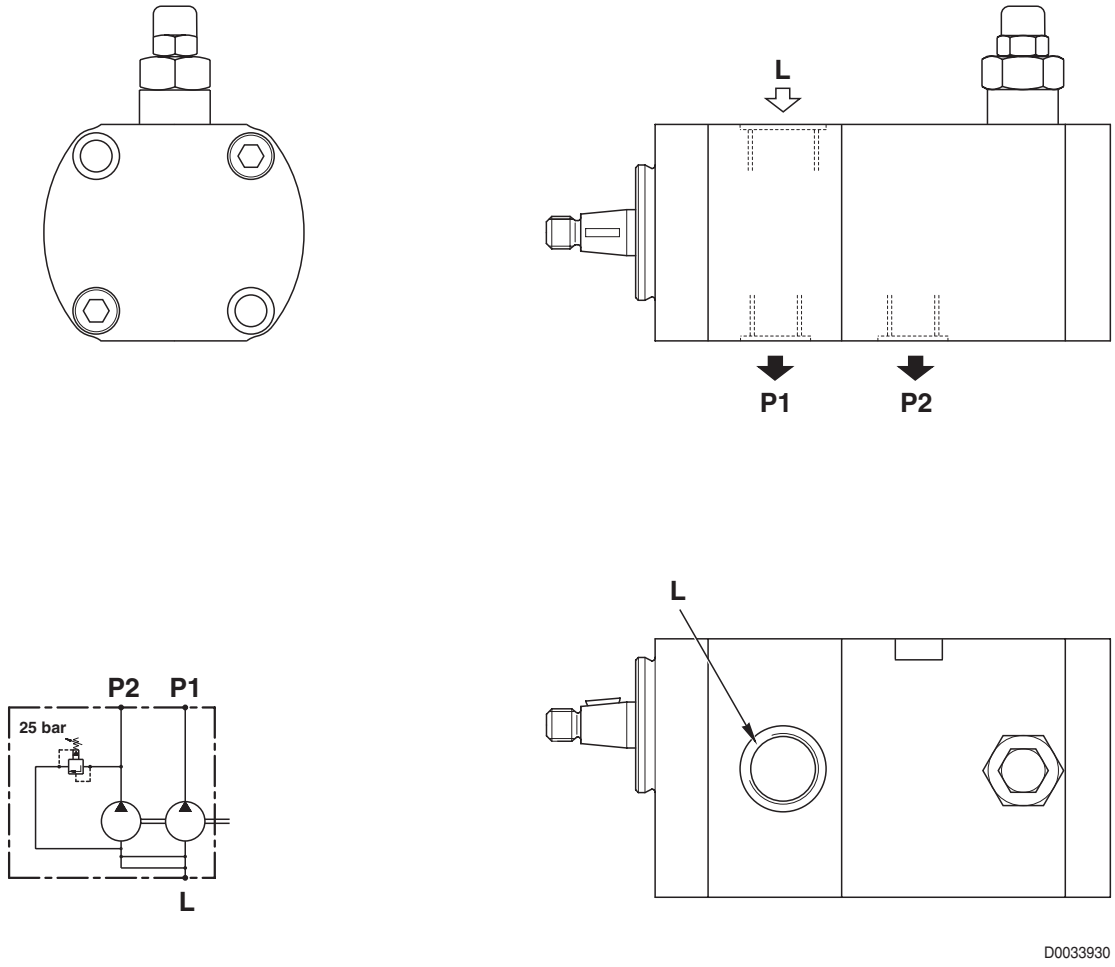
In addition, the flow rate of the variable displacement piston pump is greater than the potential demand of any single service, so that there will always be sufficient flow to satisfy several services simultaneously.



2. Fr
3. Hy
4. St
5. Lif
6. Au
7. Au
8. Lif
9. Ma
10. Tr
11. Tr
12. Au
13. Au
14. Pc
15. St
16. Fil
17. Fil
18. Pu
19. Fil
20. Tr
21. Fil
22. Pi
23. Br
24. Fil
25. Ma
va
26. Ma
27. 4V
28. Ge
29. Cc
30. Cc
31. Tr
32. Lu
33. Di
34. Re
35. Di
36. Re
37. “F
38. “R

PAGE INTENTIONALLY LEFT BLANK

5.2 GEAR PUMP FOR TRANSMISSION ZF 7100



D0033930

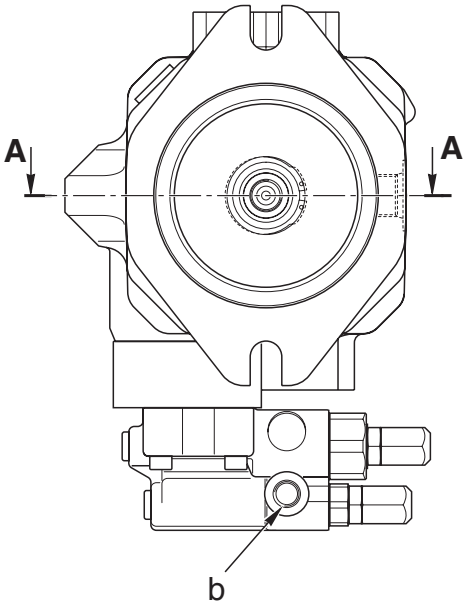
FUNCTION

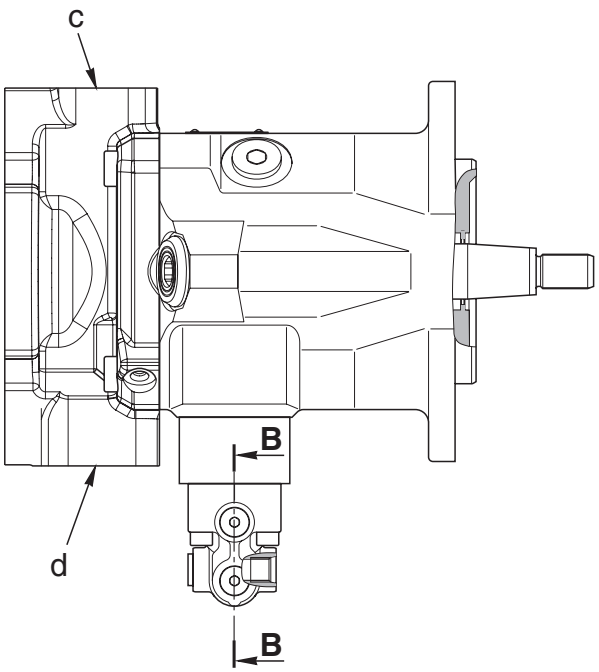
Port L: suction
Port P1: lubrication delivery
Port P2: transmission delivery

CHARACTERISTICS

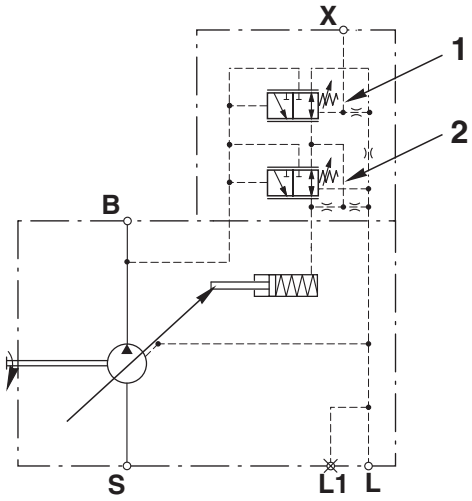
Displacement: 25 cc/rev (68 ,/min)
Maximum pressure: 25♀10 bar

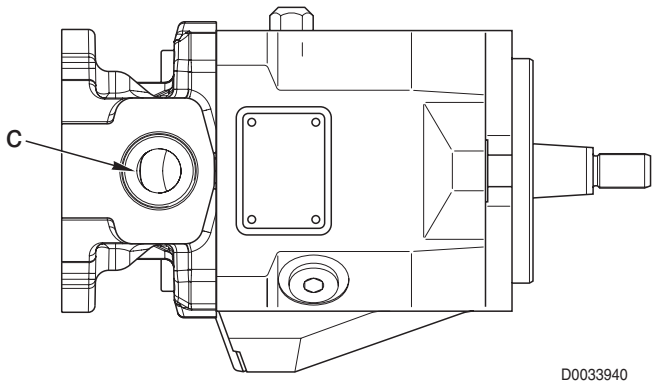
5.3 VARIABLE DISPLACEMENT PUMP





HYDRAULIC DIAGRAM





CONNECTIONS

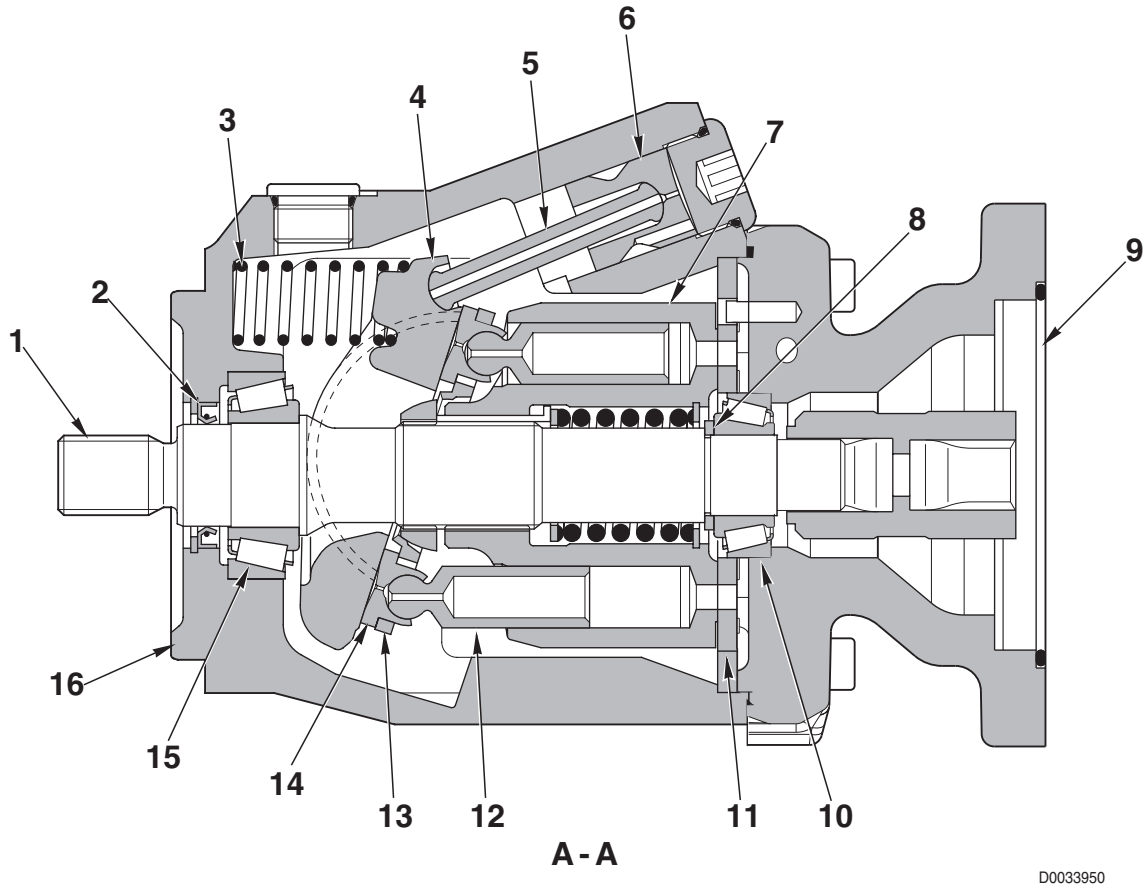
a. Port L - To gearbox
b. Port X - From auxiliary control valve or services
c. Port B - To auxiliary services control valve
d. Port S - From reservoir

COMPONENTS

1. Load Sensing valve
2. Pressure cut-off valve

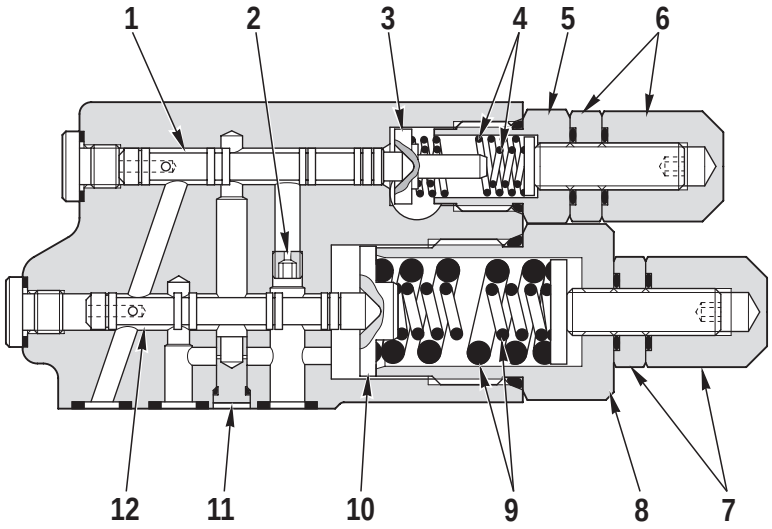
FUNCTION

Port L: return
Port X: LS signal
Port S: suction
Port B: delivery



COMPONENTS

1. Drive shaft
2. Oil seal
3. Swash plate return spring
4. Swash plate
5. Control rod
6. Control piston
7. Cylinder block
8. Spacer
9. Cover
10. Bearing
11. Valve plate
12. Pistons (no.9)
13. Piston retaining ring
14. Piston shoe
15. Taper roller bearing
16. Pump housing



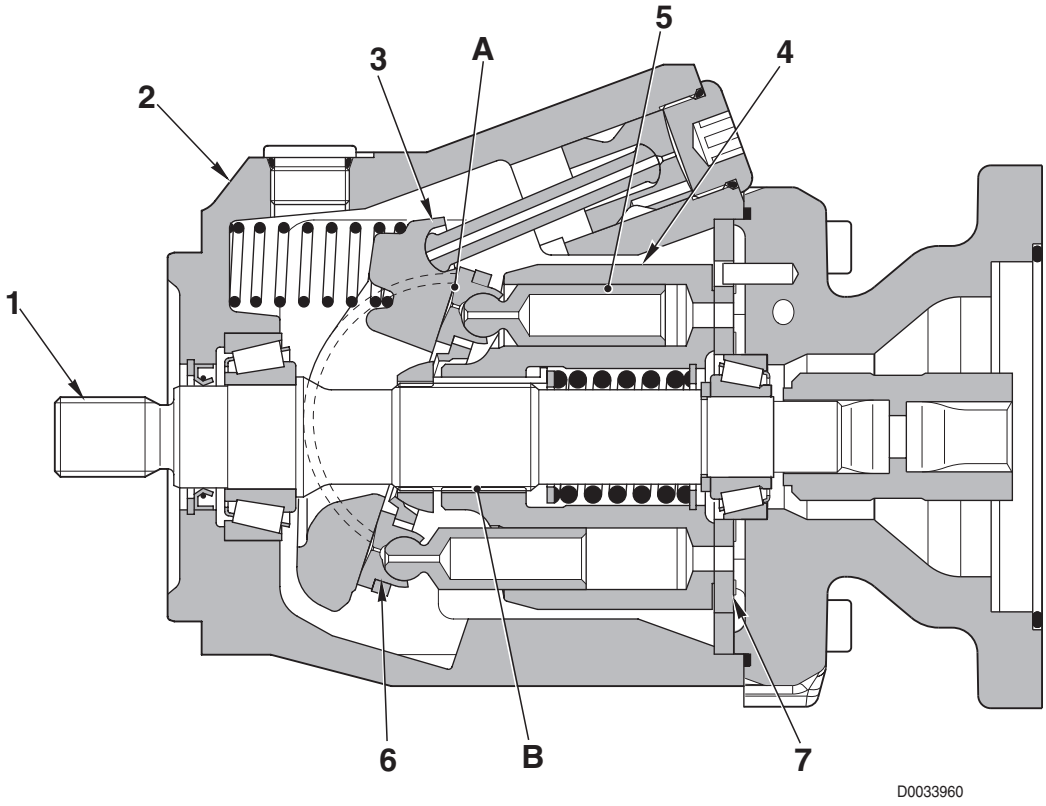
COMPONENTS

1. Load Sensing valve spool
2. Choke
3. Collar
4. Load Sensing valve springs
5. Spring cover
6. Adjuster nuts
7. Adjuster nuts
8. Spring cover
9. Pressure control valve springs
10. Collar
11. Choke (Ø 0.6 mm) (0.024 in)
12. Pressure control valve spool

5.3.1 HYDRAULIC PUMP

FUNCTION

- The rotation and torque of the pump shaft are converted into hydraulic energy and the flow of pressurised oil is regulated in accordance with the demand from the various actuators.
- It is possible to vary the pump delivery by changing the angle of the swash plate.



CONSTRUCTION

- Cylinder block (4) is fixed to shaft (1) by broached fitting *B* and shaft (1) is supported by the front and rear bearings.
- The end of piston (5) is spherical; piston shoe (6) is staked to form a single assembly. Piston (5) and shoe (6) together form a ball joint.
- Swash plate (3) has a flat surface *A* against which piston shoes (6) slide with a circular motion.
- Pistons (5) stroke axially within their bores in cylinder block (4).
- The rotation of cylinder block (4) pressurises the oil in the cylinder bores; the positions of the inlet and outlet ports are determined by slots in valve plate (7).
  The oil is drawn into the bores and forced out through the slots in valve plate (7).

OPERATION

1. *Operation of the pump*

1 - Cylinder block (4) rotates with shaft (1) and piston shoes (6) slide on flat surface «*A*».
Swash plate (3) can swing within arc «*B*»; angle «α» between the axis of shaft (1) and axis *X* of swash plate (3) can be changed to alter the stroke of the pistons. Angle «α» is known as the «swash plate angle».

2 - When axis *X* of swash plate (3) is at an angle «α» to shaft (1) and consequently to cylinder block (4), surface «*A*» acts as a cam for piston shoes (6). Consequently, as the shaft rotates, pistons (5) stroke within their bores in cylinder block (4), thereby creating a difference between volumes *C* and *D* which causes oil to be drawn in and forced out in quantities equal to this difference (*D* -- *C*=delivery).
In other terms, as cylinder block (4) rotates the volume of chamber *D* is reduced causing the oil to be delivered while the volume of chamber *C* is increased, thereby causing oil to be drawn in. (Fig. 1 shows the condition of the pump on completion of the suction stage in chamber *D* and the delivery stage in chamber *C*).

3 - When axis *X* of swash plate (3) is parallel to the axis of cylinder block (4) (swash plate angle «α»=0), the difference between volumes *C* and *D* inside cylinder block (6) is zero and no oil is pumped (Fig. 2).
(In reality, swash plate angle «α» is never truly equal to 0).

4 - Pump delivery is therefore directly proportional to swash plate angle «α»

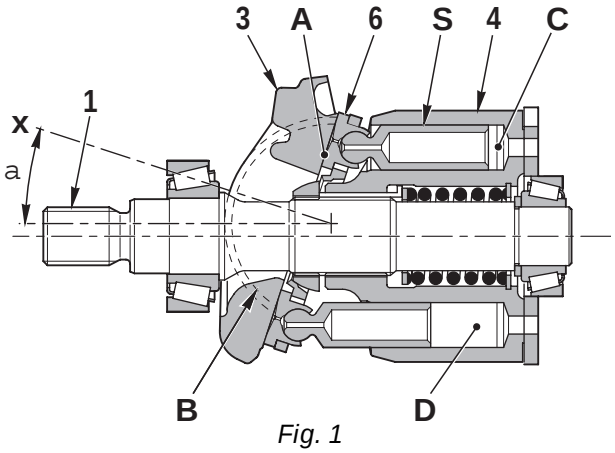


Fig. 1

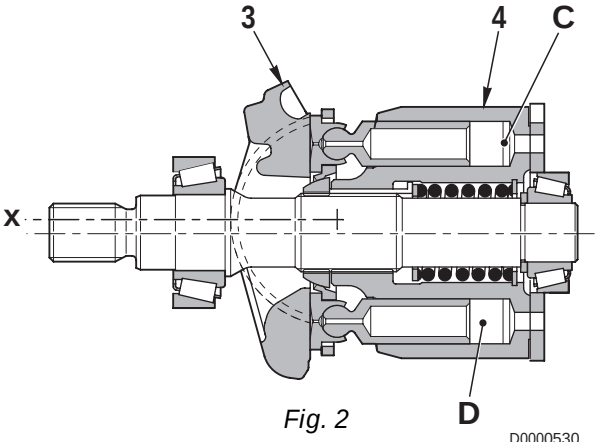


Fig. 2

2. *Pump delivery control*

- When the pump runs at a given speed, the quantity of oil delivered to the work ports is regulated by angle «α» of swash plate (3).
The swash plate is maintained in the maximum displacement position by spring (10) in contrast with the positioning piston, which defines angle «α».
- When the pump operates below the maximum pressure, angle «α» is set in such a way that the difference between pump discharge pressure and LS signal pressure assumes a specific value (control pressure differential).
- When the pump operates at maximum pressure, angle «α» is set in such a way as to guarantee the flow rate without exceeding maximum pressure. This means that angle «α» is set to a slightly lower value than that requested by the LS signal.

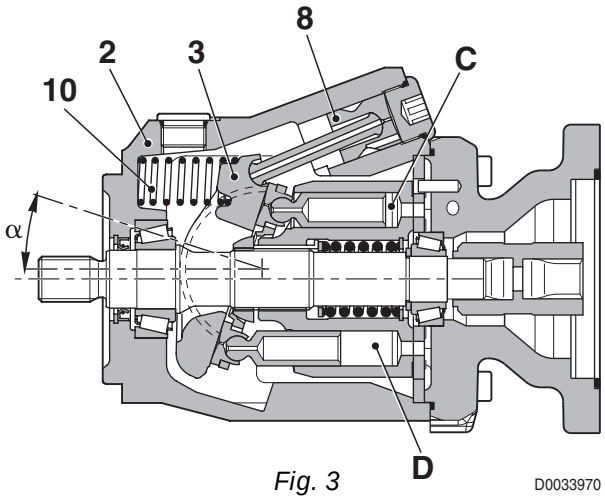
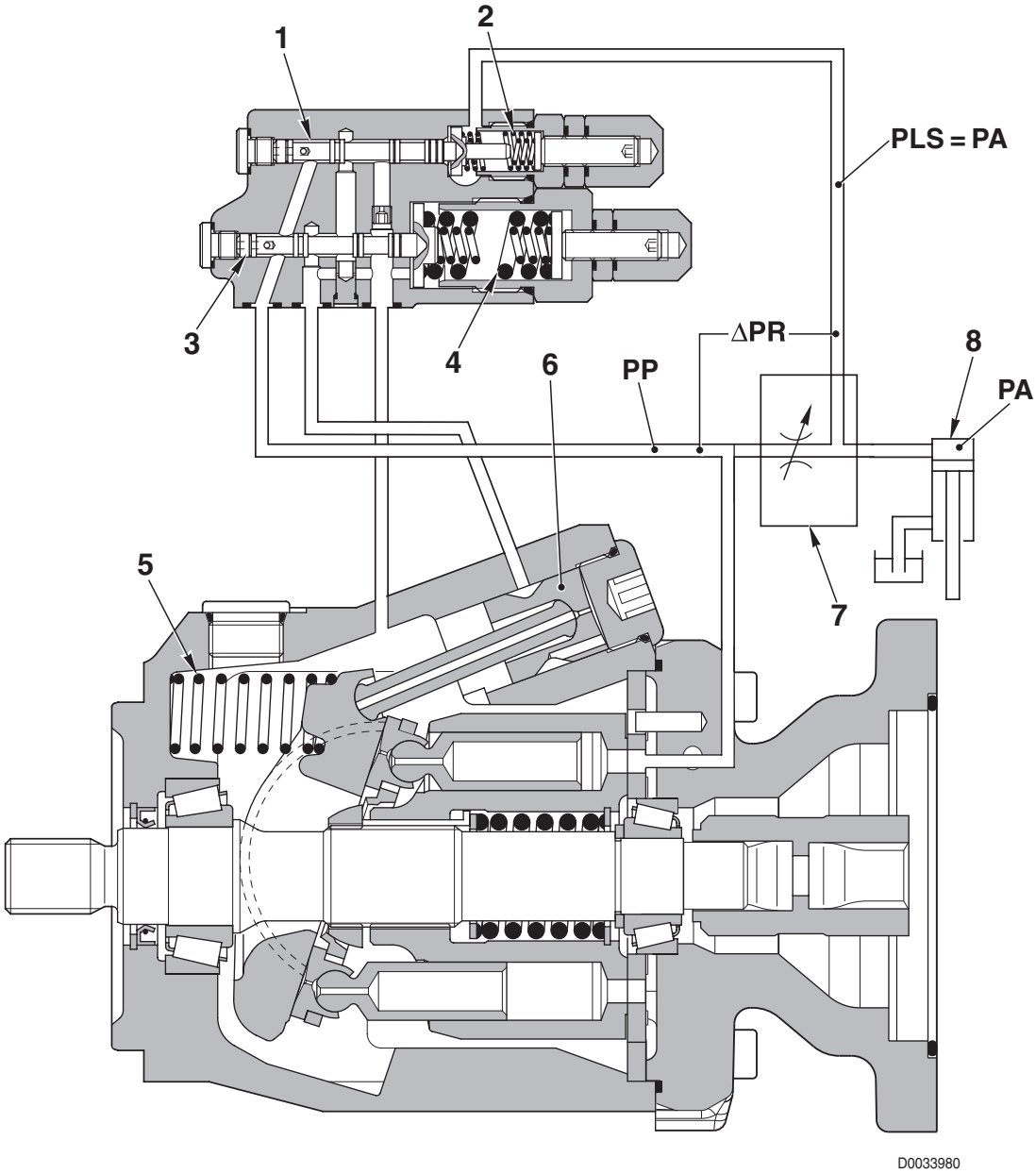


Fig. 3 D0033970

5.3.2. LOAD SENSING VALVE, PRESSURE CUT-OFF VALVE



COMPONENTS

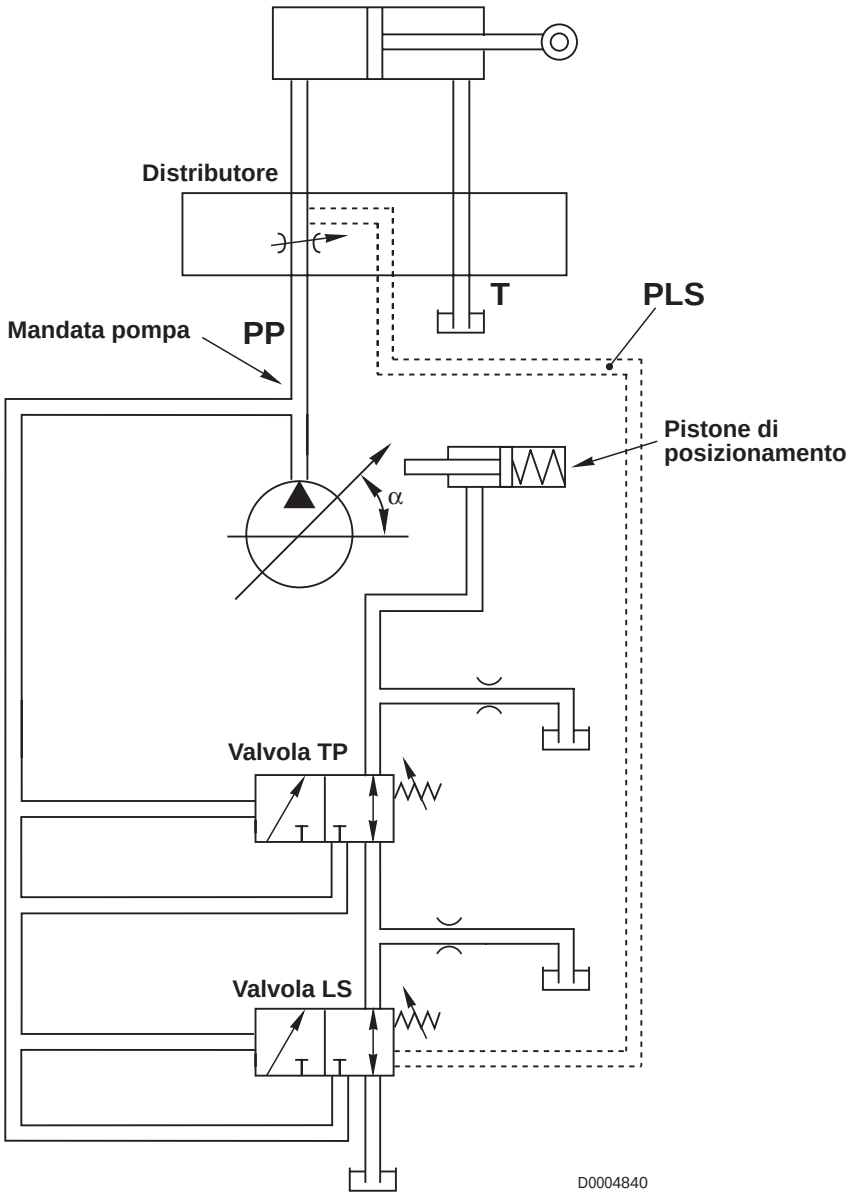
1. Load Sensing valve spool
2. Load sensing valve spring
3. Pressure cut-off valve spool
4. Pressure cut-off valve spring
5. Swash plate return spring
6. Control piston
7. Directional control valve
8. Work port

OPERATING PRINCIPLE

Controls the angle of the pump swash plate

- The swash-plate angle of the pump (and consequently the pump displacement), is controlled in such a way that pressure difference Δ*PR* between pump discharge pressure *PP* and delivery pressure *PLS* to the load at the work port of the control valve is maintained at a constant value. (Δ*PR* = Pump discharge pressure *PP* – Delivery *pressure to load PLS*).
- If pressure difference Δ*PR* falls relative to the pressure setting of the *LS* valve, the swash plate angle will increase. If pressure difference Δ*PR* rises, the swash plate angle will decrease.

  ★ For more detailed information on this mechanism, see the description of the «HYDRAULIC PUMP».



LOAD SENSING VALVE (LS)

FUNCTION

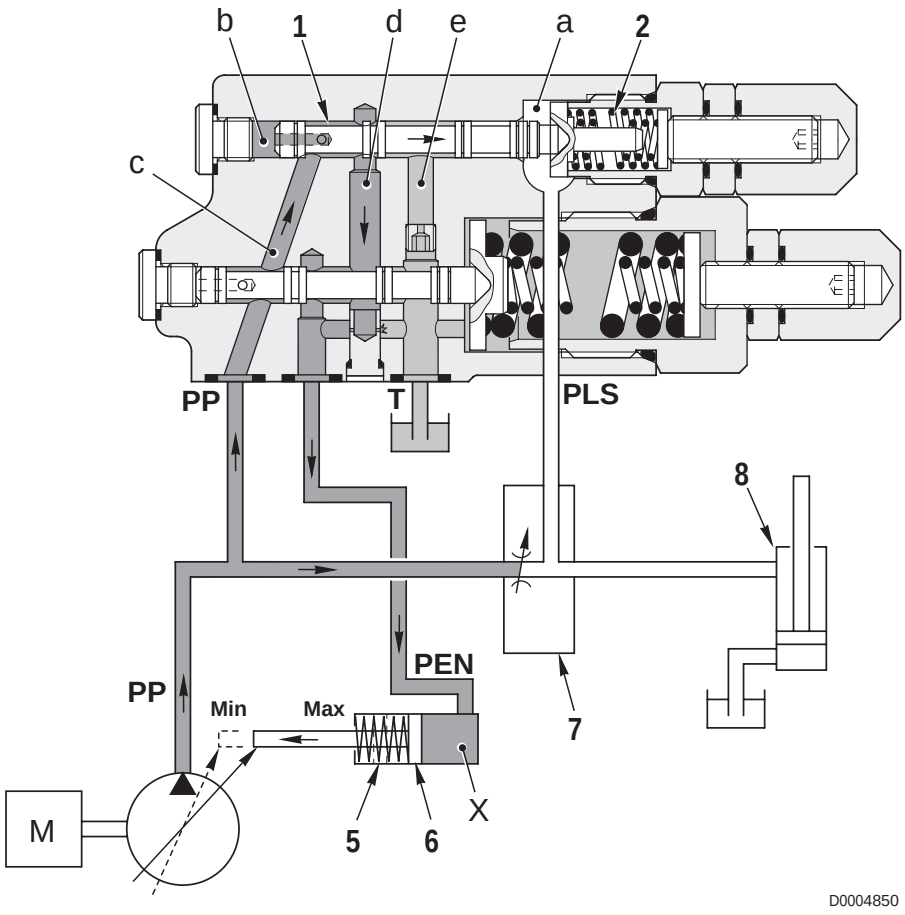
- The LS valve controls the pump delivery according to the stroke of the directional control valve lever, i.e., according to the demand for oil flow from the actuators.
- *Valve LS* detects the demand from the actuators by way of pressure difference ΔPR between pump discharge pressure *PP* and pressure *PLS* at the outlet of the directional control valve; this enables the valve to regulate delivery *Q* of the main pump.
  (*PP*, *PLS* and ΔPR, are respectively: the pump discharge pressure, the pressure of the Load Sensing signal and the pressure difference between these two values).
- In other terms, the *LS* valve detects pressure difference ΔPR generated by the flow of oil passing through the passages uncovered by the spool, and regulates pump delivery *Q* so as to maintain a constant pressure drop. This means that the pump delivery is proportional to the demand from the directional control valve.

OPERATION

The operation of the pump can be described in four main stages:

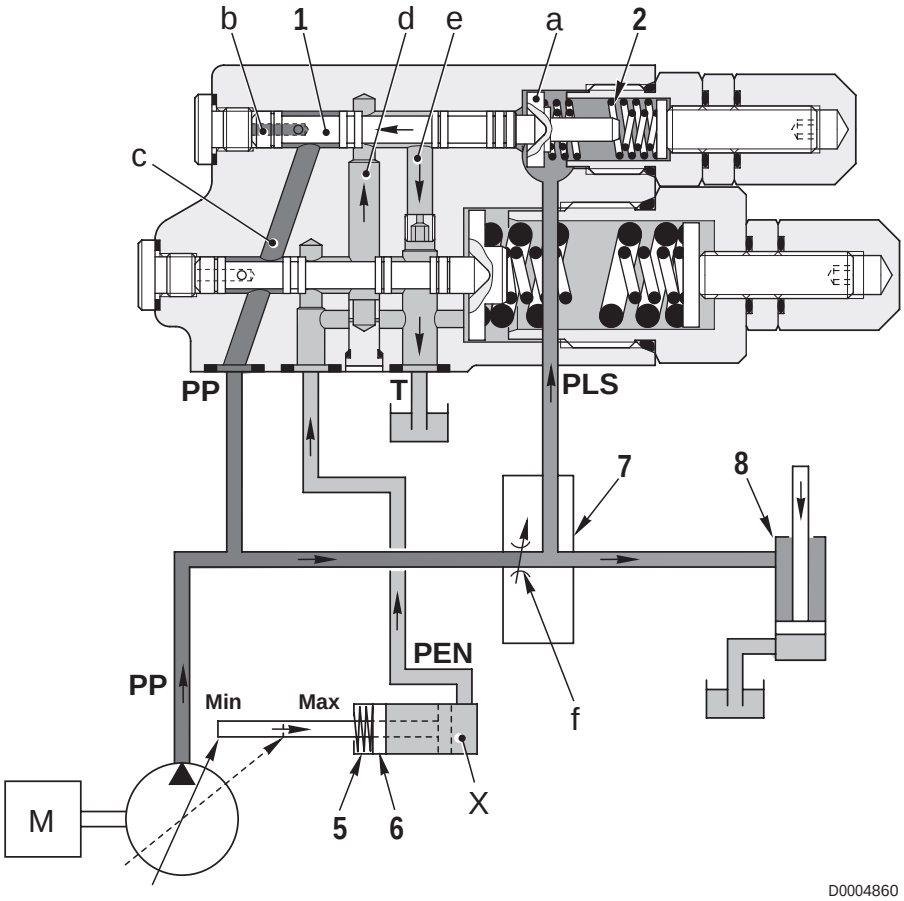
a. When the directional control valve is in neutral position
b. When a control lever is operated
c. When the flow rate stabilises
d. When the system enters the “saturation” condition

a. When the directional control valve is in «NEUTRAL» position



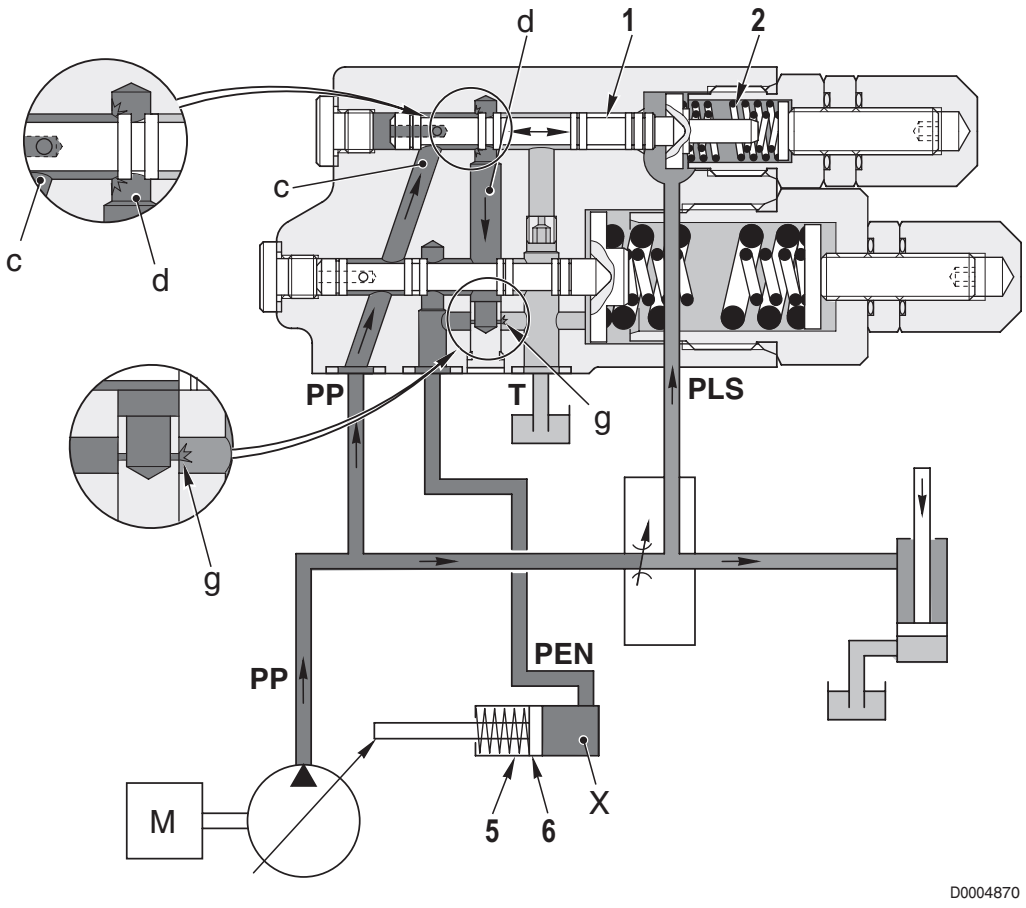
- The pressure *PLS* of the *LS* signal from the control valve outlet port, enters chamber *a* of the *LS* valve; the pump delivery pressure *PP* enters the chamber *b* on the opposite side.
- The position of spool (1) is determined by the combination of the force created by pressure *PLS* plus the force exerted by spring (2) and by the force exerted on the opposite side of the spool by pressure *PP*.
- Before the engine is started, control piston (6) is pushed to the right by spring (5) (position corresponding to the maximum swash plate angle).
- When the engine is started, if all the control valve spools are in «NEUTRAL», pressure *PLS* of the *LS* signal remains at 0 bar (0 psi) as no fluid is delivered from the control valve outlets and the signal is connected to tank.
  At the same time, pump delivery pressure *PP* increases as there is no demand from the work ports.
  When the force exerted by pressure *PP* in chamber *b* balances the force exerted by spring (2), spool (1) moves to the right and allows fluid at pressure *PP* to flow into chamber *X* of piston (6) by connecting passages *c* and *d*.
- The force exerted by the fluid pressure on piston (6) overcomes the force of spring (5). The control piston is thus pushed to the left, i.e. towards the minimum swash plate angle position.
- Pump delivery pressure *PP* stabilizes around the value of approximately 22 bar (319 psi), which corresponds to the standby pressure.

b. When a control lever is operated



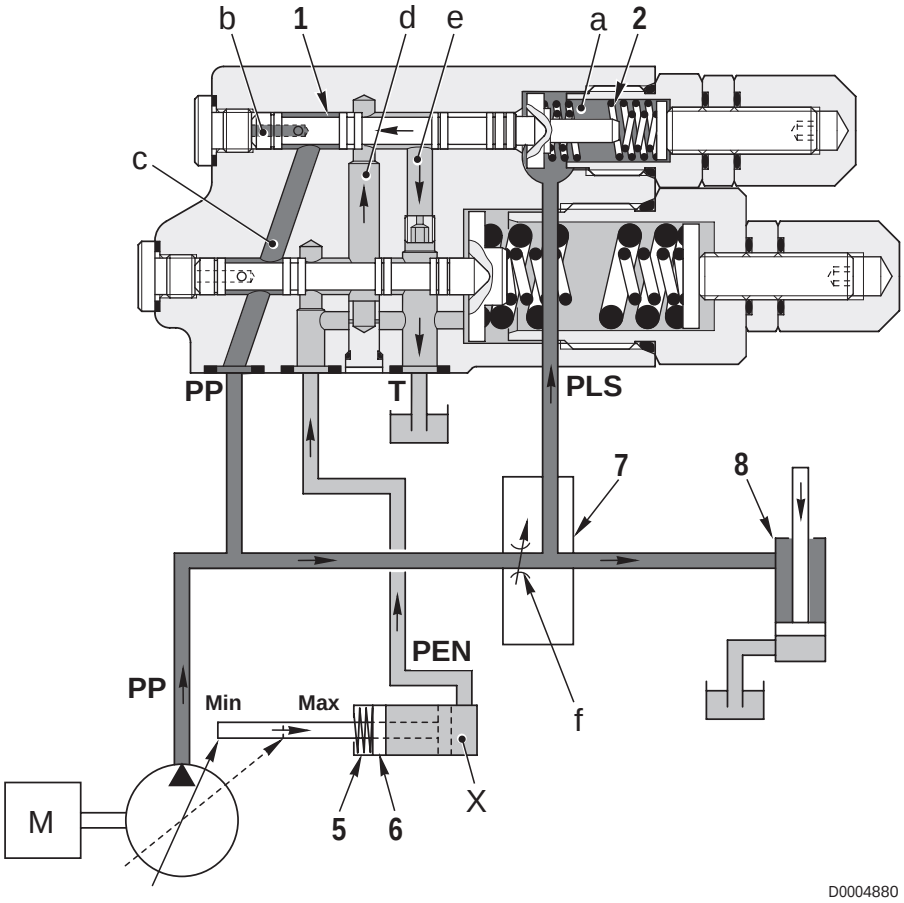
- When a control valve lever is shifted from the NEUTRAL position, this generates an *LS* signal corresponding to pressure *PLS*.
- The *LS* signal pressure in chamber *a* causes the spool to shift to the left, thereby connecting passages *d* and *e*. Chamber *X* is depressurised and spring (5) causes the swash plate to move to the maximum displacement angle.
- System balance conditions are restored when pressure ΔPR exerts on spool (1) the difference in force due to spring (2) and hence passages *c* and *d* are reconnected to each other.

c. When the flow rate stabilises



- When the pump delivery matches the demand from the directional control valve, pump delivery pressure *PP* present in chamber *b* of the *LS* valve balances the combination of the forces exerted by pressure *PLS* of the *LS* valve in chamber *a* and by spring (6).
  On reaching a state of balance, piston (1) stops in an intermediate position.
- In this condition, the passage connecting chamber *c* to chamber *d* remains partially open, thereby maintaining the pressure in chamber *d*.
  An oil flow enters control piston (6) at a sufficient pressure to balance the force exerted by spring (5).
- The stability of this equilibrium is ensured by a stabilised flow from flow restrictor *g*.
- The force of spring (2) is adjusted in such a way that piston (1) is balanced when
  $PP - PLS = \Delta PR = 22$ bar (319 psi).
- In practice, pump delivery is made proportional to the aperture of the auxiliary control valve, maintaining the pressure difference $\Delta PR = 22$ bar (319 psi).
- This condition remains unaltered until there is a change in the operating conditions (e.g. a change in engine speed, reduction or increase in the demand for flow or pressure, etc.).

d. When the system enters the "saturation" condition

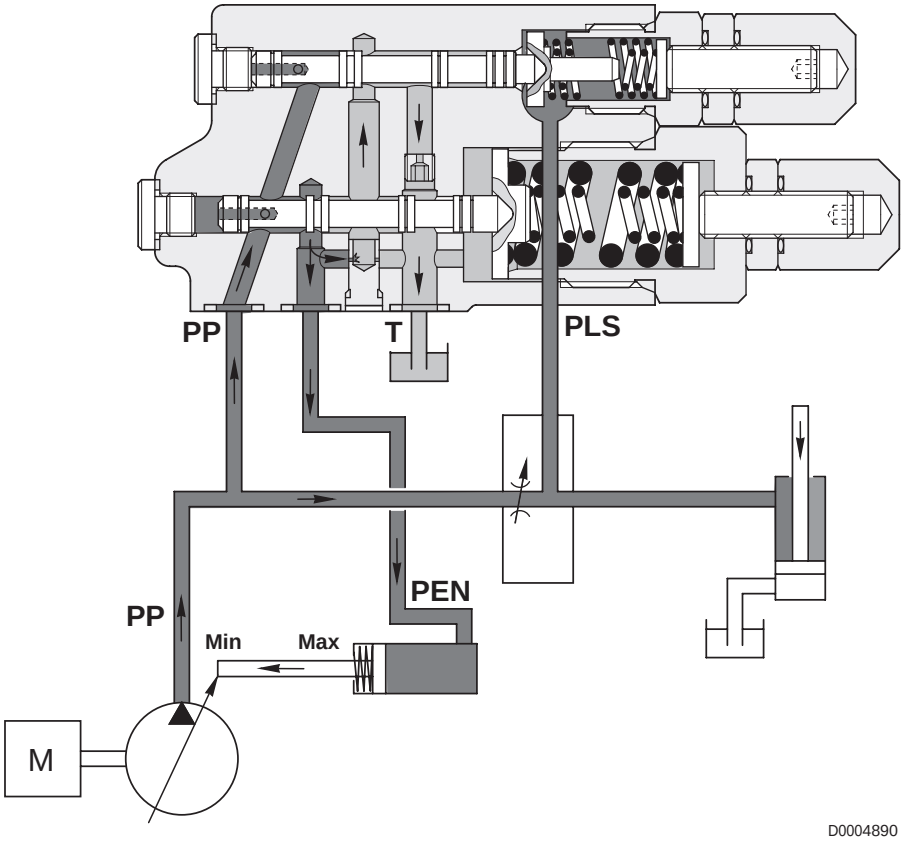


- When the engine speed is reduced while one or more hydraulic actuators are in operation, pump delivery is also reduced. Consequently the swash plate angle is changed to increase pump delivery.
- When the pump reaches its maximum displacement and can therefore no longer increase the flow rate, the difference between pump pressure *PP* and pressure *PLS* of the *LS* valve (differential pressure ΔPR) decreases ("saturation" condition).
- Pressure *PLS* in chamber *a* of the *LS* valve becomes almost equal to the pump pressure *PP* and the control piston (1) shifts to the left under the combined action of pressure *PLS* and spring (2).
  The piston thus closes passage *c* and opens the connection between passages *d* and *e*.
- The pressurised oil in chamber *X* of the control piston (6) flows through passages *d* and *e* and into the return chamber of the pump; consequently the pressure in chamber *X* of control piston (6) becomes equal to the return pressure.
- Control piston (6) is therefore shifted to the right by the action of spring (5), to the position corresponding to the maximum swash plate angle.

PRESSURE CUT-OFF VALVE (TP)

FUNCTION

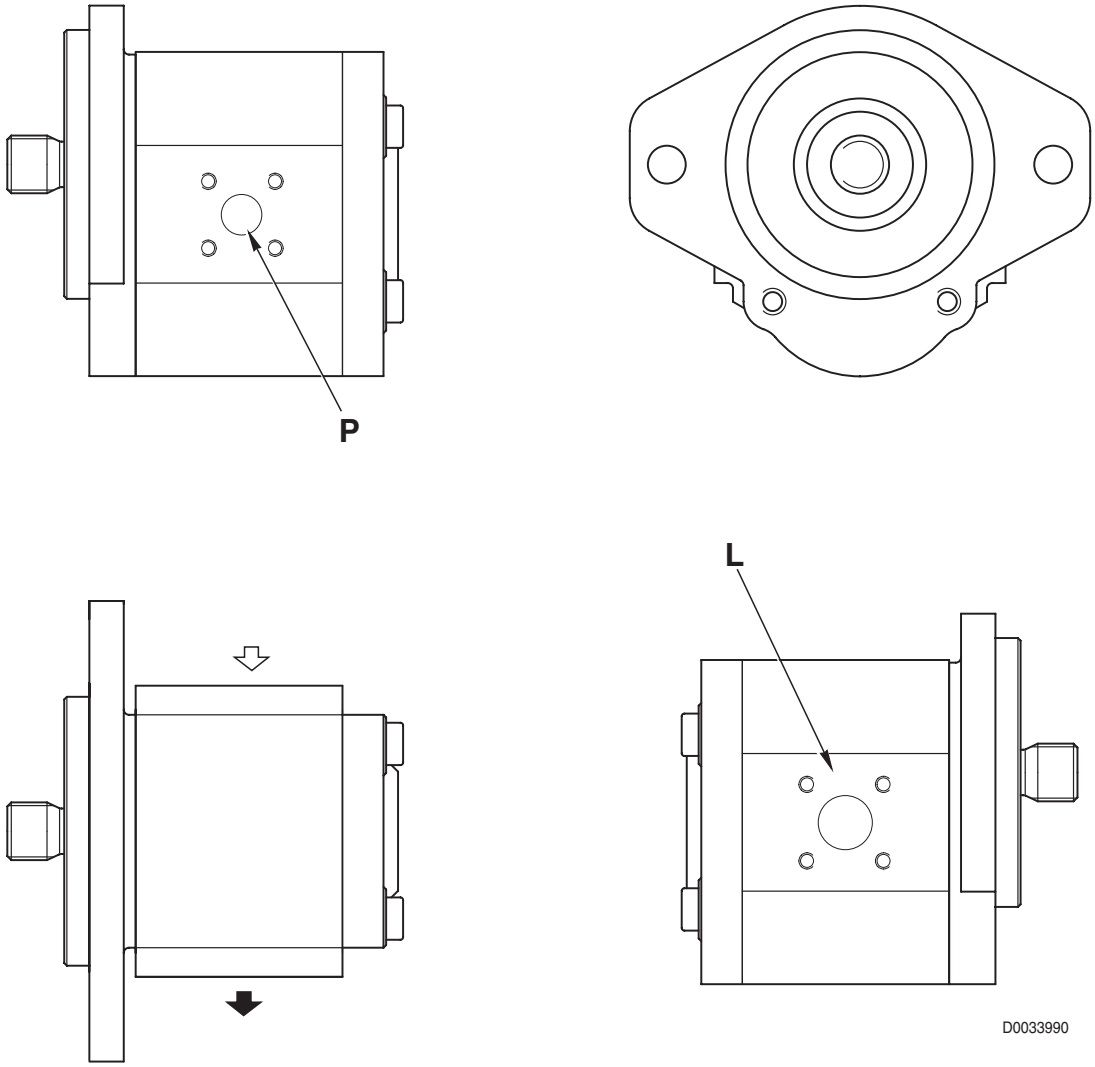
- The pressure cut-off valve determines the maximum pump delivery pressure.



OPERATION

- The pressure cut-off valve senses the pump delivery pressure and, on reaching the maximum pressure setting, reduces pump delivery to zero, bypassing the action of the LS valve.
- Pump delivery is then regulated at the minimum value to ensure internal lubrication of the main auxiliary services pump and maintenance of maximum pressure in the hydraulic system.

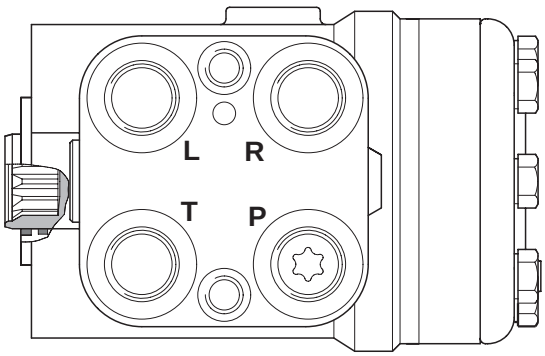
5.4 STEERING GEAR PUMP

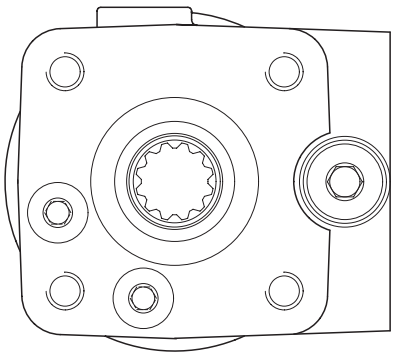


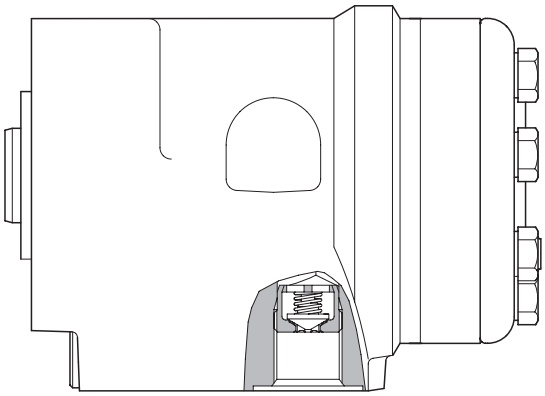
FUNCTION
Port L: suction
Port P: delivery

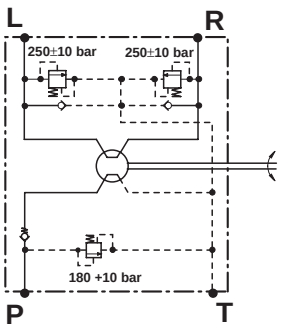
CHARACTERISTICS
Displacement: 11 cc/rev
Maximum pressure: 180 bar

5.5 POWER STEERING









D0030250

FUNCTION

Port P: delivery
Port T: return
Port R: right steering
Port L: left steering

CHARACTERISTICS

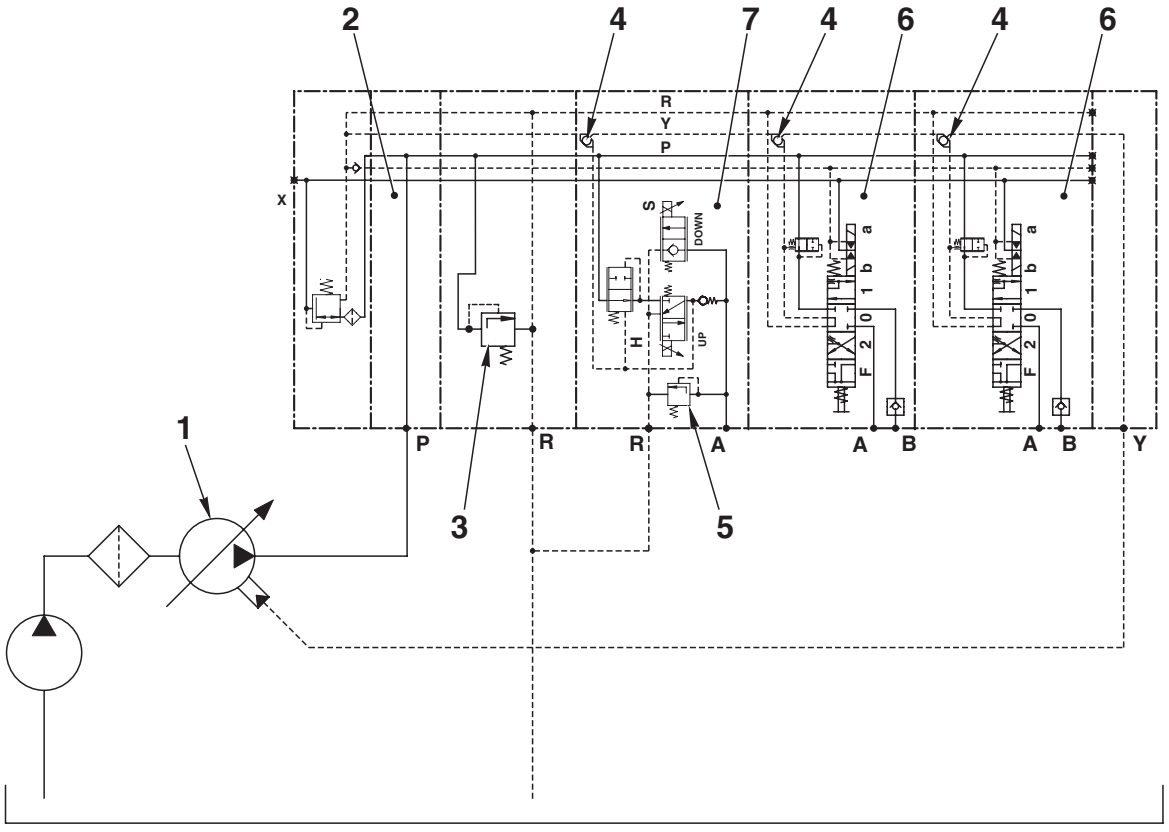
Displacement: 125 cc/rev
Maximum pressure: 180÷190 bar
Relief valve: 240÷260 bar

5.6 AUXILIARY SERVICES CONTROL VALVE

FUNCTION

The function of the auxiliary services control valve is to control the flow of pressurised oil to the auxiliary services and the rear lift.

This control valve is of the parallel circuit Load Sensing type.



D0034000

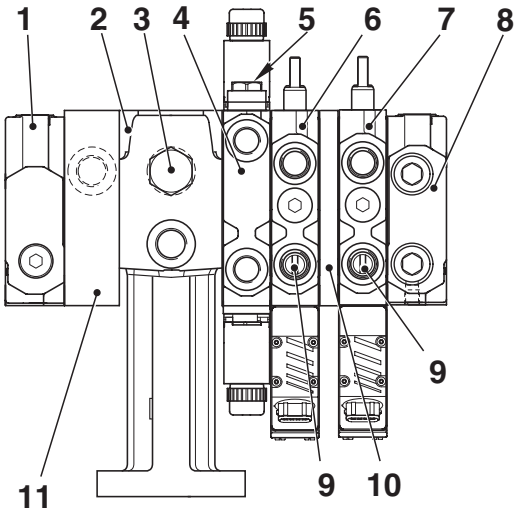
REAR AXLE

DESCRIPTION

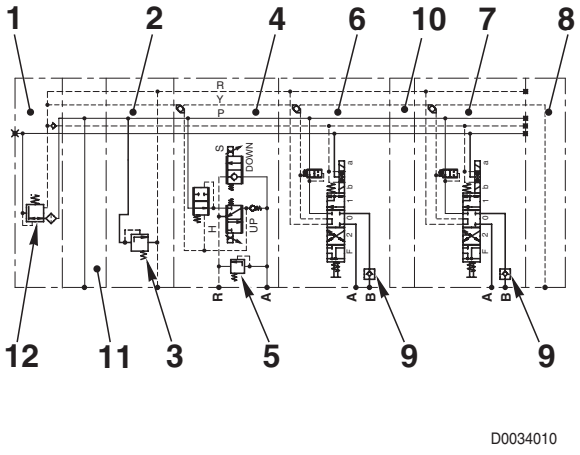
- The pressurised oil from variable displacement pump (1) enters the inlet section (2) (or trailer braking valve) from where it is distributed to the spool sections through internal passages.
- All the spools (6), when operated, generate a pressure signal (Load Sensing signal) that is equal to the pressure demand from each load.
  The highest of these pressure signals, selected by bistable valves (4), is sent to the variable displacement pump through port *Y* of the control valve.
- On the lift control element (7) there is an antishock valve (5) (on the "raise" control side), which serves to prevent any excessive pressure surges caused by jolting of the implement.
- Maximum working pressure is regulated by relief valve (3) located on the control valves support.

5.6.1 CONTROL VALVE TYPES

4-WAY VERSION

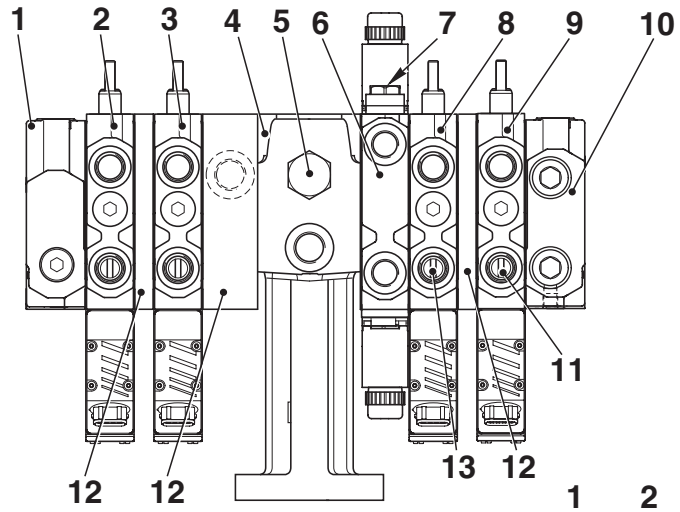


HYDRAULIC DIAGRAM

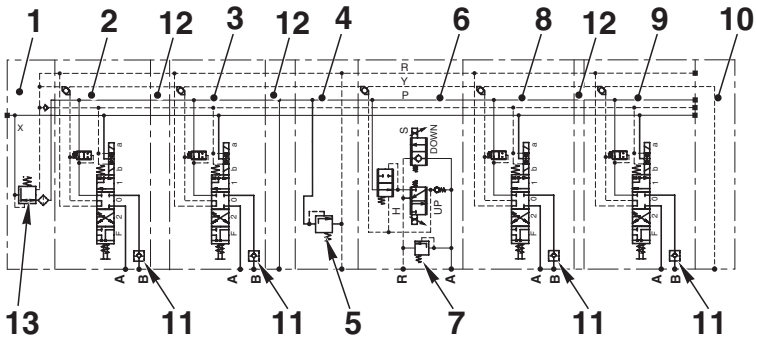


1. LH end cover
2. Manifold
3. Relief valve
4. Lift control valve section
5. Antishock valve
6. Valve section n° 1
7. Valve section n° 2
8. RH end cover with LS signal outlet
9 Check valve (mechanically operated)
10. Spacer
11. Spacer
12. Pilot valve for electrically operated sections

8-WAY VERSION



HYDRAULIC DIAGRAM



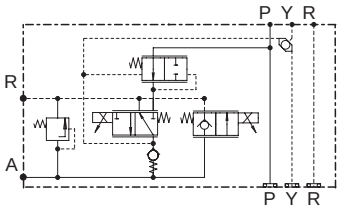
1. LH end cover with pilot valve for electrically operated sections
2. electrically operated section n° 1
3. electrically operated section n° 2
4. Manifold
5. Lift control section
6. Antishock valve
7. Control valve section n° 3
8. Control valve section n° 4
9. RH end cover with LS signal outlet
10. Check valve (mechanically operated)
11. Spacer
12. Pilot valve for electrically operated sections

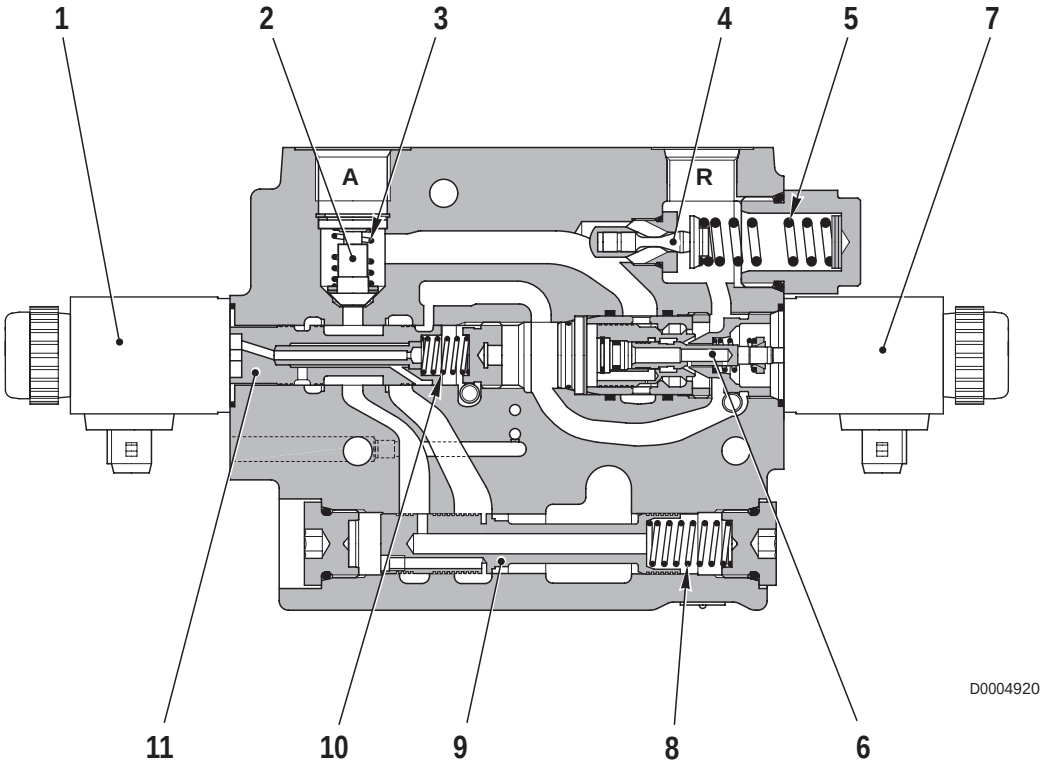
5.6.2 LIFT CONTROL ELEMENT

DESCRIPTION

- The lift control element is a 1-way hydraulic control valve operated by two proportional solenoid valves.
- The control incorporates an antishock valve that protects the hydraulic circuit against pressure surges caused by jolting of the implement during work and transport.

HYDRAULIC DIAGRAM





COMPONENTS

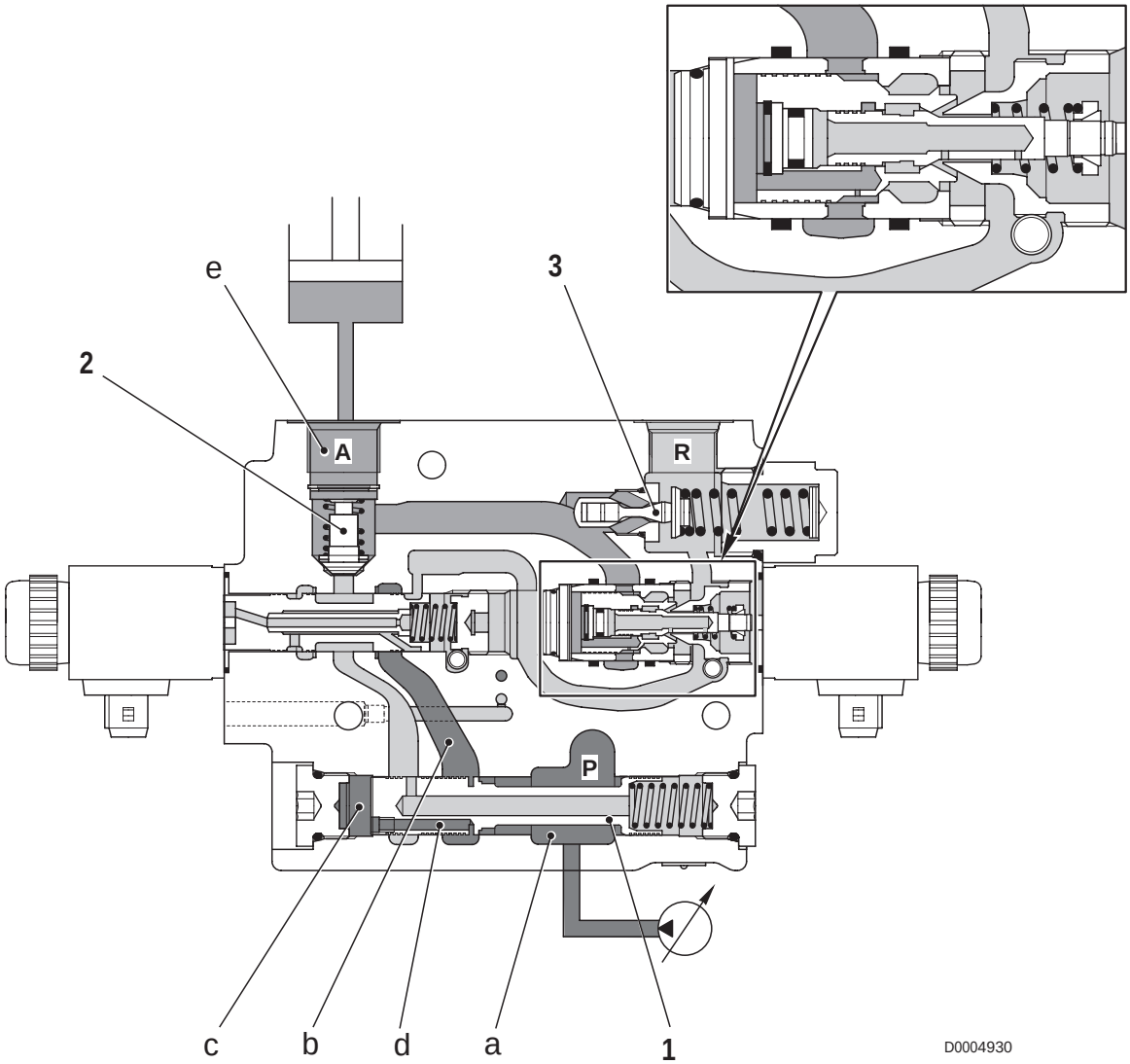
1. UP control solenoid valve
2. Check valve
3. Check valve spring
4. Antishock valve
5. Antishock valve spring
6. DOWN control spool
7. DOWN control solenoid valve
8. Flow control spring
9. Flow control spool
10. Spring
11. UP control spool

OPERATION

1. When the lift control is in neutral position

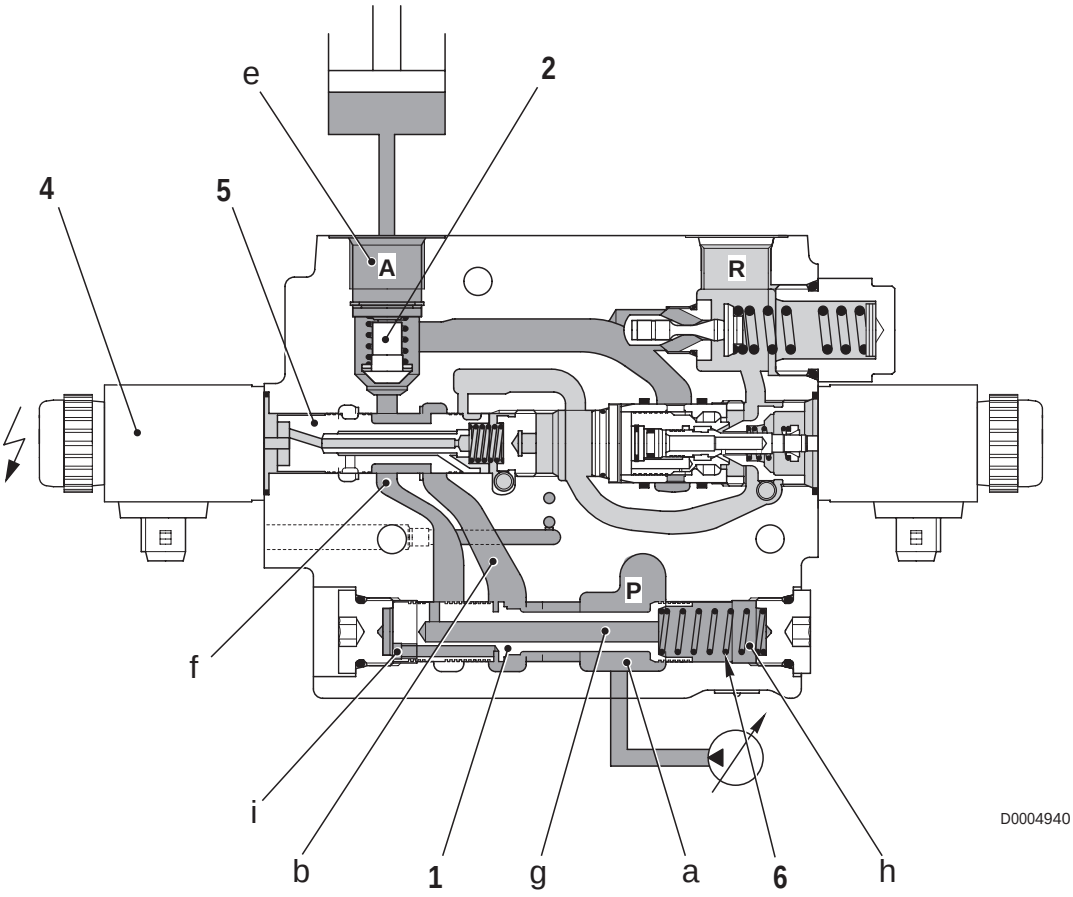
- The oil from the pump enters chamber *a* and from here flows into passage *b*.
- At the same time, the oil flows into chamber *c* of the flow control valve (1) through passage *d*.
- This causes the spool to shift to the right until the connecting passage between chamber *a* and passage *b* is closed.
- The pressure in chamber *e* caused by the weight of the implement mounted on the linkage (e.g.: plough), keeps check valve (2) closed, thereby ensuring that the lift maintains its position.
- Chamber *e* is thus a closed chamber that prevents any uncontrolled movement of the lift.
- The pressure in chamber *e* also acts on antishock valve (3) that eliminates any pressure surges caused by jolting of the implement during work or transport.

.



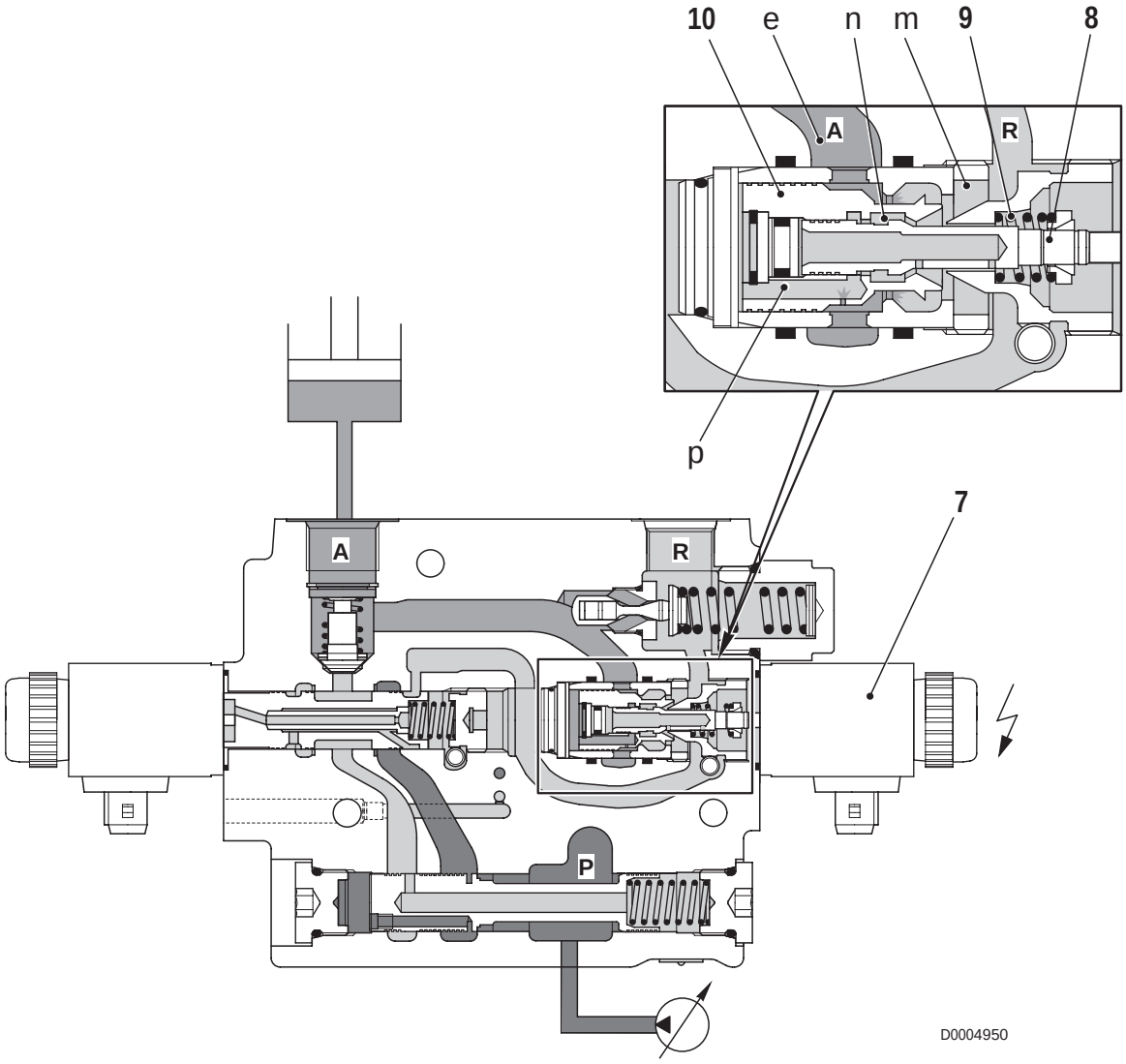
2. When the lift is raised

- When the lift is raised, the electronic lift control energises solenoid (4) which moves spool (5) to the right.
- The oil in passage *b* can therefore flow through check valve (2) into chamber *e* and from there to the lift cylinders.
- At the same time, the pressure present in passage *b* can flow into chamber *a* and line *f* and from there through passage *g* into chamber *h* of flow control valve (1).
- As the oil pressure is the same on both sides of the spool, the spool is shifted by the force of spring (6) and the oil can flow from chamber *a* into passage *b*.



3. When the lift is lowered

- During lifting or when the lift is stationary, spool (8) is pushed to the right by spring (9).
- As a result, the passage between chambers *m* and *n* is closed and the pressure in chamber *p* pushes spool (10) to the right.
- When the lift is lowered, the lift electronic control unit energises solenoid (7) that moves spool (8) to the left.
- The oil in chamber *n* can flow into chamber *m* and the pressure in chamber *p* is reduced.
- The equilibrium between the forces generated by the pressure values in chambers *e* and *p* on spool (10) is thus lost and spool (10) is shifted leftward allowing flow between chamber *e* and chamber *m*, which is connected to the return circuit.
- As a result, the oil in the lift cylinders is directed to the drain circuit and the lift is lowered.
- As the solenoid is of the proportional type, the more current supplied, the further spool (8) shifts to the left, thereby allowing more oil to flow and the lift to descend more rapidly.
- The electronic control obtains float position by energising solenoid valve (7) and holding it fully open.
- In this condition, the oil in the lift cylinders is sent to the drain circuit so that the lift is free to move up and down and follow the contours of the terrain.



PAGE INTENTIONALLY
LEFT BLANK

SECTION 20

CONTENTS

1. DIAGNOSIS TOOLS

1.1 ALL ROUND TESTER

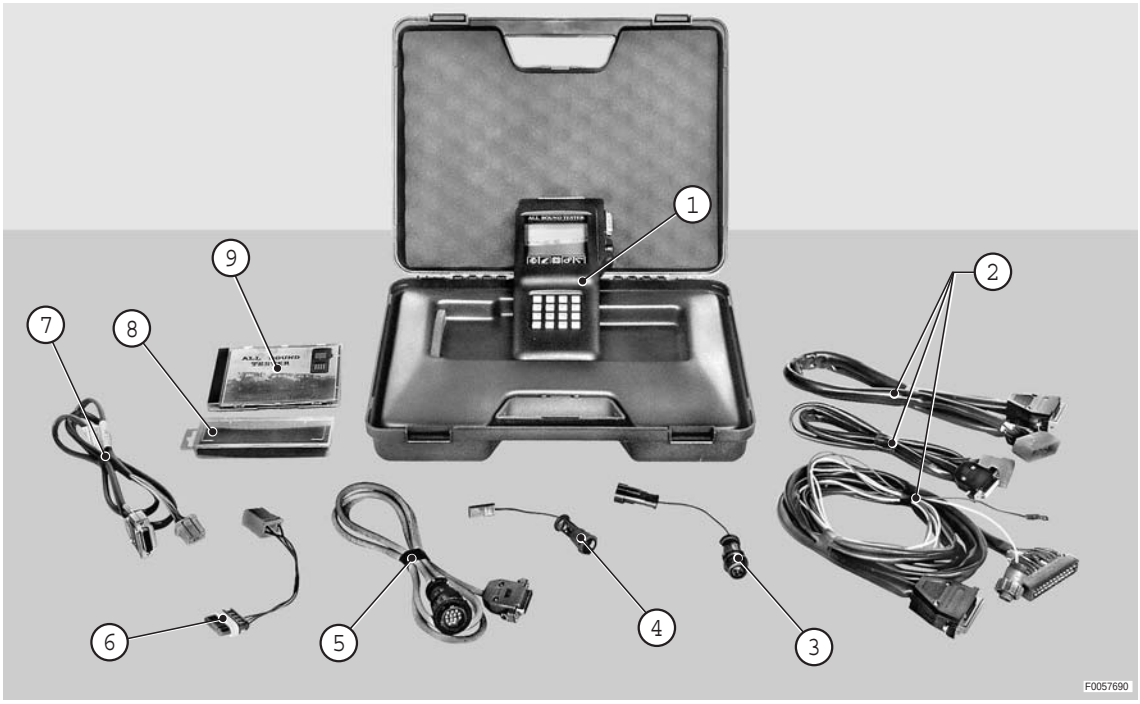
To enable correct fault analysis, facilitate the procedure of putting the tractor into service and check correct operation of theelectrical components used in the lift systems, front axle suspension and ASM, the service technician is provided with an instrument called All Round Tester (abbreviated to ART throughout the manual).

Using the ART, the technician can:
- display errors (faults) that have occurred;
- execute the sensor calibration or set-up procedures;
- display data detected by the electronic control units (e.g. status of the sensors) responsible for managing the various systems.

The ART communicates with the tractor's electronic control units via one or more of the diagnostic sockets installed on the tractor.
The ART is supplied with a number of different connection cables, which are to be selected in accordance with the type of tractor and the procedures indicated in the shop manuals or on the CD provided in the tester kit.

1.1.1 DESCRIPTION OF THE KIT

The ART is supplied to Authorised Workshops in a carrying case containing:



Range	Code	Description	Qty
	5.9030.730.6/30	Case, complete	1
1	5.9030.730.0	All Round Tester	1
2	5.9030.681.3/10	Diagnostic cable for BOSCH EHR4 rear hydraulic lift	1
		Diagnostic and programming cable for Electronic regulator, original type	1
		Diagnostic cable of SBA system, original type	1
3	5.9030.681.7	Adapter cable for radar connector	1
4	5.9030.681.5	Adapter cable for wheel speed sensor connector	1
5	5.9030.681.4	Cable for diagnostic socket	1
6	0.011.6178.4	Adapter cable for diagnostic socket on armrest	1
7	0.011.5445.4	Cable for connection to diagnostic socket in engine, gearbox, and lift control units zone	1
8	0.010.2154.2	EPROM port box	1
9	307.1056.8/60	CD ROM	1

CAUTION

To enable connection of the ART to the tractor electronics, a further adapter cable is required: P/N 0.012.6655.4 (not supplied with the kit). The cable can be purchased from the parts service.

1.1.2 NOTES ON CORRECT USE

The ART is protected against battery polarity inversion, and positive or negative voltage surges (1 msec).

Do not attempt to connect the ART to non-dedicated sockets, and do not use trailing connections or extension cables.

The display features permanent backlighting in order to ensure visibility in all light conditions.

A knob on the side allows adjustment of the contrast. If no information appears on the display it may be that the knob is positioned in such a way that data displayed on the screen are not visible.

The tester operates correctly at temperatures between 0 and 40 °C, and should be switched off every 30 minutes to maximise its service life.

Before disconnecting the ART from the diagnostic socket, turn the starter key to the "*O*" (OFF) position.

1.1.3 DESCRIPTION OF THE TESTER

The ART includes:

1 - Liquid crystal display featuring permanent backlighting

2 - 16-key alphanumeric keypad

3 - Contrast adjustment knob.
To adjust contrast. If no information appears on the display it may be that the knob is positioned in such a way that data reading field on the screen is not visible.

4 - Parallel port (used to connect the ART to systems with electronic control units that do not have microprocessors).

5 - Serial port (used to connect the ART to systems with electronic control units incorporating microprocessors).

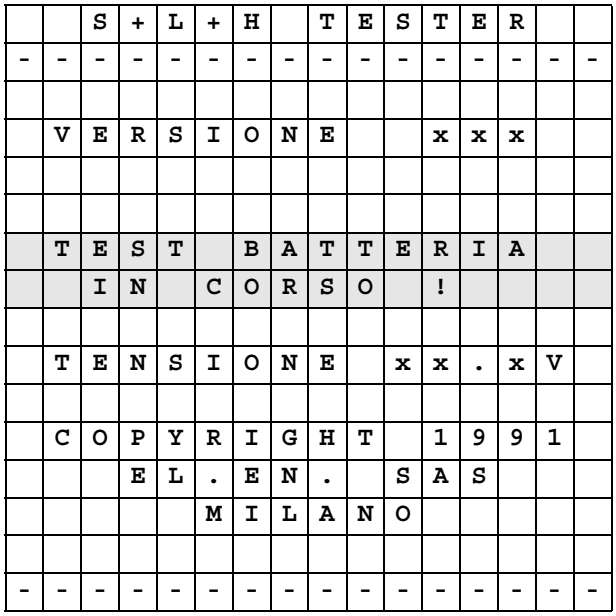
1.1.4 GENERAL NOTES ON CONNECTING AND POWERING UP THE TESTER

To connect the tester to the tractor electronic system proceed as follows:

1 - Stop the engine and remove the key from the starter switch;
2 - connect the ART to a diagnostic socket;
3 - insert the key in the starter switch and turn it to "*I*" (ON).

When the ART powers up, a page appears showing an internal test run by the instrument to check the battery charge. If the voltage registers less than 10V, the ART does not have sufficient power to connect to the control units, whereas if the value is higher than 15V the instrument could be damaged.

After a few seconds, the tester attempts to connect to the electronic system and displays a page (which may vary depending on the tractor or the connector to which it is plugged), from which the technician can choose to connect to a given control unit and test the operation of the components.



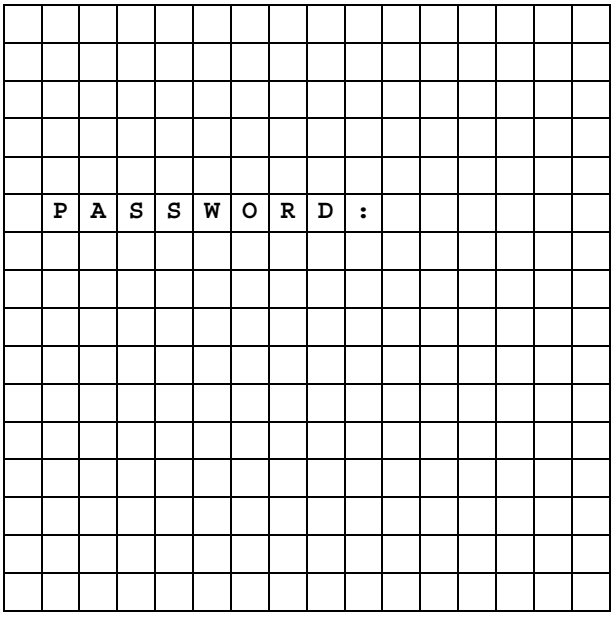
1.1.5 SELECTION OF THE DISPLAY LANGUAGE

The ART is able to display information in a number of different languages (factory setting: ITALIAN).

To change the display language, proceed as follows.

1 - Stop the engine and remove the key from the starter switch
2 - connect the ART to a diagnostic socket
3 - While holding down key *A* on the keypad, turn the starter key to "*I*" (ON)

4 - Enter the password *1 2 3 F*.



5 - Press *1.*

	C	O	N	F	I	G	U	R	A	Z	I	O	N	E	
					M	E	N	U							
	1	-	S	E	L	.	L	i	n	g	u	a			
	2	-	P	o	r	t	e		S	e	r	i	a	l	i
			S	C	E	L	T	A							
			E		U	S	C	I	T	A					

6 - Press *C* and then the key corresponding to the desired language.
In the example illustrated, pressing *2* selects English.

7 - Press *E* twice to exit

8 - Turn the starter key to "*O*" (OFF) and disconnect the ART from the diagnostic socket.

S	E	L	E	Z	I	O	N	E		L	I	N	G	U	A
	D	i	s	p	o	n	i	b	i	l	i				
1	-	I	T	A	L	I	A	N	O						
2	-	E	N	G	L	I	S	H							
3	-	D	E	U	T	S	C	H							
4	-	F	R	A	N	C	A	I	S						
5	-	P	O	R	T	U	G	U	E	S					
6	-	E	S	P	A	N	O	L							
A	T	T	U	A	L	E	:	I	t	a	l	i	a	n	o
N	U	O	V	A	:	E	N	G	L	I	S	H			
	C		p	e	r		c	a	m	b	i	a	r	e	
			E		U	S	C	I	T	A					

1.1.6 SETTING THE SERIAL PORTS

The tractor electronic systems to which the ART can be connected are different one from another and utilize different pinouts at the diagnostic socket for interfacing purposes.

For this reason, the serial ports must first be configured so as to guarantee full compatibility of the ART with all SAME electronic systems.

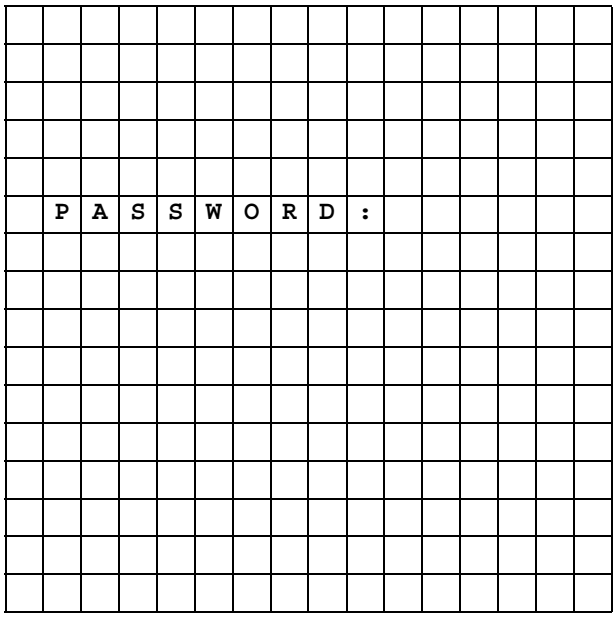
To change the serial ports configuration, proceed as follows.

1 - Stop the engine and remove the key from the starter switch

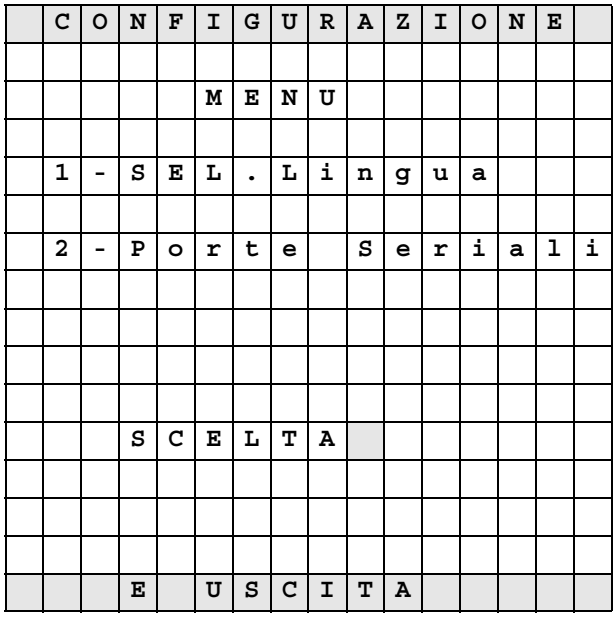
2 - connect the ART to a diagnostic socket

3 - While holding down key A on the keypad, turn the starter key to "*I*" (ON)

4 - Enter the password *1 2 3 F*.



5 - Press *2*.



6 - Enable all the serial ports by pressing *1* seven times.
7 - Press *E* twice to exit.
8 - Turn the starter key to "*O*" (OFF) and disconnect the ART from the diagnostic socket.

C	O	N	F	I	G	.		S	E	R	I	A	L	I
A	t	t	u	a	l	e		1	0	0	0	1	1	1
N	u	m	.	S	e	r	.	7	6	5	4	3	2	1
N	U	O	V	A				1	1	1	1	1	1	1
1	-	A	b	i	l	i	t	a		P	o	r	t	e
0	-	D	i	s	a	b	i	l	i	t	a		P	.
			E		U	S	C	I	T	A				

1.2 “SERDIA 2000 LEVEL III" SOFTWARE

To enable correct analysis of faults, facilitate the procedure of putting the tractor into service and check correct operation of the engine electrical components, the Technician is provided with a software application called SERDIA (P/N.5.9030.740.4/30), to be installed on a laptop computer.

With SERDIA, the technician can:

- display errors (faults) that have occurred;
- program the control unit;
- carry out sensor calibration or setting procedures.

1.2.1 DESCRIPTION OF THE KIT

The SERDIA software is supplied to Authorised Workshops in a carrying case with all the basic items needed for operation.

The case contains:

Pos.	*Code*	*Description*	*Qty*
	5.9030.740.4/30	Case, complete	1
1	5.9030.740.0/10	. Installation disk	1
2	5.9030.740.2/10	. Level III interface General revision + USB cable	1
3	5.9030.741.0	Adapter cable *(not included in kit)*	1

Data is exchanged between the SERDIA software and the control units by way of a diagnostic socket incorporated in the tractor wiring.

Accordingly, the SERDIA package is supplied with an interface cable that must be used on the particular model and version of tractor being serviced.

1.3 “EDS EST45” SOFTWARE”

To enable correct analysis of faults, facilitate the procedure of putting the tractor into service and check correct operation of the transmission and Infocenter, the Technician is provided with a software application called EDS (P/N.), to be installed on a laptop computer.

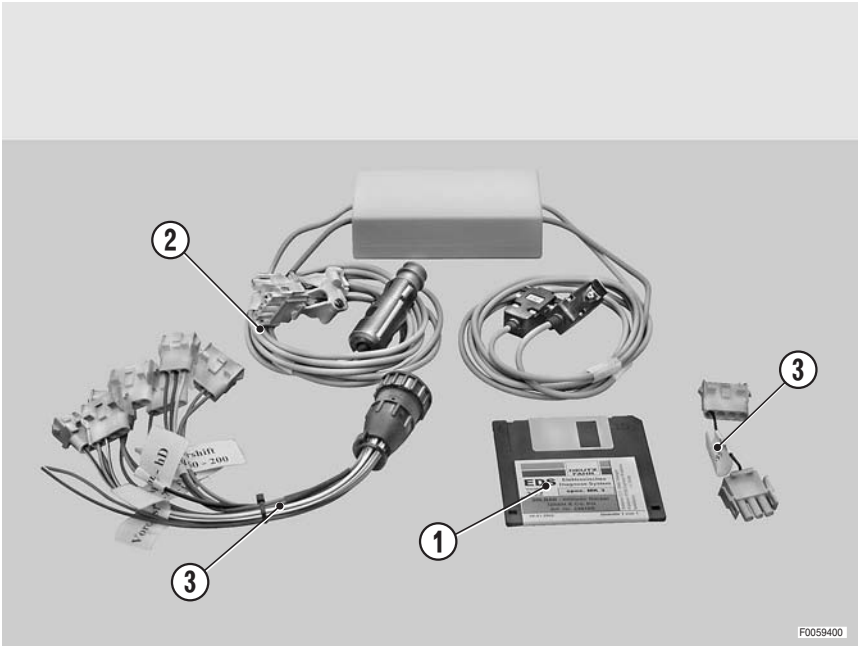
With EDS, the technician can:

- display errors (faults) that have occurred;
- configure the control unit;
- carry out sensor calibration or setting procedures.

1.3.1 DESCRIPTION OF THE KIT

EDS is supplied to Authorised Workshops with the following basic items needed for operation.

The kit includes:



Pos.	Code	Description	Qty
	5.9030.742.0	Complete English language kit	1
	5.9030.742.1	Complete German language kit	1
1	5.9030.742.2	Installation disk (Ref. Wilbar 236162)	1
2	5.9030.742.3	Interface cable (Ref. Wilbar 0797-385)	1
3	5.9030.742.4	Interface cable (Ref. Wilbar KA 96-0526)	1

Data is exchanged between the EDS software and the control units by way of a diagnostic socket incorporated into the tractor wiring.

Accordingly, the EDS software comes with different types of interface cables for the different models and versions of tractor being serviced, which must be used as indicated in the relative workshop manuals.

2. CONNECTING THE TESTER TO THE ELECTRONIC CONTROL UNITS

This chapter describes how to connect the various diagnostic tools provided for the use of the technician.

2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS

CAUTION

Before connecting the ART, switch off the engine and remove the key from the ignition.

1 - Connect cable (1) (P/N 5.9030.681.4) to the ART® (2) (P/N 5.9030.730.0)
2 - Join connector (3) of cable (2) to cable (4) (P/N 0.012.6655.4) and plug connector (5) into connector X4 located internally of the right hand side console.
3 - Check that connectors (5) and X4 are securely connected.
4 - Insert the key in the starter switch and turn it to "*I*" (ON) to switch on the tester.

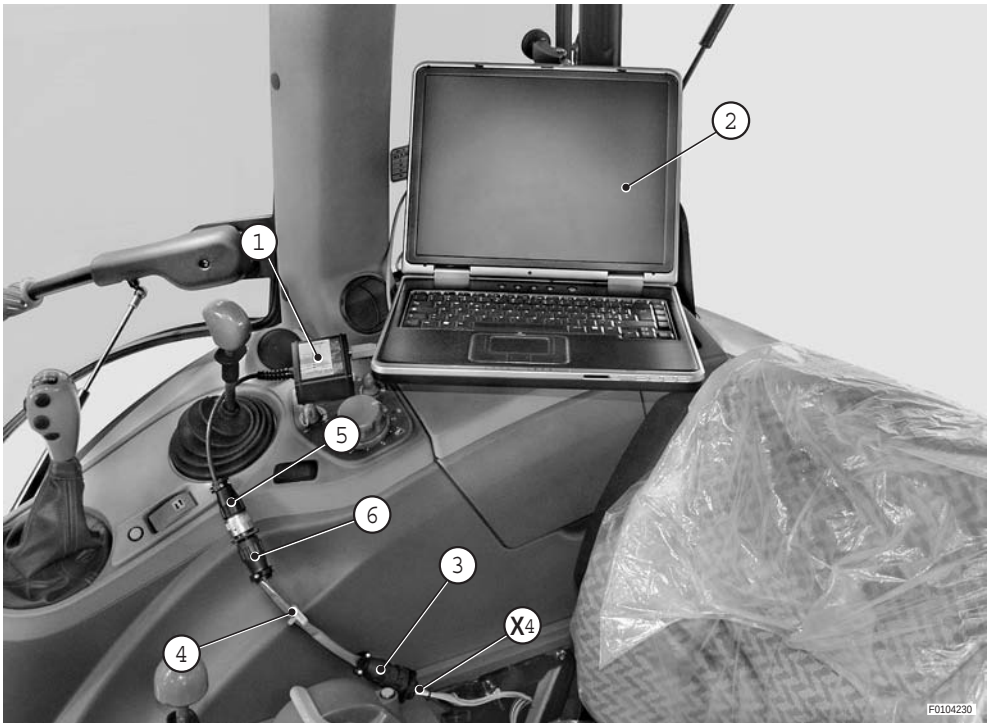
5 - Following power up, the ART performs the battery level test.
6 - Press the key corresponding to the control unit to be tested.

CAUTION

Avoid starting the engine unless required for the purpose of diagnosis or sensor calibration.

T	E	S	T		D	I	S	P	O	N	I	B	I	L	I
						M	E	N	U						
1	-	A	R	M	R	E	S	T							
2	-	H	L	H	P										
			S	C	E	L	T	A	_						

2.2 CONNECTING THE LAPTOP COMPUTER WITH "SERDIA 2000" SOFTWARE TO THE ENGINE CONTROL UNIT



1 - Connect interface (1) (P/N 5.9030.740.2/10) to the USB port of the laptop computer (2).
2 - Plug connector (3) of cable (4) (P/N 5.9030.741.0) into connector X4 located inside the right-hand side console.
3 - Connect connectors (5) and (6).
4 - With the laptop computer switched on and the Serdia program launched, put the key in the starter switch and turn it to "*I*" (ON).

3. INTRODUCTION TO THE TRACTOR ELECTRONIC SYSTEM

3.1 ELECTRONIC SYSTEM

The tractors in this series are equipped with electronic control units for the management of various functions. Each control unit is dedicated to the management of one or more systems.

All the control units are interconnected by means of a CANBUS network.

The control units have self-diagnostic functions and can detect and store in memory faults (alarms) regarding the components to which they are connected.

All alarms are sent via the CANBUS to the Infocenter, where they can be displayed on a screen by the operator.

The tractor's electronic system incorporates a socket used for calibration, diagnosis and programming of the control units; by connecting the All Round Tester ® (ART®) or a laptop computer (with the SERDIA and EDS diagnostic software applications installed) to these sockets, the technician can program the tractor's operating characteristics in accordance with the available options (front PTO, etc.), test the operation of the sensors and pushbutton controls, calibrate the sensors and troubleshoot the system.

By connecting the ART® to the HLHP control unit it is possible to display the active and passive alarms of all the control units.

The engine ECU, HLHP control unit and armrest alarms are managed by the HLHP control unit with two numerical codes named *SPN* (*S*uspect *P*arameter *N*umber i.e. possible faulty device) and *FMI* (*F*ailure *M*ode *I*dentifier i.e. fault code identifier).

Transmission control unit alarms are managed using the same alphanumerical code managed by the transmission control unit.

Through these codes and descriptive messages, the technician can troubleshoot the system and, using the options in the test and monitor menu screens, test operation of system components.

The SERDIA program is another diagnostic instrument for the engine management system. This program allows the technician to test the operation of engine components, as well as display any alarms detected directly by the engine control unit.

3.2 CANBUS SYSTEM

The CANBUS network is a communication system that allows information to be exchanged between two or more electronic control units in the form of “digital messages”, i.e. suitably encoded information that is transmitted over the network and used by the other control units.

Examples of the type of information sent over the CANBUS include the current draw of a solenoid, the engine rpm or, more simply, the status of a pressure switch or pushbutton.

In this way it is possible to manage, electronically, a greater number of systems using a smaller number of sensors than with a conventional system, while simplifying the wiring and making troubleshooting quicker and easier.
Each control unit is programmed so that it only reads the data related to the system it manages and ignores all other information.

On the tractors in this series, the CANBUS interconnects the following control units:

1 - transmission control unit
2 - engine control unit
3 - armrest
4 - HLHP control unit
5 - Infocenter
6 - supplementary CANBUS socket.

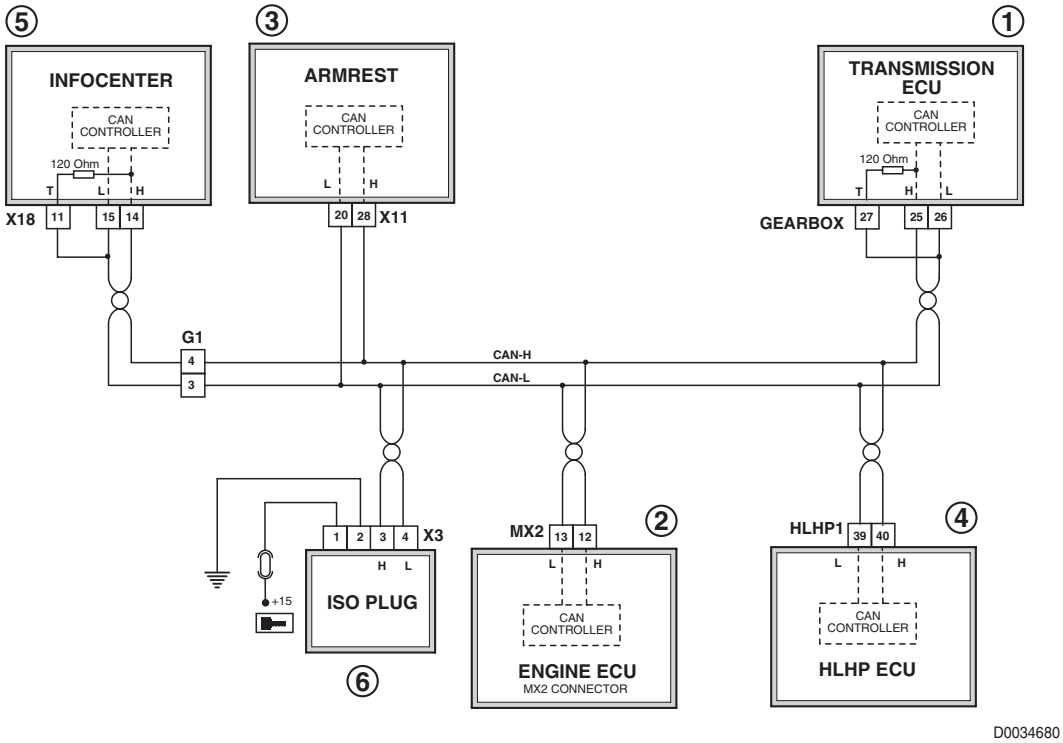
The CANBUS physically consists of a twisted pair of wires, called CAN H and CAN L, on which the digital messages are transmitted.

The digital messages are generated by a "differential" voltage system that provides a high degree of immunity to electromagnetic interference from the surrounding environment.

The CANBUS wires interconnect the armrest and the instrument panel, thereby forming the basic network to which all the other control units are connected in parallel.

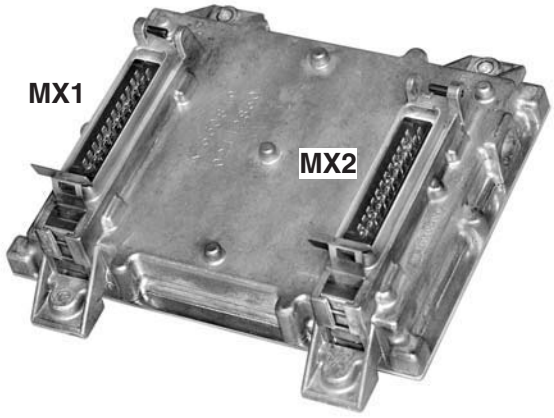
The armrest and the instrument panel may be designated "termination" control units (i.e. they form the "terminations" of the network). At each of these control units there is a 120 Ohm resistor connected between the wires of the CANBUS network.

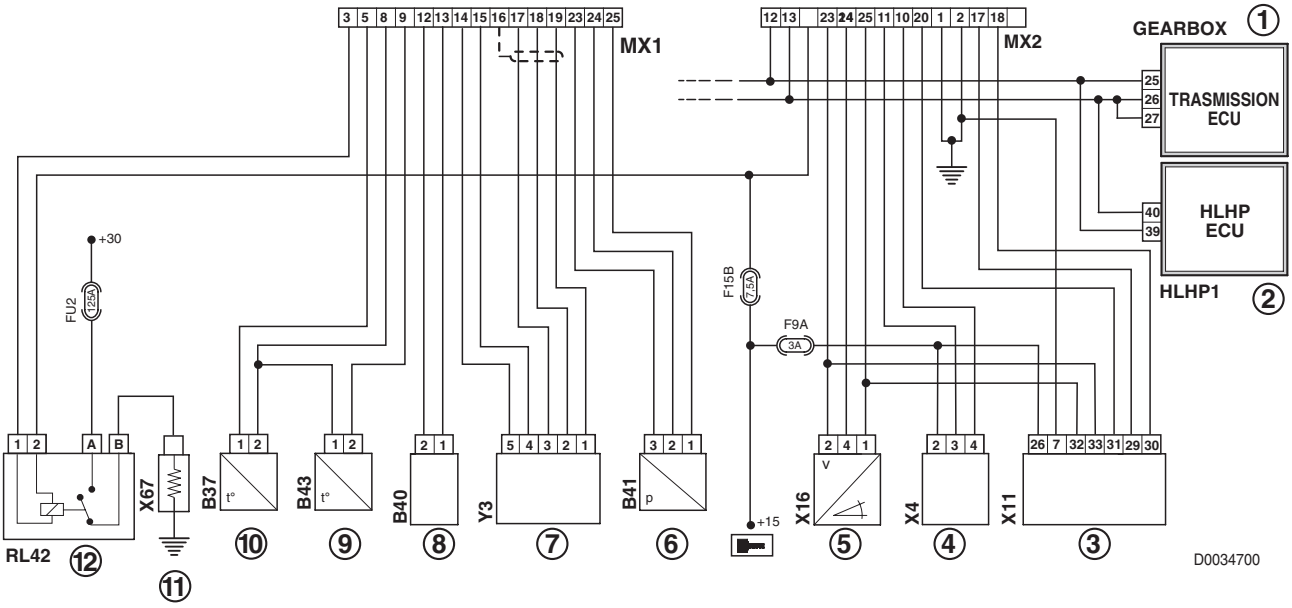
The entire network therefore has a total resistance of 60 Ohm created by the two 120 Ohm resistors in parallel.



3.2.1 ENGINE CONTROL UNIT (DEUTZ EMR2)

The engine control unit is responsible for supervising operation of the engine; To do this, it receives commands given by the operator via the hand throttle, accelerator pedal or the engine speed memory key; then, in accordance with other signals received from the engine speed sensor (pick up), coolant temperature, fuel temperature and boost pressure sensors, it sends a modulated voltage signal (PWM) to the fuel injection pumps actuator.
The ECU also manages the preheating system and enables the preheating device in accordance with coolant and fuel temperature to facilitate engine starting even in extreme conditions.
By connecting the ART® to the diagnostic socket in the control units compartment, the technician can connect to the HLHP control unit and check for the presence of active and passive alarms concerning the engine.
For a more detailed analysis of engine faults or operation, the technician must connect a laptop computer (SERDIA program installed) to the diagnostic socket.





1 - Transmission control unit
2 - HLHP control unit
3 - Armrest (manual Holde pushbutton) and throttle potentiometer armrest
4 - Diagnostic socket
5 - Accelerator pedal potentiometer
6 - Engine turbocharging pressure sensor
7 - Actuator
8 - Camshaft speed sensor
9 - Engine coolant temperature sensor
10 - Fuel temperature sensor
11 - Preheating device
12 - Preheating relay

3.2.2 HLHP CONTROL UNIT

The HLHP control unit is designed and programmed to manage the functions of the following systems:

1 - rear lift

2 - rear PTO

3 - front PTO

4 - front axle suspension

5 - ASM

6 - Auxiliary control valves

in accordance with the operating conditions and requests received from the operator.

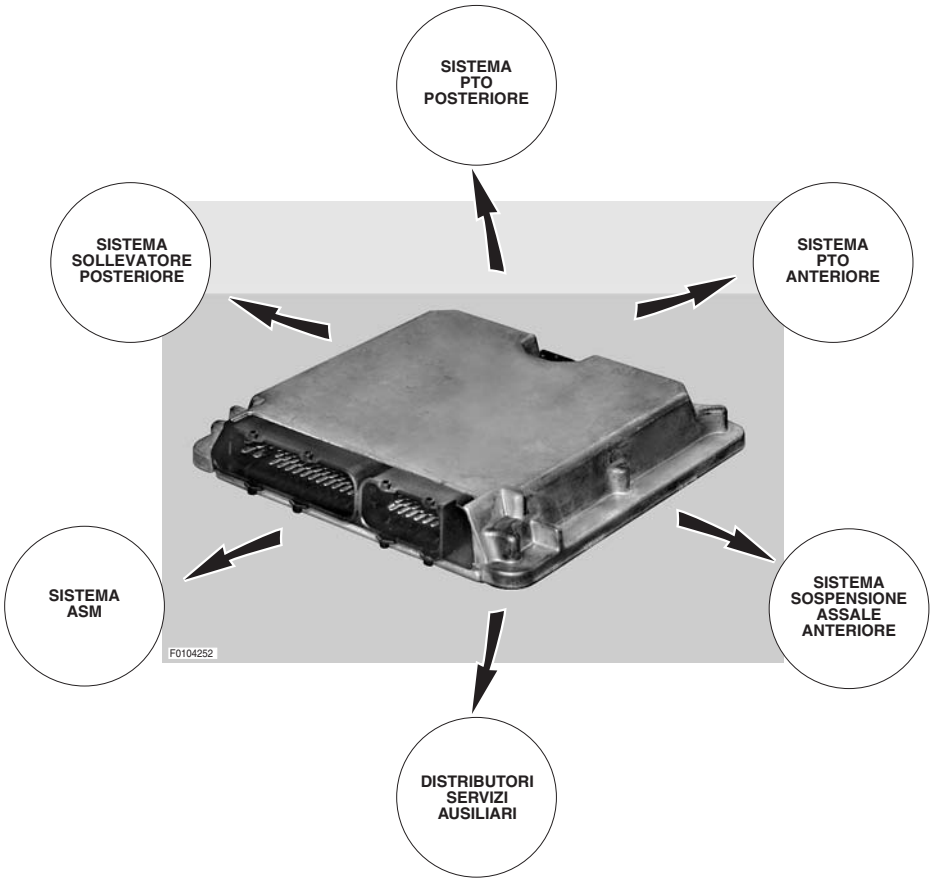
Using the ART® you can access the list of alarms detected by the HLHP and engine control units.

These alarms are divided into two categories:

- active alarms, i.e. all those alarms for which the cause has not yet been removed;
- passive alarms, i.e. all those alarms for which the cause has been eliminated or which simply cease without requiring any action.

Both these types of alarm are stored in memory in the form of an *SPN* code (*S*uspect *P*arameter *N*umber - possible faulty device) and an *FMI* code (*F*ailure *M*ode *I*dentifier - Fault code identifier). Through these codes, the technician can troubleshoot the system and, using the Test and Monitor menus, check the operation of system components.

By connecting the ART® to the diagnostic socket, the technician can access the HLHP control unit to test components, configure the control unit and display the active and passive alarms related to the components connected to the HLHP control unit and the alarms detected directly by the engine and transmission control units.

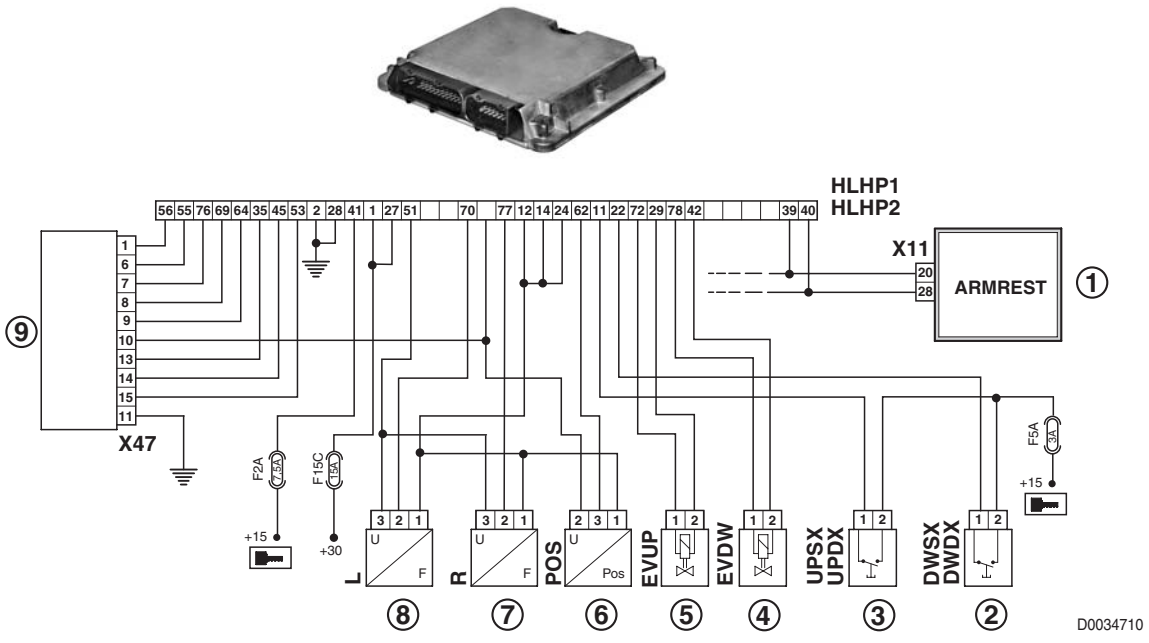


3.2.2.1 REAR LIFT SYSTEM

The electronic system controls the movements of the lift according to the commands and the operating mode selected by the operator using the control panel on the right console.
The operator can select five different control types:

- position control;
- draft control;
- depth/position control;
- wheelslip control;
- draft, wheelslip and depth control;
- implement locking for transport.

Furthermore, the system also automatically activates the anti-pitching control when tractor speed exceeds 8 km/h with the lift in "locked" condition and the maximum lift height knob turned fully clockwise.
The transport lock can be activated by the operator but, for reasons of safety, it is activated automatically by the system once three minutes have elapsed with the tractor travelling and the lift unit in stop status or when the tractor exceeds a groundspeed of 20 km/h.
The system compares the command given by the operator with the signals received from the lift position sensor, draft sensors, wheel speed sensor and radar, and executes the command by operating a control valve equipped with two solenoid valves.
The control valve routes high pressure oil to two hydraulic cylinders that raise or lower the implement connected to the lift.
The control console, sensors required for system operation and lift pushbuttons on the fenders are connected directly to the HLHP control unit.
For more detailed information on operation of the power lift, see the use and maintenance manual for the specific tractor.



1 - Armrest
2 - Lift "Down" pushbuttons
3 - Lift 'Up' pushbuttons
4 - Lift 'Down' control solenoid
5 - Lift 'Up' control solenoid
6 - Lift position sensor
7 - RH draft sensor
8 - LH draft sensor
9 - Lift control console

3.2.2.2 REAR PTO SYSTEM

The electronic system controls the rear PTO in accordance with the commands given by the operator via the pushbuttons on the right-hand console.

The operator is provided with two pushbuttons to activate the rear PTO and the AUTO PTO system.

The front and rear PTO control pushbuttons located in the cab are connected to the armrest, whereas the rear PTO speed selector pushbutton, the control pushbuttons mounted on the fenders and all the remaining system components are connected directly to the HLHP control unit.

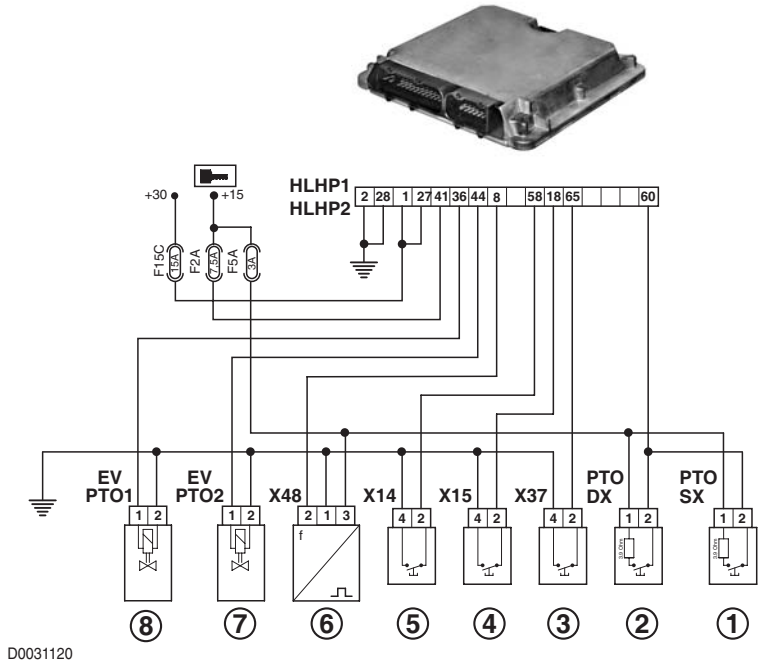
The system receives the command given by the operator and activates accordingly the rear PTO and speed selector solenoid valves that send oil under pressure to the PTO engagement clutches and the speed selector.

3.2.2.3 FRONT PTO SYSTEM

The electronic system controls the front PTO in accordance with the commands given by the operator via the pushbuttons on the console on the right-hand side of the cab.

The command signals from the console controls are transmitted to the lift control unit, which operates the solenoid valve that controls engagement of the front PTO.

For further details on the operation of the system, consult the specific use and maintenance manual for the tractor.



1 - Left rear PTO pushbutton (on fender)
2 - Right rear PTO pushbutton (on fender)
3 - Front PTO pushbutton
4 - Rear PTO pushbutton (on cab)
5 - AUTO PTO pushbutton
6 - PTO speed sensor
7 - PTO engagement solenoid valve
8 - Front PTO solenoid valve

3.2.2.4 FRONT AXLE SUSPENSION SYSTEM

This system, when activated by the operator by pressing the corresponding pushbutton on the armrest, automatically controls the position of the front end of the tractor relative to the road surface.

When the operator activates the system, the control unit operates the LS signal and 'Up' control solenoid valves until the signal received from the position sensor corresponds to the programmed value.

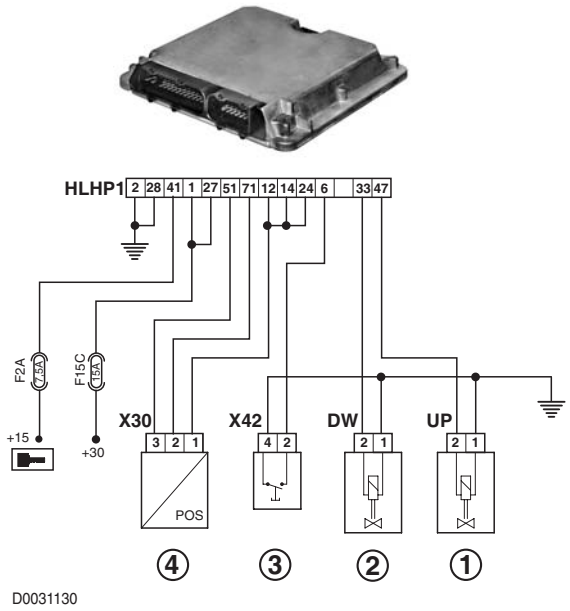
At this point, the control unit deactivates the solenoid valves, but the system remains active. When the axle position varies due to tractor motion, the control unit automatically makes the necessary corrections to return the axle to the programmed position.

The front axle suspension system thus becomes a further means to limit the pitching motion of the tractor, thereby increasing stability and responsiveness in emergency braking.

All the control components of the system (pushbutton, position sensor, and solenoid valves) are connected directly to the HLHP control unit, which controls operation of the solenoid valves in accordance with the signal received from the position sensor.

The only data read via the CANBUS are the system activation signal (via the pushbutton on the armrest) and the ground speed, which is used to activate or deactivate the system according to the tractor speed.

For further details on the operation of the system, consult the specific use and maintenance manual for the tractor.



1 - Front axle 'Up' solenoid
2 - Front axle 'Down' solenoid
3 - Front suspension pushbutton
4 - Front axle suspension position sensor

3.2.2.5 ASM SYSTEM

When activated by the operator the ASM system automatically controls the engagement and disengagement of four-wheel drive and the differential locks.

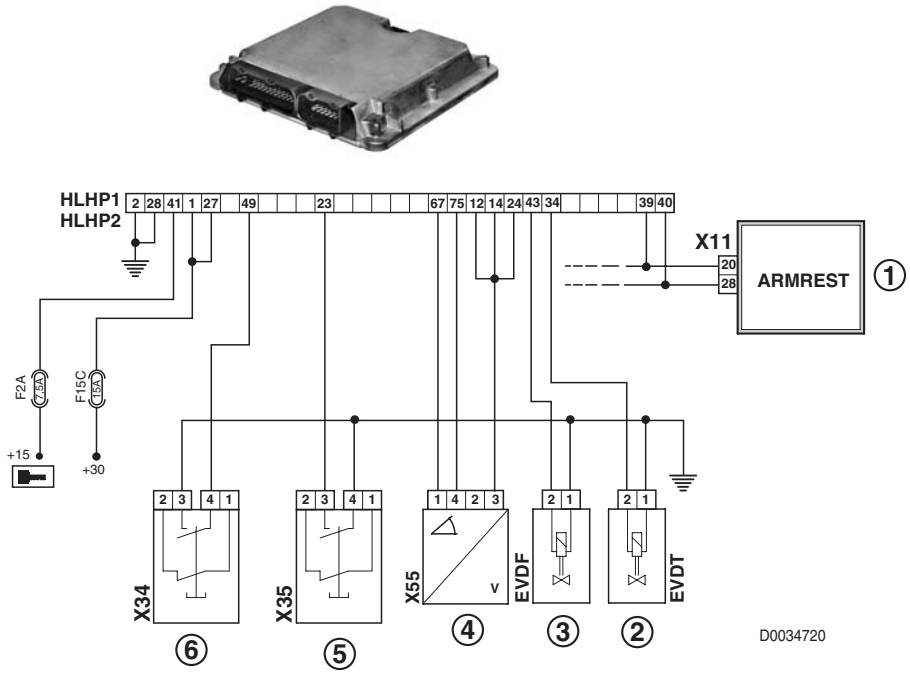
The parameters used to determine exclusion of the differential lock and disengagement of four-wheel drive are:

- travel speed
- steering angle
- braking type

The system activation command and the signals from the brake pedals and ground speed sensors arrive at the control unit via the CANBUS, while the steering angle sensor, the differential lock solenoids and 4WD engagement solenoid are connected directly to the HLHP control unit.

The control unit processes the data and, according to the system status, activates or deactivates the solenoid valves controlling engagement of four-wheel drive and the differential locks.

For further details on the operation of the system, consult the specific use and maintenance manual for the tractor.

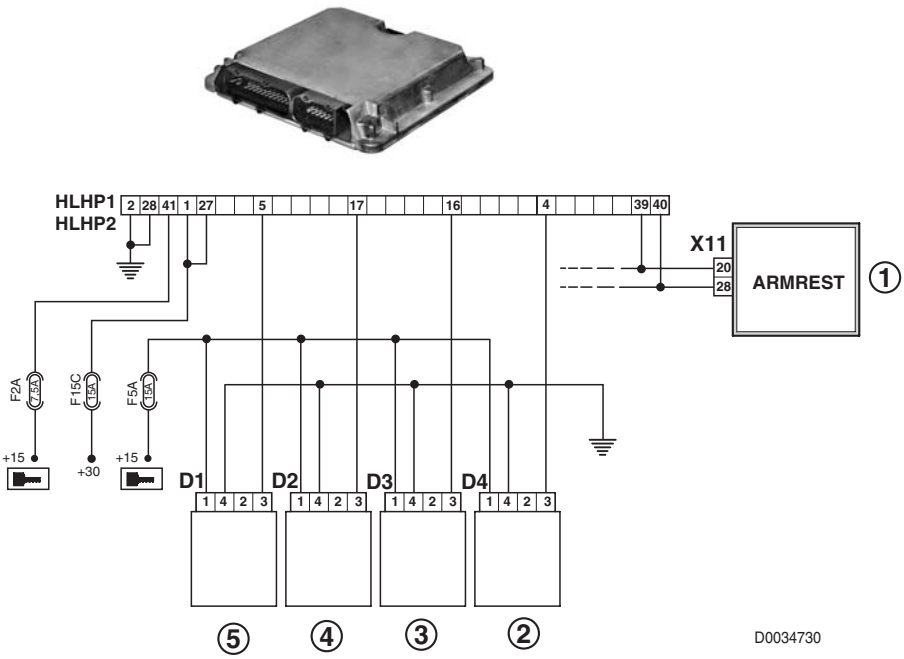


1 - Armrest
2 - 4WD engagement control solenoid
3 - Differential lock solenoid
4 - Steering angle sensor
5 - RH brake pedal pressed sensor
6 - LH brake pedal pressed sensor

3.2.2.6 AUXILIARY SERVICES CONTROL VALVE SYSTEM

This system makes it possible to manage activation of the auxiliary services control valves.

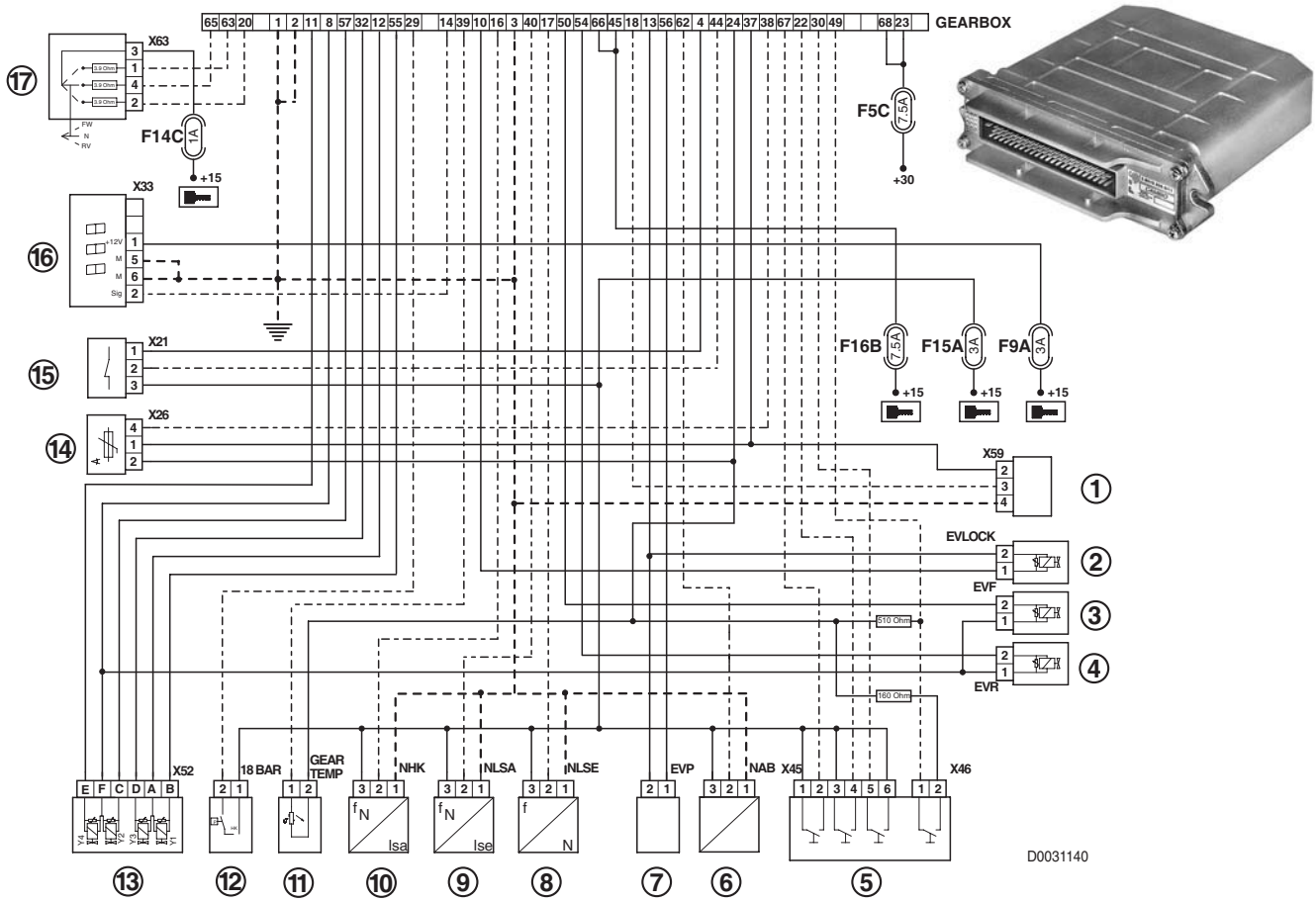
The commands imparted by the operator by means of the pushbuttons and joysticks on the armrest are transmitted via the CANBUS to the HLHP control unit which activates the relevant control valves.



1 - Armrest
2 - Control valve n°4
3 - Control valve n°3
4 - Control valve n°2
5 - Control valve n°1

3.3 TRANSMISSION CONTROL UNIT

The engine control unit is responsible for supervising operation of the transmission; it receives commands from the operator by way of the the shuttle lever, the range selection buttons and the clutch pedal, and, according to the signals returned by the engine speed and torque sensors, shifts between the ranges selected with the controls by piloting the operation of the 8 solenoid valves of the clutch actuators.
The control unit is connected to a display that provides the operator with information concerning the operating status of the transmission (selected travel direction, selected range, etc.) and signals any alarms detected by means of the alphanumeric codes.
By connecting the laptop PC (with EDS software installed) the Technician can connect to the transmission control unit and display alarms associated with the transmission.
Management of transmission control unit alarms is based on two classes of alarms called active alarms and passive alarms.
On EDS all alarms are shown in two windows that supply indications concerning the number of the alarm detected, the status of the alarm (active or passive), the number of times the alarm has been detected and the time of transmission operation at which the alarm occurred for the first time.



1 - FIELD/ROAD sensor
2 - Neutral lock solenoid valve
3 - "FIELD" mode solenoid valve
4 - "ROAD" mode solenoid valve
5 - Gear lever
6 - Speed sensor for odometer
7 - Proportional solenoid valve
8 - Engine speed sensor
9 - Gearbox output shaft speed sensor
10 - Transmission speed sensor
11 - Transmission oil temperature sensor
12 - Engine oil low pressure switch
13 - Gear change solenoid valves
14 - Clutch pedal position sensor
15 - Clutch pedal pressed proximity sensor
16 - Transmission display
17 - Reverse shuttle control lever

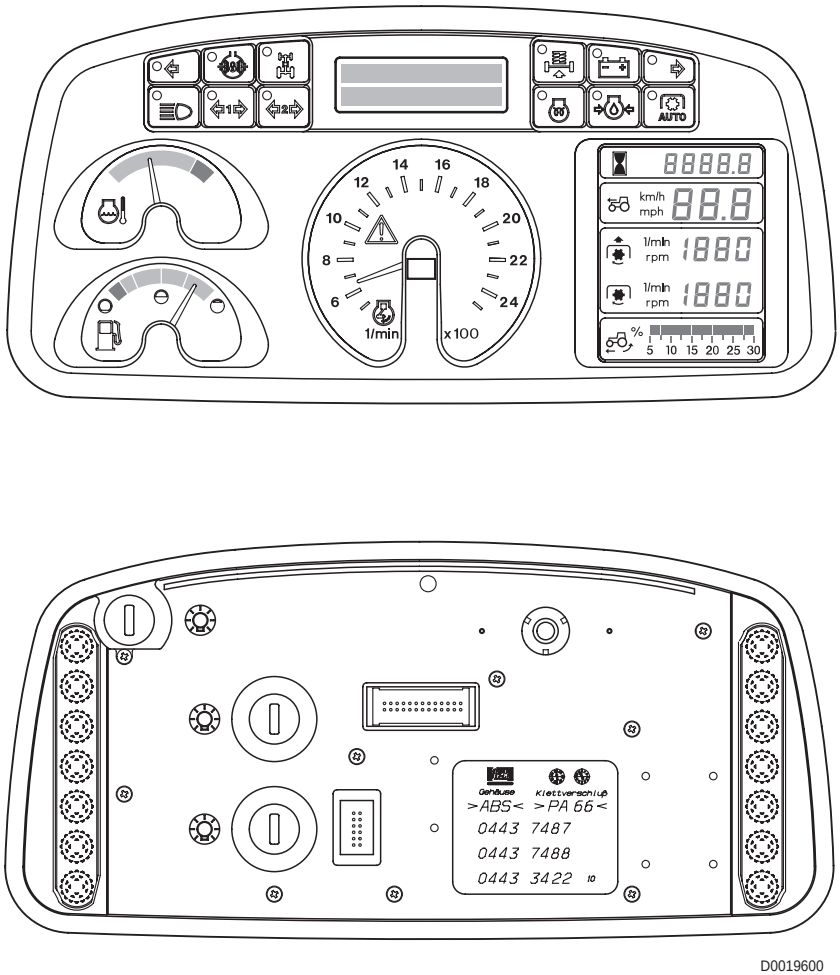
3.4 INFOCENTER

The Infocenter control unit is designed and programmed to manage and display the essential information needed by the operator to control the machine under different conditions of use, to show performance data in real time, and to activate an indicator light warning of faults detected by the engine control unit.

The Infocenter comprises a single module with two integral displays which provide information in the form of text messages and analog instruments on the engine rpm, fuel level, etc.

The instrument panel features several indicator lamps signalling the operating status of tractor systems or the presence of faults (e.g. clogged oil filters, etc.).

The display located to the right of the Infocenter provides indications regarding the operation of the tractor (road speed, wheelslip, rotations speeds of the front and rear PTOs) and the number of operating hours.



D0019600

PAGE INTENTIONALLY
LEFT BLANK

4. PUTTING THE TRACTOR INTO SERVICE

4.1 INTRODUCTION

This chapter contains all the information required to establish or restore correct operation of the tractor's various electronic systems.

Whenever an electronic control unit of the tractor is changed or a calibration-sensitive electronic component replaced, the control unit or component must be put into service as from new.

The necessary procedures must be carried out by a skilled technician, who in turn must follow the instructions in the manual precisely.

4.2 RENEWING THE ENGINE CONTROL UNIT

The ECU is supplied as a spare part in 2 versions:

- control unit with software but *without* DATASET
- control unit with software and *with* DATASET

The DATASET is the complete set of engine data that is specific to the engine serial number.

If an engine control unit without DATASET is ordered, before changing the control unit, it is necessary to read all the engine data (DATASET) from the old control unit and save them to a file, which is subsequently to be loaded onto the new control unit. In this case no calibration is required.

If the control unit is faulty and it is not possible to read the complete DATASET, it will be necessary to order a control unit with DATASET (provide the engine serial number indicated on the name plate of the control unit plate and the engine data plate). In this case it will only be necessary carry out the procedures to set the engine operating hours and calibrate the accelerator pedal and hand throttle.

NOTE

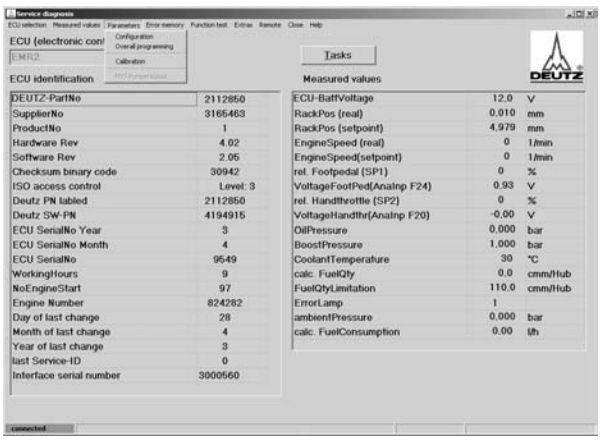
The accelerator pedal and handbrake calibration procedures can be carried out using either the SERDIA program, or the ART connected to the HLHP control unit. Both procedures are described below.

4.2.1 READING AND SAVING DATA

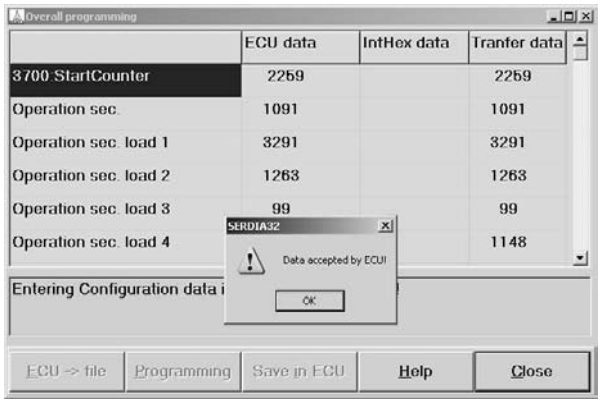
1 - Connect a laptop computer with the SERDIA program installed (for details see "2.2 CONNECTING THE LAPTOP COMPUTER WITH “SERDIA 2000” SOFTWARE TO THE ENGINE CONTROL UNIT").

2 - Turn the starter key to “I” (ON) and launch the SERDIA program.

3 - From the “PARAMETER” menu, select the option “OVERALL PROGRAMMING”.



4 - Click on “ECU -> file” and save the data to a floppy disk or to the computer hard disk (c:\; d:\).



NOTE

Make sure that the file has in fact been saved.

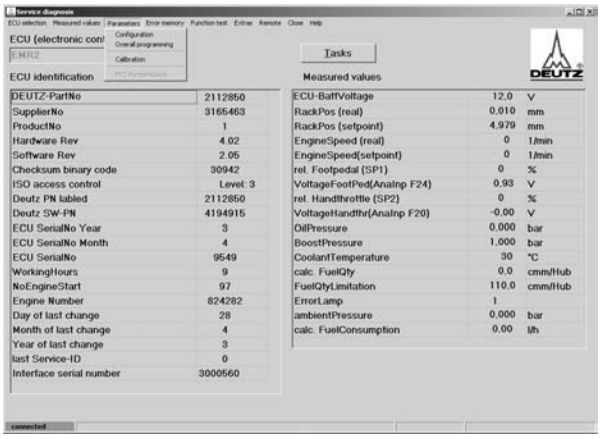
The files are automatically saved with the following names: 0044444.hex where the digits "44444" correspond to the engine serial number.

4.2.2 PROGRAMMING THE CONTROL UNIT

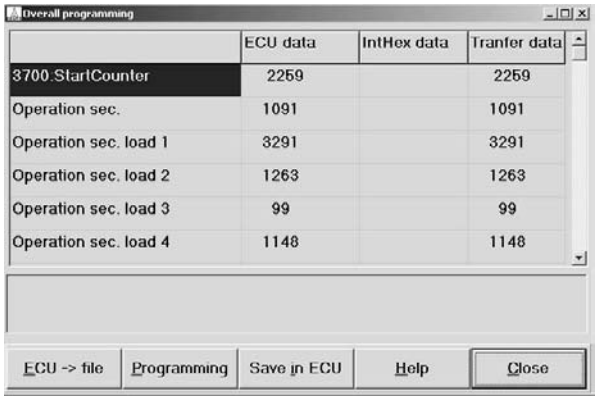
1 - Connect a laptop computer with the SERDIA program installed (for details see "2.2 CONNECTING THE LAPTOP COMPUTER WITH “SERDIA 2000” SOFTWARE TO THE ENGINE CONTROL UNIT").

2 - Turn the starter key to “I” (ON) and launch the SERDIA program.

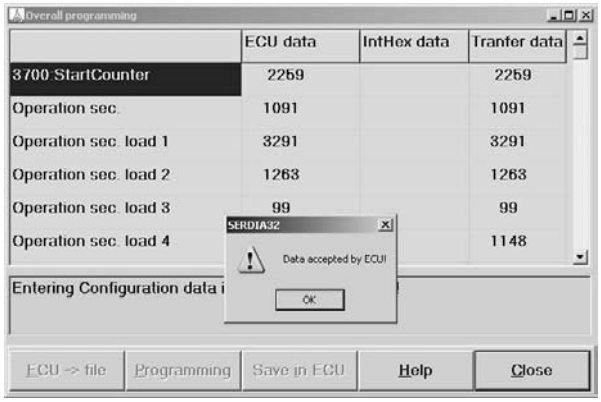
3 - From the “PARAMETER” menu, select the option “OVERALL PROGRAMMING”.



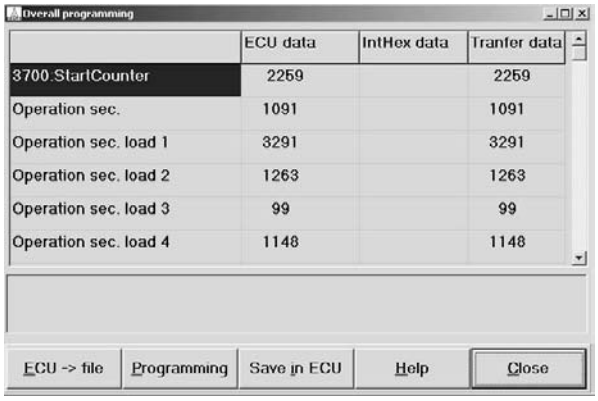
4 - Click on “PROGRAMMING” and select the file saved previously, or procured from Technical Assistance.



5 - When the message "DATA ACCEPTED BY ECU" appears, press Enter.



6 - At this point, carry out the procedure to set the engine operating hours (for details, see "4.2.3 PROCEDURE FOR SETTING ENGINE OPERATING HOURS" starting from point 4).

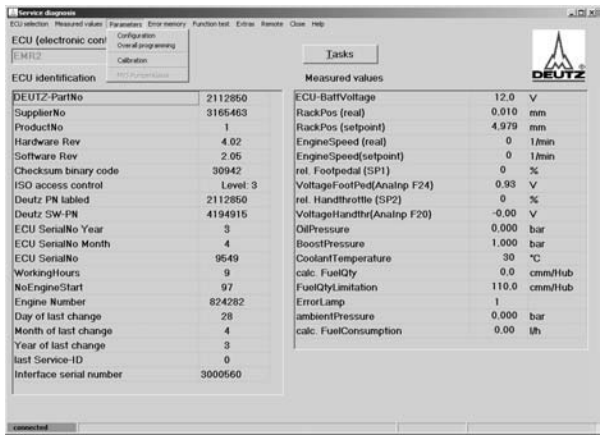


4.2.3 PROCEDURE FOR SETTING ENGINE OPERATING HOURS

1 - Connect a laptop computer with the SERDIA program installed (for details see "2.2 CONNECTING THE LAPTOP COMPUTER WITH "SERDIA 2000" SOFTWARE TO THE ENGINE CONTROL UNIT").

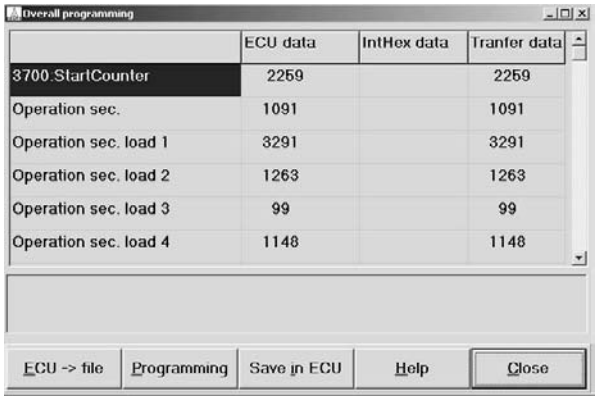
2 - Turn the starter key to "I" (ON) and launch the SERDIA program.

3 - From the "PARAMETER" menu, select the option "OVERALL PROGRAMMING".



4 - Edit parameter "3701: WORKINGHOURS", entering in the third column the number of engine operating hours.

5 - Click on the "SAVE IN ECU" button and when the message "DATA ACCEPTED BY ECU" appears, press Enter and exit the program.



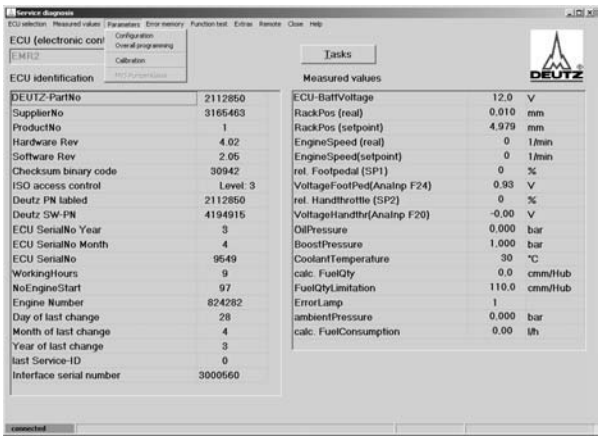
4.2.4 CALIBRATION OF THE ACCELERATOR PEDAL (USING THE SERDIA PROGRAM)

NOTE

This operation must be carried out with the engine off and the parking brake applied.

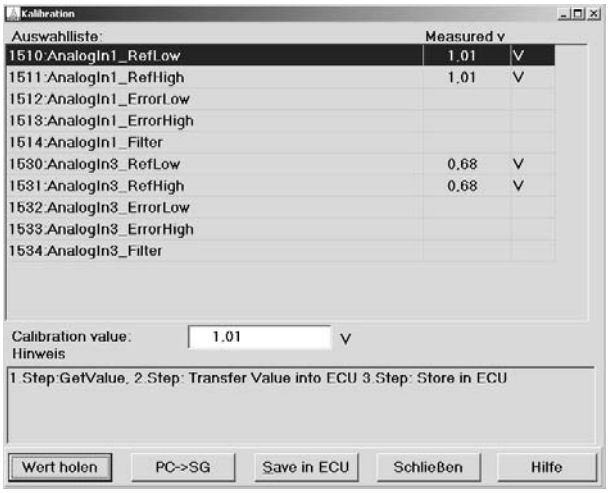
1 - Connect a laptop computer with the SERDIA program installed (for details see «Connection of laptop computer with "SERDIA" software to the engine control unit»), turn the starter key to the "*I*" (ON) position and start the SERDIA program.

2 - From the "PARAMETER" menu, select the option "CALIBRATION".



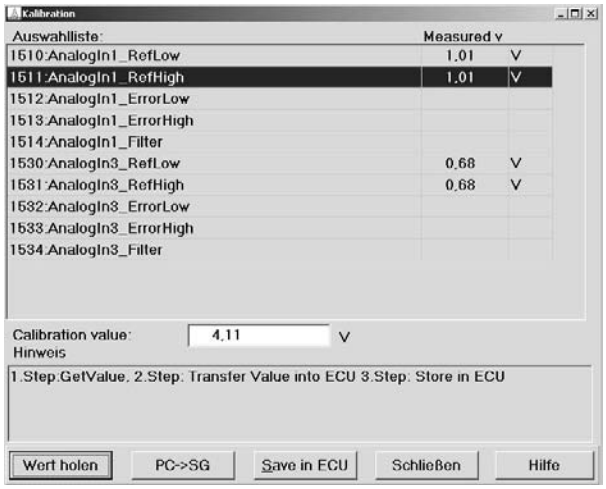
3 - Select the line containing parameter "1510: AnalogIn1_RefLow", slightly depress the accelerator pedal and release it, then click the "GET VALUE" button to allow the software to acquire the value.

4 - Click "PC->ECU" then click "SAVE IN ECU" to save the new parameter.



5 - Select the line containing parameter "1511: AnalogIn1_RefHigh" and fully depress the accelerator pedal, and, while holding it depressed, click "GET VALUE" to allow the software to acquire the value.

6 - Click "PC->ECU" then click "SAVE IN ECU" to save the new parameter.

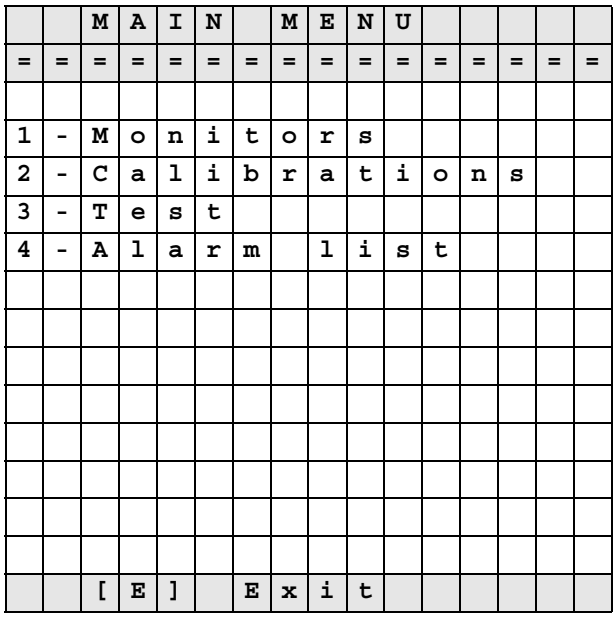


4.2.5 CALIBRATION OF THE ACCELERATOR PEDAL (USING THE ART)

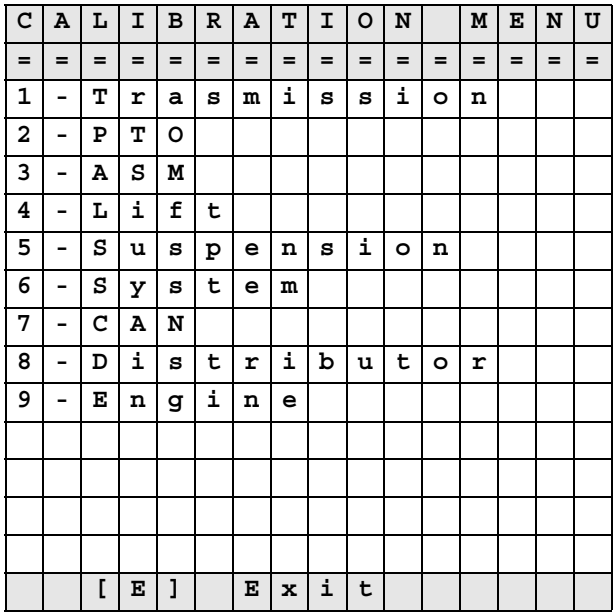
NOTE
This operation must be carried out with the engine off and the parking brake applied.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

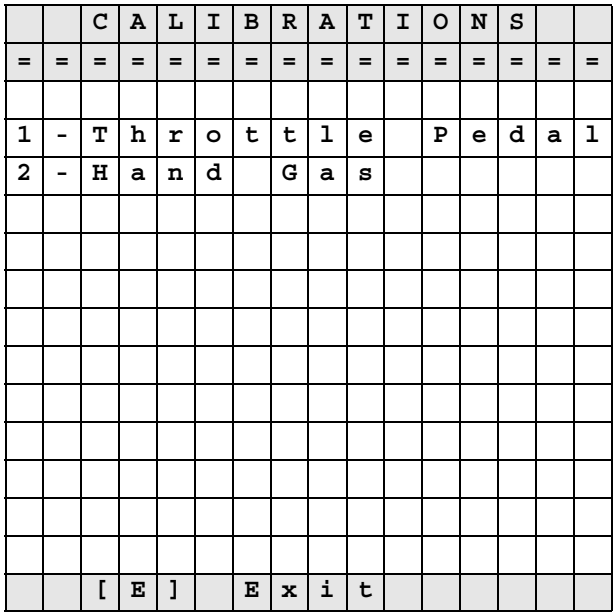
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*9 - ENGINE*”.



4 - Press “*1 - Accelerator pedal*”.



5 - With the accelerator pedal released, press "*C*" to confirm the parameter.

6 - Fully depress the accelerator pedal and, when the value has stabilised, press "*C*" to confirm the parameter and terminate the calibration procedure.

7 - Release the accelerator pedal and, when the value has stabilised, press "*C*" to confirm the parameter and terminate the calibration procedure.

		P	E	D	A	L		C	A	L	I	B	R		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
					P	r	e	s	s						
		a	c	c	e	l	e	r	a	t	o	r			
p	e	d	a	l		t	o		m	a	x		a	n	d
	t	h	e	n		p	r	e	s	s	[	C	]		
		[	E	]		E	x	i	t						

8 - If calibration was successful, the following message will be displayed:

		C	A	L	I	B	R	A	T	I	O	N			
							O	K							

9 - If calibration was not completed successfully, the following message will be displayed:

		C	A	L	I	B	R	A	T	I	O	N			
					E	R	R	O	R						

In this case check the accelerator pedal sensor for possible faults or incorrect installation, then repeat the procedure.

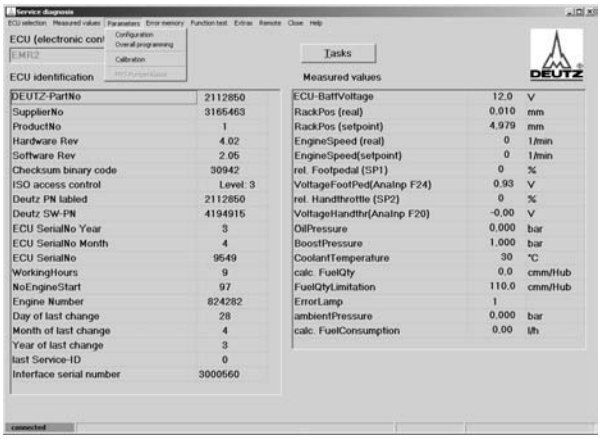
		P	E	D	A	L		C	A	L	I	B	R		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
					P	r	e	s	s						
		a	c	c	e	l	e	r	a	t	o	r			
p	e	d	a	l		t	o		m	a	x		a	n	d
	t	h	e	n		p	r	e	s	s	[	C	]		
		[	E	]		E	x	i	t						

4.2.6 CALIBRATION OF THE HAND THROTTLE (USING THE SERDIA PROGRAM)

NOTE
This operation must be carried out with the engine off and the parking brake applied.

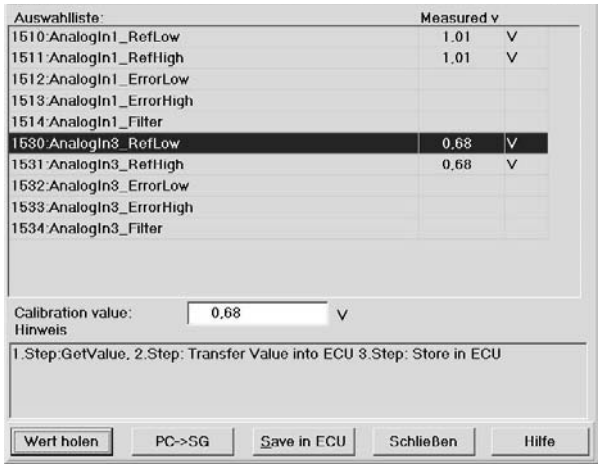
1 - Connect a laptop computer with the SERDIA program installed (for details see «Connection of laptop computer with "SERDIA" software to the engine control unit»), turn the starter key to the "*I*" (ON) position and launch the SERDIA program.

2 - From the "PARAMETER" menu, select the option "CALIBRATION".



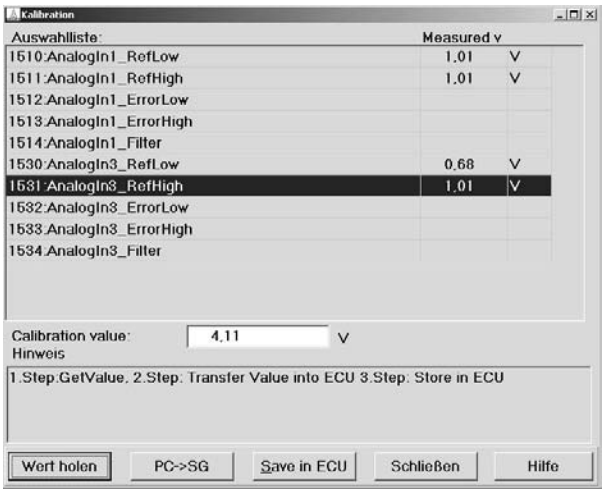
3 - Select the line containing parameter “1530: AnalogIn3_RefLow” and slightly depress the accelerator pedal and release it, then click "GET VALUE" to allow the software to acquire the value.

4 - Click “PC->ECU” then click “SAVE IN ECU” to save the new parameter.



5 - Select the line containing parameter “1531: AnalogIn3_RefHigh" and fully depress the accelerator, and, while holding it depressed, click on "GET VALUE" to allow the software to acquire the value.

6 - Click “PC->ECU” then click “SAVE IN ECU” to save the new parameter.



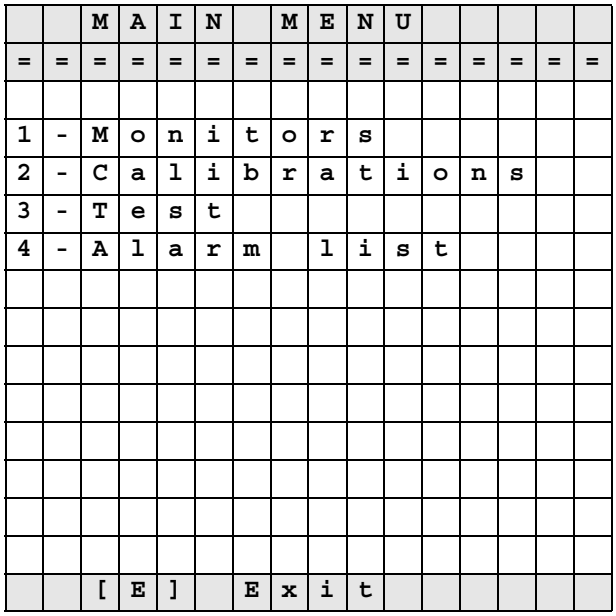
4.2.7 CALIBRATION OF THE HAND THROTTLE (USING THE ART)

NOTE

This operation must be carried out with the engine off and the parking brake applied.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*9 - ENGINE*”.

C	A	L	I	B	R	A	T	I	O	N		M	E	N	U
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n			
2	-	P	T	O											
3	-	A	S	M											
4	-	L	i	f	t										
5	-	S	u	s	p	e	n	s	i	o	n				
6	-	S	y	s	t	e	m								
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r			
9	-	E	n	g	i	n	e								
		[	E	]		E	x	i	t						

4 - Press “*2 - Hand Gas*”.

		C	A	L	I	B	R	A	T	I	O	N	S		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	h	r	o	t	t	l	e		P	e	d	a	l
2	-	H	a	n	d		G	a	s						
		[	E	]		E	x	i	t						

5 - Move the throttle lever back towards the rear of the tractor and press "*C*" to confirm the parameter.

H	A	N	D		G	A	S		C	A	L	I	B	R	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		P	u	s	h		h	a	n	d	g	a	s		
		t	o		m	a	x		a	n	d				
					t	h	e	n							
			p	r	e	s	s				[	C	]		
		[	E	]		E	x	i	t						

6 - Move the throttle lever towards the front of the tractor and press "*C*" to confirm the parameter and terminate the calibration procedure.

7 - If calibration was successful, the following message will be displayed:

		C	A	L	I	B	R	A	T	I	O	N			
						O	K								

8 - If calibration was not completed successfully, the following message will be displayed:

		C	A	L	I	B	R	A	T	I	O	N			
					E	R	R	O	R						

In this case check the hand throttle sensor for possible faults or incorrect installation and then repeat the procedure.

H	A	N	D		G	A	S		C	A	L	I	B	R	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		P	u	l	l		h	a	n	d	g	a	s		
			t	o		m	i	n		a	n	d			
						t	h	e	n						
			p	r	e	s	s				[	C	]		
		[	E	]		E	x	i	t						

4.3 RENEWING THE TRANSMISSION CONTROL UNIT

NOTE

All the control unit configuration and calibration procedures can be carried out using either the WINEDS program, or the ART connected to the HLHP control unit.

The procedures with the ART are described below.

Whenever the transmission control unit is renewed, the technician must carry out the following operations:

1 - Model configuration
2 - Basis wheel configuration
3 - Wheel circumference configuration
4 - Maximum travel speed configuration (German market only)
5 - Clutch pedal calibration
6 - Main clutch calibration
7 - FIELD/ROAD sensor calibration
8 - Deletion

The configuration and calibration operations are necessary to program the electronic control unit with the parameters to be used to operate the transmission correctly.

4.3.1 MODEL CONFIGURATION

NOTE

This operation must be carried out with the engine off and the parking brake applied.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

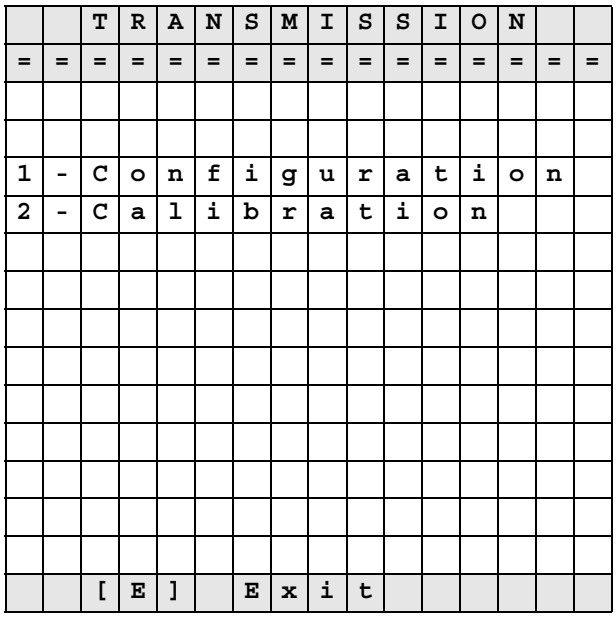
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

		M	A	I	N		M	E	N	U					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	M	o	n	i	t	o	r	s						
2	-	C	a	l	i	b	r	a	t	i	o	n	s		
3	-	T	e	s	t										
4	-	A	l	a	r	m		l	i	s	t				
		[	E	]		E	x	i	t						

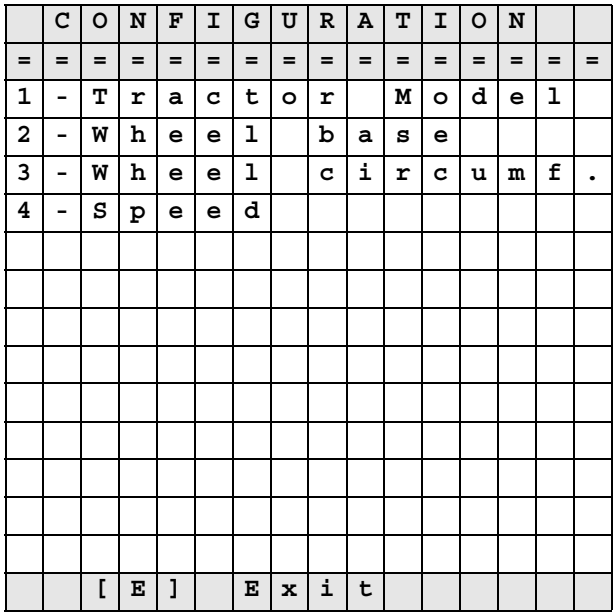
3 - Press “*1 - Transmission*”.

C	A	L	I	B	R	A	T	I	O	N		M	E	N	U
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n			
2	-	P	T	O											
3	-	A	S	M											
4	-	L	i	f	t										
5	-	S	u	s	p	e	n	s	i	o	n				
6	-	S	y	s	t	e	m								
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r			
9	-	E	n	g	i	n	e								
		[	E	]		E	x	i	t						

4 - Press "*1 - Configuration*".

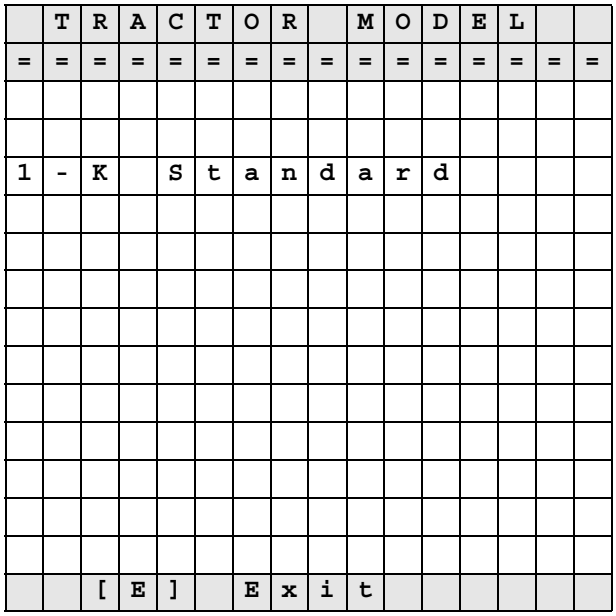


5 - Press "*1 - Model Config.*".



6 - Press the button corresponding to the transmission installed, choosing from the options available, and press "*E*" to save the data.

Style	*Transmission*	*Key*
AGROTRON K90	T7115L	2
AGROTRON K100	T7117L	3
AGROTRON K110	T7119L	4
AGROTRON K120	T7120	5



NOTE
If you select the wrong option by mistake or are not sure of your selection, cancel the procedure by pressing "A".

7 - The following messages will be displayed in sequence:

				W	a	i	t		f	o	r			
	c	o	m	m	u	n	i	c	a	t	i	o	n	

		C	a	l	i	b	r	a	t	i	o	n		
	i	n		p	r	o	g	r	e	s	s	.	.	

8 - If the configuration procedure was completed successfully, the following message will be displayed:

		C	o	n	f	i	g	u	r	a	t	i	o	n
				s	u	c	c	e	s	s	f	u	l	

9 - If the configuration was not completed successfully, one of the following messages will appear:

- Communication error between the HLHP control unit and the transmission control unit caused by interference or problems on the CANBUS.

	C	o	m	m	u	n	i	c	a	t	i	o	n	
				e	r	r	o	r						

- Operator procedure error.

			A	b	n	o	r	m	a	l				
		p	r	o	c	e	d	u	r	e				
				s	t	o	p							

- Information interpretation error.

	E	r	r	o	r		d	u	r	i	n	g		
	c	o	n	f	i	g	u	r	a	t	i	o	n	

- The configuration was not carried out because the engine was running.

C	o	n	f	i	g	u	r	a	t	i	o	n		
p	o	s	s	i	b	l	e		o	n	l	y		
				i	f		e	n	g	i	n	e		
				s	t	o	p	p	e	d				

10 -Press "*E*" to go back to the "*CONFIGURATION*" menu and then proceed with the configuration of the basic wheel (for details, see "10 - Press "E" to go back to the "CONFIGURATION" menu and then proceed with the configuration of the basic wheel (for details, see starting from point 5)." starting from point 5).

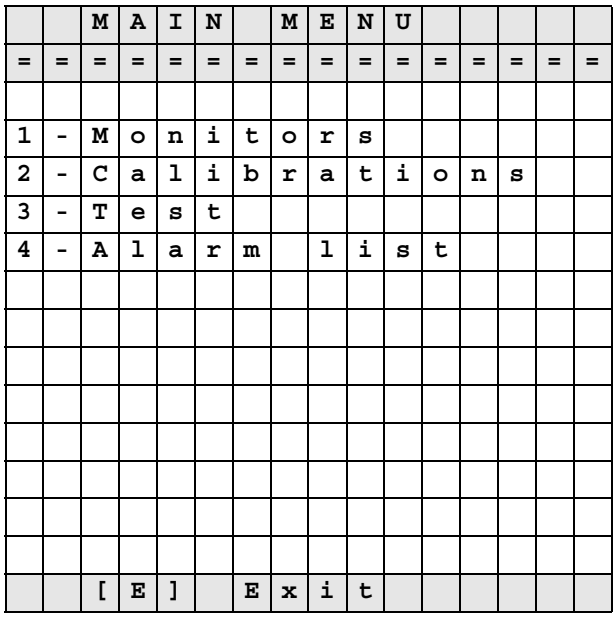
4.3.2 CONFIGURATION OF THE BASIC WHEEL

NOTE

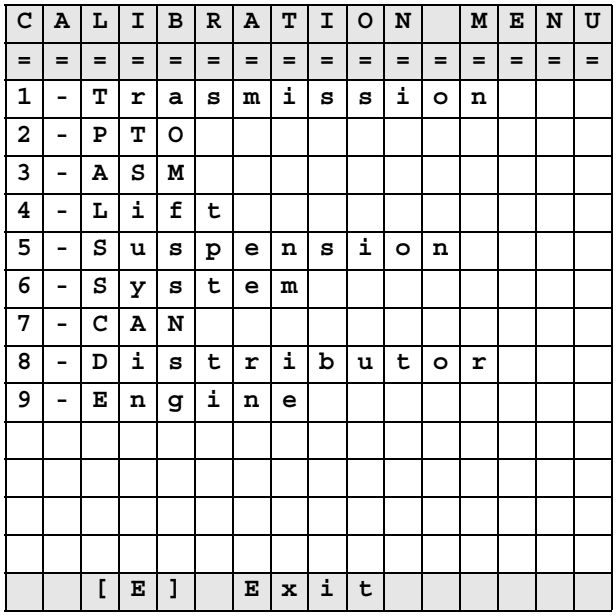
This operation must be carried out with the engine off and the parking brake applied.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

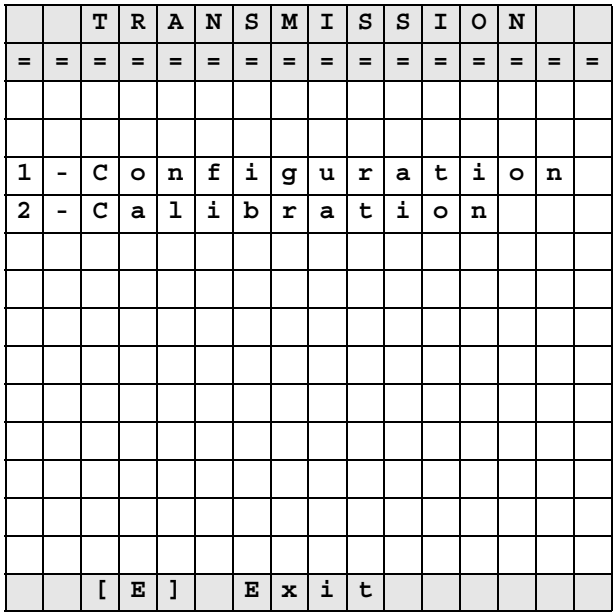
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*1 - Transmission*”.



4 - Press “*1 - Configuration*”.



5 - Press "*2 - Basic Wheel*".

	C	O	N	F	I	G	U	R	A	T	I	O	N		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	c	t	o	r		M	o	d	e	l	
2	-	W	h	e	e	l		b	a	s	e				
3	-	W	h	e	e	l		c	i	r	c	u	m	f	.
4	-	S	p	e	e	d									
		[	E	]		E	x	i	t						

6 - Press the key corresponding to the tyre fitted on the tractor, choosing from the options available, and press "*C*" to save the setting and return to the "CONFIGURATION" menu.

Type of tyre fitted	*Tyre type*	*Key*
16.9 R34 480/70 R34 540/65 R34	16.9 R34	1
18.4 R34 520/70 R34 600/65 R34	18.4 R34	2
16.9 R38 480/70 R38 540/65 R38	16.9 R38	3
18.4 R38 520/70 R38 600/65 R38	18.4 R38	4

	K			W	H	E	E	L		B	A	S	E		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	1	6	.	9		R	3	4						
2	-	1	8	.	4		R	3	4						
3	-	1	6	.	9		R	3	8						
4	-	1	8	.	4		R	3	8						
		[	A	]	A	b	o	r	t						
		[	C	]	S	t	o	r	e						

NOTES

- Option "4" is only displayed for 110 and 120 HP tractors.
- If you select the wrong option by mistake, you can cancel it by pressing "A".

7 - Carry out the procedure for configuration of the wheel circumference (for details, see "4.3.3 CONFIGURATION OF THE WHEEL CIRCUMFERENCE (USING THE ART)" starting from point 5).

4.3.3 CONFIGURATION OF THE WHEEL CIRCUMFERENCE (USING THE ART)

NOTE

This operation must be carried out with the engine off and the parking brake applied.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

```
    MAIN MENU
==========
1 - Monitors
2 - Calibrations
3 - Test
4 - Alarm list
[E]   Exit
```

3 - Press “*1 - Transmission*”.

```
CALIBRATION MENU
==========
1 - Trasmission
2 - PTO
3 - ASM
4 - Lift
5 - Suspension
6 - System
7 - CAN
8 - Distributor
9 - Engine
[E]   Exit
```

4 - Press “*1 - Configuration*”.

```
   TRANSMISSION
==========
1 - Configuration
2 - Calibration
[E]   Exit
```

5 - Press "*3 - Wheel Circ.*".

	C	O	N	F	I	G	U	R	A	T	I	O	N		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	c	t	o	r		M	o	d	e	l	
2	-	W	h	e	e	l		b	a	s	e				
3	-	W	h	e	e	l		c	i	r	c	u	m	f	.
4	-	S	p	e	e	d									
		[	E	]		E	x	i	t						

6 - Enter the value corresponding to the type of tyre fitted to the tractor as indicated in the table below:

Type of tyre fitted	Value (mm)
16.9 R34	4717
16.9 R38	5024
18.4 R34	4923
18.4 R38	5238
480/70 R34	4745
480/70 R38	5057
520/70 R34	4927
520/70 R38	5258
540/65 R34	4701
540/65 R38	5016
600/65 R34	4925
600/65 R38	5507

	W	h	e	e	l		c	i	r	c	u	m	f	.	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l			:				5	0	5	0
N	e	w						:				5	0	5	0
		[	D	]		E	r	a	s	e					
		[	E	]		E	x	i	t						

NOTE

The values given in the table are purely theoretical. The actual value must be checked each time in accordance with the make and type of tyre fitted to the tractor. If it is not possible to obtain the correct wheel circumference value for a particular type of tyre, carry out the wheel circumference calibration procedure (for details, see "4.3.4 CALIBRATION OF THE WHEEL CIRCUMFERENCE (WITHOUT USING THE ART)").

NOTE

If you enter an incorrect value, you can cancel it one digit at a time by pressing "D".

7 - The screen page is displayed and if the operation was not performed correctly, the technician can cancel it by pressing "*A*" to restore the previous value, otherwise pressing "*C*" confirms the new calibration value and returns you to the "CONFIGURATION" menu".

GERMAN MARKET ONLY

8 - Calibrate the maximum travel speed (for details, see "4.3.5 CONFIGURATION OF THE MAXIMUM TRAVEL SPEED (GERMAN MARKET ONLY)" starting from point 5).

FOR ALL OTHER MARKETS

9 - Press "*E*" to return to the "TRANSMISSION" menu and carry out the clutch pedal calibration operation (for details, see "4.3.6 CALIBRATION OF THE CLUTCH PEDAL" starting from point 4).

	W	h	e	e	l		c	i	r	c	u	m	f	.	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l			:				5	0	5	0
N	e	w						:				5	0	5	0
		[	A	]	A	b	o	r	t						
		[	C	]	S	t	o	r	e						

4.3.4 CALIBRATION OF THE WHEEL CIRCUMFERENCE (WITHOUT USING THE ART)

NOTE

This procedure can be performed every time that the tyres are changed or when the correct wheel circumference value is not known.

IMPORTANT

To calibrate the wheel circumference the tractor must be parked on a flat asphalted surface with markers indicating the start and the end of the path placed 100 metres apart. The tractor must be driven over the distance at a speed greater than 2 km/h.

1 - Park the tractor near the marker indicating the start of the course, switch off the engine and turn the starter key to "O" (OFF).

2 - With the starter key in position "O" (OFF), turn on the hazard warning lights and move the headlights control lever to the full beam position and hold it there, then, within 4 seconds, turn the starter key to "I" (ON) and start the engine.

3 - If the procedure has been performed correctly the Infocenter will display the message "WHEEL CALIBRATION"; at this point, release the headlights control lever and start travelling with the tractor.

4 - When the tractor reaches the marker at the start of the course, move the headlights control lever to the full beam position and then release it immediately. The Infocenter will display the message "Calibration in progress" with the cursor "o" continuously moving from left to right and vice versa.

5 - On reaching the end of course marker, move the headlights control lever to the full beam position and then release it immediately. If the procedure has been performed correctly the Infocenter will display the message " Wheel successfully calibrated".

NOTE

The calibration will be automatically cancelled and the Infocenter will display the message "Calibration error value out of range" if:

a - measurement is not started within 60 seconds of the appearance of the message "WHEEL CALIBRATION";

b - measurement is not terminated within 180 seconds of starting (the tractor moves too slowly or the headlight control lever is not operated);

c - the engine is stopped;

d - the tractor is stopped (or the travel speed falls below 2 km/h).

4.3.5 CONFIGURATION OF THE MAXIMUM TRAVEL SPEED (GERMAN MARKET ONLY)

WARNING

The maximum travel speed of the tractor varies according to the market in which it is to be used. It is therefore the RESPONSIBILITY OF THE AUTHORISED SERVICE CENTRE to configure the parameter correctly in accordance with the legal requirements applicable in the country of use:

- for all markets (except Germany) the maximum homologated speed 40 km/h.

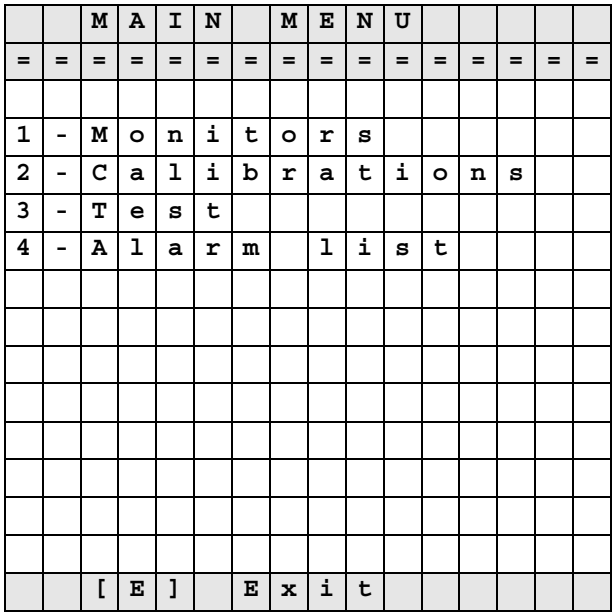
- for the German market only the maximum homologated speed is 50 km/h

NOTE

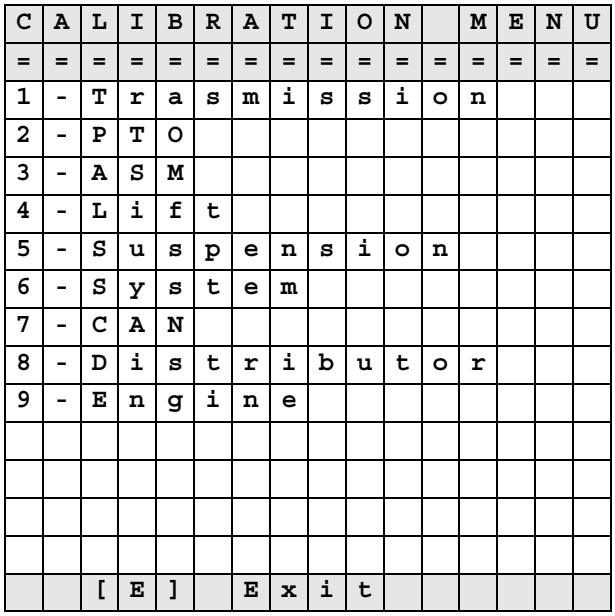
This operation must be carried out with the engine off and the parking brake applied.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*1 - Transmission*”.



4 - Press "*1 - Configuration*".

		T	R	A	N	S	M	I	S	S	I	O	N		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	C	o	n	f	i	g	u	r	a	t	i	o	n	
2	-	C	a	l	i	b	r	a	t	i	o	n			
		[	E	]		E	x	i	t						

5 - Press "*4 - Speed*".

	C	O	N	F	I	G	U	R	A	T	I	O	N		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	c	t	o	r		M	o	d	e	l	
2	-	W	h	e	e	l		b	a	s	e				
3	-	W	h	e	e	l		c	i	r	c	u	m	f	.
4	-	S	p	e	e	d									
		[	E	]		E	x	i	t						

6 - Enter the value corresponding to the maximum homologated travel speed of the tractor. and then press "*C*" to return to the "CONFIGURATION" menu.

NOTE

If you select the wrong option by mistake, press "*A*" to cancel.

7 - Press "*E*" to return to the "TRANSMISSION" menu and carry out the clutch pedal calibration operation (for details, see "4.3.6 CALIBRATION OF THE CLUTCH PEDAL" starting from point 4).

				V	E	L	O	C	I	T	Y				
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
0	-	2	0		k	m	/	h							
1	-	3	0		k	m	/	h							
2	-	4	0		k	m	/	h							
3	-	5	0		k	m	/	h							
		[	A	]	A	b	o	r	t						
		[	C	]	S	t	o	r	e						

4.3.6 CALIBRATION OF THE CLUTCH PEDAL

NOTE

This operation must be carried out with the engine off and the parking brake applied.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

```
      MAIN MENU
= = = = = = = = = = = = = = =
1 - Monitors
2 - Calibrations
3 - Test
4 - Alarm list
[E] Exit
```

3 - Press “*1 - Transmission*”.

```
CALIBRATION MENU
= = = = = = = = = = = = = = =
1 - Transmission
2 - PTO
3 - ASM
4 - Lift
5 - Suspension
6 - System
7 - CAN
8 - Distributor
9 - Engine
[E] Exit
```

4 - Press “*2 - Calibrations*”.

```
    TRANSMISSION
= = = = = = = = = = = = = = =
1 - Configuration
2 - Calibration
[E] Exit
```

5 - Press "*1-Clutch Pedal*".

```
  CALIBRATION
==============
1-Clutch Pedal
2-Main Clutch
3-FRRS
[E] Exit
```

6 - Press "*C*" then slowly depress and release the clutch pedal.

7 - If calibration was successful, the following message will be displayed:

```
Press the clutch pedal
slowly to end of travel,
then release the pedal
slowly and bring it back
to the starting position
[C] Start calib.
[E] Exit
```

```
Calibration
successful
```

8 - If the calibration procedure was not completed successfully, one of the following messages will be displayed:

- Information interpretation error.

```
Communication
error
```

- Operator procedure error.

```
Abnormal
Procedure
stop
```

- Calibration value outside minimum or maximum parameters.

```
TCU calibration
error
```

- The configuration was not carried out because the engine was running.

```
Configuration
possible only
if engine
stopped
```

9 - Press "*E*" to return to the "*CALIBRATIONS*" menu and carry out the main clutch calibration operation (for details, see "4.3.7 CALIBRATION OF THE MAIN CLUTCH" starting from point 5).

4.3.7 CALIBRATION OF THE MAIN CLUTCH

NOTE

To carry out the calibration of the main clutch, bring the transmission oil temperature to about 40 °C and position the tractor on a flat asphalt surface with at least 10 metres of free space ahead.

Put the transmission into neutral by moving the shuttle lever to the "NEUTRAL" position, engage third gear, check that the gearbox is in ROAD mode and that the parking brake is released.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

3 - Press “*1 - Transmission*”.

4 - Press “*2 - Calibrations*”.

```
    MAIN MENU
= = = = = = = = = = = = = = =
1 - Monitors
2 - Calibrations
3 - Test
4 - Alarm list
[E] Exit
```

```
CALIBRATION MENU
= = = = = = = = = = = = = = =
1 - Transmission
2 - PTO
3 - ASM
4 - Lift
5 - Suspension
6 - System
7 - CAN
8 - Distributor
9 - Engine
[E] Exit
```

```
  TRANSMISSION
= = = = = = = = = = = = = = =
1 - Configuration
2 - Calibration
[E] Exit
```

5 - Press "*2-Main Clutch*".

```
   CALIBRATION
==========
1-Clutch Pedal
2-Main Clutch
3-FRRS
[E] Exit
```

6 - Press "*C*" and move the shuttle lever to "FORWARD".

7 - The tractor will move forward in jerks until the screen indicating the termination of the procedure appears.

```
Press the clutch pedal slowly to end of travel, then release the pedal slowly and bring it back to the starting position
[C] Start calib.
[E] Exit
```

```
Calibration
successful
```

8 - If the calibration procedure was not completed successfully, one of the following messages will be displayed:

- Error in the interpretation of the information by the transmission control unit (transmission error on CANBUS).

```
Communication
error
```

- Operator procedure error.

```
Abnormal
Procedure
stop
```

- Calibration not performed because basic parameters were not observed (engine speed, handbrake released, and direction of the shuttle lever.

```
TCU calibration
error
```

9 - Press "*E*" to return to "*CALIBRATIONS*" menu and perform the calibration of the field/road sensor (for details, see "4.3.8 CALIBRATION OF THE FIELD/ ROAD SENSOR" starting from point 5).

4.3.8 CALIBRATION OF THE FIELD/ROAD SENSOR

NOTE

To calibrate the FIELD/ROAD sensor, the engine must be running at idle speed and the gear lever must be in neutral.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

```
    MAIN MENU
= = = = = = = = = = = = = = =
1 - Monitors
2 - Calibrations
3 - Test
4 - Alarm list
[E] Exit
```

3 - Press “*1 - Transmission*”.

```
CALIBRATION MENU
= = = = = = = = = = = = = = =
1 - Transmission
2 - PTO
3 - ASM
4 - Lift
5 - Suspension
6 - System
7 - CAN
8 - Distributor
9 - Engine
[E] Exit
```

4 - Press “*2 - Calibrations*”.

```
  TRANSMISSION
= = = = = = = = = = = = = = =
1 - Configuration
2 - Calibration
[E] Exit
```

5 - Press “*3-FRRS*”.

```
  CALIBRATION
==========
1-Clutch Pedal
2-Main Clutch
3-FRRS
[E] Exit
```

6 - This message will appear to indicate that the automatic calibration procedure has been started.

7 - If calibration was successful, the following message will be displayed

```
Calibration
successful
```

```
Wait for
communication
```

8 - If the calibration procedure was not completed successfully, one of the following messages will be displayed:

- Error in the interpretation of the information by the transmission control unit (transmission error on CANBUS).

```
Communication
error
```

- Operator procedure error.

```
Abnormal
procedure
stop
```

- The calibration was not performed because the engine was not running.

```
TCU calibration
error
```

9 - Press "*E*" to return to "*CALIBRATIONS*" menu and perform the calibration of the field/road sensor (for details, see "4.3.9 CLEARING ALL ALARMS").

4.3.9 CLEARING ALL ALARMS

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*4 - ALARMS*”.

		M	A	I	N		M	E	N	U					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	M	o	n	i	t	o	r	s						
2	-	C	a	l	i	b	r	a	t	i	o	n	s		
3	-	T	e	s	t										
4	-	A	l	a	r	m		l	i	s	t				
		[	E	]		E	x	i	t						

3 - Press “*9 - Deletion*”.

		A	L	A	R	M		M	E	N	U				
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	H	L	H	P		a	c	t	i	v	e			
2	-	H	L	H	P		p	a	s	s	i	v	e		
3	-	E	n	g	i	n	e		a	c	t	i	v	e	
4	-	E	n	g	i	n	e		p	a	s	s	i	v	e
5	-	T	r	a	n	s	m	.		a	c	t	i	v	e
6	-	T	r	a	n	s	m	.	p	a	s	s	i	v	e
9	-	E	r	a	s	e		a	l	a	r	m			
		[	E	]		E	x	i	t						

4 - Press “*3*”.

5 - The following message will be displayed:

	A	l	a	r	m		a	r	e		b	e	e	n	
				e	r	a	s	e	d						

6 - Press "*E*" three times to return to the "CALIBRATIONS" menu and turn the starter key to "O" (OFF).

		E	R	A	S	E		A	L	A	R	M			
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	H	L	H	P		a	l	a	r	m				
2	-	E	n	g	i	n	e		a	l	a	r	m		
3	-	T	r	a	n	s	.		a	l	a	r	m		
4	-	A	r	m	r	e	s	t		a	l	a	r	m	
		[	E	]		E	x	i	t						

4.4 RENEWING THE HLHP CONTROL UNIT (VALID UP TO SOFTWARE SC.0038.AC)

Each time the HLHP control unit is renewed, the operator must carry out the following operations:

1 - Initialization of the HLHP control unit
2 - Configure the system for presence of front PTO (only if installed)
3 - Enable the ASM system (only if installed)
4 - Calibrate the steering angle sensor (only with ASM)
5 - Configure the system for presence of radar (only if installed)
6 - Calibrate the low and high positions of the lift
7 - Configure the system for the presence of front axle suspension (if installed)
8 - Set the Infocenter display language
9 - Setting the Infocenter display language

CAUTION

On completion of the operations, power must be switched off and then back on from the ignition key to save the parameter settings.

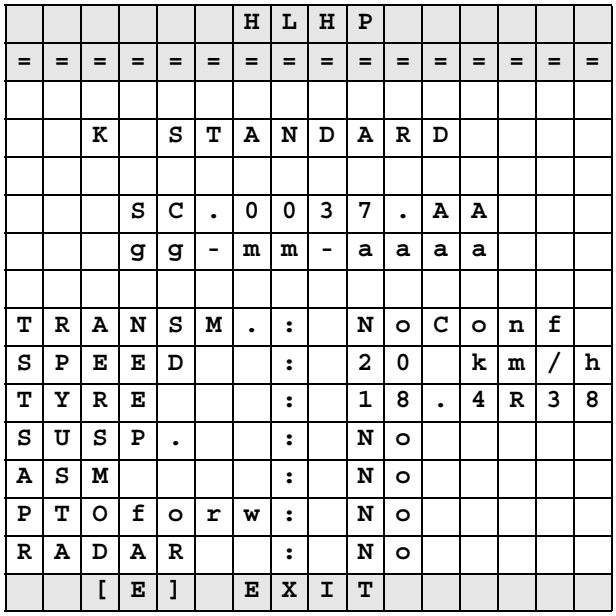
The purpose of sensor calibration is to inform the control unit of the correct limit values for the up and down movements of the lift and of the value read by the steering angle sensor when the wheels are in the straight-ahead position.
To perform the calibration, connect the ART to the connector located in the fusebox in the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu and proceed as described below.

NOTE

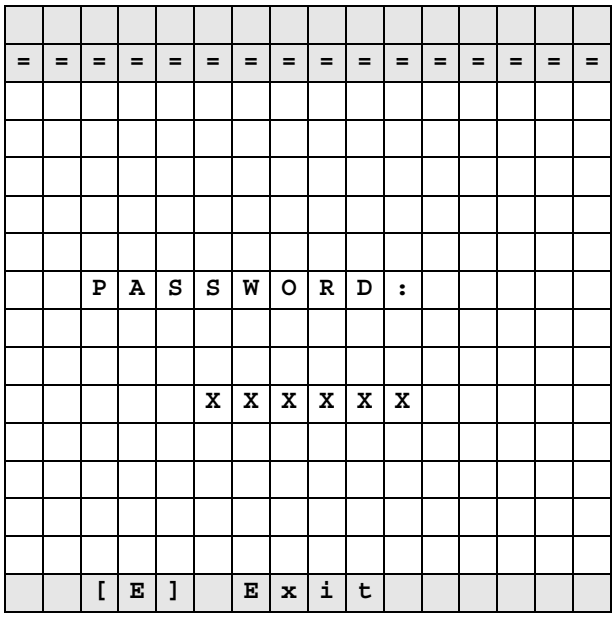
Unless otherwise specified, these operations must be carried out with the engine stopped, the parking brake on and the shuttle lever in neutral.

4.4.1 INITIALIZATION OF THE HLHP CONTROL UNIT

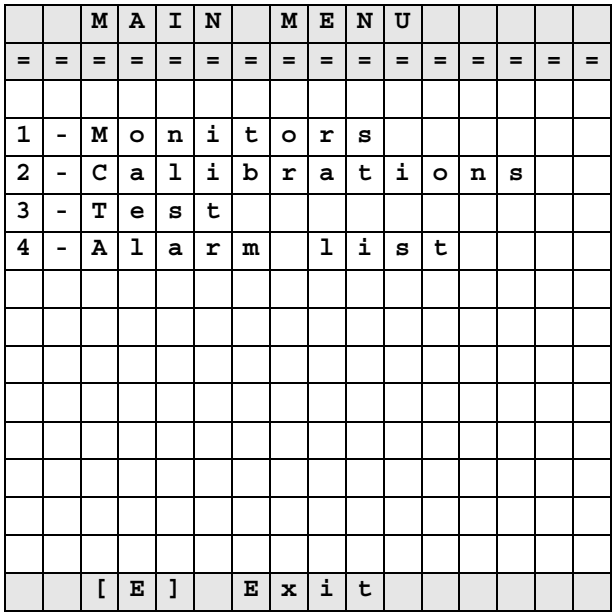
1 - From the control unit opening menu press "*0*" twice.



2 - At the password prompt, press in sequence “C”, “1”, “B”, “0”, “9”, “0”.

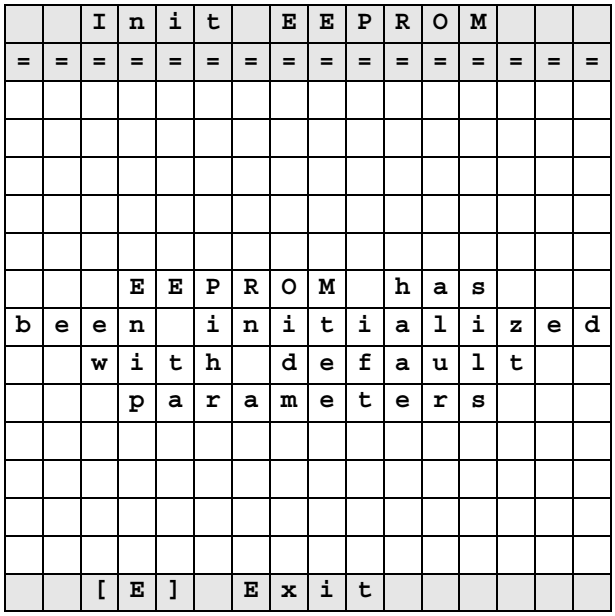


3 - Press "*E*" once to return to the main menu.



4 - Press “*0*” and wait for the screen indicating that control unit initialisation has been completed correctly.

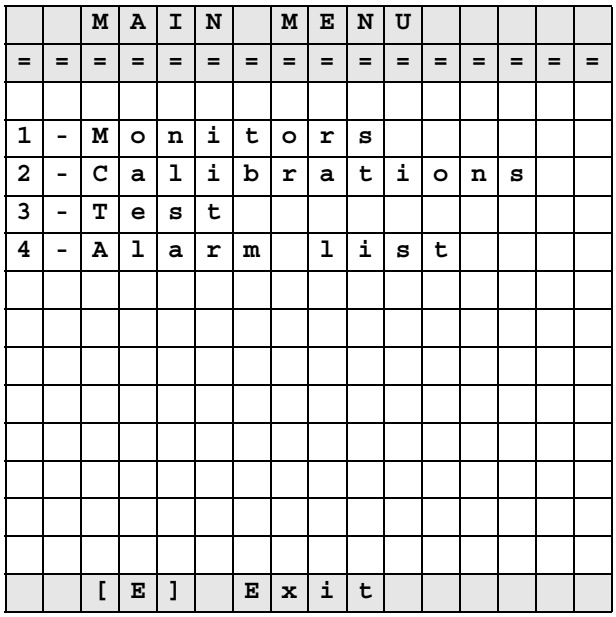
5 - Press “*E*” turn the starter key to “*O*” (OFF) and then back to “*I*” (ON) and proceed with the calibration of the sensors and configuration of the options.



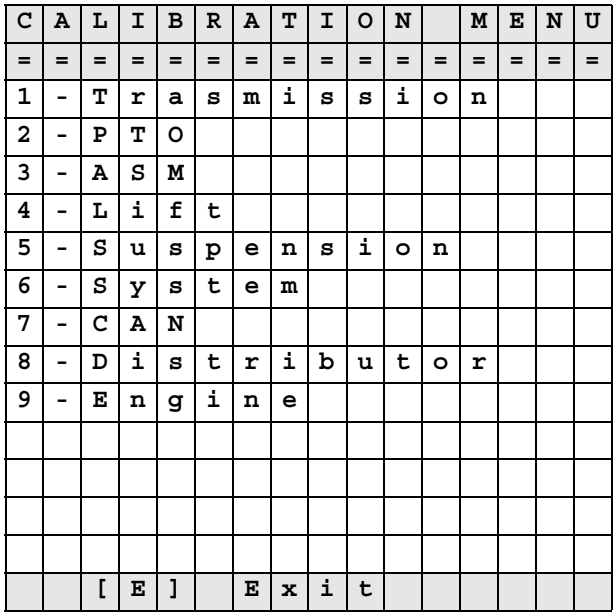
4.4.2 CONFIGURING THE SYSTEM FOR THE PRESENCE OF THE FRONT PTO (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

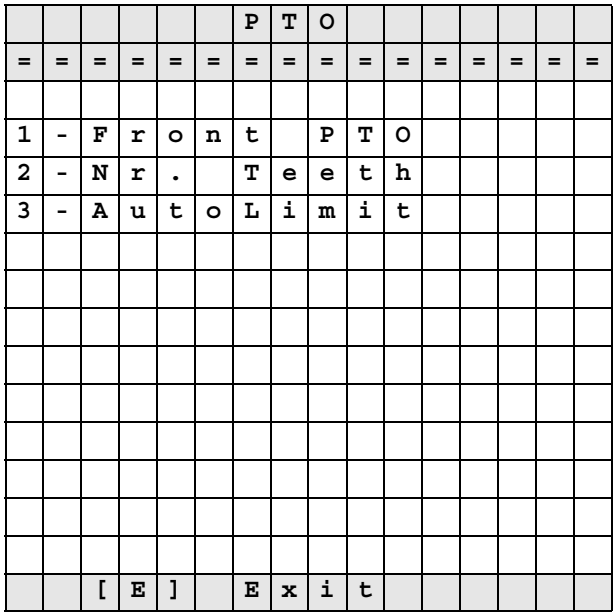
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*2 - PTO*”.



4 - Press “*1-Front PTO* ”.

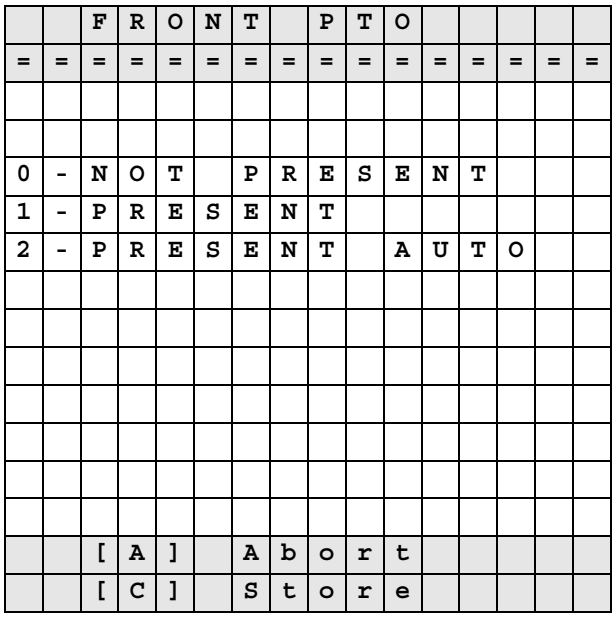


5 - Press "*1*" to enable operation of the front PTO and press "*C*" to save the setting.

NOTE

- The option "*2 - AUTO PRESENT*" must never be used.
- If you select the wrong option by mistake, press "*A*" to cancel.

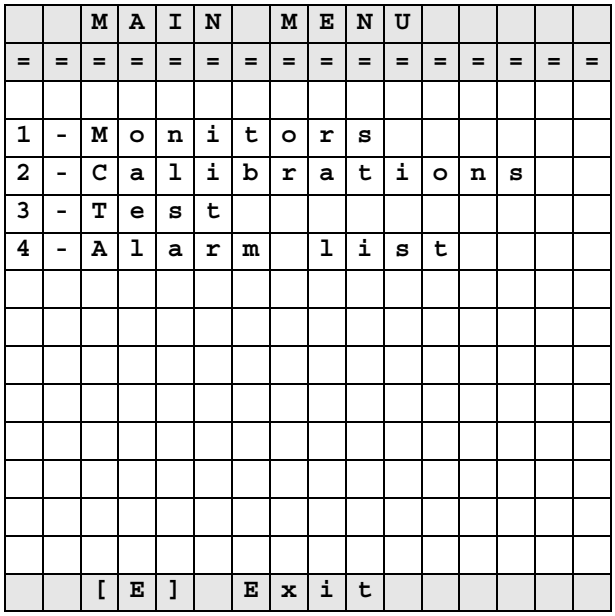
6 - Press "*E*" to return to the "CALIBRATIONS" menu and carry out the procedure to enable the ASM system (for details, see "4.4.3 ENABLING THE ASM SYSTEM (ONLY IF INSTALLED)" starting from point 3) or to configure the system for the presence of the radar (for details, see "4.4.5 CONFIGURING THE SYSTEM FOR THE PRESENCE OF RADAR (ONLY IF INSTALLED)" starting from point 3) or to calibrate the high and low positions of the lift (for details, see "4.4.6 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT" starting from point 4).



4.4.3 ENABLING THE ASM SYSTEM (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press "*3 - ASM*".

C	A	L	I	B	R	A	T	I	O	N		M	E	N	U
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n			
2	-	P	T	O											
3	-	A	S	M											
4	-	L	i	f	t										
5	-	S	u	s	p	e	n	s	i	o	n				
6	-	S	y	s	t	e	m								
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r			
9	-	E	n	g	i	n	e								
		[	E	]		E	x	i	t						

4 - Press "*1-Enabling.*".

						A	S	M							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	E	n	a	b	l	e								
2	-	D	T	/	S	t	e	e	r						
3	-	D	i	f	/	S	t	e	e	r					
4	-	D	T	/	S	p	e	e	d						
5	-	D	i	f	/	S	p	e	e	d					
6	-	N	e	w		a	x	l	e						
7	-	S	t	e	e	r	C	a	l	.					
		[	E	]		E	x	i	t						

5 - Press "*1*" to enable the system then press "*C*" to save the setting and return to the "ASM" menu.

NOTE

If you select the wrong option by mistake, press "*A*" to cancel.

6 - Carry out the procedure to enable the ASM (for details, see "4.4.4 CALIBRATION OF THE STEERING ANGLE SENSOR (WITH ASM ONLY)" starting from point 3).

						A	S	M							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
0	-	N	O	T		P	R	E	S	E	N	T			
1	-	P	R	E	S	E	N	T							
		[	A	]		A	b	o	r	t					
		[	C	]		S	t	o	r	e					

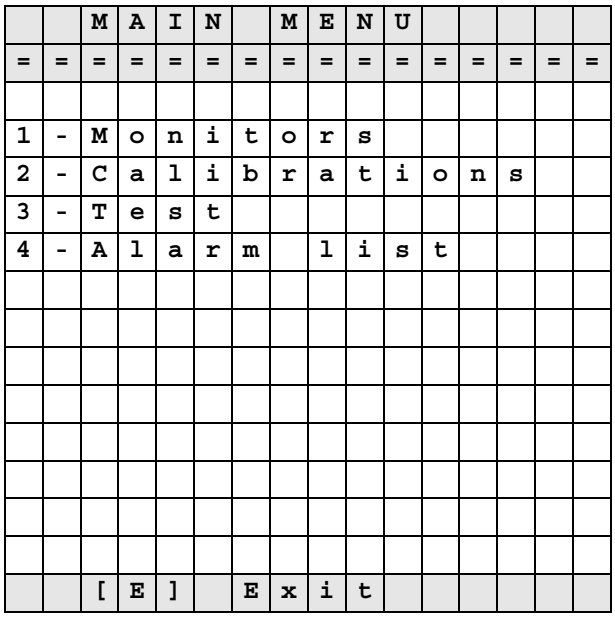
4.4.4 CALIBRATION OF THE STEERING ANGLE SENSOR (WITH ASM ONLY)

NOTE

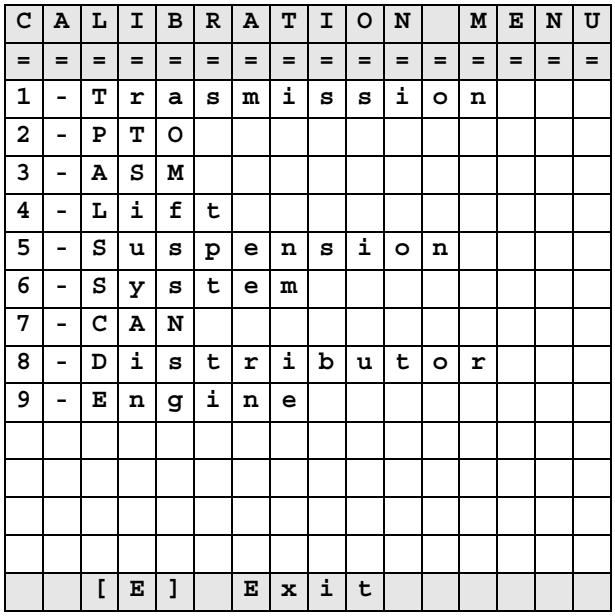
To carry out this calibration, start the engine and keep it running at idle speed.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

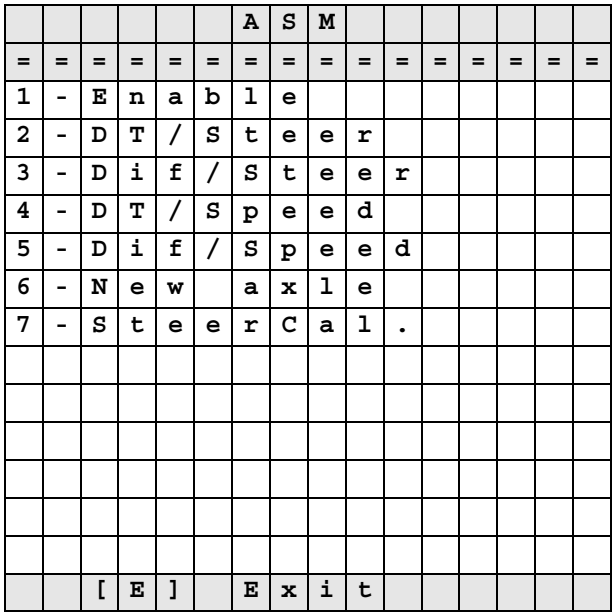
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*3 - ASM*”.

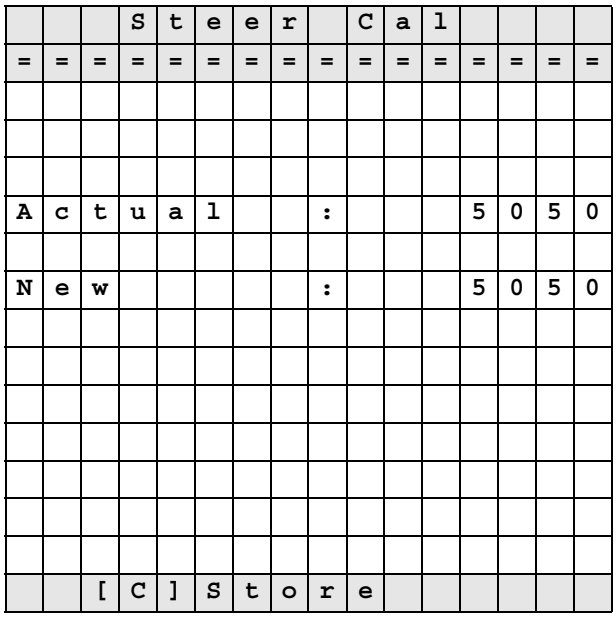


4 - Press “*7-Steering Cal.*”.



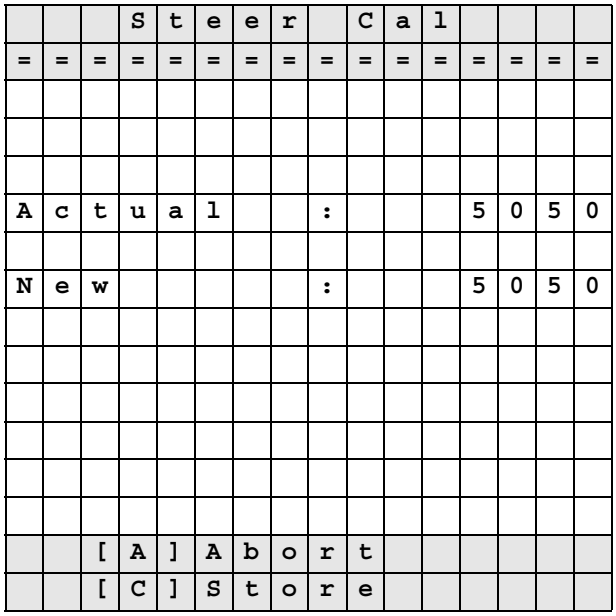
5 - Turn the steering so that the front wheels are aligned in the straight-ahead position, then press "*E*" to save the value.

NOTE
To facilitate wheel alignment, this calibration can be performed with the tractor in motion.



6 - The following screen will appear, and if the parameter was not set correctly you can press "*A*" to cancel the operation, restore the previous value and return to the "ASM" menu.

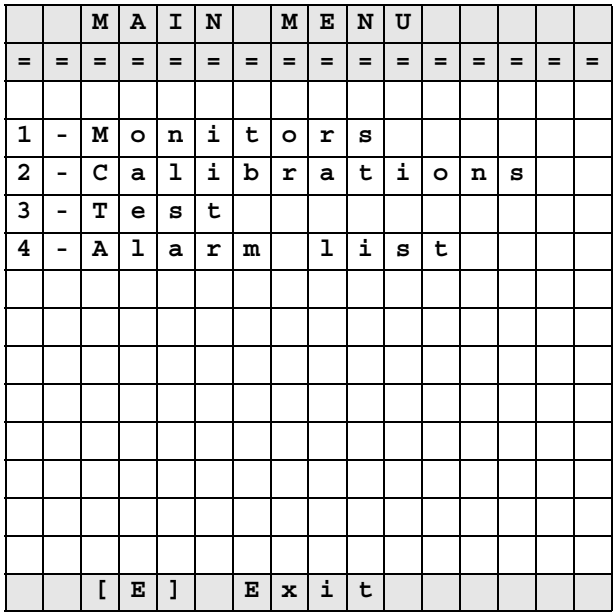
7 – Press "*C*" to confirm the value and return to the " ASM " menu then press "*E*" to return to the "Calibrations" menu and configure the system for the presence of radar (for details, see "4.4.5 CONFIGURING THE SYSTEM FOR THE PRESENCE OF RADAR (ONLY IF INSTALLED)" starting from point 3) or to calibrate the high and low positions of the lift (for details, see "4.4.6 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT" starting from point 3).



4.4.5 CONFIGURING THE SYSTEM FOR THE PRESENCE OF RADAR (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press "*4 - Lift*".

C	A	L	I	B	R	A	T	I	O	N		M	E	N	U
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n			
2	-	P	T	O											
3	-	A	S	M											
4	-	L	i	f	t										
5	-	S	u	s	p	e	n	s	i	o	n				
6	-	S	y	s	t	e	m								
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r			
9	-	E	n	g	i	n	e								
		[	E	]		E	x	i	t						

4 - Press "*1-Options*".

P	a	r	a	m	e	t	e	r	s		M	e	n	u	'
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	O	p	t	i	o	n	s							
2	-	C	a	l	i	b	r	a	t	i	o	n	s		
		[	E	]		E	x	i	t						

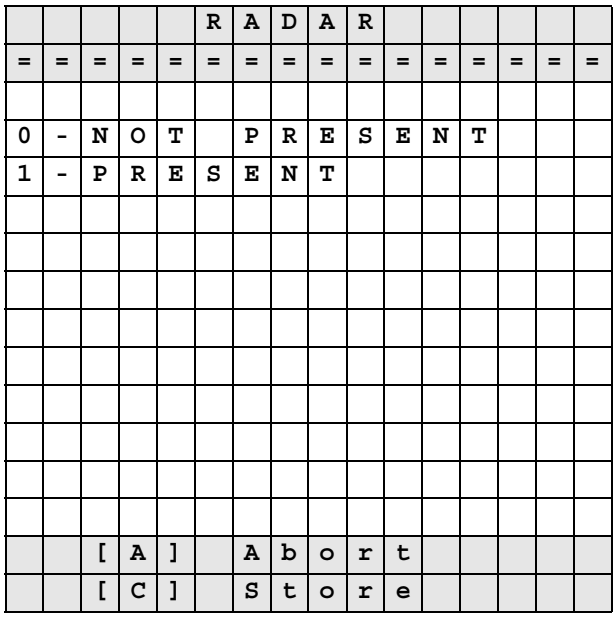
5 - Press "*8*".

				O	P	T	I	O	N	S					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	u	t	o	D	r	o	p						
2	-	S	e	n	s	i	t	i	v	.					
3	-	E	x	t	S	e	n	s	o	r					
4	-	M	I	X		m	o	d	e						
8	-	R	a	d	a	r	E	n	a	b	l	e			
9	-	R	a	d	a	r		K							
		[	E	]		E	x	i	t						

6 - Press "*1*" to enable the radar and press "*C*" to save the setting.

7 - If the parameter was not set correctly, press *A*" to cancel the operation, restore the previous value and return to the "PARAMETERS" menu.

8 - Press "*C*" to return to the "PARAMETERS" menu, press "*E*" once and carry out the procedure for calibration of the high and low positions of the lift (for details, see "4.4.6 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT" starting from point 3).



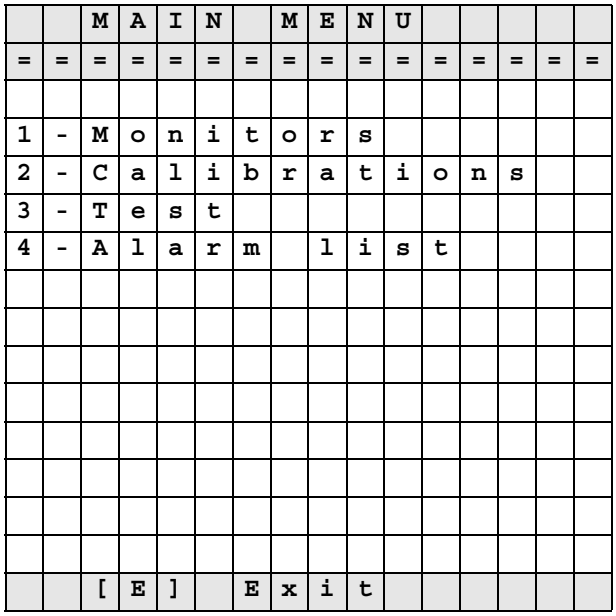
4.4.6 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT

NOTE

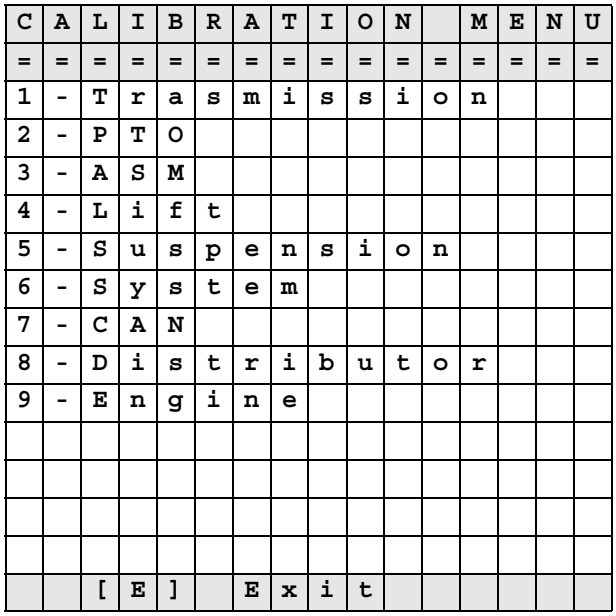
To carry out this calibration, start the engine and keep it running at idle speed.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

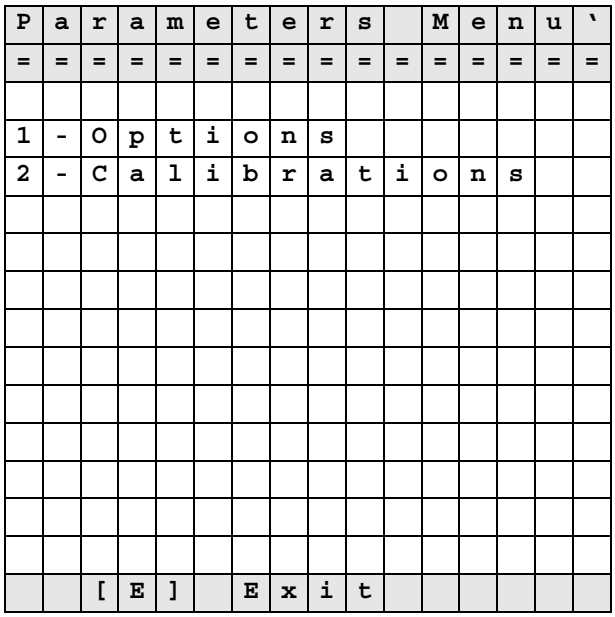


3 - Press “*4 - Lift*”.



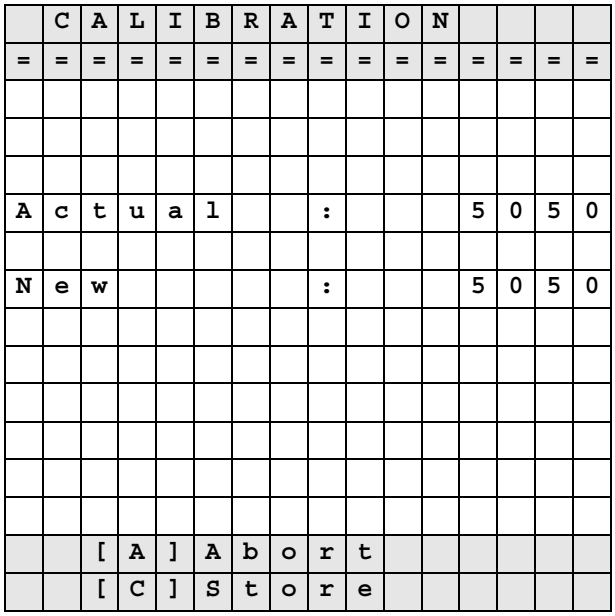
4 - Press "*2-Calibrations*".

5 - Unlock the lift by holding pressed the Lock key and holding it down. When the frequency at which the red LED is flashing changes, the lift is unlocked.



6 - Press "*1*".

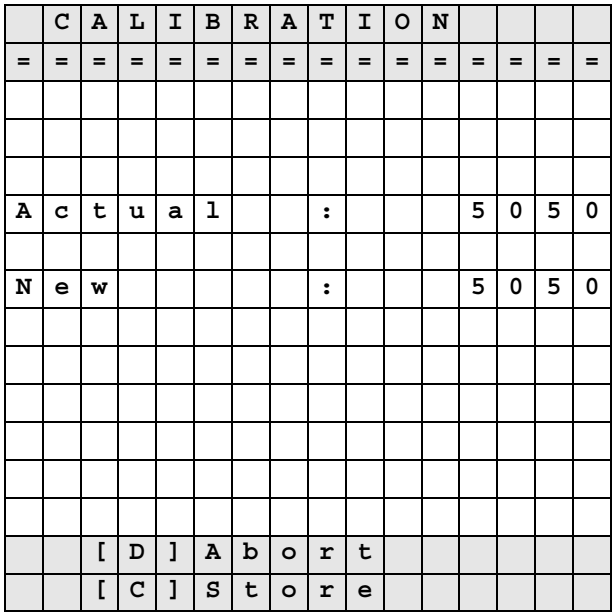
7 - Press "*2*" and the ART® will display the following screen:



8 - Press the lift 'Down' button to lower the lift to its full depth (while the lift is being lowered, the "new" value should continuously increase).

9 - When the lift has arrived at its mechanical travel limit, press "*E*" to save the value.

10 - If the operation was not carried out correctly, the technician can cancel it by pressing "*A*" and restore the previous value, whereas pressing "*C*", will confirm the new setting and cause the "CALIBRATIONS" menu to reappear.



11 - Press “*2*”.

12 - Press the lift 'Up' button to raise the lift to its full height (while the lift is being raised the "new" value should continuously decrease).

13 - When the lift has reached its upper travel limit, press the 'Down' button until the voltage reading is approximately 0.35V less than the value recorded at the travel limit, then press “*E*” to save the value to the memory.

14 - If the operation was not carried out correctly, the technician can cancel it by pressing “*D*” and restore the previous value, whereas pressing “*C*”, will confirm the new setting and cause the "CALIBRATIONS” menu to reappear.

```
   Calibrazioni
=  =  =  =  =  =  =  =  =  =  =  =  =  =  =  =
Attuale   :        5050
Nuovo     :        5050
[D]Annulla
[C]Conferma
```

15 - Press “*E*” twice to return to the "CALIBRATIONS" menu to configure the system for the presence of front axle suspension (for details, see "4.4.7 CONFIGURING THE SYSTEM FOR THE PRESENCE OF FRONT AXLE SUSPENSION (ONLY IF INSTALLED)" starting from point 3) or to set the language on the INFOCENTER display (for details, see "4.4.8 SETTING THE INFOCENTER DISPLAY LANGUAGE" starting from point 3).

4.4.7 CONFIGURING THE SYSTEM FOR THE PRESENCE OF FRONT AXLE SUSPENSION (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the right compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

```
   MAIN MENU
=  =  =  =  =  =  =  =  =  =  =  =  =  =  =  =
1 - Monitors
2 - Calibrations
3 - Test
4 - Alarm list
[E] Exit
```

3 - Press “*5 - Suspensions*”.

C	A	L	I	B	R	A	T	I	O	N		M	E	N	U
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n			
2	-	P	T	O											
3	-	A	S	M											
4	-	L	i	f	t										
5	-	S	u	s	p	e	n	s	i	o	n				
6	-	S	y	s	t	e	m								
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r			
9	-	E	n	g	i	n	e								
		[	E	]		E	x	i	t						

4 - Press “*1*”.

			S	U	S	P	E	N	S	I	O	N			
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	E	n	a	b	l	e								
2	-	V	e	l	o	c	i	t	y						
3	-	T	y	p	e										
		[	E	]		E	x	i	t						

5 - Press "*1*" to enable the radar and press "*C*" to save the value.

6 - If the parameter was not set correctly, you can press "*A*" to cancel the operation, restore the previous value and return to the "SUSPENSIONS" page.

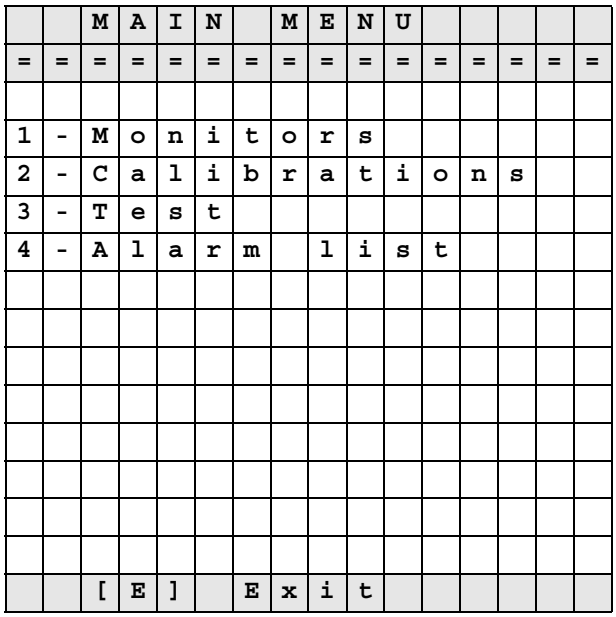
7 - Carry out the procedure to set the Infocenter display language (for details, see ""4.4.8 SETTING THE INFOCENTER DISPLAY LANGUAGE" starting from point 3).

			S	U	S	P	E	N	S	I	O	N			
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
0	-	N	O	T		P	R	E	S	E	N	T			
1	-	P	R	E	S	E	N	T							
		[	A	]		A	b	o	r	t					
		[	C	]		S	t	o	r	e					

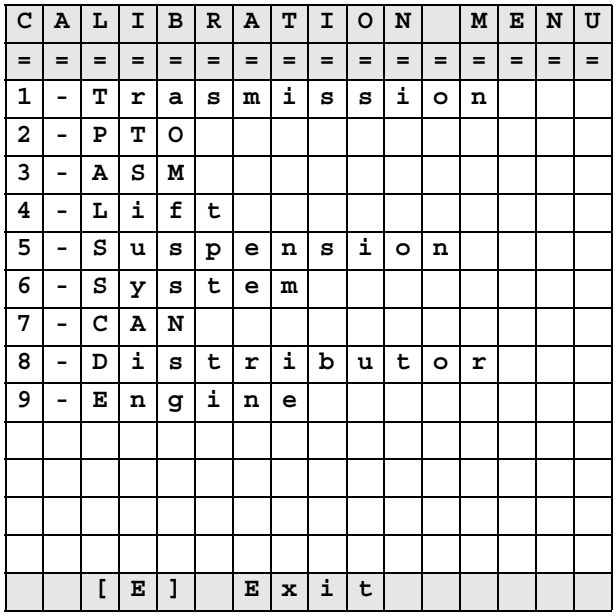
4.4.8 SETTING THE INFOCENTER DISPLAY LANGUAGE

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

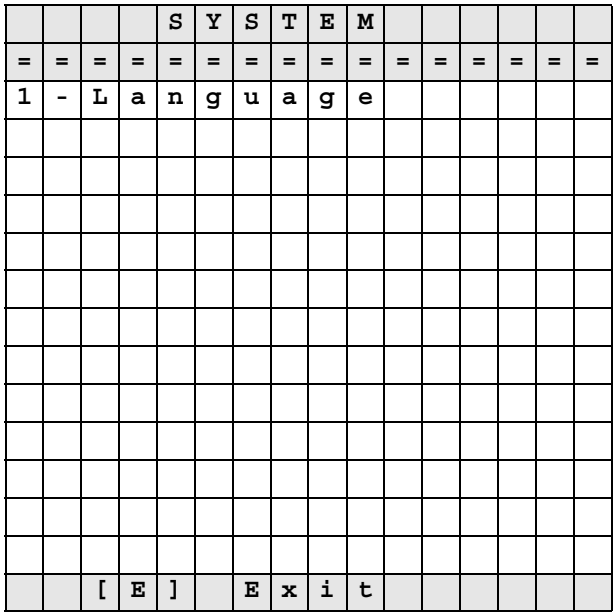
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*6 - System*”.



4 - Press “*1*”.



5 - Press the key corresponding to the desired language choosing from the options displayed, and press "*C*" to save the value and return to the "SYSTEM" menu.

6 - If the operation was not carried out correctly, press "*A*" to cancel, restore the previous value and return to the "SYSTEM" menu.

```
      L A N G U A G E
= = = = = = = = = = = = = = =
0 - I t a l i a n o
1 - E n g l i s h
2 - F r a n c a i s
3 - D e u t s c h
4 - E s p a n o l
5 - P o r t u g u e s e
[ A ]   A b o r t
[ C ]   S t o r e
```

4.4.9 CLEARING ALL ALARMS

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press *"4 - ALARMS"*.

```
    M A I N   M E N U
= = = = = = = = = = = = = = =
1 - M o n i t o r s
2 - C a l i b r a t i o n s
3 - T e s t
4 - A l a r m   l i s t
[ E ]   E x i t
```

3 - Press “*9 - Deletion*”.

```
  A L A R M   M E N U
= = = = = = = = = = = = = = =
1 - H L H P   a c t i v e
2 - H L H P   p a s s i v e
3 - E n g i n e   a c t i v e
4 - E n g i n e   p a s s i v e
5 - T r a n s m .   a c t i v e
6 - T r a n s m . p a s s i v e
9 - E r a s e   a l a r m
[ E ]   E x i t
```

4 - Press “*3*”.

5 - The following message will be displayed:

	A	l	a	r	m		a	r	e		b	e	e	n	
				e	r	a	s	e	d						

6 - Press "*E*" three times to return to the "CALIBRATIONS" menu and turn the starter key to "O" (OFF).

		E	R	A	S	E		A	L	A	R	M		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	H	L	H	P		a	l	a	r	m			
2	-	E	n	g	i	n	e		a	l	a	r	m	
3	-	T	r	a	n	s	.		a	l	a	r	m	
4	-	A	r	m	r	e	s	t		a	l	a	r	m
		[	E	]		E	x	i	t					

4.5 RENEWING THE HLHP CONTROL UNIT (VALID UP TO SOFTWARE SC.0038.AD)

Each time the HLHP control unit is renewed, the operator must carry out the following operations:

1 - Initialization of the HLHP control unit
2 - Configuration of the tractor model
3 - System configuration for presence of front PTO (only if installed)
4 - Enable the ASM system (only if installed)
5 - Calibrate the steering angle sensor (only with ASM)
6 - Configure the system for presence of radar (only if installed)
7 - Calibrate low and high positions of the lift
8 - Configure the system for the presence of front axle suspension (if installed)
9 - Set the Infocenter display language
10 - Configure the association between control valve levers and auxiliary services (for versions with 4 control valves only)
11 - Setting the Infocenter display language

CAUTION

On completion of the operations, power must be switched off and then back on from the ignition key to save the parameter settings.

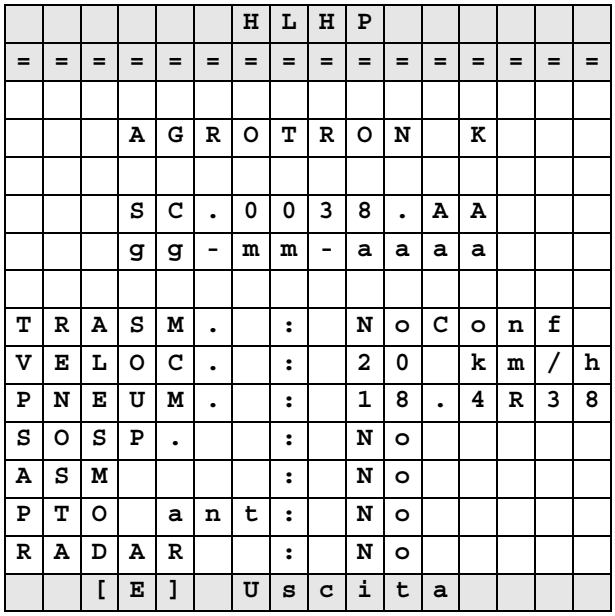
The purpose of sensor calibration is to inform the control unit of the correct limit values for the up and down movements of the lift and of the value read by the steering angle sensor when the wheels are in the straight-ahead position.
To perform the calibration, connect the ART to the connector located in the fusebox in the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu and proceed as described below.

NOTE

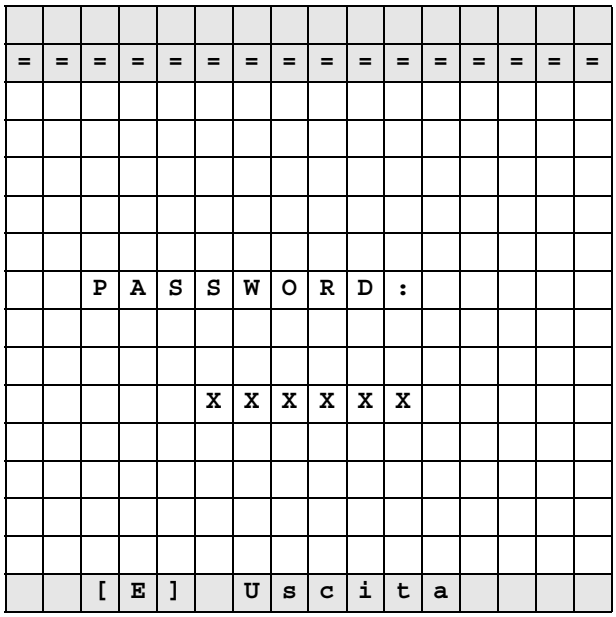
Unless otherwise specified, these operations must be carried out with the engine stopped, the parking brake on and the shuttle lever in neutral.

4.5.1 INITIALIZATION OF THE HLHP CONTROL UNIT

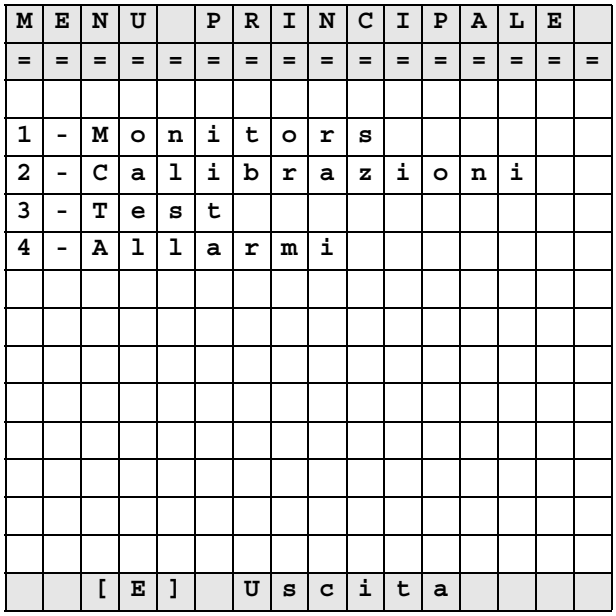
1 - From the control unit opening menu press "*0*" twice.



2 - At the password prompt, press in sequence “C”, “1”, “B”, “0”, “9”, “0”.

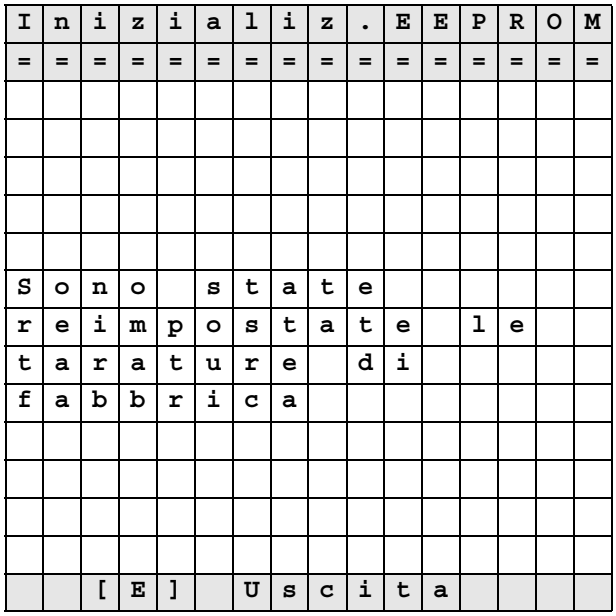


3 - Press "*E*" once to return to the main menu.



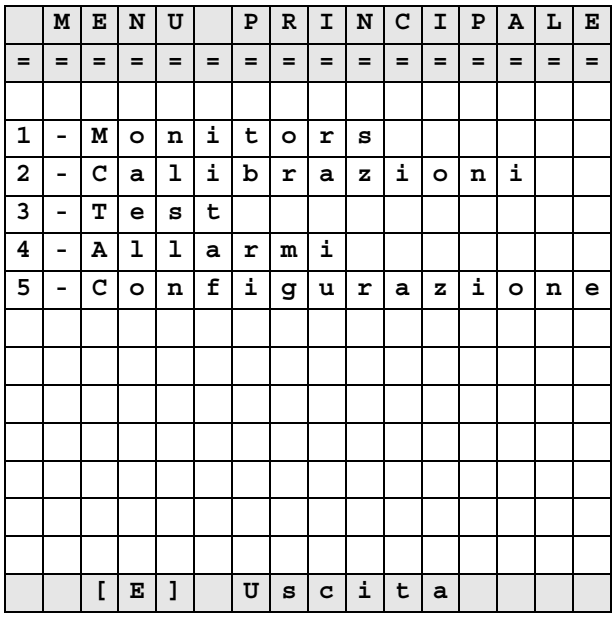
4 - Press “*0*” and wait for the screen indicating that control unit initialisation has been completed correctly.

5 - Press “*E*”, turn the starter key to “*O*” (OFF) and then back to “*I*” (ON) and proceed with the calibration of the tractor model (for details, see"4.5.2 CONFIGURATION OF THE TRACTOR MODEL".

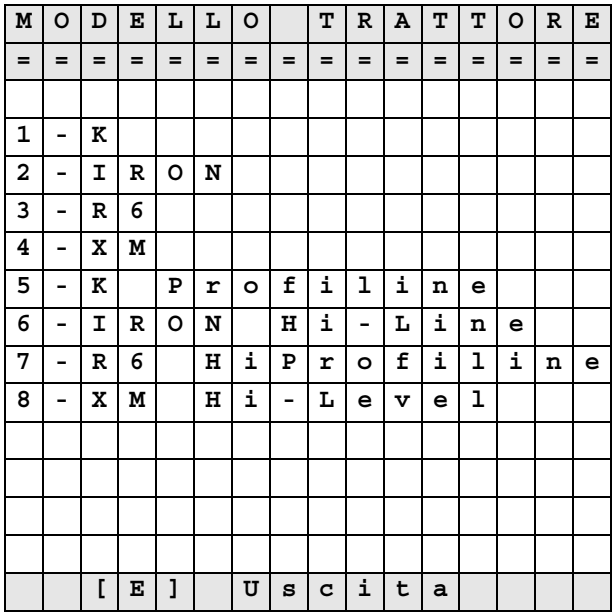


4.5.2 CONFIGURATION OF THE TRACTOR MODEL

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see «Connecting ART® to the HLHP control unit»).

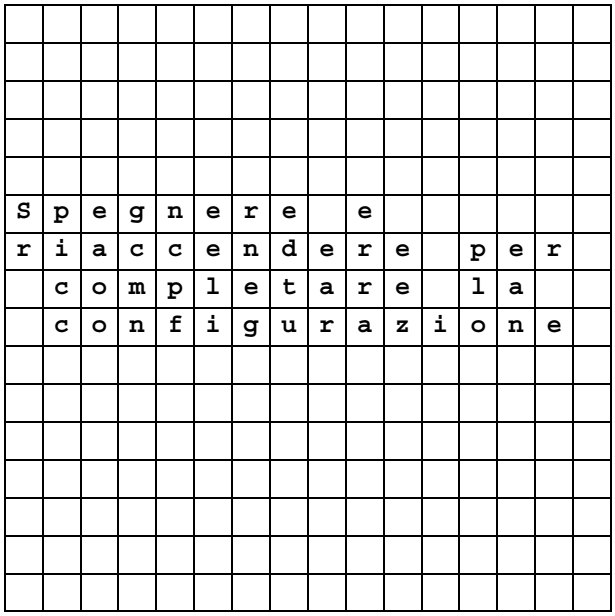


2 - From the “MAIN MENU” press “5” and the ART® will display the following screen:



3 - Press “5” to select the model corresponding to the tractor in use and the ART® will display the following screen:

4 - Turn the starter key to “O” (OFF) and then back to “I” (ON) and proceed with the calibration of the sensors and configuration of the options.



4.5.3 CONFIGURING THE SYSTEM FOR THE PRESENCE OF THE FRONT PTO (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

```
MENU PRINCIPALE
==========
1 - Monitors
2 - Calibrazioni
3 - Test
4 - Allarmi
[E] Uscita
```

3 - Press “*2 - PTO*”.

```
CALIBRAZIONI
==========
1 - Trasmissione
2 - PTO
3 - ASM
4 - Sollevatore
5 - Sospensioni
6 - Sistema
7 - CAN
8 - Distributori
9 - Motore
[E] Uscita
```

4 - Press “*1-Front PTO* ”.

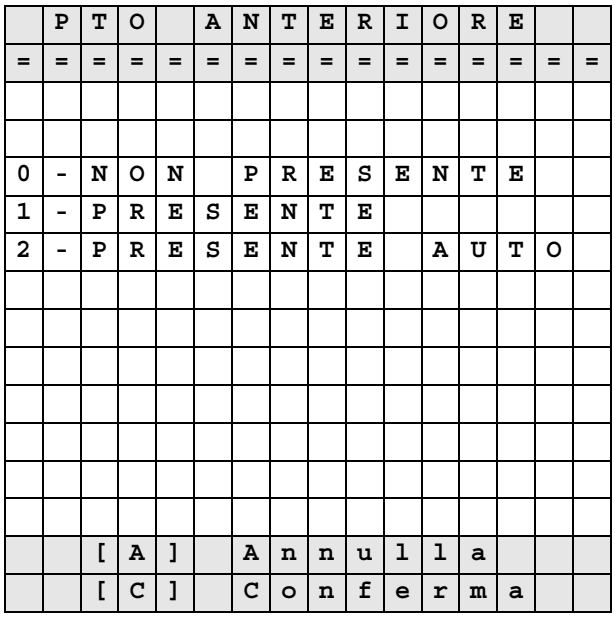
```
PTO
==========
1 - PTO Anter.
2 - DentiSens.
3 - SogliaAut
[E] Uscita
```

5 - Press "*1*" to enable operation of the front PTO and press "*C*" to save the setting.

NOTE

- The option "*2– - AUTO PRESENT* " must never be used.
- If you select the wrong option by mistake, press "*A*" to cancel.

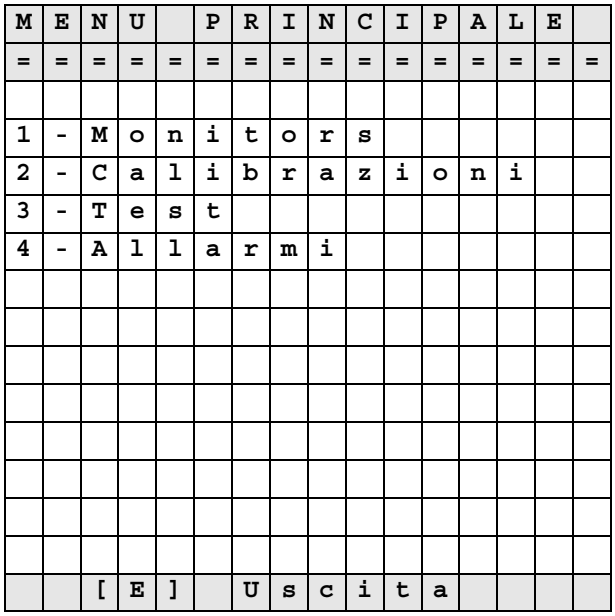
6 - Press "*E*" to return to the "CALIBRATIONS" menu and carry out the procedure to enable the ASM system (for details, see "4.4.3 ENABLING THE ASM SYSTEM (ONLY IF INSTALLED)" starting from point 3) or to configure the system for the presence of the radar (for details, see "4.4.5 CONFIGURING THE SYSTEM FOR THE PRESENCE OF RADAR (ONLY IF INSTALLED)" starting from point 3) or to calibrate the high and low positions of the lift (for details, see "4.4.6 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT" starting from point 4).



4.5.4 ENABLING THE ASM SYSTEM (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press "*3 - ASM*".

		C	A	L	I	B	R	A	Z	I	O	N	I	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n	e	
2	-	P	T	O										
3	-	A	S	M										
4	-	S	o	l	l	e	v	a	t	o	r	e		
5	-	S	o	s	p	e	n	s	i	o	n	i		
6	-	S	i	s	t	e	m	a						
7	-	C	A	N										
8	-	D	i	s	t	r	i	b	u	t	o	r	i	
9	-	M	o	t	o	r	e							
		[	E	]		U	s	c	i	t	a			

4 - Press "*1-Enabling.*".

						A	S	M						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	b	i	l	i	t	a	z	.				
2	-	D	T	/	S	t	e	r	z	o				
3	-	D	i	f	f	/	S	t	e	r	z	o		
4	-	D	T	/	V	e	l	.						
5	-	D	i	f	f	/	V	e	l	.				
6	-	N	u	o	v	o	A	s	s	a	l	e		
7	-	C	a	l	.	S	t	e	r	z	o			
		[	E	]		U	s	c	i	t	a			

5 - Press "*1*" to enable the system then press "*C*" to save the setting and return to the "ASM" menu.

NOTE

If you select the wrong option by mistake, press "*A*" to cancel.

6 - Carry out the procedure to enable the ASM (for details, see "4.4.4 CALIBRATION OF THE STEERING ANGLE SENSOR (WITH ASM ONLY)" starting from point 3).

						A	S	M						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
0	-	N	O	N		P	R	E	S	E	N	T	E	
1	-	P	R	E	S	E	N	T	E					
		[	A	]		A	n	n	u	l	l	a		
		[	C	]		C	o	n	f	e	r	m	a	

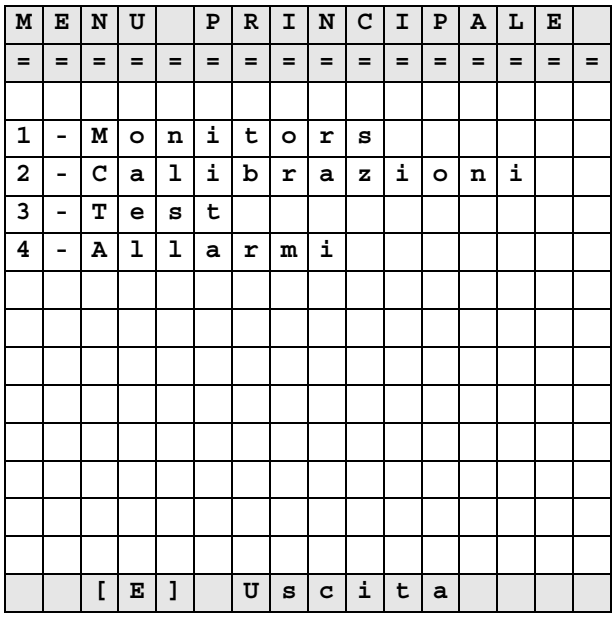
4.5.5 CALIBRATION OF THE STEERING ANGLE SENSOR (WITH ASM ONLY)

NOTE

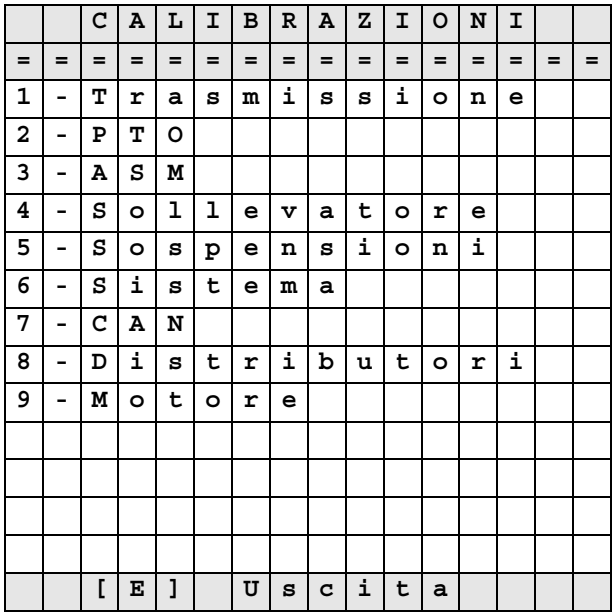
To carry out this calibration, start the engine and keep it running at idle speed.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

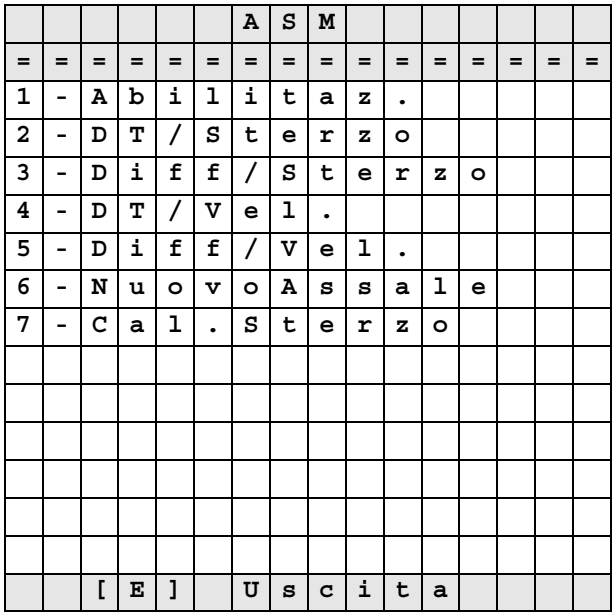
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*3 - ASM*”.

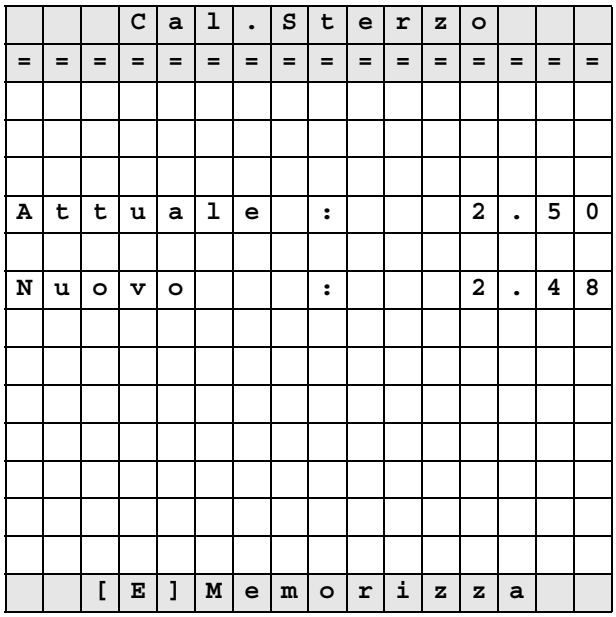


4 - Press “*7-Steering Cal.*”.



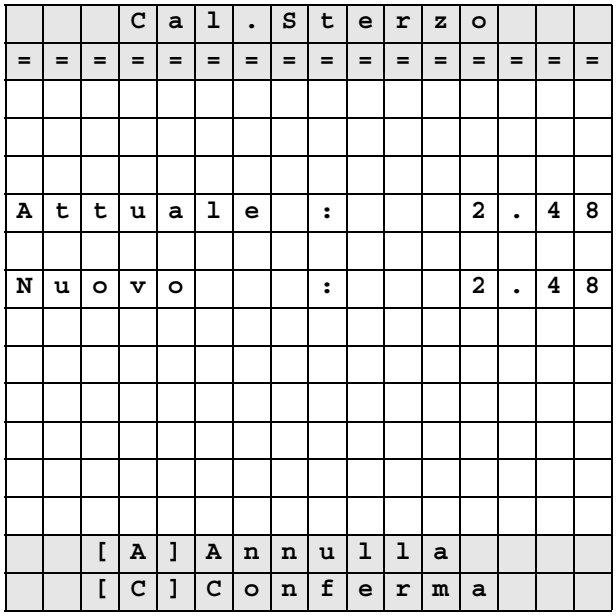
5 - Turn the steering so that the front wheels are aligned in the straight-ahead position, then press "*E*" to save the value.

NOTE
To facilitate wheel alignment, this calibration can be performed with the tractor in motion.



6 - The following screen will appear, and if the parameter was not set correctly you can press "*A*" to cancel the operation, restore the previous value and return to the "ASM" menu.

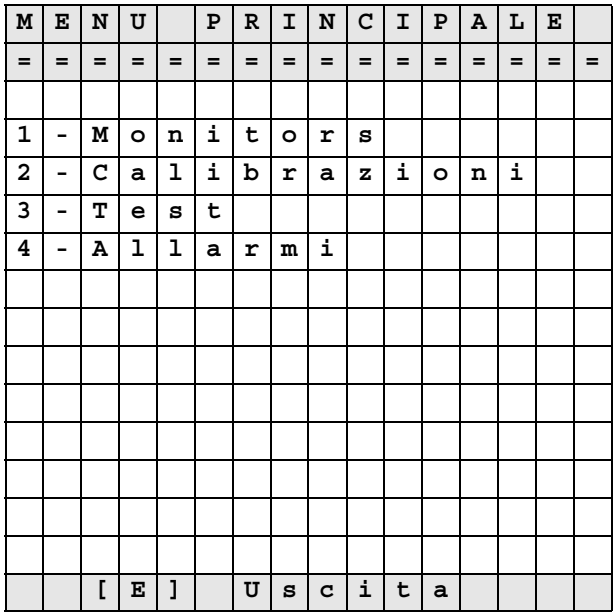
7 – Press "*C*" to confirm the value and return to the " ASM " menu then press "*E*" to return to the "Calibrations" menu and configure the system for the presence of radar (for details, see "4.4.5 CONFIGURING THE SYSTEM FOR THE PRESENCE OF RADAR (ONLY IF INSTALLED)" starting from point 3) or to calibrate the high and low positions of the lift (for details, see "4.4.6 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT" starting from point 3).



4.5.6 CONFIGURING THE SYSTEM FOR THE PRESENCE OF RADAR (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*4 - Lift*”.

		C	A	L	I	B	R	A	Z	I	O	N	I		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n	e		
2	-	P	T	O											
3	-	A	S	M											
4	-	S	o	l	l	e	v	a	t	o	r	e			
5	-	S	o	s	p	e	n	s	i	o	n	i			
6	-	S	i	s	t	e	m	a							
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r	i		
9	-	M	o	t	o	r	e								
		[	E	]		U	s	c	i	t	a				

4 - Press “*1-Options*”.

M	e	n	u	‘		P	a	r	a	m	e	t	r	i	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	O	p	z	i	o	n	i							
2	-	C	a	l	i	b	r	a	z	i	o	n	i		
3	-	C	a	l	i	b	.	P	o	t	e	n	z	.	
		[	E	]		U	s	c	i	t	a				

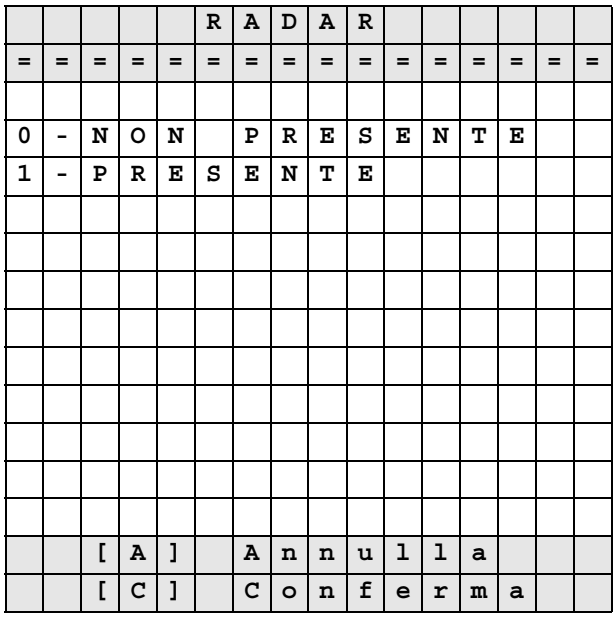
5 - Press “*8*”.

				O	P	Z	I	O	N	I					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	D	i	s	c	e	s	a	A	u	t	o	0	0	1
2	-	S	e	n	s	i	b	i	l	.			2	5	5
3	-	S	e	n	s	E	s	t	e	r	n	o	0	0	1
4	-	M	o	d	o		M	I	X				0	0	1
8	-	R	a	d	a	r							0	0	0
9	-	C	o	s	t	R	a	d	a	r		0	1	3	0
		[	E	]		U	s	c	i	t	a				

6 - Press "*1*" to enable the radar and press "*C*" to save the setting.

7 - If the parameter was not set correctly, press*A*" to cancel the operation, restore the previous value and return to the "PARAMETERS" menu.

8 - Press "*C*" to return to the "PARAMETERS" menu, press "*E*" once and carry out the procedure for calibration of the high and low positions of the lift (for details, see "4.4.6 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT" starting from point 3).



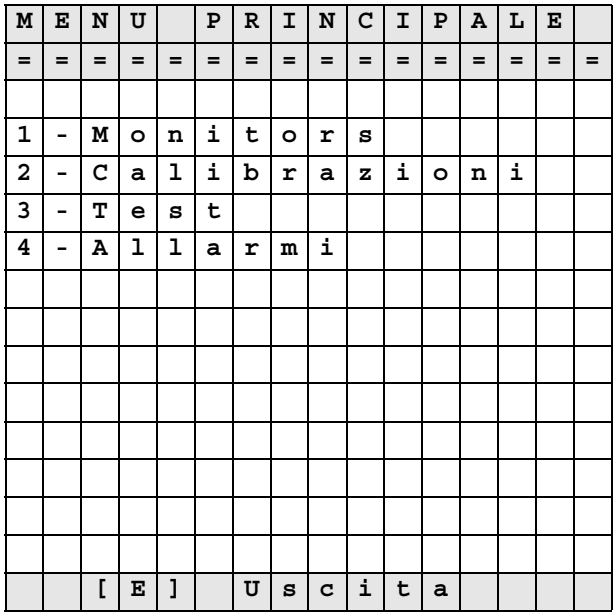
4.5.7 CALIBRATION OF THE HIGH AND LOW POSITIONS OF THE LIFT

NOTE

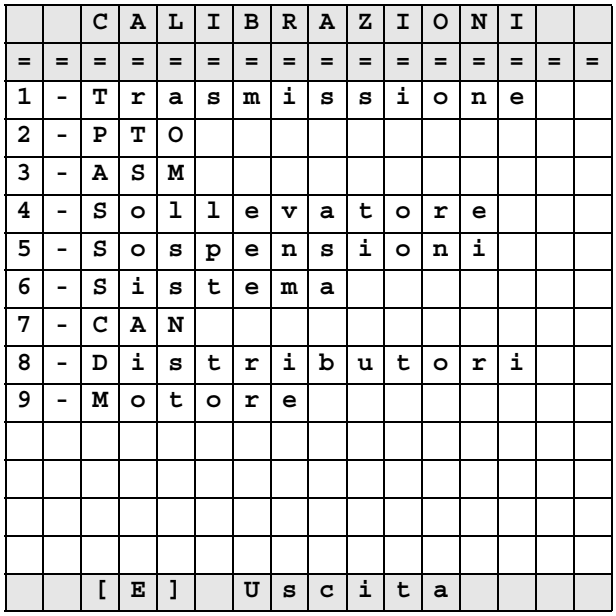
To carry out this calibration, start the engine and keep it running at idle speed.

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.

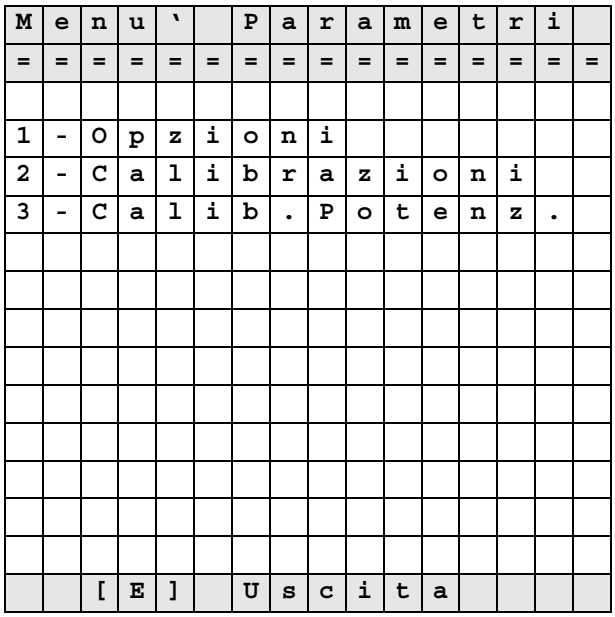


3 - Press “*4 - Lift*”.



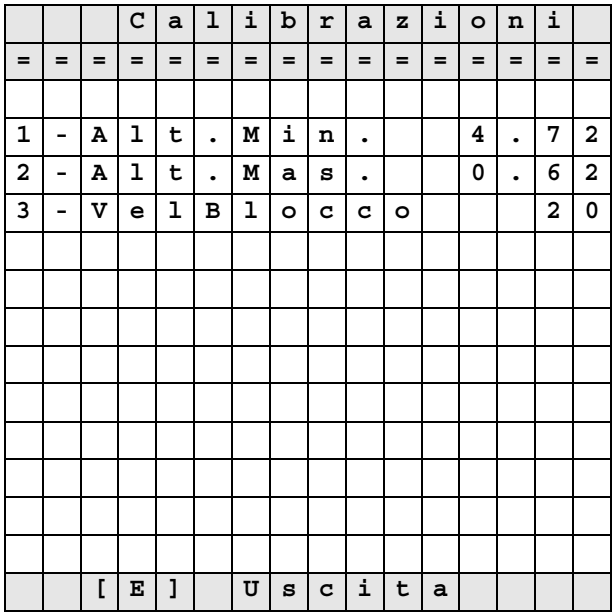
4 - Press "*2-Calibrations*".

5 - Unlock the lift by holding pressed the Lock key and holding it down. When the frequency at which the red LED is flashing changes, the lift is unlocked.



6 - Press "*1*".

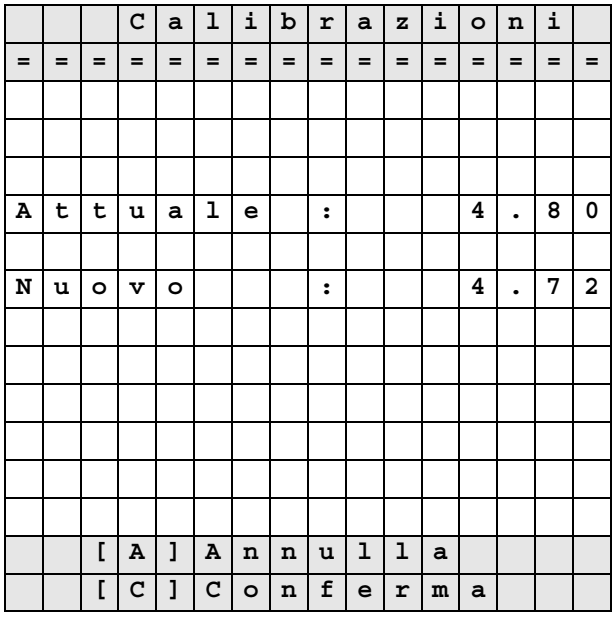
7 - Press "*2*" and the ART® will display the following screen:



8 - Press the lift 'Down' button to lower the lift to its full depth (while the lift is being lowered, the "new" value should continuously increase).

9 - When the lift has arrived at its mechanical travel limit, press "*E*" to save the value.

10 - If the operation was not carried out correctly, the technician can cancel it by pressing "*A*" and restore the previous value, whereas pressing "*C*", will confirm the new setting and cause the "CALIBRATIONS" menu to reappear.

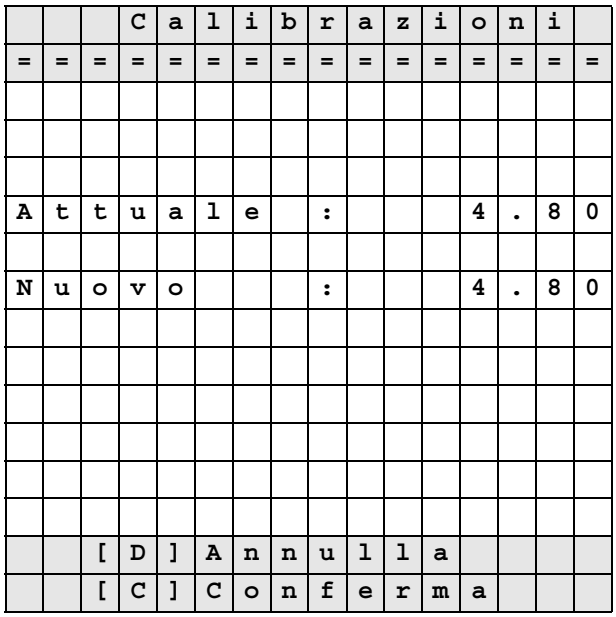


11 - Press “*2*”.

12 - Press the lift 'Up' button to raise the lift to its full height (while the lift is being raised the "new" value should continuously decrease).

13 - When the lift has reached its upper travel limit, press the 'Down' button until the voltage reading is approximately 0.35V less than the value recorded at the travel limit, then press “*E*” to save the value to the memory.

14 - If the operation was not carried out correctly, the technician can cancel it by pressing “*D*” and restore the previous value, whereas pressing “*C*”, will confirm the new setting and cause the "CALIBRATIONS” menu to reappear.

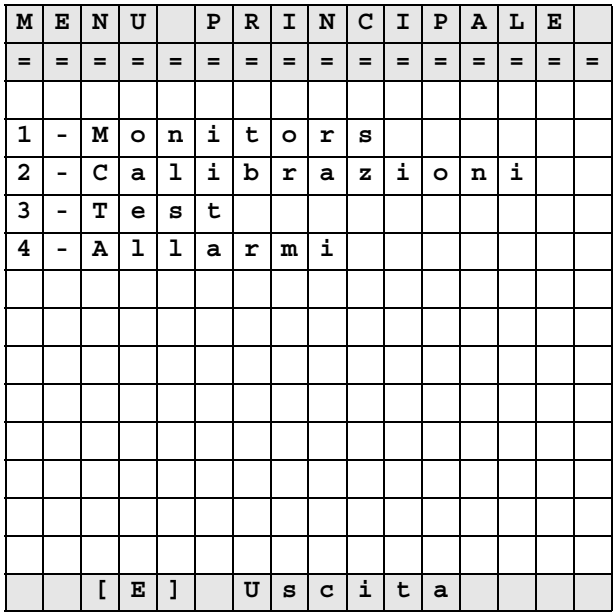


15 - Press “*E*” twice to return to the "CALIBRATIONS" menu to configure the system for the presence of front axle suspension (for details, see "4.4.7 CONFIGURING THE SYSTEM FOR THE PRESENCE OF FRONT AXLE SUSPENSION (ONLY IF INSTALLED)" starting from point 3) or to set the language on the INFOCENTER display (for details, see "4.4.8 SETTING THE INFOCENTER DISPLAY LANGUAGE" starting from point 3).

4.5.8 CONFIGURING THE SYSTEM FOR THE PRESENCE OF FRONT AXLE SUSPENSION (ONLY IF INSTALLED)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*5 - Suspensions*”.

		C	A	L	I	B	R	A	Z	I	O	N	I		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n	e		
2	-	P	T	O											
3	-	A	S	M											
4	-	S	o	l	l	e	v	a	t	o	r	e			
5	-	S	o	s	p	e	n	s	i	o	n	i			
6	-	S	i	s	t	e	m	a							
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r	i		
9	-	M	o	t	o	r	e								
		[	E	]		U	s	c	i	t	a				

4 - Press “*1*”.

			S	O	S	P	E	N	S	I	O	N	E		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	b	i	l	i	t	a					0	0	0
2	-	V	e	l	o	c	i	t	a				0	0	2
3	-	T	i	p	o								0	0	1
4	-	C	o	n	t	r	o	l	l	o	D	T	0	0	0
		[	E	]		U	s	c	i	t	a				

5 - Press "*1*" to enable the radar and press "*C*" to save the value.

6 - If the parameter was not set correctly, you can press "*A*" to cancel the operation, restore the previous value and return to the "SUSPENSIONS" page.

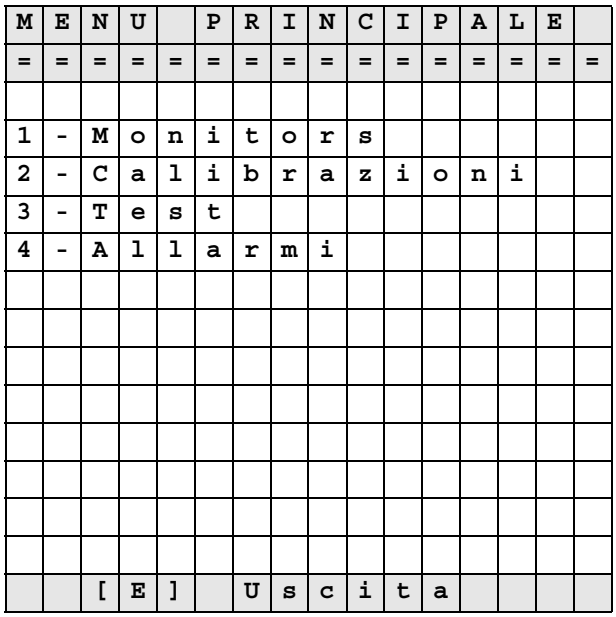
7 - Carry out the procedure to set the Infocenter display language (for details, see ""4.4.8 SETTING THE INFOCENTER DISPLAY LANGUAGE" starting from point 3).

			S	O	S	P	E	N	S	I	O	N	E		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
0	-	N	O	N		P	R	E	S	E	N	T	E		
1	-	P	R	E	S	E	N	T	E						
		[	A	]		A	n	n	u	l	l	a			
		[	C	]		C	o	n	f	e	r	m	a		

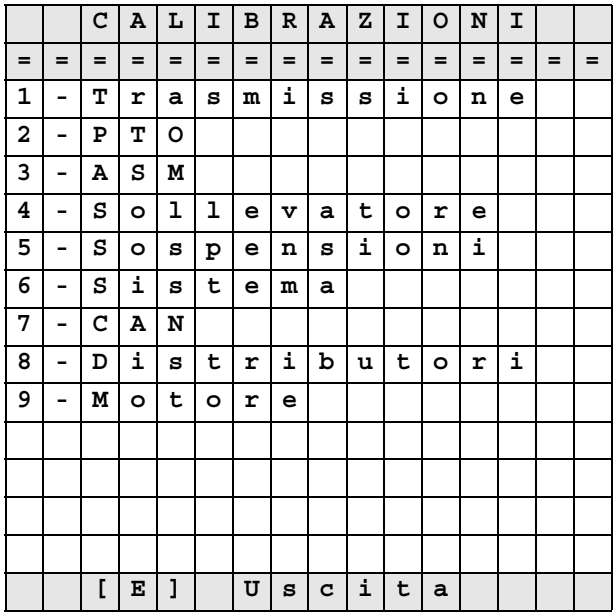
4.5.9 SETTING THE INFOCENTER DISPLAY LANGUAGE

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

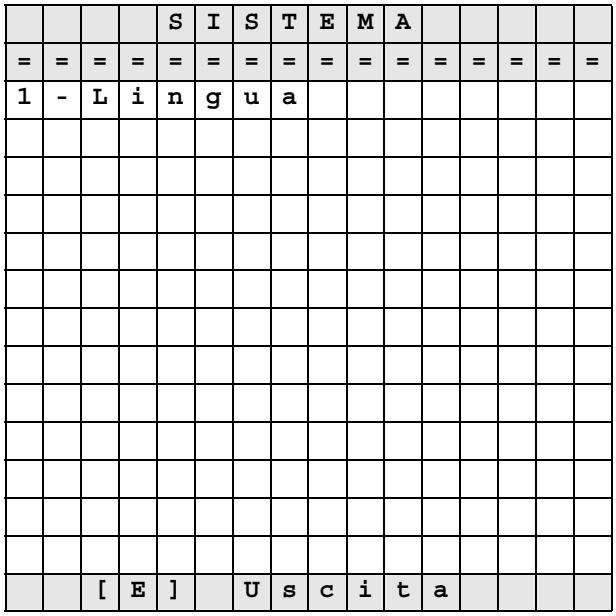
2 - From the "MAIN MENU" press “*2 - CALIBRATIONS*”.



3 - Press “*6 - System*”.

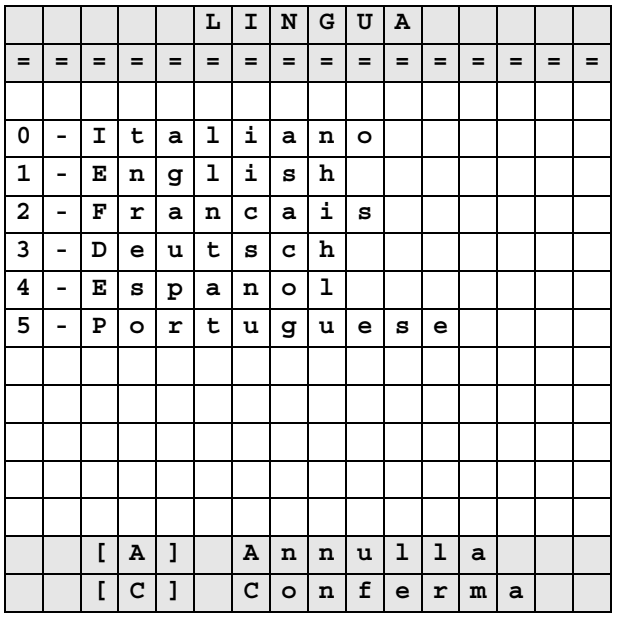


4 - Press “*1*”.



5 - Press the key corresponding to the desired language choosing from the options displayed, and press "*C*" to save the value and return to the "SYSTEM" menu.

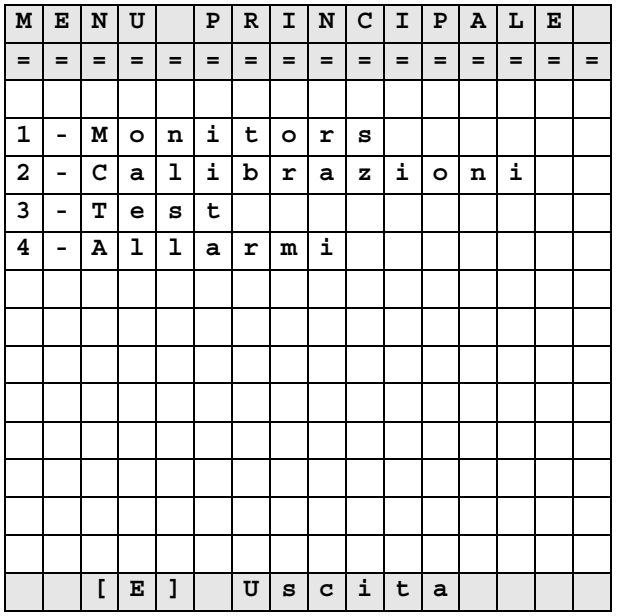
6 - If the operation was not carried out correctly, press "*A*" to cancel, restore the previous value and return to the "SYSTEM" menu.



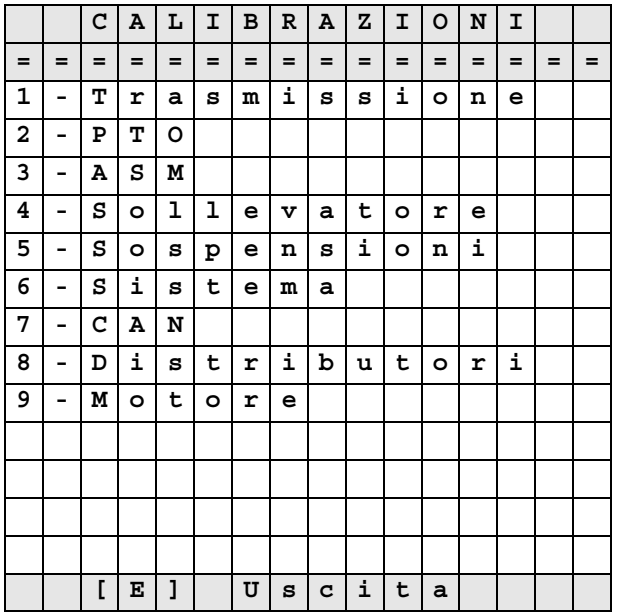
4.5.10 CONFIGURE THE ASSOCIATION BETWEEN CONTROL VALVE LEVERS AND AUXILIARY SERVICES (FOR VERSIONS WITH 4 CONTROL VALVES ONLY)

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see «Connecting ART® to the HLHP control unit»).

2 - From the "MAIN MENU" press "2" and the ART® will display the following screen:



3 - Press "8".



4 - Press “1”

```
  DISTRIBUTORI
==========
1-TIPO      000
2-TempoMax  0060
3-Comandi   000
[E] Uscita
```

5 - Press the key corresponding to the desired configuration choosing from the options displayed, and press "C" to save the value and return to the "SYSTEM" menu.

```
  COMANDI DISTR.
==========
Comandi -> dist.
0- 1234 -> 1234
1- 1234 -> 3412
[E] Uscita
```

4.5.11 CLEARING ALL ALARMS

1 - Connect the ART® to the connector in the RH compartment in the cab, select the HLHP control unit from the “AVAILABLE TESTS” menu, then proceed as described. (For details, see "2.1 CONNECTING ART® TO THE HLHP CONTROL UNITS").

2 -From the "MAIN MENU" press "4 - ALARMS"".

M	E	N	U		P	R	I	N	C	I	P	A	L	E	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	M	o	n	i	t	o	r	s						
2	-	C	a	l	i	b	r	a	z	i	o	n	i		
3	-	T	e	s	t										
4	-	A	l	l	a	r	m	i							
		[	E	]		U	s	c	i	t	a				

3 - Press “*9 - Deletion*”.

		M	E	N	U		A	L	L	A	R	M	I		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	H	L	H	P		a	t	t	i	v	i			
2	-	H	L	H	P		p	a	s	s	i	v	i		
3	-	M	o	t	o	r	e		a	t	t	i	v	i	
4	-	M	o	t	o	r	e		p	a	s	s	i	v	i
5	-	T	r	a	s	m	.		A	t	t	i	v	i	
6	-	T	r	a	s	m	.		P	a	s	s	i	v	i
9	-	C	a	n	c	e	l	l	a	z	i	o	n	e	
		[	E	]		U	s	c	i	t	a				

4 - Press “*3*”.

5 - The following message will be displayed:

		G	l	i		a	l	l	a	r	m	i			
		s	o	n	o		s	t	a	t	i				
		c	a	n	c	e	l	l	a	t	i				

6 - Press "*E*" three times to return to the "CALIBRATIONS" menu and turn the starter key to "O" (OFF).

C	A	N	C	E	L	L	A		A	L	L	A	R	M	I
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	H	L	H	P										
2	-	M	o	t	o	r	e								
3	-	T	r	a	s	m	i	s	s	i	o	n	e		
4	-	B	r	a	c	c	i	o	l	o					
		[	E	]		U	s	c	i	t	a				

4.6 RENEWAL OF THE ARMREST CONTROL UNIT

Each time the armrest control unit is renewed, the operator must carry out the following operations:

1 - calibration of the hand throttle

2 - calibration of control valves n°3 and n°4 joystick

Calibration of these sensors serves to inform the control unit of the current values for the control lever travel limits, thereby ensuring correct operation of the actuators associated with the levers.

To perform the calibration, connect the ART to the connector in the fuses compartment of the cab, then select the armrest from the “AVAILABLE TESTS” menu and proceed as described.

NOTE: Unless otherwise specified, these operations must be carried out with the engine stopped, the parking brake on and the shuttle lever in neutral.

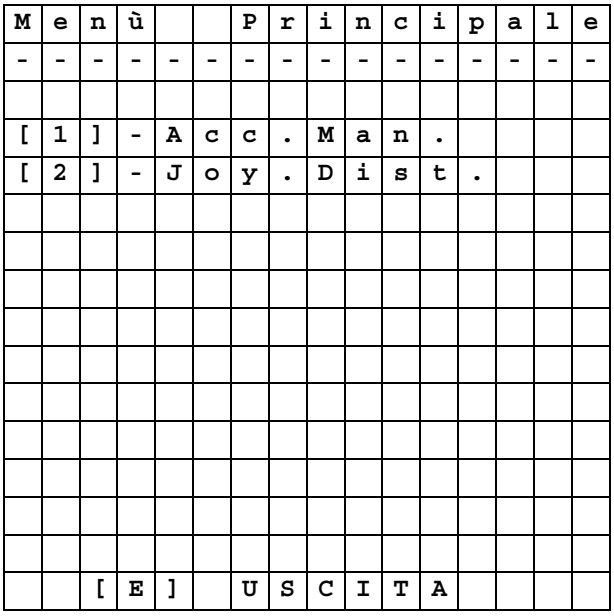
4.6.1 CALIBRATION OF THE HAND THROTTLE

For details on how to perform the calibration of the hand throttle see 4.2.6 or 4.2.7 in this chapter.

4.6.2 CALIBRATION OF THE JOYSTICK FOR CONTROL VALVES N°3 AND N°4

1 - From menu “1. Main menu” press “*3*” to access the main menu.

2 - Press “*2*”.



3 - Press “*1*”.

	C	a	l	i	b	.	J	o	y	-	D	i	s	t	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	D	I	S	T	R	I	B	U	T	O	R	E		3	
1	-	J	.	D	.	3		M	I	N				9	5
2	-	J	.	D	.	3		M	A	X			8	2	0
3	-	J	.	D	.	3		M	E	D			5	1	0
	D	I	S	T	R	I	B	U	T	O	R	E		4	
4	-	J	.	D	.	4		M	I	N			2	4	0
5	-	J	.	D	.	4		M	A	X			7	7	0
6	-	J	.	D	.	4		M	E	D			5	1	0
		[	E	]		U	S	C	I	T	A				

4 - Move the control valve joystick lever *back towards the rear of the tractor* and, while holding the position, press “*E*”.

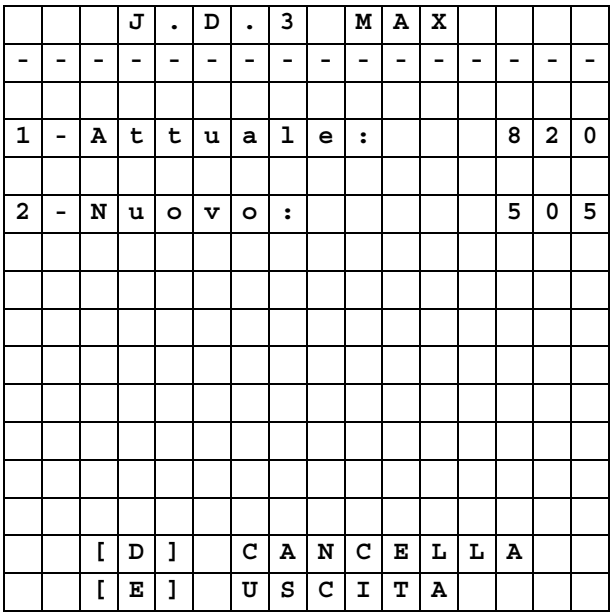
			J	.	D	.	3		M	I	N				
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	A	t	t	u	a	l	e	:					9	5
2	-	N	u	o	v	o	:						5	0	5
		[	D	]		C	A	N	C	E	L	L	A		
		[	E	]		U	S	C	I	T	A				

5 - If the operation was not carried out correctly, the technician can cancel it by pressing “*A*” and restore the previous value, whereas pressing “*C*” will confirm the new setting and cause the system to return to menu “3.2. Cont. Valve Joy. Calib.”.

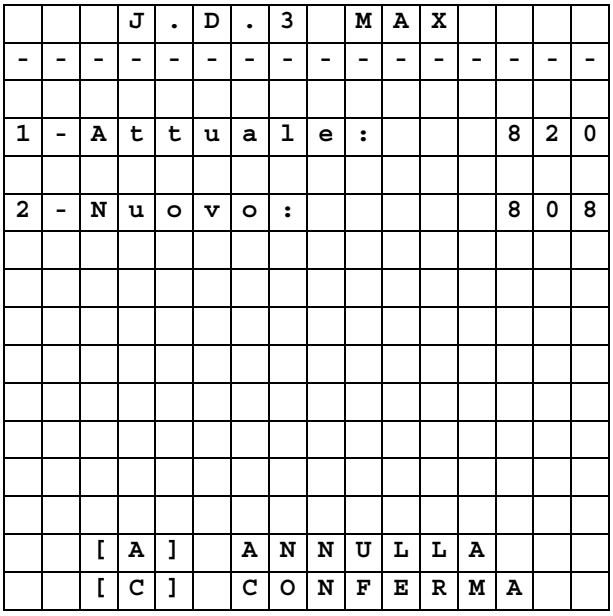
			J	.	D	.	3		M	I	N				
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	A	t	t	u	a	l	e	:					9	5
2	-	N	u	o	v	o	:							9	8
		[	A	]		A	N	N	U	L	L	A			
		[	C	]		C	O	N	F	E	R	M	A		

6 - Press "*2*".

7 - Move the control valve joystick lever *towards the front of the tractor* and, while holding the position, press "*E*".

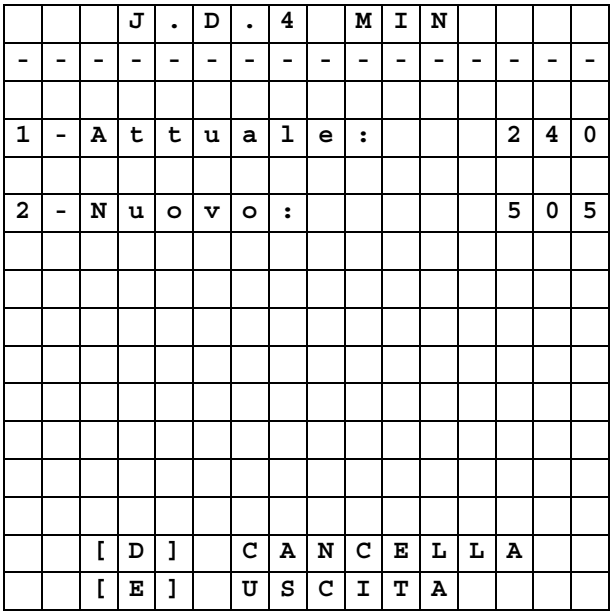


8 - If the operation was not carried out correctly, the technician can cancel it by pressing "*A*" and restore the previous value, whereas pressing "*C*", will confirm the new setting and cause the system to return to menu "3.2. Cont. Valve Joy. Calib.".

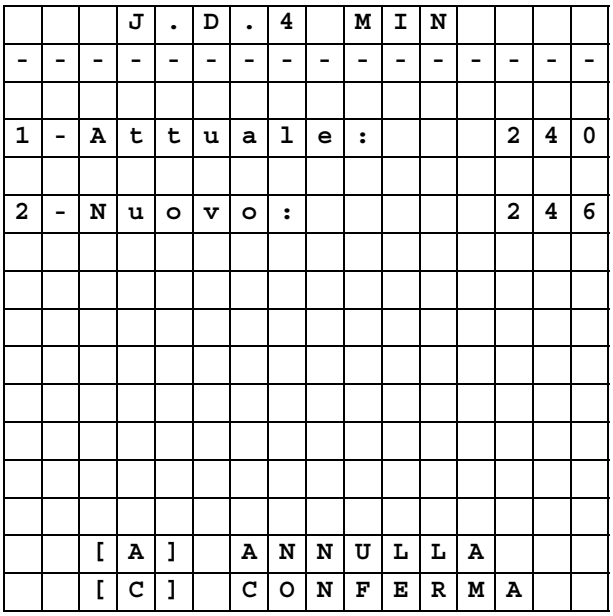


9 - Press "*1*".

10 - Move the control valve joystick lever *to the right* and, while holding the position, press "*E*".

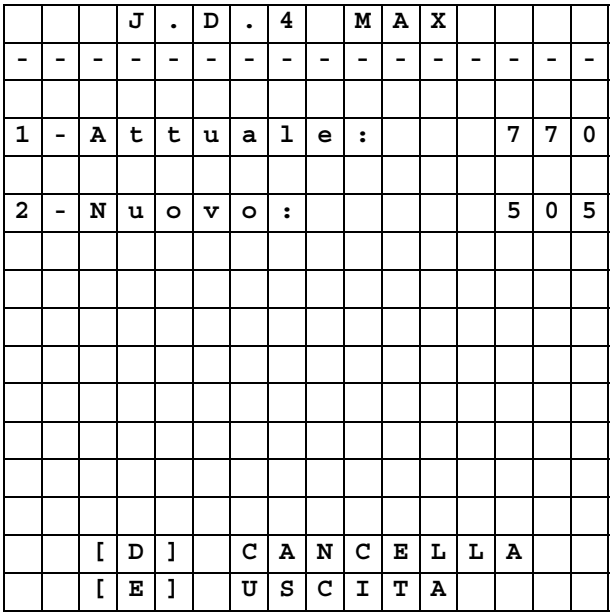


11 - If the operation was not carried out correctly, the technician can cancel it by pressing "*A*" and restore the previous value, whereas pressing "*C*" will confirm the new setting and cause system to return to menu "3.2. Cont. Valve Joy. Calib.".

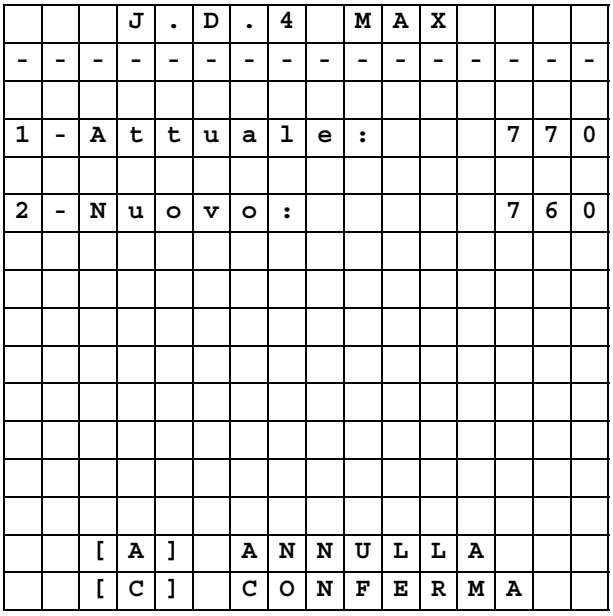


12 - Press "*2*".

13 - Move the control valve joystick lever *to the left* and, while holding the position, press "*E*".

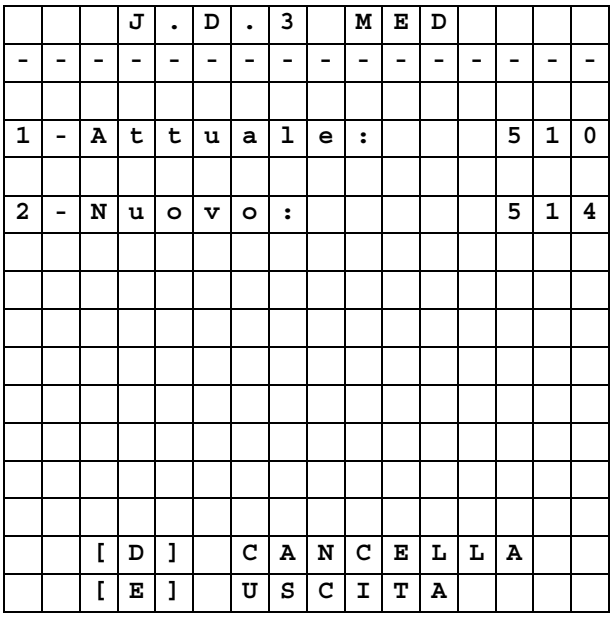


14 - If the operation was not carried out correctly, the technician can cancel it by pressing "*A*" and restore the previous value, whereas pressing "*C*", will confirm the new setting and cause the system to return to menu "3.2. Cont. Valve Joy. Calib.".

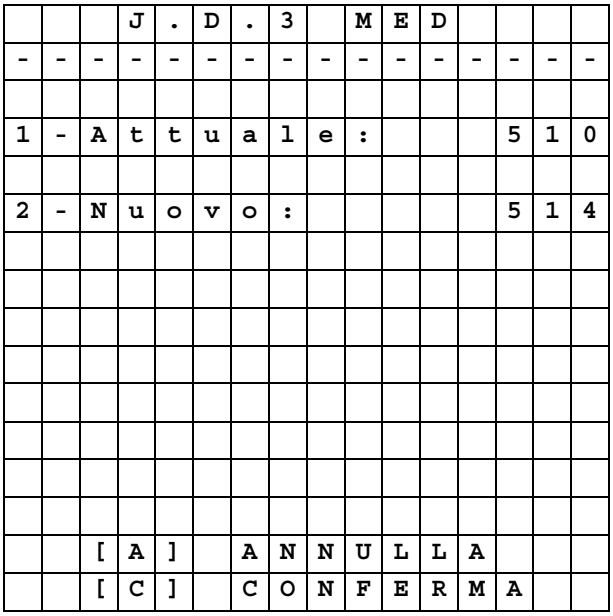


15 - Repeatedly move the joystick in all directions and release it so that it automatically assumes the neutral position, then press "*3*".

16 - Without moving the joystick, press "*E*".

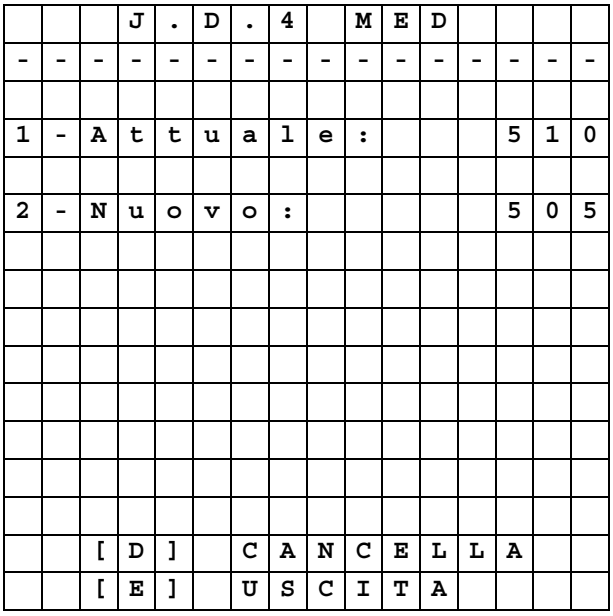


17 - If the operation was not carried out correctly, the technician can cancel it by pressing "*A*" and restore the previous value, whereas pressing "*C*", will confirm the new setting and cause the system to return to menu "3.2. Cont. Valve Joy. Calib.".



18 - Without moving the joystick, press "*6*".

19 - Without moving the joystick, press "*E*".



20 - If the operation was not carried out correctly, the technician can cancel it by pressing "*A*" and restore the previous value, whereas pressing "*C*", will confirm the new setting and cause the system to return to menu "3.2. Cont. Valve Joy. Calib.".

			J	.	D	.	4		M	E	D			
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	A	t	t	u	a	l	e	:			5	1	0
2	-	N	u	o	v	o	:					5	0	5
		[	A	]		A	N	N	U	L	L	A		
		[	C	]		C	O	N	F	E	R	M	A	

5. ALARMS

INTRODUCTION

This chapter contains a list of all the alarms that can be detected by the tractor's electronic system.

To facilitate the search for alarms, the list below shows the alarms as they are displayed on the Infocenter and the corresponding alarms displayed on the HLHP control unit.

1 - *List of alarms displayed on the Infocenter*: this table lists in alphanumeric order all those alarms that can appear on the central display of the Infocenter.
Each alarm is also associated with the corresponding alarm code that appears on the ART when connected to the HLHP control unit, together with a brief description of the cause.

2 - *HLHP control unit list of alarms:* this table lists in alphanumeric order all those alarms that are connected with the HLHP control unit and can appear on the ART in 4.1 and 4.2 menus.
Each alarm is also associated with a brief description of the cause.

3 - *ECU list of alarms:* this table lists in alphanumeric order all those alarms that are connected with the ECU and can appear on the ART, when connected to the HLHP control unit, in the 4.3 and 4.4 menus.
Each alarm is also associated with a brief description of the cause and the corresponding alarm that can be displayed using the SERDIA program.

4 - *Transmission control unit list of alarms:* this table lists in alphanumeric order all those alarms that are connected with the transmission control unit and can appear on the ART, when connected to the HLHP control unit, in the 4.5 and 4.6 menus.
Each alarm is also associated with a brief description of the cause and the reactions of the transmission system to the alarm.

5 - *Armrest list of alarms*

6 - *CAN BUS system alarms:* this section contains some alarms that can be managed by the tractor's electronic control units.

All alarms are classified into two types:

- *Active alarms* i.e. all those alarms of which the cause has not yet been removed.
- *Passive alarms* i.e. all those alarms for which the cause has been removed.

5.1 ALARMS DISPLAYED ON THE INFOCENTER

This table lists all the alarms related to faults that can be identified by the HLHP, engine and transmission control units.

All the alarms are displayed on the central display of the INFOCENTER on two lines; therefore, for easier identification, in the table the alarm messages are shown divided between two lines.

The table is made up of the following columns:

- *1st line on display:* first line of alarm shown on display.
- *2nd line on display:* second line of alarm shown on display.
- *Code on ART:* alarm code as would be read connecting the ART to the HLHP control unit.
- *ECU:* identifies the control unit that detected the fault.
- *Description:* a brief description of the possible cause of the fault.
- *Page:* the number of the page where the checks to be carried out are indicated.

Should any alarm messages not included in this list be displayed, the control unit will display the message "Generic alarm" followed by an identification code (which may be an SPN-FMI code or a hexadecimal code). In this case, contact the Technical Assistance Service for further information.

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page*.
10-Calib. friz. prin.	Errore aggiornamento	10	TRANSM.	The control unit detects errors in the main clutch calibration values	20-203
11-Pedale frizione E2P	Errore aggiornamento	11	TRANSM.	The control unit detects errors in the main clutch calibration values	20-203
12-Sensore temperatu-ra	Segnale non valido	12	TRANSM.	The control unit detects a problem with the power input to the transmission oil temperature sensor.	20-204
13-Sensore temperatu-ra	Segnale troppo basso	13	TRANSM.	The control unit detects a problem with the power input to the temperature sensor.	20-205
14-Switch di neutra	Frequenza non corretta	14	TRANSM.	The control unit detects a problem with reading the main clutch input speed and transmission output speed depending on the status of the start-up enabling sensor (which signals when the transmission is in neutral and when a gear is selected)	20-206
18-Circuito idraulico	Frequenza non corretta	18	TRANSM.	The control unit detects a problem with reading the oil pressure and transmission operating status	20-207
21-Velocità elevata	Errore aggiornamento	21	TRANSM.	The control unit detects a ground speed higher than the permissible limit	20-208
22-Temp. shuttle-mode	Errore aggiornamento	22	TRANSM.	The control unit detects that the transmission oil temperature is higher than the permitted value when the tractor is working in "FIELD" mode	20-208
23-Temp.transport-mode	Errore aggiornamento	23	TRANSM.	The control unit detects that the transmission oil temperature is higher than the permitted value when the tractor is working in "ROAD" mode.	20-209
24-frizione principale	Velocita' elevata	24	TRANSM.	The control unit detects the main clutch running overspeed.	20-209
25-Ingresso velocità	Errore aggiornamento	25	TRANSM.	The control unit detects a conflict between the information on the engine speed via CANBUS and that read by the rpm nLse sensor.	20-210

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
36-EV cambio 2	non connesso	36	TRANSM.	The control unit detects that solenoid Y4 is either not connected or faulty	20-211
37-EV cambio 2	Corto circuito	37	TRANSM.	The control unit detects that the control line of solenoid Y4 is short-circuiting to earth	20-212
38-EV cambio 2	Difetto meccanico	38	TRANSM.	The control unit detects that the control line of solenoid Y4 is short-circuiting to battery positive	20-213
39-EV cambio 1	non connesso	39	TRANSM.	The control unit detects that solenoid Y2 is either not connected or faulty	20-214
40-EV cambio 1	Corto circuito	40	TRANSM.	The control unit detects that the control line of solenoid Y2 is short-circuiting to earth	20-215
41-EV cambio 1	Difetto meccanico	41	TRANSM.	The control unit detects that the control line of solenoid Y2 is short-circuiting to battery positive	20-216
47-Sensore vel. nAB	Segnale non valido	47	TRANSM.	The control unit detects that the rpm sensor nAb is disconnected or short-circuiting to battery positive.	20-217
48-Sensore vel. nAB	Segnale troppo basso	48	TRANSM.	The control unit detects that the rpm sensor nAb is short-circuiting to earth	20-218
4B-Sensore vel. nAB	Frequenza non corretta	4B	TRANSM.	The control unit detects unreliable information coming from the rpm sensor nAb	20-219
50-Sensore vel. nHK	Segnale non valido	50	TRANSM.	The control unit detects that rpm sensor nHk is disconnected or short-circuiting to battery positive.	20-220
51-Sensore vel. nHK	Segnale troppo basso	51	TRANSM.	The control unit detects that the rpm sensor nHk is short-circuiting to earth	20-221
52-Sensore vel. nHK	Frequenza non corretta	52	TRANSM.	The control unit detects unreliable information coming from the rpm sensor nHk	20-222
53-Sensore vel.nLSA	Segnale non valido	53	TRANSM.	The control unit detects that rpm sensor nLsa is disconnected or short-circuiting to battery positive.	20-223
54-Sensore vel.nLSA	Segnale troppo basso	54	TRANSM.	The control unit detects that rpm sensor nLsa is short-circuiting to earth	20-224
55-Sensore vel.nLSA	Frequenza non corretta	55	TRANSM.	The control unit detects unreliable information coming from the rpm sensor nLsa	20-225
5F-Sensore FRRS	Errore aggiornamento	5F	TRANSM.	The control unit detects that the calibration values of the field/road position sensor are incorrect.	20-226
60-calibrazione FRRS	Errore aggiornamento	60	TRANSM.	The control unit detects that the calibration values of the field/road position sensor are incorrect	20-226
61-Sensore FRRS	Segnale non valido	61	TRANSM.	The control unit detects that the field/ road position sensor is shorting to a positive feed (+5V).	20-227
62-Sensore FRRS	Segnale non valido	62	TRANSM.	The control unit detects that the field/ road position sensor is shorting to battery positive (+12V).	20-228

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
63-Sensore FRRS	Segnale troppo basso	63	TRANSM.	The control unit detects that the field/ road position sensor is disconnected or shorting to earth.	20-229
64-Pedale frizione	Frequenza non corretta	64	TRANSM.	The control detects a conflict in the information received from the clutch pedal position sensor and clutch pedal depressed sensor, regarding the position of the pedal	20-230
65-Pedale frizione	Segnale troppo basso	65	TRANSM.	The control unit detects that the clutch pedal position sensor is disconnected or short-circuiting to earth	20-231
66-Pedale frizione	Segnale non valido	66	TRANSM.	The control unit detects that the clutch pedal position sensor is shorting to battery positive	20-232
67-Alimen. Sens. AU1	Corto circuito	67	TRANSM.	The control unit detects that the clutch pedal position sensor power supply is below the correct value	20-233
68-Alimen. Sens. AU1	Difetto meccanico	68	TRANSM.	The control unit detects that the clutch pedal position sensor power supply is above the correct value	20-234
69-Pedale frizione	Frequenza non corretta	69	TRANSM.	The control unit detects one or more threshold values of the clutch pedal position sensor out of range.	20-235
70-Pedale frizione E2P	Errore aggiornamento	70	TRANSM.	The control unit detects that the calibration values of the clutch pedal have not been saved correctly due to a defect in the EEPROM memory locations, or that the clutch pedal has never been calibrated	20-235
73-Pulsante aper. friz.	Segnale troppo basso	73	TRANSM.	The control unit detects that the "Comfort Clutch" button is disconnected or short-circuiting to earth	20-236
74-Pulsante aper. friz.	Segnale non valido	74	TRANSM.	The control unit detects that the "Comfort Clutch" button is short-circuiting to battery positive	20-237
76-EV proporzionale	non connesso	76	TRANSM.	The control unit detects that the main clutch solenoid valve is disconnected.	20-238
77-Elettrovalvola pro-porzionale	Corto circuito	77	TRANSM.	The control unit detects that the main clutch proportional solenoid valve is short-circuiting to earth.	20-239
79-EV direz. avanti	non connesso	79	TRANSM.	The control unit detects that the forward drive solenoid Y3 is disconnected	20-240
80-EV direz. avanti	Corto circuito	80	TRANSM.	The control unit detects that the forward drive solenoid Y3 is shorting to earth	20-241
82-EV direz. indietro	non connesso	82	TRANSM.	The control unit detects that the reverse drive solenoid Y1 is disconnected	20-242
83-EV direz. indietro	Corto circuito	83	TRANSM.	The control unit detects that the reverse drive solenoid Y1 is shorting to earth	20-243
85-Leva inversore	Frequenza non corretta	85	TRANSM.	The control unit detects a problem affecting the shuttle control lever.	20-244
87-Pin di codifica non coincidono	con tipo di veicolo	87	TRANSM.	The control unit detects that the current draw of the main clutch solenoids and forward/reverse solenoids Y1 and Y3 and the lock solenoid is abnormal.	20-245

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
89-Alimentazione VPS1	Frequenza non corretta	89	TRANSM.	The control unit detects that the current draw of the main clutch solenoids and forward/reverse solenoids Y1 and Y3 and the lock solenoid is abnormal.	20-246
90-Alimentazione VPS2	Frequenza non corretta	90	TRANSM.	The control unit detects that the current draw of the powershift solenoid valves Y2, Y4, Y5 and Y6 is abnormal	20-247
91-Frizione principale	Frequenza non corretta	91	TRANSM.	The control unit detects a conflict between values read by the NLSA and NHK sensors, the clutch pedal position sensor and the position of the creeper control lever	20-248
92-Tensione batteria	Segnale non valido	92	TRANSM.	The control unit has detected an abnormally high input voltage	20-249
93-Tensione batteria	Segnale troppo basso	93	TRANSM.	The control unit has detected an abnormally low input voltage	20-250
94-EV proporzionale	Difetto meccanico	94	TRANSM.	The control unit detects that the main clutch solenoid valve is shorting to a positive feed	20-251
95-EV direz. avanti	Difetto meccanico	95	TRANSM.	The control unit detects that the forward drive solenoid Y3 is shorting to a positive feed	20-252
96-EV direz. indietro	Difetto meccanico	96	TRANSM.	The control unit detects that the reverse drive solenoid Y1 is shorting to battery positive	20-253
97-Programma errato	Frequenza non corretta	97	TRANSM.	The control unit detects that the transmission control unit software has not been programmed correctly	20-254
98-Config.errata	Frequenza non corretta	98	TRANSM.	The control unit detects that transmission configuration data have not been programmed correctly.	20-254
99-Config. veicolo	Errore aggiornamento	99	TRANSM.	The control unit detects that tractor configuration data have not been saved correctly (CHECKSUM ERROR)	20-255
Acceleratore a mano	Segnale non valido	561 - 2	HLHP	The engine control unit has detected an error in the value of the hand throttle signal (via CANBUS).	20-128
Alimen. sensori 5V	Segnale non valido	655 - 2	HLHP	The control unit detects a short-circuit in the 5V sensors power supply line.	20-163
Alimen. sensori 8V	Segnale non valido	654 - 2	HLHP	The control unit detects a short circuit in 8V sensor power supply line.	20-162
B0-Sensore vel. nLSE	Segnale troppo basso	B0	TRANSM.	The control unit detects that the rpm sensor nLse is disconnected or short-circuiting to battery positive.	20-256
B1-Sensore vel. nLSE	Segnale non valido	B1	TRANSM.	The control unit detects that the rpm sensor nLse is short-circuiting to earth	20-257
B2-Sensore vel. nLSE	Frequenza non corretta	B2	TRANSM.	The control detects unreliable information from the rpm sensor nLse	20-258
B3-FRRS EV campo	non connesso	B3	TRANSM.	The control unit detects that the "Field" mode selector solenoid Y5 is disconnected	20-259
B4-FRRS EV campo	Difetto meccanico	B4	TRANSM.	The control unit detects that the "Field" mode selector solenoid Y5 is shorting to battery positive	20-260

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
B5-FRRS EV campo	Corto circuito	B5	TRANSM.	The control unit detects that the "Field" mode selector solenoid Y5 is shorting to earth	20-261
B6-FRRS EV strada	non connesso	B6	TRANSM.	The control unit detects that the "Road" mode selector solenoid Y6 is disconnected	20-262
B7-FRRS EV strada	Difetto meccanico	B7	TRANSM.	The control unit detects that the "Road" mode selector solenoid Y6 is shorting to battery feed	20-263
B8-FRRS EV strada	Corto circuito	B8	TRANSM.	The control unit detects that the "Road" mode selector solenoid Y6 is shorting to earth	20-264
B9-EV Blocco Neutra	non connesso	B9	TRANSM.	The control unit detects that the gearbox neutral lock solenoid Y7 is disconnected	20-265
BA-EV Blocco Neutra	Difetto meccanico	BA	TRANSM.	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to battery positive	20-266
BB-EV Blocco Neutra	Corto circuito	BB	TRANSM.	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to earth	20-267
Bracciolo,	Errore scheda	634 - 12	ARMREST	Internal error detected	20-279
Bracciolo,flusso	distrib.1 disconnesso	637 - 4	ARMREST	Detection: control valve 1 max. flow potentiometer disconnected	20-280
Bracciolo,flusso	distrib.3 scollegato	635 - 4	ARMREST	Detection: control valve 3 potentiometer disconnected	20-279
Bracciolo,flusso	distrib.4 scollegato	636 - 4	ARMREST	Detection: control valve 4 max. flow potentiometer disconnected	20-280
Bracciolo,flusso max.	distrib.3 disconnesso	641 - 4	ARMREST	Detection: control valve 3 max. flow potentiometer disconnected	20-281
Bracciolo,flusso max.	distrib.4 disconnesso	642 - 4	ARMREST	Detection: control valve 4 max. flow potentiometer disconnected	20-281
Bracciolo,flusso,	distrib.2 disconnesso	639 - 4	ARMREST	Detection: control valve 2 max. flow potentiometer disconnected	20-280
Bracciolo,memoria	blocco 0 in errore	648 - 2	ARMREST	Detection: Incorrect group 0 memory configuration	20-284
Bracciolo,memoria	blocco 1 in errore	649 - 2	ARMREST	Detection: Incorrect group 1 memory configuration	20-284
Bracciolo,memoria	blocco 2 in errore	650 - 2	ARMREST	Detection: Incorrect group 2 memory configuration	20-285
Bracciolo,memoria	blocco 3 in errore	651 - 2	ARMREST	Detection: Incorrect group 3 memory configuration	20-285
Bracciolo,memoria	blocco 4 in errore	652 - 2	ARMREST	Detection: Incorrect group 4 memory configuration	20-285
Bracciolo,memoria	blocco 5 in errore	657 - 2	ARMREST	Detection: Incorrect group 5 memory configuration	20-286
Bracciolo,potenziom.	APS scollegato	696 - 4	ARMREST	Detection: APS potentiometer disconnected	20-286
Bracciolo,tempo,	distrib.1 disconnesso	638 - 4	ARMREST	Detection: control valve 1 time set potentiometer disconnected	20-280

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
Bracciolo,tempo,	distrib.2 disconnesso	640 - 4	ARMREST	Detection: control valve 2 time set potentiometer disconnected	20-281
Bracciolo,tensione	12V non corretta	644 - 8	ARMREST	Detection: Incorrect 12V voltage	20-282
Bracciolo,tensione	5V dist. non corretta	647 - 8	ARMREST	Detection: potentiometer power supply control valve incorrect 5V voltage	20-284
Bracciolo,tensione	6V non corretta	645 - 8	ARMREST	Detection: Incorrect 6V voltage	20-283
C0-Msg PTCTL1 REQ-GEAR	Errore Segnale CAN	C0	TRANSM.	The transmission control unit detects an error in the information received by the HLHP control unit regarding the request for range gear engagement.	20-268
C3-Msg EEC1 ENG-SPEED	Errore Segnale CAN	C3	TRANSM.	The transmission control unit detects an error in the information received by the ECU regarding the communication of engine speed.	20-269
CF-Allarme generico CF	Timeout CAN Msg	CF	TRANSM.	The transmission control unit detects a fault on the CANBUS line.	20-270
Comando inversore	Segnale non valido	63 - 2	HLHP	The transmission control unit has detected an error in the value of the shuttle lever signal (via CANBUS).	20-104
D1-Msg LIMITATION	Timeout CAN Msg	D1	TRANSM.	The transmission control unit detects a fault on the CANBUS controller.	20-270
D2-Msg HPSACTRL	Timeout CAN Msg	D2	TRANSM.	The transmission control unit detects a fault on the CANBUS controller.	20-271
Elettrovalvola D.T.	Corto circuito +12V	552 - 3	HLHP	The control unit detects that the 4WD solenoid is shorting to battery positive.	20-123
Elettrovalvola D.T.	Corto circuito massa	552 - 4	HLHP	The control unit detects that the 4WD solenoid is shorting to earth.	20-124
Elettrovalvola D.T.	Dispositivo guasto	552 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-127
Elettrovalvola D.T.	Guasto non identificato	552 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-126
Elettrovalvola D.T.	non connesso	552 - 5	HLHP	The control unit detects that the 4WD solenoid is disconnected.	20-125
Elettrovalvola D.T.	Segnale non valido	552 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-122
Errore CAN Motore	messaggio in timeout	633 - 9	HLHP	Detection of the absence of a connection via the CANBUS to the engine control unit.	20-155
Errore CAN TCU	messaggio in timeout	632 - 9	HLHP	Detection of the absence of a connection via the CANBUS to the transmission control unit.	20-155
Errore memoria	Blocco 0	661 - 8	HLHP	The control unit signals that EEPROM used to store the system parameters is damaged.	20-165
EV differenziale	Corto circuito +12V	653 - 3	HLHP	The control unit detects that the differential lock solenoid is shorting to a positive feed.	20-157

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
EV differenziale	Corto circuito massa	653 - 4	HLHP	The control unit detects that the differential lock solenoid is shorting to earth.	20-158
EV differenziale	Dispositivo guasto	653 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-161
EV differenziale	Guasto non identificato	653 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-160
EV differenziale	non connesso	653 - 5	HLHP	The control unit detects that the diff lock solenoid is not connected.	20-159
EV differenziale	Segnale non valido	653 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-156
EV discesa sollevatore	Corto circuito	603 - 6	HLHP	Detection: lift "down" solenoid valve is short-circuited	20-139
EV discesa sollevatore	Corto circuito +12V	603 - 3	HLHP	The control unit detects that the lift 'down' solenoid is shorting to battery positive.	20-136
EV discesa sollevatore	Corto circuito massa	603 - 4	HLHP	The control unit detects that the lift 'down' solenoid is shorting to earth.	20-137
EV discesa sollevatore	non connesso	603 - 5	HLHP	The control unit detects an excessive current draw by the lift 'down' solenoid.	20-138
EV discesa sospens.	Corto circuito +12V	622 - 3	HLHP	The control unit detects that the front axle suspension 'down' solenoid is shorting to a positive feed.	20-149
EV discesa sospens.	Corto circuito massa	622 - 4	HLHP	The control unit detects that the front axle suspension 'down' solenoid is shorting to earth.	20-150
EV discesa sospens.	Dispositivo guasto	622 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'down' solenoid.	20-153
EV discesa sospens.	Guasto non identificato	622 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'down' solenoid.	20-152
EV discesa sospens.	non connesso	622 - 5	HLHP	The control unit detects that the front axle suspension 'down' solenoid is disconnected.	20-151
EV discesa sospens.	Segnale non valido	622 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'down' solenoid.	20-148
EV PTO anteriore	Corto circuito +12V	551 - 3	HLHP	The control unit detects that the front PTO solenoid is shorting to battery positive.	20-117
EV PTO anteriore	Corto circuito massa	551 - 4	HLHP	The control unit detects that the front PTO solenoid is shorting to earth.	20-118
EV PTO anteriore	Dispositivo guasto	551 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-121

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
EV PTO anteriore	Guasto non identificato	551 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-120
EV PTO anteriore	non connesso	551 - 5	HLHP	The control unit detects that the front PTO solenoid is not connected.	20-119
EV PTO anteriore	Segnale non valido	551 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-116
EV PTO posteriore	Corto circuito +12V	550 - 3	HLHP	The control unit detects that the rear PTO solenoid is shorting to battery positive.	20-111
EV PTO posteriore	Corto circuito massa	550 - 4	HLHP	The control unit detects that the rear PTO solenoid is shorting to earth.	20-112
EV PTO posteriore	Dispositivo guasto	550 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-115
EV PTO posteriore	Guasto non identificato	550 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-114
EV PTO posteriore	non connesso	550 - 5	HLHP	The control unit detects that the rear PTO solenoid is not connected	20-113
EV PTO posteriore	Segnale non valido	550 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-110
EV salita sollevatore	Corto circuito	602 - 6	HLHP	Detection: lift "up" solenoid valve is short-circuited	20-135
EV salita sollevatore	Corto circuito +12V	602 - 3	HLHP	The control unit detects that the lift 'up' solenoid is shorting to battery positive.	20-132
EV salita sollevatore	Corto circuito massa	602 - 4	HLHP	The control unit detects that the lift 'up' solenoid is shorting to earth.	20-133
EV salita sollevatore	non connesso	602 - 5	HLHP	The control unit detects an excessive current draw by the lift 'up' solenoid.	20-134
EV salita sospens.	Corto circuito +12V	621 - 3	HLHP	The control unit detects that the front axle suspension 'up' solenoid is shorting to battery positive.	20-143
EV salita sospens.	Corto circuito massa	621 - 4	HLHP	The control unit detects that the front axle suspension 'up' solenoid is shorting to earth.	20-144
EV salita sospens.	Dispositivo guasto	621 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'up' solenoid.	20-147
EV salita sospens.	Guasto non identificato	621 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'up' solenoid.	20-146
EV salita sospens.	non connesso	621 - 5	HLHP	The control unit detects that the front axle suspension 'up' solenoid is disconnected.	20-145
EV salita sospens.	Segnale non valido	621 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'up' solenoid.	20-142
EXT Bracciolo,tensione	5V non corretta	646- 8	ARMREST	Detection: lift console incorrect supply voltage.	20-283

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
Motore,acc. pedale	Guasto non identificato	91 - 11	ENGINE	The engine control unit has detected the absence of a connection to the accelerator pedal position sensor or a signal out of range.	20-187
Motore,acc. pedale	Segnale non valido	91 - 2	ENGINE	The control unit detects that the connection to the accelerator pedal position sensor is either non-existent or short-circuiting.	20-175
Motore,accel. manuale	Segnale non valido	201 - 2	ENGINE	The control unit detects that the connection to the hand throttle position sensor is either non-existent or short-circuiting.	20-176
Motore,attuatore	Dispositivo guasto	536 - 12	ENGINE	The engine control unit has detected that the actuator position signal does not match the requirement.	20-184
Motore,attuatore	Non Calibrato	536 - 13	ENGINE	The engine control unit has detected that the reference signal for the position of the actuator does not match the requirement.	20-185
Motore,Errore CAN	Dispositivo guasto	743 - 12	ENGINE	CANBUS line controller damaged	20-188
Motore,Errore CAN	Errore aggiornamento	743 - 9	ENGINE	The engine control unit has not been able to read or send a message on the CANBUS.	20-188
Motore,Errore CAN	FMI 14	743 - 14	ENGINE	The engine control unit has detected that the connection to the CANBUS is not present.	20-189
Motore,Errore CAN	Segnale non valido	898 - 2	ENGINE	Error in connection to CANBUS	20-188
Motore,Errore interno	Segnale non valido	766 - 2	ENGINE	The engine control unit has detected an error in reading the work memory during the normal control cycle.	20-190
Motore,Errore interno	Segnale non valido	766 - 2	ENGINE	The engine control unit detects an actuator power input outside the specified parameters.	20-192
Motore,Errore interno	Segnale non valido	766 - 2	ENGINE	The control unit detects that the power input to the accelerator pedal position sensor is missing or incorrect.	20-192
Motore,Errore interno	Segnale non valido	766 - 2	ENGINE	The control unit detects that the power input to the engine boost pressure sensor is missing or incorrect.	20-190
Motore,Errore interno	Segnale non valido	766 - 2	ENGINE	The engine control unit has detected an internal error.	20-192
Motore,Errore Memoria	Dispositivo guasto	752 - 12	ENGINE	The engine control unit has detected an error in reading the program memory during the normal control cycle.	20-189
Motore,Errore Memoria	Segnale non valido	752 - 2	ENGINE	The engine control unit has detected a “Stack Overflow” error during the execution of the program.	20-194
Motore,fuori giri	FMI 14	702 - 14	ENGINE	The engine control unit detects that the engine is or has been running overspeed (above 3100 rpm).	20-181
Motore,Parametri E2P	Dispositivo guasto	765 - 12	ENGINE	The engine control unit has detected an error in writing the parameters.	20-189

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
Motore,Parametri E2P	Segnale non valido	765 - 2	ENGINE	The engine control unit has detected a discrepancy between the parameters written in EEPROM.	20-194
Motore,Press. Atmosf.	Dispositivo guasto	108 - 12	ENGINE	The engine control unit detects that atmospheric pressure is outside the permissible limits.	20-193
Motore,pressione turbo.	Segnale non valido	102 - 2	ENGINE	The engine control unit has detected that the engine turbo charge pressure signal is either non-existent or unreliable.	20-177
Motore,Regolatore	Difetto meccanico	535 - 7	ENGINE	The engine control unit has detected that the difference between the command and the response of the actuator is greater than 10%.	20-186
Motore,sens. velocita	Frequenza non corretta	190 - 8	ENGINE	The engine control unit detects that the signal from the engine pickup is either non-existent or incorrect.	20-174
Motore,sens.temp. ECU	Dispositivo guasto	171 - 12	ENGINE	The engine control unit detects that its internal temperature is too high.	20-193
Motore,Temp. gasolio	Segnale non valido	174 - 2	ENGINE	The engine control unit has detected that the fuel temperature signal is either non-existent or unreliable.	20-179
Motore,Temp. gasolio	Segnale troppo elevato	174 - 0	ENGINE	The engine control unit has detected a fuel temperature higher than the alarm threshold.	20-182
Motore,temperatura	Segnale non valido	110 - 2	ENGINE	The engine control unit has detected that the coolant temperature signal is either non-existent or unreliable.	20-178
Motore,temperatura	Segnale troppo elevato	110 - 0	ENGINE	The engine control unit has detected a coolant temperature higher than the alarm threshold	20-180
Motore,temperatura	Segnale troppo elevato	110 - 0	ENGINE	The engine control unit has detected a coolant temperature higher than the alarm threshold	20-180
Msg PTCTL1 TRAVDIR	Dispositivo guasto	C1	TRANSM.	The transmission control unit detects an error in the information received by the HLHP control unit regarding the travel direction selection request.	20-268
Pedale acceleratore	Dispositivo guasto	51 - 12	HLHP	The engine control unit has detected an error in the value of the accelerator pedal signal (via CANBUS).	20-104
Puls.manuale DOWN sollev.	Corto circuito massa	695 - 3	HLHP	The control unit detects that the lift 'down' control buttons on the rear fenders are continuously pressed.	20-170
Puls.manuale UP sollev.	Corto circuito massa	694 - 3	HLHP	The control unit detects that the lift 'up' control buttons on the rear fenders are continuously pressed.	20-169
Pulsante PTO esterno	Corto circuito +12V	662 - 3	HLHP	The control unit detects that the rear PTO control buttons on the rear fenders are continuously pressed.	20-166
Sensore di sterzo	Corto circuito +12V	689 - 3	HLHP	The control unit detects that the steering angle sensor is shorting to battery positive.	20-167
Sensore di sterzo	Corto circuito massa	689 - 4	HLHP	The ECU detects that the steering angle sensor is disconnected.	20-168

1st line on display	*2nd line on display*	*Code on ART*	*ECU*	*Description*	*Page.*
Sensore pos. sollev.	Corto circuito +12V	601 - 3	HLHP	The control unit detects that the lift position sensor is shorting to battery positive.	20-129
Sensore pos. sollev.	Corto circuito massa	601 - 4	HLHP	The control unit detects that the lift position sensor is shorting to earth.	20-130
Sensore pos. sollev.	Dispositivo guasto	601 - 12	HLHP	The control unit detects an internal fault in the control unit in the input signal of the lift position sensor.	20-131
Sensore pos. sospens.	Corto circuito +12V	620 - 3	HLHP	The control unit detects that the front axle suspension position sensor is shorting to battery positive.	20-140
Sensore pos. sospens.	Corto circuito massa	620 - 4	HLHP	The control unit detects that the front suspension position sensor is disconnected.	20-141
Sensore Radar	Dispositivo guasto	656 - 12	HLHP	The control unit detects that the radar, when installed, does not send any signals when the travel speed exceeds 2 km/h.	20-164
Sensore sforzo destro	Corto circuito +12V	541 - 3	HLHP	The control unit detects that the RH draft sensor is shorting to battery positive.	20-108
Sensore sforzo destro	Corto circuito massa	541 - 4	HLHP	The control unit detects that the RH draft sensor is shorting to earth.	20-109
Sensore sforzo sin.	Corto circuito +12V	540 - 3	HLHP	The control unit detects that the LH draft sensor is shorting to battery positive.	20-106
Sensore sforzo sin.	Corto circuito massa	540 - 4	HLHP	The control unit detects that the LH draft sensor is shorting to earth.	20-107
Tensione batteria	Segnale non valido	158 - 2	HLHP	The control unit has detected that the battery voltage is lower or higher than the operating limits (lower than 10.0V or higher than 15.0V).	20-105

5.2 HLHP CONTROL UNIT ALARMS

Alarm code	Infocenter	Description	Page.
SPN 51 - FMI 12	Pedale acceleratore Dispositivo guasto	The engine control unit has detected an error in the value of the accelerator pedal signal (via CANBUS).	20-104
SPN 63 - FMI 2	Comando inversore Segnale non valido	The transmission control unit has detected an error in the value of the shuttle lever signal (via CANBUS).	20-104
SPN 158 - FMI 2	Tensione batteria Segnale non valido	The control unit has detected that the battery voltage is lower or higher than the operating limits (lower than 10.0V or higher than 15.0V).	20-105
SPN 540 - FMI 3	Sensore sforzo sin. Corto circuito +12V	The control unit detects that the LH draft sensor is shorting to battery positive.	20-106
SPN 540 - FMI 4	Sensore sforzo sin. Corto circuito massa	The control unit detects that the LH draft sensor is shorting to earth.	20-107
SPN 541 - FMI 3	Sensore sforzo destro Corto circuito +12V	The control unit detects that the RH draft sensor is shorting to battery positive.	20-108
SPN 541 - FMI 4	Sensore sforzo destro Corto circuito massa	The control unit detects that the RH draft sensor is shorting to earth.	20-109
SPN 550 - FMI 2	EV PTO posteriore Segnale non valido	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-110
SPN 550 - FMI 3	EV PTO posteriore Corto circuito +12V	The control unit detects that the rear PTO solenoid is shorting to battery positive.	20-111
SPN 550 - FMI 4	EV PTO posteriore Corto circuito massa	The control unit detects that the rear PTO solenoid is shorting to earth.	20-112
SPN 550 - FMI 5	EV PTO posteriore non connesso	The control unit detects that the rear PTO solenoid is not connected.	20-113
SPN 550 - FMI 11	EV PTO posteriore Guasto non identificato	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-114
SPN 550 - FMI 12	EV PTO posteriore Dispositivo guasto	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-115
SPN 551 - FMI 2	EV PTO anteriore Segnale non valido	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-116
SPN 551 - FMI 3	EV PTO anteriore Corto circuito +12V	The control unit detects that the front PTO solenoid is shorting to battery positive.	20-117
SPN 551 - FMI 4	EV PTO anteriore Corto circuito massa	The control unit detects that the front PTO solenoid is shorting to earth.	20-118
SPN 551 - FMI 5	EV PTO anteriore non connesso	The control unit detects that the front PTO solenoid is not connected.	20-119
SPN 551 - FMI 11	EV PTO anteriore Guasto non identificato	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-120
SPN 551 - FMI 12	EV PTO anteriore Dispositivo guasto	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-121
SPN 552 - FMI 2	Elettrovalvola D.T. Segnale non valido	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-122
SPN 552 - FMI 3	Elettrovalvola D.T. Corto circuito +12V	The control unit detects that the 4WD solenoid is shorting to battery positive.	20-123

Alarm code	*Infocenter*	*Description*	*Page.*
SPN 552 - FMI 4	Elettrovalvola D.T. Corto circuito massa	The control unit detects that the 4WD solenoid is shorting to earth.	20-124
SPN 552 - FMI 5	Elettrovalvola D.T. non connesso	The control unit detects that the 4WD engagement solenoid is not connected.	20-125
SPN 552 - FMI 11	Elettrovalvola D.T. Guasto non identificato	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-126
SPN 552 - FMI 12	Elettrovalvola D.T. Dispositivo guasto	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-127
SPN 561 - FMI 2	Acceleratore a mano Segnale non valido	The engine control unit has detected an error in the value of the hand throttle signal (via CANBUS).	20-128
SPN 601 - FMI 3	Sensore pos. sollev. Corto circuito +12V	The control unit detects that the lift position sensor is shorting to battery positive.	20-129
SPN 601 - FMI 4	Sensore pos. sollev. Corto circuito massa	The control unit detects that the lift position sensor is shorting to earth.	20-130
SPN 601 - FMI 12	Sensore pos. sollev. Dispositivo guasto	The control unit detects an internal fault in the control unit in the input signal of the lift position sensor.	20-131
SPN 602 - FMI 3	EV salita sollevatore Corto circuito +12V	The control unit detects that the lift UP solenoid is shorting to battery positive.	20-132
SPN 602 - FMI 4	EV salita sollevatore Corto circuito massa	The control unit detects that the lift UP solenoid is shorting to earth.	20-133
SPN 602 - FMI 5	EV salita sollevatore non connesso	The control unit detects that the current draw of the lift UP solenoid valve is excessive.	20-134
SPN 602 - FMI 6	EV salita sollevatore Corto circuito	Detection: lift UP solenoid valve is short-circuited	20-135
SPN 603 - FMI 3	EV discesa sollevatore Corto circuito +12V	The control unit detects that the lift DOWN solenoid is shorting to battery positive.	20-136
SPN 603 - FMI 4	EV discesa sollevatore Corto circuito massa	The control unit detects that the lift DOWN solenoid is shorting to earth.	20-137
SPN 603 - FMI 5	EV discesa sollevatore non connesso	The control unit detects that the current draw of the lift DOWN solenoid valve is excessive.	20-138
SPN 603 - FMI 6	EV discesa sollevatore Corto circuito	Detection: lift "down" solenoid valve is short-circuited	20-139
SPN 604 - FMI 3		Alarm available but not utilized.	-
SPN 604 - FMI 4		Alarm available but not utilized.	-
SPN 605 - FMI 3		Alarm available but not utilized.	-
SPN 605 - FMI 4		Alarm available but not utilized.	-
SPN 606 - FMI 3		Alarm available but not utilized.	-
SPN 606 - FMI 4		Alarm available but not utilized.	-
SPN 607 - FMI 3		Alarm available but not utilized.	-
SPN 607 - FMI 4		Alarm available but not utilized.	-

Alarm code	Infocenter	Description	Page.
SPN 620 - FMI 3	Sensore pos. sospens. Corto circuito +12V	The control unit detects that the front axle suspension position sensor is shorting to battery positive.	20-140
SPN 620 - FMI 4	Sensore pos. sospens. Corto circuito massa	The control unit detects that the front suspension position sensor is disconnected.	20-141
SPN 621 - FMI 2	EV salita sospens. Segnale non valido	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension UP solenoid.	20-142
SPN 621 - FMI 3	EV salita sospens. Corto circuito +12V	The control unit detects that the front axle suspension UP solenoid is shorting to battery positive.	20-143
SPN 621 - FMI 4	EV salita sospens. Corto circuito massa	The control unit detects that the front axle suspension UP solenoid is shorting to earth.	20-144
SPN 621 - FMI 5	EV salita sospens. non connesso	The control unit detects that the front axle suspension UP solenoid is disconnected.	20-145
SPN 621 - FMI 11	EV salita sospens. Guasto non identificato	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension UP solenoid.	20-146
SPN 621 - FMI 12	EV salita sospens. Dispositivo guasto	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension UP solenoid.	20-147
SPN 622 - FMI 2	EV discesa sospens. Segnale non valido	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension DOWN solenoid.	20-148
SPN 622 - FMI 3	EV discesa sospens. Corto circuito +12V	The control unit detects that the front axle suspension DOWN solenoid is shorting to battery positive.	20-149
SPN 622 - FMI 4	EV discesa sospens. Corto circuito massa	The control unit detects that the front axle suspension DOWN solenoid is shorting to earth.	20-150
SPN 622 - FMI 5	EV discesa sospens. non connesso	The control unit detects that the front axle suspension DOWN solenoid is disconnected.	20-151
SPN 622 - FMI 11	EV discesa sospens. Guasto non identificato	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension DOWN solenoid.	20-152
SPN 622 - FMI 12	EV discesa sospens. Dispositivo guasto	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension DOWN solenoid.	20-153
SPN 623 - FMI 2		Alarm available but not utilized.	-
SPN 623 - FMI 3		Alarm available but not utilized.	-
SPN 623 - FMI 4		Alarm available but not utilized.	-
SPN 623 - FMI 5		Alarm available but not utilized.	-
SPN 623 - FMI 11		Alarm available but not utilized.	-
SPN 623 - FMI 12		Alarm available but not utilized.	-
SPN 625 - FMI 13		Alarm available but not utilized.	-
SPN 626 - FMI 11		Alarm available but not utilized.	-

Alarm code	Infocenter	Description	Page.
SPN 631 - FMI 9		Alarm available but not utilized.	-
SPN 632 - FMI 9	Errore CAN TCU messaggio in timeout	Detection of the absence of a connection via the CANBUS to the transmission control unit.	20-155
SPN 633 - FMI 9	Errore CAN Motore messaggio in timeout	Detection of the absence of a connection via the CANBUS to the engine control unit.	20-155
SPN 653 - FMI 2	EV differenziale Segnale non valido	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-156
SPN 653 - FMI 3	EV differenziale Corto circuito +12V	The control unit detects that the differential lock solenoid is shorting to battery positive.	20-157
SPN 653 - FMI 4	EV differenziale Corto circuito massa	The control unit detects that the differential lock solenoid is shorting to earth.	20-158
SPN 653 - FMI 5	EV differenziale non connesso	The control unit detects that the diff lock solenoid is not connected.	20-159
SPN 653 - FMI 11	EV differenziale Guasto non identificato	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-160
SPN 653 - FMI 12	EV differenziale Dispositivo guasto	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-161
SPN 654 - FMI 2	Alimen. sensori 8V Segnale non valido	The control unit detects a short circuit in 8V sensor power feed.	20-162
SPN 655 - FMI 2	Alimen. sensori 5V Segnale non valido	The control unit detects a short circuit in the 5V sensors power supply line.	20-163
SPN 656 - FMI 12	Sensore Radar Dispositivo guasto	The control unit detects that the radar, when installed, does not send any signals when the travel speed exceeds 2 km/h.	20-164
SPN 661 - FMI 8	Errore memoria Blocco 0	The control unit signals that EEPROM used to store the system parameters is damaged.	20-165
SPN 662 - FMI 3	Pulsante PTO esterno Corto circuito +12V	The control unit detects that the rear PTO control buttons on the rear fenders are continuously pressed.	20-166
SPN 663 - FMI 12		Alarm available but not utilized.	-
SPN 664 - FMI 12		Alarm available but not utilized.	-
SPN 665 - FMI 11		Alarm available but not utilized.	-
SPN 689 - FMI 3	Sensore di sterzo Corto circuito +12V	The control unit detects that the steering angle sensor is shorting to battery positive.	20-167
SPN 689 - FMI 4	Sensore di sterzo Corto circuito massa	The ECU detects that the steering angle sensor is disconnected.	20-168
SPN 690 - FMI 4		Alarm available but not utilized.	-
SPN 691 - FMI 4		Alarm available but not utilized.	-
SPN 692 - FMI 4		Alarm available but not utilized.	-
SPN 693 - FMI 3		Alarm available but not utilized.	-

Alarm code	*Infocenter*	*Description*	*Page.*
SPN 693 - FMI 4		Alarm available but not utilized.	-
SPN 694 - FMI 3	Puls.manuale UP sollev. Corto circuito massa	The control unit detects that the lift UP control buttons on the rear fenders are continuously pressed.	20-169
SPN 695 - FMI 3	Puls.manuale DOWN sollev. Corto circuito massa	The control unit detects that the lift DOWN control buttons on the rear fenders are continuously pressed.	20-170

← *SPN 51 - FMI 12*

← *Pedale acceleratore*
Dispositivo guasto

DESCRIPTION

The control unit detects that the value of the accelerator pedal position sensor signal is not within the permissible minimum and maximum limits.

CHECK

- Check whether there are any alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter “CANBUS LINE ALARMS”.
- Calibrate the accelerator pedal sensor (for details, see "4.3.6 CALIBRATION OF THE CLUTCH PEDAL")
- Cancel all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.

← *SPN 63 - FMI 2*

← *Comando inversore*
Segnale non valido

DESCRIPTION

The control unit detects that the value of the shuttle lever signal is not within the permissible minimum and maximum limits.

CHECK

- Check whether there are any alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter “CANBUS LINE ALARMS”.
- Cancel all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.

← *SPN 158 - FMI 2*

← *Tensione batteria*
Segnale non valido

DESCRIPTION

The control unit has detected that the battery voltage is lower or higher than the operating limits (lower than 10.0V or higher than 15.0V).

CAUTION
Never connect the ART with the engine running when this alarm is indicated on the Infocenter display, as the instrument could be damaged.

CHECK

- Check, with the engine off, that the battery voltage is within the prescribed range (normal voltage 12V - 13.5V).

1 - VOLTAGE HIGHER THAN NORMAL

- Check whether or not the battery voltage returns to normal with the engine running. In this instance the problem may be attributable to a fault in the HLHP control unit, otherwise, if the voltage increases above the normal value, the cause of the problem is malfunctioning of the alternator voltage regulator.

2 - VOLTAGE BELOW NORMAL

NOTE
This alarm is activated generally when the battery voltage is less than 10V.
It can be caused by an excessive current draw when the engine is started, or if the battery is damaged or cannot be recharged by the alternator.
This alarm is generally only displayed as a passive alarm on the ART. Should the alarm be displayed among the active alarms, and the battery voltage is within the prescribed range (normal voltage 12V - 13.5V) with the engine on, the control unit must be renewed.

- Check, with the engine off, that the battery voltage is within the prescribed range (normal voltage 12V - 13.5V). Lower voltage values may be detected following prolonged disuse of the tractor, in this case it is not necessary to replace the battery immediately.
- Check first whether or not the battery voltage returns to normal with the engine running. In this instance the problem may be attributable to the battery being discharged or damaged; if not, and the voltage remains lower or higher than the prescribed minimum, the trouble is caused by incorrect operation of the alternator.

NOTE
In extreme cases, when the battery is seriously damaged (short circuiting), the alternator may not be able to recharge the cells or generate sufficient voltage. Before changing the alternator, verify its correct or incorrect operation by connecting a new battery.

← *SPN 540 - FMI 3*

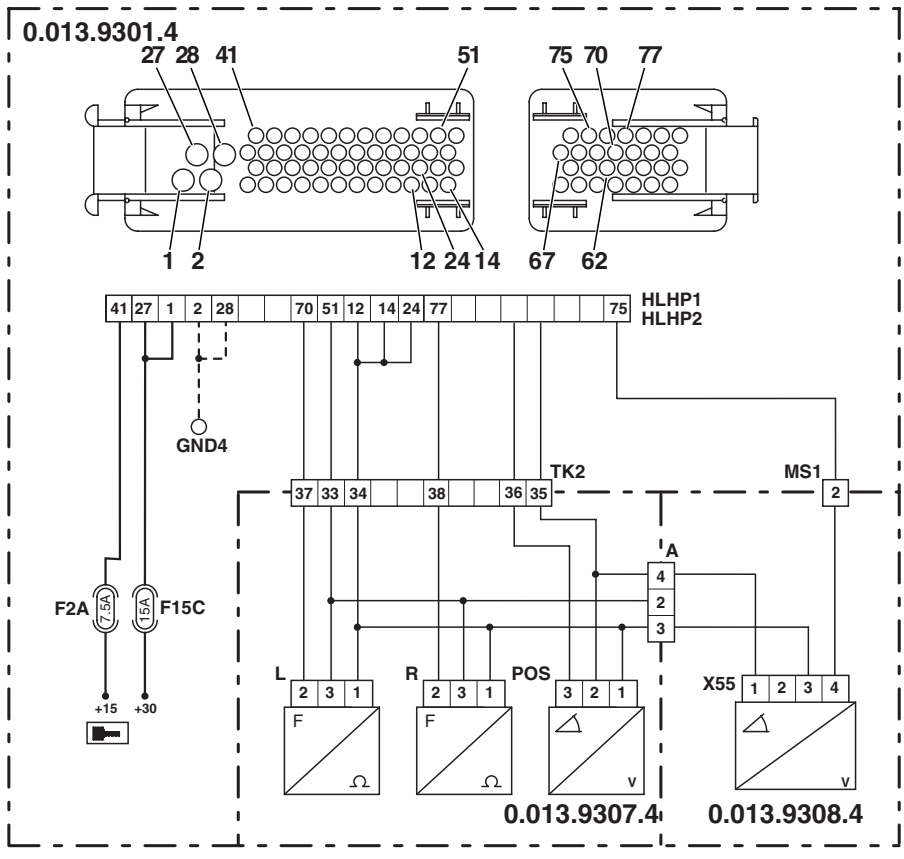
← *Sensore sforzo sin.*
Corto circuito +12V

DESCRIPTION

The control unit detects that the LH draft sensor is shorting to battery positive.

CHECK

- Check that the contacts on the “L” connector of the LH draft sensor and “HLHP2” of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), check that the lift draft sensor is receiving power correctly (approx. 8 Vdc between pin 3 (positive) and pin 1 (negative) of connector “L”)
- With the starter key in position “I” (ON) and the "HLHP2" connector disconnected from the control unit, connect a test meter to pin 2 of connector “L” and to the ground on the tractor frame and check for 0 voltage (meter reading: 0V).
- Cancel all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034660

← *SPN 540 - FMI 4*

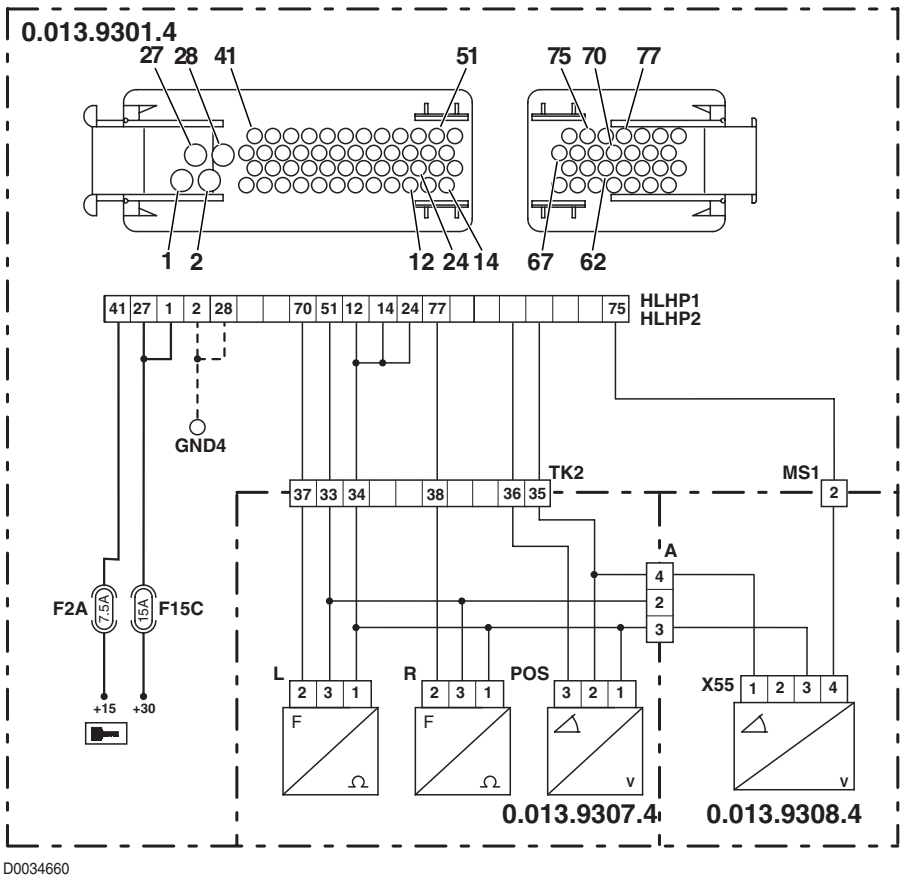
← *Sensore sforzo sin.*
Corto circuito massa

DESCRIPTION

The control unit detects that the LH draft sensor is shorting to earth.

CHECK

- Check that the contacts on the “L” connector of the LH draft sensor and “HLHP2” of the HLHP control unit are not oxidised and are firmly connected
- With the starter key in position “I” (ON), check that the lift draft sensor is receiving power correctly (approx. 8 Vdc between pin 3 (positive) and pin 1 (negative) of connector “L”)
- With the connector "HLHP2" disconnected from the control unit, check that there is electrical continuity between pin 70 of the connector "HLHP2" and pin 2 of the connector "L"".
- With the starter key in position “O” (OFF) and “HLHP2” connector disconnected from the control unit, connect a test meter to pin 2 of the connector “L” and to the earth on the transmission and test the resistance to check for a short circuit (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034660

← *SPN 541 - FMI 3*

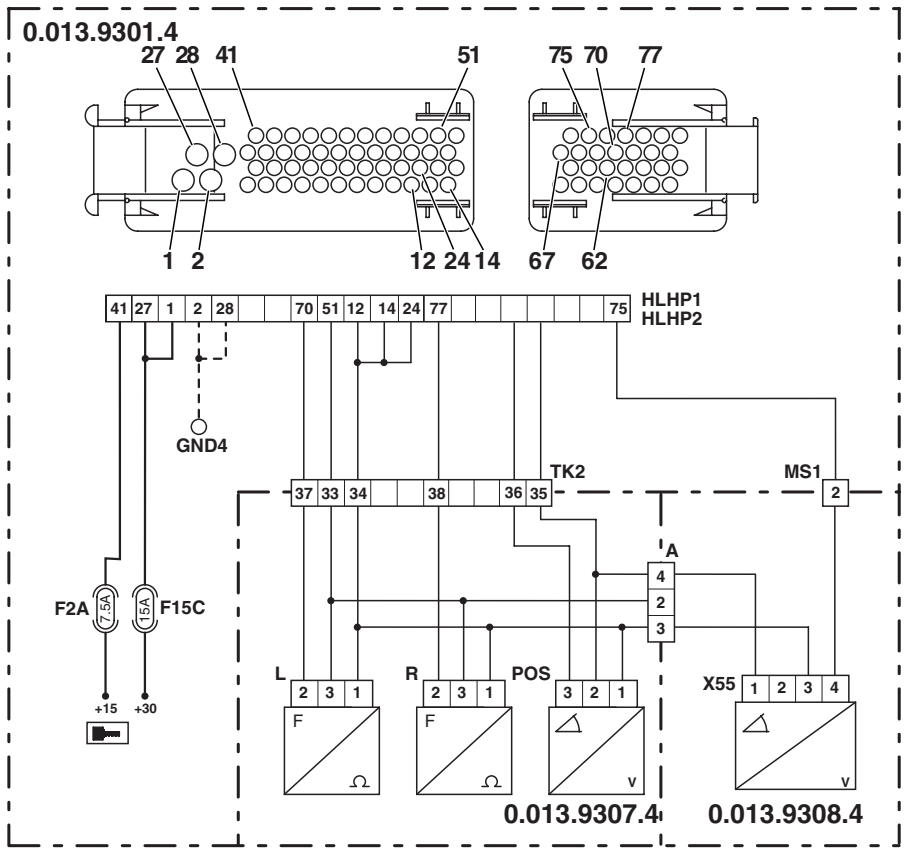
← *Sensore sforzo destro*
Corto circuito +12V

DESCRIPTION

The control unit detects that the RH draft sensor is shorting to battery positive.

CHECK

- Check that the contacts on the “R” connector of the RH draft sensor and “HLHP2” of the HLHP control unit are not oxidised and are firmly connected
-)With the starter key in position “I” (ON), check that the lift draft sensor is receiving power correctly (approx. 8 Vdc between pin 3 (positive) and pin 1 (negative) of connector “R”)
- With the starter key in position “I” (ON) and the "HLHP2" connector disconnected from the control unit, connect a test meter to pin 2 of connector “R” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034660

← *SPN 541 - FMI 4*

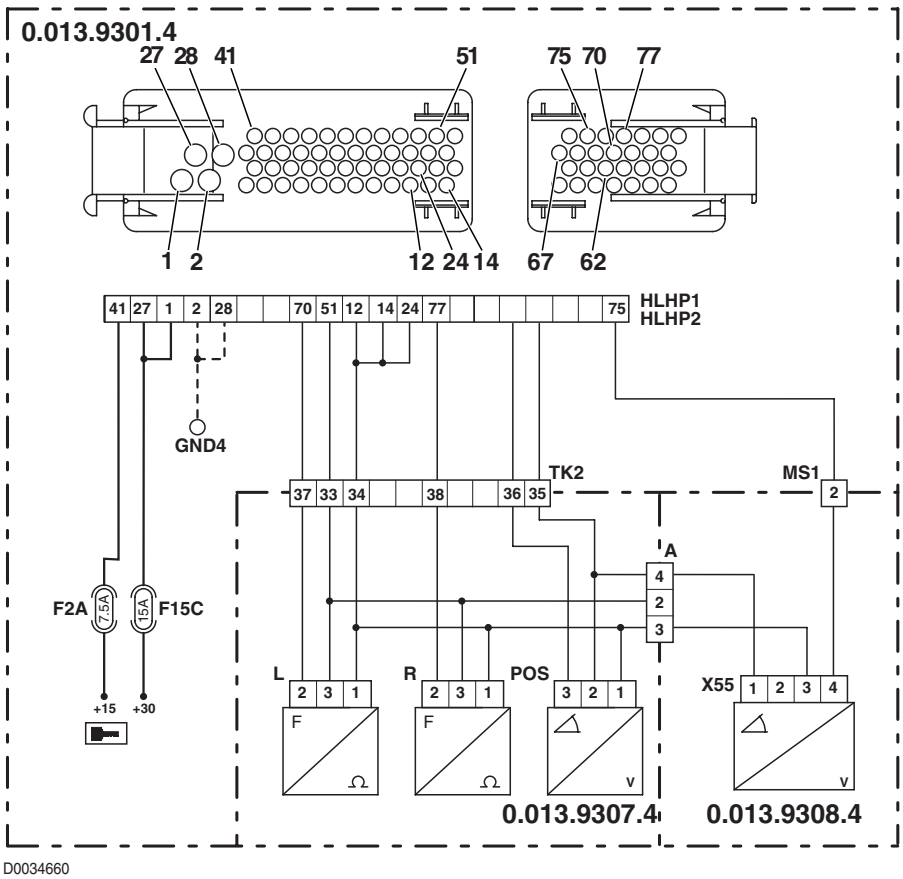
← *Sensore sforzo destro*
Corto circuito massa

DESCRIPTION

The control unit detects that the RH draft sensor is shorting to earth.

CHECK

- Check that the contacts on the “L” connector of the RH draft sensor and “HLHP2” of the HLHP control unit are not oxidised and are firmly connected
- With the starter key in position “I” (ON), check that the lift draft sensor is receiving power correctly (approx. 8 Vdc between pin 3 (positive) and pin 1 (negative) of connector “L”)
- With the connector "HLHP2" disconnected from the control unit, check that there is electrical continuity between pin 77 of the connector "HLHP2" and pin 2 of the connector "R"".
- With the starter key in position “O” (OFF) and connector “HLHP2” disconnected from the control unit, connect a test meter to pin 2 of connector “R” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034660

← *SPN 550 - FMI 2*

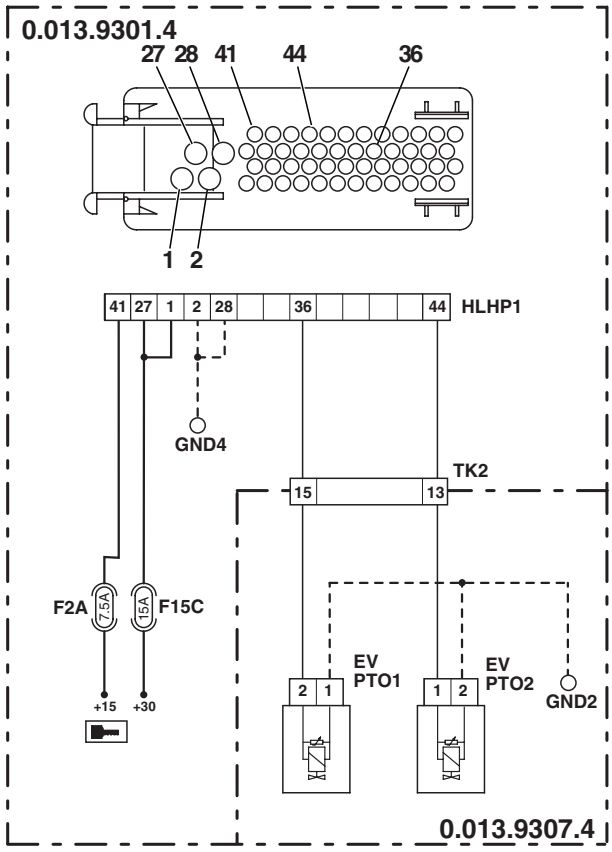
← *EV PTO posteriore*
Segnale non valido

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO2” connector of the rear PTO solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034650

← *SPN 550 - FMI 3*

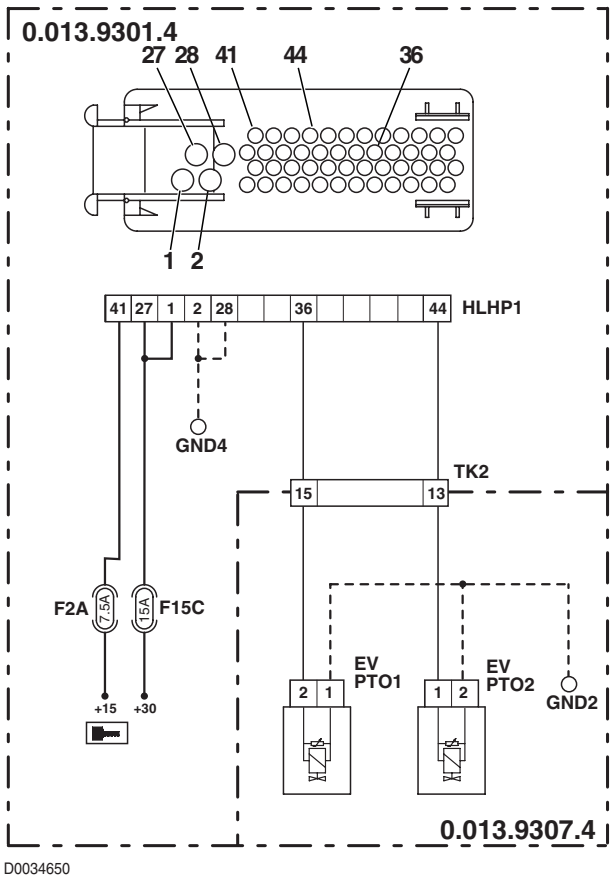
← *EV PTO posteriore*
Corto circuito +12V

DESCRIPTION

The control unit detects that the rear PTO solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO2” connector of the rear PTO solenoid are not oxidised and are firmly connected
- With the starter key in position “I” (ON) and the "HLHP1" connector disconnected from the control unit, connect a test meter to pin 2 of connector “EVPTO2” to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034650

← *SPN 550 - FMI 4*

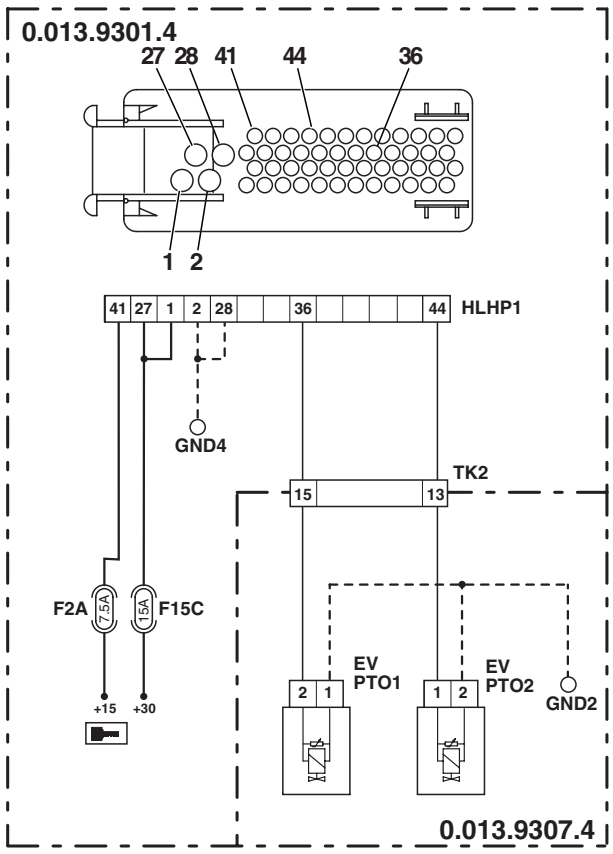
← *EV PTO posteriore*
Corto circuito massa

DESCRIPTION

The control unit detects that the rear PTO solenoid is shorting to earth.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO2” connector of the rear PTO solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 2 of connector “EVPTO2” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034650

← *SPN 550 - FMI 5*

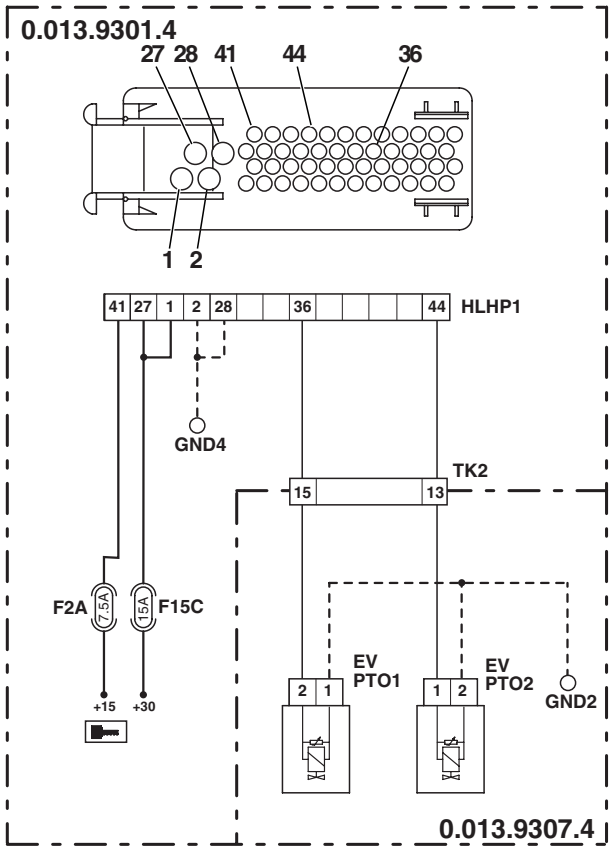
← *EV PTO posteriore non connesso*

DESCRIPTION

The control unit detects that the rear PTO solenoid is not connected.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO2” connector of the rear PTO solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “EVPTO2” and to pin 36 of the " HLHP1" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of connector“EVPTO2” and to the earth on the transmission and perform a resistance test to check that the wire is not broken (meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034650

← *SPN 550 - FMI 11*

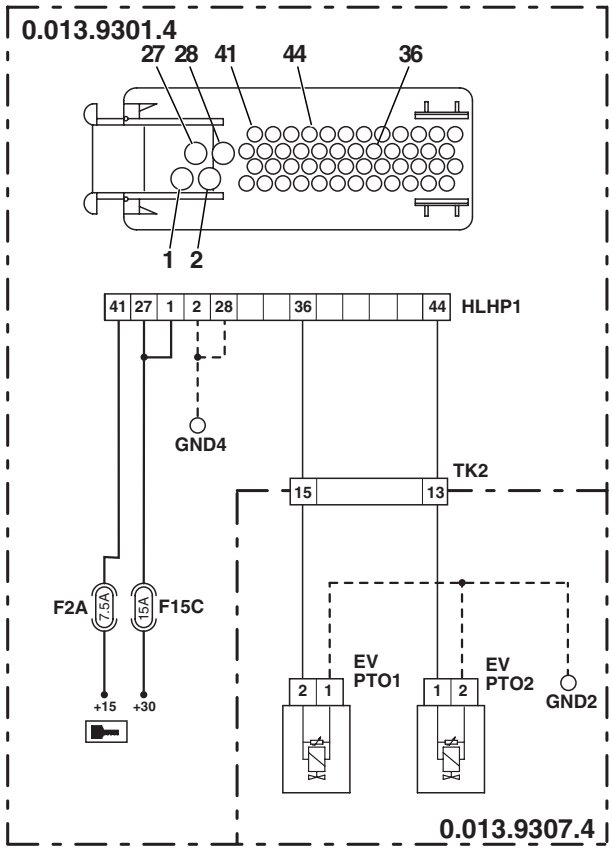
← *EV PTO posteriore*
Guasto non identificato

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO2” connector of the rear PTO solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034650

← *SPN 550 - FMI 12*

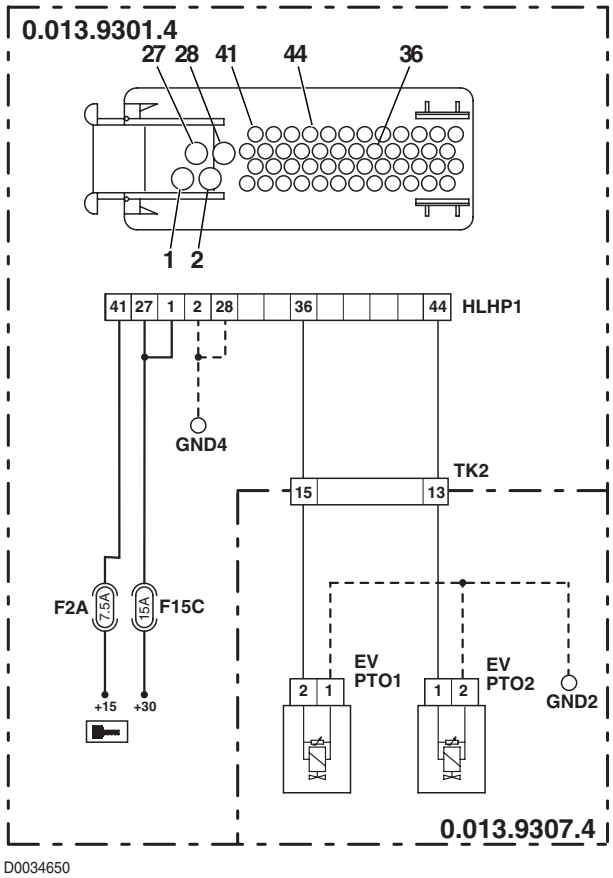
← *EV PTO posteriore*
Dispositivo guasto

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO2” connector of the rear PTO solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034650

← *SPN 551 - FMI 2*

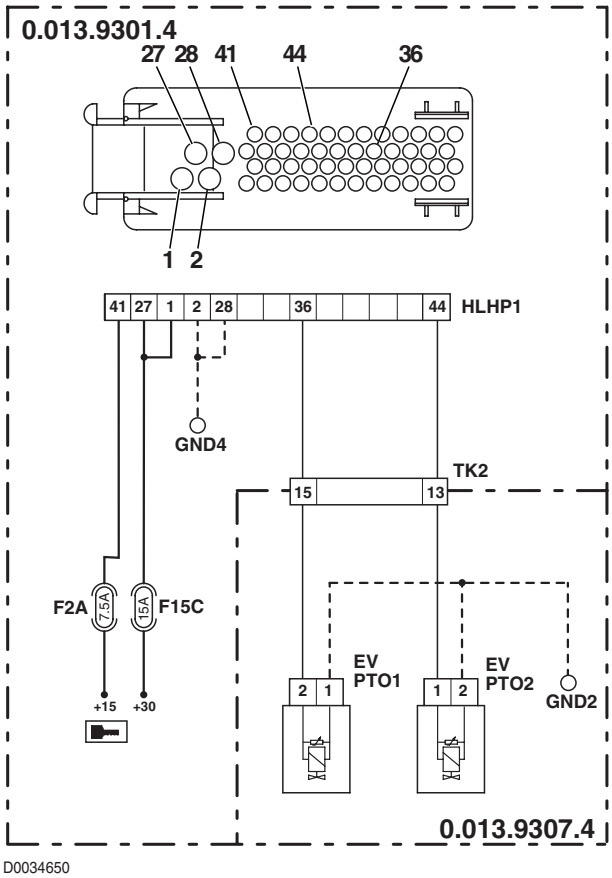
← *EV PTO anteriore*
Segnale non valido

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO1” connector of the rear PTO solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034650

← *SPN 551 - FMI 3*

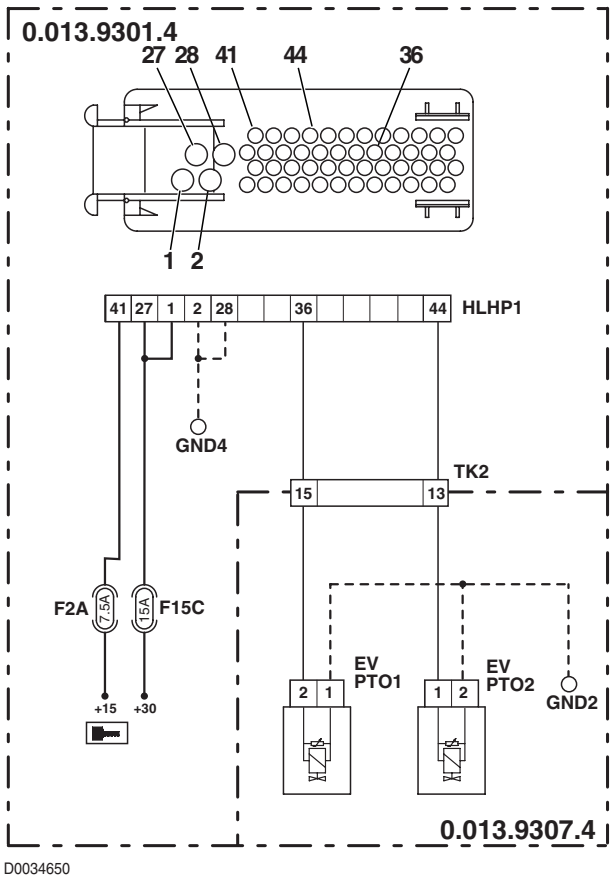
← *EV PTO anteriore*
Corto circuito +12V

DESCRIPTION

The control unit detects that the front PTO solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO1” connector of the rear PTO solenoid are not oxidised and are firmly connected
- With the starter key in position “I” (ON) and the "HLHP1" connector disconnected from the control unit, connect a test meter to pin 2 of connector “EVPTO1” to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



← *SPN 551 - FMI 4*

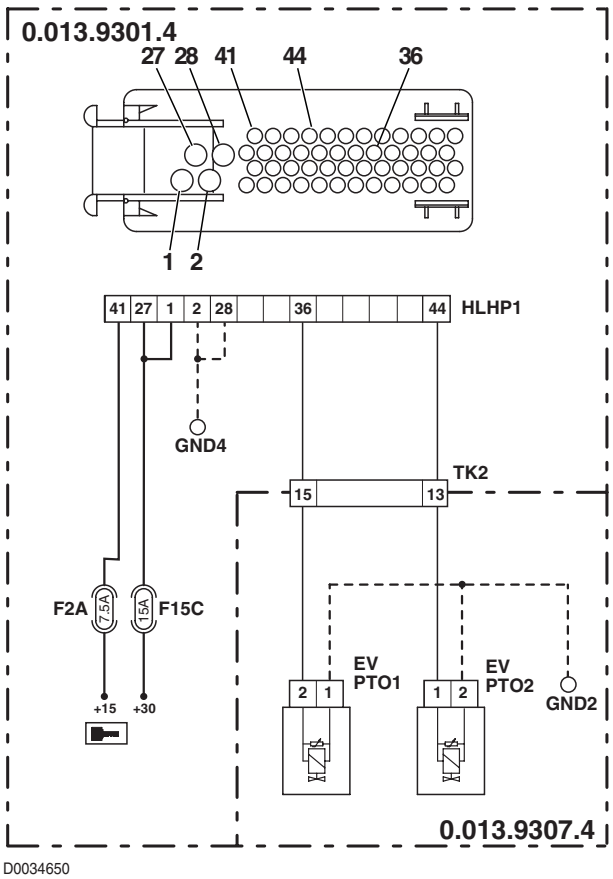
← *EV PTO anteriore*
Corto circuito massa

DESCRIPTION

The control unit detects that the front PTO solenoid is shorting to earth.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO1” connector of the rear PTO solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 2 of connector “EVPTO1” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034650

← *SPN 551 - FMI 5*

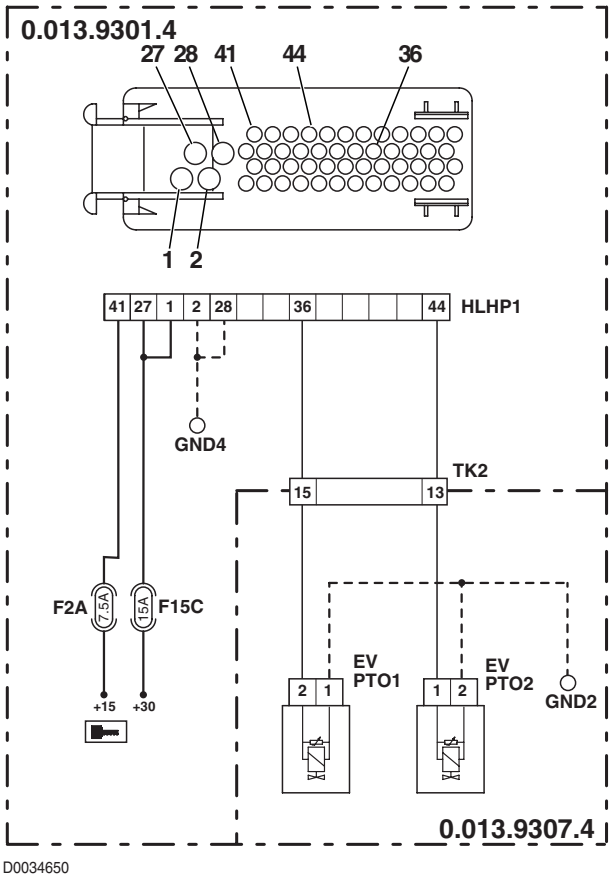
← *EV PTO anteriore non connesso*

DESCRIPTION

The control unit detects that the front PTO solenoid is not connected.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO1” connector of the front PTO solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “EVPTO1” and to pin 44 of the " HLHP1" connector and measure the resistance to verify that there is electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of connector “EVPTO1” and to the earth on the transmission and perform a resistance test to check that the wire is not broken (meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034650

← *SPN 551 - FMI 11*

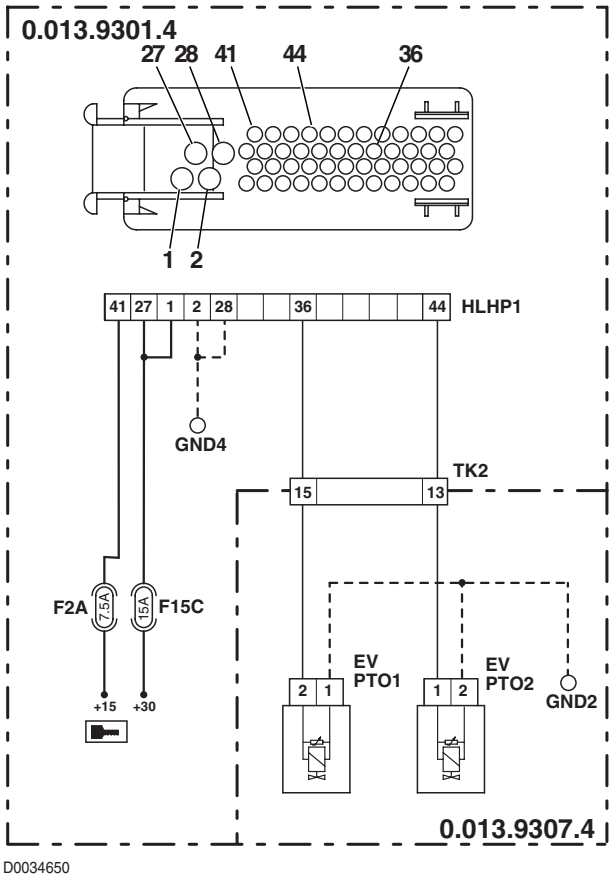
← *EV PTO anteriore*
Guasto non identificato

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO1” connector of the front PTO solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034650

← *SPN 551 - FMI 12*

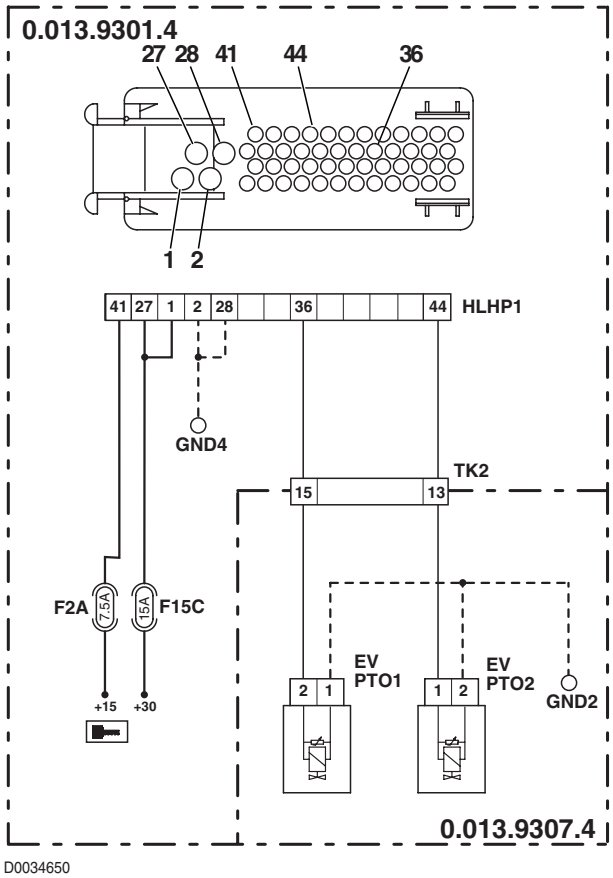
← *EV PTO anteriore*
Dispositivo guasto

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO1” connector of the front PTO solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034650

← *SPN 552 - FMI 2*

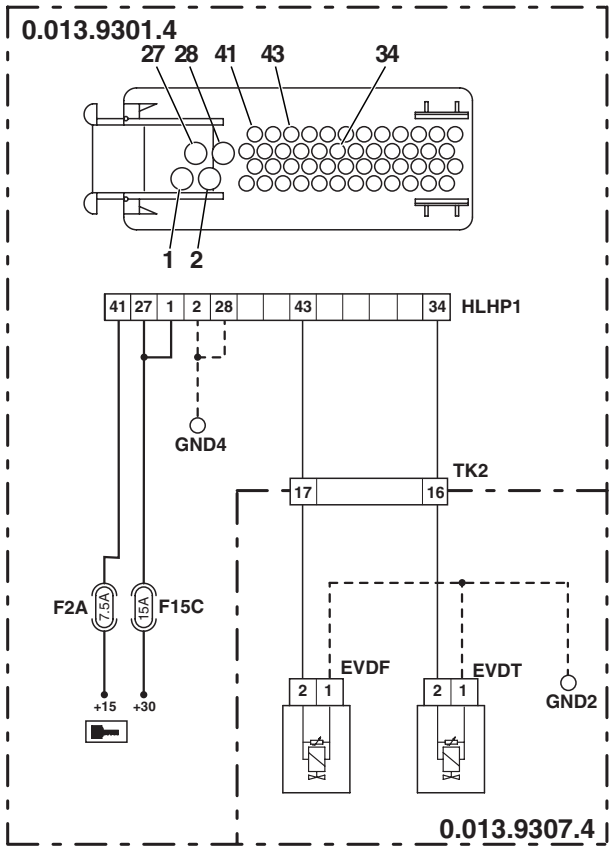
← *Elettrovalvola D.T.*
Segnale non valido

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVLOCK” connector of the 4WD solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 552 - FMI 3*

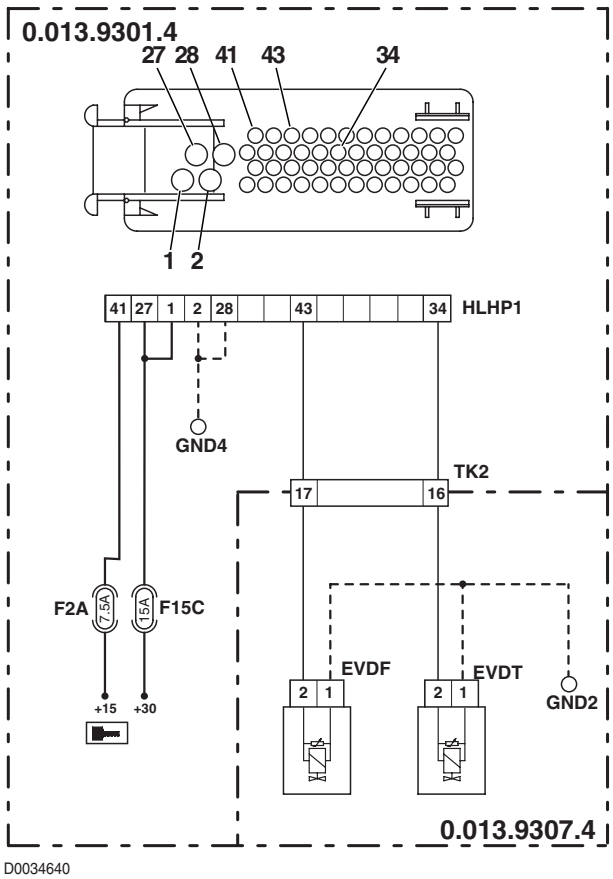
← *Elettrovalvola D.T.*
Corto circuito +12V

DESCRIPTION

The control unit detects that the 4WD solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDT” connector of the 4WD solenoid are not oxidised and are firmly connected
- With the starter key in position “I” (ON) and the "HLHP1" connector disconnected from the control unit, connect a test meter to pin 2 of connector “EVDT” to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 552 - FMI 4*

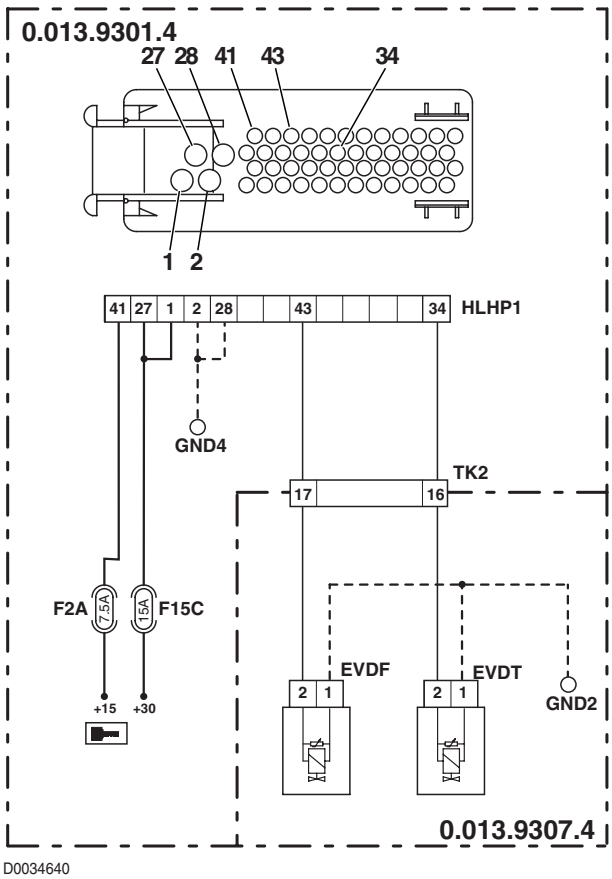
← *Elettrovalvola D.T.*
Corto circuito massa

DESCRIPTION

The control unit detects that the 4WD solenoid is shorting to earth.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDT” connector of the 4WD solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 2 of connector “EVDT” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034640

← *SPN 552 - FMI 5*

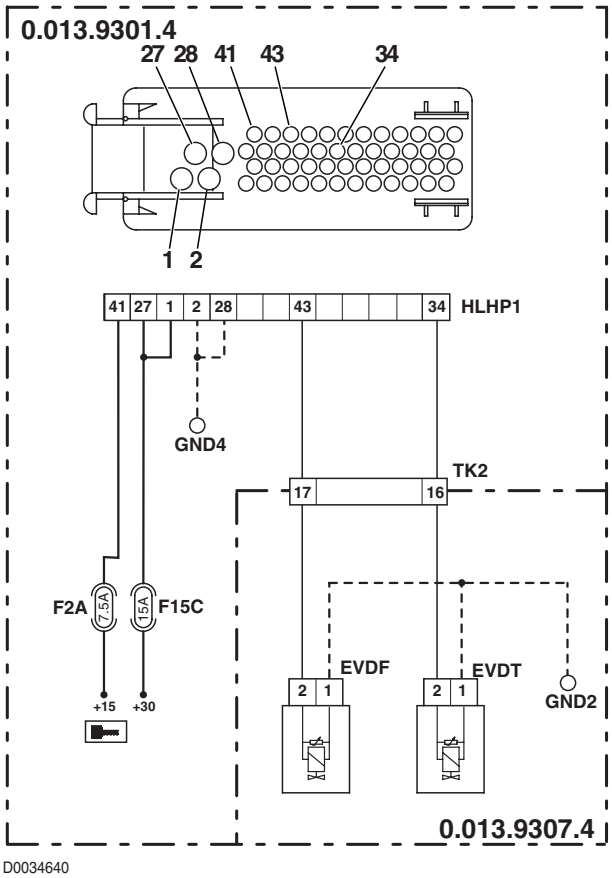
← *Elettrovalvola D.T. non connesso*

DESCRIPTION

The control unit detects that the 4WD engagement solenoid is not connected.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDT” connector of the 4WD solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “EVDT” and to pin 34 of the " HLHP1" connector and measure the resistance to verify that there is electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of connector “EVDT” and to the earth on the transmission and perform a resistance test to check that the wire is not broken (meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



← *SPN 552 - FMI 11*

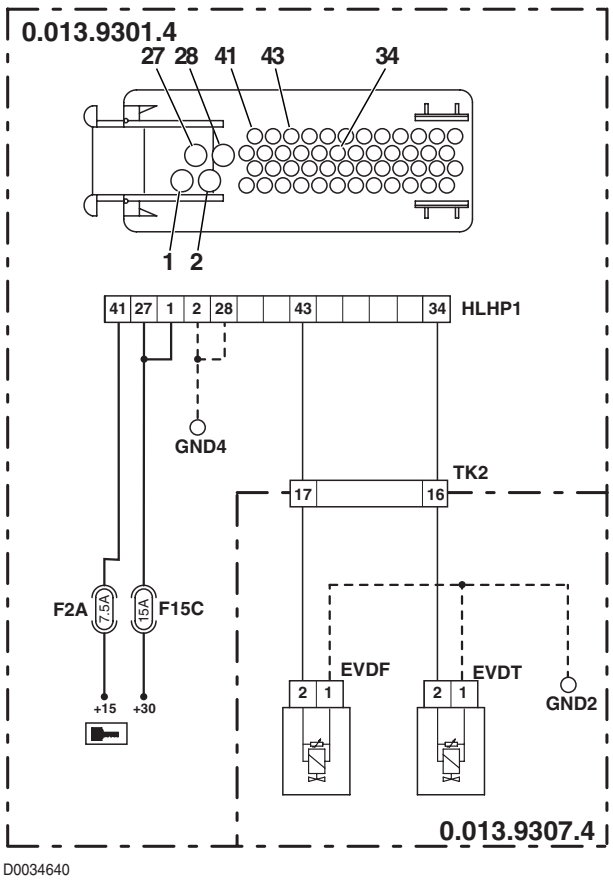
← *Elettrovalvola D.T.*
Guasto non identificato

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDT” connector of the 4WD solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 552 - FMI 12*

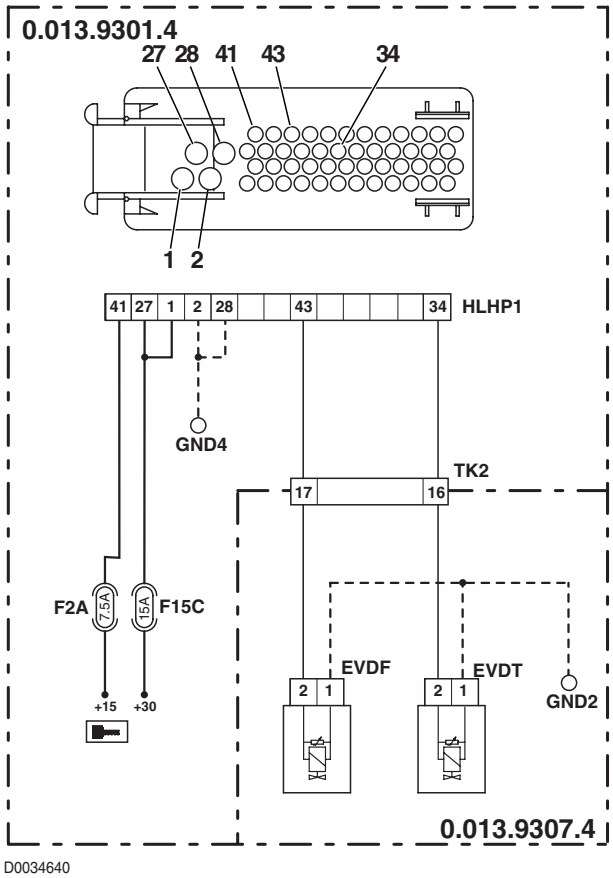
← *Elettrovalvola D.T.*
Dispositivo guasto

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDT” connector of the 4WD solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 561 - FMI 2*

← *Acceleratore a mano*
Segnale non valido

DESCRIPTION

The control unit detects that the value of the hand throttle position sensor signal is not within the permissible minimum and maximum limits.

CHECK

- Check whether there are any alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter “CANBUS LINE ALARMS”.
- Calibrate the hand throttle sensor (for details, see "4.2.6 CALIBRATION OF THE HAND THROTTLE (USING THE SERDIA PROGRAM)" or "4.2.7 CALIBRATION OF THE HAND THROTTLE (USING THE ART)").
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.

← *SPN 601 - FMI 3*

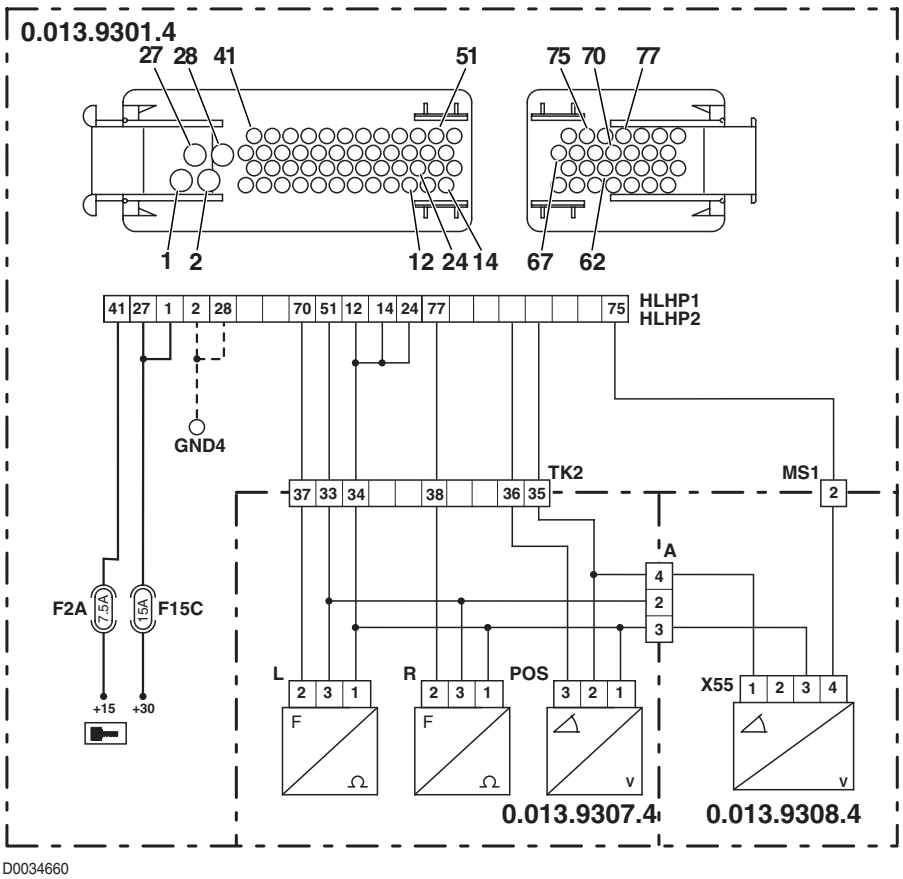
← *Sensore pos. sollev.*
Corto circuito +12V

DESCRIPTION

The control unit detects that the lift position sensor is shorting to battery positive.

CHECK

- Check that the contacts on the connector “POS” of the lift position sensor and the “HLHP2” connector of the HLHP control unit are not oxidised and are firmly connected
- With the starter key in position “I” (ON), check that the lift position sensor is receiving power correctly (approx. 5 Vdc between pin 3 (positive) and pin 1 (negative) of connector “POS”).
- With the starter key in position “I” (ON), and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 2 of connector “POS” and to the earth on the cab and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034660

← *SPN 601 - FMI 4*

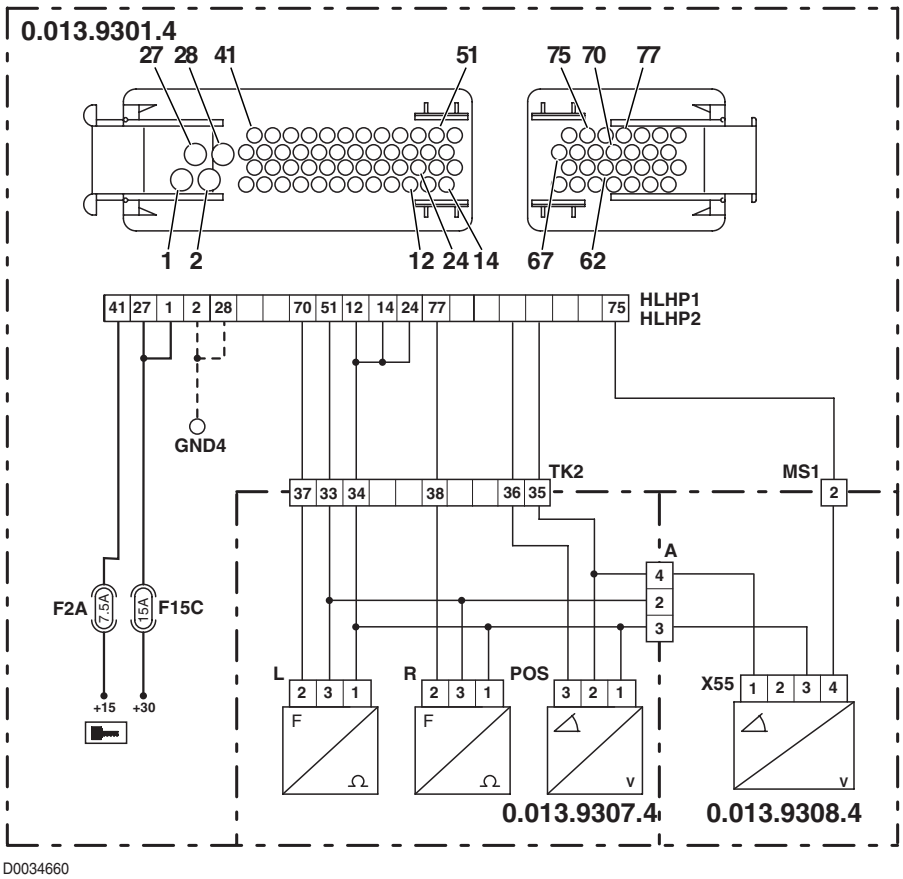
← *Sensore pos. sollev.*
Corto circuito massa

DESCRIPTION

The control unit detects that the lift position sensor is shorting to earth.

CHECK

- Check that the contacts on the connector “POS” of the lift position sensor and the “HLHP” connector of the HLHP control unit are not oxidised and are firmly connected
- With the starter key in position “I” (ON), check that the lift position sensor is receiving power correctly (approx. 5 Vdc between pin 3 (positive) and pin 1 (negative) of connector “POS”).
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 2 of connector “POS” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 1 and pin 2 of connector “POS” and perform a resistance test to check that the connectors are not shorting (meter reading: infinity).
- Check correct operation of the sensor (for technical details, see section 40)
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034660

← *SPN 601 - FMI 12*

← *Sensore pos. sollev.*
Dispositivo guasto

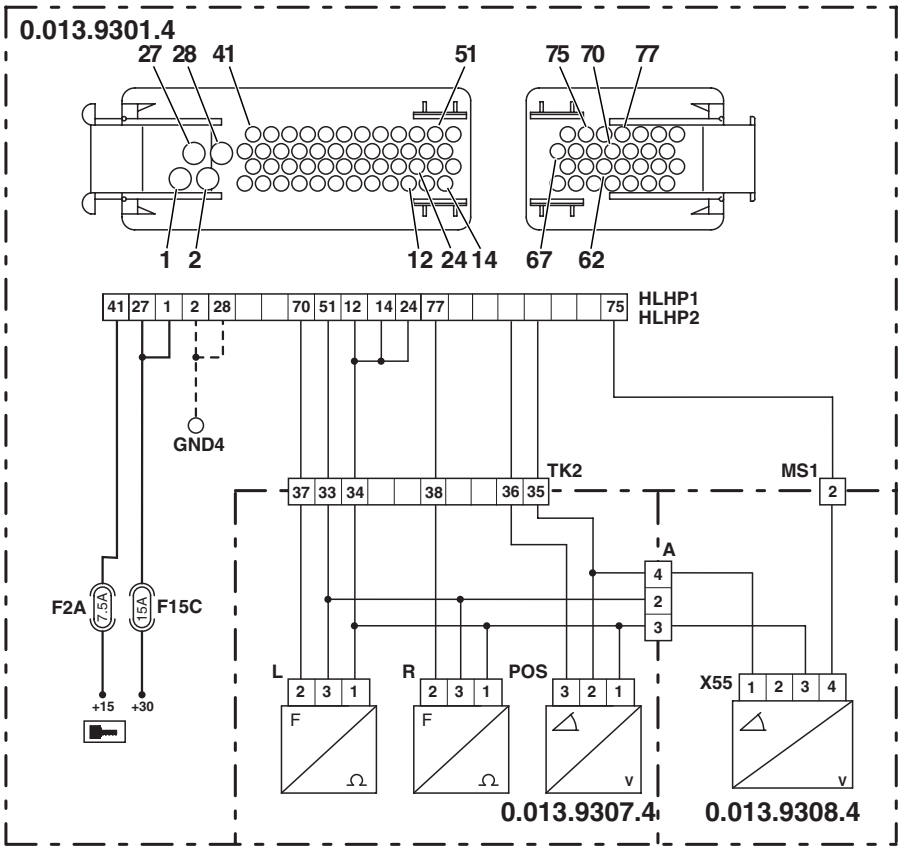
DESCRIPTION

The control unit detects an internal fault in the control unit in the input signal of the lift position sensor.

NOTE
This alarm is generated when the sensor is not receiving power correctly and the control unit fails to detect an input signal. When this alarm is displayed, alarms related to the power inputs and earths of the components whose power feed is connected in parallel to this sensor may also appear.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “POS” connector of the rear PTO solenoid are not oxidised and are firmly connected.
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034660

← *SPN 602 - FMI 3*

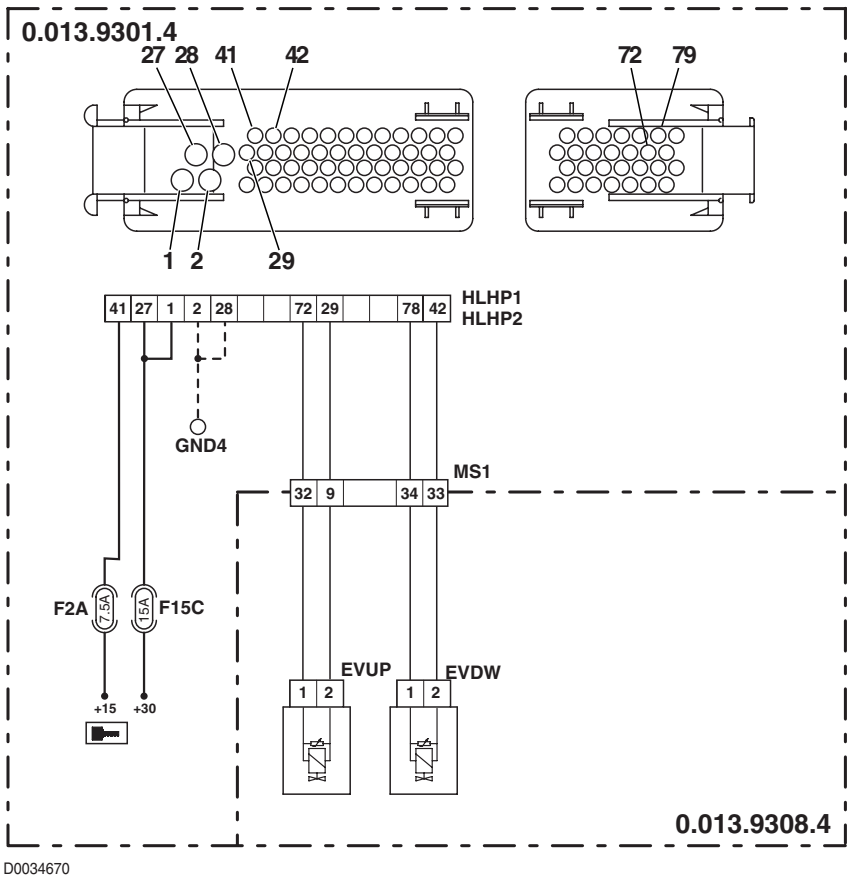
← *EV salita sollevatore*
Corto circuito +12V

DESCRIPTION

The control unit detects that the lift UP solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “EVUP” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 1 of connector “EVUP” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON), and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin2 of connector “EVUP” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



← *SPN 602 - FMI 4*

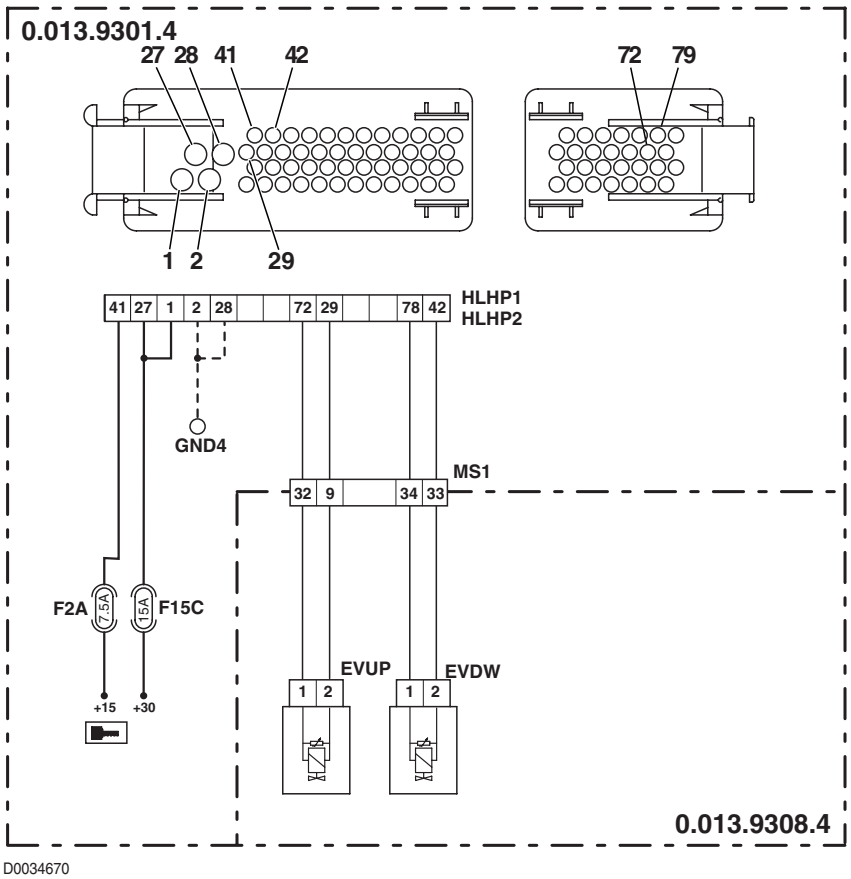
← *EV salita sollevatore*
Corto circuito massa

DESCRIPTION

The control unit detects that the lift UP solenoid is shorting to earth.

CHECK

- Check that the contacts on the “EVUP” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 1 of connector “EVUP” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



← *SPN 602 - FMI 5*

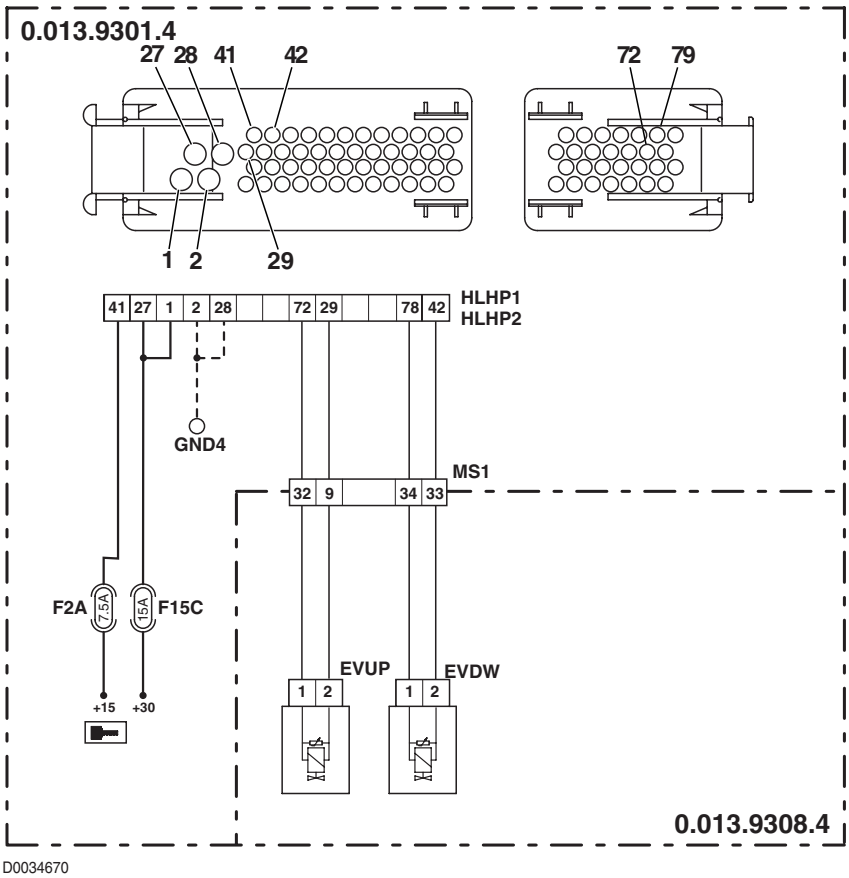
← *EV salita sollevatore non connesso*

DESCRIPTION

The control unit detects that the current draw of the lift UP solenoid valve is excessive.

CHECK

- Check that the contacts on the “EVUP” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- Test the internal resistance of the solenoid (for the technical details, see unit 40).
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 1 and pin 2 of connector “EVUP” and perform a resistance test to check that the connectors are not shorting (meter reading: infinity).
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 2 of connector “EVUP” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034670

← *SPN 602 - FMI 6*

← *EV salita sollevatore*
Corto circuito

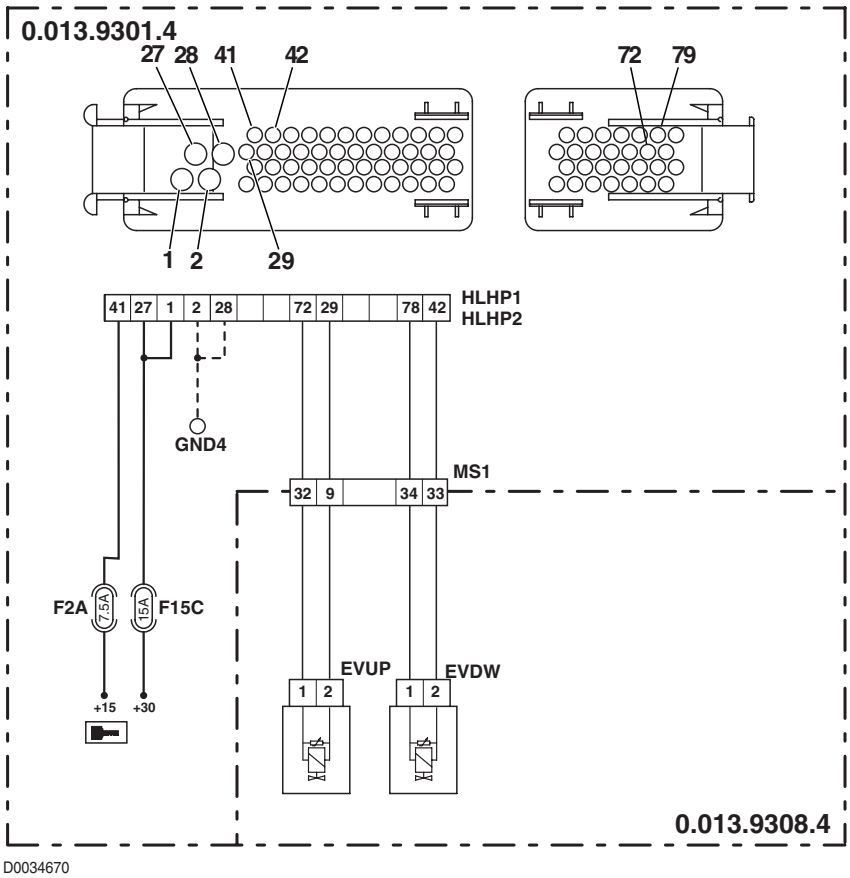
DESCRIPTION

The control unit detects a short circuit in the control wire of the lift UP solenoid.

NOTE
This alarm is generated when the control unit detects an abnormal current draw (but not excessively high) on pin 72 of the connector "HLHP2".

CHECK

- Check that the contacts on the “EVUP” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of the connector “EVUP” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF), connect a test meter to pins 1 and 2 of connector “EVUP” and test the resistance to check for a short circuit (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



← *SPN 603 - FMI 3*

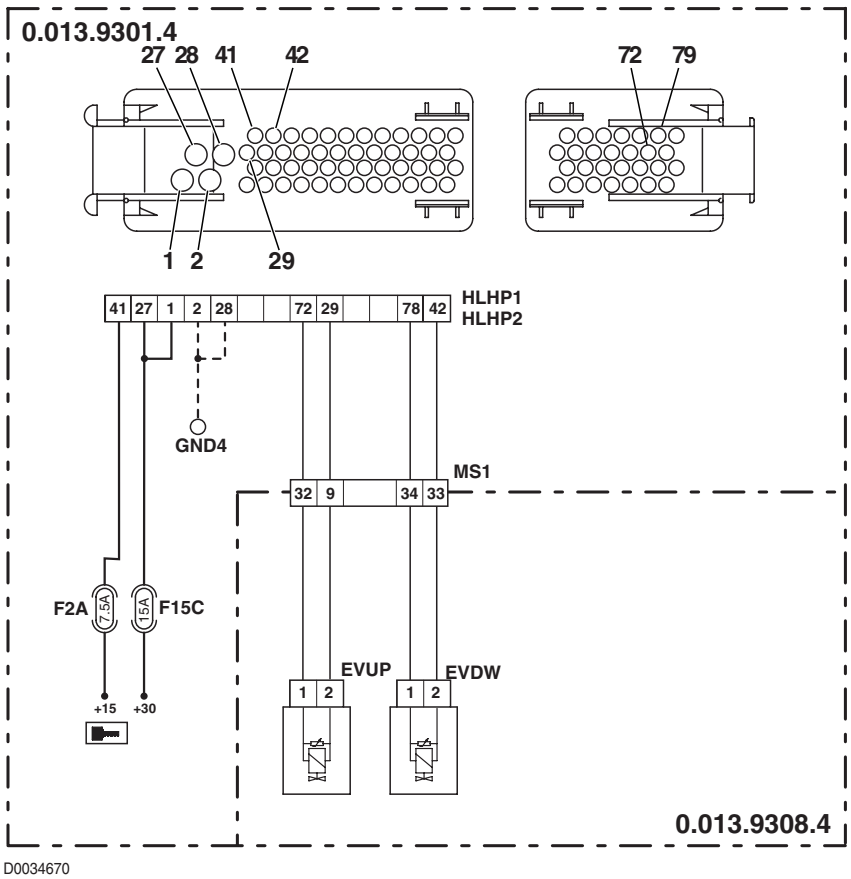
← *EV discesa sollevatore*
Corto circuito +12V

DESCRIPTION

The control unit detects that the lift DOWN solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “EVDW” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 1 of connector “EVDW” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON), and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 2 of connector “EVDW” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



← *SPN 603 - FMI 4*

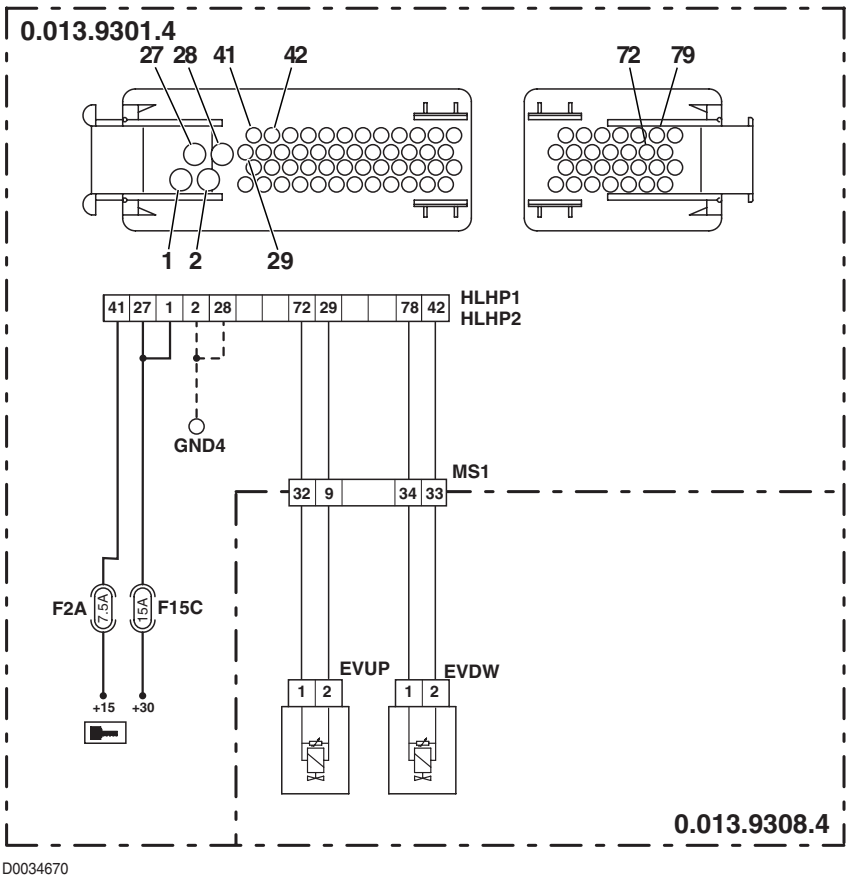
← *EV discesa sollevatore*
Corto circuito massa

DESCRIPTION

The control unit detects that the lift DOWN solenoid is shorting to earth.

CHECK

- Check that the contacts on the “EVDW” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 1 of connector “EVDW” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



← *SPN 603 - FMI 5*

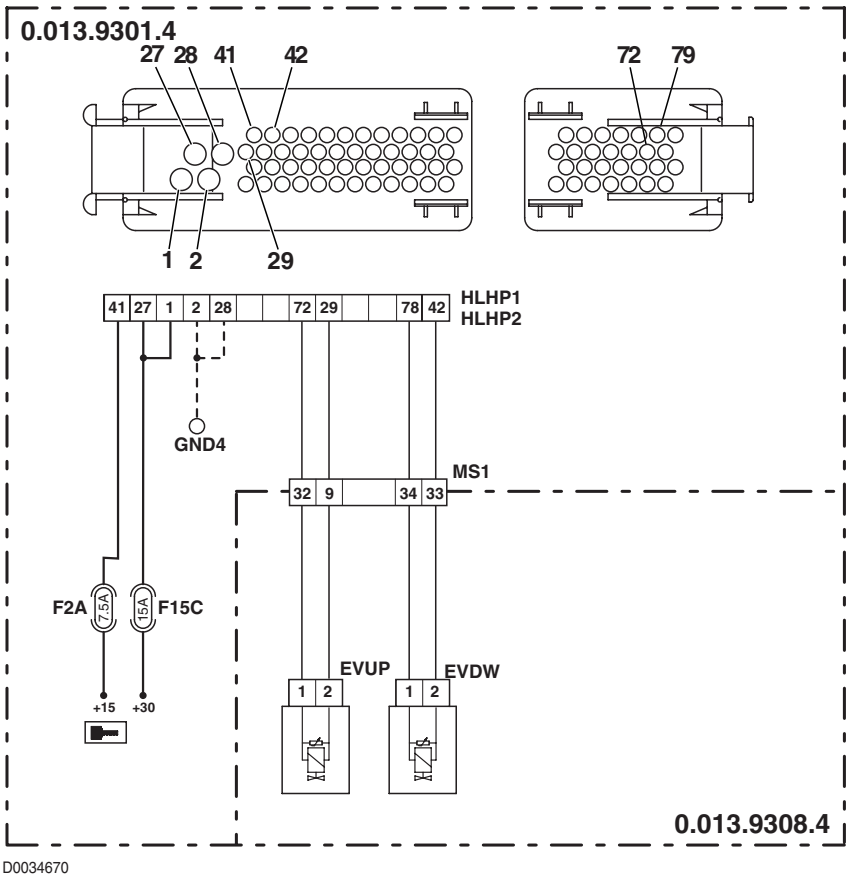
← *EV discesa sollevatore non connesso*

DESCRIPTION

The control unit detects that the current draw of the lift DOWN solenoid valve is excessive.

CHECK

- Check that the contacts on the “EVDW” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- Test the internal resistance of the solenoid (for the technical details, see unit 40).
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 1 and pin 2 of connector “EVDW” and perform a resistance test to check that the connectors are not shorting (meter reading: infinity).
- With the starter key in position “O” (OFF) and "HLHP1" and "HLHP2" connectors disconnected from the control unit, connect a test meter to pin 2 of connector “EVDW” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034670

← *SPN 603 - FMI 6*

← *EV discesa sollevatore*
Corto circuito

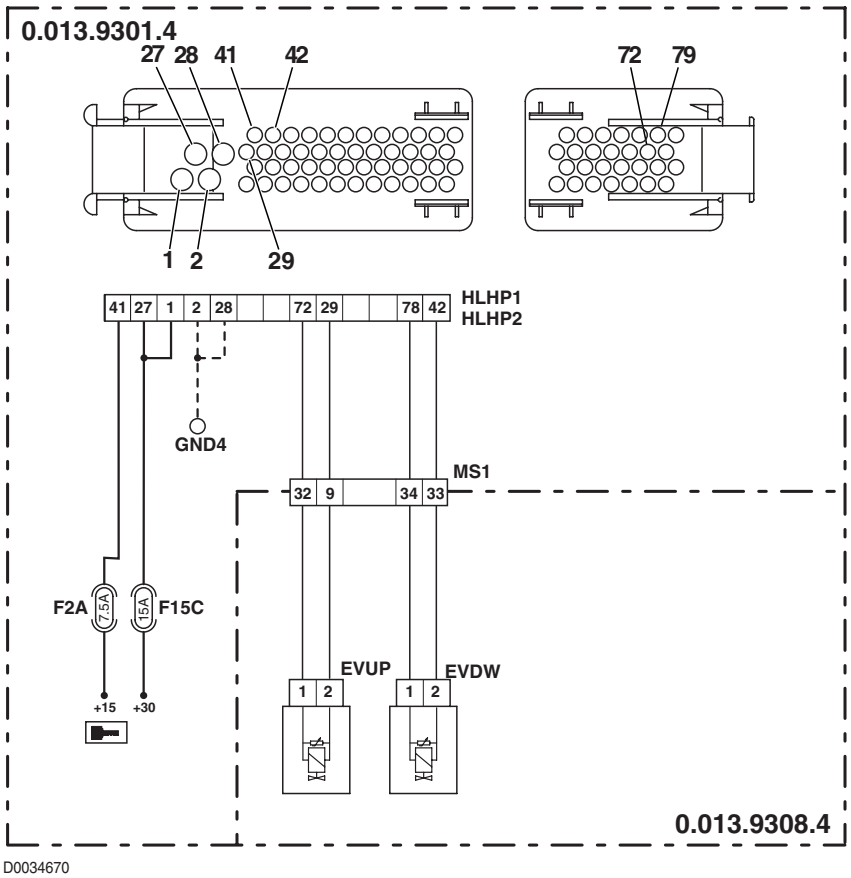
DESCRIPTION

The control unit detects a short circuit in the control wire of the lift DOWN solenoid.

NOTE
This alarm is generated when the control unit detects an abnormal current draw (but not excessively high) on pin 78 of the connector "HLHP2".

CHECK

- Check that the contacts on the “EVDW” solenoid connectors and “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of the connector “EVDW” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF), connect a test meter to pins 1 and 2 of connector “EVDW” and test the resistance to check for a short circuit (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034670

← *SPN 620 - FMI 3*

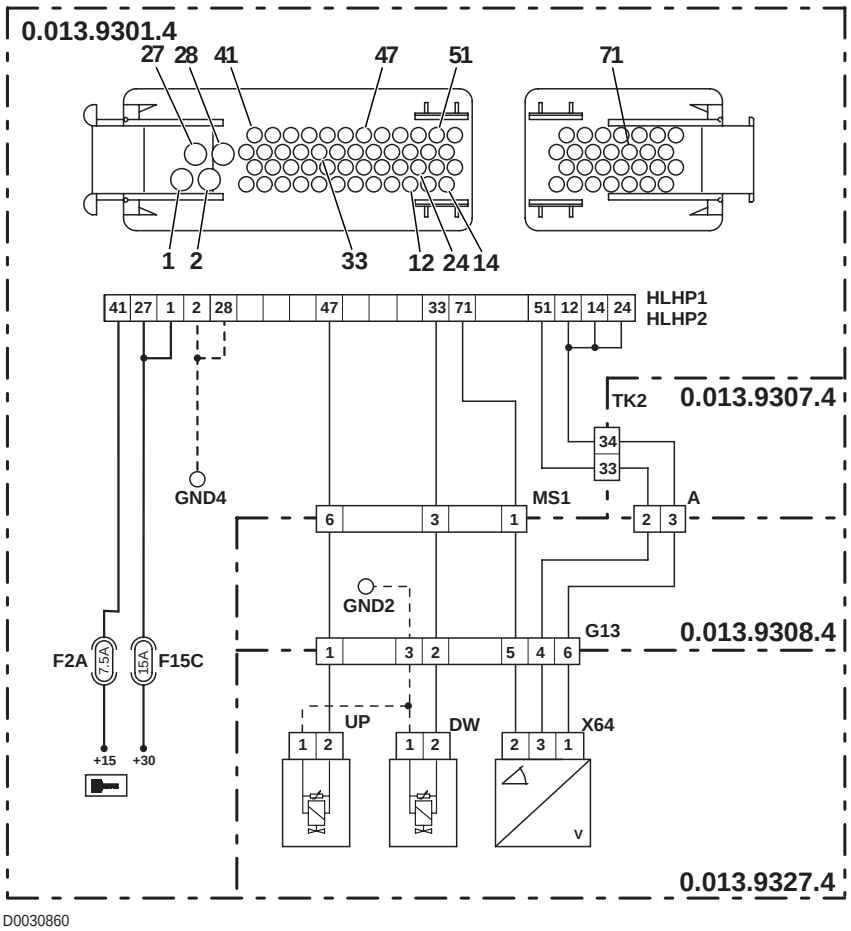
← *Sensore pos. sospens.*
Corto circuito +12V

DESCRIPTION

The control unit detects that the front axle suspension position sensor is shorting to battery positive.

CHECK

- Check that the contacts on the connector “X64” of the front suspension position sensor and the “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), check that the front suspension position sensor is receiving power correctly (approx. 8 Vdc between pin 3 (positive) and pin 1 (negative) of connector “X64”).
- With the starter key in position “I” (ON), connect a test meter to pin 2 of connector “X64” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 620 - FMI 4*

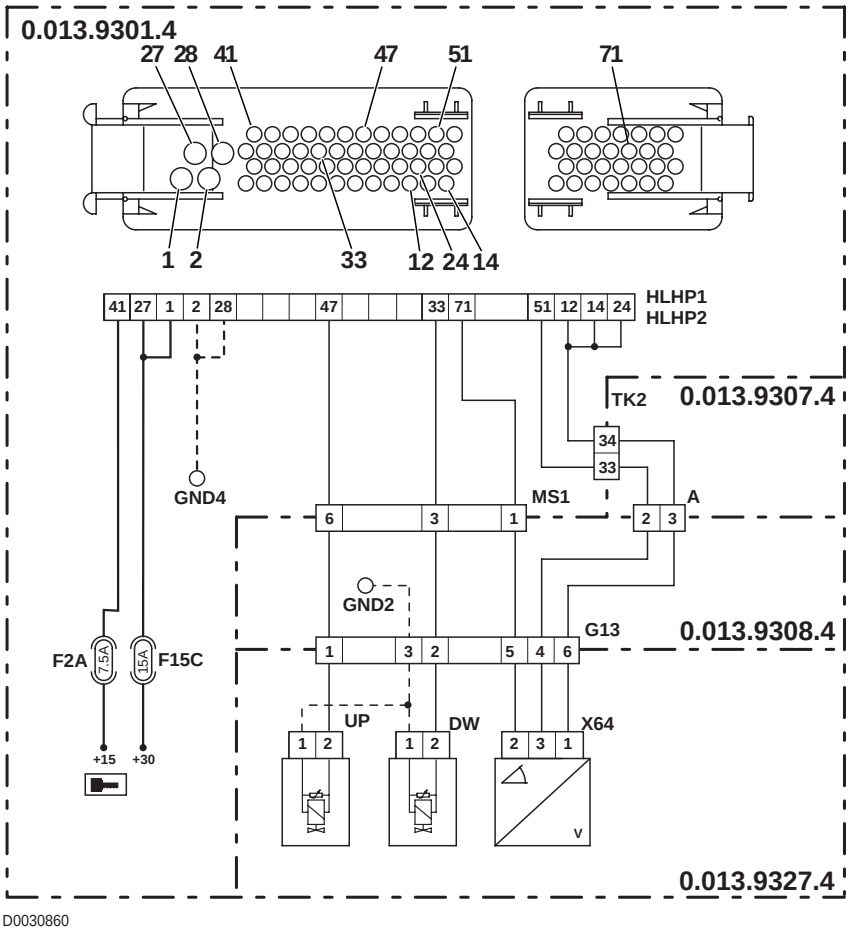
← *Sensore pos. sospens.*
Corto circuito massa

DESCRIPTION

The control unit detects that the front suspension position sensor is disconnected.

CHECK

- Check that the contacts on the connector “X64” of the front suspension position sensor and the “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), check that the front suspension position sensor is receiving power correctly (approx. 8 Vdc between pin 3 (positive) and pin 1 (negative) of connector “X64”).
- Check continuity between pin 71 of connector “HLHP2” and pin 2 of connector “X64”.
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “X64” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 621 - FMI 2*

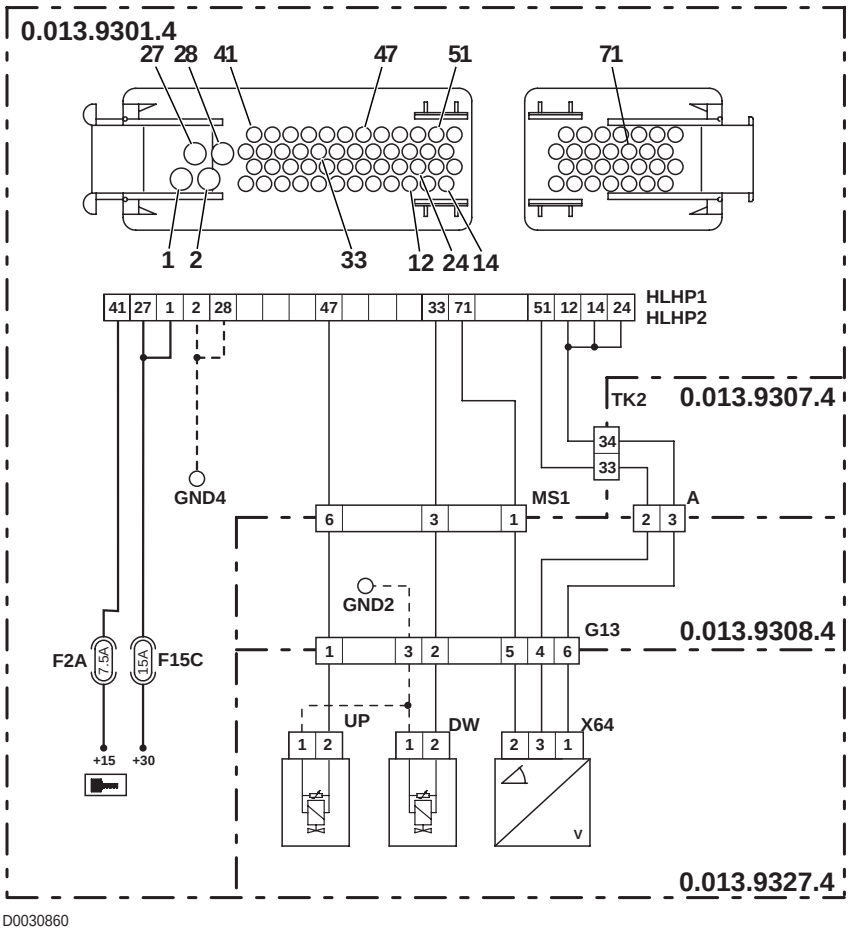
← *EV salita sospens.*
Segnale non valido

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front axle suspension UP solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “UP” connector of the front axle UP solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 621 - FMI 3*

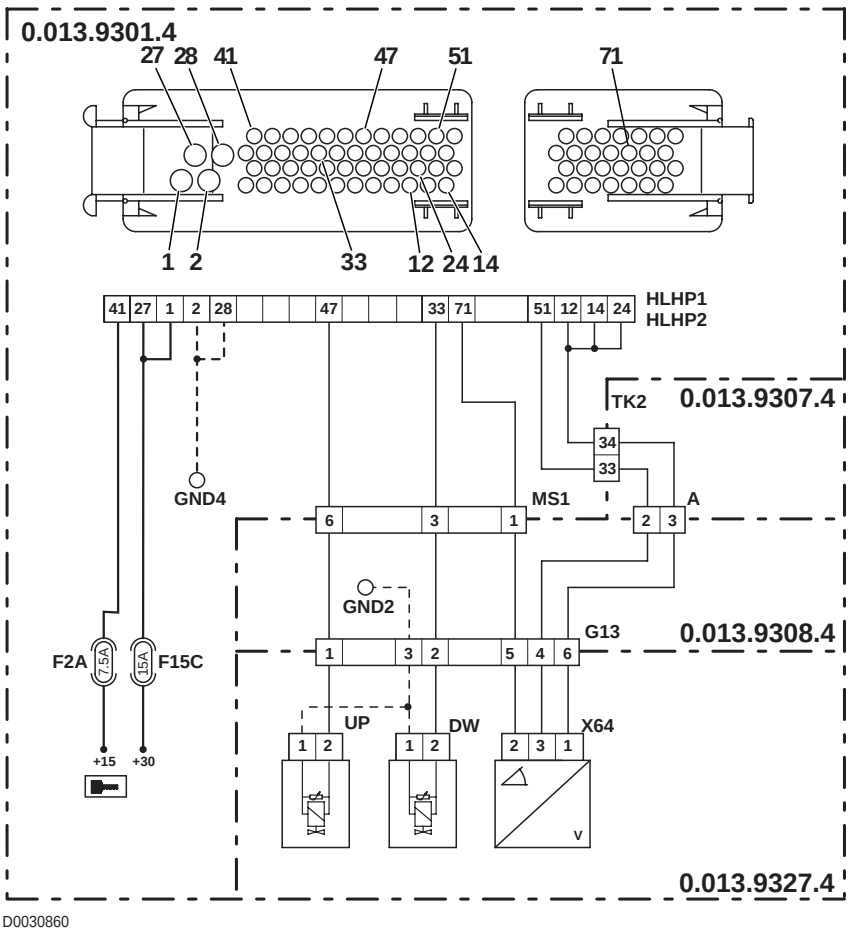
← *EV salita sospens.*
Corto circuito +12V

DESCRIPTION

The control unit detects that the front axle suspension UP solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “UP” connector of the front axle UP solenoid are not oxidised and are firmly connected
- With the starter key in position “I” (ON) and the "HLHP1" connector disconnected from the control unit, connect a test meter to pin 2 of connector “UP” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 621 - FMI 4*

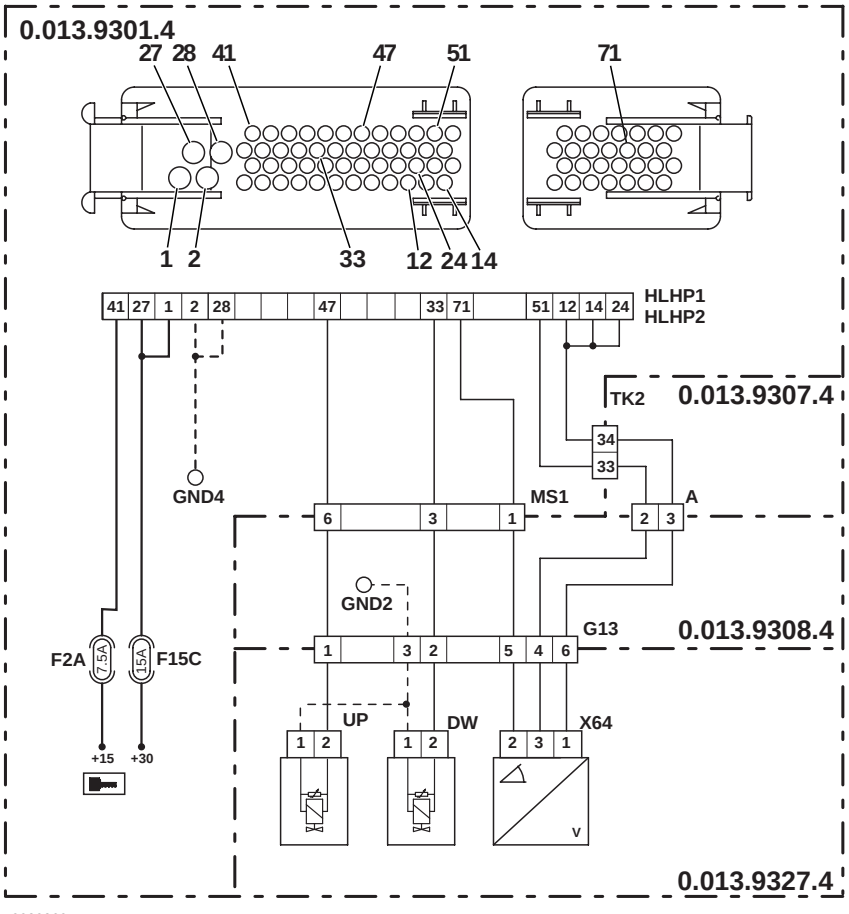
← *EV salita sospens.*
Corto circuito massa

DESCRIPTION

The control unit detects that the front axle suspension UP solenoid is shorting to earth.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “UP” connector of the front axle UP solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 2 of connector “UP” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0030860

← *SPN 621 - FMI 5*

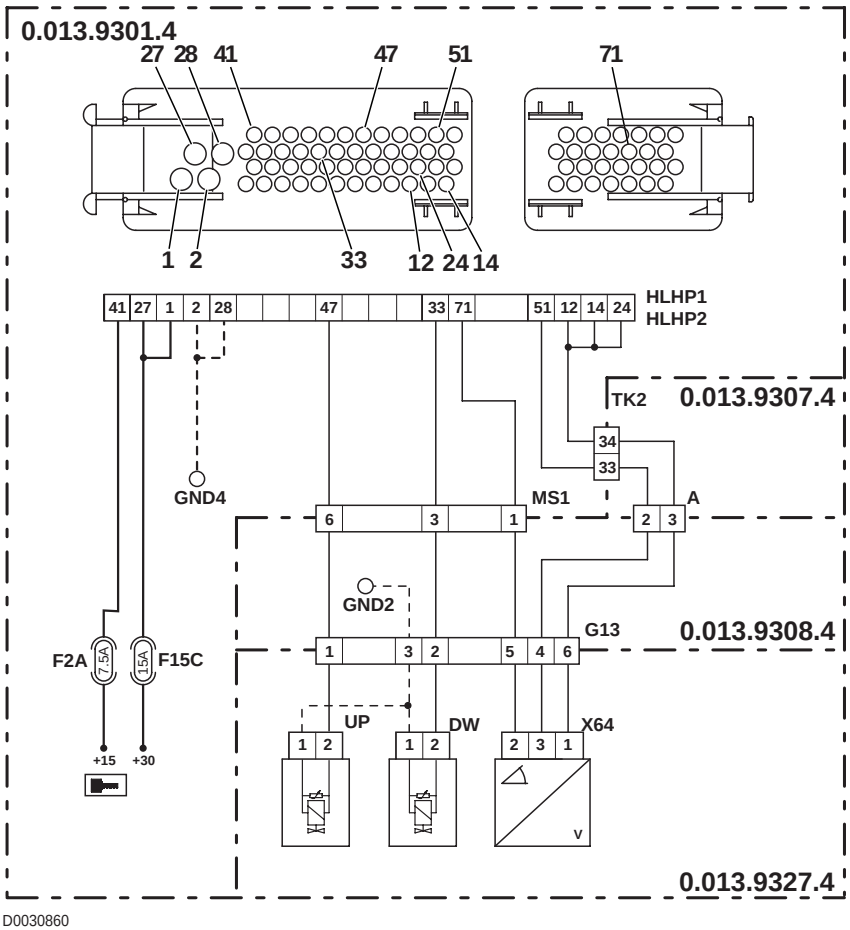
← *EV salita sospens. non connesso*

DESCRIPTION

The control unit detects that the front axle suspension UP solenoid is disconnected.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “UP” connector of the front axle UP solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “UP” and to pin 47 of the " HLHP1" connector and measure the resistance to verify that there is electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of the “UP” connector and to the earth on the transmission and perform a resistance test to check that the wire is not broken (meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0030860

← *SPN 621 - FMI 11*

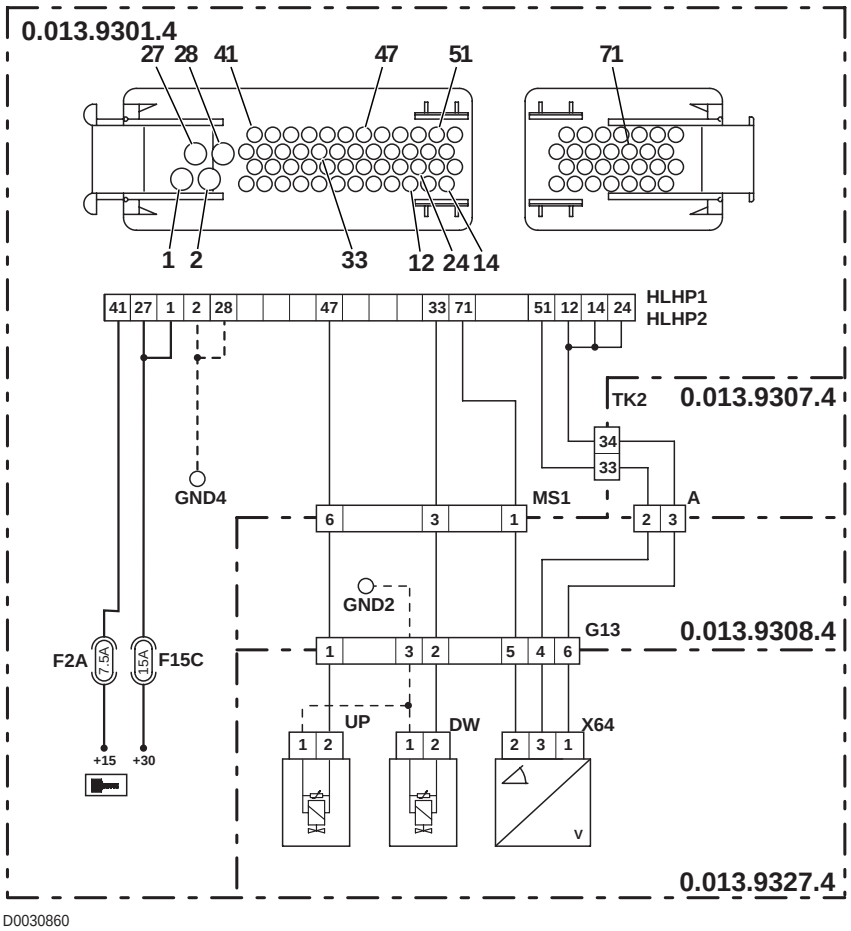
← *EV salita sospens.*
Guasto non identificato

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front axle suspension UP solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “UP” connector of the front axle UP solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 621 - FMI 12*

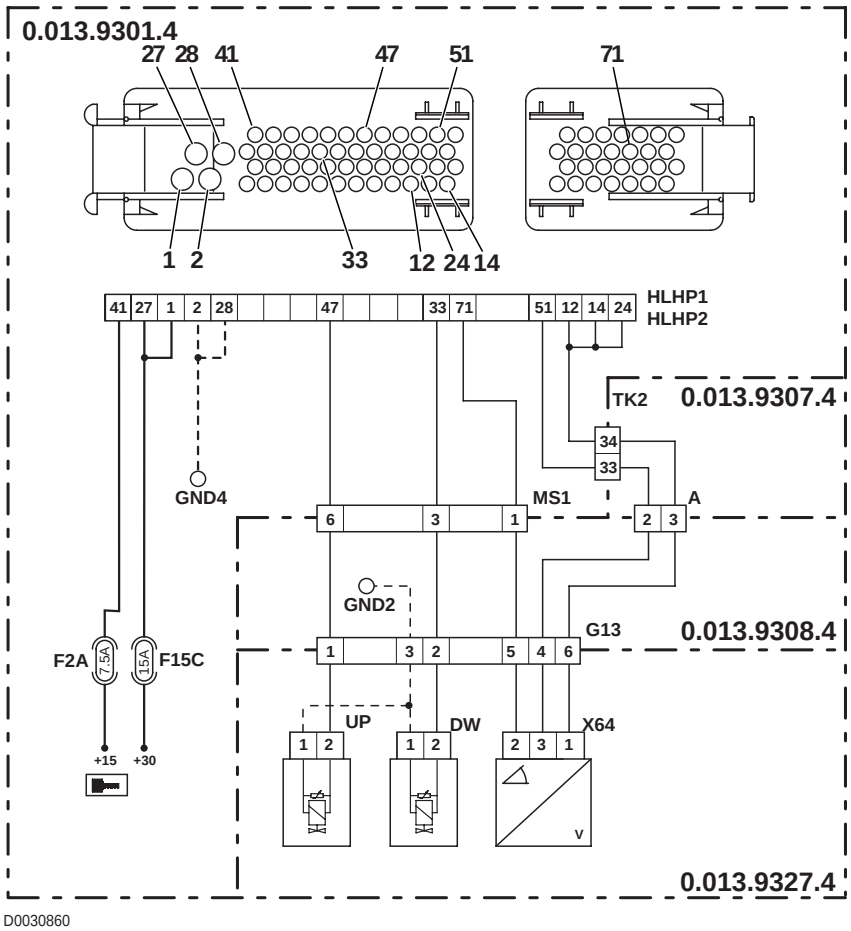
← *EV salita sospens.*
Dispositivo guasto

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front axle suspension UP solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “UP” connector of the front axle UP solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 622 - FMI 2*

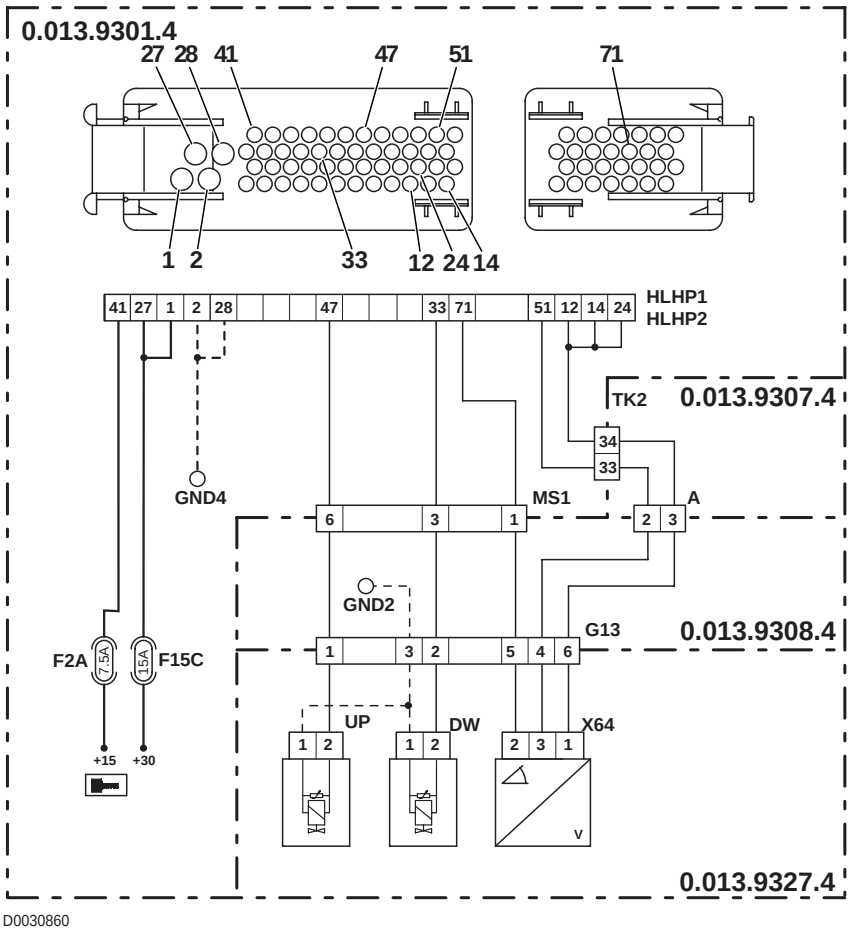
← *EV discesa sospens.*
Segnale non valido

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front axle suspension DOWN solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “DW” connector of the front axle DOWN solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 622 - FMI 3*

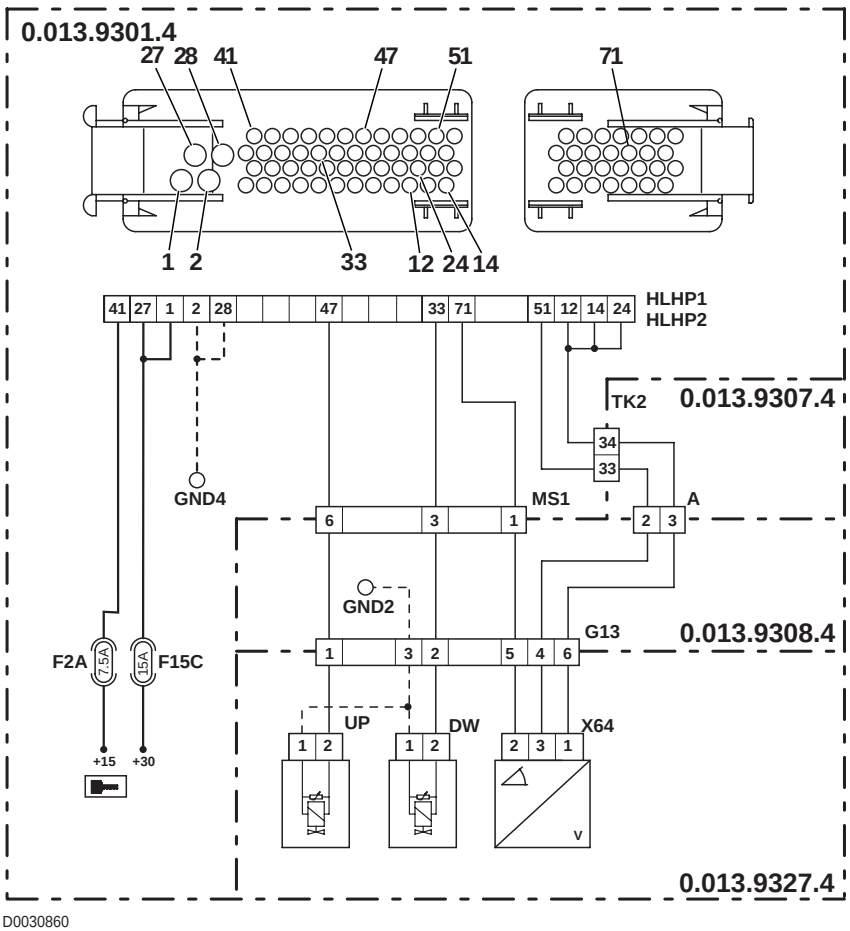
← *EV discesa sospens.*
Corto circuito +12V

DESCRIPTION

The control unit detects that the front axle suspension DOWN solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “DW” connector of the front axle DOWN solenoid are not oxidised and are firmly connected
- With the starter key in position “I” (ON) and the "HLHP1" connector disconnected from the control unit, connect a test meter to pin 2 of connector “DW” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 622 - FMI 4*

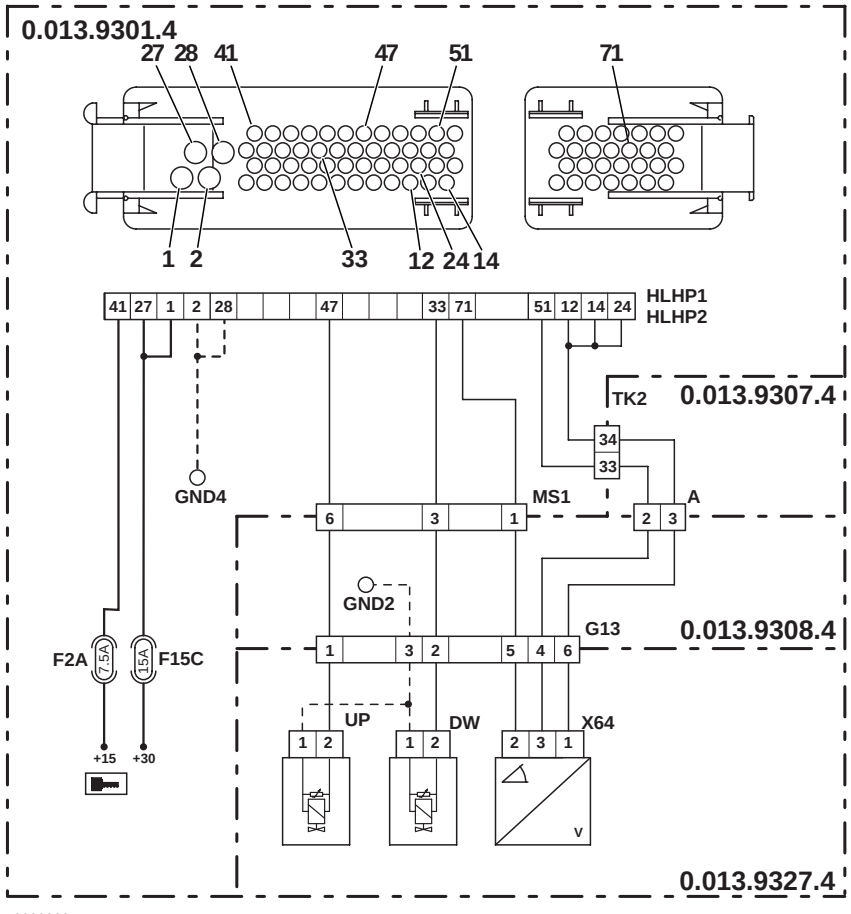
← *EV discesa sospens.*
Corto circuito massa

DESCRIPTION

The control unit detects that the front axle suspension DOWN solenoid is shorting to earth.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “DW” connector of the front axle DOWN solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 2 of connector “DW” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0030860

← *SPN 622 - FMI 5*

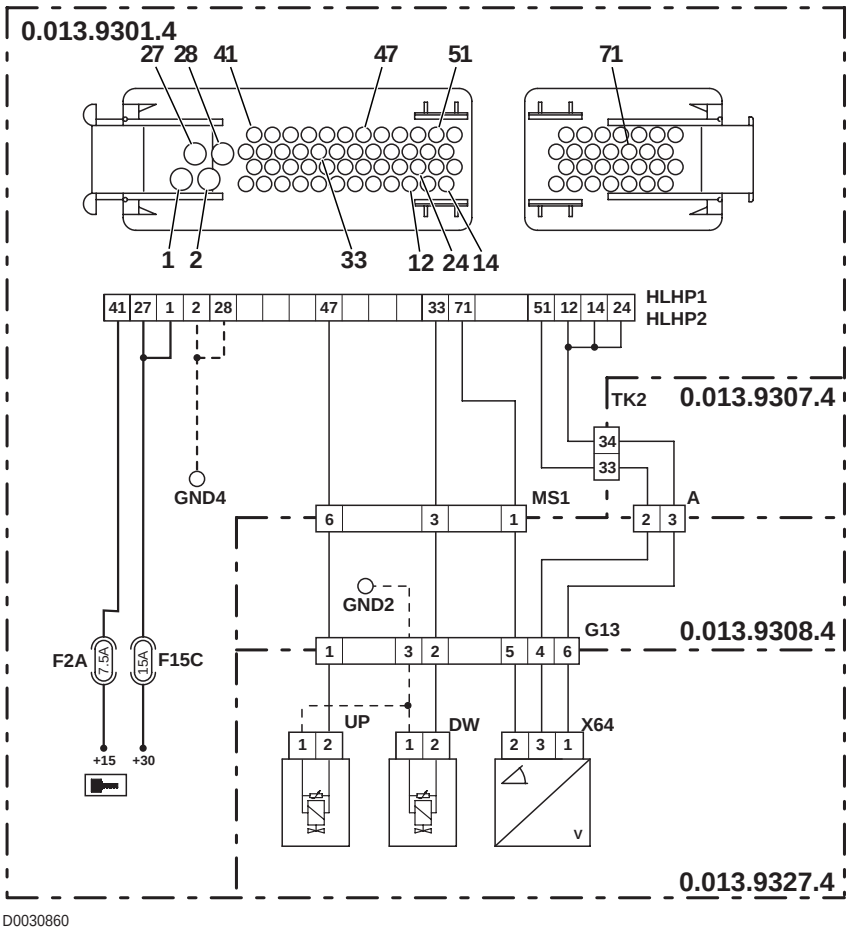
← *EV discesa sospens. non connesso*

DESCRIPTION

The control unit detects that the front axle suspension DOWN solenoid is disconnected.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “DW” connector of the front axle DOWN solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “DW” and to pin 33 of the " HLHP1" connector and measure the resistance to verify that there is electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of connector “DW” and to the earth on the transmission and perform a resistance test to check that the wire is not broken (meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0030860

← *SPN 622 - FMI 11*

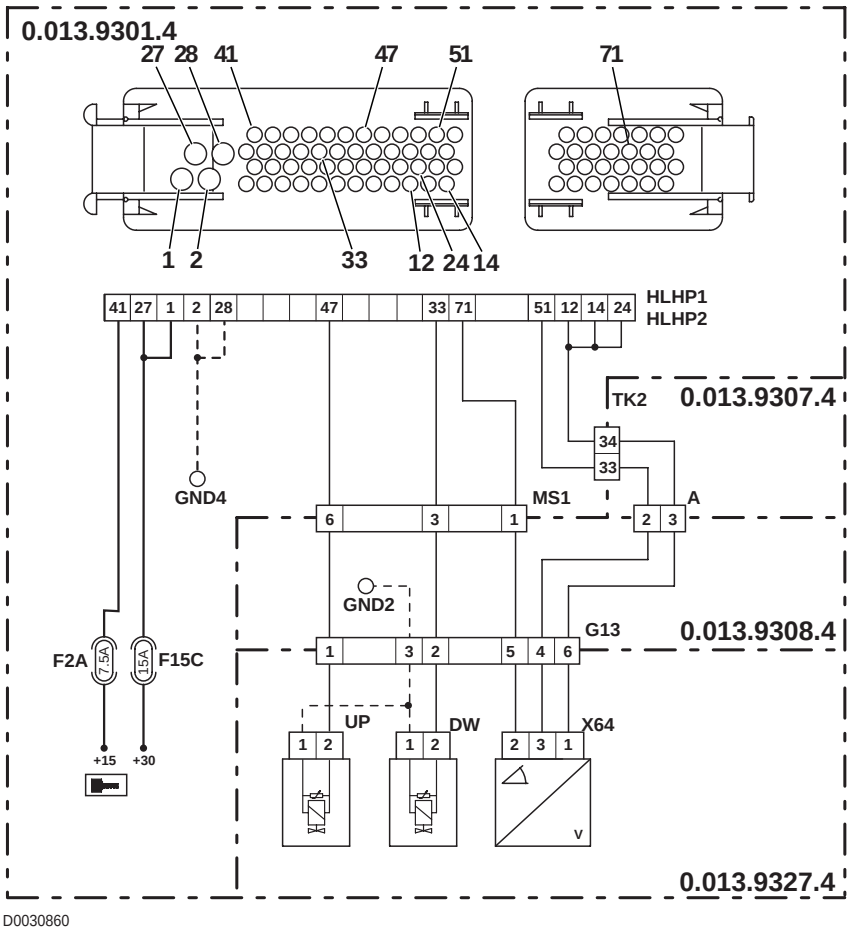
← *EV discesa sospens.*
Guasto non identificato

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front axle suspension DOWN solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “DW” connector of the front axle DOWN solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 622 - FMI 12*

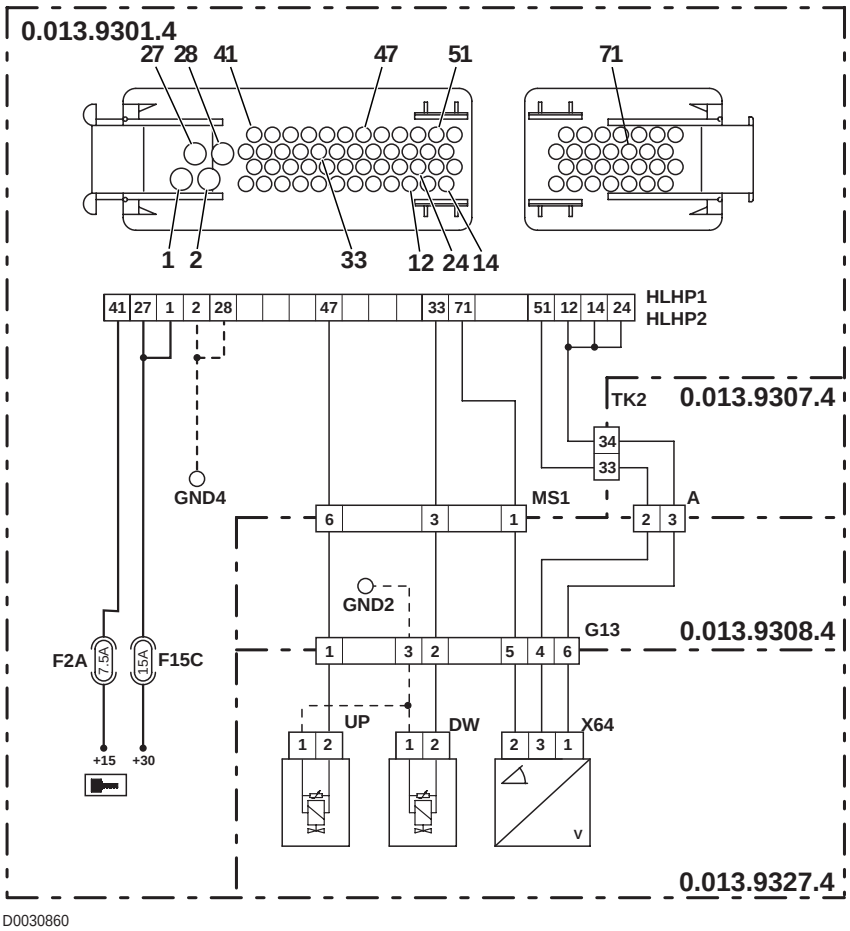
← *EV discesa sospens.*
Dispositivo guasto

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the front axle suspension DOWN solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “DW” connector of the front axle DOWN solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0030860

← *SPN 631 - FMI 9*

← *Errore CAN Bracciolo - messaggio in timeout*

DESCRIPTION

Detection of the absence of a connection via the CANBUS to the armrest

CHECK

- The HLHP control unit detects that the CANBUS connection to the transmission control unit is either not present or not correct.
- For details, see heading “5.5 CANBUS ALARMS”.

← *SPN 632 - FMI 9*

← *Errore CAN TCU messaggio in timeout*

DESCRIPTION

Detection of the absence of a connection via the CANBUS to the transmission control unit.

CHECK

- The HLHP control unit detects that the CANBUS connection to the transmission control unit is either not present or not correct.
- For details, see heading"5.6 CANBUS ALARMS".

← *SPN 633 - FMI 9*

← *Errore CAN Motore messaggio in timeout*

DESCRIPTION

Detection of the absence of a connection via the CANBUS to the engine control unit.

CHECK

- The HLHP control unit detects that the CANBUS connection to the engine control unit is either not present or not correct.
- For details, see heading"5.6 CANBUS ALARMS".

← *SPN 653 - FMI 2*

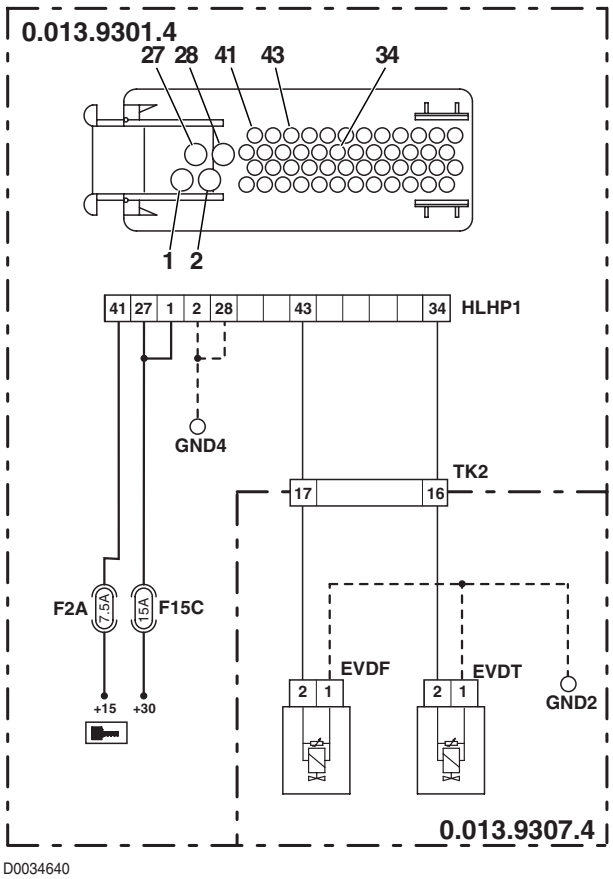
← *Errore CAN Motore messaggio in timeout*

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDF” connector of the differential lock solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 653 - FMI 3*

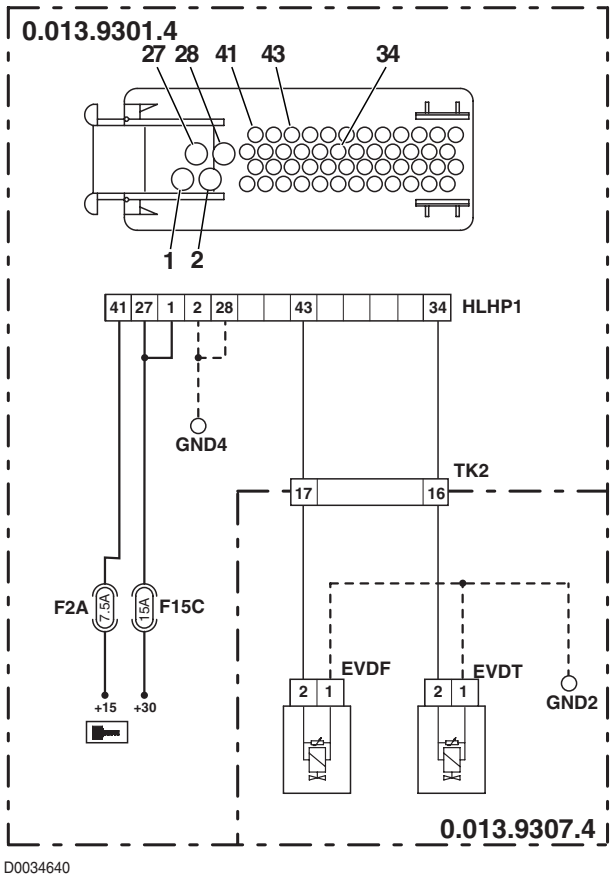
← *EV differenziale*
Corto circuito +12V

DESCRIPTION

The control unit detects that the differential lock solenoid is shorting to battery positive.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDF” connector of the differential lock solenoid are not oxidised and are firmly connected
- With the starter key in position “I” (ON) and the "HLHP1" connector disconnected from the control unit, connect a test meter to pin 2 of connector “EVDF” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 653 - FMI 4*

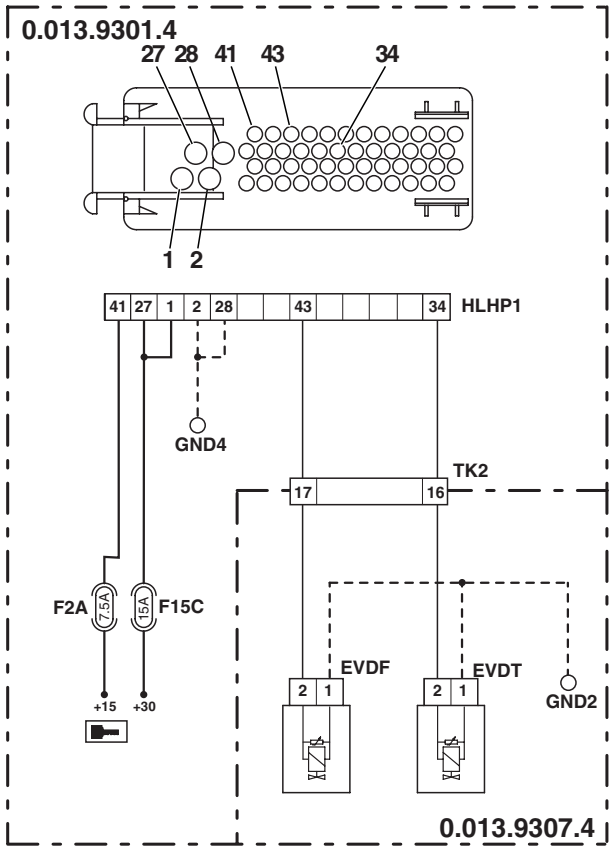
← *EV differenziale*
Corto circuito massa

DESCRIPTION

The control unit detects that the differential lock solenoid is shorting to earth.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDF” connector of the differential lock solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 2 of connector “EVDF” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034640

← *SPN 653 - FMI 5*

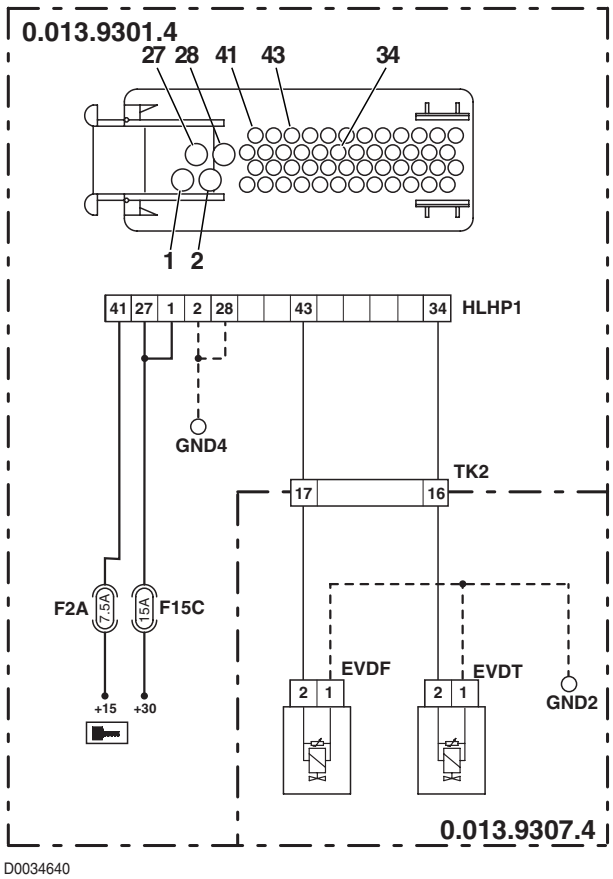
← *EV differenziale non connesso*

DESCRIPTION

The control unit detects that the differential lock solenoid is not connected.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVPTO2” connector of the differential lock solenoid are not oxidised and are firmly connected
- Test the internal resistance of the solenoid (for the technical details, see unit 40)
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “EVDF” and to pin 43 of the " HLHP1" connector and measure the resistance to verify that there is electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of connector “EVDF” and to the earth on the transmission and perform a resistance test to check that the wire is not broken (meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034640

← *SPN 653 - FMI 11*

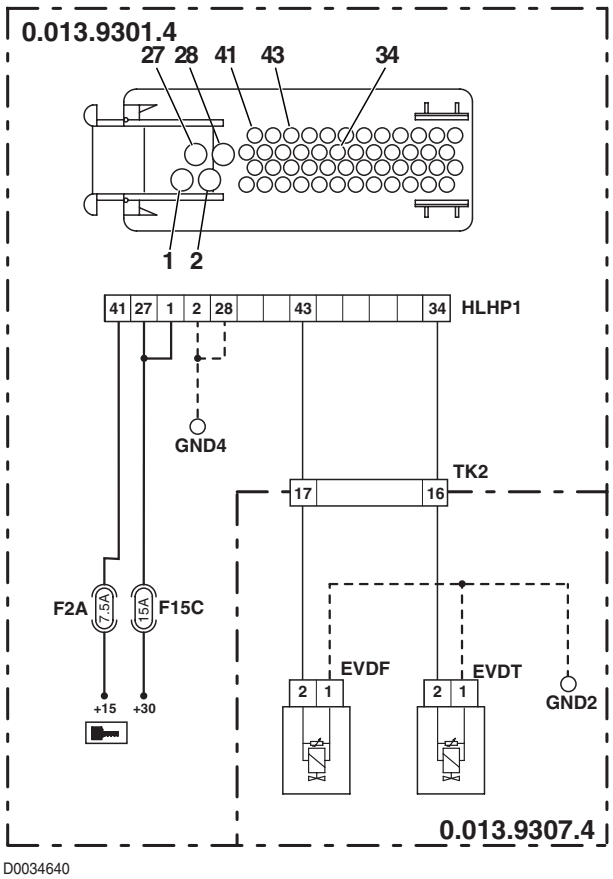
← *EV differenziale*
Guasto non identificato

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDF” connector of the differential lock solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 653 - FMI 12*

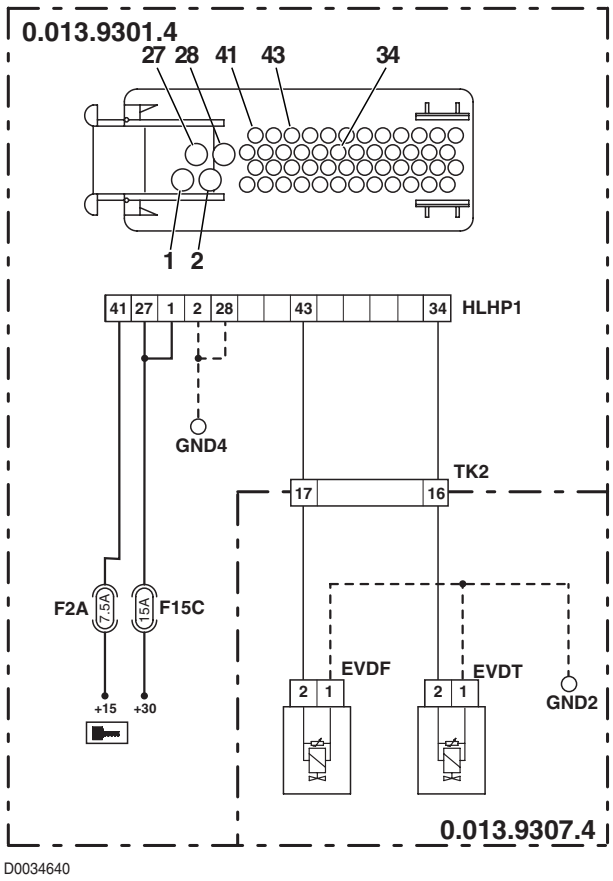
← *EV differenziale*
Dispositivo guasto

DESCRIPTION

The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.

CHECK

- Check that the contacts on the “HLHP1” connector of the control unit and the “EVDF” connector of the differential lock solenoid are not oxidised and are firmly connected
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034640

← *SPN 654 - FMI 2*

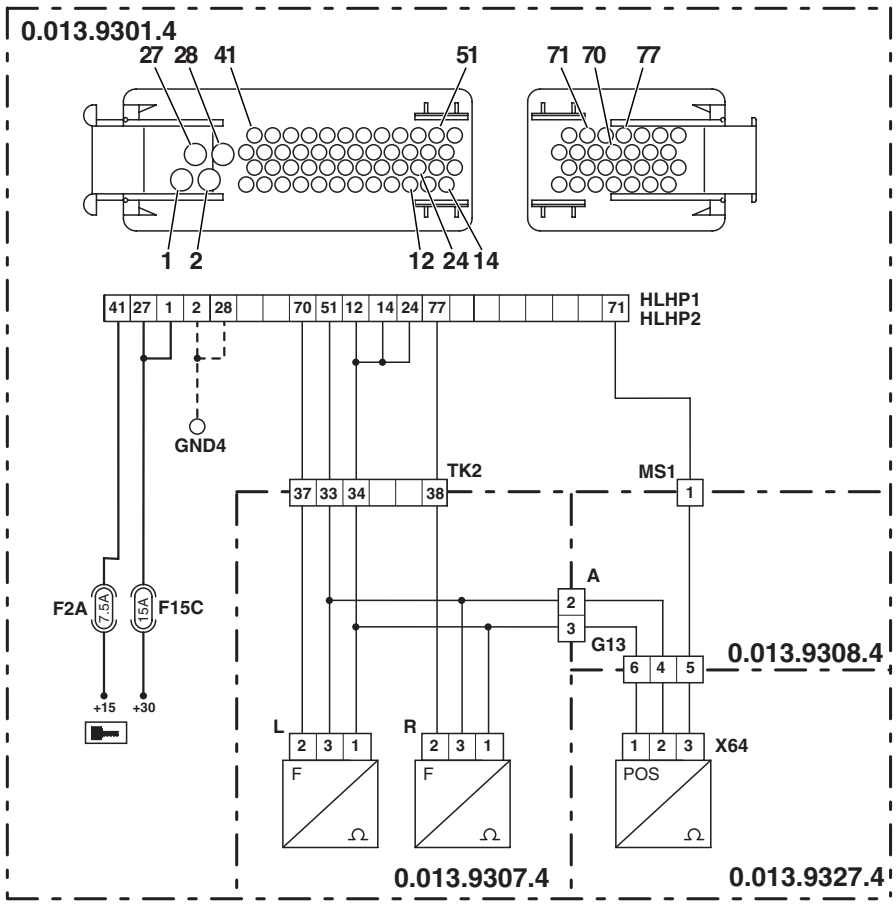
← *Alimen. sensori 8V*
Segnale non valido

DESCRIPTION

The control unit detects a short circuit in 8V sensor power feed.

CHECK

- Check that the contacts on the “HLHP1” and "HLHP2" connectors of the control unit are not oxidised and are firmly connected
- With the starter key in position “I” (ON) and the " HLHP1" connector disconnected, connect a test meter to pin 51 of connector “HLHP1” and to the earth on the cab and check for 0 voltage (meter reading: 0V).
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 51 of connector “HLHP1” and to the earth on the cab and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034620

← *SPN 655 - FMI 2*

← *Alimen. sensori 5V*
Segnale non valido

DESCRIPTION

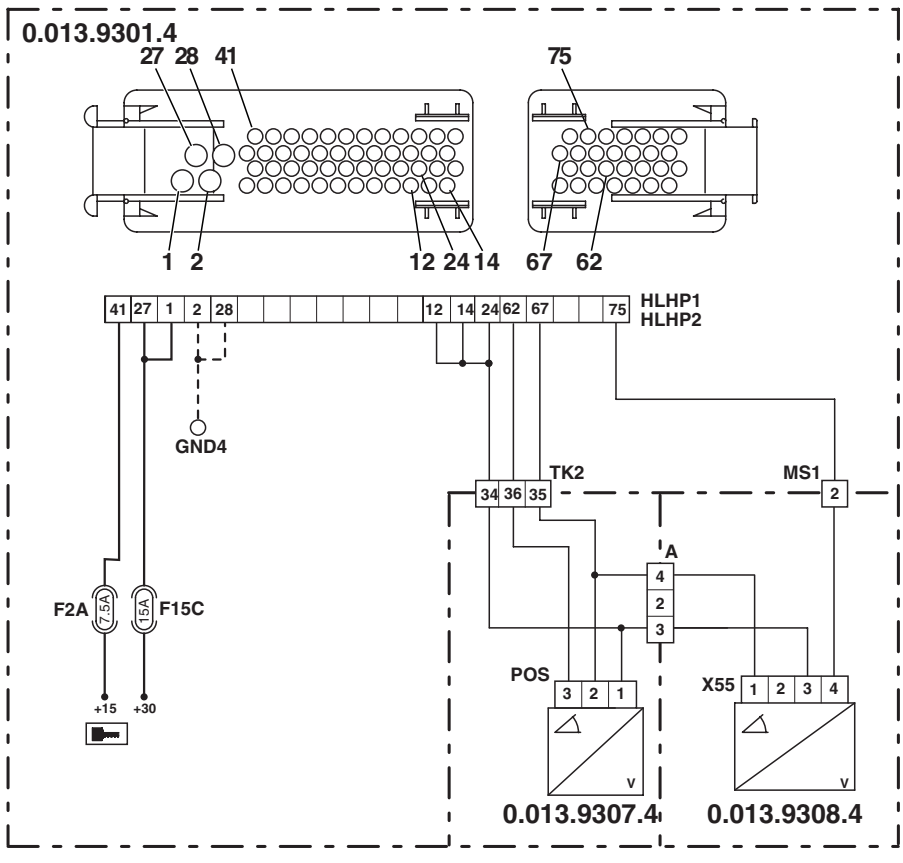
The control unit detects a short circuit in the 5V sensors power supply line.

NOTE

Remove lift console and connect also connector X38

CHECK

- Check that the contacts on the “HLHP1” and "HLHP2" connectors of the control unit are not oxidised and are firmly connected
- With the starter key in position “O” (OFF) and the " HLHP2" connector disconnected, connect a test meter to pin 67 of connector “HLHP2” and to the earth on the cab and perform a resistance test to check for 0 voltage (meter reading: 0V).
- With the starter key in position “O” (OFF) and connector " HLHP1" disconnected, connect a test meter to pin 67 of connector “HLHP2” and to the earth on the cab and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Check that connectors G38 are disconnected and are not oxidized or damaged.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034610

← *SPN 656 - FMI 12*

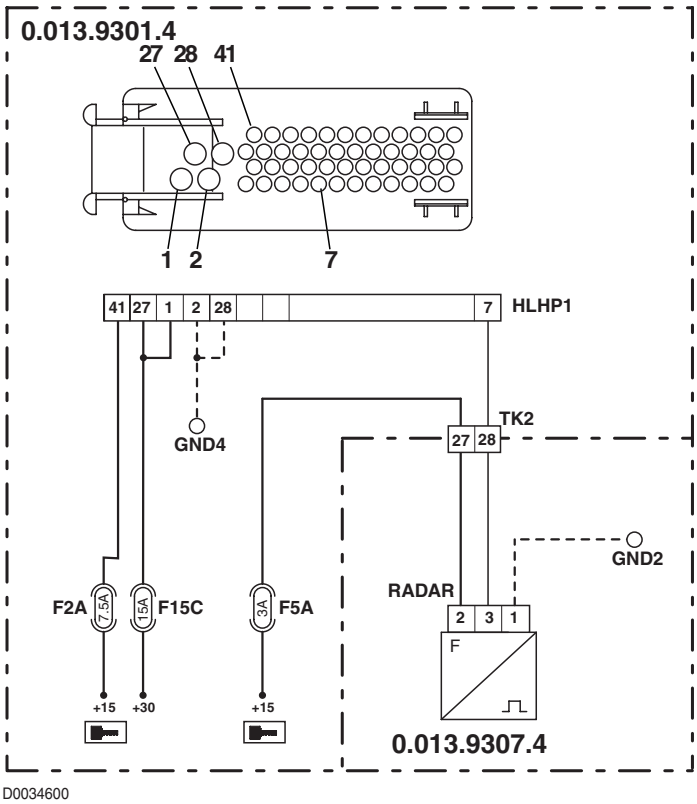
← *Sensore Radar*
Dispositivo guasto

DESCRIPTION

The control unit detects that the radar, when installed, does not send any signals when the travel speed exceeds 2 km/h.

CHECK

- Check that the contacts on the "RADAR" and “HLHP1" connectors of the control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), check that the radar is receiving power correctly (approx. 12 Vdc between pin 3 (positive) and pin 1 (negative) of connector "RADAR").
- With the starter key in position “O” (OFF) and the “HLHP1” connector disconnected from the control unit, check for electrical continuity between pin 7 of connector “HLHP1” and pin 2 of connector “RADAR”.
- Check that the radar is functioning correctly (for details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034600

SPN 661 - FMI 8

Errore memoria
Blocco 0

DESCRIPTION

The control unit signals that EEPROM used to store the system parameters is damaged.

CHECK

- Repeat the procedure for initialization of the of the HLHP control unit (for details, see "4.4.1 INITIALIZATION OF THE HLHP CONTROL UNIT") then check whether the alarm is still present, in which case the control unit will have to be replaced.

← *SPN 662 - FMI 3*

← *Pulsante PTO esterno*
Corto circuito massa

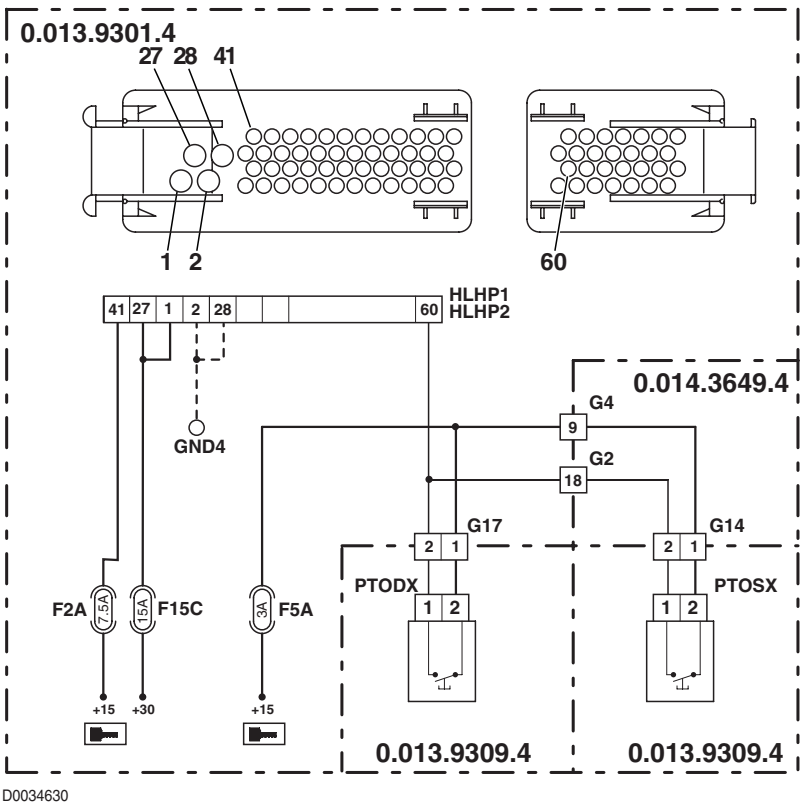
DESCRIPTION

The control unit detects that the rear PTO control buttons on the rear fenders are continuously pressed.

NOTE
This alarm is generated when, for accidental reasons, one of the rear PTO control buttons remains pressed for more than 1 minute. If this alarm first appears in the list of active alarms and is then transferred to the passive alarms list, the problem is deemed to have been solved automatically.

CHECK

- Check that the contacts on the connectors “PTOSX”, "PTODX" and “HLHP2” of the HLHP control unit are not oxidised and are firmly connected.
- Check that the pushbuttons are functioning correctly (for technical details, see Group 40)
- With the starter key in position “I” (ON) and the "HLHP2" connector disconnected from the control unit, connect a test meter to pin 1 of connectors “PTOSX” and "PTODX" and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034630

← *SPN 689 - FMI 3*

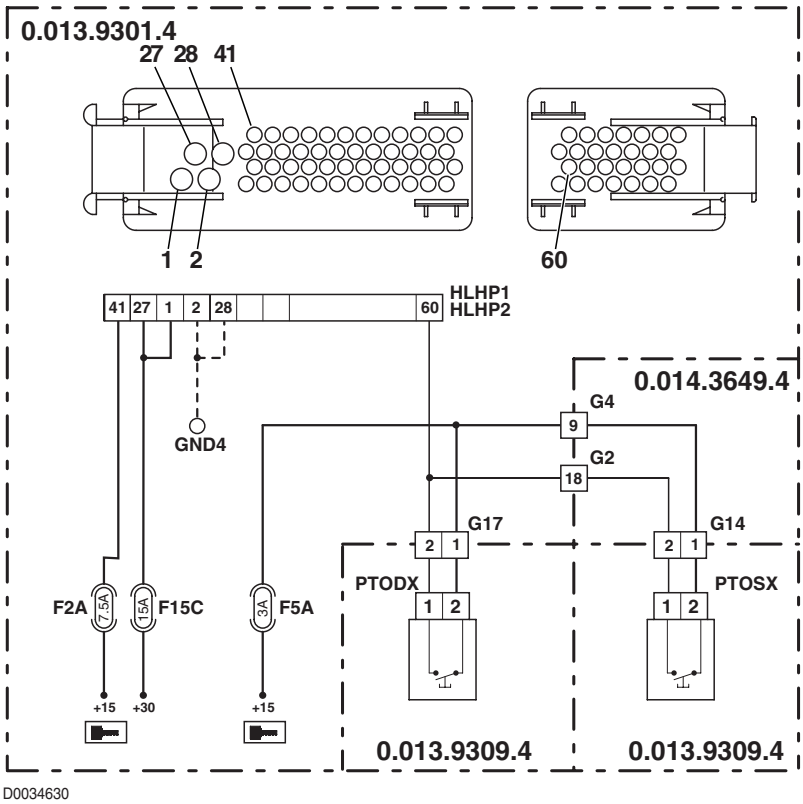
← *Sensore di sterzo*
Corto circuito +12V

DESCRIPTION

The control unit detects that the steering angle sensor is shorting to battery positive.

CHECK

- Check that the contacts on the connector “X55” of the steering angle sensor and the “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), check that the steering angle sensor is receiving power correctly (approx. 5 Vdc between pin 1 (positive) and pin 3 (negative) of connector “X55”).
- With the starter key in position “I” (ON), connect a test meter to pin 2 of connector “X55” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



← *SPN 689 - FMI 4*

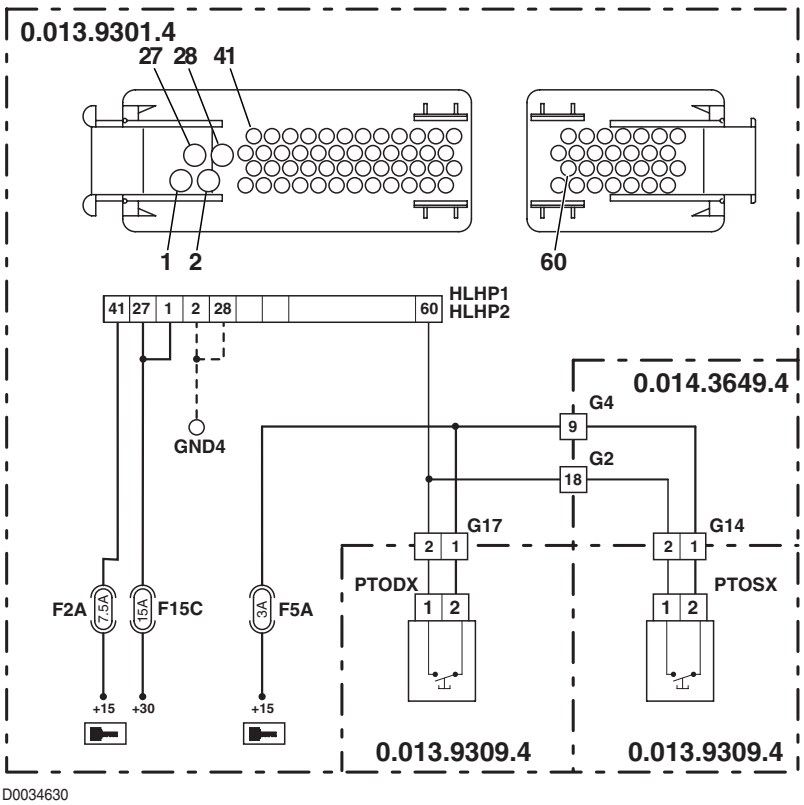
← *Sensore di sterzo*
Corto circuito massa

DESCRIPTION

The ECU detects that the steering angle sensor is disconnected.

CHECK

- Check that the contacts on the connector “X55” of the steering angle sensor and the “HLHP1" and "HLHP2” connectors of the HLHP control unit are not oxidised and are firmly connected.
- With the starter key in position “I” (ON), check that the steering angle sensor is receiving power correctly (approx. 5 Vdc between pin 1 (positive) and pin 3 (negative) of connector “X55”).
- Check continuity between pin 77 of connector “HLHP2” and pin 2 of connector “X55”.
- With the starter key in position “O” (OFF)), connect a test meter to pin 2 of connector “X55” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position and check if the alarm is still present as an active alarm, in which case the control unit must be renewed.



D0034630

← *SPN 694 - FMI 3*

← *Puls.manuale UP sollev.*
Corto circuito massa

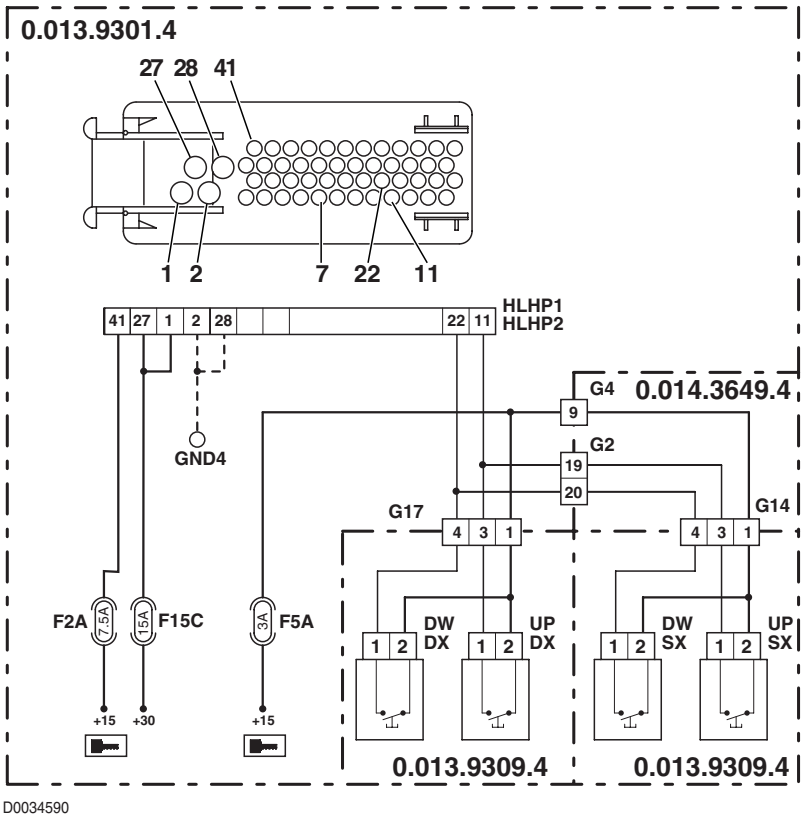
DESCRIPTION

The control unit detects that the lift UP control buttons on the rear fenders are continuously pressed.

NOTE
This alarm is generated when, for accidental reasons, one of the lift UP control buttons remains pressed for more than 1 minute. If this alarm first appears in the list of active alarms and is then transferred to the passive alarms list, the problem is deemed to have been solved automatically.

CHECK

- Check that the contacts on the connectors “UPSX”, "UPDX" and “HLHP1” of the HLHP control unit are not oxidised and are firmly connected.
- Check that the pushbuttons are functioning correctly (for technical details, see Group 40)
- With the starter key in position “I” (ON) and the "HLHP2" connector disconnected from the control unit, connect a test meter to pin 1 of connectors "UPSX” and "UPDX" and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034590

← *SPN 695 - FMI 3*

← *Puls.manuale DOWN sollev.*
Corto circuito massa

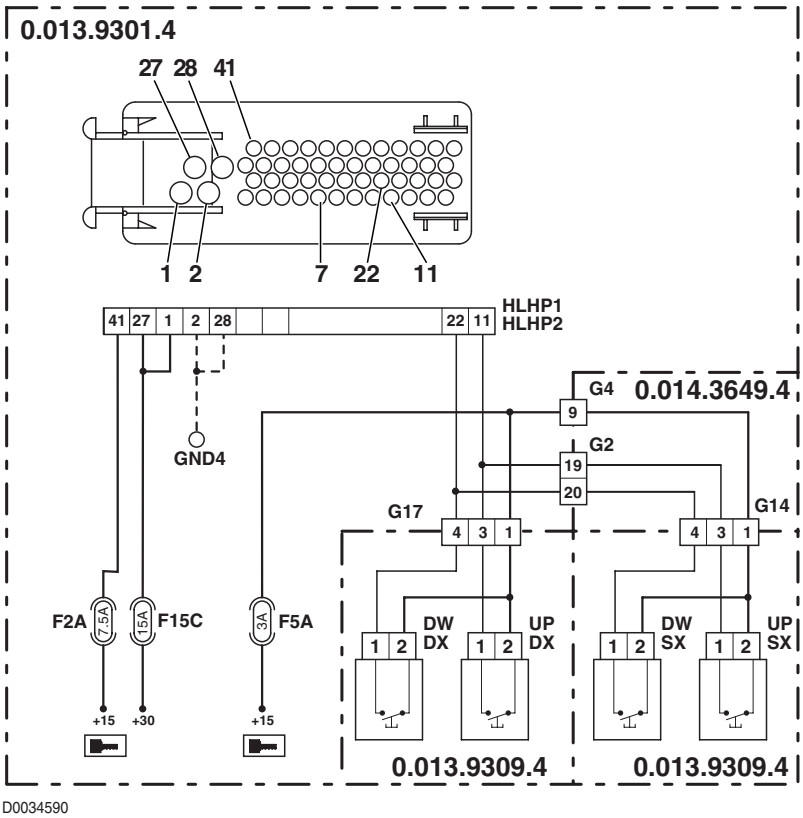
DESCRIPTION

The control unit detects that the lift DOWN control buttons on the rear fenders are continuously pressed.

NOTE
This alarm is generated when, for accidental reasons, one of the lift DOWN control buttons remains pressed for more than 1 minute. If this alarm first appears in the list of active alarms and is then transferred to the passive alarms list, the problem is deemed to have been solved automatically.

CHECK

- Check that the contacts on the connectors “DWSX”, "DWDX" and “HLHP1” of the HLHP control unit are not oxidised and are firmly connected.
- Check that the pushbuttons are functioning correctly (for technical details, see Group 40)
- With the starter key in position “I” (ON) and the "HLHP2" connector disconnected from the control unit, connect a test meter to pin 1 of connectors "DWSX" and "DWDX" and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034590

5.3 ENGINE CONTROL UNIT ALARMS

The engine control unit informs the operator of any malfunction affecting monitored components, both audibly and visually (fault warning light) by way of the Infocenter.

The control unit signals faults by means of a graphic symbol in accordance with two modes:

1 - *flashing symbol*: with this type of indication the ECU informs the operator that one of the components in the engine system is faulty, but normal operation of the engine remains unaffected.
The engine continues to run correctly.

2 - *steadily illuminated symbol*: this type of indication informs the operator that one of the components in the engine system is faulty, and continuing to work under these conditions could result in serious damage to the engine.
Usually the engine will stop when an alarm of this type appears and it will no longer be possible to restart it until the fault has been rectified.

Alarm code	*Serdia*	*Infocenter*	*Description*	*Page.*
SPN 84 - FMI 8	3	–	Alarm available but not utilized.	–
SPN 91 - FMI 11	67	Motore, acc. pedale Guasto non identificato	The engine control unit has detected the absence of a connection to the accelerator pedal position sensor or a signal out of range.	20-187
SPN 91 - FMI 2	5	Motore, acc. pedale Segnale non valido	The control unit detects that the connection to the accelerator pedal position sensor is either non-existent or short-circuiting.	20-175
SPN 108 - FMI 12	87	Motore, Press. Atmosf. Dispositivo guasto	The engine control unit detects that atmospheric pressure is outside the permissible limits.	20-193
SPN 100 - FMI 2	8	–	Alarm available but not utilized.	–
SPN 100 - FMI 1	30	–	Alarm available but not utilized.	–
SPN 100 - FMI 1	40	–	Alarm available but not utilized.	–
SPN 102 - FMI 2	7	Motore, pressione turbo. Segnale non valido	The engine control unit has detected that the engine turbo charge pressure signal is either non-existent or unreliable.	20-177
SPN 105 - FMI 2	10	–	Alarm available but not utilized.	–
SPN 105 - FMI 0	32	–	Alarm available but not utilized.	–
SPN 105 - FMI 0	42	–	Alarm available but not utilized.	–
SPN 110 - FMI 2	9	Motore, temperatura Segnale non valido	The engine control unit has detected that the coolant temperature signal is either non-existent or unreliable.	20-178
SPN 110 - FMI 0	31	Motore, temperatura Segnale troppo elevato	The engine control unit has detected a coolant temperature higher than the alarm threshold	20-180
SPN 111 - FMI 1	34	–	Alarm available but not utilized.	–
SPN 110 - FMI 0	41	Motore, temperatura Segnale troppo elevato	The engine control unit has detected a coolant temperature higher than the alarm threshold	20-183
SPN 111 - FMI 1	44	–	Alarm available but not utilized.	–
SPN 171 - FMI 12	86	Motore, sens.temp. ECU Dispositivo guasto	The engine control unit detects that its internal temperature is too high.	20-193

Alarm code	*Serdia*	*Infocenter*	*Description*	*Page.*
SPN 174 - FMI 2	11	Motore, Temp. gasolio Segnale non valido	The engine control unit has detected that the fuel temperature signal is either non-existent or unreliable.	20-179
SPN 174 - FMI 0	36	Motore, Temp. gasolio Segnale troppo elevato	The engine control unit has detected a fuel temperature higher than the alarm threshold.	20-182
SPN 190 - FMI 8	1	Motore, sens. velocita Frequenza non corretta	The engine control unit detects that the signal from the engine pickup is either non-existent or incorrect.	20-174
SPN 190 - FMI 8	2	–	Alarm available but not utilized.	–
SPN 190 - FMI 0	4	–	Alarm available but not utilized.	–
SPN 201 - FMI 2	6	Motore, accel. manuale Segnale non valido	The control unit detects that the connection to the hand throttle position sensor is either non-existent or short-circuiting.	20-176
SPN 535 - FMI 13	59	–	Alarm available but not utilized.	–
SPN 536 - FMI 13	52	Motore, attuatore Non Calibrato	The engine control unit has detected that the reference signal for the position of the actuator does not match the requirement.	20-185
SPN 536 - FMI 12	50	Motore, attuatore Dispositivo guasto	The engine control unit has detected that the actuator position signal does not match the requirement.	20-184
SPN 535 - FMI 7	53	Motore, Regolatore Difetto meccanico	The engine control unit has detected that the difference between the command and the response of the actuator is greater than 10%.	20-186
SPN 563 - FMI 6	63	–	Alarm available but not utilized.	–
SPN 563 - FMI 2	60	–	Alarm available but not utilized.	–
SPN 572 - FMI 2	62	–	Alarm available but not utilized.	–
SPN 702 - FMI 14	35	Motore, fuori giri FMI 14	The engine control unit detects that the engine is or has been running overspeed (above 3100 rpm).	20-181
SPN 743 - FMI 14	74	Motore, Errore CAN FMI 14	The engine control unit has detected that the connection to the CANBUS is not present.	20-189
SPN 743 - FMI 12	70	Motore, Errore CAN Dispositivo guasto	CANBUS line controller damaged	20-188
SPN 743 - FMI 9	71	Motore, Errore CAN Errore aggiornamento	The engine control unit has not been able to read or send a message on the CANBUS.	20-188
SPN 752 - FMI 12	77	Motore, Errore Memoria Dispositivo guasto	The engine control unit has detected an error in reading the program memory during the normal control cycle.	20-189
SPN 752 - FMI 2	93	Motore, Errore Memoria Segnale non valido	The engine control unit has detected a “Stack Overflow” error during the execution of the program.	20-194
SPN 765 - FMI 12	76	Motore, Parametri E2P Dispositivo guasto	The engine control unit has detected an error in writing the parameters.	20-189

Alarm code	*Serdia*	*Infocenter*	*Description*	*Page.*
SPN 765 - FMI 2	90	Motore, Parametri E2P Segnale non valido	The engine control unit has detected a discrepancy between the parameters written in EEPROM.	20-194
SPN 766 - FMI 2	78	Motore, Errore interno Segnale non valido	The engine control unit has detected an error in reading the work memory during the normal control cycle.	20-190
SPN 766 - FMI 2	80	Motore, Errore interno Segnale non valido	The engine control unit detects an actuator power input outside the specified parameters.	20-190
SPN 766 - FMI 2	83	Motore, Errore interno Segnale non valido	The control unit detects that the power supply to the accelerator pedal position sensor is either absent or incorrect.	20-191
SPN 766 - FMI 2	84	Motore, Errore interno Segnale non valido	The control unit detects that the power supply to the engine boost pressure sensor is either absent or incorrect.	20-192
SPN 766 - FMI 2	85	–	Alarm available but not utilized.	–
SPN 766 - FMI 2	94	Motore, Errore interno Segnale non valido	The engine control unit has detected an internal error.	20-194
SPN 898 - FMI 2	68	Motore, Errore CAN Segnale non valido	Error in connection to CANBUS	20-188

ALARM N° 001

← *SPN 190 - FMI 8*

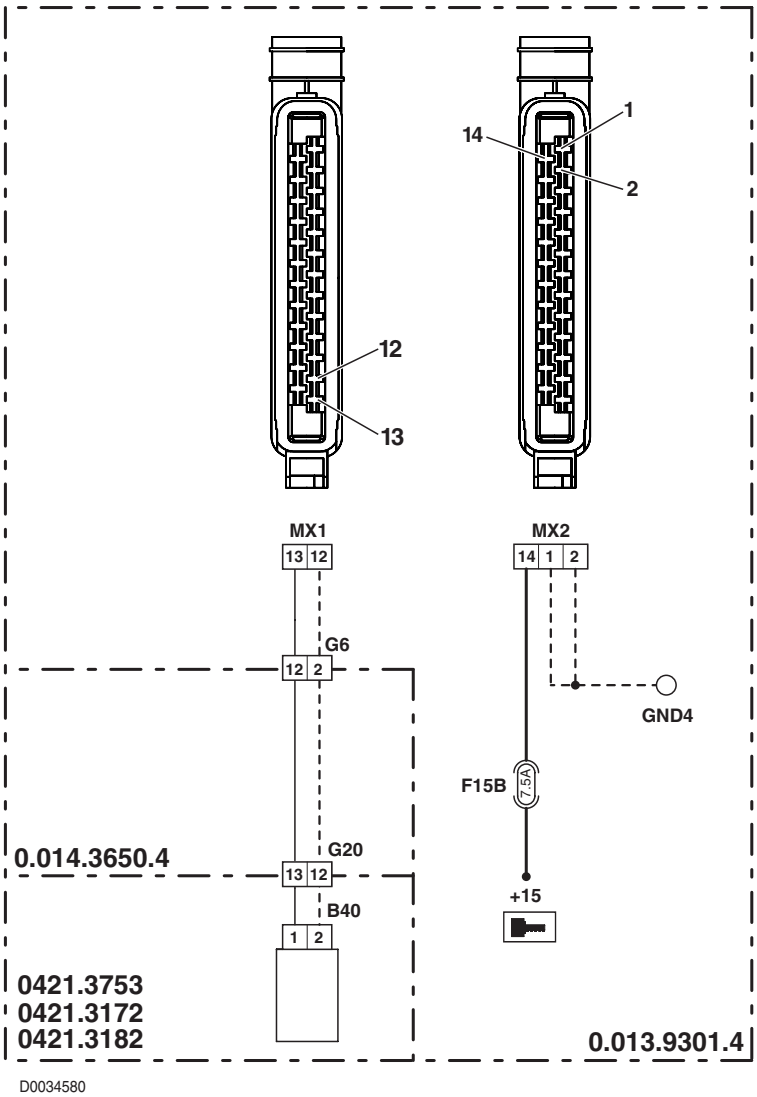
← *Motore, sens. velocita*
Frequenza non corretta

DESCRIPTION

The engine control unit detects that the signal from the engine pickup is either absent or incorrect.

CHECK

- Check that the engine speed pickup is installed correctly and at the specified distance from the pulse wheel
- Check that the internal resistance of the sensor is correct (for details, see section 40)
- Check that the contacts on connector “B40” and on engine control unit “MX1” are not oxidised and are firmly connected.
- Check for electrical continuity between pin 1 of connector “B40” and pin 12 of connector “MX1”.
- Check for electrical continuity between pin 2 of connector “B40” and pin 13 of connector “MX1”.



D0034580

ALARM N° 005

← *SPN 91 - FMI 2*

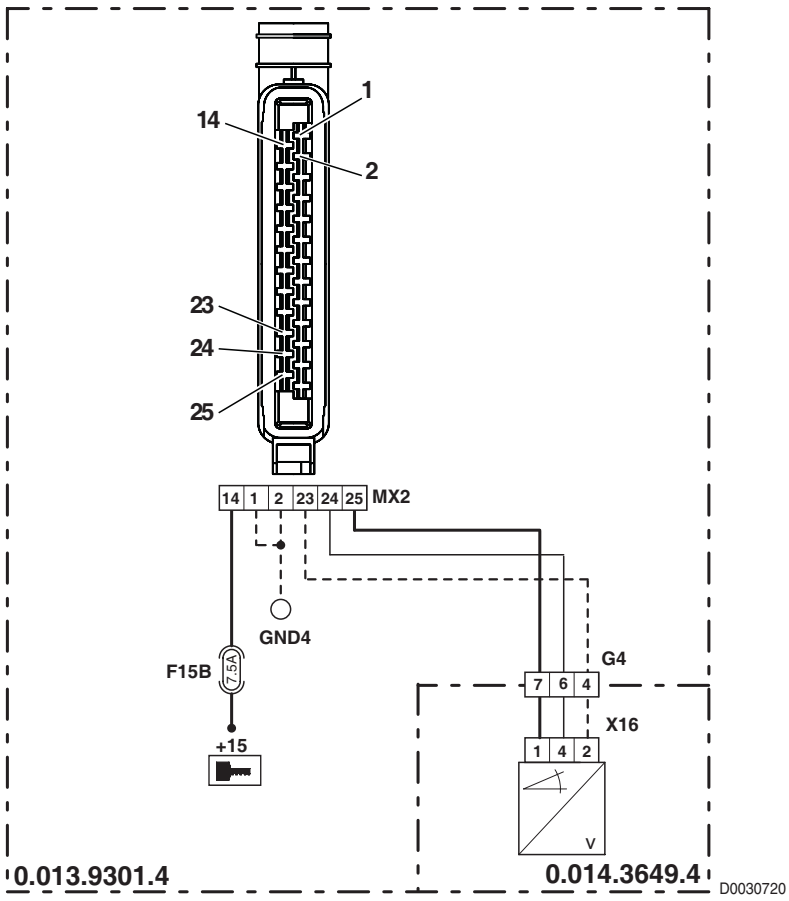
← *Motore, acc. pedale*
Segnale non valido

DESCRIPTION

The control unit detects that the connection to the accelerator pedal position sensor is either absent or short-circuiting.

CHECK

- Check that the contacts on control unit connector "MX1" and connector “X16” are firmly connected and are not oxidised
- Check that the accelerator pedal position sensor is receiving power correctly (approx. 5 Vdc measured between pin 32 (positive) and pin 30 (negative) of connector “X11").
- With connector “MX1” unplugged from the engine control unit, check for electrical continuity between pin 4 of connector “X16” and pin 24 of connector “MX1”.
- With the starter key in position “O” (OFF) and connector "MX1" disconnected from the engine control unit, connect a test meter to pin 4 of connector “X16” and to the earth on the cab and perform a resistance test to check for shorts to earth (meter reading: infinity).
- With connector "MX1" connected to the engine control unit and the starter key in position "I" (ON), connect a test meter to pin 4 of connector "X16" and to the earth on the cab and check the voltage is zero (meter reading 0V).
- Check that the resistance characteristics of the accelerator pedal position sensor are correct (for technical details see group 40).



ALARM N° 006

← *SPN 201 - FMI 2*

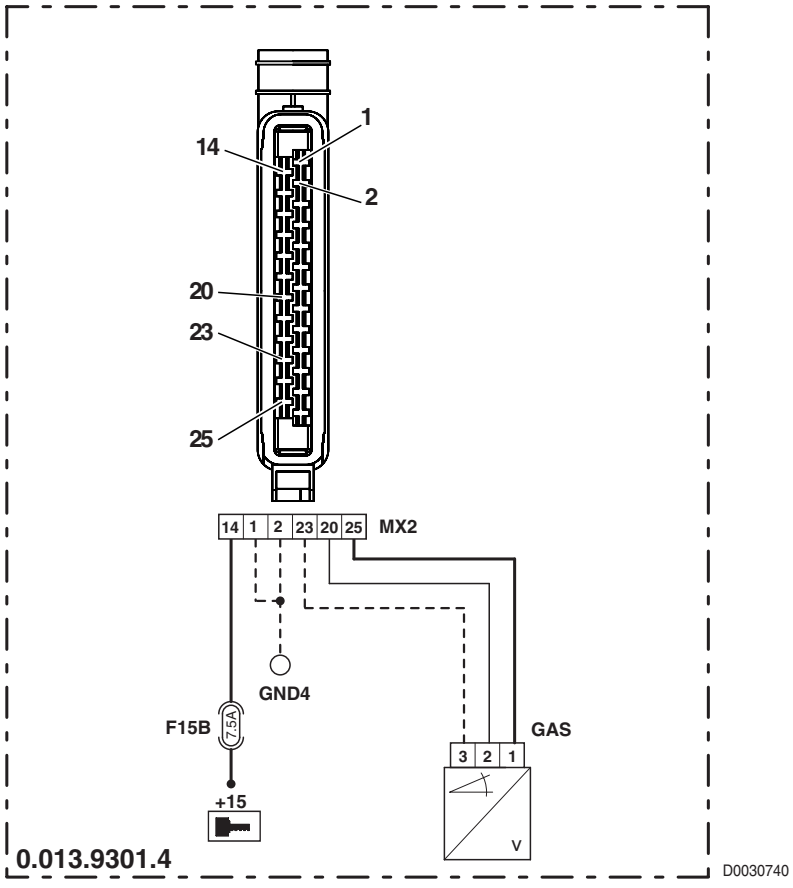
← *Motore, accel. manuale*
Segnale non valido

DESCRIPTION

The control unit detects that the connection to the hand throttle position sensor is either absent or short-circuiting.

CHECK

- Check that the contacts on ECU connector “MX1” and connector “GAS” are firmly connected and are not oxidised
- Check that the accelerator pedal position sensor is receiving power correctly (approx. 5 Vdc measured between pin 32 (positive) and pin 30 (negative) of connector “X11")
- With connector “MX1” unplugged from the engine control unit, check for electrical continuity between pin 2 of the "GAS" connector and pin 20 of connector “MX1”.
- With the starter key in position “O” (OFF) and connector "MX1" disconnected from the engine control unit, connect a test meter to pin 2 of the "GAS" connector and to the earth on the cab and perform a resistance test to check for shorts to earth (meter reading: infinity).
- With the connector "MX1" connected to the engine control unit and the starter key in position "I" (ON), connect a test meter to pin 2 of the "GAS" connector and to the cab earth and check that there is no voltage (test meter reading 0V).
- Check that the resistance characteristics of the accelerator pedal position sensor are correct (for technical details see group 40).



ALARM N° 007

← SPN 102 - FMI 2

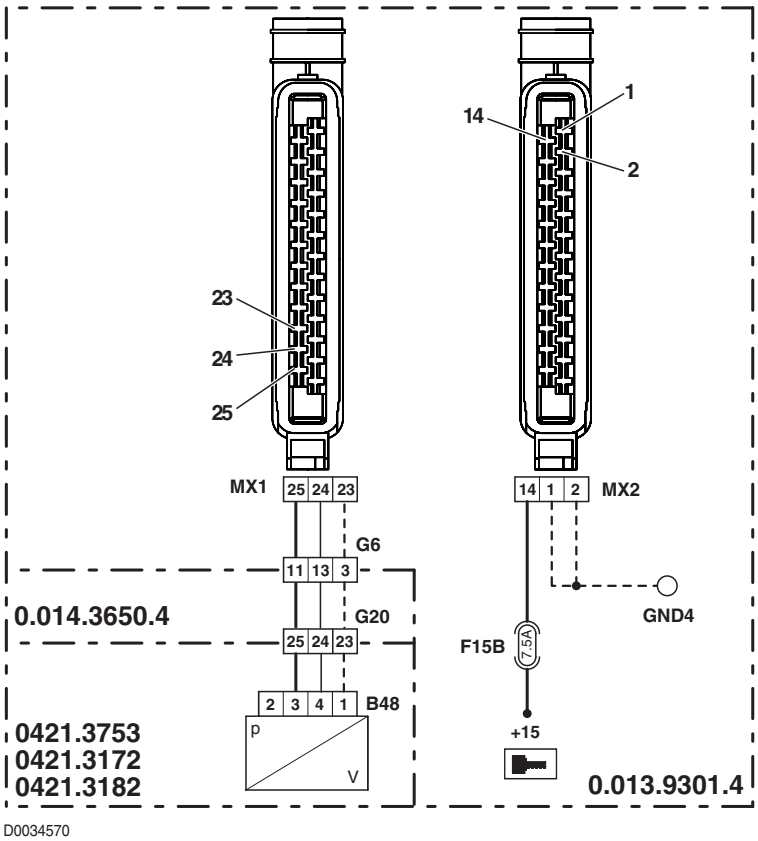
← Motore, pressione turbo.
Segnale non valido

DESCRIPTION

The engine control unit has detected that the engine turbo charge pressure signal is either absent or unreliable.

CHECK

- Check continuity between pin 1 of connector “B48” and pin 23 of connector “MX1”
- Check continuity between pin 2 of connector “B48” and pin 24 of connector “MX1”
- Check continuity between pin 3 of connector “B48” and pin 25 of connector “MX1”
- Check correct operation of the sensor (for technical details, see section 40)
- Check that the power input to the sensor is correct (5 Vdc approx measured between pin 3 (positive) and pin 1 (negative) of connector “B48")
- With connector "MX1" disconnected from the engine control unit and the starter key in the "I" (ON) position, connect a test meter to pin 2 of connector "B48" and to the engine earth, and check that voltage is zero (meter reading 0V).
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “B48” and to engine earth, and measure the resistance to check for possible ground faults (meter reading: infinity).



D0034570

ALARM N° 009

← *SPN 110 - FMI 2*

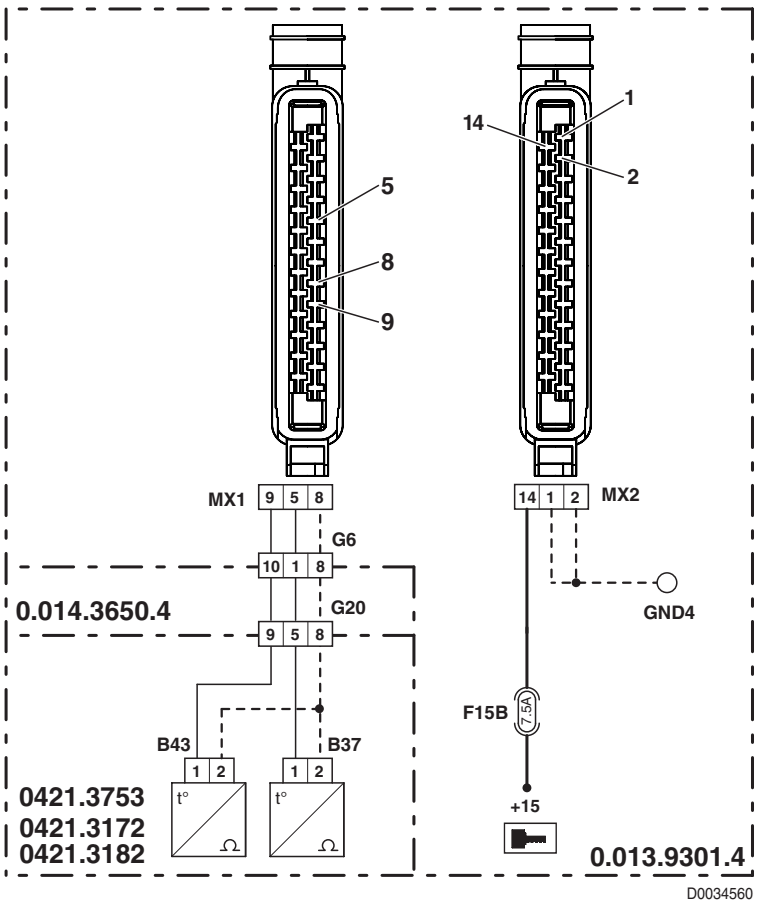
← *Motore, temperatura*
Segnale non valido

DESCRIPTION

The engine control unit has detected that the coolant temperature signal is either absent or unreliable.

CHECK

- Check for electrical continuity between pin 1 of connector “B43” and pin 9 of connector “MX1”.
- Check for electrical continuity between pin 2 of connector “B43” and pin 8 of connector “MX1”.
- Check that the temperature sensor is functioning correctly and does not give a false reading; use an external infrared thermometer and compare the reading with the value received from the sensor by the engine control unit.
- Check that the coolant level is within normal limits
- Check with the Serdia program that parameters "510 CoolantTempWarn" (normal value: 113 °C) and “514 CoolantTempEcy” (normal value: 130 °C) are correct
- Check correct operation of the sensor (for technical details, see section 40)
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and check that voltage is zero (meter reading 0V).
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 2 of connector “B43” and to engine earth, and check that voltage is zero (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and measure the resistance to check for possible ground faults (meter reading: infinity).
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “B43” and to the earth on the engine and perform a resistance test to check for shorts to earth (meter reading: infinity).



ALARM N° 011

← *SPN 174 - FMI 2*

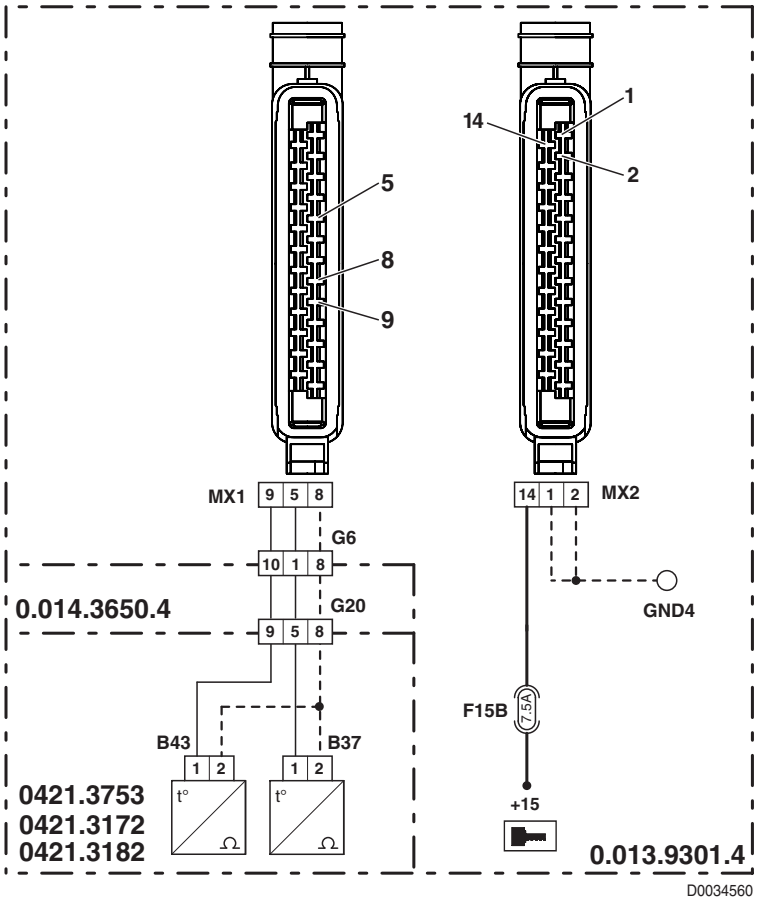
← *Motore, Temp. gasolio*
Segnale non valido

DESCRIPTION

The engine control unit has detected that the fuel temperature signal is either non-existent or unreliable.

CHECK

- Check for electrical continuity between pin 1 of connector “B37” and pin 5 of connector “MX1”.
- Check for electrical continuity between pin 2 of connector “B37” and pin 8 of connector “MX1”.
- Check correct operation of the sensor (for technical details, see section 40)
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 1 of connector “B37” and to engine earth, and check that there is no voltage registering (meter reading 0V).
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 2 of connector “B37” and to engine earth, and check that there is no voltage registering (meter reading 0V).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of connector “B37” and to the earth on the engine and perform a resistance test to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “B37” and to the earth on the engine and perform a resistance test to check for shorts to earth (meter reading: infinity).



ALARM N° 031

← *SPN 110 - FMI 0*

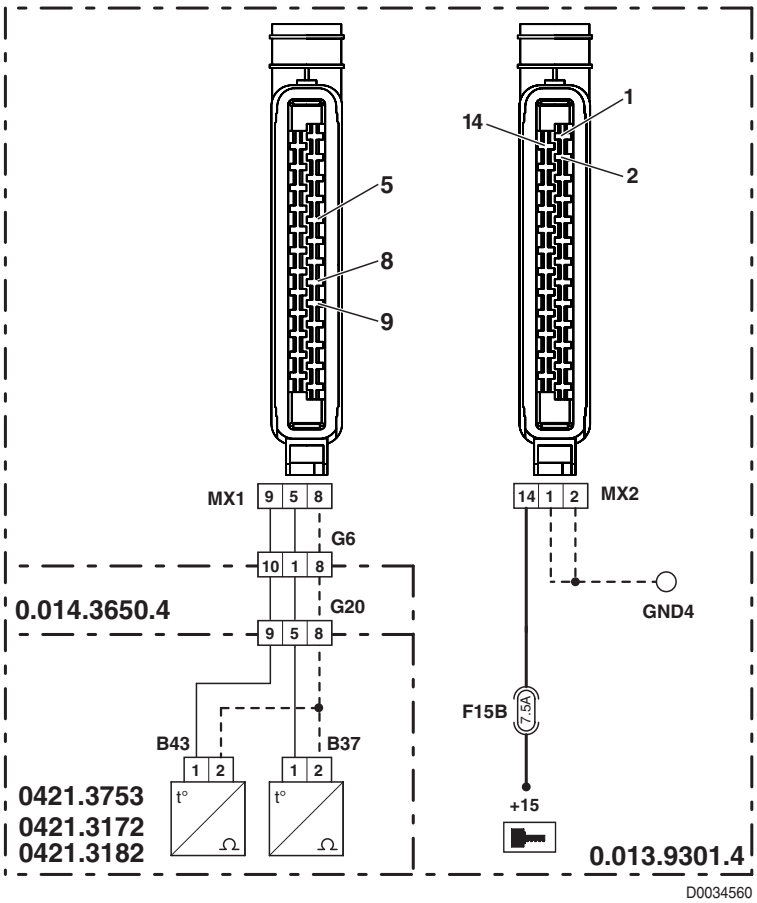
← *Motore, temperatura*
Segnale troppo elevato

DESCRIPTION

The engine control unit has detected a coolant temperature higher than the alarm threshold.

CHECK

- Check with the Serdia program that the parameter “510 CoolantTempWarn” is correct (normal value: 113 °C)
- Check correct operation of the sensor (for technical details, see section 40)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).



ALARM N° 035

← *SPN 702 - FMI 14*

← *Motore, fuori giri*
FMI 14

DESCRIPTION

The engine control unit detects that the engine is or has been running overspeed (above 3100 rpm).

NOTE
This alarm is generally activated when, with the tractor on a downhill gradient, the engine is used as a brake and forced to run at higher speed.
The alarm is usually reset automatically when the tractor reaches level ground.
If the alarm resets, no testing is necessary.

CHECK

- Check with the Serdia program that parameter “21 Speed over” is correct (normal value: 3100 rpm)
- Check that the engine speed pickup sensor functions correctly and does not give a false reading; use an external sensor and compare the reading obtained with the value received from the pickup by the engine control unit.
- Check that the injection pumps control rod slides freely.
- Check that the internal resistance values for the actuator are correct (for details see section 40).
- Check that the parameter “1 TeethPickUp1” is correct (normal value=48).

ALARM N° 036

← SPN 174 - FMI 0

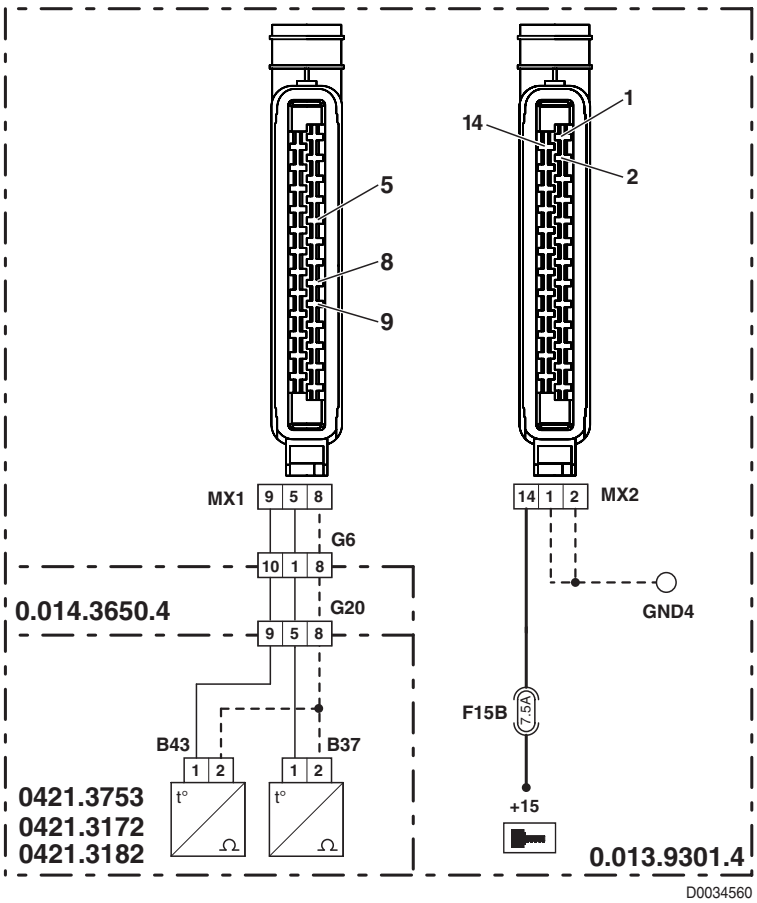
← Motore, Temp. gasolio
Segnale troppo elevato

DESCRIPTION

The engine control unit has detected a fuel temperature higher than the alarm threshold.

CHECK

- Check correct operation of the sensor (for technical details, see section 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of connector "B43" and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).



ALARM N° 041

← SPN 110 - FMI 0

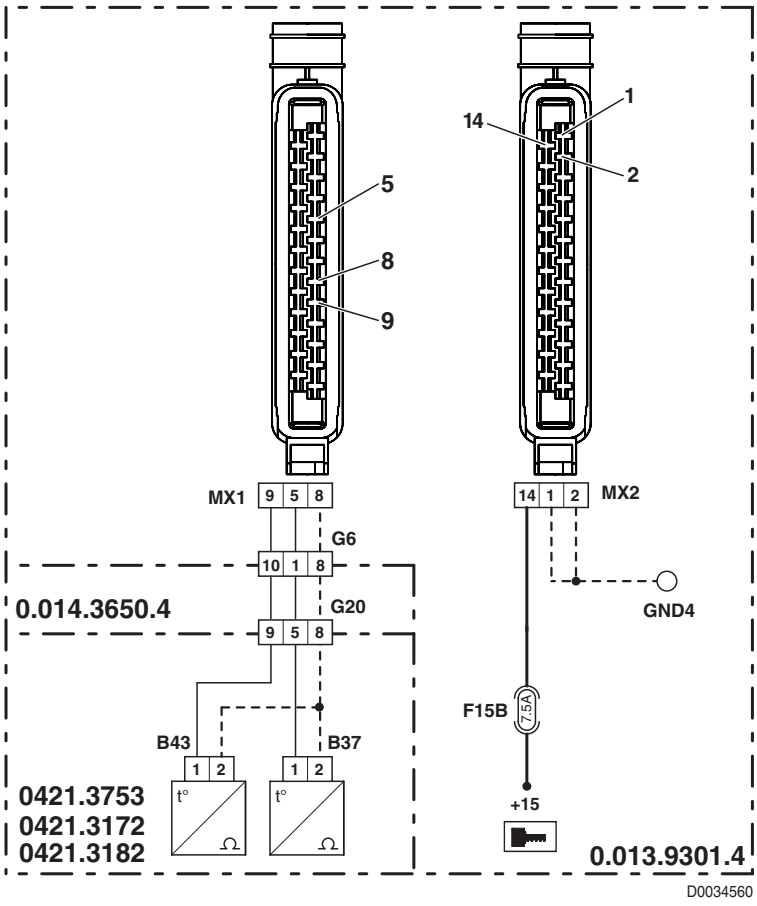
← Motore, temperatura
Segnale troppo elevato

DESCRIPTION

The engine control unit has detected a coolant temperature higher than the alarm threshold.

CHECK

- Check that the coolant level is within normal limits
- Check with the Serdia program that the parameter “514 CoolantTempEcy” (normal value: 130 °C) is correct
- Check correct operation of the sensor (for technical details, see section 40)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and measure the resistance to check for possible short circuits to earth (meter reading: infinity).



ALARM N° 050

← *SPN 536 - FMI 12*

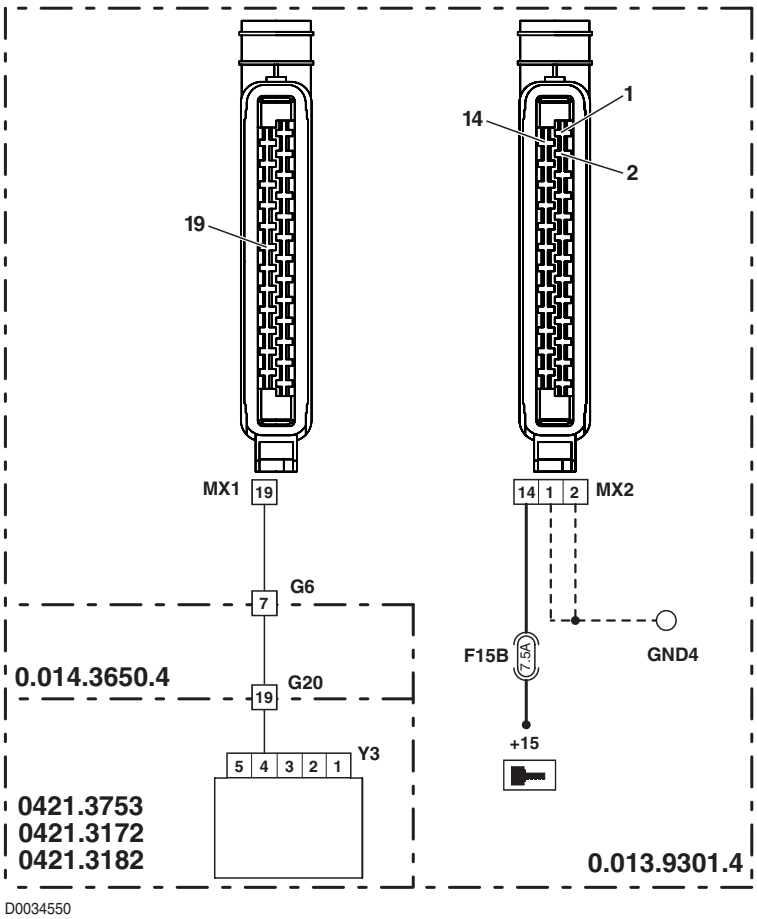
← *Motore, attuatore*
Dispositivo guasto

DESCRIPTION

The engine control unit has detected that the actuator position signal does not match the requirement.

CHECK

- Check that the contacts on connector “Y3” and on the control unit “MX1” are firmly attached and not oxidised.
- Check for electrical continuity between pin 4 of connector “Y3” and pin 19 of connector “MX1”.
- Check that the internal resistance values for the actuator are correct (for details see section 40).
- With the starter key in the “I” (ON) position and the engine 'off', connect a test meter to pin 4 of connector “Y3” and to engine earth, and check that there is no voltage registering (meter reading: 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 4 of connector “Y3” and to engine earth, and measure the resistance to check for possible short circuits to earth (meter reading: infinity).
- If the fault persists, renew the actuator.



ALARM N° 052

← SPN 536 - FMI 13

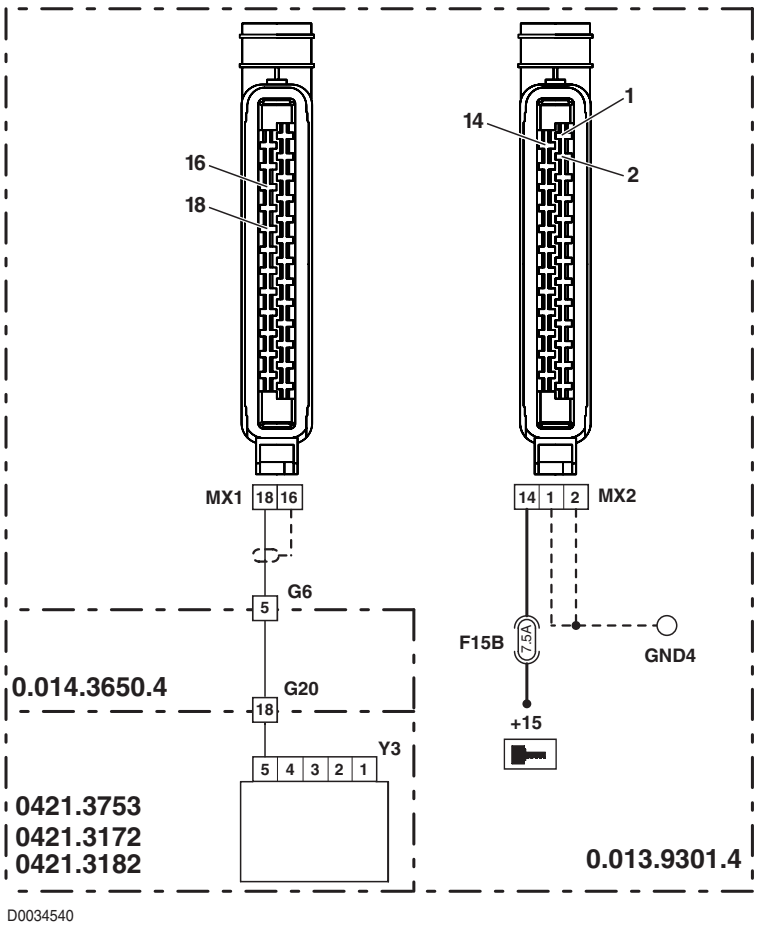
← Motore, attuatore
Non Calibrato

DESCRIPTION

The engine control unit has detected that the reference signal for the position of the actuator does not match the requirement.

CHECK

- Check that the contacts on connector “Y3” and on the control unit “MX1” are firmly attached and not oxidised.
- Check for electrical continuity between pin 5 of connector “Y3” and pin 18 of connector “MX1”.
- Check that the internal resistance values for the actuator are correct (for details see section 40).
- With the starter key in the “I” (ON) position and the engine 'off', connect a test meter to pin 5 of connector “Y3” and to engine earth, and check that there is no voltage registering (meter reading: 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 5 of connector “Y3” and to engine earth, and measure the resistance to check for possible short circuits to earth (meter reading: infinity).
- If the fault persists, renew the actuator.



ALARM N° 053

← *SPN 535 - FMI 7*

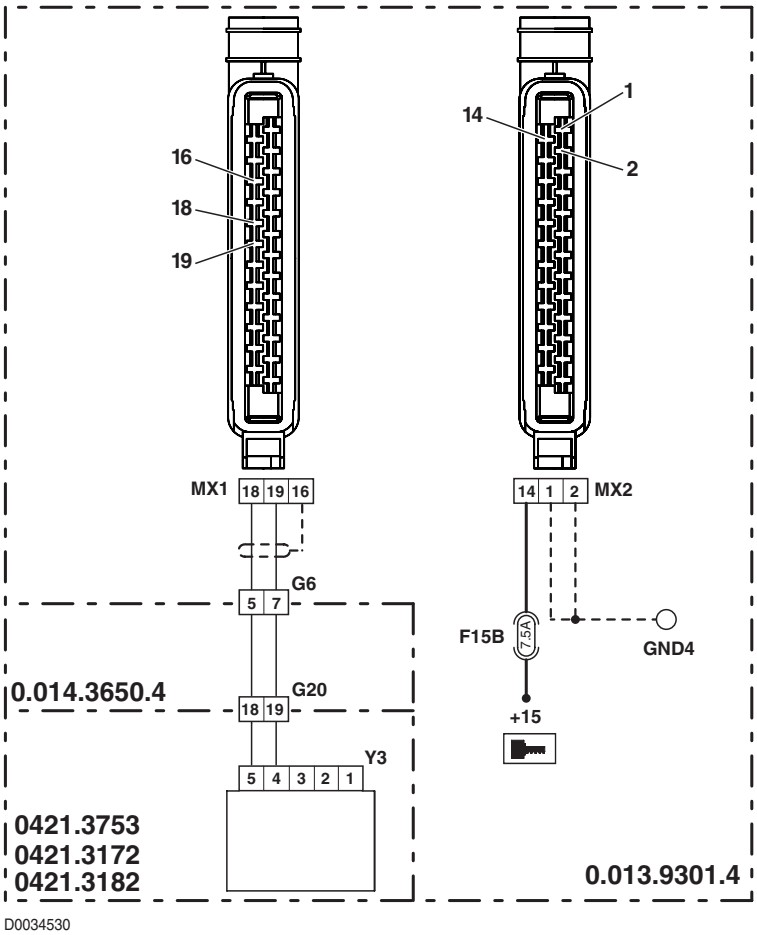
← *Motore, Regolatore*
Difetto meccanico

DESCRIPTION

The engine control unit has detected that the difference between the command and the response of the actuator is greater than 10%.

CHECK

- Check that the internal resistance values for the actuator are correct (for details see section 40).
- Check that the injection pumps control rod slides freely.
- Check that the fuel injection pumps have not seized.
- Check that the contacts on connector “Y3” and on the control unit “MX1” are firmly attached and not oxidised.
- Check for electrical continuity between pin 4 of connector “Y3” and pin 19 of connector “MX1”.
- Check for electrical continuity between pin 5 of connector “Y3” and pin 18 of connector “MX1”.



D0034530

ALARM N° 067

← *SPN 091 - FMI 11*

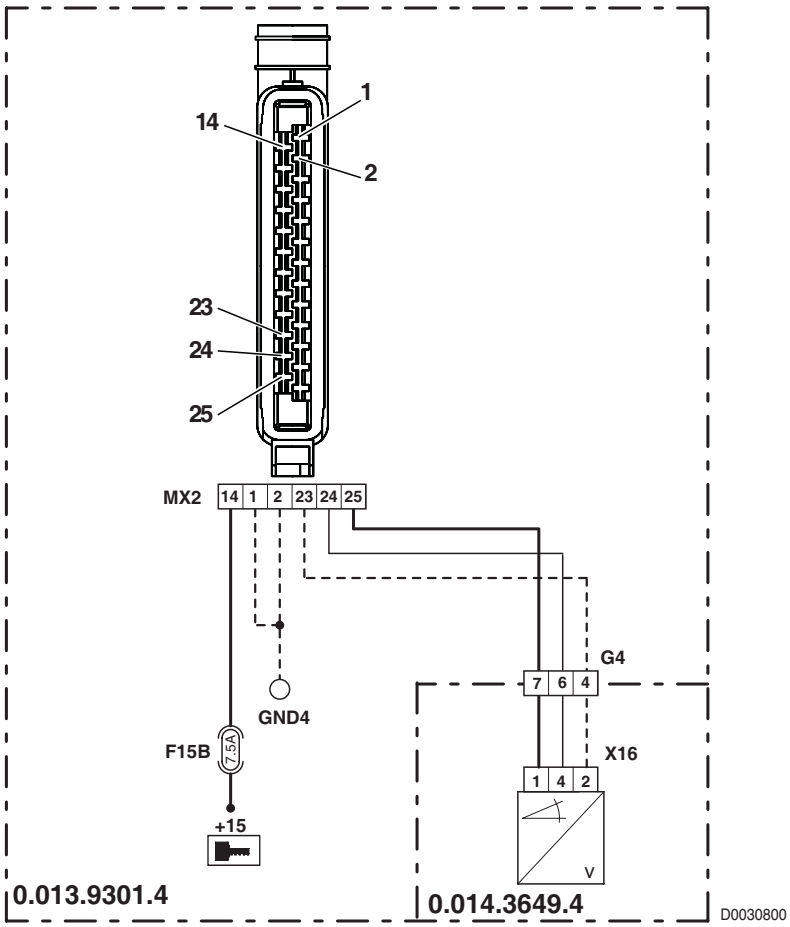
← *Motore, acc. pedale*
Guasto non identificatot

DESCRIPTION

The engine control unit has detected the absence of a connection to the accelerator pedal position sensor or a signal out of range.

CHECK

- Check that the contacts on control unit connector "MX1" and connector “X16” are firmly connected and are not oxidised
- Check that the resistance characteristics of the accelerator pedal position sensor are correct (for technical details see group 40)
- Check that the accelerator pedal position sensor is receiving power correctly (approx. 5 Vdc measured between pin 30 (positive) and pin 32 (negative) of the connector “X11")
- With connector “MX1” unplugged from the engine control unit, check for electrical continuity between pin 4 of connector “X16” and pin 24 of connector “MX1”.
- With the starter key in position “O” (OFF), connect a test meter to pin 4 of connector “X16” and to the earth on the cab and perform a resistance test to check for shorts to earth (meter reading: infinity).
- With connector "MX1" connected to the engine control unit and the starter key in position "I" (ON), connect a test meter to pin 4 of connector "X16" and to the earth on the cab and check the voltage is zero (meter reading 0V).



ALARM N° 068

← *SPN 898 - FMI 2*

← *Motore, Errore CAN*
Segnale non valido

DESCRIPTION

The engine control unit has not been able to read or send a message on the CANBUS.

CHECK

- For details, see chapter "5.6 CANBUS ALARMS".

ALARM N° 070

← *SPN 743 - FMI 12*

← *Motore, Errore CAN*
Dispositivo guasto

DESCRIPTION

The engine control unit has detected that the CANBUS controller is damaged.

CHECK

- For details, see chapter "5.6 CANBUS ALARMS".

ALARM N° 071

← *SPN 743 - FMI 9*

← *Motore, Errore CAN*
Errore aggiornamento

DESCRIPTION

The engine control unit has not been able to read or send a message on the CANBUS.

CHECK

- For details, see chapter "5.6 CANBUS ALARMS".

ALARM N° 074

← SPN 743 - FMI 14

← Motore, Errore CAN
FMI 14

DESCRIPTION

The engine control unit has detected that the connection to the CANBUS is not present.

CHECK

- For details, see chapter "5.6 CANBUS ALARMS".

ALARM N° 076

← SPN 765 - FMI 12

← Motore, Parametri E2P
Dispositivo guasto

DESCRIPTION

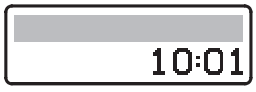
The engine control unit has detected an error in writing the parameters.

CHECK

- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- Repeat the data write procedure, and if the problem persists, contact the Technical Assistance Service.

ALARM N° 077

← SPN 752 - FMI 12



← Motore, Errore Memoria
Dispositivo guasto

DESCRIPTION

The engine control unit has detected an error in reading the program memory during the normal control cycle.

CHECK

- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- If the problem persists, contact the Technical Assistance Service.

ALARM N° 078

← *SPN 766 - FMI 2*

← *Motore, Errore interno*
Segnale non valido

DESCRIPTION

The engine control unit has detected an error in reading the work memory during the normal control cycle.

CHECK

- Note down the values of the parameters “3895 RAMTestAddr” and “3896 RAMTestPattern”
- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- If the problem persists, contact the Technical Assistance Service.

ALARM N° 080

← *SPN 766 - FMI 2*

← *Motore, Errore interno*
Segnale non valido

DESCRIPTION

The engine control unit detects an actuator power input outside the specified parameters.

CHECK

- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- Check whether the alarm is still present, and, if so, contact the TECHNICAL ASSISTANCE SERVICE.

ALARM N° 083

← *SPN 766 - FMI 2*

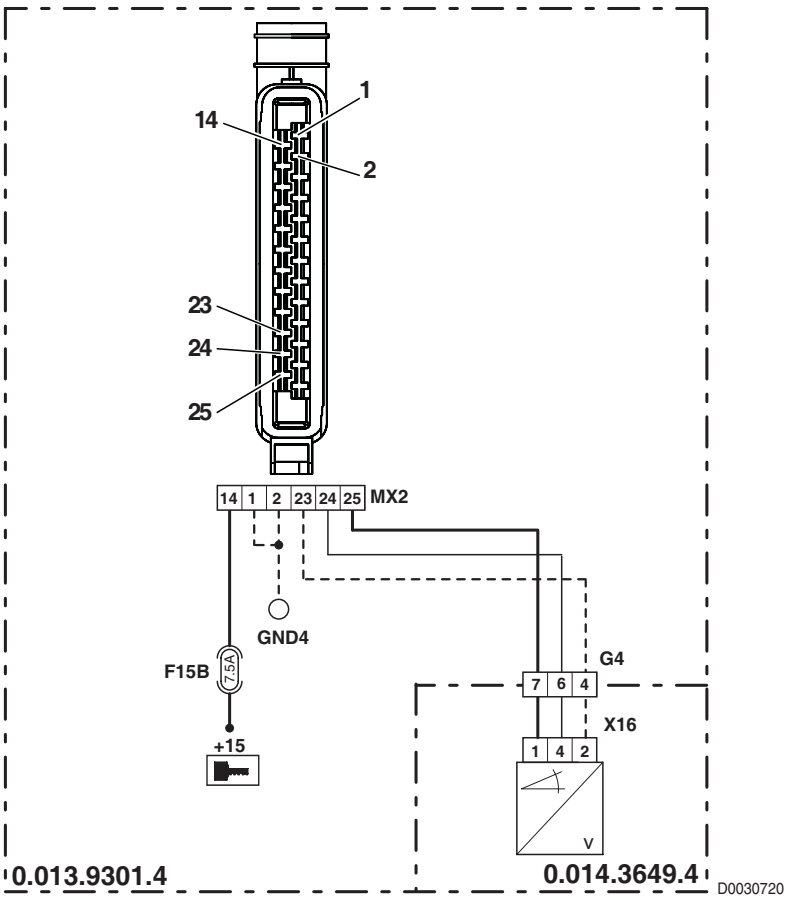
← *Motore, Errore interno*
Segnale non valido

DESCRIPTION

The control unit detects that the power supply to the accelerator pedal position sensor is either absent or incorrect.

CHECK

- Check that the accelerator pedal position sensor is receiving power correctly (approx. 5 Vdc measured between pin 1 (positive) and pin 2 (negative) of connector “X16")
- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- Check whether the alarm is still present, and, if so, contact the TECHNICAL ASSISTANCE SERVICE.



ALARM N° 084

← *SPN 766- FMI 2*

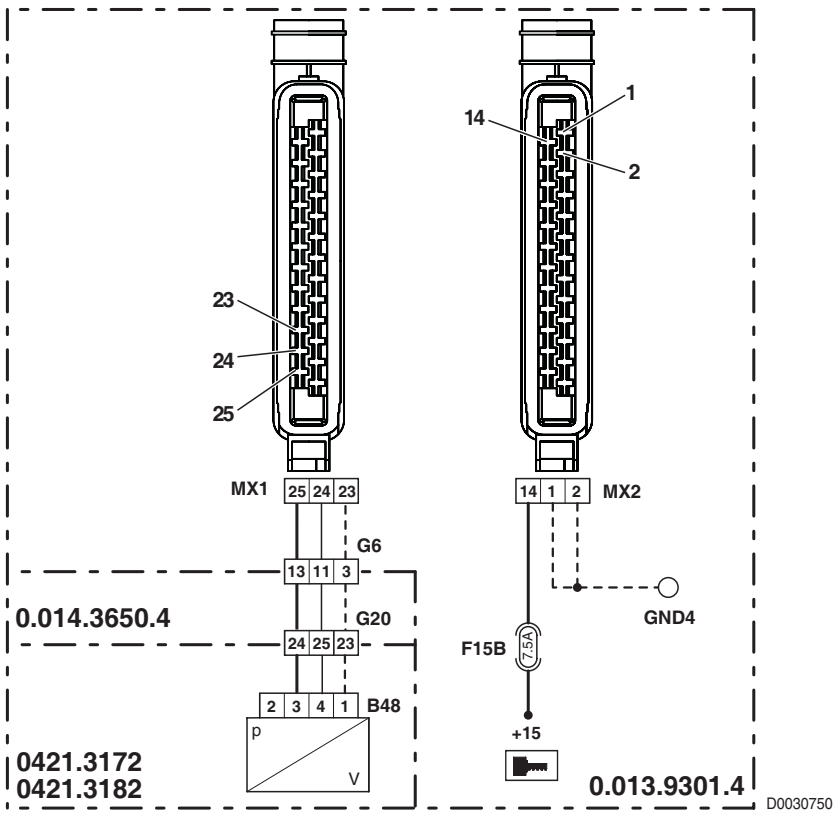
← *Motore, Errore interno*
Segnale non valido

DESCRIPTION

The control unit detects that the power supply to the engine turbocharge pressure sensor is either absent or incorrect.

CHECK

- Check that the engine turbocharge pressure sensor is receiving power correctly (approx. 5 Vdc between pin 3 (positive) and pin 1 (negative) of connector “B48”)
- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- Check whether the alarm is still present, and, if so, contact the TECHNICAL ASSISTANCE SERVICE.



ALARM N° 086

← *SPN 171 - FMI 12*

← *Motore, sens.temp. ECU*
Dispositivo guasto

DESCRIPTION

The engine control unit detects that its internal temperature is too high.

CHECK

- Turn the starter key to "O" (OFF) and wait a few minutes for the engine to cool down.
  Turn the key back to "I" (ON) and check that the alarm does not reappear.
- If the alarm is repeated, contact the TECHNICAL ASSISTANCE SERVICE.

ALARM N° 087

← *SPN 108 - FMI 12*

← *Motore, Press. Atmosf.*
Dispositivo guasto

DESCRIPTION

The engine control unit detects that atmospheric pressure is outside the permissible limits.

CHECK

- Turn the starter key to "O" (OFF) and wait a few minutes.
  Turn the key back to "I" (ON) and check that the alarm does not reappear.
- If the alarm is repeated, contact the TECHNICAL ASSISTANCE SERVICE.

ALARM N° 090

← *SPN 765 - FMI 2*

← *Motore, Parametri E2P*
Segnale non valido

DESCRIPTION

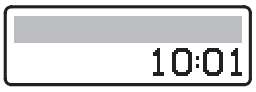
The engine control unit has detected a discrepancy between the parameters written in EEPROM.

CHECK

- Check that the parameter values to be written in the control unit EEPROM are correct and consistent with one another.
- Send the parameters to the control unit again.
- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- If the problem persists, contact the Technical Assistance Service.

ALARM N° 093

← *SPN 752 - FMI 2*



← *Motore, Errore Memoria*
Segnale non valido

DESCRIPTION

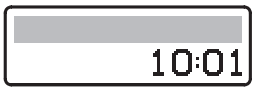
The engine control unit has detected a “Stack Overflow” error during the execution of the program.

CHECK

- Note down the values of parameters “3897 CStackTestFreeBytes” and “3898 IStackTestFreeBytes”
- Turn the starter key to “O” (OFF) and then back to “I” (ON).
- If the problem persists, contact the Technical Assistance Service.

ALARM N° 094

← *SPN 766 - FMI 2*



← *Motore, Errore interno*
Segnale non valido

DESCRIPTION

The engine control unit has detected an internal error.

CHECK

- Contact the Technical Assistance Service.

5.6 CANBUS ALARMS

In order to remedy any problems signalled on the CANBUS by one or more of the control units, it is first necessary to fully understand the method by which the control units are connected to the CANBUS.

The CANBUS physically consists of two twisted wires, designated CAN_H and CAN_L, along which data is transmitted by the control units.

Between these two wires there are two 120 Ohm resistors, each connected in parallel, and therefore the resistance measured at any point in the system should be 60 Ohm.

The resistors are physically located inside the Infocenter and the transmission control unit, which therefore can be considered as termination control units.

The supplementary CANBUS connector and all the other control units are connected in parallel to the line connecting the two termination control units.

Should one of the two resistors burn out, a resistance reading measured at any point of the system will be 120 Ohm.
In this case the CANBUS line continues to function, but the influence of external interference from high voltage cables, radio transmitters and other devices that may generate radio signals, causes the generation of CANBUS alarms which, although they will normally self-reset, may appear very frequently.
In this case therefore you may encounter problems with some of the various tractor systems that cannot be solved by means of electrical/electronic diagnostics of the components associated with the faulty system since they are related exclusively to a problem on the CANBUS line.

When one of the two termination control units is disconnected, or if a CANBUS wire comes loose from a connector of one these two control units, as in the previous case, a resistance of 120 Ohm may be measured at any point of the system, but the cause of the problem can be rectified by repairing the faulty control unit connection.

If the two CANBUS wires were short circuited to each other, the resistance would be zero (0 Ohm). In this case all the control units would signal all the detectable faults.
The same situation would occur if one of the two wires shorts to ground or to a positive power supply on one of the CANBUS line wires

When a problem on the CANBUS line is detected by one or more control units, connect the ART to the HLHP control unit and access the "CAN Monitor" screen to check which control units are correctly connected to the CANBUS; use the following table to identify the cause of the alarm.

5.6.1 ALARMS TABLE

Control unit that detects alarm	Code on		Alarm description	Cases							
	ECU	HLHP		1	2	3	4	5	6	7	8
CANBUS status on HLHP x.x CAN Status"		CAN EMR	Connection to the engine control unit	OK	FAULT	FAULT	OK	FAULT	OK	FAULT	
		CAN TCU	Connection to the transmission control unit	OK	FAULT	OK	FAULT	FAULT	OK	FAULT	
		CAN IC	Connection to the Infocenter	FAULT	OK	OK	OK	FAULT	OK	FAULT	
		CAN UI	Connection to the armrest	OK	FAULT	OK	FAULT	FAULT	FAULT	FAULT	
Transmission	C0	C0	Communication problem with HLHP control unit (range gear engagement control)	P	A		A	A		P	R
	C1	C1	Communication problem with HLHP control unit (forward/reverse selection)	P	A		A	A		P	R
	C3	C3	Communication problem with engine control unit (engine speed)	P		A	A			P	R
	CF	CF	Communication problem with engine control unit	P		A	A			P	R
	D1	D1	Communication problem with engine control unit	P		A	A			P	R
	D2	D2	Communication problem with HLHP control unit	P	A		A	A		P	R
HLHP	SPN 51 - FMI 12		Communication problem with engine control unit		A	A		A		P	
	SPN 63 - FMI 2		Communication problem with transmission control unit		A		A	A		P	
	SPN 561 - FMI 2		Communication problem with engine control unit		A	A		A		P	
	SPN 631 - FMI 9		Connection to armrest control unit not present		A		A	A	A	P	
	SPN 632 - FMI 9		Connection to transmission control unit not present		A		A	A		P	
	SPN 633 - FMI 9		Connection to engine control unit not present		A	A		A		P	
Engine	68	SPN 898 - FMI 2	Accelerator pedal data reception error	P	A	A		A		P	R
	71	SPN 743 - FMI 9	Reception/transmission error on CANBUS	P	P	A	P	P	P	P	R
	70	SPN 743 - FMI 12	CANBUS line controller damaged			P					
	74	SPN 743 - FMI 14	Fault on CANBUS line		P	A	P	P	P	A	R

KEY

R: alarm caused by interference on CANBUS, reset automatically and transferred to passive alarms

A: active alarm

P: alarm that might be present

CASE 1 ANALYSIS

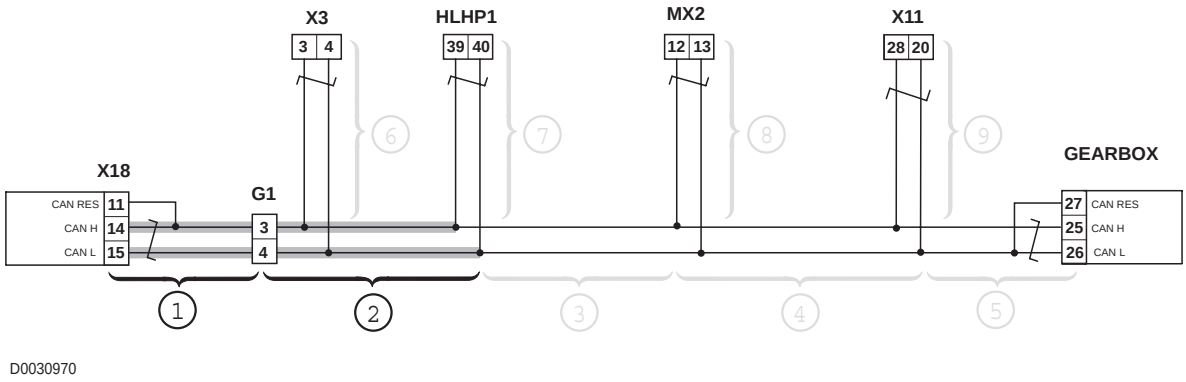
DESCRIPTION

This fault is generally caused by disconnection of the Infocenter connector or by a break in one of the CANBUS wires in section "1" or "2".

WARNING
Before testing the resistance or continuity of the wiring, turn the starter key to "O" (OFF) and disconnect the lead from the negative battery terminal.

CHECK

- Check that the contacts on connector “X18” of the Infocenter are not oxidized and are firmly secured.
- Connect a test meter to pin 14 and to pin 15 of connector “X18” on the wiring side and check that the resistance is 120 Ohm.
- If the resistance reading is 0 Ohm, reconnect connector "X18" to the Infocenter and connect a test meter to pin 3 and to pin 4 of connector "G1" on the central wiring side and check that the resistance is 120 Ohm.
- If the resistance reading is 0 Ohm, the fault can be attributed to a break in one of the wires of the CANBUS in the central wiring loom and can be remedied by repairing or renewing the wiring loom.
- If the resistance reading is 120 Ohm, check the continuity of the wiring between pin 3 of connector "G1" and pin 14 of connector "X18" and between pin 4 of connector "G1" and pin 15 (or 11) of connector "X18".
  If continuity is not detected, the instrument panel wiring must be repaired or renewed.



D0030970

CASE 2 ANALYSIS

DESCRIPTION

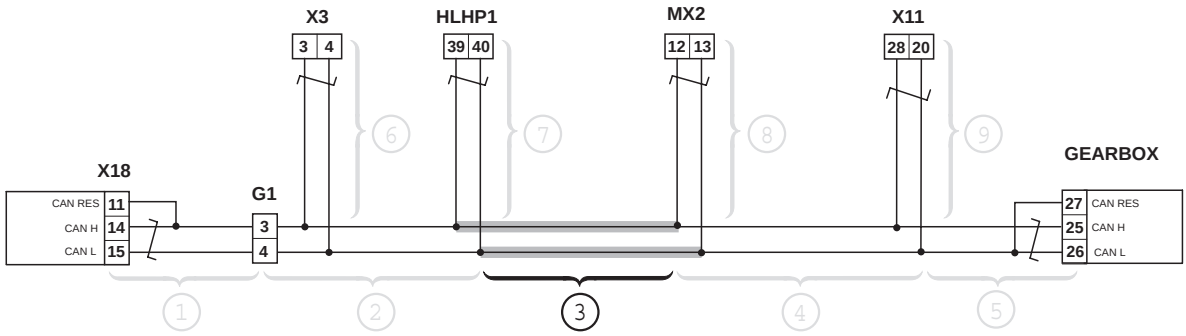
This fault is generally caused by disconnection of the HLHP control unit or by a break in one of the CANBUS wires in section "3".

WARNING

Before testing the resistance or continuity of the wiring, turn the starter key to "O" (OFF) and disconnect the lead from the negative battery terminal.

CHECK

- The fault can be attributed to a break in one of the CANBUS wires and can be remedied by repairing or renewing the wiring.



D0030980

CASE 3 ANALYSIS

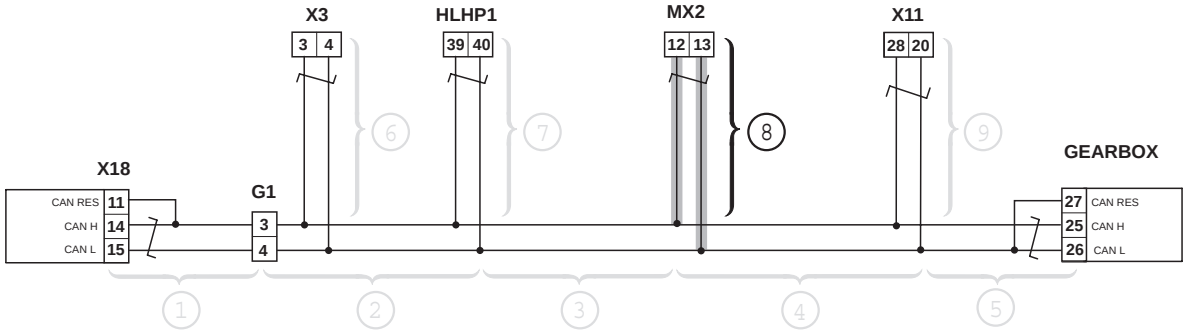
DESCRIPTION

This fault is generally caused by the disconnection or by a break in one of the CANBUS wires in section “8”.

WARNING
Before testing the resistance or continuity of the wiring, turn the starter key to "O" (OFF) and disconnect the lead from the negative battery terminal.

CHECK

- Check that the power supply to the engine control unit is correct (12 Vdc measured between pin 14 (positive) and pins 1 and 2 (negative) of connector "MX2" on wiring side).
  If the voltage is zero, check the condition of fuse F15B (7.5 A).
- Check that the contacts on connector “MX2” of the engine control unit are not oxidised and are firmly secured.
- Connect a test meter to pin 12 and to pin 13 of connector “MX2” on the wiring side and check that the resistance is approx. 60 Ohm.
  If the resistance reading is different from the value specified above, repair or renew the wiring loom.
- If the fault is not identified by the above checks, it can be attributed to a defective CANBUS controller, and can be remedied by renewing the engine control unit.
  Before renewing the engine control unit, use SERDIA to check the active alarms detected by the control unit.
  If alarm 70 is present, the engine control unit must be renewed.



D0030990

CASE 4 ANALYSIS

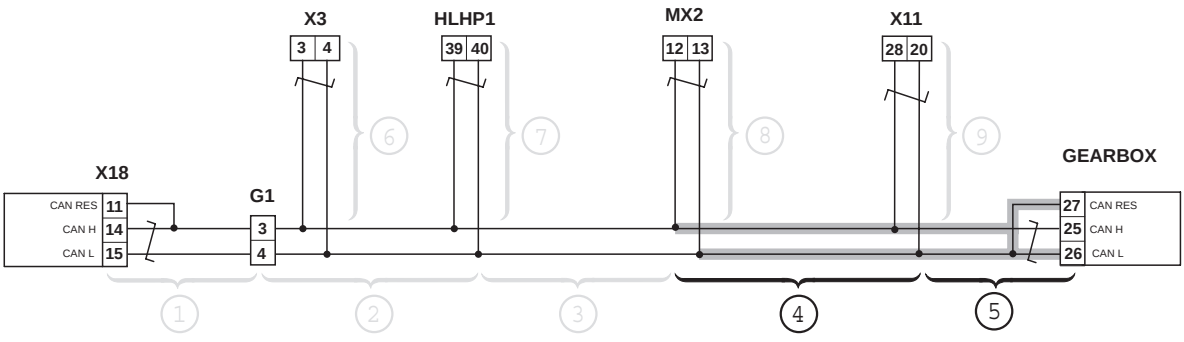
DESCRIPTION

This fault is generally caused by the disconnection of the transmission control unit connector or by a break in one of the CANBUS wires in section "4" or "5".

WARNING
Before testing the resistance or continuity of the wiring, turn the starter key to "O" (OFF) and disconnect the lead from the negative battery terminal.

CHECK

- Check that the power supply to the transmission control unit is correct with the starter key in position "0" (OFF) (12 Vdc measured between pins 23 and 68 (positive) and between pins 1 and 2 (negative) of the "GEARBOX" connector on the wiring side).
  If the voltage is zero, check the condition of fuse F5C (7.5A).
- Check that the power supply to the transmission control unit is correct when the starter key is in the "I" (ON) position (12 Vdc measured between pins 45 and 66 (positive) and between pins 1 and 2 (negative) of connector "GEARBOX" on the wiring side).
  If the voltage is zero, check the condition of fuse F16B (7.5A).
- Check that the contacts on the “GEARBOX” connector of the transmission control unit are not oxidised and are firmly secured.
- Connect a test meter to pin 26 and to pin 27 of the “GEARBOX” connector of the control unit and check that the resistance is approx.120 Ohm.
  If the resistance differs from this value, fit a new control unit.
- Connect a test meter to pin 25 and to pin 26 (or to pin 27) of the “GEARBOX” connector on the wiring side and check that the resistance is approx. 120 Ohm.
  If the resistance reading differs from this value, repair or renew wiring.
- If the fault is not identified by the above checks, it can be attributed to a defective CANBUS controller, and can be remedied by renewing the transmission control unit. Before proceeding with renewal of the engine control unit, use the EDS to check all the active alarms detected by the control unit.



D0031000

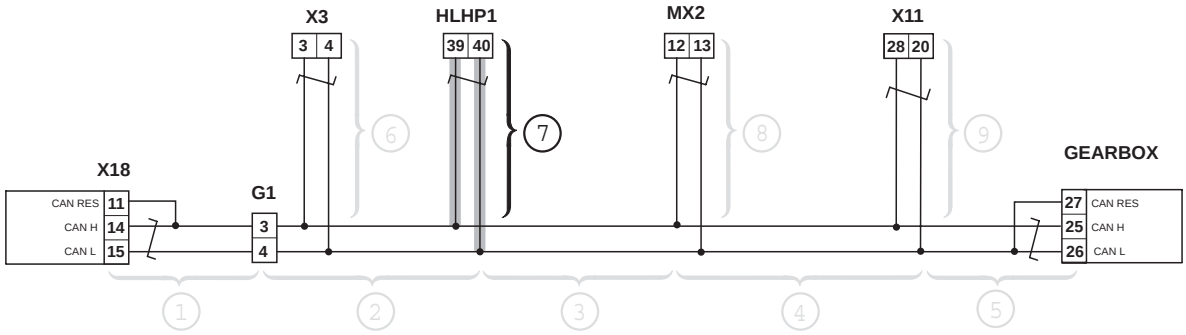
CASE 5 ANALYSIS

DESCRIPTION

This fault is generally caused by the disconnection of connector "HLHP1" of the HLHP control unit or by a break in one of the CANBUS wires in section "7".

CHECK

- Check that the power supply to the HLHP control unit is correct with the starter key in the "0" (OFF) position (12 Vdc between pins 1 and 27 (positive) and between pins 2 and 28 (negative) of the connector "HLHP1" of the wiring loom). If the voltage is zero, check the condition of fuse F15C (15A).
- Check that the power supply to the transmission control unit is correct with the starter key in the "I" (ON) position (12 Vdc between pin 41 (positive) and between pins 2 and 28 (negative) of the "GEARBOX" wiring connector). If the voltage is zero, check the condition of fuse F2A (7.5A).
- Check that the contacts on connector “HLHP1” of the control unit are not oxidised and are firmly secured.
- Connect a test meter to pin 39 and to pin 40 of connector “HLHP1” on the wiring side and check that the resistance is 60 Ohm. If the resistance reading differs from this value, repair or renew wiring.
- If the fault is not identified by the above checks, it can be attributed to a defective CANBUS controller, and can be remedied by renewing the HLHP control unit.



D0031010

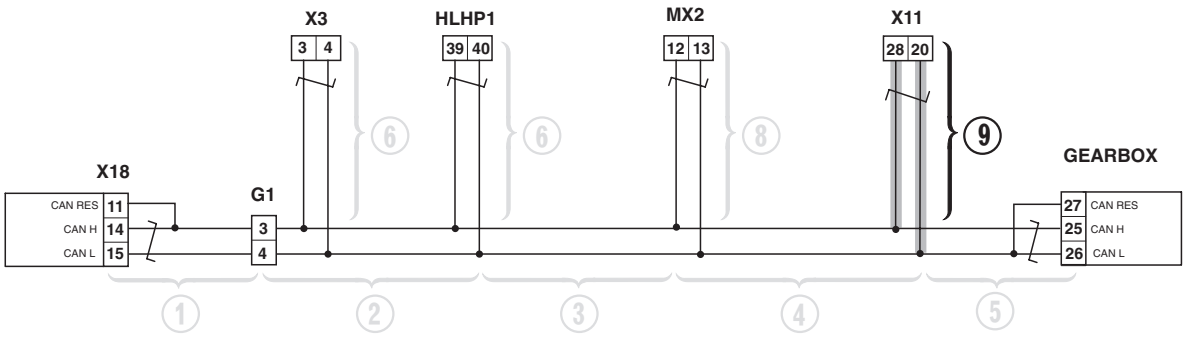
CASE 6 ANALYSIS

DESCRIPTION

This fault is generally caused by the disconnection of the armrest connector or by a break in one of the CANBUS wires in section “9”.

CHECK

- Check that the armrest is receiving power correctly with the starter key in position “I” (ON) (12 Vdc between pin 7 (positive) and pin 26 (negative) of connector “X11” on wiring side).
  If the voltage is zero, check the condition of fuse F9A.
- Check that the contacts on the armrest connector “X11” are not oxidised and are firmly secured.
- Connect a test meter to pin 20 and to pin 28 of connector “X11” on the wiring side and check that the resistance is approx. 60 Ohm.
  If the resistance reading differs from this value, repair or renew wiring.
- If the fault is not identified by the above checks, it can be attributed to a defective CANBUS controller and can be remedied by renewing the HLHP control unit.



D0034410

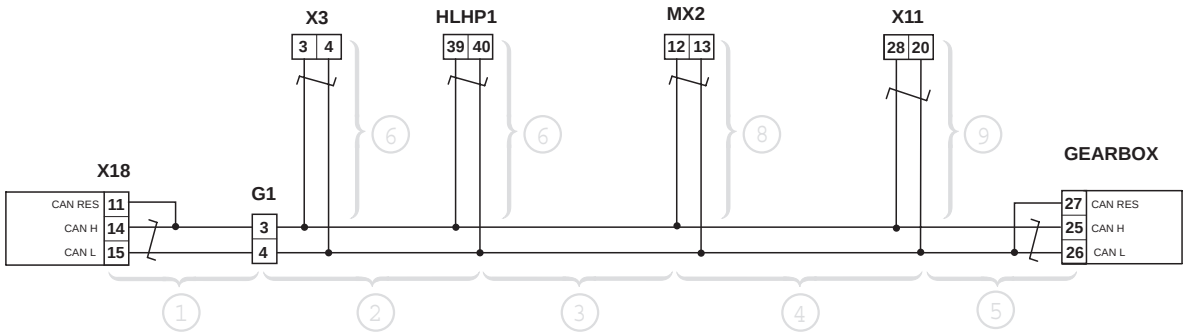
CASE 7 ANALYSIS

DESCRIPTION

This fault is caused by a short circuit of the CANBUS wires at any point in the system or by a short circuit of the wires to earth or to battery positive.

CHECK

- Check that the contacts of connector “X3” of the supplementary CANBUS socket are not short circuited.
- Check that the contacts on connectors “X11” of the armrest (not fitted in this version), “HLHP1” of the HLHP control unit, “GEARBOX” of the transmission control unit, “MX2” of the engine control unit and “X18” of the Infocenter are not oxidised or short circuited and that they are firmly secured.
- With the starter key in position “O” (OFF), and with all the connectors connected to their respective control units, connect a test meter to pin 3 of connector “X3” and to ground on the cab and perform a resistance test to check for shorts to earth (meter reading: infinity).
  Repeat the procedure with pin 4 of connector “X3”.
- With the starter key in position “I” (ON), and with all the connectors connected to their respective control units, connect a test meter to pin 3 of connector “X3” and to ground on the cab and check for 0 voltage (meter reading: 0V).
  Repeat the procedure with pin 4 of connector “X3”.
- If the fault is not identified by the above checks, it can be attributed to a short circuit between the CANBUS wires, and can be remedied by repairing or renewing the wiring loom.



D0031020

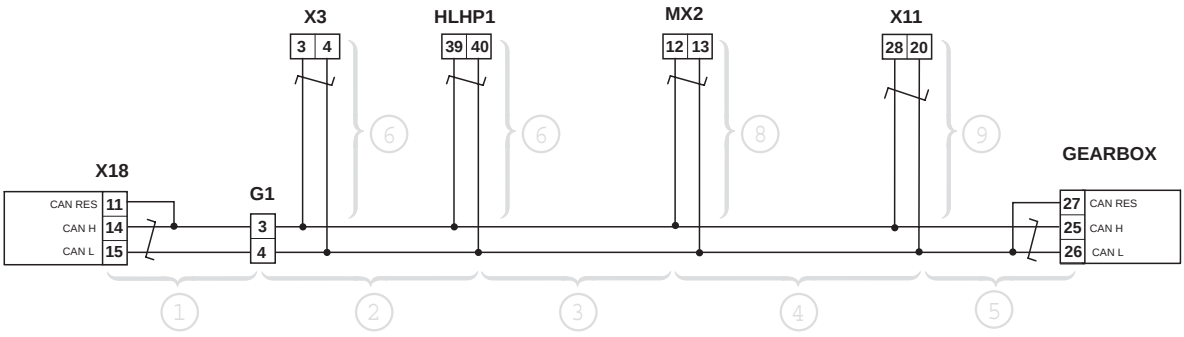
CASE 8 ANALYSIS

DESCRIPTION

This fault is caused by external interference created by high tension wires, radio transmitters and other devices that generate radio frequency signals that can interfere with data transmission on the CANBUS.

CHECK

- The fault can be caused by burning out of the termination resistors or by the presence of strong electromagnetic fields in the working area.
- Check that the contacts on connectors “GEARBOX” of the transmission control unit and “X18” of the Infocenter are not oxidised or short circuited and that they are firmly secured.
- Connect a test meter to pin 25 and to pin 27 of connector “GEARBOX” of the control unit and check that the resistance is approx. 120 Ohm.
  If the resistance differs from this value, fit a new control unit.
- Connect a test meter to pin 14 and to pin 11 of connector “X18” on the Infocenter side and check that the resistance is approx.120 Ohm.
  If the resistance differs from this value, fit a new Infocenter.



D0031020

5.4 TRANSMISSION CONTROL UNIT ALARMS

The transmission control unit warns the operator of any malfunction affecting monitored components, by way of audible signals, and messages generated in the display on the right hand front upright of the cab and on the Infocenter.

The fault signal on the transmission display involve the display of the key symbol together with a code and, in certain cases, also an audible alarm, while the fault is signalled on the Infocenter by means of text messages.

In the event of two or more alarms being activated simultaneously, the display will show only the one with the higher code.

All alarms presented on the display correspond directly to the alarm conditions detected via EDS, apart from a certain number associated with malfunction of the connection between the control unit and the display, which are shown on the display with the “EE” alarm code.

In addition to coded alarms, there are also conditions in which the control unit is unable to diagnose the cause of the fault; these are identifiable from abnormalities in operation of the transmission.

Depending on the severity of the fault by which it is triggered, a given alarm can have a limiting effect on the way the transmission is managed.

In many instances, where the fault is not serious, a warning appears in the display and the operation of the transmission remains substantially unaffected, whereas in other cases, the warning is displayed and operation will be totally inhibited, or in less serious cases, simply limited.

5.4.1 DEFINITION OF TRANSMISSION OPERATING MODES

When a fault occurs, depending on the severity, the transmission control will respond by selecting one of the following modes:

1 - Limp-Home
2 - Limp-Home-Ls
3 - No-Aps
4 - Substitute strategy
5 - Emergency drive
6 - Transmission shutdown
7 - TC-Shutdown

1 - *Limp-Home*
In this mode operation of the transmission is limited.
When this operating mode is activated the transmission automatically selects neutral and the powershift can no longer be used; the gears must be shifted with the mechanical linkage only.
Forward/reverse direction changes can only be effected when the tractor is completely stationary and the shuttle lever is in the neutral position for more than 1 second (or, if exclusively alarm 47 is present direction changes are possible simply by pressing the clutch pedal).
To quit this operating mode the following conditions must be met: fault repaired and shuttle lever moved to "NEUTRAL" or clutch pedal fully depressed.

2 - *Limp-Home-Ls*
In this mode operation of the transmission is limited.
When this operating mode is activated the transmission automatically selects neutral.
Forward/reverse direction changes can only be effected when the tractor is completely stationary and the shuttle lever is in the neutral position for more than 1 second.
To quit this operating mode the following conditions must be met: fault repaired and shuttle lever moved to "NEUTRAL" or clutch pedal fully depressed.

3 - *No-Aps*
In this operating mode the transmission operates only in manual mode.
When this operating mode is activated the transmission is managed exclusively by commands given directly by the operator.
To quit this operating mode the fault must be repaired.

4 - *Substitute strategy*
In this operating mode the transmission management system locks up and the powershift can no longer be used; the

gears must be shifted with the mechanical linkage only.
To quit this operating mode the following conditions must be met: fault repaired and shuttle lever moved to "NEUTRAL" or clutch pedal fully depressed.

5 - *Emergency drive*
In this mode operation of the transmission is limited.
The powershift can no longer be used and the gears must be shifted with the mechanical linkage only.
The main clutch engagement curve reverts to the default settings.
It is not possible to modulate the main clutch using the clutch pedal (each movement of the clutch pedal causes full engagement or disengagement of the clutch).
The power supply to solenoid valves Y2, Y4, Y5 and Y6 is removed.
Any variation in the signal from the clutch pedal position sensor or the clutch pedal depressed sensor will cause the transmission to revert to neutral.
The tractor will only start to move from completely stationary when the shuttle lever is placed in neutral position for more than one second.
To quit this operating mode the following conditions must be met: fault repaired and shuttle lever moved to "NEUTRAL".

6 - *Transmission shutdown*
In this mode the transmission operation is completely inhibited.
When this shutdown occurs the transmission locks up completely and reverts to neutral; the power supply to solenoid valves Y1, Y3, HK and Y7 is removed.
To quit this operating mode the following conditions must be met: fault repaired and shuttle lever moved to "NEUTRAL".

7 - *TC-Shutdown*
In this mode the transmission is completely locked in its operation.
When this shutdown occurs the transmission locks up completely and reverts to neutral; the power supply to all solenoid valves is removed.
To quit this operating mode the following condition must be met: fault repaired.

5.4.2 SYSTEM ANOMALIES NOT DETECTED BY THE TRANSMISSION CONTROL UNIT

Art	Infocenter	Description	Operating mode	Page.
10	10-Calib. friz. prin. TC-possibile errore	The control unit detects errors in the main clutch calibration values		20-203
11	11-Pedale frizione E2P TC-possibile errore	The control unit detects errors in the main clutch calibration values		20-203
12	12-Sensore temperatura TC-Ingresso a +12V	The control unit detects a problem with the power input to the transmission oil temperature sensor.		20-204
13	13-Sensore temperatura TC-Ingresso a massa	The control unit detects a problem with the power input to the temperature sensor.		20-205
14	14-Switch di neutra TC-Errore logico	The control unit detects a discrepancy between the speeds sensed at the main clutch input and at the transmission output, indicated by the status of the start enable sensor (which indicates whether the transmission is in neutral or gears are engaged)		20-206
15	–	Alarm available but not utilized	–	–
16	–	Alarm available but not utilized	–	–
17	–	Alarm available but not utilized	–	–
18	18-Circuito idraulico TC-Errore logico	The control unit detects a discrepancy between the oil pressure reading and the operating status of the transmission		20-207
21	21-Velocita' troppo elevata TC-possibile errore	The control unit detects a ground speed higher than the permissible limit		20-208
22	22-Temp. shuttle-mode TC-possibile errore	The control unit detects a transmission oil temperature higher than the permissible limit with the tractor operating in “FIELD” mode		20-208
23	23-Temp.transport-mode TC-possibile errore	The control unit detects a transmission oil temperature higher than the permissible limit with the tractor operating in “ROAD” mode.		20-209
24	frizione principale velocita' elevata	The control unit detects the main clutch running overspeed.		20-209
25	25-Ingresso velocità TC-possibile errore	The control unit detects a conflict between the information on the engine speed via CANBUS and that read by the nLse pick-up sensor.		20-210
27	–	Alarm available but not utilized	–	–
28	–	Alarm available but not utilized	–	–
29	–	Alarm available but not utilized	–	–
30	–	Alarm available but not utilized	–	–
31	–	Alarm available but not utilized	–	–
32	–	Alarm available but not utilized	–	–

Art	Infocenter	Description	Operating mode	Page.
33	–	Alarm available but not utilized	–	–
34	–	Alarm available but not utilized	–	–
35	–	Alarm available but not utilized	–	–
36	36-EV cambio 2 TC-Circ. aperto uscita	The control unit detects that solenoid Y4 is either not connected or faulty	SUBSTITUTE STRATEGY	20-211
37	37-EV cambio 2 TC-Corto massa uscita	The control unit detects that the control line of solenoid Y4 is short-circuiting to earth	SUBSTITUTE STRATEGY	20-212
38	38-EV cambio 2 TC-Corto +12V uscita	The control unit detects that the control line of solenoid Y4 is short-circuiting to battery positive	SUBSTITUTE STRATEGY	20-213
39	39-EV cambio 1 TC-Circ. aperto uscita	The control unit detects that solenoid Y2 is either not connected or faulty	SUBSTITUTE STRATEGY	20-214
40	40-EV cambio 1 TC-Corto massa uscita	The control unit detects that the control line of solenoid Y2 is short-circuiting to earth	SUBSTITUTE STRATEGY	20-215
41	41-EV cambio 1 TC-Corto +12V uscita	The control unit detects that the control line of solenoid Y2 is short-circuiting to battery positive	SUBSTITUTE STRATEGY	20-216
47	47-Sensore vel. nAB TC-Ingresso a +12V	The control unit detects that the rpm sensor nAb is disconnected or short-circuiting to battery positive.	LIMP-HOME	20-217
48	48-Sensore vel. nAB TC-Ingresso a massa	The control unit detects that the rpm sensor nAb is short-circuiting to earth	LIMP-HOME	20-218
4B	4B-Sensore vel. nAB TC-Errore logico	The control unit detects unreliable information coming from the rpm sensor nAb	LIMP-HOME	20-219
50	50-Sensore vel. nHK TC-Ingresso a +12V	The control unit detects that the rpm sensor nHk is disconnected or short-circuiting to battery positive	LIMP-HOME	20-220
51	51-Sensore vel. nHK TC-Ingresso a massa	The control unit detects that the rpm sensor nHk is short-circuiting to earth	LIMP-HOME	20-221
52	52-Sensore vel. nHK TC-Errore logico	The control unit detects unreliable information coming from the rpm sensor nHk	LIMP-HOME	20-222
53	53-Sensore vel.nLSA TC-Ingresso a +12V	The control unit detects that the rpm sensor nLsa is disconnected or short-circuiting to battery positive	LIMP-HOME	20-223
54	54-Sensore vel.nLSA TC-Ingresso a massa	The control unit detects that rpm sensor nLsa is short-circuiting to earth	LIMP-HOME	20-224
55	55-Sensore vel.nLSA TC-Errore logico	The control unit detects unreliable information coming from the rpm sensor nLsa	LIMP-HOME	20-225
5F	5F-Sensore FRRS TC-possibile errore	The control unit detects that the calibration values of the field/road position sensor are incorrect.		20-226

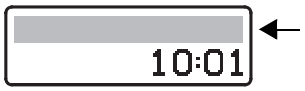
Art	Infocenter	Description	Operating mode	Page.
60	60-calibrazione FRRS TC-possibile errore	The control unit detects that the calibration values of the field/road position sensor are incorrect		20-226
61	61-Sensore FRRS TC-Ingresso a +12V	The control unit detects that the field/ road position sensor is shorting to battery positive (+5V).	LIMP-HOME-LS	20-227
62	62-Sensore FRRS TC-Ingresso a +12V	The control unit detects that the field/ road position sensor is shorting to battery positive (+12V).	TC-SHUTDOWN	20-228
63	63-Sensore FRRS TC-Ingresso a massa	The control unit detects that the field/ road position sensor is disconnected or shorting to earth.	LIMP-HOME-LS	20-229
64	64-Pedale frizione TC-Errore logico	The control detects a conflict in the information received from the clutch pedal position sensor and clutch pedal depressed sensor, regarding the position of the pedal	EMERGENCY DRIVE	20-230
65	65-Pedale frizione TC-Ingresso a massa	The control unit detects that the clutch pedal position sensor is disconnected or short-circuiting to earth	EMERGENCY DRIVE	20-231
66	66-Pedale frizione TC-Ingresso a +12V	The control unit detects that the clutch pedal position sensor is shorting to battery positive	EMERGENCY DRIVE or TC-SHUTDOWN	20-232
67	67-Alimen. Sens. AU1 TC-Corto massa uscita	The control unit detects that the power input to the clutch pedal position sensor is less than the prescribed value	EMERGENCY DRIVE or TC-SHUTDOWN	20-233
68	68-Alimen. Sens. AU1 TC-Corto +12V uscita	The control unit detects that the power input to the clutch pedal position sensor is higher than the correct value	EMERGENCY DRIVE or TC-SHUTDOWN	20-234
69	69-Pedale frizione TC-Errore logico	The control unit detects one or more threshold values of the clutch pedal position sensor out of range.	EMERGENCY DRIVE or TC-SHUTDOWN	20-235
70	70-Pedale frizione E2P TC-possibile errore	The control unit detects that the calibration values of the clutch pedal have not been saved correctly due to a defect in the EEPROM memory locations, or that the clutch pedal has never been calibrated	EMERGENCY DRIVE or TC-SHUTDOWN	20-235
71	–	Alarm available but not utilized	–	–
72	–	Alarm available but not utilized	–	–
73	73-Pulsante aper. friz. TC-Ingresso a massa	The control unit detects that the "Comfort Clutch" button is disconnected or short-circuiting to earth	LIMP-HOME-LS	20-236
74	74-Pulsante aper. friz. TC-Ingresso a +12V	The control unit detects that the "Comfort Clutch" button is short-circuiting to battery positive	LIMP-HOME-LS	20-237

Art	Infocenter	Description	Operating mode	Page.
76	76-EV proporzionale TC-Circ. aperto uscita	The control unit detects that the proportional solenoid valve operating the main clutch is disconnected	TC-SHUTDOWN	20-238
77	77-Elettrovalvola proporzionale TC-Corto massa uscita	The control unit detects that the proportional solenoid valve operating the main clutch is short-circuiting to earth	TC-SHUTDOWN	20-239
79	79-EV direz. avanti TC-Circ. aperto uscita	The control unit detects that the forward travel solenoid Y3 is disconnected	TC-SHUTDOWN	20-240
80	80-EV direz. avanti TC-Corto massa uscita	The control unit detects that the forward travel solenoid Y3 is shorting to earth	TC-SHUTDOWN	20-241
82	82-EV direz. indietro TC-Circ. aperto uscita	The control unit detects that the reverse travel solenoid Y1 is disconnected	TC-SHUTDOWN	20-242
83	83-EV direz. indietro TC-Corto massa uscita	The control unit detects that the reverse travel solenoid Y1 is shorting to earth	TC-SHUTDOWN	20-243
85	85-Leva inversore TC-Errore logico	The control unit detects a problem affecting the shuttle control lever.	SUBSTITUTE-STRATEGY or TRANSMISSION SHUTDOWN	20-244
87	Pin di codifica non coincidono con tipo di veicolo	The control unit detects that the type of vehicle has not been programmed correctly	TC-SHUTDOWN.	20-245
89	89-Alimentazione VPS1 TC-Errore logico	The control unit detects that the current draw of the main clutch solenoids and forward/reverse solenoids Y1 and Y3 and the lock solenoid is abnormal.	TC-SHUTDOWN	20-246
90	90-Alimentazione VPS2 TC-Errore logico	The control unit detects that the current draw of the powershift solenoid valves Y2, Y4, Y5 and Y6 is abnormal	TC-SHUTDOWN	20-247
91	91-Frizione principale TC-Errore logico	The control unit detects a conflict between values read by the NLSA and NHK sensors, the clutch pedal position sensor and the position of the creeper control lever	TC-SHUTDOWN	20-248
92	92-Tensione batteria TC-Ingresso a +12V	The control unit has detected an abnormally high input voltage	TRANSMISSION SHUTDOWN	20-249
93	93-Tensione batteria TC-Ingresso a massa	The control unit has detected an abnormally low input voltage	TRANSMISSION SHUTDOWN	20-250
94	94-EV proporzionale TC-Corto +12V uscita	The control unit detects that the main clutch solenoid valve is short-circuiting to battery positive	TC-SHUTDOWN	20-251
95	95-EV direz. avanti TC-Corto +12V uscita	The control unit detects that the forward travel solenoid Y3 is shorting to battery positive	TC-SHUTDOWN	20-252
96	96-EV direz. indietro TC-Corto +12V uscita	The control unit detects that the reverse travel solenoid Y1 is shorting to battery positive	TC-SHUTDOWN	20-253

Art	Infocenter	Description	Operating mode	Page.
97	97-Programma errato TC-Errore logico	The control unit detects that the transmission control unit software has not been programmed correctly	TC-SHUTDOWN	20-254
98	98-Config.errata TC-Errore logico	The control unit detects that transmission configuration data have not been programmed correctly.	TC-SHUTDOWN	20-254
99	99-Config. veicolo TC-possibile errore	The control unit detects that machine configuration data have not been saved correctly (CHECKSUM ERROR)	TC-SHUTDOWN	20-255
AB	–	Alarm available but not utilized	–	–
AC	–	Alarm available but not utilized	–	–
AD	–	Alarm available but not utilized	–	–
B0	B0-Sensore vel. nLSE TC-Ingresso a massa	The control unit detects that the rpm sensor nLse is disconnected or short-circuiting to battery positive	LIMP-HOME	20-256
B1	B1-Sensore vel. nLSE TC-Ingresso a +12V	The control unit detects that the rpm sensor nLse is short-circuiting to earth	LIMP-HOME	20-257
B2	B2-Sensore vel. nLSE TC-Errore logico	The control detects unreliable information coming from the rpm sensor nLse	LIMP-HOME	20-258
B3	B3-FRRS EV campo TC-Circ. aperto uscita	The control unit detects that the "FIELD" mode selector solenoid Y5 is disconnected	TC-SHUTDOWN	20-259
B4	B4-FRRS EV campo TC-Corto +12V uscita	The control unit detects that the "FIELD" mode selector solenoid Y5 is shorting to battery positive	TC-SHUTDOWN	20-260
B5	B5-FRRS EV campo TC-Corto massa uscita	The control unit detects that the "FIELD" mode selector solenoid Y5 is shorting to earth	TC-SHUTDOWN	20-261
B6	B6-FRRS EV strada TC-Circ. aperto uscita	The control unit detects that the "ROAD" mode selector solenoid Y6 is disconnected	TC-SHUTDOWN	20-262
B7	B7-FRRS EV strada TC-Corto +12V uscita	The control unit detects that the "ROAD" mode selector solenoid Y6 is shorting to battery positive	TC-SHUTDOWN	20-263
B8	B8-FRRS EV strada TC-Corto massa uscita	The control unit detects that the "ROAD" mode selector solenoid Y6 is shorting to earth	TC-SHUTDOWN	20-264
B9	B9-EV Blocco Neutra TC-Circ. aperto uscita	The control unit detects that the gearbox neutral lock solenoid Y7 is disconnected	TC-SHUTDOWN	20-265
BA	BA-EV Blocco Neutra TC-Corto +12V uscita	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to battery positive	TC-SHUTDOWN	20-266
BB	BB-EV Blocco Neutra TC-Corto massa uscita	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to earth	TC-SHUTDOWN	20-267

Art	*Infocenter*	*Description*	*Operating mode*	*Page.*
C0	C0-Msg PTCTL1 REQGEAR TC-Errore Segnale CAN	The transmission control unit detects an error in the information received by the HLHP control unit regarding the request for range gear engagement.	LIMP-HOME-LS	20-268
C3	C3-Msg EEC1 ENGSPEED TC-Errore Segnale CAN	The transmission control unit detects an error in the information received by the ECU regarding the communication of engine speed.	LIMP-HOME-LS	20-269
C6	–	Alarm available but not utilized	–	–
C9	–	Alarm available but not utilized	–	–
CB	–	Alarm available but not utilized	–	–
CF	CF-Messaggio EEC1 TC-Timeout CAN Msg	The transmission control unit detects a fault on the CANBUS line.	LIMP-HOME-LS	20-270
D0	–	Alarm available but not utilized	–	–
D1	D1-Msg LIMITATION TC-Timeout CAN Msg	The transmission control unit detects a fault on the CANBUS controller.	–	20-270
D2	D2-Msg HPSACTRL TC-Timeout CAN Msg	The transmission control unit detects a fault on the CANBUS controller.	–	20-271
EE	–	The display detects a problem of communication with the transmission control unit.	–	20-271
GEN1	–	EDS software unable to connect to the transmission control unit.	–	20-272
GEN2	–	Transmission slips unexpectedly from forward or reverse drive into neutral.	–	20-273
GEN3	–	The transmission continues to shift range automatically every 1 or 2 seconds	–	20-274
GEN4	–	Momentary loss of traction with the tractor in motion	–	20-274
GEN5	–	The transmission remains in neutral	–	20-275

← *10*



← *0-Calib. friz. prin.*
TC-possibile errore

DESCRIPTION

The control unit detects errors in the main clutch calibration values

NOTE
This alarm is always displayed when, following replacement of the control unit, the procedure to put the new control unit into service has not been carried out.

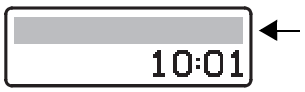
ECU RESPONSE

The control unit does not limit the operation of the transmission, but sets the contact pressure on the main clutch pedal to the default value (99.99, corresponding to the value registering at the end of the engagement ramp).

CHECK

- Perform the main clutch calibration procedure.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *11*



← *11-Pedale frizione E2P*
TC-possibile errore

DESCRIPTION

The control unit detects errors in the main clutch calibration values

ECU RESPONSE

The control unit does not limit the operation of the transmission, but sets the contact pressure on the main clutch pedal to the default value (99.99, corresponding to the value registering at the end of the engagement ramp).

CHECK

- Perform the main clutch calibration procedure.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *12*

← *12-Sensore temperatura TC-Ingresso a +12V*

DESCRIPTION

The control unit detects a problem with the power input to the transmission oil temperature sensor.

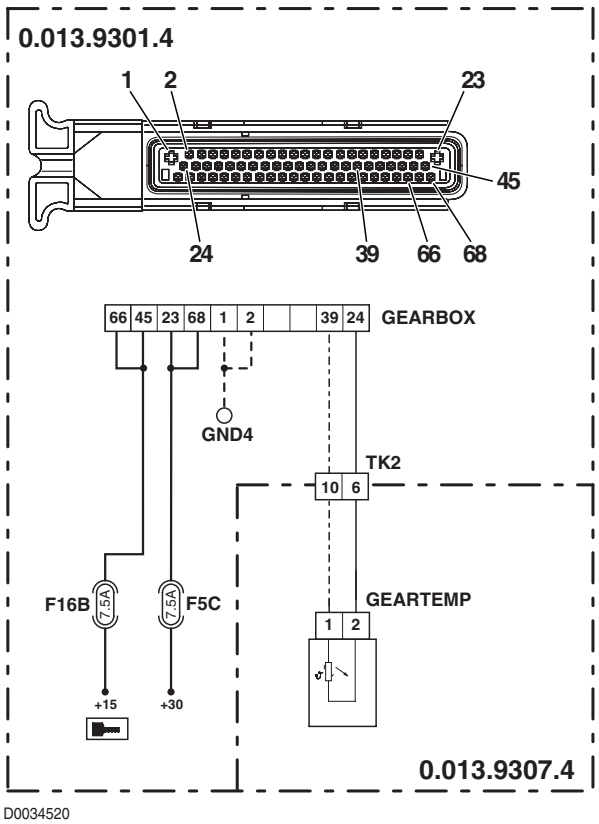
NOTE
This alarm could be displayed as a result of alarm 66 or 68 being activated.

ECU RESPONSE

The control unit does not limit operation of the transmission but sets the transmission temperature to the "Cold transmission" default value.

CHECK

- Check that the contacts on the “GEARTEMP” and "GEARBOX" connectors of the lift control unit are not oxidized and are firmly secured.
- Check correct operation of the sensor (for technical details, see section 40)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “GEARTEMP” and to pin 24 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “GEARTEMP” and to pin 39 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the connector "GEARBOX" disconnected from the engine control unit and the starter key in the "I" (ON) position, connect a test meter to pin 1 of the connector "GEARTEMP" and to the transmission earth and check that there is no voltage (test meter reading 0V).
- With the connector "GEARBOX" disconnected from the engine control unit and the starter key in the "I" (ON) position, connect a test meter to pin 2 of the connector "GEARTEMP" and to the transmission earth and check that there is no voltage (test meter reading 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0034520

← *13*

← *13-Sensore temperatura TC-Ingresso a massa*

DESCRIPTION

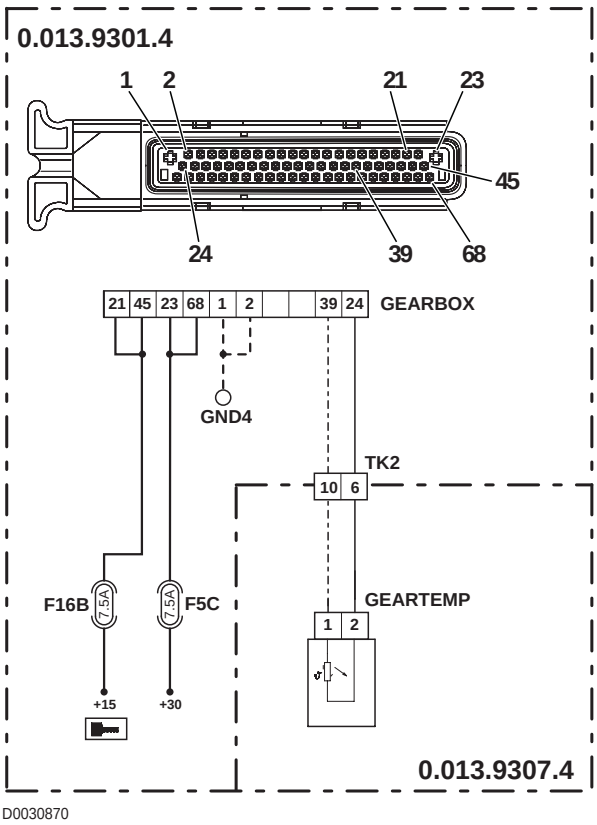
The control unit detects a problem with the power input to the temperature sensor.

ECU RESPONSE

The control unit does not limit operation of the transmission but sets the transmission temperature to the "Cold transmission" default value.

CHECK

- Check that the contacts on the “GEARTEMP” and "GEARBOX" connectors of the lift control unit are not oxidized and are firmly secured.
- Check correct operation of the sensor (for technical details, see section 40)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “GEARTEMP” and to engine earth, and measure the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “GEARTEMP” and to the earth on the transmission and perform a resistance test to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0030870

← *14*

← *14-Switch di neutra*
TC-Errore logico

DESCRIPTION

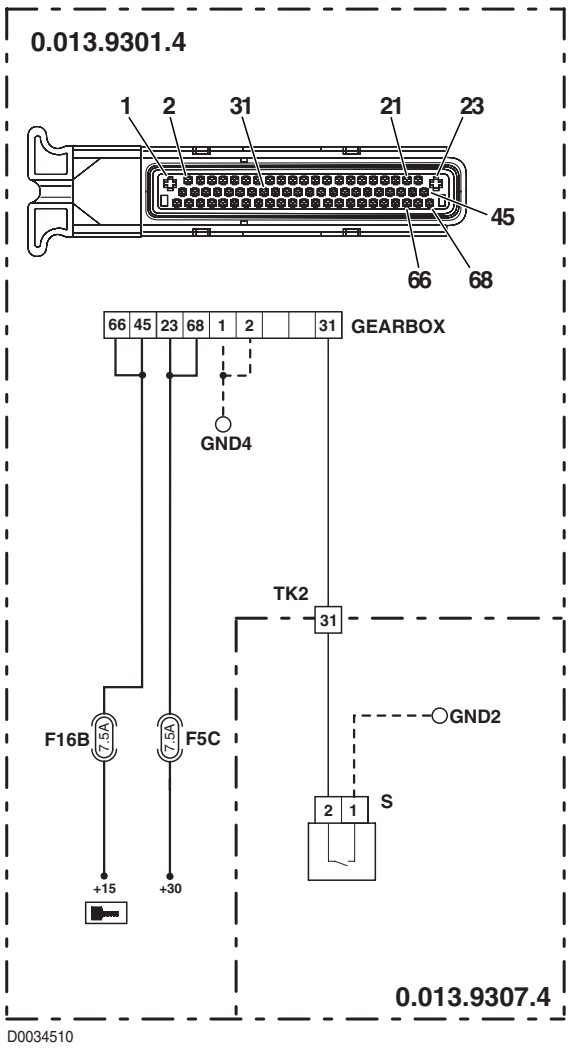
The control unit detects a discrepancy between the speeds sensed at the main clutch input and at the transmission output, indicated by the status of the start enable sensor (which indicates whether the transmission is in neutral or gears are engaged)

ECU RESPONSE

The control unit does not limit the operation of the transmission.

CHECK

- In the event that there are other alarms activated, relating to the main clutch speed sensor (nHk) and the engine speed sensor (nAb), verify the cause as described under the relative alarm headings before proceeding as follows.
- Check that the contacts on the “S” connector of the starter enable switch and on the "GEARBOX" lift control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin 30 of relay “RL9” and to the earth on the engine and perform a resistance test to check for electrical continuity with the mechanical gearbox in neutral (meter reading 0 Ohm) and open circuit with gear selected (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



← *18*

← *18-Circuito idraulico TC-Errore logico*

DESCRIPTION

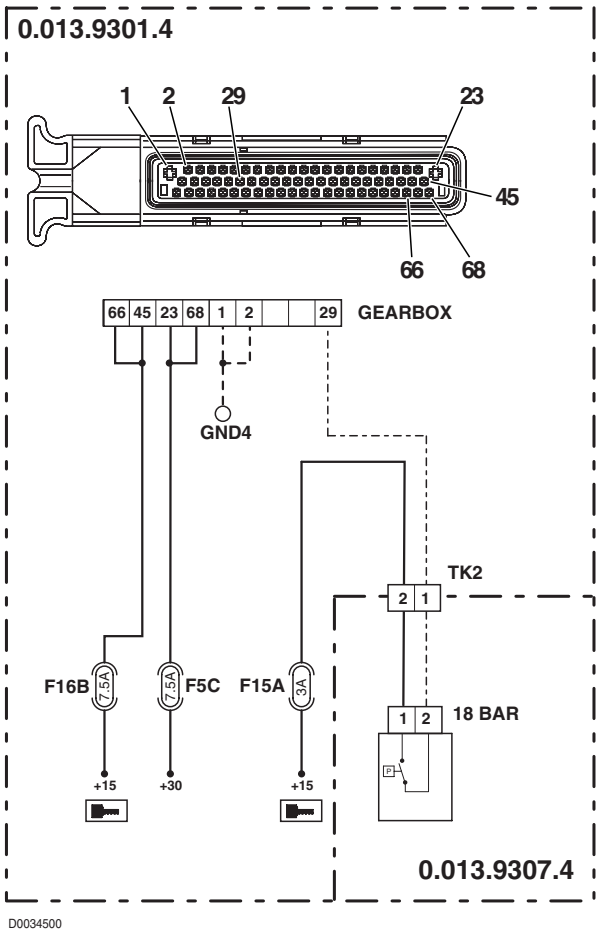
The control unit detects a discrepancy between the oil pressure reading and the operating status of the transmission

ECU RESPONSE

The control unit does not limit the operation of the transmission, but indicates the problem via the Infocenter.

CHECK

- If there are other alarms present relating to the NLSA, NLSE, NAB and NHK speed sensors, identify the cause as described under the relative alarm headings before proceeding as described below.
- Check that the contacts on the “18BAR” connector of the transmission oil temperature sensor and the “GEARBOX” connector of the lift control unit are not oxidised and are firmly connected.
- Check correct operation of the sensor (for technical details, see section 40)
- With the starter key in position “I” (ON), check that the transmission oil temperature sensor is receiving power correctly (12V between pin 1 (positive) of connector “18BAR” and the earth on the transmission)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “18BAR” and to pin 29 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading 0 Ohm).
- Check the pressure in the hydraulic circuit of the transmission system.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0034500

21

21-Velocita' troppo elevata
TC-possibile errore

DESCRIPTION

The control unit detects a ground speed higher than the permissible limit

ECU RESPONSE

The control unit does not limit the operation of the transmission, but sounds a continuous beep until ground speed returns within the permissible limits.

CHECK

- Reduce ground speed.

22

22-Temp. shuttle-mode
TC-possibile errore

DESCRIPTION

The control unit detects a transmission oil temperature higher than the permissible limit with the tractor operating in “FIELD” mode

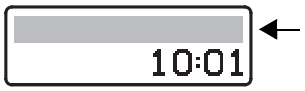
ECU RESPONSE

The control unit does not limit the operation of the transmission, but when the alarm is activated five beeps will be sounded in succession and a single beep every two minutes thereafter.

CHECK

- Reduce the load on the transmission.
- Switch off the engine.

← *23*



← *23-Temp.transport-mode*
TC-possibile errore

DESCRIPTION

The control unit detects a transmission oil temperature higher than the permissible limit with the tractor operating in “ROAD” mode.

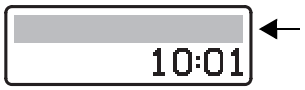
ECU RESPONSE

The control unit does not limit the operation of the transmission and does not display any alarm message.

CHECK

- Reduce ground speed.

← *24*



← *frizione principale*
velocita' elevata

DESCRIPTION

The control unit detects the main clutch running overspeed.

ECU RESPONSE

The control unit does not limit the operation of the transmission.

CHECK

- Reduce ground speed immediately

← *25*

← *25-Ingresso velocità TC-possibile errore*

DESCRIPTION

The control unit detects a conflict between the engine speed information acquired via CANBUS and the value read by the nLse pick-up sensor.

ECU RESPONSE

The control unit limits operation to “No-APS” mode.

CHECK

- Check that the NLSE and NLSA connectors have not been inadvertently swapped around (the NLSA connector should be installed on the sensor nearest the engine).
- If there are other alarms activated relating to the nLse engine speed sensor (alarms B0, B1 and B2), check the cause as described under the relative alarm headings before proceeding as follows.
- Check that the engine control unit does not detect any alarms regarding the CANBUS as active or passive alarms (SPN 743 FMI 9 on the HLHP control unit and Serdia alarm n° 71) or the engine speed sensor (SPN 190 FMI 8 on the HLHP control unit and Serdia alarm n° 1).
- Connect the ART to the HLHP control unit and check, in the “3.1.2 INPUT FREQ” menu, that the engine speed signal is correctly transmitted via the CANBUS.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to “I” (ON); if the alarm is still present the control unit must be renewed.

← *36*

← *36-EV cambio 2*
TC-Circ. aperto uscita

DESCRIPTION

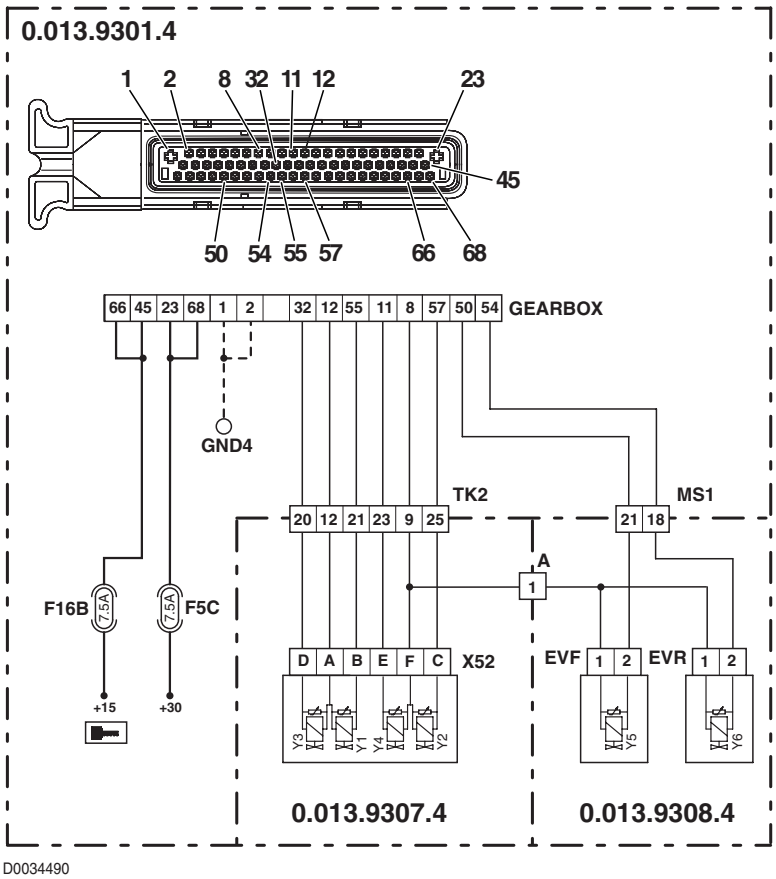
The control unit detects that solenoid Y4 is either not connected or faulty

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on connector “X52” and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin E and pin F of connector “X52” on the transmission and perform a resistance test to check solenoid valve impedance (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin E of connector “X52” and to pin 11 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034490

← *37*

← *37-EV cambio 2*
TC-Corto massa uscita

DESCRIPTION

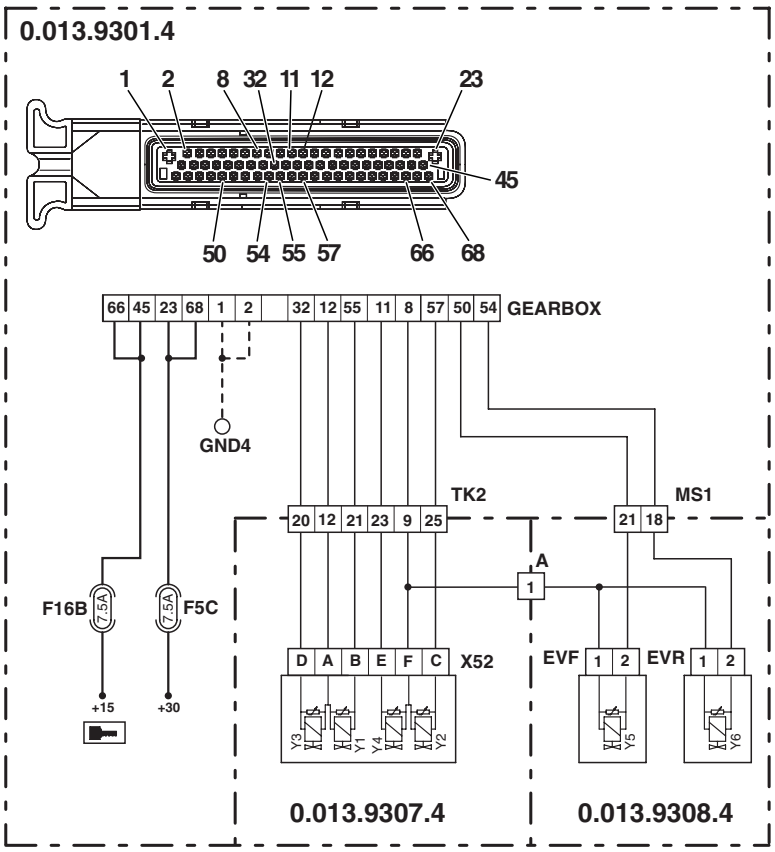
The control unit detects that the control line of solenoid Y4 is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on connector “X52” and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin E and pin F of connector “X52” on the transmission and perform a resistance test to check solenoid valve impedance (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin E of connector “X52” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin E of connector “X52” on the transmission and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034490

← *38*

← *38-EV cambio 2*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the control line of solenoid Y4 is short-circuiting to battery positive

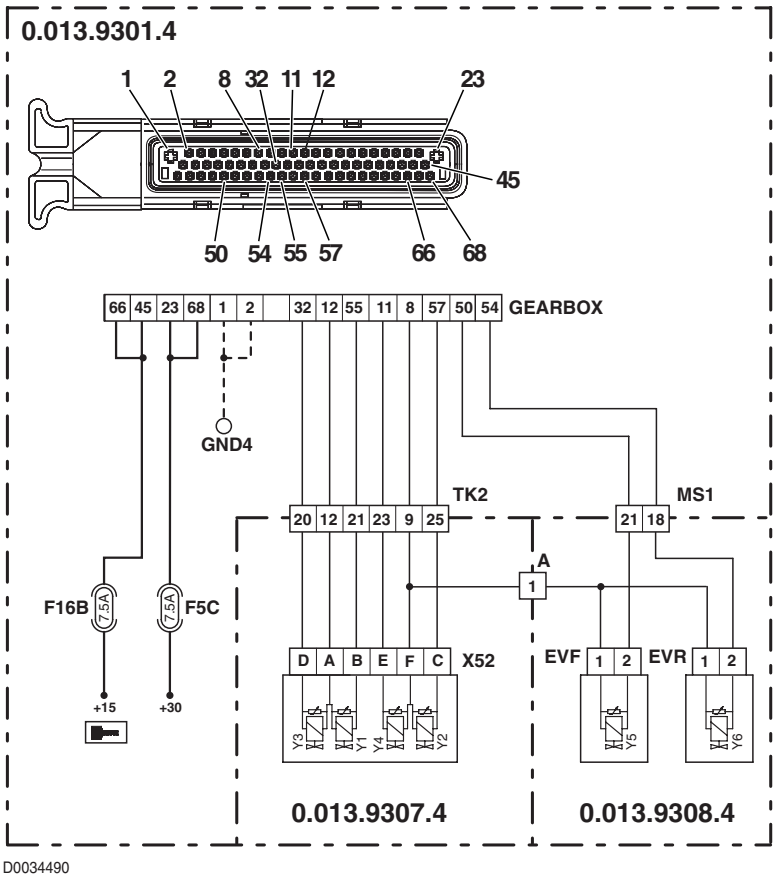
ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

NOTE
This alarm could be displayed as a result of alarm 90 being activated.

CHECK

- Check that the contacts on connector “X52” and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), connect a test meter to pin C of connector “X52” and to the earth on the transmission and check for 0 voltage (meter reading 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034490

← *39*

← *39-EV cambio 1*
TC-Circ. aperto uscita

DESCRIPTION

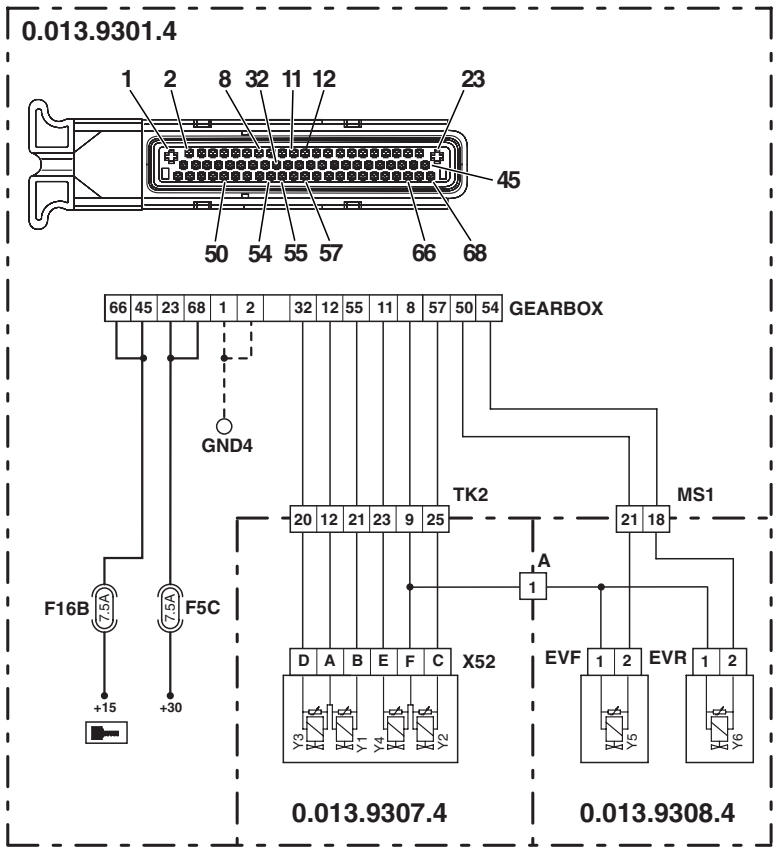
The control unit detects that solenoid Y2 is either not connected or faulty

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on connector “X52” and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin C and pin F of connector “X52” on the transmission and perform a resistance test to check solenoid valve impedance (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin C of connector “X52” and to pin 57 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034490

← *40*

← *40-EV cambio 1*
TC-Corto massa uscita

DESCRIPTION

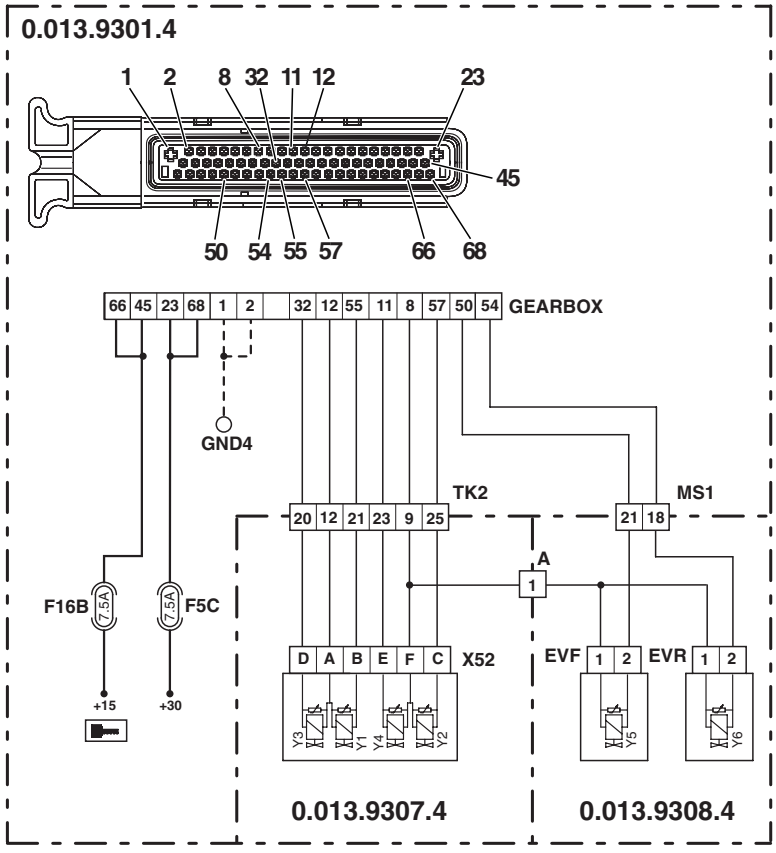
The control unit detects that the control line of solenoid Y2 is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on connector “X52” and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin C and pin F of connector “X52” on the transmission and perform a resistance test to check solenoid valve impedance (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin C of connector “X52” on the transmission and to the earth on the transmission and test impedance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin C of connector “X52” on the transmission and to the earth on the transmission and test impedance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed



D0034490

← *41*

← *41-EV cambio 1*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the control line of solenoid Y2 is short-circuiting to battery positive

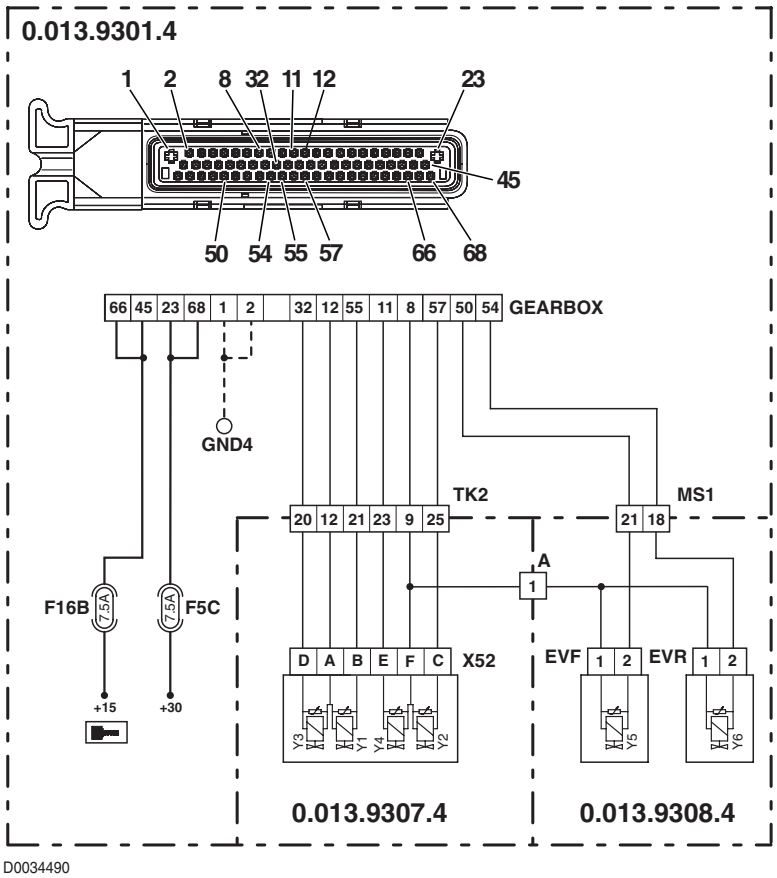
ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

NOTE
This alarm could be displayed as a result of alarm 90 being activated.

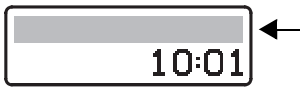
CHECK

- Check that the contacts on connector “X52” and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), connect a test meter to pin C of connector “X52” and to the earth on the transmission and check for 0 voltage (meter reading 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *47*



← *47-Sensore vel. nAB*
TC-Ingresso a +12V

DESCRIPTION

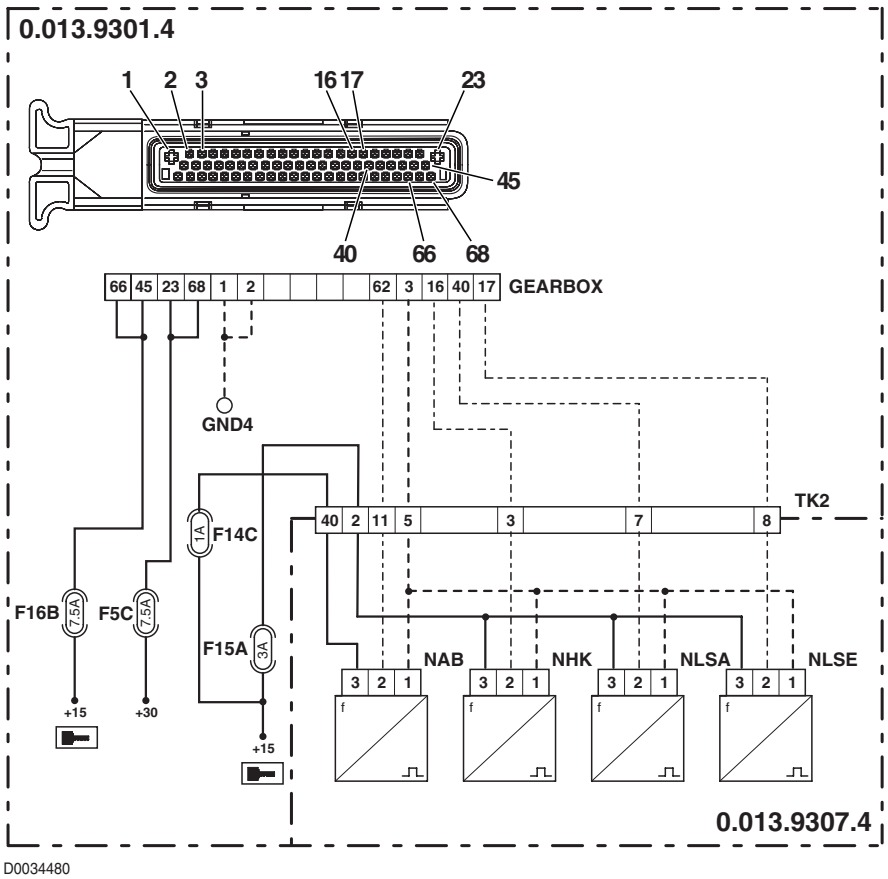
The control unit detects that the rpm sensor nAb is disconnected or short-circuiting to battery positive.

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NAB” connector and on the "GEARBOX" transmission control unit are not oxidised and are firmly secured.
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) of connector “NAB“ and the earth on the transmission).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “NAB” and to the earth on the transmission and check for 0 voltage (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NAB” and to pin 62 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “NAB” and to pin 3 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *48*

← *48-Sensore vel. nAB*
TC-Ingresso a massa

DESCRIPTION

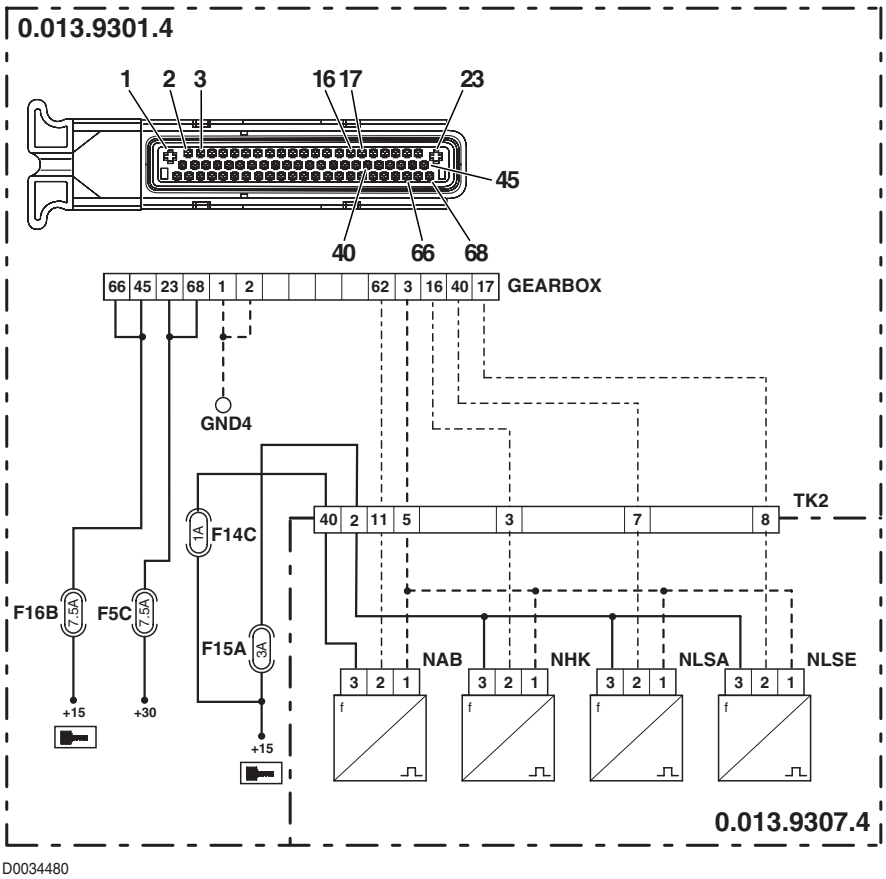
The control unit detects that the rpm sensor nAb is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NAB” connector and on the "GEARBOX" transmission control unit are not oxidised and are firmly secured.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NAB” and to transmission earth, and measure the resistance to check that there are no short circuits to earth (meter reading: infinity).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *4B*

← *4B-Sensore vel. nAB*
TC-Errore logico

DESCRIPTION

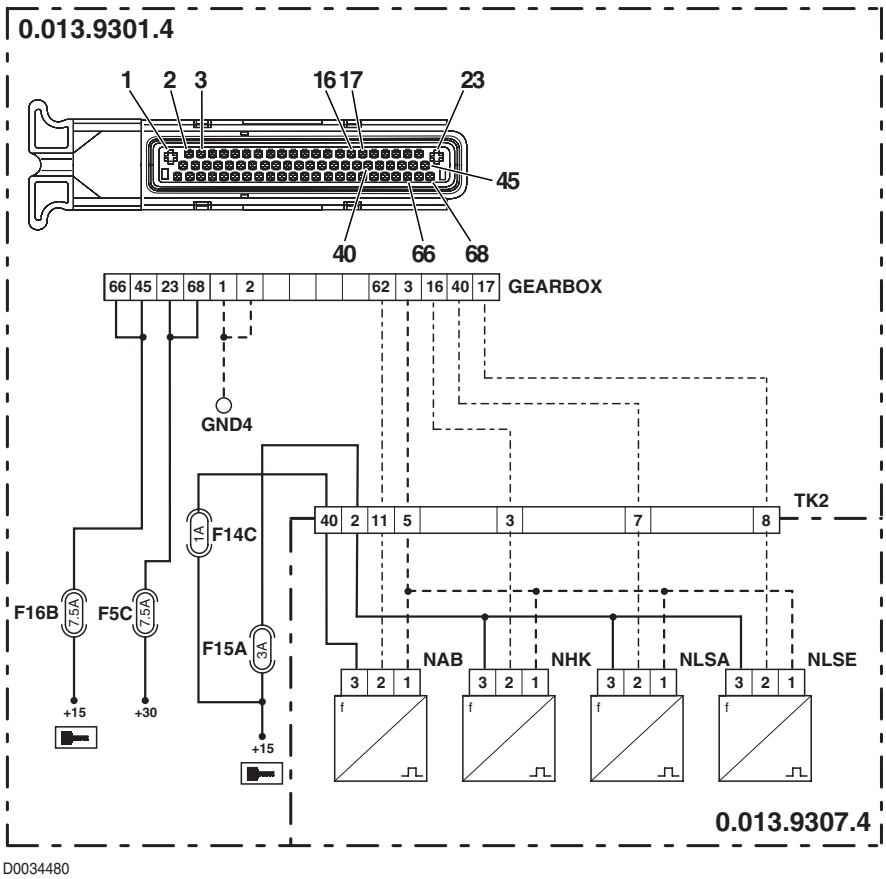
The control unit detects unreliable information coming from the rpm sensor nAb

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NAB” connector and on the "GEARBOX" transmission control unit are not oxidised and are firmly secured.
- Check correct operation of the sensor (for technical details, see section 40).
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) of connector “NAB“ and the earth on the transmission).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “NAB” and to pin 3 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *50*

← *50-Sensore vel. nHK*
TC-Ingresso a +12V

DESCRIPTION

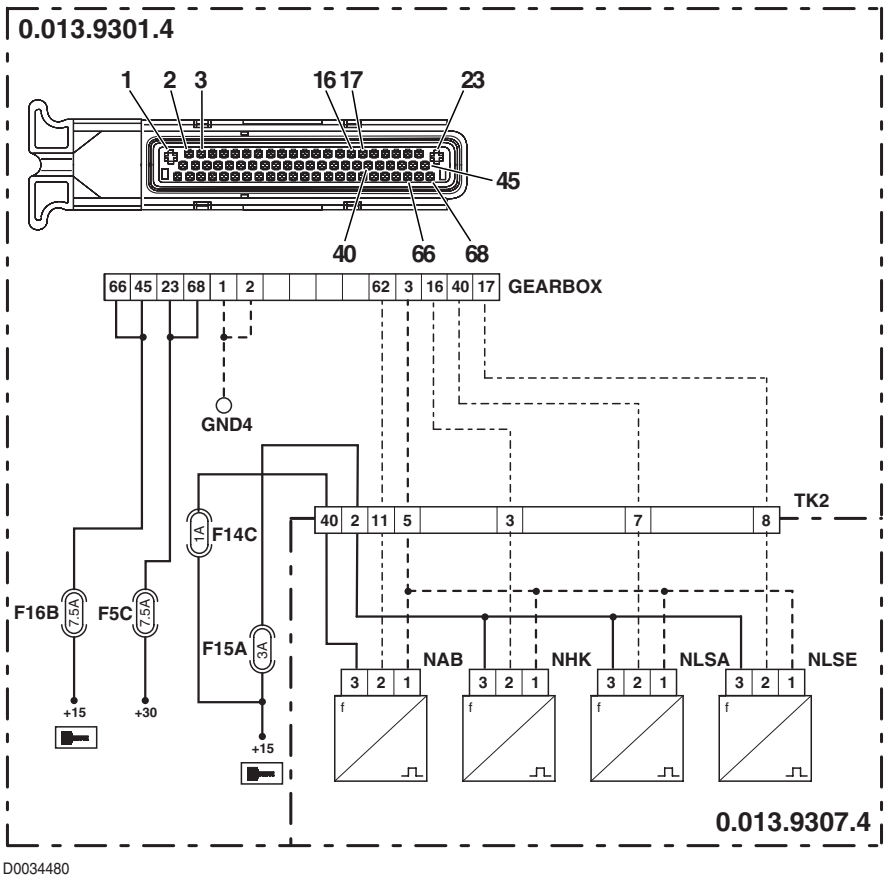
The control unit detects that the rpm sensor nHk is disconnected or short-circuiting to battery positive

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

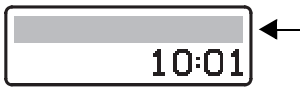
CHECK

- Check that the contacts on the “NHK” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) of connector “NHK” and the earth on the transmission).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “NHK” and to the earth on the transmission and check for 0 voltage (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NHK” and to pin 16 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “NHK” and to pin 3 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← 51



← *51-Sensore vel. nHK*
TC-Ingresso a massa

DESCRIPTION

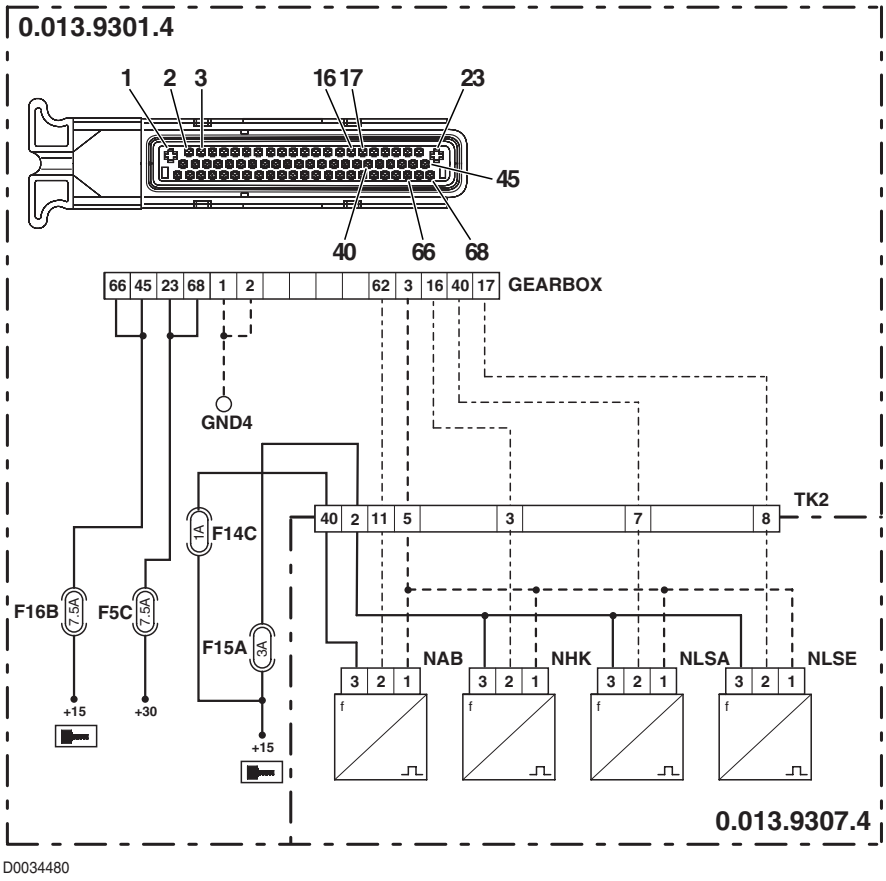
The control unit detects that the rpm sensor nHk is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NHK” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NHK” and to transmission earth, and measure the resistance to check that there are no short circuits to earth (meter reading: infinity).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *52*

← *52-Sensore vel. nHK*
TC-Errore logico

DESCRIPTION

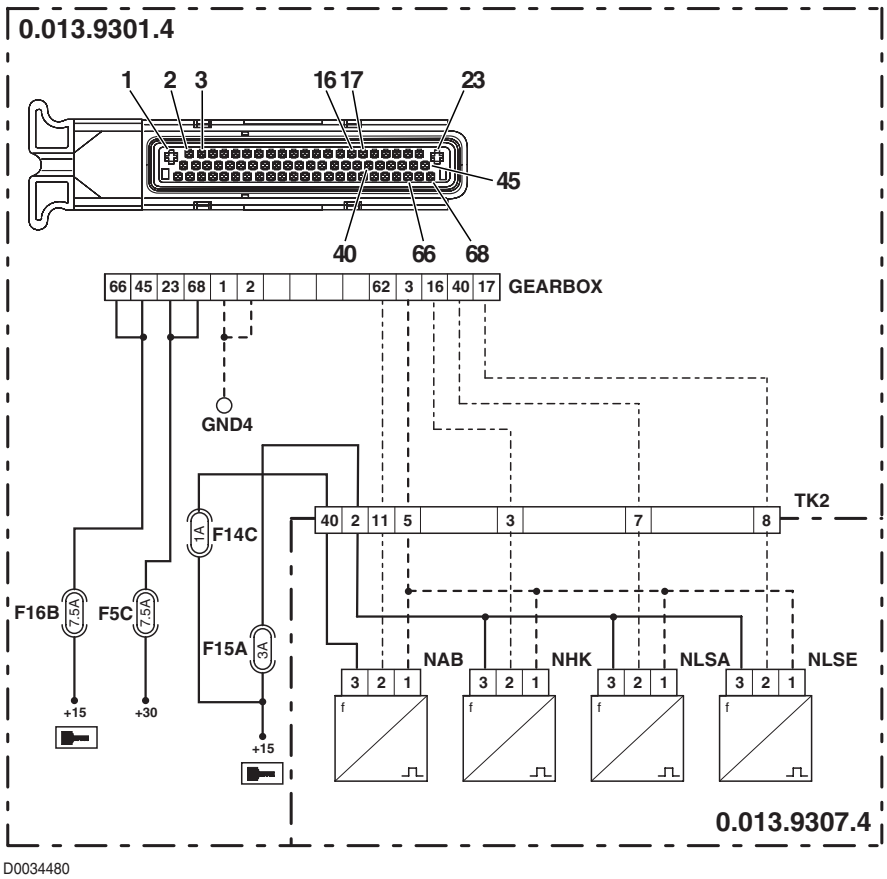
The control unit detects unreliable information coming from the rpm sensor nHk

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

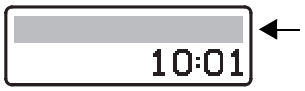
CHECK

- Check that the contacts on the “NHK” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Check correct operation of the sensor (for technical details, see section 40).
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) of connector “NHK” and the earth on the transmission).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “NHK” and to pin 3 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *53*



← *53-Sensore vel.nLSA*
TC-Ingresso a +12V

DESCRIPTION

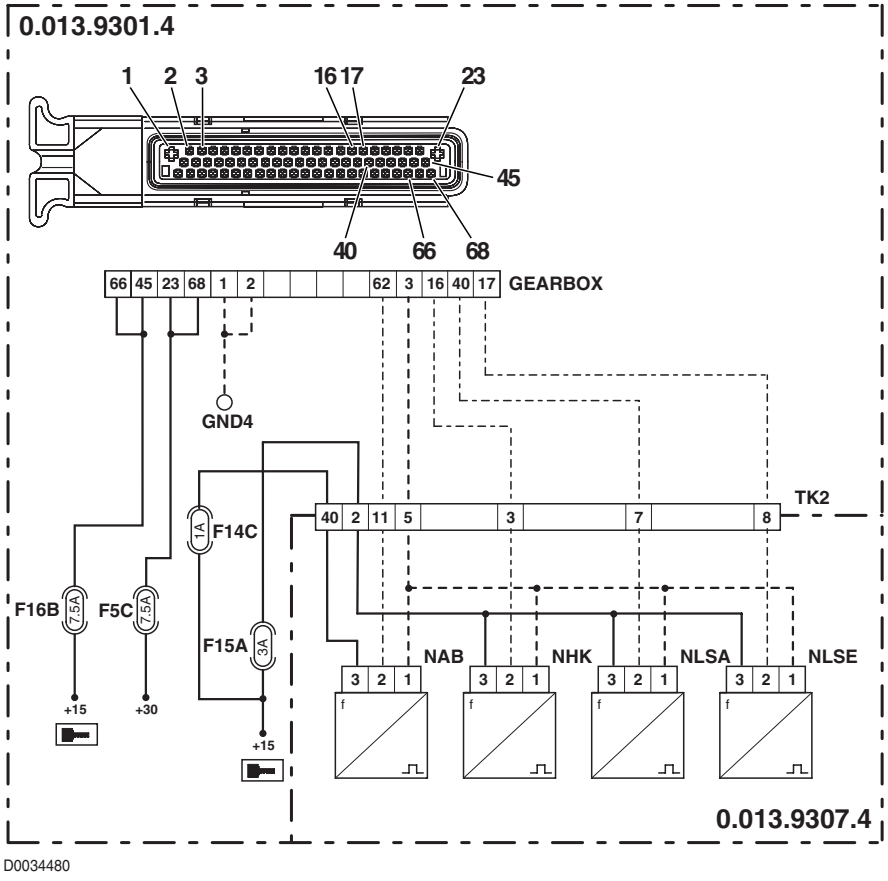
The control unit detects that the rpm sensor nLsa is disconnected or short-circuiting to battery positive

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NLSA” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) of connector “NLSA“ and to the earth on the transmission).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “NLSA” and to the earth on the transmission and check for 0 voltage (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NLSA” and to pin 40 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “NLSA” and to pin 3 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *54*

← *54-Sensore vel.nLSA*
TC-Ingresso a massa

DESCRIPTION

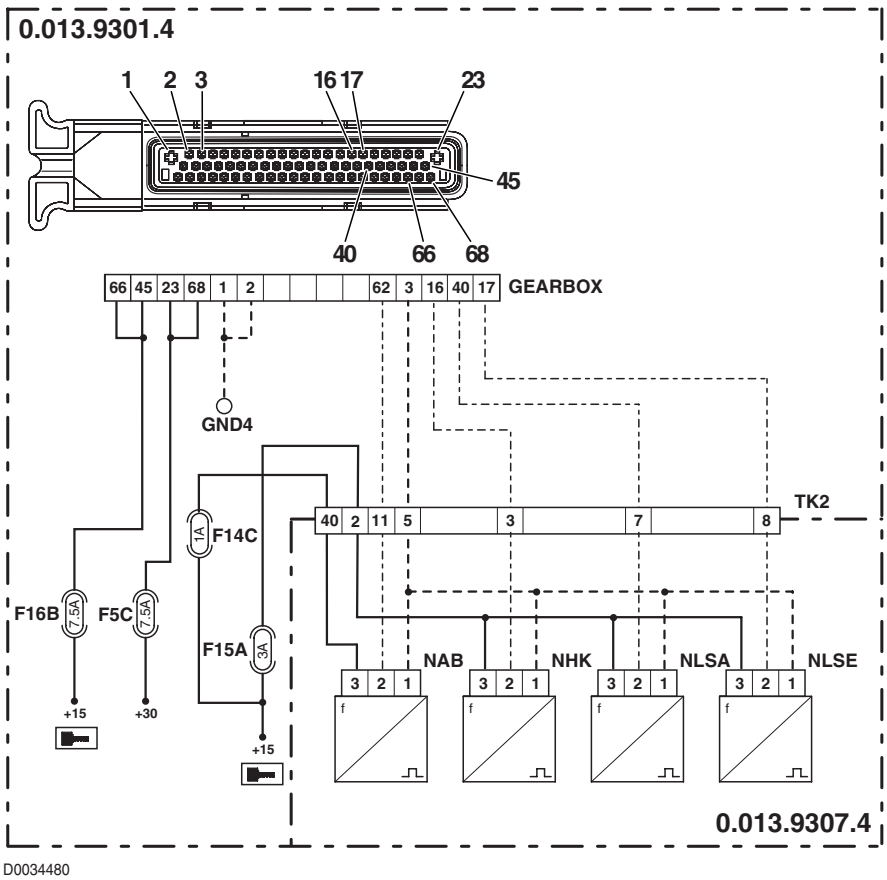
The control unit detects that rpm sensor nLsa is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NLSA” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NLSA” and to transmission earth, and measure the resistance to check that there are no short circuits to earth (meter reading: infinity).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *55*

← *55-Sensore vel.nLSA*
TC-Errore logico

DESCRIPTION

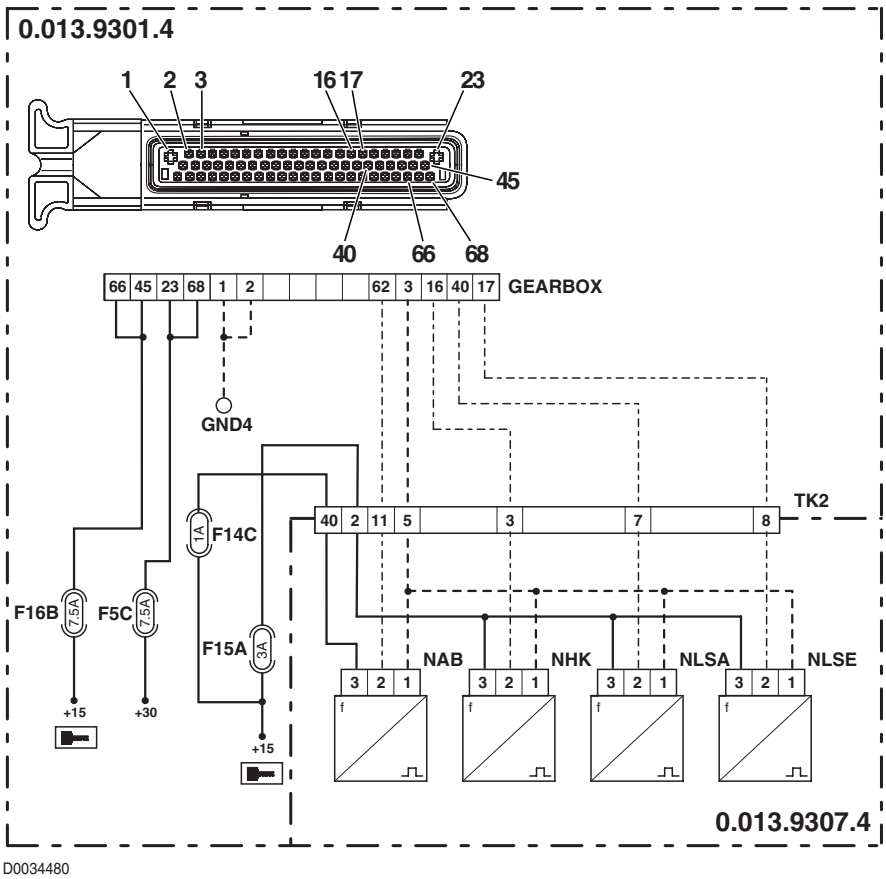
The control unit detects unreliable information coming from the rpm sensor nLsa

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NLSA” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Check correct operation of the sensor (for technical details, see section 40).
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) of connector “NLSA“ and to the earth on the transmission).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “NLSA” and to pin 3 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *5F*

← *5F-Sensore FRRS*
TC-possibile errore

DESCRIPTION

The control unit detects that the calibration values of the field/road position sensor are incorrect.

ECU RESPONSE

The control unit does not limit the operation of the transmission, but restores the default values.

CHECK

- Calibrate the field/road position sensor.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *60*

← *60-FRRS calibration*
TC-possible error

DESCRIPTION

The control unit detects that the calibration values of the field/road position sensor are incorrect

ECU RESPONSE

The control unit does not limit the operation of the transmission, but restores the default values.

CHECK

- Calibrate the field/road position sensor.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *61*

← *61-Sensore FRRS*
TC-Ingresso a +12V

DESCRIPTION

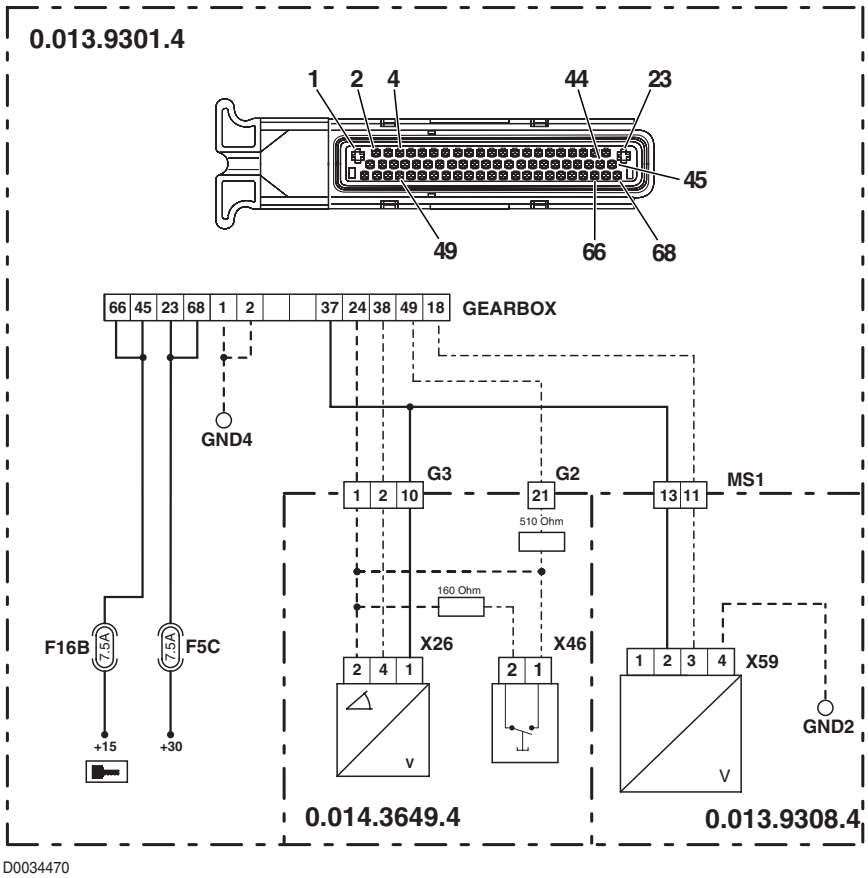
The control unit detects that the field/road position sensor is shorting to battery positive (+5V).

ECU RESPONSE

The control unit limits operation to "LIMP-HOME-LS" mode, and at the first attempt to shuttle in either direction, the transmission will shift to neutral and a continuous beep will sound.

CHECK

- Check that the contacts on the “X59” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Check that the sensor is functioning correctly.
- With the starter key in position “I” (ON), check that the field/road position sensor is receiving power correctly (5V between pin 2 (positive) and pin 4 (negative) of connector “X59”).
- With the starter key in position “I” (ON), connect a test meter to pin 3 and to pin 4 of connector "X59" and check for 0 voltage (meter reading: 0V).
- With the starter key in position “O” (OFF), connect a test meter to pin 2 and to pin 3 of connector "X59" and perform a resistance test to check that the connectors are not shorting (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← *62*

← *62-Sensore FRRS*
TC-Ingresso a +12V

DESCRIPTION

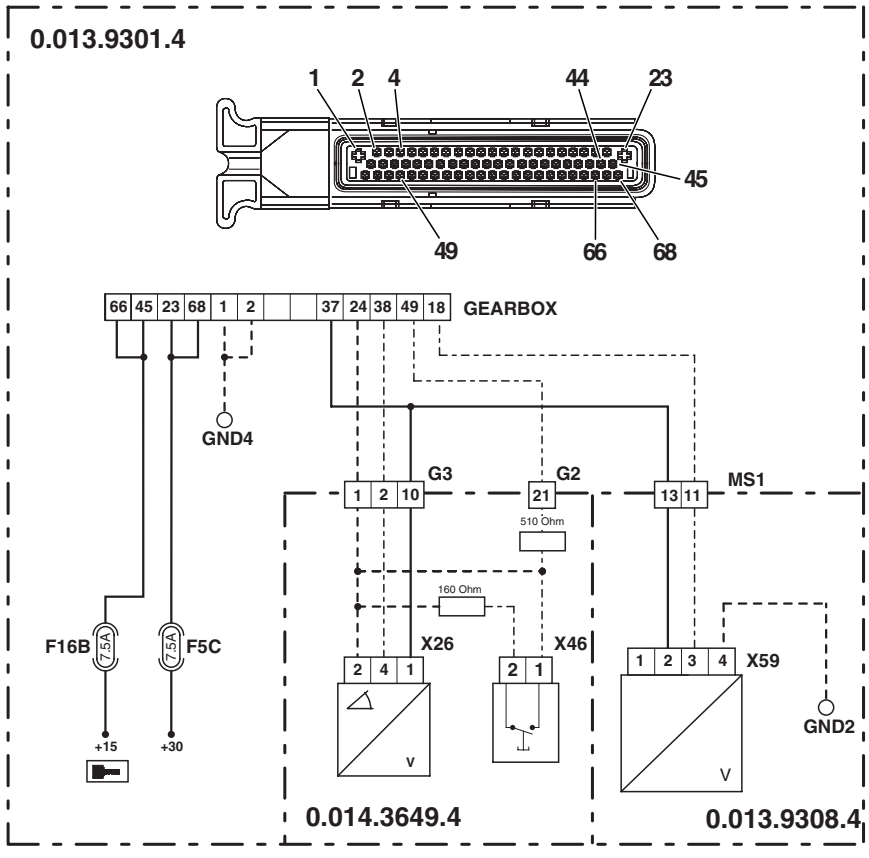
The control unit detects that the field/road position sensor is shorting to battery positive (+12V).

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “X59” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), check that the field/road position sensor is receiving power correctly (5V between pin 2 (positive) and pin 4 (negative) of connector “X59”).
- With the starter key in position “I” (ON), connect a test meter to pin 3 and to pin 4 of connector "X59" and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← *63*

← *63-Sensore FRRS*
TC-Ingresso a massa

DESCRIPTION

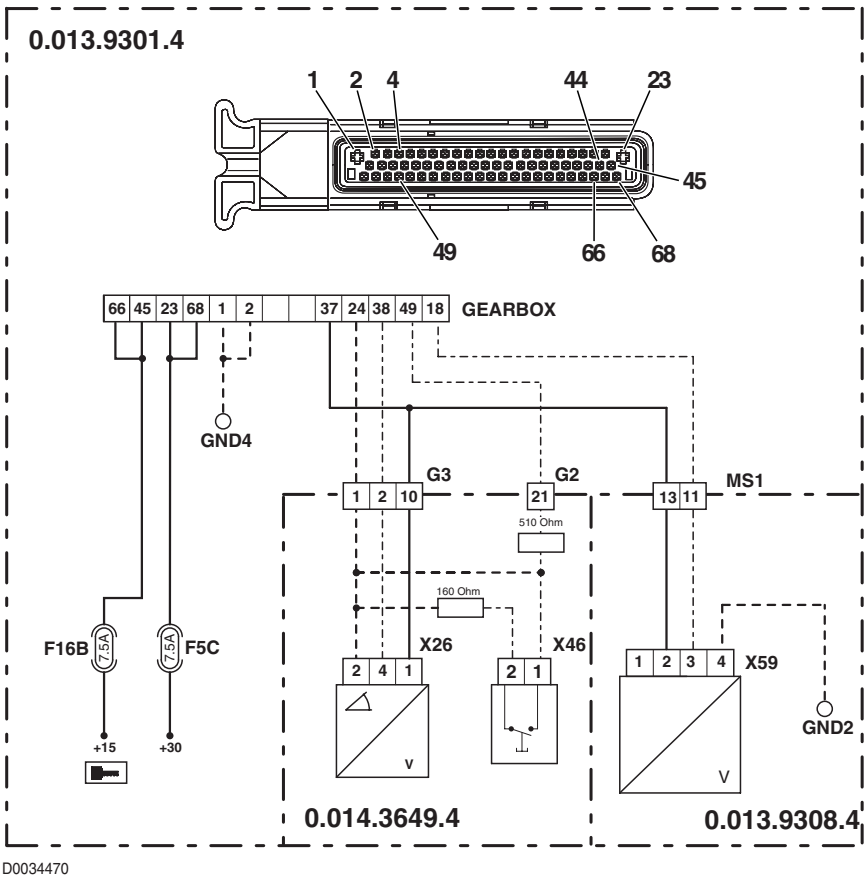
The control unit detects that the field/road position sensor is disconnected or shorting to earth.

ECU RESPONSE

The control unit limits operation to "LIMP-HOME-LS" mode, and at the first attempt to shuttle in either direction, the transmission will shift to neutral and a continuous beep will sound.

CHECK

- Check that the contacts on the “X59” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), check that the field/road position sensor is receiving power correctly (5V between pin 2 (positive) and pin 4 (negative) of connector “X59”).
- With the starter key in position “O” (OFF), connect a test meter to pin 3 and to pin 4 of connector "X59" and perform a resistance test to check that the connectors are not shorting (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 3 of connector “X59” and to pin 18 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← *64*

← *64-Pedale frizione*
TC-Errore logico

DESCRIPTION

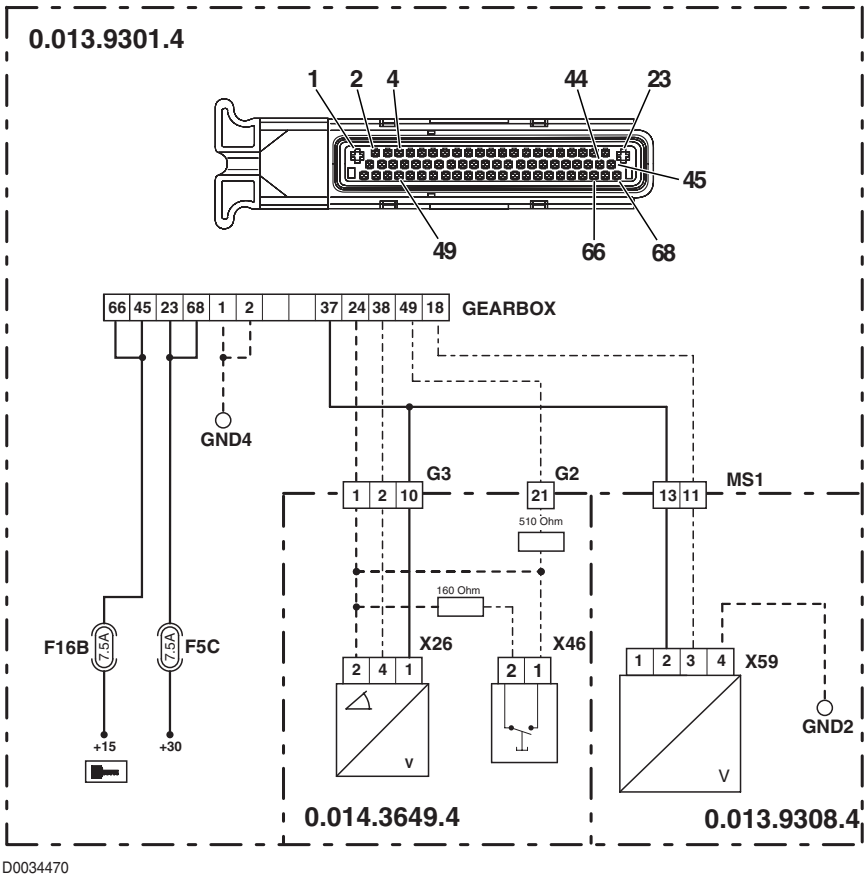
The control detects a conflict in the information received from the clutch pedal position sensor and clutch pedal depressed sensor, regarding the position of the pedal

ECU RESPONSE

The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded

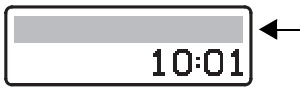
CHECK

- In the event that there are other alarms activated, relating to the clutch pedal position sensor, verify the cause as described under the relative alarm headings before proceeding as follows.
- Check that the contacts on the “X26” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Check that the clutch pedal position sensor can travel through its full stroke and that it is correctly connected to the clutch pedal (for details, see "CLUTCH PEDAL AND ACCESSORIES in section 30).
- Calibrate the clutch pedal position sensor.
- Check correct operation of the clutch pedal depressed proximity sensor (for details see section 40)
- Check that the clutch pedal proximity sensor is positioned correctly (for details, see "CLUTCH PEDAL AND ACCESSORIES" in section 30).
- Check correct operation of the clutch pedal position sensor (for details see section 40)
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← *65*



← *65-Pedale frizione*
TC-Ingresso a massa

DESCRIPTION

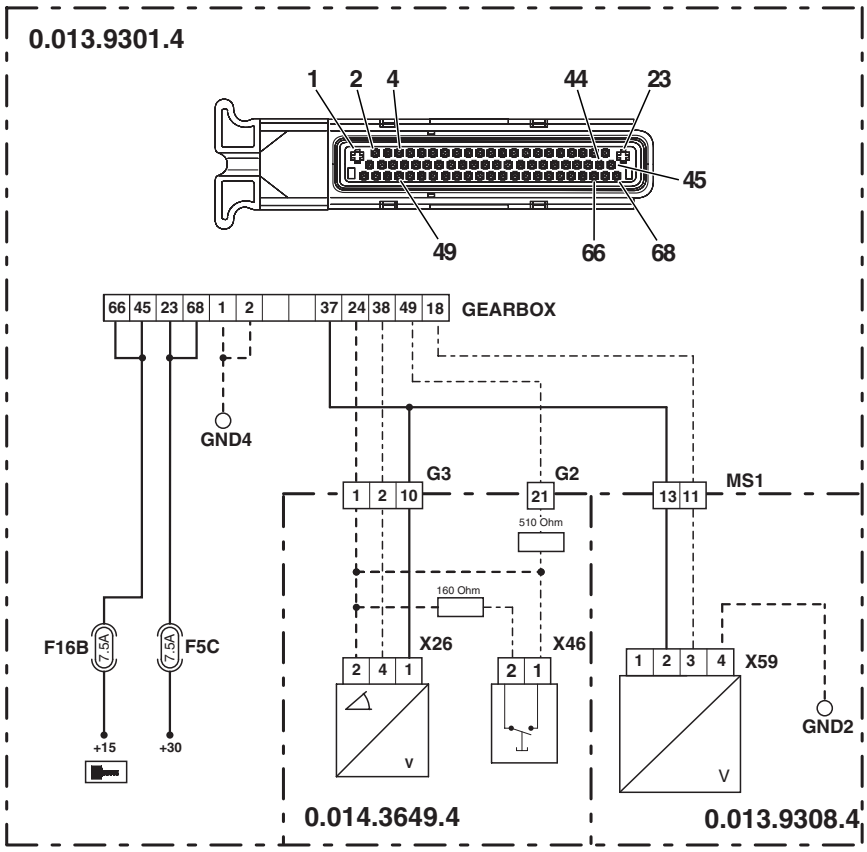
The control unit detects that the clutch pedal position sensor is disconnected or short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded.

CHECK

- Check that the contacts on the “X26” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), check that the clutch pedal position sensor is receiving power correctly (5V between pin 1 (positive) and pin 2 (negative) of connector “X26”).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “X26” and to the earth on the transmission and check for 0 voltage (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 4 of connector “X26” and to pin 38 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← *66*

← *66-Pedale frizione*
TC-Ingresso a +12V

DESCRIPTION

The control unit detects that the clutch pedal position sensor is shorting to battery positive

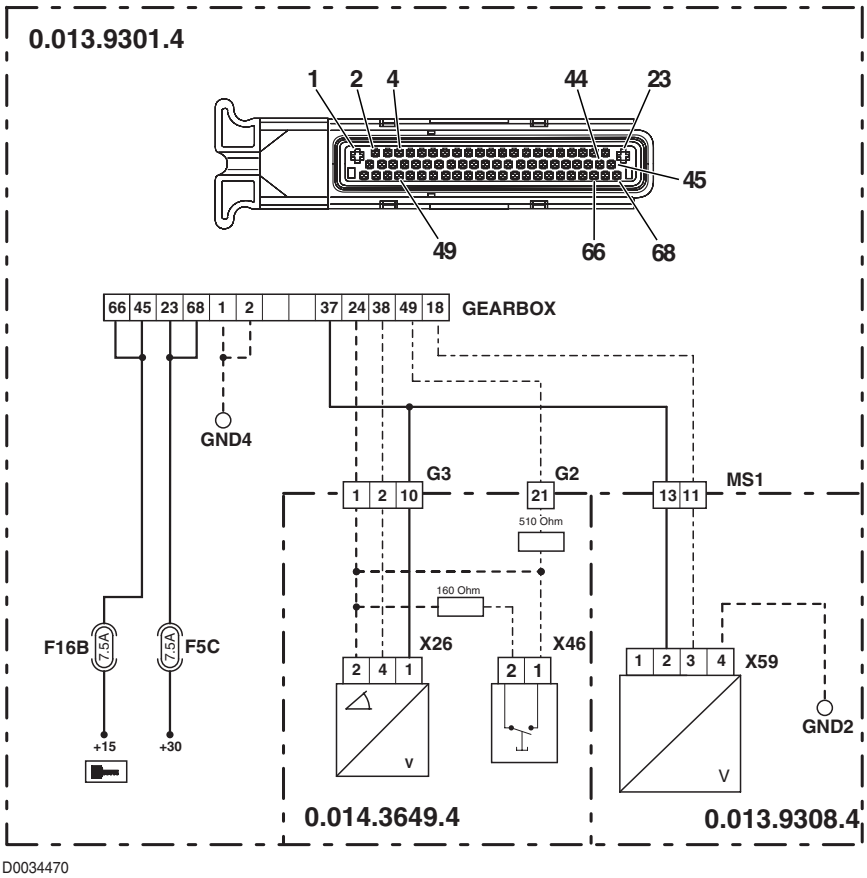
ECU RESPONSE

The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE
This alarm could be displayed as a result of alarm 12 or 68 being activated.

CHECK

- Check that the contacts on the “X26” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), check that the clutch pedal position sensor is receiving power correctly (5V between pin 1 (positive) and pin 2 (negative) of connector “X34”).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “X26” and to the earth on the cab and check for 0 voltage (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 4 of connector “X26” and to pin 38 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← 67

← 67-Alimen. Sens. AU1
TC-Corto massa uscita

DESCRIPTION

The control unit detects that the power input to the clutch pedal position sensor is less than the prescribed value

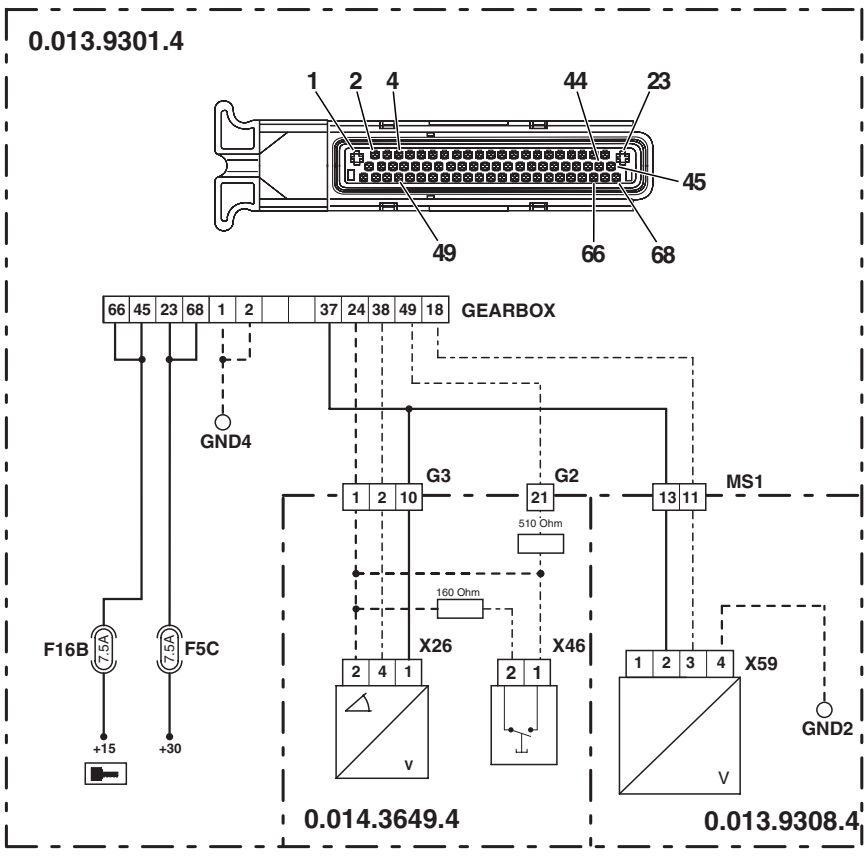
ECU RESPONSE

The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE
This alarm could be displayed as a result of alarm 69 being activated.

CHECK

- If there are other alarms present relating to the clutch pedal position sensor, the transmission oil temperature, the "comfort clutch" button or the field/road position sensor, identify the cause as described under the relative alarm headings before proceeding as described below.
- Check that the contacts on the “X26” connector of the clutch pedal position sensor and “GEARTEMP” connector of the transmission oil temperature sensor and on the "GEARBOX" transmission control unit are not oxidised and are firmly secured.
- With the starter key in position “I” (ON), check that the clutch pedal position sensor is receiving power correctly (5V between pin 1 (positive) and pin 2 (negative) of connector “X26”).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← *68*

← *68-Alimen. Sens. AU1*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the power input to the clutch pedal position sensor is higher than the correct value

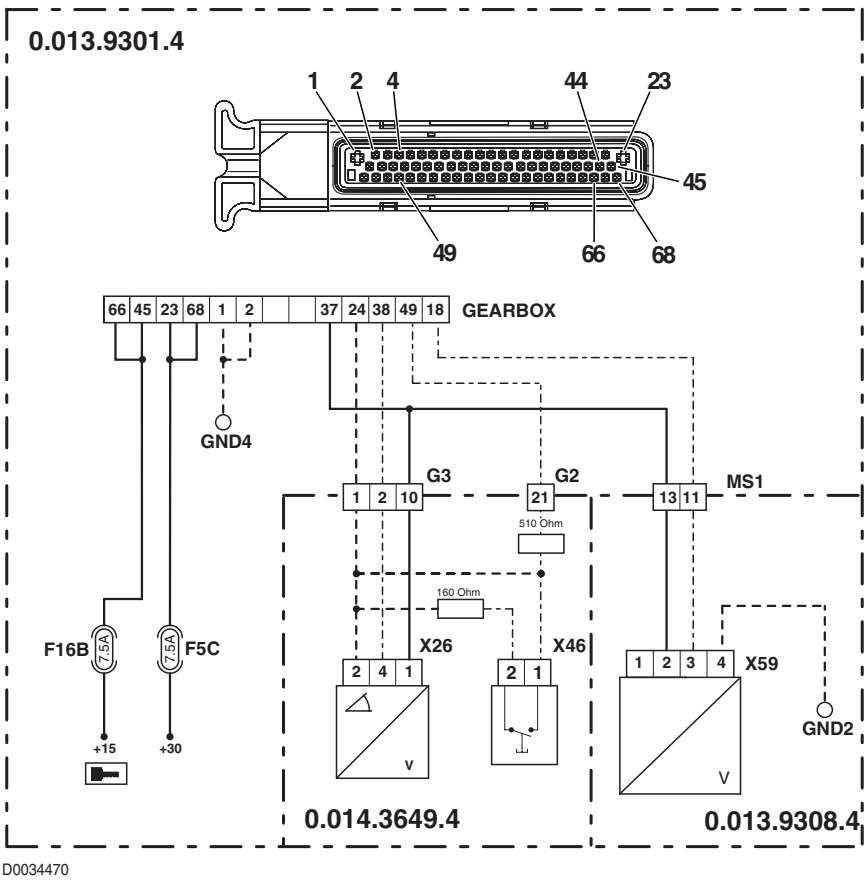
ECU RESPONSE

The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE
This alarm could be displayed as a result of alarm 12 or 66 being activated.

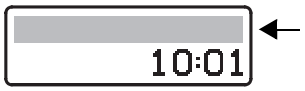
CHECK

- If there are other alarms present relating to the clutch pedal position sensor, the transmission oil temperature, the "comfort clutch" button or the field/road position sensor, identify the cause as described under the relative alarm headings before proceeding as described below.
- Check that the contacts on the “X26” connector of the clutch pedal position sensor and “GEARTEMP” connector of the transmission oil temperature sensor and on the "GEARBOX" transmission control unit are not oxidised and are firmly secured.
- With the starter key in position “I” (ON), check that the clutch pedal position sensor is receiving power correctly (5V between pin 1 (positive) and pin 2 (negative) of connector “X26”).
- Check correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034470

← *69*



← *69-Pedale frizione*
TC-Errore logico

DESCRIPTION

The control unit detects one or more threshold values of the clutch pedal position sensor out of range.

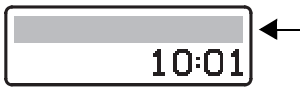
ECU RESPONSE

The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

CHECK

- Perform the clutch pedal position sensor calibration procedure.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *70*



← *70-Pedale frizione E2P*
TC-possibile errore

DESCRIPTION

The control unit detects that the calibration values of the clutch pedal have not been saved correctly due to a defect in the EEPROM memory locations, or that the clutch pedal has never been calibrated

ECU RESPONSE

The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE
This alarm could be displayed as a result of alarm 64 being activated.

CHECK

- Perform the clutch pedal position sensor calibration procedure.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *73*

← *73-Pulsante aper. friz.*
TC-Ingresso a massa

DESCRIPTION

The control unit detects that the "Comfort Clutch" button is disconnected or short-circuiting to earth

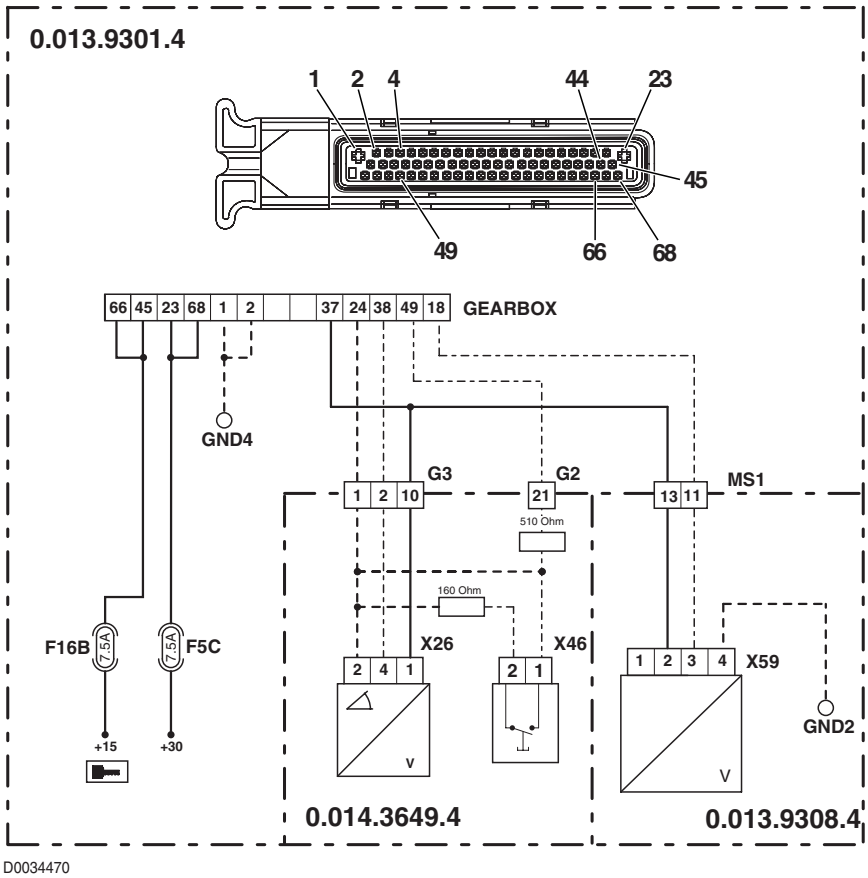
NOTE
This alarm could be displayed as a result of alarm 12 being activated.

ECU RESPONSE

The control unit limits operation to "LIMP-HOME-LS" mode, the transmission shifts to neutral and a continuous beep sounds.

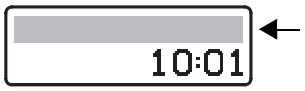
CHECK

- Check that the contacts on the “X46” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Check that the pushbutton is functioning correctly (for technical details, see Group 40)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “X11” and to pin 24 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected and "X46" connector connected, connect a test meter to pin 24 and to pin 49 of connector “GEARBOX” and test the resistance to check for:
  - meter reading 510 Ohm with "comfort clutch" button released;
  - meter reading approx. 122 Ohm with "comfort clutch" button pressed.
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “X46” and to pin and earth on the cab and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “X46” and to earth on the cab and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0034470

← 74



← *74-Pulsante aper. friz.*
TC-Ingresso a +12V

DESCRIPTION

The control unit detects that the "Comfort Clutch" button is short-circuiting to battery positive

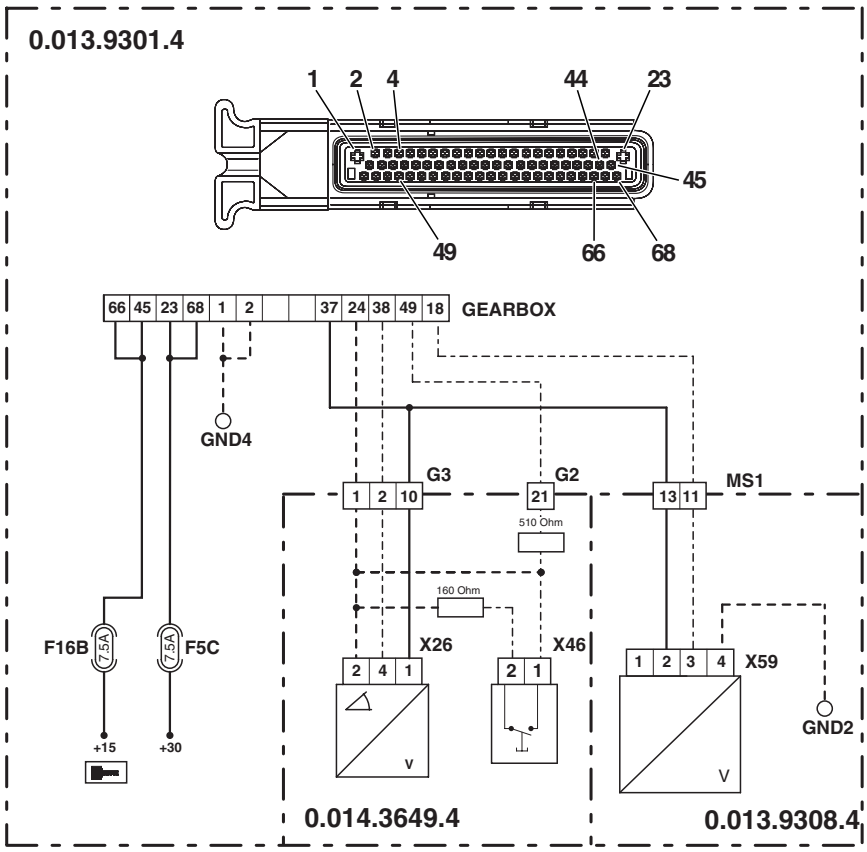
NOTE
This alarm could be displayed as a result of alarm 12 being activated.

ECU RESPONSE

The control unit limits operation to "LIMP-HOME-LS" mode, the transmission shifts to neutral and a continuous beep sounds.

CHECK

- Check that the contacts on the “X46” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the connector "GEARBOX" disconnected from the engine control unit and the starter key in the "I" (ON) position, connect a test meter to pin 1 of connector "X46" and to the transmission earth and check for 0 voltage (test meter reading 0V).
- With the connector "GEARBOX" disconnected from the engine control unit and the starter key in the "I" (ON) position, connect a test meter to pin 2 of connector "X46" and to the transmission earth and check for 0 voltage (test meter reading 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0034470

← *76*

← *76-EV proporzionale*
TC-Circ. aperto uscita

DESCRIPTION

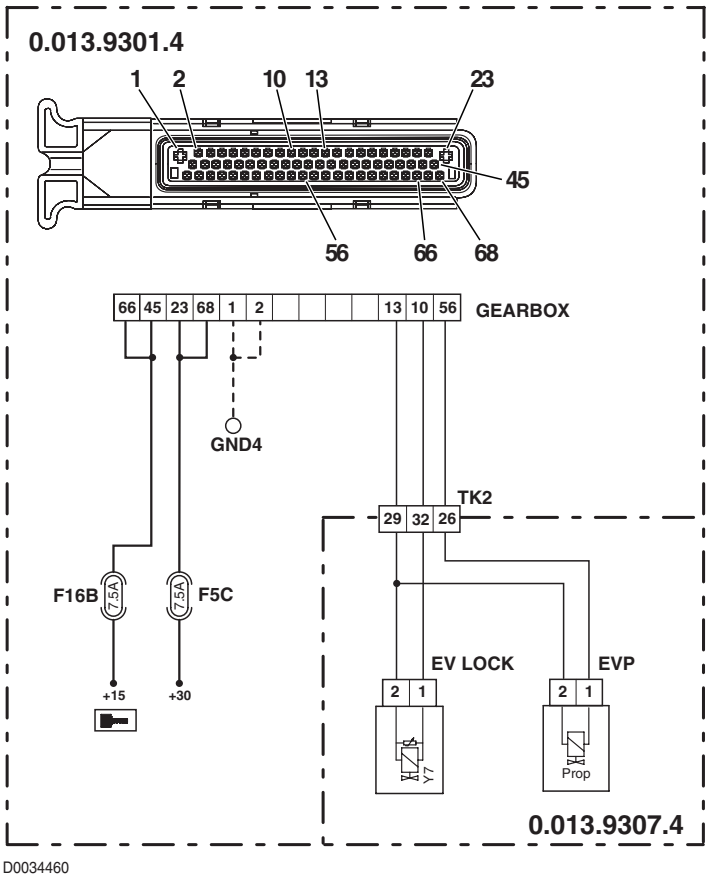
The control unit detects that the proportional solenoid valve operating the main clutch is disconnected

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVP” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EVP” and to pin 56 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “EVP” and to pin 13 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in position “I” (ON), check that the proportional solenoid valve is receiving power correctly (12 V between pin 2 (positive) of connector “EVP” and the earth on the transmission).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034460

← *77*

← *77-Elettrovalvola proporzionale TC-Corto massa uscita*

DESCRIPTION

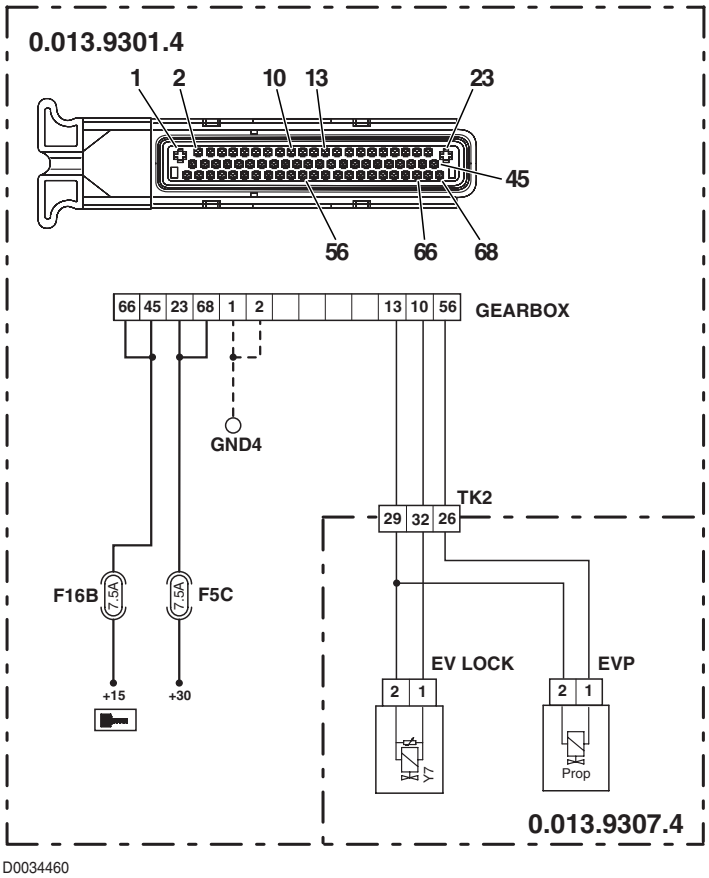
The control unit detects that the proportional solenoid valve operating the main clutch is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVP” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVP” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034460

← *79*

← *79-EV direz. avanti*
TC-Circ. aperto uscita

DESCRIPTION

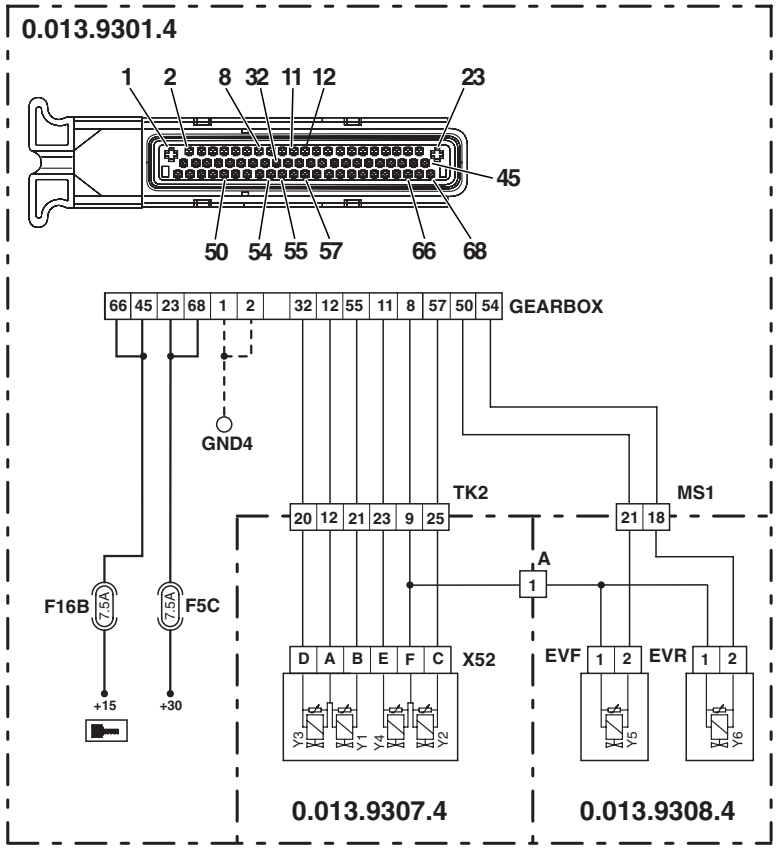
The control unit detects that the forward travel solenoid Y3 is disconnected

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “X52” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin A and to pin D of connector “X52” on the transmission and perform a resistance test to check for the solenoid valve resistance (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin D of connector “X52” and to pin 32 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *80*

← *80-EV direz. avanti*
TC-Corto massa uscita

DESCRIPTION

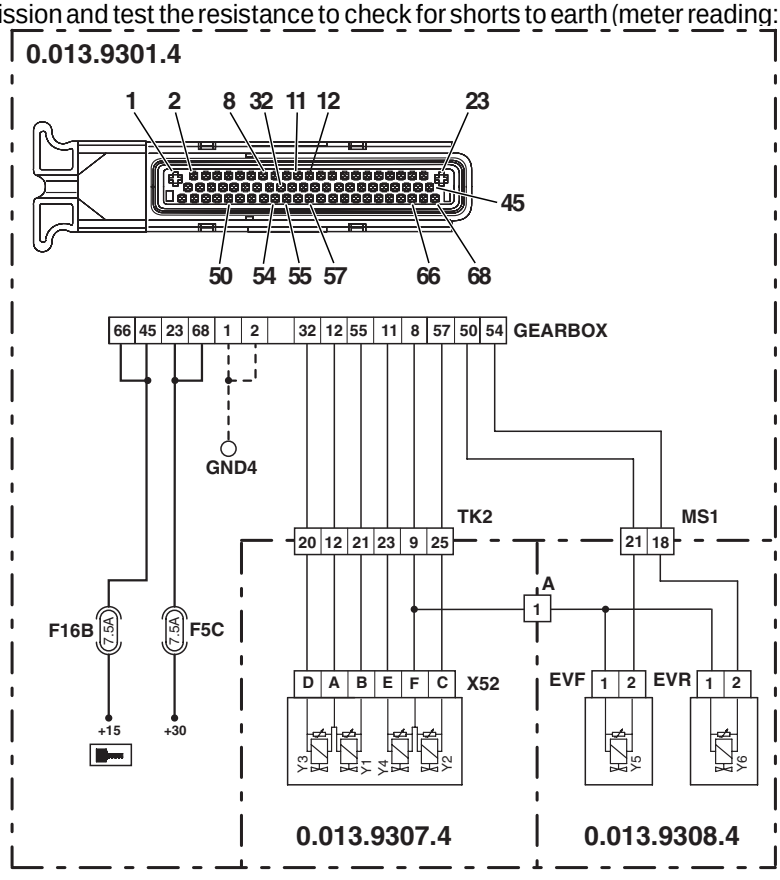
The control unit detects that the forward travel solenoid Y3 is shorting to earth

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “X52” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin A and to pin D of connector “X52” on the transmission and perform a resistance test to check for the solenoid valve resistance (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin D of connector “X52” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin D of connector “X52” on the transmission and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

←82

← *82-EV direz. indietro*
TC-Circ. aperto uscita

DESCRIPTION

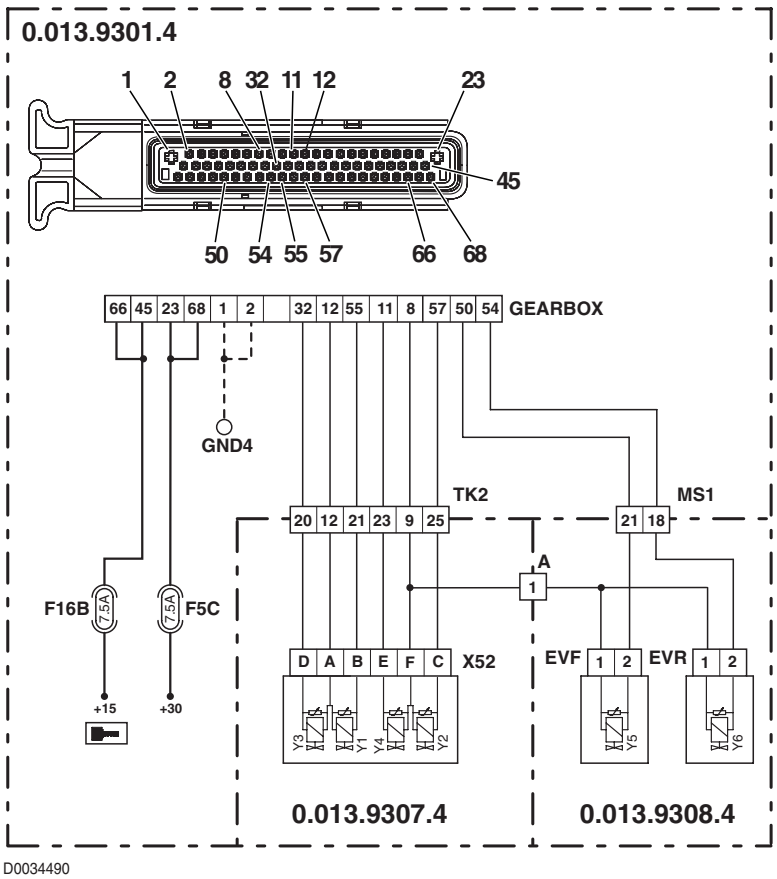
The control unit detects that the reverse travel solenoid Y1 is disconnected

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- With the starter key in position “O” (OFF), connect a test meter to pin A and to pin B of connector “X52” on the transmission and perform a resistance test to check for the solenoid valve resistance (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin B of connector “X52” and to pin 32 of the "GEARBOX" connector and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *83*

← *83-EV direz. indietro*
TC-Corto massa uscita

DESCRIPTION

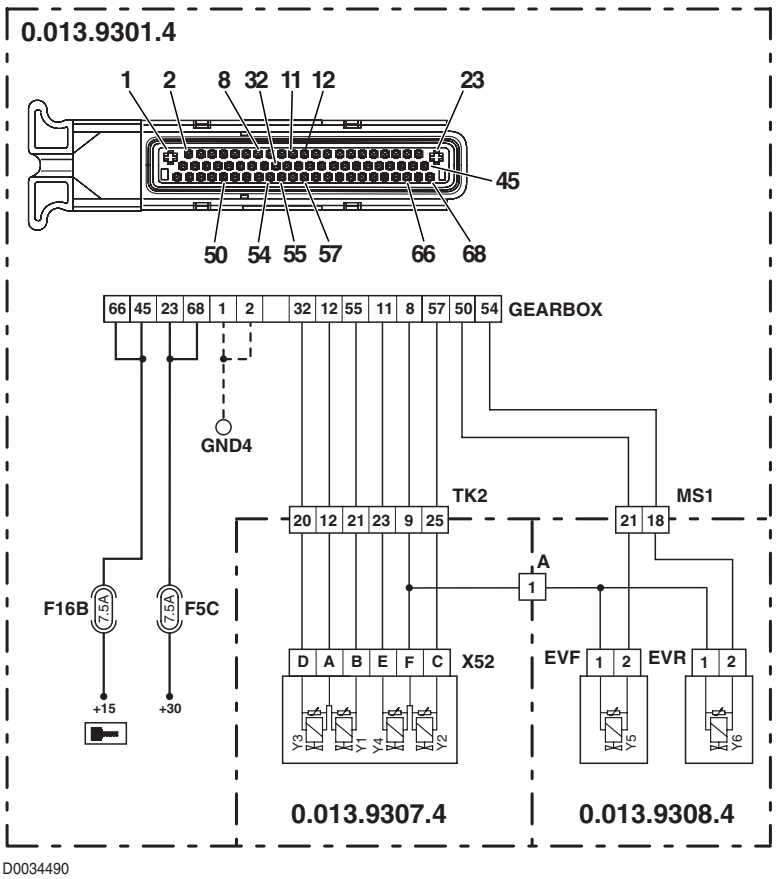
The control unit detects that the reverse travel solenoid Y1 is shorting to earth

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “X52” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “O” (OFF), connect a test meter to pin A and to pin B of connector “X52” on the transmission and perform a resistance test to check for the solenoid valve resistance (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin B of connector “X52” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin B of connector “X52” on the transmission and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *85*

← *85-Leva inversore*
TC-Errore logico

DESCRIPTION

The control unit detects a problem affecting the shuttle control lever.

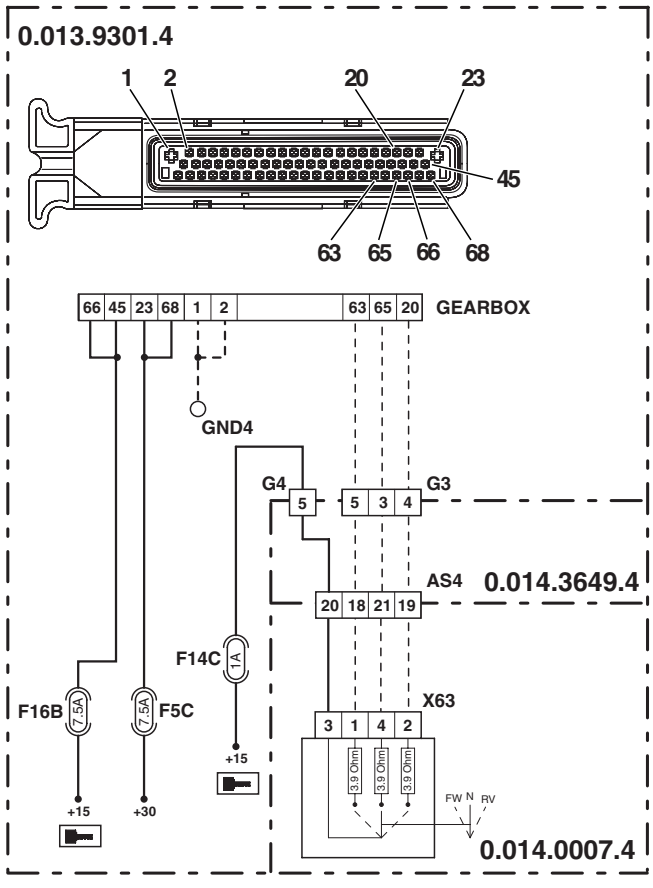
ECU RESPONSE

The control unit limits operation to:

- "SUBSTITUTE-STRATEGY" if the tractor is equipped with an armrest console; in this configuration, forward-reverse direction changes can be made using the joystick on the armrest;
- "TRANSMISSION-SHUTDOWN" if the tractor is not equipped with an armrest console; in this configuration, the control unit puts the transmission into neutral and emits a continuous beep.

CHECK

- Check that the contacts on the "X63" connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Verify the correct operation of the shuttle lever (for details see section 40).
- With the starter key in position "I" (ON), check that the shuttle control lever is receiving power correctly (12V between pin 3 (positive) of connector "X63" and the earth on the cab)
- With the starter key in position "O" (OFF) and "GEARBOX" connector disconnected, connect a test meter alternately to pin 1, pin 2, pin 3 and pin 4 of connector "X63" and to earth on the cab and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position "O" (OFF) and "GEARBOX" connector disconnected, connect a test meter alternatively to pin 1 of connector "X63" and alternately to pin 2, pin 3 and pin 4 and perform a resistance test to check for shorts (meter reading: infinity).
- With the starter key in position "O" (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector "X63" and alternately to pin 3 and pin 4 and perform a resistance test to check for shorts (meter reading: infinity).
- With the starter key in position "O" (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 3 of connector "X63" and to pin 4 and perform a resistance test to check for shorts (meter reading: infinity).
- With the starter key in position "I" (ON), connect a test meter alternately to pin 1, pin 2 and pin 4 of connector "X63" and to the earth on the cab and check for 0 voltage (meter reading 0V).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034450

← *87*

← *Pin di codifica non coincidono con tipo di veicolo*

DESCRIPTION

The control unit detects that the type of vehicle has not been programmed correctly

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode.

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch, the clutch pedal and the road/field sensor.
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 66 of connector "GEARBOX" and to the earth on the cab and check for 0 voltage (meter reading 12V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed

← *89*

← *89-Alimentazione VPS1*
TC-Errore logico

DESCRIPTION

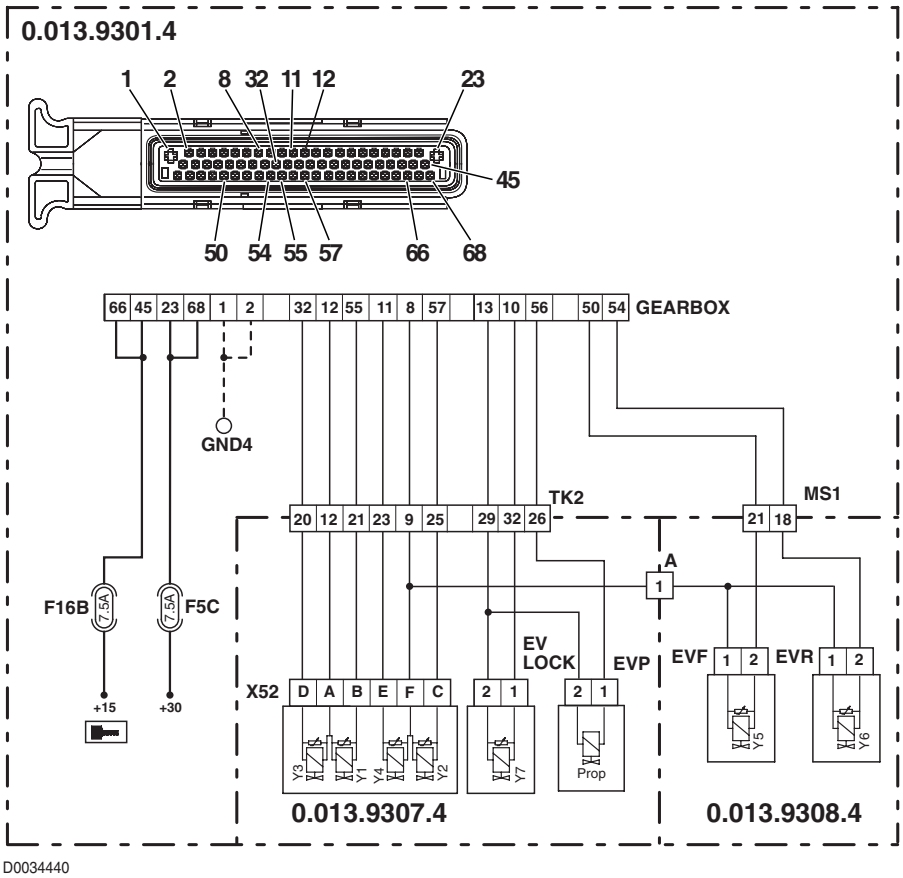
The control unit detects that the current draw of the main clutch solenoids and forward/reverse solenoids Y1 and Y3 and the lock solenoid is abnormal.

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin A of connector “X52” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVP” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVLOCK” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin A of connector “X52” and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVP” and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVLOCK” and check for 0 voltage (meter reading: 0V).
- With the starter key in the “I” (ON) position, connect a test meter to pins 23 and 68 and measure the voltage (meter reading: 12V)
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034440

← 90

← 90-Alimentazione VPS2
TC-Errore logico

DESCRIPTION

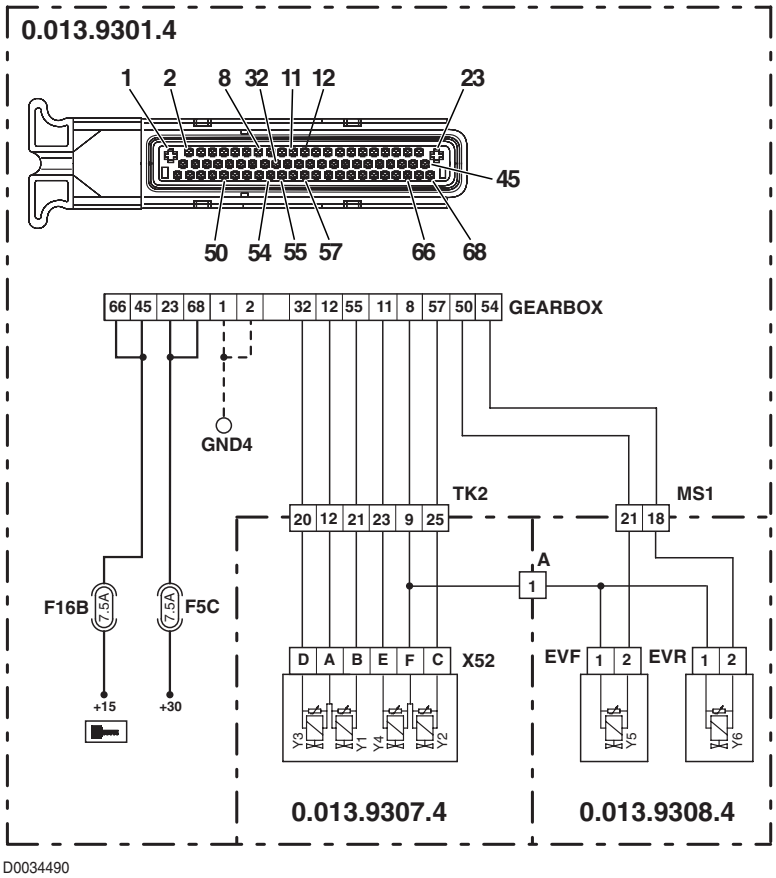
The control unit detects that the current draw of the powershift solenoid valves Y2, Y4, Y5 and Y6 is abnormal

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin F of connector “X52” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVF” (or EVR) and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pins 23 and 68 and measure the voltage (meter reading: 12V)
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *91*

← *91-Frizione principale*
TC-Errore logico

DESCRIPTION

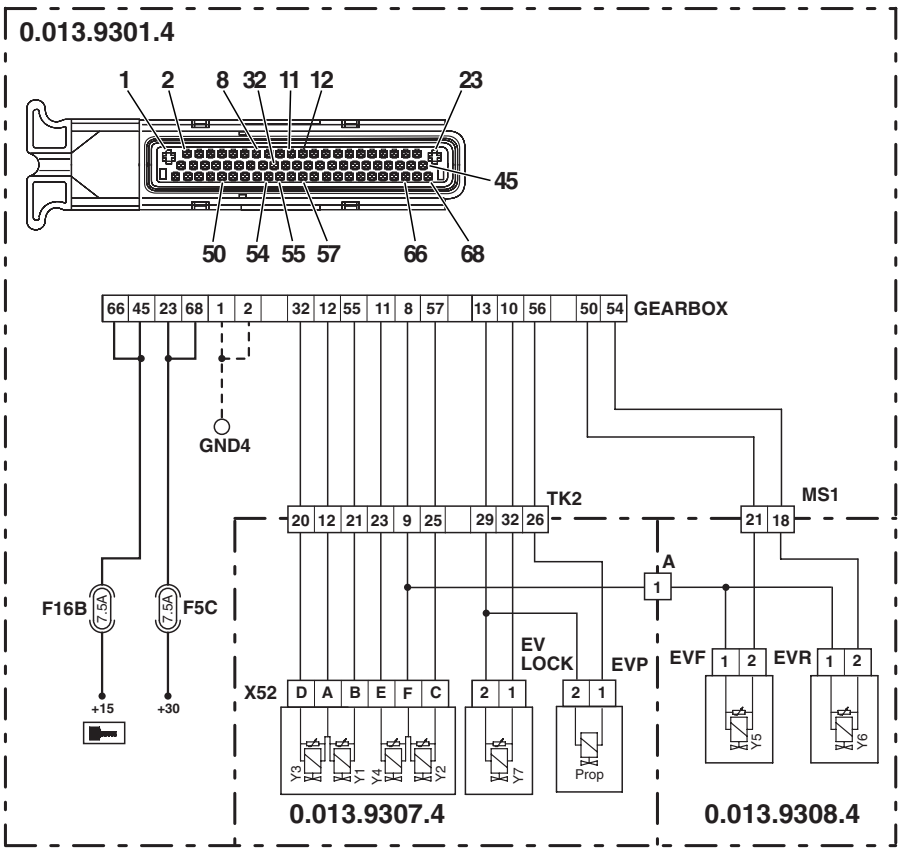
The control unit detects a conflict between values read by the NLSA and NHK sensors, the clutch pedal position sensor and the position of the creeper control lever

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral.

CHECK

- Check that the creeper engagement lever is in the correct position and the sensor correctly placed.
- Check correct operation of the creeper engagement sensor (for details, see section 40).
- Test the resistance of the proportional solenoid valve (for details, see section 40).
- Check that the “NHK” e “NAB” connectors have not been inadvertently swapped around (the NAB connector should be installed on the sensor nearest the rear lift).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVP” and to the earth on the transmission and check for 0 voltage (meter reading: 0 V).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin F of connector “X52” and test the resistance to check for shorts to earth (meter reading: infinity).
- Check the transmission hydraulic system
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034440

← *92*

← *92-Tensione batteria TC-Ingresso a +12V*

DESCRIPTION

The control unit has detected an abnormally high input voltage

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral. In the event that one or more of alarms 64, 65, 66, 67, 68, 69 or 70 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE
This alarm is activated generally when the alternator charging voltage is irregular, and can be caused only by a fault affecting the alternator itself.

CHECK

- Check, with the engine off, that the battery voltage is within the prescribed range (normal voltage 12V - 13.5V).
- Check first whether or not the battery voltage returns to normal with the engine running. In this instance the problem may be attributable to a fault in the ECU, which must therefore be replaced with a new unit, otherwise the trouble is being caused by incorrect operation of the alternator voltage regulator.

← *93*

← *93-Tensione batteria*
TC-Ingresso a massa

DESCRIPTION

The control unit has detected an abnormally low input voltage

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral. In the event that one or more of alarms 64, 65, 66, 67, 68, 69 or 70 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE
This alarm is generally activated when the battery voltage is less than 10V and can be caused by excessive current draw when the engine is started, or if the battery is damaged or cannot be recharged by the alternator.
For this reason, this alarm can only be be displayed on EDS among the passive alarms. Should the alarm be displayed among the active alarms, the control unit must be renewed.

CHECK

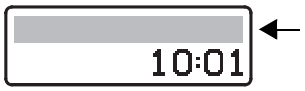
- See if the alarm is indicated as an active alarm; if so, the control unit must be renewed.
- Check, with the engine off, that the battery voltage is as prescribed (higher than 12V); if not, install a new battery.

  NOTE
  Lower voltages may be recorded after the tractor has been standing idle for an extended period; this does not mean necessarily that the battery needs replacing.

- Check first whether or not the battery voltage returns to normal with the engine running. In this instance the problem may be attributable to the battery being discharged or damaged; if not, and the voltage remains lower than the prescribed minimum, the trouble is caused by incorrect operation of the alternator.

  NOTE
  In extreme cases, when the battery is seriously damaged (short circuiting), the alternator may not be able to recharge the cells or generate sufficient voltage. Before changing the alternator, check its correct or incorrect operation by connecting a new battery.

← *94*



← *94-EV proporzionale*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the main clutch solenoid valve is short-circuiting to battery positive

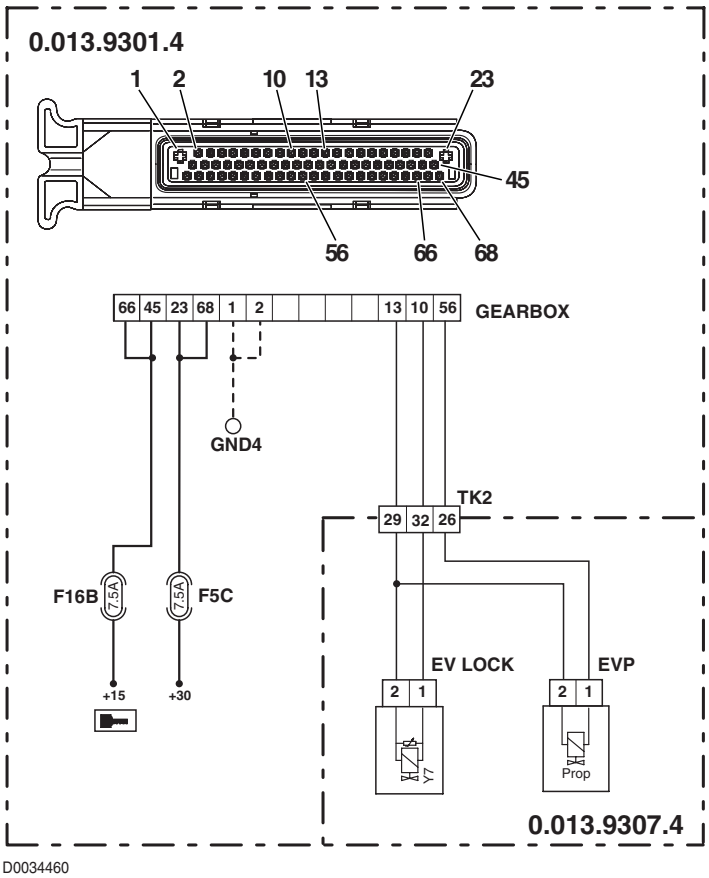
ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE
This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVP” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVP” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034460

← *95*

← *95-EV direz. avanti*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the forward travel solenoid Y3 is shorting to battery positive

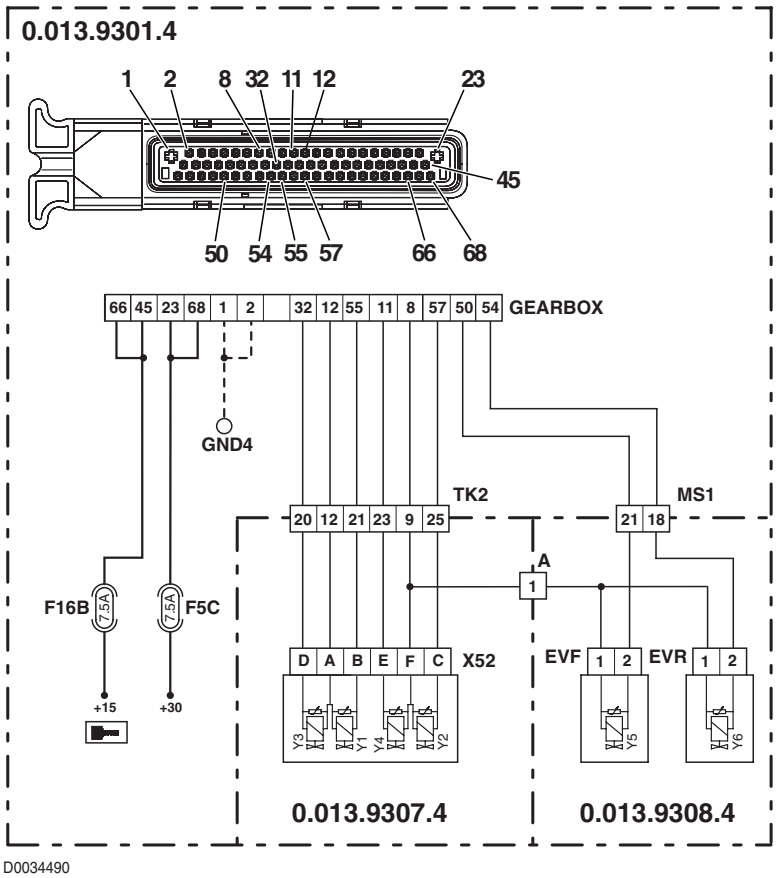
ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE
This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin A of connector “X52” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin D of connector “X52” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *96*

← *96-EV direz. indietro*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the reverse travel solenoid Y1 is shorting to battery positive

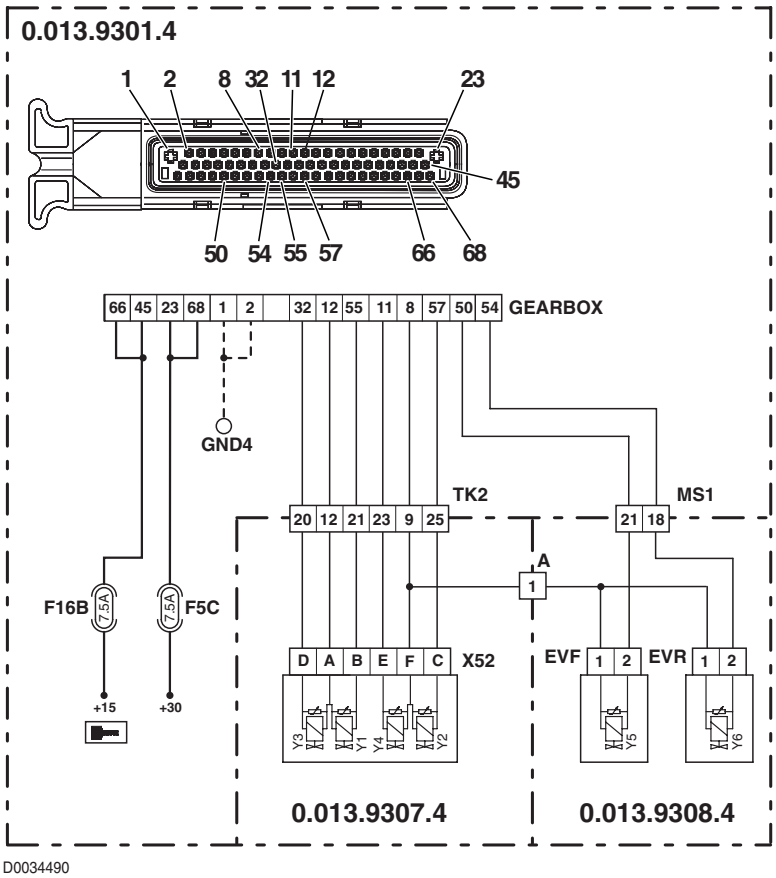
ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE
This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin A of connector “X52” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin B of connector “X52” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

97

97-Programma errato
TC-Errore logico

DESCRIPTION

The control unit detects that the transmission ECU software has not been programmed correctly

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode.

CHECK

- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

98

98-Config.errata
TC-Errore logico

DESCRIPTION

The control unit detects that transmission configuration data have not been programmed correctly.

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode.

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch, the clutch pedal and the road/field sensor.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *99*

← *99-Config. veicolo*
TC-possibile errore

DESCRIPTION

The control unit detects that machine configuration data have not been saved correctly (CHECKSUM ERROR)

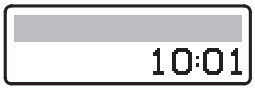
ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode.

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch and the clutch pedal.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *B0*



← *B0-Sensore vel. nLSE*
TC-Ingresso a massa

DESCRIPTION

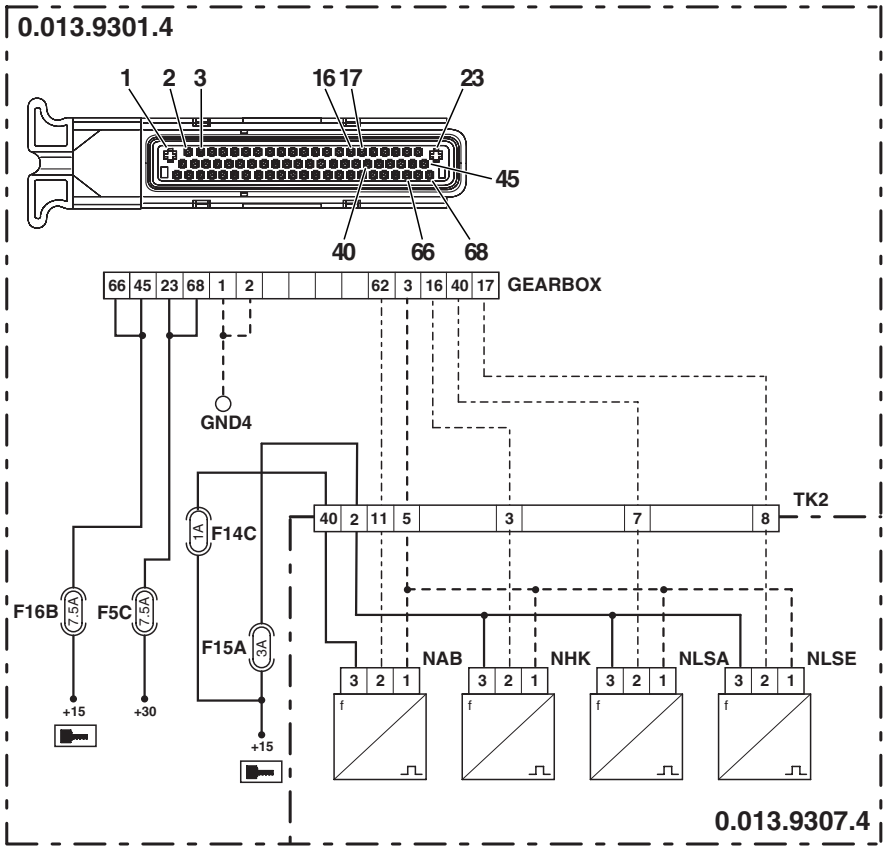
The control unit detects that the rpm sensor nLse is disconnected or short-circuiting to battery positive

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NLSE” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) and pin 1 (negative) of connector “NLSE“).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “NLSE” and to the earth on the transmission and check for 0 voltage (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NLSE” and to pin 17 of connector "GEARBOX" and measure the resistance to verify that there is electrical continuity (test meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *B1*

← *B1-Sensore vel. nLSE*
TC-Ingresso a +12V

DESCRIPTION

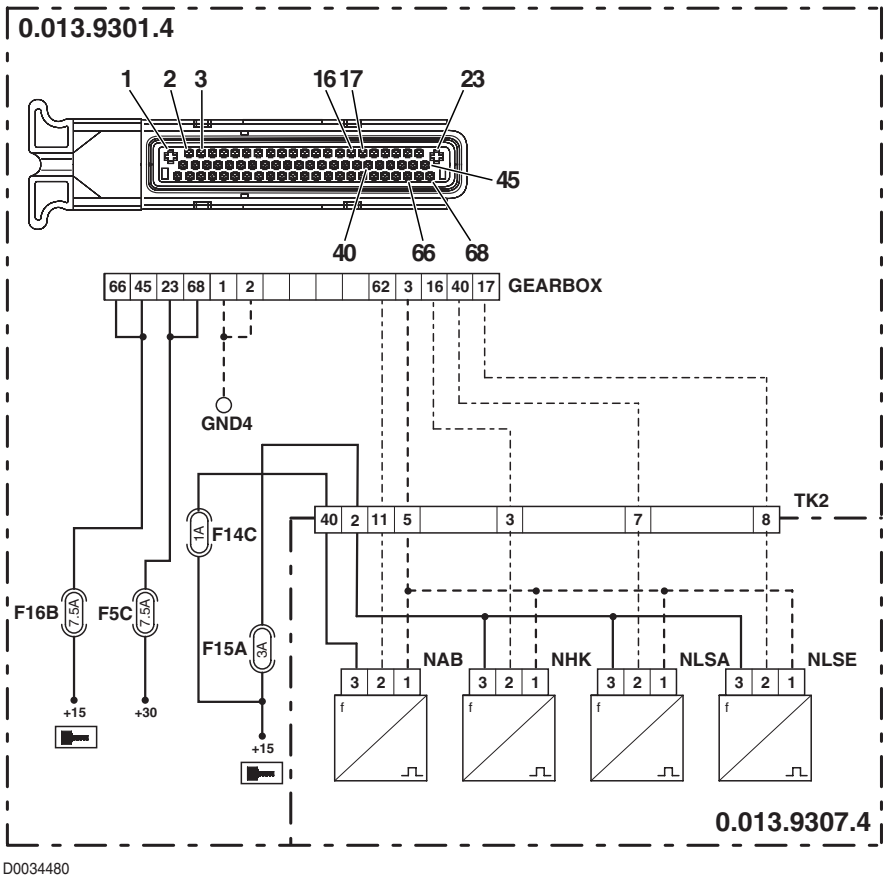
The control unit detects that the rpm sensor nLse is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NLSE” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NLSE” and to transmission earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *B2*

← *B2-Sensore vel. nLSE*
TC-Errore logico

DESCRIPTION

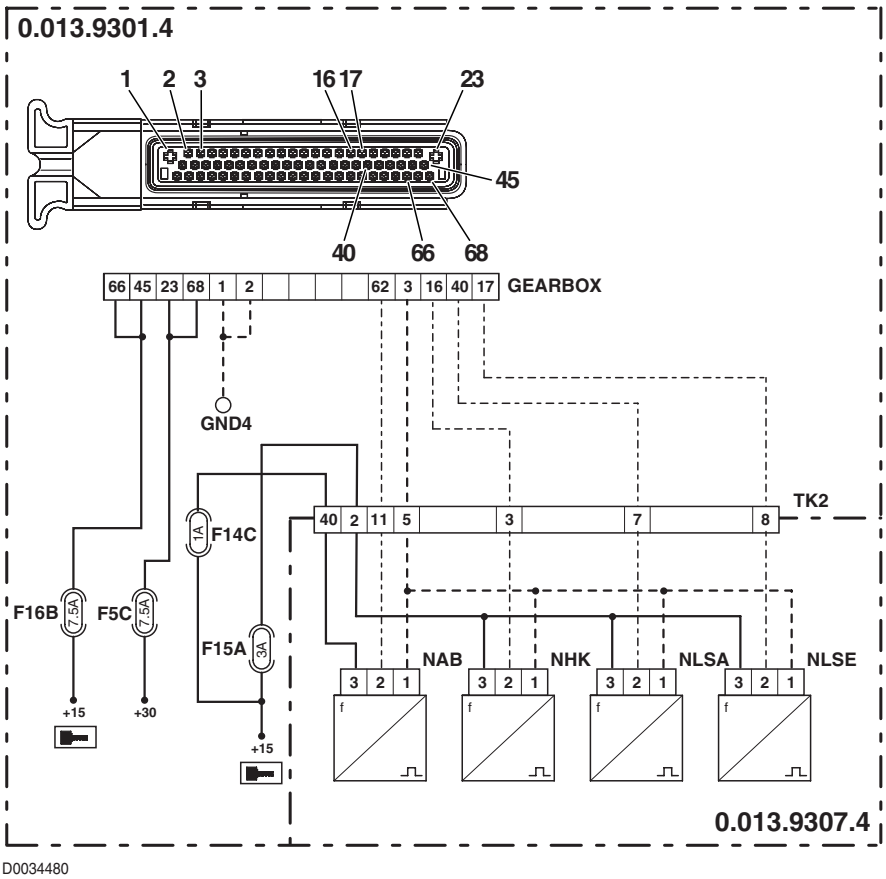
The control detects unreliable information coming from the rpm sensor nLse

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “NLSE” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in position “I” (ON), check that transmission output rpm sensor is receiving power correctly (12 V between pin 3 (positive) and pin 1 (negative) of connector “NLSE“).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034480

← *B3*

← *B3-FRRS EV campo*
TC-Circ. aperto uscita

DESCRIPTION

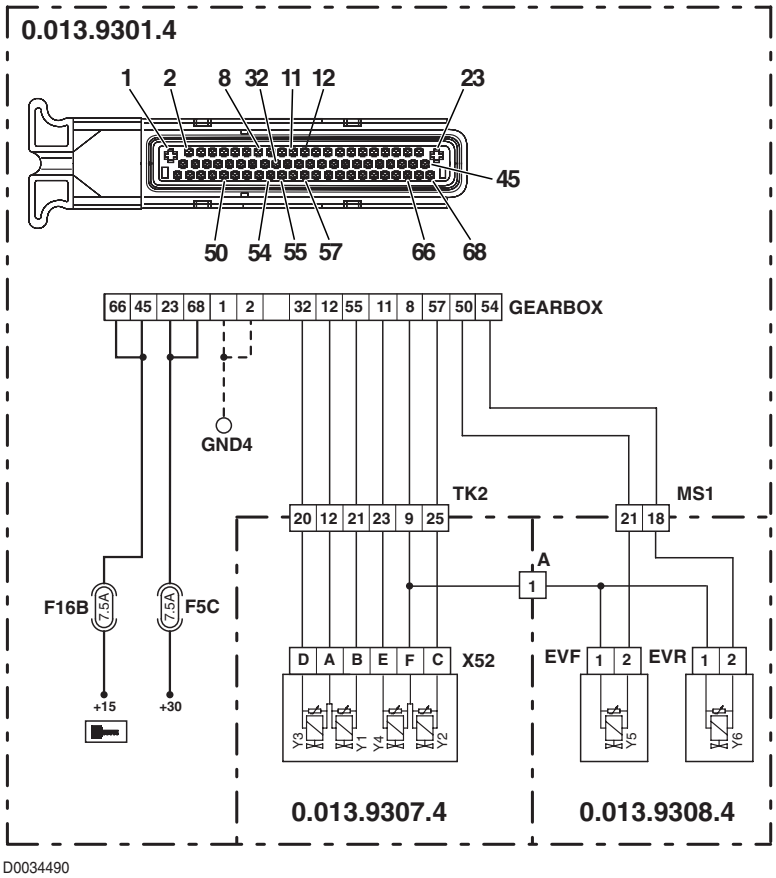
The control unit detects that the "FIELD" mode selector solenoid Y5 is disconnected

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVF” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EVF” and to pin 50 of connector "GEARBOX" and measure the resistance to verify that there is electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *B4*

← *B4-FRRS EV campo*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the "FIELD" mode selector solenoid Y5 is shorting to battery positive

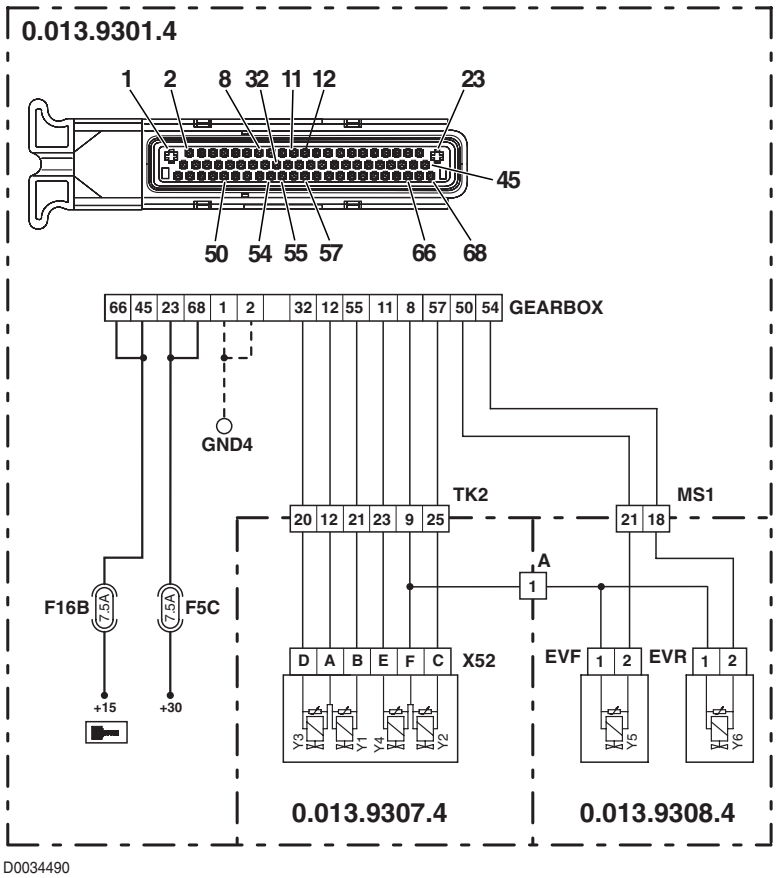
ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE
This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVF” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVF” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *B5*

← *B5-FRRS EV campo*
TC-Corto massa uscita

DESCRIPTION

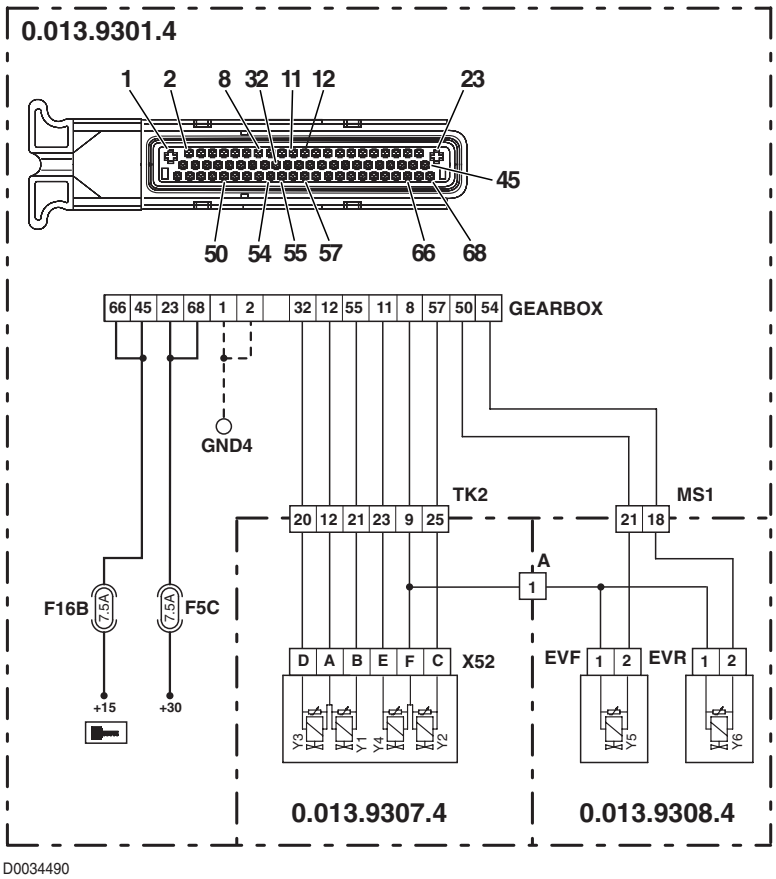
The control unit detects that the "FIELD" mode selector solenoid Y5 is shorting to earth

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVF” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVF” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *B6*

← *B6-FRRS EV strada*
TC-Circ. aperto uscita

DESCRIPTION

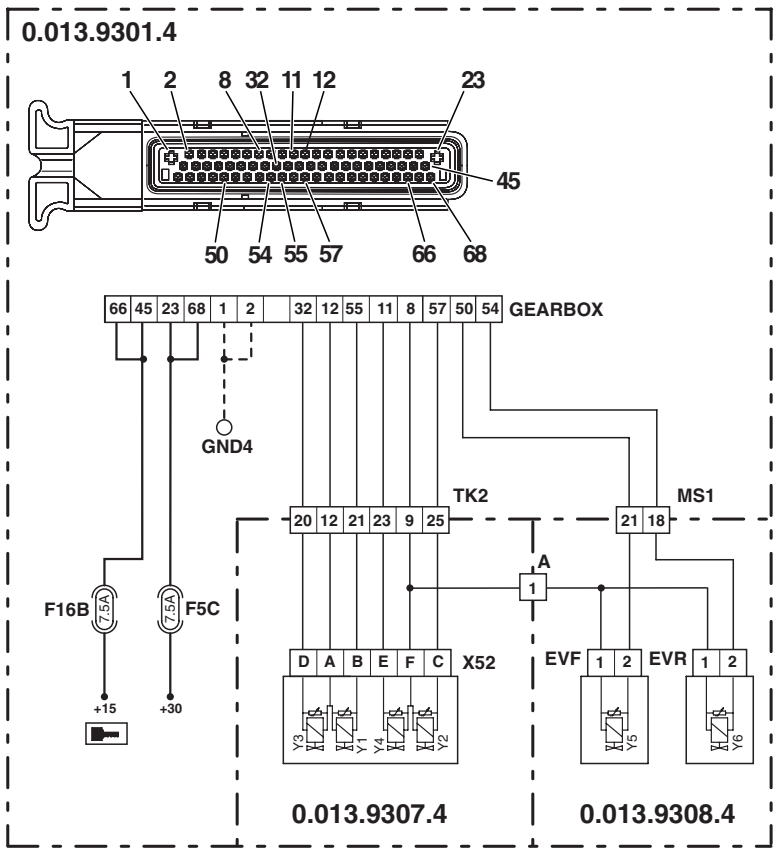
The control unit detects that the "ROAD" mode selector solenoid Y6 is disconnected

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVR” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EVR” and to pin 50 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *B7*

← *B7-FRRS EV strada*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the "ROAD" mode selector solenoid Y6 is shorting to battery positive

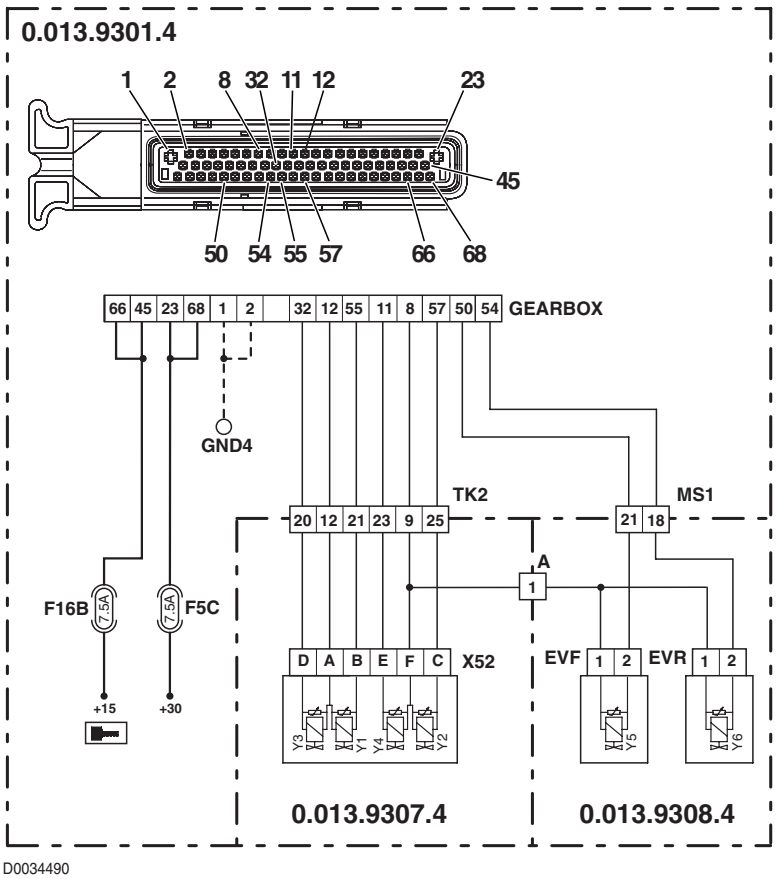
ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE
This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVR” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVR” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *B8*

← *B8-FRRS EV strada*
TC-Corto massa uscita

DESCRIPTION

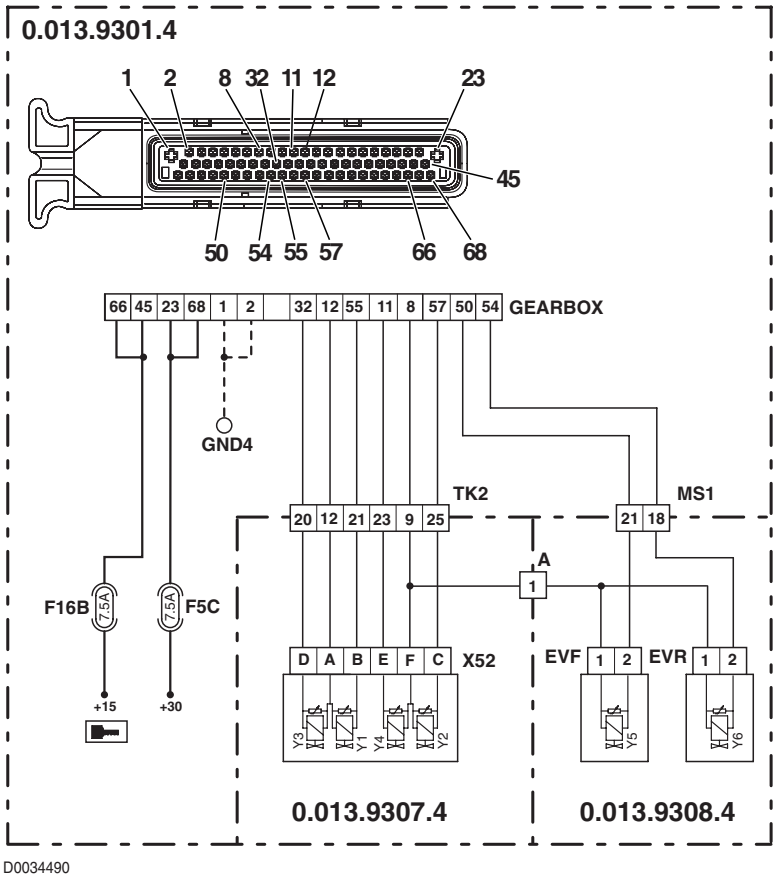
The control unit detects that the "ROAD" mode selector solenoid Y6 is shorting to earth

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVR” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVR” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034490

← *B9*

← *B9-EV Blocco Neutra*
TC-Circ. aperto uscita

DESCRIPTION

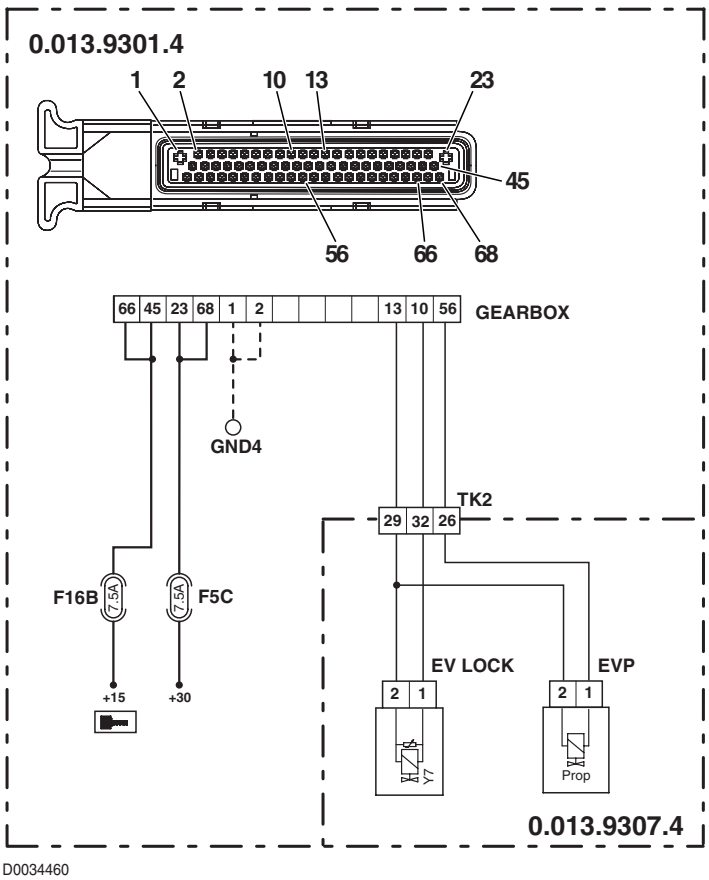
The control unit detects that the gearbox neutral lock solenoid Y7 is disconnected

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVLOCK” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in position “O” (OFF), connect a test meter to pin 1 of connector “EVLOCK” and to pin 10 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034460

← *BA*

← *BA-EV Blocco Neutra*
TC-Corto +12V uscita

DESCRIPTION

The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to battery positive

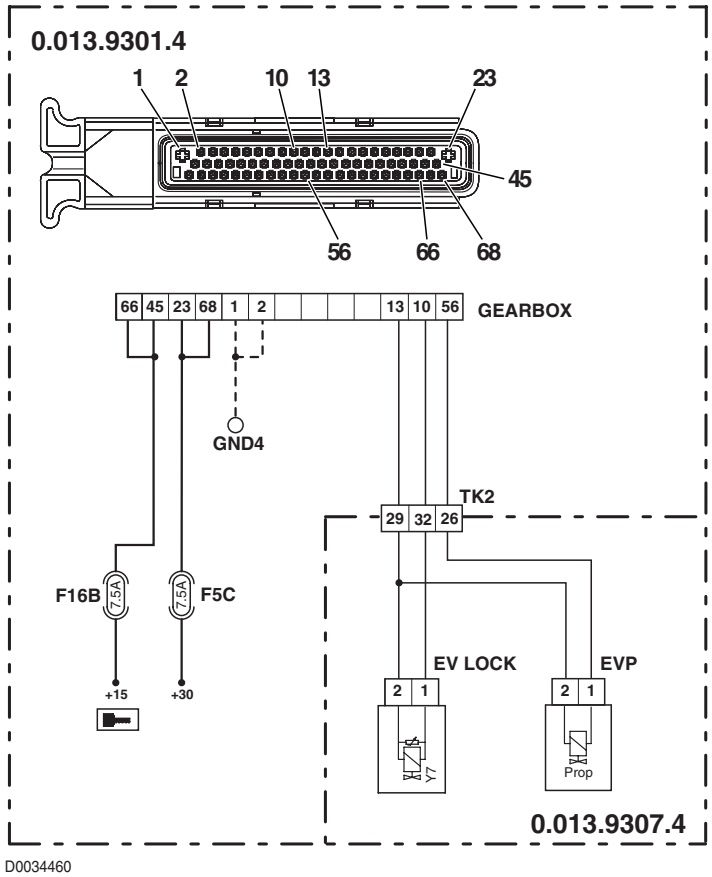
ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE
This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVLOCK” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 2 of connector “EVLOCK” and to the earth on the transmission and check for 0 voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034460

← *BB*

← *BB-EV Blocco Neutra*
TC-Corto massa uscita

DESCRIPTION

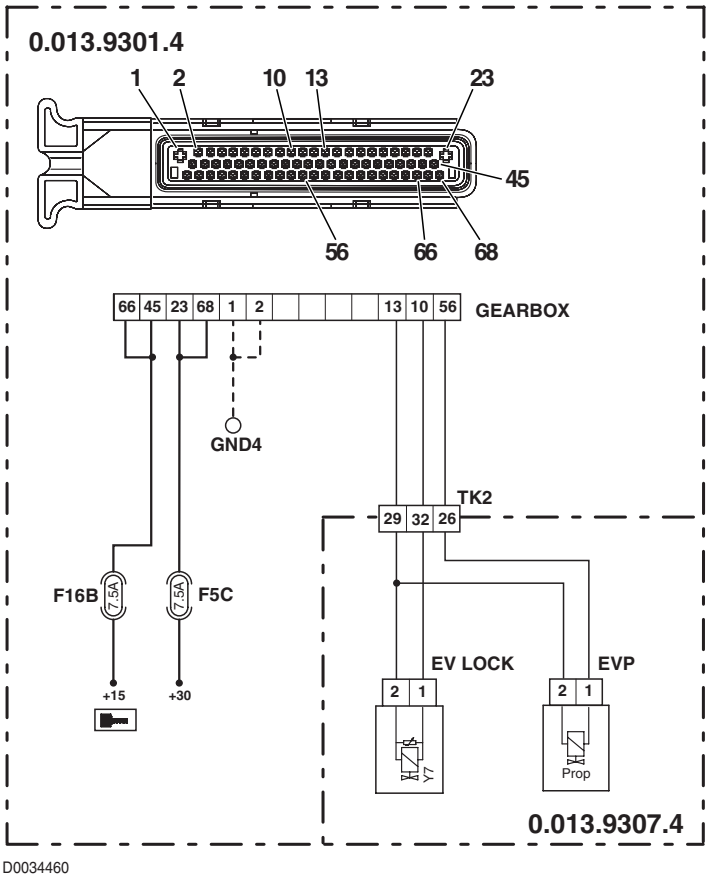
The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to earth

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on the “EVLOCK” connector and on the "GEARBOX" transmission control unit are not oxidized and are firmly secured.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 1 of connector “EVLOCK” and to the earth on the transmission and test the resistance to check for shorts to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0034460

← *C0*

← *C0-Msg PTCTL1 REQGEAR*
TC-Errore Segnale CAN

DESCRIPTION

The transmission control unit detects an error in the information received by the HLHP control unit regarding the request for range gear engagement.

ECU RESPONSE

The control unit limits operation to "LIMP-HOME-LS" mode.

CHECK

- Connect the ART to the HLHP control unit and check in the “3.1.1 DIGITAL INPUTS” menu that range up and down buttons in the gearbox lever operate correctly.
- Check whether there are any alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter “CANBUS LINE ALARMS”.
- Cancel all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position: if the alarm is still present, the control unit must be renewed.

← *C1*

← *Msg PTCTL1 TRAVDIR*
Dispositivo guasto

DESCRIPTION

The transmission control unit detects an error in the information received by the HLHP control unit regarding the request for direction of travel selection.

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode if the shuttle lever operates correctly, otherwise to "TRANSMISSION-SHUTDOWN" mode.

CHECK

- Connect the ART to the armrest console and check in the “2.1 Joystick” menu that the travel direction selection buttons operate correctly.
- Connect the ART to the HLHP control unit and check whether there are any active or passive alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter “CANBUS LINE ALARMS”
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position: if the alarm is still present, the control unit must be renewed.

← *C3*

← *C3-Msg EEC1 ENGSPEED*
TC-Errore Segnale CAN

DESCRIPTION

The transmission control unit detects an error in the information received by the ECU regarding the communication of engine speed.

ECU RESPONSE

The control unit limits operation to "LIMP-HOME-LS" mode.

CHECK

- Connect the ART to the HLHP control unit and check, in the “3.1.2 INPUT FREQ” menu, that the engine speed signal is correctly transmitted via the CANBUS.
- Check that the engine control unit does not detect any alarms regarding the CANBUS as active or passive alarms and, if necessary, test the wiring following the instructions given in the chapter "5.6 CANBUS ALARMS".
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position: if the alarm is still present, the control unit must be renewed.

← *CF*

← *CF-Messaggio EEC1*
TC-Timeout CAN Msg

DESCRIPTION

The transmission control unit detects a fault on the CANBUS line.

ECU RESPONSE

The control unit limits operation to "LIMP-HOME-LS" mode.

CHECK

- Check that the contacts on the connector "GEARBOX" are not oxidized and are firmly secured.
- Check the CANBUS following the instructions given in the chapter "5.6 CANBUS ALARMS".
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *D1*

← *D1-Msg LIMITATION*
TC-Timeout CAN Msg

DESCRIPTION

The transmission control unit detects a fault on the CANBUS controller.

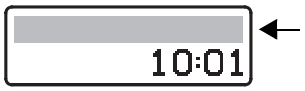
ECU RESPONSE

The control unit does not limit tractor operation.

CHECK

- Connect the ART to the HLHP control unit and check whether there are any alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter "5.6 CANBUS ALARMS".
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *D2*



← *D2-Msg HPSACTRL*
TC-Timeout CAN Msg

DESCRIPTION

The transmission control unit detects a fault on the CANBUS controller.

ECU RESPONSE

The control unit does not limit tractor operation.

CHECK

- Connect the ART to the HLHP control unit and check whether there are any alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter "5.6 CANBUS ALARMS".
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *EE*

DESCRIPTION

The display detects a problem of communication with the transmission control unit.

CHECK

- Check the electrical connection between transmission display and control unit.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

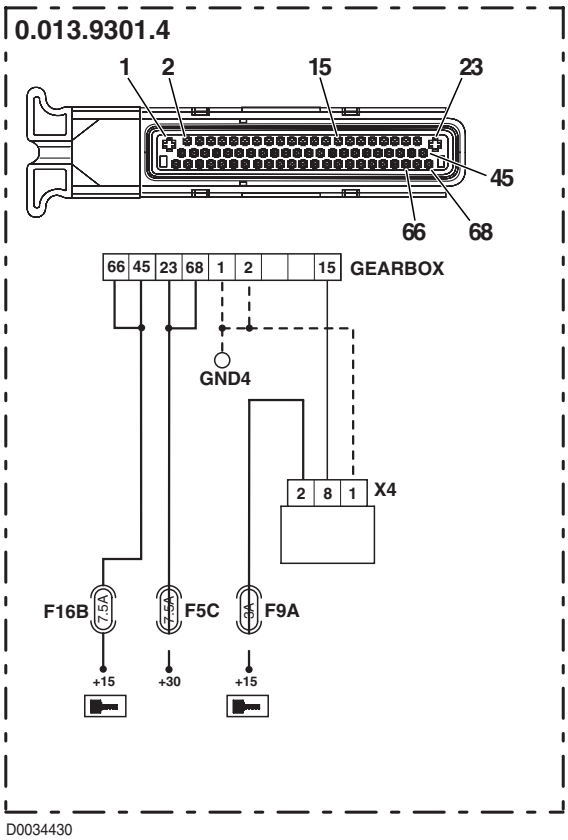
← *GEN1*

DESCRIPTION

EDS software unable to connect to the transmission control unit.

CHECK

- Turn the starter key first to “O” (OFF) and then back to the “I” (ON) position, and try connecting to the transmission control unit.
- Check the condition of the transmission control unit power supply fuses F5C and F16B
- With the starter key in the “O” (OFF) position check that the control unit is receiving power correctly (12V between pin 23 and pin 68 (positive) and pin 1 and pin 2 (negative) of connector “GEARBOX”).
- With the starter key in position “I” (ON), check that the control unit is receiving power correctly (12 V between pin 21 and pin 45 (positive) and pin 1 and pin 2 (negative) of the "GEARBOX" connector).
- With the starter key in position “O” (OFF) and "GEARBOX" connector disconnected, connect a test meter to pin 8 of connector “X4” (diagnostic connector) and to the earth on the cab and test the resistance to check for shorts to earth (meter reading: infinity).
- With the starter key in position “I” (ON) and "GEARBOX" connector disconnected, connect a test meter to pin 8 of connector “X4” (diagnostic connector) and to the earth on the cab and check for 0 voltage (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 8 of connector “X4” (diagnostic connector) and to pin 15 of connector "GEARBOX" and measure the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- If the fault cannot be traced and rectified through this procedure, fit a new control unit.



← *GEN2*

DESCRIPTION

Transmission switches unexpectedly from forward or reverse drive into neutral.

ECU RESPONSE

The display indicates forward drive, reverse drive and neutral status simultaneously, and a continuous beep is sounded.

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch and the clutch pedal.
- Check the wiring, following the procedures described for alarms 53, 54, 55, B0, B1 and B2.
- Check the pressure in the hydraulic circuit of the transmission system.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *GEN3*

DESCRIPTION

The transmission continues to shift range automatically every 1 or 2 seconds

ECU RESPONSE

None.

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch and the clutch pedal.
- Check the wiring, following the procedures described for alarms 36, 37, 38, 39, 40 and 41.
- Check the wiring, following the procedures described for alarms 53, 54, 55, B0, B1 and B2.
- Check the pressure in the hydraulic circuit of the transmission system.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

← *GEN4*

DESCRIPTION

Momentary loss of traction with the tractor in motion

ECU RESPONSE

None.

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch and the clutch pedal.
- Check the wiring, following the procedures described for alarms 53, 54, 55, B0, B1 and B2.
- Check the pressure in the hydraulic circuit of the transmission system.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

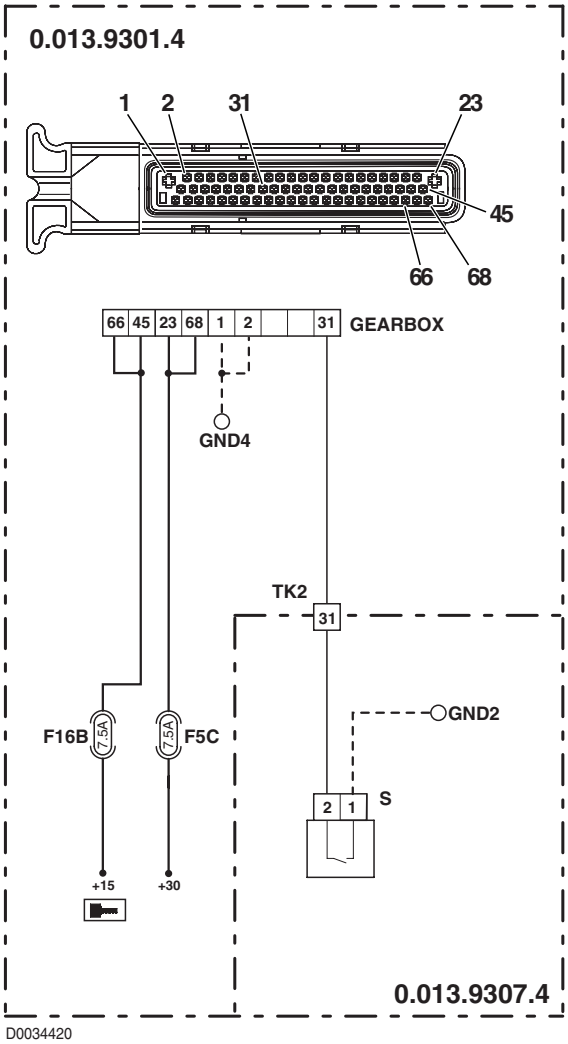
← *GEN5*

DESCRIPTION

The transmission remains in neutral

CHECK

- Check that the contacts on the “S” connector of the starter enable switch and on the "GEARBOX" lift control unit are not oxidized and are firmly secured.
- Check that the switch is functioning correctly (for details, see Group 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “S” and to pin 31 of connector "GEARBOX" and measure the resistance to verify that there is electrical continuity (test meter reading 0 Ohm).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0034420

PAGE INTENTIONALLY
LEFT BLANK

5.5 ARMREST ALARMS

The armrest informs the operator of any malfunction affecting monitored components, both audibly and visually by way of the Infocenter.

Connecting the ART® to the armrest makes it possible to view the complete list of alarms detected in the form of short descriptive messages, while connecting the ART® to the HLHP control unit makes it possible to display the list in the form of numerical codes designated *SPN* (*S*uspect *P*arameter *N*umber i.e. possible faulty device) and *FMI* (*F*ailure *M*ode *I*dentifier) and the number of times the alarm in question has occurred.

On Infocenter	*On Art HPSA SPN-FMI*	*On armrest ART*	*Description*	*Page*
Bracciolo, Errore scheda	SPN 634-FMI 12	Massa Pot.guasta	Internal error detected	20-279
Bracciolo,flusso distrib.3 scollegato	SPN 635-FMI 4	Joy dist3 scoll.	Cntr. valve 3 potentiometer disconnected	20-279
Bracciolo,flusso distrib.4 scollegato	SPN 636-FMI 4	Joy dist4 scoll.	Cntr. valve 4 potentiometer disconnected	20-279
Bracciolo,flusso max. distrib.3 disconnesso	SPN 641-FMI 4	Pot.Dist3F.scol.	Cntr. valve 3 max. flow potentiometer disconnected	20-281
Bracciolo,flusso max. distrib.4 disconnesso	SPN 642-FMI 4	Pot.Dist4F.scol.	Cntr. valve 4 max. flow potentiometer disconnected	20-281
Bracciolo,flusso distrib.1 disconnesso	SPN 637-FMI 4	Pot.Dist1F.scol.	Cntr. valve 1 max. flow potentiometer disconnected	20-280
Bracciolo,flusso, distrib.2 disconnesso	SPN 639-FMI 4	Pot.Dist2F.scol.	Cntr. valve 2 max. flow potentiometer disconnected	20-280
Bracciolo,memoria blocco 0 in errore	SPN 648-FMI 2	E2P CONFIG BRACC	Incorrect group 0 memory configuration	20-284
Bracciolo,memoria blocco 1 in errore	SPN 649-FMI 2	EEPROM FILTER1	Incorrect group 1 memory configuration	20-284
Bracciolo,memoria blocco 2 in errore	SPN 650-FMI 2	EEPROM FILTER 2	Incorrect group 2 memory configuration	20-285
Bracciolo,memoria blocco 3 in errore	SPN 651-FMI 2	EEPROM FILTER 3	Incorrect group 3 memory configuration	20-285
Bracciolo,memoria blocco 4 in errore	SPN 652-FMI 2	EEPROM FILTER 4	Incorrect group 4 memory configuration	20-285
Bracciolo,memoria blocco 5 in errore	SPN 657-FMI 2	EEPROM CALIB	Incorrect group 5 memory configuration	20-286
Bracciolo,potenziom. APS scollegato	SPN 696-FMI 4	Pot.APS.scol.	APS potentiometer disconnected	20-286
Bracciolo,tempo, distrib.1 disconnesso	SPN 638-FMI 4	Pot.Dist1T.scol.	Cntr. valve 1 time set potentiometer disconnected	20-280
Bracciolo,tempo, distrib.2 disconnesso	SPN 640-FMI 4	Pot.Dist2T.scol.	Cntr. valve 2 time set potentiometer disconnected	20-281
Bracciolo,tensione 12V non corretta	SPN 644-FMI 8	Alimentaz. 12V	Incorrect 12V power supply	20-282

Bracciolo,tensione 5V dist. non corretta	SPN 647-FMI 8	Alimentaz.5V INT	Cntr. valve potentiometer 5V power supply incorrect	20-284
Bracciolo,tensione 6V non corretta	SPN 645-FMI 8	Alimentaz. 6v8	Incorrect 6V voltage	20-283
EXT Bracciolo, tensione 5V non corretta	SPN 646-FMI 8	Alimentaz.5V	Lift unit console power supply voltage incorrect	20-283

← *SPN 634 - FMI 12*
Massa Pot. guasta

← *Bracciolo*
Errore scheda

DESCRIPTION

Internal error detected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

← *SPN 635 - FMI 4*
Joy dist3 scoll.

← *Bracciolo, flusso*
distrib.3 scollegato

DESCRIPTION

Detection: control valve 3 potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

← *SPN 636 - FMI 4*
Joy dist4 scoll.

← *Bracciolo, flusso*
distrib.4 scollegato

DESCRIPTION

Detection: control valve 4 potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 637 - FMI 4
Pot.Dist1F.scol.

Bracciolo, flusso distrib.1 disconnesso

DESCRIPTION

Detection: control valve 1 max. flow potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 638 - FMI 4
Pot.Dist1T.scol.

Bracciolo, tempo distrib.1 disconnesso

DESCRIPTION

Detection: control valve 1 time set potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 639 - FMI 4
Pot.Dist2F.scol.

Bracciolo, flusso distrib.2 disconnesso

DESCRIPTION

Detection: control valve 2 max. flow potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 640 - FMI 4
Pot.Dist2T.scol.

Bracciolo, tempo distrib.2 disconnesso

DESCRIPTION

Detection: control valve 2 time set potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 641 - FMI 4
Pot.Dist3F.scol.

Bracciolo, flusso max. distrib.3 disconnesso

DESCRIPTION

Detection: control valve 3 max. flow potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 642 - FMI 4
Pot.Dist4F.scol.

Bracciolo, flusso max. distrib.4 disconnesso

DESCRIPTION

Detection: control valve 4 max. flow potentiometer disconnected

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 644 - FMI 8
Alimentaz. 12V

Bracciolo, tensione
12V non corretta

DESCRIPTION

The control unit has detected that the battery voltage is off range (lower than 10.0V or higher than 15.0V)

NOTE

This alarm is activated generally when the battery voltage is less than 10V.
It can be caused by excessive current draw when the engine is started, or if the battery is damaged or cannot be recharged by the alternator.
This alarm is generally only displayed as a passive alarm on the ART. Should the alarm be displayed among the active alarms, and the battery voltage is within the prescribed range (normal voltage 12V - 13.5V) with the engine on, the armrest must be renewed.

CAUTION

Never connect the ART with the engine running when this alarm is displayed on the Infocenter as the instrument could be damaged if the alarm is activated by a excessive battery voltage.

CHECK

- Check, with the engine off, that the battery voltage is within the prescribed range (normal voltage 12V - 13.5V). Lower voltage values can be detected after prolonged disuse of the tractor although this does not make it necessary to change the battery.
- Check first whether or not the battery voltage returns to normal with the engine running. In this instance the problem may be attributable to the battery being discharged or damaged; if not, and the voltage remains lower or higher than the prescribed minimum, the trouble is being caused by incorrect operation of the alternator.

NOTE

In extreme cases, when the battery is seriously damaged (short-circuiting), the alternator may not be able to recharge the cells or generate sufficient voltage. Before changing the alternator, verify its correct or incorrect operation by connecting a new battery.

SPN 645 - FMI 8
Alimentaz. 6v8

Bracciolo, tensione
6V non corretta

DESCRIPTION

Detection: Incorrect 6V voltage

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 646 - FMI 8
Alimentaz.5V EXT

Bracciolo, tensione
5V non corretta

DESCRIPTION

Detection: lift unit console power supply voltage incorrect.

CHECK

- Check that the contacts on the “X47” connector of the lift console and “X11” connector of the armrest are not oxidised and are firmly secured.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 10 and to pin 11 of connector “X47” (console side) and measure the resistance to check for electrical continuity (test meter reading: 800 - 1000 Ohm).
  If the resistance differs from this value, fit a new lift console.
- With the starter key in position “O” (OFF), connect a test meter to pin 10 of connector “X47” of the console (wiring side) and to the earth on the cab and perform a resistance test to check for shorts to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pin 10 of connector “X47” of the console (wiring side) and to the earth on the cab and perform a resistance test to check for shorts to battery positive (meter reading: 0 V).
- With the starter key in position “I” (ON), check that the lift console is receiving power correctly (5 Vdc between pin 10 (positive) and pin 11 (negative) of wiring side connector “X47”) .
- If the fault is not identified by the above checks, it can be attributed to a defective controls unit (located under the tip-up armrest), and can be remedied by renewing the controls unit.

SPN 647 - FMI 8
Alimentaz.5V INT

Bracciolo, tensione 5V dist. non corretta

DESCRIPTION

Detection: potentiometer power supply control valve incorrect 5V voltage

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 648 - FMI 2
E2P CONFIG BRACC

Bracciolo, memoria blocco 0 in errore

DESCRIPTION

Detection: Incorrect group 0 memory configuration

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 649 - FMI 2
EEPROM FILTER1

Bracciolo, memoria blocco 1 in errore

DESCRIPTION

Detection: Incorrect group 1 memory configuration

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 650 - FMI 2
EEPROM FILTER2

Bracciolo, memoria blocco 2 in errore

DESCRIPTION

Detection: Incorrect group 2 memory configuration

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 651 - FMI 2
EEPROM FILTER3

Bracciolo, memoria blocco 3 in errore

DESCRIPTION

Detection: Incorrect group 3 memory configuration

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 652 - FMI 2
EEPROM FILTER4

Bracciolo, memoria blocco 4 in errore

DESCRIPTION

Detection: Incorrect group 4 memory configuration

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 657 - FMI 2
EEPROM CALIB

Bracciolo, memoria blocco 5 in errorer

DESCRIPTION

Detection: Incorrect group 5 memory configuration

CHECK

- The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

SPN 696 - FMI 4
Pot.APS.scol.

Bracciolo, potenziom. APS scollegato

DESCRIPTION

Detection: APS potentiometer disconnected

CHECK

The only way to solve this alarm is to renew the controls unit located under the tip-up armrest.

6. ENGINE CONTROL UNIT TESTER PROGRAM

6.1 ACCESS AND COMUNICATION

SERDIA (diagnostics and service) is a PC software application that allows communication with the control units mu means of a notebook PC and interface.

The SERDIA program supports control units DEUTZ EMR1, EMR2, EMS2 and MVS and allows communication with several control units with just one program.

The updated version is communicated by means of service communications.

All modifications relative to settings, parameterisation, cancellation of error memories and calibration of control units are possible only with SERDIA.

SERDIA operates with Windows 2000 - XP operating systems.

The user interface makes it possible to retrieve all functions required simply by clicking the buttons with the mouse.

The following menu options can be open:

- Control units selection
- Parameterisation
- Error memory
- Operation test
- Activities
- Instruments

6.1.1 MINIMUM RESOURCES

The following minimum standards and resources are required for SERDIA operation:

- Notebook or PC with USB serial interface.
- Video card: minimum VGA
- 80486 processor (higher)
- Minimum memory 256 MB RAM
- Approx. 50 Mb free space on HD
- CD-Rom drive
- Software: Windows 2000 operating system or more recent version

6.1.2 ORDERING

SERDIA, and all special DEUTZ tools, can be ordered from:

SAME-DEUTZ-FAHR ITALIA S.p.A.

Viale F. CASSANI, 15

24047 TREVIGLIO (BG) - ITALY

6.1.2.1 INITIAL UTILISATION

For the initial utilisation we recommend the SERDIA package (LEVEL III) P/N 5.9030.740.4/30.

Supply:

- SERDIA software
- diagnostic interface with user level implemented
- concise installation instructions
- reference with tools and adapters for fault finding procedures
- carrying case

6.1.2.2 ORDERING OF INDIVIDUAL ITEMS

Meaning	*Competence level*	*Order N°*

Installation disk		5.9030.740.0/10
Level III interface	General revision	5.9030.740.2/10

6.1.2.3 ADAPTER

Individual OEMs have their own diagnostic connectors. Therefore the SERDIA interface calls for the use of an intermediate element (adapter) between the 12-pin DEUTZ connector and the respective OEM connector.

For diagnostics of DEUTZ-Fahr tractor engines SAME-DEUTZ-FAHR GROUP supplies suitable adapters (DEUTZ 12-pin -> DFA 14-pin) as genuine original spare parts:

ORDER N° 5.9030.741.0

6.1.3 CONNECTION OF NOTEBOOK AND SOFTWARE INSTALLATION

6.1.3.1 INSTALLATION OF SERDIA 2000

If the WINDOWS operating system is not yet installed on your hard disk, install it now following the installation instructions supplied with the software.

6.1.3.2 USER LEVELS, ACCESS AUTHORISATION

DEUTZ Service has provided three different user levels for SERDIA users (I, II, III,). The levels are preset in the interface.

The reason for the different access levels is to prevent unauthorised personnel from tampering with individual parameter settings (similar to the lead seals applied to the injection pumps).

With this access authorisations system, a filter is implemented whereby only the parameters and function fields permitted for the various user levels are accessible.

6.1.3.3 CREATION OF CONNECTION BETWEEN CONTROL UNIT (ENGINE) AND NOTEBOOK

Communication specifications:

- Serial communication
- BaudRate = 9600
- Serialport = COM1

SERDIA supplies as standard an interface for connection between the control unit and the customer's notebook PC. Even though

several security measures are implemented in the interface and in the control unit, including reverse polarity protection,

protection against voltage surges and galvanic separation, it is not possible to eliminate completely the risk of errors, therefore the connection

of the notebook with the control units must be carried out in strict compliance with the following instructions.

Procedure for connection taking care to observe the specified sequence of operations:

1) Switch off the engine by switching off the starter switch (terminal 15). Do not switch on the notebook PC yet.
2) Connect the interface diagnostic connector with the diagnostic connection on the vehicle, system.

The diagnostic connector must be fitted by the customer and can be included in the DEUTZ supply on request.

3) Connect the other side of the interface with the RS 232/COM1 serial port (9-pin connector on the rear of your notebook PC).

Note: on PCs the COM1 port may be occupied by the mouse. In this case you must connect the interface cable to the second serial port (COM2) which must then be configured (see chapter What to do if...?).

4) You can now switch on the starter switch (cl.15) and power up the notebook. The engine must not be started.
5) Launch the SERDIA application as described in chapter 1.8, launching the program.

6.1.3.4 LAUNCHING THE PROGRAM

In the Windows operating system the SERDIA program will open by double clicking the corresponding icon.

The first time you use the program:

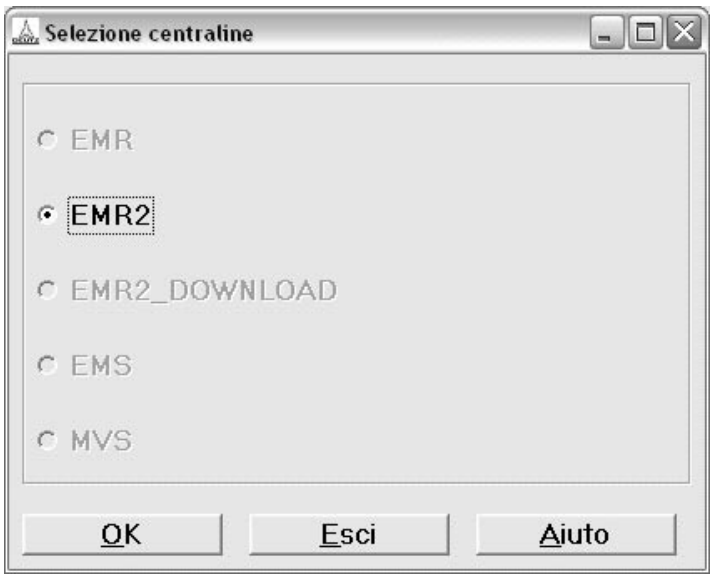
the first time the program is opened it will initially perform a control unit recognition routine. SERDIA checks which control units

are connected and with which control units it is possible to communicate. This procedure may last around 30 seconds, because the program

successively interrogates all the possible control units. During this interval the message "searching for connected control units"

will be displayed on the screen. Immediately afterwards the screen shows the "Control unit selection" form, in which any unrecognised control units

are displayed in grey.



- Select the required control unit and confirm with OK.
- The message "Initialisation active!" is displayed (lasting approximately 7 seconds). A connection with the control unit is established.

Relaunching the program:

SERDIA records the last control units recognised at the time of the previous program launch (e.g. EMR2). If said control units are connected during the second program launch, SERDIA will skip the recognition phase and starts initialising the control units immediately. This significantly reduces the time required for the program to open.

The message "Initialization active" is displayed (duration of approx. 7 seconds). A connection with the control unit is established.

If another control unit has been connected before relaunching the program, the recognition procedure is started (duration approx. 30 seconds).

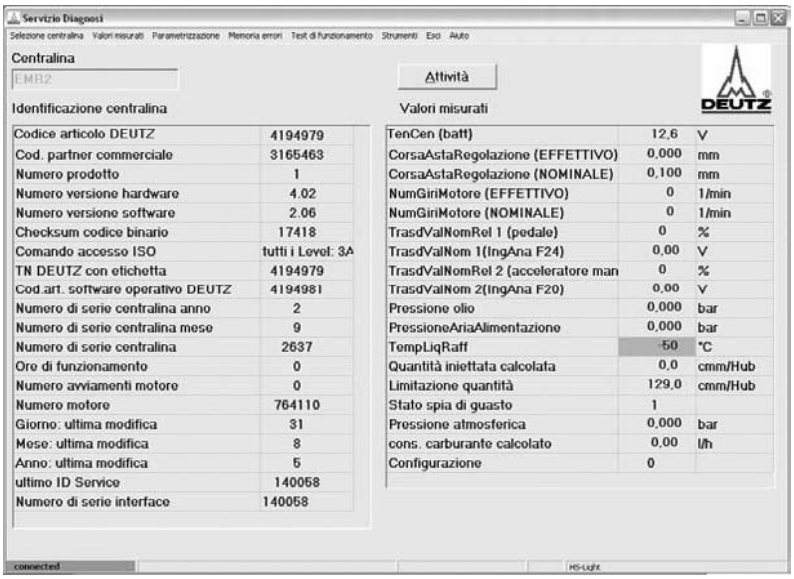
For engines with two control units (e.g. EMR with EMS2) it is possible to select the required control unit, performing a new recognition procedure (see 2.1).

6.1.3.5 PROCEDURE FOR COMMUNICATION WITH THE CONTROL UNIT

Possible communication procedure:

after having performed the communication procedure correctly the main screen form is displayed "Service diagnostic" with the fields "Control Units", "Control unit identification" and "Measured values" (see Control unit selection chapter).

In addition to a selection menu, said forms contain the "Activity" button (see "Activity" chapter).



The communication status between the PC/notebook and control unit is represented by means of text and a coloured section in the status bar:

Yellow (flashing): ISO blocks processing, i.e. exchange of data (e.g. measured values) between SERDIA and the control unit.

Green (flashing): ISO connection OK, i.e. only blocks are exchanged to maintain communication between SERDIA and the control unit active.

red: communication interrupted.

Communication procedure failed:

the communication procedure can fail for the following reasons:

- No control unit or interface connected
- Communication error, see Errors chapter in the communication procedure.

In both cases an error message is displayed and SERDIA proposes offline mode, see the Offline Mode chapter.

6.1.3.6 OFFLINE MODE

If no control unit/engine and/or interface is available, you can use SERDIA in password protected mode or in DEMO mode for training purposes.

Password protected mode and DEMO mode are proposed by SERDIA whenever an incorrect communication procedure is signalled.

Click on "OK". Select the required mode in the "Confirm" window.

6.1.3.7 PASSWORD PROTECTED MODE

If you confirmed by clicking "Yes", after entering password 4000000 authorised users can read and print data, although the cannot edit them.

6.1.3.8 DEMO MODE (TRAINING WITHOUT CONTROL UNIT)

If you press "No" the program enters DEMO mode.

1) In this mode you can practice using SERDIA without values.
2) You can read and print the graphics stored in the program.

On the contrary, in this mode it is not possible to perform operating tests of the control unit functions, for example.

6.1.4 PROGRAM COMMANDS

1) In "Windows" open the SERDIA program
2) From the main menu screen of SERDIA click on "Control unit selection".
3) From the "Control unit selection" screen select the required control unit
4) From the main SERDIA screen select the required menu option

6.1.4.1 MAIN SCREEN, MENU SELECTION

Menu item	*Control units*	*Explanation*
Control unit selection		
Control unit selection	All	Selection of required control unit (you can select just one control unit)
Print	all	Export the values measured or the identification data of the control unit to a printer or file
Protocol	all	Port configuration (Level IIIa only)
New recognition	all	New control unit recognition
Load operating software	EMR2	Load operating software in EMR2 (Level IIIa only)
Engine switched off	EMR2	Remote engine switch off
RG Reset	EMR2	Control unit reset
Measured values		
Current measured values	all	Display of all current values (also with engine stopped, but with U-Batt.).
Ram values	all	EMR1: Level II only, EMR2: Level III, IIIa
In/Out Allocation	all	Allocation of signals utilised to control unit pins
CAN status	all	Single CAN monitor
Parameterisation		
Configuration	all	Read and edit configuration
Programming complete		Level III, IIIa only
Calibration		Data logger calibration, e.g. pedal travel transducer
Errors memory		
Errors memory	all	Read, display, and clear errors memory
Errors memory 2	EMR2	Read, display, and clear errors memory (Level III, IIIa only)
Operating test		Control actuators, e.g. regulation element actuation (Level III, IIIa only)
Extra		
Maximum speed	EMR2	Selection of three different max. speeds
Logistic data	all	
Collective load	EMR2	
Maintenance data		
Help	all	General help for main menu form and relative buttons.
Activity	EMR2	For specific maintenance tasks

6.1.4.2 MENU OPTION "CONTROL UNIT SELECTION"

SERDIA can communicate only with one control unit. Therefore the first step is to select the required control unit by clicking on "Control unit selection" in the menu.

For more information refer to the chapter Control unit selection.

6.1.4.3 "MEASURED VALUES" ("CURRENT MEASURED VALUES") MENU OPTION

From a list of values measured including the inputs and outputs, you can select and display a series of values.

The displayed values that have exceeded an upper or lower limit value (if set) are highlighted by means of colours.

The values displayed are exclusively the measurement points associated with the control unit in question, with the following distinction

- read values
- read electronic system values

sorted by

- definition
- value
- unit

The values are updated with a predefined scanning frequency. They can be displayed with engine running or with engine stopped.

For more information refer to the chapter Measurement values.

6.1.4.4 "PARAMETERISATION" MENU OPTION

The numerous facilities available in relation to DEUTZ control units make it necessary to carry out targeted programming specifically adapted in relation to the various operating conditions. If requested by the customer, modifications can be made to the parameterisation, adaptations to local situations, or replacements, all of which make it necessary to access the programming data.

Modifications to the parameterisation are only possible by means of SERDIA!

This menu option is also utilised to replace screwdriver settings, which are required in the case of analog control units.

Within the framework of preset limits, individual parameters can be edited (such as, for example, dynamic behaviour).

Parameterisation is performed in two separate screens, one for configuration and one for calibration. Access to the fields of the various screens depends on the authorisation level of the connected user. Fields for which the user does not have the necessary access privileges are not displayed.

6.1.4.5 "ERRORS MEMORY" MENU OPTION

This menu option is used to read the error messages stored in the control units.

Error messages refer exclusively to the electrical engine equipment, such as the wiring and the data logger. For example, a typical error message could be "A general fault has occurred or a cable is broken/short circuited".

Only passive error messages can be deleted. Active error messages will remain in the memory.

Active error messages can be transformed into passive error messages by eliminating the relative error.

Error messages are retained in the memory also when the battery/power supply is connected.

The following information is displayed together with the error message:

- error position
- error type
- ambient data at time of error
- total number of errors (relative to the positions)
- frequency
- error status (active/passive)
- emergency mode operation (yes / no)

SERDIA offers auxiliary functions for the elimination of errors. You can also use the menu options "Measurement values" and "Operating tests". For more information refer to the chapter Errors memory.

6.1.4.6 "OPERATING TESTS" MENU OPTION

SERDIA supports a large number of operating tests divided in accordance with the specific control unit (e.g. test of adjustment element for EMR2).

Testing operating performance offers a valuable tool, especially in relation to troubleshooting procedures and maintenance work.

For example, you can activate and test individual outputs of the control units by selecting test mode.

CAUTION: The tractor engine must be switched off

In the operating test the actuators of the tester program are activated by bypassing the running software of the control unit.

Actuators are switched on or off in the nominal value column by clicking on the control box alongside the description of the actuator. The reactions of the status of the actuator activated by the control unit are displayed under the real value.

The actuator status test always resides in the control unit and can be transmitted to SERDIA exclusively from the control unit. In other words, if the effective required value is not obtained, this probably indicates a wiring error. The use of the combination of menu options "Errors memory" and "Operating tests" may be helpful to pinpoint the cause of faults.

For more information on the subject of Operating tests refer to the chapter Operating tests.

6.1.4.7 "TOOLS" MENU OPTION

SERDIA supports a large number of specific tools for the control units.

Various submenus can be opened each of which containing its own video page:

- Top speed
- Logistic data
- Collective load
- Maintenance overrun
- OVerride memory
- Maintenance data

For more information refer to the chapter Tools.

6.1.4.8 HELP

In addition to these operating instructions you can also use SERDIA's Help function. In Windows, click on the "Help" button.

6.1.5 END COMMUNICATION

Before removing the connections between the notebook PC and the engine control unit, go back to the main screen page and click on "Exit".

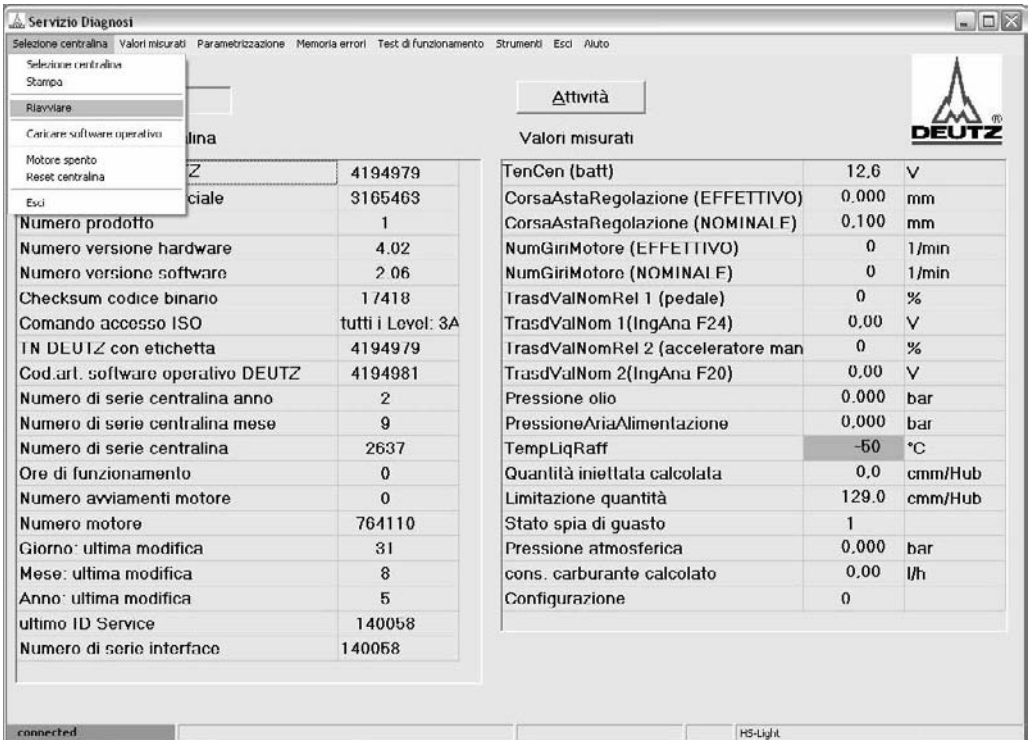
If any parameters have been changed it may be advisable to check the current parameterisation. To do this, proceed as follows:

1. Close SERDIA
2. Switch off the engine power supply and then switch it on again.
3. Restart SERDIA
4. Reactivate the control unit
5. Select the "Parameterisation" option
6. From the configuration page click on the "CENTR->PC" button
7. Export the configuration data by clicking the "PRINT" button
8. Print the engine documentation
9. Only once SERDIA is disconnected (after clicking "Exit"), disconnect the engine control unit from the notebook PC (interface with cable).

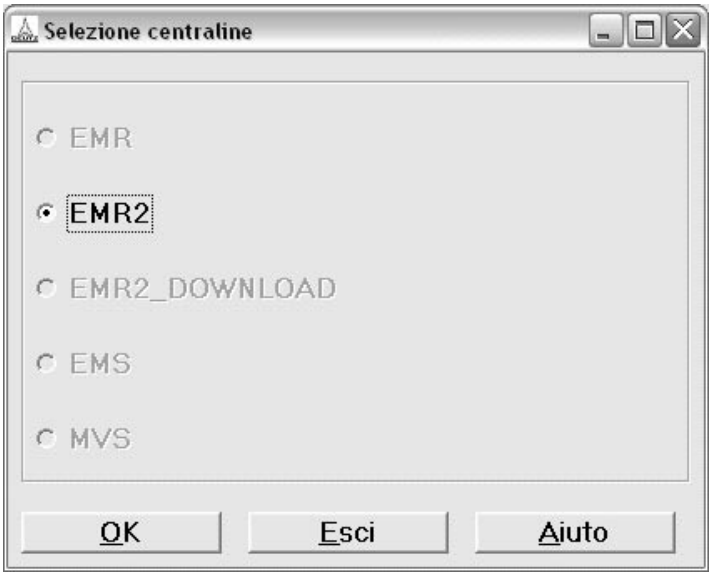
6.2 CONTROL UNIT SELECTION

6.2.1 SELECTION OF TWO CONTROL UNITS

SERDIA automatically attempts to establish a connection with the last control unit recognised. If another control unit has been selected, you need to repeat the control units recognition procedure by means of the "Control uni selection" / "New recognition" menu option (duration approx. 30 seconds).



After the recognition phase the control units selection page will be displayed, showing exclusively the control units that have been recognised. Control units that cannot be selected are shown in grey.



Possible control units:

- EMR1, EMR2 (electronic engine governor)
- MVS (electromagnetic valve system)
- EMS2 (Engine Monitoring System)

6.2.2 PRINT (EXPORT)

The data for identification of the selected control units and the data of other windows can be exported in two different ways:

1) Print to printer

To obtain a printout you will need to select a suitable printer driver in Windows.
The logistic data are shown at the head of all printouts:

- control unit type
- date
- time (system time set on the notebook)
- serial interface number

In addition, data relative to identification of the control unit and data of the measured values are shown.

2) Print to file

The resulting file can be edited, e.g. using Excel.
The following table illustrates the various options for storage of the data of the various video pages:

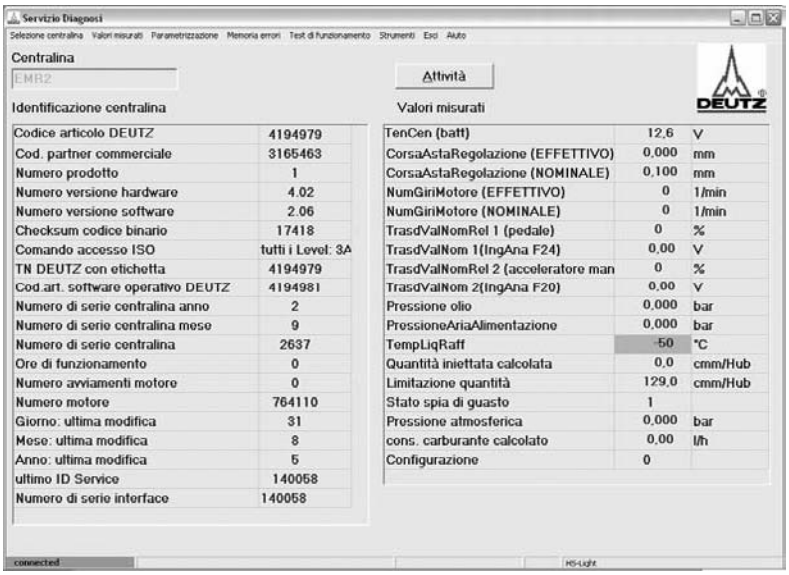
- as a printable file for further processing
- as a configuration file for communication of changes
- as a graphic file (*.egr) that can be read in SERDIA demo mode.

From form	*Key*	*Extension*	*Comment*
Service diagnostics	Print (file)	*.ecu	for further processing, e.g. in Excel
Current measured values	File	*.msv	
RAM values	File	*.msv	for further processing, e.g. in Excel (EMR1: Level IIIa only, EMR2: Level III, IIIa only)
Graphic	(AscII)	*.agr	for further processing, e.g. in Excel
	(Binary	*.egr	readable in DEMO SERDIA mode
Input/Output	Print (file)	*.ino	for further processing, e.g. in Excel
Configuration	Print (file)	*.kfg	
	Save to file	*.hex	configuration file
		*.tds	partial record, Level IIIa only
Complete programming	Control unit-->file	*.hex	configuration file (complete records, Levels III and IIIa)
Errors memory	Print (file)	*.err	for further processing, e.g. in Excel
Logistic data	Print (file)	*.dat	

6.2.3 PROTOCOL

This menu option is provided exclusively for DEUTZ for configuration of the interface.

6.2.4 IDENTIFICATION AND MEASUREMENT DATA



6.2.4.1 MEANING OF IDENTIFICATION DATA

- DEUTZ Part Number: Part number of the selected control unit.
- Commercial partner code: commercial partner code
- Product number:
  Selected control unit type:
  1 = EMR1, EMR2
  2 = MVS
  3 = EMS2
- Hardware version number: this number defines the version of the control unit.
- Software version number: this is the number of the control unit's EEPROM chip. If the number to the left of the decimal point is changed (e.g. from 2. 1 to 3.1), the record will no longer work with the control unit. In this case contact the manufacturer.
- Binary code checksum: binary code
- ISO access command: ISO access commands
- TN DEUTZ with label: label number
- Part number DEUTZ operative software: part number of Deutz management software
- Control unit serial number - Serial number year - Serial number month: year and month serial numbers
- Operating hours: number of engine running hours
- Number of engine starts
- Engine number
- Day of last modification - Month of last modification - Year of last modification: date on which parameterisation was carried out on the control unit
- Last Service ID: serial number of the interface utilised during the last intervention. The first number denotes the intervention level.
- Interface serial number: serial number of the currently used interface.

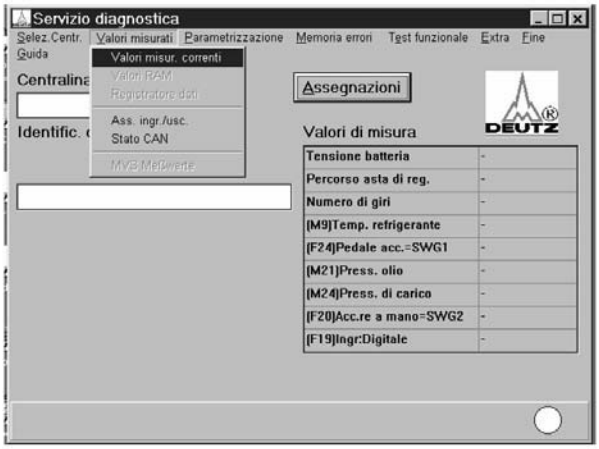
6.2.4.2 MEASUREMENT DATA

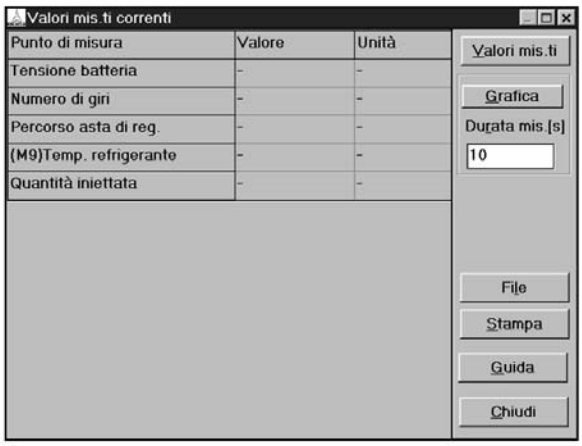
The "Measured values" field shows a part of the measured values.
This selection is not configurable.

6.3 MEASUREMENT VALUES

6.3.1 CURRENT VALUES (IN GENERAL)

The measured values are read cyclically and displayed in the "Current measured values" page.





Values that are outside the measurement rage of the sensor are highlighted by means of the following colours:

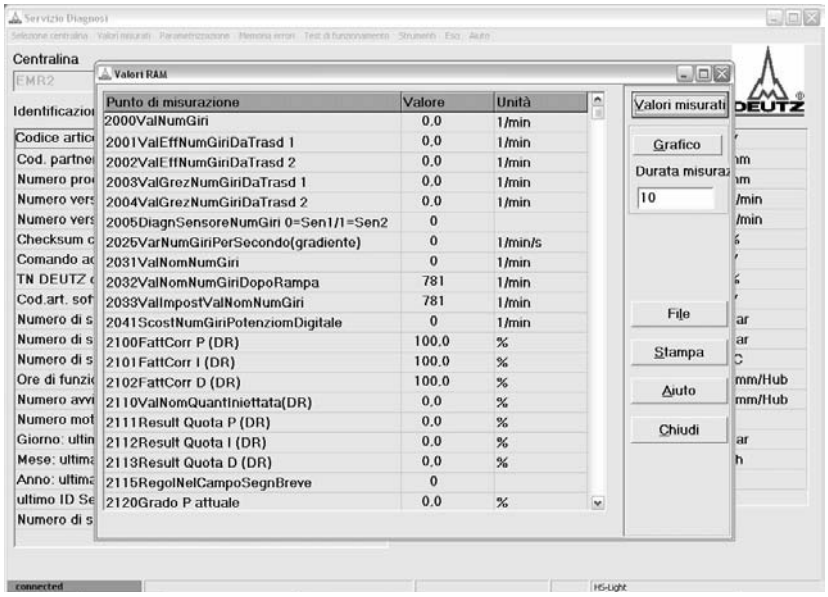
- Yellow: measurement range passed.
- Blue: Measurement range not reached.

EXPLANATION OF FUNCTION BUTTONS:

- *Measured values:* the "Select measured values" window is displayed with all the available values. In this window you can select also the values that you wish to display. In general, the fewer the values to be displayed the higher the display refresh frequency. The number of possible values available varies in accordance with the type of control unit.
- *Graphic:* the "Graphic" button serves to display the time trend of the selected measurement parameters (max. 5 parameters). If you select more than five measurement parameters an error message will be returned.
- *Measurement duration:* the duration of the recording is shown in seconds in the Measurement duration field. The smallest value of measurement duration is one second. The maximum limit is several hours (defined in units of one second). The default setting is 10 seconds.
  The shortest measurement time is
  40 ms for RAM values
  60 ms for other values.
  A measurement duration of 10 seconds results in:
  for RAM values 10,000 ms/40 ms = 250 measurement points
  for all other values 100,000 ms/60 ms = 166 measurement points.
  Since the program offers a maximum of approximately 2000 measurement points, before starting the registration of data the measurement frequency is adapted automatically.
  The smallest possible measurement frequency is given by the duration of the data transmission from the control unit to the PC.
  The more measurement parameters to be displayed simultaneously the greater the duration of the data transmission and the lower the measurement frequency.
- *File:*
  the updated measurement data can be saved to file and retrieved at a later date, e.g. for additional processing with Excel.
- *Print:* the displayed measured values are printed.
- *Exit:* return to the main "Service diagnostics" window.

6.3.1.1 SELECTION OF MEASURED VALUES

A list of the available measured values is displayed.



You can select which values are to be included in this list. The values are selected by clicking the required boxes. No more than five values can be selected for the graphic representation (see 3.1.2 Graphics).
To activate or deactivate a larger number of values use the four buttons to the right of the list. The button functions are as follows:

- *Save:* the selection of displayed values is saved to a file.
- *Open:* the values selection is retrieved from a file.
- *Delete selection:* the display of all values is deactivated.
- *Select all:* display of all values is activated.
- *OK:* to restore the display of current values. Changes in the values selection are saved.
- *Exit:* to return to the display of current values. Changes in the values selection are abandoned.

The following tables show the measured values that can be displayed. For certain parameters you will also need a configuration (see chapter 4 Parameterisation), in which it is possible to assign specific measurement points to the inputs/ outputs of EMR1/EMR2 ("Configuration" menu, page 11: Assignment of inputs to measured values" and "page 13: Assignment of outputs to measured values"). The values required for the configuration of parameters are shown in the table. The assignment can be checked in the "Measured values" menu with the "Illustration of inputs/outputs" menu (see Inputs/Outputs).

6.3.1.1.1 EMR2 MEASURED VALUES

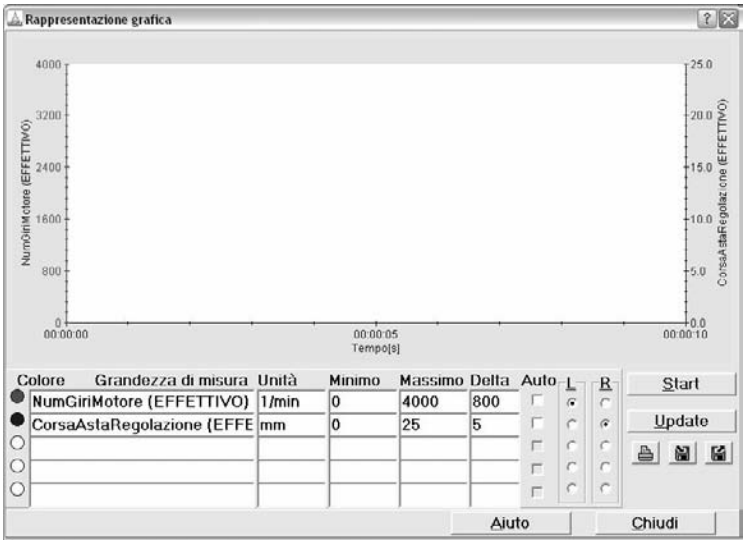
VALUES SELECTION

Definition of measurement points	*Description*	*Corresponding RAM value*
	Battery voltage	
	Speed 1 (crankshaft)	2000
	Speed 1 (crankshaft)	2031
	Speed 2 (cam shaft)	2002
	Control rod travel	2300
	Control rod travel	2330
	Engine coolant temperature	2904
	Fuel temperature	2906
	Air supply temperature	2905
	Accelerator potentiometer voltage	2900
	Hand throttle	
	Hand throttle	2901
	Air supply temperature	2902
Oil pressure	Oil pressure	2903
Atmospheric pressure	Atmospheric pressure	2930
Engine coolant level	Engine coolant level	2820
Engine brake status	Engine brake status	2826
Gearbox status	Gearbox status	2827
Error lamp status	Error lamp status	2868
Origin of engine stop		
LIMIT. Speed		
Speed	Travel speed	
Fuel consumption calculation	Fuel consumption	2360
Injected quantity calculation	Injection quantity	2350
Quantity limitation	Quantity limitation	2701
Active quantity limitation	Active quantity limitation	
Preset active nominal value		
Active performance reduction		
Active curve		3145
Active rpm limitation		
	Oil pressure warning signal (optional)	
	Torque (optional)	
Output: (F16) frequency	Rpm 1 Rpm 2	2000 2001 2002
Output: (F16) digital 7		2857
Output: (M2) digital 3		2853

Definition of measurement points	*Description*	*Corresponding RAM value*
Digital input (F6) 3	Input	2854
Dig. input (F18) /PWM 1	Input	2856
Dig. input (F18) /PWM 1	Input	
Digital input (F19) 4	Input	
Dig./Analog Input (F20) 3	Input	
Dig. input (F21) /PWM 2	Input	
	Input	
	Input	
	Air supply temperature	2905
	Fuel temperature	2906
	Input	
	Engine coolant temperature	2904
	Oil pressure sensor input	
	Air supply temperature sensor input	

6.3.1.2 GRAPHICS

If you select a maximum of 5 measured values, clicking on "Graphic" opens the "Graphic Representation" window.



The measured parameters are represented within a display range (minimum to maximum).
The values on the axis scales are entered in the "Delta" column.

Selecting the "Help" check box allows you to execute the representation in a scale selected automatically by the program. Since the program performs the representation taking account of the minimum and maximum values of the various measured parameters, it is not possible to execute the automatic scale representation in the case of measured parameters that are constant through time.

A maximum of two axes are created, one on the left and one on the right of the display field..
In L columns (left) and R columns (right) you can assign a representation on the axis to a parameter.

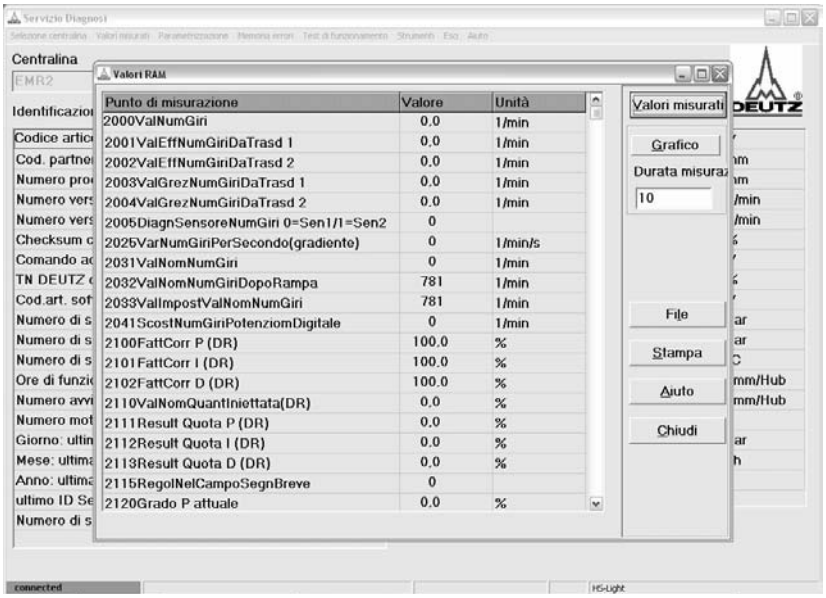
EXPLANATION OF FUNCTION BUTTONS:

- *Start:* this function button starts the data recording procedure.
- *Update*: this button updates the displayed information. The update is necessary if any change has been made to the minimum, maximum, or delta values. The update will take account of the new values.
- *Print:* click on this button to send the data to a printer. First a printer selection screen will be displayed followed by a screen in which you can enter a comment. Finally the printout is generated.
- *Save:* the formations of the displayed representations can be saved to file in two different formats:
  1) as an ASCII file (*.agr) for further processing, e.g. using Excel
  2) as a binary file (*.egr) for representation of graphics in offline mode, see 1.9 Offline mode.

- *Open:* The graphic information saved in a file is retrieved and displayed.

6.3.2 RAM VALUES

RAM values are calculated from the measurement values by means of the microprocessors in the control units and they are made available by SERDIA.



The following table shows the possible RAM values that are utilised by EMR2 control units.

2000Speed
2001SpeedPickUp1
2002SpeedPickUp2
2003SpeedPickUp1Value
2004SpeedPickUp2Value
2005ActivePickUp
2025SpeedGradient
2031SpeedSetp
2032SpeedSetpRamp
2033SpeedSetpSelect
2041DigitalPotOffset
2100P_CorrFactor
2101I_CorrFactor
2102D_CorrFactor
2110FuelSpeedGovernor
2111SpeedGov:P-Part
2112SpeedGov:I-Part
2113SpeedGov:D-Part
2115StaticCorrActive
2120DroopPresent

2130IMFuelSetp
2131IMFuelSetpSelect
2132IMOrAllSpeedGov
2133IMGovAtMaxOrIdle
2134IMFuelSetOrGovernor
2135IMSetpoint
2140TorqueSetpoint
2141TorqueReserveMax
2142TorqueReserveCurve
2143TorqueLimitMax
2144TorqueLimitCurve
2145TorqueLimitCurveAct
2150EngineBrakeActive
2251LimitsDelay
2280GlowPlugActive
2281FlameGlowPlugActive
2282FlameValveActive

2283PreheatActive
2284PostheatActive
2285StartReadActive

2300ActPos
2330ActPosSetpoint
2350FuelQuantity
2353FuelQuantityCorr
2360FuelConsumption
2361FuelEconomy
2400Can:Online
2401Can:RxTelActive
2402Can:RxTelTimeOut
2403Can:RxTelVoltTimOut
2404Can:RxIRCount
2405Can:TxIRCount
2406Can:BusOffCount
2407Can:RxBufOverflow
2408Can:Tx0BufOverflow
2409Can:Tx1BufOverflow
2410Can:FragBufOverflow
2411Can:SetpointPhase
2412Can:SetpointError
2533FuelTempFuelCorr
2600EngineNo:Low
2601EngineNo:High
2602FunctionSetNo:Low
2603FunctionSetNo:High
2604CanSetNo:Low
2605CanSetNo:High
2606ASAP2SetNo
2607SerdialD:Low
2608SerdialD:High
2609SerdiaDate:Day
2610SerdiaDate:Month
2611SerdiaDate:Year
2612EOLDate:Day
2613EOLDate:Month
2614EOLDate:Year

2701FuelLimitMax
2702FuelLimitStart
2703FuelLimitSpeed
2704FuelLimitBoost
2705FuelLimitSimBoost
2706FuelLimitVelocity
2707FuelLimitCan
2710FuelLimitMinActive
2711FuelLimitMaxActive
2712StartLimitActive
2713SpeedLimitActive
2714BoostLimitActive
2715SimBoostLimitActive
2716VelocityLimitActive
2717CanLimitActive
2720SpeedLimit1Active
2721SpeedLimit2Active
2722SpeedLimit3Active
2723ReduceCan
2724ReduceOilPressure
2725ReduceCharAirTemp
2726ReduceCoolantTemp
2727ReduceAmbientPress
2730SetpLimitCan
2731SetpLimitVelocity
2740Setp1Source:Analog
2741Setp1Source:PWM
2742Setp1Source:Subst
2743Setp1Source:Can
2750CurrSetp:Setpoint1
2751CurrSetp:Setpoint2
2752CurrSetp:SpeedFix1
2753CurrSetp:SpeedFix2
2754CurrSetp:Freeze
2755CurrSetp:FreezeSetp
2756CurrSetp:HoldButton
2757CurrSetp:MinButton
2758CurrSetp:MaxButton

2759CurrSetp:CalIdle
2761CurrSetp:VeloIdle
2810SwitchDroop2
2811SwitchDroopCurve
2812SwitchSpeedFix1
2813SwitchSpeedFix2
2814SwitchSpeedLimit2
2815SwitchSpeedLimit3
2816SwitchGovernIMOrAll
2817SwitchFreezeSpeed
2818SwitchFreezeSetp
2819SwitchOilLevel
2820SwitchCoolantLevel
2821SwitchSpeedInc
2822SwitchSpeedDec
2823SwitchMinButton
2824SwitchMaxButton
2825SwitchHoldButton
2826SwitchBrake
2827SwitchNeutral
2828SwitchGlowPlug
2829SwitchEngineStop
2851DigitalOut1
2852DigitalOut2
2853DigitalOut3
2854DigitalOut4
2855DigitalOut5
2856DigitalOut6
2857DigitalOut7
2861DigitalOut1State
2862DigitalOut2State
2863DigitalOut3State
2864DigitalOut4State
2865DigitalOut5State
2866DigitalOut6State
2867DigitalOut7State
2868StatusErrorLamp
2900Setpoint1Extern

2901Setpoint2Extern
2902BoostPressure
2903OilPressure
2904CoolantTemp
2905CharAirTemp
2906FuelTemp
2920BoostPressureCorr
2921FuelTempCorr
2930AmbientPressure
2931AmbientPressActive
3000ConfigurationError
3001ErrPickUp1
3002ErrPickUp2
3003ErrVelocity
3004ErrOverSpeed
3005ErrSetp1Extern
3006ErrSetp2Extern
3007ErrBoostPressure
3008ErrOilPressure
3009ErrCoolantTemp
3010ErrCharAirTemp
3011ErrFuelTemp
3030ErrOilPressWarn
3031ErrCoolantTempWarn
3032ErrCharAirTempWarn
3033ErrOilLevelWarn
3034ErrCoolantLevelWarn
3035ErrWarnSpeed
3036ErrFuelTempWarn
3040ErrOilPressEcy
3041ErrCoolantTempEcy
3042ErrChargeAirTempEcy
3043ErrOilLevel
3044ErrCoolantLevel
3050ErrFeedback
3052ErrRefFeedback
3053ErrActuatorDiff
3059ErrFeedbackAdjust

3060ErrDigitalOutput3
3062ErrDigitalOutput7
3063ErrOverCurrentOD3
3067ErrHardwSetp1
3068ErrCanSetp1
3070ErrCanBus
3071ErrCanComm
3076ErrParamStore
3077ErrProgramTest
3078ErrRAMTest
3080ErrPowerCurrent
3083ErrRef1
3084ErrRef2
3085ErrRef4
3086ErrIntTemp
3087ErrAmbPressure
3090ErrData
3093ErrStack
3094ExceptionNumber
3095ExceptionAddrLow
3096ExceptionAddrHigh
3097ExceptionFlag
3098ErrorActive
3099EEPROMErrorCode
3101S1ErrPickUp1
3102S1ErrPickUp2
3103S1ErrVelocity
3104S1ErrOverSpeed
3105S1ErrSetp1Extern
3106S1ErrSetp2Extern
3107S1ErrBoostPressure
3108S1ErrOilPressure
3109S1ErrCoolantTemp
3110S1ErrChargeAirTemp
3111S1ErrFuelTemp
3130S1ErrOilPressWarn
3131S1ErrCoolTempWarn
3132S1ErrChAirTempWarn

3133S1ErrOilLevelWarn
3134S1ErrCoolLevelWarn
3135S1ErrWarnSpeed
3136S1ErrFuelTempWarn
3140S1ErrOilPressEcy
3141S1ErrCoolantTempEcy
3142S1ErrCharAirTempEcy
3143S1ErrOilLevel
3144S1ErrCoolantLevel
3150S1ErrFeedback
3152S1ErrRefFeedback
3153S1ErrActuatorDiff
3159S1ErrFeedbackAdjust
3160S1ErrDigitalOut3
3162S1ErrDigitalOut6
3163S1ErrOverCurrentOD3
3167S1ErrHardwSetp1
3168S1ErrCanSetp1
3170S1ErrCanBus
3171S1ErrCanComm
3174S1ErrCanPassive
3176S1ErrParamStore
3177S1ErrProgramTest
3178S1ErrRAMTest
3180S1ErrPowerCurrent
3183S1ErrRef1
3184S1ErrRef2
3185S1ErrRef4
3186S1ErrIntTemp
3187S1ErrAmbPressure
3190S1ErrData
3193S1ErrStack
3194S1ErrIntern
3201S2ErrPickUp1
3202S2ErrPickUp2
3203S2ErrVelocity
3204S2ErrOverSpeed
3205S2ErrSetp1Extern

3206S2ErrSetp2Extern
3207S2ErrBoostPressure
3208S2ErrOilPressure
3209S2ErrCoolantTemp
3210S2ErrChargeAirTemp
3211S2ErrFuelTemp
3230S2ErrOilPressWarn
3231S2ErrCoolTempWarn
3232S2ErrChAirTempWarn
3233S2ErrOilLevelWarn
3234S2ErrCoolLevelWarn
3235S2ErrWarnSpeed
3236S2ErrFuelTempWarn
3240S2ErrOilPressEcy
3241S2ErrCoolantTempEcy
3242S2ErrCharAirTempEcy
3243S2ErrOilLevel
3244S2ErrCoolantLevel
3250S2ErrFeedback
3252S2ErrRefFeedback
3253S2ErrActuatorDiff
3259S2ErrFeedbackAdjust
3260S2ErrDigitalOut3
3262S2ErrDigitalOut6
3263S2ErrOverCurrentOD3
3267S2ErrHardwSetp1
3268S2ErrCanSetp1
3270S2ErrCanBus
3271S2ErrCanComm
3274S2ErrCanPassive
3276S2ErrParamStore
3277S2ErrProgramTest
3278S2ErrRAMTest
3280S2ErrPowerCurrent
3283S2ErrRef1
3284S2ErrRef2
3285S2ErrRef4
3286S2ErrIntTemp

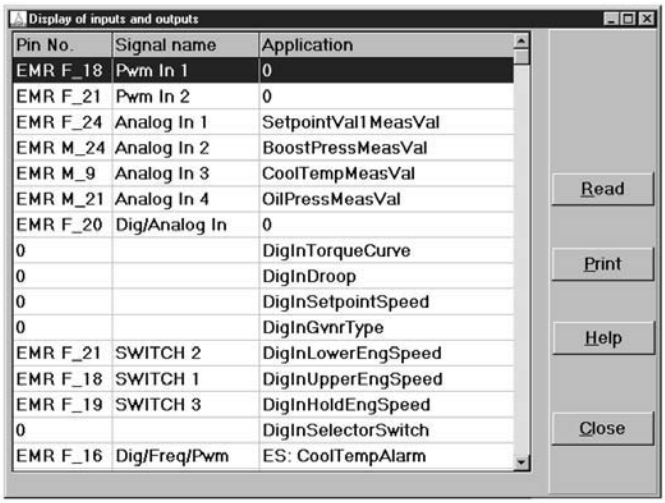
3287S2ErrAmbPressure
3290S2ErrData
3293S2ErrStack
3294S2ErrIntern
3300Velocity
3350EGRValveActive
3351EGRFuelFilter
3352EGRBoostLimitActive
3353EGRFuelActive
3354EGRCoolantActive
3355EGRAmbientActive
3356EGRMapActive
3500PWMIn1
3501FrequencyIn1
3502PWMIn2
3503FrequencyIn2
3510AnalogIn1
3511AnalogIn1_Value
3520AnalogIn2
3521AnalogIn2_Value
3530AnalogIn3
3531AnalogIn3_Value
3540AnalogIn4
3541AnalogIn4_Value
3550TempIn1
3551TempIn1_Value
3560TempIn2
3561TempIn2_Value
3570TempIn3
3571TempIn3_Value
3600ServoCurrrent
3601PowerSupply
3603Reference1+5V
3604Reference2+5V
3605Reference4+5V
3606IntTemp
3700StartCounter
3701WorkingHours

3702WorkingSeconds
3720LoadWorkMap:h
3730LoadWorkMap:s
3740ElectronicTemp:T
3745ElectronicTemp:h
3750ElectronicTemp:s
3800EmergencyAlarm
3801CommonAlarm
3802EngineStop
3803EngineStopped
3804EngineStarting
3805EngineRunning
3806EngineReleased
3810ButtonActive
3821EEPROMAccess:ISO
3823EEPROMAccess:Button
3827EEPROMAccess:Memory
3828EEPROMAccess:Work
3830Phase
3840HardwareVersion
3841AddHardwareVersion
3842SoftwareVersion
3843BootSoftwareVersion
3844SerialDate
3845SerialNumber
3847BootDevelopmVersion
3850Identifier
3851LastIdentifier
3865CalculationTime
3870Timer
3895RAMTestAddr
3896RAMTestPattern
3897CStackTestFreeBytes
3898IStackTestFreeBytes
3905ServoPIDCorr
3906ServoStateStatic
3916ServoCurrentSetp
3917ServoCurrentCorr

3944EMR1ActuatorActive
3950Feedback
3955FeedbackReference
3960FeedbackCorrection

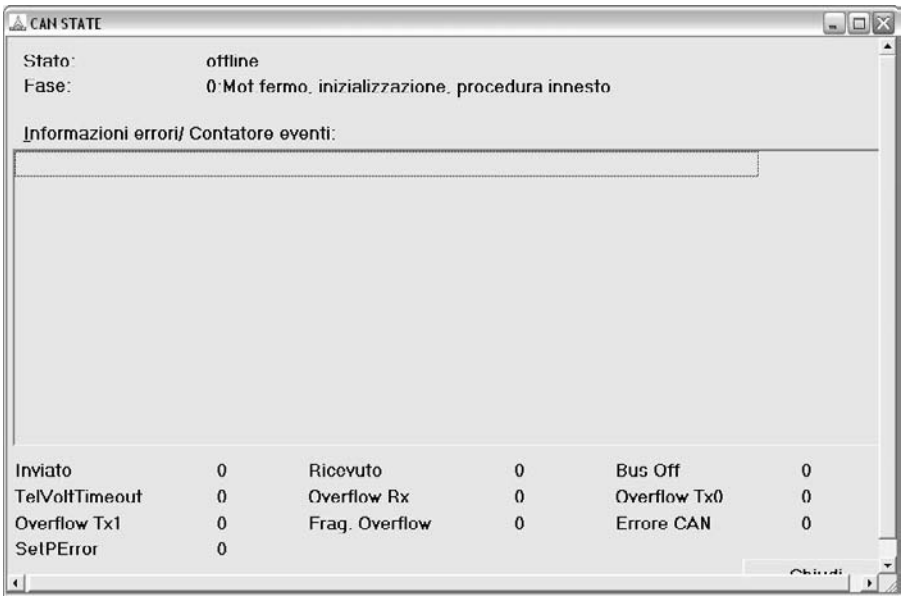
6.3.3 INPUT/OUTPUT CONFIGURATION

The inputs and outputs can be configured. The current settings of the inputs and outputs are displayed under this menu option.



6.3.4 CAN STATUS

This window shows CAN bus activities of EMR1 and EMR2.



- *Sent:* contains CAN information:TxCounter (from 0 to 65,535 words). This value increases with each CAN transmission signal and indicates the data sending activities of the EMR1 control unit.
- *Received:* contains CAN information:RxIrCounter (from 0 to 65,535 words). This value increases with each CAN transmission signal and indicates the data sending activities of the EMR1 control unit.
- *Bus Off:* counter that indicates the frequency with which the EMR1 control unit has disconnected from the CAN bus due to permanent errors (CanBusOff-Counter from 0 to 255 bytes).
- *Status:* CanOnline indicates whether the EMR1 control unit is active on the CAN bus. The value 1 for online status and 0 for offline status is transmitted on the ISO 9141 interface. The SERDIA program displays the message "online" (for value 1) or "offline" (for value 0).

- *Phase:* The CanSetPointPhase variable (from 0 to 255 bytes) is transmitted by means of the ISO 9141 interface. This variable indicates the duration in the preset nominal value:

Phase	*Text*
0	MotSteht, initialisation, start procedure
1	MotSteht, stop phase 1, no CAN error
2	MotSteht, stop phase 2, CAN timeout error
3	MotStartet, ... until the optimal engine speed is recognised
4	MotLäuft, EMR1 wait for nominal value via CAN
5	MotLäuft, nominal value present via CAN ok
6	MotLäuft, emergency operation, nominal value procedure by means of CAN interrupted
7	This phase is not present

ERROR INFORMATION / EVENTS COUNTER

The EMR1 sends the special CanErrorNumber (from 0 to 255 byte) for CAN bus errors by means of the ISO 9141 interface. These numbers are associated with a text message that is displayed in the CAN interface window on the SERDIA program.

Code	*Text*
0	no errors present
1	Request message not present on object of controller 15
2	controller object not valid
3	controller object multiple assignment
4	CAN active but no message activated
5	diagnostic object not activated
6	scanrate 0 in diagnostic message
7	scanrate 0 in nominal value telegram
8	configuration of nominal rpm 6 not suitable for TSC2 activation
9	TSC1 is activated but 'SolldrehzKonf' is not on '6'
10	'ReglerKonf=6', but neither TSC1 nor FktUmschaltg is activated
11	'ReglerKonf=6 & SolldrehzKonf=6', but TSC1 is not activated
12	TSC1 activated, but 'ReglerKonf!=6'
13	
14	
100	reception message interrupted
101	nominal value telegram interrupted with engine stopped (replacement value)
102	nominal telegram value not present with engine stopped due to insufficient battery voltage
103	nominal telegram value not present after engine start due to insufficient battery voltage
104	nominal telegram value not present after engine start, replacement value not used
105	nominal telegram value not present with engine running, replacement value used

In the case of reception message timeout errors special processing is required. These messages are always accompanied by error number 100.

To identify which message caused a timeout error, SERDIA proceeds as follows:

- CanRxObjAvtive, which indicates the active messages, i.e. the messages effectively received by bits.
- CanConf_bits contains reception messages configured by bits.

SERDIA rejects CanRxObjActive by bit (inactive message) and subsequently executes an AND connection by bit with CanConf_bits. This results in obtaining reception messages by bit that are configured but not active (CanRxTimOutBits).

A text is associated with each CanRxTimeOutBits bit, representing the names of the various reception messages.

Since it is not possible to utilise all the bits, entering "dc" (don't care) in the text causes the text to be excluded for the bit in question.

If the text "100 reception message interrupted" is displayed, also the text of the list of missing reception messages is generated.

Example of error information displayed:

100 reception message interrupted
engine temperature
oil level / engine oil pressure
function switching
aspiration / exhaust gas conditions

VanRxTimeOutBit	*Text*
0	Engine temperature
1	Aspiration / exhaust gas conditions
2	Oil level / engine oil pressure
3	TSC1
4	Engine protection
5	Function switching

6.4 PARAMETERS

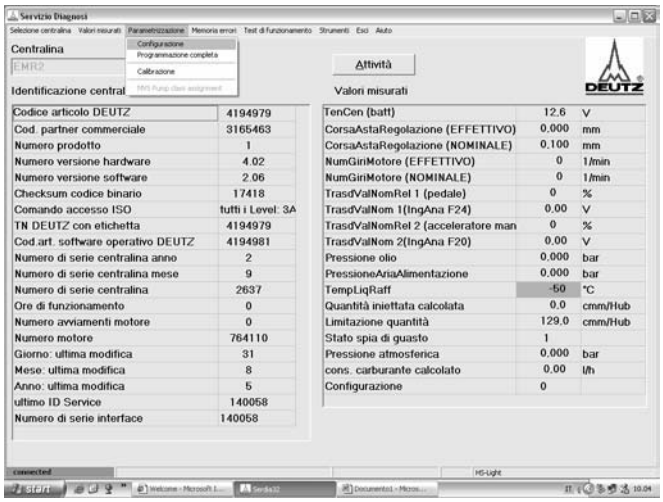
6.4.1 CONFIGURATION (GENERAL)

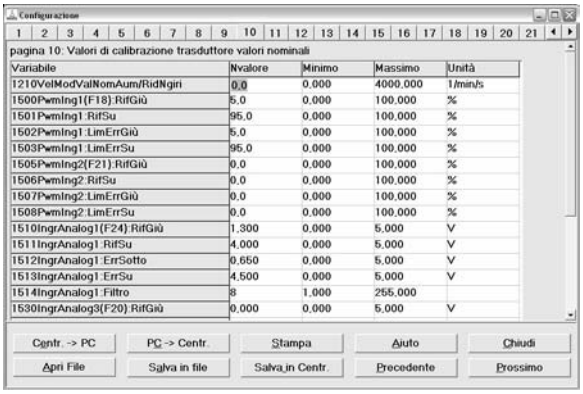
IMPORTANT NOTES

1 - Before making any changes you must first save the original data record for security purposes.

2 - You can perform a test with the engine running only for PID values and this procedure must be carried out only by skilled personnel.

3 - Incorrect settings can result in damage to the engine!





CONFIGURATION PROCEDURE

With the "Parameterisation" option in the menu bar you can enter the "Configuration" page. The configuration procedure is as follows:

- In the heading click on the tab relative to the required page or
- use the "Next" and "Previous" buttons to scroll through the pages until arriving at the page that contains the parameters to be set (e.g.: 'accelerator pedal (SWG1) upper reference' on page 10: transducer calibration values-nominal values).
- Click on the "New value" field and enter the required numerical value, which must be between the minimum and maximum specified.
- Click on the "PC->CENTR " button. All the configuration data are transmitted to the control unit. At this point the data are resident in the control unit and they can be utilised to test the engine settings. Note however that said data will be lost when the power supply is disconnected.
- store the record in the control unit by means of the "Save in ECU" button (all data will be overwritten).
- To check the data (read/display) use the "CENTR->PC" button.
- Once the engine test has produced satisfactory results, the record can be saved on the hard disk or on a diskette by means of the "Save to file" button.

EXPLANATION OF FUNCTION BUTTONS:

- *CENTR.->PC:* the configuration data are read and displayed from the control unit.
- *PC->CENTR.:* the modified configuration data are transmitted to the control unit. To save the data, press the "Save in ECU" button.
- *Open file:* the configuration data are read and displayed from file (*.hex).
- *Save to file:*
  Yes: if required, you can group the configuration data together and save them as a partial record
  No: all configuration data are saved to a file (*.hex).
  The proposed filename (not obligatory) is formed of the engine number. Alternative filenames can be used if required.
  Then click OK. The file (i.e. the engine data record) is saved with the filename <numeromotore>.hex.

- *Save in ECU:* The configuration data are saved permanently in the control unit
  WARNING!
  - *Do not make any changes to the parameterisation unless the reasons for such changes are clear and carefully assessed and you have full information concerning the value you intend to alter.*
  - *All changes to the configuration must be reported.*
  - *The procedure for reporting changes is illustrated in Technical Information 0199-99-9827*
- *Previous:* the data of the previous screen are displayed.
- *Next:* the data of the next screen are displayed.
- Print: export the specified configuration data to a printer. The configuration window can be printed page by page or by a series of pages (from page x to page y), or in their entirety.

6.4.2 COMPLETE PROGRAMMING

Saving the data from a control unit:

- Read the control unit data with "ECU->file". The "Save as..." window is displayed.
- Save the data to a file with the required name as <nomefile>.hex.
  You can use an alternative name in place of the proposed name <numeromotore>.hex. Then confirm by clicking the OK button. The file (i.e. the engine data record) is saved with the chosen name.

Complete programming of the control unit:

- Click on the "Programming" button. The "Open" window will be displayed.
- Select the required file and open it.
- Click on the "Save in ECU" button.

Of all the configuration data only the operative data read from the control unit (second column) or from a file (third column) are displayed. Before the transmission of configuration data to the control unit, the operative data can be edited in the fourth column. Also these data will be transmitted together with the transmission of the configuration data to the control unit.

Complete programming is not available for access levels I and II.

EXPLANATION OF FUNCTION BUTTONS:

- *ECU->file:* The configuration data are read, displayed, and saved by the control unit as a HEX file.

PROGRAMMING:

the edited configuration data or configuration data in the form of a HEX file are transmitted to the control unit. To export the data in a definitive manner press the "Save in ECU" button in EMR1.

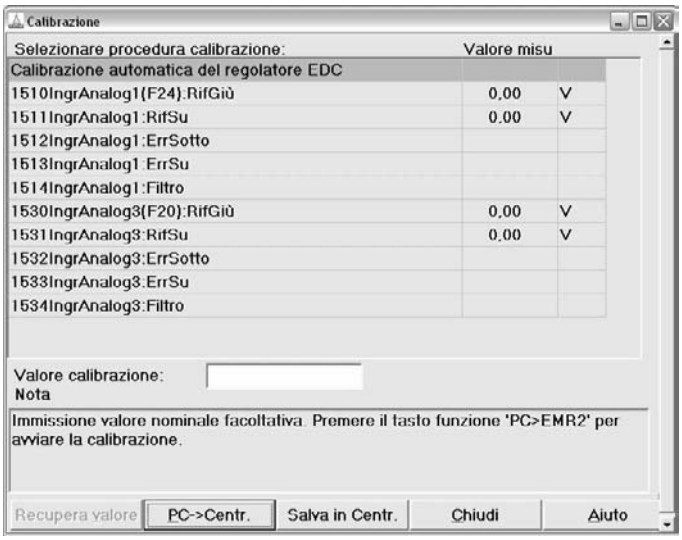
- *Save in ECU*: the configuration data are saved permanently in the control unit.

6.4.3 CALIBRATION

System component calibration procedures are available only by means of the diagnostics interface. For this purpose you will need the SERDIA diagnostic software. In combination with the EMR1 you will need to calibrate the accelerator pedal and (if present) the hand throttle potentiometer (this requirement is not applicable to the units).

Important requirements:

- engine switched off
- power supply voltage (start / terminal 15) present
- accelerator pedal installed



EXPLANATION OF DEFINITIONS (EXAMPLES):

- 1510.... = accelerator pedal transducer pin F24
- 1530.... = normal accelerator pedal potentiometer pin F20

GENERAL CALIBRATION PROCEDURE:

- Select the calibration dimension in the top window.
- Set the accelerator pedal / hand throttle potentiometer to the required position.
- "Read value" button active: press the button, the calibration value assigned to a position is displayed in the edit field.
- "Read value" button inactive: enter the calibration value in the edit field.
- Export the calibration value to the control unit with "PC->ECU".
- Save the calibration value to the control unit with "Save in ECU".
- Switch on the ignition switch and then switch it off again.

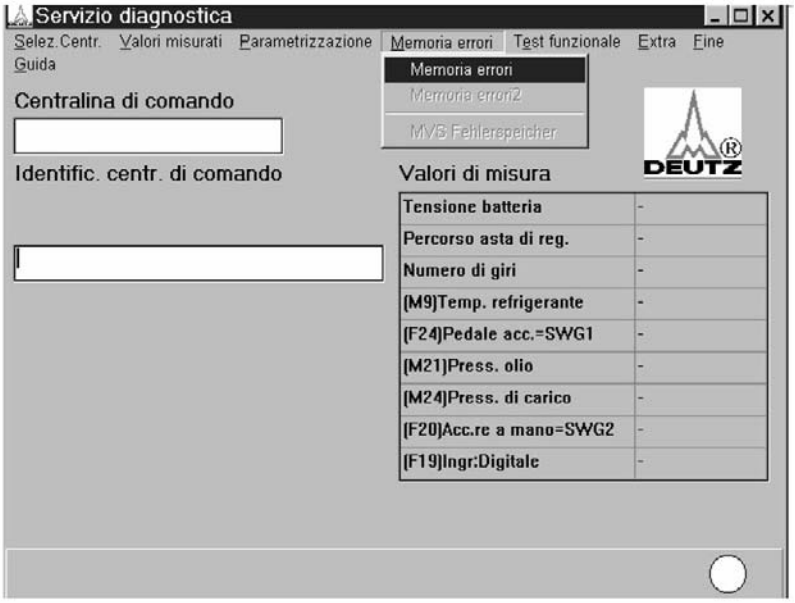
EXPLANATION OF FUNCTION BUTTONS:

- *Read value:* if the active "Read value" button is activated, you can use it to read the calibration value corresponding to a pedal position.
- *PC->ECU:* The displayed calibration value is transmitted to the control unit.
- *Save in ECU:* the calibration data are permanently saved on the control unit.

6.5 FAULTS MEMORY

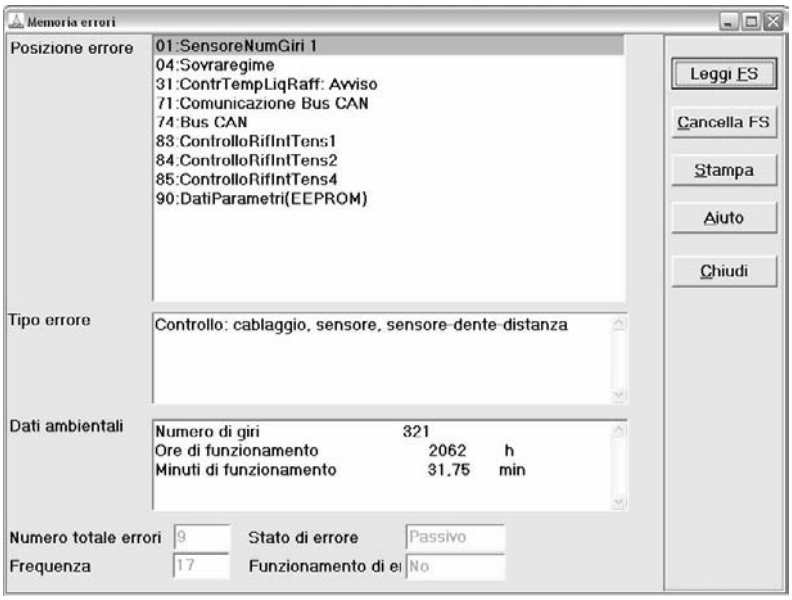
6.5.1 GENERAL INFORMATION

The errors memory lists the anomalies that have occurred since the last memory erasure and that can be diagnosed. Select the "Errors memory" option to display the current contents of the errors log.



When the errors are eliminated, you can also erase the corresponding error messages in the "Errors memory" window:

- Display the errors memory warnings by pressing the "Read ME" button
- Use the mouse to highlight the displayed error position in the "Errors position" window
- (e.g.: "8112:(M17) adjustment travel sensor"). The error position is shown in grey.
- Click the "Delete ME" button. The error position is erased and the warning disappears.
- Quit the "Errors memory" window by clicking "Exit".



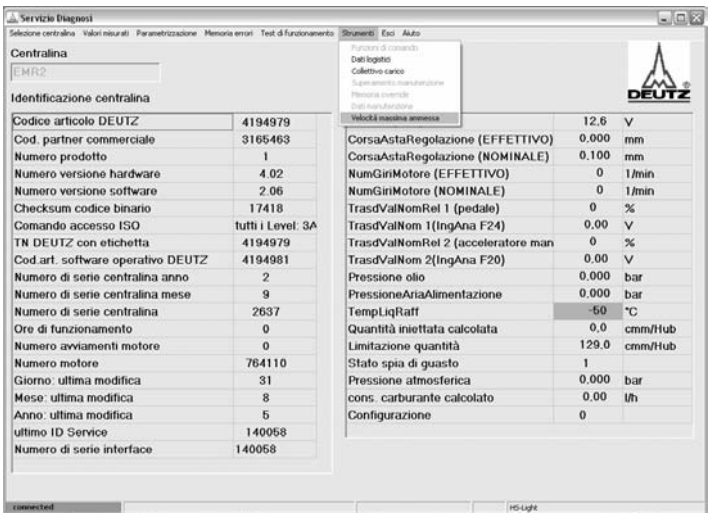
FIELDS DESCRIPTION

- *Error position:* list of error positions from which you can select an error position to obtain detailed information. Since there are several causes of errors for certain components, this list may show several repeated error positions. For example, oil pressure control: degree of performance and cut-off limit.
- *Error type:* all the data in this field refer to the error position selected in the top field of the list.
- *Ambient data:* supplementary data (e.g. measurement dimensions) that contain additional information concerning the selected error position.
- *Total errors:* total number of all recorded error positions.
- *Frequency:* frequency with which the selected error position occurs.
- *Error status:* selected error active or passive

EXPLANATION OF FUNCTION BUTTONS:

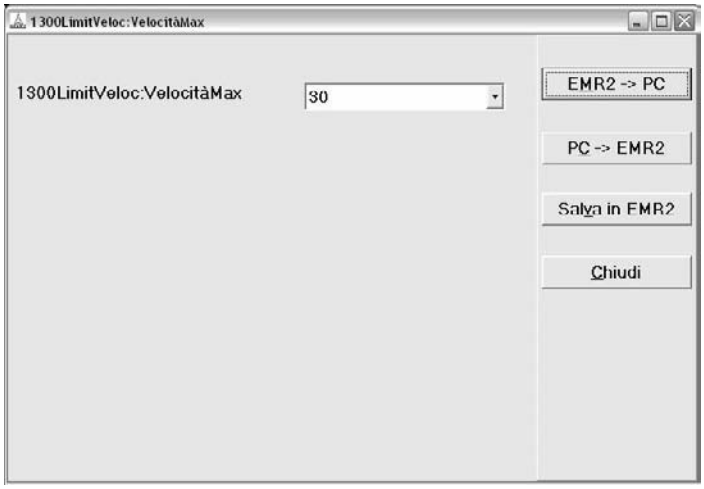
- *Read mem.:* with this button you can import the error memory again from the control unit and the display will be updated.
- *Clear Mem:* with this button request is transmitted to the control unit to clear the errors memory.

6.6 EXTRA



6.6.1 TOP SPEED

In this form you can select three different tractor top speeds (30, 40, 50 km/h).



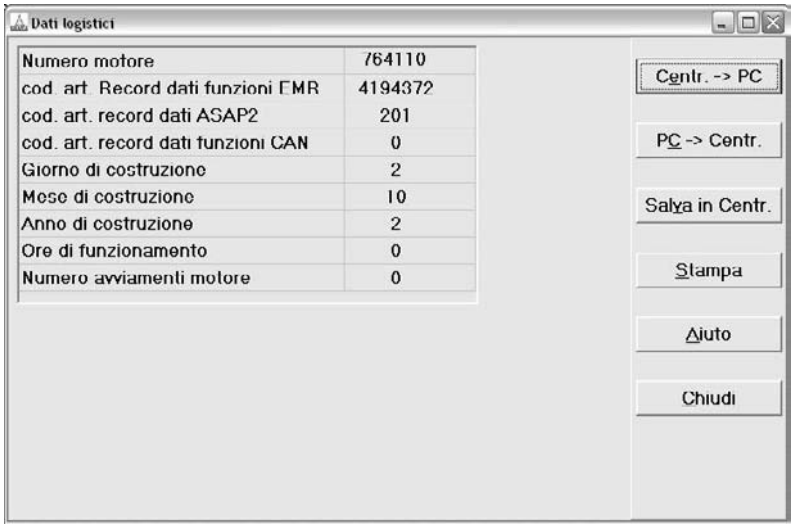
6.6.2 LOGISTIC DATA

In this form you can display and print the control unit logistic data.

EMR1/EMR2:

- engine no.
- EMR functions record part number
- ASAP2 record part number
- date, month, and year of completion
- only EMR2:
- CAN functions record part number
- operating hours
- number of engine starts

Wiring and saving of control unit data is reserved exclusively to DEUTZ AG.



6.6.3 LOADS COLLECTIVE

This form provides an overview of the fields of speeds and loads at which the engine has been operated. Records in the control unit can be deleted again by users with higher access authorisation levels.

Limitation: only EMR2 and EMS2

6.7 ACTIVITY

6.7.1 EMR2

For maintenance tasks, the forms for specific configuration activities are displayed under this button of the SERDIA main screen:

Diagnostics and tests

- governor behaviour measurement
- start process measurement
- surveillance function measurement
- air intake pressure measurement
- sensor measurements
- city measurements
- measurement of nominal values preset data
- measurement of digital inputs/outputs

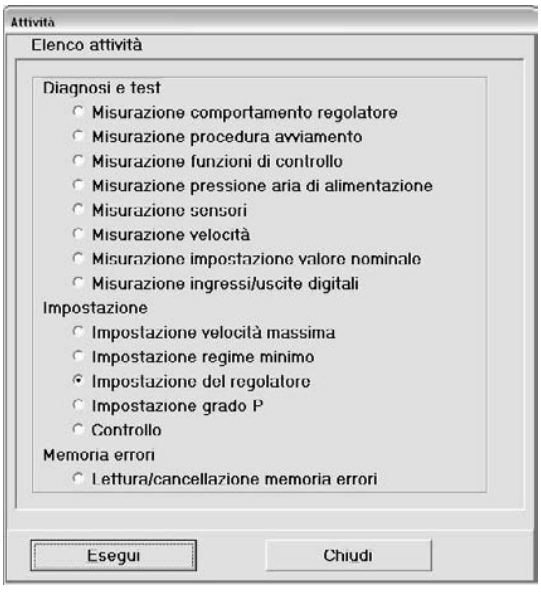
Settings

- top speed setting
- idle speed setting
- governor measurement
- P level measurement
- determination of inputs/outputs
- surveillance

Error logs

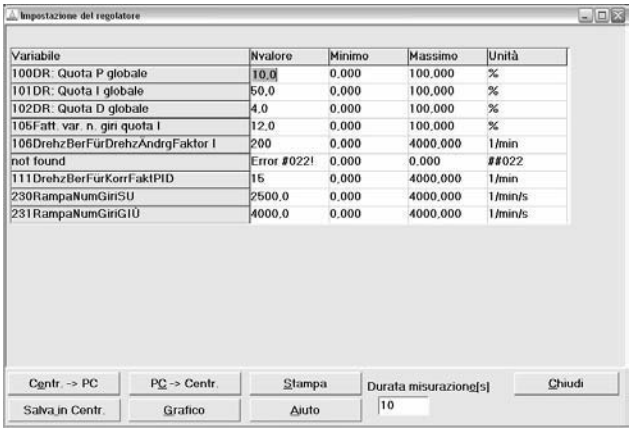
- display / clear errors log

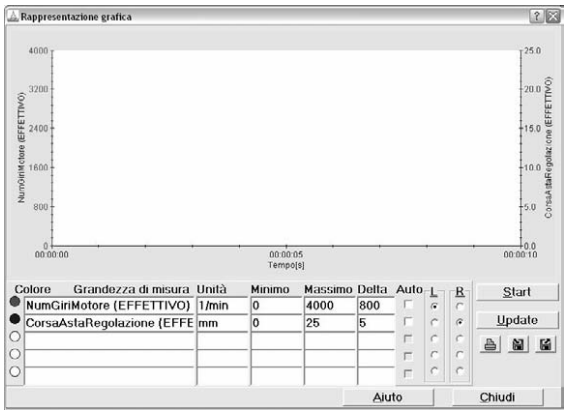
6.7.1.1 EXAMPLE OF GOVERNOR SETTING



Procedure:

- Click on the "Activities" button.
- Click on the "set up: governor setting" box. The "governor settings" menu will be displayed.





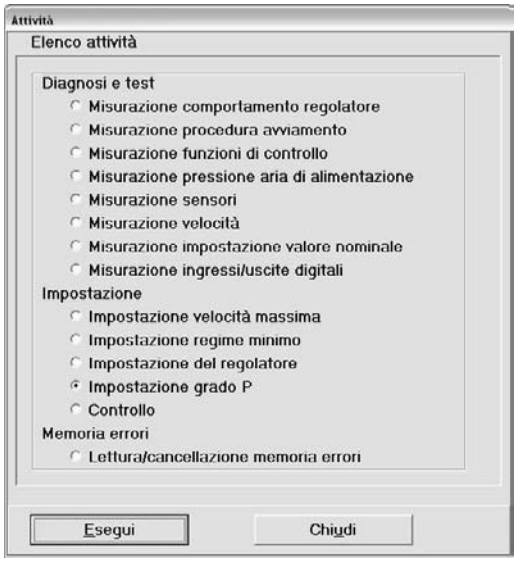
Explanation of function buttons:

- *ECU->PC:* the configuration data are read and displayed from the control unit.
- *PC->ECU:* the modified configuration data are transmitted to the control unit. To store the data permanently, click the "Save in ECU" button
- *Save in ECU:* the configuration data are saved permanently in the control unit.

All changes to the configuration must be communicated!
The notification procedure is described in service bulletin 0199-99-9287.

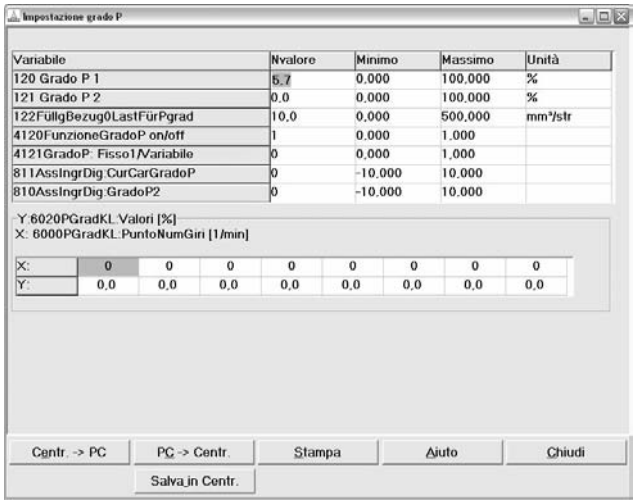
- *Graphic:* With the "Graphic" button you can display the graphic representation of the time trend of the selected measurement parameters (max. 5). If more than 5 parameters are selected an error message will be displayed.
- *Measurement duration:* the duration of the recording is shown in seconds in the Measurement duration field. The smallest value of measurement duration is one second. The maximum limit is several hours (defined in units of one second). The default setting is 10 seconds. The minimum measurement interval is
  40 ms for RAM values and
  60 ms for the other values. A measurement duration of 10 seconds results in
  10000 ms/40 ms = 250 measurement points for RAM values and
  10000 ms/60 ms = 166 measurement points for other values.
  Since the program includes a maximum of 200 measurement points, before the start of the data recording the measurement period is adapted automatically. The minimum measurement interval is established by the duration of data transmission from the control unit to the PC. The more measurement parameters to be displayed simultaneously the greater the duration of the data transmission and the lower the measurement interval.
- *Print:* the displayed measurement values are printed.
- *Exit:* return to the "Activities" menu.

6.7.1.2 EXAMPLE OF P LEVEL SETTING



Procedure:

- Click on the "Activity" button.
- Click on the "set up: set P level" box. The "P level setting" menu is displayed.



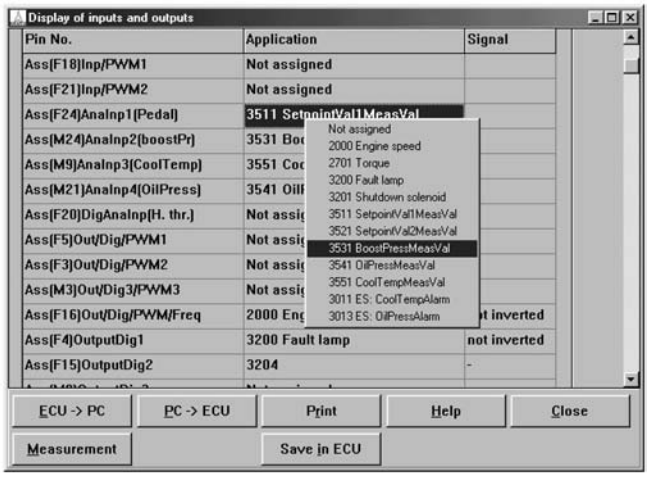
Explanation of function buttons:

- ECU->PC: the configuration data are read and displayed from the control unit.
- PC->ECU: the modified configuration data are transmitted to the control unit. To store the data permanently, click the "Save in ECU" button.
- Save in : the configuration data are saved permanently in the control unit.

All changes to the configuration must be communicated!
The notification procedure is described in service bulletin 0199-99-9287.

- *Print:* the displayed measurement values are printed.
- *Exit:* return to the "Activities" menu.

6.7.1.3 SETTING THE INPUTS AND OUTPUTS



With the "Activity" button, in "Inputs and Outputs setting" the possible data

1. can be displayed by right-clicking the mouse
2. the values are assigned by left-clicking the mouse

In the same form you can also assign the activatable functions and the measurement values of all the inputs and outputs displayed (to do this click on the "Measurement" button).
This configuration facility is only possible with access level III.

6.8 WHAT TO DO IF...?

6.8.1 SERDIA IN GENERAL

6.8.1.1 ERRORS IN COMMUNICATION SETTINGS

If it proves impossible to establish communication despite the connection between interface and control unit, the following error message will be displayed

Possible causes of the error message:

- power supply missing to control unit or interface
- Interruption of power supply voltage when engine is stopped
- Incorrect attribution of port on PC (see 9.1.2)
- Connection error of the power supply voltage poles from engine to interface
- Not all of the four wires are connected (+,-,k,l)
- Incorrect or faulty control unit.

Elimination, possibility of quick checks:

- The yellow LED of the interface must illuminate when SERDIA is opened.
- Measure the power supply voltage on the diagnostic connector (the interface requires 8-28 Vdc).
- Check ports assignment.
- Connect another control unit.

Additional information on the subject of power supply voltage for control units, interface, and PC:

- EMR control units are compatible with an operating voltage of at least 10 V up to a maximum of 30 V (typical range 12-24 V).
  Current draw: 5 A with 12 V, 7 A with 24 V
- The interface is supplied by the engine and is compatible with a power input voltage of between 12 V and 24 V.
- The control units and interface are protected against polarity inversion and overvoltage. Despite this protection, incorrect connection, e.g. to a 230 V supply, can result in damage.
- Thanks to the optical connection integrated in the interface, the PC (notebook and printer) can be connected to the vehicle battery and ground without risks for the control unit and interface and without any loss of data.

6.8.2 EMR2

6.8.2.1 FLUCTUATING ENGINE SPEED

Finding the causes:

Similarly to engines with a mechanical governor, also when troubleshooting engines with the EMR2 control unit it is necessary to consider the engine components such as the pump, accessibility of the control rod, fuel system, and so forth. Specifically, if the engine was previously functioning correctly, the causes of subsequent speed fluctuations are usually unrelated to the EMR2.

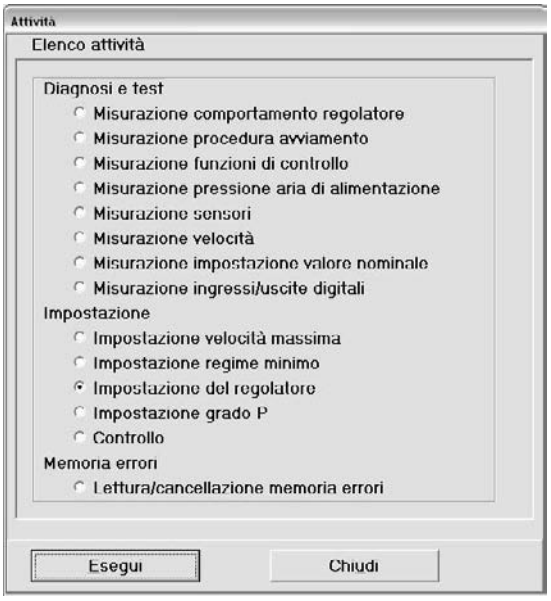
Governor setup:

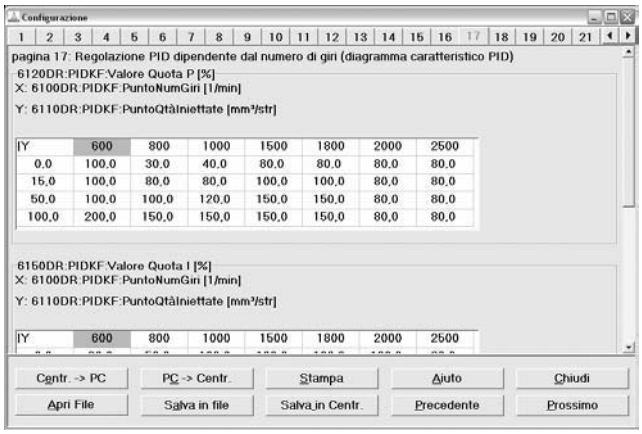
governor settings are initially required for new applications and they must be tested and documented with the system (engine and plant) in all operating conditions.

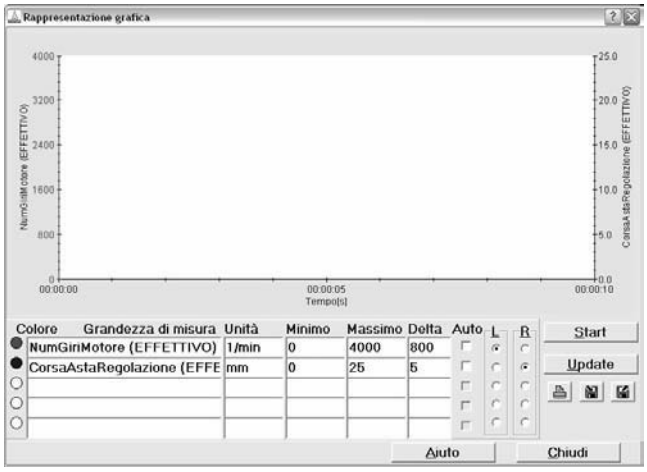
If the new application has been completed and approved, you must inform the manufacturer of the governor parameters that are specific to the application. For subsequent engines with the same application it is not usually necessary to execute another adaptation.

Menu path:

SERDIA main menu -> Activities menu -> governor setup box -> Run







Basic notes concerning corrections to the setup:

- Make corrections to settings when the engine is running.
- Increasing PID values leads to greater amplitude of governor oscillation.
- In the "New value" field record the value to be corrected. One way to do this is to highlight the original value with the mouse and then enter the new value (the original value will be automatically overwritten).
- Click on the "PC->ECU" button to send the new value to the control unit. The governor imports the new regulator settings and the result can be assessed by observing operation of the engine.
- After correcting the settings and before disconnecting the power supply (terminal 15), save the new parameter setting in EMR1. This is achieved by clicking the "Save in ECU" button.

Basic governing setup:

The control unit is programmed at the end of the band with the following standard values.

Parameters (variables)	*Standard values*		*Notes*
	Aggregate	*Vehicle*	
Speed governor Factor - P	18-20	4,0	Basic setting and PID values application factors. These parameters are independent from the engine status (rpm, constantly active load) and they represent the main tools for setting of the governor.
Speed governor Factor - I	10,0	10,0	
Speed governor Factor - D	5-12	2,5	
Speed governor	90,0	65,0	Lowering the governor parameter for the static field
Speed governor	15,0	80,0	Rpm band for nominal value. In this rpm band the engine runs in the status field with precision and uniformity without abrupt reactions to changes in rpm.
Governor Pos. Factor - P	10,0	10,0	Corrections of settings can be made in accordance with the manufacturer.
Governor Pos. Factor - I	10-15	5,0	
Governor Pos. Factor - D	5-10	5,0	
Governor Pos. Factor – DT2	8.0	8.0	
Governor Pos.	160-180	180.0	
Governor Pos.	0.25	0.25	

Standard values, parameters that depend on engine speed and load:

3 characteristic curves for P,I and D values = ftk (rpm, injected quantity).

Parameters (variables)	*Standard values*	*Notes*
X: rpm supports	60…2500	7 rpm values
Y: quantity supports (cmm/lift)	0, 20 …100	4 injected quantity values
Characteristic curve (%)	100	Total 3 x 28 registration. Registration of 100% triggers the transmission of the rpm PID governor values (page 4). Corrections must be executed in the various work points.

Execution of governor correction:

Before changing the parameters it is advisable to store the current configuration with "save to file" and/or print configuration pages 4, 5 and 17.

The adjustment procedure is performed in three steps:

1. PID governor basic parameters. The adjustment is basically performed with the basic parameters.

- If you need to perform a new basic governor adjustment, set all the governor characteristic curves to 100%.
- The P dimension is the main parameter and it must therefore be set first. Increase the parameter value for "DrehzRegler:P-Anteil" starting from 10% until the engine starts to oscillate at f > 1 Hz with excitation by means of abrupt load changes. Then reduce the P dimension by 25%.
  Example: P dimension with tendency to oscillate (unstable) = 12. 12-25 % of 12 = 9 (new setting value).
  The adjustment depends primarily on the moment of inertia of plant mass (engine + alternator).
  For moments of mass inertia of up to 8kgm2, the value range for the P dimension is between 10 and 45 %.
  With higher moments of mass inertia the P dimension can be increase up to 90 %.
  Note for engine units: calculation of optimal governor values is performed with the operating engine speed and various different loads. Take note of the various P dimensions calculated in this manner and record them as average value in "DrehzRegler:P-Anteil".
  For dual frequency systems you must take account of the second frequency when calculating the average value.
  Note for vehicle engines: calculation of the optimal adjustment values is performed on various points of engine speeds and loads. Take note of the various P dimensions calculated in this manner and record them as average values in

"DrehzRegler:P-Anteil".
The various P dimensions resulting from the different load and rpm points must be correct in the PID characteristic curve.

- Use the same procedure to adjust the D and I dimensions. Increase the value starting from 5 % until reaching conditions of instability and then return by 25 %.

2. *Parameters for static and dynamic operation.*
   Setting the parameters "Speed governor: damping" and "Speed governor: damping range" (page 4).
   With the parameter "Speed governor: damping range" you can establish the band of engine speeds in which the rpm is in static state.
   For example, the value 15 rpm establishes for the engine speed a range of +/-15 rpm.
   With the parameter "Speed governor: damping" you can determine the reduction of the governor parameters (PID dimensions) for the static range. Backwards, i.e. if the engine speed is within the engine speed band for the nominal value, the parameters of the governor (PID dimensions) decrease to the value corresponding to the damping factor.
   Example: speed governor: P dimension = 10 %
   to speed governor: damping = 65 %
   In this way, dimension P in static engine behaviour in the range of nominal engine speed +/- damping range is reduced to 6.5 %. The goal of this intervention is to arrive at a situation wherein the engine functions in a precise and stable manner in the nominal speed band without reacting violently to small changes in speed. If, following a fault, the engine should function outside the speed band, the programmed governor parameters are restored to 100 % effectiveness and the governor corrects speed errors as rapidly as possible.
   For standard settings refer to the basic settings of the governor. Corrections of the setting are possible only during the engine running test.

3. *Parameters that depend on the engine speed and load.*
   For the basic P, I and D parameters there is a characteristic curve of the parameter that depends on the engine speed and injected quantity (load) (page 17). The effective parameters are determined by the multiplications of the basic parameters by the contents of the characteristic curves.
   Example: speed governor: P dimension =10 %
   P dimension characteristic curve = 200 % at 2000 rpm and 50 cmm/lift
   Result: for the indicated work point the P dimension becomes effective with 20 %.

6.8.2.2 ACCELERATOR PEDAL CALIBRATION

In normal circumstances the accelerator pedal is operated by the tractor operator. The accelerator input (PIN 24 on vehicle connector) can be utilised also as a remote control input, as required for locomotive and marine applications. Calibration is required however in all cases.
Calibration must be performed both for initial commissioning of the customer and Service and in the event of the installation of replacements. The accelerator is not always part of the DEUTZ AG supply. However, we recommend using the DEUTZ pedal transducer P/N 0419 9457. Further to agreements entered into with the manufacturer the customer may however install alternative accelerators.
Condition:

- Connection as per overview of EMR1 system:
  signal input (pin 24 / vehicle connector) versus GND (pin 23 / vehicle connector)
- Analog signal:
  > 0.5 V (accelerator at rest), e.g. 1 V
  < 4.5 V (accelerator pressed fully down against limit stop), e.g. 4 V
- The reference voltage is provided by EMR1 on the vehicle connector (pin 25 + 5 V).
  This reference voltage is compatible also with the hand throttle potentiometer. Therefore, the load current with the parallel connection of the pedal accelerator and the hand throttle potentiometer must be no greater than 25 mA in total (i.e. total resistance > 200 Ω).

Accelerator calibration by means of the "Calibration" menu:

Calibration is executed from the menu. The two travel stops "Accelerator rest position" and "Accelerator depressed" are calibrated as limit values. See "General calibration procedure".

Accelerator calibration by means of the "Measured values" "Configuration" menu:
The aim of the calibration procedure is to inform the control unit of the limit values of the two travel stops "accelerator rest position" and "accelerator depressed" respectively as the lower and upper reference point. Moreover, they must be set in

accordance with the two reference points "Upper error value" (+5 % of the upper reference point) and "Lower error value" (-5 % of the upper reference point).

Definition of parameters

Configuration form	*Calibration form*	*Value*
Accelerator (SWG1) upper error value	Accelerator (SWG1) upper error limit [max. …5V]	Max. nominal value x 1,05+
Accelerator (SWG1) upper reference	Accelerator (SWG1) full speed [fully depressed, upper limit]	Max. nominal value
Accelerator (SWG1) lower reference	Accelerator (SWG1) rest position [lower limit]	Pedal rest position = idle speed
Accelerator (SWG1) lower error value	Accelerator (SWG1) lower error limit [0 V…rest position]	Pedal rest position - 0.05 x max. nominal value

Measurement of limit values:

- Open the "Measurement values", "Current measurement values" menu.
- Measured value "(F24) accelerator =SWG1": with the pedal in the rest position (lower reference) and the pedal fully depressed (upper reference) "Retrieve value" and transmit it and save it in the control unit.

Configuration:

- Open the "Configuration" option in the "Parameterisation" menu.
- Record the values on the basis of the following example table ("Accelerator input configuration", see below).
- Conversion: 5 V = 1023 digits.

Example: accelerator pedal input configuration

Parameters (variables)	*Factory setting*		*Effective value / measured value*	*Calibration*	*Configuration*
	mV	*Digital*	*mV*	*mV*	*Digital*
Accelerator (SWG1) upper error value	4750	973		4357 [1]	893
Accelerator (SWG1) upper reference	4500	921	4150	4150	850
Accelerator (SWG1) lower reference	500	102	670	670	137
Accelerator (SWG1) lower error value	250	51		463 [2]	95

1) Measured value "upper reference" + 5 % (of the upper reference)

2) Measured value "lower reference" + 5 % (of the upper reference)

6.8.2.3 HAND THROTTLE CALIBRATION

The hand throttle (pin 20 FS) is installed on vehicles such as agricultural machinery. The operator can set the required rpm, for example during ploughing work, and remove his foot from the accelerator pedal completely. In the same way as for mechanically adjusted levers, before starting the engine the position of the hand throttle must be set to 0 (idle speed).

The position of the hand throttle prevails over the position of the accelerator pedal and determines the engine idle speed. The idle speed can be adjusted from a minimum value (650 rpm) and a nominal value (e.g. 2300 rpm) in a manner that is proportional to the nominal value setting. On the basis of the hand throttle setting the engine reacts in the same way as to the pedal accelerator. If the hand throttle is set to a given engine speed, e.g. 1500 rpm, pressing the accelerator pedal will change engine speed only above this setting.

The position of the hand throttle is unrelated to the DEUTZ supply, instead it must be factory programmed in the EMR1. In terms of control element the customer can install a potentiometer.

Requirement for the definition of the hand throttle (potentiometer) nominal value for customer installation:

- Input on vehicle connector pin 20
- Potentiometer supply as per pedal transducer, reference voltage 5V pin 25 and GND pin 23.
- Reference voltage load together with pedal transducer < 25 mA.
- Protection rating IP65
- Displacement of the travel stops between 10 % and 90 % of the potentiometer value.

Example: potentiometer resistance = 1 Ω, the adjustment range between the mechanical travel stops can be between 100 Ω and 900 Ω. This adjustment range can be achieved by

a) restriction of the rotation angle

b) additional resistor on the power lines.

Hand throttle potentiometer calibration:

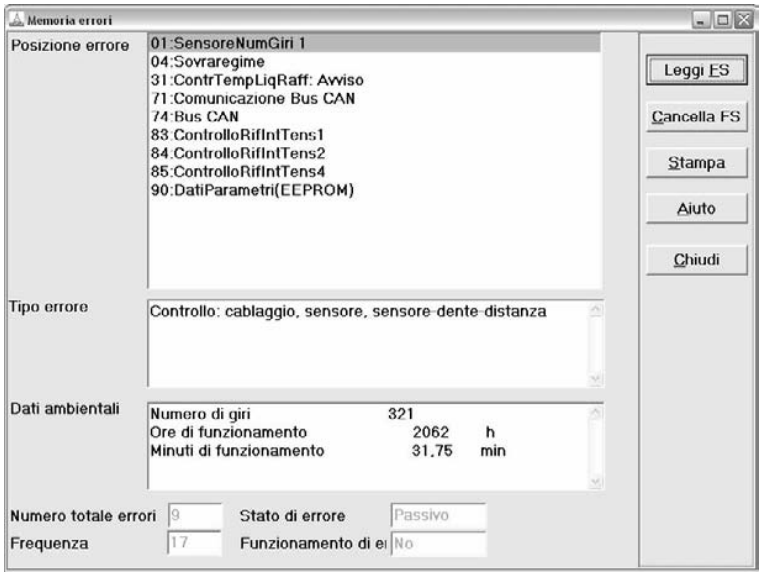
The two potentiometer end stops must be calibrated.

The aim of the calibration procedure is to inform the control unit of the limit values of the two end stops "Potentiometer in minimum speed position" and "Potentiometer nominal speed end stop", respectively as the lower and upper reference points. Moreover, also the "Upper error value" (+5% % of the upper reference point) and the "Lower error value" (-5 % of the upper reference point) must be programmed in accordance with the two reference points.

Definition of parameters

Configuration form	*Calibration form*	*Value*
Hand throttle (SWG2) upper error value	Hand throttle (SWG2) upper error limit [upper limit …5V]	Nominal rpm x 1.05+
Hand throttle (SWG2) upper reference	Hand throttle (SWG2) full speed (upper limit)	Nominal rpm
Hand throttle (SWG2) lower reference	Accelerator (SWG2) speed from standstill [lower limit]	Idle speed
Hand throttle (SWG2) lower error value	Hand throttle (SWG2) lower error limit [lower limit 0V]	Idle speed - 0.05 x nominal speed

6.8.2.4 TROUBLESOOTING EXAMPLE



Troubleshooting:

Connection interrupted? *Not OK* Restore connection.
OK
Fouled or corroded contacts? *Not OK* Clean or renew connector.
OK
Faulty sensor? *Not OK* Renew sensor.
OK
Faulty cable edge connector? *Not OK* Check or renew cable edge connector.

6.8.2.5 ENGINE FAILS TO START

Error reference	*Possible cause*	*Reset*
Choke rpm > 160 rpm not reached	Check with Multimeter: voltage on starter motor terminals < 7 V (12V system)	Change the batteries. Clean the ground cable on the connections
Choke rpm OK, the regulator rod moves to the starting position.	Fuel supply fault.	Restore correct fuel supply.
Choke rpm OK, adjustment rod remains in idle speed position.	Power supply voltage interrupted, connector to incorrect pins or with incorrect polarity.	Disconnect vehicle connector and check the following positions : Pin 14F=+Ubatt Pin 1F=-Ubatt Pin 2F='Ubatt
	Cut-out magnet faulty or not connected.	
	Control rod movements are stiff.	Find the trouble spot and rectify the cause.
	Faulty speed sensor.	Renew sensor, check connection and lines.
	Start load limitation set too low or an excessively high heating liquid temperature is signalled to the EMR1.	Use the Serdia program to check the value of measurement "(M9) coolant temperature " in the "Current measurement values" menu.
Fault warning light flashing.	A critical error has occurred in the EMR1 system. Before performing any further start attempts rectify the fault.	Fault finding with Serdia.

Error signal with Serdia: "8405: adjustment device (governor, stroke adjustment system, control rod".	Recognition of deviation of the governor stroke, value measured in the cut-out field. Cut-out magnet faulty or not connected	Renew the control element, see governor replacement Service example. No further adjustment operations are required.
Error signal with Serdia: "8170: (M13)Rpm 1, cam shaft".	Short circuit or interruption of the speed sensor (cam shaft sensor) or the line or the connection.	Renew the sensor, check for dirt or corrosion of the armature, check the lines between the connector of the vehicle, and check for sensor damage.
Error signal with Serdia: "8210: Loss of EEPROM data" "8220:Coil data lost" "8020:control unit (governor control)	EMR1 memory error. EMR1 memory error. Control unit faulty.	Renew control unit. Transfer data from the original control unit to the new control unit 1:1.
Error signal with Serdia: "8160: (M21)Oil pressure sensor"	Also with the engine stopped the measurement value "(M21) Oil pressure" remains outside its range limits	Renew the sensor, check for dirt or corrosion of the armature, check the lines between the connector of the vehicle, and check for sensor damage.
Error signal with Serdia: "8140: (M9)Coolant temperature sensor"	Also with the engine stopped the measurement value "(M9) Coolant temperature" remains outside its range limits	Renew sensor, check connector and line.
Error signal with Serdia: "8120: (F24)Accelerator pedal = SWG 1"	The accelerator pedal is incorrectly calibrated	Check and, if necessary, edit the calibration values in the "Calibration" menu.

6.8.2.6 ENGINE DIES FOR NO APPARENT REASON

Error reference	*Possible cause*	*Reset*
After powering off: (the ignition switch has not yet been activated On/Off) fault indicator light off	Power off has not taken place and EMR1 fault indication generated. Other possibilities: Fuel supply Surveillance of speed independent from EMR1 Power supply voltage interruption.	 Repair fuel system. Check for the presence of an additional speed surveillance system (e.g. lift magnet) and investigate the relative system, if found. Check the vehicle EMR1 connector, fuse, ignition switch, and also for bad contacts.
After powering off: (the ignition switch has not yet been activated On/Off) fault indicator light permanently illuminated	Use Serdia to pinpoint the position and area of the fault, fault indication Overspeed (possible, for example, in the event of abrupt load changes). for example "pressure" additional note: "inactive".	Depending on the specific fault indication, perform targeted troubleshooting procedures: Reference value: correct speed if appropriate + 15 % Check contact of the oil pressure sensor connector and renew sensor if necessary.
After powering off: (the ignition switch has not yet been activated On/Off) fault indicator light flashing	A critical fault has occurred in the EMR1 system. Before starting the engine find the fault with Serdia.	Take corrective action on the basis of the precise location of the fault. The action may include replacing the control unit, the control element, or the sensor. The additional note "inactive" refers to a bad contact in the specified fault point.

6.8.2.7 REPLACEMENT OF EMR1 CONTROL ELEMENT

The control element is a purely mechanical component of the EMR1, installed in a fixed manner on the engine. The control magnet that forms part of the device is activated by the EMR1 and it positions the control rod and therefore serves to adjust the supply of fuel to the engine. A stroke sensor installed in the control element informs EMR1 of the potion of the control rod.
The following fault messages may make it necessary to renew the control element:

- 8113:(M17) Control stroke sensor
- 8405: Control element (governor, stroke measurement system, control rod)

Replacement instructions:

- Disconnect the power input to EMR1 and detach the connection cable to the control unit.
  The battery positive lead must be disconnected for safety reasons.
- Remove the original control element and clean the mounting surface on the engine.

CAUTION: with the control element removed the control rod will be in the maximum load position so the engine must not be started under any circumstances!

- Fit the new control element using DUETZ insulating past P/N 0101 6102.
  When you renew the control element you need to check its compatibility with the control unit.
  There are currently 3 possible combinations in the case of replacement:

Control element / control unit compatibility

Control unit, TN	*Software vers. n° EMR1*	*Corresponding control element, TN*	*Behaviour in the case of replacement of the control element*
0211 1846		0211 1841	In the case of replacement, this combination must be completely replaced by the combination 0211 1911 / 0211 1910. In addition, you should also consult the manufacturer.
0211 1910		0211 1911	
0211 2017	1.08	0211 1926	The control element is equivalent to 0211 1911. Only the fixing system to the mounting is different.
0211 2017	1.11	0211 1926	
0211 2686 0211 2690	1.10	0211 1926	
0211 6178 0419 9995	1.31	Bosch EDC	The control element and the pump are in combination. Changing the EDC control element: additional adjustments are necessary 1) Self calibration (Level 4) 2) Transmit the EDC data to the control unit (Level 3)

CAUTION: specific information for 1015. Pay attention to the pump with the EDC control element.

- Restore the connection to the control unit and start the engine.
- With SERDIA, in the "Parameters" -> "Configuration" menu transmit the parameters to the EMR1 with the "PC->ECU" button and test operation of the engine.
- If the engine runs smoothly, save the parameters to the control unit.
- When the test with SERDIA is completed clear the errors log.
- In the SERDIA main menu open the list for identification of control units and print the logistic data in "Tools" as documentation.
- The original control element should be returned to the manufacturer together with the documentation.

6.8.2.8 RENEWING CONTROL UNITS

The control unit can be renewed in two different ways:

1. Original control unit damaged but data still legible (communication with SERDIA possible).
2. Installation of a new control unit with factory-programmed engine record.

Overview of EMR1 control units

1012/1013/2013		*1015*		*1012/1013 for Deutz-Fahr only*	
- With NM label - Programmed -TN in SERPIC	- Without NM label - Not programmed -TN on control unit	- With NM label - Programmed -TN in SERPIC	- Without NM label - Not programmed -TN on control unit	- With NM label - Programmed -TN in SERPIC	- Without NM label - Not programmed -TN on control unit
0211 2016	0211 2017	0211 2016	0211 2017	0211 2451	0211 2088 see also SM 130-99-9305
Started from 0211 2581	Started from 0211 2570	Started from 0422 6179	Started from 0422 6178	Started from 0211 2580	Started from 0211 2571
See also SM 130-27-9308				See also SM 130-27-9308	
Started from	Started from	Started from	Started from	Started from	Started from
0211 26911 1)	0211 2686 1)	0419 4043 1)	0419 9995 1)	0211 2692 1)	0211 2690 1)

1) TN updated, reconsigned with order.

Overview of EMR2 control units

For all series	
- With NM label - Programmed -TN in SERPIC	- Without NM label - Not programmed -TN on control unit
0211 2704	0211 2850

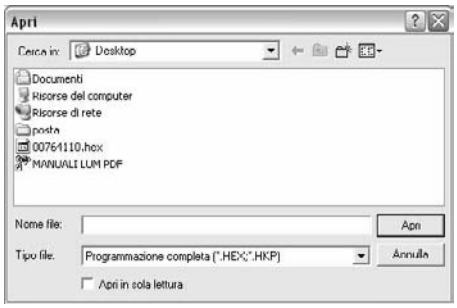
Notes on the above records:

- With NM label - Programmed - *TN in SERPIC*	Complete control unit. For operation of the engine, each control unit must be programmed with its own specific engine record and must bear an adhesive label (sensor no.). In this manner engine and control unit form an integrated unit. When ordering a new control unit specify both the engine type and also the NM. The completion is carried out by DEUTZ.
- Without NM label - Not programmed -TN on control unit	Control unit not programmed. The engine cannot be started in conjunction with this control unit. In the framework of maintenance work, this control unit can be completed with the transmission of the specific record of the engine from the original control unit by means of SERDIA with access level III, refer also to the SERDIA manual "Complete programming". For maintenance work it is also possible to order unprogrammed controlled units of DEUTZ Service partners (competence class II). Completion (also NM label) is executed by the Service partner. If the record cannot be read from the original control unit, it can be requested by email with the same procedure as that described in SM 0199-99-9287 "Notification of EMR control data modifications".

METHOD 1

Phase 1: Reading of engine record from the original control unit:

- Switch on ignition/power supply voltage.
- Start the SERDIA program.
- In SERDIA, change in the "Parameters"-> "Complete programming" menu.
- Click the "ECU->file" button. The configuration data are read. The "Save as..." window is then displayed.
- Enter a name and save the file.



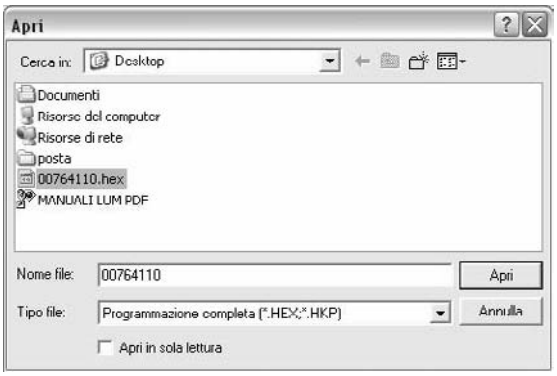
The proposed filename (not obligatory) is formed of the engine number, although other names are possible.
Then confirm by clicking the OK button. The file (i.e. the engine data record) is saved with the name <numeromotore>.hex.
After importing the data record from the original control unit it will also contain data concerning the operating hours of the engine and the number of engine elements.

- Quit the program. Switch off the ignition/power supply voltage.

Phase 2: Renewal of the control unit:

Compatibility of the control units must be checked on the basis of the above table, the contents of which must be observed (same part number). Also compatibility of the control unit with the control element must be checked and observed.

- Switch on the ignition/power supply voltage.
- Start the SERDIA program.
- In SERDIA, change in the "Parameters"-> "Complete programming" menu.
- Click on the "Programming" button. The "Open" window will be displayed.
- Select the saved engine data record (<numeromotore>.hex) and double click on it.
- Transmit the engine record data to the EMR1 by clicking the "Next" button.
- Save the engine data record by clicking the control unit "Save in ECU" button.



Phase 3: Start the engine and check that it is running satisfactorily.

- Clear the errors from the "Errors log" menu

METHOD 2

Each EMR2 has a specific data record for the engine, which is saved in a DUETZ AG central computer when the engine is delivered. Any modifications to the EMR1 configuration must be communicated to DEUTZ AG. When ordering a new control unit, the unit in question must be programmed with a data record, which is in the possession of DEUTZ AG filed under the relative engine number. If corrections of the engine settings are not communicated to DEUTZ AG, they cannot be taken into account when programming a new control unit.

- Switch on ignition/power supply voltage.
- disconnect both connections from the original control unit. Connect the control unit with the engine and vehicle connectors (both 25 pin connectors).
- Switch on ignition/power supply voltage.
- Start the SERDIA program.
- Clear the errors from the "Errors log" menu.
- Start the engine and check that it is running satisfactorily.

6.8.2.9 CONFIGURATION DATA READING ERRORS

This error warning is generated only if SERDIA is unable to read the HEX file. In this case the file may contain special accents (ä,ö,ü) or characters that cannot be interpreted by SERDIA.

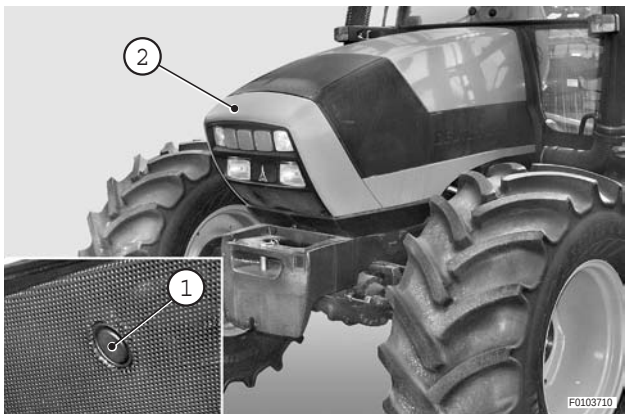
SECTION 30

CONTENTS

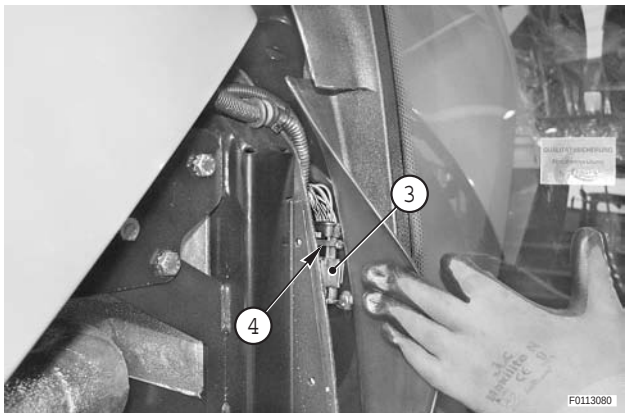
ENGINE HOOD

Removal

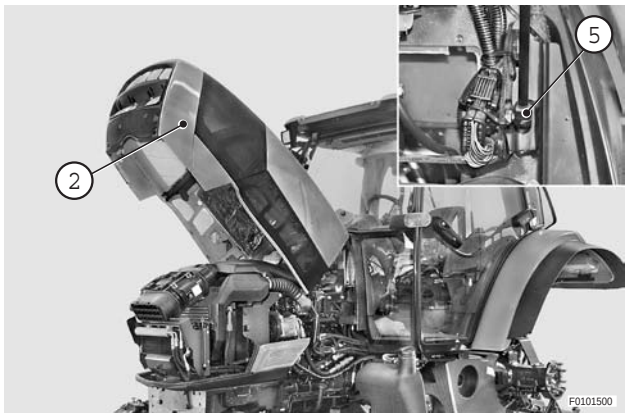
1 - Press button (1) and open engine hood (2).



2 - Unplug connector (3) for light units power supply and release the wiring from clip (4).



3 - Detach gas springs (5) from hood (2).

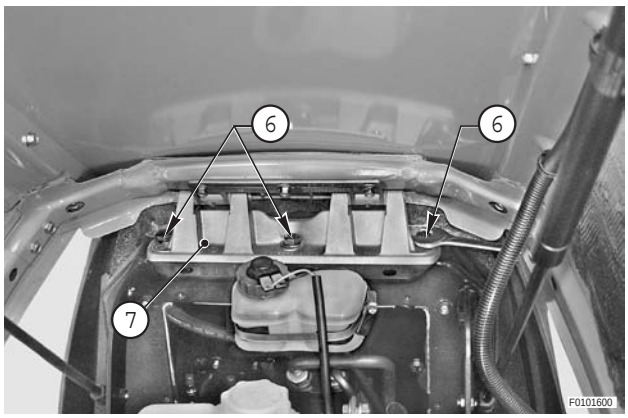


4 - Unscrew and remove screws (6) and washers securing hood casing (7).

5 - Remove the hood.

kg Hood: approx. 65 kg (143 lb.)

In the absence of a suitable hoist, the hood may be removed with the assistance of other people after having agreed the movements to be carried out.



Refitting

- Refitting is the reverse of removal.

WHEELS

FRONT WHEELS

Removal

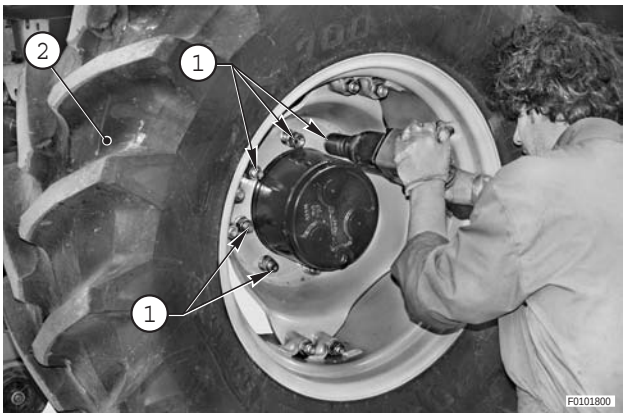
⚠ On tractors with front suspension, before stopping the engine prior to removal of the front wheels, disengage the front suspension by pressing the pushbutton in the cab for at least 20 seconds.

1 - Apply the parking brake.

2 - Position under the differential housing a trolley jack "*A*" with a minimum lifting capacity of 15 tons. and a maximum lift height of at least 15 cm (6 in.).

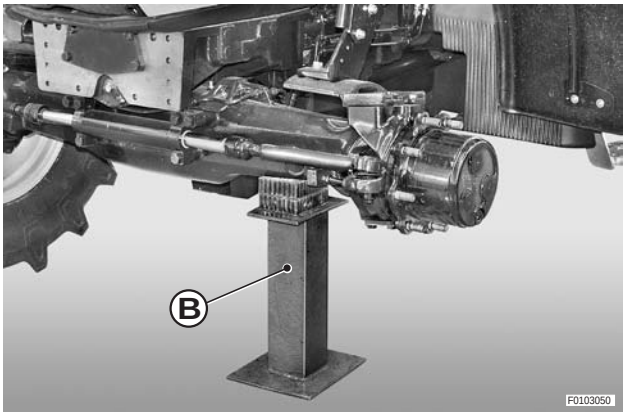
★ Drive safety wedges between the axle and the trunnion mounting.

3 - Raise the front end of the tractor sufficiently to eliminate flexure of the tyre walls and to lift the wheels by approximately 2 cm (0.8 in.).



4 - Slacken off all the wheel nuts (1); remove the wheel nuts, leaving one (for safety) at the top of the wheel. ⁘ 1

5 - While holding the wheel vertical, remove the last nut and remove wheel (2).



6 - Position a stand "*B*" under the axle and lower the tractor.

7 - Repeat the above operations to remove the other rear wheel.

Refitting

- Refitting is the reverse of removal.

⁘ 1

Nm Wheel nuts: 350 Nm (258 lb.ft.)

★ Tighten the nuts gradually in a crosswise sequence.

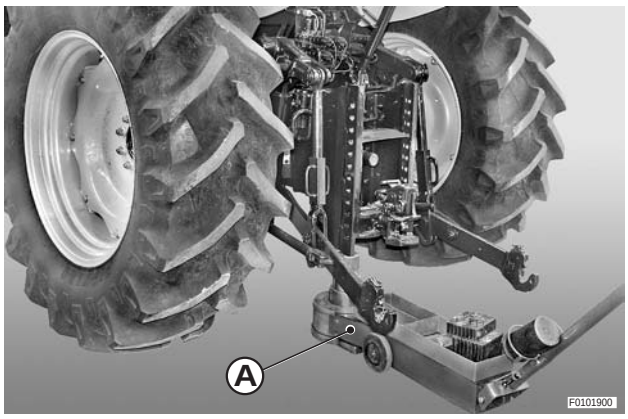
REAR WHEELS

Removal

1 - Position under the rear gearbox a trolley jack "*A*" with minimum lifting capacity of 5 tons. and a maximum lift height of at least 15 cm (6 in.).

★ Position jack "*A*" so that is nearer to the wheel to be removed.

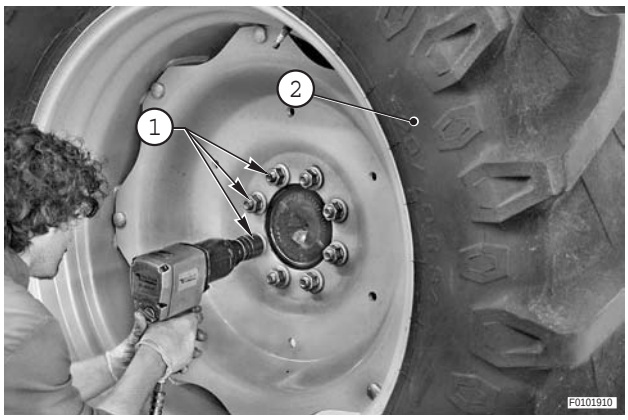
2 - Elevate the tractor until the tyre of the front wheel to be removed just clears the ground.



3 - Slacken off all the wheel nuts (1); remove the wheel nuts, leaving one (for safety) at the top of the wheel.

※ 1

4 - While holding the wheel vertical, remove the last wheel nut and remove wheel (2).

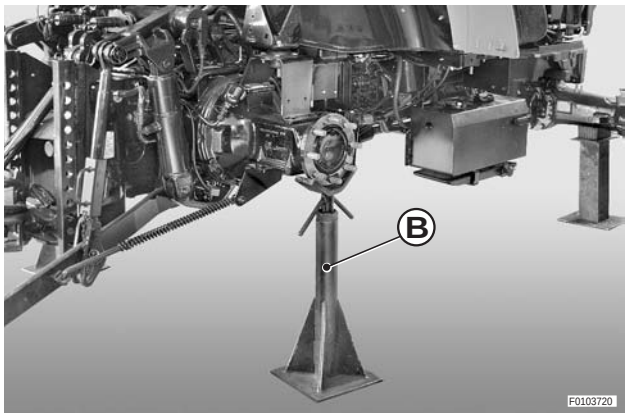


5 - Position a stand "*B*" with lateral retaining wings under the rear axle housing and lower the jack so that the axle rests on the stand.

★ Axle stand capacity: 2 tonnes minimum

6 - Check that the stand is correctly positioned before removing the jack.

7 - Repeat the above operations to remove the other rear wheel.



Refitting

- Refitting is the reverse of removal.

※ 1

Nm Wheel nuts:
M18x1.5: 370 Nm± 10%(273 lb.ft.±10%)

★ Tighten the nuts gradually in a crosswise sequence.

FRONT FENDERS

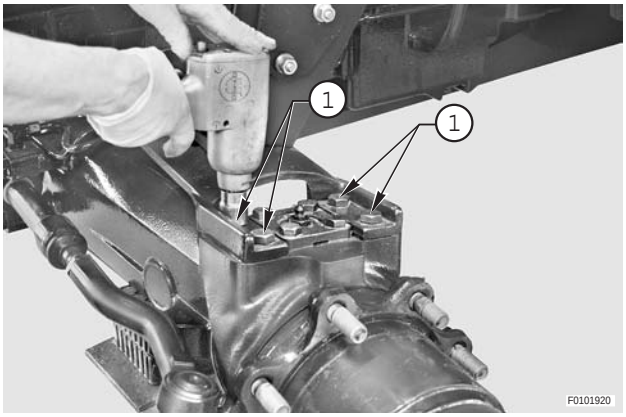
Removal

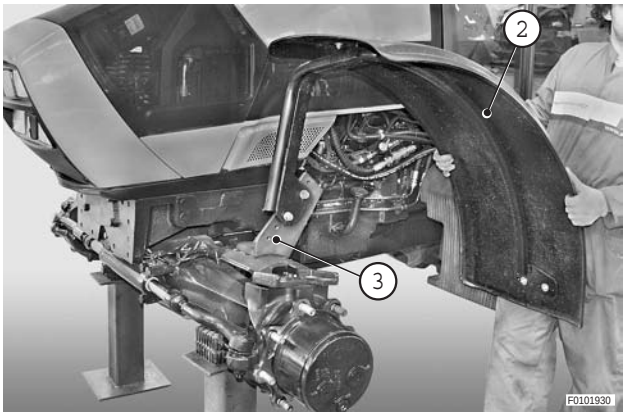
★ Removal of the front fenders is only necessary for major repairs and overhauls where additional working space is required at the side of the tractor and whenever the tractor is to be supported on stands.

1 - Remove the front wheels.
(For details, see "WHEELS - FRONT WHEELS").

2 - Unscrew and remove screws (1) and remove fender (2) complete with mounting bracket (3).

kg Fender assembly: approx. 20 kg





Refitting

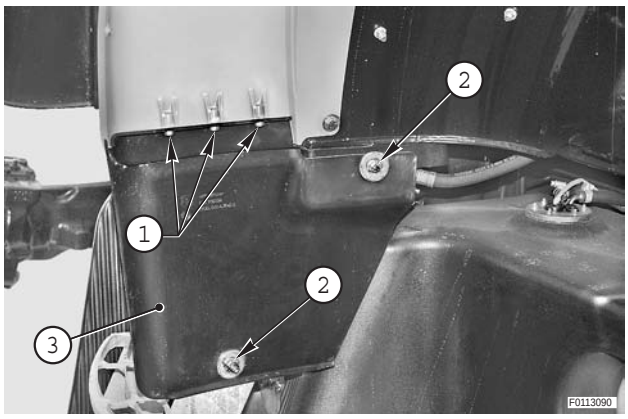
• Refitting is the reverse of removal.

CAB ACCESS STEPS

Removal

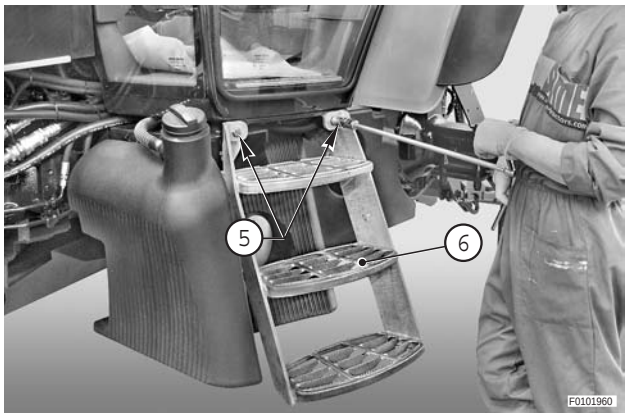
1 - Remove the rear wheel on the appropriate side. (For details, see "WHEELS - REAR WHEELS")

2 - Remove screws (1) (qty 3), nuts (2) and remove fender (3).



3 - Loosen screw (4).

4 - Remove screws (5) and remove cab access steps (6).



Refitting

- Refitting is the reverse of removal.

FUEL TANK

Removal

a - Do not smoke or allow naked flames in the vicinity during the removal, refitting and filling operations.

b - Wipe up any spilt fuel immediately before someone slips on it.

c - Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Drain the fuel tank completely by siphoning off the fuel.

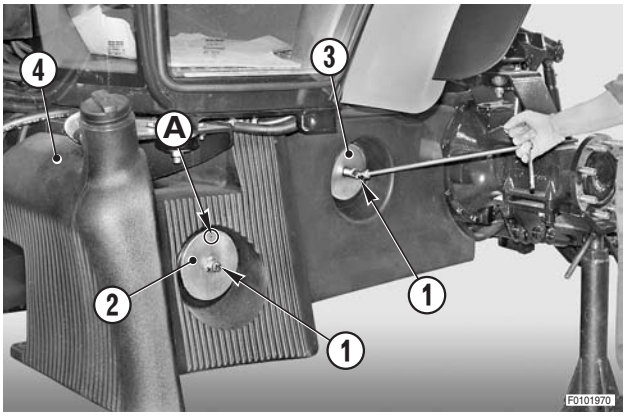
Fuel: max. 150 , (39.6 US.gall.)

2 - Remove the left rear wheel. (For details, see: "WHEELS - REAR WHEELS")

3 - Remove the cab access steps on the left-hand side. (For details, see: "CAB ACCESS STEPS")

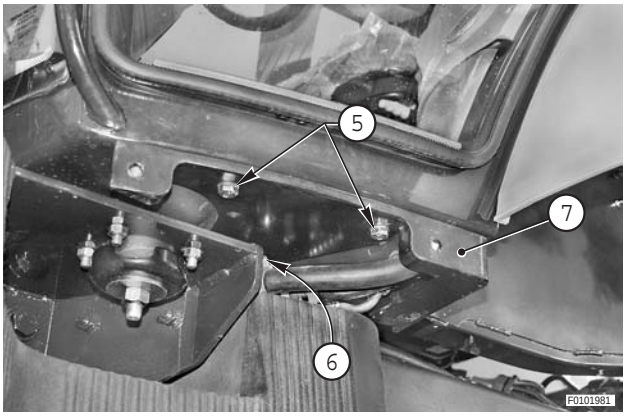
4 - Remove screws (1) and remove locating (2) and retaining discs (3) of fuel tank (4).

★ Note the position of hole "*A*" as the tank is levelled by rotating the front washer.



• *For versions without cab pneumatic suspension*

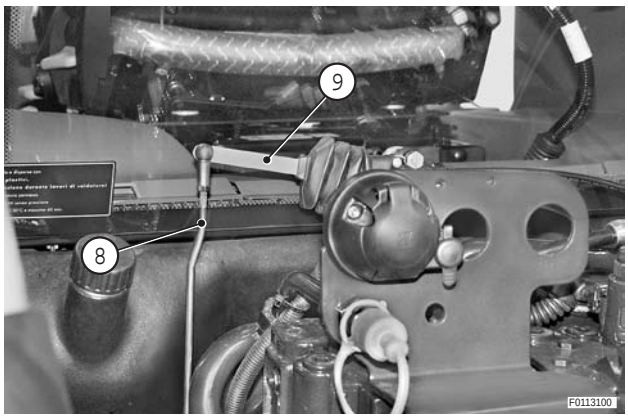
5 - Remove screws (5) (qty 2), loosen screw (6) and remove support (7).



• *For versions with cab pneumatic suspension*

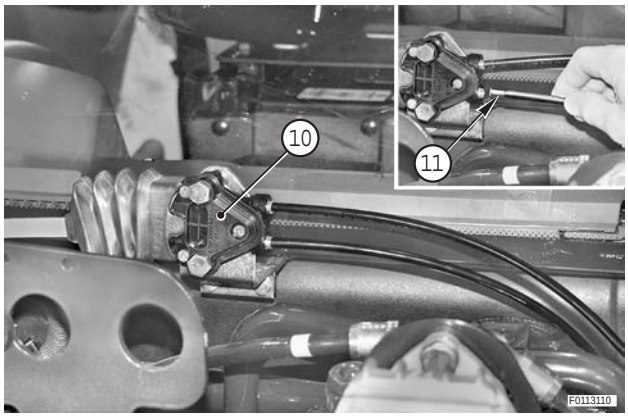
Eliminate all residual pressure from the trailer air circuit.

6 - Disconnect tie rod (8) and lower completely lever (9) to discharge any residual pressure from the cab suspension circuit.

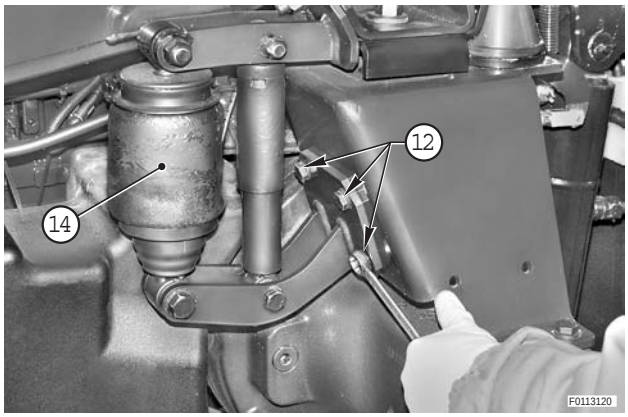


7 - Disconnect the cab suspension circuit supply pipe from valve (10).

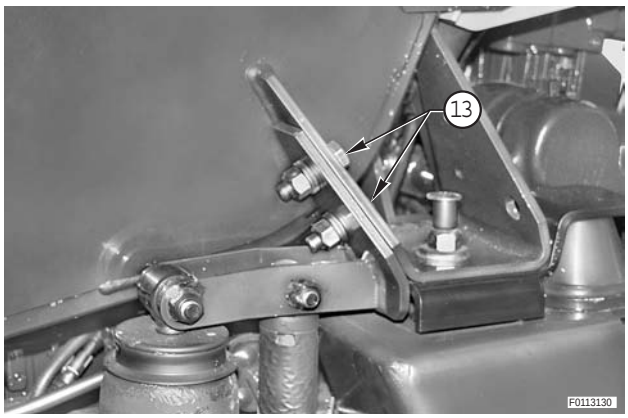
★ Recover pipe (11).



8 - Remove the three screws (12).

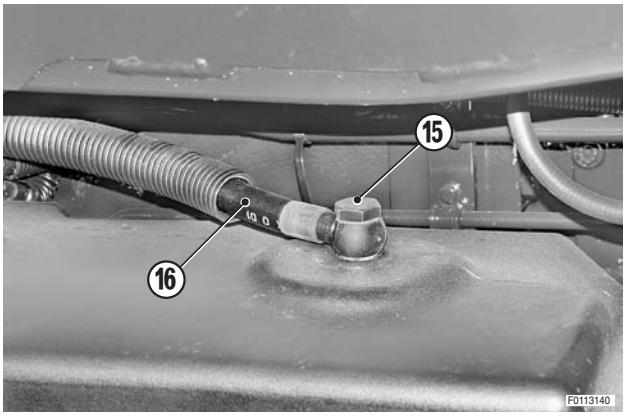


9 - Remove the two screws (13) and move shock absorber assembly (14).

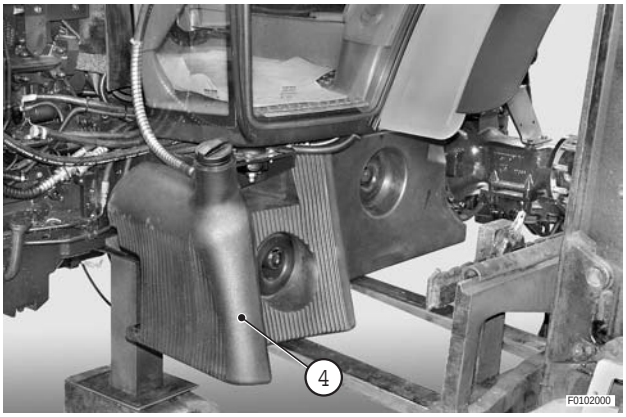


• *For all versions*

10 - Remove union (15) and disconnect breather pipe (16).
★ Renew the copper washers on reassembly

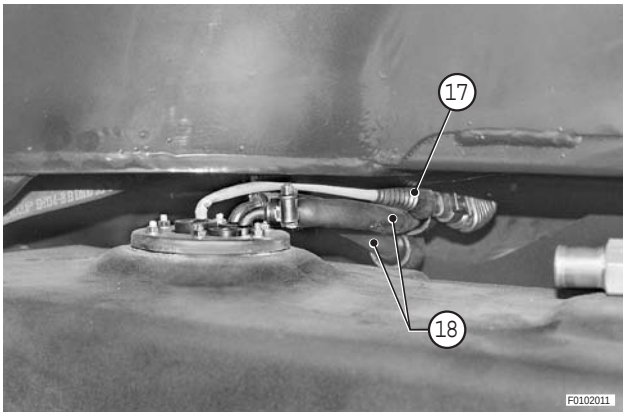


11 - Position suitable lifting equipment under fuel tank (4) and pull it slightly outwards.



12 - Unplug fuel level sensor connector (17).

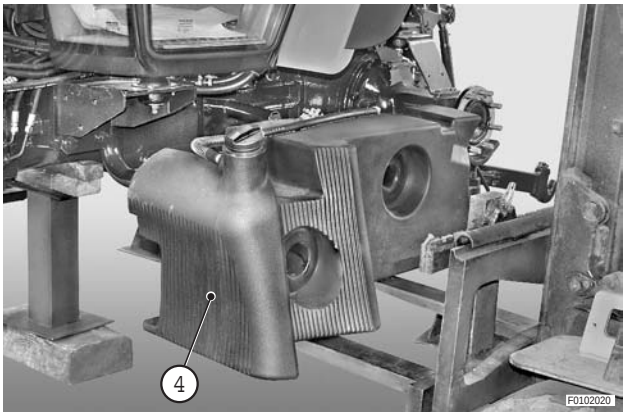
13 - Loosen the clamps and disconnect fuel delivery and return pipes (18).
★ Mark the hoses to avoid error when reconnecting.
★ Plug the pipes to prevent the entry of impurities.



14 - Remove fuel tank (4).

Refitting

• Refitting is the reverse of removal.



COOLERS-RADIATOR ASSEMBLY

COMPLETE ASSEMBLY

Removal

1 - Remove the engine hood.
(For details, see "ENGINE HOOD").

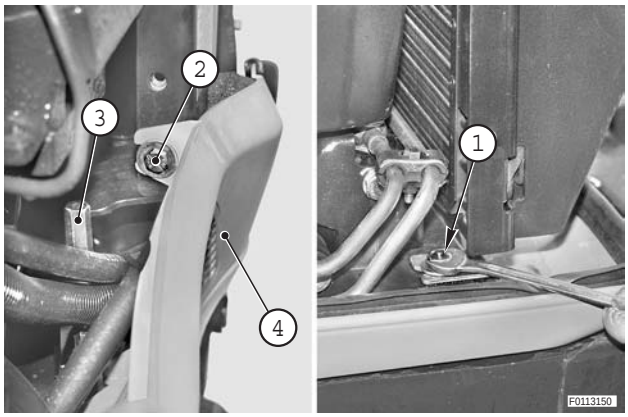
2 - Recover the refrigerant from the air conditioning system. (For details, see "AIR CONDITIONING SYSTEM")

3 - Drain the engine cooling system.

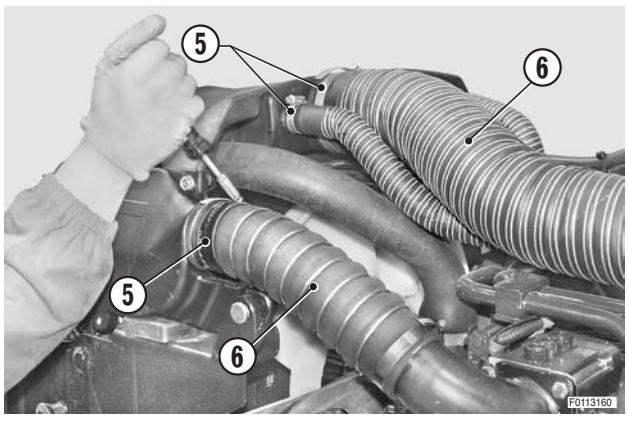
Coolant:

Mod.	*90*	*100*	*110*	*120*
+	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10

4 - Loosen screws (1), (2) and (3) and remove lower guard (4).

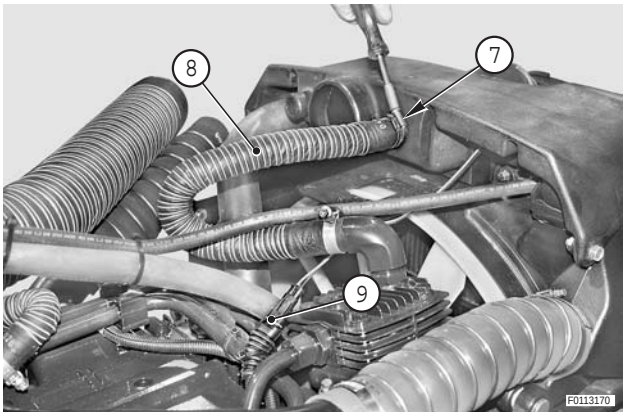


5 - Loosen clamps (5) and disconnect pipes (6).

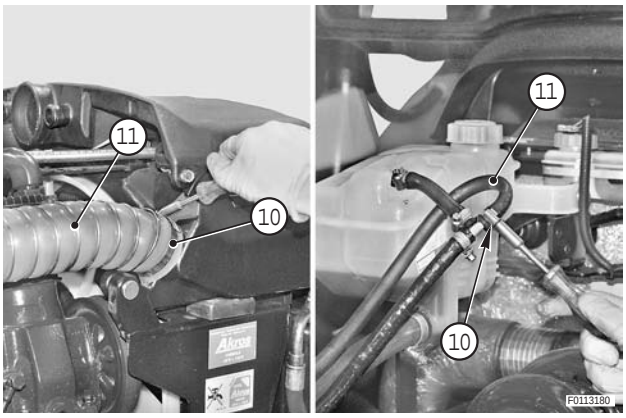


6 - Loosen clamp (7) and disconnect pipe (8).

7 - Unplug connector (9) from filter clogging sensor .

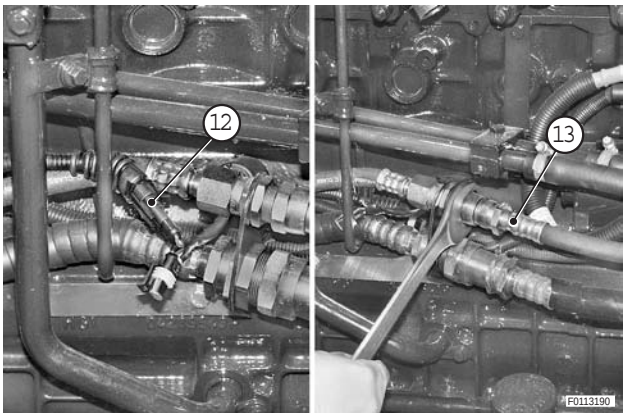


8 - Loosen clamps (10) and disconnect pipes (11)

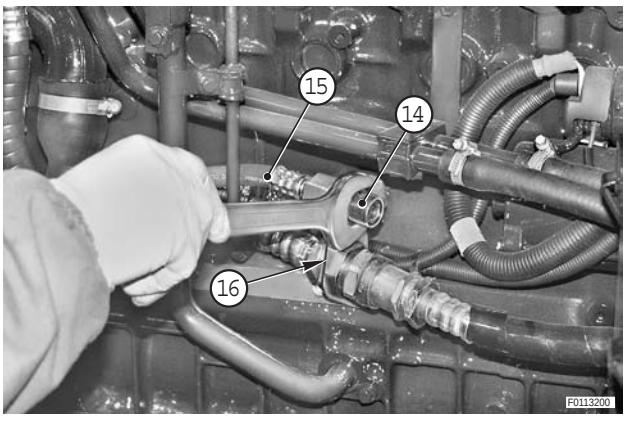


9 - Disconnect connector (12) of the air conditioning pressure switch.

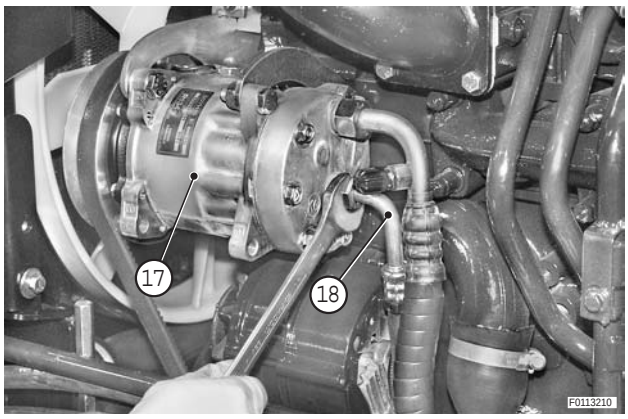
10 - Unscrew and disconnect air conditioning system discharge pipe (13).



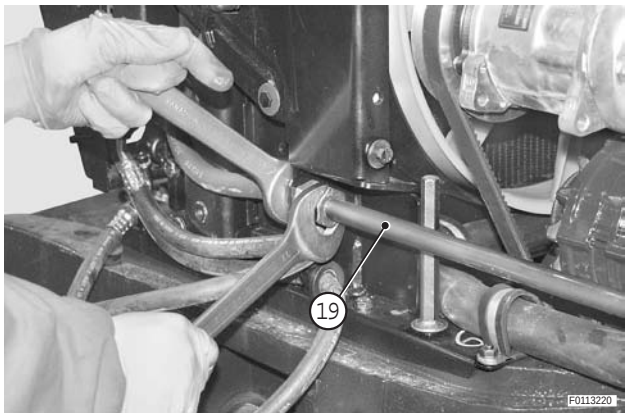
11 - Remove ringnut (14) and disconnect pipe (15) from support (16).



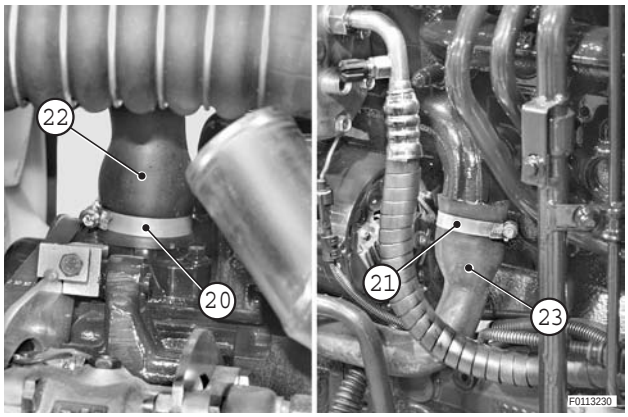
12 - Disconnect discharge pipe (18) from air compressor (17).
★ Immediately plug the pipe to prevent moisture from entering the system.



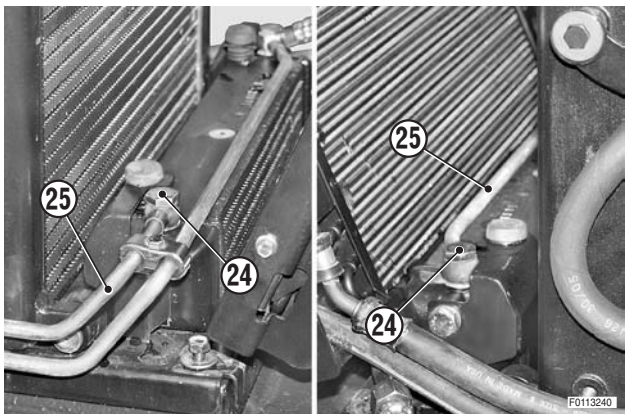
13 - Disconnect return pipe (19) from the exchanger.
★ Plug the pipes to prevent the entry of impurities.



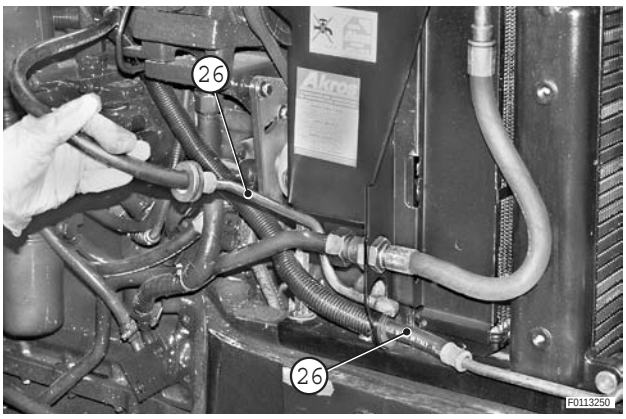
14 - Loosen clamps (20) and (21) and disconnect fuel delivery (22) and return (23) pipes to radiator.



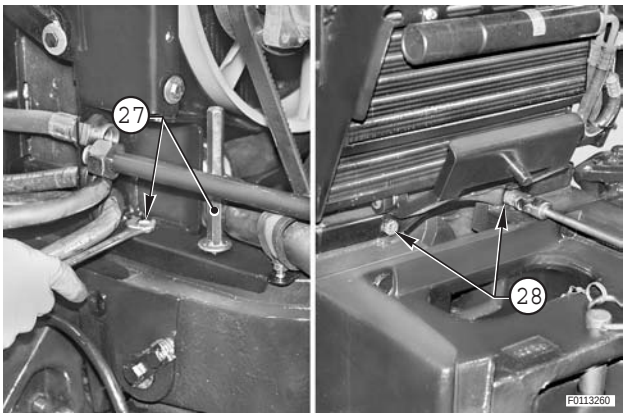
15 - Undo fittings (24) and disconnect pipes (25) from the exchanger.



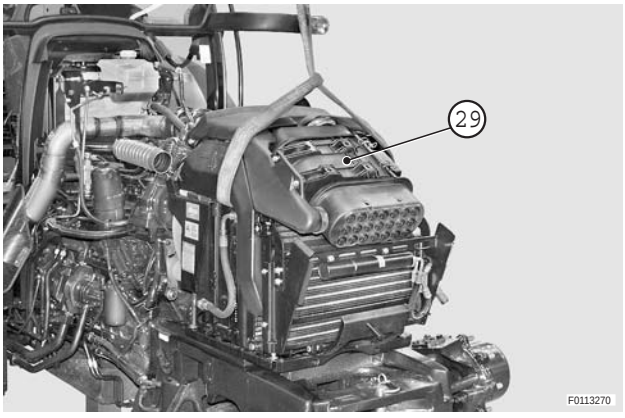
16 - Withdraw pipes (26) from the radiators support.



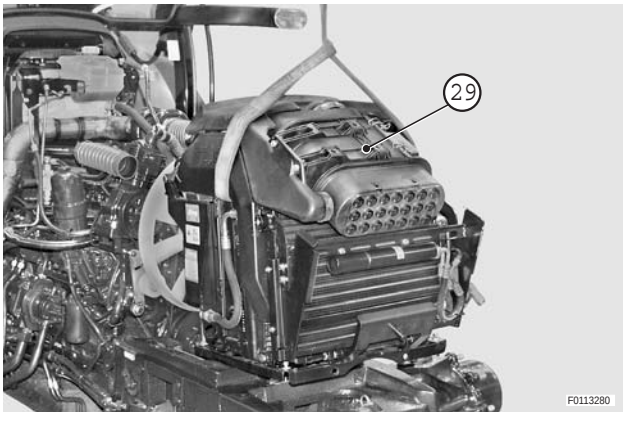
17 - Remove screws (27) (qty 2) and (28).



18 - Attach radiator assembly (29) to a hoist and take up the slack in the lifting sling; slide the radiator assembly forwards until the fan is free from the cowling.



19 - Remove radiator assembly (29).



Refitting

- Refitting is the reverse of removal.

★ Remove the plugs and reconnect the pipes immediately, tightening the fittings fully to ensure moisture does not get into the system

★ Inspect the seals and renew them if damaged.

1 - Flush and recharge the air conditioning system. (For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

2 - Fill the engine cooling system with coolant.

Coolant:

Mod.	*90*	*100*	*110*	*120*
+	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10

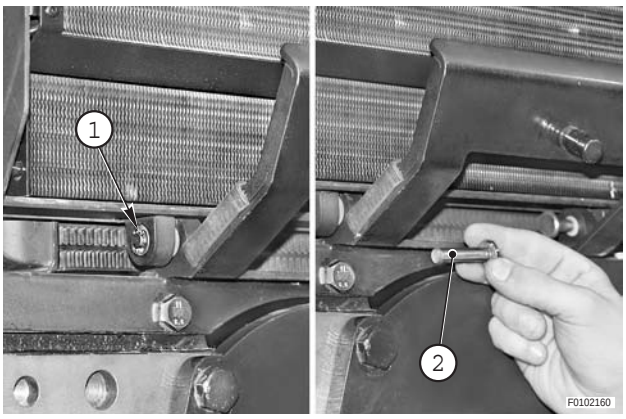
3 - Start the engine and run for a few minutes to allow the coolant to circulate.

4 - Stop the engine, check the coolant level in the expansion tank and top up if necessary.

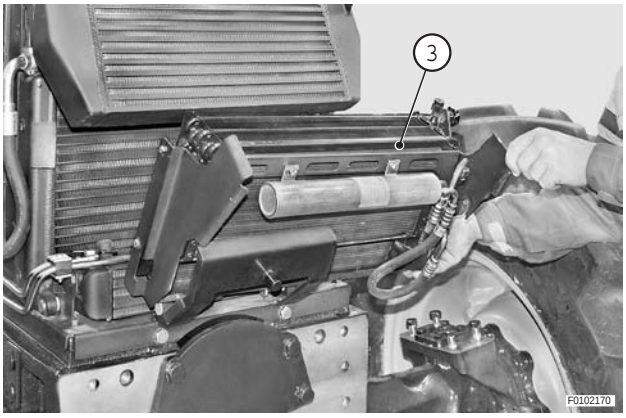
FUEL COOLER

Removal

1 - Remove circlips (1) and remove pivot pins (2) on both sides.

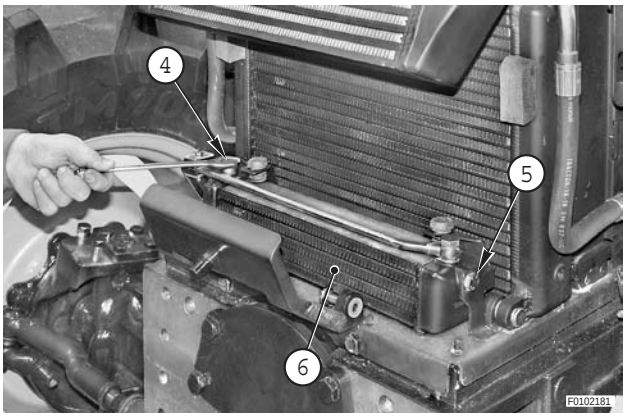


2- Move condenser--drier assembly (3) to one side.



3 - Undo fittings (4) and screws (5) and remove fuel cooler (6).

★ Renew the copper washers on reassembly.



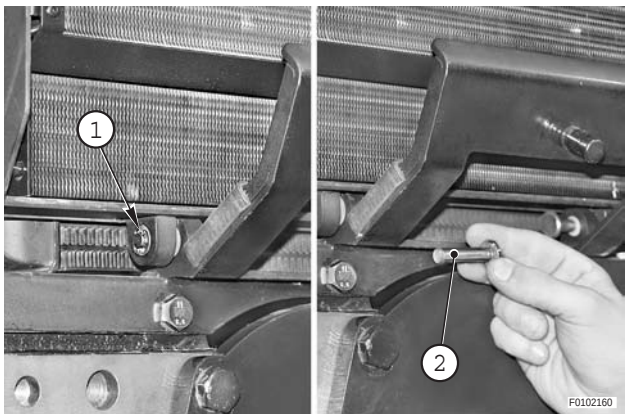
Refitting

- Refitting is the reverse of removal.

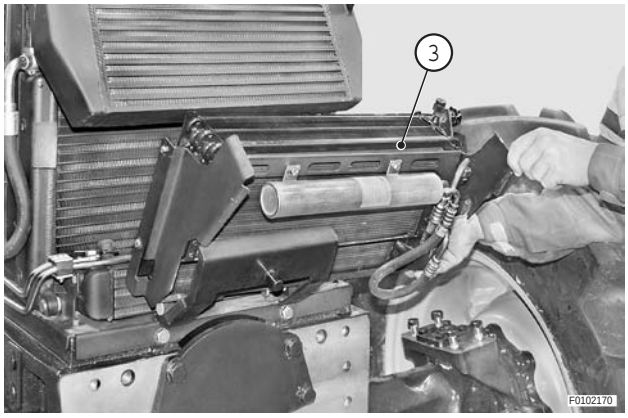
TRANSMISSION OIL COOLER

Removal

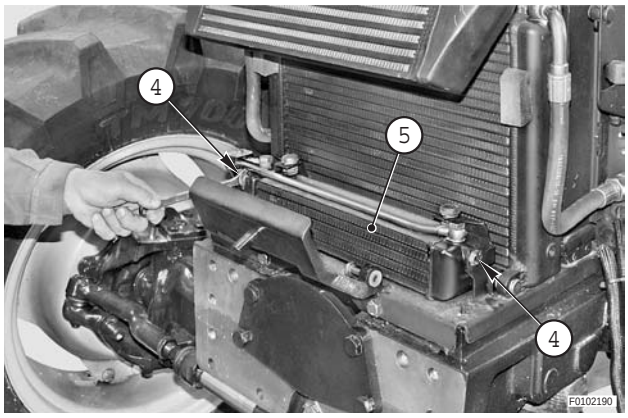
1 - Remove circlips (1) and remove pivot pins (2).



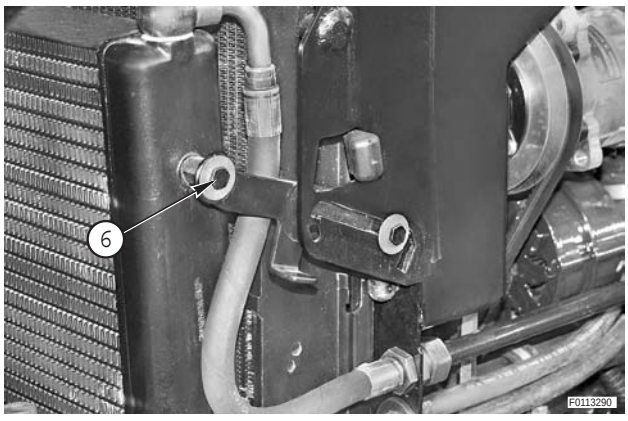
2- Move condenser--drier assembly (3) to one side.



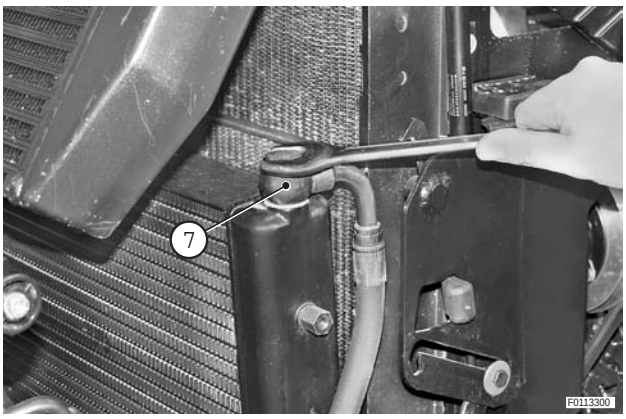
3 - Remove screws (4) and move fuel cooler (5) to one side.



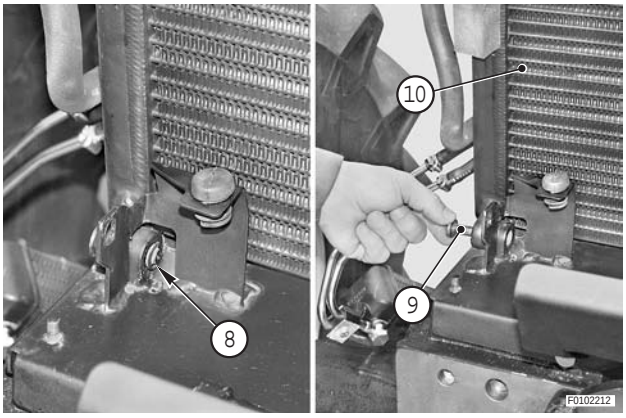
4 - Remove screw (6).



5 - Remove unions (7) on both sides.
★ Renew the copper washers on reassembly.



6 - Remove circlips (8), remove pivot pins (9) on both sides and remove cooler assembly (10).



Refitting

- Refitting is the reverse of removal.

1 - Start the engine and allow the gearbox oil to circulate for about 5 minutes to fill the coolers; check the seals and fittings for leaks.

2 - Stop the engine and check the gearbox oil level; top up, if necessary.

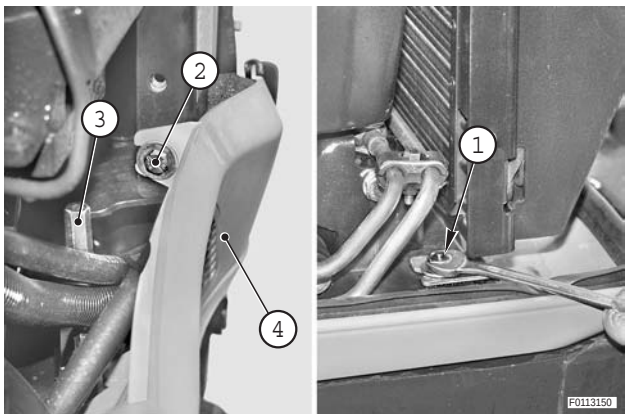
⚠ This operation is essential if new coolers have been fitted.

ENGINE COOLING SYSTEM RADIATOR

Removal

Disconnect the lead from the battery negative terminal (–).

1 - Loosen screws (1), (2) and (3) and remove lower guard (4).

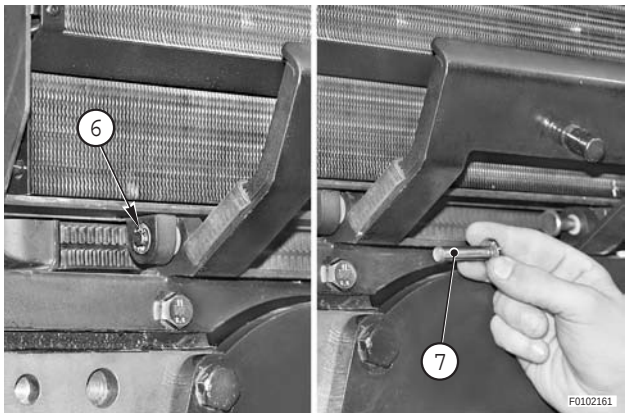


2 - Drain off the engine coolant:

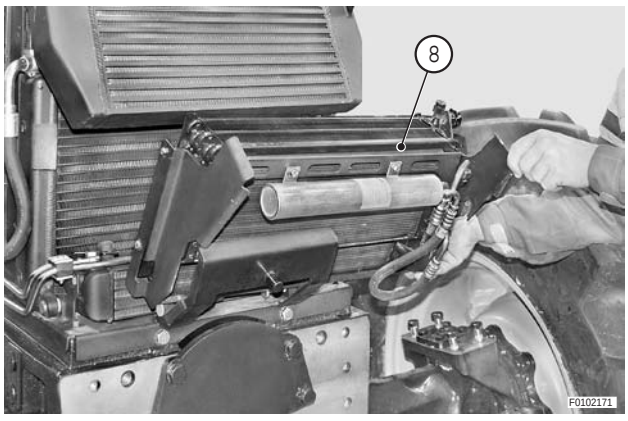
Coolant:

Mod.	*90*	*100*	*110*	*120*
+	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10

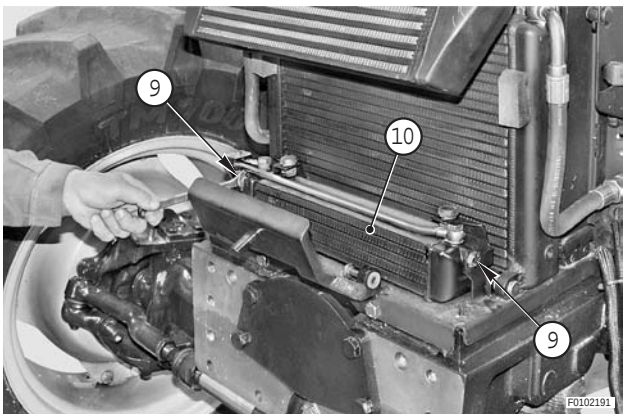
3 - Remove circlips (6) and remove pivot pins (7).



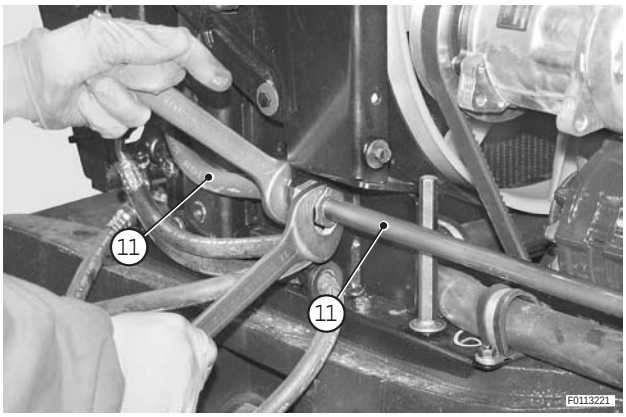
4- Move condenser--drier assembly (8) to one side .



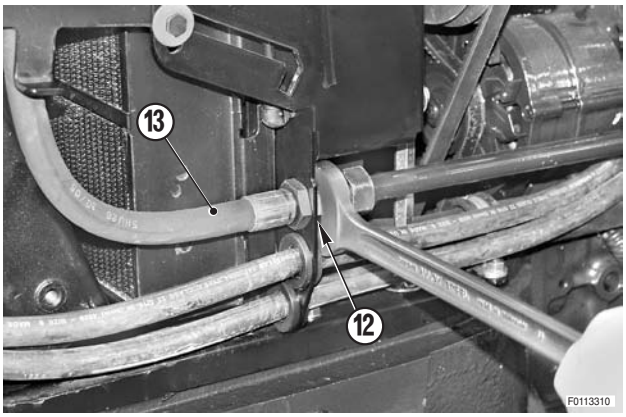
5 - Remove screws (9) and move fuel cooler (10) to one side.



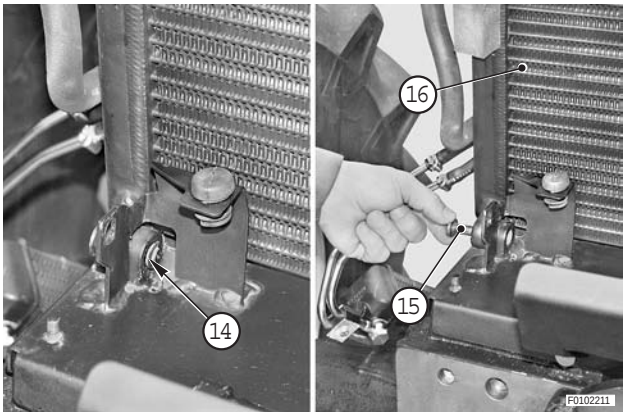
6 - Disconnect pipes (11) from both sides of the radiator.
★ Plug the pipes to prevent the entry of impurities.



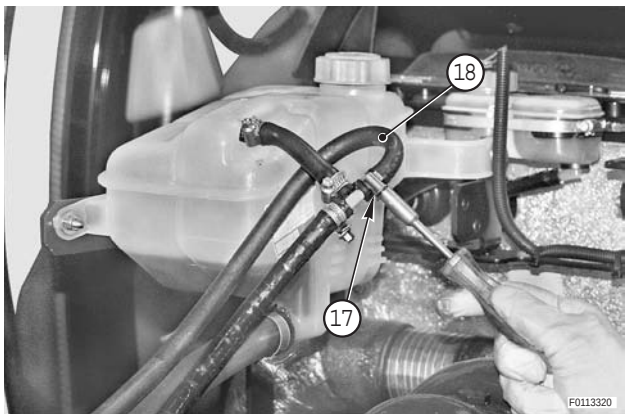
7 - Remove nuts (12) and move pipes (13).



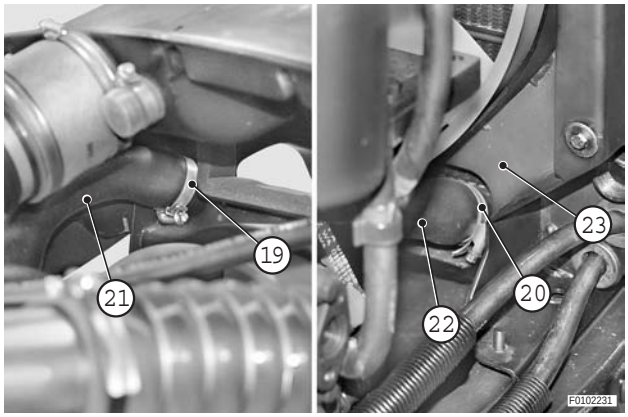
8 - Remove circlips (14), remove pivot pins (15) on both sides and remove gearbox oil cooler (16).



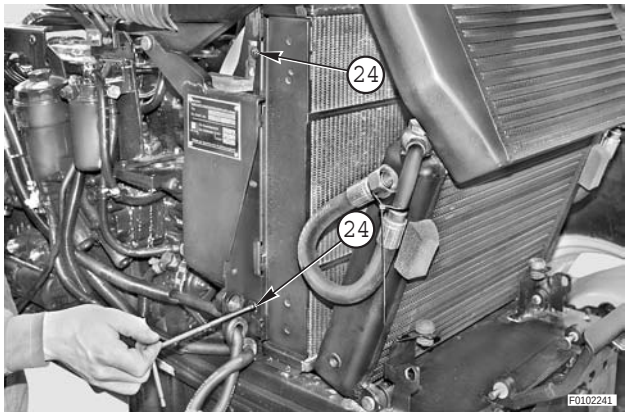
9 - Loosen clamp (17) and disconnect line (18).



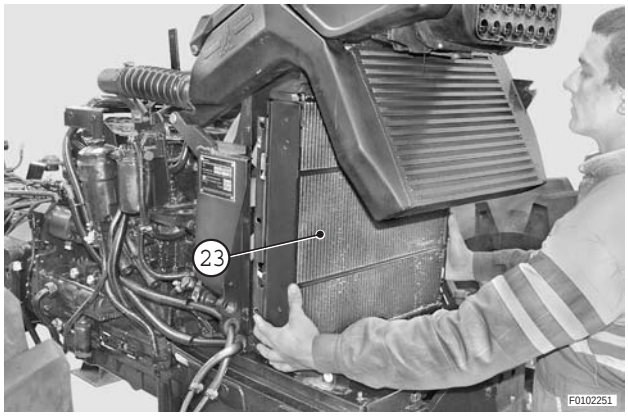
10 - Loosen clamps (19) and (20) and disconnect hoses (21) and (22) from radiator (23).



11 - Remove screws (24) (two per side).



12 - Remove complete radiator assembly (23).



Refitting

- Refitting is the reverse of removal.

1 - Fill the engine cooling system.

 Coolant:

Mod.	*90*	*100*	*110*	*120*
+	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10

2 - Start the engine and allow the gearbox oil and coolant to circulate and check for leaks.

3 - Stop the engine, check the coolant level in the expansion tank and top up if necessary.

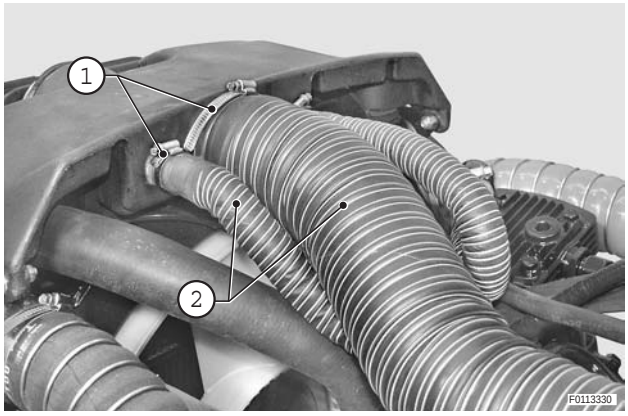
4 - Check the gearbox oil level. Top up if necessary.

AIR FILTER ASSEMBLY

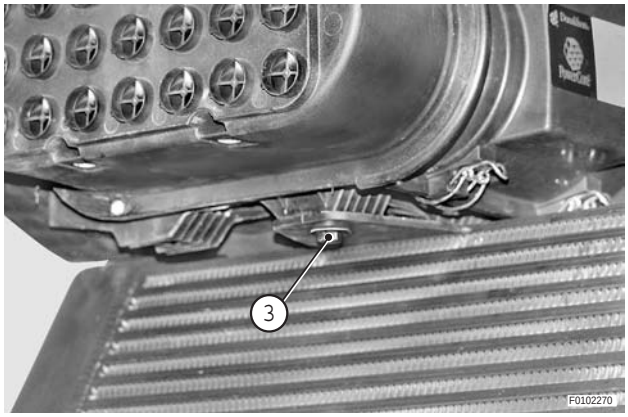
Removal

1 - Unplug air filter clogging sensor connector.

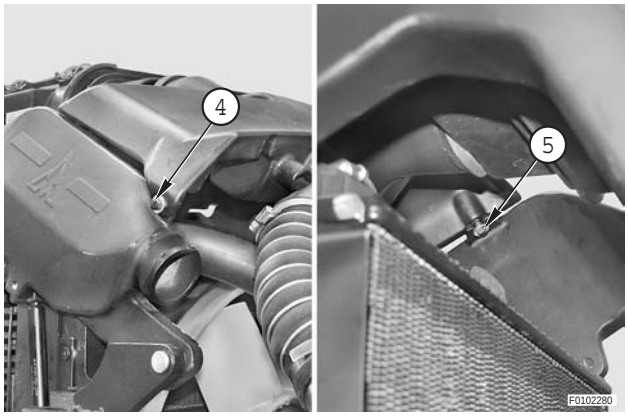
2 - Loosen clamps (1) and disconnect pipes (2).



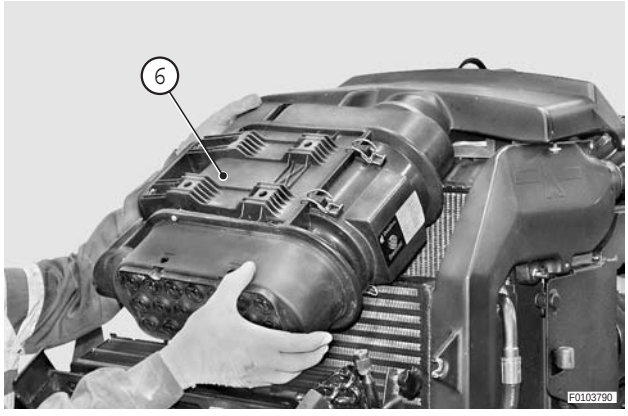
3 - Remove screw (3).



4 - Remove screws (4) and (5) on both sides.



5 - Remove air filter assembly (6). ※1



Refitting

- Refitting is the reverse of removal.

※1

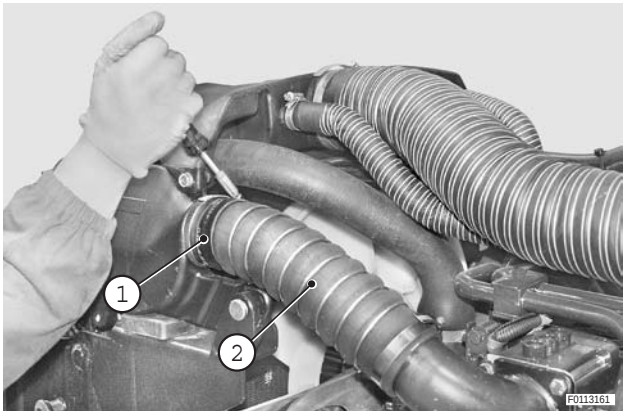
★ If the complete filter assembly is to be renewed, fit new sealing gaskets.

INTERCOOLER

Removal

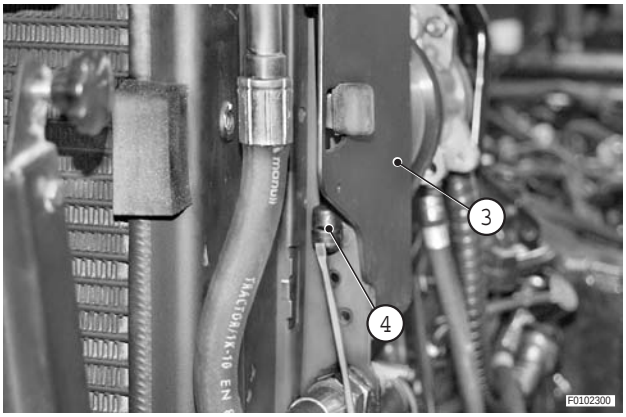
1 - Remove the complete air filter assembly.
(For details, see "AIR FILTER ASSEMBLY").

2 - Loosen clamps (1) and disconnect pipes (2) on both sides.

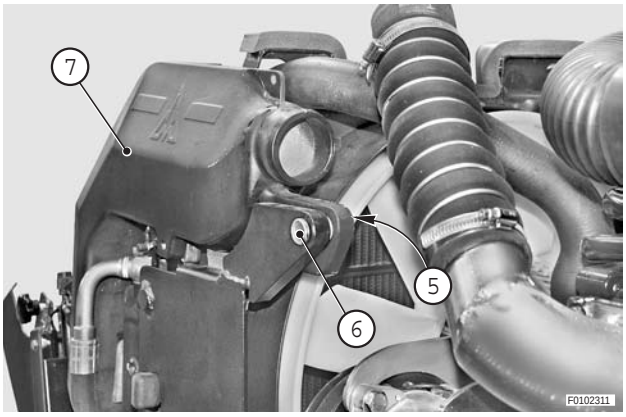


3 - While supporting the intercooler, detach gas spring (4) from radiator support (3).

4 - Lower the intercooler as far as it will go.



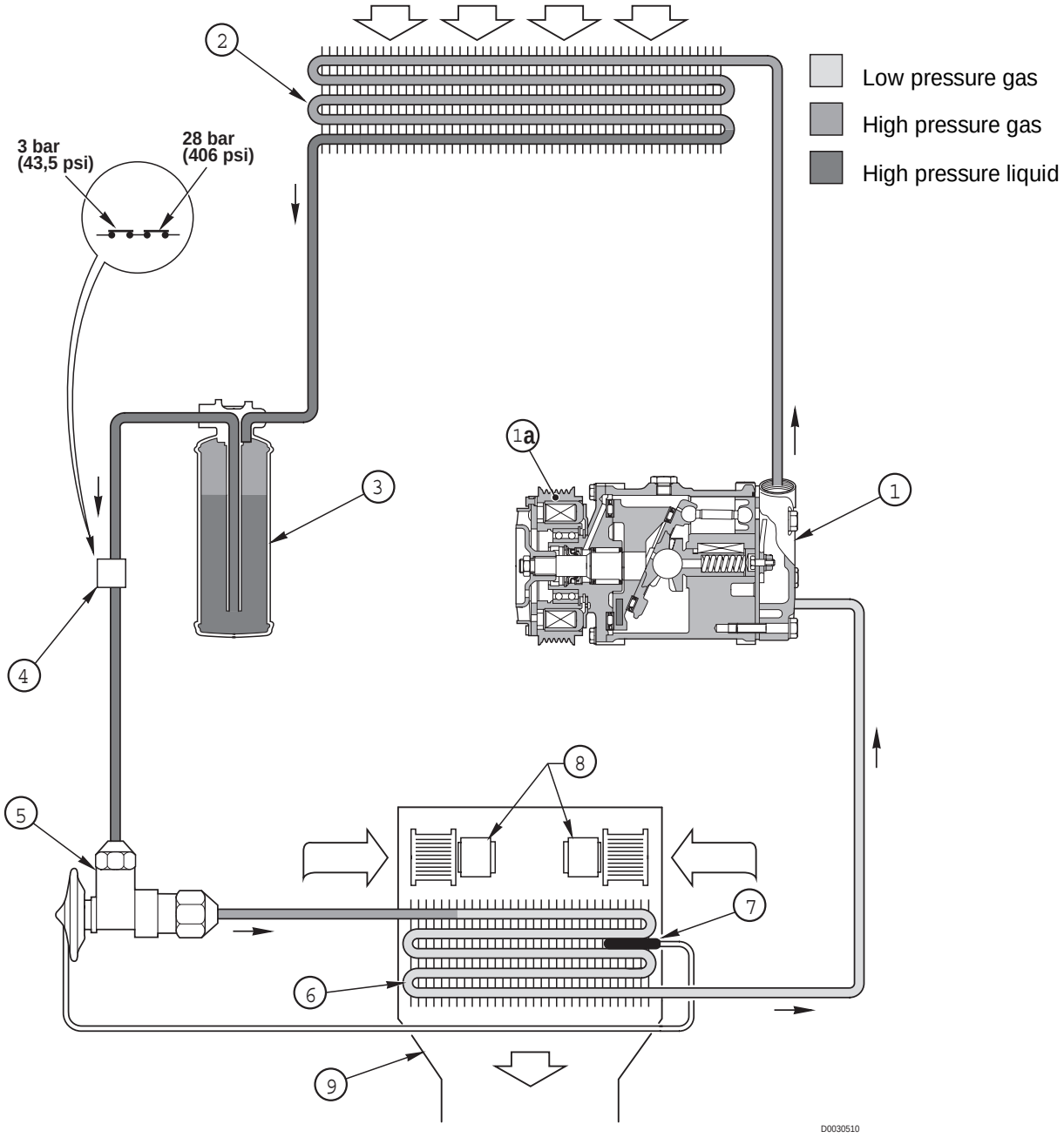
5 - Remove circlips (5), remove pivot pins (6) on both sides and remove intercooler (7).



Refitting

- Refitting is the reverse of removal.

AIR CONDITIONING SYSTEM



1 - Compressor with electromagnetic clutch
2 - Condenser
3 - Dryer tank-filter
4 - Bistable pressure switch for compressor clutch engagement/disengagement
5 - Expansion valve
6 - Evaporator
7 - Evaporator minimum temperature electronic sensor
8 - Cab air blowers
9 - Air cowling

TECHNICAL SPECIFICATIONS

- Minimum and maximum pressures: 2.4÷28.5 bar (34.8 – 413.3 psi)
- Refrigerant type: R134a
- Refrigerant quantity: 1600 g (56.4 oz)
- Total quantity of moisture-free oil added at 1st charging: 210 cm^3 (12.81 Cu.in.)

Operation

Compressor (1) is driven from the crankshaft via a drivebelt and pulley with an electromagnetic clutch (1a), which is operated from a switch on the control panel.

The system is protected by a safety pressure switch, which performs the following functions:

1 - To inhibit engagement of electromagnetic clutch (1a) when the system pressure falls below 2.4 bar (34.8 psi) as a result of incomplete charging or refrigerant loss.

2 - To disengage clutch (1a) and thereby stop the compressor when the pressure exceeds the permitted maximum of 28.5 bar (413.3 psi) (generally as a result of over-heating.

The refrigerant (in vapour state) is drawn in by the compressor where it is compressed. This compression causes the temperature of the vapour to rise; in these conditions the refrigerant flows to the condenser (2) where its heat is dissipated by the air flow until the fluid reaches the condensation temperature, changing to the high pressure liquid phase.

At this point the refrigerant is transferred to filter-drier unit (3), which performs three functions: filters out impurities, absorbs moisture contained in the circuit, and finally, acts as a storage reservoir.

The refrigerant in the liquid phase is transferred to evaporator (6) into which it is injected through an expansion valve (5), which constantly meters the flow to ensure optimum evaporation.

In the evaporator, the refrigerant is heated and expands to the point of evaporation with an ambient temperature of around – 8°C (17.6°F).

The temperature of the air flow through evaporator (6) generated by centrifugal blowers (8) is significantly higher than – 8°C (17.6°F), and therefore it transfers heat to the refrigerant, causing it to boil and evaporate.

At the outlet of evaporator (6) the refrigerant is aspirated by compressor (1) and a new cycle begins.

The removal of heat from the ambient air flowing over the evaporator causes the moisture in the air to condense, and the air is thus dehumidified; the moisture condenses on the fins of the evaporator, where, if it is not maintained at a temperature above 0°C (32°F), it will freeze and impair evaporator efficiency.

The task of maintaining the evaporator at a temperature above 0°C (32°F) (and within the optimum temperature for efficient heat exchange), is performed by electronic temperature sensor (7); this sensor disengages clutch (1a) of compressor (1) when the temperature falls to the lower limit and engages clutch (1a) when the evaporator temperature reaches the upper limit.

The condensate that forms on the fins of evaporator (6) contains dust, pollen and other airborne particulate; continuous condensation thus has the effect of purifying the air, and the droplets of condensate are conveyed to the exterior of the vehicle via two condensate drain lines.

A fixed quantity of anti-freeze oil is added to the circuit in order to lubricate all the mechanical components of the system; a certain percentage of this oil circulates continuously in the form of an oil mist, thereby lubricating the compressor (pistons and bearings) and the expansion valve.

Evacuation, flushing and recharging

1 - Before evacuating, flushing and recharging the air conditioning system, inspect the system for leaks using a leak detector.

2 - To service the air conditioning system you will require a dedicated servicing station capable of performing the following operations:

a - Aspiration of the refrigerant fluid.

b - Creation of a high vacuum to purge the system completely.

c - Filtration of the recovered refrigerant.

d - Separation of the anti-freeze and lubricating oil from the liquid refrigerant and determination of its quantity by weight.

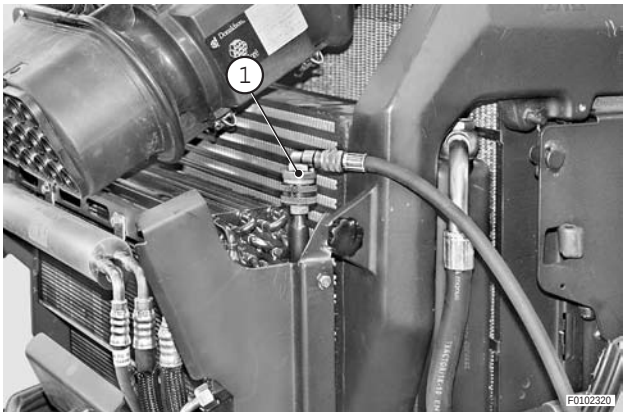
e - Recharging system with the exactly the same amounts of refrigerant and oil as the quantities recovered.

f - Measuring the system discharge side pressure and return pressure (low pressure).

1. Emptying the system

1 - Connect the maintenance station to the high pressure service connection (1) and follow the specific instructions of the maintenance station in order to discharge the system.

2 - Disconnect the system component to be renewed or overhauled immediately after the maintenance station has terminated the procedure; *plug the open ends of the system pipes as quickly as possible.*

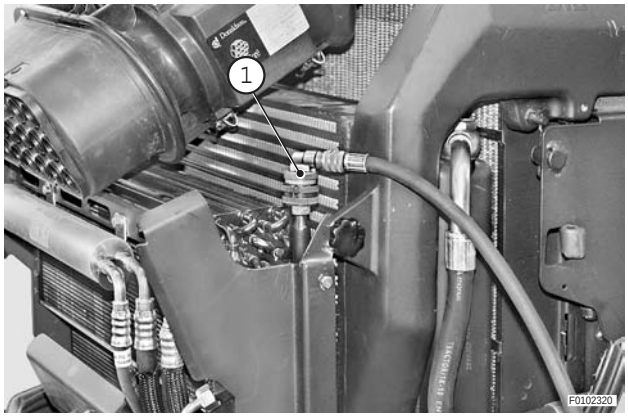


2. Flushing and recharging the system

Before each recharging, the system must be purged of all air, moisture and contaminants (oxides, deposits). This entails creating a high vacuum within the system to evaporate any moisture present.
The vapour, when extracted, draws with it any contaminants present in the system.

★ For the purging and recharging operations, the maintenance station must be connected to high (1) and low (2) pressure service valves.

Maximum vacuum" must be maintained for at least 10 minutes.

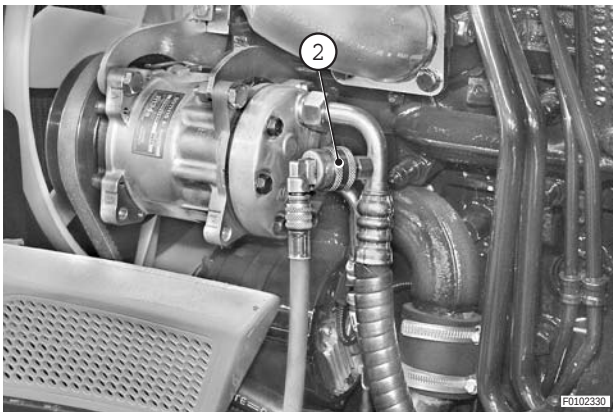


★ After flushing, the moisture-free oil recovered during the discharging operation must be re-introduced into the system, followed by the refrigerant.

Quantity of refrigerant (R134a): 1600 g (56.4 oz.)
Oil quantity: see quantity recovered.

If the system has to be discharged and flushed in order to renew a system component, the quantity of oil in the replaced component must be measured and the same amount of new oil must added to that recovered with the refrigerant.

For details of the oil and refrigerant recharging procedure, refer to the instructions supplied with the service machine.

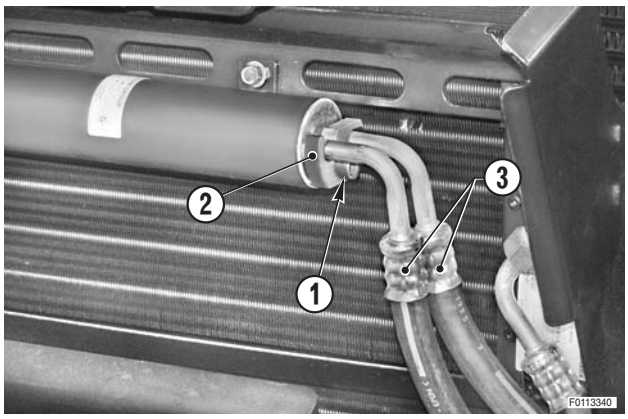


FILTER – DRIER

Removal

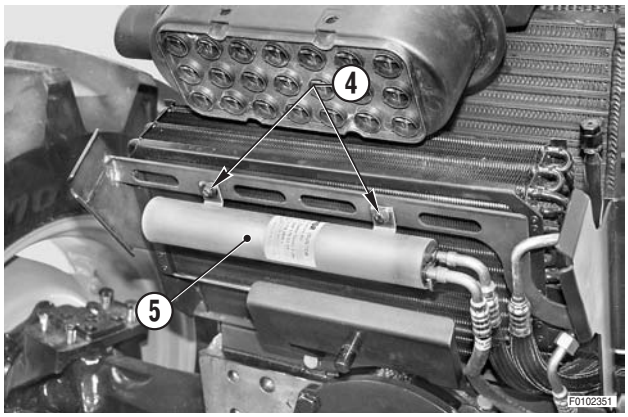
1 - Recover the refrigerant from the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

2 - Remove screw (1) remove retaining washer (2) and disconnect inlet and delivery pipes (3).
★ Plug the pipes to prevent the ingress of dirt.



3 - Remove screws (4) and remove filter-dryer (5).

⚠ If the filter-dryer has to be renewed, the quantity of oil in the replaced unit must be measured to determine the quantity of oil that must be added to the circuit.



Refitting

• Refitting is the reverse of removal.

1

★ Remove the plugs and reconnect the pipelines straight away, tightening fully to ensure moisture does not get into the system.

★ Inspect the O-rings and renew if damaged.

1 - Purge and recharge the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

CONDENSER ASSEMBLY

Removal

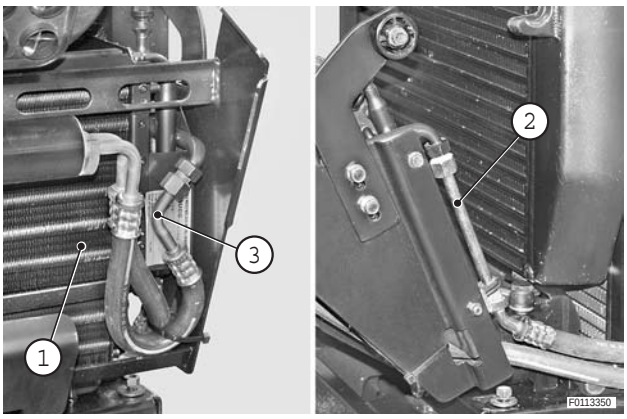
Remove the key from the ignition and apply the parking brake.

1 - Recover the refrigerant from the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

2 - Disconnect pipes (2) and (3) from condense (1).

※ 1

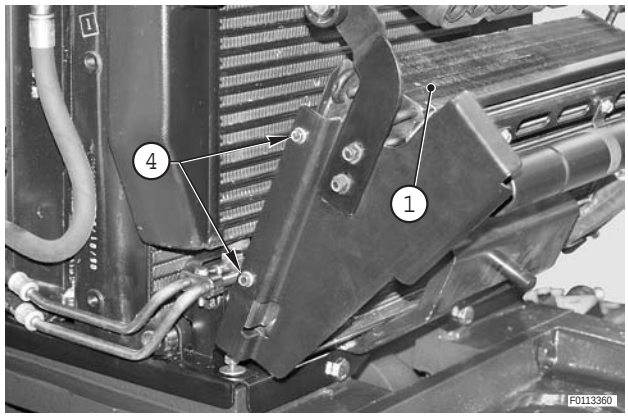
★ Plug the open ends of the pipes immediately to prevent moisture getting into the circuit.



5 - Remove the four screws (4).

6 - Remove condenser assembly (1).

★ Take particular care not to damage the fins.



Refitting

- Refitting is the reverse of removal.

※ 1

★ Remove the plugs and reconnect the pipelines straight away, tightening fully to ensure moisture does not get into the system.

★ Inspect the O-rings and renew if damaged.

1 - Purge and recharge the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

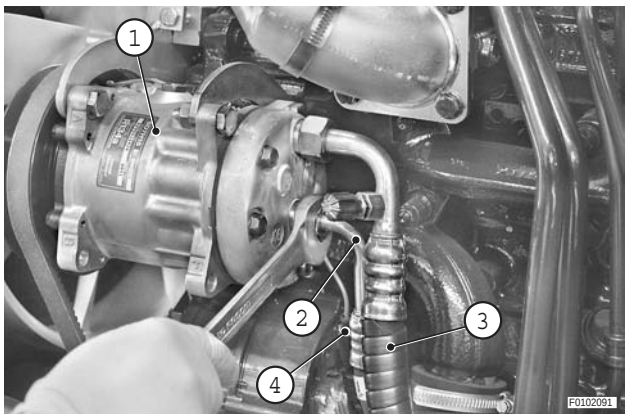
COMPRESSOR

Removal

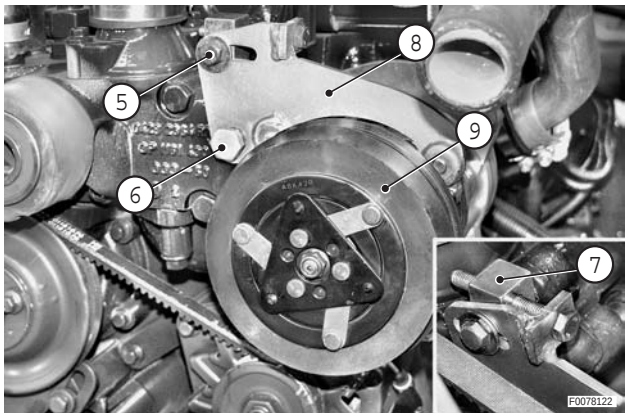
1 - Recover the refrigerant from the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

2 - Disconnect inlet (2) and delivery (3) lines from compressor (1).
★ Plug the open ends of the pipes immediately to prevent moisture getting into the circuit. ※ 1

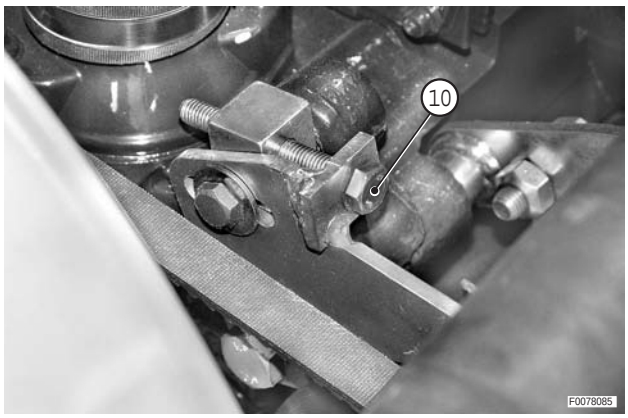
3 - Unplug electromagnetic clutch control connector (4).



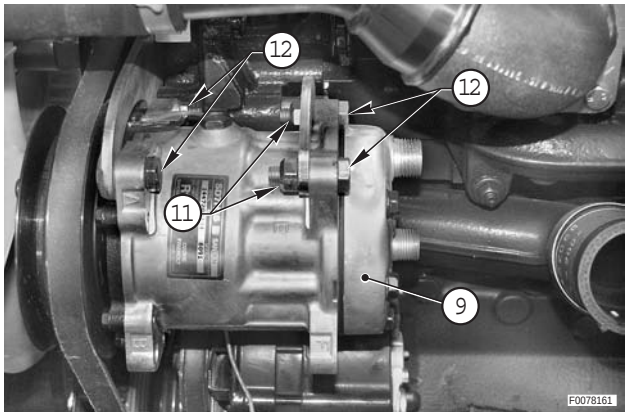
4 - Loosen screws (5), (6) responsible for securing reaction block (7) and fulcrum of support (8) of compressor (9).



5 - Turn tensioner screw (10) to slacken the fan and compressor drivebelt.
★ Loosen the drivebelt sufficiently to be able to slip it off the compressor pulley.



6 - Unscrew and remove self-locking nuts (11) and fixing screws (12); remove compressor (9).



Refitting

- Refitting is the reverse of removal.

※1

★ Remove the plugs and reconnect the pipelines straight away, tightening fully to ensure moisture does not get into the system.

★ Inspect the O-rings and renew them if damaged.

1 - Adjust the tension of the compressor/fan drivebelt. (For details, see "ENGINE FAN DRIVE BELT").

2 - Purge and recharge the air conditioning system. (For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

HEATER ASSEMBLY (MANUAL VERSION)

COMPLETE ASSEMBLY

Removal

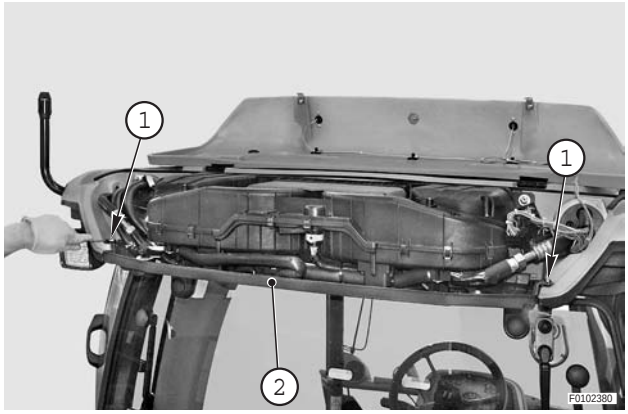
⚠ Disconnect the battery negative terminal (–) from the parking brake.

1 - Drain the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging"). ⁘ 1

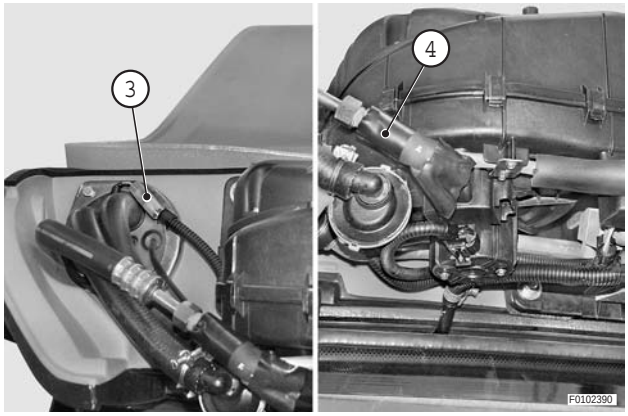
★ Recover the system oil and make a note of the quantity.

⁘ 2

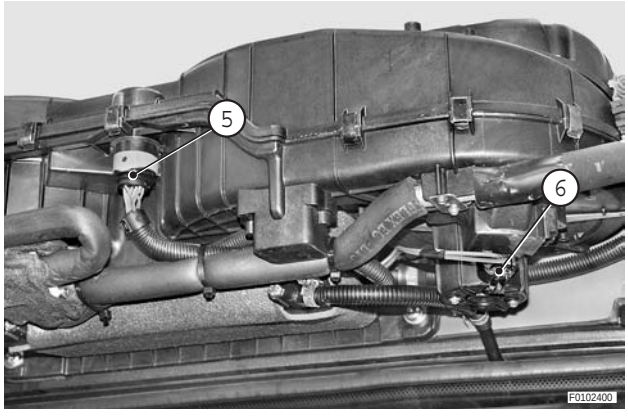
2 - Remove the two screws (1) and remove lower partition (2).



3 - Disconnect rotating beacon connector (3) and left fan connector (4).

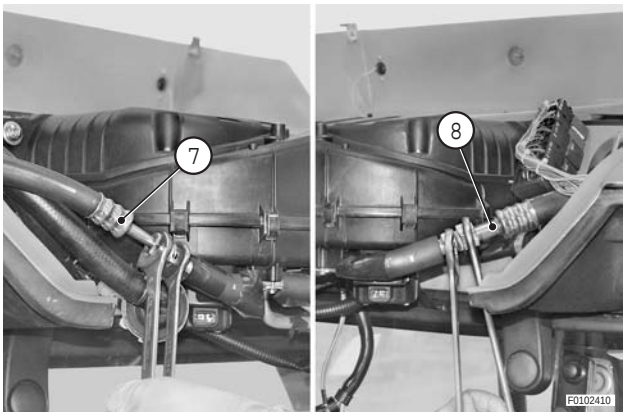


4 - Disconnect connector (5) and RH fan connector (6) and remove wiring.

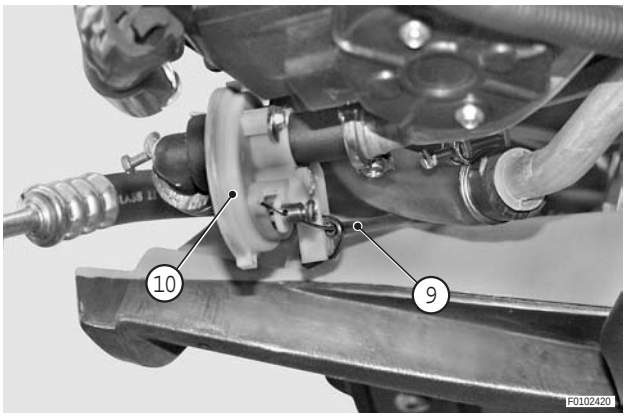


5 - Disconnect pipes (7) and (8) of the air conditioning system. 3

★ Plug the open ends of the pipes immediately to prevent moisture getting into the circuit.

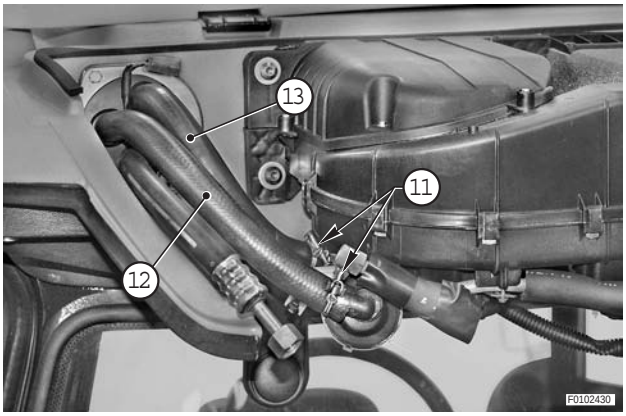


6 - Disconnect the heating valve (10) control cable (9).

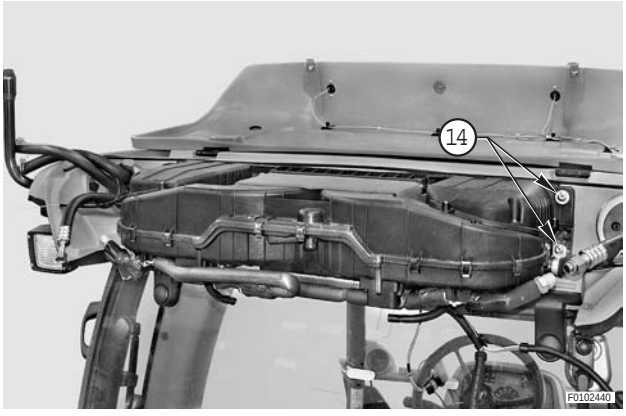


7 - Loosen clamp (11) and disconnect heating system pipes (12) and (13).

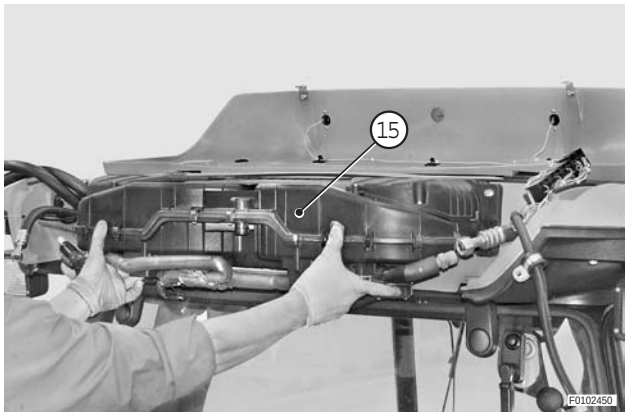
★ Mark the hoses to avoid error when reconnecting.



8 - Remove all eight screws (14).



9 - Remove heating-air conditioning assembly (15).



Refitting

- Refitting is the reverse of removal.

※ 1

★ Charge the system with the previously noted quantity of refrigerant oil.

※ 2

★ Quantity of R134a: 1600 g (56.4 oz)

★ After recharging the system, check the seals on the system pipes using a leak detector.

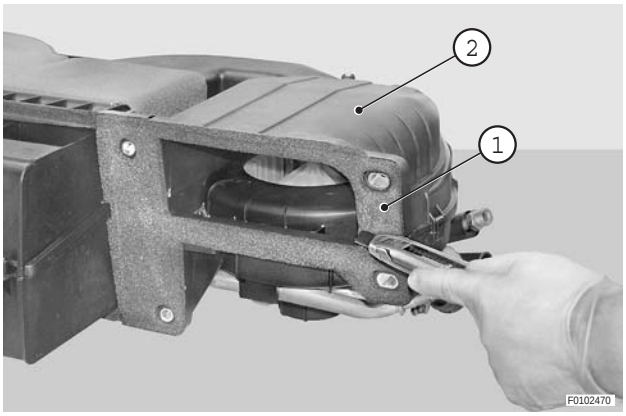
※ 3

Nm High pressure fitting (5/8' - 18UNF):– 13.6÷20.3 Nm (10 ---– 15 lb.ft)

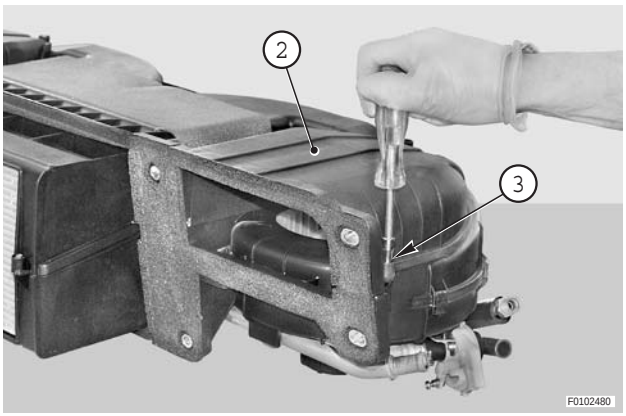
Nm Low pressure fitting (7/8'–14UNF): 35.3³–42 Nm (26 -- 31 lb.ft)

UPPER HALF DUCT

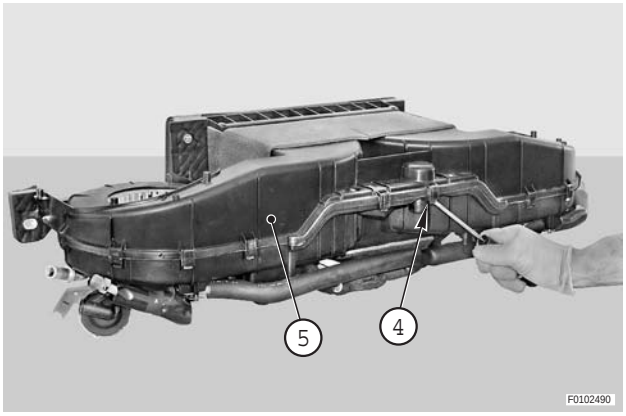
1 - Cut gasket (1) along the joint between covers (2).



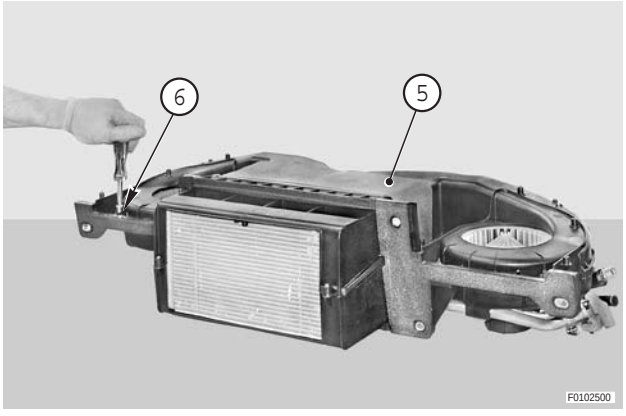
2 - Remove screws (3) and remove cover (2) on both sides.



3 - Undo the ten spring clips (4) securing half duct (5).



4 - Remove all screws (6) and remove half duct (5).



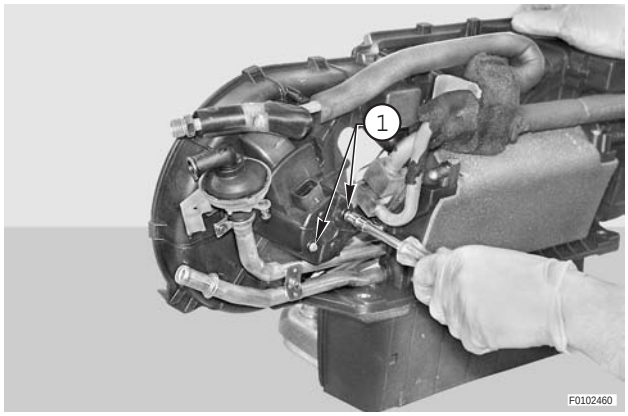
Assembly

- Refitting is the reverse of removal.

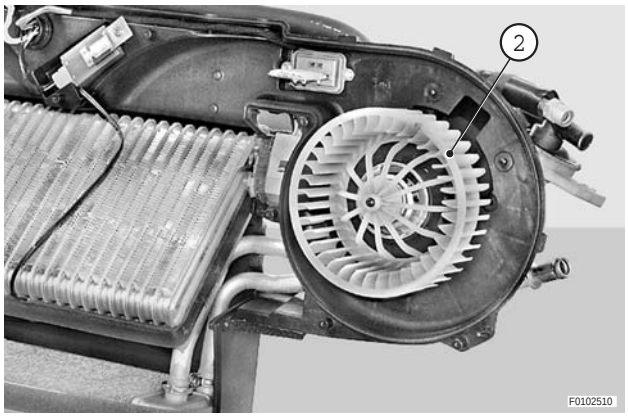
FANS

Disassembly

1 - Remove the two screws (1).



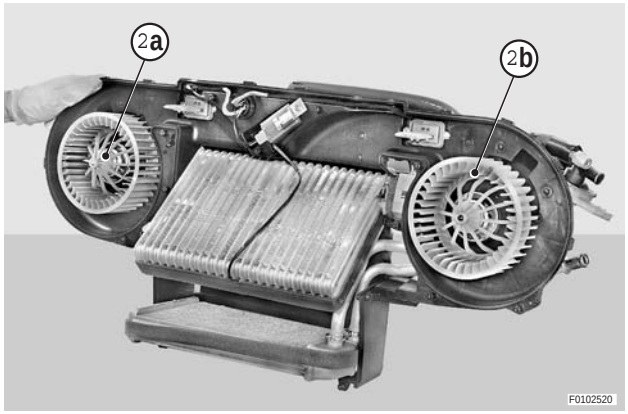
2 - Remove fans (2) as required.



Assembly

- Refitting is the reverse of removal.

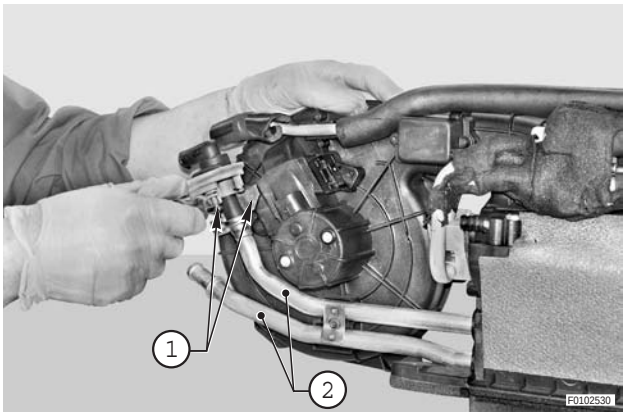
★ If both fans are removed, install white fan (2a) on the left-hand side of the assembly and green fan (2b) on the right-hand side.



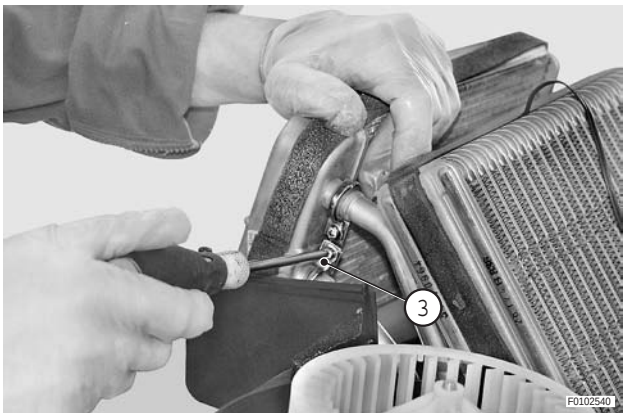
HEATER MATRIX

Disassembly

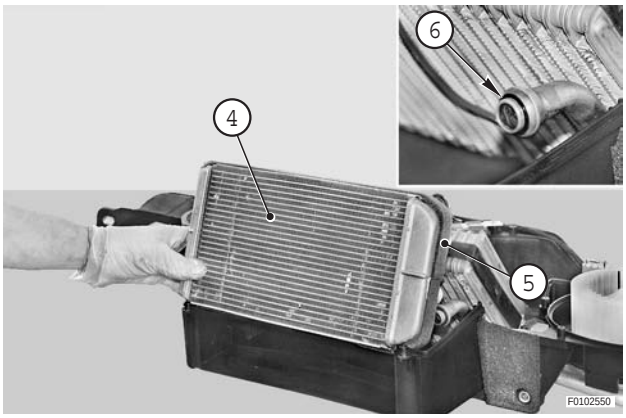
1 - Remove the four screws (1) to free heating system pipes (2).



2 - Remove clamps (3). ※1



3 - Remove heater matrix (4).
- ★ If the heater matrix is to be renewed, also renew the gasket (5).
- ★ Check the condition of O-rings (6) and renew them if necessary.



Assembly

- Refitting is the reverse of removal.

※1

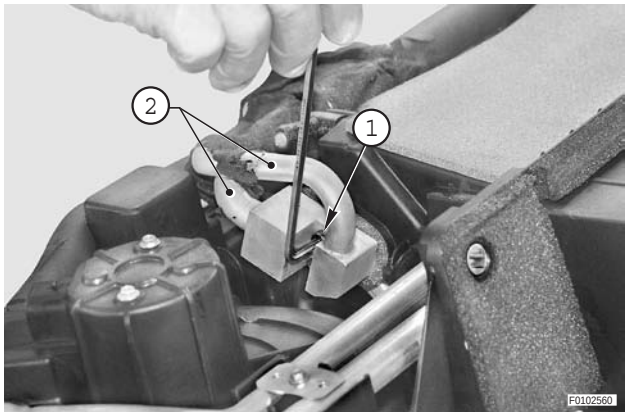
- ★ When refitting hose clamps (3), ensure that they are positioned as shown in the figure.

AIR CONDITIONING EVAPORATOR

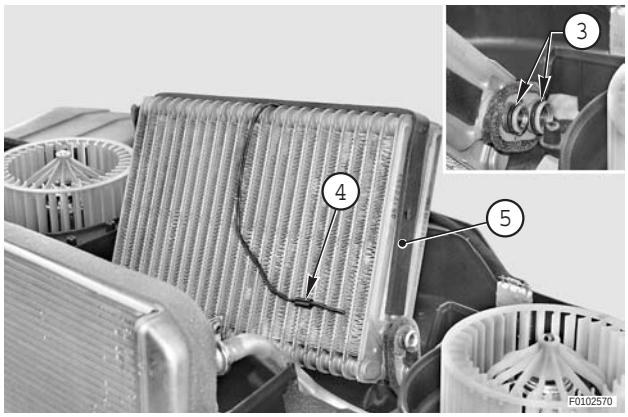
Disassembly

1 - Remove screws (1). ※1

2 - Disconnect evaporator (2) from pipes.



3 - Disconnect probe (4) of the safety thermostat and remove the evaporator.
- ★ Check the condition of O-rings (3) and renew them if necessary.
- ★ If the evaporator is to be renewed, also renew gaskets (5).
- ★ Note the exact position of temperature sensor probe (4).



Assembly

- Refitting is the reverse of removal.

※1

Nm Screws: 4±0.4 Nm (2.9±0.3 lb.ft.)

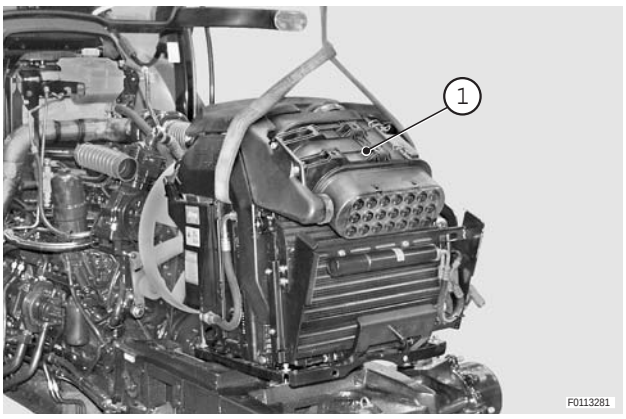
ENGINE COOLING FAN ASSEMBLY

ENGINE COOLING FAN

Removal

⚠ Disconnect the negative lead (–) from the battery and apply the parking brake.

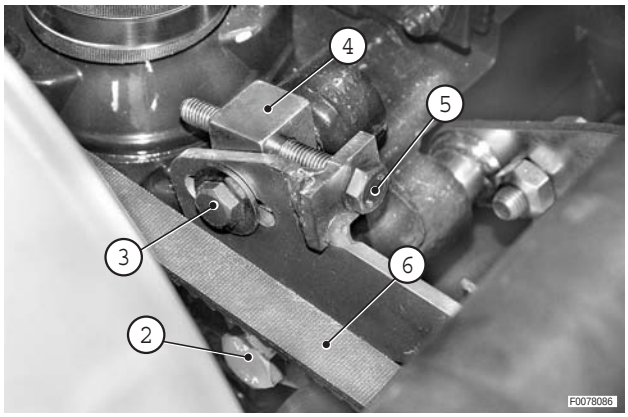
1 - Remove radiator-heater matrix assembly (1). (For details, see "COOLERS-RADIATOR ASSEMBLY").



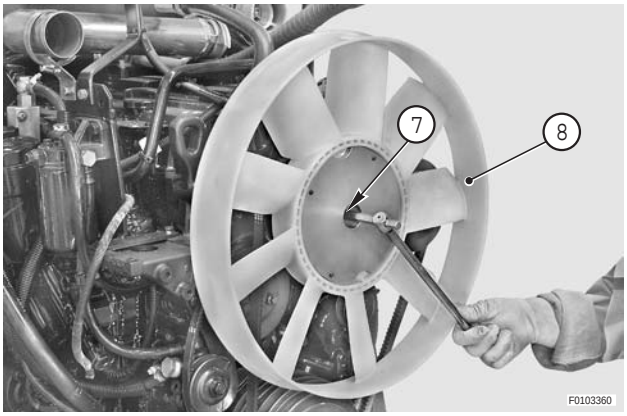
2- Loosen screws (2) and (3) securing air conditioning compressor and tensioner block (4).

3 - Turn screw (5) anticlockwise in order to slacken and release fanbelt (6).

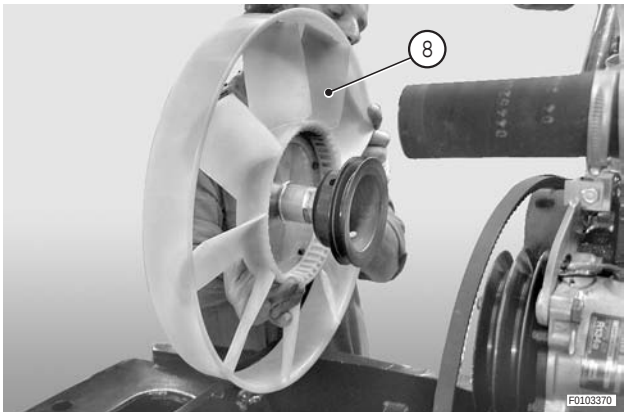
1



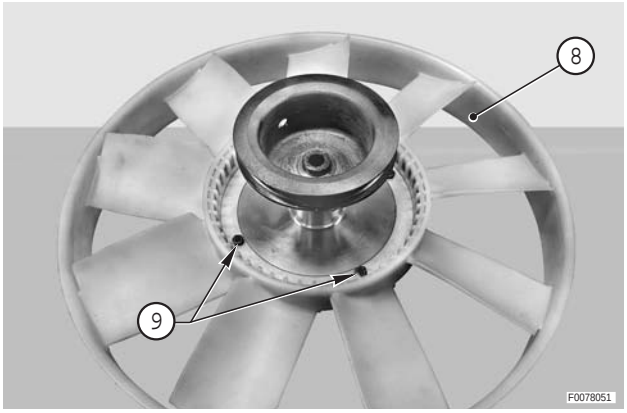
4 - Using a hex socket wrench, loosen and remove the central screw (7) securing the fan (8) and its pulley.



5 - Remove fan assembly (8).

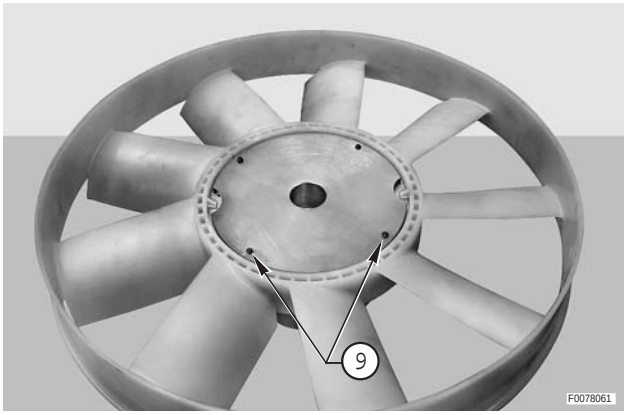


6 - With fan assembly (8) on a bench, loosen and remove the four retaining bolts (9) and remove the old fan.



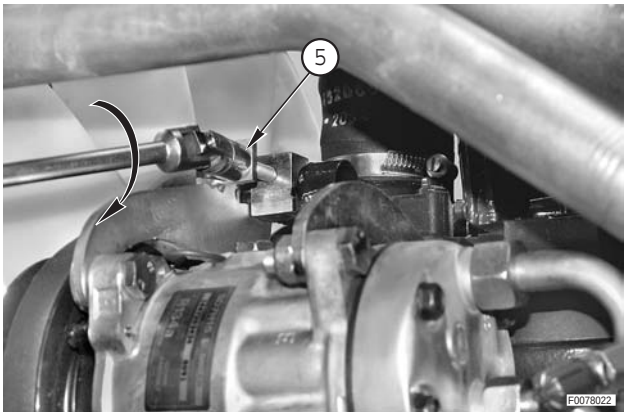
7 - Position the new fan taking care to align the two front locating marks.

8 - Tighten down screws (9) of the fan-pulley assembly.



Refitting

- Refitting is the reverse of removal.



1

★ Turn tensioner screw (5) clockwise to tension the compressor/fan drivebelt.
(For details, see"ENGINE FAN DRIVE BELT").

1 - Fill the engine cooling system.

Coolant: ..... max. 17.5 , (4.62 US. gall.)

2 - Purge and recharge the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

3 - Start the engine and run for a few minutes to allow the coolant to circulate.

4 - Stop the engine; check the level of the coolant in the expansion tank and top up if necessary.

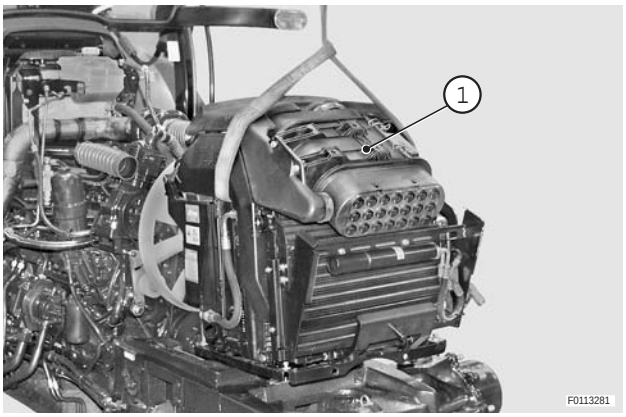
ENGINE FAN DRIVE BELT

Removal

⚠ Remove the key from the ignition and apply the parking brake.

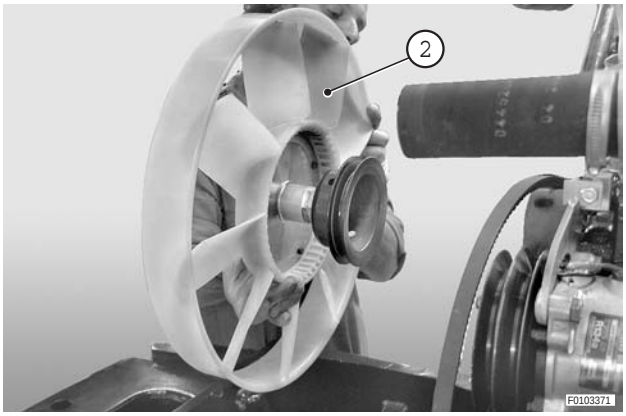
1 - Recover the refrigerant from the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Evacuation, flushing and recharging").

2 - Remove radiator-heater matrix assembly (1).
(For details, see COOLERS-RADIATOR ASSEMBLY").



3 - Remove the compressor drivebelt.
(For details, see "COMPRESSED AIR CIRCUIT - COMPRESSOR DRIVE BELT").

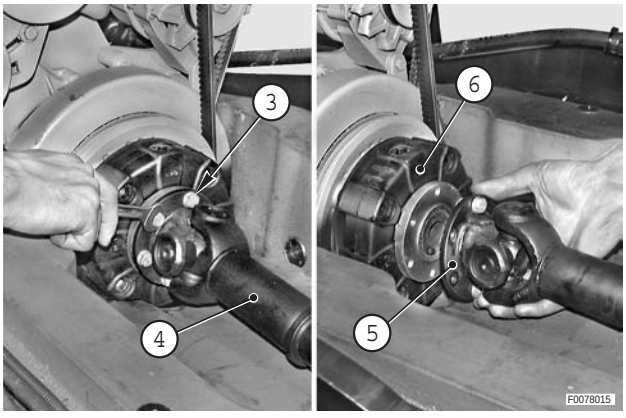
4 - Remove fan (2).
(For details, see "ENGINE COOLING FAN").



• *For models with front PTO*

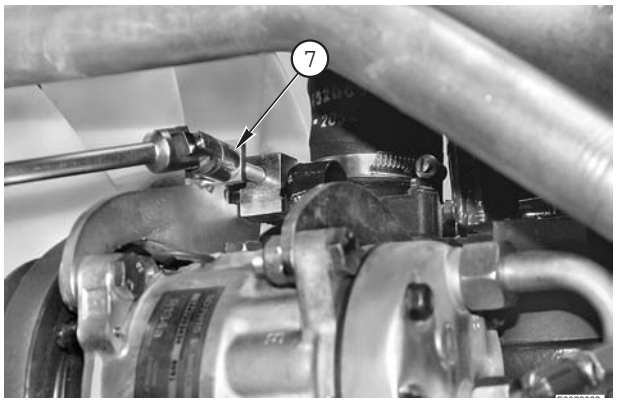
5 - Loosen and fully unscrew the six screws (3) securing the flange of cardan shaft (4).

6 - Detach flange (5) from flexible coupling (6).



• *For all versions*

7 - Loosen tensioner (7) and remove the old drivebelt.
※ 1



Refitting

• Refitting is the reverse of removal.

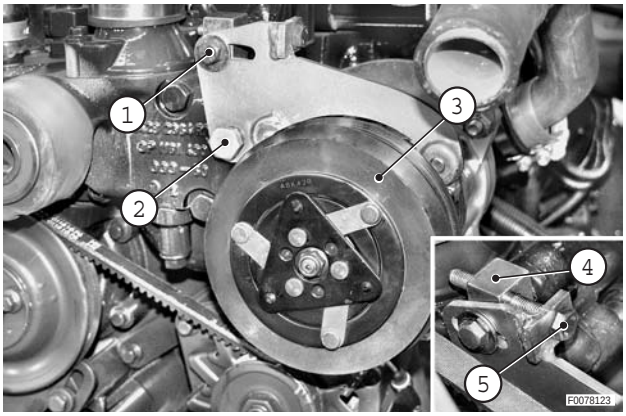
※ 1

★ Adjust the tension of the belt.
(For details, see next heading).

Tensioning

★ Before adjusting the tension, carefully examine the drivebelt for signs of wear.
The belt must be renewed immediately at the first sign of cracking, fraying or separation of the plies.

⚠ If a new belt is fitted, re-adjust the tension after approx. 15 operating hours.

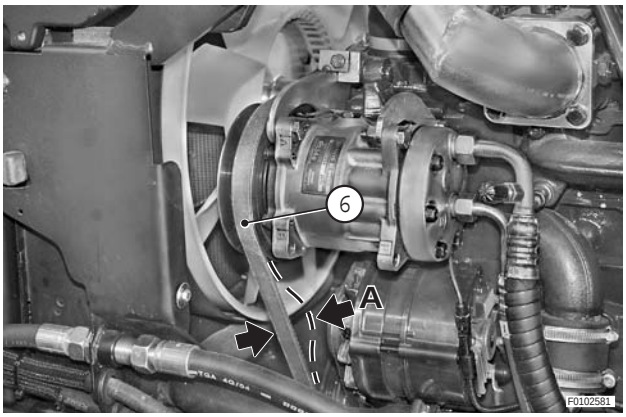


1 - Loosen screws (1) and (2) securing air conditioning compressor (3) and tensioner block (4).

2 - Turn tensioner screw (5) clockwise to tension drivebelt (6) as indicated below:
- ★ Static deflection "*A*" on first fitting: 550±50 N
- ★ Static deflection "*A*" after 15 minutes: 400±50 N

⚠ The check should be carried out with the engine cold.

3 - Tighten screws (1) and (2).



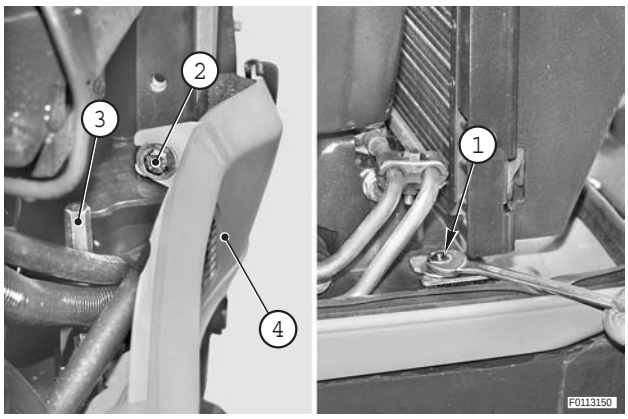
ALTERNATOR ASSEMBLY

ALTERNATOR

Removal

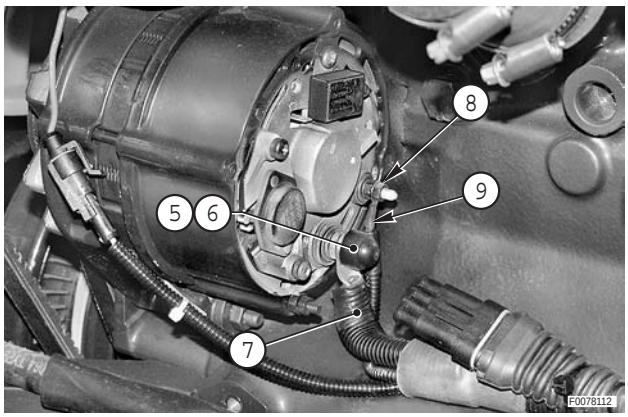
Remove the battery cover and disconnect the negative battery lead (–).

1 - Loosen screws (1), (2) and (3) and remove lower guard (4).



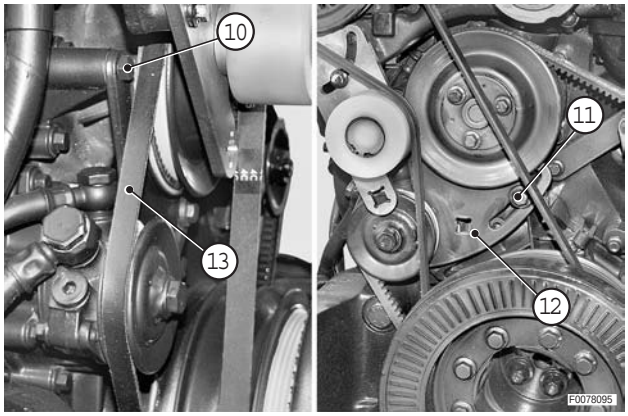
2 - Remove guard (5), remove nut (6) and disconnect lead (7).

3 - Remove nut (8) and disconnect lead (9).



4 - Loosen screws (10) and (11) of fuel pump bracket (12) in order to slacken off drivebelt (13).

5 - Remove alternator (14).
For details, see the engine manual.

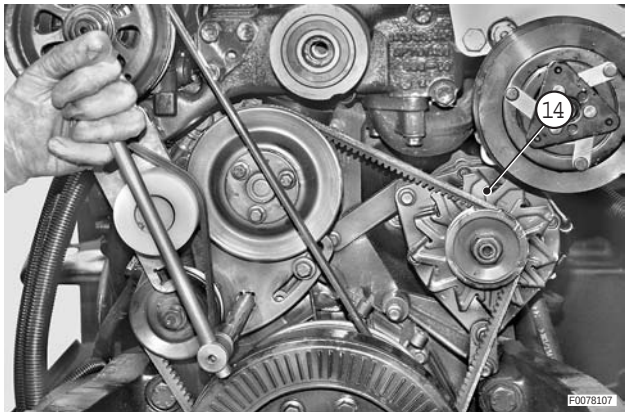


Refitting

- Refitting is the reverse of removal

※ 1

★ Adjust the tension of the drivebelt.
(For details, see "ALTERNATOR DRIVEBELT").



ALTERNATOR DRIVEBELT

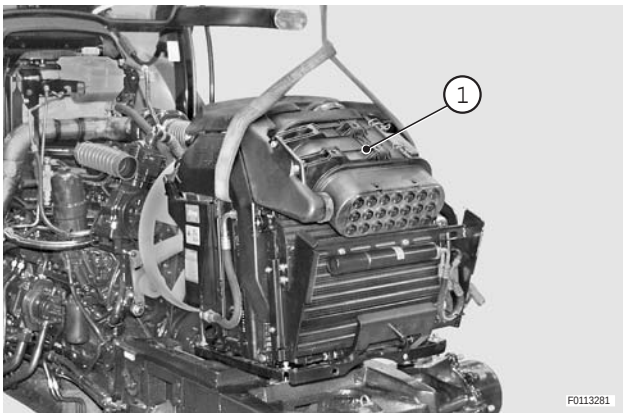
Removal

★ The belt must be renewed at the first signs of wear. Check for fraying, cracks and separation of the belt plies.

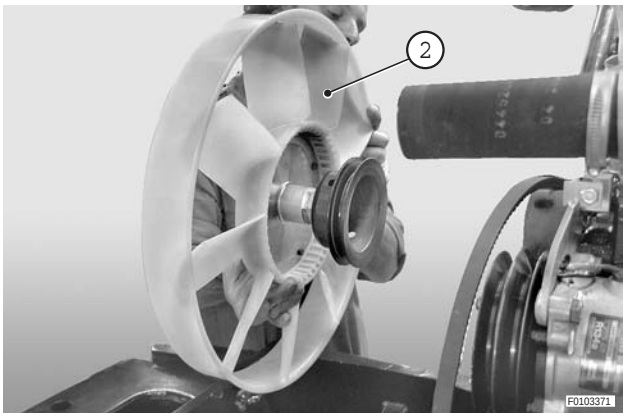
★ Some of the operations described below refer only to models equipped with front PTO.
If the tractor in question is not equipped with these items, any operations that refer specifically to them should be ignored.

⚠ Disconnect the battery's negative (–) terminal.

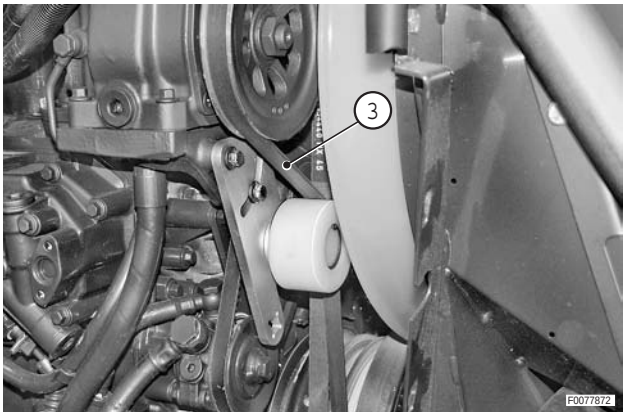
1 - Remove radiators assembly (1).
(For details, see "COOLERS-RADIATOR ASSEMBLY").



2 - Remove the cooling fan assembly (2).
(For details, see "ENGINE COOLING FAN"). ※1



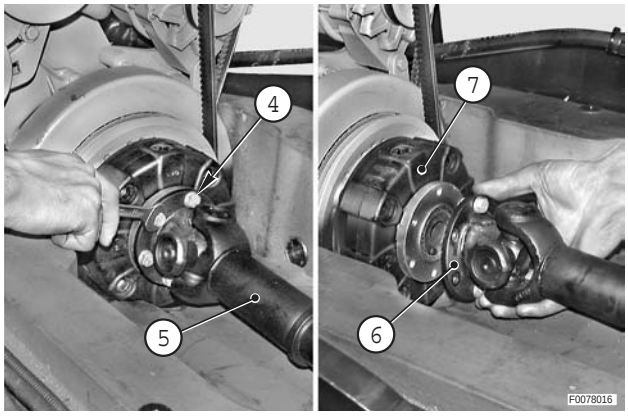
3 - Slacken the air compressor drivebelt (3).
(For details, see "COMPRESSOR DRIVE BELT").
※2



• *For models with front PTO*

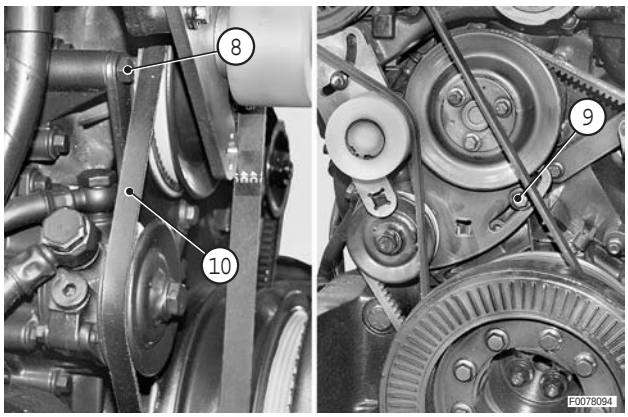
4 - Loosen and fully unscrew six bolts (4) securing the flange of cardan shaft (5).

5 - Detach flange (6) from flexible coupling (7).



6- Loosen screws (8) and (9) securing the fuel lift pump, disengage alternator drivebelt (10) and remove it by passing it between the crankshaft pulley and the front support.

⁘ 3



Refitting

• Refitting is the reverse of removal.

⁘ 1

★ Adjust the tension of the fan belt. (For details, see ("ENGINE FAN DRIVE BELT").

⁘ 2

★ Adjust the tension of the air compressor drivebelt. (For details, see "COMPRESSOR DRIVE BELT").

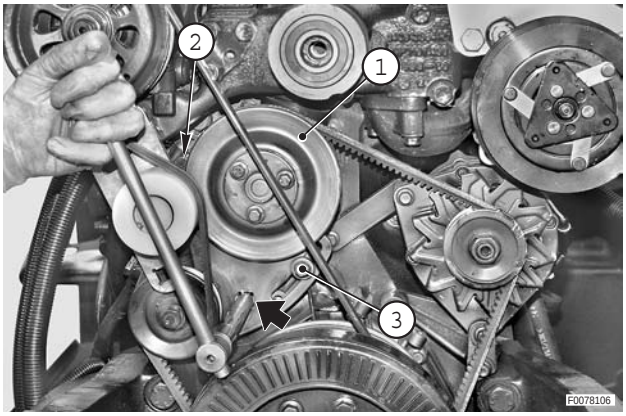
⁘ 3

★ Adjust the tension of the belt. (For details, see next heading).

Tensioning

1 - Tension the belt using a *T* bar with a 3/4" drive extension bar, or a 3/4" angle drive bar inserted in the aperture in fuel pump support (1).

2 - To tension the drivebelt, turn the bar clockwise and tighten screws (2) and (3).

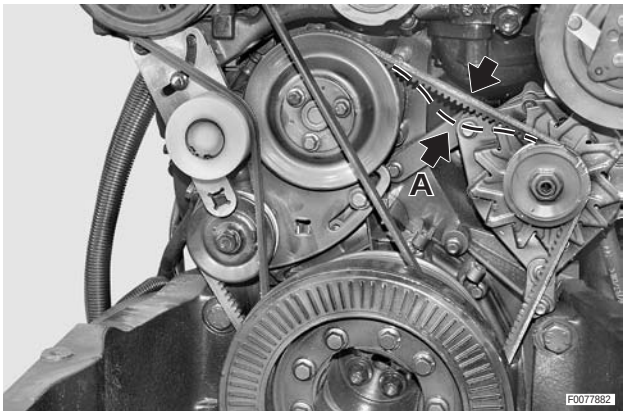


3 - To check that the tension is correct, use the tool and procedure indicated in the engine manual.

★ Static deflection "*A*" on first fitting:
13 mm drivebelt: 450±50 N

★ Static deflection "*A*" after 15 minutes:
13 mm drivebelt: 300±50 N

⚠ The check should be carried out with the engine cold.

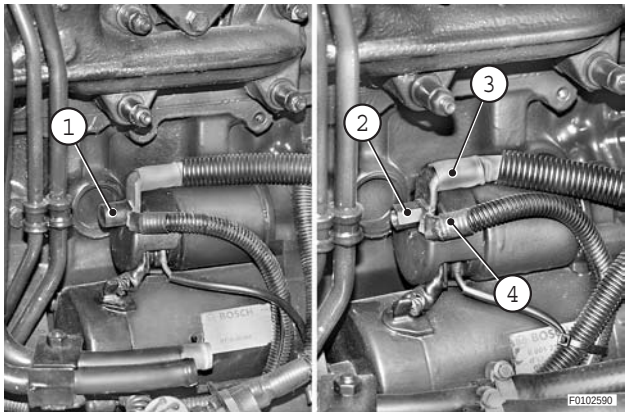


STARTER MOTOR

Removal

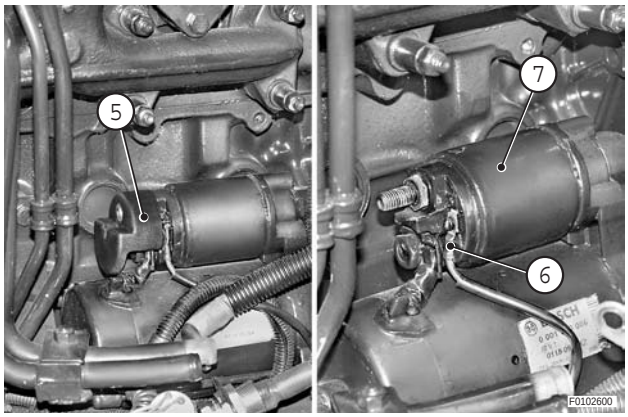
Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove cover (1) and nut (2) securing leads (3) and (4).



2 - Remove cover (5) and disconnect lead (6).

4 - Remove starter motor (7).
For details, see the engine manual.



Refitting

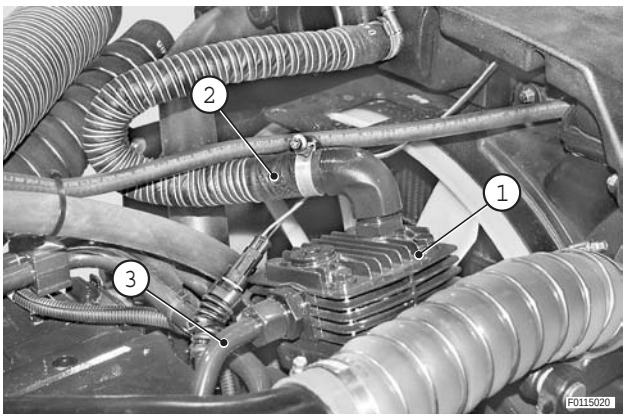
- Refitting is the reverse of removal.

COMPRESSED AIR CIRCUIT

AIR COMPRESSOR

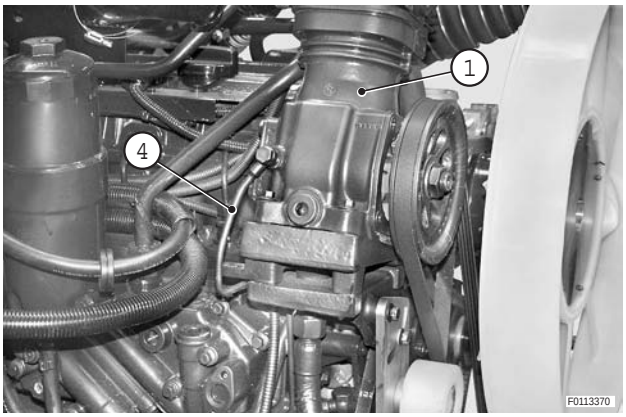
Removal

1 - Disconnect air suction pipe (2) and pressure pipe (3) from compressor (1).

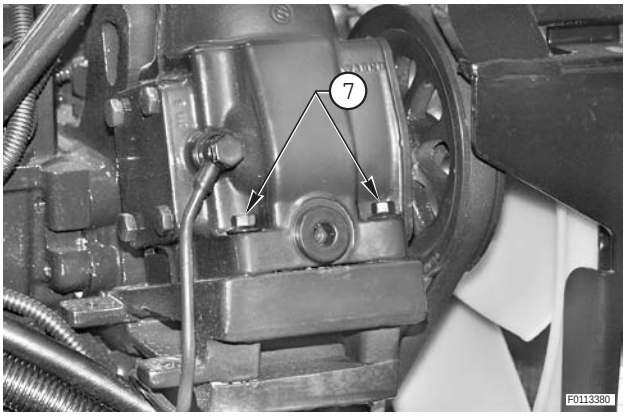


2 - Disconnect oil lubrication pipe (4) from compressor (1).
★ Always renew the seals of the lube oil pipe.

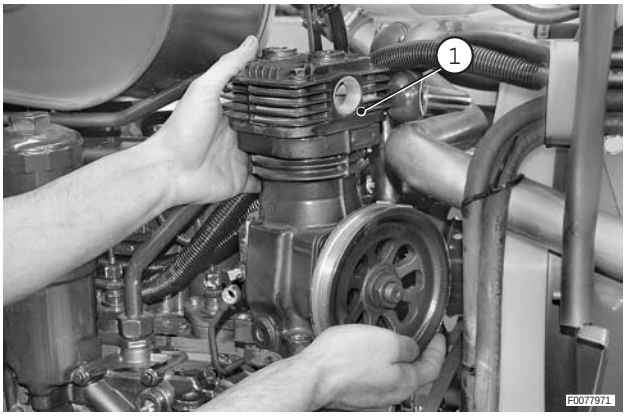
3 - Loosen screws (5) in order to slacken off drivebelt (6).
※ 1



4 - Loosen and remove compressor fixing screws (7).



5 - Remove compressor (1), withdrawing it upwards.
★ Check the condition of the O-ring and renew if necessary.



Refitting

- Refitting is the reverse of removal.

※ 1

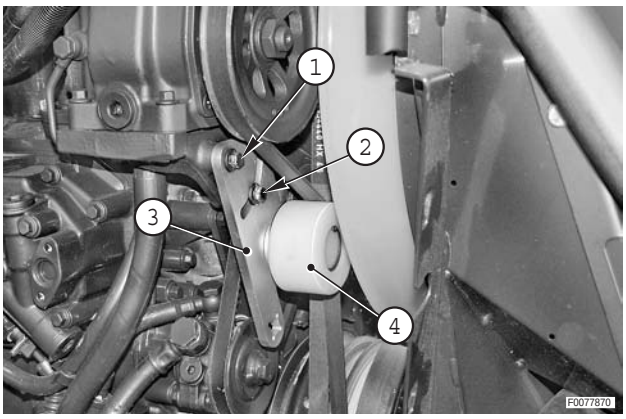
★ Adjust the tension of the drivebelt.
(For details, see "COMPRESSOR DRIVE BELT").

COMPRESSOR DRIVE BELT

Removal

Remove the key from the ignition and apply the parking brake.

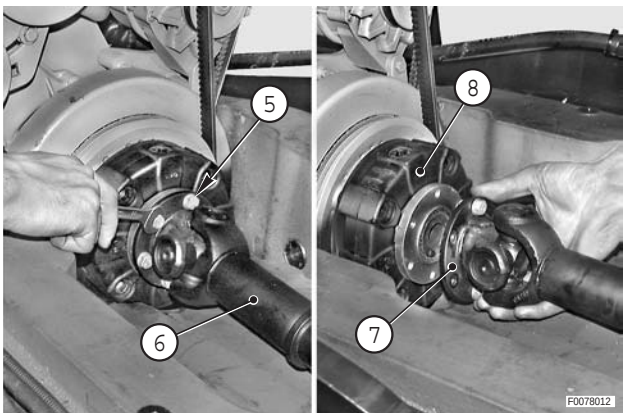
1 - Loosen pivot and fixing screws (1), (2) of bracket (3) supporting belt tensioner pulley (4). ※1



• *For models with front PTO only*

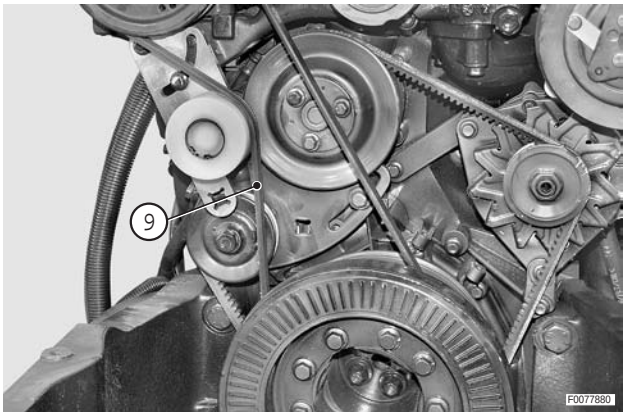
2 - Loosen and fully unscrew the six screws (5) securing the flange of cardan shaft (6).

3 - Detach flange (7) from flexible coupling (8).



• *For all versions*

4 - Remove worn drivebelt (9).



Refitting

• Refitting is the reverse of removal.

※1

★ Adjust the tension of the belt.
(For details, see next heading).

Tensioning

★ Before adjusting the tension, carefully examine the drivebelt for signs of wear.
The belt must be renewed immediately at the first sign of cracking, fraying or separation of the plies.

⚠ If a new belt is fitted, re-adjust the tension after approx. 15 operating hours.

2 - Loosen pivot and fixing screws (1), (2) of bracket (3) as for the belt renewal procedure.

3 - Tension the drivebelt using a *T* bar and 3/4" drive extension bar inserted through the aperture in bracket (3).

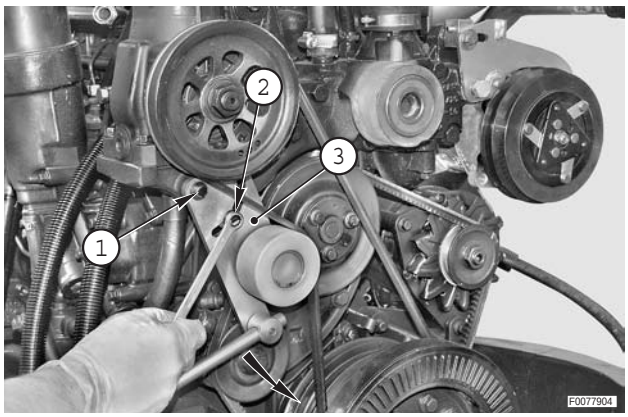
4 - To tension the drivebelt, turn the bar counterclockwise and tighten screws (1), (2).

5 - Check the tension adjustment using the tool and method described in the engine manual.

★ Static deflection on first fitting: 550±50 N

★ Static deflection after 15 minutes: 400±50 N

⚠ The check should be carried out with the engine cold.



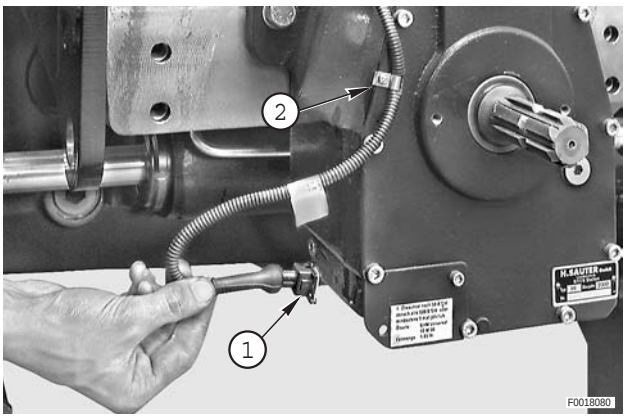
FRONT PTO

ASSEMBLY

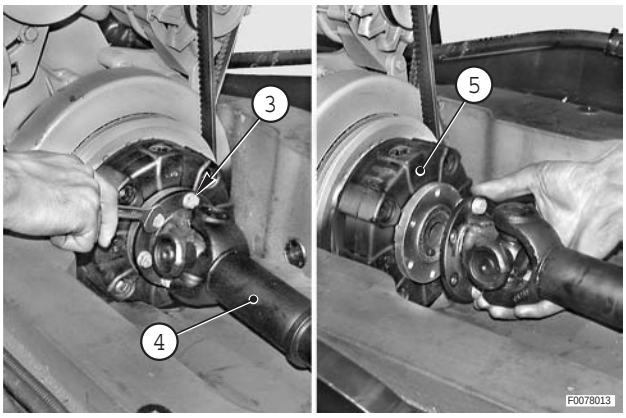
Removal

1 - Remove the complete front lift assembly .

2 - Unplug connector (1) and release the wiring from clip (2).



3 - Fully unscrew screws (3) securing cardan shaft (4) to flexible coupling (5) and detach the flange.



4 - Unscrew the four screws (6) but only remove the two lower screws.

★ Leave the two upper screws in position for safety.

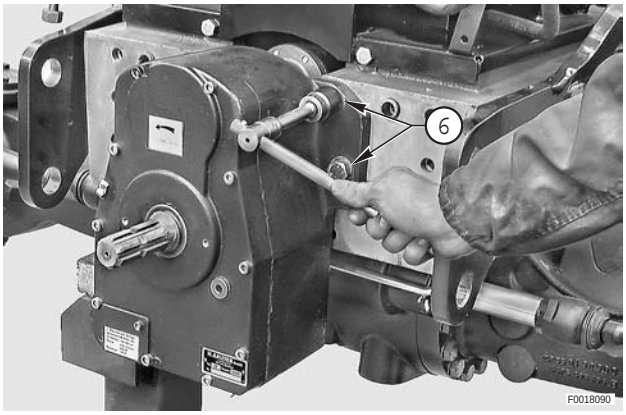
※ 1

5 - Fit a non-slip block to a trolley jack; position the non-slip block under the PTO assembly.

6 - Remove the upper screws left in position for safety and remove PTO assembly (7) supporting cardan shaft (4).

★ If necessary, use a lever to help separate the components.

kg PTO: 70 kg (154 lb.)

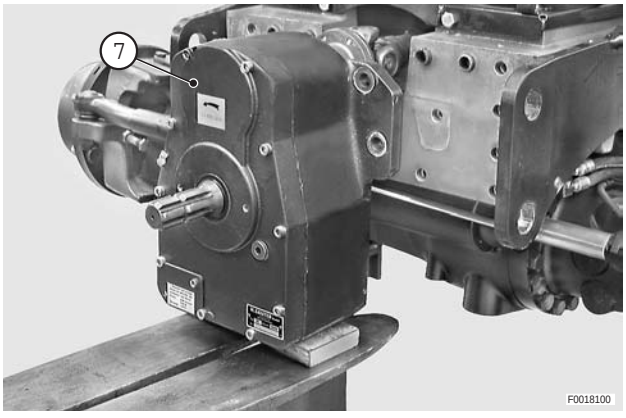


Refitting

• Refitting is the reverse of removal.

※ 1

Nm Screws: 214 Nm (157.7 lb.ft.)



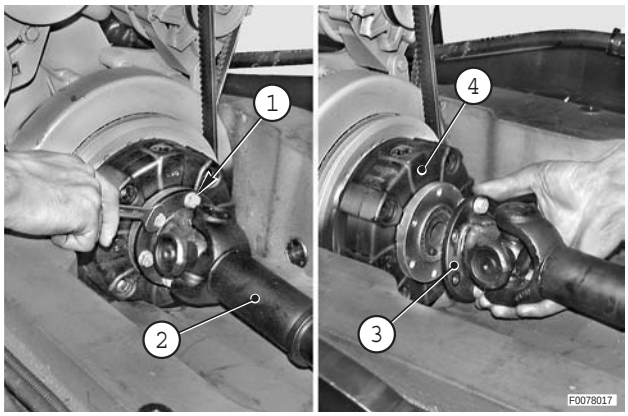
FLEXIBLE COUPLING

Renewal

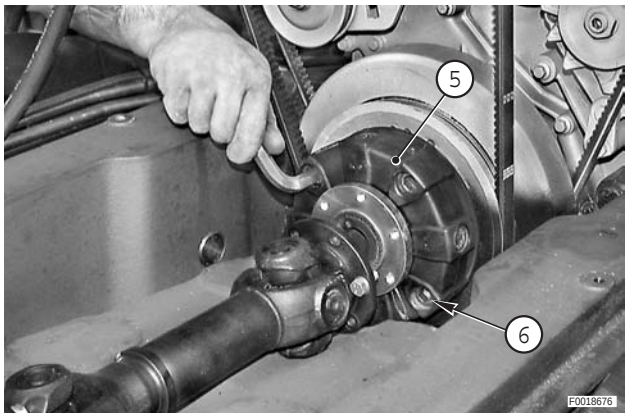
1 - Remove complete radiator assembly. (For details, see "COOLERS-RADIATOR ASSEMBLY").

2 - Loosen and fully unscrew the six screws (1) securing the flange of cardan shaft (2).

3 - Detach flange (3) from flexible coupling (4).



4 - Unscrew and remove retaining screws (6) of coupling (5) and remove the coupling itself. ※ 1



Refitting

- Refitting is the reverse of removal.

※ 1

Screws: Loctite 243

Screws: 139±10% Nm (102.4±10% lb.ft.)

FRONT AXLE DRIVE SHAFT

Removal

⚠ Remove the key from the ignition and apply the parking brake.

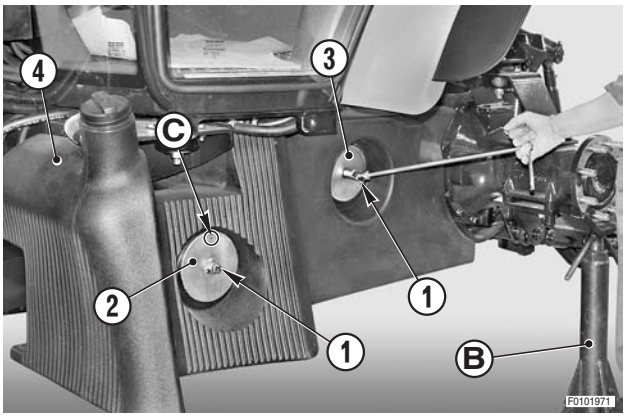
1 - Using suitable lifting equipment "*A*", raise the front of the tractor by about 10-12 cm (4-5 in.).

2 - Position two stands under the front axle able to support the tractor.

3 - Remove screws (2) and remove locating and retaining discs (2) of fuel tank (3).

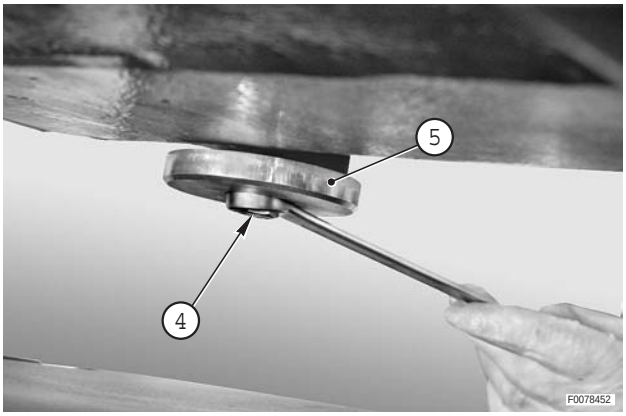
★ Mark the washers so as to avoid error when refitting the tank.

★ Note the position of hole "*A*" as the tank is levelled by rotating the front washer.



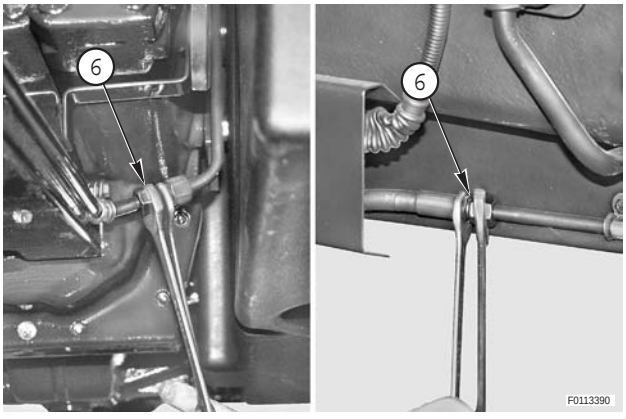
• *For all versions*

4 - Move the fuel tank 8–10 cm–towards the outside. Loosen and remove screw (4) retaining spacer (5) and the shield.

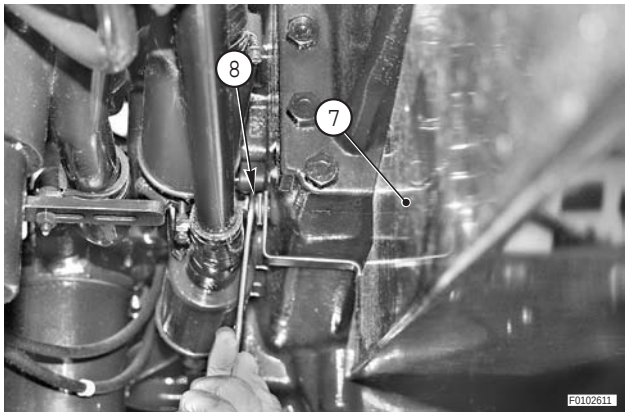


5 - Loosen unions (6) and free the differential locking pipe.

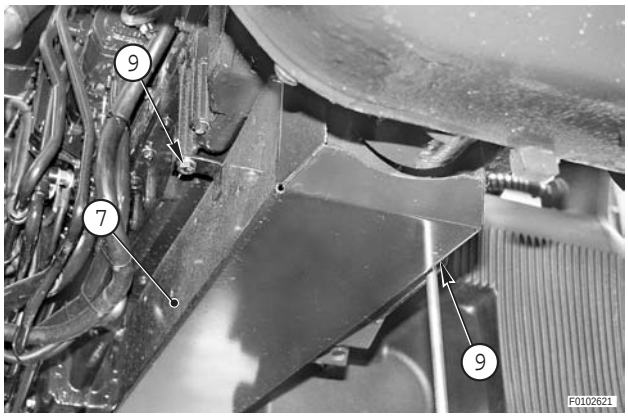
★ Plug the pipes to prevent the entry of impurities.



6 - Support shield (7) and remove screw (8).



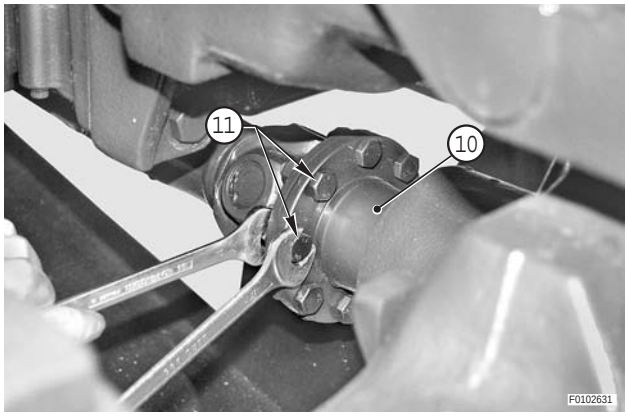
7 - Remove screws (9) and remove shield (7).



8 - Position a support under shaft (10) and remove flange screws and lock nuts (11).

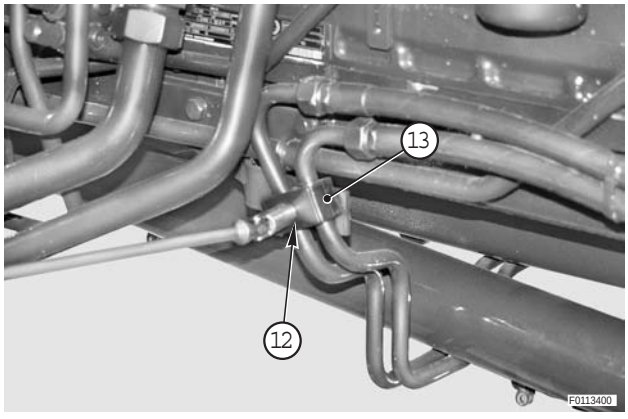
※ 1

★ Disengage the parking brake so that the shaft can be turned.



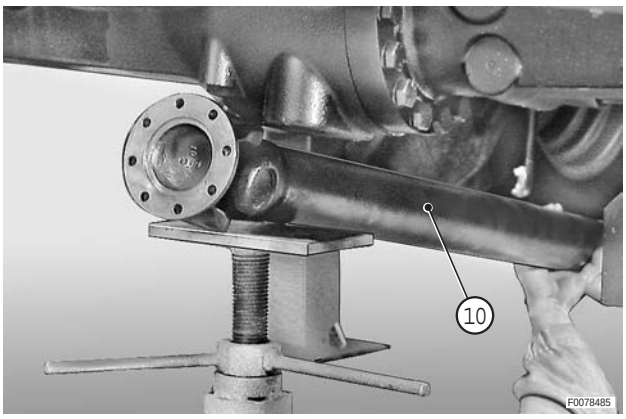
• *For tractors with front axle suspension*

9 - Remove screw (12) and remove clamp (13).



• *For all versions*

10 - Disconnect the flanges and withdraw drive shaft (10) towards the front of the tractor. ※ 2



Refitting

• Refitting is the reverse of removal.

※ 1

Nm Nuts: 43.5±10% Nm (32±10% lb.ft.)

★ Tighten the screws in crosswise sequence.

※ 2

Rear coupling: grease.

FRONT AXLE
VERSION WITHOUT AXLE SUSPENSION

Removal

Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

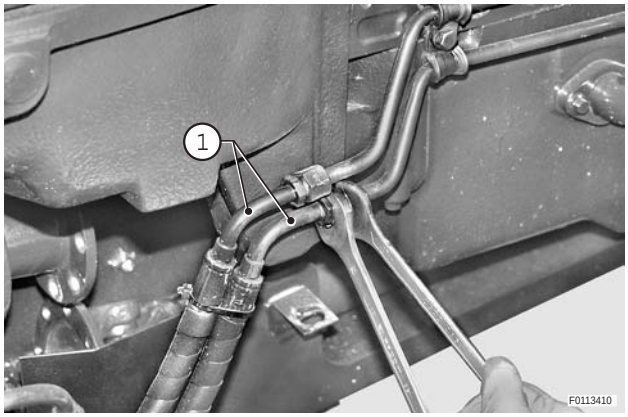
1 - Remove the front wheels.
(For details, see "FRONT WHEELS").

2 - Remove the front fenders.
(For details, see "FRONT FENDERS")

3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT")

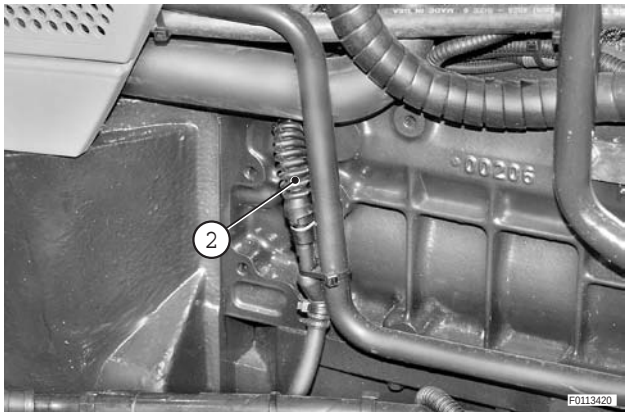
4 - Position a trolley jack “A” under the engine sump and remove stands previously positioned under the front axle.

5 - Disconnect steering control pipes (1).
- ★ Label the pipes to avoid confusion on reconnection.
- ★ Plug the pipes and ports to prevent the ingress of dirt.



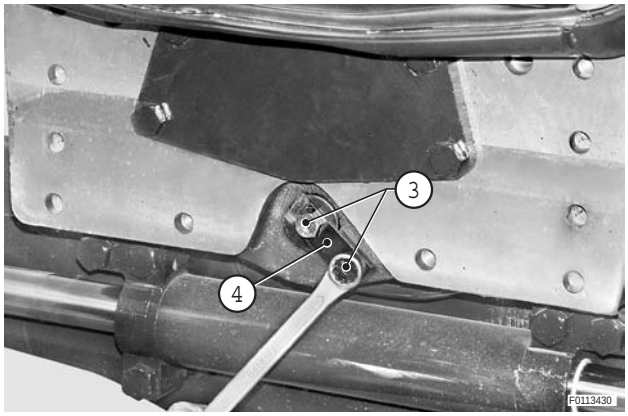
• *For version with ASM*

6 - Unplug the steering angle sensor connector (2).



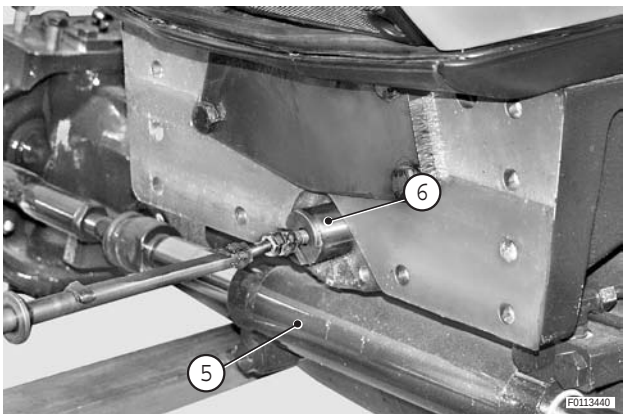
• *For all versions*

7 - Remove screws (3) and remove plate (4).

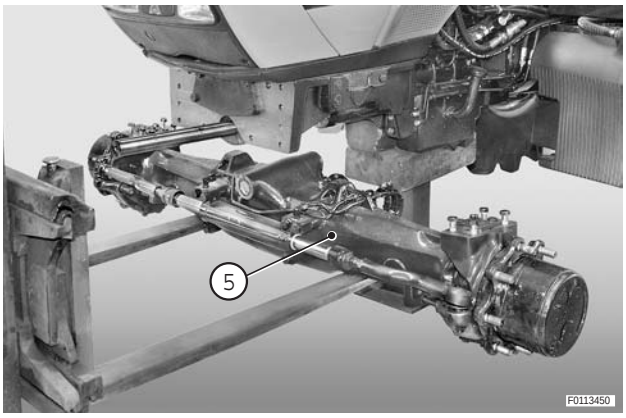


8 - Position a suitable jack under axle (5) and lever it slightly in the lift direction.

9 - Using a slide hammer puller, remove pivot pin (6).



10 - Remove complete axle assembly (5).



Refitting

- Refitting is the reverse of removal.

VERSION WITH AXLE SUSPENSION

Removal

Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

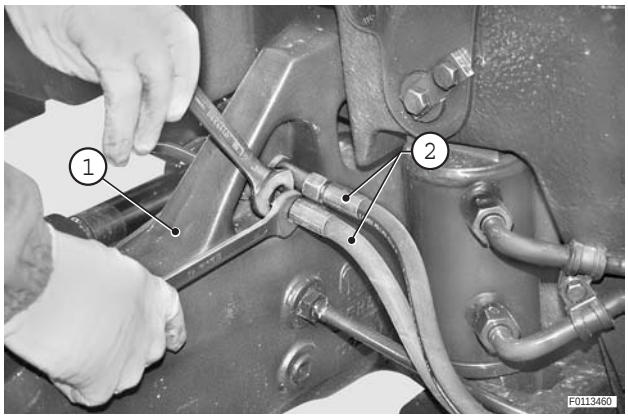
1 - Remove the front wheels.
(For details, see "FRONT WHEELS").

2 - Remove the fenders.
(For details, see "FRONT FENDERS")

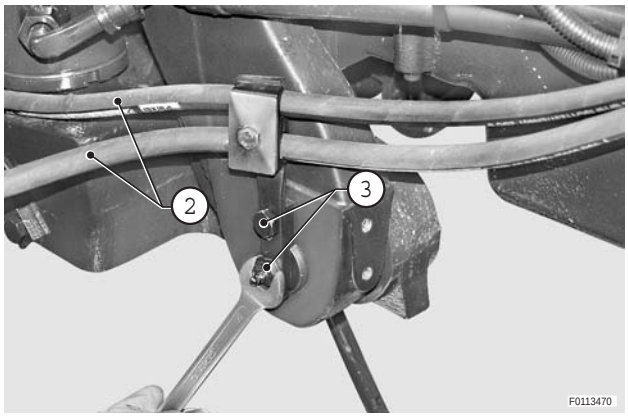
3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT")

4 - Position a trolley jack under the engine sump and remove stands previously positioned under the front axle.

5 - Disconnect steering control pipes (2) from axle (1).
★ Plug the pipes and ports to prevent the ingress of dirt.

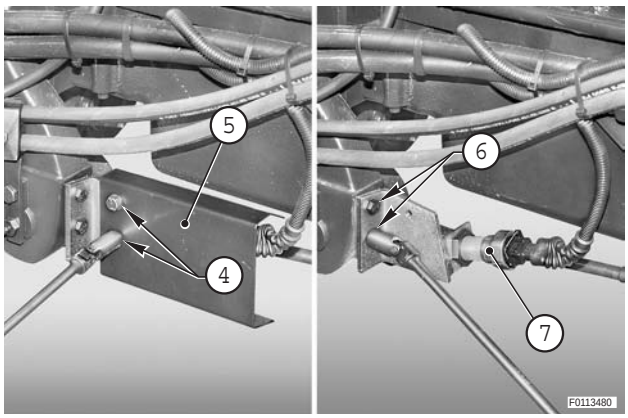


6 - Remove screws (3) and tilt pipes (2) towards the rear of the tractor.

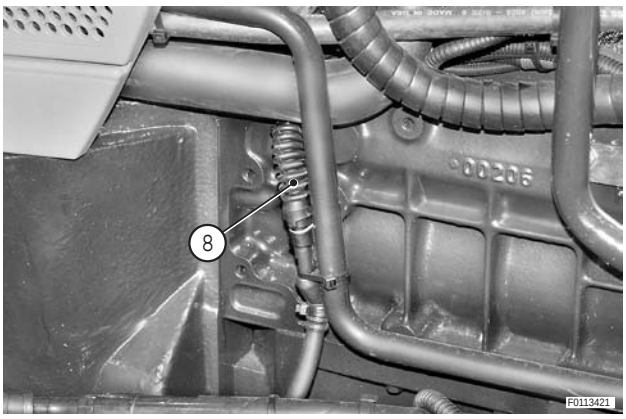


7 - Remove screws (4) and remove cover (5).

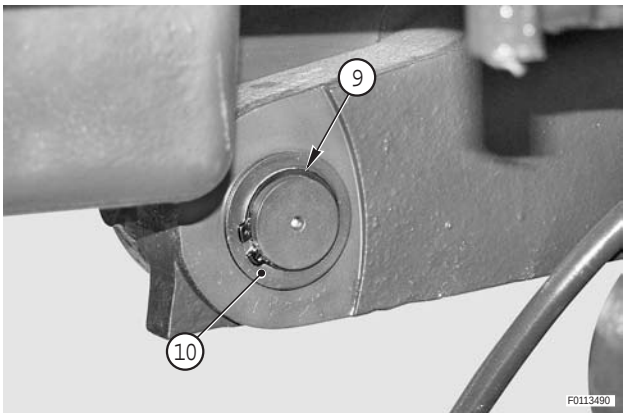
8 - Remove screws (6) and detach from the front support sensor (7).



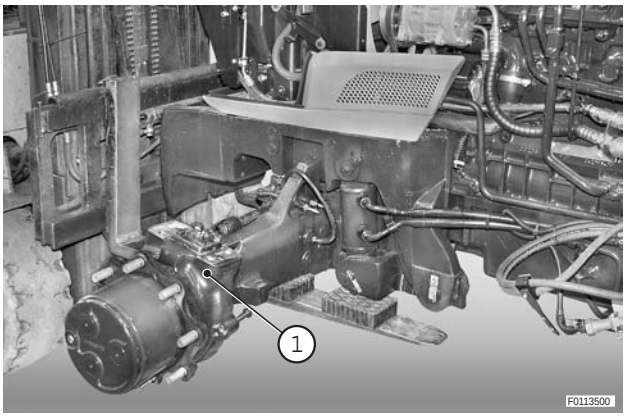
9 - Unplug the steering angle sensor connector (8).



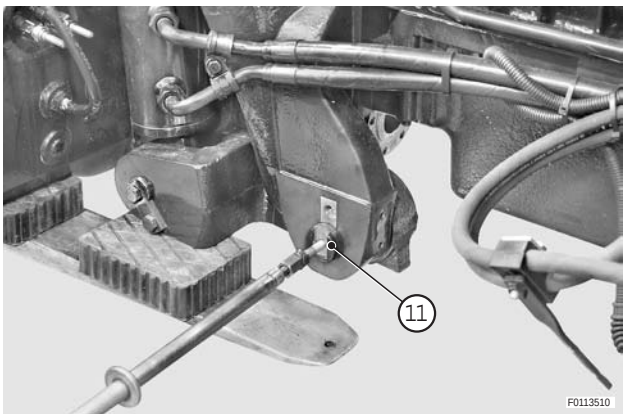
10 - Remove circlip (9) and washer (10) on both sides.



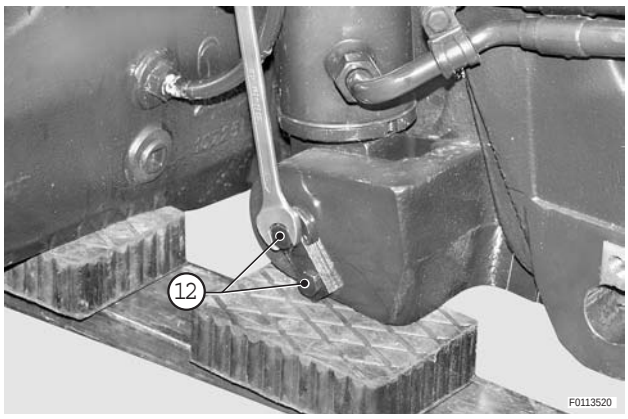
11 - Position a suitable jack under axle (1) and lever it slightly in the lift direction.



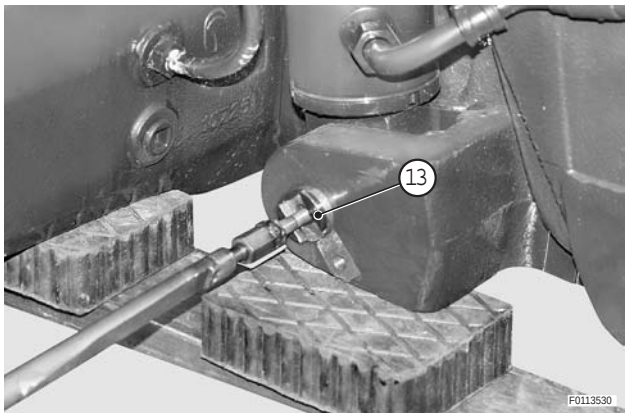
12 - Using a slide hammer puller, remove pins (11) on both sides.



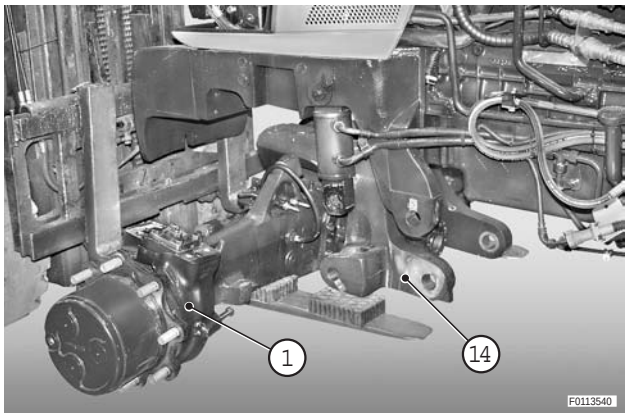
13 - Remove screws (12) and the plate on both sides.



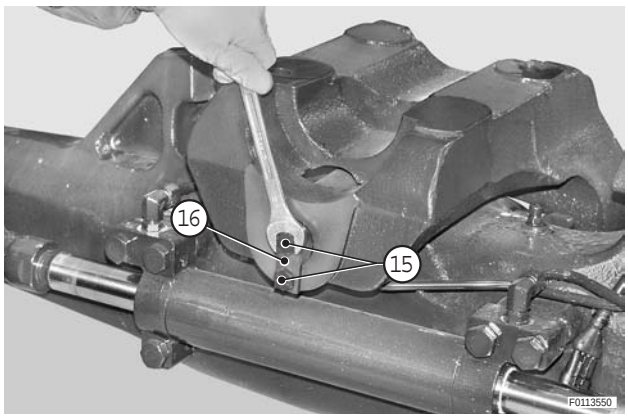
14 - Using a slide hammer puller, remove pins (13) on both sides.



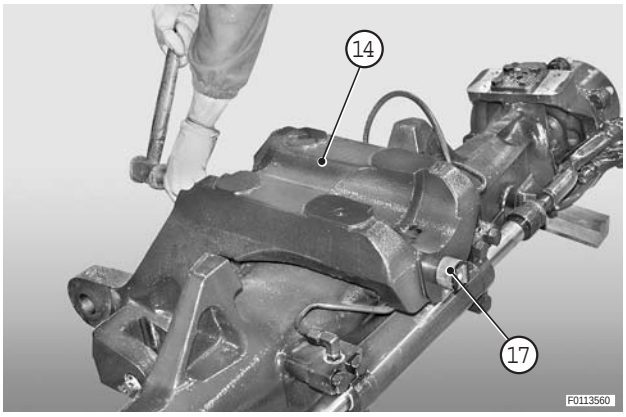
15 - Remove axle (1) complete with support (14).



16 - Remove screws (15) and remove plate (16).



17 - Withdraw oscillation pin (17) and remove support (14).



Refitting

- Refitting is the reverse of removal.

FRONT SUPPORT
COMPLETE ASSEMBLY (Version without axle suspension)

Removal

Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Remove the front wheels.
(For details, see "WHEELS - FRONT WHEELS").

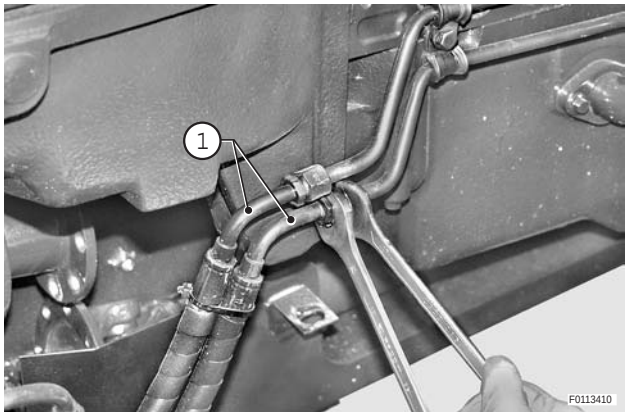
2 - Remove the front fenders.
(For details, see FRONT FENDERS").

3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT").

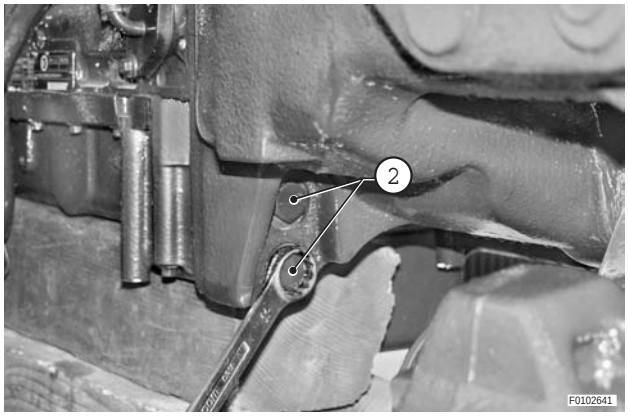
4 - Remove radiators assembly.
(For details, see "COOLERS-RADIATOR ASSEMBLY").

5 - Position a trolley jack under the engine sump and remove stands previously positioned under the front axle.

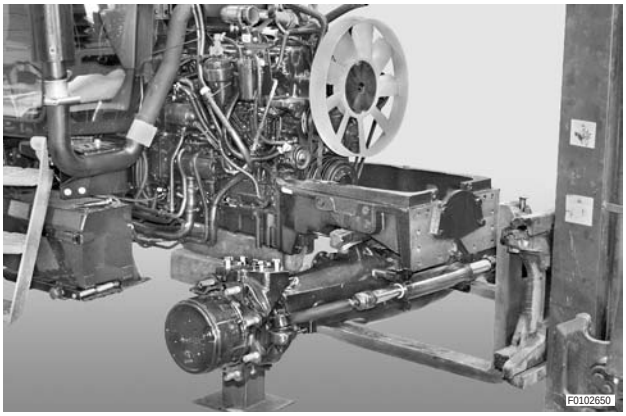
6 - Disconnect steering control pipes (1).
- ★ Label the pipes to avoid confusion on reconnection.
- ★ Plug the pipes and ports to prevent the ingress of dirt.



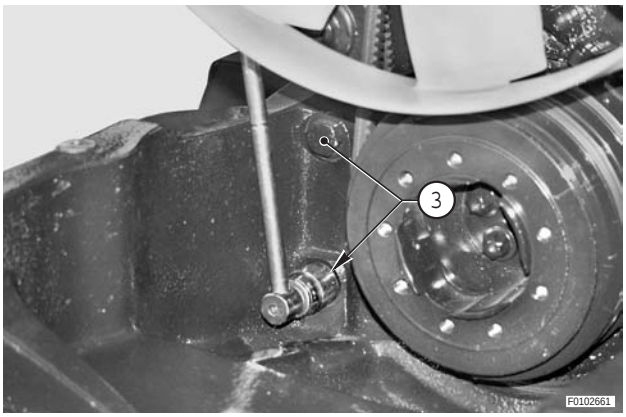
7 - Remove lower screws (2) (two per side). ⁘ 1



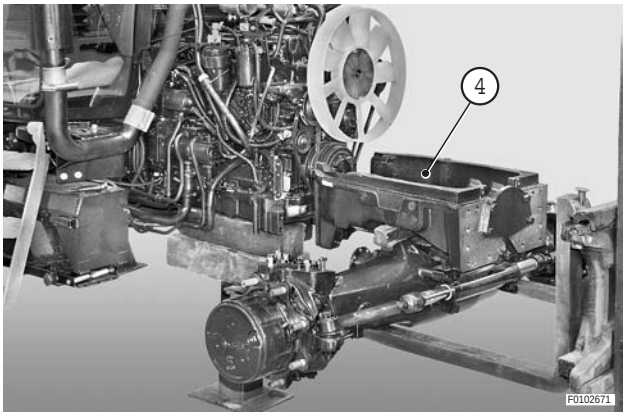
8 - Position a suitable jack under the axle and lever it slightly in the lifting direction.



9 - Remove screws (3) (two per side). ※1



10 - Remove complete front support (4). ※2



Refitting

- Refitting is the reverse of removal.

※1

Nm Screws: 260±26 Nm (191.6±19.2 lb.ft.)

※2

Locating dowels: Grease

COMPLETE ASSEMBLY (Version with axle suspension)

Removal

Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Remove the front wheels.
(For details, see "FRONT WHEELS").

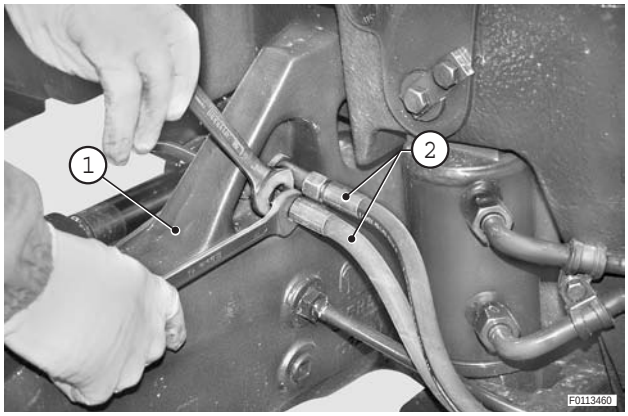
2 - Remove the front fenders.
(For details, see "FRONT FENDERS").

3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT").

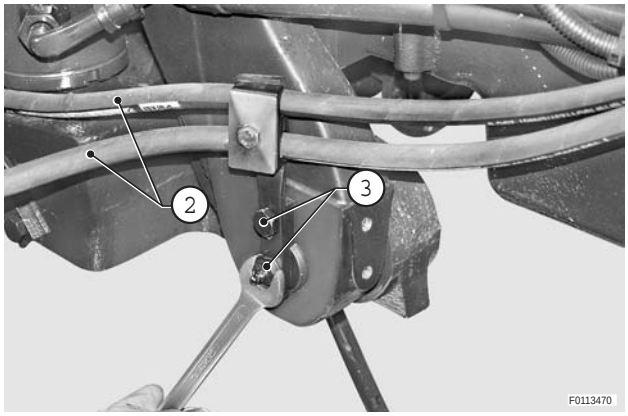
4 - Remove radiators assembly.
(For details, see "COOLERS-RADIATOR ASSEMBLY").

5 - Position a trolley jack under the engine sump and remove stands previously positioned under the front axle.

6 - Disconnect steering control pipes (2) from axle (1).
★ Plug the pipelines and ports to prevent impurities getting in.

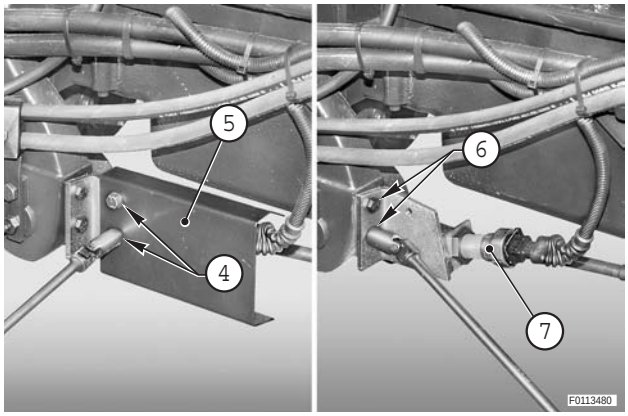


7 - Remove screws (3) and tilt pipes (2) towards the rear of the tractor. ※ 1

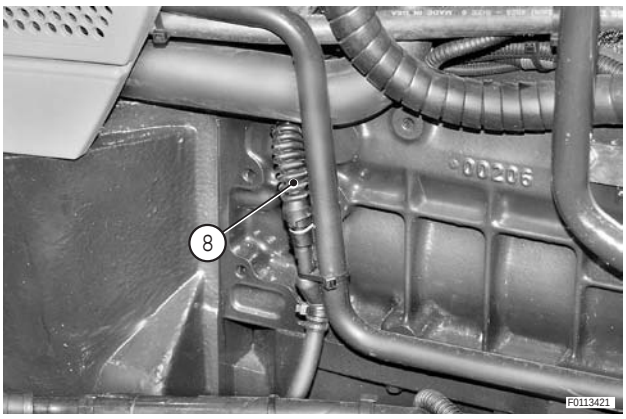


8 - Remove screws (4) and remove cover (5).

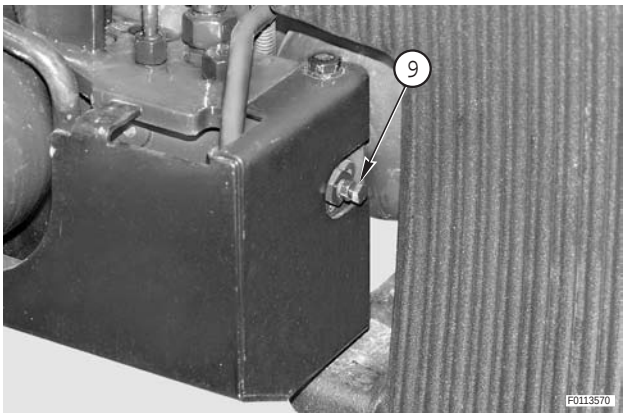
9 - Remove screws (6) and detach from the front support sensor (7).



10 - Unplug the steering angle sensor connector (8).

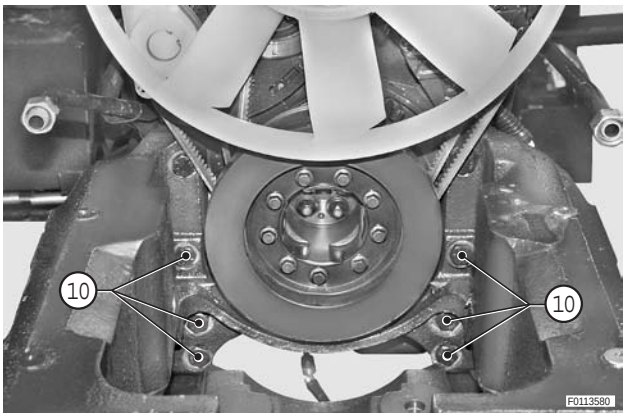


11 - Loosen screw (9) to discharge pressure in the axle suspension circuit and lower completely the front axle.

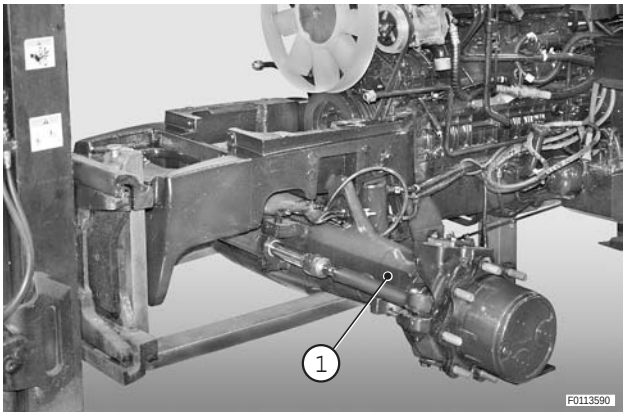


12 - Loosen and remove screws (10) (qty 6).

2

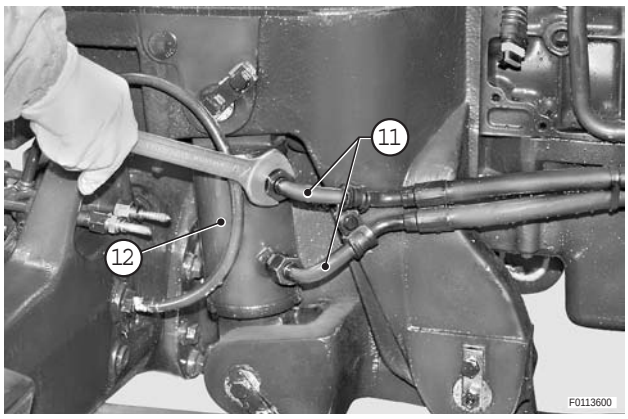


13 - Position a suitable jack under axle (1) and lift axle (1) pressing it fully home on the front support.



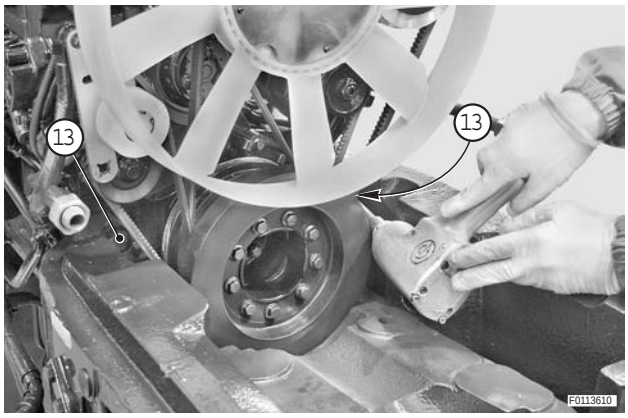
14 - Disconnect pipes (11) (two per side) from cylinders (12).

★ Plug the pipes and ports to prevent the ingress of dirt.



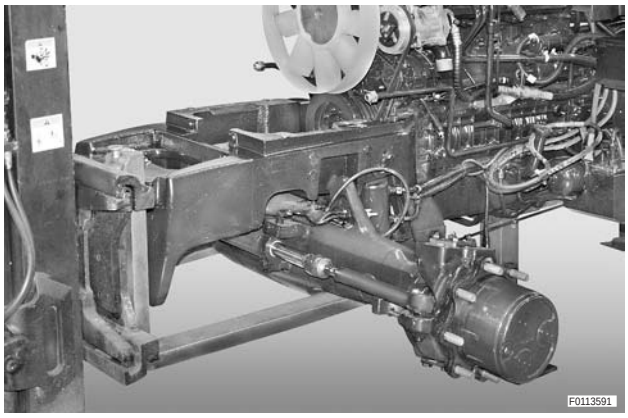
15 - Remove the two upper screws (13).

※ 2



16 - Remove the complete front support.

※ 3



Refitting

※ 1

Screws: Loctite _____

※ 2

Nm Screws: 260±26 Nm (191.6±19.2 lb.ft.)

※ 3

Locating dowels: Grease

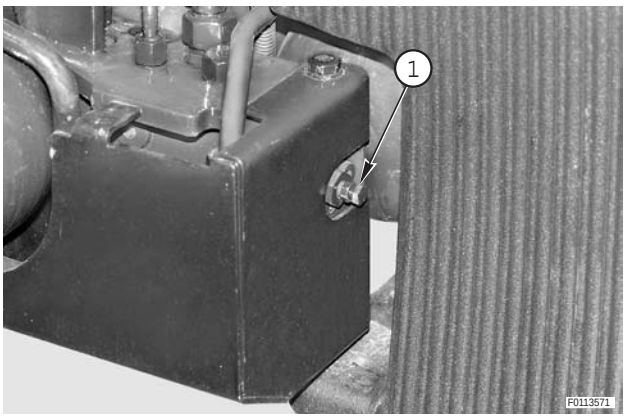
FRONT AXLE SUSPENSION
FRONT SUSPENSION CONTROL VALVE

Removal

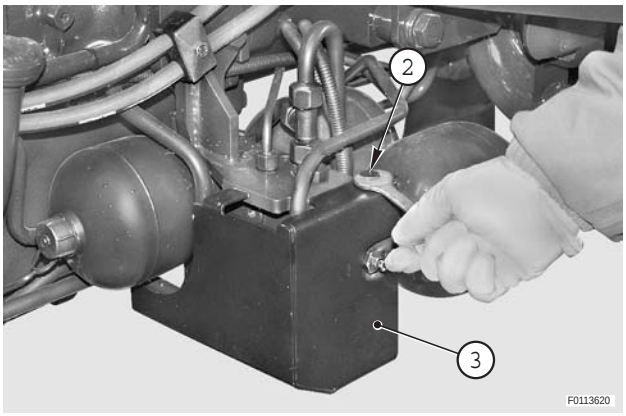
Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Loosen screw (1) to discharge pressure in the axle suspension circuit.

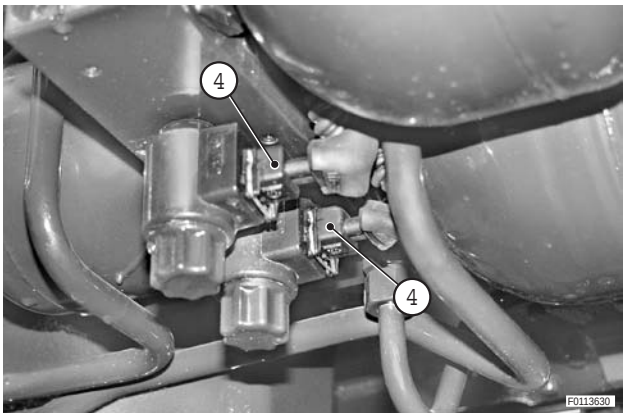
2 - Remove the fuel tank.
(For details, see "FUEL TANK").



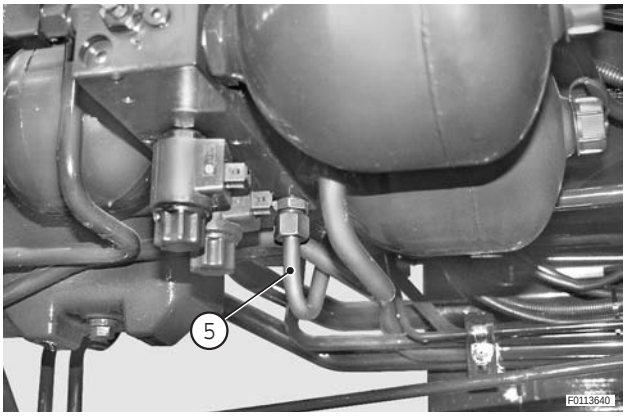
3 - Remove screw (2) and remove cover (3).



4 - Disconnect connectors (4).
★ Label the connectors to avoid confusion on refitting.

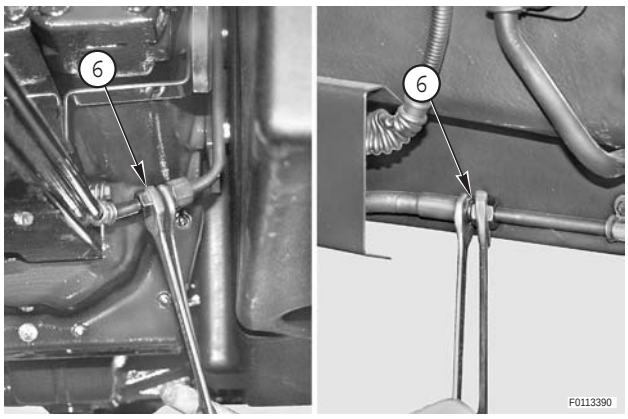


5 - Disconnect delivery pipe (5).

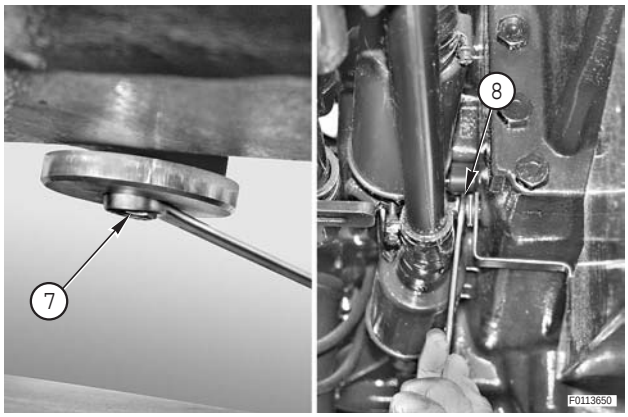


6 - Loosen unions (6) and free the differential locking pipe.

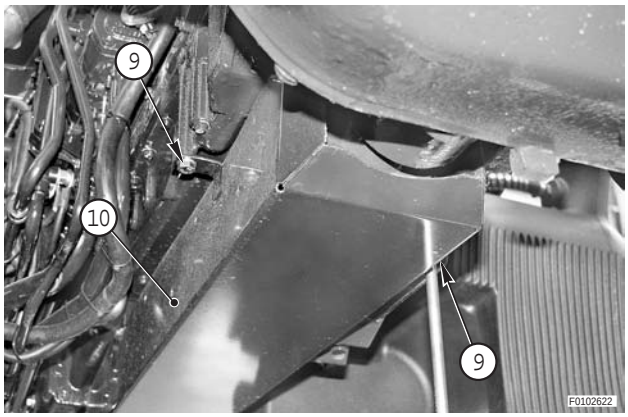
★ Plug the pipes to prevent the entry of impurities.



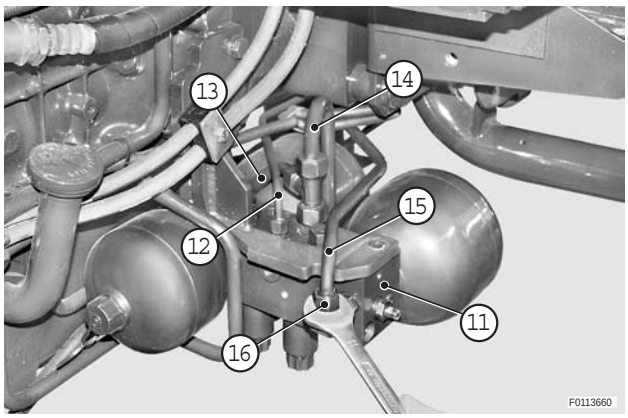
7 - Remove screws (7) and (8).



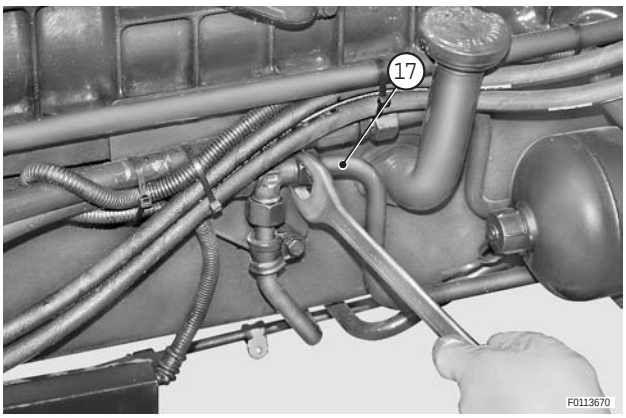
8 - Remove screws (9) and remove cover (10).



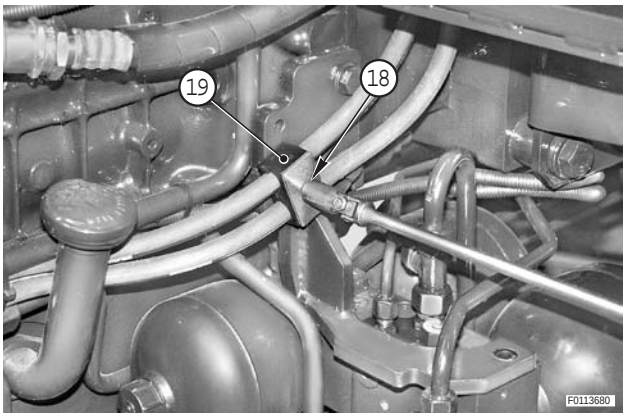
9 - Disconnect from control valve (11) pipes (12), (13) and (14) and pipe (15) and union (16).



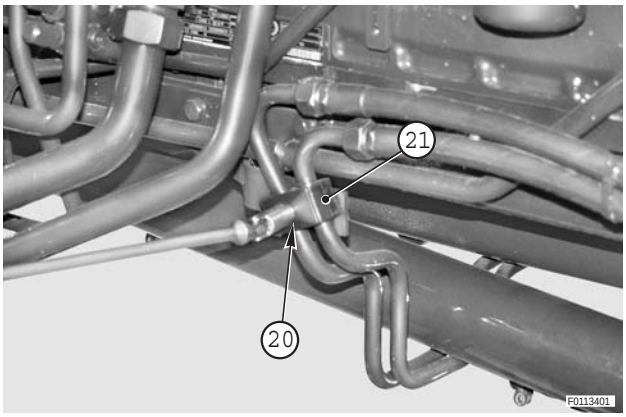
10 - Disconnect pipe (17) from the union.



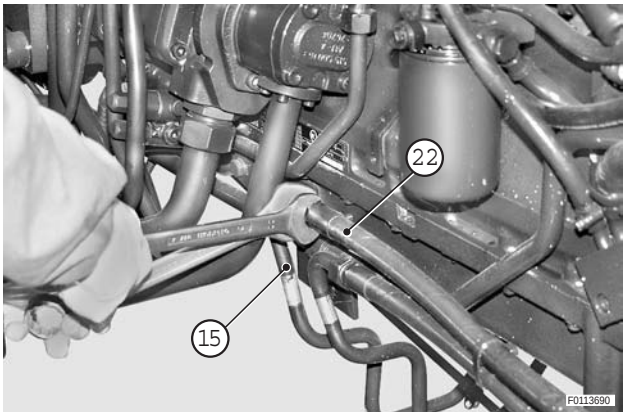
11 - Remove screw (18) remove clamp (19) and move the pipes towards the front.



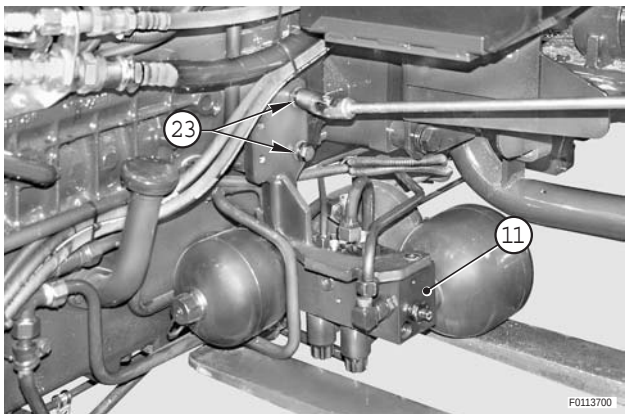
12 - Remove screw (20) and remove clamp (21).



13 - Disconnect supply line (15) from transparent tube (22) and remove pipe (15).



14 - Position a suitable jack under control valve (11), remove screws (23) and remove control valve (11).



Refitting

- Refitting is the reverse of removal.

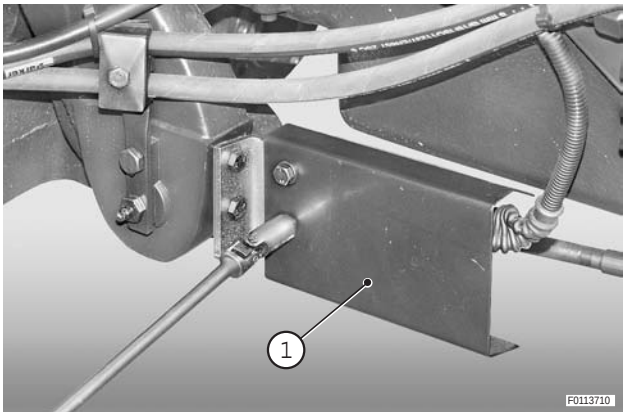
1 - Start the engine and repeatedly activate and deactivate the front suspension in order to expel any air from the system and check for leaks.

2 - Stop the engine, check the gearbox oil level and top up if necessary.

FRONT SUSPENSION POSITION SENSOR

Removal

1 - Remove cover (1).

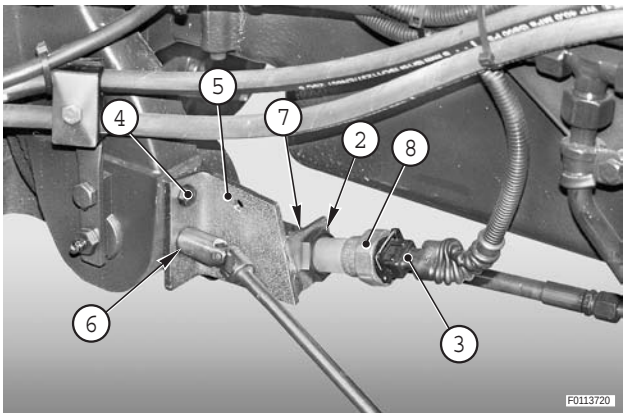


2 - Loosen rear nut (2).

3 - Unplug connector (3).

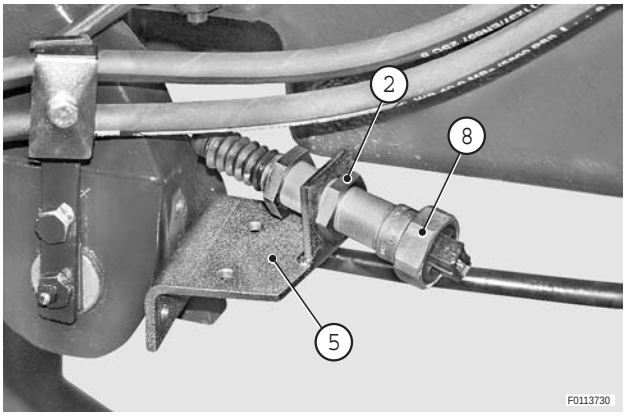
4 - Unscrew and remove upper retaining screw (4) of support (5) and loosen lower screw (6); rotate support (5).

5 - Remove lower nut (7) and remove sensor (8).



Positioning

1 - Start the engine, fully extend the front suspension cylinders and fit sensor (8) to support (5) with front nut (2) fully unscrewed.



2 - Fix support (5) and push sensor (8) in direction "*X*" until pin (9) is fully retracted.

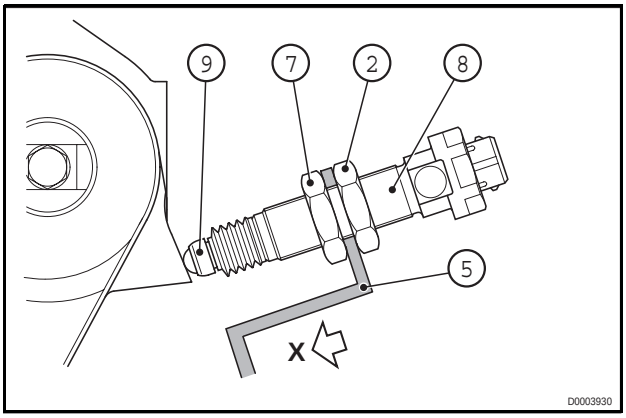
3 - Keeping the pin in this position, screw in rear nut (2) right up to support (5).

4 - Screw front nut (7) up to support (5).

5 - Back off nut (7) by one turn and tighten nut (2) to secure the sensor.

★ This adjustment prevents the possibility of the sensor sustaining impact damage at the end of its travel.

Nm Nuts: 30±6 Nm (22.1±4.4 lb.ft.)



Checking

1 - Connect the test lead *T2* (P/N 5.9030.743.1) between sensor (8) and wiring (3); start the engine and, using a multimeter, check the voltage when the cylinders are in the mid-stroke position.

★ Voltage with cylinders in mid-stroke position = 3.8V

Fully retract the cylinders and check the voltage.

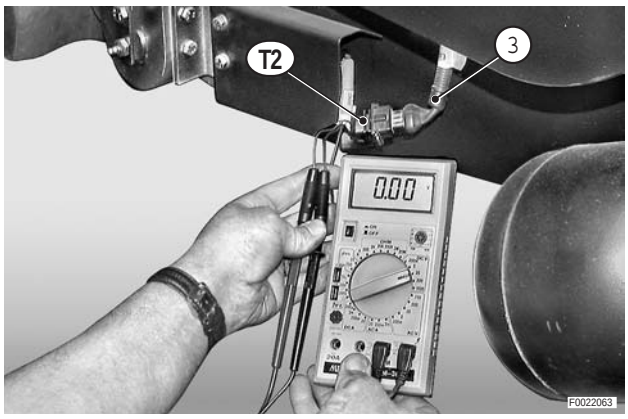
★ Voltage with cylinders retracted = 1.90÷1.95V

★ The voltage is measured between the terminals of the brown (earth) and blue (signal) wires

NOTE. The same reading can also be taken using the suspension section of the ART program. (For details see ART in section 20)

2 - Stop the engine, disconnect lead *T2* (P/N 5.9030.743.1) and connect the wiring to the sensor.

3 - Refit cover (1).



FRONT SUSPENSION CYLINDERS

Removal

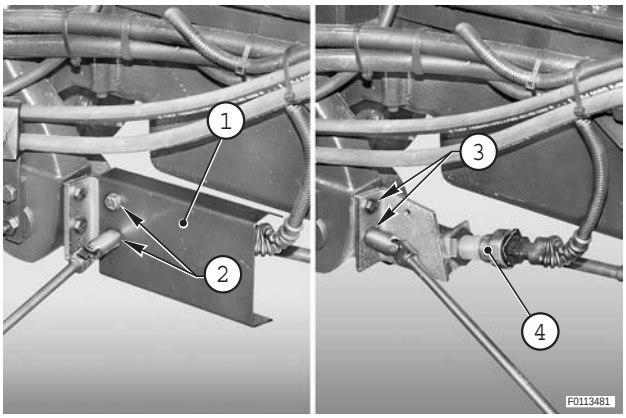
All operations are to be carried out with the parking brake applied.

1 - Remove the front wheels.
(For details, see "FRONT WHEELS").

2 - Remove the front fenders.
(For details, see "FRONT FENDERS").

3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT").

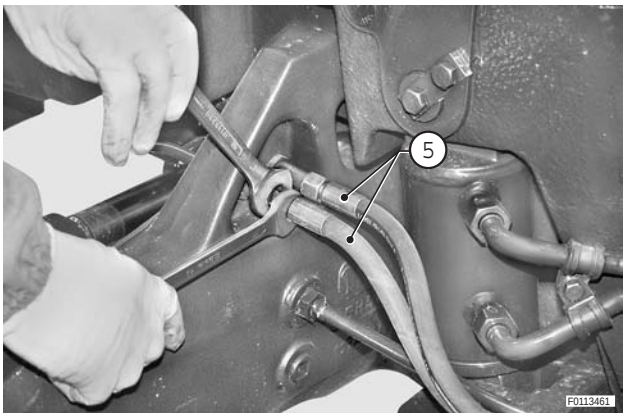
4 - Position a trolley jack under the engine sump and remove stands previously positioned under the front axle.



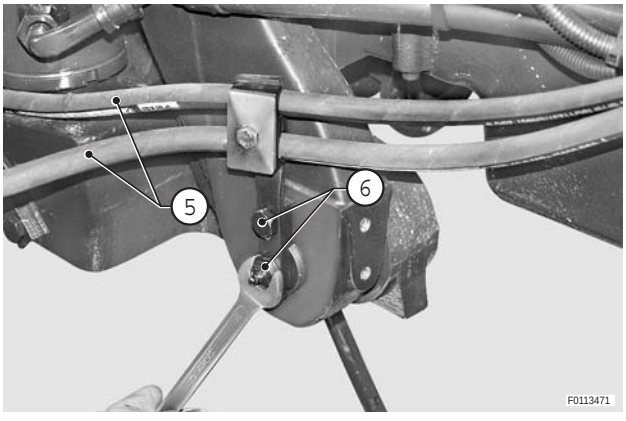
5 - Remove screws (1) and remove cover (2).

6 - Remove screws (3) and detach from the front support sensor (4).

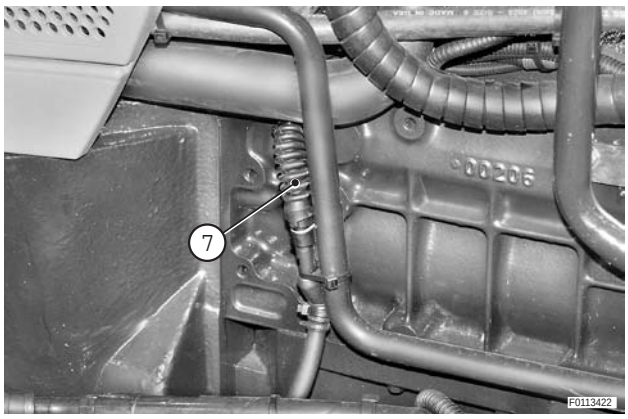
7 - Disconnect the steering cylinder pipes (5).
★ Plug the pipes to prevent the entry of impurities.



8 - Remove screws (6) and tilt pipes (5) towards the rear of the tractor.

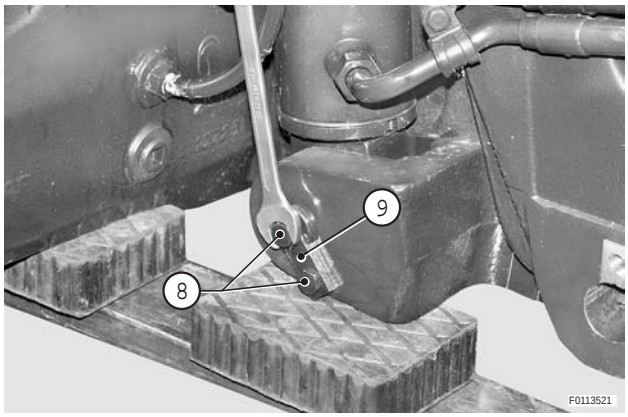


9 - Unplug the steering angle sensor connector (7).

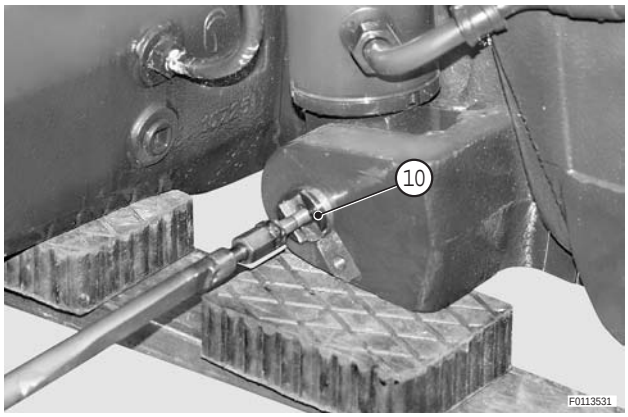


10 - Position a suitable jack under the axle and lever it slightly in the lifting direction.

11 - Remove screws (8) and retaining bars (9) of the lower pivot pins.



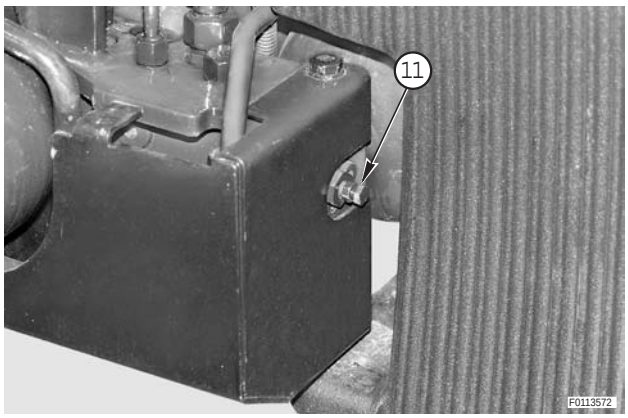
12 - Using the slide hammer puller, remove lower pivot pins (10).



13 - Lower the axle to disengage the lower mountings of the cylinders.

⚠ Discharge the residual pressure from the suspension system by unscrewing valve (11) about two full turns.

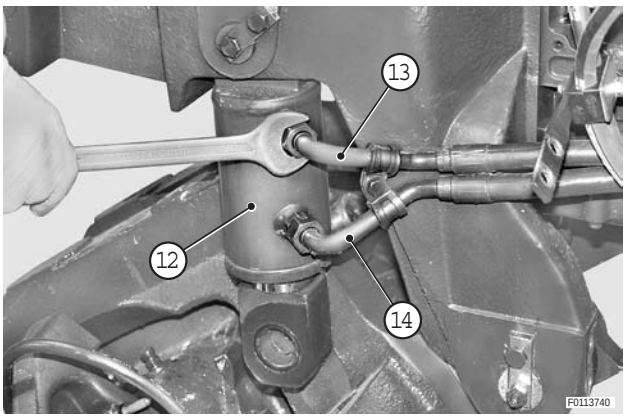
★ Wait a few minutes after discharging the pressure, then re-close the valve.



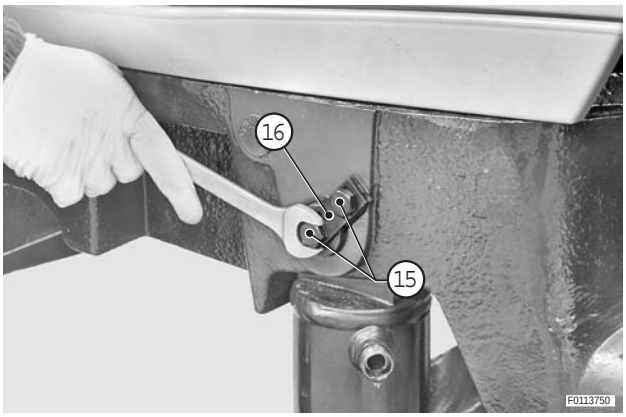
14 - Disconnect pipelines (13) and (14) from cylinders (12).

⚠ Loosen the fitting by a few turns, but before fully disconnecting them, push them to detach them from the couplers and release any residual pressure in the system.

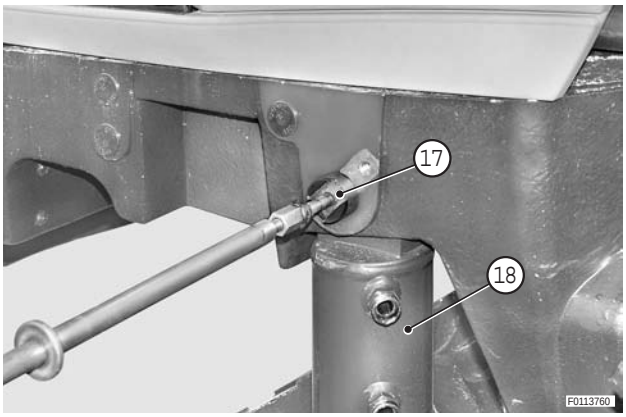
★ Plug the pipes to prevent the entry of impurities.



15 - Remove screws (15) and retaining bars (16) of the upper pivot pins.



16 - Using a slide hammer puller, remove upper pivot pins (17) and remove cylinders (18).



Refitting

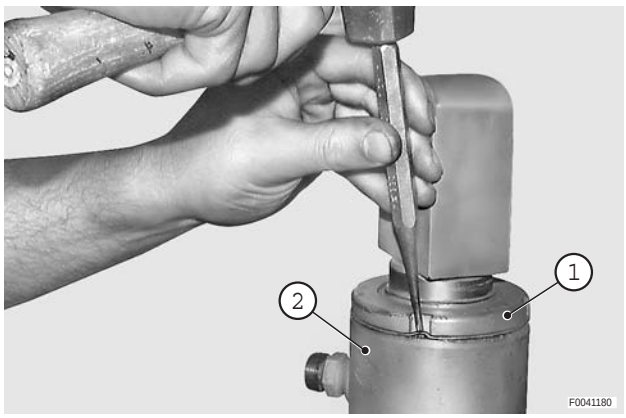
- Refitting is the reverse of removal.

1 - Start the engine and turn the steering wheel repeatedly to full lock in both directions. Activate and deactivate the suspension a number of times to expel air from the system and check for leaks.

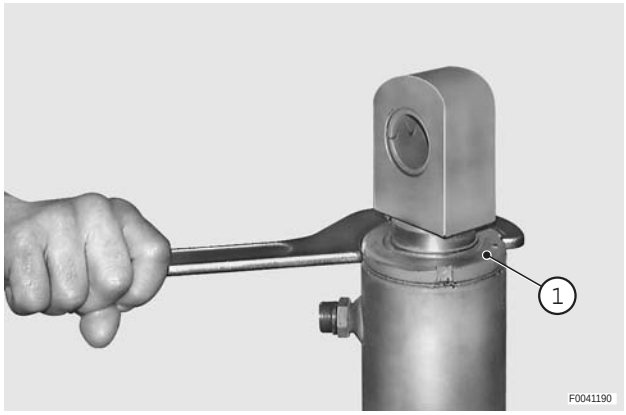
2 - Stop the engine, check the gearbox oil level and top up if necessary.

Disassembly

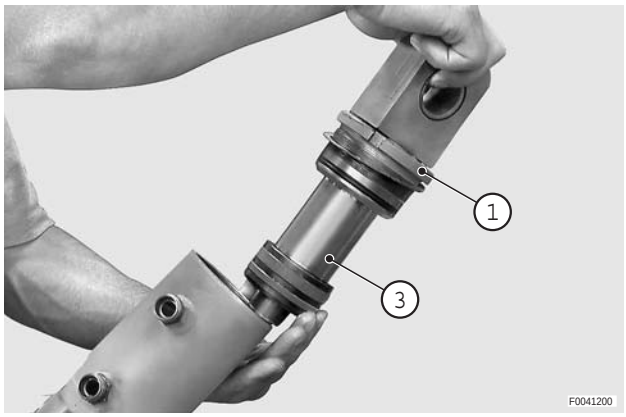
1 - Relieve the staking on the lock washer located between end cap (1) and cylinder (2).



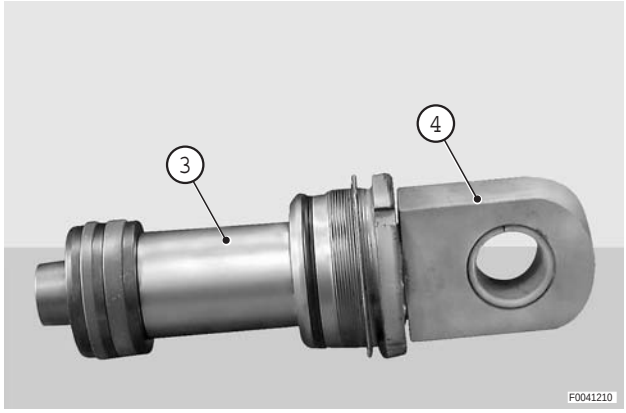
2 - Using a pin wrench, unscrew end cap (1). ※ 1



3 - Withdraw rod (3) complete with end cap (1) and seals. ※ 2



4 - Heat the eye of piston (4) to a temperature of 100÷120 °C (212-248 °F) and detach it from rod (3). ※ 3

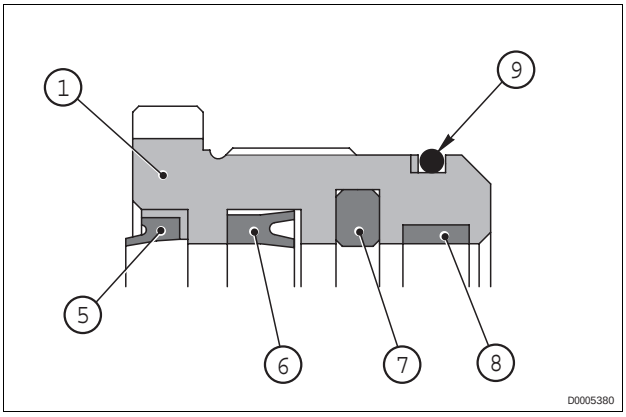


5 - Withdraw end cap (1) from the rod and remove in order rod wiper (5), seals (6), (7) and guide (8). ※ 2

★ Take care not to damage the seatings of the seals.

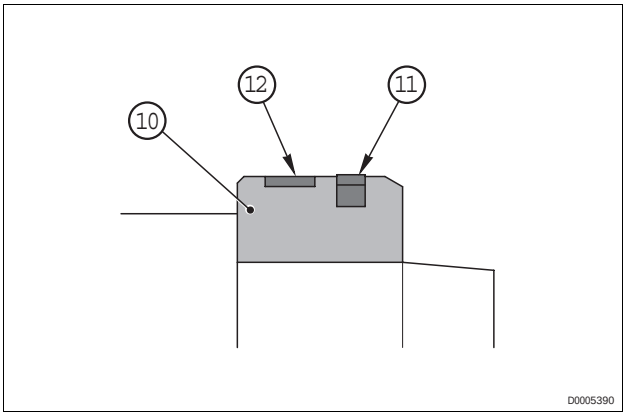
6 - Remove O-ring seal (9).

★ Make a note of which way round the seals are assembled.



7 - Remove seal (11) and guide (12) from piston (10).

★ Take care not to damage the seal seating.



Assembly

• Refitting is the reverse of removal.

※ 1

Nm Head: 500±20 Nm (368.5±14.7 lb.ft)

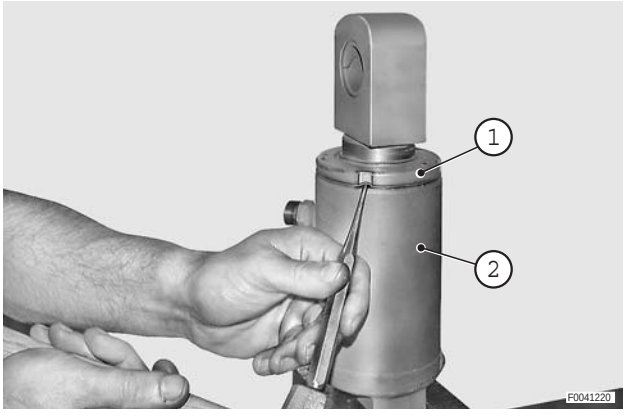
※ 2

Seals: Oil

※ 3

Nm Piston eye: 380±10 Nm (280.1±7.4 lb.ft)

1 - Stake the lock washer tabs into the notch on cylinder (2) and into one of the notches on end cap (1).



BRAKE CYLINDERS

Removal

Disconnect the lead from the battery negative terminal (–).

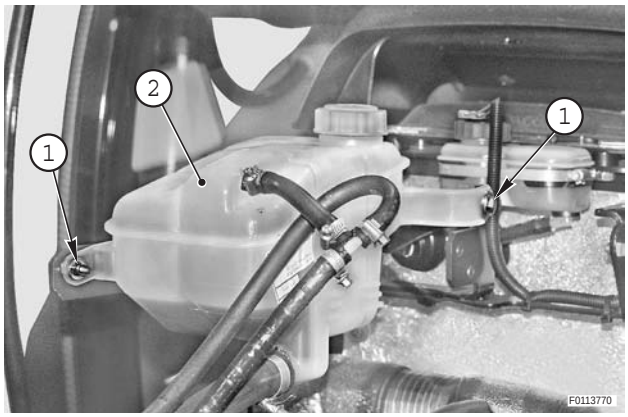
1 - Remove the hood.
(For details, see "ENGINE HOOD").

2 - Remove the initial section of the exhaust pipe.
(For details, see "EXHAUST SYSTEM").

★ Do not remove the silencer and the middle section of the exhaust pipe.

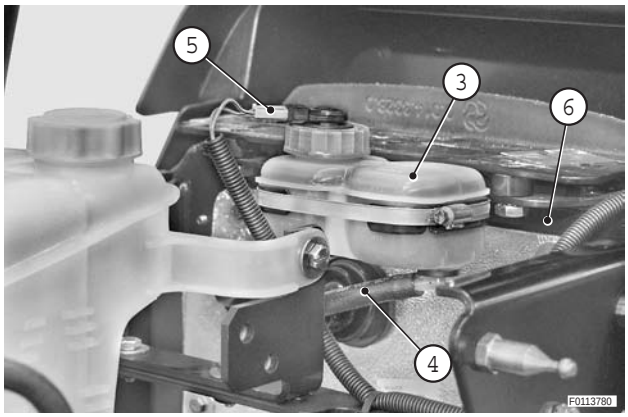
3 - Remove the front console.
(For details, see "FRONT CONSOLE").

4 - Remove screws (1) move expansion tank (2) towards the front.



5 - Drain all the fluid from brake fluid reservoir (3) and detach pipes (4) from reservoir (3).

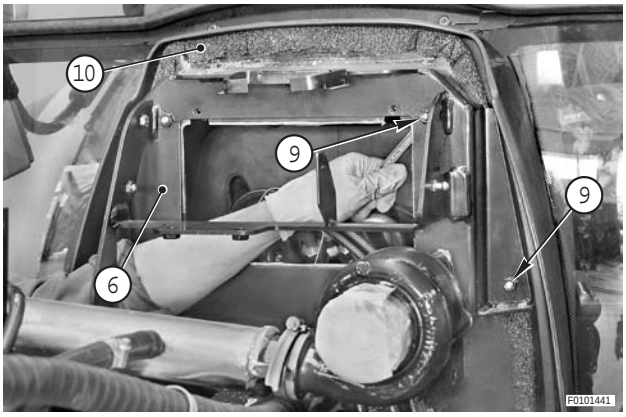
6 - Disconnect connectors (5), detach brake fluid reservoir (3) from support (6).



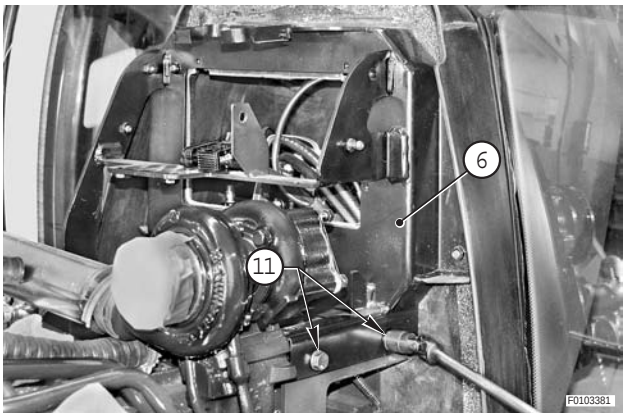
7 - Remove screws (7) and remove partition (8).

• *For versions without cab pneumatic suspension*

8 - remove screws (9) (qty 4)and detach guard (10) from support (6).

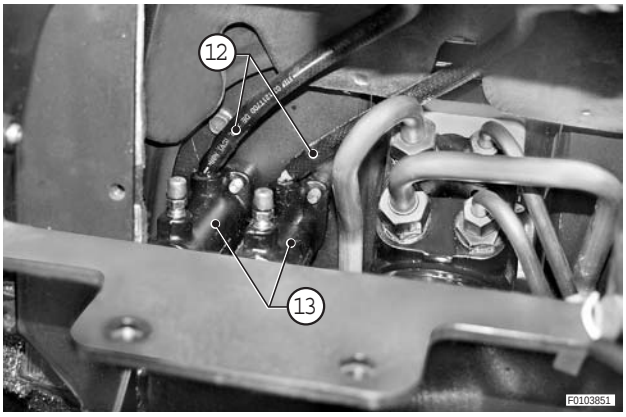


9 - Remove screws (11) (two per side) and remove guard (6).

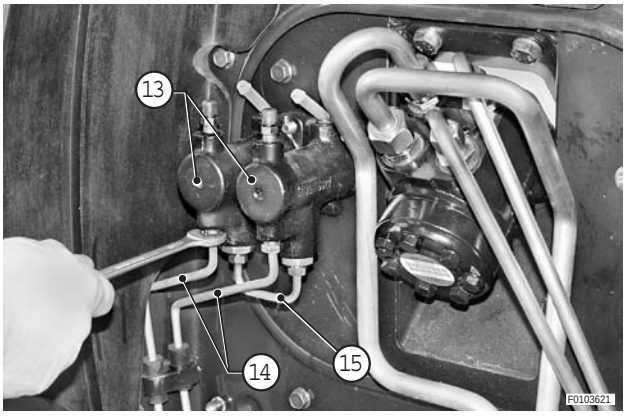


• *For all versions*

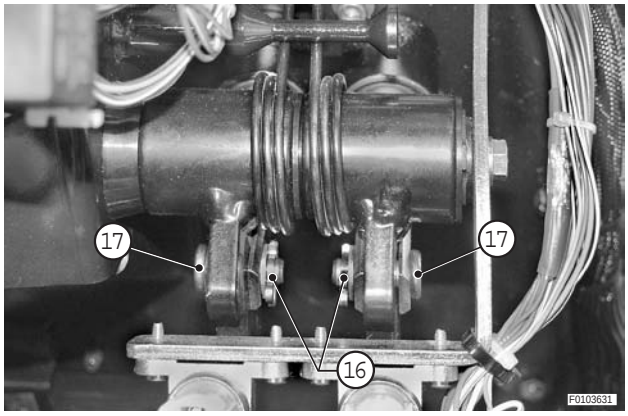
10 - Disconnect pipes (12) from brake cylinders (13).



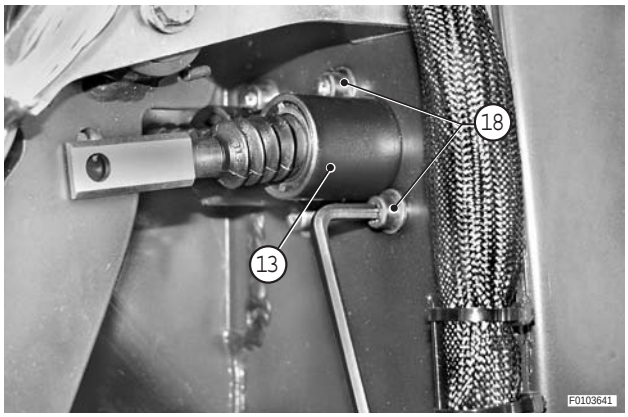
11 - Disconnect feed pipes (13) and by-pass pipe (15) between cylinders (14).



12 - Remove split pins (16) and remove pivot pins (17).



13 - Remove screws (18) (qty. 4) and remove brake cylinders (13).



Refitting

- Refitting is the reverse of removal.

1 - Fill the brake fluid reservoir to the maximum level.

2 - Bleed the air from the braking system.

POWER STEERING PUMP

STEERING VALVE ASSEMBLY

Removal

Disconnect the lead from the battery negative terminal (–).

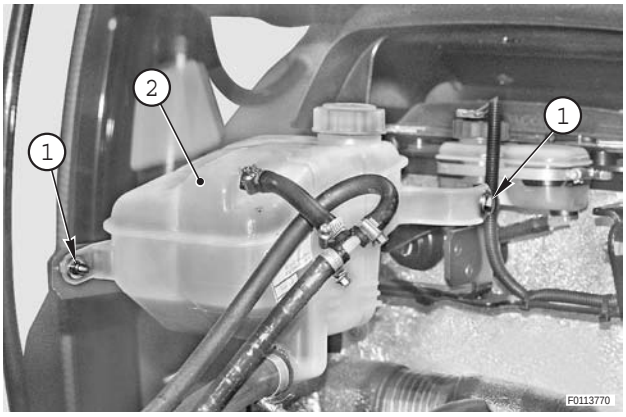
1 - Remove the hood.
(For details, see "ENGINE HOOD").

2 - Remove exhaust pipe assembly.
(For details, see "EXHAUST SYSTEM".
★ Do not remove the silencer and the middle section of the exhaust pipe.

3 - Remove the front console.
(For details, see "FRONT CONSOLE").

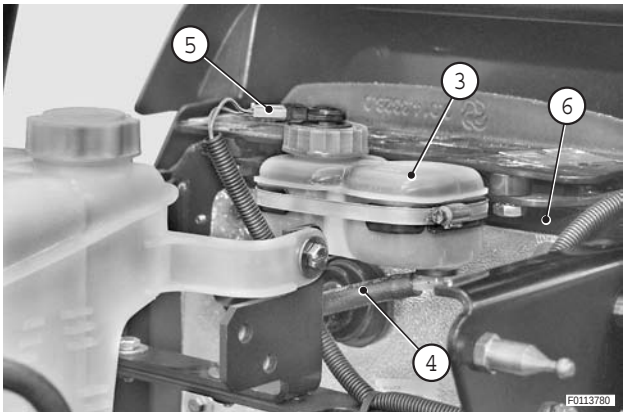
• *For versions without cab pneumatic suspension*

4 - Remove screws (1) move expansion tank (2) towards the front.



5 - Drain all the fluid from brake fluid reservoir (3) and detach pipes (4) from reservoir (3).

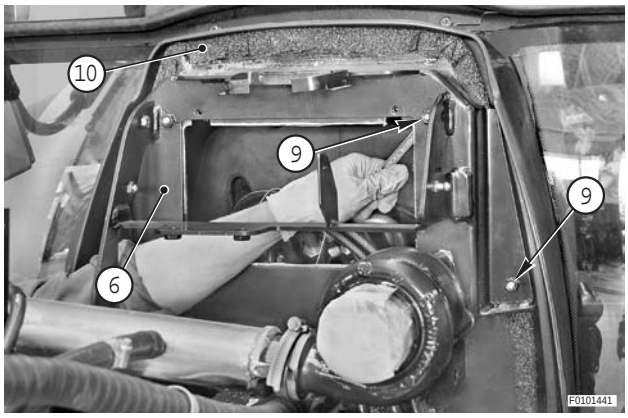
6 - Disconnect connectors (5), detach brake fluid reservoir (3) from support (6).



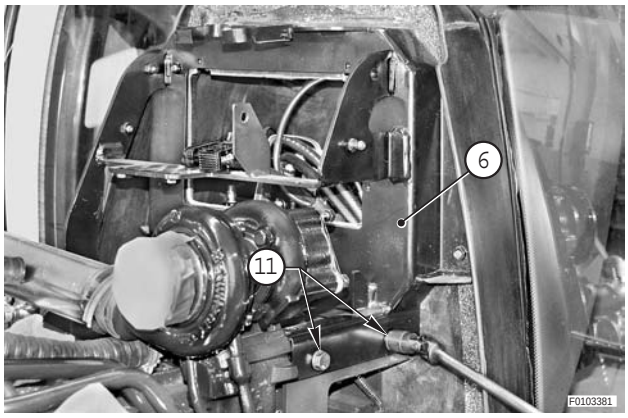
7 - Remove screws (7) and remove partition (8).

• *For versions without cab pneumatic suspension*

8 - remove screws (9) (qty 4)and detach guard (10) from support (6).

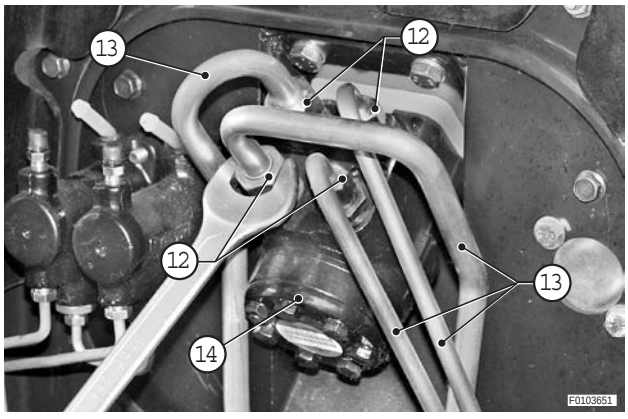


9 - Remove screws (11) (two per side) and remove guard (6).

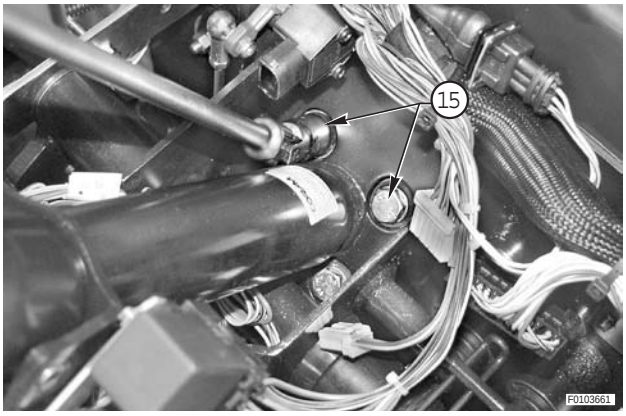


• *For all versions*

10 - Loosen unions (12) and disconnect hoses (13) from power steering (14). ⁘ 1

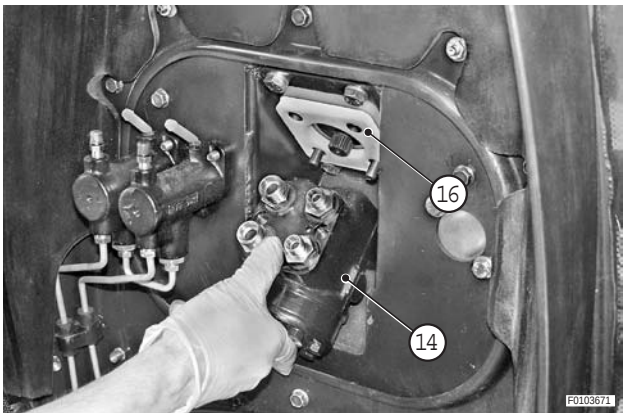


11 - Remove screws (15).



12 - Remove power steering (14).

★ If necessary, reposition plate (16) with the relative spacers. ⁘ 2



Refitting

• Refitting is the reverse of removal.

⁘ 1

Nm Hose connection union: 60 Nm (44.2 lb.ft.)

⁘ 2

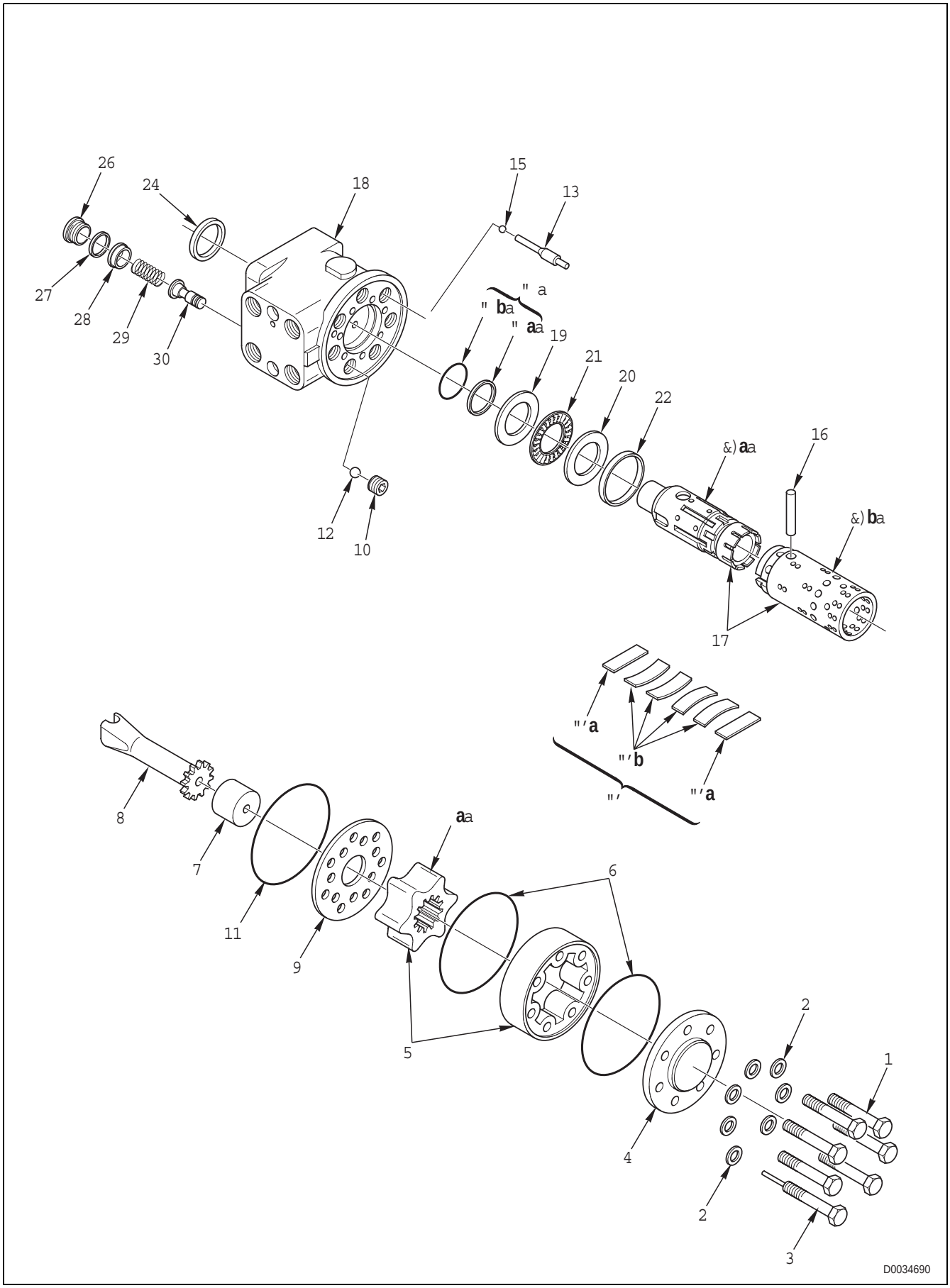
★ If the hose connection fittings have been removed from the steering valve, replace the seals. Torque reassembled fittings to 70 Nm (51.6 ft lb).

1 - Start the engine and turn the steering wheel repeatedly in both directions to eliminate any air from the power steering system.

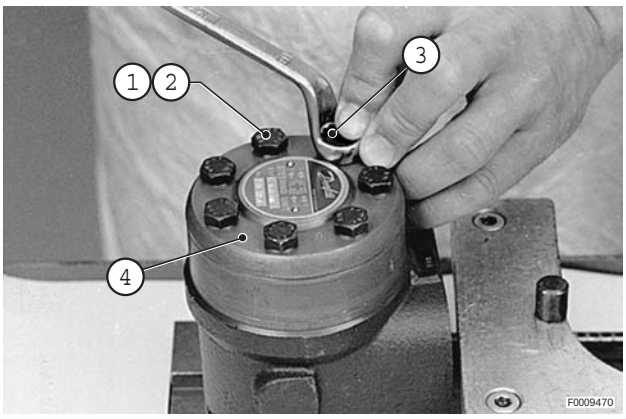
2 - Check the unions for leaks.

3 - Bleed the air from the brake circuits.

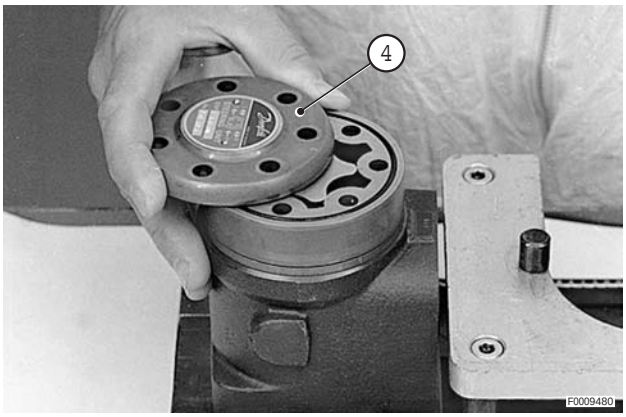
Disassembly



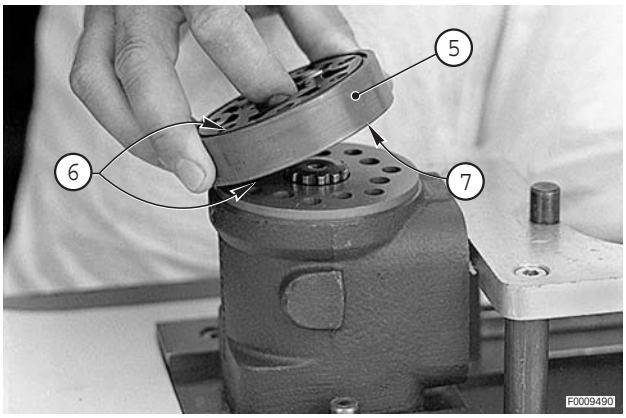
1 - Unscrew and remove screws (1) and (3) and washers (2) securing cover (4) (6 screws plus one special screw).



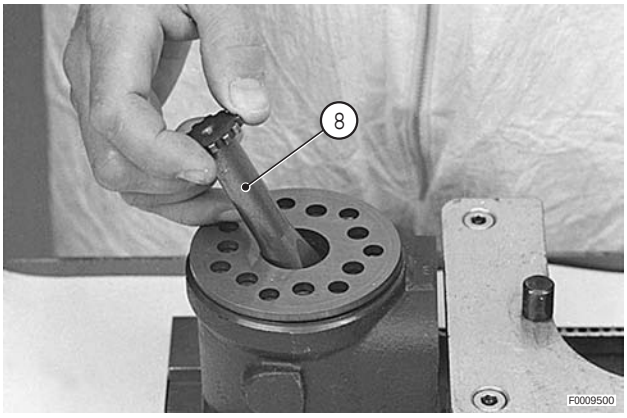
2 - Remove cover (4) by sliding it off sideways.



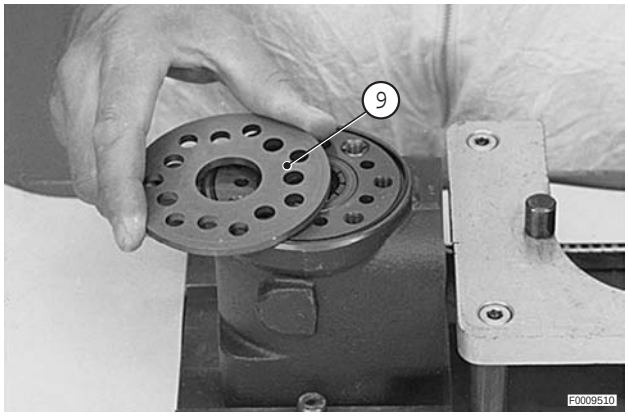
3 - Remove stator/rotor assembly (5) complete with O-rings (6) and spacer (7).



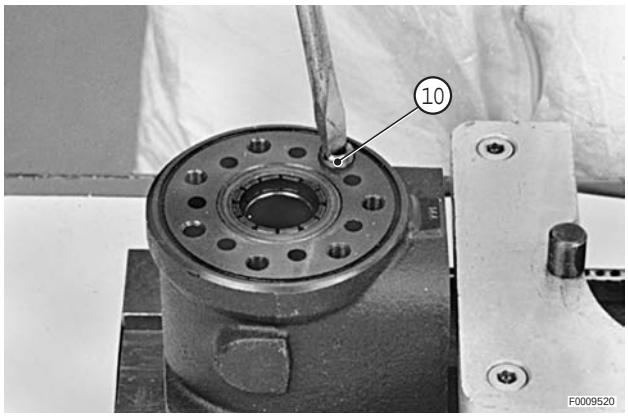
4 - Remove drive shaft (8).



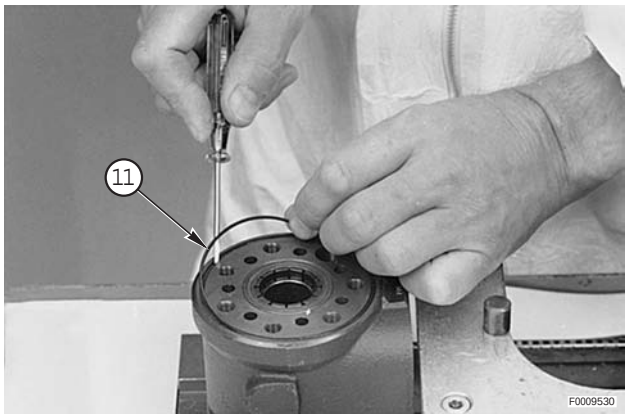
5 - Remove distributor plate (9).



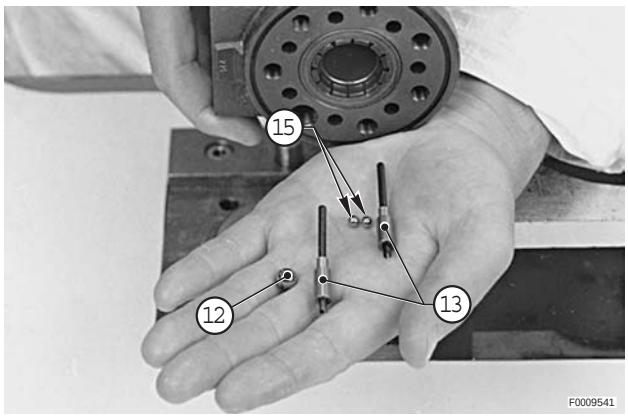
6 - Remove safety valve stop bush (10).



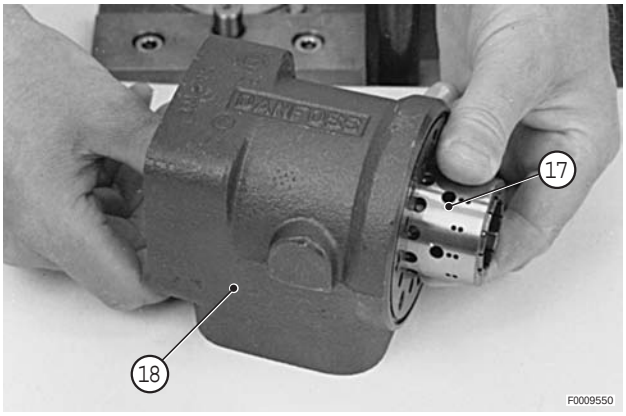
7 - Remove O-ring (11).



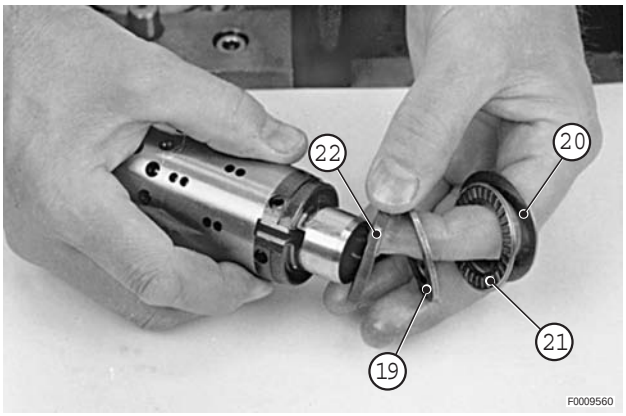
8 - Remove ball (12) of the check valve and pins (13) and balls (15) of the suction valves.



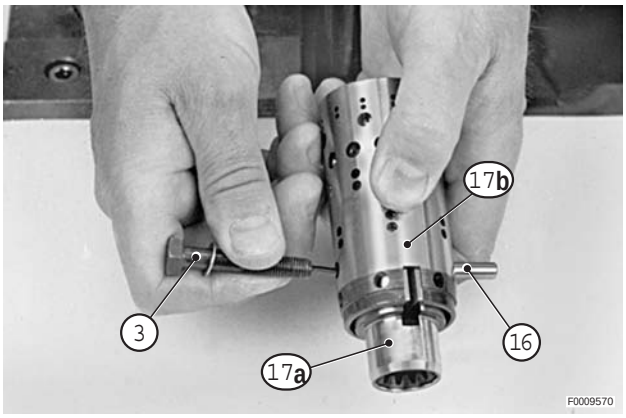
9 - Checking through the central hole of the spool, position cross pin (16) horizontally.
Push assembly (17) and the bearing assembly out of power steering housing (18).



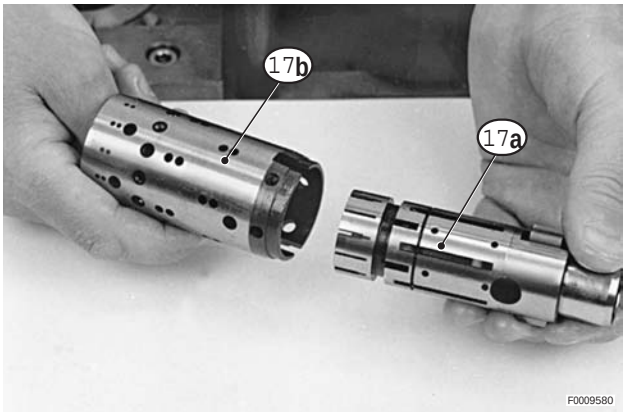
10 - Remove outer race (19), inner race (20) and roller bearing (21) from the spool. remove also ring (22).
★ Inner race (20) (thin) may sometimes remain in the steering valve housing; ensure that it is fact removed.



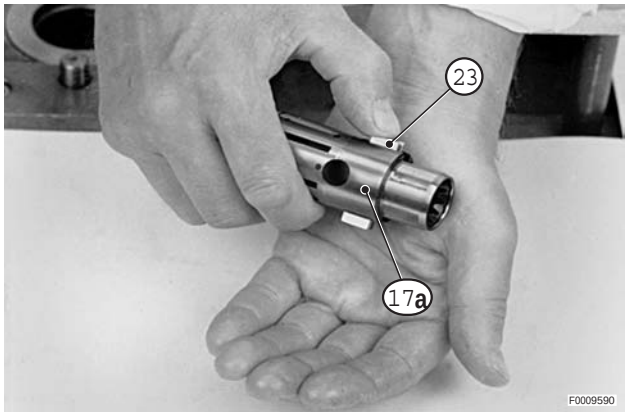
11 - Remove cross pin (16), bush (17b) and spool (17a).
★ Use special cover screw (3).



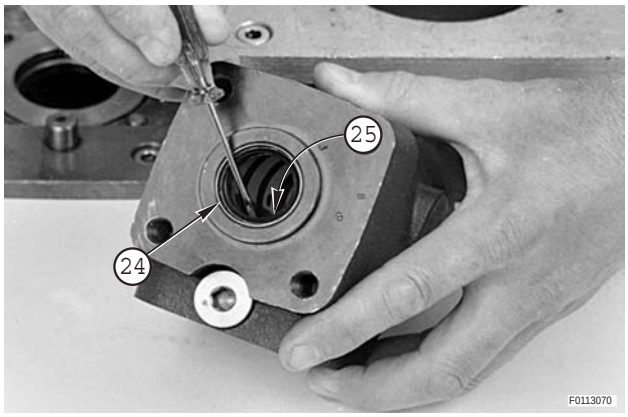
12 - Slowly withdraw spool (17a) from bush (17b).



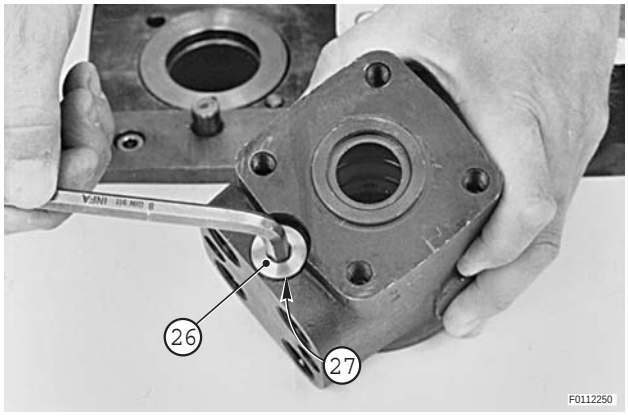
13 - Press neutral position springs (23) and remove them from spool (17a).



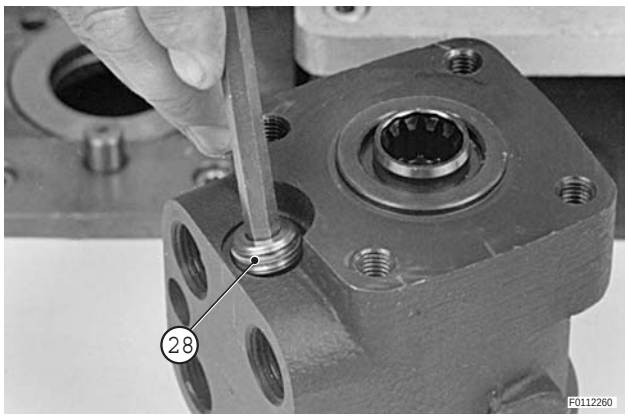
14 - Remove dust seal (24) and composite seal (25) (O-ring + seal).



15 - Remove plug (26) and its gasket (27).

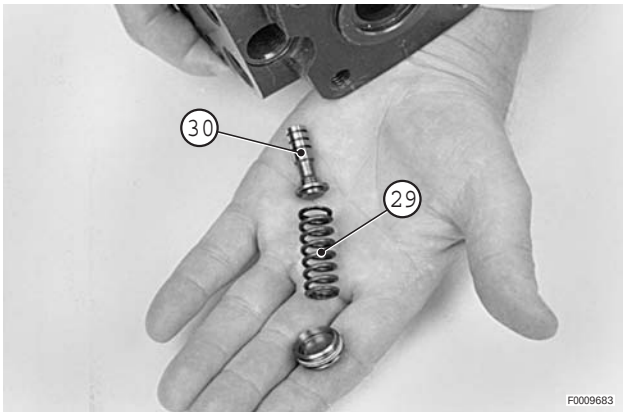


16 - Remove pressure relief adjuster screw (28).



17 - Turn over the power steering housing and remove spring (29) and relief valve (30).

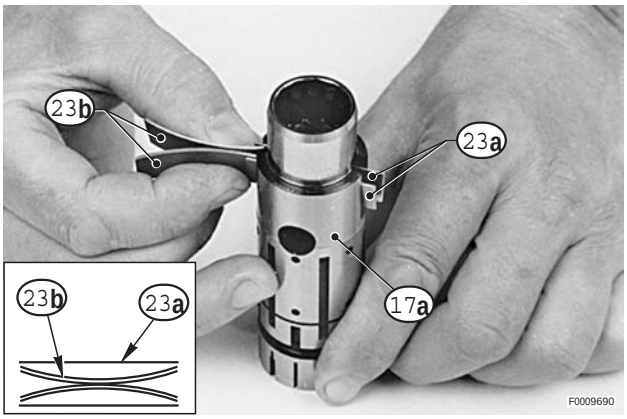
★ The seat of the relief valve is a force fit in the housing and cannot be removed.



Assembly

★ Prior to reassembly, lubricate all components with gearbox oil.

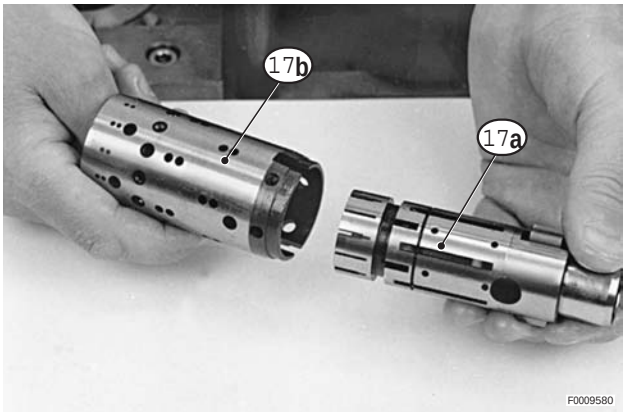
1 - Insert two flat washers (23a) in the seat and centre them relative to the diameter of spool (17a). Insert the four curved washers (23b) in pairs between the two flat washers (23a) and push them fully home.



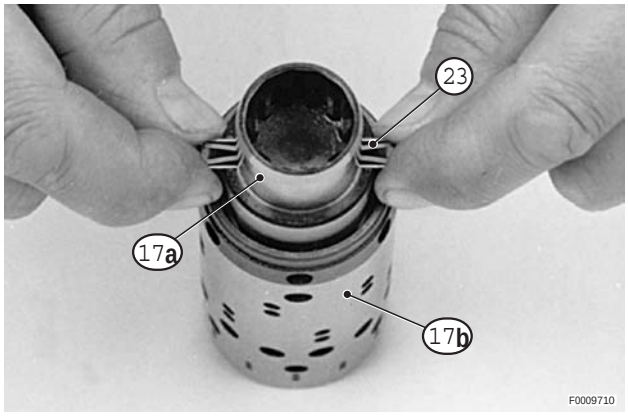
2 - Align spring assembly (23).

3 - Insert spool (17a) in bush (17b).

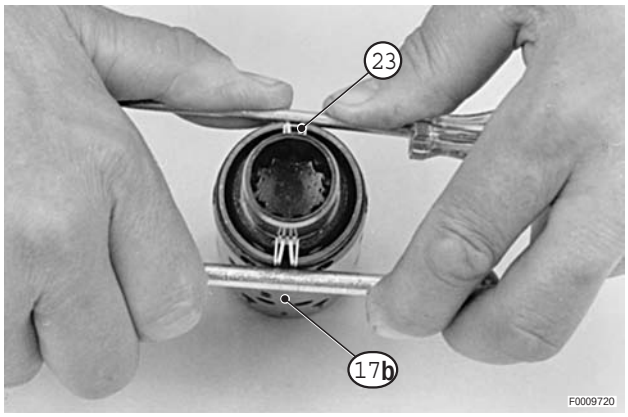
★ Check that the position between the bush and the spool is as described in stage 1.



4 - Simultaneously push springs (23) and spool (17a) until the springs are seated in the slots in bush (17b).

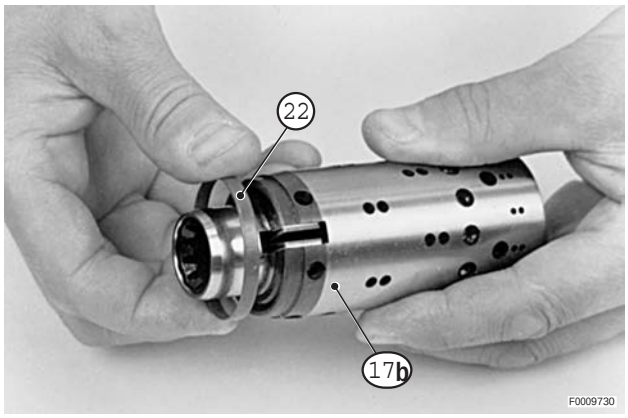


5 - Align springs (23) and make sure they are positioned centrally in relation to the diameter of bush (17b).

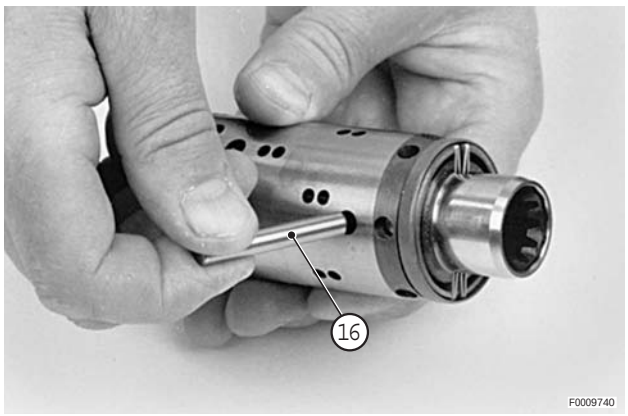


6 - Install ring (22) on its seat on bush (17b).

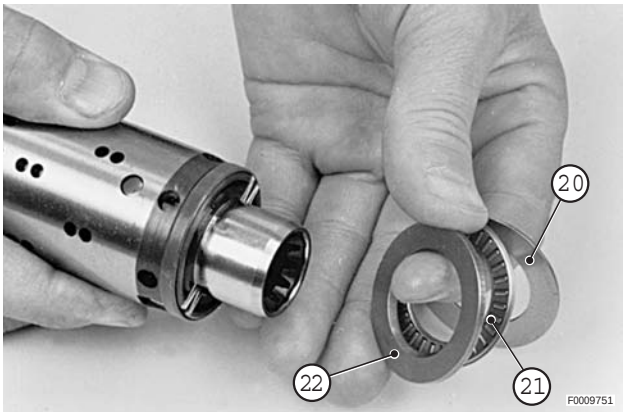
★ Ring (22) must be free to rotate without interfering with springs (23).



7 - Insert cross pin (16).

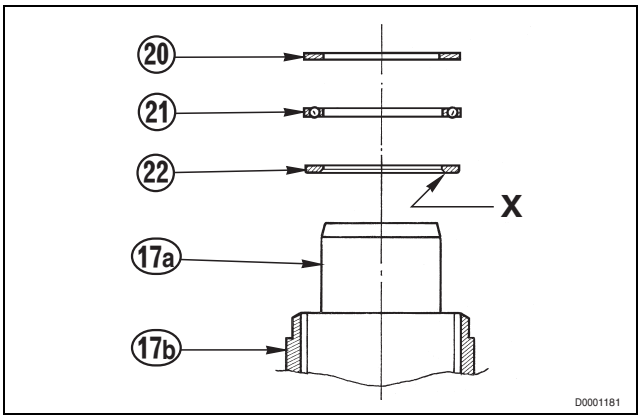


8 - Install the thrust bearing components in the order indicated in point 9.

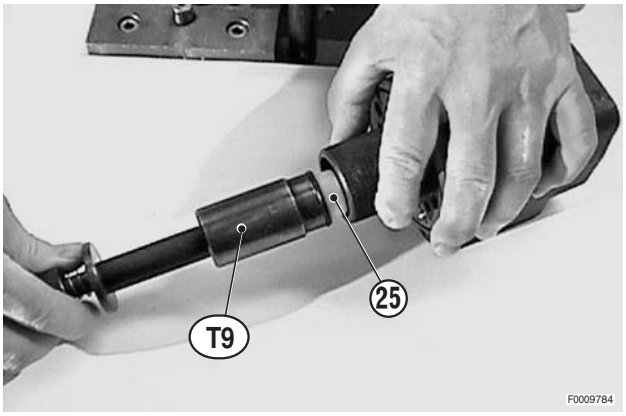


9 - Thrust bearing assembly.
17a -Spool
17b -Bush
21- Needle roller bearing
20 -Inner ring
22 -Outer ring

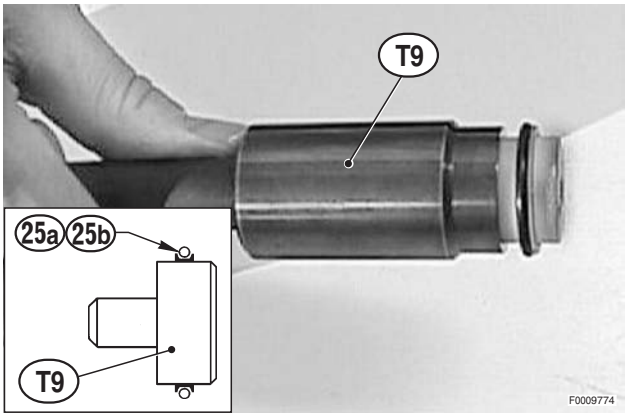
⚠ The outer ring must be installed with the chamfer "**X**" facing the shoulder of the spool.



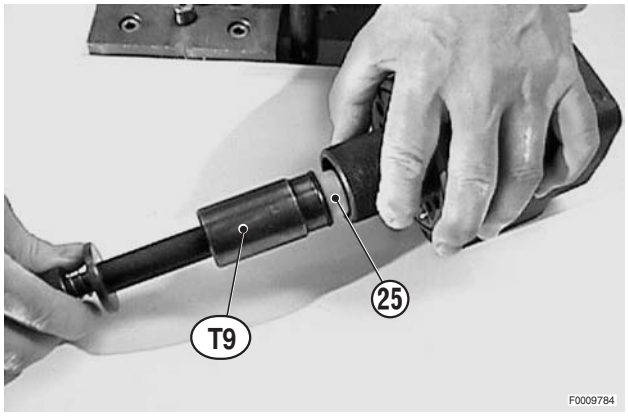
10 - Position power valve housing (18) so the hole is horizontal.
Insert the guide of special tool *T9* (P/N 5.9030.480.0) in the bush/spool assembly bore.



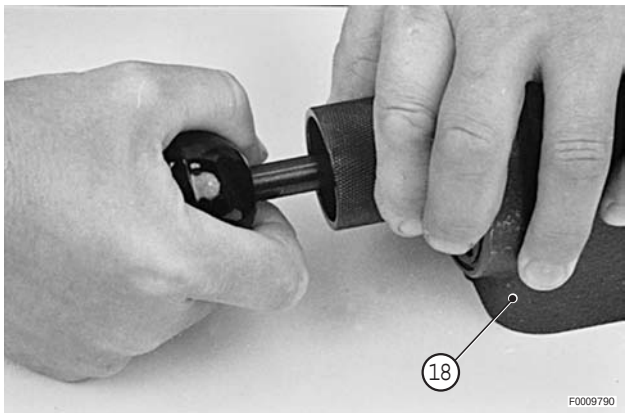
11 - Lubricate oil seal (25a) and O-ring (25b) and fit them on the push rod of tool *T9* (P/N 5.9030.480.0).



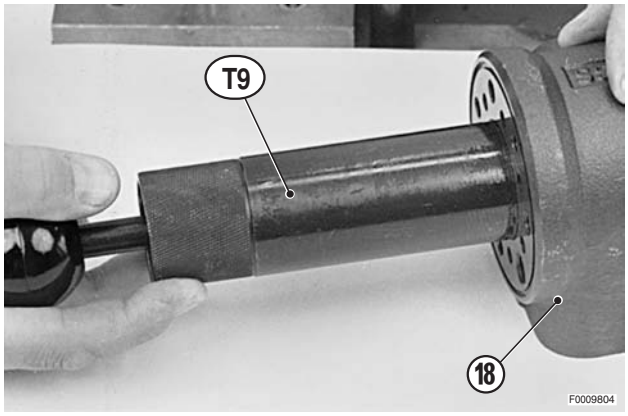
12 - Fit tool *T9* (P/N 5.9030.480.0) and insert it in the guide previously inserted in the power steering bore.



13 - Push seal (25) into its seat in steering valve housing (18) while rotating it to ease it into position.

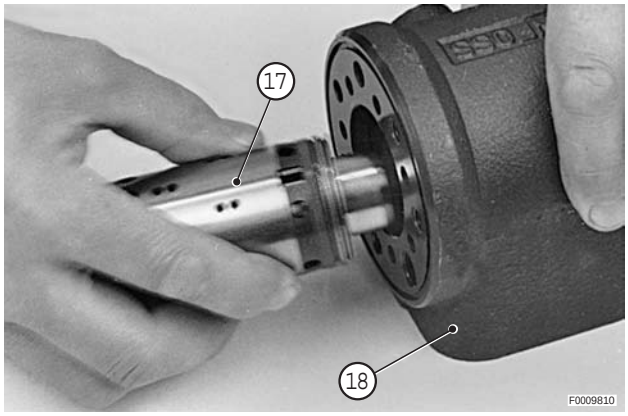


14 - Withdraw from power steering housing (18) tool *T9* (P/N 5.9030.480.0) and the guide, leaving the gasket holder plunger in position.

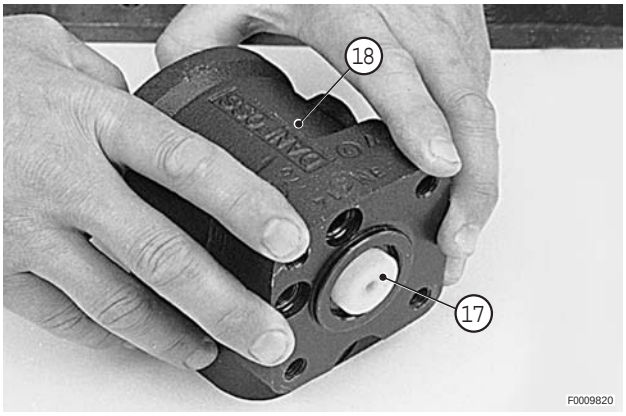


15 - Insert bush/spool assembly (17) in steering valve bore (18).
Rotate the valve slightly while inserting it to ease it into position.

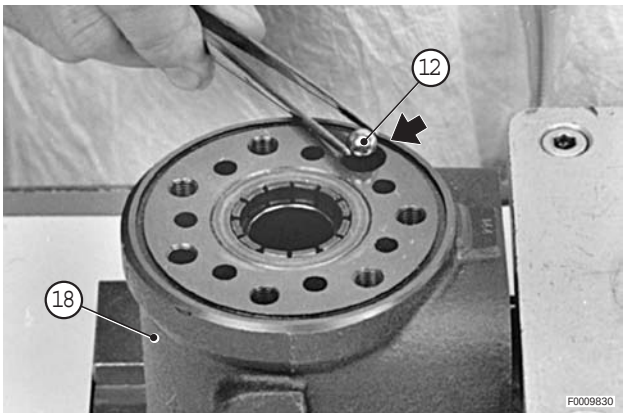
★ Keep the cross pin horizontal while inserting the assembly.



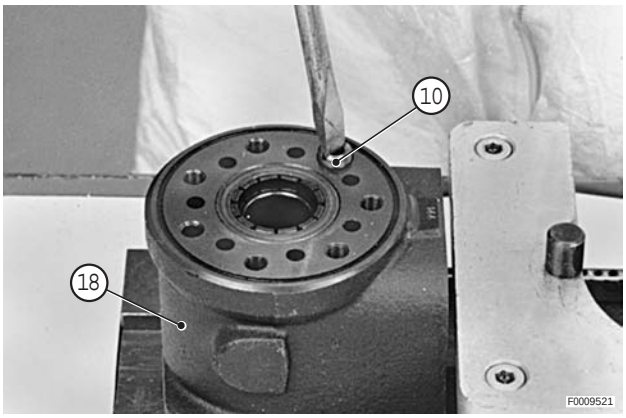
16 - Push in assembly (17) until fully seated so that it forces out the tool plunger left in the housing in step 14.



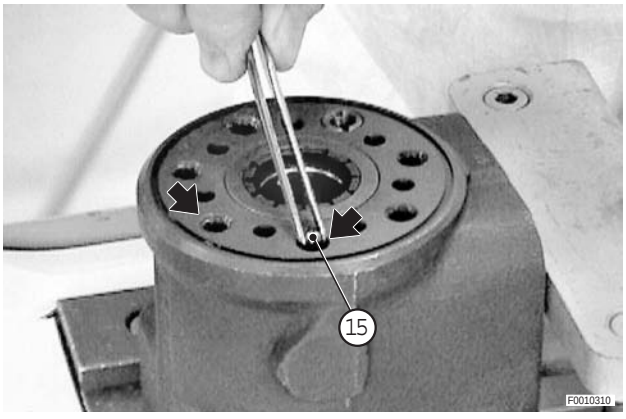
17 - Rotate steering valve housing (18) until the centre hole is vertical.
Insert ball (12) of the relief valve in the hole indicated by the arrow.



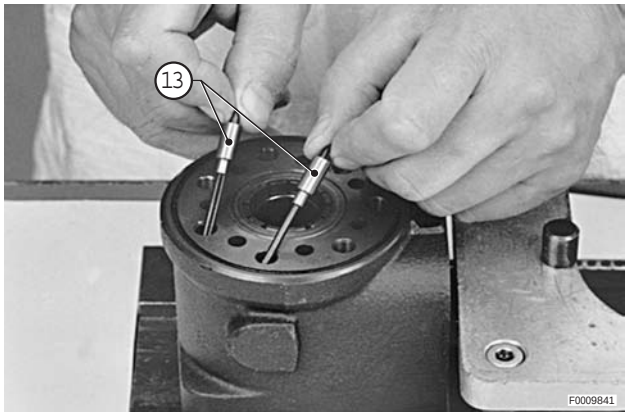
18 - Screw valve retaining bush (10) into the bore of the relief valve.
★ The top of the retaining bush should be set below the face of power steering housing (18).



19 - Insert the two balls (15) in the holes indicated by the arrows.

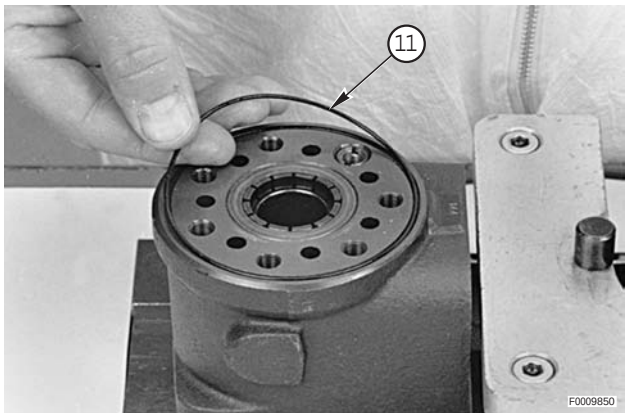


20 - Insert stems (13) in the same holes.

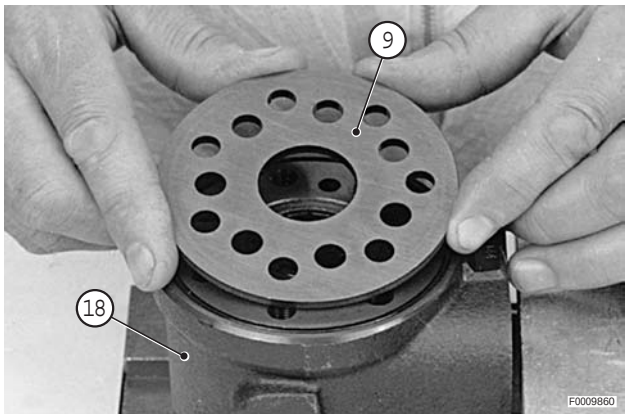


21 - Lubricate O-ring (11) and fit it in its seat.

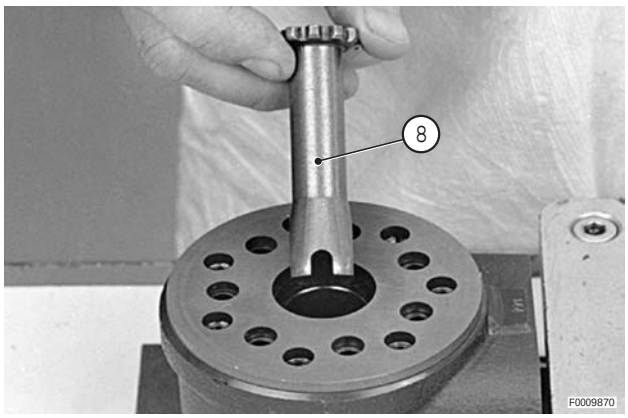
O-ring: Gearbox oil



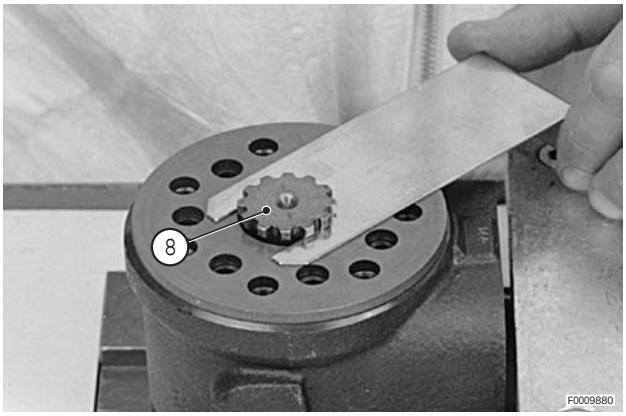
22 - Locate distributor plate (9) so that its holes are aligned with the holes in power steering housing (18).



23 - Insert drive shaft (8) in the hole so that it engages the cross pin; check that the engagement with the cross pin is parallel to the steering column mounting face.

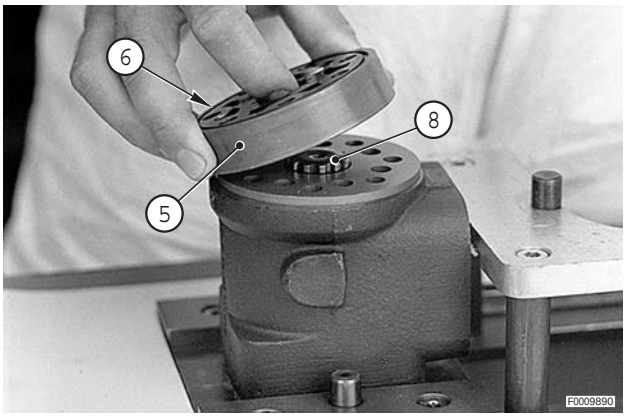


24 - Position the drive shaft so that it is vertical and hold it in this position using a suitable tool.

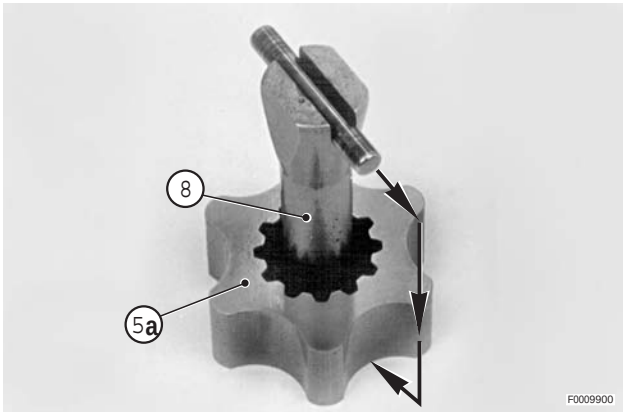


25 - Lubricate the two O-rings (6) and fit them in the two grooves in rotary spool unit (5).
Fit rotary spool unit (5) to drive shaft (8).

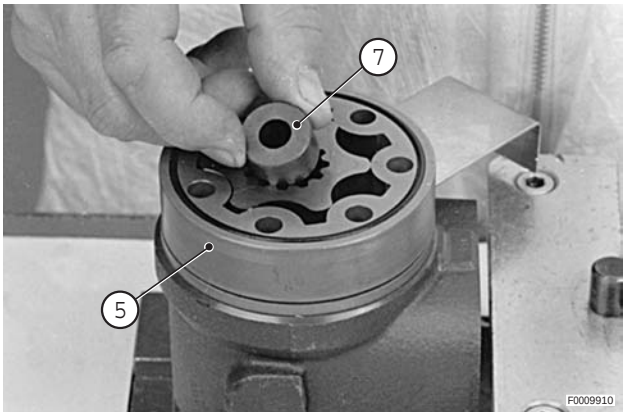
O-rings: Gearbox oil



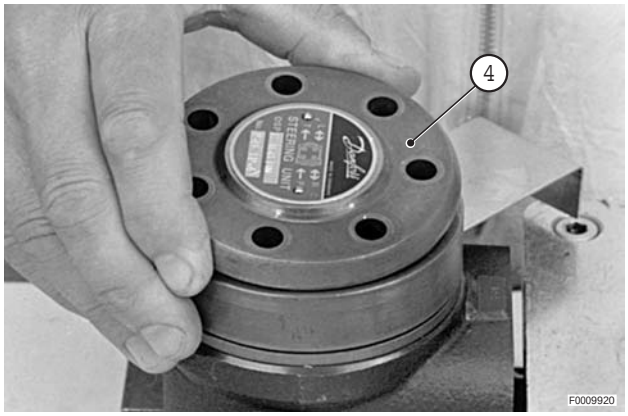
⚠ Install rotor (5a) on drive shaft (8) so that the valley between two lobes is aligned with the groove in the end of the drive shaft. Then turn outer ring (5b) to align the fixing holes.



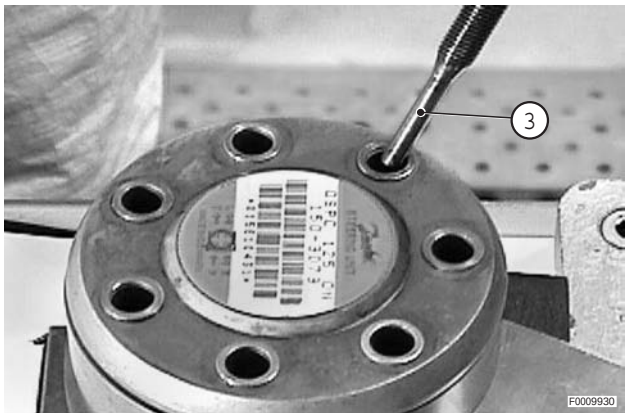
26 - Install spacer (7).



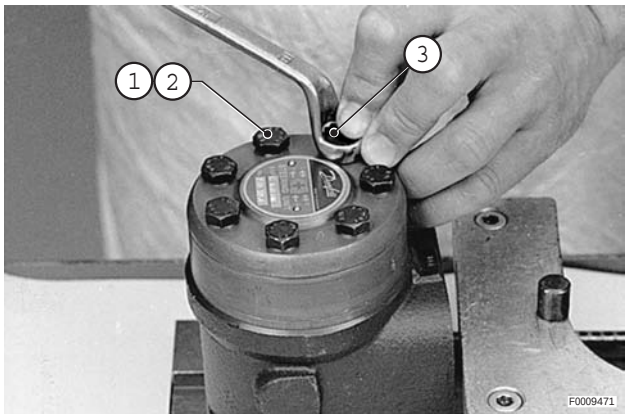
27 - Fit cover (4).



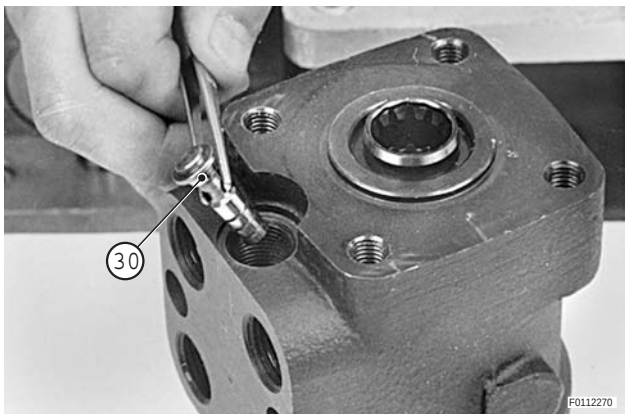
28 - Insert special screw (3) complete with washer (2) in the hole indicated in the photo.



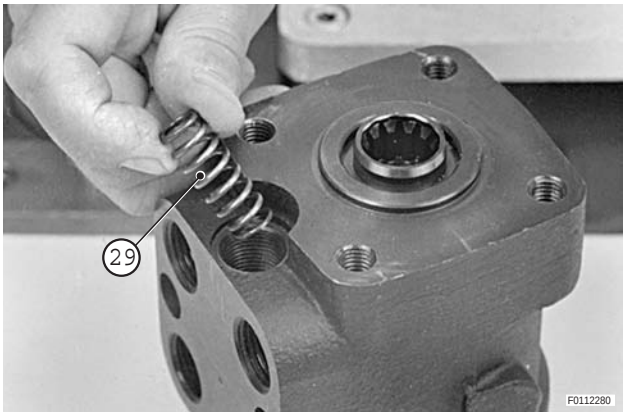
29 - Insert the six screws (1) complete with washers (2). Tighten screws (1) and (3) in a crosswise sequence to a torque of 30±6 Nμ (22.1±4.4 lb.ft.).



30 - Fit relief valve (30).

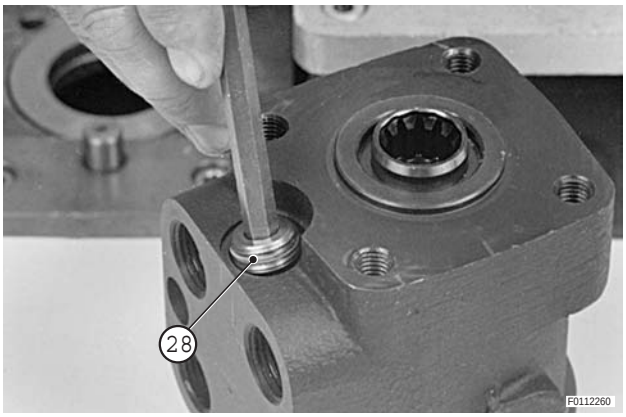


31` - Fit spring (29).



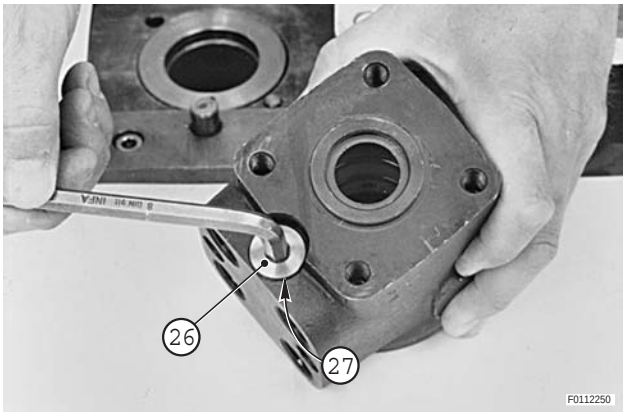
32- Fit pressure adjustment screw (28).

★ Calibrate the maximum working pressure on a test bench.
(For details, see “Pressure relief valve” in this chapter).

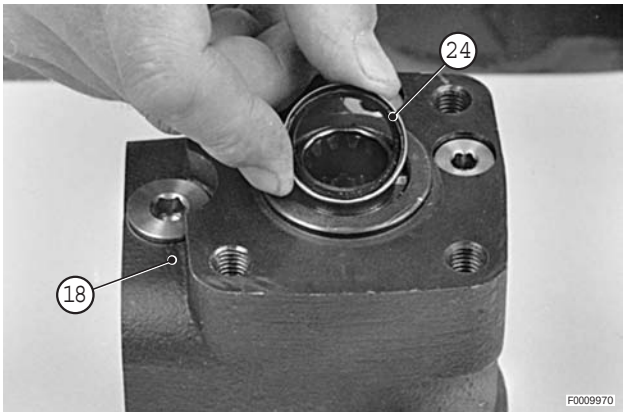


33 - Fit plug (26) complete with seal (27).

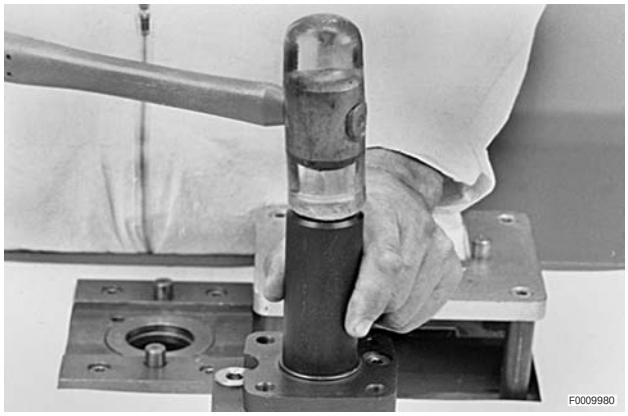
Nm Plug: 50±10 Nm (36.8±7.4 lb.ft.)



34 - Locate dust seal (24) in power steering housing (18).



35 - Install dust seal (24) in the steering valve housing using a suitable drift and a soft faced mallet.

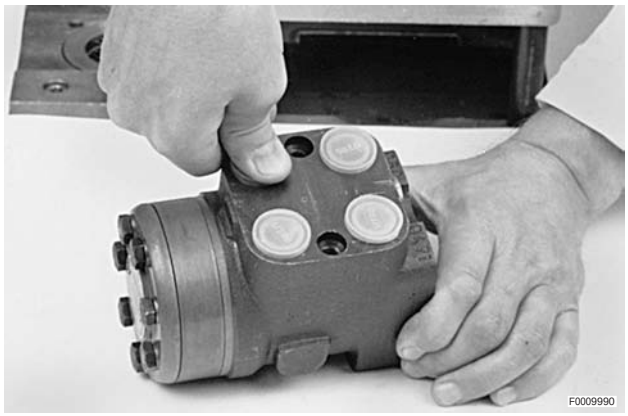


• *For all versions*

36 - Close off the oil ports with plastic plugs to prevent impurities getting in.

★ Fit the plugs by hand pressure alone; do not use a hammer.

37 - On completion of the assembly operation, test the operating pressure of the relief valve and calibrate as necessary.
"RELIEF VALVE"(For details, see in this chapter)



RELIEF VALVE

Testing the operating pressure

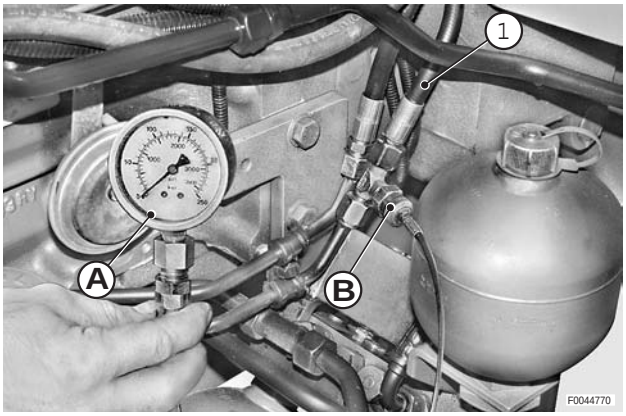
1 - Disconnect steering pipe (1) and connect union "*B*" connected in turn to a 400 bar full scale pressure gauge "*A*".

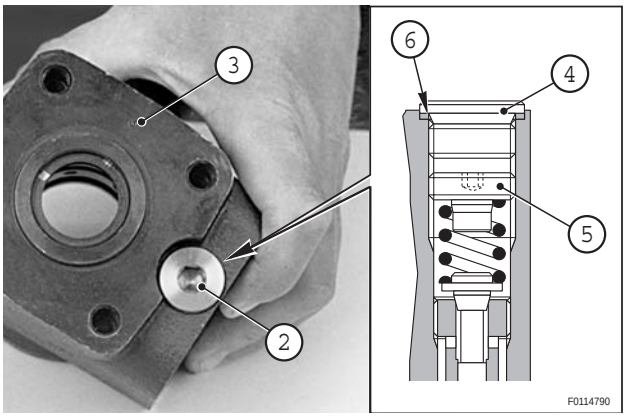
2 - Start the engine and turn the wheel back and forth between the full lock positions to eliminate all air from the system.

3 - Force the steering to full lock on the side opposite to that on which the pressure gauge is connected, and read off the maximum continuous pressure on the gauge "*A*".

★ Maximum permissible pressure: 180÷190 bar

4 - If the pressure reading differs from that specified, adjust pressure relief valve (2) of power steering (3).





Adjusting the calibration

1 - Remove plug (4).

2 - Using a 4 mm hex key, proceed to adjust the relief pressure by positioning adjustment screw (5).

- To INCREASE, turn the screw CLOCKWISE
- To REDUCE, turn the screw COUNTERCLOCK-WISE.

3 - Refit plug (4), checking that seal (6) is correctly seated.

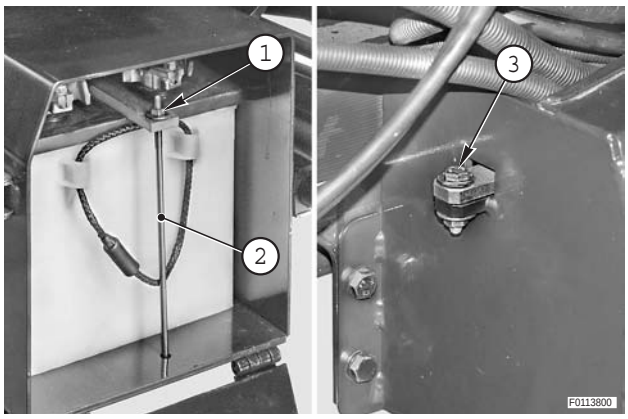
Nm Plug: 50±10 Nm (36.8±7.4 lb.ft.)

BATTERY SUPPORT

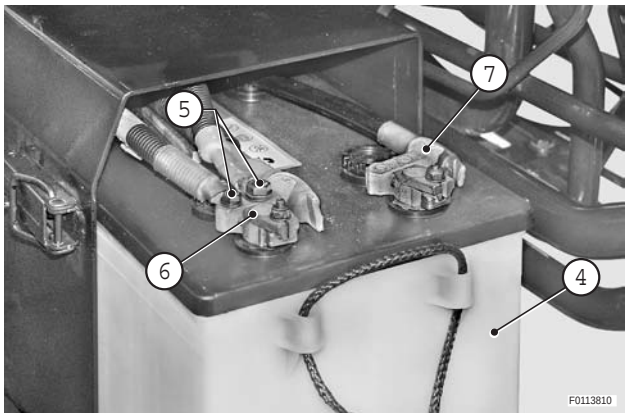
Removal

Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Remove nut (1), remove tie rod (2) and loosen screw (3).

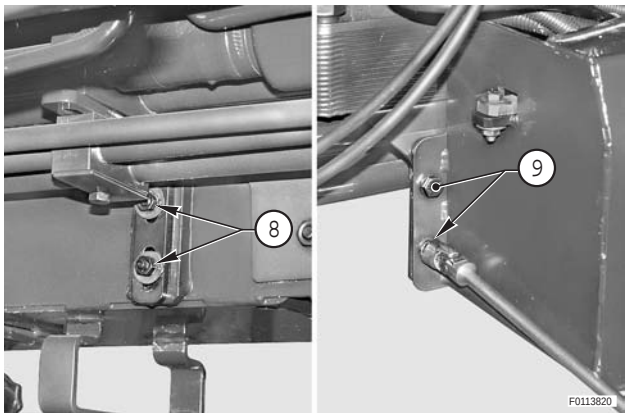


2 - Remove battery (4), remove screws (5) and detach lead (6) from the positive terminal.
★ Disconnect first lead (7) from the battery negative terminal (–).

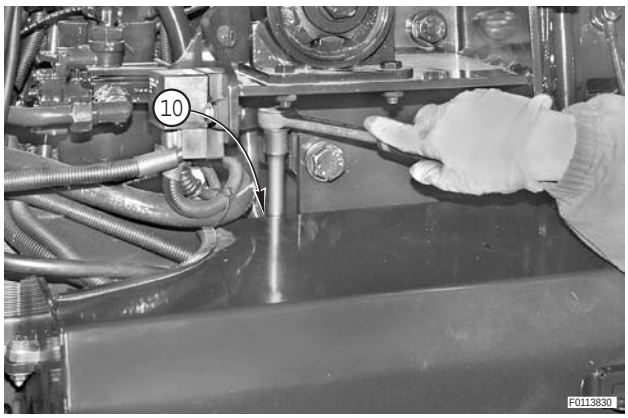


3 - Remove battery (4).

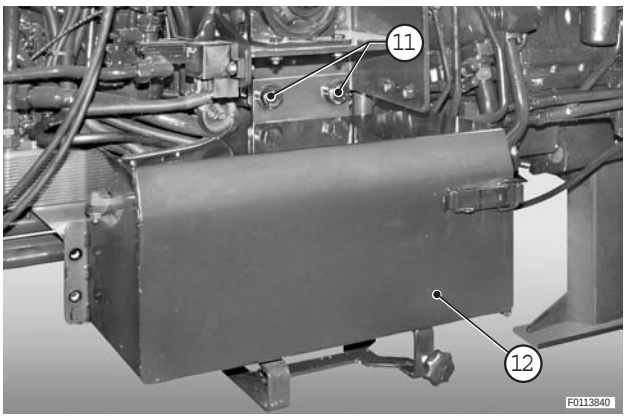
4 - Remove nuts (8) and remove screws (9).



5 - Remove screw (10).



6 - Remove screws (11) and remove battery support (12).



Refitting

- Refitting is the reverse of removal.

HYDRAULIC PUMPS

TRANSMISSION PUMP

Removal

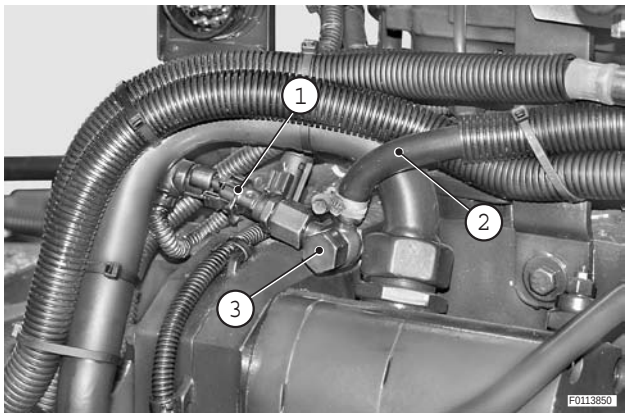
1 - stop the engine, remove the key from the starter switch and apply the parking brake.

2 - Allow the engine to cool down to ambient temperature.

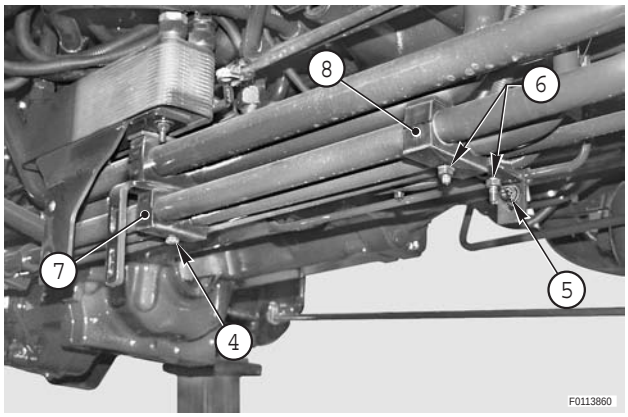
1 - Remove the cab.
(For details, see "CAB").

2 - Disconnect connector (1), pipe (2) and remove union (3).

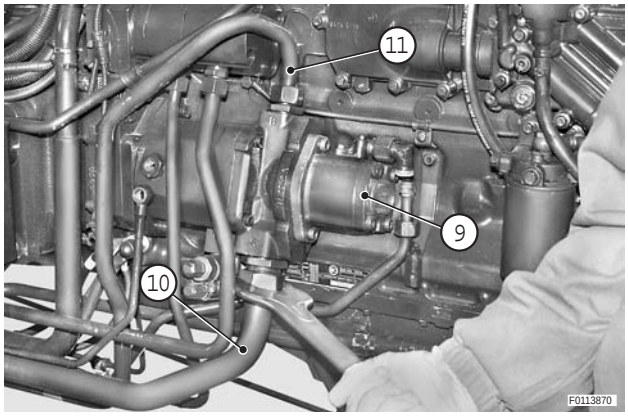
★ Plug the pipes and open fittings to prevent the entry of impurities.



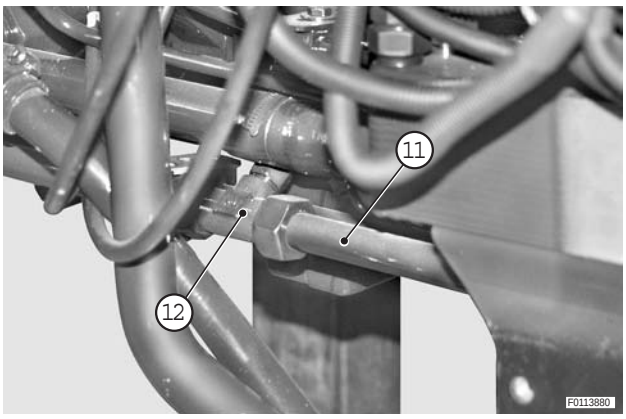
3 - Remove screws (4) and (5) and nuts (6) and remove clamps (7) and (8).



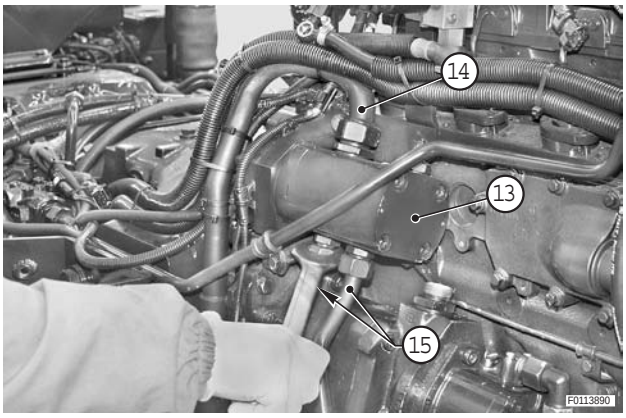
4 - Disconnect suction pipe (10) and delivery pipe (11) from pump (9).



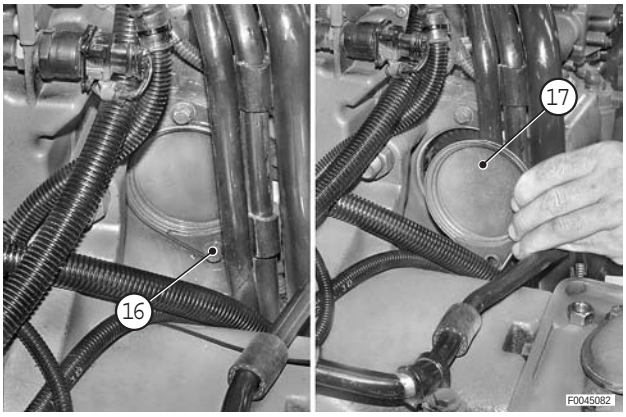
5 - Disconnect pipe (11) from union (12).



6 - Disconnect suction and delivery pipes (14) and (15) from pump (13).
★ Plug the pipes to prevent the entry of impurities.

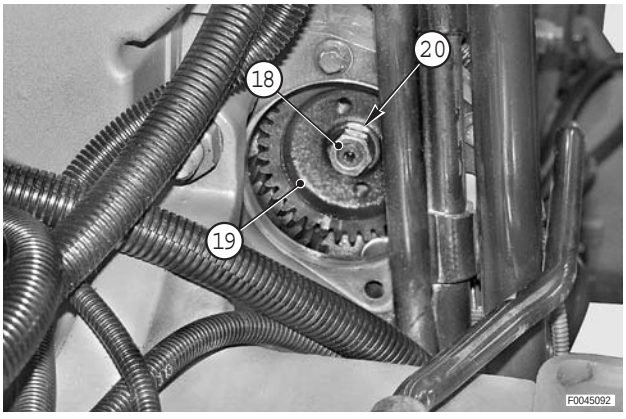


7 - Remove screw (16) and remove cover assembly (17).



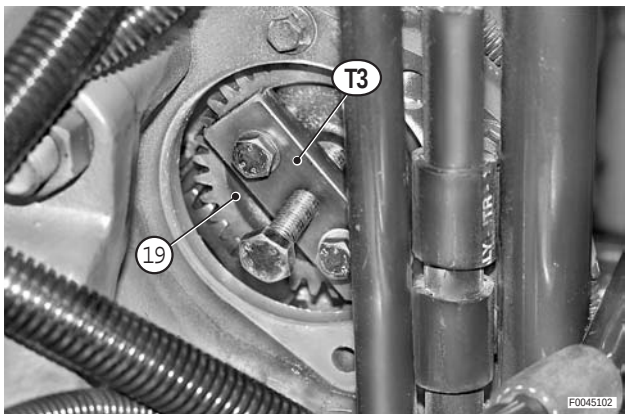
⚠ Before proceeding, close the passage between the lower part of the pump gear and the engine sump.
★ Use non-crushable material.

8 - Remove nut (18) securing gear (19) and washer (20).



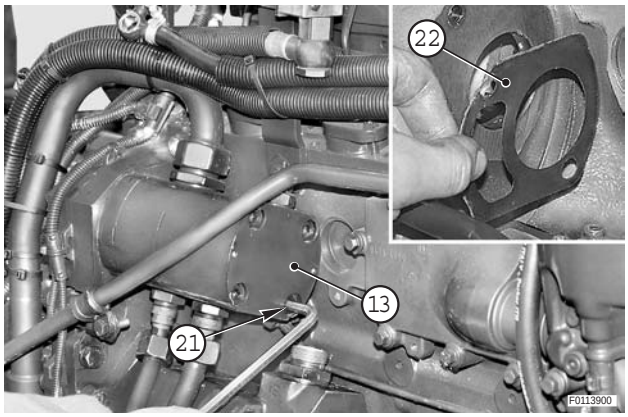
9 - Turn the engine over by hand so that the slot for the machine key is in the top position.
Using puller *T3* (part no. 5.9030.895.0), remove pump drive gear (19).
Remove the machine key.

⚠ Take care not to drop the key into the crankcase.



10 - Unscrew and remove screws (21) and remove pump (13).

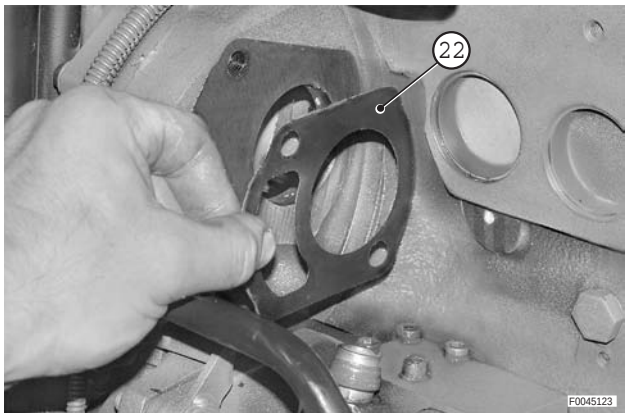
★ Recover also gasket (22) that should be renewed on reassembly.



Refitting

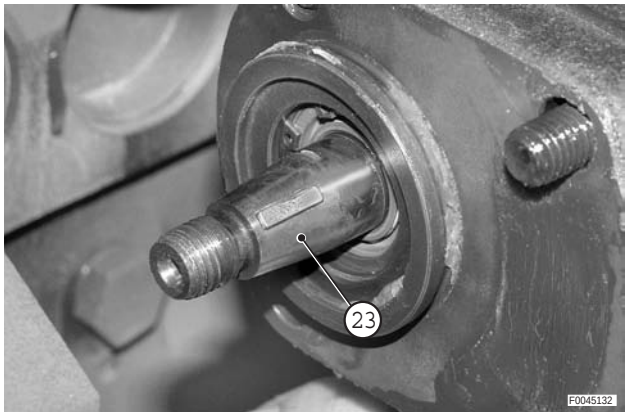
1 - Position gasket (22).

★ To hold the gasket in place, apply grease to the contact surface of the engine.

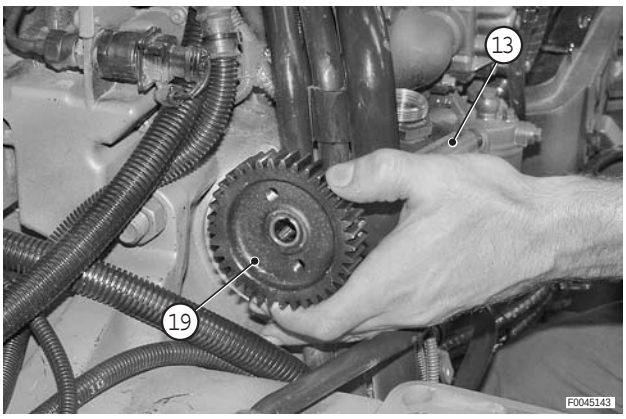


2 - Position machine key (23) on the pump shaft with the slot facing upwards.

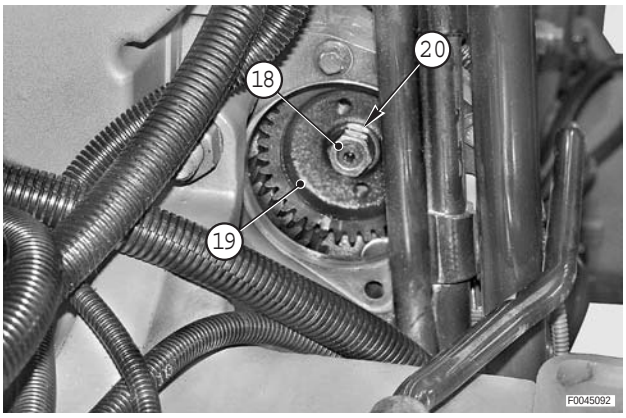
★ Keep the flat face of the key inclined towards the gear hub spline.



3 - Fit pump (13) and gear (19) simultaneously.
★ To help seat the gear and the machine key correctly, gently turn pump (13).



4 - Hold gear (19) in position by hand tightening nut (18) with washer (20).

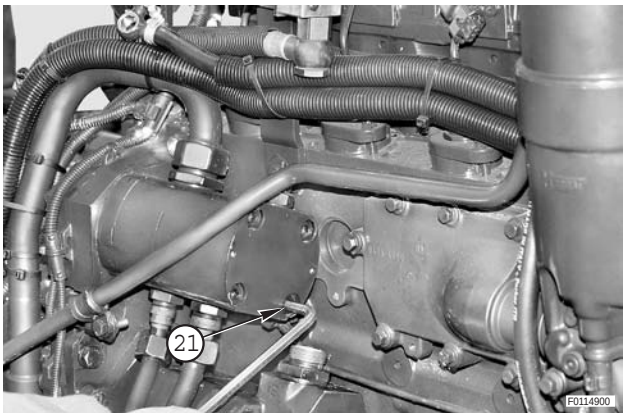


5 - Tighten down the pump with screws (21).
★ Tighten alternate screws gradually in sequence.

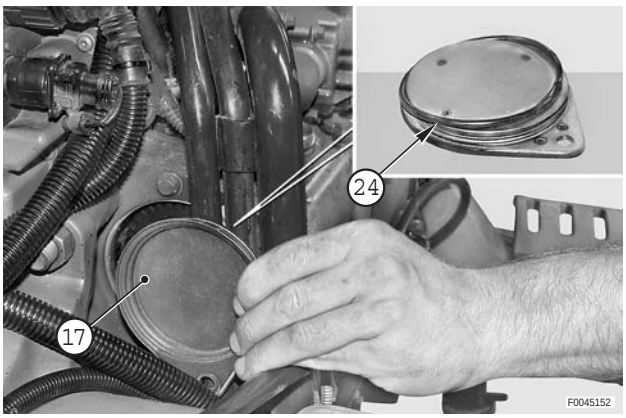
Nm Screws M10: 50±10 Nm (36.9±7.4 lb.ft.)

6 - Lock gear (18) with nut (17).

Nm Nut M12x2.5: 50±10 Nm (36.9±7.4 lb.ft.)



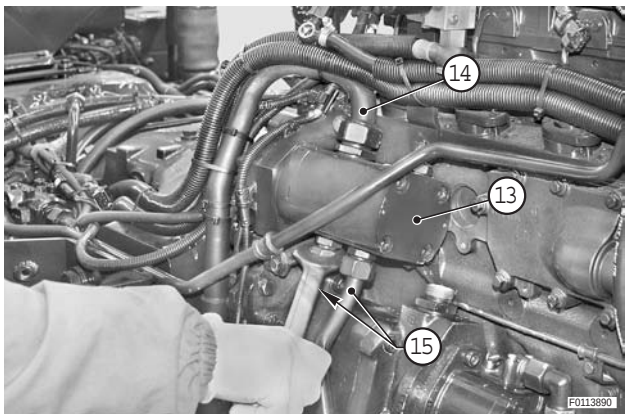
7 - Remove the material closing the passage between the engine sump and fit cover (17).
★ Carefully inspect the O-ring (24).



8 - Connect suction and delivery pipes (14) and (15).
★ Before connecting the upper suction pipe, fill the pump (13) with gearbox oil.

9 - Fit the cab and the hood side panel.

10 - Start the engine and check the gaskets and test the operation of the gearbox.



SERVICES PUMP

Removal

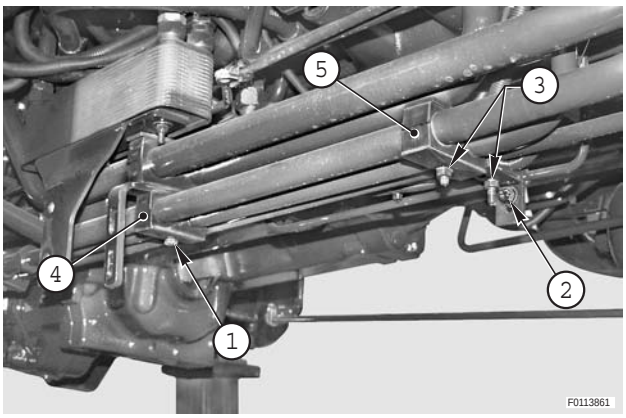
1 -Stop the engine, remove the key from the starter switch and apply the parking brake.

2 - Allow the engine to cool to ambient temperature.

1 - Drain off all the oil in the reservoir. ⁘ 1

Oil in the reservoir: max. 45 , (11.9 US gall.)

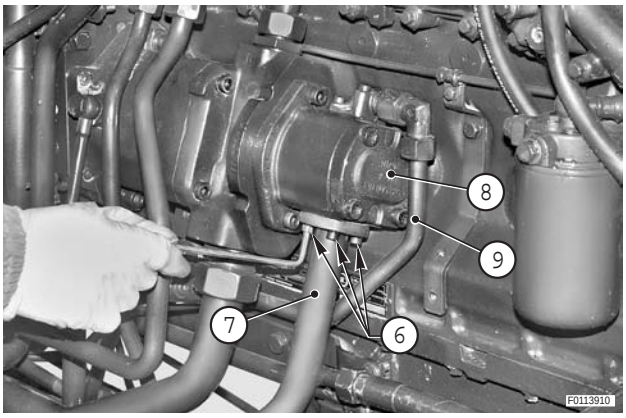
2 - Remove screws (1) and (2) and nuts (3) and remove clamps (4) and (5).



3 - Remove screws (6) and detach pipe (7) from pump (8).

★ Check the condition of the O-ring and renew if necessary.

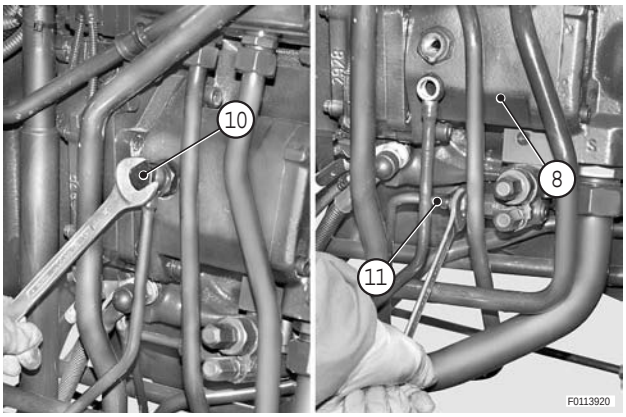
4 - Detach pipe (9) from the pump.



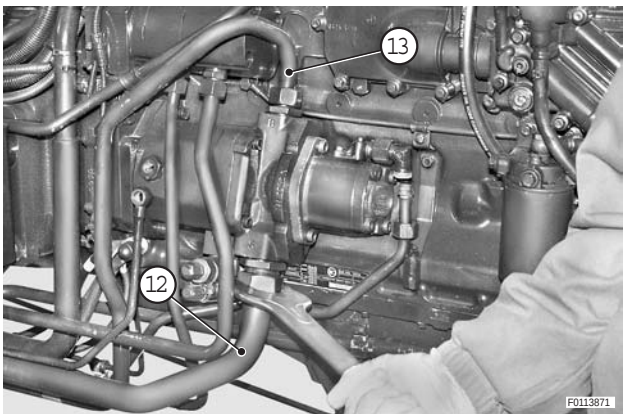
5 - Remove union (10).

★ Renew the copper gaskets on reassembly.

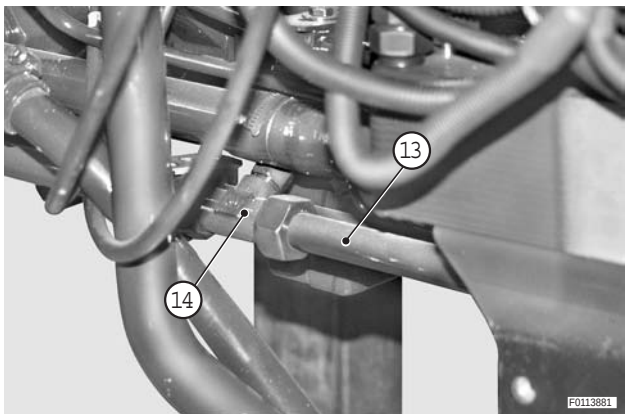
6 - Disconnect pipe (11) from pump (8).



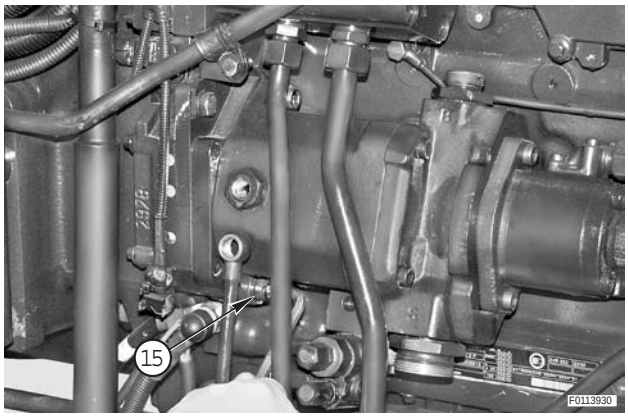
7 - Disconnect suction and delivery pipes (12) and (13).



8 - Disconnect pipe (13) from union (14).

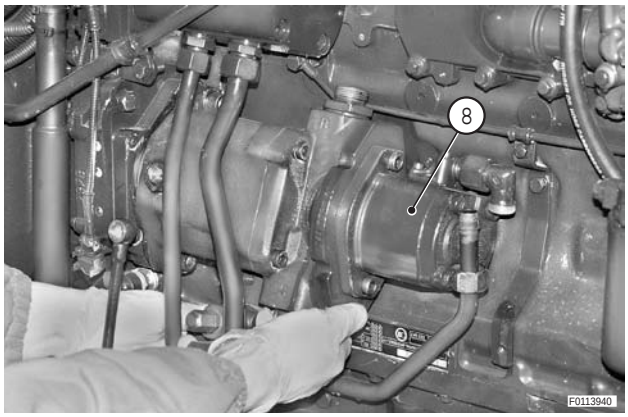


9 - Remove screws (15).



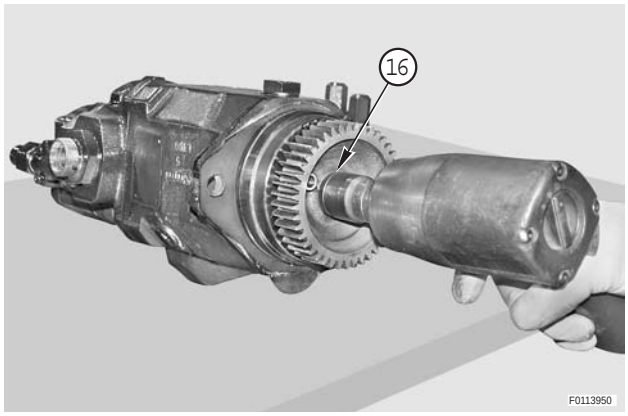
10 - Remove pump assembly (8).

※ 2

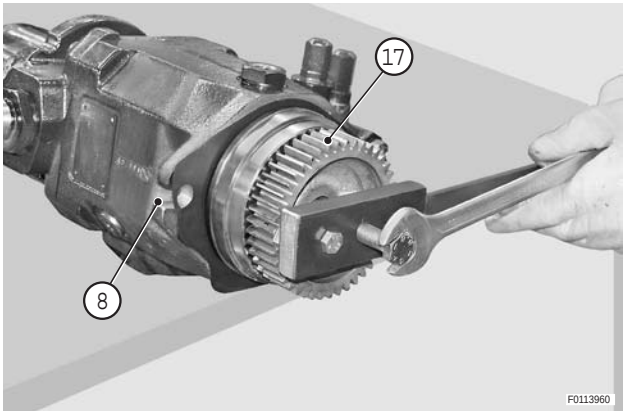


11 - Remove nut (16).

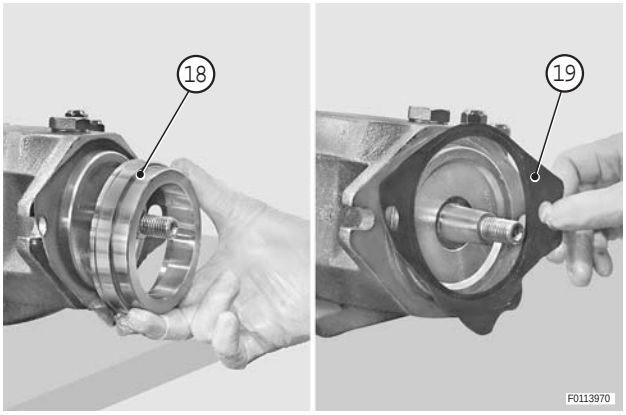
※ 3



12 - Using a suitable puller screwed in on gear holes (17), separate gear (17) from pump (8).

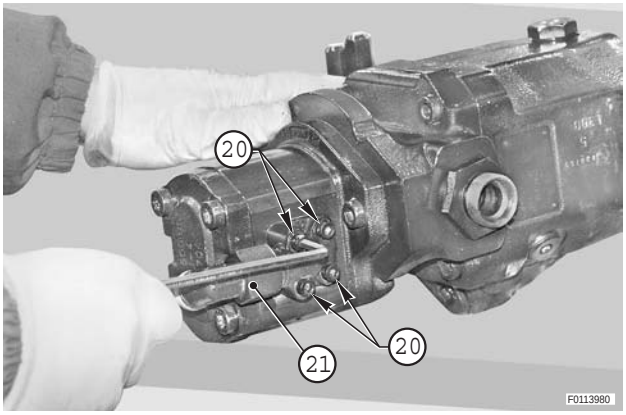


13 - Remove spacer (18) and paper gasket (19).



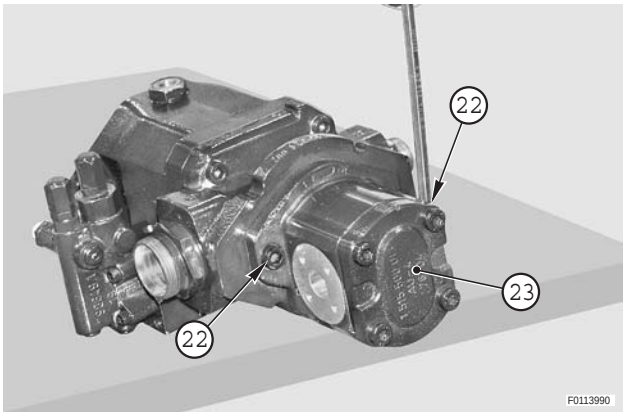
14 - Remove screws (20) and remove union (21).

4

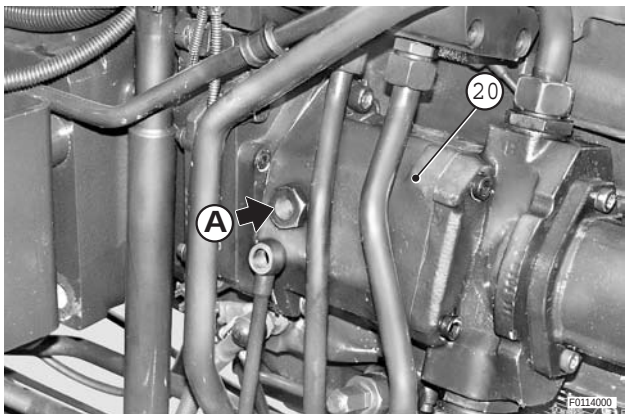


15 - Remove screws (22) and remove pump (23).

★ Check the condition of the O-ring and renew if necessary.



Refitting



1

Oil in the reservoir: max 45 , (11.9 US gall.)

2

★ Fill the body of pump (20) with oil through hole “*A*”.

3

Nut: Loctite 242

4

★ Do not fit pump (23) at this stage. Fit the pump only once you have fixed pump (8) to the engine.

1 - Start the engine and turn the steering to full lock in both directions in order to expel any air from the system and check for leaks.

STEERING PUMP

Removal

1 - Stop the engine, remove the key from the starter switch and apply the parking brake.

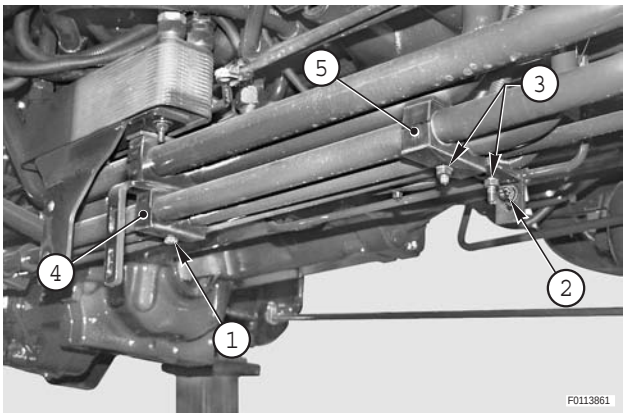
2 - Allow the engine to cool down to ambient temperature.

1 - Drain off all the oil in the reservoir.

※ 1

Oil in the reservoir: max. 45 , (11.9 US.gall.)

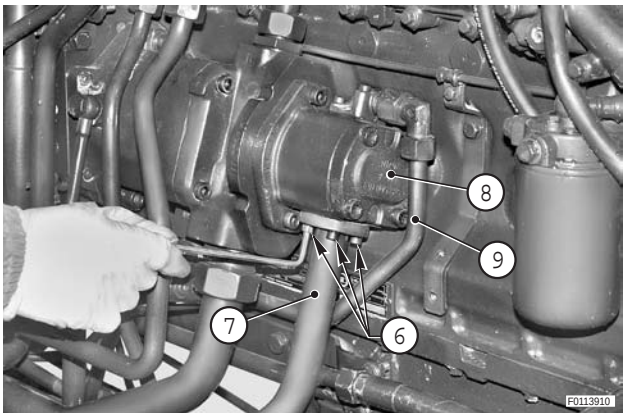
2 - Remove screws (1) and (2) and nuts (3) and remove clamps (4) and (5).



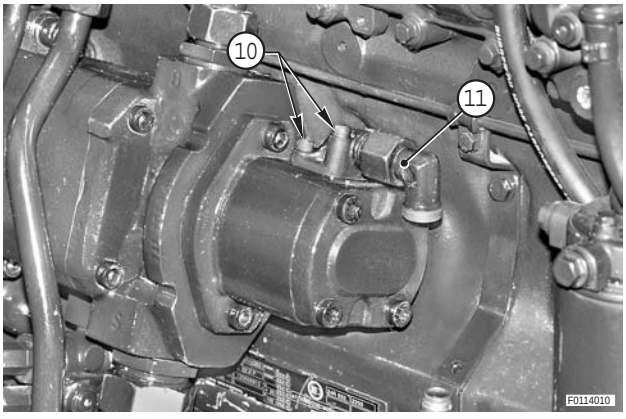
3 - Remove screws (6) and detach pipe (7) from pump (8).

★ Check the condition of the O-ring and renew if necessary.

4 - Detach pipe (9) from pump (8).

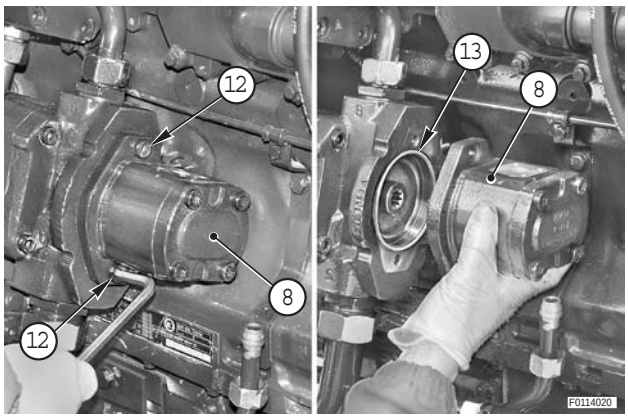


5 - Remove screws (10) and remove union (11).



6 - Remove screws (12)and remove pump (8).

★ Check the condition of the O-ring (13) and renew it if necessary.



Refitting

- Refitting is the reverse of removal.

※ 1

Oil in the reservoir: max. 45 , (11.9 US.gall.)

1 - Start the engine and turn the steering to full lock in both directions in order to expel any air from the system and check for leaks.

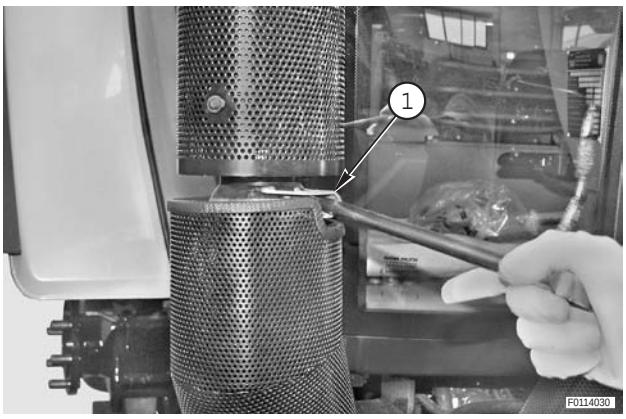
EXHAUST SYSTEM

SILENCER

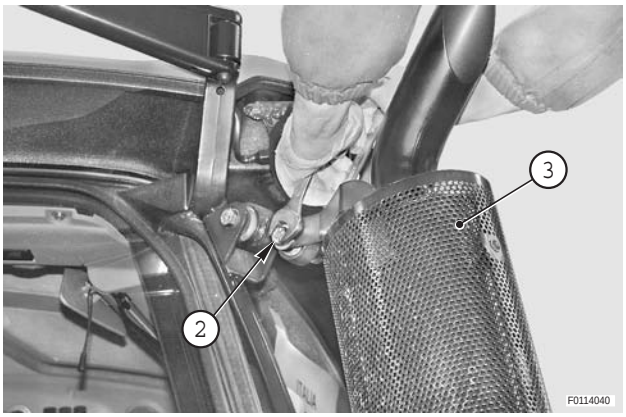
Removal

Remove the key from the ignition and apply the parking brake.

1 - Using a lever, remove clamp (1).



2 - Remove screw (2) and remove silencer (3).



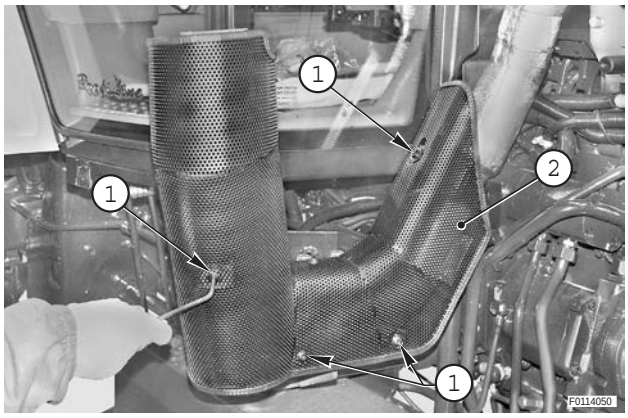
Refitting

- Refitting is the reverse of removal.

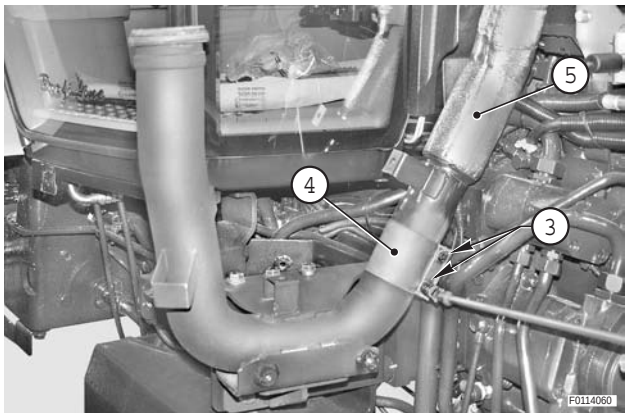
EXHAUST PIPE

Removal

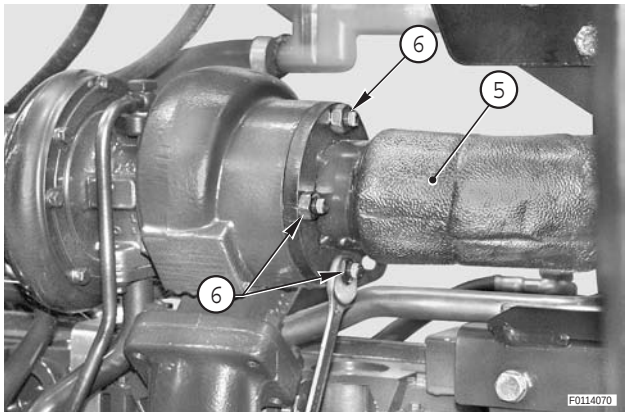
1 - Remove screws (1) and remove guard (2).



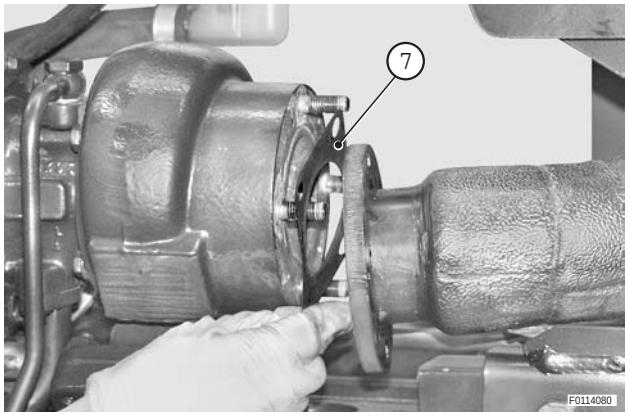
2 - Loosen screws (3) and move clamp (4) joining exhaust pipe (5).



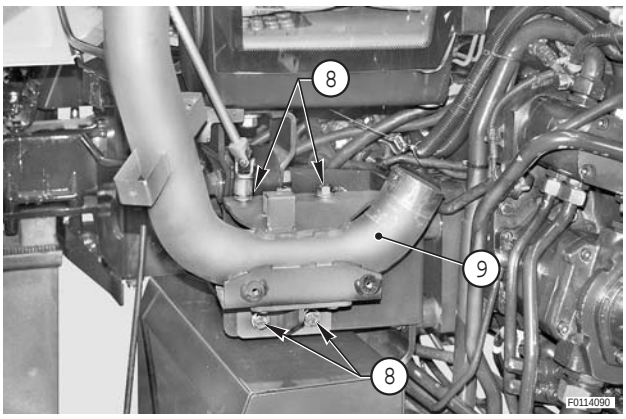
3 - Remove nuts (6) (qty 4) and remove exhaust pipe (5).



4 - Remove gasket (7).
★ Note the direction in which the seal is fitted.



5 - Remove screws (8) (qty 4) and remove exhaust pipe (9).



Refitting

- Refitting is the reverse of removal.

CAB

Removal

Disconnect the lead from the battery negative terminal (–).

1 - Remove the hood.
(For details, see "ENGINE HOOD").

2 - Remove exhaust pipe assembly.
(For details, see "EXHAUST SYSTEM".

3 - Remove the fuel tank.
(For details, see "FUEL TANK").

4 - Remove the rear wheels. (For details, see "WHEELS - REAR WHEELS")

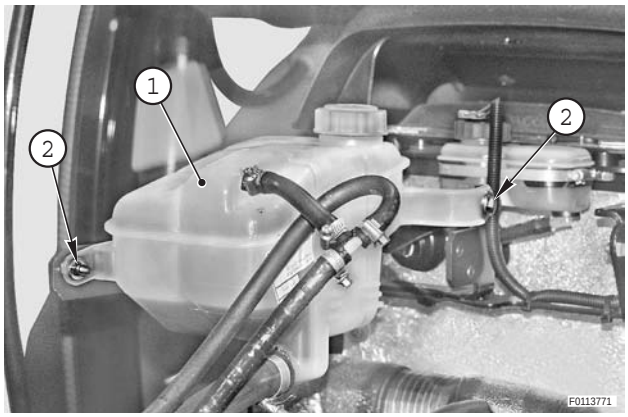
5 - Remove the access steps on the right-hand side.
(For details, see "CAB ACCESS STEPS").

6 - Remove the battery support.
(For details, see "BATTERY SUPPORT")

7 - Completely drain expansion tank (1).

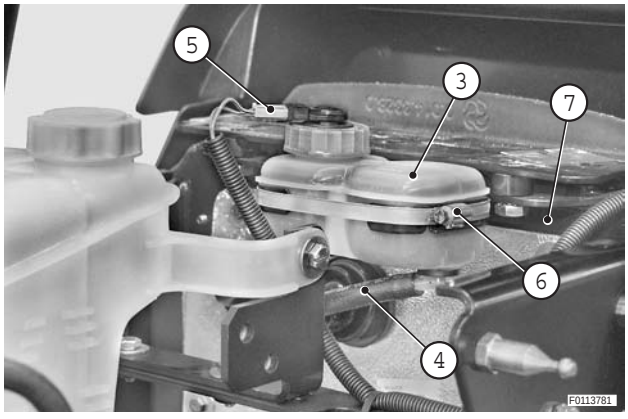
Coolant:
max. 5 , (1.32 US. gall.)

8 - Remove screws (2) (qty 2) and remove expansion tank (1).



9 - Drain all the fluid from brake fluid reservoir (3) and detach pipes (4) from reservoir (3).

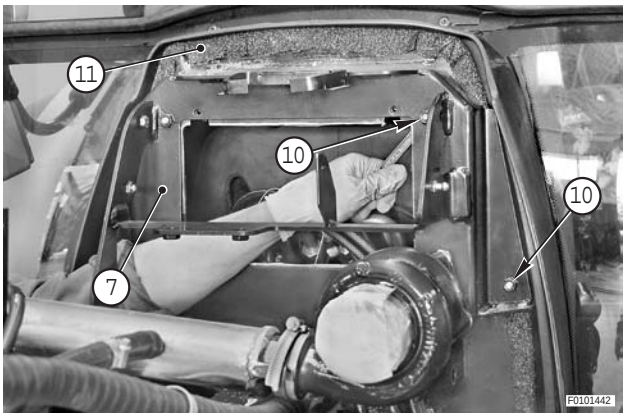
10 - Disconnect connectors (5), loosen clamp (6) and detach brake fluid reservoir (3) from support (7).



11 - Remove screws (8) and remove partition (9).

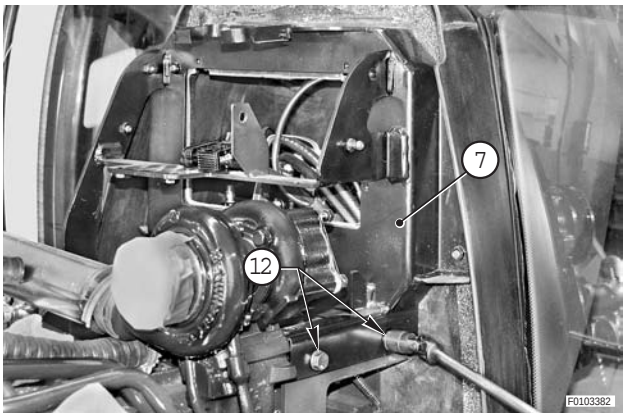
• *For versions without cab pneumatic suspension*

12 - Remove screws (10) (qty 4) and detach guard (11) from support (7).

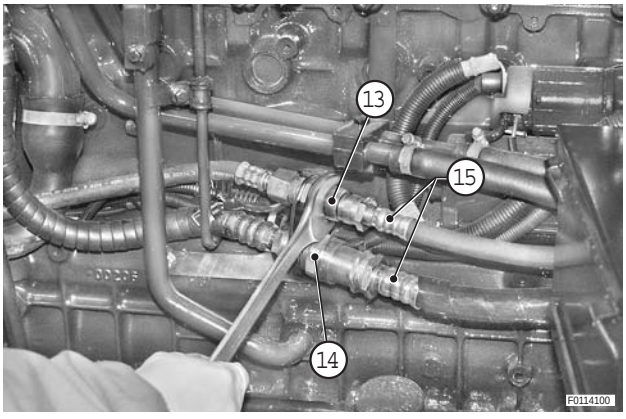


• *For all versions*

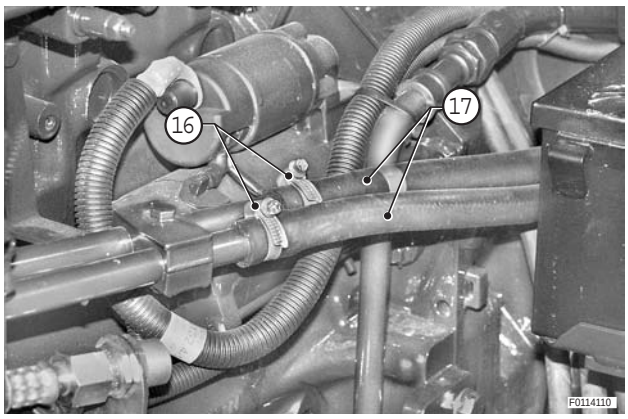
13 - Remove screws (12) (two per side) and remove support (7).



14 - Loosen unions (13) and (14) and disconnect air conditioning pipes (15).

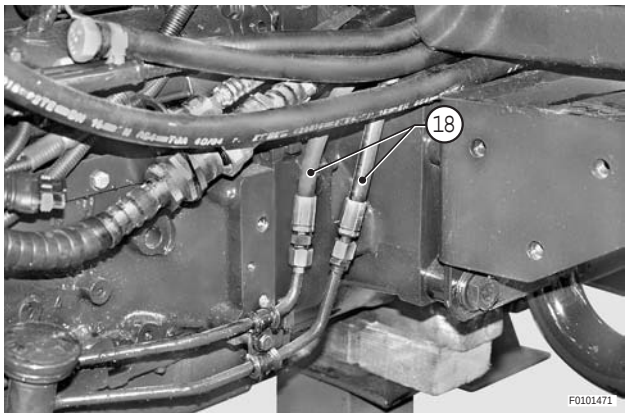


15 - Loosen clamps (16) and disconnect pipes (17) from the heating system.
- ★ Label the pipes to avoid confusion on reconnection.
- ★ Plug the pipes to prevent the entry of impurities.



• *For versions without front axle suspension*

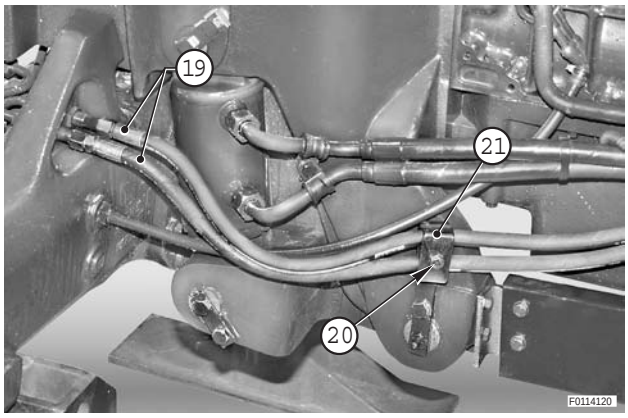
16 - Disconnect steering control pipes (18).
- ★ Plug the pipes to prevent the entry of impurities.



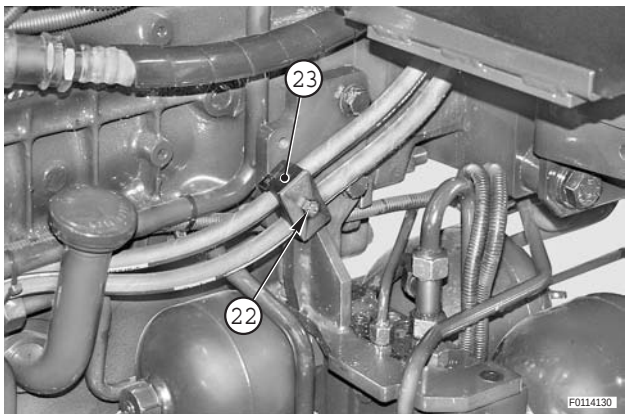
• *For version with front axle suspension*

17 - Disconnect steering control pipes (19).
- ★ Plug the pipes and ports to prevent the ingress of dirt.

18 - Remove screw (20) and remove clamp (21).

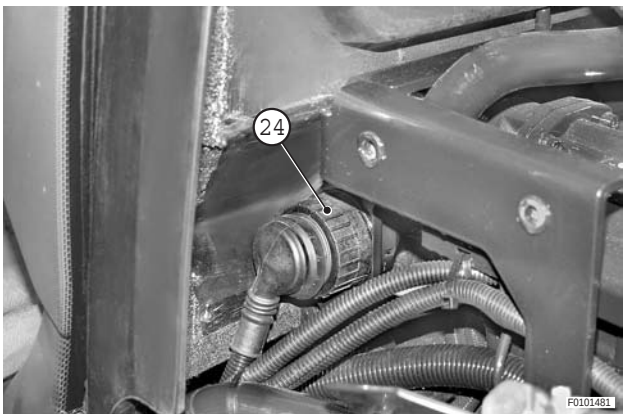


19 - Remove screw (22) and remove clamp (23).



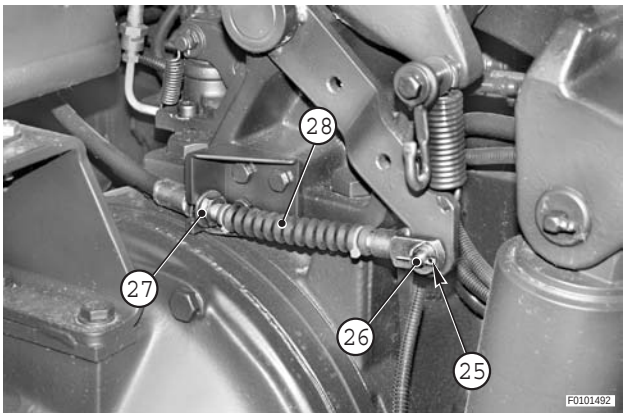
• *For all versions*

20 - Unplug connector (24).

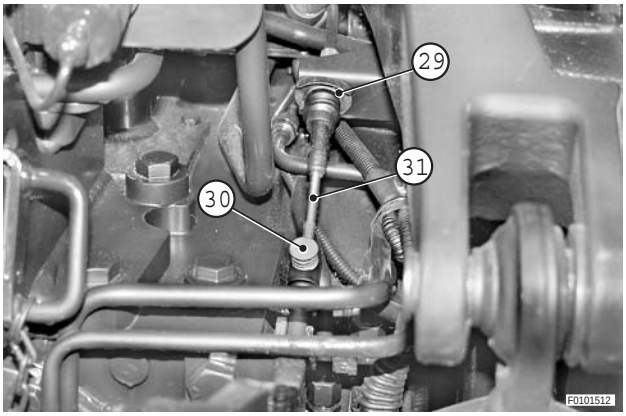


21 - Remove split pin (25) and remove pivot pin (26).

22 - Loosen nut (27) and disconnect parking brake cable (28).



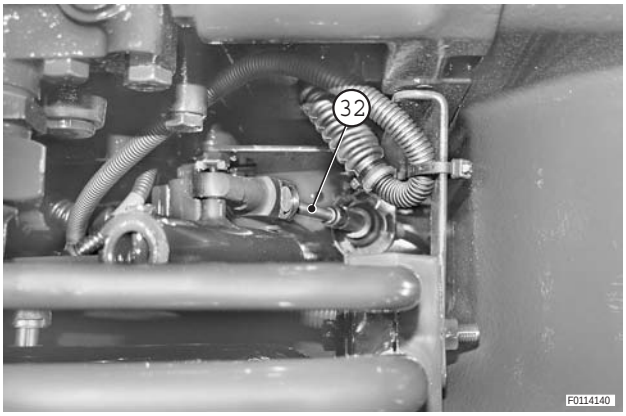
23 - Remove retaining clip (29), press button (30) and disconnect cable (39) from the support.



• *For version with creeper*

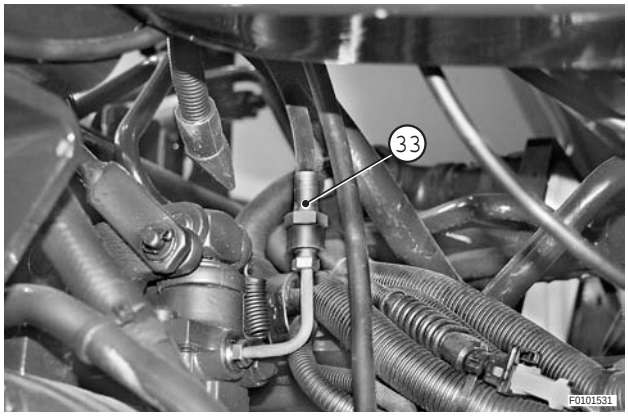
24 - Using the same procedure as described in the previous step, disconnect creeper cable (32).

★ The transmission control is installed between the hydraulic oil reservoir and the transmission.



• *For all versions*

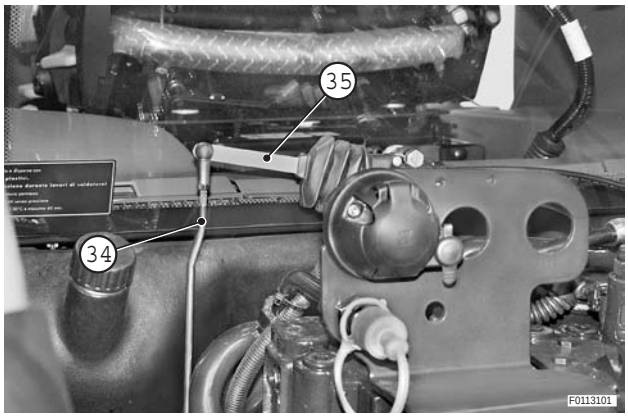
25 - Disconnect brake pipes (33) on both sides.
★ Plug the pipes to prevent the entry of impurities.



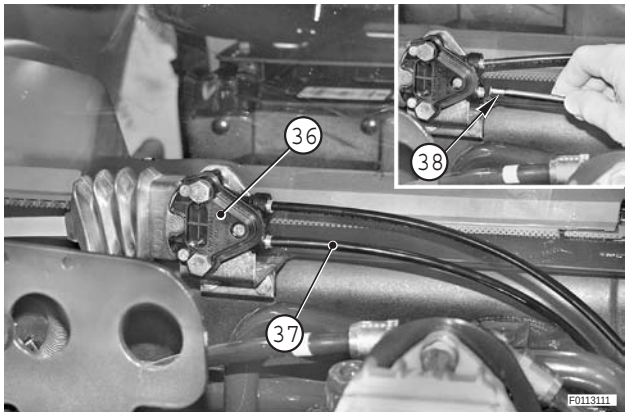
• *For versions with pneumatic suspension*

⚠ Eliminate all residual pressure from the trailer air circuit.

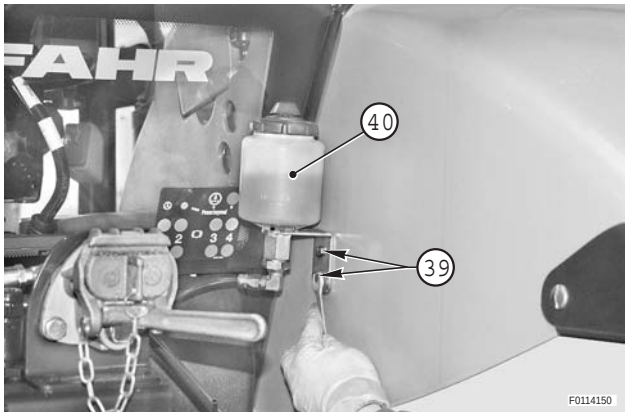
26 - Disconnect tie rod (34) and lower completely lever (35) to discharge pressure from the cab suspension circuit.



27 - Disconnect cab suspension circuit pipe (37) from valve (36).
★ Recover pipe (38).

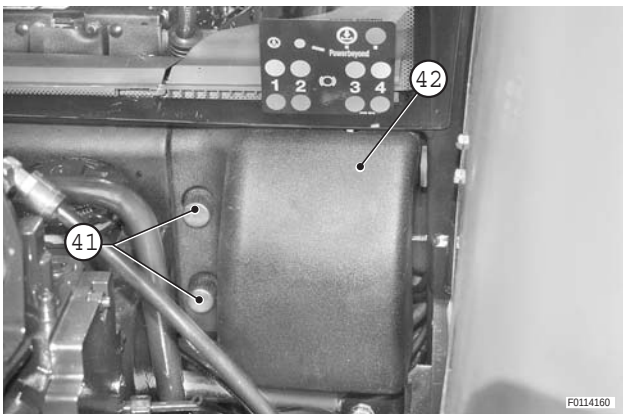


28 - Remove screws (39) and disconnect antifreeze coolant tank (40) from the fender.

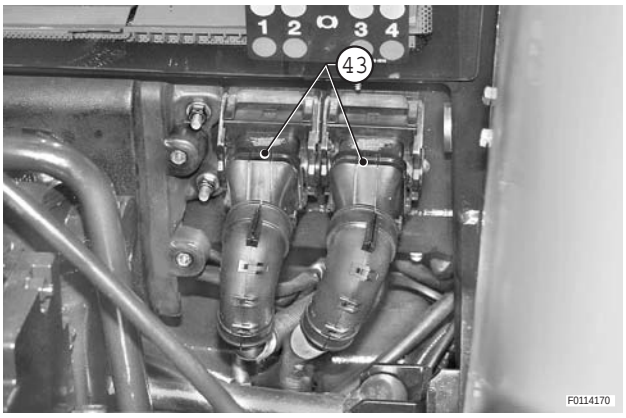


• *For all versions*

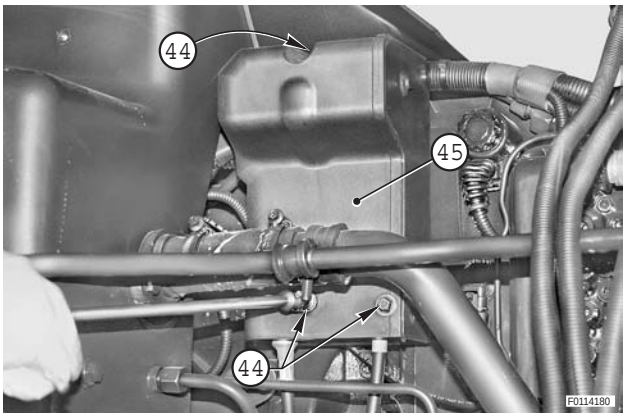
29 - Remove knobs (41) and remove cover (42).



30 - Disconnect connectors (43).

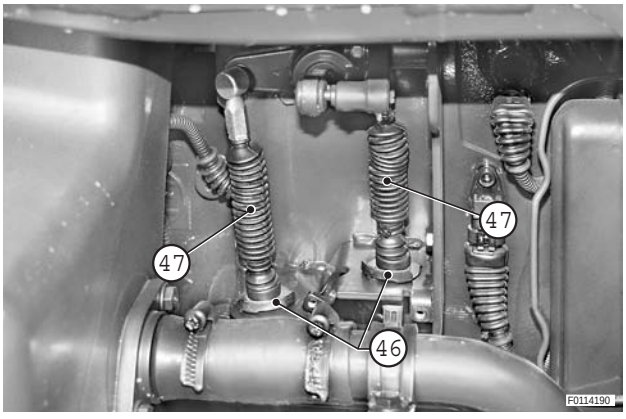


31 - Remove screws (44) (qty 3) and remove guard (45).



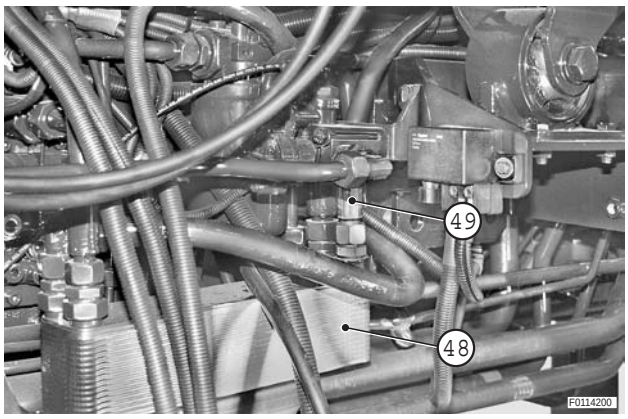
32 - Remove retaining clips (46) and disconnect gearbox control cables (47).

★ Label the wires to avoid confusion on reconnection.

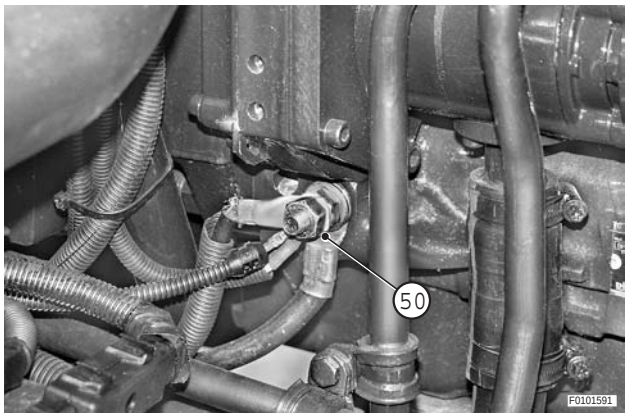


33 - Disconnect power steering return pipe (49) from the cooler (48).

★ Plug the pipe and the hole in the axle to prevent impurities getting in.



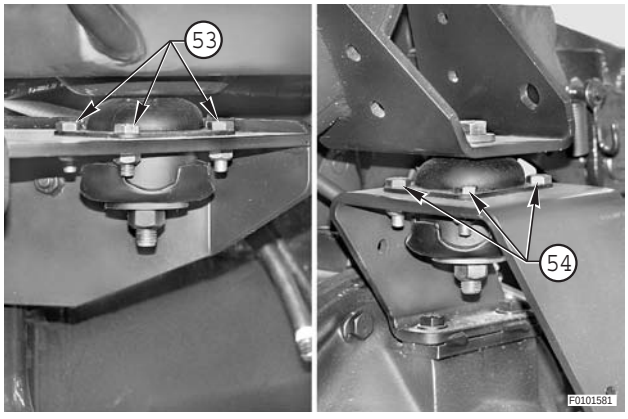
34 - Disconnect earth leads (50).



35 - Remove cover (51), remove screws (52) and detach the light supports from both sides of the cab.

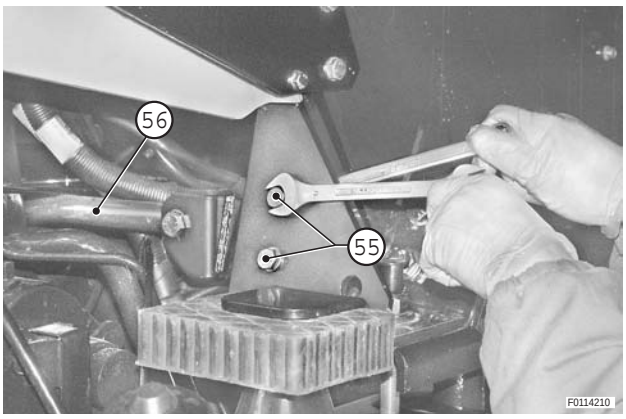
• *For versions without cab pneumatic suspension*

36 - Remove nuts (53) and (54) on both sides.

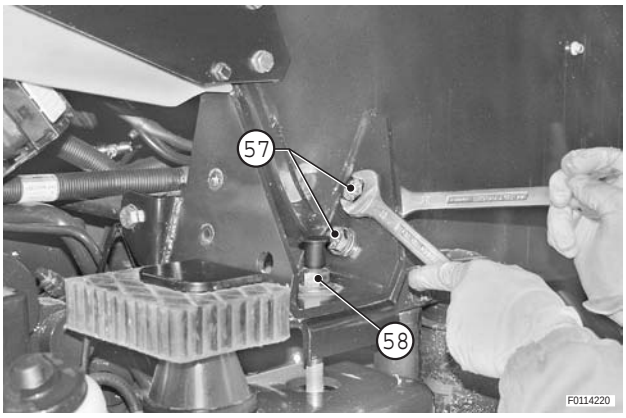


• *For versions with cab pneumatic suspension*

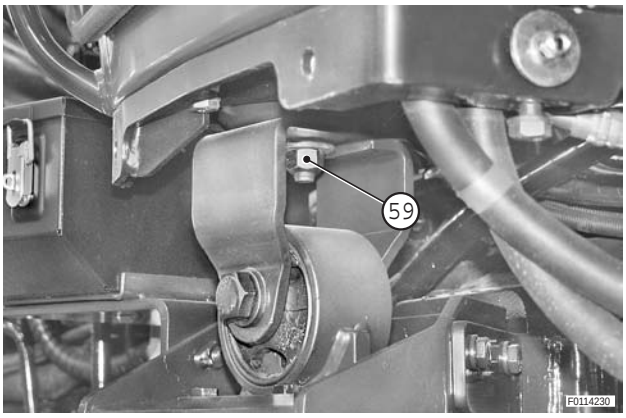
37 - Remove screws (55) and disconnect stabilization bar (50).



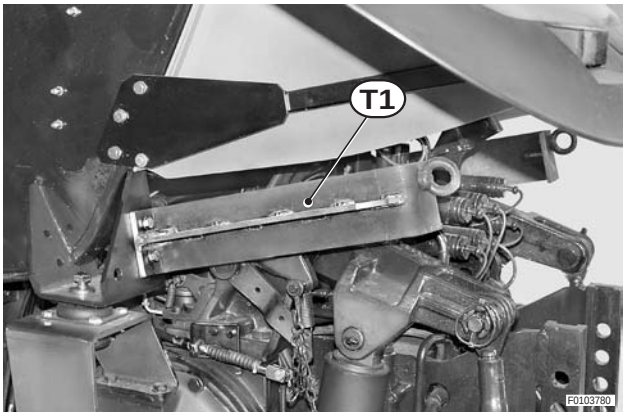
38 - Remove cab fixing screws (57) from the supports and remove nuts (58).



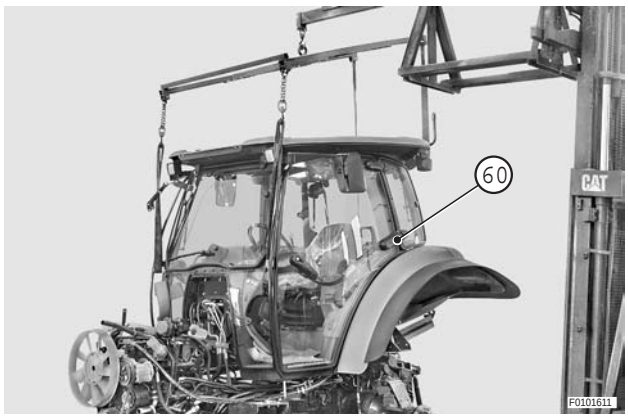
39 - Remove cab front fixing nuts (59).



40 - Fit special tool *T1* (P/N 5.9030.990.0).

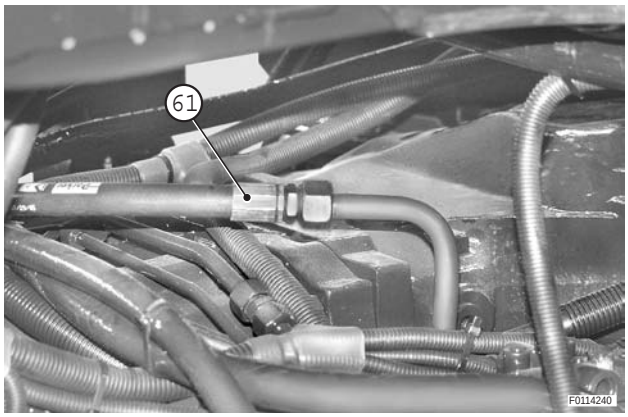


41 - Attach cab (60) to a suitable hoist and raise it slightly to gain access to the power steering pipe.



42 - Disconnect delivery pipe (61) to power steering.
★ Plug the pipes to prevent the entry of impurities.

43 - Remove the cab.



Refitting

- Refitting is the reverse of removal.

ENGINE

Preparation for removal

Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Remove the hood.
(For details, see "ENGINE HOOD").

2 - Remove the cab.
(For details, see "CAB").

3 - Remove front support.
(For details, see "FRONT SUPPORT").

4 - Remove the front axle suspension control valve.
(For details, see "FRONT AXLE SUSPENSION")

5 - Drain off all the oil from the reservoir and transmission.

Transmission oil: max. 45 , (11.9 US.gall.)

Oil in the reservoir: max. 45 , (11.9 US.gall.)

※ 1

6 - Position stand “*A*” under the connecting housing.

7 - Proceed as described in the heading "Separation or removal" in this chapter.

Preparation before separating the engine from the transmission

Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Remove the hood.
(For details, see "ENGINE HOOD").

2 - Remove the cab.
(For details, see "CAB").

3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT").

4 - Remove the battery.

5 - Drain off all the oil from the reservoir and transmission.

Transmission oil: max. 45 , (11.9 US.gall.)

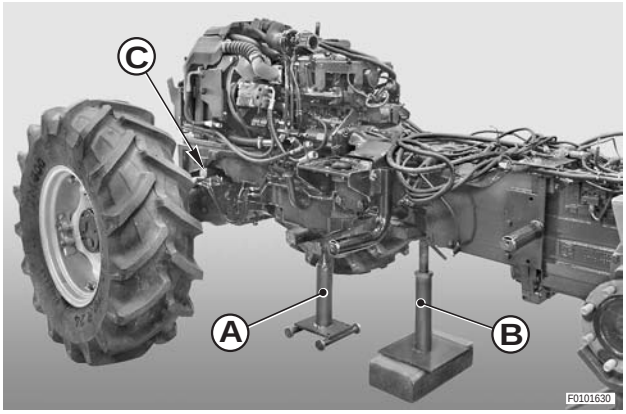
Oil in the reservoir: max. 45 , (11.9 US.gall.)

※ 1

6 - Position trolley stand “*A*” under the engine sump and stand “*B*” under the connecting housing.

7 - Drive two wedges “*C*” between the front support and the front axle to prevent the engine from dropping when it is moved.

8 - Proceed as described in the heading "Separation or removal" in this chapter.

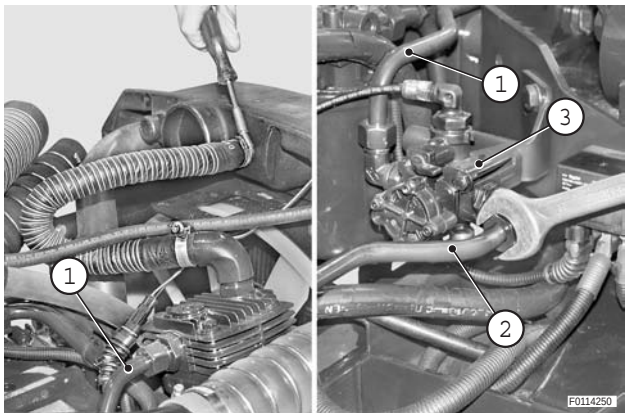


Separation or removal

• *For versions with air system*

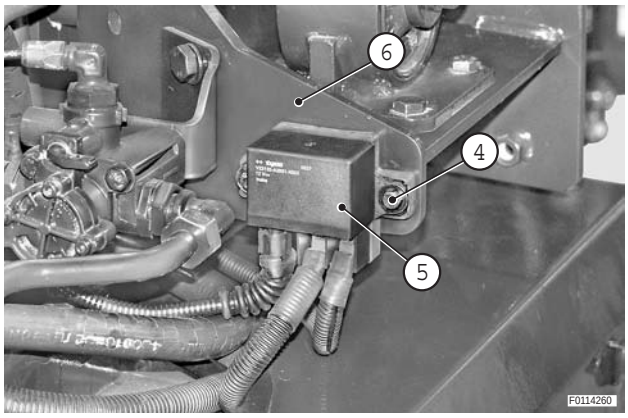
1 - Disconnect pipe (1) from the compressor.

2 - Disconnect pipes (1) and (2) from valve (3) and remove the pipe.

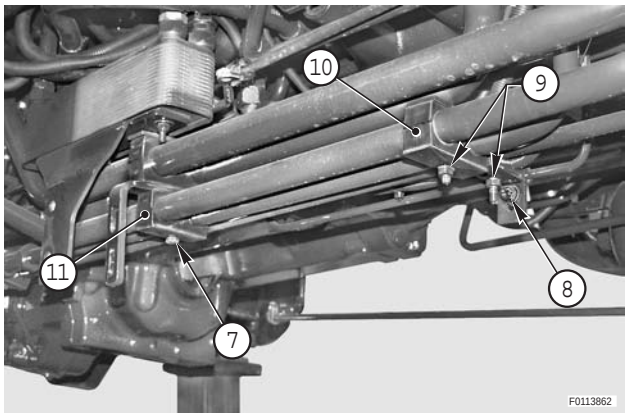


• *For all versions*

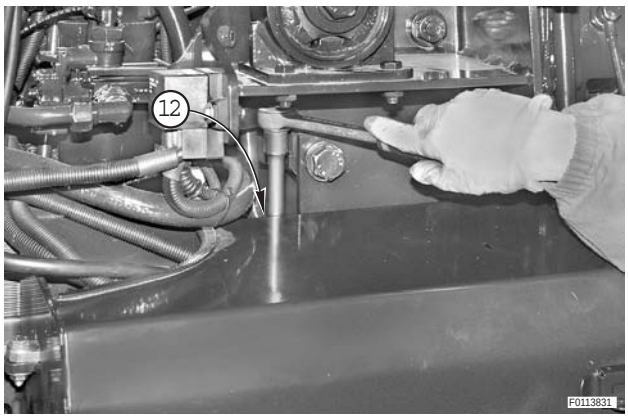
3 - Remove screws (4) and disconnect relay (5) from cab support (6).



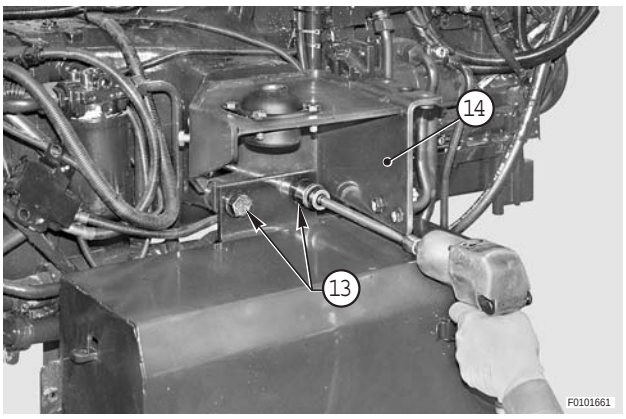
4 - Remove screws (7) and (8) and nuts (9) and remove clamps (10) and (11).



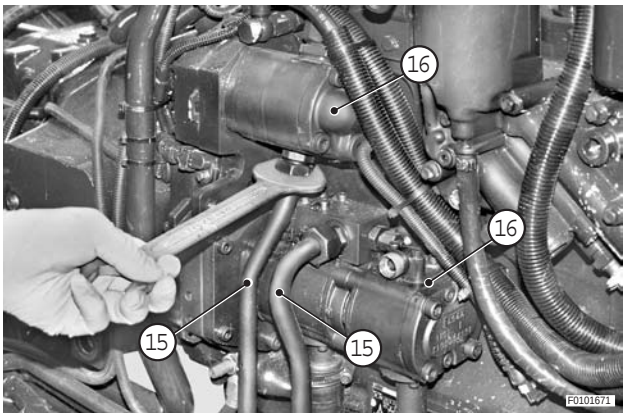
5 - Remove screw (12)



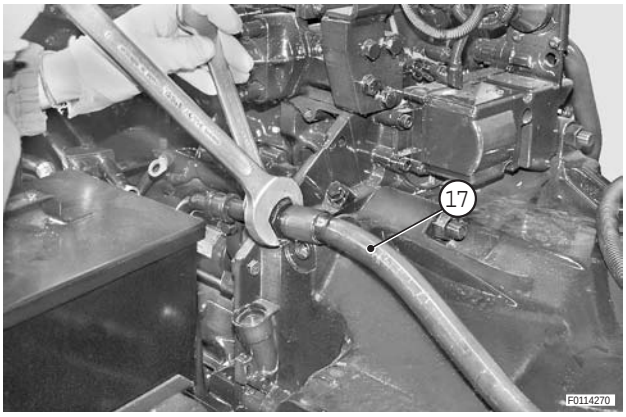
6 - Remove screws (13) and remove cab support (14).



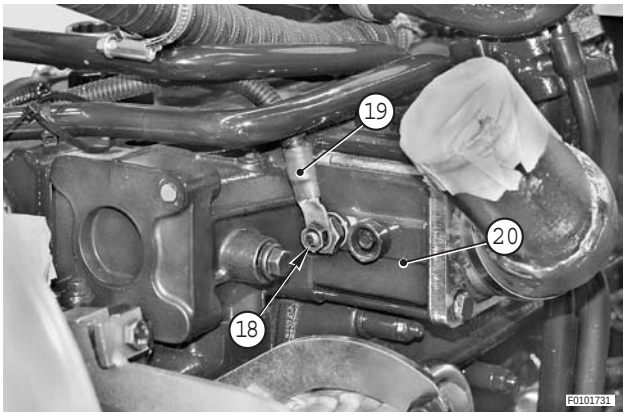
7 - Disconnect all pipes (15) from cylinders (16) and remove them.



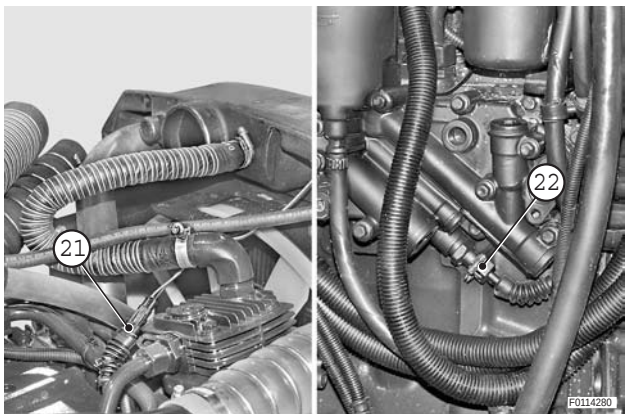
8 - Disconnect pipe (17).



9 - Remove nut (18) and disconnect cable (19) from thermostarter (20).

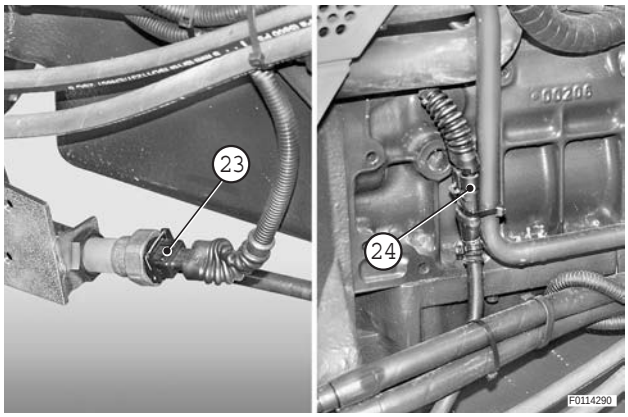


10 - Unplug connectors (21) of air cleaner clogging sensor (22) and engine oil pressure sensor.



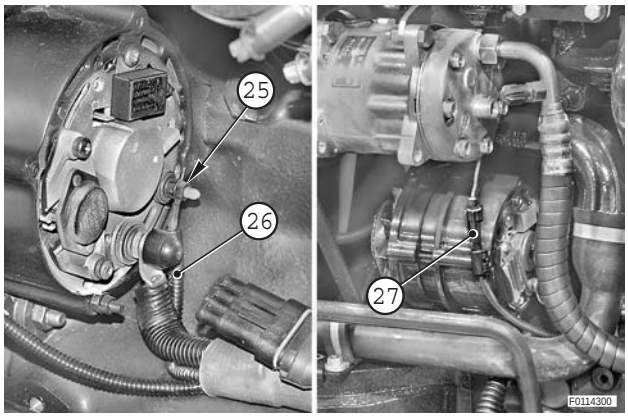
11 - Unplug axle position sensor connector (23).

12 - Unplug steering angle sensor connector (24).

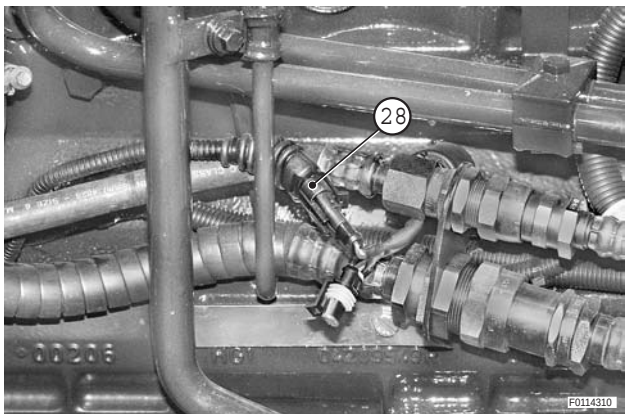


13 - Remove nut (25) and disconnect alternator cable (26).

14 - Unplug air conditioning compressor connector (27).

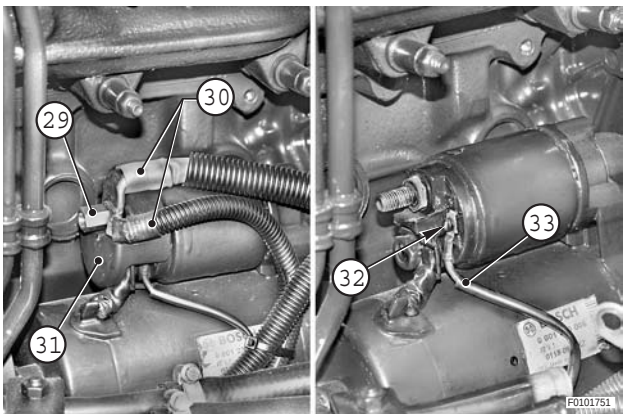


15 - Unplug air conditioning pressure switch connector (28).

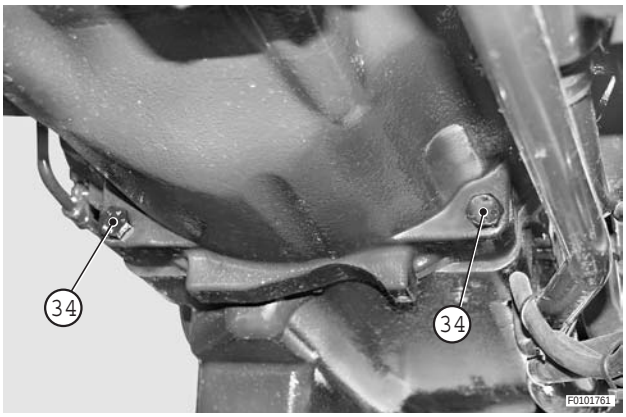


16 - Remove nut (29), disconnect cables (30) and remove guard (31).

17 - Remove screw (32) and disconnect starter cable (33).

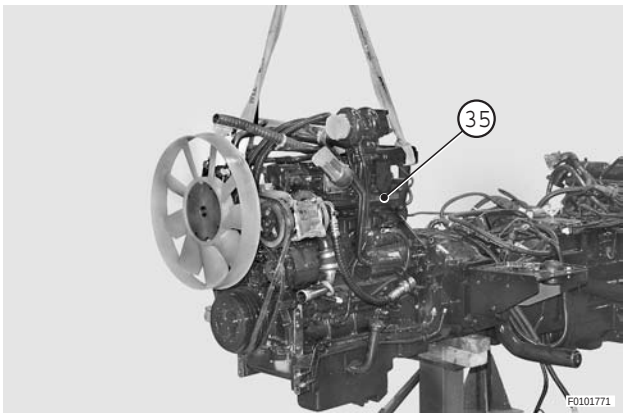


18 - Loosen and remove lower screws (31). ※ 2

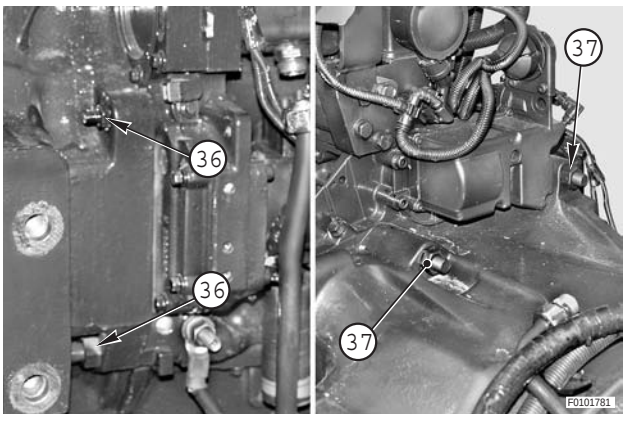


• *In case of engine removal only*

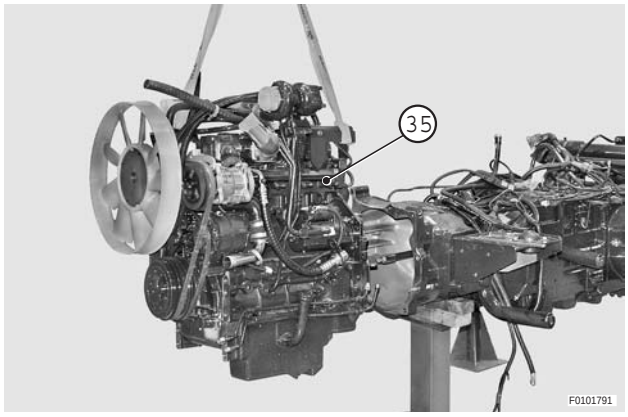
19 - Attach engine (35) to a hoist and take up the slack in the lifting ropes.



20 - Remove nuts (36) (two per side) and (37). ※ 2

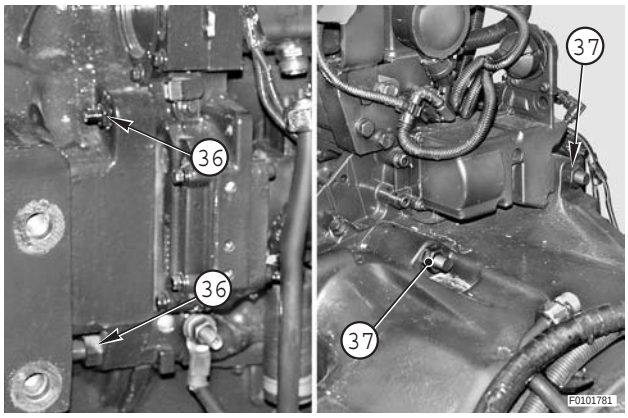


21 - Remove engine assembly (35).

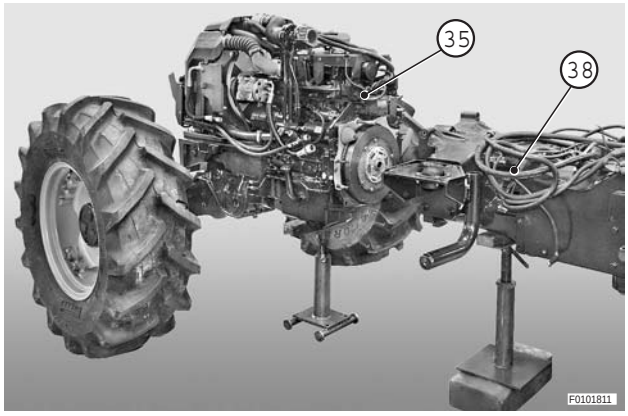


- *For engine-transmission separation only*

22 - Remove nuts (36) (two per side) and (37). ※ 2



23 - Move engine (35) away from transmission (38) by pushing both front wheels.



Refitting

- Refitting is the reverse of removal.

※ 1

Transmission oil: max. 45 , (11.9 US gall.)

※ 2

Screw M16: 260±26 Nm (191.6±19.2 lb.ft.)

Nuts M12: 110±11 Nm (81±8.1 lb.ft.)

Nuts M16: 260±26 Nm (191.6±19.2 lb.ft.)

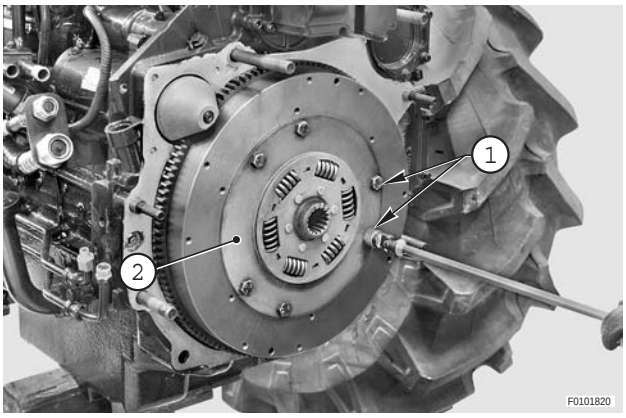
TORSIONAL SPRING PLATE

Removal

1 - Separate the engine from the transmission. (For details, see "ENGINE").

2 - Remove screws (1) and remove torsional spring plate (2).

※ 1

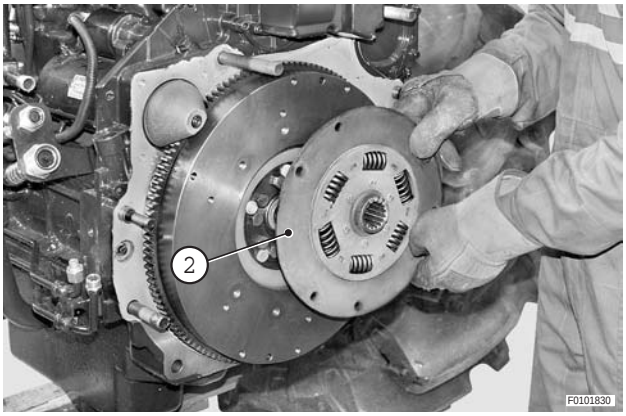


Refitting

- Refitting is the reverse of removal.

※ 1

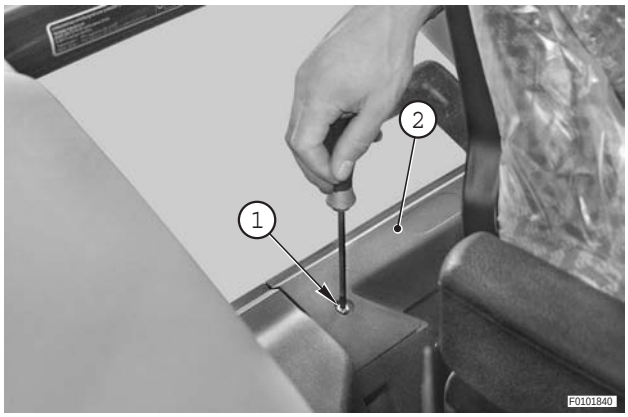
★ Fit torsional spring plate (2) ensuring that the longer side of the hub is facing towards the transmission.



FLOOR MAT

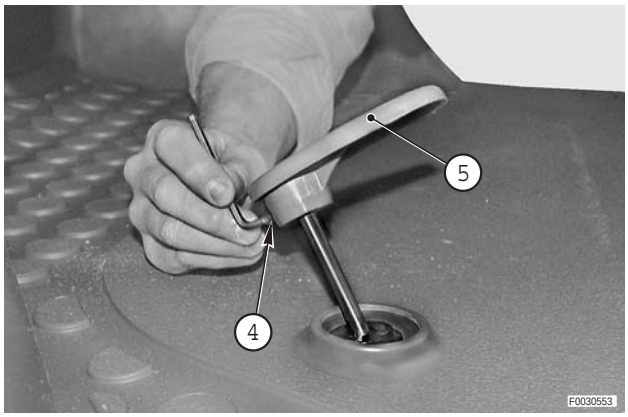
Removal

1 - Remove screws (1) and remove frame (2).



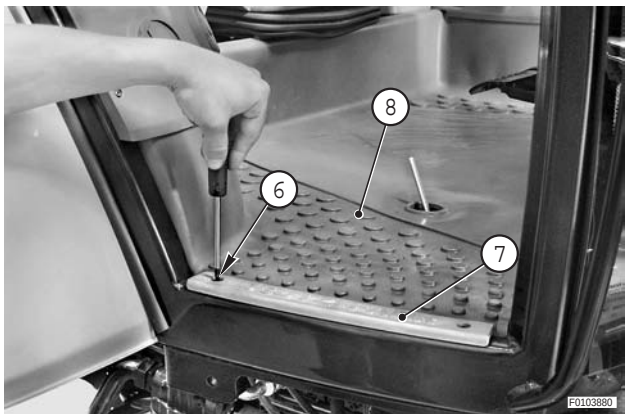
2 - Remove cover (3).

3 - Loosen grub screw (4) and remove accelerator pedal (5).



4 - Remove screws (6) and remove profiles (7) on both side.

5 - Remove floor mat (8).



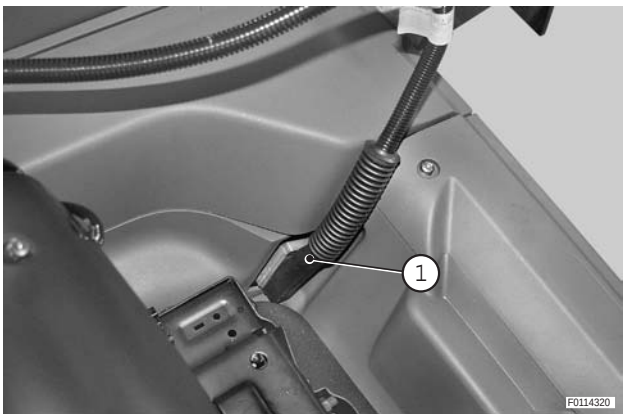
Refitting

- Refitting is the reverse of removal.

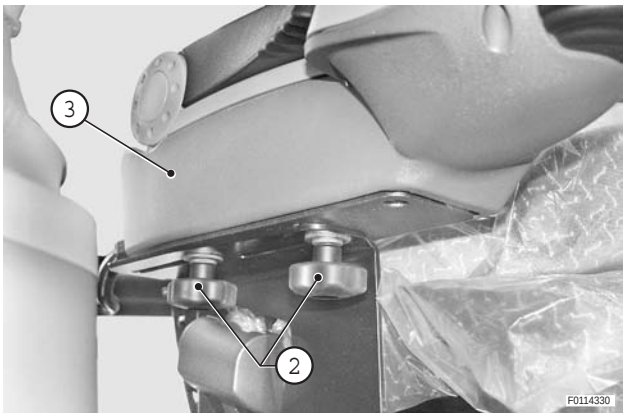
MULTIFUNCTION ARMREST

Removal

1 - Disconnect connector (1).



2 - Remove knobs (2) and remove armrest (3).



Refitting

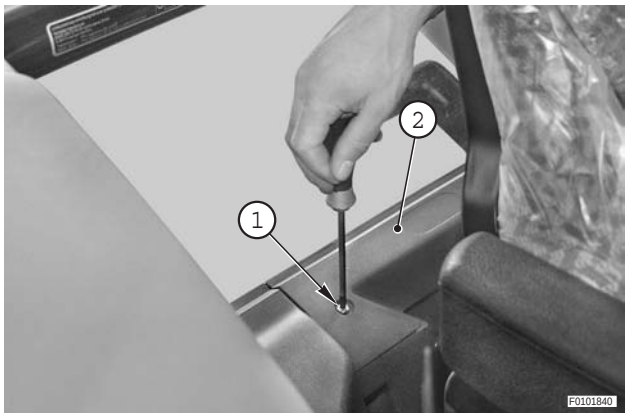
- Refitting is the reverse of removal.

SEAT

Removal

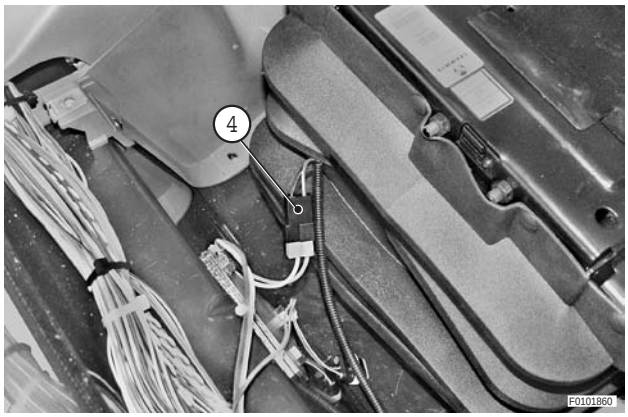
1 - Take out screws (2) (qty 2) and remove frame (1).

2 - Remove multifunction armrest.
(For details, see "MULTIFUNCTION ARMREST").

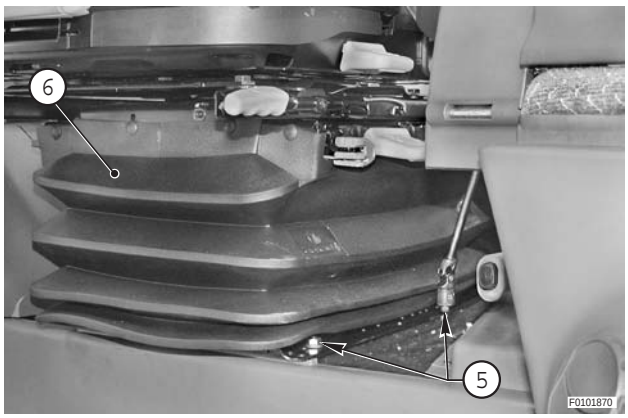


3 - Remove cover (3).

4 - Unplug connector (4).



5 - Remove screws (5) (qty 4) and remove seat (6).



Refitting

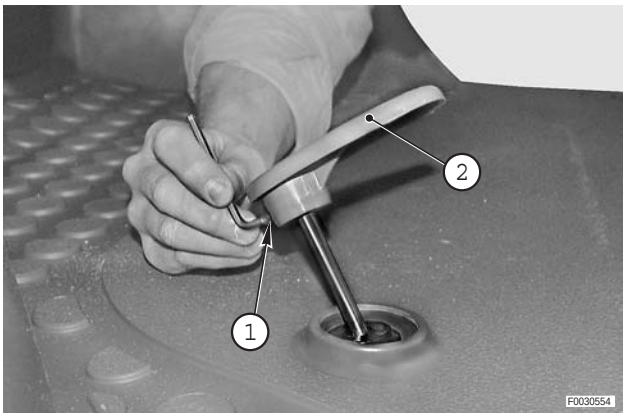
- Refitting is the reverse of removal.

ACCELERATOR PEDAL POTENTIOMETER

Removal

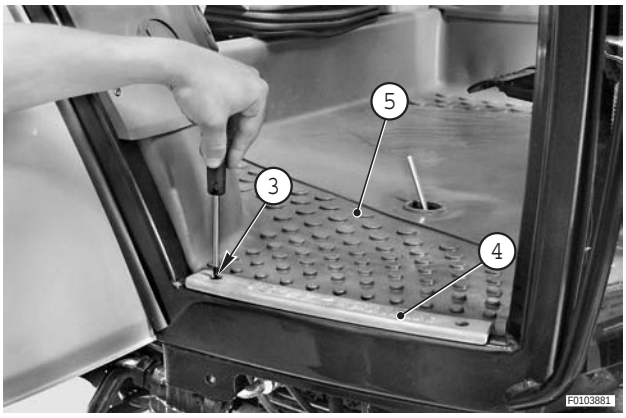
⚠ Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Loosen grub screw (1) and remove accelerator pedal (2). ⁘ 1

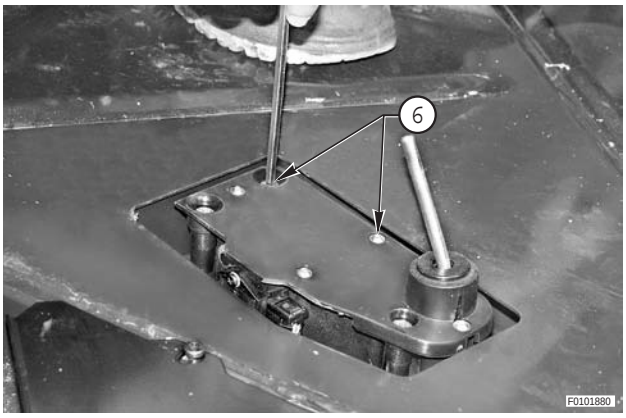


2 - Remove screws (3) (qty 2) and remove right-hand side profile (4).

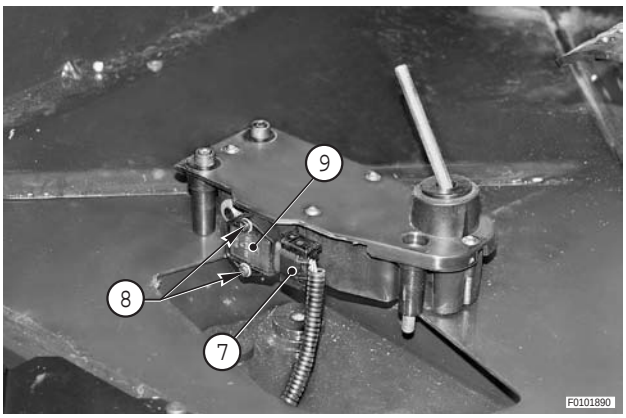
3 - Lift up part of floor mat (5).



4 - Remove screws (6).



5 - Unplug connector (7), remove screws (8) and remove potentiometer (9).



Refitting

- Refitting is the reverse of removal.

※ 1

★ Calibrate the accelerator pedal as described in Group 20. (For details, see CALIBRATION OF THE ACCELERATOR PEDAL)

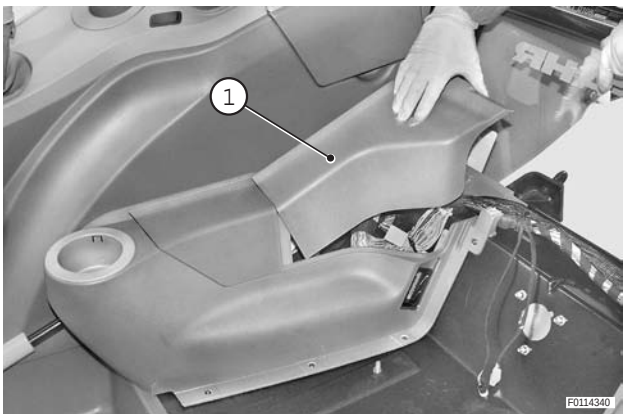
RIGHT-HAND CONSOLE

Removal

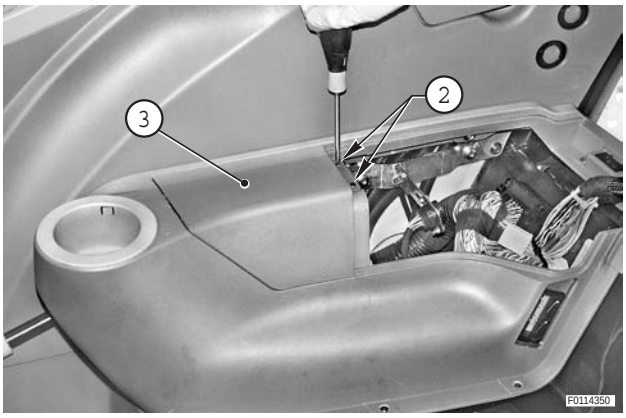
Disconnect the lead from the negative terminal (–) of the battery and apply the parking brake.

1 - Remove the seat.
(For details, see "SEAT").

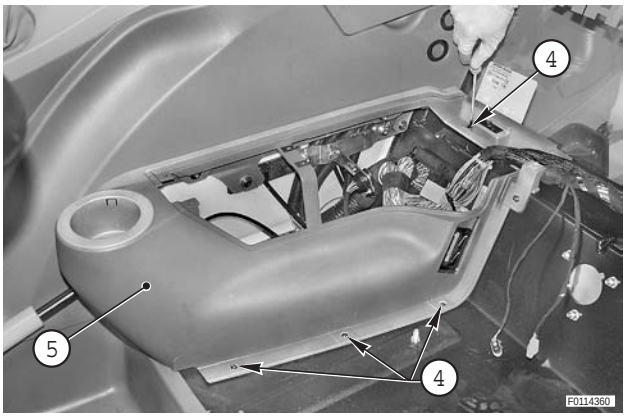
2 - Remove hood (1).



3 - Remove screws (2) and remove cover (3).

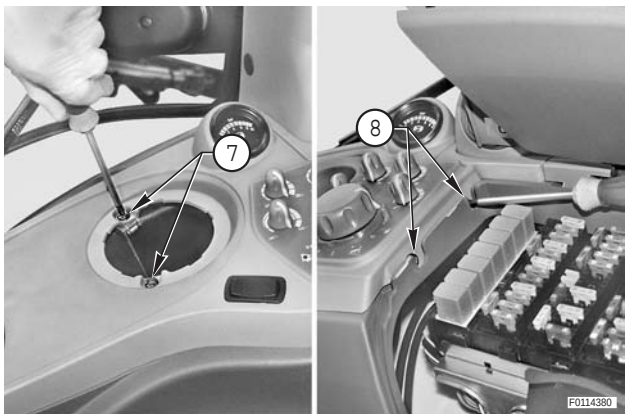


4 - Remove screws (4) (qty 7) and remove hood (5).
★ In case of renewal, it will be necessary to disconnect the wiring connectors from the control units and from the parking brake.

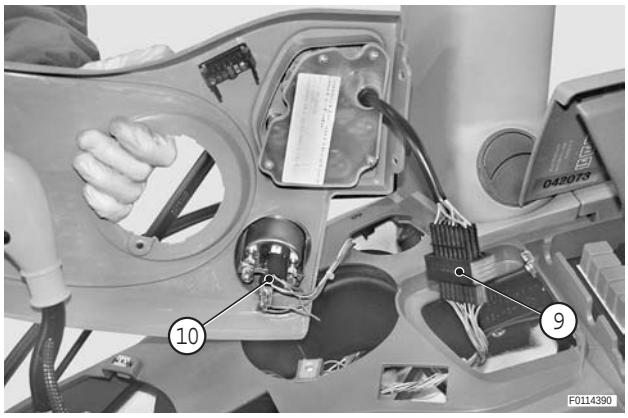


5 - Remove cover (6).

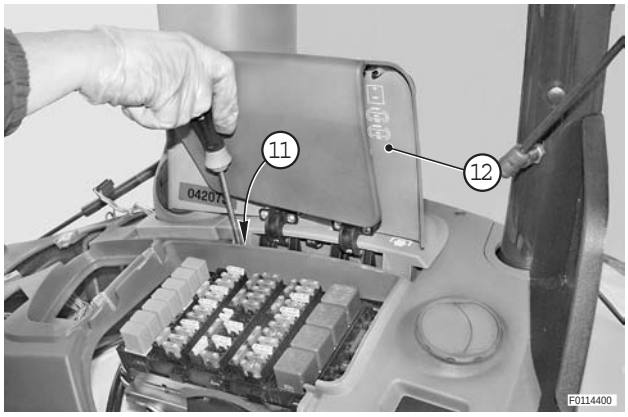
6 - Remove screws (7) and (8).



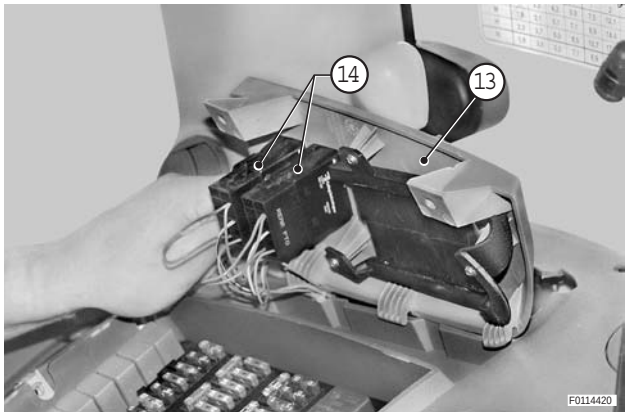
7 - Lift up the console and unplug lift console connector (9) and air compressed pressure gauge connector (10).



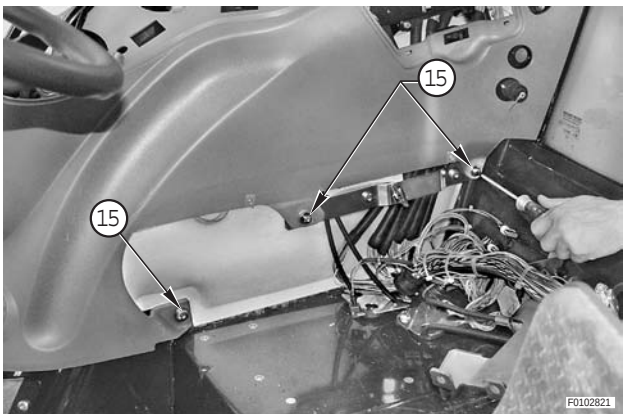
8 - Remove screws (11) (qty 4) and remove door (12).



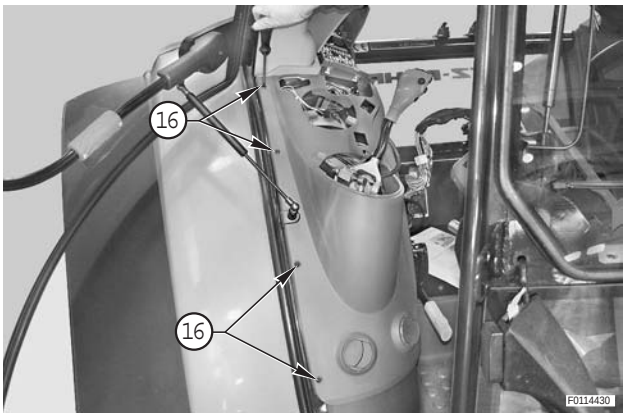
9 - Remove console (13) and disconnect wiring connectors (14) of the rear PTO control pushbuttons.



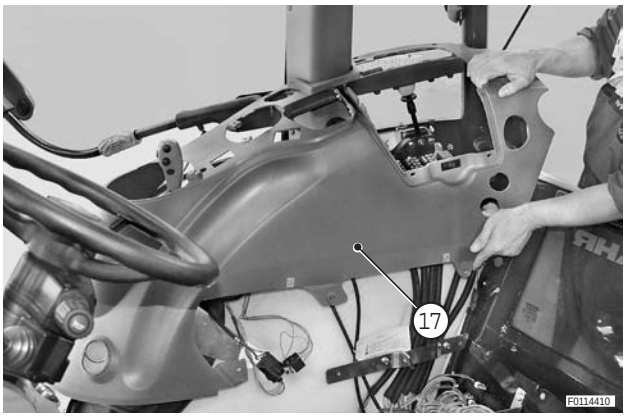
10 - Remove screws (15) (qty 3).



11 - Remove screws (16) (qty 6).



12 - Remove right hand console (17).



Refitting

- Refitting is the reverse of removal.

CREEPER

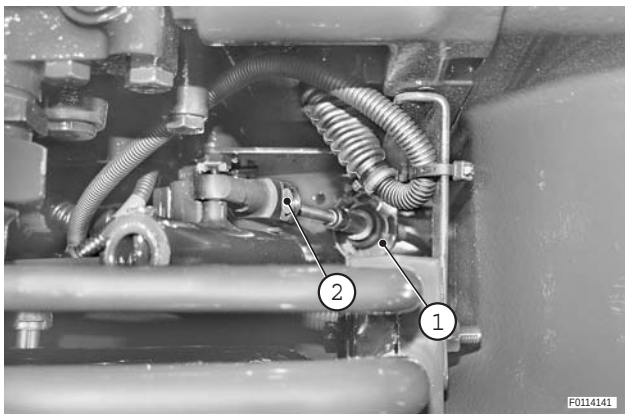
CONTROL CABLES

Removal

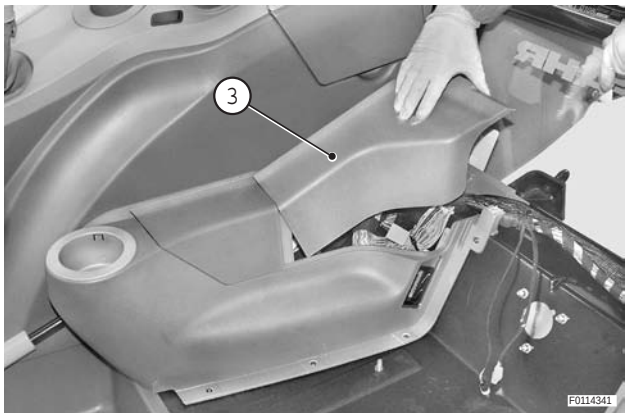
Disconnect the lead from the battery negative terminal (–) and apply the parking brake.

1 - Remove the armrest.
(For details, see "MULTIFUNCTION ARMREST").

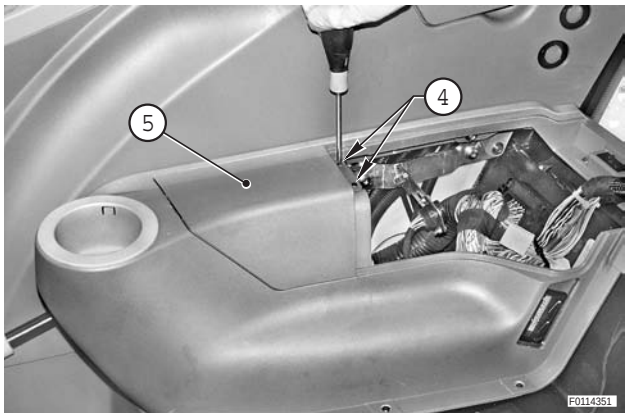
2 - Remove retaining clip (1), press button (2) and disconnect the cable. ⁘ 1



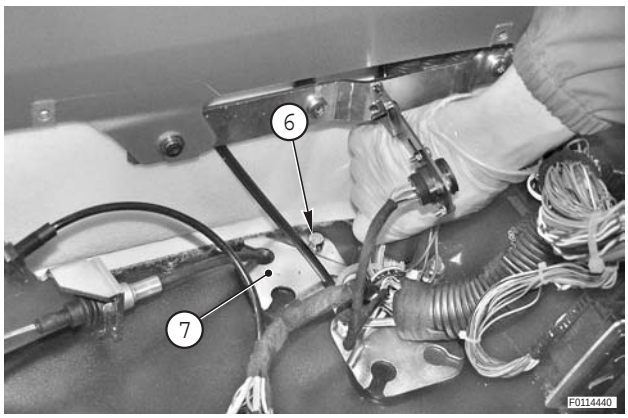
3 - Remove hood (3).



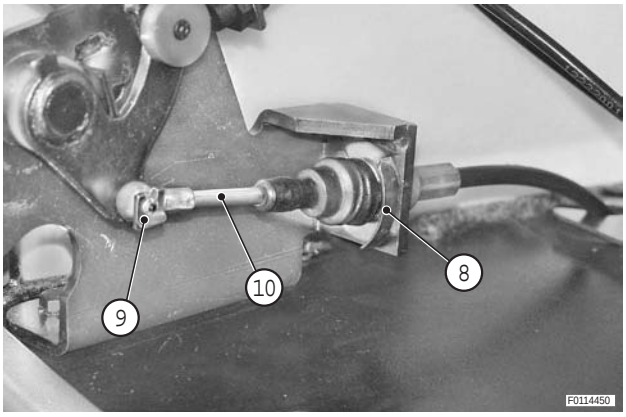
4 - Remove screws (4) and remove cover (5).



5 - Remove screw (6) and remove control cables retaining plate (7).



6 - Remove spring (8), remove circlip (9) and withdraw cable (10).



Refitting

- Refitting is the reverse of removal.

REAR PTO SPEED SELECTOR LEVER

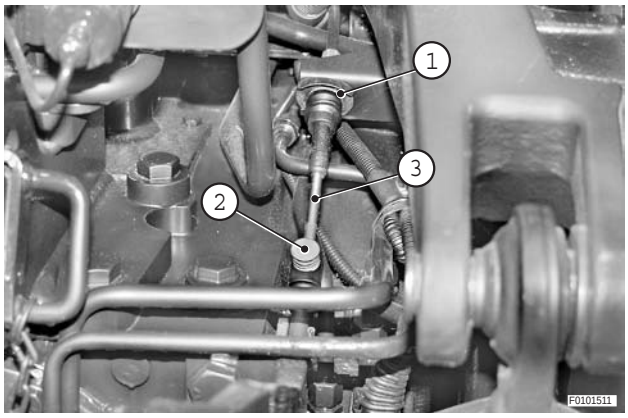
Removal

Disconnect the lead from the negative terminal (–) of the battery and apply the parking brake.

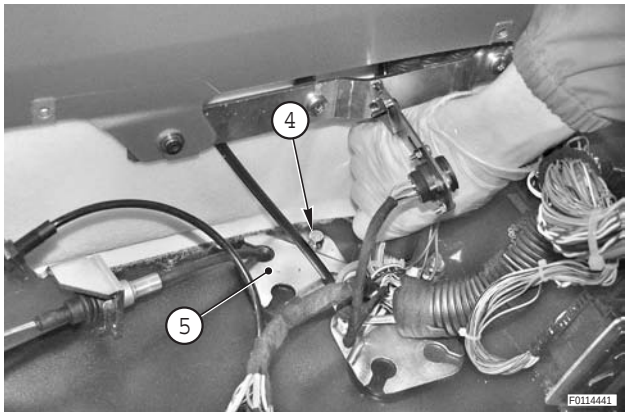
1 - Remove the right-hand console.
(For details, see "RIGHT-HAND CONSOLE").

2 - Move the PTO speed selector lever to the PTO 540 ECO position.

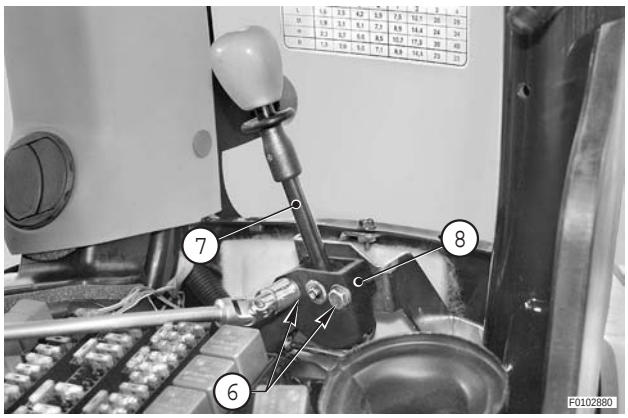
3 - Remove the retaining clip (1), press the button (2) and disconnect the cable (3) from the support. ※ 1



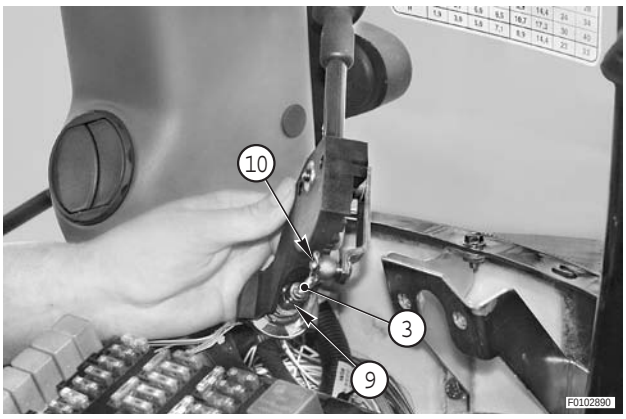
4- Remove screw (4) and remove control cables retaining plate (5).



5 - Remove screws (6) and detach lever (7) from support (8).



6 - Remove retaining clip (9) and circlip (10), and withdraw control cable (3).



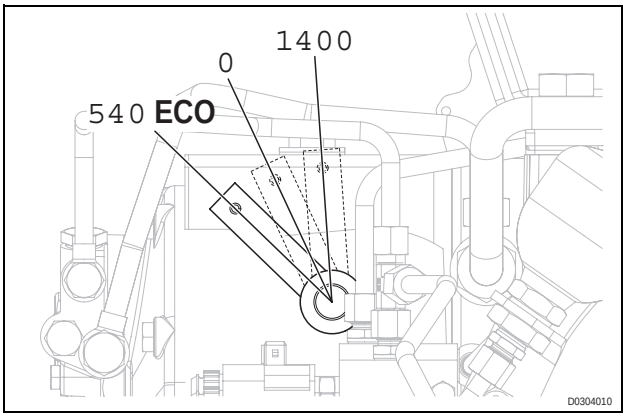
Refitting

- Refitting is the reverse of removal.

※1

★ PTO speed selector lever (11) must be in the fully lowered position when control cable (3) is attached.

★ After connecting control cable (3), check that lever (11) can move through its full travel towards the front of tractor and that the correct PTO speed is engaged when the lever is aligned with the corresponding symbol marked on the console.



GEARSHIFT CONTROL

Removal

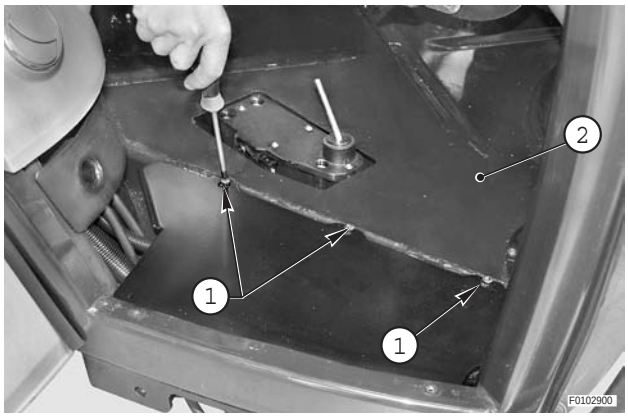
Disconnect the lead from the negative terminal (–) of the battery and apply the parking brake.

1 - Remove the right-hand console.
(For details, see "RIGHT-HAND CONSOLE").

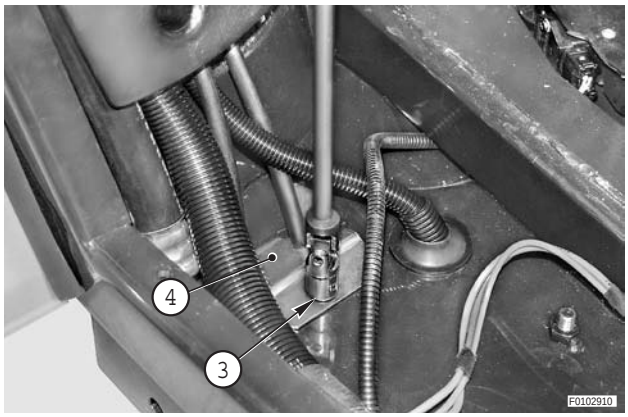
2 - Remove the rear wheel.
(For details, see "WHEELS - REAR WHEELS").

3 - Remove the cab access steps on the right-hand side:
(For details, see "CAB ACCESS STEPS").

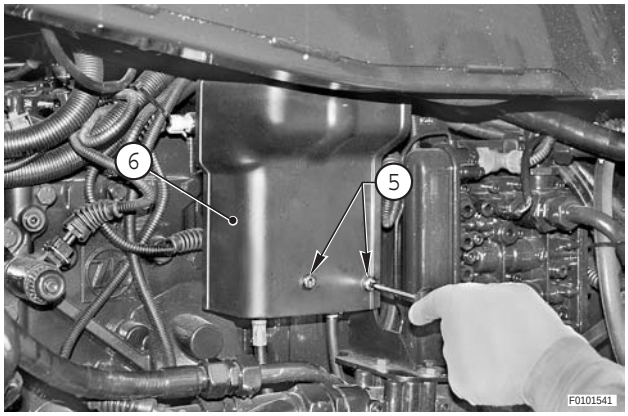
4 - Remove screws (1) and remove cover (2).



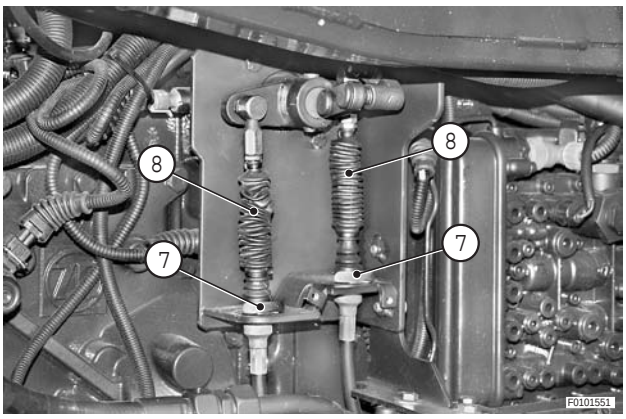
5 - Remove screw (3) and remove control cables retaining plate (4).



6 - Remove screws (5) (qty 3) and remove guard (6).

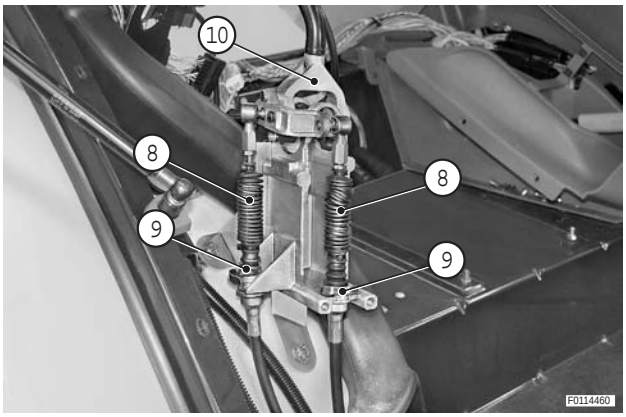


7 - Remove retaining clip (7) of gearshift control cable (8) to be removed.



8 - Remove retaining clip (9) and disconnect relative gearshift control cable (8) from lever (10).

9 - Withdraw cable (8). ※ 1

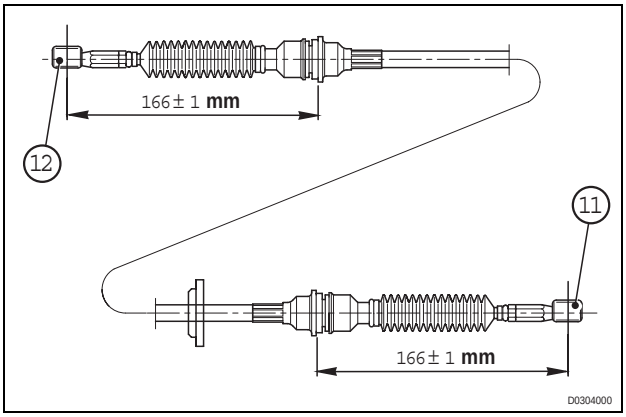


Refitting

- Refitting is the reverse of removal.

※ 1

★ Check that end fitting (11) or (12) protrudes the correct distance.



PARKING BRAKE

CONTROL CABLE

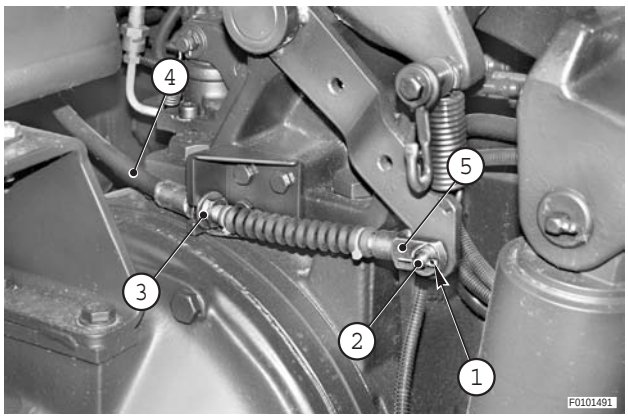
Removal

Disconnect the lead from the battery negative terminal (–).

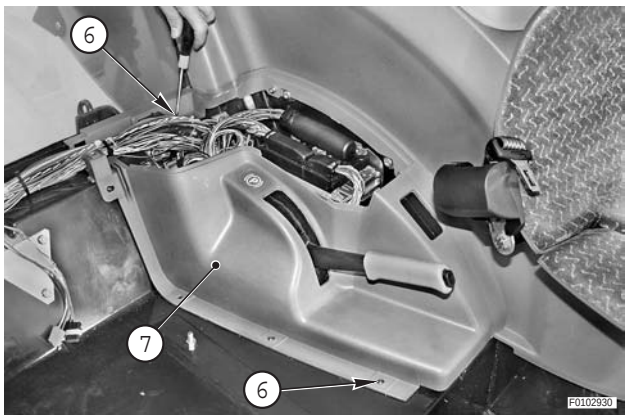
1 - Remove the seat.
(For details, see "SEAT").

2 - Remove split pins (1) and remove pivot pin (2).
1

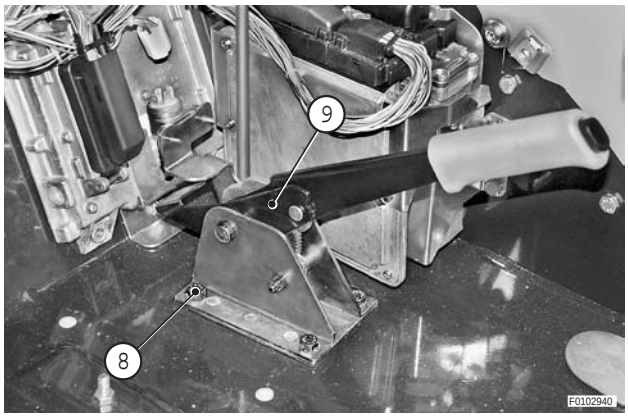
3 - Loosen nut (3) and disconnect parking brake cable (4).
★ Remove fork (5).



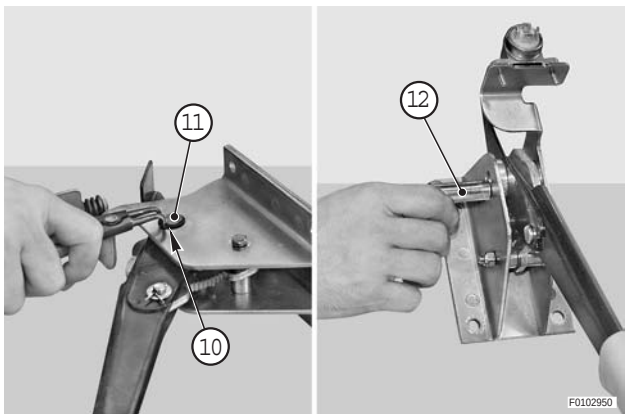
4 - Remove screws (6) (qty 7) and open hood (7) by tilting back to left.



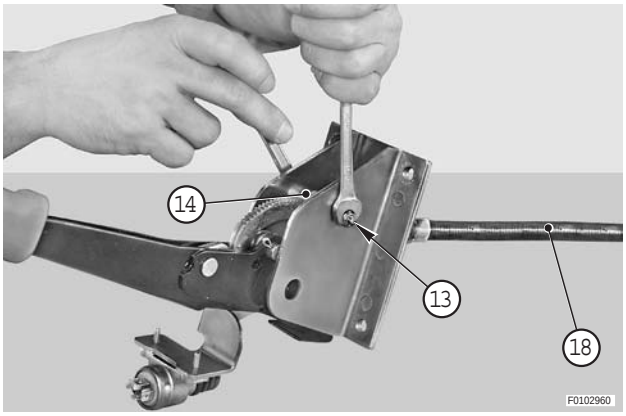
5 - Remove screws (8) (qty 4) and remove lever assembly (9).



6 - Remove circlip (10) and remove pin (11).
★ Recover spacers (12).

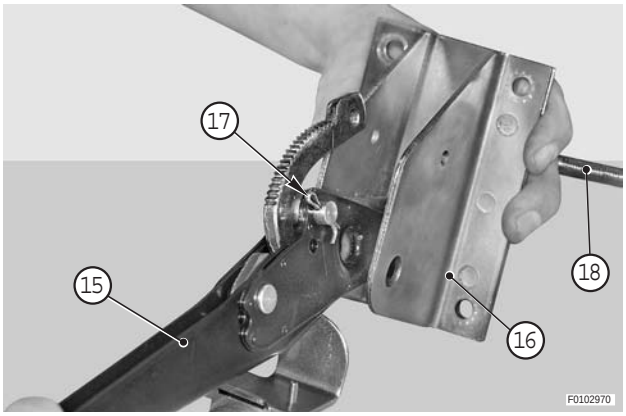


7 - Remove screw (13).
★ Recover spacers (14).



8 - Withdraw lever (15) from support (16).

9 - Remove split pin (17), withdraw the pivot pin and remove control cable (18).



Refitting

- Refitting is the reverse of removal.

1

★ Adjust the parking brake travel.
(For details, see "PARKING BRAKE LEVER").

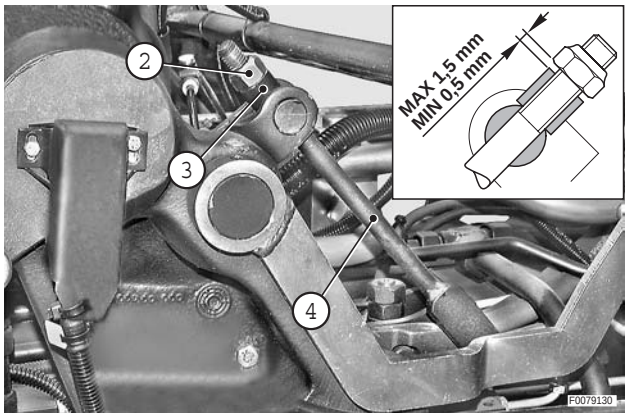
PARKING BRAKE LEVER

Adjustment

1 - Before proceeding with the adjustment, operate handbrake lever (1) repeatedly in order to eliminate any play and check that the control cable slides freely.

2 - Apply a dynamometer max 500 Nm full scale to the handgrip, and raise the lever to the first notch; check that the force applied to reach the first notch is within the normal limits.

★ Normal effort: 300÷30 N (55÷5 lb.)



3 - If you find a different value, loosen nut (2) with smallest amount of play and tighten nut (3) having greatest amount of play.

4 - Then check that the distances between nuts (2) and (3) of tie rods (4) are 0.5÷1.5 mm (0.02 –-- 0.06 in.).

5 - Take the tractor to a straight section of asphalted road at least 50 m (97 yards) long.

6 - Engage gear and move off.

7 - With the tractor in motion, depress the clutch pedal and fully apply handbrake (1); check that the rear wheels lock up simultaneously.

8 - If the rear wheels do not lock up at the same time, *screw in* by just a few degrees nut (2) *corresponding to the wheel that fails to lock up* and *screw out the nut corresponding to the other wheel*.

9 - Repeat the previous operations until both rear wheels lock up simultaneously when the handbrake is fully applied.

10 - Check that parking lever travel is within the normal limits.

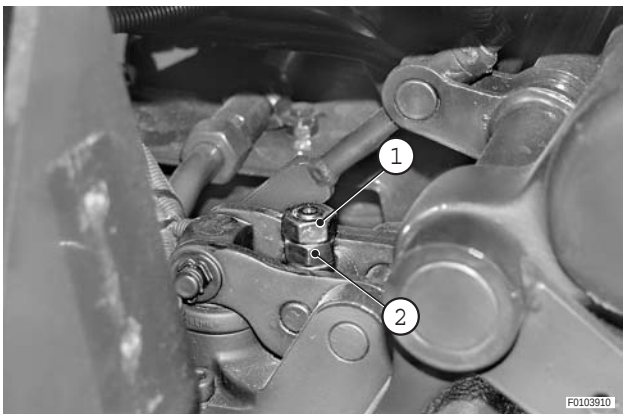
★ Normal lever travel: max. 5 notches

If adjustment is required, turn nuts (2) by equal amounts.

SERVICE BRAKE

BRAKE DEVICE

Adjustment



1 - Remove locknut (1) and partially unscrew nut (2).

2 - Tighten nut (2) to the specified torque.

Nm Nut (2): 10 Nm (7.4 lb.ft.)

3 - Unscrew nut (2) by 1/4 turns, then tighten locknut (1) to the specified torque.

Nm Locknut (1): 80 Nm (59 lb.ft.)

4 - Repeat the procedure on the brake on the opposite side.

5 - Adjust the parking brake travel.
(For details, see "PARKING BRAKE LEVER").

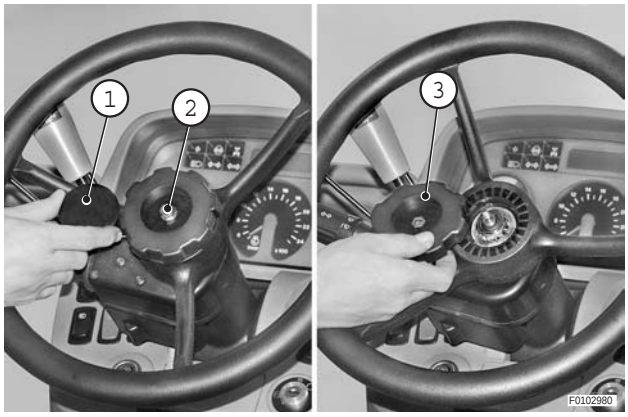
STEERING WHEEL

Removal

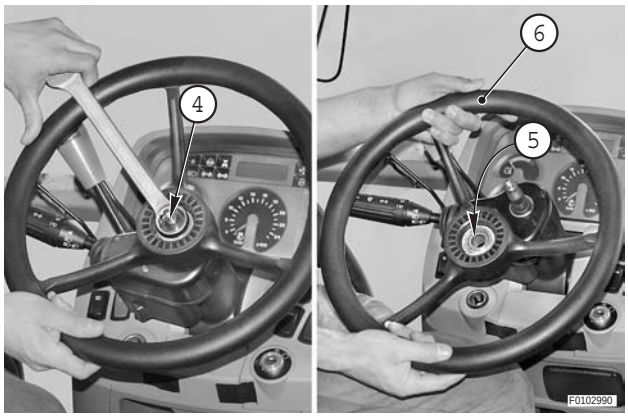
Disconnect the lead from the battery negative terminal (–).

1 - Remove centre cover (1) and remove nut (2) with its washer.

2 - Remove locknut (3) for telescopic adjustment of the steering wheel.



3 - Remove nut (4), serrated washer (5) and remove steering wheel (6). ※ 1



Refitting

- Refitting is the reverse of removal.

※ 1

Nm Steering wheel nut:
M18x1.5: 40±10% Nm (29.5±10% lb.ft.)
M8: 10±2 Nm (7.4±1.5 lb.ft.)

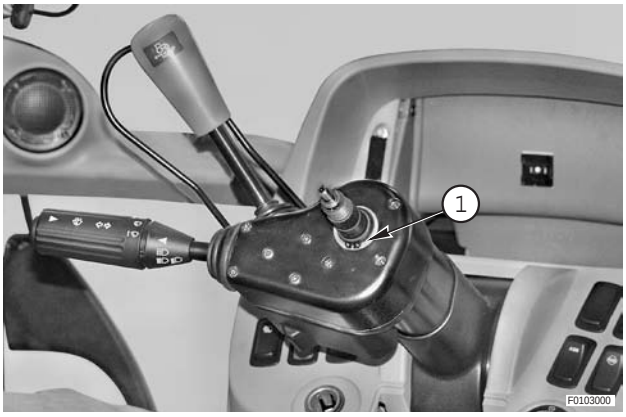
SHUTTLE LEVER

Removal

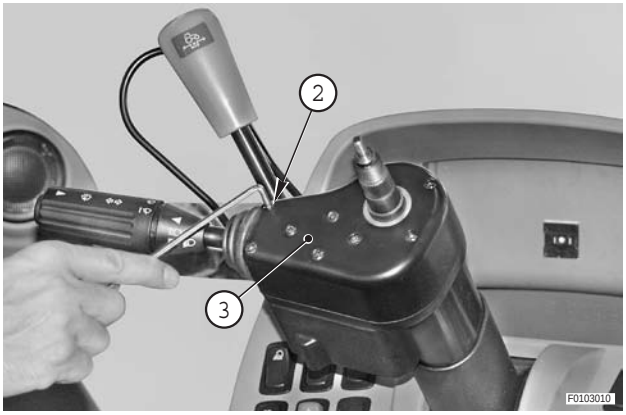
Disconnect the lead from the battery negative terminal (–).

1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").

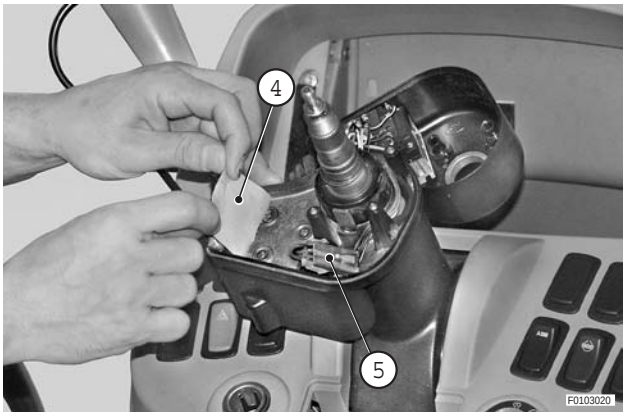
2 - Remove circlip (1).



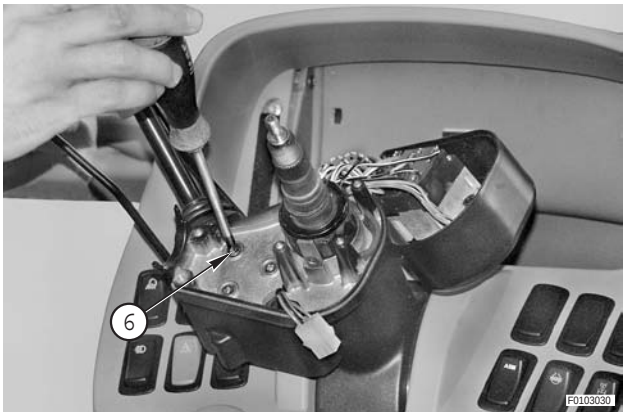
3 - Loosen and remove screws (2) (qty 5) and lift and position lights selector switch assembly (3) on one side.



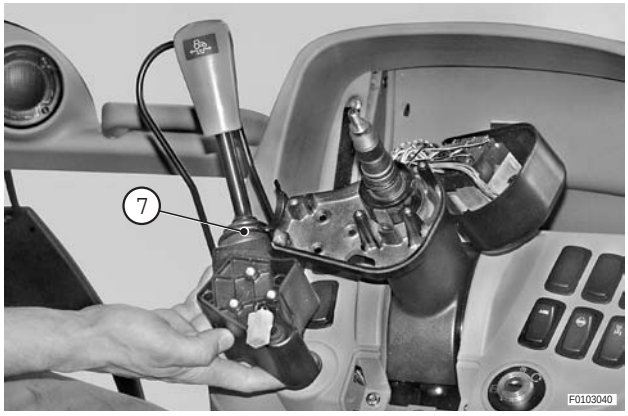
4 - Remove adhesive tape (4) and disconnect wiring connector (5).



5 - Remove screws (6).



6 - Remove shuttle lever assembly (7).



Refitting

- Refitting is the reverse of removal.

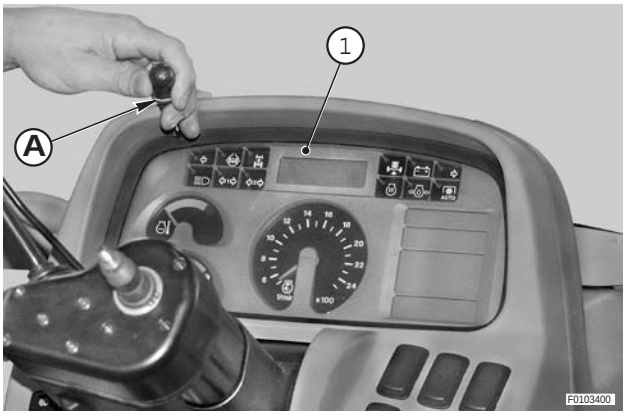
LIGHTS SELECTOR SWITCH

Removal

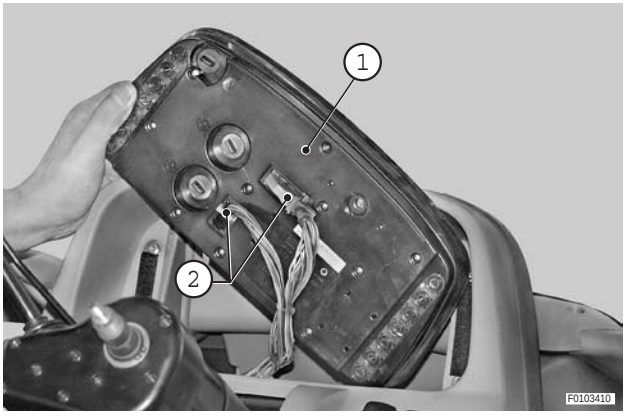
Disconnect the lead from the battery negative terminal (–).

1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").

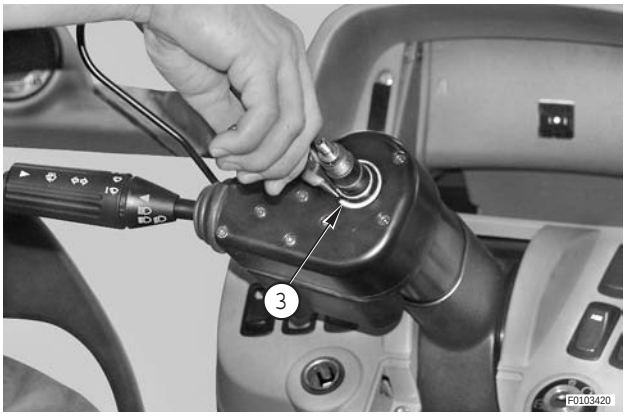
2 - Inset thin blade "*A*" under the gasket and prise off infocenter (1).



3 - Unplug connectors (2) from infocenter (1).



4 - Remove circlip (3).

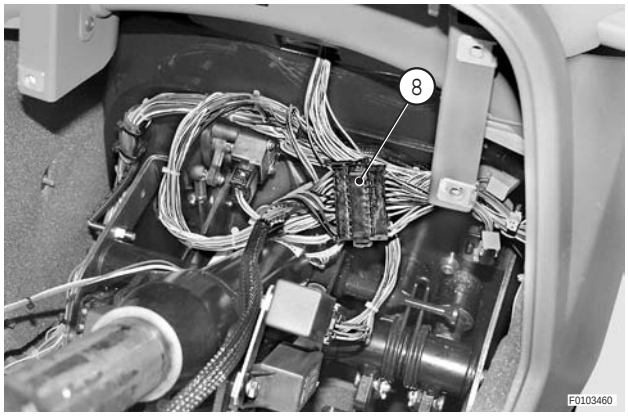


5 - Remove cover (4).

6 - Remove screws (5) (qty 6) and remove front dashboard (6).

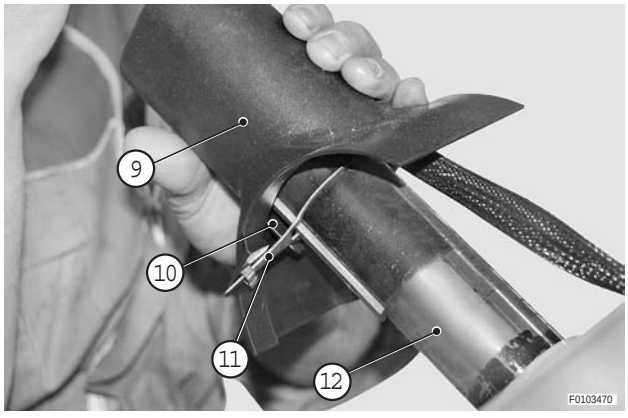
7 - Unplug LH and RH side connectors (7). ⁘ 1

8 - Disconnect lights selector switch connector (8).



9 - Rotate shroud (9) to align rotation lock key (11) with spring (10) and slide shroud (9) off steering tube (12).

10 - Remove the dashboard complete with the lights selector.



Refitting

- Refitting is the reverse of removal.

FRONT CONSOLE

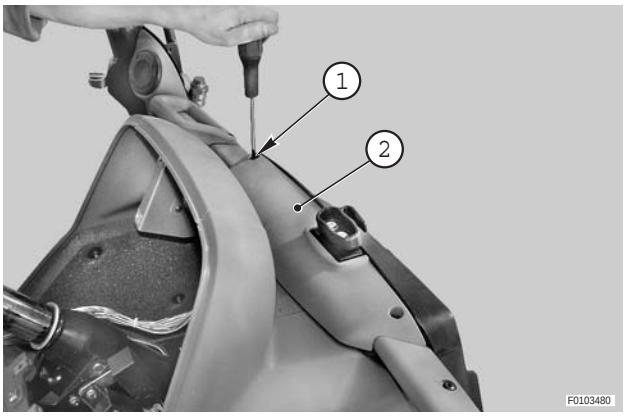
Removal

Disconnect the lead from the battery negative terminal (–).

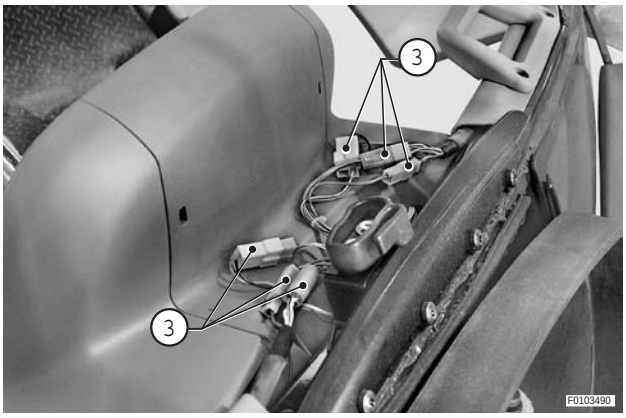
1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").

2 - Remove the lights selector switch.
(For details, see "LIGHTS SELECTOR SWITCH").

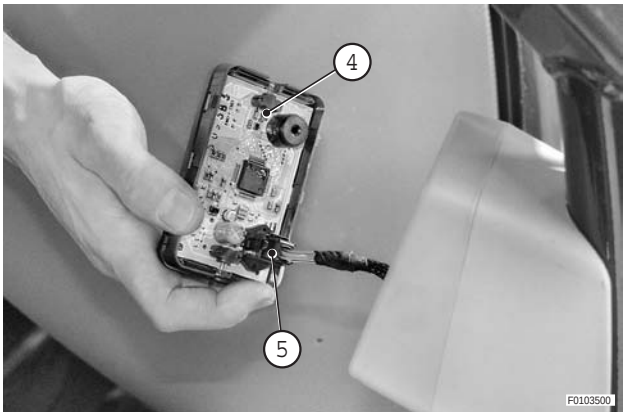
3 - Remove screws (1) and remove cover (2).



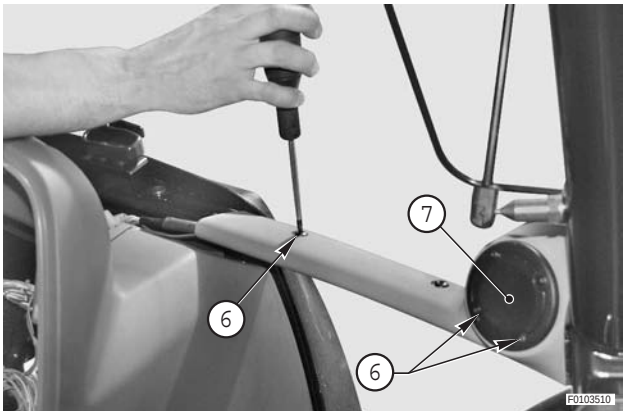
4 - Disconnect all wiring connectors (3).
★ Label the connectors to avoid confusion on reconnection.



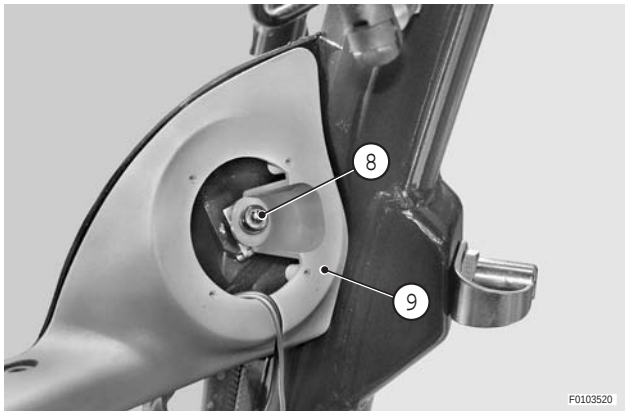
5 - Remove transmission display (4) and disconnect wiring connector (5).



6 - Remove screws (6) (qty 6) and remove speaker cover (7).

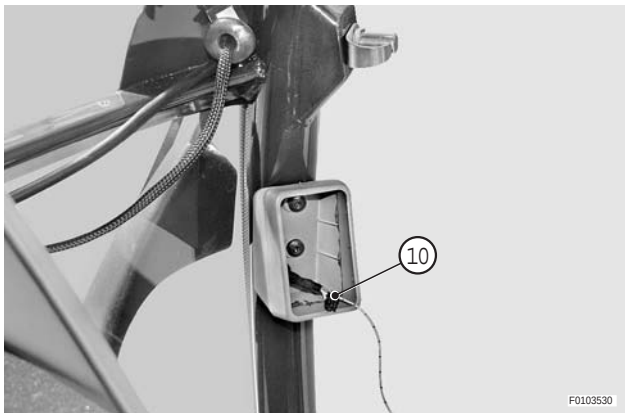


7 - Remove screw (8) and remove speaker support (9).

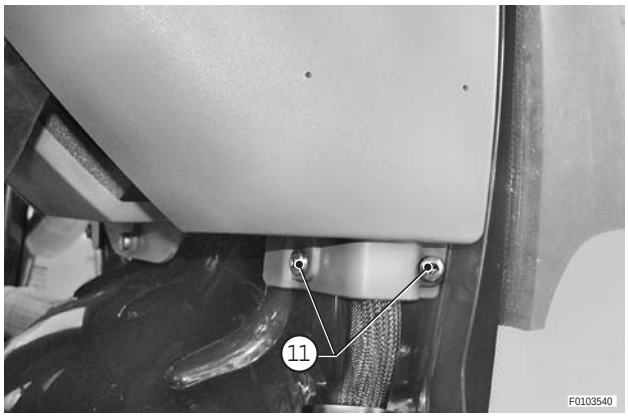


8 - Withdraw the wiring.

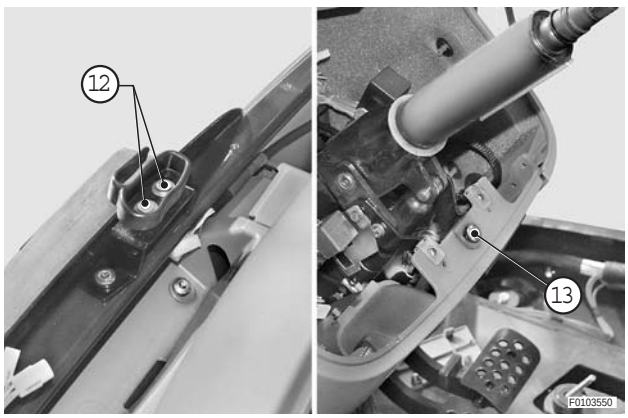
★ To facilitate installation, attach the wiring to a piece of string to be left in the cab structure.



9 - Remove lower screws (11) (qty 4).



10 - Remove screws (12) (qty 2) and (13).



11 - Remove front console (14).

Refitting

- Refitting is the reverse of removal.

CLUTCH PEDAL AND ACCESSORIES

POSITION SENSOR

Removal

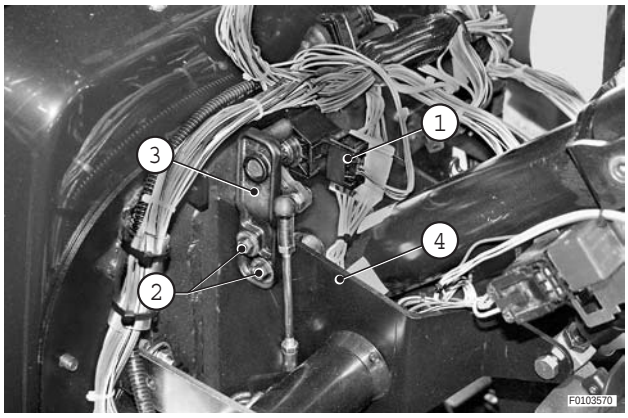
⚠ Disconnect the lead from the battery negative terminal (–).

1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").

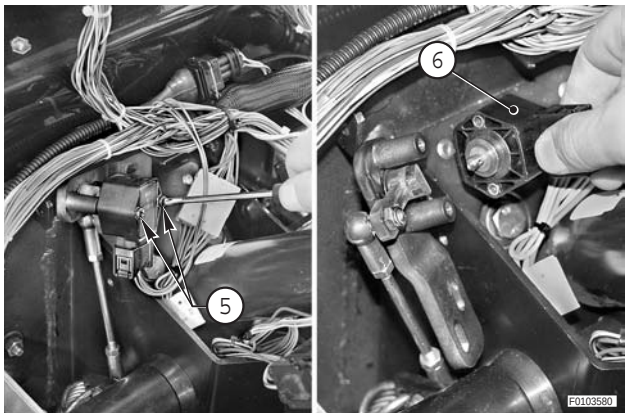
2 - Remove the steering column switch unit.
(For details, see "LIGHTS SELECTOR SWITCH").

3 - Remove the front console.
(For details, see "FRONT CONSOLE").

4 - Disconnect connector (1) and remove screws (2).
★ Before removing screws (2), mark the position of support (3) in relation to pedals support (4).

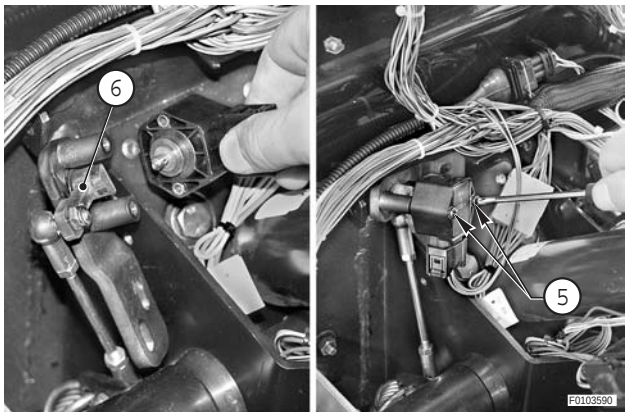


5 - Remove screws (5) and remove sensor (6).



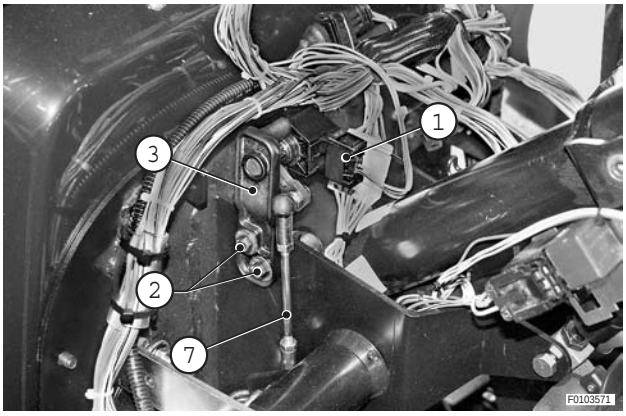
Refitting

1 - Fit sensor (6) and secure with screws (5).



2 - Connect wiring connector (1) and secure support (3) with screws (2).

★ Make sure that tie-rod (7) is firmly and correctly attached to clutch pedal and sensor.



3 - Temporarily install instrument panel (8) and reconnect all previously disconnected wiring connectors.

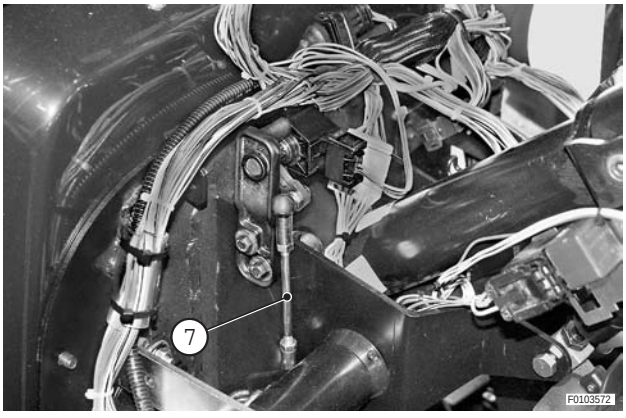
★ Connect also the wiring connector of transmission display and steering column switch unit.

4 - Connect lead to negative terminal (–) of the battery and connect ART to diagnostic socket.

5 - Select the HLHP control unit and then access menu "3.1.3 Analog inputs"; check that, with the clutch pedal released, sensor output voltage is 0.8±0.1 V.

		A	N	A	L	O	G	2		I	N	P	U	T	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	l	u	t	c	h						1	.	1	0	V
C	l	u	t	c	h								1	2	%
C	l	u	t	c	h	(	r	e	e	d	)		O	F	F
F	R	R	S								3	.	2	0	V
A	P	S	-	P	o	t	i							0	%
T	e	m	p	.								0	7	0	C
C	l	u	t	c	h	P	r	e	s	s	0	.	0	0	b
C	a	l	i	b	.	P	r	e	s	s	0	.	0	0	b

6 - If the voltage is not within the specified limits, lengthen or shorten tie-rod (7) until you reach the optimal value.

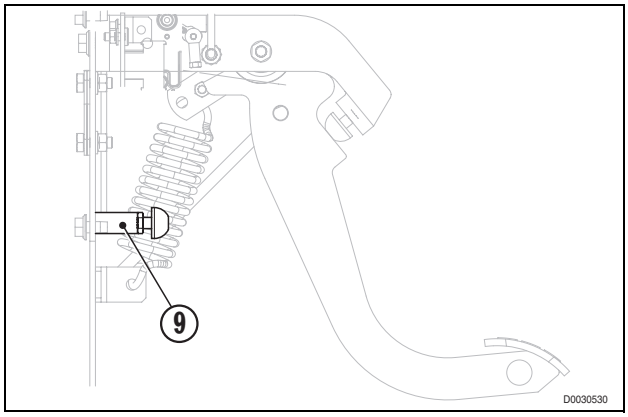


7 - Fully depress the clutch pedal and check that sensor output voltage is 4.3±0.1 V.

		A	N	A	L	O	G	2		I	N	P	U	T	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	l	u	t	c	h						3	.	9	8	V
C	l	u	t	c	h								9	1	%
C	l	u	t	c	h	(	r	e	e	d	)		O	F	F
F	R	R	S								3	.	2	0	V
A	P	S	-	P	o	t	i							0	%
T	e	m	p	.								0	7	0	C
C	l	u	t	c	h	P	r	e	s	s	0	.	0	0	b
C	a	l	i	b	.	P	r	e	s	s	0	.	0	0	b

8 - If voltage is not within specified limits, lengthen or shorten the pedal travel accordingly by adjusting stop (9).

9 - Proceed to calibrate the clutch pedal position sensor. (For details, see 4.3.6 CLUTCH PEDAL CALIBRATION in section 20).



10 - Disconnect the lead from the negative terminal (–) of the battery and remove the instrument panel.

11 - Install front console.
(For details, see "FRONT CONSOLE").

12 - Install steering column switch unit.
(For details, see "LIGHTS SELECTOR SWITCH").

13 - Install steering wheel.
(For details, see "STEERING WHEEL").

PROXIMITY SENSOR (Clutch pedal depressed sensor)

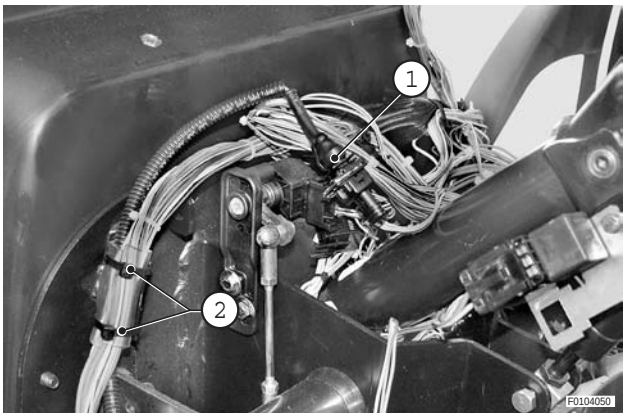
Removal

Disconnect lead from negative terminal (–) of the battery and apply the parking brake.

1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").

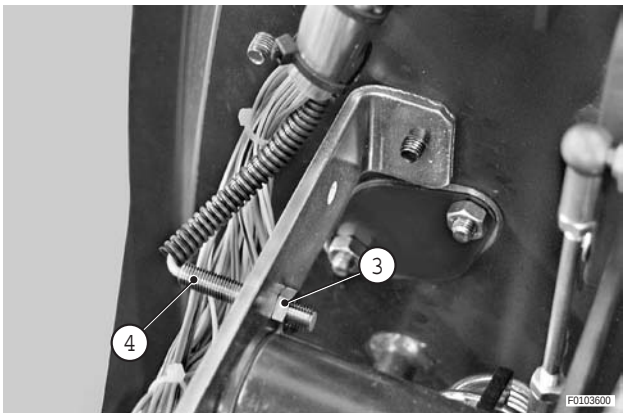
2 - Remove steering column switch unit.
(For details, see "LIGHTS SELECTOR SWITCH").

3 - Unplug connector (1) and release wiring from clip (2).



4 - Remove nut (3) and remove sensor (4).

※ 1



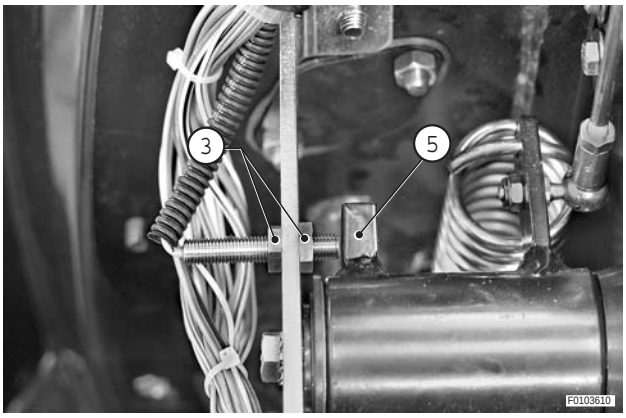
Refitting

- Refitting is the reverse of removal.

※ 1

1 - Fully depress the clutch pedal.

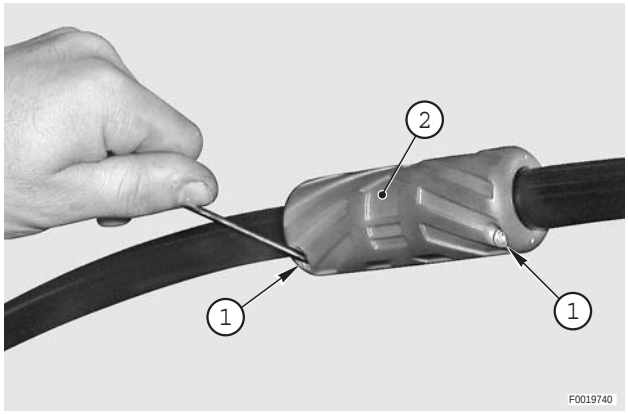
2 - Adjust sensor position in relation to sleeve (5) by way of nuts (3).
★ Spacer "*D*" between sensor and cam:
0.5÷1.0 Nm (0.02÷0.04 in.)



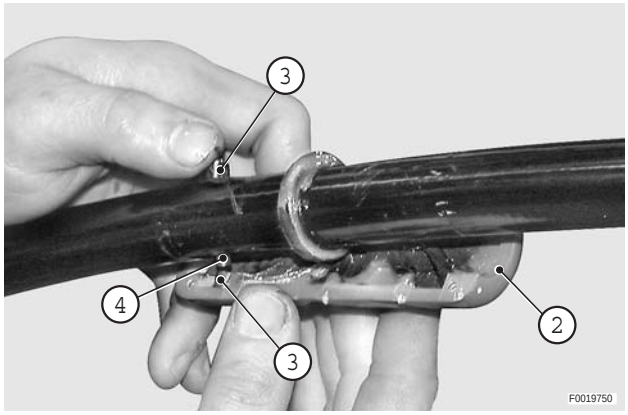
CAB DOOR LATCH CABLE

Renewal

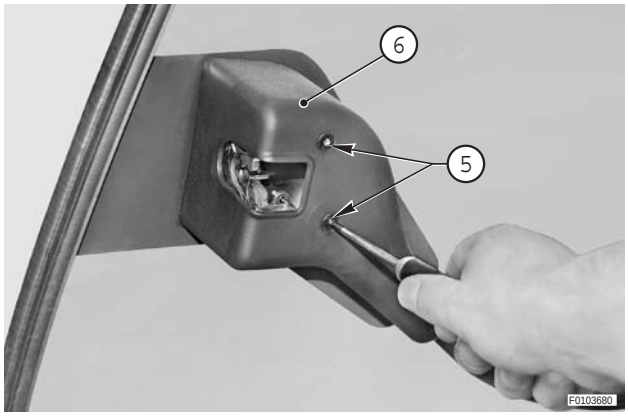
1 - Loosen and remove screws (1) (n° 4) responsible for joining the halves of door handle (2).



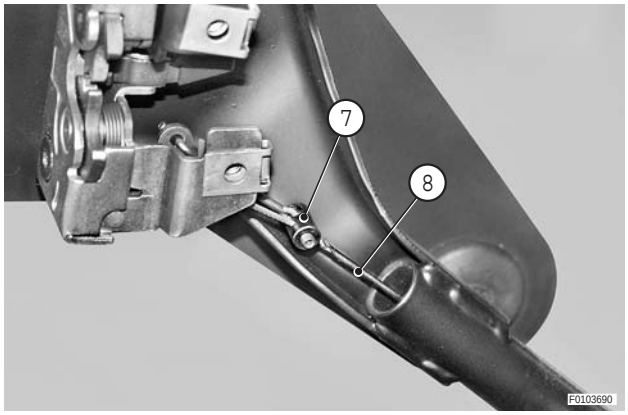
2 - Remove the two halves and recover bushes (3) and cable driving pin (4).



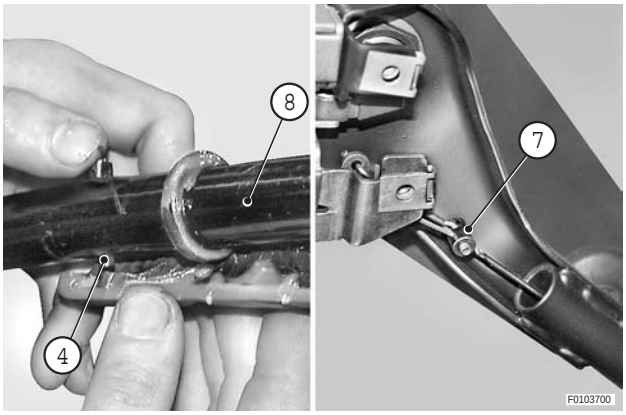
3 - Unscrew and remove fixing screws (5) of door lock cover (6).



4 - Loosen clamp (7) and withdraw cable (8).



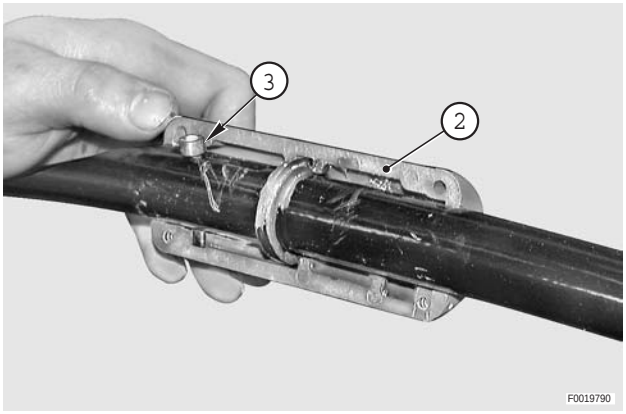
5 - Feed new cable (8) starting from handle side; engage it with pin (4) and clamp (7).
With the cable under slight tension, tighten down the clamp nut.



6 - Lubricate bushes (3) and the handle sliding surfaces; fit bushes onto pin and refit handle (2).

Seats and bushes: Molykote

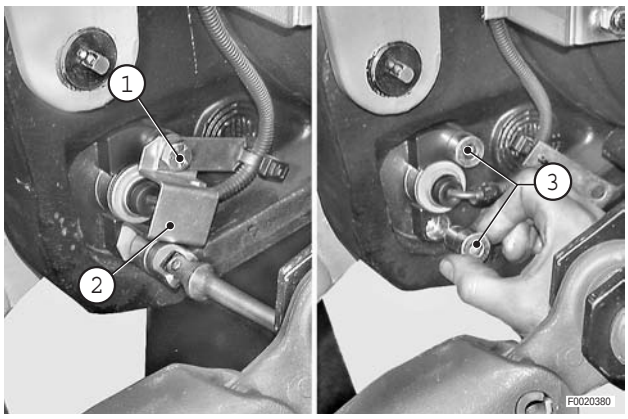
7 - Check that the door opens correctly and complete the refitting procedure.



LIFT DRAFT SENSOR

Removal

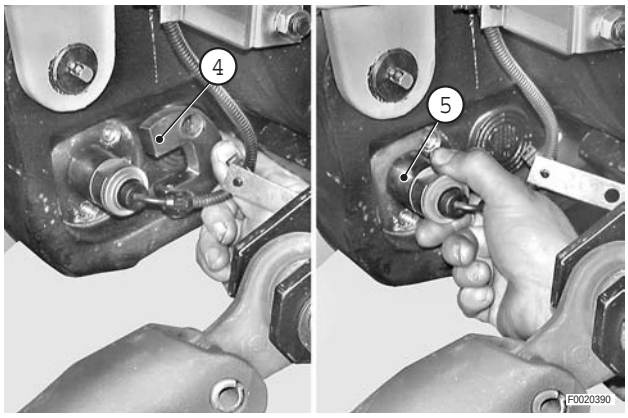
1 - Remove screws (1) and remove cover (2) and spacers (3).



2 - Support lift arm, remove bracket (4) and sensor (5).

3 - Release wiring from the retaining straps and unplug connector of sensor being removed.

★ The wiring connectors are located under the cab and can be accessed from the left-hand side of the tractor.



Refitting

- Refitting is the reverse of removal.

★ Make sure the sensor is installed the right way round.

LIFT POSITION SENSOR

Checking

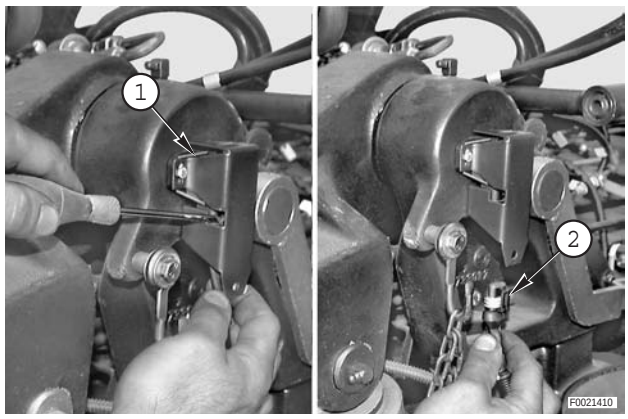
Switch off the engine and remove the key from the ignition.

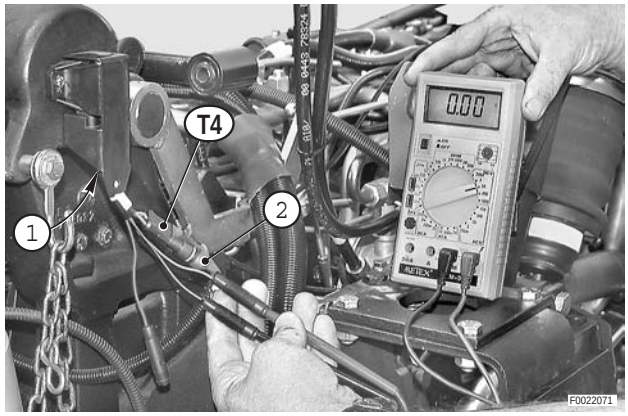
1 - Cut the retaining strap and, using a thin blade, disconnect the connector (2) from the position sensor (1).

2 - Connect the test lead *T4* (code 5.9030.743.0) between connector (2) and sensor (1).

3 - Start the engine and with a multimeter check that the supply voltage and the signal voltages with the lift raised and lowered are within the specified ranges:

- ★ Power supply voltage (red - blue wires): 5.5±1V (DC)
- ★ Signal voltage with lift raised (brown-blue wires): greater than or equal to 0.5Vdc
- ★ Signal voltage with lift lowered (brown-blue wires): less than or equal to 4.5Vdc
- ★ If the voltage readings are not within the specified ranges, renew the sensor.

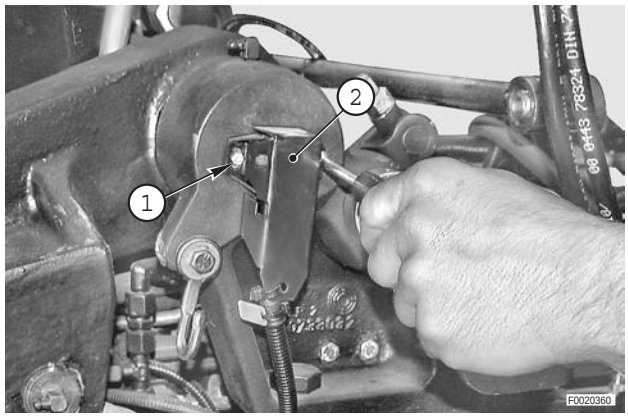




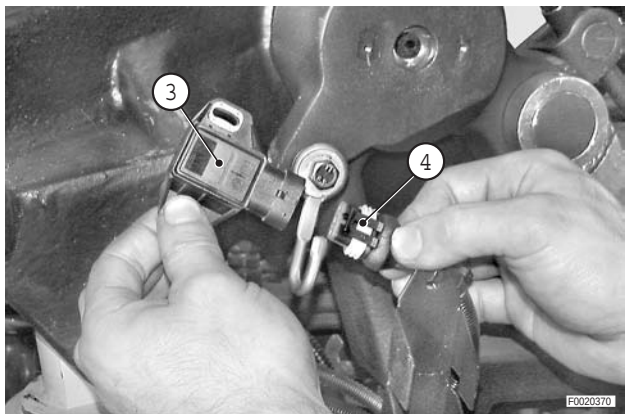
Removal

Switch off the engine and remove the key from the ignition.

1 - Remove screws (1) securing cover (2) and sensor.



2 - Remove sensor (3) and unplug connector (4).



Renewal of the position sensor bush (only if necessary)

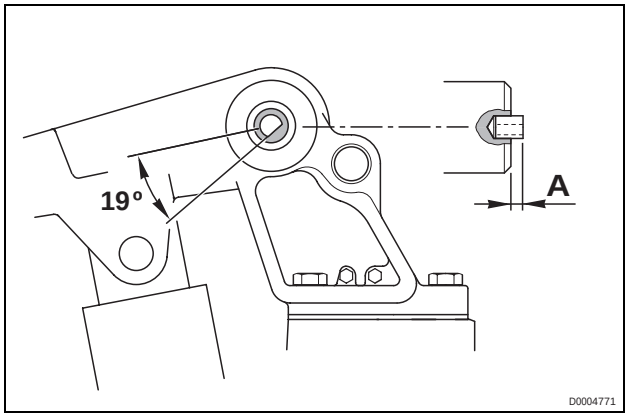
1 - After removing the worn bush, clean and degrease the seating.

Activator: Loctite 7649

2 - Apply sealant to the surfaces of the hole and fit the new bush, with the milled position at an angle of 19° and maintaining protrusion "*A*" of 4.5$^{0}_{-0.5}$ mm.

Sealant: Loctite 648

3 - Allow the sealant to cure for at least 30 minutes before fitting the sensor.



Refitting

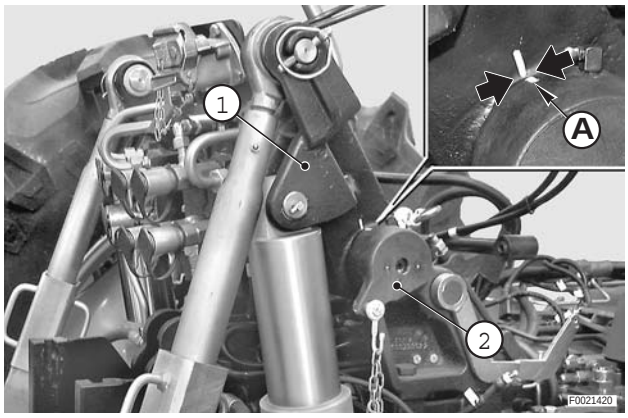
- Refitting is the reverse of removal.
  - ★ Before finally tightening the screws, rotate the sensor fully in a counter-clockwise direction; adjust the position sensor as described in the following paragraph.

Adjustment

1 - Detach any mounted implements from the 3-point linkage.

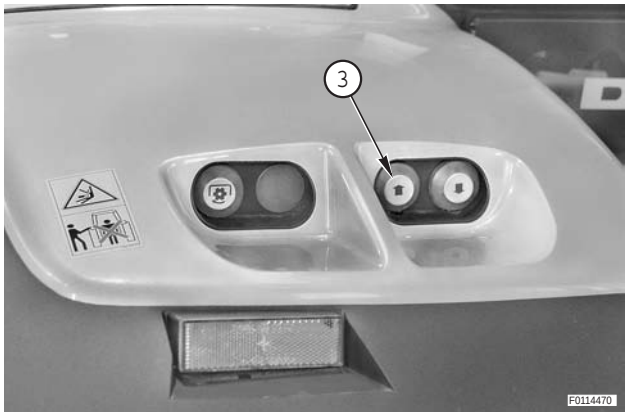
2 - With the engine stopped, raise the lift arms to their maximum height using suitable lifting equipment.

3 - Make reference marks "*A*" on lever (1) and on bearing support (2).

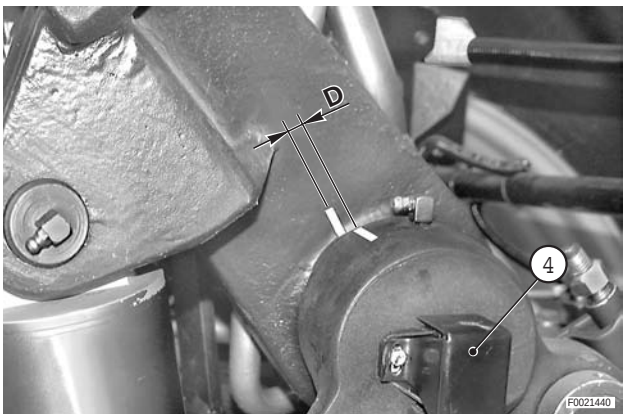


4 - Lower the lift to its maximum depth position.

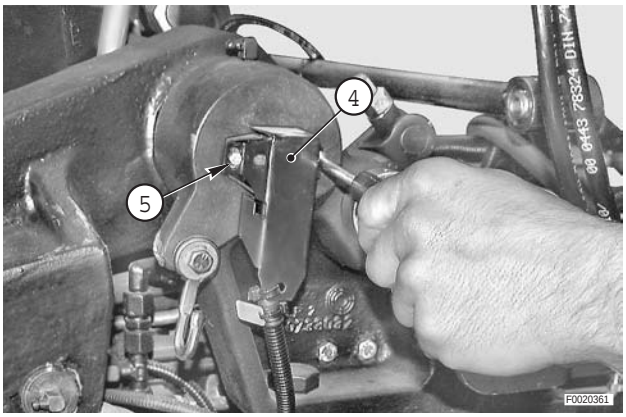
5 - Start engine, and while holding down external pushbutton (3), command lift upward movement until lift reaches stop. Keep pressing button (3) while simultaneously turning position sensor (4) clockwise.



6 - As sensor (4) is rotated, the lift will start to rise; release pushbutton (3) and stop rotating sensor when the reference marks made in step 3 are separated by distance of "*D*" of 5÷6 mm (0.20 - 0.24 in).



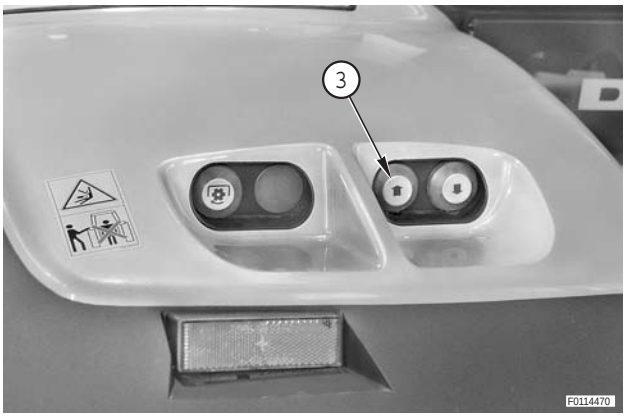
7 - Fix sensor (4) in position by tightening the screws (5).



8 - Check the adjustment by first lowering the lift (using external pushbutton (3)) to an intermediate position and then raising continuously until lift stops, which must occur in compliance with the offset between the marks applied in step 6, without reaching the mechanical limit stop and hence without over-pressurising the hydraulic system.

9 - If necessary, alter the position of the sensor by turning it a few degrees in a counter-clockwise direction.

10 - Calibrate the sensor.
(For details, see 4.4.6 CALIBRATION OF THE LIFT HIGH AND LOW POSITIONS in section 20).



AUXILIARY SERVICES CONTROL VALVE

Removal

1 - Park the tractor on level ground and lower the rear lift and the front suspension fully.

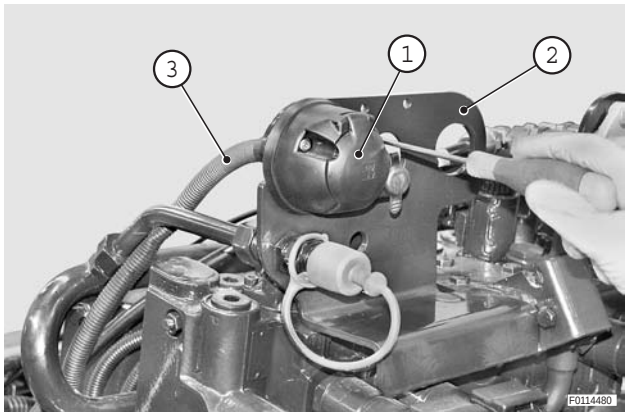
2 - Apply the parking brake and remove the key from the ignition.

3 - Clean control valve thoroughly and dry the area, paying special attention to the part facing the tractor cab.

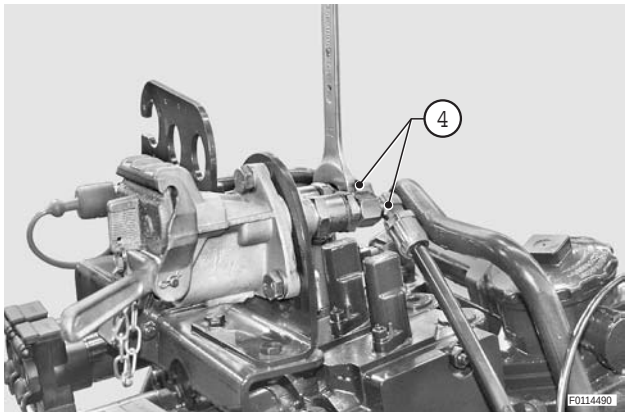
4 - Plug the pipes and ports immediately to prevent the ingress of dirt.

Discharge any residual pressure from the trailer braking system.

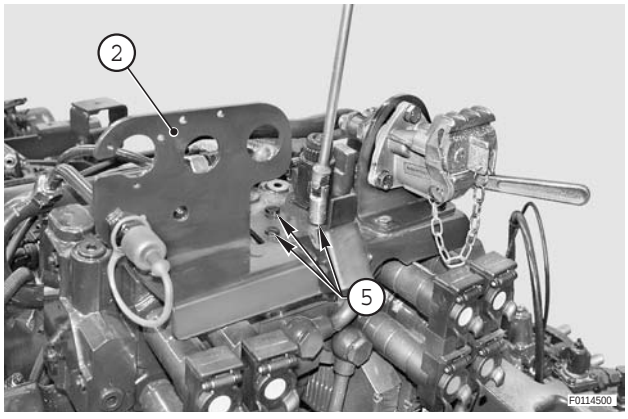
1 - Disconnect trailer coupler (1) from support (2) and remove line (3).



2 - Disconnect trailer braking lines (4).

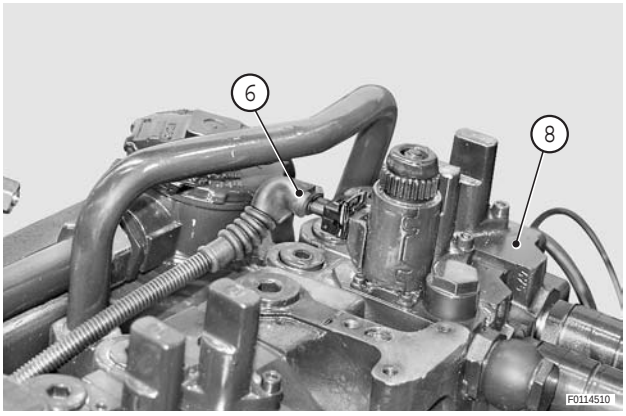


3 - Remove screws (5) and remove support (2).

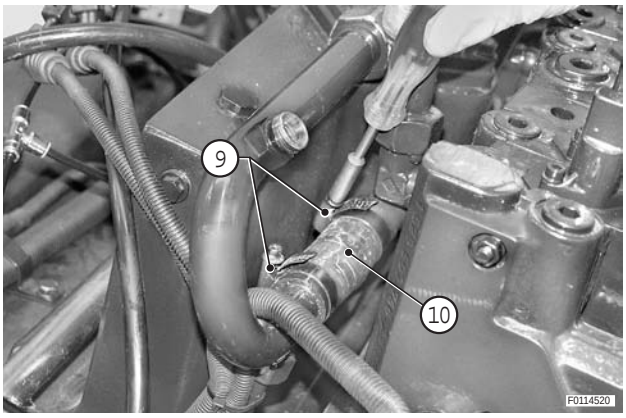


4 - Disconnect connectors (6) (DW) and (7) (UP) from lift unit control valve (8).

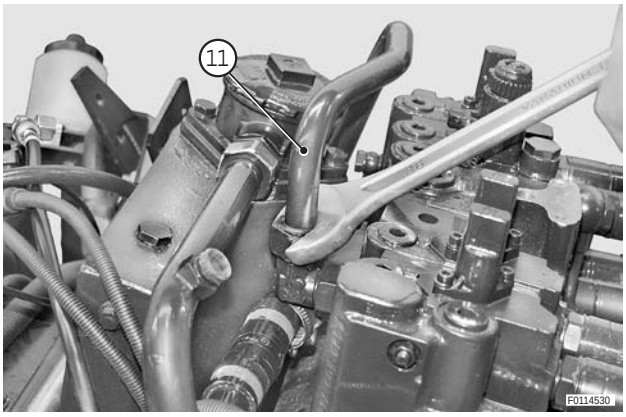
※ 1



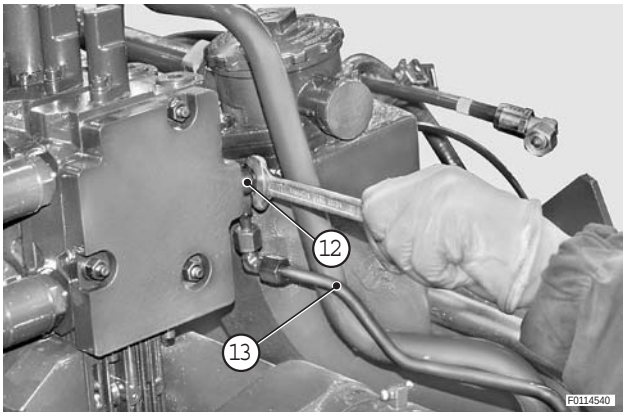
5 - Loosen clamps (9) and move hose (10).



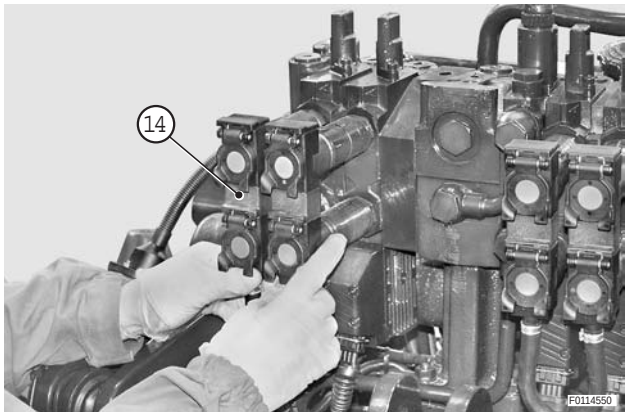
6- Disconnect delivery pipe (11).



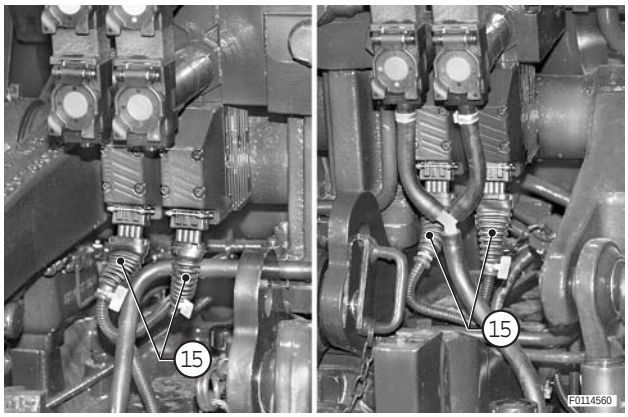
7 - Remove union (12) and disconnect load sensing line (13).



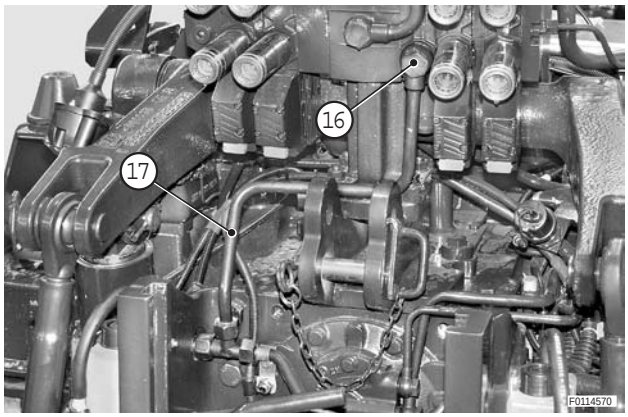
8 - Remove oil collector protections (14) from the couplers.



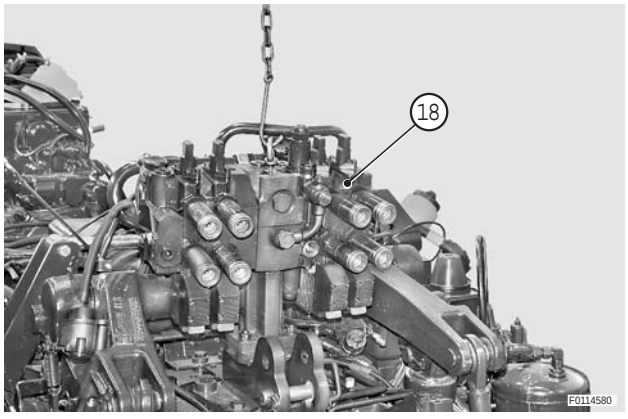
9 - Disconnect control valve connectors (15).
★ Label connectors to avoid confusion on refitting.



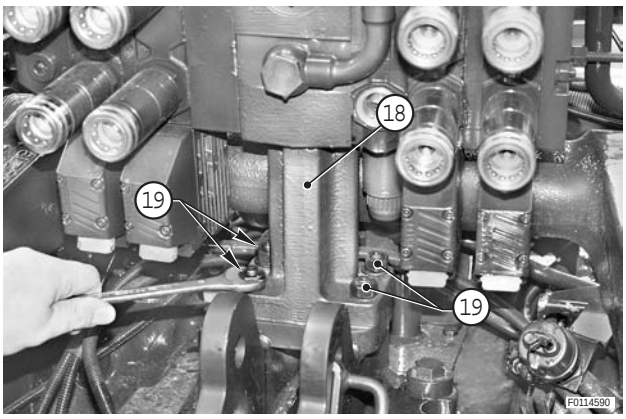
10 - Remove union (16) and remove pipe (17).



11 - Connect control valve units (18) to a lifting device and take the strain with the rope.



12 - Remove nuts (19) and remove control valves unit (18).



Refitting

- Refitting is the reverse of removal.

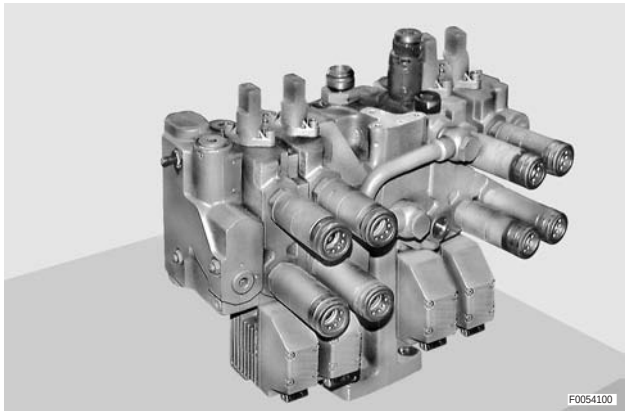
⁘ 1

★ Position the connectors on the solenoids of the upper lift control valve
DW upper (6)
UP lower (7)

1 - Start the engine and fully raise and lower the lift a number of times to expel air from the circuits and check for leaks.

Disassembly

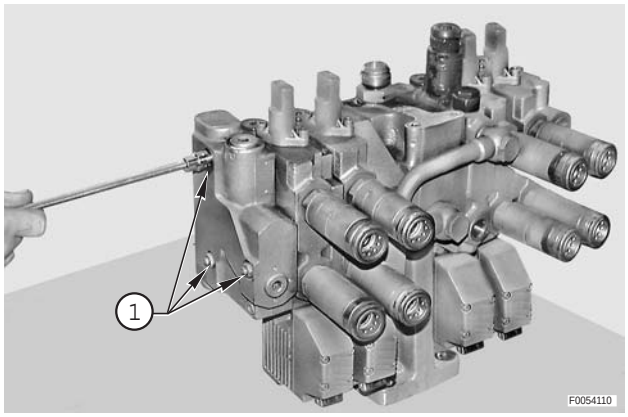
★ The control valves are assembled in stacks and should only be disassembled in order to renew the individual sections or in the event of leaks between the sections; any overhaul of the control valves should be carried out directly by the manufacturer or an authorised service centre.



1 - Loosen and remove the nuts (1) securing the valve sections to be removed.

★ Loosen the nuts gradually and sequentially to accommodate the expansion of the seals between the sections.

※ 1



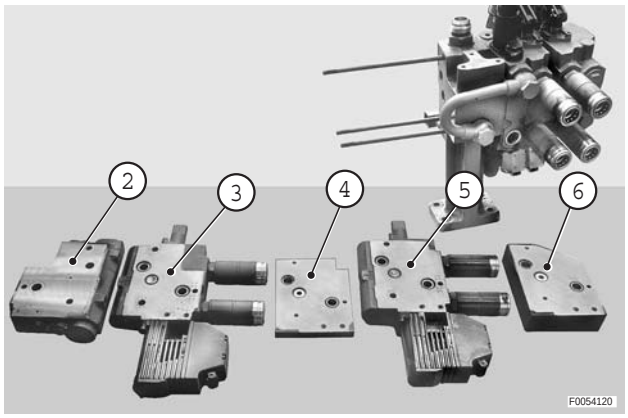
Left hand control valve

2 - First remove end cover (2), then the first solenoid operated valve section *RP* (3), spacer (4), second solenoid operated valve section FP (5) and subplate (6) (or trailer braking valve).

※ 1 ※ 2

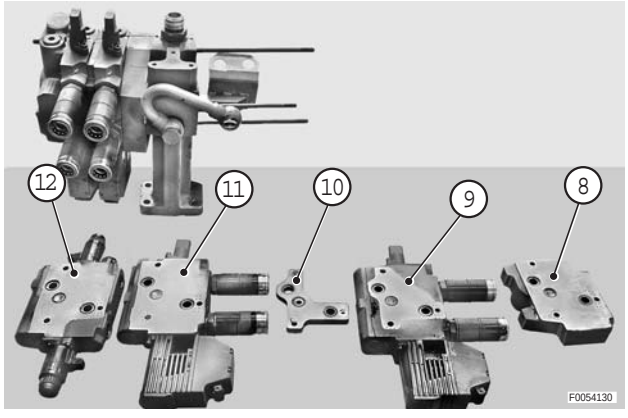
⚠ Recover the distance washers located between the sections, and make a note of their positions (For details refer to the assembly operations).

※ 3



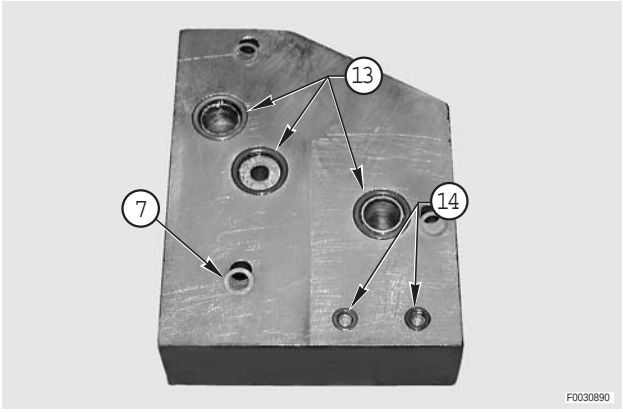
Right hand control valve

3 - Repeat the steps as described for the left hand control valve.
(Parts 8-9-10-11-12) ※ 1 ※ 2 ※ 3



Assembly

- To reassemble, repeat the above steps in reverse order.



※ 1

★ Before bringing the valve sections, spacers and plates together, make certain that O-rings (13) and (14) are correctly positioned.

★ To keep the O-rings in place, smear the seats with grease.

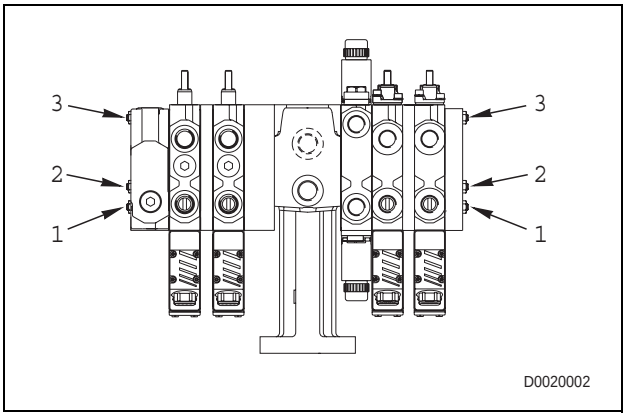
★ Be careful not to confuse the position of the O-rings with that of the distance washers.

※ 2

Nm Tightening torque for nuts:
30 ♀ 3 Nm (22 ♀ 2.2 lb.ft.)

★ Nut tightening sequence:
1 - 2 - 3 (see figure alongside)

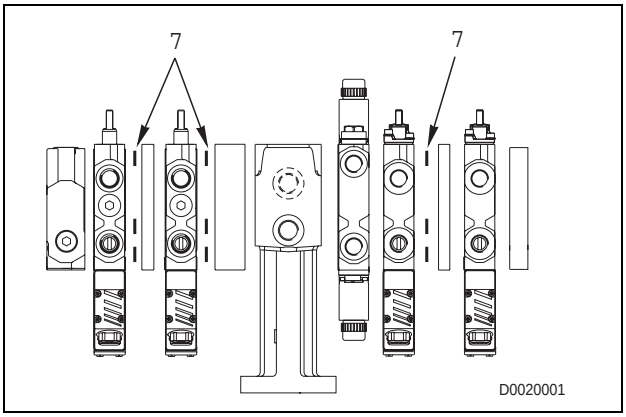
★ Tighten the nuts a little at a time, observing the prescribed sequence.

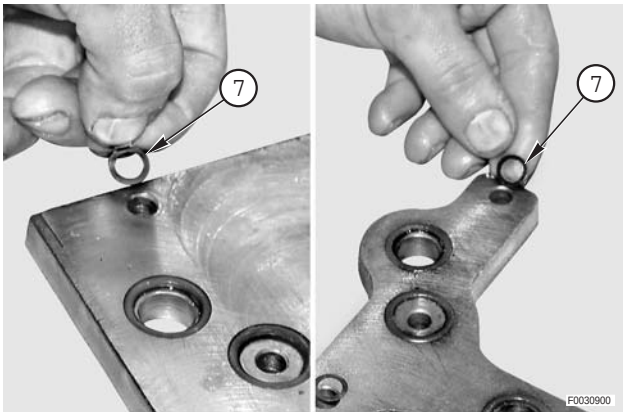


※ 3

★ Locate the distance washers (7) as illustrated in the figure alongside.

⚠ The distance washers (7) must be located only between the surfaces of sections with no markings.





SECTION 40

CONTENTS

STRUCTURE OF THE UNIT

For easier consultation, this unit has been divided into the following chapters:

1. INTRODUCTION

Contains a brief description of the terminology used, the procedures to follow for troubleshooting and repairs, and the instruments required for troubleshooting.

2. INDEXES

Contains the indices arranged by connector name, by component code and by component description.

3. COMPONENTS

Contains the layouts of the connectors used in the electrical system, descriptions of the components installed on the tractor,the technical data necessary for functional testing and the pinouts of the electronic control units.

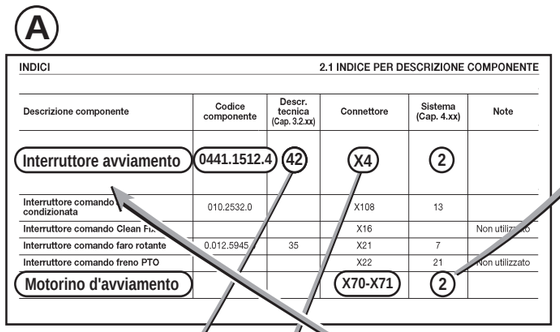
4. SYSTEMS

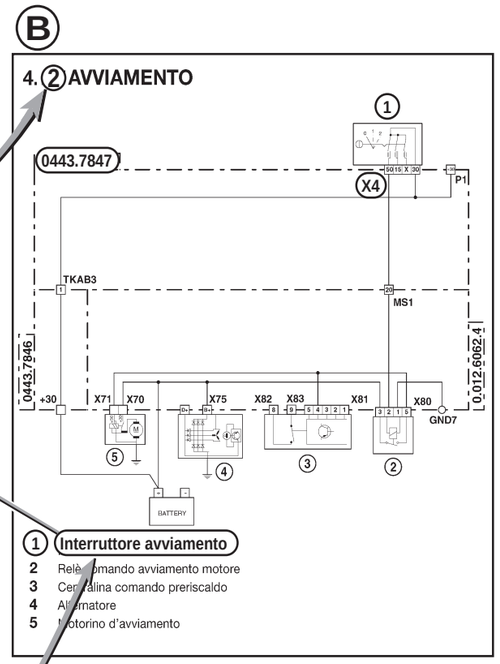
Contains the electrical diagrams of the tractor's systems.

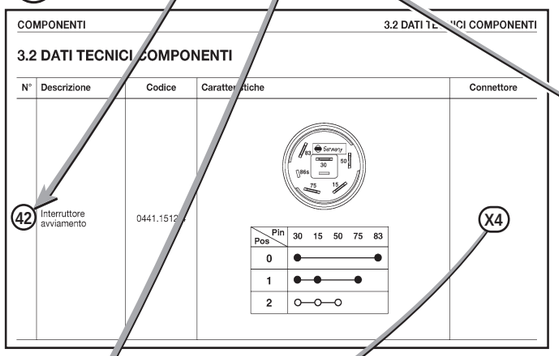
5. WIRING LOOMS

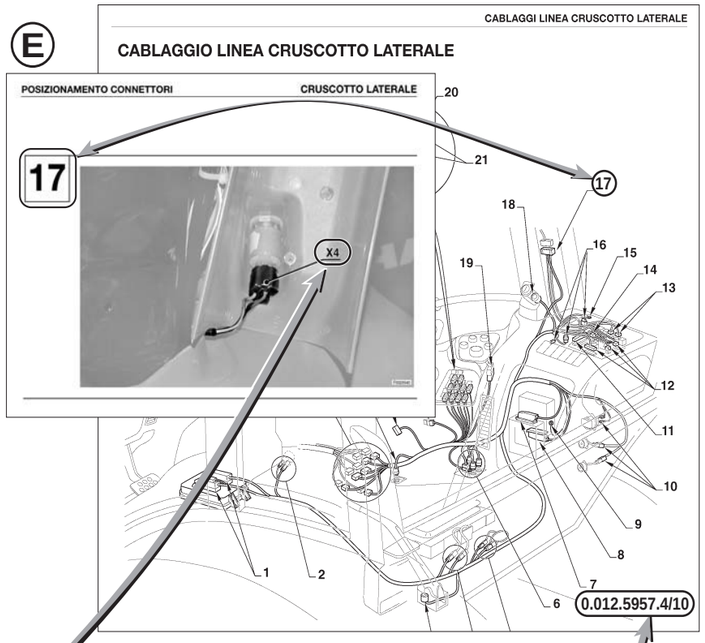
Contains the layouts, the wiring diagrams and the positioning of connectors on the tractor.

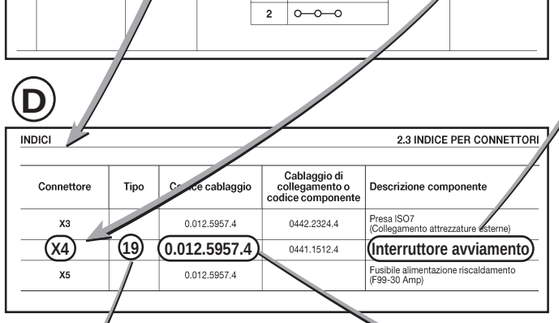
HOW TO CONSULT THE UNIT

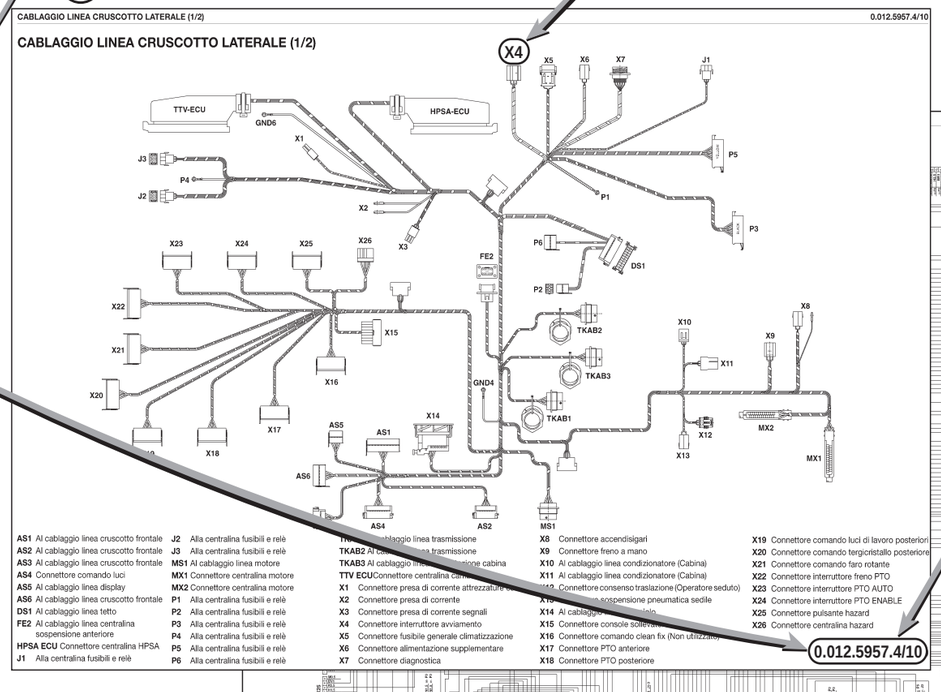


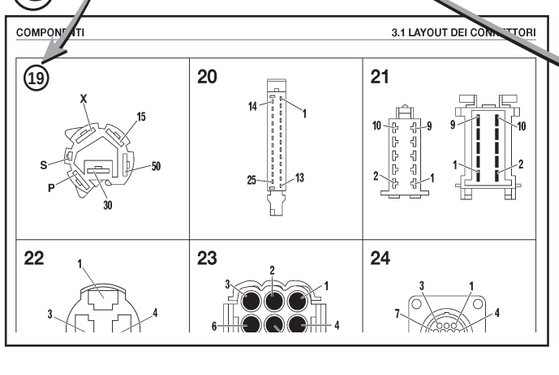












Consultation example

The quickest way to determine the cause of a malfunction of a component is to check all the components in the system in which the component is incorporated.
In the example given on this page the simulated fault is a malfunctioning starter motor that fails to start the engine.

1 - Look in heading «*2.1. Component description index*» for the starter motor and determine the system in which it is incorporated.
The system is indicated in the column «*System (heading 4.xx)*» and in this case it is "*2*" (figure A).

2 - Consult heading «*4.2 Starting*» (figure B) where all system components are shown in the electrical diagram; these components are accompanied by numbers that correspond to the key on the same page.

3 - Check all the components in the system, starting, for example, with switch "*1*".

4 - Look in heading «*2.1. Component description index*» (figure A) for "*Starting enabling switch*" and check in the column «*Technical Descr'n (heading 3.2.xx)*» whether there is a technical description (in this case it is shown under n° 42 in the heading «*3.2 component technical data*») (figure C).
Take note also of the name of the connector to which the component is connected (in this case "*X4*").

Only if the position of the component on the tractor is not known

5 - Look in paragraph «*2.3 Connector index*» (figure D) for the name of the connector to which the component is connected (in this case "*X4*") and note down the wiring loom in which it is incorporated (in this case "*0.012.5957.4*") and the type of connector (in this case "*19*").

6 - Look for the wiring loom in chapter «*5. Layouts, electrical wiring diagrams, connector positions*» using the index at the beginning of the chapter.

7 - Look for the name of the connector in the photos attached to the electrical diagrams and determine its position on the tractor from the drawing (figure E).
NOTE.
The wiring diagrams (figure F) contain the names and descriptions of the connectors that are used in all the tables of chapter 2.

8 - Using the data contained in heading «*3.2 Component technical data*» (figure C) in position no. *42*, check operation of the switch.

⚠ If the pinout of the connector is not known, look in heading «*3.1 Connector layouts*» (figure G) for the number found in the "*Type*" column of the «*2.3 Connector index*» heading.

1. INTRODUCTION

This section of the workshop manual is intended as a practical guide to troubleshooting the tractor's electrical and electronic systems.

The following pages provide the technician with all the necessary information regarding the tractor's systems and components.

Due to the possible time difference between the introduction of technical modifications (in line with our policy of continuous product improvement) and the corresponding amendment of our printed documentation, we are obliged to state that the data contained in this document are subject to modification and as such are not binding.

1.1 LIST OF WIRING HARNESSES

1.2 DEFINITION OF COMPONENTS AND SYMBOLS

To prevent any misunderstanding or ambiguity, listed below are definitions for some of the key terms used in this unit.

TERM	*DESCRIPTION*
Connector	Element used to connect two components (e.g. wiring-switch, wiring-wiring)
Temperature sensor	Electrical component that converts the temperature of a medium (air, water, oil, etc.) into a voltage or resistance
Pressure sensor	Electrical component that converts the pressure of a medium (air, water, etc.) into a voltage or resistance
Position sensor	Electrical component that converts the angular or linear position of an object into a voltage
Pressure switch	Switch that changes state (opens or closes a contact) according to the operating pressure in the circuit in which it is installed
Thermostat	Switch that changes state (opens or closes a contact) according to the temperature of the medium in which it is immersed.
Lights switch	Mechanical component that opens or closes one or more electrical contacts.
Solenoid valve	Valve operated by applying electrical current to a coil (or solenoid)

Chapter “3.2 Description of components” shows the wiring diagrams for certain switches and buttons.
The following symbols are used for ease of interpretation:

SYMBOL	*DESCRIPTION*
	Contact between pins CLOSED (stable switch position)
	Contact between pins CLOSED (unstable switch position)
	Indicator LED
	Indicator lamp
	Diode

1.3 GENERAL RULES

The inspection, maintenance, troubleshooting and repair operations are essential to ensure that the tractor continues to operate correctly over time and to prevent malfunctions and breakdowns.

The scope of this paragraph is to describe repair procedures and to help improve the quality of repairs.

1.3.1 MODIFICATION OF THE TRACTOR'S ELECTRICAL/ELECTRONIC CIRCUITS

The manufacturer prohibits any modification or alteration of the electrical wiring for the connection of any non-approved electrical applicances or components.

In particular, if it is discovered that the electrical system or a component has been modified without authorisation, the Manufacturer will accept no liability for any damage to the vehicle and the vehicle warranty will be invalidated.

1.3.2 MAIN WIRING FAULTS

a. Poor contact between connectors

The main causes of poor contact between connectors are incorrect insertion of the male into the female connector, deformation of one or both connectors, and corrosion or oxidation of the pin contact surfaces.

b. Defective pin soldering or crimping

The pins of the male and female connectors make good contact in the crimped or soldered area, but the wires are subjected to excessive strain leading to breakage of the insulation of the wire itself and a poor connection.

c. Disconnecting wiring

If components are disconnected by pulling on the wires, or if components are removed with the wires still connected, or if the wiring is subject to heavy impact this could damage the connections at the pins, breaking strands of wire.

d. Penetration of water in connectors

The connectors are designed to prevent penetration of liquids (water, oil etc.); however, when the tractor is cleaned using high-pressure water or steam, water could penetrate into or condense inside the connectors.

As the connectors are designed to prevent liquid penetration, any water that does get in will not be able to drain out, and thus may cause short circuits across the pins.

For this reason it is good practice to dry the connectors with a low pressure jet of compressed air after washing the tractor.

e. Oil or dirt on connectors

Oil or grease on the connectors or pins can create a poor contact (oil and grease are non-conductors) .
Clean the connectors thoroughly using a dry cloth or a low pressure jet of compressed air and use specific products (deoxidising sprays, etc.) to degease the contacts.

- ★ Take care not to bend the pins when cleaning them.
- ★ Use dehydrated not lubricated compressed air.

1.3.3 REMOVAL, REFITTING AND DRYING OF CONNECTORS AND WIRING

a. Disconnection of connectors

When disconnecting wiring, pull on the connectors rather than on the wires themselves.
For connectors that are held in position with screws or levers, fully loosen the screws, then pull on the connector.
For connectors that are clipped together, fully depress the clip then pull the connector apart.
After disconnecting connectors, cover them in a waterproof material to prevent dirt or moisture getting into the contacts.

b. Connecting the connectors

Inspect the connectors to check their condition:

- Make sure the pin contact surfaces are free of water, dirt or oil.
- Check that the connectors are not deformed and that the pins are not corroded.
- Check that the connector casings are not damaged or split.

★ If a connector is contaminated with oil or grease, or if moisture has penetrated the casing, clean it as described in paragraph 1.3.2.

★ If a connector is damaged, deformed or broken, replace it with a new one.

When inserting connectors, make sure they are properly aligned before applying any force.
For connectors with clips, insert the two halves until they clip together.

c. Cleaning and drying wiring

When wiring is dirty or contaminated with oil or grease, clean it with a dry cloth, or, if necessary, with water or steam.
If the wiring has to be cleaned with water, avoid directing the water or steam jet on the connectors; if water penetrates the connector, proceed as described in paragraph 1.3.2.

★ Check that the connector is not short circuited by water by testing the continuity across the pins.

★ After checking that the connector is good condition, degrease the contacts using a deoxidising product.

d. Renewal of damaged electrical components.

- When replacing electrical components (fuses, relays, etc.), use only original parts supplied by the manufacturer.
- When replacing fuses, check that the new fuse conforms to DIN 72581 or ISO 8820 standards and in particular:
  - fuse F1 (100A) DIN 72581/2
  - bayonet fuse (F2, F3, etc.) DIN 72581/3C
  - fuse F51 (100A) and F52 (200A) ISO 8820

  The fitting of replacement fuses that do not comply with these standards will invalidate the warranty with immediate effect and release the manufacturer from all liability.
- When replacing relays, make sure that the new relay conforms to the standards marked on the original relay.

1.4 DIAGNOSTIC INSTRUMENTS

For the correct diagnosis of any faults in the tractor's electrical system, the following instruments are required:

1 - *Digital multimeter* with the following minimum characteristics:
AC VOLT 0-600
DC VOLT 0-600
OHM..... 0-32M
AC AMP..... 0-10
DC AMP 0-10

2 - *Computer* with "*SERDIA*" and "*EDS*" software installed

3 - *All Round Tester* or *computer "PCTESTER"* software installed

1.5 WIRE COLOUR CODES

COLOUR CODES	
A	Light blue
B	White
C	Orange
G	Yellow
H	Grey
L	Blue

COLOUR CODES	
M	Brown
N	Black
R	Red
S	Pink
V	Green
Z	Purple

2. INDEXES

2.1 INDEX BY PART DESCRIPTION

Component description	Component part number	Technical descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)	Notes
Cigar lighter	2.7099.770.0		X25	7	
Alternator	0118.2173		B+ D+	2-11	
Actuator	0211.2588	6	Y3	4	
Radio			X92	12	Manual air conditioner
Horn			X60	5-6	
Battery			+30 +30A +30B		
Armrest	0.014.3360.4		X11	4-7-11-18-19-21	4 directional control valves version
Armrest	0.014.3358.4		X11	4-7-11-18-19-21	2 directional control valves version
Hazard lights control unit	2.8639.007.0/10		X43	5-6	
HLHP Control unit	2.8519.038.0/30		HLHP1 - HLHP2	7-13-14-15-16-17-18-19-20-21	
Engine control unit	0421.3098		MX1 - MX2	2-3-4-7-21	
Transmission control unit	2.8519.028.0/10		GEARBOX	2-7-16-21	
Fan speed selector switch			X77	13	Manual air conditioner
Fan speed selector switch			X80	13	Manual air conditioner
Air conditioning compressor	0443.7338		X56	13	
Lift control console	0.013.8345.4/20		X47	18	
Transmission display	0441.9280.4		X33	16	
Preheating device	0428.4880		X67	3	
Directional control valve 1	0445.1872		D1	20	
Directional control valve 2	0445.1872		D2	20	
Directional control valve 3	0445.1872		D3	20	
Directional control valve 4	0445.1872		D4	20	
Gearbox in neutral locking solenoid valve	0.010.3343.0		LOCK SV	16	
Differential lock control solenoid valve	0442.3824		DIFF SV	17	
Front axle suspension 'Down' solenoid valve			DW	15	
4WD control solenoid valve	0443.1661	5	4WD SV	17	
Front PTO engagement solenoid valve			PTO 1 SV	19	
Rear PTO control solenoid valve	0.010.2628.2		PTO 2 SV	19	
Front axle up control solenoid valve			UP	15	

Component description	Component part number	Technical descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)	Notes
Lift Down solenoid valve			DW SV	18	
Trailer parking brake solenoid valve	0.900.0397.9		X69	14	
"FIELD" mode solenoid valve	0443.1661	5	F SV	16	
"ROAD" mode solenoid valve	0443.1661	5	R SV	16	
Main clutch proportional solenoid valve	0443.4425	7	P SV	16	
Lift Up solenoid valve			UP SV	18	
Gear change solenoid valves (Y1, Y2, Y3, Y4)	0441.6685	33	X52	16	
Right headlamp	2.8039.240.0		X62	5-6	For driving on the right
Right headlamp	2.8039.250.0		X62	5-6	For driving on the left
Right headlamp on arms	2.8059.528.0		G34	6	For driving on the right with lift
Right headlamp on arms	2.8059.527.0		G34	6	For driving on the left with lift
Left headlamp	2.8039.240.0		X61	5-6	For driving on the right
Left headlamp	2.8039.250.0		X61	5-6	For driving on the left
Left headlamp on arms	2.8059.528.0		G32	6	For driving on the right with lift
Left headlamp on arms	2.8059.527.0		G32	6	For driving on the left with lift
RH rear direction indicator	2.8059.500.0		X65 (RH)	5-6-14	
LH rear direction indicator	2.8059.510.0		X65 (LH)	5-6-14	
Front RH outer worklight	2.8039.160.0		C2	8-9	
Front LH outer worklight	2.8039.160.0		C1	8-9	
RH rear sidelight and brake light	2.8059.500.0		X66 (RH)	5-6-14	
LH rear sidelight and brake light	2.8059.510.0		X66 (LH)	5-6-14	
Number plate light	2.8059.526.0		X71 - X72	5-6	Manual air conditioner
RH direction indicator and sidelight	2.8039.270.0		X115	5-6	On arms
LH direction indicator and sidelight	2.8039.280.0		X114	5-6	On arms
Right-hand supplementary light	2.8039.296.0		X117	8-9	On arms
Left-hand supplementary light	2.8039.296.0		X116	8-9	On arms
Right-hand front worklight on cab	2.8039.295.0/ 10		X103	9	Version with electric demisting rearview mirrors
Right-hand front worklight on cab	2.8039.295.0/ 10		X103	8	Version without electric demisting rearview mirrors
Right-hand front worklight on cab	2.8039.295.0/ 10		X105	9	Version with electric demisting rearview mirrors

Component description	Component part number	Technical descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)	Notes
Left-hand front worklight on cab	2.8039.295.0/10		X104	9	Version with electric demisting rearview mirrors
Left-hand front worklight on cab	2.8039.295.0/10		X104	8	Version without electric demisting rearview mirrors
Left-hand front worklight on cab	2.8039.295.0/10		X106	9	Version with electric demisting rearview mirrors
Right-hand rear worklight on cab	2.8039.295.0/10		X107	9	Version with electric demisting rearview mirrors
Right-hand rear worklight on cab	2.8039.295.0/10		X107	8	Version without electric demisting rearview mirrors
Right-hand rear worklight on cab	2.8039.295.0/10		X109	9	Version with electric demisting rearview mirrors
Left-hand rear worklight on cab	2.8039.295.0/10		X108	9	Version with electric demisting rearview mirrors
Left-hand rear worklight on cab	2.8039.295.0/10		X108	8	Version without electric demisting rearview mirrors
Left-hand rear worklight on cab	2.8039.295.0/10		X110	9	Version with electric demisting rearview mirrors
Rotating beacon	2.6039.017.0		X99	5-6	
Infocenter	0443.3422.4/20		X17 - X18	3-5-6-7-11-14-21	
ASM switch (not utilised)			X39		
Starter switch	0441.1512.4	28	X38	2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21	
Differential lock control switch (not utilised)			X40		
Lift lock control switch (not utilised)			X48		
Rear worklights switch	0.012.5954.4	31	X82	8-9	Manual air conditioner
Switch for worklights on arms	0.012.5943.4	23	X111	8-9	Version with worklights on arms
Rotating beacon on/off switch	0.012.5945.4	37	X81	5-6	Manual air conditioner
Door open warning light switch	2.7659.255.0	30	X83	7	Manual air conditioner
Low/full beam headlights switch	0.012.5941.4	21	X112	6	Version without worklights on arms
Recirculation switch			X79	13	Manual air conditioner
Rearview mirror demister switch	0.013.7108.4		X87	7	Manual air conditioner
Power lift control switch (not utilised)			X20		

Component description	Component part number	Technical descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)	Notes
Front axle suspensions switch (not utilised)			X42	15	
Rear screen wiper switch	0.012.5946.4	29	X86	10	Manual air conditioner
Start enable switch (Green)	0441.6066	15	S	2	
Front worklights switch	0.012.5943.4	23	X22	8-9	
Handbrake switch	0439.1395	17	X8	14	
Hazard warning lights switch	0.013.1330.4	24	X23	5-6	
4WD engagement switch (not utilised)			X41		
Front PTO engagement switch	0.012.5951.4/ 10	27	X37	19	
AUTO PTO engagement switch	0.012.5948.4/ 10	20	X15	19	
Rear PTO engagement switch	0.012.5950.4/ 10	19	X14	19	
Sidelights switch	0.012.5940.4	25	X24	5-6-7-8-9-12-13-14-15-16-17-18-19	
Right brake pedal switch	0439.1395	17	X35	14-17	
Left brake pedal switch	0439.1395	17	X34	14-17	
Gearbox control lever	0.014.4950.4		X45 -X46	16	
Shuttle control lever	0.012.7076.4		X63	16	
Courtesy light	2.8339.074.0		X85	7	Manual air conditioner
Manual air conditioner control panel lights			X78	13	Manual air conditioner
Compressed air gauge	0442.5709	18	X12 - X13	14	
Right-hand recirculation motor	0.013.2142.0		X73	13	Manual air conditioner
Left-hand recirculation motor	0.013.2142.0		X74	13	Manual air conditioner
Windscreen wiper motor	2.9019.200.0/ 10		X100	10	
Rear screen wiper motor	2.9019.190.0		X91	10	Manual air conditioner
Right-hand fan motor	0.900.0035.3		X90	13	Manual air conditioner
Left-hand fan motor	0.900.0035.4		X88	13	Manual air conditioner
Starter motor			+30C +50	2	
Interior roof light	2.8339.231.0		X75	7	Manual air conditioner
Windscreen washer pump	0.013.8360.0		X2	10	
Rear screen washer pump	0.013.8360.0		X1	10	
Supplementary CANBUS socket			X3	21	
Power socket	2.6039.020.0		X10	7	

Component description	Component part number	Technical descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)	Notes
Diagnostic socket			X4	7	
ISO4 socket (power supply to implements)	0442.2323.4		X9	18	
Trailer socket			X53	5-6-14	
Air conditioning pressure switch			X54	13	
Trailer braking low pressure switch	0.900.0064.4		X70	14	
Transmission oil low pressure switch	0443.1690	1	18 BAR	16	
Steering system pressure switch			X51	11	
Engine oil pressure switch	0118.2227	32	X50	11	
HOLD" button (not utilised)			HOLD	4	
Rear lift Down Rx pushbutton	2.7659.182.0	4	DW (RH)	18	
RH rear PTO button (on mudguard)	2.7659.177.0/ 20	12	PTO (RH)	19	
RH rear lift up button	2.7659.182.0	4	UP (RH)	18	
LH rear lift down button	2.7659.182.0	4	DW (LH)	18	
LH rear PTO button (on mudguard)	2.7659.177.0/ 20	12	PTO (LH)	19	
LH rear lift up button	2.7659.182.0	4	UP (LH)	18	
Radar	0.008.8048.4/ 10	13	RADAR	18	
Radar (UK)	0.010.7172.4	14	RADAR	18	
Driver's seat	0.014.5564.4		X7	7	
Steering angle sensor	0.900.0081.4		X55	17	
Field/road sensor	0.900.0277.8		X59	16	
Air cleaner clogged sensor			X49	11	
Fuel level sensor	2.7059.823.0/ 10	34	X58	11	
Hand throttle position sensor (not utilised)			GAS	4	
Accelerator pedal position sensor	0442.9390/10		X16	4	
Clutch pedal position sensor	0443.2708	26	X26	16	
Rear lift position sensor	0443.8667.0	11	POS	18	
Front axle suspension position sensor	0.009.2194.4/ 10	35	X64	15	
Trailer braking pressure sensor	0.011.9428.0	36	X68	14	
Trailer braking pressure sensor	0.011.9428.0	36	X68	14	
Clutch pedal depressed proximity sensor	0442.4165/10	22	X21	16	
Lift draft sensor (right)	0.014.3972.4		R	18	
Lift draft sensor (left)	0.014.3972.4		L	18	
Engine boost pressure sensor	0419.4078		B48	4	
Fuel temperature sensor	0419.9809	2	B37	4	

Component description	Component part number	Technical descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)	Notes
Engine coolant temperature sensor	0419.9809	2	B43	4	
Transmission oil temperature sensor	0441.6649	8	GEAR TEMP	16	
Clutch speed sensor	0443.4551		NHK	16	
Gearbox input shaft speed sensor	0443.4551		NLSE	16	
Rear PTO speed sensor	0443.8352		PTO	19	
Camshaft speed sensor	0419.9792	3	B40	4	
Wheel speed sensor	0443.8450	9	NAB	16	
Gearbox output shaft speed sensor	0443.8449	10	NLSA	16	
Creeper engagement sensor	0443.6527	16	X5	2	
Brake fluid level sensor			X57	14	
Right-hand rearview mirror with electric demisting	0.014.2021.4		X101	7	Version with electric demisting rearview mirrors
Left-hand rearview mirror with electric demisting	0.014.2022.4		X102	7	Version with electric demisting rearview mirrors
Right-hand tweeter	0.012.1725.0		X30	12	
Left-hand tweeter	0.012.1725.0		X27	12	
Right-hand woofer	0.013.2161.0		X84	12	Manual air conditioner
Left-hand woofer	0.013.2161.0		X76	12	Manual air conditioner

2.2 INDEX BY PART CODE

Code	Description	Technical descr'n (Chap. 3.2.xx)	Connector	System (head. 4.xx)	Notes
0118.2173	Alternator		B+ D+	2-11	
0118.2227	Engine oil pressure switch	32	X50	11	
0211.2588	Actuator	6	Y3	4	
0419.4078	Engine boost pressure sensor		B48	4	
0419.9792	Camshaft speed sensor	3	B40	4	
0419.9809	Fuel temperature sensor	2	B37	4	
0419.9809	Engine coolant temperature sensor	2	B43	4	
0421.3098	Engine control unit		MX1 - MX2	2-3-4-7-21	
0428.4880	Preheating device		X67	3	
0439.1395	Handbrake switch	17	X8	14	
0439.1395	Right brake pedal switch	17	X35	14-17	
0439.1395	Left brake pedal switch	17	X34	14-17	
0441.6066	Start enable switch (Green)	15	S	2	
0441.6649	Transmission oil temperature sensor	8	GEAR TEMP	16	
0441.6685	Gear change solenoid valves (Y1, Y2, Y3, Y4)	33	X52	16	
0442.3824	Differential lock control solenoid valve		DIFF SV	17	
0442.5709	Compressed air gauge	18	X12 - X13	14	
0443.1661	4WD control solenoid valve	5	4WD SV	17	
0443.1661	"FIELD" mode solenoid valve	5	F SV	16	
0443.1661	ROAD" mode solenoid valve	5	R SV	16	
0443.1690	Transmission oil low pressure switch	1	18 BAR	16	
0443.2708	Clutch pedal position sensor	26	X26	16	
0443.4425	Main clutch proportional solenoid valve	7	P SV	16	
0443.4551	Clutch speed sensor		NHK	16	
0443.4551	Gearbox input shaft speed sensor		NLSE	16	
0443.6527	Creeper engagement sensor	16	X5	2	
0443.7338	Air conditioning compressor		X56	13	
0443.8352	Rear PTO speed sensor		PTO	19	
0443.8449	Gearbox output shaft speed sensor	10	NLSA	16	
0443.8450	Wheel speed sensor	9	NAB	16	

Code	Description	Technical descr'n (Chap. 3.2.xx)	Connector	System (head. 4.xx)	Notes
0445.1872	Directional control valve 1		D1	20	
0445.1872	Directional control valve 2		D2	20	
0445.1872	Directional control valve 3		D3	20	
0445.1872	Directional control valve 4		D4	20	
0.008.8048.4/10	Radar	13	RADAR	18	
0.009.2194.4/10	Front axle suspension position sensor	35	X64	15	
0.010.2628.2	Rear PTO control solenoid valve		PTO 2 SV	19	
0.010.3343.0	Gearbox in neutral locking solenoid valve		LOCK SV	16	
0.010.7172.4	Radar (UK)	14	RADAR	18	
0.011.9428.0	Trailer braking pressure sensor	36	X68	14	
0.011.9428.0	Trailer braking pressure sensor	36	X68	14	
0.012.1725.0	Right-hand tweeter		X30	12	
0.012.1725.0	Left-hand tweeter		X27	12	
0.012.5940.4	Sidelights switch	25	X24	5-6-7-8-9-12-13-14-15-16-17-18-19	
0.012.5941.4	Low/full beam headlights switch	21	X112	6	Version without worklights on arms
0.012.5943.4	Switch for worklights on arms	23	X111	8-9	Version with worklights on arms
0.012.5943.4	Front worklights switch	23	X22	8-9	
0.012.5945.4	Rotating beacon on/off switch	37	X81	5-6	Manual air conditioner
0.012.5946.4	Rear screen wiper switch	29	X86	10	Manual air conditioner
0.012.5948.4/10	AUTO PTO engagement switch	20	X15	19	
0.012.5950.4/10	Rear PTO engagement switch	19	X14	19	
0.012.5951.4/10	Front PTO engagement switch	27	X37	19	
0.012.5954.4	Rear worklights switch	31	X82	8-9	Manual air conditioner
0.012.7076.4	Shuttle control lever		X63	16	
0.013.1330.4	Hazard warning lights switch	24	X23	5-6	
0.013.2142.0	Right-hand recirculation motor		X73	13	Manual air conditioner
0.013.2142.0	Left-hand recirculation motor		X74	13	Manual air conditioner

Code	Description	Technical descr'n (Chap. 3.2.xx)	Connector	System (head. 4.xx)	Notes
0.013.2161.0	Right-hand woofer		X84	12	Manual air conditioner
0.013.2161.0	Left-hand woofer		X76	12	Manual air conditioner
0.013.7108.4	Rearview mirror demister switch		X87	7	Manual air conditioner
0.013.8345.4/ 20	Lift control console		X47	18	
0.013.8360.0	Windscreen washer pump		X2	10	
0.013.8360.0	Rear screen washer pump		X1	10	
0.014.2021.4	Right-hand rearview mirror with electric demisting		X101	7	Version with electric demisting rearview mirrors
0.014.2022.4	Left-hand rearview mirror with electric demisting		X102	7	Version with electric demisting rearview mirrors
0.014.3358.4	Armrest		X11	4-7-11-18-19-21	2 directional control valves version
0.014.3360.4	Armrest		X11	4-7-11-18-19-21	4 directional control valves version
0.014.3972.4	Lift draft sensor (right)		R	18	
0.014.3972.4	Lift draft sensor (left)		L	18	
0.014.4950.4	Gearbox control lever		X45 -X46	16	
0.014.5564.4	Driver's seat		X7	7	
0.900.0035.3	Right-hand fan motor		X90	13	Manual air conditioner
0.900.0035.4	Left-hand fan motor		X88	13	Manual air conditioner
0.900.0064.4	Trailer braking low pressure switch		X70	14	
0.900.0081.4	Steering angle sensor		X55	17	
0.900.0277.8	Field/road sensor		X59	16	
0.900.0397.9	Trailer parking brake solenoid valve		X69	14	
0441.1512.4	Starter switch	28	X38	2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21	
0441.9280.4	Transmission display		X33	16	
0442.2323.4	ISO4 socket (power supply to implements)		X9	18	
0442.4165/10	Clutch pedal depressed proximity sensor	22	X21	16	
0442.9390/10	Accelerator pedal position sensor		X16	4	

Code	Description	Technical descr'n (Chap. 3.2.xx)	Connector	System (head. 4.xx)	Notes
0443.3422.4/20	Infocenter		X17 - X18	3-5-6-7-11-14-21	
0443.8667.0	Rear lift position sensor	11	POS	18	
2.6039.017.0	Rotating beacon		X99	5-6	
2.6039.020.0	Power socket		X10	7	
2.7059.823.0/10	Fuel level sensor	34	X58	11	
2.7099.770.0	Cigar lighter		X25	7	
2.7659.177.0/20	RH rear PTO button (on mudguard)	12	PTO (RH)	19	
2.7659.177.0/20	LH rear PTO button (on mudguard)	12	PTO (LH)	19	
2.7659.182.0	Rear lift Down Rx pushbutton	4	DW (RH)	18	
2.7659.182.0	RH rear lift up button	4	UP (RH)	18	
2.7659.182.0	LH rear lift down button	4	DW (LH)	18	
2.7659.182.0	LH rear lift up button	4	UP (LH)	18	
2.7659.255.0	Door open warning light switch	30	X83	7	Manual air conditioner
2.8039.160.0	Front RH outer worklight		C2	8-9	
2.8039.160.0	Front LH outer worklight		C1	8-9	
2.8039.240.0	Right headlamp		X62	5-6	For driving on the right
2.8039.240.0	Left headlamp		X61	5-6	For driving on the right
2.8039.250.0	Right headlamp		X62	5-6	For driving on the left
2.8039.250.0	Left headlamp		X61	5-6	For driving on the left
2.8039.270.0	RH direction indicator and sidelight		X115	5-6	On arms
2.8039.280.0	LH direction indicator and sidelight		X114	5-6	On arms
2.8039.295.0/10	Right-hand front worklight on cab		X103	9	Version with electric demisting rearview mirrors
2.8039.295.0/10	Right-hand front worklight on cab		X103	8	Version without electric demisting rearview mirrors
2.8039.295.0/10	Right-hand front worklight on cab		X105	9	Version with electric demisting rearview mirrors
2.8039.295.0/10	Left-hand front worklight on cab		X104	9	Version with electric demisting rearview mirrors

Code	Description	Technical descr'n (Chap. 3.2.xx)	Connector	System (head. 4.xx)	Notes
2.8039.295.0/10	Left-hand front worklight on cab		X104	8	Version without electric demisting rearview mirrors
2.8039.295.0/10	Left-hand front worklight on cab		X106	9	Version with electric demisting rearview mirrors
2.8039.295.0/10	Right-hand rear worklight on cab		X107	9	Version with electric demisting rearview mirrors
2.8039.295.0/10	Right-hand rear worklight on cab		X107	8	Version without electric demisting rearview mirrors
2.8039.295.0/10	Right-hand rear worklight on cab		X109	9	Version with electric demisting rearview mirrors
2.8039.295.0/10	Left-hand rear worklight on cab		X108	9	Version with electric demisting rearview mirrors
2.8039.295.0/10	Left-hand rear worklight on cab		X108	8	Version without electric demisting rearview mirrors
2.8039.295.0/10	Left-hand rear worklight on cab		X110	9	Version with electric demisting rearview mirrors
2.8039.296.0	Right-hand supplementary light		X117	8-9	On arms
2.8039.296.0	Left-hand supplementary light		X116	8-9	On arms
2.8059.500.0	RH rear direction indicator		X65 (RH)	5-6-14	
2.8059.500.0	RH rear sidelight and brake light		X66 (RH)	5-6-14	
2.8059.510.0	LH rear direction indicator		X65 (LH)	5-6-14	
2.8059.510.0	LH rear sidelight and brake light		X66 (LH)	5-6-14	
2.8059.526.0	Number plate light		X71 - X72	5-6	Manual air conditioner
2.8059.527.0	Right headlamp on arms		G34	6	For driving on the left with lift
2.8059.527.0	Left headlamp on arms		G32	6	For driving on the left with lift
2.8059.528.0	Right headlamp on arms		G34	6	For driving on the right with lift
2.8059.528.0	Left headlamp on arms		G32	6	For driving on the right with lift
2.8339.074.0	Courtesy light		X85	7	Manual air conditioner
2.8339.231.0	Interior roof light		X75	7	Manual air conditioner
2.8519.028.0/10	Transmission control unit		GEARBOX	2-7-16-21	

Code	Description	Technical descr'n (Chap. 3.2.xx)	Connector	System (head. 4.xx)	Notes
2.8519.038.0/30	HLHP Control unit		HLHP1 - HLHP2	7-13-14-15-16-17-18-19-20-21	
2.8639.007.0/10	Hazard lights control unit		X43	5-6	
2.9019.190.0	Rear screen wiper motor		X91	10	Manual air conditioner
2.9019.200.0/10	Windscreen wiper motor		X100	10	

2.3 INDEX BY CONNECTOR

Connector	Wiring code	Connection wiring or component part number	Component description	Notes
+30A	0.013.9301.4/50		Battery	
+30B	0.014.3658.4/10		Battery	
+30C	0.014.1563.4/10		Starter motor	
	0.014.1564.4			
	0.014.5132.4/10			
+30	0.014.5132.4/10		Battery	
+50	0.013.9308.4/70		Starter motor	
18 BAR	0.013.9307.4/70	0443.1690	Transmission oil low pressure switch	
A	0.013.9307.4/70	0.013.9308.4/70		
AS4	0.014.0007.4	0.014.3649.4/40		
B1	0421.3172		Not utilised	
B6	0421.3753		Not utilised	
B37	0421.3172	0419.9809	Fuel temperature sensor	
	0421.3182			
	0421.3753			
B40	0421.3172	0419.9792	Camshaft speed sensor	
	0421.3182			
	0421.3753			
B43	0421.3172	0419.9809	Engine coolant temperature sensor	
	0421.3182			
	0421.3753			
B48	0421.3172	0419.4078	Engine turbo pressure sensor	
	0421.3182			
	0421.3753			
B+	0.014.1563.4/10	0118.2173	Alternator	
	0.014.1564.4			
C1	0.013.4085.4/20	2.8039.160.0	Front LH outer worklight	
C2	0.013.4085.4/20	2.8039.160.0	Front RH outer worklight	
D1	0.013.2588.4/10	0445.1872	Directional control valve 1	
D2	0.013.2588.4/10	0445.1872	Directional control valve 2	
D3	0.013.2588.4/10	0445.1872	Directional control valve 3	
D4	0.013.2588.4/10	0445.1872	Directional control valve 4	
D+	0.013.9308.4/70	0118.2173	Alternator	

Connector	Wiring code	Connection wiring or component part number	Component description	Notes
D1-D2	0.013.9308.4/70	0.013.2588.4/10		
D3-D4	0.013.9307.4/70	0.013.2588.4/10		
DW (RH)	0.013.9309.4/30	2.7659.182.0	Rear lift Down Rx pushbutton	
DW (LH)	0.013.9309.4/30	2.7659.182.0	LH rear lift down button	
DW	0.013.9327.4/40		Front axle suspension 'Down' solenoid valve	
DIFF SV	0.013.9307.4/70	0442.3824	Differential lock control solenoid valve	
4WD SV	0.013.9307.4/70	0443.1661	4WD control solenoid valve	
DW SV	0.013.9308.4/70		Lift Down solenoid valve	
F SV	0.013.9308.4/70	0443.1661	"FIELD" mode solenoid valve	
LOCK SV	0.013.9307.4/70	0.010.3343.0	Gearbox in neutral locking solenoid valve	
P SV	0.013.9307.4/70	0443.4425	Main clutch proportional solenoid valve	
PTO 1 SV	0.013.9307.4/70		Front PTO engagement solenoid valve	
PTO 2 SV	0.013.9307.4/70	0.010.2628.2	Rear PTO control solenoid valve	
R SV	0.013.9308.4/70	0443.1661	"ROAD" mode solenoid valve	
UP SV	0.013.9308.4/70		Lift Up solenoid valve	
F30	0421.3172		Not utilised	
	0421.3182			
	0421.3753			
G1	0.013.9301.4/50	0.014.3649.4/40		
G2	0.013.9301.4/50	0.014.3649.4/40		
G3	0.013.9301.4/50	0.014.3649.4/40		
G4	0.013.9301.4/50	0.014.3649.4/40		
G5	0.013.9301.4/50	0.014.3649.4/40		
G6	0.013.9301.4/50	0.014.3650.4/10		
G7	0.013.9301.4/50	0.013.9304.4/40		
G8	0.013.9301.4/50	0.013.9304.4/40		
G9	0.014.3649.4/40		Not utilised	
G10	0.013.9307.4/70		Not utilised	
G11	0.014.3649.4/40	0.014.1874.4/20		Version with worklights on arms
G11		0.014.1875.4/10		Version without worklights on arms
G12	0.013.9304.4/40	0.014.1567.4/10		Manual air conditioner
G13	0.013.9308.4/70	0.013.9327.4/40		
G14	0.014.3649.4/40	0.013.9309.4/30		

Connector	Wiring code	Connection wiring or component part number	Component description	Notes
G15	0.014.3649.4/40	0.013.9309.4/30		
G16	0.013.9301.4/50		Wiring connector	Must be disconnected
G17	0.013.9301.4/50	0.013.9309.4/30		
G18	0.013.9301.4/50	0.013.9309.4/30		
G19	0.013.9308.4/70	0.013.0663.4/30		
G20	0.014.3650.4/10	0421.3172		
		0421.3182		
		0421.3753		
G21	0.013.9304.4/40	0.013.9310.4/20		Manual air conditioner
		0.014.1565.4/10		Version with electric demisting rearview mirrors
G22	0.013.9304.4/40	0.013.9310.4/20		Manual air conditioner
		0.014.1565.4/10		Version with electric demisting rearview mirrors
G23	0.013.9304.4/40	0.013.9310.4/20		Manual air conditioner
G24	0.013.9304.4/40	0.013.9310.4/20		Manual air conditioner
		0.014.1565.4/10		Version with electric demisting rearview mirrors
G25	0.013.9304.4/40	0.013.9310.4/20		Manual air conditioner
		0.014.1565.4/10		Version with electric demisting rearview mirrors
G26	0.013.9304.4/40	0.013.9310.4/20		Manual air conditioner
G27	0.013.9304.4/40	0.011.3824.4		Manual air conditioner
G28	0.013.0663.4/30	0.013.4085.4/20		
G29	0.013.0663.4/30	0.013.4085.4/20		
G30	0.013.9301.4/50		Not utilised	
G31	0.013.9304.4/40			Manual air conditioner
G32	0.014.0002.4	0.014.0732.4/10		
		2.8059.528.0		
		2.8059.527.0	Left headlamp on arms	For driving on the right with lift

Connector	Wiring code	Connection wiring or component part number	Component description	Notes
G33	0.014.3649.4/40	0.014.0732.4/10		
G34	0.014.0002.4	0.014.0732.4/10		
		2.8059.528.0	Right headlamp on arms	For driving on the right with lift
		2.8059.527.0	Right headlamp on arms	For driving on the left with lift
G35	0.014.3649.4/40	0.014.0732.4/10		
G36	0.014.3649.4/40	0.014.0732.4/10		
G37	0.014.3649.4/40	0.014.0732.4/10		
G38	0.013.9301.4/50		Wiring connector	Must be disconnected
GAS	0.013.9301.4/50		Hand throttle position sensor (not utilised)	
GEARBOX	0.013.9301.4/50	2.8519.028.0/10	Transmission control unit	
GEAR TEMP	0.013.9307.4/70	0441.6649	Transmission oil temperature sensor	
HLHP1	0.013.9301.4/50	2.8519.038.0/30	HLHP Control unit	
HLHP2	0.013.9301.4/50	2.8519.038.0/30	HLHP Control unit	
HOLD	0.013.9301.4/50		HOLD" button (not utilised)	
L	0.013.9307.4/70	0.014.3972.4	Lift draft sensor (left)	
MS1	0.013.9301.4/50	0.013.9308.4/70		
MX1	0.013.9301.4/50	0421.3098	Engine control unit	
MX2	0.013.9301.4/50	0421.3098	Engine control unit	
NAB	0.013.9307.4/70	0443.8450	Wheel speed sensor	
NHK	0.013.9307.4/70	0443.4551	Clutch speed sensor	
NLSA	0.013.9307.4/70	0443.8449	Gearbox output shaft speed sensor	
NLSE	0.013.9307.4/70	0443.4551	Gearbox input shaft speed sensor	
OIL TEMP	0.013.9307.4/70		Not utilised	
POS	0.013.9307.4/70	0443.8667.0	Rear lift position sensor	
PTO (RH)	0.013.9309.4/30	2.7659.177.0/20	RH rear PTO button (on mudguard)	
PTO (LH)	0.013.9309.4/30	2.7659.177.0/20	LH rear PTO button (on mudguard)	
PTO	0.013.9308.4/70	0443.8352	Rear PTO speed sensor	
R	0.013.9307.4/70	0.014.3972.4	Lift draft sensor (right)	
RADAR	0.013.9307.4/70	0.008.8048.4/10	Radar	
RADAR	0.013.9307.4/70	0.010.7172.4	Radar (UK)	
S	0.013.9307.4/70	0441.6066	Start enable switch (Green)	
STOLL	0.013.9301.4/50		Not utilised	
T	0.013.0663.4/30		Not utilised	

Connector	Wiring code	Connection wiring or component part number	Component description	Notes
TK2	0.013.9301.4/50	0.013.9307.4/70		
Not utilised	0.013.9308.4/70	0443.7355.4/10		
		0443.7356.4		
UP (RH)	0.013.9309.4/30	2.7659.182.0	RH rear lift up button	
UP (LH)	0.013.9309.4/30	2.7659.182.0	LH rear lift up button	
UP	0.013.9327.4/40		Front axle up control solenoid valve	
X1	0.013.9301.4/50	0.013.8360.0	Rear screen washer pump	
X2	0.013.9301.4/50	0.013.8360.0	Windscreen washer pump	
X3	0.013.9301.4/50		Supplementary CANBUS socket	
X4	0.013.9301.4/50		Diagnostic socket	
X5	0.013.9301.4/50	0443.6527	Creeper engagement sensor	
X6	0.013.9301.4/50		Not utilised	
X7	0.013.9301.4/50	0.014.5564.4	Driver's seat	
X8	0.013.9301.4/50	0439.1395	Handbrake switch	
X9	0.013.9301.4/50	0442.2323.4	ISO4 socket (power supply to implements)	
X10	0.013.9301.4/50	2.6039.020.0	Power socket	
X11	0.013.9301.4/50	0.014.3360.4	Armrest	4 directional control valves version
		0.014.3358.4	Armrest	2 directional control valves version
X12	0.014.3649.4/40	0442.5709	Compressed air gauge	
X13	0.014.3649.4/40	0442.5709	Compressed air gauge	
X14	0.014.3649.4/40	0.012.5950.4/10	Rear PTO engagement switch	
X15	0.014.3649.4/40	0.012.5948.4/10	AUTO PTO engagement switch	
X16	0.014.3649.4/40	0442.9390/10	Accelerator pedal position sensor	
X17	0.014.3649.4/40	0443.3422.4/20	Infocenter	
X18	0.014.3649.4/40	0443.3422.4/20	Infocenter	
X19	0.014.3649.4/40		Not utilised	
X20	0.014.3649.4/40		Power lift control switch (not utilised)	
X21	0.014.3649.4/40	0442.4165/10	Clutch pedal depressed proximity sensor	
X22	0.014.3649.4/40	0.012.5943.4	Front worklights switch	
X23	0.014.3649.4/40	0.013.1330.4	Hazard warning lights switch	
X24	0.014.3649.4/40	0.012.5940.4	Sidelights switch	
X25	0.014.3649.4/40	2.7099.770.0	Cigar lighter	
X26	0.014.3649.4/40	0443.2708	Clutch pedal position sensor	

Connector	Wiring code	Connection wiring or component part number	Component description	Notes
X27	0.014.3649.4/40	0.012.1725.0	Left-hand tweeter	
X28	0.013.9301.4/50		Not utilised	
X30	0.014.3649.4/40	0.012.1725.0	Right-hand tweeter	
X33	0.014.3649.4/40	0441.9280.4	Transmission display	
X34	0.014.3649.4/40	0439.1395	Left brake pedal switch	
X35	0.014.3649.4/40	0439.1395	Right brake pedal switch	
X36	0.014.3649.4/40		Not utilised	
X37	0.014.3649.4/40	0.012.5951.4/10	Front PTO engagement switch	
X38	0.014.3649.4/40	0441.1512.4	Starter switch	
X39	0.014.3649.4/40		ASM switch (not utilised)	
X40	0.014.3649.4/40		Differential lock control switch (not utilised)	
X41	0.014.3649.4/40		4WD engagement switch (not utilised)	
X42	0.014.3649.4/40		Front axle suspensions switch (not utilised)	
X43	0.014.3649.4/40	2.8639.007.0/10	Hazard lights control unit	
X45	0.014.3649.4/40	0.014.4950.4	Gearbox control lever	
X46	0.014.3649.4/40	0.014.4950.4	Gearbox control lever	
X47	0.014.3649.4/40	0.013.8345.4/20	Lift control console	
X48	0.014.3649.4/40		Lift lock control switch (not utilised)	
X49	0.013.9307.4/70		Air cleaner clogged sensor	
X50	0.013.9307.4/70	0118.2227	Engine oil pressure switch	
X51	0.013.9307.4/70		Steering system pressure switch	
X52	0.013.9307.4/70	0441.6685	Gear change solenoid valves (Y1, Y2, Y3, Y4)	
X53	0.013.9308.4/70		Trailer socket	
X54	0.013.9308.4/70		Air conditioning pressure switch	
X55	0.013.9308.4/70	0.900.0081.4	Steering angle sensor	
X56	0.013.9308.4/70	0443.7338	Air conditioning compressor	
X57	0.013.9308.4/70		Brake fluid level sensor	
X58	0.013.9308.4/70	2.7059.823.0/10	Fuel level sensor	
X59	0.013.9308.4/70	0.900.0277.8	Field/road sensor	
X60	0.013.0663.4/30		Horn	
X61	0.013.0663.4/30	2.8039.240.0	Left headlamp	For driving on the right
		2.8039.250.0	Left headlamp	For driving on the left

Connector	Wiring code	Connection wiring or component part number	Component description	Notes
X62	0.013.0663.4/30	2.8039.240.0	Right headlamp	For driving on the right
		2.8039.250.0	Right headlamp	For driving on the left
X63	0.014.0007.4	0.012.7076.4	Shuttle control lever	
X64	0.013.9327.4/40	0.009.2194.4/10	Front axle suspension position sensor	
X65 (RH)	0.013.9309.4/30	2.8059.500.0	RH rear direction indicator	
X65 (LH)	0.013.9309.4/30	2.8059.510.0	LH rear direction indicator	
X66 (RH)	0.013.9309.4/30	2.8059.500.0	RH rear sidelight and brake light	
X66 (LH)	0.013.9309.4/30	2.8059.510.0	LH rear sidelight and brake light	
X67	0.014.1563.4/10	0428.4880	Preheating device	
	0.014.1564.4			
X68	0443.7355.4/10	0.011.9428.0	Trailer braking pressure sensor	
	0443.7356.4			
X69	0443.7356.4	0.900.0397.9	Trailer parking brake solenoid valve	
X70	0443.7356.4	0.900.0064.4	Trailer braking low pressure switch	
X71	0.013.9304.4/40	2.8059.526.0	Number plate light	Manual air conditioner
X72	0.013.9304.4/40	2.8059.526.0	Number plate light	Manual air conditioner
X73	0.013.9304.4/40	0.013.2142.0	Right-hand recirculation motor	Manual air conditioner
X74	0.013.9304.4/40	0.013.2142.0	Left-hand recirculation motor	Manual air conditioner
X75	0.013.9304.4/40	2.8339.231.0	Interior roof light	Manual air conditioner
X76	0.013.9304.4/40	0.013.2161.0	Left-hand woofer	Manual air conditioner
X77	0.013.9304.4/40		Fan speed selector switch	Manual air conditioner
X78	0.013.9304.4/40		Manual air conditioner control panel lights	Manual air conditioner
X79	0.013.9304.4/40		Recirculation switch	Manual air conditioner
X80	0.013.9304.4/40		Fan speed selector switch	Manual air conditioner
X81	0.013.9304.4/40	0.012.5945.4	Rotating beacon on/off switch	Manual air conditioner
X82	0.013.9304.4/40	0.012.5954.4	Rear worklights switch	Manual air conditioner
X83	0.013.9304.4/40	2.7659.255.0	Door open warning light switch	Manual air conditioner

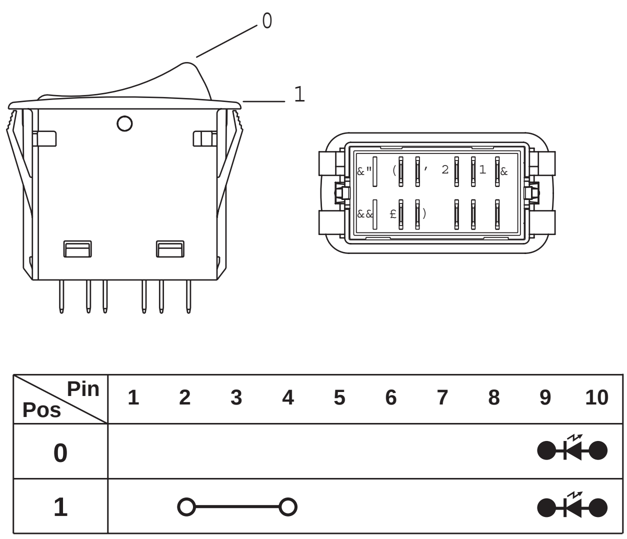
Connector	Wiring code	Connection wiring or component part number	Component description	Notes
X84	0.013.9304.4/40	0.013.2161.0	Right-hand woofer	Manual air conditioner
X85	0.013.9304.4/40	2.8339.074.0	Courtesy light	Manual air conditioner
X86	0.013.9304.4/40	0.012.5946.4	Rear screen wiper switch	Manual air conditioner
X87	0.013.9304.4/40	0.013.7108.4	Rearview mirror demister switch	Manual air conditioner
X88	0.013.9304.4/40	0.900.0035.4	Left-hand fan motor	Manual air conditioner
X90	0.013.9304.4/40	0.900.0035.3	Right-hand fan motor	Manual air conditioner
X91	0.013.9304.4/40	2.9019.190.0	Rear screen wiper motor	Manual air conditioner
X92	0.013.9304.4/40		Radio	Manual air conditioner
X99	0.011.3824.4	2.6039.017.0	Rotating beacon	
X100	0.014.1567.4/10	2.9019.200.0/10	Windscreen wiper motor	
X101	0.013.9310.4/20	0.014.2021.4	Right-hand rearview mirror with electric demisting	Version with electric demisting rearview mirrors
X102	0.013.9310.4/20	0.014.2022.4	Left-hand rearview mirror with electric demisting	Version with electric demisting rearview mirrors
X103	0.013.9310.4/20	2.8039.295.0/10	Right-hand front worklight on cab	Version with electric demisting rearview mirrors
	0.014.1565.4/10			Version without electric demisting rearview mirrors
X104	0.013.9310.4/20	2.8039.295.0/10	Left-hand front worklight on cab	Version with electric demisting rearview mirrors
	0.014.1565.4/10			Version without electric demisting rearview mirrors
X105	0.013.9310.4/20	2.8039.295.0/10	Right-hand front worklight on cab	Version with electric demisting rearview mirrors
X106	0.013.9310.4/20	2.8039.295.0/10	Left-hand front worklight on cab	Version with electric demisting rearview mirrors
X107	0.013.9310.4/20	2.8039.295.0/10	Right-hand rear worklight on cab	Version with electric demisting rearview mirrors
	0.014.1565.4/10			Version without electric demisting rearview mirrors

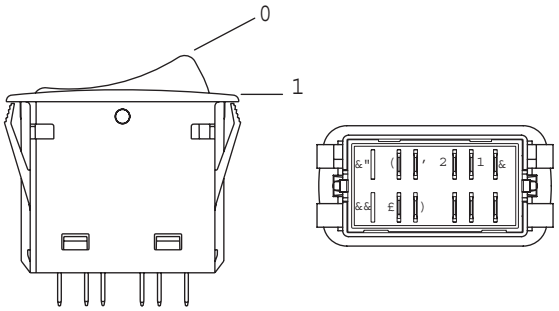
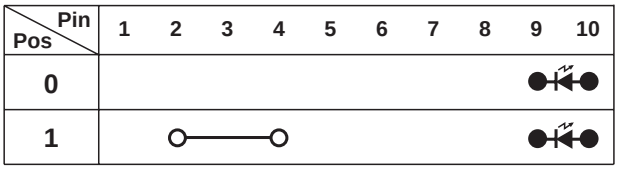
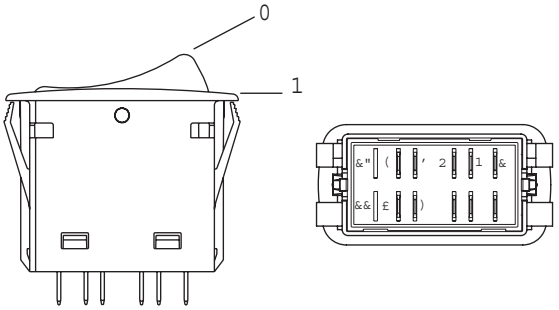
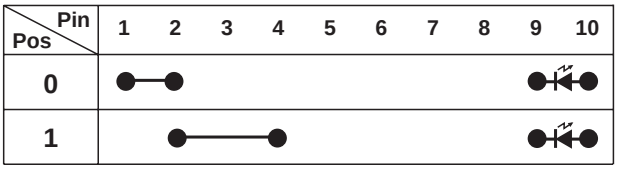
Connector	Wiring code	Connection wiring or component part number	Component description	Notes
X108	0.013.9310.4/20	2.8039.295.0/10	Left-hand rear worklight on cab	Version with electric demisting rearview mirrors
	0.014.1565.4/10			Version without electric demisting rearview mirrors
X109	0.013.9310.4/20	2.8039.295.0/10	Right-hand rear worklight on cab	Version with electric demisting rearview mirrors
X110	0.013.9310.4/20	2.8039.295.0/10	Left-hand rear worklight on cab	Version with electric demisting rearview mirrors
X111	0.014.1874.4/20	0.012.5943.4	Switch for worklights on arms	Version with worklights on arms
X112	0.014.1875.4/10	0.012.5941.4	Low/full beam headlights switch	Version without worklights on arms
X114	0.014.0732.4/10	2.8039.280.0	LH direction indicator and sidelight	On arms
X115	0.014.0732.4/10	2.8039.270.0	RH direction indicator and sidelight	On arms
X116	0.014.0002.4	2.8039.296.0	Left-hand supplementary light	On arms
X117	0.014.0002.4	2.8039.296.0	Right-hand supplementary light	On arms
Y3	0421.3172	0211.2588	Actuator	
	0421.3182			
	0421.3753			

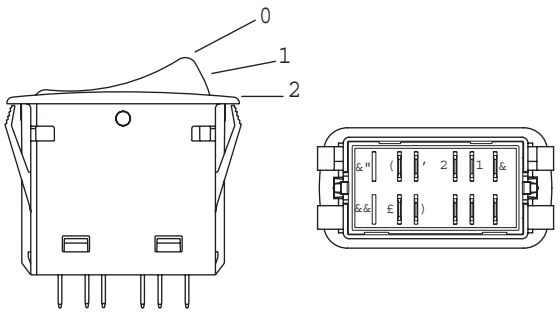
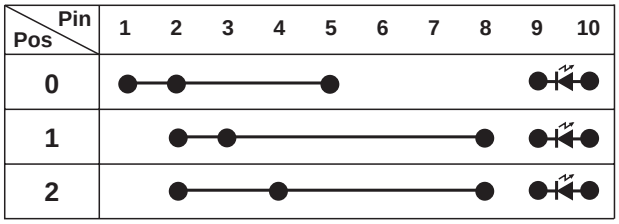
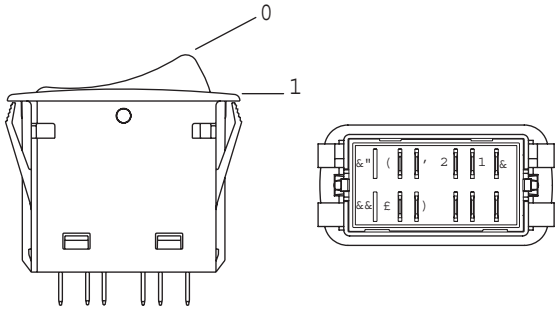
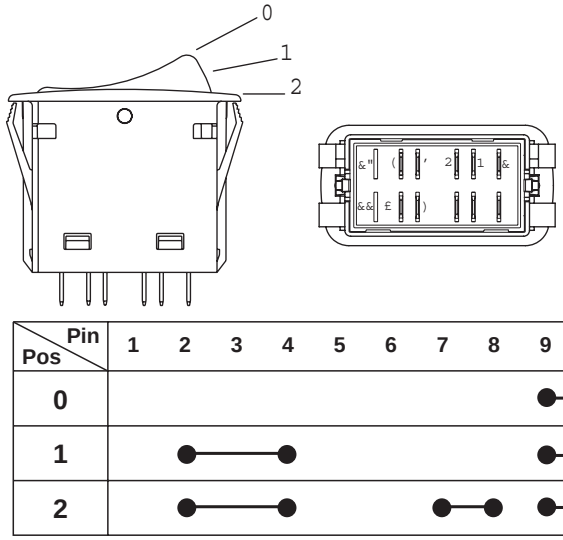
3. COMPONENTS

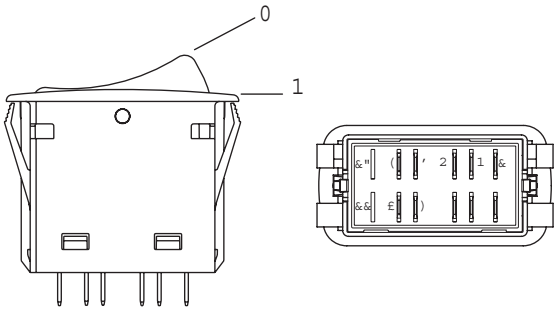
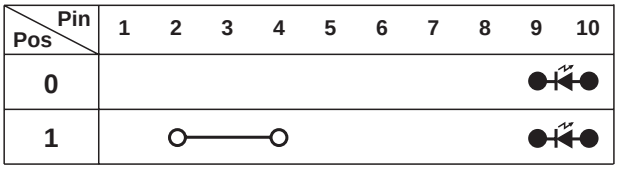
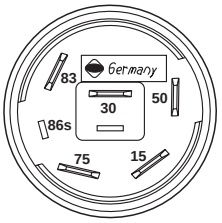
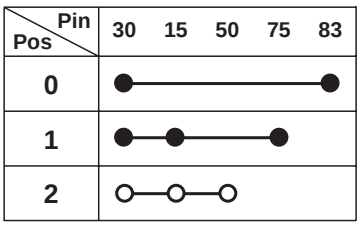
3.1 COMPONENT TECHNICAL DATA

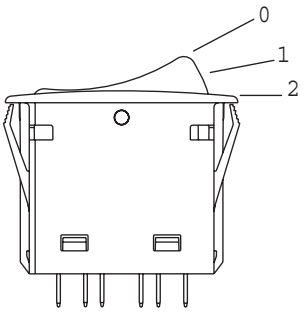
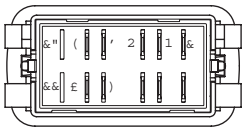
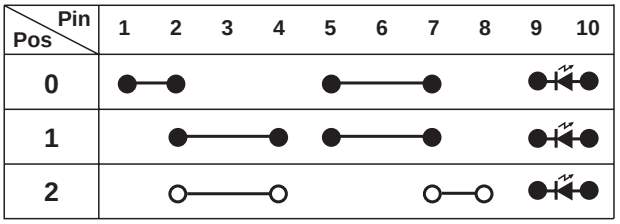
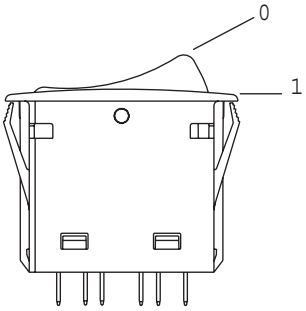
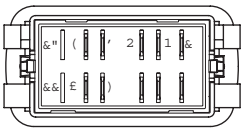
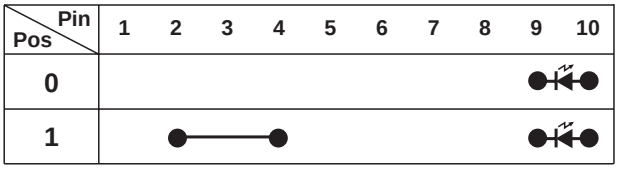
No	Description	Code	Characteristics	Connector
1	Transmission oil low pressure switch	0443.1690	Normally open contact (NO) Switching pressure: 18 bar	18 BAR
2	Fuel temperature sensor	0419.9809	Resistance at 21.5 °C: ~2.3 kOhm	B37
	Engine coolant temperature sensor			B43
3	Camshaft speed sensor	0419.9792	Resistor: 310 Ohm Inductance: 140mH Peak voltage: 40mV	B40
4	Lift up/down pushbutton	2.7659.182.0	Normally open contact (NO)	DW (RH) / DW (LH) / UP (RH) / UP (LH)
5	"FIELD" mode solenoid valve	0443.1661	Pin1 = earth Pin2 = power Resistance between pin1 and pin 2: 10 Ohm	F SV
	"ROAD" mode solenoid valve			R SV
	4WD control solenoid valve			4WD SV
6	Actuator	0211.2588	Measured across pin 3 and pin 4: ~ 25 Ohm Measured across pin 3 and pin 5: ~ 25 Ohm Measured across pin 1 and pin 2: ~ 1.3 Ohm	Y3
7	Main clutch proportional solenoid valve	0443.4425	Pin1 = earth Pin2 = power Resistance between pin1 and pin 2: approx. 5 Ohm	P SV
8	Transmission oil temperature sensor	0441.6649	Resistance between pin 1 and pin 2: at 25°C 1000 ±15 Ohm at 100°C 1696 ±35 Ohm at 150°C 2211 ±80 Ohm	GEAR TEMP
9	Wheel speed sensor	0443.8450	Pin1 = earth Pin2 = square wave signal Pin3 = 12V power High level: 3.5-4.3 V Low level: 0.6-1.2 V	NAB
10	Gearbox output shaft speed sensor (nLsa)	0443.8449	Pin1 = earth Pin2 = square wave signal Pin3 = 12V power High level: 3.5-4.3 V Low level: 0.6-1.2 V	NLSA
11	Rear lift position sensor	0443.8667.0	Pin1 = earth Pin2 = 5.0Vdc power supply Pin3 = analog signal 0.6 Vdc output (Lift links fully raised) 4.5 Vdc output (Lift links fully lowered)	POS

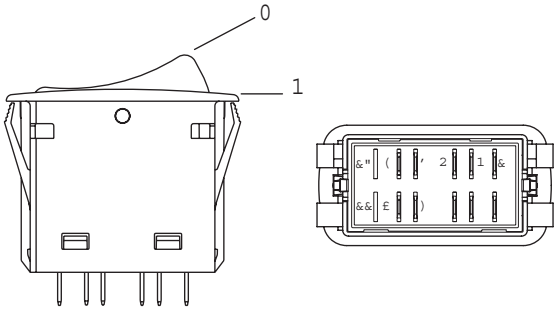
No	*Description*	*Code*	*Characteristics*	*Connector*
12	Rear PTO button (on mudguard)	2.7659.177.0/20	Resistance between Pin1 and Pin2 with button pressed: 3.9 Ohm	RH PTO / LH PTO
13	Radar (Italy)	0.008.8048.4/10	Pin 1 = earth Pin 2 = pulse signal (130 pulses/metre) Pin 3 = 12 V power With the radar powered on, the voltage at pin 2 should change when a hand is passed in front of the sensor Radar nominal frequency: 24125 GHz ± 25 MHz	RADAR
14	Radar (UK)	0.010.7172.4	Pin 1 = earth Pin 2 = pulse signal (130 pulses/metre) Pin 3 = 12 V power With the radar powered on, the voltage at pin 2 should change when a hand is passed in front of the sensor Radar nominal frequency: 24300 GHz ± 25 MHz	RADAR
15	Start enable switch	0441.6066	Normally closed switch (NC) resistance with contact closed 3.9 Ohm Colour: Green	S
16	Creeper engagement sensor	0443.6527	Normally closed switch (NC) resistance with contact closed 3.9 Ohm	X5
17	Lights switch	0439.1395	Across Pin 1 and Pin 2: Normally closed contact (NC) Across Pin 3 and Pin 4: Normally open contact (NO)	X8/ X34/ X35
18	Compressed air gauge	0442.5709	Pin G = input from sensor Pin + = 12V power Pin - = earth	X12/ X13
19	Rear PTO engagement switch	0.012.5950.4/10		X14

No	Description	Code	Characteristics	Connector
20	AUTO PTO engagement switch	0.012.5948.4/10	 	X15
21	Low/full beam headlights switch	0.012.5941.4	 	X112
22	Clutch pedal depressed proximity sensor	0442.4165/10	Pin1 = earth Pin2 = analog signal: 0 Volt with sensor covered by metal 12 Vdc with sensor exposed Pin3 = 12V power	X21

No	Description	Code	Characteristics	Connector
23	Front worklights switch	0.012.5943.4		X22
	Switch for worklights on arms			X111
24	Hazard warning lights switch	0.013.1330.4		X23
25	Sidelights switch	0.012.5940.4		X24

No	Description	Code	Characteristics	Connector
26	Clutch pedal position sensor	0443.2708	Pin1 = 5.0Vdc power Pin2 = earth Pin4 = analog signal Output 0.5V DC (Pedal fully released) 4.5 Vdc output (Pedal fully depressed)	X26
27	Front PTO engagement switch	0.012.5951.4/10	 	X37
28	Starter switch	0441.1512.4	 	X38

No	Description	Code	Characteristics	Connector
41	Rear screen wiper switch	0.012.5946.4	  	X86
30	Door open warning light switch	2.7659.255.0	Normally closed contact (NC)	X83
31	Rear worklights switch	0.012.5954.4	  	X82
32	Engine oil pressure switch	0118.2227	Normally closed contact (NC) Switching pressure: 0.5 ± 0.2 bar at 90 ± 5 °C	X50
33	Solenoid valves Y1, Y2 and Y5	0441.6685	Pin1 = earth Pin2 = power Resistance between pin1 and pin 2: 28 ± 2 Ohm	X52
34	Fuel level sensor	2.7059.823.0/10	Resistance between pin 1 and pin 2: with tank full 175-195 Ohm with tank half full 85-96 Ohm with tank empty 4-7 Ohm	X58
35	Front axle suspension position sensor	0.009.2194.4	Pin1 = earth Pin2 = Output signal Pin3 = 10Vdc power Output 0.2Vdc (sensor released) Output 8.3Vdc (sensor fully pressed) Check the supply voltage	X64
36	Trailer braking pressure sensor	0.011.9428.0	12 Vdc power Resistance at 0 bar 10-13 Ohm Resistance at 6 bar 119-129 Ohm	X68

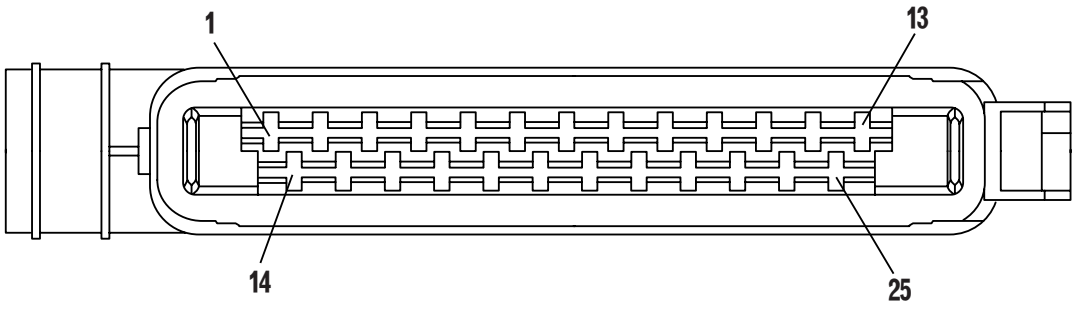
No	Description	Code	Characteristics	Connector
37	Rotating beacon on/ off switch	0.012.5945.4		X81

Pos \ Pin	1	2	3	4	5	6	7	8	9	10
0									●	●
1		●		●					●	●

3.2 PINOUTS AND DESCRIPTIONS OF ELECTRONIC CONTROL UNITS

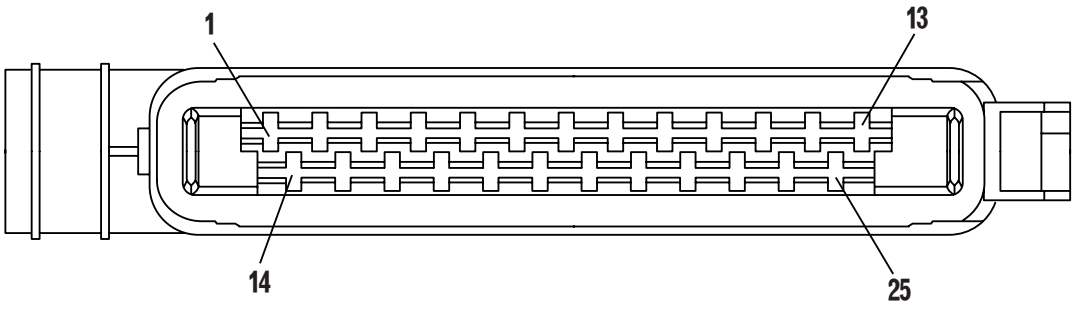
3.2.1 ENGINE CONTROL UNIT (0421.3098)

CONNECTOR MX1



Grub screw	Volts	Abbreviation	Description
1			Not utilised
2			Not utilised
3			Power (-) for preheating relay
4			Not utilised
5			Analog input, fuel temperature sensor
6			Not utilised
7			Not utilised
8	0 V	GND	Reference voltage for signal on pins 5 and 9
9			Analog input, coolant temperature sensor
10			Not utilised
11			Not utilised
12	0V	GND	Reference voltage for signal on pin 13
13			Digital input, speed 1 (camshaft)
14		STG-	PWM output, actuator electromagnet signal
15		STG+	PWM output, actuator electromagnet signal
16			Shielding of control rack position sensor (for pins 17, 18 and 19)
17		RF-	Common connection for measurement and reference coils
18		RF REF	Analog input, reference coil signal
19		RF MESS	Analog input, measurement signal from measurement coil
20			Not utilised
21			Not utilised
22			Not utilised
23	0V	GND	Reference voltage for signal on pin 24
24			Analog input, turbo charge pressure sensor signal
25	+5V	+5V LDA	5V reference voltage for signal on pin 24

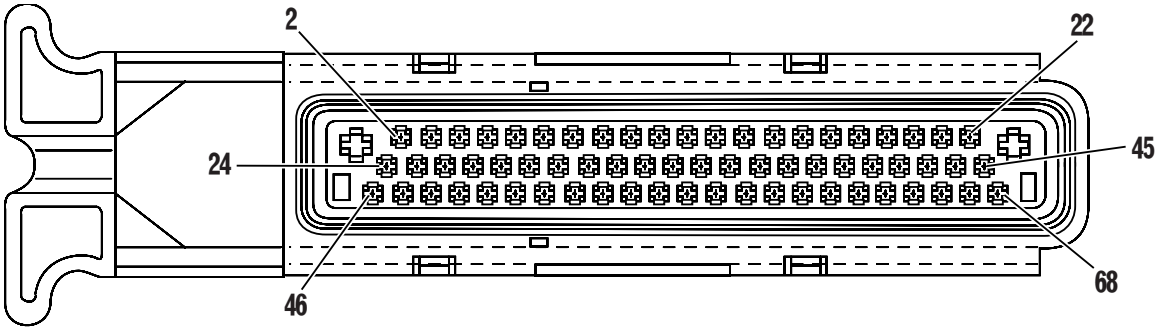
CONNECTOR MX2



Pin	*Volts*	*Abbreviation*	*Description*
1	0V	31	Battery negative
2	0V	31	Battery negative
3			Digital output, preheating indicator lamp control
4			Not utilised
5			Not utilised
6			Digital input, creeper engaged signal
7			Not utilised
8			Not utilised
9			Not utilised
10		L	ISO 9141 serial interface (Diagnostics connector)
11		K	ISO 9141 serial interface (Diagnostics connector)
12		CAN_H	CAN_H
13		CAN_L	CAN_L
14	+12V	+15	Battery positive (15+)
15			Not utilised
16			Not utilised
17			Reference voltage for signal on pin 18
18			Digital input, HOLD button signal
19			Not utilised
20			Analog input, hand throttle sensor signal
21			Not utilised
22			Not utilised
23	0V	GND	Reference voltage for signal on pins 20 and 24
24			Analog input, signal from accelerator pedal sensor (SWG)
25	+5V	+5V REF	5V reference voltage for signal on pins 20 and 24

3.2.2 TRANSMISSION CONTROL UNIT (2.8519.028.0)

GEARBOX CONNECTOR

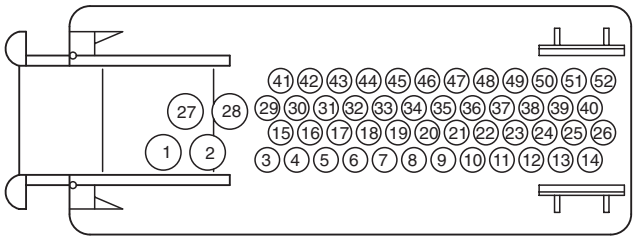


Pin	Volts	Abbreviation	Description
1	0V	VM1	Battery negative
2	0V	VM2	Battery negative
3	0V	VMG1	Reference voltage for signal on pins 16, 17, 40 and 62
4	0V	VMG2	Reference voltage for signal on pin 44
5		ADM4	Not utilised
6			Not utilised
7			Not utilised
8		VPS2	Power (+) common, solenoid valves Y2, Y4, Y5, Y6
9			Not utilised
10		AIP2	Power, solenoid valve Y7
11		ADM6	Power, solenoid valve Y4
12		VPS1	Power common, solenoid valves Y1 and Y3
13	+12V	VPS1	Power, proportional solenoid valve
14		SD1	Display control signal
15		SDDK	Diagnostics connector
16		EF5	Digital input, main clutch rpm sensor (nAb)
17		EF7	Digital input, input rpm sensor (nLse)
18		EVPR	Analog input, FIELD/ROAD position sensor signal
19			Not utilised
20		ED3	Analog input, reverse drive control signal
21			Not utilised
22		ED7	Digital signal, range downshift pushbutton
23		VPE1	Battery positive (30+)
24		VMGA2	Reference voltage (-) for signal on pins 38, 39 and 49
25		CANH	CAN H
26		CANL	CAN L
27		CANRES	CAN RES
28			Not utilised
29		ED11	Digital input, low transmission oil pressure signal
30			Digital input, FIELD/ROAD mode control signal

Pin	Volts	Abbreviation	Description
31		EDM1	Signal, mechanical gearbox neutral
32		AIP3	Power, solenoid valve Y3
33			Not utilised
34			Not utilised
35			Not utilised
36			Not utilised
37		AU	Reference voltage (+) for signal on pins 18 and 38
38		EU1	Analog input, angular position of clutch pedal sensor signal
39		ER1	Analog input, temperature sensor signal
40		EF6	Digital input, output rpm sensor (nLsa)
41			Not utilised
42			Not utilised
43			Not utilised
44		ED8	Digital input, clutch pedal full travel sensor
45		VPI	Battery positive (15+)
46			Not utilised
47			Not utilised
48			Not utilised
49		ER2	Digital input, clutch comfort button
50		AIP7	Power, solenoid valve Y6
51			Not utilised
52			Not utilised
53			Not utilised
54			Not utilised
55		AIP4	Power, solenoid valve Y1
56	0V	AIP1	Power (-), proportional solenoid valve
57		ADM5	Power, solenoid valve Y2
58			Not utilised
59			Not utilised
60			Not utilised
61			Not utilised
62		EF4	Digital input, rpm sensor (NAB)
63		ED1	Analog input, forward drive control signal
64			Not utilised
65		ED2	Analog input, neutral control signal
66		ED9	Battery positive (15+)
67		ED6	Digital signal - range upshift pushbutton
68	+12V	VPE2	Battery positive (30+)

3.2.3 HLHP CONTROL UNIT (P/N 2.8519.027.0/10)

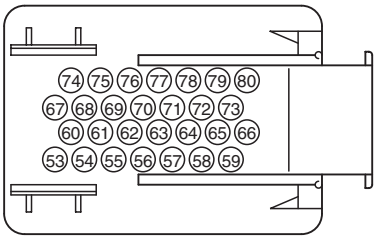
HLHP1 CONNECTOR



Pin	*Volts*	*Abbreviation*	*Description*
1	12V		Battery positive (30+)
2	0V		Battery negative
3			Not utilised
4			Power, 6-way solenoid valve
5			Power, lift stop LED
6			Not utilised
7			Digital input, radar
8			Input, rear PTO speed sensor
9			Not utilised
10			Not utilised
11			Digital input, lift up buttons (on mudguards)
12			Reference voltage (-) for pins 51, 62, 71, 75, 77
13			Not utilised
14			Reference voltage (-) for pins 51, 62, 71, 75, 77
15			Not utilised
16			Digital input, lift down button (in cab)
17			Power, lift up LED
18			Digital input, AUTO PTO button
19			Not utilised
20			Not utilised
21			Not utilised
22			Digital input, lift down buttons (on mudguards)
23			Digital input, RH brake pedal
24			Reference voltage (-) for pins 62, 70, 71, 75, 77
25			Not utilised
26			Not utilised
27	12V		Battery positive (30+)
28	0V		Battery negative
29			Power (-) to lift up solenoid valve
30			Not utilised
31			Not utilised
32			Not utilised
33			Power to front axle suspension down solenoid valve

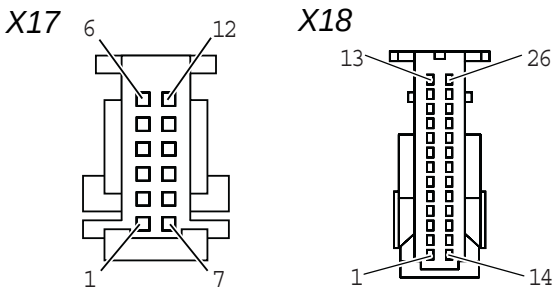
34			Power to four-wheel drive engagement solenoid valve
35			Not utilised
36			Power to rear PTO solenoid valve
37			Not utilised
38			Digital input, braking signal
39			CAN_L
40			CAN_H
41	12V		Battery positive (15+)
42			Power (-) to lift down solenoid valve
43			Power to differential lock solenoid valve
44			Power to front PTO solenoid valve
45			Not utilised
46			Not utilised
47			Power to front axle suspension up solenoid valve
48			Not utilised
49			Digital input, LH brake pedal
50			ISO 9141 K serial interface
51			Reference voltage (+8V) for pins 70, 71, 77
52			Not utilised

HLHP2 CONNECTOR



Pin	*Voltage*	*Abbreviation*	*Description*
53			Not utilised
54			Digital input, alternator D+ signal (engine running)
55			Not utilised
56			Not utilised
57			Analog input, external lift sensor
58			Digital input, rear PTO button (in cab)
59			Not utilised
60			Digital input, rear PTO buttons (on mudguards)
61			Not utilised
62			Analog input, rear lift position sensor
63			Not utilised
64			Not utilised
65			Digital input, front PTO button
66			Not utilised
67			Reference voltage (+5V) for pins 55, 56, 62, 64, 69, 75, 76
68			Not utilised
69			Not utilised
70			Analog input, LH draft sensor
71			Analog input, front axle suspension position sensor
72			Power (+) to lift up solenoid valve
73			Not utilised
74			Not utilised
75			Analog input, steering angle sensor
76			Not utilised
77			Analog input, RH draft sensor
78			Power (+) to lift down solenoid valve

3.2.4 INFOCENTER

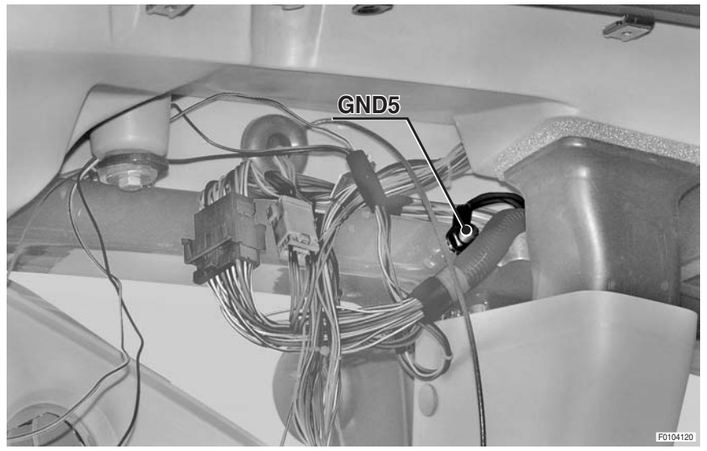


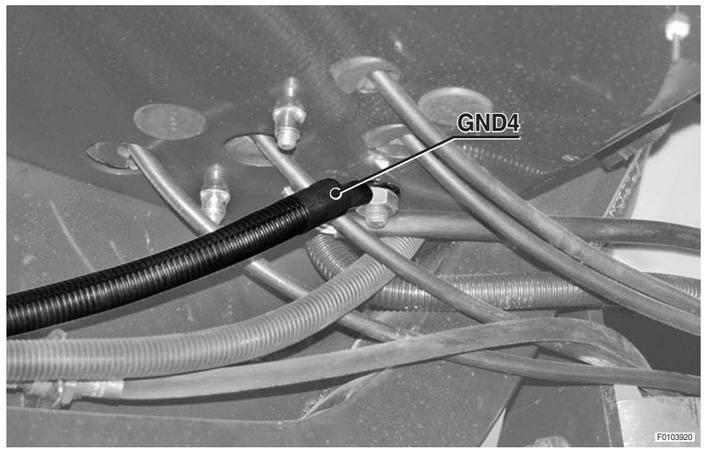
CONNECTOR X17			
Pin	*Volts*	*Abbreviation*	*Description*
1			Not utilised
2		KL 49	KL 49
3		RA	Relay-output, 9A current carrying capacity
4			Not utilised
5		KL 49A	Connected voltage of turn signal relay
6		KL49 A	Connected voltage of turn signal relay
7		LA	Relay-output, 9A current carrying capacity
8		LA	Relay-output, 9A current carrying capacity
9		KL49 B	Lamp output, 12V 1.5W
10		KL49 A	Connected voltage of turn signal relay
11		KL49 A	Connected voltage of turn signal relay
12		RA	Relay-output, 9A current carrying capacity

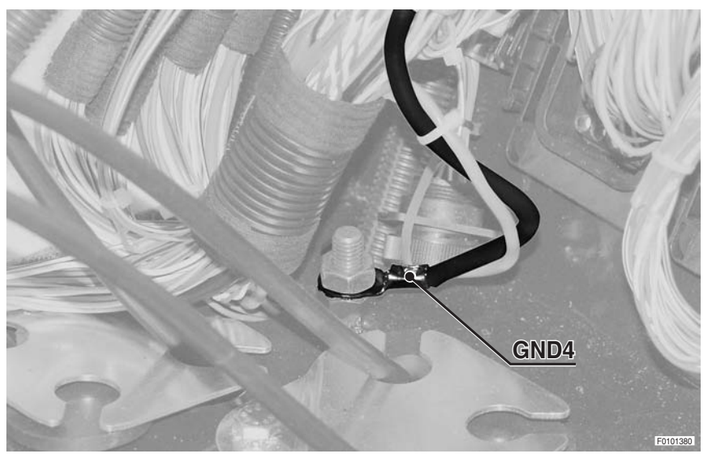
CONNECTOR X18			
Pin	*Voltage*	*Abbreviation*	*Description*
1		BLINK2	2nd trailer flasher indicator light
2		BLINK1	1st trailer flasher indicator light
3		BL_IN_LI	Input, LH turn signal
4		BL_IN_RE	Input, RH turn signal
5	0V	KL31	Battery negative
6	+12V	KL 58	+58 lights
7		LADEK	Battery charge indicator light
8		LUFTF	Air cleaner clogged
9		ÖLDRUCK	Engine oil pressure warning light
10		TRAILER	Input, trailer braking indicator light
11		CAN_RES	CAN_RES
12	+12V	KL15	Battery positive (15+)
13		TANK	Input, fuel level sensor
14		CAN_H	CAN_H
15		CAN_L	CAN_L
16		FERNL	Main beam indicator light

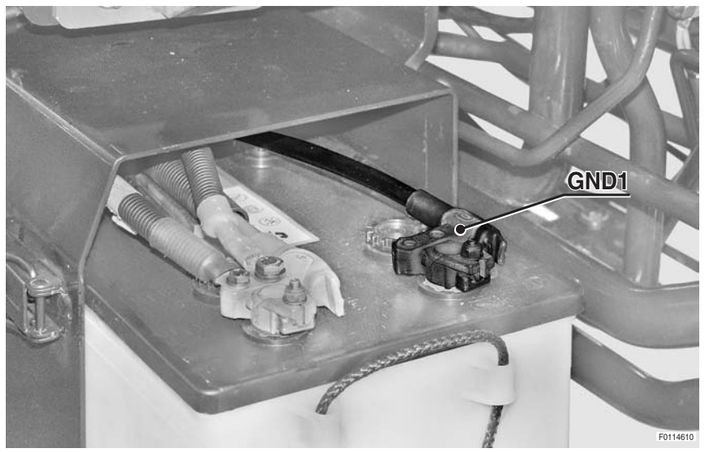
17		HYDR	Not utilised
18		HANDBR	Handbrake on warning light
19		VORGL	Glowplugs test
20		RXD	Diagnostic interface reception
21	+12V	KL30	Battery positive (30+)
22		TXD	Diagnostics interface transmission
23		ESCERA	Input to ESC button
24		RETMEN	Input to RET button
25		MEN+	Input to M+ button
26		MEN-	Input to M- button-

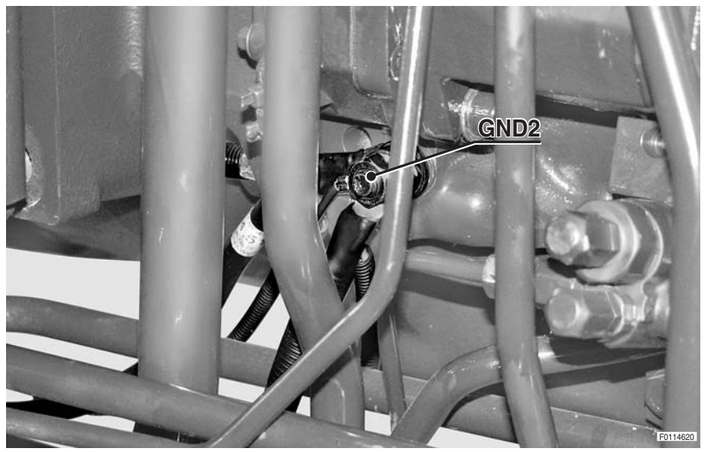
4. SYSTEMS
4.1 EARTHING POINTS



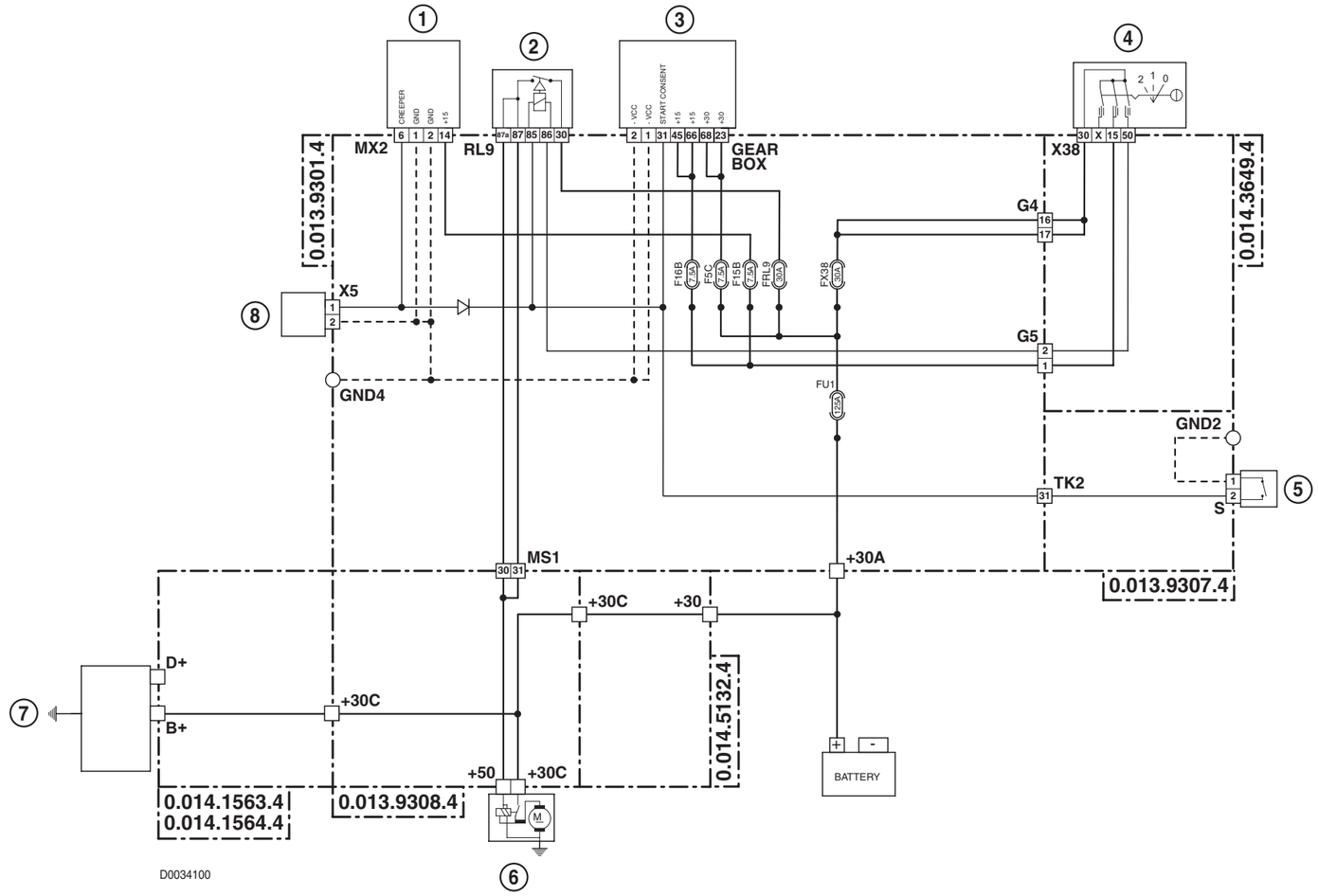






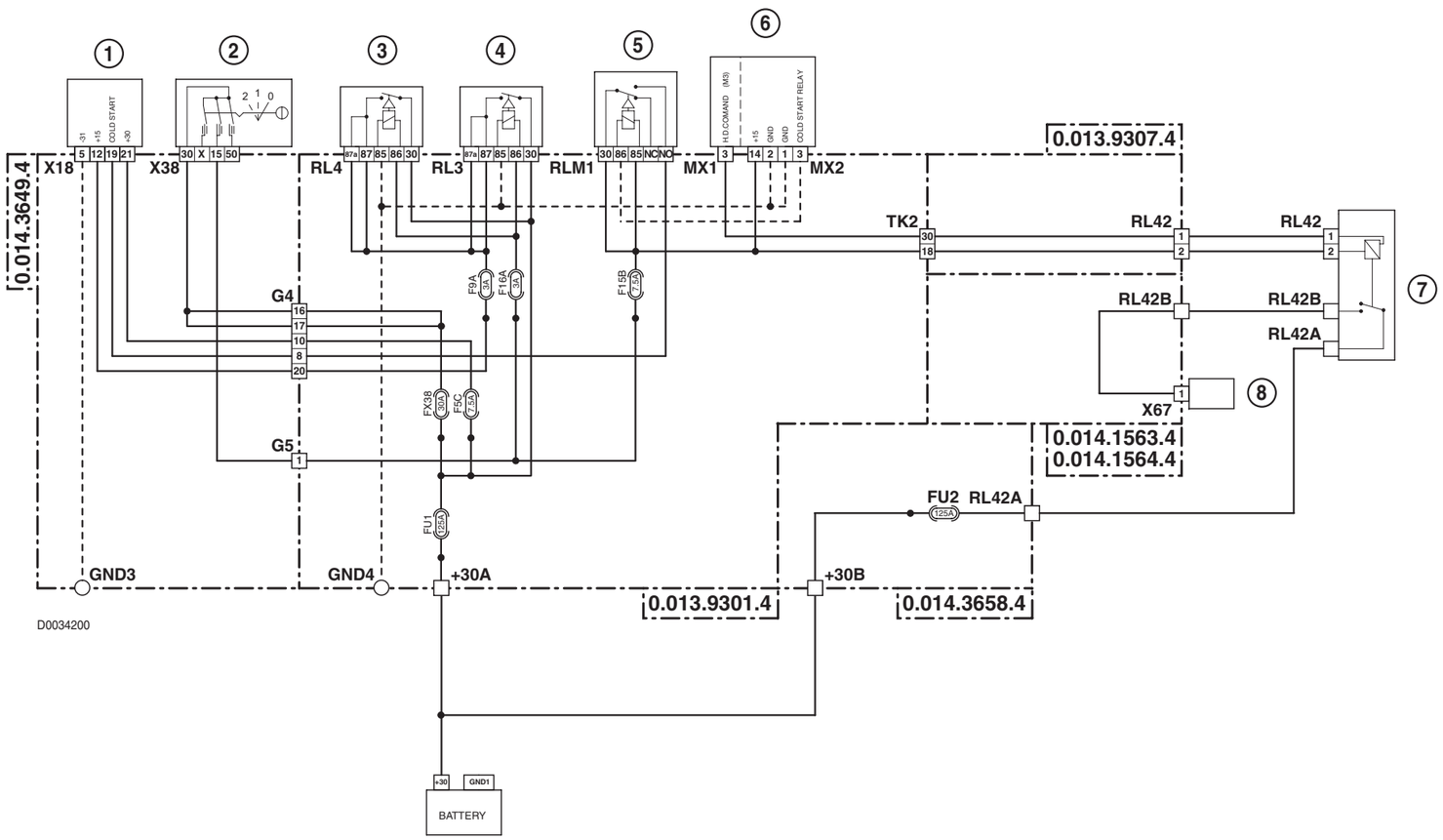


4.2 STARTING



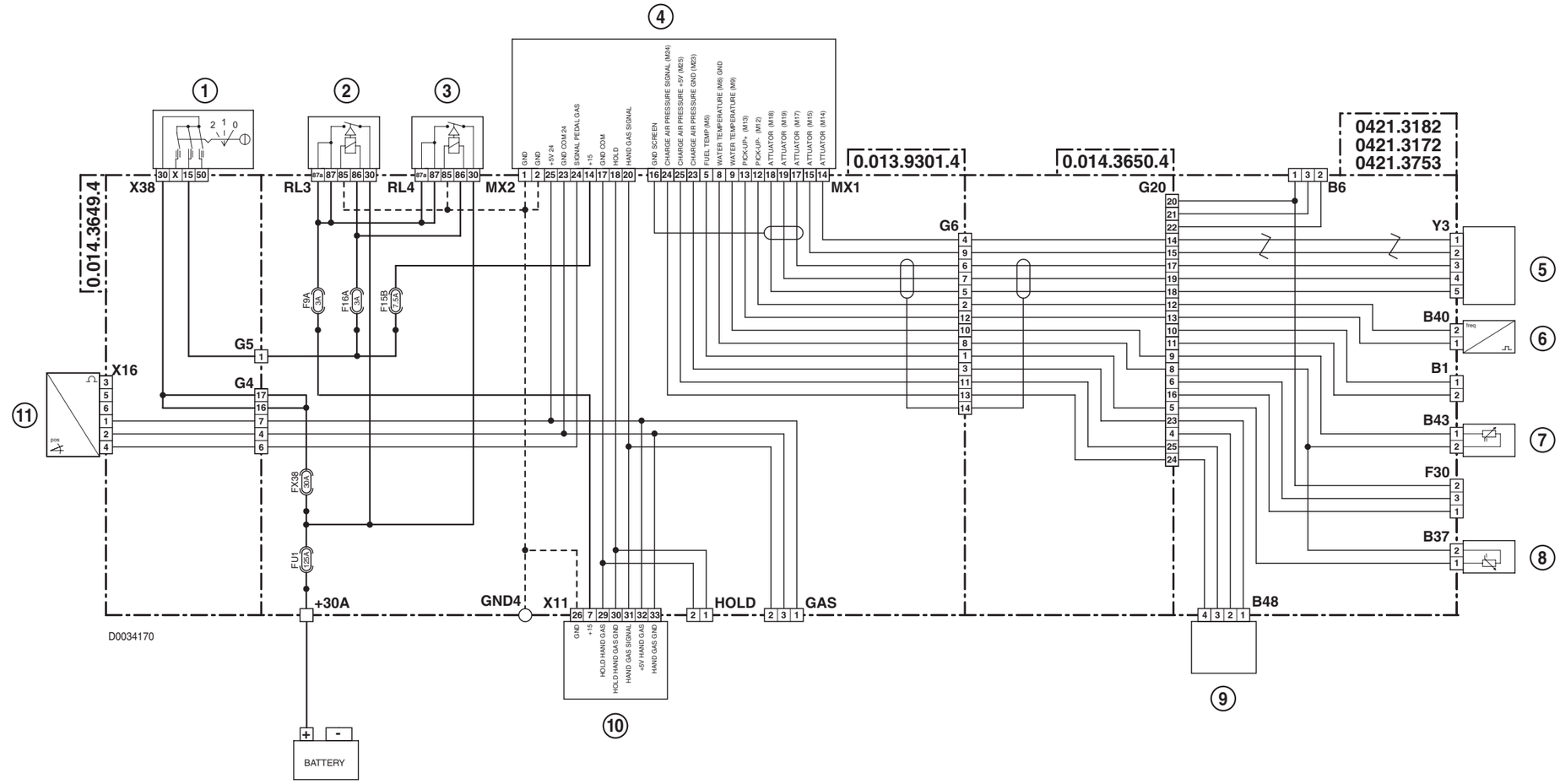
1 Engine control unit
2 Engine starter relay
3 Transmission control unit
4 Starter switch
5 Start enabling switch (Green)
6 Starter motor
7 Alternator
8 Creeper engagement sensor

4.3 PREHEATING



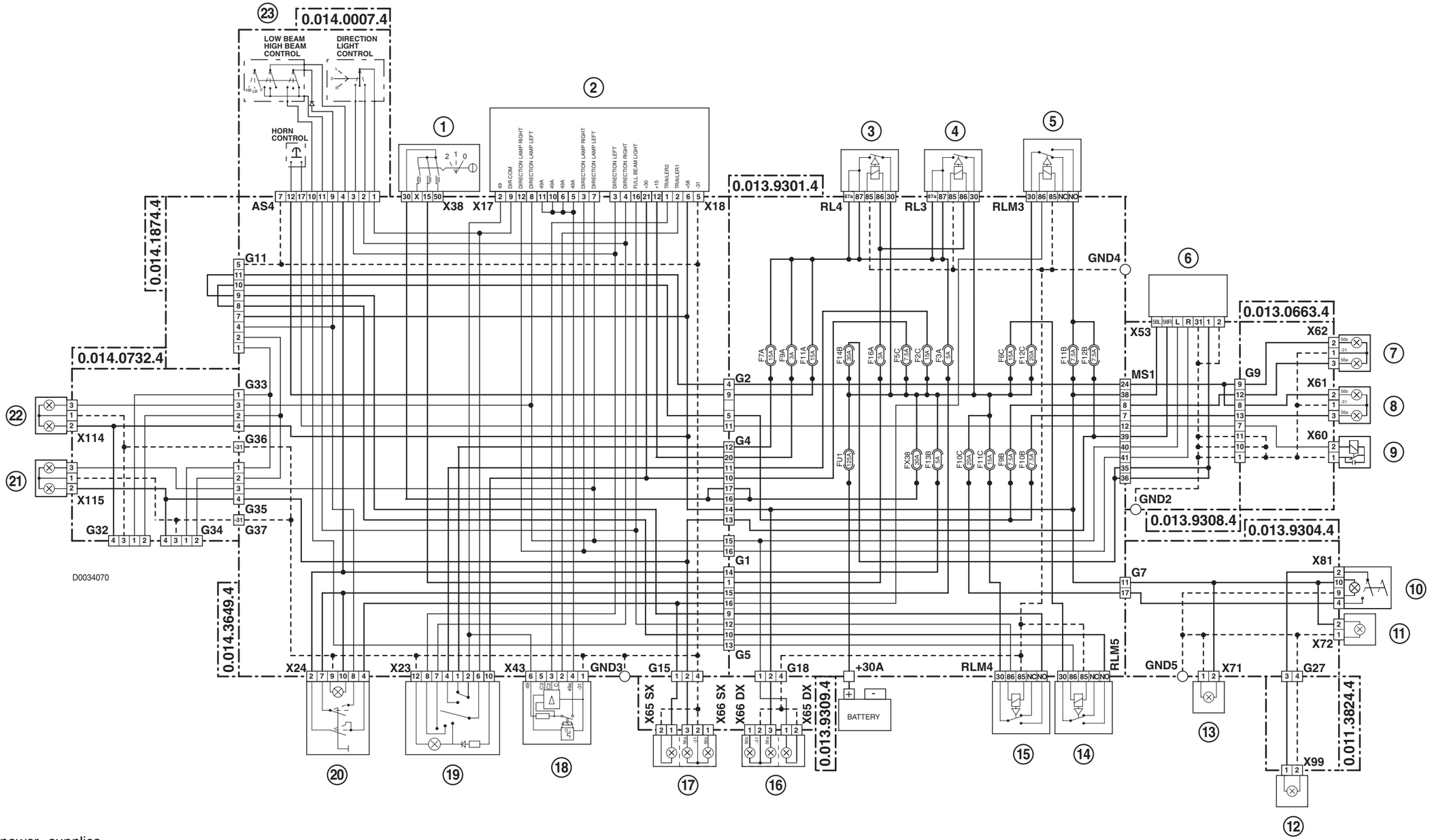
1 Infocenter
2 Starter switch
3 Ignition controlled power supplies relay
4 Ignition controlled power supplies relay
5 Preheating relay
6 Engine control unit
7 Preheating relay
8 Preheating device

4.4 ELECTRONIC ENGINE CONTROL



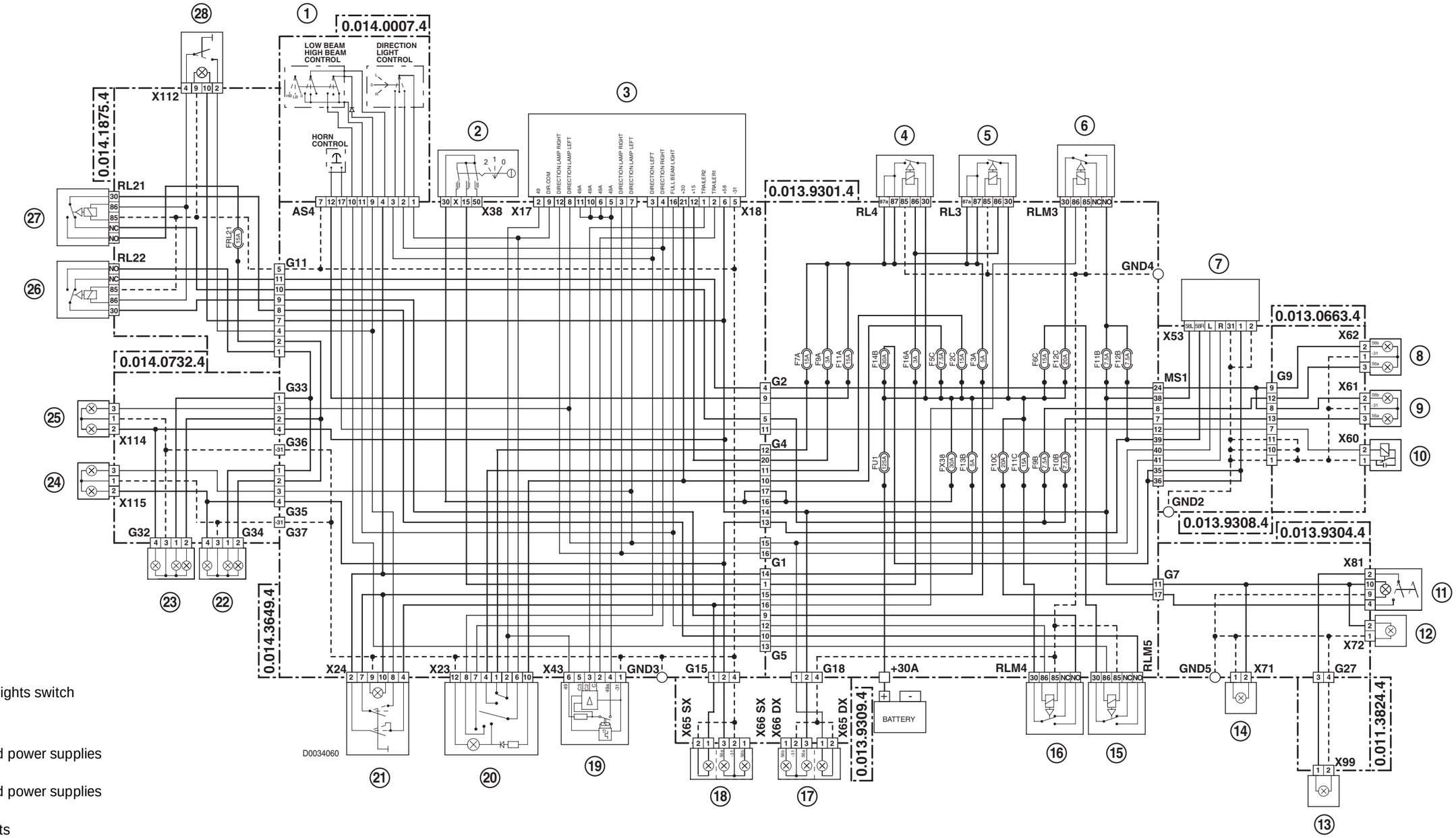
1 Starter switch
2 Ignition controlled power supplies relay
3 Ignition controlled power supplies relay
4 Engine control unit
5 Actuator
6 Camshaft speed sensor
7 Engine coolant temperature sensor
8 Fuel temperature sensor
9 Engine boost pressure sensor
10 Armrest
11 Throttle pedal position sensor

4.5 LIGHTS - STEERING COLUMN SWITCH UNIT (VERSION WITHOUT FRONT LIFT)



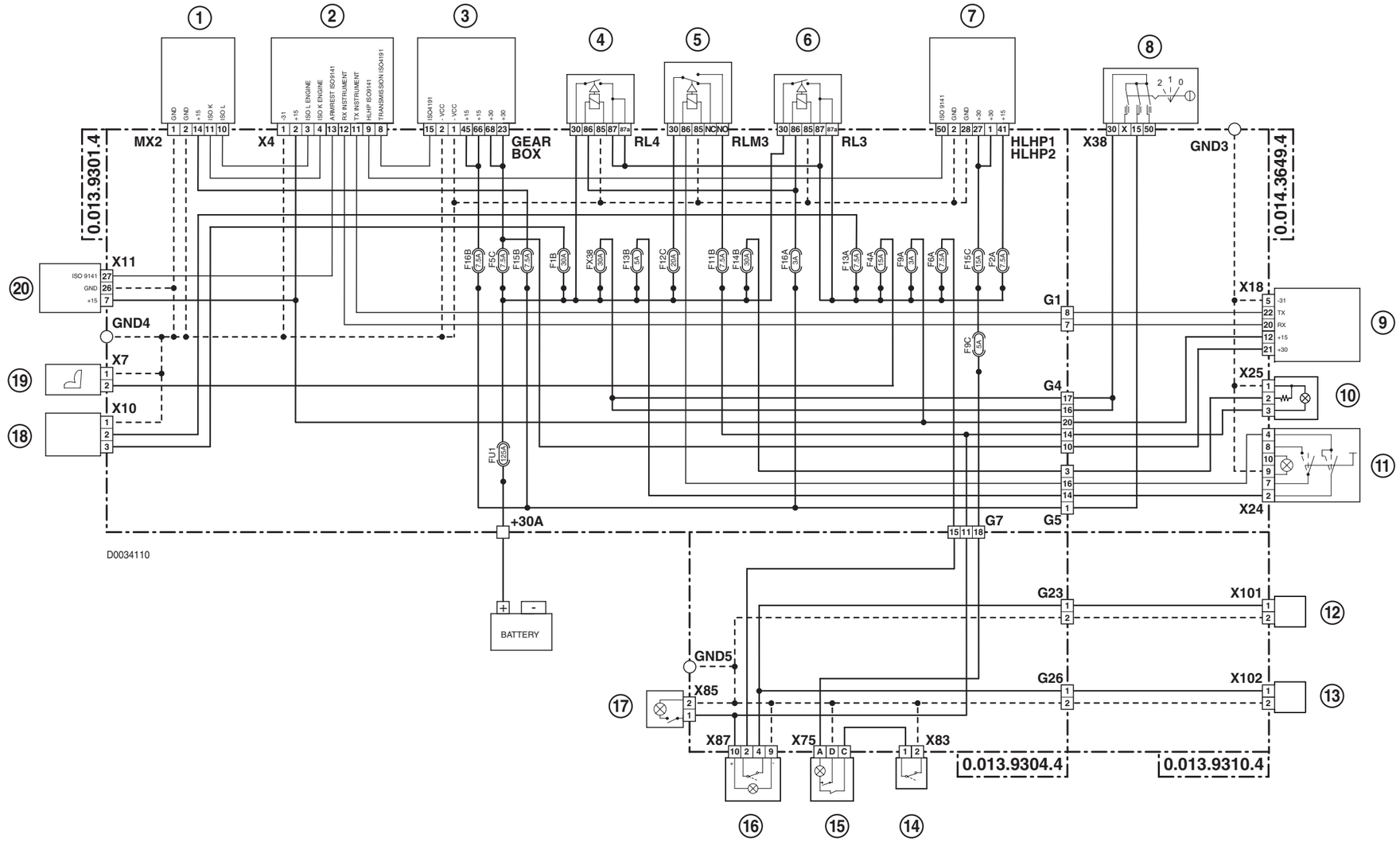
1 Starter switch
2 Infocenter
3 Ignition controlled power supplies relay
4 Ignition controlled power supplies relay
5 Relay for sidelights
6 Trailer socket
7 Right headlamp
8 Left headlamp
9 Horn
10 Rotating beacon on/off switch
11 Number plate light
12 Rotating beacon
13 Number plate light
14 Relay for low beam headlights
15 Relay for full beam headlights
16 RH rear sidelight and brake light
17 LH rear direction indicator
18 Hazard lights control unit
19 Hazard warning lights switch
20 Sidelights switch
21 RH direction indicator and sidelight
22 LH direction indicator and sidelight
23 Steering column lights switch

4.6 LIGHTS - STEERING COLUMN SWITCH UNIT (VERSION WITH FRONT LIFT)



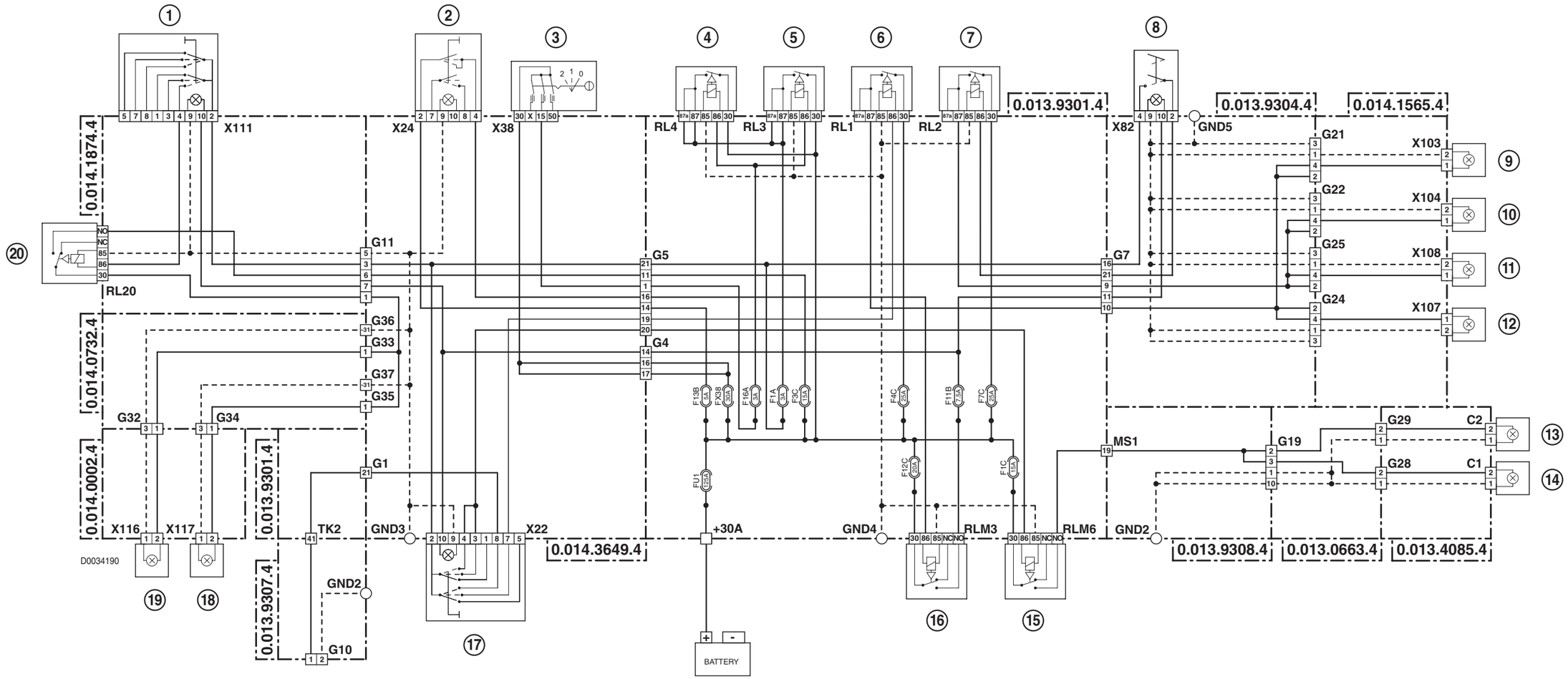
1 Steering column lights switch
2 Starter switch
3 Infocenter
4 Ignition controlled power supplies relay
5 Ignition controlled power supplies relay
6 Relay for sidelights
7 Trailer socket
8 Right headlamp
9 Left headlamp
10 Horn
11 Rotating beacon on/off switch
12 Number plate light
13 Rotating beacon
14 Number plate light
15 Relay for low beam headlights
16 Relay for full beam headlights
17 RH rear sidelight and brake light
RH rear direction indicator
18 LH rear direction indicator
LH rear sidelight and brake light
19 Hazard lights control unit
20 Hazard warning lights switch
21 Sidelights switch
22 Right front light on arms
23 Left front light on arms
24 RH sidelight and direction indicator
25 LH sidelight and direction indicator
26 Relay for full beam headlights
27 Relay for low beam headlights
28 Low/full beam headlights switch

4.7 DIAGNOSTICS ACCESSORIES



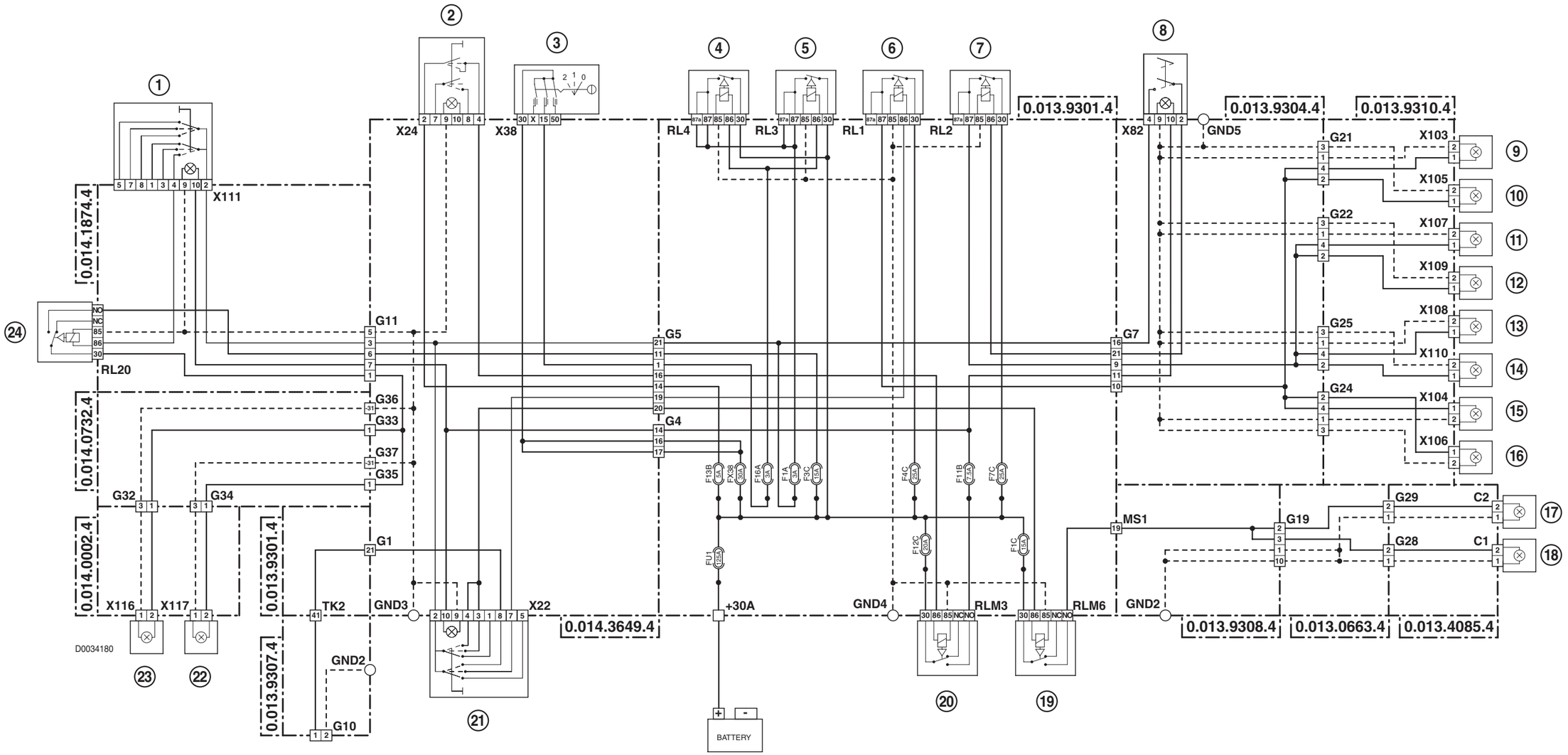
1 Engine control unit
2 Diagnostic socket
3 Transmission control unit
4 Ignition controlled power supplies relay
5 Relay for sidelights
6 Ignition controlled power supplies relay
7 HLHP control unit
8 Starter switch
9 Infocenter
10 Cigar lighter
11 Sidelights switch
12 Right-hand rearview mirror with electric demisting
13 Left-hand rearview mirror with electric demisting
14 Door open warning light connector
15 Courtesy light
16 Rearview mirror demister switch
17 Courtesy light
18 Power socket
19 Driver's seat
20 Armrest

4.8 WORKLIGHTS (VERSION WITHOUT DEMISTING MIRRORS)



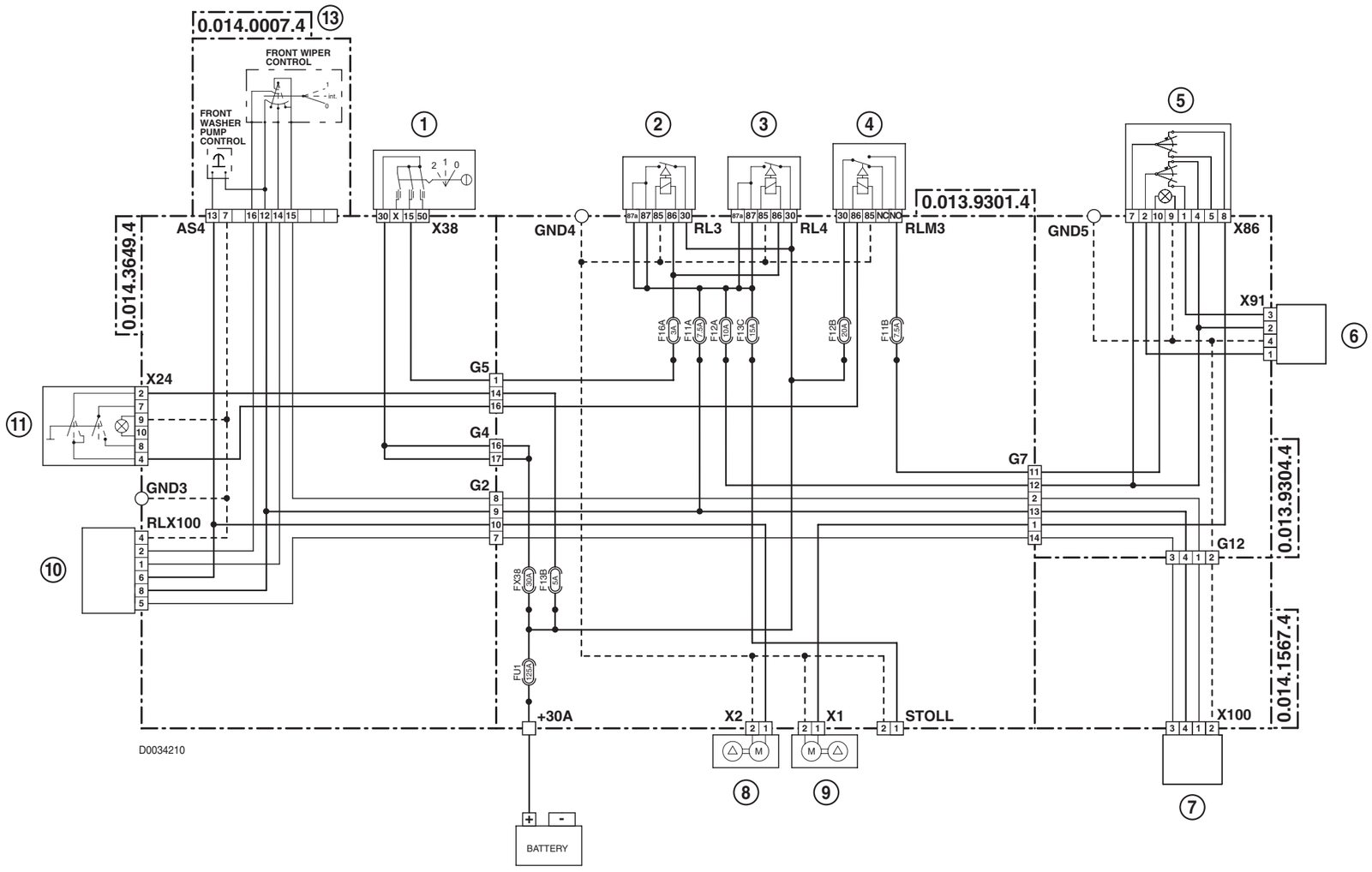
1 Switch for worklights on arms
2 Sidelights switch
3 Starter switch
4 Ignition controlled power supplies relay
5 Ignition controlled power supplies relay
6 Front worklights relay
7 Rear worklights relay
8 Switch for rear worklights
9 Right-hand front worklight on cab
10 Left-hand front worklight on cab
11 Left-hand rear worklight on cab
12 Right-hand rear worklight on cab
13 Front RH outer worklight
14 Front LH outer worklight
15 Side worklights relay
16 Relay for sidelights
17 Front worklights switch
18 Right-hand supplementary light
19 Left-hand supplementary light
20 Relay for worklights on arms

4.9 WORKLIGHTS (VERSION WITH DEMISTING MIRRORS)



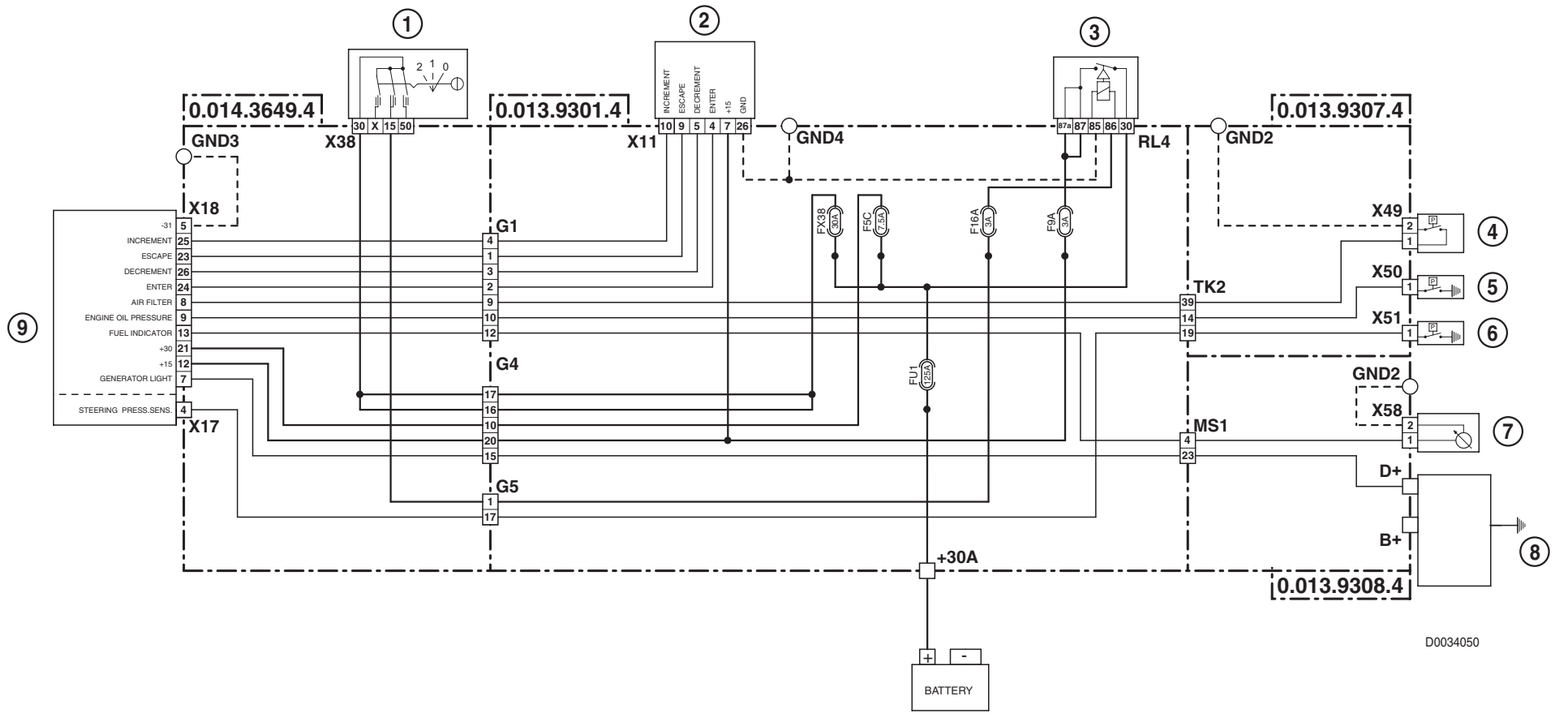
1 Switch for worklights on arms
2 Sidelights switch
3 Starter switch
4 Ignition controlled power supplies relay
5 Ignition controlled power supplies relay
6 Front worklights relay
7 Rear worklights relay
8 Switch for rear worklights
9 Right-hand front worklight on cab
10 Right-hand front worklight on cab
11 Right-hand rear worklight on cab
12 Right-hand rear worklight on cab
13 Left-hand rear worklight on cab
14 Left-hand rear worklight on cab
15 Left-hand front worklight on cab
16 Left-hand front worklight on cab
17 Front RH outer worklight
18 Front LH outer worklight
19 Side worklights relay
20 Relay for sidelights
21 Front worklights switch
22 Right-hand supplementary light
23 Left-hand supplementary light
24 Relay for worklights on arms

4.10 WINDSCREEN WIPERS



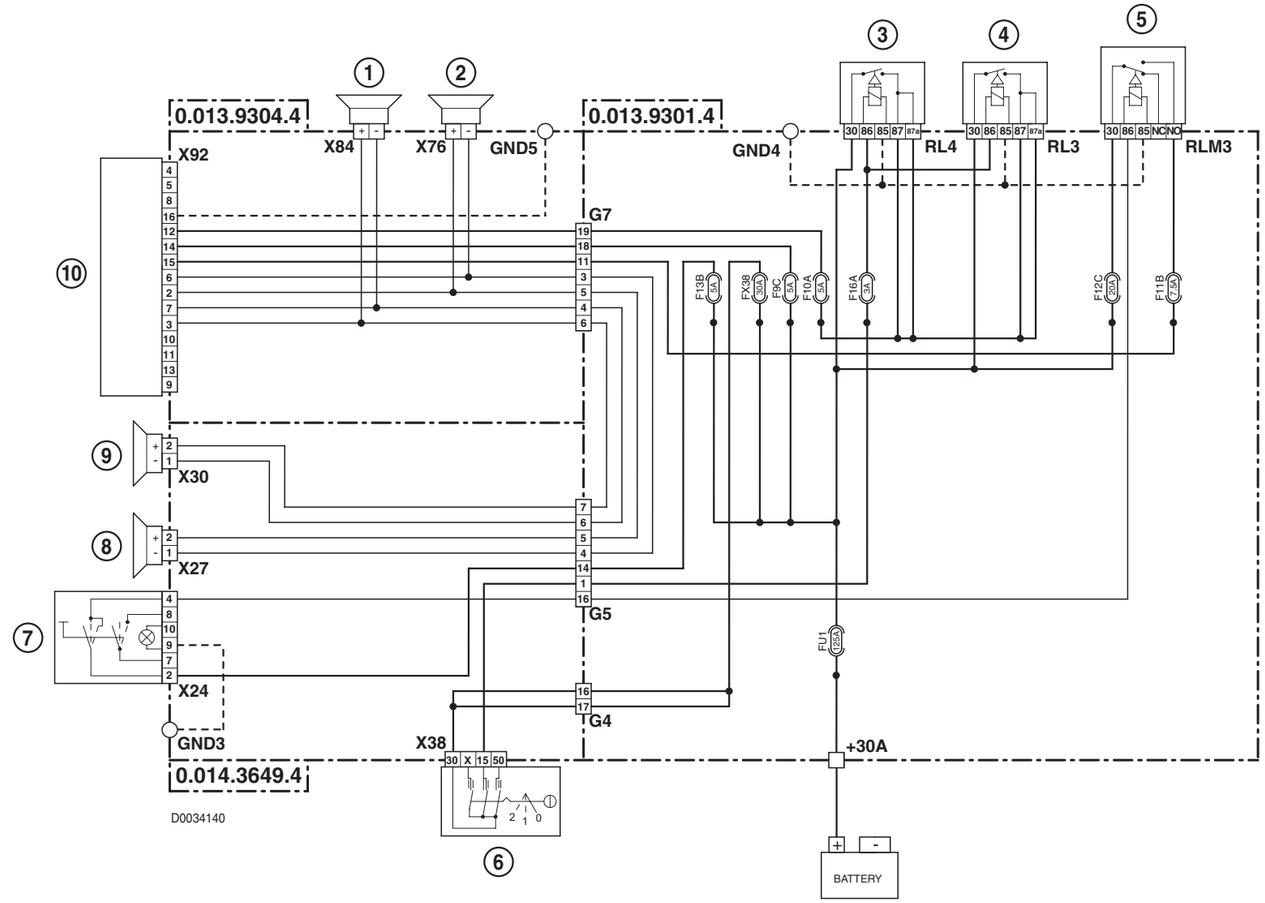
1 Starter switch
2 Ignition controlled power supplies relay
3 Ignition controlled power supplies relay
4 Relay for sidelights
5 Rear window wiper switch
6 Rear window wiper motor
7 Windscreen wiper motor
8 Windscreen washer pump
9 Rear window washer pump
10 Windscreen wiper motor
11 Sidelights switch
12 Steering column lights switch

4.11 INSTRUMENT PANEL



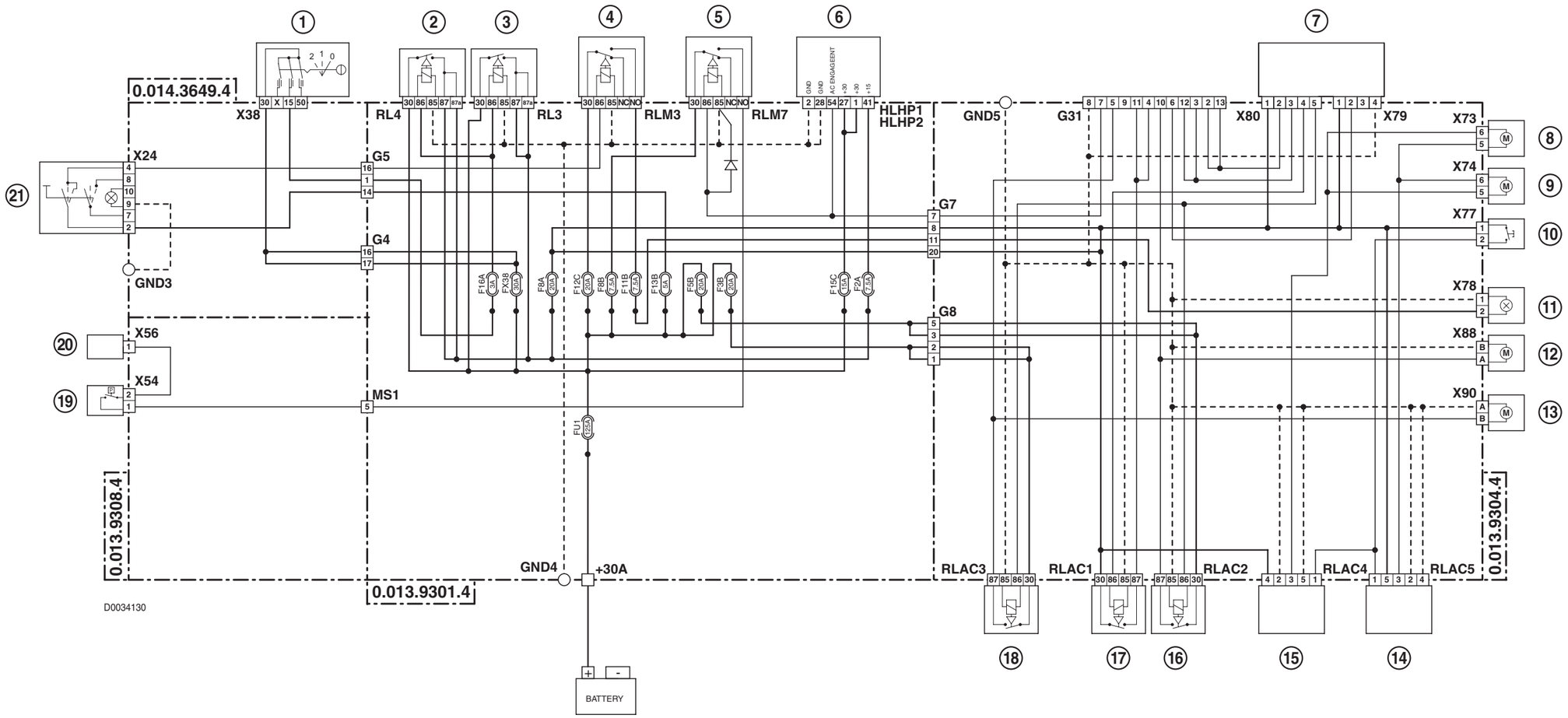
1 Starter switch
2 Armrest
3 Ignition controlled power supplies relay
4 Air cleaner clogging sensor
5 Engine oil pressure switch
6 Steering system pressure switch
7 Fuel level sensor
8 Alternator
9 Infocenter

4.12 RADIO



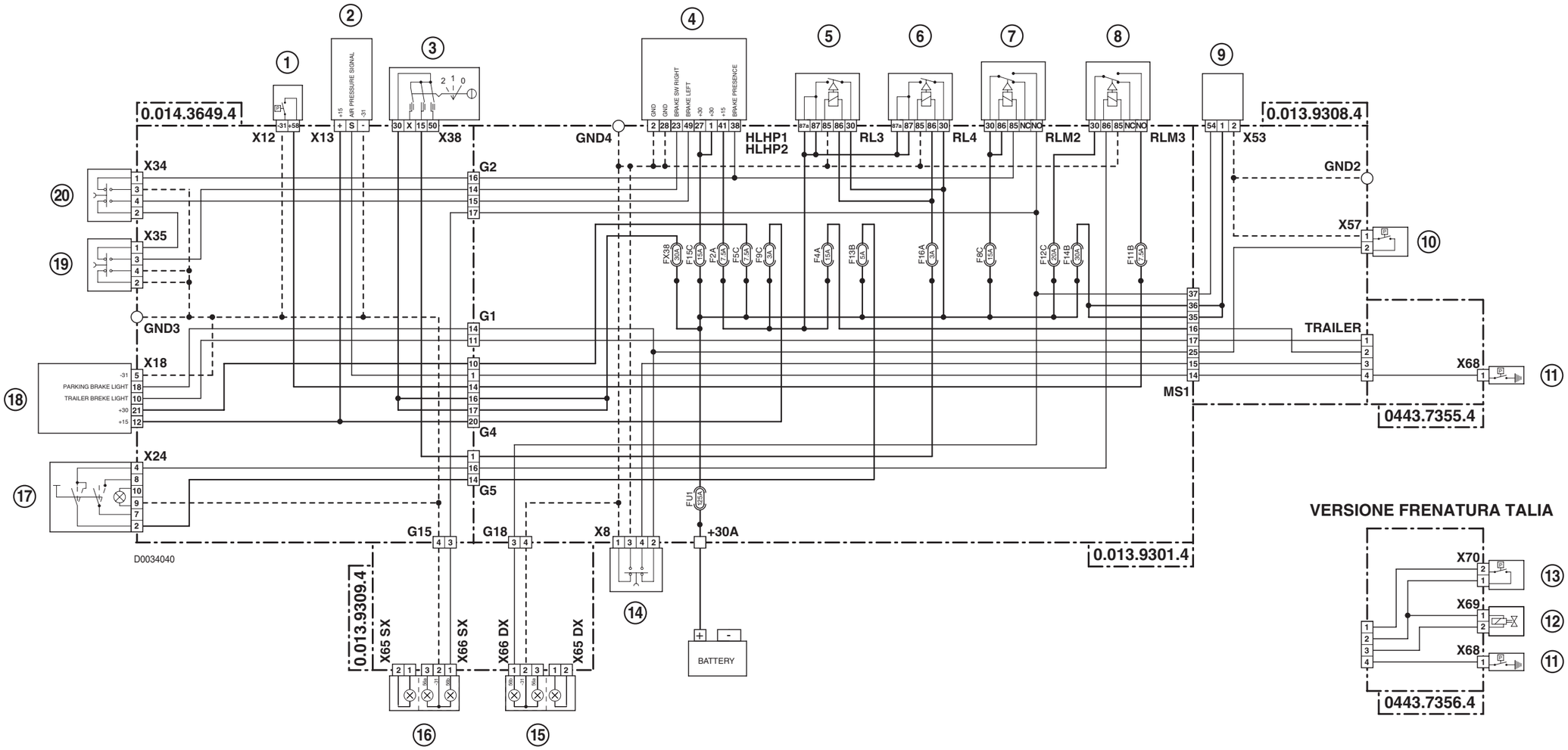
1 Right-hand woofer
2 Left-hand woofer
3 Ignition controlled power supplies relay
4 Ignition controlled power supplies relay
5 Relay for sidelights
6 Starter switch
7 Sidelights switch
8 Left-hand tweeter
9 Right-hand tweeter
10 Radio

4.13 MANUAL AIR CONDITIONER



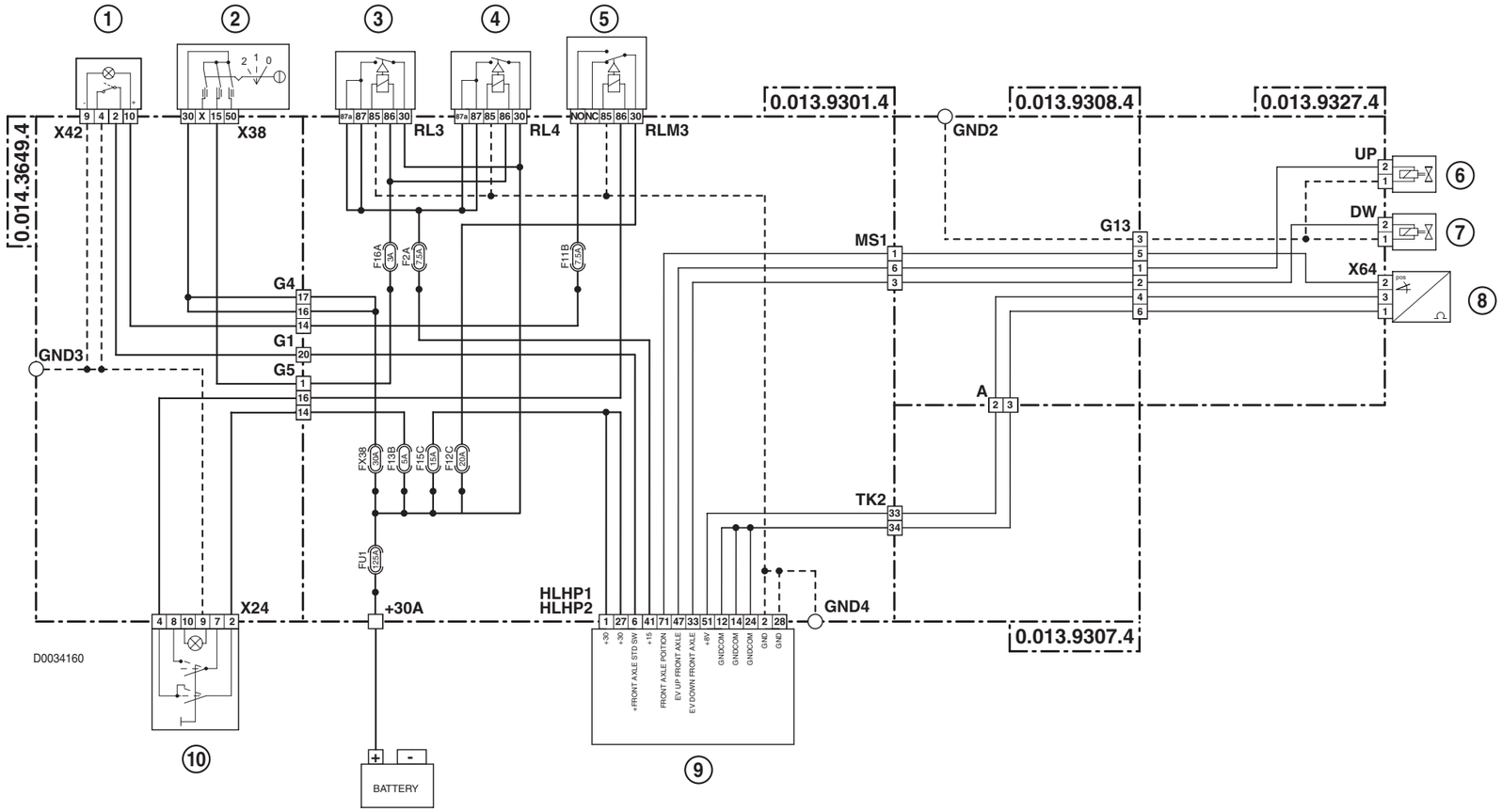
1 Starter switch
2 Ignition controlled power supplies relay
3 Ignition controlled power supplies relay
4 Relay for sidelights
5 Air conditioning compressor relay
6 HLHP control unit
7 Fan speed selector switch
Recirculation switch
8 Right-hand recirculation motor
9 Left-hand recirculation motor
10 Fan speed selector switch
11 Manual air conditioner control panel lights
12 Left-hand fan motor
13 Right-hand fan motor
14 Relay for recirculation 2
15 Relay for recirculation 1
16 Relay for fan 4th speed
17 Relay for fan 3rd speed
18 Relay for fan speed 4b
19 Air conditioning pressure switch
20 Air conditioning compressor
21 Sidelights switch

4.14 BRAKES



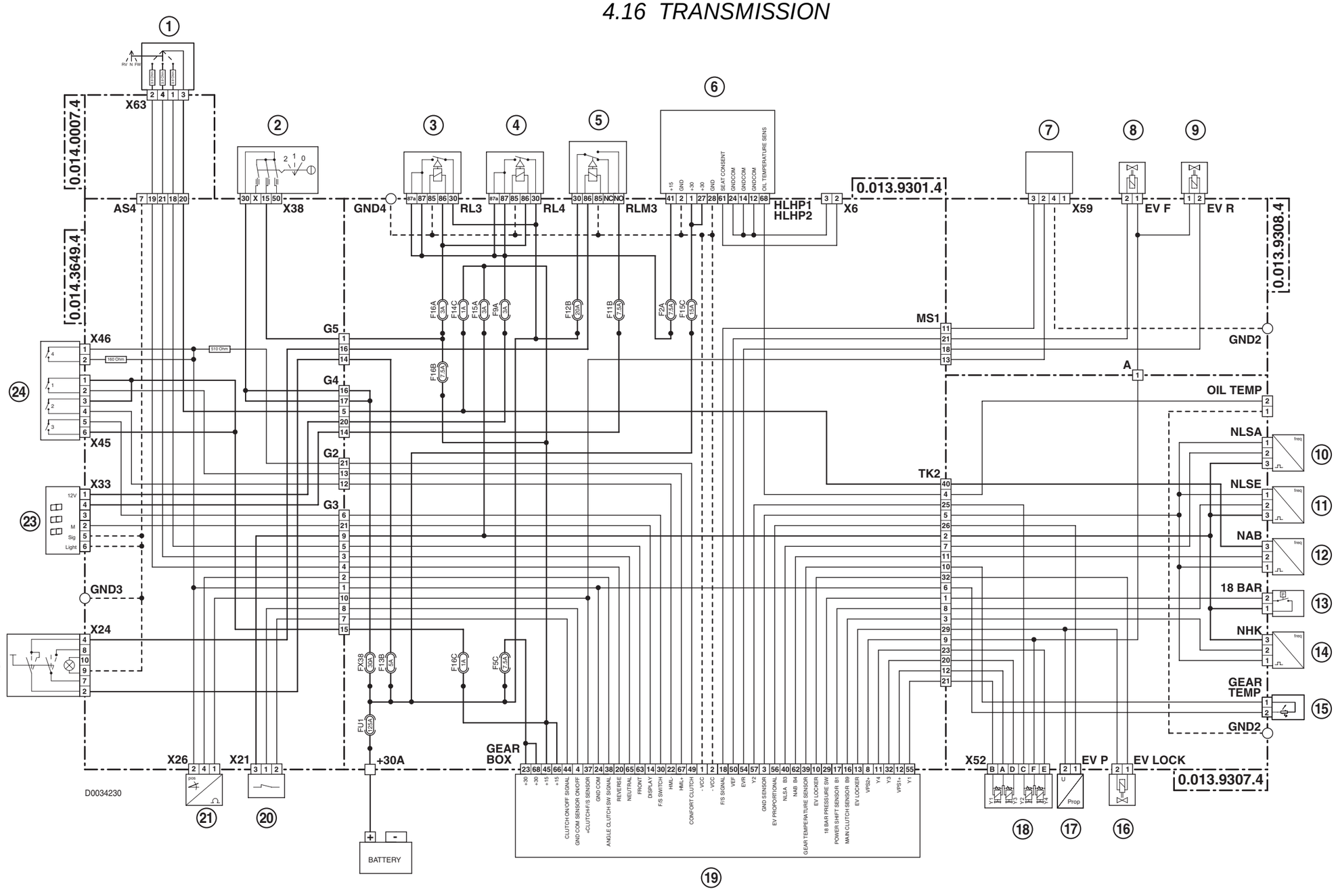
1 Compressed air pressure gauge
2 Compressed air pressure gauge
3 Starter switch
4 HLHP control unit
5 Ignition controlled power supplies relay
6 Ignition controlled power supplies relay
7 Brake lights relay
8 Relay for sidelights
9 Trailer socket
10 Brake fluid level sensor
11 Trailer braking pressure sensor
12 Solenoid valve for trailer parking brake
13 Trailer braking low pressure switch
14 Handbrake switch
15 RH rear direction indicator
RH rear sidelight and brake light
16 LH rear direction indicator
LH rear sidelight and brake light
17 Sidelights switch
18 Infocenter
19 Right brake pedal switch
20 Left brake pedal switch

4.15 FRONT AXLE SUSPENSION



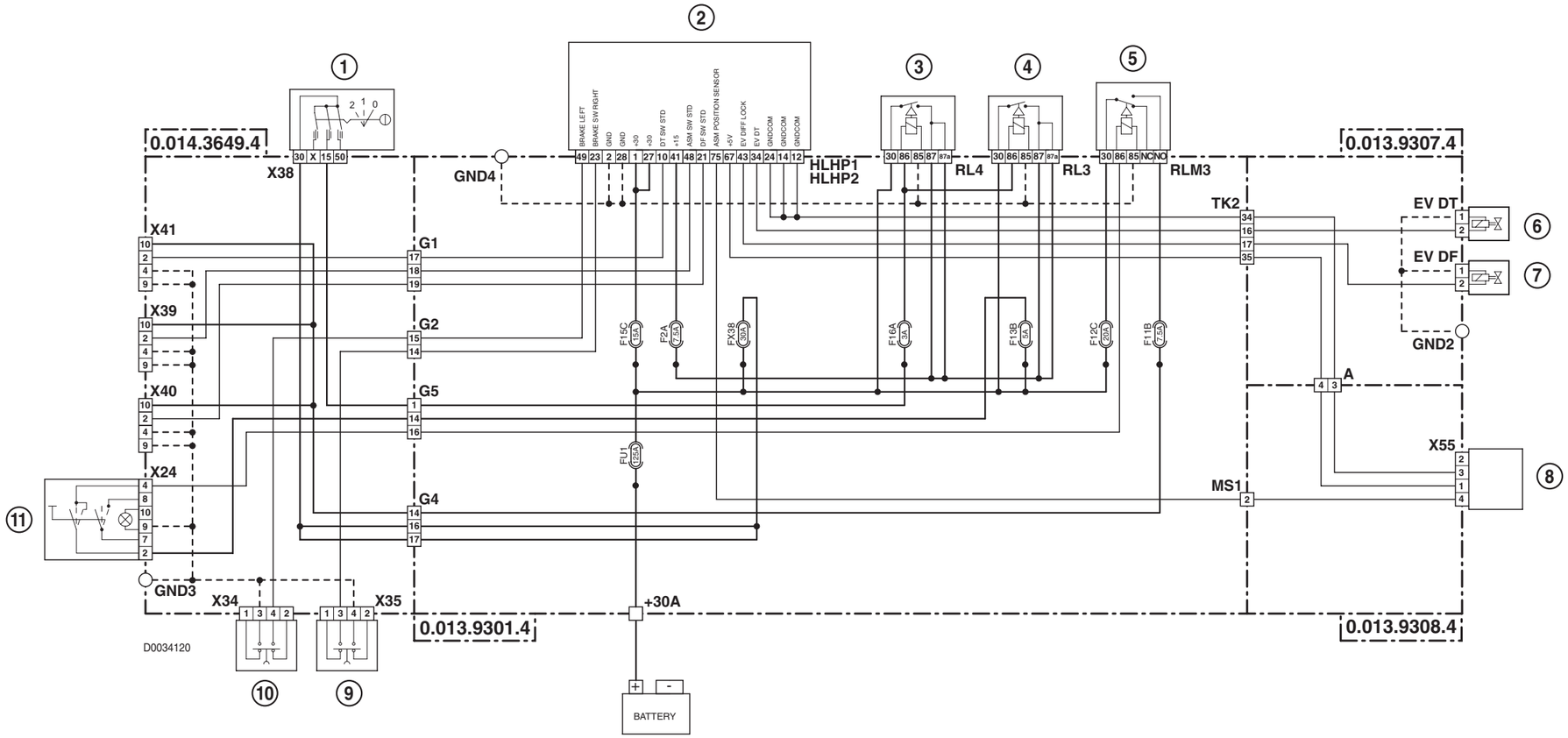
1 Front axle suspensions switch (not utilised)
2 Starter switch
3 Ignition controlled power supplies relay
4 Ignition controlled power supplies relay
5 Relay for sidelights
6 Front axle up control solenoid valve
7 Front axle down control solenoid valve
8 Front axle suspension position sensor
9 HLHP control unit
10 Sidelights switch

4.16 TRANSMISSION



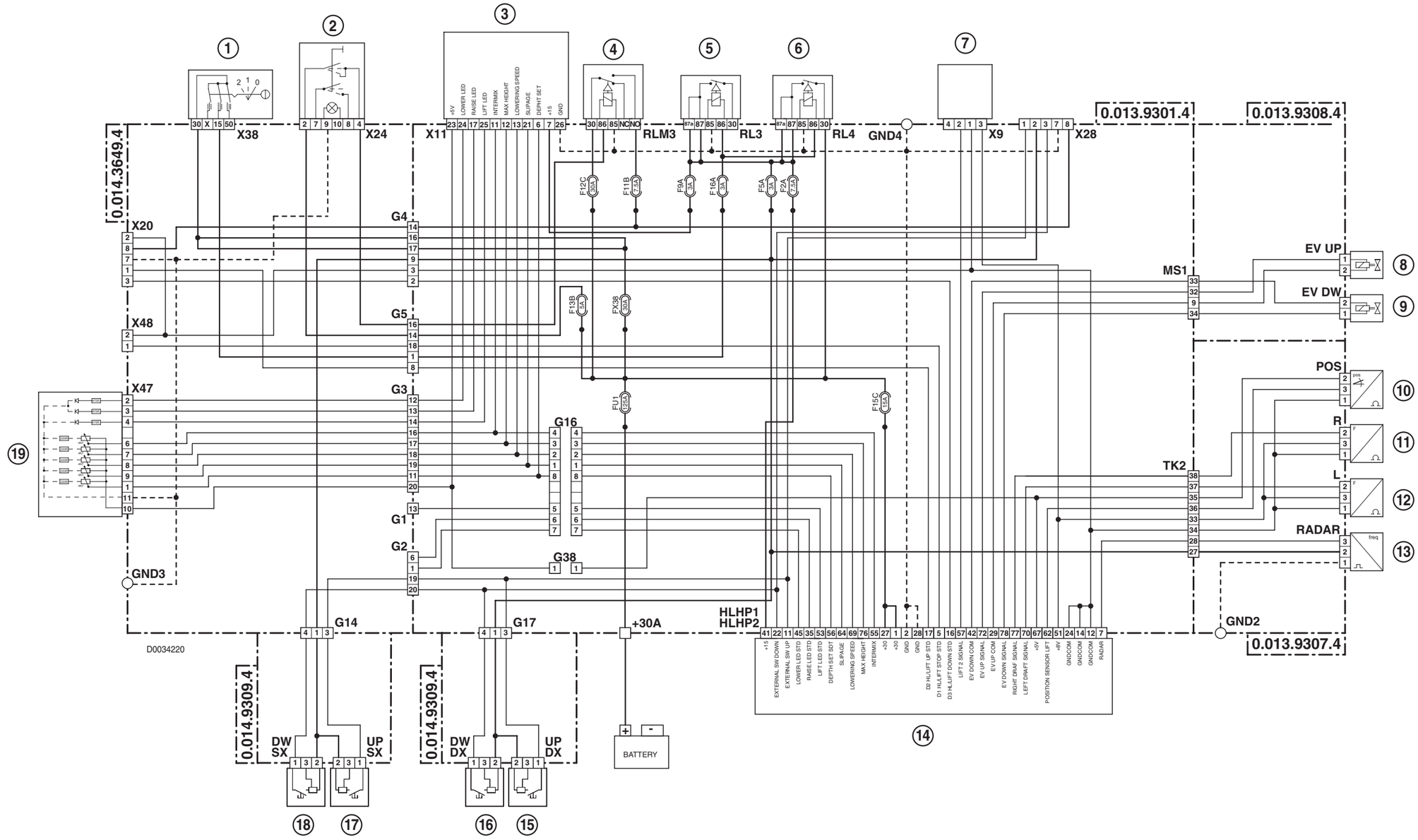
1 Shuttle control lever
2 Starter switch
3 Ignition controlled power supplies relay
4 Ignition controlled power supplies relay
5 Relay for sidelights
6 HLHP control unit
7 Field/road sensor
8 "FIELD" mode solenoid valve
9 "ROAD" mode solenoid valve
10 Gearbox output shaft speed sensor
11 Gearbox input shaft speed sensor
12 Wheel speed sensor
13 Low transmission oil pressure switch
14 Clutch speed sensor
15 Transmission oil temperature sensor
16 Gearbox in neutral locking solenoid valve
17 Main clutch proportional solenoid valve
18 Gear change solenoid valves (Y1, Y2, Y3, Y4)
19 Transmission control unit
20 Clutch pedal depressed proximity sensor
21 Clutch pedal position sensor
22 Sidelights switch
23 Transmission display
24 Gearbox control lever

4.17 ASM - 4WD - DIFFERENTIAL



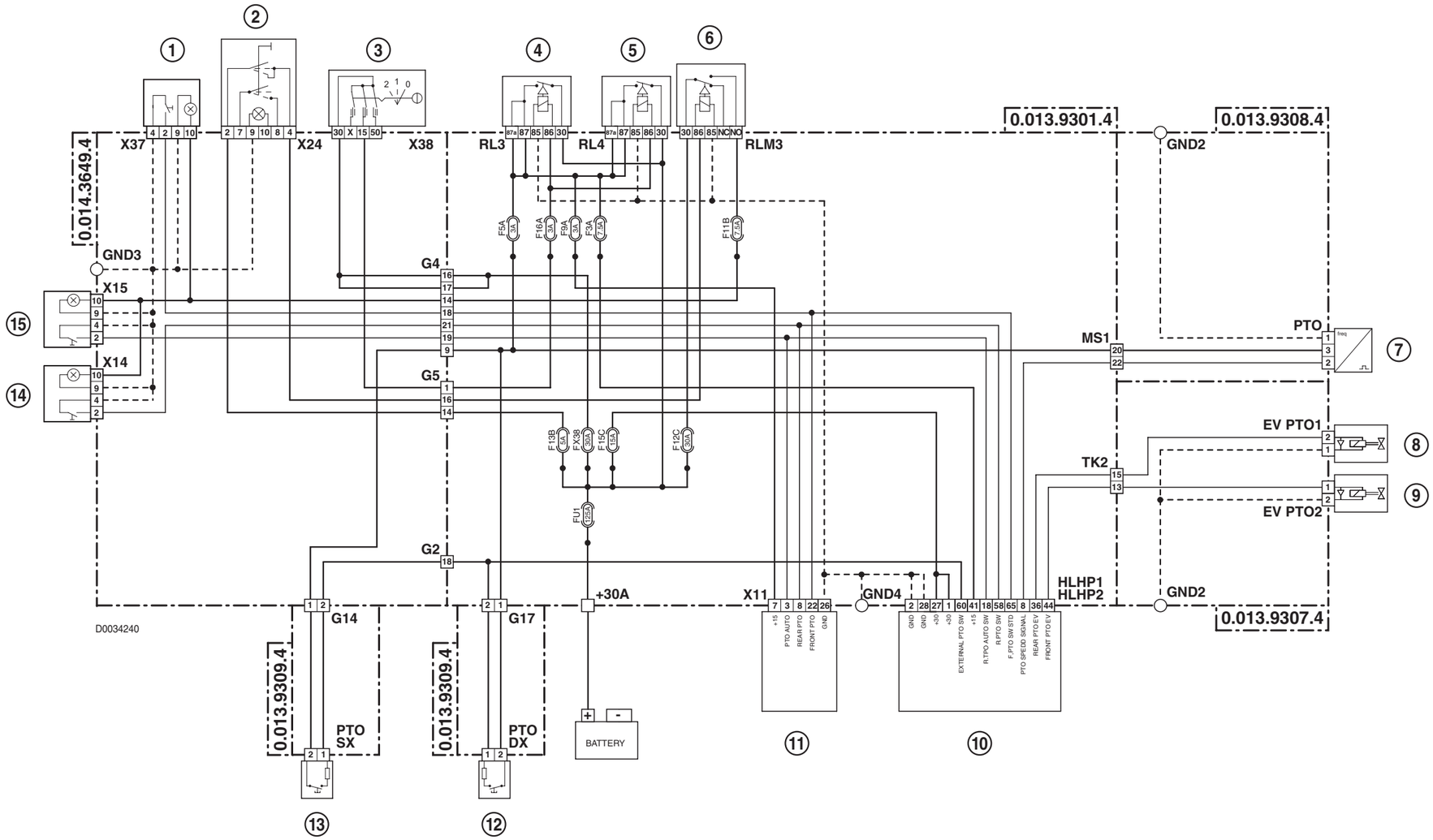
1 Starter switch
2 HLHP control unit
3 Ignition controlled power supplies relay
4 Ignition controlled power supplies relay
5 Relay for sidelights
6 4WD control solenoid valve
7 Differential lock solenoid valve
8 Steering angle sensor
9 Right brake pedal switch
10 Left brake pedal switch
11 Sidelights switch

4.18 ELECTRONIC LIFT



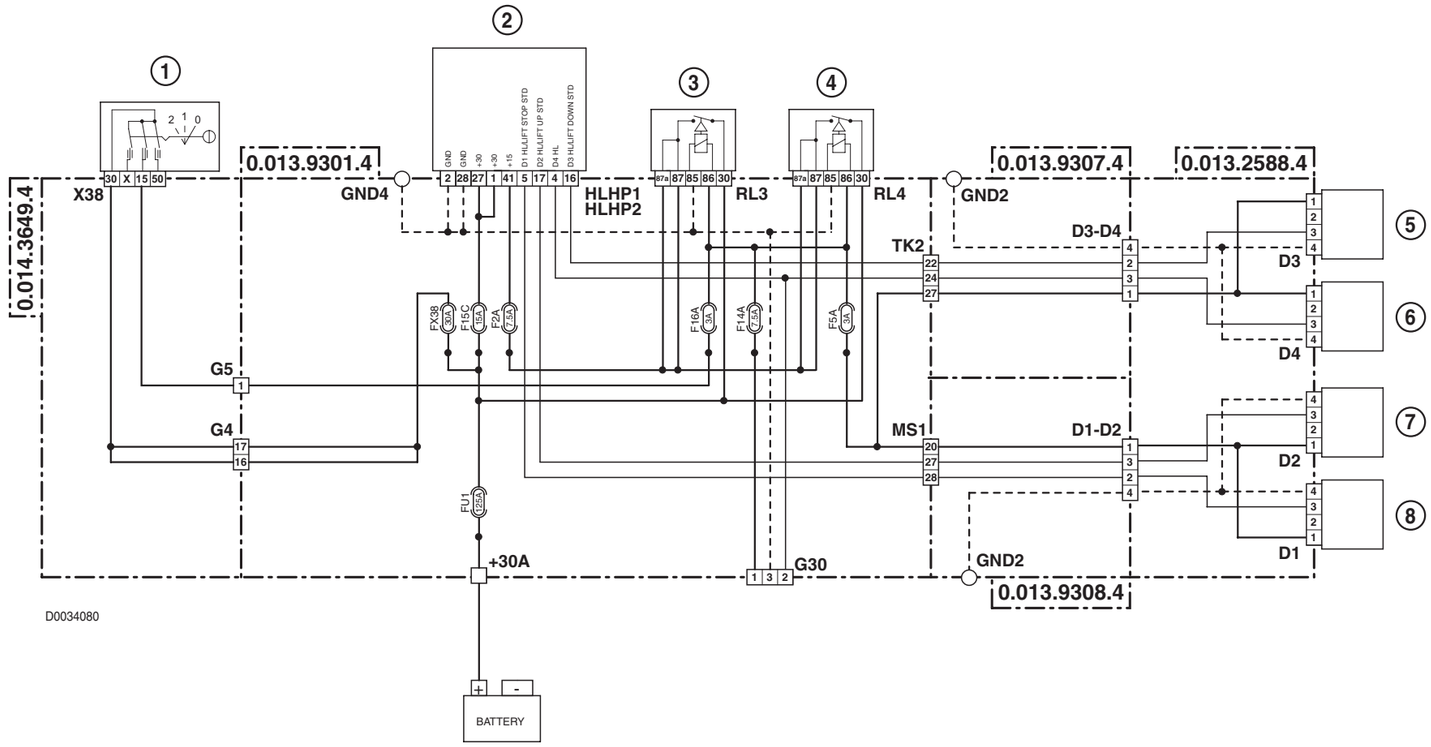
1 Starter switch
2 Sidelights switch
3 Armrest
4 Relay for sidelights
5 Ignition controlled power supplies relay
6 Ignition controlled power supplies relay
7 ISO4 socket (Power for external implements)
8 Lift Up solenoid valve
9 Lift lowering solenoid valve
10 Rear lift position sensor
11 Lift draft sensor (right)
12 Lift draft sensor (left)
13 Radar
14 HLHP control unit
15 RH rear lift up button
16 RH rear lift down button
17 LH rear lift up button
18 LH rear lift down button
19 Lift control console

4.19 FRONT AND REAR PTO



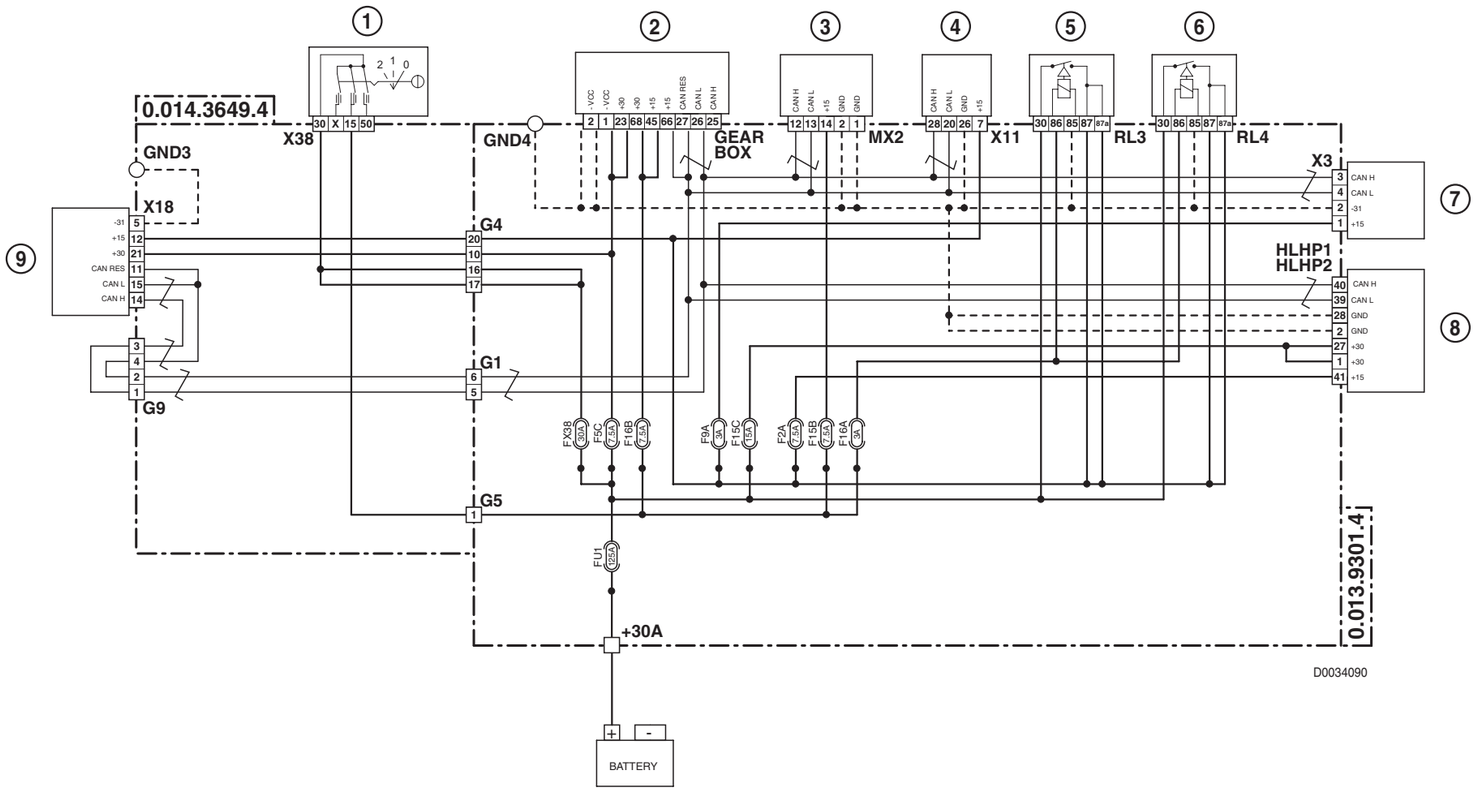
1 Front PTO engagement switch
2 Sidelights switch
3 Starter switch
4 Ignition controlled power supplies relay
5 Ignition controlled power supplies relay
6 Relay for sidelights
7 Rear PTO speed sensor
8 Front PTO engagement solenoid valve
9 Rear PTO engagement solenoid valve
10 HLHP control unit
11 Armrest
12 RH rear PTO button (on mudguard)
13 LH rear PTO button (on mudguard)
14 Rear PTO engagement switch
15 AUTO PTO engagement switch

4.20 DIRECTIONAL CONTROL VALVES



1 Starter switch
2 HLHP control unit
3 Ignition controlled power supplies relay
4 Ignition controlled power supplies relay
5 Directional control valve 3
6 Directional control valve 4
7 Directional control valve 2
8 Directional control valve 1

4.21 CAN BUS

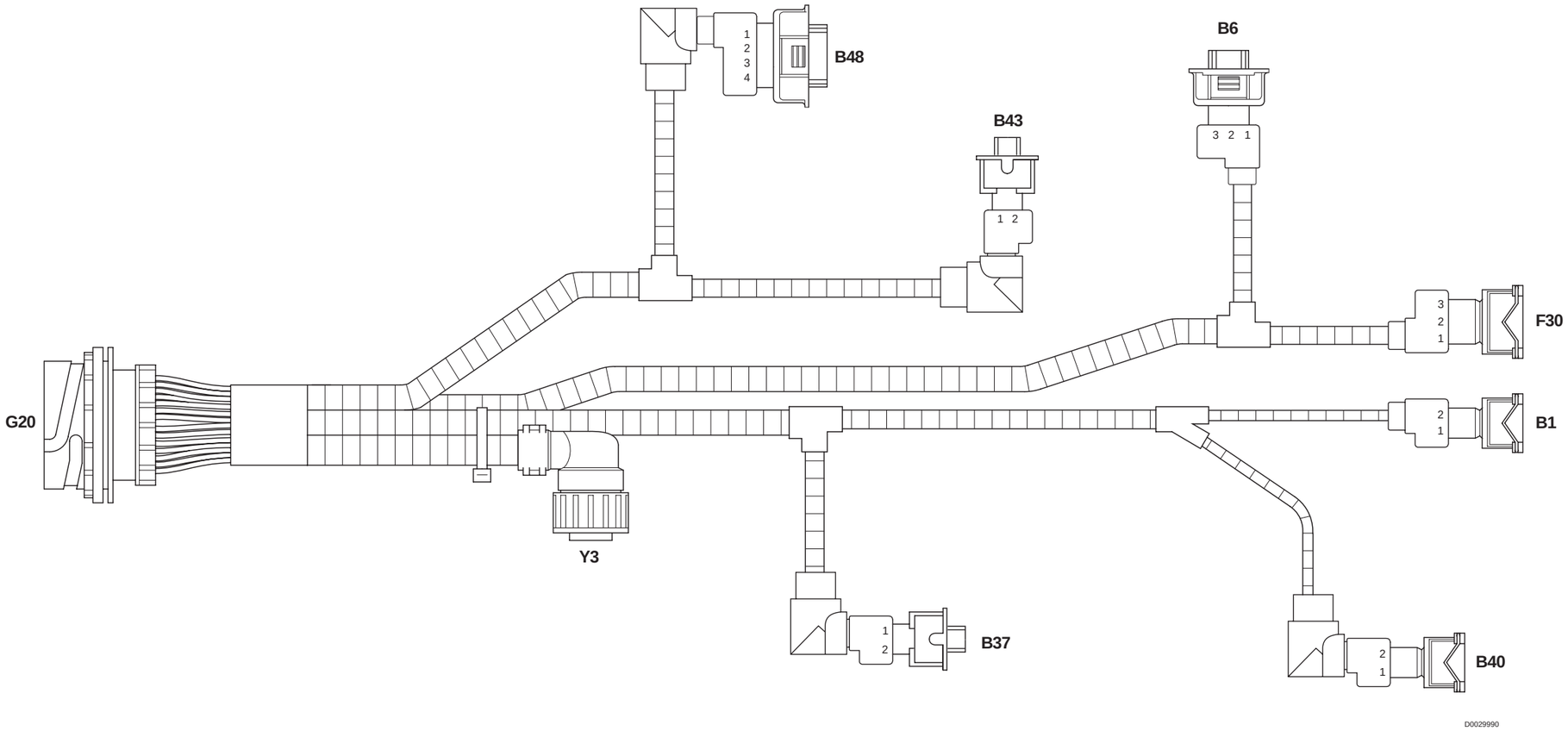


1 Starter switch
2 Transmission control unit
3 Engine control unit
4 Armrest
5 Ignition controlled power supplies relay
6 Ignition controlled power supplies relay
7 Supplementary CANBUS socket
8 HLHP control unit
9 Infocenter

PAGE INTENTIONALLY LEFT BLANK

5. WIRING LOOMS

ENGINE WIRING (4 CYLINDERS) (1/2)



B1	Not utilised
B6	Not utilised
B37	Fuel temperature sensor
B40	Camshaft speed sensor
B43	Engine coolant temperature sensor
B48	Engine turbocharging pressure sensor
F30	Not utilised
G20	To engine wiring
Y3	Actuator

ENGINE WIRING (4 CYLINDERS) (2/2)

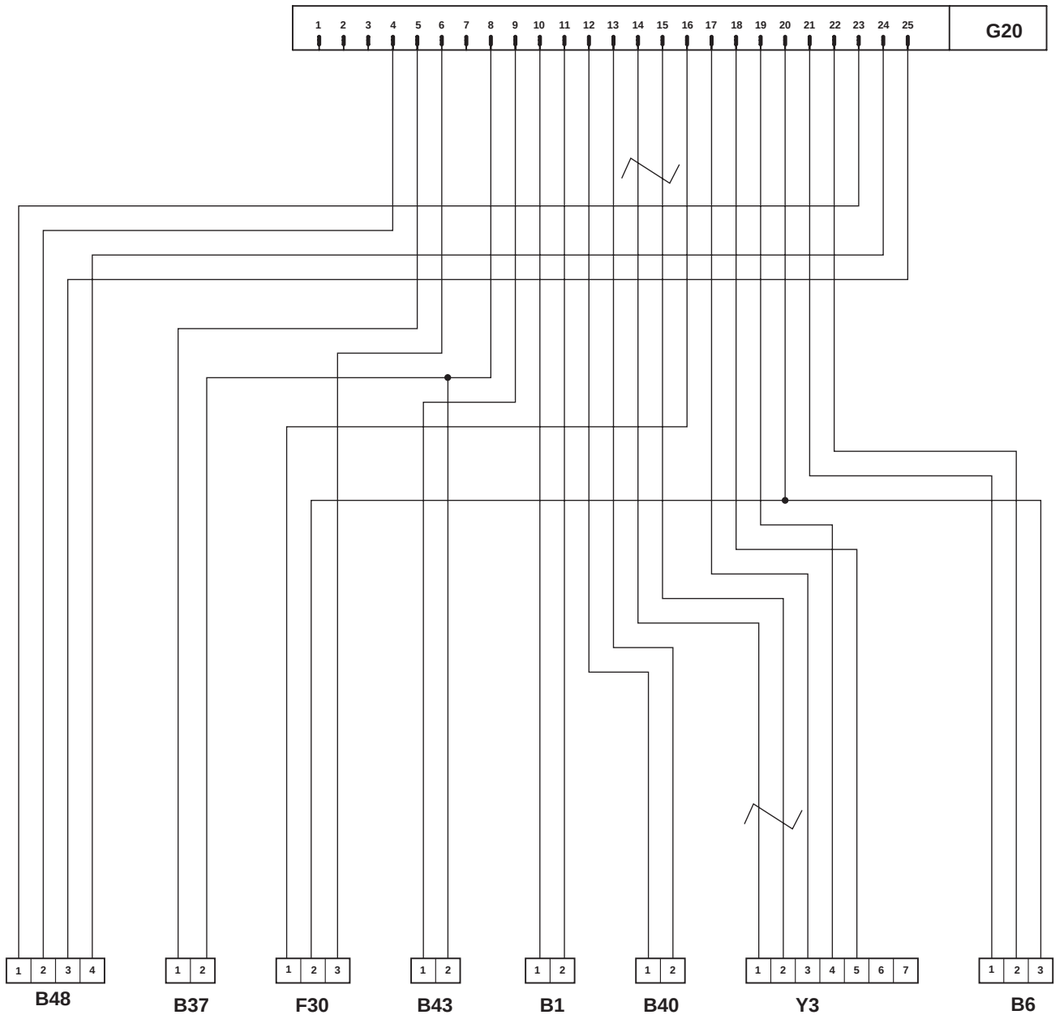
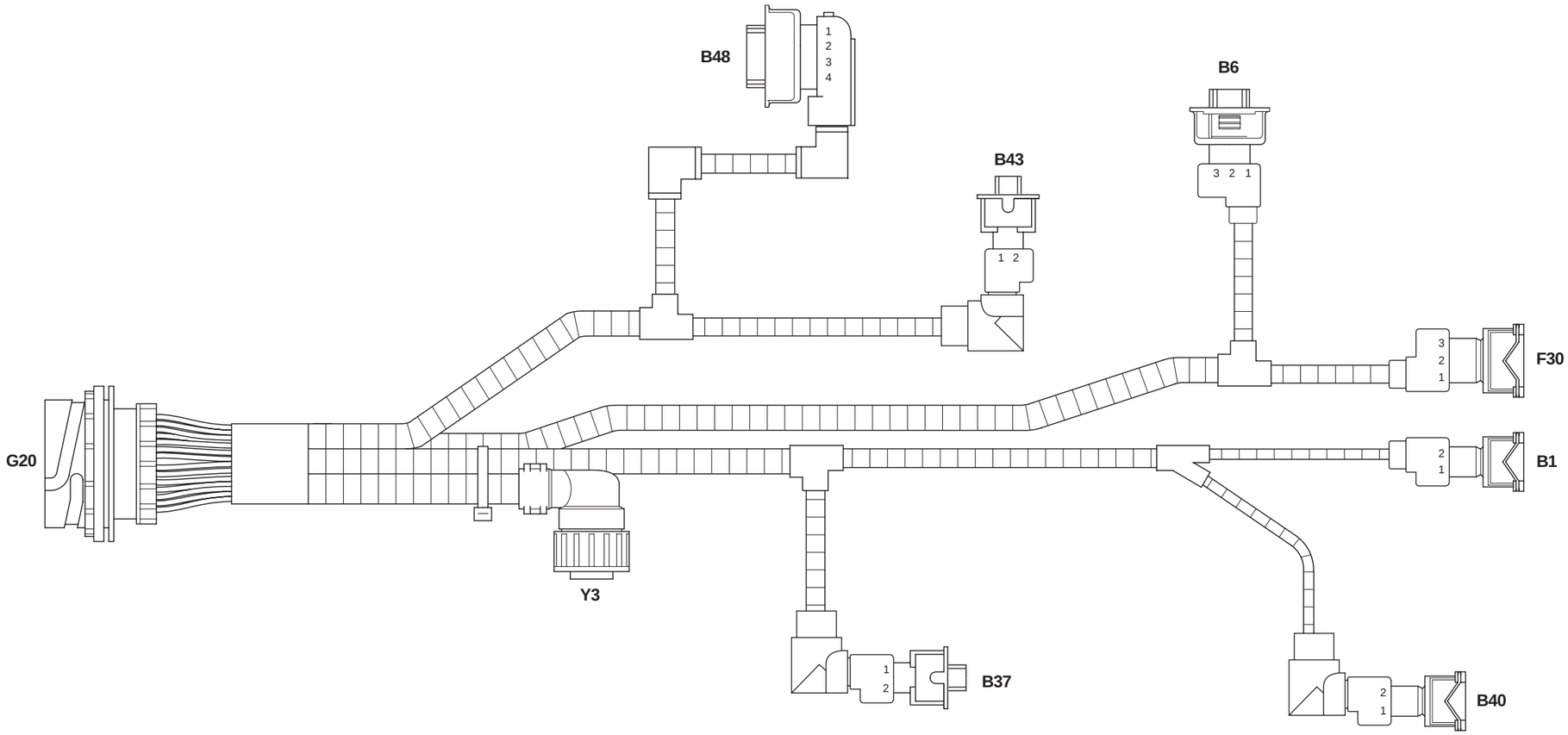


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030000

ENGINE WIRING (6 CYLINDERS) engine serial number–> 0109278 (1/2)



B1	Not utilised
B6	Not utilised
B37	Fuel temperature sensor
B40	Camshaft speed sensor
B43	Engine coolant temperature sensor
B48	Engine turbocharging pressure sensor
F30	Not utilised
G20	To engine wiring
Y3	Actuator

ENGINE WIRING (6 CYLINDERS)(2/2)
engine serial number –> 0109278

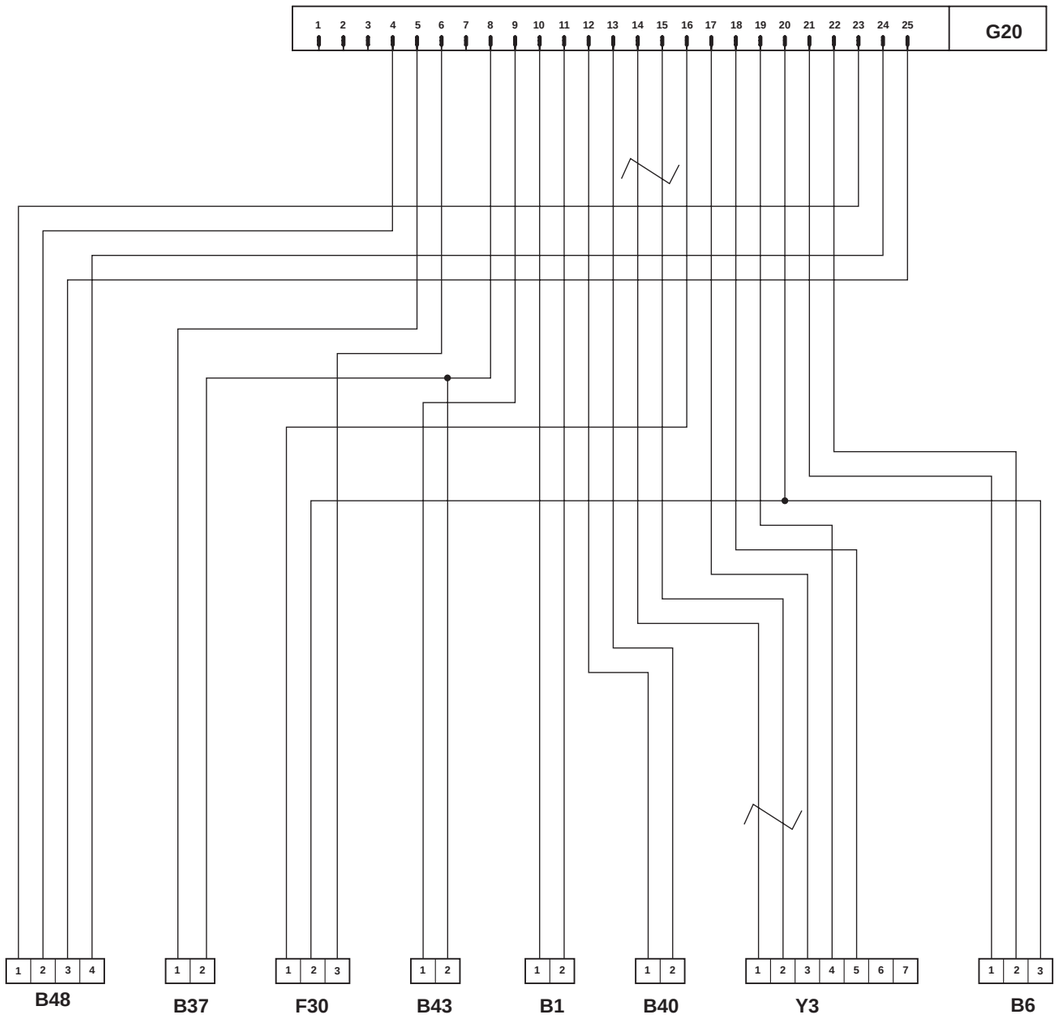
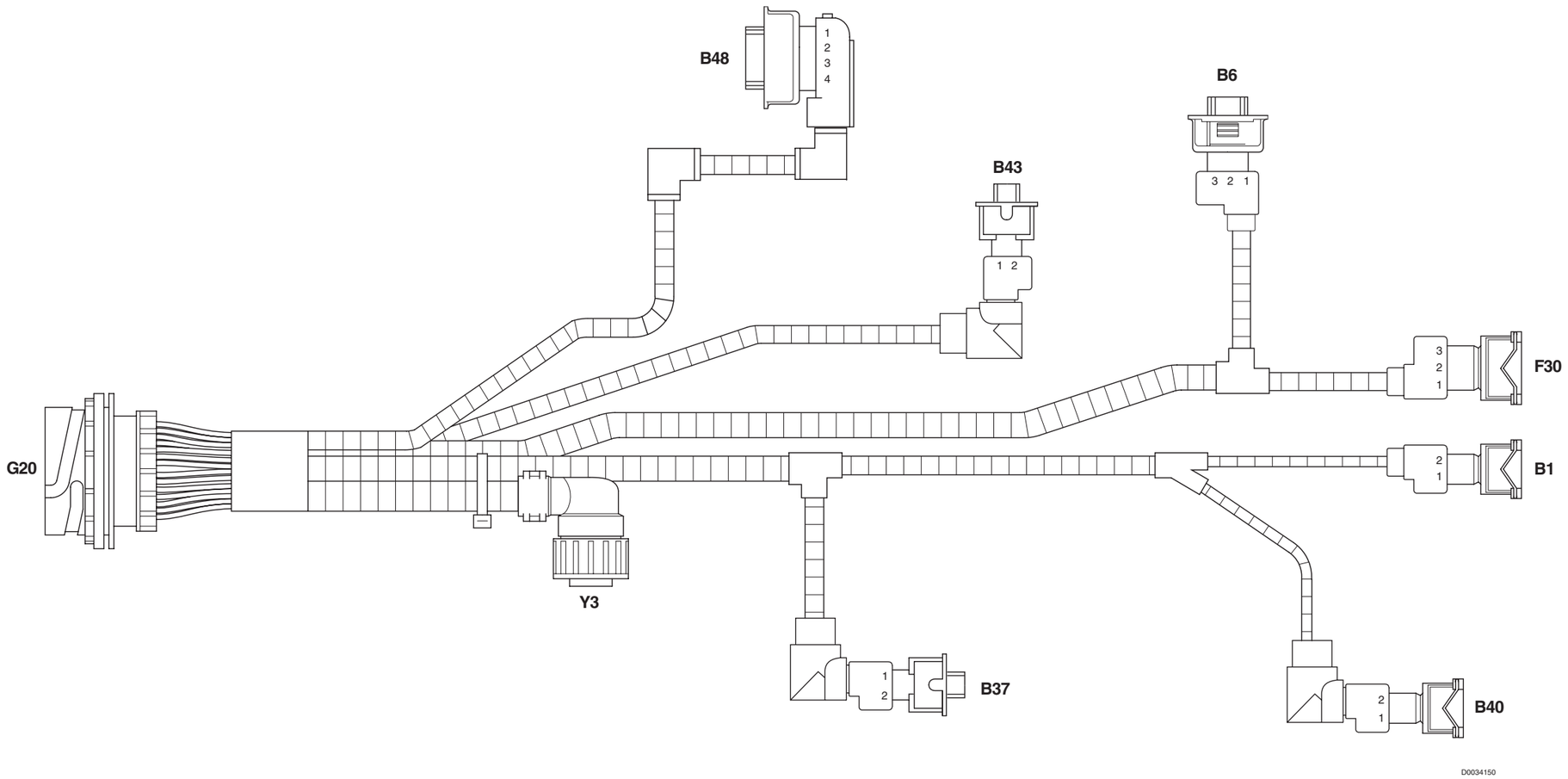


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030000

ENGINE WIRING (6 CYLINDERS) engine serial number 10063954 –> (1/2)



B1	Not utilised
B6	Not utilised
B37	Fuel temperature sensor
B40	Camshaft speed sensor
B43	Engine coolant temperature sensor
B48	Engine turbocharging pressure sensor
F30	Not utilised
G20	To engine wiring
Y3	Actuator

ENGINE WIRING (6 CYLINDERS) (2/2) engine serial number 10063954–>

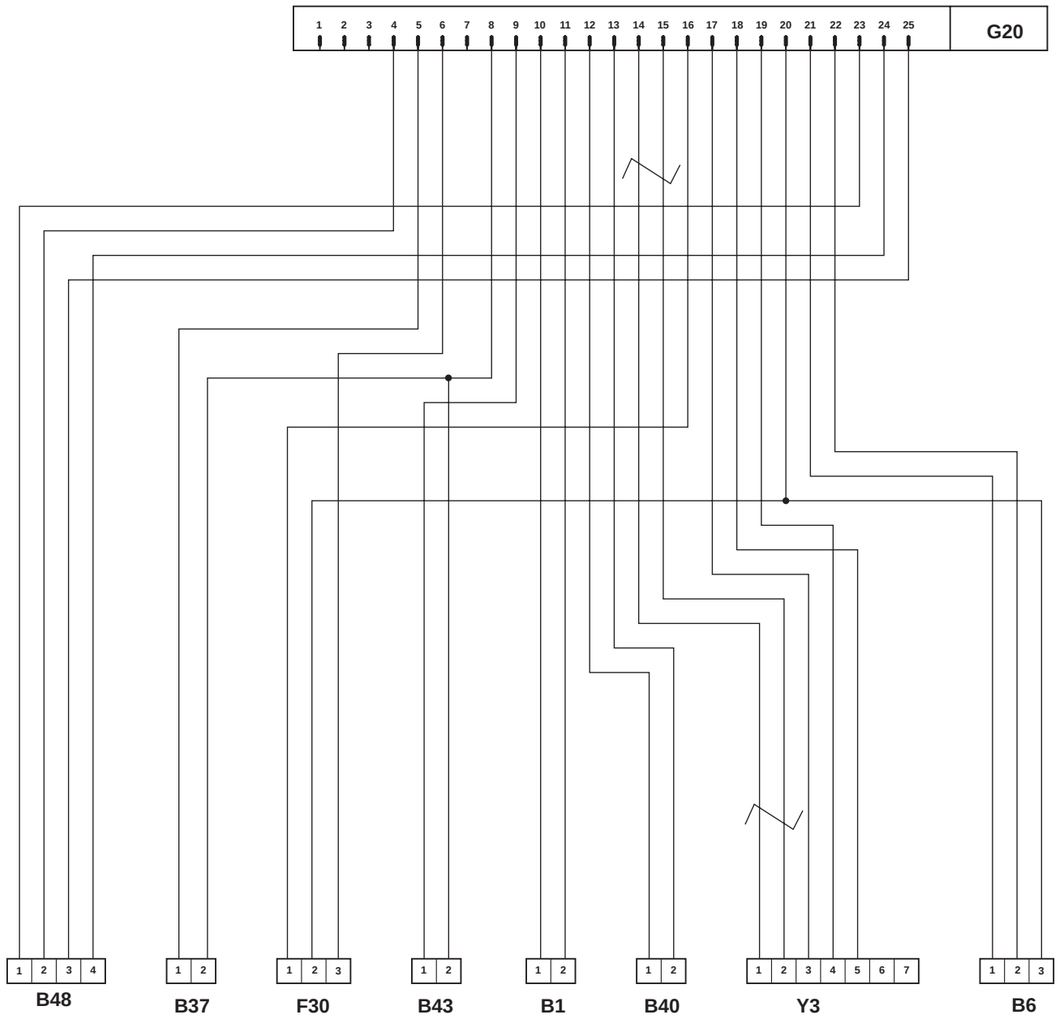
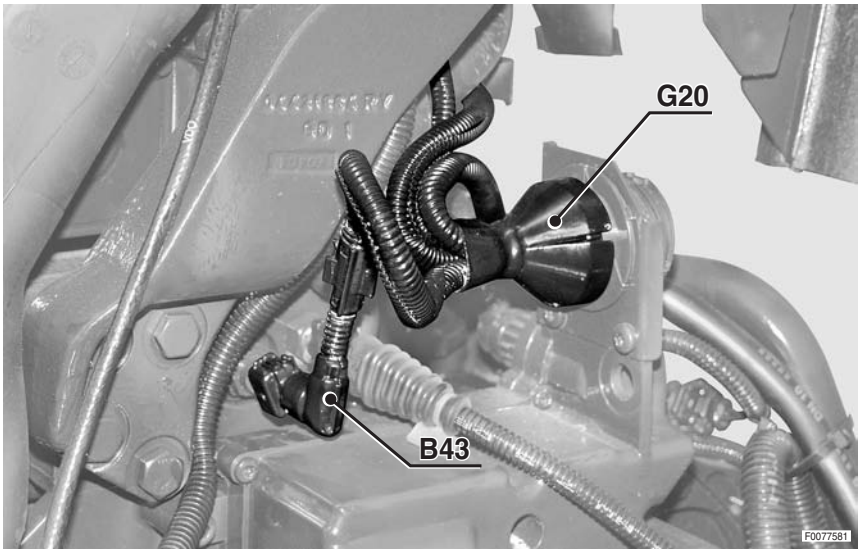


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

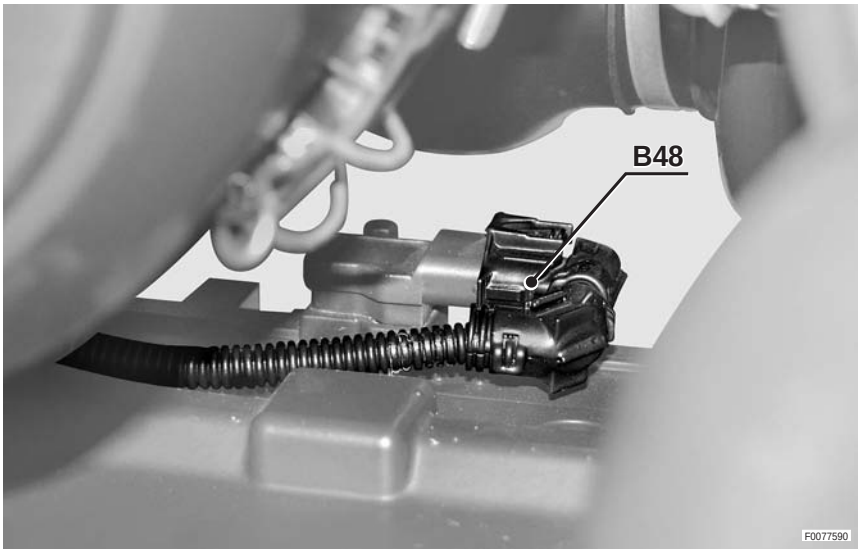
D0030000

CONNECTOR POSITIONS

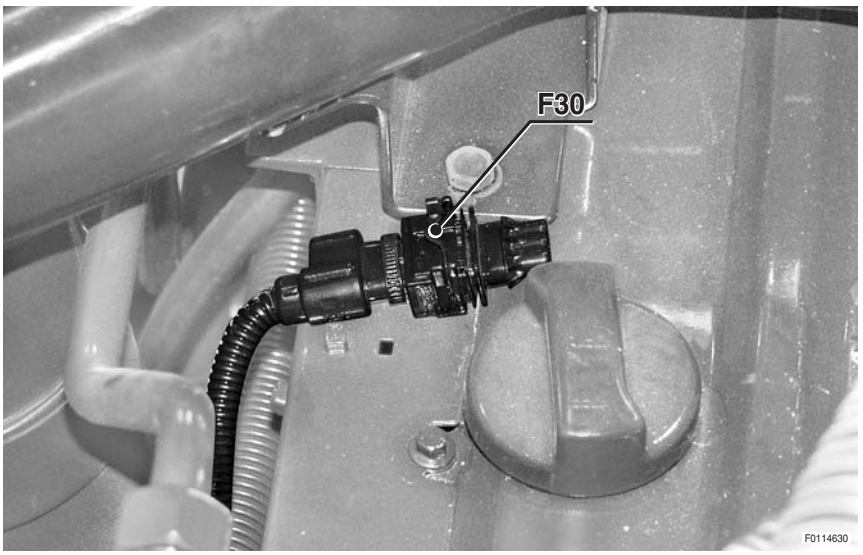
1



2

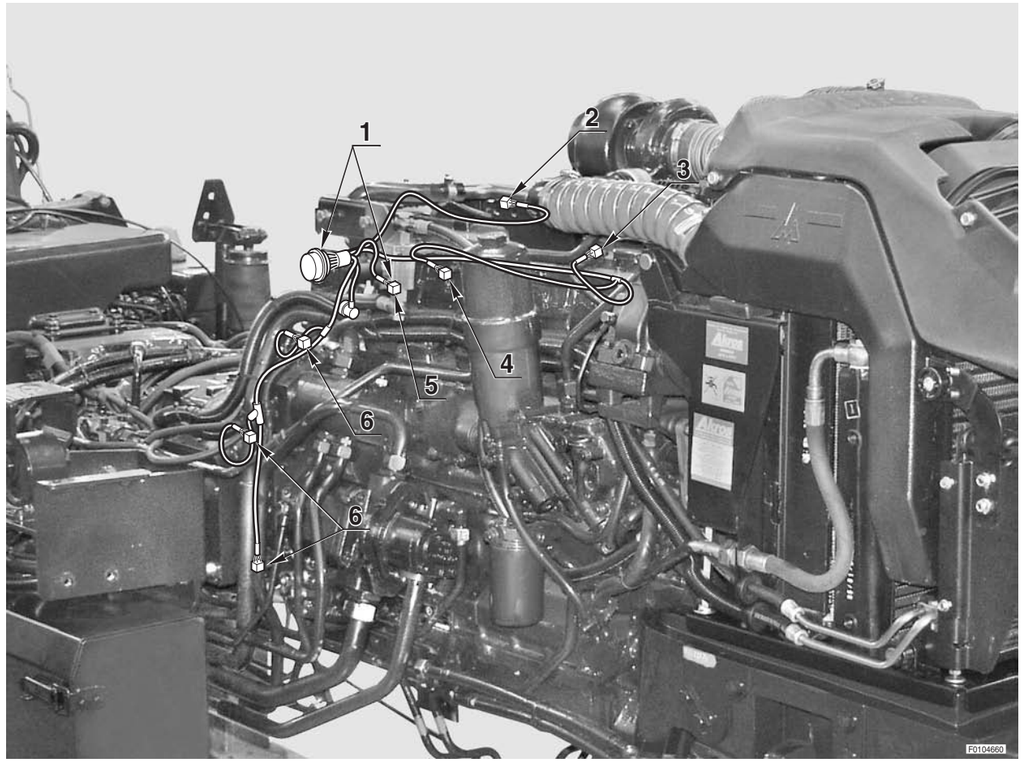


3

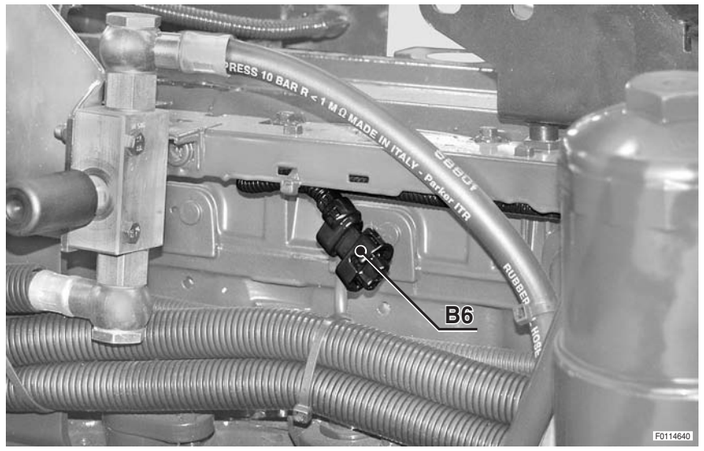


PAGE INTENTIONALLY
LEFT BLANK

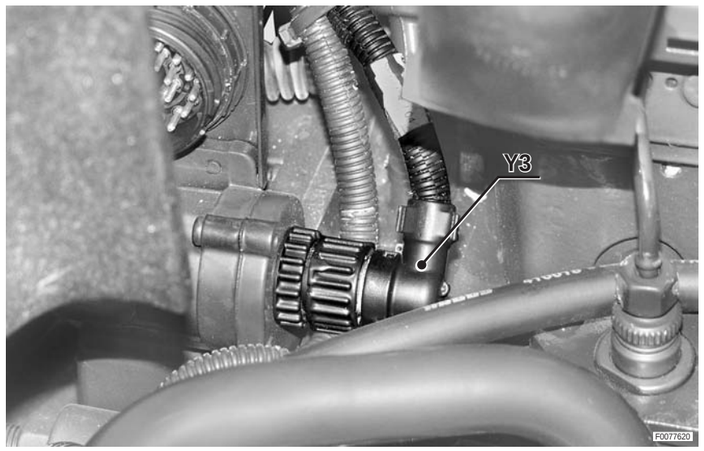
ENGINE WIRING (4 CYLINDER) - ENGINE WIRING (6 CYLINDER)



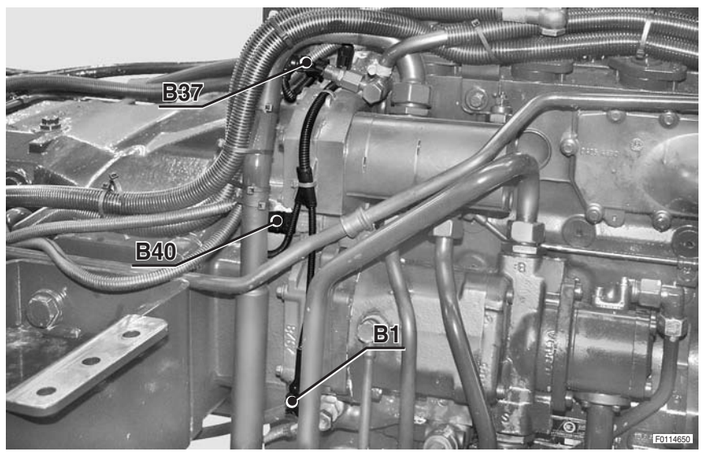
4



5



6



PAGE INTENTIONALLY
LEFT BLANK

ENGINE HOOD WIRING

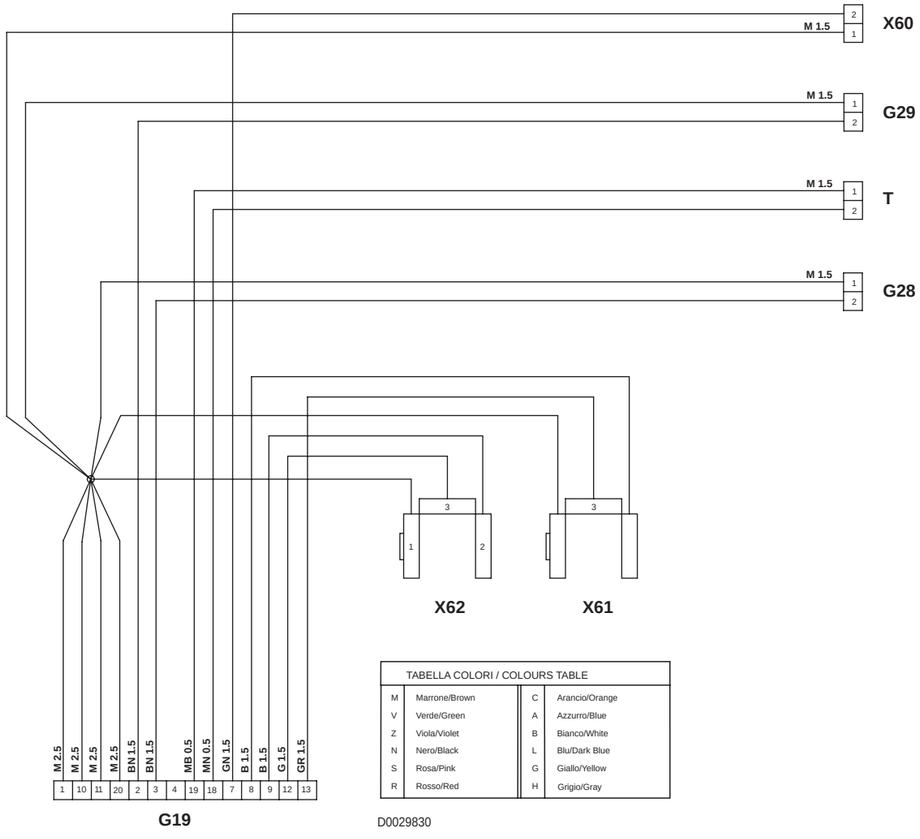
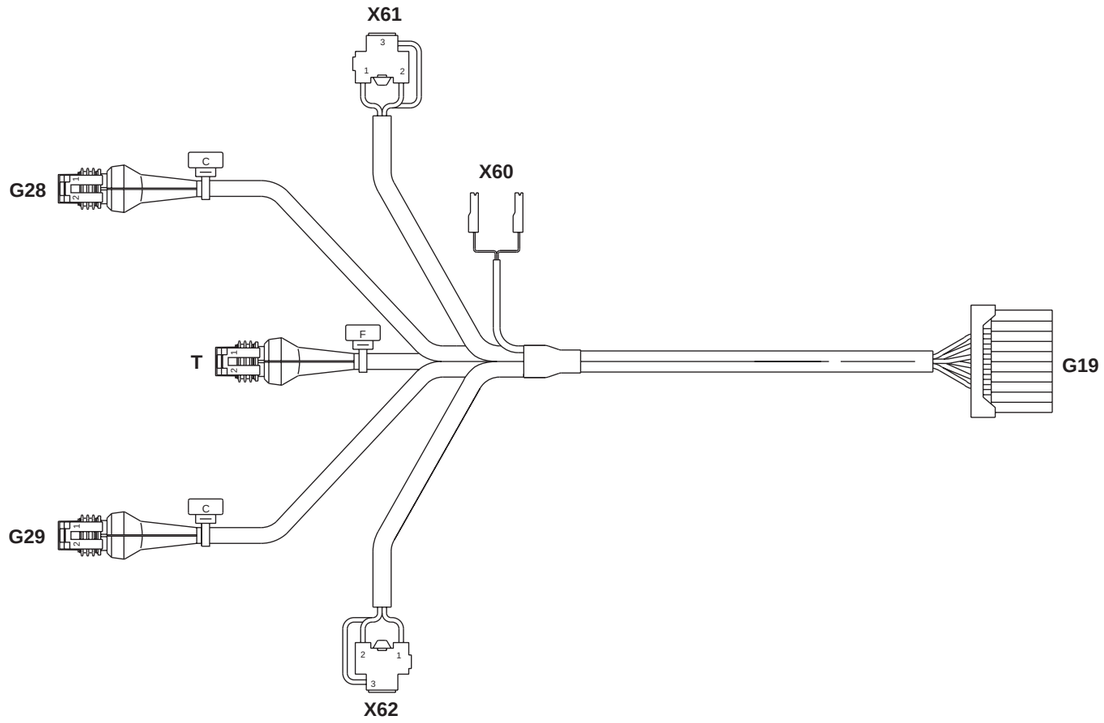


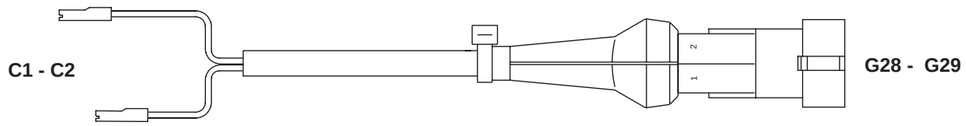
TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

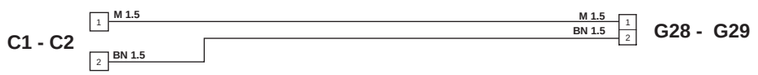
D0029830



G19 To left transmission wiring
G28 To front worklights wiring
G29 To front worklights wiring
T Not utilised
X60 Horn
X61 Left headlamp
X62 Right headlight

FRONT WORKLIGHTS WIRING





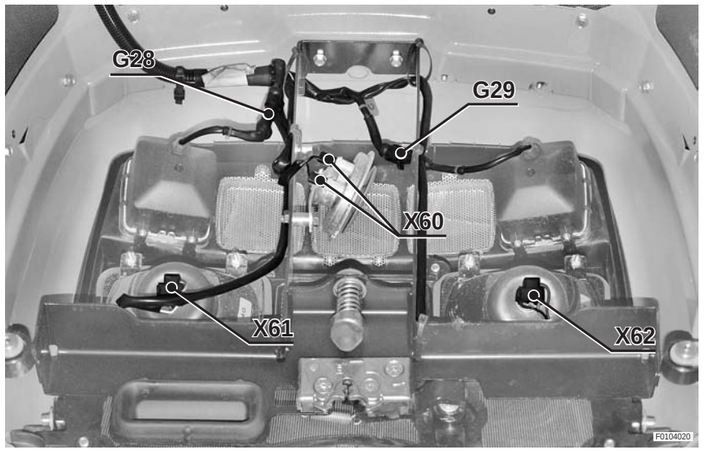
D0030070

TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

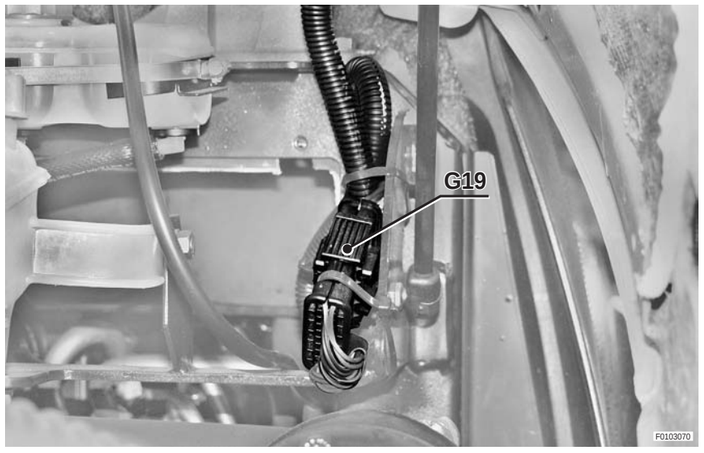
C1	Front LH outer worklight
C2	Front RH outer worklight
G28	To engine hood wiring
G29	To engine hood wiring

CONNECTOR POSITIONS

1



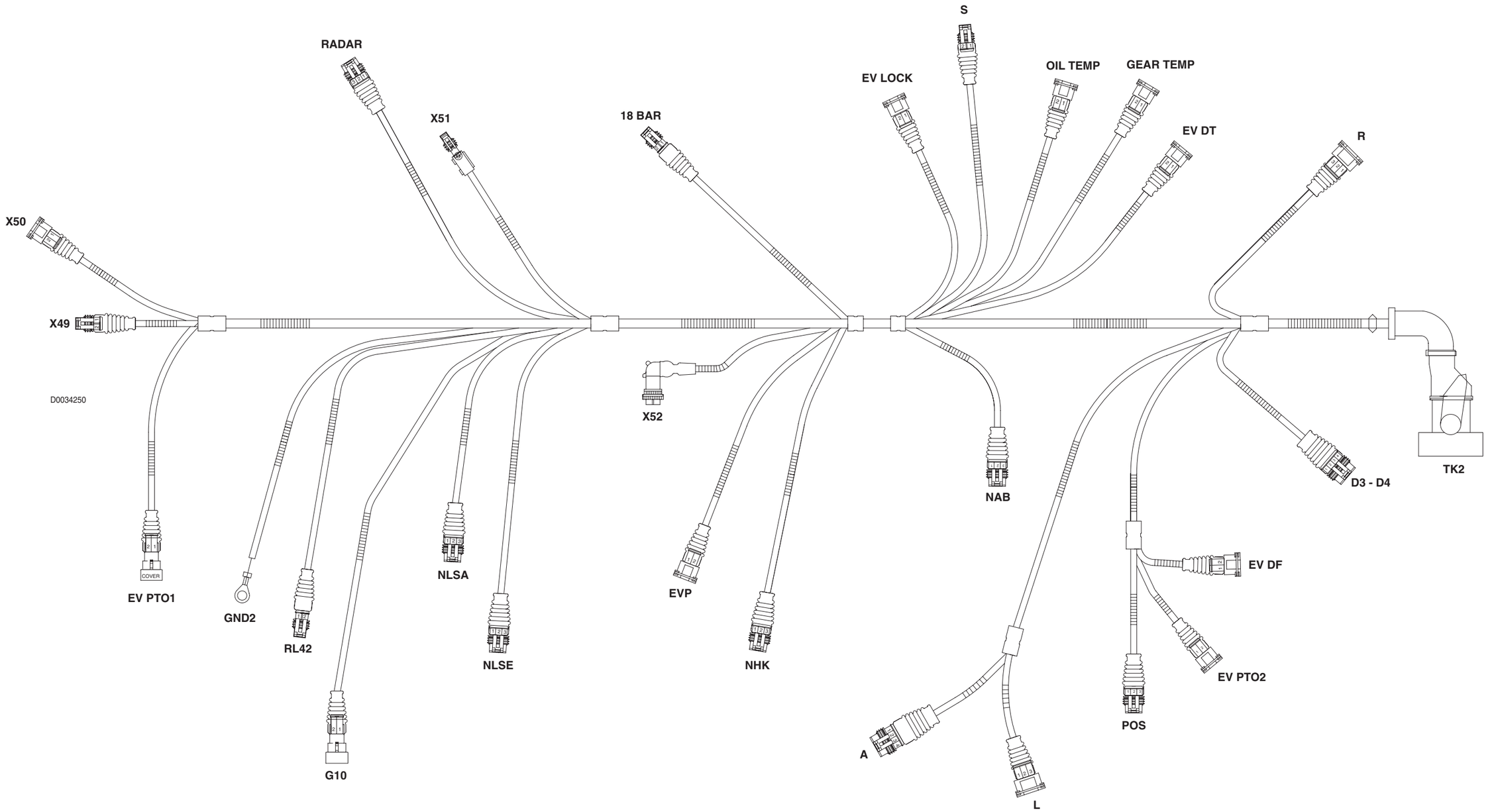
2



ENGINE HOOD WIRING - FRONT WORKLIGHTS WIRING

PAGE INTENTIONALLY
LEFT BLANK

RIGHT-HAND TRANSMISSION WIRING (1/2)



18 BAR Transmission oil low pressure switch
A To left-hand transmission wiring
D3-D4 To control valve wiring
EV DF Differential lock control solenoid valve
EV DT Four-wheel drive control solenoid valve
EV LOCK Gearbox neutral locking solenoid valve
EV P Main clutch proportional solenoid valve
EV PTO 1 Front PTO engagement solenoid valve
EV PTO 2 Rear PTO engagement solenoid valve
GEAR TEMP Transmission oil temperature sensor
GND2 Earthing point 2
L Lift draft sensor (left)
NAB Wheel speed sensor
NHK Clutch speed sensor
NLSA Gearbox output shaft speed sensor
NLSE Gearbox input shaft speed sensor
OIL TEMP Not utilised
POS Rear lift position sensor
R Lift draft sensor (right)
RADAR Radar
RL42 Preheating relay
S Start enabling switch (Green)
TK2 To central wiring
X49 Air filter clogging sensor
X50 Engine oil pressure switch
X51 Steering circuit pressure switch
X52 Gear change solenoid valves (Y1, Y2, Y3, Y4)

RIGHT-HAND TRANSMISSION WIRING (2/2)

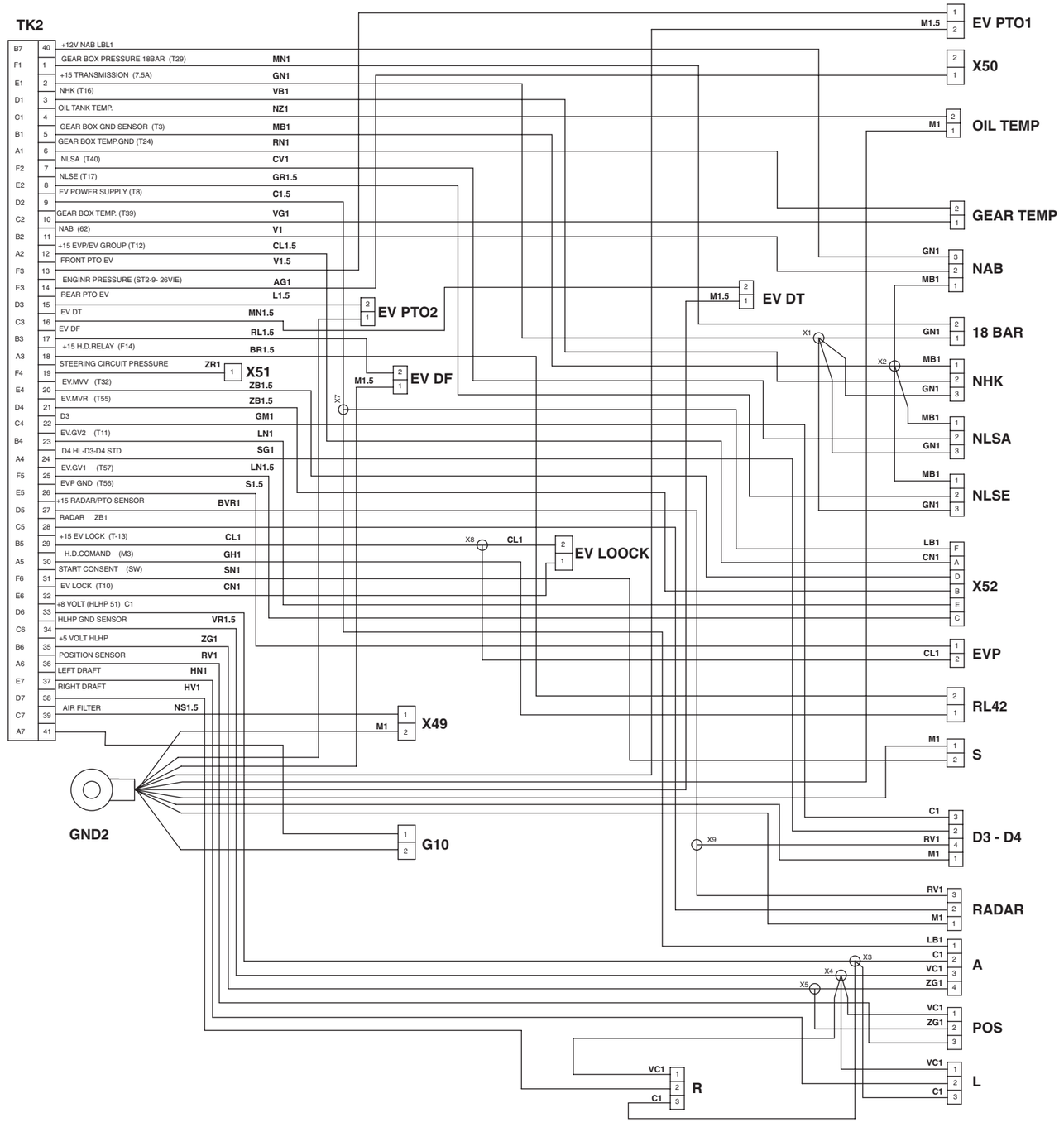


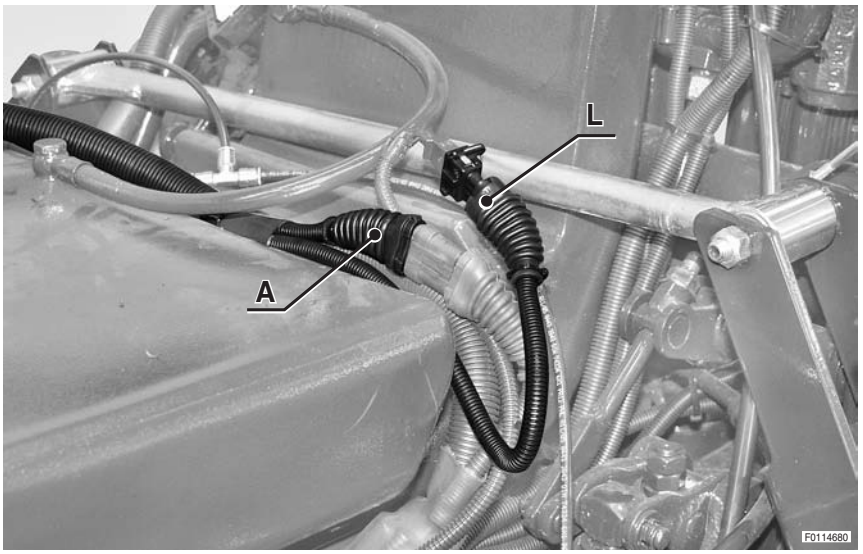
TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0034260

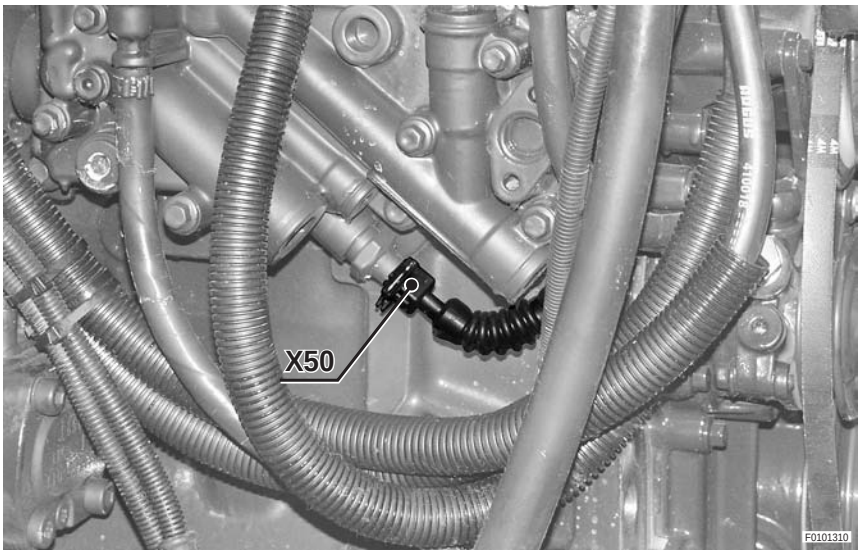
CONNECTOR POSITIONS

1

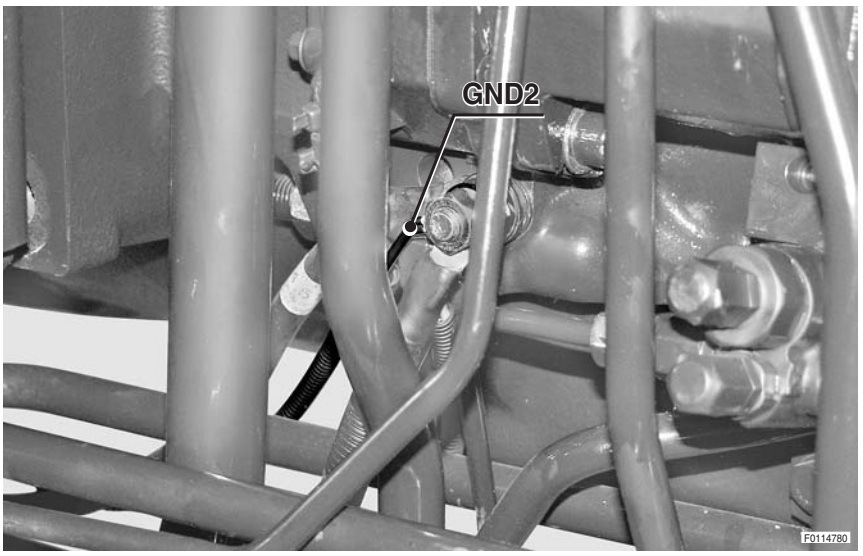
2



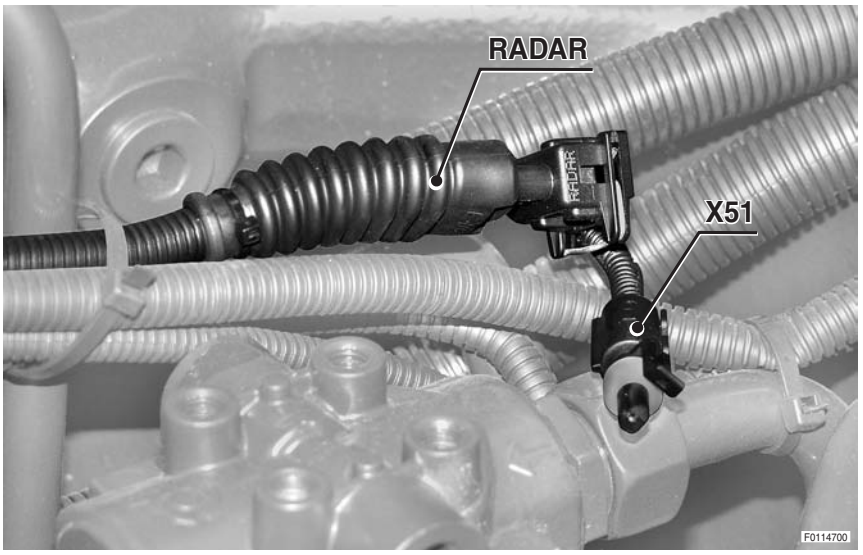
3



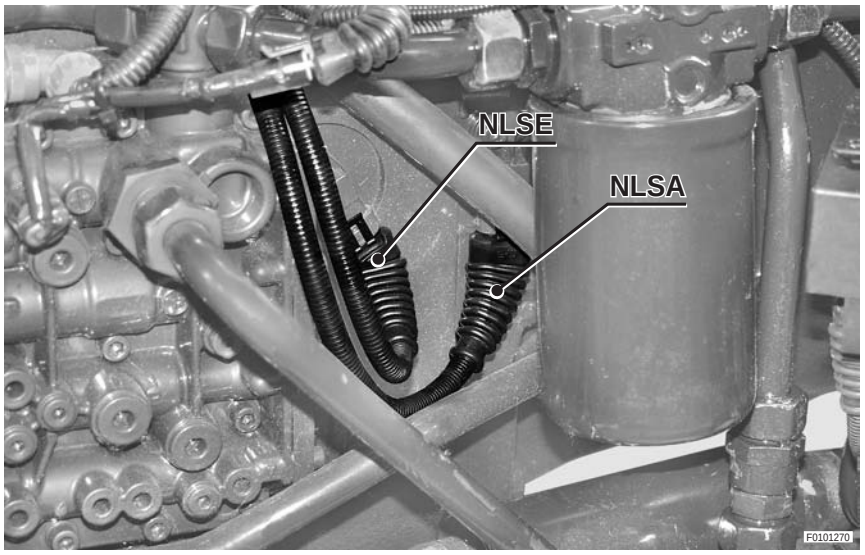
4



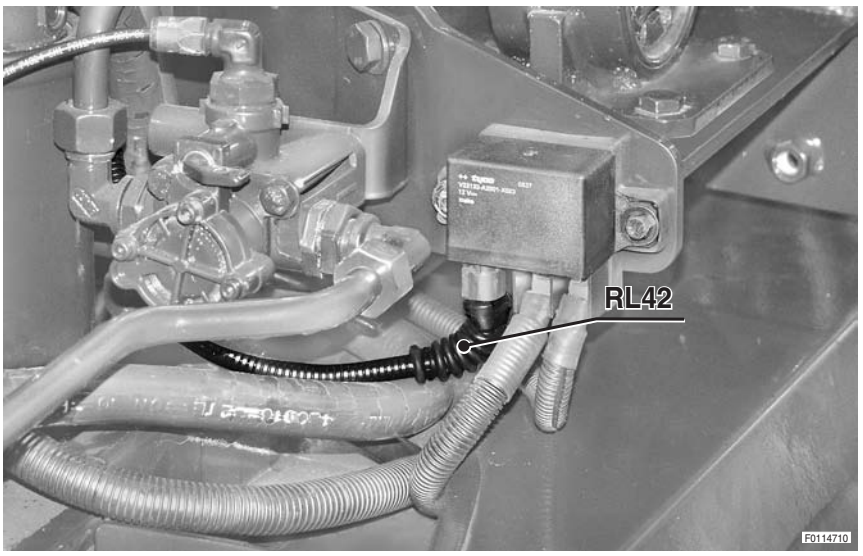
5



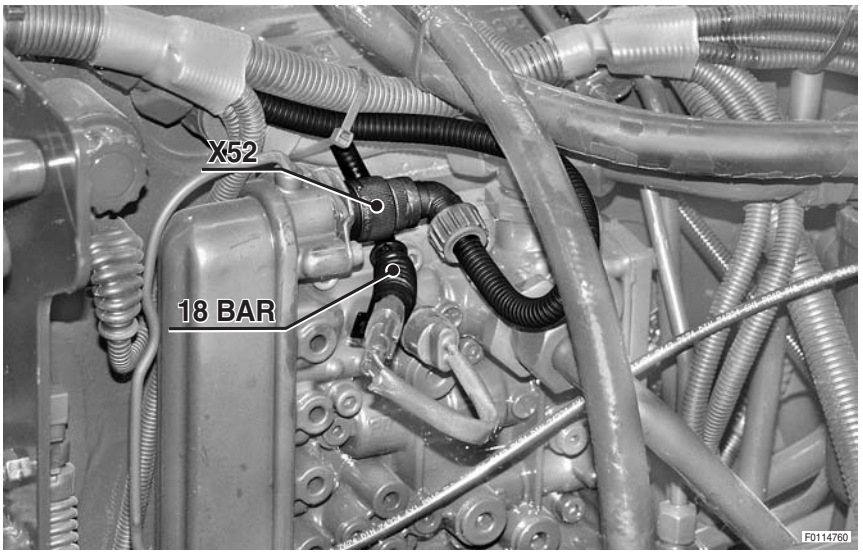
6



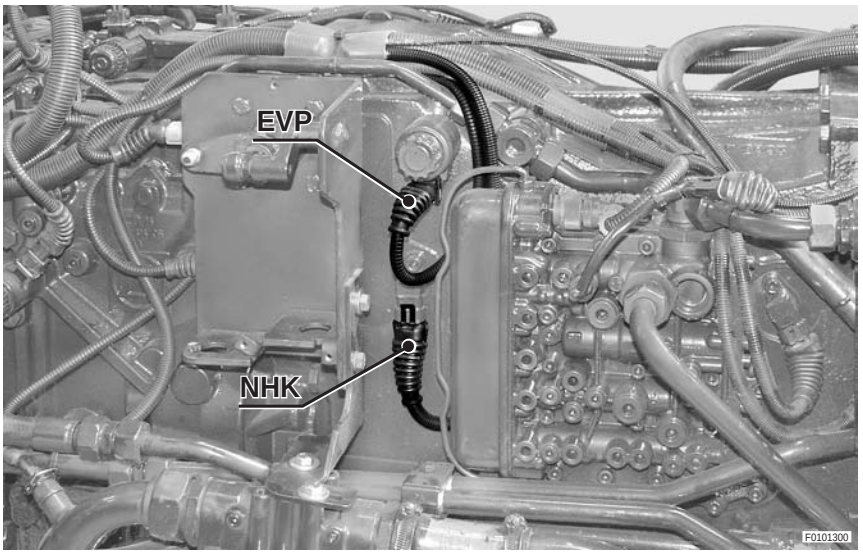
7



8

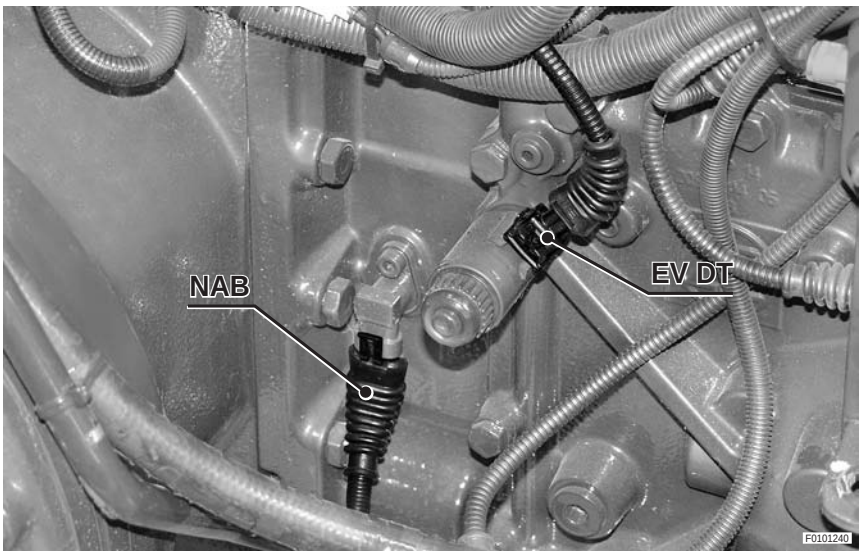


9

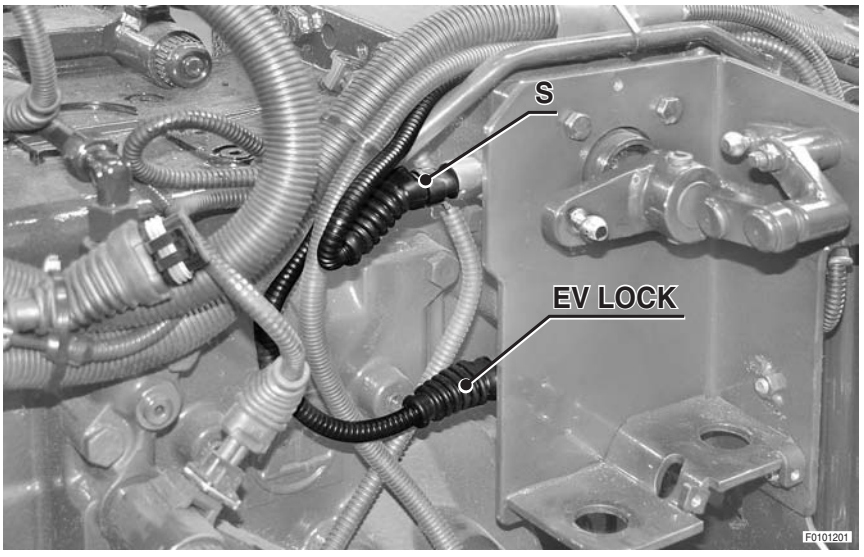


10

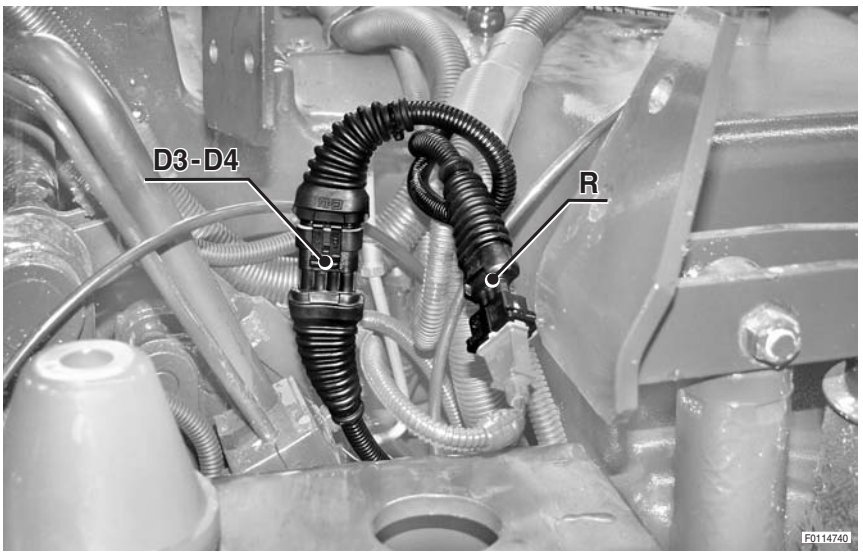
11



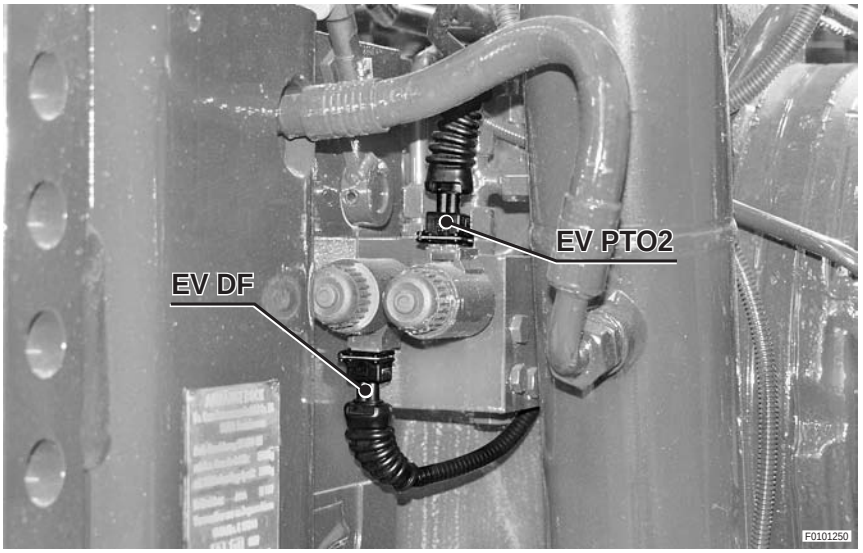
12



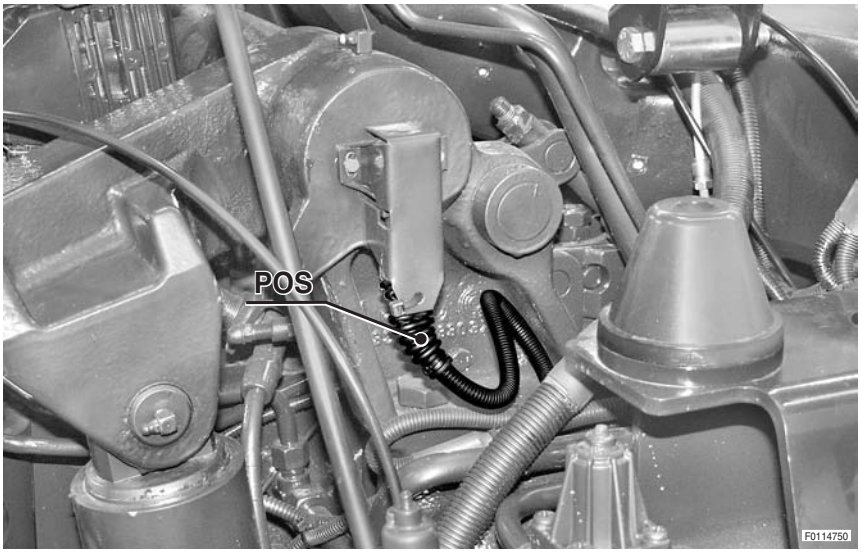
13



14

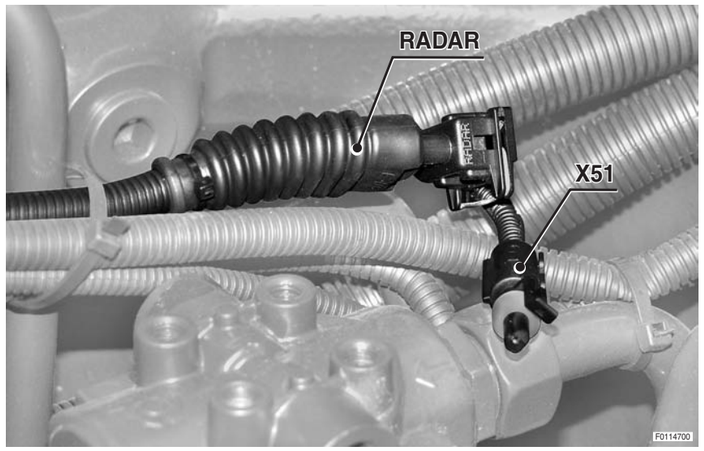


15

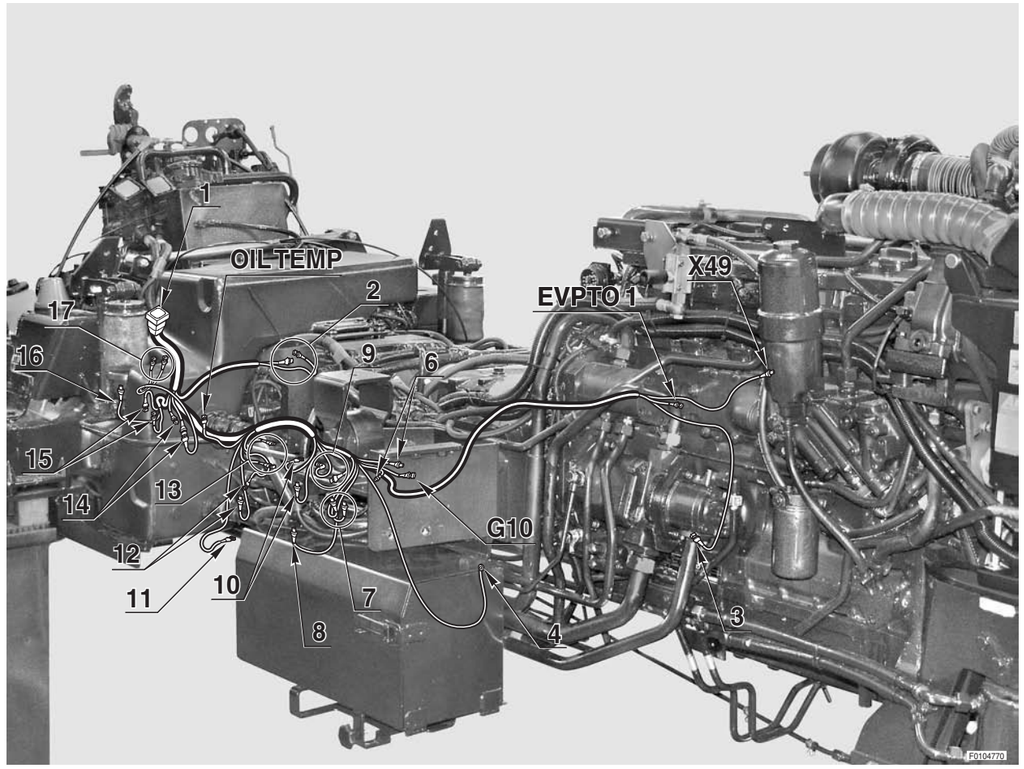


PAGE INTENTIONALLY
LEFT BLANK

16



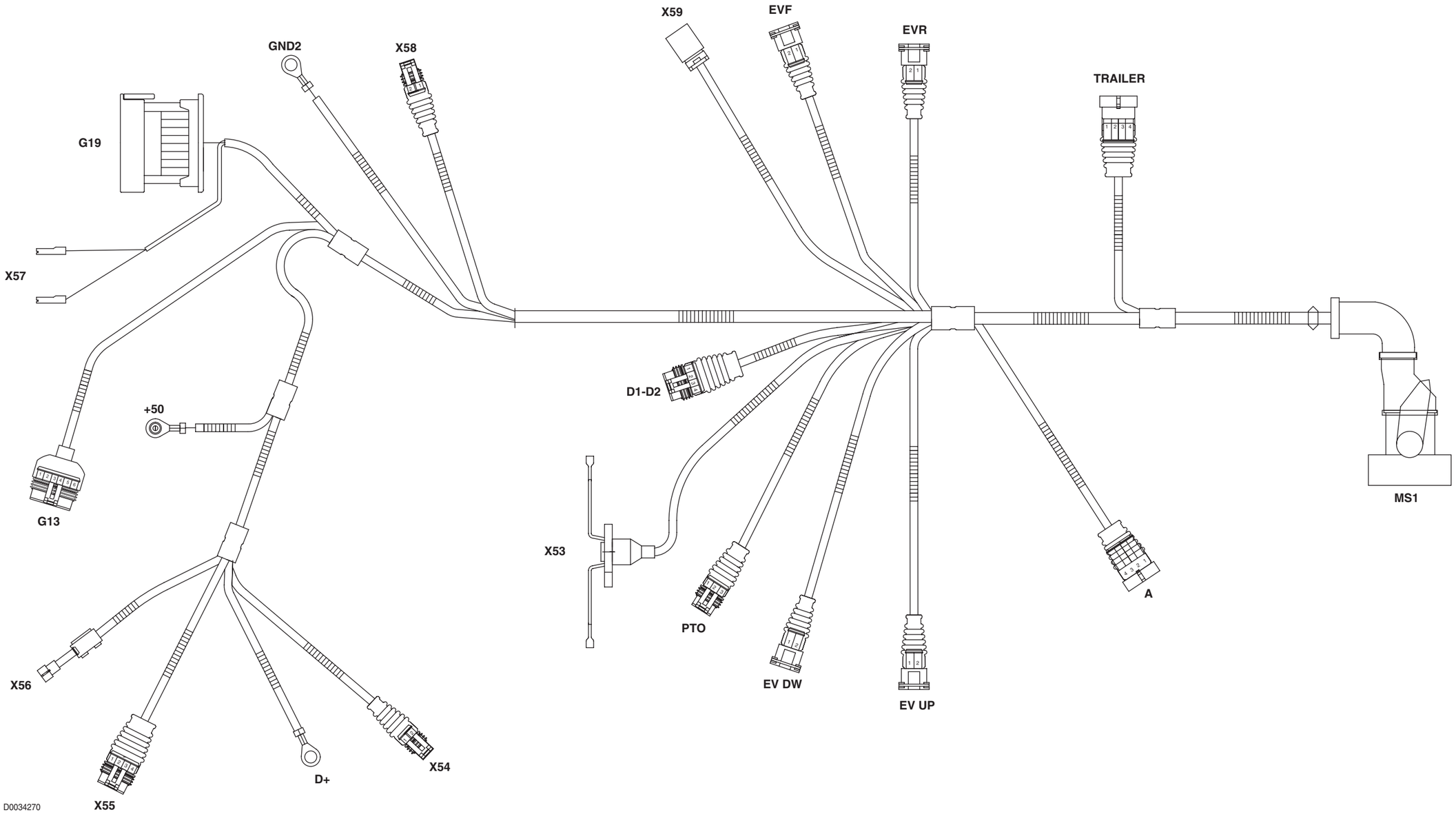
RIGHT-HAND TRANSMISSION WIRING
DIRECTIONAL CONTROL VALVES WIRING 2/4



0.013.9307.4/70
0.013.2588.4/10

PAGE INTENTIONALLY
LEFT BLANK

LEFT-HAND TRANSMISSION WIRING (1/2)



+50	Starter motor	*EV UP*	Lift up solenoid valve	*X53*	Trailer socket
A	To right-hand transmission wiring	*G13*	To front axle suspensions wiring	*X54*	Air conditioning pressure switch
D+	Alternator	*G19*	To engine hood wiring	*X55*	Steering angle sensor
D1-D2	To control valve wiring	*GND2*	Earthing point 2	*X56*	Air conditioning system compressor
EV DW	Lift down solenoid valve	*MS1*	To central wiring	*X57*	Brake fluid level sensor
EV F	"FIELD" mode solenoid valve	*PTO*	Rear PTO speed sensor	*X58*	Fuel level sensor
EV R	"ROAD" mode solenoid valve	*TRAILER*	To trailer braking wiring	*X59*	Field/road sensor

LEFT-HAND TRANSMISSION WIRING (2/2)

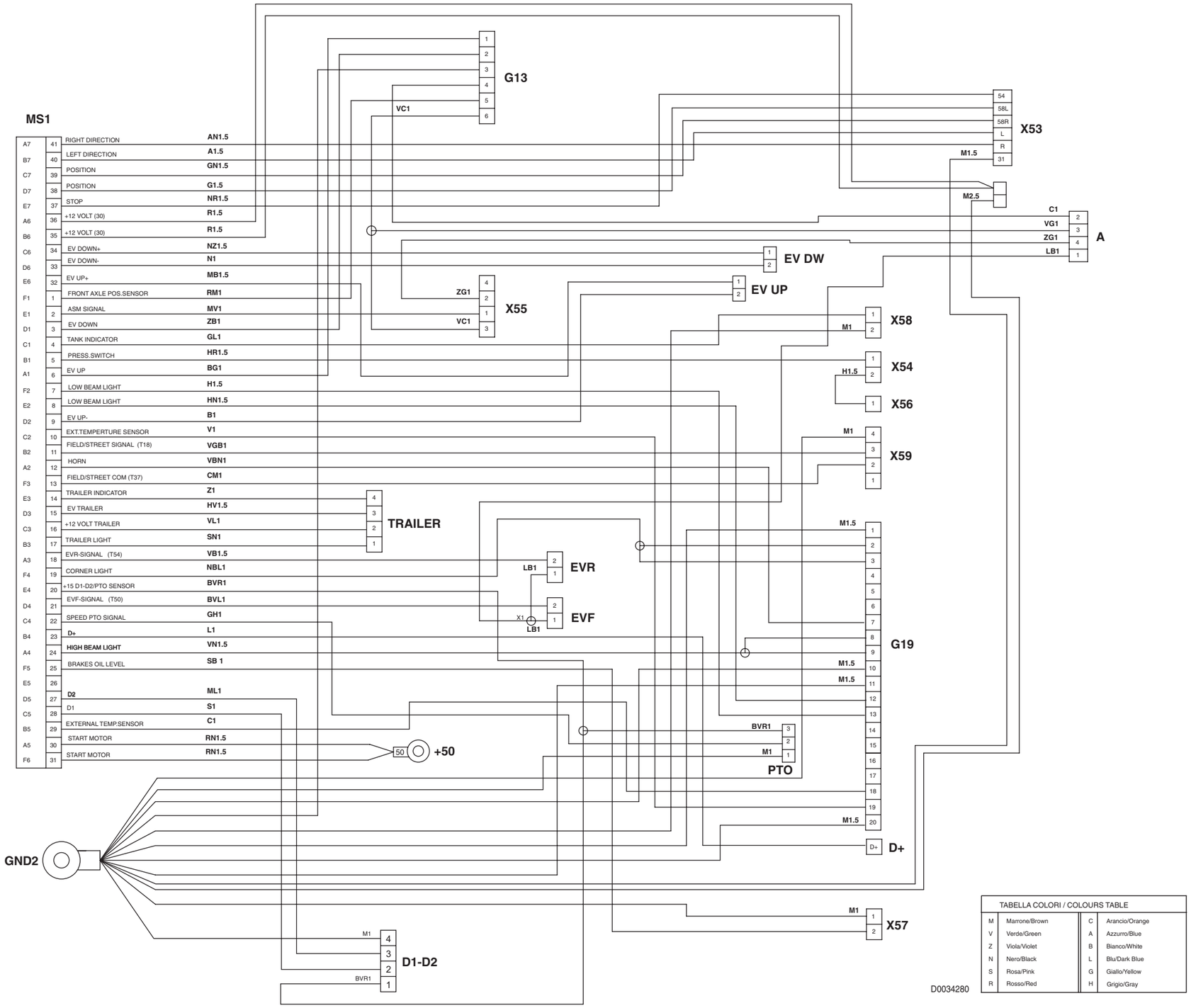
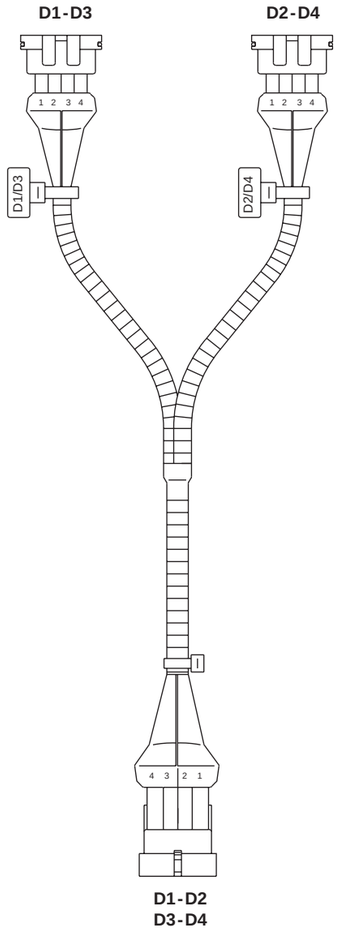


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0034280

CONTROL VALVES WIRING 2/4



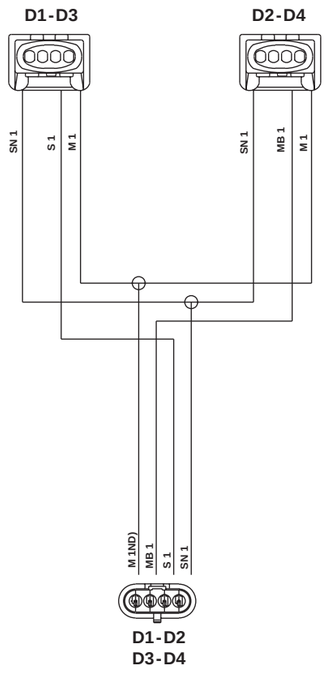


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

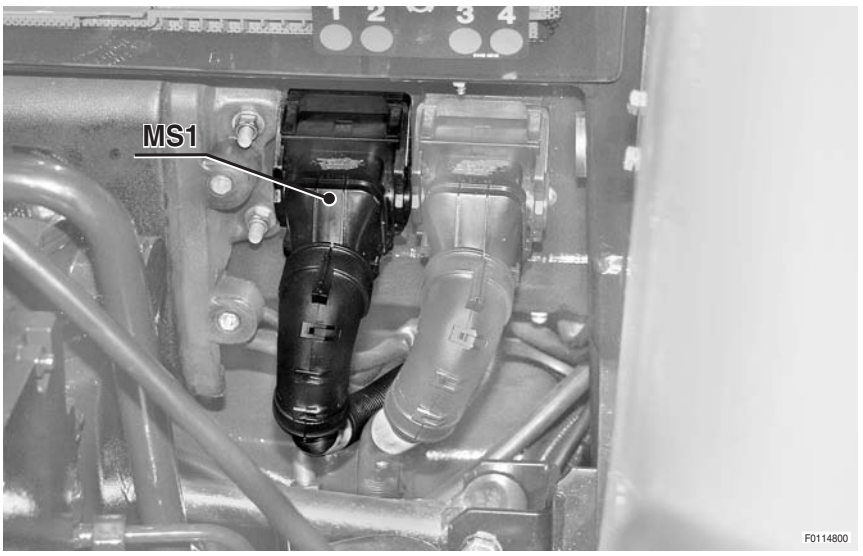
D0034290

D1-D2 To left transmission wiring
D3-D4 To right transmission wiring

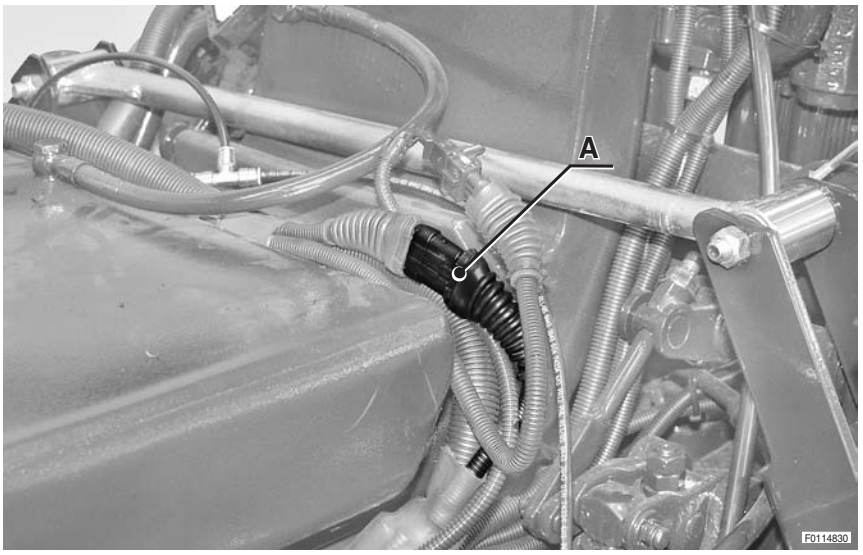
PAGE INTENTIONALLY LEFT BLANK

CONNECTOR POSITIONS

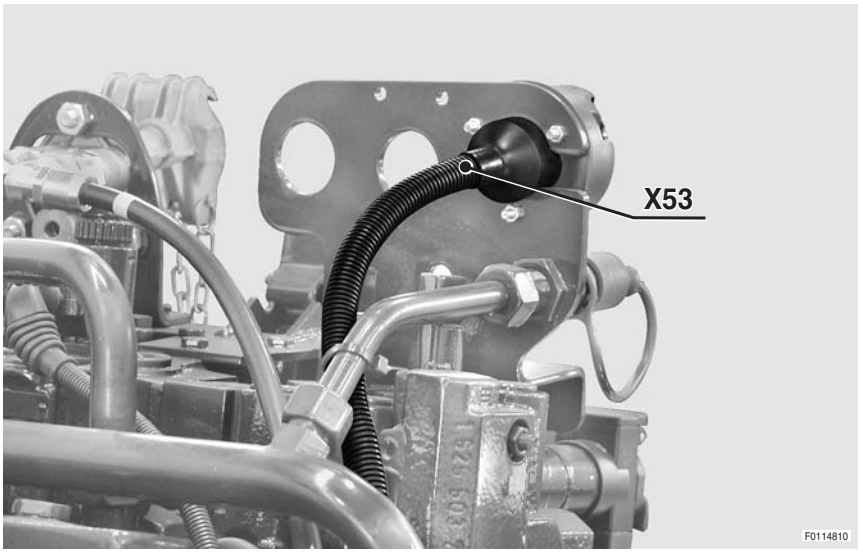
1



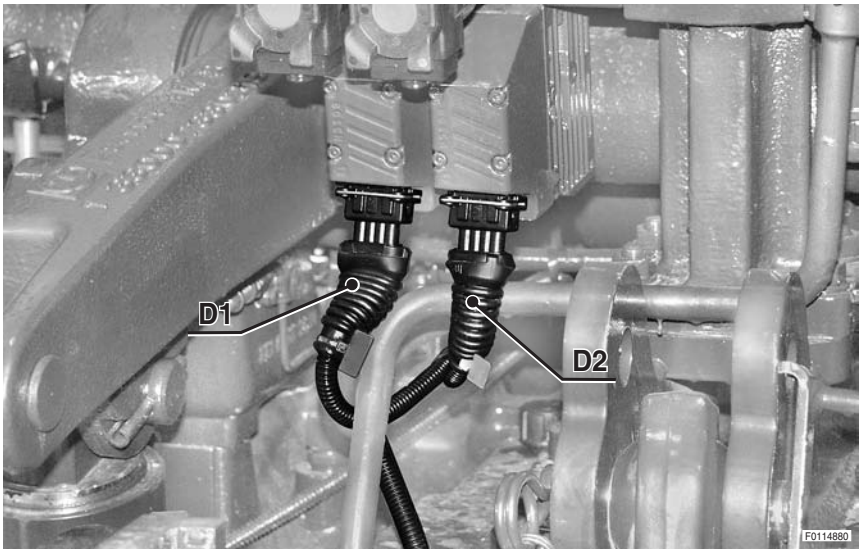
2



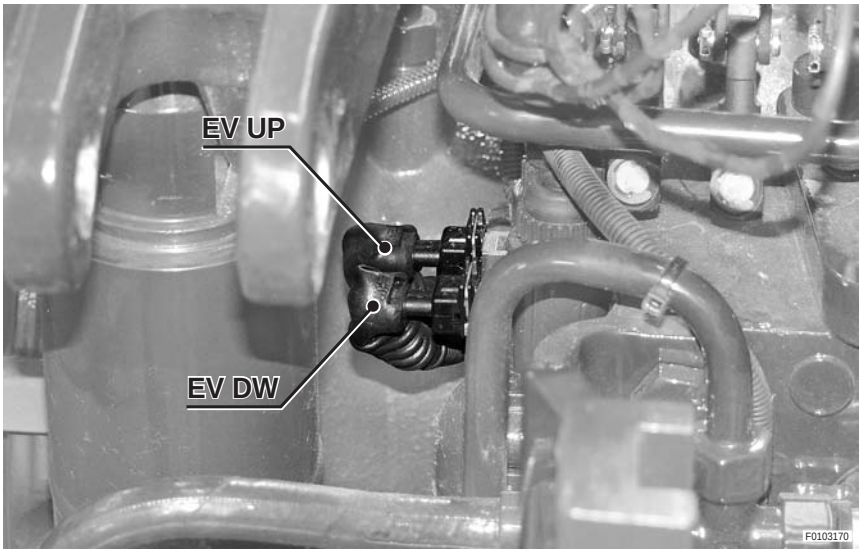
3



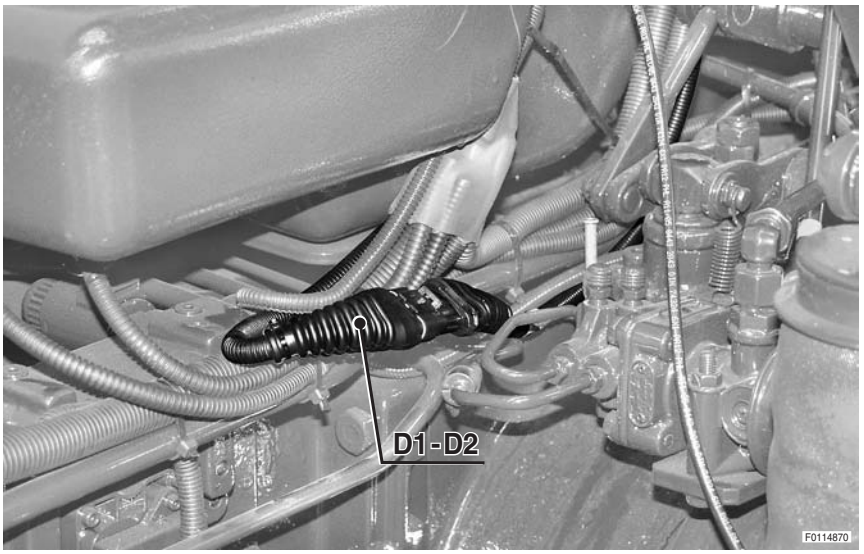
4



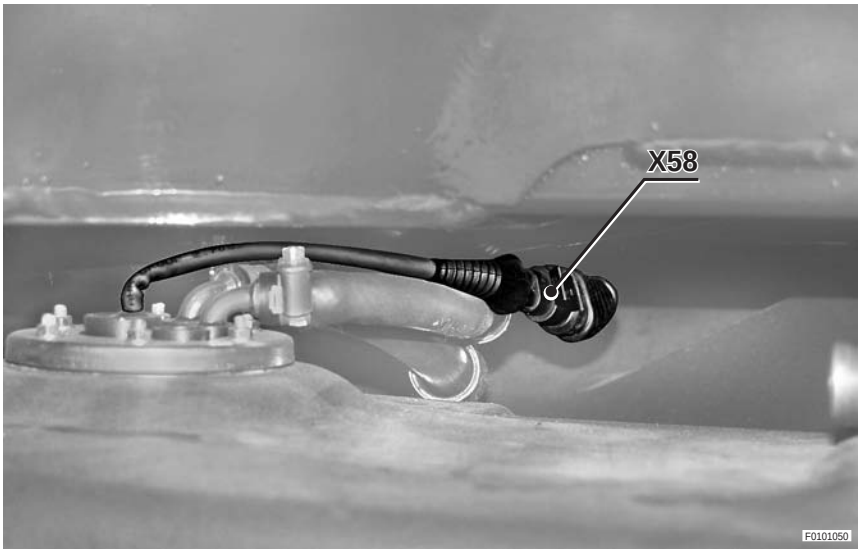
5



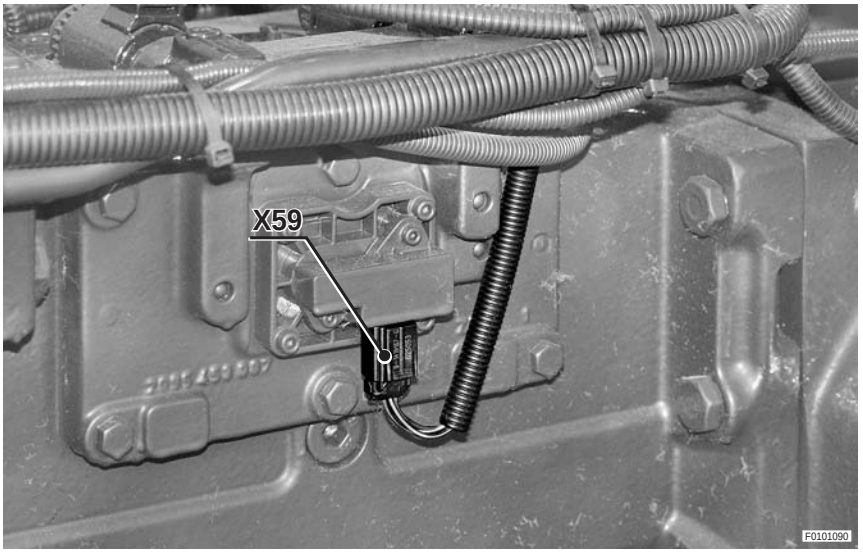
6



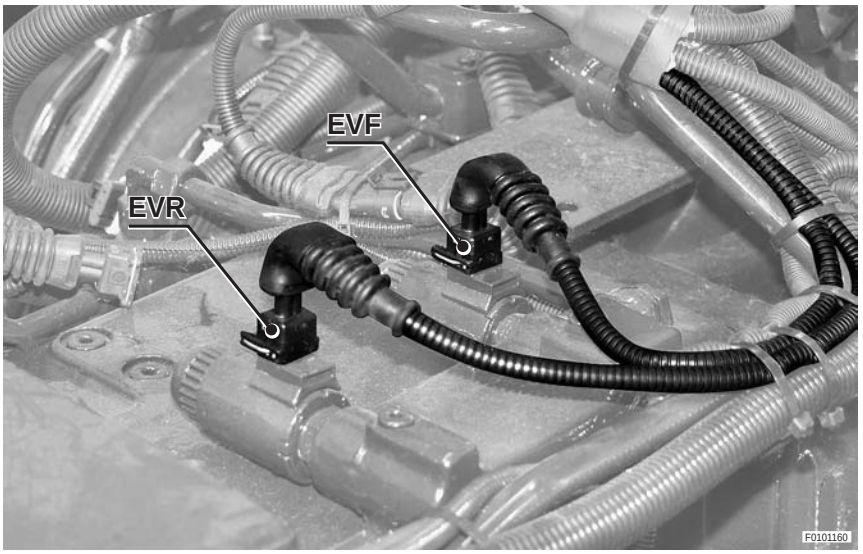
7



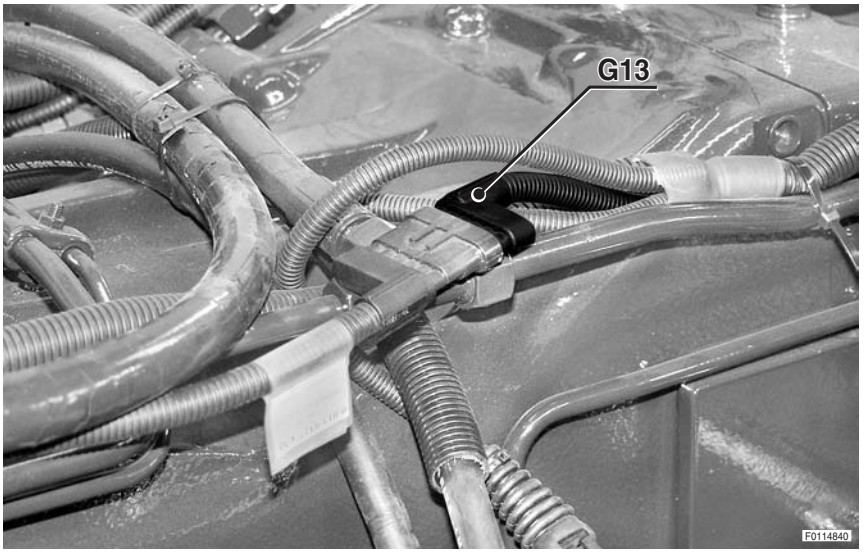
8



9

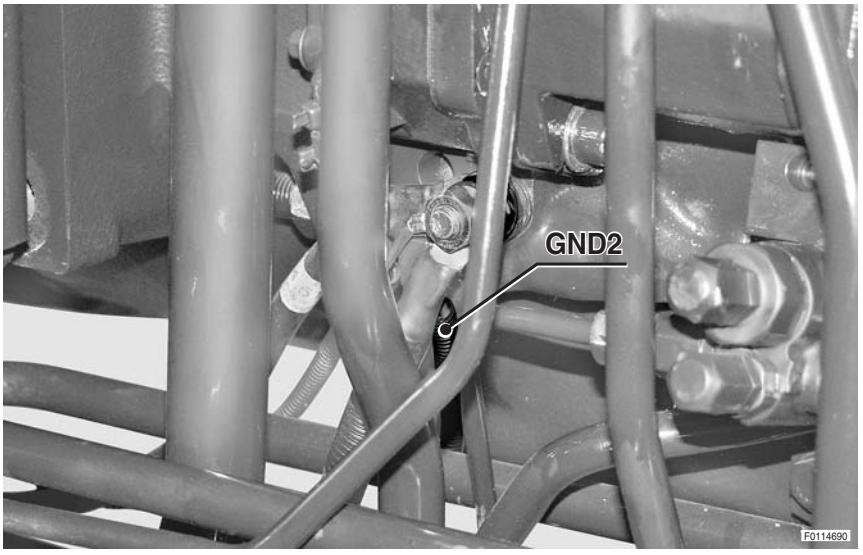


10

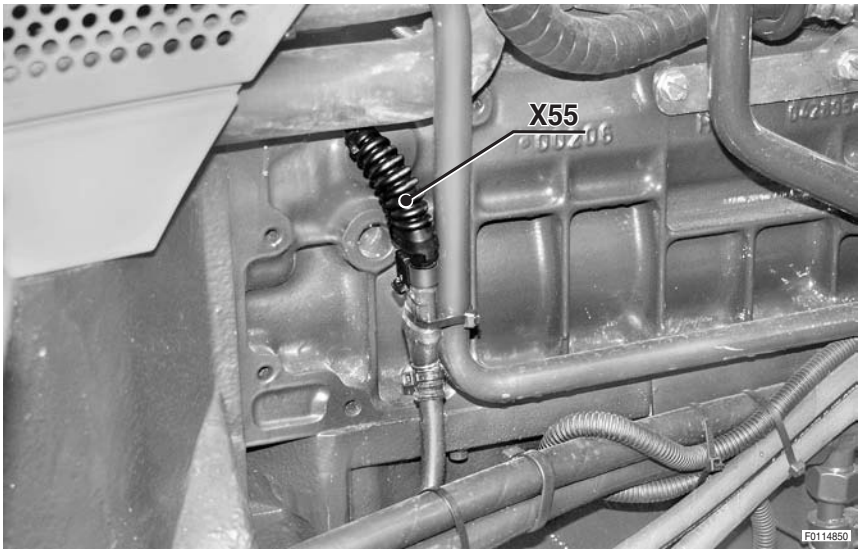


11

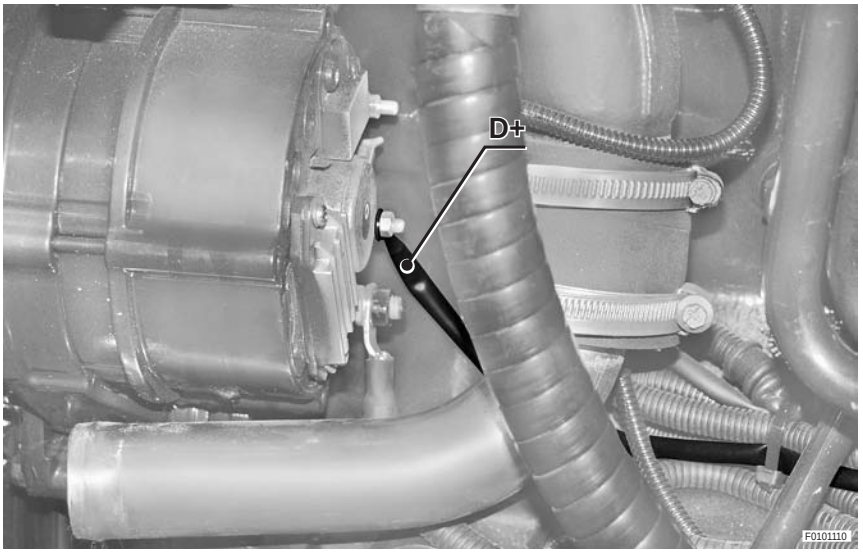
12



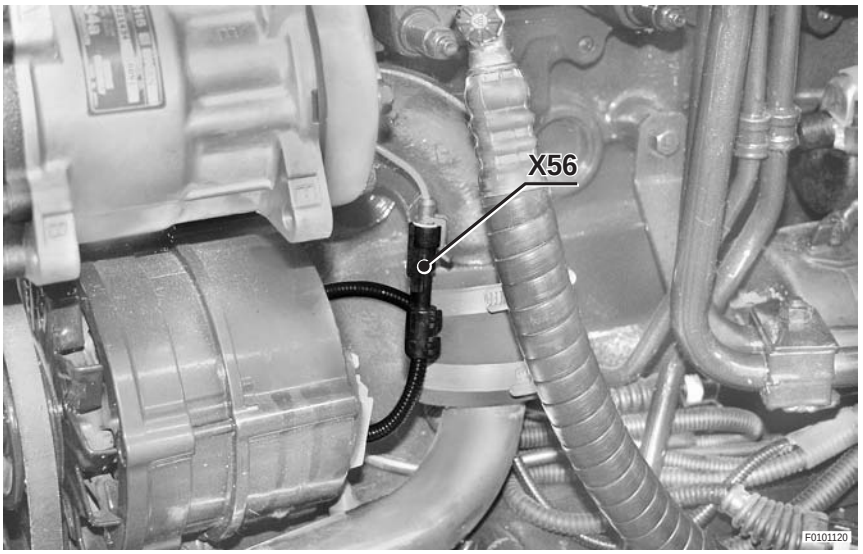
13



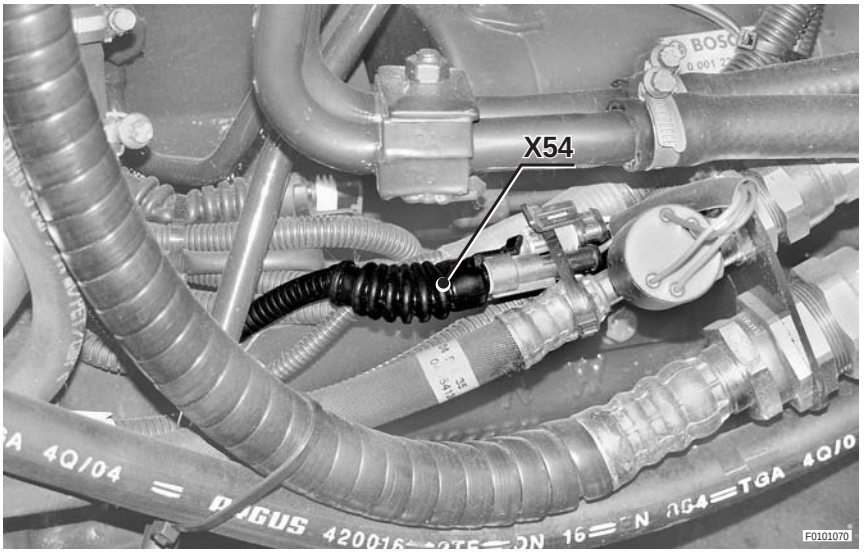
14



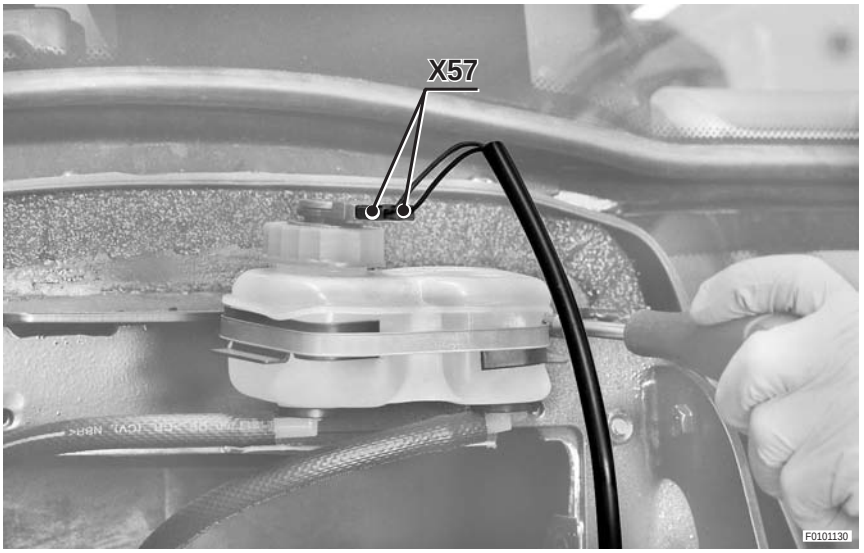
15



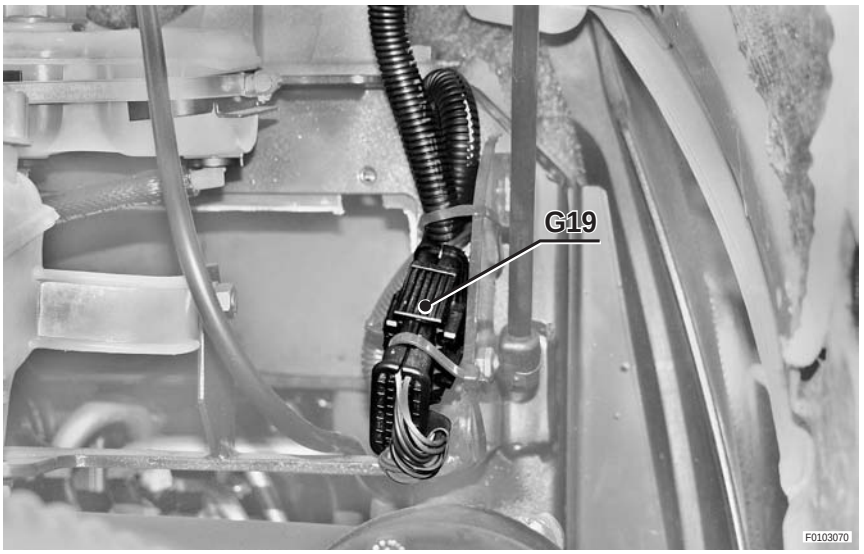
16



17

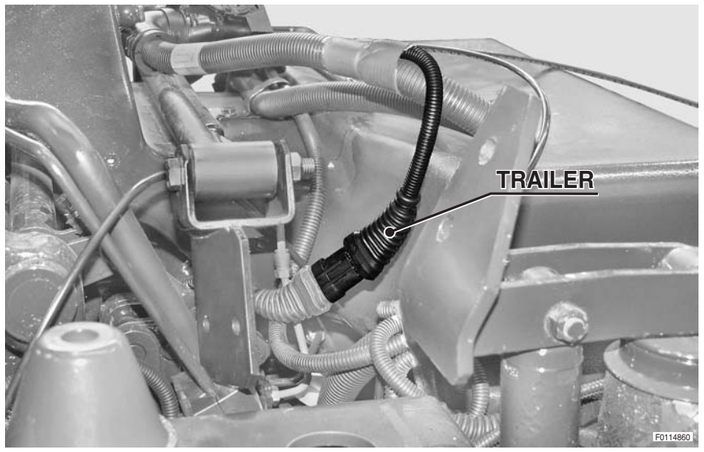


18

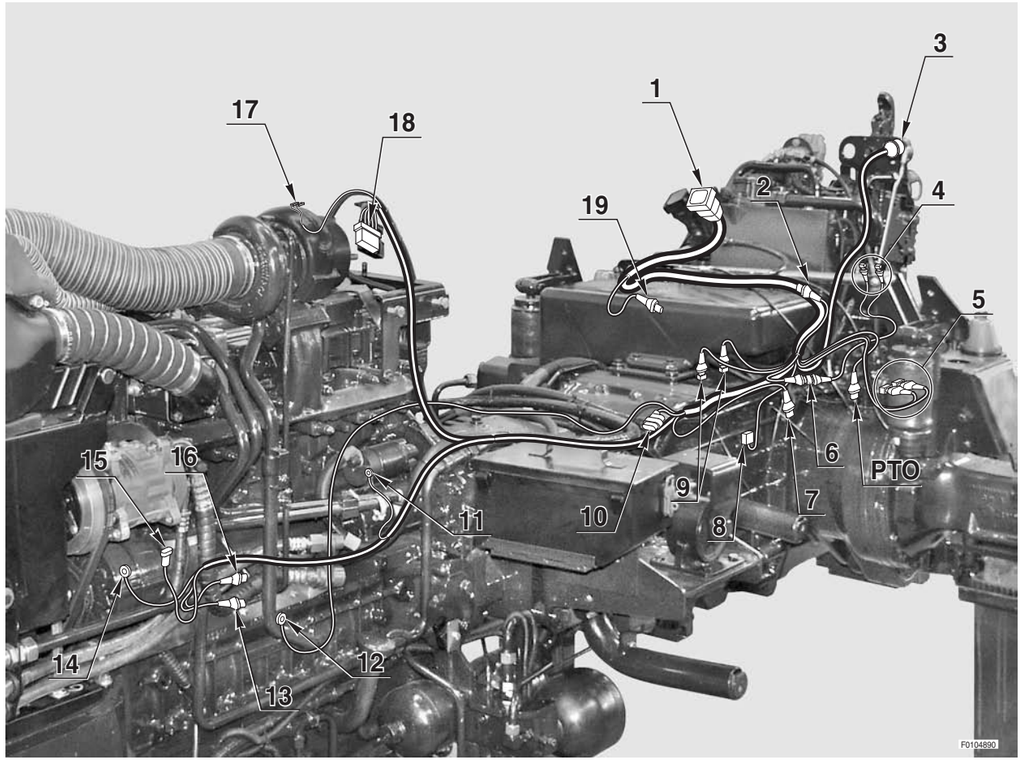


CEFT-HAND TRANSMISSION WIRING

19



CONTROL VALVES WIRING 2/4



0.013.9308.4/70
0.013.2588.4/10

PAGE INTENTIONALLY
LEFT BLANK

TRAILER BRAKE WIRING (ITALY)

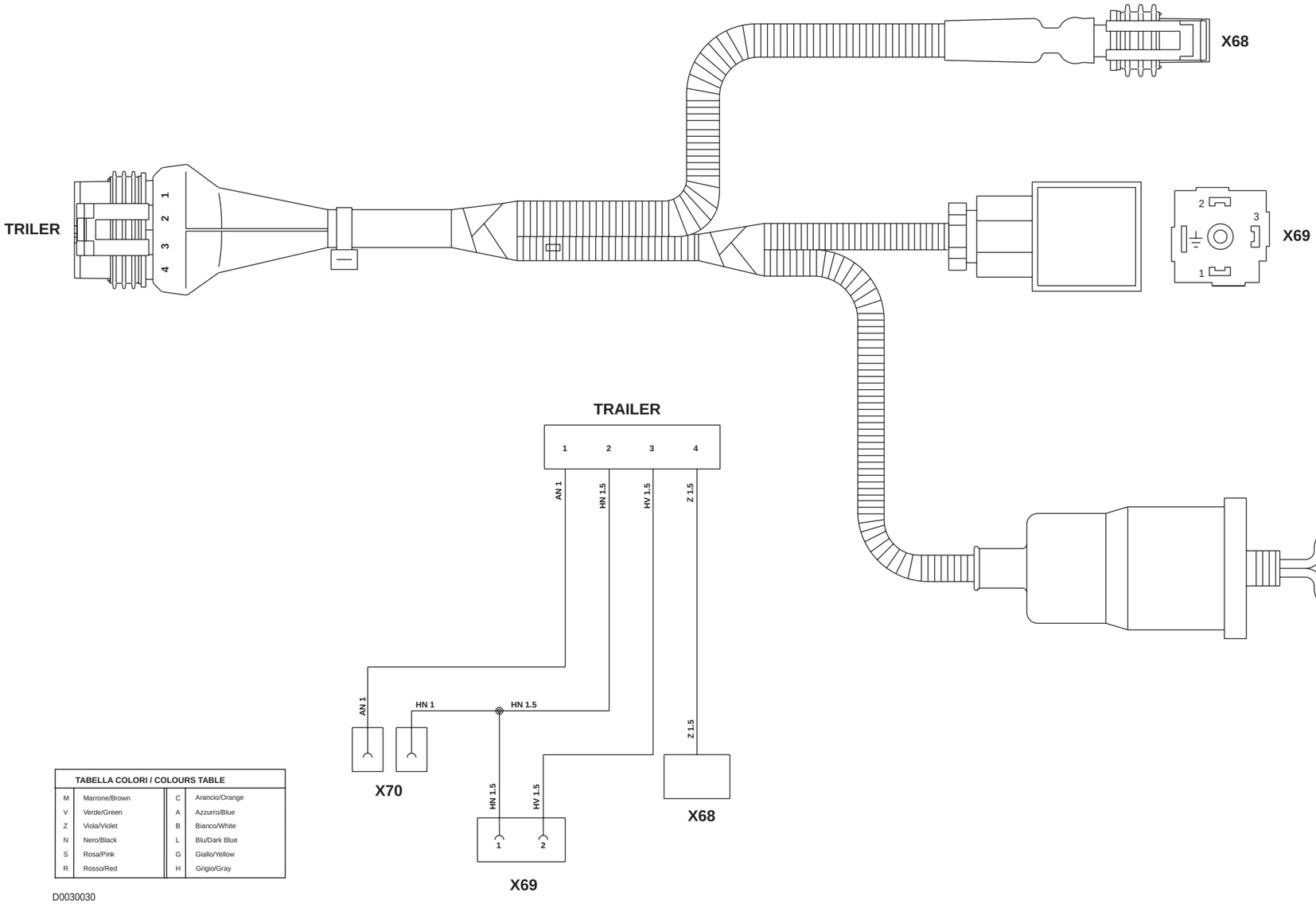


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030030

TRAILER To left-hand transmission wiring
X68 Trailer braking pressure sensor
X69 Trailer parking brake solenoid valve
X70 Trailer braking low pressure switch

PAGE INTENTIONALLY
LEFT BLANK

TRAILER BRAKE WIRING (GERMANY)

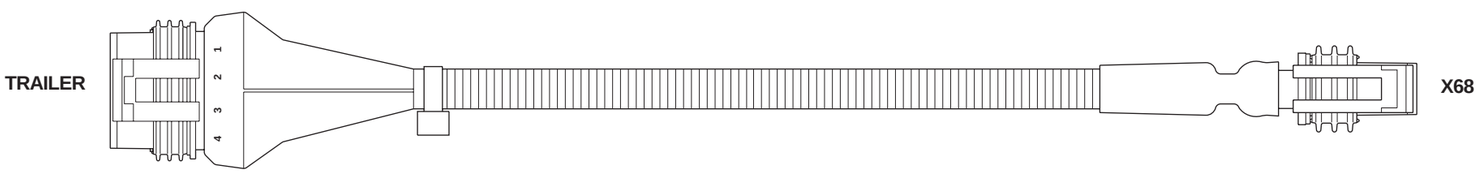


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030040

TRAILER To left-hand transmission wiring
X68 Trailer braking pressure sensor

PAGE INTENTIONALLY
LEFT BLANK

FRONT AXLE SUSPENSION WIRING

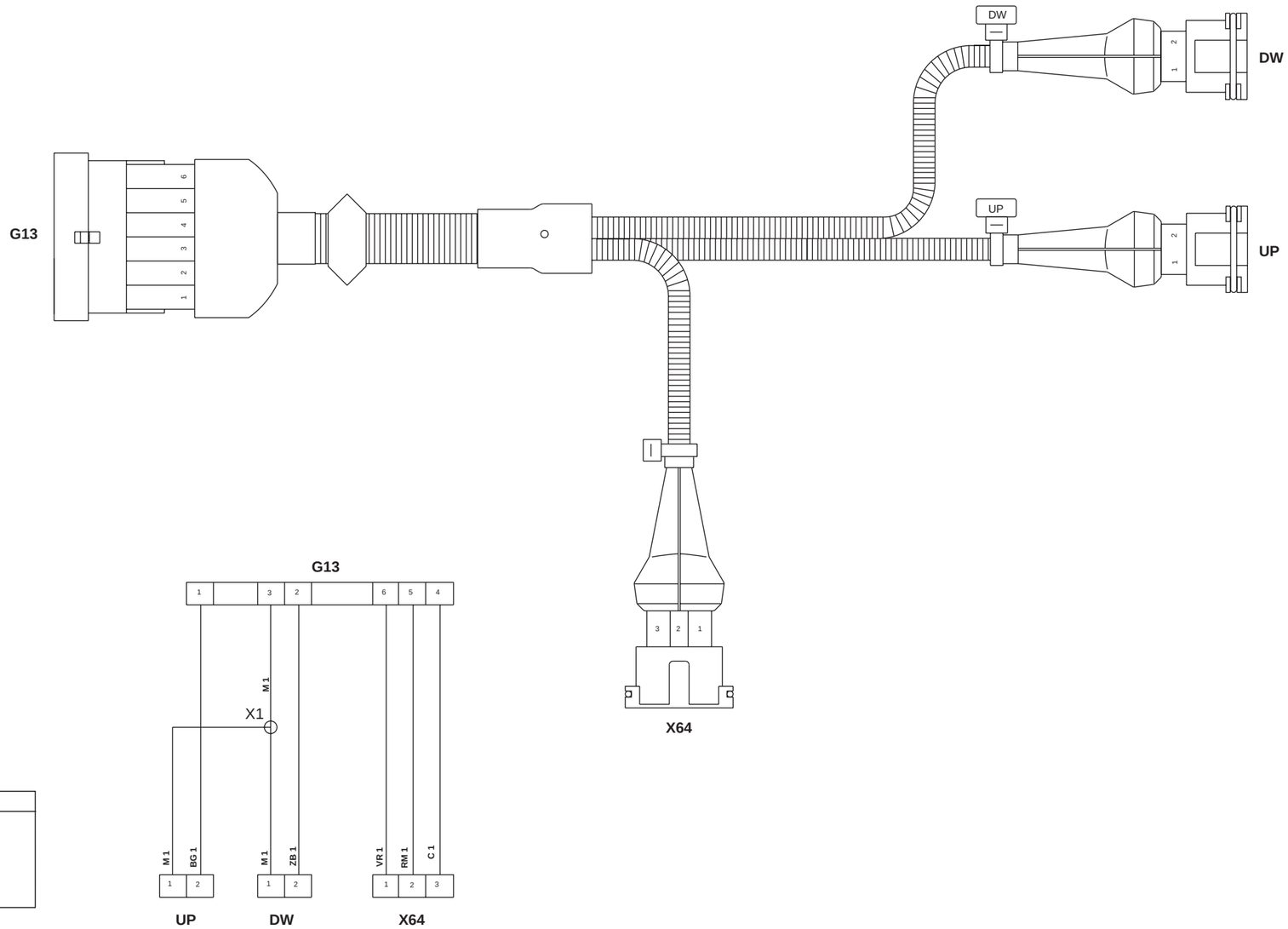
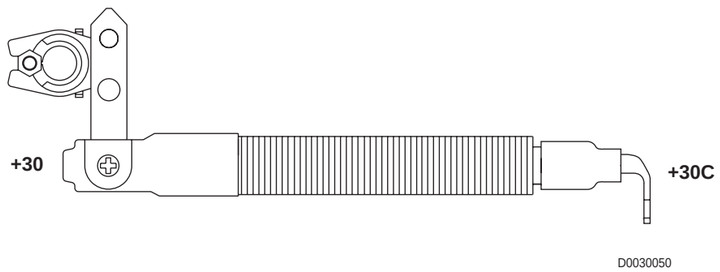


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

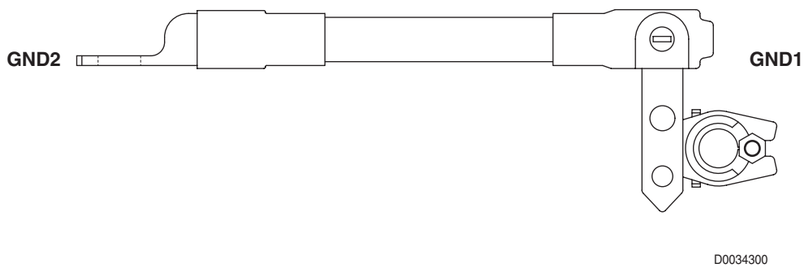
D0029870

DW Front axle down solenoid valve
G13 To left transmission wiring
UP Front axle up solenoid valve
X64 Front axle suspension position sensor

PAGE INTENTIONALLY
LEFT BLANK



+30 Battery
+30C Starter motor



GND1 Battery
GND2 Earthing point 2

BATTERY POSITIVE WIRING
BATTERY NEGATIVE WIRING

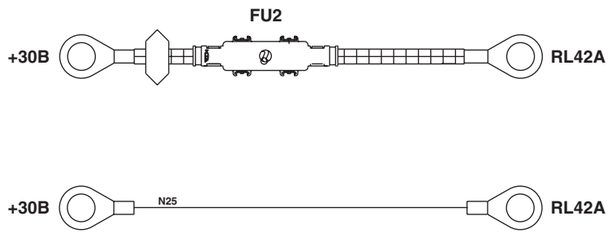


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0034310

+30B Battery
FU2 Preheating relay supply fuse
RL42A Preheating relay

POWER SUPPLY WIRING (1/2)

4 CYLINDERS

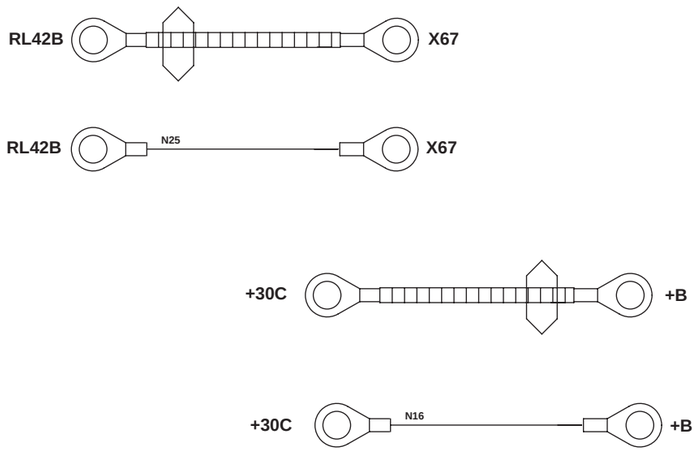


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029910

+30C Starter motor
B+ Alternator
RL42B Preheating relay
X67 Preheating device

6 CYLINDERS

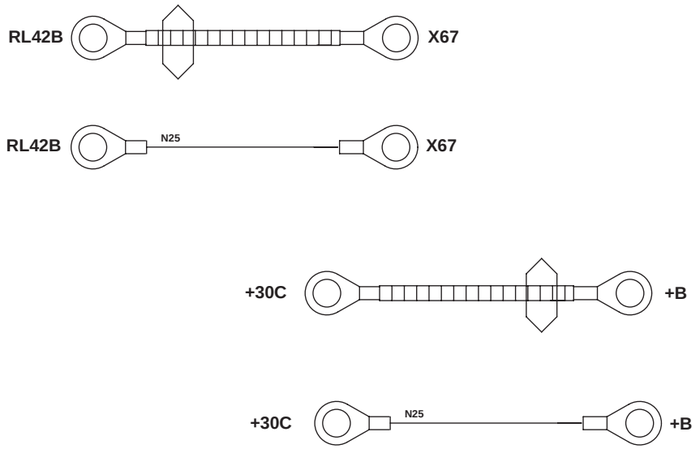


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029900

+30C Starter motor
B+ Alternator
RL42B Preheating relay
X67 Preheating device

POWER SUPPLY WIRING (2/2)

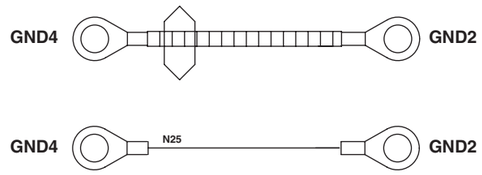


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

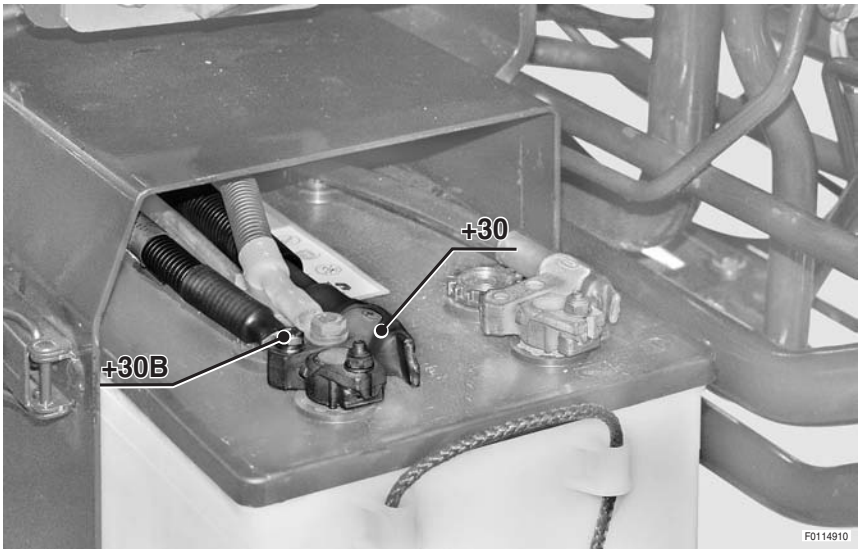
D0034320

CAB EARTH WIRING

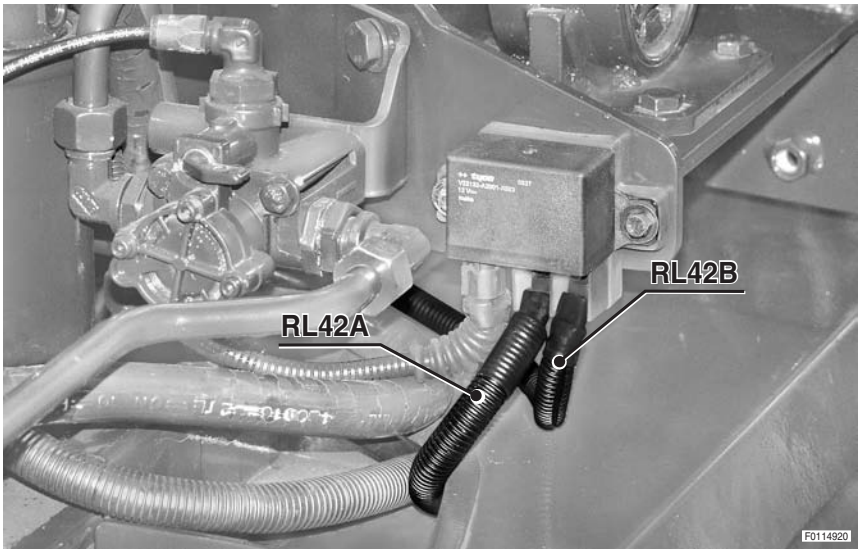
GND2 Earthing point 2
GND4 Earthing point 4

CONNECTOR POSITIONS

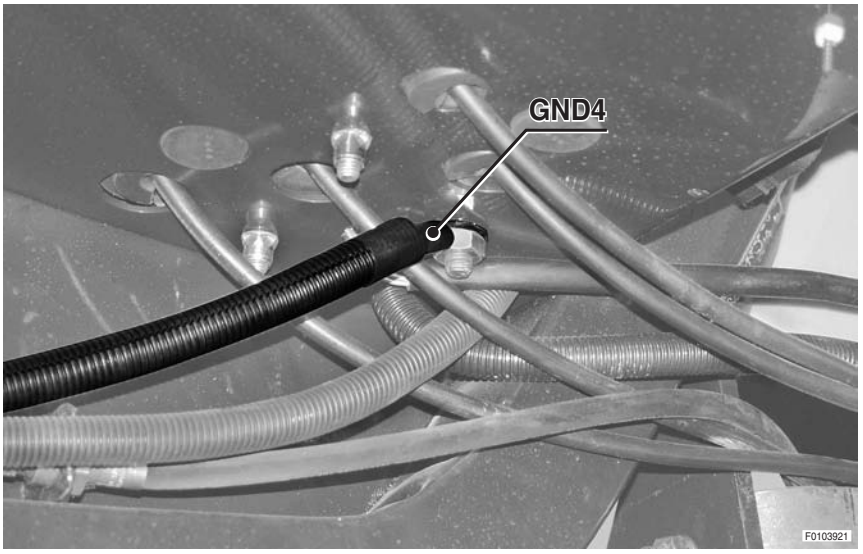
1



2

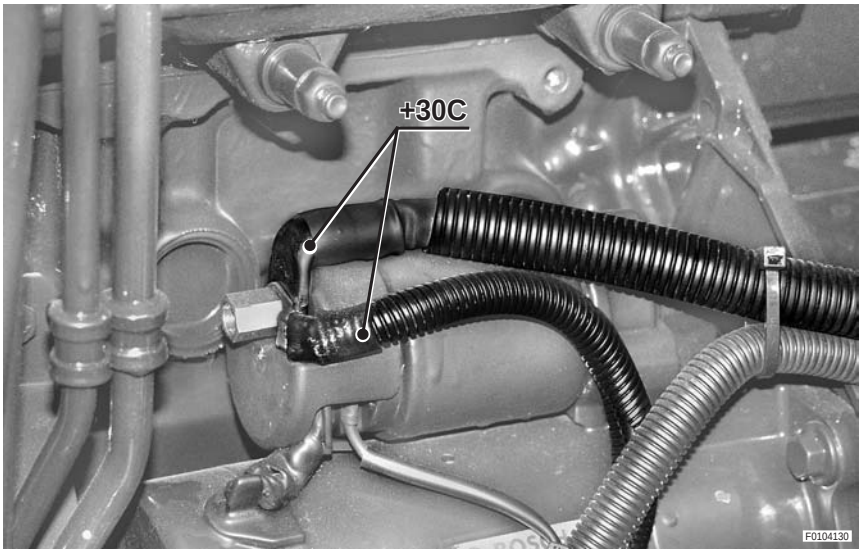


3

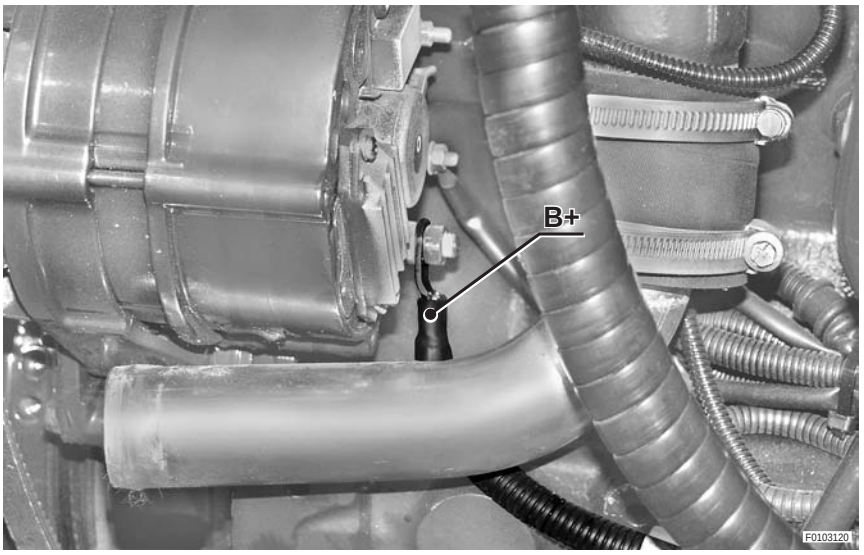


4

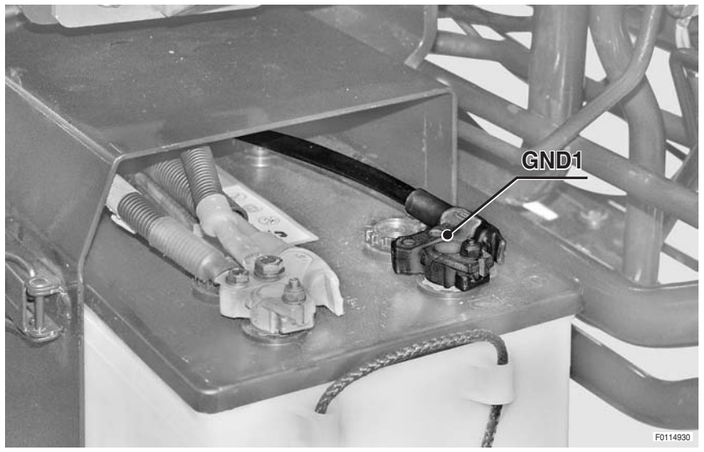
5



6

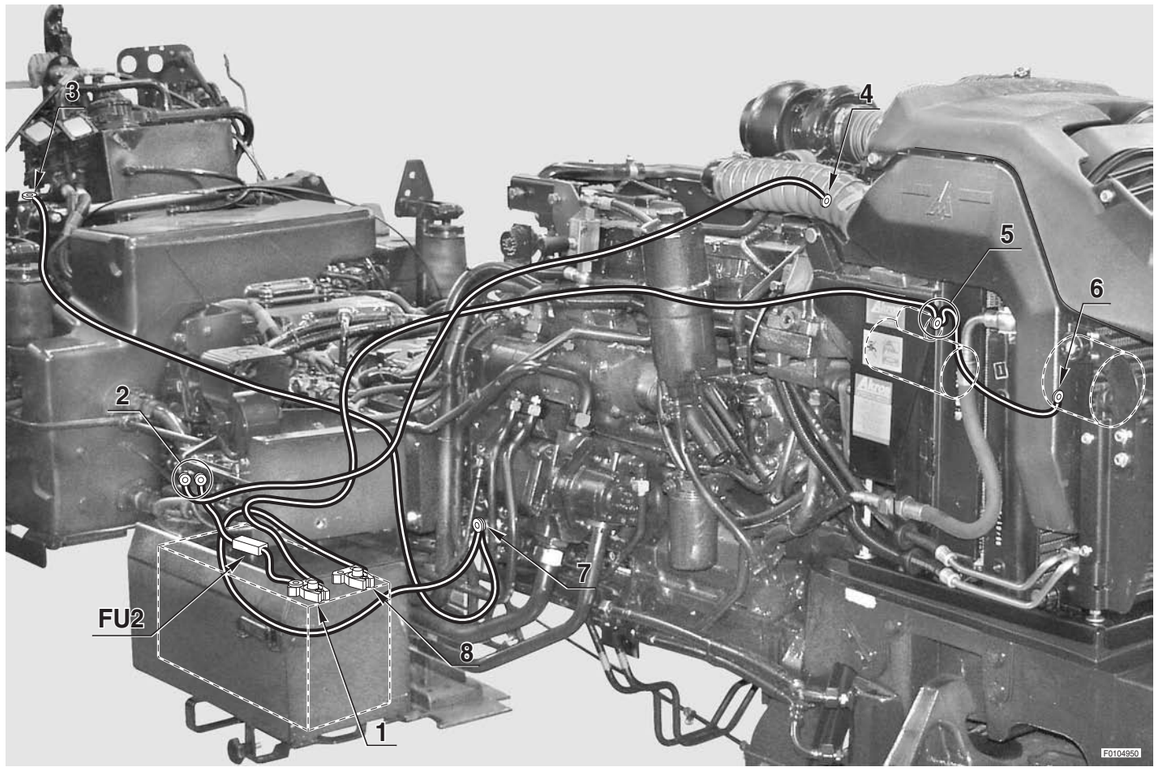


7



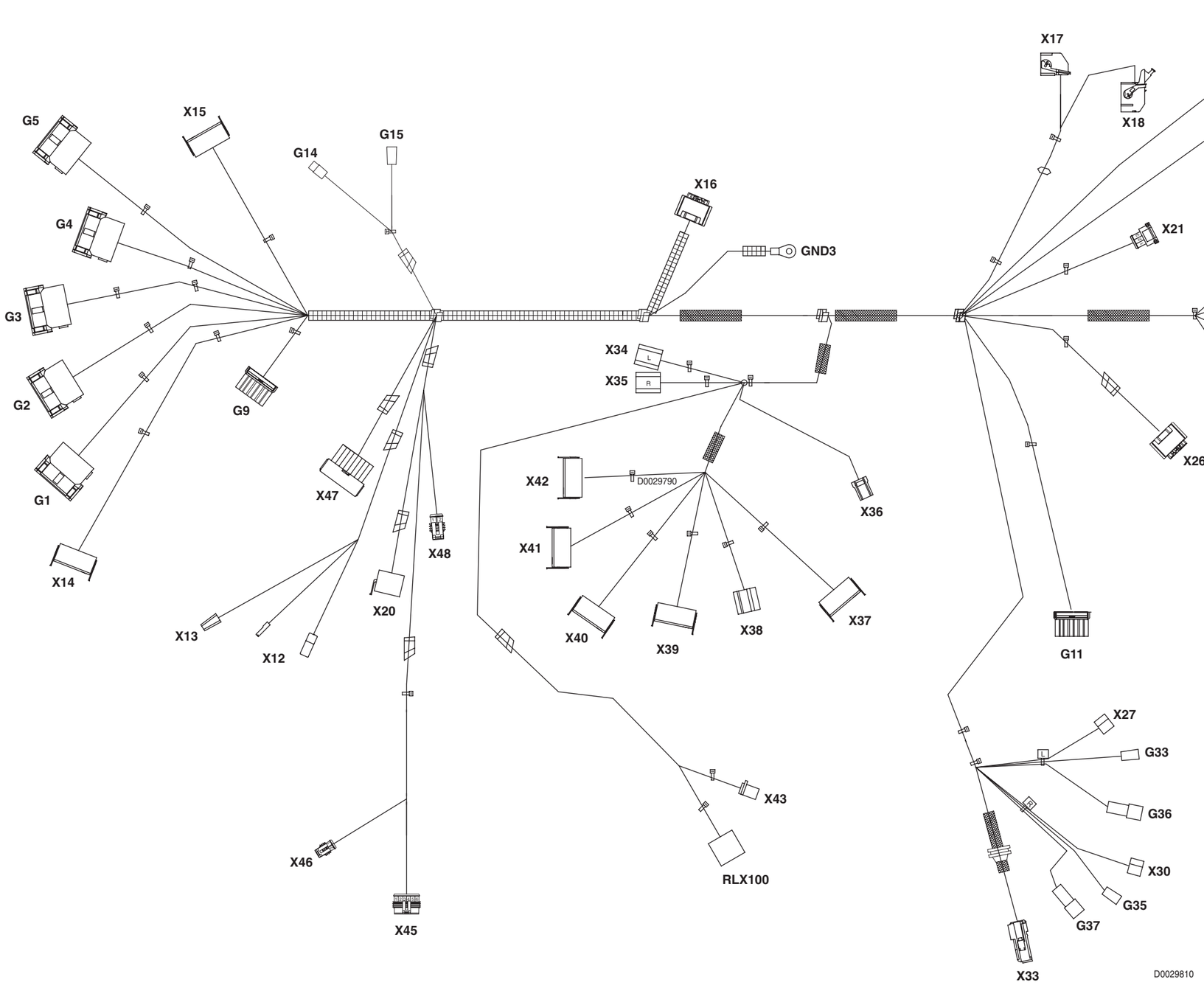
8

BATTERY POSITIVE WIRING - BATTERY NEGATIVE WIRING - POWER SUPPLY WIRING - CAB EARTH WIRING



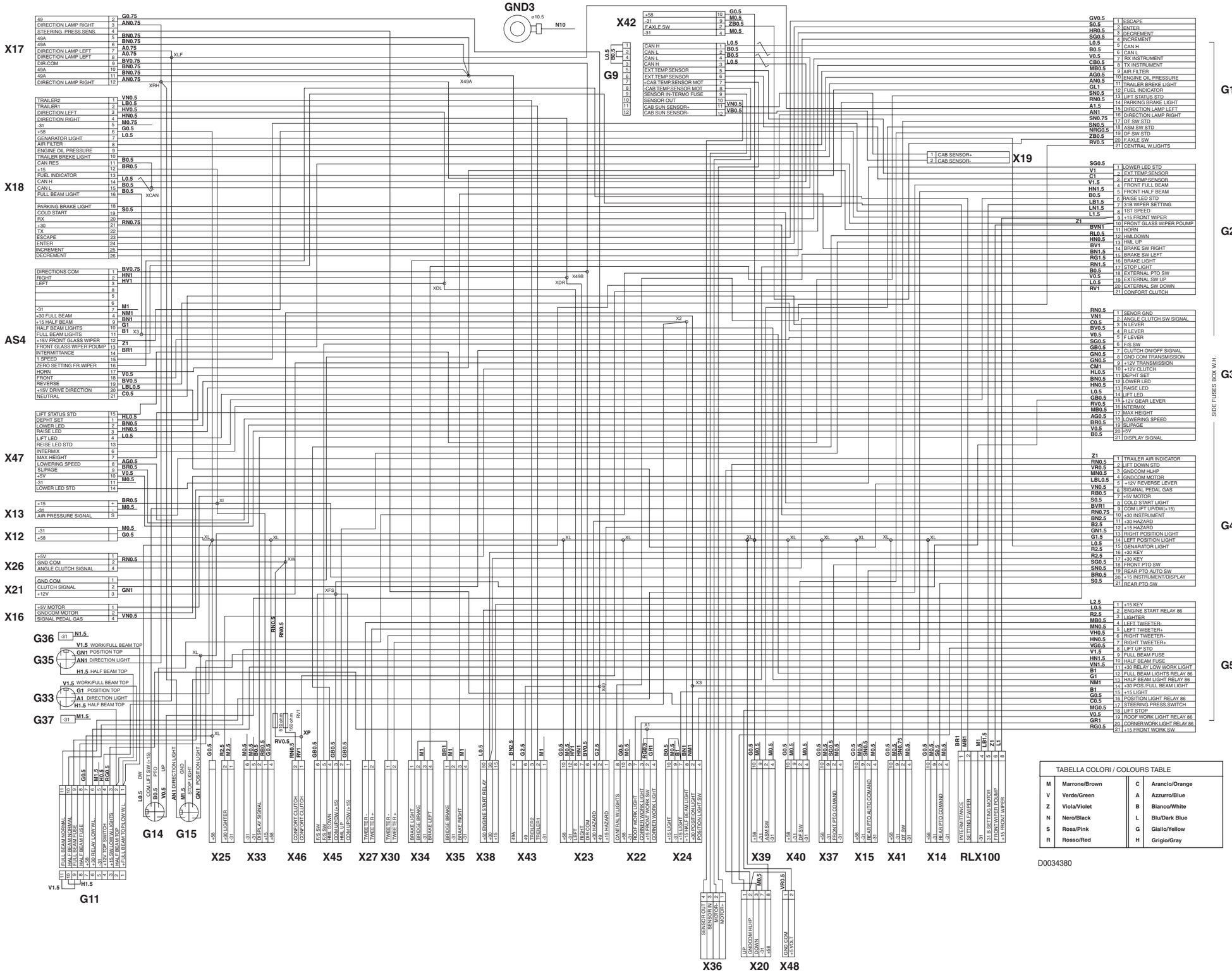
PAGE INTENTIONALLY
LEFT BLANK

INSTRUMENT PANEL WIRING (1/2)



AS4 To lights selector switch wiring
G1 To central wiring
G2 To central wiring
G3 To central wiring
G4 To central wiring
G5 To central wiring
G9 Not utilised
G11 To upper lights/worklights wiring on arm
G14 To fenders wiring
G15 To fenders wiring
G33 To wiring for lights on arms
G35 To wiring for lights on arms
G36 To wiring for lights on arms
G37 To wiring for lights on arms
GND3 Earthing point 3
RLX100 Windscreen wiper motor relay
X12 Compressed air pressure gauge
X13 Compressed air pressure gauge
X14 Rear PTO engagement switch
X15 AUTO PTO engagement switch
X16 Accelerator pedal position sensor
X17 Infocenter
X18 Infocenter
X19 Not utilised
X20 Lift control switch
X21 Clutch pedal depressed proximity sensor
X22 Front worklights switch
X23 Hazard lights switch
X24 Sidelights switch
X25 Cigar lighter
X26 Clutch pedal position sensor
X27 Left-hand tweeter
X30 Right-hand tweeter
X33 Transmission display
X34 Left brake pedal switch
X35 Right brake pedal switch
X36 Not utilised
X37 Front PTO engagement switch
X38 Starter switch
X39 ASM switch
X40 Differential lock switch
X41 4WD engagement control switch
X42 Front axle suspensions switch
X43 Hazard warning lights control unit
X45 Gearbox control lever
X46 Gearbox control lever
X47 Lift control console
X48 Lift lock control switch

INSTRUMENT PANEL WIRING (2/2)



FENDERS WIRING

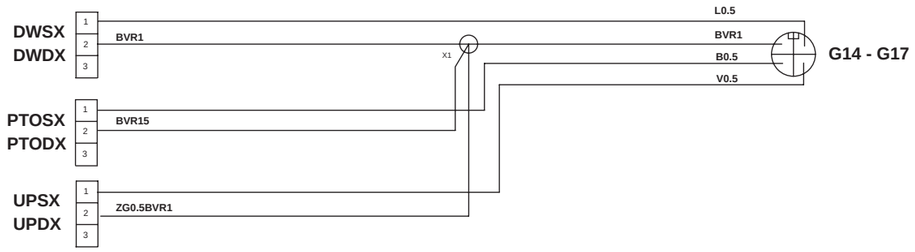
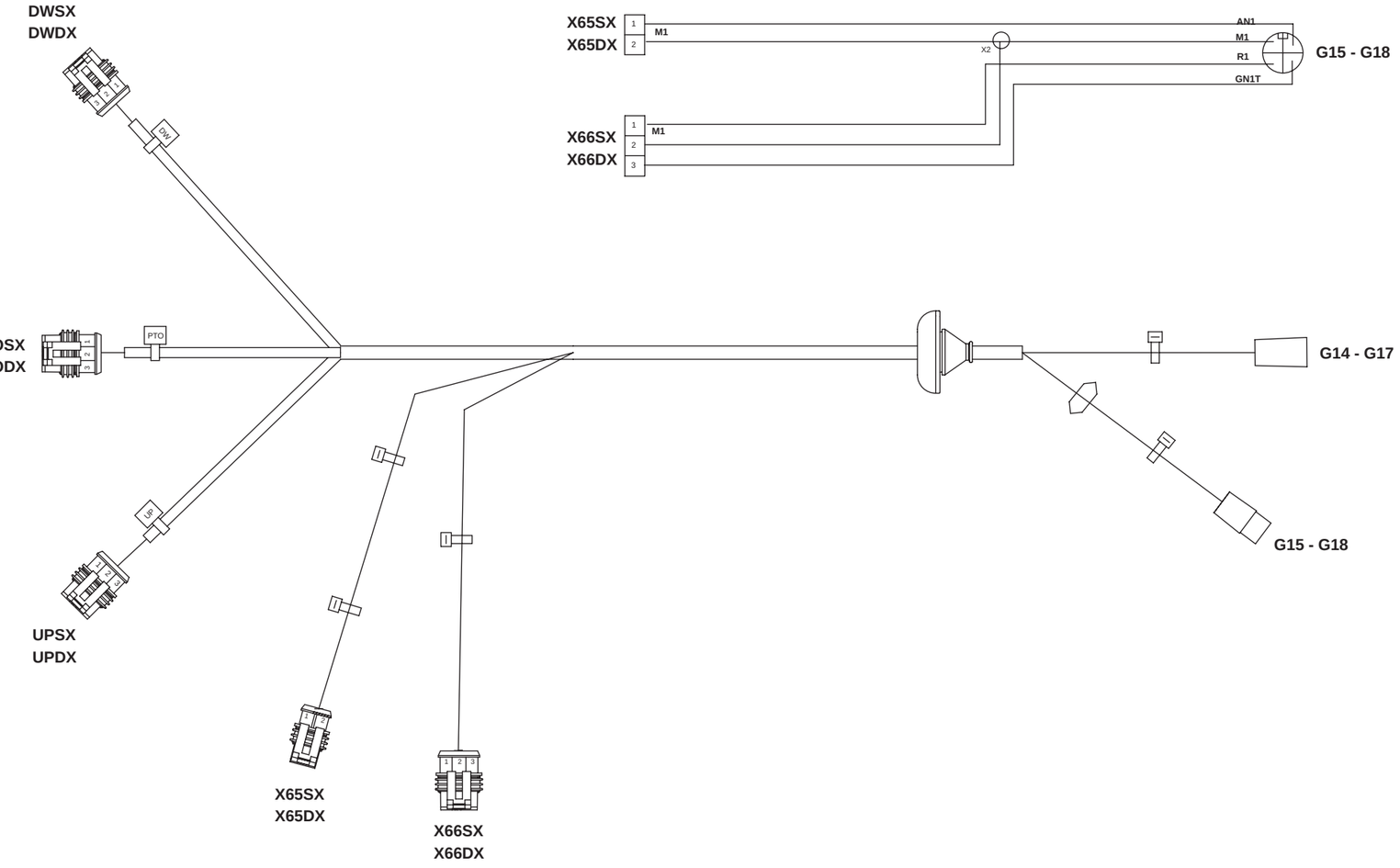


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029890



DW DX RH rear lift down button
DW SX LH rear lift down button
G14 To instrument panel wiring
G15 To instrument panel wiring
G17 To central wiring
G18 To central wiring

PTO DX RH rear PTO button (on fender)
PTO SX LH rear PTO button (on fender)
UP DX RH rear lift up button
UP SX LH rear lift up button
X65 DX RH rear direction indicator
X65 SX LH rear direction indicator

X66 DX RH rear sidelight and brake light
X66 SX LH rear sidelight and brake light

WIRING FOR LIGHTS ON ARMS

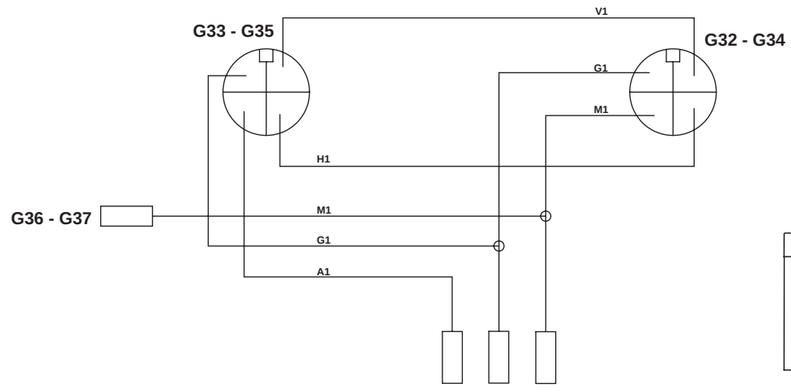
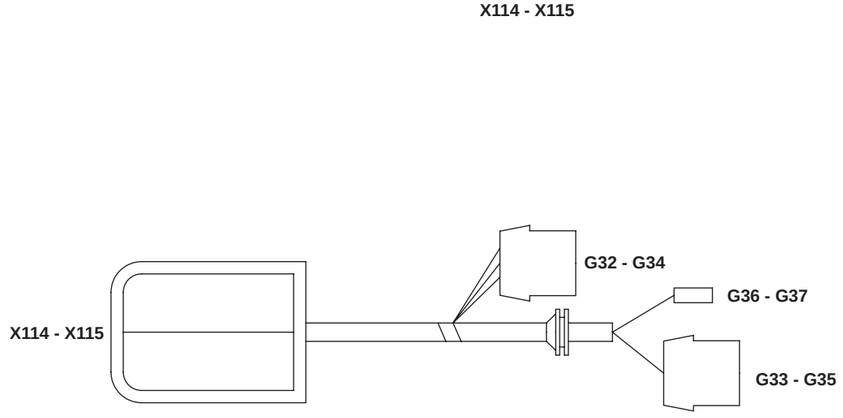


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030090



G32	Left front light on arms
G33	To instrument panel wiring
G34	Right front light on arms
G35	To instrument panel wiring
G36	To instrument panel wiring
G37	To instrument panel wiring
X114	Left sidelight and direction indicator
X115	Right sidelight and direction indicator

WIRING FOR SUPPLEMENTARY LIGHTS ON ARMS

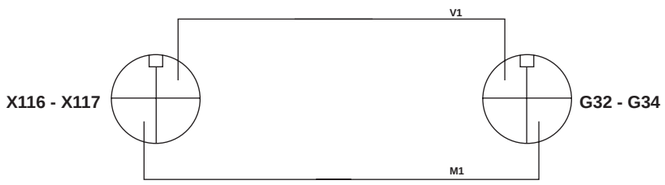
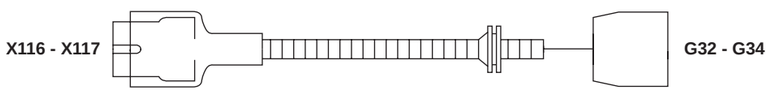


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030100



G32 To wiring for front lights on arms
G34 To wiring for front lights on arms
X116 Left-hand supplementary light
X117 Right-hand supplementary light

UPPER LIGHTS WIRING (VERSION WITH LIFT)

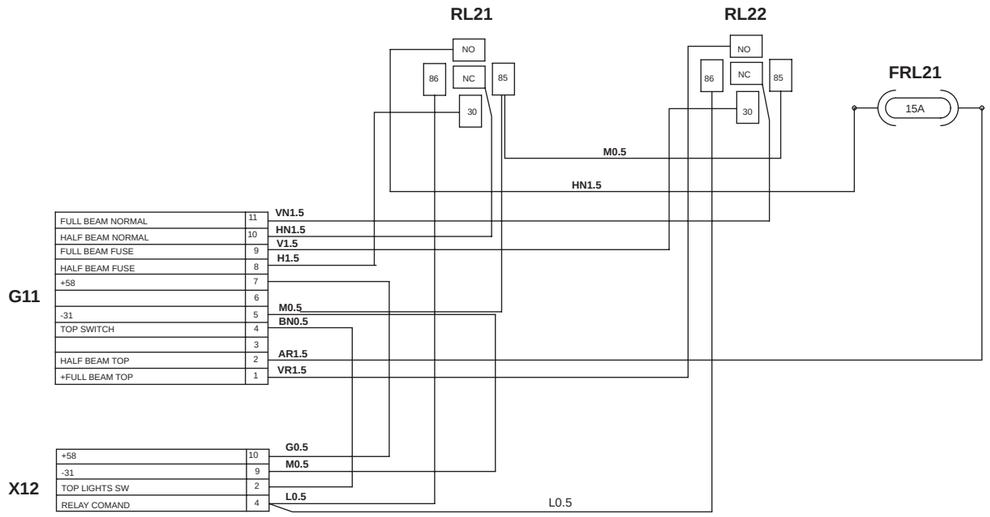
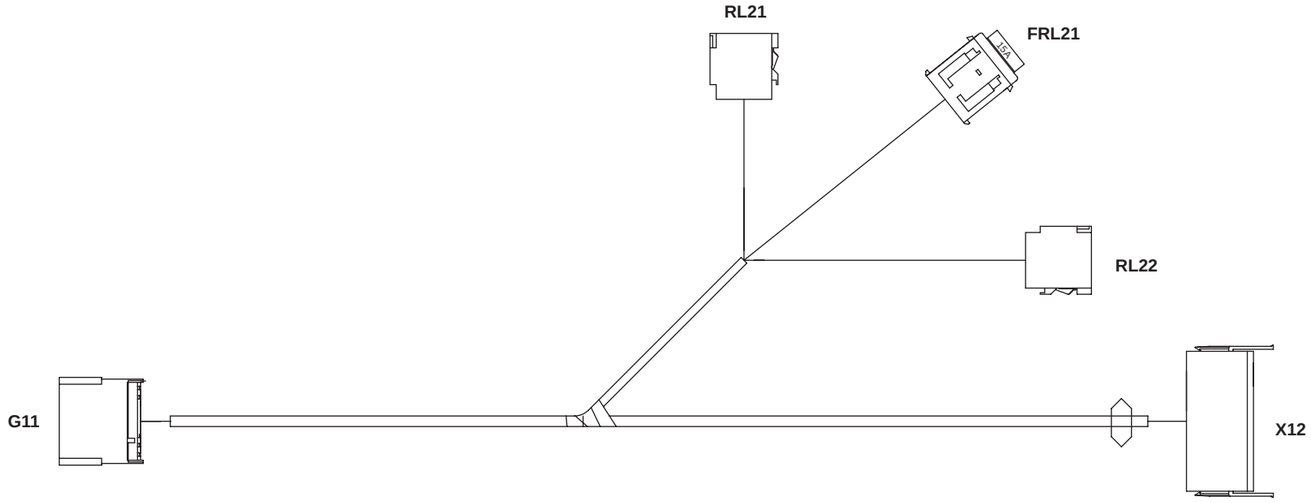


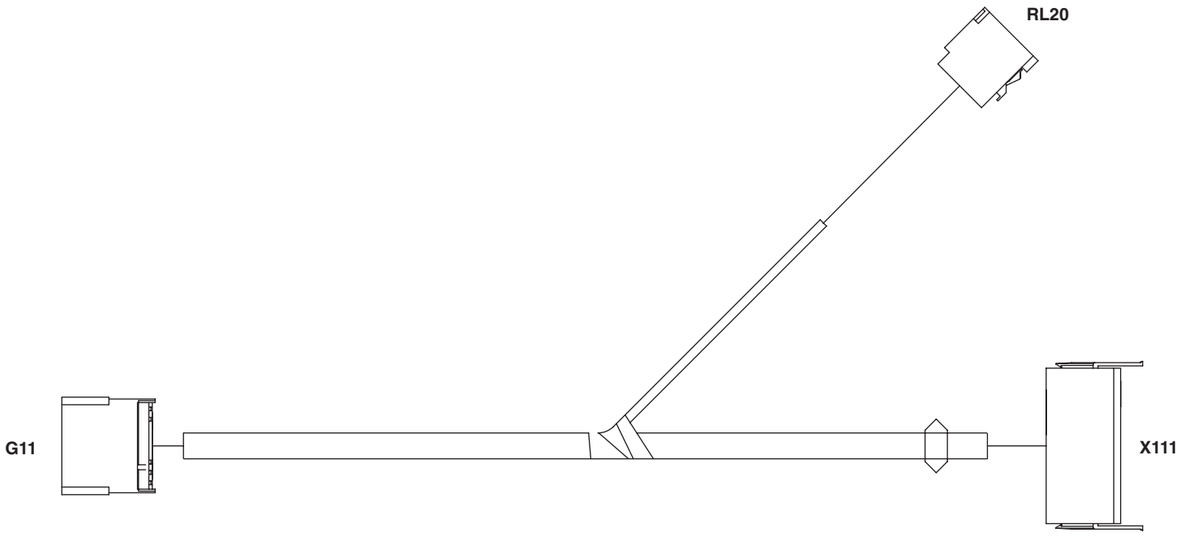
TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029980



FRL21	Low beam headlights relay supply fuse
G11	To instrument panel wiring
RL21	Relay for low beam headlights
RL22	Relay for full beam headlights
X112	Low/full beam headlights switch

WIRING FOR WORKLIGHTS ON ARMS (VERSION WITHOUT LIFT)



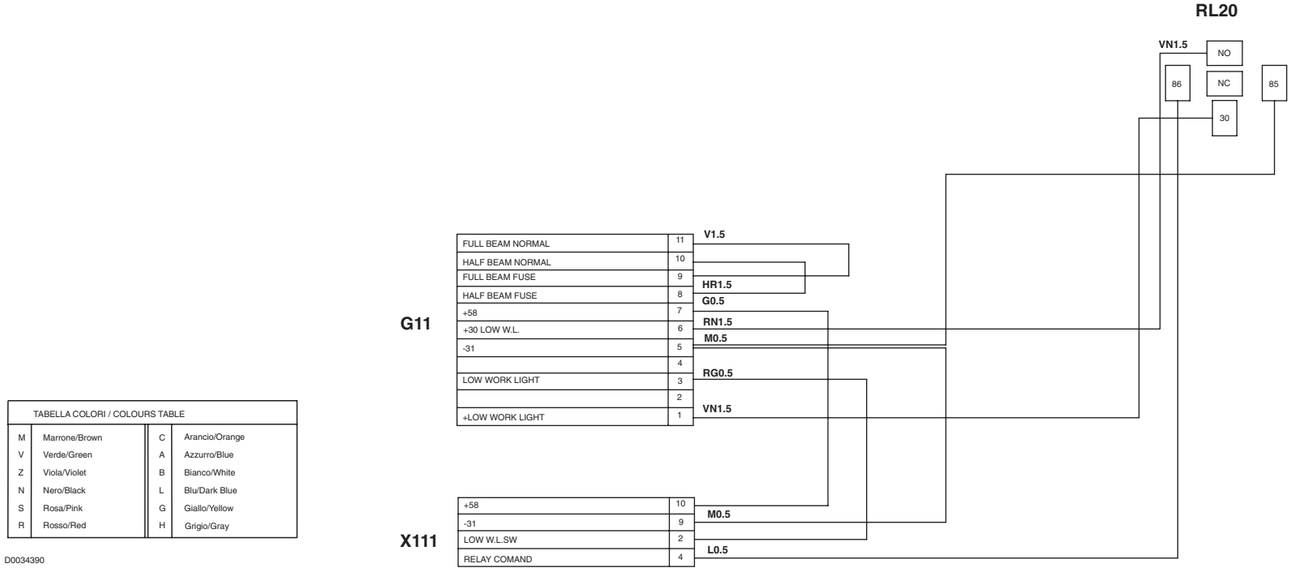


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

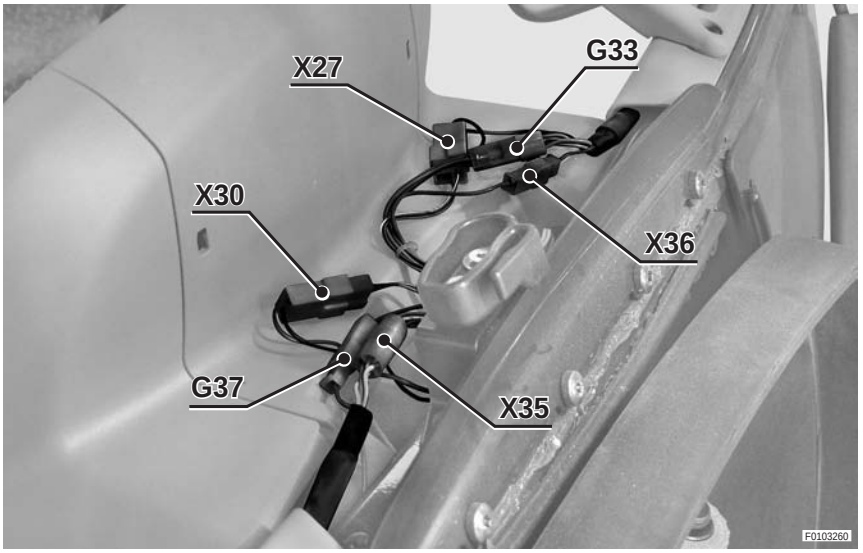
D0034390

G11 To instrument panel wiring
RL20 Relay for worklights on arms
X111 Switch for worklights on arms

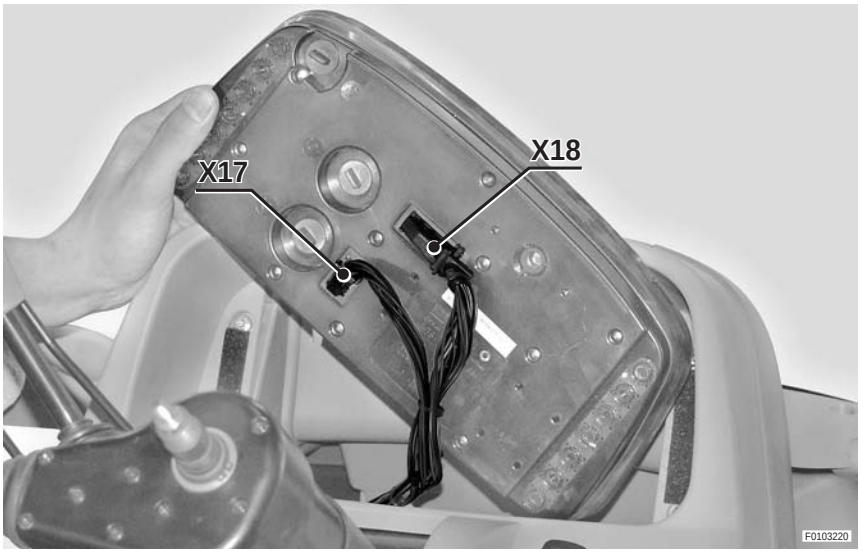
PAGE INTENTIONALLY
LEFT BLANK

CONNECTOR POSITIONS

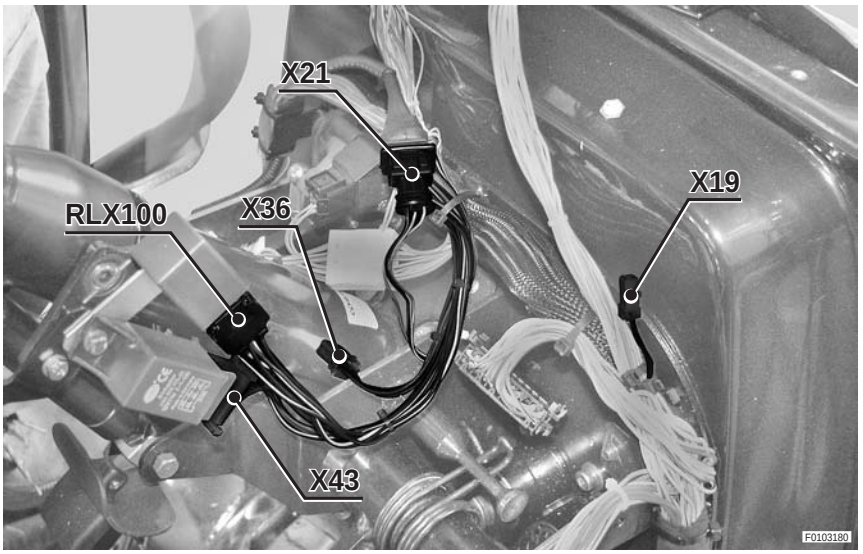
1



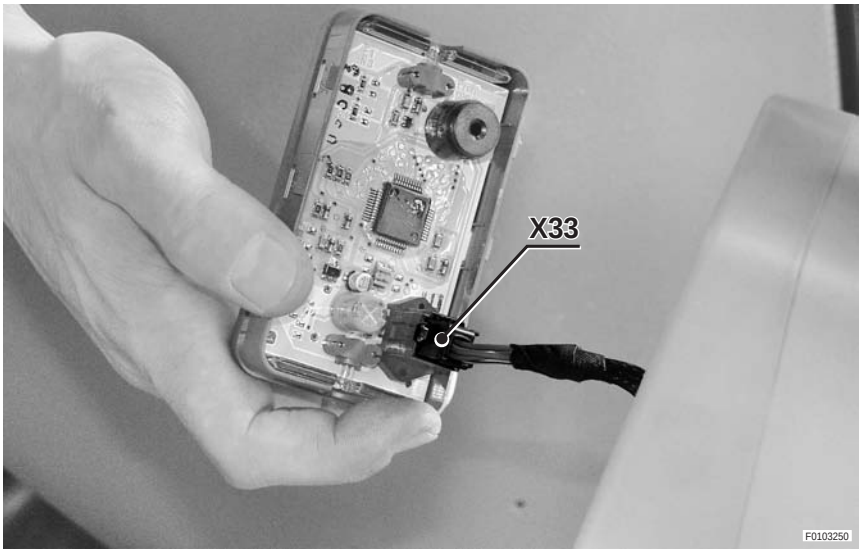
2



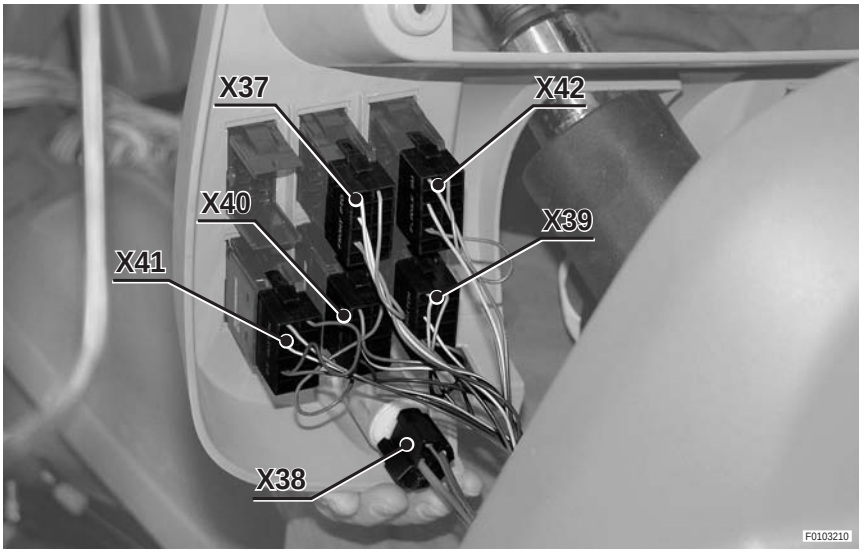
3



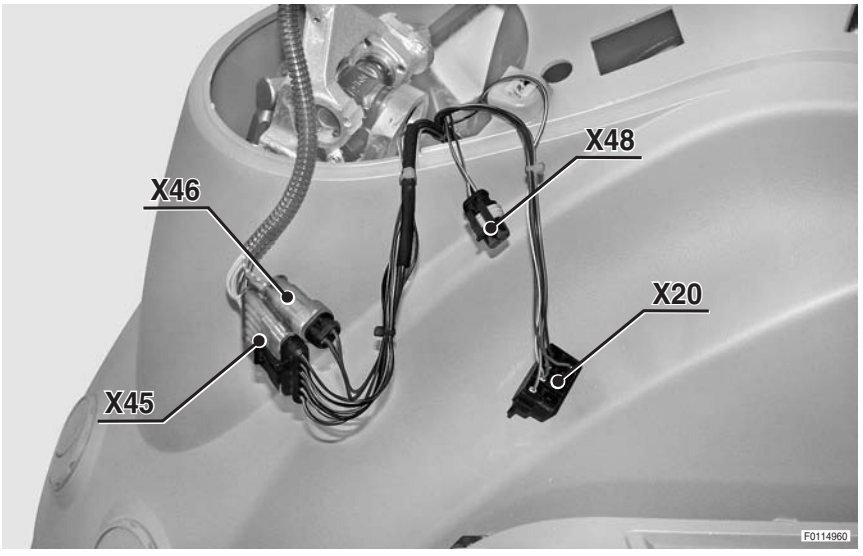
4


X33
F0103250

5


X37
X42
X40
X39
X41
X38
F0103210

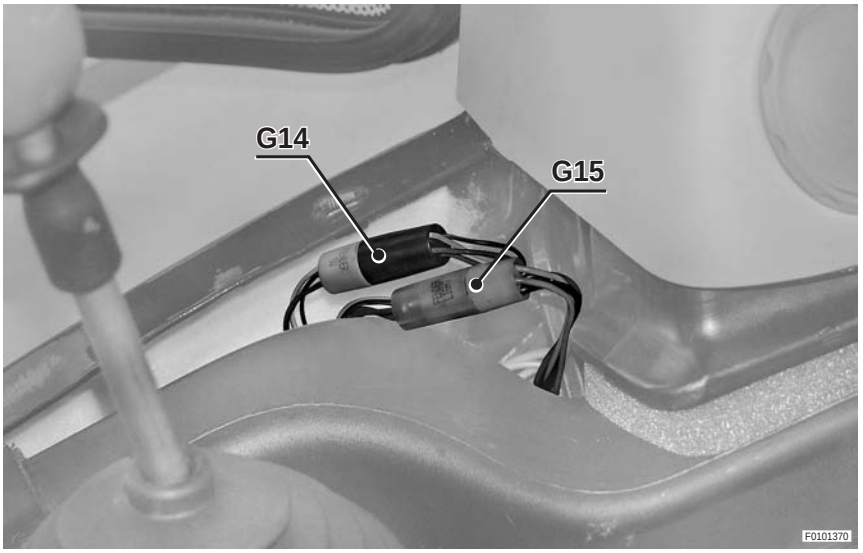
6


X48
X46
X20
X45
F0114960

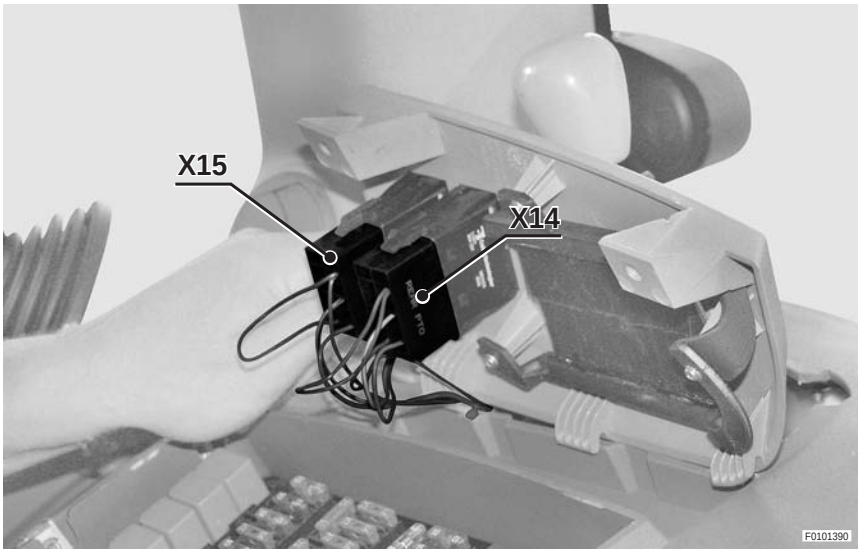
7


042073
X13
X47
X12
F0114970

8

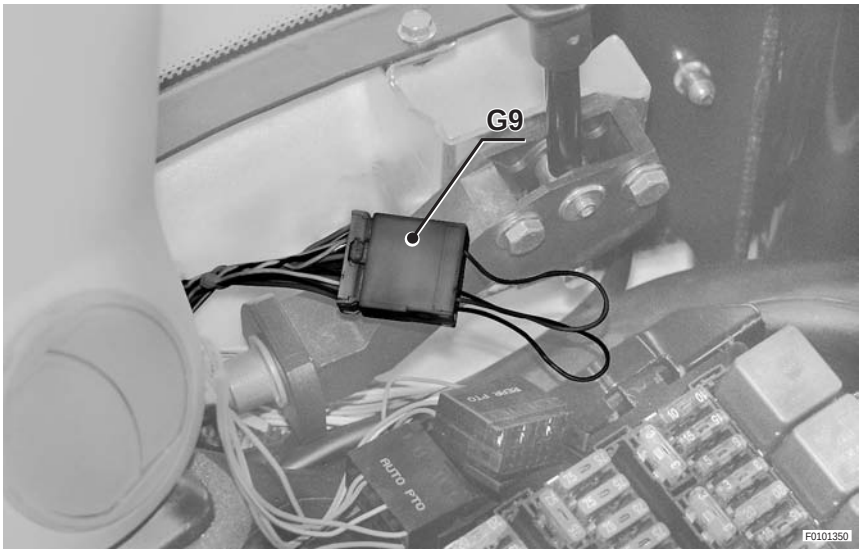

G14
G15
F0101370

9

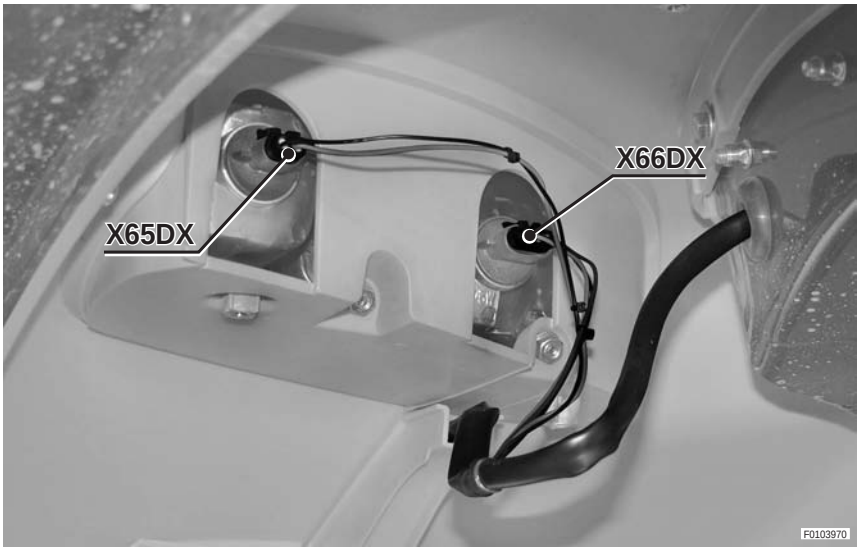

X15
X14
F0101390

10

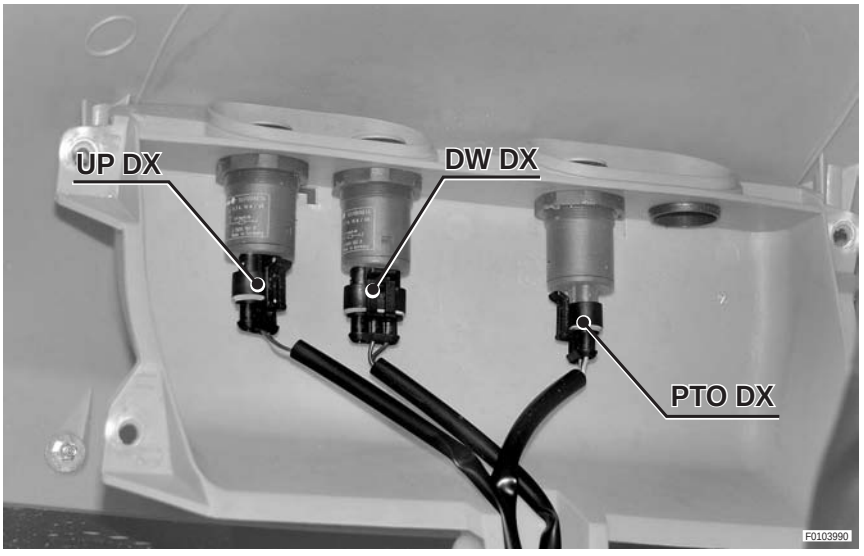
VERSION
WHIT MANUAL AIR
CONDITIONER



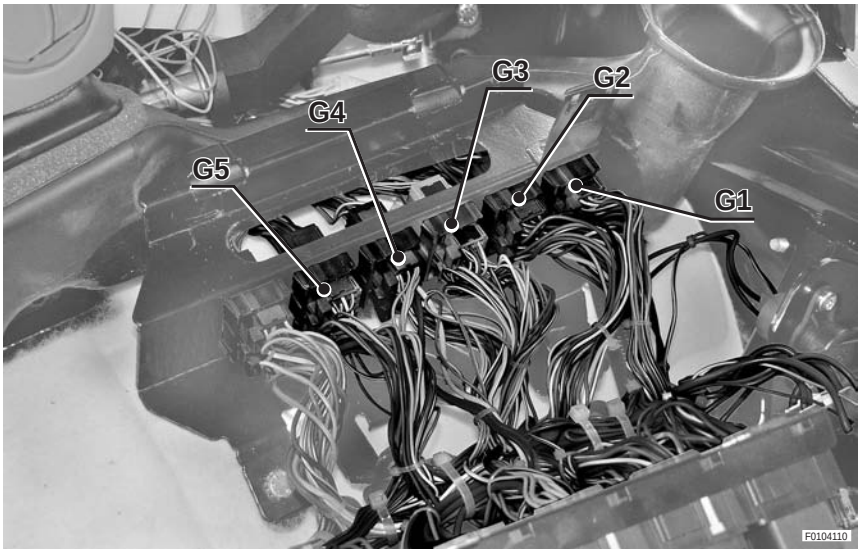
11



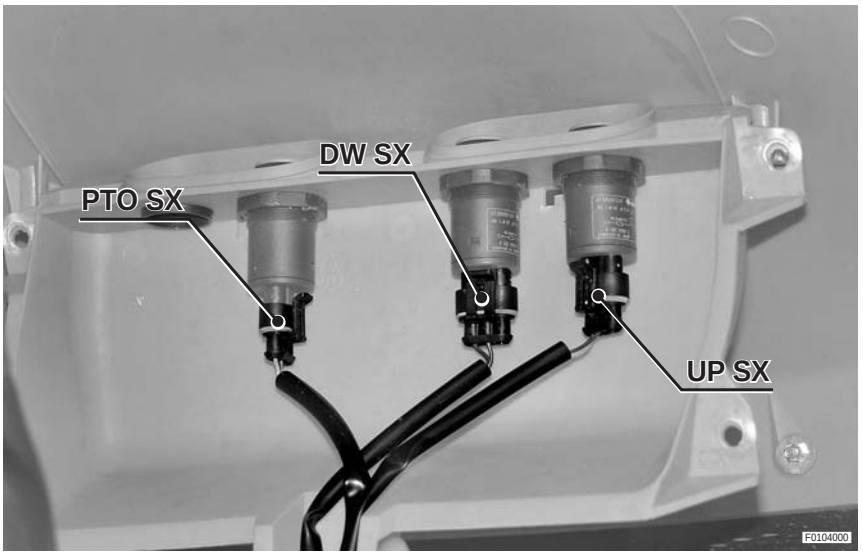
12



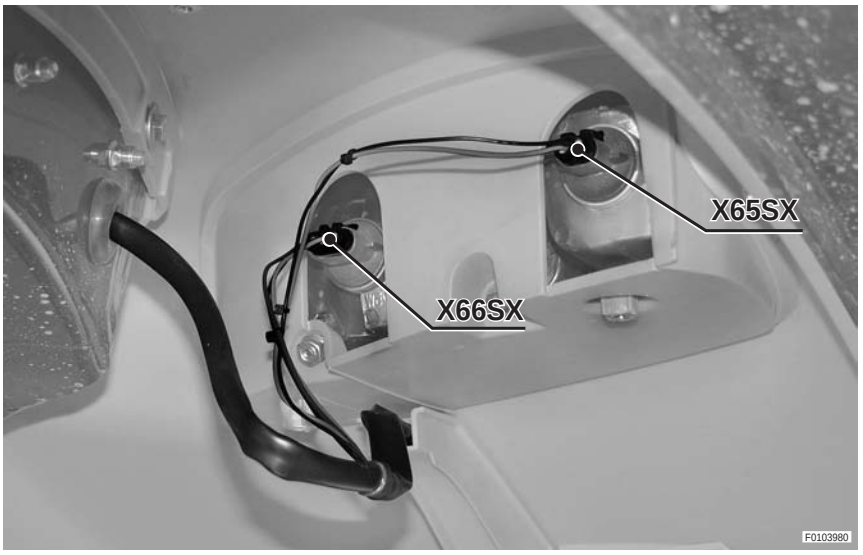
13


G3
G2
G4
G5
G1
F0104110

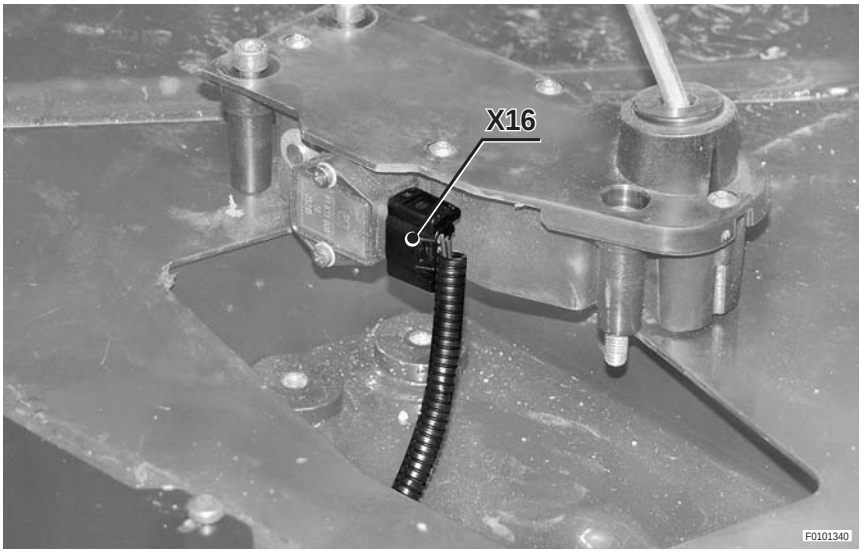
14


DW SX
PTO SX
UP SX
F0104000

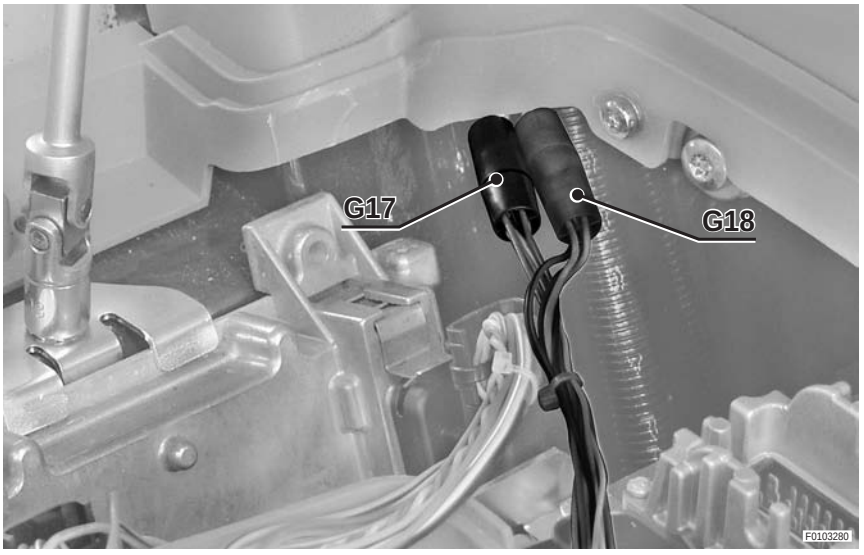
15


X65SX
X66SX
F0103980

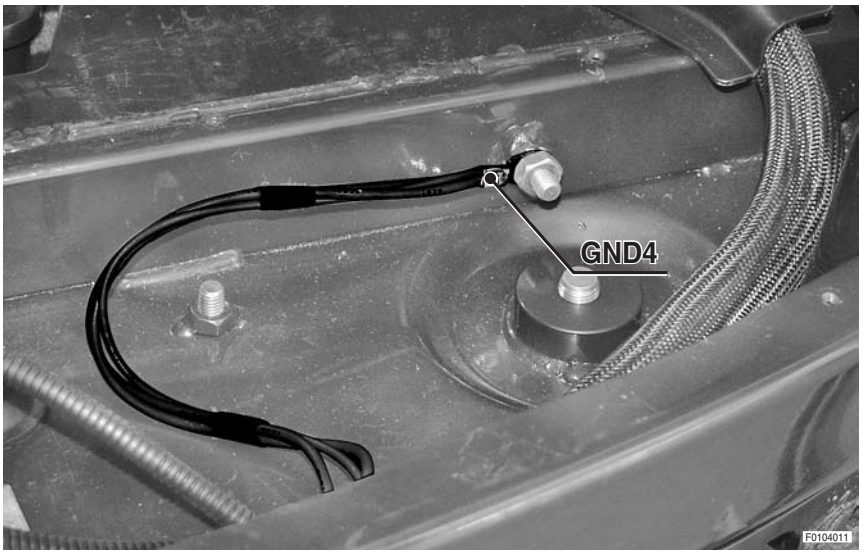
16



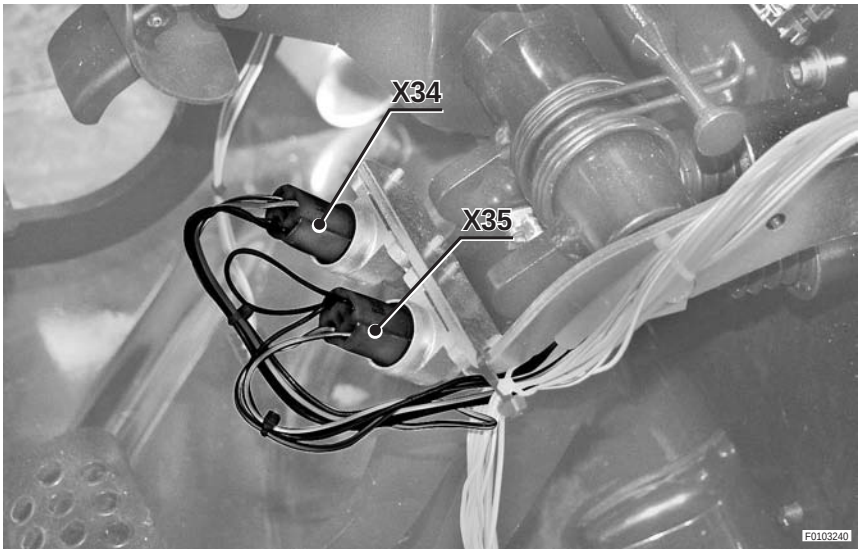
17



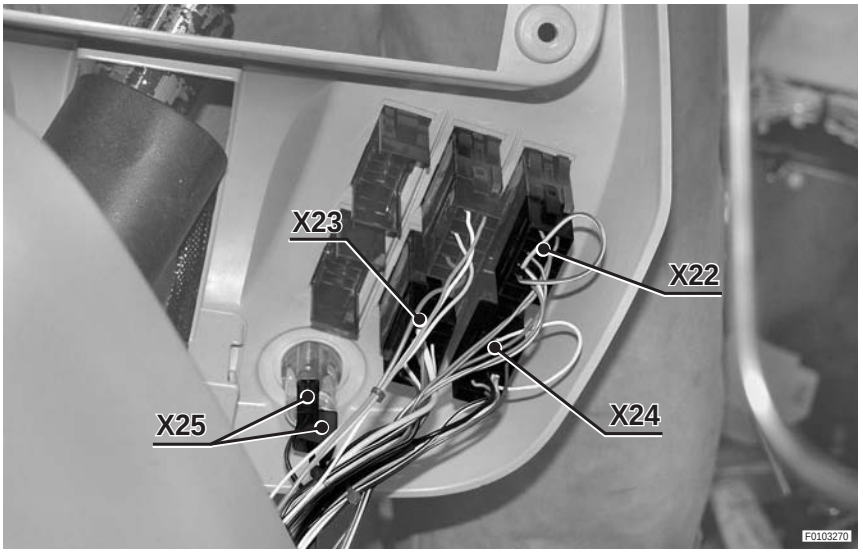
18



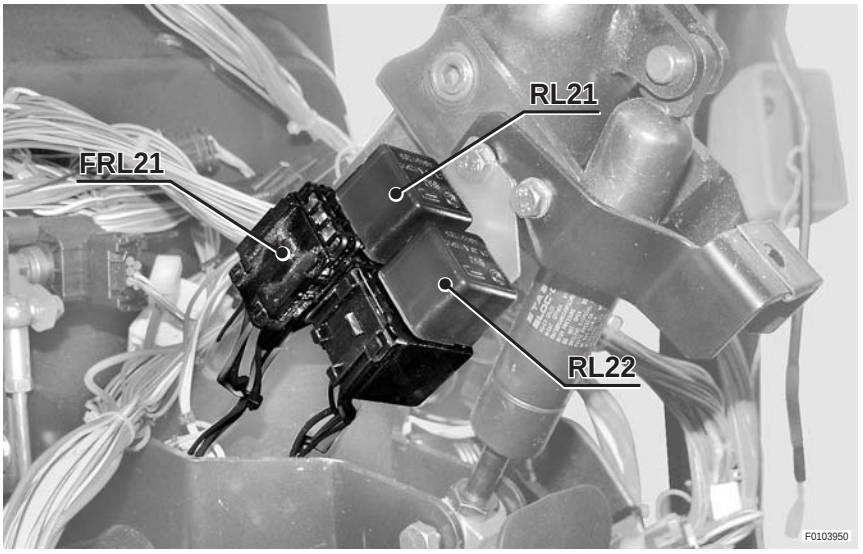
19



20

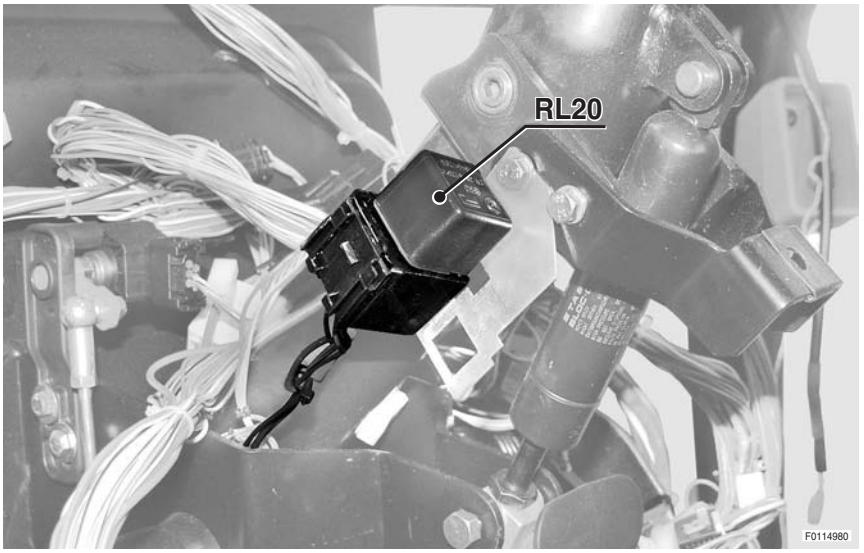


21



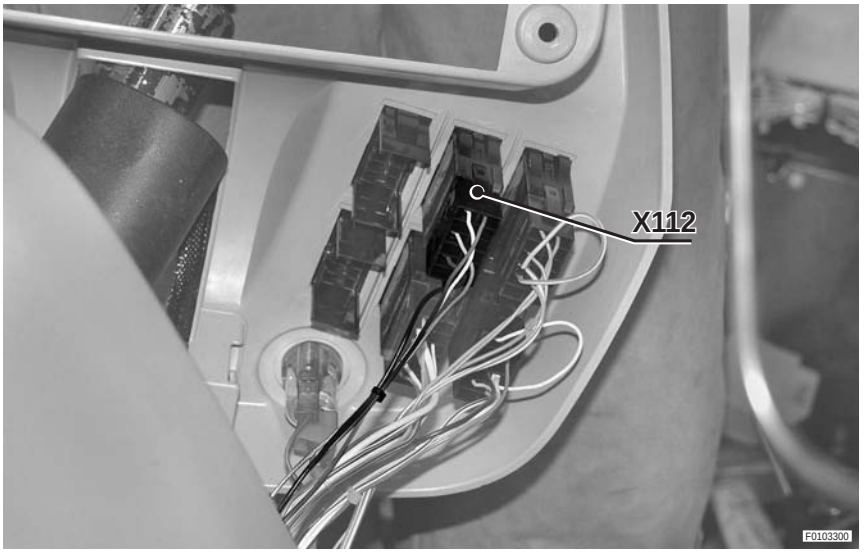
WITH LIFT

21

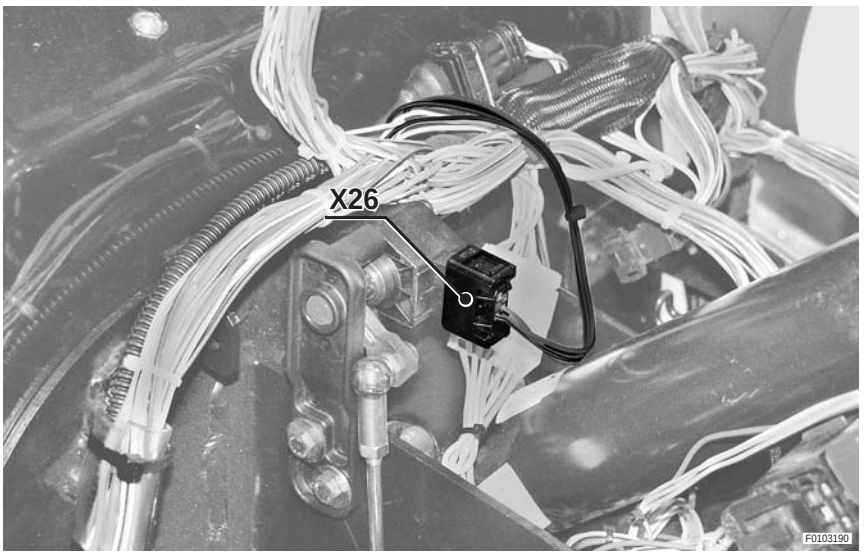


WITHOUT LIFT

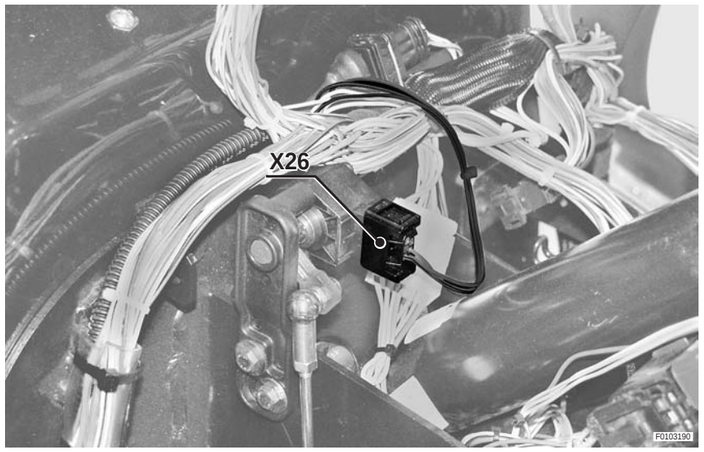
22



23

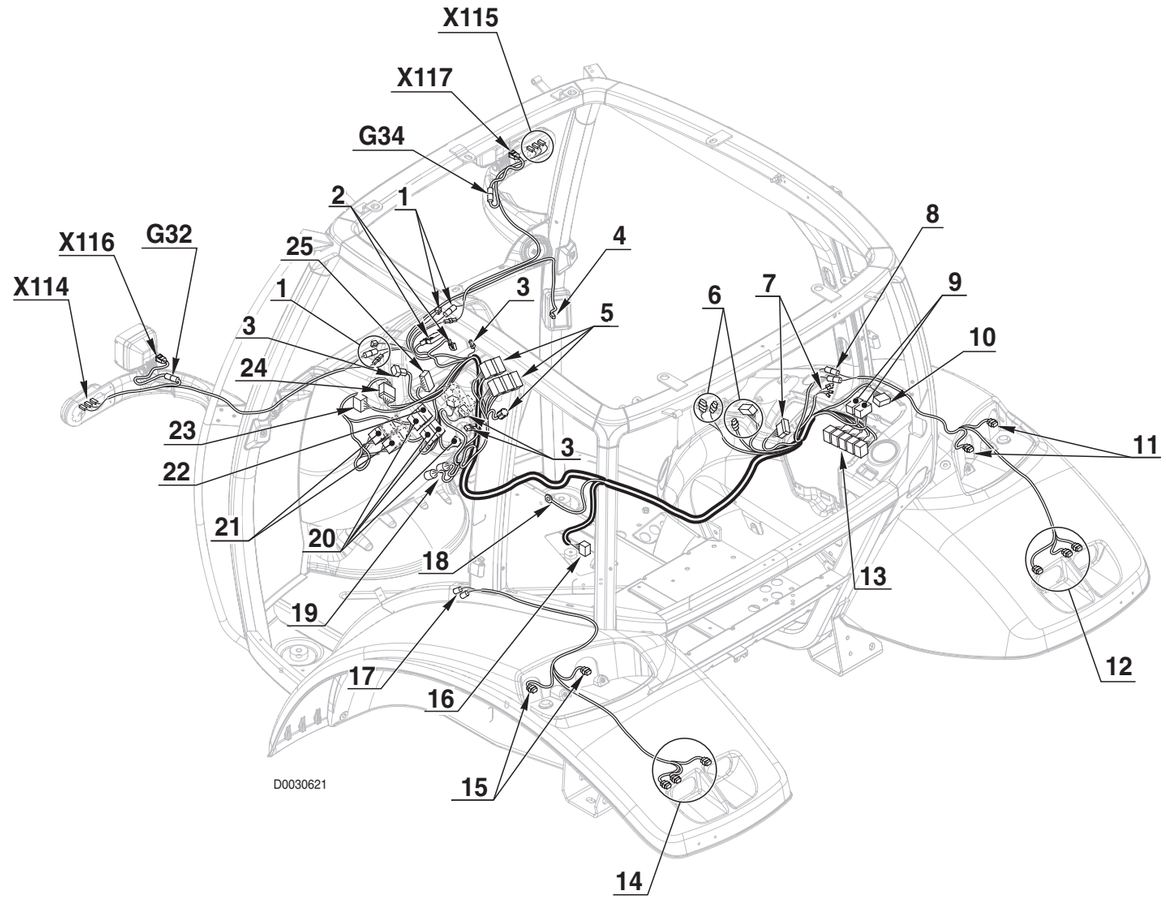


24



25

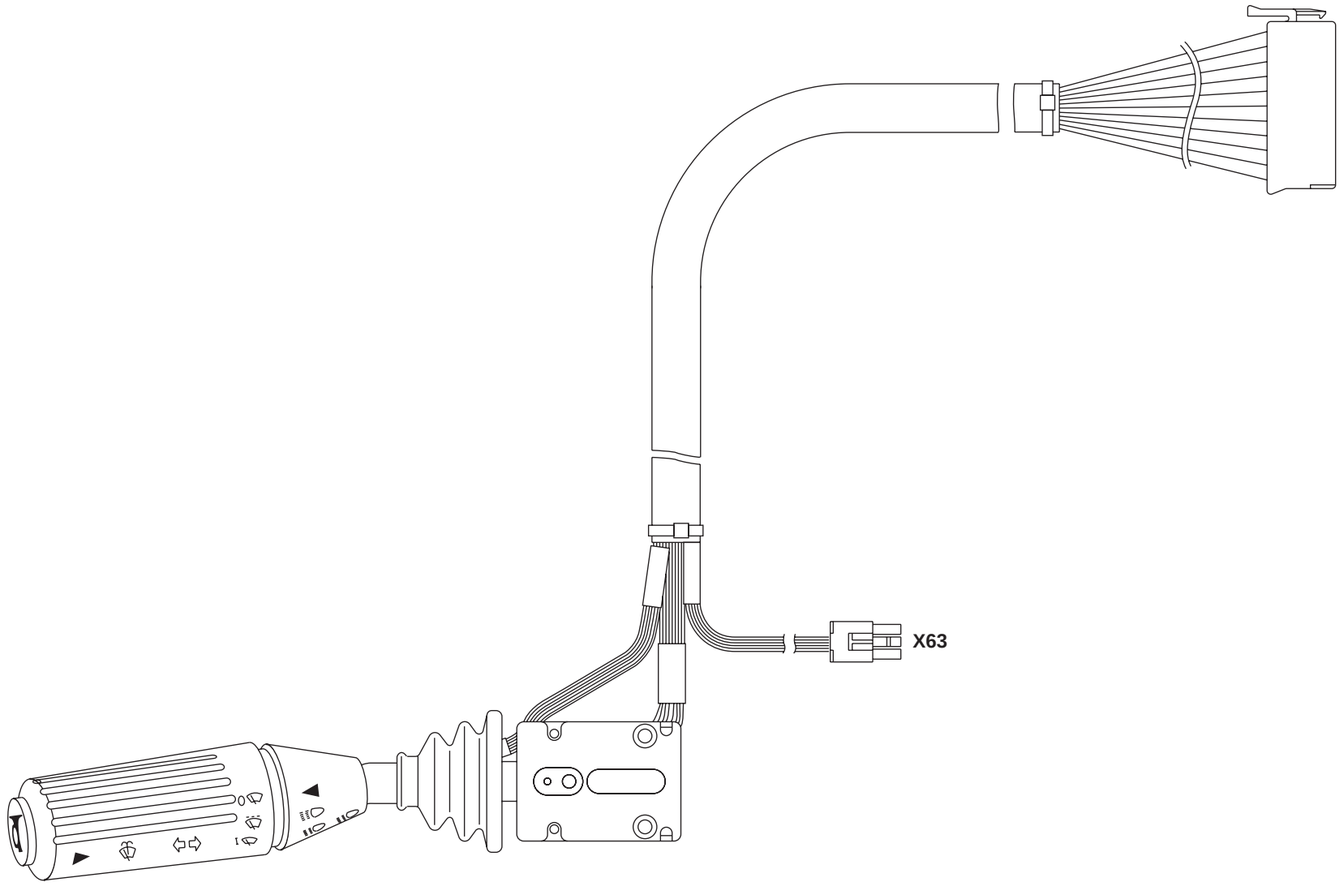
INSTRUMENT PANEL WIRING - FENDERS WIRING WIRING FOR HEADLIGHTS ON ARMS - WIRING FOR SUPPLEMENTARY LIGHTS ON ARMS - UPPER LIGHTS WIRING - WIRING FOR WORKLIGHTS ON ARMS



0.014.3649.4/40
0.013.9309.4/30
0.014.0732.4/10
0.014.0002.4
0.014.1875.4/10
0.014.1874.4/20

PAGE INTENTIONALLY
LEFT BLANK

LIGHTS SELECTOR SWITCH WIRING



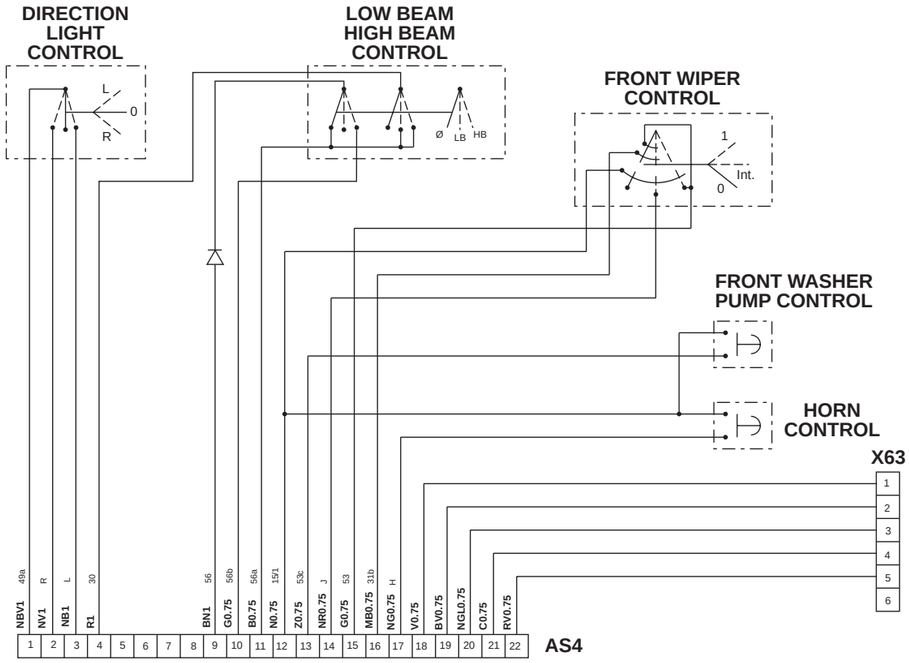


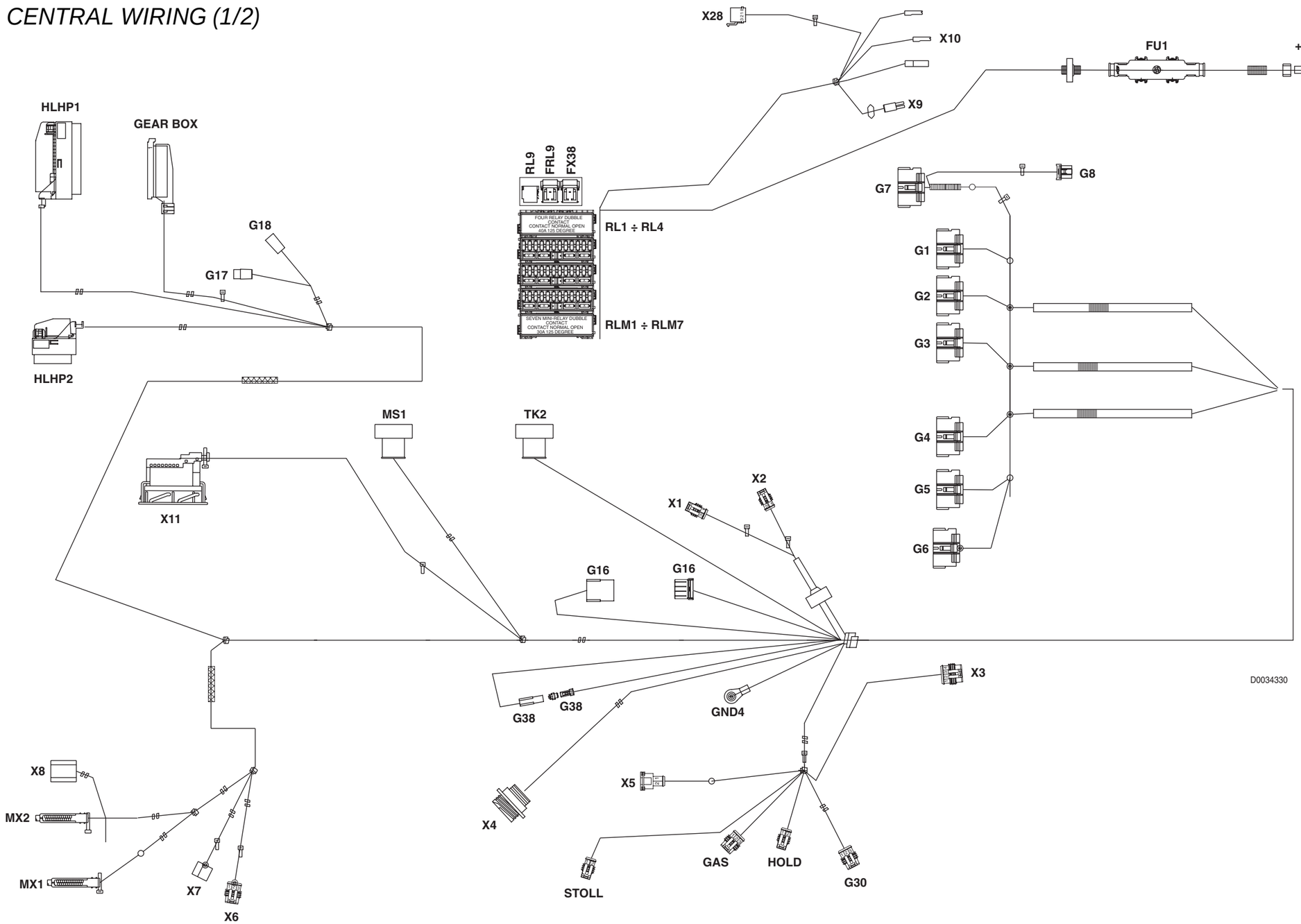
TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030080

AS4 To the instrument panel wiring
X63 Shuttle control lever

PAGE INTENTIONALLY
LEFT BLANK

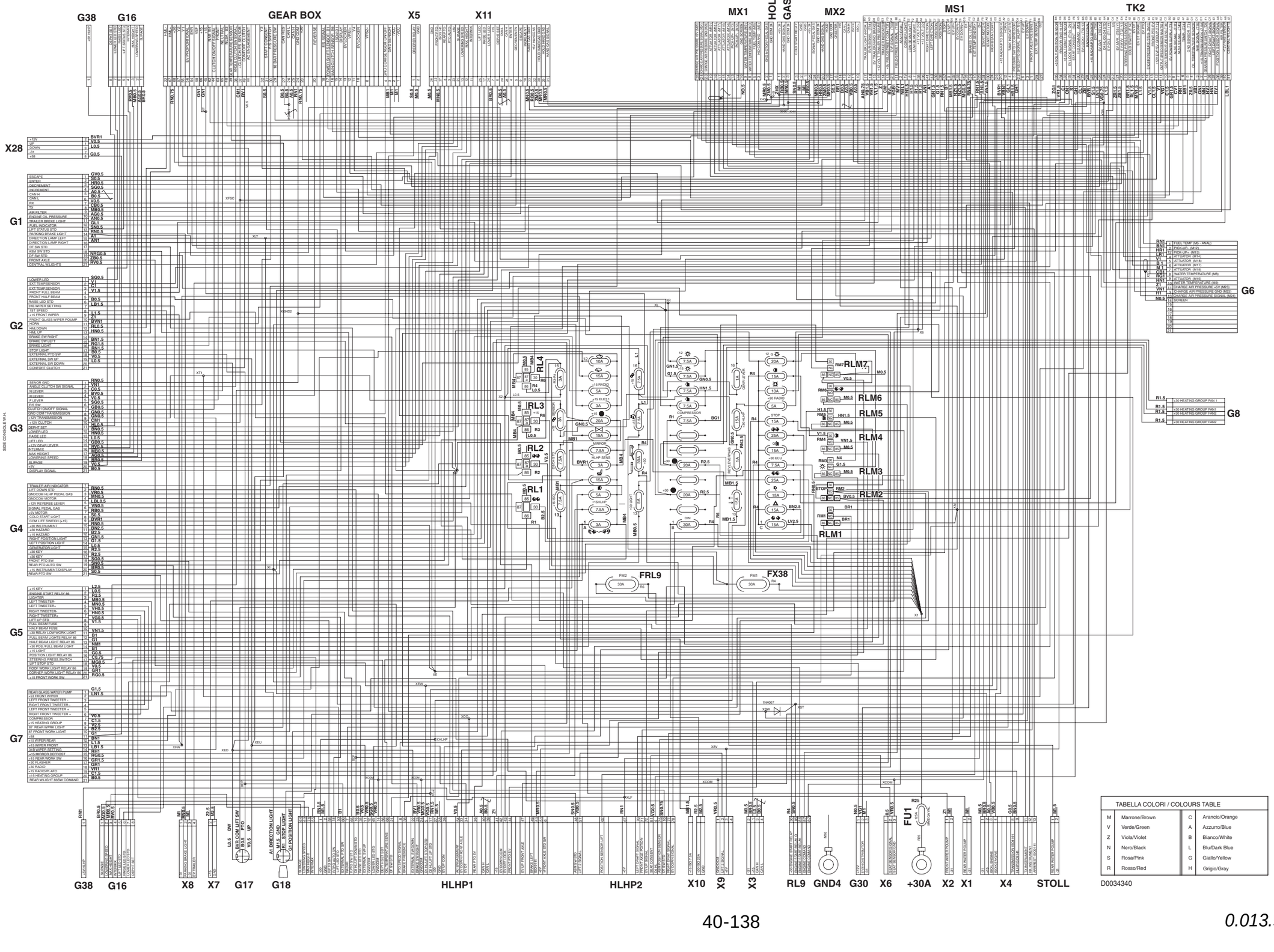
CENTRAL WIRING (1/2)



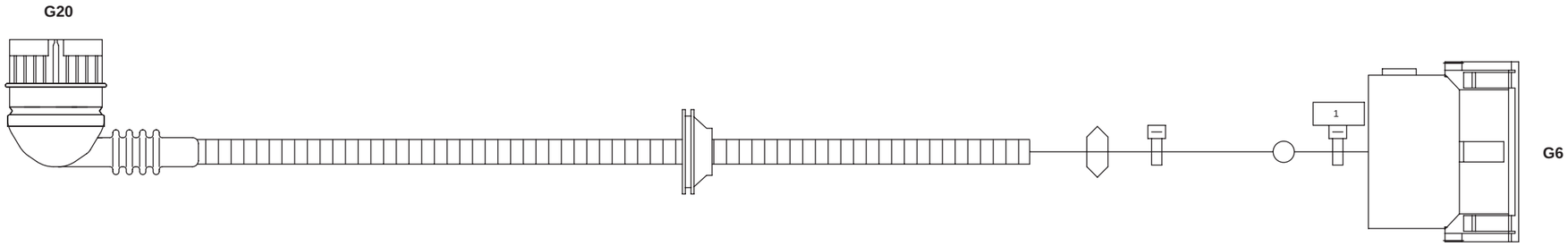
MX1 Engine control unit
MX2 Engine control unit
RL1 Front worklights relay
RL2 Rear worklights relay
RL3 Ignition controlled power supply relay
RL4 Ignition controlled power supply relay
RL9 Engine starting relay
RLM1 Preheating relay
RLM2 Brake lights relay
RLM3 Relay for sidelights
RLM4 Relay for full beam headlights
RLM5 Relay for low beam headlights
RLM6 Side worklights relay
RLM7 Air conditioning compressor relay
STOLL Not utilised
TK2 To right-hand transmission wiring
X1 Rear screenwasher pump
X2 Windscreen washer pump
X3 Supplementary CANBUS socket
X4 Diagnostic socket
X5 Creeper engagement sensor
X6 Not utilised
X7 Driver's seat
X8 Handbrake switch
X9 ISO4 socket (Power for external implements)
X10 Power socket
X11 Armrest
X28 Not utilised

+30A Battery
FRL9 Engine starting relay supply fuse
FU1 Battery main fuse (125A)
FX38 Starter switch supply fuse
G1 To instrument panel wiring
G2 To instrument panel wiring
G3 To instrument panel wiring
G4 To instrument panel wiring
G5 To instrument panel wiring
G6 To engine wiring
G7 To roof line wiring
G8 To roof line wiring
G16 Wiring connector
G17 To fenders wiring
G18 To fenders wiring
G30 To control valves wiring
G38 Wiring connector
GAS Hand throttle position sensor
GEAR BOX Transmission control unit
GND4 Earthing point 4
HLHP1 HLHP control unit
HLHP2 HLHP control unit
HOLD "HOLD" button
MS1 To left transmission wiring

CENTRAL WIRING (2/2)



ENGINE WIRING



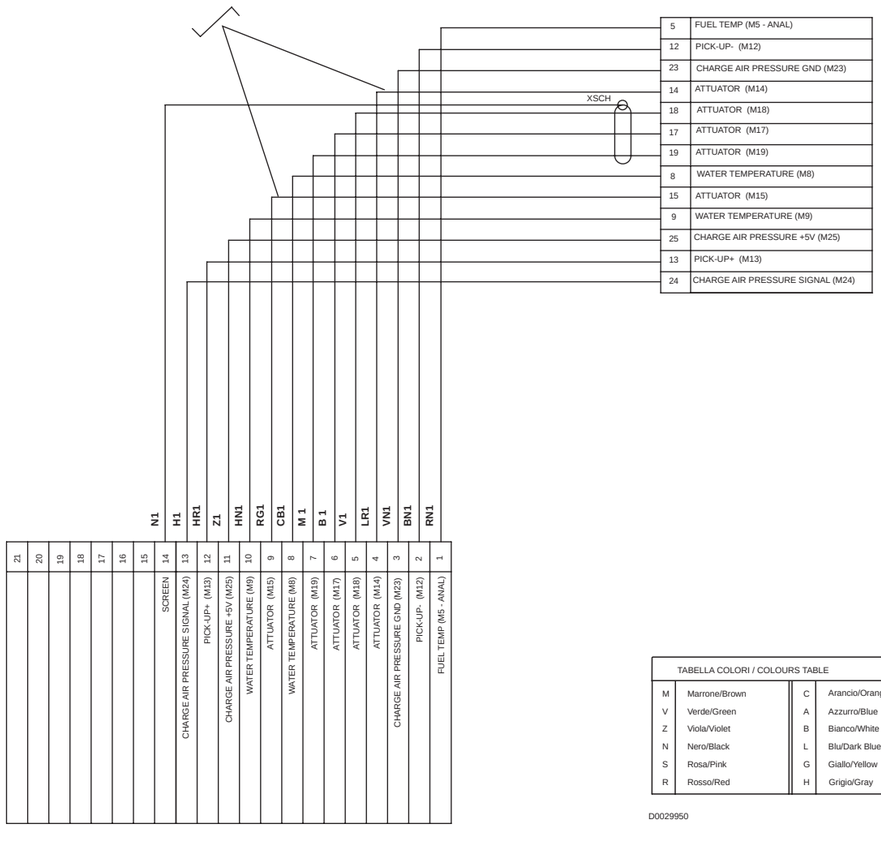


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

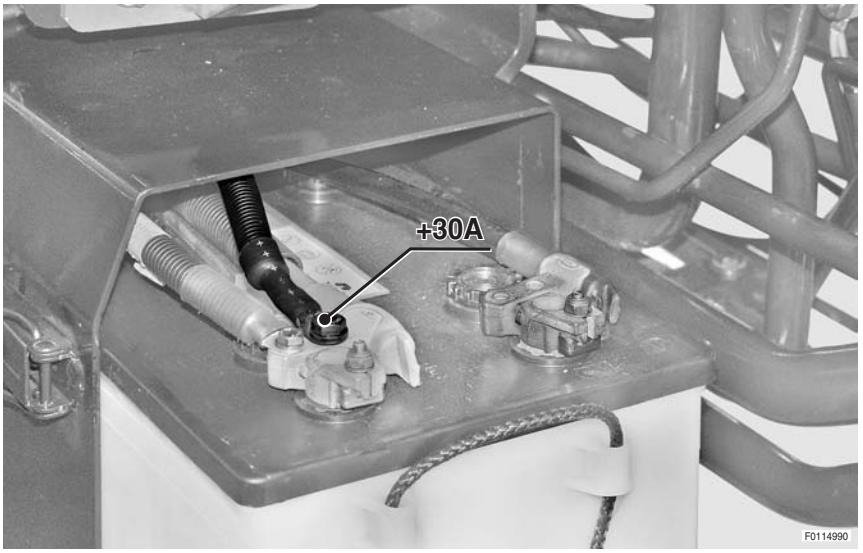
D0029950

G6 To central wiring
G20 To engine wiring

PAGE INTENTIONALLY
LEFT BLANK

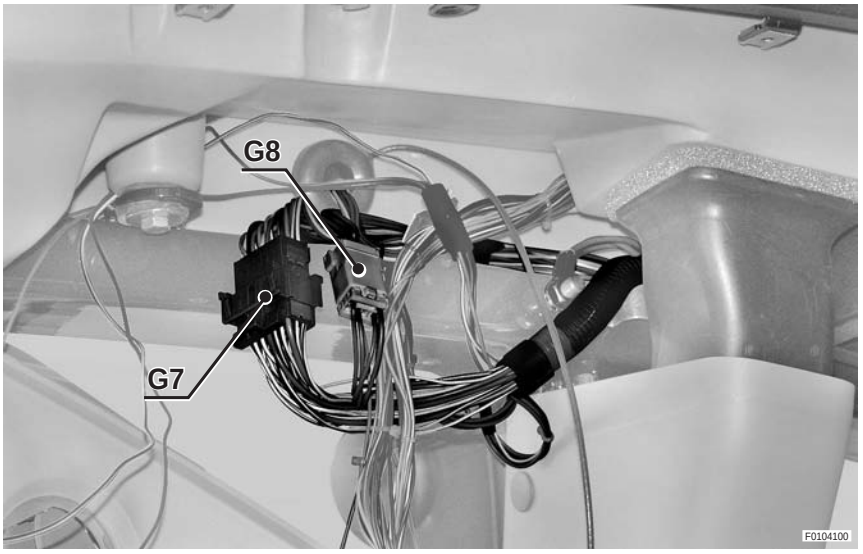
CONNECTOR POSITIONS

1

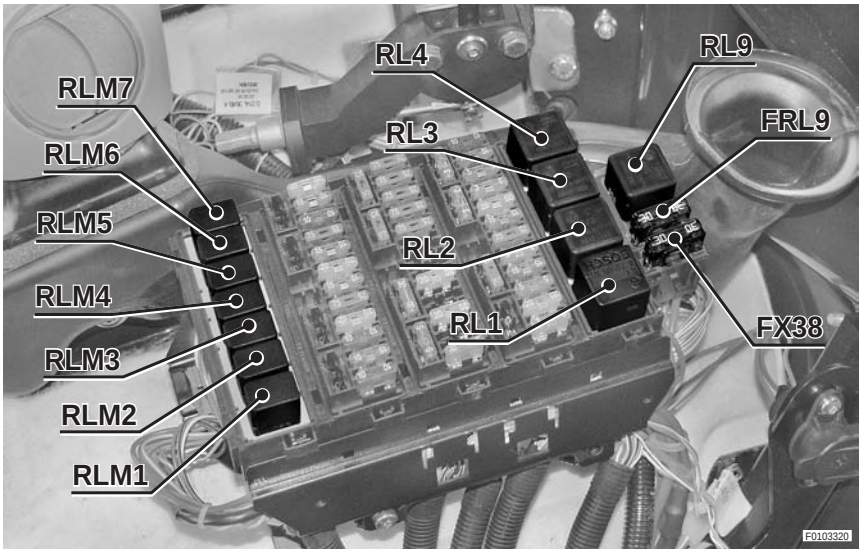


2

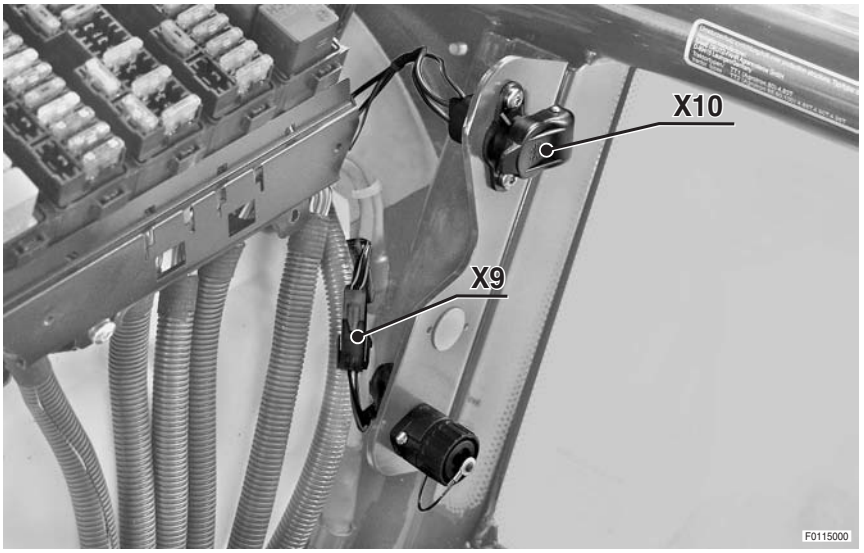
3



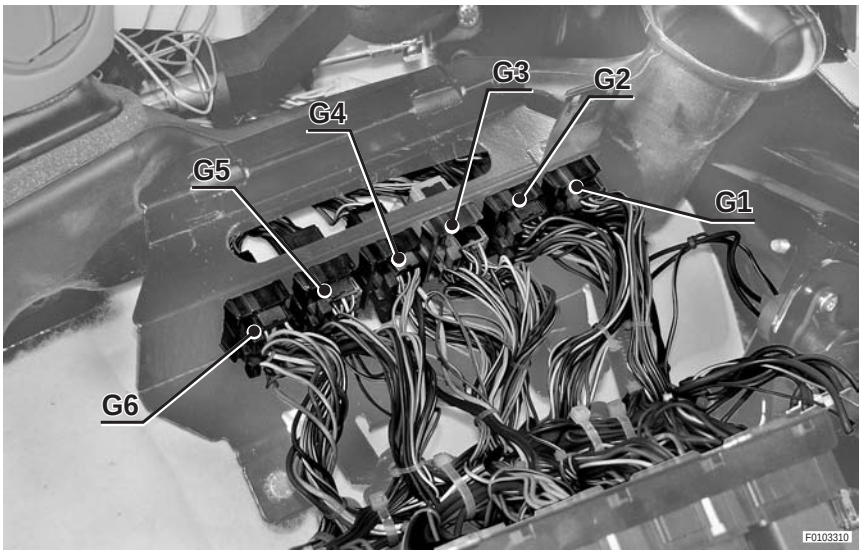
4


RL4
RL9
RLM7
RL3
FRL9
RLM6
RLM5
RL2
RLM4
RL1
FX38
RLM3
RLM2
RLM1
F0103320

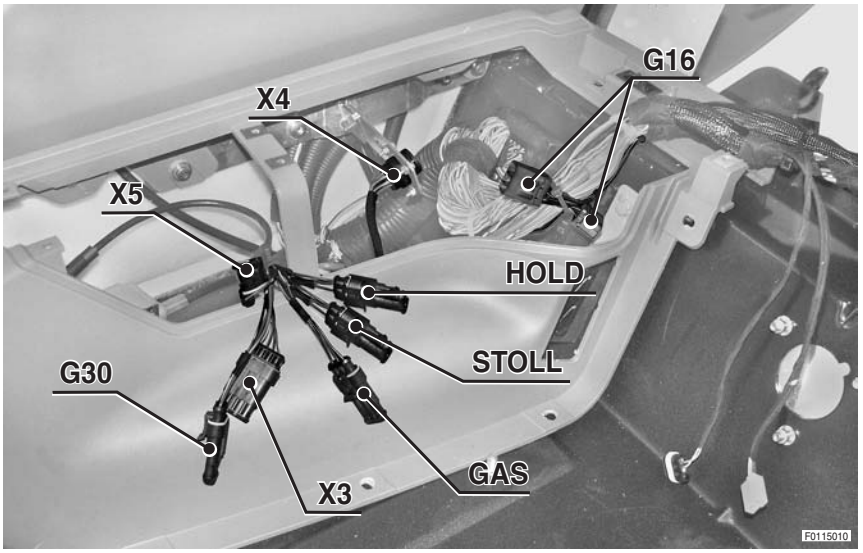
5


X10
X9
F0115000

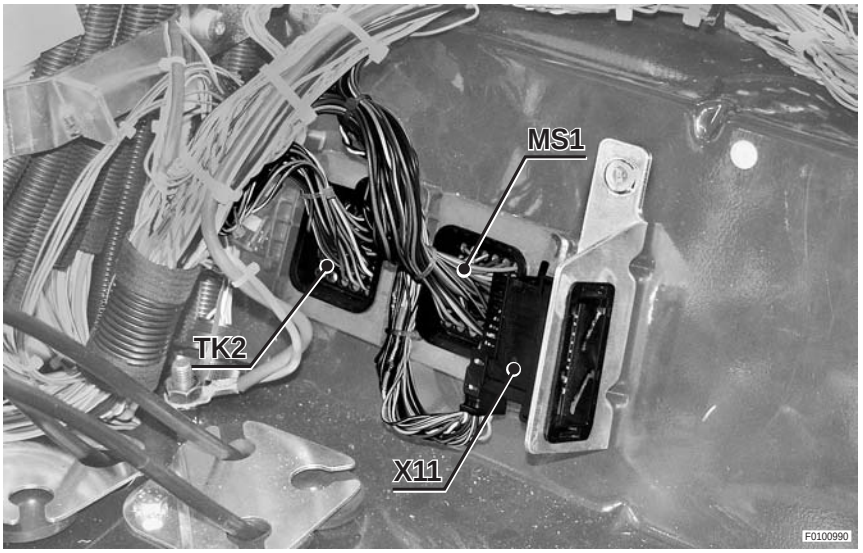
6


G3
G2
G4
G5
G1
G6
F0103310

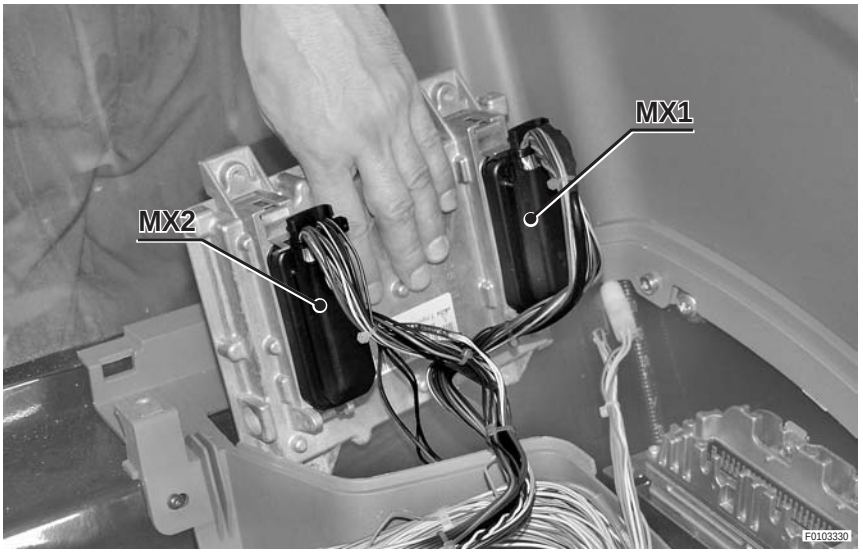
7


G16
X4
X5
HOLD
STOLL
G30
GAS
X3
F0115010

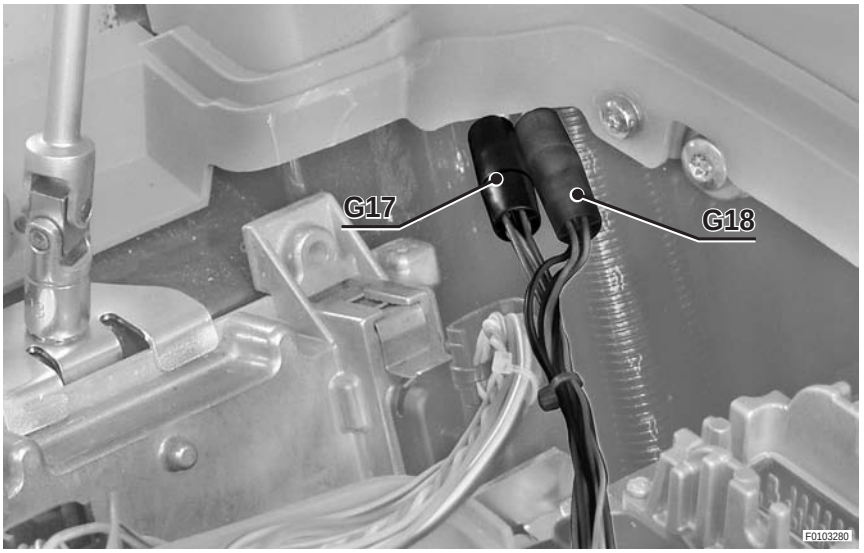
8


MS1
TK2
X11
F0100990

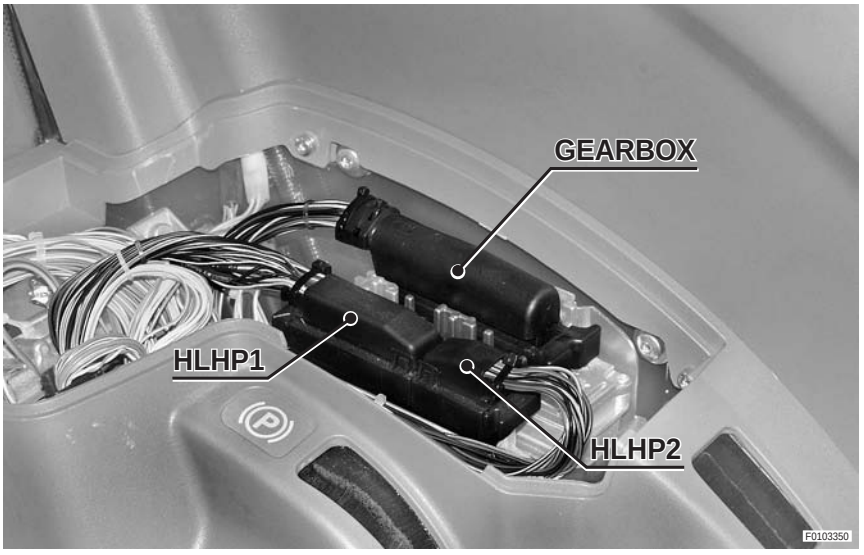
9


MX1
MX2
F0103330

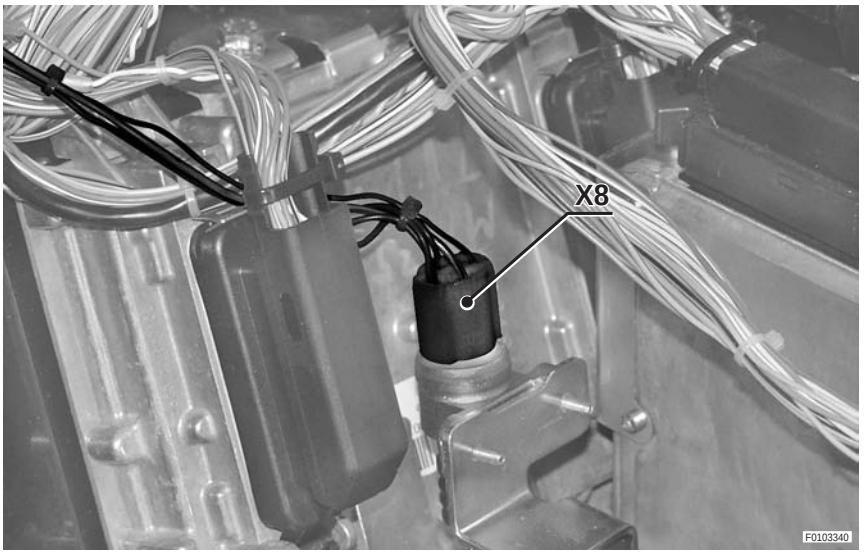
10



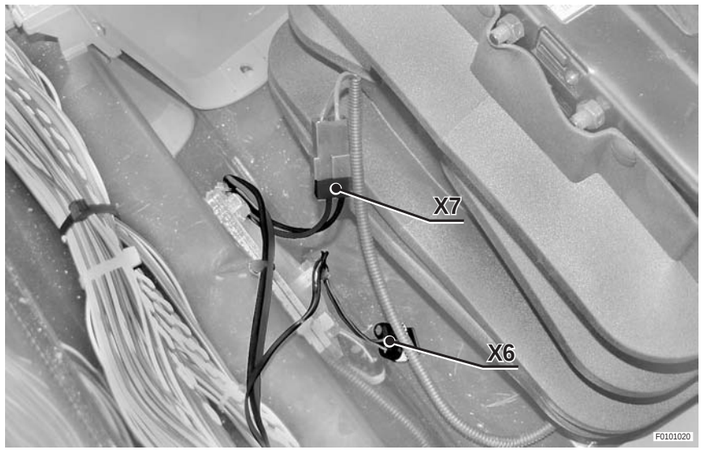
11



12

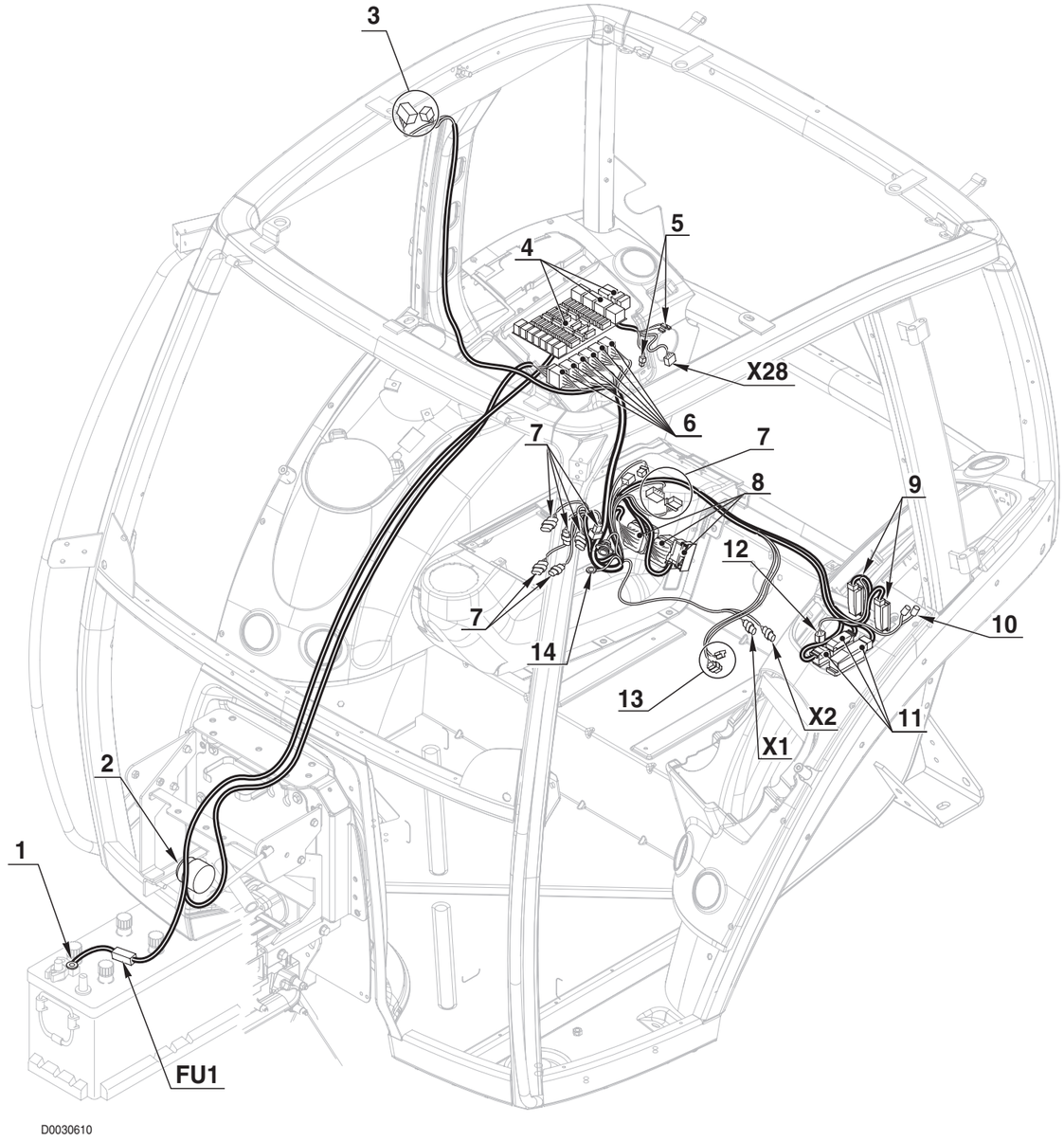


13



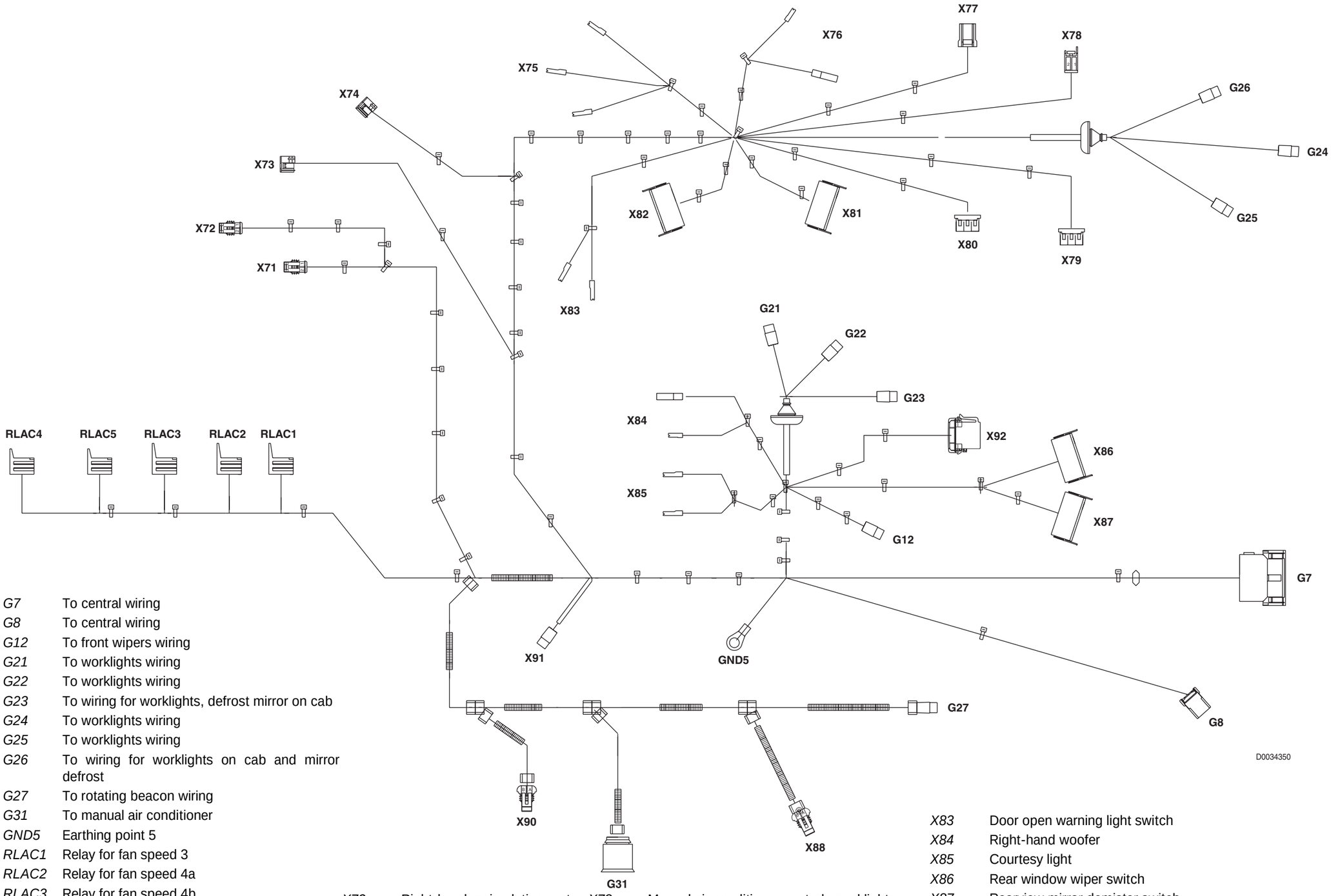
14

CENTRAL WIRING - ENGINE WIRING



PAGE INTENTIONALLY
LEFT BLANK

ROOF LINE WIRING (1/2)



G7 To central wiring
G8 To central wiring
G12 To front wipers wiring
G21 To worklights wiring
G22 To worklights wiring
G23 To wiring for worklights, defrost mirror on cab
G24 To worklights wiring
G25 To worklights wiring
G26 To wiring for worklights on cab and mirror defrost
G27 To rotating beacon wiring
G31 To manual air conditioner
GND5 Earthing point 5
RLAC1 Relay for fan speed 3
RLAC2 Relay for fan speed 4a
RLAC3 Relay for fan speed 4b
RLAC4 Relay for recirculation 1
RLAC5 Relay for recirculation 2
X71 Number plate light
X72 Number plate light

X73 Right-hand recirculation motor
X74 Left-hand recirculation motor
X75 Courtesy light
X76 Left-hand woofer
X77 Fan speed selector switch
X78 Manual air conditioner control panel lights
X79 Recirculation switch
X80 Fan speed selector switch
X81 Rotating beacon on/off switch
X82 Rear worklights switch

X83 Door open warning light switch
X84 Right-hand woofer
X85 Courtesy light
X86 Rear window wiper switch
X87 Rearview mirror demister switch
X88 Left-hand fan motor
X90 Right-hand fan motor
X91 Rear window wiper motor
X92 Radio

ROOF LINE WIRING (2/2)

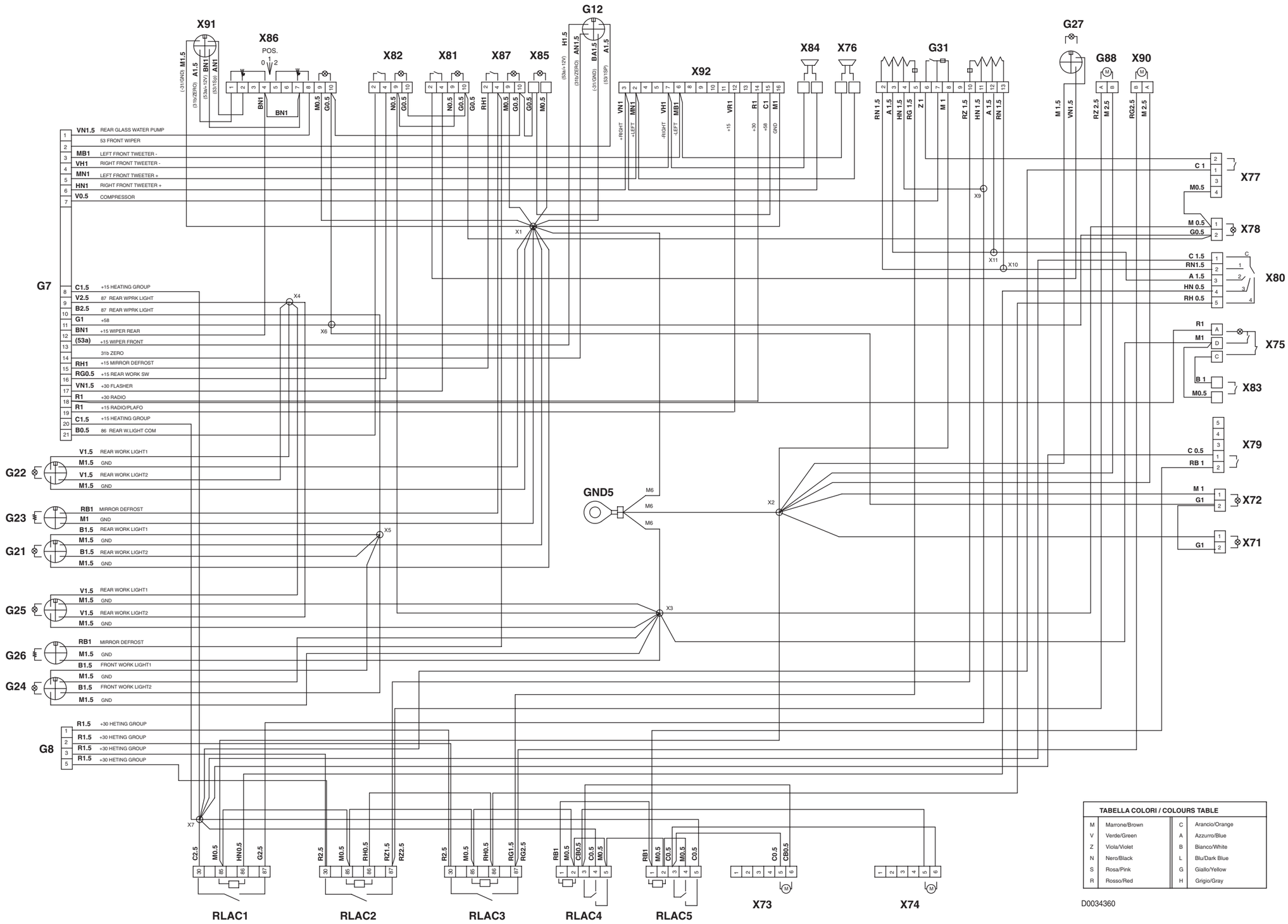
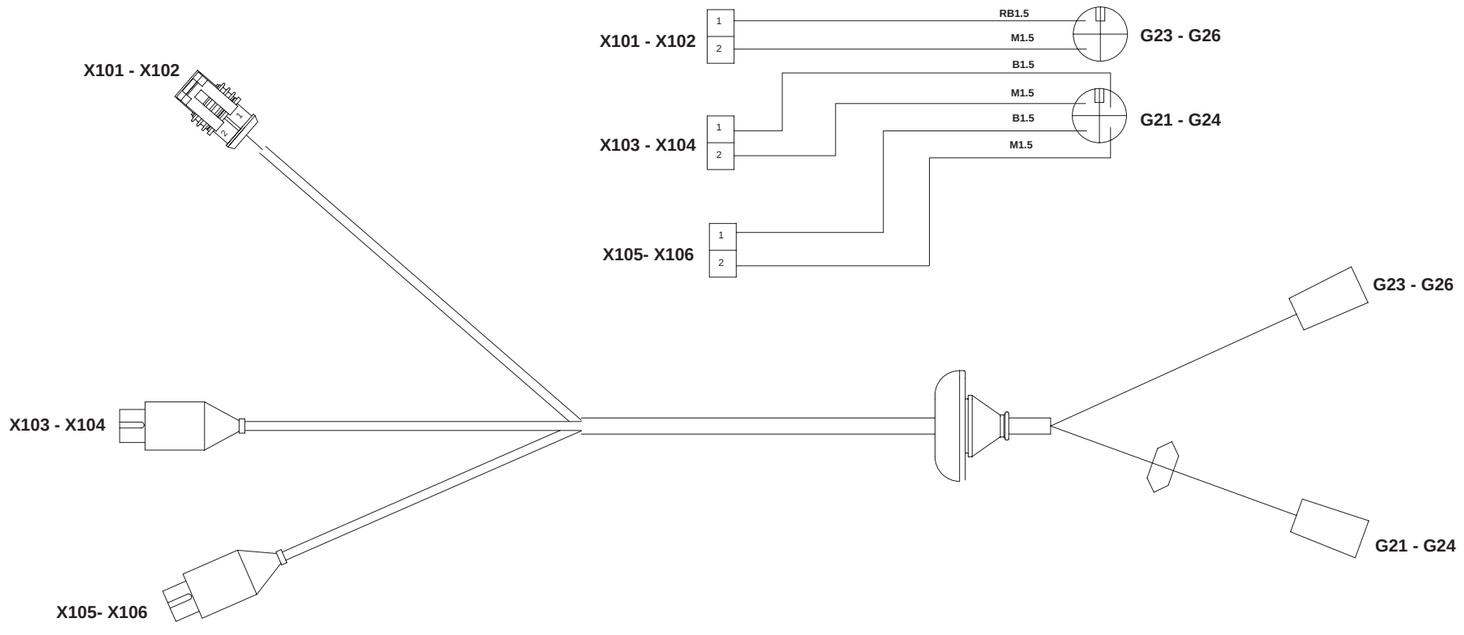


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0034360

WIRING FOR WORKLIGHTS, DEFROST MIRROR ON CAB (HL VERSION)



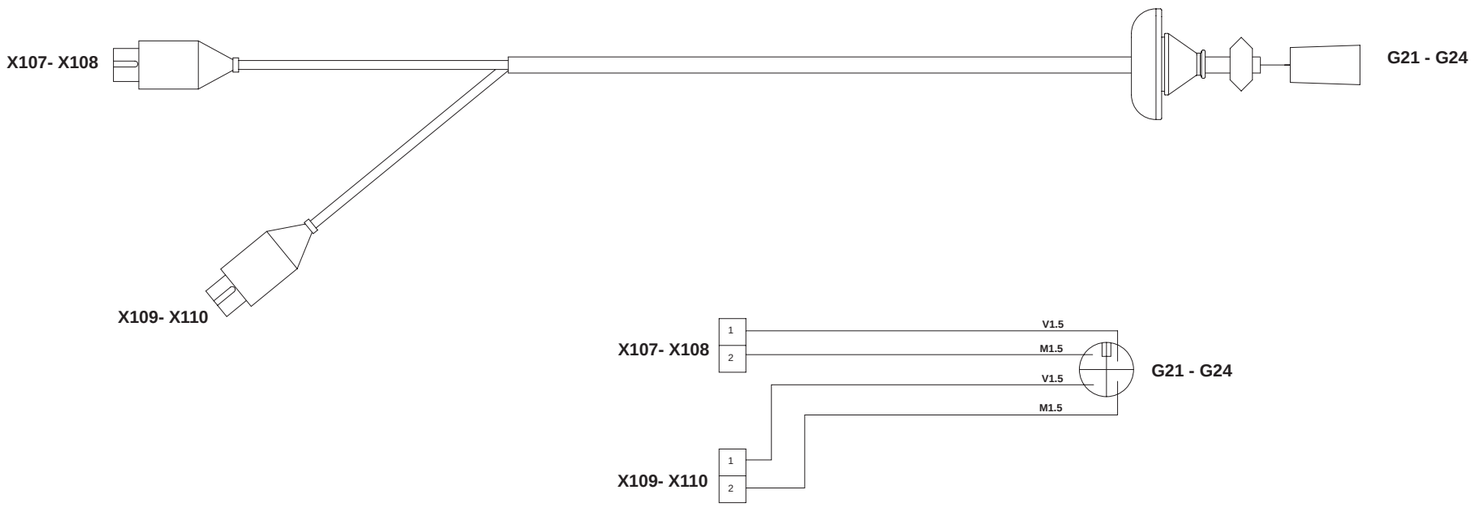


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029930

G21 To roof line wiring
G22 To roof line wiring
G23 To roof line wiring
G24 To roof line wiring
G25 To roof line wiring
G26 To roof line wiring
X101 Right-hand rearview mirror with electric demisting
X102 Left-hand rearview mirror with electric demisting
X103 Right-hand front worklight on cab
X104 Left-hand front worklight on cab
X105 Right-hand front worklight on cab
X106 Left-hand front worklight on cab
X107 Right-hand rear worklight on cab
X108 Left-hand rear worklight on cab
X109 Right-hand rear worklight on cab
X110 Left-hand rear worklight on cab

WIRING FOR WORKLIGHTS ON CAB (STANDARD VERSION)

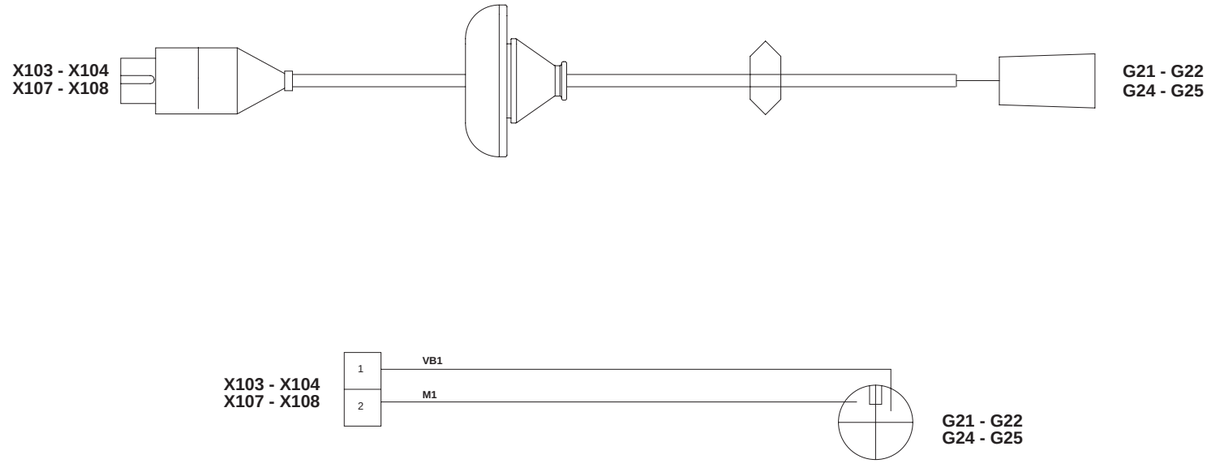


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029960

G21	To roof line wiring
G22	To roof line wiring
G24	To roof line wiring
G25	To roof line wiring
X103	Right-hand front worklight on cab
X104	Left-hand front worklight on cab
X107	Right-hand rear worklight on cab
X108	Left-hand rear worklight on cab

WINDSCREEN WIPER WIRING

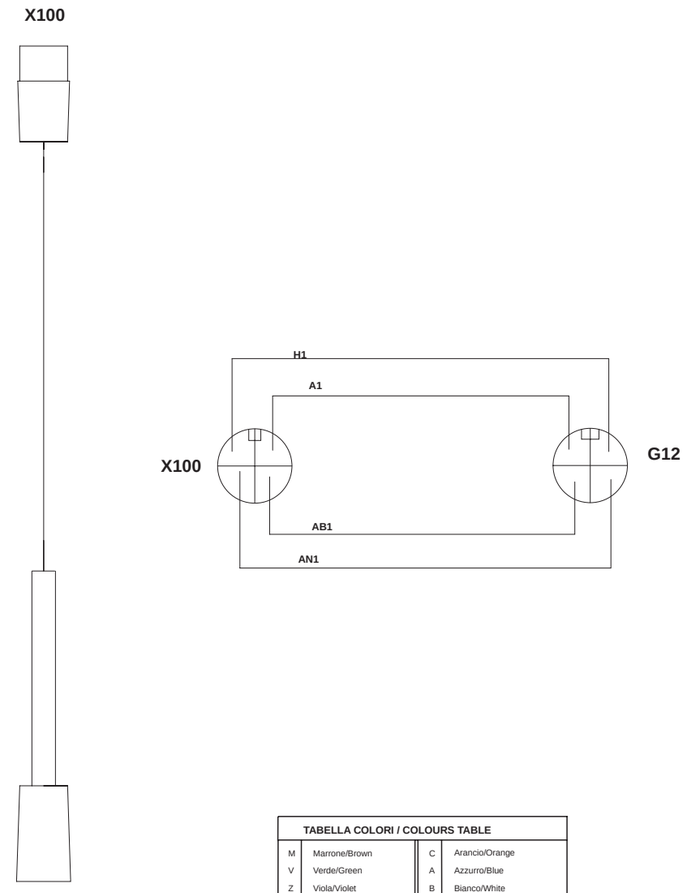


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029940

G12 To roof line wiring
X100 Windscreen wiper motor

ROTATING BEACON WIRING

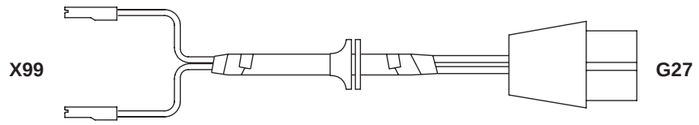


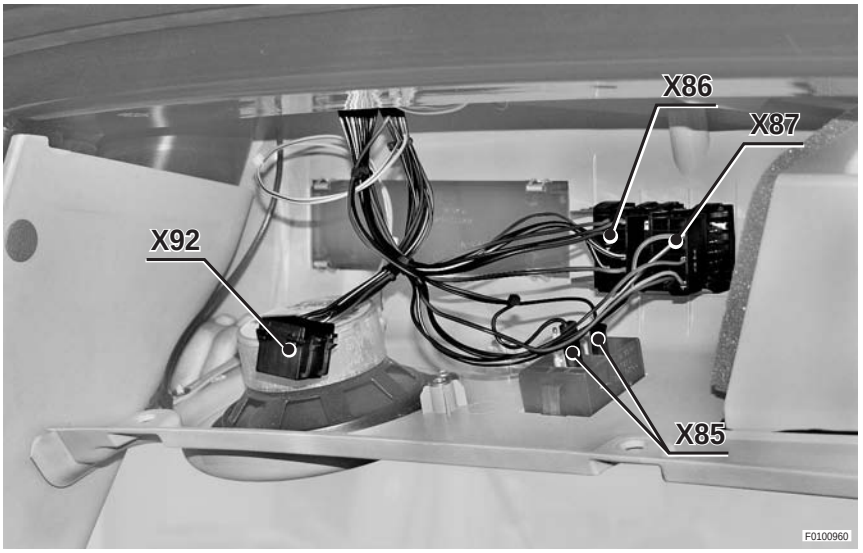
TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030060

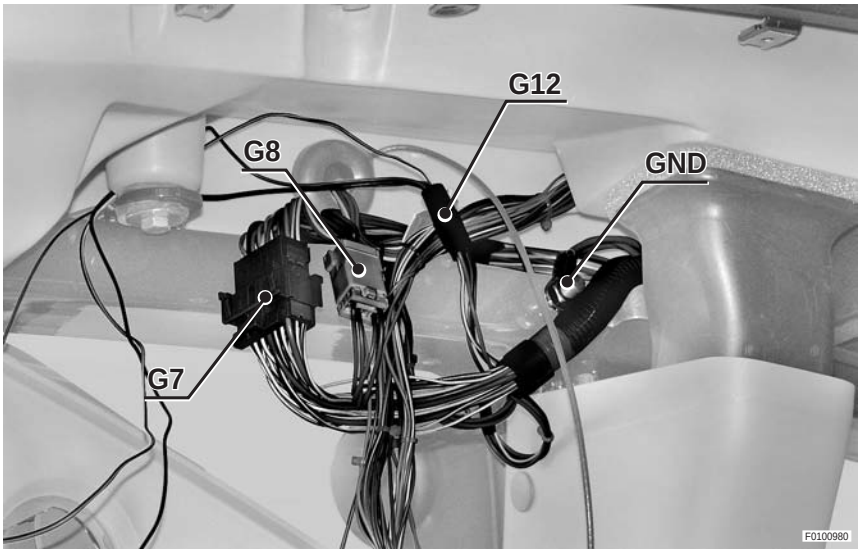
G27 To roof line wiring
X99 Rotating light

CONNECTOR POSITIONS

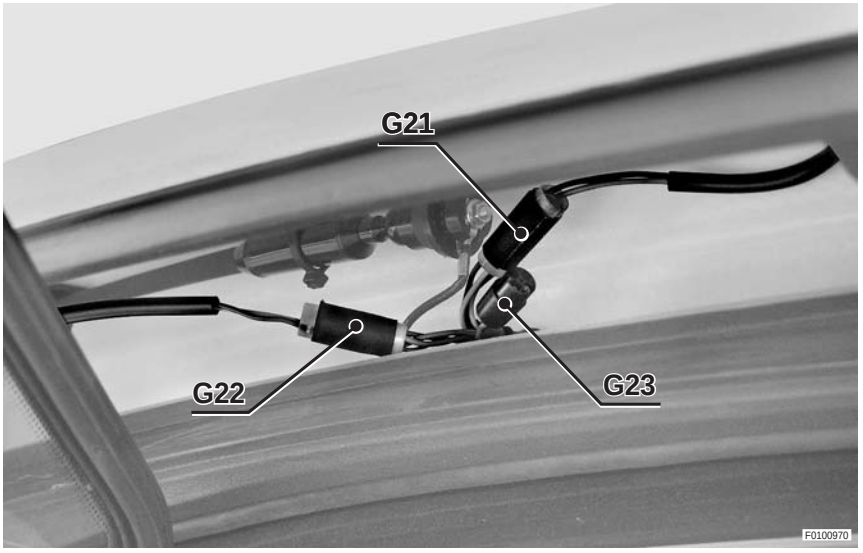
1



2



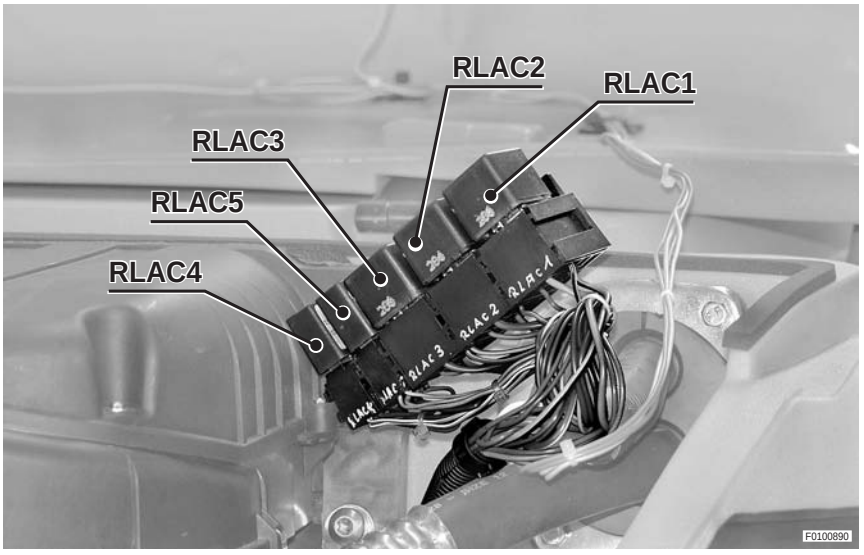
3



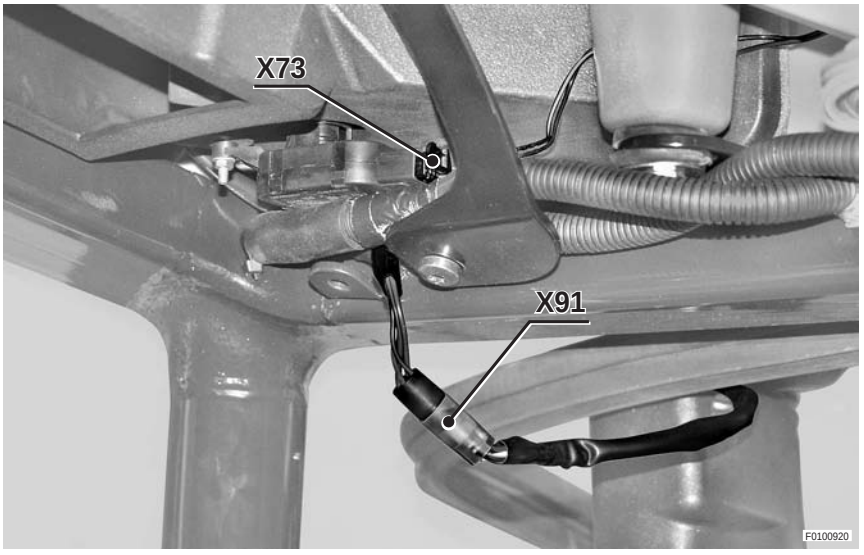
4


X84
F0100940

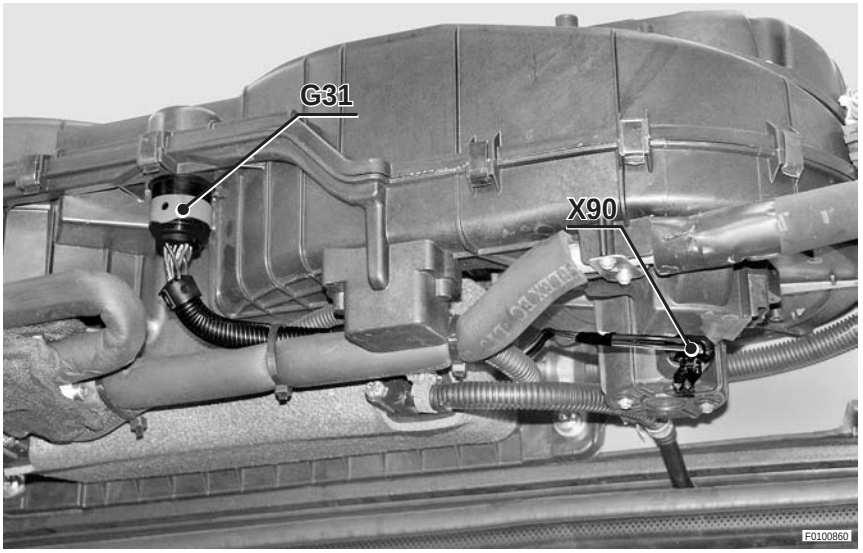
5


RLAC2
RLAC1
RLAC3
RLAC5
RLAC4
F0100890

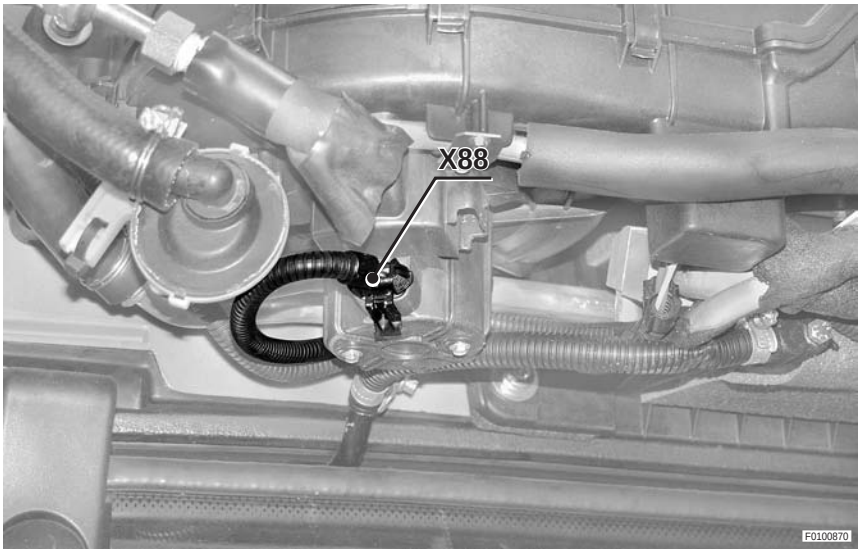
6


X73
X91
F0100920

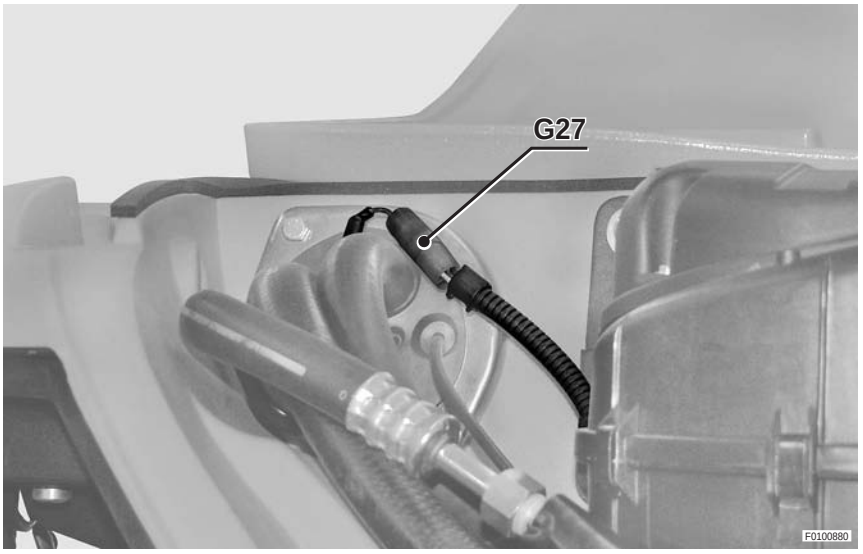
7



8

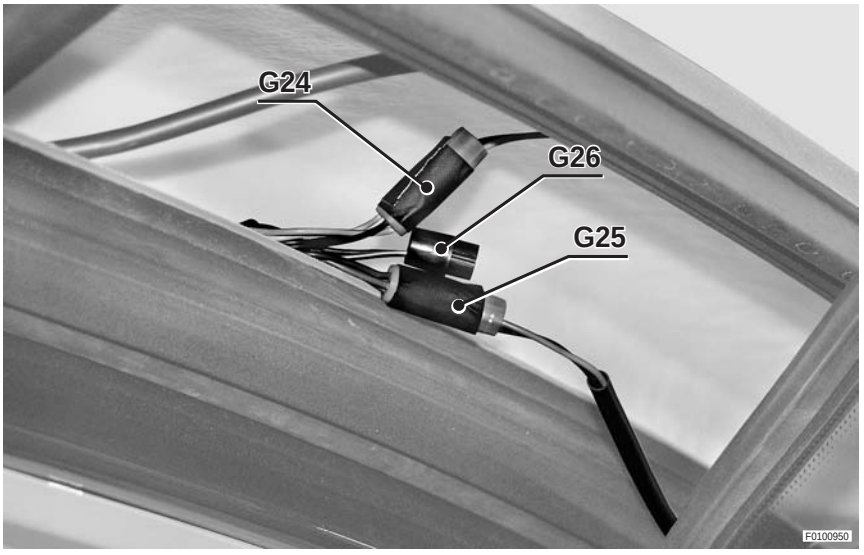


9

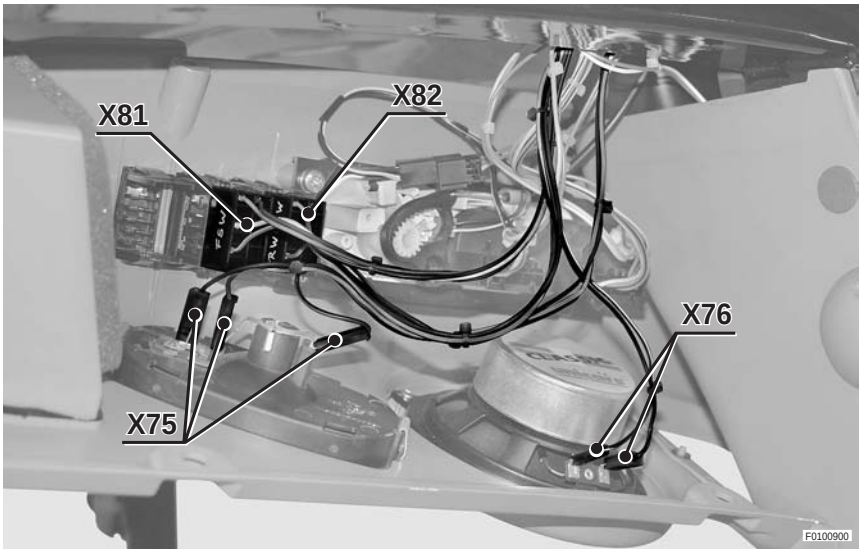


10

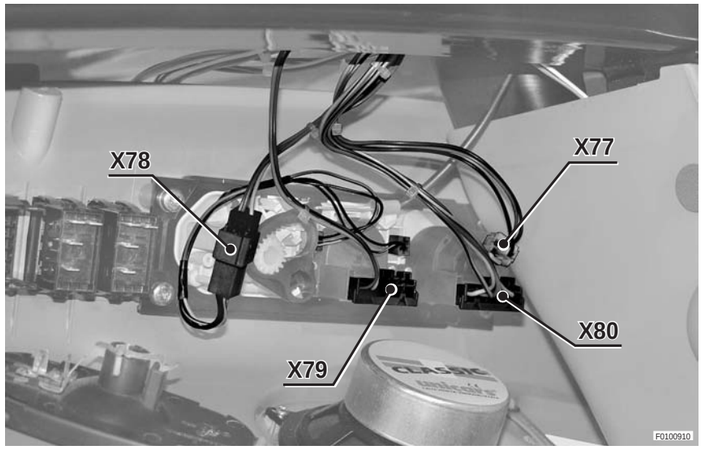
11



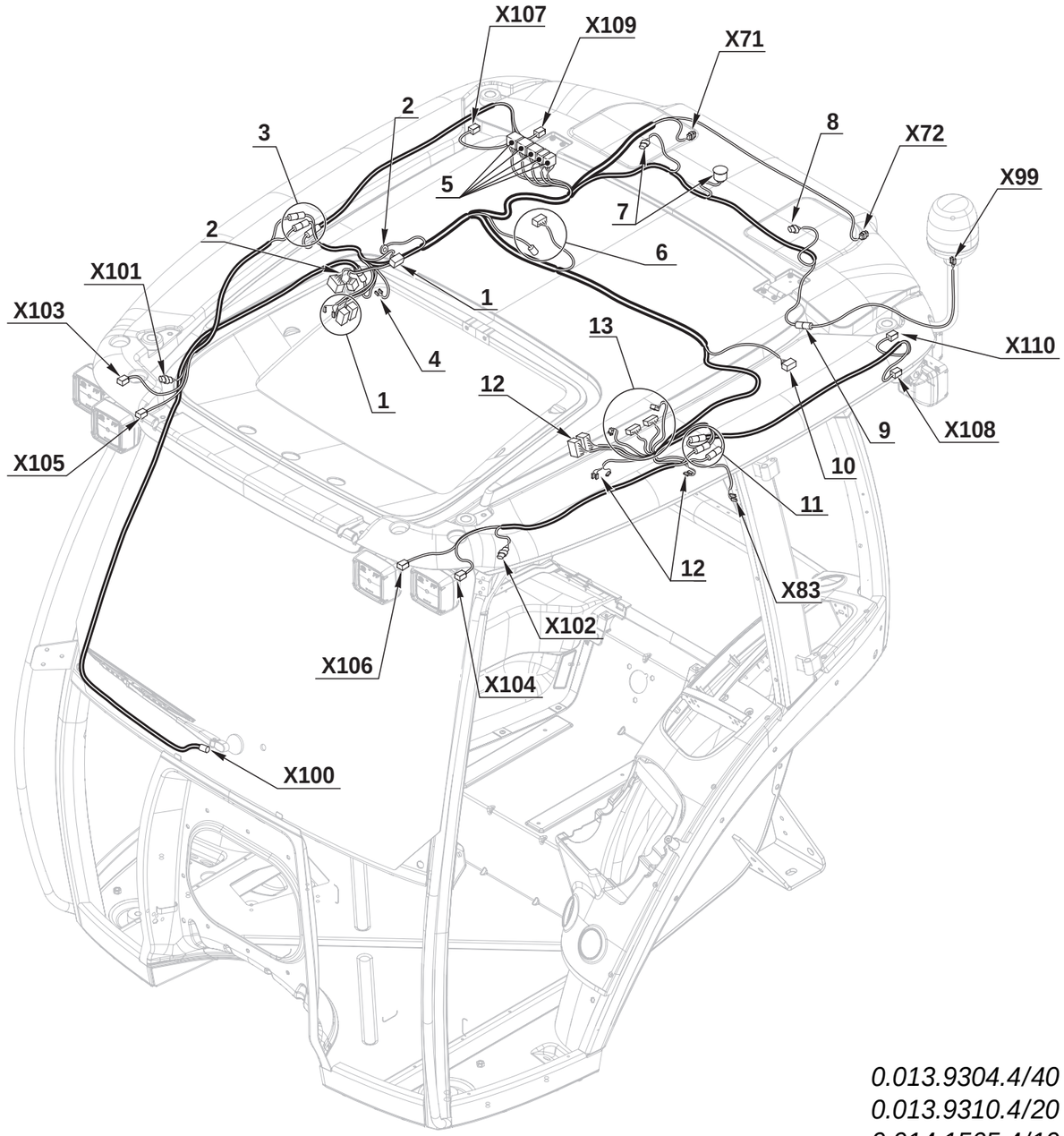
12



13



ROOF LINE WIRING - WORKLIGHTS WIRING, MIRROR DEFROST ON CAB - WIRING FOR WORKLIGHTS ON CAB - WINSCREEN WIPER WIRING - ROTARY BEACON WIRING



0.013.9304.4/40
0.013.9310.4/20
0.014.1565.4/10
0.014.1567.4/10
0.011.3824.4

PAGE INTENTIONALLY
LEFT BLANK

Der zeitliche Unterschied zwischen der Aktualisierung der Druckschriften und der Durchführung technischer Veränderungen (die ständig vorgenommen werden, um immer hochwertigere Erzeugnisse auf den Markt zu bringen) erfordern aus Gründen der Korrektheit des Hinweises, dass die in dieser Ausgabe enthaltenen Daten jederzeit geändert werden können und deshalb unverbindlich sind.

Le temps qui s'écoule entre la mise à jour en impression et les modifications techniques (ces dernières changeant continuellement afin d'offrir aux utilisateurs des produits toujours plus qualifiés) nous oblige a vous signaler que les données de la présente publication pourraient être susceptibles de variations. Elles sont données sans engagement de notre part.

Because of the possible time lag between the introduction of technical modifications (an on-going process the aim of which is to offer products which are being continually improved) and the latest update of the manual, we must point out, for the sake of correctness,that the data contained in this edition are liable to change at any time and are therefore not binding.

La differenza tra i tempi di aggiornamento in stampa e i tempi delle modifiche tecniche (variando queste ultime continuamente, ciò al fine di offrire prodotti sempre più qualificati) impongono di dichiarare, per correttezza, che i dati contenuti nella presente edizione sono suscettibili di variazione in qualsiasi momento e che quindi non sono impegnativi.

La diferencia entre los tiempos necesarios para poner al dia la impresiòn y los tiempos de las modificaciones tècnicas (las que se verifican continuamente, con el objeto de ofrecer productos cada vez màs calificados) nos imponen declarar, por corrección, que los datos contenidos en la presente ediciòn estàn sujetos a variaciones en cualquier momento y que portanto no son obligativos.

A diferença entre os tempos necessãrios para actualizar a impressão e os tempos das modificacões técnicas (que se verificam continuamente, a fim de oferecer um produto cada vez mais qualificado), obrigam-nos a declarar, que os dados contidos neste manuel são susceptiveis de variacão em qualquer momento e que portanto não são vinculatórios.

NOTES

07 - 2006
By Personal computing

cod. 307.1132.3.6
Technical Publications Dep.

Company with Quality System
Certified in compliance with ISO 9001:2000

SAME DEUTZ-FAHR DEUTSCHLAND GmbH

07-2006

307. 1132. 3. 6