

WORKSHOP MANUAL

AGROTRON K 90

AGROTRON K 100

AGROTRON K 110

AGROTRON K 120



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.



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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 designed for a specific 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 severe 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 copious amounts 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 copious amounts 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, on the tractor, 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; these bolts should only be removed when the component has been securely attached to a hoist or when supporting blocks have been put in position.
- 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 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 tractor components, first check that they are not deformed 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 prevent the ingress of dirt and dust.

2. PRECAUTIONS FOR REFITTING OPERATIONS

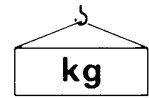
- Tighten nuts and bolts to the specified tightening torques.
- When refitting flexible pipes and wires, take care not to twist or tangle them.
- Always fit new seals, O-rings, cotter pins and safety stop rings on reassembly; make sure that the ends of the cotter pins are separated and bent back so that the pin cannot be withdrawn from the hole.
- Ensure that circlips are correctly installed in their seatings.
- Always fit new seals, O-rings, cotter pins and safety stop rings; ensure that cotter pins are bent over so that they cannot work loose.


- 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; only apply the force necessary to clip the two halves together.
- Bolt down flanged fittings evenly, tightening the bolts 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.



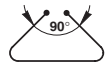



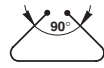
LIFTING INSTRUCTIONS



! 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 

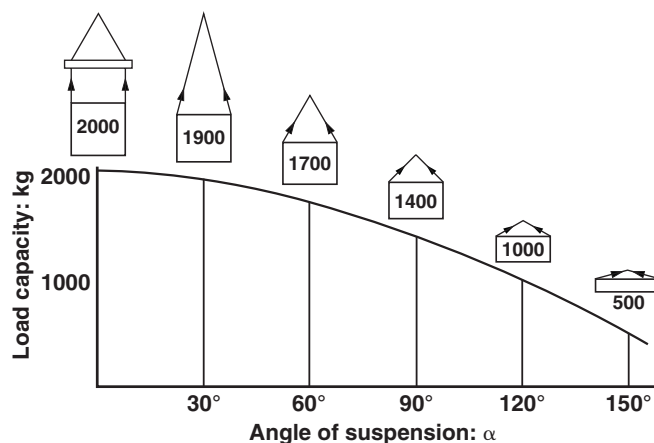
WIRE ROPES - SLINGS

- 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 branches 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.


ATTENTION!

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 ; 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.


E.g.: **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)  : Indicates the existence of special information regarding refitting of the component in question.


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

E.g.: **REFITTING UNIT**: Operation heading

- Refitting is the reverse of removal

 : Technique to be applied during refitting

★: Technique or important information regarding the refitting operation


•  ℓ: Filling with oil or liquid with quantity

2. During removal and refitting operations, in addition to the general safety rules, you must also apply 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  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.

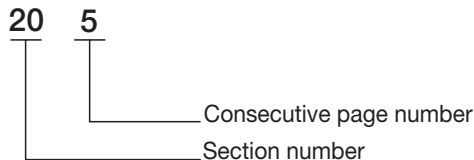
HOW TO USE AND UPDATE THE MANUAL

1. UPDATING THE MANUAL

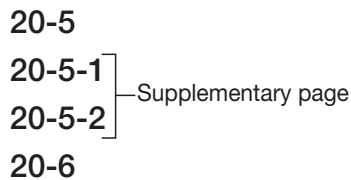
All additions, corrections or amendments to the manual will be sent to the Authorised Service Centres. Before starting any repair or overhaul operations, check that you have the most recent updates as these may contain supplementary data not present in previous issues.

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:

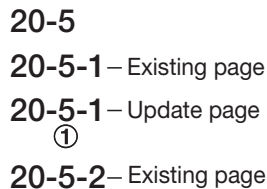


2 - **Supplementary pages:** indicated with a hyphen (-) and consecutive number after the page number. Example:



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:



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.

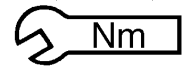
3. SYMBOLS USED IN THE MANUAL

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.

Symbol	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.

Symbol	Meaning	Notes
	Coating	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 torques	Parts requiring special tightening torque during refitting or assembly.

STANDARD TIGHTENING TORQUES



1. NUTS AND BOLTS

! 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%.

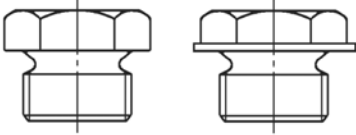
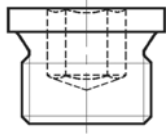
BOLT SIZE		BOLT CLASS					
		8.8		10.9		12.9	
		Nm	lb.ft.	Nm	lb.ft.	Nm	lb.ft.
COARSE THREAD	M6x1	8,0–8,8	5.9–6.5	11,8–13,0	8.7–9.6	13,8–15,2	10.2–11.2
	M8x1.25	19,4–21,4	14.3–15.8	28,5–31,5	21.0–23.2	33,3–36,9	24.5–27.2
	M10x1.5	38,4–42,4	28.3–31.2	56,4–62,4	41.6–46.0	67,4–74,4	49.7–54.8
	M12x1.75	66,5–73,5	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

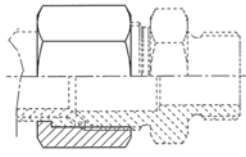
★ The tightening torques indicated below refer to fittings assembled on any material.

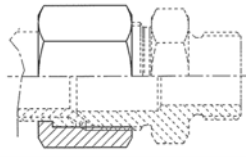
	Thread size	Straight end fittings		"T" end fittings		"L" end fittings		90° end fittings	
		Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%	Wrench	Torque Nm ±10%
METRIC THREADS	M10x1.25	17	14	14	14	14	14	14	14
		19	14	17	14	17	14		
	M12x1.25	19	30	17	30	17	30	17	30
	M14x1.5	19	40	19	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 EYE ATTACHMENT

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

Thread size	Unions for one-way fittings		Unions for three-way fittings		Unions for four-way fittings	
	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 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.
POLYURETHANE (for faces and flanges)	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.

THREADLOCKERS, ADHESIVES, SEALANTS AND LUBRICANTS

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.
POLYURETHANE SEALANTS	Silastic 738 (Dow Corning) Colour: milky white	One-part silicone adhesive/sealant, 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, use 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 x 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	
US gall. x 3.785	= litres
pint x 0.568	
quart x 1.137	
US.gpm x 3.785	
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/ℓ
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	= Eng.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
ℓ/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/ℓ x 10.00	= lb./Imp.gal.
kg/ℓ 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

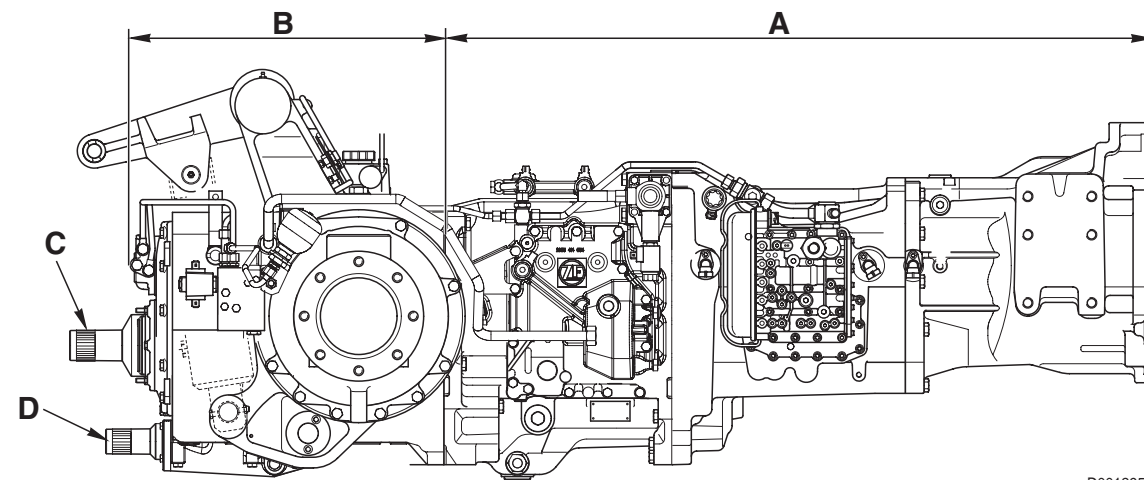
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1. TRANSMISSION

INTRODUCTION

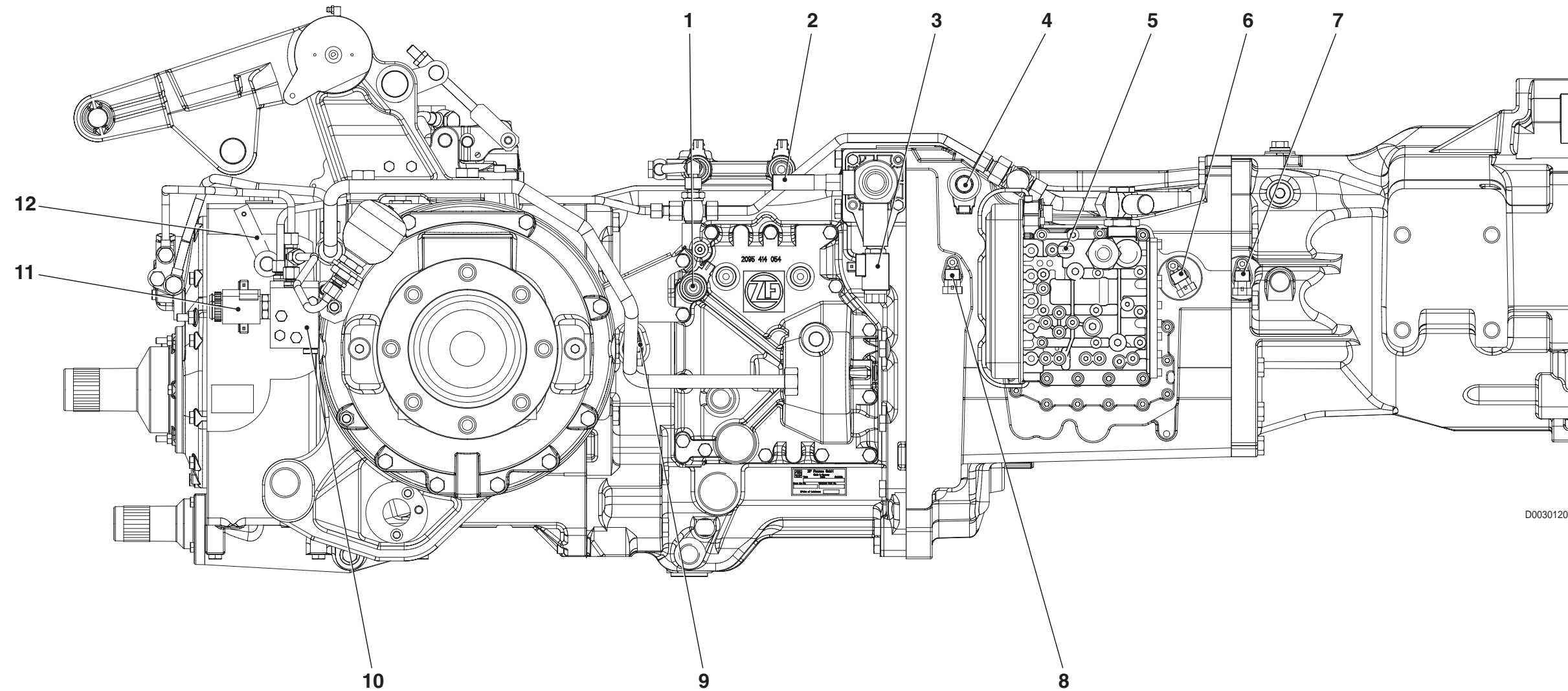
- The tractors in this series are equipped with a POWER SHUTTLE transmission. Shifting between forward and reverse is managed entirely by the electronic control unit without the operator having to use the clutch pedal. This is made possible by a proportional solenoid valve that controls the main clutch directly.
- The transmission can be divided into the following sections:
 - A.** Power Shuttle transmission
 - B.** Rear axle
 - C.** Rear PTO
 - D.** Syncro PTO



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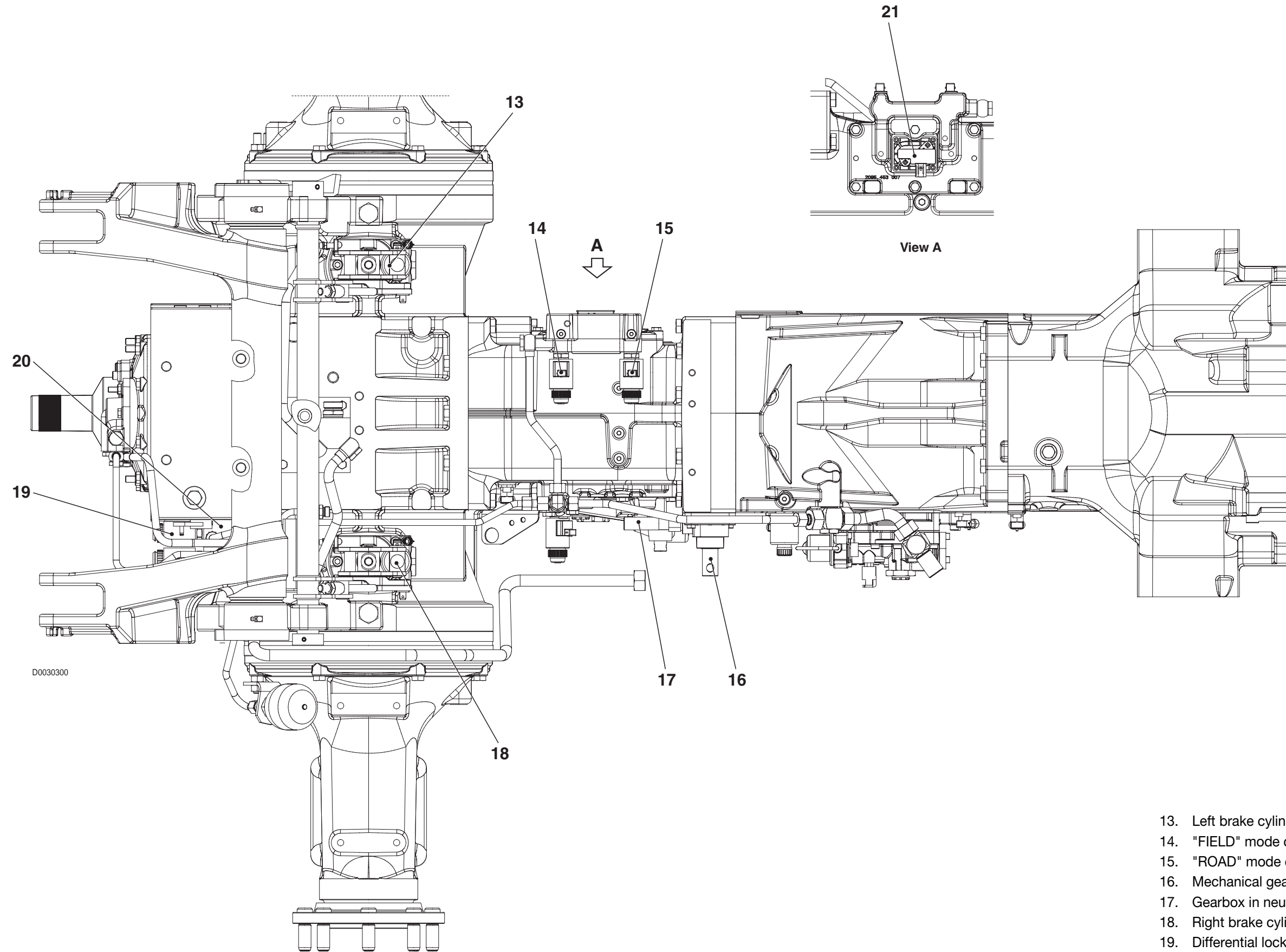
1.1 POWER SHUTTLE TRANSMISSION

1.1.1 MAIN COMPONENTS

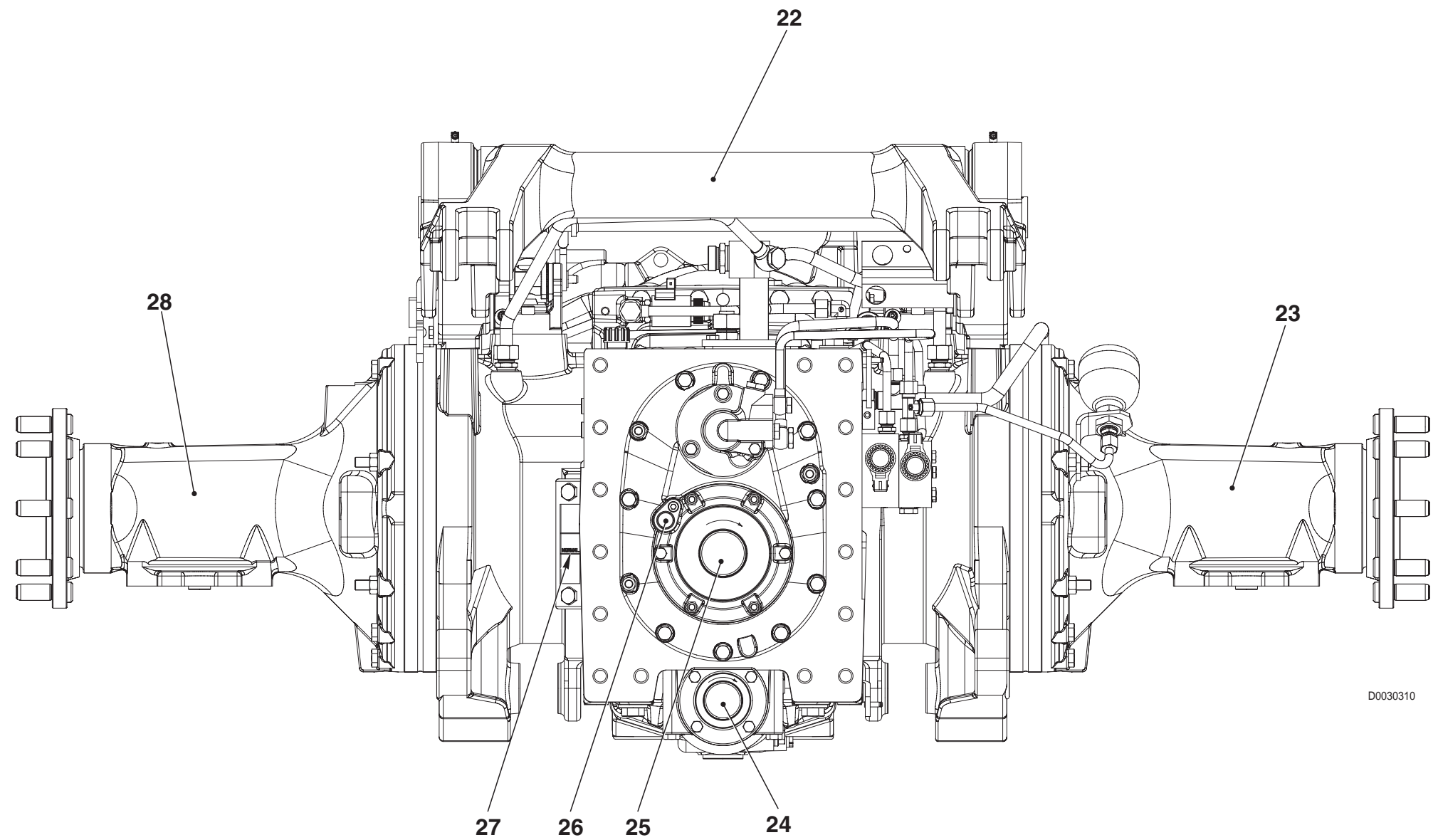


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- | | | |
|---|---|--|
| 1. Four-wheel drive control solenoid valve | 5. Transmission oil low pressure sensor | 9. Odometer speed sensor (nAb) |
| 2. Gearbox in neutral sensor | 6. Engine speed sensor (nLse) | 10. Rear PTO control valve |
| 3. Gearbox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



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



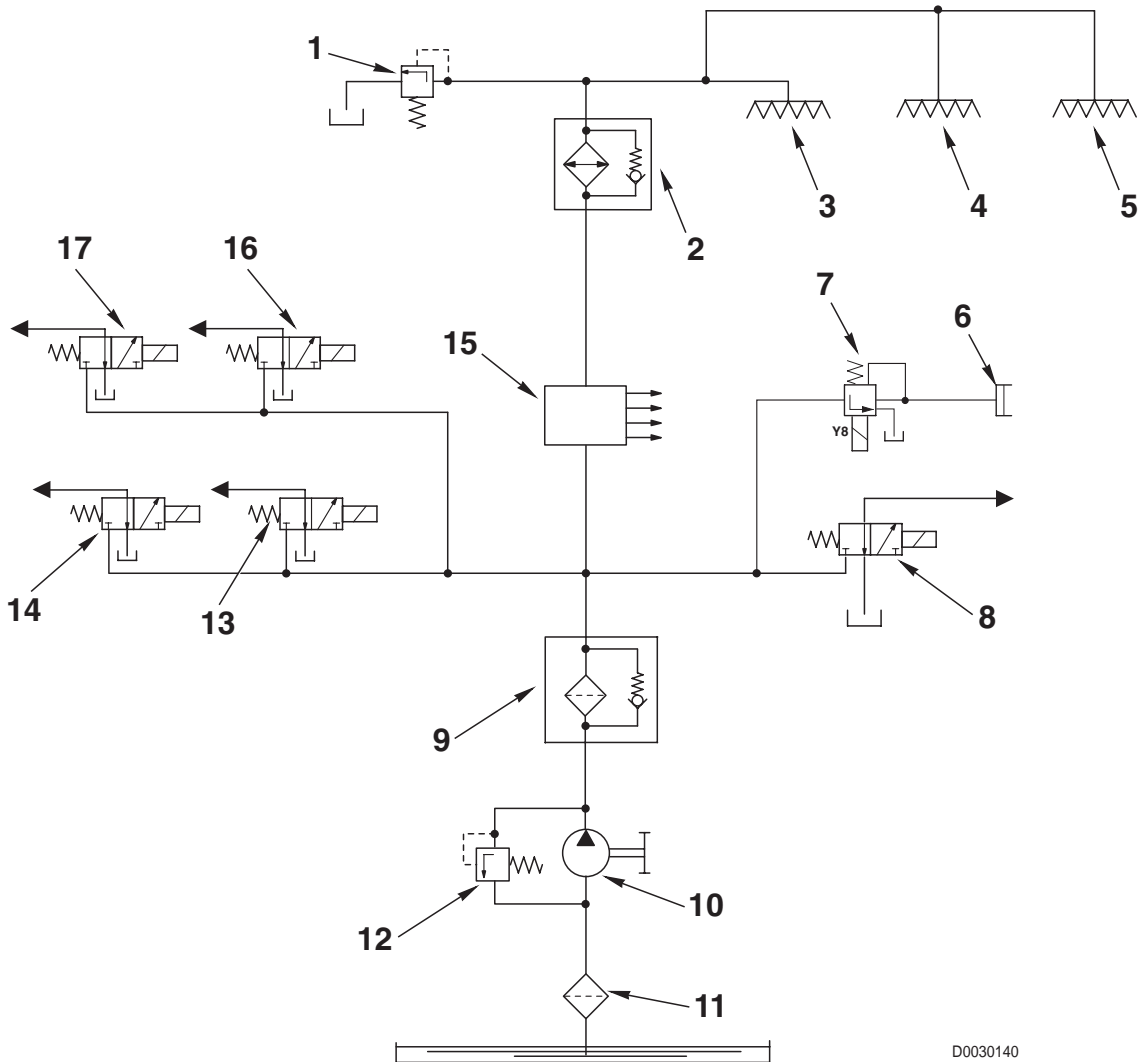
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- 22. Lift shaft
- 23. RH trumpet housing
- 24. Rear PTO
- 25. Synchro PTO
- 26. Rear PTO speed sensor
- 27. Gearbox oil level indicator
- 28. LH trumpet housing

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



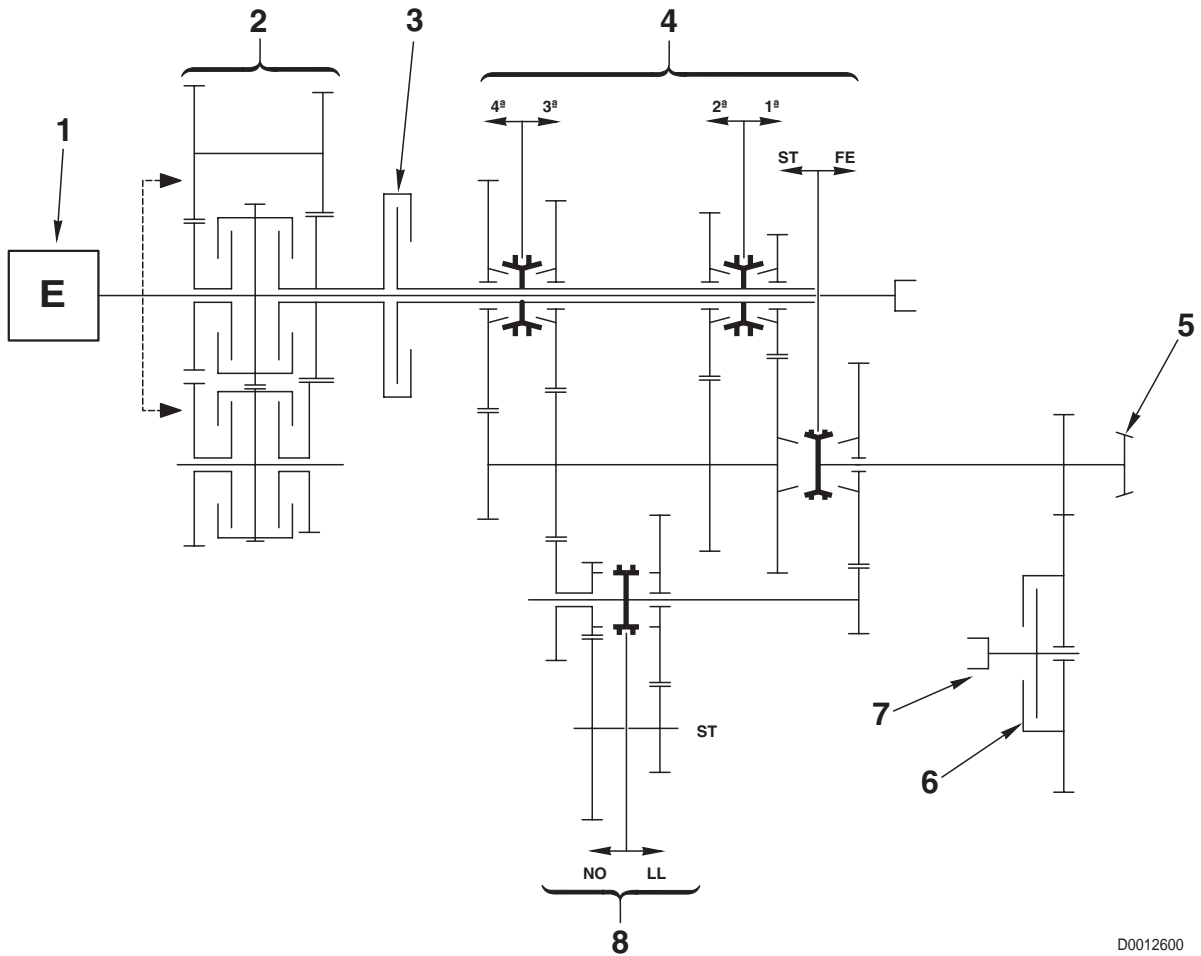
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- | | | |
|---|---|---|
| 1 - Lubrication circuit pressure relief valve | 8 - Four-wheel drive control solenoid valve | 14 - Differential lock control solenoid valve |
| 2 - Cooler | 9 - Pressurised filter | 15 - gearbox control valve |
| 3 - Gearbox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

1.1.3 GEARBOX

DESCRIPTION

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

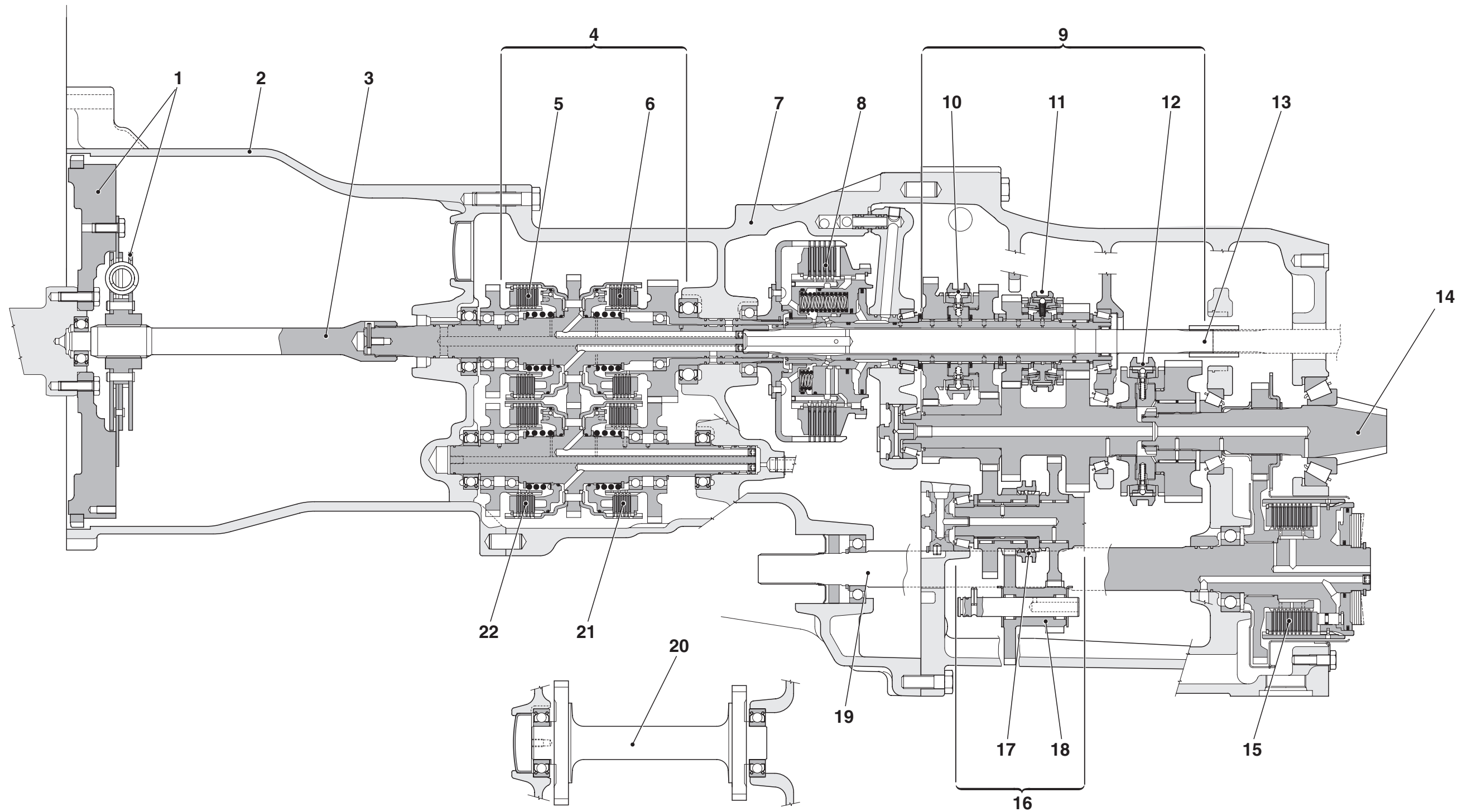


D0012600

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
8. Creeper unit

GEARBOX COMPONENTS



- 1. Damper flywheel
- 2. Housing
- 3. Input shaft
- 4. Hydraulically-controlled gearbox
- 5. Clutch "A"
- 6. Clutch "B"
- 7. Clutch housing
- 8. Main clutch

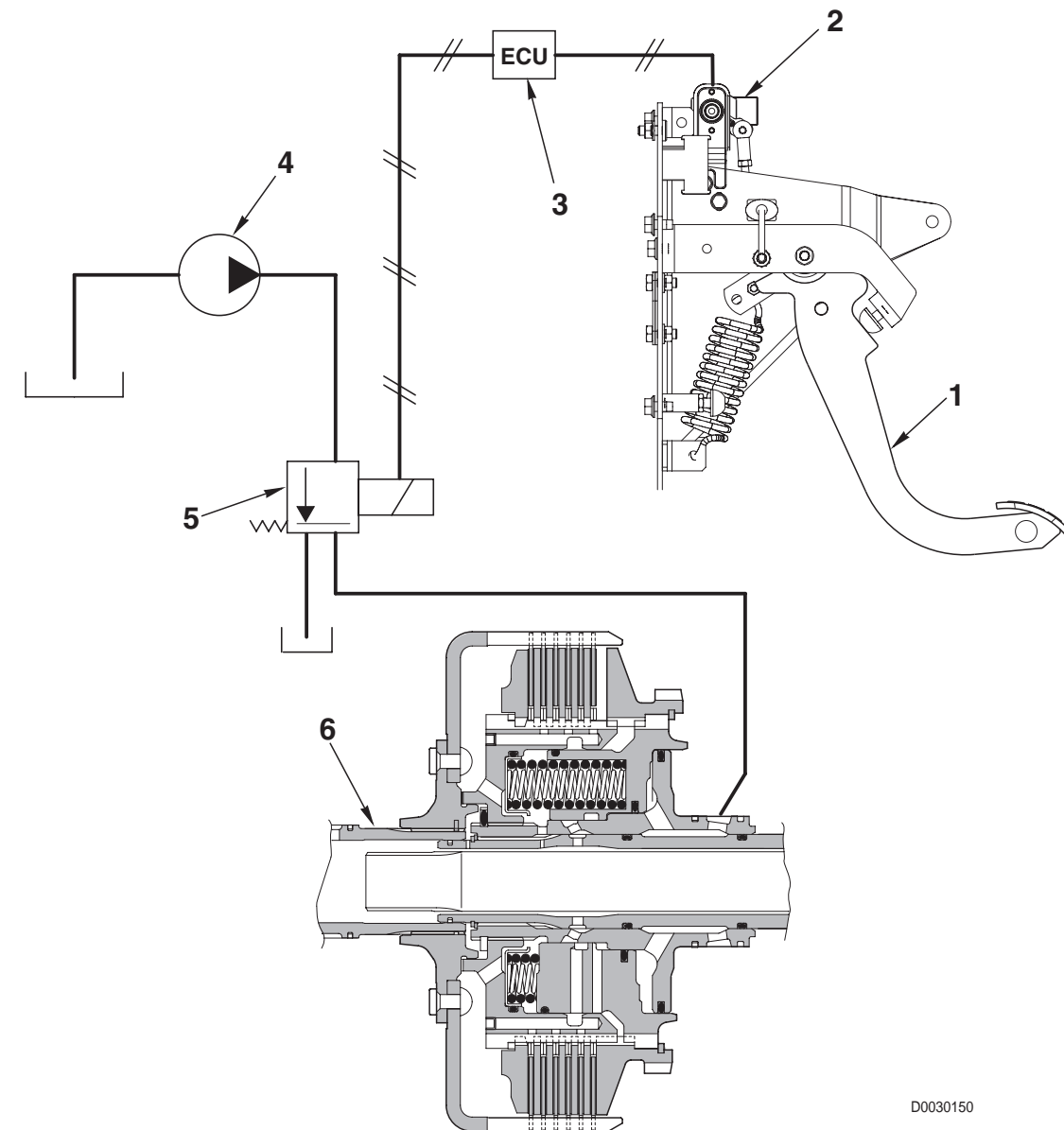
- 9. Mechanical gearbox
- 10. 3rd and 4th gear synchroniser
- 11. 1st and 2nd speed synchroniser
- 12. Field/road synchroniser
- 13. Rear PTO drive shaft
- 14. Pinion
- 15. 4WD control clutch
- 16. Creeper unit

- 17. Creeper unit synchroniser
- 18. Creeper unit driven shaft
- 19. Four-wheel drive output shaft
- 20. Reverse gear driven shaft
- 21. Clutch "C"
- 22. Clutch "D"

D0012661

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.



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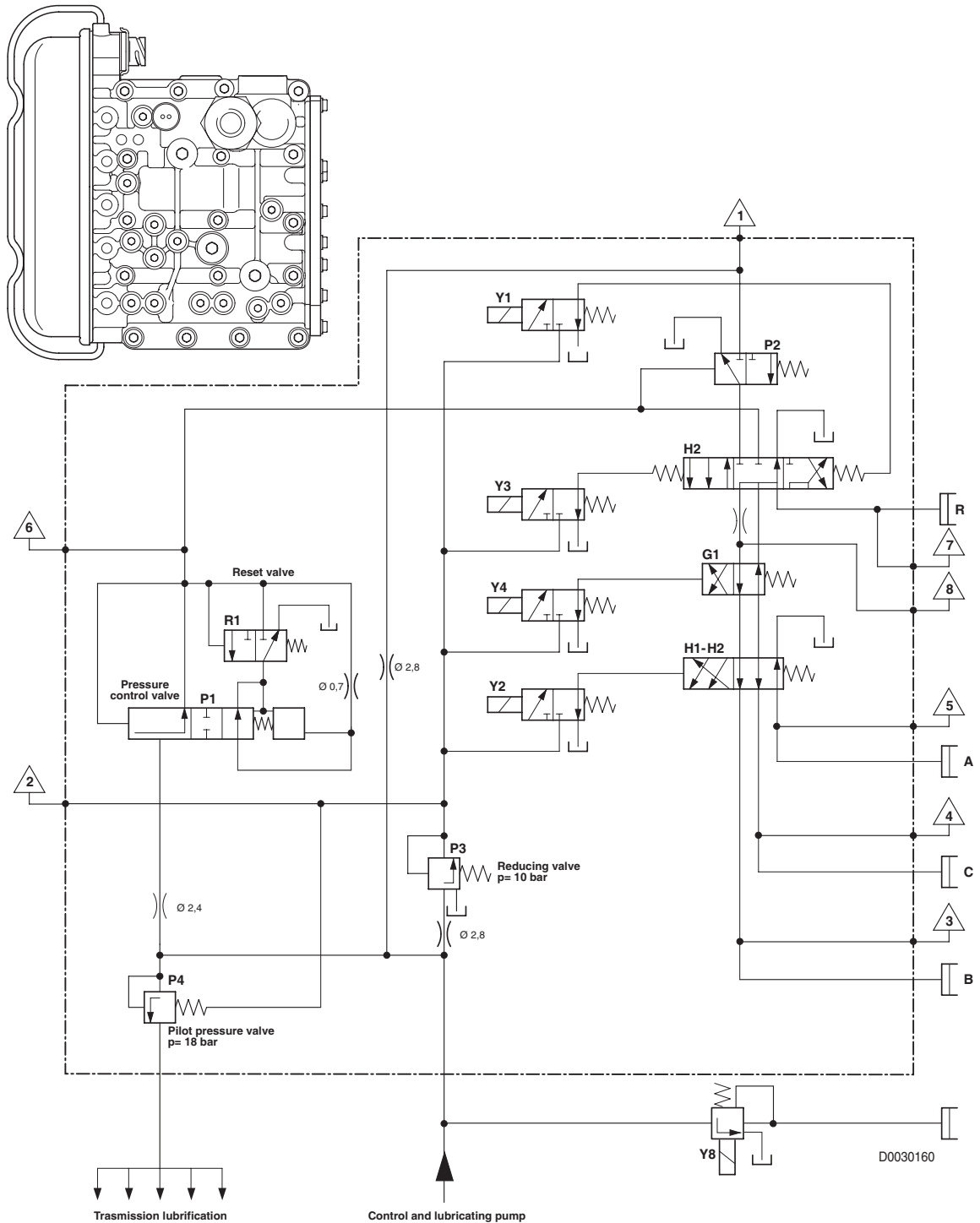
1. Clutch pedal
2. Clutch pedal position sensor
3. Electronic transmission control unit
4. Transmission gear pump
5. Proportional solenoid valve for clutch control
6. Main clutch

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.

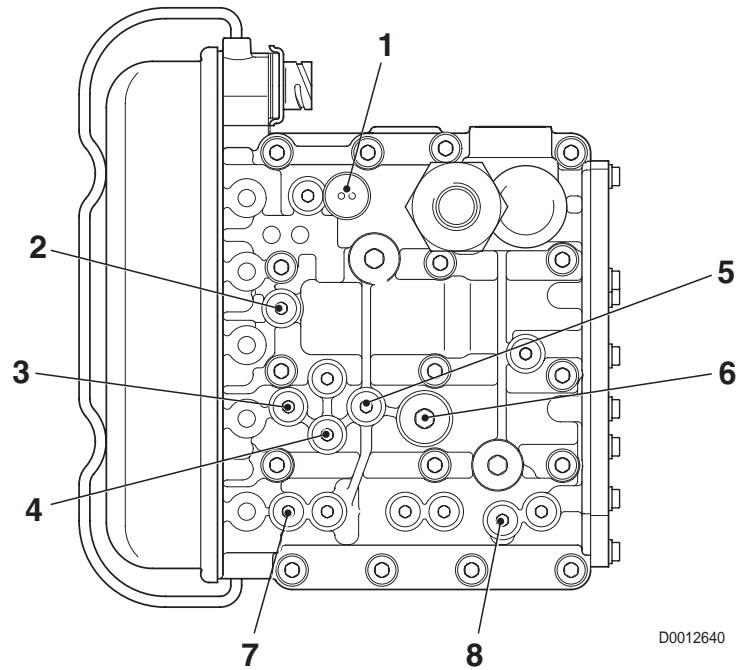
The hydraulic gearbox control valve controls the engagement of the **H**, **M** and **L** gears and the direction of travel.

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



A. GEARBOX CONTROL VALVE

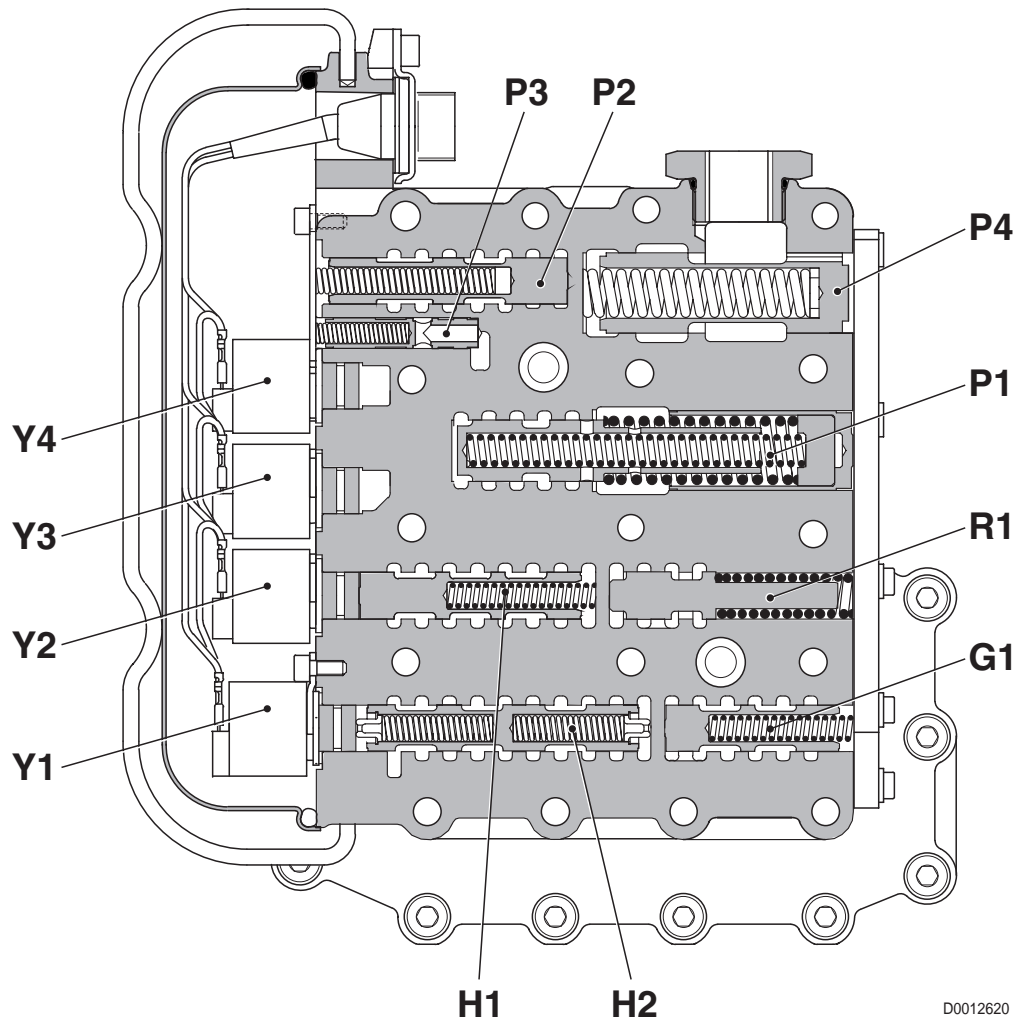
PRESSURE TEST POINTS



D0012640

Pos.	Function	Thread size	Pressure
1	General pressure	M10x1	18 bar
2	Pilot pressure	M10x1	10 bar
3	B clutch pressure	M10x1	18 bar
4	C clutch pressure	M10x1	18 bar
5	A clutch pressure	M10x1	18 bar
6	Pressure P_g to clutches	M18x1	18 bar
7	D clutch pressure	M10x1	18 bar
8	Engagement pressure	M10x1	18 bar

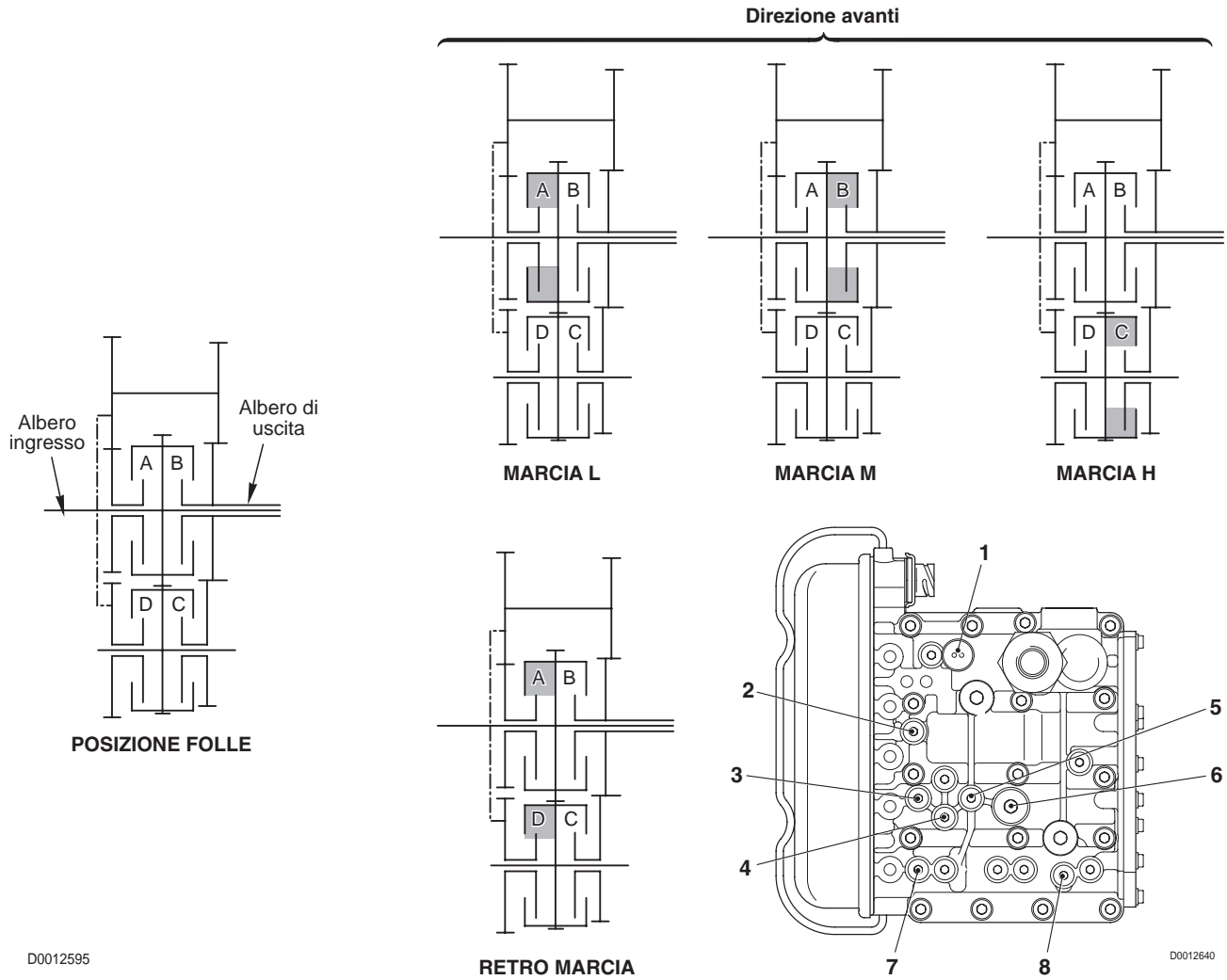
MAIN COMPONENTS



D0012620

- G1** Clutch selection valve
- H1** Clutch 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 engagement valve **H2** (MRV electr. REV)
- Y2** Pilot solenoid valve for engagement valve **H1** (GV1 valve TRANSM.1)
- Y3** Pilot solenoid valve for engagement valve **H2** (MVV electr. FWD)
- Y4** Pilot solenoid valve for engagement valve **G1** (GV2 valve TRANSM. 2)

1.1.6 CLUTCH ENGAGEMENT AND SOLENOID VALVE OPERATION SCHEMATIC



D0012595

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

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

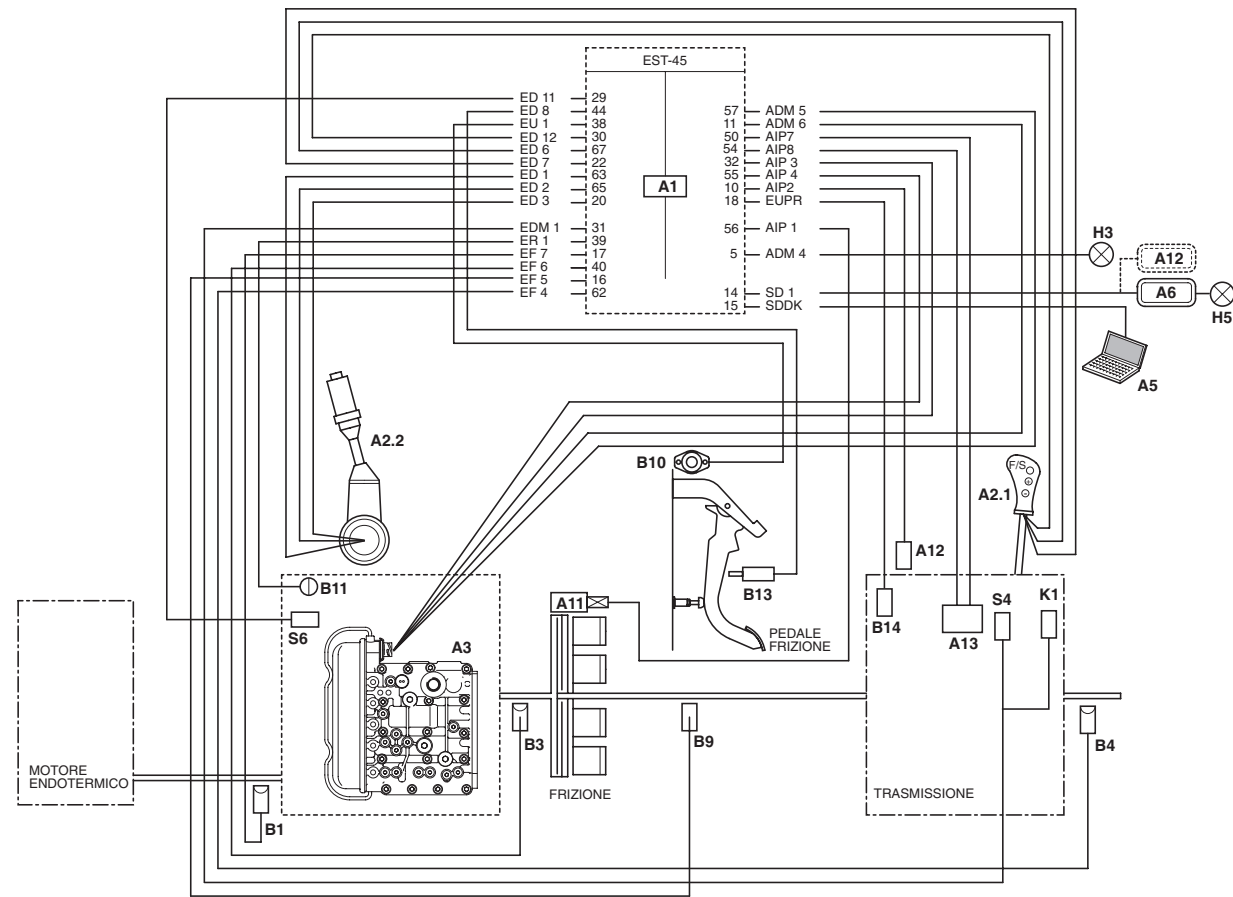
● = Solenoid valve energised

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

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

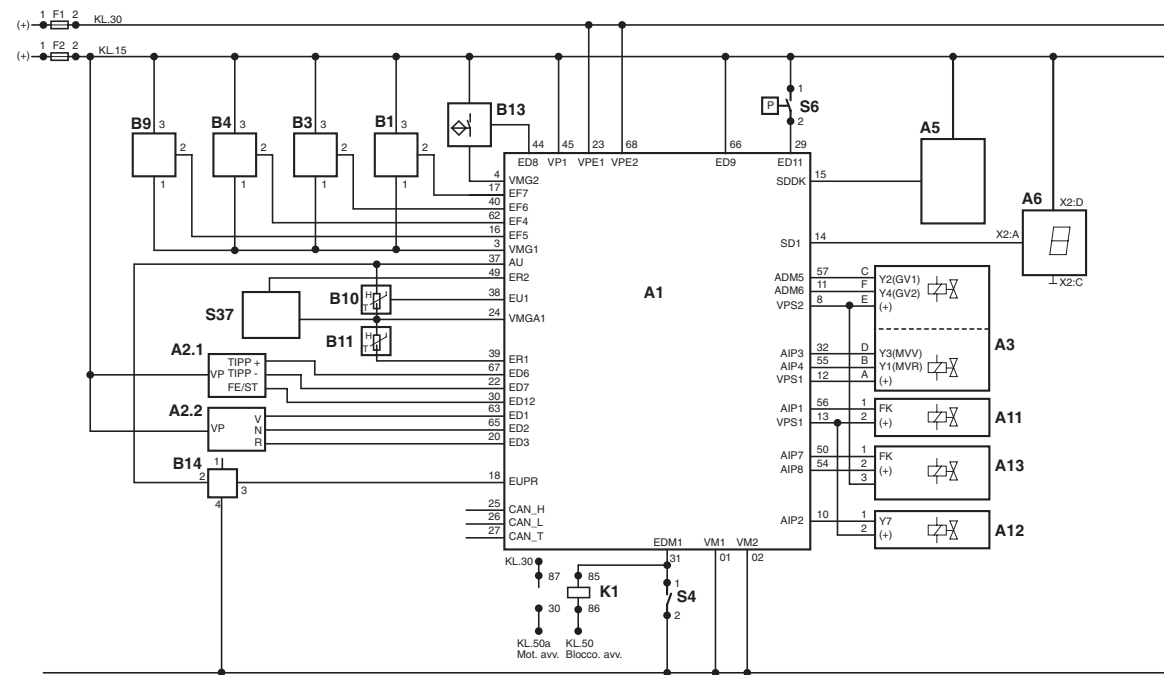
● = Solenoid valve energised

1.1.7 TRANSMISSION ELECTRONIC SYSTEM SCHEMATIC



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)



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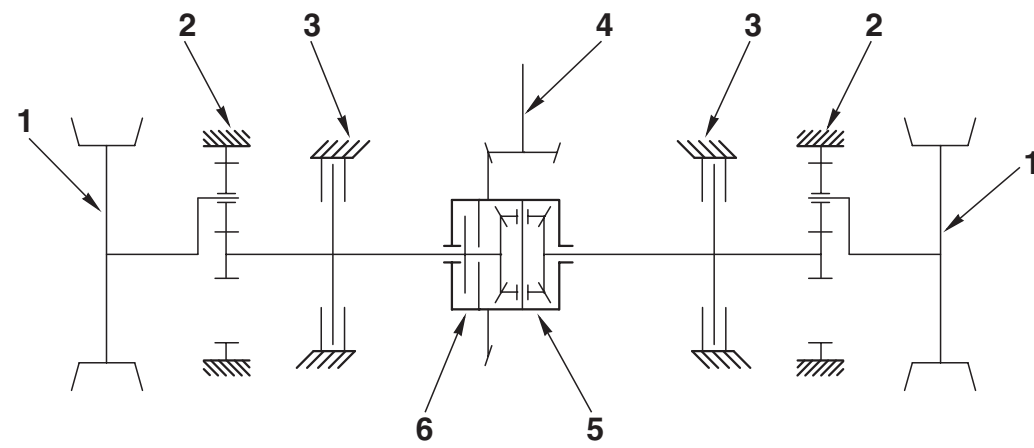
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1.2 REAR AXLE

DESCRIPTION

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

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

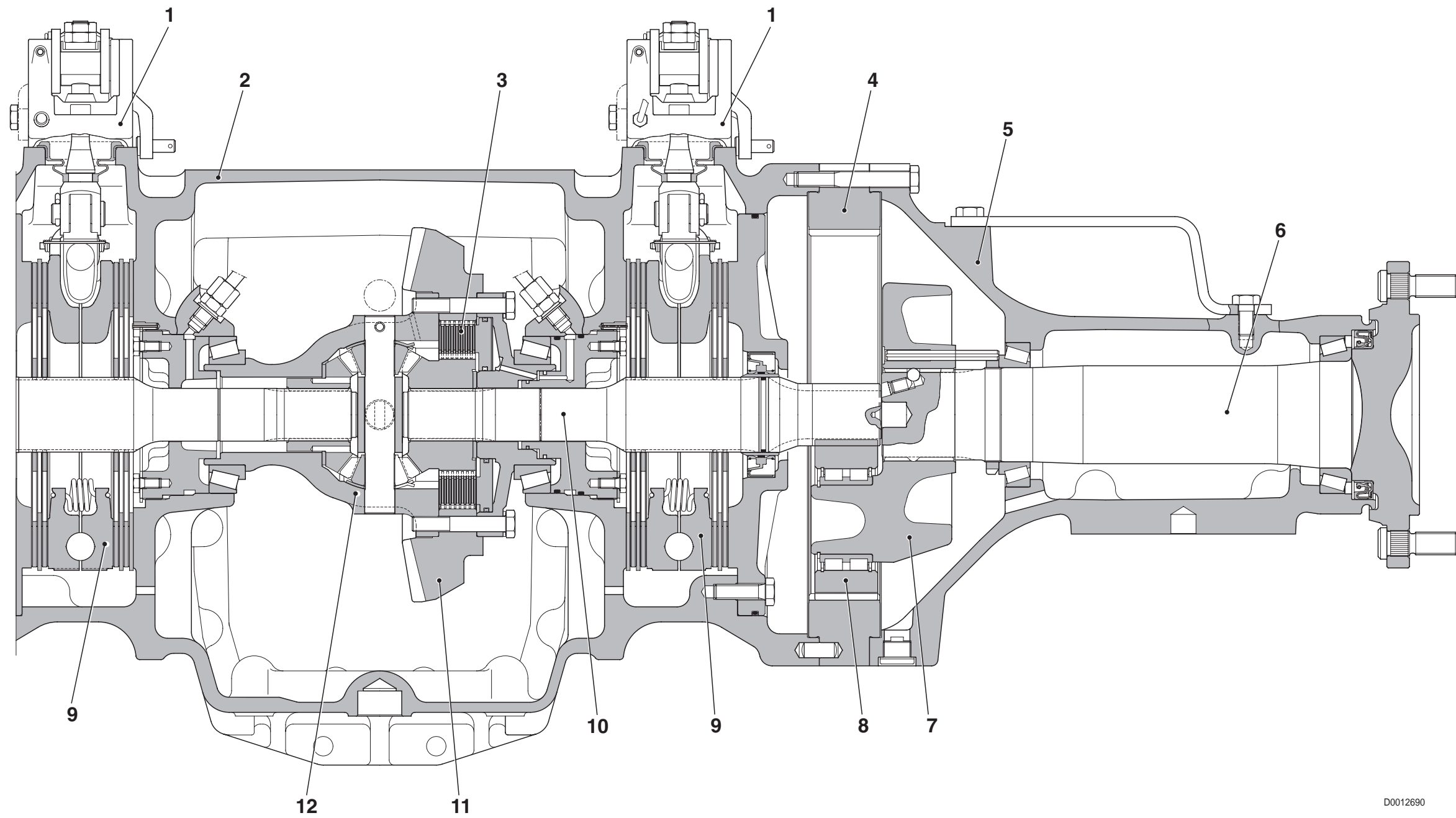


D0012670

COMPONENTS

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

COMPONENTS



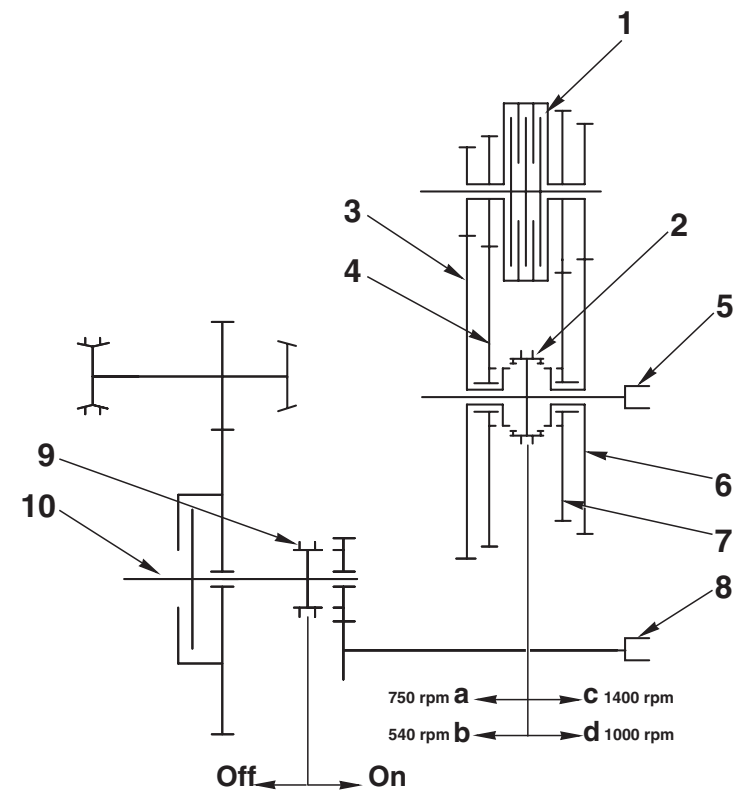
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- | | |
|-------------------------|-----------------------|
| 1. Brake control device | 9. Brake |
| 2. Axle housing | 10. Axle shaft |
| 3. Differential lock | 11. Bevel crown wheel |
| 4. Crown wheel | 12. Differential |
| 5. Trumpet housing | |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

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 the Syncro 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.



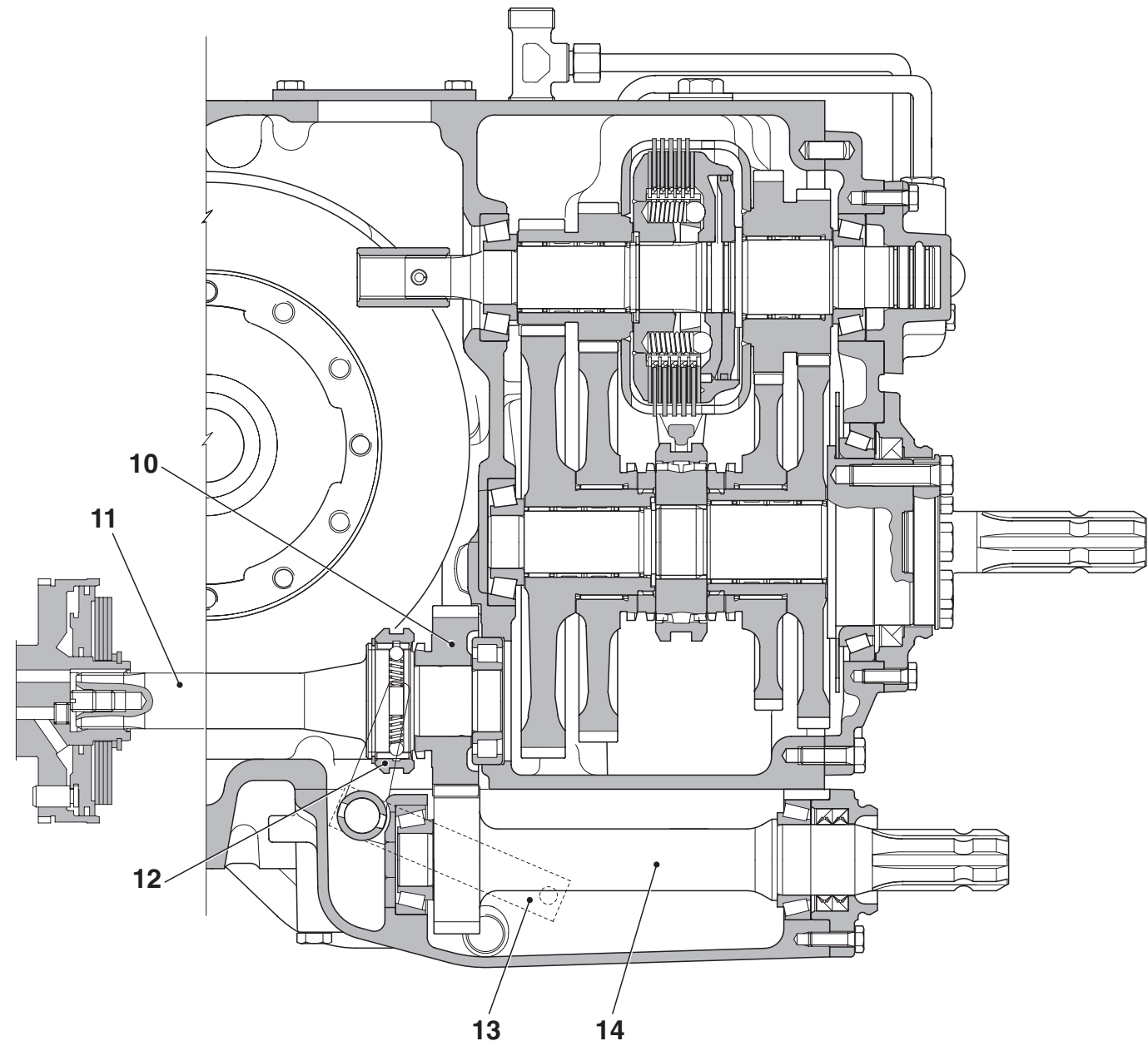
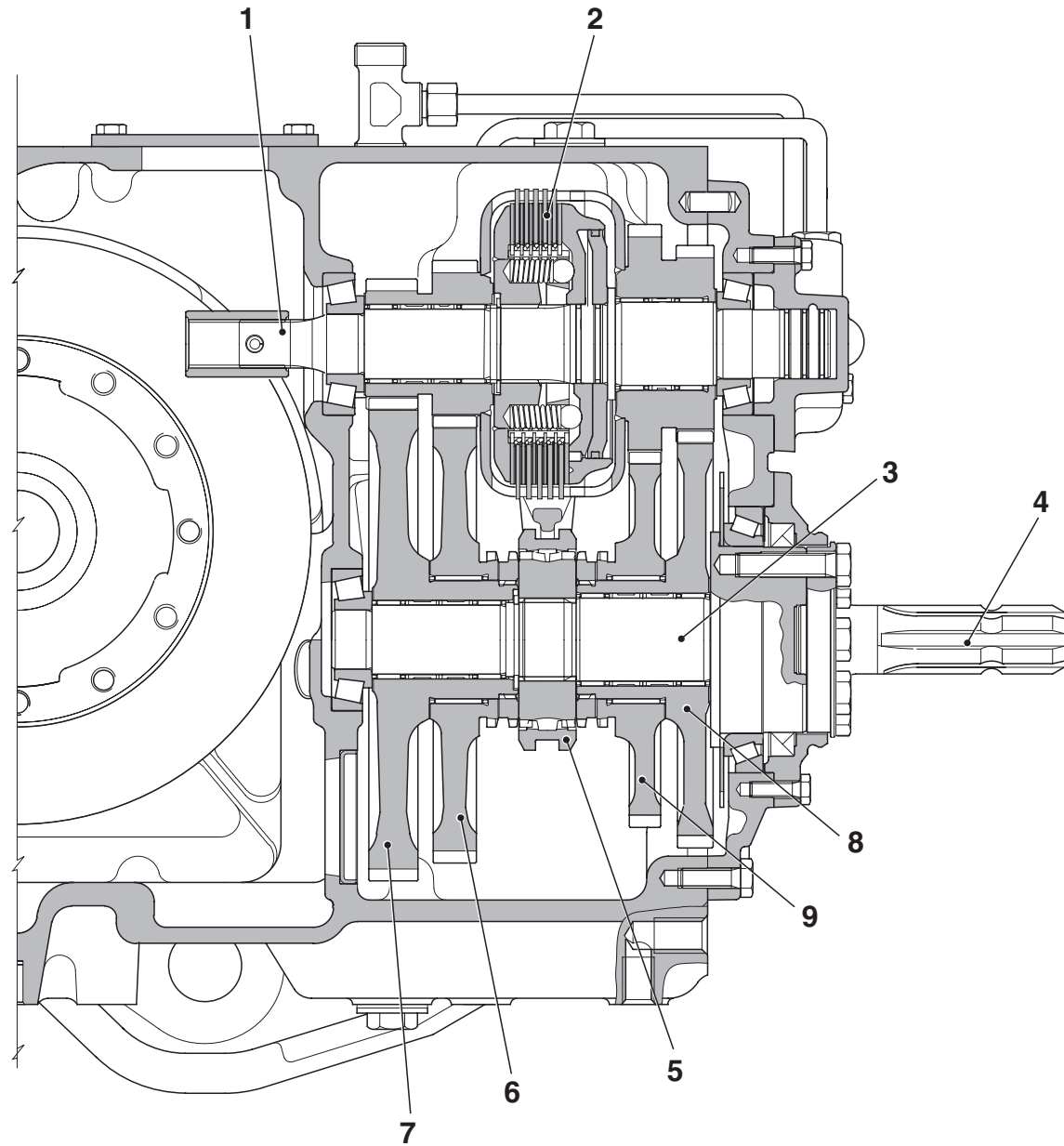
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- | | |
|------------------------|-----------------------------------|
| 1. Clutch | 6. 1000 rpm driven gear |
| 2. Synchronizer | 7. 1400 rpm driven gear |
| 3. 540 rpm driven gear | 8. Syncro PTO shaft |
| 4. 750 rpm driven gear | 9. Syncro PTO engagement |
| 5. PTO shaft | 10. Four-wheel drive output shaft |

COMPONENTS

4-SPEED VERSION

4-SPEED AND SYNCRO PTO VERSION



D0030190

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

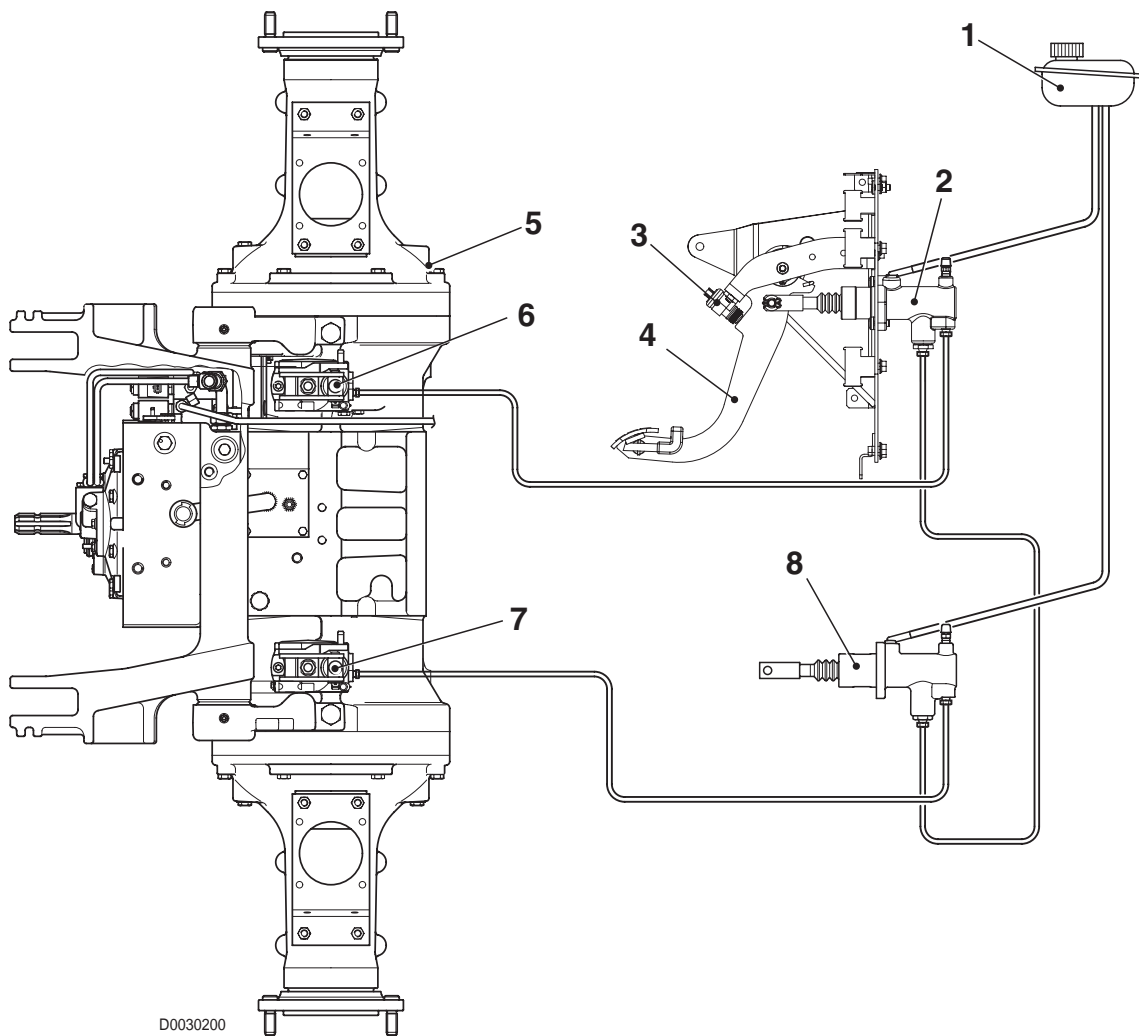
- 8 - 1000 rpm driven gear
- 9 - 1400 rpm driven gear
- 10 - Syncro PTO driving gear
- 11 - Four-wheel drive output shaft
- 12 - Syncro PTO engagement device
- 13 - Engagement control lever
- 14 - Syncro PTO output shaft

2. BRAKING SYSTEM

DESCRIPTION

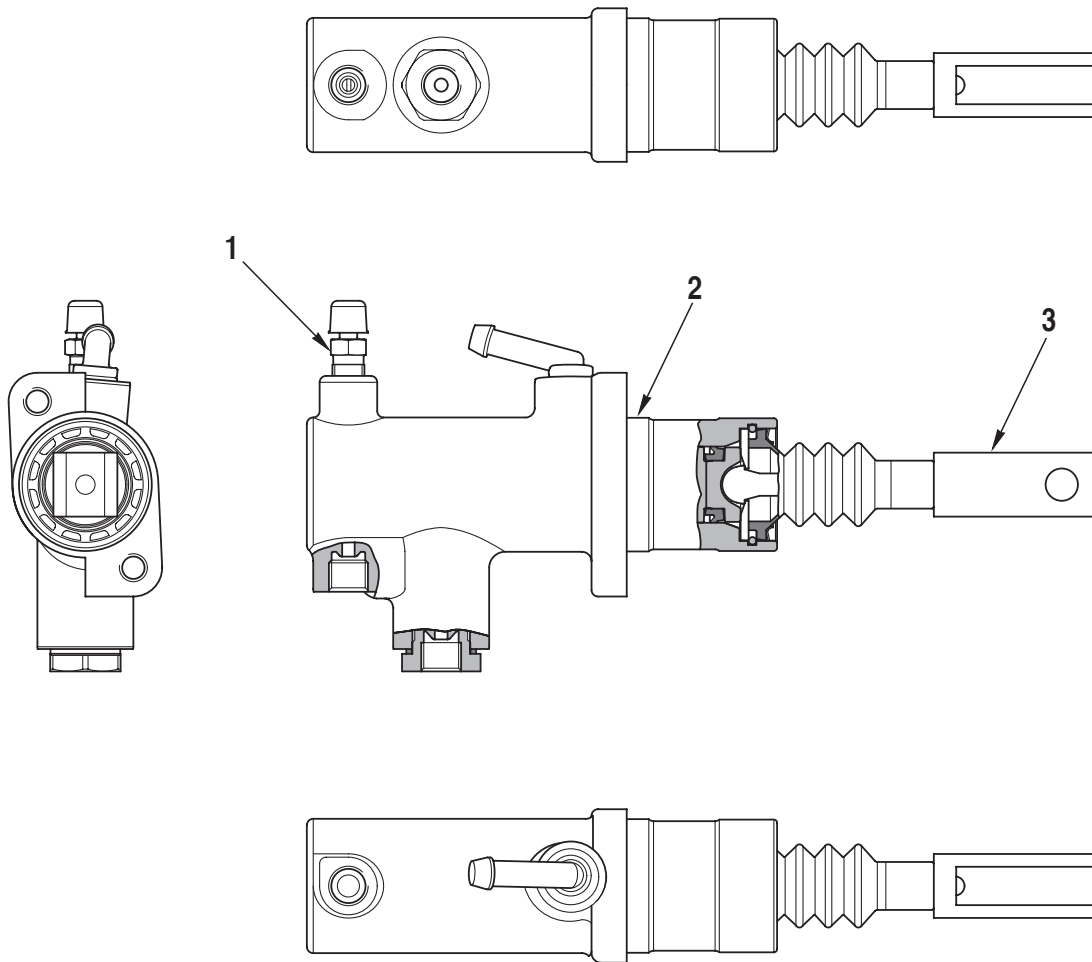
The braking system is comprised of 2 braking devices (one for each rear wheel) operated by two hydraulic pumps by way of mechanical controls.

Each pump 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 | 7. Left brake |
| 2. Right brake pump | 8. Left brake pump |
| 3. Brake microswitches (no. 2) | |
| 4. Brake pedal | |
| 5. Rear axle | |
| 6. Right brake | |

2.1 BRAKE PUMP



D0004520

1. Bleed screw
2. Pump housing
3. Control rod

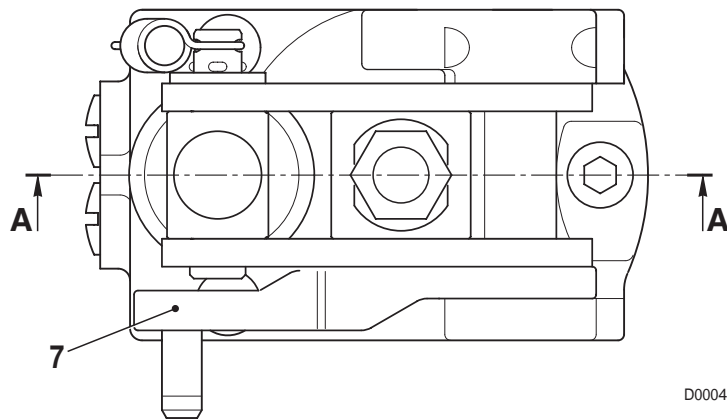
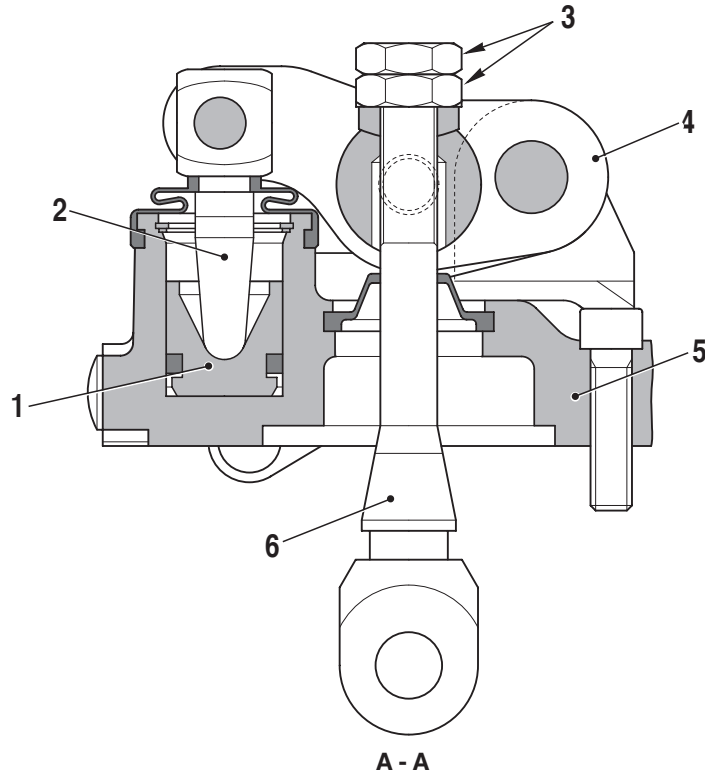
CHARACTERISTICS

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



D0004530

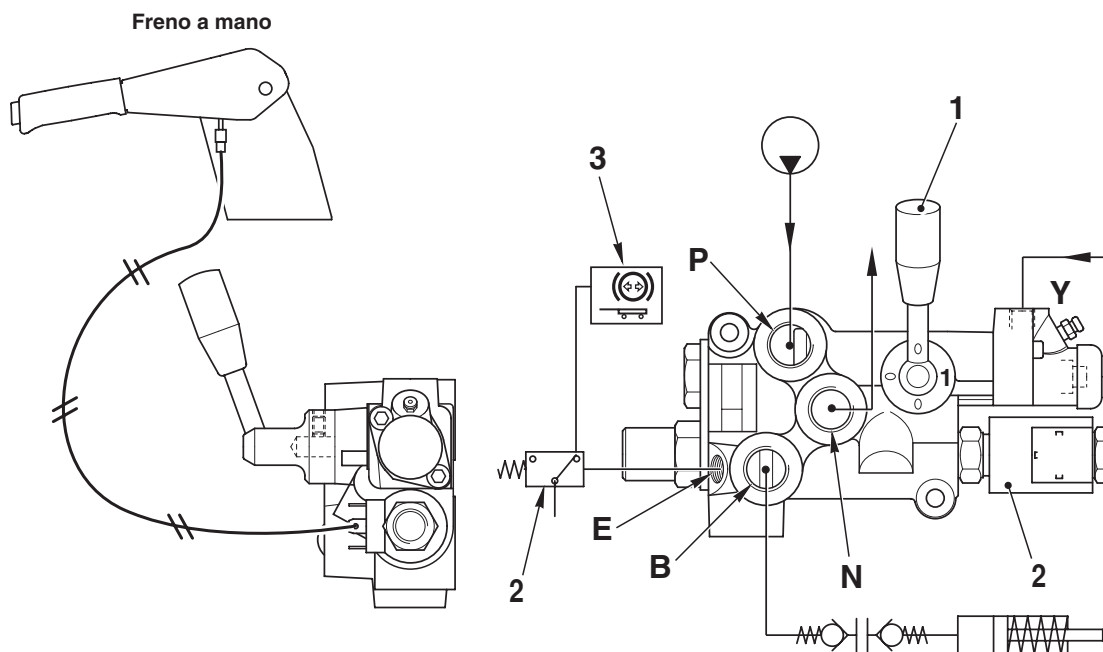
- | | |
|--------------------|--------------------------------|
| 1. Piston | 5. Support |
| 2. Plunger | 6. Rod |
| 3. Adjustment nuts | 7. Parking brake control lever |
| 4. Lever | |

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)



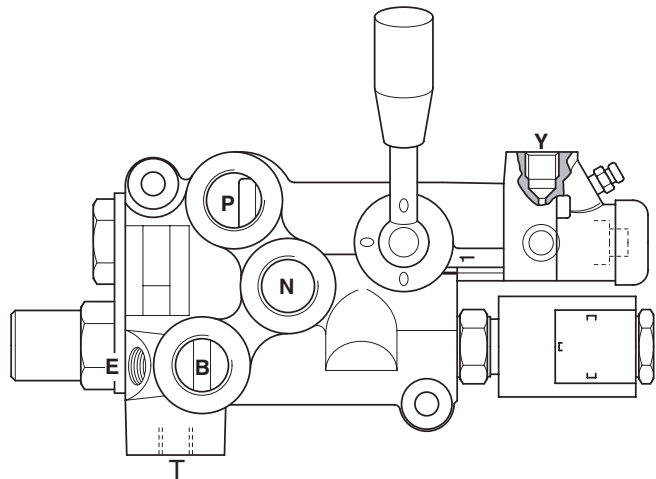
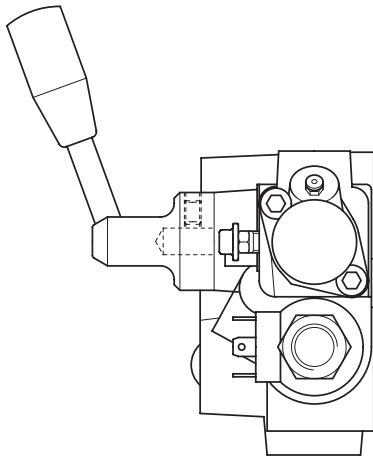
D0012720

1. Valve control lever in position "1"

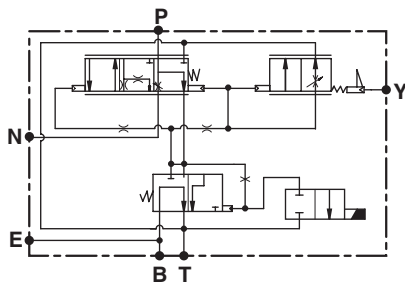
- When the lever (1) is in position "1" (valve activated) and the brake pedals are not pressed, a pressure of 12.5 bar (181.3 psi) is available at port **B**.
- This pressure is supplied constantly to the trailer to release the parking brake.
- When the driver applies the handbrake, this energizes the solenoid valve (2); the pressure at port **B** is thus eliminated.
- The pressure at port **B** is directly proportional to the pressure in the tractor braking (Y) circuit.

2. Valve control lever in position "O"

- When the lever (1) is in position "O" (valve deactivated), there is no pressure at port **B**. In this condition, the pressure at port **B** remains null regardless of the pressure in the tractor braking circuit.



HYDRAULIC DIAGRAM



D0030210

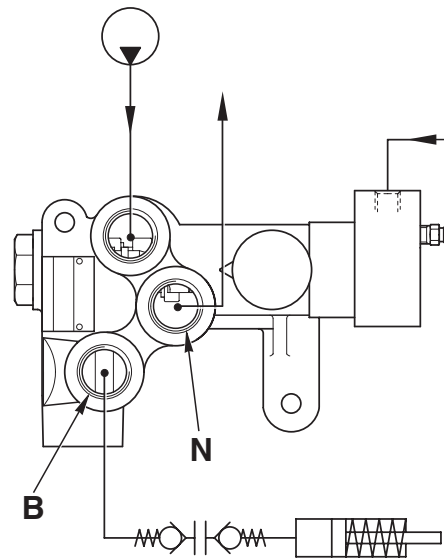
FUNCTION

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

CHARACTERISTICS

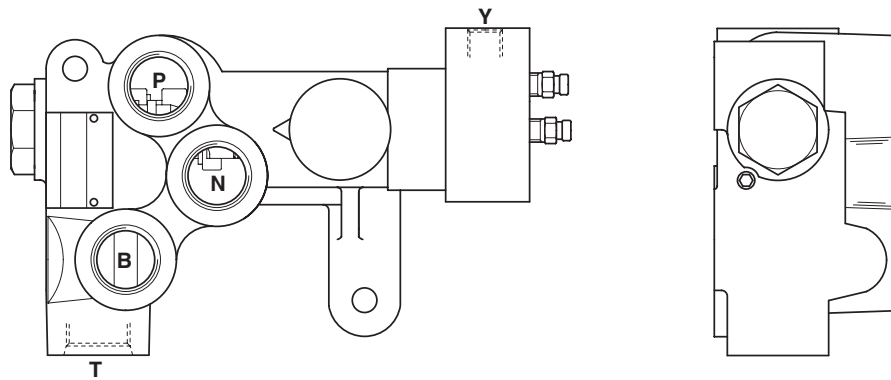
- Maximum operating pressure at port N: 200 bar (2900 psi)
- Minimum constant pressure at port B: 12.5±2 bar (181.3±29 psi)
- Maximum pressure at port B: 135±5 bar (1957.5±72.5 psi)
- Oil delivery flow rate: 20÷80 ℓ/min (5.3–21.14 US.gpm)

2.3.2 HYDRAULIC TRAILER BRAKING (EXPORT VERSION)

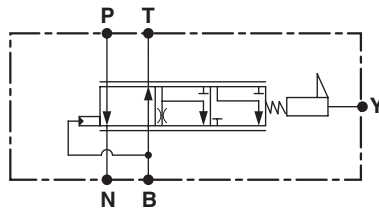


D0022940

- When the brakes are not applied there is no pressure at port **B**.
- When the operator applies the tractor brakes, the pressure in the circuit pilots the braking valve and the pressure at port **B** increases proportionally to the pressure in the tractor braking circuit.



HYDRAULIC DIAGRAM



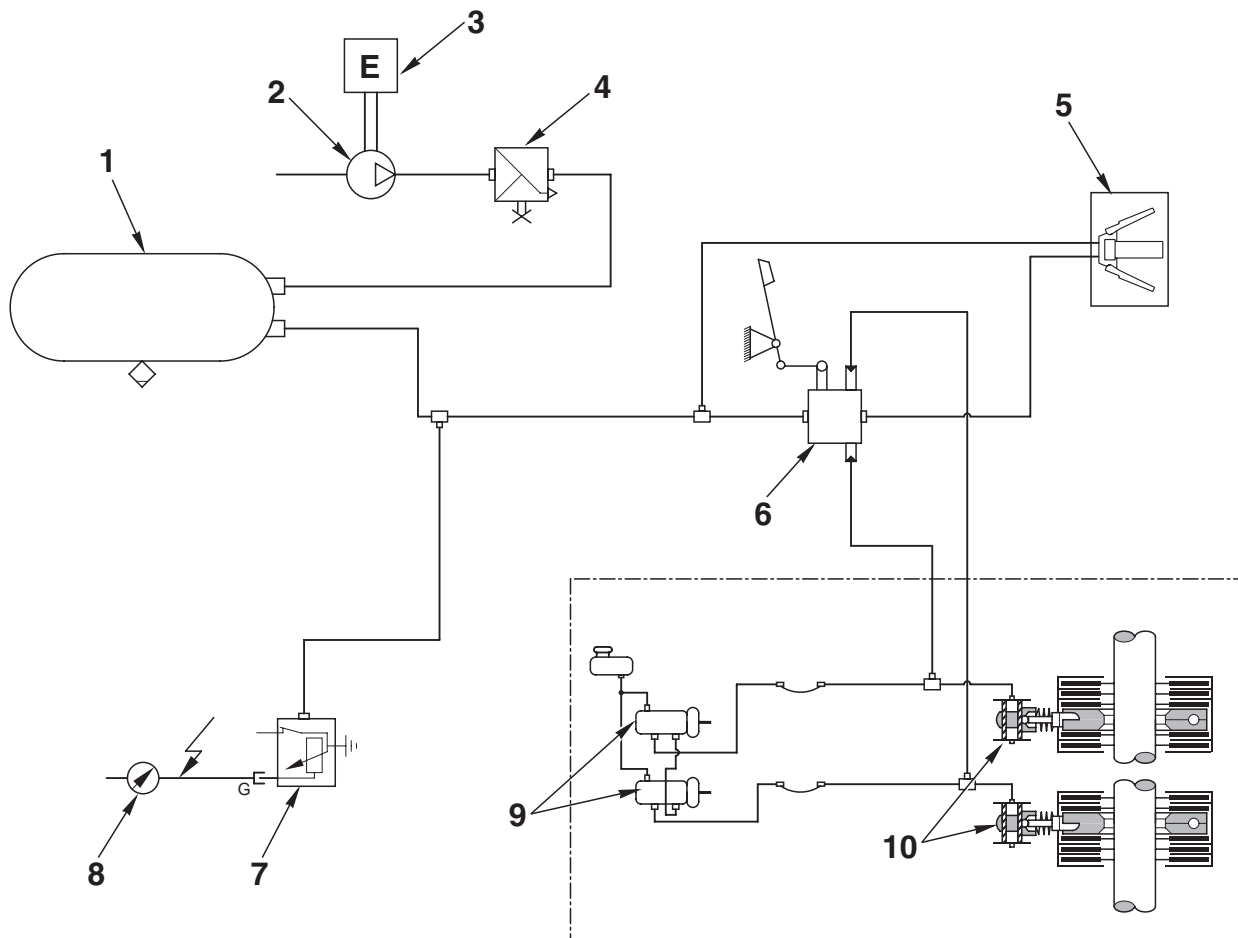
D0004570

- 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: 130÷150 bar (1885-2175 psi)
- Oil delivery flow rate: 20÷80 ℓ/min (5.3 – 21.14 US.gpm)

2.3.3 AIR TRAILER BRAKING (ITALY VERSION)

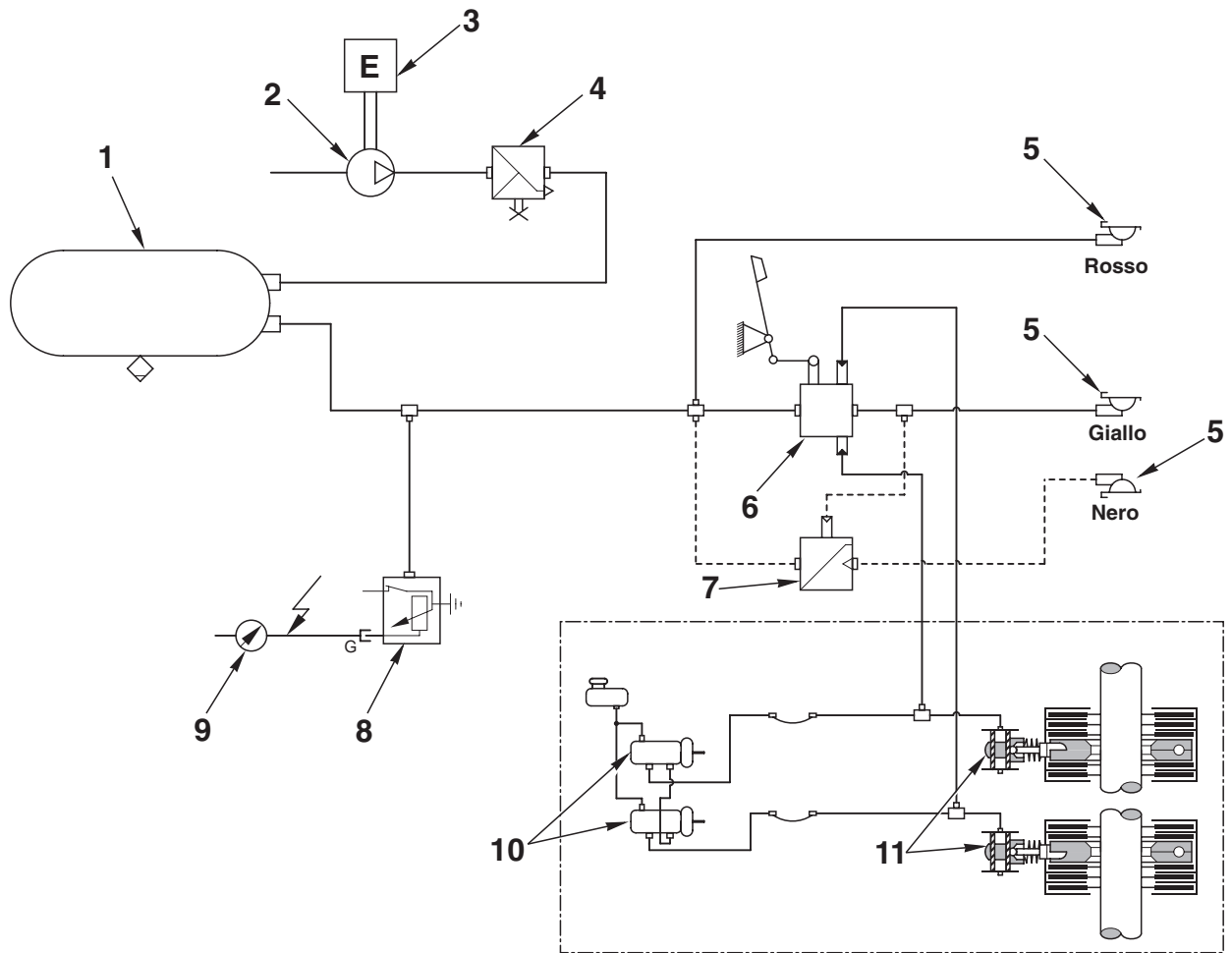


D0011690

COMPONENTS

- | | |
|---|-------------------------------|
| 1. Compressed air reservoir | 6. Trailer braking valve |
| 2. Air compressor | 7. Circuit pressure sensor |
| 3. Engine | 8. Circuit pressure indicator |
| 4. Pressure limiting valve
(7.8 bar (113 psi)) | 9. Brake operating pump |
| 5. Quick-action coupler for trailer | 10. Braking device |

2.3.4 AIR TRAILER BRAKING (EXPORT VERSION)

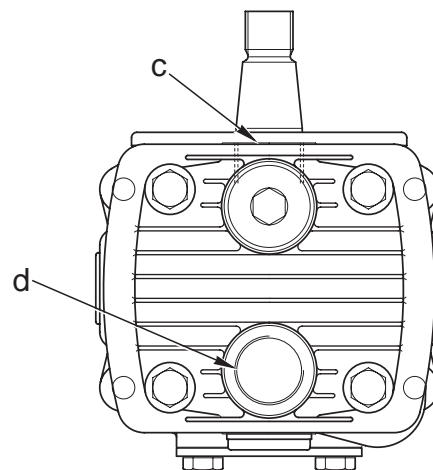
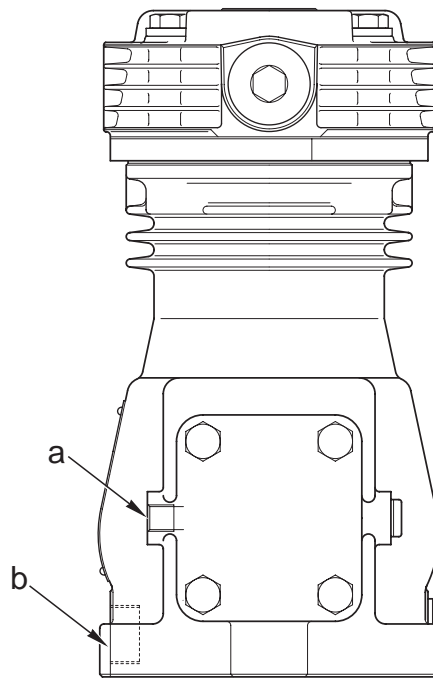
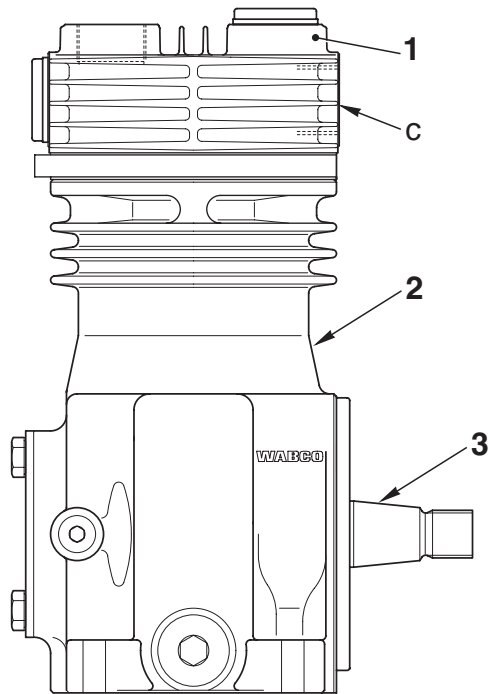


D0011680

- 1. Compressed air reservoir
- 2. Air compressor
- 3. Engine
- 4. Pressure limiting valve (7.8 bar (113 psi))
- 5. Quick-action coupler for trailer

- 6. Trailer braking valve (2-way)
- 7. Trailer braking valve (1-way)
- 8. Circuit pressure sensor.
- 9. Circuit pressure indicator
- 10. Brake operating pump
- 11. Braking device

COMPRESSOR



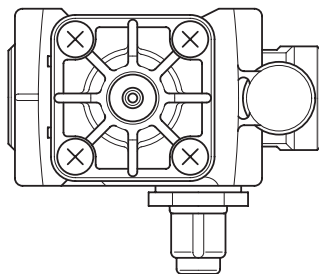
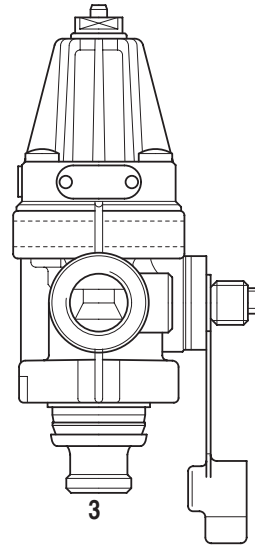
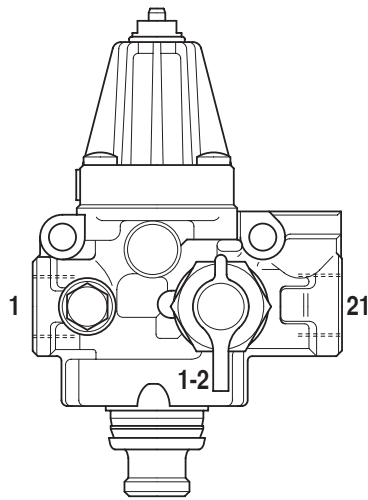
D0012880

- a. Compressor lubrication
- b. Compressor lube oil return
- c. Port 0 - Air intake
- d. Port 2 - Air delivery
- 1. Head
- 2. Cylinder
- 3. Drive shaft

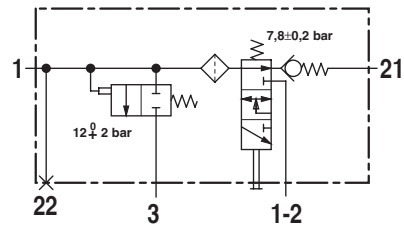
CHARACTERISTICS

Bore: 75 mm
 Stroke: 36 mm
 Displacement: 159 cm³
 Max. pressure: 18 bar
 Crankshaft end float: 0.2± to 0.6 mm

PRESSURE LIMITING VALVE



SCHEMATIC



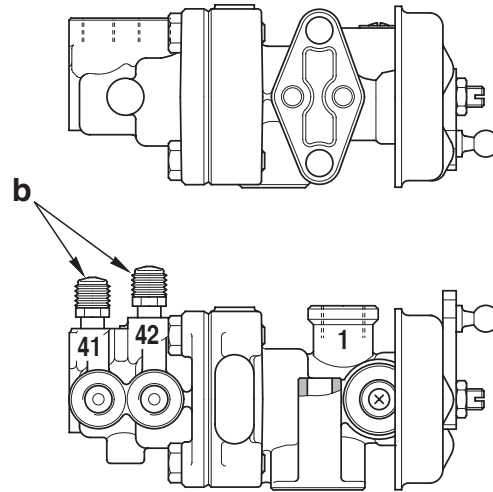
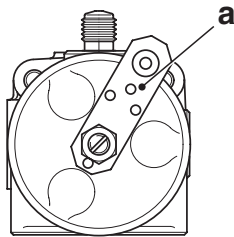
D0004690

- Port 1 - From compressor
- Port 3 - Excess pressure vent
- Port 21 - To compressed air reservoir

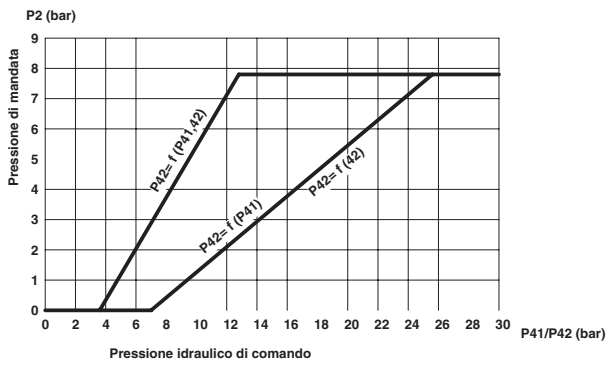
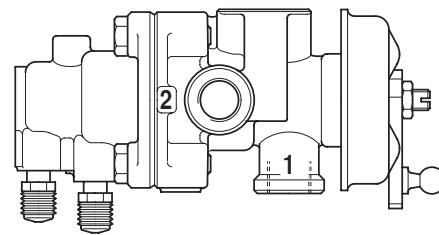
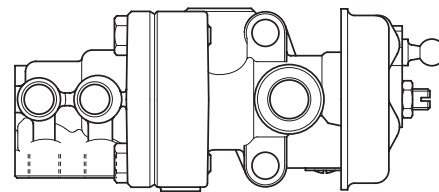
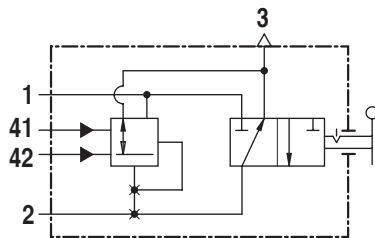
CHARACTERISTICS

- 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)



SCHEMATIC

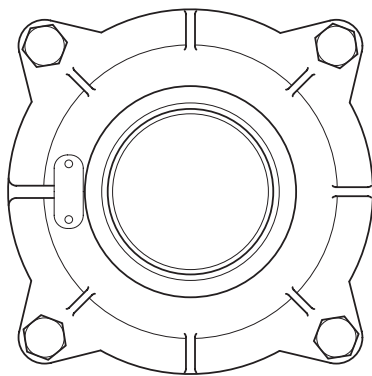
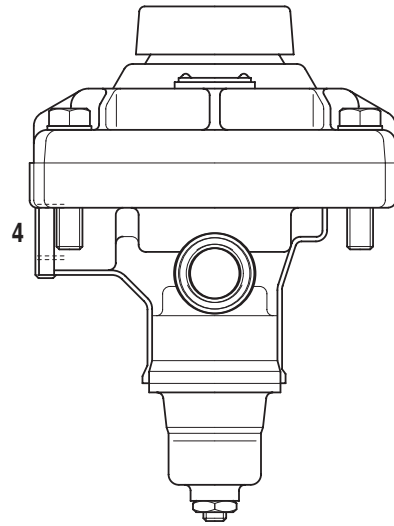
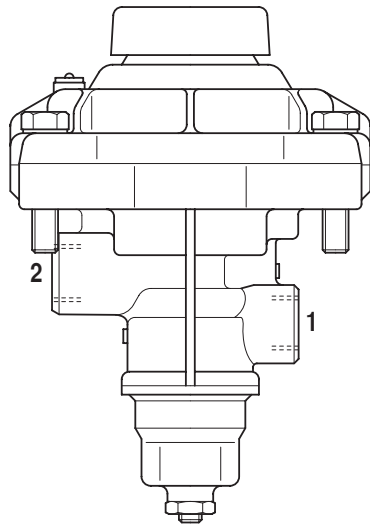


D0004760

- a. Parking brake control lever
- b. Air vent screws

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

TRAILER BRAKING VALVE (1-WAY)



D0004710

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

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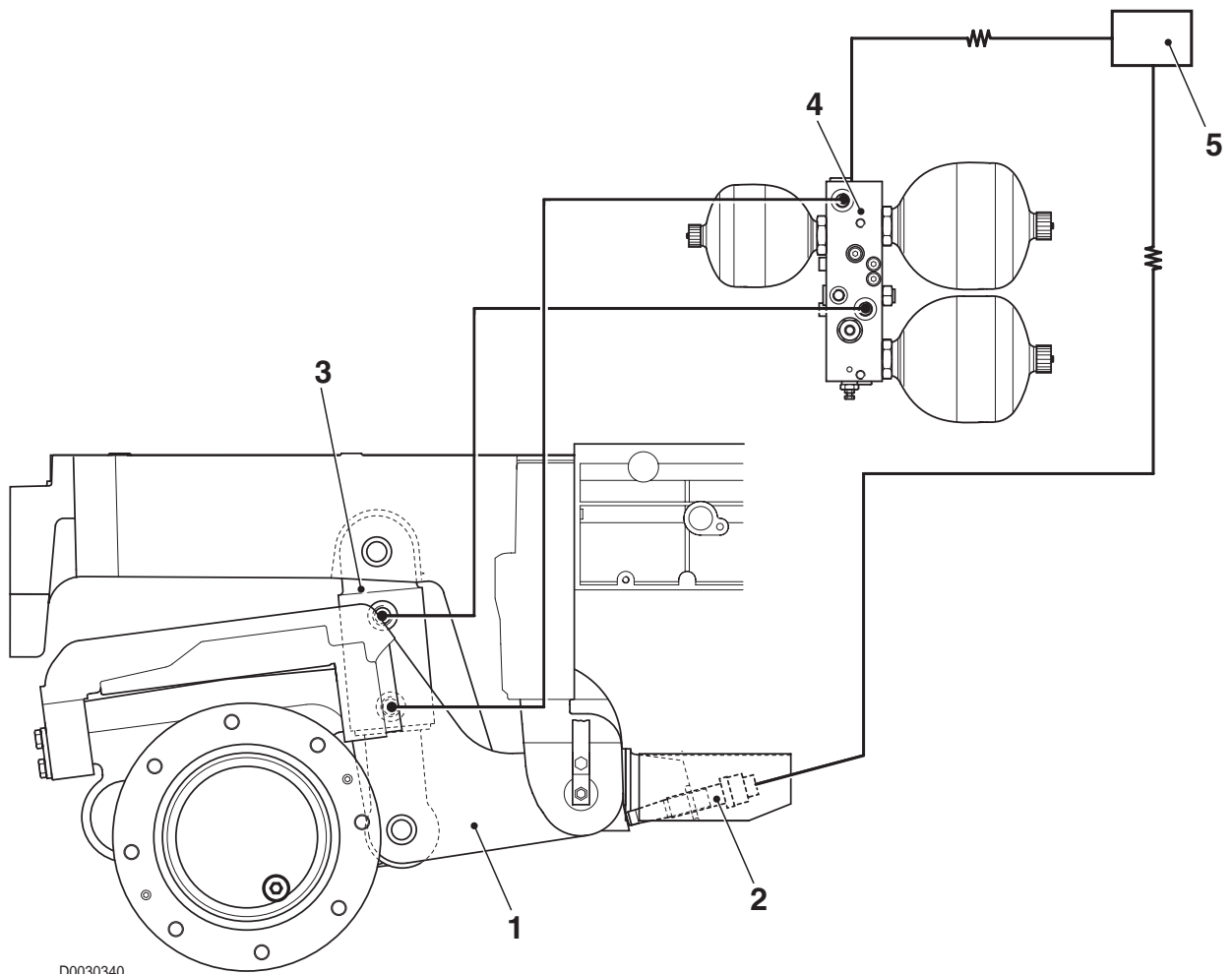
3. HYDRAULIC FRONT AXLE SUSPENSION

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:

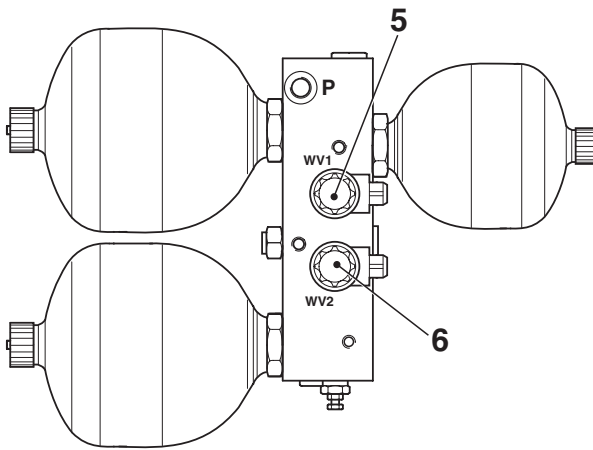
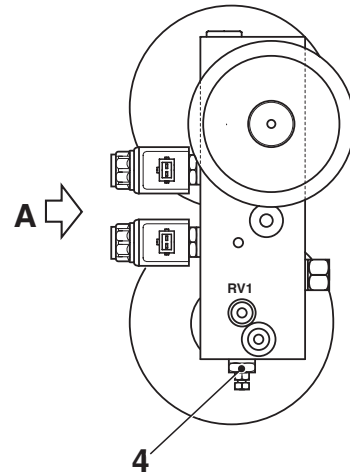
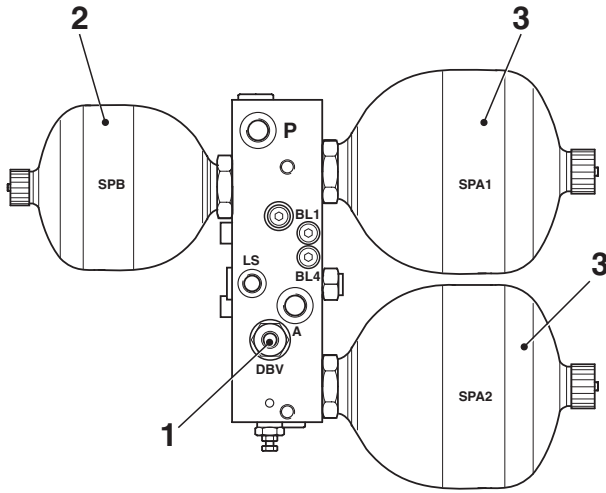
- swinging axle support arm (1)
- position sensor (2)
- suspension cylinders (no. 2) (3)
- front suspension control valve (4)
- electronic control unit (5)



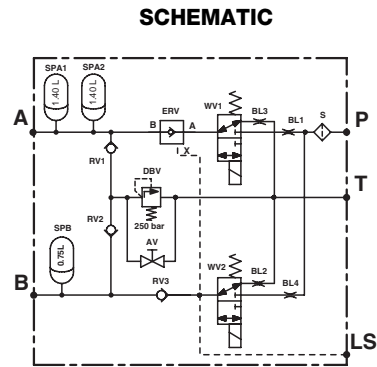
3.1 FRONT SUSPENSION CONTROL VALVE

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 the raising and lowering of the front axle.



View A

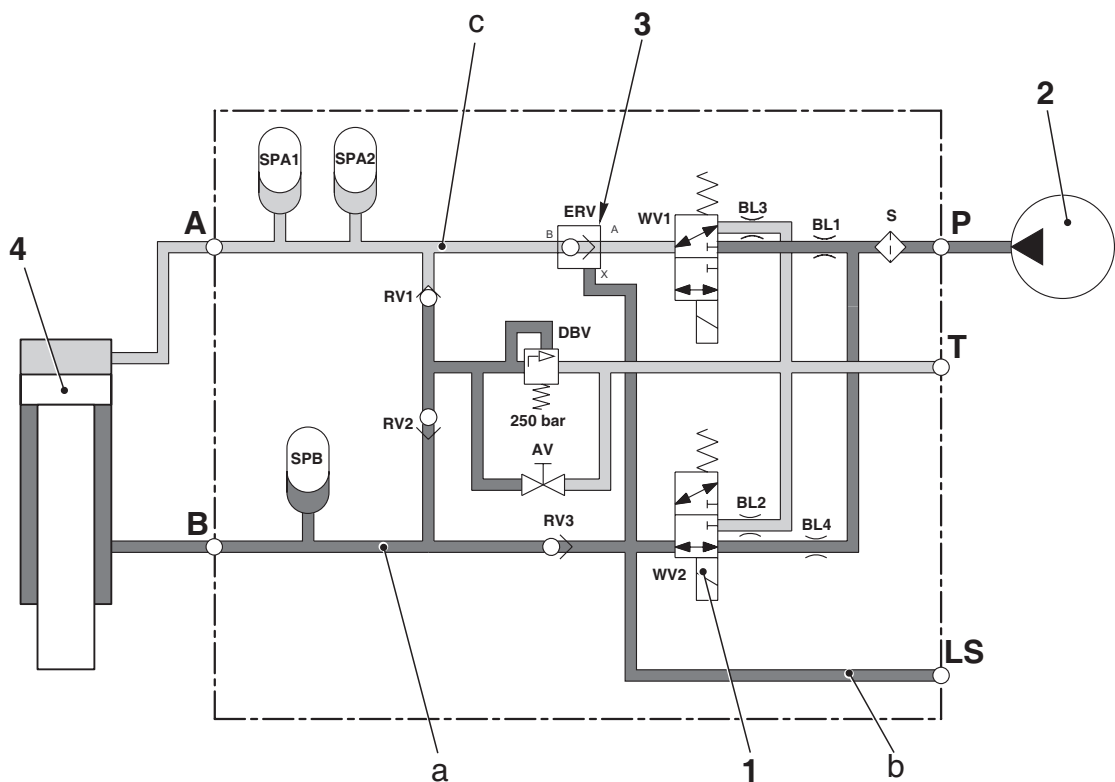


D0030290

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

OPERATION

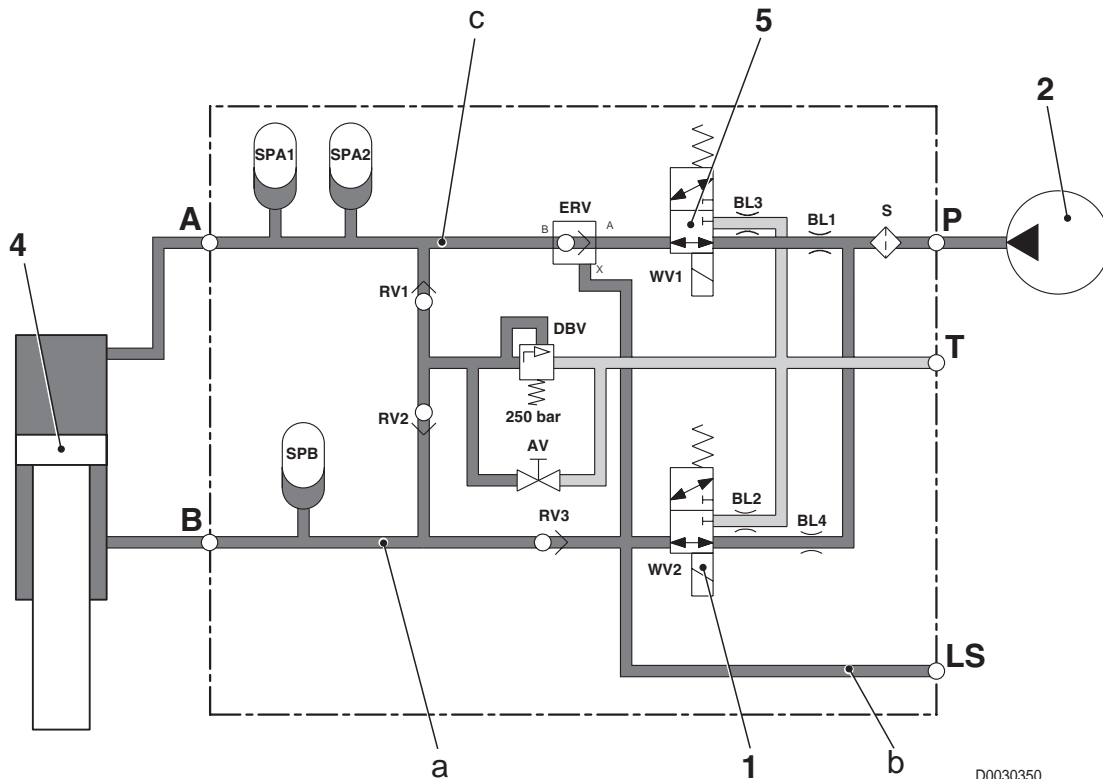
1. When the suspension is deactivated



D0030360

- When the suspension is deactivated, the electronic control unit energises the solenoid valve (1) by sending an **LS** signal to the priority valve via port **LS**.
- This allows the pressurised oil from the pump (2) to flow to lines **a** and **b** and the one-way valve (3) is opened allowing oil in the discharge line **c** to flow.
- The 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 pressing a switch.

2. When the operator activates the suspension

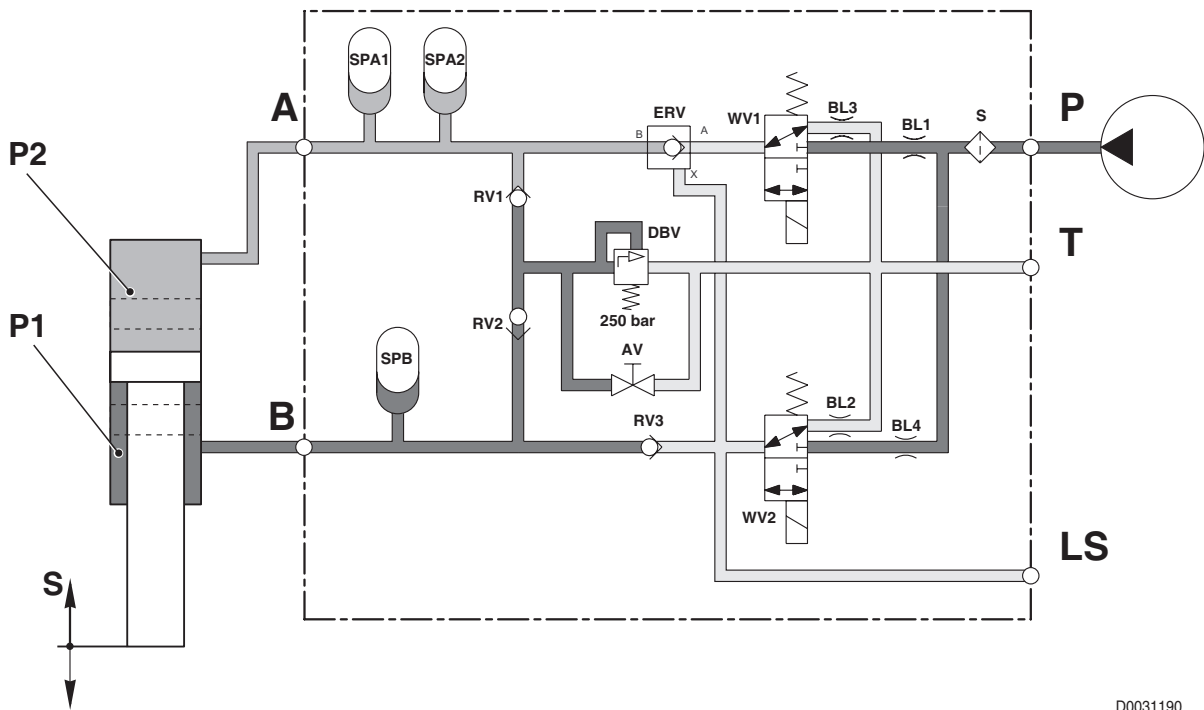


D0030350

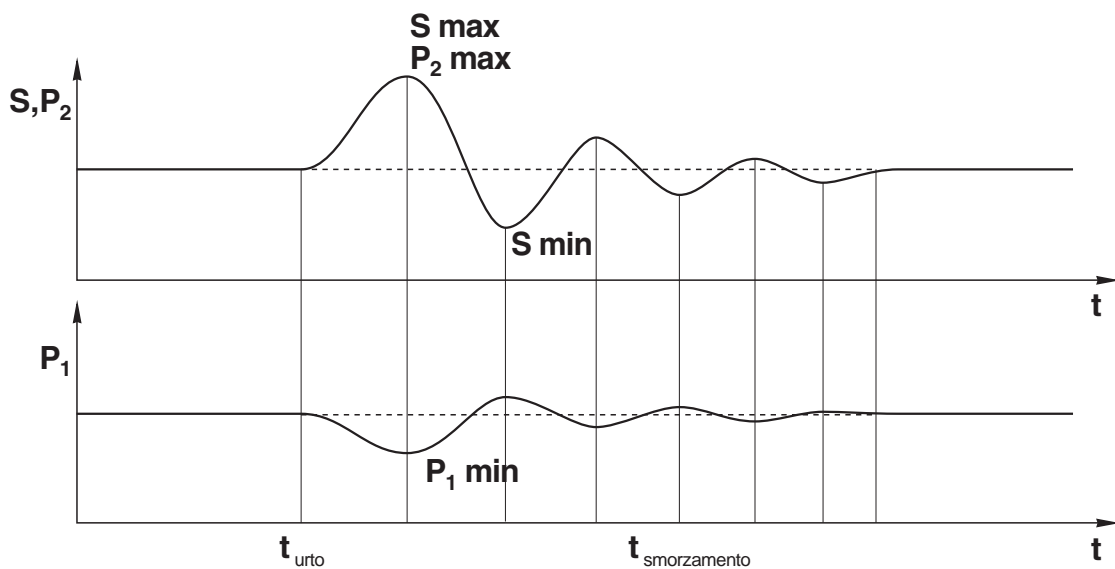
- When the operator presses the switch to activate the suspension, the electronic control unit energises the solenoids (1) and (5).
- This allows the pressurised oil from the pump (2) to flow to lines **a** and **c** and, because of the difference in cross-section between the two ends of the piston (4) on which the pressure acts, the piston (4) starts extending.
- At the same time, the oil compresses the diaphragms of the accumulators and the pressure in lines **a** and **b** increases.
- When the position sensor detects that the tractor levelling position has been reached, the electronic control unit de-energizes the solenoid valves (1) and (5) and the system with the accumulators pre-loaded is cut off 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 (the accumulators 6 are compressed) while the 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.



D0031190

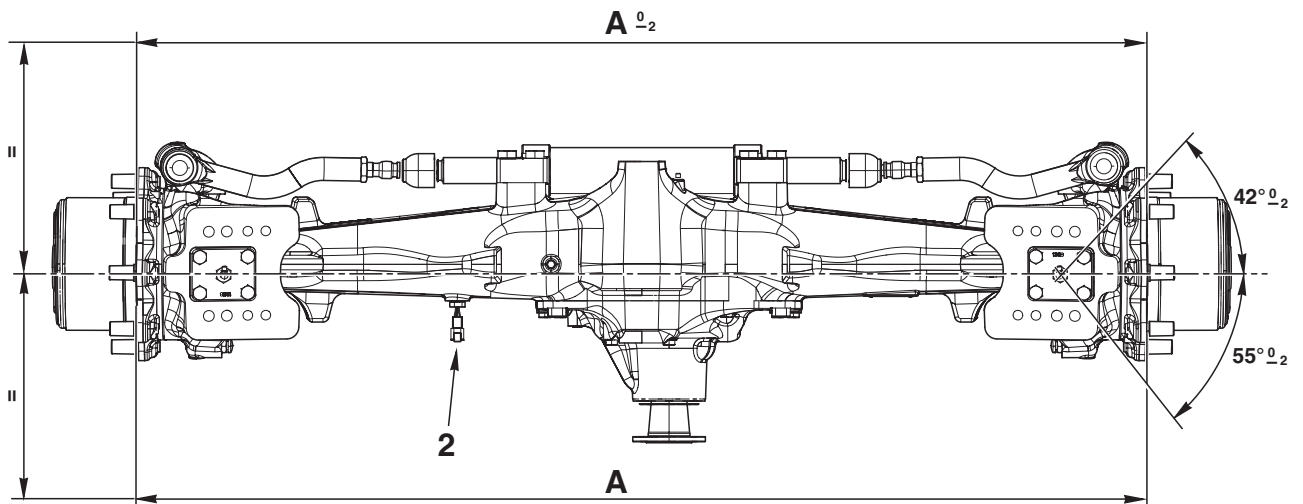
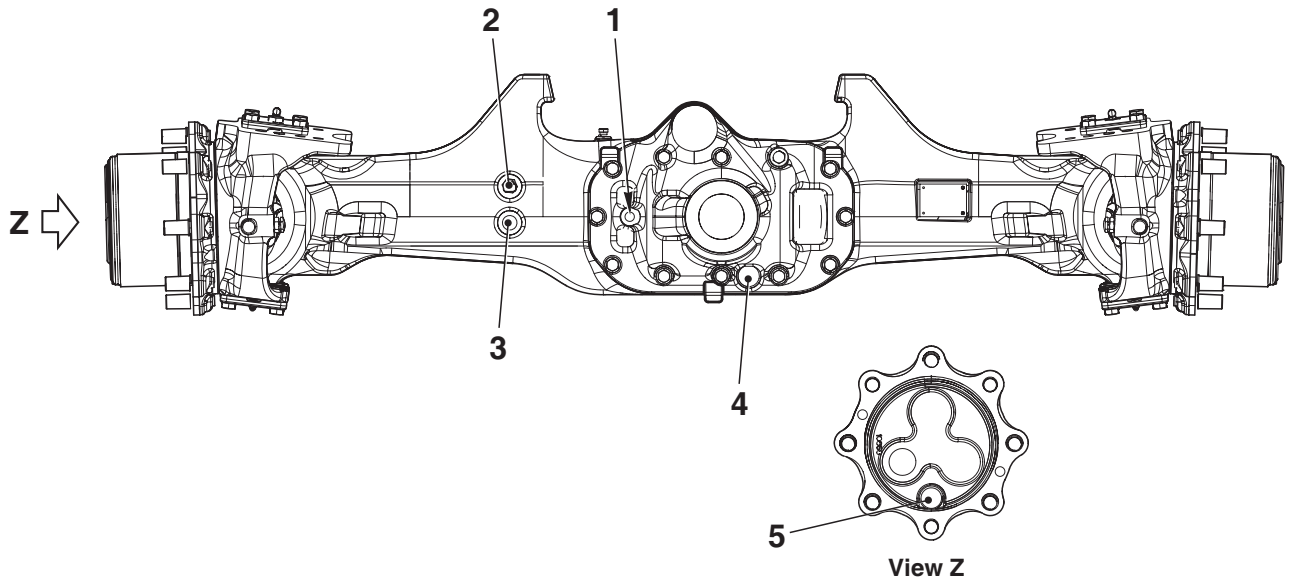


D0002410

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4. FRONT AXLE

★ The figure shows the suspended axle version



D0011790

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 plug and oil level for differential
4. Differential drain plug
5. Filler plug and oil drain for final drive

5. HYDRAULIC SYSTEM

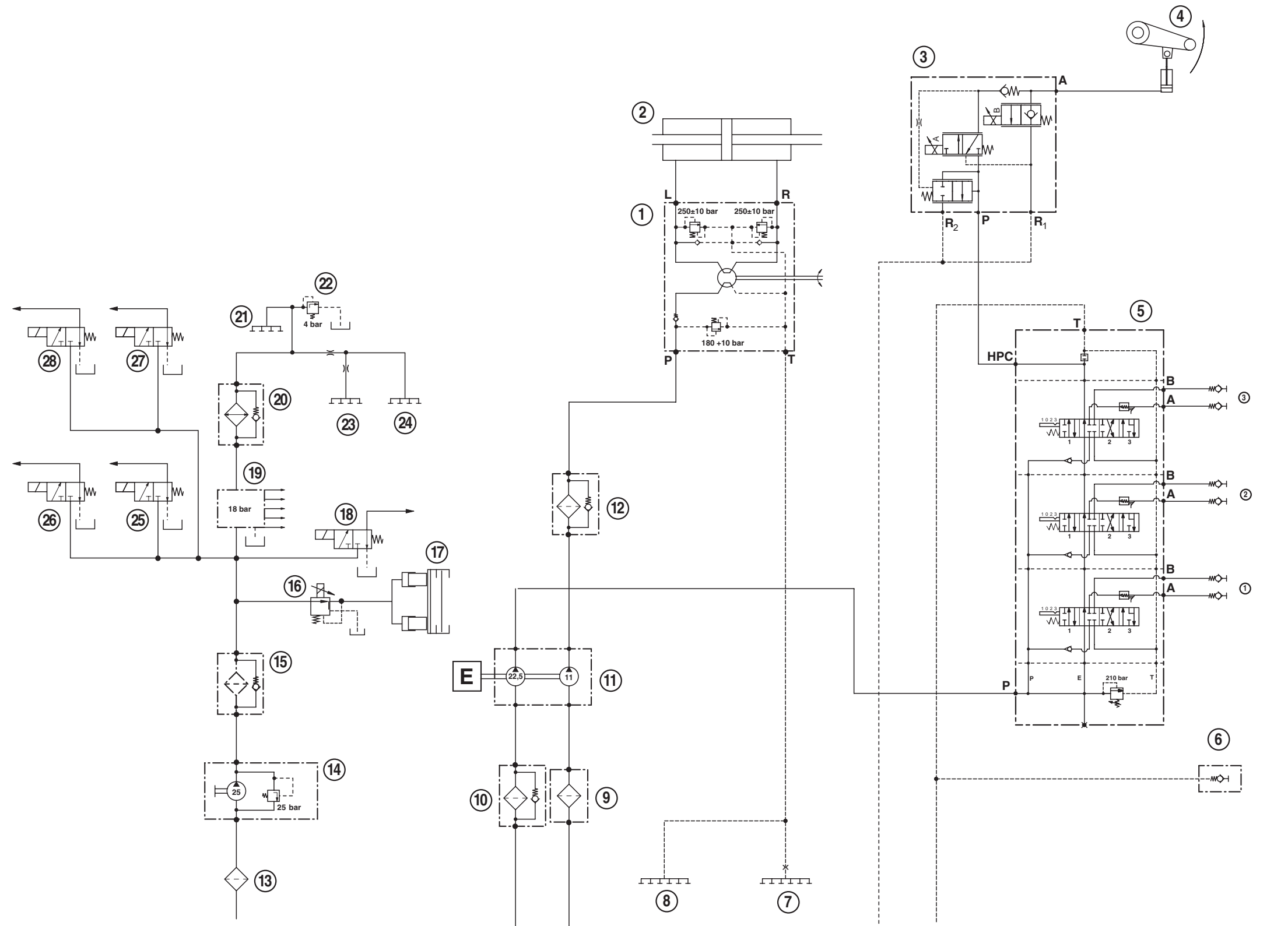
DESCRIPTION

The tractors in this series are equipped with a Closed Centre (CC) hydraulic system, with one gear pump to supply the transmission circuit and a tandem gear pump to supply the steering circuit and services (auxiliary service control valves, trailer braking, etc.).

The CC hydraulic system supplies oil to the loads at a rate of flow that is proportional to the engine speed.

This means that when the engine is running at top speed and no hydraulic services are in operation (e.g. during road use), the pump will continue to circulate oil in the hydraulic circuit at the rate of approximately 80 ℓ/min (with a consequent increase in temperature and oil consumption) without any of this oil being used.

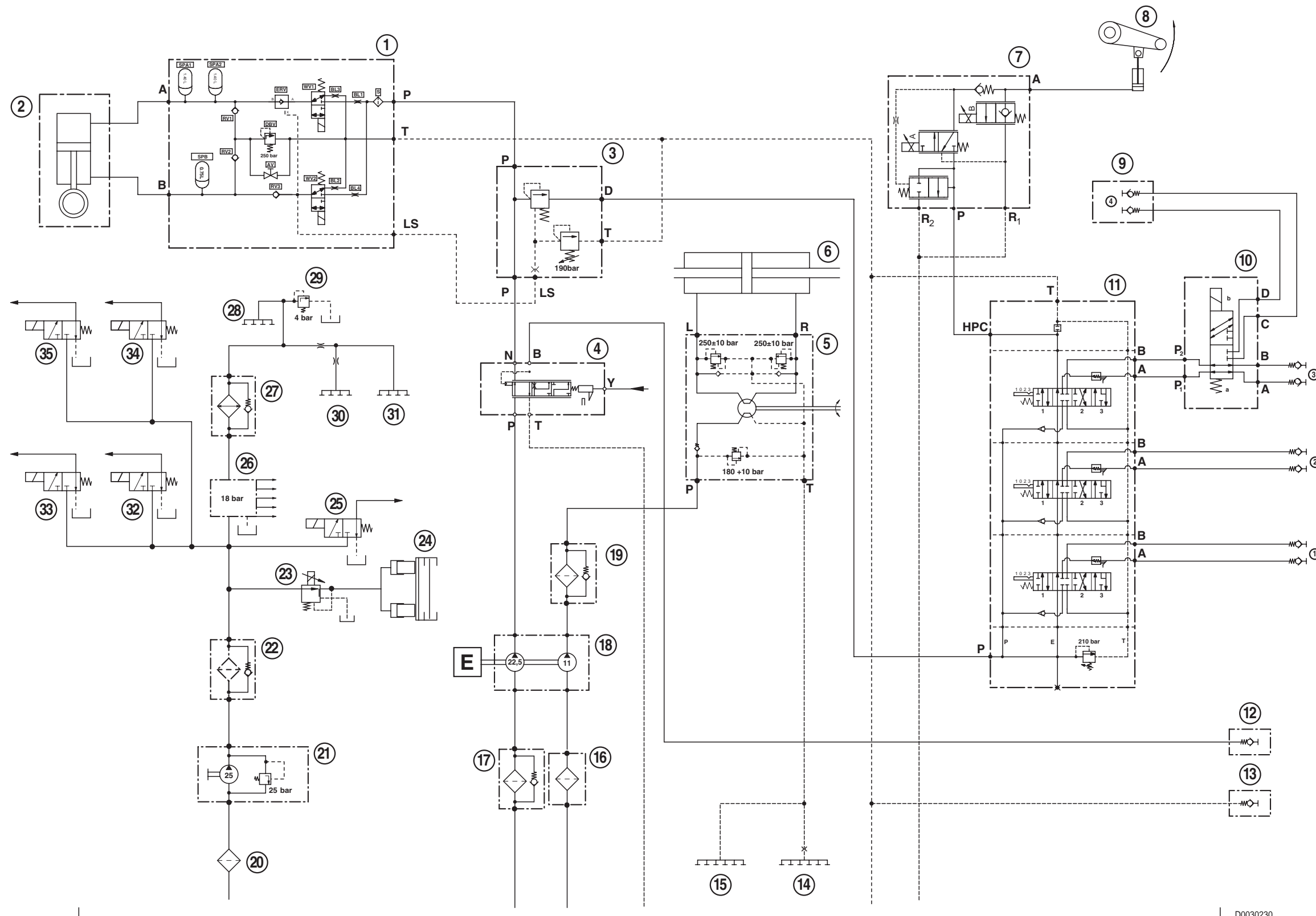
5.1 HYDRAULIC DIAGRAM (standard version)



- 1. Power steering
- 2. Steering cylinder
- 3. Lift control valve (elements 3 and 4)
- 4. Lift
- 5. Auxiliary services control valve
- 6. Free drain
- 7. Pinion lubrication
- 8. Rear axle lubrication
- 9. Filter for steering circuit
- 10. Filter for services circuit
- 11. Gear pump for services and steering circuit
- 12. Steering circuit delivery filter
- 13. Filter for transmission circuit
- 14. Transmission gear pump
- 15. Filter for transmission circuit
- 16. Main clutch proportional solenoid valve
- 17. Main clutch
- 18. Four wheel drive (4WD) clutch solenoid valve
- 19. Hydraulic gearbox control valve
- 20. Oil cooler
- 21. Transmission lubrication
- 22. Lubrication circuit pressure relief valve
- 23. Differential lubrication
- 24. Rear PTO lubrication
- 25. Differential lock control solenoid valve
- 26. Rear PTO control solenoid valve
- 27. "FIELD" mode control solenoid valve
- 28. "ROAD" mode control solenoid valve

D0030220

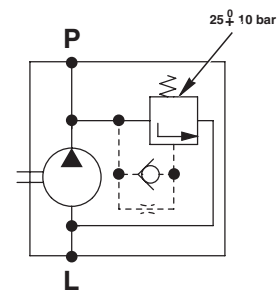
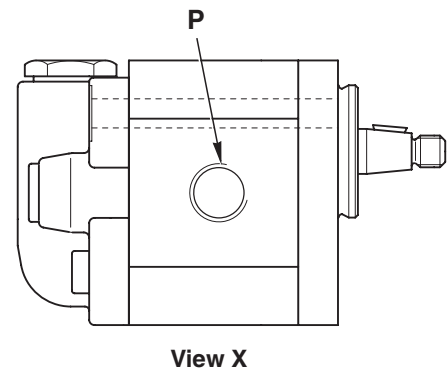
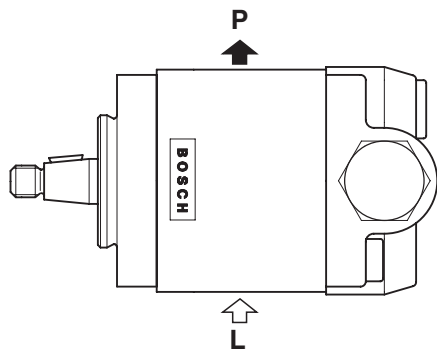
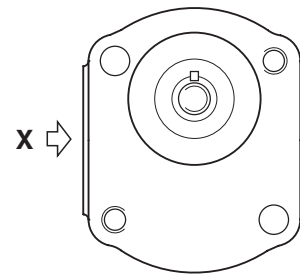
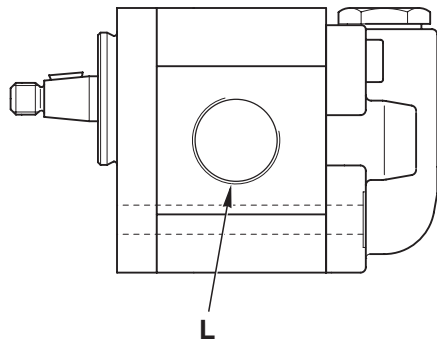
5.2 HYDRAULIC DIAGRAM (full version)



D0030230

1. Front axle suspension control valve
2. Front axle suspension cylinder (no. 2)
3. Priority valve for front axle suspension
4. Trailer braking valve
5. Power steering
6. Steering cylinder
7. Lift control valve
8. Lift
9. Front connection (connection no. 4)
10. Front lift mechanism solenoid valve
11. Auxiliary services control valve
12. Trailer brake connection
13. Free drain
14. Pinion lubrication
15. Brakes lubrication
16. Filter for steering circuit
17. Filter for services circuit
18. Gear pump for services and steering circuit
19. Steering circuit delivery filter
20. Filter for transmission circuit
21. Transmission gear pump
22. Filter for transmission circuit
23. Four wheel drive (4WD) clutch solenoid valve
24. Hydraulic gearbox control valve
25. Transmission lubrication
26. Lubrication circuit pressure relief valve
27. Oil cooler
30. Differential lubrication
31. Rear PTO lubrication
32. Differential lock control solenoid valve
33. Rear PTO control solenoid valve
34. "FIELD" mode control solenoid valve
35. "ROAD" mode control solenoid valve

5.3 GEAR PUMP FOR TRANSMISSION ZF 7100



D0011730

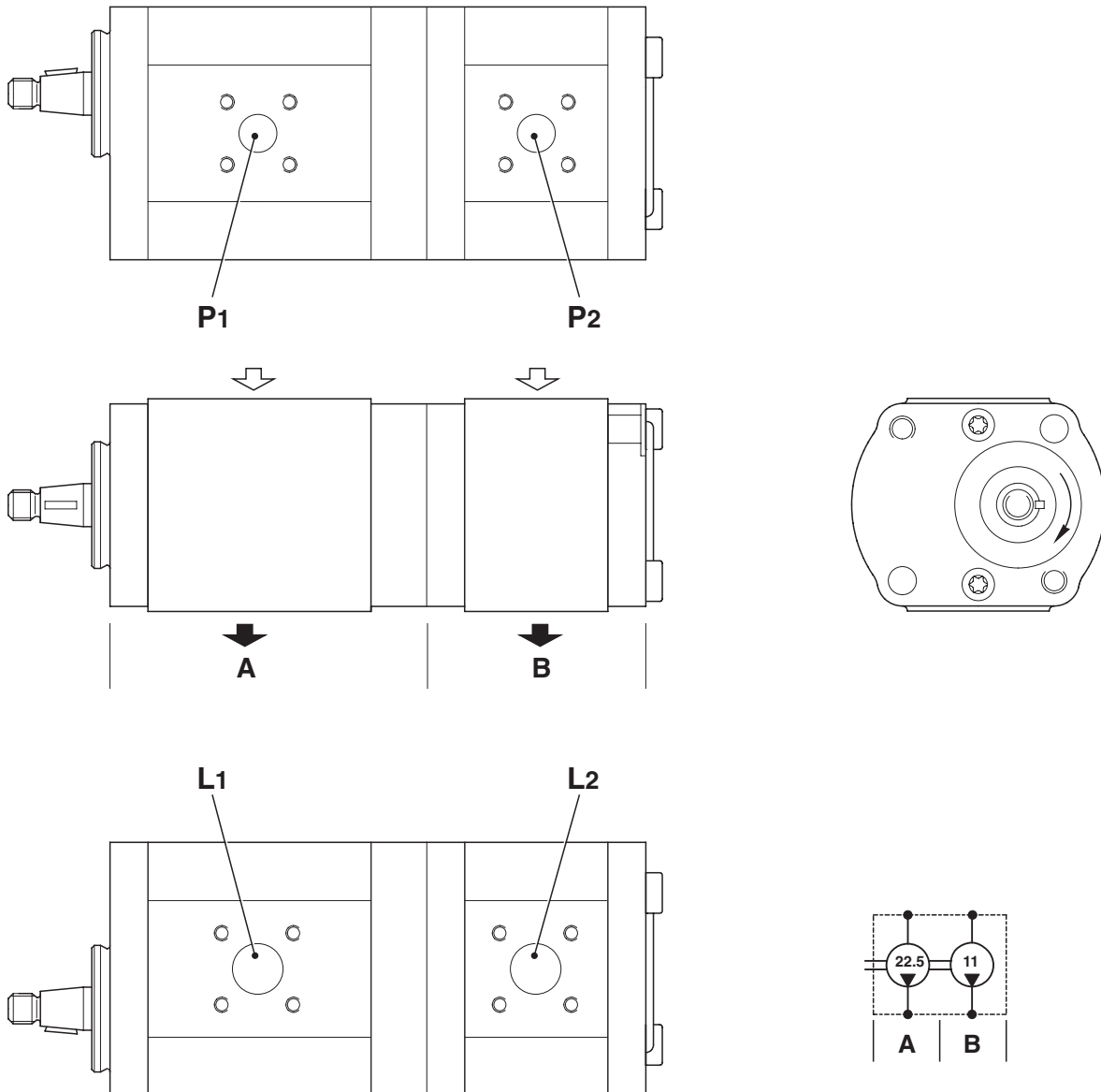
FUNCTION

Port L: suction
 Port P: delivery

CHARACTERISTICS

Displacement: 25 cc/rev (68 ℓ/min)
 Maximum pressure: 25 ± 10 bar

5.4 GEAR PUMP FOR SERVICES AND STEERING



D0030240

FUNCTION

- Port L1: suction
- Port L2: suction
- Port P1: services delivery
- Port P2: power steering delivery

CHARACTERISTICS

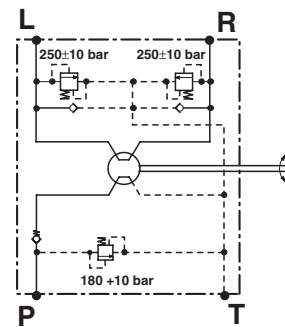
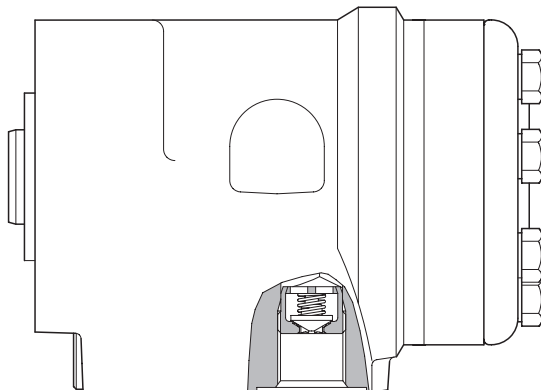
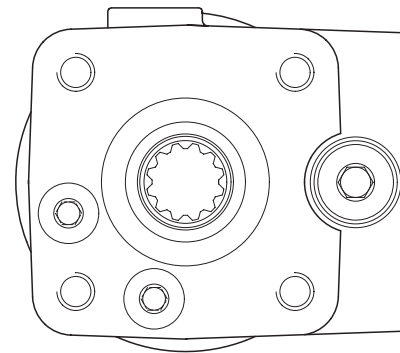
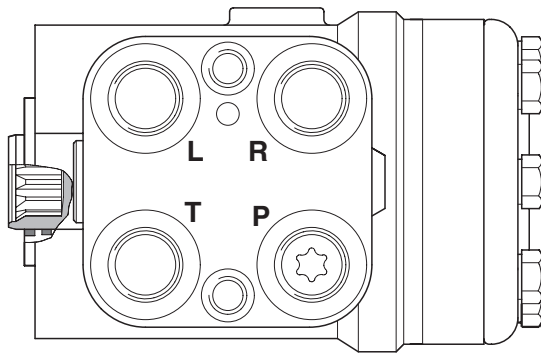
Pump A

- Displacement: 22.5 cc/rev (61.2 ℓ/min)
- Maximum pressure: 200 bar (2900 psi)

Pump B

- Displacement: 11 cc/rev (29.9 ℓ/min)
- Maximum pressure: 180 bar (2610 psi)

5.5 POWER STEERING



D0030250

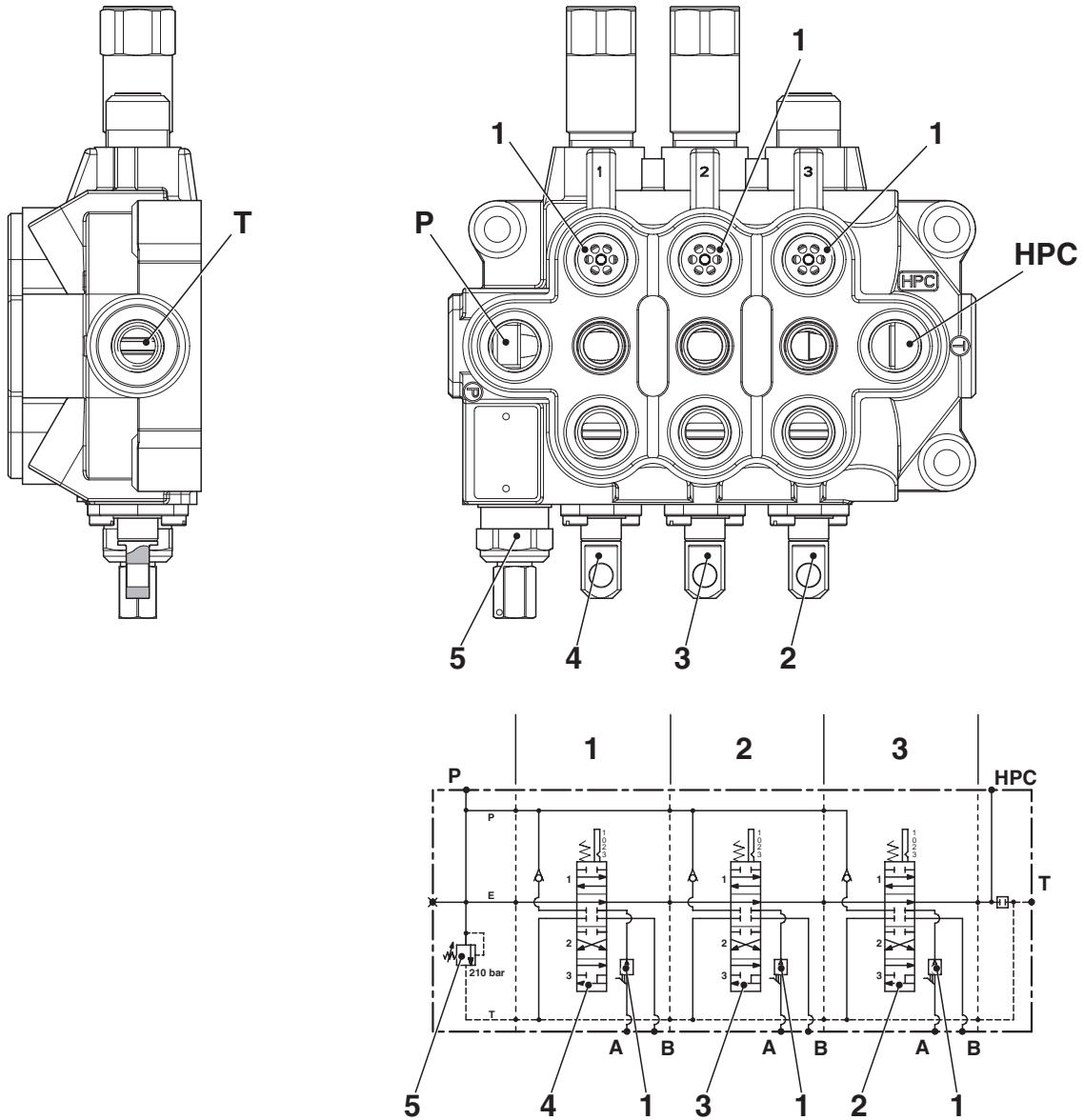
FUNCTION

- Port P: delivery
- Port T: outlet
- Port R: right steering
- Port L: left steering

CHARACTERISTICS

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

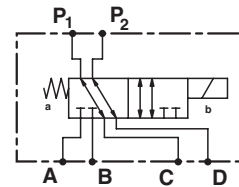
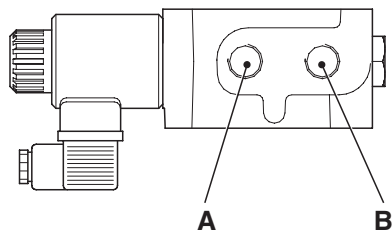
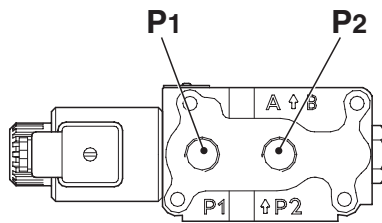
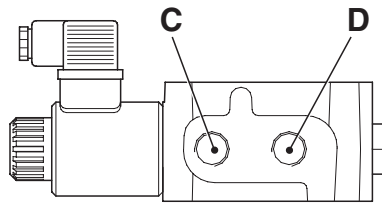
5.6 AUXILIARY SERVICES CONTROL VALVE



D0030260

- 1. Check valve
- 2. Control valve element no. 3
- 3. Control valve element no. 2
- 4. Control valve element no. 1
- 5. Pressure relief valve

5.7 FRONT LIFT MECHANISM SOLENOID VALVE



D0030320

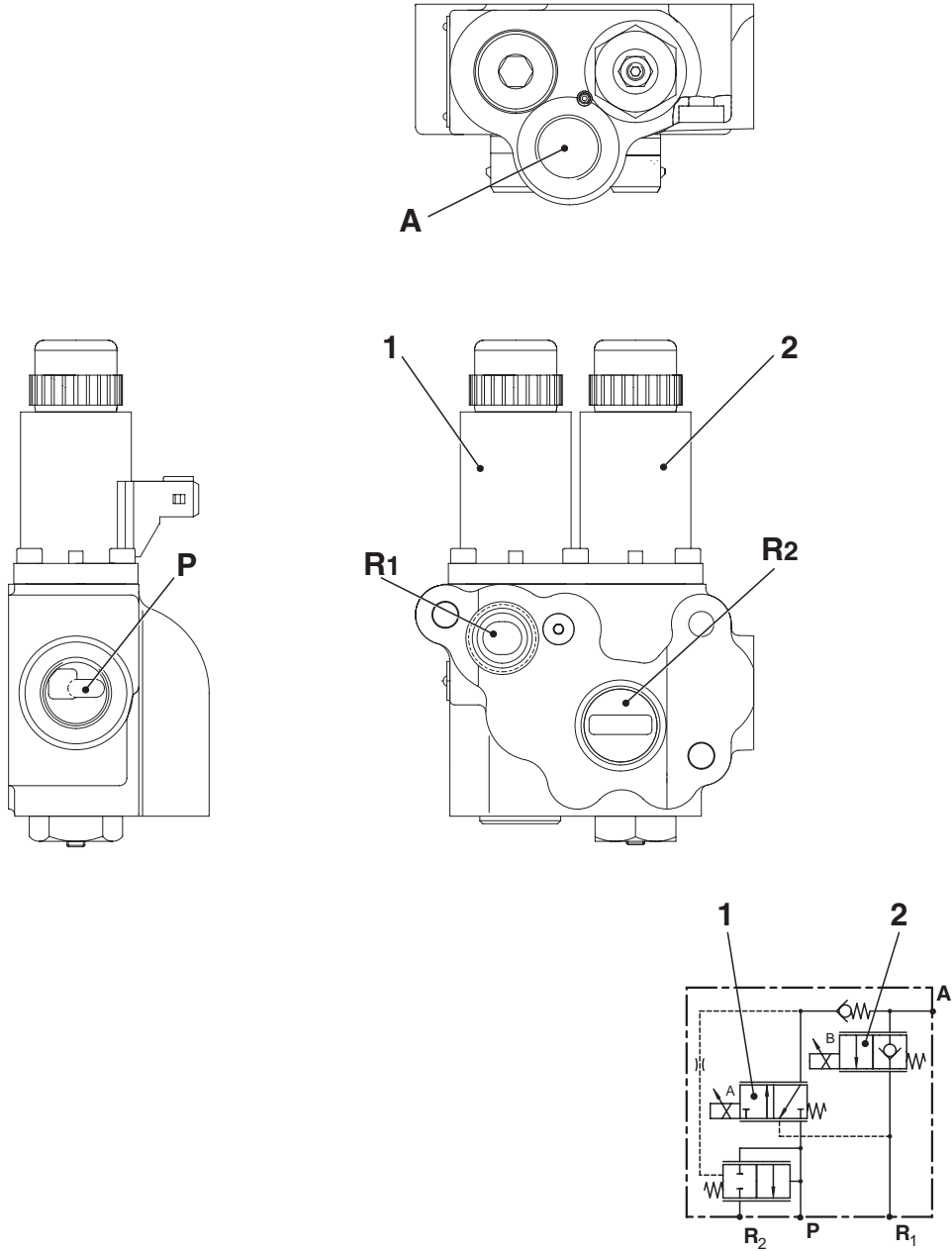
CONNECTION

P1 - P2 - Supply

A - B - 4th-way outlet

C - D - 3rd-way outlet

5.8 LIFT CONTROL ELEMENT



D0030270

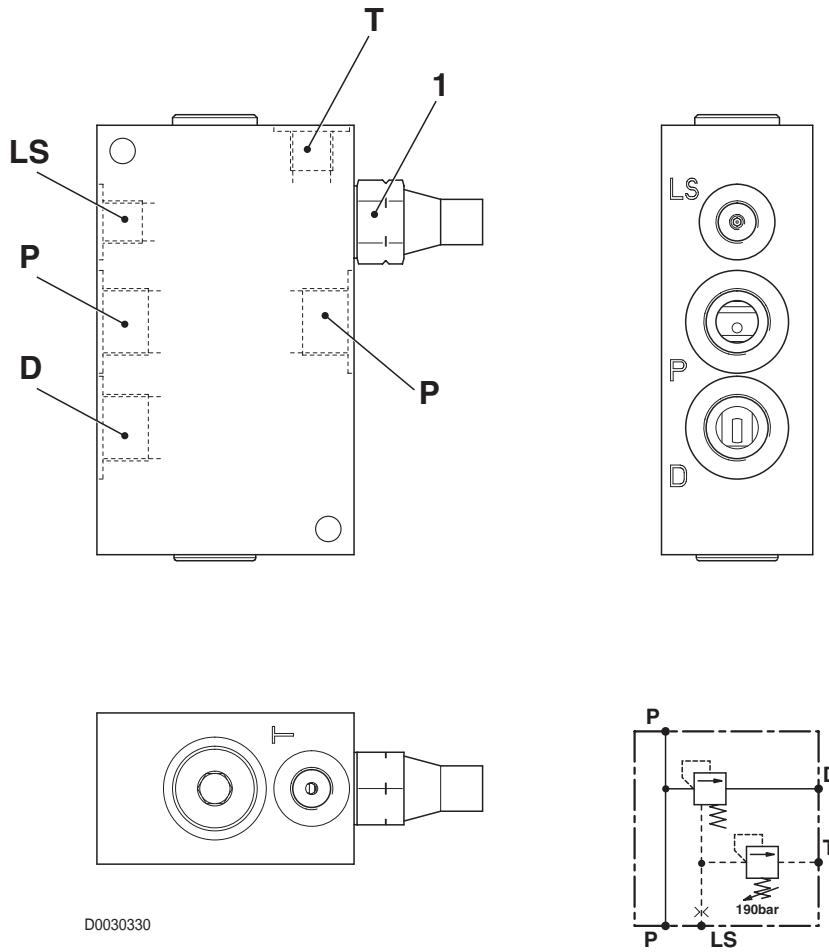
COMPONENTS

- 1. Down control solenoid
- 2. Up control solenoid

PORT CONNECTIONS

- P - Supply
- A - To lift cylinders
- R1 - Outlet
- R2 - Outlet

5.9 PRIORITY VALVE FOR FRONT AXLE SUSPENSION



COMPONENTS

- 1. Pressure relief valve

PORT CONNECTIONS

- P - Supply
- T - Exhaust
- LS - LS signal input
- D - Auxiliary services control valve supply

SECTION 20

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1. DIAGNOSIS TOOLS

1.1 ALL ROUND TESTER

To facilitate operations related to fault diagnosis, putting the tractor into service and functional testing of the electrical components of the lift systems, front axle suspension and ASM, service technicians are provided with an instrument called the All Round Tester (abbreviated to ART throughout the manual).

Using the ART, the technician can:

- display errors (faults) that have occurred;
- carry out sensor calibration or setting procedures;
- display data monitored by the various electronic control units (e.g. status of sensors) by which systems are managed.

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:



Pos	Alarm	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	Rear hydraulic lift diagnosis cable - BOSCH EHR4	1
		Engine electronic rpm control diagnosis and programming cable - type 1	1
		SBA system diagnosis cable - type 1	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 connection to armrest diagnosis socket	1
7	0.011.5445.4	Cable for connection to engine-transmission-lift control units diagnosis socket	1
8	0.010.2154.2	EPROM box	1
9	307.1056.8/60	CD ROM	1

CAUTION

To enable connection of the ART to the tractor's electronic system, a further adapter cable is required: part no. 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 overvoltages of momentary duration (1 msec).

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

The display is permanently backlit to ensure readability in any ambient light conditions.

A knob on the side allows adjustment of the contrast. If the display appears blank, the contrast control knob may be in a position that renders the characters invisible.

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 - A backlit liquid crystal display
- 2 - An alphanumeric keypad with 16 keys
- 3 - Display contrast control knob.
Used to adjust the contrast. If the display appears blank, it is possible that the contrast knob is adjusted in such a way that the data is not visible on the screen.
- 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 electronic system of the tractor, proceed as follows:

- 1 - switch off the engine and remove the starter key;
- 2 - connect the ART to a diagnosis socket;
- 3 - put 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.

		S	+	L	+	H		T	E	S	T	E	R		
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		V	E	R	S	I	O	N	E		x	x	x		
		T	E	S	T		B	A	T	T	E	R	I	A	
		I	N		C	O	R	S	O		!				
		T	E	N	S	I	O	N	E		x	x	.	x	V
		C	O	P	Y	R	I	G	H	T		1	9	9	1
				E	L	.	E	N	.		S	A	S		
						M	I	L	A	N	O				
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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 - Switch off the engine and remove the starter key
- 2 - Connect the ART to a diagnosis socket
- 3 - Press and hold **A** on the keypad, while inserting and positioning the starter key at “I” (ON).

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

		P	A	S	S	W	O	R	D	:					

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 language.
- 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 diagnosis 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 port settings, proceed as follows.

- 1 - Switch off the engine and remove the starter key
- 2 - Connect the ART to a diagnosis socket
- 3 - Press and hold A on the keypad, while inserting and positioning the starter key at "I" (ON)

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

		P	A	S	S	W	O	R	D	:								

- 5 - Press **2**.

	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 - Enable all 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

The SERDIA software package (part no. 5.9030.740.4/30) is designed to assist the technician in operations related to fault diagnosis, putting the tractor into service and testing electrical components of the engine. This software is to be installed on a portable computer.

With SERDIA, the technician can:

- display errors (faults) that have been detected;
- program the control unit;
- carry out sensor calibration procedures.

1.2.1 DESCRIPTION OF THE KIT

The SERDIA software is supplied to Authorised service centres in a carrying case with all the basic items required for its operation.

The case contains:



Pos.	Alarm	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

The SERDIA software communicates with the tractor's electronic control units via a diagnostics socket incorporated in the tractor wiring.

The SERDIA software is therefore supplied with an interface cable specific to the particular model and version of tractor being serviced.

1.3 EDS EST45 SOFTWARE

The EDS software package (part no.) is designed to assist the technician in operations related to fault diagnosis, putting the tractor into service and testing transmission and Infocenter components. The EDS software is to be installed on a portable computer.

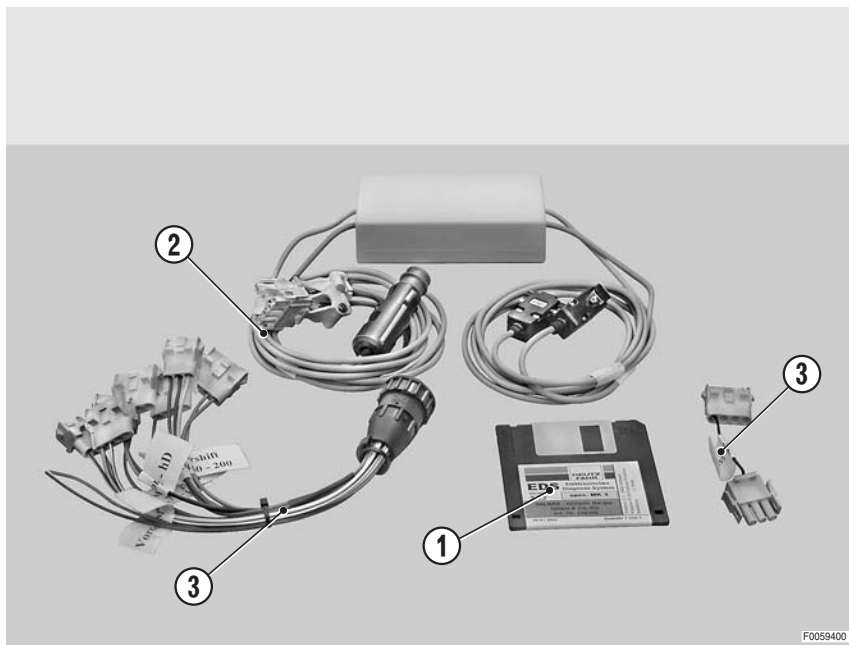
With EDS, the technician can:

- display errors (faults) that have been detected;
- configure the control unit;
- carry out sensor calibration procedures.

1.3.1 DESCRIPTION OF THE KIT

EDS is supplied to Authorised Service Centres complete with the following basic items required for its operation.

The kit includes:



Pos.	Alarm	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

The EDS software communicates with the tractor's electronic control units via a diagnostics socket incorporated in the tractor wiring.

The EDS software is therefore supplied with different interface cables specific to the various types of tractor, 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 diagnostics instruments provided for the use of the technician.

2.1 CONNECTING THE 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) (code 5.9030.861.4) to the ART® (2) (code 5.9030.730.0).
- 2 - Connect the connector (3) of the cable (2) to the cable (4) (part no. 0.012.6655.4) and insert the connector (5) in connector X4 located inside the right-hand console.
- 3 - Check that connectors (5) and X4 are securely connected.
- 4 - -Insert the starter key and turn to the "I" (ON) position to power up the tester.

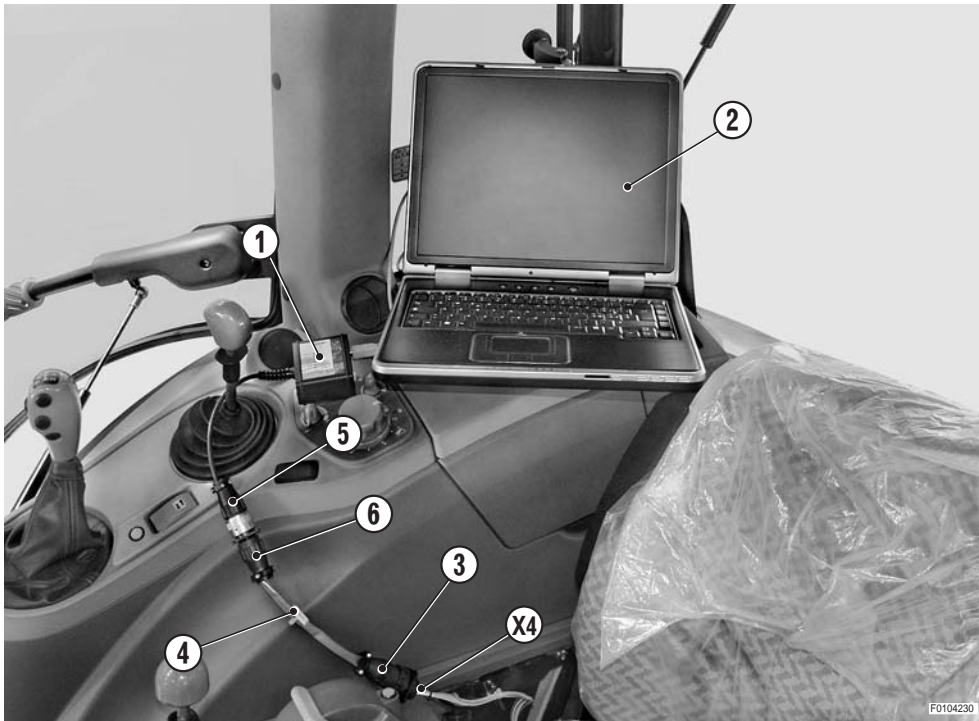
- 5 - On power up, the ART performs the battery level test.
- 6 - Press the key corresponding to the control unit to be tested.

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	P	S	A	-	2	0	5	H	L			
				S	C	E	L	T	A	-				

2.2 CONNECTING THE PORTABLE COMPUTER WITH "SERDIA 2000" SOFTWARE TO THE ENGINE ECU



- 1 - Connect the interface (1) (part no. 5.9030.740.2/10) to the USB port of the portable computer (2).
- 2 - Insert the connector (3) of cable (4) (part no. 5.9030.741.0) in connector X4 located inside the right-hand console.
- 3 - Connect the connectors (5) and (6).
- 4 - With the portable computer switched on and the Serdia programme launched, put the key in the starter switch and turn it to "I" (ON).

3. INTRODUCTION TO THE ELECTRONIC SYSTEM OF THE TRACTOR

3.1 ELECTRONIC SYSTEM

The tractors in this series are equipped with electronic control units for the management of various tractor 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 portable computer with SERDIA and EDS diagnostics software to the socket, the technician can program the operating parameters of the tractor according to the options available (front PTO, etc.), test the operation of the sensors and pushbutton controls, calibrate the sensors and carry out troubleshooting procedures.

By connecting the ART_ to the HLHP control unit, the operator can display all active and passive alarms generated by all the tractor's control units.

Alarms generated by the engine control unit, the HLHP control unit and the armrest are managed by the HLHP with two numeric codes: **SPN** (**S**uspect **P**arameter **N**umber) and **FMI** (**F**ailure **M**ode **I**dentifier).

The alarms generated by the transmission control unit are managed using the same alphanumeric codes used by the transmission control unit itself.

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". These are suitably encoded information that are transmitted over the network and used by other control units.

Some examples of the type of information sent over the CANBUS are 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 electronically manage 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 facility
- 4 - HLHP control unit
- 5 - Infocenter
- 6 - supplementary CANBUS socket.

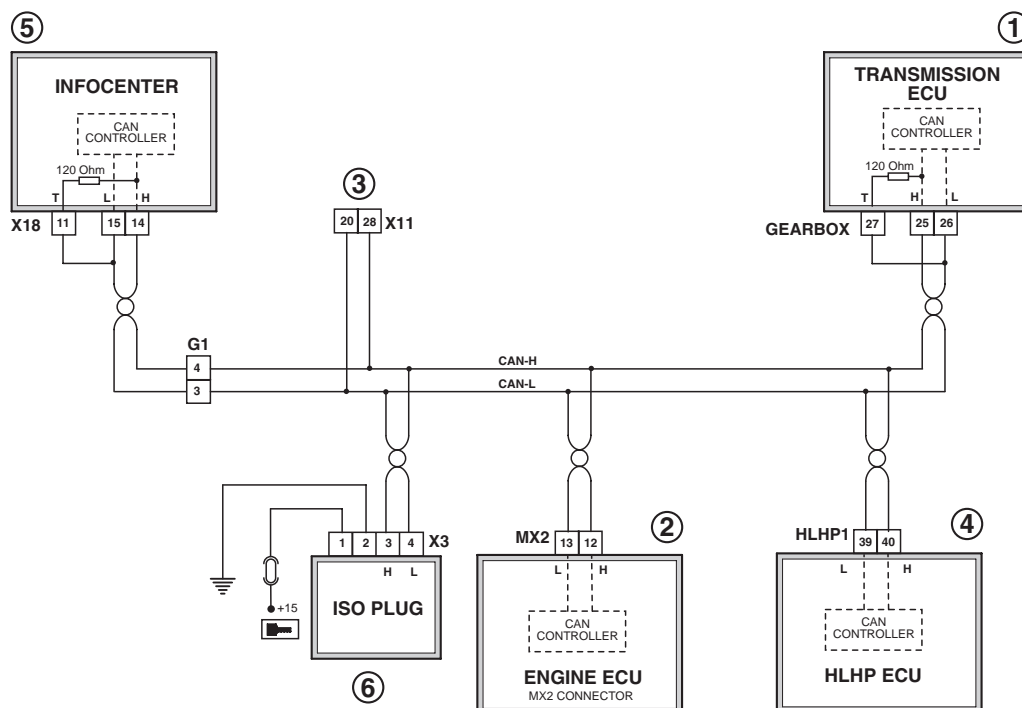
The CANBUS physically consists of a pair of braided wires, called CAN H and CAN L, on which the digital messages are transmitted.

The digital messages are generated by a "differential" voltage system that provides a high degree of immunity to any electromagnetic interference from on-board sources.

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). Both these control units are connected via the CANBUS wires to a 120 Ohm resistor.

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



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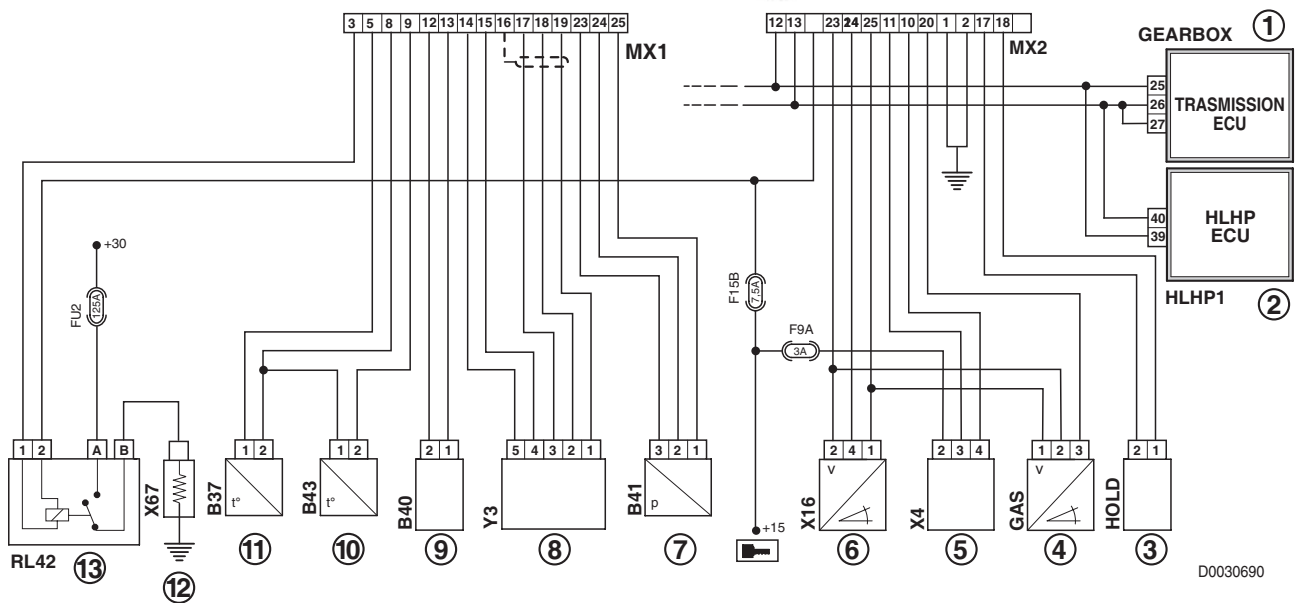
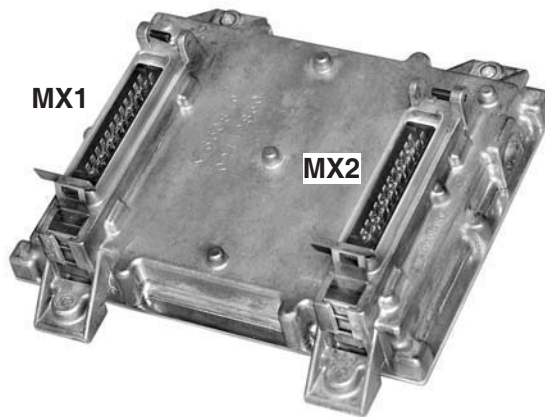
3.2.1 ENGINE CONTROL UNIT (DEUTZ EMR2)

The job of this control unit is to supervise the 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 pickup, coolant temperature, fuel temperature and boost pressure sensors, it sends a modulated voltage signal (PWM) to the actuator of the fuel injection pumps.

The engine control unit also supervises the preheating system, activating the preheating control relay in accordance with the coolant and fuel temperatures to improve engine starting in difficult conditions.

By connecting the ART(r) to the diagnostics socket located in the control units compartment, the technician can connect to the HLHP control unit and check if there are any active or passive alarms regarding the engine.

For a more in-depth analysis of engine faults or operation, the technician must connect a portable computer loaded with SERDIA software to the diagnostic socket.



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- | | |
|-------------------------------------|--|
| 1 - Transmission control unit | 8 - Actuator |
| 2 - HLHP control unit | 9 - Camshaft speed sensor |
| 3 - HOLD button | 10 - Engine coolant temperature sensor |
| 4 - Hand throttle potentiometer | 11 - Fuel temperature sensor |
| 5 - Diagnostic socket | 12 - Preheating device |
| 6 - Accelerator pedal potentiometer | 13 - Preheating relay |
| 7 - Engine boost pressure sensor | |

3.2.2 HLHP CONTROL UNIT

The HLHP control unit has been 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

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

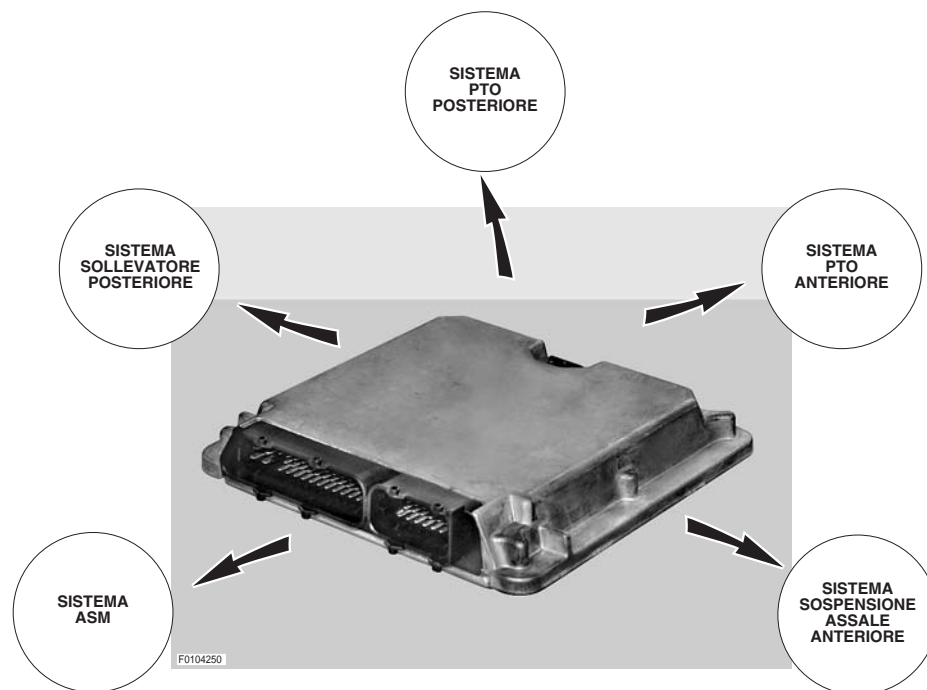
With the ART(r) it is also possible to view the list of alarms detected by the HLHP and engine control units.

These alarms are divided into two categories:

- active alarms, i.e. all those alarms of which the cause has not yet been removed;
- passive alarms, i.e. all those alarms of which the cause has been eliminated or which simply cease on their own.

Both these types of alarm are stored in memory in the form of an **SPN** code (**S**uspect **P**arameter **N**umber) and an **FMI** code (**F**ailure **M**ode Identifier). Through these codes the technician can troubleshoot the system and, using the options in the test and monitor menu screens, test operation of system components.

By connecting the ART(r) to the diagnostic socket, the technician can access the HLHP control unit to test components, program the control unit and display the active and passive alarms related to the HLHP, and the alarms detected by the engine and transmission control units.



3.2.2.1 REAR LIFT SYSTEM

The electronic system controls the lift in accordance with the commands received from the operator and the operating mode selected using the control panel on the right-hand console.

The operator can choose one of five control types:

- position control;
- draft control;
- depth/position control;
- wheelslip control;
- draft, wheelslip and depth control;
- transport lock.

The system also automatically activates the anti-pitching control if the tractor speed exceeds 8 km/h when the lift is in "locked" condition and the maximum lift height knob is turned fully clockwise

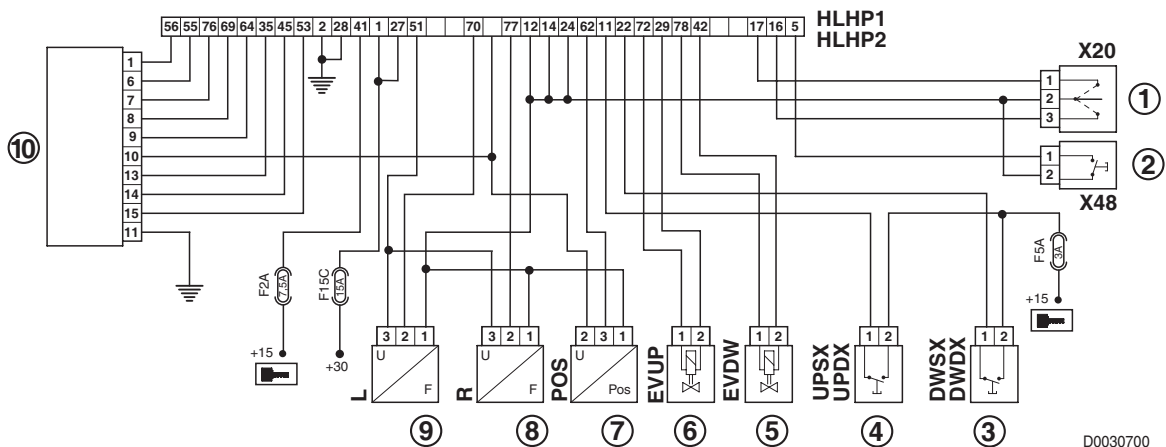
The transport lock can also be engaged manually by the operator, but for safety reasons, it is engaged automatically by the control system when the tractor is in motion for more than three minutes and the lift is in stop condition or when the tractor speed exceeds 20 km/h.

The system compares the command given by the operator with the signals transmitted from the wheel speed sensor and the radar, and executes the command by operating a directional control valve equipped with two solenoid valves.

The directional control valve sends oil under pressure to the two hydraulic rams that raise and lower the implement attached to the lift.

The lift control console, the system sensors and the lift control pushbuttons mounted on the rear fenders are directly connected to the HLHP control unit .

For more detailed information on the operation of the power lift, see the use and maintenance manual for the specific tractor.



D0030700

- | | |
|----------------------------------|--------------------------------|
| 1 - Lift control switch | 6 - Lift 'Up' control solenoid |
| 2 - Lift lock control switch | 7 - Lift position sensor |
| 3 - Rear lift 'Down' pushbuttons | 8 - Right draft sensor |
| 4 - Rear lift 'Up' pushbuttons | 9 - Left draft sensor |
| 5 - Lift 'Down' control solenoid | 10 - 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 has two pushbuttons available, one which activates the rear PTO and one which activates the AUTO PTO system.

The in-cab pushbutton controls for the front and rear PTOs are connected to the armrest, while the rear PTO speed selector, the pushbuttons mounted on the rear fenders and all the other components of the system are connected directly to the HLHP control unit.

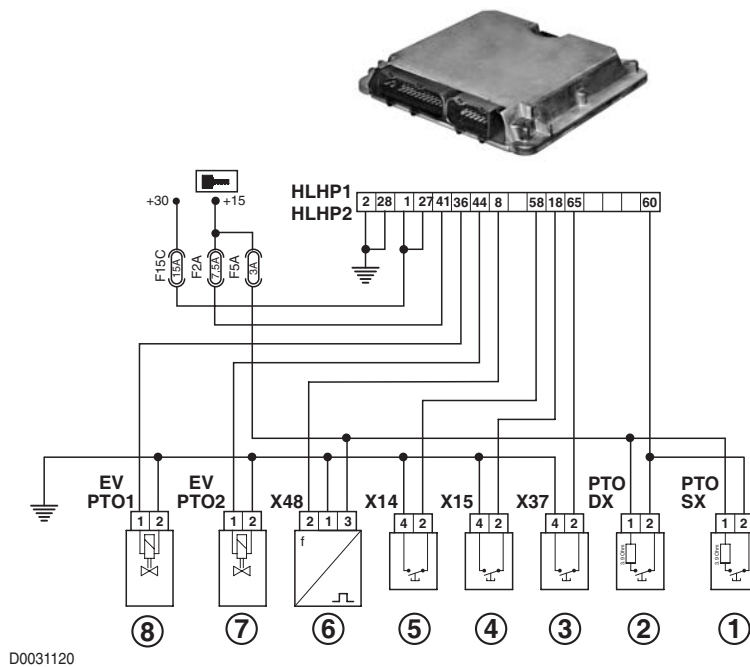
The system receives the command given by the operator and activates accordingly the rear PTO and speed selector solenoid valves that send oil under pressure to the PTO clutches and the speed selector.

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, please consult the specific use and maintenance manual for the tractor.



D0031120

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

3.2.2.4 FRONT AXLE SUSPENSION SYSTEM

This system, when activated by the operator pressing the pushbutton on the armrest, automatically controls the height 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.

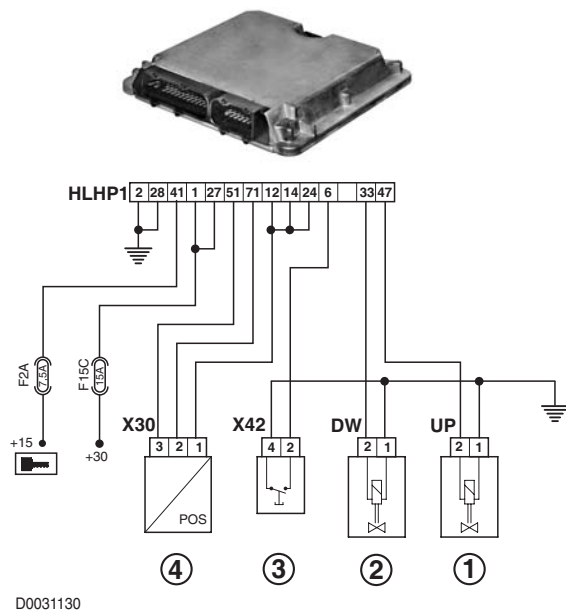
At this point, the control unit deactivates the solenoid valves, but the system remains active. When the axle position varies during tractor motion, the control unit automatically makes the necessary corrections to return the axle to the programmed height.

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 that is 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, please 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

This system, when activated by the operator, automatically controls the engagement and disengagement of the four-wheel drive and the differential locks.

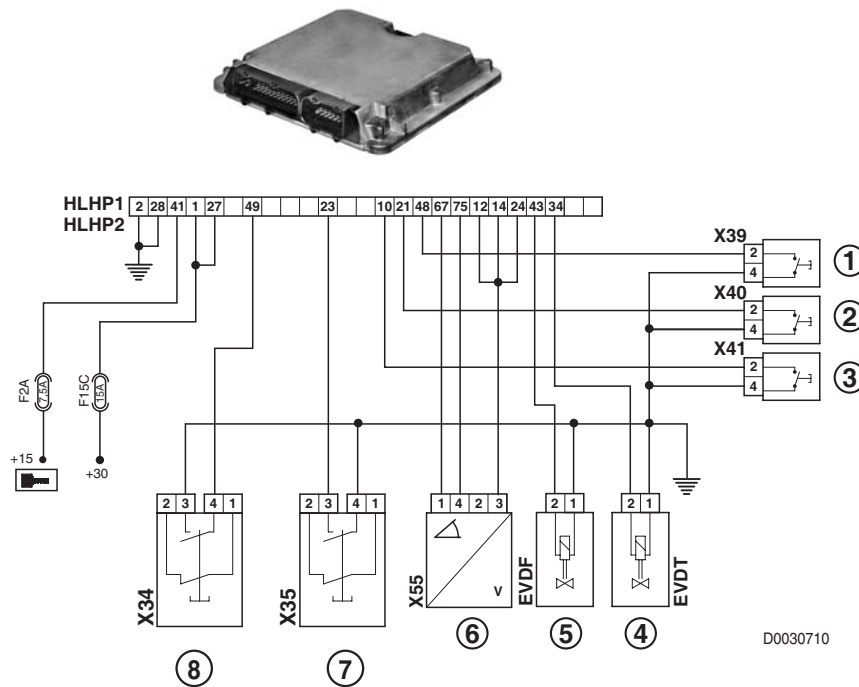
The parameters used to determine exclusion of the differential lock and disengagement of the four-wheel drive are:

- ground 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 and programmed parameters, activates or deactivates the solenoid valves controlling engagement of the four-wheel drive and the differential locks.

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



D0030710

- 1 - ASM activation switch
- 2 - Differential lock control switch
- 3 - 4WD control switch
- 4 - 4WD control solenoid
- 5 - Differential lock control solenoid
- 6 - Steering angle sensor
- 7 - Right brake pressed sensor
- 8 - Left brake pressed sensor

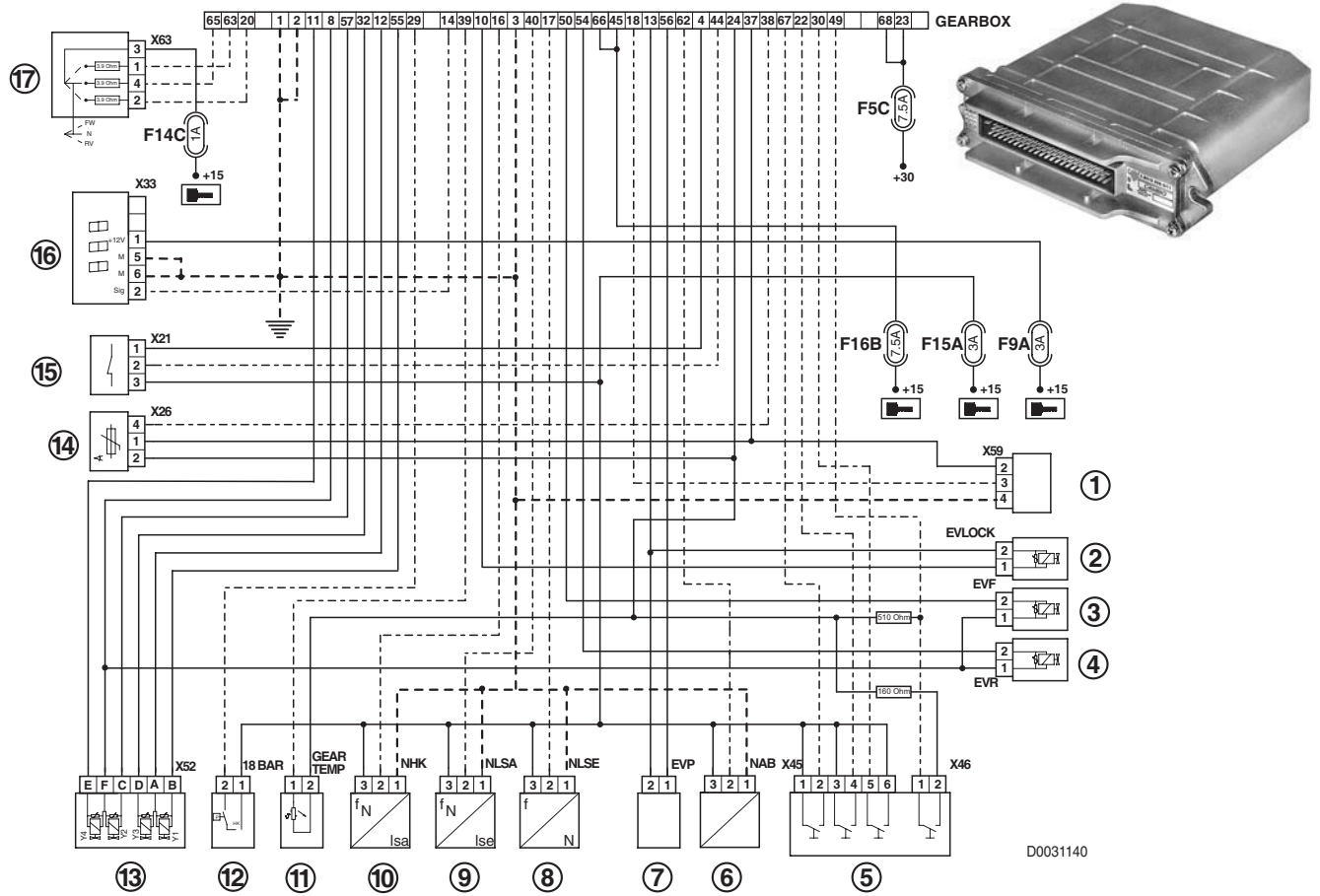
3.3 TRANSMISSION CONTROL UNIT

The function of the transmission control unit is to supervise the operation of the transmission; it receives commands from the operator by way of the shuttle lever, the range selection buttons and the clutch pedal, and, according to the signals returned by the engine speed and torque sensors, it shifts between the ranges selected with the controls by piloting the 8 solenoid valves that operate the clutches.

The control unit is connected to a display that provides the operator with information regarding the transmission operating status (direction of travel selected, range engaged, etc.) and signals the alphanumeric codes of any alarms detected. By connecting a portable computer loaded with EDS software, the technician can connect to the transmission control unit and display any alarms regarding the transmission.

Alarms managed by the transmission control unit are divided into two categories: active and passive.

On EDS, all the alarms are displayed in two windows, with indications for the number of the detected alarm, the status of the alarm (active or passive), the number of times the alarm has been detected and time in terms of transmission operating hours at which the alarm was first detected.



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

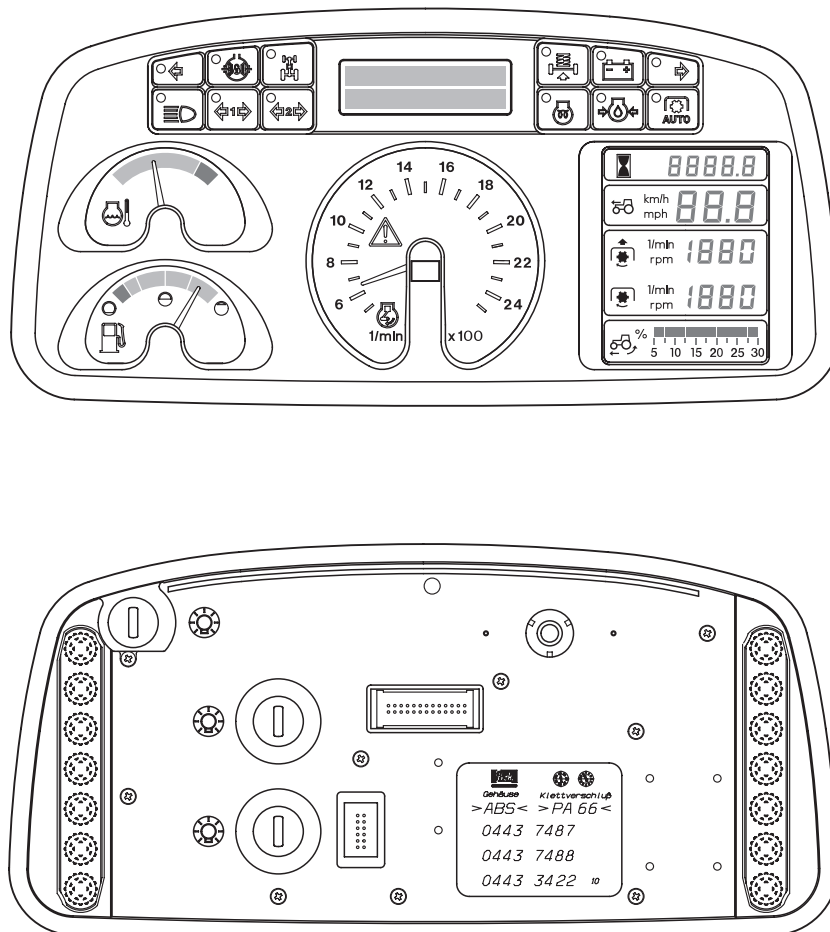
3.4 INFOCENTER

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 to alert the operator to 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 indicating engine rpm, fuel level, etc..

The instrument panel also incorporates indicator lights showing the operating status of various tractor systems, or the presence of faults (e.g. clogged oil filter, 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.



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4. COMMISSIONING THE TRACTOR

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 RENEWAL OF THE ENGINE CONTROL UNIT

Two versions of the engine control unit are available as replacement parts:

- 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.

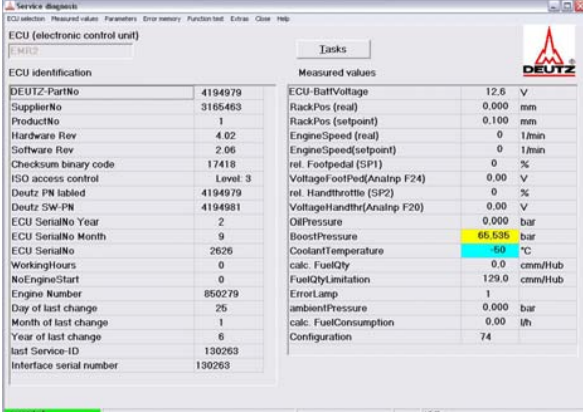
If the control unit is faulty and it is not possible to read the complete DATASET, it will be necessary to order a control unit with DATASET (provide the engine serial number indicated on the name plate of the control unit plate and the engine data plate). In this case it will only be necessary carry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

NOTE

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

4.2.1 READING AND SAVING DATA

- 1 - Connect a portable computer loaded with the SERDIA program (for details see "2.2 CONNECTING THE PORTABLE COMPUTER WITH "SERDIA 2000" SOFTWARE TO THE ENGINE ECU").
- 2 - Turn the starter key to "I" (ON) and launch the SERDIA program.
- 3 - From the "PARAMETER" menu, select the option "OVERALL PROGRAMMING".



The screenshot shows the SERDIA software interface with two main panels: 'ECU identification' and 'Measured values'.

ECU identification		Measured values	
DEUTZ-PartNo	4194979	ECU-BattVoltage	12.6 V
SupplierNo	3185463	RackPos (real)	0.000 mm
ProductNo	1	RackPos (setpoint)	0.100 mm
Hardware Rev	4.02	EngineSpeed (real)	0 1/min
Software Rev	2.06	EngineSpeed(setpoint)	0 1/min
Checksum binary code	17418	rel. Footpedal (SP1)	0 %
ISO access control	Level 3	VoltageFootPed(Anatnp F24)	0.00 V
Deutz PN labled	4194979	rel. Handthrottle (SP2)	0 %
Deutz SW-PN	4194981	VoltageHandthr(Anatnp F20)	0.00 V
ECU SerialNo Year	2	DilPressure	0.000 bar
ECU SerialNo Month	9	BoostPressure	65.535 bar
ECU SerialNo	2626	CoolantTemperature	-59 °C
WorkingHours	0	calc. FuelQty	0.0 cmm/Hub
NoEngineStart	0	FuelQtyLimitation	129.0 cmm/Hub
Engine Number	850279	ErrorLamp	1
Day of last change	25	ambientPressure	0.000 bar
Month of last change	1	calc. FuelConsumption	0.00 l/h
Year of last change	6	Configuration	74
last Service-ID	130263		
Interface serial number	130263		

4. COMMISSIONING THE TRACTOR

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

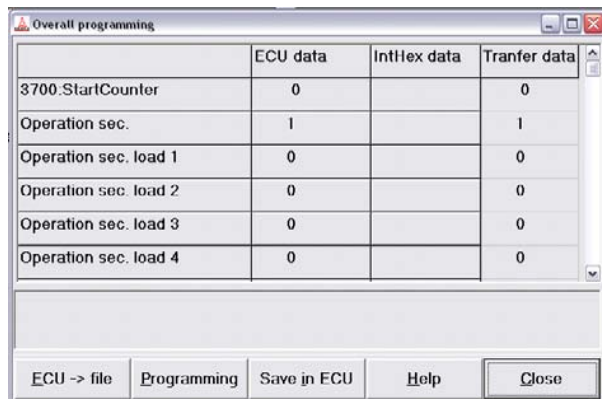
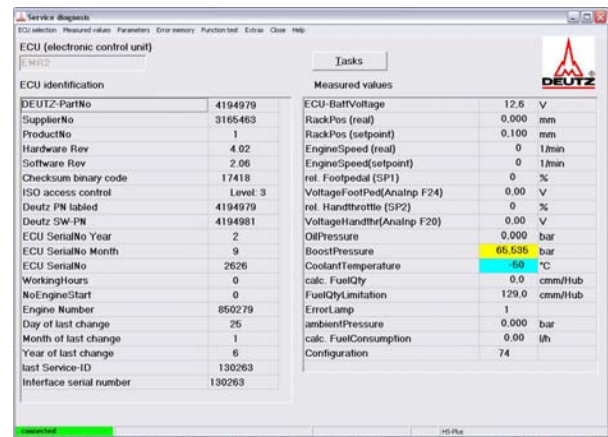
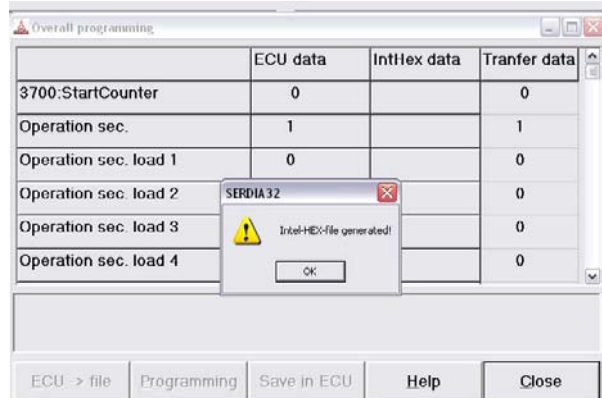
NOTE

Make sure that the file has in fact been saved
The files are automatically saved with the following names: 00444444.hex where the digits "44444" correspond to the engine serial number.

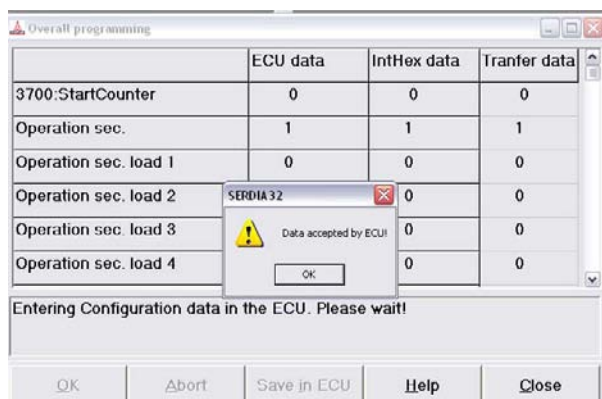
4.2 RENEWAL OF THE ENGINE CONTROL UNIT

4.2.2 PROGRAMMING THE CONTROL UNIT

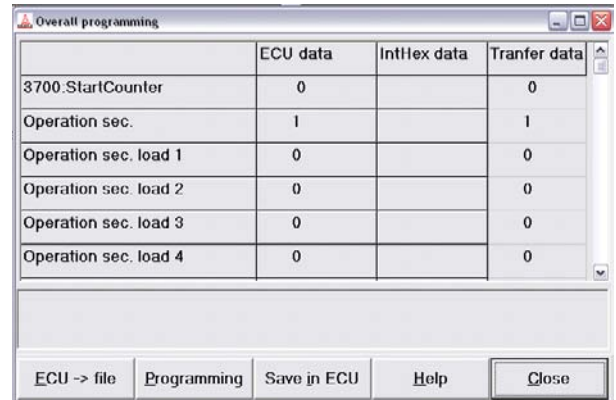
- Connect a portable computer loaded with the SERDIA program (for details see "2.2 CONNECTING THE PORTABLE COMPUTER WITH "SERDIA 2000" SOFTWARE TO THE ENGINE ECU").
- Turn the starter key to "I" (ON) and launch the SERDIA program.
- From the "PARAMETER" menu, select the option "OVERALL PROGRAMMING".
- Click on "PROGRAMMING" and select the file saved previously, or obtained from Technical Assistance.



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

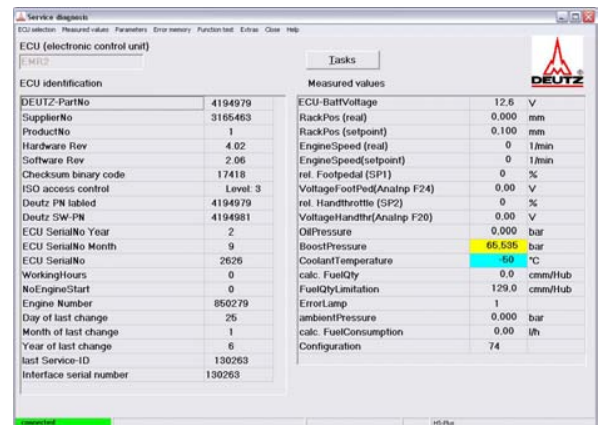


- 6 - At this point, carry out the procedure to set the engine operating hours (for details, see "4.2.3 PROCEDURE FOR SETTING THE ENGINE OPERATING HOURS" starting from point 4).

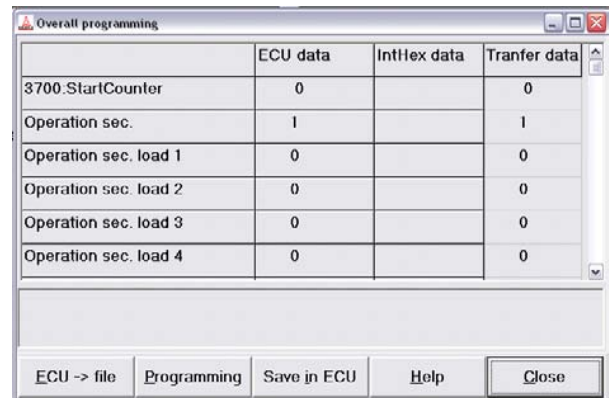


4.2.3 PROCEDURE FOR SETTING THE ENGINE OPERATING HOURS

- 1 - Connect a portable computer loaded with the SERDIA program (for details see "2.2 CONNECTING THE PORTABLE COMPUTER WITH "SERDIA 2000" SOFTWARE TO THE ENGINE ECU").
- 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 the 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.

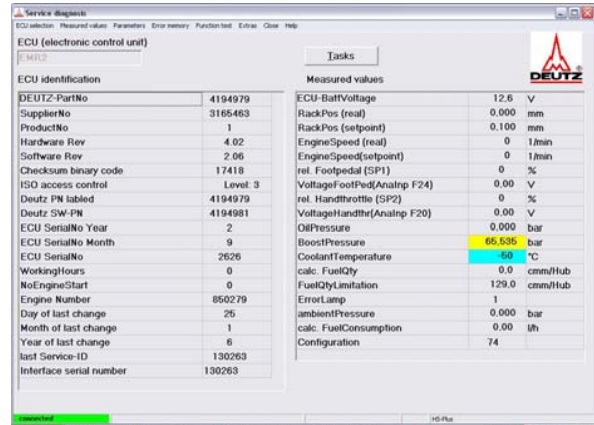


4.2.4 CALIBRATION OF THE ACCELERATOR PEDAL (USING THE SERDIA PROGRAM)

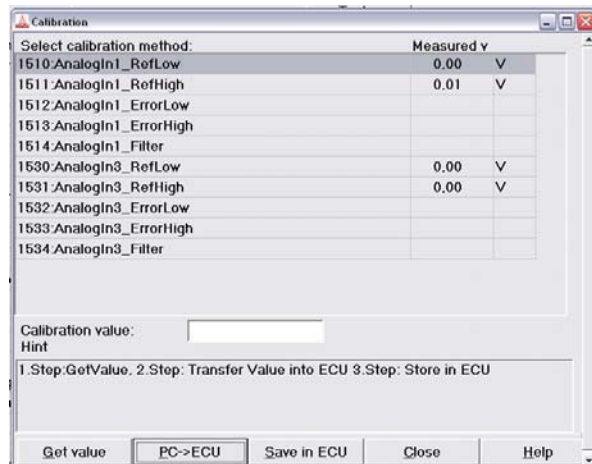
NOTE

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

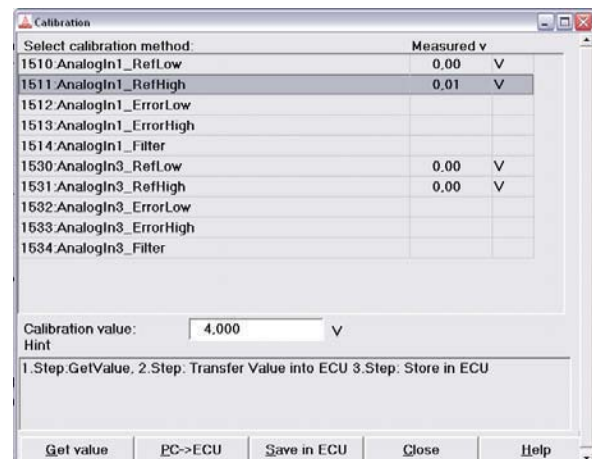
- 1 - Connect a portable computer loaded with the SERDIA program (for details, see "Connection of a portable computer with "SERDIA" software to the engine control unit"), turn the starter key to "I" (ON) and launch the SERDIA program.
- 2 - From the "PARAMETER" menu, select the option "CALIBRATION".



- 3 - Select the line containing the parameter "1510: AnalogIn1_RefLow", slightly depress the accelerator pedal and release it, then click the button "GET VALUE" to get the software to read the value.
- 4 - Click "PC->ECU", then click "SAVE IN ECU" to save the new parameter.



- 5 - Select the line containing the parameter "1511: AnalogIn1_RefHigh" and fully depress the accelerator pedal, and, while holding it depressed, click on "GET VALUE" to get the software to read 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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see: "2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").

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

3 - Press "**9 - ENGINE**".

4 - Press "**1 - Accel. pedal**".

		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						

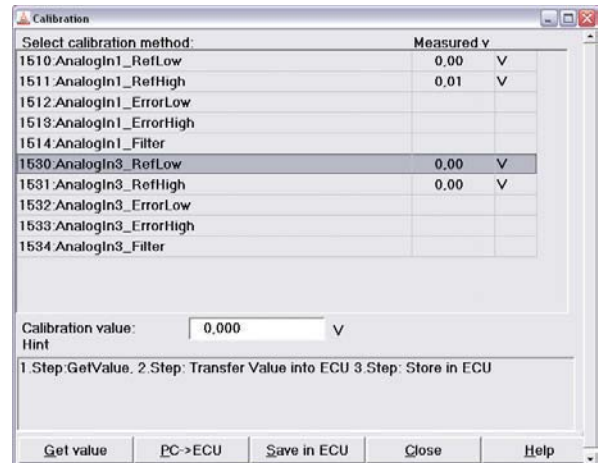
C	A	L	I	B	R	A	T	I	O	N		M	E	N	U
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	T	r	a	s	m	i	s	s	i	o	n			
2	-	P	T	O											
3	-	A	S	M											
4	-	L	i	f	t										
5	-	S	u	s	p	e	n	s	i	o	n				
6	-	S	y	s	t	e	m								
7	-	C	A	N											
8	-	D	i	s	t	r	i	b	u	t	o	r			
9	-	E	n	g	i	n	e								
		[	E	]		E	x	i	t						

		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						

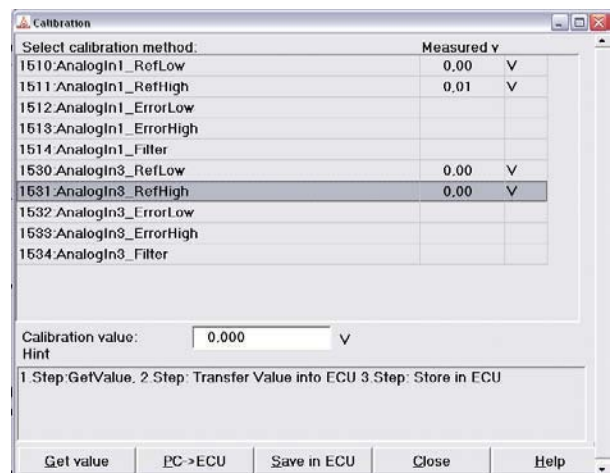
4. COMMISSIONING THE TRACTOR

- 3 - Select the line containing the parameter "1530: AnalogIn3_RefLow" and slightly depress the accelerator pedal and release it, then click "GET VALUE" to get the software to read the value.
- 4 - Click "PC->ECU", then click "SAVE IN ECU" to save the new parameter.

4.2 RENEWAL OF THE ENGINE CONTROL UNIT



- 5 - Select the line containing the parameter "1531: AnalogIn3_RefHigh" and fully depress the accelerator pedal, and, while holding it depressed, click on "GET VALUE" to get the software to read 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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see:"2.1 CONNECTING THE 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					

4. COMMISSIONING THE TRACTOR

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

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

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

8 - If the 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 that the accelerator pedal sensor is not faulty or installed incorrectly, then repeat the procedure.

4.2 RENEWAL OF THE ENGINE CONTROL UNIT

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 RENEWAL OF THE TRANSMISSION CONTROL UNIT

NOTE

All the control unit configuration and programming procedures can be performed using either the WINEDS program or using the ART connected to the HLHP control unit.

The procedure using the ART is described below.

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

- 1 - Configuration of the model
- 2 - Configuration of the basic wheel
- 3 - Configuration of the wheel circumference
- 4 - Configuration of the maximum travel speed (German market only)
- 5 - Calibration of the clutch pedal
- 6 - Calibration of the main clutch
- 7 - Calibration of the FIELD/ROAD sensor
- 8 - Cancellation

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 CONFIGURATION OF THE MODEL

NOTE

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

- 1 - Connect the ART to the connector located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see: "2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").
- 2 - From the "MAIN MENU" press "**2 - CALIBRATIONS**".

- 3 - Press "**1 - Transmission**".

		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							

		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							

4.3.2 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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see:"2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").
- 2 - From the "MAIN MENU" press "2 - CALIBRATIONS".

- 3 - Press "1 - Transmission".

- 4 - Press "1 - Configuration".

		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						

		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								

		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 "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" save 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 CV 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 5).

7 - The screen page is displayed and if the operation was not performed correctly, the technician has the possibility to 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.

FOR GERMAN MARKET ONLY

8 - Calibrate the maximum travel speed (for details, see "4.3.5 CONFIGURATION OF THE MAXIMUM TRAVEL SPEED (FOR 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 course placed 100 metres apart. The tractor must be driven over the course at a speed greater than 2 km/h.

- 1 - Park the tractor near to 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 display will show the message "CALIBRAZIONE RUOTE" (EN = WHEEL CALIBRATION, FR = ETALONNAGE ROUES, DE = EICHUNG RADKREIS); at this point, release the headlights control lever and move off.
- 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 "Calibrazione in corso" (EN = Calibration in progress, FR = Etallonage avancer, DE = Eichung Radkreis) 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 "Calibrazione terminata con successo" (EN = Wheel successfully calibrated, FR = Wheel successfully calibrated, DE = Eichung Radkreis erfolgreich).

NOTE

The calibration will be automatically cancelled and the Infocenter will display the message "Errore di calibrazione valore fuori limite" (EN = Calibration error value out of range, FR = Calibration error value out of range, DE = Eichung nicht erfolgreich) when:

- a - measurement is not initiated within 60 seconds of the appearance of the message "CALIBRAZIONE RUOTE" (EN = WHEEL CALIBRATION, FR = ETALONNAGE ROUES, DE = EICHUNG RADKREIS);
- b - measurement is not terminated within 180 seconds of it 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 (FOR 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 is 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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see: "2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").
- 2 - From the "MAIN MENU" press "2 - CALIBRATIONS".

- 3 - Press "1 - Transmission".

		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						

		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".

	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 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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see: "2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").
- 2 - From the "MAIN MENU" press "2 - CALIBRATIONS".

- 3 - Press "1 - Transmission".

- 4 - 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						

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						

	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						

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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see: "2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").
- 2 - From the "MAIN MENU" press "2 - CALIBRATIONS".
- 3 - Press "1 - Transmission".

		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					

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 - Calibrations".

		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						

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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see:"2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press "2 - CALIBRATIONS".

3 - Press "1 - Transmission".

4 - 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						

		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								

		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								

4.4 RENEWAL OF THE HLHP CONTROL UNIT

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 - Set the type of PTO output shaft
- 10 - Setting the Infocenter display language

CAUTION

On completion of the operations, the power must be switched off and then back on 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 fuse box 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 introductory menu press "0" twice.

						H	L	H	P						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		K		S	T	A	N	D	A	R	D				
			S	C	.	0	0	3	7	.	A	A			
			g	g	-	m	m	-	a	a	a	a			
T	R	A	N	S	M	.	:		N	o	C	o	n	f	
S	P	E	E	D			:		2	0		k	m	/	h
T	Y	R	E				:		1	8	.	4	R	3	8
S	U	S	P	.			:		N	o					
A	S	M					:		N	o					
P	T	O	f	o	r	w	:		N	o					
R	A	D	A	R			:		N	o					
		[E]		E	X	I	T						

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4.4 RENEWAL OF THE HLHP CONTROL UNIT

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

=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t									

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

=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
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									

4 - Press "0" and wait for the screen indicating that control unit initialization has been completed correctly.

5 - Press "E" turn the starter key to "0" (OFF) and then back to "I" (ON), then proceed with the calibration of the sensors and configuration of the options.

=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t									

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

- 1 - Connect the ART to the connector located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see:"2.1 CONNECTING THE 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 "2 - PTO".

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-Front PTO.".

					P	T	O							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	F	r	o	n	t	P	T	O					
2	-	N	r	.	T	e	e	t	h					
3	-	A	u	t	o	L	i	m	i	t				
		[E]	E	x	i	t						

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

NOTE

- The option "2 - PRESENTE AUTO" 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).

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

4.4.3 ENABLING THE ASM SYSTEM (ONLY IF INSTALLED)

- 1 - Connect the ART to the connector located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see: "2.1 CONNECTING THE 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 "**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-Enab.**".

						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 and press "**C**" to save 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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see:"2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").

2 - From the "MAIN MENU" press "2 - CALIBRATIONS".

3 - Press "3 - ASM".

4 - Press "7-Steer.Cal".

		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						

		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								

						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								

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					

4. COMMISSIONING THE TRACTOR

4.4 RENEWAL OF THE HLHP CONTROL UNIT

- 4 - Press "**2 - Calibrations**".
- 5- Unlock the lift by holding pressed the Lock key. When the frequency at which the red LED is flashing changes, the lift is unlocked.

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							

- 6 - Press "**1**".
- 7 - 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).
- 8 - When the lift has arrived at its mechanical travel limit, press "**E**" to save the value.
- 9 - If the operation was not carried out correctly, press "**A**" to cancel it and restore the previous value, otherwise press "**C**" to confirm the new value and return to the "CALIBRATIONS" menu.

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

- 10 - Press "**2**".
- 11 - 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).
- 12 - When the lift has reached its upper travel limit, press the 'Down' button until the voltage reads approximately 0.35V less than the value registered at the travel limit, then press "**E**" to save the value to memory.
- 13 - If the operation was not carried out correctly, press "**D**" to cancel it and restore the previous value, otherwise press "**C**" to confirm the new calibration value and return to the "CALIBRATIONS" menu.

	C	A	L	I	B	R	A	T	I	O	N				
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l		:			5	0	5	0		
N	e	w				:				5	0	5	0		
		[	D	]	A	b	o	r	t						
		[	C	]	S	t	o	r	e						

- 14 - 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 INFOCENTER display language (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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see:"2.1 CONNECTING THE ART TO THE HLHP CONTROL UNITS").
- 2 - From the "MAIN MENU" press "2 - CALIBRATIONS".
- 3 - Press "5 - Suspensions".

	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					

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 "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 located in the compartment on the right-hand side of the cab, select the HLHP control unit from the "AVAILABLE TESTS" menu, then proceed as described. (For details, see:"2.1 CONNECTING THE 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						

4.4.9 CANCELLING ALL THE ALARMS

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

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

3 - press "9 - Cancellation".

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).

		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						

		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						

		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						

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 - **List of HLHP control unit alarms:** this table lists in alphanumeric order all the alarms directly related to the HLHP control unit and which can be displayed on the ART in menus 4.1 and 4.2.
For each alarm there is also a brief description of the cause.
- 3 - **List of engine control unit alarms:** this table lists in alphanumeric order all the alarms directly related to the engine control unit and which can be displayed by the ART in menus 4.3 and 4.4 when connected to the HLHP control unit.
For each alarm in the list, there is a brief description of the cause and the corresponding alarm that can be displayed using the Serdia program.
- 4 - **List of transmission control unit alarms:** this table lists in alphanumeric order all the alarms directly related to the transmission control unit and which can be displayed on the ART in menus 4.5 and 4.6 when connected to the HLHP control unit.
For each alarm in the list, there is a brief description of the cause and the corresponding response of the transmission control unit.
- 5 - **CAN BUS system alarms:** this section describes some of the alarms generated by the 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:** contains the first line of the alarm as shown on the display.
- **2nd line on display:** contains the second line of the alarm as shown on the display.
- **Code on ART:** contains the alarm code that can be retrieved by connecting the ART.
- **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. main clutch	TC-Warnings	10	TRANS M.	The control unit detects that the main clutch calibration values are outside the permissible limits	20-189
11-E2P clutch pedal	TC-Warnings	11	TRANS M.	The control unit detects errors in the main clutch calibration values	20-189
12-Temperature sensor	TC-Input short battery	12	TRANS M.	The control unit detects a problem in the feed to the transmission oil temperature sensor	20-190
13-Temperature sensor	TC-Input short ground	13	TRANS M.	The control unit detects a problem in the feed to the temperature sensor	20-191
14-Syncr Neutral switch	TC-logical fault	14	TRANS M.	The control unit detects a discrepancy between the speed readings at the main clutch input and the transmission output and the status of the start enable sensor (which signals that the transmission is in neutral or that a mechanical gear is engaged)	20-192
18-System pressure	TC-logical fault	18	TRANS M.	The control unit detects a discrepancy between the oil pressure reading and the operating status of the transmission	20-193
21-Limit speed exceeded	TC-Warnings	21	TRANS M.	The control unit detects a ground speed higher than the permissible limit	20-194
22-Temp. shuttle-mode	TC-Warnings	22	TRANS M.	The control unit detects that the transmission oil temperature exceeds the maximum value permitted when the tractor is working in "FIELD" mode	20-194
23-Temp.transport-mode	TC-Warnings	23	TRANS M.	The control unit detects that the transmission oil temperature exceeds the maximum value permitted when the tractor is working in "ROAD" mode	20-195
25-Input speed	TC-Warnings	25	TRANS M.	The control unit detects a discrepancy between engine speed value acquired via the CANBUS and the value read by the nLse sensor	20-196

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
36-EV gear 2	TC-Output open circuit	36	TRANS M.	The control unit detects that the solenoid Y4 is faulty or not connected	20-197
37-EV gear 2	TC-Out shorted ground	37	TRANS M.	The control unit detects that the control line of solenoid Y4 is shorting to earth	20-198
38-EV gear 2	TC-Out shorted battery	38	TRANS M.	The control unit detects that the control line of solenoid Y4 is shorting to a positive feed	20-199
39-EV gear 1	TC-Output open circuit	39	TRANS M.	The control unit detects that the solenoid Y2 is faulty or not connected	20-200
40-EV gear 1	TC-Out shorted ground	40	TRANS M.	The control unit detects that the control line of solenoid Y2 is shorting to earth	20-201
41-EV gear 1	TC-Out shorted battery	41	TRANS M.	The control unit detects that the control line of solenoid Y2 is shorting to a positive feed	20-202
47-nAB speed sensor	TC-Input short battery	47	TRANS M.	The control unit detects that the speed sensor nAb is disconnected or shorting to a positive feed.	20-203
48-nAB speed sensor	TC-Input short ground	48	TRANS M.	The control unit detects that the speed sensor nAb is shorting to earth	20-204
4B-nAB speed sensor	TC-logical fault	4B	TRANS M.	The control unit detects anomalous information coming from the speed sensor nAb	20-205
50-nHK speed sensor	TC-Input short battery	50	TRANS M.	The control unit detects that the speed sensor nHK is disconnected or shorting to a positive feed	20-206
51-nHK speed sensor	TC-Input short ground	51	TRANS M.	The control unit detects that the speed sensor nHk is shorting to earth	20-207
52-nHK speed sensor	TC-logical fault	52	TRANS M.	The control unit detects anomalous information coming from the speed sensor nHk	20-208
53-nLSA speed sensor	TC-Input short battery	53	TRANS M.	The control unit detects that the speed sensor nLsa is disconnected or shorting to a positive feed	20-209
54-nLSA speed sensor	TC-Input short ground	54	TRANS M.	The control unit detects that the speed sensor nLsa is shorting to earth	20-210
55-nLSA speed sensor	TC-logical fault	55	TRANS M.	The control unit detects anomalous information coming from the speed sensor nLsa	20-211
5F-FRRS sensor	TC-Warnings	5F	TRANS M.	The control unit detects that the calibration values of the field/road position sensor are incorrect.	20-212
60-FRRS calibration	TC-Warnings	60	TRANS M.	The control unit detects that the calibration values of the field/road position sensor are incorrect.	20-212
61-FRRS sensor	TC-Input short battery	61	TRANS M.	The control unit detects that the field/road position sensor is shorting to a positive feed (+5V).	20-213
62-FRRS sensor	TC-Input short battery	62	TRANS M.	The control unit detects that the field/road position sensor is shorting to a positive feed (+12V).	20-214

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
63-FRRS sensor	TC-Input short ground	63	TRANS M.	The control unit detects that the field/road position sensor is disconnected or shorting to earth.	20-215
64-Clutch Pedal Sensor	TC-logical fault	64	TRANS M.	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 clutch pedal	20-216
65-Clutch Pedal Sensor	TC-Input short ground	65	TRANS M.	The control unit detects that the clutch pedal sensor is disconnected or shorting to earth	20-217
66-Clutch Pedal Sensor	TC-Input short battery	66	TRANS M.	The control unit detects that the clutch pedal position sensor is shorting to a positive feed.	20-218
67-AU1 Sensor supply	TC-Out shorted ground	67	TRANS M.	The control unit detects that the feed to the clutch pedal position sensor is below correct value	20-219
68-AU1 Sensor supply	TC-Out shorted battery	68	TRANS M.	The control unit detects that the feed to the clutch pedal position sensor is above correct value	20-220
69-Clutch Pedal Sensor	TC-logical fault	69	TRANS M.	The control unit detects one or more threshold values of the clutch pedal position sensor out of range	20-221
70-E2P clutch pedal	TC-Warnings	70	TRANS M.	The control unit detects that the main clutch calibration values incorrectly saved due to a fault in the EEPPROM memory blocks or that the clutch pedal has not yet been calibrated	20-221
73-Comfort clutch	TC-Input short ground	73	TRANS M.	The control unit detects that the "Comfort Clutch" pushbutton is either disconnected or shorting to earth	20-222
74-Comfort clutch	TC-Input short battery	74	TRANS M.	The control unit detects that the "Comfort Clutch" pushbutton is shorting to a positive feed	20-223
76-EV proportional	TC-Output open circuit	76	TRANS M.	The control unit detects that the main clutch proportional control solenoid is disconnected	20-224
77-Proportional valve	TC-Out shorted ground	77	TRANS M.	The control unit detects that the main clutch proportional control solenoid is shorting to earth	20-225
79-EV direct. forward	TC-Output open circuit	79	TRANS M.	The control unit detects that the forward drive solenoid Y3 is disconnected.	20-226
80-EV direct. forward	TC-Out shorted ground	80	TRANS M.	The control unit detects that the forward drive solenoid Y3 is shorting to earth.	20-227
82-EV direct. reverse	TC-Output open circuit	82	TRANS M.	The control unit detects that the reverse drive solenoid Y1 is disconnected.	20-228
83-EV direct. reverse	TC-Out shorted ground	83	TRANS M.	The control unit detects that the reverse drive solenoid Y1 is shorting to earth.	20-229
85-Reverser Lever	TC-logical fault	85	TRANS M.	The control unit detects a problem affecting the shuttle control lever.	20-230
89-VPS1 supply	TC-logical fault	89	TRANS M.	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.	20-232

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
90-VPS2 supply	TC-logical fault	90	TRANS M.	The control unit detects that the current draw of the powershift solenoid valves Y2, Y4, Y5 and Y6 is abnormal.	20-233
91-Main clutch	TC-logical fault	91	TRANS M.	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.	20-234
92-Battery voltage	TC-Input short battery	92	TRANS M.	The control unit has detected an abnormally high input voltage	20-235
93-Battery voltage	TC-Input short ground	93	TRANS M.	The control unit has detected an abnormally low input voltage	20-236
94-EV proportional	TC-Out shorted battery	94	TRANS M.	The control unit detects that the main clutch solenoid valve is shorting to a positive feed.	20-237
95-EV direct. forward	TC-Out shorted battery	95	TRANS M.	The control unit detects that the forward drive solenoid Y3 is shorting to a positive feed.	20-238
96-EV direct. reverse	TC-Out shorted battery	96	TRANS M.	The control unit detects that the reverse drive solenoid Y1 is shorting to a positive feed.	20-239
97-Application error	TC-logical fault	97	TRANS M.	The control unit detects that the transmission control unit software has not been programmed correctly	20-240
98-Error Configuratio	TC-logical fault	98	TRANS M.	The control unit detects that transmission configuration data have not been programmed correctly.	20-240
99-Vehicle config.	TC-Warnings	99	TRANS M.	The control unit detects that tractor configuration data have not been programmed correctly (CHECKSUM ERROR)	20-241
Hand throttle	device out of order	561 - 12	HLHP	The control unit detects that the value of the hand throttle position sensor signal is not within the permissible minimum and maximum limits.	20-102
Sensor 5V supply	Signal not valid	655 - 2	HLHP	The control unit detects a short circuit in 5V sensor power feed.	20-144
Sensor 8V supply	Signal not valid	654 - 2	HLHP	The control unit detects a short circuit in 8V sensor power feed.	20-143
B0-nLSE speed sensor	TC-Input short ground	B0	TRANS M.	The control unit detects that the speed sensor nLse is disconnected or shorting to a positive feed.	20-242
B1-nLSE speed sensor	TC-Input short battery	B1	TRANS M.	The control unit detects that the speed sensor nLse is shorting to earth	20-243
B2-nLSE speed sensor	TC-logical fault	B2	TRANS M.	The control unit detects unreliable information coming from the speed sensor nLse	20-244
B3-FRRS field valve	TC-Output open circuit	B3	TRANS M.	The control unit detects that the "Field" mode selector solenoid Y5 is disconnected.	20-245
B4-FRRS field valve	TC-Out shorted battery	B4	TRANS M.	The control unit detects that the "Field" mode selector solenoid Y5 is shorting to a positive feed.	20-246
B5-FRRS field valve	TC-Out shorted ground	B5	TRANS M.	The control unit detects that the "Field" mode selector solenoid Y5 is shorting to earth.	20-247

5. ALARMS

5.1 ALARMS DISPLAYED ON THE INFOCENTER

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
B6-FRRS road valve	TC-Output open circuit	B6	TRANS M.	The control unit detects that the "Road" mode selector solenoid Y6 is disconnected.	20-248
B7-FRRS road valve	TC-Out shorted battery	B7	TRANS M.	The control unit detects that the "Road" mode selector solenoid Y6 is shorting to a positive feed.	20-249
B8-FRRS road valve	TC-Out shorted ground	B8	TRANS M.	The control unit detects that the "Road" mode selector solenoid Y6 is shorting to earth.	20-250
B9-Neutral Locker EV	TC-Output open circuit	B9	TRANS M.	The control unit detects that the gearbox neutral lock solenoid Y7 is disconnected.	20-251
BA-Neutral Locker EV	TC-Out shorted battery	BA	TRANS M.	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to a positive feed.	20-252
BB-Neutral Locker EV	TC-Out shorted ground	BB	TRANS M.	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to earth.	20-253
C0-Msg PTCTL1 REQGEAR	TC-Gruop C	C0	TRANS M.	The transmission control unit detects an error in the information received by the HLHP control unit regarding the request for range gear engagement.	20-254
C3-Msg EEC1 ENGSPEED	TC-Gruop C	C3	TRANS M.	The transmission control unit detects an error in the information received from the engine control unit regarding the engine speed signal	20-255
CF-Message EEC1	TC-Gruop A	CF	TRANS M.	The transmission control unit detects a fault on the CANBUS line.	20-256
FNR-Command	Signal not valid	63 - 2	HLHP	The control unit detects that the value of the shuttle lever signal is not within the permissible minimum and maximum limits.	20-78
D1-Msg LIMITATION	TC-Gruop A	D1	TRANS M.	The transmission control unit detects a fault on the CANBUS controller	20-256
D2-Msg HPSACTRL	TC-Gruop A	D2	TRANS M.	The transmission control unit detects a fault on the CANBUS controller	20-257
Electrovalve 4WD	Short circuit high	552 - 3	HLHP	The control unit detects that the 4WD solenoid is shorting to a positive feed.	20-97
Electrovalve 4WD	Grounding short-circuit	552 - 4	HLHP	The control unit detects that the 4WD solenoid is shorting to earth.	20-98
Electrovalve 4WD	device out of order	552 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-101
Electrovalve 4WD	Failure not ident.	552 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-100
Electrovalve 4WD	disconnected	552 - 5	HLHP	The control unit detects that the 4WD solenoid is disconnected.	20-99
Electrovalve 4WD	Signal not valid	552 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-96
Engine CAN Error	message timeou	633 - 9	HLHP	Detection of the absence of a connection via the CANBUS to the engine control unit.	20-136

5. ALARMS

5.1 ALARMS DISPLAYED ON THE INFOCENTER

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
TCU CAN Error	message timeou	632 - 9	HLHP	Detection of the absence of a connection via the CANBUS to the transmission control unit.	20-136
Memory failure	Block 0	661 - 8	HLHP	The control unit signals that EEPROM used to store the system parameters is damaged.	20-146
Differential Lock	Short circuit high	653 - 3	HLHP	The control unit detects that the differential lock solenoid is shorting to a positive feed.	20-138
Differential Lock	Grounding short-circuit	653 - 4	HLHP	The control unit detects that the differential lock solenoid is shorting to earth.	20-139
Differential Lock	device out of order	653 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-142
Differential Lock	Failure not ident.	653 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-141
Differential Lock	disconnected	653 - 5	HLHP	The control unit detects that the differential lock solenoid is disconnected.	20-140
Differential Lock	Signal not valid	653 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-137
Hitch Lower Valve	Short-circuit	603 - 6	HLHP	The control unit detects a shortcircuit in the control wire of the lift 'down' solenoid.	20-113
Hitch Lower Valve	Short circuit high	603 - 3	HLHP	The control unit detects that the lift 'down' solenoid is shorting to a positive feed.	20-110
Hitch Lower Valve	Grounding short-circuit	603 - 4	HLHP	The control unit detects that Lift Down solenoid is shorting to earth.	20-111
Hitch Lower Valve	disconnected	603 - 5	HLHP	The control unit detects an excessive current draw by the lift 'down' solenoid.	20-112
Susp. Lower Valve	Short circuit high	622 - 3	HLHP	The control unit detects that the front axle suspension 'down' solenoid is shorting to a positive feed.	20-131
Susp. Lower Valve	Grounding short-circuit	622 - 4	HLHP	The control unit detects that the front axle suspension 'down' solenoid is shorting to earth.	20-132
Susp. Lower Valve	device out of order	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.	20-135
Susp. Lower Valve	Failure not ident.	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.	20-134
Susp. Lower Valve	disconnected	622 - 5	HLHP	The control unit detects that the front axle suspension 'down' solenoid is disconnected.	20-133
Susp. Lower Valve	Signal not valid	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.	20-130
Front PTO Valve	Short circuit high	551 - 3	HLHP	The control unit detects that the front PTO solenoid is shorting to a positive feed.	20-91

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
Front PTO Valve	Grounding short-circuit	551 - 4	HLHP	The control unit detects that the front PTO solenoid is shorting to earth.	20-92
Front PTO Valve	device out of order	551 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-95
Front PTO Valve	Failure not ident.	551 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-94
Front PTO Valve	disconnected	551 - 5	HLHP	The control unit detects that the front PTO solenoid is not connected.	20-93
Front PTO Valve	Signal not valid	551 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-90
Rear PTO Valve	Short circuit high	550 - 3	HLHP	The control unit detects that the rear PTO solenoid is shorting to a positive feed.	20-85
Rear PTO Valve	Grounding short-circuit	550 - 4	HLHP	The control unit detects that the rear PTO solenoid is shorting to earth.	20-86
Rear PTO Valve	device out of order	550 - 12	HLHP	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-89
Rear PTO Valve	Failure not ident.	550 - 11	HLHP	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-88
Rear PTO Valve	disconnected	550 - 5	HLHP	The control unit detects that the rear PTO solenoid is not connected.	20-87
Rear PTO Valve	Signal not valid	550 - 2	HLHP	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-84
Hitch Raise Valve	Short-circuit	602 - 6	HLHP	The control unit detects a shortcircuit in the control wire of the lift 'Up' solenoid.	20-109
Hitch Raise Valve	Short circuit high	602 - 3	HLHP	The control unit detects that the lift 'up' solenoid is shorting to a positive feed.	20-106
Hitch Raise Valve	Grounding short-circuit	602 - 4	HLHP	The control unit detects that the lift 'Up' solenoid is shorting to earth.	20-107
Hitch Raise Valve	disconnected	602 - 5	HLHP	The control unit detects an excessive current draw by the lift 'up' solenoid.	20-108
Susp. Raise Valve	Short circuit high	621 - 3	HLHP	The control unit detects that the front axle suspension 'up' solenoid is shorting to a positive feed.	20-125
Susp. Raise Valve	Grounding short-circuit	621 - 4	HLHP	The control unit detects that the front axle suspension 'up' solenoid is shorting to earth.	20-126
Susp. Raise Valve	device out of order	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.	20-129
Susp. Raise Valve	Failure not ident.	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.	20-128

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
Susp. Raise Valve	disconnected	621 - 5	HLHP	The control unit detects that the front axle suspension 'up' solenoid is disconnected.	20-127
Susp. Raise Valve	Signal not valid	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.	20-124
Main clutch	Overspeed	24	TRANS M.	The control unit detects the main clutch running overspeed.	20-195
Engine,throttle pedal	Failure not ident.	91 - 11	ENGINE	The engine control unit has detected the absence of the connection to the accelerator pedal position sensor or a signal outside the valid range.	20-173
Engine,throttle pedal	Signal not valid	91 - 2	ENGINE	The control unit detects that the connection to the accelerator pedal sensor is not present or is shorting.	20-161
Engine Hand Gas	Signal not valid	201 - 2	ENGINE	The control unit detects that the hand throttle position sensor is disconnected or short circuiting.	20-162
Engine actor-rack	device out of order	536 - 12	ENGINE	The engine control unit has detected that the actuator position signal does not correspond to the position requested.	20-170
Engine actor-rack	Out of Calibration	536 - 13	ENGINE	The engine control unit has detected that the reference signal for the position of the actuator does not correspond to that requested.	20-171
Engine CAN Error	device out of order	743 - 12	ENGINE	CANBUS line controller damaged	20-174
Engine CAN Error	Abnormal update rate	743 - 9	ENGINE	The engine control unit has not been able to read or send a message on the CANBUS.	20-174
Engine CAN Error	FMI 14	743 - 14	ENGINE	The engine control unit has detected that the connection to the CANBUS is not present.	20-175
Engine CAN Error	Signal not valid	898 - 2	ENGINE	Error in connection to CANBUS	20-174
Engine internal fault	Signal not valid	766 - 2	ENGINE	The engine control unit has detected an error in reading the work memory during the normal control cycle.	20-176
Engine internal fault	Signal not valid	766 - 2	ENGINE	The engine control unit detects that actuator power supply is not within the permitted limits.	20-176
Engine internal fault	Signal not valid	766 - 2	ENGINE	The control unit detects that the power input to the accelerator pedal position sensor is missing or incorrect.	20-177
Engine internal fault	Signal not valid	766 - 2	ENGINE	The control unit detects that the power input to the engine boost pressure sensor is missing or incorrect.	20-178
Engine internal fault	Signal not valid	766 - 2	ENGINE	The engine control unit has detected an internal error.	20-180
Engine,Memory Error	device out of order	752 - 12	ENGINE	The engine control unit has detected an error in reading the program memory during the normal control cycle.	20-175
Engine,Memory Error	Signal not valid	752 - 2	ENGINE	The engine control unit has detected a "Stack Overflow" error during the execution of the program.	20-180

5. ALARMS

5.1 ALARMS DISPLAYED ON THE INFOCENTER

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
Engine over speed	FMI 14	702 - 14	ENGINE	The engine control unit detects that the engine is or has been running at overspeed (above 3100 rpm).	20-167
Engine,E2P Parameter	device out of order	765 - 12	ENGINE	The engine control unit has detected an error during parameter writing.	20-175
Engine,E2P Parameter	Signal not valid	765 - 2	ENGINE	The engine control unit has detected a discrepancy between the parameters that have been written to the EEPROM.	20-180
Engine, Press.	device out of order	108 - 12	ENGINE	The engine control unit detects that atmospheric pressure is outside the permitted limits.	20-179
Engine,boost pressure	Signal not valid	102 - 2	ENGINE	The engine control unit has detected the absence of the engine boost pressure signal or an invalid value for this signal.	20-163
Engine,Regulator	Mechanical defect	535 - 7	ENGINE	The engine control unit has detected that the difference between the command given and the actuator response is greater than 10%.	20-172
Engine,speed sensor	Frequency not correct	190 - 8	ENGINE	The engine control unit detects that the signal from the engine pickup is either not present or incorrect.	20-160
Engine,temp ECU sensor	device out of order	171 - 12	ENGINE	The engine control unit detects that its internal temperature is too high.	20-179
Engine Fuel temp.	Signal not valid	174 - 2	ENGINE	The engine control unit has detected the absence of the fuel temperature signal or an invalid value for this signal.	20-165
Engine Fuel temp.	Signal too high	174 - 0	ENGINE	The engine control unit has detected that the fuel temperature has exceeded the alarm threshold.	20-168
Engine,temperature	Signal not valid	110 - 2	ENGINE	The engine control unit has detected the absence of the coolant temperature signal or an invalid value for this signal.	20-164
Engine,temperature	Signal too high	110 - 0	ENGINE	The engine control unit has detected that the coolant temperature has exceeded the alarm threshold.	20-166
Engine,temperature	Signal too high	110 - 0	ENGINE	The engine control unit has detected a coolant temperature higher than the alarm threshold.	20-169
Throttle Pedal Sensor	device out of order	51 - 12	HLHP	The control unit detects that the value of the accelerator pedal position sensor signal is not within the permissible minimum and maximum limits.	20-78
Pincoding does not match	with vehicle type	87	TRANS M.	The control unit detects that the vehicle type has not been programmed correctly	20-231
Control Height Set	Short circuit high	605 - 3	HLHP	The control unit detects that the maximum lift height potentiometer is shorting to a positive feed.	20-116
Control Height Set	Grounding short-circuit	605 - 4	HLHP	The control unit detects that the maximum lift height potentiometer is shorting to earth.	20-117
Control Depth Set	Short circuit high	604 - 3	HLHP	The control unit detects that the depth control potentiometer is shorting to a positive feed.	20-114

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
Control Depth Set	Grounding short-circuit	604 - 4	HLHP	The control unit detects that the depth control potentiometer is shorting to earth.	20-115
Control Intermix	Short circuit high	607 - 3	HLHP	The control unit detects that the control mode potentiometer is shorting to a positive feed.	20-120
Control Intermix	Grounding short-circuit	607 - 4	HLHP	The control unit detects that the control mode potentiometer is shorting to earth.	20-121
Control Low Speed	Short circuit high	606 - 3	HLHP	The control unit detects that the rate-of-drop potentiometer is shorting to a positive feed.	20-118
Control Low Speed	Grounding short-circuit	606 - 4	HLHP	The control unit detects that the rate-of-drop potentiometer is shorting to earth.	20-119
Slipage potentiometer	Short circuit high	693 - 3	HLHP	The control unit detects that the wheelslip control potentiometer is shorting to a positive feed.	20-153
Slipage potentiometer	Grounding short-circuit	693 - 4	HLHP	The control unit detects that the wheelslip control potentiometer is shorting to earth.	20-154
button Hitch DOWN	Grounding short-circuit	692 - 4	HLHP	The control unit detects that the lift 'Down' control button in the cab is continually pressed.	20-152
button Hitch UP	Grounding short-circuit	691 - 4	HLHP	The control unit detects that the lift 'Up' control button in the cab is continually pressed.	20-151
Hitch DOWN manual button	Short circuit high	695 - 3	HLHP	The control unit detects that the lift 'down' control buttons on the rear fenders are continuously pressed.	20-156
Hitch UP manual button	Short circuit high	694 - 3	HLHP	The control unit detects that the lift 'up' control buttons on the rear fenders are continuously pressed.	20-155
Hitch STOP button	Grounding short-circuit	690 - 4	HLHP	The control unit detects that the lift STOP button is continually pressed.	20-150
External PTO button	Short circuit high	662 - 3	HLHP	The control unit detects that the rear PTO control buttons on the rear fenders are continuously pressed.	20-147
Steering Sensor	Short circuit high	689 - 3	HLHP	The control unit detects that the steering angle sensor is shorting to a positive feed.	20-148
Steering Sensor	Grounding short-circuit	689 - 4	HLHP	The control unit detects that the steering angle sensor is disconnected.	20-149
Rear Hitch Pos Sens	Short circuit high	601 - 3	HLHP	The control unit detects that the lift position sensor is shorting to a positive feed.	20-103
Rear Hitch Pos Sens	Grounding short-circuit	601 - 4	HLHP	The control unit detects that the lift position sensor is shorting to earth.	20-104
Rear Hitch Pos Sens	device out of order	601 - 12	HLHP	The control unit detects an internal fault in the control unit in the input signal of the lift position sensor.	20-105
Susp. pos. Sensor	Short circuit high	620 - 3	HLHP	The control unit detects that the front axle suspension position sensor is shorting to a positive feed.	20-122

1st line on display	2nd line on display	Code on ART	ECU	Description	Page
Susp. pos. Sensor	Grounding short-circuit	620 - 4	HLHP	The control unit detects that the lift position sensor is disconnected.	20-123
Radar Sensor	device out of order	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.	20-145
Draft Pin Right	Short circuit high	541 - 3	HLHP	The control unit detects that the RH draft sensor is shorting to a positive feed.	20-82
Draft Pin Right	Grounding short-circuit	541 - 4	HLHP	The control unit detects that the RH draft sensor is shorting to earth.	20-83
Draft Pin Left	Short circuit high	540 - 3	HLHP	The control unit detects that the LH draft sensor is shorting to a positive feed.	20-80
Draft Pin Left	Grounding short-circuit	540 - 4	HLHP	The control unit detects that the LH draft sensor is shorting to earth.	20-81
Battery voltage	Signal not valid	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).	20-79

5.2 HLHP CONTROL UNIT ALARMS

Alarm code	Infocenter	Description	Page
SPN 51 - FMI 12	Accelerator pedal device out of order	The engine control unit has detected an error in the value of the accelerator pedal signal (via CANBUS).	20-78
SPN 63 - FMI 2	FNR-Command Signal not valid	The transmission control unit has detected an error in the value of the shuttle lever signal (via CANBUS).	20-78
SPN 158 - FMI 2	Battery voltage Signal not valid	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).	20-79
SPN 540 - FMI 3	Draft Pin Left Short circuit high	The control unit detects that the LH draft sensor is shorting to a positive feed.	20-80
SPN 540 - FMI 4	Draft Pin Left Grounding short-circuit	The control unit detects that the LH draft sensor is shorting to earth.	20-81
SPN 541 - FMI 3	Draft Pin Right Short circuit high	The control unit detects that the RH draft sensor is shorting to a positive feed.	20-82
SPN 541 - FMI 4	Draft Pin Right Grounding short-circuit	The control unit detects that the RH draft sensor is shorting to earth.	20-83
SPN 550 - FMI 2	Rear PTO Valve Signal not valid	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-84
SPN 550 - FMI 3	Rear PTO Valve Short circuit high	The control unit detects that the rear PTO solenoid is shorting to a positive feed.	20-85
SPN 550 - FMI 4	Rear PTO Valve Grounding short-circuit	The control unit detects that the rear PTO solenoid is shorting to earth.	20-86
SPN 550 - FMI 5	Rear PTO Valve disconnected	The control unit detects that the rear PTO solenoid is not connected.	20-87
SPN 550 - FMI 11	Rear PTO Valve Failure not ident.	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-88
SPN 550 - FMI 12	Rear PTO Valve device out of order	The control unit detects an internal fault in the control unit on the power feed to the rear PTO solenoid.	20-89
SPN 551 - FMI 2	Front PTO Valve Signal not valid	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-90
SPN 551 - FMI 3	Front PTO Valve Short circuit high	The control unit detects that the front PTO solenoid is shorting to a positive feed.	20-91
SPN 551 - FMI 4	Front PTO Valve Grounding short-circuit	The control unit detects that the front PTO solenoid is shorting to earth.	20-92
SPN 551 - FMI 5	Front PTO Valve disconnected	The control unit detects that the front PTO solenoid is not connected.	20-93
SPN 551 - FMI 11	Front PTO Valve Failure not ident.	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-94
SPN 551 - FMI 12	Front PTO Valve device out of order	The control unit detects an internal fault in the control unit on the power feed to the front PTO solenoid.	20-95
SPN 552 - FMI 2	Electrovalve 4WD Signal not valid	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-96
SPN 552 - FMI 3	Electrovalve 4WD Short circuit high	The control unit detects that the 4WD solenoid is shorting to a positive feed.	20-97

Alarm code	Infocenter	Description	Page
SPN 552 - FMI 4	Electrovalve 4WD Grounding short-circuit	The control unit detects that the 4WD solenoid is shorting to earth.	20-98
SPN 552 - FMI 5	Electrovalve 4WD disconnected	The control unit detects that the 4WD solenoid is disconnected.	20-99
SPN 552 - FMI 11	Electrovalve 4WD Failure not ident.	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-100
SPN 552 - FMI 12	Electrovalve 4WD device out of order	The control unit detects an internal fault in the control unit on the power feed to the 4WD solenoid.	20-101
SPN 561 - FMI 2	Hand throttle Signal not valid	The engine control unit has detected an error in the value of the hand throttle signal (via CANBUS).	20-102
SPN 601 - FMI 3	Susp. pos. Sensor Short circuit high	The control unit detects that the lift position sensor is shorting to a positive feed.	20-103
SPN 601 - FMI 4	Susp. pos. Sensor Grounding short-circuit	The control unit detects that the lift position sensor is shorting to earth.	20-104
SPN 601 - FMI 12	Rear Hitch Pos Sens Device out of order	The control unit detects an internal fault in the control unit in the input signal of the lift position sensor.	20-105
SPN 602 - FMI 3	Hitch Raise Valve Short circuit high	The control unit detects that the lift 'up' solenoid is shorting to a positive feed.	20-106
SPN 602 - FMI 4	Hitch Raise Valve Grounding short-circuit	The control unit detects that the lift 'Up' solenoid is shorting to earth.	20-107
SPN 602 - FMI 5	Hitch Raise Valve disconnected	The control unit detects an excessive current draw by the lift 'up' solenoid.	20-108
SPN 602 - FMI 6	Hitch Raise Valve Short-circuit	Lift 'Up' solenoid short circuit	20-109
SPN 603 - FMI 3	Hitch Lower Valve Short circuit high	The control unit detects that the lift 'down' solenoid is shorting to a positive feed.	20-110
SPN 603 - FMI 4	Hitch Lower Valve Grounding short-circuit	The control unit detects that Lift Down solenoid is shorting to earth.	20-111
SPN 603 - FMI 5	Hitch Lower Valve disconnected	The control unit detects an excessive current draw by the lift 'down' solenoid.	20-112
SPN 603 - FMI 6	Hitch Lower Valve Short-circuit	Lift 'Down' solenoid short circuit	20-113
SPN 604 - FMI 3	Control Depth Set Short circuit high	The control unit detects that the depth control potentiometer is shorting to a positive feed.	20-114
SPN 604 - FMI 4	Control Depth Set Grounding short-circuit	The control unit detects that the depth control potentiometer is shorting to earth.	20-115
SPN 605 - FMI 3	Control Height Set Short circuit high	The control unit detects that the maximum lift height potentiometer is shorting to a positive feed.	20-116
SPN 605 - FMI 4	Control Height Set Grounding short-circuit	The control unit detects that the maximum lift height potentiometer is shorting to earth.	20-117
SPN 606 - FMI 3	Control Low Speed Short circuit high	The control unit detects that the rate-of-drop potentiometer is shorting to a positive feed.	20-118
SPN 606 - FMI 4	Control Low Speed Grounding short-circuit	The control unit detects that the rate-of-drop potentiometer is shorting to earth.	20-119

Alarm code	Infocenter	Description	Page
SPN 607 - FMI 3	Control Intermix Short circuit high	The control unit detects that the control mode potentiometer is shorting to a positive feed.	20-120
SPN 607 - FMI 4	Control Intermix Grounding short-circuit	The control unit detects that the control mode potentiometer is shorting to earth.	20-121
SPN 620 - FMI 3	Susp. pos. Sensor Short circuit high	The control unit detects that the front axle suspension position sensor is shorting to a positive feed.	20-122
SPN 620 - FMI 4	Susp. pos. Sensor Grounding short-circuit	The control unit detects that the lift position sensor is disconnected.	20-123
SPN 621 - FMI 2	Susp. Raise Valve Signal not valid	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'up' solenoid.	20-124
SPN 621 - FMI 3	Susp. Raise Valve Short circuit high	The control unit detects that the front axle suspension 'up' solenoid is shorting to a positive feed.	20-125
SPN 621 - FMI 4	Susp. Raise Valve Grounding short-circuit	The control unit detects that the front axle suspension 'up' solenoid is shorting to earth.	20-126
SPN 621 - FMI 5	Susp. Raise Valve disconnected	The control unit detects that the front axle suspension 'up' solenoid is disconnected.	20-127
SPN 621 - FMI 11	Susp. Raise Valve Failure not ident.	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'up' solenoid.	20-128
SPN 621 - FMI 12	Susp. Raise Valve Device out of order	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'up' solenoid.	20-129
SPN 622 - FMI 2	Susp. Lower Valve Signal not valid	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'down' solenoid.	20-130
SPN 622 - FMI 3	Susp. Lower Valve Short circuit high	The control unit detects that the front axle suspension 'down' solenoid is shorting to a positive feed.	20-131
SPN 622 - FMI 4	Susp. Lower Valve Grounding short-circuit	The control unit detects that the front axle suspension 'down' solenoid is shorting to earth.	20-132
SPN 622 - FMI 5	Susp. Lower Valve disconnected	The control unit detects that the front axle suspension 'down' solenoid is disconnected.	20-133
SPN 622 - FMI 11	Susp. Lower Valve Failure not ident.	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'down' solenoid.	20-134
SPN 622 - FMI 12	Susp. Lower Valve Device out of order	The control unit detects an internal fault in the control unit on the power feed to the front axle suspension 'down' solenoid.	20-135
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.	–

Alarm code	Infocenter	Description	Page
SPN 625 - FMI 13	–	Alarm available but not utilized.	–
SPN 626 - FMI 11	–	Alarm available but not utilized.	–
SPN 631 - FMI 9	–	Alarm available but not utilized.	–
SPN 632 - FMI 9	Motor CAN fehler message timeou	Detection of the absence of a connection via the CANBUS to the transmission control unit.	20-136
SPN 633 - FMI 9	Motor CAN fehler message timeou	Detection of the absence of a connection via the CANBUS to the engine control unit.	20-136
SPN 653 - FMI 2	Differential Lock Signal not valid	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-137
SPN 653 - FMI 3	Differential Short circuit high	The control unit detects that the differential lock solenoid is shorting to a positive feed.	20-138
SPN 653 - FMI 4	Differential Grounding short-circuit	The control unit detects that the differential lock solenoid is shorting to earth.	20-139
SPN 653 - FMI 5	Differential Lock disconnected	The control unit detects that the differential lock solenoid is disconnected.	20-140
SPN 653 - FMI 11	Differential Lock Failure not ident.	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-141
SPN 653 - FMI 12	Differential Lock device out of order	The control unit detects an internal fault in the control unit on the power feed to the differential lock solenoid.	20-142
SPN 654 - FMI 2	Sensor 8V supply Signal not valid	The control unit detects a short circuit in 8V sensor power feed.	20-143
SPN 655 - FMI 2	Sensor 5V supply Signal not valid	The control unit detects a short circuit in 5V sensor power feed.	20-144
SPN 656 - FMI 12	Radar Sensor Device out of order	The control unit detects that the radar, when installed, does not send any signals when the travel speed exceeds 2 km/h.	20-145
SPN 661 - FMI 8	Memory failure Block 0	The control unit signals that EEPROM used to store the system parameters is damaged.	20-146
SPN 662 - FMI 3	External PTO button Short circuit high	The control unit detects that the rear PTO control buttons on the rear fenders are continuously pressed.	20-147
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	Steering Sensor Short circuit high	The control unit detects that the steering angle sensor is shorting to a positive feed.	20-148
SPN 689 - FMI 4	Steering Sensor Grounding short-circuit	The control unit detects that the steering angle sensor is disconnected.	20-149
SPN 690 - FMI 4	Hitch STOP button Grounding short-circuit	The control unit detects that the lift STOP button is continually pressed.	20-150
SPN 691 - FMI 4	button Hitch UP Grounding short-circuit	The control unit detects that the lift 'Up' control button in the cab is continually pressed.	20-151
SPN 692 - FMI 4	button Hitch DOWN Grounding short-circuit	The control unit detects that the lift 'Down' control button in the cab is continually pressed.	20-152

Alarm code	Infocenter	Description	Page
SPN 693 - FMI 3	Slipage potentiometer Short circuit high	The control unit detects that the wheelslip control potentiometer is shorting to a positive feed.	20-153
SPN 693 - FMI 4	Slipage potentiometer Grounding short-circuit	The control unit detects that the wheelslip control potentiometer is shorting to earth.	20-154
SPN 694 - FMI 3	Man. lift UP button Short circuit to +12V	The control unit detects that the lift 'up' control buttons on the rear fenders are continuously pressed.	20-155
SPN 695 - FMI 3	Hitch DOWN manual button Short circuit to +12V	The control unit detects that the lift 'down' control buttons on the rear fenders are continuously pressed.	20-156



← SPN 51 - FMI 12



← Accelerator pedal device out of order

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 active or passive alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter "CANBUS 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



← FNR-Command Signal not valid

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 active or passive alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter "CANBUS 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

← Battery voltage
Signal not valid

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).

WARNING

Never connect the ART with the engine running when this alarm is displayed on the Infocenter 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, with the engine running, that the battery voltage is within the prescribed range. In this case the problem may be attributable to a fault in the HLHP control unit, otherwise, if the voltage rises above the maximum limit, the trouble is due to a malfunction 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. If the alarm is displayed among the active alarms, and the battery voltages are within the normal limits when the engine is running (between 12V and 13.5V), then the control unit should be renewed.

- Check, with the engine off, that the battery voltage is within the prescribed range (normal voltage 12V - 13.5V). Lower voltages can register after the tractor has been standing idle for an extended period; this does not necessarily mean that the battery needs replacing.
- Check first whether or not the battery voltage returns to normal with the engine running. If this is the case, the problem can be attributed to a flat or faulty battery; if on the other hand the voltage stays below or above the limit values, the problem will be due to a fault in the voltage regulator 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 fitting a new alternator, first check whether the old one is operating correctly using a new battery.



← SPN 540 - FMI 3



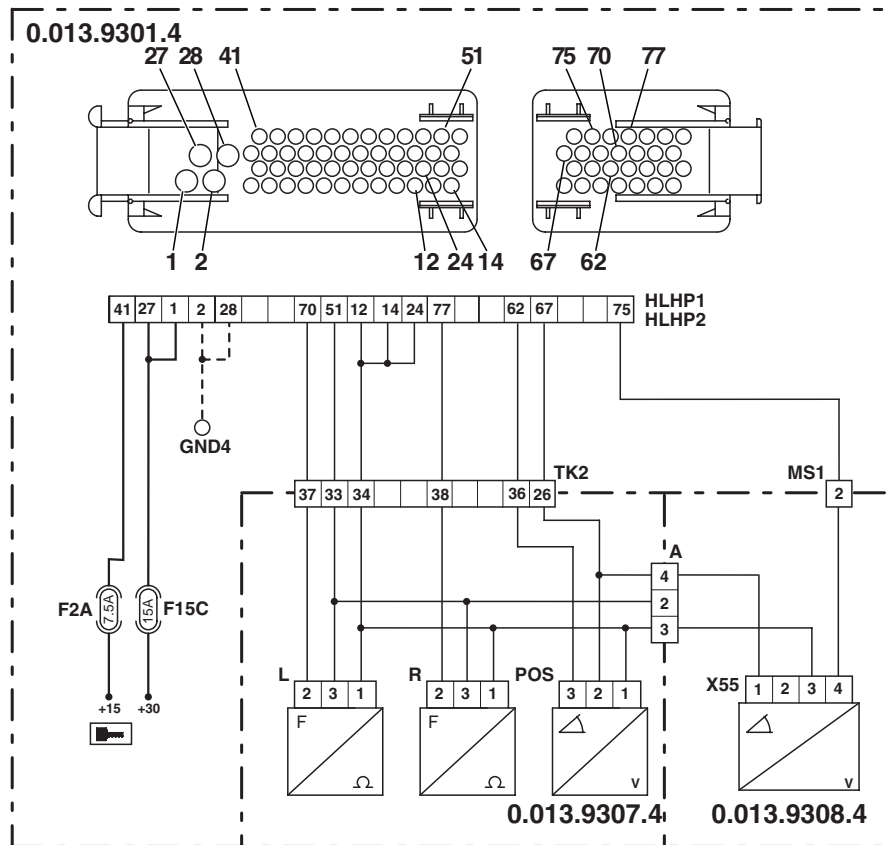
← Draft Pin Left
Short circuit high

DESCRIPTION

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

CHECK

- Check that the contacts on the connector "L" of the LH draft sensor and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the lift draft sensor is correct (voltage between pin 3 (positive) and pin 1 (negative) of the connector "L" approximately 8 Vdc).
- With the starter key in the "I" (ON) position and the connector "HLHP2" disconnected from the control unit, connect a test meter to pin 2 of the connector "L" and to the earth on the transmission and check that there is no voltage (test 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.



D0030810



← SPN 540 - FMI 4



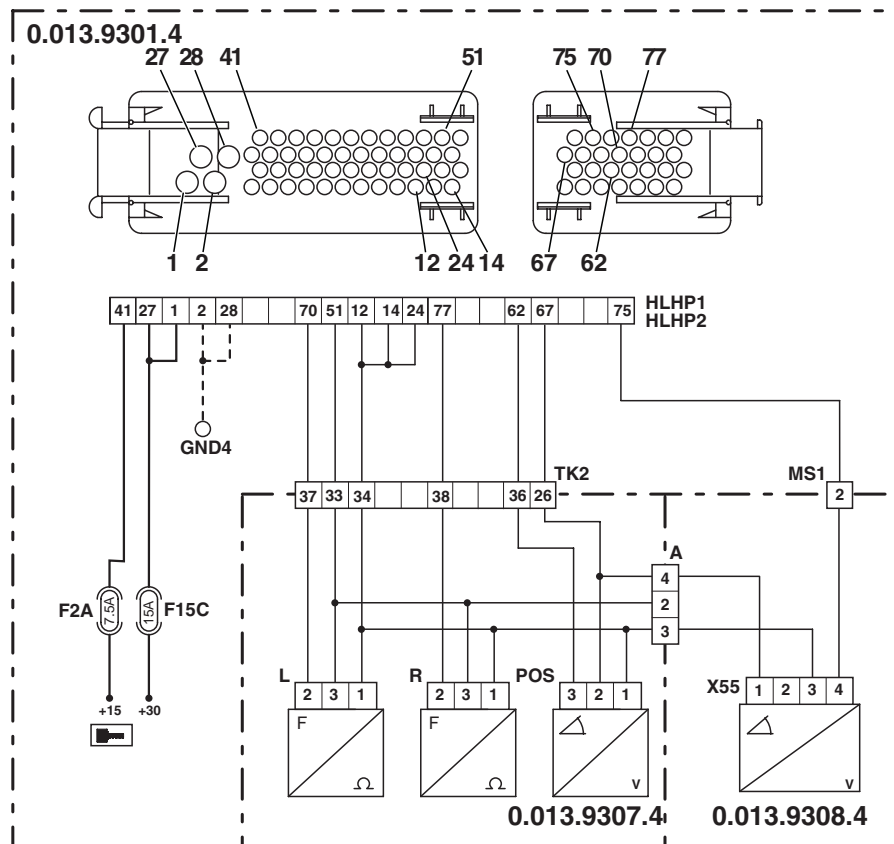
← Draft Pin Left
Grounding short-circuit

DESCRIPTION

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

CHECK

- Check that the contacts on the connector "L" of the LH draft sensor and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the lift draft sensor is correct (voltage between pin 3 (positive) and pin 1 (negative) of the connector "L" approximately 8 Vdc).
- 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 the "O" (OFF) position and the connector "HLHP2" 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 shorting to earth (test meter reading: infinity).
- 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.



D0030810



← SPN 541 - FMI 3



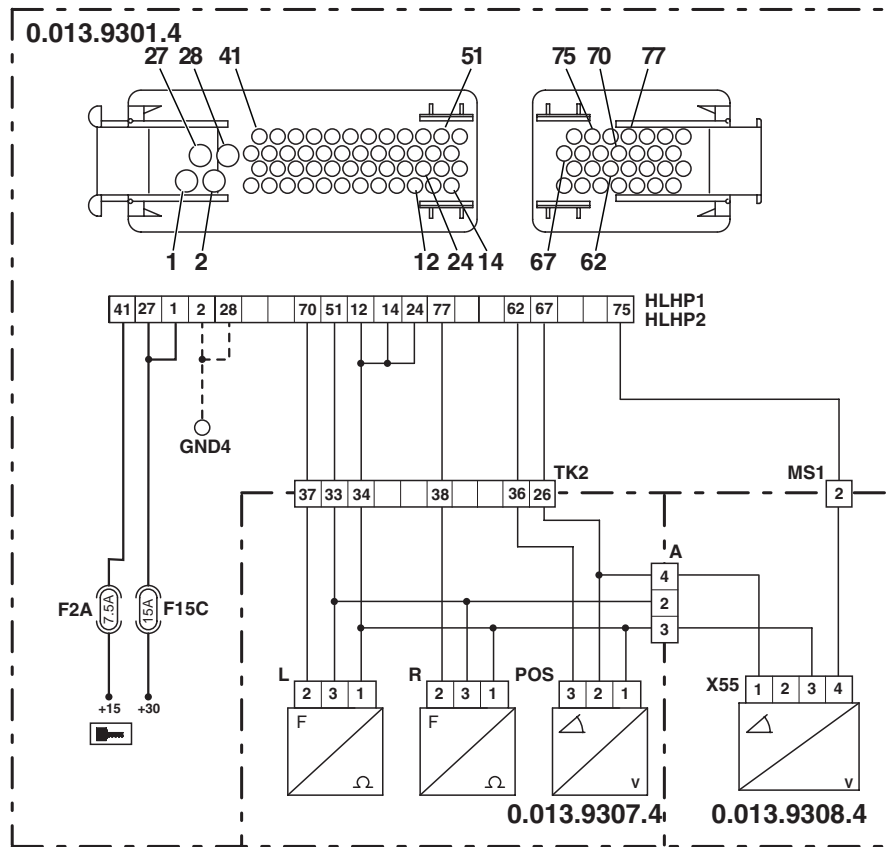
← Draft Pin Right
Short circuit high

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "R" of the RH draft sensor and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the lift draft sensor is correct (approximately 8 Vdc between pin 3 (positive) and pin 1 (negative) of the connector "R").
- With the starter key in the "I" (ON) position and the connector "HLHP2" disconnected from the control unit, connect a test meter to pin 2 of the connector "R" and to the earth on the transmission and check that there is no voltage (test 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.



D0030810



← SPN 541 - FMI 4



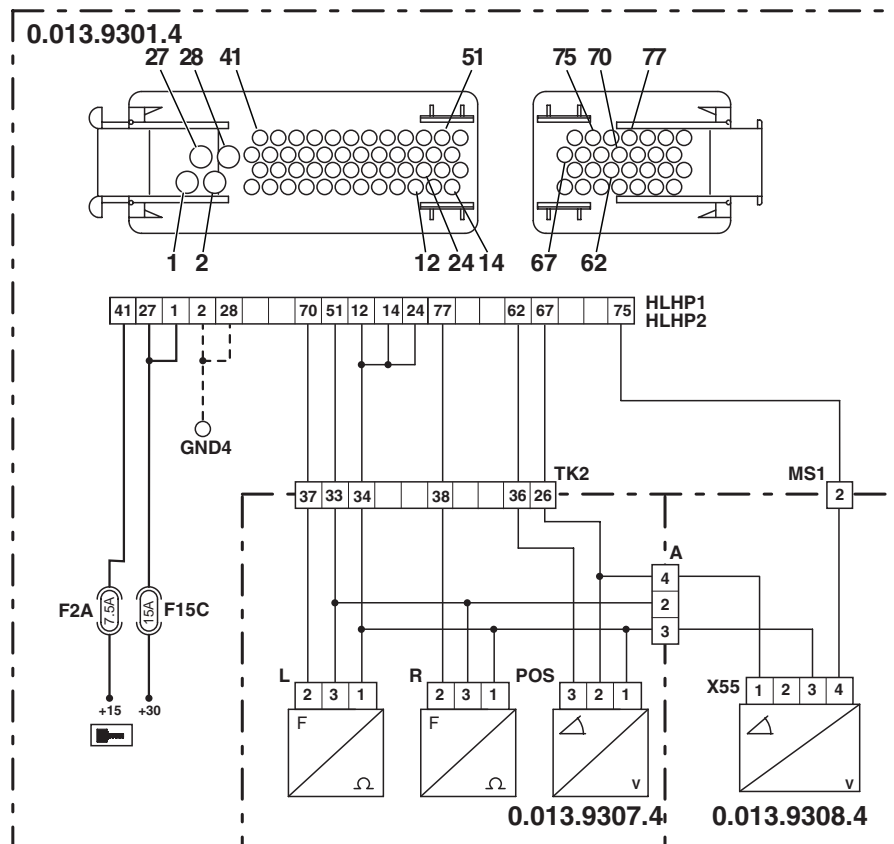
← Draft Pin Right
Grounding short-circuit

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "L" of the RH draft sensor and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the lift draft sensor is correct (voltage between pin 3 (positive) and pin 1 (negative) of the connector "L" approximately 8 Vdc).
- 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 the "O" (OFF) position and the connector "HLHP2" disconnected from the control unit, connect a test meter to pin 2 of the connector "R" and to the earth on the transmission and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030810



← SPN 550 - FMI 2



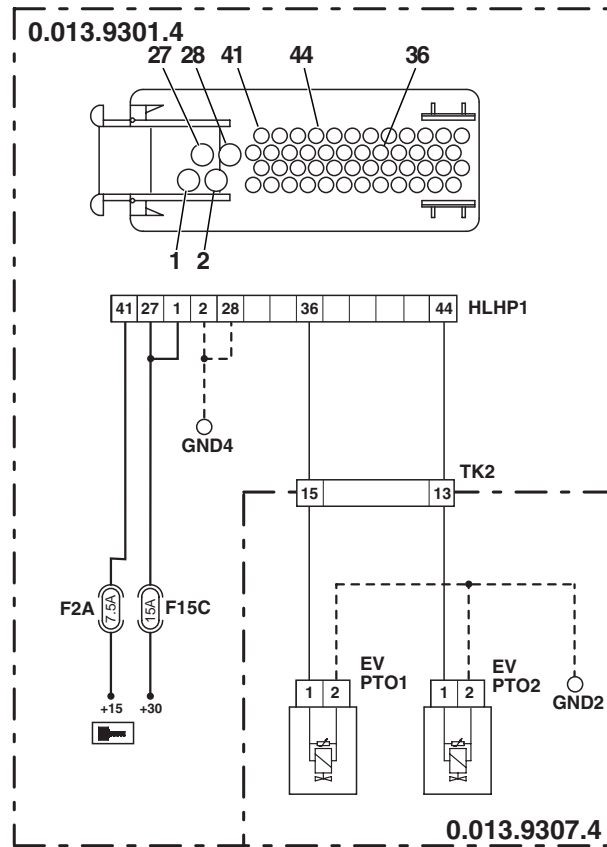
← Rear PTO Valve
Signal not valid

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 connectors "HLHP1" of the control unit and "EVPTO2" of the rear PTO solenoid are not loose or corroded.
- 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.



D0030820



← SPN 550 - FMI 3



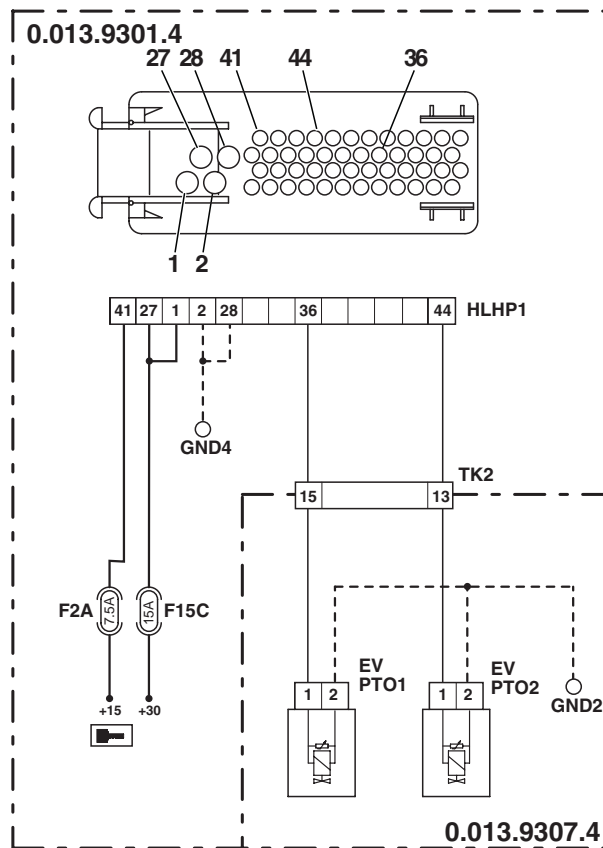
← Rear PTO Valve
Short circuit high

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVPTO2" of the rear PTO solenoid are not loose or corroded.
- With the starter key in the "I" (ON) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVPTO2" and to the earth on the transmission and check that there is no voltage (test 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.



D0030820



← SPN 550 - FMI 4



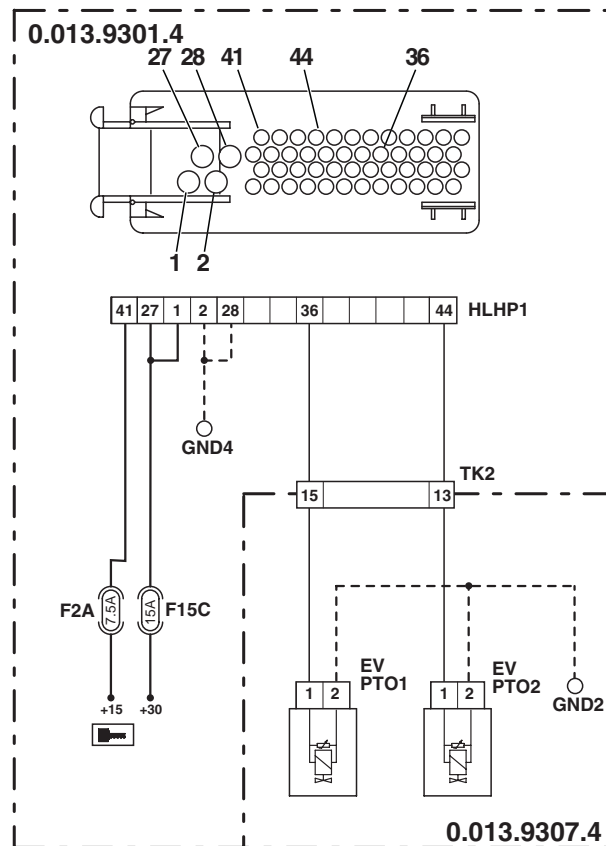
← Rear PTO Valve
Grounding short-circuit

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVPTO2" of the rear PTO solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVPTO2" and to the earth on the transmission and test the resistance to check for shorting to earth (test 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.



D0030820



← SPN 550 - FMI 5



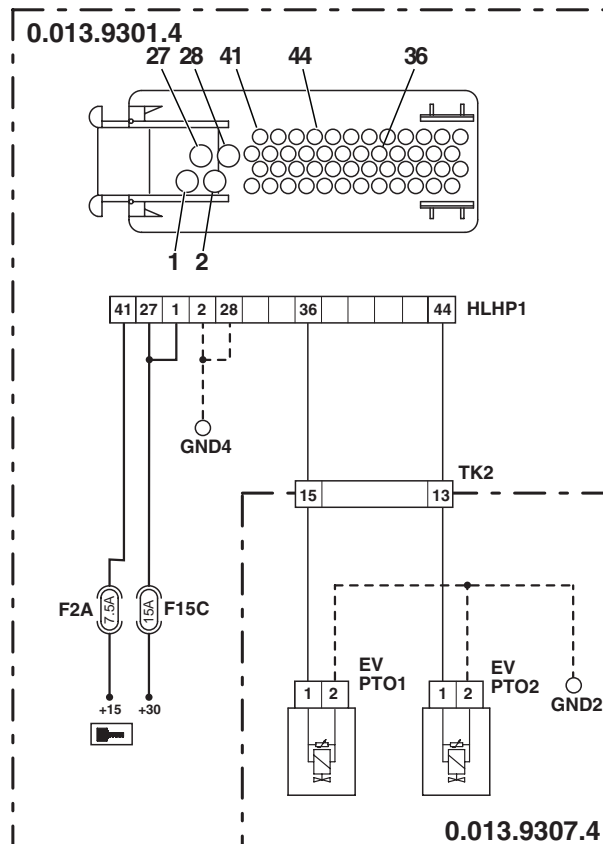
← Rear PTO Valve disconnected

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVPTO2" of the rear PTO solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "EVPTO2" and to pin 36 of the connector "HLHP1" and test 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 the "EVPTO2" connector and to the transmission earth and measure the resistance to check that the wire is not broken (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.



D0030820



← SPN 550 - FMI 11



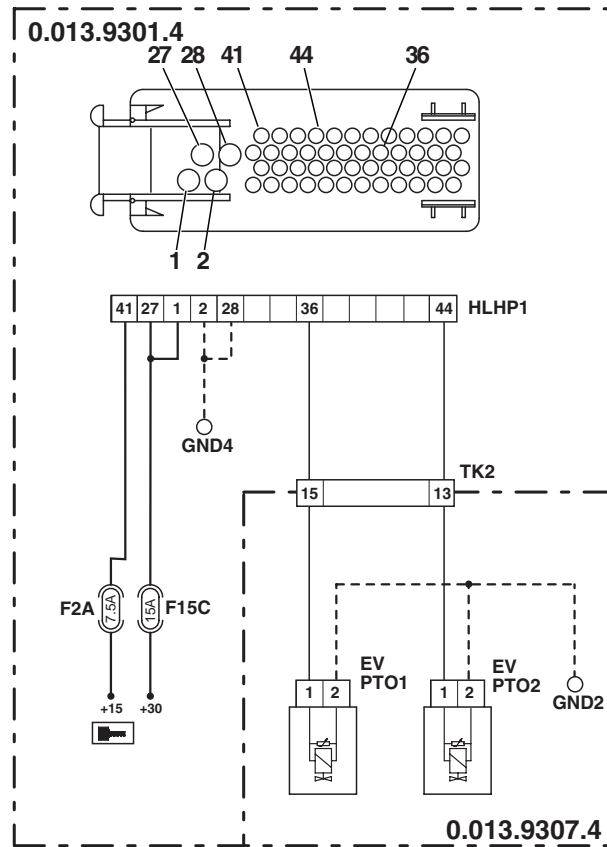
← Rear PTO Valve Failure not ident.

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 connectors "HLHP1" of the control unit and "EVPTO2" of the rear PTO solenoid are not loose or corroded.
- 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.



D0030820



← SPN 550 - FMI 12



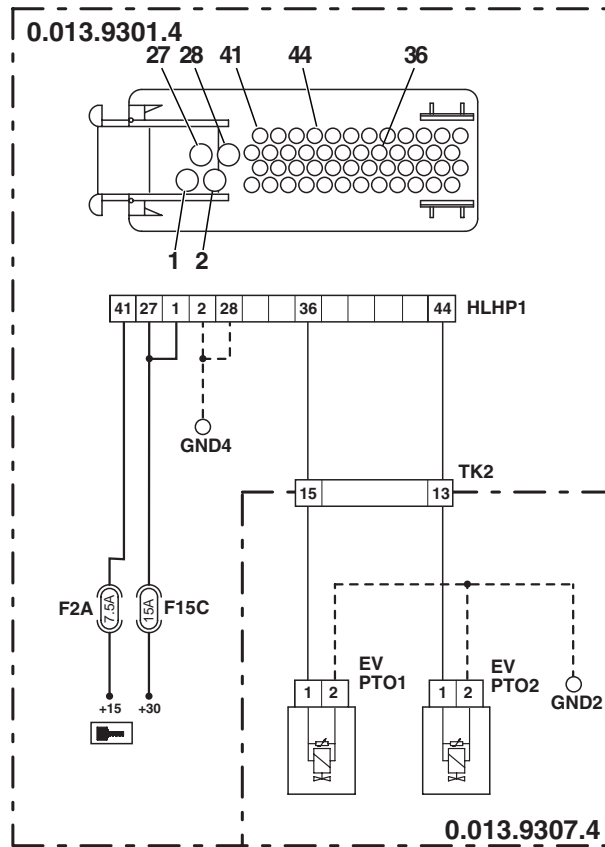
← Rear PTO Valve
Device out of order

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 connectors "HLHP1" of the control unit and "EVPTO2" of the rear PTO solenoid are not loose or corroded.
- 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.



D0030820



← SPN 551 - FMI 2



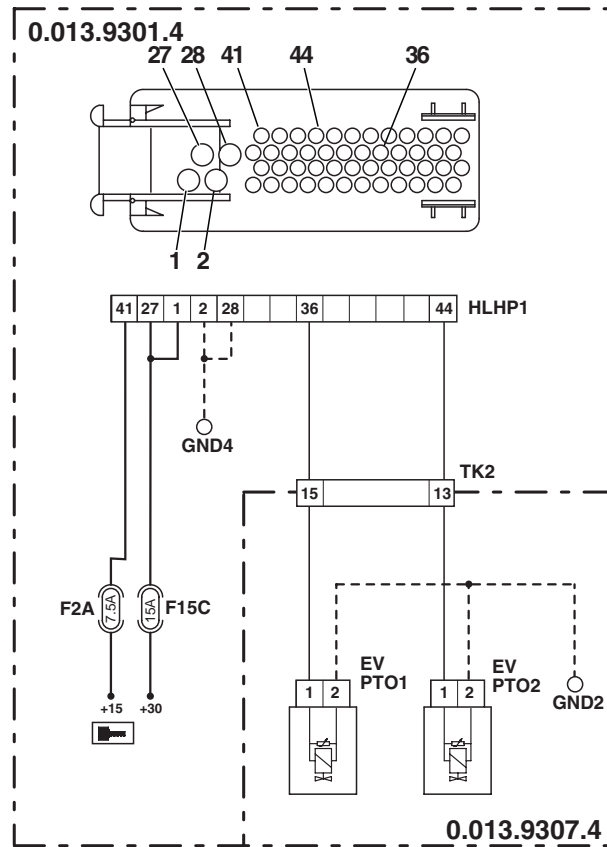
← Front PTO Valve
Signal not valid

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 connectors "HLHP1" of the control unit and "EVPTO1" of the rear PTO solenoid are not loose or corroded.
- 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.



D0030820



← SPN 551 - FMI 3



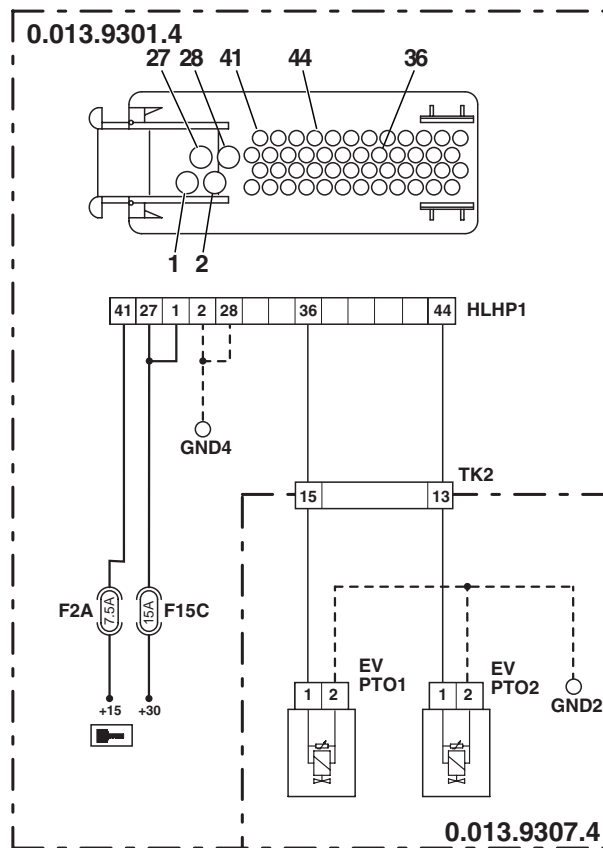
← Front PTO Valve
Short circuit high

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVPTO1" of the rear PTO solenoid are not loose or corroded.
- With the starter key in the "I" (ON) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVPTO1" and to the earth on the transmission and check that there is no voltage (test 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.



D0030820



← SPN 551 - FMI 4



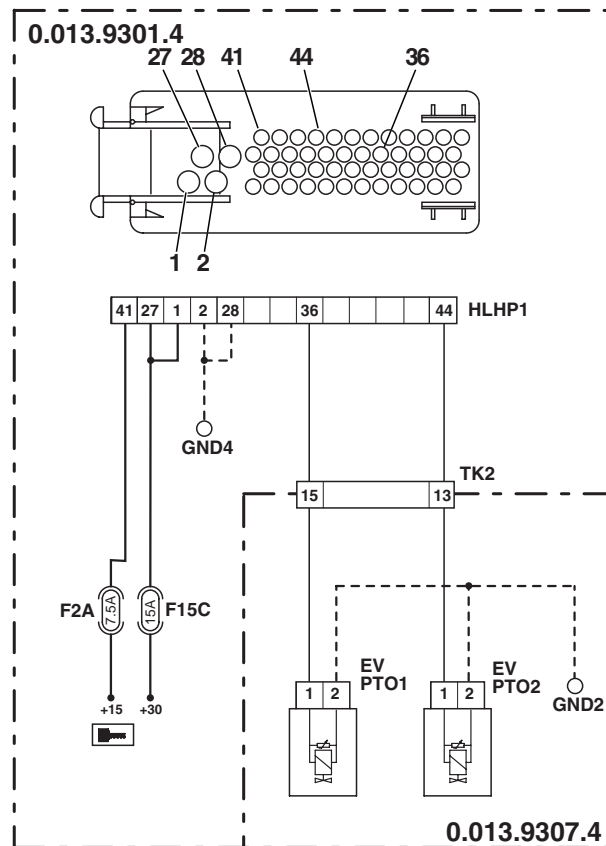
← Front PTO Valve
Grounding short-circuit

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVPTO1" of the rear PTO solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit , connect a test meter to pin 2 of the connector "EVPTO1" and to the earth on the transmission and test the resistance to check for shorting to earth (test 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.



D0030820



← SPN 551 - FMI 5



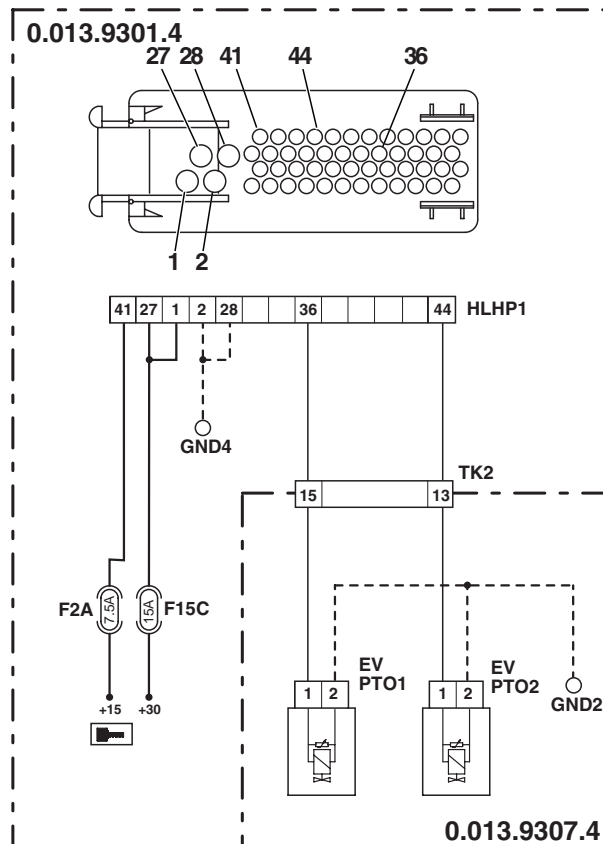
← Front PTO Valve disconnected

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVPTO1" of the front PTO solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "EVPTO1" and to pin 44 of the connector " HLHP1" and test 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 the "EVPTO1" connector and to the transmission earth and measure the resistance to check that the wire is not broken (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.



D0030820



← SPN 551 - FMI 11



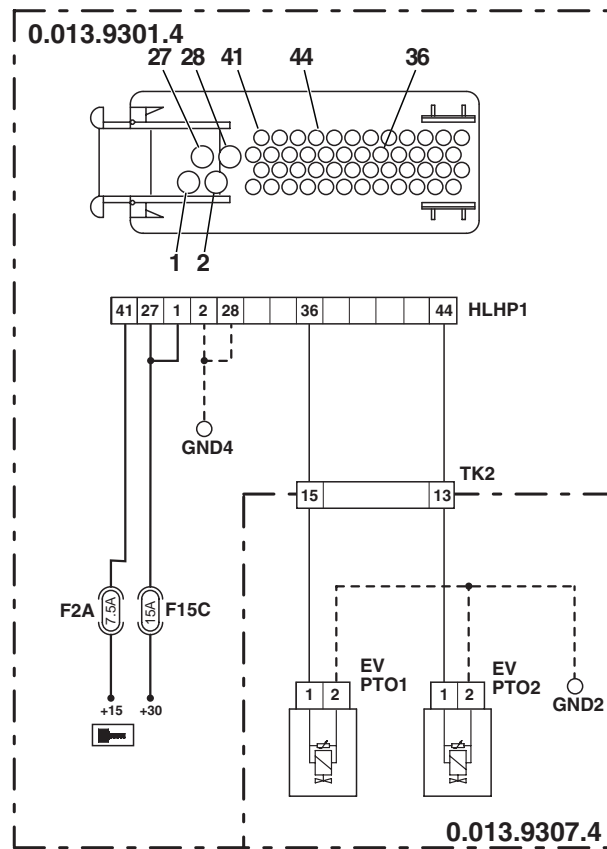
← Front PTO Valve Failure not ident.

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 connectors "HLHP1" of the control unit and "EVPTO1" of the front PTO solenoid are not loose or corroded.
- 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.



D0030820



← SPN 551 - FMI 12



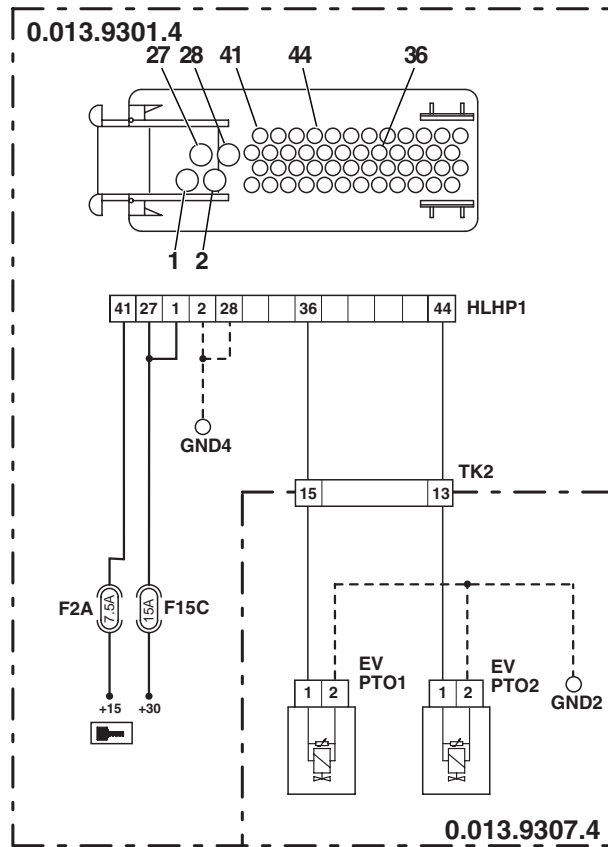
← Front PTO Valve
Device out of order

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 connectors "HLHP1" of the control unit and "EVPTO1" of the front PTO solenoid are not loose or corroded.
- 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.



D0030820



← SPN 552 - FMI 2



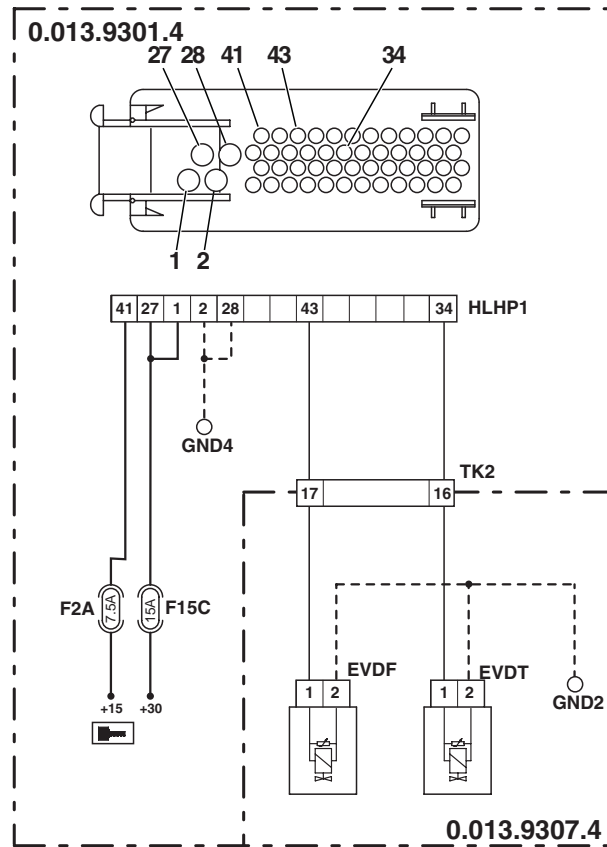
← Electrovalve 4WD
Signal not valid

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 connectors "HLHP1" of the control unit and "EVLOCK" of the 4WD solenoid are not loose or corroded.
- 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.



D0030830



← SPN 552 - FMI 3



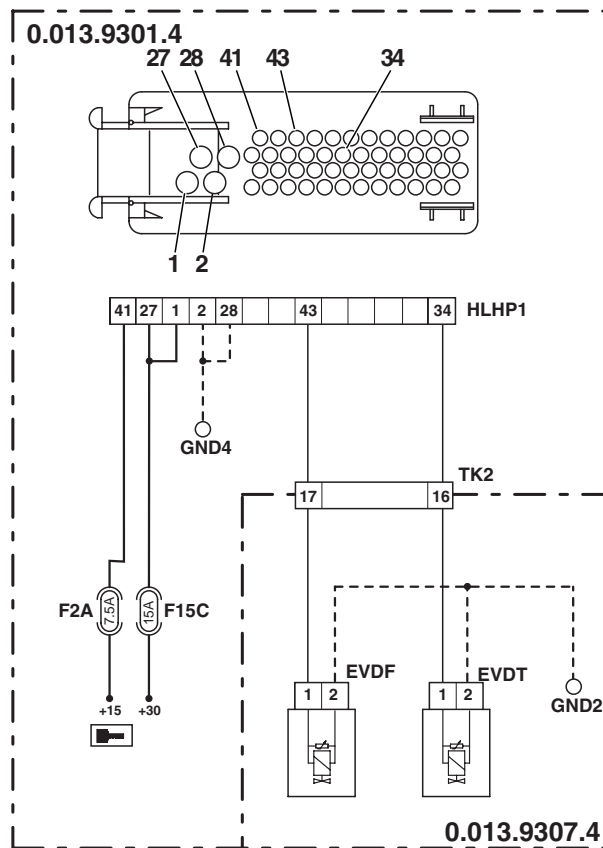
← Electrovalve 4WD
Short circuit high

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVDT" of the 4WD solenoid are not loose or corroded.
- With the starter key in the "I" (ON) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVDT" and to the earth on the transmission and check that there is no voltage (test 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.



D0030830



← SPN 552 - FMI 4



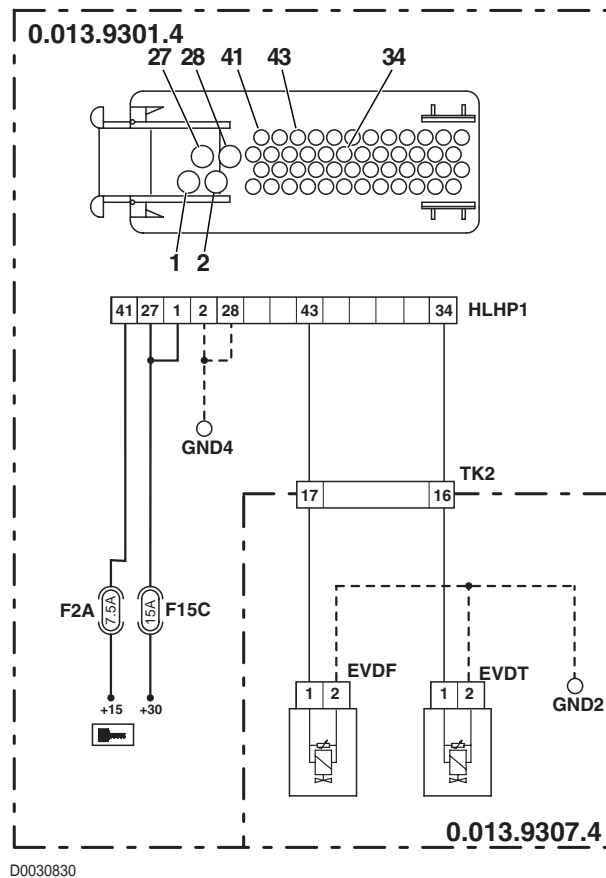
← Electrovalve 4WD
Grounding short-circuit

DESCRIPTION

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

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVDT" of the 4WD solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVDT" and to the earth on the transmission and test the resistance to check for shorting to earth (test 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.





← SPN 552 - FMI 5



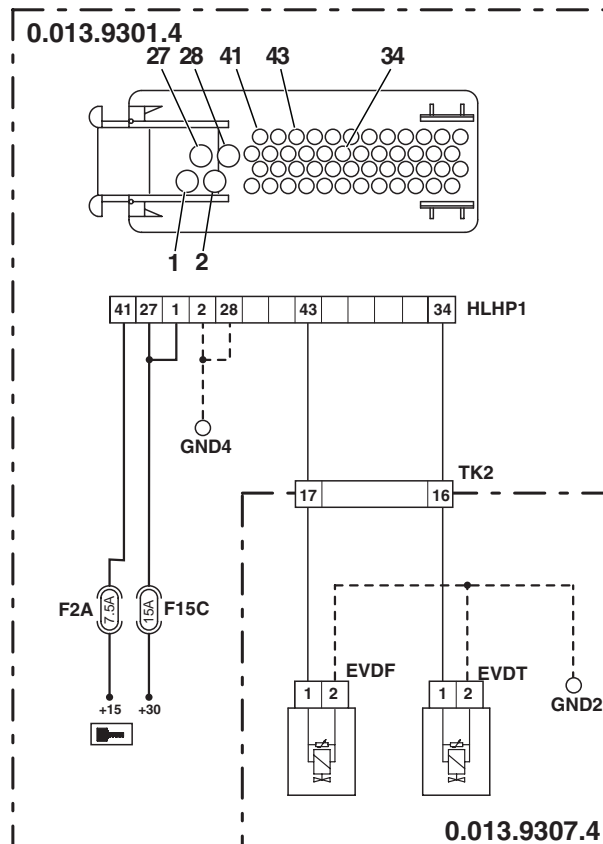
← Electrovalve 4WD disconnected

DESCRIPTION

The control unit detects that the 4WD solenoid is disconnected.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVDT" of the 4WD solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "EVDT" and to pin 34 of the connector " HLHP1" and test 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 the "EVDT" connector and to the transmission earth and measure the resistance to check that the wire is not broken (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.



D0030830



← SPN 552 - FMI 11



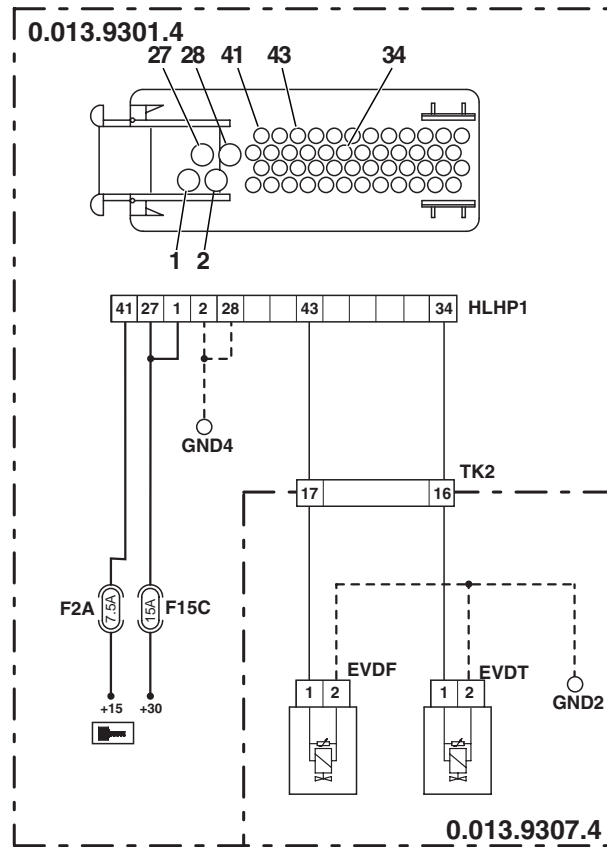
← Electrovalve 4WD
Failure not ident.

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 connectors "HLHP1" of the control unit and "EVDT" of the 4WD solenoid are not loose or corroded.
- 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.



D0030830



← SPN 552 - FMI 12



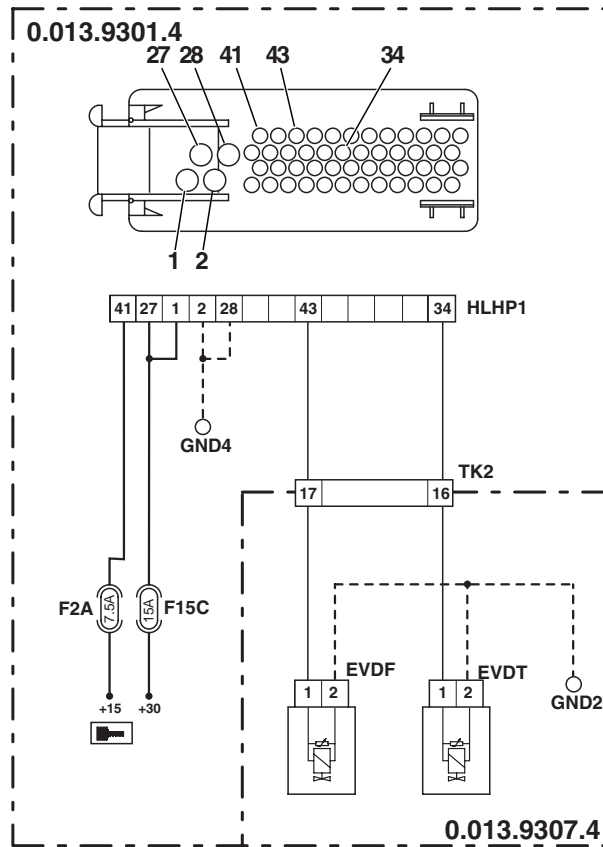
← Electrovalve 4WD
Device out of order

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 connectors "HLHP1" of the control unit and "EVDT" of the 4WD solenoid are not loose or corroded.
- 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.



D0030830



← SPN 561 - FMI 2

← Hand throttle
Signal not valid

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 active or passive alarms present regarding the CANBUS and, if necessary, check the wiring following the instructions given in the chapter "CANBUS ALARMS".
- Calibrate the hand throttle sensor (for details, see "4.2.6 CALIBRATION OF THE HAND THROTTLE (USING THE SERDIA PROGRAMME)" or "4.2.7 CALIBRATION OF THE HAND THROTTLE (USING THE ART)").
- 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 601 - FMI 3



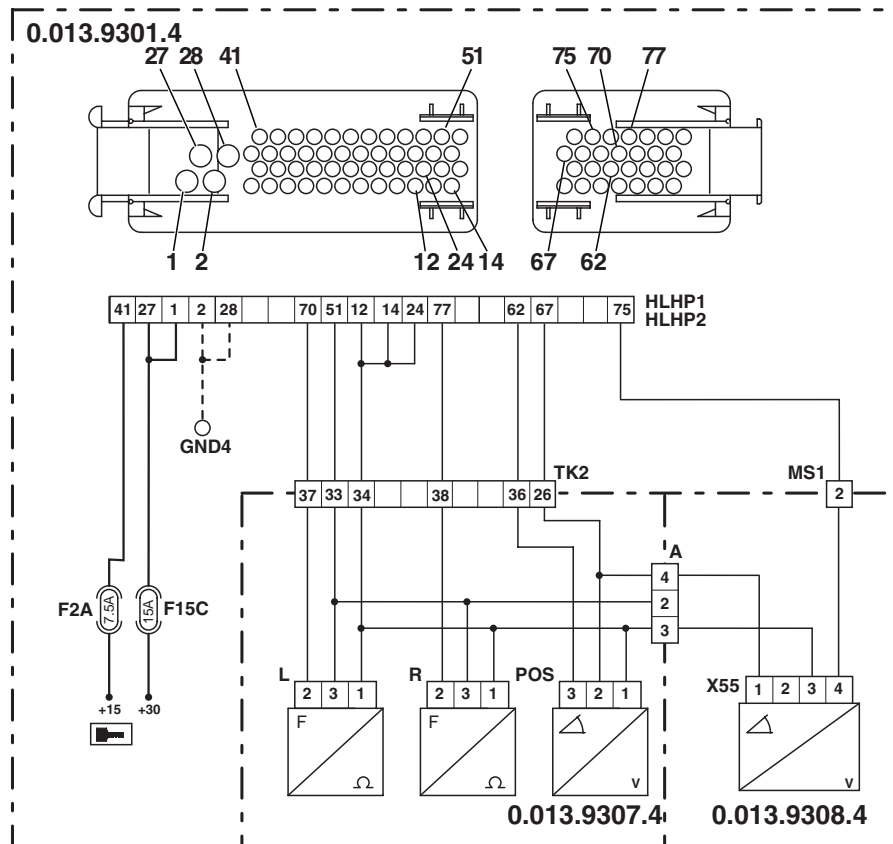
← Susp. pos. Sensor
Short circuit high

DESCRIPTION

The control unit detects that the lift position sensor is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "POS" of the lift position sensor and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the lift position sensor is correct (approximately 5Vdc between pin 1 (negative) and pin 3 (positive) of the connector "POS").
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 2 of the connector "POS" and to the cab earth and check that there is no voltage (test 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.



D0030810



← SPN 601 - FMI 4



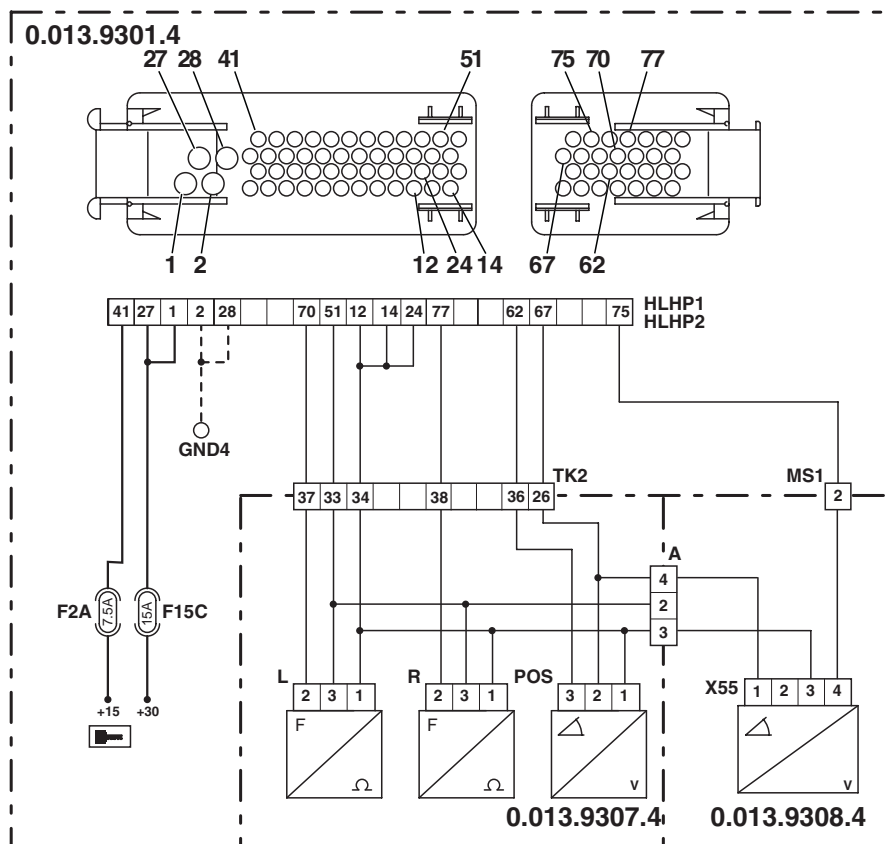
← Susp. pos. Sensor
Grounding short-circuit

DESCRIPTION

The control unit detects that the lift position sensor is shorting to earth.

CHECK

- Check that the contacts on the connectors "POS" of the lift position sensor and "HLHP" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the lift position sensor is correct (approximately 5Vdc between pin 1 (negative) and pin 3 (positive) of the connector "POS").
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 2 of the connector "POS" and to the earth on the transmission and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 and pin 2 of the connector "POS" and test the resistance to check whether they are shorting to each other (test meter reading: infinity).
- Check that the sensor is functioning correctly (for technical details, see group 40)
- 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.



D0030810



← SPN 601 - FMI 12



← Susp. pos. Sensor
Device out of order

DESCRIPTION

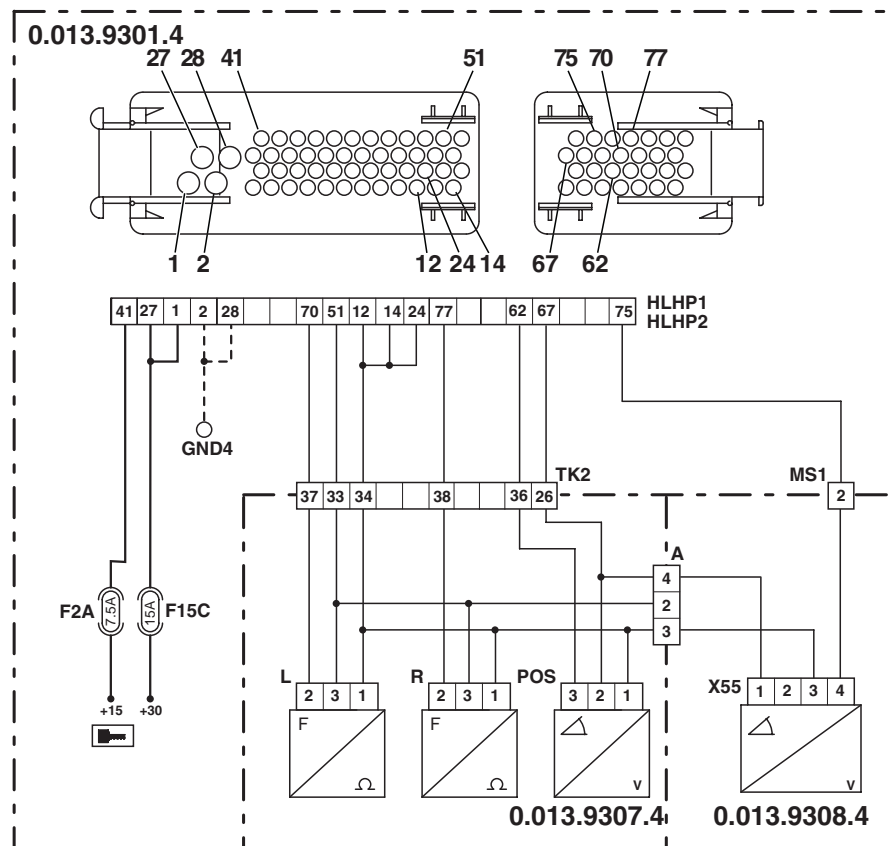
The control unit detects an internal fault in the control unit in the input signal of the lift position sensor.

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 connectors "HLHP1" of the control unit and "POS" of the rear PTO solenoid are not loose or corroded.
- 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.



D0030810



← SPN 602 - FMI 3



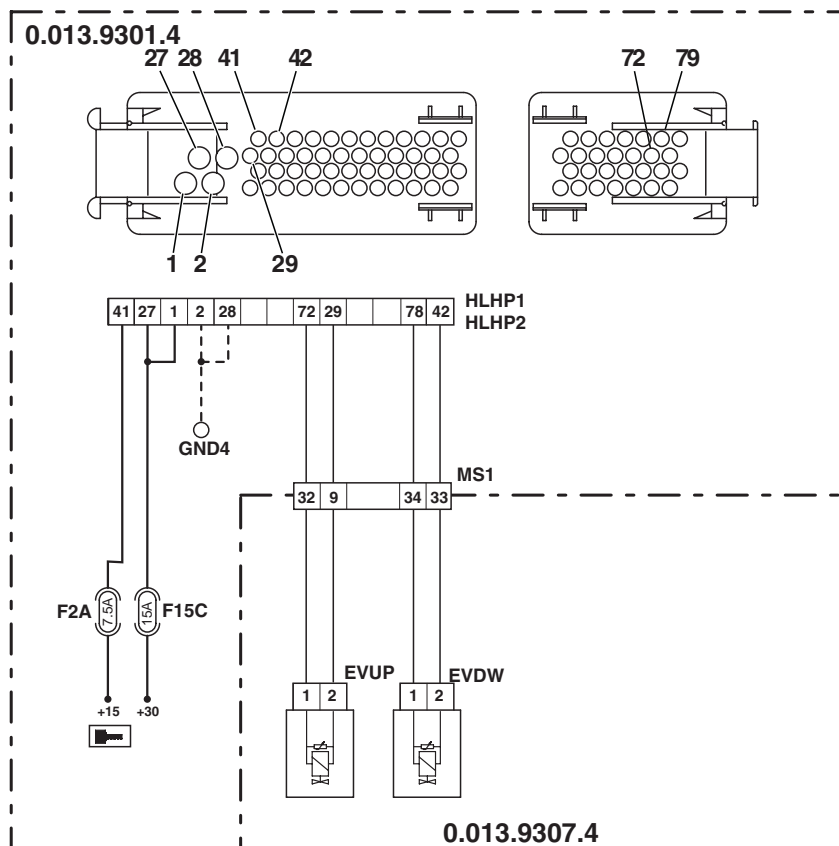
← Hitch Raise Valve Short circuit high

DESCRIPTION

The control unit detects that the lift 'up' solenoid is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "EVUP" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connector "EVUP" and to the earth on the transmission and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVUP" and to the earth on the transmission and check that there is no voltage (test 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.



D0030840



← SPN 602 - FMI 4



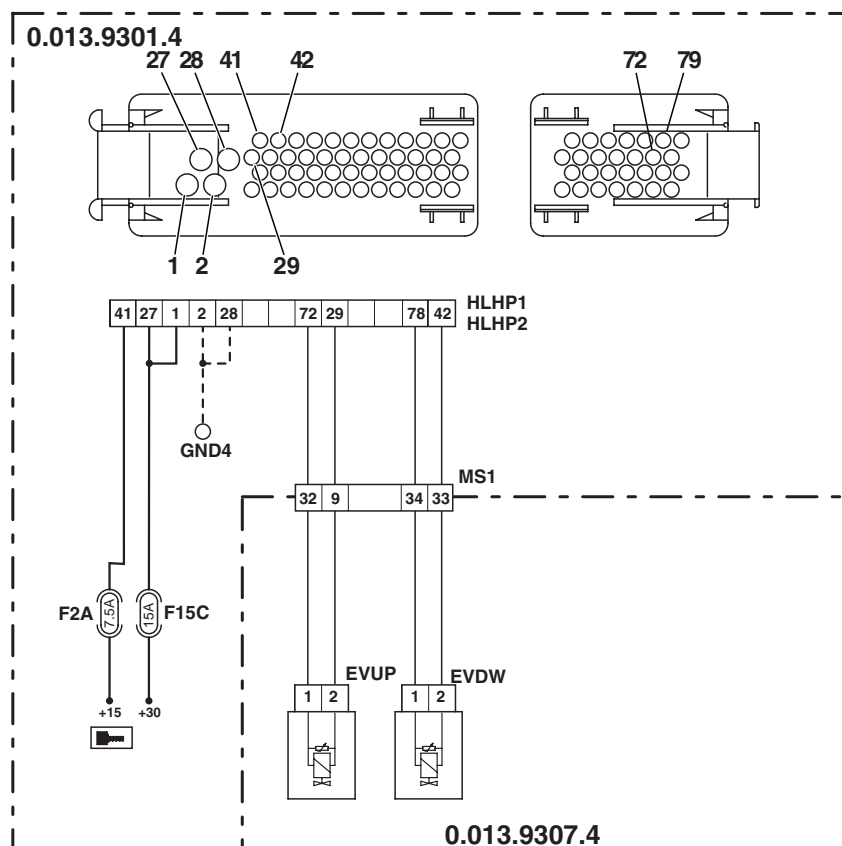
← Hitch Raise Valve
Grounding short-circuit

DESCRIPTION

The control unit detects that the lift 'Up' solenoid is shorting to earth.

CHECK

- Check that the contacts on the connectors "EVUP" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connector "EVUP" and to the earth on the transmission and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030840



← SPN 602 - FMI 5



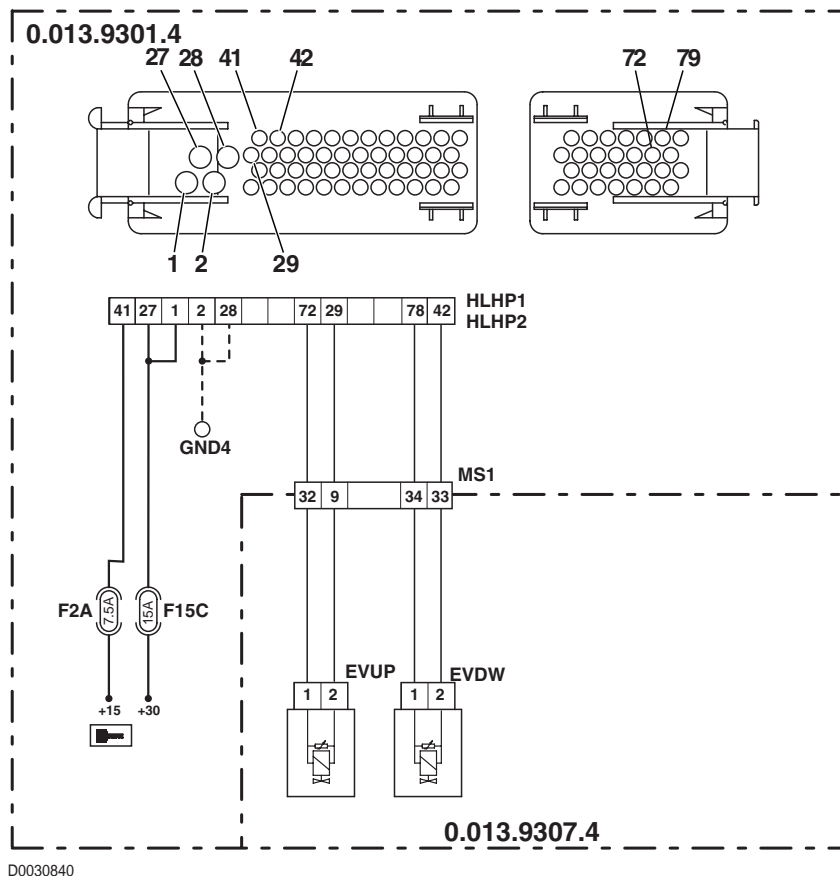
← Hitch Raise Valve disconnected

DESCRIPTION

The control unit detects an excessive current draw by the lift 'up' solenoid.

CHECK

- Check that the contacts on the connectors "EVUP" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 and pin 2 of the connector "EVUP" and test the resistance to check whether they are shorting to each other (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, 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 shorting to earth (test meter reading: infinity).
- 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 602 - FMI 6



← Hitch Raise Valve Short-circuit

DESCRIPTION

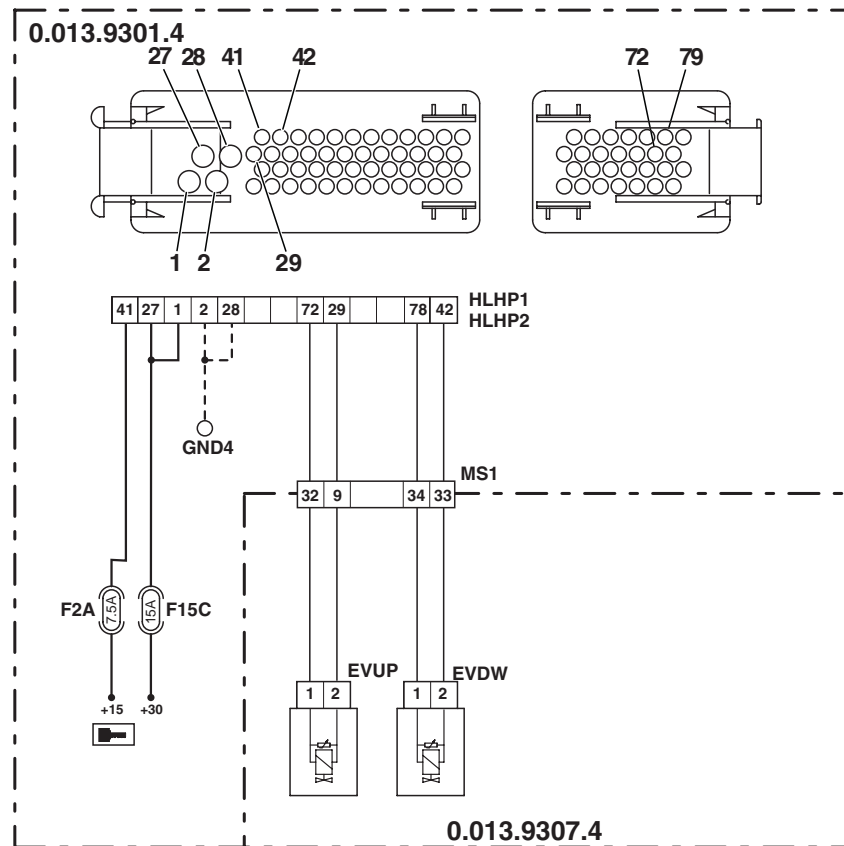
The control unit detects a shortcircuit in the control wire of the lift 'Up' solenoid.

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 connectors "EVUP" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in position "O" (OFF), connect a test meter to pin 2 of the "EVUP" connector and to the transmission earth and measure the resistance to check that there are no shorts to earth (test meter reading: infinity).
- With the starter key in position "O" (OFF), connect a test meter to pins 1 and 2 of the "EVUP" connector and measure the resistance to check that there are no short circuits (test meter reading: infinity).
- 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.



D0030840



← SPN 603 - FMI 3



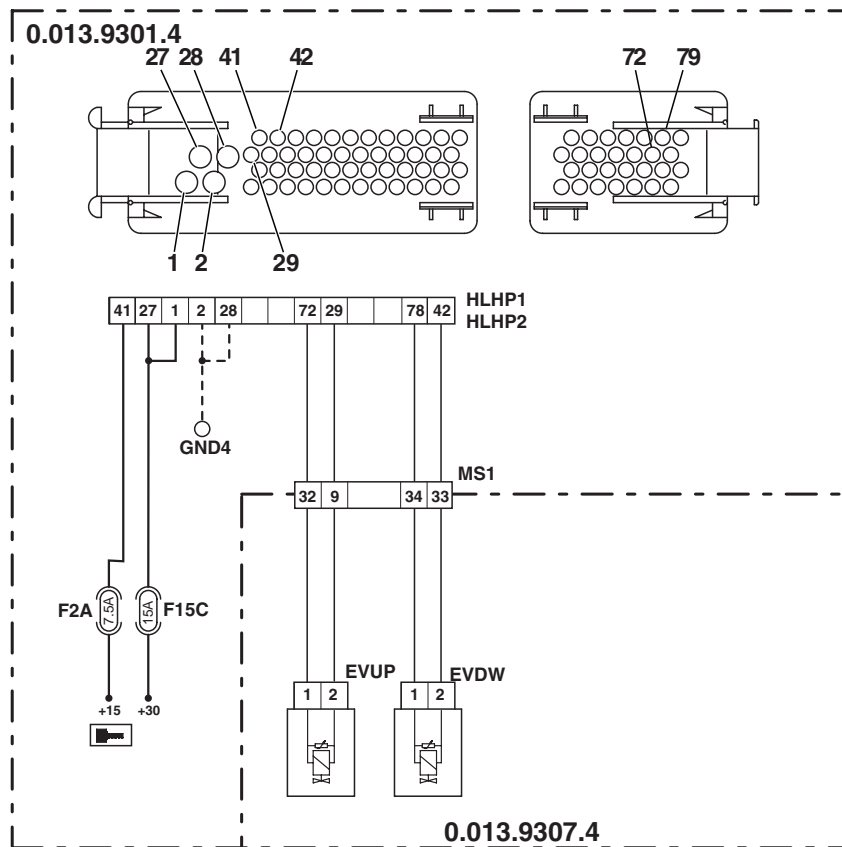
← Hitch Lower Valve
Short circuit high

DESCRIPTION

The control unit detects that the lift 'down' solenoid is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "EVDW" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connector "EVDW" and to the earth on the transmission and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVDW" and to the earth on the transmission and check that there is no voltage (test 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.



D0030840



← SPN 603 - FMI 4



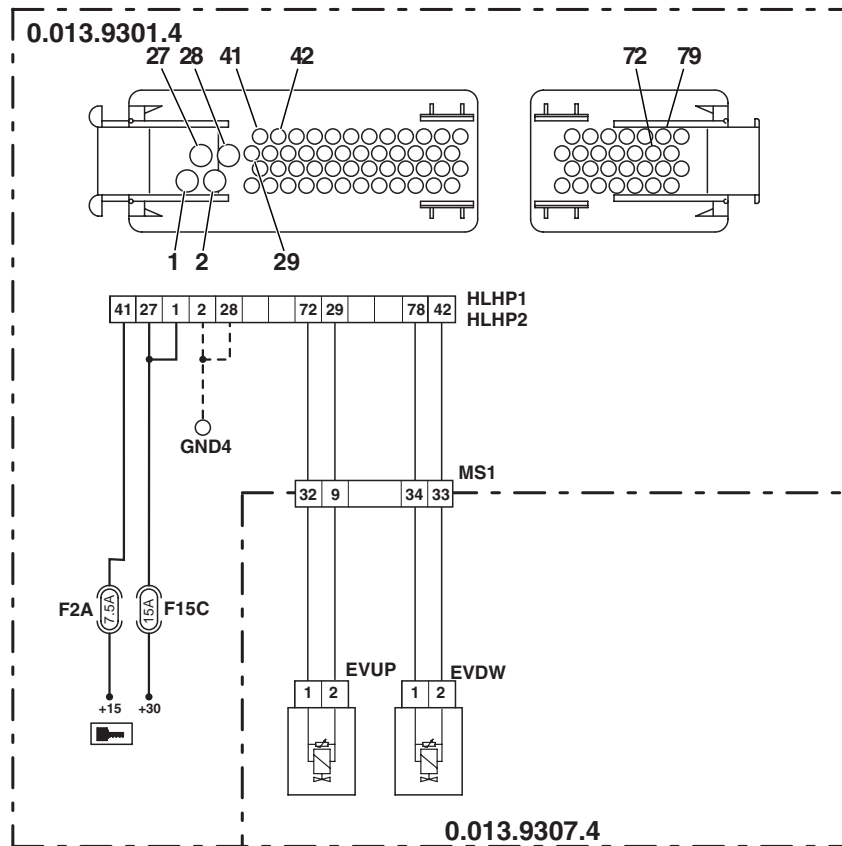
← Hitch Lower Valve
Grounding short-circuit

DESCRIPTION

The control unit detects that Lift Down solenoid is shorting to earth.

CHECK

- Check that the contacts on the connectors "EVDW" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connector "EVDW" and to the earth on the transmission and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030840



← SPN 603 - FMI 5



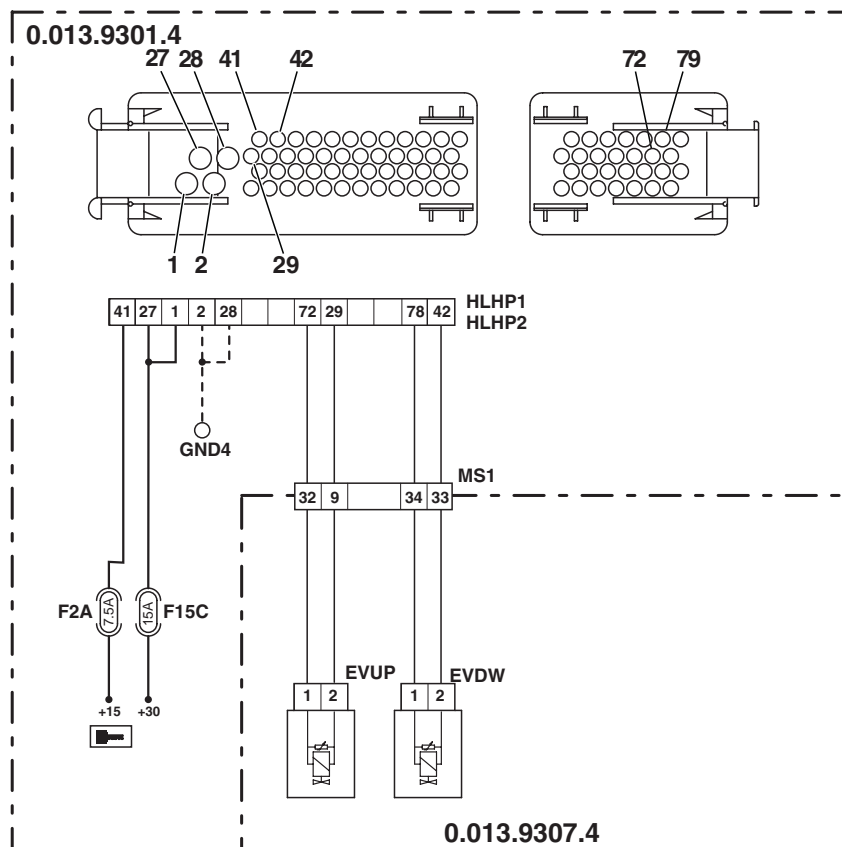
← Hitch Lower Valve disconnected

DESCRIPTION

The control unit detects an excessive current draw by the lift 'down' solenoid.

CHECK

- Check that the contacts on the connectors "EVDW" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 and pin 2 of the connector "EVDW" and test the resistance to check whether they are shorting to each other (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, 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 shorting to earth (test meter reading: infinity).
- 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.



D0030840



← SPN 603 - FMI 6



← Hitch Lower Valve Short-circuit

DESCRIPTION

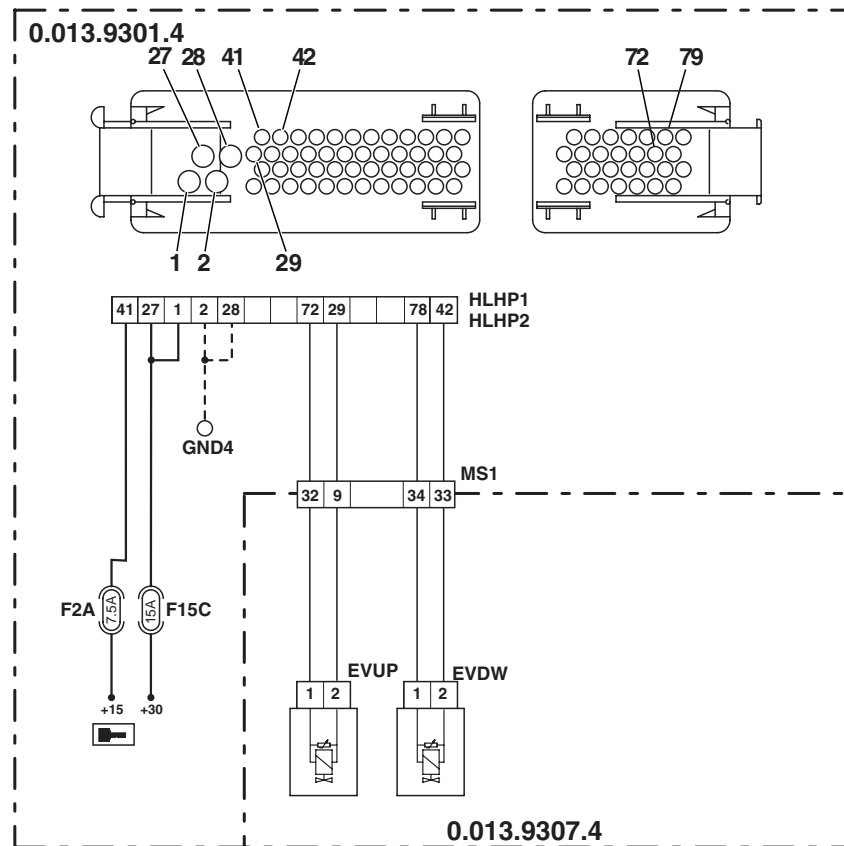
The control unit detects a shortcircuit in the control wire of the lift 'down' solenoid.

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 connectors "EVDW" of the solenoid and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in position "O" (OFF), connect a test meter to pin 2 of the "EVDW" connector and to the transmission earth and measure the resistance to check that there are no shorts to earth (test meter reading: infinity).
- With the starter key in position "O" (OFF), connect a test meter to pins 1 and 2 of the "EVDW" connector and measure the resistance to check that there are no short circuits (test meter reading: infinity).
- 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.



D0030840



← SPN 604 - FMI 3



← Control Depth Set
Short circuit high

DESCRIPTION

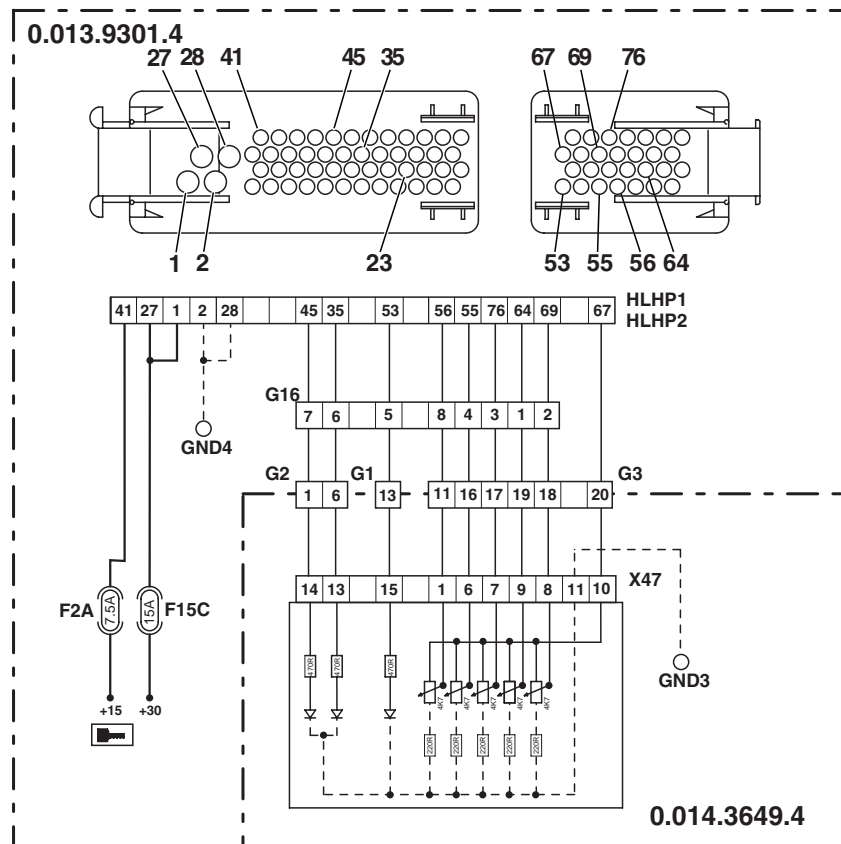
The control unit detects that the depth control potentiometer is shorting to a positive feed.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "G16" configuration, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connector "X47" and to the earth on the transmission and check that there is no voltage (test 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.



D0030850



← SPN 604 - FMI 4



← Control Depth Set
Grounding short-circuit

DESCRIPTION

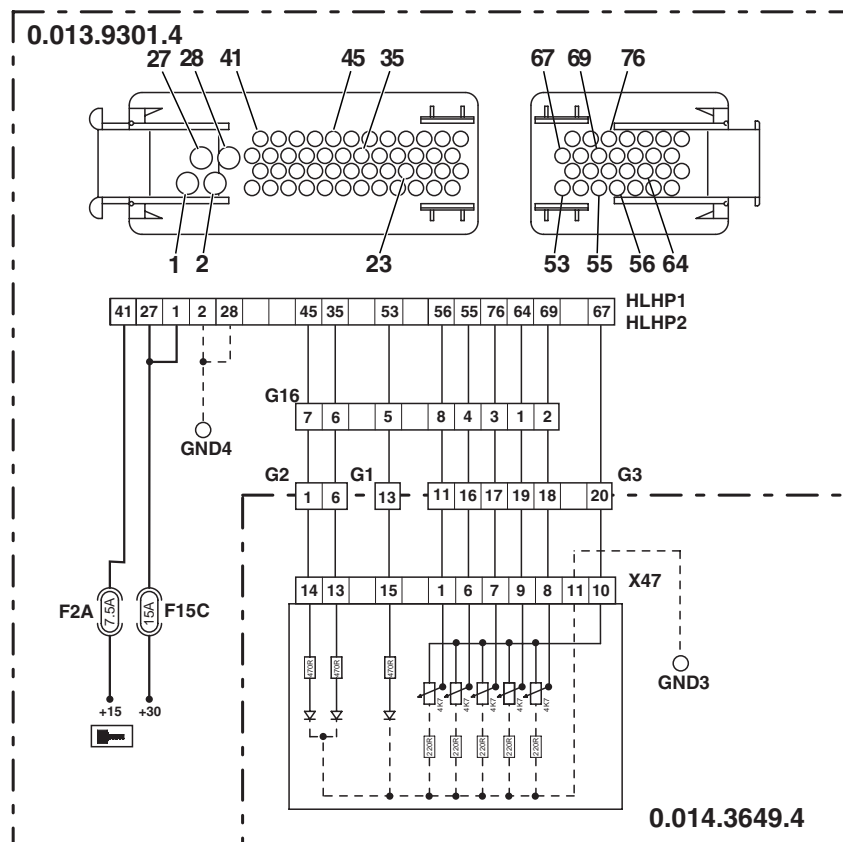
The control unit detects that the depth control potentiometer is shorting to earth.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the configuration connector "G16" is connected and that the contacts are not corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connector "X47" and to the cab earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030850



← SPN 605 - FMI 3



← Control Height Set
Short circuit high

DESCRIPTION

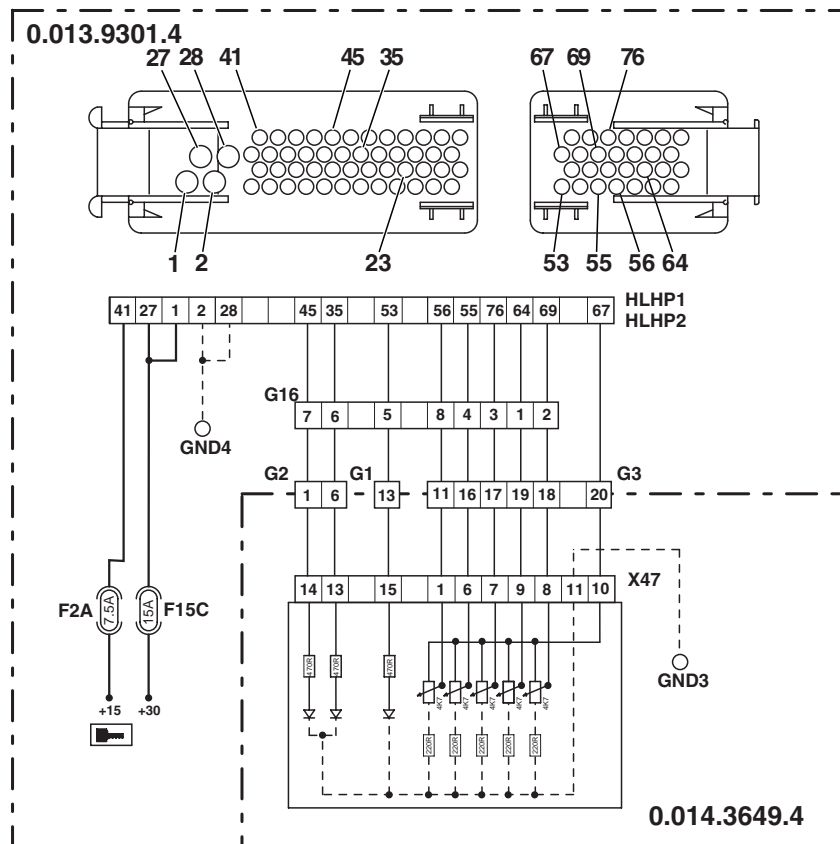
The control unit detects that the maximum lift height potentiometer is shorting to a positive feed.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "G16" configuration, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 7 of the connector "X47" and to the earth on the transmission and check that there is no voltage (test 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.



D0030850



← SPN 605 - FMI 4



← Control Height Set
Grounding short-circuit

DESCRIPTION

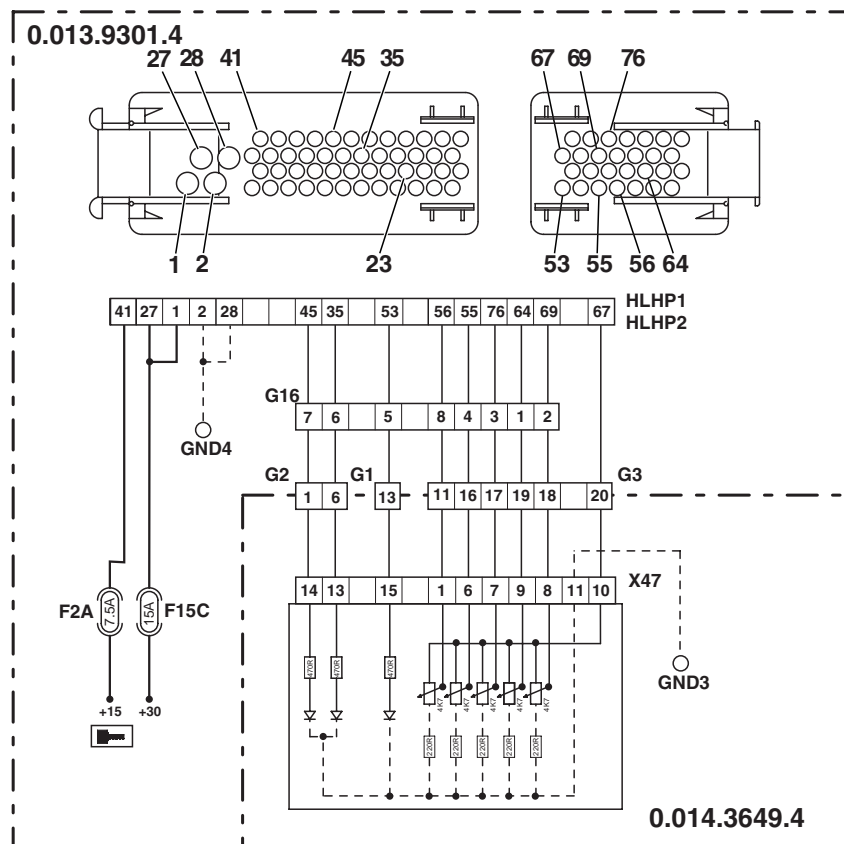
The control unit detects that the maximum lift height potentiometer is shorting to earth.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the configuration connector "G16" is connected and that the contacts are not corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 7 of the connector "X47" and to the cab earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030850



← SPN 606 - FMI 3



← Control Low Speed
Short circuit high

DESCRIPTION

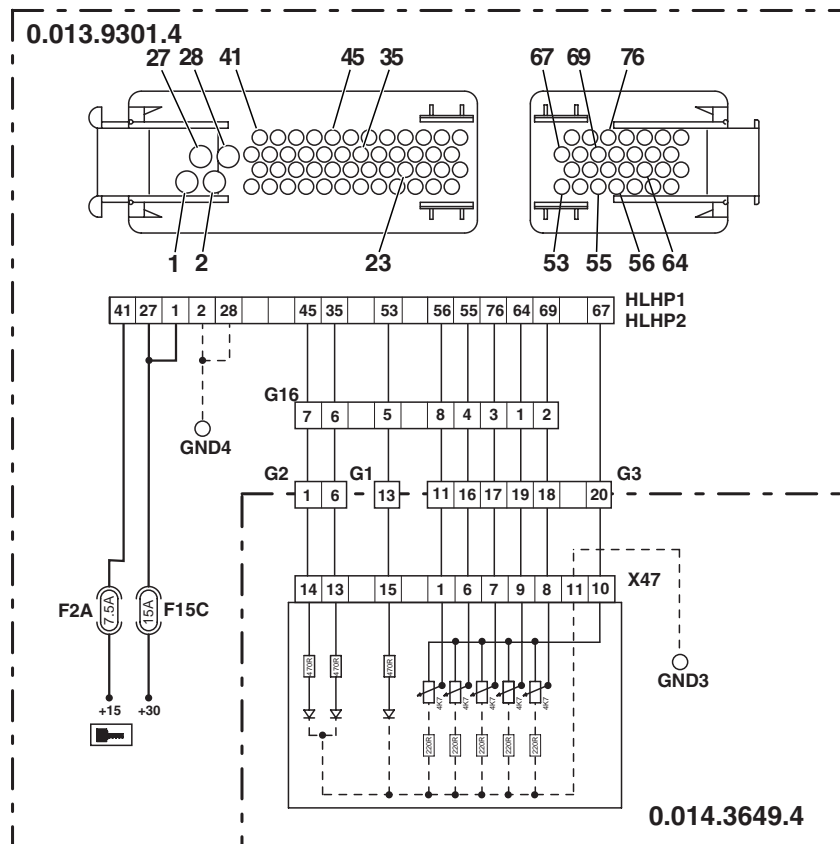
The control unit detects that the rate-of-drop potentiometer is shorting to a positive feed.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "G16" configuration, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 8 of the connector "X47" and to the earth on the transmission and check that there is no voltage (test 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.



D0030850



← SPN 606 - FMI 4



← Control Low Speed
Grounding short-circuit

DESCRIPTION

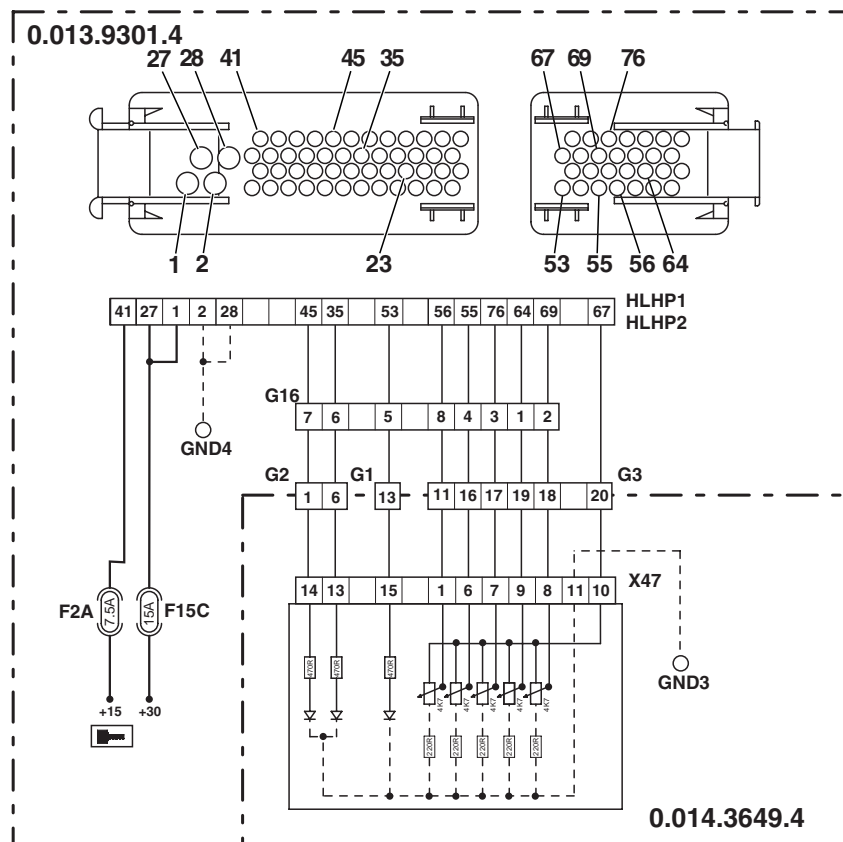
The control unit detects that the rate-of-drop potentiometer is shorting to earth.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the configuration connector "G16" is connected and that the contacts are not corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 8 of the connector "X47" and to the cab earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030850



← SPN 607 - FMI 3



← Control Intermix
Short circuit high

DESCRIPTION

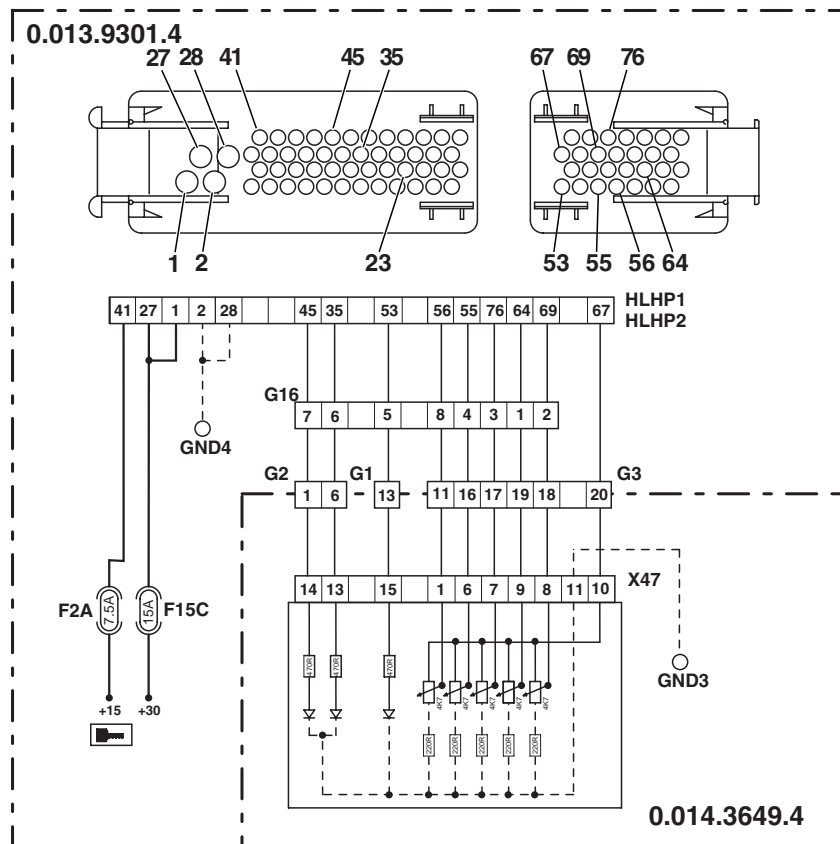
The control unit detects that the control mode potentiometer is shorting to a positive feed.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "G16" configuration, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 6 of the connector "X47" and to the earth on the transmission and check that there is no voltage (test 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.



D0030850



← SPN 607 - FMI 4



← Control Intermix
Grounding short-circuit

DESCRIPTION

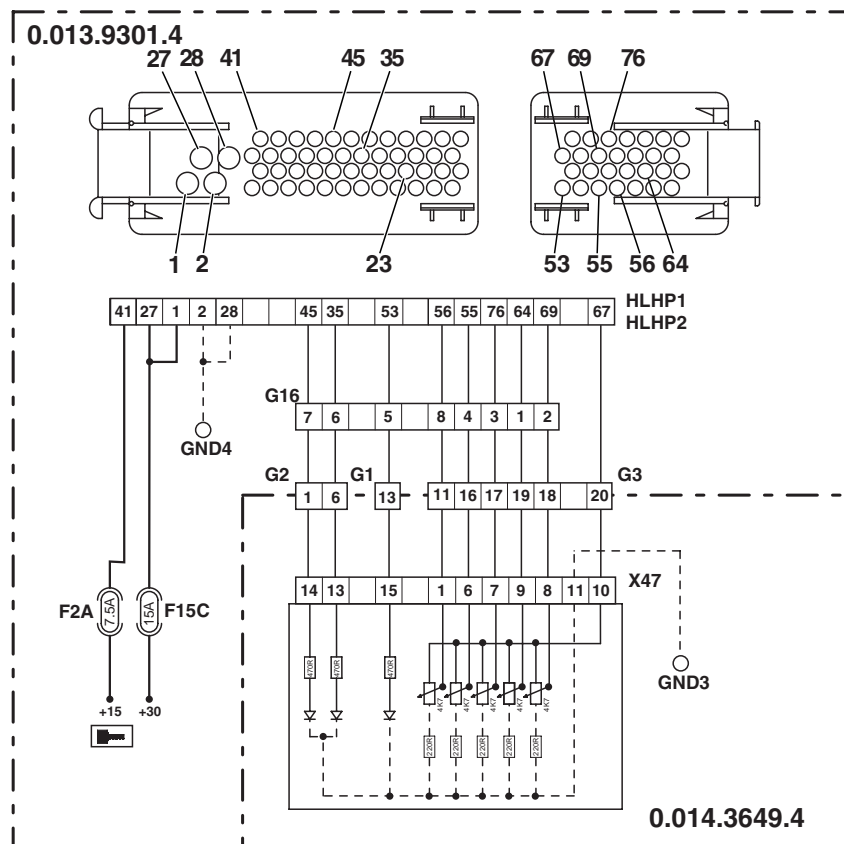
The control unit detects that the control mode potentiometer is shorting to earth.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the configuration connector "G16" is connected and that the contacts are not corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 6 of the connector "X47" and to the cab earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030850



← SPN 620 - FMI 3



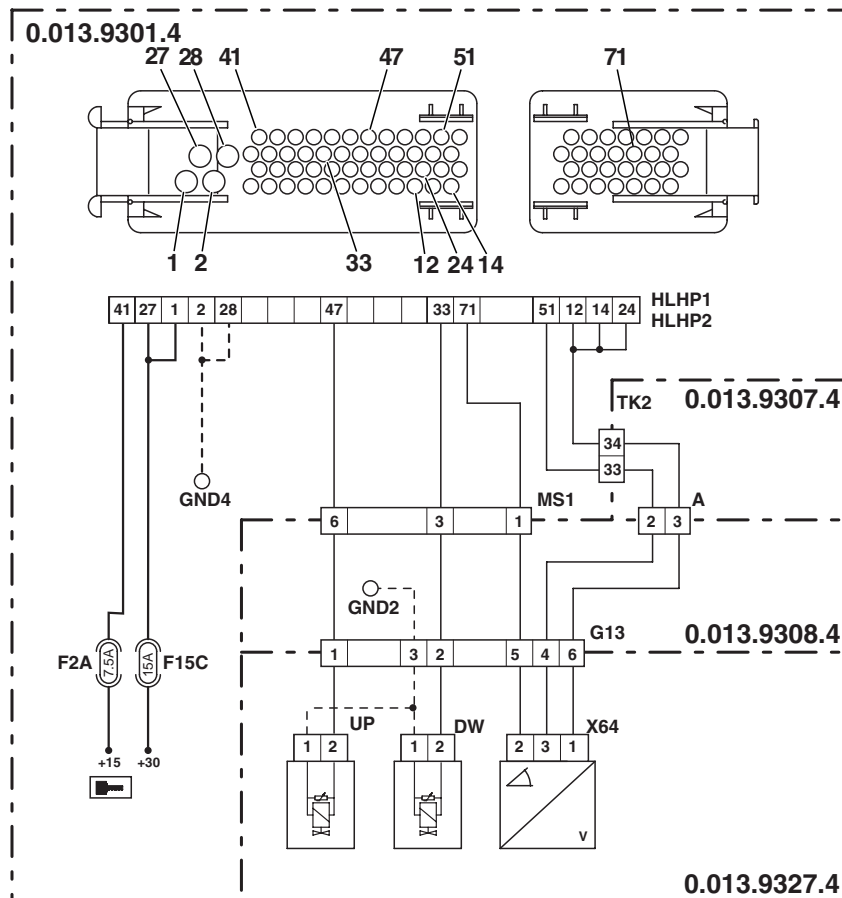
← Susp. pos. Sensor
Short circuit high

DESCRIPTION

The control unit detects that the front axle suspension position sensor is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "X64" of the front axle suspension position sensor "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the front axle position sensor is correct (voltage between pin 3 (positive) and pin 1 (negative) of the connector "X64" approximately 8 Vdc).
- With the starter key in the "I" (ON) position, connect a test meter to pin 2 of the connector "X64" and to the earth on the transmission and check that there is no voltage (test meter reading: 0V).
- Check that the sensor is functioning correctly (for technical details see Group 40).
- 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.



D0030860



← SPN 620 - FMI 4



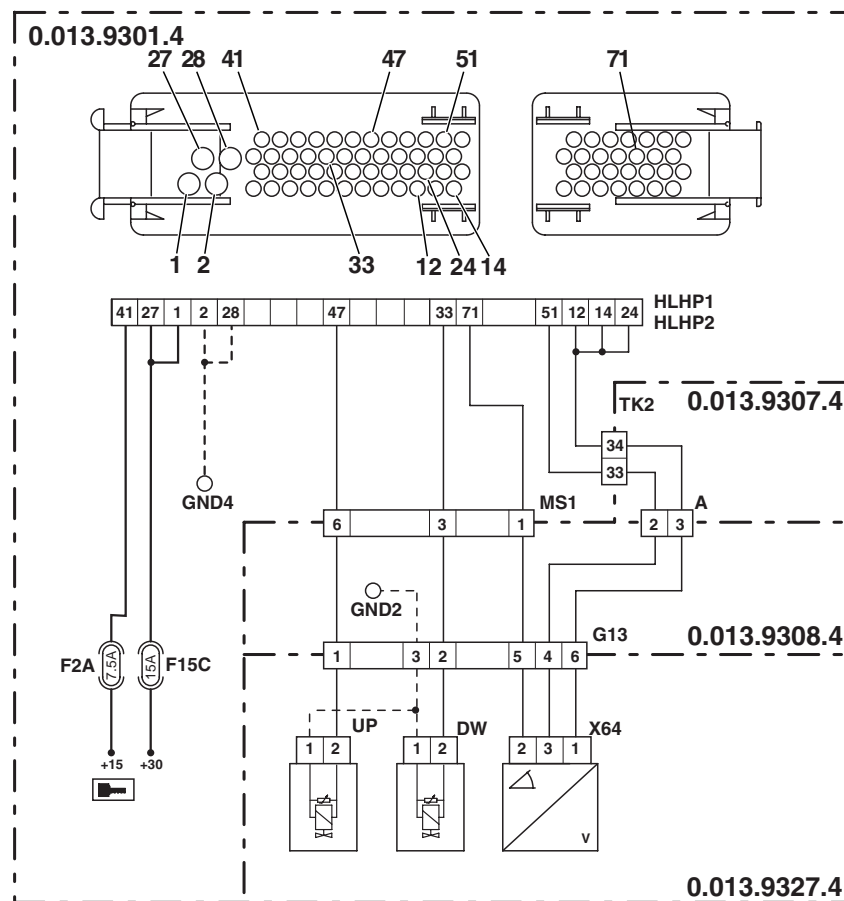
← Susp. pos. Sensor
Grounding short-circuit

DESCRIPTION

The control unit detects that the lift position sensor is disconnected.

CHECK

- Check that the contacts on the connectors "X64" of the front axle suspension position sensor "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the front axle position sensor is correct (voltage between pin 3 (positive) and pin 1 (negative) of the connector "X64" approximately 8 Vdc).
- Check for electrical continuity between pin 71 of the connector "HLHP2" and pin 2 of the connector "X64".
- With the starter key in position "O" (OFF), connect a test meter to pin 2 of the "X64" connector and to the transmission earth and measure the resistance to check that there are no shorts to earth (test meter reading: infinity).
- Check that the sensor is functioning correctly (for technical details see Group 40).
- 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.



D0030860



← SPN 621 - FMI 2



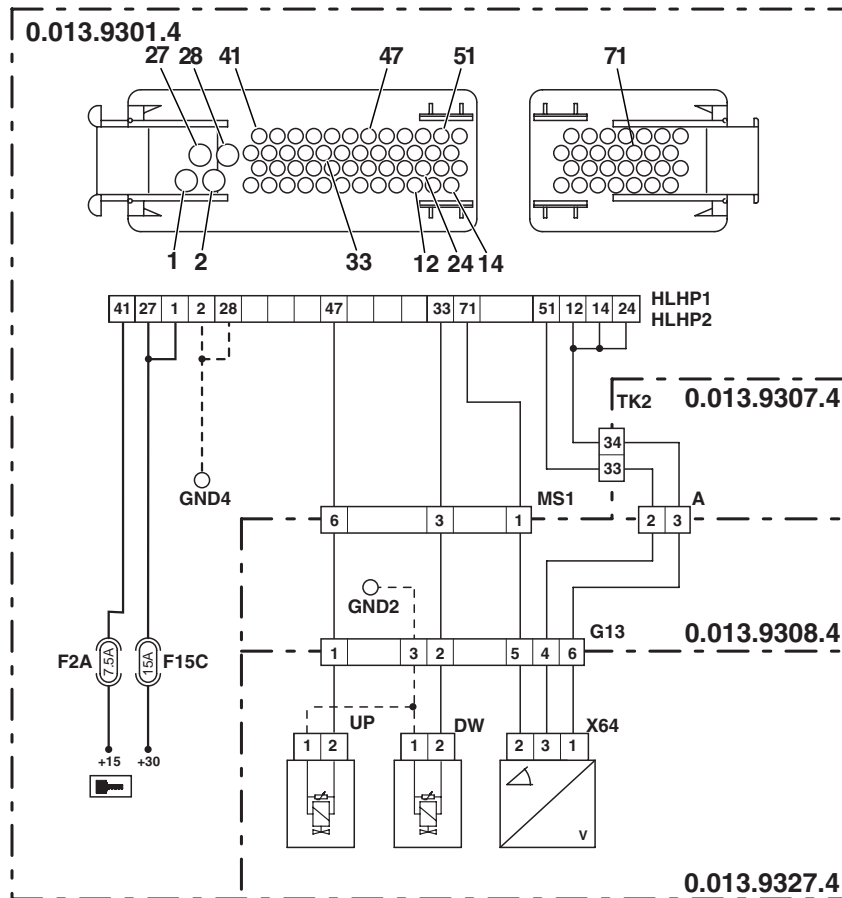
← Susp. Raise Valve
Signal not valid

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 connectors "HLHP1" of the control unit and "UP" of the front axle suspension "Up" solenoid are not loose or corroded.
- 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.



D0030860



← SPN 621 - FMI 3



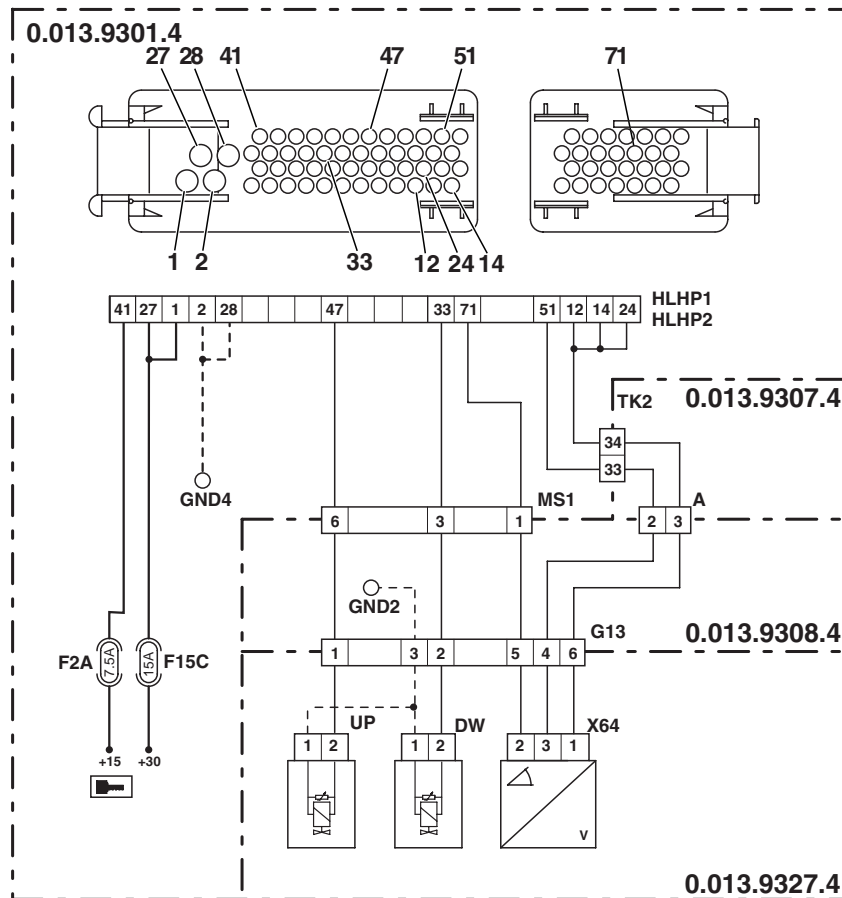
← Susp. Raise Valve
Short circuit high

DESCRIPTION

The control unit detects that the front axle suspension 'up' solenoid is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "UP" of the front axle suspension "Up" solenoid are not loose or corroded.
- With the starter key in the "I" (ON) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "UP" and to the earth on the transmission and check that there is no voltage (test 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.



D0030860



← SPN 621 - FMI 4



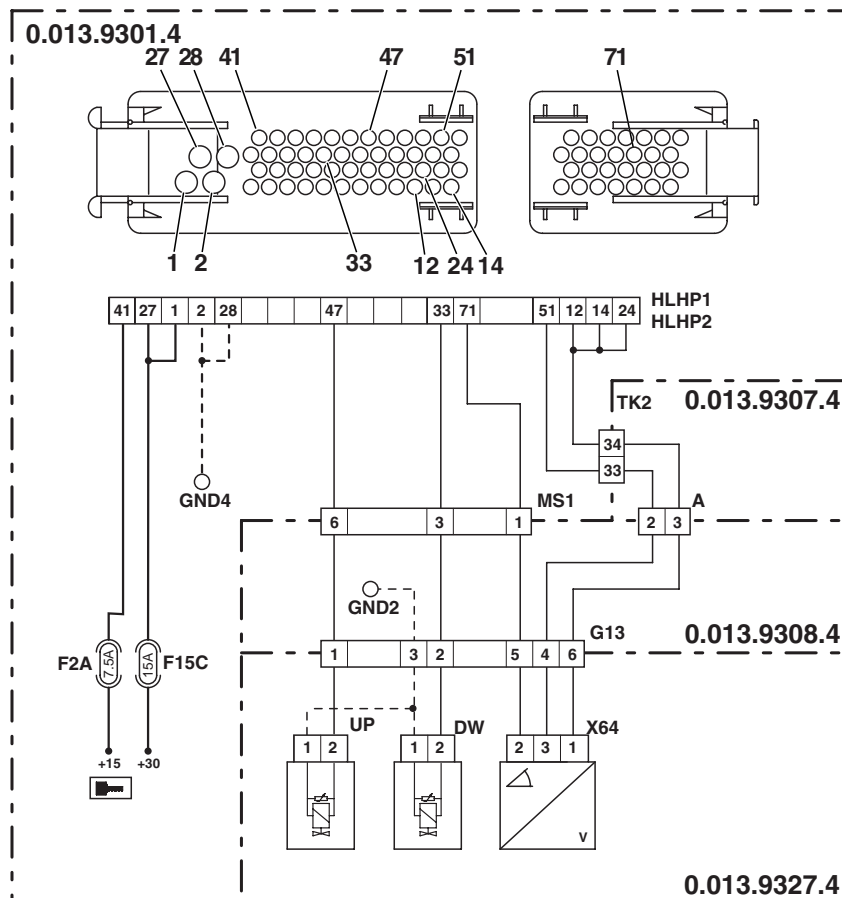
← Susp. Raise Valve
Grounding short-circuit

DESCRIPTION

The control unit detects that the front axle suspension 'up' solenoid is shorting to earth.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "UP" of the front axle suspension "Up" solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "UP" and to the earth on the transmission and test the resistance to check for shorting to earth (test 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



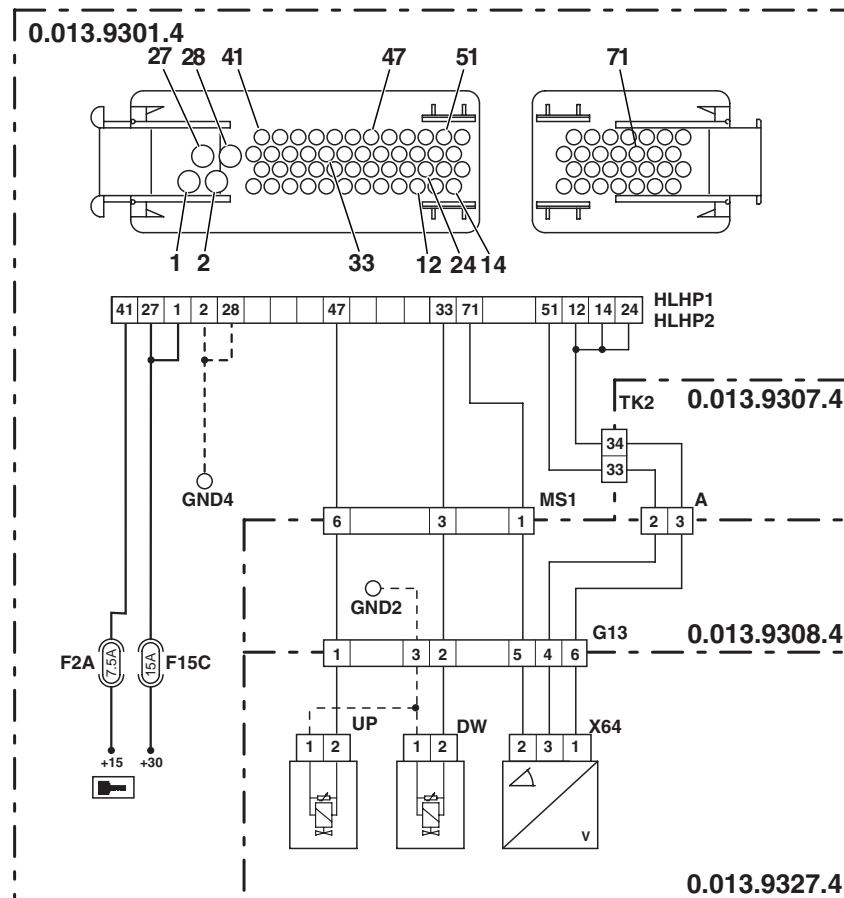
← Susp. Raise Valve disconnected

DESCRIPTION

The control unit detects that the front axle suspension 'up' solenoid is disconnected.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "UP" of the front axle suspension "Up" solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "UP" and to pin 47 of the connector "HLHP1" and test 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 the "EVDT" connector and to the transmission earth and measure the resistance to check that the wire is not broken (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.



D0030860



← SPN 621 - FMI 11



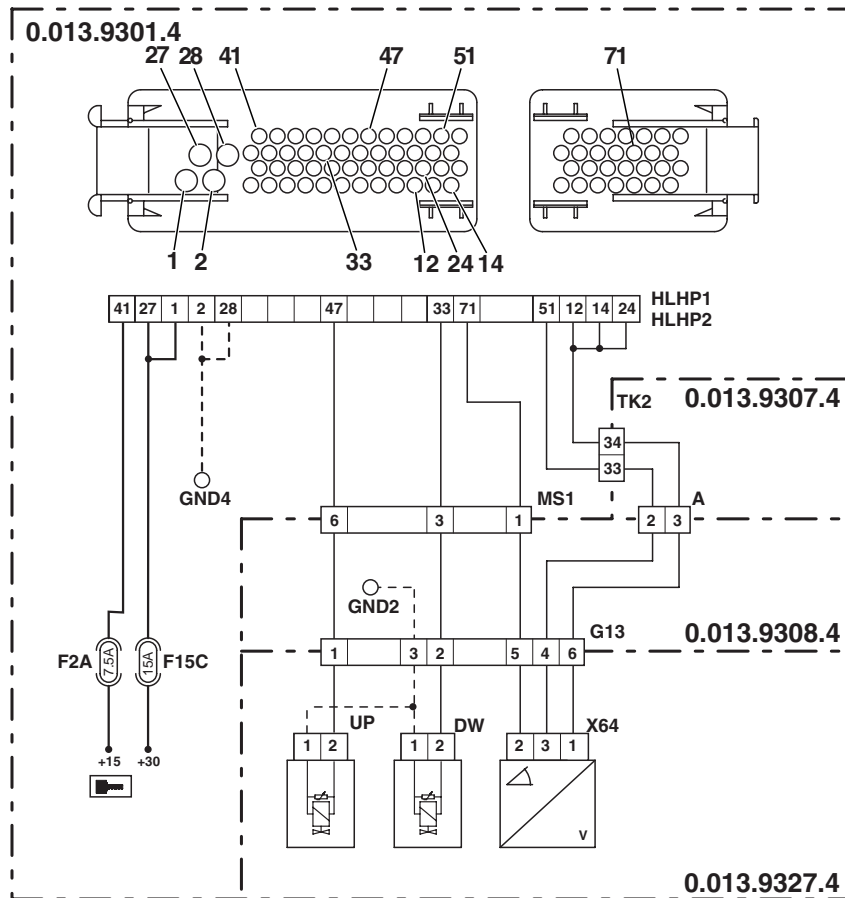
← Susp. Raise Valve Failure not ident.

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 connectors "HLHP1" of the control unit and "UP" of the front axle suspension "Up" solenoid are not loose or corroded.
- 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.



D0030860



← SPN 621 - FMI 12



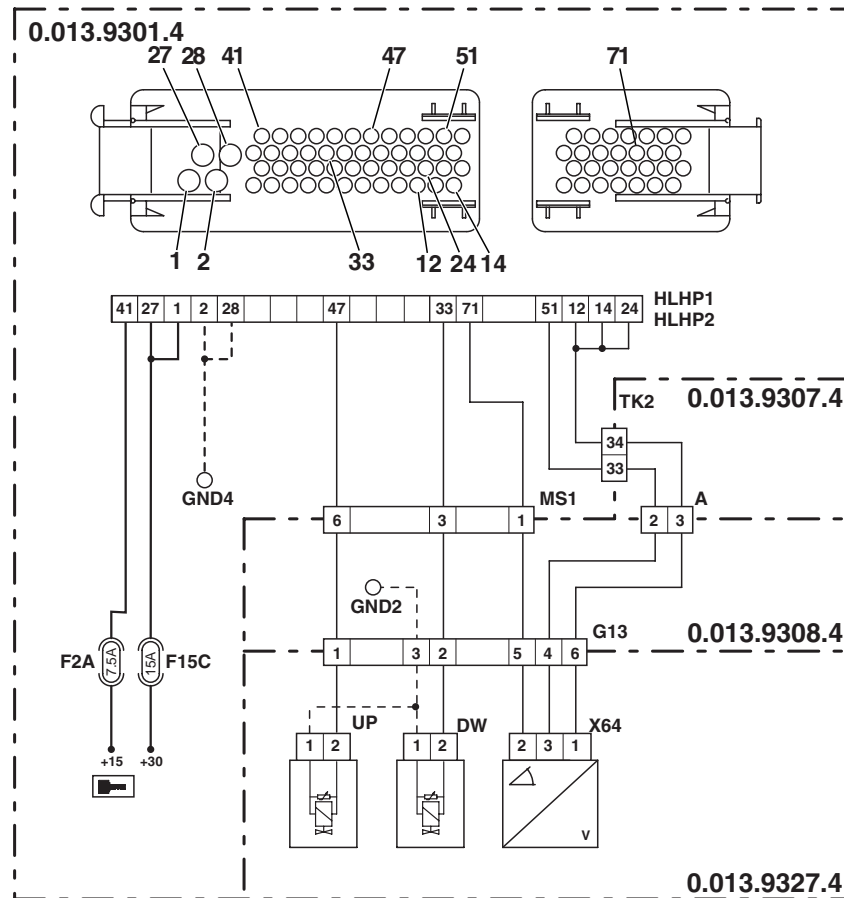
← Susp. Raise Valve
Device out of order

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 connectors "HLHP1" of the control unit and "UP" of the front axle suspension "Up" solenoid are not loose or corroded.
- 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.



D0030860



← SPN 622 - FMI 2



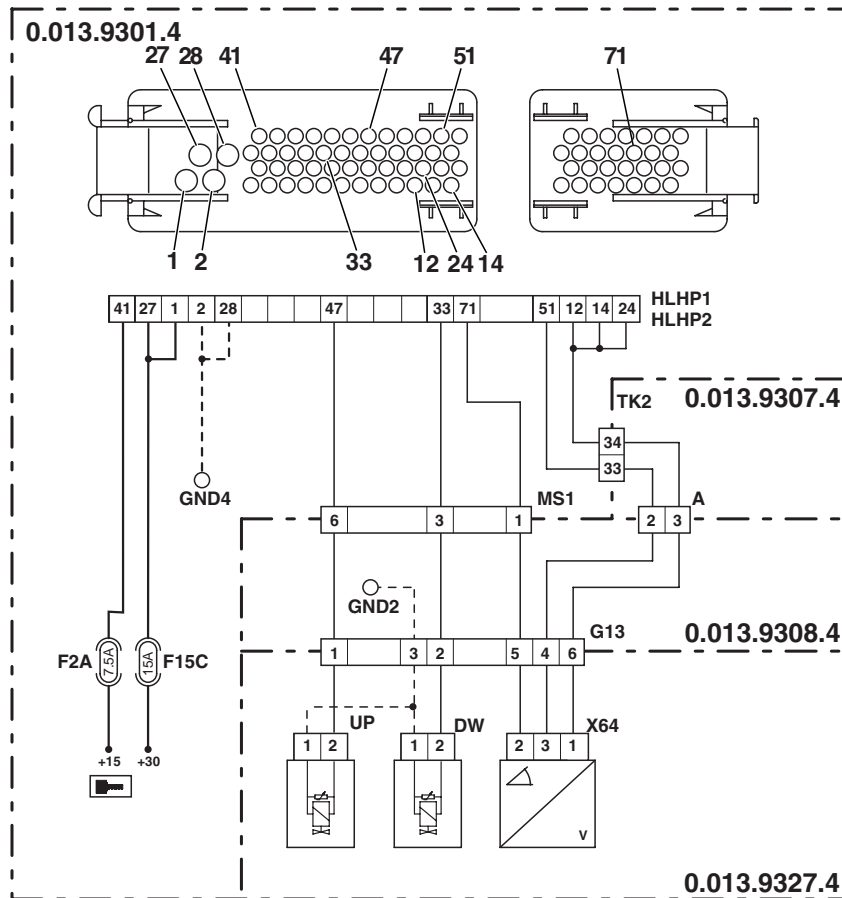
← Susp. Lower Valve
Signal not valid

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 connectors "HLHP1" of the control unit and "DW" of the front axle suspension "down" solenoid are not loose or corroded.
- 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 622 - FMI 3



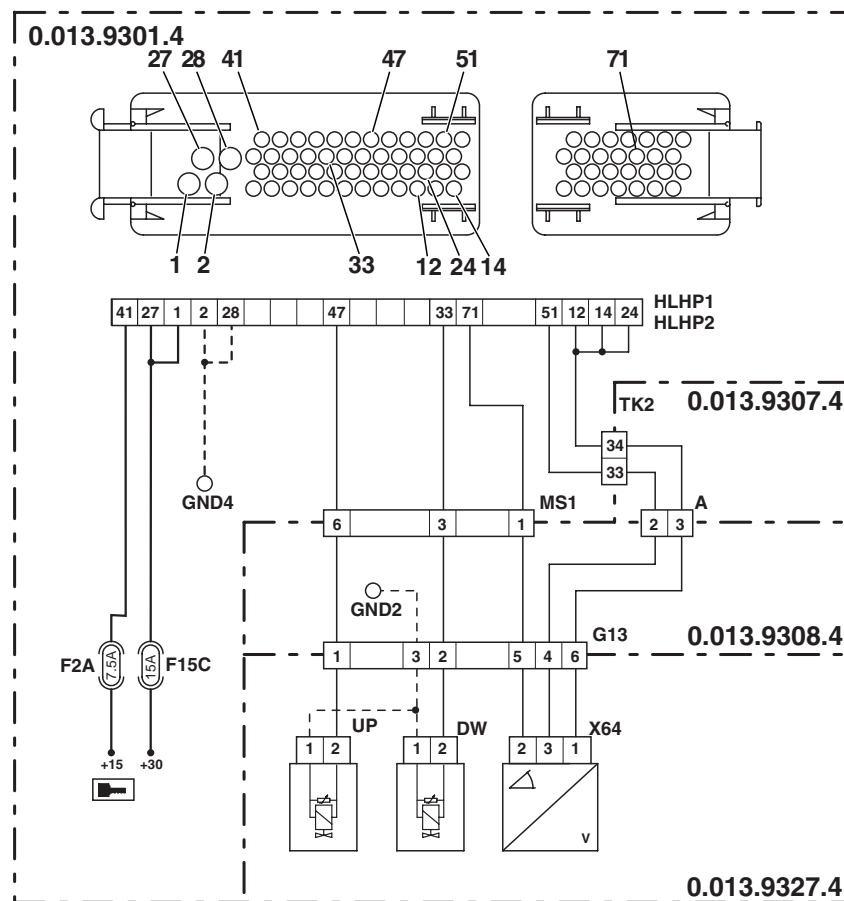
← Susp. Lower Valve
Short circuit high

DESCRIPTION

The control unit detects that the front axle suspension 'down' solenoid is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "DW" of the front axle suspension "down" solenoid are not loose or corroded.
- With the starter key in the "I" (ON) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "DW" and to the earth on the transmission and check that there is no voltage (test 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.



D0030860



← SPN 622 - FMI 4



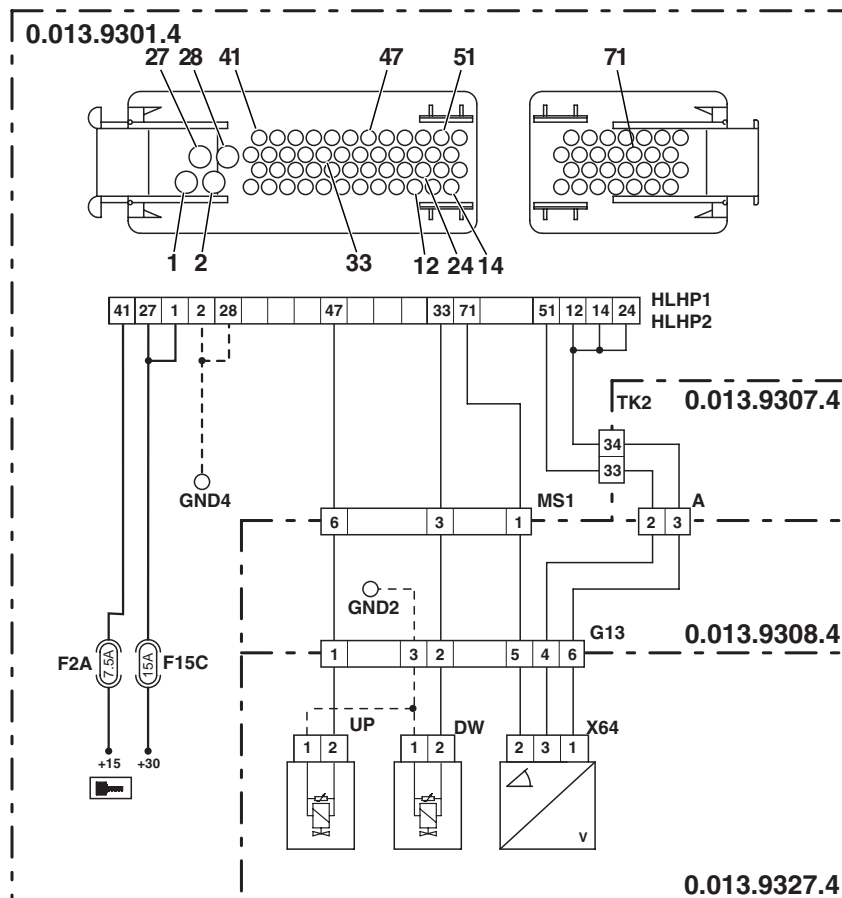
← Susp. Lower Valve
Grounding short-circuit

DESCRIPTION

The control unit detects that the front axle suspension 'down' solenoid is shorting to earth.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "DW" of the front axle suspension "down" solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "DW" and to the earth on the transmission and test the resistance to check for shorting to earth (test 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



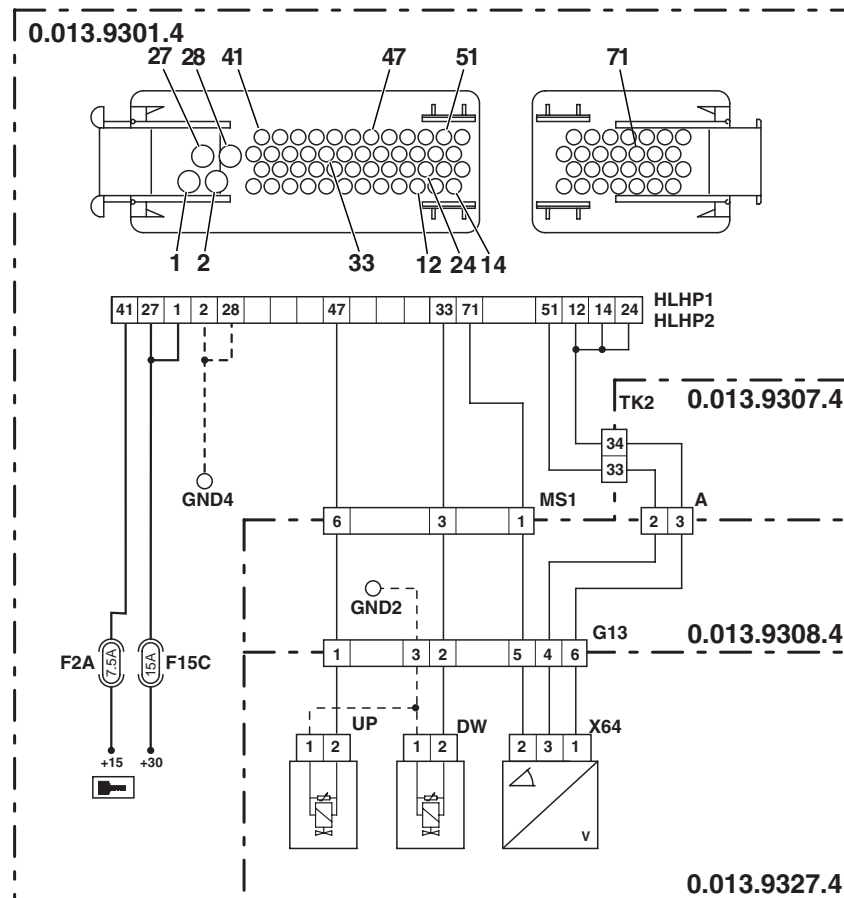
← Susp. Lower Valve disconnected

DESCRIPTION

The control unit detects that the front axle suspension 'down' solenoid is disconnected.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "DW" of the front axle suspension "down" solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "DW" and to pin 33 of the connector "HLHP1" and test 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 the "DW" connector and to the transmission earth and measure the resistance to check that the wire is not broken (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.



D0030860



← SPN 622 - FMI 11



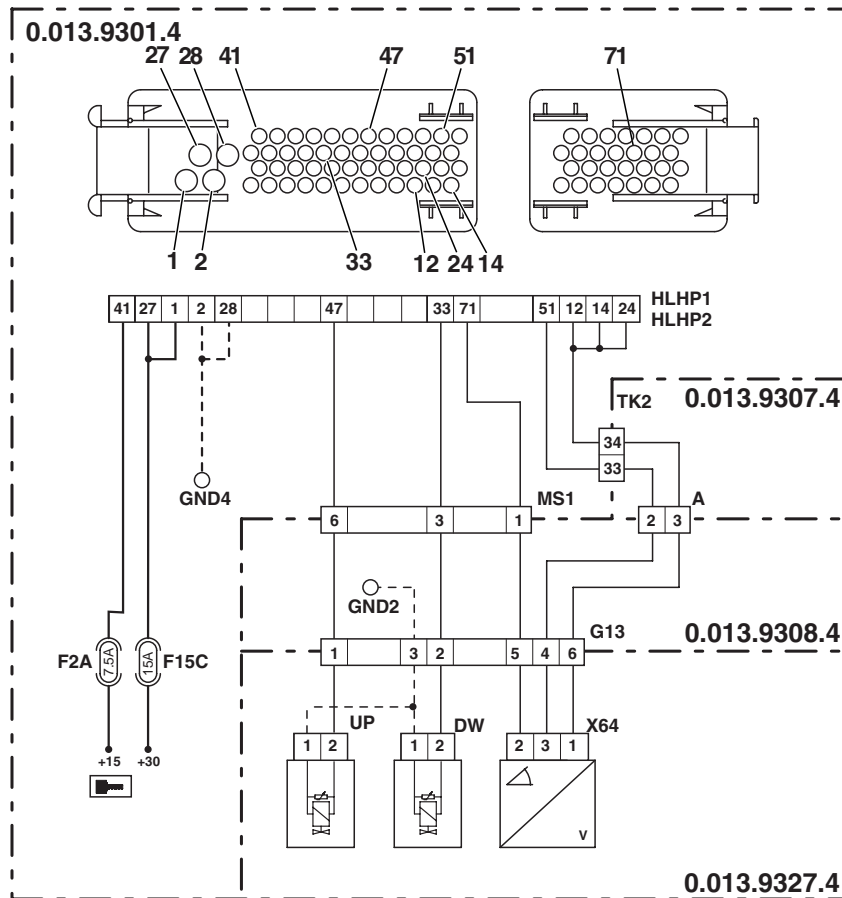
← Susp. Lower Valve Failure not ident.

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 connectors "HLHP1" of the control unit and "DW" of the front axle suspension "down" solenoid are not loose or corroded.
- 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.



D0030860



← SPN 622 - FMI 12



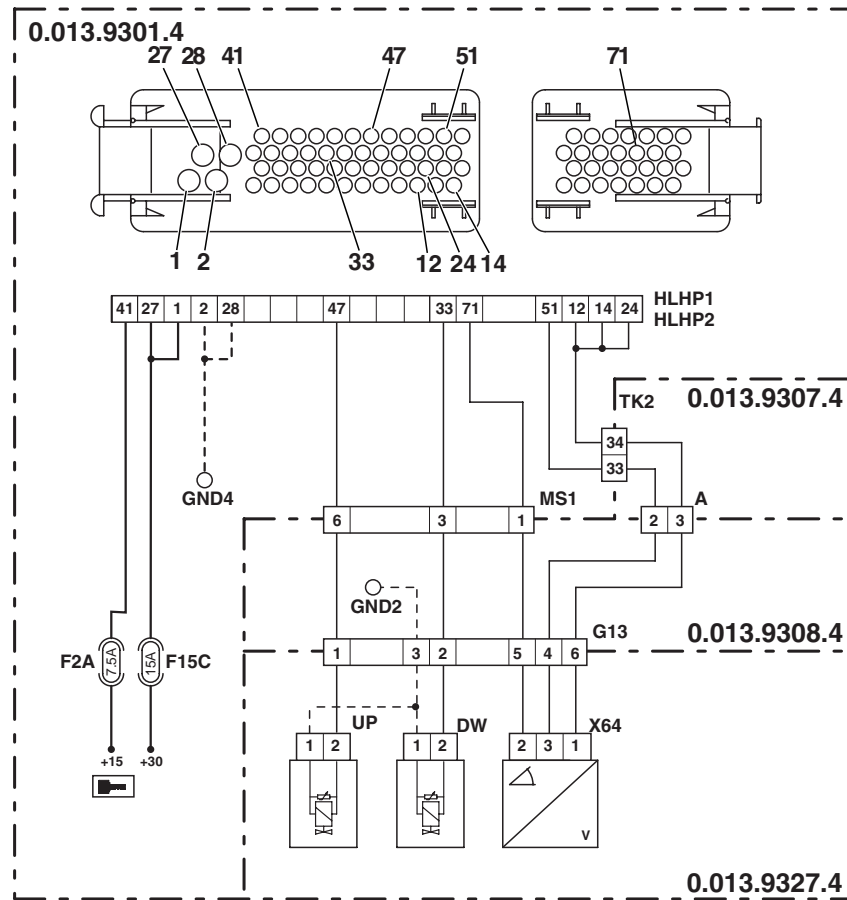
← Susp. Lower Valve Device out of order

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 connectors "HLHP1" of the control unit and "DW" of the front axle suspension "UP" solenoid are not loose or corroded.
- 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.



D0030860



← SPN 632 - FMI 9

← TCU CAN Error
message timeou**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 "5.5 CANBUS ALARMS".



← SPN 633 - FMI 9

← Engine CAN Error
message timeou**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 "5.5 CANBUS ALARMS".



← SPN 653 - FMI 2



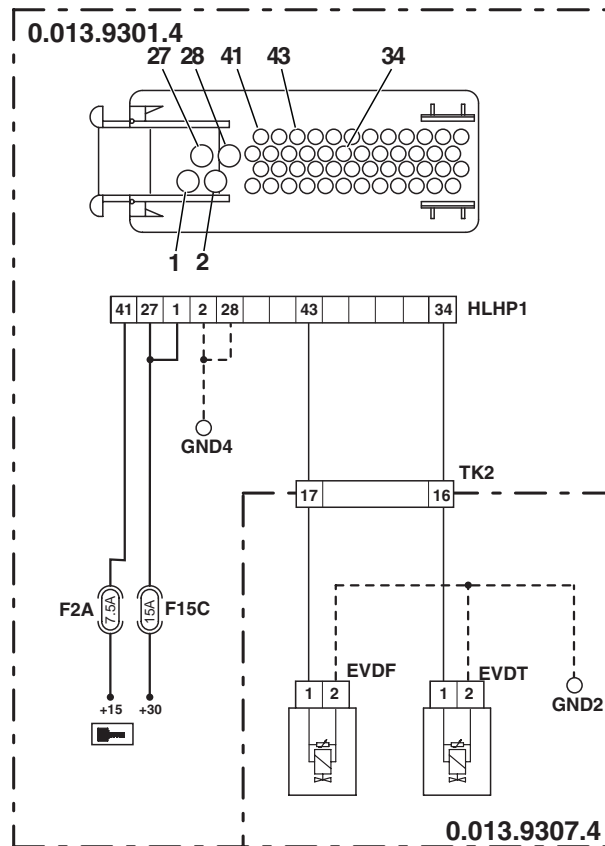
← Differential Lock
Signal not valid

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 connectors "HLHP1" of the control unit and "EVDF" of the diff lock solenoid are not loose or corroded.
- 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.



D0030830



← SPN 653 - FMI 3



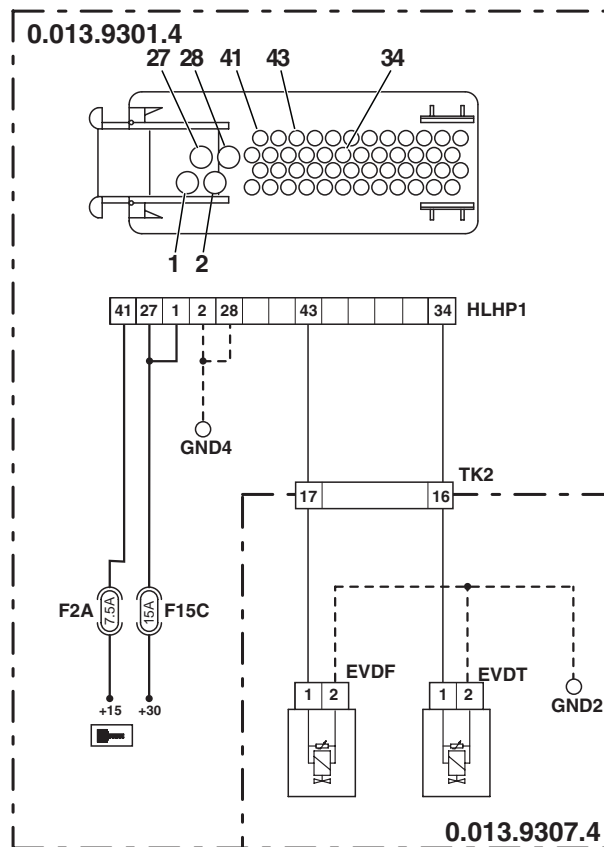
← Differential Lock
Short circuit high

DESCRIPTION

The control unit detects that the differential lock solenoid is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVDF" of the diff lock solenoid are not loose or corroded.
- With the starter key in the "I" (ON) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVDF" and to the earth on the transmission and check that there is no voltage (test 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.



D0030830



← SPN 653 - FMI 4



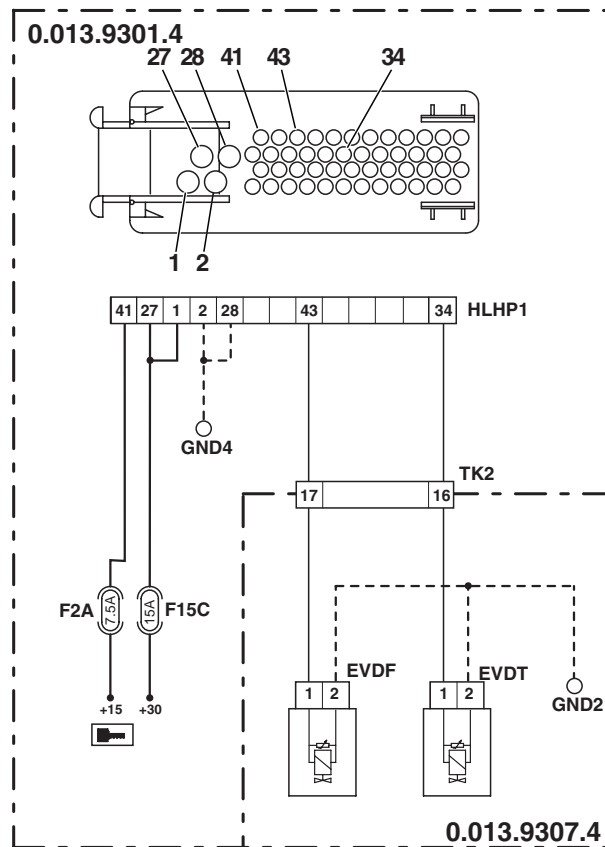
← Differential Lock
Grounding short-circuit

DESCRIPTION

The control unit detects that the differential lock solenoid is shorting to earth.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVDF" of the diff lock solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVDF" and to the earth on the transmission and test the resistance to check for shorting to earth (test 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.



D0030830



← SPN 653 - FMI 5



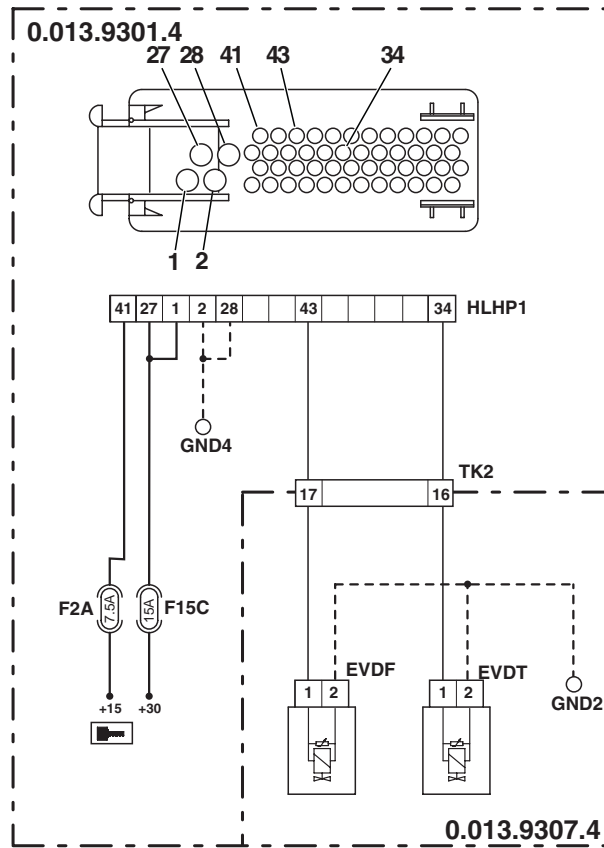
← Differential Lock disconnected

DESCRIPTION

The control unit detects that the differential lock solenoid is disconnected.

CHECK

- Check that the contacts on the connectors "HLHP1" of the control unit and "EVPTO2" of the diff lock solenoid are not loose or corroded.
- Test the internal resistance of the solenoid (for technical details see Group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "EVDF" and to pin 43 of the connector "HLHP1" and test 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 the "EVDF" connector and to the transmission earth and measure the resistance to check that the wire is not broken (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.



D0030830



← SPN 653 - FMI 11



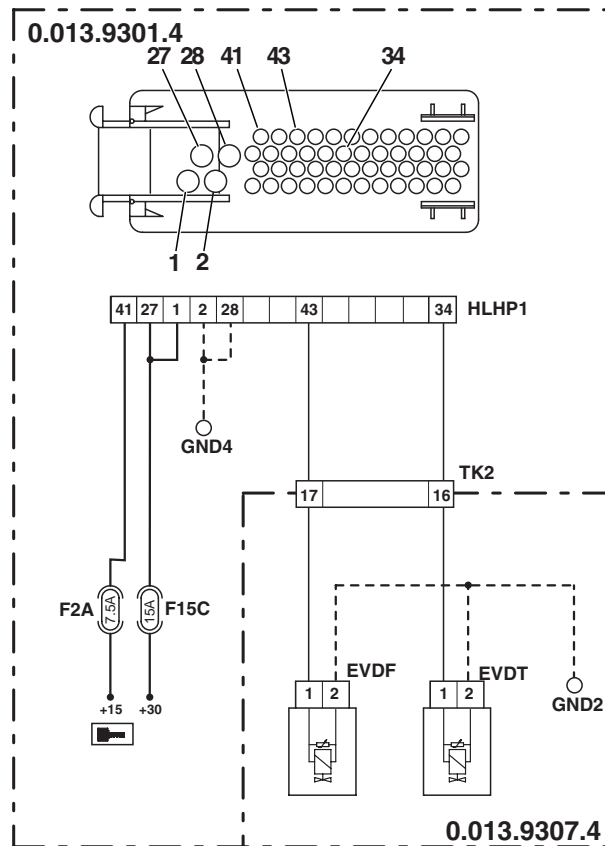
← Differential Lock Failure not ident.

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 connectors "HLHP1" of the control unit and "EVDF" of the diff lock solenoid are not loose or corroded.
- 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.



D0030830



← SPN 653 - FMI 12



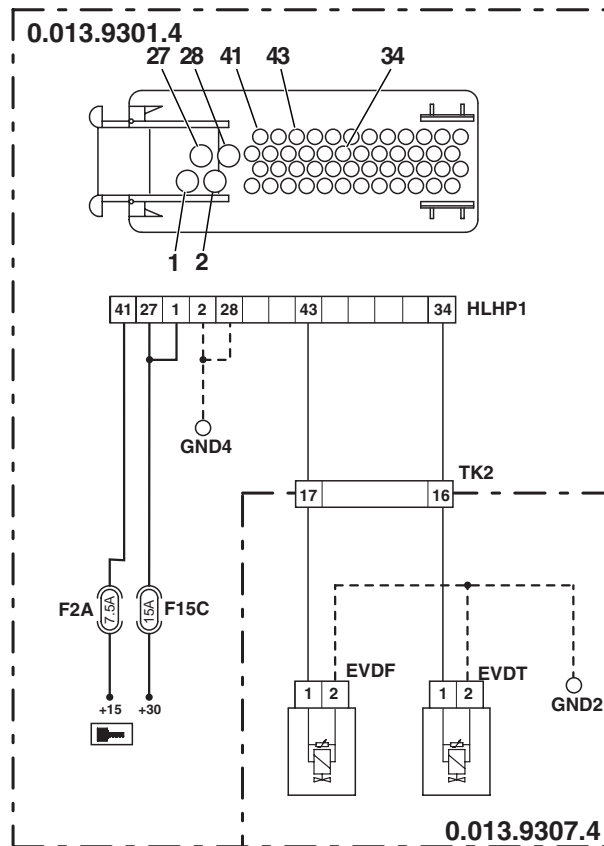
← Differential Lock
Device out of order

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 connectors "HLHP1" of the control unit and "EVDF" of the diff lock solenoid are not loose or corroded.
- 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.



D0030830



← SPN 654 - FMI 2



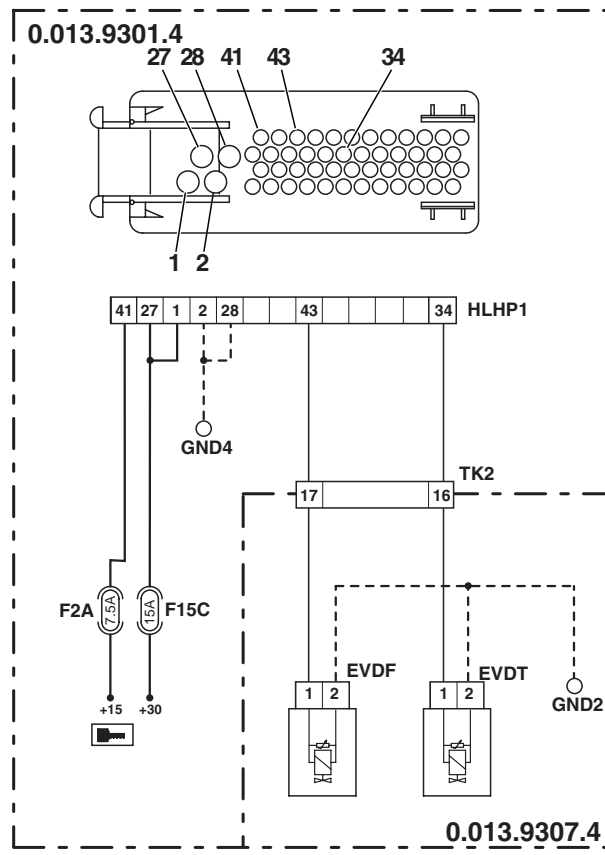
← 8V sensor power
Signal not valid

DESCRIPTION

The control unit detects a short circuit in 8V sensor power feed.

CHECK

- Check that the contacts on the connectors "HLHP1" and "HLHP2" of the control unit are not loose or corroded.
- With the starter key in the "I" (ON) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 51 of the connector "HLHP1" and to the cab earth and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 51 of the connector "HLHP1" and to the cab earth and test the resistance to check for shorting to earth (test 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.



D0030830



← SPN 655 - FMI 2



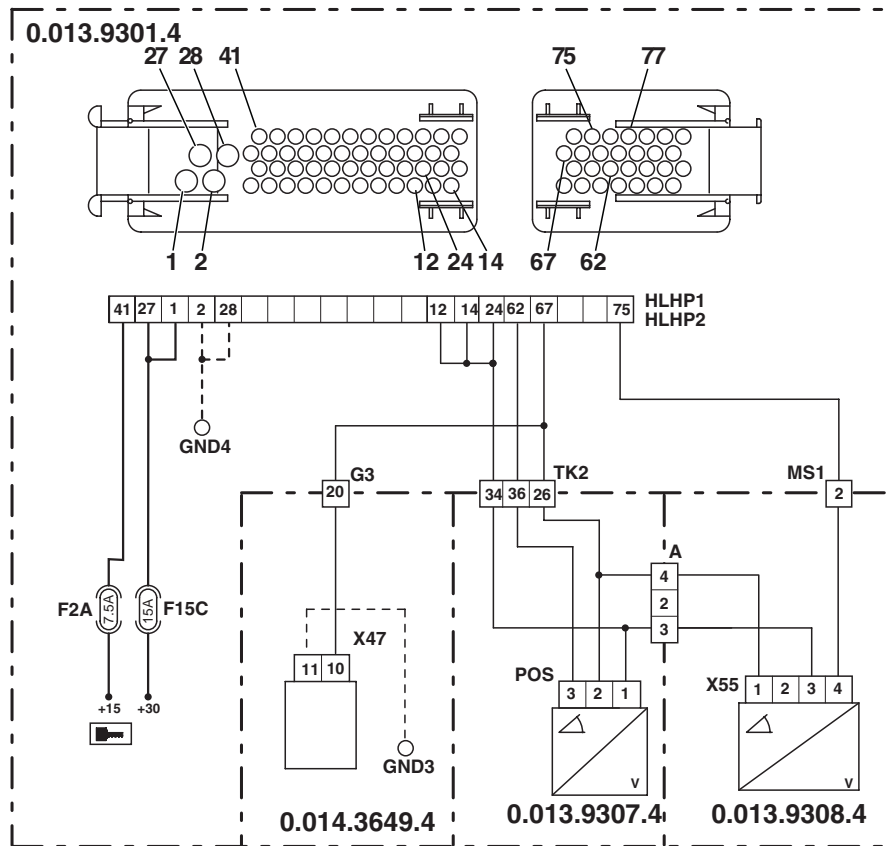
← 5V sensor power
Signal not valid

DESCRIPTION

The control unit detects a short circuit in 5V sensor power feed.

CHECK

- Check that the contacts on the connectors "HLHP1" and "HLHP2" of the control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position and the connector "HLHP2" disconnected, connect a test meter to pin 67 of the connector "HLHP2" and to the earth on the cab and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 67 of the connector "HLHP2" and to the cab earth and test the resistance to check for shorting to earth (test 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.



D0031090



← SPN 656 - FMI 12



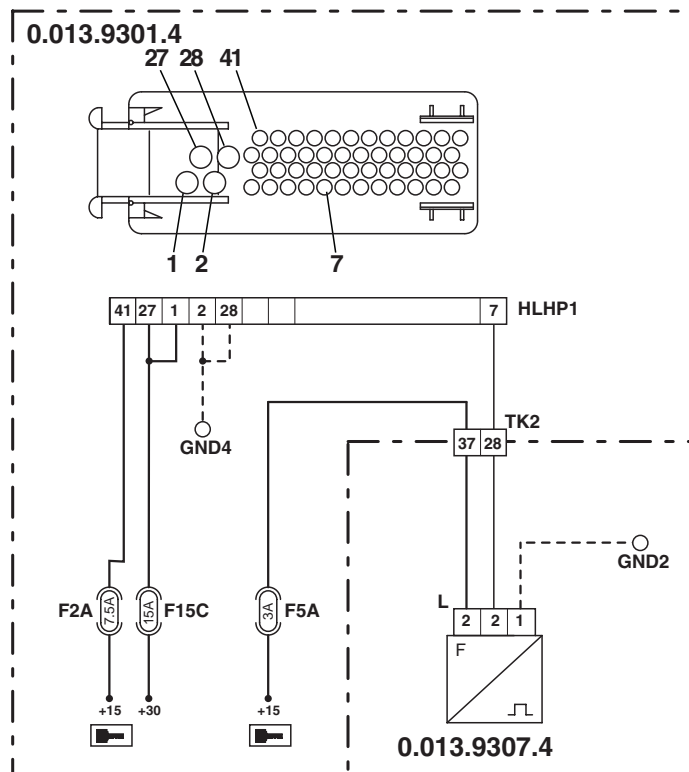
← Radar Sensor
Device out of order

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 connectors "RADAR" and "HLHP1" of the control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the radar is correct (voltage between pin 3 (positive) and pin 1 (negative) of the connector "RADAR" approximately 12 Vdc).
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, check that there is electrical continuity between pin 7 of the connector "HLHP1" and pin 2 of the connector "RADAR".
- Check that the radar is functioning correctly (for technical details see Group 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.



D0031070



← SPN 661 - FMI 8

← Memory failure
Block 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



← External PTO button
Grounding short-circuit

DESCRIPTION

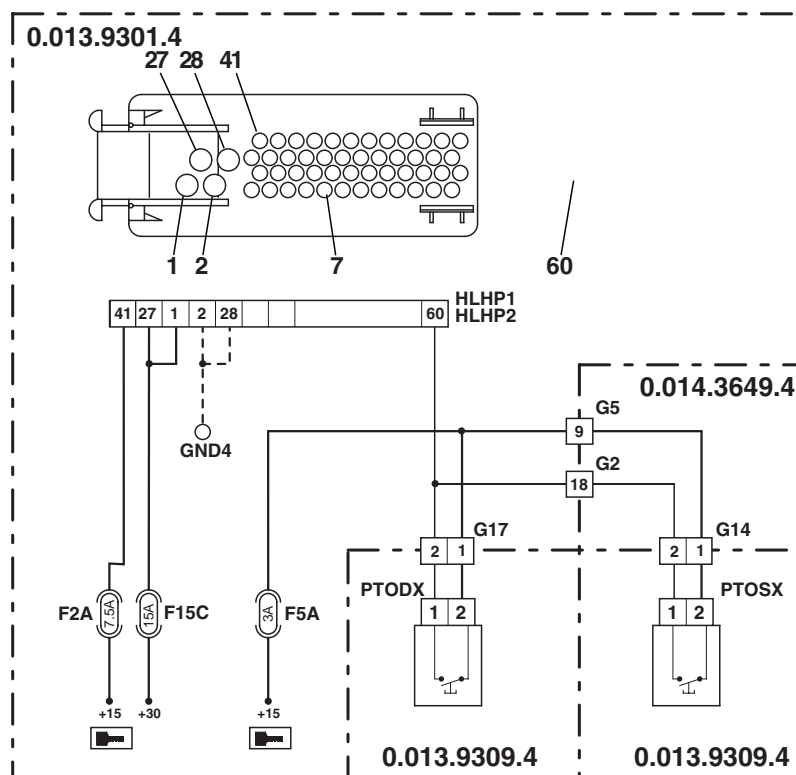
The control unit detects that the rear PTO control buttons on the rear fenders are continuously pressed.

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 loose or corroded.
- Check that the pushbuttons are functioning correctly (for technical details, see Group 40)
- With the starter key in the "I" (ON) position and the connector "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connectors "PTOSX" and "PTODX" and to the earth on the transmission 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 control unit must be renewed.



D0031080



← SPN 689 - FMI 3



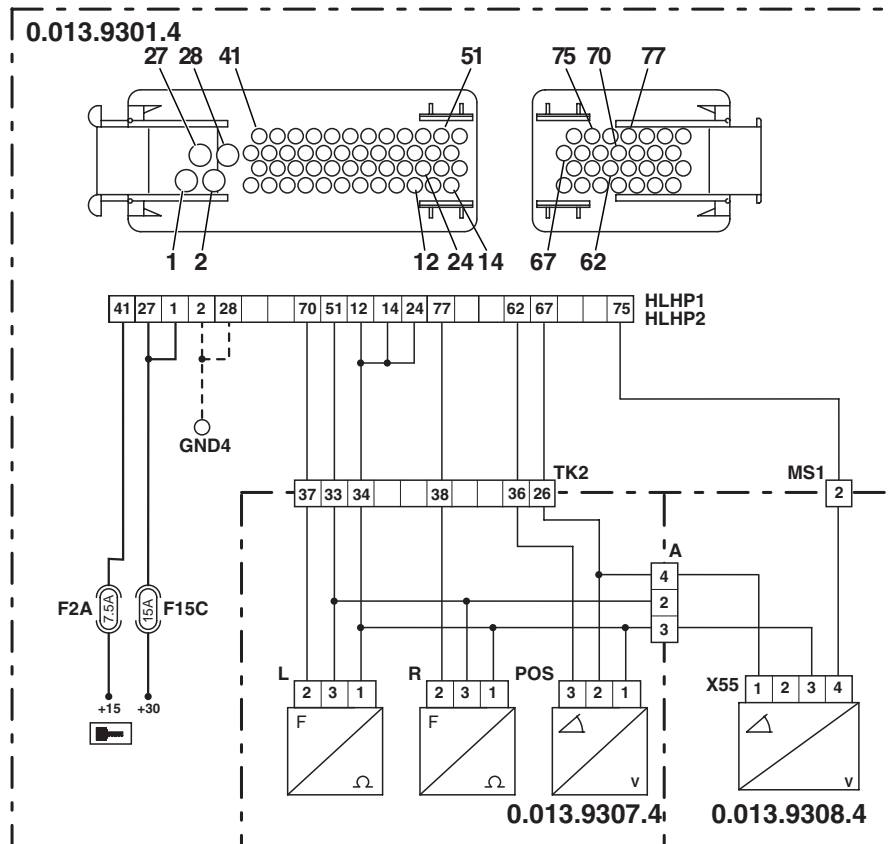
← Steering Sensor
Short circuit high

DESCRIPTION

The control unit detects that the steering angle sensor is shorting to a positive feed.

CHECK

- Check that the contacts on the connectors "X55" of the steering angle sensor and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the steering angle sensor is correct (voltage between pin 1 (positive) and pin 3 (negative) of the connector "X55" approximately 5Vdc).
- With the starter key in the "I" (ON) position, connect a test meter to pin 2 of the connector "X55" and to the earth on the transmission and check that there is no voltage (test meter reading: 0V).
- Check that the sensor is functioning correctly (for technical details see Group 40).
- 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.



D0030810



← SPN 689 - FMI 4



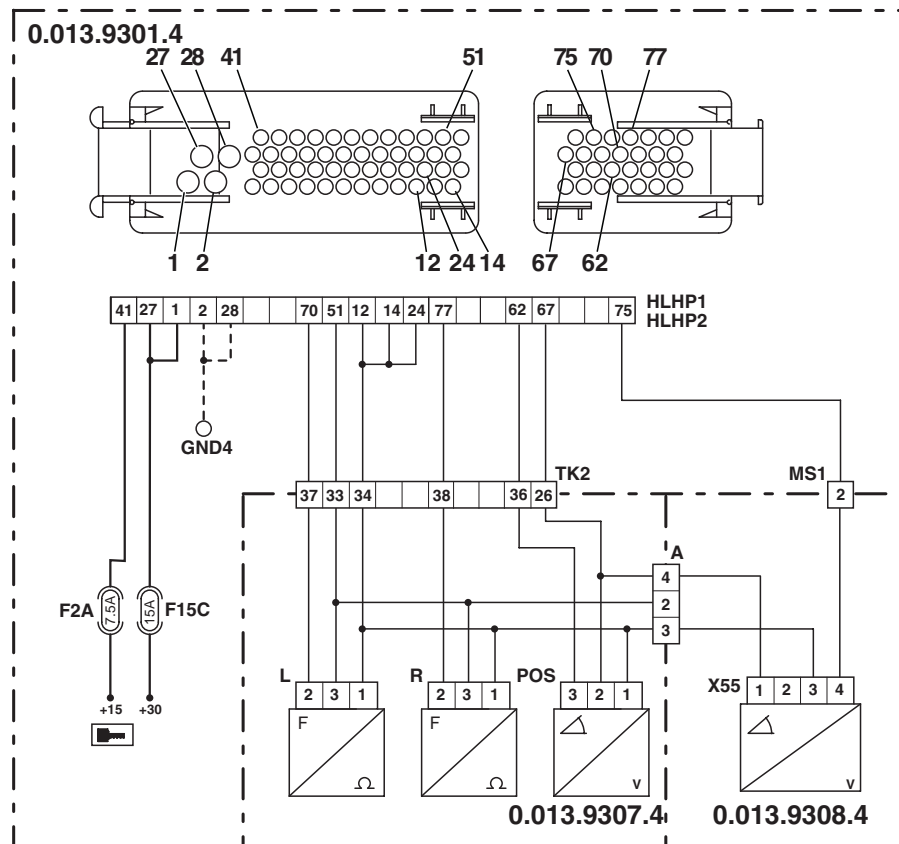
← Steering Sensor
Grounding short-circuit

DESCRIPTION

The control unit detects that the steering angle sensor is disconnected.

CHECK

- Check that the contacts on the connectors "X55" of the steering angle sensor and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the steering angle sensor is correct (voltage between pin 1 (positive) and pin 3 (negative) of the connector "X55" approximately 5Vdc).
- Check for electrical continuity between pin 77 of the connector "HLHP2" and pin 2 of the connector "X55".
- With the starter key in position "O" (OFF), connect a test meter to pin 2 of the "X55" connector and to the transmission earth and measure the resistance to check that there are no shorts to earth (test meter reading: infinity).
- Check that the sensor is functioning correctly (for technical details see Group 40).
- 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.



D0030810



← SPN 690 - FMI 4



← Hitch STOP button
Grounding short-circuit

DESCRIPTION

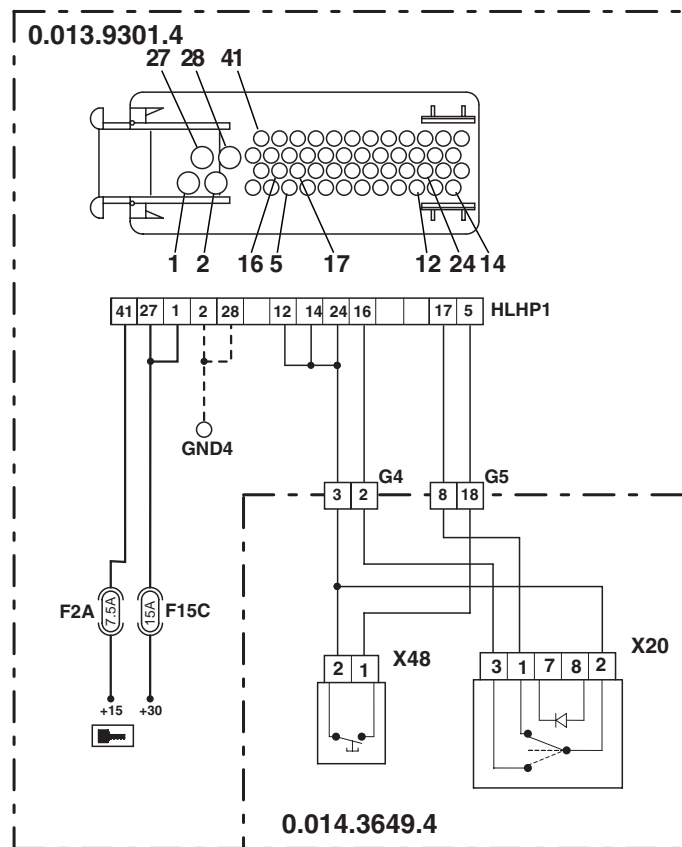
The control unit detects that the lift STOP button is continually pressed.

NOTE

This alarm is generated when, for accidental reasons, the lift STOP button 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 "X48" and "HLHP1" of the HLHP control unit are not loose or corroded.
- Check that the pushbutton is functioning correctly (for technical details, see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 2 of connector "X48" and to the earth on the cab and test the resistance to check for shorting to earth (test 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.



D0031100



← SPN 691 - FMI 4



← button Hitch UP
Grounding short-circuit

DESCRIPTION

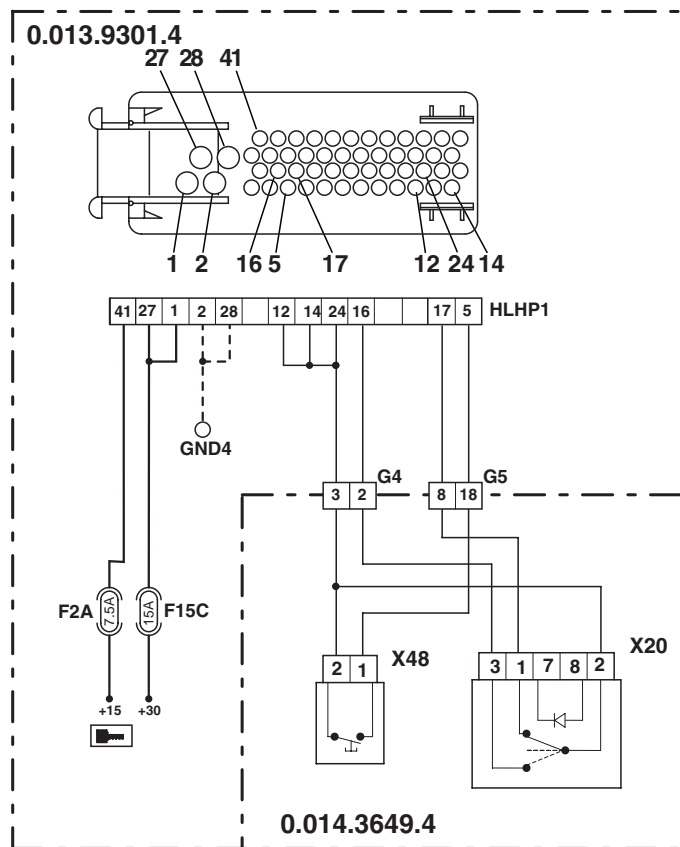
The control unit detects that the lift 'Up' control button in the cab is continually pressed.

NOTE

This alarm is generated when, for accidental reasons, the lift "Up" button in the cab 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 "X20" and "HLHP1" of the HLHP control unit are not loose or corroded.
- Check that the pushbutton is functioning correctly (for technical details, see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 1 of the connector "X20" and to the earth on the cab and test the resistance to check for shorting to earth (test 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.



D0031100



← SPN 692 - FMI 4



← button Hitch DOWN
Grounding short-circuit

DESCRIPTION

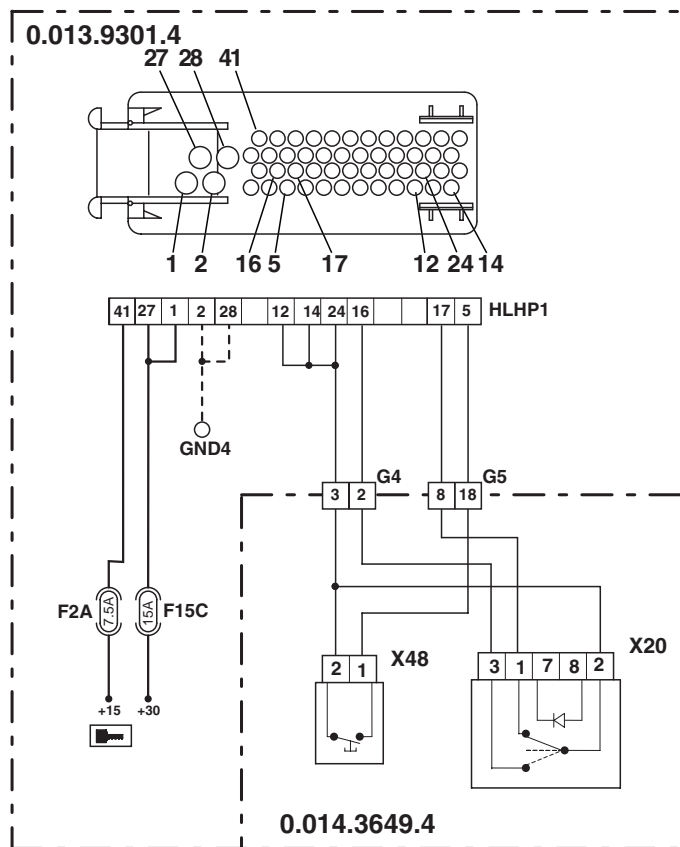
The control unit detects that the lift 'Down' control button in the cab is continually pressed.

NOTE

This alarm is generated when, for accidental reasons, the lift "down" button in the cab 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 "X20" and "HLHP1" of the HLHP control unit are not loose or corroded.
- Check that the pushbutton is functioning correctly (for technical details, see Group 40)
- With the starter key in the "O" (OFF) position and the connector "HLHP1" disconnected from the control unit, connect a test meter to pin 3 of the connector "X20" and to the earth on the cab and test the resistance to check for shorting to earth (test 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.



D0031100



← SPN 693 - FMI 3



← Slipage potentiometer
Short circuit high

DESCRIPTION

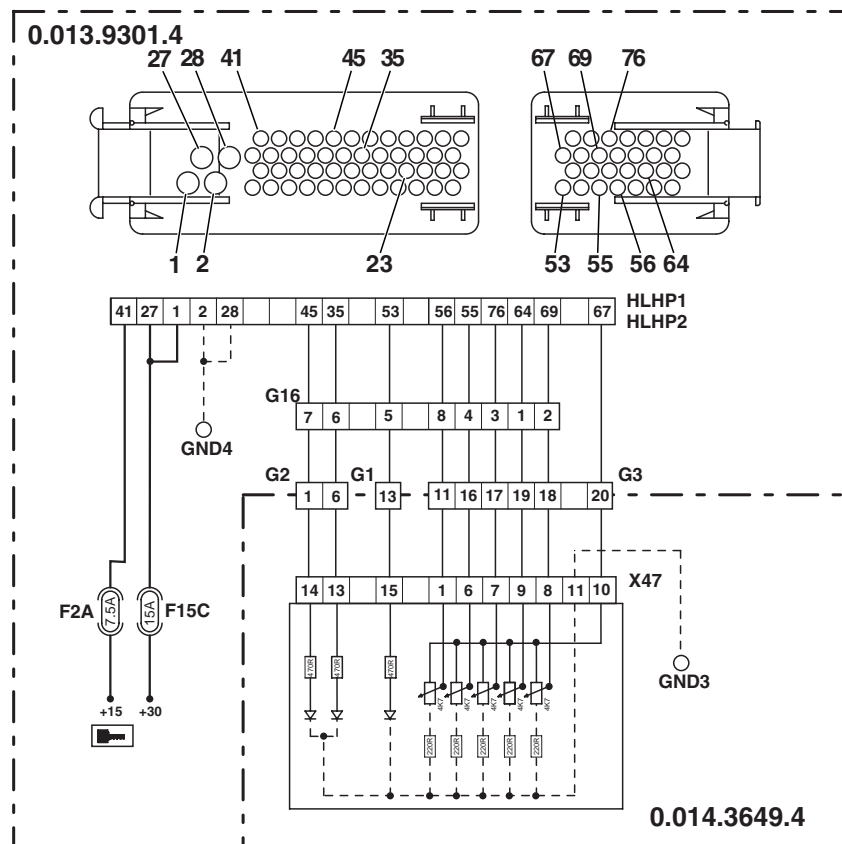
The control unit detects that the wheelslip control potentiometer is shorting to a positive feed.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "G16" configuration, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "I" (ON) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 9 of the connector "X47" and to the earth on the transmission and check that there is no voltage (test 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.



D0030850



← SPN 693 - FMI 4



← Slippage potentiometer
Grounding short-circuit

DESCRIPTION

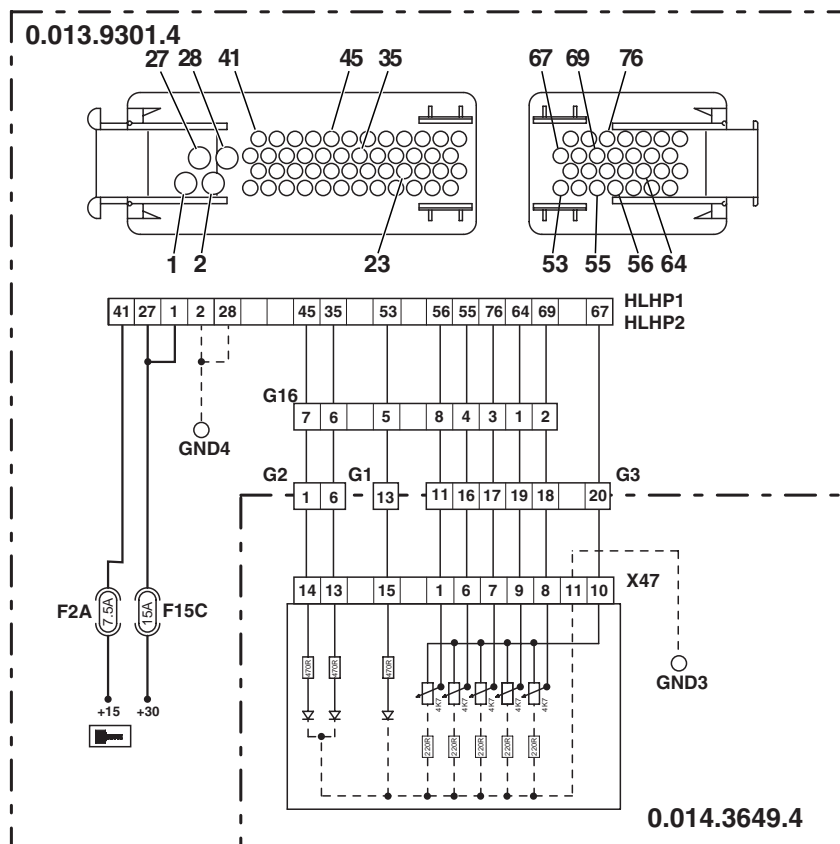
The control unit detects that the wheelslip control potentiometer is shorting to earth.

NOTE

Whenever the alarm "SPN 665 - FMI 2" (5V sensor power - Signal not valid) is also signalled, first identify the cause of this alarm; then turn the key to "O" (OFF) and then back to "I" (ON) and check that this alarm is no longer present among the active alarms. Otherwise, proceed as described.

CHECK

- Check that the contacts on the connectors "X47" of the lift console, "X11" of the armrest connection and "HLHP1" and "HLHP2" of the HLHP control unit are not loose or corroded.
- Check that the configuration connector "G16" is connected and that the contacts are not corroded.
- Check that the potentiometer is functioning correctly (for technical details, see Group 40).
- With the starter key in the "O" (OFF) position and the connectors "HLHP1" and "HLHP2" disconnected from the control unit, connect a test meter to pin 9 of the connector "X47" and to the cab earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- 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.



D0030850



← SPN 694 - FMI 3



← Hitch UP manual button
Short circuit to earth

DESCRIPTION

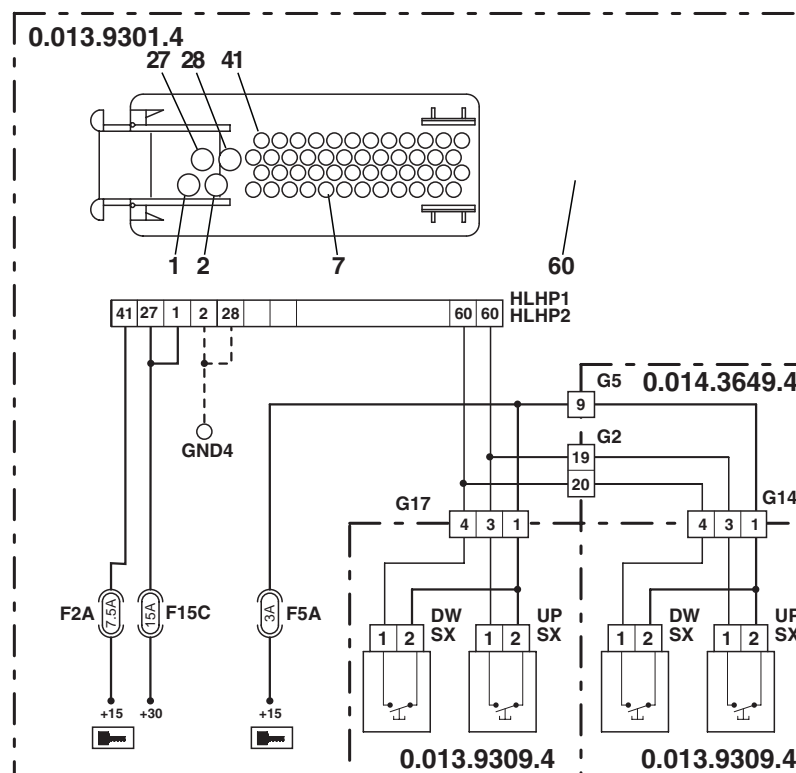
The control unit detects that the lift 'up' control buttons on the rear fenders are continuously pressed.

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 loose or corroded.
- Check that the pushbuttons are functioning correctly (for technical details, see Group 40)
- With the starter key in the "I" (ON) position and the connector "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connectors "UPSX" and "UPDX" and to the earth on the transmission 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 control unit must be renewed.



D0031110



← SPN 695 - FMI 3



← Man. lift DOWN button
Short circuit to earth

DESCRIPTION

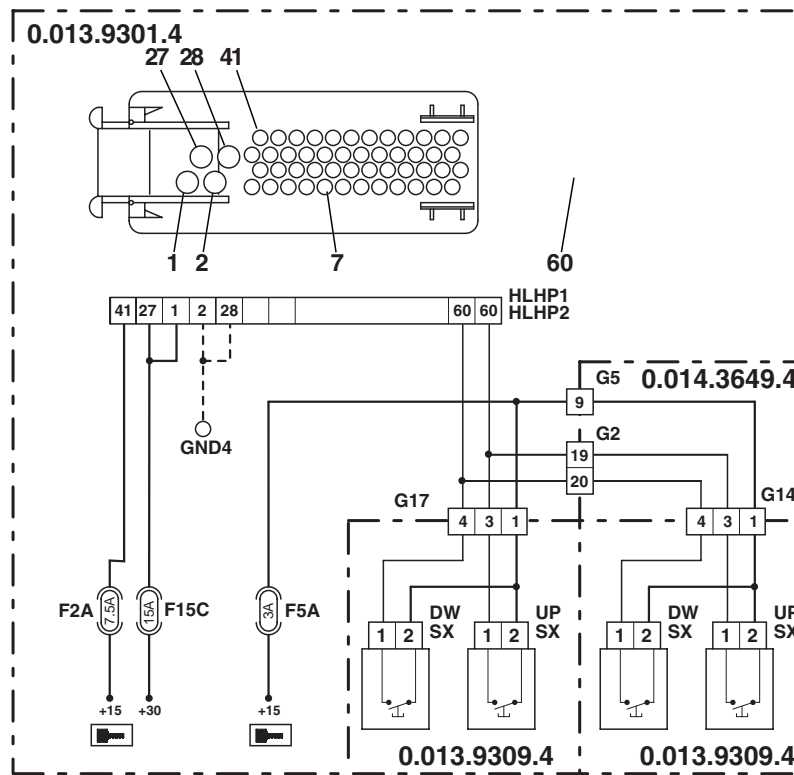
The control unit detects that the lift 'down' control buttons on the rear fenders are continuously pressed.

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 loose or corroded.
- Check that the pushbuttons are functioning correctly (for technical details, see Group 40)
- With the starter key in the "I" (ON) position and the connector "HLHP2" disconnected from the control unit, connect a test meter to pin 1 of the connectors "DWSX" and "DWDX" and to the earth on the transmission 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 control unit must be renewed.



D0031110

5.3 ENGINE CONTROL UNIT ALARMS

The engine control unit informs the operator of any malfunction affecting monitored components by way of audible and visual signals on the Infocenter.

To signal the fault, the control unit displays a graphic symbol with two modes:

- 1 - **flashing symbol:** this type of indication 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 operate normally.
- 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.
When this type of alarm occurs, the engine generally switches off and it will not be possible to operate the starter 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	Engine,throttle pedal Failure not ident.	The engine control unit has detected the absence of the connection to the accelerator pedal position sensor or a signal outside the valid range.	20-173
SPN 91 - FMI 2	5	Engine,throttle pedal Signal not valid	The control unit detects that the connection to the accelerator pedal sensor is not present or is shorting.	20-161
SPN 108 - FMI 12	87	Engine Atm. Press Device out of order	The engine control unit detects that atmospheric pressure is outside the permitted limits.	20-179
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	Engine,boost pressure Signal not valid	The engine control unit has detected the absence of the engine boost pressure signal or an invalid value for this signal.	20-163
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	Engine,temperature Signal not valid	The engine control unit has detected the absence of the coolant temperature signal or an invalid value for this signal.	20-164
SPN 110 - FMI 0	31	Engine,temperature Signal too high	The engine control unit has detected a coolant temperature higher than the alarm threshold.	20-166
SPN 111 - FMI 1	34	–	Alarm available but not utilized.	–
SPN 110 - FMI 0	41	Engine,temperature Signal too high	The engine control unit has detected a coolant temperature higher than the alarm threshold.	20-169
SPN 111 - FMI 1	44	–	Alarm available but not utilized.	–
SPN 171 - FMI 12	86	Engine,temp ECU sensor Device out of order	The engine control unit detects that its internal temperature is too high.	20-179

Alarm code	Serdia	Infocenter	Description	Page
SPN 174 - FMI 2	11	Engine Fuel temp. Signal not valid	The engine control unit has detected the absence of the fuel temperature signal or an invalid value for this signal.	20-165
SPN 174 - FMI 0	36	Engine Fuel temp. Signal too high	The engine control unit has detected that the fuel temperature has exceeded the alarm threshold.	20-168
SPN 190 - FMI 8	1	Engine,speed sensor Frequency not correct	The engine control unit detects that the signal from the engine pickup is either not present or incorrect.	20-160
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	Engine Hand Gas Signal not valid	The control unit detects that the hand throttle position sensor is disconnected or short circuiting.	20-162
SPN 535 - FMI 13	59	–	Alarm available but not utilized.	–
SPN 536 - FMI 13	52	Engine actor-rack Out of Calibration	The engine control unit has detected that the reference signal for the position of the actuator does not correspond to that requested.	20-171
SPN 536 - FMI 12	50	Engine actor-rack Device out of order	The engine control unit has detected that the actuator position signal does not correspond to the position requested.	20-170
SPN 535 - FMI 7	53	Engine,Regulator Mechanical defect	The engine control unit has detected that the difference between the command given and the actuator response is greater than 10%.	20-172
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	Engine over speed FMI 14	The engine control unit detects that the engine is or has been running at overspeed (above 3100 rpm).	20-167
SPN 743 - FMI 14	74	Engine CAN Error FMI 14	The engine control unit has detected that the connection to the CANBUS is not present.	20-175
SPN 743 - FMI 12	70	Engine CAN Error Device out of order	CANBUS line controller damaged	20-174
SPN 743 - FMI 9	71	Engine CAN Error Abnormal update rate	The engine control unit has not been able to read or send a message on the CANBUS.	20-174
SPN 752 - FMI 12	77	Engine,Memory Error Device out of order	The engine control unit has detected an error in reading the program memory during the normal control cycle.	20-175
SPN 752 - FMI 2	93	Engine,Memory Error Signal not valid	The engine control unit has detected a "Stack Overflow" error during the execution of the program.	20-180
SPN 765 - FMI 12	76	Engine,E2P Parameter Device out of order	The engine control unit has detected an error during parameter writing.	20-175

Alarm code	Serdia	Infocenter	Description	Page
SPN 765 - FMI 2	90	Engine,E2P Parameter Signal not valid	The engine control unit has detected a discrepancy between the parameters that have been written to the EEPROM.	20-180
SPN 766 - FMI 2	78	Engine internal fault Signal not valid	The engine control unit has detected an error in reading the work memory during the normal control cycle.	20-176
SPN 766 - FMI 2	80	Engine internal fault Signal not valid	The engine control unit detects that actuator power supply is not within the permitted limits.	20-176
SPN 766 - FMI 2	83	Engine internal fault Signal not valid	The control unit detects that the power input to the accelerator pedal position sensor is missing or incorrect.	20-177
SPN 766 - FMI 2	84	Engine internal fault Signal not valid	The control unit detects that the power input to the engine boost pressure sensor is missing or incorrect.	20-178
SPN 766 - FMI 2	85	–	Alarm available but not utilized.	–
SPN 766 - FMI 2	94	Engine internal fault Signal not valid	The engine control unit has detected an internal error.	20-180
SPN 898 - FMI 2	68	Engine CAN Error Signal not valid	Error in connection to CANBUS	20-174

ALARM N° 001



← SPN 190 - FMI 8



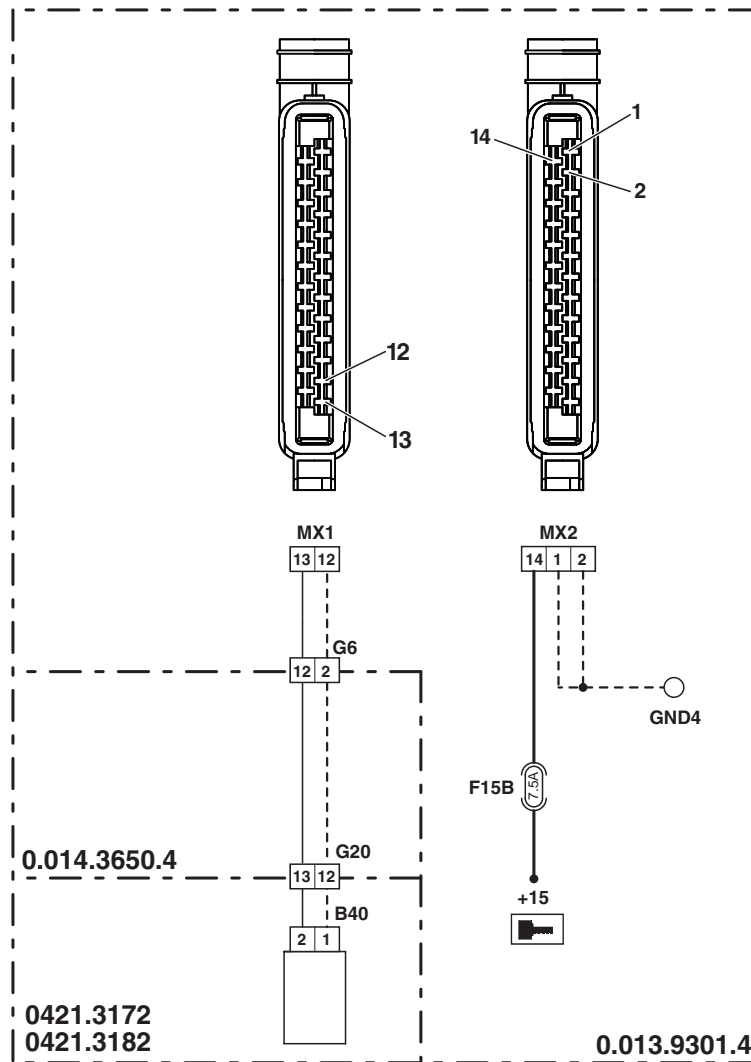
← Engine, speed sensor
Frequency not correct

DESCRIPTION

The engine control unit detects that the signal from the engine pickup is either not present 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 the connectors "B40" and "MX1" on the engine control unit are not loose or corroded.
- Test for electrical continuity between pin 1 of connector "B40" and pin 12 of connector "MX1"
- Test for electrical continuity between pin 2 of connector "B40" and pin 13 of connector "MX1"



D0030730

ALARM N° 005



← SPN 91 - FMI 2

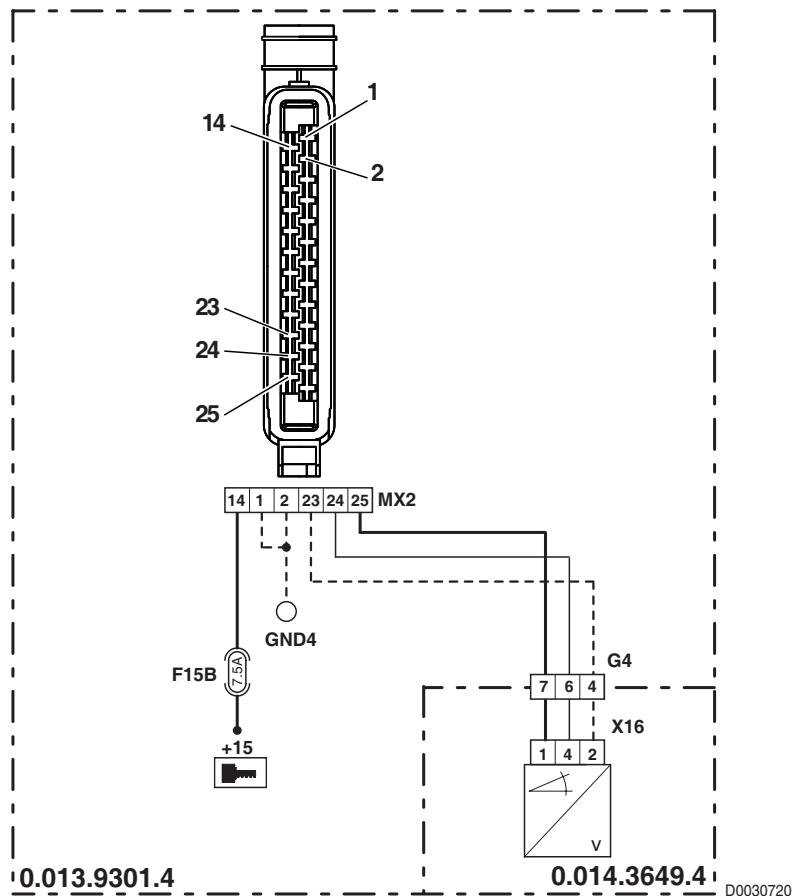
← Engine, throttle pedal
Signal not valid

DESCRIPTION

The control unit detects that the connection to the accelerator pedal sensor is not present or is shorting.

CHECK

- Check that the contacts on connector "MX1" of the control unit and connector "X16" are not loose or corroded.
- Check that the power input to the accelerator pedal position sensor is correct (approx. 5 Vdc measured between pin 32 (positive) and pin 30 (negative) of connector "X11").
- With the connector "MX1" disconnected from the engine control unit, check continuity between pin 4 of connector "X16" and pin 24 of connector "MX1".
- With the starter key in the "O" (OFF) position and the connector "MX1" disconnected from the engine control unit, connect a test meter to pin 4 of the connector "X16" and to the earth on the cab and test the resistance to check for shorting to earth (test 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 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



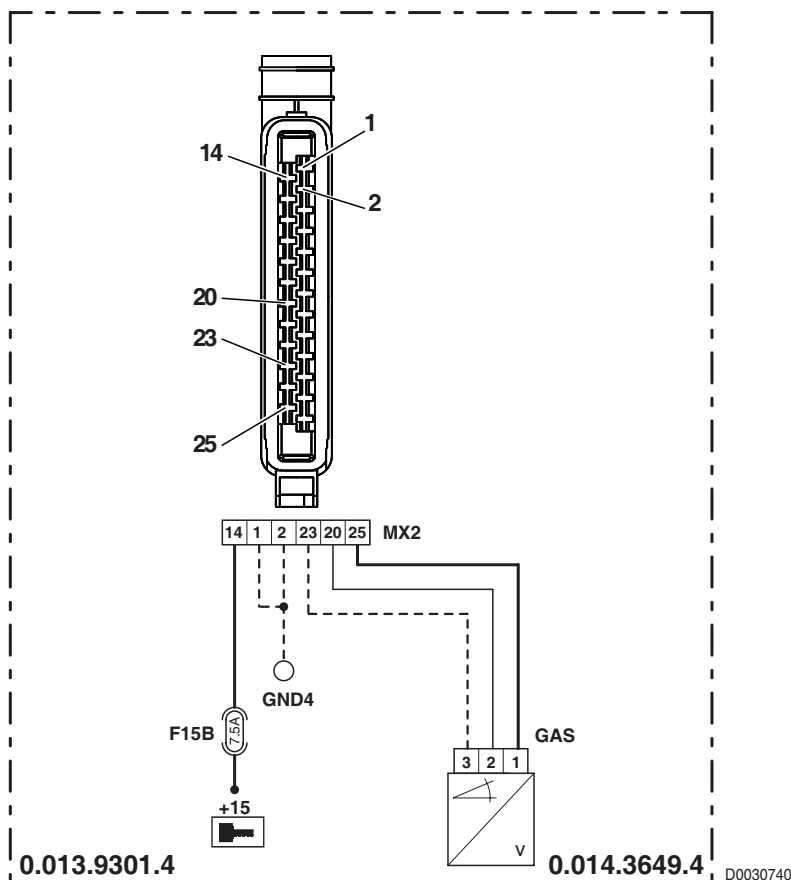
← Engine Hand Gas
Signal not valid

DESCRIPTION

The control unit detects that the hand throttle position sensor is disconnected or short circuiting.

CHECK

- Check that the contacts on the connectors "MX1" of the control unit and of the connector "GAS" are not loose or corroded.
- Check that the power input to the accelerator pedal position sensor is correct (approx. 5 Vdc measured between pin 32 (positive) and pin 30 (negative) of connector "X11").
- With the connector "MX1" disconnected from the engine control unit, check that there is electrical continuity between pin 2 of the connector "GAS" and pin 20 of the connector "MX1".
- With the starter key in the "O" (OFF) position and the connector "MX1" disconnected from the engine control unit, connect a test meter to pin 2 of the connector "GAS" and to the earth on the cab and test the resistance to check for shorting to earth (test 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 connector "GAS" 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

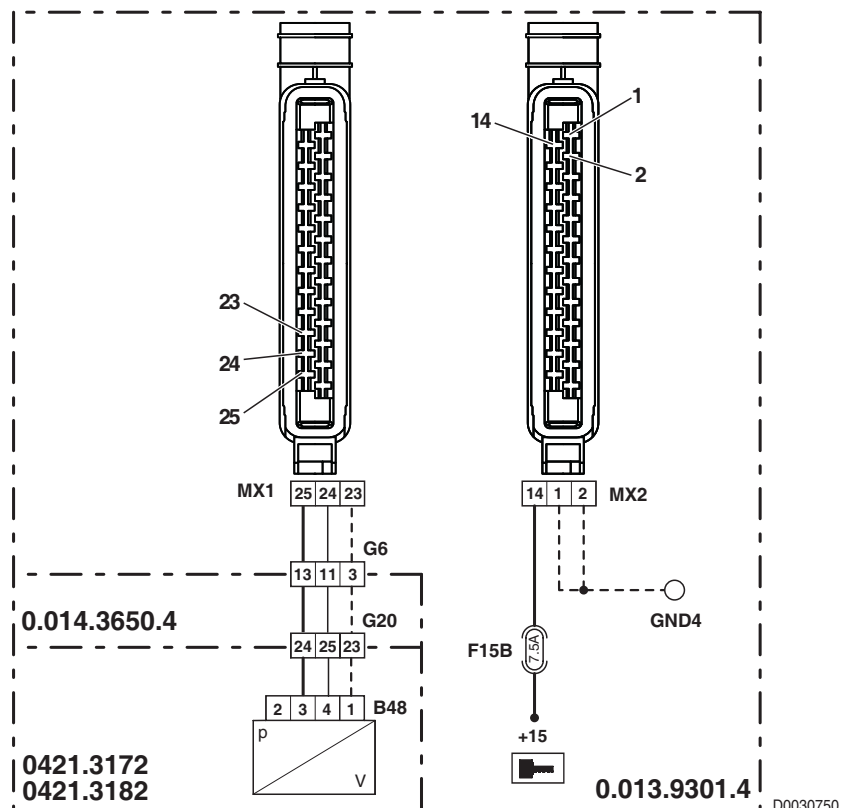
← Engine,boost pressure
Signal not valid

DESCRIPTION

The engine control unit has detected the absence of the engine boost pressure signal or an invalid value for this signal.

CHECK

- Test for electrical continuity between pin 1 of connector "B48" and pin 23 of connector "MX1"
- Test for electrical continuity between pin 2 of connector "B48" and pin 24 of connector "MX1"
- Test for electrical continuity between pin 3 of connector "B48" and pin 25 of connector "MX1"
- Check that the sensor is functioning correctly (for technical details, see group 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 the 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 there is no voltage (meter reading 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "B48" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).



ALARM N° 009



← SPN 110 - FMI 2



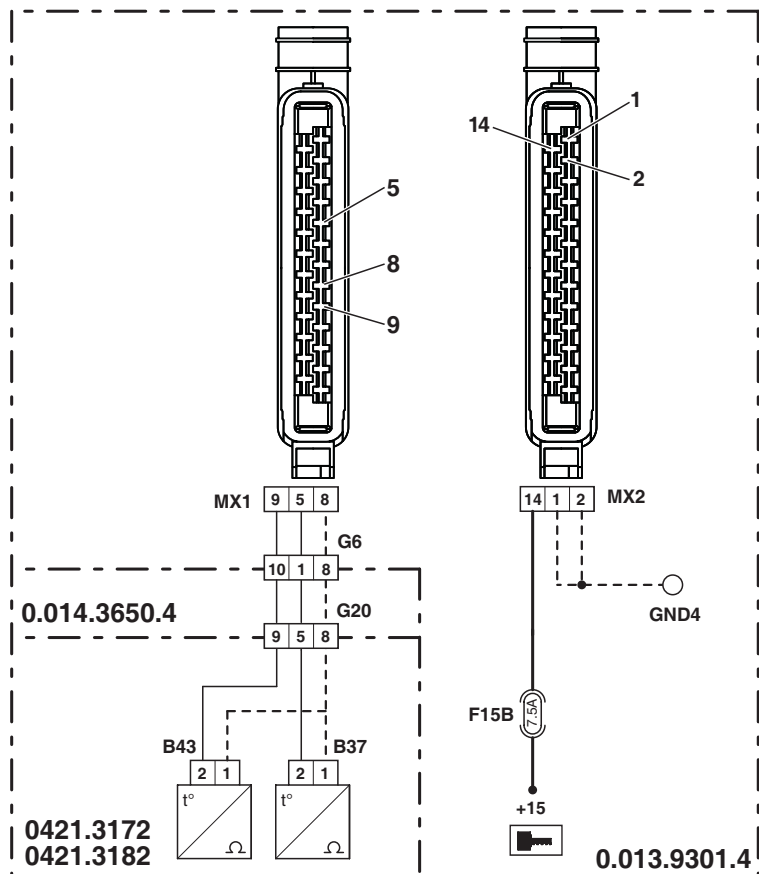
← Engine, temperature
Signal not valid

DESCRIPTION

The engine control unit has detected the absence of the coolant temperature signal or an invalid value for this signal.

CHECK

- Test for electrical continuity between pin 1 of connector “B43” and pin 9 of connector “MX1”
- Test for electrical continuity between pin 2 of connector “B43” and pin 8 of connector “MX1”
- Check that the temperature sensor functions correctly and does not give a false reading; use an 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 the parameter "510 CoolantTempWarn" (normal value: 113 °C) and “514 CoolantTempEcy” (normal value: 130 °C) is correct.
- Check that the sensor is functioning correctly (for technical details, see group 40)
- With the connector "MX1" disconnected 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 the engine earth, and check that there is no voltage (meter reading 0V).
- With the 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 "B43" and to the engine earth, and check that there is no voltage (meter reading 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of the connector "B43" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "B43" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).



D0030760

ALARM N° 011



← SPN 174 - FMI 2



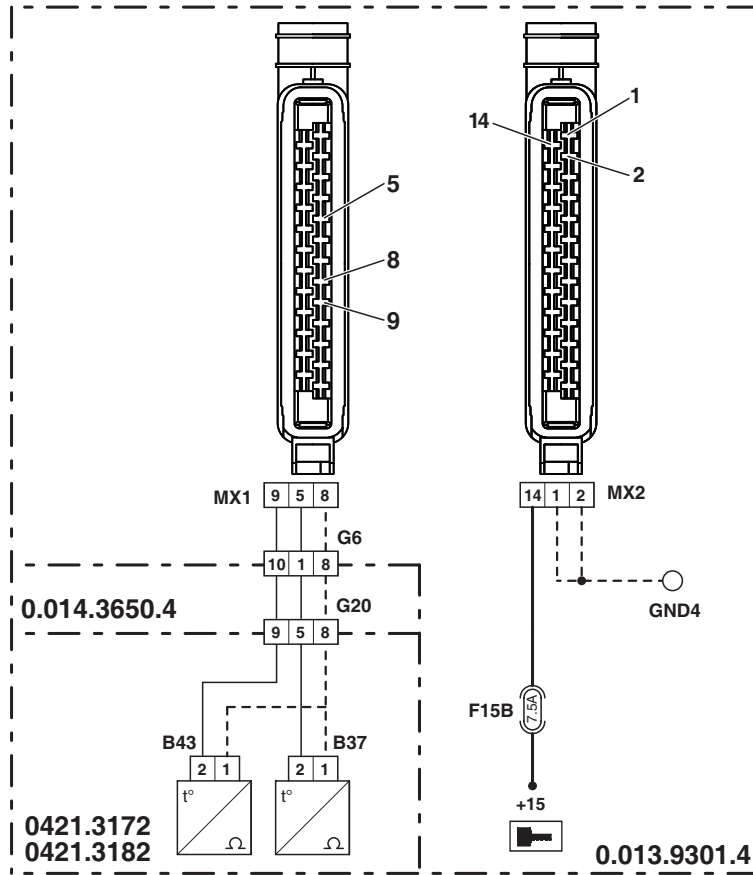
← Engine Fuel temp.
Signal not valid

DESCRIPTION

The engine control unit has detected the absence of the fuel temperature signal or an invalid value for this signal.

CHECK

- Test for electrical continuity between pin 1 of connector "B37" and pin 5 of connector "MX1"
- Test for electrical continuity between pin 2 of connector "B37" and pin 8 of connector "MX1"
- Check that the sensor is functioning correctly (for technical details, see group 40)
- With the connector "MX1" disconnected 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 the engine earth, and check that there is no voltage (meter reading 0V).
- With the 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 "B37" and to the engine earth, and check that there is no voltage (meter reading 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of the connector "B37" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "B37" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).



D0030760

ALARM N° 031



← SPN 110 - FMI 0



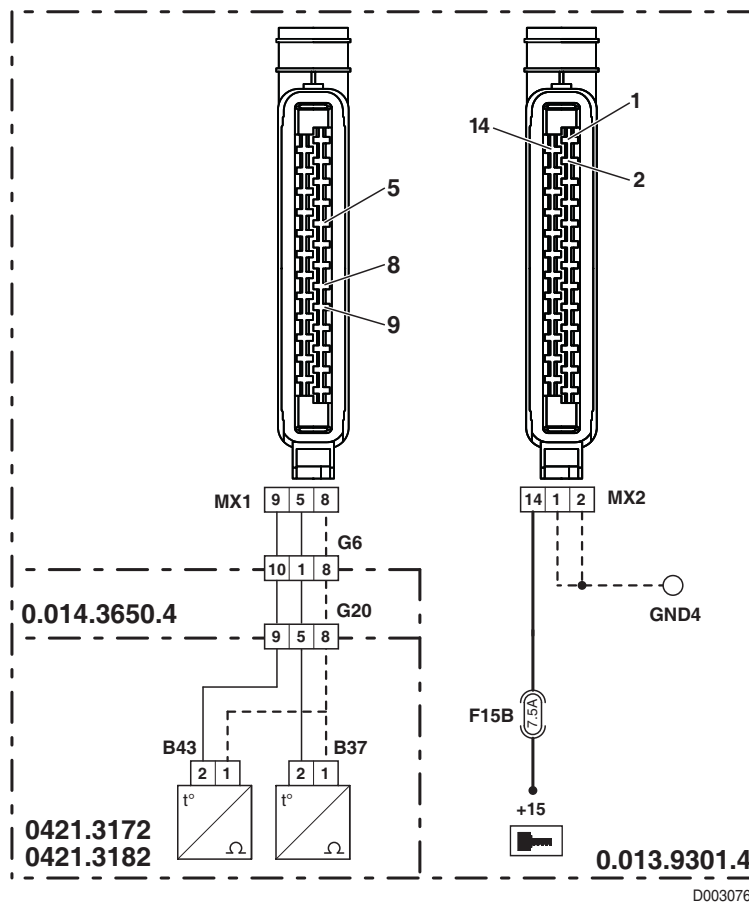
← Engine, temperature
Signal too high

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 that the sensor is functioning correctly (for technical details, see group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of the connector "B43" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).



ALARM N° 035

← SPN 702 - FMI 14

← Engine over speed
FMI 14**DESCRIPTION**

The engine control unit detects that the engine is or has been running at 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.

Should the alarm reappear, no testing is necessary.

CHECK

- Check with the Serdia program that the parameter "21 Overspeed" 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 Group 40).
- Check that the parameter "1 TeethPickUp1" is correct (normal value=48).

ALARM N° 036



← SPN 174 - FMI 0



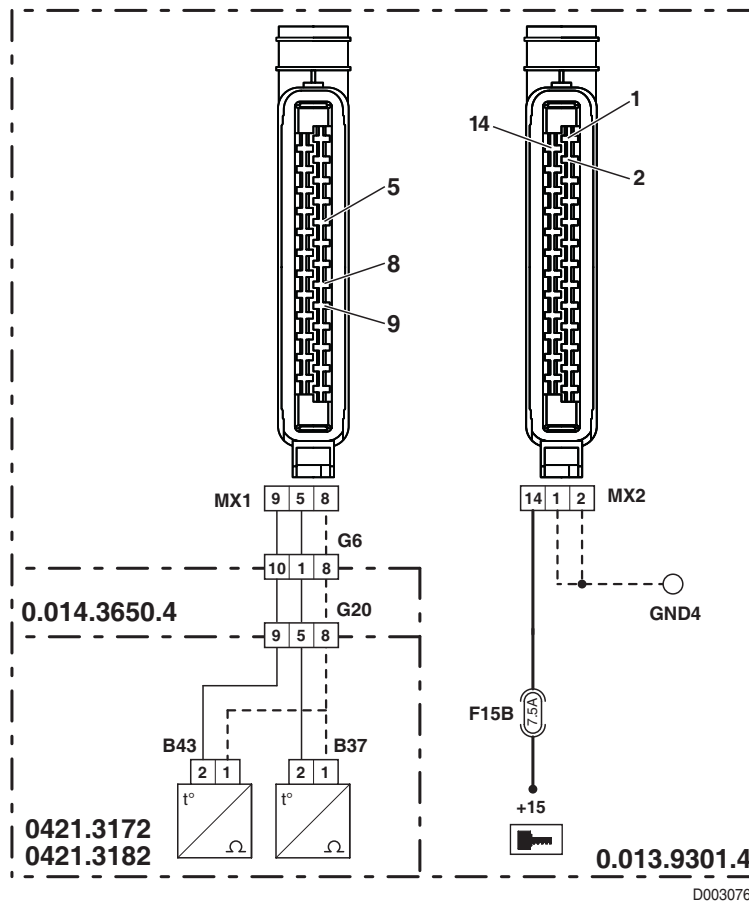
← Engine Fuel temp.
Signal too high

DESCRIPTION

The engine control unit has detected that the fuel temperature has exceeded the alarm threshold.

CHECK

- Check that the sensor is functioning correctly (for technical details, see group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of the connector "B43" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).



ALARM N° 041



← SPN 110 - FMI 0

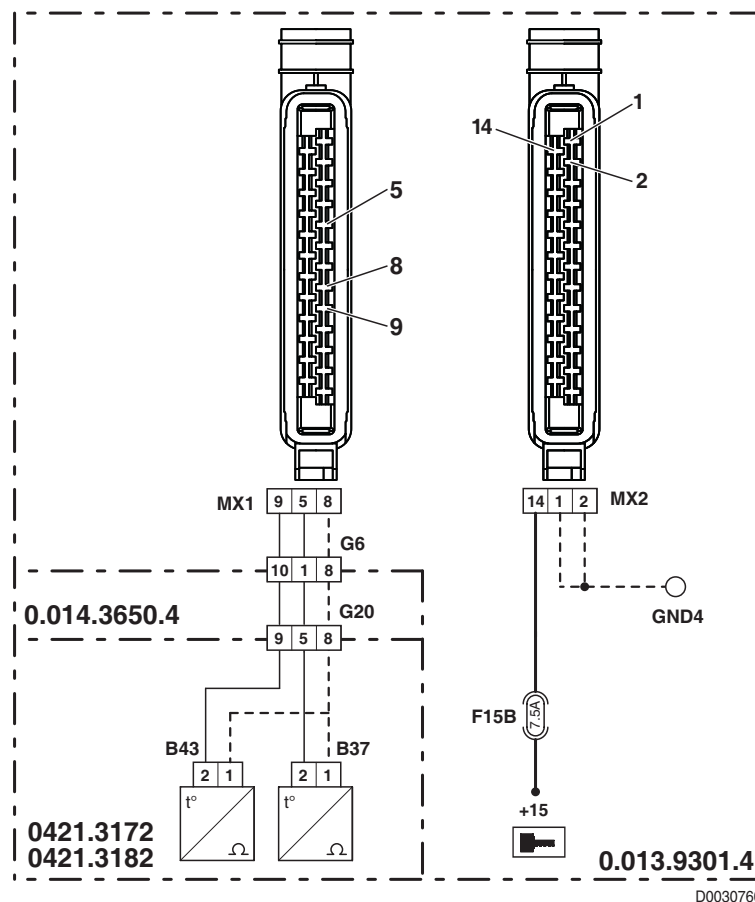
← Engine, temperature
Signal too high

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 that the sensor is functioning correctly (for technical details, see group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of the connector "B43" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).



ALARM N° 050



← SPN 536 - FMI 12



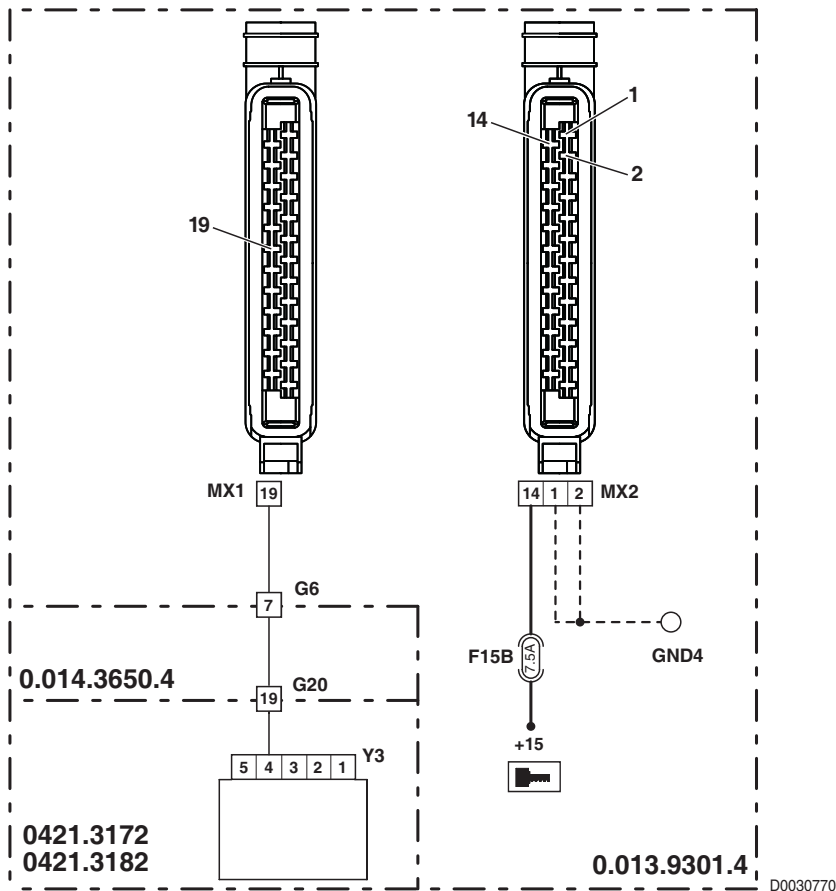
← Engine actor-rack
Device out of order

DESCRIPTION

The engine control unit has detected that the actuator position signal does not correspond to the position requested.

CHECK

- Check that the contacts on connector "Y3" and on the control unit "MX1" are not loose or corroded.
- Test 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 Group 40).
- With the starter key in the "I" (ON) position and the engine stopped, connect a test meter to pin 4 of the connector "Y3" and to the engine earth and check that there is no voltage (test meter reading 0V) .
- With the starter key in the "O" (OFF) position, connect a test meter to pin 4 of the connector "Y3" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- If the fault persists, renew the control unit.



ALARM N° 052



← SPN 536 - FMI 13



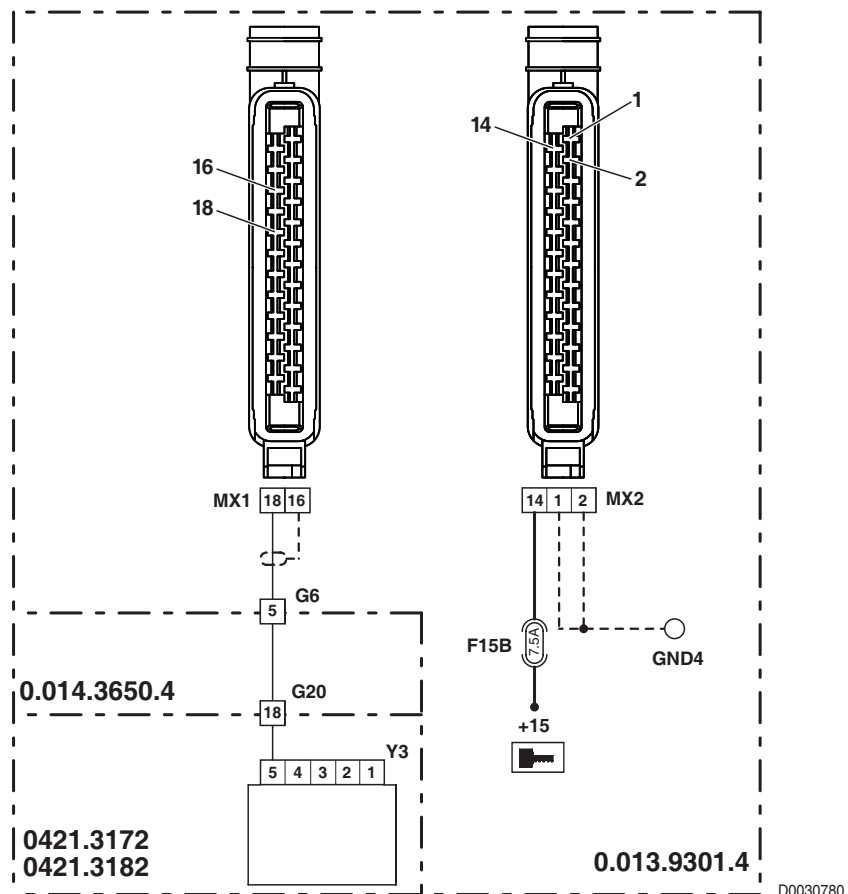
← Engine actor-rack
Out of Calibration

DESCRIPTION

The engine control unit has detected that the reference signal for the position of the actuator does not correspond to that requested.

CHECK

- Check that the contacts on connector "Y3" and on the control unit "MX1" are not loose or corroded.
- Test 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 Group 40).
- With the starter key in the "I" (ON) position and the engine stopped, connect a test meter to pin 5 of the connector "Y3" and to the engine earth and check that there is no voltage (test meter reading 0V) .
- With the starter key in the "O" (OFF) position, connect a test meter to pin 5 of the connector "Y3" and to the engine earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- If the fault persists, renew the control unit.



ALARM N° 053



← SPN 535 - FMI 7



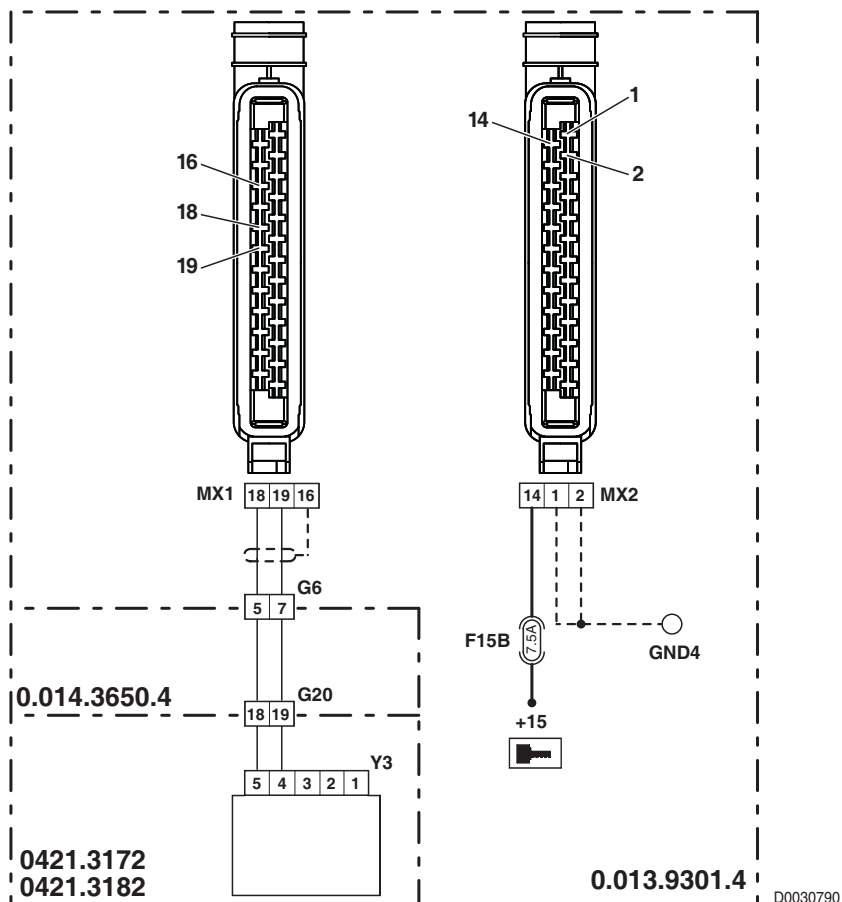
← Engine,Regulator
Mechanical defect

DESCRIPTION

The engine control unit has detected that the difference between the command given and the actuator response is greater than 10%.

CHECK

- Check that the internal resistance values for the actuator are correct (for details see Group 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 not loose or corroded.
- Test for electrical continuity between pin 4 of connector "Y3" and pin 19 of connector "MX1".
- Test for electrical continuity between pin 5 of connector "Y3" and pin 18 of connector "MX1".



ALARM N° 067



← SPN 91 - FMI 11

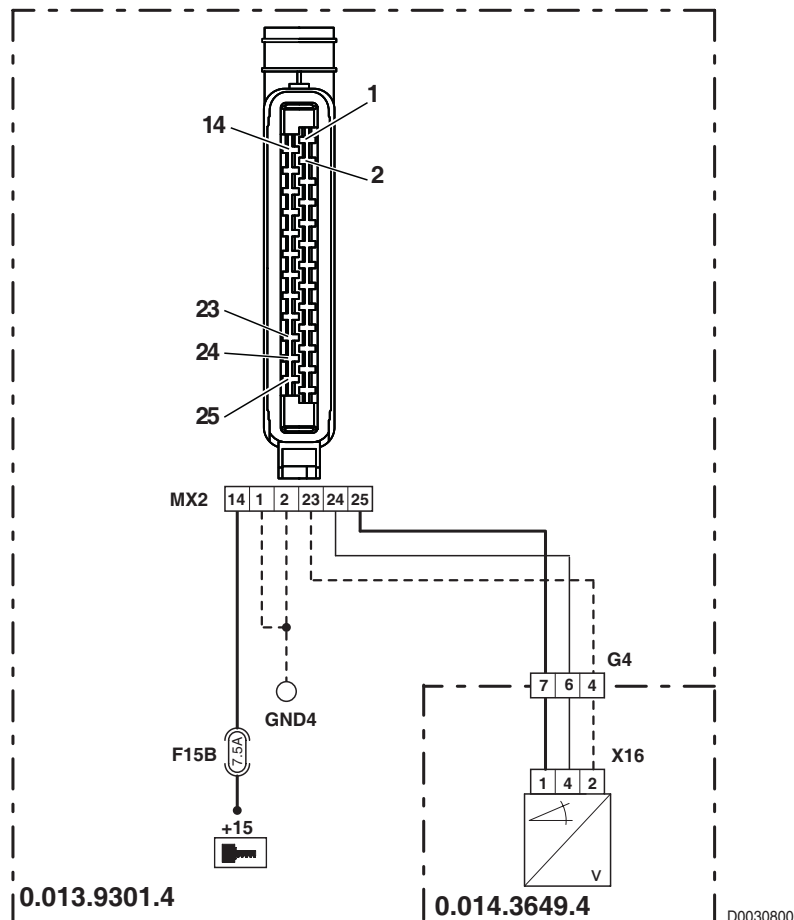
← Engine, throttle pedal
Failure not ident.

DESCRIPTION

The engine control unit has detected the absence of the connection to the accelerator pedal position sensor or a signal outside the valid range.

CHECK

- Check that the contacts on connector "MX1" of the control unit and connector "X16" are not loose or corroded.
- Check that the resistance characteristics of the accelerator pedal position sensor are correct (for technical details, see group 40).
- Check that the power input to the accelerator pedal position sensor is correct (approx. 5 Vdc measured between pin 32 (positive) and pin 30 (negative) of connector "X11").
- With the connector "MX1" disconnected from the engine control unit, check 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 the connector "X16" and to the earth on the cab and measure the resistance to verify that there are no short circuits to earth (test 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 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

← Engine CAN Error
Signal not valid**DESCRIPTION**

The engine control unit has not been able to read or send a message on the CANBUS.

CHECK

- For details, see "5.5 CANBUS ALARMS".

ALARM N° 070

← SPN 743 - FMI 12

← Engine CAN Error
Device out of order**DESCRIPTION**

The engine control unit has detected that the CANBUS controller is damaged.

CHECK

- For details, see "5.5 CANBUS ALARMS".

ALARM N° 071

← SPN 743 - FMI 9

← Engine CAN Error
Abnormal update rate**DESCRIPTION**

The engine control unit has not been able to read or send a message on the CANBUS.

CHECK

- For details, see "5.5 CANBUS ALARMS".

ALARM N° 074

← SPN 743 - FMI 14

← Engine CAN Error
FMI 14**DESCRIPTION**

The engine control unit has detected that the connection to the CANBUS is not present.

CHECK

- For details, see "5.5 CANBUS ALARMS".

ALARM N° 076

← SPN 765 - FMI 12

← Engine, E2P Parameter
Device out of order**DESCRIPTION**

The engine control unit has detected an error during parameter writing.

CHECK

- Turn the starter key first to "O" (OFF) and then back to the "I" (ON) position.
- Repeat the data write procedure, and if the problem persists, contact Technical Assistance Service.

ALARM N° 077

← SPN 752 - FMI 12

← Engine, Memory Error
Device out of order**DESCRIPTION**

The engine control unit has detected an error in reading the program memory during the normal control cycle.

CHECK

- Turn the starter key first to "O" (OFF) and then back to the "I" (ON) position.
- If the problem persists, contact Technical Assistance Service.

ALARM N° 078

← SPN 766 - FMI 2

← Engine internal fault
Signal not valid**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 first to "O" (OFF) and then back to the "I" (ON) position.
- If the problem persists, contact Technical Assistance Service.

ALARM N° 080

← SPN 766 - FMI 2

← Engine internal fault
Signal not valid**DESCRIPTION**

The engine control unit detects that actuator power supply is not within the permitted limits.

CHECK

- Turn the starter key first to "O" (OFF) and then back to the "I" (ON) position.
- Check whether the alarm is still present, and , if so, contact Technical Assistance Service.

ALARM N° 083



← SPN 766 - FMI 2

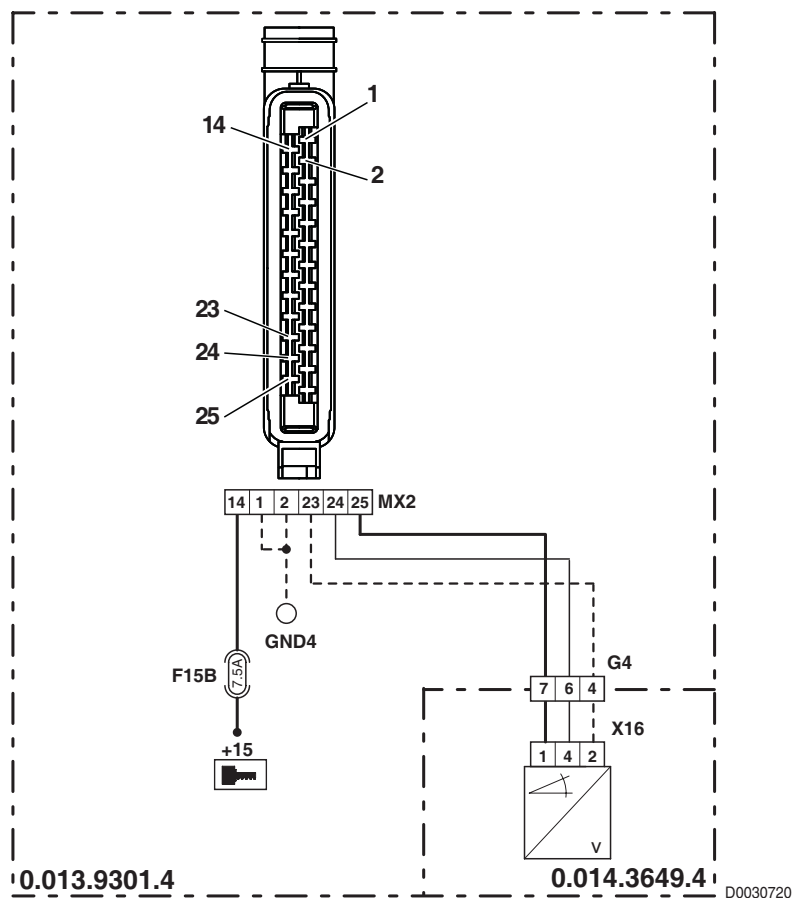
← Engine internal fault
Signal not valid

DESCRIPTION

The control unit detects that the power input to the accelerator pedal position sensor is missing or incorrect.

CHECK

- Check that the power input to the accelerator pedal position sensor is correct (5 Vdc approx measured between pin 1 (positive) and pin 2 (negative) of connector "X16").
- Turn the starter key first to "O" (OFF) and then back to the "I" (ON) position.
- Check whether the alarm is still present, and , if so, contact Technical Assistance Service.



ALARM N° 084



← SPN 766 - FMI 2



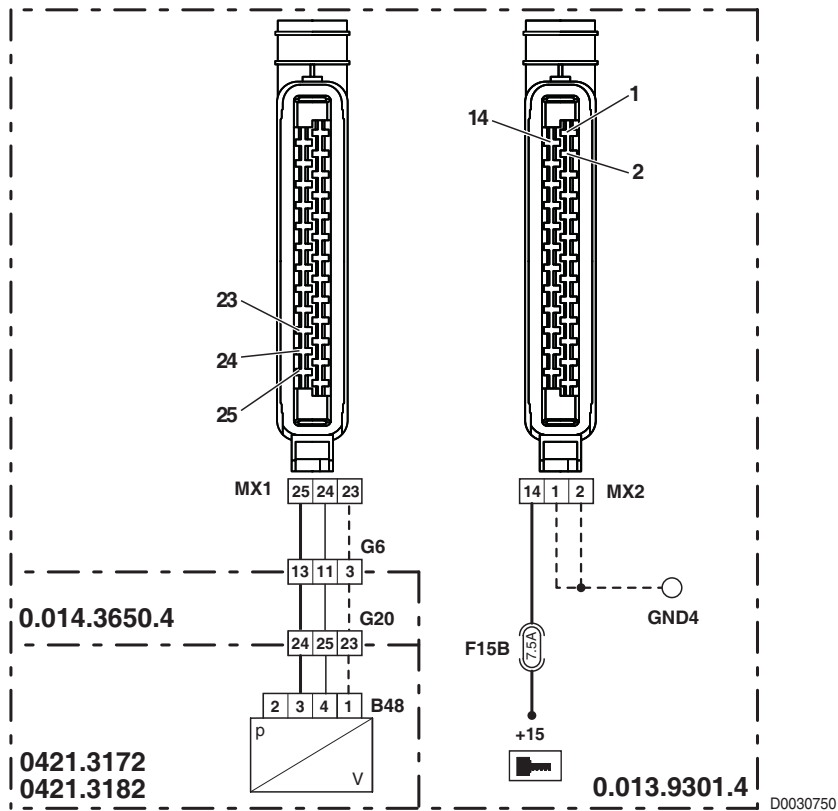
← Engine internal fault
Signal not valid

DESCRIPTION

The control unit detects that the power input to the engine boost pressure sensor is missing or incorrect.

CHECK

- Check that the power input to the turbo charge pressure sensor is correct (approximately 5Vdc between pin 3 (positive) and pin 1 (negative) of the connector "B48").
- Turn the starter key first to "O" (OFF) and then back to the "I" (ON) position.
- Check whether the alarm is still present, and , if so, contact Technical Assistance Service.



ALARM N° 086

← SPN 171 - FMI 12

← Engine,temp ECU sensor
Device out of order**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 reappears contact Technical Assistance Service.

ALARM N° 087

← SPN 108 - FMI 12

← Engine, Press.
Device out of order**DESCRIPTION**

The engine control unit detects that atmospheric pressure is outside the permitted 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 reappears contact Technical Assistance Service.

ALARM N° 090

← SPN 765 - FMI 2

← Engine, E2P Parameter
Signal not valid**DESCRIPTION**

The engine control unit has detected a discrepancy between the parameters that have been written to the 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 first to "O" (OFF) and then back to the "I" (ON) position.
- If the problem persists, contact Technical Assistance Service.

ALARM N° 093

← SPN 752 - FMI 2

← Engine, Memory Error
Signal not valid**DESCRIPTION**

The engine control unit has detected a "Stack Overflow" error during the execution of the program.

CHECK

- Note down the values of the parameters "3897 CStackTestFreeBytes" and "3898 IStackTestFreeBytes".
- Turn the starter key first to "O" (OFF) and then back to the "I" (ON) position.
- If the problem persists, contact Technical Assistance Service.

ALARM N° 094

← SPN 766 - FMI 2

← Engine internal fault
Signal not valid**DESCRIPTION**

The engine control unit has detected an internal error.

CHECK

- Contact Technical Assistance Service.

5.4 TRANSMISSION CONTROL UNIT ALARMS

The transmission control unit warns the operator of any malfunction affecting monitored components, by way of audible and visible signals on the display on the right hand front upright of the cab and on the Infocenter.

Faults are signalled on the transmission display by display of the key symbol accompanied by a fault code and, in some cases, by an audible signal, and by text messages on the Infocenter.

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 can be identified 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, the operation of the transmission is limited.

Whenever Limp-Home mode cuts in, the transmission reverts automatically to neutral and the powershift can no longer be used; the gears must be shifted with the mechanical linkage only.

Forward/reverse direction can be changed only with the tractor at a complete standstill and when the shuttle control lever has been in the neutral position for more than 1 second (or, if alarm code 47 is the only one active, simply by depressing the clutch pedal).

To bring the transmission out of this mode, the fault must be rectified and the shuttle control lever returned to the "NEUTRAL" position, or the 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 puts itself in 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 mode, the transmission operates in manual only.

When this mode cuts in, the transmission can only be operated by commands given directly by the operator.

To bring the transmission out of this mode, the fault must be rectified.

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 the 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

When this shutdown occurs, the transmission locks up completely and reverts to neutral; the power supply to the 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 operation of the transmission is completely inhibited.

When this shutdown occurs, the transmission locks up completely and reverts to neutral; the power supply to all the solenoid valves is cut off.

To bring the transmission out of this mode, the fault must be rectified.

5.4.2 ABNORMALITIES NOT DETECTED BY THE TRANSMISSION CONTROL UNIT

Abnormality	Page
The display shows the message "EE"	20-257
EDS software unable to connect to the transmission control unit	20-258
Transmission slips unexpectedly from forward or reverse drive into neutral	20-259
Transmission continues to shift range automatically every 1 or 2 seconds	20-260
Momentary loss of traction with the tractor in motion	20-260
Transmission stays permanently in neutral	20-261

Art	Infocenter	Description	Operating mode	Page
10	10-Calib. main clutch TC-Warnings	The control unit detects errors in the main clutch calibration values		20-189
11	11-E2P clutch pedal TC-Warnings	The control unit detects errors in the main clutch calibration values		20-189
12	12-Temperature sensor TC-Input short battery	The control unit detects a problem in the feed to the transmission oil temperature sensor		20-190
13	13-Temperature sensor TC-Input short ground	The control unit detects a problem in the feed to the temperature sensor		20-191
14	14-Syncr Neutral switch TC-logical fault	The control unit detects a discrepancy between the speed readings at the main clutch input and the transmission output and the status of the start enable sensor (which signals that the transmission is in neutral or that a mechanical gear is engaged)		20-192
15	–	Alarm available but not utilized.	–	–
16	–	Alarm available but not utilized.	–	–
17	–	Alarm available but not utilized.	–	–
18	18-System pressure TC-logical fault	The control unit detects a discrepancy between the oil pressure reading and the operating status of the transmission		20-193
21	21-Limit speed exceeded TC-Warnings	The control unit detects a ground speed higher than the permissible limit		20-194
22	22-Temp. shuttle-mode TC-Warnings	The control unit detects that the transmission oil temperature exceeds the maximum value permitted when the tractor is working in "FIELD" mode		20-194
23	23-Temp.transport-mode TC-Warnings	The control unit detects that the transmission oil temperature exceeds the maximum value permitted when the tractor is working in "ROAD" mode		20-195
24	Main clutch Overspeed	The control unit detects the main clutch running overspeed.		20-195
25	25-Input speed TC-Warnings	The control unit detects a discrepancy between the engine speed value acquired via CANBUS and that read by the nLse speed sensor.		20-196
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 gear 2 TC-Output open circuit	The control unit detects that the solenoid Y4 is faulty or not connected	SUBSTITUTE-STRATEGY	20-197
37	37-EV gear 2 TC-Out shorted ground	The control unit detects that the control line of solenoid Y4 is shorting to earth	SUBSTITUTE-STRATEGY	20-198
38	38-EV gear 2 TC-Out shorted battery	The control unit detects that the control line of solenoid Y4 is shorting to a positive feed	SUBSTITUTE-STRATEGY	20-199
39	39-EV gear 1 TC-Output open circuit	The control unit detects that the solenoid Y2 is faulty or not connected	SUBSTITUTE-STRATEGY	20-200
40	40-EV gear 1 TC-Out shorted ground	The control unit detects that the control line of solenoid Y2 is shorting to earth	SUBSTITUTE-STRATEGY	20-201
41	41-EV gear 1 TC-Out shorted battery	The control unit detects that the control line of solenoid Y2 is shorting to a positive feed	SUBSTITUTE-STRATEGY	20-202
47	47-nAB speed sensor TC-Input short battery	The control unit detects that the speed sensor nAb is disconnected or shorting to a positive feed.	Limp-Home	20-203
48	48-nAB speed sensor TC-Input short ground	The control unit detects that the speed sensor nAb is shorting to earth	Limp-Home	20-204
4B	4B-nAB speed sensor TC-logical fault	The control unit detects anomalous information coming from the speed sensor nAb	Limp-Home	20-205
50	50-nHK speed sensor TC-Input short battery	The control unit detects that the speed sensor nHk is disconnected or shorting to a positive feed	Limp-Home	20-206
51	50-nHK speed sensor TC-Input short ground	The control unit detects that the speed sensor nHk is shorting to earth	Limp-Home	20-207
52	52-nHK speed sensor TC-logical fault	The control unit detects anomalous information coming from the speed sensor nHk	Limp-Home	20-208
53	53-nLSA speed sensor TC-Input short battery	The control unit detects that the speed sensor nLsa is disconnected or shorting to a positive feed	Limp-Home	20-209
54	54-nLSA speed sensor TC-Input short ground	The control unit detects that the speed sensor nLsa is shorting to earth	Limp-Home	20-210
55	55-nLSA speed sensor TC-logical fault	The control unit detects anomalous information coming from the speed sensor nLsa	Limp-Home	20-211
5F	5F-FRRS sensor TC-Warnings	The control unit detects that the calibration values of the field/road position sensor are incorrect.		20-212
60	60-FRRS calibration TC-Warnings	The control unit detects that the calibration values of the field/road position sensor are incorrect.		20-212

Art	Infocenter	Description	Operating mode	Page
61	61-FRRS sensor TC-Input short battery	The control unit detects that the field/road position sensor is shorting to a positive feed (+5V).	LIMP-HOME-LS	20-213
62	62-FRRS sensor TC-Input short battery	The control unit detects that the field/road position sensor is shorting to a positive feed (+12V).	TC-SHUTDOWN	20-214
63	63-FRRS sensor TC-Input short ground	The control unit detects that the field/road position sensor is disconnected or shorting to earth.	LIMP-HOME-LS	20-215
64	64-Clutch Pedal Sensor TC-logical fault	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 clutch pedal	EMERGENCY DRIVE	20-216
65	65-Clutch Pedal Sensor TC-Input short ground	The control unit detects that the clutch pedal sensor is disconnected or shorting to earth	EMERGENCY DRIVE	20-217
66	66-Clutch Pedal Sensor TC-Input short battery	The control unit detects that the clutch pedal position sensor is shorting to a positive feed.	EMERGENCY DRIVE or TC-SHUTDOWN	20-218
67	67-AU1 Sensor supply TC-Out shorted ground	The control unit detects that the feed to the clutch pedal position sensor is below correct value	EMERGENCY DRIVE or TC-SHUTDOWN	20-219
68	68-AU1 Sensor supply TC-Out shorted battery	The control unit detects that the feed to the clutch pedal position sensor is above correct value	EMERGENCY DRIVE or TC-SHUTDOWN	20-220
69	69-Clutch Pedal Sensor TC-logical fault	The control unit detects one or more threshold values of the clutch pedal position sensor out of range	EMERGENCY DRIVE or TC-SHUTDOWN	20-221
70	70-E2P clutch pedal TC-Warnings	The control unit detects that the main clutch calibration values incorrectly saved due to a fault in the EEPROM memory blocks or that the clutch pedal has not yet been calibrated	EMERGENCY DRIVE or TC-SHUTDOWN	20-221
71	-	Alarm available but not utilized.	-	-
72	-	Alarm available but not utilized.	-	-
73	73-Comfort clutch TC-Input short ground	The control unit detects that the "Comfort Clutch" pushbutton is either disconnected or shorting to earth	LIMP-HOME-LS	20-222
74	74-Comfort clutch TC-Input short battery	The control unit detects that the "Comfort Clutch" pushbutton is shorting to a positive feed	LIMP-HOME-LS	20-223
76	76-EV proportional TC-Output open circuit	The control unit detects that the main clutch proportional control solenoid is disconnected	TC-SHUTDOWN	20-224

Art	Infocenter	Description	Operating mode	Page
77	77-Proportional valve TC-Out shorted ground	The control unit detects that the main clutch proportional control solenoid is shorting to earth	TC-SHUTDOWN	20-225
79	79-EV direct. forward TC-Output open circuit	The control unit detects that the forward drive solenoid Y3 is disconnected.	TC-SHUTDOWN	20-226
80	80-EV direct. forward TC-Out shorted ground	The control unit detects that the forward drive solenoid Y3 is shorting to earth.	TC-SHUTDOWN	20-227
82	82-EV direct. reverse TC-Output open circuit	The control unit detects that the reverse drive solenoid Y1 is disconnected.	TC-SHUTDOWN	20-228
83	83-EV direct. reverse TC-Out shorted ground	The control unit detects that the reverse drive solenoid Y1 is shorting to earth.	TC-SHUTDOWN	20-229
85	85-Reverser Lever TC-logical fault	The control unit detects a problem affecting the shuttle control lever.	SUBSTITUTE-STRATEGY or TRANSMISSION SHUTDOWN	20-230
87	Pincoding does not match with vehicle type	The control unit detects that the vehicle type has not been programmed correctly	TC-SHUTDOWN.	20-231
89	89-VPS1 supply TC-logical fault	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	20-232
90	90-VPS2 supply TC-logical fault	The control unit detects that the current draw of the powershift solenoid valves Y2, Y4, Y5 and Y6 is abnormal.	TC-SHUTDOWN	20-233
91	91-Main clutch TC-logical fault	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	20-234
92	92-Battery voltage TC-Input short battery	The control unit has detected an abnormally high input voltage	TRANSMISSION SHUTDOWN	20-235
93	93-Battery voltage TC-Input short ground	The control unit has detected an abnormally low input voltage	TRANSMISSION SHUTDOWN	20-236
94	94-EV proportional TC-Out shorted battery	The control unit detects that the main clutch proportional control solenoid is shorting to a positive feed	TC-SHUTDOWN	20-237
95	95-EV direct. forward TC-Out shorted battery	The control unit detects that the forward drive solenoid Y3 is shorting to a positive feed.	TC-SHUTDOWN	20-238
96	96-EV direct. reverse TC-Out shorted battery	The control unit detects that the reverse drive solenoid Y1 is shorting to a positive feed.	TC-SHUTDOWN	20-239
97	97-Application error TC-logical fault	The control unit detects that the transmission control unit software has not been programmed correctly	TC-SHUTDOWN	20-240

Art	Infocenter	Description	Operating mode	Page
98	98-Error Configuratio TC-logical fault	The control unit detects that transmission configuration data have not been programmed correctly.	TC-SHUTDOWN	20-240
99	99-Vehicle config. TC-Warnings	The control unit detects that tractor configuration data have not been programmed correctly (CHECKSUM ERROR)	TC-SHUTDOWN	20-241
AB	-	Alarm available but not utilized.	-	-
AC	-	Alarm available but not utilized.	-	-
AD	-	Alarm available but not utilized.	-	-
B0	B0-nLSE speed sensor TC-Input short ground	The control unit detects that the rpm sensor nLse is disconnected or short-circuiting to positive	Limp-Home	20-242
B1	B1-nLSE speed sensor TC-Input short battery	The control unit detects that the speed sensor nLse is shorting to earth	Limp-Home	20-243
B2	B2-nLSE speed sensor TC-logical fault	The control unit detects unreliable information coming from the speed sensor nLse	Limp-Home	20-244
B3	B5-FRRS field valve TC-Output open circuit	The control unit detects that the "Field" mode selector solenoid Y5 is disconnected.	TC-SHUTDOWN	20-245
B4	B4-FRRS field valve TC-Out shorted battery	The control unit detects that the "Field" mode selector solenoid Y5 is shorting to a positive feed.	TC-SHUTDOWN	20-246
B5	B5-FRRS field valve TC-Out shorted ground	The control unit detects that the "Field" mode selector solenoid Y5 is shorting to earth.	TC-SHUTDOWN	20-247
B6	B6-FRRS road valve TC-Output open circuit	The control unit detects that the "Road" mode selector solenoid Y6 is disconnected.	TC-SHUTDOWN	20-248
B7	B7-FRRS road valve TC-Out shorted battery	The control unit detects that the "Road" mode selector solenoid Y6 is shorting to a positive feed.	TC-SHUTDOWN	20-249
B8	B8-FRRS road valve TC-Out shorted ground	The control unit detects that the "Road" mode selector solenoid Y6 is shorting to earth.	TC-SHUTDOWN	20-250
B9	B9-Neutral Locker EV TC-Output open circuit	The control unit detects that the gearbox neutral lock solenoid Y7 is disconnected.	TC-SHUTDOWN	20-251
BA	BA-Neutral Locker EV TC-Out shorted battery	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to a positive feed.	TC-SHUTDOWN	20-252
BB	BB-Neutral Locker EV TC-Out shorted ground	The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to earth.	TC-SHUTDOWN	20-253
C0	C0-Msg PTCTL1 REQGEAR TC-Grup C	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	20-254

Art	Infocenter	Description	Operating mode	Page
C3	C3-Msg EEC1 ENGSPEED TC-Gruop C	The transmission control unit detects an error in the information received from the engine control unit regarding the communication of the engine speed.	LIMP-HOME-LS	20-255
C6	–	Alarm available but not utilized.	–	–
C9	–	Alarm available but not utilized.	–	–
CB	–	Alarm available but not utilized.	–	–
CF	CF-Message EEC1 TC-Gruop A	The transmission control unit detects a fault on the CANBUS line.	LIMP-HOME-LS	20-256
D0	–	Alarm available but not utilized.	–	–
D1	D1-Msg LIMITATION TC-Gruop A	The transmission control unit detects a fault on the CANBUScontroller.	–	20-256
D2	D2-Msg HPSACTRL TC-Gruop A	The transmission control unit detects a fault on the CANBUScontroller.	–	20-257
EE	–	The display detects a problem of communication with the transmission control unit.	–	20-257
GEN1	–	EDS software unable to connect to the transmission control unit	–	20-258
GEN2	–	Transmission slips unexpectedly from forward or reverse drive into neutral	–	20-259
GEN3	–	Transmission continues to shift range automatically every 1 or 2 seconds	–	20-260
GEN4	–	Momentary loss of traction with the tractor in motion	–	20-260
GEN5	–	The transmission remains in neutral	–	20-261



← 10

← 10-Calib. main clutch
TC-Warnings

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-E2P clutch pedal
TC-Warnings

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-Temperature sensor
TC-Input short battery

DESCRIPTION

The control unit detects a problem in the feed to the transmission oil temperature sensor

NOTE

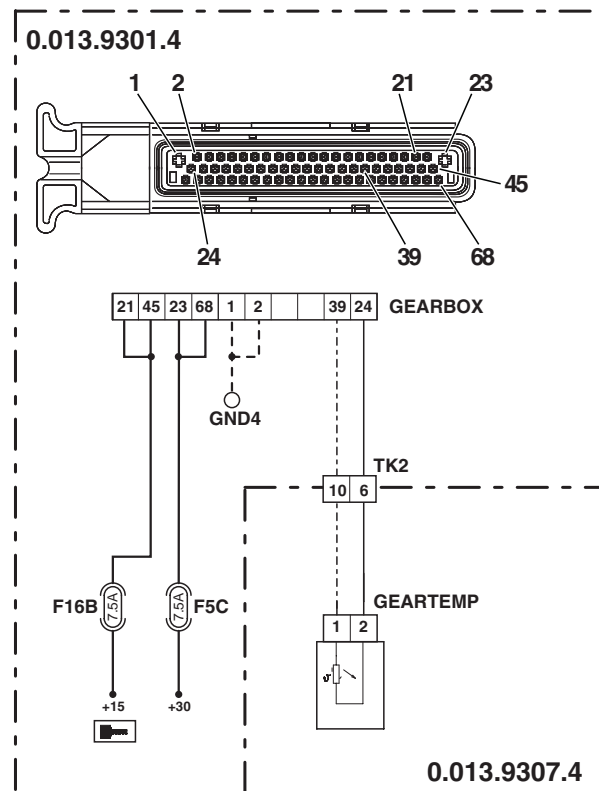
This alarm could be displayed as a result of alarm 66 or 68 being activated.

ECU RESPONSE

The control unit does not limit the operation of the transmission, but sets the transmission temperature to the "Cold transmission" default value.

CHECK

- Check that the contacts on the connector "GEARTEMP" and on the "GEARBOX" lift control unit are not loose or corroded.
- Check that the sensor 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 the connector "GEARTEMP" and pin 24 of the connector "GEARBOX" and test 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 the connector "GEARTEMP" and pin 39 of the connector "GEARBOX" and test 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 control unit must be renewed.



D0030870



← 13



← 13-Temperature sensor
TC-Input short ground

DESCRIPTION

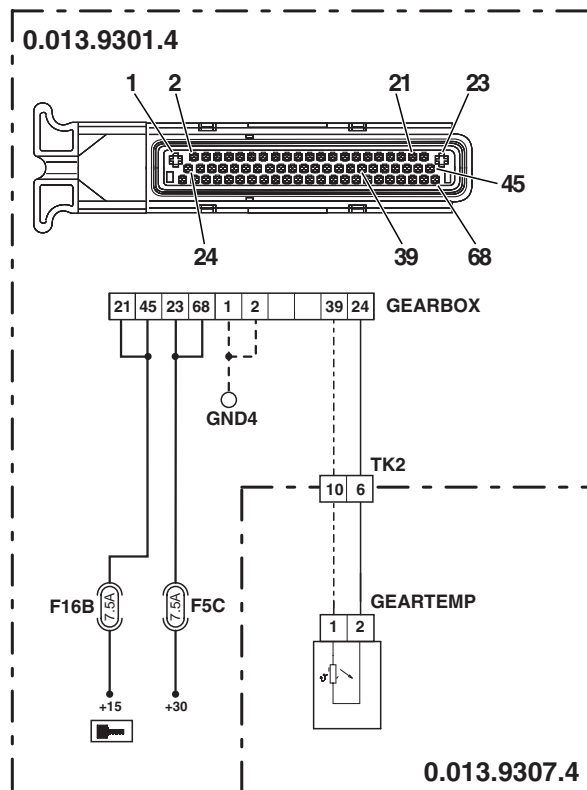
The control unit detects a problem in the feed to the temperature sensor

ECU RESPONSE

The control unit does not limit the operation of the transmission, but sets the transmission temperature to the "Cold transmission" default value.

CHECK

- Check that the contacts on the connector "GEARTEMP" and on the "GEARBOX" lift control unit are not loose or corroded.
- Check that the sensor is functioning correctly (for technical details, see group 40)
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of the connector "GEARTEMP" and to the earth on the transmission and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "GEARTEMP" and to the earth on the transmission and test the resistance to check for shorting to earth (test 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.



D0030870



← 14



← 14-Syncr Neutral switch
TC-logical fault

DESCRIPTION

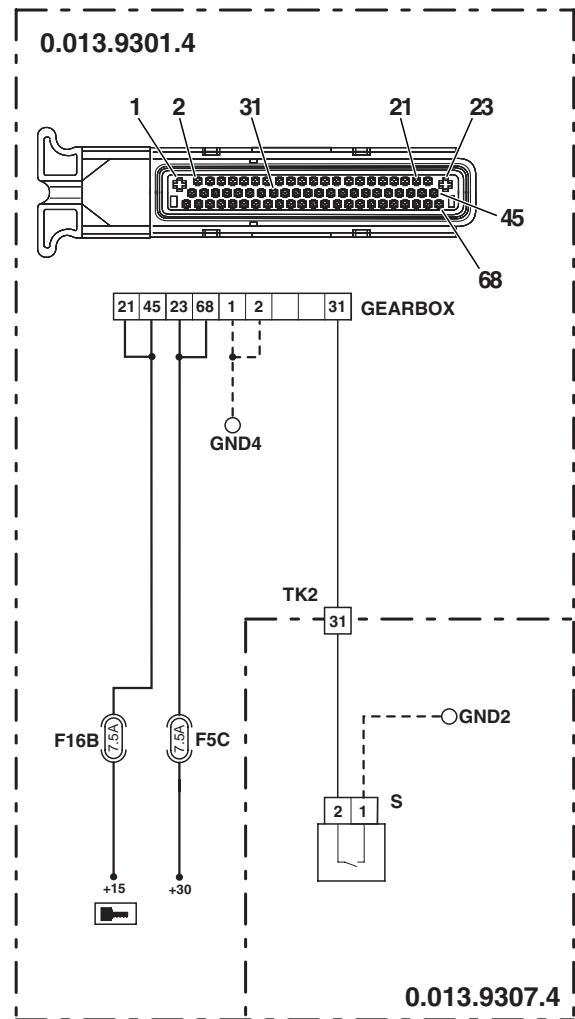
The control unit detects a discrepancy between the speed readings at the main clutch input and the transmission output and the status of the start enable sensor (which signals that the transmission is in neutral or that a mechanical gear is engaged)

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 connector "S" of the start enable switch and the "GEARBOX" lift control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin 30 of relay "RL9" and to engine earth, and measure the resistance to verify the continuity of the circuit with the mechanical shift in neutral (meter reading 0 Ohm) and a break in continuity when a gear is engaged (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.



D0030880



← 18

← 18-System pressure
TC-logical fault

DESCRIPTION

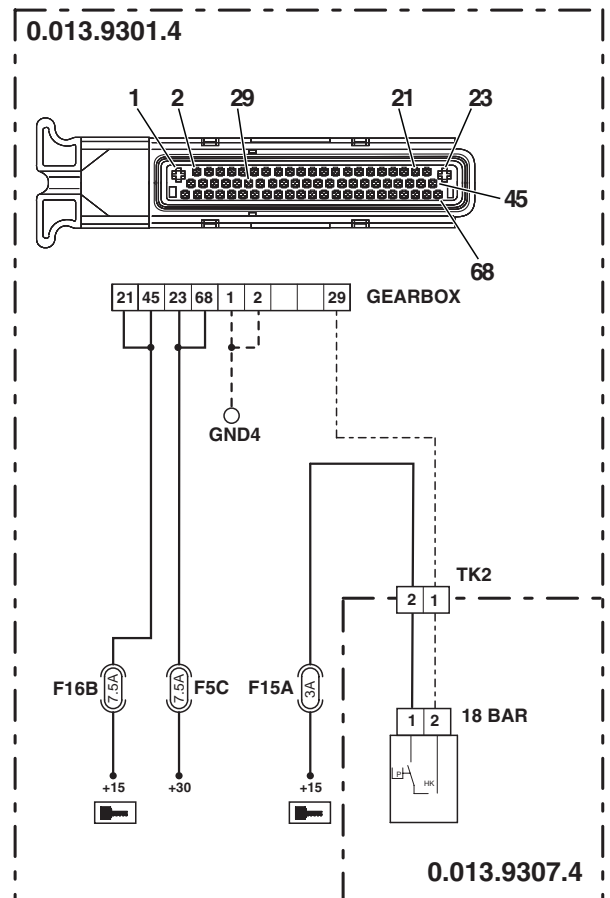
The control unit detects a discrepancy between the oil pressure reading and the operating status of the transmission

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 connectors "18BAR" of the transmission oil pressure sensor and on the "GEARBOX" lift control unit are not loose or corroded.
- Check that the sensor is functioning correctly (for technical details, see group 40)
- With the starter key in the "I" (ON) position, check that the power input to the transmission oil pressure sensor is correct (12V measured between pin 1 (positive) of the connector "18BAR" and transmission earth).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of the connector "18BAR" and to pin 29 of the connector "GEARBOX" and test the resistance to check for 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 control unit must be renewed.



D0030890



← 21

← 21-Limit speed exceeded
TC-Warnings

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-Warnings

DESCRIPTION

The control unit detects that the transmission oil temperature exceeds the maximum value permitted when the tractor is working 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-Warnings

DESCRIPTION

The control unit detects that the transmission oil temperature exceeds the maximum value permitted when the tractor is working 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

← Main clutch
Overspeed

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-Input speed
TC-Warnings

DESCRIPTION

The control unit detects a discrepancy between the engine speed value acquired via CANBUS and that read by the nLse speed 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 another alarm regarding the nLse sensor is active (alarms B0, B1 and B2), check the cause as described in the relative section before proceeding with the following operations.
- 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 menu "3.1.2 INPUT FREQ" that the engine speed signal is being transmitted correctly over the CANBUS.
- 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.



← 36



← 36-EV gear 2
TC-Output open circuit

DESCRIPTION

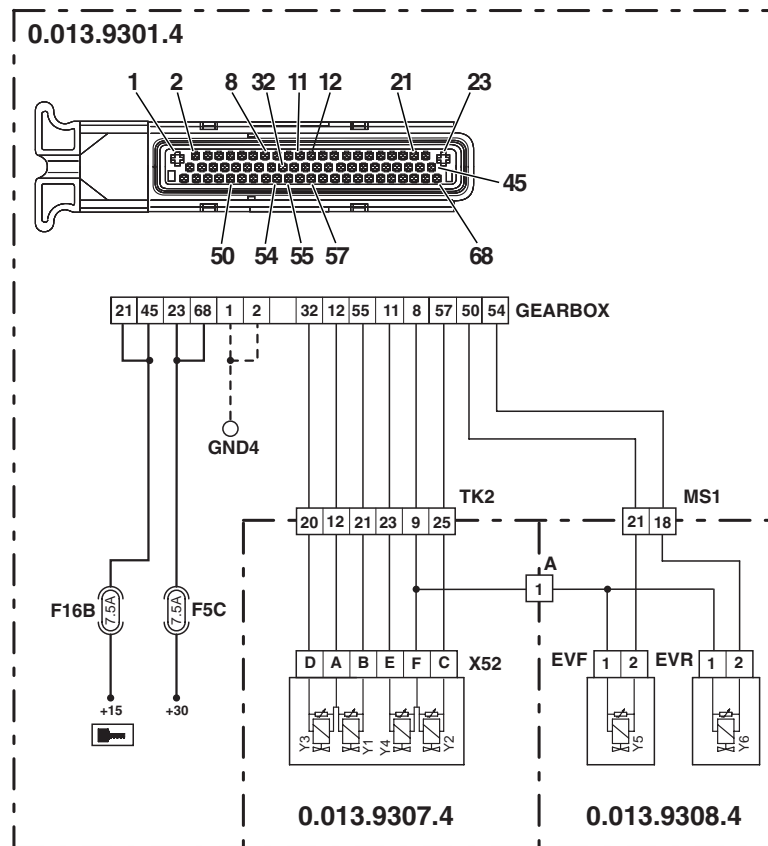
The control unit detects that the solenoid Y4 is faulty or not connected

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on the connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin E and pin F of connector "X52" on the transmission, and measure 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 E of the connector "X52" and to pin 11 of the connector "GEARBOX" and test 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.



D0030900



← 37



← 37-EV gear 2
TC-Out shorted ground

DESCRIPTION

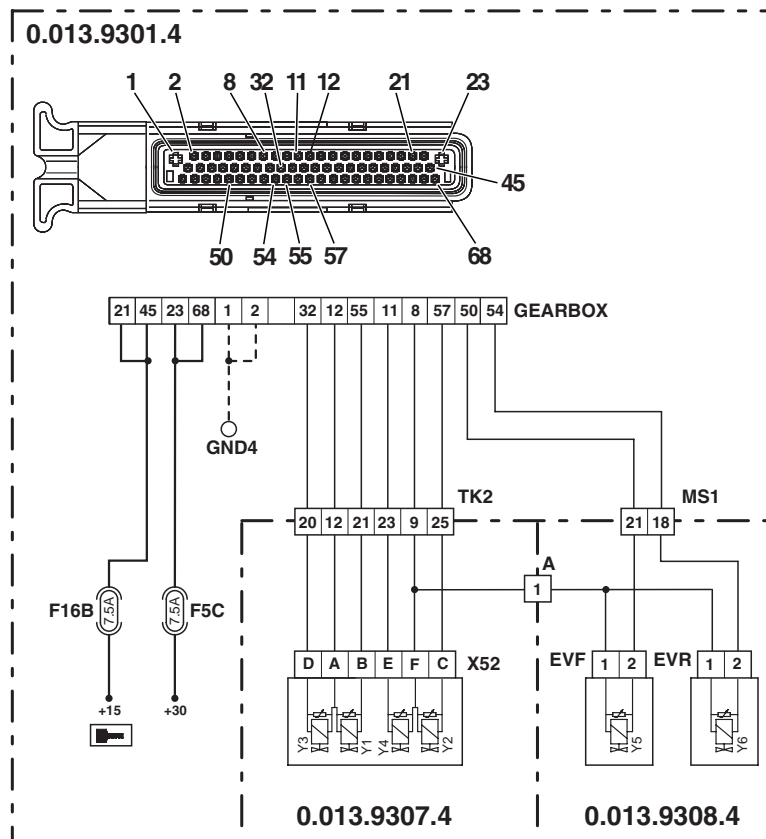
The control unit detects that the control line of solenoid Y4 is shorting to earth

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on the connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin E and to pin F of the connector "X52" on the transmission, and test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin E of the connector "X52" and to the earth on the transmission and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin E of the connector "X52" on the transmission and to the earth on the transmission and test the resistance to check for shorting to earth (test 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.





← 38



← 38-EV gear 2
TC-Out shorted battery

DESCRIPTION

The control unit detects that the control line of solenoid Y4 is shorting to a positive feed

ECU RESPONSE

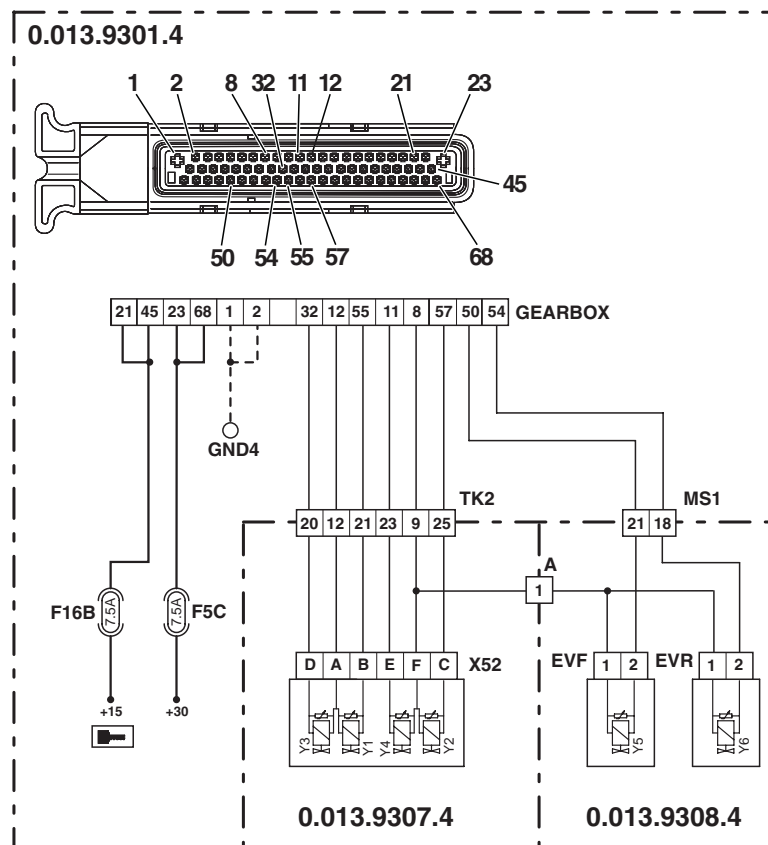
The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

NOTE

This alarm could be displayed as a result of alarm 90 being activated.

CHECK

- Check that the contacts on the connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, connect a test meter to pin C of the connector "X52" 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 control unit must be renewed.



D0030900



← 39



← 39-EV gear 1
TC-Output open circuit

DESCRIPTION

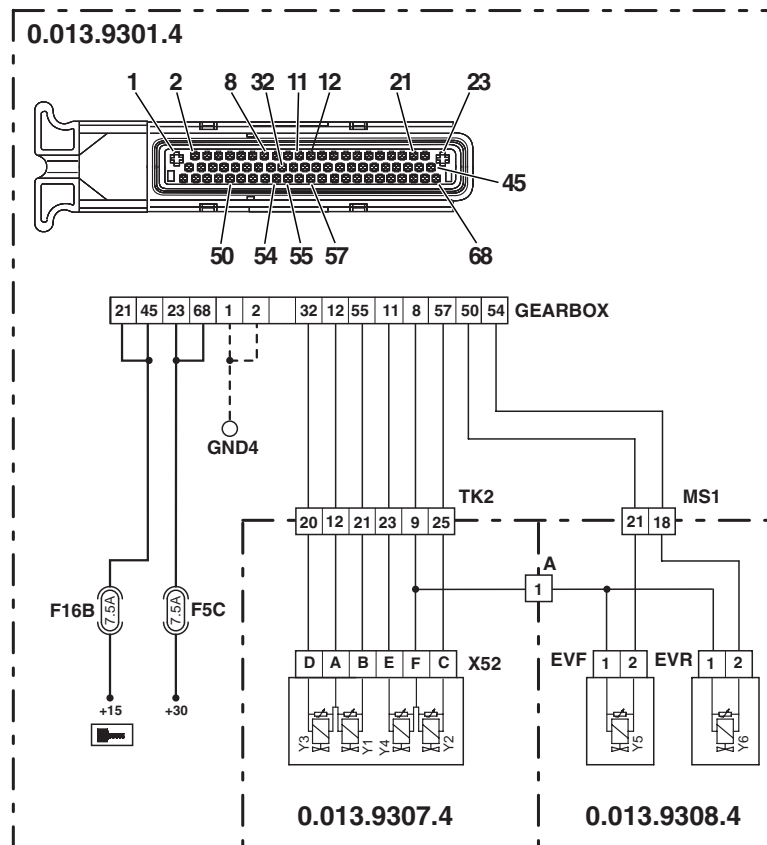
The control unit detects that the solenoid Y2 is faulty or not connected

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on the connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin C and pin F of connector "X52" on the transmission, and measure 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 C of the connector "X52" and to pin 57 of the connector "GEARBOX" and test 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.



D0030900



← 40



← 40-EV gear 1
TC-Out shorted ground

DESCRIPTION

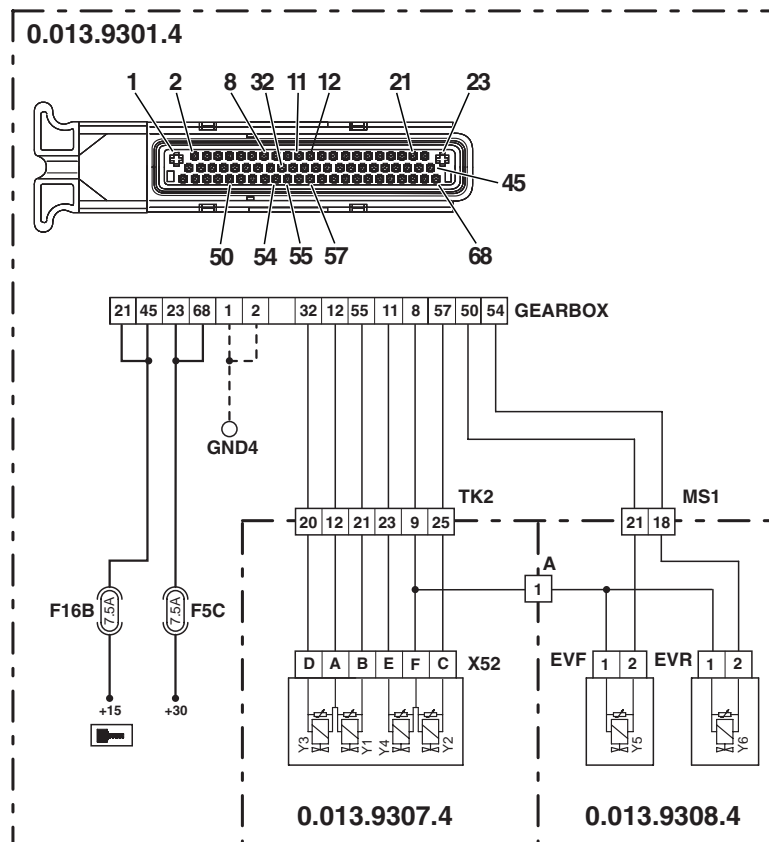
The control unit detects that the control line of solenoid Y2 is shorting to earth

ECU RESPONSE

The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

CHECK

- Check that the contacts on the connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin C and pin F of connector "X52" on the transmission, and measure the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin C of the connector "X52" and to the transmission earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin C of the connector "X52" on the transmission and to the transmission earth and test the resistance to check for shorting to earth (test 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.



D0030900



← 41



← 41-EV gear 1
TC-Out shorted battery

DESCRIPTION

The control unit detects that the control line of solenoid Y2 is shorting to a positive feed

ECU RESPONSE

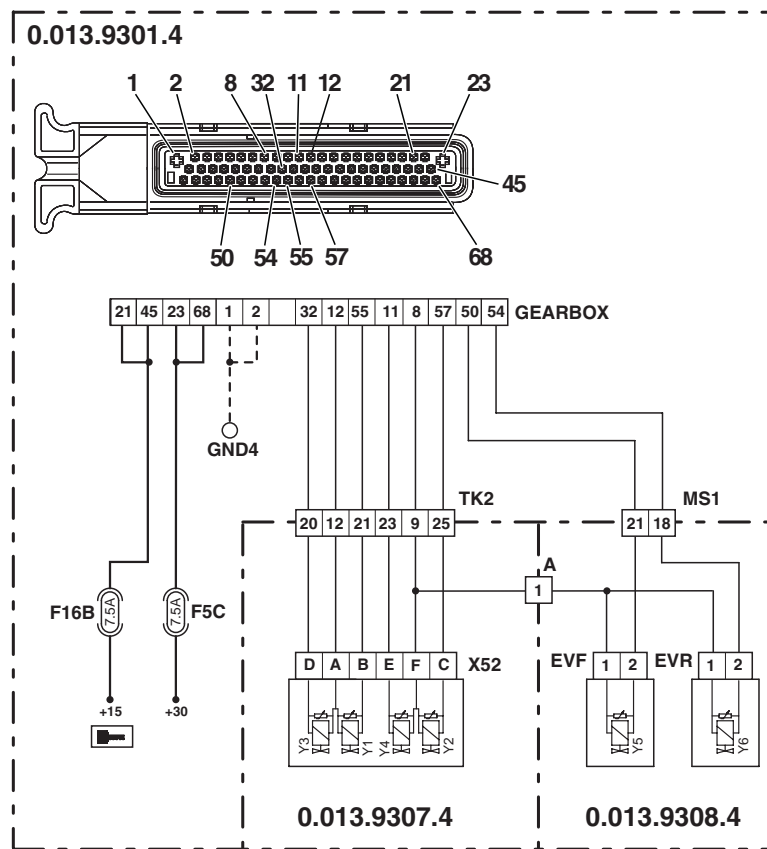
The control unit limits operation to "SUBSTITUTE STRATEGY" mode.

NOTE

This alarm could be displayed as a result of alarm 90 being activated.

CHECK

- Check that the contacts on the connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, connect a test meter to pin C of the connector "X52" 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 control unit must be renewed.



D0030900



← 47



← 47-nAB speed sensor
TC-Input short battery

DESCRIPTION

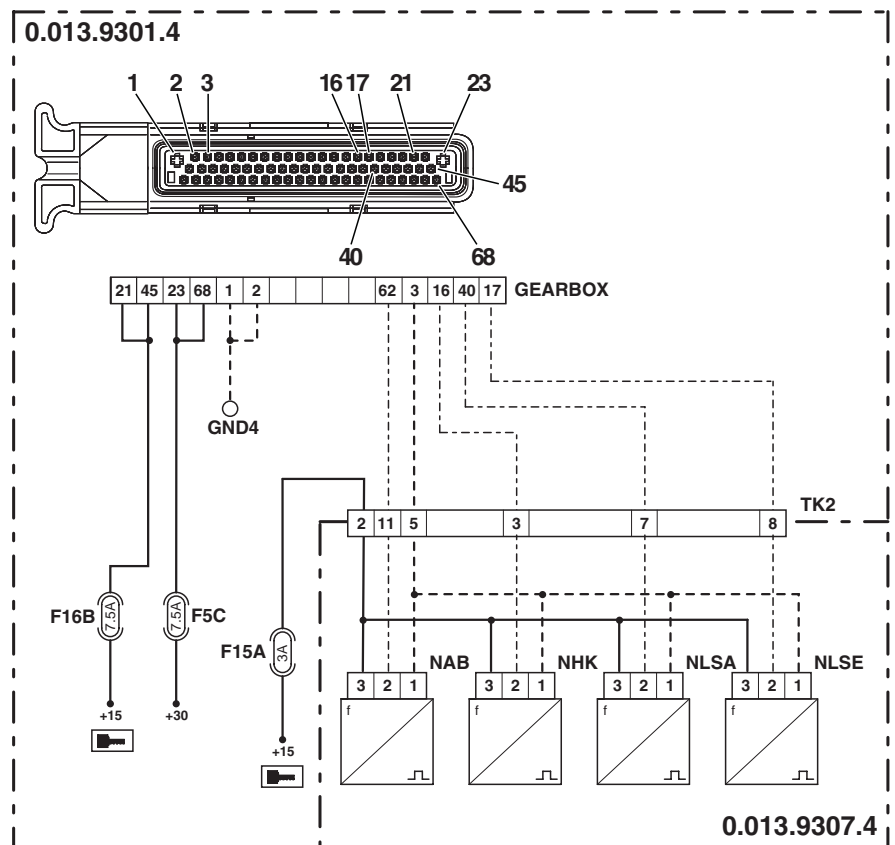
The control unit detects that the speed sensor nAb is disconnected or shorting to a positive feed.

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 connector "NAB" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the transmission output shaft speed sensor is correct (12V measured between pin 3 (positive) of the connector "NAB" and the transmission earth).
- With the starter key in the "I" (ON) position and connector "GEARBOX" unplugged, connect a test meter to pin 1 of connector "NAB" and to transmission 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 2 of connector "NAB" and to pin 62 of connector "GEARBOX", and measure the resistance to verify the continuity of the circuit (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 verify the continuity of the circuit (meter reading: 0 Ohm).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← 48



← 48-nAB speed sensor
TC-Input short ground

DESCRIPTION

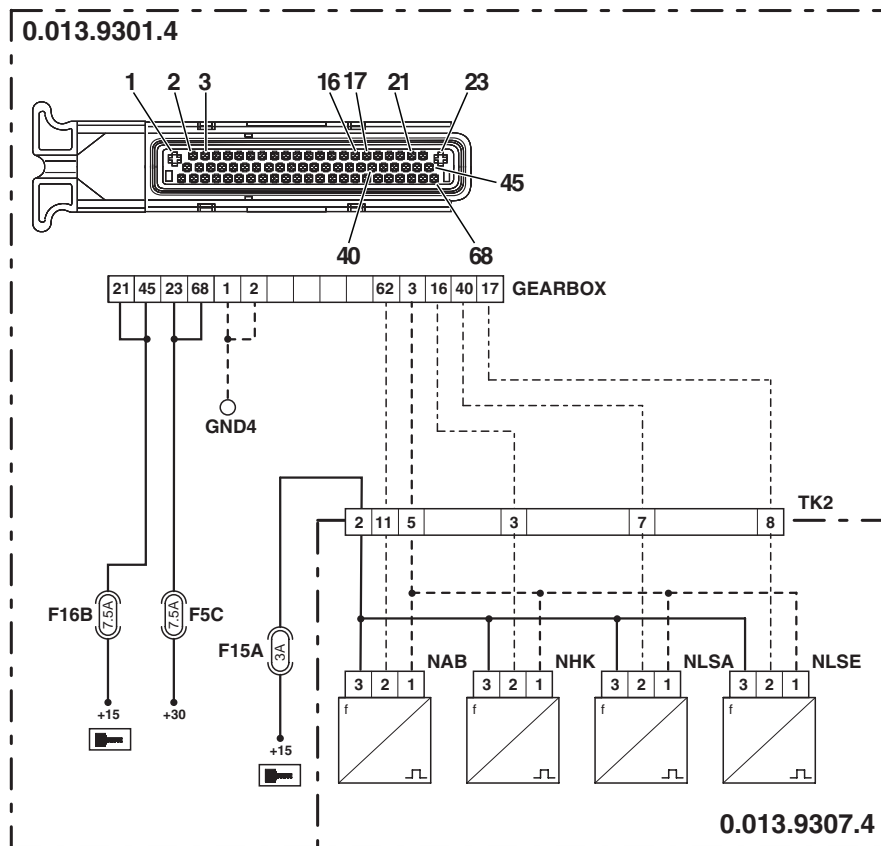
The control unit detects that the speed sensor nAb is shorting to earth

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 connector "NAB" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 verify that there are no short circuits to earth (meter reading: infinity).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← 4B



← 4B-nAB speed sensor
TC-logical fault

DESCRIPTION

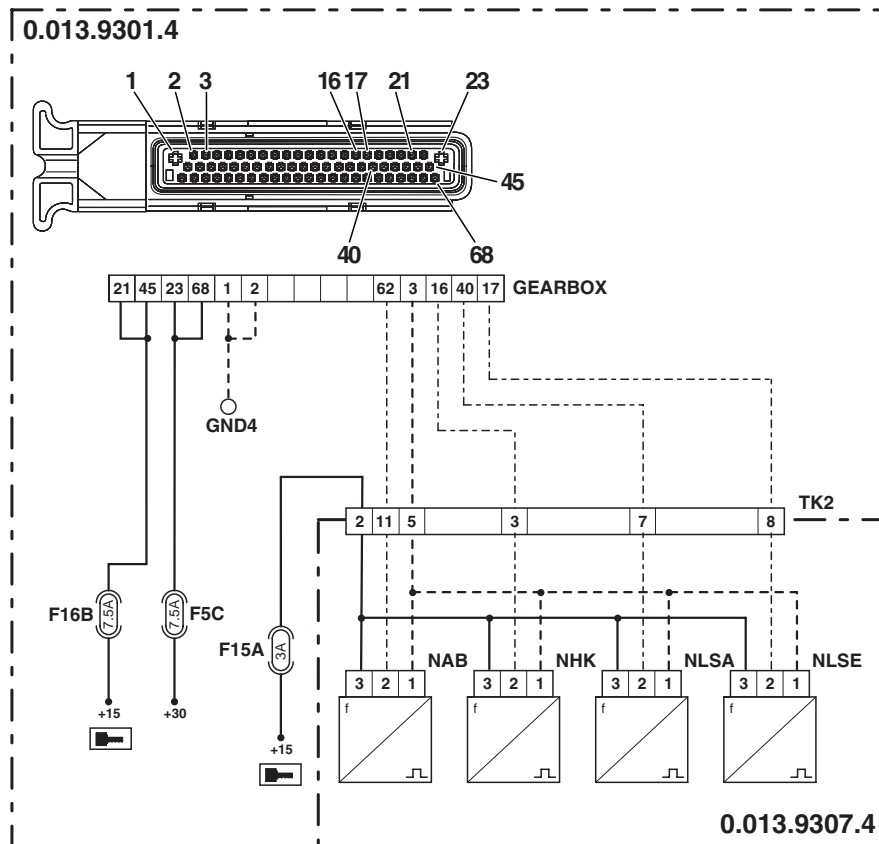
The control unit detects anomalous information coming from the speed sensor nAb

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 connector "NAB" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Check that the sensor is functioning correctly (for technical details see Group 40).
- With the starter key in the "I" (ON) position, check that the power input to the transmission output shaft speed sensor is correct (12V measured between pin 3 (positive) of the connector "NAB" and the transmission earth).
- 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 verify the continuity of the circuit (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.



D0030910



← 50



← 50-nHK speed sensor
TC-Input short battery

DESCRIPTION

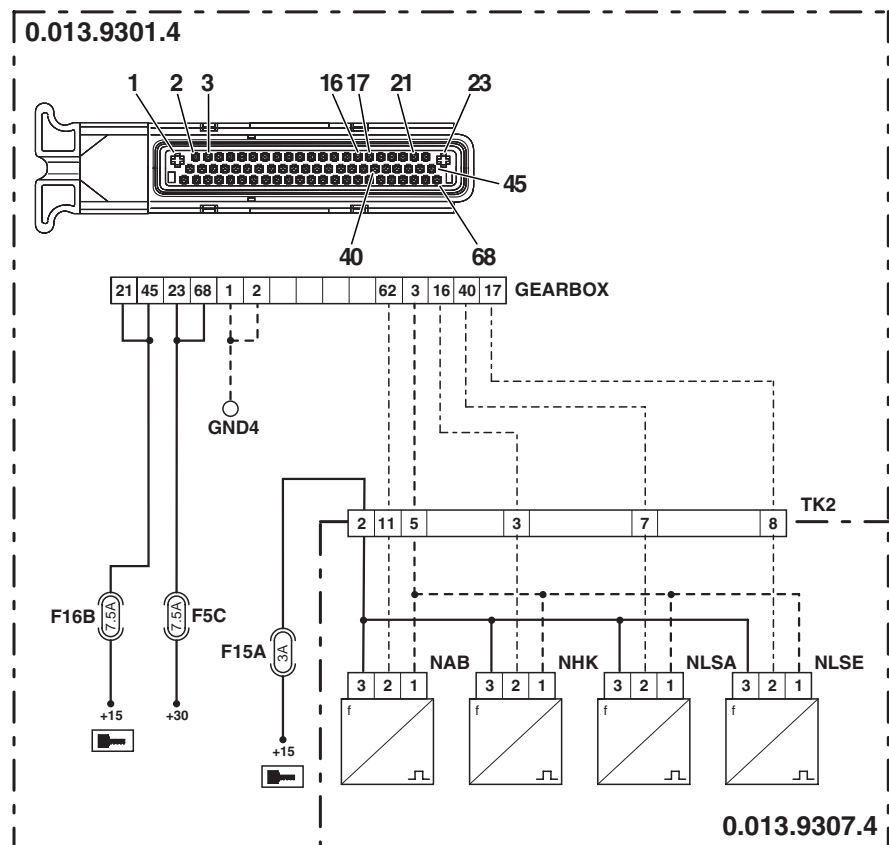
The control unit detects that the speed sensor nHK is disconnected or shorting to a positive feed

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 connector "NHK" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the transmission output speed sensor is correct (12V measured between pin 3 (positive) of the connector "NHK" and the transmission earth).
- With the starter key in the "I" (ON) position and connector “GEARBOX” unplugged, connect a test meter to pin 1 of connector “NHK” and to transmission 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 2 of connector “NHK” and to pin 16 of connector “GEARBOX”, and measure the resistance to verify the continuity of the circuit (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 verify the continuity of the circuit (meter reading: 0 Ohm).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← 51



← 50-nHK speed sensor
TC-Input short ground

DESCRIPTION

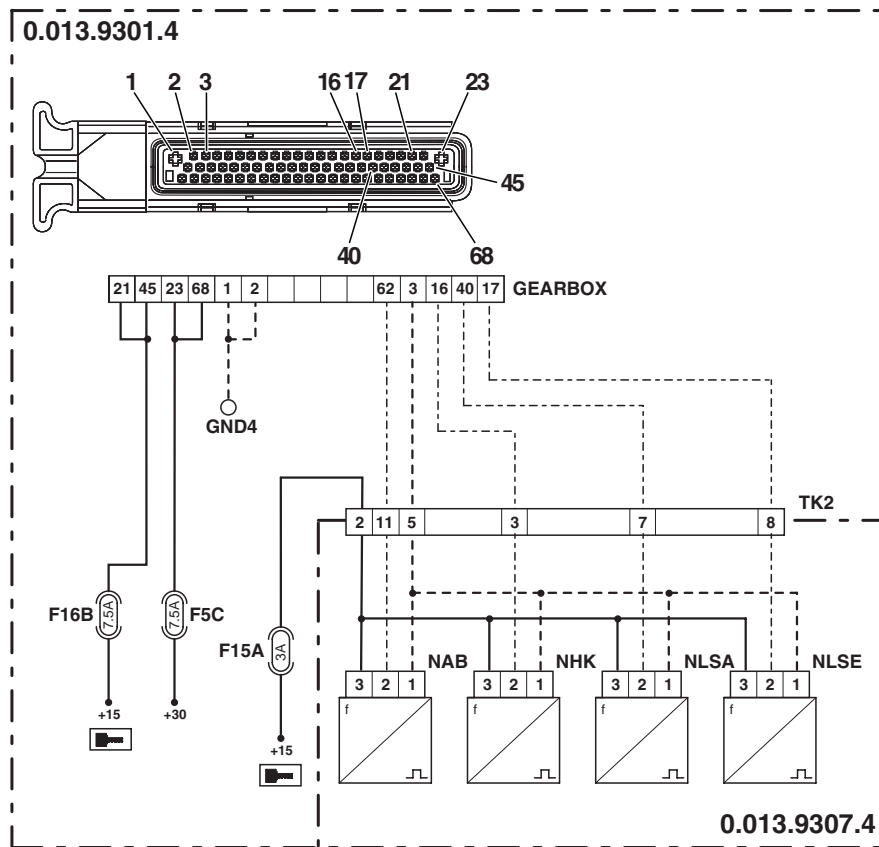
The control unit detects that the speed sensor nHk is shorting to earth

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 connector "NHK" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 verify that there are no short circuits to earth (meter reading: infinity).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← 52



← 52-nHK speed sensor
TC-logical fault

DESCRIPTION

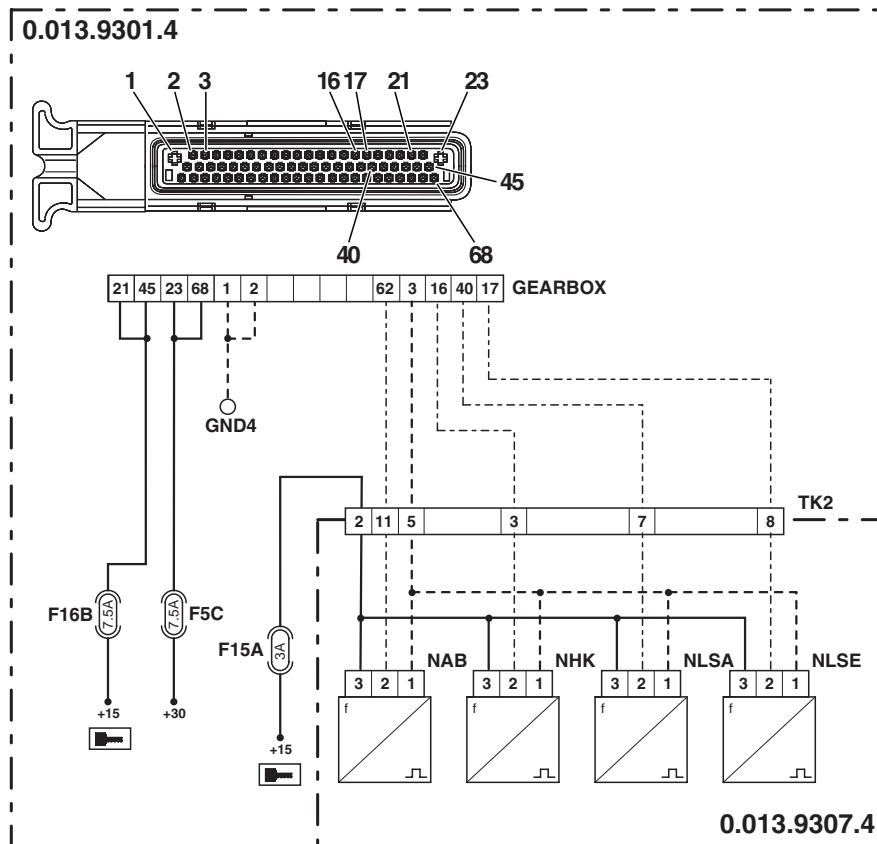
The control unit detects anomalous information coming from the speed sensor nHk

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 connector "NHK" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Check that the sensor is functioning correctly (for technical details see Group 40).
- With the starter key in the "I" (ON) position, check that the power input to the transmission output speed sensor is correct (12V measured between pin 3 (positive) of the connector "NHK" and the transmission earth).
- 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 verify the continuity of the circuit (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.



D0030910



← 53



← 53-nLSA speed sensor
TC-Input short battery

DESCRIPTION

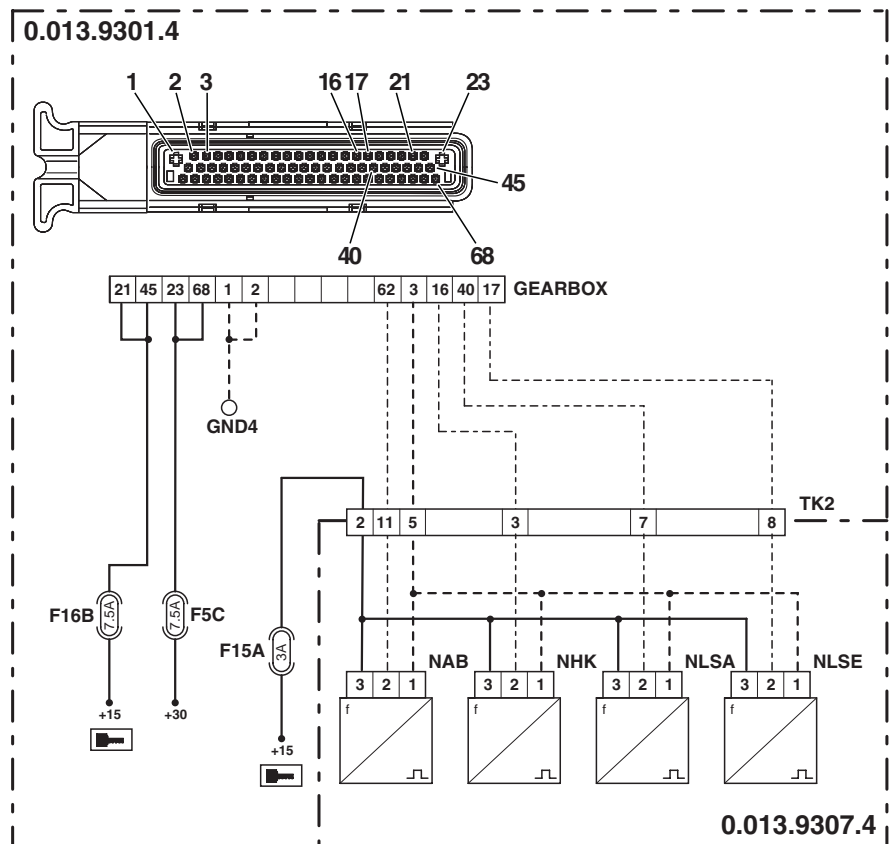
The control unit detects that the speed sensor nLSa is disconnected or shorting to a positive feed

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 connector "NLSA" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the transmission output speed sensor is correct (12V measured between pin 3 (positive) of the connector "NLSA" and the transmission earth).
- With the starter key in the "I" (ON) position and connector "GEARBOX" unplugged, connect a test meter to pin 1 of connector "NLSA" and to transmission 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 2 of connector "NLSA" and to pin 40 of connector "GEARBOX", and measure the resistance to verify the continuity of the circuit (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 verify the continuity of the circuit (meter reading: 0 Ohm).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← 54



← 54-nLSA speed sensor
TC-Input short ground

DESCRIPTION

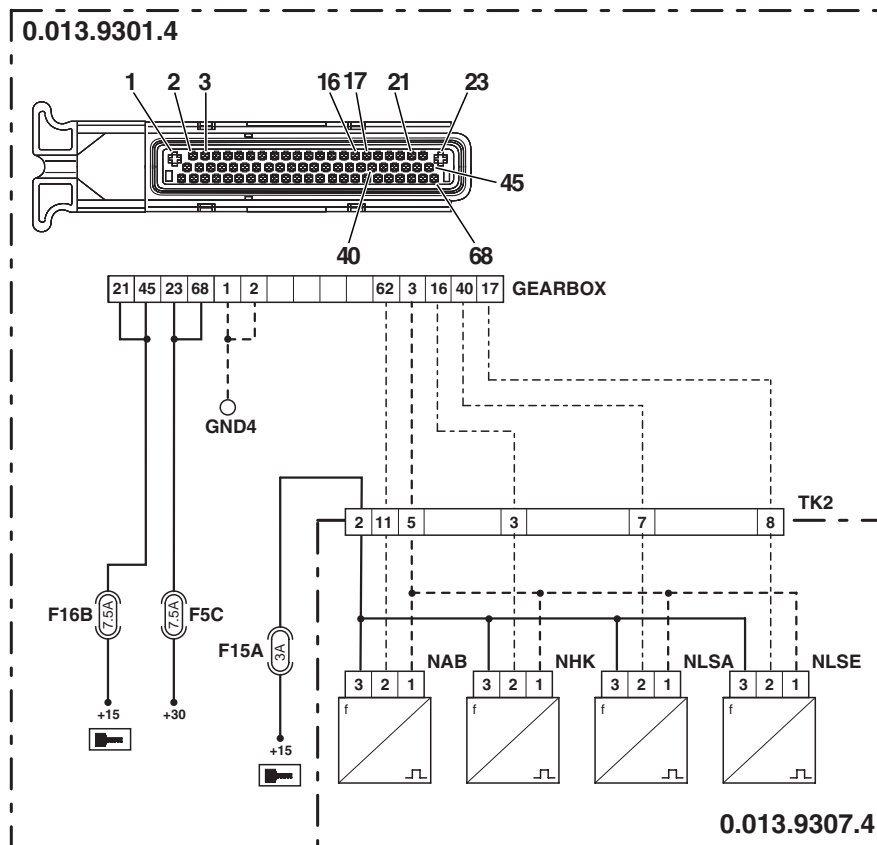
The control unit detects that the speed sensor nLSa is shorting to earth

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 connector "NLSA" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 verify that there are no short circuits to earth (meter reading: infinity).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← 55



← 55-nLSA speed sensor
TC-logical fault

DESCRIPTION

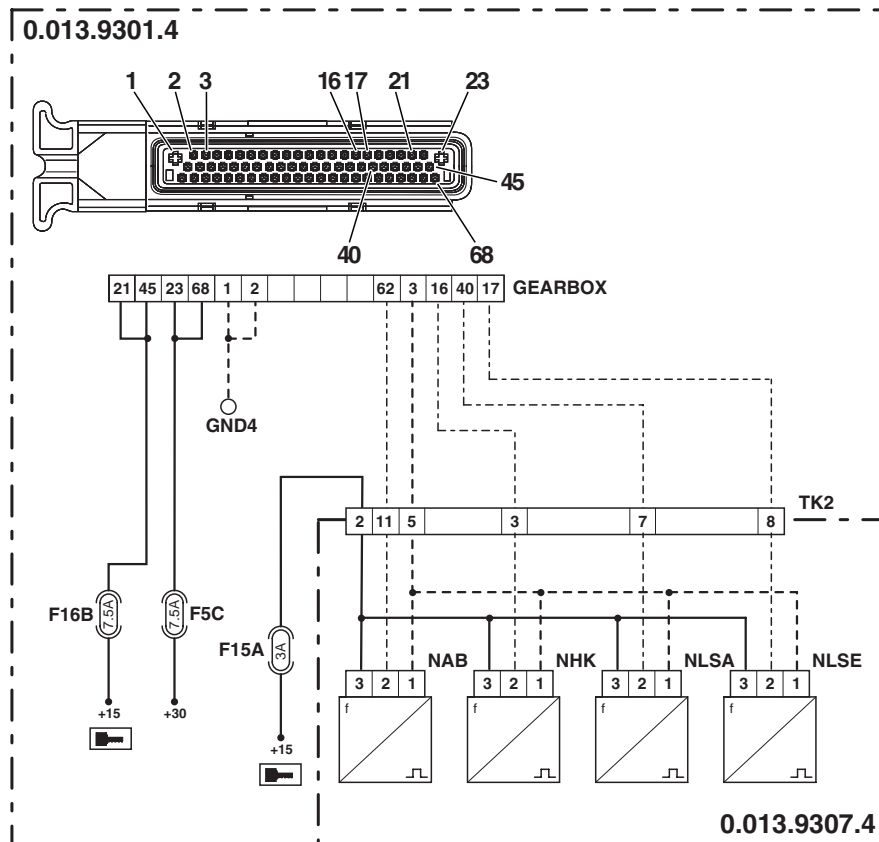
The control unit detects anomalous information coming from the speed sensor nLSa

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 connector "NLSA" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Check that the sensor is functioning correctly (for technical details see Group 40).
- With the starter key in the "I" (ON) position, check that the power input to the transmission output speed sensor is correct (12V measured between pin 3 (positive) of the connector "NLSA" and the transmission earth).
- 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 verify the continuity of the circuit (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.



D0030910



← 5F

← 5F-FRRS sensor
TC-Warnings

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-Warnings

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-FRRS sensor
TC-Input short battery

DESCRIPTION

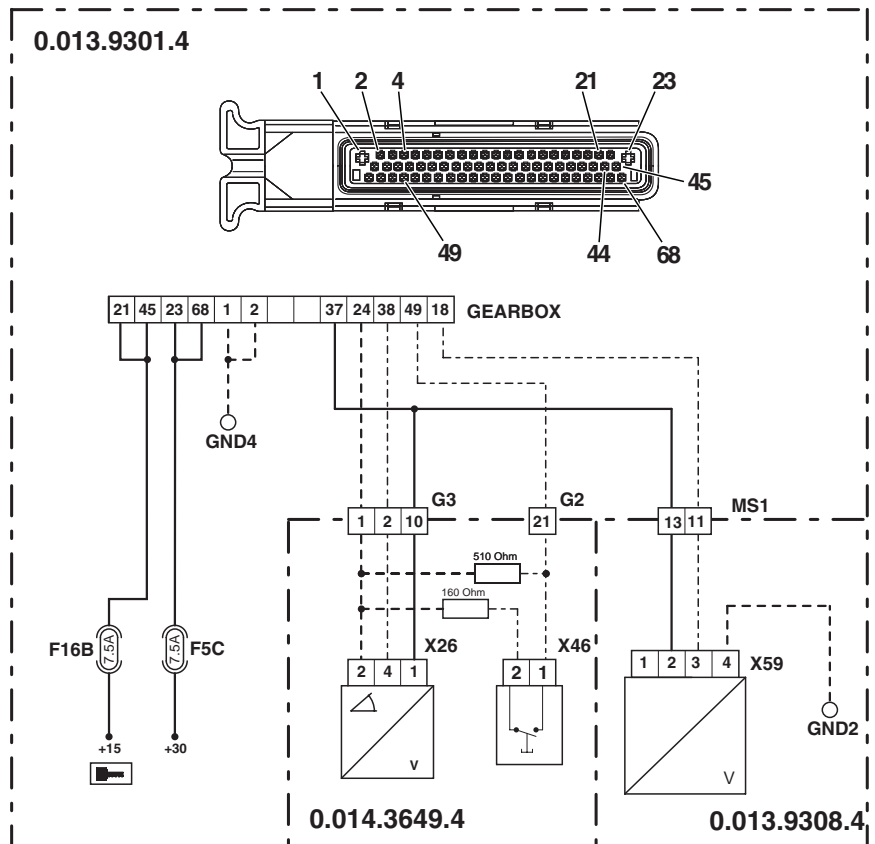
The control unit detects that the field/road position sensor is shorting to a positive feed (+5V).

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 connector "X59" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Check that the sensor is functioning correctly.
- With the starter key in the "I" (ON) position, check that the power input to the road/field position sensor is correct (5V measured between pin 2 (positive) and pin 4 (negative) of the connector "X59").
- With the starter key in the "I" (ON) position, connect a test meter to pin 3 and to pin 4 of the connector "X59" and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 and to pin 3 of the connector "X59" and test the resistance to check that they are not shorting to each other (test 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.



D00.30920



← 62



← 62-FRRS sensor
TC-Input short battery

DESCRIPTION

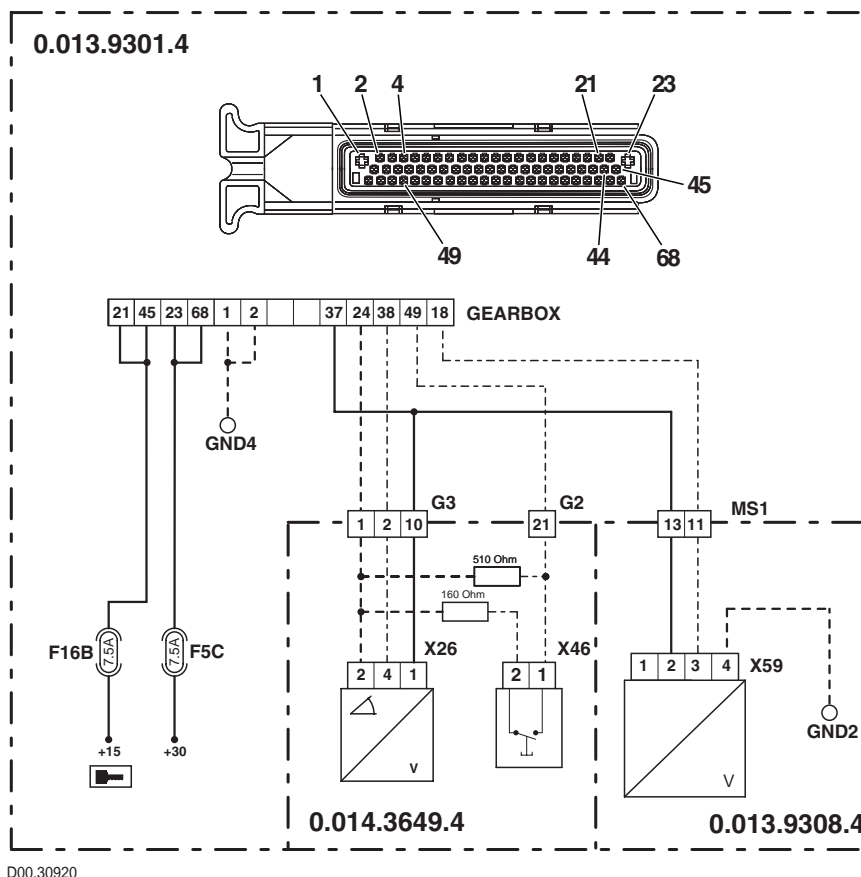
The control unit detects that the field/road position sensor is shorting to a positive feed (+12V).

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 connector "X59" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the road/field position sensor is correct (5V measured between pin 2 (positive) and pin 4 (negative) of the connector "X59").
- With the starter key in the "I" (ON) position, connect a test meter to pin 3 and to pin 4 of the connector "X59" 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 control unit must be renewed.



D00.30920



← 63



← 63-FRRS sensor
TC-Input short ground

DESCRIPTION

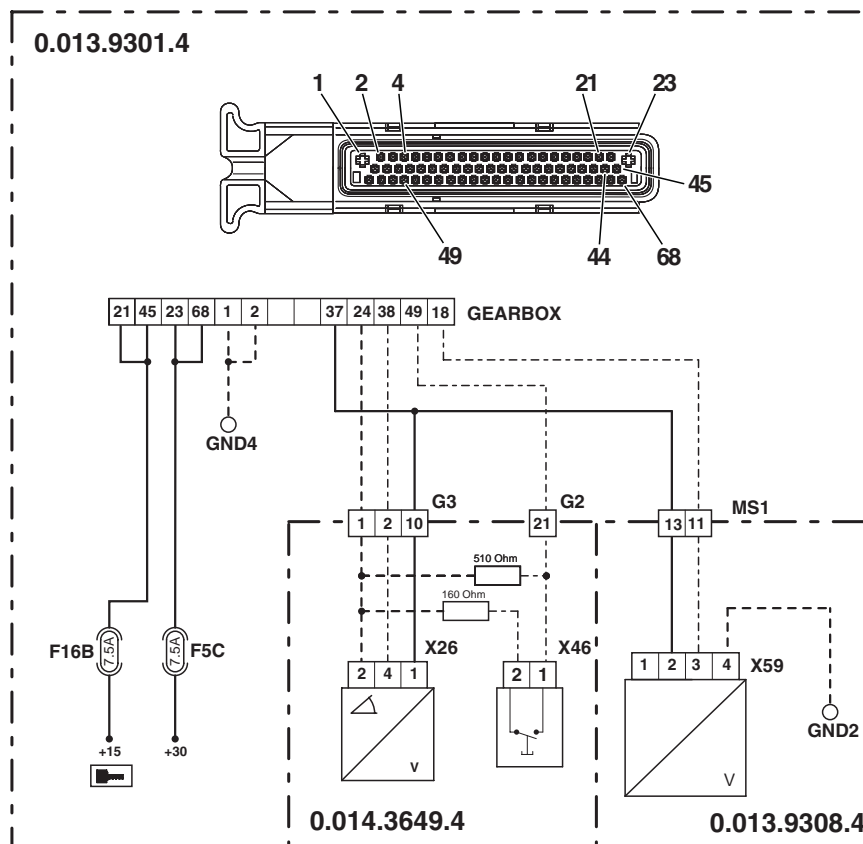
The control unit detects that the field/road position sensor is disconnected or shorting to earth.

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 connector "X59" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the road/field position sensor is correct (5V measured between pin 2 (positive) and pin 4 (negative) of the connector "X59").
- With the starter key in the "O" (OFF) position, connect a test meter to pin 3 and to pin 4 of the connector "X59" and test the resistance to check that they are not shorting to each other (test meter reading: infinity).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 3 of the connector "X59" and pin 18 of the connector "GEARBOX" and test 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.



D00.30920



← 64



← 64-Clutch Pedal Sensor
TC-logical fault

DESCRIPTION

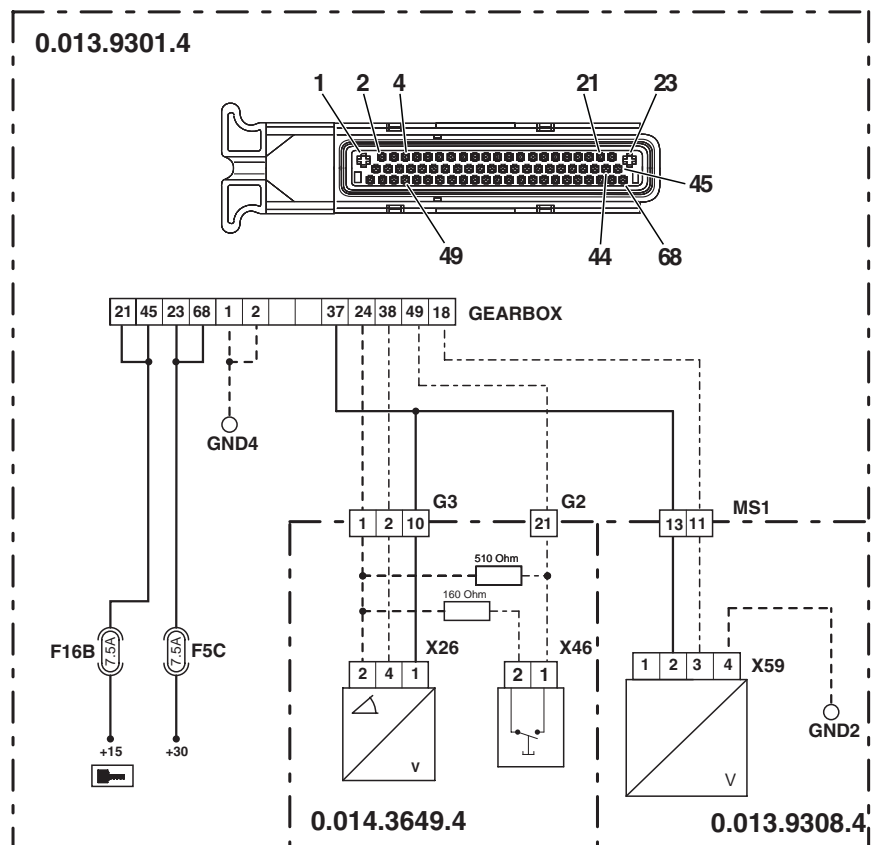
The control detects a conflict in the information received from the clutch pedal position sensor and clutch pedal depressed sensor, regarding the position of the clutch pedal

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 connector "X26" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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.
- Verify the 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).
- Verify the 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.



D00.30920



← 65



← 65-Clutch Pedal Sensor
TC-Input short ground

DESCRIPTION

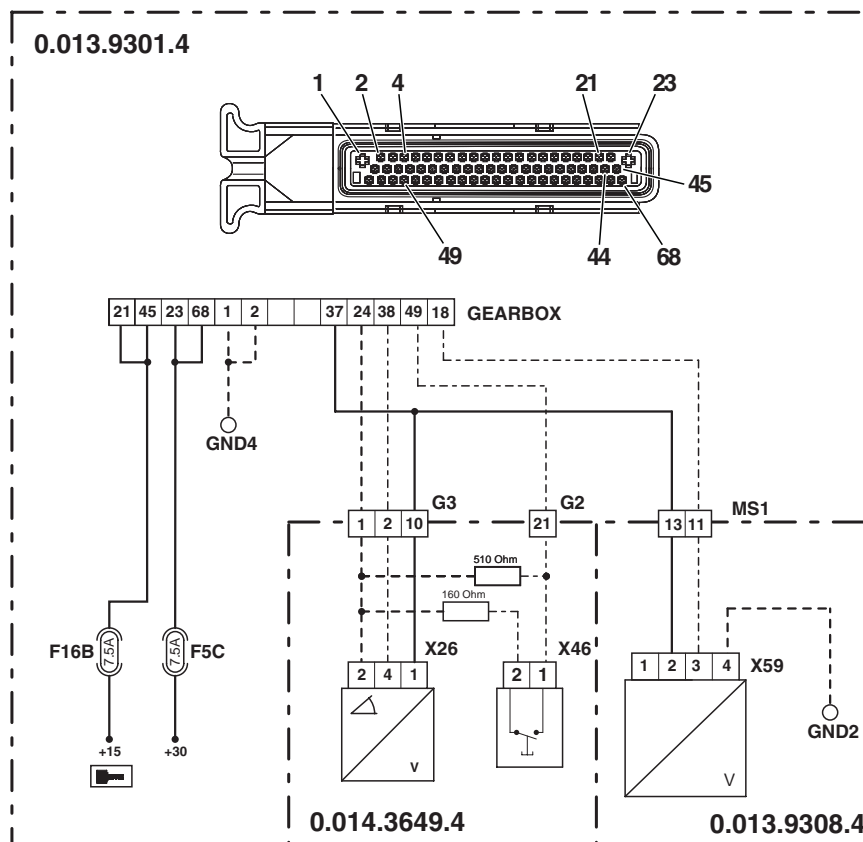
The control unit detects that the clutch pedal sensor is disconnected or shorting to earth

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 connector "X26" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the clutch pedal position sensor is correct (5V measured between pin 1 (positive) and pin 2 (negative) of connector "X26").
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected from the control unit, connect a test meter to pin 2 of the connector "X26" and to the transmission earth and check that there is no voltage (test meter reading 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 4 of the connector "X26" and to pin 38 of the connector "GEARBOX" and test the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Check that the sensor is functioning correctly (for technical details see Group 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.





← 66



← 66-Clutch Pedal Sensor
TC-Input short battery

DESCRIPTION

The control unit detects that the clutch pedal position sensor is shorting to a positive feed.

ECU RESPONSE

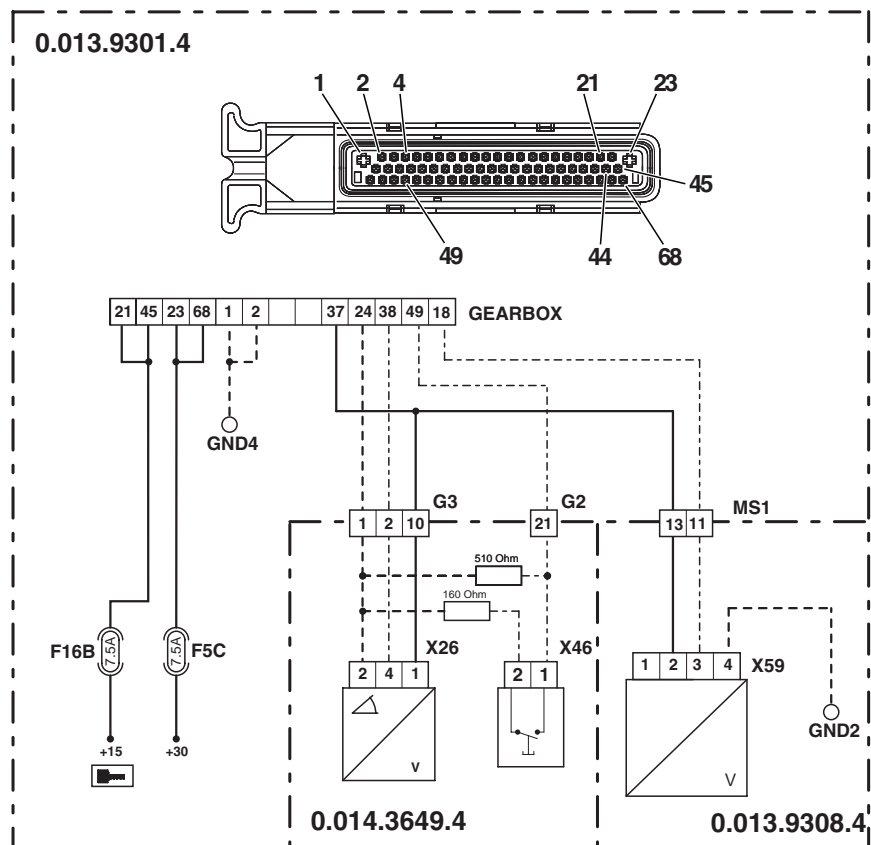
The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE

This alarm could be displayed as a result of alarm 12 or 68 being activated.

CHECK

- Check that the contacts on the connector "X26" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the clutch pedal position sensor is correct (5V measured between pin 1 (positive) and pin 2 (negative) of connector "X34").
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "X26" and to the cab earth and check that there is no voltage (test meter reading 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 4 of the connector "X26" and to pin 38 of the connector "GEARBOX" and test the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D00.30920



← 67



← 67-AU1 Sensor supply
TC-Out shorted ground

DESCRIPTION

The control unit detects that the feed to the clutch pedal position sensor is below correct value

ECU RESPONSE

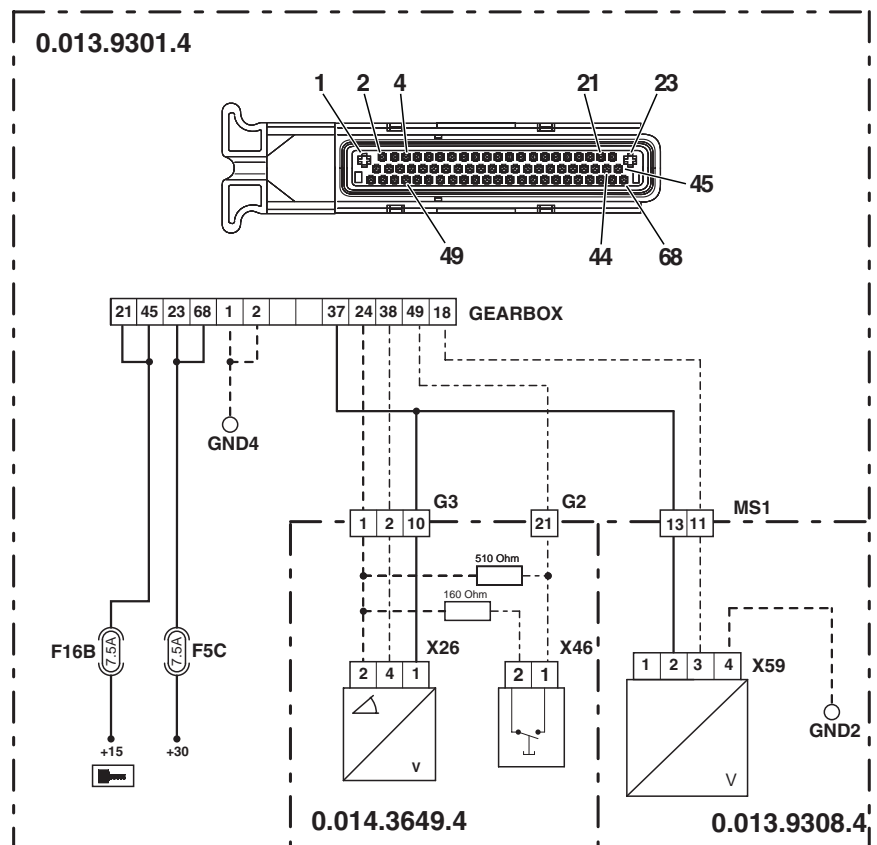
The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE

This alarm could be displayed as a result of alarm 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 connectors "X26" of the clutch pedal position sensor and "GEARTEMP" of the transmission oil temperature sensor and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the clutch pedal position sensor is correct (5V measured between pin 1 (positive) and pin 2 (negative) of connector "X26").
- Check that the sensor is functioning correctly (for technical details see Group 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.



D00.30920



← 68



← 68-AU1 Sensor supply
TC-Out shorted battery

DESCRIPTION

The control unit detects that the feed to the clutch pedal position sensor is above correct value

ECU RESPONSE

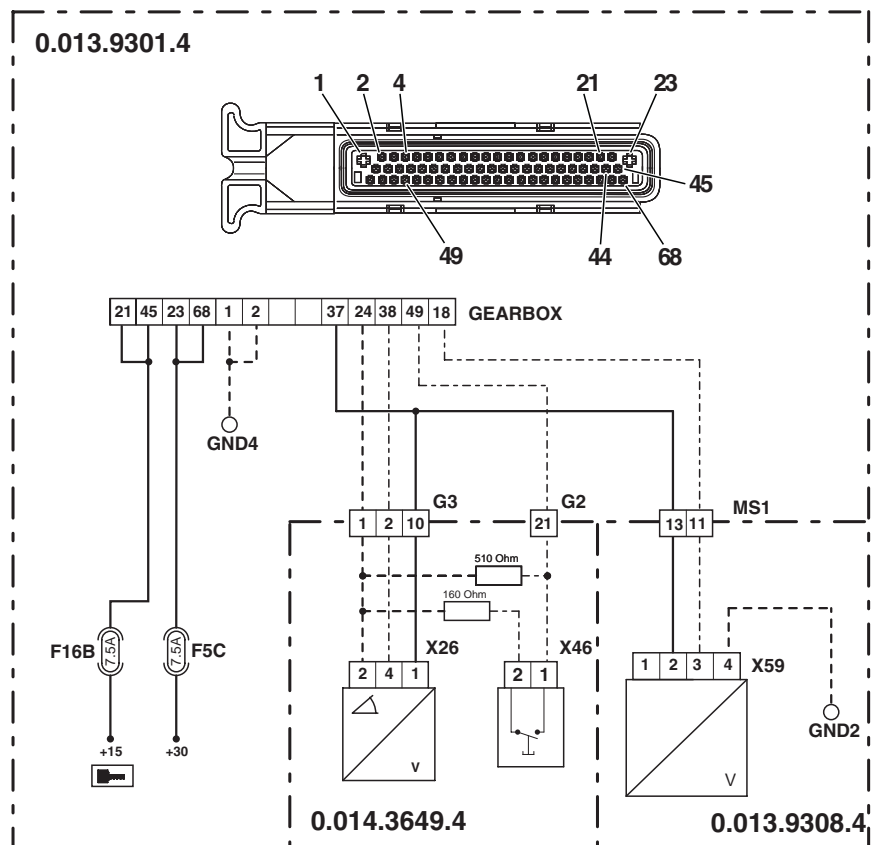
The control unit limits operation to “EMERGENCY DRIVE” mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

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 connectors "X26" of the clutch pedal position sensor and "GEARTEMP" of the transmission oil temperature sensor and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "I" (ON) position, check that the power input to the clutch pedal position sensor is correct (5V measured between pin 1 (positive) and pin 2 (negative) of connector "X26").
- Check that the sensor is functioning correctly (for technical details see Group 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.



D00.30920



← 69

← 69-Clutch Pedal Sensor
TC-logical fault

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 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-E2P clutch pedal
TC-Warnings

DESCRIPTION

The control unit detects that the main clutch calibration values incorrectly saved due to a fault in the EEPROM memory blocks or that the clutch pedal has not yet 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 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-Comfort clutch
TC-Input short ground

DESCRIPTION

The control unit detects that the “Comfort Clutch” pushbutton is either disconnected or shorting to earth

NOTE

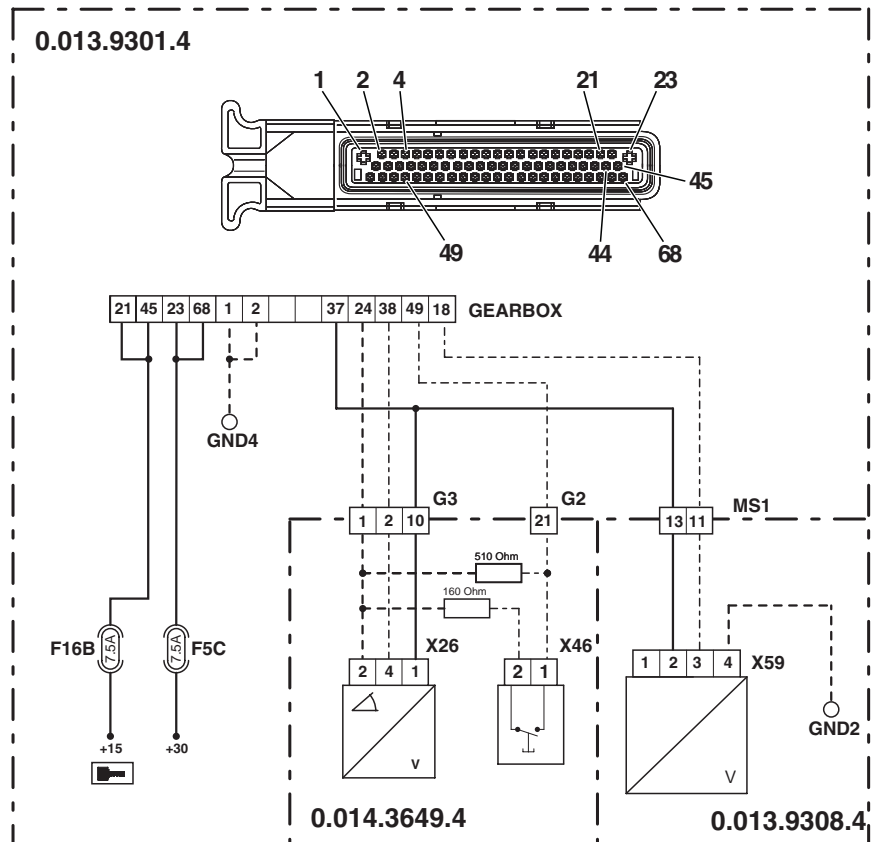
This alarm could be displayed as a result of alarm 12 being activated.

ECU RESPONSE

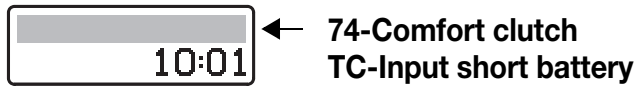
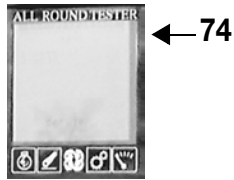
The control unit limits operation to "LIMP-HOME-LS" mode, the transmission shifts to neutral and a continuous beep sounds.

CHECK

- Check that the contacts on the connector "X46" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 connector “GEARBOX”, and measure the resistance to verify the continuity of the circuit (meter reading: 160 Ohm).
- With the starter key in the "O" (OFF) position, the connector "GEARBOX" disconnected and the connector "X46" connected, connect a test meter to pin 24 and to pin 49 of the connector "GEARBOX" and test the resistance to check that:
 - with the "comfort clutch" button released a reading of 510 Ohm is obtained;
 - with the "comfort clutch" button pressed, the resistance is approx. 122 Ohm.
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected from the control unit, connect a test meter to pin 1 of the connector "X46" and to the earth on the cab and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected from the control unit, connect a test meter to pin 2 of the connector "X46" and to the earth on the cab and test the resistance to check for shorting to earth (test 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.



D00.30920



DESCRIPTION

The control unit detects that the “Comfort Clutch” pushbutton is shorting to a positive feed

NOTE

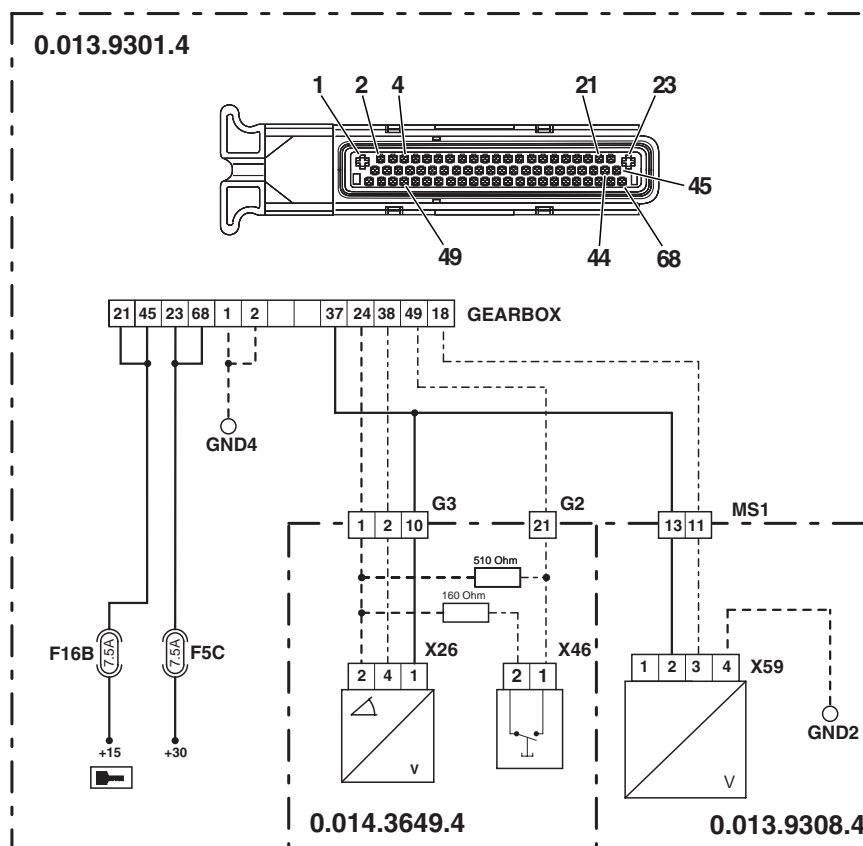
This alarm could be displayed as a result of alarm 12 being activated.

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 connector "X46" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 "X46" 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 "X46" 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 control unit must be renewed.





← 76



76-EV proportional
TC-Output open circuit

DESCRIPTION

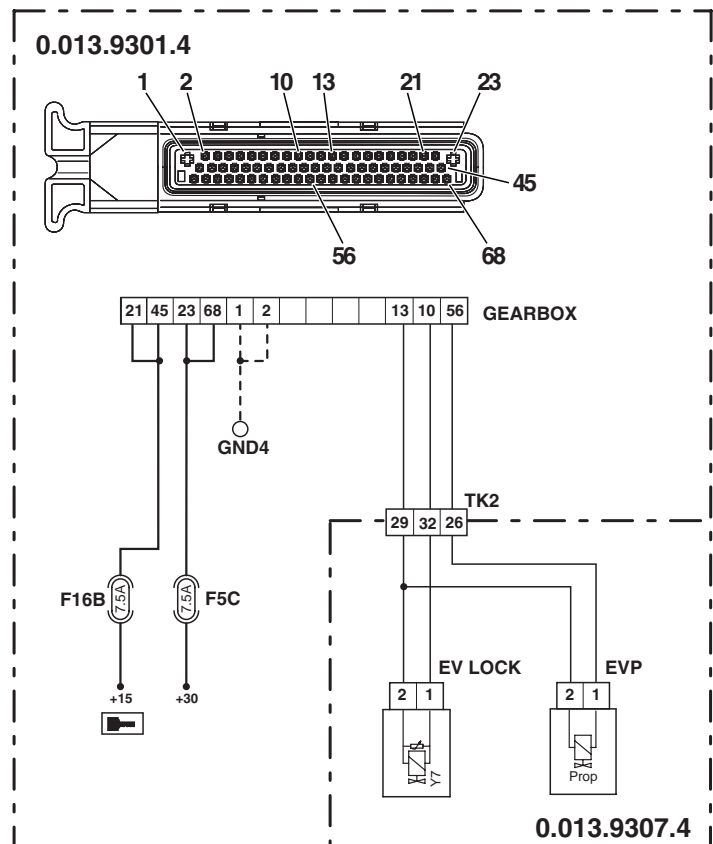
The control unit detects that the main clutch proportional control solenoid is disconnected

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 connector "EVP" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 the connector "EVP" and to pin 56 of the connector "GEARBOX" and test 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 the connector "EVP" and to pin 13 of the connector "GEARBOX" and test the resistance to check for electrical continuity (test meter reading: 0 Ohm).
- With the starter key in the "I" (ON) position, check that the power input to the proportional solenoid valve is correct (12V measured between pin 2 (positive) of the connector "EVP" and the transmission earth)
- 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.



D0030930



← 77



← 77-Proportional valve
TC-Out shorted ground

DESCRIPTION

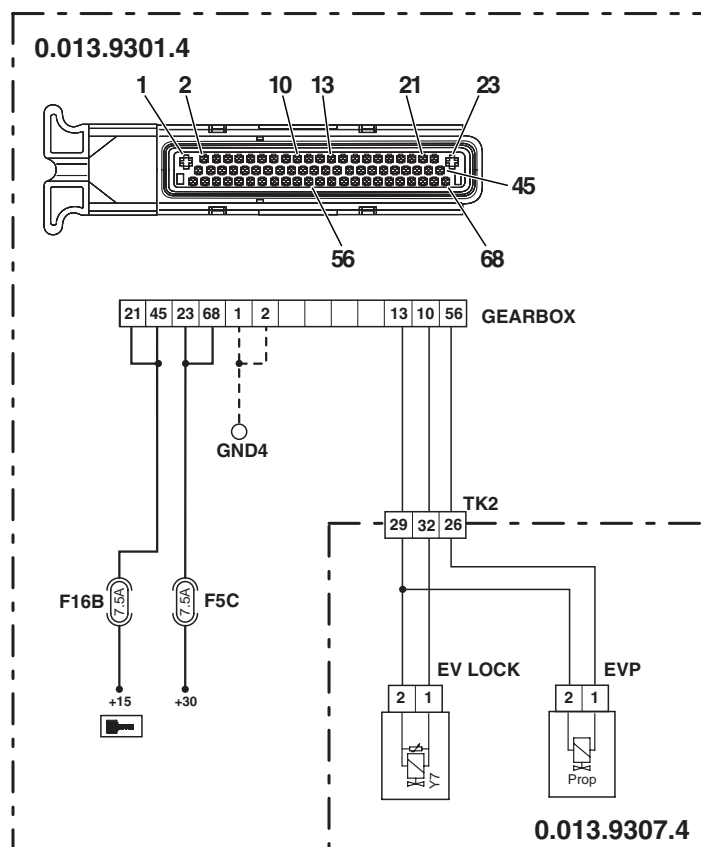
The control unit detects that the main clutch proportional control solenoid is shorting to earth

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 connector "EVP" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected from the control unit, connect a test meter to pin 1 of the connector "EVP" and to the transmission earth and test the resistance to check for shorting to earth (test 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.



D0030930



← 79



← 79-EV direct. forward
TC-Output open circuit

DESCRIPTION

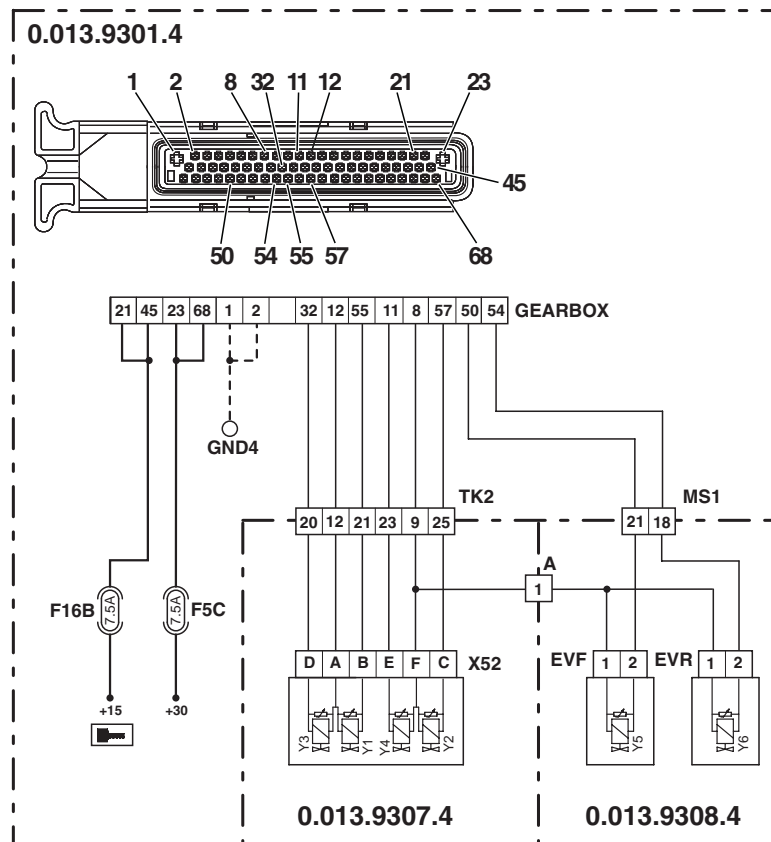
The control unit detects that the forward drive solenoid Y3 is disconnected.

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 connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin A and pin D of the connector "X52" on the transmission and 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 D of the connector "X52" and to pin 32 of the connector "GEARBOX" and test 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.



D0030900



← 80



← 80-EV direct. forward
TC-Out shorted ground

DESCRIPTION

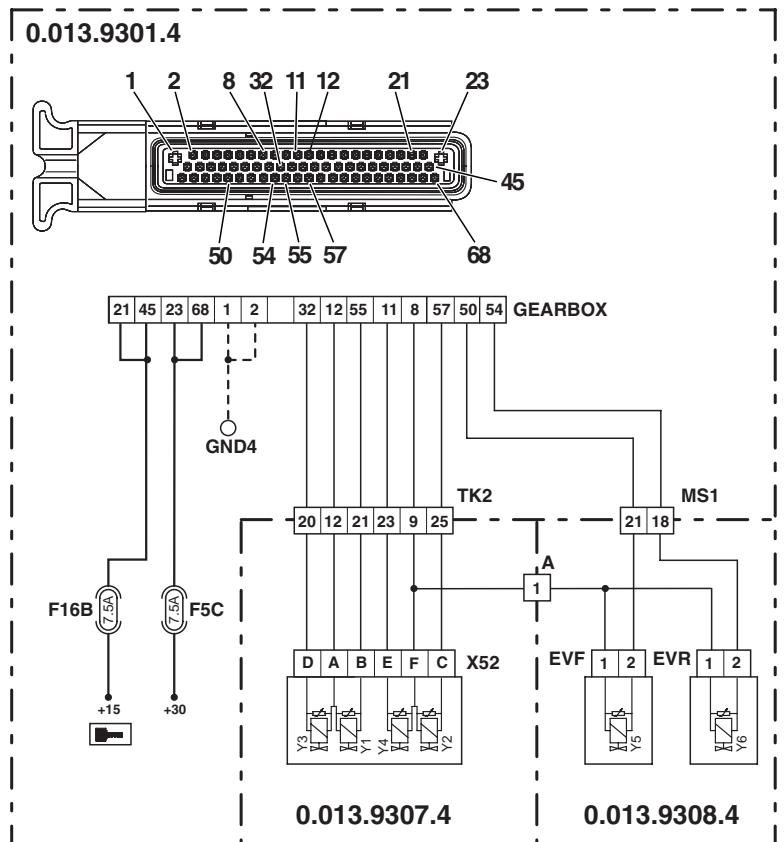
The control unit detects that the forward drive solenoid Y3 is shorting to earth.

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 connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin A and pin D of the connector "X52" on the transmission and test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected from the control unit, connect a test meter to pin D of the connector "X52" and to the transmission earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected from the control unit, connect a test meter to pin D of the connector "X52" on the transmission and to the transmission earth and test the resistance to check for shorting to earth (test 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.



D0030900



← 82



← 96-EV direct. reverse
TC-Output open circuit

DESCRIPTION

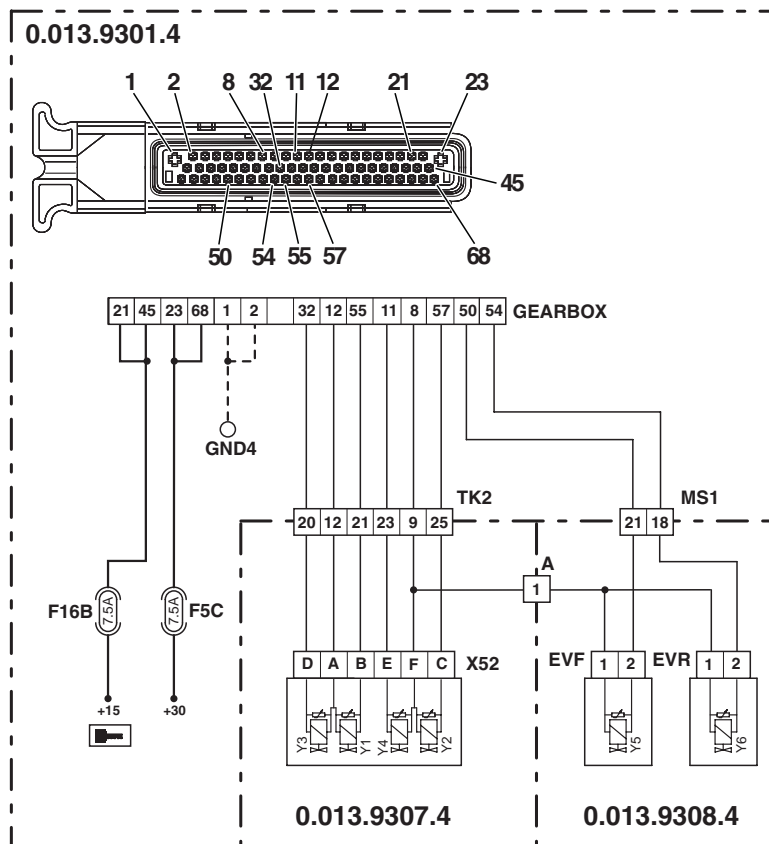
The control unit detects that the reverse drive solenoid Y1 is disconnected.

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 the "O" (OFF) position, connect a test meter to pin A e pin B of the connector "X52" on the transmission and 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 B of the connector "X52" and to pin 32 of the connector "GEARBOX" and test 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.



D0030900



← 83



← 96-EV direct. reverse
TC-Out shorted ground

DESCRIPTION

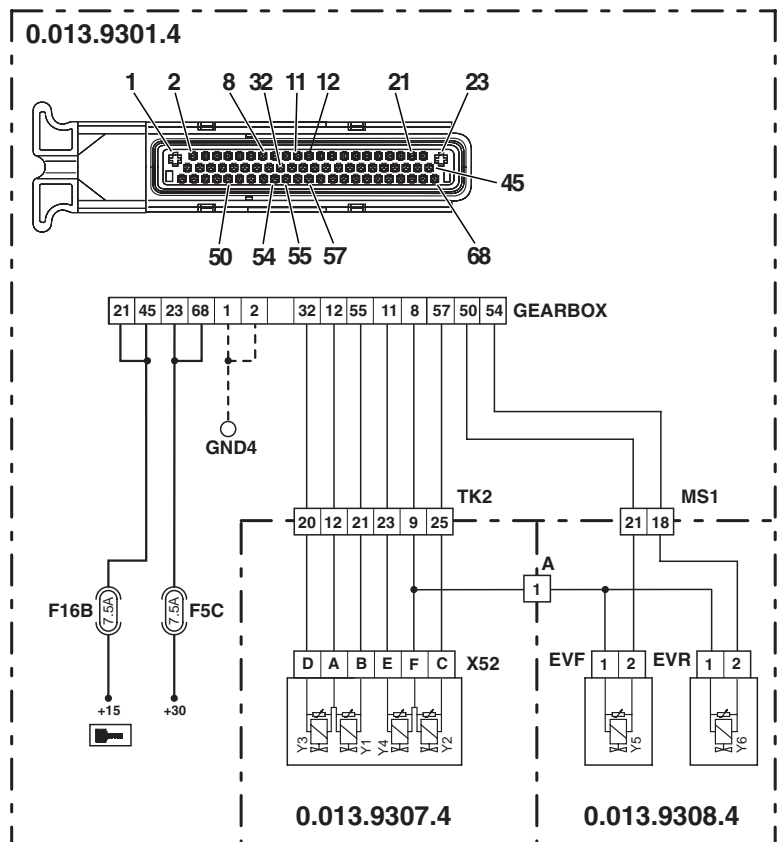
The control unit detects that the reverse drive solenoid Y1 is shorting to earth.

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 connector "X52" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the "O" (OFF) position, connect a test meter to pin A e pin B of the connector "X52" on the transmission and test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin B of the connector "X52" and to the transmission earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin B of the connector "X52" on the transmission and to the transmission earth and test the resistance to check for shorting to earth (test 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.



D0030900



← 85



← 85-Reverser Lever
TC-logical fault

DESCRIPTION

The control unit detects a problem affecting the shuttle control lever.

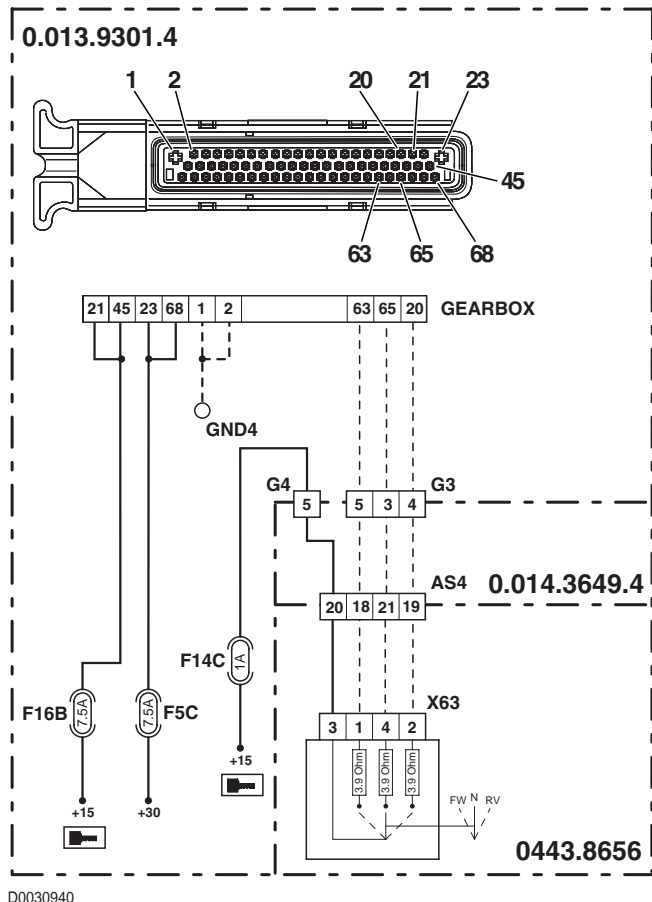
ECU RESPONSE

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 connector "X63" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Verify the correct operation of the shuttle lever (for details see section 40).
- With the starter key in the "I" (ON) position, check that the power input to the shuttle control lever is correct (12V measured between pin 3 (positive) of connector "X63" and the cab earth).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter alternately to pin 1, pin 2, pin 3 and pin 4 of the connector "X63" and to the earth on the cab and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "X63" and alternately to pin 2, pin 3 and pin 4 and test the resistance to check for short circuits (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "X63" and alternately to pin 3 and pin 4 and test the resistance to check for short circuits (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 3 of the connector "X63" and to pin 4 and test the resistance to check for short circuits (test meter reading: infinity).
- With the starter key in the "I" (ON) position, connect a test meter in alternation to pin 1, pin 2 and pin 4 of connector "X63" and to the cab earth, and check that there is no voltage registering (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.



D0030940



← 87



← Pincoding does not match with vehicle type

DESCRIPTION

The control unit detects that the vehicle type 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 the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 66 of the connector "GEARBOX" and to the cab earth and check that there is voltage (test 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-VPS1 supply
TC-logical fault

DESCRIPTION

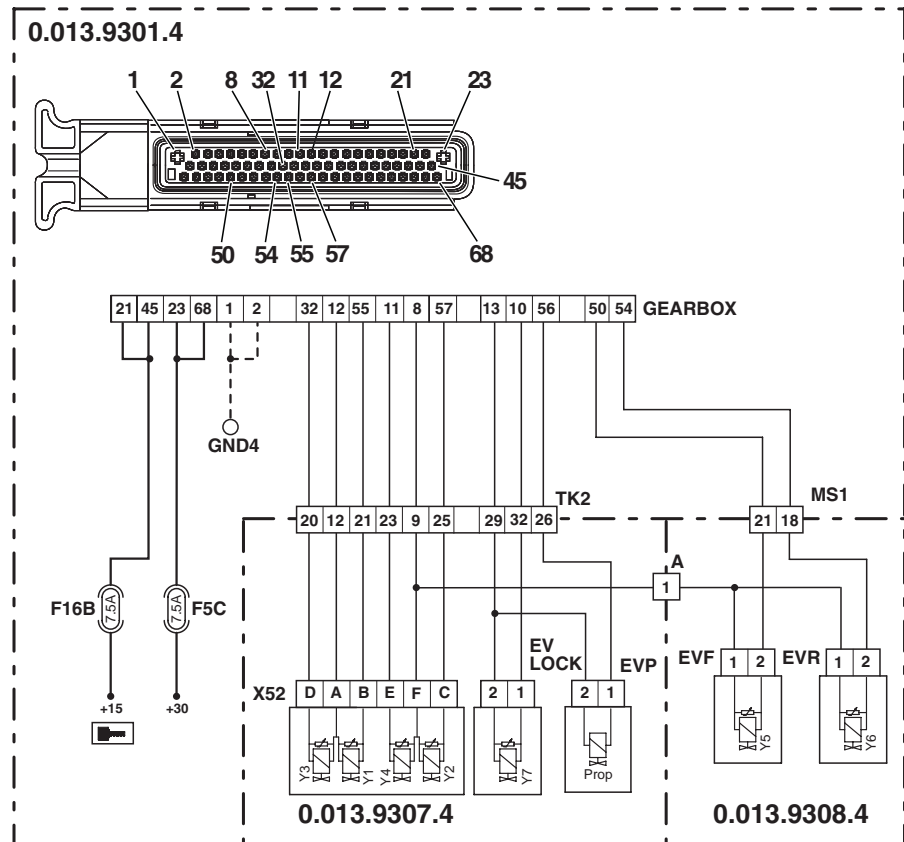
The control unit detects that the current draw of the main clutch solenoids and forward/reverse solenoids Y1 and Y3 and the lock solenoid is abnormal.

ECU RESPONSE

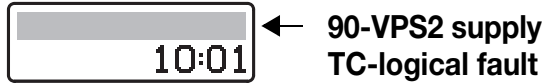
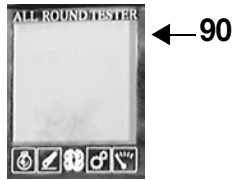
The control unit limits operation to "TC-SHUTDOWN" mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin A of the connector "X52" and to the transmission earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected from the control unit, connect a test meter to pin 2 of the connector "EVP" and to the transmission earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVLOCK" and to the transmission earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin A of the connector "X52" and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVP" and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVLOCK" and check that there is no voltage (test 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.



D0030950



DESCRIPTION

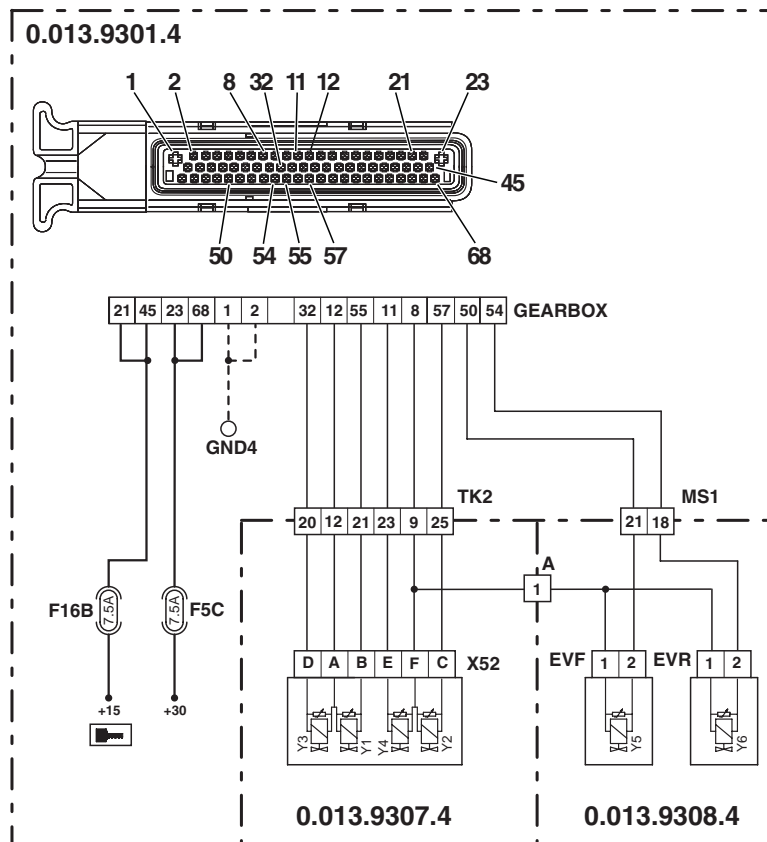
The control unit detects that the current draw of the powershift solenoid valves Y2, Y4, Y5 and Y6 is abnormal.

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 the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin F of the connector "X52" and to the transmission earth and test the resistance to check for shorting to earth (test meter reading: infinity).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVF" (or EVR) and to the transmission earth and test the resistance to check for shorting to earth (test 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.



D0030900



← 91



← 91-Main clutch
TC-logical fault

DESCRIPTION

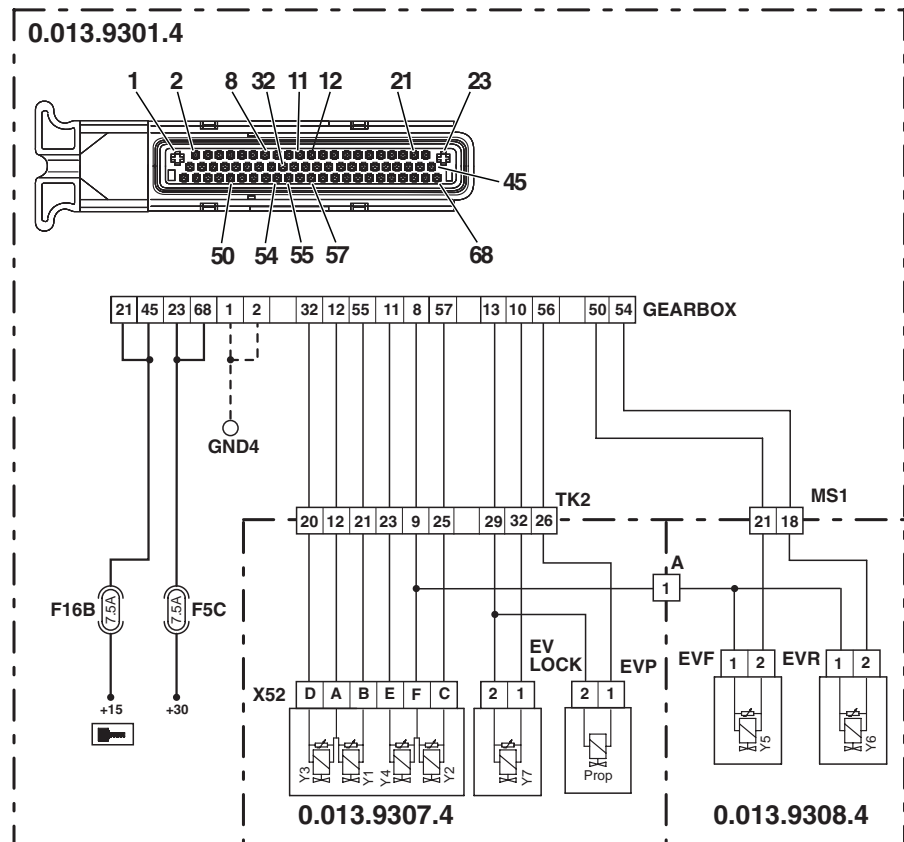
The control unit detects a conflict between values read by the NLSA and NHK sensors, the clutch pedal position sensor and the position of the creeper control lever.

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.
- Verify the 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 and 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 the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVP" and to the transmission earth and check that there is no voltage (test meter reading: 0 V).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin F of the connector "X52" and test the resistance to check for shorting to earth (test 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.



D0030950



← 92

← 92-Battery voltage
TC-Input short battery

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.

NOTA

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, with the engine running, that the battery voltage is within the prescribed range. 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-Battery voltage
TC-Input short ground

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 activated generally when the battery voltage is less than 10V and 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. For this reason, this alarm can only be displayed on EDS among the passive alarms. Should the alarm be displayed among the active alarms, the ECU must be renewed.

CHECK

- See if the alarm is indicated as an active alarm; if so, the ECU must be renewed.
- Check, with the engine off, that the battery voltage is as prescribed (higher than 12V); if not, install a new battery.

NOTA

Lower voltages can register 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 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 fitting a new alternator, first check whether the old one is operating correctly using a new battery.



← 94



← 94-EV proportional TC-Out shorted battery

DESCRIPTION

The control unit detects that the main clutch proportional control solenoid is shorting to a positive feed

ECU RESPONSE

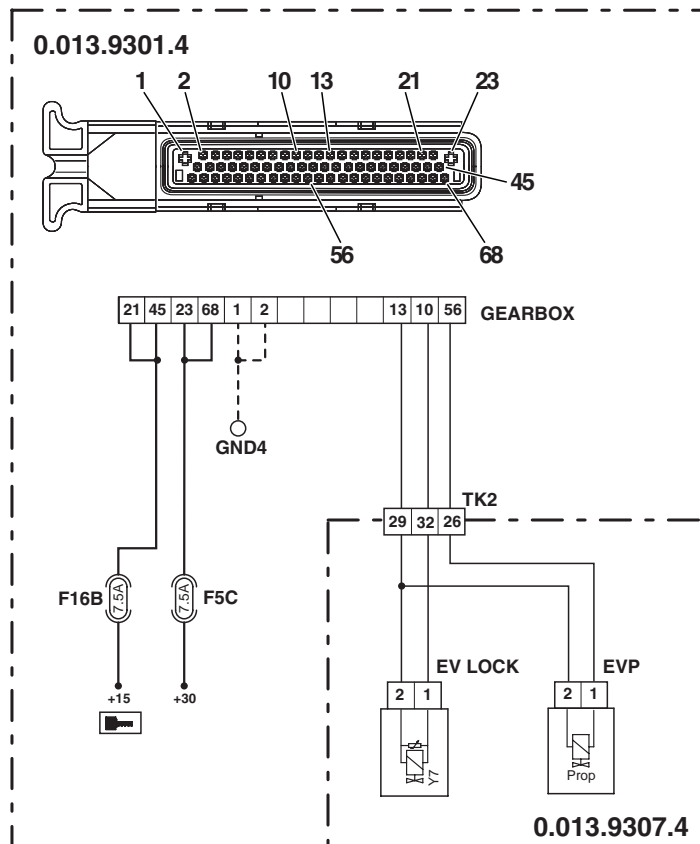
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVP" and to the transmission earth and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVP" 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 control unit must be renewed.



D0030930



← 95



← 95-EV direct. forward
TC-Out shorted battery

DESCRIPTION

The control unit detects that the forward drive solenoid Y3 is shorting to a positive feed.

ECU RESPONSE

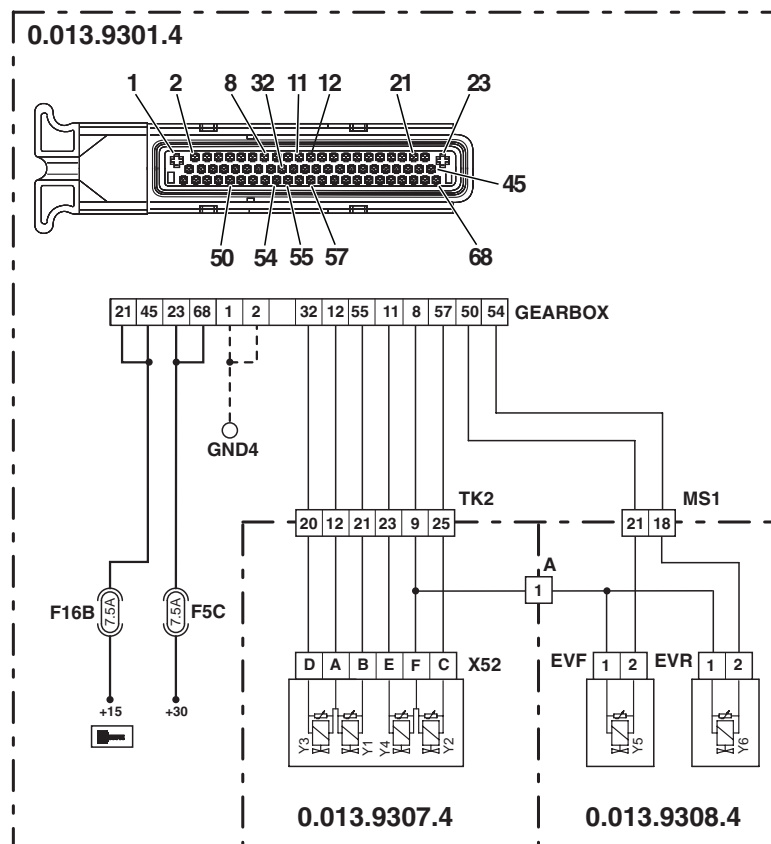
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin A of the connector "X52" and to the transmission earth and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin D of the connector "X52" 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 control unit must be renewed.



D0030900



← 96



← 96-EV direct. reverse
TC-Out shorted battery

DESCRIPTION

The control unit detects that the reverse drive solenoid Y1 is shorting to a positive feed.

ECU RESPONSE

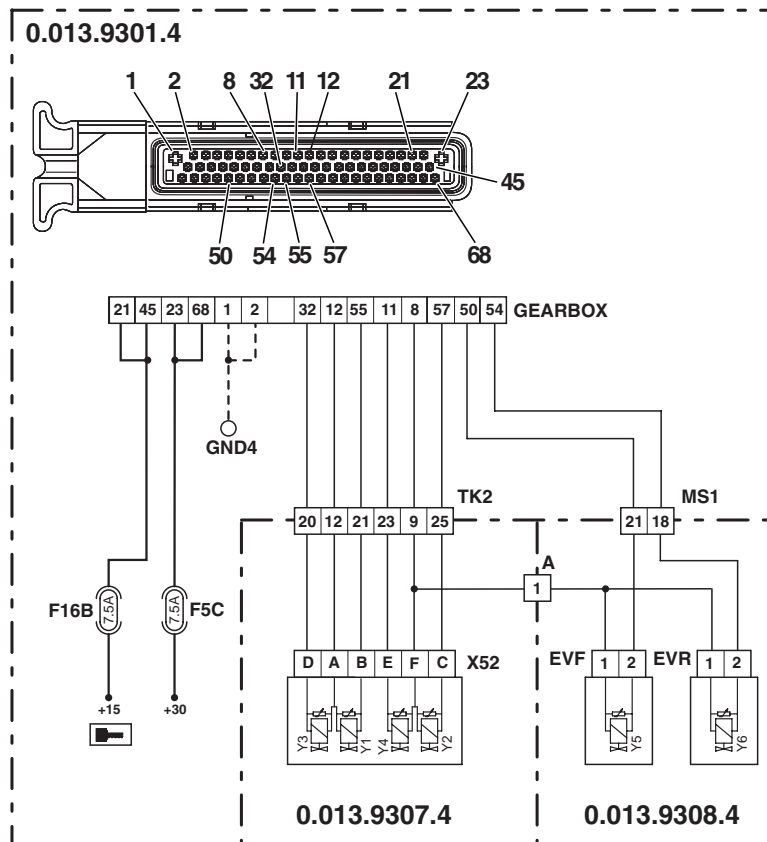
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin A of the connector "X52" and to the transmission earth and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin B of the connector "X52" 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 control unit must be renewed.



D0030900



← 97

← 97-Application error
TC-logical fault

DESCRIPTION

The control unit detects that the transmission control unit 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-Error Configuratio
TC-logical fault

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-Vehicle config.
TC-Warnings

DESCRIPTION

The control unit detects that tractor configuration data have not been programmed 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



← B2-nLSE speed sensor
TC-Input short ground

DESCRIPTION

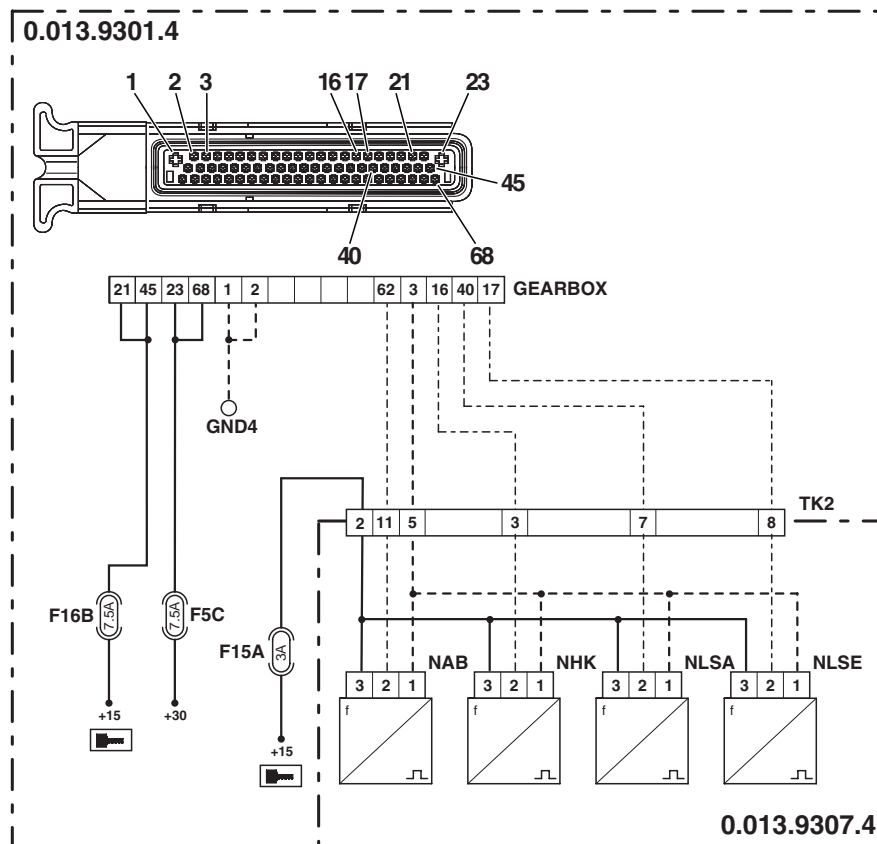
The control unit detects that the rpm sensor nLse is disconnected or short-circuiting to positive

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 connector "NLSE" and on the "GEARBOX" transmission control unit are not loose or corroded.
- With the starter key in the “I” (ON) position, check that the power input to the transmission output speed sensor is correct (12V measured between pin 3 (positive) and pin 1 (negative) of connector “NLSE”).
- With the starter key in the “I” (ON) position and connector “GEARBOX” unplugged, connect a test meter to pin 1 of connector “NLSE” and to transmission 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 2 of connector “NLSE” and to pin 17 of connector “GEARBOX”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← B1



← B2-nLSE speed sensor
TC-Input short battery

DESCRIPTION

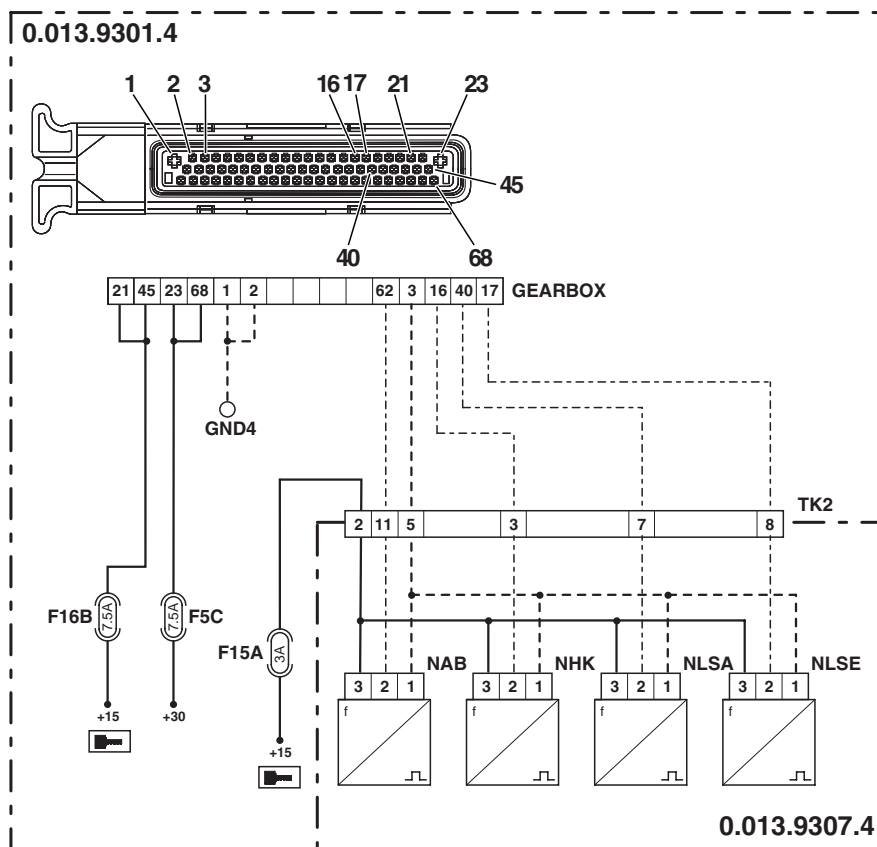
The control unit detects that the speed sensor nLse is shorting to earth

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 connector "NLSE" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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).
- Check that the sensor is functioning correctly (for technical details see Group 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.



D0030910



← B2



← B2-nLSE speed sensor
TC-logical fault

DESCRIPTION

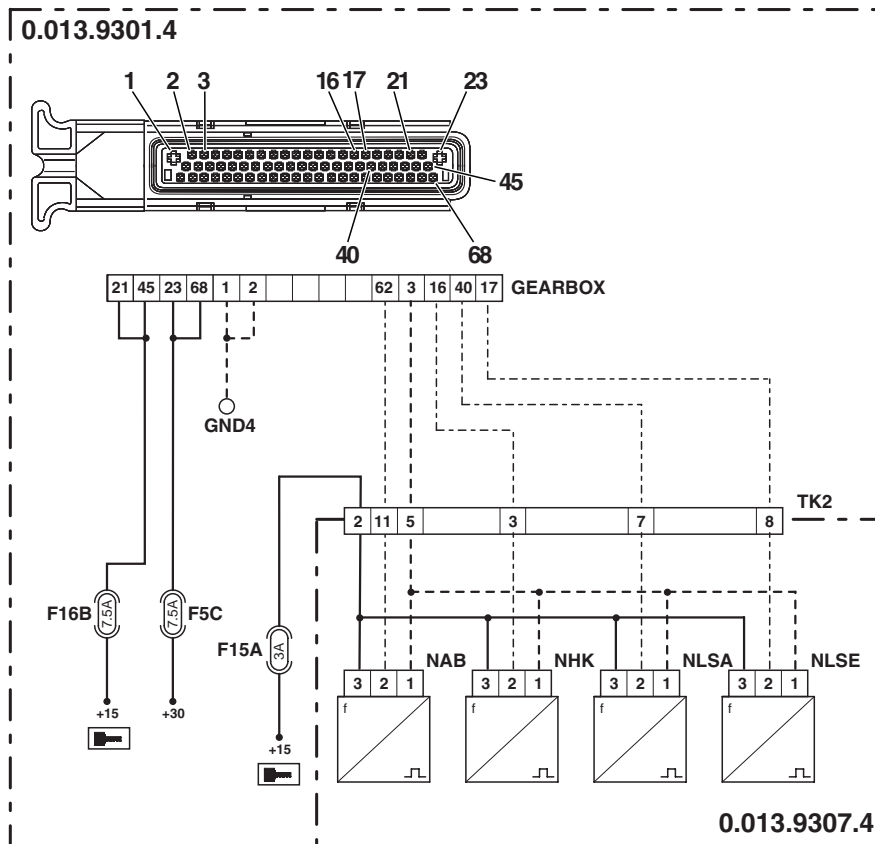
The control unit detects unreliable information coming from the speed sensor nLse

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 connector “NLSE” and on the “GEARBOX” transmission control unit are not loose or corroded.
- Check that the sensor is functioning correctly (for technical details see Group 40).
- With the starter key in the “I” (ON) position, check that the power input to the transmission output speed sensor is correct (12V measured 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.



D0030910



← B3



← B3-FRRS field valve
TC-Output open circuit

DESCRIPTION

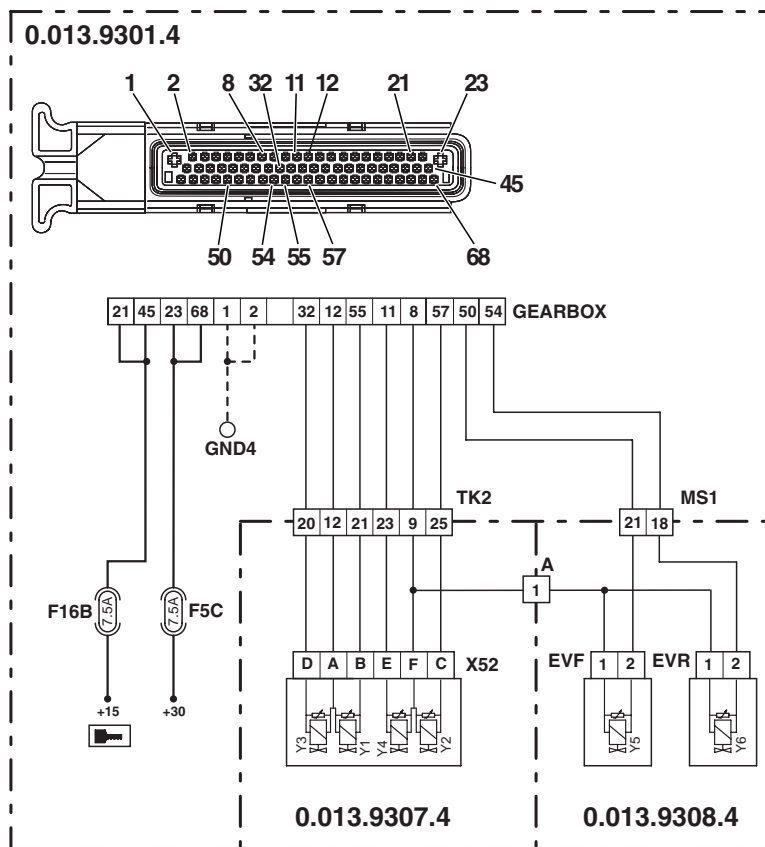
The control unit detects that the "Field" mode selector solenoid Y5 is disconnected.

ECU RESPONSE

The control unit limits operation to "TC-SHUTDOWN" mode and the transmission reverts to neutral, emitting a continuous beep.

CHECK

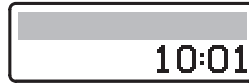
- Check that the contacts on the connector "EVF" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of the connector "EVF" and to pin 50 of the connector "GEARBOX" and test 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.



D0030900



← B4



← B4-FRRS field valve
TC-Out shorted battery

DESCRIPTION

The control unit detects that the "Field" mode selector solenoid Y5 is shorting to a positive feed.

ECU RESPONSE

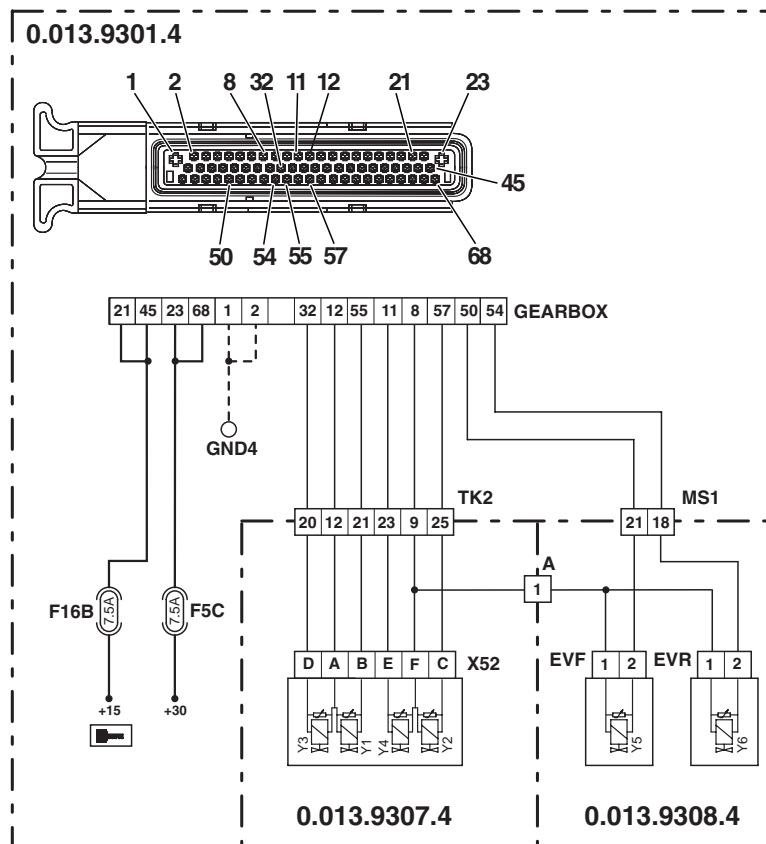
The control unit limits operation to "TC-SHUTDOWN" mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVF" and to the transmission earth and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVF" 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 control unit must be renewed.



D0030900



← B5



← B5-FRRS field valve
TC-Out shorted battery

DESCRIPTION

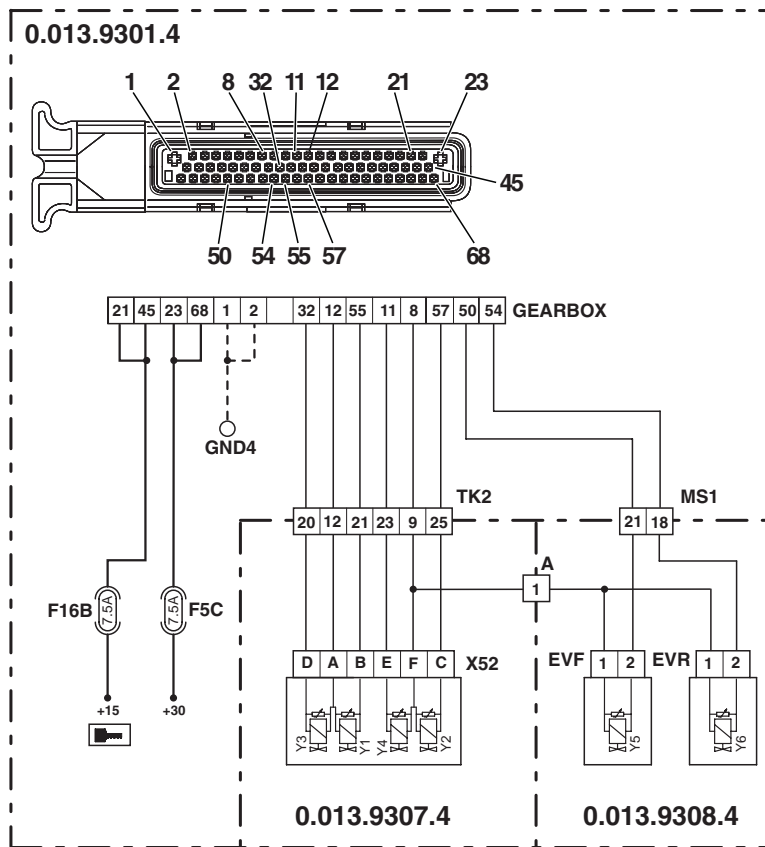
The control unit detects that the "Field" mode selector solenoid Y5 is shorting to earth.

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 connector "EVF" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVF" and to the transmission and test the resistance to check for shorting to earth (test 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.



D0030900



← B6



← B6-FRRS road valve
TC-Output open circuit

DESCRIPTION

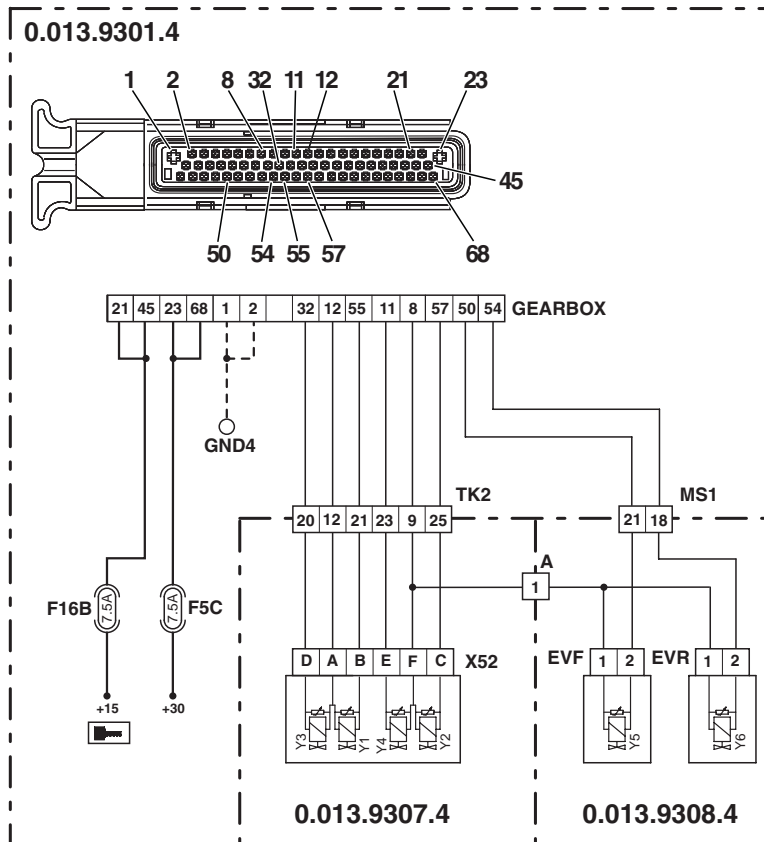
The control unit detects that the "Road" mode selector solenoid Y6 is disconnected.

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 connector "EVR" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 the connector "EVR" and to pin 50 of the connector "GEARBOX" and test 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.



D0030900



← B7



← B7-FRRS road valve
TC-Out shorted battery

DESCRIPTION

The control unit detects that the "Road" mode selector solenoid Y6 is shorting to a positive feed.

ECU RESPONSE

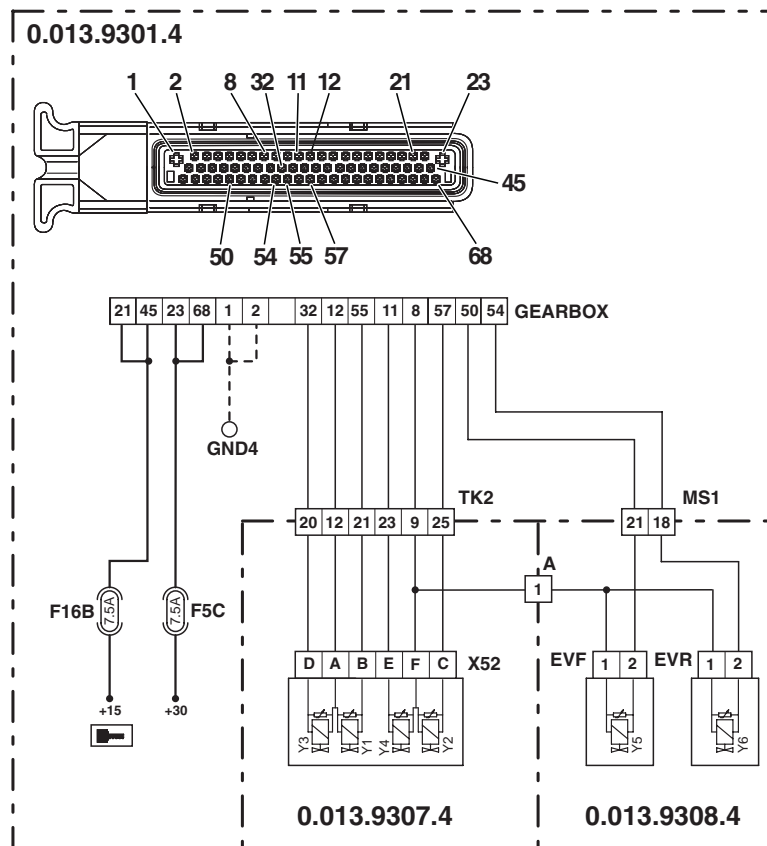
The control unit limits operation to "TC-SHUTDOWN" mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVR" and to the transmission earth and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVR" 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 control unit must be renewed.



D0030900



← B8



← B8-FRRS road valve
TC-Out shorted battery

DESCRIPTION

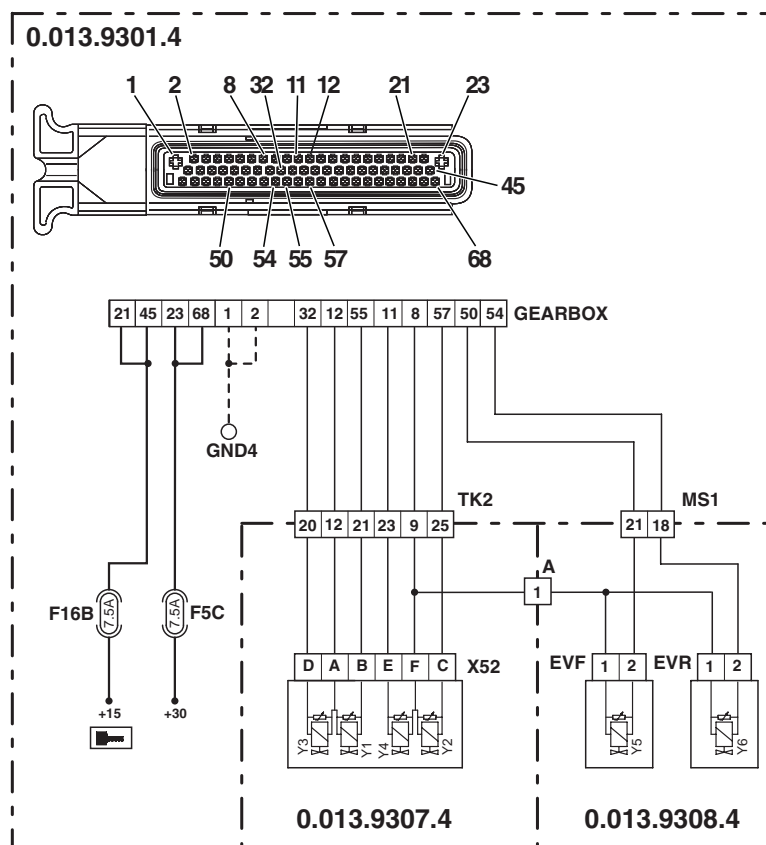
The control unit detects that the "Road" mode selector solenoid Y6 is shorting to earth.

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 connector "EVR" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVR" and to the transmission and test the resistance to check for shorting to earth (test 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.



D0030900



← B9



← B9-Neutral Locker EV
TC-Output open circuit

DESCRIPTION

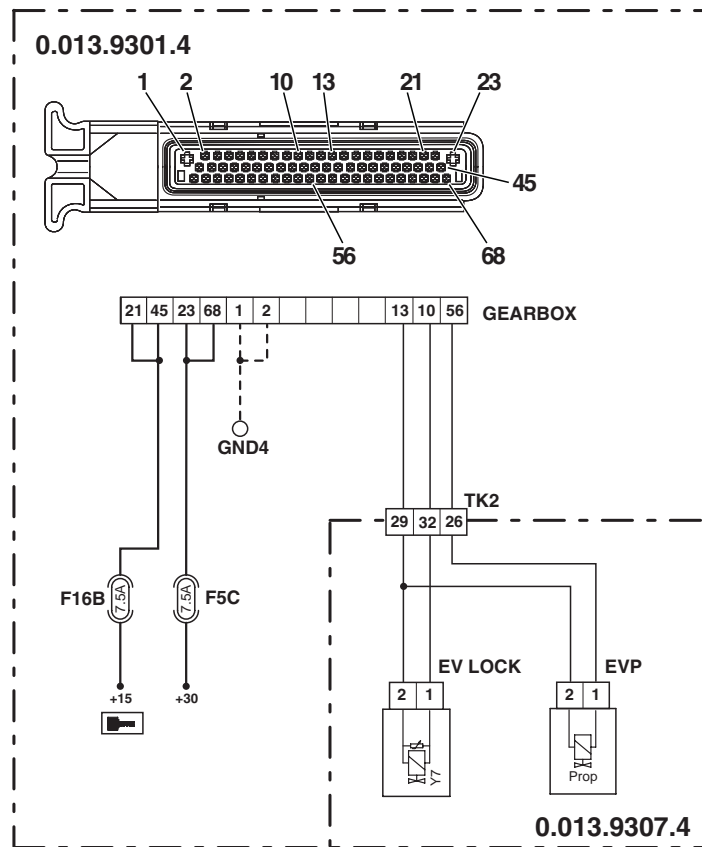
The control unit detects that the gearbox neutral lock solenoid Y7 is disconnected.

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 connector "EVLOCK" and on the "GEARBOX" transmission control unit are not loose or corroded.
- 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 the connector "EVLOCK" and to pin 10 of the connector "GEARBOX" and test 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.



D0030930



← BA



← BA-Neutral Locker EV
TC-Out shorted battery

DESCRIPTION

The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to a positive feed.

ECU RESPONSE

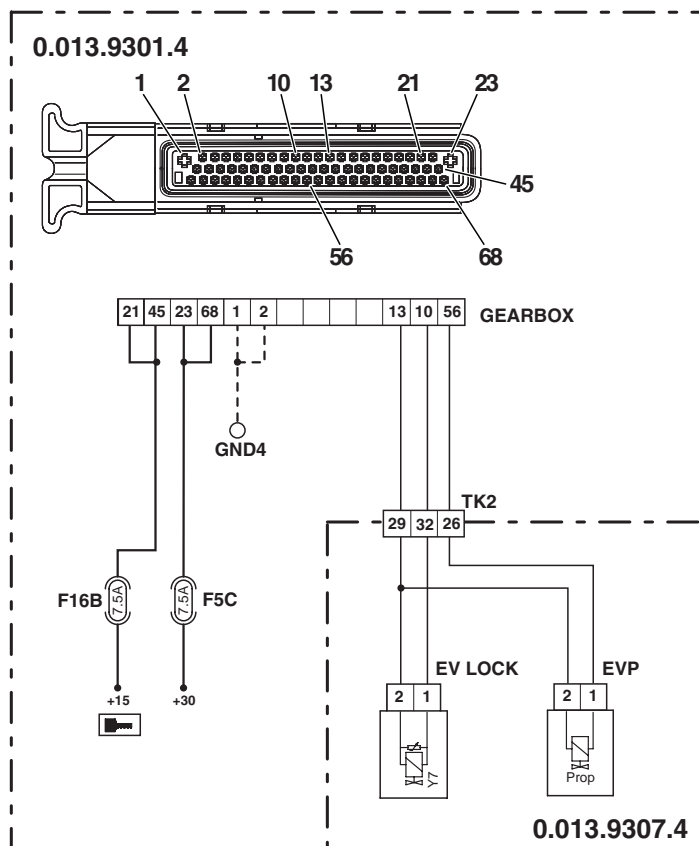
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarm 89 being activated.

CHECK

- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 2 of the connector "EVLOCK" and to the transmission earth and check that there is no voltage (test meter reading: 0V).
- With the starter key in the "I" (ON) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVLOCK" 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 control unit must be renewed.



D0030930



← BB



← BB-Neutral Locker EV
TC-Out shorted ground

DESCRIPTION

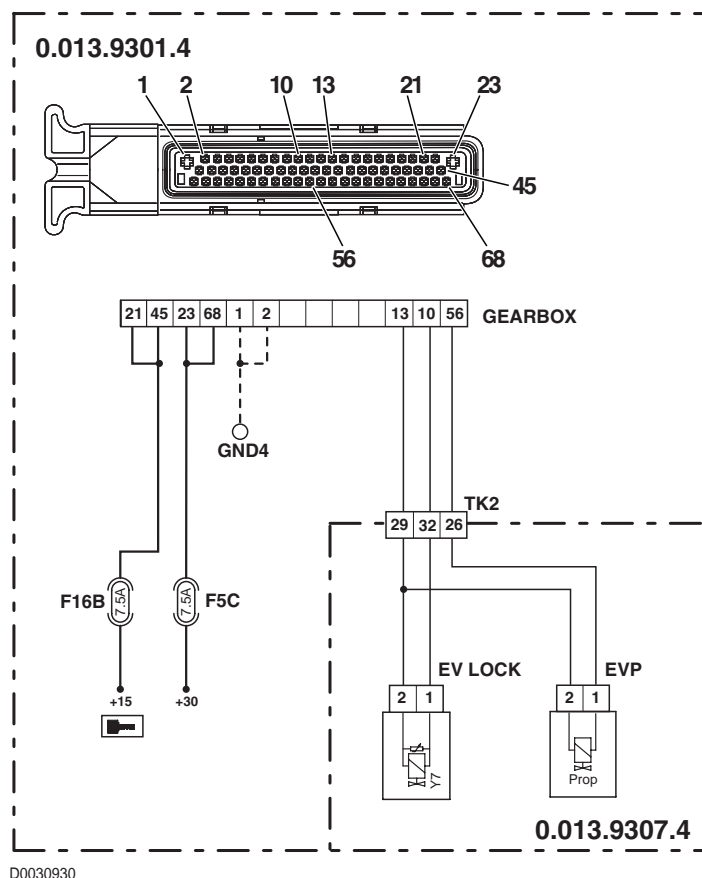
The control unit detects that the gearbox neutral lock solenoid Y7 is shorting to earth.

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 connector "EVLOCK" and on the "GEARBOX" transmission control unit are not loose or corroded.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the "O" (OFF) position and the connector "GEARBOX" disconnected, connect a test meter to pin 1 of the connector "EVLOCK" and to the transmission and test the resistance to check for shorting to earth (test 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.





← C0

← C0-Msg PTCTL1 REQGEAR
TC-Gruop C

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 menu "3.1.1 DIGITAL INPUTS" that the range gear upshift and downshift buttons on the gear lever are functioning correctly.
- 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 ALARMS".
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again; if the alarm is still present, the control unit must be renewed.



← C3

← C3-Msg EEC1 ENGSPEED
TC-Grup C

DESCRIPTION

The transmission control unit detects an error in the information received from the engine control unit regarding the communication of the 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 menu "3.1.2 INPUT FREQ" that the engine speed signal is being transmitted correctly over 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 "5.5 CANBUS ALARMS".
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again; if the alarm is still present, the control unit must be renewed.



← CF

← CF-Message EEC1
TC-Gruop A

DESCRIPTION

The transmission control unit detects a fault on the CANBUS line.

ECU RESPONSE

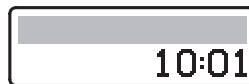
The control unit limits operation to "LIMP-HOME-LS" mode.

CHECK

- Check that the contacts on the connector "GEARBOX" are not loose or corroded.
- Check the CANBUS following the instructions given in the chapter "5.5 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-Gruop A

DESCRIPTION

The transmission control unit detects a fault on the CANBUScontroller.

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 "5.5 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-Grup A

DESCRIPTION

The transmission control unit detects a fault on the CANBUScontroller.

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 "5.5 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 that the electrical connection of transmission display with transmission control unit is present.
- 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.



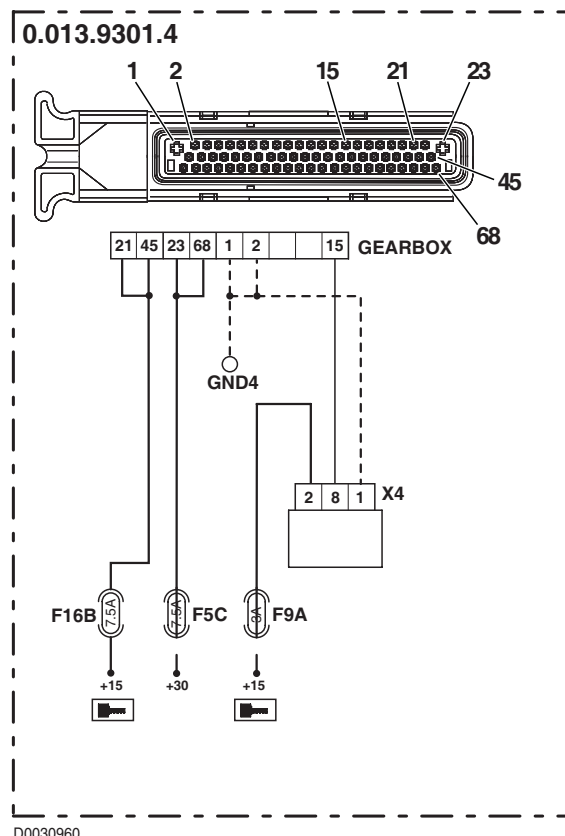
← GEN1

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 integrity of the transmission ECU power supply fuses F5C and F16B.
- With the starter key in the “O” (OFF) position, check that the power input to the control unit is correct (starter key in the “I” (ON) position, 12V measured between pin 23 and pin 68 (positive) and pin 1 and pin 2 (negative) of connector “GEARBOX”).
- With the starter key in the “I” (ON) position, check that the power input to the control unit is correct (starter key in the “I” (ON) position, 12V measured between pin 21 and pin 45 (positive) and pin 1 and pin 2 (negative) of connector “GEARBOX”).
- With the starter key in the “O” (OFF) position and the connector “GEARBOX” disconnected, connect a test meter to pin 8 of the connector “X4” (diagnostics connector) and to the earth on the cab and test the resistance to check for shorts to earth (test meter reading: infinity).
- With the starter key in the “I” (ON) position and the connector “GEARBOX” disconnected, connect a test meter to pin 8 of the connector “X4” (diagnostics connector) and to the cab earth and check that there is no voltage (test meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 8 of the connector “X4” (diagnostics connector) and pin 15 of the connector “GEARBOX” and test 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.



**DESCRIPTION**

Transmission slips 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

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.



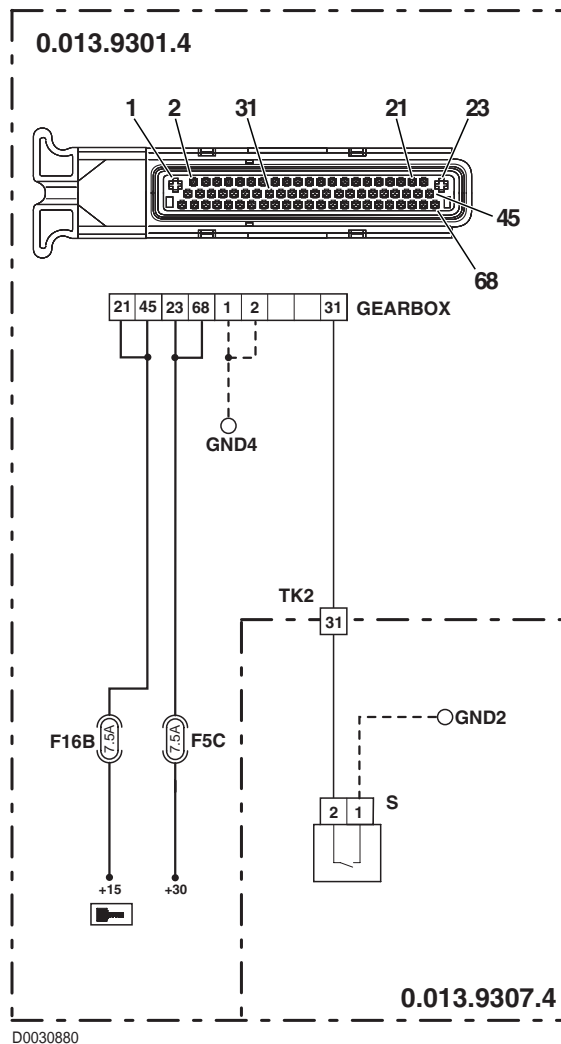
← GEN5

DESCRIPTION

The transmission remains in neutral

CHECK

- Check that the contacts on the connector "S" of the start enable switch and the "GEARBOX" lift control unit are not loose or corroded.
- 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 the connector "S" and to pin 31 of the connector "GEARBOX" and test the resistance to check for 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.



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5.5 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 braided 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 blow, a resistance reading measured at any point of the system will be 120 Ohm.

In this event, the CANBUS will continue to function, but the external interference created by high tension cables, radio transmitters and other devices that generate radio signals will cause CANBUS alarms. These alarms will generally be erased automatically, but may also return very frequently.

This could create problems with some of the tractor's systems which cannot be solved through electrical or electronic testing of the components associated with the faulty system but only through a problem with the CANBUS.

When one of the two termination control units is disconnected, or if a CANBUS wire comes loose from a connector of one of 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 may be removed by repairing the control unit connection.

If the two CANBUS wires were shortcircuited 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 would happen if one of the two wires should short to earth or to a positive feed of one of the two CANBUS wires

When one or more control units detect a problem on the CANBUS, 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.

5.7.1 ALARMS TABLE I

ECU that detects the alarm	Code on		Alarm description	Cases						
	ECU	HLHP		1	2	3	4	5	6	7
CANBUS status on HLHP "1.7 STATUS"	CAN	CAN EMR	Connection to the engine control unit	ON	OFF	OFF	ON	OFF	OFF	
		CAN TCU	Connection to the transmission control unit	ON	OFF	ON	OFF	OFF	OFF	
		CAN IC	Connection to Infocenter	OFF	ON	ON	ON	OFF	OFF	
Trasmissione	C0	C0	Problem of communication with the HLHP control unit (range gear engagement control)	P	A		A	A	P	R
	C1	C1	Problem of communication with the HLHP control unit (forward/reverse selection)	P	A		A	A	P	R
	C3	C3	Problem of communication with the engine control unit (engine speed)	P		A	A		P	R
	CF	CF	Problem of communication with the engine control unit	P		A	A		P	R
	D1	D1	Problem of communication with the engine control unit	P		A	A		P	R
	D2	D2	Problem of communication with the HLHP control unit	P	A		A	A	P	R
HLHP	SPN 51 - FMI 12		Problem of communication with the engine control unit		A	A		A	P	R
	SPN 63 - FMI 2		Problem of communication with the transmission control unit		A		A	A	P	R
	SPN 561 - FMI 2		Problem of communication with the engine control unit		A	A		A	P	R
	SPN 631 - FMI 9		Connection to the armrest control unit not present	-	-	-	-	-	-	-
	SPN 632 - FMI 9		Connection to the transmission control unit not present		A		A	A	P	R
	SPN 633 - FMI 9		Connection to the engine control unit not present		A	A		A	P	R
Motore	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	R
	70	SPN 743 - FMI 12	CANBUS line controller damaged			P				
	74	SPN 743 - FMI 14	CANBUS fault		P	A	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 (not certain)

CASE 1 ANALYSIS

DESCRIPTION

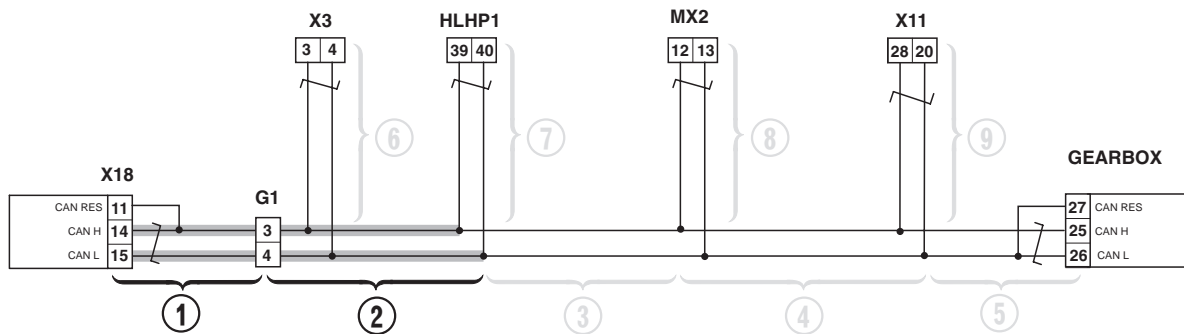
This fault is generally caused by the disconnection of the Infocenter connector or by a break in one of the CANBUS wires in section "1" or "2".

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 the connector "X18" of the Infocenter are not loose, corroded or short circuiting.
- Connect a test meter to pin 14 and to pin 15 of the connector "X18" on the wiring side and check that there is a resistance of 120 Ohm.
- If the resistance reading is 0 Ohm, reconnect the connector "X18" to the Infocenter and connect a test meter to pin 3 and to pin 4 of the 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 the connector "G1" and pin 14 of the connector "X18" and pin 4 of the connector "G1" and pin 15 (or 11) of the connector "X18". If continuity is not found, the instrument panel wiring must be repaired or renewed.



D0030970

CASE 2 ANALYSIS

DESCRIPTION

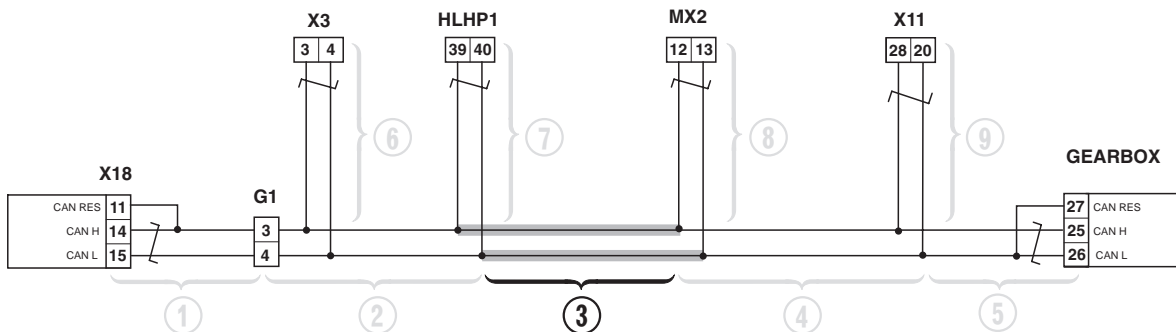
This fault is generally caused by the disconnection of the HLHP control unit or by a break in one of the CANBUS wires in section "3".

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

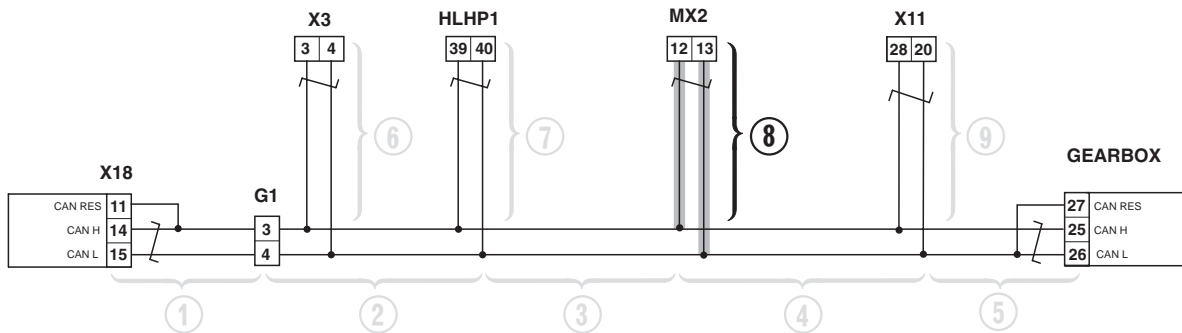
This fault is generally caused by a breakage or disconnection of one of the CANBUS wires in section "8".

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 the connector "MX2" on wiring side).
If the voltage is zero, check the condition of the fuse F15B (7.5 A).
- Check that the contacts of the engine control unit connector "MX2" are not loose or corroded.
- Connect a test meter to pin 12 and to pin 13 of the wiring loom connector "MX2" and check that the resistance is approx. 60 Ohm.
If the resistance differs from this value, the wiring loom must be repaired or renewed.
- 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

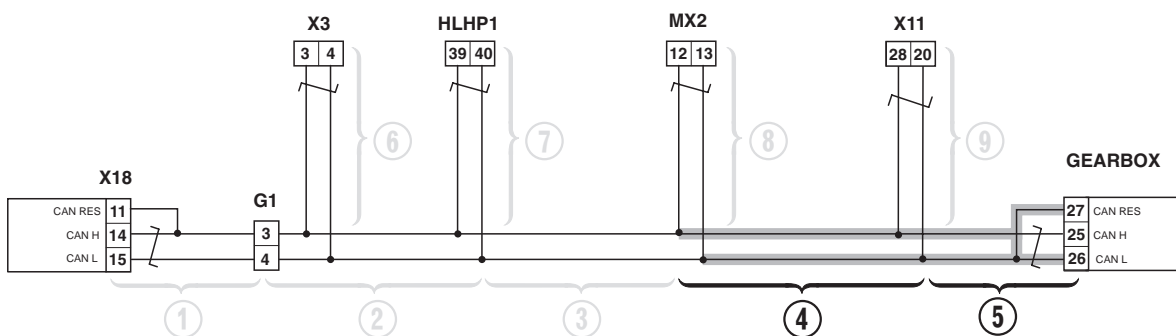
This fault is generally caused by the disconnection of the transmission control unit connector or by a break in one of the CANBUS wires in section "4" or "5".

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 pins 1 and 2 (negative) of the connector "GEARBOX" on the wiring side).
If the voltage is zero, check the condition of the 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 pins 1 and 2 (negative) of the connector "GEARBOX" on the wiring side).
If the voltage is zero, check the condition of the fuse F16B (7.5A).
- Check that the contacts of the "GEARBOX" connector of the transmission control unit are not loose or corroded.
- Connect a test meter to pin 26 and to pin 27 of the 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 25 and to pin 26 (or to pin 27) of the connector "GEARBOX" of the wiring loom and check that the resistance is 120 Ohm.
If the resistance differs from this value, fit a new control unit.
- 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

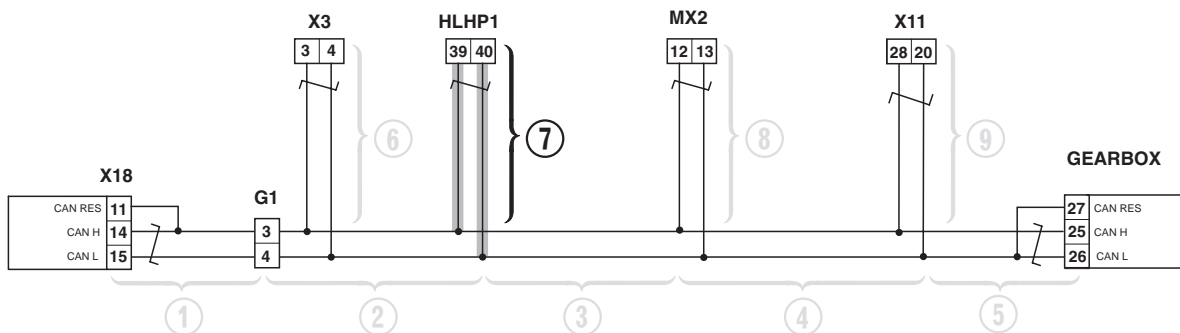
CASE 5 ANALYSIS

DESCRIPTION

This fault is generally caused by the disconnection of the 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) (12 Vdc between pins 1 and 27 (positive) and pins 2 and 28 (negative) of the connector "HLHP1" of the wiring loom).
If the voltage is zero, check the condition of the 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 measured between pin 41 (positive) and pins 2 and 28 (negative) of the wiring connector "GEARBOX").
If the voltage is zero, check the condition of the fuse F2A (7.5A).
- Check that the contacts on the connector "HLHP1" of the control unit are not loose or corroded.
- Connect a test meter to pin 39 and to pin 40 of the connector "HLHP1" of the wiring and check that the resistance is 60 Ohm.
If the resistance differs from this value, 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 HLHP control unit.



D0031010

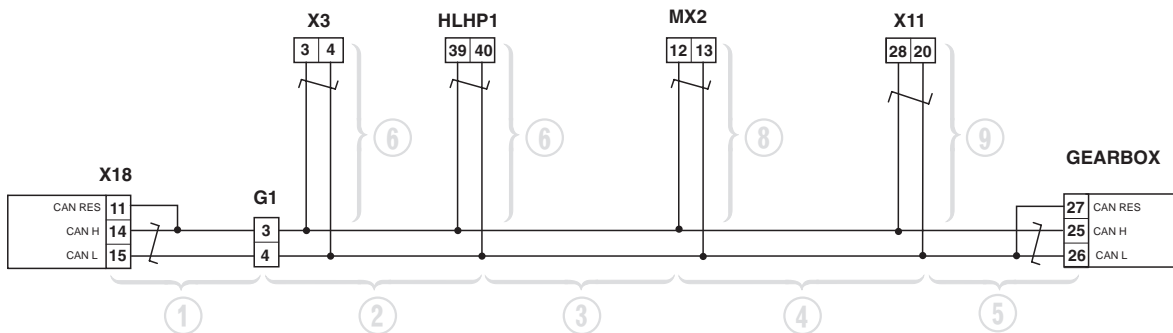
CASE 6 ANALYSIS

DESCRIPTION

This fault is caused by a shortcircuit of the CANBUS wires at any point in the system or by a shortcircuit of the wires to earth or to a positive feed.

CHECK

- Check that the contacts on the connector "X3" on the CANBUS auxiliary socket are not short circuiting.
- Check that the contacts on the connectors "X11" of the armrest (not installed on this version), "HLHP1" of the HLHP control unit, "GEARBOX" of the transmission control unit, "MX2" on the engine control unit and "X18" of the Infocenter are not loose, corroded or short circuiting.
- With the starter key in position "O" (OFF) and all the connectors connected to their respective control units, connect a test meter to pin 3 of the connector "X3" and to the cab earth and measure the resistance to check that there are no shorts to earth (test meter reading: infinity). Repeat the procedure with pin 4 del connector "X3"
- With the starter key in position "I" (ON) and all the connectors connected to their respective control units, connect a test meter to pin 3 of the connector "X3" and to the cab earth and check that there is no voltage present (test meter reading: 0V). Repeat the procedure with pin 4 del connector "X3"
- If the fault is not identified by the above checks, it can be attributed to a shortcircuit between the CANBUS wires, and can be remedied by repairing or renewing the wiring loom.



D0031020

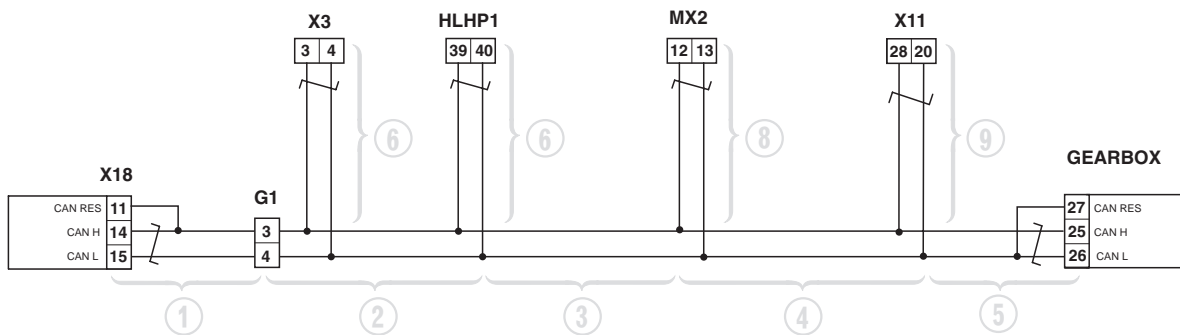
CASE 7 ANALYSIS

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 attributed to a broken termination resistor, or to the presence of a strong electromagnetic field in the work area.
- Check that the contacts on the connectors "GEARBOX" of the gearbox control unit and "X18" of the Infocenter are not loose, corroded or short circuiting.
- Connect a test meter to pin 25 and pin 27 of the control unit side of the "GEARBOX" connector and check that the resistance is approx. 120 Ohm.
If the resistance is incorrect, fit a new control unit.
- Connect a test meter to pin 14 and to pin 11 of the connector "X18" on the Infocenter side and check that the resistance is 120 Ohm.
If the resistance differs from the above value, renew the Infocenter.



D0031020

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6. ENGINE CONTROL UNIT TEST PROGRAM

6.1 ACCESS AND COMMUNICATION

SERDIA (diagnostics service) is software for PC that enables communication with the engine control units via a notebook computer and an interface cable.

SERDIA supports the DEUTZ EMR1, EMR2, EMS2 and MVS control units and it is therefore possible to communicate with a number of different control units using a single type of software.

Updated versions are notified through service bulletins.

Operations relative to the modification of settings, parameterization, cancellation of error memories and calibration of control units

are only possible with SERDIA.

SERDIA operates with Windows 2000 - XP operating systems.

The user interface allows the user to call up all the necessary functions with a click of the mouse button.

The following menu options can be accessed:

- Control unit selection
- Parameterization
- Errors memory
- Function tests
- Activities
- Tools

6.1.1 MINIMUM EQUIPMENT REQUIREMENTS

The following is list of the basic equipment required to operate the SERDIA program:

- Notebook or PC with USB serial port.
- Video card: VGA minimum
- 80486 processor (or higher)
- 256 MB RAM minimum
- Hard disk with approximately 50 Mb of free space
- CD-Rom reader
- Software: Windows 2000 or later operating system

6.1.2 ORDERING INFORMATION

SERDIA, like all DEUTZ special tools and instruments, can be ordered from:

SAME-DEUTZ-FAHR ITALIA S.p.A.

Viale F. CASSANI, 15

24047 TREVIGLIO (BG) - ITALY

6.1.2.1 FIRST USE

For first use, we recommend the SERDIA (LEVEL III) package, part no. 5.9030.740.4/30.

Supply includes:

- SERDIA software
- diagnostic interface with preset user levels
- brief installation instructions
- list of instruments and adapters useful for troubleshooting
- carry case

6.1.2.2 ORDERING SINGLE ARTICLES

Meaning	Competence level	Order N°
Installation disk		5.9030.740.0/10
Level III interface	General overhaul	5.9030.740.2/10

6.1.2.3 ADAPTER

Individual OEM's have their own diagnostic connectors. For this reason, the SERDIA interface requires an adapter to make the connection between the DEUTZ 12-pole connector and the OEM connector.

Suitable adapters (12-pin DEUTZ > 14-pin DFA) are available as original parts from SAME-DEUTZ-FAHR GROUP for the diagnosis of DEUTZ-Fahr tractor engines:

ORDER N_ 5.9030.741.0

6.1.3 CONNECTING THE NOTEBOOK AND INSTALLING THE SOFTWARE**6.1.3.1 INSTALLATION OF SERDIA 2000**

If Windows is not already installed on your hard disk, then it must be installed first following the installation instructions for Windows 2000.

6.1.3.2 USER LEVELS, ACCESS AUTHORISATION

DEUTZ Service has defined three different user levels (I, II, III,) for the SERDIA interface.

This to prevent unauthorised persons from accessing certain parameter settings (e.g. injection pump weighting).

This access control system ensures each user can only access those parameters and fields permitted to his/her user level.

6.1.3.3 CREATING A CONNECTION BETWEEN THE ENGINE CONTROL UNIT AND THE NOTEBOOK COMPUTER**Communication characteristics:**

- Serial communication
- BaudRate = 9600
- Serialport = COM1

SERDIA provides an interface cable to make the connection between the control unit and the client notebook . Although the interface cable and control unit incorporate a number of safety measures, such a protection and against polarity inversion,

overvoltage and galvanic separation, there is still the possibility of human error and for this reason the it is important to adhere exactly to the following procedure when making the connection between the notebook and the control units .

Connection procedure; all operations must be carried out in the sequence indicated:

- 1) Switch off the engine, starter switch off (terminal 15). Do not turn on the notebook yet.
- 2) Connect the diagnostics connector of the interface cable to the diagnostic socket on the vehicle/system.

Installation of the diagnostics connector is the responsibility of the customer and may be supplied as optional equipment by DEUTZ.

- 3) Connect the other end of the interface cable to the RS 232/COM1 serial port (9-pin connector on the rear of the notebook).

Note on some PCs the COM1 port may already be occupied by the mouse. In this case, the interface cable should be connected to the second serial port (COM2) which will then have to be configured (see chapter What to do if ...).

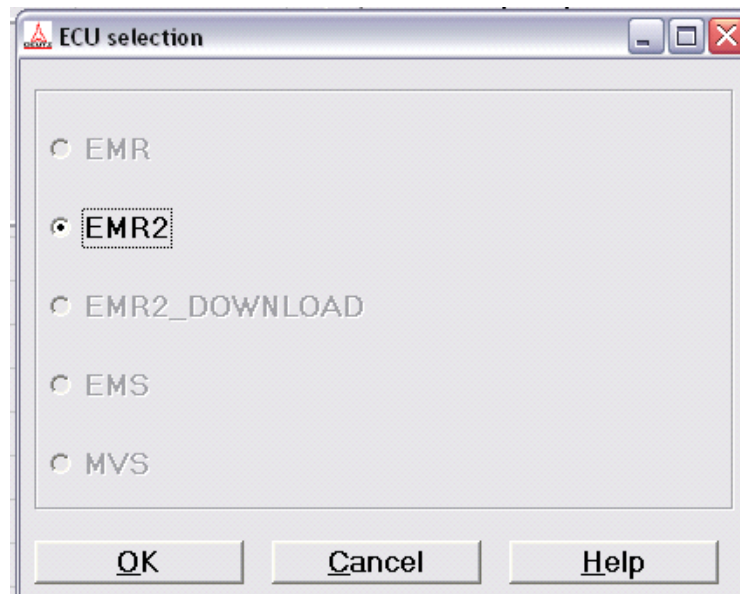
- 4) At this point the starter switch (cl.15) and the notebook may be turned on. The engine remains off.
- 5) Launch the SERDIA program as described in chapter 1.8, "Starting the program".

6.1.3.4 STARTING THE PROGRAM

In Windows, the SERDIA program opens with a double click of the mouse.

First time the program is launched:

the first time the program is run, SERDIA will carry out a search to determine which control units are connected and with which it can communicate. SERDIA will carry out a search to determine which control units are connected and with which it can communicate. This procedure can take up to thirty seconds while the program interrogates all the possible control units in turn. During this time, the program displays the message "Searching for connected ECUS". This is immediately followed by the "ECU selection screen", in which any control units that have not been recognised are shown in grey.



- Select the desired control unit and confirm with OK.
- The message "Initialization in progress!" is displayed (duration approx. 7 sec.). A connection is established with the control unit.

Restarting the program:

When it is next launched, SERDIA recalls all the control units it recognised the previous time it was launched (e.g. EMR2). If these same control units are connected the second time the program is launched, then SERDIA will skip the identification procedure and immediately start initialization of the control units. This significantly reduces the amount of time taken to launch the program.

The message "Initialization in progress!" is displayed. (duration approx. 7 sec.). A connection is established with the control unit.

If another control unit has been connected since the last time the program was launched, the recognition procedure is initiated (duration of approx. 30 seconds).

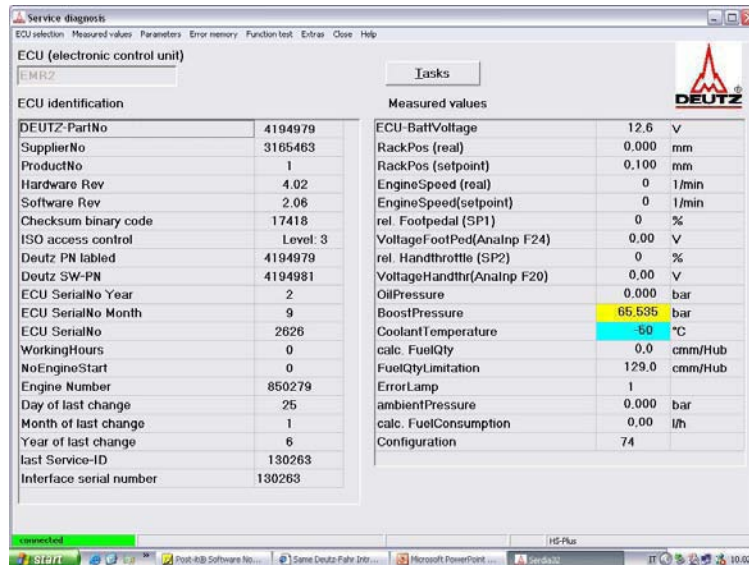
For engines with two control units (e.g. EMR and EMS2), it is possible to select the desired control unit by repeating the recognition procedure (v. 2.1).

6.1.3.5 PROCEDURE FOR COMMUNICATION WITH THE CONTROL UNIT

Possible communication procedure:

on successful completion of the communication procedure, the main "Diagnostic service" screen is displayed with the fields "ECUs", "ECU identification" and "Measured values" (see Control unit selection).

In addition to the selection menu, this screen also contains the "Activity" button (see "Activity").



The status of the communication between the PC/notebook and the control unit is indicated by text and a coloured indicator in the status bar:

Yellow (intermittent): ISO block processing, i.e. exchange of data (e.g. measured values) between SERDIA and the control unit.

Green (intermittent): ISO connection OK, i.e. blocks exchanged only to maintain active communication between SERDIA and the control unit.

Red: communication interrupted.

Communication procedure failure:

the communication procedure may fail for the following reasons:

- No control unit or interface connected
- An error has occurred during the communication procedure, see "Errors in the communication procedure".

In both cases an error message is displayed and SERDIA proposes offline mode, see "Offline mode".

6.1.3.6 OFFLINE MODE

If no control unit/ engine and/or interface is available, for training purposes SERDIA can be run in password protected mode or DEMO mode.

SERDIA proposes password protected mode and DEMO mode each time an error in the communication procedure is signalled.



Click on "OK". Select the required mode in the "Confirm" dialog box.



6.1.3.7 PASSWORD PROTECTED MODE

By clicking "Yes", authorised users can enter the password 4000000 in order to read, print, but not edit the data.



6.1.3.8 DEMO MODE (TRAINING WITHOUT A CONTROL UNIT)

Clicking "no" takes you to DEMO mode.

- 1) In this mode you can practise using SERDIA without any values.
- 2) You can read and print graphs stored in memory.

However it is not possible, for example, to test control unit functions.

6.1.4 PROGRAM COMMANDS

- 1) Launch the SERDIA program from Windows.
- 2) From the main SERDIA screen, click "ECU selection".
- 3) From the "ECU selection" screen, select the desired control unit.
- 4) From the main SERDIA screen, select the desired menu option

6.1.4.1 MAIN SCREEN, MENU SELECTION

Menu option	ECUs	Explanation
ECU selection		
ECU selection	all	Selection of the desired control unit (only one control unit may be selected at a time)
Print	all	Export measured values or control unit identification data to a printer or a file
Protocol	all	Port configuration (for Level IIIa only)
New recognition	all	Recognition of a new control unit
Load operating software	EMR2	Load operating software in EMR2 (for Level IIIa only)
Engine switched off	EMR2	Remote engine shutdown
Reset RG	EMR2	Reset control unit
Measured values		
Current measured values	all	Display of all current values (also with engine off, but with U-BAtt.)
RAM values	all	EMR1: Level IIIa only, EMR2: Levels III, IIIa only
In/Out assignment	all	Assignment of signals to pins of the control unit
CAN Status	all	Simple CAN monitor
Parameterization		
Configuration	all	Read and edit configuration
Complete programming		Levels III, IIIa only
Calibration		Calibration of values recorder, e.g. pedal travel transducer
Error memory		
Error memory	all	Read, display and cancel the error memory
Error memory 2	EMR2	Read, display and cancel the error memory (Levels III, IIIa only)
Function test		Command the actuators, e.g. operate the governor (Levels III, IIIa only)
Extra		
Maximum speed	EMR2	Selection of three different maximum speed values
Logistical data	all	
Collective load	EMR2	
Maintenance data		
Help	all	General help for the main screen and control buttons.
Activity	EMR2	For certain maintenance tasks

6.1.4.2 "ECU SELECTION" MENU OPTION

SERDIA can communicate with only control unit at a time.

For this reason, it is necessary to select the desired control unit from the menu "ECU selection".

For further information see "ECU selection".

6.1.4.3 "MEASURED VALUES" MENU OPTION ("CURRENT MEASURED VALUES")

You can select and display a number of values from a list of measured values, including inputs and outputs.

Any values that have exceeded a minimum or maximum limit (where applicable) are highlighted in colour.

Only those measurement points related to the control unit are displayed with the distinction:

- read values
- read electronic system values

arranged by

- definition
- value
- unit

The values are updated at predefined intervals. They can be displayed with the engine stopped or with the engine running.

For further information see "Measurement values".

6.1.4.4 "PARAMETERISATION" MENU OPTION

The numerous possibilities offered by DEUTZ control units mean that programming can be specifically targeted to the conditions in which the tractor is to be used. Changes to the parameterization may be necessary for a number of reasons; on request from the customer, for adaptation to local conditions or following renewal of a control unit.

Changes to the parameterization are only possible with SERDIA!

With this menu, changes are made even to the screwdriver settings required by analog control units.

Individual parameters can be modified within predefined limits (such as dynamic behaviour, for example).

Parameterization is divided over two separate screens, one for configuration and one for calibration. Access to the fields of the various screens is restricted according to the user level. Fields which the user is not authorised to access are not displayed.

6.1.4.5 "ERROR MEMORY" MENU OPTION

With this menu option you can retrieve the error messages stored in the control unit memories.

The error messages relate exclusively to the electrical components of the engine, such as the multipin wiring connector and the values recorder.

For example, an error message could read "general anomaly or open/short circuit".

Only passive error messages may be cancelled; active error messages remain in memory.

Active error messages are converted into passive error messages once the error has been eliminated.

The error messages will remain in memory even if the battery/power supply is connected.

The following information is displayed along with the error messages:

- position of error
- type of error
- ambient data at time error occurred
- total number of errors (of the positions)
- frequency
- status of the error (active / passive)
- emergency operation (yes / no)

SERDIA provides auxiliary means for the elimination of errors. The "Measurement values" and "Function test" menu options may also be used. For further information, see "Error memory".

6.1.4.6 "FUNCTION TEST" MENU OPTION

SERDIA supports numerous function tests specific to the various control units (e.g. governor test for the EMR2).

The function test provides a valuable tool for fault tracing and maintenance operations.

For example, the individual outputs of the control units can be activated in the function test mode.

WARNING: the engine must be switched off

During function tests, the actuators of the tester program activated by running the software of the control unit.

The actuators are switched on and off in the nominal value column by clicking the check box next to the description of the actuator. The changing status of the actuator in response to being activated by the control unit is displayed in the effective value column.

Control of the status of the actuator always resides with the control unit and can be transmitted to SERDIA only from the control unit itself. In other words, if the desired effective value is not obtained, the reason probably lies in a wiring fault. The combined use of the "Error memory" and "Operating test" menu options may be useful to help identify the cause of the error.

For further information on function tests, see the relative chapter.

6.1.4.7 "TOOLS" MENU OPTION

SERDIA supports numerous specific instruments for the various control units.

A number of submenus can be accessed, each of which contains its own menu screen:

- Maximum speed
- Logistic data
- Collective load
- Maintenance exceeded
- Memory override
- Maintenance data

For further information, see "Tools".

6.1.4.8 HELP

In addition to these instructions, information on the use of SERDIA can be obtained from the program's own Help function.

From Windows, click

the "Help" button.

6.1.5 TERMINATE COMMUNICATION

Before disconnecting the notebook from the engine control unit, return to the main menu and click the "Exit" button.

If parameters have been changed, it may be useful for safety reasons to carry out a check of the current parameterization.

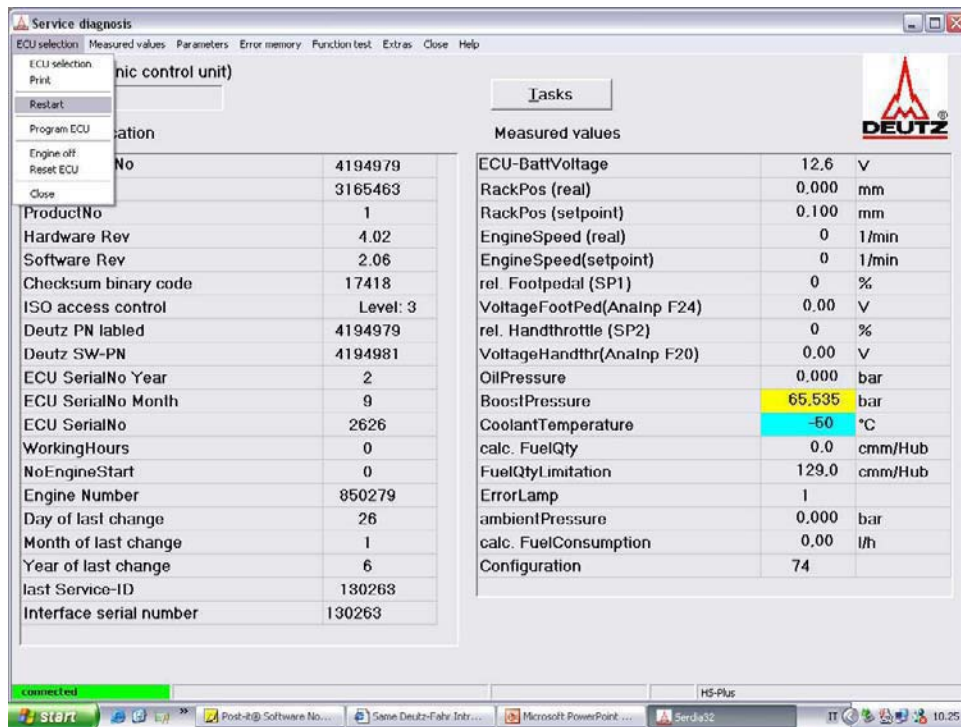
To do this, proceed as follows:

1. Close SERDIA
2. Switch the power to the engine off and then on again.
3. Relaunch SERDIA
4. Reactivate the control unit
5. Select the "Parameterization" menu option
6. From the configuration screen, click on the "CENTR->PC" button
7. Export the configuration data by clicking on the "Print" button
8. Print the engine documentation
9. Always quit SERDIA by clicking "Exit" before disconnecting the engine control unit from the notebook (interface cable).

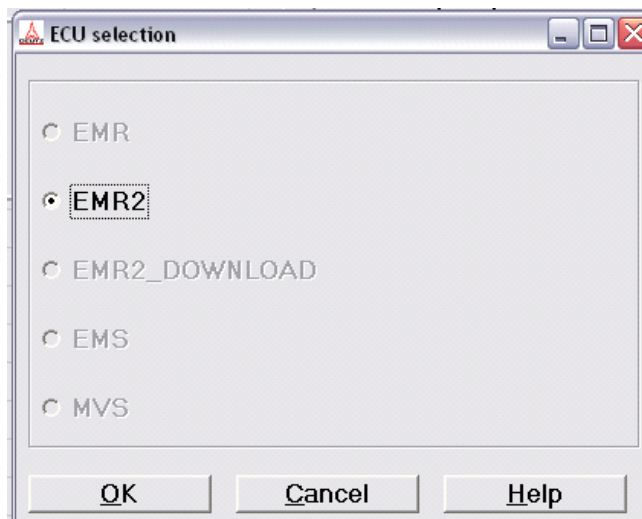
6.2 ECU SELECTION

6.2.1 SELECTION OF TWO ECUs

SERDIA automatically tries to reconnect the last control unit to be recognised. If another control unit has been selected, it will be necessary to repeat the control unit recognition procedure using the menu options "ECU selection"/ "New recognition" (duration approx. 30 seconds).



After performing the recognition procedure, the program displays the ECU selection screen, which presents only those control units which have been recognised. Control units that cannot be selected are displayed in grey.

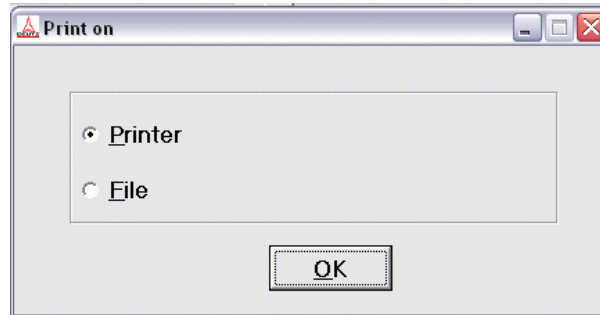


Possible control units:

- EMR1, EMR2 (electronic engine governor)
- MVS (electromagnetic valve system)
- EMS2 (Engine Monitoring System)

6.2.2 PRINT (EXPORT)

The identification data of the selected control units and the data in the other windows can be exported in two ways:



1) Printing on paper

To do this you need to select an appropriate printer driver in Windows.

The logistical data appear at the top of all printouts:

- type of control unit
- Date
- time (system time determined by the notebook)
- serial port number

The control unit identification data and the measured values data are also displayed.

2) Printing to a file

The file thus created can be processed using Excel, for example.

The following table illustrates the possible ways in which the data contained in the various screens can be saved in memory:

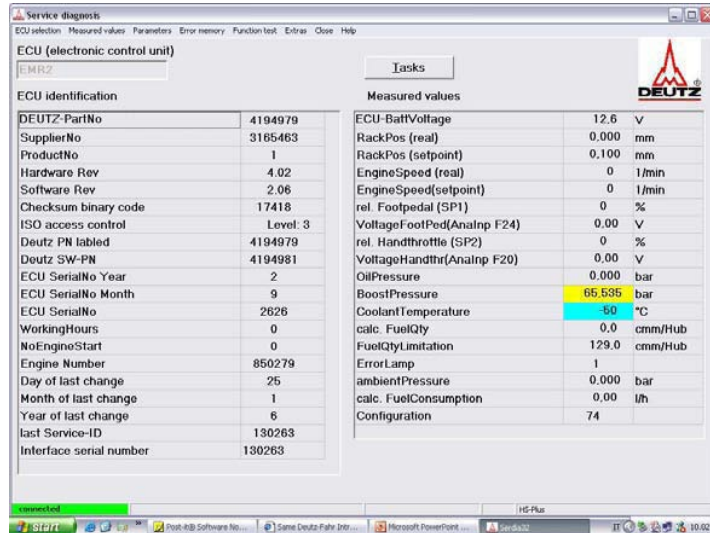
- as printable files for further processing
- as configuration files for the communication of modifications
- as graphic files (*.egr) that can be read in SERDIA demo mode.

From the screen	Button	Extension	Comment
Diagnostics Service	Print (file)	*.ecu	for further processing, in Excel for example
Current measured values	File	*.msv	
RAM values	File	*.msv	for further processing, in Excel for example (EMR1: Level IIIa only, EMR2: only Level III, IIIa)
Graphic	(Ascll)	*.agr	for further processing, in Excel for example
	(Binary)	*.egr	can be read in SERDIA demo mode
Input/Output	Print (file)	*.ino	for further processing, in Excel for example
Configuration	Print (file)	*.kfg	
	Save to a file	*.hex	configuration file
		*.tds	partial record , Level IIIa only
Complete programming	ECU-->file	*.hex	configuration file (complete records, Level III and IIIa)
Error memory	Print (file)	*.err	for further processing, in Excel for example
Logistical 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 SIGNIFICANCE OF THE IDENTIFICATION DATA

- DEUTZ article code: article code of the selected control unit.
- Commercial partner code: commercial partner code:
- Product number:
Type of ECU selected:
1 = EMR1, EMR2
2 = MVS
3 = EMS2
- Hardware version number: the control version.
- Software version number: the number of the EEPROM installed in the control unit. If the digit to the left of the decimal point is changed (e.g. from 2. 1 to 3.1), the record will not function on the control unit. In this case it will be necessary to contact the manufacturer.
- Checksum binary code: binary code
- ISO access command: ISO access commands
- TN DEUTZ with label: label number
- DEUTZ operating software article code:: Deutz software article code
- ECU serial number - Year serial number - Month serial number: year and month serial numbers
- Hours of operation: number of hours that the engine has been running
- Number of times the engine has been started
- Engine number
- Day of last modification - Month of last modification - Year of last modification: date on which control unit parameterization was performed
- Last ID Service: serial number of the interface used during the last intervention. The initial digit indicates the level of intervention.
- Interface serial number: serial number of the interface currently used.

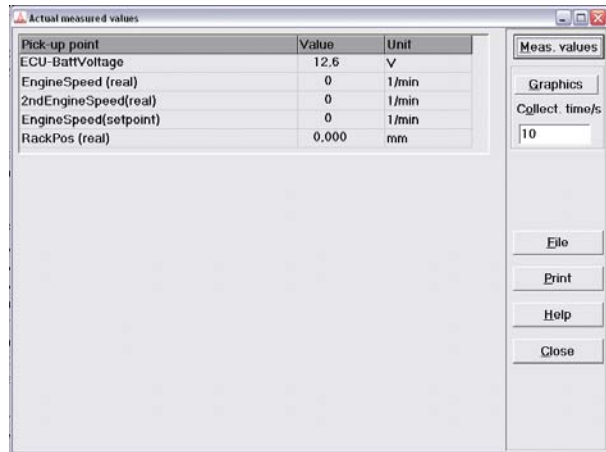
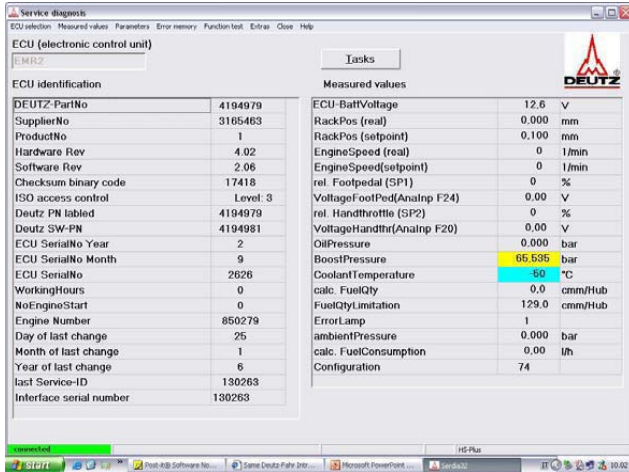
6.2.4.2 MEASUREMENT DATA

Some of the measured values are displayed directly in the field "Measured values". This selection cannot be configured.

6.3 MEASUREMENT VALUES

6.3.1 CURRENT VALUES (IN GENERAL)

The values measured are read cyclically and displayed in the "Current measured values" screen.



Values outside the sensor measurement ranges are highlighted in colour:

- Yellow: value over measurement range
- Blue: value below measurement range

EXPLANATION OF THE FUNCTION KEYS:

- **Measured values:** the "Measured values selection" window is displayed with all the available measure values. In this you can also select the values that are to be displayed. generally speaking, the fewer the values displayed the greater the frequency with which the display is updated. The number of available values varies according to the type of control unit.
- **Graphics:** the "Graphics" button serves to display in graphic form the variations in the selected measured values (max. 5) over time. If more than five measurement values are selected, an error message will be displayed.
- **Duration of measurement:** the duration of the measurement reading is indicated in seconds in the field "Duration of measurement". The minimum value of measurement duration is one second. The maximum value can be set to several hours (expressed in seconds).

The standard setting is 10 seconds. The shortest measurement time is 40 ms for RAM values, and 60 ms for all other values.

A measurement duration of 10 seconds gives:

for RAM values, $10,000 \text{ ms} / 40 \text{ ms} = 250$ measurement points,
for other values, $100,000 \text{ ms} / 60 \text{ ms} = 166$ measurement points.

Given that the program supports a maximum of 2000 measurement points, before recording the data, the measurement frequency is automatically adjusted.

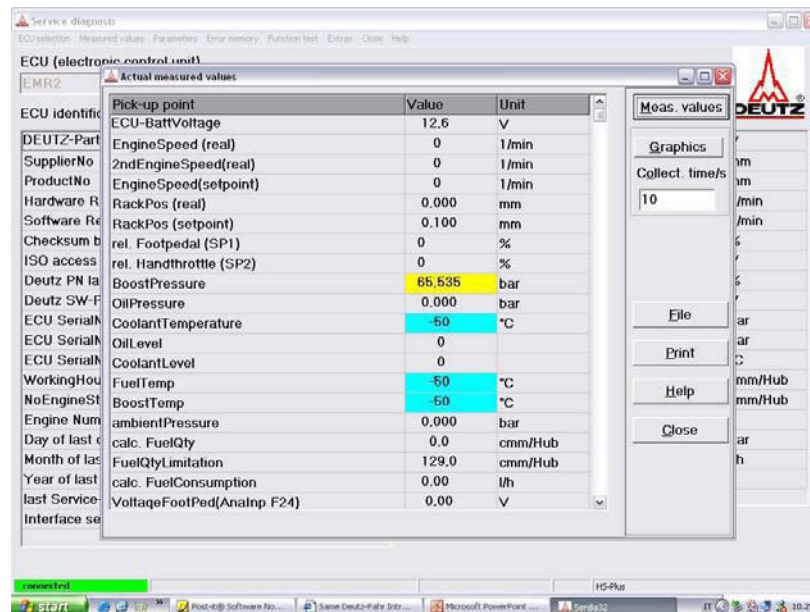
The minimum possible measurement frequency is determined by the duration of data transmission from the control unit to the PC.

The greater the number of measurement values to be displayed simultaneously, the greater the amount of time taken for data transmission and thus the lower the measurement frequency.

- **File:** updated measurement data can be saved in a file and subsequently recalled for further processing, using Excel, for example.
- **Print:** prints the displayed measurement values.
- **Exit:** returns to the main "Diagnostic service" screen.

6.3.1.1 SELECTION OF MEASURED VALUES

Displays the list of available measured values



From this list you can select the values to be displayed. To select a value, click the corresponding check box. No more than five values can be selected at a time for graphic representation (v. 3.1.2 Graphics).

To activate or deactivate a greater number of values, use the four buttons on the right of the list, which have the following functions:

- **Save:** saves the selection of measured values in a file.
- **Open:** reads the selection of measured values from a file.
- **Cancel selection:** deactivates display of all values.
- **Select all:** activates display of all values.
- **OK:** returns to display of current values. Modifications to the values selection are saved in memory.
- **Exit:** returns to display of current values. Modifications to the values selection are cancelled.

The following tables indicate the measured values that can be displayed. For some parameters, it will be necessary to perform a configuration operation (see chapter 4 "Parameterization"), in which certain measurement points can be assigned to the EMR1/EMR2 inputs/outputs ("Configuration" menu, page 11: "Assignment of inputs to measured values" page 13: and "Assignment of outputs to measured values"). The values necessary for configuration of the parameters are indicated in the table. The assignment can be checked in the "Measured values" menu, in the window "Illustration of inputs/outputs" (see "Inputs/outputs").

6.3.1.1.1 EMR2 MEASURED VALUES

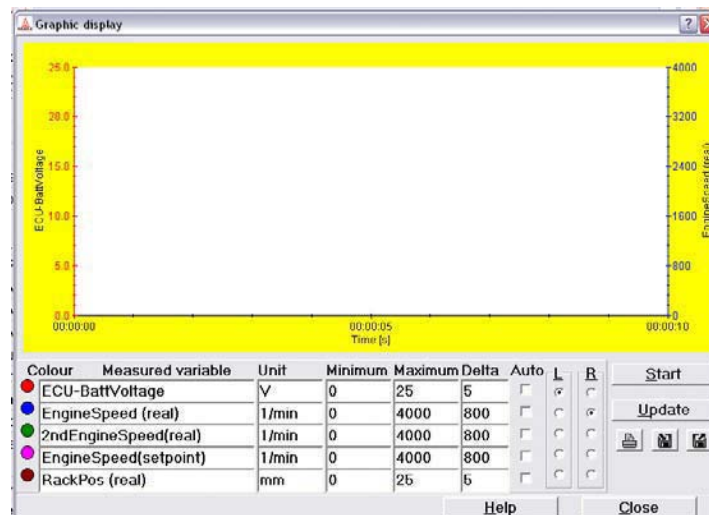
VALUE SELECTION

Definition of measurement points	Description	Corresponding RAM value
	Battery voltage	
	Number of revolutions 1 (crankshaft)	2000
	Number of revolutions 1 (crankshaft)	2031
	Number of revolutions 2 (camshaft)	2002
	Control rod travel	2300
	Control rod travel	2330
	Coolant temperature	2904
	Fuel temperature	2906
	Intake air temperature	2905
	Accelerator potentiometer voltage	2900
	Hand throttle	
	Hand throttle	2901
	Intake air pressure	2902
Oil pressure	Oil pressure	2903
Atmospheric pressure	Atmospheric pressure	2930
Coolant level	Coolant level	2820
Engine brake status	Engine brake status	2826
Gearbox status	Gearbox status	2827
Error warning light status	Error warning light status	2868
Origin of engine stop		
Speed limit.		
limit.	Driving speed	
Fuel consumption calculation	Fuel consumption	2360
Injected quantity calculation	Injected quantity	2350
Quantity limitation	Quantity limitation	2701
Quantity limitation active	Quantity limitation active	
Predefined nominal value active		
Performance reduction active		
Curve active		3145
Revs. limitation active		
	Oil pressure warning signal (optional)	
	Torque (optional)	
Output: (F16) frequency	Number of revs 1 Number of revs 2	2000 2001 2002
Output: (F16) digital 7		2857

Output: (M2) digital 3		2853
Definition of measurement points	Description	Corresponding RAM value
Input(F6) digital 3	Input	2854
Input (F18) dig./PWM 1	Input	2856
Input (F18) dig./PWM 1	Input	
Input (F19) Digitale 4	Input	
Input (F20) Dig./Analog. 3	Input	
Input (F21) Dig./PWM 2	Input	
	Input	
	Input	
	Intake air temperature	2905
	Fuel temperature	2906
	Input	
	Coolant temperature	2904
	Input, Oil pressure sensor	
	Input , intake air temperature sensor	

6.3.1.2 GRAPHICS

If you select a maximum of 5 measured values, clicking the "Graphics" button displays the window "Graphic representation".



The measured values are displayed in a window (from minimum to maximum).

The scales of the axes are indicated in the "Delta" column.

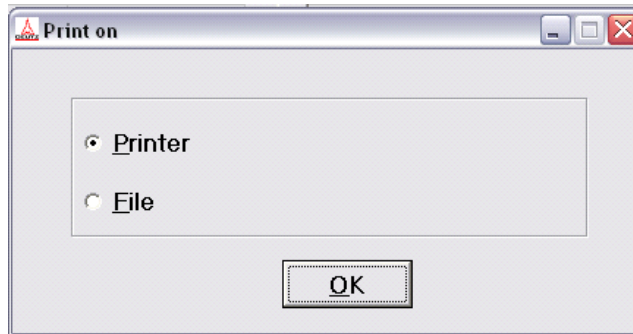
If the "Auto" check box is ticked, the graph scale will be automatically selected by the program. As the program prepares the graph taking into account the minimum and maximum values of the various measured values, the automatic scale function cannot be applied in cases of measured values that are constant over time.

A maximum of two axes are drawn, one on the left and one on the right of the graph window.

Values can be assigned to the axes in the columns L (left) and R (right).

EXPLANATION OF THE FUNCTION KEYS:

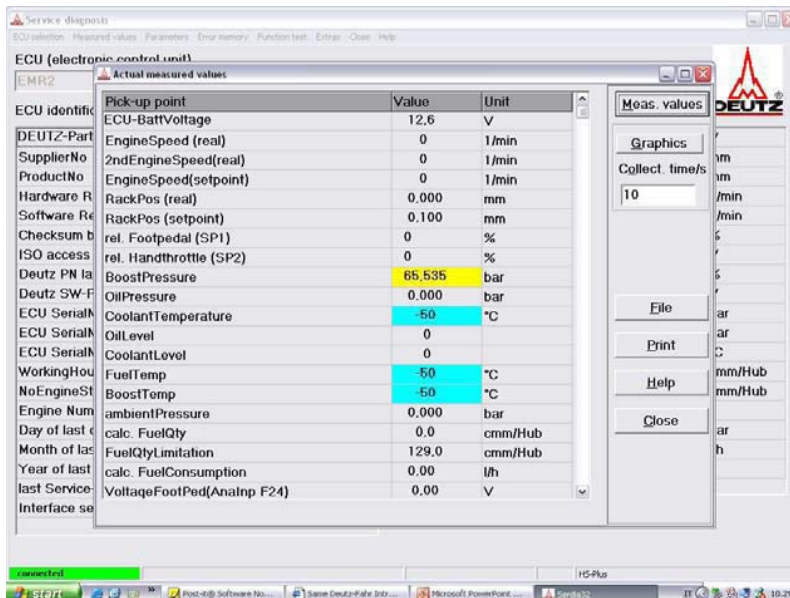
- **Start:** initiates data recording.
- **Update:** updates the information displayed. Updating is necessary if the minimum, maximum or delta value has been modified. Updating will take account of the new values.
- **Print:** by clicking this button, the data can be sent to a printer First the printer selection screen is displayed, the operator can enter a comment and finally the data are printed.
- **Save:** the graphs can be saved to a file in two ways:
 - 1) as an ASCII file (*.agr) for further processing using Excel. for example
 - 2) as a binary file (*.egr) for subsequent offline graphic representation, v. 1.9 Offline mode.



- **Open:** The graphic information saved in a file are read and displayed.

6.3.2 RAM VALUES

The RAM values are calculated from the measurement values by the microprocessors of the control units and are then made available by SERDIA.



The following table illustrates the possible RAM values which are to be used by EMR2 control units.

2000Speed	2283PreheatActive	2701FuelLimitMax
2001SpeedPickUp1	2284PostheatActive	2702FuelLimitStart
2002SpeedPickUp2	2285StartReadActive	2703FuelLimitSpeed
2003SpeedPickUp1Value	2300ActPos	2704FuelLimitBoost
2004SpeedPickUp2Value	2330ActPosSetpoint	2705FuelLimitSimBoost
2005ActivePickUp	2350FuelQuantity	2706FuelLimitVelocity
2025SpeedGradient	2353FuelQuantityCorr	2707FuelLimitCan
2031SpeedSetp	2360FuelConsumption	2710FuelLimitMinActive
2032SpeedSetpRamp	2361FuelEconomy	2711FuelLimitMaxActive
2033SpeedSetpSelect	2400Can:Online	2712StartLimitActive
2041DigitalPotOffset	2401Can:RxTelActive	2713SpeedLimitActive
2100P_CorrFactor	2402Can:RxTelTimeOut	2714BoostLimitActive
2101I_CorrFactor	2403Can:RxTelVoltTimOut	2715SimBoostLimitActive
2102D_CorrFactor	2404Can:RxIRCount	2716VelocityLimitActive
2110FuelSpeedGovernor	2405Can:TxIRCount	2717CanLimitActive
2111SpeedGov:P-Part	2406Can:BusOffCount	2720SpeedLimit1Active
2112SpeedGov:I-Part	2407Can:RxBufOverflow	2721SpeedLimit2Active
2113SpeedGov:D-Part	2408Can:Tx0BufOverflow	2722SpeedLimit3Active
2115StaticCorrActive	2409Can:Tx1BufOverflow	2723ReduceCan
2120DroopPresent	2410Can:FragBufOverflow	2724ReduceOilPressure
2130IMFuelSetp	2411Can:SetpointPhase	2725ReduceCharAirTemp
2131IMFuelSetpSelect	2412Can:SetpointError	2726ReduceCoolantTemp
2132IMOrAllSpeedGov	2533FuelTempFuelCorr	2727ReduceAmbientPress
2133IMGovAtMaxOrIdle	2600EngineNo:Low	2730SetpLimitCan
2134IMFuelSetOrGovernor	2601EngineNo:High	2731SetpLimitVelocity
2135IMSetpoint	2602FunctionSetNo:Low	2740Setp1Source:Analog
2140TorqueSetpoint	2603FunctionSetNo:High	2741Setp1Source:PWM
2141TorqueReserveMax	2604CanSetNo:Low	2742Setp1Source:Subst
2142TorqueReserveCurve	2605CanSetNo:High	2743Setp1Source:Can
2143TorqueLimitMax	2606ASAP2SetNo	2750CurrSetp:Setpoint1
2144TorqueLimitCurve	2607SerdiadID:Low	2751CurrSetp:Setpoint2
2145TorqueLimitCurveAct	2608SerdiadID:High	2752CurrSetp:SpeedFix1
2150EngineBrakeActive	2609SerdiadDate:Day	2753CurrSetp:SpeedFix2
2251LimitsDelay	2610SerdiadDate:Month	2754CurrSetp:Freeze
2280GlowPlugActive	2611SerdiadDate:Year	2755CurrSetp:FreezeSetp
2281FlameGlowPlugActive	2612EOLDate:Day	2756CurrSetp:HoldButton
2282FlameValveActive	2613EOLDate:Month	2757CurrSetp:MinButton
	2614EOLDate:Year	2758CurrSetp:MaxButton

2759CurrSetp:Calldle
2761CurrSetp:Veloldle
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

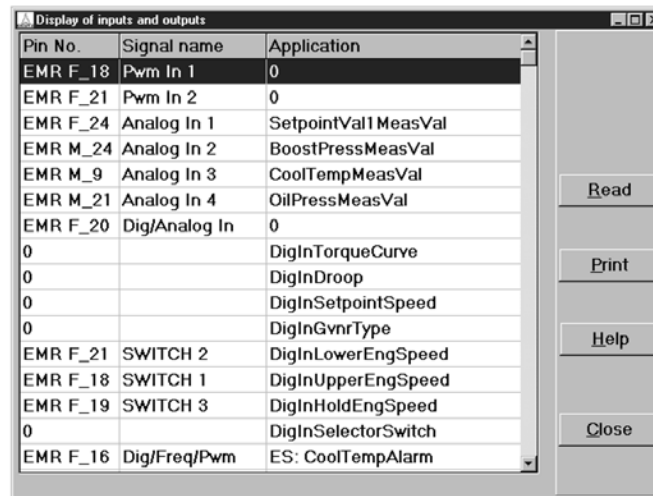
3287S2ErrAmbPressure
3290S2ErrData
3293S2ErrStack
3294S2ErrIntern
3300Velocity
3350EGRValveActive
3351EGRFuelFilter
3352EGRBoostLimitActive
3353EGRFuelActive
3354EGRCoolantActive
3355EGRAmbientActive
3356EGRMapActive
3500PWMin1
3501FrequencyIn1
3502PWMin2
3503FrequencyIn2
3510AnalogIn1
3511AnalogIn1_Value
3520AnalogIn2
3521AnalogIn2_Value
3530AnalogIn3
3531AnalogIn3_Value
3540AnalogIn4
3541AnalogIn4_Value
3550TempIn1
3551TempIn1_Value
3560TempIn2
3561TempIn2_Value
3570TempIn3
3571TempIn3_Value
3600ServoCurrent
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

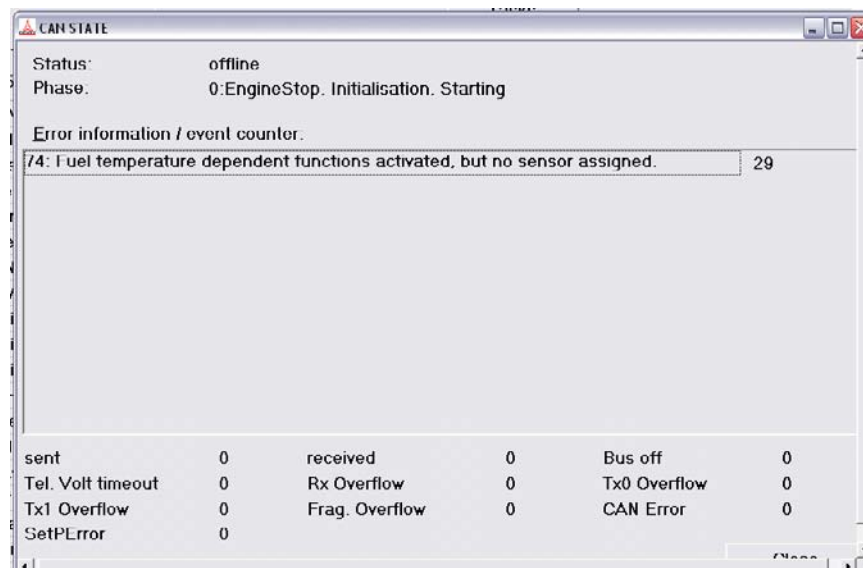
The inputs and outputs can be configured. This menu option displays the current settings of the input and output signals.



Pin No.	Signal name	Application
EMR F_18	Pwm In 1	0
EMR F_21	Pwm In 2	0
EMR F_24	Analog In 1	SetpointVal1 MeasVal
EMR M_24	Analog In 2	BoostPressMeasVal
EMR M_9	Analog In 3	CoolTempMeasVal
EMR M_21	Analog In 4	OilPressMeasVal
EMR F_20	Dig/Analog In	0
0		DigInTorqueCurve
0		DigInDroop
0		DigInSetpointSpeed
0		DigInGvnrType
EMR F_21	SWITCH 2	DigInLowerEngSpeed
EMR F_18	SWITCH 1	DigInUpperEngSpeed
EMR F_19	SWITCH 3	DigInHoldEngSpeed
0		DigInSelectorSwitch
EMR F_16	Dig/Freq/Pwm	ES: CoolTempAlarm

6.3.4 CAN Status

This window displays the CAN bus activities of the EMR1 and EMR2 control units.



Status:	offline				
Phase:	0:EngineStop. Initialisation. Starting				
Error information / event counter:					
/4: Fuel temperature dependent functions activated, but no sensor assigned.					29
sent	0	received	0	Bus off	0
Tel. Volt timeout	0	Rx Overflow	0	Tx0 Overflow	0
Tx1 Overflow	0	Frag. Overflow	0	CAN Error	0
SetPError	0				

- **Sent:** contains the Can:TxCounter information (from 0 to 65,535 words). This value increases each time a CAN signal is sent and indicates the data transmission activity of the EMR1 control unit.
- **Received:** contains the Can:RxIcCounter information (from 0 to 65,535, words). This value increases each time a CAN signal is sent and indicates the data transmission activity of the EMR1 control unit.
- **Bus Off:** counter that indicates the frequency with which the EMR1 control unit is disconnected by the CAN bus due to permanent errors (CanBusOff-Counter from 0 to 255, byte).
- **Status:** CanOnline indicates if the EMR1 control unit is active on the CAN bus. The value 1 for online and the value 0 for offline is transmitted via the ISO 9141 interface. The SERDIA program displays the text "on-line" (for value 1) or "offline" (for value 0).

- **Phase:** The CanSetPointPhase variable (from 0 to 255, byte) is transmitted via the ISO 9141 interface. This variable indicates the duration of the predefined nominal value:

Phase	Text
0	MotSteht, initialization, startup procedure
1	MotSteht, stop phase 1, no CAN error
2	MotSteht, stop phase 2, CAN timeout error
3	MotStartet, until idle speed is recognised
4	MotLäuft,, EMR1 waits for nominal value via CAN
5	MotLäuft,, predefined nominal value via CAN ok
6	MotLäuft,, emergency operation, nominal value via CAN procedure interrupted
7	This phase is not present

ERROR INFORMATION / EVENTS COUNTER

The EMR1 sends the special CanErrorNumber (from 0 to 255 bytes) for CAN bus errors via the ISO 9141 interface. Serdia assigns a text to this number, which is displayed in the CAN interface window.

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	diagnosis object not activated
6	scanrate 0 in a diagnosis message
7	scanrate 0 in a nominal value telegram
8	configuration number of nominal revs 6 not suited to TSC2 activation
9	TSC1 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	interrupted reception message
101	nominal value telegram interrupted with engine stopped (exchange value)
102	nominal value telegram missing with engine stopped for insufficient battery voltage
103	nominal value telegram missing after starting engine for insufficient battery voltage
104	nominal value telegram missing after starting engine, substitute value not utilised
105	nominal value telegram missing with engine running, substitute value used

Special treatment is required in the case of timeout errors for reception messages. These messages are always accompanied by error number 100.

To identify which message caused the timeout error, SERDIA proceeds as follows:

- CanRxObjActive, which indicates the active messages, i.e., messages effectively received by bit.
 - CanConf_bits contains the configured reception messages by bit.
- SERDIA denies CanRxObjActive by bit (message not active) and then performs an AND connection by bit with CanConf_bits. This obtains the reception messages by bit that are configured and not active (CanRxTimeOutBits). Each bit of CanRxTimeOutBits is assigned a text that represents the names of the various reception messages. Since all the bits cannot be used, inserting "dc" for "don't care" in the text determines the exclusion of the text for the relative bit.
- If the text "100 reception message interrupted", the text of the list of missing reception messages will also be generated .

Example of error information displayed:

100 reception message interrupted
 engine temperature
 engine oil level / oil pressure
 function commutation
 intake / exhaust gas conditions

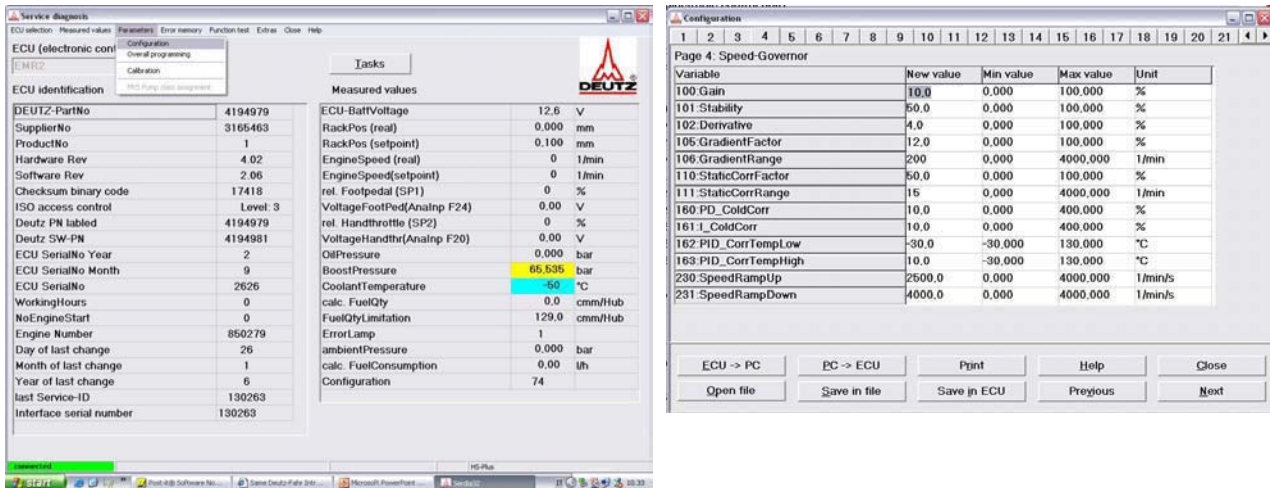
VanRxTimeOutBit	Text
0	Engine temperature
1	Intake / exhaust gas conditions
2	Engine oil level / oil pressure
3	TSC1
4	Engine protection
5	Function commutation

6.4 PARAMETERS

6.4.1 CONFIGURATION (GENERAL)

IMPORTANT NOTES

- 1 - Before making any modifications, for safety reasons, always make a backup of the original data record.
- 2 - Tests with the engine running may only be carried out for PID values and these are to be performed exclusively by trained personnel.
- 3 - Incorrect settings may damage the engine!



CONFIGURATION PROCEDURE

Clicking the "Parameterization" option on the menu bar takes you to the "Configuration" screen. The configuration procedure is as follows:

- On the heading, click on the tab of the desired page, or
- using the "Next" and "Previous" buttons, scroll through the page containing the parameters to be set (e.g.: 'accelerator pedal (SWG1) upper reference' on page 10: transducer calibration-nominal values).
- Click with the mouse in the "New value" field and enter the required numeric value, which must lie between the indicated minimum and maximum values.
- Click "PC->CENTR". All the configuration data are transmitted to the control unit. At this point the data have been transferred to the control unit and may be used to test the engine parameter settings. However all these data will be lost on disconnecting the power supply.
- save the record in the control unit memory by clicking "Save in ECU" (all the data will be overwritten).
- The data can read and displayed using "CENTR->PC".
- If the engine function test gives a positive result, the record can be saved on the hard disk or diskette using the "Save in file" button.

EXPLANATION OF THE FUNCTION KEYS:

- **ECU->PC:** reads and displays the configuration data from the control unit.
- **PC->ECU:** sends the modified configuration data to the control unit. To save the data, click the button "Save in ECU."
- **Open file:** reads and displays the configuration data from a file (*.hex).
- **Save in file:**
Yes: if desired, the configuration data can be grouped together and saved as a partial record
No: all the configuration data are saved in a file (*.hex).
The program proposes the engine number as the name for the file, but the user does not have to accept. Other names can be used. Then click on OK. The file (i.e., the engine data record) is saved with the name<enginenum>.hex.
- **Save in ECU:** permanently saves the configuration data in the control unit memory

WARNING!

- **Do not make any modifications to the parameterization unless there are clear and carefully-considered reasons for such changes and there is clear information on the value to be changed.**
- **All changes to the configuration must be reported.**
- **The procedure for reporting changes is described in service bulletin 0199-99-9827**
- **Previous:** displays the data of the previous screen.
- **Next:** displays the data of the previous screen.
- **Print:** export the indicated configuration data to a printer. The configuration window can be printed specifying individual pages, a range of pages (from page x to page y) or in its entirety.

6.4.2 COMPLETE PROGRAMMING

Saving of the data contained in the control unit:

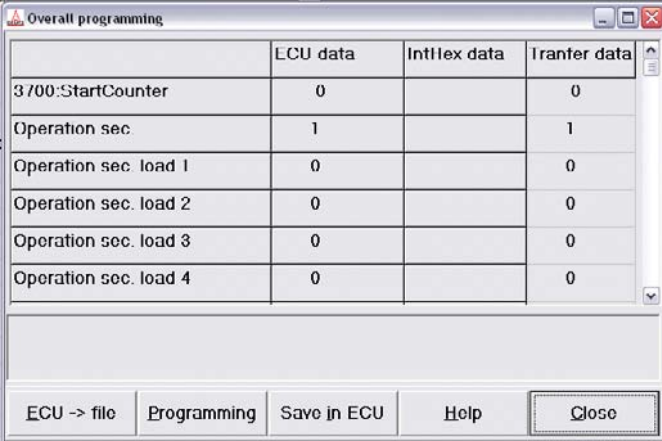
- Read the control unit data using "ECU->file". The "Save with name" window is displayed.
- Save data under the required name <filename>.hex.
The user can enter any name he chooses in place of the proposed file name <enginenum>.hex. Then press OK to confirm. The file (i.e. the engine data record) is saved with the chosen name.

Complete programming of the control unit:

- Click "Programming"; the "Open" window is displayed.
- Select and open the desired file.
- Click on "Save in ECU".

Of the configuration data, only the operating data read from the control unit are displayed (second column) or from a third file (third column). Before transmission of the configuration data to the control unit, the operating may be modified in the fourth column. These data will then be transmitted along with the configuration data to the control unit.

Complete programming is not possible in Level I or II.



	ECU data	Intillex data	Transfer data
3700:StartCounter	0		0
Operation sec.	1		1
Operation sec. load 1	0		0
Operation sec. load 2	0		0
Operation sec. load 3	0		0
Operation sec. load 4	0		0

ECU -> file Programming Save in ECU Help Close

EXPLANATION OF THE FUNCTION KEYS:

- **ECU->file:** The configuration data are read from the control unit, displayed and saved to memory in the form of a HEX file.

Programming:

the modified configuration data or present in the form of a HEX file are transmitted to the control unit. To export the data definitively, click on "Save in ECU" in the EMR1.

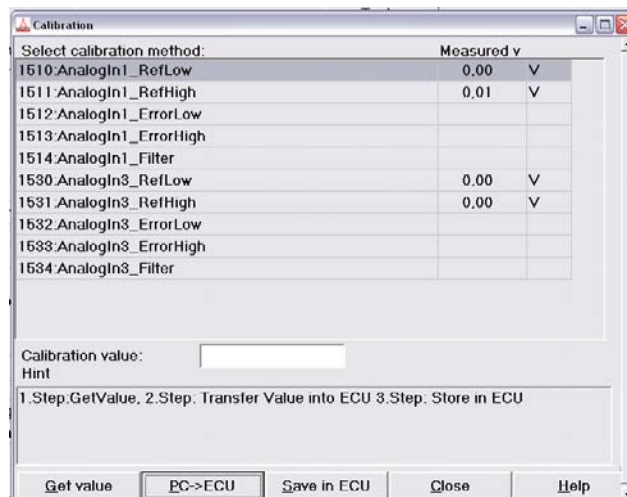
- **Save in ECU:** permanently saves the configuration data in the control unit.

6.4.3 CALIBRATION

The calibration of system components is only possible via the diagnostics interface. This requires the use of the SERDIA diagnostic software. Along with the EMR1, it will be necessary to calibrate the accelerator pedal and (if present) the hand throttle potentiometer (does not applicable to assemblies).

Important requirements:

- engine stopped
- power supply (ignition/terminal 15) switched on
- accelerator pedal installed



EXPLANATION OF DEFINITIONS (EXAMPLES):

- 1510.... = accelerator pedal transducer pin F24
- 1530.... = normal accelerator potentiometer pin F20

GENERAL PROCEDURE FOR CALIBRATION:

- Select the dimension for calibration in the upper window.
- Move the accelerator pedal/ hand throttle potentiometer to the desired position.
- "Read value" button active: click the button, the calibration value assigned to a position is displayed in the edit field.
- "Read value" button inactive: enter the calibration value on the edit field.
- Export the calibration value to the control unit using "PC->ECU".
- Save the calibration value in the control unit memory using "Save in ECU".
- Switch the ignition on and then off.

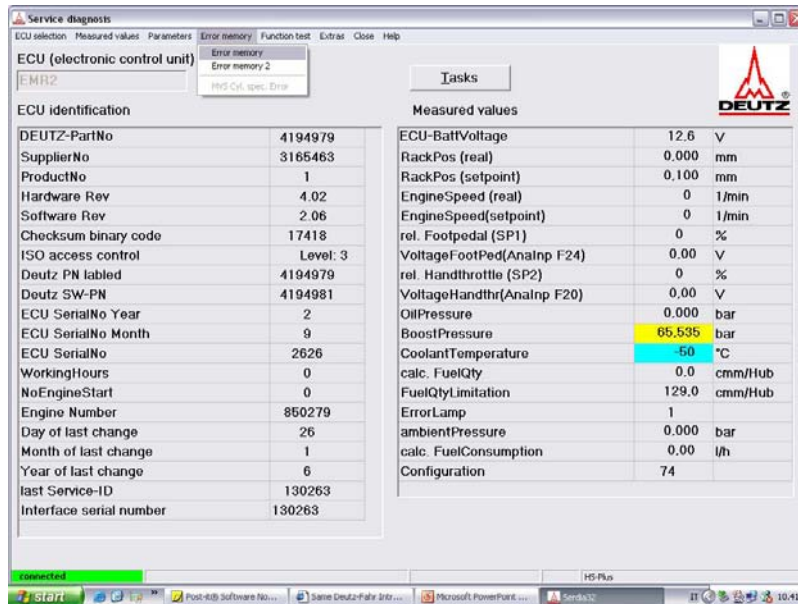
EXPLANATION OF THE FUNCTION KEYS:

- **Read value:** if the "Read value" button is active, by clicking on it the user can read the calibration value corresponding to a position of the accelerator pedal.
- **PC->ECU:** The calibration value displayed is transmitted to the control unit.
- **Save in ECU:** the configuration data are permanently saved in the control unit memory.

6.5 ERROR MEMORY

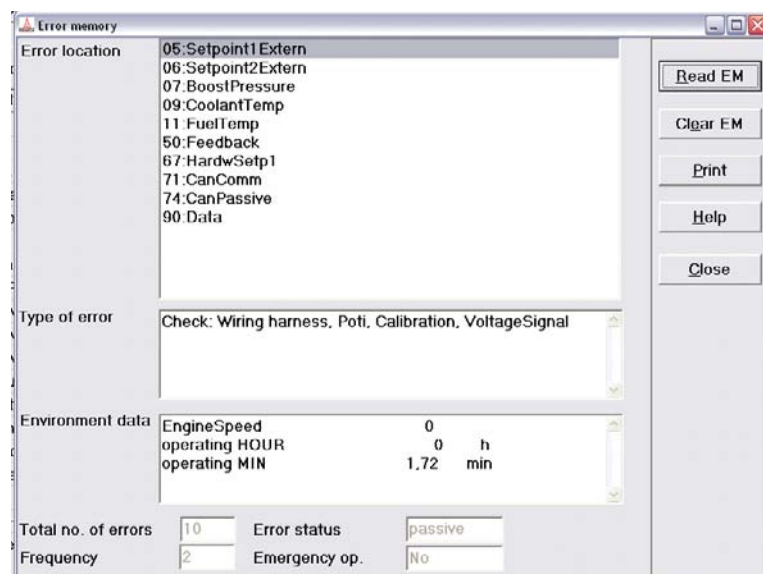
6.5.1 GENERAL INFORMATION

The errors memory list the anomalies that have been diagnosed since the last time the memory was cancelled. Selecting the menu option "Errors memory" displays the current contents of the memory.



When an error is eliminated, the corresponding error message can be cancelled in the "Errors memory" window:

- To display the error memory messages, press the "Read EM" button.
- In the "Error position" window, select with the mouse the displayed error position (e.g.: "8112:(M17) control rod travel sensor"). The error position will be highlighted in grey.
- Click on the "Cancel EM" button. The error position will be cancelled and the message will disappear.
- Click on "Exit" to quit "Error memory".



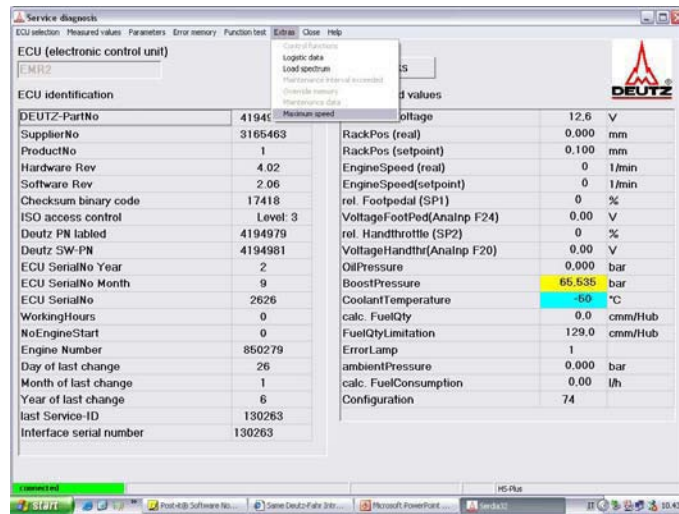
DESCRIPTION OF THE FIELDS

- **Error position:** list of error positions from which you can select an error position to access more detailed information. Given that some components have a number of different causes for errors, some of the error positions in this list may be repeated. For example, oil pressure warning: performance level and extinguishing limit.
- **Error type:** all the data in this field refer to the error position selected in the list in the field above.
- **Ambient data:** additional information (e.g. measurement dimensions), regarding the selected error position.
- **Total no. of errors:** total number of error positions recorded.
- **Frequency:** frequency with which the selected error position appears.
- **Error status:** active or passive status of the selected error

EXPLANATION OF THE FUNCTION KEYS:

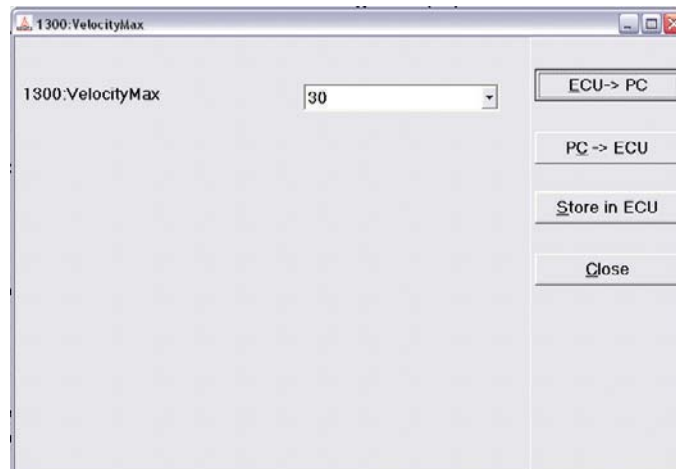
- **Read mem.:** imports the error memory from the control unit and updates the display accordingly.
- **Cancel Mem:** sends a request to the control unit to cancel the error memory.

6.6 EXTRA



6.6.1 MAXIMUM SPEED

In this screen you can select three different top speeds for the vehicle (30, 40, 50 km/h).



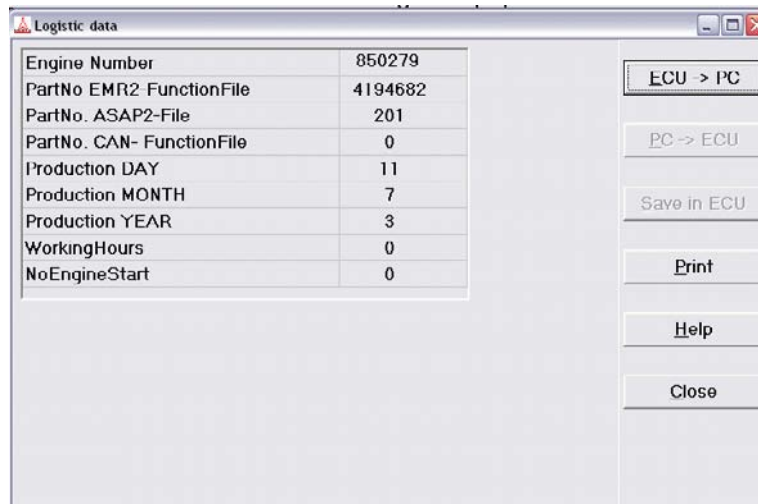
6.6.2 LOGISTICAL DATA

In this screen you can display and print the logistical data from the control unit.

EMR1/EMR2:

- engine n.
- EMR functions record article code
- ASAP2 record article code
- date, month and year of completion
- EMR2 only:
- CAN functions record article code
- hours of operation
- number of engine starts

Writing and saving of data from the control unit are restricted to DEUTZ AG.



6.6.3 GENERAL LOADS

This screen presents an overview of the engine speeds and loads under which the engine has been operated. The data recorded in the control unit can be cancelled by users with the highest level of access authority.

Limitation: EMR2 and EMS2 only

6.7 ACTIVITY

6.7.1 EMR2

For servicing operations, this button in the main SERDIA screen displays the various screens for certain configuration activities:

Diagnostics and tests

- governor behaviour measurement
- starting process measurement
- monitoring function measurement
- intake air pressure measurement
- sensor measurement
- city measurement
- predefined nominal values measurement
- digital input/output measurement

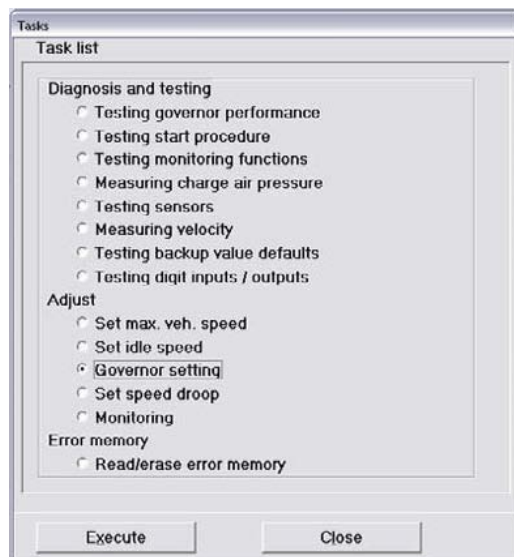
Settings

- maximum speed setting
- idle speed setting
- governor measurement
- P degree measurement
- input/output setting
- monitoring

Error memory

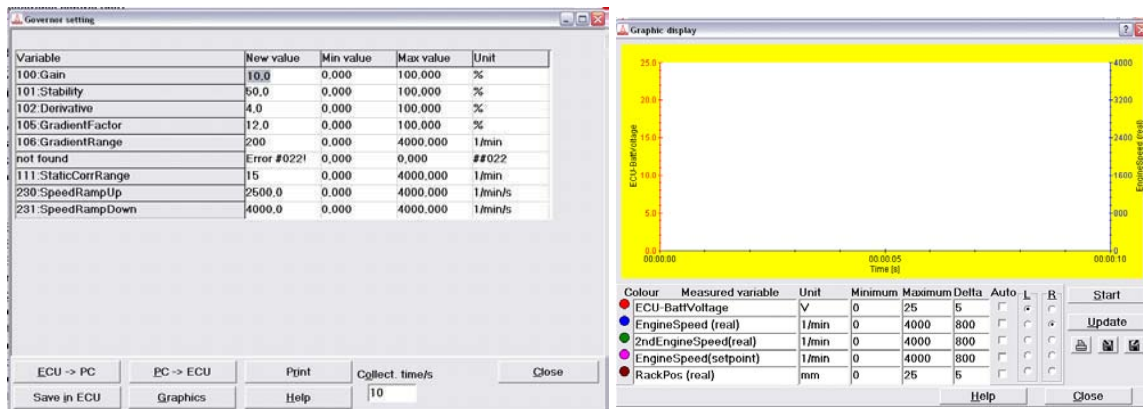
- display/cancel error memory

6.7.1.1 EXAMPLE OF GOVERNOR SETTING



PROCEDURE:

- Click the "Activity" button.
- Click the box "set: governor setting". The "Governor settings" menu is displayed.



Explanation of the function keys:

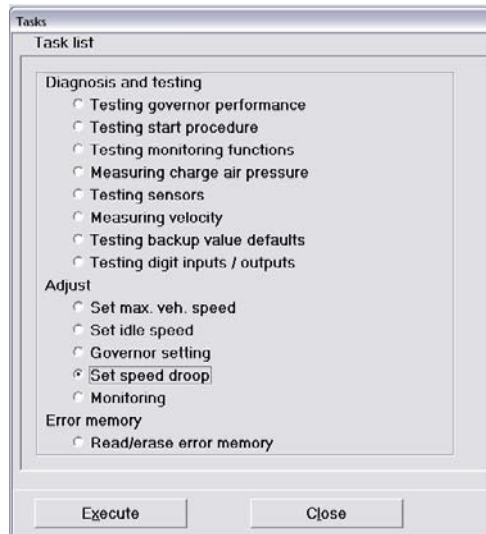
- **ECU->PC:** reads and displays the configuration data from the control unit.
- **PC->ECU:** transmits the modified configuration data to the control unit. To permanently save the data, click "Save in ECU".
- **Save in ECU:** permanently saves the configuration data in the control unit memory.

All changes to the configuration must be reported!

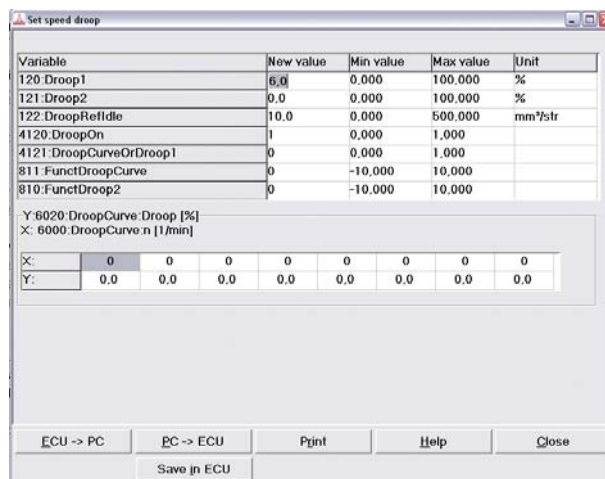
The procedure for reporting changes is described in service bulletin 0199-99-9287.

- **Graphics:** the "Graphics" button serves to display in graphic form the variations in the selected measured values over time (max. 5). If more than 5 values are selected, an error message will be displayed.
- **Duration of measurement:** the duration of the measurement reading is indicated in seconds in the field "Duration of measurement". The minimum value of measurement duration is one second. The maximum value can be set to several hours (expressed in seconds). The standard setting is 10 seconds. The shortest measurement time is 40 ms for RAM values and 60 ms for all other values. A measurement duration of 10 seconds gives:
for RAM values $10000 \text{ ms} / 40 \text{ ms} = 250$ measurement points,
for all other values, $10000 \text{ ms} / 60 \text{ ms} = 166$ measurement points.
Given that the program supports a maximum of 200 measurement points, before recording the data, the measurement frequency is automatically adjusted. The minimum possible measurement frequency is determined by the duration of data transmission from the control unit to the PC. The greater the number of measurement values to be displayed simultaneously, the greater the amount of time taken for data transmission and thus the lower the measurement frequency.
- **Print:** prints the displayed measurement values.
- **Exit:** returns you to the "Activity" menu.

6.7.1.2 EXAMPLE OF P LEVEL SETTING

**PROCEDURE:**

- Click on the "Activity" button.
- Click the box "Set: P level setting". The "P level setting" menu is displayed.

**Explanation of the function keys:**

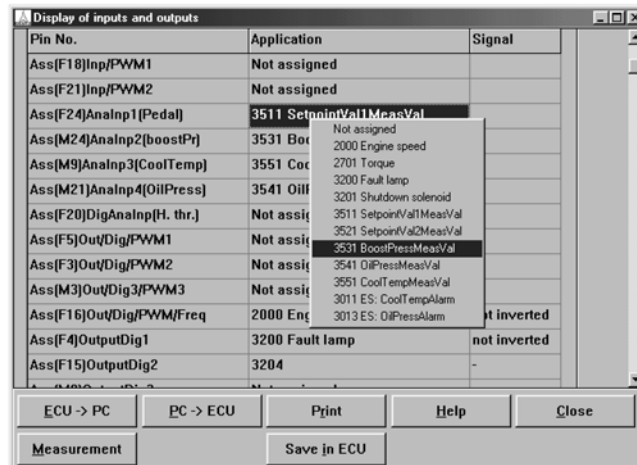
- ECU->PC: reads and displays the configuration data from the control unit.
- PC->ECU: sends the modified configuration data to the control unit. To permanently save the data, click "Save in ECU".
- Save in : permanently saves the configuration data in the control unit.

All changes to the configuration must be reported!

The procedure for reporting changes is described in service bulletin 0199-99-9287.

- **Print:** prints the displayed measurement values.
- **Exit:** returns you to the "Activity" menu.

6.7.1.3 SETTING THE INPUTS AND OUTPUTS



With the "Activity" button, in the "Input and Output setting" screen, the possible data are:

1. displayed using the right mouse button
2. assigned using the left mouse button

In this same screen you can also assign the functions to be activated as well as the measurement values of the all the displayed inputs and outputs (by clicking on the "Measurement" button).

This configuration operation can only be performed by Level III users.

6.8 POSSIBLE PROBLEMS

6.8.1 SERDIA IN GENERAL

6.8.1.1 COMMUNICATION SETTINGS ERRORS

If a connection has been made between the interface and the control unit it is not possible to establish communication, the following error message is displayed



Possible causes of the error message:

- no power supply to the ECU or the interface
- The power supply was interrupted when the engine was switched off
- Port incorrectly allocated on the PC (v. 9.1.2)
- Polarity of power supply from the engine to the interface inverted
- Not all four conductors are connected (+,-,k,l)
- Control unit faulty or wrong control unit.

Elimination of possible causes, rapid checking:

- The yellow LED on the interface should illuminate when SERDIA is launched.
- Test the voltage of the diagnostic socket power supply (the interface requires a power supply of 8-28 Vdc).
- Check port allocations.
- Connect another control unit.

Additional information on the power supply requirements of the control units, the interface and the PC:

- The EMR control units require a voltage of ranging from a minimum of 10 V up to a maximum of 30 V (12-24 V type). Current draw: 5 A with 12 V, 7 A with 24 V
- The interface receives its power from the engine and can operate with supply voltages ranging from 12 V to 24 V.
- The control units and the interface are protected against polarity inversion and over-voltage. Nonetheless, accidental connection to 230 V , for example, could damage these appliances.
- With the optical coupling integrated in the interface, it is possible to connect the PC (notebook, including printer) to the battery or the vehicle earth without any risk of damage to the control unit and interface or data loss.

6.8.2 EMR2

6.8.2.1 THE ENGINE HUNTS

Tracing the cause:

Just like engines with mechanical governors, to find the cause of faults on engines with EMR2 control units, it is necessary to look at engine components such as the pump, accessibility to the control rod, fuel system etc. In particular, if an engine has previously run satisfactorily, any subsequent hunting will, in most cases, not be attributable to the EMR2.

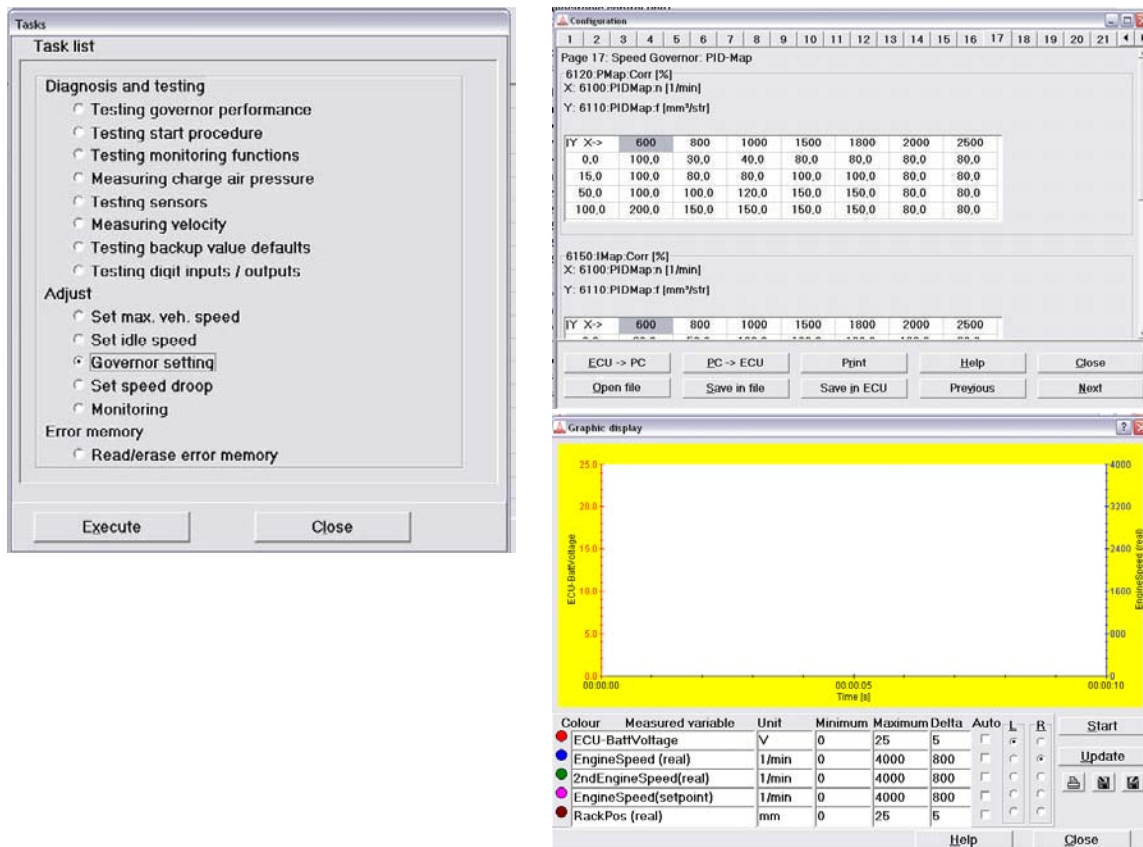
Governor settings:

the governor adjustment is valid, in principle, for new applications and must be tested and documented with the system (engine and system) all operating stages.

If the new application has been completed and approved, it will be necessary to inform the manufacturer of the governor parameters specific to the application. For subsequent engines with the same application, further adjustments will not normally be necessary.

Menu pathway:

SERDIA main menu -> Activity menu -> Governor settings box -> Apply



General notes on changing the settings:

- Adjust the settings with the engine running.
- An increase in the P-I-D values will result in a greater oscillation amplitude of the governor.
- Enter the value to be corrected in the "New value" field. One way to do this is to highlight the old value with the cursor and then enter the new value (the old value will be automatically removed).
- Click on the "PC->ECU" button to send the new value to the control unit. The governor acquires the new parameter settings and the result will be apparent in the operation of the engine.
- When the parameter settings have been adjusted, before disconnecting the power supply (terminal 15), save the new values in the EMR1 control unit. To do this click on the "Save in ECU" button.

Basic governor settings:

The control unit is programmed at the end of the band with the following standard values.

Parameters (variables)	Standard values		Notes
	Assembly	Vehicle	
Gov. rpm Factor - P	18-20	4,0	Standard settings and application factors P-I-D. These parameters are independent of the engine status (rpm, permanently active load) and represent the main instruments of governor adjustment.
Gov. rpm Factor - I	10,0	10,0	
Gov. rpm Factor - D	5-12	2,5	
Gov. rpm	90,0	65,0	Lowering the governor parameter for the static field.
Gov. rpm	15,0	80,0	Rpm band for the nominal value. In this rpm band, the engine runs in the static field accurately and evenly, without reacting violently to any changes in the rpm.
Pos. Gov. Factor - P	10,0	10,0	Corrections to the parameter settings may only be made with permission of the manufacturer.
Gov.pos. Factor - I	10-15	5,0	
Gov.pos. Factor - D	5-10	5,0	
Gov.pos. Factor - DT2	8,0	8,0	
Gov.pos.	160-180	180,0	
Gov.pos.	0,25	0,25	

Standard values, parameters dependent on the rpm and the load:

3 characteristic curves for values P, I and D = ftk (rpm, quantity injected).

Parameters (variables)	Standard values	Notes
X: supports revs (rpm)	60...2500	7 rpm values
Y: supports quantity (cmm/lift)	0, 20 ... 100	4 injected quantity values
Characteristic curve (%)	100	Total 3 x 28 adjustments. The 100% adjustment cause transmission of the PID rpm governor values (page 4). Corrections must be made at different working points.

Correction of the adjustment:

Before making any changes to the parameter settings, it is always advisable to save the existing configuration using the "save in file" button and/or print the configuration pages 4, 5 and 17.

The adjustment procedure comprises three stages:

1. Basic governor parameters PID. The adjustment principally concerns the basic parameters.

- If a new basic adjustment of the governor is necessary, set all the characteristic curves of the governor to 100%.
- The value P is the main parameter and must be set first. Increase the value of the "DrehzRegler:P-Anteil" parameter in steps of 10% until an engine oscillation tendency of $f > 1$ Hz is achieved when excited by a sudden variation in the load. Then reduce the P value by 25%.

Example: P values with oscillation tendency (unstable) = 12. 12-25 % of 12 = 9 (new value).

The adjustment depends prevalently on the mass moment of inertia of the system (engine + generator).

For mass moments of inertia up to 8kgm², the range for the P value is between 10 and 45 %.

With greater mass moments of inertia, the P value may be increased up to 90 %.

Note for engine assemblies: calculation of the optimal governor values is to be performed using the operating rpm and different loads. Make a note of the various P values obtained in this way and enter the average value in "DrehzRegler:P-Anteil".

For double frequency systems, it is important to take into account the second frequency when determining the average value.

Note for vehicle engines: optimal adjustment values are to be calculated for various rpm and load points. Make a note of the various P values obtained in this way and enter the average value in "DrehzRegler:P-Anteil".

The different P values obtained for the different rpm and load points are to be corrected in the PID characteristics curve.

- Use the same basic procedure to then adjust the D and I values. Increase the value in steps of 5 % until instability is reached, then reduce the value by 25 %.

2. Static and dynamic operating parameters.

Setting the "Governor rpm: damping" and "Governor rpm: damping field" parameters (page 4).

The parameter "Governor rpm: damping field" determines the revs band for which the rpm status is deemed static.

For example, the value 15 rpm sets this band to +/-15 1/min.

The parameter "Governor rpm: damping" determines the reduction in the governor parameters (PID values) for the static field. If the rpm is within the nominal value rpm band, the governor parameters (PID values) are reduced to the values corresponding to the damping factor.

Example: governor rpm: P = 10 %

at governor rpm: damping = 65 %

In this way, the P value in the behaviour of the static engine of the nominal rpm field +/- damping field is reduced to 6.5 %. The purpose of this intervention is to ensure that the engine runs smoothly and evenly within the nominal rpm band, without reacting violently to small variations in the rpm. If a fault causes the engine run outside the rpm band, the governor parameter settings will become effective again at 100 % and the governor will correct the rpm error in the shortest time possible.

For standard settings, see the basic governor settings. Corrections to the parameter settings are only possible during the engine operating test.

3. Parameters dependent on the rpm and load.

For the basic parameters P, I and D, there is a characteristic curve of the rpm and load dependent parameter (page 17). The effective parameter values are obtained by multiplying the basic parameters by the values of the characteristics curve.

Example: governor rpm: value P = 10 %

characteristic curve value P = 200 % at 2000 rpm and 50 cmm/lift

Result: for the working point indicated, the value P becomes effective at 20 %.

6.8.2.2 CALIBRATION OF THE ACCELERATOR PEDAL

The accelerator is normally a driver operated pedal. The input provided for the accelerator (PIN 24 of vehicle connector) can also be used as remote control input, as necessary in locomotive and ship applications. Calibration is necessary in all cases.

Calibration may be performed both during the putting into service procedure or following component replacement. The accelerator is not always included in the DEUTZ AG supply. However, we advise the DEUTZ pedal transducer art. code 0419 9457. Other accelerators may be fitted by the customer, subject to agreement with the manufacturer.

Condition:

- Connection as per overview of EMR1 system:
signal input (pin 24 / vehicle connector) against GND (pin 23 / vehicle connector)
- Analogue signal:
> 0.5 V (accelerator in rest position), e.g. 1 V
< 4.5 V (accelerator pressed against travel stop), e.g. 4 V
- A reference voltage is provided by the EMR1 control unit on the vehicle connector (pin 25 + 5 V).
This reference voltage is also suitable for the hand throttle potentiometer. Therefore the current load with connection parallel of the pedal transducer and hand throttle potentiometer must not exceed a total of 25 mA (i.e. total resistance > 200 Ω).

Accelerator calibration using the "Calibration" menu:

The calibration is performed from the menu. The two travel stops "Accelerator in rest position" and "Accelerator pressed" are calibrated as the limit values. See "General calibration procedure".

Calibration of the accelerator using the "Measured values" and "Configuration" menu:

The purpose of the calibration is inform the control unit of the values of the two positions "accelerator rest position" and "accelerator pressed" as the respective lower and upper reference points. Furthermore, relative to these two reference points, it is also necessary to define the "Upper error value" (+5 % of the upper reference point) and the "Lower error value" (-5 % of the upper reference limit).

Definition of the parameters

Configuration screen	Calibration screen	Value
Accelerator (SWG1) upper error value	Accelerator (SWG1) upper error value [maximum...5V]	Max. nominal value. x 1.05+
Accelerator (SWG1) upper reference	Accelerator (SWG1) at maximum [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 value [0 V...rest position]	Pedal rest position - 0.05 x max. nominal value

Measurement of the limit values:

- Open the "Measurement values" menu, and "Current measurement values".
- Value measured "(F24) accelerator=SWG1": with the pedal in the rest position (lower reference) and fully depressed (upper reference) "acquire value" and save it in the control unit.

Configuration:

- Select the "Parameterization" and "Configuration" menu options.
- Record the values in accordance with the indications given in the following table ("Configuration of the accelerator input", see below).
- Conversion: 5 V = 1023 digits.

Example: configuration of the accelerator pedal input

Parameters (variables)	Factory setting		Effective value/ measured value	Calibration	Configuration
	mV	Digital				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 "upper reference" value + 5 % (of upper reference)

2) Measured "lower reference" value + 5 % (of upper reference)

6.8.2.3 CALIBRATION OF THE HAND THROTTLE

The hand throttle (pin 20 FS) is provided for vehicles such as agricultural machines. The driver can use the hand throttle to set the desired engine speed for ploughing, for example, and then take his foot off the accelerator. Like mechanically adjusted levers, the hand throttle must be set to 0 (idle speed) before starting the engine.

The position of the hand throttle overrides that of the accelerator pedal and determines the idle speed.

The rpm can be adjusted between the minimum engine speed (650 rpm) and the nominal engine speed (e.g. 2300 rpm) in proportion to the nominal value setting. The engine responds in a similar way to the hand throttle setting as it does to the accelerator pedal. If for example the hand throttle is used to set an engine speed of 1500 rpm, the accelerator pedal will only have priority over the hand throttle when this speed is exceeded.

The hand throttle position is not included in the DEUTZ supply and must be factory programmed in the EMR1. The customer can install a potentiometer as an additional control.

Requirements for setting the nominal value of the hand throttle (potentiometer) installed by the customer:

- Input Pin 20 vehicle connector
- Power supply for potentiometer as per pedal transducer, reference voltage 5V pin 25 and GND pin 23.

- Reference voltage load together with pedal transducer < 25 mA.
- Protection class: IP65
- Movement 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 is between 100 Ω and 900 Ω. This adjustment range can be reached by

- restricting the rotation angle
- additional resistor in the power supply lines.

Calibration of hand throttle potentiometer:

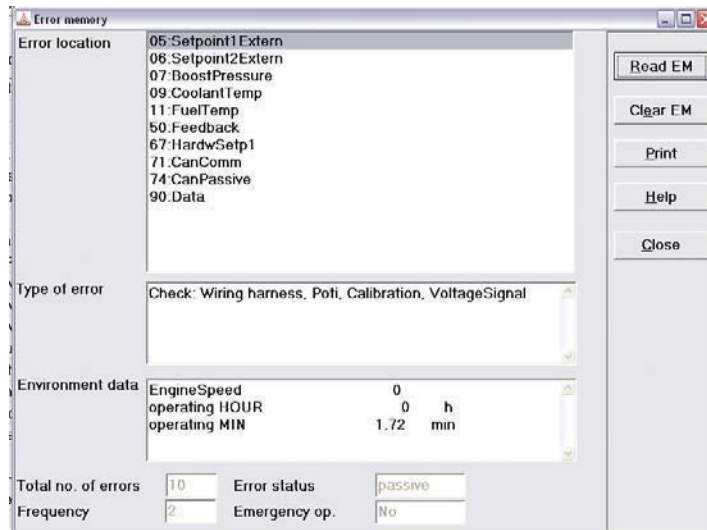
The two travel stops of the potentiometer must be calibrated.

The purpose of this calibration is to inform the control unit of the limit values of the two travel stops "Potentiometer in idle speed position" and "Potentiometer stop nominal rpm" as respectively the lower and upper reference points. Furthermore, relative to these two reference points, it is also necessary to define the "Upper error value" (+5% of the upper reference point) and the "Lower error value" (-5 % of the upper reference point).

Definition of the parameters

Configuration screen	Calibration screen	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) at maximum (upper limit)	Nominal rpm
Hand throttle (SWG2) lower reference	Hand throttle (SWG2) idle speed (lower limit)	Idle speed
Hand throttle (SWG2) lower error value	Hand throttle (SWG2) lower error limit (0V...lower limit)	Idle speed - 0.05 x nominal rpm

6.8.2.4 FAULT TRACING EXAMPLE



Fault tracing:

- Connection interrupted? **Not OK** Restore connection.
- OK**
- Contacts dirty or corroded? **Not OK** Clean or renew the wiring connector.
- OK**
- Sensor faulty? **Not OK** Renew the sensor.
- OK**
- Cable comb faulty? **Not OK** Check/ renew the cable comb.

6.8.2.5 THE ENGINE FAILS TO START

Problem	Possible cause	Remedy
The starter motor speed fails to reach > 160 rpm	Check with a Multimeter: voltage on the starter motor terminals < 7 V (with 12 V system)	Renew the batteries. Clean the earth lead connections.
Starter motor rpm OK, control rod moves to starting position.	Fault in the fuel supply system.	Restore the fuel supply.
Starter motor rpm OK, control rod remains in idle speed position	Power supply interrupted , connected to wrong pins or polarity inverted . Engine stop solenoid faulty or not connected. Control rod stiff. Speed sensor faulty. Starting load limitation set too low or to high coolant temperature signalled to the EMR1 .	Disconnect the vehicle wiring connector and check the positions: Pin 14F=+Ubatt Pin 1F=-Ubatt Pin 2F='Ubatt Localise and remove the cause. Renew the sensor, check the connections and the wires Use Serdia to check the measurement value "(M9) coolant temperature" in the "Current measurement values" menu.
The error warning light flashes.	A critical error has occurred in the EMR1 system. This fault must be eliminated before carrying out any further starting tests.	Tracing the fault using Serdia.
Serdia error signal: "8405: governor system (governor, travel measurement system, control rod".	Recognition of the governor travel difference, value measured in the stop field. Engine stop solenoid faulty or not connected	Renew the governor system, see governor renewal service example. No further adjustments are necessary.
Serdia error signal: "8170: (M13) Rpm 1, camshaft".	Short circuit or open circuit of the camshaft speed sensor or its wiring/connector.	Renew the sensor, check the connector for dirt and and corrosion, check the wiring between the vehicle connector and the sensor, check the sensor for damage.
Serdia error signal: "8210: Loss of EEPROM data" "8220:Loss of coil data" "8020:ECU (governor control)	Memory error in EMR1. Memory error in EMR1. Control unit faulty.	Renew the control unit. Transmit the data from the old control unit to the new control unit 1:1.
Serdia error signal: "8160: (M21)Oil pressure sensor"	Even when the engine is switched off the measurement value "(M21)Oil pressure" remains outside the limit values.	Renew the sensor, check the connector for dirt and and corrosion, check the wiring between the vehicle connector and the sensor, check the sensor for damage.
Serdia error signal: "8140: (M9) Coolant temperature sensor"	Even when the engine is switched off the measurement value "(M9) Coolant temperature" remains outside the limit values.	Renew the sensor, check the connector and wiring.
Serdia error signal: "8120: (F24) Accelerator pedal = SWG 1"	The accelerator pedal is not correctly calibrated	Check and, if necessary, modify the calibration values in the "Calibration" menu.

6.8.2.6 THE ENGINE STOPS FOR NO APPARENT REASON

Problem	Possible cause	Remedy
After the engine stops: (the key switch has not be operated) fault warning light off	The engine stopped without the EMR1 signalling a fault. Other possibilities: Fuel supply Rpm control independent of the EMR1 Interruption of the power supply.	Restore the fuel supply. Check whether there is another rpm control system present (e.g.. lift coil) and inspect the system. Check the vehicle wiring connector, EMR1, fuse, keyswitch, for open contacts.
After the engine stops: (the keyswitch has not yet been operated, turned on/off) fault warning light permanently on	Use Serdia to trace the fault, fault warning Over-speed (e.g. in response to a sudden change in the load). e.g.. "pressure" additional note: "inactive".	Investigate the problem in accordance with the fault warning: Reference value : correct the rpm + 15 % Check the contacts of the oil pressure sensor connector, renew the sensor if necessary.
After the engine stops: (the keyswitch has not yet been operated, turned on/off) fault warning light flashing	Critical fault in the EMR1 system. Use Serdia to locate the fault before starting the engine.	Take appropriate action according to the location of the fault, that may include renewal of the control unit, governor or sensor. The additional note "inactive" refers to a bad contact of the indicated faulty component.

6.8.2.7 RENEWAL OF THE EMR1 GOVERNOR

The governor is a purely mechanical component of the EMR1, permanently mounted to the engine. The governor coil is energised by the EMR1 and serves to position the control rod to adjust the quantity of fuel delivered to the engine. A control rod travel sensor installed in the governor signals the position of the control rod to the EMR1 control unit.

The appearance of the following error messages may necessitate renewal of the governor:

- 8113:(M17) Control rod travel sensor
- 8405: Governor system (governor, travel measurement system, control rod)

Instructions for renewal:

- Disconnect the power to the EMR1 and disconnect the connection cable to the control unit. For safety reasons, the lead must be disconnected from the positive battery terminal.
- Remove the old governor and clean the mounting area on the engine.

WARNING: with the governor removed, the control rod should be in maximum delivery position ; for this reason the engine must not be started!

- Fit the new governor with sealant paste DEUTZ art. code 0101 6102.
When fitting a new governor, it is necessary to make sure that it is compatible with the control unit. There are currently 3 possible combinations:

Governor/control unit compatibility

Control unit, TN	Software n_ vers. EMR1	Corresponding governor, TN	Procedure in the event of renewal of the governor
0211 1846		0211 1841	In the event of renewal, this combination should be replaced completely by the combination 0211 1911 / 0211 1910. It will also be necessary to contact the manufacturer.

0211 1910		0211 1911	
0211 2017	1.08	0211 1926	The governor is equivalent to the 0211 1911. Only 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 governor and pump are a combination. Renewal of the EDC governor: further adjustments are necessary 1) Autocalibration (Level 4) 2) Transmit EDC data to the control unit (Level 3)

WARNING: for 1015. Be careful of the pump with EDC governor.

- Restore the connection to the control unit and restart the engine.
- With SERDIA, access the "Parameters menu" -> "Configuration", and transmit the parameters to EMR1 using the "PC->ECU" button and test operation of the engine.
- If the engine runs satisfactorily, save the parameters settings in the control unit memory.
- On completion of the SERDIA test, cancel the errors memory.
- In the main SERDIA menu, open the control unit identification list and print the logistical data in "Tools" for documentation.
- The old governor should be returned with the documentation to the manufacturer.]

6.8.2.8 RENEAL OF THE CONTROL UNITS

Control unit renewal can be performed in two ways:

1. The old control unit is damaged, but the data are still legible (it is possible to establish communication with SERDIA).
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	- Without NM label	- With NM label	- Without NM label	- With NM label	- Without NM label
- Programmed	- Not programmed	- Programmed	- Not programmed	- Programmed	- Not programmed
-TN in SERPIC	-TN on control unit	-TN in SERPIC	-TN on control unit	-TN in SERPIC	-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
Started from 0211 26911 1)	Started from 0211 2686 1)	Started from 0419 4043 1)	Started from 0419 9995 1)	Started from 0211 2692 1)	Started from 0211 2690 1)

1) TN updated, to be returned on ordering.

Overview of EMR2 control units

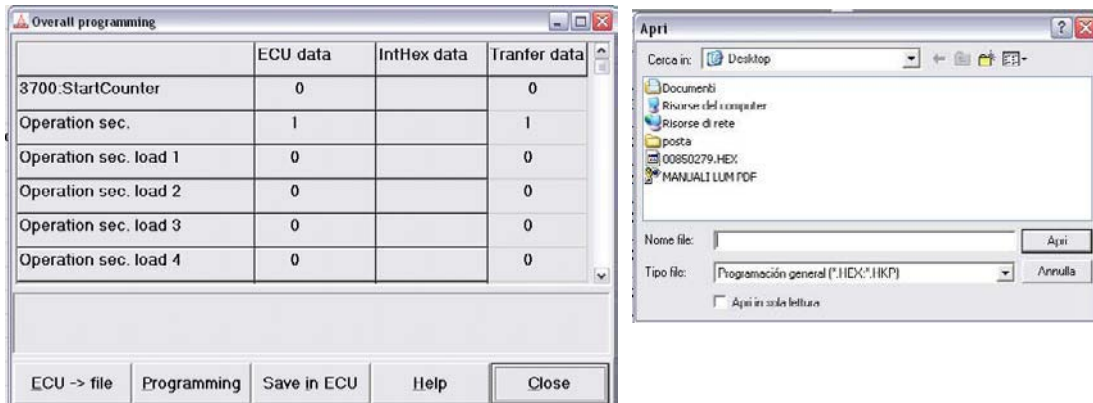
For all series	
- With NM label	- Without NM label
- Programmed	- Not programmed
-TN in SERPIC	-TN on control unit
0211 2704	0211 2850

Notes on the above records:

<ul style="list-style-type: none"> - With NM label - Programmed - TN in SERPIC 	<p>Complete control unit.</p> <p>For engine operation, each control unit must be programmed with its own specific engine record and must bear an adhesive label (engine no.). The control unit and the engine thus form an integrated unit.</p> <p>When ordering a new control unit, it is necessary to indicate the NM as well as the engine type. The completion of the control unit will be carried out by DEUTZ.</p>
<ul style="list-style-type: none"> - Without NM label - Not programmed -TN on control unit 	<p>Control unit not programmed.</p> <p>The engine cannot be started with this control unit.</p> <p>Within the context of servicing operations, this control unit may be completed with the transmission of the specific engine record from the old control unit by SERDIA Level III, see also the SERDIA manual "Complete programming".</p> <p>For servicing operations, it is also possible to order unprogrammed control units from DEUTZ Service partners (competence class II). Completion of the control unit (including the NM label) is carried out by the Service partner. If the engine record in the old control unit cannot be read, it can be requested by e-mail following the procedure described in SM 0199-99-9287 "Notification of modifications to EMR data".</p>

METHOD 1**Stage 1: Reading the engine record from the old control unit:**

- Switch on the ignition/power supply.
- Launch SERDIA.
- In SERDIA, change in the "Parameters" menu-> "Complete programming".
- Click on the "ECU->file" button. All the configuration files are read. The "Save as" box opens.
- Save the file.



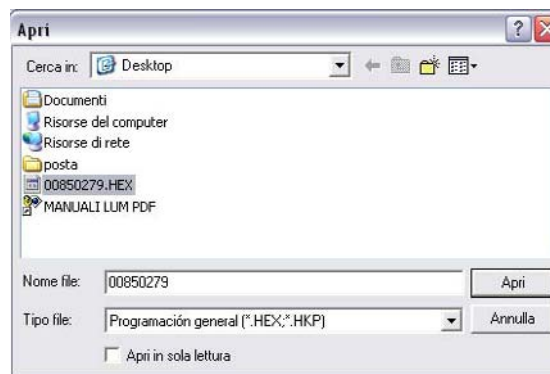
The program will propose the engine number as the file name, however you can choose another name if you wish. Then press OK to confirm. The file (i.e. the engine data record) is saved under the name <enginenum>.hex. After importing the data record from the old control unit, this file will also contain information on the engine operating hours and the number of engine elements.

- Exiting the program. Switch off the ignition/power supply.

Stage 2: Control unit renewal:

Control unit compatibility must be verified in accordance with the above table (same art. code.). The compatibility of the control unit with the governor must also be ensured.

- Switch on the ignition/power supply.
- Launch SERDIA.
- In SERDIA, change in the "Parameters" menu -> "Complete programming".
- Click on the "Programming" button. The "Open" window is displayed.
- Double click to select the saved engine data record (<enginenum>.hex) .
- Send the engine data record to the EMR1 by clicking "Send".
- Save the engine data record by clicking on "Save in ECU" .

**Stage 3: Start the engine and check that it runs satisfactorily.**

- Cancel the errors memory in the "Errors memory" menu.

METHOD 2

Each EMR2 has a data record specific to the engine, which is saved in a central computer at DEUTZ AG on delivery of the engine. DEUTZ AG must be notified of any modifications to the EMR1 configuration settings. Whenever a new control unit is ordered, it will be programmed with the engine data record stored by DEUTZ AG under the corresponding engine number. If modifications to the engine data are not communicated to DEUTZ AG, then it will not be possible to take them into consideration when programming a new control unit.

- Switch off the ignition/ power supply.
- disconnect both connections of the old control unit. Connect the control unit to the engine and vehicle wiring connectors (both 25 pin).
- Switch on the ignition/power supply.
- Launch SERDIA.
- Cancel the errors memory in the "Errors memory" menu.
- Start the engine and check that it runs satisfactorily.

6.8.2.9 ERROR IN READING THE CONFIGURATION DATA

This error message is displayed if SERDIA not able to read the Hex file. The file could contain umlauts (ä,ö,ü) or other characters that cannot be read by SERDIA.

SECTION 30

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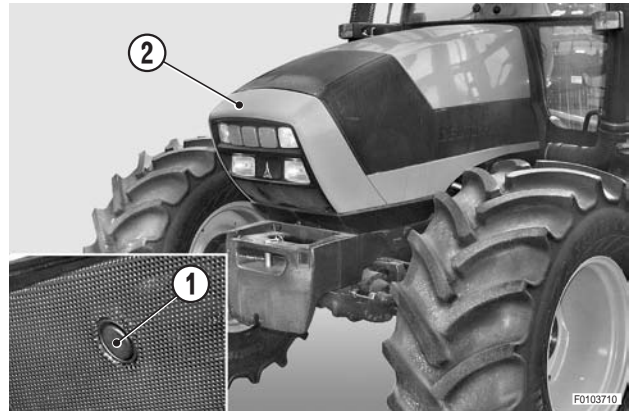
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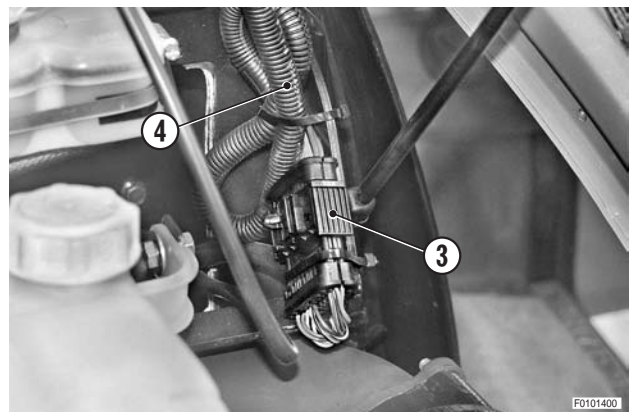
ENGINE HOOD

Removal

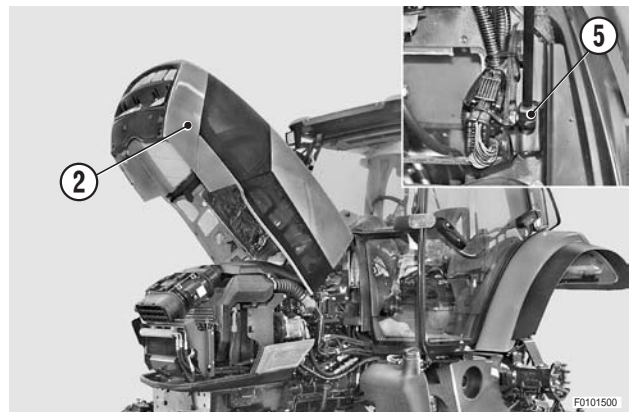
1 - Press the button (1) and open the engine hood (2).



2 - Disconnect the light units wiring connector (3) and free the wiring harness (4) from the cable ties.



3- Detach the gas springs (5) from the hood (2).



4 - Loosen and remove the retaining bolts (6) and washer of the hood support (7).

5 - Remove the hood.



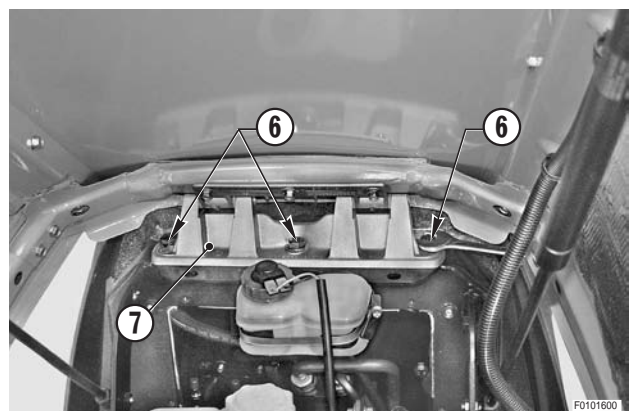
Hood: approx. 65 kg (143 lb.)



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.

• For normal front axles

2 - Position under the differential housing a trolley jack "A" with a lifting capacity of at least 15 tonnes and a maximum lifting height of at least 15 cm (6 in.).

★ Drive safety wedges between the axle and the front axle support.

• For suspended front axles

2 - Position centrally under the support a trolley jack "A" with a lifting capacity of at least 5 tonnes and a maximum lifting height of at least 15 cm (6 in.).

• For all versions

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 all the nuts except one at the top of the wheel (for safety). **⊗ 1**

5 - While holding the wheel vertical, remove the last nut and remove the wheel (2).

6 - Position a stand "B" under the axle and lower the tractor.

7 - Repeat the above operations for the other wheel.

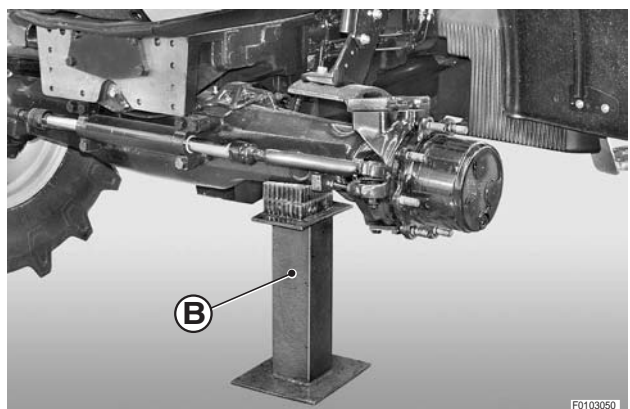
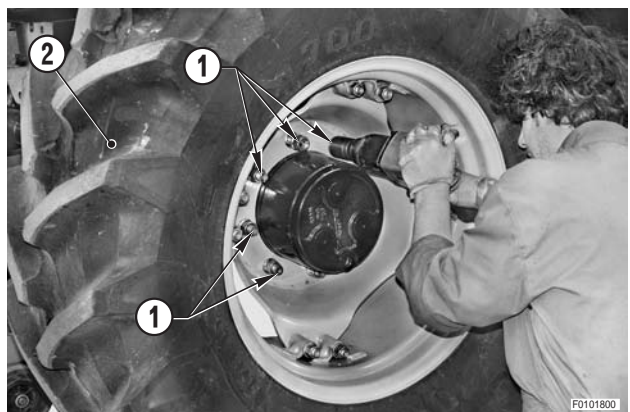
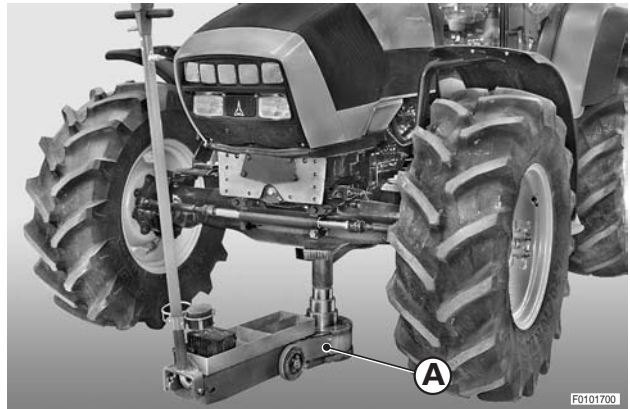
Refitting

• Refitting is the reverse of removal.

⊗ 1

Nm Wheel nuts: 350 Nm (258 lb.ft.)

★ Tighten the nuts gradually in a crosswise sequence.

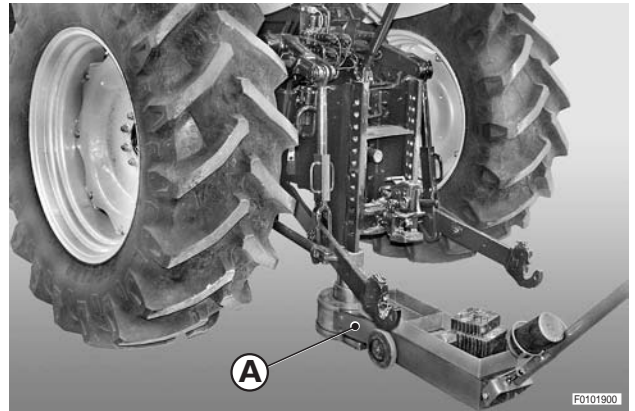


REAR WHEELS

Removal

- 1 - Position under the rear gearbox a trolley jack "A" with a lifting capacity of at least 5 tonnes and a maximum lifting height of at least 15 cm (6 in.).
 - ★ Position the jack "A" so that is nearer to the wheel to be removed.

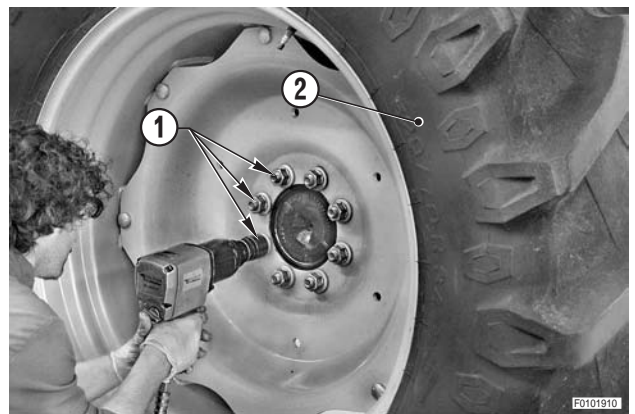
- 2 - Raise the tractor until the tyre of the front wheel to be removed is just clear of the ground.



- 3 - Slacken off all the wheel nuts (1); remove all the nuts except one at the top of the wheel (for safety).



- 4 - While holding the wheel vertical, remove the last wheel nut and remove the wheel (2).

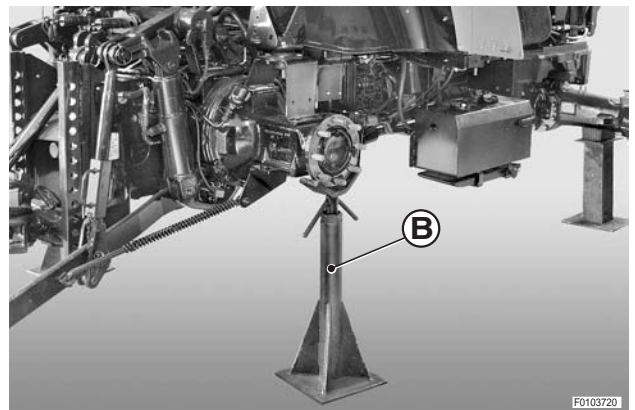


- 5 - Position under the rear axle a stand "B" with lateral retaining wings for safety and lower the trolley jack until the axle is resting on the stand.

- ★ Stand capacity: min 2 tonnes

- 6 - Check that the stand is in exactly the right position and then remove the trolley jack.


- 7 - Repeat the above operations to remove the other wheel.



Refitting

- Refitting is the reverse of removal.



 Wheel nuts:
M18x1.5: 370 Nm_ 10%(273 lb.ft._10%)

- ★ Tighten the wheel 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.

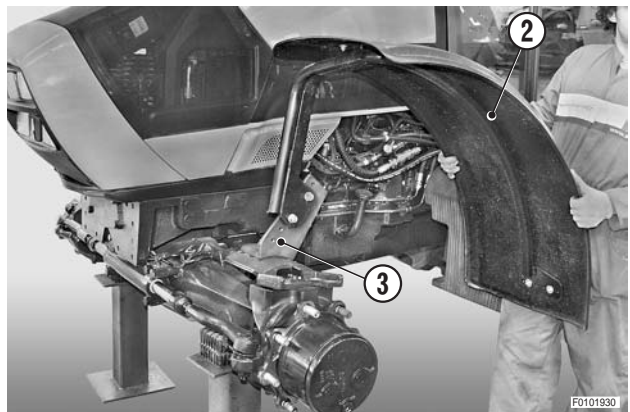
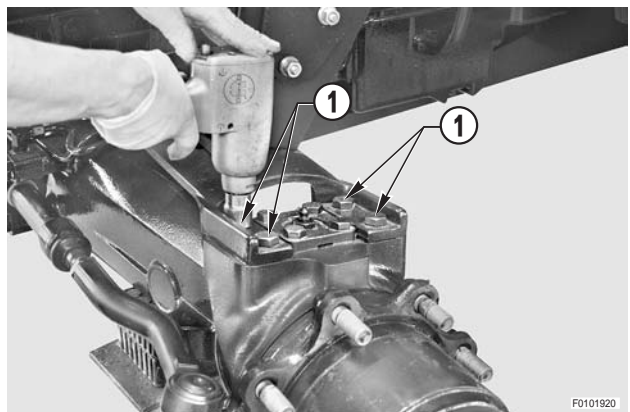
1 - Remove the front wheels.

(For details, see "WHEELS - FRONT WHEELS").

2 - Loosen and remove the bolts (1) and remove the fender (2) complete with the bracket (3).



fender assembly: approx. 20 kg



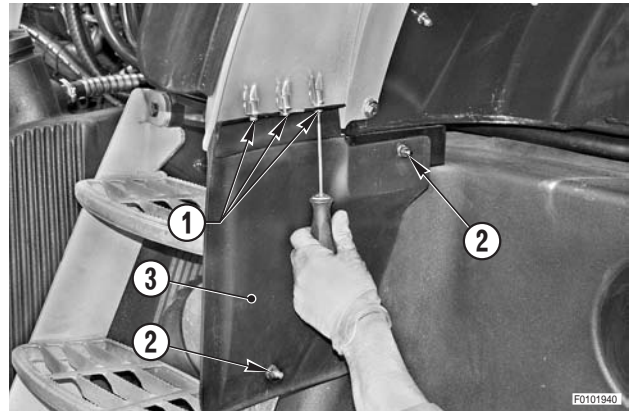
Refitting

- Refitting is the reverse of removal.

CAB ACCESS STEPS

Removal

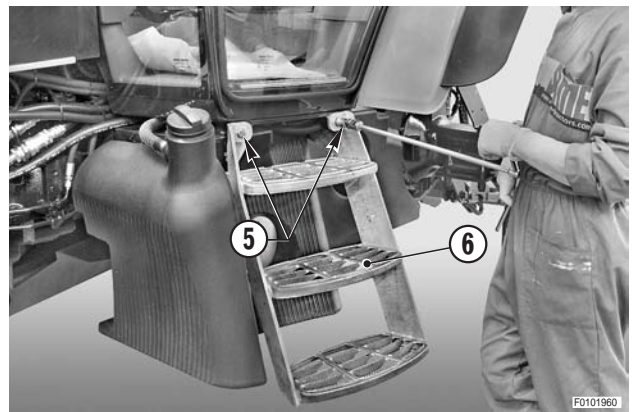
- 1 - Remove the wheel on the appropriate side.
(For details, see "WHEELS - REAR WHEELS":
- 2 - Remove the three bolts (1), the nuts (2), and remove the fender (3).



- 3 - Remove the screw (4).



- 4 - Remove the bolts (5) and remove the cab access steps (6).




Refitting

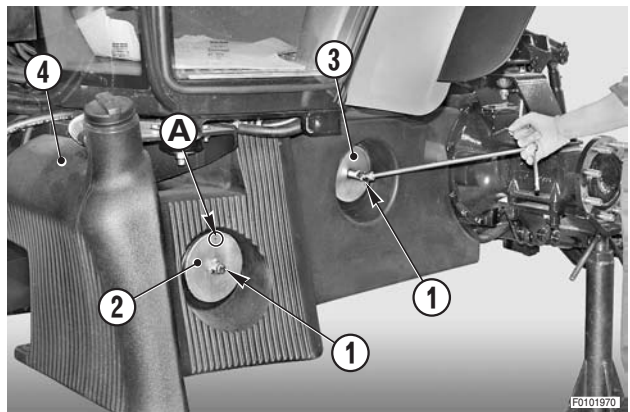
- Refitting is the reverse of removal.

FUEL TANK

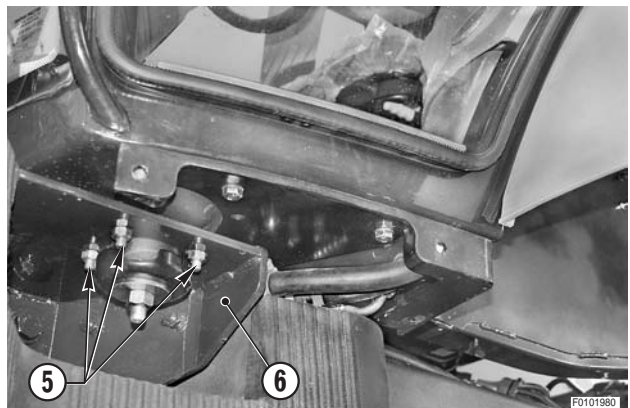
Removal

- ⚠** a - Do not smoke or allow naked flames in the vicinity during the removal, refitting and filling of the fuel tank.
 - b - Wipe up any spilt fuel immediately before someone slips on it.
 - c - Disconnect the lead from the negative battery terminal (-) and apply the parking brake.
- 1 - Drain the fuel tank completely by siphoning off the fuel.
 -  Fuel: max. 150 approx. 40 ℓ (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")

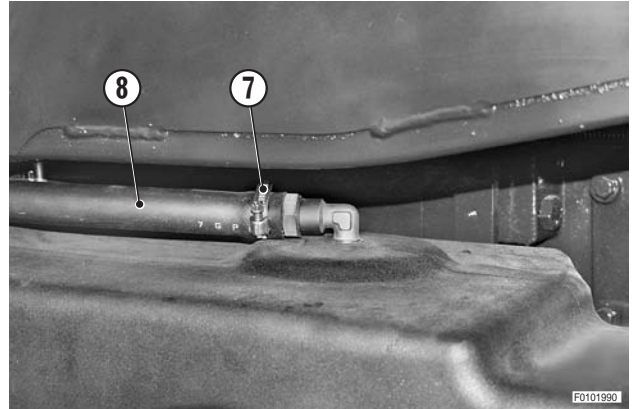
- 4 - Remove the bolts (1) and remove the locating (2) and retaining washers (3) of the tank (4).
 - ★ Note the position of the hole "A" as the tank is levelled by rotating the front washer.



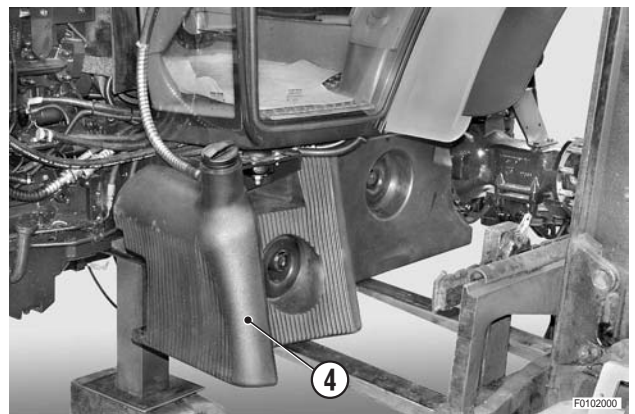
- 5 - Remove the three bolts (5) and remove the support (6).



- 6 - Loosen the hose clamp (7) and disconnect the breather pipe (8).



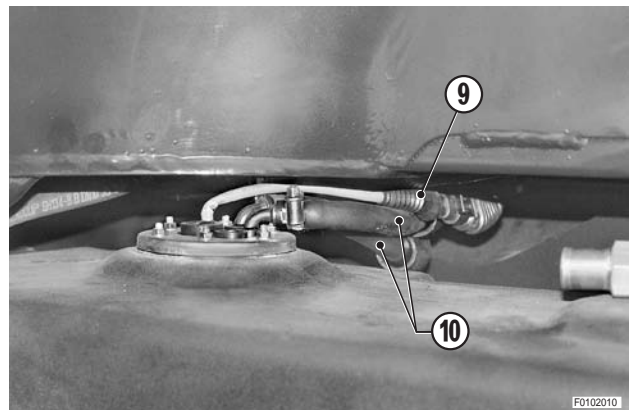
- 7 - Position suitable lifting equipment under the fuel tank (4) and pull it slightly outwards.



- 8 - Disconnect the wiring connector (9) of the fuel level sensor.

- 9 - Loosen the clamps and disconnect the pickup and return pipes (10).

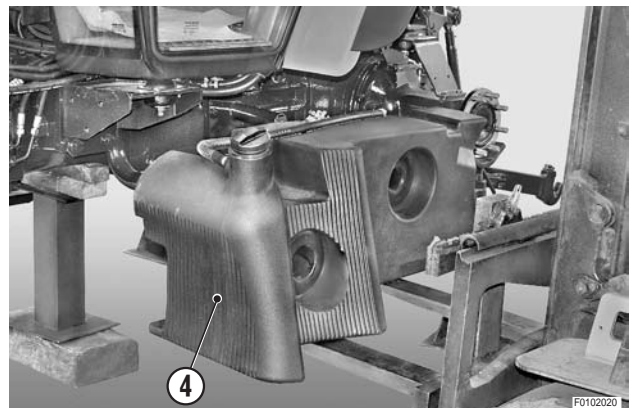
- ★ Mark the pipes to avoid error when reconnecting.
- ★ Plug the pipes to prevent the entry of impurities.



- 10 - Remove the fuel tank (4).

Refitting

- Refitting is the reverse of removal.




COOLERS-RADIATOR ASSEMBLY

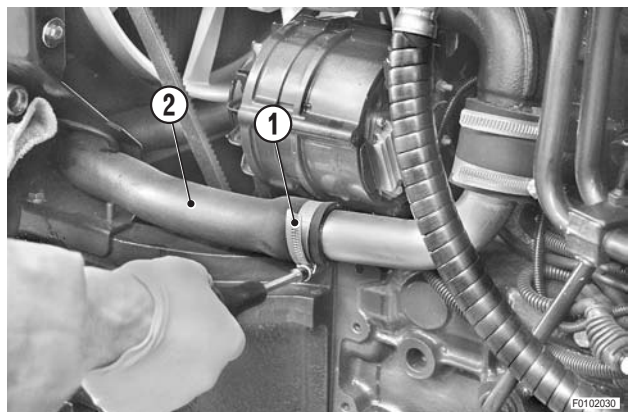
COMPLETE ASSEMBLY

Removal

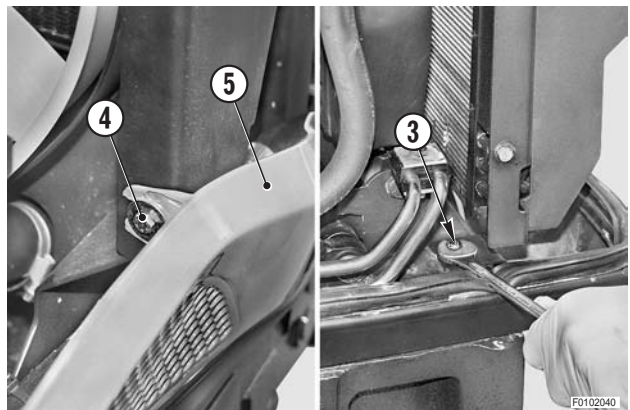
- 1 - Remove the engine hood.
(For details, see "ENGINE HOOD").
- 2 - Recover the refrigerant from the air conditioning system. (For details, see: "AIR CONDITIONING SYSTEM").
- 3 - Loosen the clamp (1), disconnect the hose (2) and drain off the engine coolant.

 Coolant:

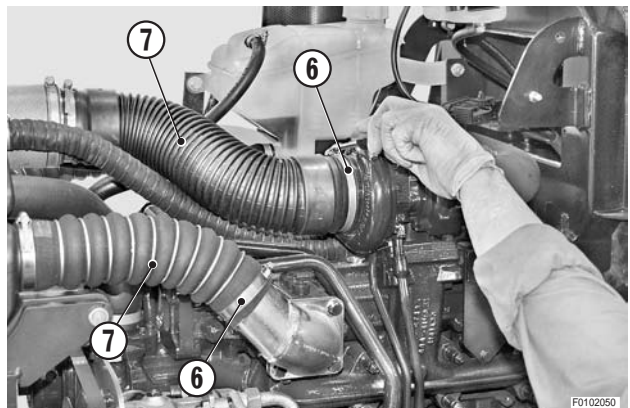
Mod.	90	100	110	120
ℓ	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10



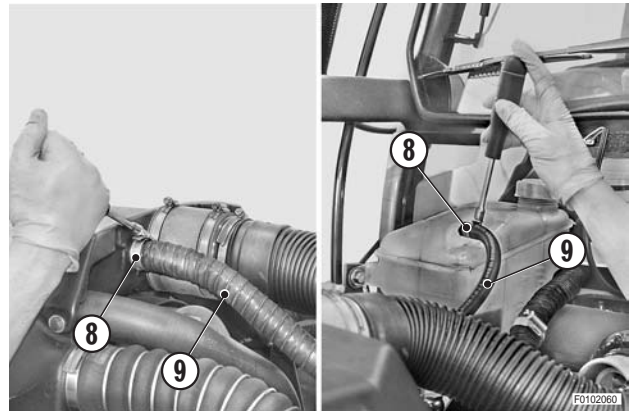
- 4 - Loosen the bolts (3), remove the nuts (4) and remove the lower heat shield (5).



- 5- Loosen the clamps (6) and disconnect the pipes (7).

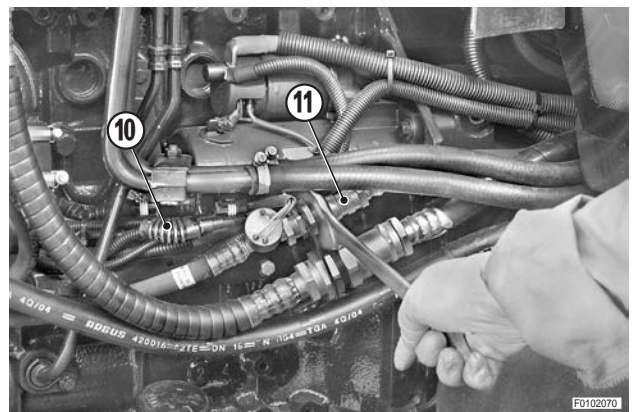


6- Loosen the clamps (8) and disconnect the pipes (9).



7 - Disconnect the wiring connector (10) of the air conditioning pressure switch.

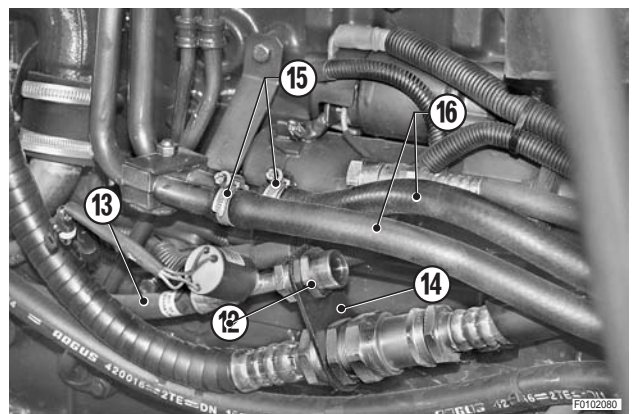
8 - Unscrew and disconnect the air conditioning outlet pipe (11).



9 - Remove the nut (12) and disconnect the pipe (13) from the support (14).

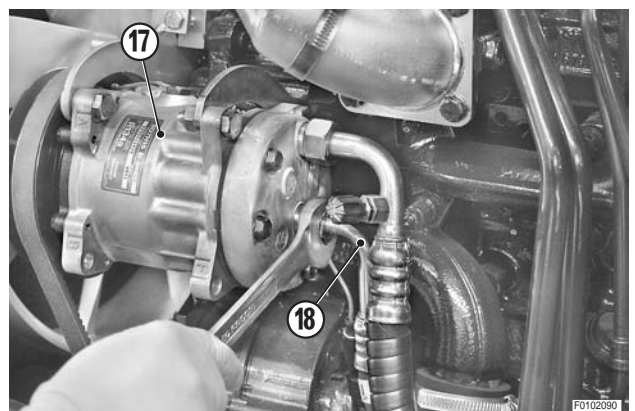
10 - Loosen the clamps (15) and disconnect the heater outlet and return pipes (16).

- ★ Plug the pipes to prevent the entry of impurities.
- ★ Label the pipes to avoid confusion on refitting.

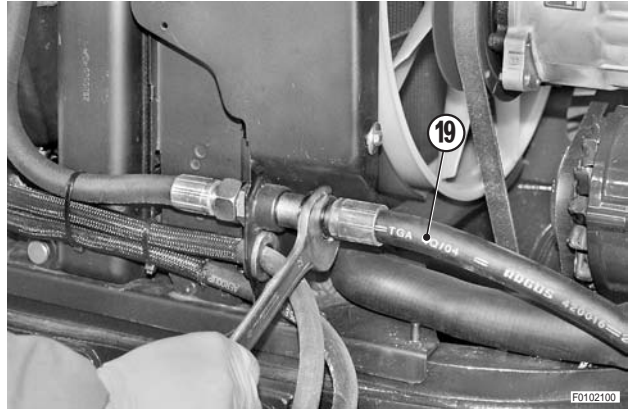


11 - Disconnect the outlet pipe (18) from the compressor (17).

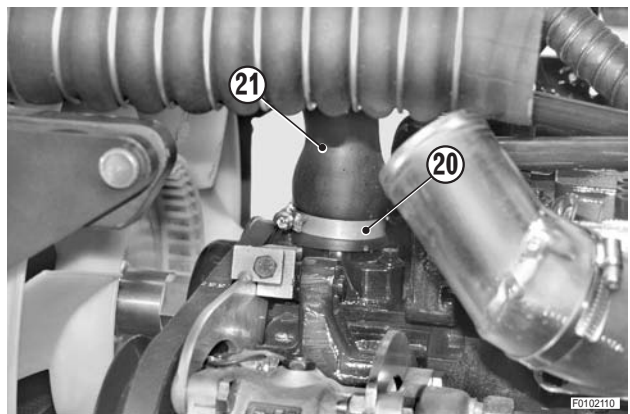
- ★ Immediately plug the pipe to prevent moisture from entering the system.



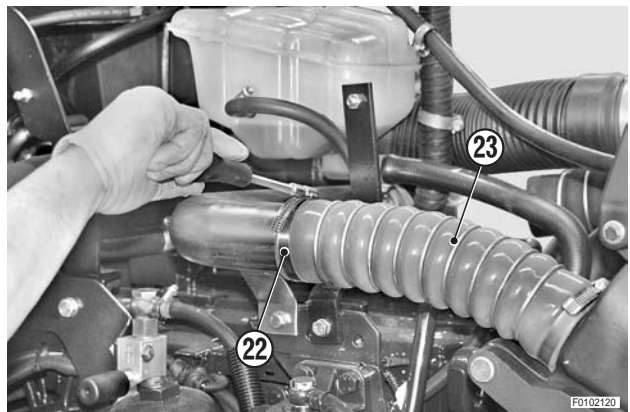
- 12 - Disconnect the return pipe (19) from the cooler.
 ★ Plug the pipes to prevent the entry of impurities.



- 13 - Loosen the hose clamp (20) and disconnect the radiator inlet hose (21).



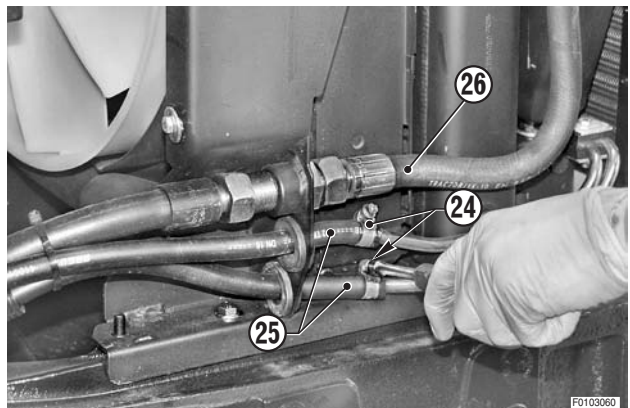
- 14 - Loosen the hose clamp (22) and disconnect the intercooler outlet pipe (23).



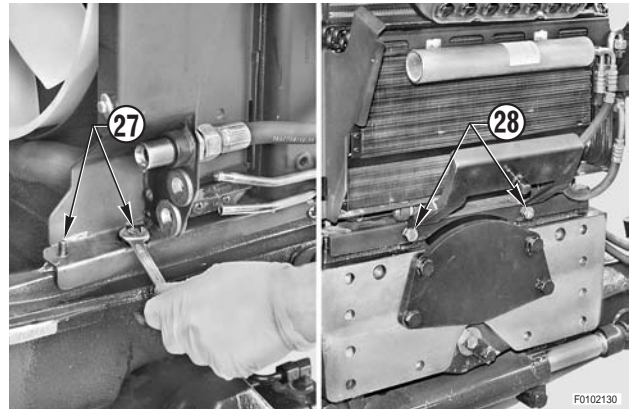
- 15 - Loosen the clamps (24) and disconnect the cooler outlet and return pipes (25).

★ Label the pipes to avoid confusion on refitting.

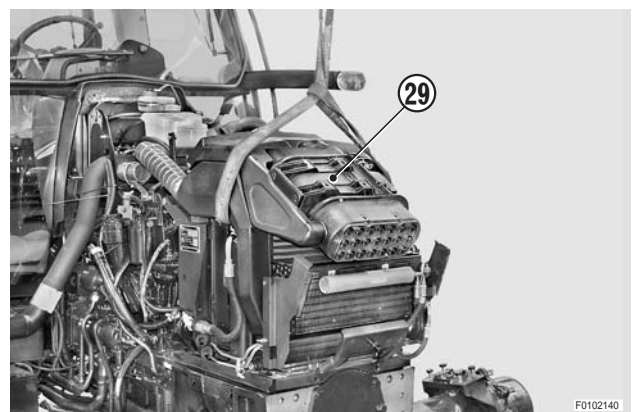
- 16 - Disconnect the supply pipe to the cooler (26).
 ★ Plug the pipelines to prevent impurities getting in.
 ★ Disconnect the wiring connector of the air filter clogging sensor.



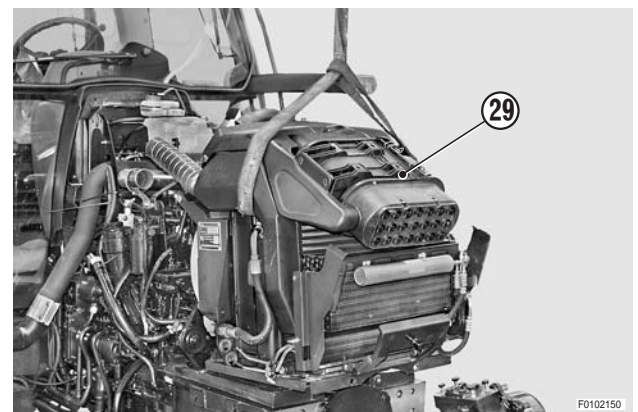
18 - Remove the two bolts (27) and the bolt (28).



19 - Attach the 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.



20 - Remove the complete 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 - Discharging, flushing and recharging").
- 2 - Fill the engine cooling system.



Coolant:

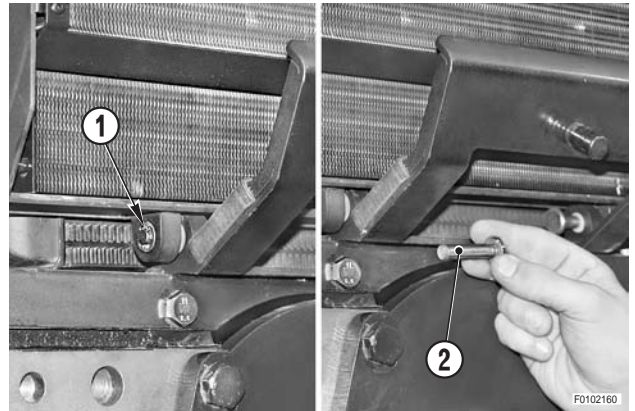
Mod.	90	100	110	120
ℓ	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10

- 3 - Start the engine and run for a few minutes to allow the coolant to circulate; check the system for leaks.
- 4 - Stop the engine, check the coolant level in the expansion tank and top up if necessary.

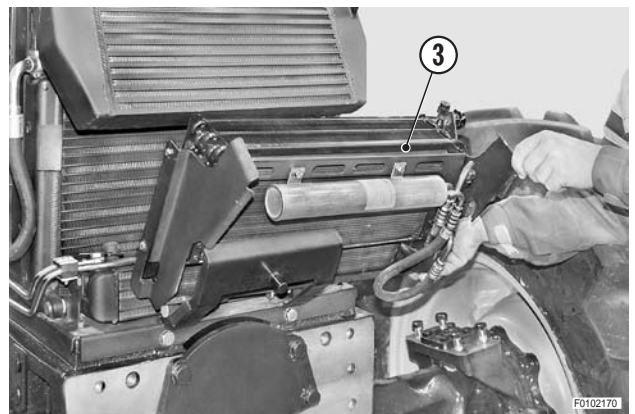
FUEL COOLER

Removal

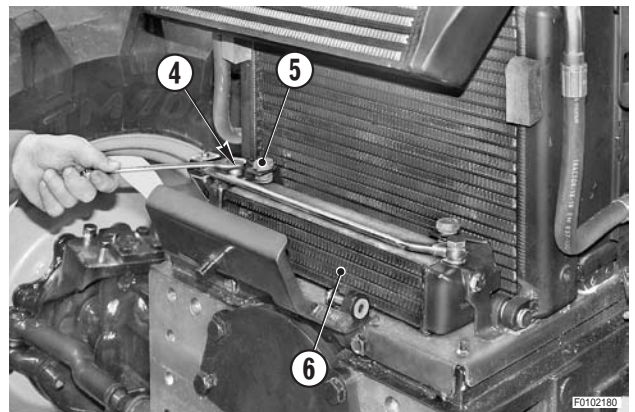
- 1 - Remove the circlips (1) and remove the pivot pins (2) on both sides.



- 2- Move the condenser--drier assembly to one side (3).



- 3 - Undo the fittings (4) and the bolts (5) and remove the fuel cooler (6).
★ Renew the copper washers on reassembly.



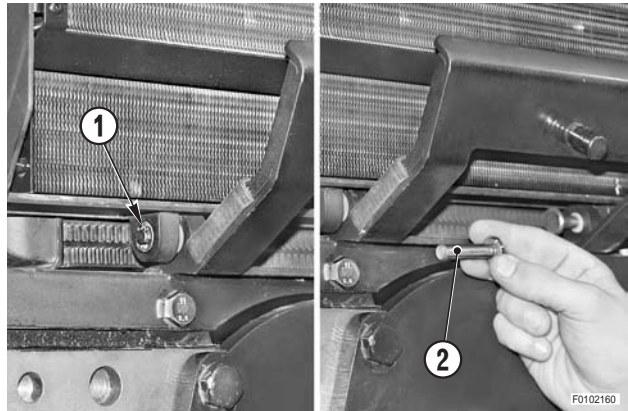
Refitting

- Refitting is the reverse of removal.

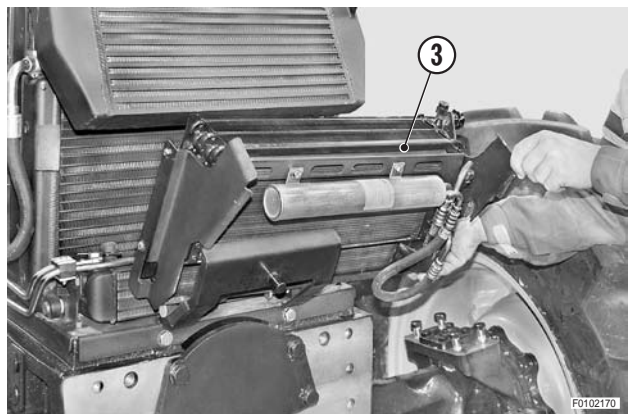
TRANSMISSION OIL COOLER

Removal

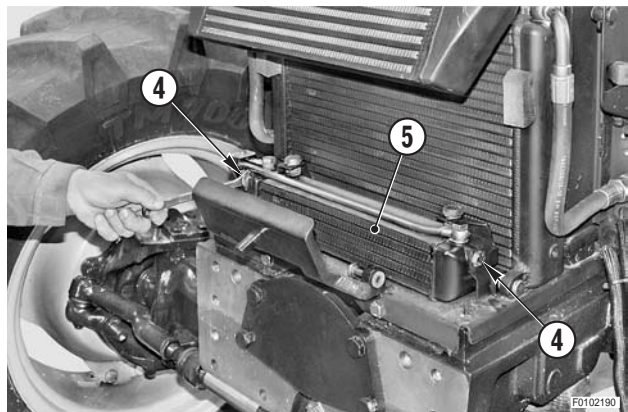
1 - Remove the circlips (1) and remove the pivot pins (2).



2- Move the condenser--drier assembly to one side (3).

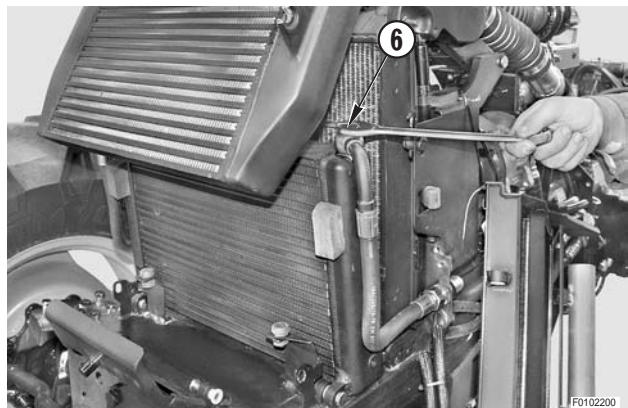


3 - Remove the bolts (4) and move the fuel cooler (5) to one side.

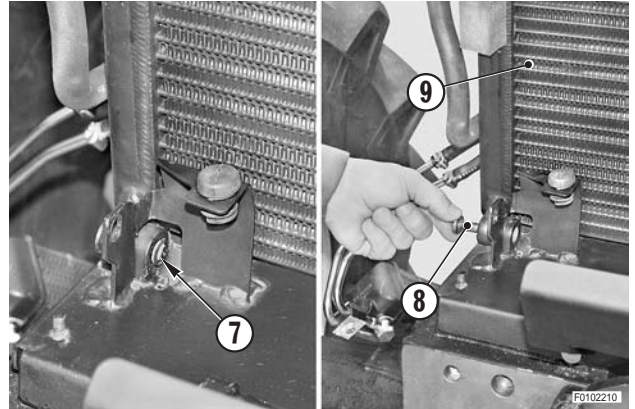


4 - Remove the unions (6).


★ Fit new copper washers on reassembly.



- 5 - Remove the circlips (7), remove the pivot pins (8) on both sides and remove the cooler (9).



Refitting

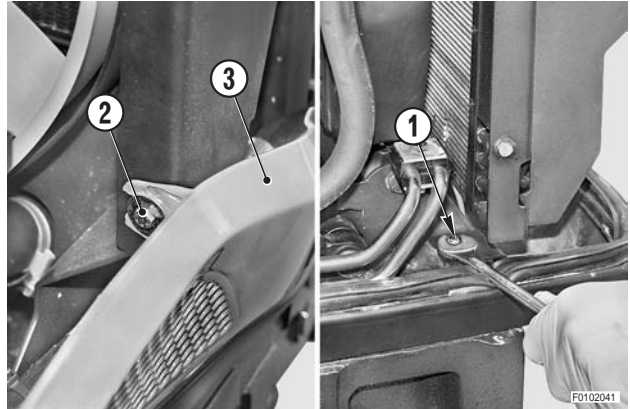
- Refitting is the reverse of removal.
- 1 - Start the engine and allow the gearbox oil to circulate for about 5 minutes to fill the coolers; check the seals and fittings for leaks.
 - 2 - Stop the engine and check the gearbox oil level; top up, if necessary.
-  This operation is essential if new coolers have been fitted.

ENGINE COOLING SYSTEM RADIATOR

Removal

! Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Loosen the bolts (1), remove the nuts (2) and remove the lower heat shield (3).

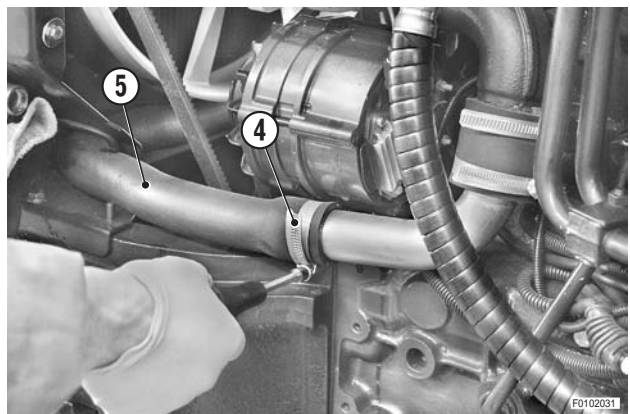


- 2 - Loosen the hose clamp (4), disconnect the hose (5) and drain off the engine coolant:

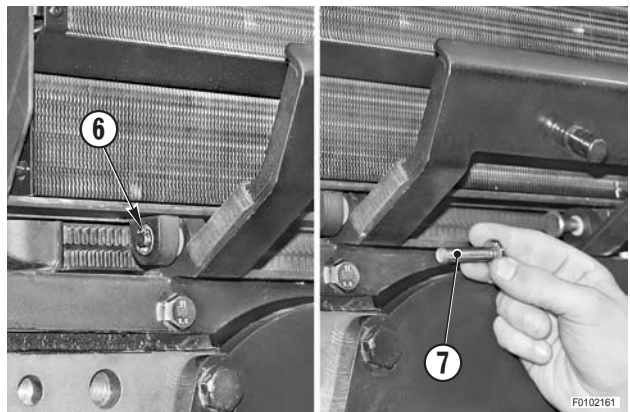


Coolant:

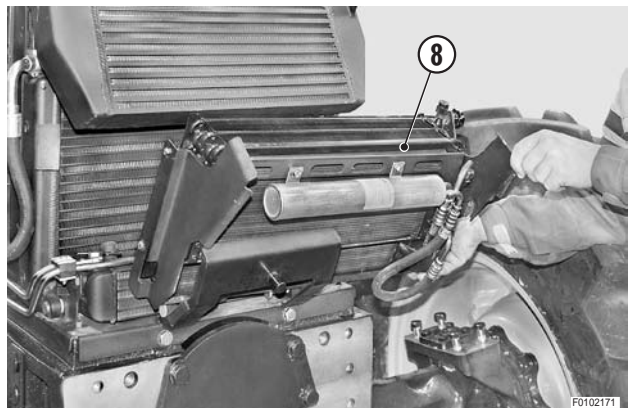
Mod.	90	100	110	120
ℓ	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10



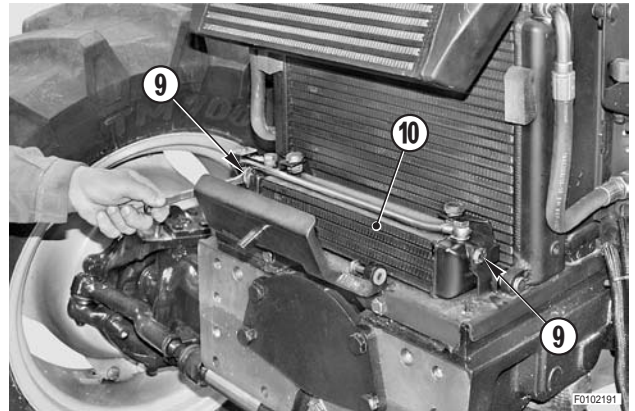
- 3 - Remove the circlips (6) and remove the pivot pins (7).



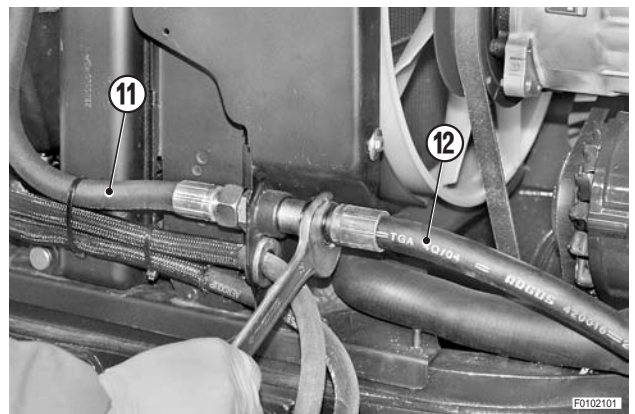
- 4- Move the condenser--drier assembly to one side (8).



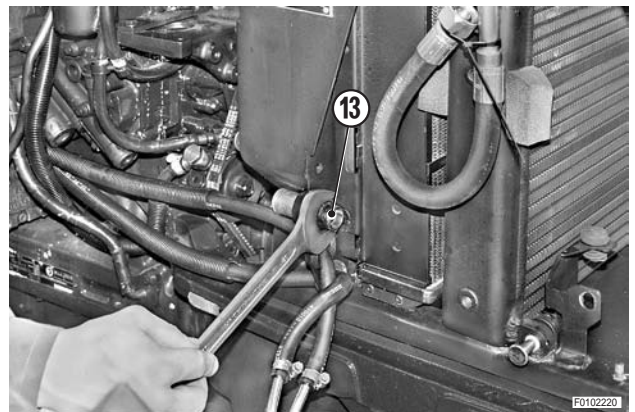
- 5 - Remove the bolts (9) and move the fuel cooler (10) to one side.



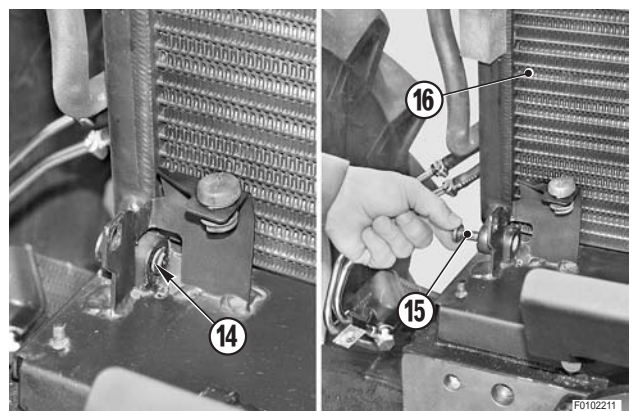
- 6 - Disconnect the pipes (11) and (12) from both sides of the radiator.
★ Plug the pipes to prevent the entry of impurities.



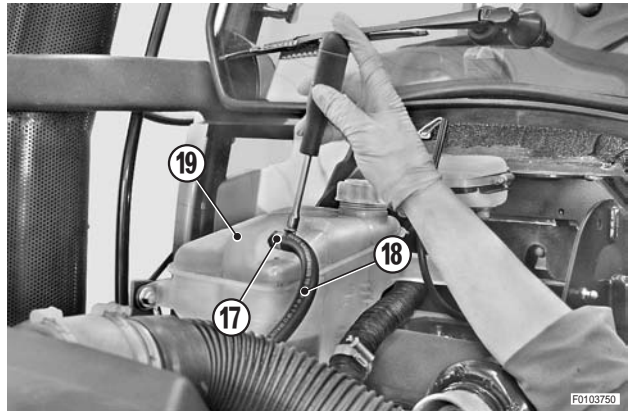
- 7 - Remove the unions (13) on both sides.



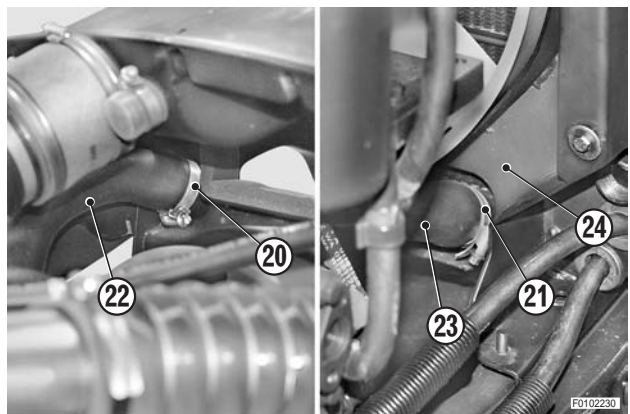
- 8 - Remove the circlips (14), remove the pivot pins (15) on both sides and remove the gearbox oil cooler (16).



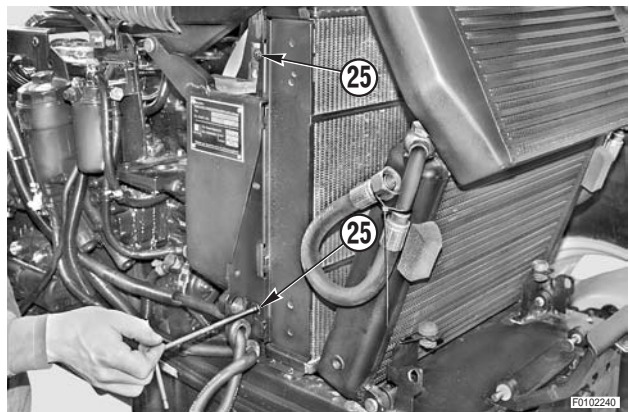
9 - Loosen the clamp (17) and disconnect the pipe (18) from the expansion tank (19).



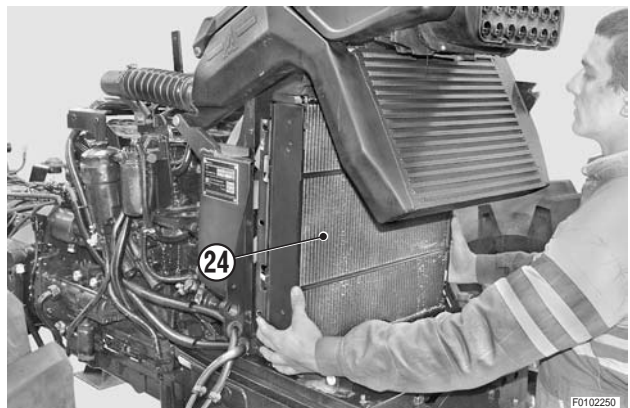
10 - Loosen the clamps (20) and (21) and disconnect the hoses (22) and (23) from the radiator (24).



11 - Remove the bolts (25) (two per side).



12 - Remove the complete radiator assembly (24).



Refitting

- Refitting is the reverse of removal.

1 - Fill the engine cooling system.



Coolant:

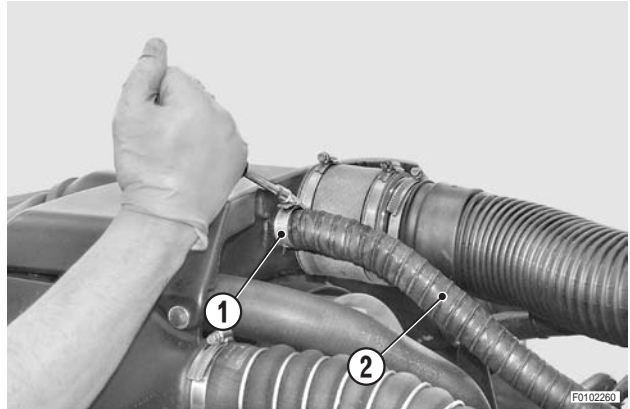
Mod.	90	100	110	120
ℓ	15,5	15,5	17,5	15,5
US.gall.	4.10	4.10	4.62	4.10

- 2 - Start the engine and allow the gearbox oil and coolant to circulate for a few minutes; 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 and top up if necessary.

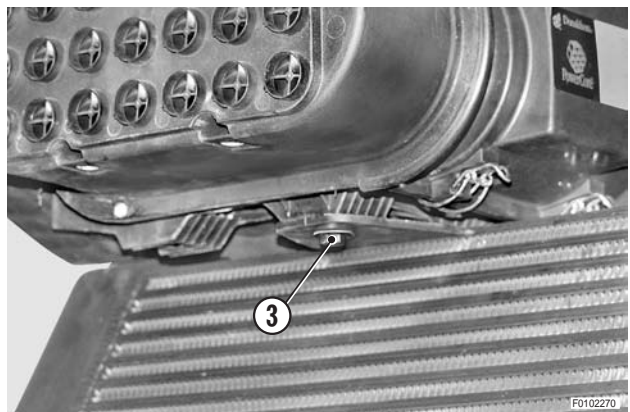
AIR FILTER ASSEMBLY

Removal

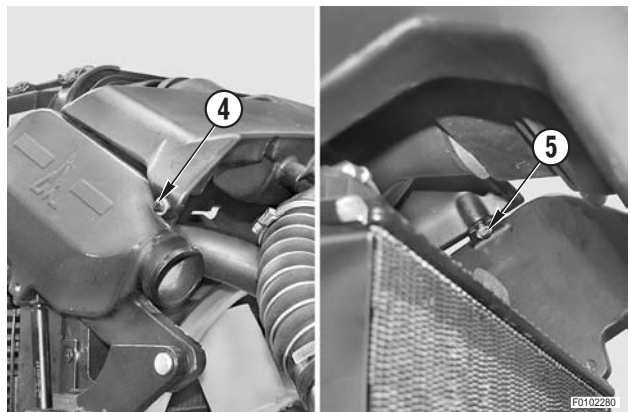
- 1 - Disconnect the wiring connector of the filter clogging sensor.
- 2- Loosen the clamps (1) and disconnect the pipes (2).




- 3 - Remove the screw (3).



- 4 - Remove the bolts (4) and (5) on both sides.



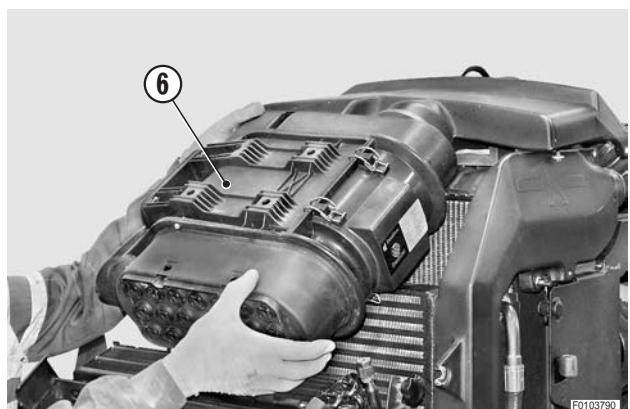
- 5 - Remove the complete air filter assembly (6). 

Refitting

- Refitting is the reverse of removal.



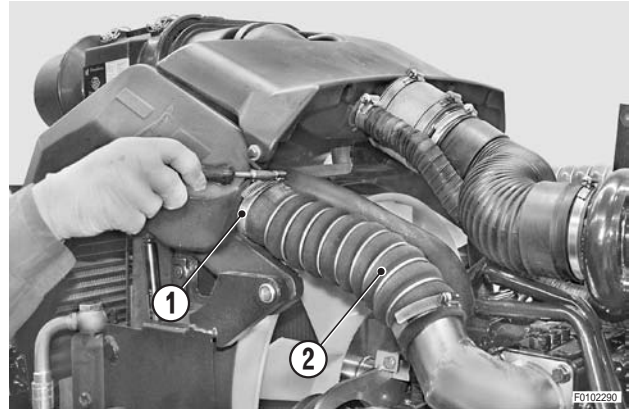
- ★ If the complete filter assembly is to be renewed, fit new sealing gaskets.



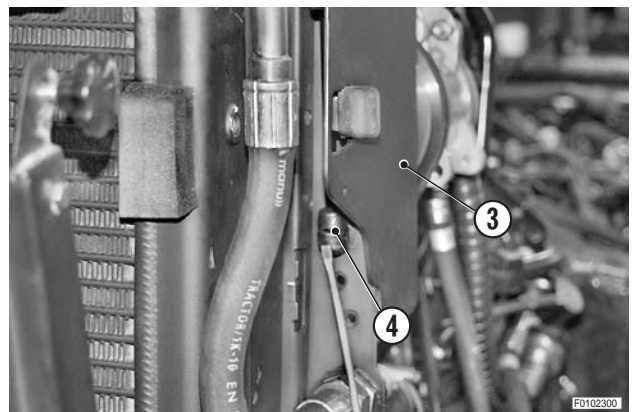
INTERCOOLER

Removal

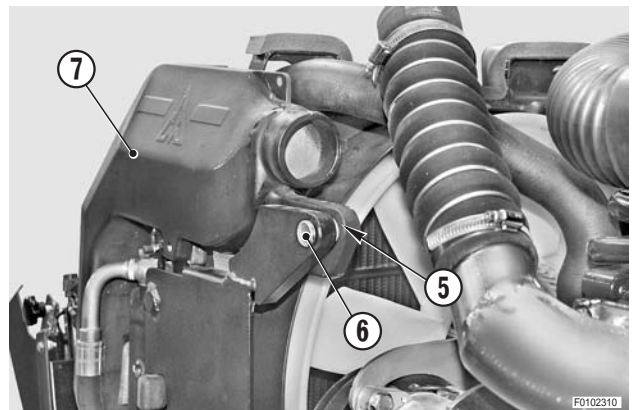
- 1 - Remove the complete air filter assembly.
(For details, see "AIR FILTER ASSEMBLY").
- 2 - Loosen the hose clamps (1) and disconnect the hoses (2) on both sides.



- 3 - While supporting the intercooler, detach the gas spring (4) from the radiator support (3).
- 4 - Lower the intercooler as far as it will go.



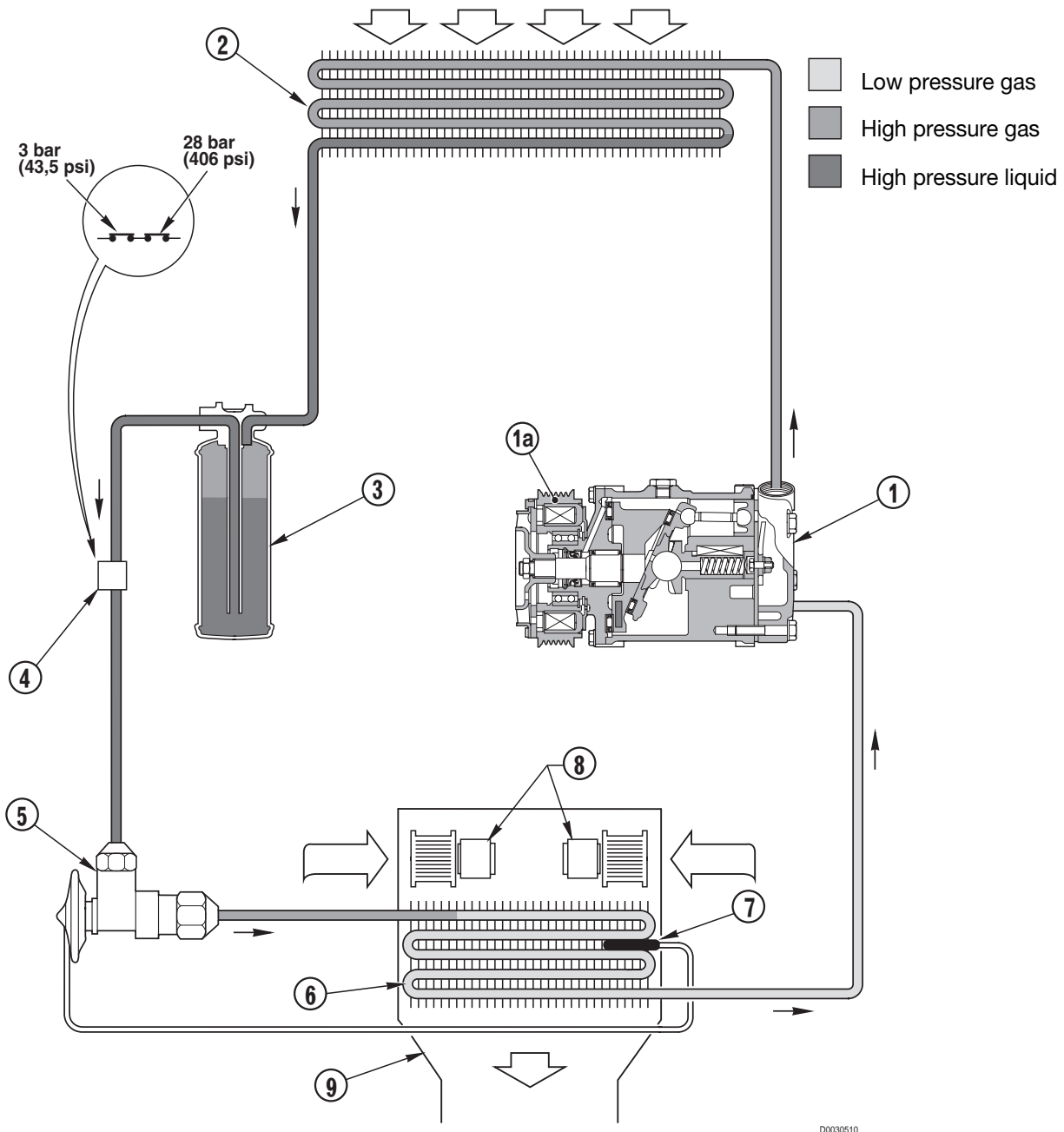
- 5 - Remove the circlips (5), remove the pivot pins (6) on both sides and remove the intercooler (7).



Refitting

- Refitting is the reverse of removal.

AIR CONDITIONING SYSTEM



D0030510

- 1 - Compressor with electromagnetic clutch
- 2 - Condenser
- 3 - Receiver-drier
- 4 - Bistable pressure switch for compressor clutch engagement/disengagement
- 5 - Expansion valve
- 6 - Evaporator
- 7 - Evaporator temperature sensor
- 8 - Cab air blowers
- 9 - Condenser cooling fan

TECHNICAL DATA

- Minimum and maximum pressures: 2.4 -28.5 bar (34.8 - 413.3 psi)
- Refrigerant: R134a
- Quantity of refrigerant: 1600 g (56.4 oz.)
- Total quantity of moisture-free oil added at 1st charging: 210 cm₃ (12.81 Cu.in.)

Operation

The 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 the 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 the 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, causing the temperature of the vapour to rise; the refrigerant flows to the condenser (2), where its heat is radiated to the air flow and it is thus cooled to the point where it condenses to high-pressure liquid.

On leaving the condenser, the liquefied refrigerant flows to the receiver-drier (3) which performs three main functions: to filter out any impurities, to absorb any water in the circuit, and finally, to act as a storage reservoir.

On leaving the receiver-drier, the clean, dry liquid passes to the evaporator (6) through an expansion valve (5), which meters the flow of refrigerant into the evaporator 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 over the evaporator (6) generated by the centrifugal blowers (8) is significantly higher than -8°C (17.6°F), and therefore it gives up its heat to the refrigerant, causing it to boil and evaporate.

On leaving the evaporator (6), the refrigerant returns to the compressor (1) to repeat the cycle.

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 temperature above 0°C (32°F), it will freeze and compromise the efficiency of the evaporator.

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 an electronic temperatures sensor (7); this sensor disengages the compressor clutch (1a) when the temperature falls to the lower limit and engages the clutch (1a) when the evaporator temperature reaches an upper limit.

The condensate that forms on the evaporator (6) fins contains dust, pollen and other particles suspended in the air; continuous condensation thus has the effect of purifying the air, and the drips of condensate are conveyed out of the vehicle via two ducts.

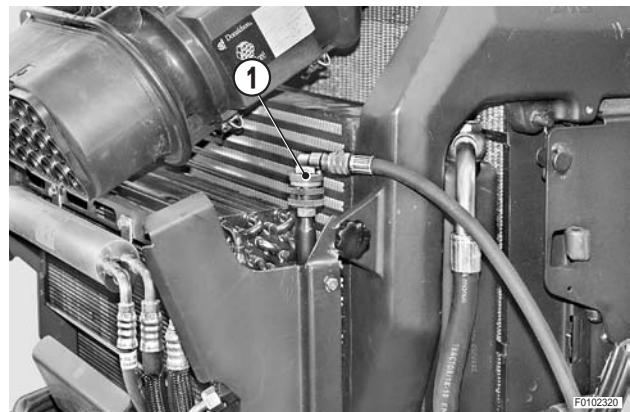
A fixed quantity of moisture-free oil is added to the circuit in order to lubricate all the mechanical components of the system; a certain percentage of this oil continuously circulates in the form of an oil mist, thereby lubricating the compressor (pistons and bearings) and the expansion valve.

Discharging, flushing and recharging

- ⚠ 1 - Before discharging, flushing and recharging the air conditioning system, inspect the system for leaks using a suitable leak detector.
- 2 - To service the air conditioning system you will require a dedicated servicing machine capable of performing the following operations:
 - a - Aspiration of the refrigerant.
 - b - Creation of a high vacuum to purge the system of contaminants.
 - c - Filtration of the recovered refrigerant.
 - d - Separation of the moisture-free oil from the liquid refrigerant and determination of its quantity by weight.
 - e - Recharging system with exactly the same amounts of refrigerant and oil as those recovered.
 - f - Measuring the system delivery side pressure and return pressure (low pressure).

1. Discharging the system

- 1 - Connect the service machine to the high pressure service valve (1) and follow the specific instructions for the service machine to discharge the system.
- 2 - Disconnect the system component to be renewed or overhauled immediately after the service machine stops; **plug the ends of disconnected connection pipes as soon as possible.**

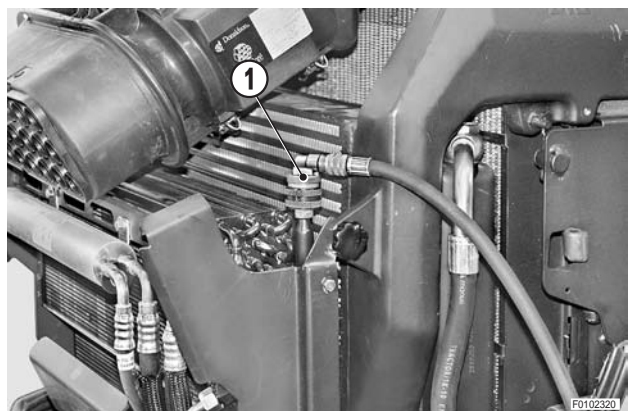


2. Flushing and recharging the system

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 service machine must be connected to the high (1) and low (2) pressure service valves.

- ⚠ Maximum vacuum” must be maintained for at least 10 minutes.



- ★ After purging, the moisture-free oil recovered during the discharging operation must be re-introduced into the system, followed by the refrigerant.



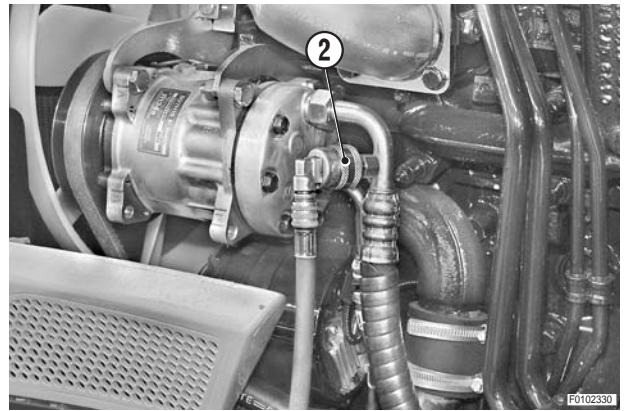
Quantity of refrigerant (R134a): 1600 g (56.4 oz.)
Quantity of oil: the quantity recovered.



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 be added to that recovered with the refrigerant.



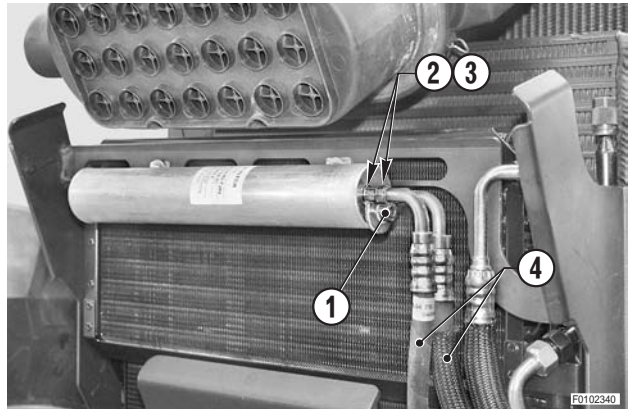
For details of the oil and refrigerant recharging procedure, refer to the instructions supplied with the service machine.



RECEIVER - DRIER

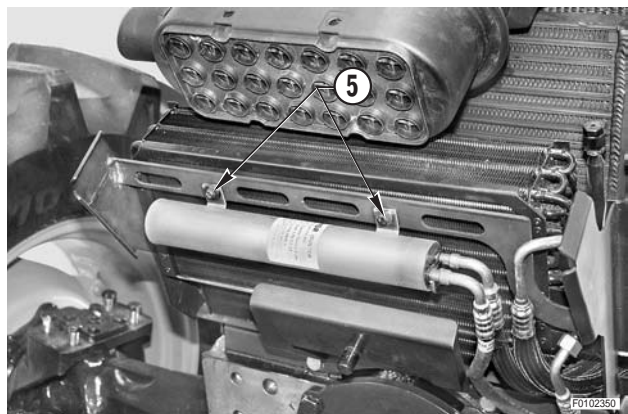
Removal

- 1 - Recover the refrigerant from the system.
(For details, see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").
- 2 - Remove bolt (1) and the washers (2) and (3) and disconnect the inlet and outlet pipes (4).
 - ★ Immediately plug the ends of the pipes to prevent the entry of moisture.



- 3 - Remove the bolts (5) and remove the receiver -drier.

- ⚠ If the receiver-drier needs to be renewed, measure the quantity of oil contained in the assembly to determine the quantity that will have to be put back into the system.



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 - Discharging, flushing and recharging").

CONDENSER ASSEMBLY

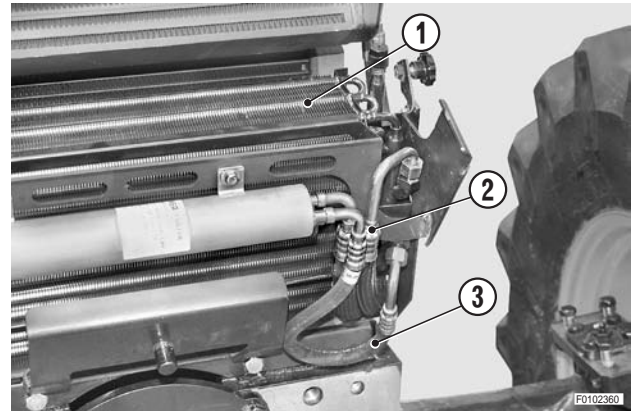
Removal

⚠ Remove the key from the ignition and apply the parking brake.

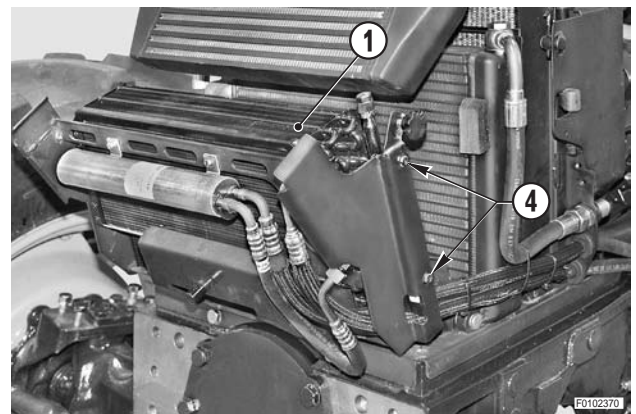
- 1 - Recover the refrigerant from the system.
(For details, see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").
- 2 - Disconnect the pipes (2) and (3) from the condenser (1).

※ 1

- ★ Plug the open ends of the pipes immediately to prevent moisture getting into the circuit.



- 5 - Remove the screws (4).
- 6 - Remove the condenser assembly (1).
★ Take particular care not to damage the fins.



Refitting


- Refitting is the reverse of removal.

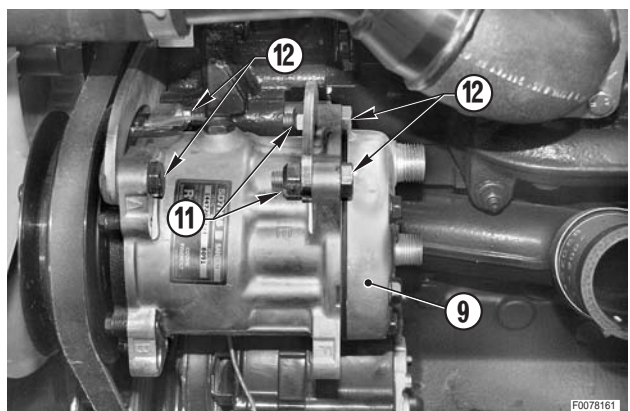
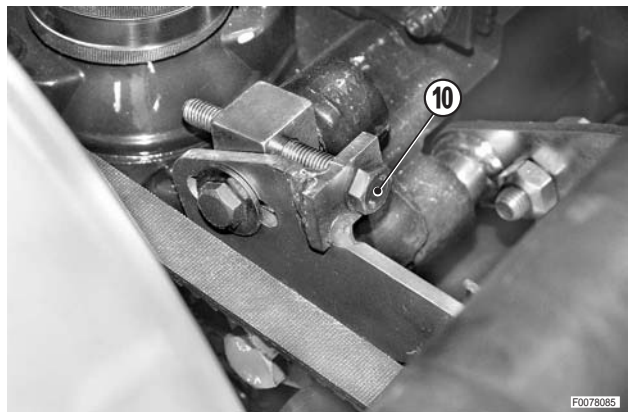
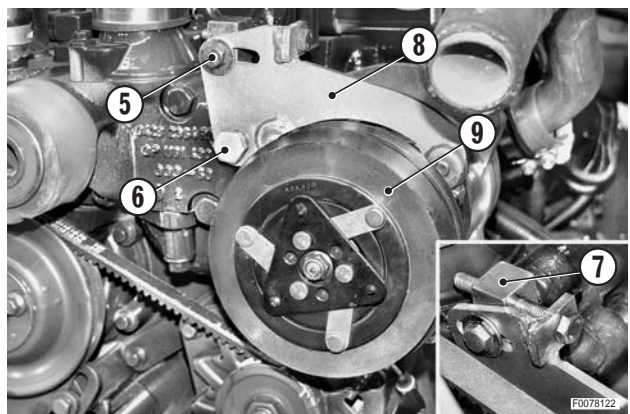
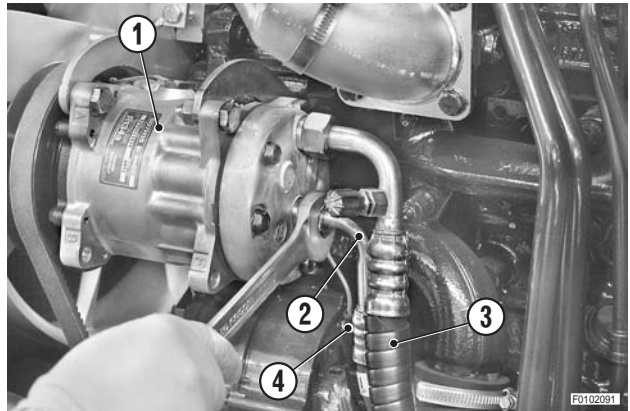
※ 1

- ★ 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 - Discharging, flushing and recharging").

COMPRESSOR

Removal

- 1 - Recover the refrigerant from the system.
(For details, see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").
- 2 - Disconnect the inlet (3) and delivery (4) lines from the compressor (2).
 - ★ Plug the open ends of the pipes immediately to prevent moisture getting into the circuit. 
- 3 - Disconnect the wiring connector (4) of the electromagnetic clutch control.
- 4 - Loosen the bolts (5) and (6) securing the tensioner block (7) and acting as pivot for the support (8) of the compressor (9).
- 5 - Turn the 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 - Loosen and remove the self-locking nuts (12) and bolts (13); remove the 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 "FAN BELT").
 - 2 - Purge and recharge the air conditioning system. (For details, see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").

HEATER ASSEMBLY

COMPLETE ASSEMBLY

Removal

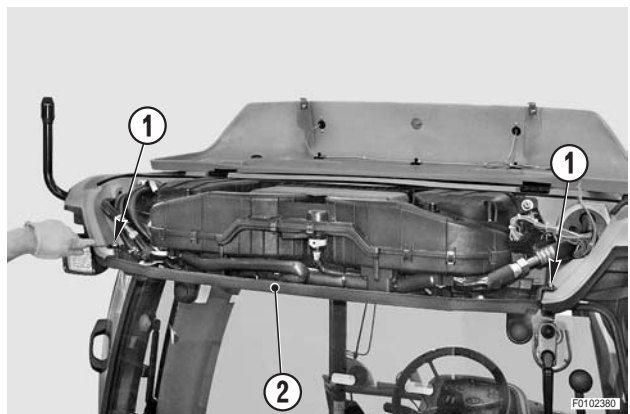
! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

1 - Recover all the refrigerant from the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging"). 

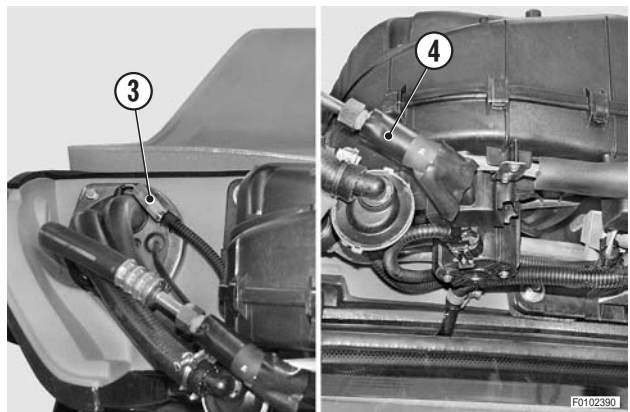
★ Recover the system oil and make a note of the quantity.



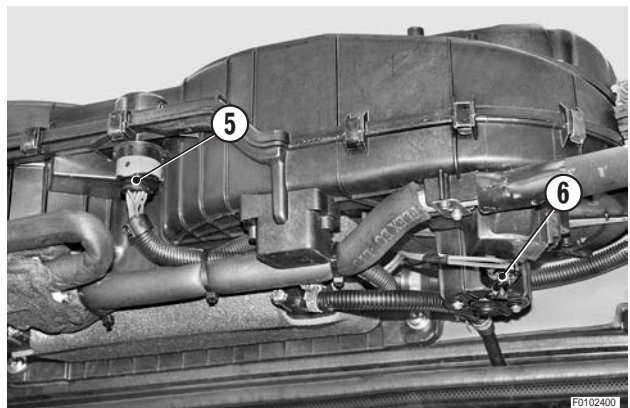
2 - Remove the two bolts (1) and remove the lower panel (2).



3 - Disconnect the wiring connector (3) of the flashing beacon and the wiring connector (4) of the left fan.



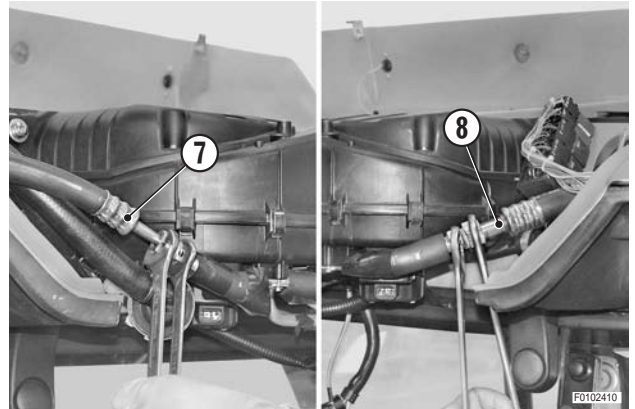
4 - Disconnect the wiring connector (5) and the wiring connector (6) of the right-hand fan and withdraw the wiring harness.



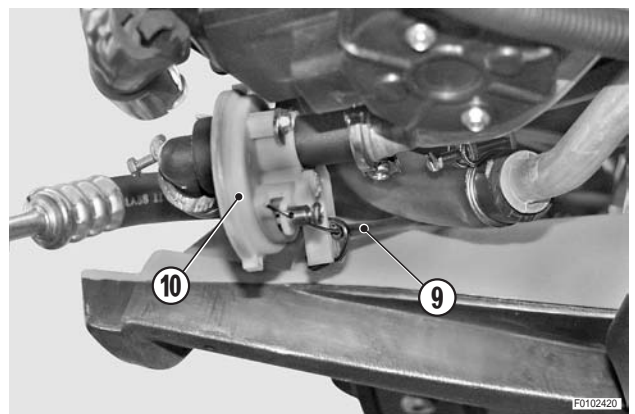
5 - Disconnect the air conditioning pipes (7) and (8).

※ 3

- ★ Immediately plug the open ends of the pipes to prevent moisture getting in to the system.

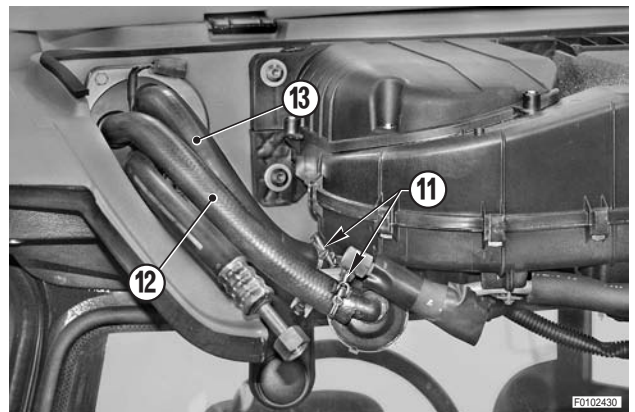


6 - Disconnect the control cable (9) of the heating valve (10).

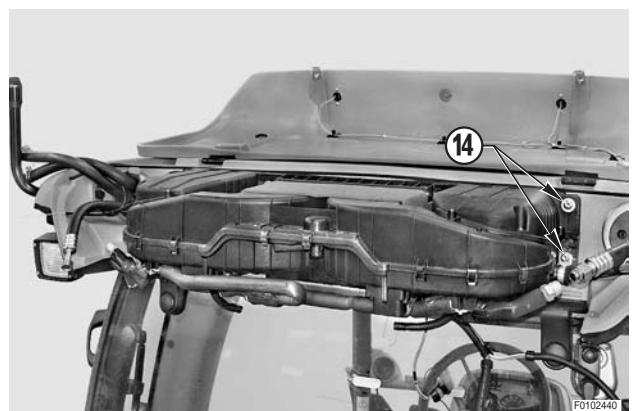


7 - Loosen the hose clamp (11) and disconnect the heating hoses (12) and (13).

- ★ Mark the pipes to avoid error when reconnecting.



8 - Remove all eight bolts (14).



9 - Remove the 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.

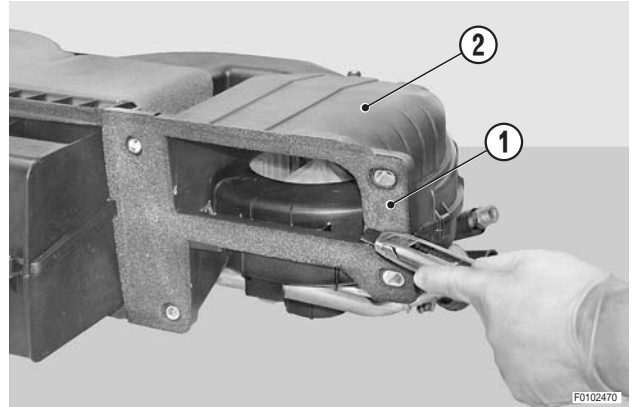
※ 3

 High pressure fitting (5/8" - 18UNF):
13.6–20.3 Nm (10 –15 lb.ft)

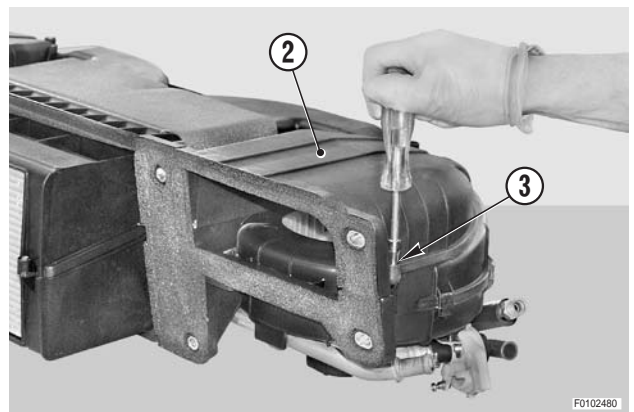
 Low pressure fitting (7/8" - 14UNF):
35,3–42 Nm (26–31 lb.ft)

UPPER HALF DUCT

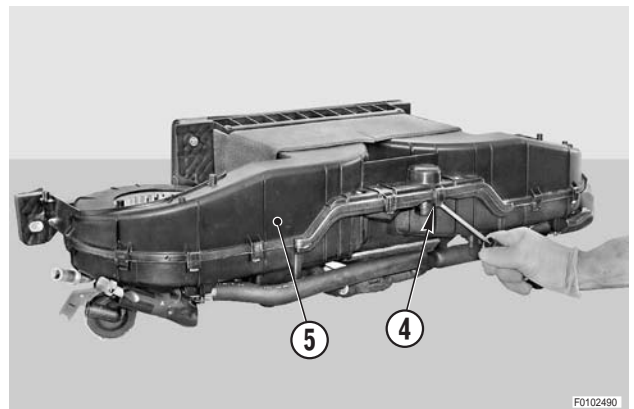
- 1 - Cut the gasket (1) along the joint between the covers (2).



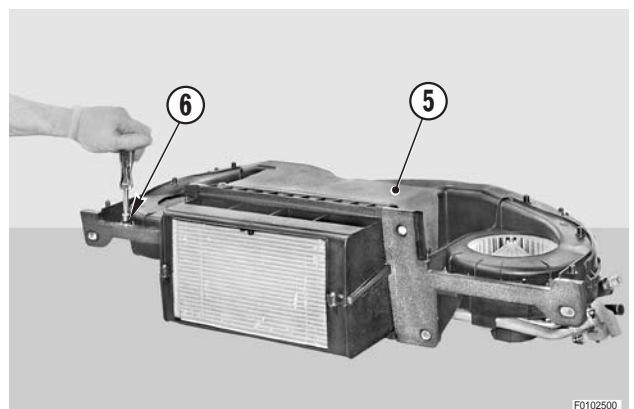
- 2 - Remove the screws (3) and remove the covers (2) on both sides.



- 3 - Undo the ten spring clips (4) securing the half duct (5).



- 4 - Remove all the screws (6) and remove the half duct (5).



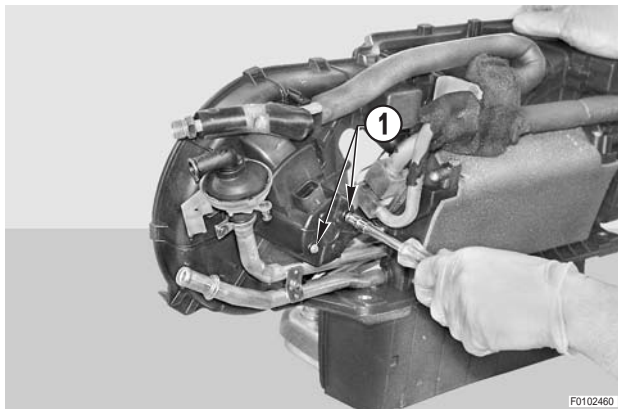
Assembly

- To assemble, follow the disassembly steps in reverse order.

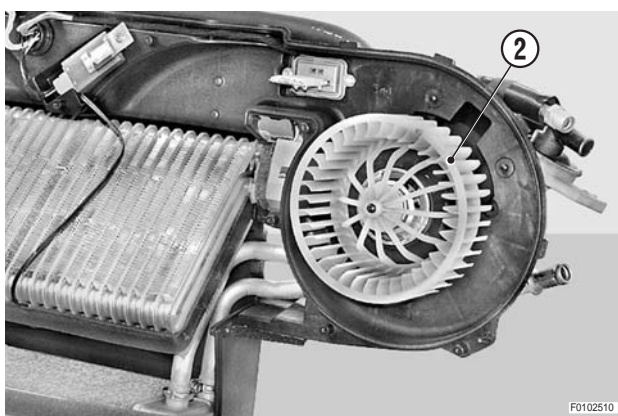
FANS

Disassembly

1 - Remove the two bolts (1).

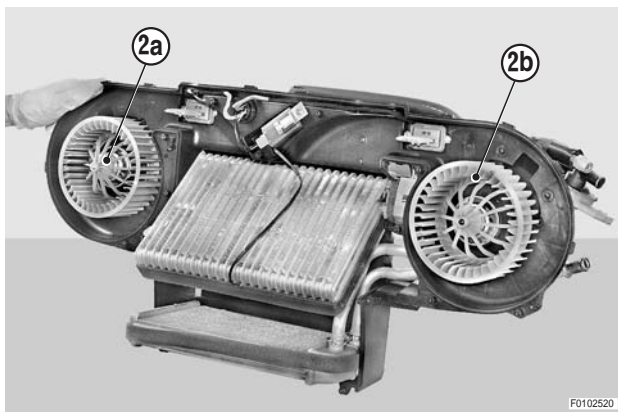


2 - Remove the fan/s (2) as required.



Assembly

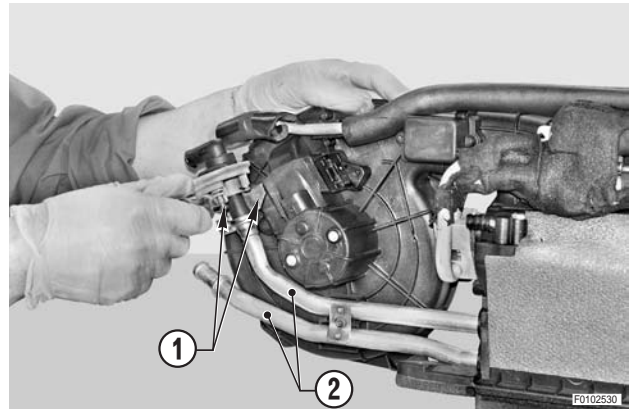
- To assemble, follow the disassembly steps in reverse order.
- ★ If both fans are removed, install the white fan (2a) on the left-hand side of the assembly and the green fan (2b) on the right-hand side.



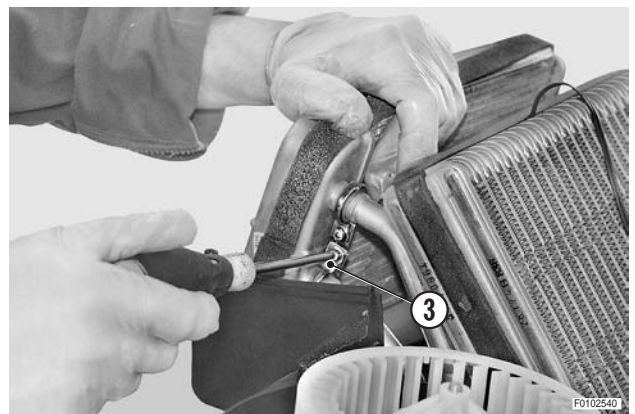
HEATER MATRIX

Disassembly

1 - Remove the four bolts (1) to free the heating pipes (2).

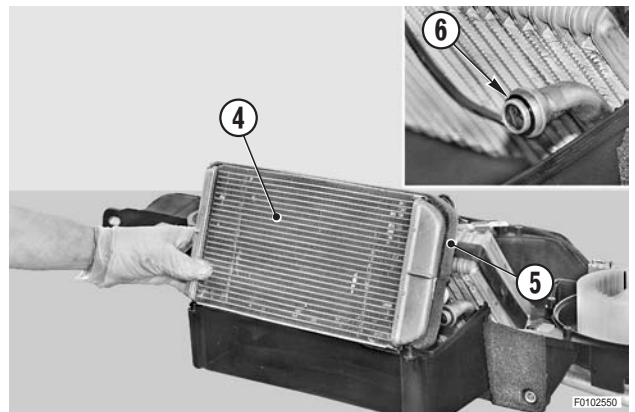


2 - Remove the hose clamps (3).



3 - Remove the heater matrix (4).

- ★ If the heater matrix is to be renewed, also renew the gasket (5).
- ★ Check the condition of the O-rings (6) and renew them if necessary.



Assembly

- To assemble, follow the disassembly steps in reverse order.



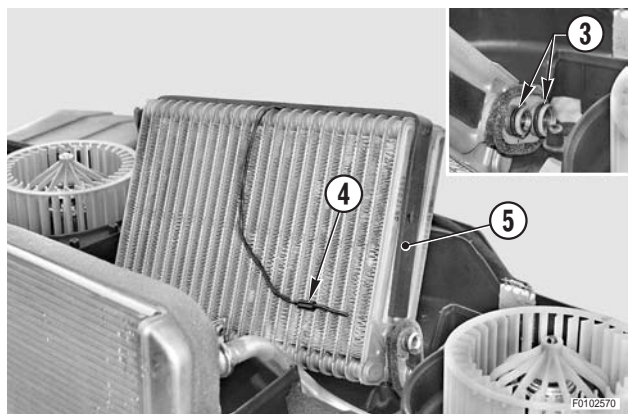
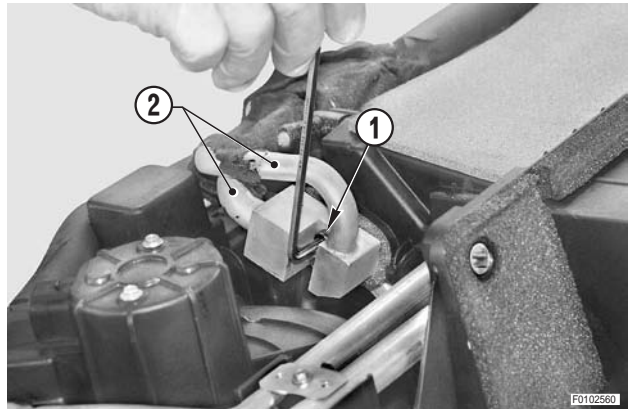
- ★ When refitting the hose clamps (3), ensure that they are positioned as shown in the figure.



AIR CONDITIONING EVAPORATOR

Disassembly


- 1 - Remove the screws (1). ✖ 1
 - 2 - Disconnect the evaporator (2) from the pipes.
-
- 3 - Disconnect the probe (4) of the safety thermostat and remove the evaporator.
 - ★ Check the condition of the O-rings (3) and renew them if necessary.
 - ★ If the evaporator is to be renewed, also renew the gaskets (5).
 - ★ Note the exact position of the temperature sensor probe (4).



Assembly

- To assemble, follow the disassembly steps in reverse order.

✖ 1

 Bolts: 4 ± 0.4 Nm (2.9 ± 0.3 lb.ft.)

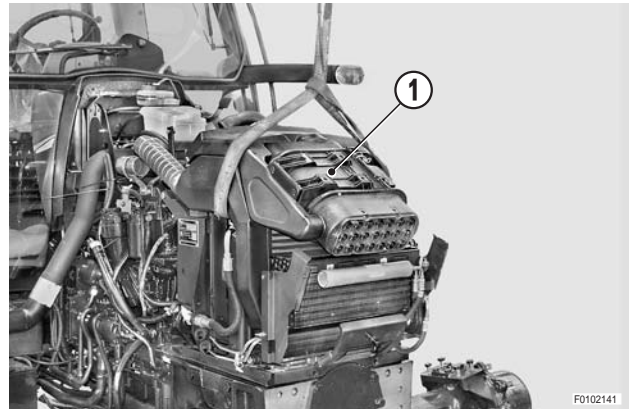
ENGINE COOLING FAN ASSEMBLY

ENGINE COOLING FAN

Removal

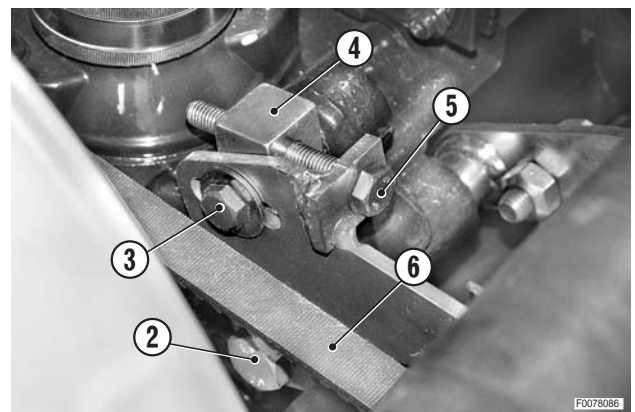
⚠ Remove the cover and disconnect the lead from the negative terminal (-) of the battery.

1 - Remove the complete radiator-coolers assembly (1).
(For details, see "COOLERS-RADIATOR ASSEMBLY").

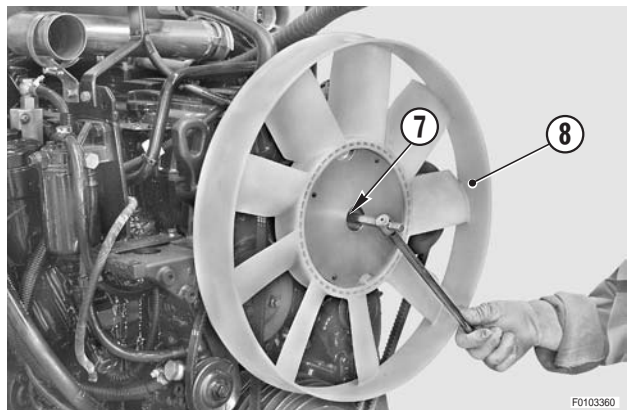


2 - Loosen the bolts (2) and (3) securing the air conditioning compressor and the tensioner block (4).

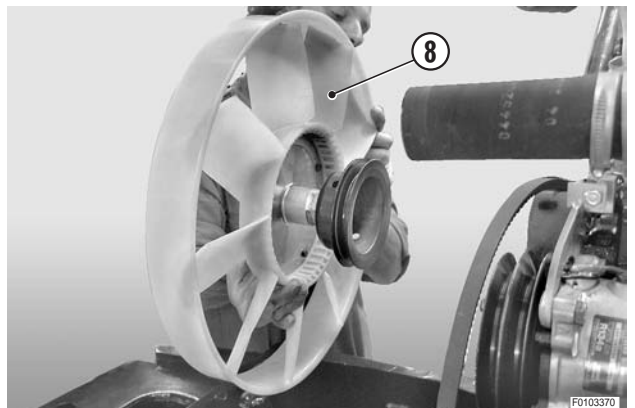
3 - Turn the screw (5) anti-clockwise in order to slacken and release the fanbelt (6).



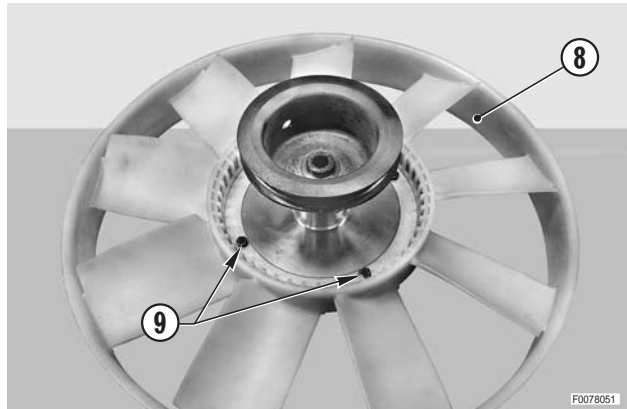
4 - Using a hex socket wrench, loosen and remove the central screw (7) securing the fan (8) and its pulley.



5 - Remove the complete fan assembly (8).

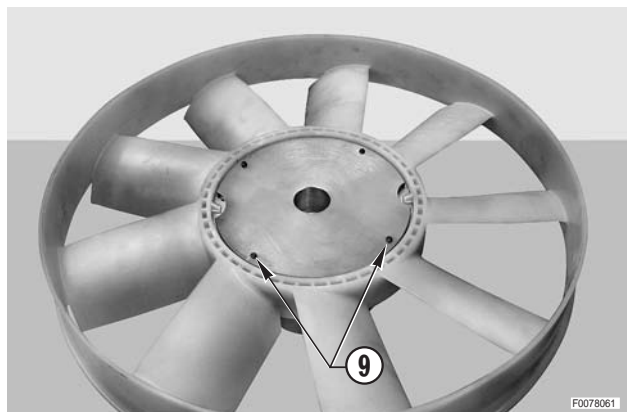


- 6 - With the fan assembly (8) on a bench, loosen and remove the four retaining bolts (9) and remove the old fan.



- 7 - Position the new fan taking care to align the two front locating marks.

- 8 - Tighten the bolts (9) of the fan-pulley assembly.



Refitting

- Refitting is the reverse of removal.



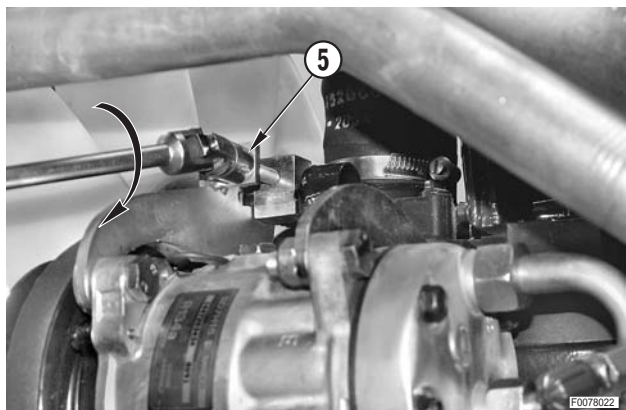
- ★ Turn the tensioner screw (5) clockwise to tension the compressor/fan drivebelt. (For details, see "FAN BELT").

- 1 - Fill the engine cooling system.



Coolant: max. 17,5 ℓ (4.62 US gal.)

- 2 - Purge and recharge the air conditioning system. (For details, see "AIR CONDITIONING SYSTEM - Discharging, 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.



FAN BELT

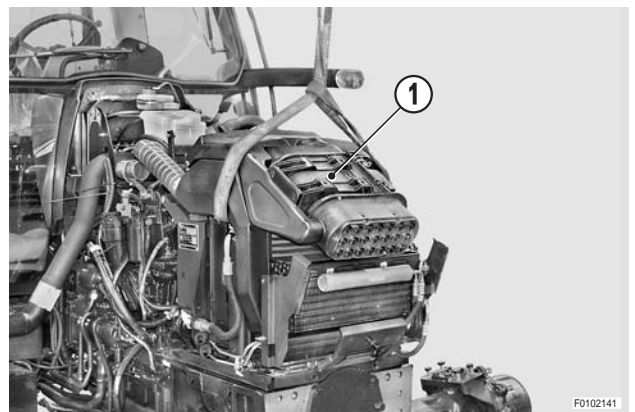
Removal

! Remove the key from the ignition and apply the parking brake.

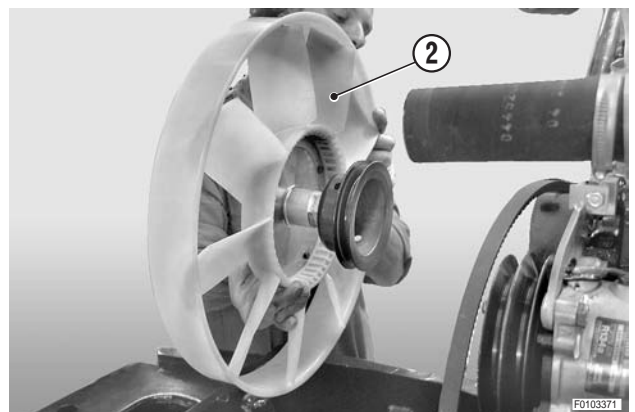
1 - Recover the refrigerant from the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").

2 - Remove the radiator-coolers assembly (1).
(For details, see COOLERS-RADIATOR ASSEMBLY").

3 - Remove the compressor drive belt.
(For details, see "COMPRESSED AIR CIRCUIT - COMPRESSOR DRIVEBELT").



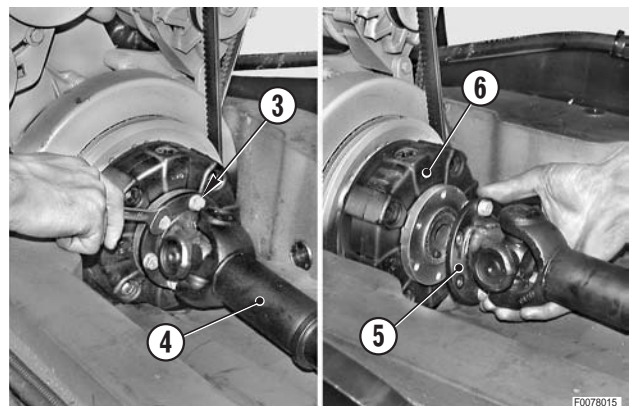
4 - Remove the fan (2).
(For details, see "ENGINE COOLING FAN").



• For models with front PTO

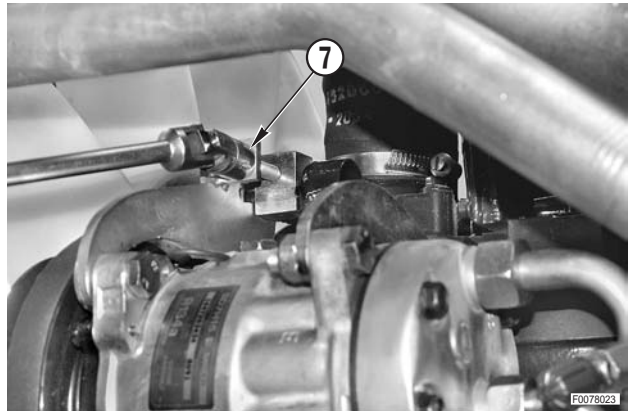
5 - Loosen and fully unscrew the six bolts (3) securing the flange of the cardan shaft (4).

6 - Detach the flange (5) from the flexible coupling (6).



- **For all versions**

7 - Loosen the tensioner (7) and remove the old drive belt.



Refitting


- Refitting is the reverse of removal.

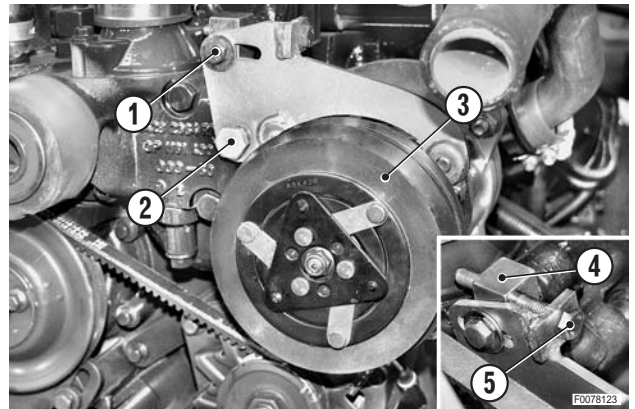


- ★ Adjust the tension of the belt.
(For details, see next heading).

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 the bolts (1) and (2) securing the air conditioning compressor (3) and the tensioner block (4).

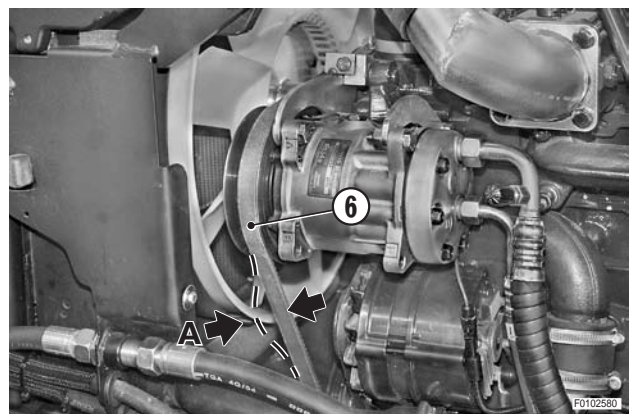
2 - Turn the tensioner screw (5) clockwise to tension drivebelt (6) as indicated below:

- ★ Static deflection "A" immediately after 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 bolts (1) & (2).



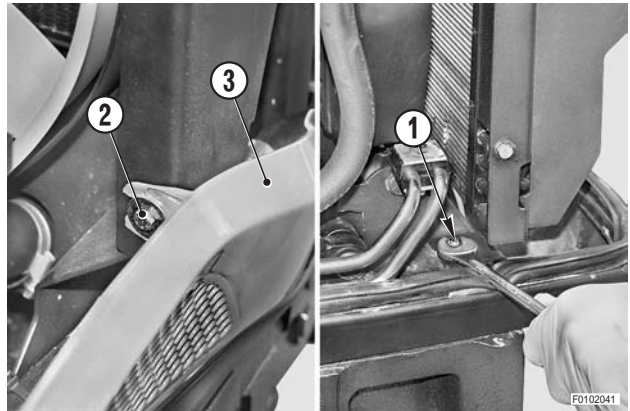
ALTERNATOR ASSEMBLY

ALTERNATOR

Removal

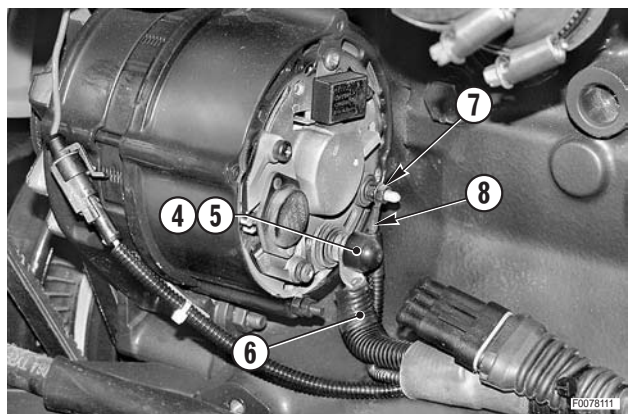
! Remove the cover and disconnect the lead from the negative terminal (-) of the battery.

1 - Loosen the bolts (1), remove the nuts (2) and remove the lower heat shield (3).



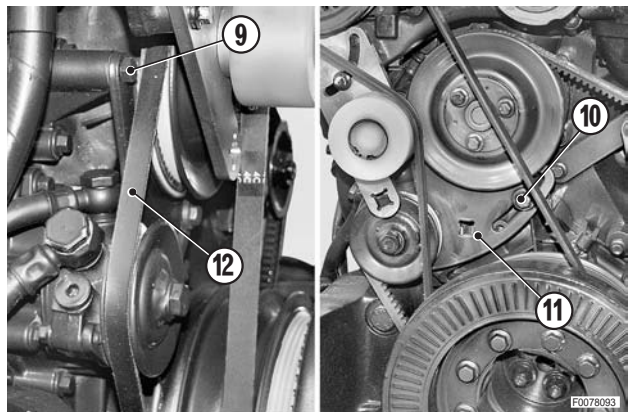
2 - Remove the terminal protector (4), remove the nut (5) and disconnect the lead (6).

3 - Remove the nut (7) and disconnect the lead (8).



4 - Loosen the bolts (9) and (10) of the fuel pump bracket (11) in order to slacken off the drivebelt (12).

5 - Remove the alternator (13).
For details, see the engine manual.

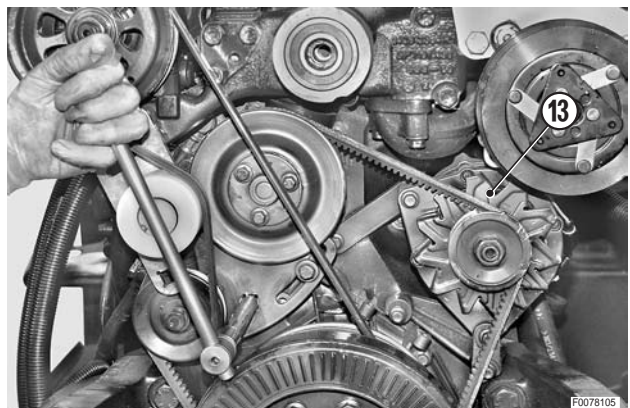


Refitting

- Refitting is the reverse of removal.

1

- ★ Adjust the tension of the belt.
(For details, see "ALTERNATOR DRIVEBELT").

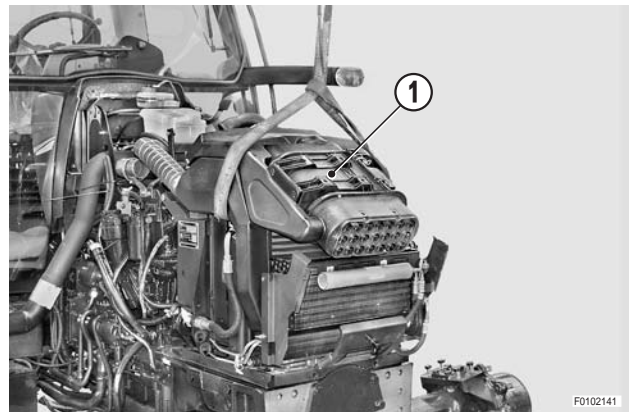


ALTERNATOR DRIVEBELT

Removal

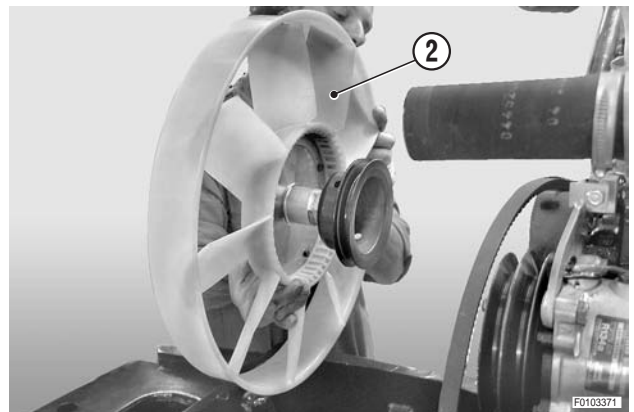
- ★ The belt must be renewed at the first signs of wear. Check for fraying, cracks and separation of the belt plies.
- ★ The operations described below refer to tractors equipped with front PTO . On tractors without a front PTO, ignore the relative steps.
- ⚠ Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the complete coolers assembly (1).
(For details, see "COOLERS-RADIATOR ASSEMBLY").



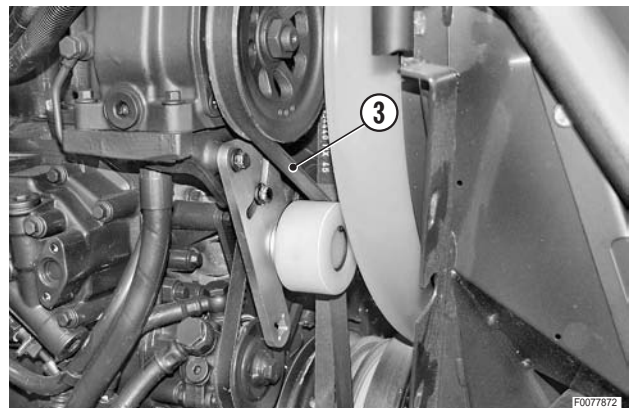
- 2 - Remove the cooling fan assembly (2).
(For details, see "ENGINE COOLING FAN").

⊠ 1



- 3 - Slacken the air compressor drivebelt (3).
(For details, see "COMPRESSOR DRIVEBELT").

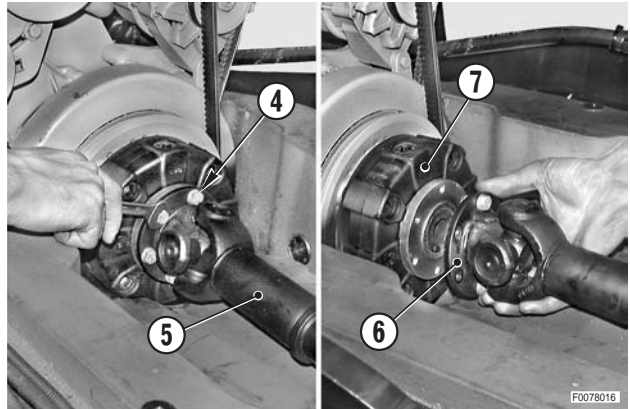
⊠ 2



• For models with front PTO

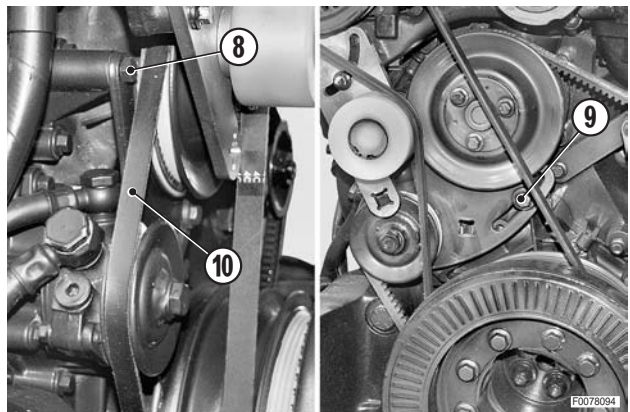
4 - Loosen and fully unscrew the six bolts (4) securing the flange of the cardan shaft (5).

5 - Detach the flange (7) from the flexible coupling (8).



6 - Loosen the bolts (8) and (9) securing the fuel lift pump, disengage the alternator drivebelt (10) and remove it by passing it between the crankshaft pulley and the front axle support.

⊠ 3



Refitting

• Refitting is the reverse of removal.

⊠ 1

★ Adjust the tension of the fan belt. (For details, see: "FAN BELT").

⊠ 2

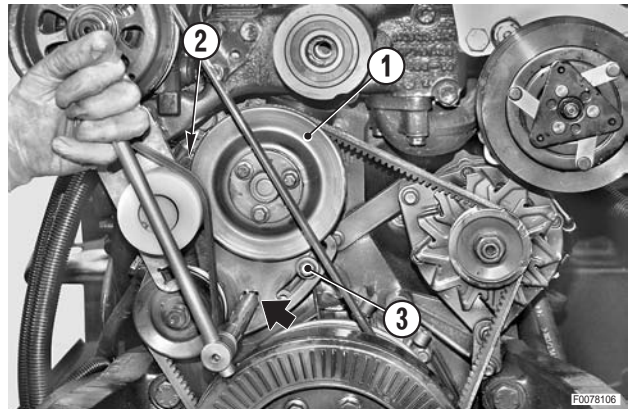
★ Adjust the tension of the air compressor drivebelt. (For details, see "COMPRESSOR DRIVEBELT").

⊠ 3

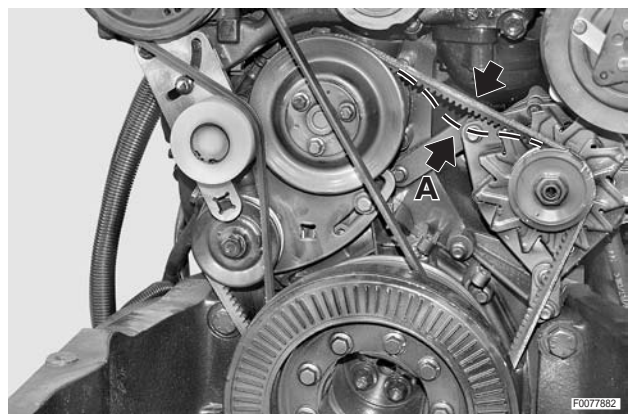
★ Adjust the tension of the belt. (For details, see next heading).

Tensioning

- 1 - Tension the belt using a **Tee** bar with a 3/4" drive extension bar, or a 3/4" angle drive bar inserted in the aperture in the lift pump support (1).
- 2 - Tension the drivebelt by turning the bar clockwise and then tighten down the bolts (2) and (3).



- 3 - To check that the tension is correct, use the tool and procedure indicated in the engine manual.
 - ★ Static deflection "A" immediately after fitting:
13 mm belt: 450 ± 50 N
 - ★ Static deflection "A" after 15 minutes:
13 mm belt: 300 ± 50 N
- ⚠ The check should be carried out with the engine cold.

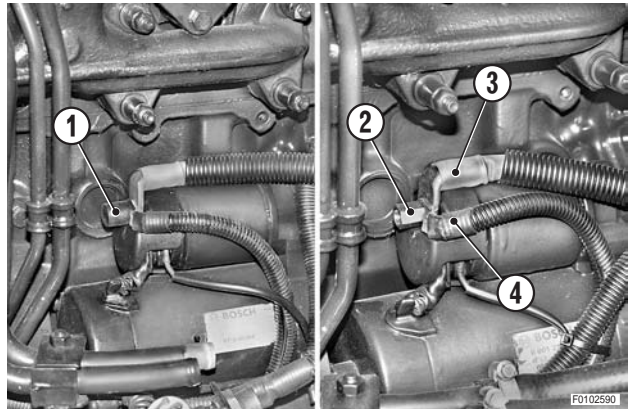


STARTER MOTOR

Removal

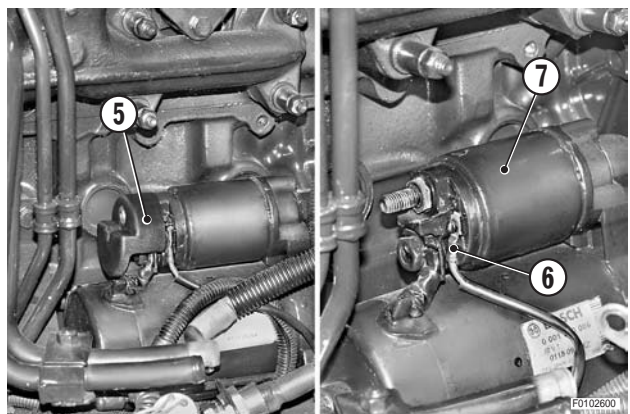
! Remove the cover and disconnect the lead from the negative terminal (-) of the battery.

1 - Remove the terminal protector (2) and the nut (3) securing leads (4) and (5).



2 - Remove the terminal cover (5) and disconnect the lead (6).

4 - Remove the starter motor (7).
For details, see the engine manual.



Refitting

- Refitting is the reverse of removal.

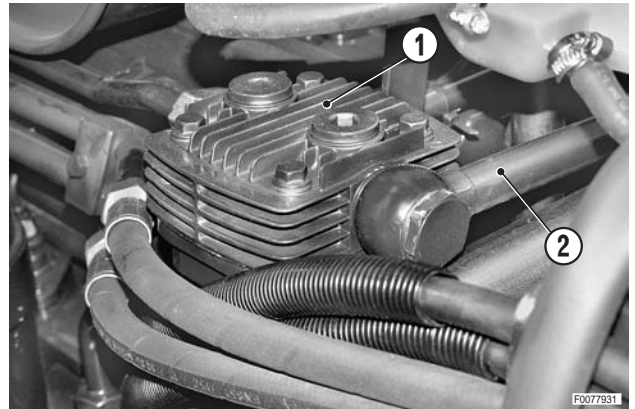
COMPRESSED AIR CIRCUIT

AIR COMPRESSOR

Removal

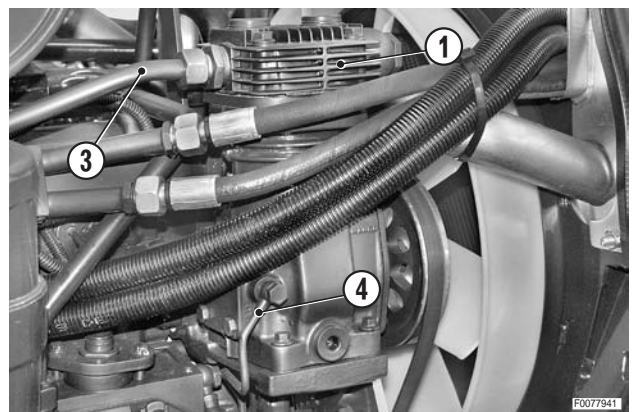
- 1 - Disconnect the air suction pipe (2) from the compressor (1).

★ Always renew the copper gaskets.

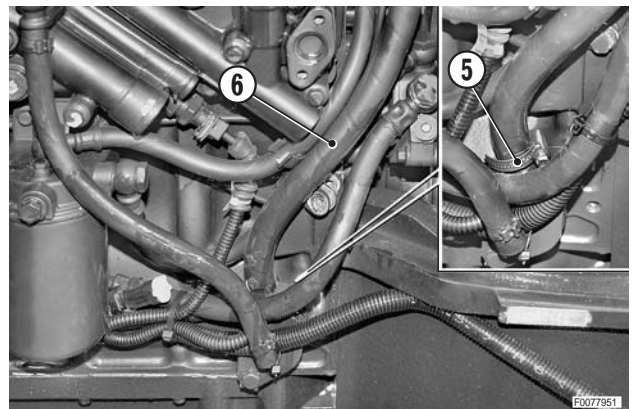


- 2 - Disconnect the pressure pipe (3) and lube oil pipe (4) from the compressor (1).

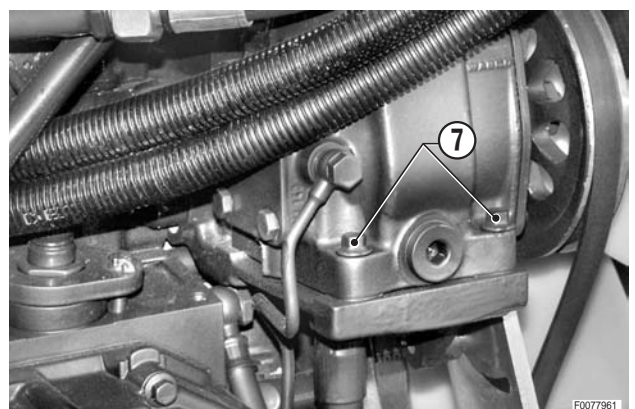
★ Always renew the seals of the lube oil pipe.



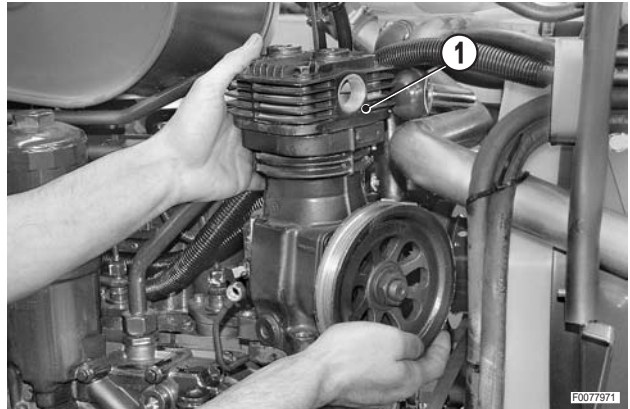
- 3 - Loosen the hose clamp (5) and disconnect the lube oil recovery pipe (6).



- 4 - Loosen and remove the bolts (7) securing the compressor.



5 - Remove the compressor (1), withdrawing it upwards.



Refitting

- Refitting is the reverse of removal.

! If the oil has been drained from the compressor crankcase, add engine oil before re-connecting the lube pipe.



Quantity of oil: approx. 100 g (0.220 lb.)



- ★ Adjust the tension of the drivebelt.
(For details, see "COMPRESSOR DRIVEBELT").

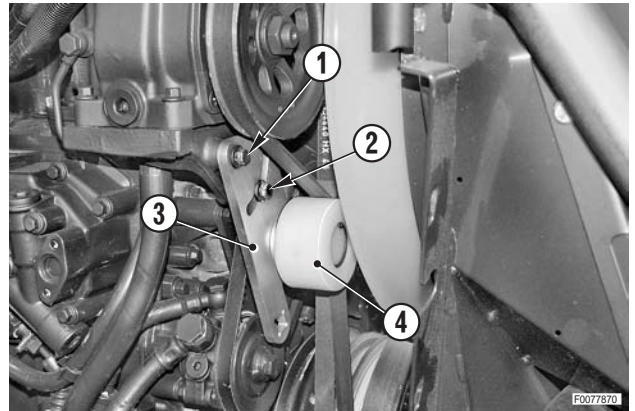
COMPRESSOR DRIVEBELT

Removal

⚠ Remove the key from the ignition and apply the parking brake.

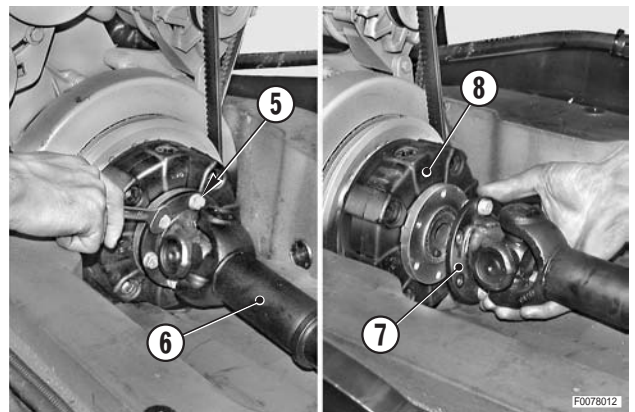
- 1 - Loosen the pivot and fixing bolts (1 and 2) of the mounting bracket (3) of the tensioner pulley (4).

※ 1



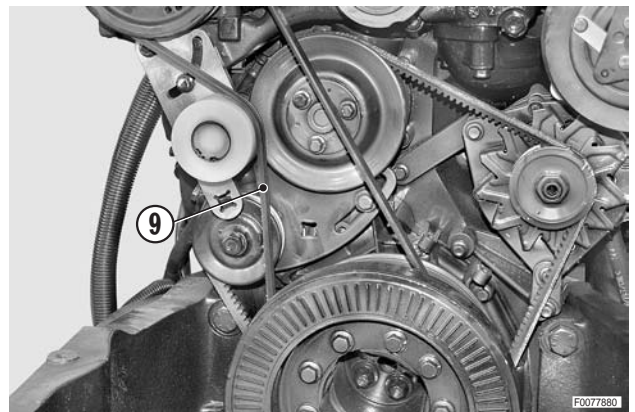
- **For models with front PTO only**

- 2 - Loosen and fully unscrew the six bolts (5) (n°6) securing the flange of the cardan shaft (6).
- 3 - Detach the flange (7) from the flexible coupling (8).



- **For all versions**

- 4 - Remove the worn drivebelt (9).



Refitting

- Refitting is the reverse of removal.

※ 1

- ★ Adjust the tension of the drivebelt.
(For details, see next paragraph).

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.

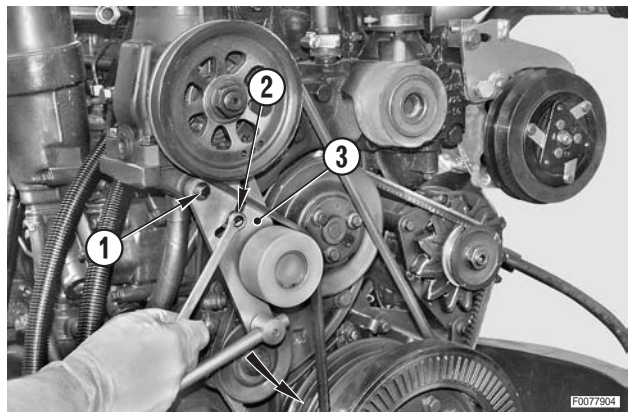
⚠ If a new belt is fitted, re-adjust the tension after approx. 15 operating hours.

- 2 - Loosen the pivot and fixing bolts (1), (2) of the bracket (3) as for the belt renewal procedure.
- 3 - Tension the drivebelt using a **Tee** bar and 3/4" drive extension bar inserted through the aperture in the bracket (3).
- 4 - To tension the drivebelt, turn the bar clockwise and then tighten the bolts (1), (2).
- 5 - Check the tension adjustment using the tool and method described in the engine manual.

★ Static deflection immediately after fitting: 550 ± 50 N

★ Static deflection after 15 minutes: 400 ± 50 N

⚠ The check should be carried out with the engine cold.

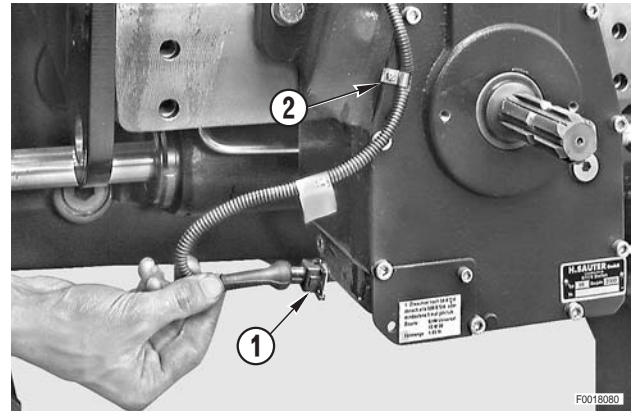


FRONT PTO

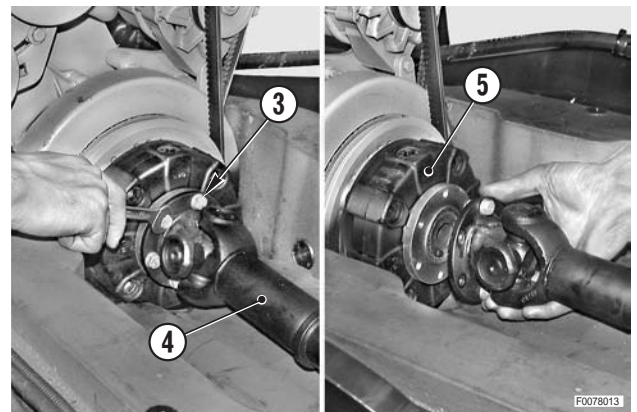
COMPLETE ASSEMBLY

Removal

- 1 - Remove the complete front lift assembly.
- 2 - Unplug the connector (1) and release the wiring from the clip (2).



- 3 - Fully unscrew the bolts (3) securing the drive shaft (4) to the flexible coupling (5) and detach the flange.



- 4 - Loosen the four bolts (6) but only remove the two lower bolts.

★ Leave the two upper bolts in position for safety.



- 5 - Fit a non-slip block to a trolley jack; position the non-slip block under the PTO assembly.

- 6 - Remove the two upper bolts previously left for safety and remove the PTO assembly (7) while supporting the cardan shaft (4).

★ If necessary, use a lever to help separate the assembly from the tractor.



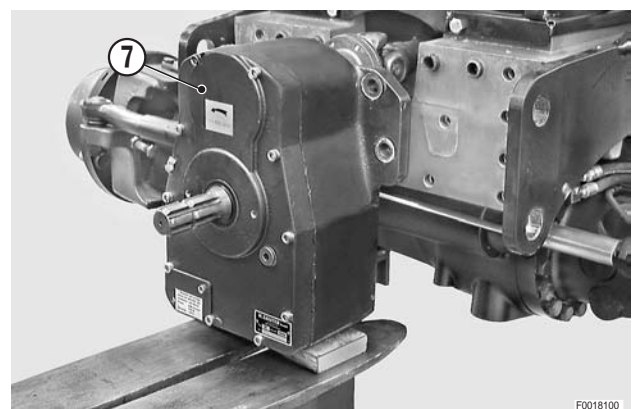
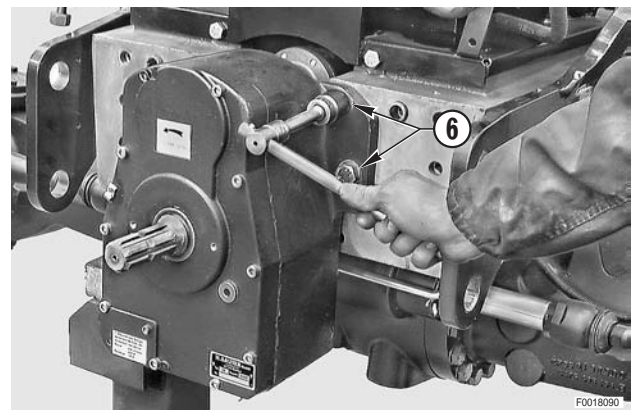
PTO: 70 kg (154 lb.)

Refitting

- Refitting is the reverse of removal.



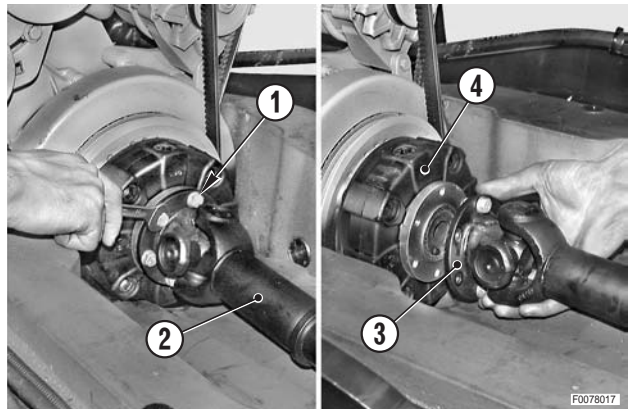
Bolts: 214 Nm (157.7 lb.ft.)




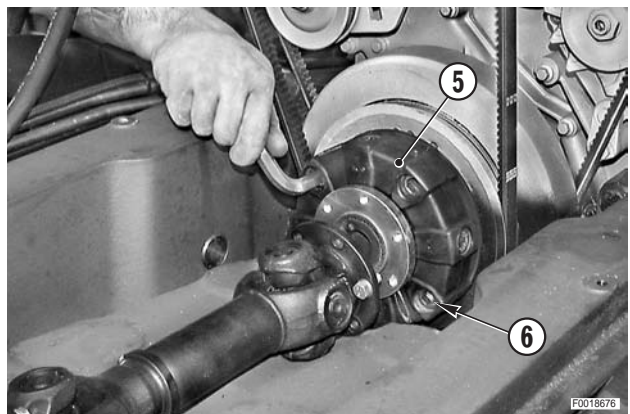
FLEXIBLE COUPLING

Renewal

- 1 - Remove the complete radiator assembly.
(For details, see "COOLERS-RADIATOR ASSEMBLY").
- 2 - Loosen and fully unscrew the six bolts (1) securing the flange of the cardan shaft (2).
- 3 - Detach the flange (3) from the flexible coupling (4).



- 4 - Loosen and remove the bolts (6) securing the coupling (5) and remove the coupling. 




Refitting

- Refitting is the reverse of removal.



 Bolts: Loctite 243

 Bolts: $139 \pm 10\%$ Nm ($102.4 \pm 10\%$ lb.ft.)

FRONT AXLE DRIVE SHAFT

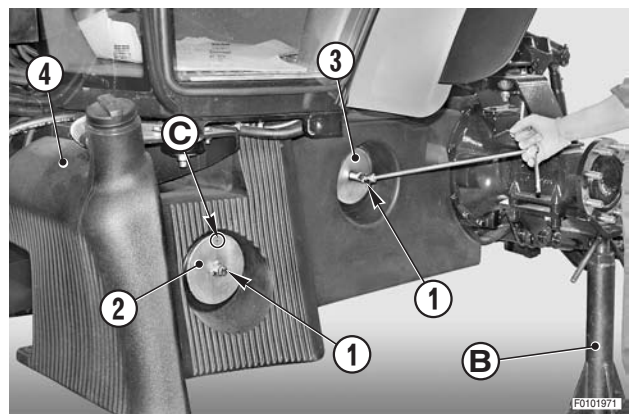
Removal

⚠ 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 capable of supporting the tractor's weight under the front axle.

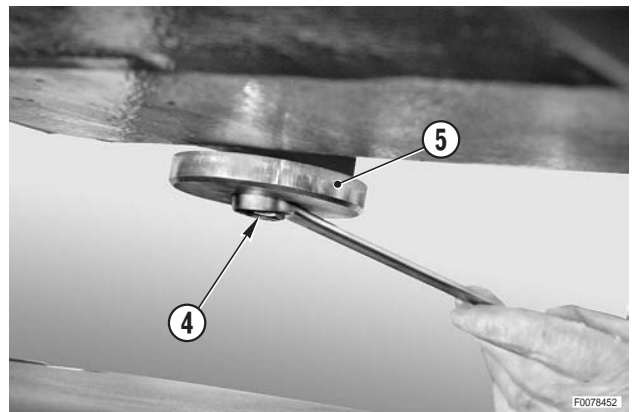


- 3 - Remove the bolts (1) and remove the locating and retaining washers (2) of the tank (3).
 - ★ Mark the washers so as to avoid error when refitting the tank.
 - ★ Note the position of the hole "A" as the tank is levelled by rotating the front washer.

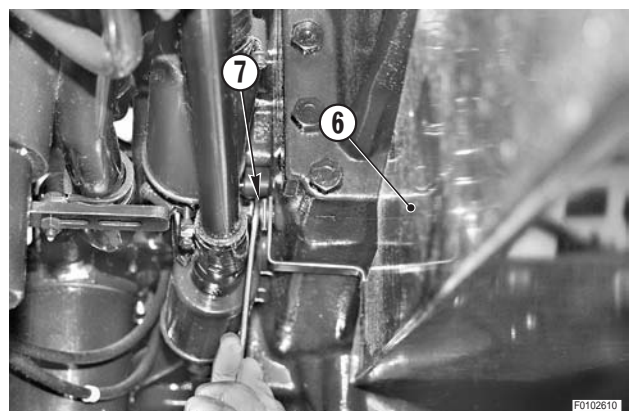


• **For all versions**

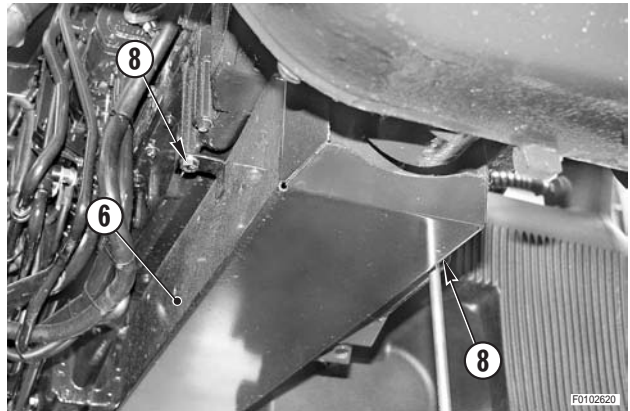
- 4 - Move the fuel tank outwards by 8-10 cm. Loosen and remove the bolt (4) securing the spacer (5) and the drive shaft shield.



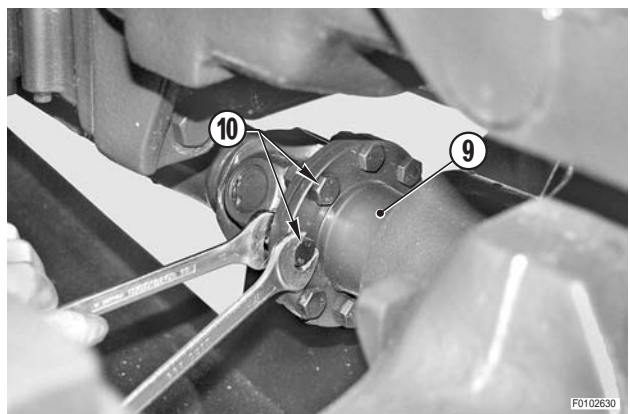
- 5 - Support the shield (6) and remove the bolt (7).



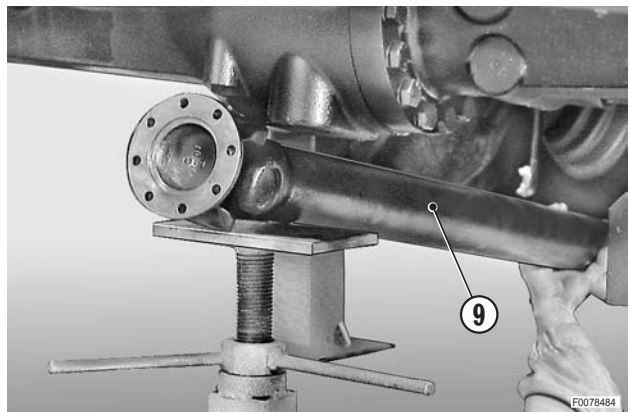
6 - Remove the bolts (8) and remove the shield (6).



7 - Position a support under the drive shaft (9) and remove the flange bolts and nuts (10).




8 - Disconnect the flanges and withdraw the drive shaft (9) towards the front of the tractor.



Refitting

- Refitting is the reverse of removal.



 Nuts: $43.5 \pm 10\%$ Nm ($32 \pm 10\%$ lb.ft.)

★ Tighten the nuts in a cross-wise sequence.



 Rear coupling: Grease

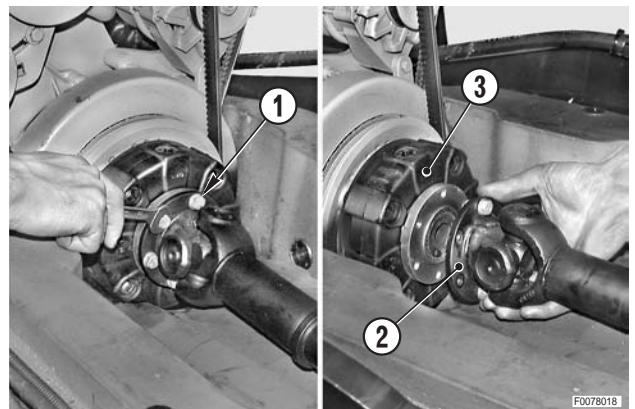
FRONT SUPPORT

COMPLETE ASSEMBLY (Version without front axle suspension)

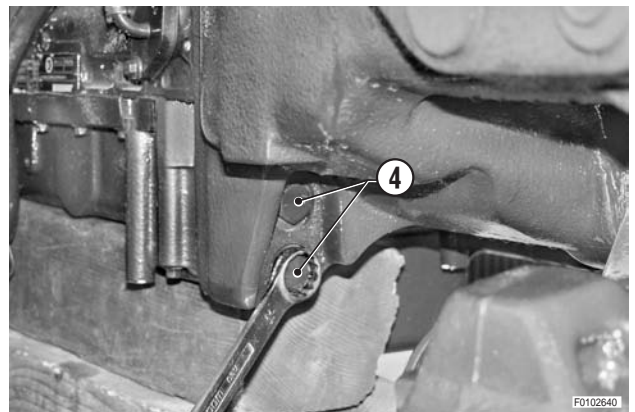
Removal

! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

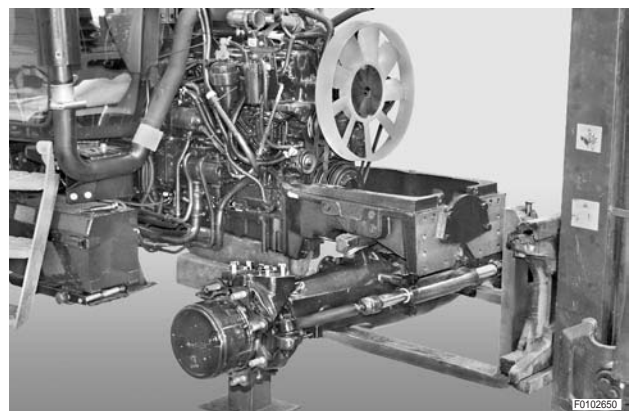
- 1 - Remove the front wheels.
(For details, see "WHEELS - FRONT WHEELS").
- 2 - Remove the front fenders.
(For details, see "FRONT FENDERS").
- 3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT").
- 4 - Remove the the complete radiator-coolers assembly.
(For details, see "COOLERS-RADIATOR ASSEMBLY").
- 5 - Remove the six bolts (1) and detach the flange (2) from the flexible coupling (3).



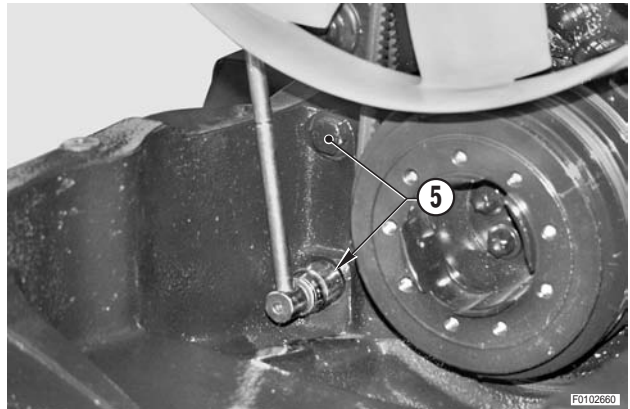
- 6 - Remove the lower bolts (4) (2 per side).



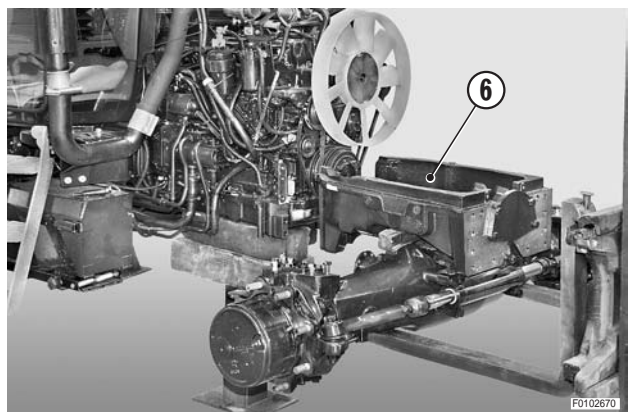
- 7 - Position suitable lifting equipment under the axle and slightly raise the axle.



8 - Remove the bolts (5) (2 per side).




9 - Remove the complete front support assembly (6).




Refitting

- Refitting is the reverse of removal.




 Bolts: 260±26 Nm (191.6±19.2 lb.ft.)



 Locating dowels: grease

BRAKE MASTER CYLINDERS

Removal

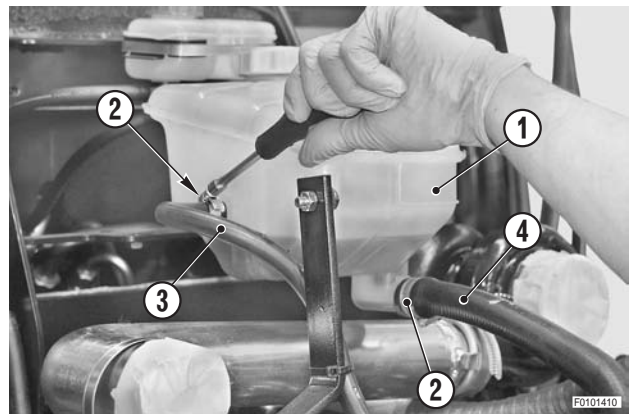
 Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the hood.
(For details, see "ENGINE HOOD").
- 2 - Remove the complete exhaust pipe.
(For details, see "COMPLETE 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 - Completely drain the expansion tank (1).



Coolant:
max. 5 ℓ (1.32 US gal.)

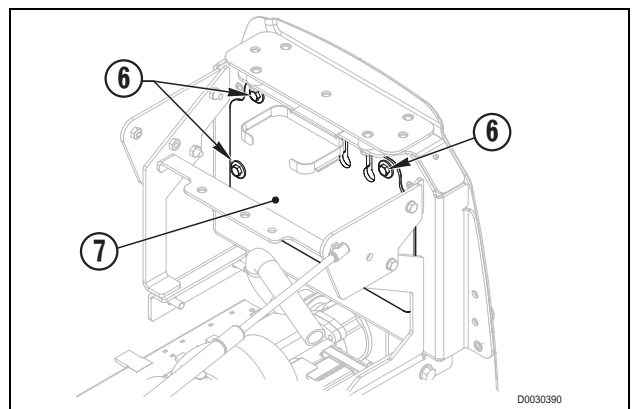
- 5 - Loosen the hose clamps (2) and disconnect the pipes (3) and (4) from the expansion tank (1).



- 6 - Remove the two bolts (5) and remove the expansion tank (1).

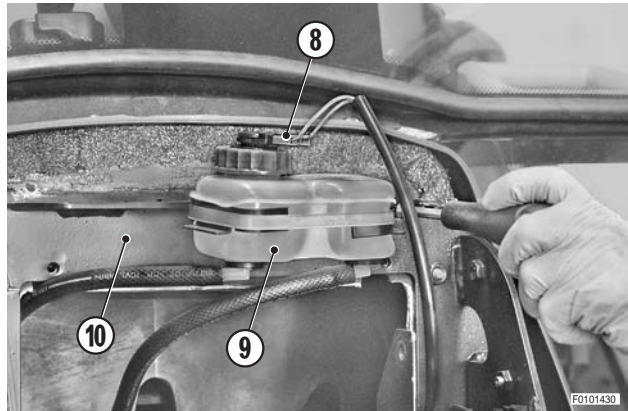


- 7 - Remove the bolts (6) and remove the bulkhead (7).

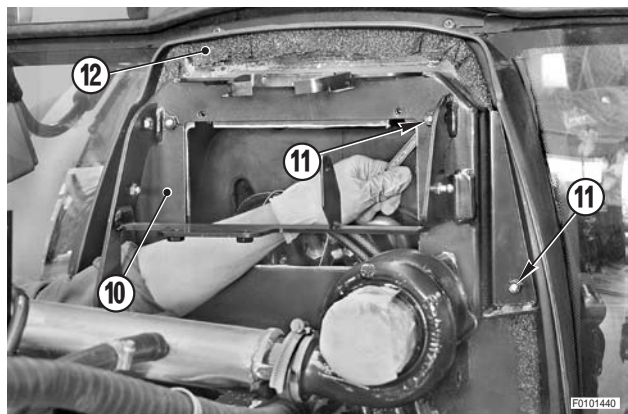


BRAKE MASTER CYLINDERS

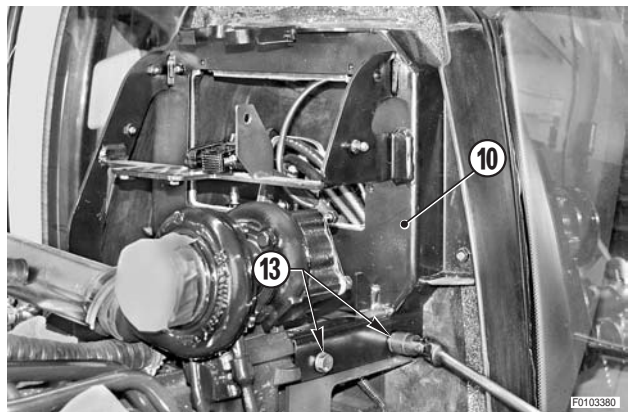
- 8 - Disconnect the wiring connectors (8), detach the brake fluid reservoir (9) from the support (10).



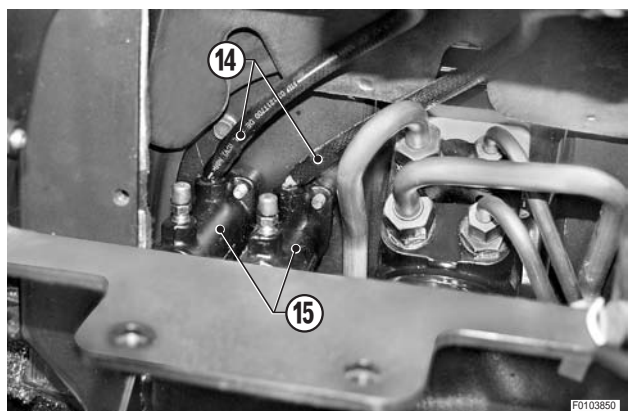
- 9 - Remove the four bolts (11) and detach the protection (12) from the support (10).



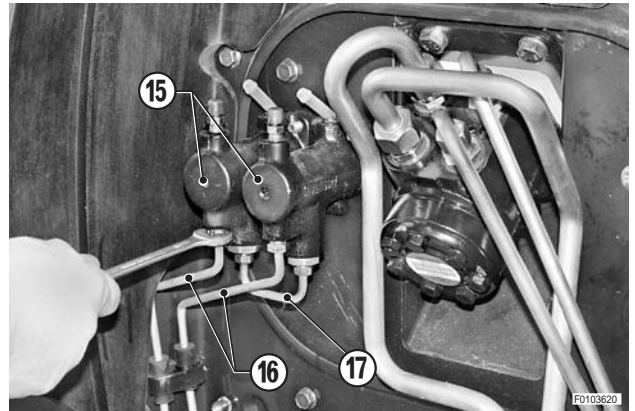
- 10 - Remove the bolts (13) (2 per side) and remove the support (10).



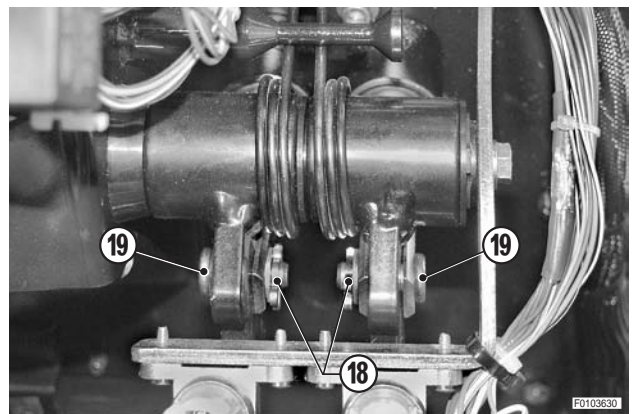
- 11 - Drain all the fluid from the brake fluid reservoir.
12 - Disconnect the pipes (14) from the brake master cylinders (15).



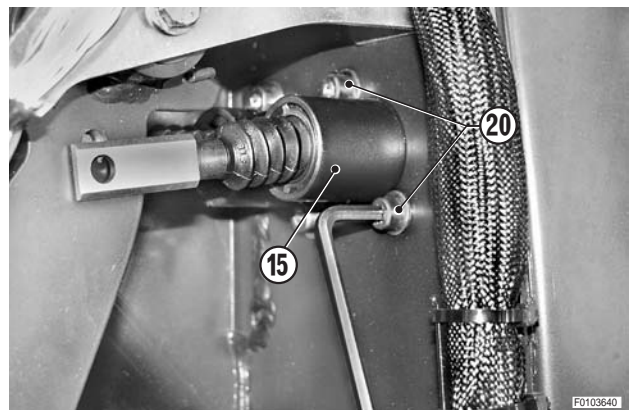
- 13 - Disconnect the pressure lines (16), and the by-pass (17) line interconnecting the master cylinders (15).



- 14 - Remove the split pins (18) and remove the pivot pins (19).



- 15 - Remove the 4 bolts (20) and remove the brake master cylinders (15).



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

STEERING VALVE ASSEMBLY

Removal

⚠ Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the hood.
(For details, see "ENGINE HOOD").
- 2 - Remove the complete exhaust assembly.
(For details, see "COMPLETE EXHAUST SYSTEM").
★ Do not remove the silencer and the middle section of the exhaust pipe.

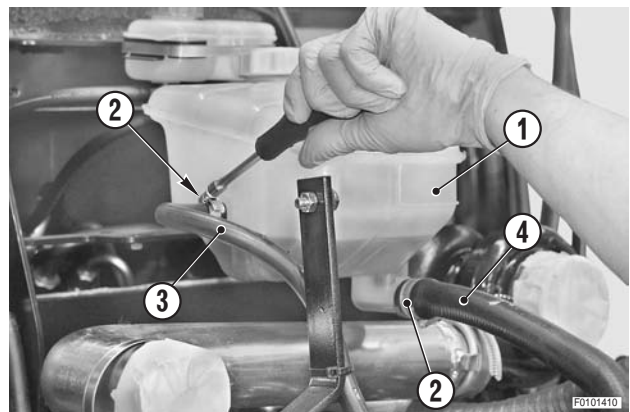
- 3 - Remove the front console.
(For details, see "FRONT CONSOLE").

- 4 - Completely drain the expansion tank (1).



Coolant:
max. 5 ℓ (1.32 US gal.)

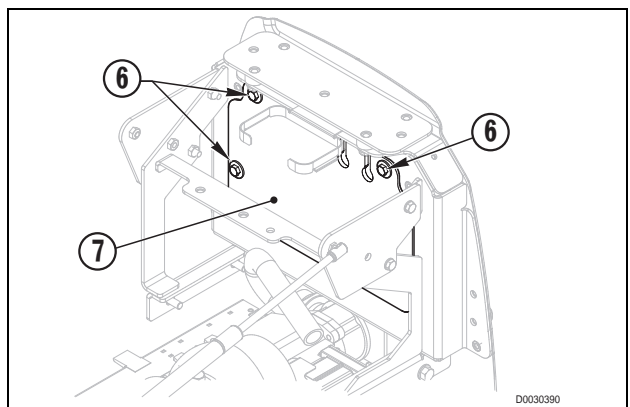
- 5 - Loosen the hose clamps (2) and disconnect the pipes (3) and (4) from the expansion tank (1).



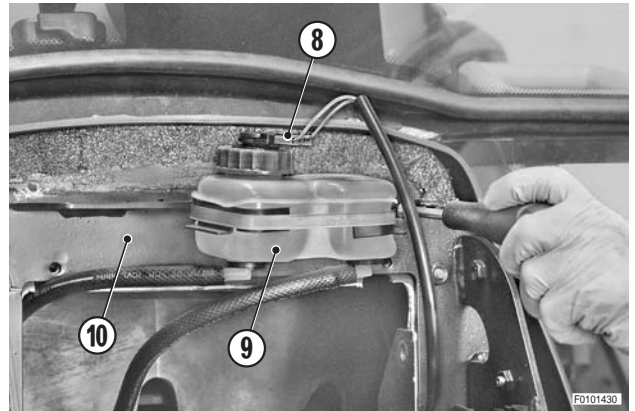
- 6 - Remove the two bolts (5) and remove the expansion tank (1).



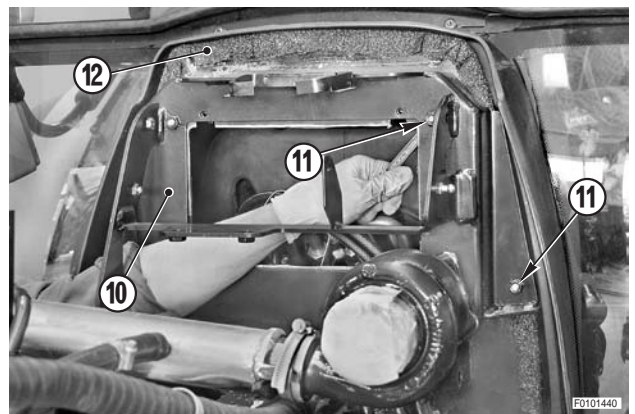
- 7 - Remove the bolts (6) and remove the bulkhead (7).



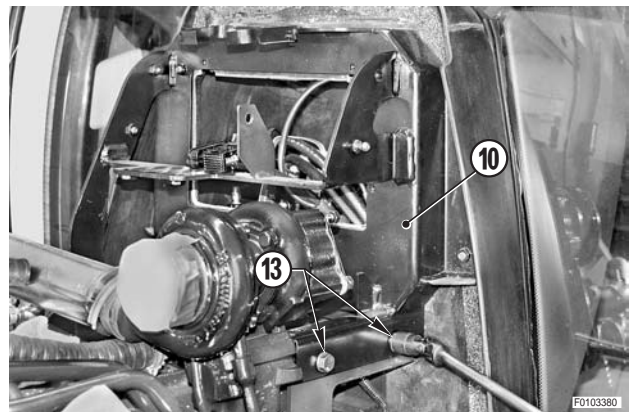
8 - Disconnect the wiring connectors (8), detach the brake fluid reservoir (9) from the support (10).



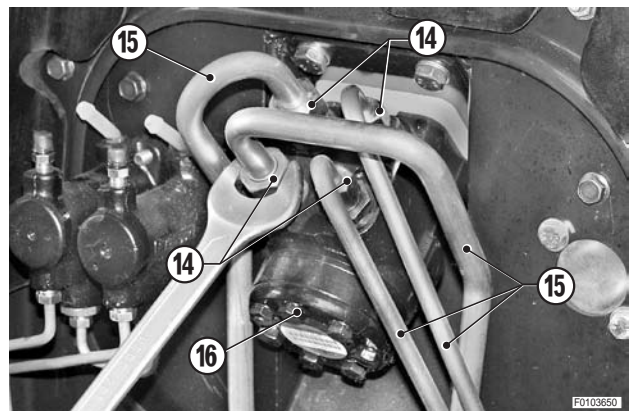
9 - Remove the four bolts (11) and detach the protection (12) from the support (10).



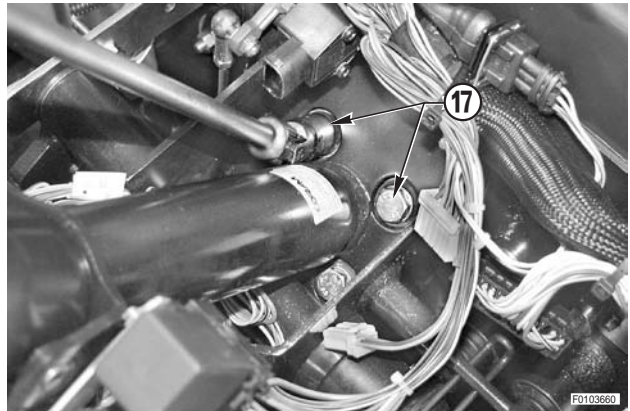
10 - Remove the bolts (13) (2 per side) and remove the support (10).



11 - Loosen the fittings (14) and disconnect the hoses (15) from the steering valve (16). ✖ 1



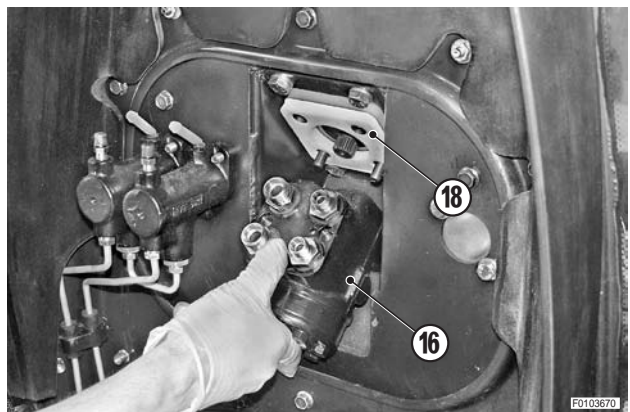
12 - Remove the screws (17).



13 - Remove the steering valve (16).

- ★ If necessary, reposition the plate (18) with the relative spacers.

⊗ 2



Refitting

- Refitting is the reverse of removal.

⊗ 1

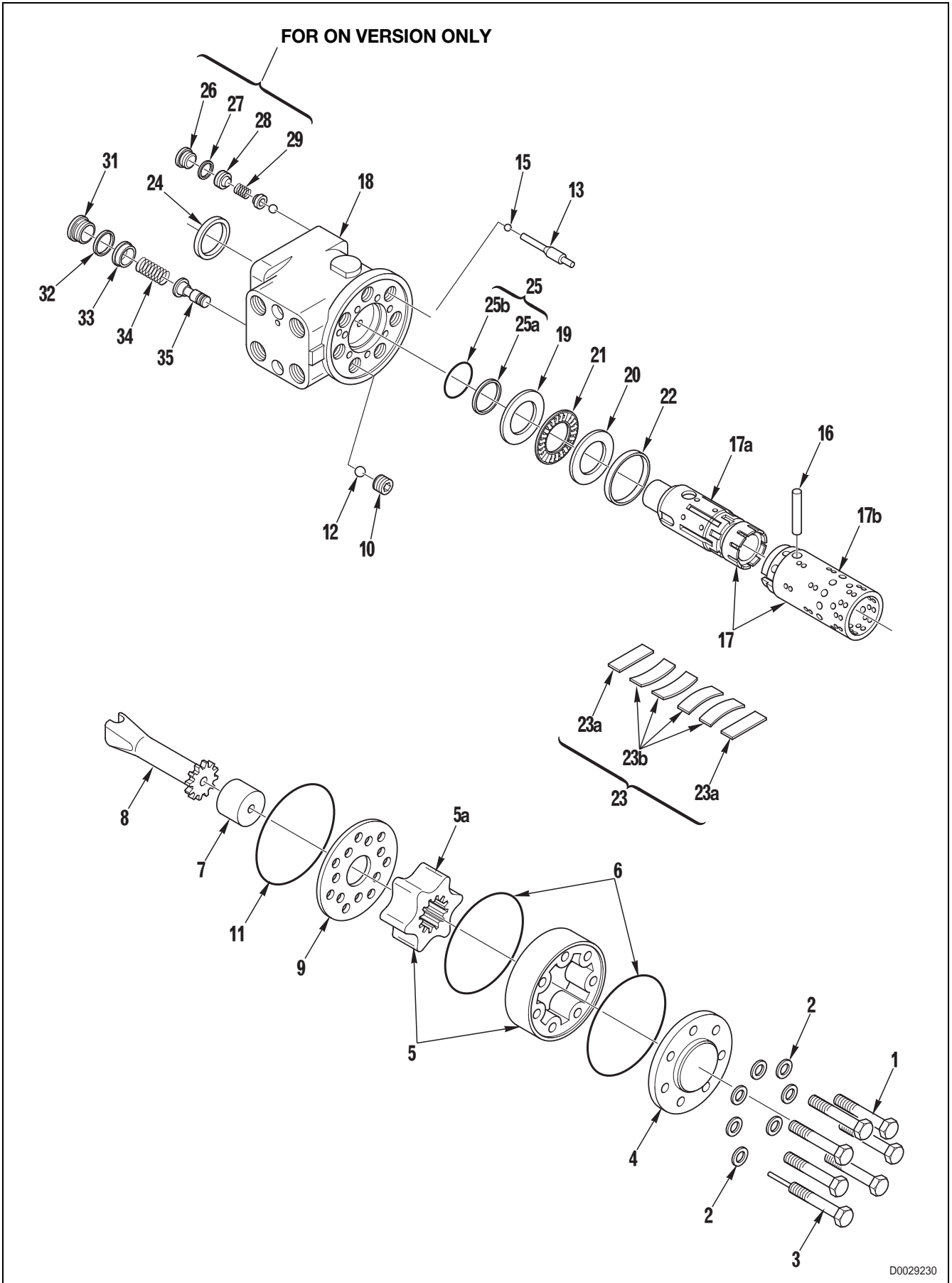
 Nm Hose connection fittings: 60 Nm (44.2 lb.ft.)

⊗ 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)

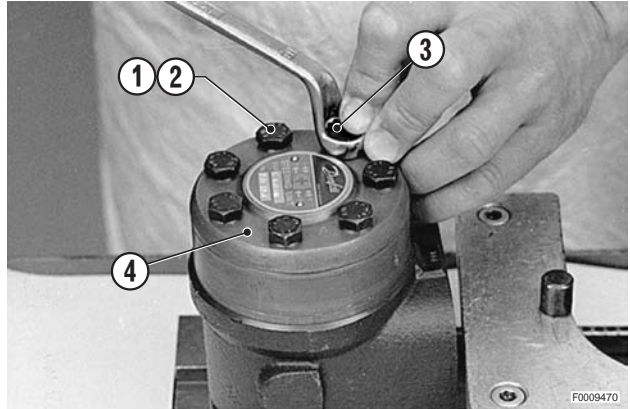
- 1 - Start the engine, and steer full lock on each side a few times to eliminate any air from the power steering circuit.
- 2 - Check the fittings and pipelines for leaks.

Disassembly

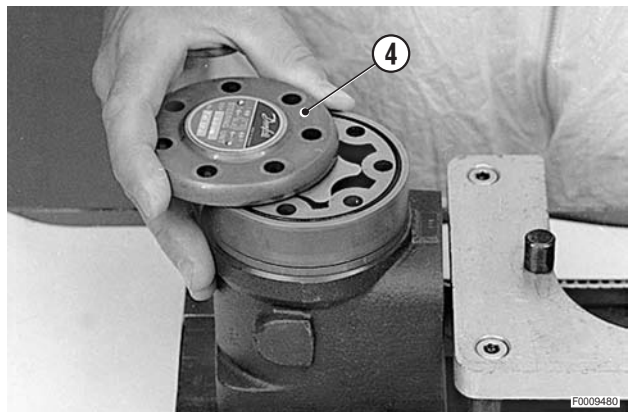


D0029230

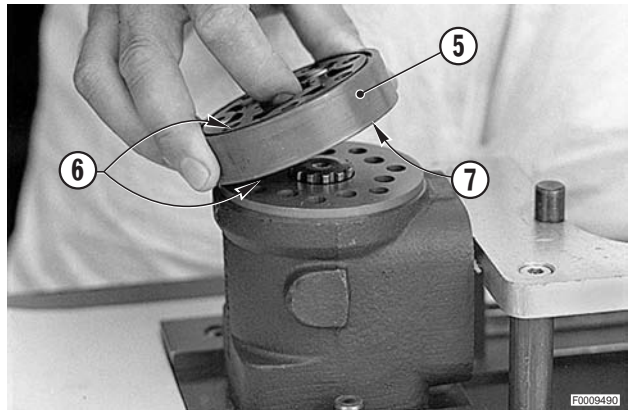
1 - Loosen and remove the screws (1) and (3) and the washers (2) securing the cover (4) (6 screws plus one special screw).



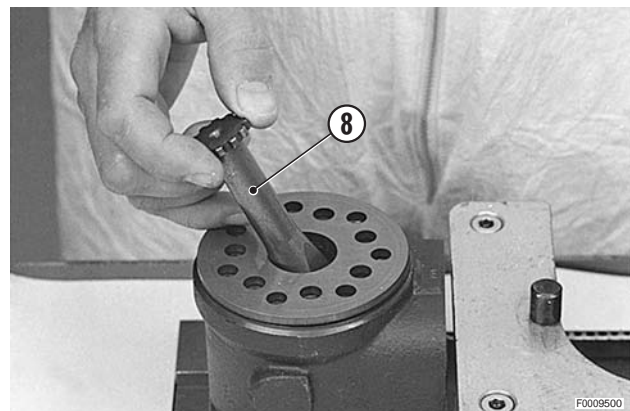
2 - Remove the cover (4) by sliding it off sideways.



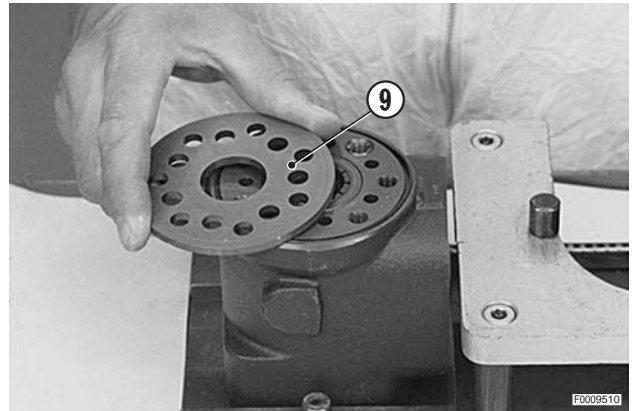
3 - Remove the stator/rotor assembly (5) complete with the O-rings (6) and the spacer (7).



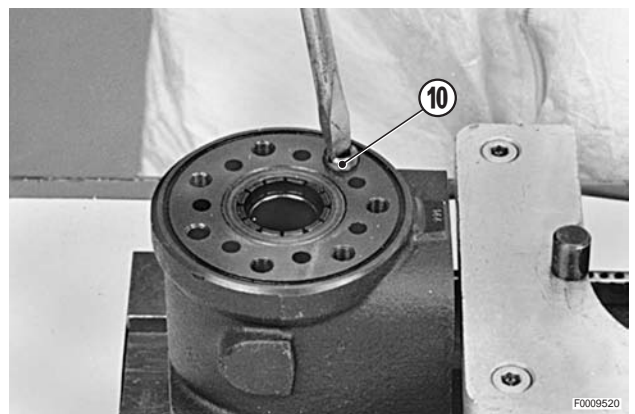
4 - Remove the drive shaft (8).



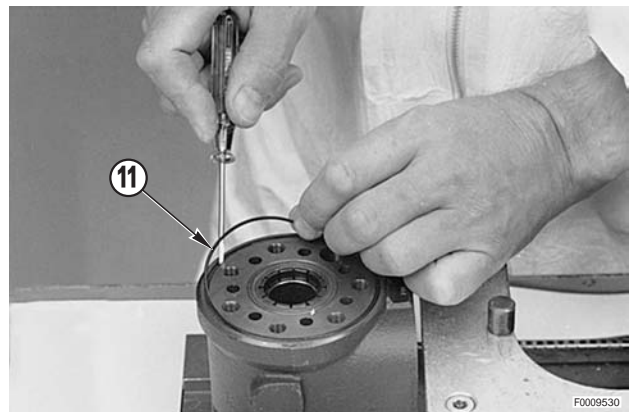
5 - Remove the distributor plate (9).



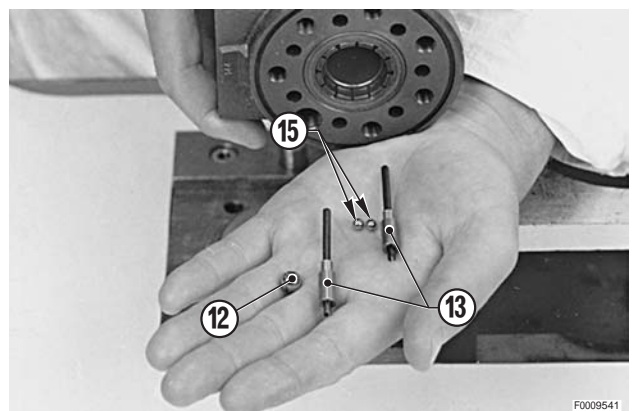
6 - Remove the safety valve bush (10).



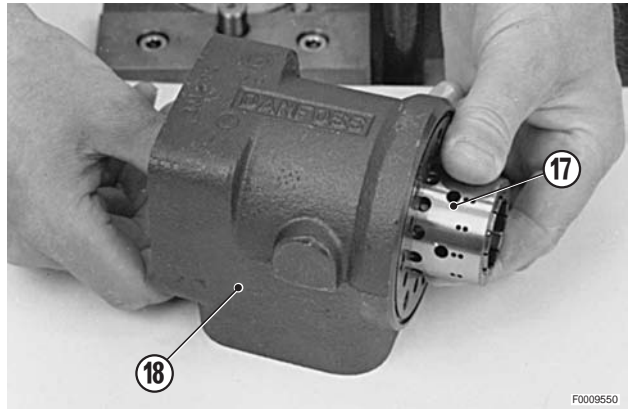
7 - Remove the O-ring (11).



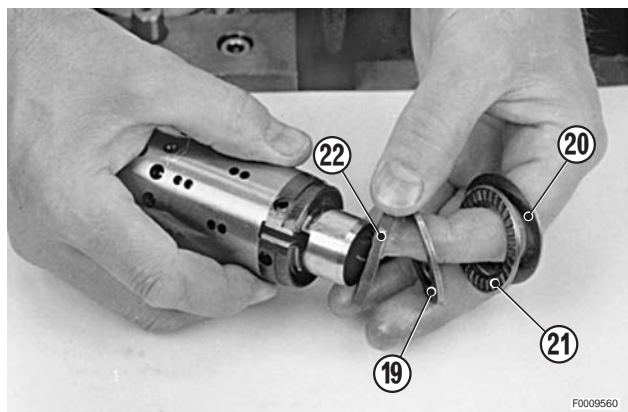
8 - Remove the ball (12) of the check valve and the pins (13) and balls (15) of the suction valves.



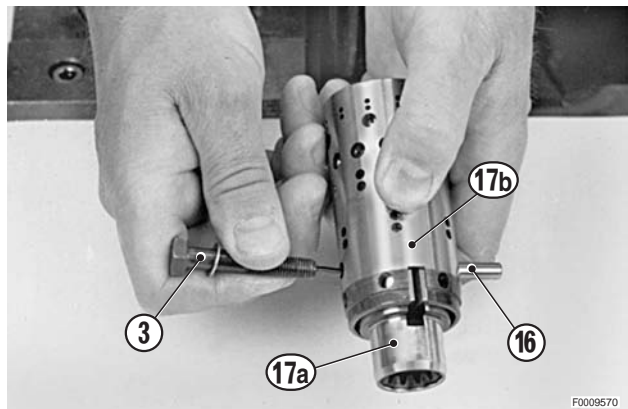
- 9 - Checking through the central hole of the rotary valve, position the cross pin (16) horizontally. Push the rotary valve assembly (17) and the bearing assembly out of the steering valve housing (18).



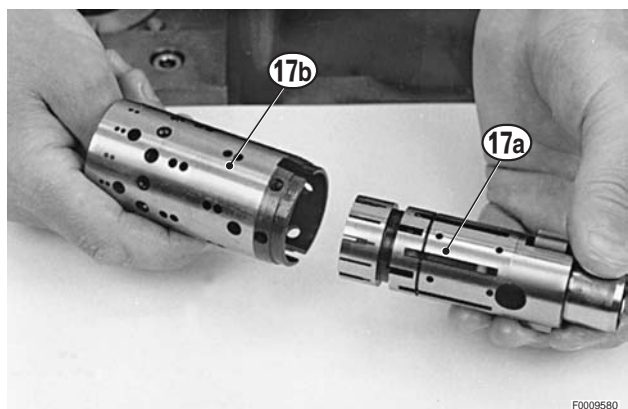
- 10 - Remove the outer race (19), the inner race (20) and the roller bearing (21) from the rotary valve; also remove the ring (22).
★ The inner race (20) (thin) can sometimes remain in the steering valve housing; ensure that it is in fact removed.



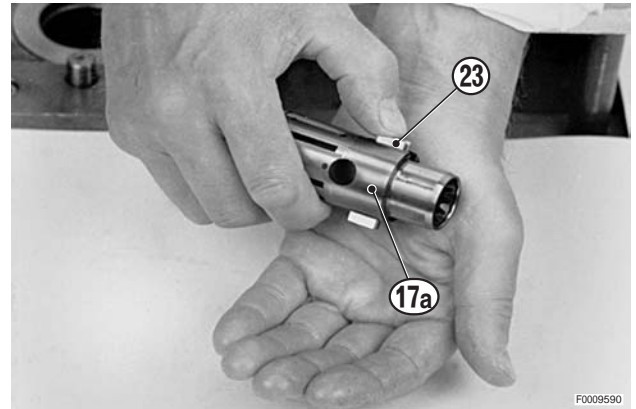
- 11 - Remove the cross pin (16), the valve sleeve (17b) and the valve spool (17a).
★ Use the special cover screw (3).



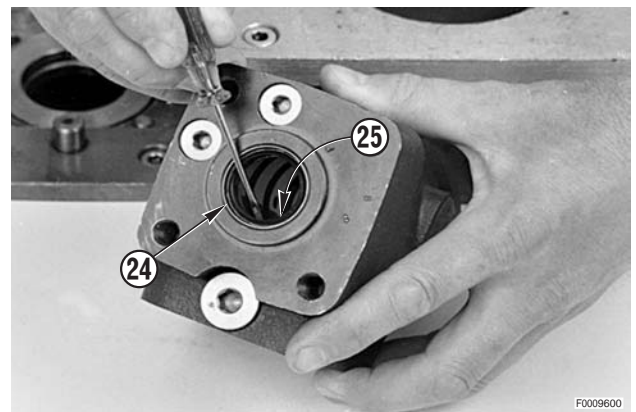
- 12 - Slowly withdraw the spool (17a) from the sleeve (17b).



13 - Press the neutral position springs (23) and remove them from the spool (17a).

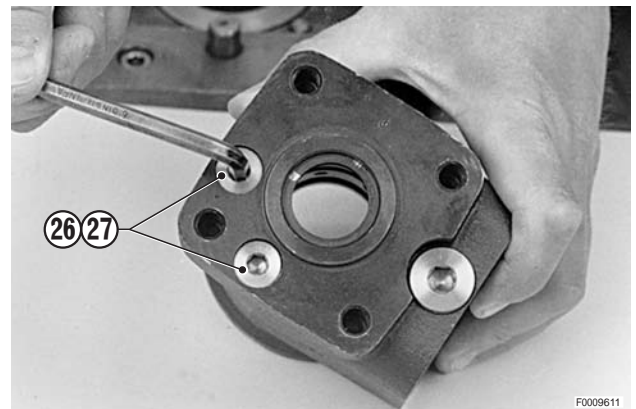


14 - Remove the dust seal (24) and the composite seal (25) (O-ring + seal).

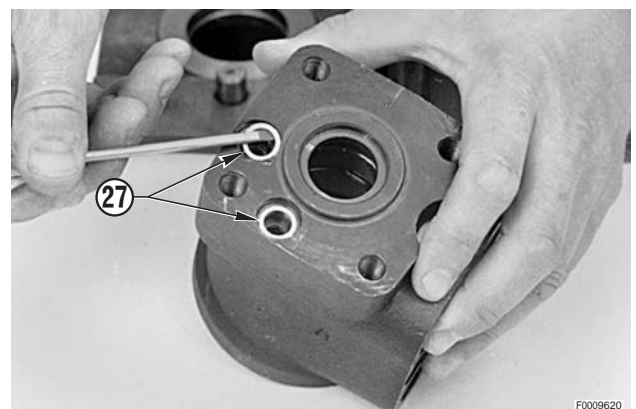


• For ON versions

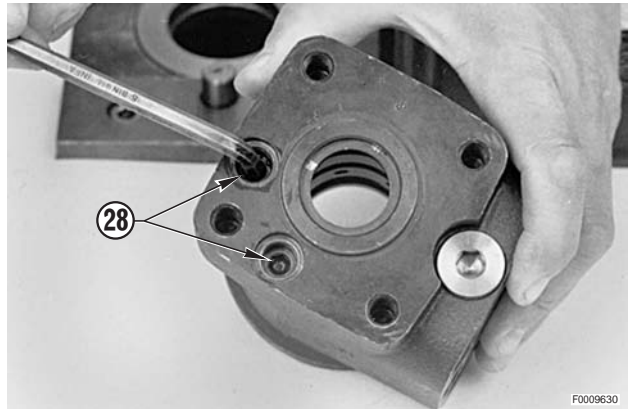
15 - Remove the plugs (26) of the antishock valves.



16 - Remove the seals (27).

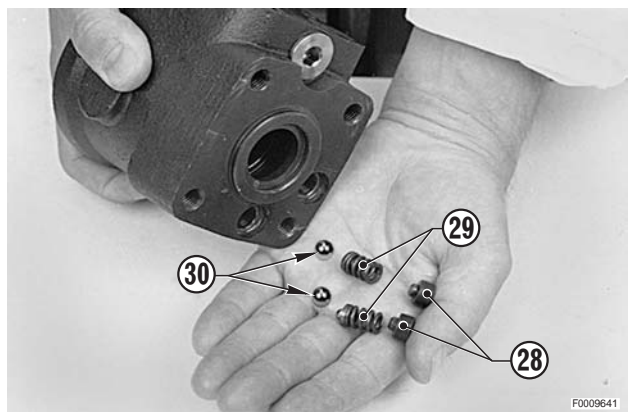


17 - Remove the calibration screws (28).

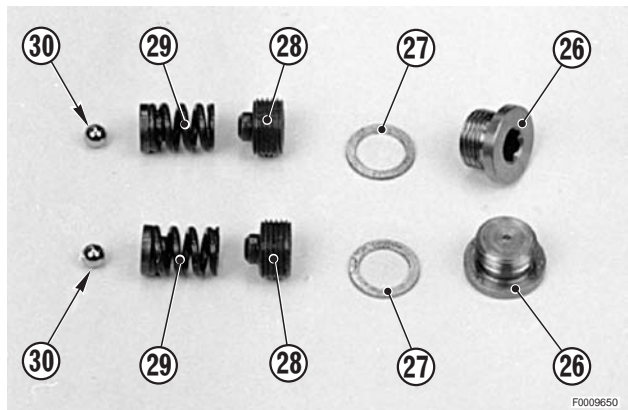


18 - Remove the springs (29) and the two balls (30).

★ The valve seats are fixed inside the steering valve housing and cannot be removed.

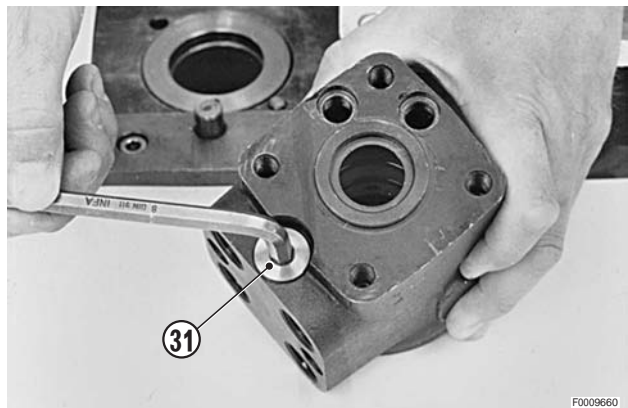


19 - Check that the valve components are arranged as shown in the photo.

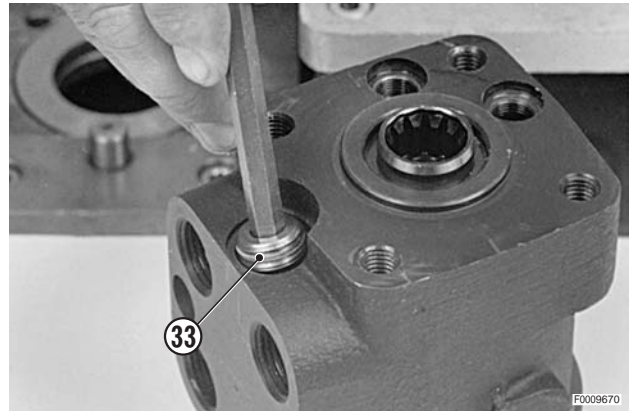


• For all versions

20 - Remove the plug (31) and the relative seal.

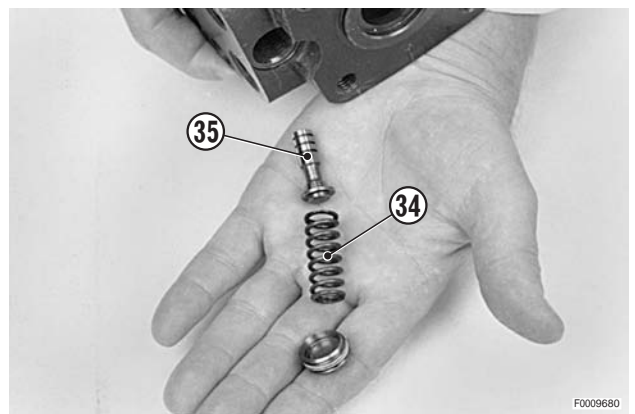


21 - Remove the maximum pressure adjuster screw (33).



22 - Turn over the steering valve housing and remove the spring (34) and the relief valve (35).

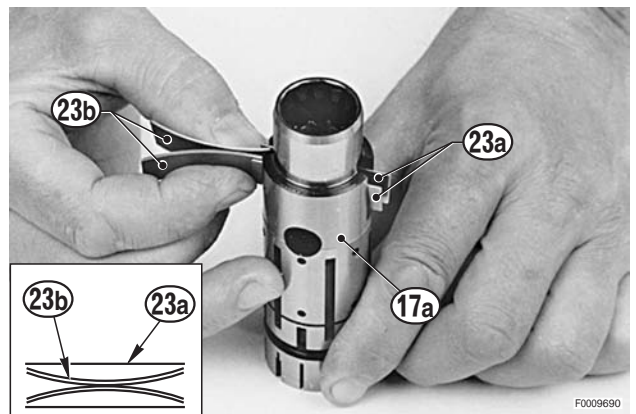
★ The seat of the relief valve is a force fit in the housing and cannot be removed.



Assembly

★ Prior to reassembly, lubricate all components with gearbox oil.

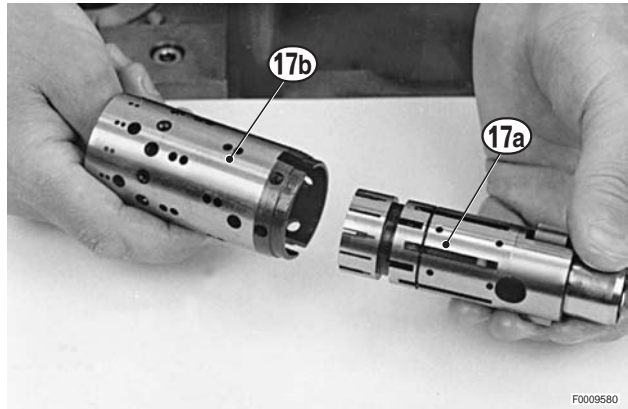
1 - Insert the two flat springs (23a) and position them centrally relative to the diameter of inner sleeve of the spool (17a). Insert the four curved springs (23b), arranged in pairs, between the two flat springs (23a) and push them in fully.



2 - Align the spring assembly (23).



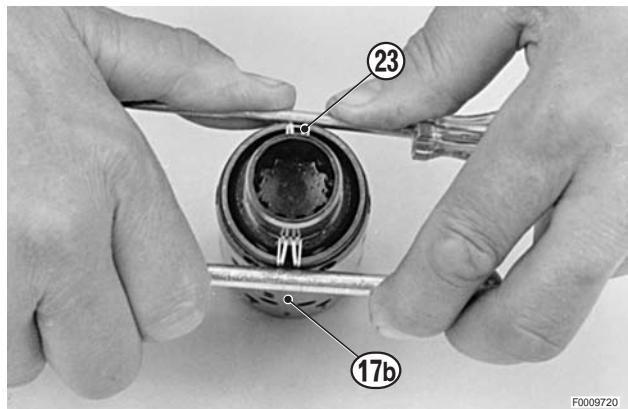
- 3 - Insert the rotary valve spool (17a) in the sleeve (17b).
★ Check that the sleeve are positioned as described in step 1.



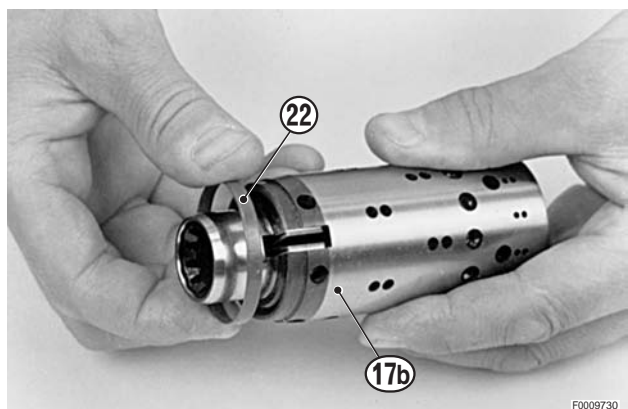
- 4 - Simultaneously push the springs (23) and the spool(17a) until the springs are seated in the slots in the sleeve (17b).



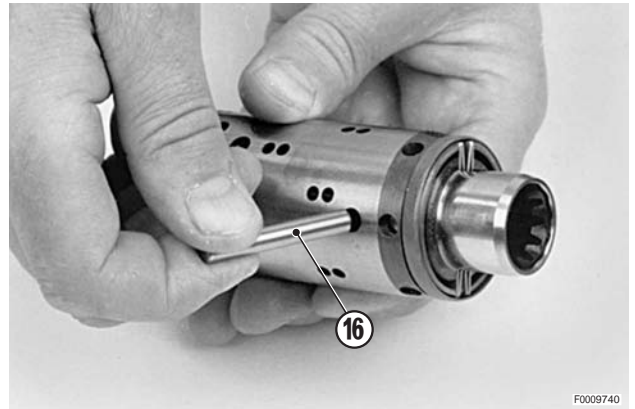
- 5 - Align the springs (23) and make sure they are positioned centrally in relation to the diameter of the sleeve (17b).



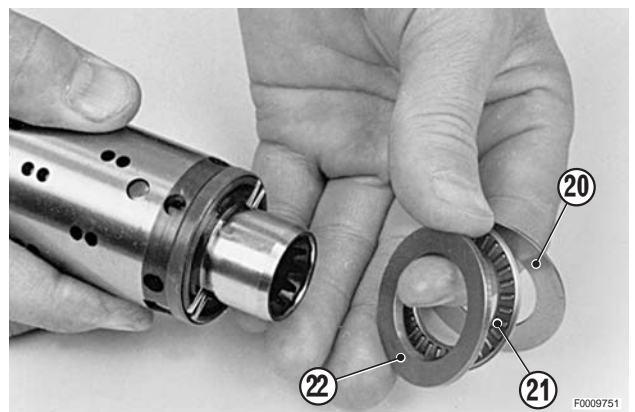
- 6 - Install the ring (22) on its seat on the sleeve (17b).
★ The ring (22) must be free to rotate without interfering with the springs (23).



7 - Insert the cross pin (16).



8 - Install the thrust bearing components in the order indicated in step 9.



9 - Thrust bearing assembly.

17a -Inner sleeve

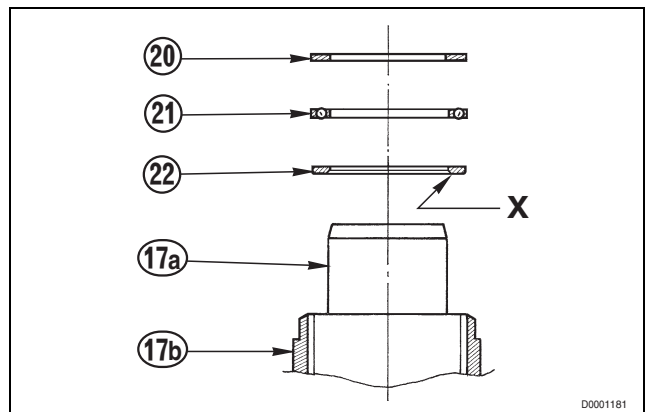
17b -Outer sleeve

21- Needle roller bearing

20 -Inner thrust washer

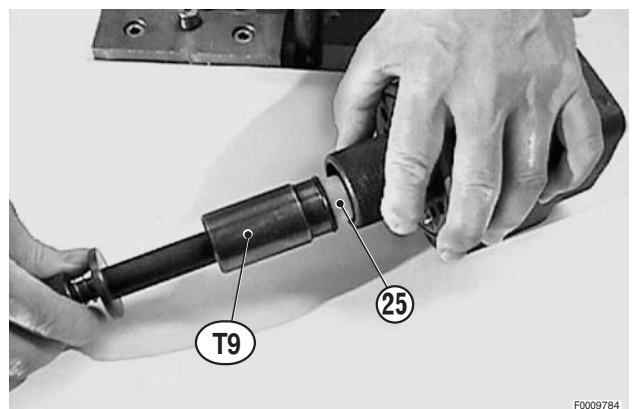
22 -Outer thrust washer

⚠ The outer race must be installed with the chamfer "X" facing the shoulder of the valve spool.

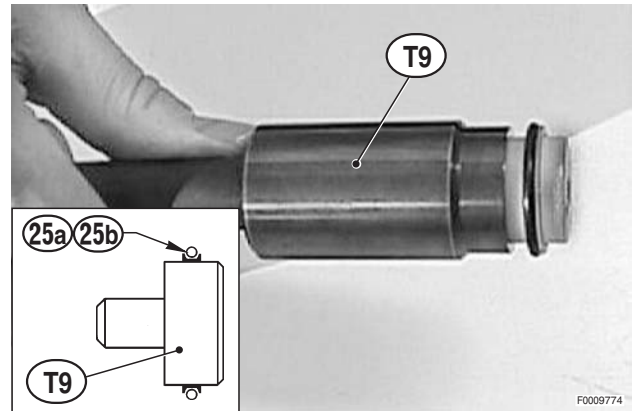


10 - Position the steering valve housing (18) so the hole is horizontal.

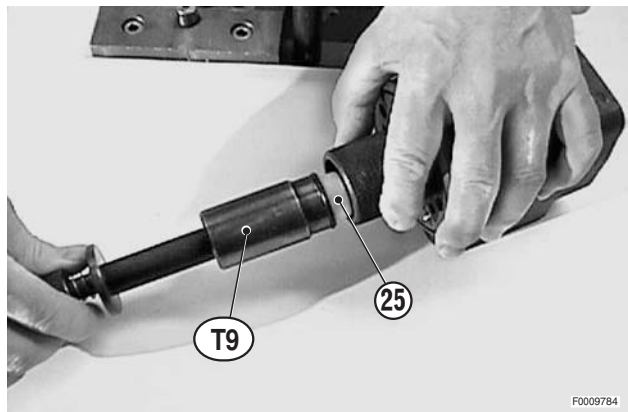
Insert the guide of special tool **T9** (part no...) into the valve spool assembly. 5.9030.480.0).



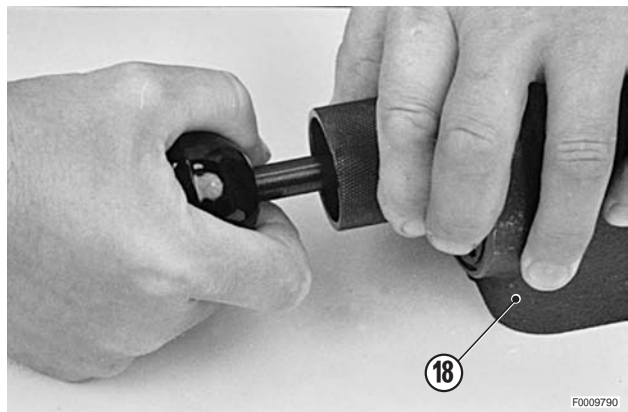
11 - Lubricate the oil seal (25a) and O-ring (25b) and install them on the plunger of the tool **T9** (part no. 5.9030.480.0).



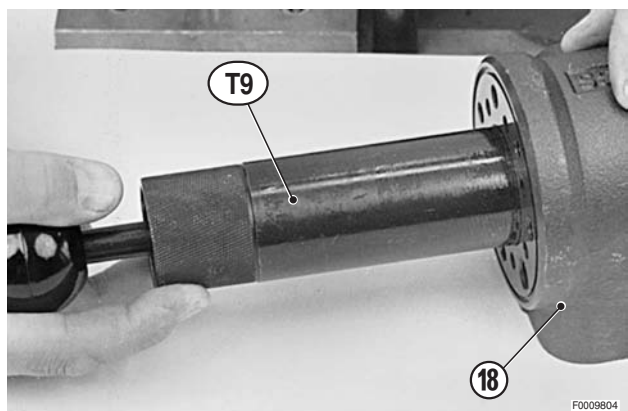
12 - Install the tool **T9** (part no. 5.9030.480.0). and insert it in the guide previously inserted in the central bore of the power steering unit.



13 - Push the composite seal (25) into its seat in the steering valve housing (18) while rotating it to ease it into position.

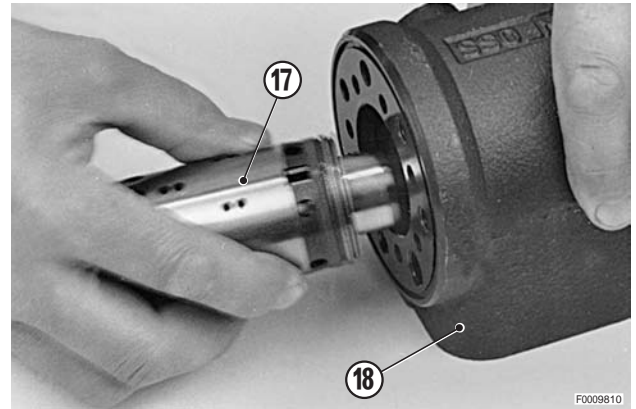


14 - Withdraw from the steering valve housing (18) the tool **T9** (part no. 5.9030.480.0). and the guide, leaving the tool plunger in the housing.

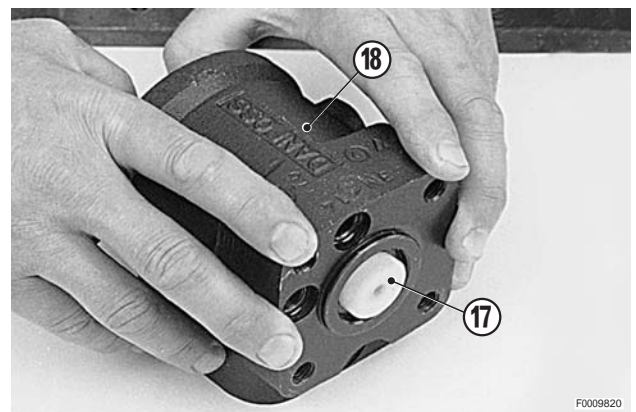


- 15 - Insert the rotary valve assembly (17) in the hole of the steering valve (18).
Rotate the valve slightly while inserting it to ease it into position.

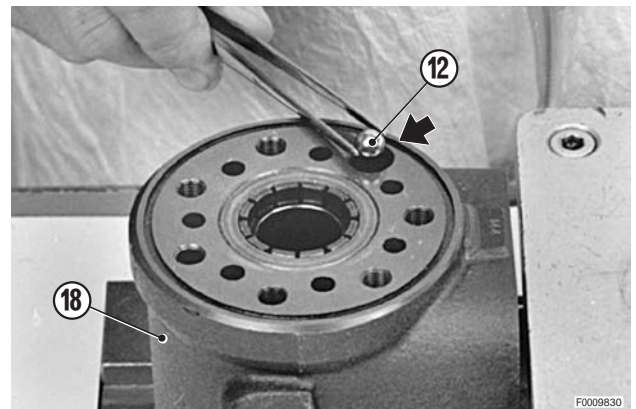
★ Keep the cross pin horizontal while inserting the rotary valve assembly.



- 16 - Push in the assembly (17) until fully seated so that it forces out the tool plunger left in the housing in step 14.

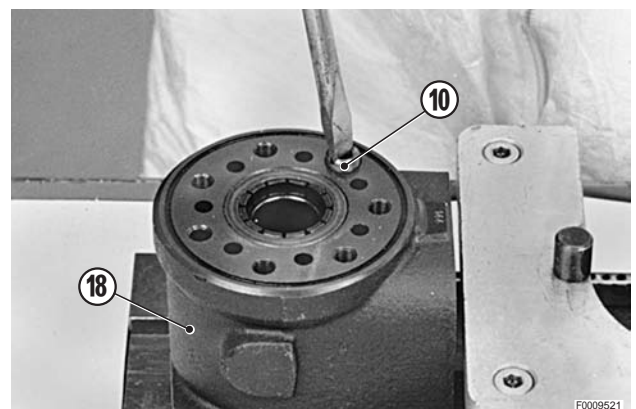


- 17 - Rotate the steering valve housing (18) until the centre hole is vertical.
Insert the ball (12) of the safety valve in the hole indicated by the arrow.

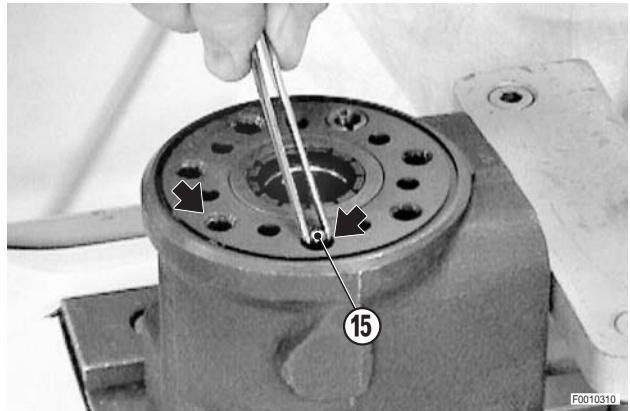


- 18 - Screw the safety valve retaining bush (10) into the hole.

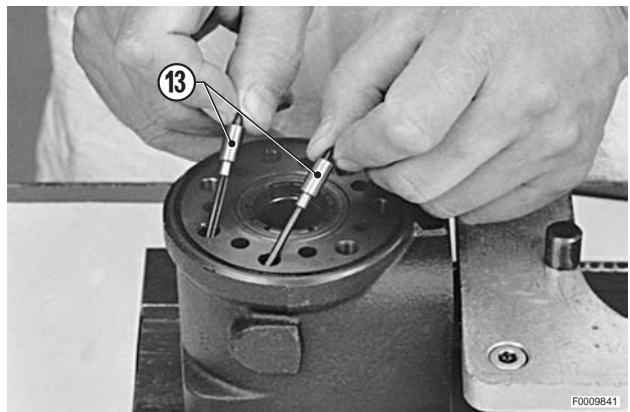
★ The top of the retaining bush should be set below the face of steering valve housing (18).




19 - Insert the two balls (15) in the holes indicated by the arrows.

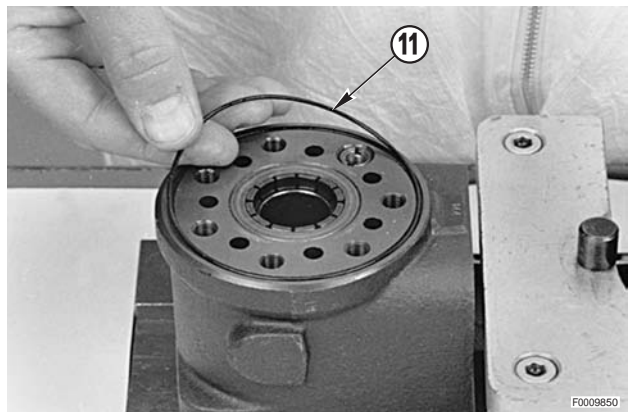


20 - Insert the pins (13) in the same holes.

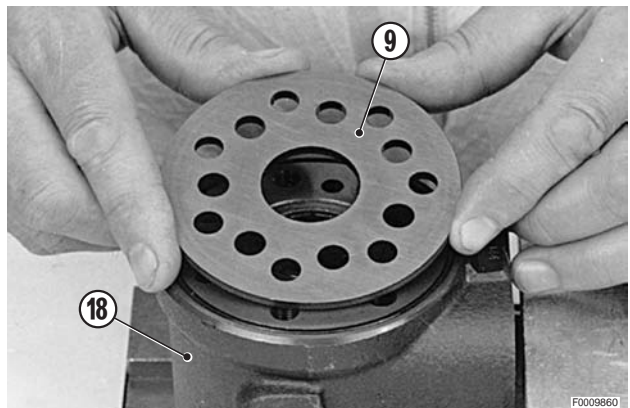


21 - Lubricate the O-ring (11) and install it.

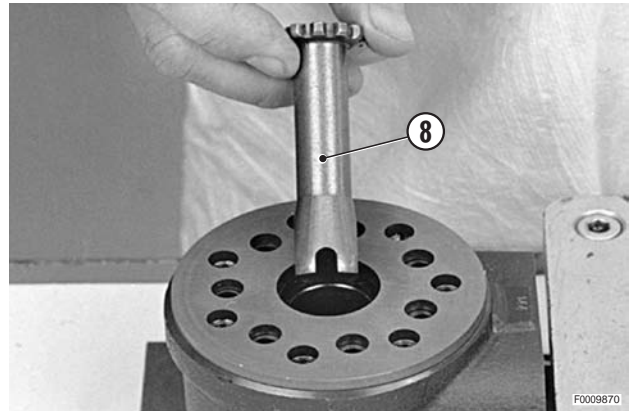
 O-ring: gearbox oil



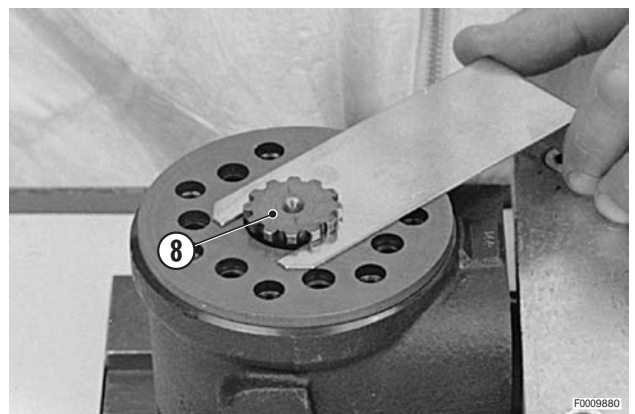
22 - Locate the distributor plate (9) so that its holes are aligned with the holes in the steering valve housing (18).




23 - Insert the drive shaft (8) in the hole and engage the cross pin; check that pin seating is parallel to the face of the steering valve that mounts to the steering wheel shaft.

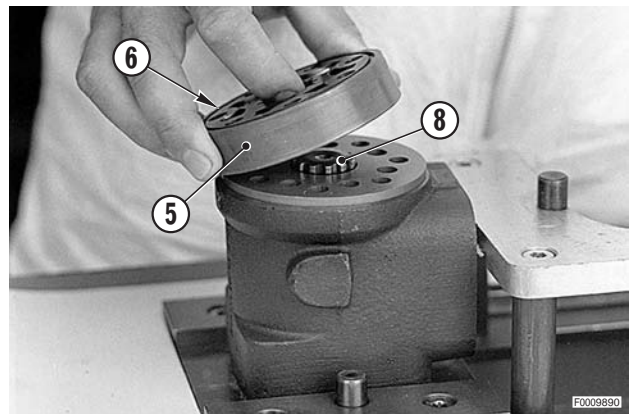



24 - Position the drive shaft so that it is vertical and hold it in this position using a suitable tool.

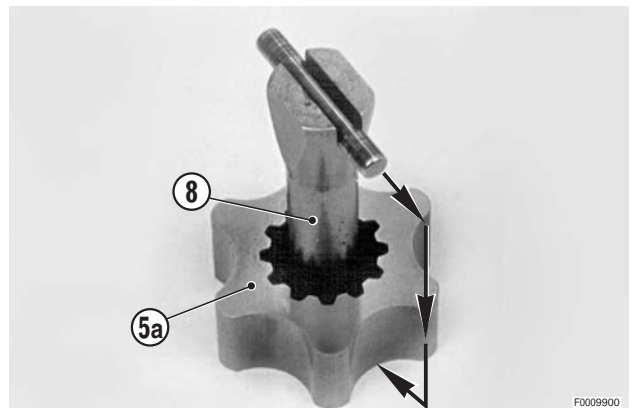


25 - Lubricate the two O-rings (6) and fit them in the two grooves in the rotor-stator assembly (5). Fit the rotor-stator (5) assembly to the drive shaft (8).

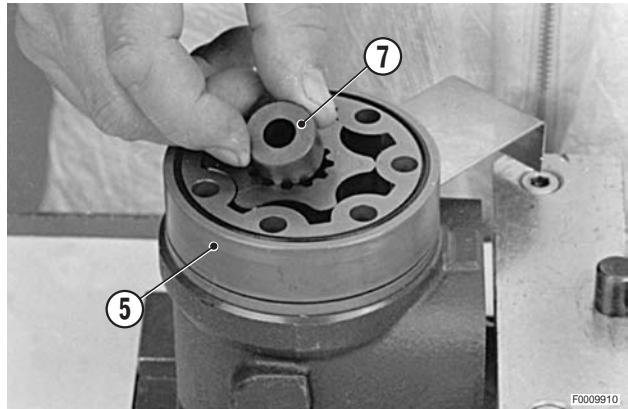
 O-rings: gearbox oil



 Install the rotor (5a) on the drive shaft (8) so that the valley between two lobes is aligned with the groove in the end of the drive shaft. Then rotate the outer rotor (5b) to align the fixing holes.



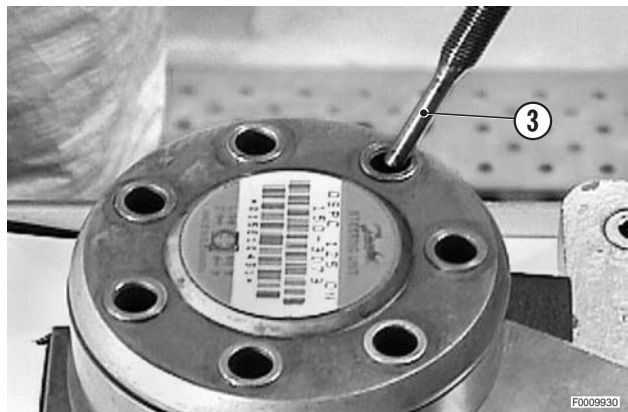
26 - Install the spacer (7).



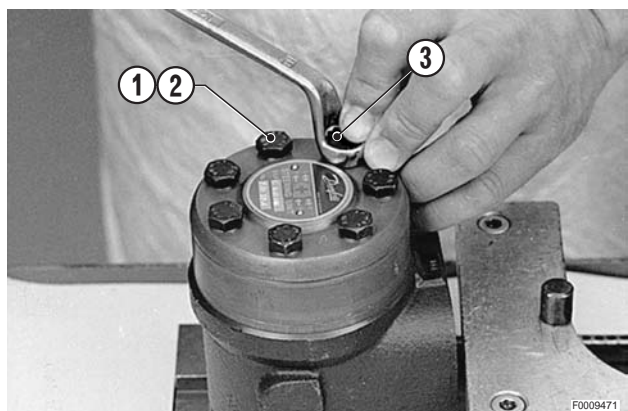
27 - Fit the cover (4).



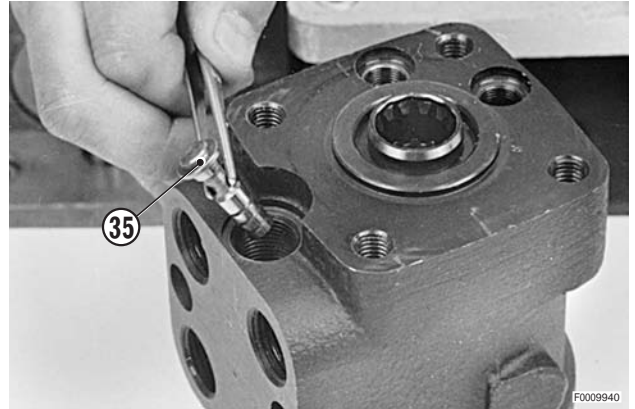
28 - Insert the special screw (3) complete with the washer (2) in the hole indicated in the photo.



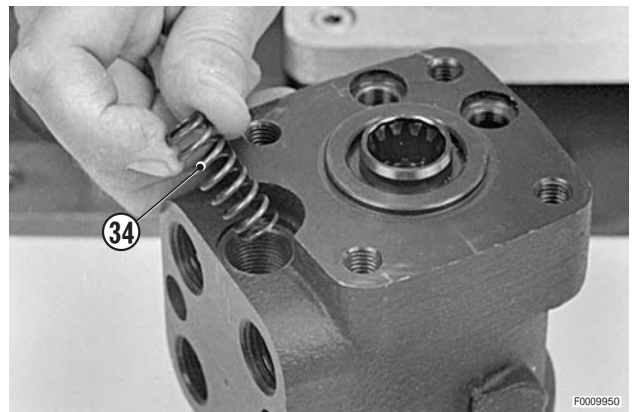
29 - Insert the six screws (1) complete with washers (2). Tighten the screws (1) and (3) in a crosswise sequence to a torque of 30 ± 6 Nm (22.1 ± 4.4 lb.ft.).



30 - Fit the relief valve (35).

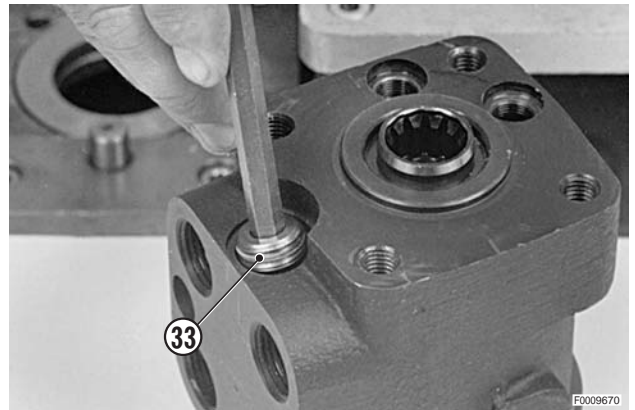


31 - Fit the spring (34).



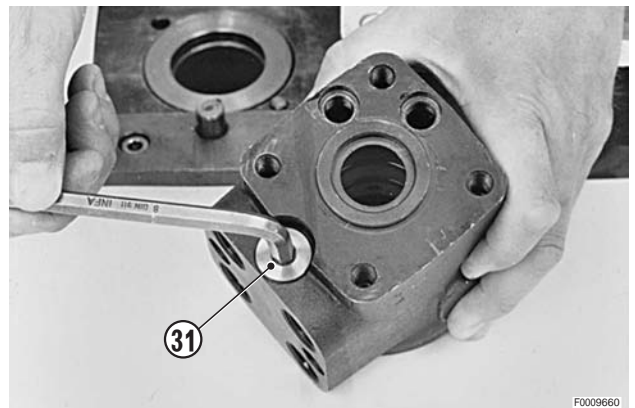
32 - Fit the pressure adjustment screw (33).

- ★ Calibrate the maximum working pressure on a test bench.
- ★ Pressure: 180+10 bar (2610+145 psi)

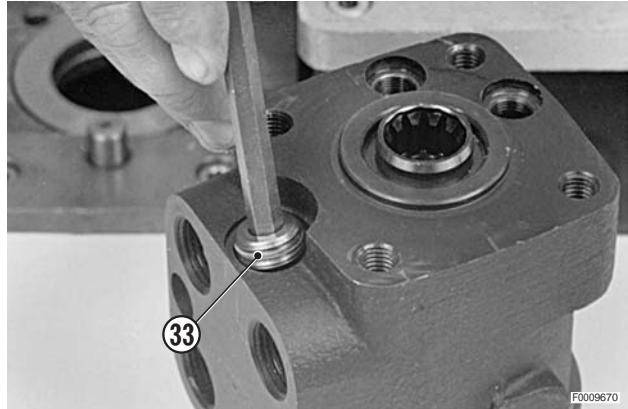


33 - Fit the plug (31) complete with seal.

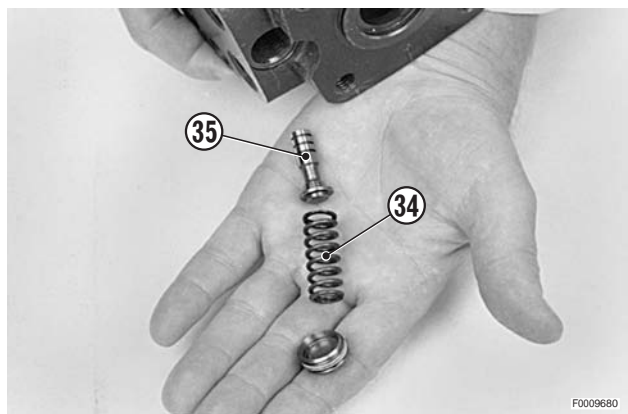
-  Plug: 50±10 Nm (36.8±7.4 lb.ft.)



34 - Locate the dust seal (24) in the steering valve housing (18).

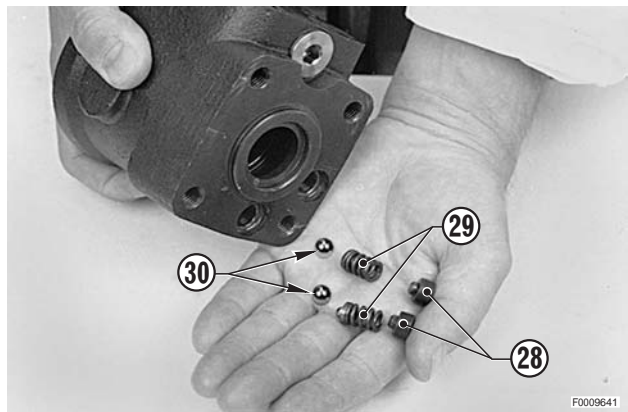


35 - Install the dust seal (24) in the steering valve housing using a suitable drift and a soft faced mallet.

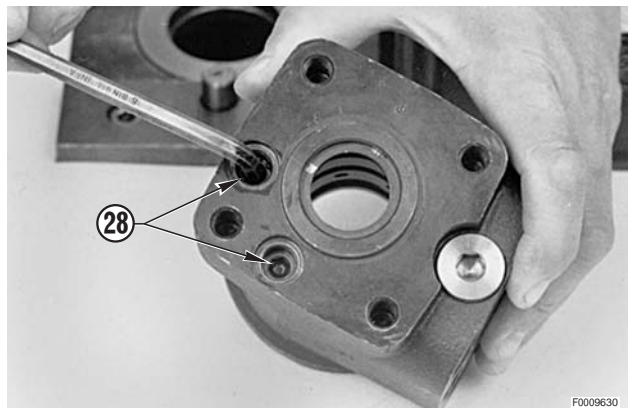


• For ON versions


36 - Insert the balls (30), springs (29) and setscrews (28) in their sockets.

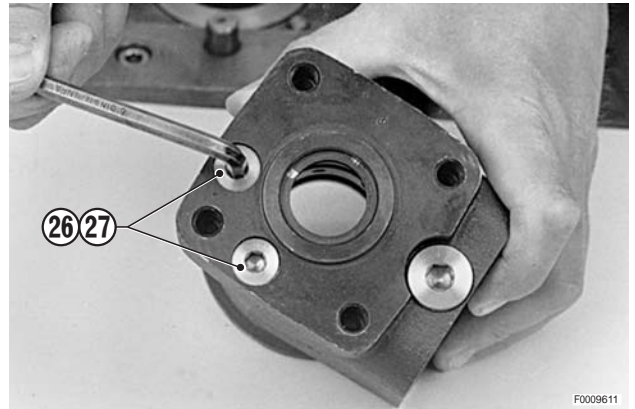


37 - Tighten the calibration screws (28) in their seats.



38 - Fit the seals (27) and screw in the plugs (26).

 Plugs: 30 Nm (22.1 lb.ft.)



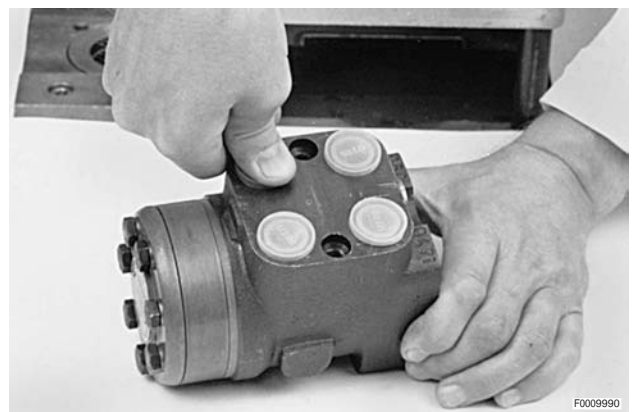
• **For all versions**

39 - 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.

40 - On completion of the assembly operation, test the operating pressure of the relief valve and calibrate as necessary.

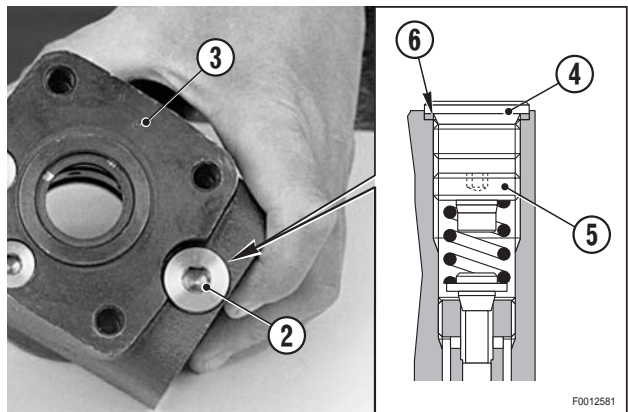
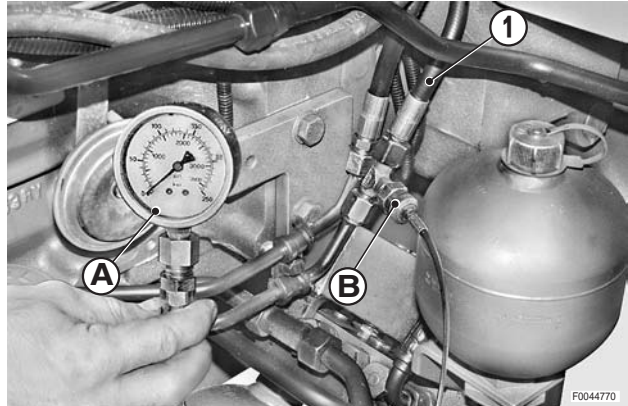
(For details, see "RELIEF VALVE" in this chapter).



RELIEF VALVE


Testing the operating pressure

- 1 - Disconnect a steering hose (1) and connect a fitting "B" with a 400 bar 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:
191–198 bar (2270-2871 psi)
- 4 - If the pressure reading differs from that specified, adjust the setting of the pressure relief valve (2) of the power steering unit (3) on the bench.



Adjusting the operating pressure

- 1 - Remove the plug (4).
- 2 - Loosen off the screw (5) using a 4 mm hex socket wrench.
 - To INCREASE the pressure, turn the screw CLOCKWISE
 - To REDUCE the pressure, turn the screw COUNTERCLOCKWISE.
- 3 - Refit the plug (4), checking the gasket (6) is in its seating.

 Plug: 50±10 Nm (36.8±7.4 lb.ft.)

HYDRAULIC PUMPS

TRANSMISSION PUMP

Removal

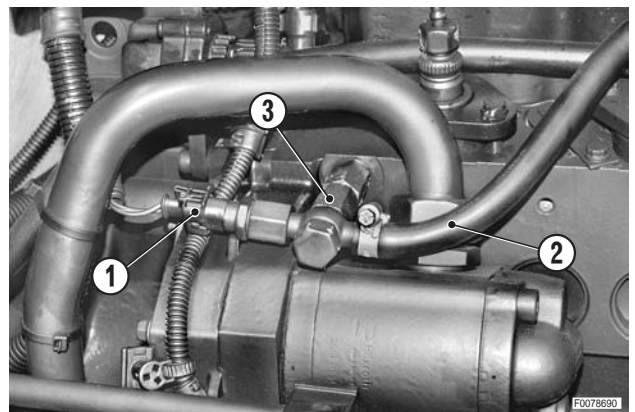
⚠ 1 - Switch off the engine, remove the key from the ignition and apply the parking brake.

2 - Allow the engine to cool down to ambient temperature.

1 - Remove the cab.
(For details, see "CAB").

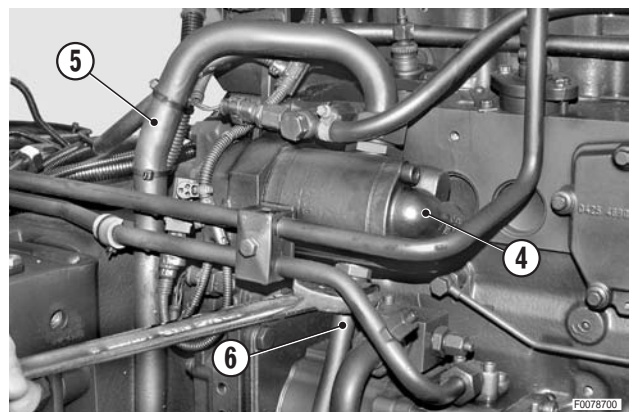
2 - Disconnect the connector (1), the pipe (2) and remove the fitting (3).

★ Plug the pipes and open fittings to prevent the entry of impurities.

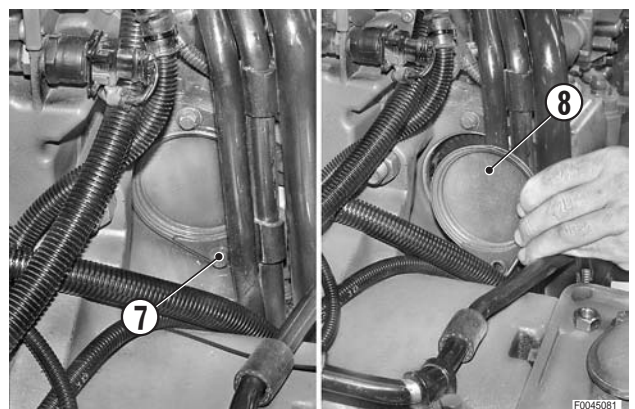


3 - Disconnect the suction and delivery pipes (5) and (6) from the pump (4).

★ Plug the pipes to prevent the entry of impurities.



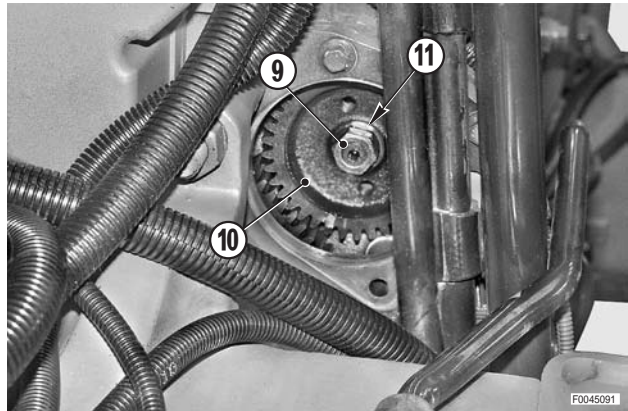
4 - Remove the screw (7) and the cover (8).



⚠ Before proceeding, close the passage between the lower part of the pump gear and the engine sump.

★ Use non-crushable material.

5 - Remove the nut (9) securing the gear (10) and the washer (11).

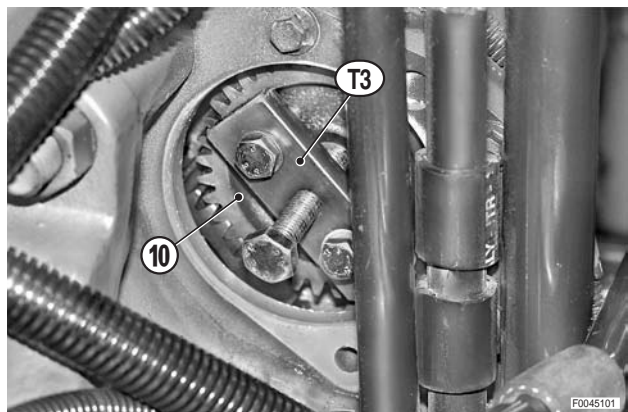


6 - Turn the engine over by hand so that the slot for the machine key is in the top position.

Using the puller **T3** (part no. 5.9030.895.0), remove the pump drive gear (10). 5.9030.895.0) withdraw the pump drive gear (10).

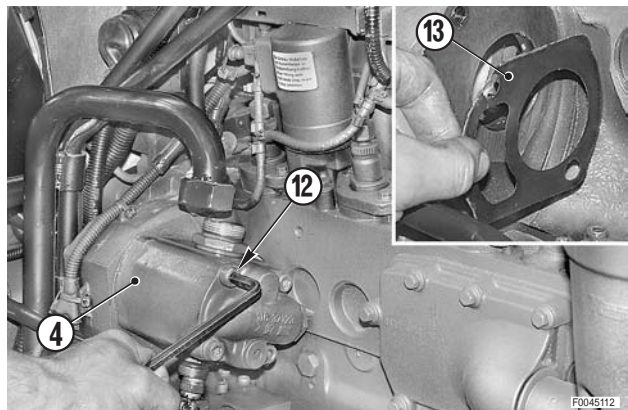
Remove the machine key.

Remove the machine key. ⚠ Take care not to drop the key into the crankcase.



7 - Loosen and remove the bolts (12) and remove the pump (4).

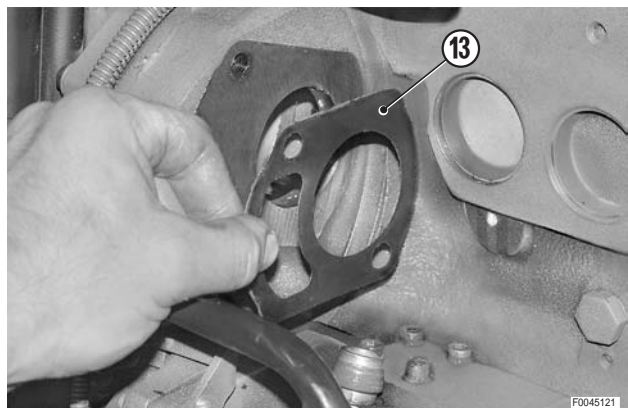
★ Recover also the gasket (13) that should be renewed on reassembly.



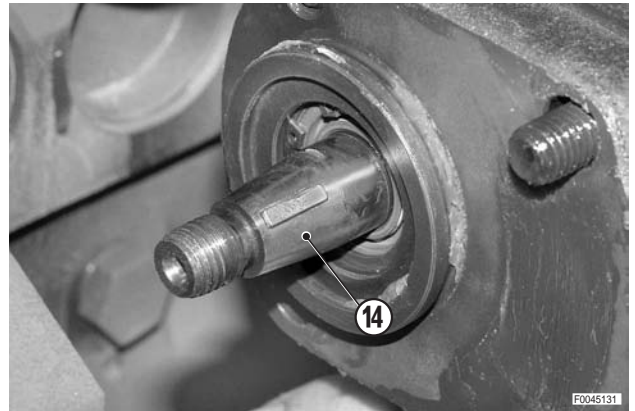
Refitting

1 - Position the gasket (13).

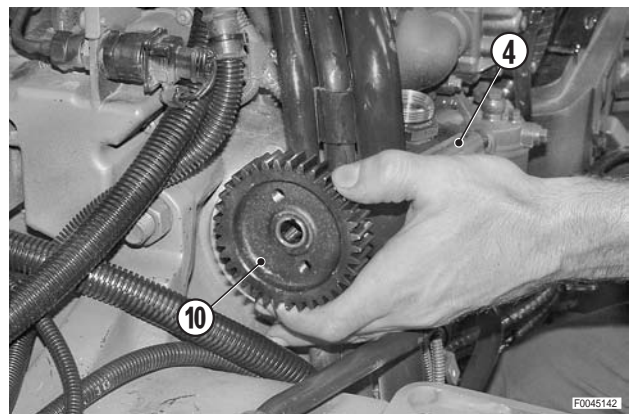
★ To hold the gasket in place, apply grease to the contact surface of the engine.



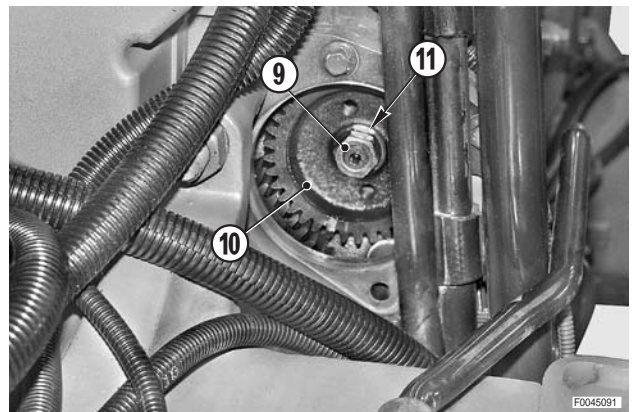
- 2 - Position the machine key (14) on the pump shaft with the slot facing upwards.
 - ★ Keep the flat face of the key inclined towards the gear hub spline.




- 3 - Fit the pump (4) and gear (10) simultaneously.
 - ★ To help seat the gear and the machine key correctly, gently turn the pump (4).




- 4 - Hold the gear (10) in position by hand tightening the nut (9) with the washer (11).

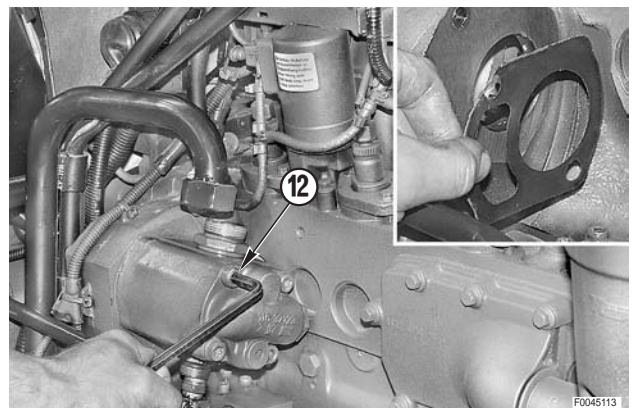


- 5 - Secure the pump with the bolts (12).
 - ★ Tighten alternate bolts gradually in sequence.

 Bolts M10: 50±10 Nm (36.9±7.4 lb.ft.)

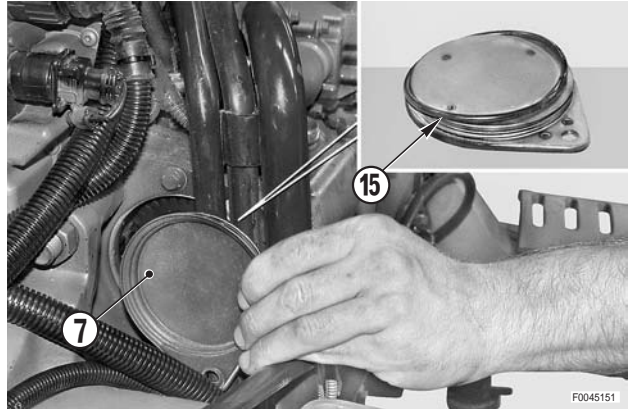
- 6 - Secure the gear (10) with the nut (9).

 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 the cover (8).

★ Carefully check the condition of the O-ring (15).

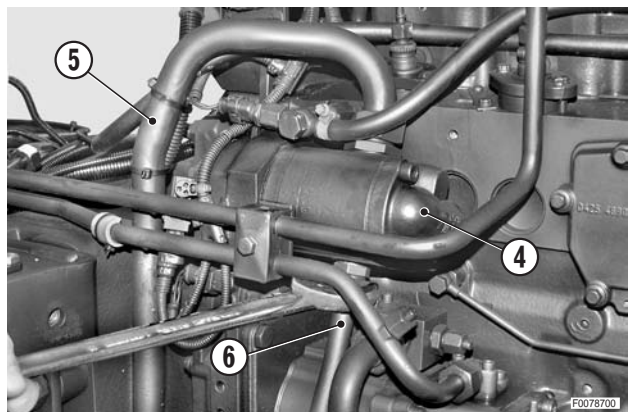


8 - Connect the suction and delivery pipes (5) and (6).

★ Before connecting the upper suction pipe, fill the pump (4) 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.




STEERING AND SERVICES PUMP

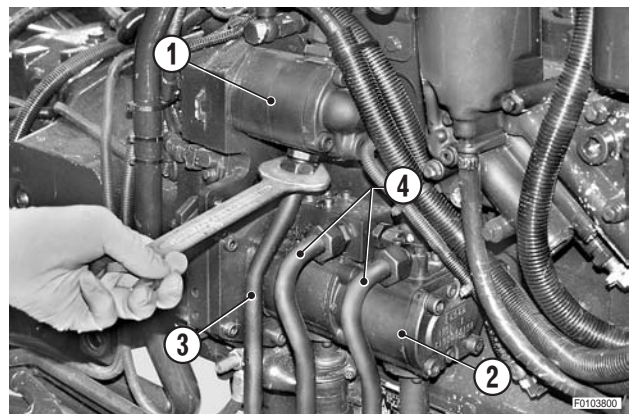
Removal

- ⚠ 1 - Stop the engine, remove the key from the ignition and apply the parking brake.
- 2 - Allow the engine to cool down to ambient temperature.
- 1 - Drain off all the oil from the transmission.

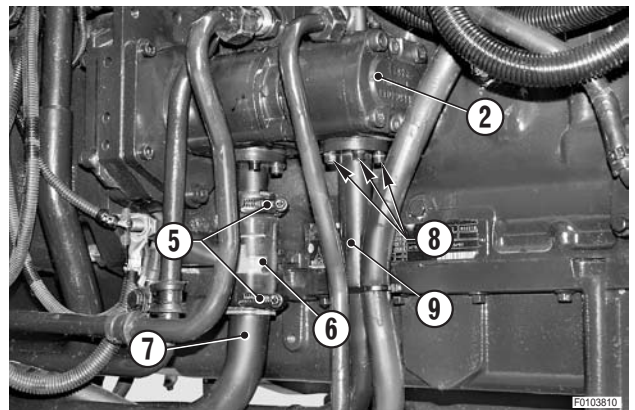
※ 1

 Transmission oil: max. 45 approx. 40 ℓ (11.9 US.gall.)

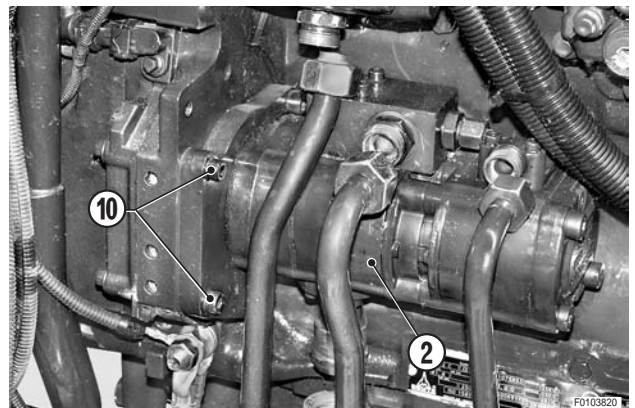
- 2 - Disconnect the pressure lines (3) and (4) from the pumps (1) and (2).



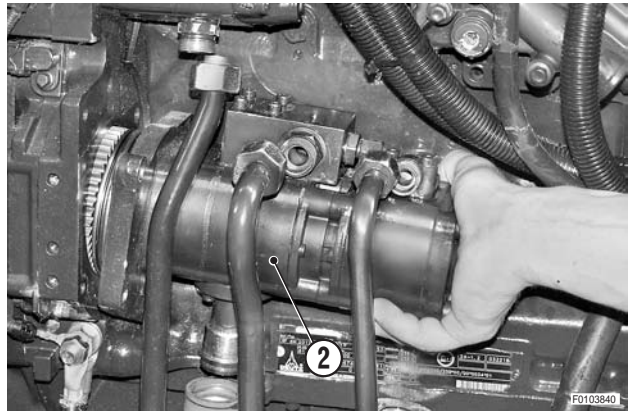
- 3 - Loosen the hose clamps (5) and slide the sleeve (6) on to the suction line (7).
- 4 - Remove all the bolts (8) and disconnect the suction line (9) from the pump (2).
 - ★ Check the condition of the O-ring and renew it if necessary.



- 5 - Loosen and remove the bolts (10) securing the pump (2).



6 - Remove the pump assembly (2).

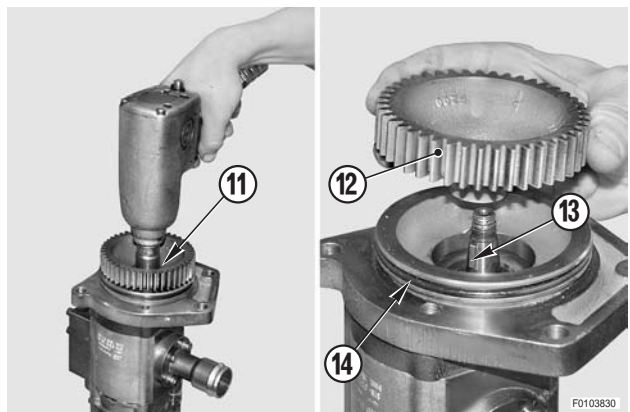


7 - Remove the nut (11).

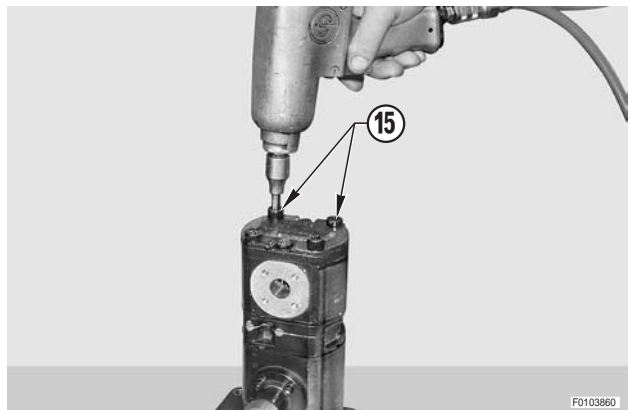
8 - Remove the drive gear (12)

★ Recover the machine key (13).

★ Renew the O-ring (14) on reassembly.

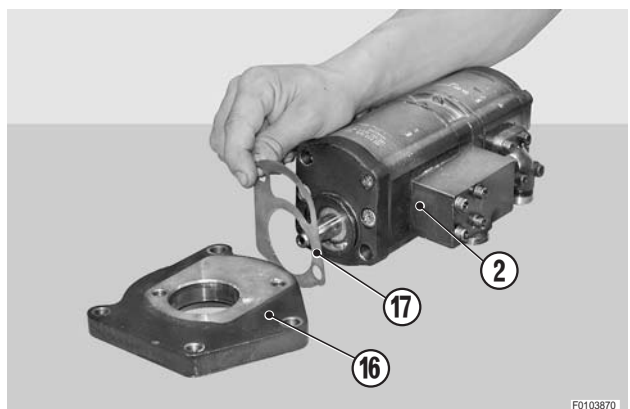


9 - Remove the screws (15).



10 - Separate the pump support (16) from the pump (2) and remove the paper gasket (17).


★ Renew the paper gasket on reassembly.



Refitting

- Refitting is the reverse of removal.



 Transmission oil: max. 45 approx. 40 ℓ (11.9 US.gall.)

- 1 - Start the engine and repeatedly turn the steering to full lock in both directions to expel any air from the steering circuit and check seals for leaks.

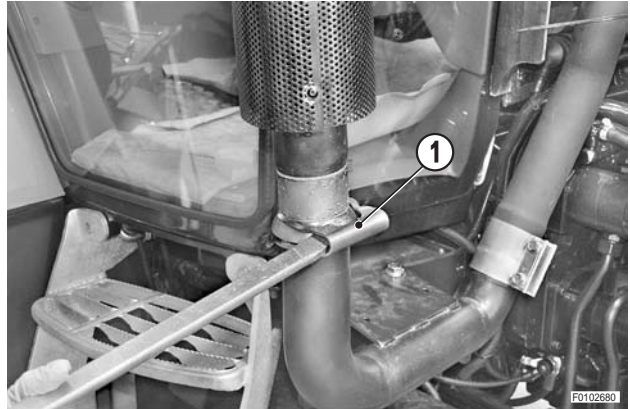
COMPLETE EXHAUST SYSTEM

SILENCER

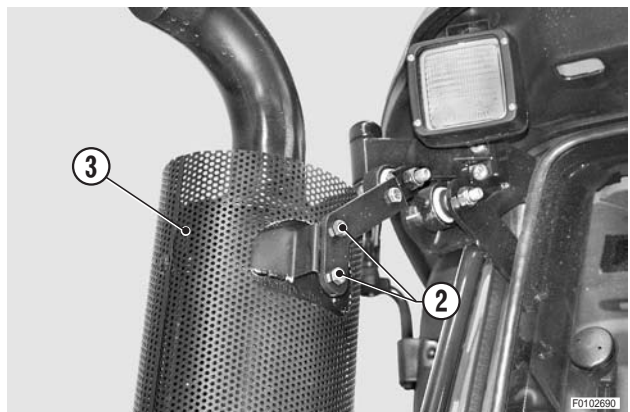
Removal

⚠ Remove the key from the ignition and apply the parking brake.

1 - Using a lever, remove the clamp (1).



2 - Remove the bolts (2) (two per side) and remove the silencer (3).



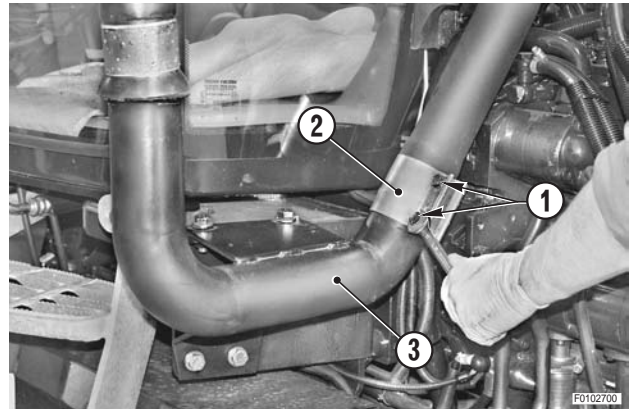
Refitting

- Refitting is the reverse of removal.

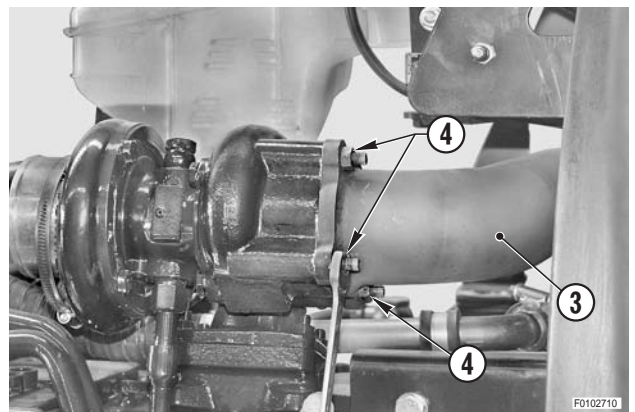
EXHAUST PIPE

Removal

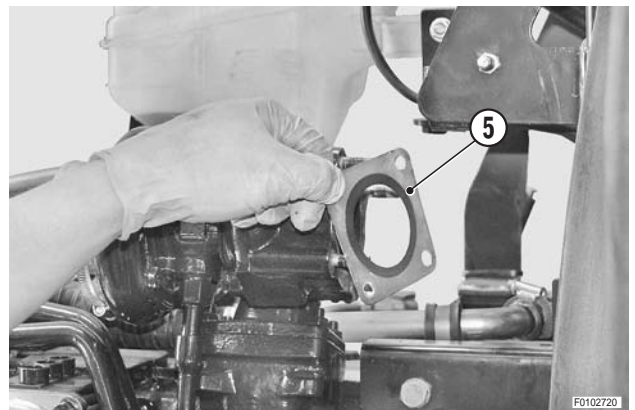
- 1 - Loosen the bolts (1) and slide the connection clamp (2) onto the exhaust pipe (3).



- 2 - Remove the four nuts (4) and the exhaust pipe (3).



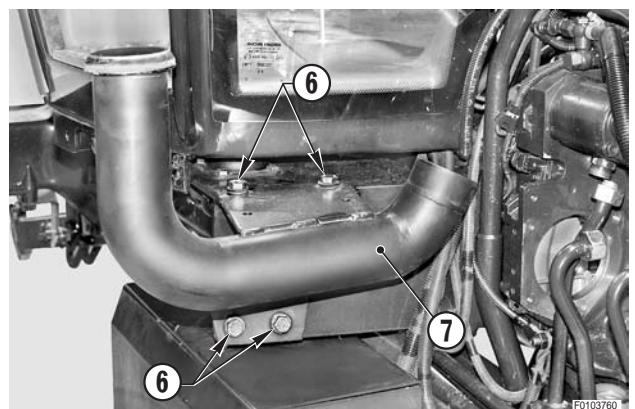
- 3 - Remove the gasket (5).
★ Note which way round the seals are fitted.
- 4 - Remove the silencer.
(For details, see "SILENCER").



- 5 - Remove the four bolts (6) and remove the exhaust pipe (7).

Refitting

- Refitting is the reverse of removal.



CAB

Removal

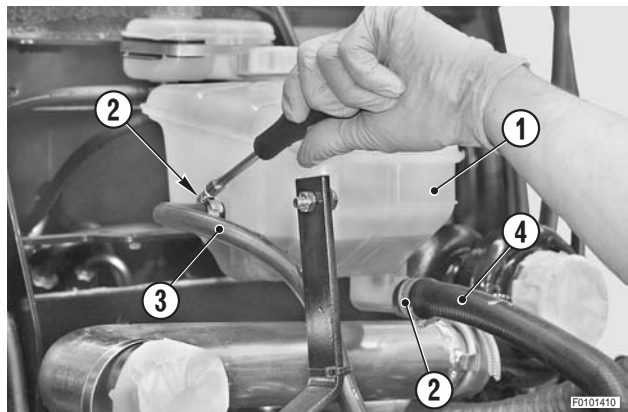
! Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the hood.
(For details, see "ENGINE HOOD").
- 2 - Remove the complete exhaust pipe.
(For details, see "COMPLETE EXHAUST SYSTEM").
- 3 - Remove the fuel tank.
(For details, see "FUEL TANK").
- 4 - Remove both 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 - Completely drain the expansion tank (1).

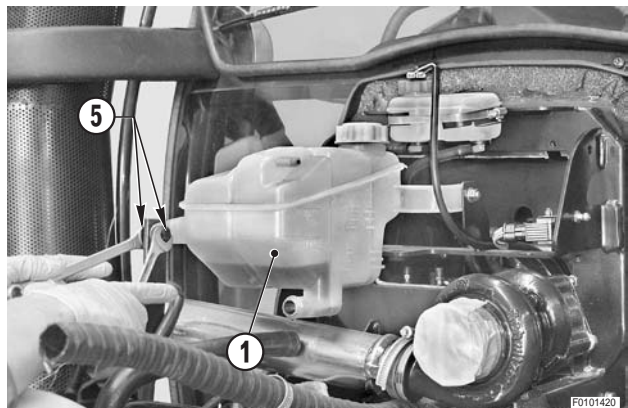


Coolant:
max. 5 ℓ (1.32 US gal.)

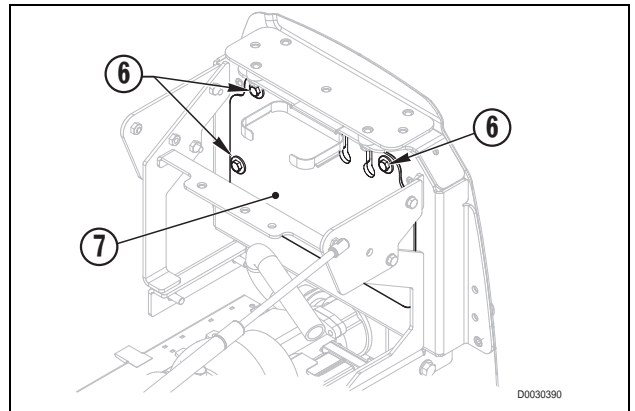
- 7 - Loosen the hose clamps (2) and disconnect the pipes (3) and (4) from the expansion tank (1).



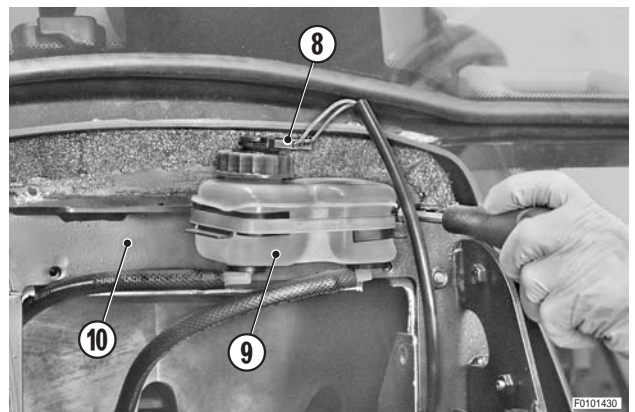
- 8 - Remove the two bolts (5) and remove the expansion tank (1).



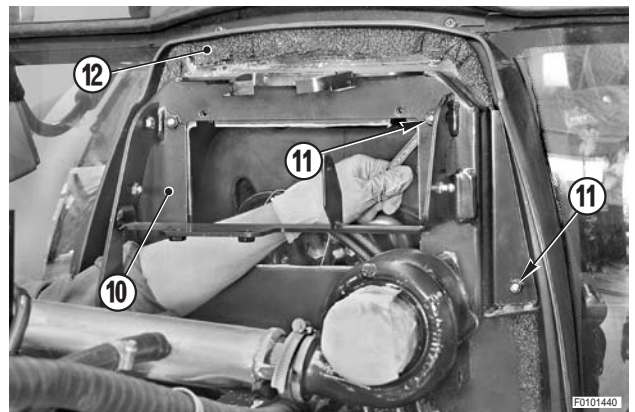
9 - Remove the bolts (6) and remove the bulkhead (7).



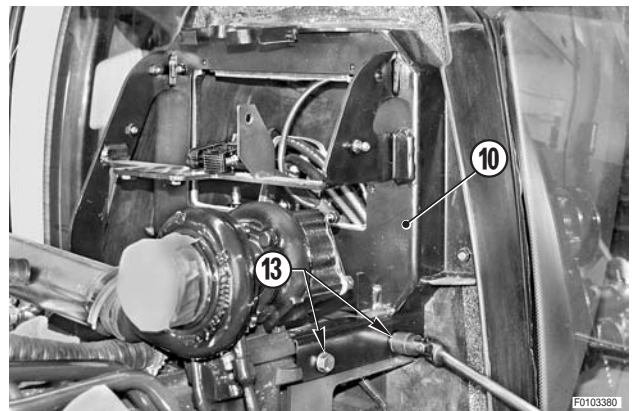
10 - Disconnect the wiring connectors (8), unscrew and remove the brake fluid reservoir (9) from the support (10).



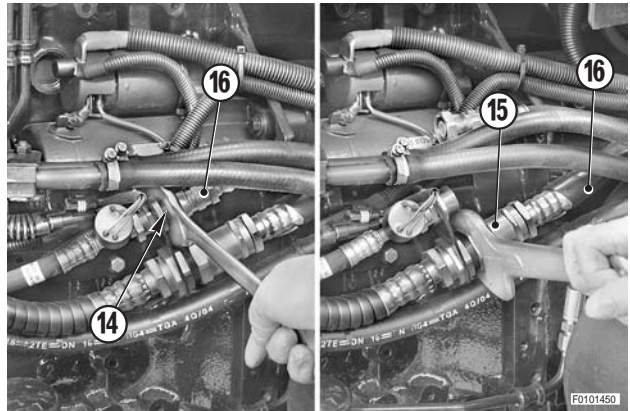
11 - Remove the four bolts (11) and detach the protection (12) from the support (10).



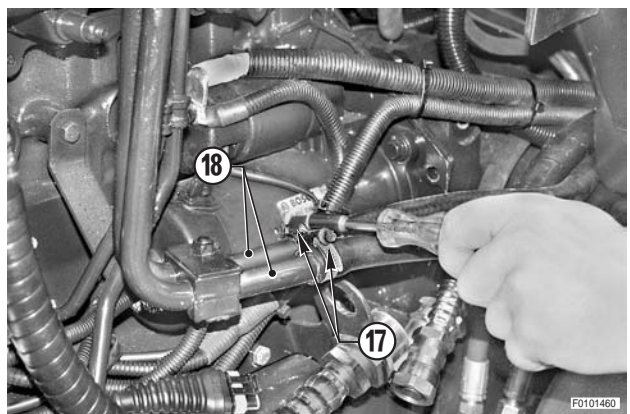
12 - Remove the bolts (13) (2 per side) and remove the support (10).



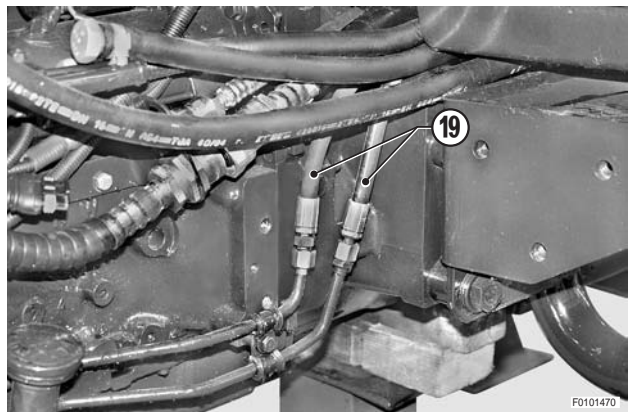
13 - Loosen the fittings (14) and (15) and disconnect the air conditioning pipes (16).



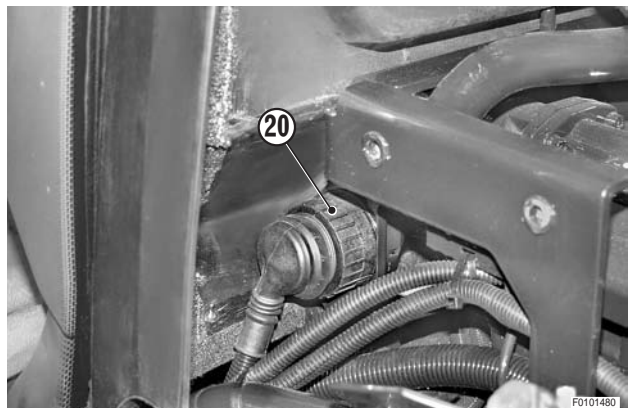
14 - Loosen the hose clamps (17) and disconnect the heater hoses (18).
★ Label the pipes to avoid confusion on refitting.
★ Plug the pipes to prevent the entry of impurities.



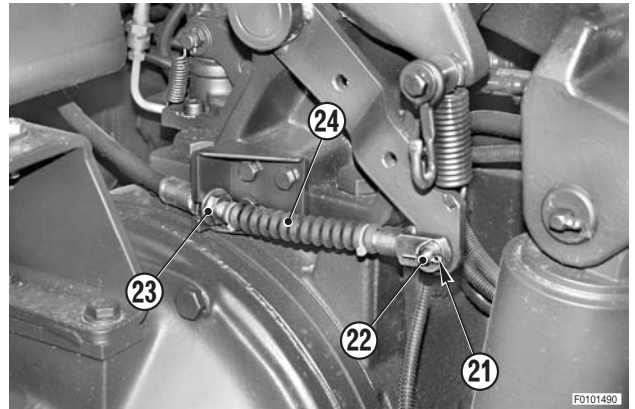
15 - Disconnect the steering hoses (19).
★ Plug the pipes to prevent the entry of impurities.



16 - Disconnect the connector (20).

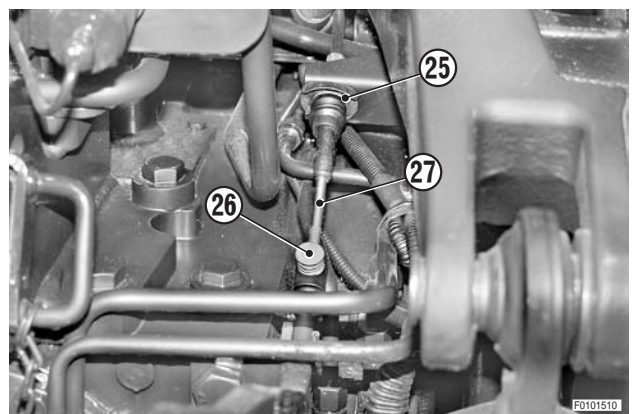


17 - Remove the cotter pin (21) and remove the pivot pin (22).

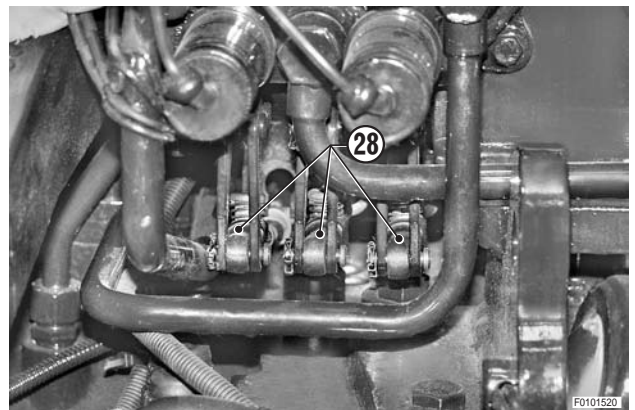


18 - Loosen the nut (23) and disconnect the parking brake cable (24).

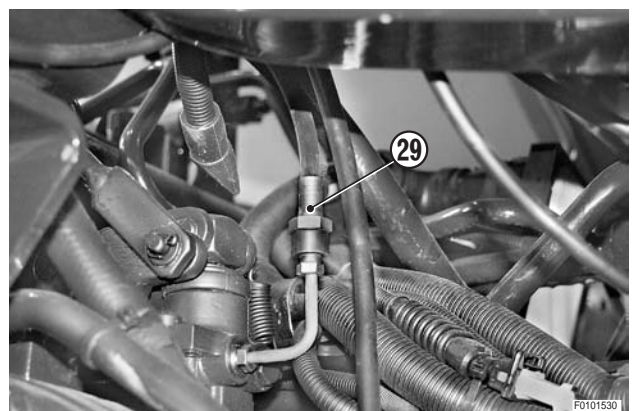
19 - Remove the retaining clip (25), press the button (26) and disconnect the cable (27) from the support.



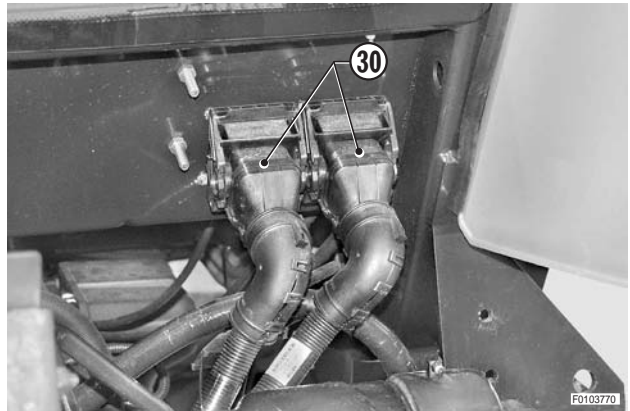
20 - Using the same procedure as described in the previous step, disconnect the auxiliary services control valve cables (28).



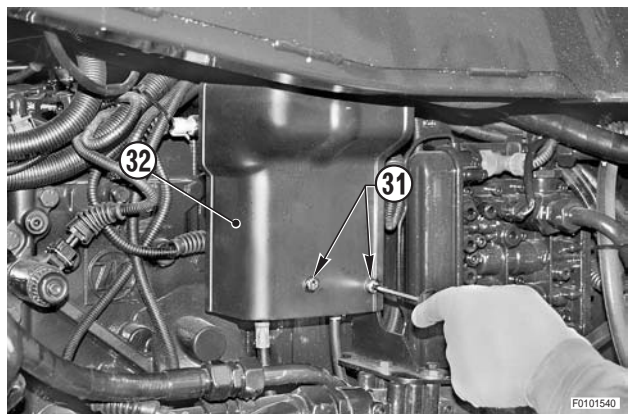
21 - Disconnect the brake hoses (29) on both sides.
★ Plug the pipes to prevent the entry of impurities.



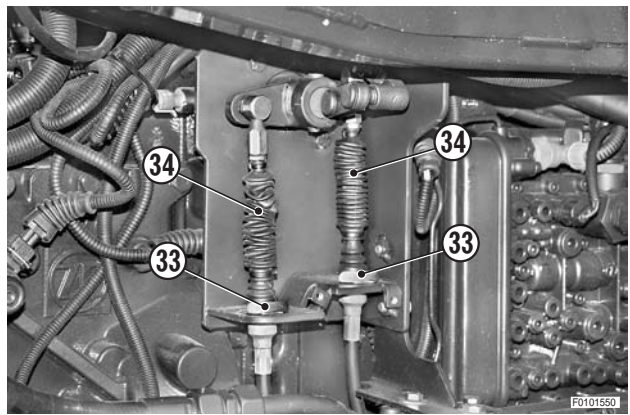
22 - Disconnect the wiring connectors (30).



23 - Remove the three bolts (31) and remove the shield (32).



24 - Remove the retaining clips (33) and disconnect the gearbox control cables (34).
★ Label the control cables to avoid confusion on reconnection.

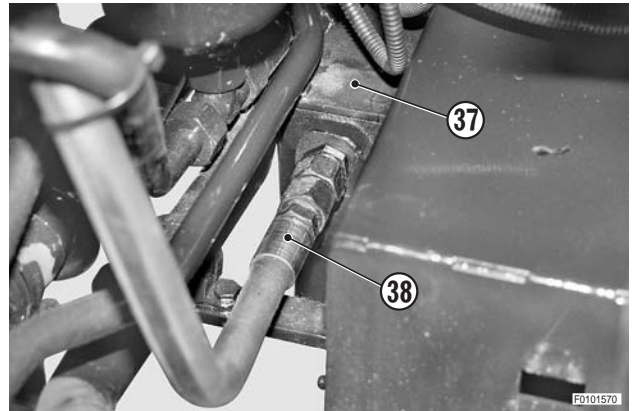


25 - Remove the cover (35), remove the bolts (36) and detach the light supports from both sides of the cab.

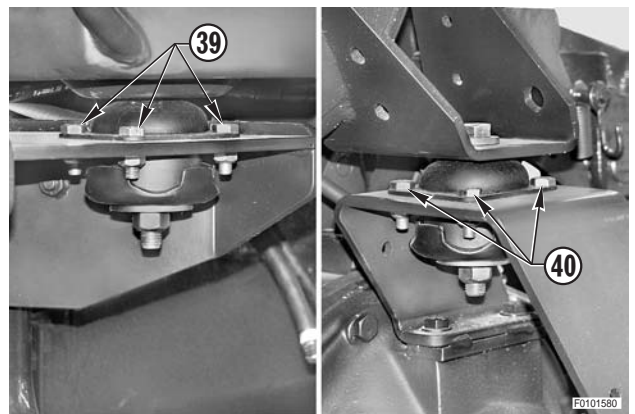


26 - Disconnect the pipe (38) to the steering valve from the filter (37).

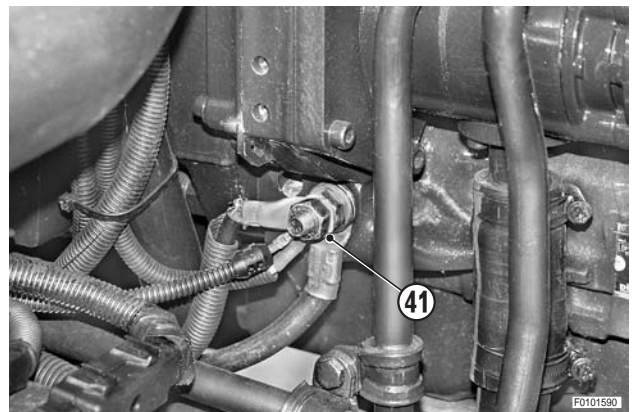
★ Plug the pipe to prevent the entry of impurities.



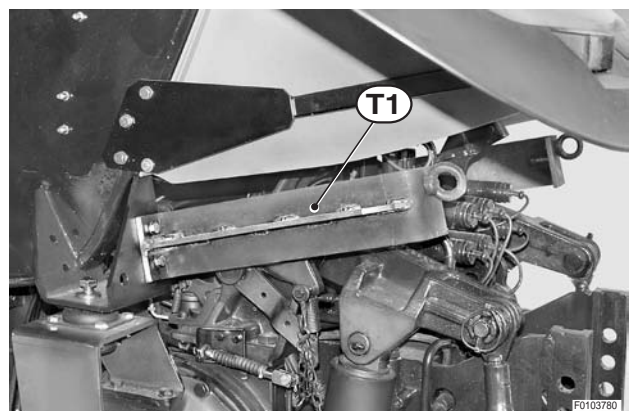
27 - Remove the nuts (39) and (40) from both sides.



28 - Disconnect the earth leads (41).



29 - Fit the special tool **T1** (part no. 5.9030.990.0).

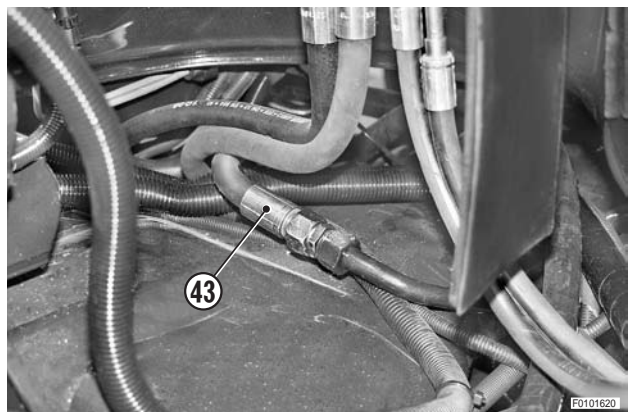


30 - Attach the cab (42) to a suitable hoist and raise it slightly to gain access to the power steering pipe.



31 - Disconnect the power steering return pipe (43).
★ Plug the pipes to prevent the entry of impurities.

32 - Remove the cab.



Refitting


- Refitting is the reverse of removal.

ENGINE

Preparation for removal

! Disconnect the lead from the negative terminal (-) of the battery 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 support.
(For details, see "FRONT SUPPORT").
- 4 - Remove the battery.
- 5 - Drain off all the oil contained in the transmission.

 Transmission oil: max. 45 ℓ (11.9 US gal.)

 1


- 6 - Position a stand "A" under the clutch housing.
- 7 - Proceed as described in the paragraph "Separation or removal" in this chapter.

Preparation before separating the engine from the transmission

! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

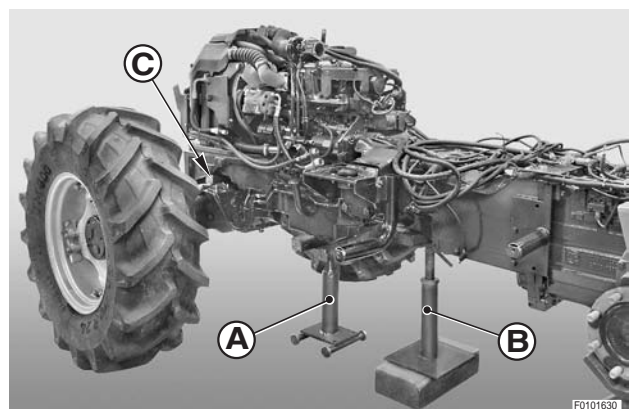
- 1 - Remove the hood.
(For details, see "ENGINE HOOD").
- 2 - Remove the cab.
(For details, see "CAB").
- 3 - Remove the front axle drive shaft.
(For details, see "FRONT AXLE DRIVE SHAFT").
- 4 - Remove the battery.

- 5 - Drain off all the oil contained in the transmission.

 Transmission oil: max. 45 ℓ (11.9 US gal.)

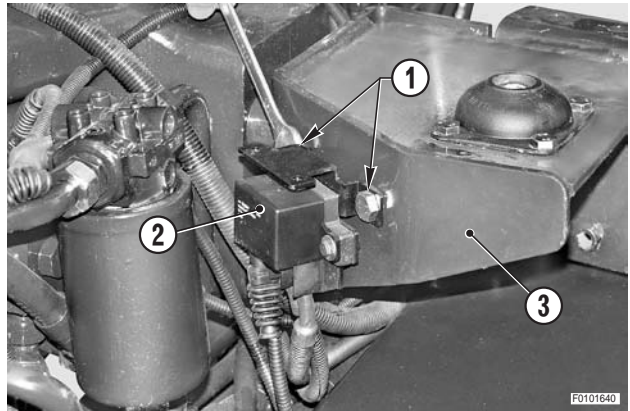
 1

- 6 - Position a trolley jack "A" under the engine sump and a stand "B" under the clutch 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 paragraph "Separation or removal" in this chapter.

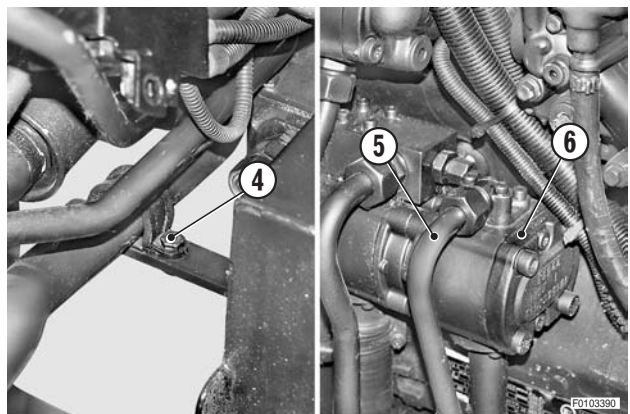


Separation or removal

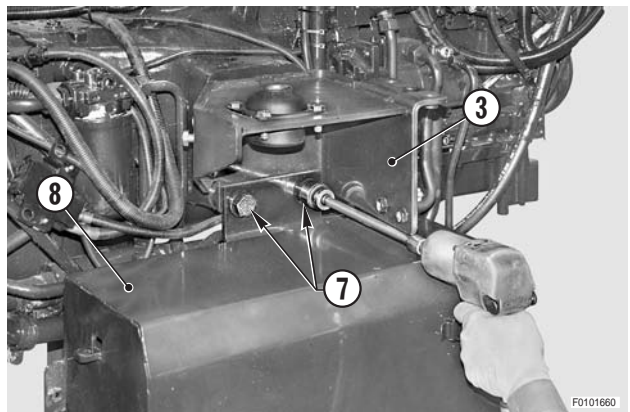
- 1 - Remove the screws (1) and disconnect the relay (2) from the cab support (3).



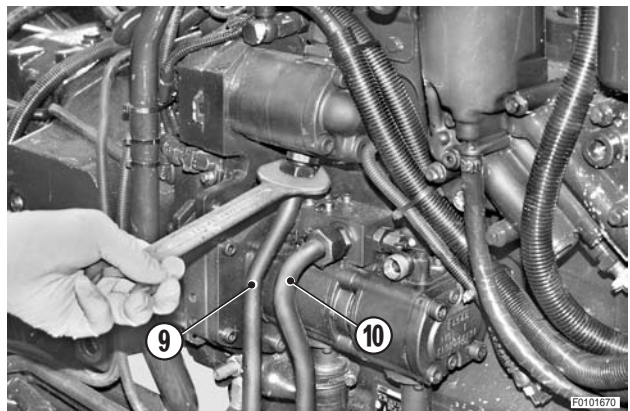
- 2 - Remove the screw (4).
- 3 - Disconnect the pressure line (5) from the pump (6).
★ Plug the pipe to prevent the entry of impurities.



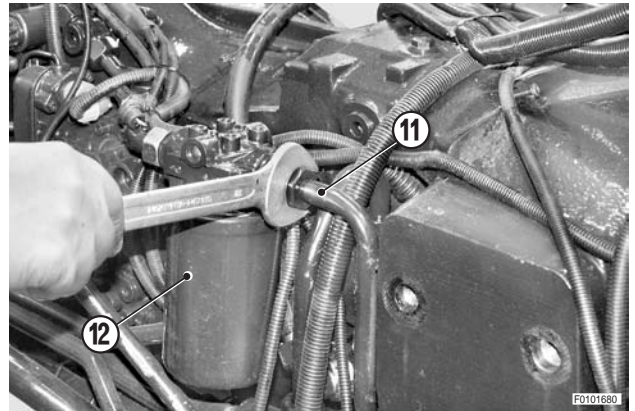
- 4 - Remove the two bolts (7) and remove the battery support (8).
- 5 - Remove the remaining bolts (7) and remove the cab support (3).



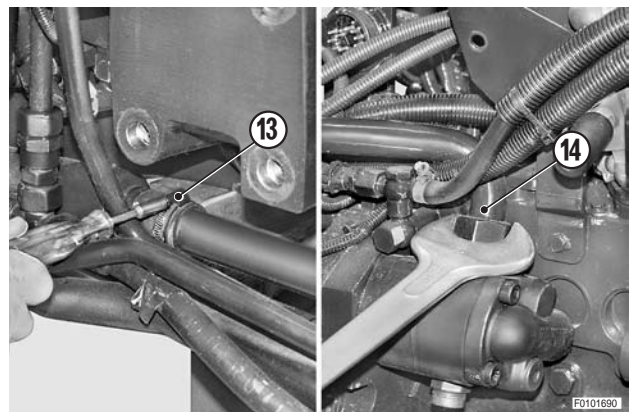
- 6 - Disconnect the pipes (9) and (10) from the pumps.
★ Plug the pipes to prevent the entry of impurities.



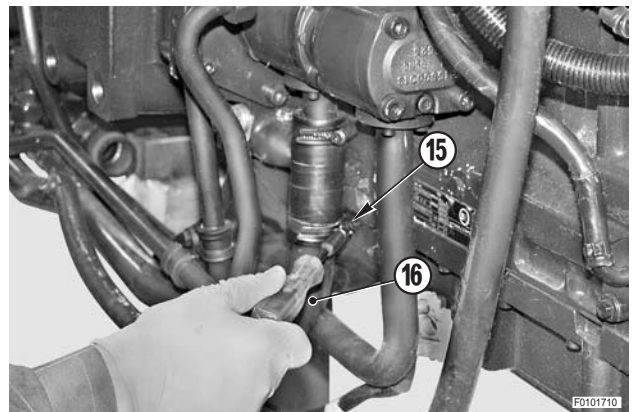
- 7 - Disconnect the pipe (11) from the filter (12) and move it outwards.



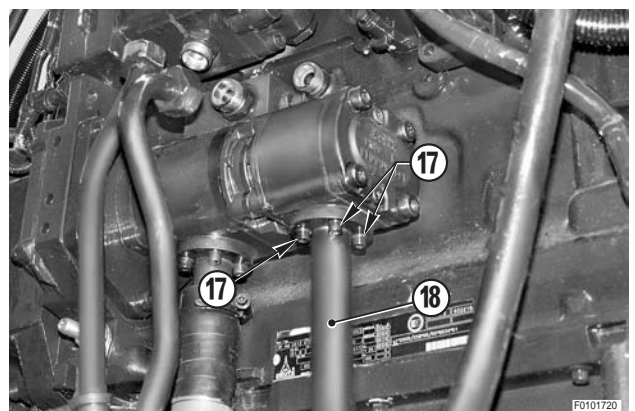
- 8 - Loosen the hose clamp (13) and remove the hose (14).



- 9 - Loosen the hose clamp (15) and disconnect the hose (16) from the sleeve.

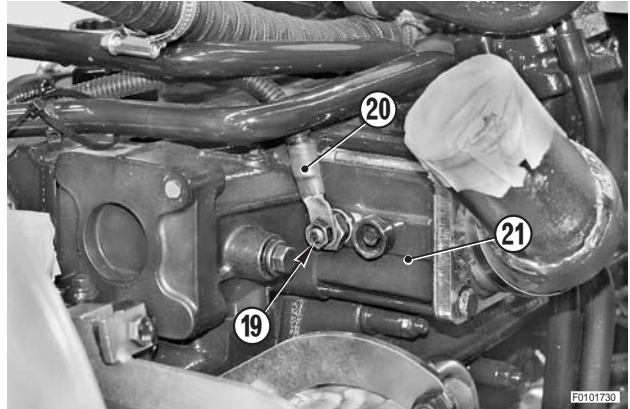


- 10 - Remove the screws (17) and disconnect the pipe (18) from the pump.
★ Check the condition of the O-ring and renew it if necessary.

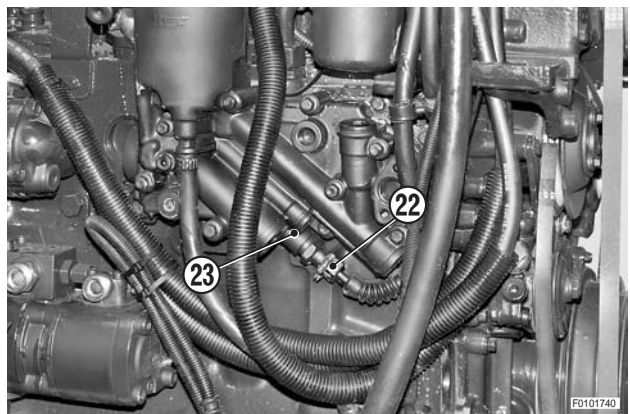


ENGINE

- 11 - Remove the nut (19) and disconnect the cable (20) from the thermostarter (21).

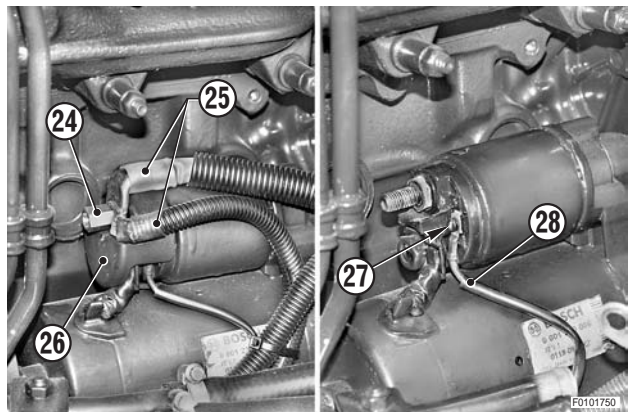


- 12 - Disconnect the wiring connector (22) from the engine oil pressure sensor (23) and withdraw the wiring towards the rear of the tractor.



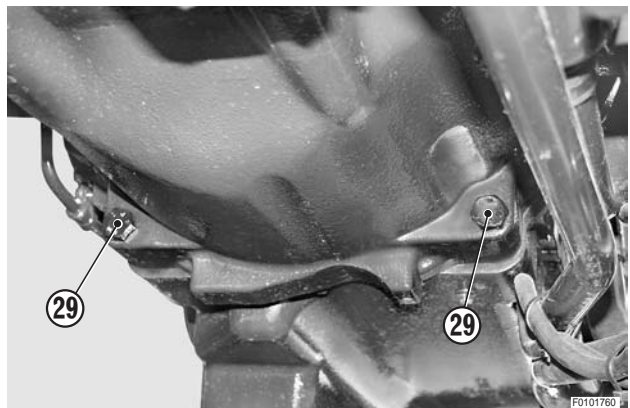
- 13 - Remove the nut (24), disconnect the cables (25) and remove the shield (26).

- 14 - Remove the bolt (27) and disconnect the starter cable (28).



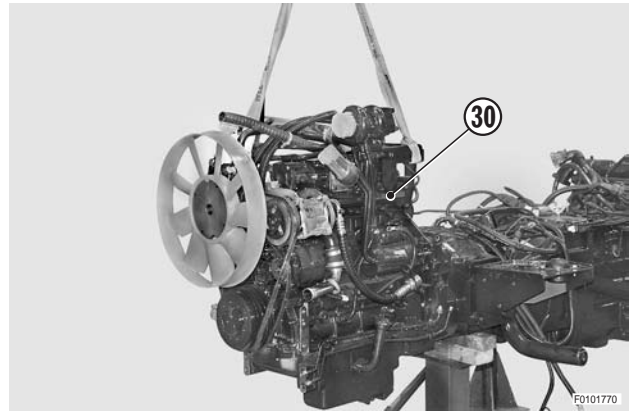
- 15 - Loosen and remove the lower bolts (29).


✖ 2

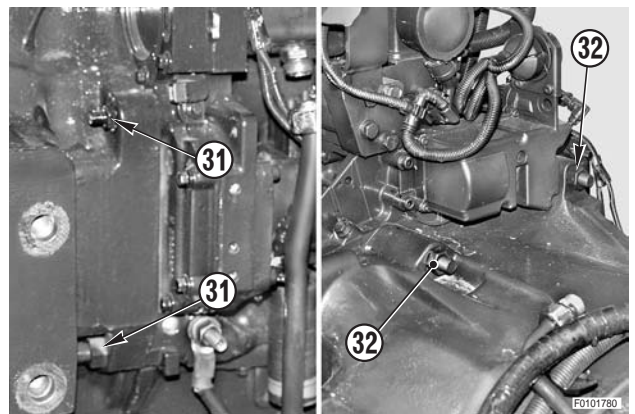


- **In case of engine removal only**

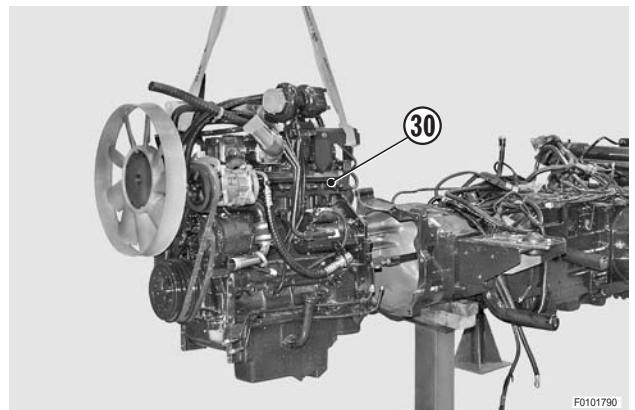
16 - Attach the engine (30) to a hoist and take up the slack in the lifting ropes.




17 - Remove the nuts (31) (two per side) and (32). 

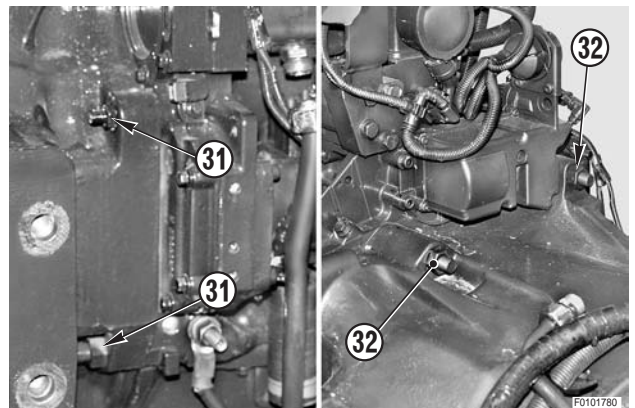


18 - Remove the complete engine (30).

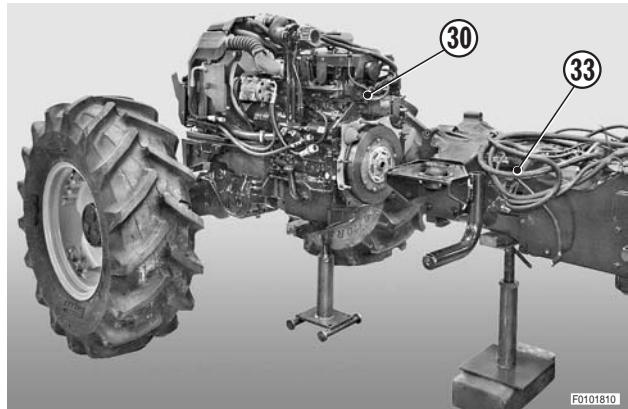


- **For engine-transmission separation only**

19 - Remove the nuts (31) (two per side) and (32). 



- 20 - Move the engine (30) away from the transmission (33) by pushing both front wheels.



Refitting


- Refitting is the reverse of removal.


✳ 1




Transmission oil: max. 45 ℓ (11.9 US gal.)

✳ 2

 Bolt M16: 260±26 Nm (191.6±19.2 lb.ft.)

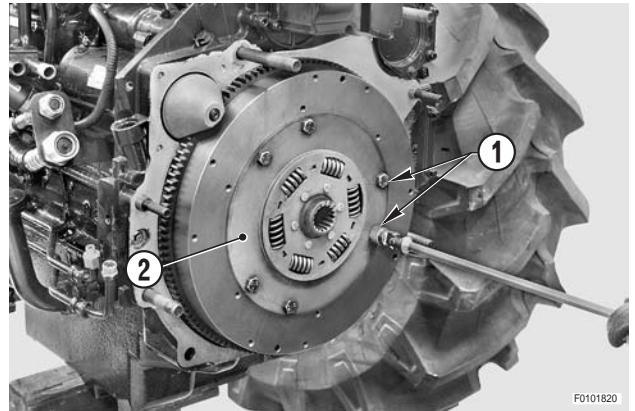
 Nuts M12: 110±11 Nm (81_8.1 lb.ft.)

 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 the screws (1) and remove the torsional spring plate (2).

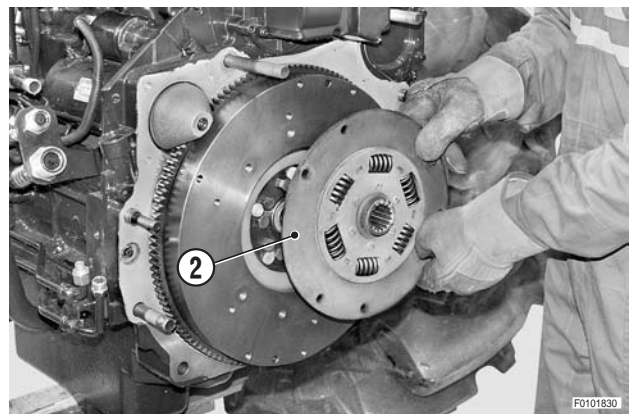


Refitting

- Refitting is the reverse of removal.



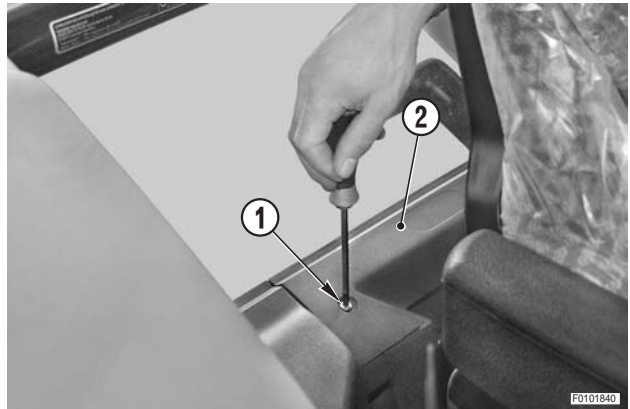
- ★ Fit the torsional spring plate (2) ensuring that the longer side of the hub is facing towards the transmission.



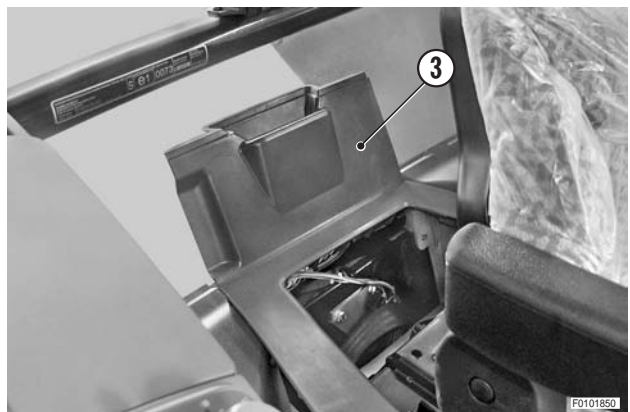
FLOOR MAT

Removal

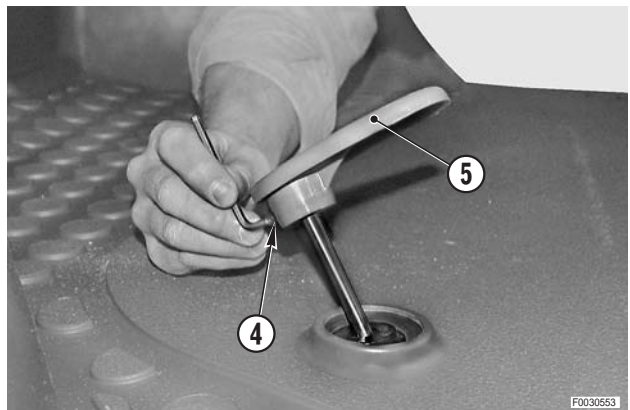
1 - Remove the screws (1) and remove the frame (2).



2 - Remove the cover (3).

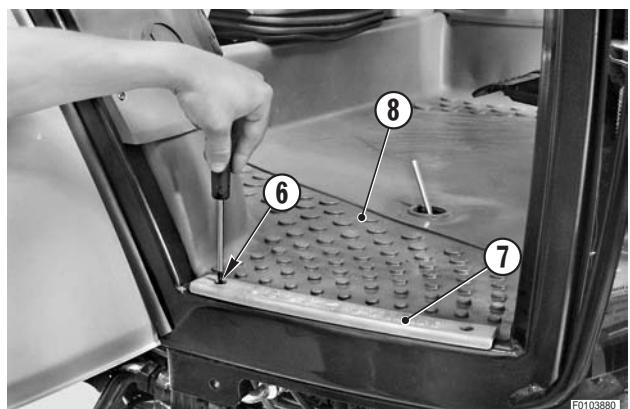


3 - Loosen the grub screw (4) and remove the accelerator pedal (5).



4 - Remove the screws (6) and remove the edge strips (7) on both sides.

5 - Remove the floor mat (8).



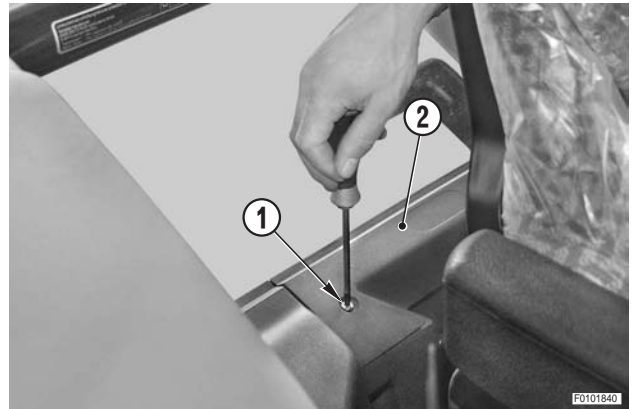
Removal

- Refitting is the reverse of removal.

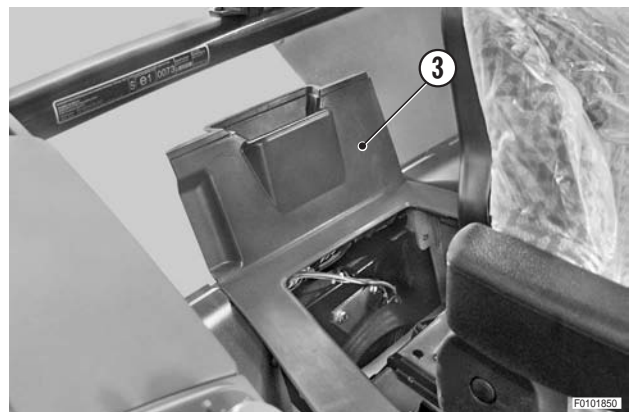
DRIVER'S SEAT

Removal

1 - Remove the two screws (1) and remove the frame (2).



2 - Remove the cover (3).

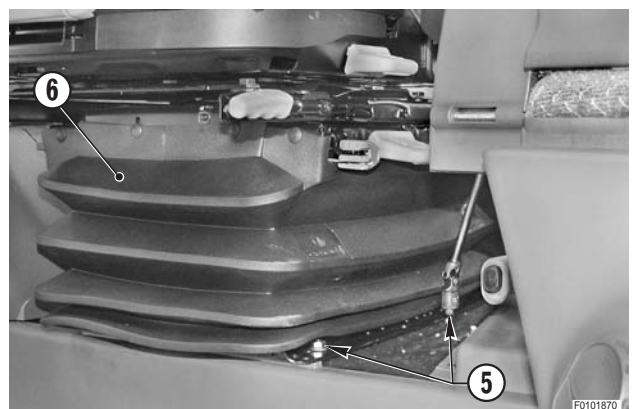


- For versions with air sprung seat only

3 - Disconnect the connector (4).



4 - Remove the four bolts (5) and remove the seat (6).




Refitting

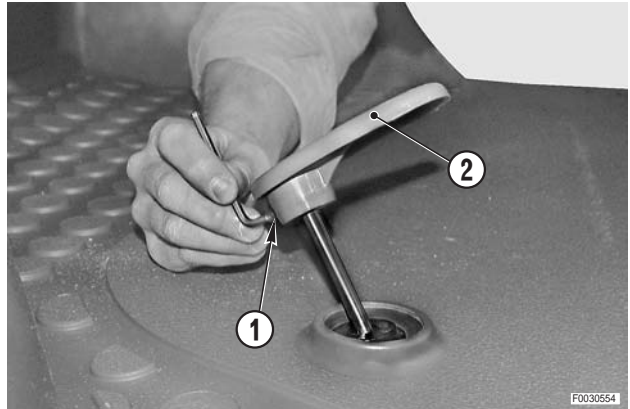
- Refitting is the reverse of removal.

ACCELERATOR PEDAL POTENTIOMETER

Removal

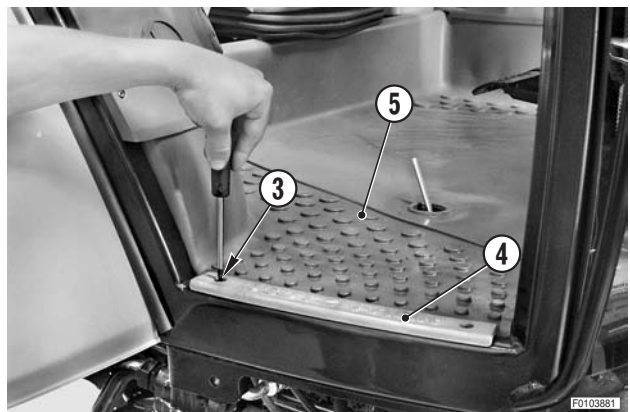
! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

1 - Loosen the grub screw (1) and remove the accelerator pedal (2). 

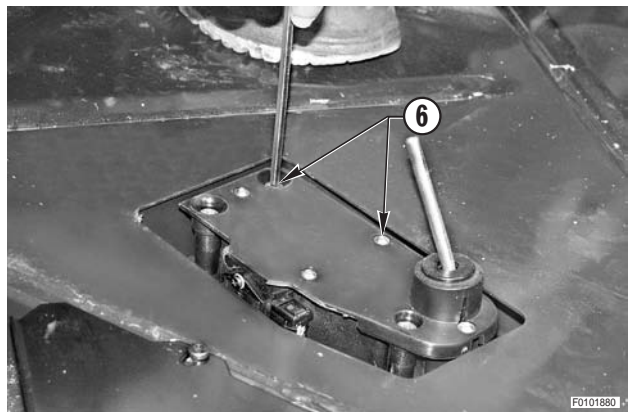


2 - Remove the two screws (3) and remove the edge strip (4) on the right-hand side.

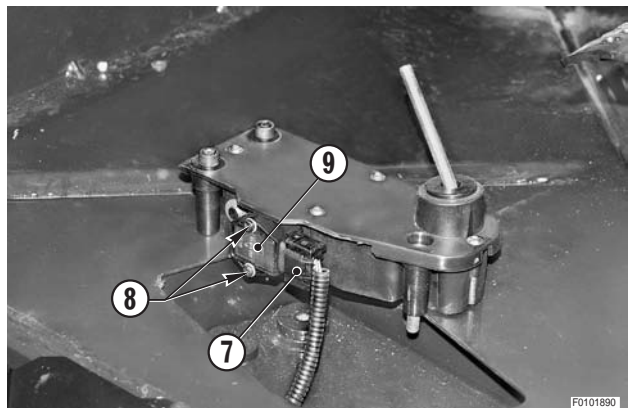
3 - Lift up part of the floor mat (5).



4 - Remove the screws (6).



5 - Disconnect the wiring connector (7), remove the screws (8) and remove the potentiometer (9).



Refitting

- Refitting is the reverse of removal.



- ★ Calibrate the accelerator pedal as described in Group 20.
(For details, see CALIBRATION OF THE ACCELERATOR
PEDAL)

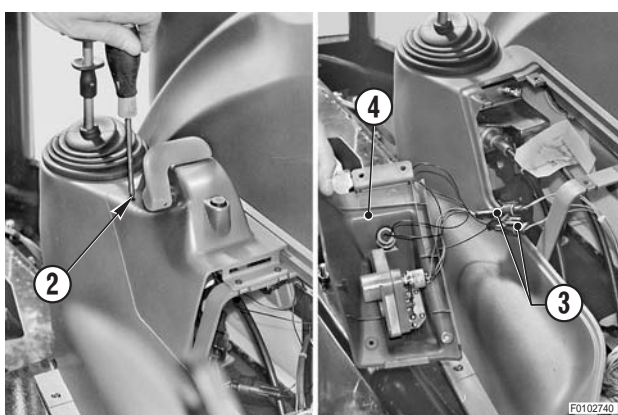
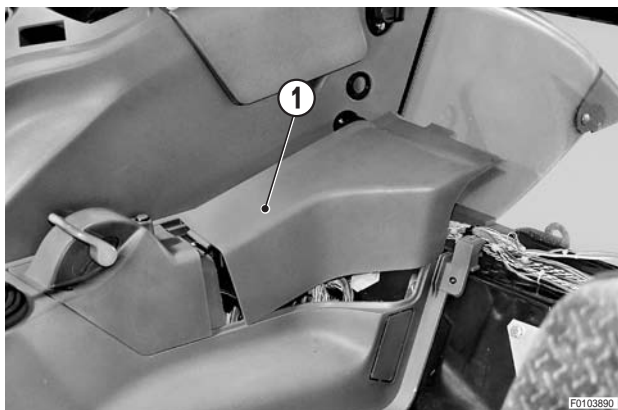
CONSOLE SHROUDS ON RIGHT SIDE

REMOTE VALVE LEVERS SHROUD

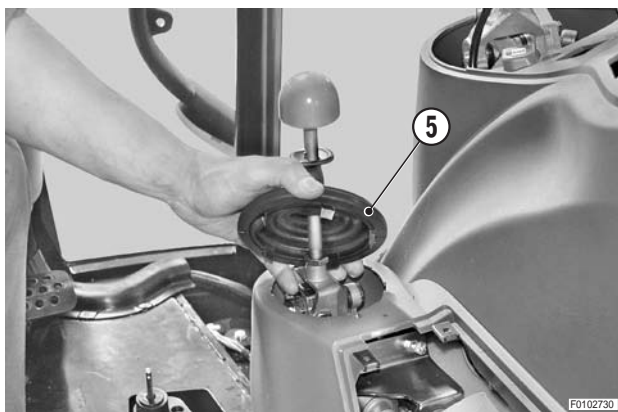
Removal

! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

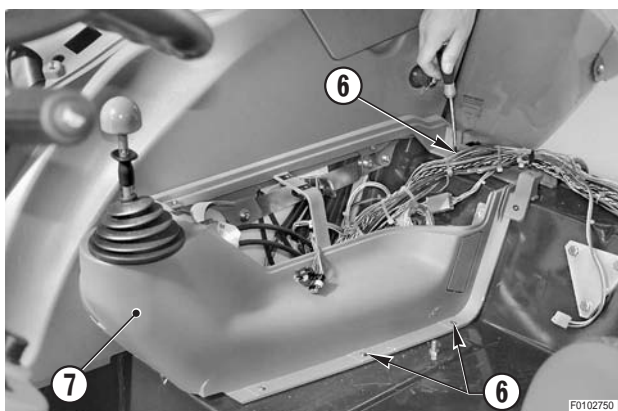
- 1 - Remove the seat.
(For details, see "DRIVER'S SEAT").
- 2 - Remove the shroud (1).
- 3 - Remove the screws (2), disconnect the wiring connectors (3) and remove the hand throttle (4).



- 4 - Detach the gaiter (5) from the remote valve control lever.



- 5 - Remove the seven screws (6) and remove the shroud (7).
 - ★ In case of renewal, it will be necessary to disconnect the wiring connectors from the control units and from the parking brake.



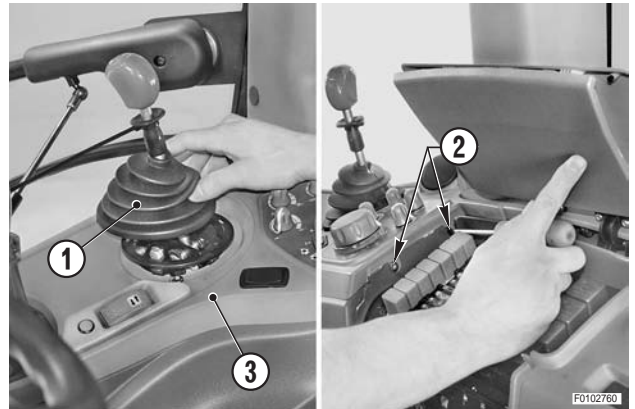
Refitting

- Refitting is the reverse of removal.

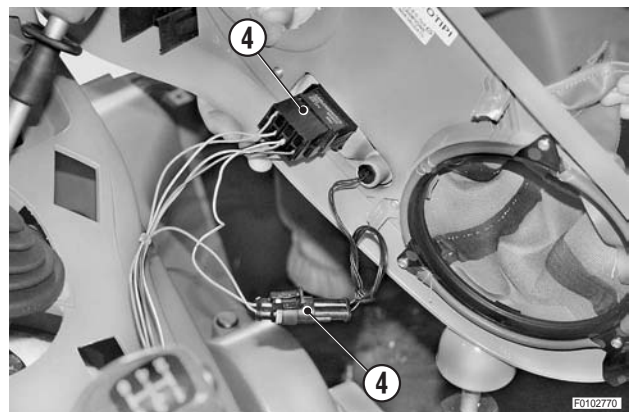
RIGHT-HAND CONSOLE

Removal

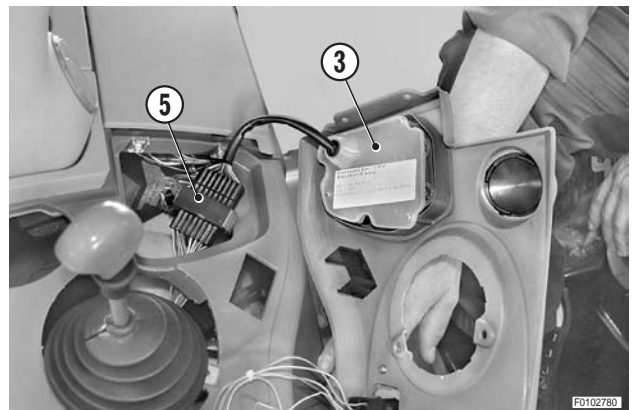
- 1 - Remove the remote valve lever shroud.
(For details, see "REMOTE VALVE LEVERS SHROUD").
- 2 - Release the gaiter (1), remove the screws (2) and raise the console (3).



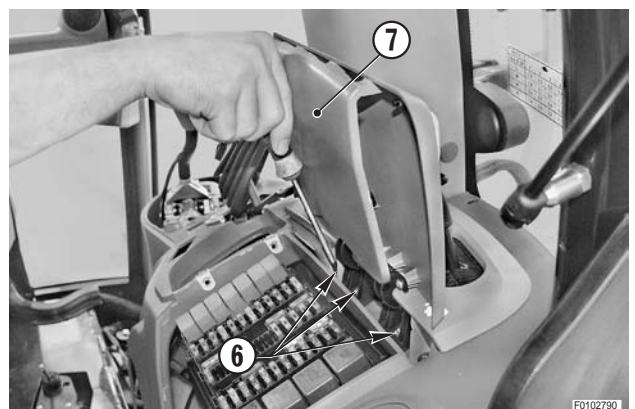
- 3 - Disconnect the wiring connectors (4) of the lift control pushbuttons.



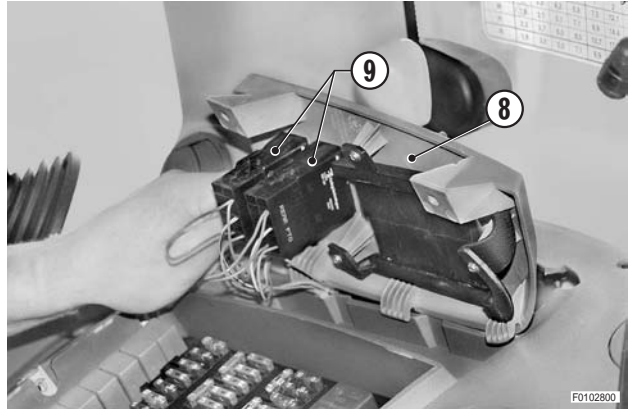
- 4 - Disconnect the wiring connector (5) of the lift control console and remove the console (3).



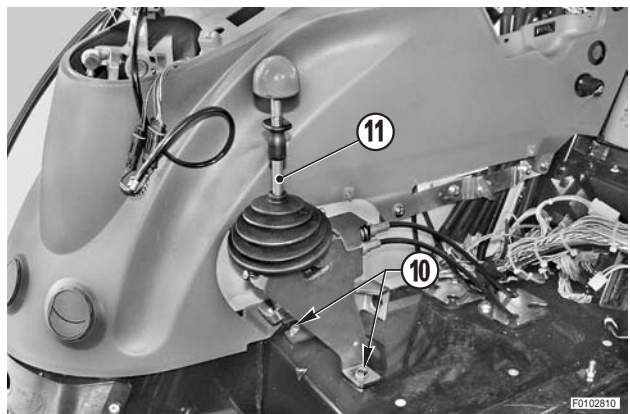
- 5 - Remove the four screws (6) and remove the cover (7).



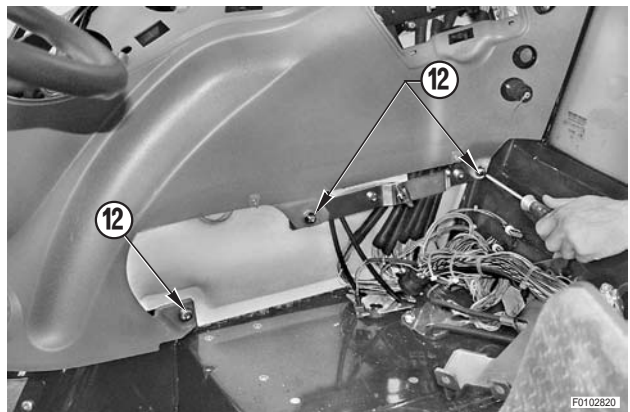
6 - Remove the console (8) and disconnect the wiring connectors (9) of the rear PTO control pushbuttons.



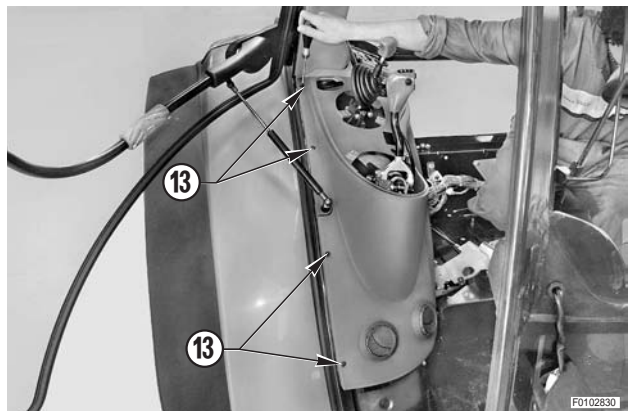
7 - Remove the three screws (10) and move the remote valves control lever (11) to one side.



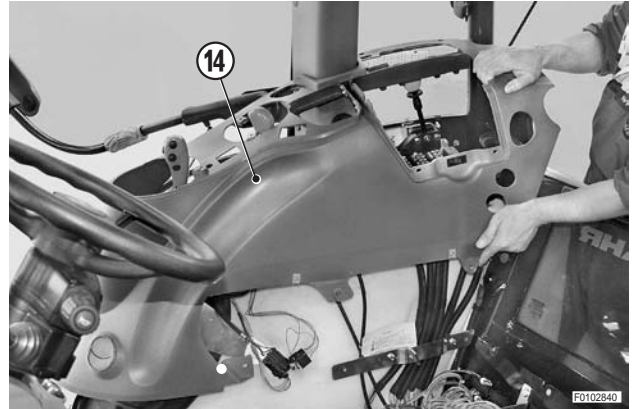
8 - Remove the two bolts (12).



9 - Remove the two bolts (13).



10 - Remove the right-hand console (14).



Refitting

- Refitting is the reverse of removal.

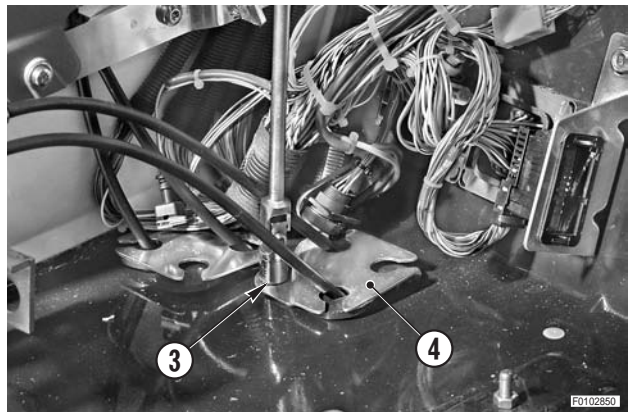
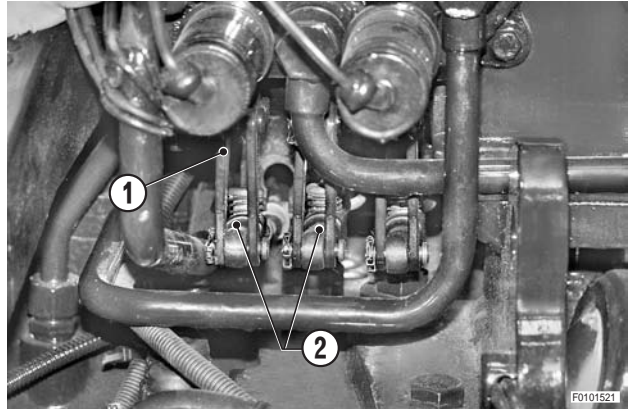
CONTROL CABLES

REMOTE VALVE CROSS-GATE CONTROL LEVER

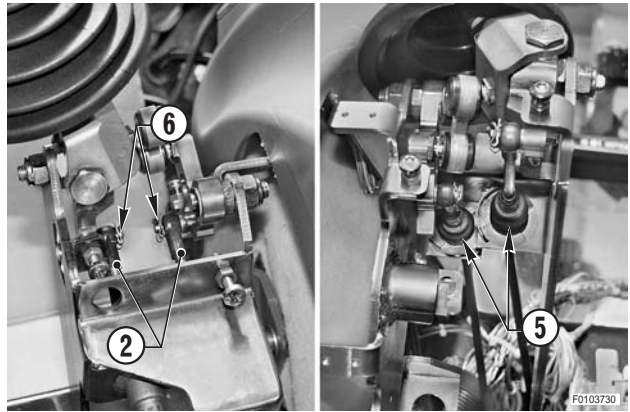
Removal

! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

- 1 - Remove the remote valve lever shroud.
(For details, see "CONSOLE SHROUDS ON RIGHT SIDE").
- 2 - Disconnect the control cable (2) to be removed from the remote control valve (1). ※ 1
- 3 - Remove the bolt (3) and the remove the control cables retaining plate (4).



- 4 - Remove the cable retaining clip (5), remove the circlips (6) and withdraw the control cable (2).



Refitting

- Refitting is the reverse of removal.


※ 1

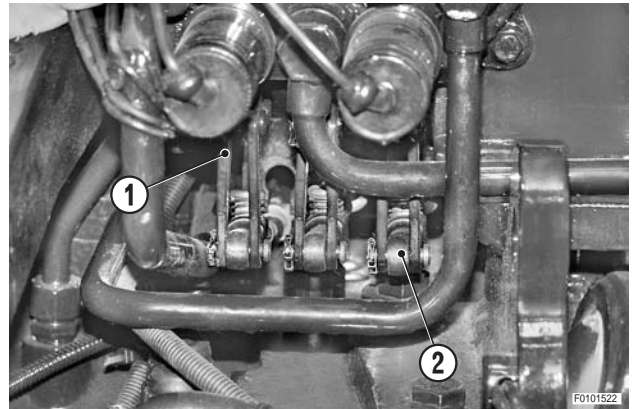
- ★ The remote valve control lever must be in the central position when the control cable is attached.
- ★ After connecting the control cable, check that the lever can move through its full travel distance in both directions.

REMOTE CONTROL VALVE - 3rd SPOOL CONTROL

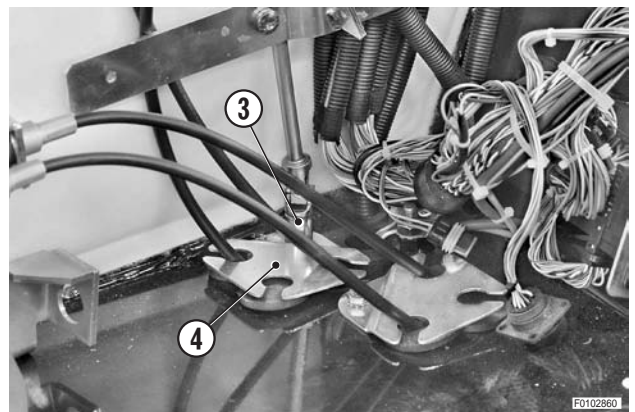
Removal

⚠ Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

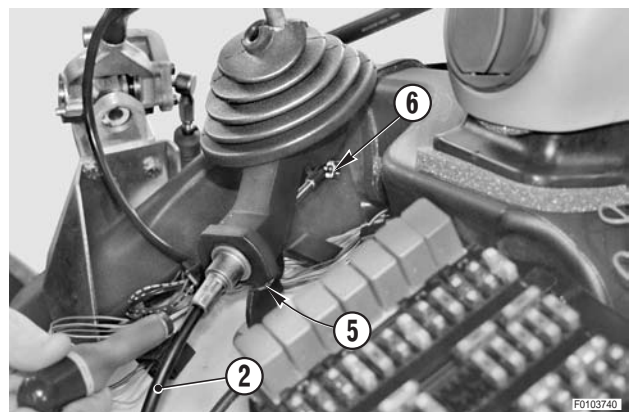
- 1 - Remove the right-hand console.
(For details, see "CONSOLE SHROUDS ON RIGHT SIDE").
- 2 - Disconnect the control cable (2) from the remote control valve (1). 



- 3 - Remove the bolt (3) and the remove the control cables retaining plate (4).



- 4 - Remove the retaining clip (5) and the circlip (6), and withdraw the control cable (2).



Refitting

- Refitting is the reverse of removal.

 1

- ★ The remote valve control lever must be in the central position when the control cable is attached.
- ★ After connecting the control cable, check that the lever can move through its full travel distance in both directions.

REAR PTO SPEED SELECTOR LEVER

Removal

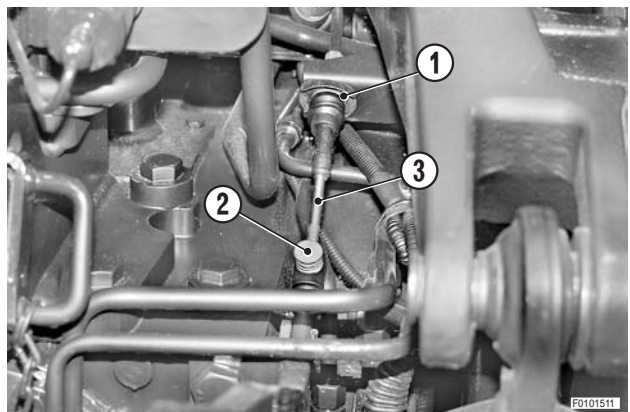
! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

- 1 - Remove the right-hand console.
(For details, see "CONSOLE SHROUDS ON RIGHT SIDE").
- 2 - Move the PTO speed selector lever to the PTO 540 ECO position.

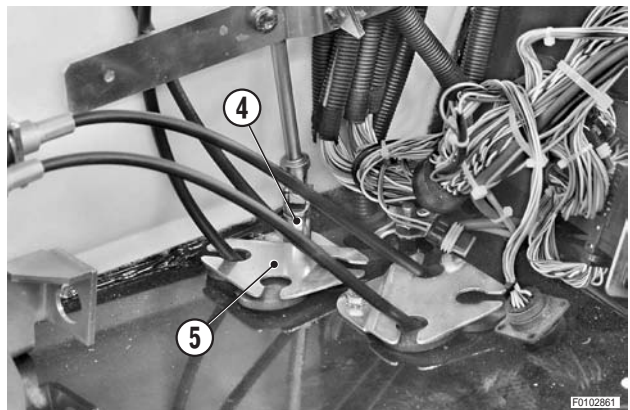


- 3 - Remove the retaining clip (1), press the pushbutton(2) and disconnect the control cable (3) from the support.

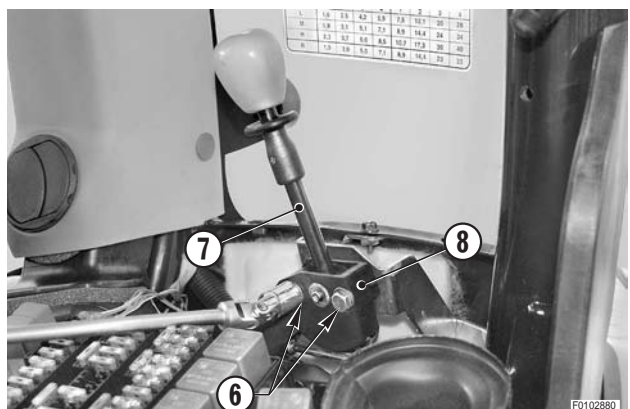
※ 1



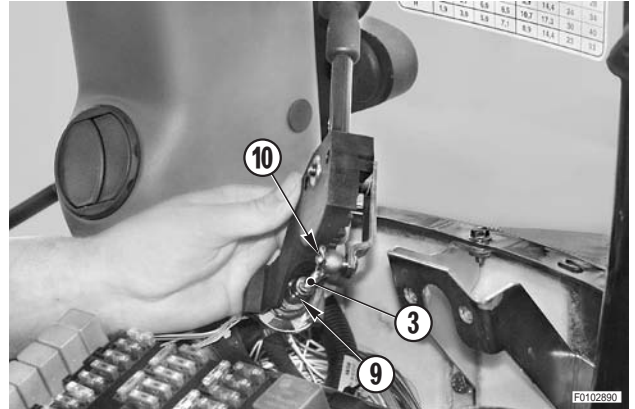
- 4- Remove the screw (4) and remove the control cable retaining plate (5).



- 5 - Remove the screws (6) and disconnect the lever (7) from the support (8).



- 6 - Remove the retaining clip (9) and the circlip (10), and withdraw the control cable (3).

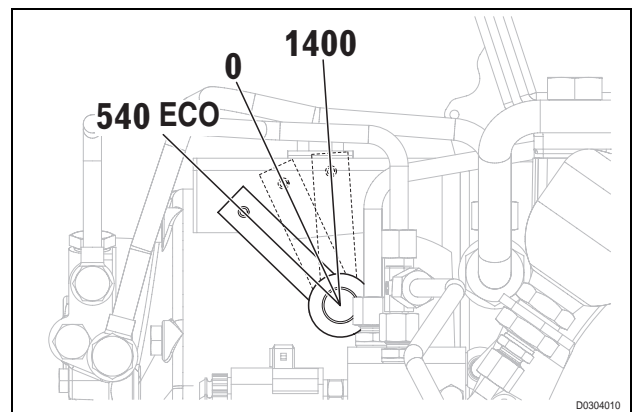


Refitting

- Refitting is the reverse of removal.



- ★ The PTO speed selector lever (11) must be in the fully lowered position when the control cable (3) is attached.
- ★ After connecting the control cable (3), check that the 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.



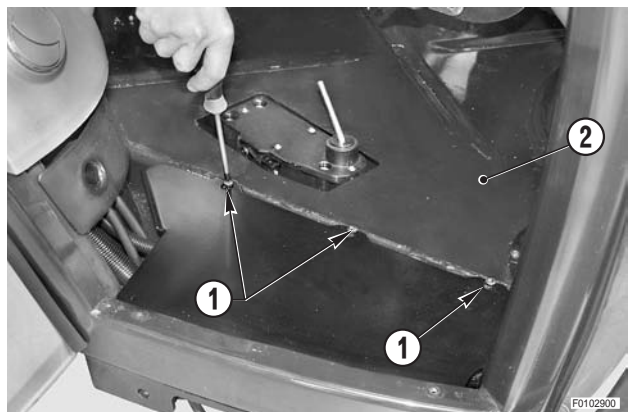
GEARSHIFT CONTROL

Removal

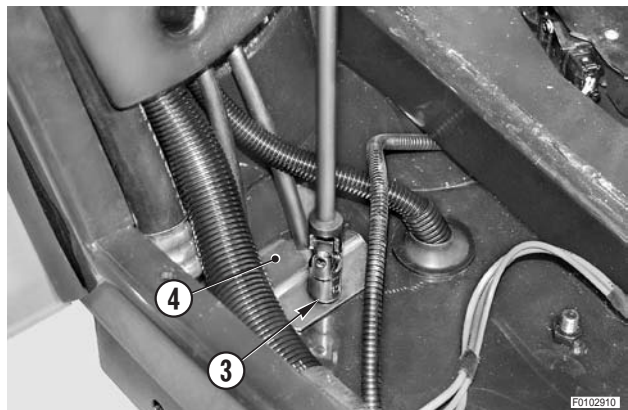
! Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

- 1 - Remove the right-hand console.
(For details, see "CONSOLE SHROUDS ON RIGHT SIDE").
- 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").

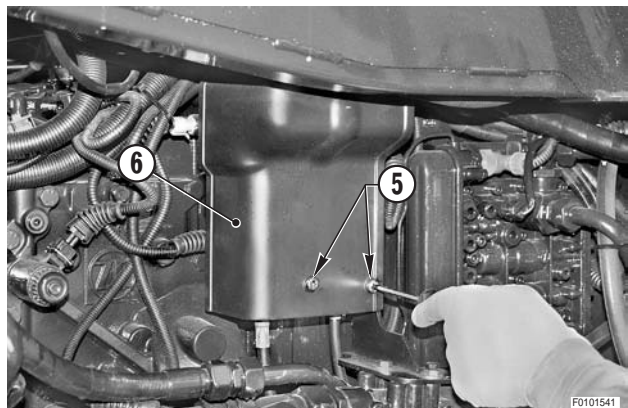
- 4 - Remove the screws (1) and remove the cover (2).



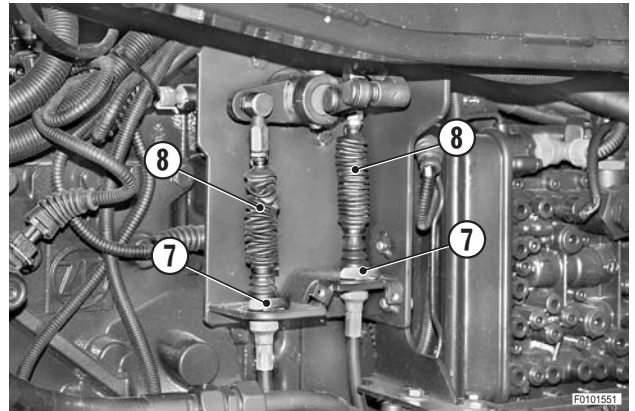
- 5 - Remove the screw (3) and remove the control cable retaining bracket (4).



- 6 - Remove the three bolts (5) and remove the shield (6).

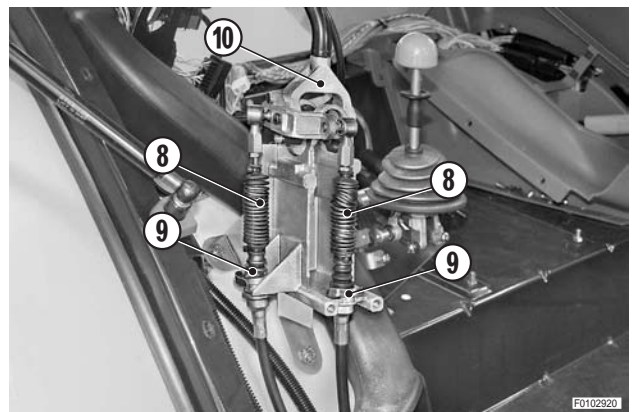


7 - Remove the retaining clip (7) of the gearshift control cable (8) to be removed.



8 - Remove the retaining clip (9) and disconnect the relative gearshift control cable (8) from the lever (10).

9 - Withdraw the cable (8).

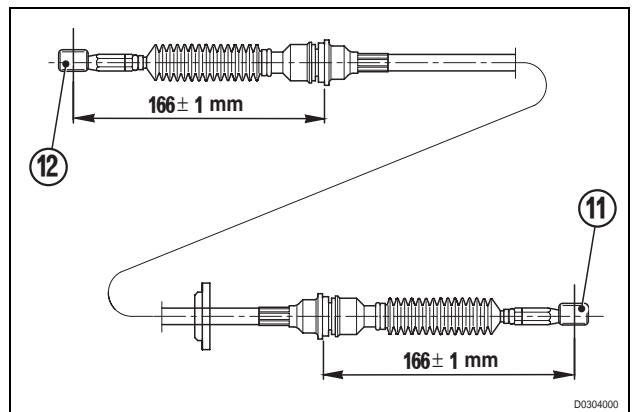


Refitting

- Refitting is the reverse of removal.



- ★ Check that the end fitting (11) or (12) protrudes the correct distance.



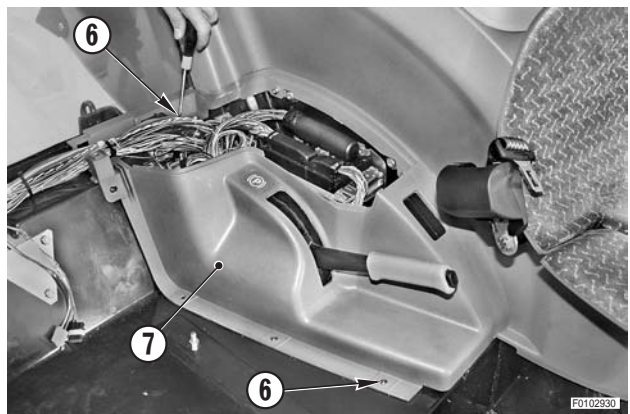
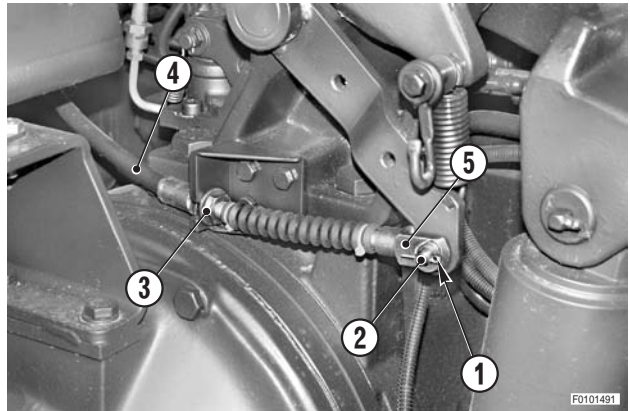
PARKING BRAKE

CONTROL CABLE

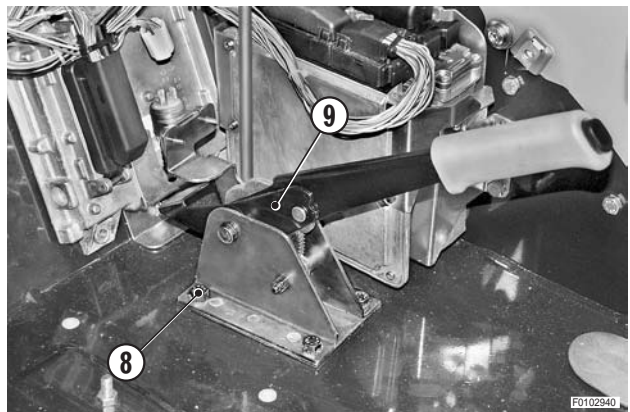
Removal

⚠ Disconnect the lead from the negative terminal (-) of the battery.

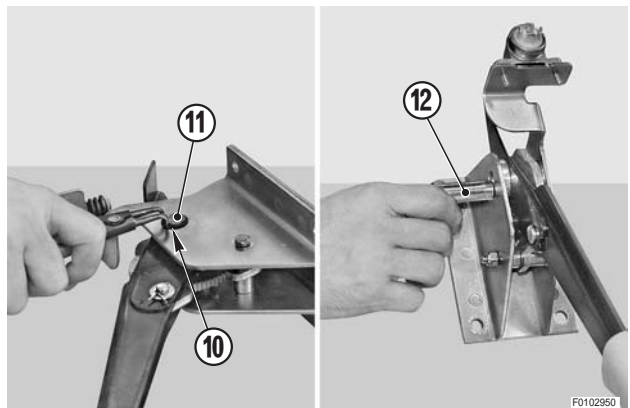
- 1 - Remove the seat.
(For details, see "DRIVER'S SEAT").
- 2 - Remove the cotter pins (1) and remove the pivot pin (2). ※ 1
- 3 - Loosen the nut (3) and disconnect the parking brake cable (4).
★ Remove the clevis (5).
- 4 - Remove the seven screws (6) and turn the shroud over on to its left side (7).



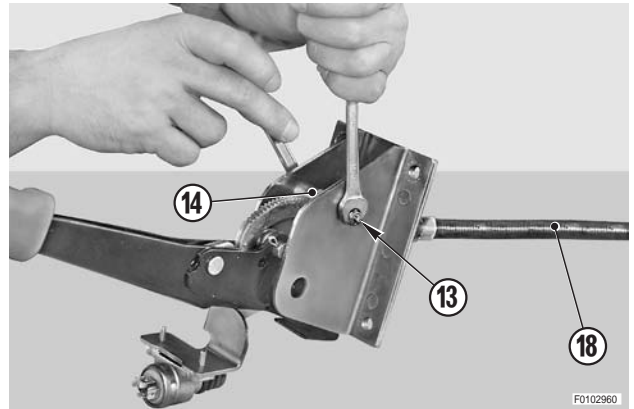
- 5 - Remove the four screws (8) and remove the lever assembly (9).



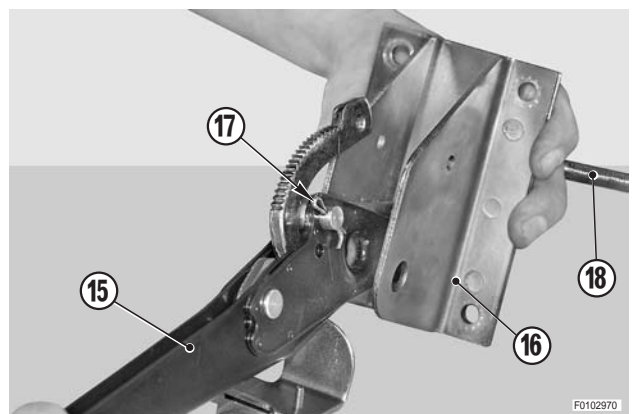
- 6 - Remove the circlip (10) and remove the pivot pin (11).
★ Recover the spacers (12).



- 7 - Remove the screw (13).
★ Recover the spacers (14).



- 8 - Withdraw the lever (15) from the support (16).
9 - Remove the cotter pin (17), withdraw the pivot pin and remove the control cable (18).



Refitting

- Refitting is the reverse of removal.

※ 1

- ★ Adjust the parking brake travel.
(For details, see "PARKING BRAKE LEVER").

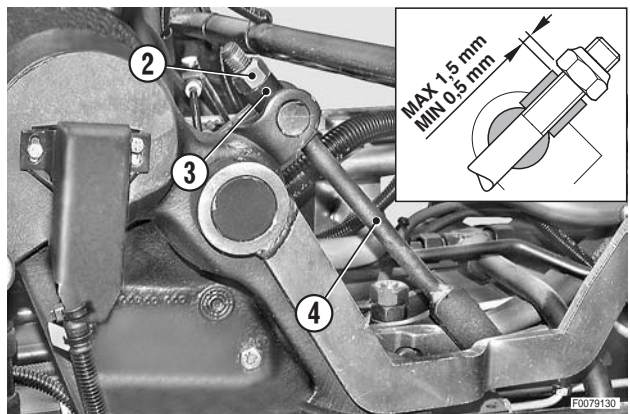
PARKING BRAKE LEVER

Adjustment

- 1 - Before proceeding with the adjustment, operate the handbrake lever (1) repeatedly in order to eliminate any play and check that the control cable slides freely.
- 2 - Apply a dynamometer with a scale of up to 500 Nm to the handgrip, and raise the handbrake 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 the force is outside these limits, screw out the nut (2) with the least clearance and screw in the nut (3) with most clearance.
- 4 - Then check that the distances between the nuts (2) and (3) of the tie-rods (4) are 0.5–1.5 mm (0.02 – 0.06 in.).





- 5 - Take the tractor to straight section of asphalted road at least 50 m (97 yard) in length.
- 6 - Engage gear and move off.
- 7 - With the tractor in motion, depress the clutch pedal and fully apply the 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 **gradually and by just a few degrees the 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.
 - ★ Lever travel: max. 5 notches

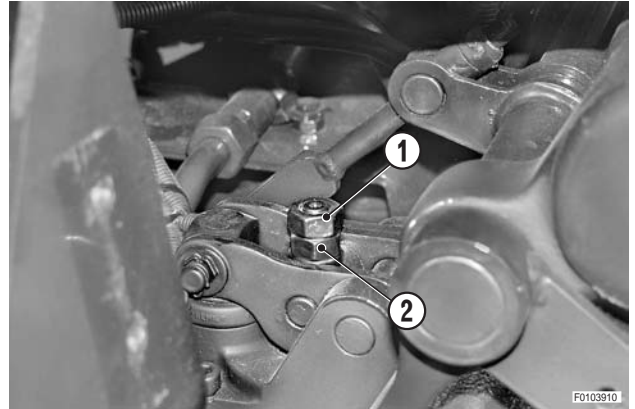
If adjustment is required, turn the two nuts (2) by equal amounts.

SERVICE BRAKE

BRAKE

Adjustment

- 1 - Loosen the locknut (1) and partially unscrew the nut (2).
- 2 - Tighten the nut (2) to the specified torque.
 Nut (2): 10 Nm (7.4 lb.ft.)
- 3 - Unscrew the nut (2) by 1 1/4 turns, then tighten the locknut (1) to the specified torque.
 Locknut (1): 80 Nm (59 lb.ft.)
- 4 - Repeat the procedure on the brake on the opposite side.
- 5 - Adjust the parking travel.
(For details, see "PARKING BRAKE LEVER").

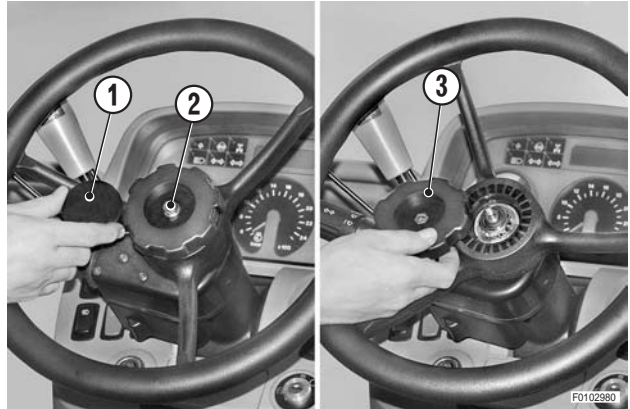


STEERING WHEEL

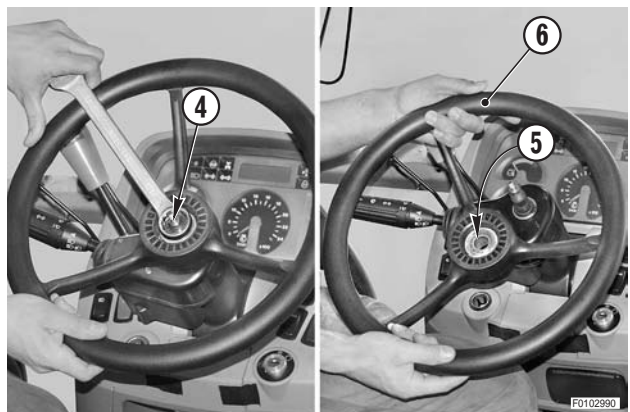
Removal

! Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the centre cover (1) and remove the nut (2) with its washer.
- 2 - Remove the locknut (3) for telescopic adjustment of the steering wheel.




- 3 - Remove the nut (4), the toothed washer (5) and remove the steering wheel (6).



Refitting

- Refitting is the reverse of removal.



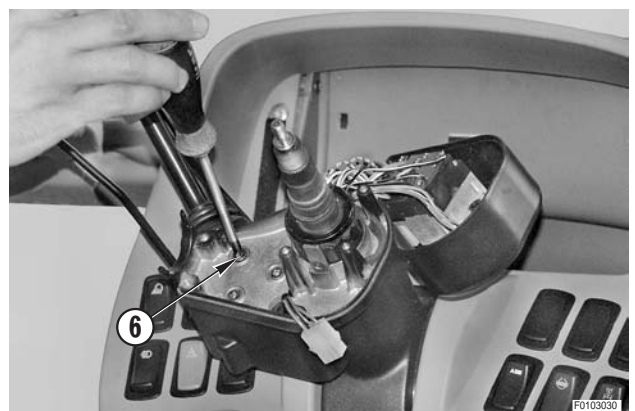
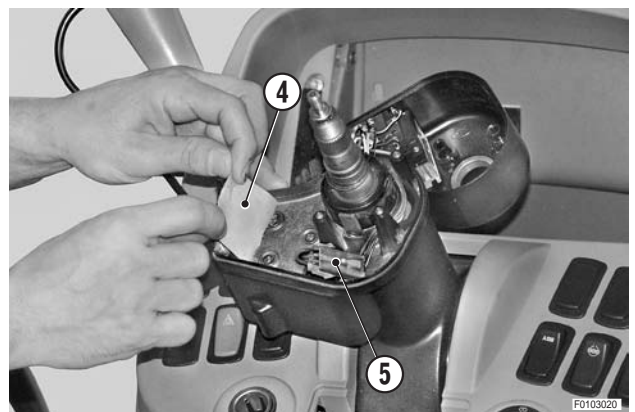
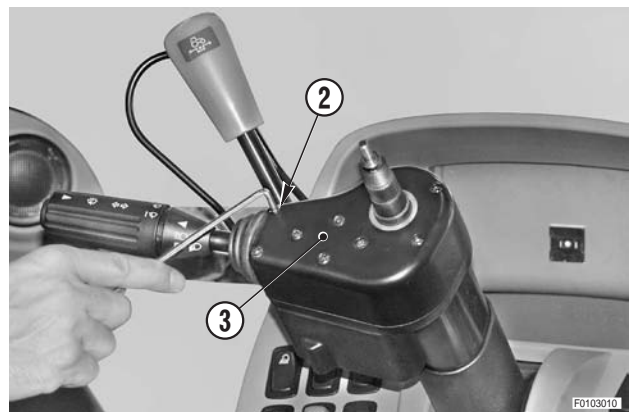
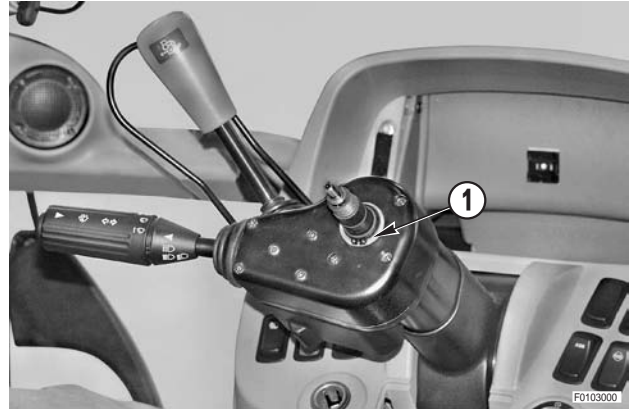
-  Nm Steering wheel nut:
M18x1.5: 40±10% Nm (29.5±10% lb.ft.)
M8: 10±2 Nm (7.4±1.5 lb.ft.)

SHUTTLE LEVER

Removal

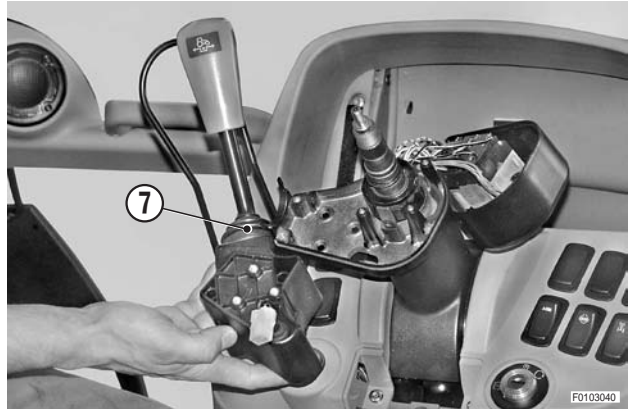
⚠ Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").
- 2 - Remove the circlip (1).
- 3 - Loosen and remove the five screws (2) and move the steering column switch unit (3) to one side.
- 4 - Remove the adhesive tape (4) and disconnect the wiring connector (5).
- 5 - Remove the screws (6).



SHUTTLE LEVER

6 - Remove the shuttle lever assembly (7).



Refitting

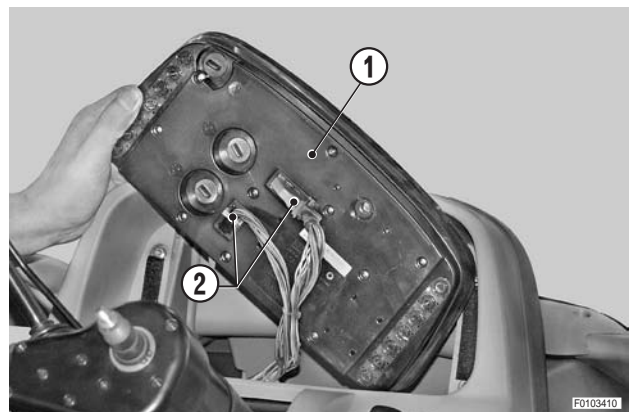
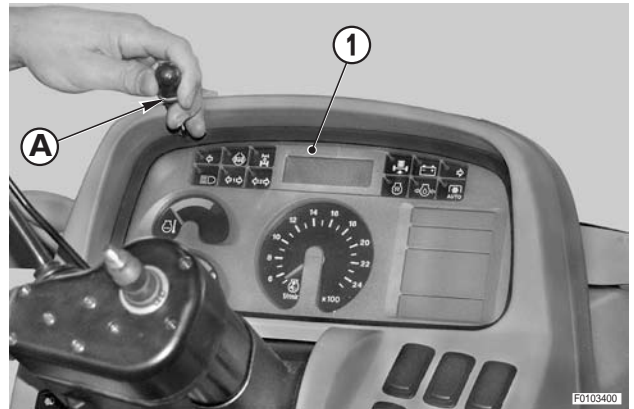
- Refitting is the reverse of removal.

STEERING COLUMN SWITCH UNIT

Removal

⚠ Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").
- 2 - Insert a thin blade "A" under the gasket and prise off the infocenter (1).
- 3 - Disconnect the wiring connectors (2) from the infocenter (1).



- 4 - Remove the circlip (3).




- 5 - Remove the cover (4).



STEERING COLUMN SWITCH UNIT

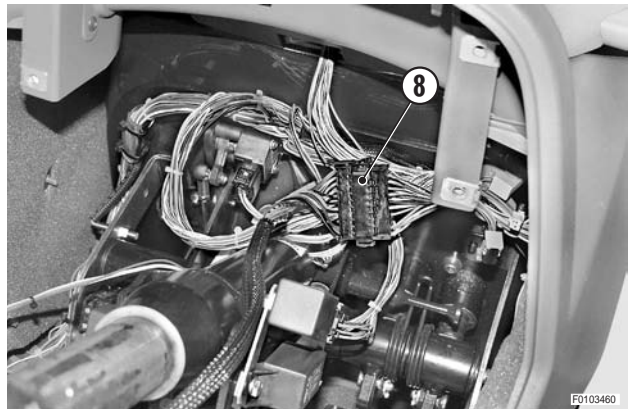
- 6 - Remove the six screws (5) and remove the front dashboard (6).



- 7 - Disconnect the wiring connectors (7) on the left and on the right. 

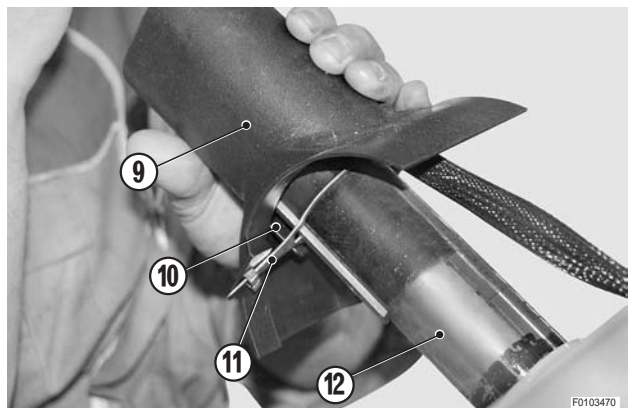


- 8 - Disconnect the lights switch connector (8).



- 9 - Rotate the shroud (9) to align the rotation lock key (11) with the spring (10) and slide the shroud (9) off the steering tube (12).

- 10 - Remove the dashboard complete with the steering column switch unit.



Refitting

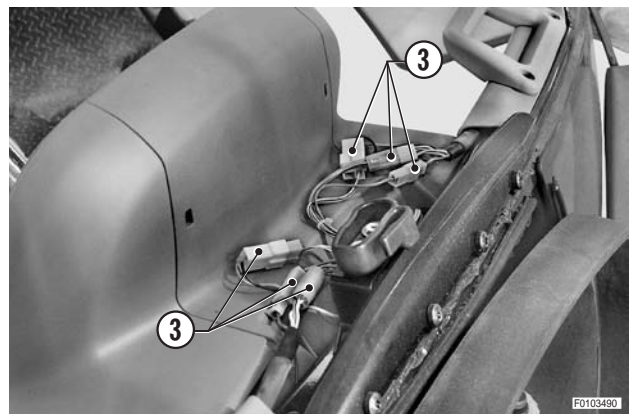
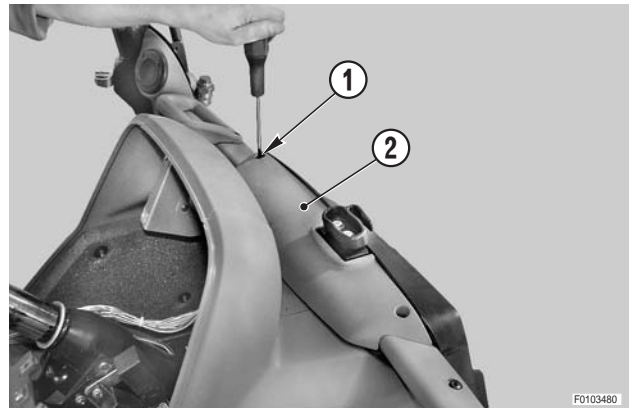
- Refitting is the reverse of removal.

FRONT CONSOLE

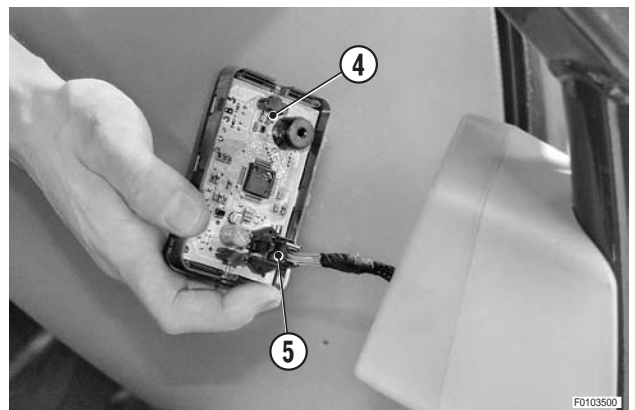
Removal

⚠ Disconnect the lead from the negative terminal (-) of the battery.

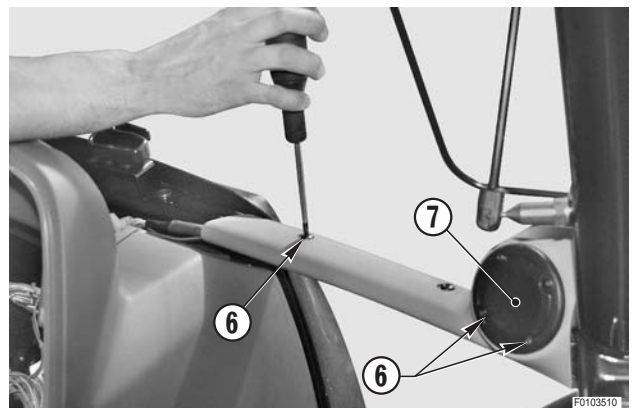
- 1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").
- 2 - Remove the steering column switch unit
(For details, see "STEERING COLUMN SWITCH UNIT").
- 3 - Remove the screws (2) and remove the cover (3).
- 4 - Disconnect all the wiring connectors (3).
★ Label all the connectors from one side to avoid confusion on reconnection.



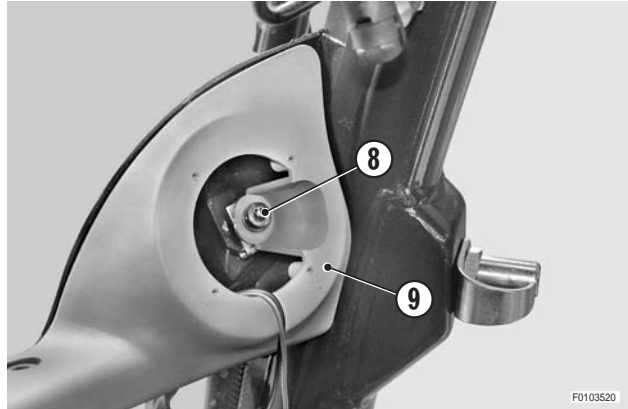
- 5 - Remove the transmission display (4) and disconnect the wiring connector (5).



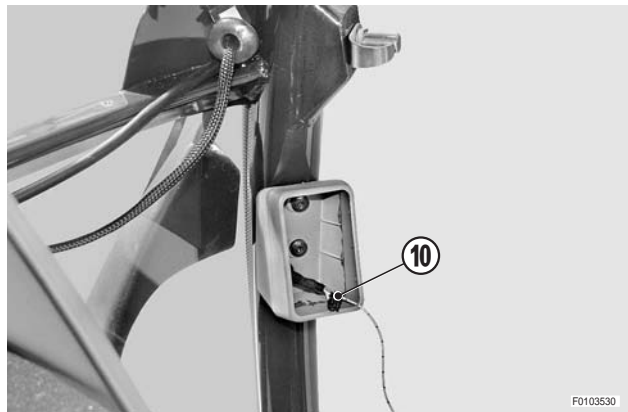
- 6 - Remove the six screws (6) and remove the loudspeaker cover (7).



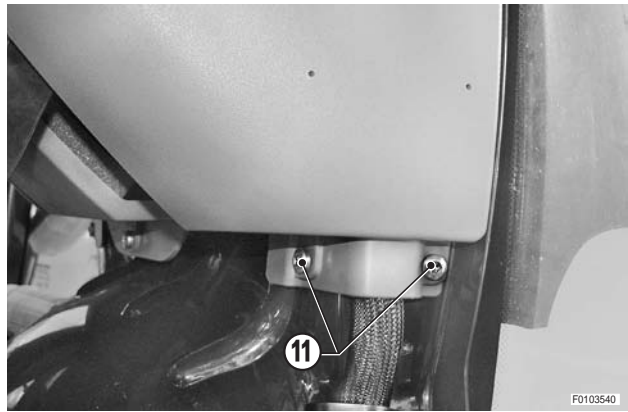
7 - Remove the screw (8) and remove the loudspeaker support (9).



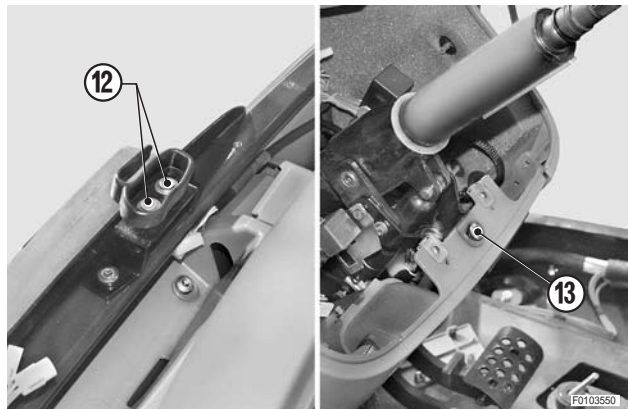
8 - Withdraw the wiring.
★ To facilitate installation, attach the wiring to a piece of string to be left in the cab structure.



9 - Remove the four lower screws (11).



10 - Remove the two screws (12) and the screw (13).



11 - Remove the front console (14).



Refitting

- Refitting is the reverse of removal.

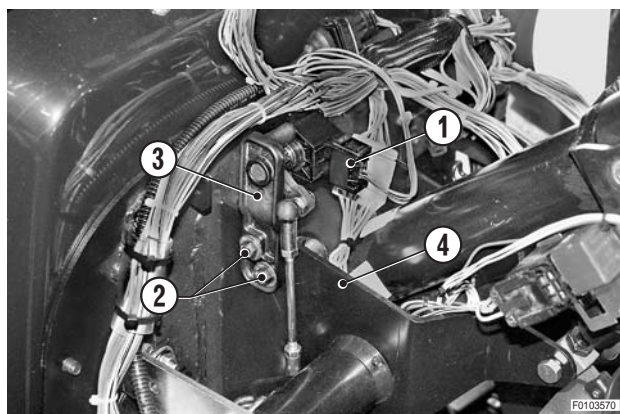
CLUTCH PEDAL AND ACCESSORIES

POSITION SENSOR

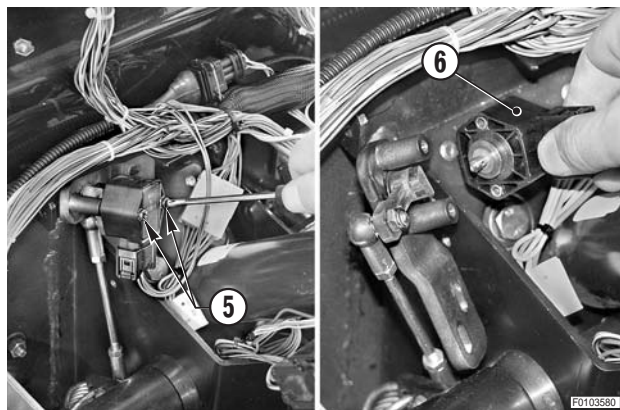
Removal

! Disconnect the lead from the negative terminal (-) of the battery.

- 1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").
- 2 - Remove the steering column switch unit
(For details, see "STEERING COLUMN SWITCH UNIT").
- 3 - Remove the front console.
(For details, see "FRONT CONSOLE").
- 4 - Disconnect the wiring connectors (1) and remove the screws (2).
★ Before removing the screws (2), mark the position of the support (3) in relation to the pedals support (4).

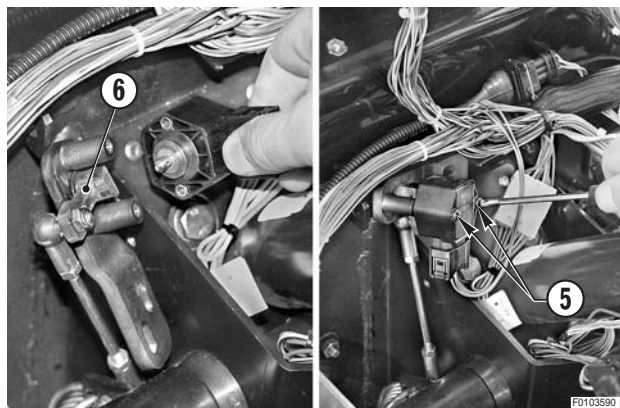


- 5 - Remove the screws (5) and remove the sensor (6).



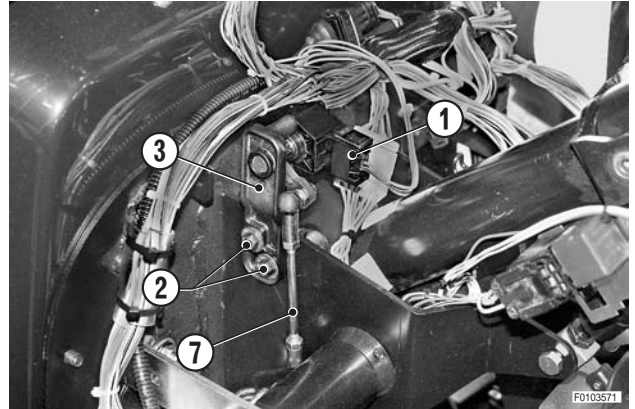
Refitting

- 1 - Install the sensor (6) and secure with the screws (5).



2 - Connect the wiring connector (1) and secure the support (3) with the screws (2).

★ Make sure that the tie-rod (7) is firmly and correctly attached to the clutch pedal and the sensor.



3 - Temporarily install the dashboard (8) and reconnect all the previously disconnected wiring connectors.

★ Connect also the wiring connector of transmission display and steering column switch unit.

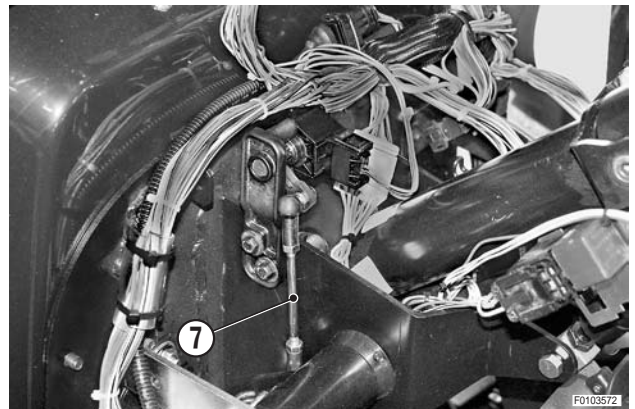
4 - Connect the lead to the negative terminal (-) of the battery and connect the ART to the diagnostic socket



5 - Select the HLHP control unit and then access the menu "3.1.3 Analog inputs"; check that, with the clutch pedal released, the 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
C	a	l	i	b	.	P	r	e	s	s	0	.	0	0

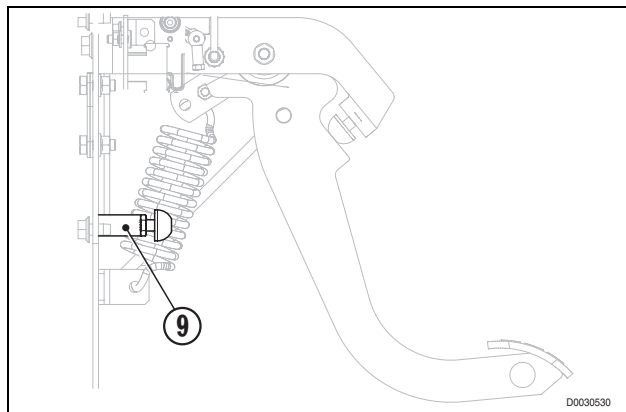
6 - If the voltage is not within the specified limits, lengthen or shorten the tie-rod (7) accordingly to adjust the value.



7 - Fully depress the clutch pedal and check that the 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
C	l	u	t	c	h							9	1
C	l	u	t	c	h	(	r	e	e	d)		O	F
F	R	R	S							3	.	2	0
A	P	S	-	P	o	t	i						0
T	e	m	p	.							0	7	0
C	l	u	t	c	h	P	r	e	s	s	0	.	0
C	a	l	i	b	.	P	r	e	s	s	0	.	0

- 8 - If the voltage is not within the specified limits, lengthen or shorten the pedal travel accordingly by adjusting the stop (9).
- 9 - Proceed to calibrate the clutch pedal position sensor. (For details, see 4.3.6 CLUTCH PEDAL CALIBRATION in section 20).



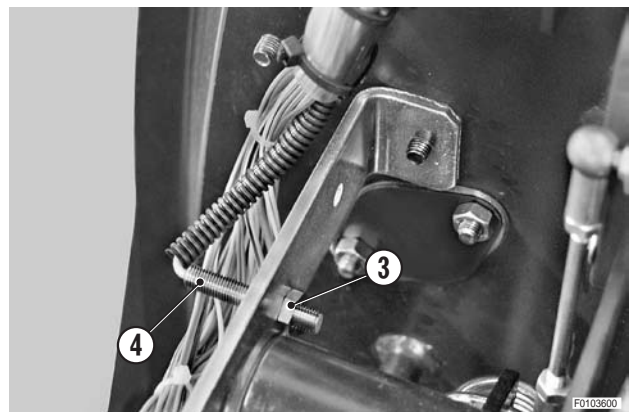
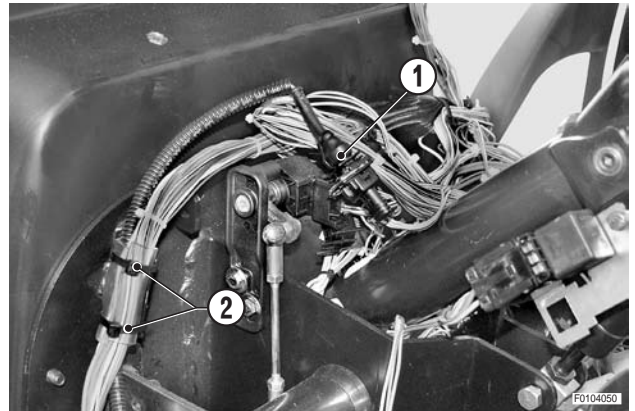
- 10 - Disconnect the lead from the negative terminal (-) of the battery and remove the dashboard.
- 11 - Install the front console. (For details, see "FRONT CONSOLE").
- 12 - Install the steering column switch unit. (For details, see "STEERING COLUMN SWITCH UNIT").
- 13 - Install the steering wheel. (For details, see "STEERING WHEEL").

PROXIMITY SENSOR (Clutch pedal depressed sensor)

Removal

⚠ Disconnect the lead from the negative terminal (-) of the battery and apply the parking brake.

- 1 - Remove the steering wheel.
(For details, see "STEERING WHEEL").
- 2 - Remove the steering column switch unit
(For details, see "STEERING COLUMN SWITCH UNIT").
- 3 - Disconnect the wiring connector (1) and release the wiring from the cable tie (2).
- 4 - Remove the nut (3) and the sensor (4).

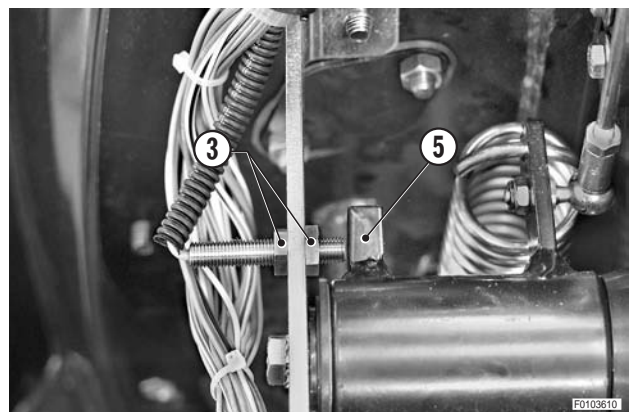


Refitting

- Refitting is the reverse of removal.



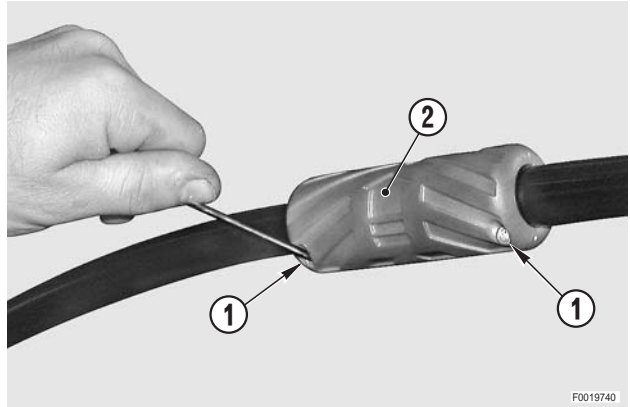
- 1 - Fully depress the clutch pedal.
- 2 - Adjust the position of the sensor relative to the face of the bracket (5) by way of the adjuster nuts (3).
 - ★ Spacer "D" between sensor and cam:
0.5–1.0 Nm (0.02–0.04 in.)



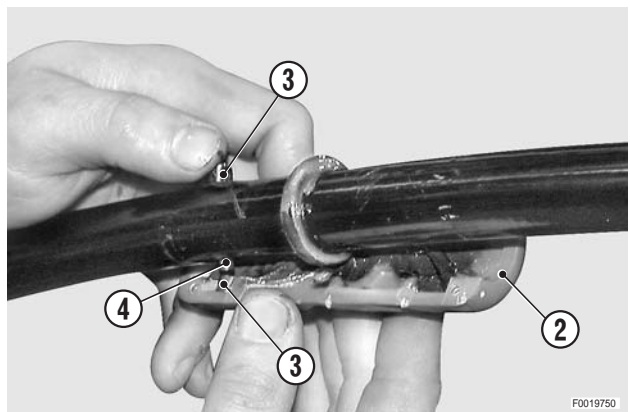
CAB DOOR CABLE

Renewal

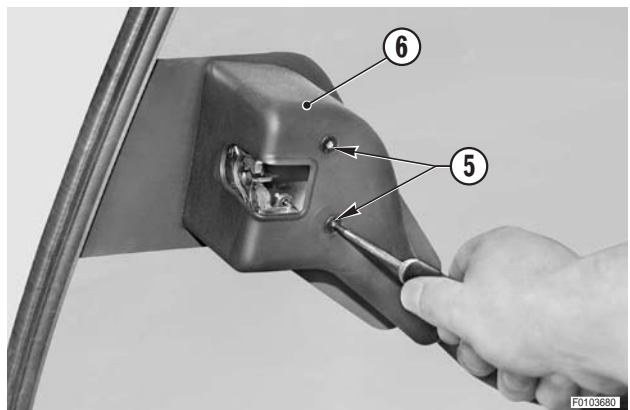
1 - Loosen the four screws (1) joining the two halves of the handle (2).



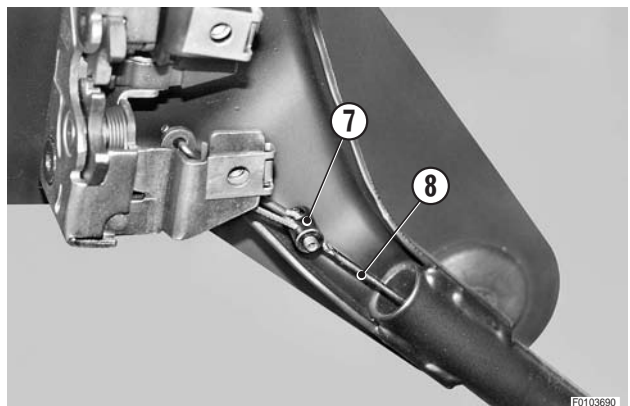
2 - Remove the handle halves and recover the bushes (3) and cable pin (4).



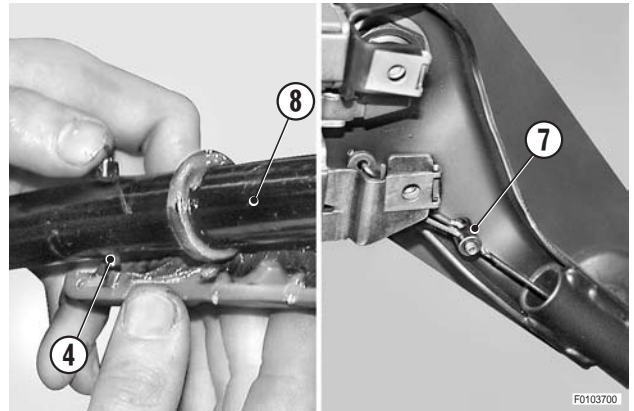
3 - Loosen and remove the retaining screws (5) of the lock cover (6).




4 - Loosen the clamp nut (7) and withdraw the cable (8).



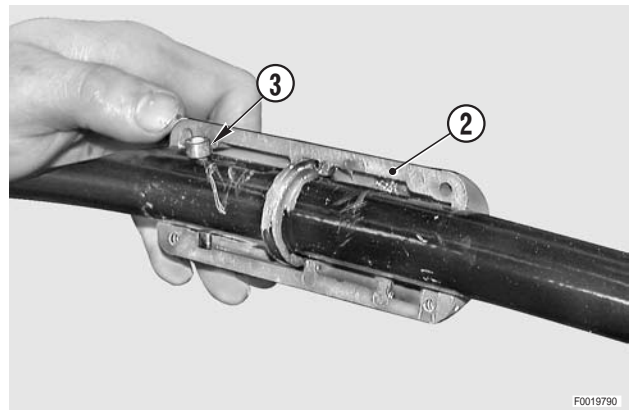
- 5 - Insert the new cable (8) starting from the handle end; engage it in the pin (4) and the clamp (7). While keeping the cable slightly taut, tighten down the clamp.



- 6 - Lubricate the bushes (3) and the slideways of the handle; fit the bushes on the pin and fit the handle (2).

 Slideways and bushes: Molikote

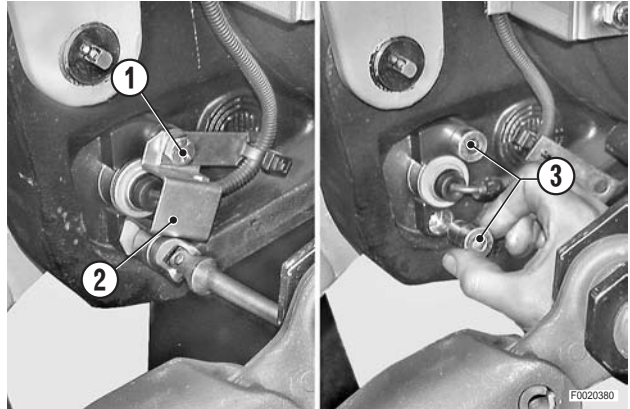
- 7 - Check that the door opens correctly and complete the refitting procedure.



LIFT DRAFT SENSOR

Removal

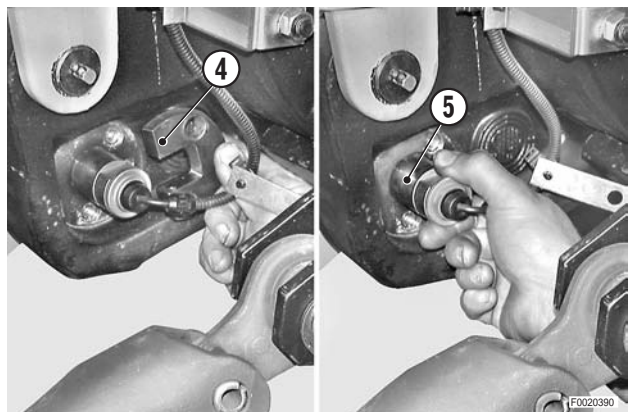
- 1 - Remove the screws (1) and remove the cover (2) and the spacers (3).



- 2 - Support the lift arm, remove the bracket (4) and the sensor (5).

- 3 - Release the wiring from the retaining straps and disconnect the wiring connector of the sensor to be removed.

- ★ The wiring connectors are located under the cab and can be accessed from the left-hand side of the tractor.



Refitting

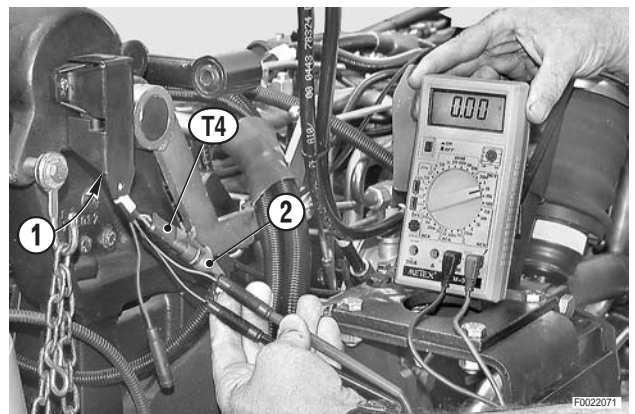
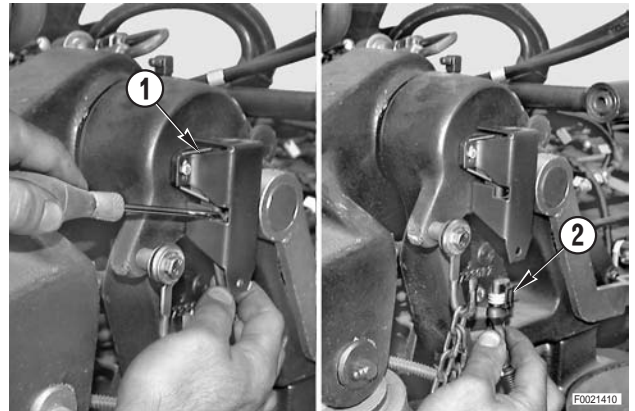
- Refitting is the reverse of removal.
 - ★ Make sure the sensor is installed the right way round.

LIFT POSITION SENSOR

Check

⚠ Switch off the engine and remove the key from the ignition.

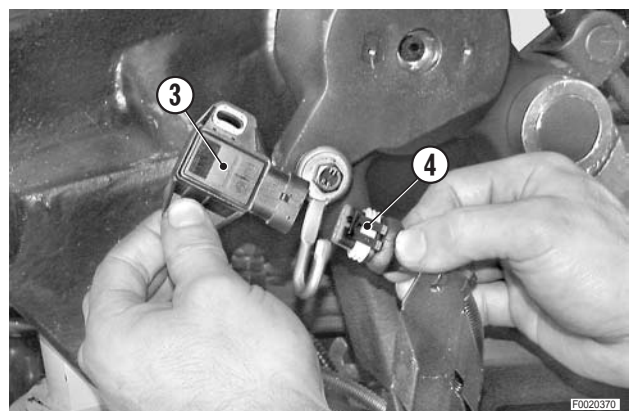
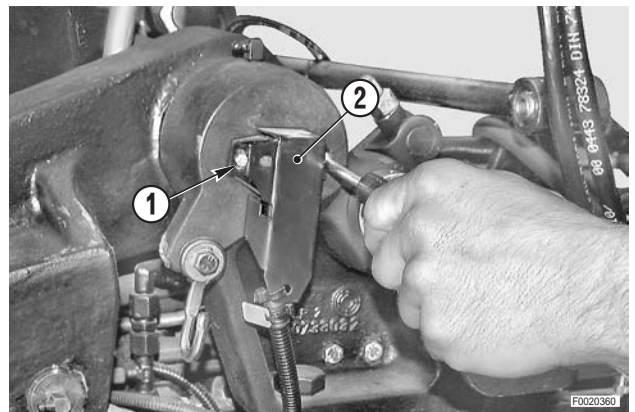
- 1 - Cut the retaining strap and, using a thin blade, disconnect the connector (2) from the position sensor (1).
- 2 - Connect the test lead **T4** (part no. 5.9030.743.0) between the connector (2) and the sensor (1).
- 3 - Start the engine and with a multimeter check that the supply voltage and the signal voltages with the lift raised and lowered are within the specified ranges:
 - ★ Supply voltage (red - blue wires):
5.5±1Vdc
 - ★ 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 the screws (1) securing the cover (2) and the sensor.
- 2 - Remove the sensor (3) and disconnect the wiring connector (4).




Renewal of the position sensor bush (only if necessary)

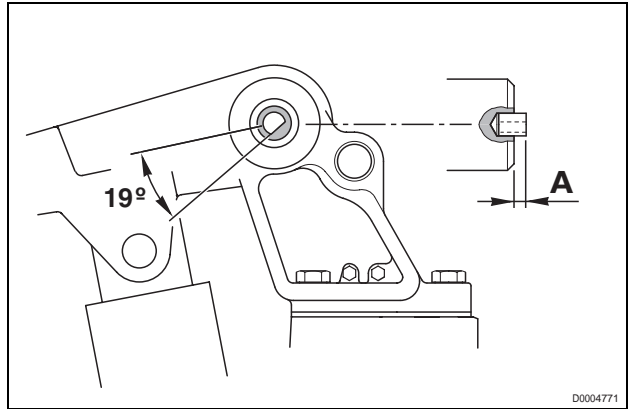
- 1 - After removing the worn bush, clean and activate the seating.

 Activator: Loctite 7649

- 2 - Apply sealant to the surfaces of the hole and fit the new bush, with the flat positioned at an angle of 19° and maintaining a protrusion "A" of 4.5 ± 0.5 mm.

 Sealant: Loctite 648

- 3 - Allow the sealant to cure for at least 30 minutes before fitting the sensor.

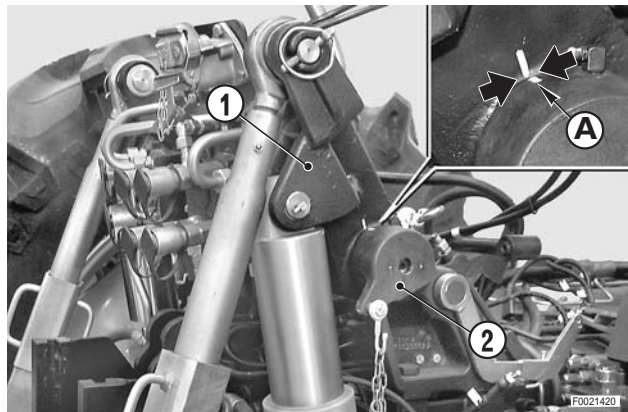


Refitting

- 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 the lever (1) and on the bearing support (2).

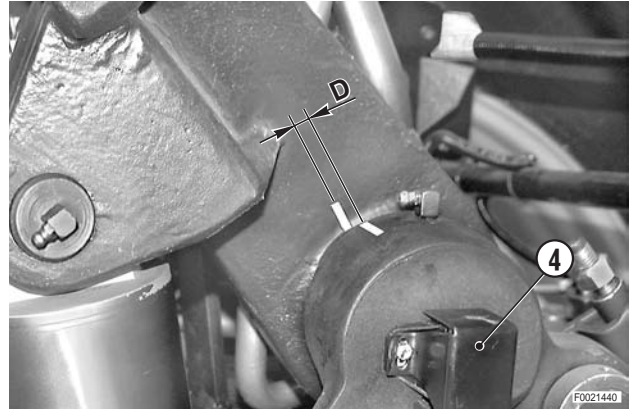


- 4 - Lower the lift to its maximum depth position.
- 5 - Start the engine, push the external pushbutton (3) to rise the lift arms up to it stop. Hold the pushbutton (3) depressed and at the same time rotate the sensor (4) in clockwise.

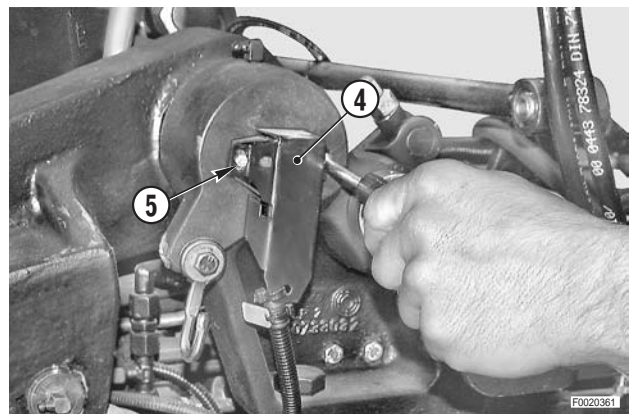


LIFT POSITION SENSOR

- 6 - Start rotation of the sensor (4) when the lift starts to rise; stop sensor rotation and release the pushbutton (3) when the marks made in step 3 are at a distance apart "D" of 5–6 mm (0.20 - 0.24 in.) .



- 7 - Fix the 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 to the maximum height by holding the pushbutton pressed; the lift arms should stop before reaching the mechanical limit and thus over-pressurising the hydraulic system, at which point the reference marks should be the distance apart indicated in step 6.

- 9 - If necessary, alter the position of the sensor by turning it a few degrees in a counter-clockwise direction.

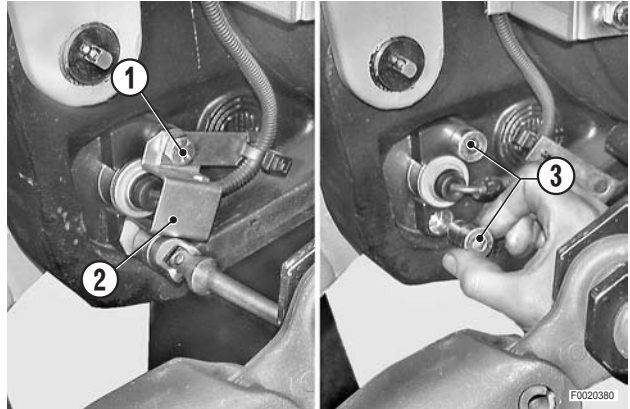
- 10 - Calibrate the sensor.
(For details, see 4.4.6 CALIBRATION OF THE LIFT HIGH AND LOW POSITIONS in section 20).



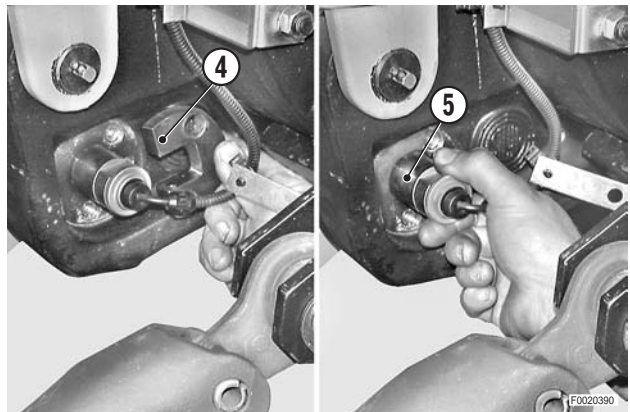
LIFT DRAFT SENSOR

Removal

- 1 - Remove the screws (1) and remove the cover (2) and the spacers (3).



- 2 - Support the lift arm, remove the bracket (4) and the sensor (5).



- 3 - Release the wiring from the retaining straps and unplug the sensor connector (6).

- ★ 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.

SECTION 40

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THE 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. Indices

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 harnesses

Contains the layouts, the wiring diagrams and the positioning of connectors on the tractor.

HOW TO CONSULT THE UNIT

A

2.1 COMPONENT DESCRIPTION INDEX					
Description	Code	Technical (para. 3.2.xx)	Connector	System (para. 4.xx)	Notes
Start enable switch (green)	0441.6066	11	START	2	
Starter motor			X47	2	
Starter switch			X86		

B

4.2 ENGINE START

C

3.2 COMPONENT TECHNICAL DATA					
N°	Description	Code	Characteristics	Notes	Connector
11	Start enable switch	0441.6066	Normally closed switch (NC) resistance with contact closed 3.9 Ohm	Green	START
12	Handbrake switch	0439.1395	Normally closed switch (NC) resistance with contact closed 3.9 Ohm		X90

D

2.3 CONNECTOR INDEX				
Connector	Type	Wiring code	Connection wiring or component code	Component description
ST1	32	0442.9936.4		Infocenter (1)
ST2	20	0442.9936.4		Infocenter (2)
START		0443.7847 0.012.3639.4	0441.6066	Start enable switch (green)

E

ENGINE WIRING

F

ENGINE WIRING (120-165 CV) (1/2)

G

3.1 CONNECTOR LAYOUTS		
10	11	12
13	14	15
16	17	18

How to consult the table

The quickest way to determine the cause of a malfunction of a component (e.g. the starter motor) is to check all the components in the system in which the component is incorporated.

In this example, the problem is a malfunction of the starter motor, which fails to start the engine.

- 1 - Look in paragraph "2.1. Component description index" for the starter motor and identify the system in which it is incorporated. The system is indicated in the column "System (para. 4.xx)" and in this case is "2" (figure A).
- 2 - Consult paragraph "4.2 Starting" (figure B), in which the electrical diagram indicates all the components in the system; 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 the switch "2".
- 4 - Look in paragraph "2.1. Component description index" (figure A) for "Starting enabling switch (Green)" and check in the column "Technical (para. 3.2.xx)" if there is a technical description of the component (in this case it is given at n° 11 of the paragraph "3.2 Component technical data") (figure C). Note down also the name of the connector to which the component is connected (in this case "START").

Only if the position of the component 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 "START") and note down the wiring harness in which it is incorporated (in this case "0443.7847" or "0.012.3639.4") and the type of connector (in this case "10").
- 6 - Look for the wiring harness 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.** In the electrical diagrams (figure F) are indicated the names of the connectors and the descriptions that are used in all the tables of chapter 2.
- 8 - Using the data contained in the paragraph "3.2 Component technical data" (figure C) in position n° 11, check the operation of the switch.

! If the pinout of the connector is not known, look in paragraph "3.1 Connector layouts" (figure G) for the number found in the column "Type" of paragraph "2.3 Connector index".

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 HARNESSSES






DESCRIPTION	CODE	PAGE.
RIGHT-HAND TRANSMISSION WIRING	0.013.9307.4/40	40-83
SUPPLY WIRING	0.014.3658.4	40-108
SUPPLY WIRING (4 CYLINDERS)	0.014.1563.4/10	40-109
SUPPLY WIRING (6 CYLINDERS)	0.014.1564.4	40-109
CENTRAL WIRING	0.013.9301.4/30	40-137
ENGINE BONNET WIRING	0.013.0663.4/30	40-79
CONTROL VALVE WIRING	0.014.2647.4/20	40-161
INSTRUMENT PANEL WIRING	0.014.3649.4/10	40-115
LIGHTS SELECTOR SWITCH WIRING	0.014.0007.4	40-135
CONTROL VALVE WIRING	0.014.1617.4	40-159
CONTROL VALVE SOLENOID VALVE WIRING	0.010.4795.3/10	40-160
WIRING FOR LIGHTS ON ARMS	0.014.0732.4/10	40-118
FRONT WORKLIGHTS WIRING	0.013.4085.4/20	40-80
WIRING FOR WORKLIGHTS ON CAB	0.014.1565.4/10	40-150
WIRING FOR WORKLIGHTS, DEFROST MIRROR ON CAB (HL VERSION)	0.013.9310.4/20	40-149
UPPER LIGHTS WIRING (VERSION WITH LIFT)	0.014.1875.4/10	40-120
UPPER LIGHTS WIRING (VERSION WITHOUT LIFT)	0.014.1874.4/10	40-121
WIRING FOR SUPPLEMENTARY LIGHTS ON ARMS	0.014.0002.4	40-119
ROTATING BEACON WIRING	0.011.3824.4	40-152
TRAILER BRAKE WIRING (GERMANY)	0443.7355.4	40-103
TRAILER BRAKE WIRING (ITALY)	0443.7356.4	40-101
ROOF LINE WIRING	0.013.9304.4/30	40-147
ENGINE WIRING	0.014.3650.4/10	40-139
ENGINE WIRING (4 CYLINDERS)	0421.3182	40-71
ENGINE WIRING (6 CYLINDERS)	0421.3172	40-73
BATTERY NEGATIVE WIRING	0.012.4029.4	40-107
MUDGUARD WIRING	0.013.9309.4/30	40-117
BATTERY POSITIVE WIRING	0442.2156	40-107
FRONT AXLE SUSPENSION WIRING	0.013.9327.4/30	40-105
WINDSCREEN WIPER WIRING	0.014.1567.4/10	40-151
LEFT-HAND TRANSMISSION WIRING	0.013.9308.4/40	40-91

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
Pressureswitch	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.
Switch	Mechanical component that opens or closes one or more electrical contacts.
HML control	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 identification:

SYMBOL	DESCRIPTION
	Contact between CLOSED pins (stable position of switch)
	Contact between CLOSED pins (non-stable position of switch)
	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 appliances 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 oxidisation of the pin contact surfaces.

b. Defective pin welding or crimping

The pins of the male and female connectors make good contact in the crimped or welded area, but the wires are subjected to excessive tension, leading to breakage of the insulation or 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 a 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, it is possible that when the tractor is cleaned using high-pressure water or steam, water could penetrate or condense in 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 shortcircuits 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 degrease 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

Check the condition of the connectors:

- 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 connecting 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 the connector is in 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, ecc.) DIN 72581/3C
 - fuse F51 (100A) e F52 (200A) and 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 any 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** loaded with the “**SERDIA**” and “**EDS**”
- 3 - **All Round Tester** or **computer** loaded with the “**PCTESTER**”

1.5 WIRE COLOUR CODES

COLOUR CODES		COLOUR CODES	
A	Light blue	M	Brown
B	White	N	Black
C	Orange	R	Red
G	Yellow	S	Pink
H	Grey	V	Green
L	Dark blue	Z	Purple

2. INDEX

2.1 INDEX BY PART DESCRIPTION

Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para (Cap. 4.xx)	Notes
Cigar lighter	2.7099.770.0		X25	7	
Alternator	0118.2173		B+	2	4 cylinders
Alternator	0118.2173		B+	2	6 cylinders
Alternator	0118.2173		D+	2-11	
Actuator	0211.2588	43	Y3	4	4 cylinders
Actuator	0211.2588	43	Y3	4	6 cylinders
Radio			X92	12	
Horn			X60	5-6	
Battery			+30A		
Battery			+30B		
Battery			+30		
Battery			GND1		
Hazard lights control unit	2.8639.007.0/10		X43	5-6	
HLHP Control unit	2.8519.027.0/10		HLHP1	7-11-14-15-16-17-18-19-20-21	
HLHP Control unit	2.8519.027.0/10		HLHP2	7-11-14-15-16-17-18-19-20-21	
Engine control unit	0421.3098		MX1	3-4	
Engine control unit	0421.3098		MX2	2-3-4-7-21	
Transmission control unit	2.8519.028.0		GEAR BOX	2-7-16-21	
Fan speed selector switch	0.900.0033.4		X77	13	
Fan speed selector switch	0.900.0033.4		X80	13	
Air conditioning compressor	0443.7338		X56	13	
Wiring connector			G16		Connected on the "standard" version, open on the "HL" version
Lift control console	0.013.8345.4/10		X47	18	
Transmission display	0441.9280.4		X33	16	
Preheating device	0428.4880		X67	3	4 cylinders
Preheating device	0428.4880		X67	3	6 cylinders
Gearbox in neutral locking solenoid valve	0.010.3343.0		LOCK SV	16	
Front connection mechanism solenoid valve	0445.3270		X118	20	
Differential lock control solenoid valve	0442.3824		DIFF SV	17	
Front axle down control solenoid valve			DW	15	
Four wheel drive (4WD) clutch solenoid valve	0443.1661	5	EV DT	17	

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2.1 INDEX BY PART DESCRIPTION

Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para (Cap. 4.xx))	Notes
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	
Lift Down solenoid valve	0.010.2439.2	6	EV DW	18	
Trailer parking brake solenoid valve	0.900.0064.6		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	0.010.2439.2	6	EV UP	18	
Gear change solenoid valves (Y1, Y2, Y3, Y4)	0441.6685	34	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 front light on arms	2.8059.528.0		G34	6	For driving on the right with lift
Right front light 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 front light on arms	2.8059.528.0		G32	6	For driving on the right with lift
Left front light 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	5-6	
Number plate light	2.8059.526.0		X72	5-6	
RH direction indicator and sidelight	2.8039.270.0		X115	5-6	
LH direction indicator and sidelight	2.8039.280.0		X114	5-6	
Right-hand supplementary light	2.8039.296.0		X117	8-9	
Left-hand supplementary light	2.8039.296.0		X116	8-9	

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2.1 INDEX BY PART DESCRIPTION

Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para (Cap. 4.xx)	Notes
Right-hand front worklight on cab	2.8039.295.0/10		X103	8	Without electric demisting rearview mirrors
Right-hand front worklight on cab	2.8039.295.0/10		X103	9	With electric demisting rearview mirrors
Right-hand front worklight on cab	2.8039.295.0/10		X105	9	With electric demisting rearview mirrors
Left-hand front worklight on cab	2.8039.295.0/10		X104	8	Without electric demisting rearview mirrors
Left-hand front worklight on cab	2.8039.295.0/10		X104	9	With electric demisting rearview mirrors
Left-hand front worklight on cab	2.8039.295.0/10		X106	9	With electric demisting rearview mirrors
Right-hand rear worklight on cab	2.8039.295.0/10		X107	8	Without electric demisting rearview mirrors
Right-hand rear worklight on cab	2.8039.295.0/10		X107	9	With electric demisting rearview mirrors
Right-hand rear worklight on cab	2.8039.295.0/10		X109	9	With electric demisting rearview mirrors
Left-hand rear worklight on cab	2.8039.295.0/10		X108	8	Without electric demisting rearview mirrors
Left-hand rear worklight on cab	2.8039.295.0/10		X108	9	With electric demisting rearview mirrors
Left-hand rear worklight on cab	2.8039.295.0/10		X110	9	With electric demisting rearview mirrors
Rotating beacon	2.6039.017.0		X99	5-6	
Starter switch supply fuse			FX38		
Engine starter relay supply fuse			FRL9		
Arm worklight relay supply fuse			FRL20		With worklights on arms
Low beam headlights relay supply fuse			FRL21		Without worklights on arms
Preheating relay power fuse			FU2		
Battery main fuse (125A)			FU1		
Infocenter	0443.3422.4/20		X17	5-6-11	
Infocenter	0443.3422.4/20		X18	3-5-6-7-11-14-21	
ASM switch	0.013.9321.4/10	29	X39	17	

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2.1 INDEX BY PART DESCRIPTION

Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para Cap. 4.xx)	Notes
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 switch	0.013.9320.4/10	30	X40	17	
Lift lock control switch	2.7659.256.0		X48	18	
Switch for front worklights	0.012.5954.4	39	X82	8-9	
Switch for worklights on arms	0.012.5943.4	23	X111	8-9	With worklights on arms
Switch for rear worklights	0.012.5945.4	38	X81	5-6	
Door open warning light switch	2.7659.255.0	40	X83	7	
Low/full beam headlights switch	0.012.5941.4	42	X112	6	Without worklights on arms
Recirculation switch	0.010.2532.0		X79	13	
Rearview mirror demister switch	0.013.7108.4		X87	7	
Power lift control switch	2.7659.257.0	21	X20	18	
Front axle suspensions switch	0.013.9322.4	32	X42	15	
Rear window wiper switch	0.012.5946.4	41	X86	10	
Start enable switch (Green)	0441.6066	15	S	2	
Front worklights switch	0.012.5943.4	23	X22	8-9-10	
Handbrake switch	0439.1395	17	X8	14	
Hazard warninglights switch	0.013.1330.4	24	X23	5-6	
4WD engagement switch	0.013.9319.4/10	31	X41	17	
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	5-6-7-8-9-12-13-14-15-16-17-19	
Right brake pedal switch	0439.1395	17	X35	14-17	
Left brake pedal switch	0439.1395	17	X34	14-17	
Gearbox control lever	0.013.7121.4		X45	16	
Gearbox control lever	0.013.7121.4		X46	16	
Shuttle control lever	0.012.7076.4		X63	16	
Courtesy light	2.8339.074.0		X85	7	
Manual air conditioner control panel lights	0.010.2530.1		X78	13	
Compressed air pressure gauge	0442.5709	18	X12	14	
Compressed air pressure gauge	0442.5709	18	X13	14	
Right-hand recirculation motor	0.013.2142.0		X73	13	

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2.1 INDEX BY PART DESCRIPTION

Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para (Cap. 4.xx)	Notes
Left-hand recirculation motor	0.013.2142.0		X74	13	
Windscreen wiper motor	2.9019.200.0		X100	10	
Rear window wiper motor	2.9019.190.0		X91	10	
Right-hand fan motor	0.900.0035.3		X90	13	
Left-hand fan motor	0.900.0035.4		X88	13	
Starter motor			+30C	2	
Starter motor			+30C	2	4 cylinders
Starter motor			+30C	2	6 cylinders
Starter motor			+50	2	
Interior roof light	2.8339.231.0		X75	7	
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 take-off	2.6039.020.0		X10	7	
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	33	X50	11	
"HOLD" button	2.7659.256.0		HOLD	4	
Front mechanism solenoid valve control button	2.7659.265.0		X113	20	
RH lift Down 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 pushbutton	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 pushbutton	2.7659.182.0	4	UP (LH)	18	
Earthing point 2			GND2		
Earthing point 2			GND2		
Earthing point 2			GND2		
Earthing point 2			GND2		

Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para Cap. 4.xx)	Notes
Earthing point 3			GND3		
Earthing point 4			GND4		
Earthing point 4			GND4		
Earthing point 5			GND5		
Radar	0.008.8048.4/10	13	RADAR	18	
Radar (UK)	0.010.7172.4	14	RADAR	18	
Front mechanism solenoid valve supply relay			RL30	20	
Key positive supply relay			RL3	3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21	
Key positive supply relay			RL4	3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21	
Engine starter relay			RL9	2	
Air conditioning compressor control relay			RLM7	13	
Front worklights relay			RL1	8-9	
Side worklights relay			RLM6	8-9	
Rear worklights relay			RL2	8-9	
Arm worklights relay			RL20	8-9	With worklights on arms
Relay for full beam headlights			RL22	6	Without worklights on arms
Relay for full beam headlights			RLM4	5-6	
Relay for low beam headlights			RL21	6	Without worklights on arms
Relay for low beam headlights			RLM5	5-6	
Relay for sidelights			RLM3	5-6-7-8-9-10-12-13-14-15-16-17-19	
Brake lights relay			RLM2	14	
Preheating relay			RLM1	3	
Relay for recirculation 1			RLAC4	13	
Relay for recirculation 2			RLAC5	13	
Relay for fan speed 3			RLAC1	13	
Relay for fan speed 4a			RLAC2	13	
Relay for fan speed 4b			RLAC3	13	
Windscreen wiper motor relay			RLX100	10	
Preheating relay			RL42	3	
Preheating relay			RL42A	3	
Preheating relay			RL42B	3	4 cylinders
Preheating relay			RL42B	3	6 cylinders

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Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para (Cap. 4.xx)	Notes
Driver's seat	0.014.2781.4		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	35	X58	11	
Hand throttle position sensor	0.014.2659.0		GAS	4	
Accelerator pedal position sensor	0442.9390/10		X16	4	
Clutch pedal position sensor	0443.2708	26	X26	16	
Lift position sensor switch	0443.8667.0	11	POS	18	
Front axle suspension position sensor	0.009.2194.4	36	X64	15	
Trailer braking pressure sensor	0.011.9428.0	37	X68	14	
Trailer braking pressure sensor	0.011.9428.0	37	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	4 cylinders
Engine boost pressure sensor	0419.4078		B48	4	6 cylinders
Fuel temperature sensor	0419.9809	2	B37	4	4 cylinders
Fuel temperature sensor	0419.9809	2	B37	4	6 cylinders
Coolant temperature sensor	0419.9809	2	B43	4	4 cylinders
Coolant temperature sensor	0419.9809	2	B43	4	6 cylinders
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	4 cylinders
Camshaft speed sensor	0419.9792	3	B40	4	6 cylinders
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	With electric demisting rearview mirrors

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Component description	Alarm Component	Technical descr'n (Cap. 3.2.xx)	Connector	System (para (Cap. 4.xx)	Notes
Left-hand rearview mirror with electric demisting	0.014.2022.4		X102	7	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	
Left-hand woofer	0.013.2161.0		X76	12	

2.2 COMPONENT CODE INDEX

Alarm	Description	Technical descr'n (Cap. 3.2.xx)	Connector	System (par. 4.xx)	Notes
0.009.2194.4	Front axle suspension position sensor	36	X64	15	
0.010.2439.2	Lift Down solenoid valve	6	EV DW	18	
0.010.2439.2	Lift Up solenoid valve	6	EV UP	18	
0.010.2530.1	Manual air conditioner control panel lights		X78	13	
0.010.2532.0	Recirculation switch		X79	13	
0.010.2628.2	Rear PTO engagement 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	
0118.2173	Alternator		B+	2	4 cylinders
0118.2173	Alternator		B+	2	6 cylinders
0118.2173	Alternator		D+	2-11	
0118.2227	Engine oil pressure switch	33	X50	11	
0.011.9428.0	Trailer braking pressure sensor	37	X68	14	
0.011.9428.0	Trailer braking pressure sensor	37	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	5-6-7-8-9-12-13-14-15-16-17-19	
0.012.5941.4	Low/full beam headlights switch	42	X112	6	Without worklights on arms
0.012.5943.4	Switch for worklights on arms	23	X111	8-9	With worklights on arms
0.012.5943.4	Front worklights switch	23	X22	8-9-10	
0.012.5945.4	Switch for rear worklights	38	X81	5-6	
0.012.5946.4	Rear window wiper switch	41	X86	10	
0.012.5954.4	Switch for front worklights	39	X82	8-9	
0.012.7076.4	Shuttle control lever		X63	16	
0.013.1330.4	Hazard warninglights switch	24	X23	5-6	
0.013.2142.0	Right-hand recirculation motor		X73	13	
0.013.2142.0	Left-hand recirculation motor		X74	13	
0.013.2161.0	Right-hand woofer		X84	12	
0.013.2161.0	Left-hand woofer		X76	12	

Alarm	Description	Technical descr'n (Cap. 3.2.xx)	Connector	System (par. 4.xx)	Notes
0.013.7108.4	Rearview mirror demister switch		X87	7	
0.013.7121.4	Gearbox control lever		X45	16	
0.013.7121.4	Gearbox control lever		X46	16	
0.013.8360.0	Windscreen washer pump		X2	10	
0.013.8360.0	Rear screen washer pump		X1	10	
0.013.9322.4	Front axle suspensions switch	32	X42	15	
0.014.2021.4	Right-hand rearview mirror with electric demisting		X101	7	With electric demisting rearview mirrors
0.014.2022.4	Left-hand rearview mirror with electric demisting		X102	7	With electric demisting rearview mirrors
0.014.2659.0	Hand throttle position sensor		GAS	4	
0.014.2781.4	Driver's seat		X7	7	
0.014.3972.4	Lift draft sensor (right)		R	18	
0.014.3972.4	Lift draft sensor (left)		L	18	
0211.2588	Actuator	43	Y3	4	4 cylinders
0211.2588	Actuator	43	Y3	4	6 cylinders
0419.4078	Engine boost pressure sensor		B48	4	4 cylinders
0419.4078	Engine boost pressure sensor		B48	4	6 cylinders
0419.9792	Camshaft speed sensor	3	B40	4	4 cylinders
0419.9792	Camshaft speed sensor	3	B40	4	6 cylinders
0419.9809	Fuel temperature sensor	2	B37	4	4 cylinders
0419.9809	Fuel temperature sensor	2	B37	4	6 cylinders
0419.9809	Coolant temperature sensor	2	B43	4	4 cylinders
0419.9809	Coolant temperature sensor	2	B43	4	6 cylinders
0421.3098	Engine control unit		MX1	3-4	
0421.3098	Engine control unit		MX2	2-3-4-7-21	
0428.4880	Preheating device		X67	3	4 cylinders
0428.4880	Preheating device		X67	3	6 cylinders
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	

Alarm	Description	Technical descr'n (Cap. 3.2.xx)	Connector	System (par. 4.xx)	Notes
0441.6685	Gear change solenoid valves (Y1, Y2, Y3, Y4)	34	X52	16	
0442.3824	Differential lock control solenoid valve		DIFF SV	17	
0442.5709	Compressed air pressure gauge	18	X12	14	
0442.5709	Compressed air pressure gauge	18	X13	14	
0443.1661	Four wheel drive (4WD) clutch solenoid valve	5	EV DT	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	
0445.3270	Front connection mechanism solenoid valve		X118	20	
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	
0443.8667.0	Lift position sensor switch	11	POS	18	
0.900.0033.4	Fan speed selector switch		X77	13	
0.900.0033.4	Fan speed selector switch		X80	13	
0.900.0035.3	Right-hand fan motor		X90	13	
0.900.0035.4	Left-hand fan motor		X88	13	
0.900.0064.4	Trailer braking low pressure switch		X70	14	
0.900.0064.6	Solenoid valve for trailer parking brake		X69	14	
0.900.0081.4	Steering angle sensor		X55	17	

Alarm	Description	Technical descr'n (Cap. 3.2.xx)	Connector	System (par. 4.xx)	Notes
0.900.0277.8	Field/road sensor		X59	16	
2.6039.017.0	Rotating beacon		X99	5-6	
2.6039.020.0	Power take-off		X10	7	
2.7099.770.0	Cigar lighter		X25	7	
2.7659.182.0	RH lift Down pushbutton	4	DW (RH)	18	
2.7659.182.0	RH rear lift Up pushbutton	4	UP (RH)	18	
2.7659.182.0	LH lift Down pushbutton	4	DW (LH)	18	
2.7659.182.0	LH rear lift Up pushbutton	4	UP (LH)	18	
2.7659.255.0	Door open warning light switch	40	X83	7	
2.7659.256.0	Lift lock control switch		X48	18	
2.7659.256.0	"HOLD" button		HOLD	4	
2.7659.257.0	Power lift control switch	21	X20	18	
2.7659.265.0	Front mechanism solenoid valve control button		X113	20	
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
2.8039.296.0	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	5-6	
2.8059.526.0	Number plate light		X72	5-6	

Alarm	Description	Technical descr'n (Cap. 3.2.xx)	Connector	System (par. 4.xx)	Notes
2.8059.527.0	Right front light on arms		G34	6	For driving on the left with lift
2.8059.527.0	Left front light on arms		G32	6	For driving on the left with lift
2.8059.528.0	Right front light on arms		G34	6	For driving on the right with lift
2.8059.528.0	Left front light on arms		G32	6	For driving on the right with lift
2.8339.074.0	Courtesy light		X85	7	
2.8339.231.0	Interior roof light		X75	7	
2.8519.028.0	Transmission control unit		GEAR BOX	2-7-16-21	
2.9019.190.0	Rear window wiper motor		X91	10	
2.9019.200.0	Windscreen wiper motor		X100	10	
0.008.8048.4/10	Radar	13	RADAR	18	
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	
0.013.8345.4/10	Lift control console		X47	18	
0.013.9319.4/10	4WD engagement switch	31	X41	17	
0.013.9320.4/10	Differential lock switch	30	X40	17	
0.013.9321.4/10	ASM switch	29	X39	17	
0442.4165/10	Clutch pedal depressed proximity sensor	22	X21	16	
0442.9390/10	Accelerator pedal position sensor		X16	4	
0443.3422.4/20	Infocenter		X17	5-6-11	
0443.3422.4/20	Infocenter		X18	3-5-6-7-11-14-21	
2.7059.823.0/10	Fuel level sensor	35	X58	11	
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	
2.8039.295.0/10	Right-hand front worklight on cab		X103	8	Without electric demisting rearview mirrors
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		X105	9	Version with electric demisting rearview mirrors

Alarm	Description	Technical descr'n (Cap. 3.2.xx)	Connector	System (par. 4.xx)	Notes
2.8039.295.0/10	Left-hand front worklight on cab		X104	8	Without electric demisting rearview mirrors
2.8039.295.0/10	Left-hand front worklight on cab		X104	9	Version with 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	8	Without 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		X109	9	Version with electric demisting rearview mirrors
2.8039.295.0/10	Left-hand rear worklight on cab		X108	8	Without 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		X110	9	Version with electric demisting rearview mirrors
2.8519.027.0/10	HLHP Control unit		HLHP1	7-11-14-15-16-17-18-19-20-21	
2.8519.027.0/10	HLHP Control unit		HLHP2	7-11-14-15-16-17-18-19-20-21	
2.8639.007.0/10	Hazard lights control unit		X43	5-6	

2.3 CONNECTOR INDEX

Connector	Wiring code	Connection wiring or component code	Component description	Notes
+30A	0.013.9301.4/30		Battery	
+30B	0.014.3658.4		Battery	
+30C	0442.2156		Starter motor	4 cylinders
	0.014.1563.4/10			
	0.014.1564.4				6 cylinders
+30	0442.2156		Battery	
+50	0.013.9308.4/40		Starter motor	
18 BAR	0.013.9307.4/40	0443.1690	Transmission oil sensor	
A	0.013.9307.4/40	0.013.9308.4/40		
AS4	0.014.3649.4/10	0.014.0007.4		
B1	0421.3182		Not utilised	4 cylinders
	0421.3172			6 cylinders
B6	0421.3182		Not utilised	4 cylinders
	0421.3172			6 cylinders
B37	0421.3182	0419.9809	Fuel temperature sensor	4 cylinders
	0421.3172			6 cylinders
B40	0421.3182	0419.9792	Camshaft speed sensor	4 cylinders
	0421.3172			6 cylinders
B43	0421.3182	0419.9809	Coolant temperature sensor	4 cylinders
	0421.3172			6 cylinders
B48	0421.3182	0419.4078	Engine boost pressure sensor	4 cylinders
	0421.3172			6 cylinders
B+	0.014.1563.4/10	0118.2173	Alternator	4 cylinders
	0.014.1564.4			6 cylinders
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	
D+	0.013.9308.4/40	0118.2173	Alternator	
D1-D2	0.013.9308.4/40		Not utilised	
D3-D4	0.013.9307.4/40	0.014.1617.4		
DW (RH)	0.013.9309.4/30	2.7659.182.0	RH lift Down pushbutton	
DW (LH)	0.013.9309.4/30	2.7659.182.0	LH lift Down pushbutton	
DW	0.013.9327.4/30		Front axle down control solenoid valve	

Connector	Wiring code	Connection wiring or component code	Component description	Notes
DIFF SV	0.013.9307.4/40	0442.3824	Differential lock control solenoid valve	
EV DT	0.013.9307.4/40	0443.1661	Four wheel drive (4WD) clutch solenoid valve	
EV DW	0.013.9308.4/40	0.010.2439.2	Lift Down solenoid valve	
F SV	0.013.9308.4/40	0443.1661	"FIELD" mode solenoid valve	
LOCK SV	0.013.9307.4/40	0.010.3343.0	Gearbox in neutral locking solenoid valve	
P SV	0.013.9307.4/40	0443.4425	Main clutch proportional solenoid valve	
PTO 1 SV	0.013.9307.4/40		Front PTO engagement solenoid valve	
PTO 2 SV	0.013.9307.4/40	0.010.2628.2	Rear PTO engagement solenoid valve	
R SV	0.013.9308.4/40	0443.1661	"ROAD" mode solenoid valve	
EV UP	0.013.9308.4/40	0.010.2439.2	Lift Up solenoid valve	
F30	0421.3182		Not utilised	4 cylinders
	0421.3172			6 cylinders
FRL9	0.013.9301.4/30		Engine starter relay supply fuse	
FRL20	0.014.1874.4/10		Arm worklights relay supply fuse	Version with worklights on arms
FRL21	0.014.1875.4/10		Low beam headlights relay supply fuse	Without worklights on arms
FU1	0.013.9301.4/30		Battery main fuse (125A)	
FU2	0.014.3658.4		Preheating relay power fuse	
FX38	0.013.9301.4/30		Starter switch supply fuse	
G1	0.013.9301.4/30	0.014.3649.4/10		
G2	0.013.9301.4/30	0.014.3649.4/10		
G3	0.013.9301.4/30	0.014.3649.4/10		
G4	0.013.9301.4/30	0.014.3649.4/10		
G5	0.013.9301.4/30	0.014.3649.4/10		
G6	0.013.9301.4/30	0.014.3650.4/10		
G7	0.013.9301.4/30	0.013.9304.4/30		
G8	0.013.9301.4/30	0.013.9304.4/30		
G9	0.014.3649.4/10		Not utilised	
G11	0.014.3649.4/10	0.014.1874.4/10		With worklights on arms
		0.014.1875.4/10		Without worklights on arms
G12	0.013.9304.4/30	0.014.1567.4/10		
G13	0.013.9308.4/40	0.013.9327.4/30		

Connector	Wiring code	Connection wiring or component code	Component description	Notes
G14	0.014.3649.4/10	0.013.9309.4/30		
G15	0.014.3649.4/10	0.013.9309.4/30		
G16	0.013.9301.4/30		Wiring connector	Connected on the "standard" version, open on the "HL" version
G17	0.013.9301.4/30	0.013.9309.4/30		
G18	0.013.9301.4/30	0.013.9309.4/30		
G19	0.013.9308.4/40	0.013.0663.4/30		
G20	0.014.3650.4/10	0421.3182		4 cylinders
		0421.3172		6 cylinders
G21	0.013.9304.4/30	0.013.9310.4/20		With electric demisting rearview mirrors
		0.014.1565.4/10		Without electric demisting rearview mirrors
G22	0.013.9304.4/30	0.013.9310.4/20		With electric demisting rearview mirrors
		0.014.1565.4/10		Without electric demisting rearview mirrors
G23	0.013.9304.4/30	0.013.9310.4/20		With electric demisting rearview mirrors
G24	0.013.9304.4/30	0.013.9310.4/20		With electric demisting rearview mirrors
		0.014.1565.4/10		Without electric demisting rearview mirrors
G25	0.013.9304.4/30	0.013.9310.4/20		With electric demisting rearview mirrors
		0.014.1565.4/10		Without electric demisting rearview mirrors
G26	0.013.9304.4/30	0.013.9310.4/20		With electric demisting rearview mirrors
G27	0.013.9304.4/30	0.011.3824.4		
G28	0.013.0663.4/30	0.013.4085.4/20		
G29	0.013.0663.4/30	0.013.4085.4/20		
G30	0.013.9301.4/30	0.014.2647.4/20		
G31	0.013.9304.4/30		To manual air conditioner	

Connector	Wiring code	Connection wiring or component code	Component description	Notes
G32	0.014.0732.4/10	2.8059.528.0	Left front light on arms	For driving on the right with lift
		2.8059.527.0	Left front light on arms	For driving on the left with lift
	0.014.0732.4/10	0.014.0002.4		
G33	0.014.3649.4/10	0.014.0732.4/10		
G34	0.014.0732.4/10	2.8059.528.0	Right front light on arms	For driving on the right with lift
		2.8059.527.0	Right front light on arms	For driving on the left with lift
	0.014.0732.4/10	0.014.0002.4		
G35	0.014.3649.4/10	0.014.0732.4/10		
G36	0.014.3649.4/10	0.014.0732.4/10		
G37	0.014.3649.4/10	0.014.0732.4/10		
G38	0.014.1617.4	0.010.4795.3/10		
GAS	0.013.9301.4/30	0.014.2659.0	Hand throttle position sensor	
GEAR BOX	0.013.9301.4/30	2.8519.028.0	Transmission control unit	
GEAR TEMP	0.013.9307.4/40	0441.6649	Transmission oil temperature sensor	
GND1	0.012.4029.4		Battery	
GND2	0.012.4029.4		Earthing point 2	
	0.013.9307.4/40			
	0.013.9308.4/40			
	0.014.3658.4			
GND3	0.014.3649.4/10		Earthing point 3	
GND4	0.013.9301.4/30		Earthing point 4	
	0.014.3658.4			
GND5	0.013.9304.4/30		Earthing point 5	
HLHP1	0.013.9301.4/30	2.8519.027.0/10	HLHP Control unit	
HLHP2	0.013.9301.4/30	2.8519.027.0/10	HLHP Control unit	
HOLD	0.013.9301.4/30	2.7659.256.0	"HOLD" button	
L	0.013.9307.4/40	0.014.3972.4	Lift draft sensor (left)	
MS1	0.013.9301.4/30	0.013.9308.4/40		
MX1	0.013.9301.4/30	0421.3098	Engine control unit	
MX2	0.013.9301.4/30	0421.3098	Engine control unit	
NAB	0.013.9307.4/40	0443.8450	Wheel speed sensor	
NHK	0.013.9307.4/40	0443.4551	Clutch speed sensor	
NLSA	0.013.9307.4/40	0443.8449	Gearbox output shaft speed sensor	

Connector	Wiring code	Connection wiring or component code	Component description	Notes
NLSE	0.013.9307.4/40	0443.4551	Gearbox input shaft speed sensor	
OIL TEMP	0.013.9307.4/40		Not utilised	
POS	0.013.9307.4/40	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	0.013.9308.4/40	0443.8352	Rear PTO speed sensor	
R	0.013.9307.4/40	0.014.3972.4	Lift draft sensor (right)	
RADAR	0.013.9307.4/40	0.008.8048.4/10	Radar	
	0.013.9307.4/40	0.010.7172.4	Radar (UK)	
RL1	0.013.9301.4/30		Front worklights relay	
RL2	0.013.9301.4/30		Rear worklights relay	
RL3	0.013.9301.4/30		Key positive supply relay	
RL4	0.013.9301.4/30		Key positive supply relay	
RL9	0.013.9301.4/30		Engine starter relay	
RL20	0.014.1874.4/10		Arm worklights relay	With worklights on arms
RL21	0.014.1875.4/10		Relay for low beam headlights	Without worklights on arms
RL22	0.014.1875.4/10		Relay for full beam headlights	Without worklights on arms
RL30	0.014.2647.4/20		Front mechanism solenoid valve supply relay	
RL42	0.013.9307.4/40		Preheating relay	
RL42A	0.014.3658.4		Preheating relay	
RL42B	0.014.1563.4/10		Preheating relay	4 cylinders
	0.014.1564.4		Preheating relay	6 cylinders
RLAC1	0.013.9304.4/30		Relay for fan speed 3	
RLAC2	0.013.9304.4/30		Relay for fan speed 4a	
RLAC3	0.013.9304.4/30		Relay for fan speed 4b	
RLAC4	0.013.9304.4/30		Relay for recirculation 1	
RLAC5	0.013.9304.4/30		Relay for recirculation 2	
RLM1	0.013.9301.4/30		Preheating relay	
RLM2	0.013.9301.4/30		Brake lights relay	
RLM3	0.013.9301.4/30		Relay for sidelights	
RLM4	0.013.9301.4/30		Relay for full beam headlights	
RLM5	0.013.9301.4/30		Relay for low beam headlights	
RLM6	0.013.9301.4/30		Side worklights relay	

Connector	Wiring code	Connection wiring or component code	Component description	Notes
RLM7	0.013.9301.4/30		Air conditioning compressor relay	
RLX100	0.014.3649.4/10		Windscreen wiper motor relay	
S	0.013.9307.4/40	0441.6066	Start enable switch (Green)	
STOLL	0.013.9301.4/30		Not utilised	
T	0.013.0663.4/30		Not utilised	
TK2	0.013.9301.4/30	0.013.9307.4/40		
TRAILER	0.013.9308.4/40	0443.7355.4		
		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	0.013.9327.4/30		Front axle up control solenoid valve	
X1	0.013.9301.4/30	0.013.8360.0	Rear screen washer pump	
X2	0.013.9301.4/30	0.013.8360.0	Windscreen washer pump	
X3	0.013.9301.4/30		Supplementary CANBUS socket	
X4	0.013.9301.4/30		Diagnostic socket	
X5	0.013.9301.4/30	0443.6527	Creeper engagement sensor	
X6	0.013.9301.4/30		Not utilised	
X7	0.013.9301.4/30	0.014.2781.4	Driver's seat	
X8	0.013.9301.4/30	0439.1395	Handbrake switch	
X9	0.013.9301.4/30	0442.2323.4	ISO4 socket (power supply to implements)	
X10	0.013.9301.4/30	2.6039.020.0	Power take-off	
X11	0.013.9301.4/30		Not utilised	
X12	0.014.3649.4/10	0442.5709	Compressed air pressure gauge	
X13	0.014.3649.4/10	0442.5709	Compressed air pressure gauge	
X14	0.014.3649.4/10	0.012.5950.4/10	Rear PTO engagement switch	
X15	0.014.3649.4/10	0.012.5948.4/10	AUTO PTO engagement switch	
X16	0.014.3649.4/10	0442.9390/10	Accelerator pedal position sensor	
X17	0.014.3649.4/10	0443.3422.4/20	Infocenter	
X18	0.014.3649.4/10	0443.3422.4/20	Infocenter	
X19	0.014.3649.4/10		Not utilised	
X20	0.014.3649.4/10	2.7659.257.0	Power lift control switch	
X21	0.014.3649.4/10	0442.4165/10	Clutch pedal depressed proximity sensor	
X22	0.014.3649.4/10	0.012.5943.4	Front worklights switch	
X23	0.014.3649.4/10	0.013.1330.4	Hazard warninglights switch	

Connector	Wiring code	Connection wiring or component code	Component description	Notes
X24	0.014.3649.4/10	0.012.5940.4	Sidelights switch	
X25	0.014.3649.4/10	2.7099.770.0	Cigar lighter	
X26	0.014.3649.4/10	0443.2708	Clutch pedal position sensor	
X27	0.014.3649.4/10	0.012.1725.0	Left-hand tweeter	
X30	0.014.3649.4/10	0.012.1725.0	Right-hand tweeter	
X33	0.014.3649.4/10	0441.9280.4	Transmission display	
X34	0.014.3649.4/10	0439.1395	Left brake pedal switch	
X35	0.014.3649.4/10	0439.1395	Right brake pedal switch	
X36	0.014.3649.4/10		Not utilised	
X37	0.014.3649.4/10	0.012.5951.4/10	Front PTO engagement switch	
X38	0.014.3649.4/10	0441.1512.4	Starter switch	
X39	0.014.3649.4/10	0.013.9321.4/10	ASM switch	
X40	0.014.3649.4/10	0.013.9320.4/10	Differential lock switch	
X41	0.014.3649.4/10	0.013.9319.4/10	4WD engagement switch	
X42	0.014.3649.4/10	0.013.9322.4	Front axle suspensions switch	
X43	0.014.3649.4/10	2.8639.007.0/10	Hazard lights control unit	
X45	0.014.3649.4/10	0.013.7121.4	Gearbox control lever	
X46	0.014.3649.4/10	0.013.7121.4	Gearbox control lever	
X47	0.014.3649.4/10	0.013.8345.4/10	Lift control console	
X48	0.014.3649.4/10	2.7659.256.0	Lift lock control switch	
X49	0.013.9307.4/40		Air cleaner clogged sensor	
X50	0.013.9307.4/40	0118.2227	Engine oil pressure switch	
X51	0.013.9307.4/40		Steering system pressure switch	
X52	0.013.9307.4/40	0441.6685	Gear change solenoid valves (Y1, Y2, Y3, Y4)	
X53	0.013.9308.4/40		Trailer socket	
X54	0.013.9308.4/40		Air conditioning pressure switch	
X55	0.013.9308.4/40	0.900.0081.4	Steering angle sensor	
X56	0.013.9308.4/40	0443.7338	Air conditioning compressor	
X57	0.013.9308.4/40		Brake fluid level sensor	
X58	0.013.9308.4/40	2.7059.823.0/10	Fuel level sensor	
X59	0.013.9308.4/40	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 code	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	0.013.9327.4/30	0.009.2194.4	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	4 cylinders
	0.014.1564.4	0428.4880	Preheating device	6 cylinders
X68	0443.7355.4	0.011.9428.0	Trailer braking pressure sensor	
	0443.7356.4			
X69	0443.7356.4	0.900.0064.6	Solenoid valve for trailer parking brake	
X70	0443.7356.4	0.900.0064.4	Trailer braking low pressure switch	
X71	0.013.9304.4/30	2.8059.526.0	Number plate light	
X72	0.013.9304.4/30	2.8059.526.0	Number plate light	
X73	0.013.9304.4/30	0.013.2142.0	Right-hand recirculation motor	
X74	0.013.9304.4/30	0.013.2142.0	Left-hand recirculation motor	
X75	0.013.9304.4/30	2.8339.231.0	Interior roof light	
X76	0.013.9304.4/30	0.013.2161.0	Left-hand woofer	
X77	0.013.9304.4/30	0.900.0033.4	Fan speed selector switch	
X78	0.013.9304.4/30	0.010.2530.1	Manual air conditioner control panel lights	
X79	0.013.9304.4/30	0.010.2532.0	Recirculation switch	
X80	0.013.9304.4/30	0.900.0033.4	Fan speed selector switch	
X81	0.013.9304.4/30	0.012.5945.4	Switch for rear worklights	
X82	0.013.9304.4/30	0.012.5954.4	Switch for front worklights	
X83	0.013.9304.4/30	2.7659.255.0	Door open warning light switch	
X84	0.013.9304.4/30	0.013.2161.0	Right-hand woofer	
X85	0.013.9304.4/30	2.8339.074.0	Courtesy light	
X86	0.013.9304.4/30	0.012.5946.4	Rear window wiper switch	
X87	0.013.9304.4/30	0.013.7108.4	Rearview mirror demister switch	

Connector	Wiring code	Connection wiring or component code	Component description	Notes
X88	0.013.9304.4/30	0.900.0035.4	Left-hand fan motor	
X90	0.013.9304.4/30	0.900.0035.3	Right-hand fan motor	
X91	0.013.9304.4/30	2.9019.190.0	Rear window wiper motor	
X92	0.013.9304.4/30		Radio	
X99	0.011.3824.4	2.6039.017.0	Rotating beacon	
X100	0.014.1567.4/10	2.9019.200.0	Windscreen wiper motor	
X101	0.013.9310.4/20	0.014.2021.4	Right-hand rearview mirror with electric demisting	With electric demisting rearview mirrors
X102	0.013.9310.4/20	0.014.2022.4	Left-hand rearview mirror with electric demisting	With electric demisting rearview mirrors
X103	0.014.1565.4/10	2.8039.295.0/10	Right-hand front worklight on cab	Without electric demisting rearview mirrors
	0.013.9310.4/20			With electric demisting rearview mirrors
X104	0.014.1565.4/10	2.8039.295.0/10	Left-hand front worklight on cab	Without electric demisting rearview mirrors
	0.013.9310.4/20			With electric demisting rearview mirrors
X105	0.013.9310.4/20	2.8039.295.0/10	Right-hand front worklight on cab	With electric demisting rearview mirrors
X106	0.013.9310.4/20	2.8039.295.0/10	Left-hand front worklight on cab	With electric demisting rearview mirrors
X107	0.014.1565.4/10	2.8039.295.0/10	Right-hand rear worklight on cab	Without electric demisting rearview mirrors
	0.013.9310.4/20			With electric demisting rearview mirrors
X108	0.014.1565.4/10	2.8039.295.0/10	Left-hand rear worklight on cab	Without electric demisting rearview mirrors
	0.013.9310.4/20			With electric demisting rearview mirrors
X109	0.013.9310.4/20	2.8039.295.0/10	Right-hand rear worklight on cab	With electric demisting rearview mirrors
X110	0.013.9310.4/20	2.8039.295.0/10	Left-hand rear worklight on cab	With electric demisting rearview mirrors
X111	0.014.1874.4/10	0.012.5943.4	Switch for worklights on arms	With worklights on arms

Connector	Wiring code	Connection wiring or component code	Component description	Notes
X112	0.014.1875.4/10	0.012.5941.4	Low/full beam headlights switch	Without worklights on arms
X113	0.014.2647.4/20	2.7659.265.0	Front mechanism solenoid valve control button	
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
X118	0.010.4795.3/10	0445.3270	Front connection mechanism solenoid valve	
Y3	0421.3182	0211.2588	Actuator	4 cylinders
	0421.3172			6 cylinders

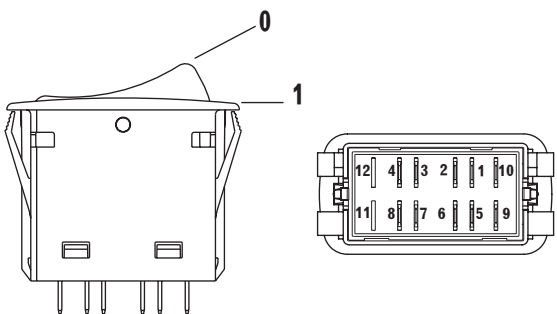
3. COMPONENTS

3.1 COMPONENT TECHNICAL DATA

N°	Description	Alarm	Characteristics	Connector
1	Transmission oil low pressure switch	0443.1690	Normally open contact (NO) Commutation 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	Resistance: 310 Ohm Inductance: 140mH Peak voltage: 40mV	B40
4	Lift up/ downpushbutton	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
	Four wheel drive (4WD) clutch solenoid valve			EV DT
6	Lift up/ downsolenoid	0.010.2439.2	Resistance between pin1 and pin 2: 1.56 to 1.66 Ohm at 20°C	DW SV / UP SV
7	Main clutch proportional solenoid valve	0443.4425	Pin1 = earth Pin2 = power Resistance between pin1 and pin 2: ~ 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 = 5.0V DC power supply Pin3 = analog signal Output 0,6V DC (Lift links fully Up) Output 4,5V DC (Lift links fully Down)	POS

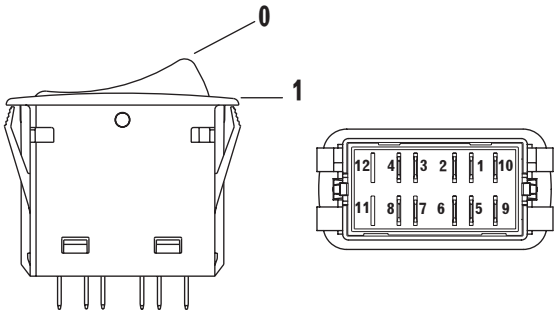
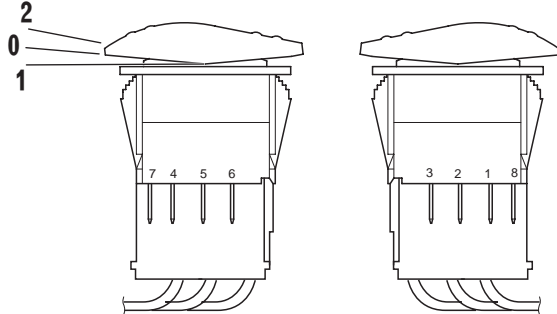
3. COMPONENTS

3.1 COMPONENT TECHNICAL DATA

N°	Description	Alarm	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 = square wave signal (130 pulses per metre) Pin 3 = 12 V power supply With the radar powered up, a variation in voltage should register at pin 2 when a hand is passed over the sensing element Nominal radar frequency: 24125 GHz \pm 25 MHz	RADAR																																	
14	Radar (UK)	0.010.7172.4	Pin 1 = earth Pin 2 = square wave signal (130 pulses per metre) Pin 3 = 12 V power supply With the radar powered up, a variation in voltage should register at pin 2 when a hand is passed over the sensing element Nominal radar frequency: 24300 GHz \pm 25 MHz	RADAR																																	
15	Start enable switch	0441.6066	Normally closed switch (NC) resistance with contact closed 3.9 Ohm Colour: Green	S																																	
16	Creep engagement sensor	0443.6527	Normally closed switch (NC) resistance with contact closed 3.9 Ohm	X5																																	
17	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 pressure 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	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> <tr> <td>1</td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	⚡	1	○	○							●	⚡	X14
Pin Pos	1	2	3	4	5	6	7	8	9	10																											
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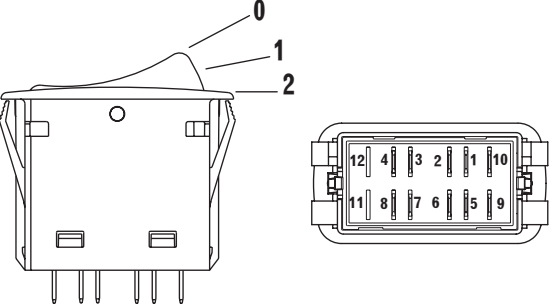
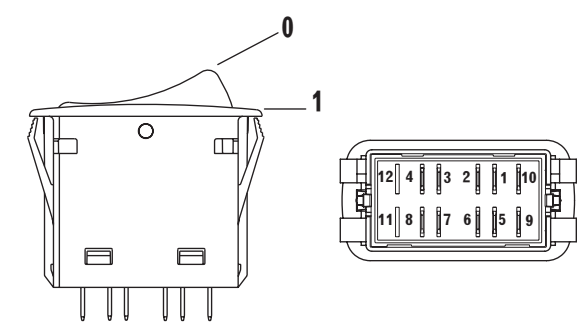
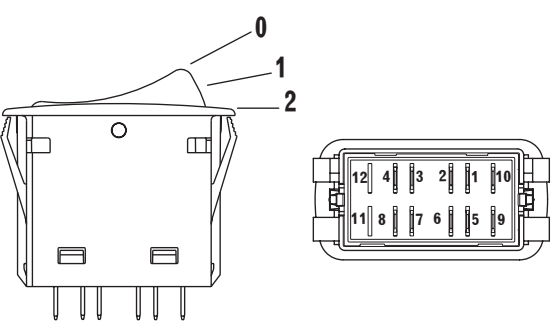
3. COMPONENTS

3.1 COMPONENT TECHNICAL DATA

N°	Description	Alarm	Characteristics	Connector																																				
20	AUTO PTO engagement switch	0.012.5948.4/10	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> <tr> <td>1</td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	⚡	1	○	○							●	⚡	X15			
Pin Pos	1	2	3	4	5	6	7	8	9	10																														
0									●	⚡																														
1	○	○							●	⚡																														
21	Power lift control switch	2.7659.257.0	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> <tr> <td>2</td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	1	●	●					●	⚡	0							●	⚡	2		●	●				●	⚡	X20
Pin Pos	1	2	3	4	5	6	7	8																																
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0							●	⚡																																
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22	Clutch pedal depressed proximity sensor	0442.4165/10	<p>Pin1 = earth Pin2 = analog signal: 0 Volt with sensor covered by metal 12 Volt with sensor exposed Pin3 = 12V power</p>	X21																																				

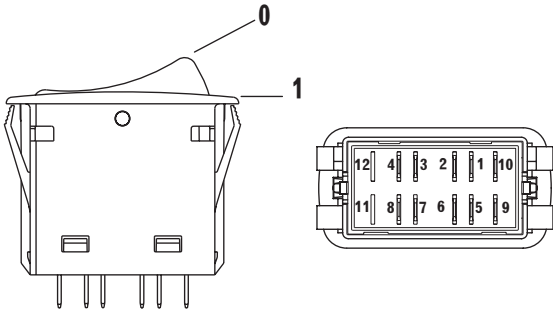
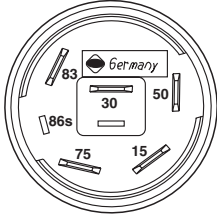
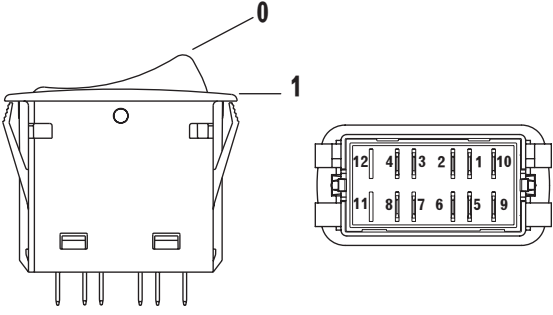
3. COMPONENTS

3.1 COMPONENT TECHNICAL DATA

N°	Description	Alarm	Characteristics	Connector																																												
23	Front worklights switch	0.012.5943.4		X22																																												
	Switch for worklights on arms		<table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>●</td> <td>●</td> <td>—</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td></td> <td>●</td> <td>●</td> <td>—</td> <td>●</td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>2</td> <td></td> <td>●</td> <td>●</td> <td>—</td> <td>●</td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0	●	●	—	●					●	●	1		●	●	—	●				●	●	2		●	●	—	●				●	●	X111
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24	Hazard warning lights switch	0.013.1330.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>4</th> <th>6</th> <th>7</th> <th>8</th> <th>10</th> <th>12</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td></td> <td>●</td> <td>●</td> <td>—</td> <td>●</td> <td>●</td> <td>—</td> <td>●</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>—</td> <td>—</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	4	6	7	8	10	12	0	●	●							1		●	●	—	●	●	—	●						●	—	—	●	X23								
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					●	—	—	●																																								
25	Sidelights switch	0.012.5940.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td></td> <td>●</td> <td>—</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>2</td> <td></td> <td>●</td> <td>—</td> <td>●</td> <td></td> <td></td> <td>●</td> <td>—</td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	●	1		●	—	●					●	●	2		●	—	●			●	—	●	●	X24
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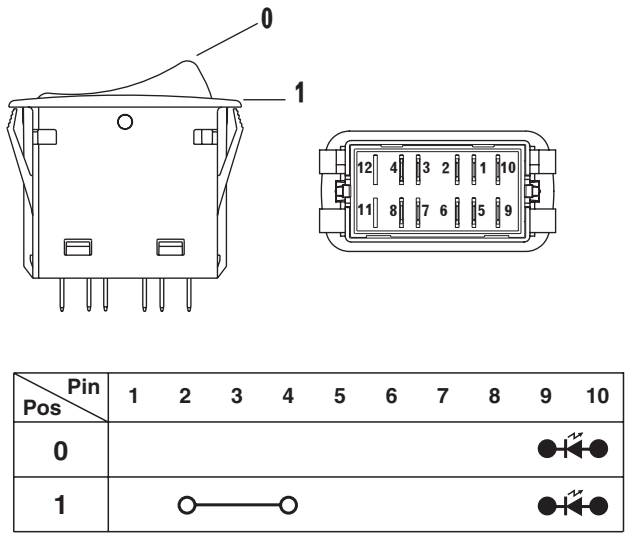
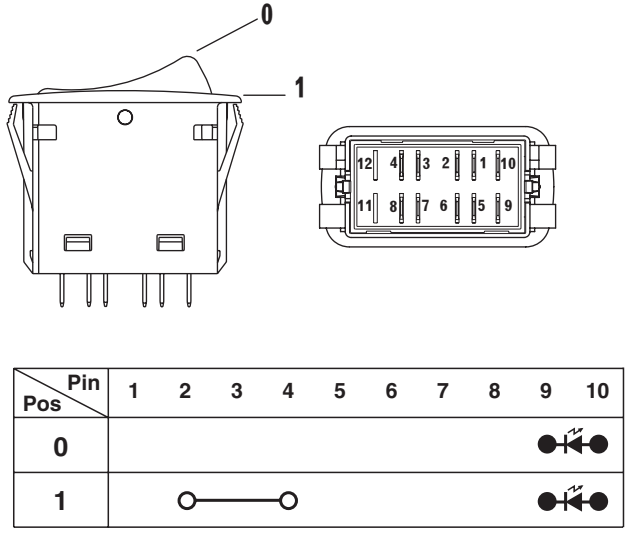
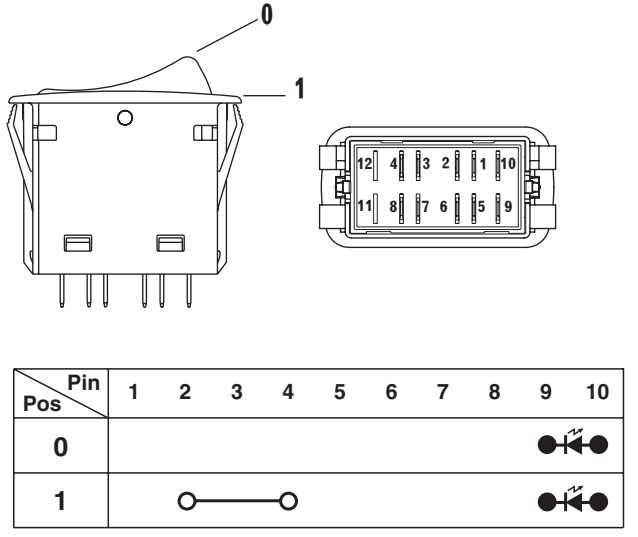
3. COMPONENTS

3.1 COMPONENT TECHNICAL DATA

N°	Description	Alarm	Characteristics	Connector																																	
26	Clutch pedal position sensor	0443.2708	<p>Pin1 = 5.0V DC power Pin2 = earth Pin4 = analog signal Output 0.5V DC (Pedal fully released) Output 4,5V DC (Pedal fully depressed)</p>	X26																																	
27	Front PTO engagement switch	0.012.5951.4/10	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> <tr> <td>1</td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	⚡	1	○	○							●	⚡	X37
Pin Pos	1	2	3	4	5	6	7	8	9	10																											
0									●	⚡																											
1	○	○							●	⚡																											
28	Starter switch	0441.1512.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>30</th> <th>15</th> <th>50</th> <th>75</th> <th>83</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> <td>●</td> </tr> <tr> <td>2</td> <td>○</td> <td>○</td> <td>○</td> <td></td> <td></td> </tr> </tbody> </table>	Pin Pos	30	15	50	75	83	0	●	●	●	●	●	1	●	●	●	●	●	2	○	○	○			X38									
Pin Pos	30	15	50	75	83																																
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2	○	○	○																																		
29	ASM switch	0.013.9321.4/10	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> <tr> <td>1</td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>⚡</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	⚡	1	○	○							●	⚡	X39
Pin Pos	1	2	3	4	5	6	7	8	9	10																											
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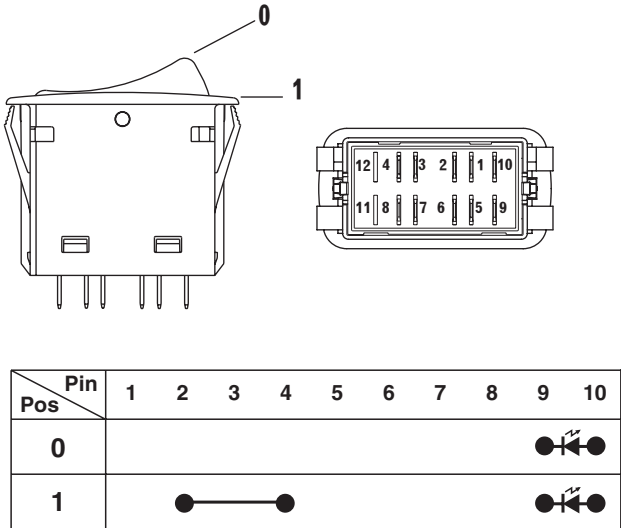
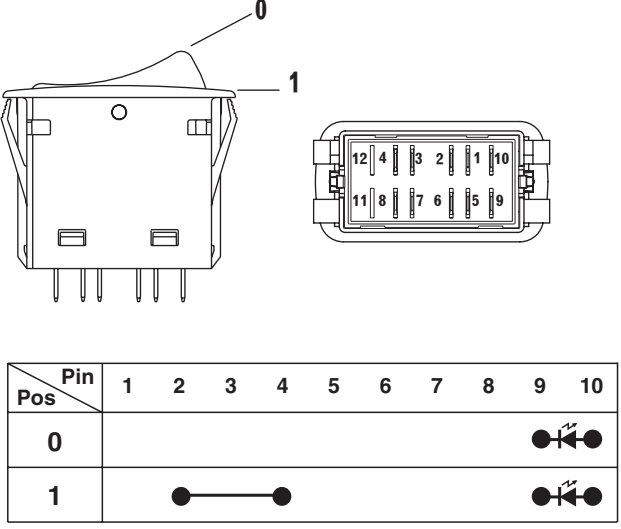
3. COMPONENTS

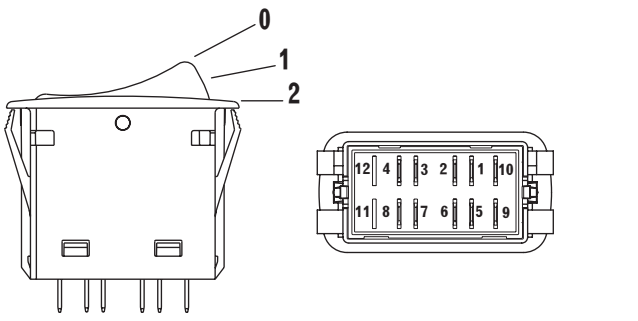
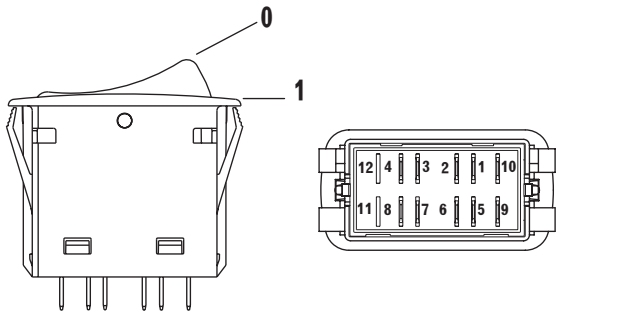
3.1 COMPONENT TECHNICAL DATA

N°	Description	Alarm	Characteristics	Connector																																	
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0									●	●																											
1	○	○							●	●																											
31	4WD engagement switch	0.013.9319.4/10	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	●	1	○	○							●	●	X41
Pin Pos	1	2	3	4	5	6	7	8	9	10																											
0									●	●																											
1	○	○							●	●																											
32	Front axle suspensions switch	0.013.9322.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	●	1	○	○							●	●	X42
Pin Pos	1	2	3	4	5	6	7	8	9	10																											
0									●	●																											
1	○	○							●	●																											
33	Engine oil pressure switch	0118.2227	Normally closed contact (NC) Commutation pressure: 0.5 ± 0.2 bar to 90 ± 5 °C	X50																																	

3. COMPONENTS

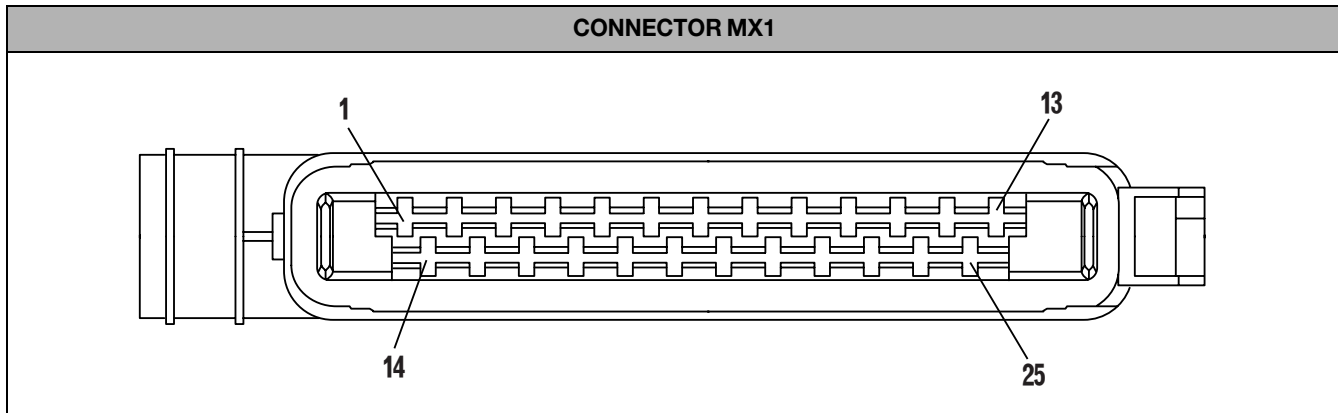
3.1 COMPONENT TECHNICAL DATA

N°	Description	Alarm	Characteristics	Connector																																	
34	Solenoid valves Y1, Y2 and Y5	0441.6685	Pin1 = earth Pin2 = power Resistance between pin1 and pin 2: 28 ± 2 Ohm	X52																																	
35	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																																	
36	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																																	
37	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																																	
38	Switch for rear worklights	0.012.5945.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	●	1		●	●						●	●	X81
Pin Pos	1	2	3	4	5	6	7	8	9	10																											
0									●	●																											
1		●	●						●	●																											
39	Rear worklights switch	0.012.5954.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0									●	●	1		●	●						●	●	X82
Pin Pos	1	2	3	4	5	6	7	8	9	10																											
0									●	●																											
1		●	●						●	●																											
40	Door open warning light switch	2.7659.255.0	Normally closed contact (NC)	X83																																	

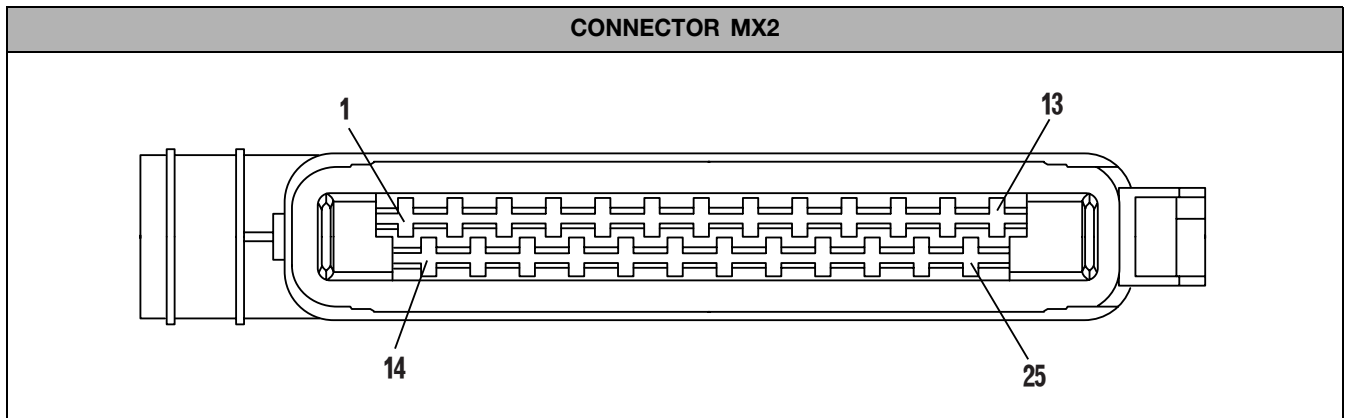
N°	Description	Alarm	Characteristics	Connector																																												
41	Rear screen wiper switch	0.012.5946.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>●</td> <td>●</td> <td></td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td></td> <td>●</td> <td>●</td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>2</td> <td></td> <td>○</td> <td>○</td> <td></td> <td></td> <td></td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0	●	●			●	●			●	●	1		●	●		●	●			●	●	2		○	○				○	○	●	●	X86
Pin Pos	1	2	3	4	5	6	7	8	9	10																																						
0	●	●			●	●			●	●																																						
1		●	●		●	●			●	●																																						
2		○	○				○	○	●	●																																						
42	Low/full beam headlights switch	0.012.5941.4	 <table border="1"> <thead> <tr> <th>Pin Pos</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> <tr> <td>1</td> <td></td> <td>●</td> <td>●</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Pin Pos	1	2	3	4	5	6	7	8	9	10	0	●	●							●	●	1		●	●						●	●	X112											
Pin Pos	1	2	3	4	5	6	7	8	9	10																																						
0	●	●							●	●																																						
1		●	●						●	●																																						
43	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																																												

3.2 PINOUTS AND DESCRIPTIONS OF ELECTRONIC CONTROL UNITS

3.2.1 ENGINE CONTROL UNIT (0421.3098)

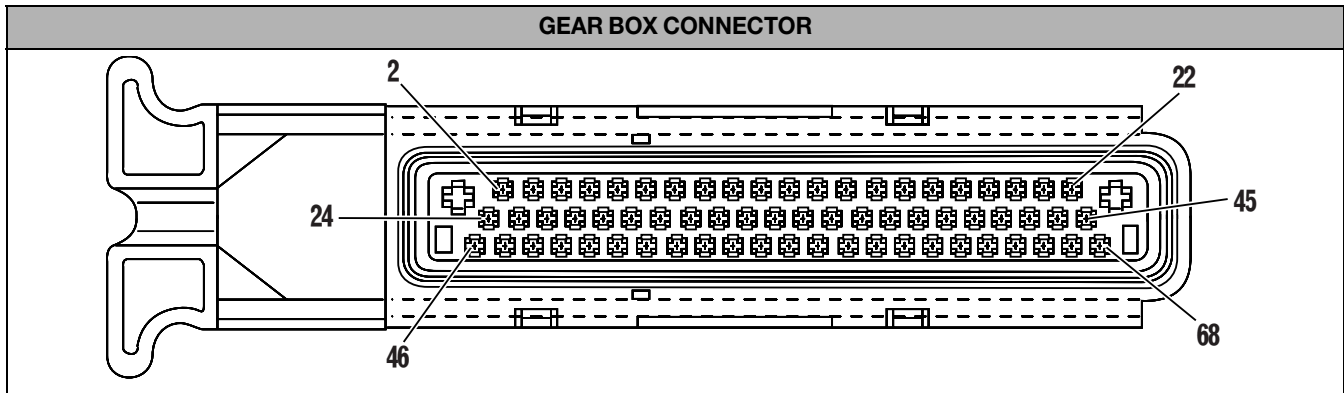


Pin	Volts.	Abbreviation	Description
1			Not utilised
2			Not utilised
3			Power (-) for preheating relay
4			Not utilised
5			Analog input, fuel temperature sensor
6			Not utilised
7			Not utilised
8	0 V	GND	Reference voltage for signal on pin 5 and 9
9			Analog input, coolant temperature sensor
10			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 coil signal
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



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

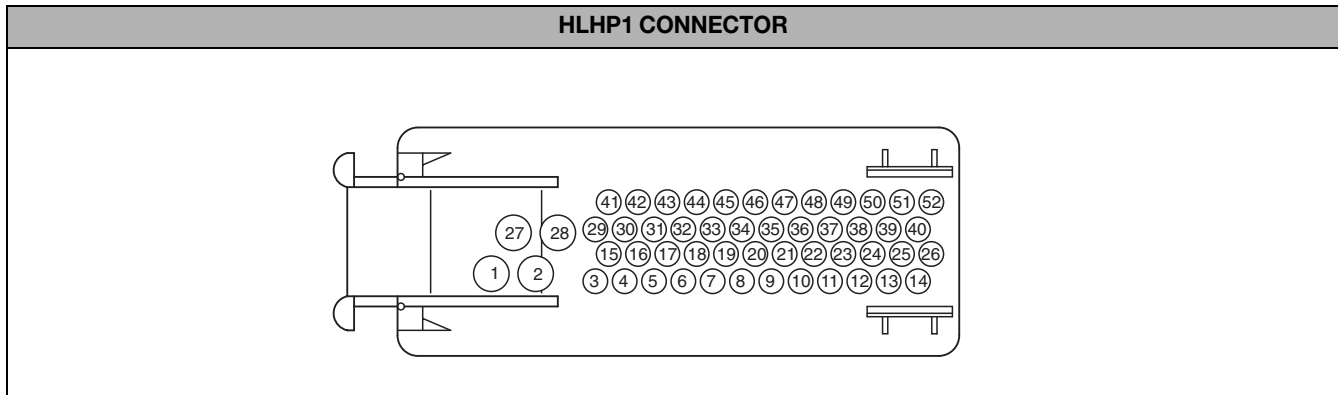
3.2.2 TRANSMISSION CONTROL UNIT (2.8519.028.0)



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

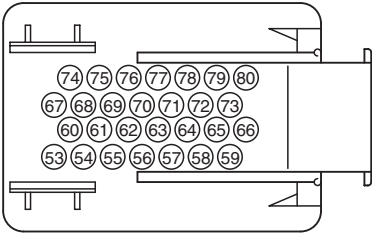
Pin	Volts.	Abbreviation	Description
31		EDM1	Signal, mechanical gearbox neutral
32		AIP3	Power, solenoid valve Y3
33			Not utilised
34			Not utilised
35			Not utilised
36			Not utilised
37		AU	Reference voltage (+) for signal on pins 18 and 38
38		EU1	Analog input, angular position of clutch pedal sensor 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)

3.2.3HLHP CONTROL UNIT (CODE 2.8519.027.0/10)

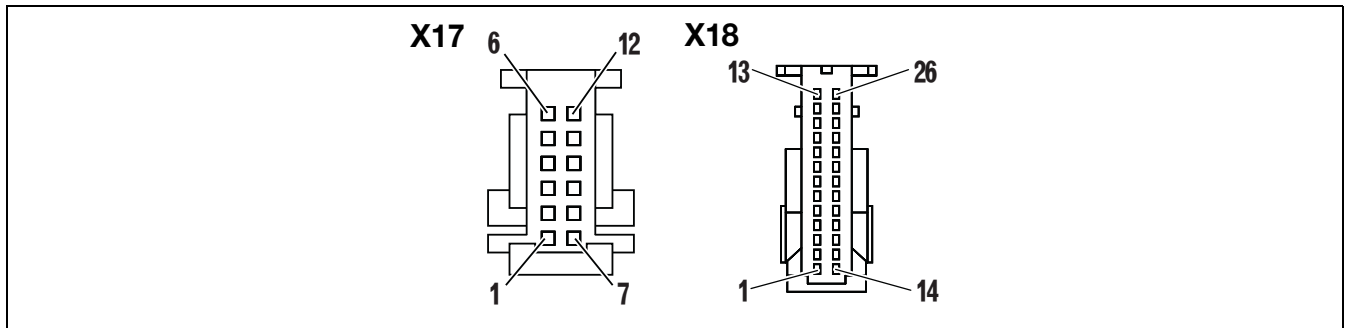


Pin	Volts.	Abbreviation	Description
1	12V		Battery positive (+30)
2	0V		Battery negative
3			Not utilised
4			Power, 6-way solenoid valve
5			Power, lift stop LED
6			Digital input, front axle suspension button
7			Digital input, radar
8			Input, rear PTO speed sensor
9			Not utilised
10			Digital input, four-wheel drive engagement button
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			Digital input, differential lock button
22			Digital input, lift down buttons (on mudguards)
23			Digital input, RH brake pedal
24			Reference voltage (-) for pins 70, 62, 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			Power, lift up LED
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			Power, lift down LED
46			Not utilised
47			Power to front axle suspension up solenoid valve
48			Digital input, ASM button
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	Volts.	Abbreviation	Description
53			Power, lift status LED
54			Digital input, alternator D+ signal (engine running)
55			Analog input, work mode potentiometer
56			Analog input, depth adjustment potentiometer
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			Analog input, slip potentiometer
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			Analog input, down speed potentiometer
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			Analog input, maximum height potentiometer
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

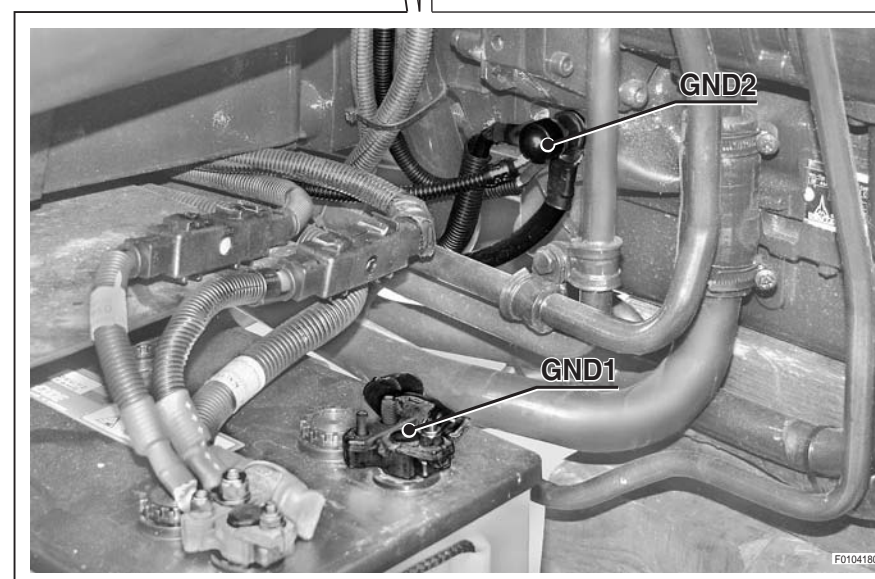
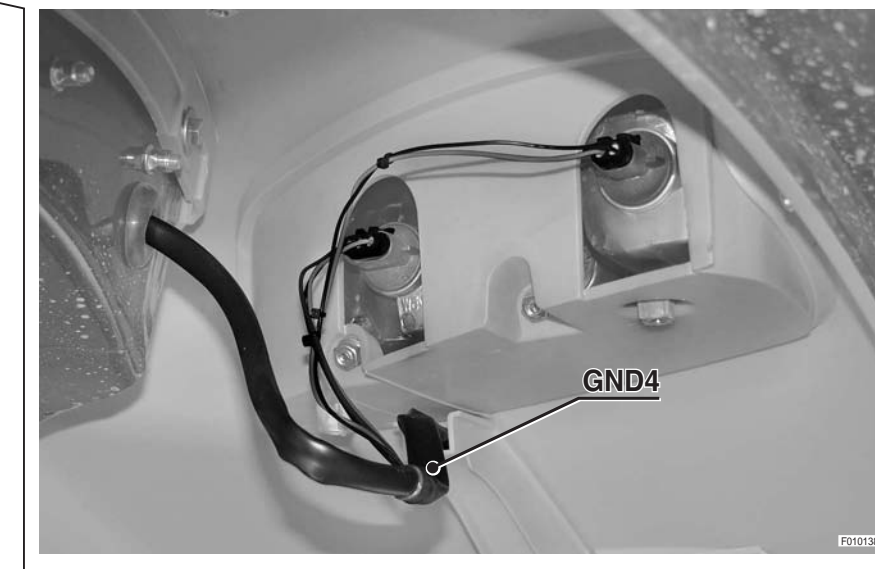
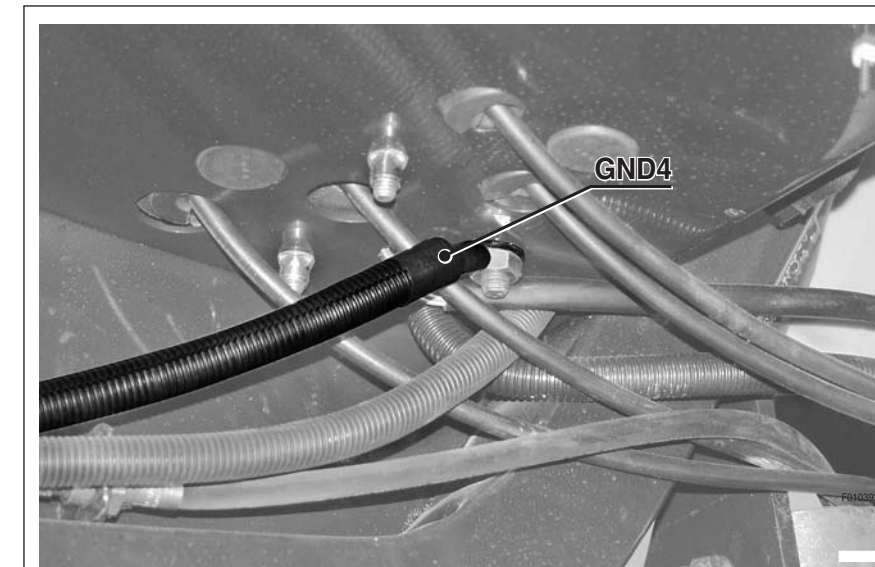
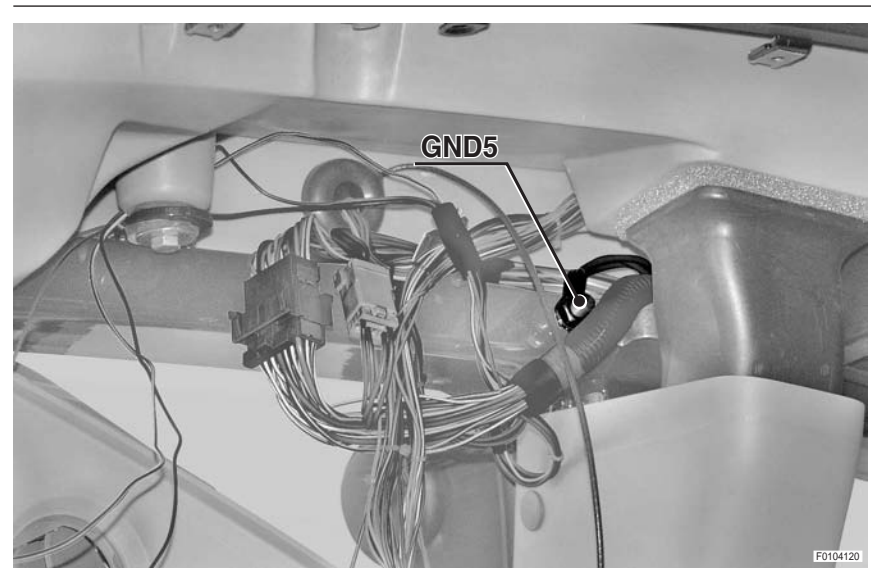
CONNECTOR X18

Pin	Volts.	Abbreviation	Description
1		BLINK2	2nd trailer flasher indicator light
2		BLINK1	2nd 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

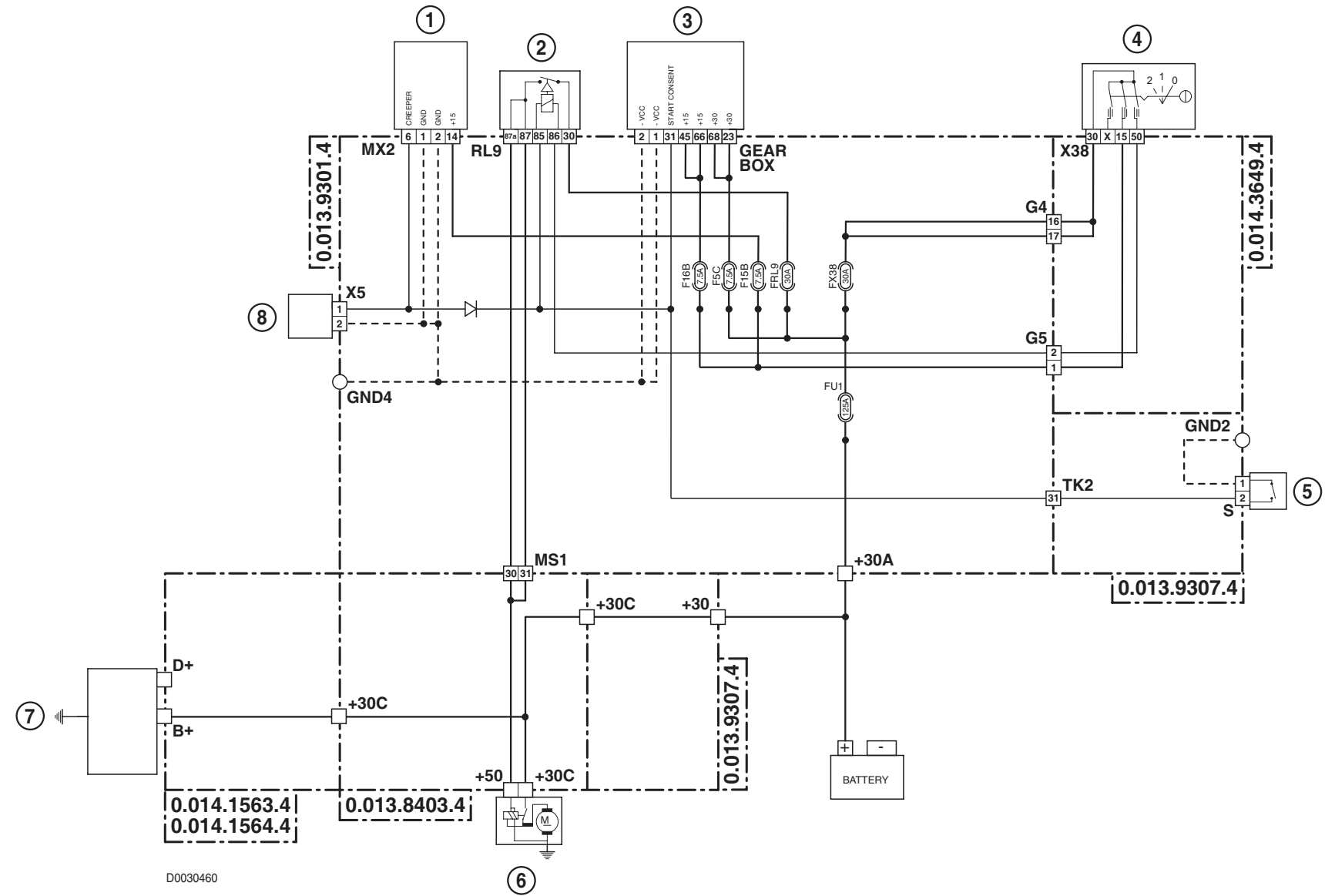
17		HYDR	Not utilised
18		HANDBR	Handbrake on warning light
19		VORGL	Glowplugs test
20		RXD	Diagnostic interface reception
21	+12V	KL30	Battery positive (+30)
22		TXD	Diagnostics interface transmission
23		ESCERA	Input to ESC button
24		RETMEN	Input to RET button
25		MEN+	Input to M+ button
26		MEN-	Input to M- button

4. SYSTEMS

4.1 EARTHING POINTS



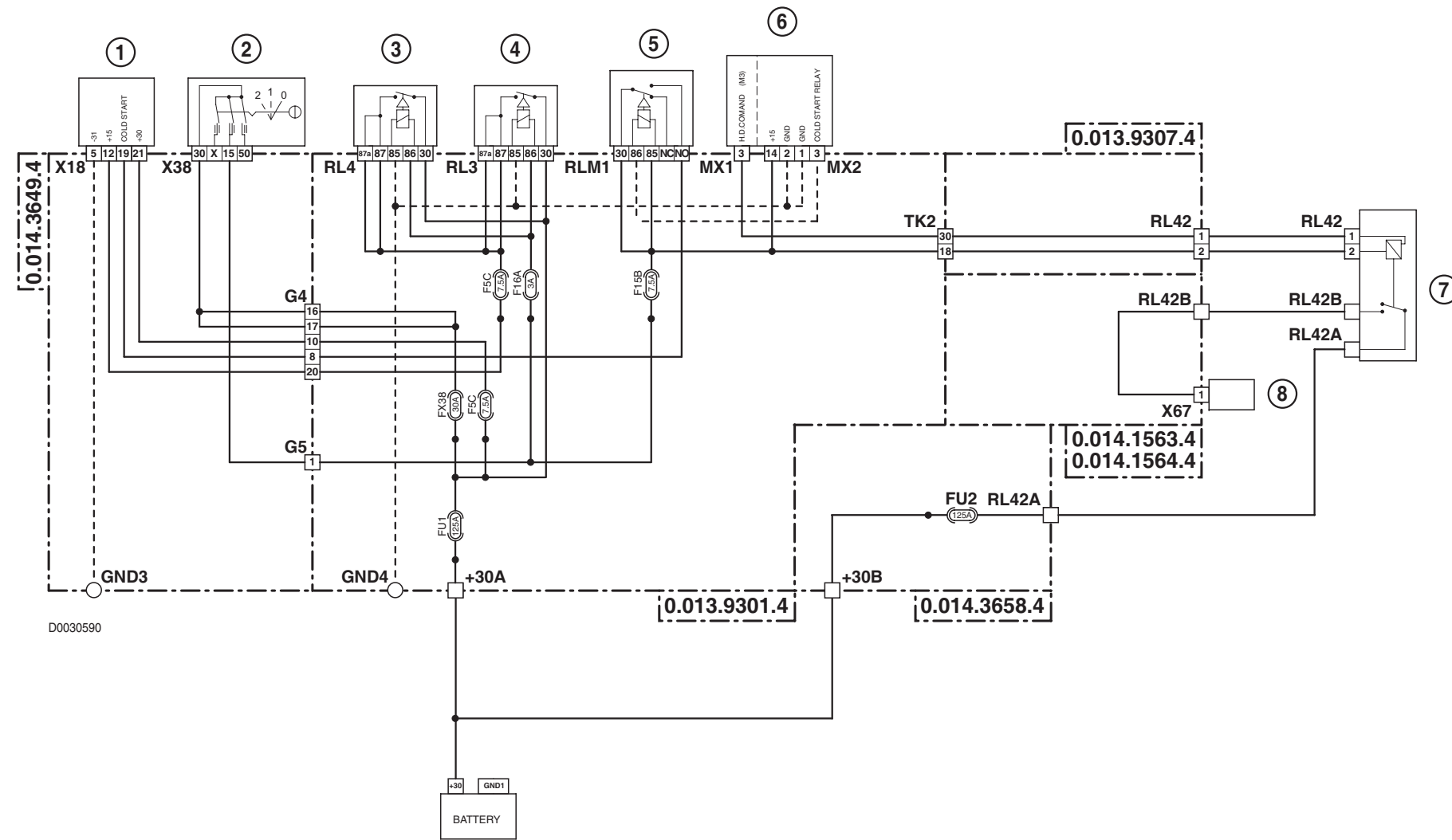
4.2 STARTING THE ENGINE



D0030460

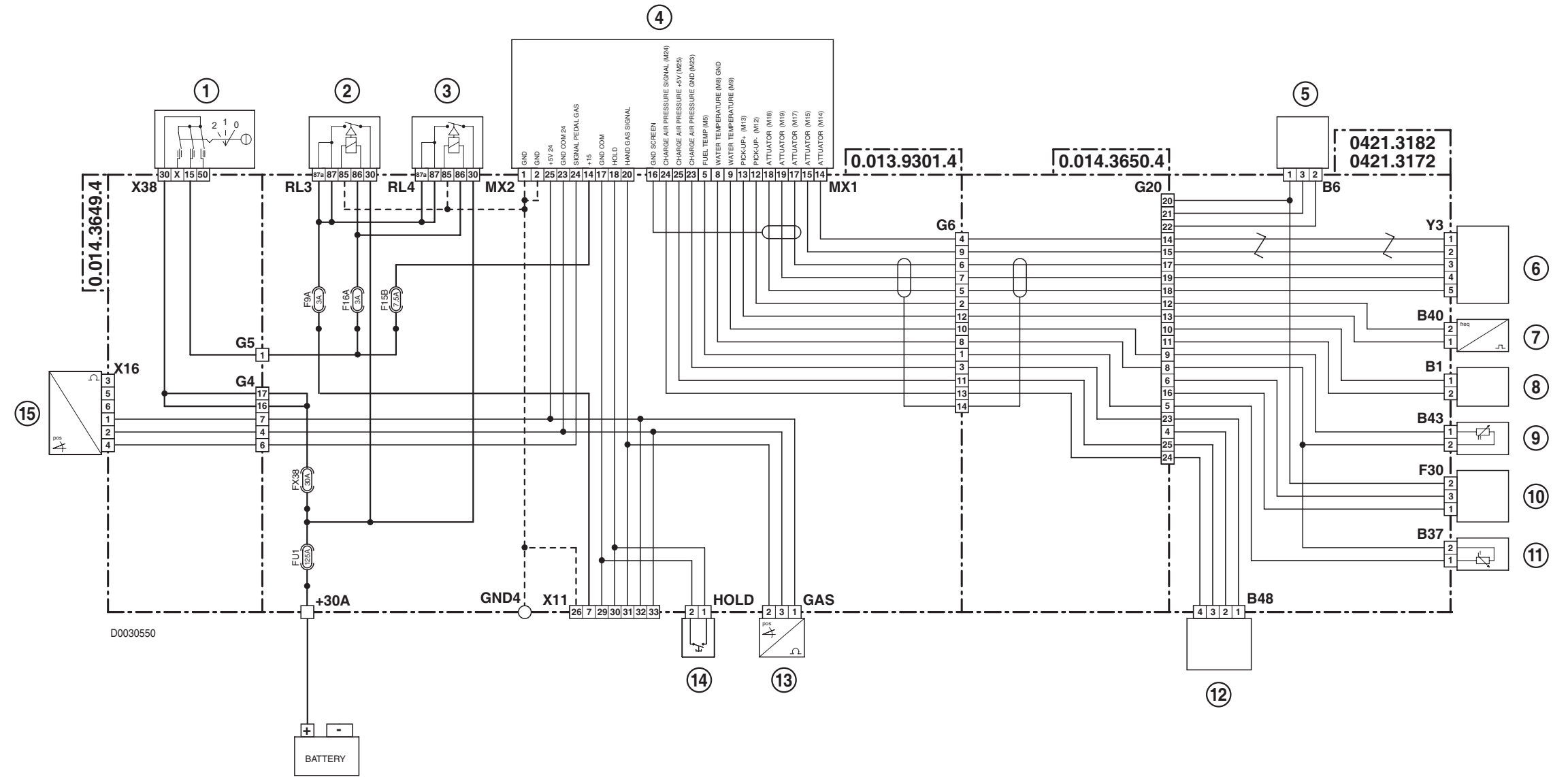
- 1 Engine control unit
- 2 Engine starter relay
- 3 Transmission control unit
- 4 Starter switch
- 5 Start enable switch (Green)
- 6 Starter motor
- 7 Alternator
- 8 Creeper engagement sensor

4.3 PRE-HEATING



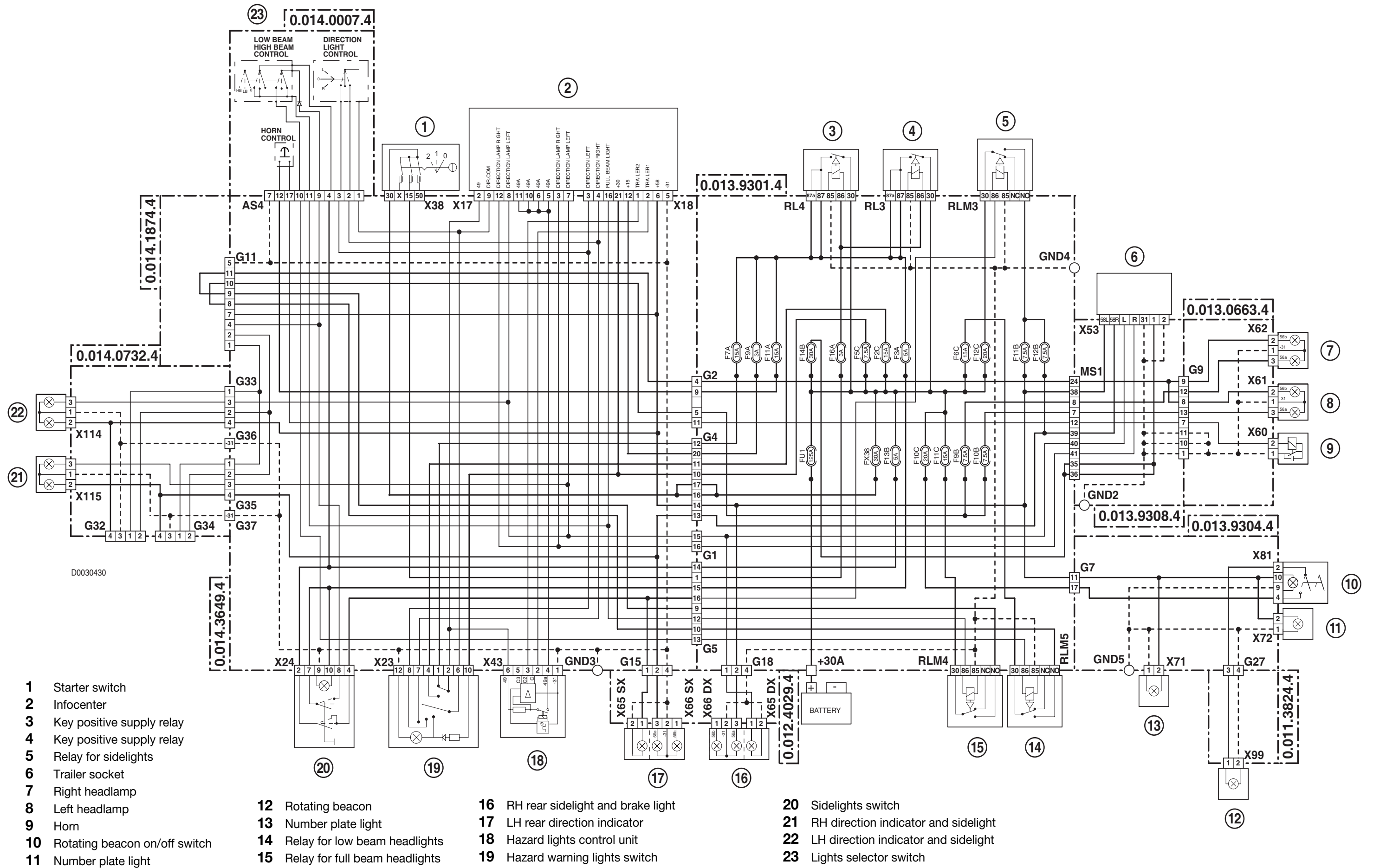
- 1 Infocenter
- 2 Starter switch
- 3 Key positive supply relay
- 4 Key positive supply relay
- 5 Preheating relay
- 6 Engine control unit
- 7 Preheating relay
- 8 Preheating device

4.4 ELECTRONIC ENGINE CONTROL

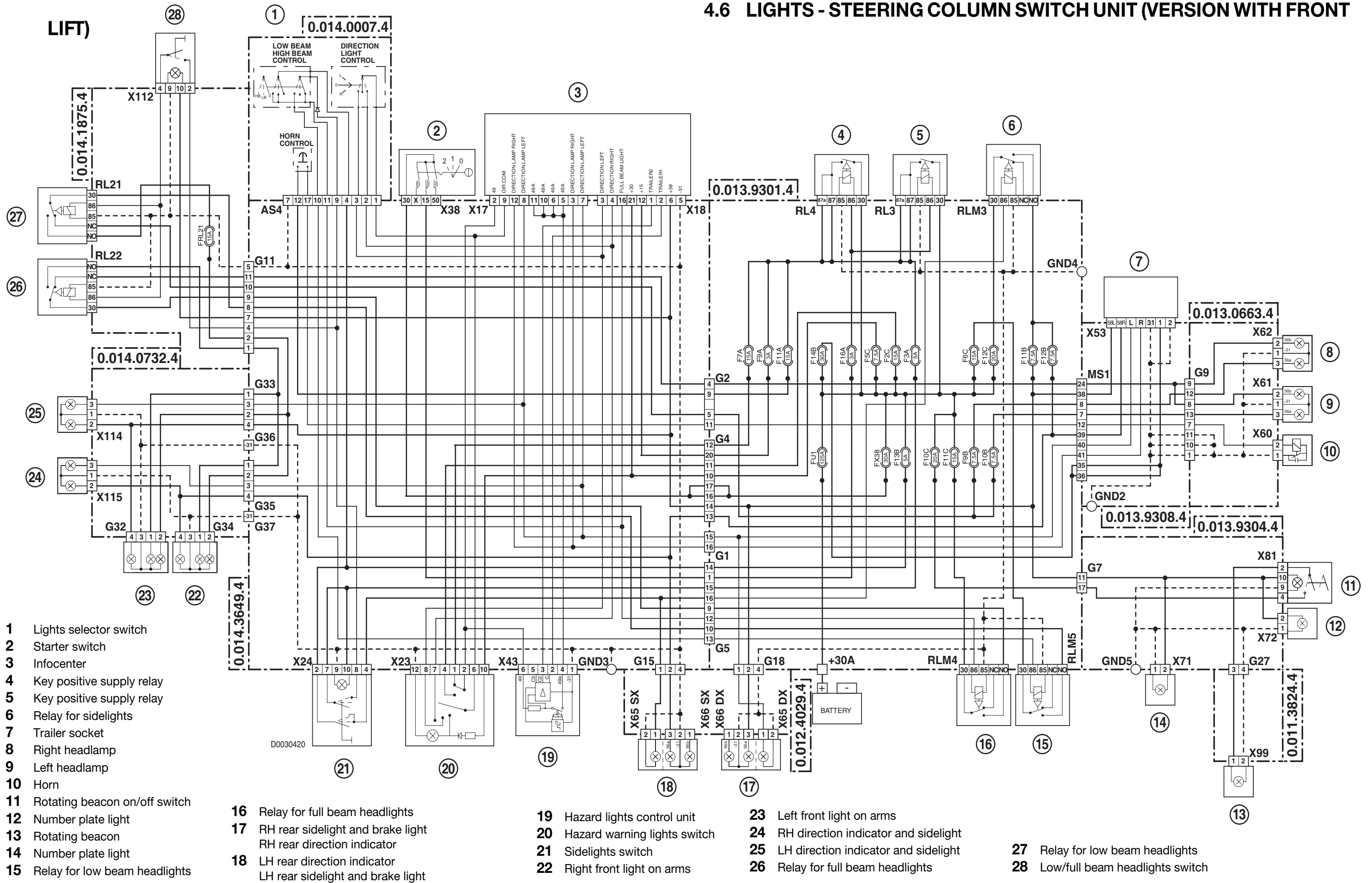


- | | | | |
|----|-----------------------------------|----|-----------------------------------|
| 1 | Starter switch | 11 | Fuel temperature sensor |
| 2 | Key positive supply relay | 12 | Engine turbocharging sensor |
| 3 | Key positive supply relay | 13 | Hand throttle position sensor |
| 4 | Engine control unit | 14 | "HOLD" button |
| 5 | Not utilised | 15 | Accelerator pedal position sensor |
| 6 | Actuator | | |
| 7 | Camshaft speed sensor | | |
| 8 | Not utilised | | |
| 9 | Engine coolant temperature sensor | | |
| 10 | Not utilised | | |

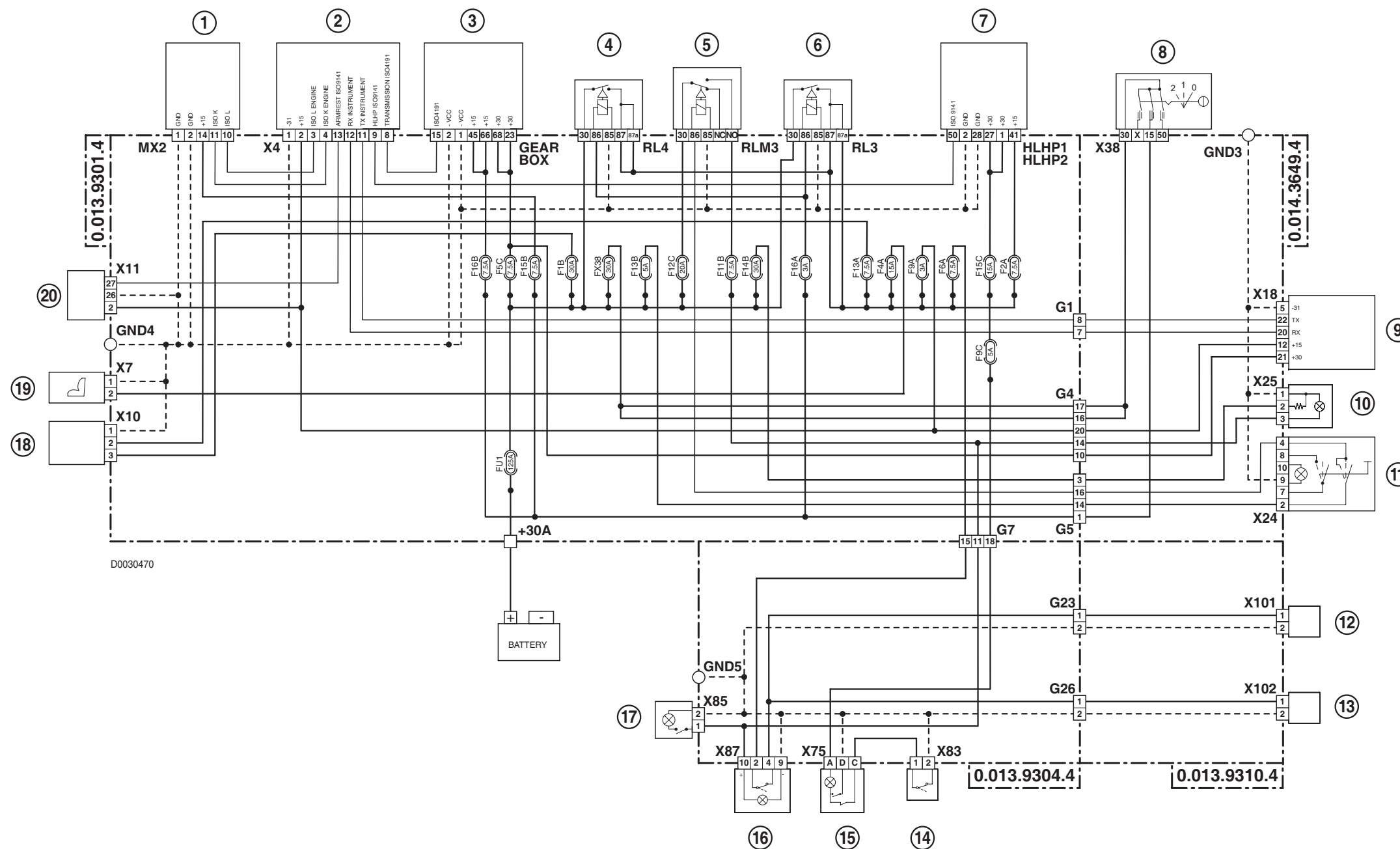
4.5 LIGHTS - STEERING COLUMN SWITCH UNIT (VERSION WITHOUT FRONT LIFT)



4.6 LIGHTS - STEERING COLUMN SWITCH UNIT (VERSION WITH FRONT

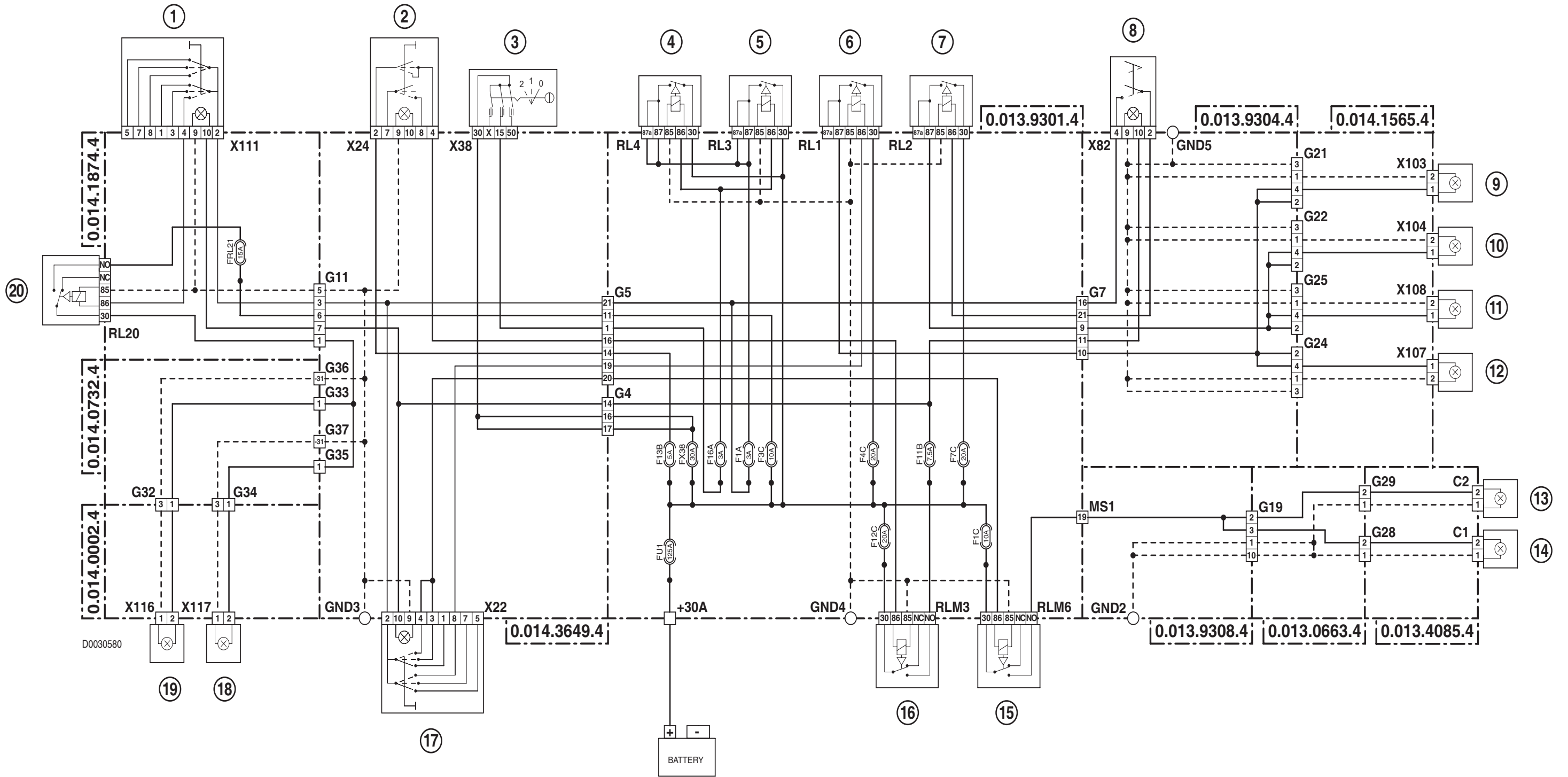


4.7 DIAGNOSTICS ACCESSORIES



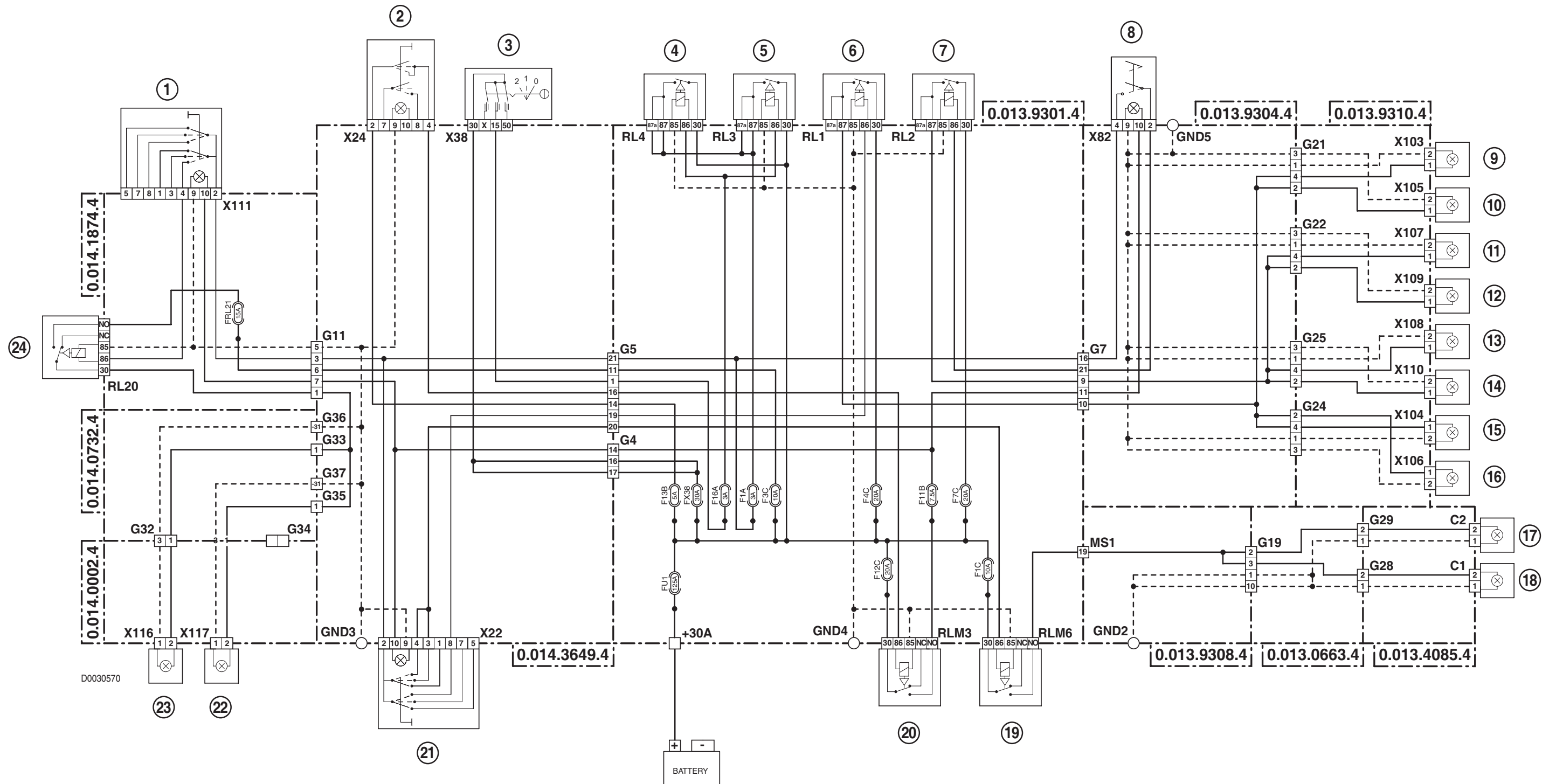
- | | | |
|--|--|---|
| <ul style="list-style-type: none"> 1 Engine control unit 2 - Diagnostic socket 3 Transmission control unit 4 Key positive supply relay 5 Relay for sidelights 6 Key positive supply relay 7 HLHP control unit | <ul style="list-style-type: none"> 8 Starter switch 9 Infocenter 10 Cigar 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 switch | <ul style="list-style-type: none"> 15 Ceiling light 16 Rearview mirrors demister switch 17 Courtesy light 18 Power take-off 19 Driving seat 20 Not utilised |
|--|--|---|

4.8 WORKLIGHTS (VERSION WITHOUT DEMISTING MIRRORS)



- | | | |
|--|---|--|
| <p>1 Arm worklight switch</p> <p>2 Sidelights switch</p> <p>3 Starter switch</p> <p>4 Key positive supply relay</p> <p>5 Key positive supply relay</p> <p>6 Front worklights relay</p> <p>7 Rear worklights relay</p> | <p>8 Switch for rear worklights</p> <p>9 Right-hand front worklight on cab</p> <p>10 Left-hand front worklight on cab</p> <p>11 Left-hand rear worklight on cab</p> <p>12 Right-hand rear worklight on cab</p> <p>13 Front RH outer worklight</p> <p>14 Front LH outer worklight</p> | <p>15 Side worklights relay</p> <p>16 Relay for sidelights</p> <p>17 Front worklights switch</p> <p>18 Right-hand supplementary light</p> <p>19 Left-hand supplementary light</p> <p>20 Arm worklights relay</p> |
|--|---|--|

4.9 WORKLIGHTS (VERSION WITH DEMISTING MIRRORS)



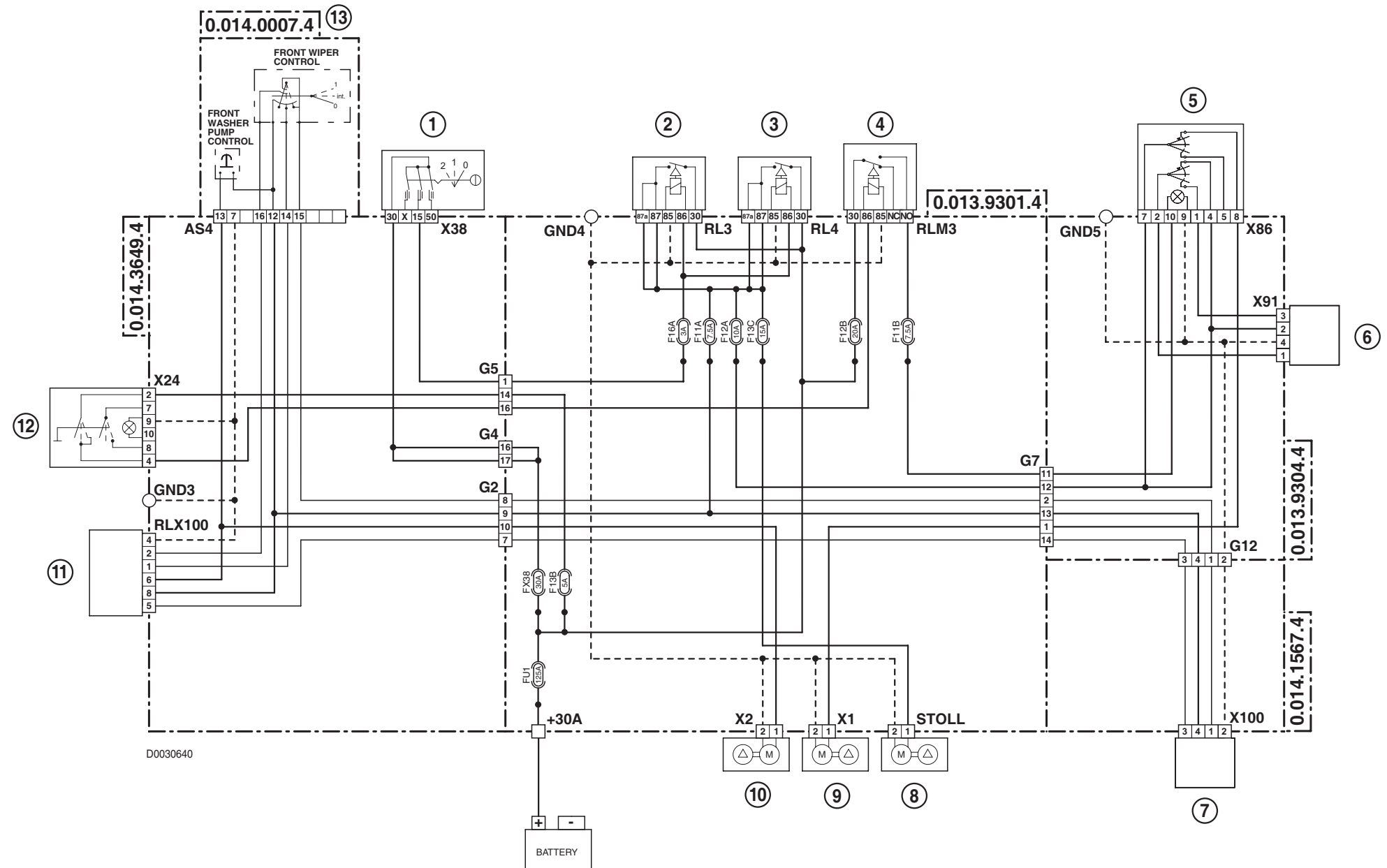
- 1 Arm worklight switch
- 2 Sidelights switch
- 3 Starter switch
- 4 Key positive supply relay
- 5 Key positive supply relay
- 6 Front worklights relay
- 7 Rear worklights relay

- 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

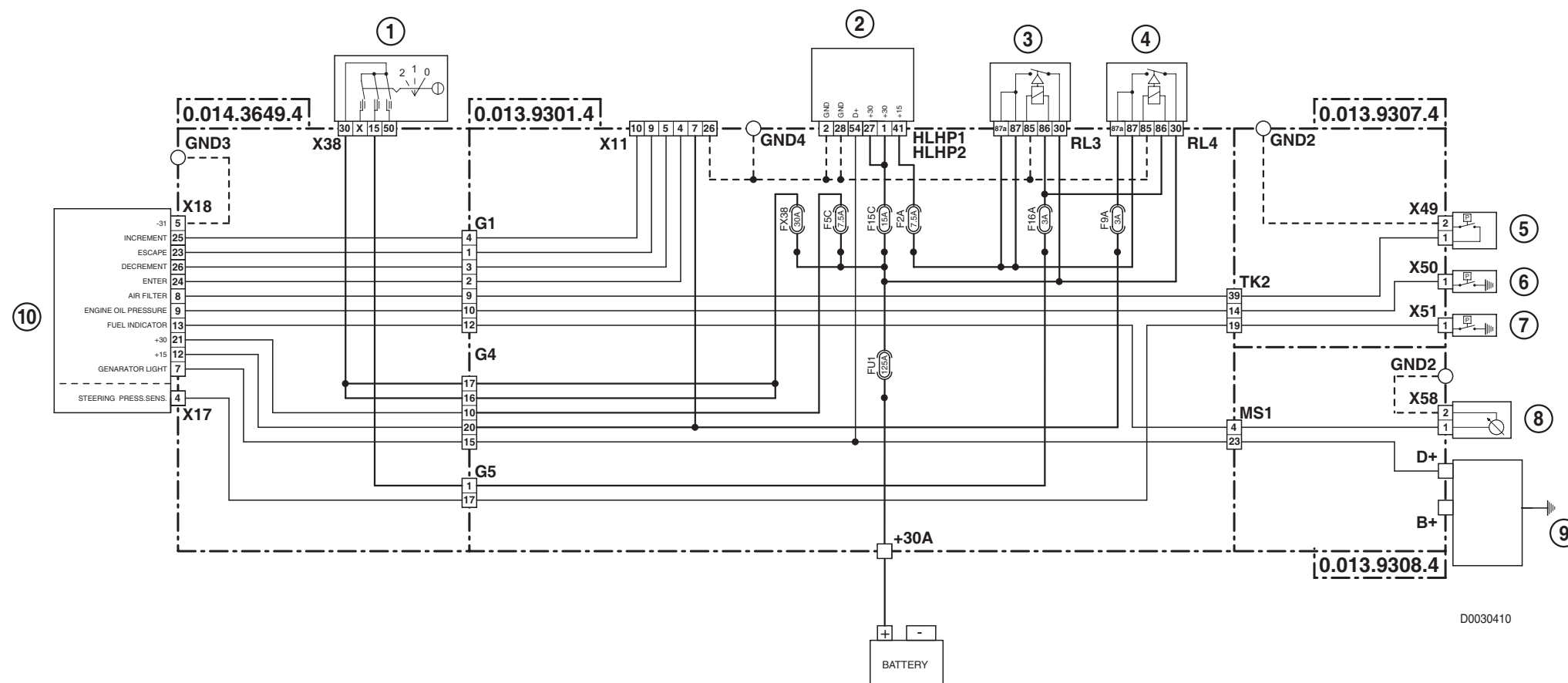
- 22 Right-hand supplementary light
- 23 Left-hand supplementary light
- 24 Arm worklights relay

4.10 WINDSCREEN WIPERS



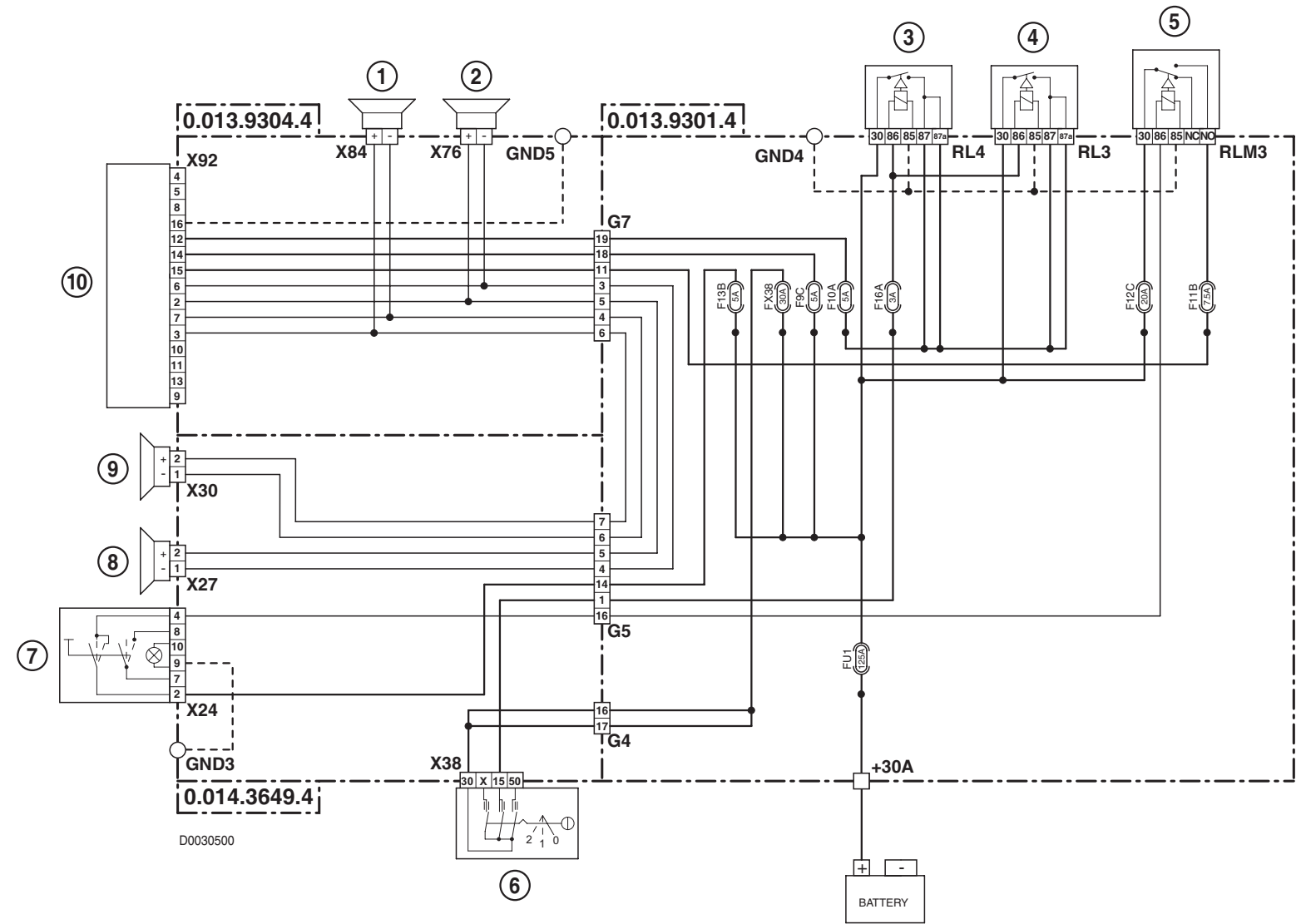
- | | | | |
|---|---------------------------|----|------------------------------|
| 1 | Starter switch | 8 | Not utilised |
| 2 | Key positive supply relay | 9 | Rear window washer pump |
| 3 | Key positive supply relay | 10 | Windscreen washer pump |
| 4 | Relay for sidelights | 11 | Windscreen wiper motor relay |
| 5 | Rear window wiper switch | 12 | Sidelights switch |
| 6 | Rear window wiper motor | 13 | Lights selector switch |
| 7 | Windscreen wiper motor | | |

4.11 INSTRUMENT PANEL



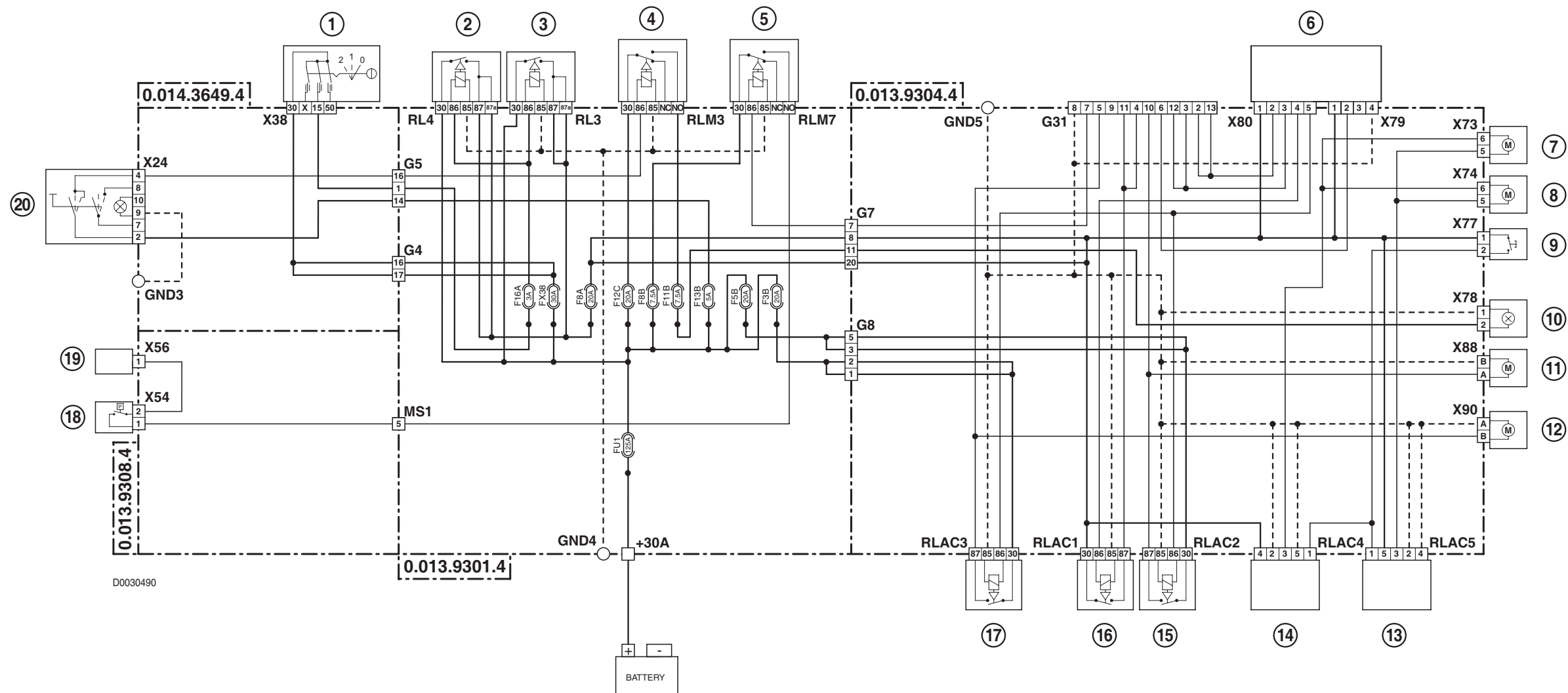
- 1 Starter switch
- 2 HLHP control unit
- 3 Key positive supply relay
- 4 Key positive supply relay
- 5 Air cleaner clogged sensor
- 6 Engine oil pressure switch
- 7 Steering system pressure switch
- 8 Fuel level sensor
- 9 Alternator
- 10 Infocenter

4.12 RADIO



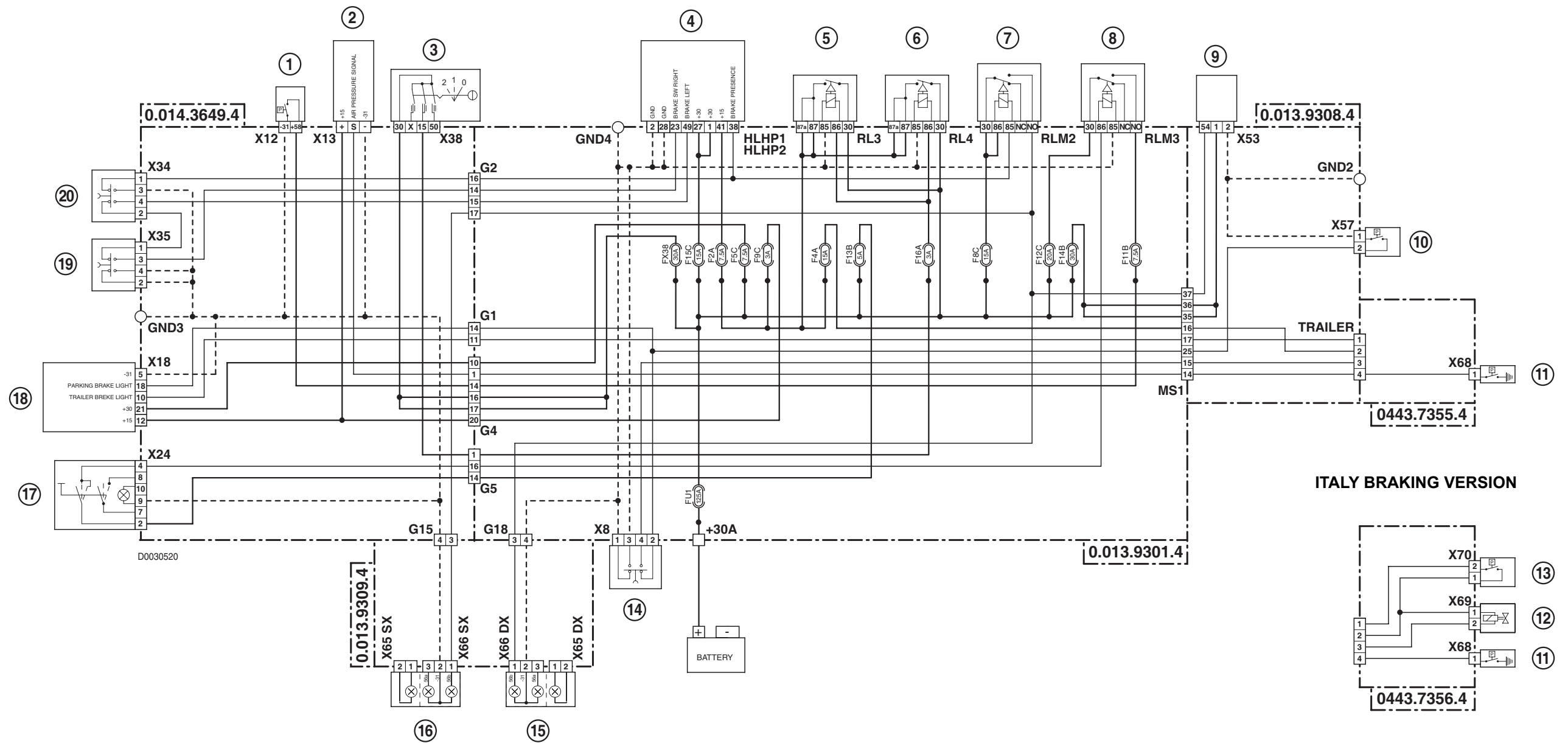
- 1 Right-hand woofer
- 2 Left-hand woofer
- 3 Key positive supply relay
- 4 Key positive supply relay
- 5 Relay for sidelights
- 6 Starter switch
- 7 Sidelights switch
- 8 Left-hand tweeter
- 9 Right-hand tweeter
- 10 Radio

4.13 MANUAL AIR CONDITIONER



- 1 Starter switch
- 2 Key positive supply relay
- 3 Key positive supply relay
- 4 Relay for sidelights
- 5 Air conditioning compressor relay
- 6 Fan speed selector switch
Recirculation switch
- 7 Right-hand recirculation motor
- 8 Left-hand recirculation motor
- 9 Fan speed selector switch
- 10 Manual air conditioner control panel lights
- 11 Left-hand fan motor
- 12 Right-hand fan motor
- 13 Relay for recirculation 2
- 14 Relay for recirculation 1
- 15 Relay for fan speed 4a
- 16 Relay for fan speed 3
- 17 Relay for fan speed 4b
- 18 Air conditioning pressure switch
- 19 Air conditioning compressor
- 20 Sidelights switch

4.14 BRAKES

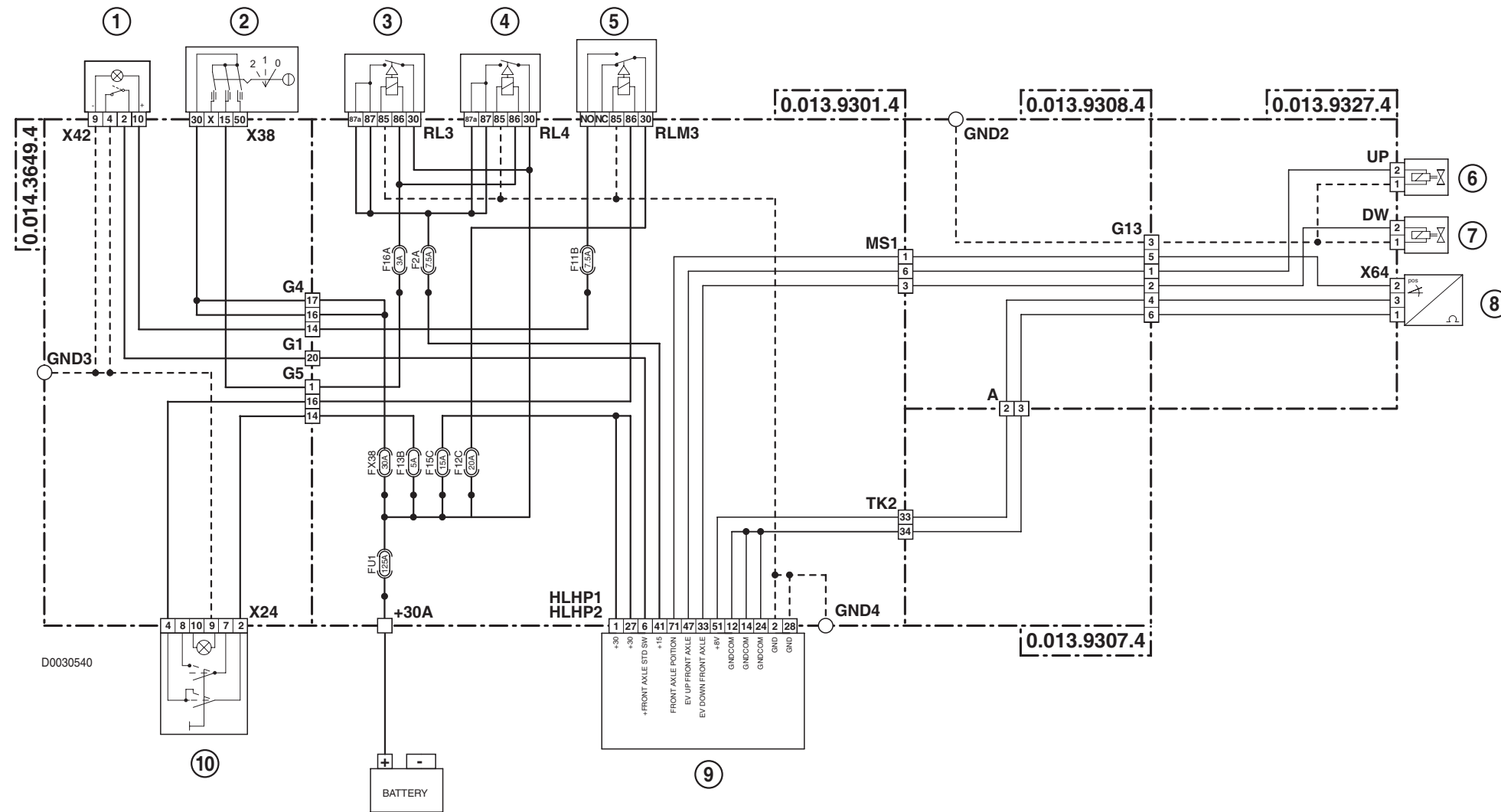


- 1 Compressed air pressure gauge
- 2 Compressed air pressure gauge
- 3 Starter switch
- 4 HLHP control unit
- 5 Key positive supply relay
- 6 Key positive supply relay
- 7 Brake lights relay
- 8 Relay for sidelights
- 9 Trailer socket

- 10 Brake fluid level sensor
- 11 Trailer braking pressure sensor
- 12 Trailer parking brake solenoid valve
- 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

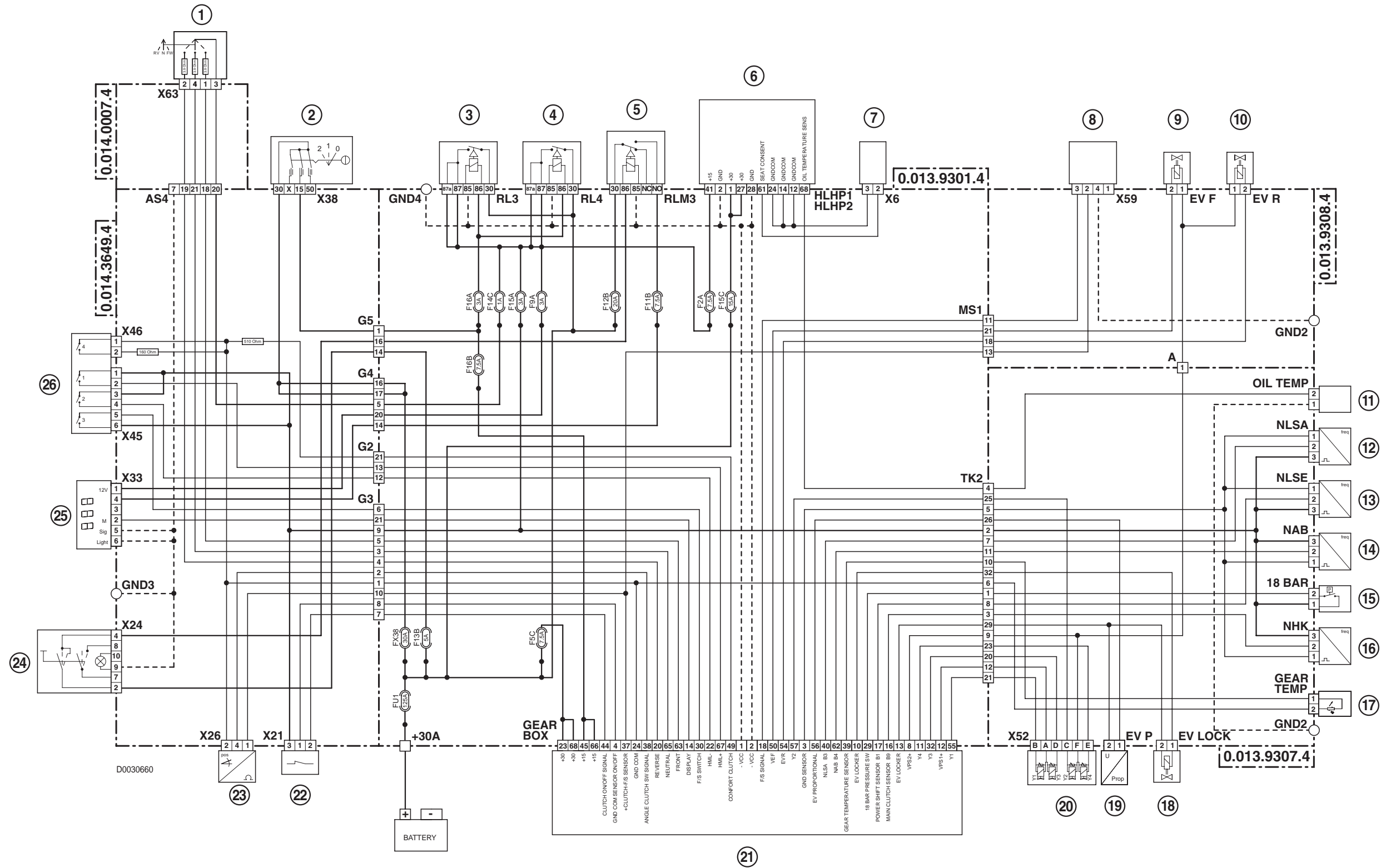
- 17 Sidelights switch
- 18 Infocenter
- 19 Right brake pedal switch
- 20 Left brake pedal switch

4.15 FRONT AXLE SUSPENSION



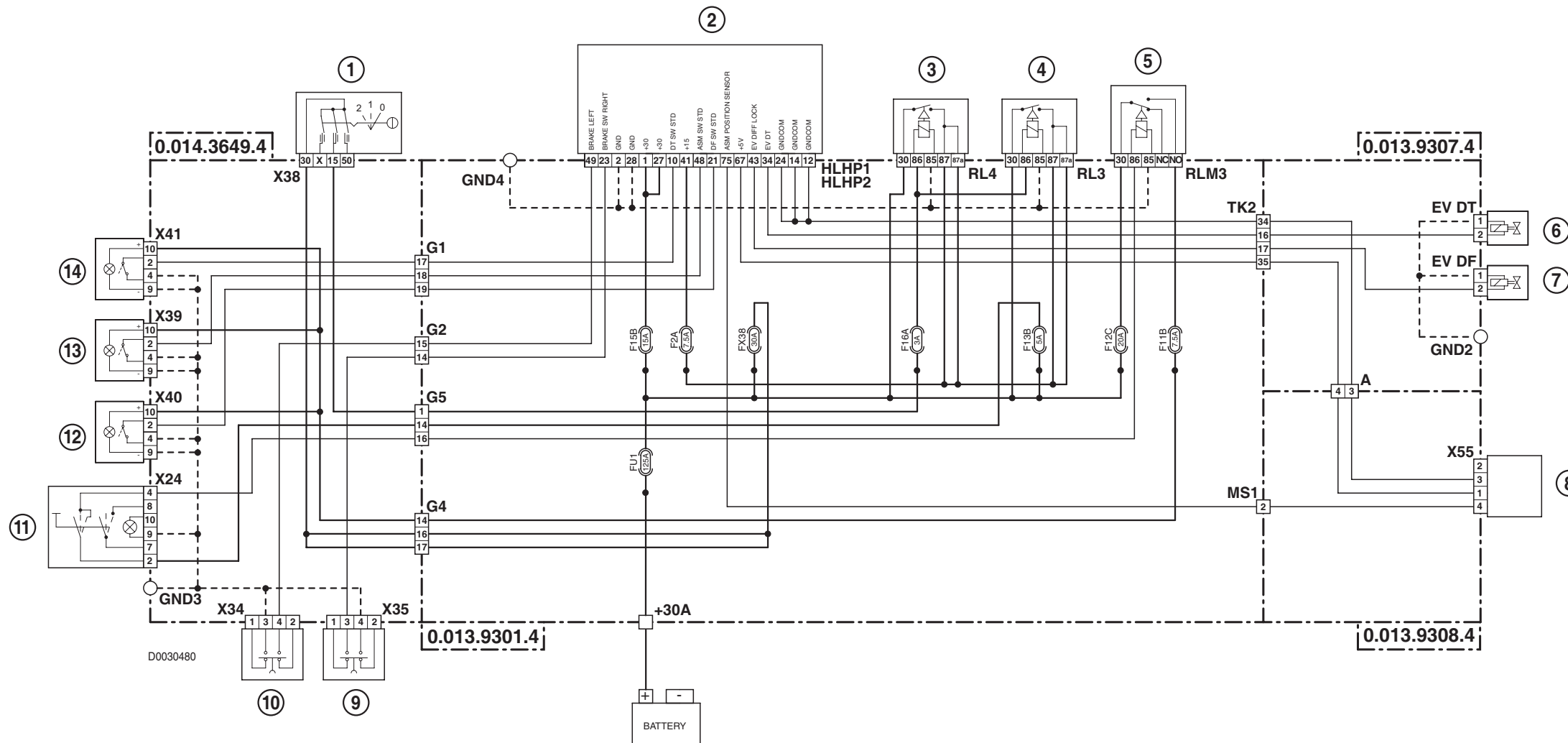
- 1 Front axle suspensions switch
- 2 Starter switch
- 3 Key positive supply relay
- 4 Key positive supply relay
- 5 Relay for sidelights
- 6 Front axle up control solenoid valve
- 7 Front axle down control solenoid valve
- 8 Front axle suspension position sensor
- 9 HLHP control unit
- 10 Sidelights switch

4.16 TRANSMISSION



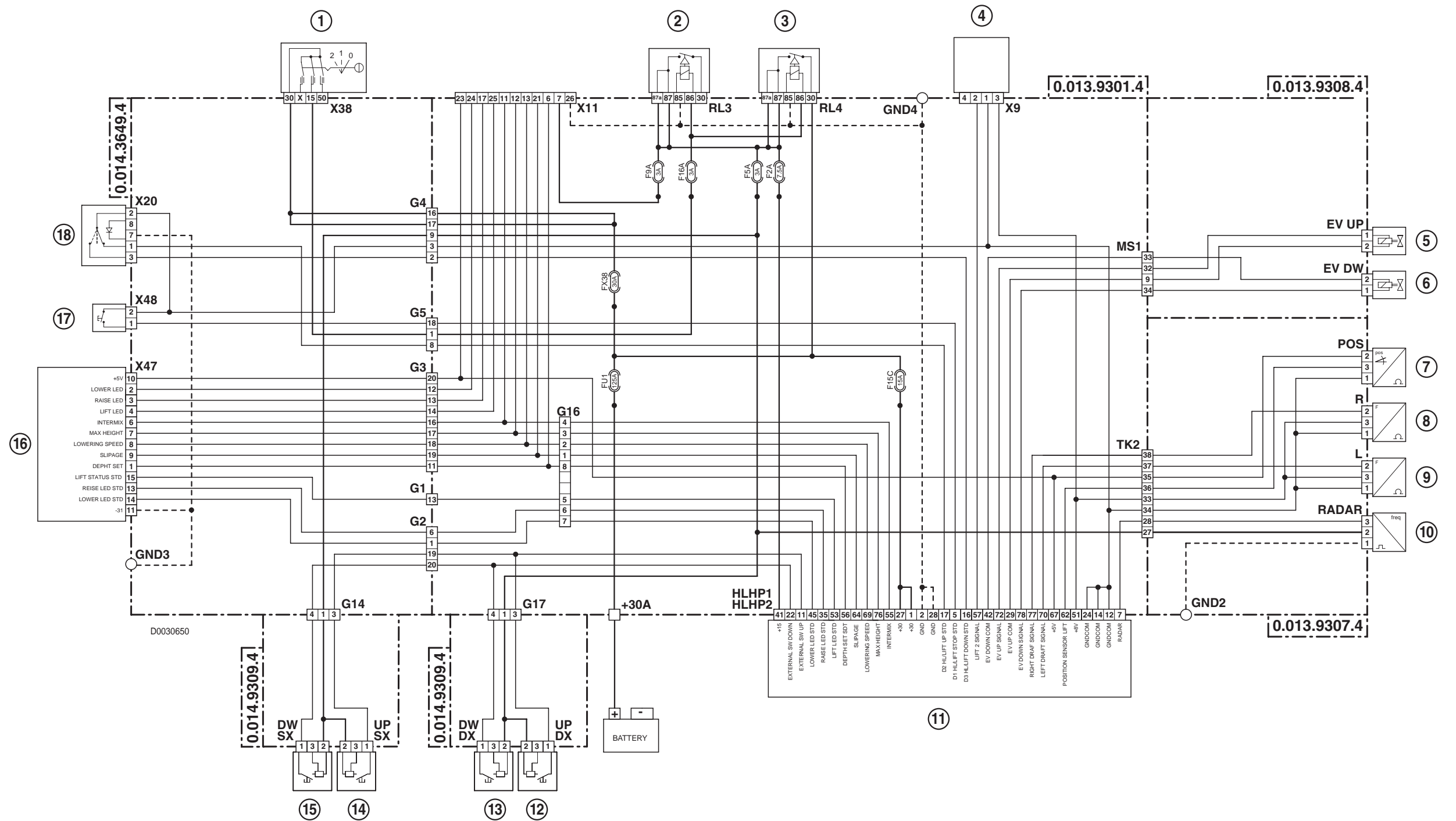
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|-----------------------------|--------------------------------------|---|--|
| 1 Shuttle control lever | 8 Field/road sensor | 15 Transmission oil low pressure switch | 22 Clutch pedal depressed proximity sensor |
| 2 Starter switch | 9 "FIELD" mode solenoid valve | 16 Clutch speed sensor | 23 Clutch pedal position sensor |
| 3 Key positive supply relay | 10 "ROAD" mode solenoid valve | 17 Transmission oil temperature sensor | 24 Sidelights switch |
| 4 Key positive supply relay | 11 Not utilised | 18 Gearbox in neutral locking solenoid valve | 25 Transmission display |
| 5 Relay for sidelights | 12 Gearbox output shaft speed sensor | 19 Main clutch proportional solenoid valve | 26 Gearbox control lever |
| 6 HLHP control unit | 13 Gearbox input shaft speed sensor | 20 Gear change solenoid valves (Y1, Y2, Y3, Y4) | |
| 7 Not utilised | 14 Wheel speed sensor | 21 Transmission control unit | |

4.17 ASM - FOUR-WHEEL DRIVE - DIFFERENTIAL



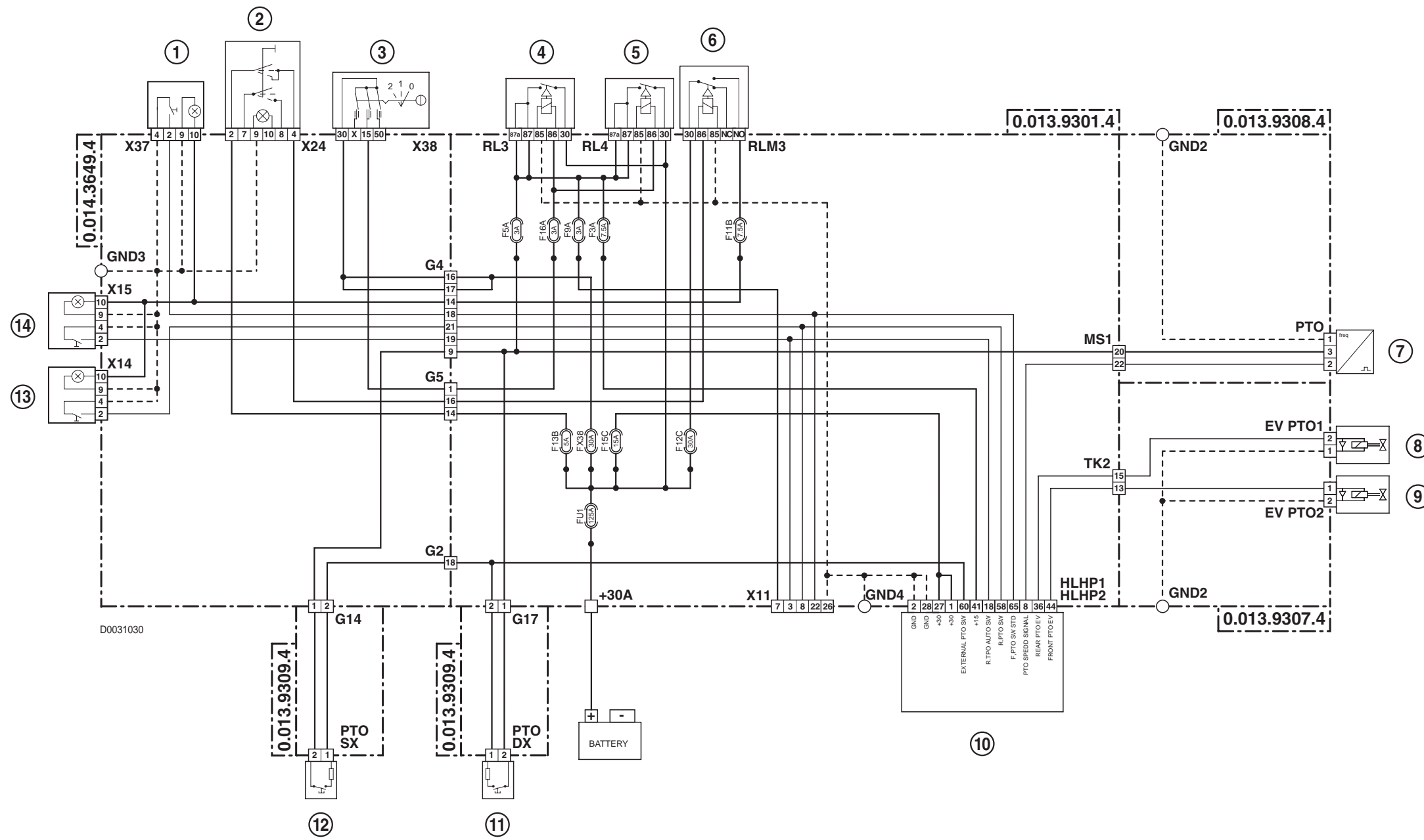
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|--|-----------------------------|
| 1 Starter switch | 9 Right brake pedal switch |
| 2 HLHP control unit | 10 Left brake pedal switch |
| 3 Key positive supply relay | 11 Sidelights switch |
| 4 Key positive supply relay | 12 Differential lock switch |
| 5 Relay for sidelights | 13 ASM switch |
| 6 Four wheel drive (4WD) clutch solenoid valve | 14 4WD engagement switch |
| 7 Differential lock control solenoid valve | |
| 8 Steering angle sensor | |

4.18 ELECTRONIC LIFT



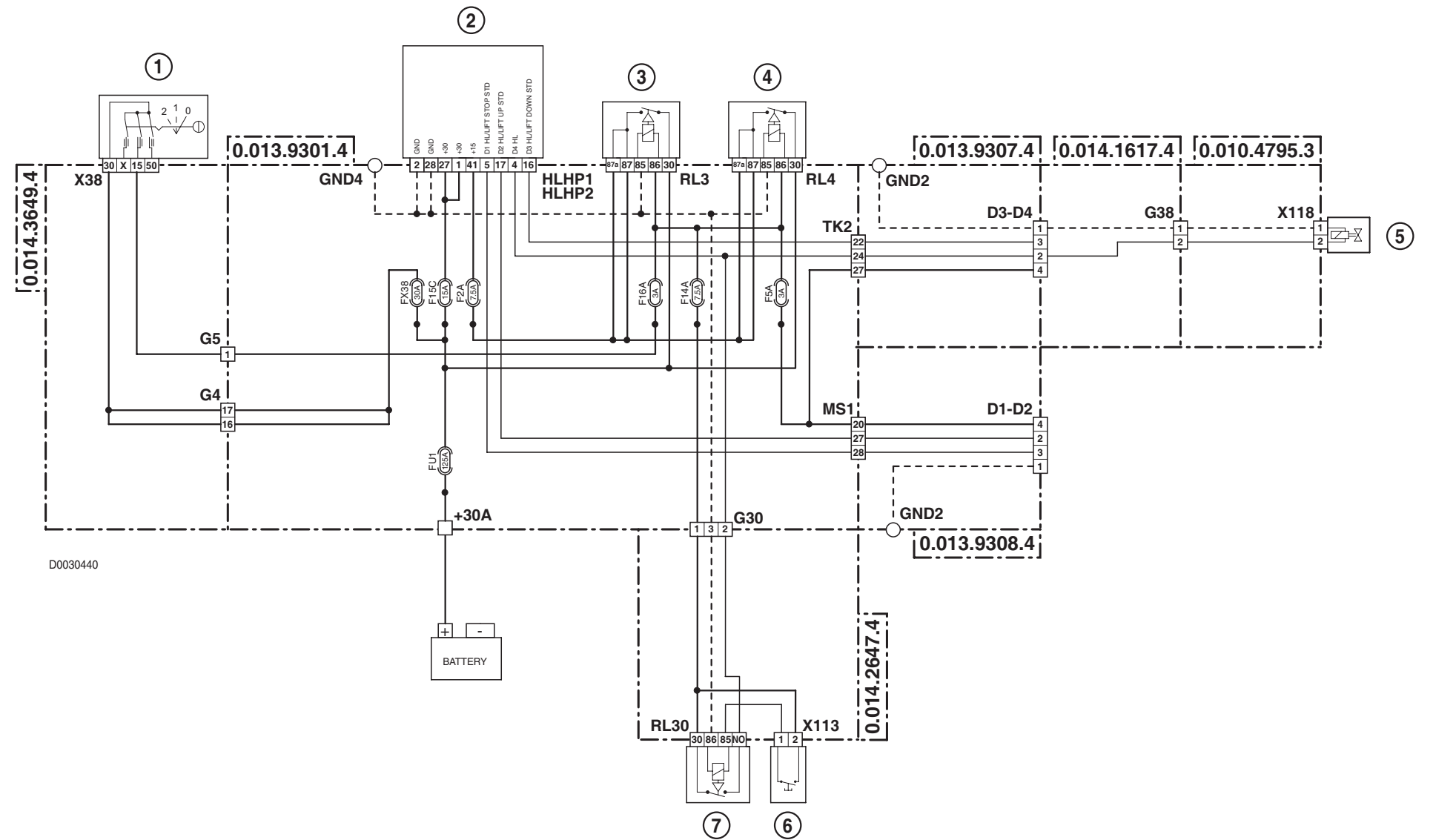
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|---|-----------------------------|------------------------------|
| 1 Starter switch | 8 Lift draft sensor (right) | 15 LH rear lift down button |
| 2 Key positive supply relay | 9 Lift draft sensor (left) | 16 Lift control console |
| 3 Key positive supply relay | 10 Radar | 17 Lift lock control switch |
| 4 ISO4 socket (Power for external implements) | 11 HLHP control unit | 18 Power lift control switch |
| 5 Lift Up solenoid valve | 12 RH rear lift up button | |
| 6 Lift Down solenoid valve | 13 RH rear lift down button | |
| 7 Rear lift position sensor | 14 LH rear lift up button | |

4.19 FRONT AND REAR PTO



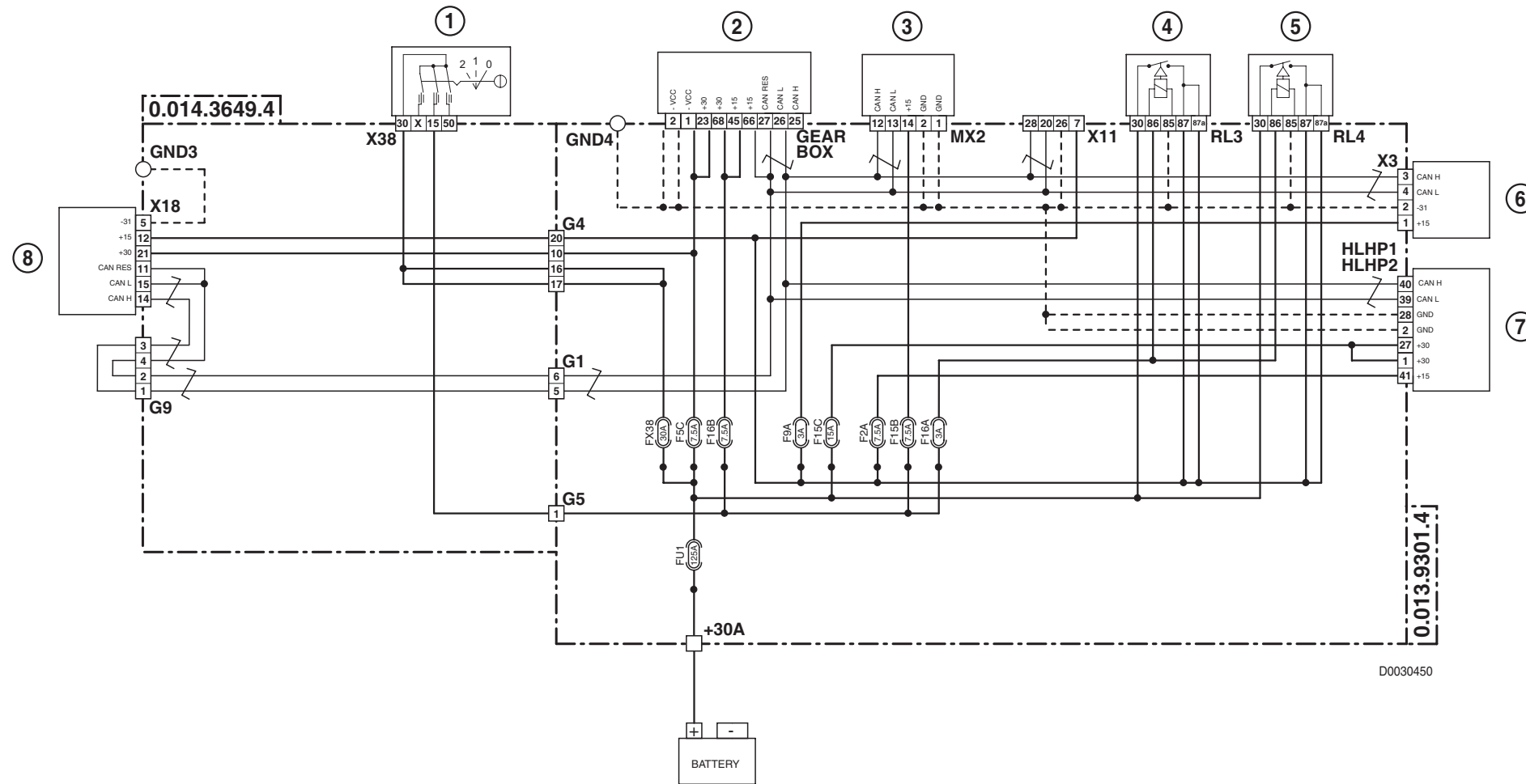
- | | |
|---------------------------------------|-------------------------------------|
| 1 Front PTO engagement switch | 10 HLHP control unit |
| 2 Sidelights switch | 11 RH rear PTO button (on mudguard) |
| 3 Starter switch | 12 LH rear PTO button (on mudguard) |
| 4 Key positive supply relay | 13 Rear PTO engagement switch |
| 5 Key positive supply relay | 14 AUTO PTO engagement switch |
| 6 Relay for sidelights | |
| 7 Rear PTO speed sensor | |
| 8 Front PTO engagement solenoid valve | |
| 9 Rear PTO engagement solenoid valve | |

4.20 CONTROL VALVES



- 1 Starter switch
- 2 HLHP control unit
- 3 Key positive supply relay
- 4 Key positive supply relay
- 5 Front connection mechanism solenoid valve
- 6 Front mechanism solenoid valve control button
- 7 Front mechanism solenoid valve supply relay

4.21 CAN BUS

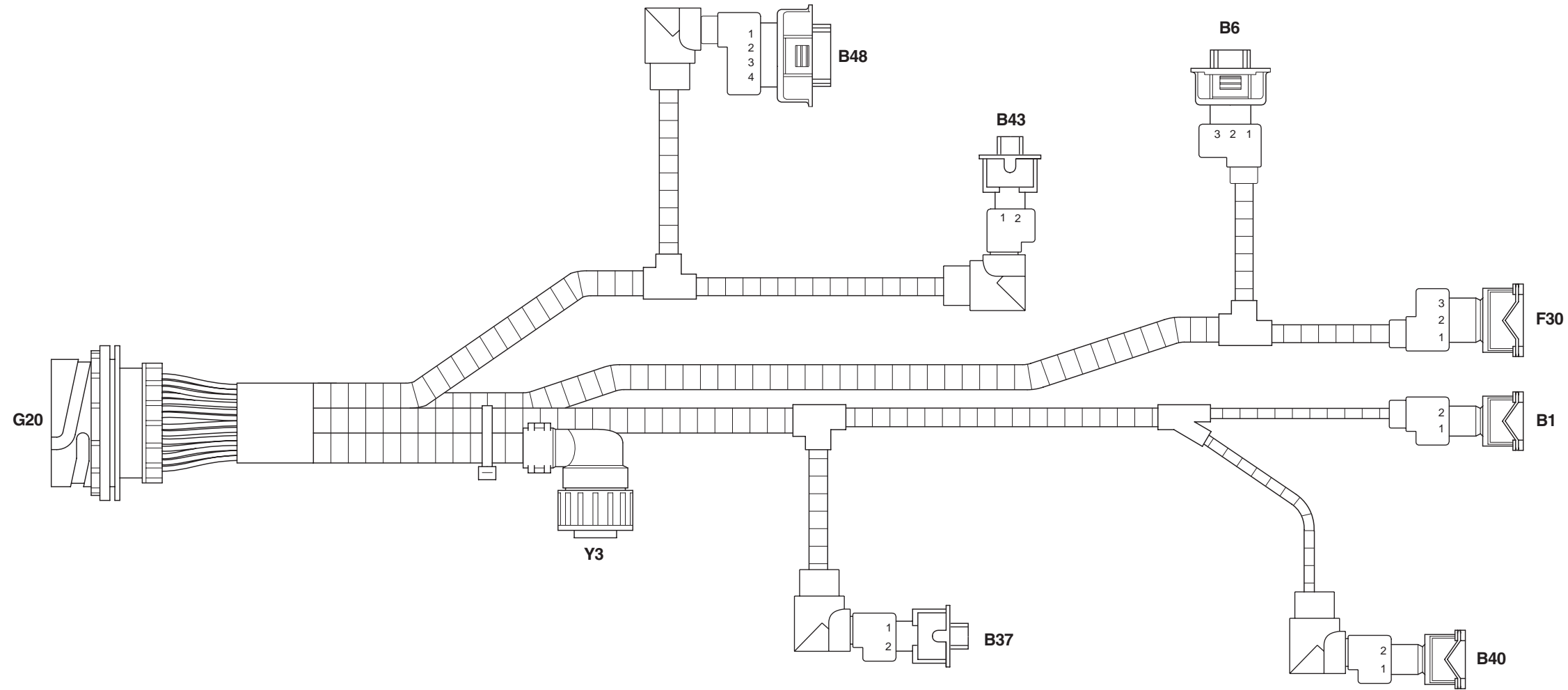


- 1 Starter switch
- 2 Transmission control unit
- 3 Engine control unit
- 4 Key positive supply relay
- 5 Key positive supply relay
- 6 Supplementary CANBUS socket
- 7 HLHP control unit
- 8 Infocenter

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5. WIRING

ENGINE WIRING (4 CYLINDERS) (1/2)



D0029980

B1	Not utilised
B6	Not utilised
B37	Fuel temperature sensor
B40	Camshaft speed sensor
B43	Coolant temperature sensor
B48	Engine turbocharging sensor
F30	Not utilised
G20	To engine wiring
Y3	Actuator

ENGINE WIRING (4 CYLINDERS) (2/2)

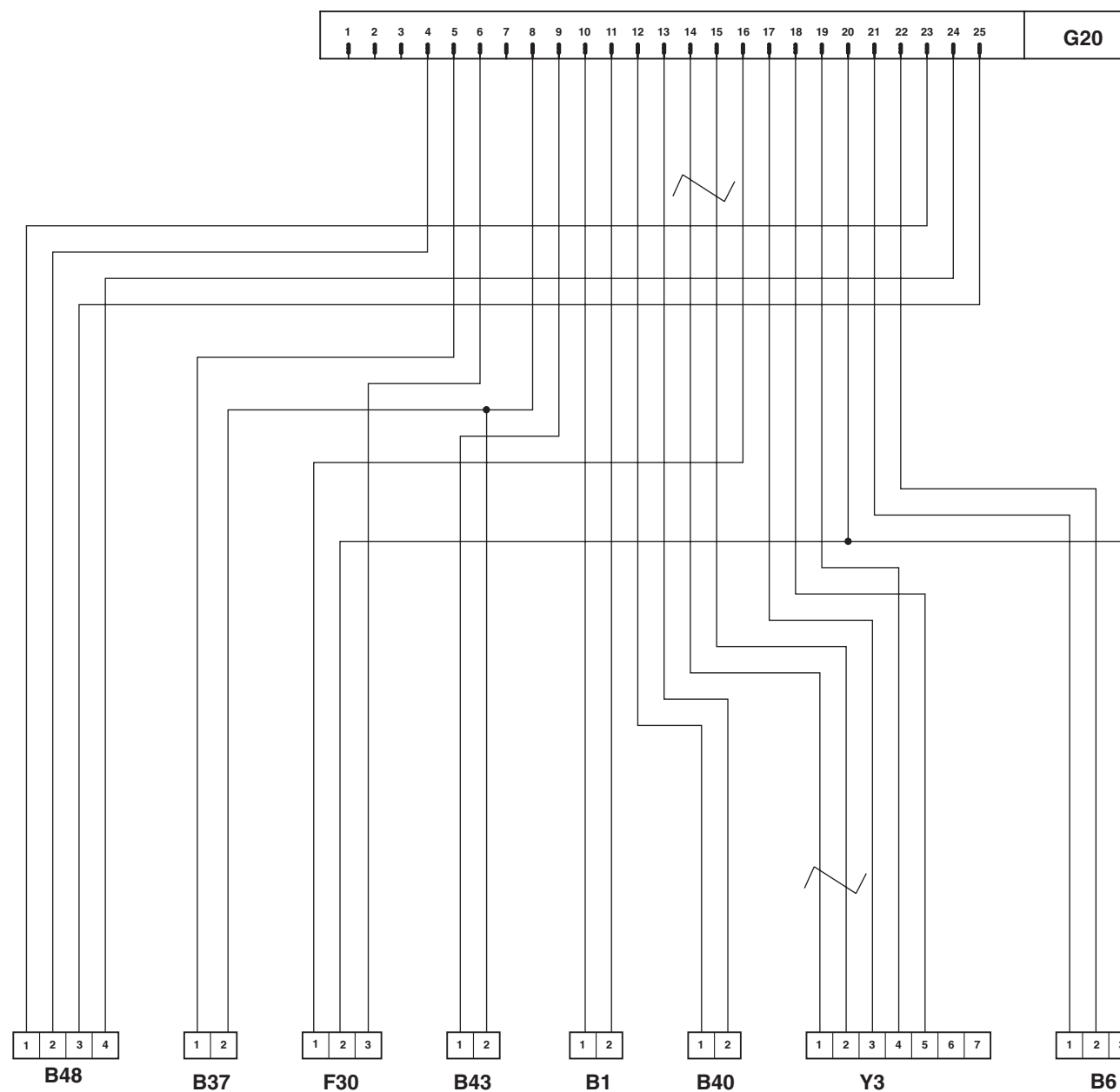
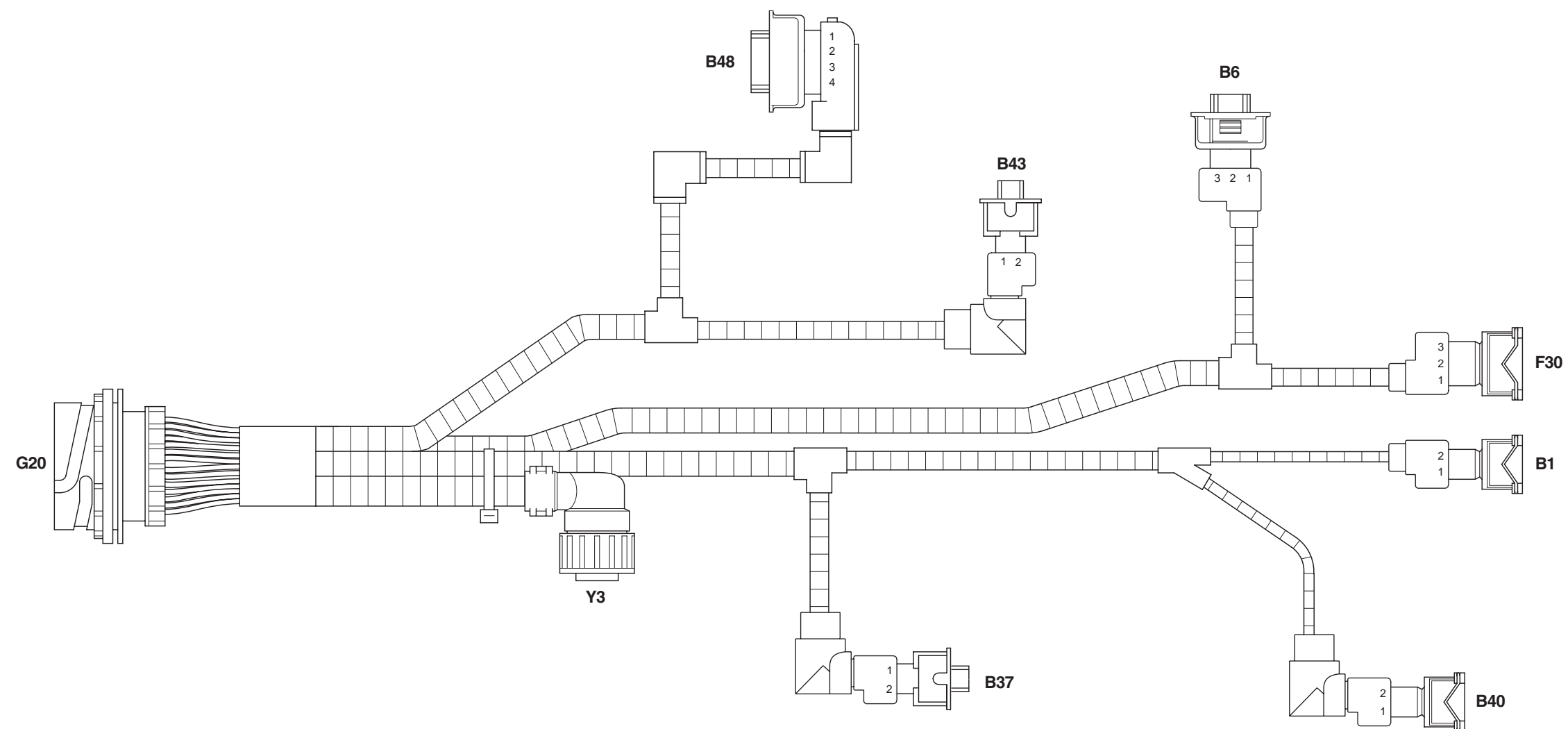


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M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030000

ENGINE WIRING (6 CYLINDERS) (1/2)



- B1** Not utilised
- B6** Not utilised
- B37** Fuel temperature sensor
- B40** Camshaft speed sensor
- B43** Coolant temperature sensor
- B48** Engine turbocharging sensor
- G20** To engine wiring
- F30** Not utilised
- Y3** Actuator

ENGINE WIRING (6 CYLINDERS) (2/2)

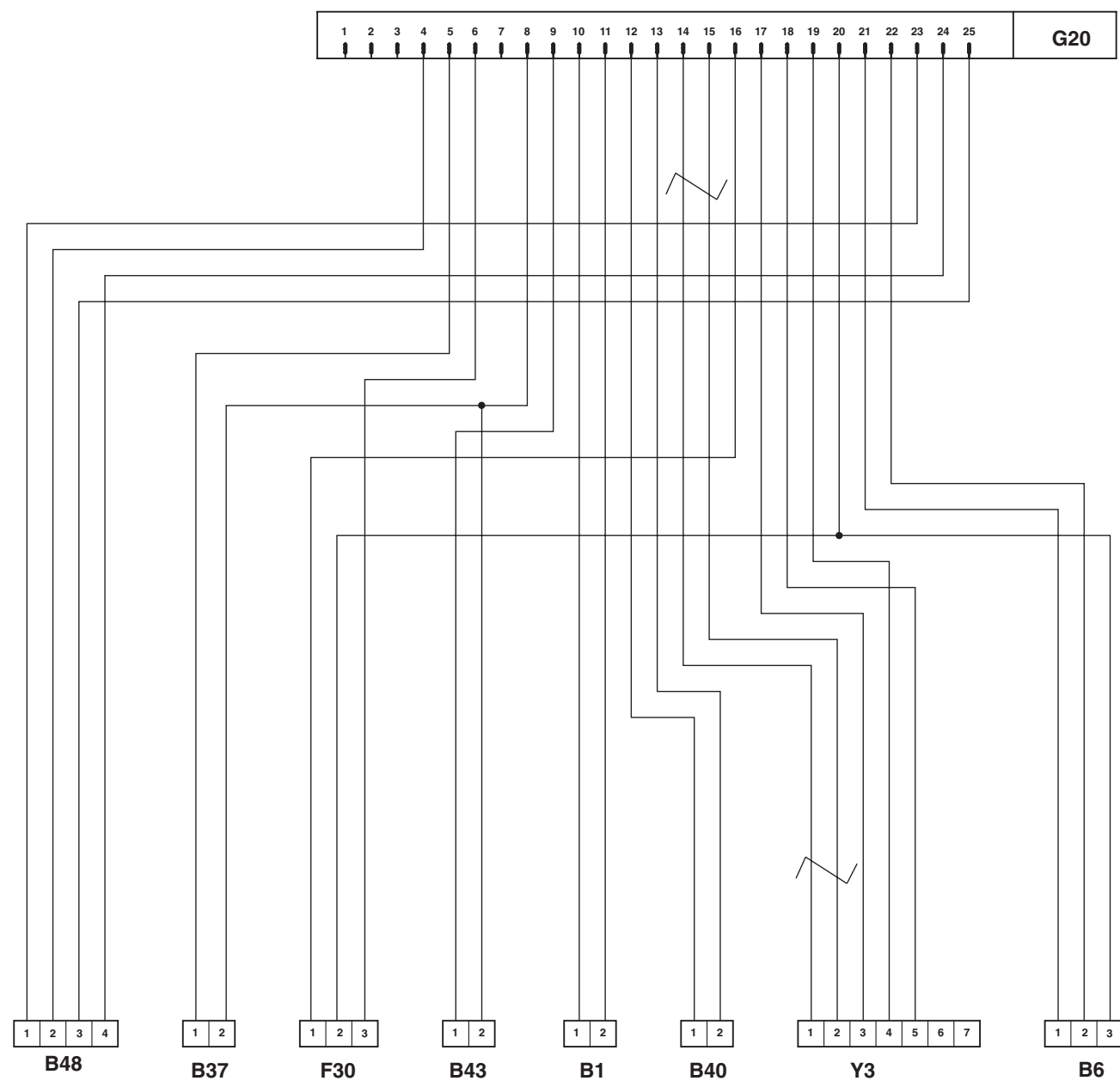
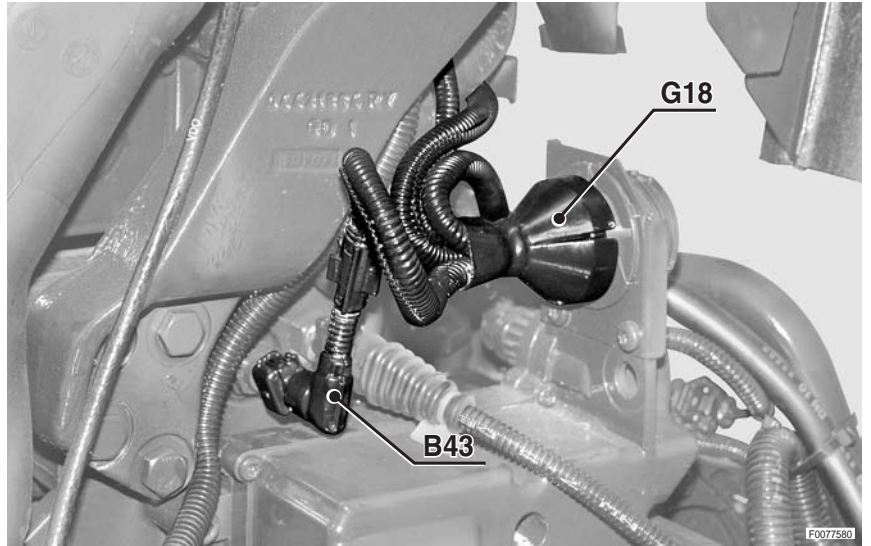


TABELLA COLORI / COLOURS TABLE			
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Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

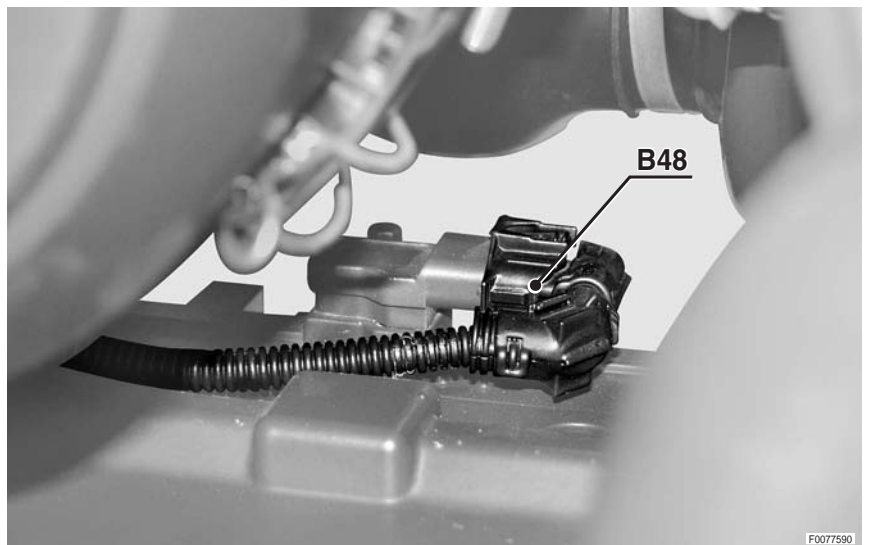
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CONNECTORS LOCATION

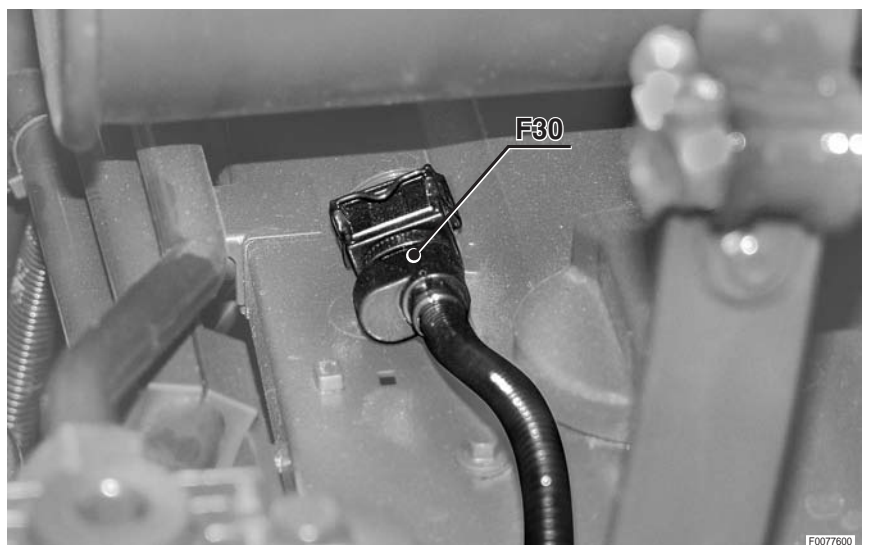
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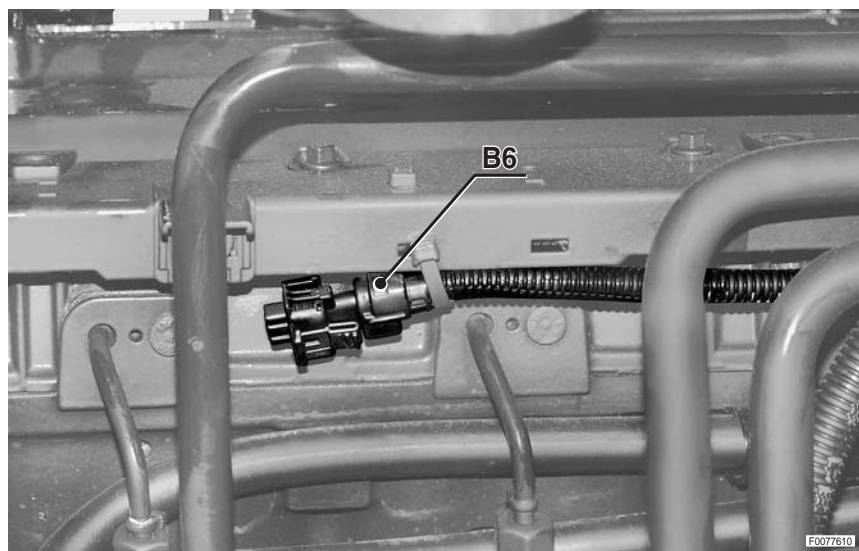
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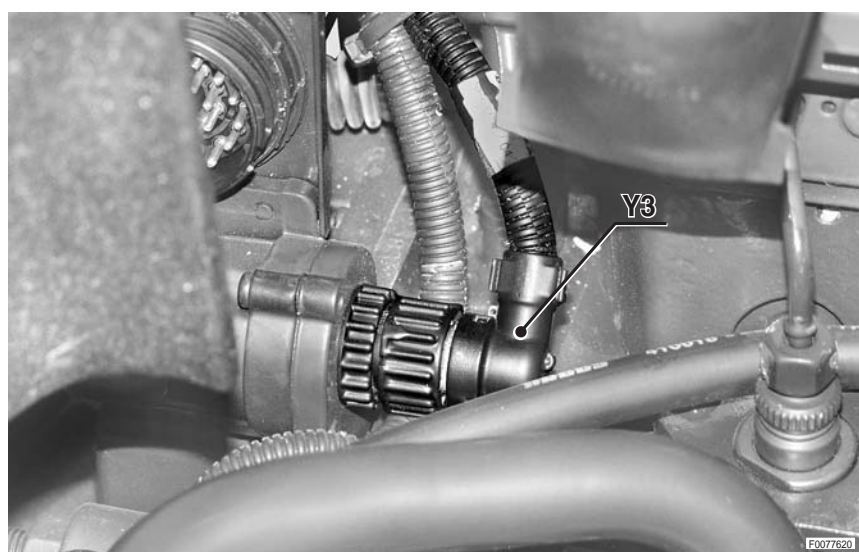
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**ENGINE WIRING (4 CYLINDERS) -
ENGINE WIRING (6 CYLINDERS)**

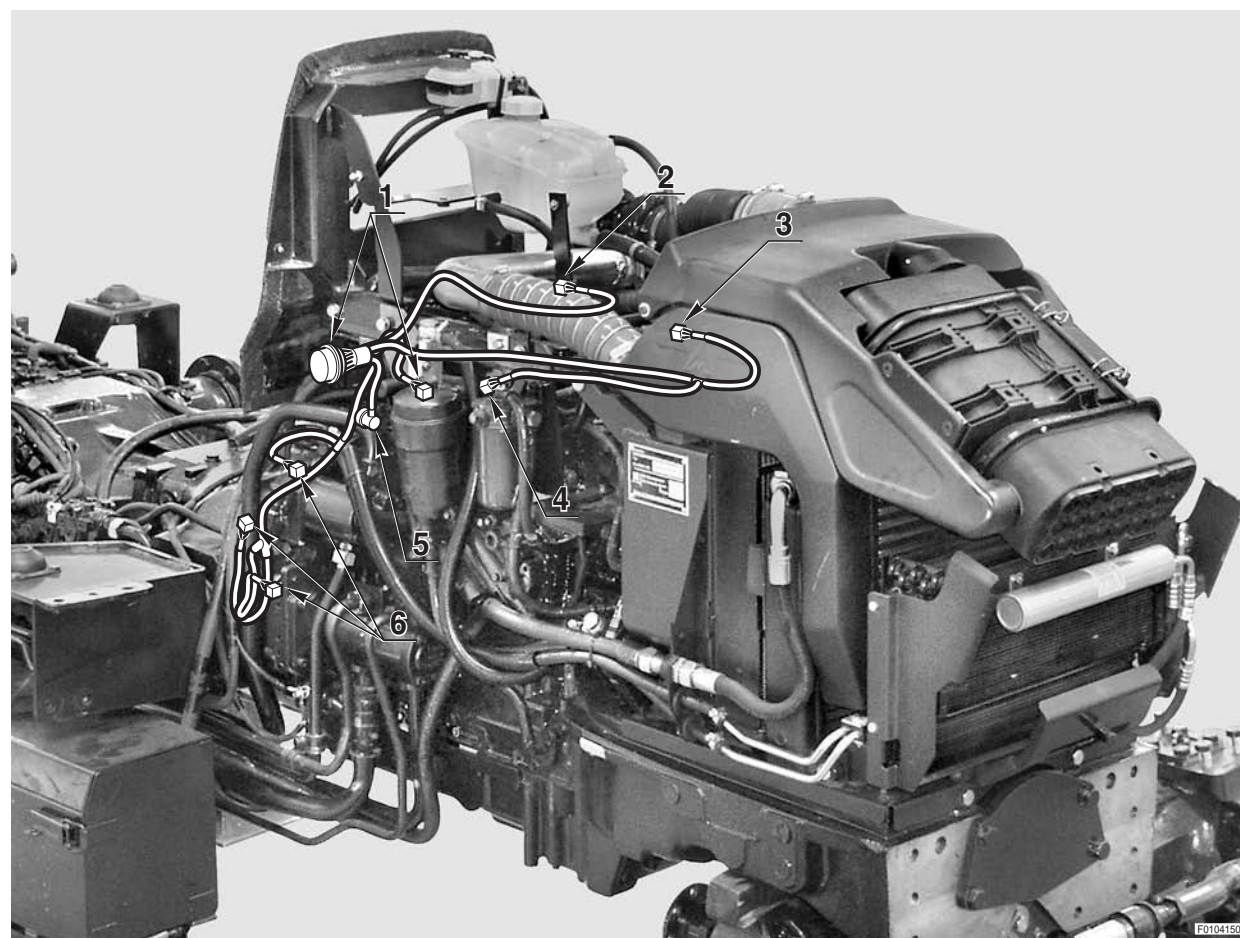
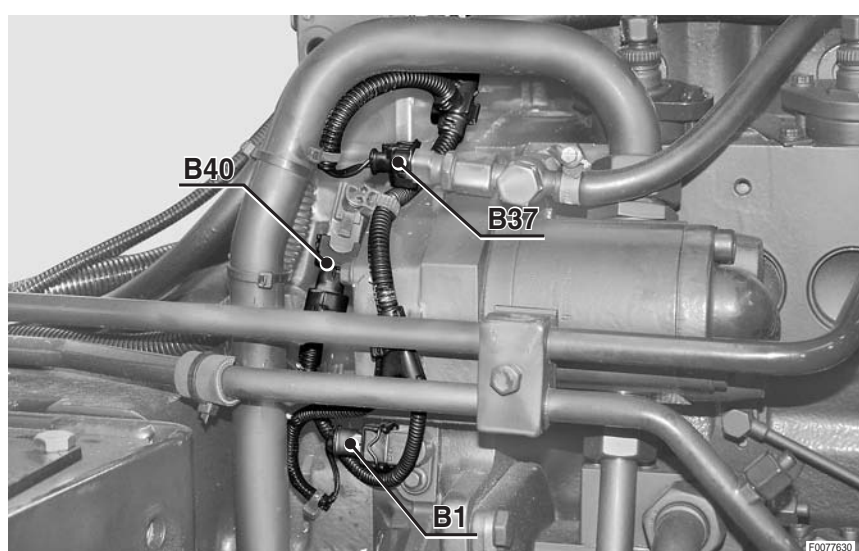
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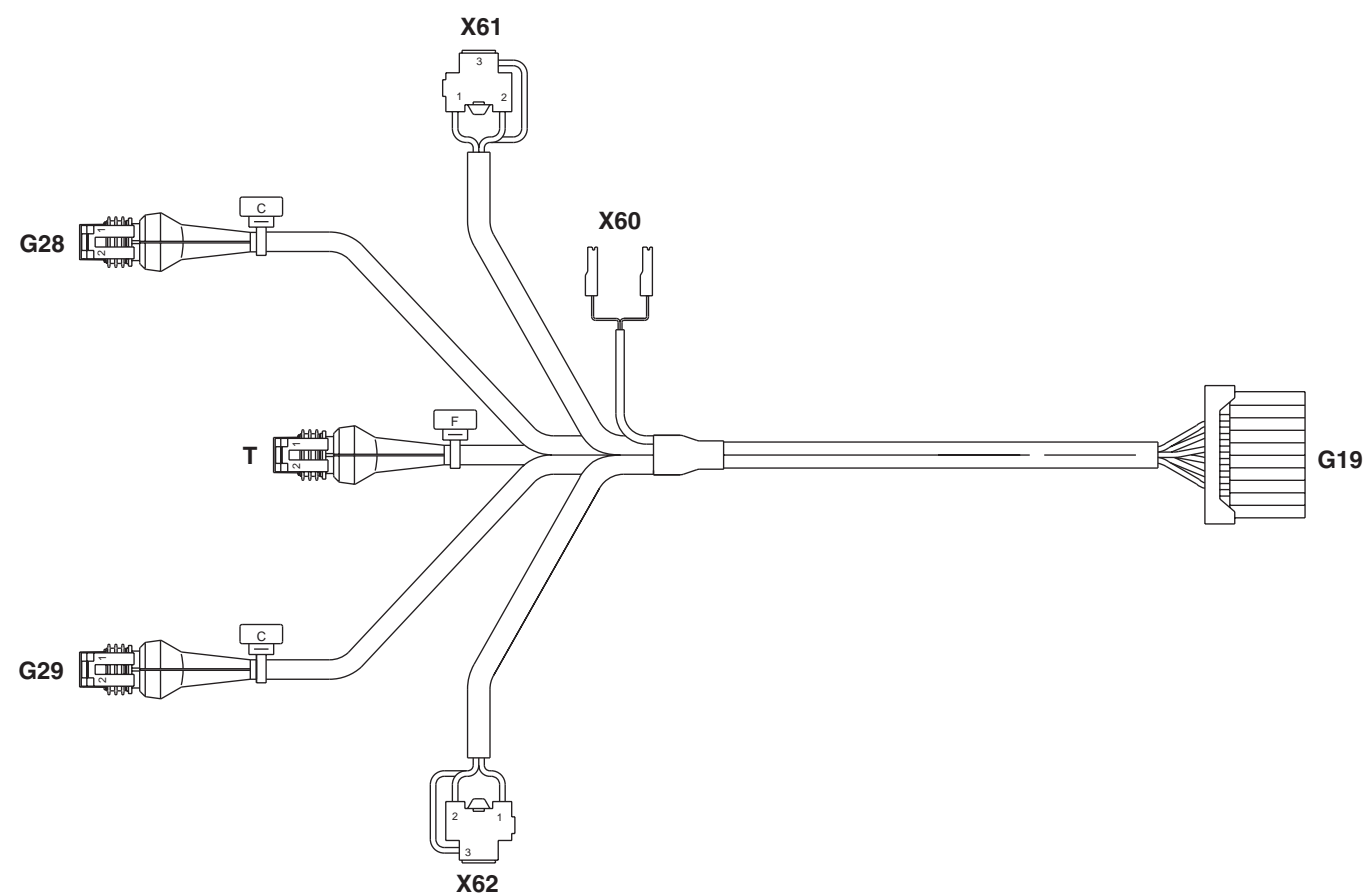
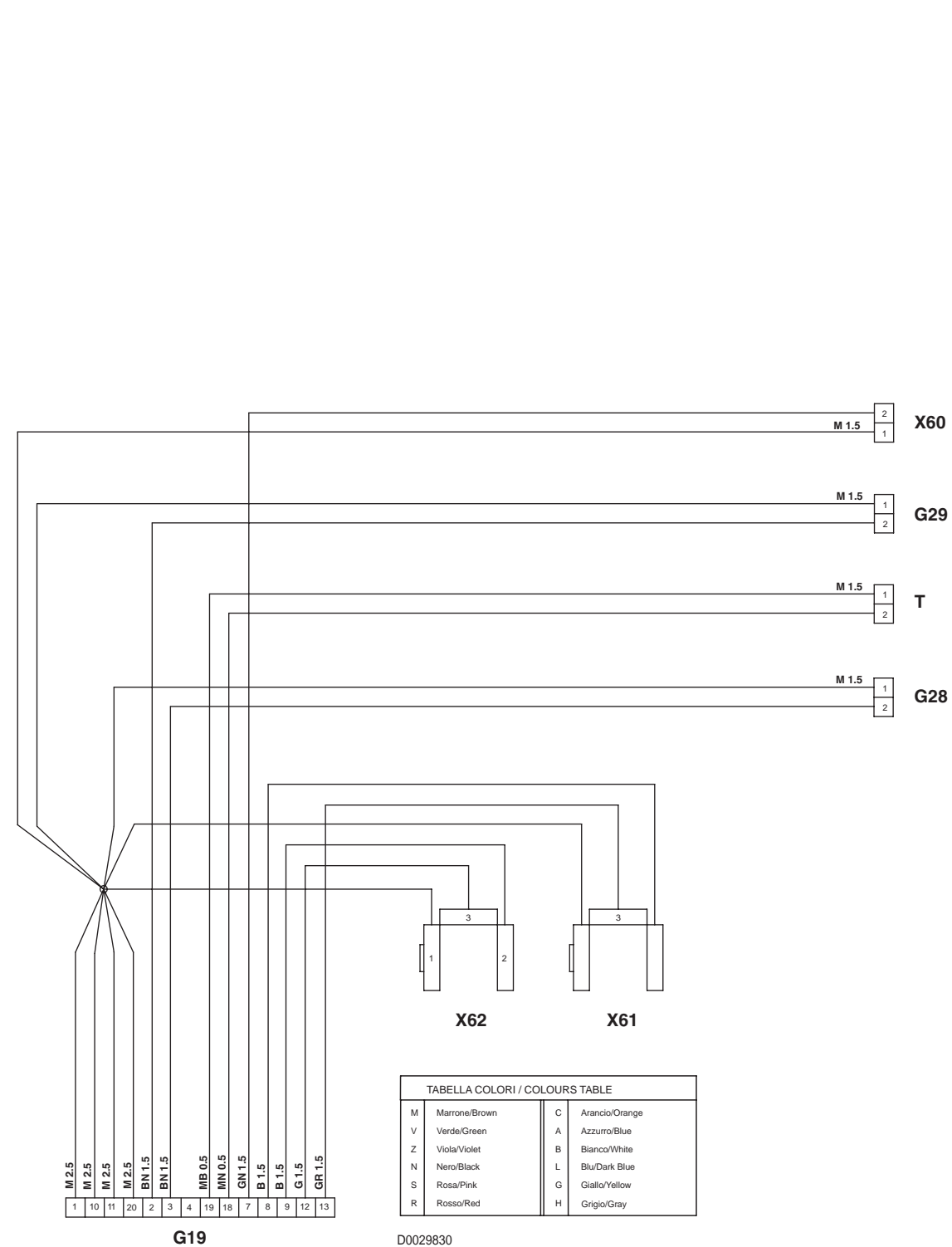
6



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ENGINE BONNET WIRING



- G19** To left-hand transmission wiring
- G28** To front worklights wiring
- G29** To front worklights wiring
- T** Not utilised
- X60** Horn
- X61** Left headlamp
- X62** Right headlamp

FRONT WORKLIGHTS WIRING

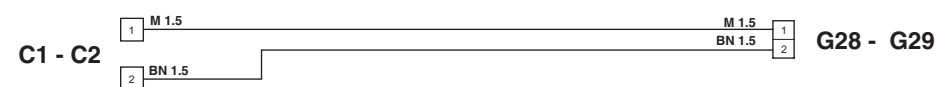
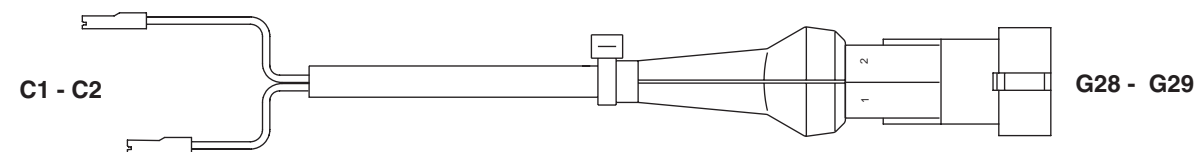


TABELLA COLORI / COLOURS TABLE

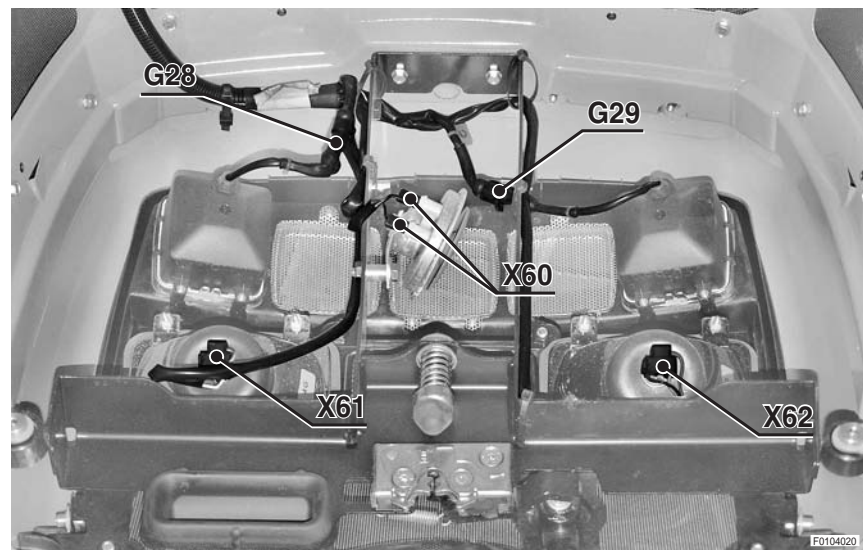
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V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030070

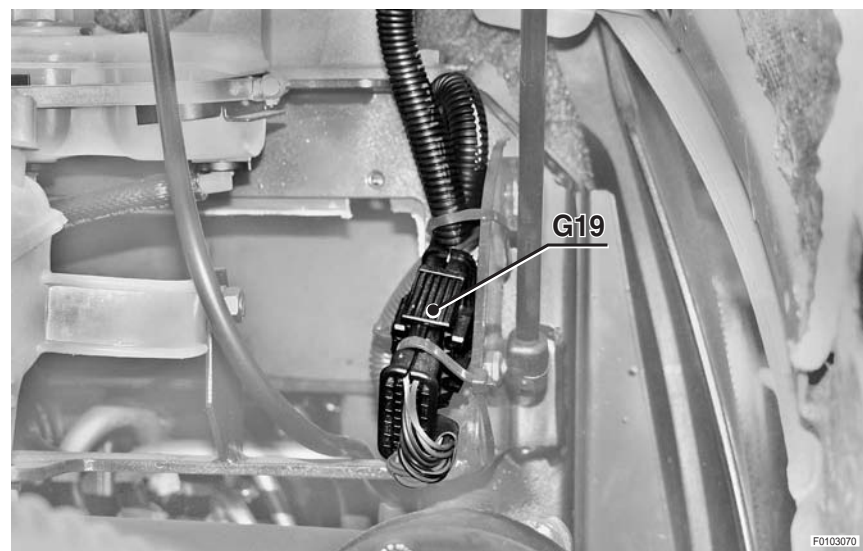
- C1** Front LH outer worklight
- C2** Front RH outer worklight
- G28** To engine bonnet wiring
- G29** To engine bonnet wiring

CONNECTORS LOCATION

1



2

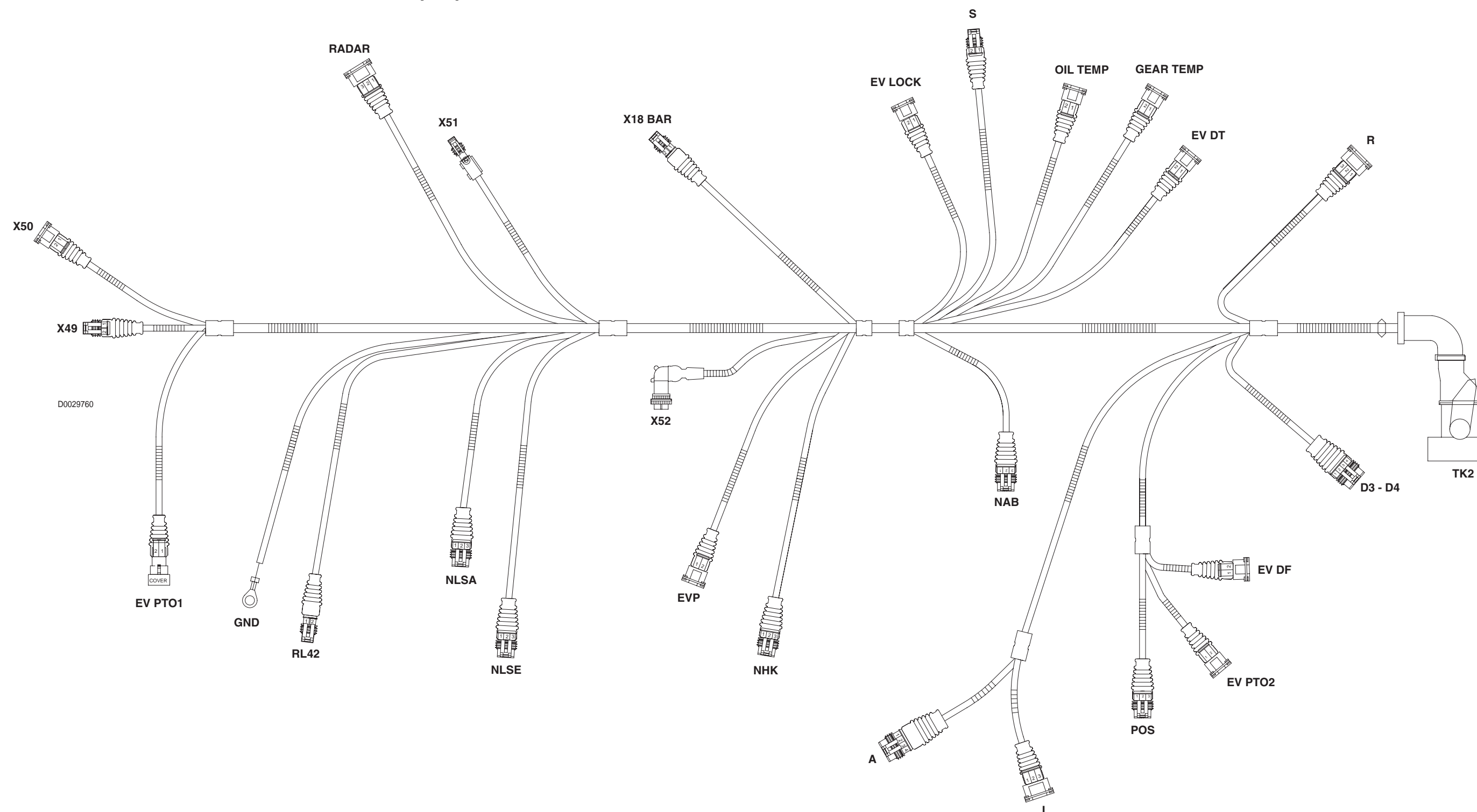


ENGINE BONNET WIRING - FRONT WORKLIGHTS WIRING



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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 in 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 Pre-heating relay
S Start enable switch (Green)
TK2 To central wiring
X49 Air cleaner clogged sensor
X50 Engine oil pressure switch
X51 Steering system pressure switch
X52 Gear change solenoid valves (Y1, Y2, Y3, Y4)

RIGHT-HAND TRANSMISSION WIRING (2/2)

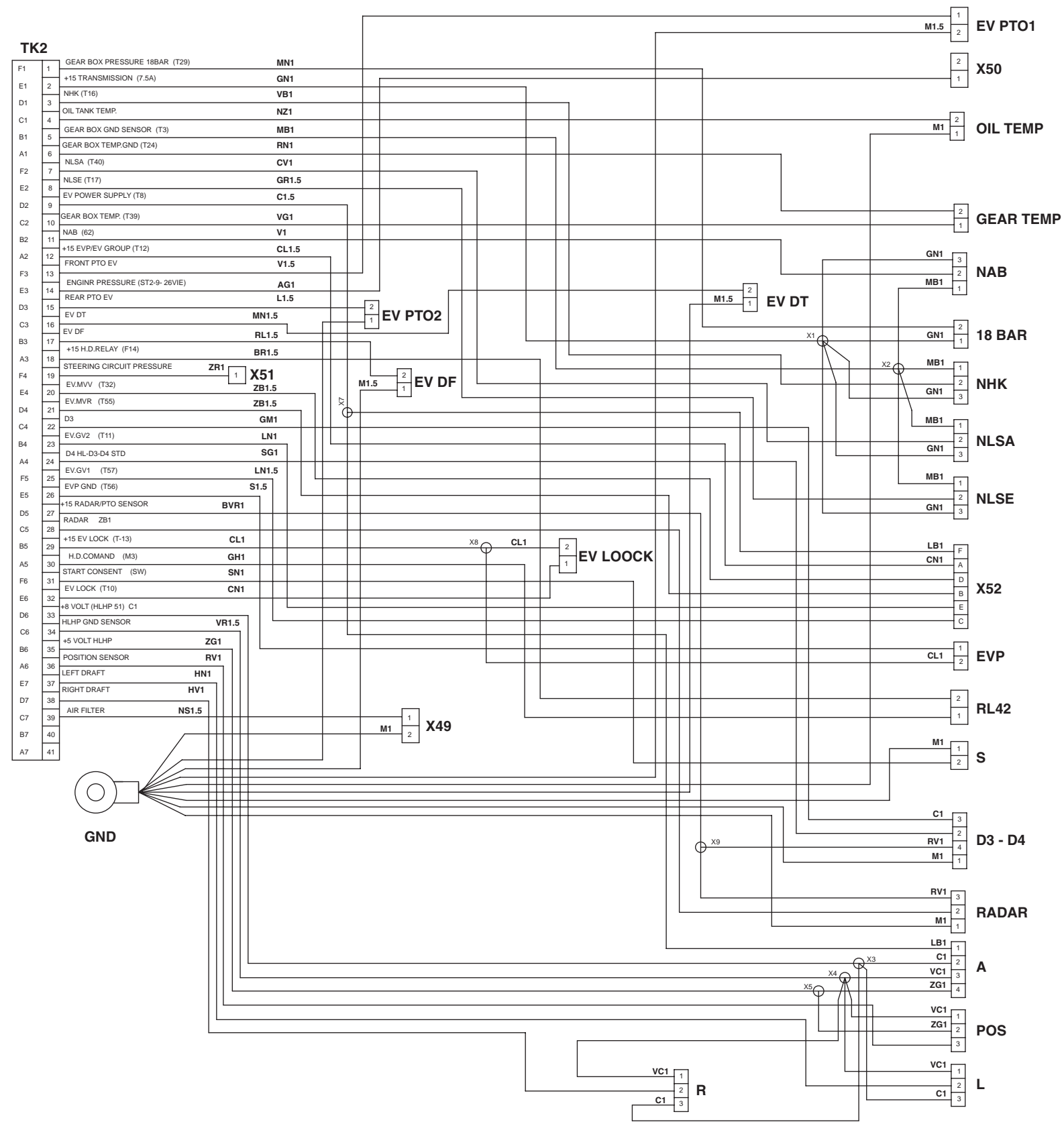
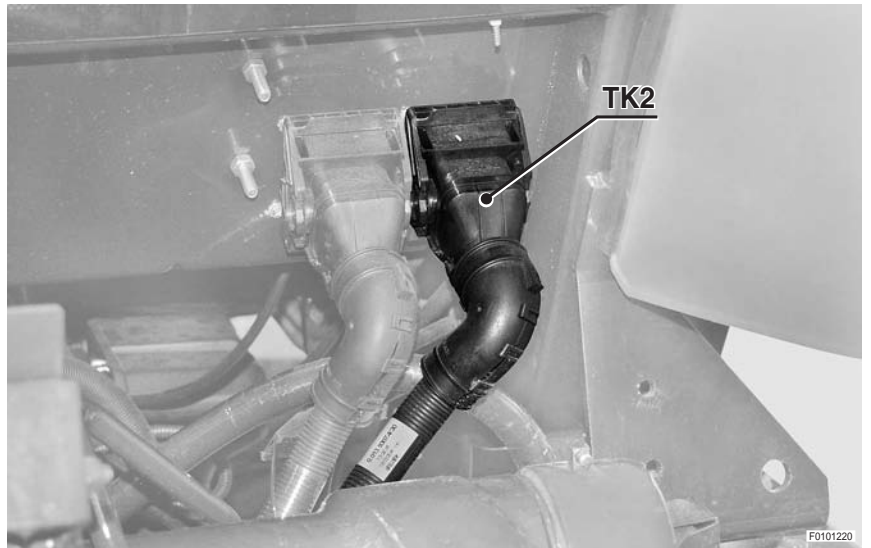


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V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029770

CONNECTORS LOCATION

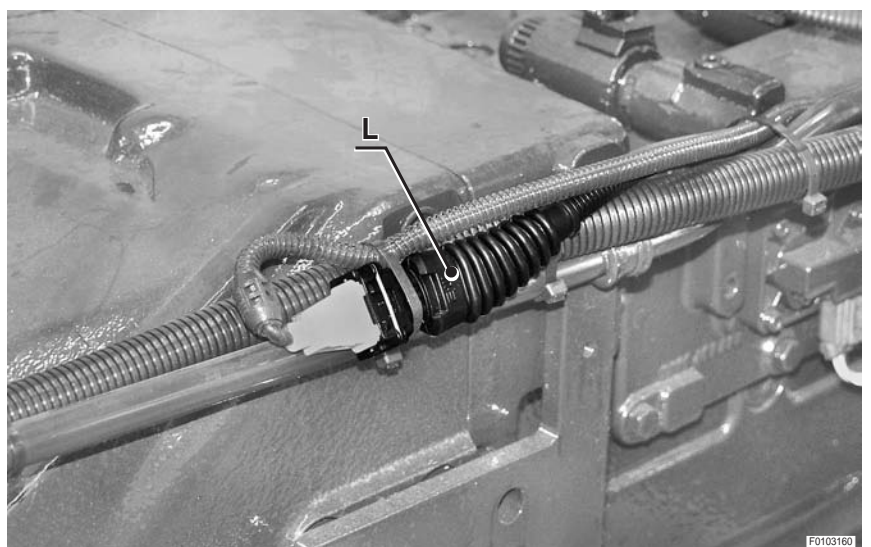
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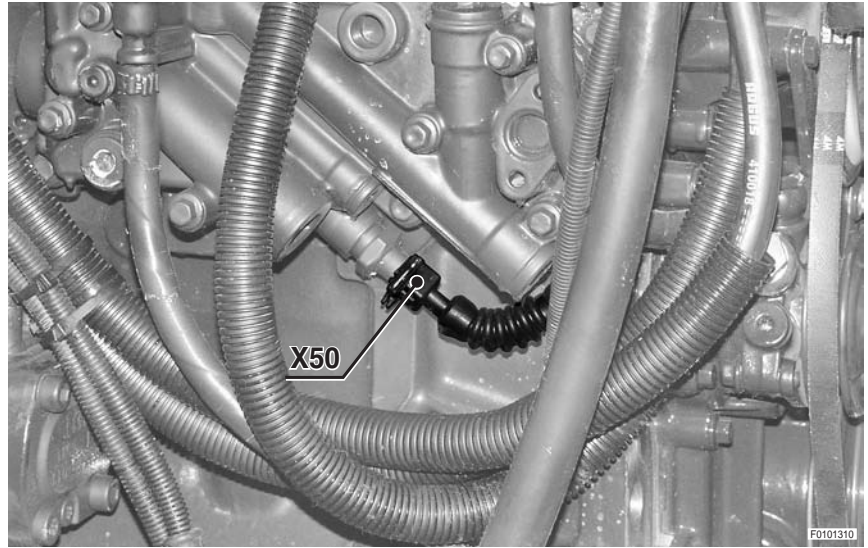
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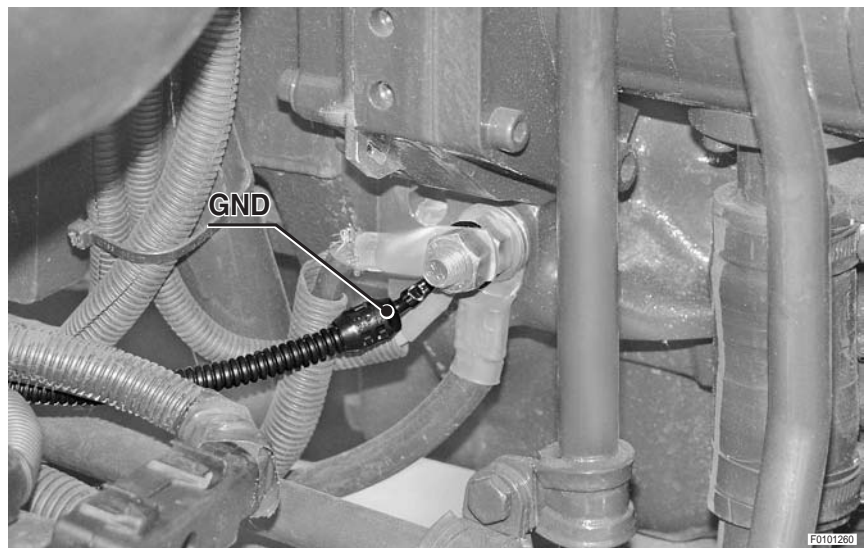
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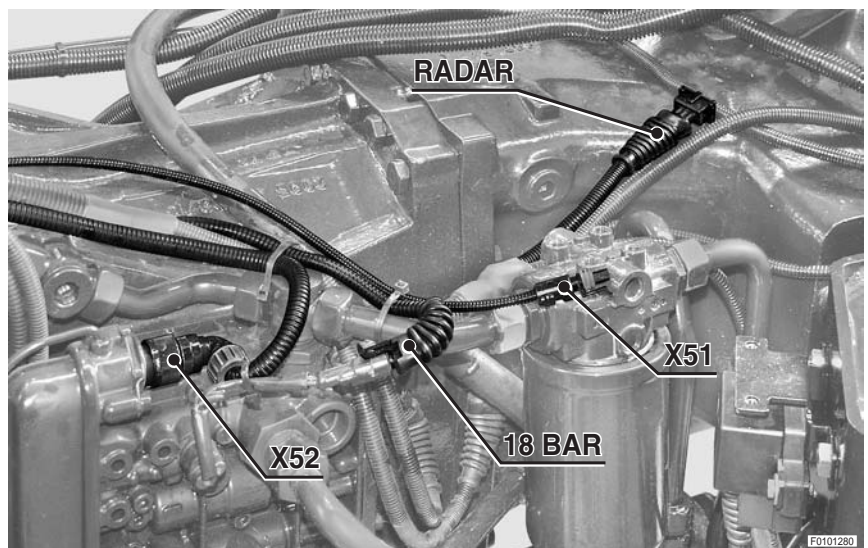
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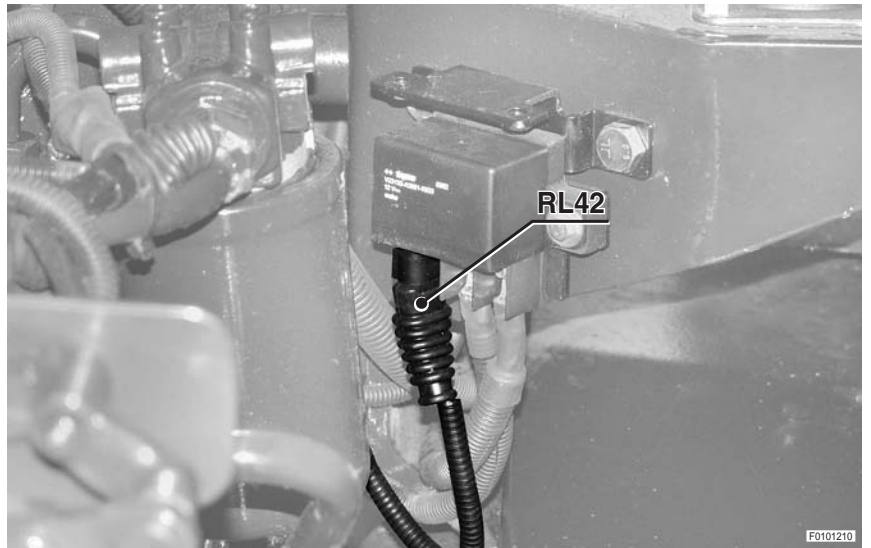
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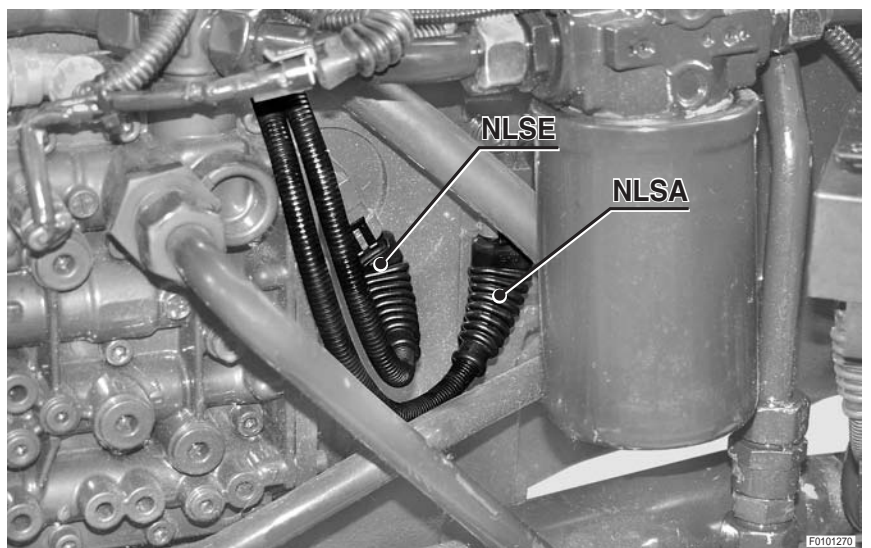
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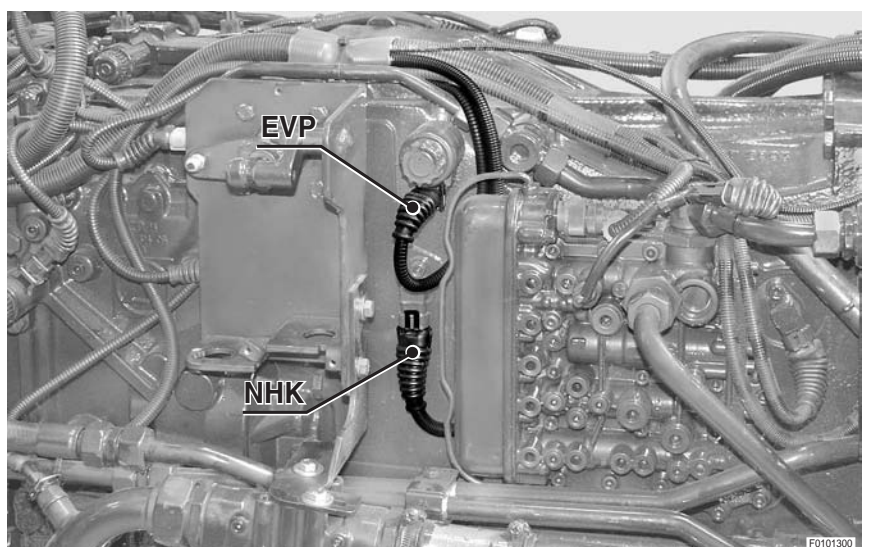
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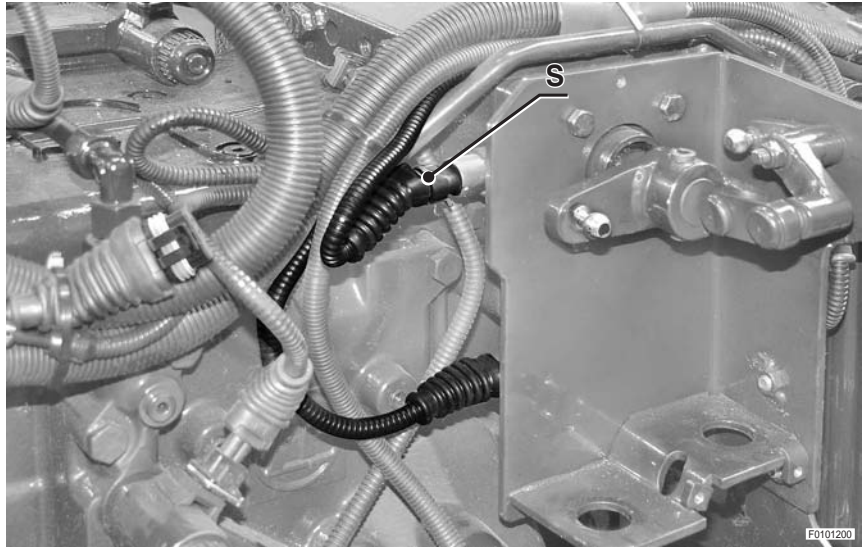
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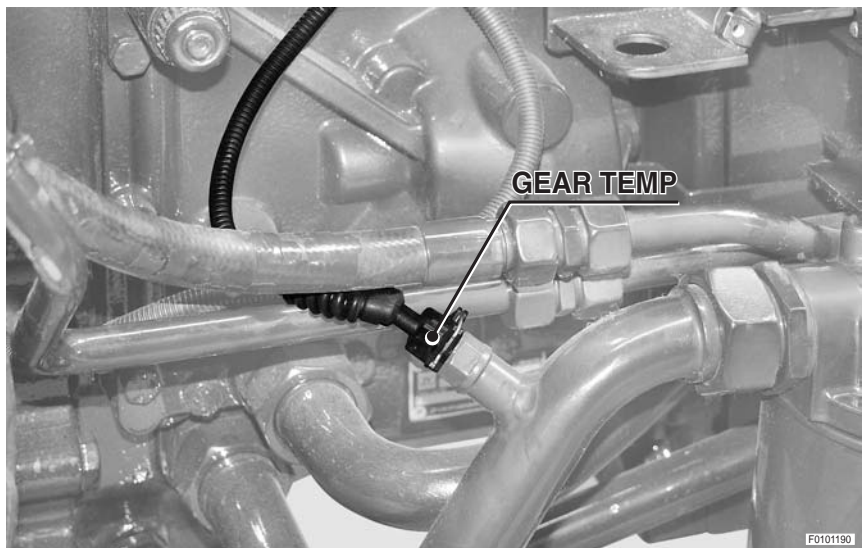


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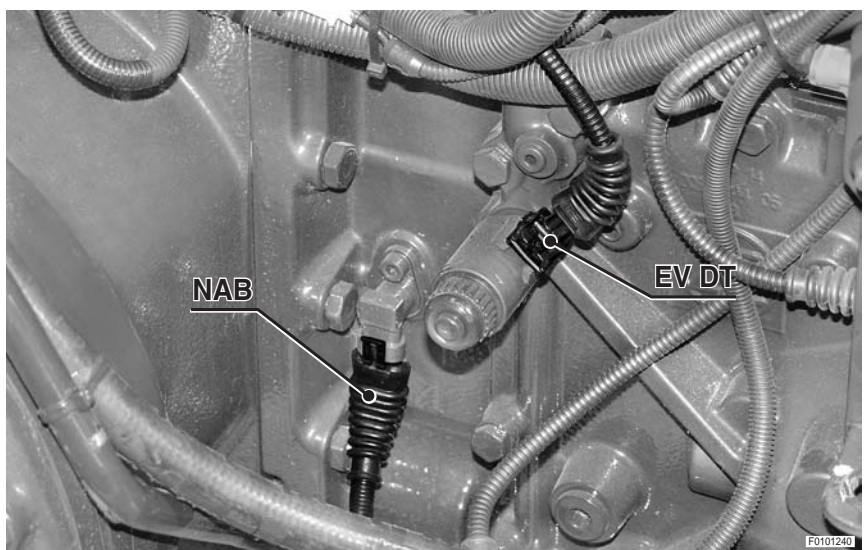
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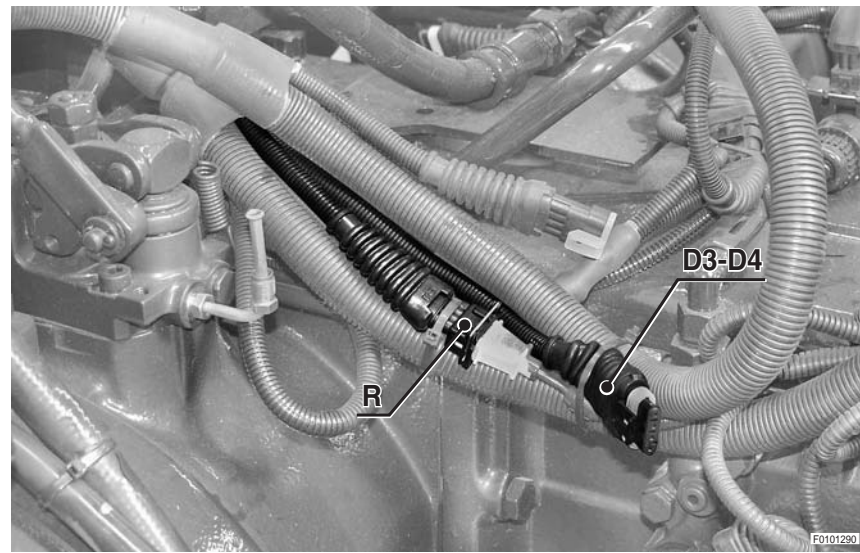
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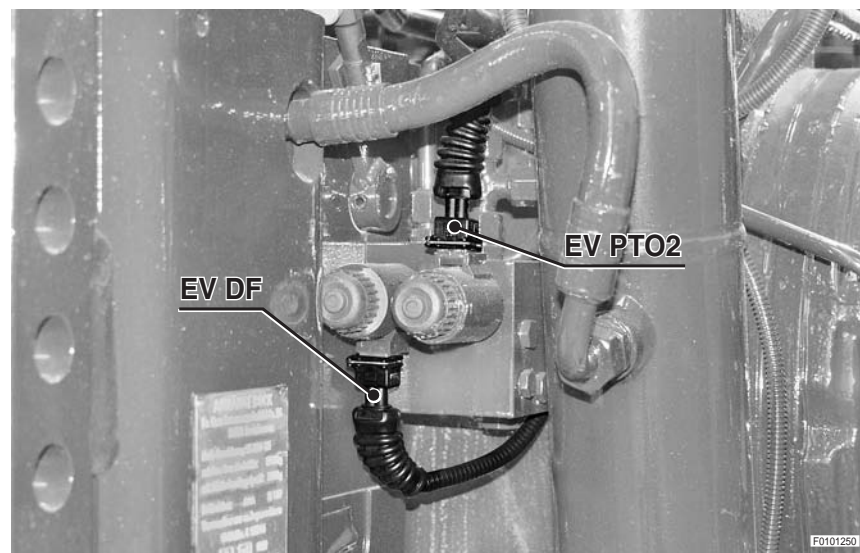


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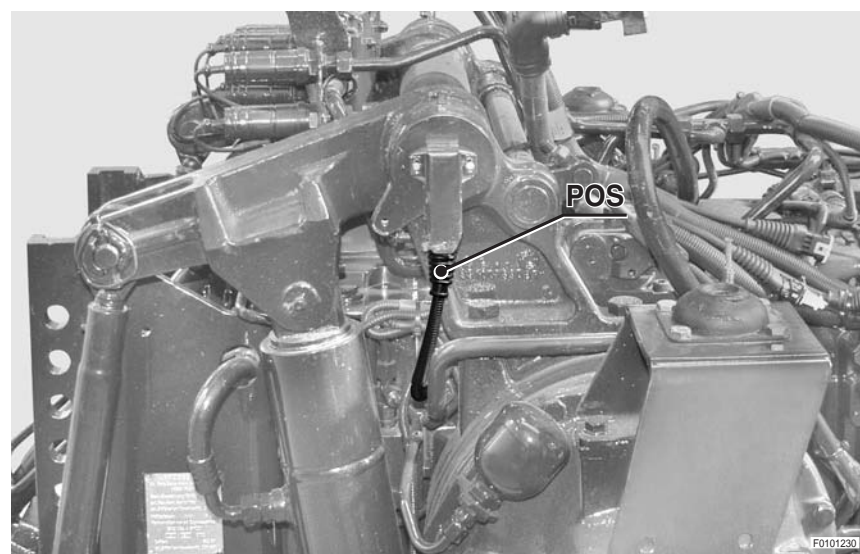
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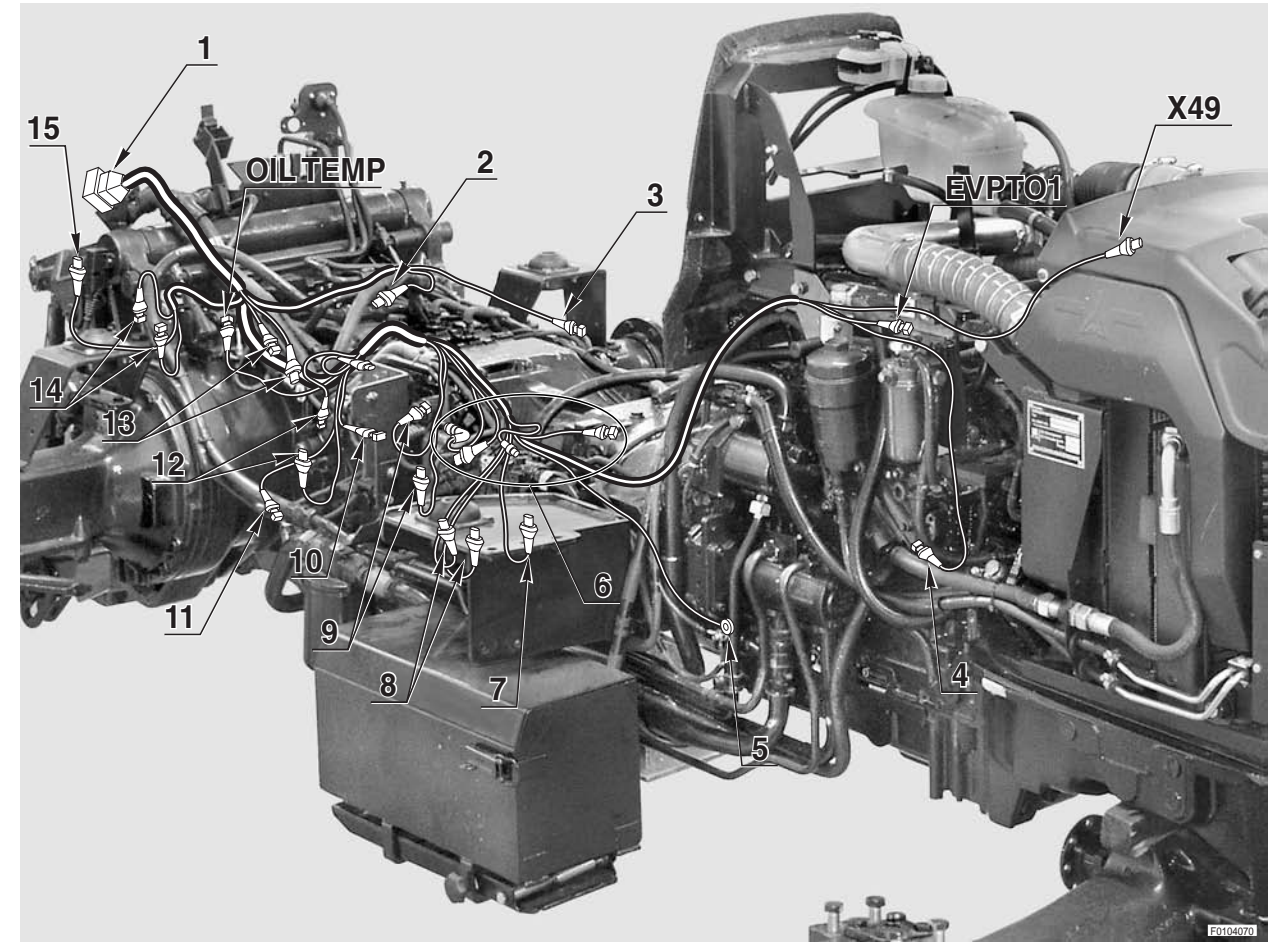
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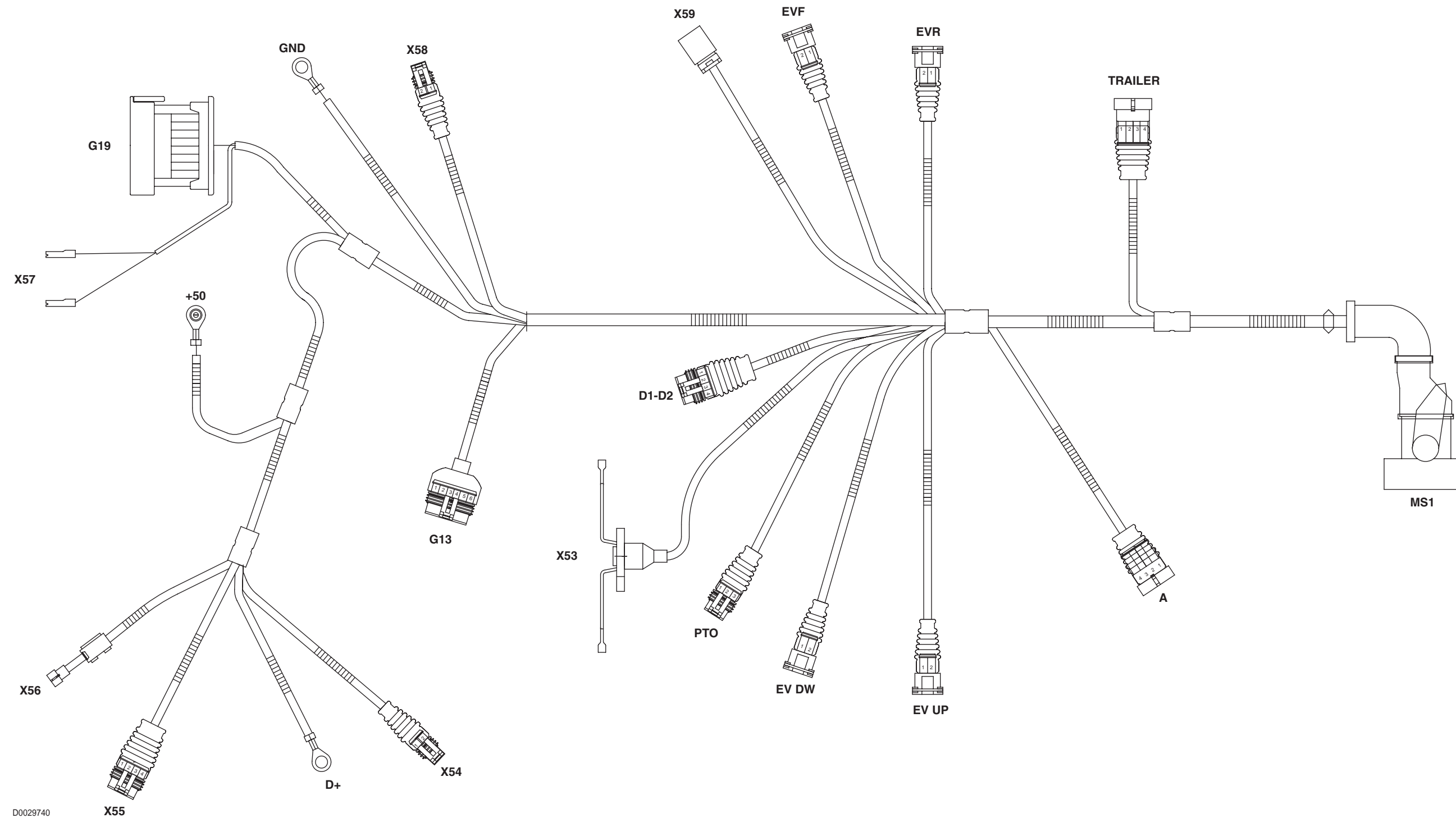


RIGHT-HAND TRANSMISSION WIRING



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LEFT-HAND TRANSMISSION WIRING (1/2)



D0029740

+50	Starter motor	EV UP	Lift up solenoid valve	X53	Trailer socket
A	To right-hand transmission wiring	G13	To front axle suspension wiring	X54	Air conditioning pressure switch
D+	Alternator	G19	To engine bonnet wiring	X55	Steering angle sensor
D1-D2	Not utilised	GND2	Earthing point 2	X56	Air conditioning 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)

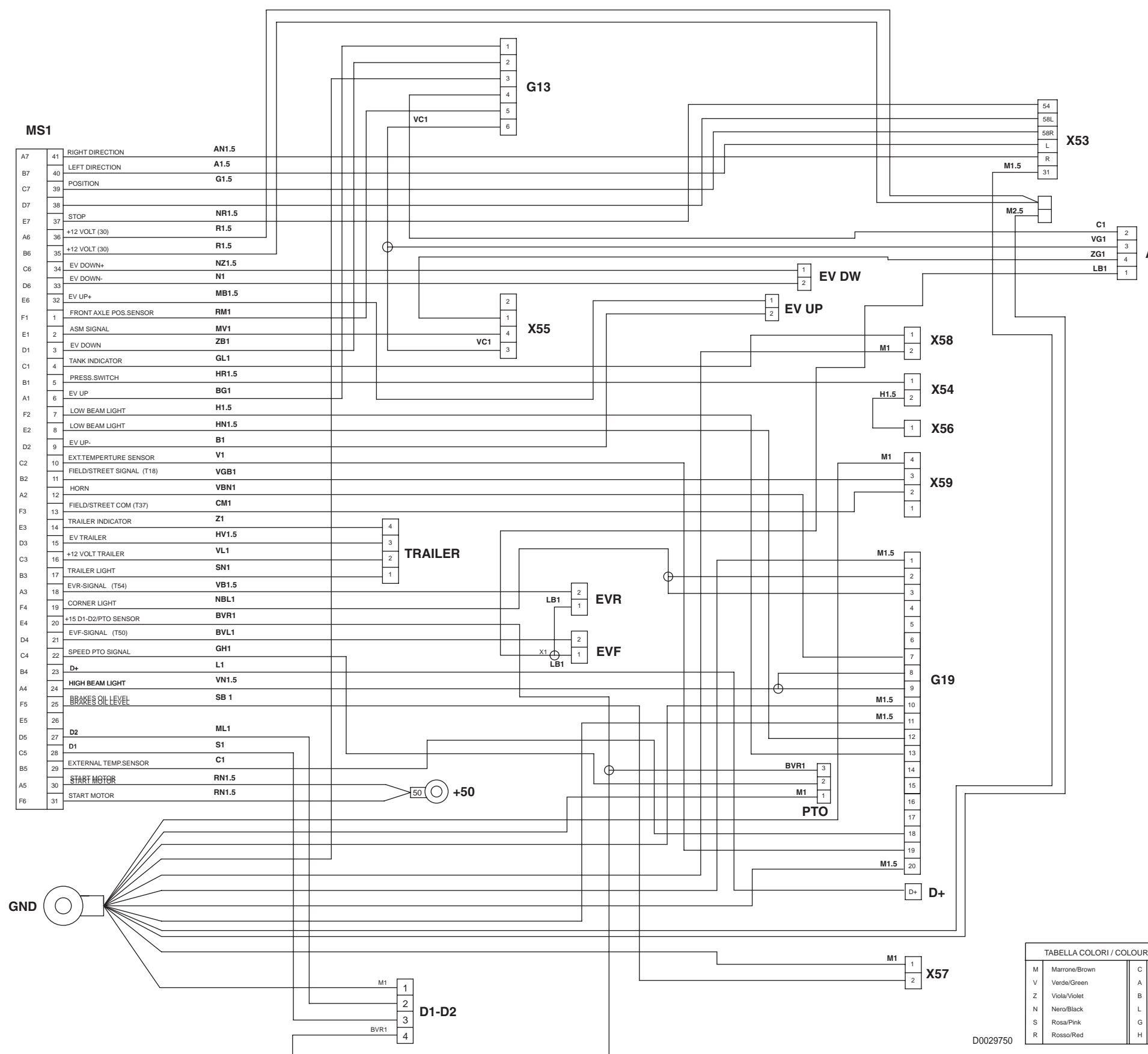


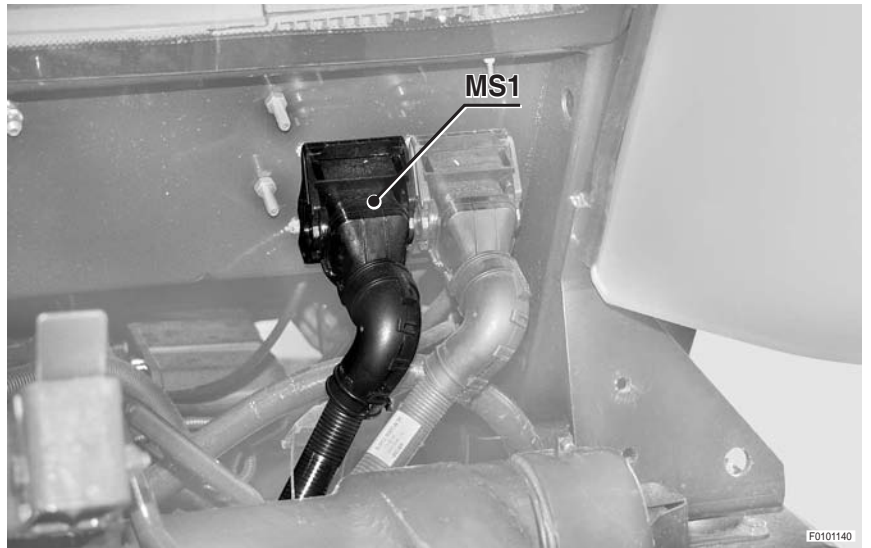
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V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rossa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

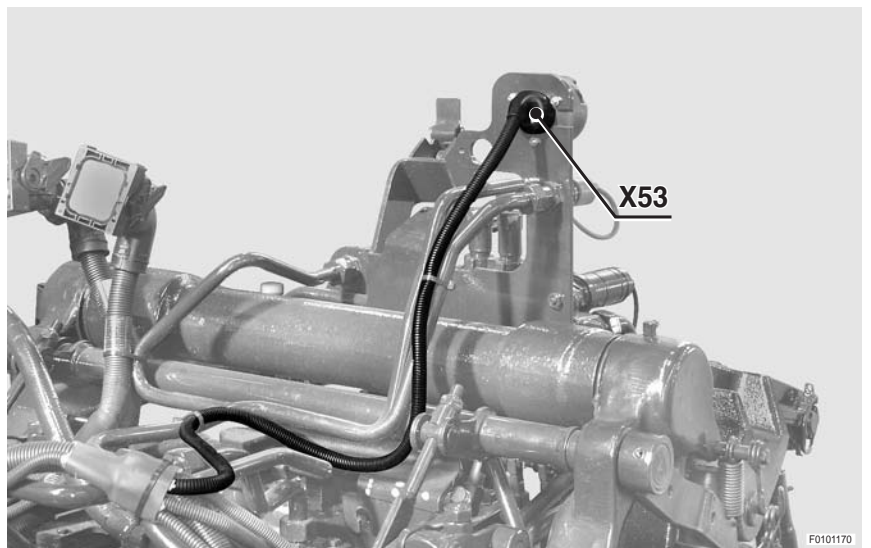
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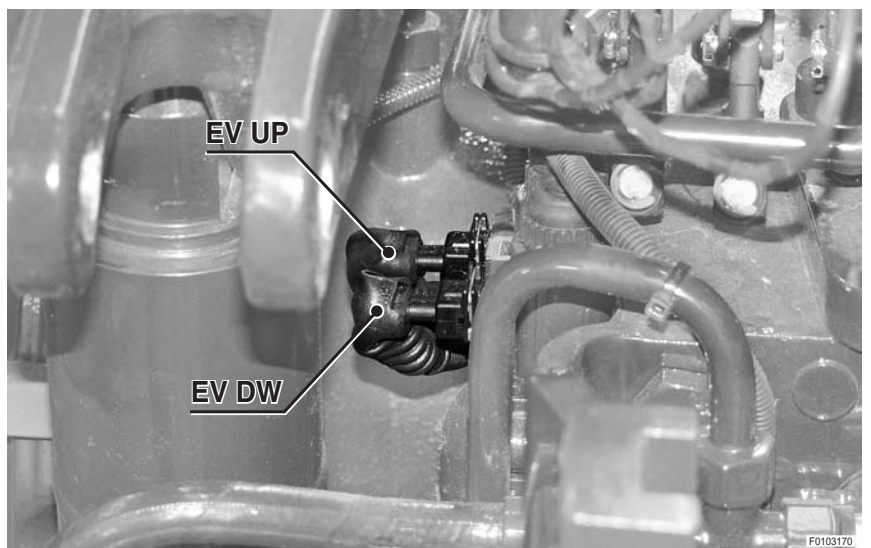
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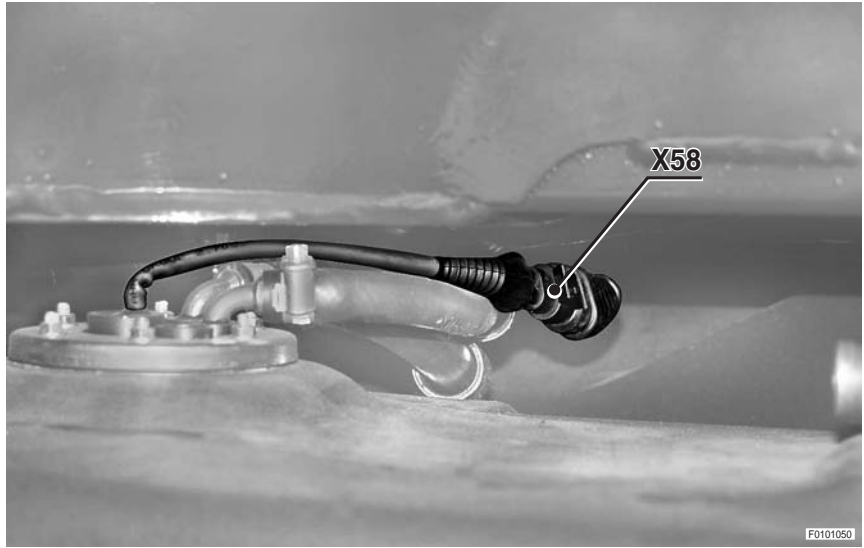
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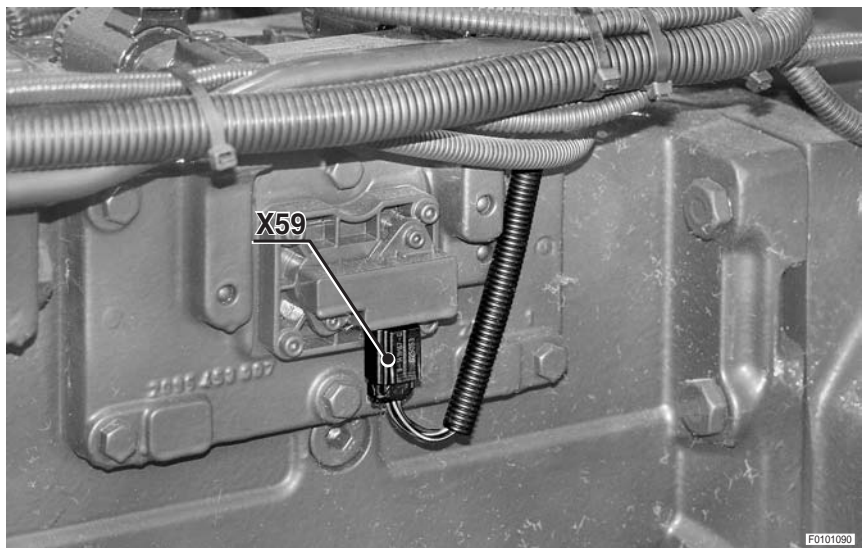
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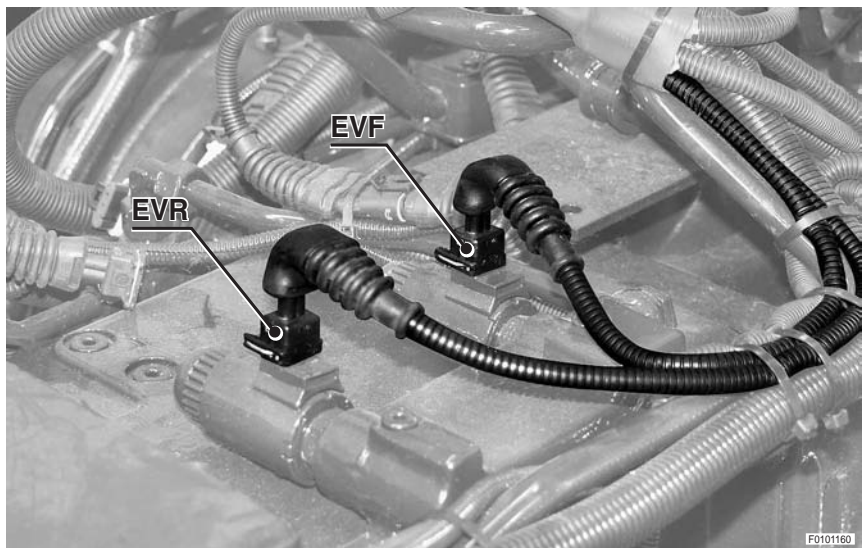
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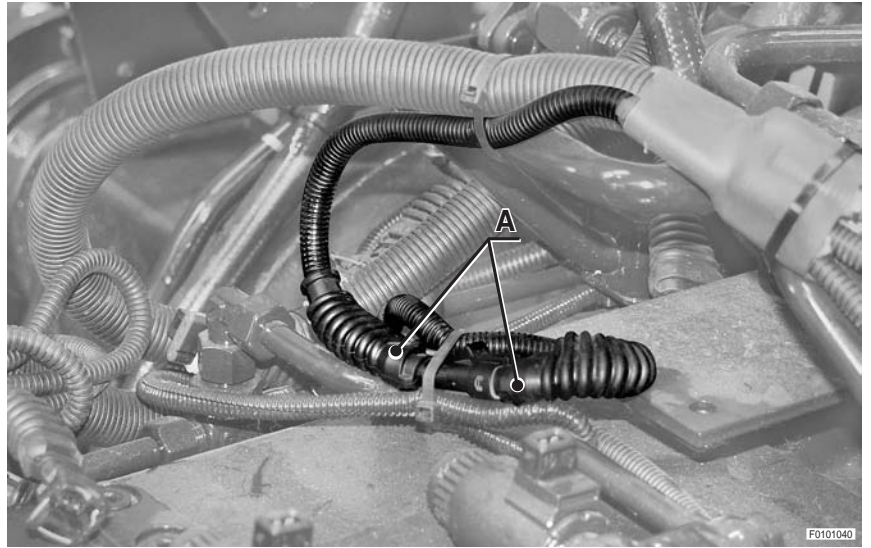
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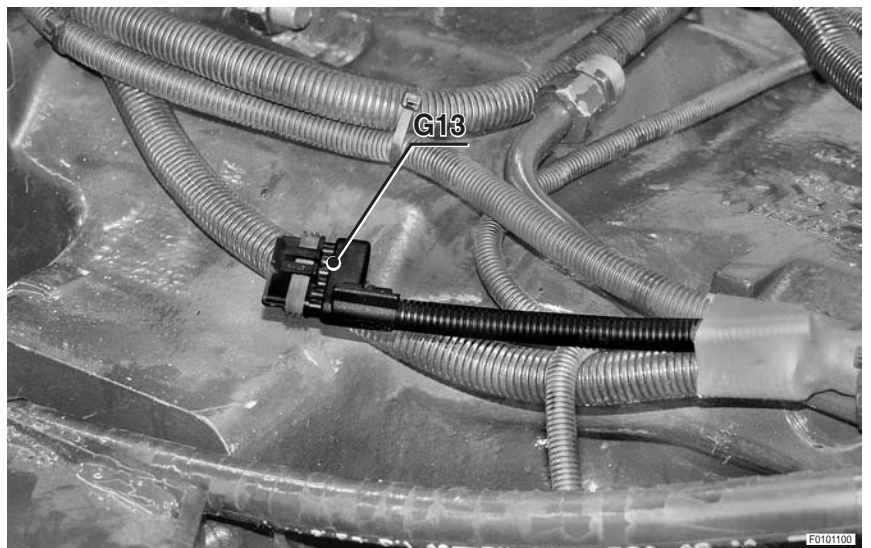
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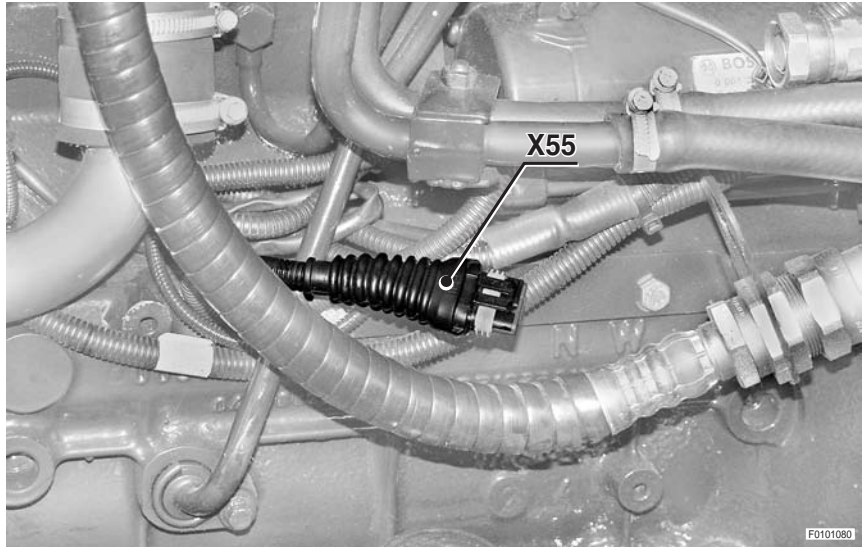
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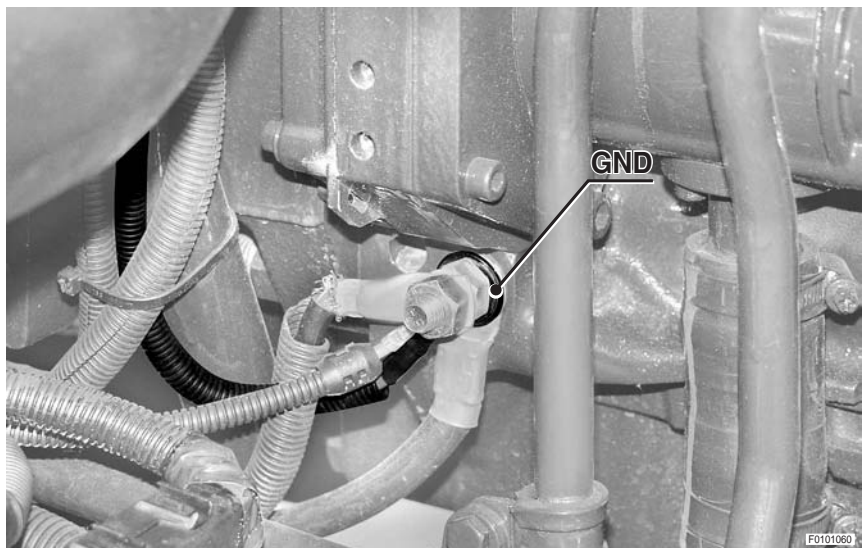
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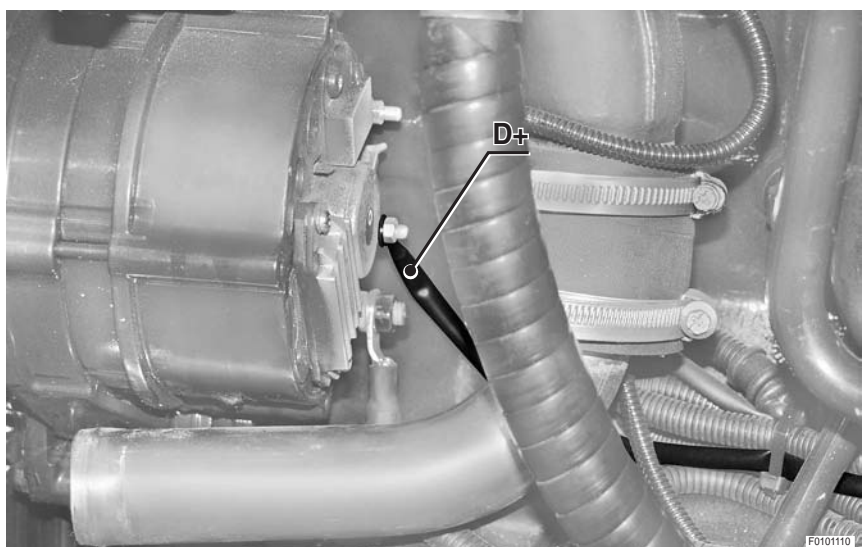
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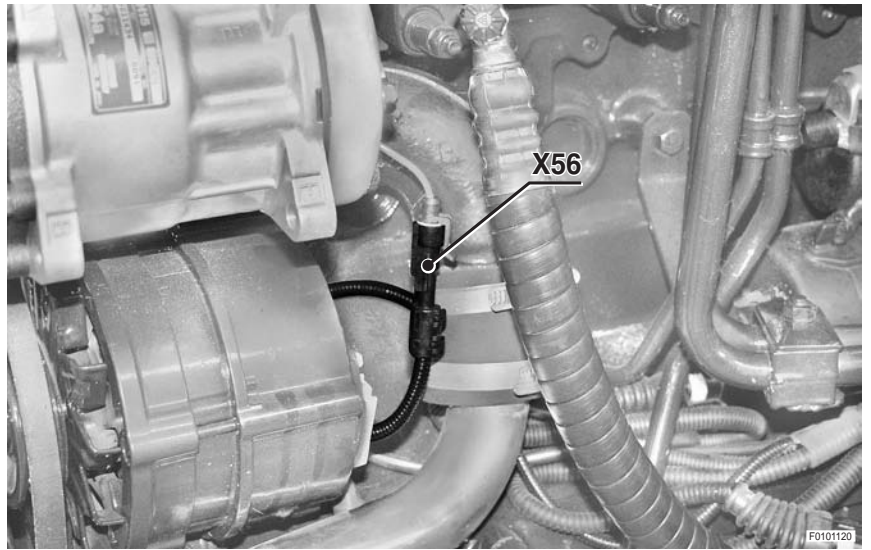
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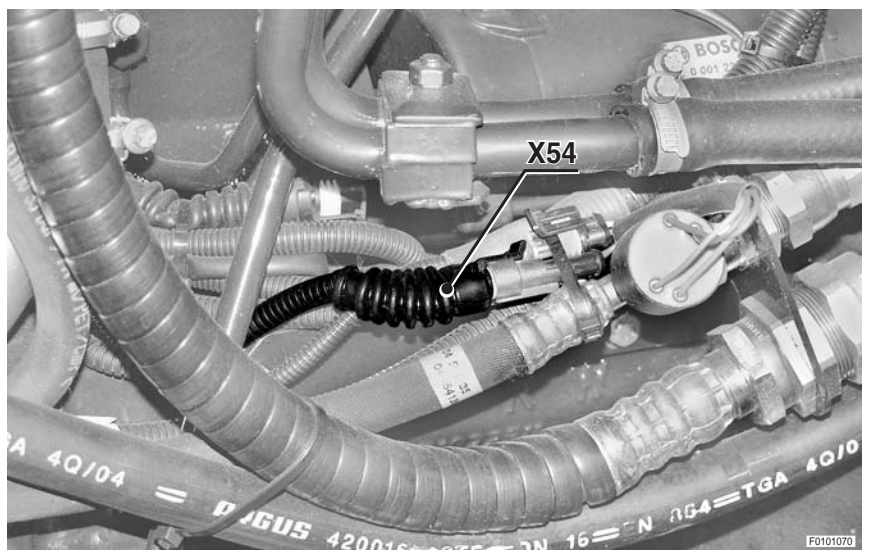
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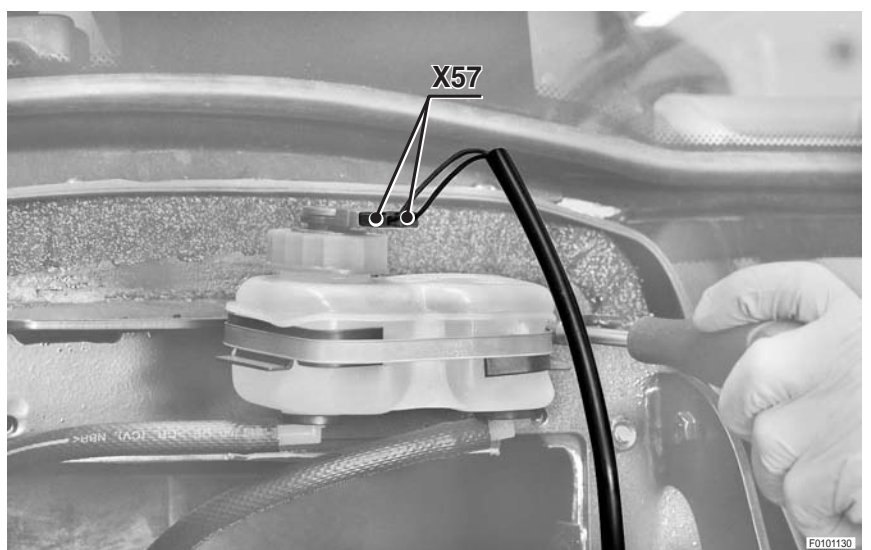
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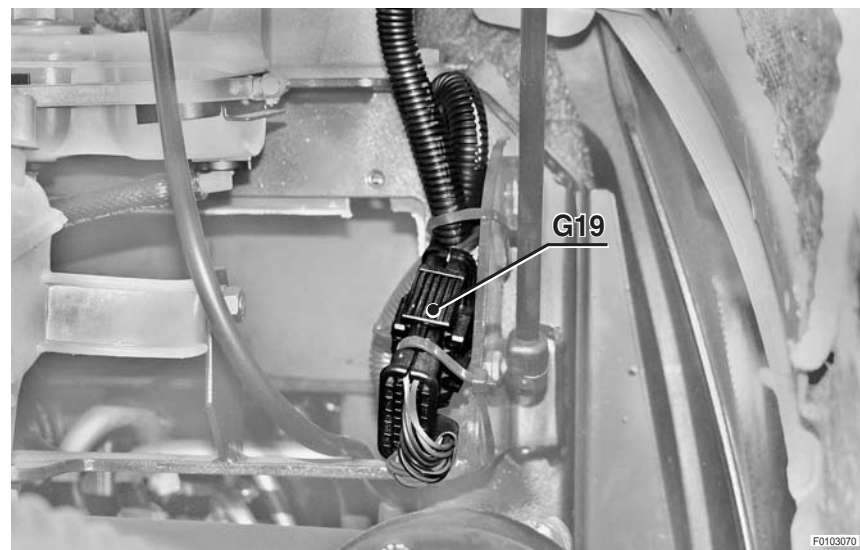


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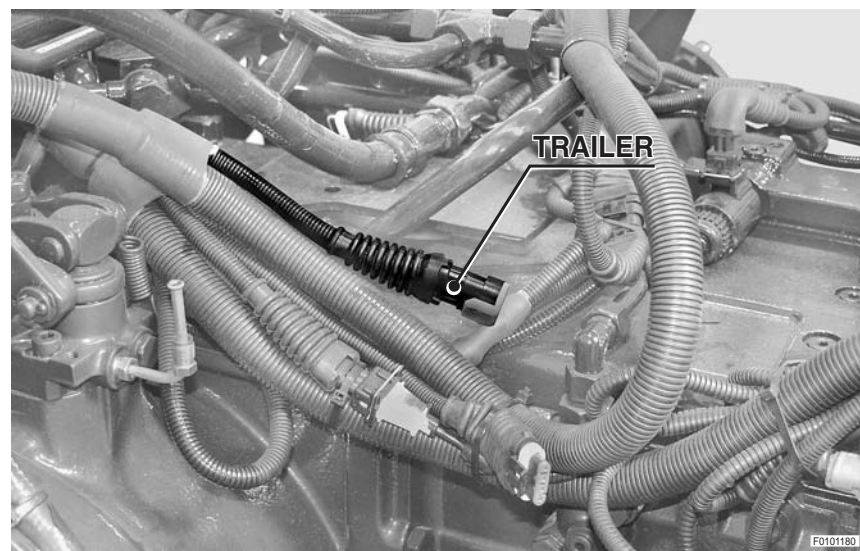


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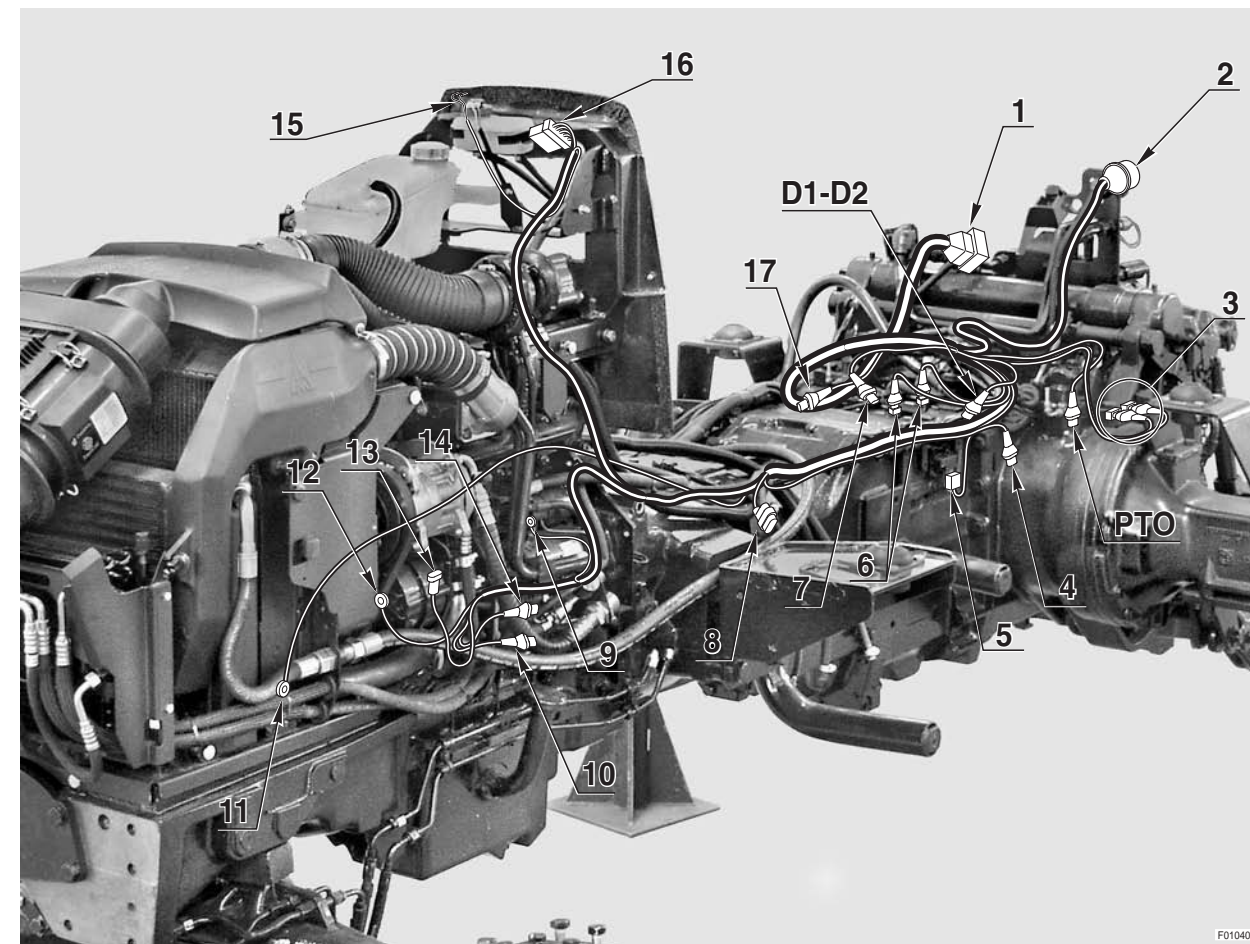
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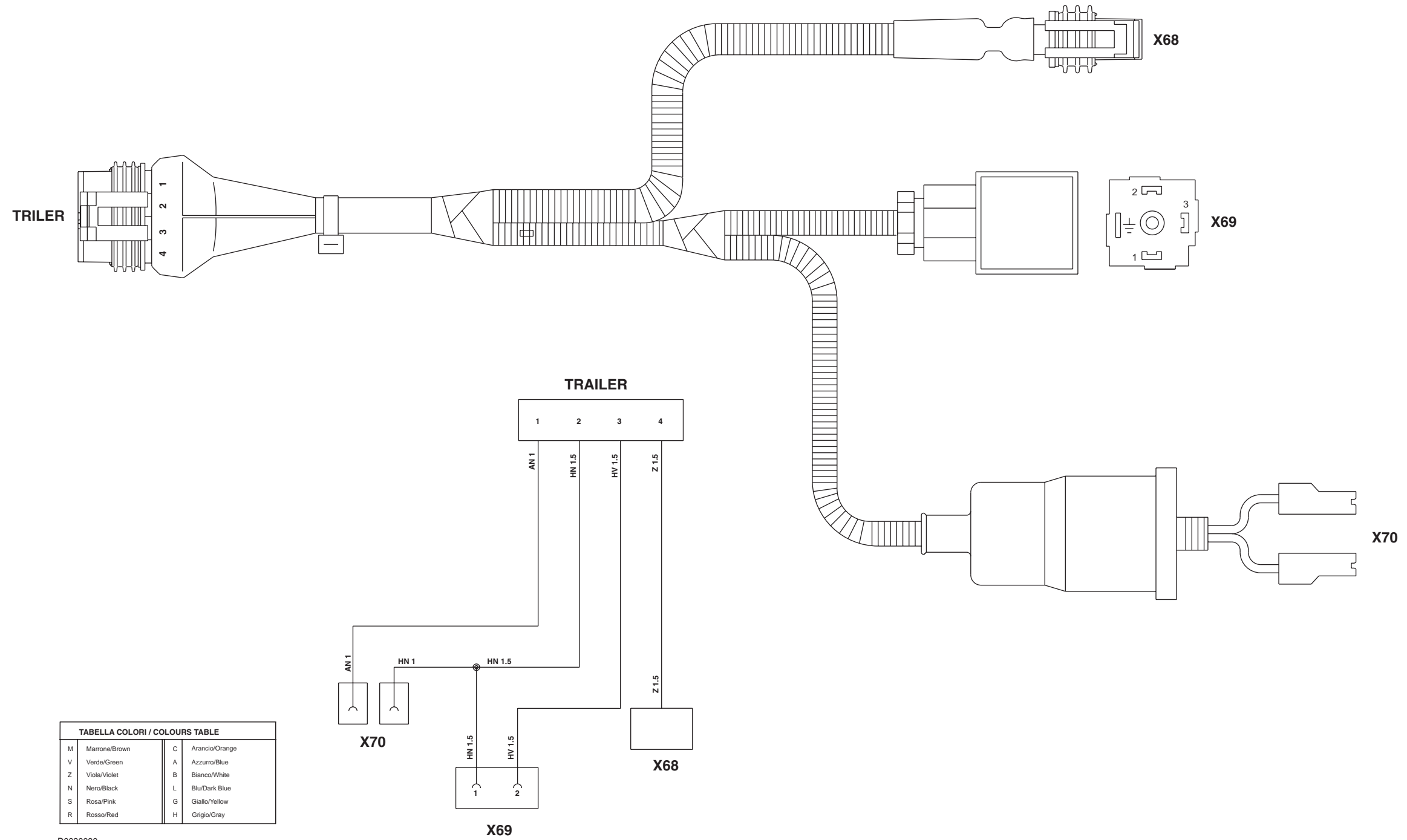


LEFT-HAND TRANSMISSION WIRING



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TRAILER BRAKE WIRING (ITALY)



TRAILER To left-hand transmission wiring

X68 Trailer braking pressure sensor

X69 Trailer parking brake solenoid valve

X70 Trailer braking low pressure switch

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TRAILER BRAKE WIRING (GERMANY)

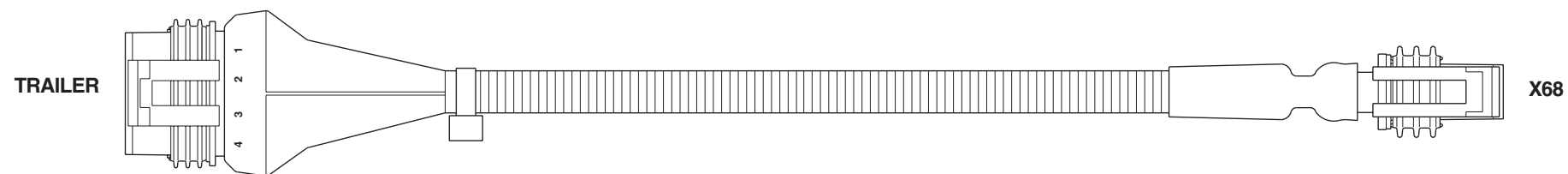


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V	Verde/Green	A	Azzurro/Blue
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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030040

TRAILER To left-hand transmission wiring
X68 Trailer braking pressure sensor

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FRONT AXLE SUSPENSION WIRING

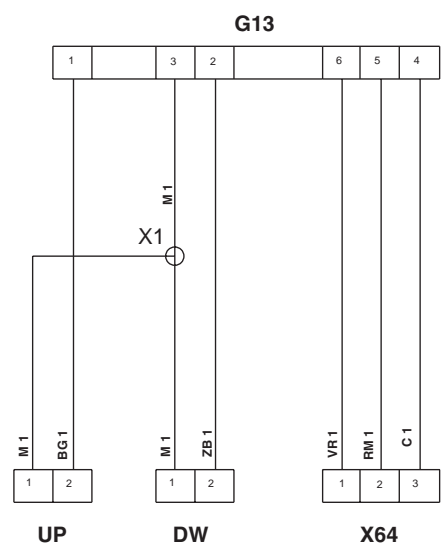
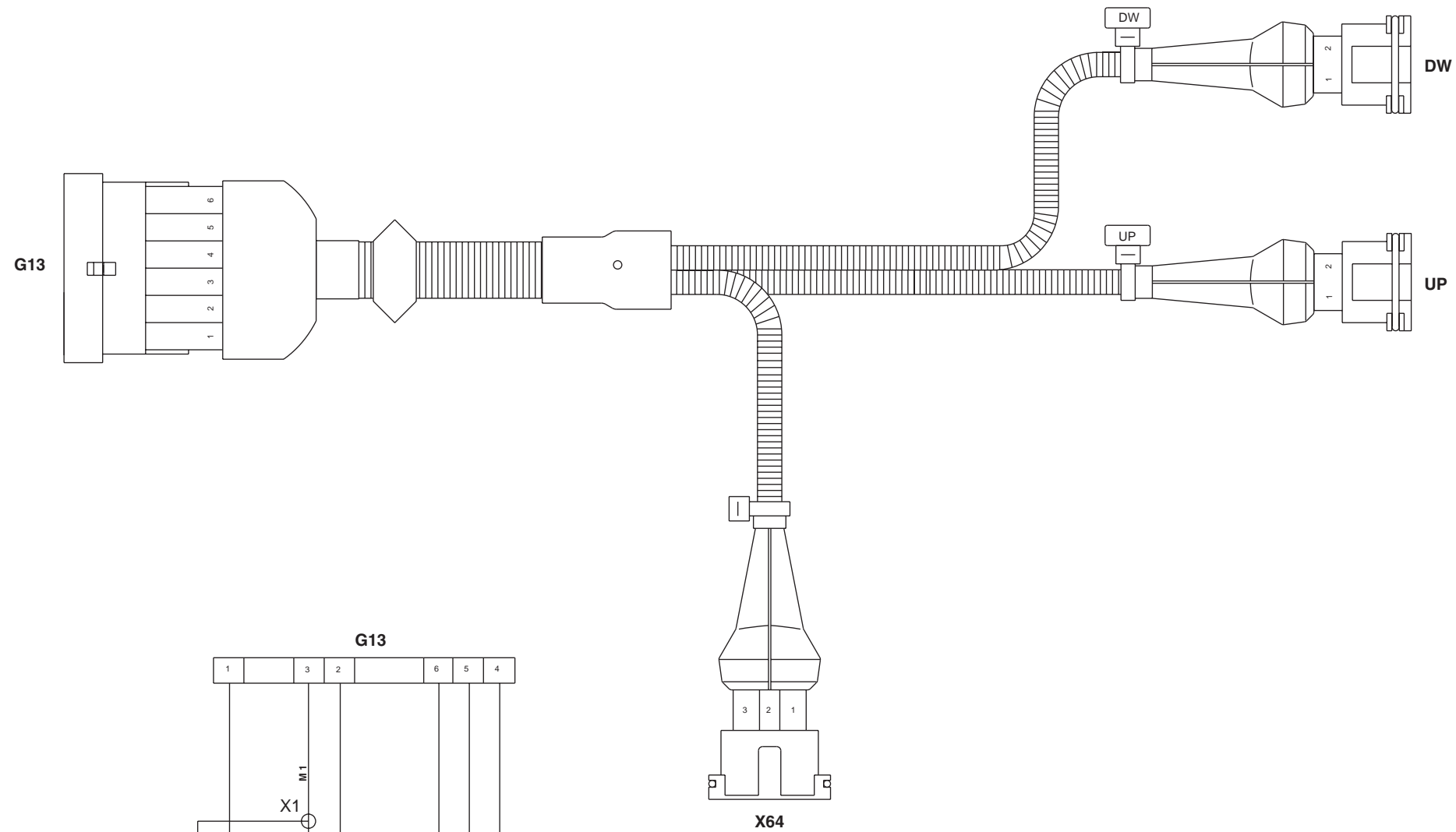


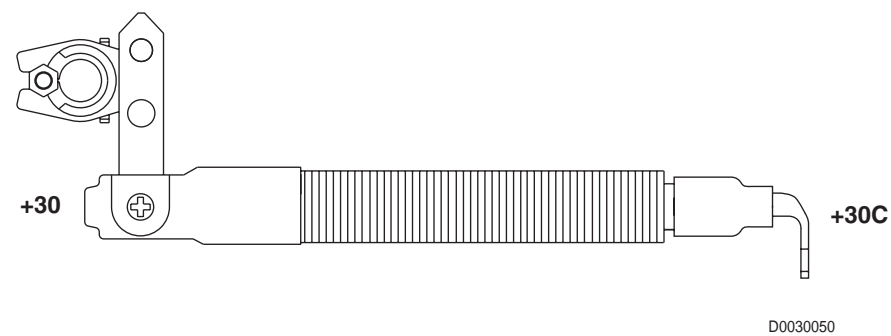
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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029870

- DW** Front axle down solenoid valve
- G13** To left-hand transmission wiring
- UP** Front axle up solenoid valve
- X64** Front axle suspension position sensor

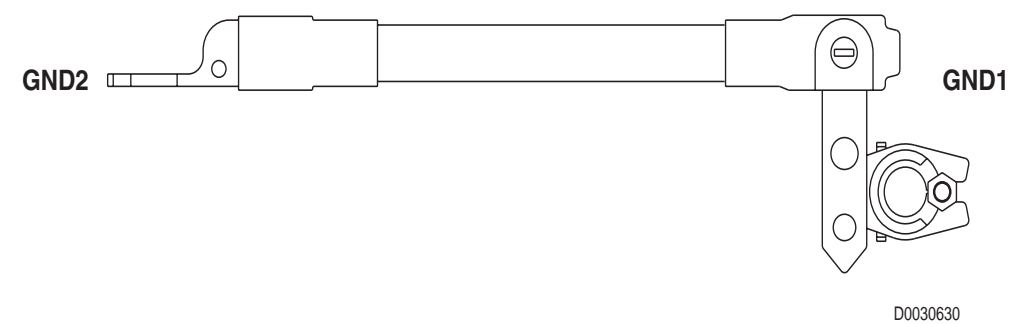
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BATTERY POSITIVE WIRING



+30 Battery
+30C Starter motor

BATTERY NEGATIVE WIRING



GND1 Battery
GND2 Earthing point 2

SUPPLY WIRING (1/2)

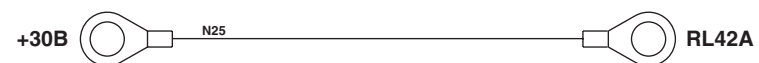
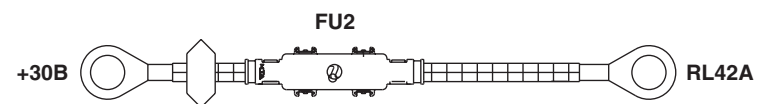
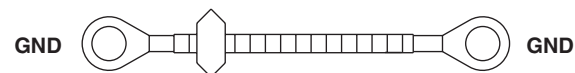


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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray



D0029920

- +30B** Battery
- FU2** Pre-heating relay supply fuse
- GND2** Earthing point 2
- GND4** Earthing point 4
- RL42A** Pre-heating relay

SUPPLY WIRING (2/2)

4 CYLINDERS

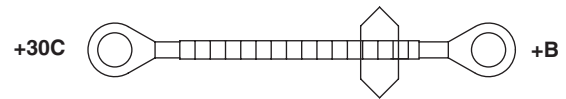
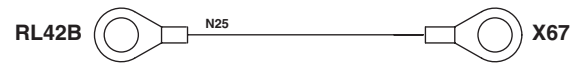
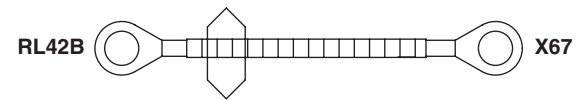


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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029910

- +30C** Starter motor
- B+** Alternator
- RL42B** Pre-heating relay
- X67** Pre-heating device

6 CYLINDERS

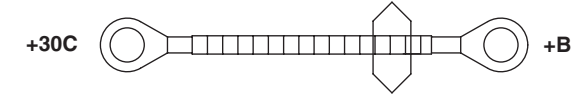
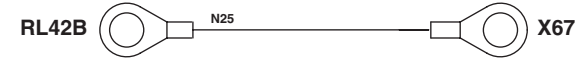
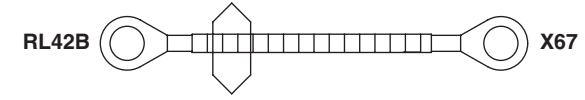


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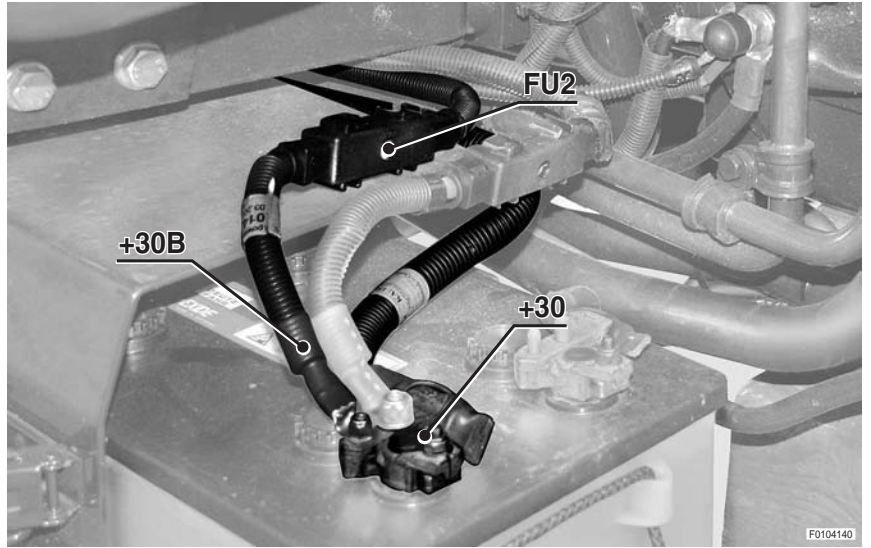
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- +30C** Starter motor
- B+** Alternator
- RL42B** Pre-heating relay
- X67** Pre-heating device

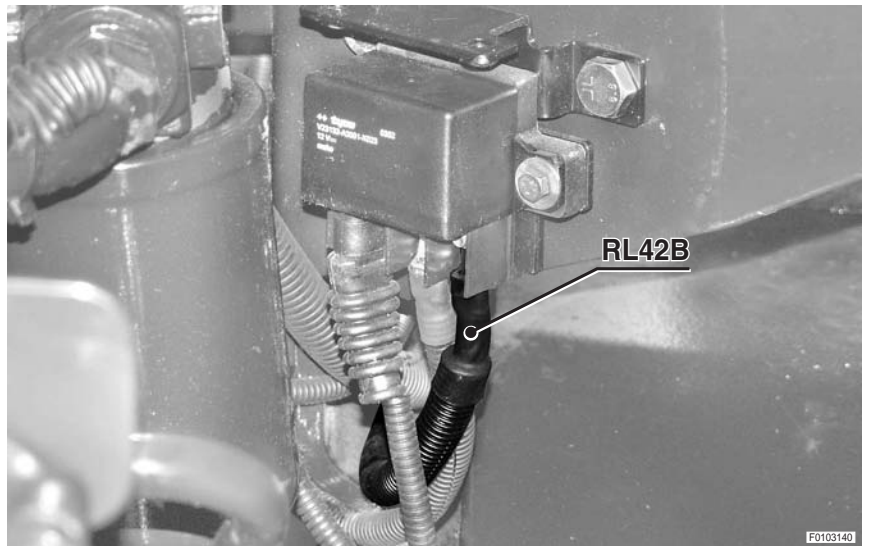
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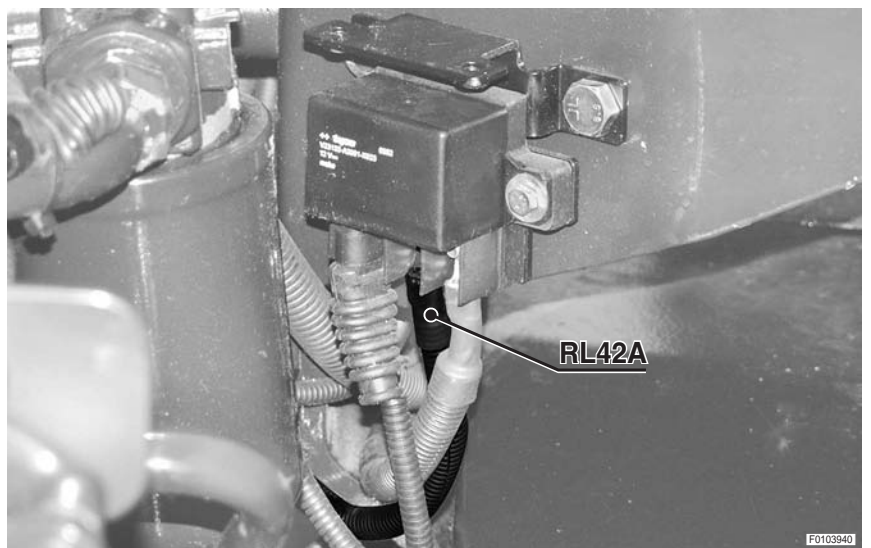
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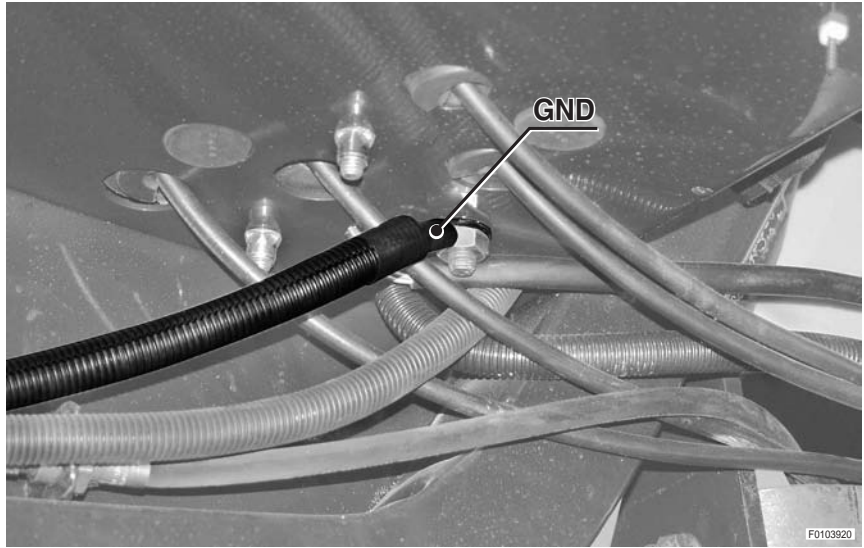
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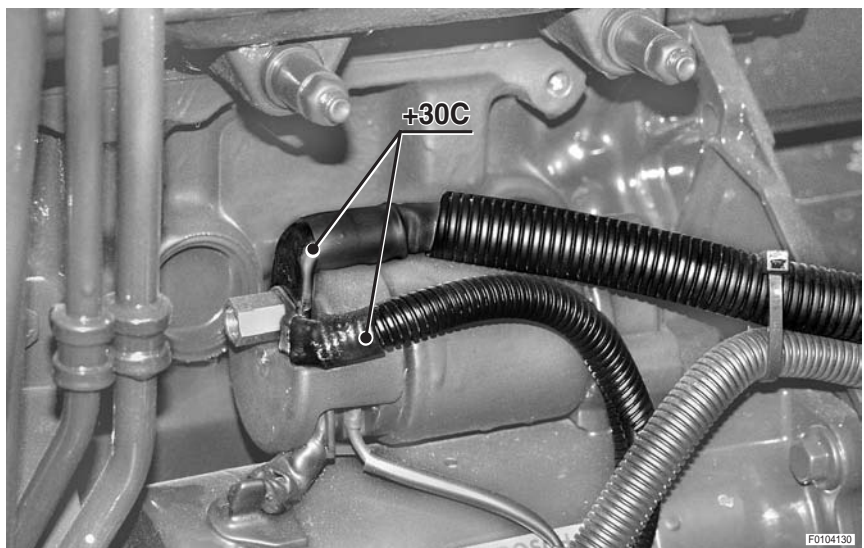
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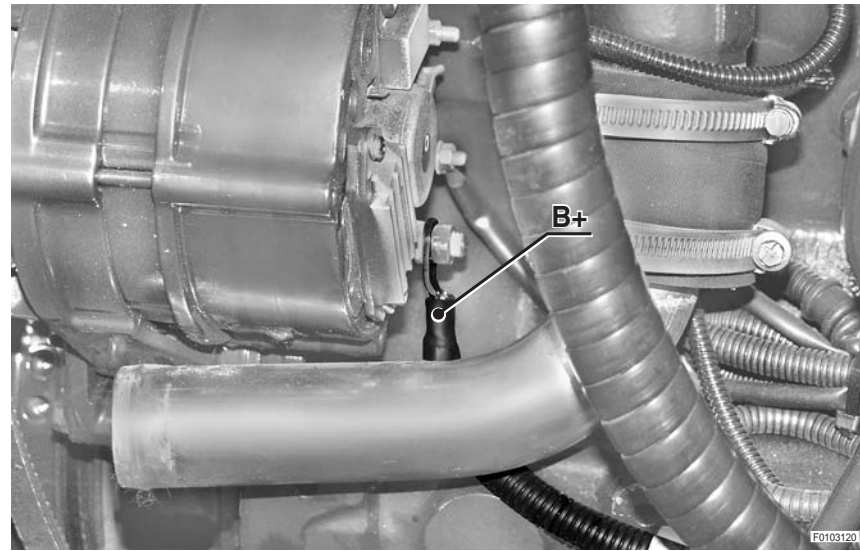


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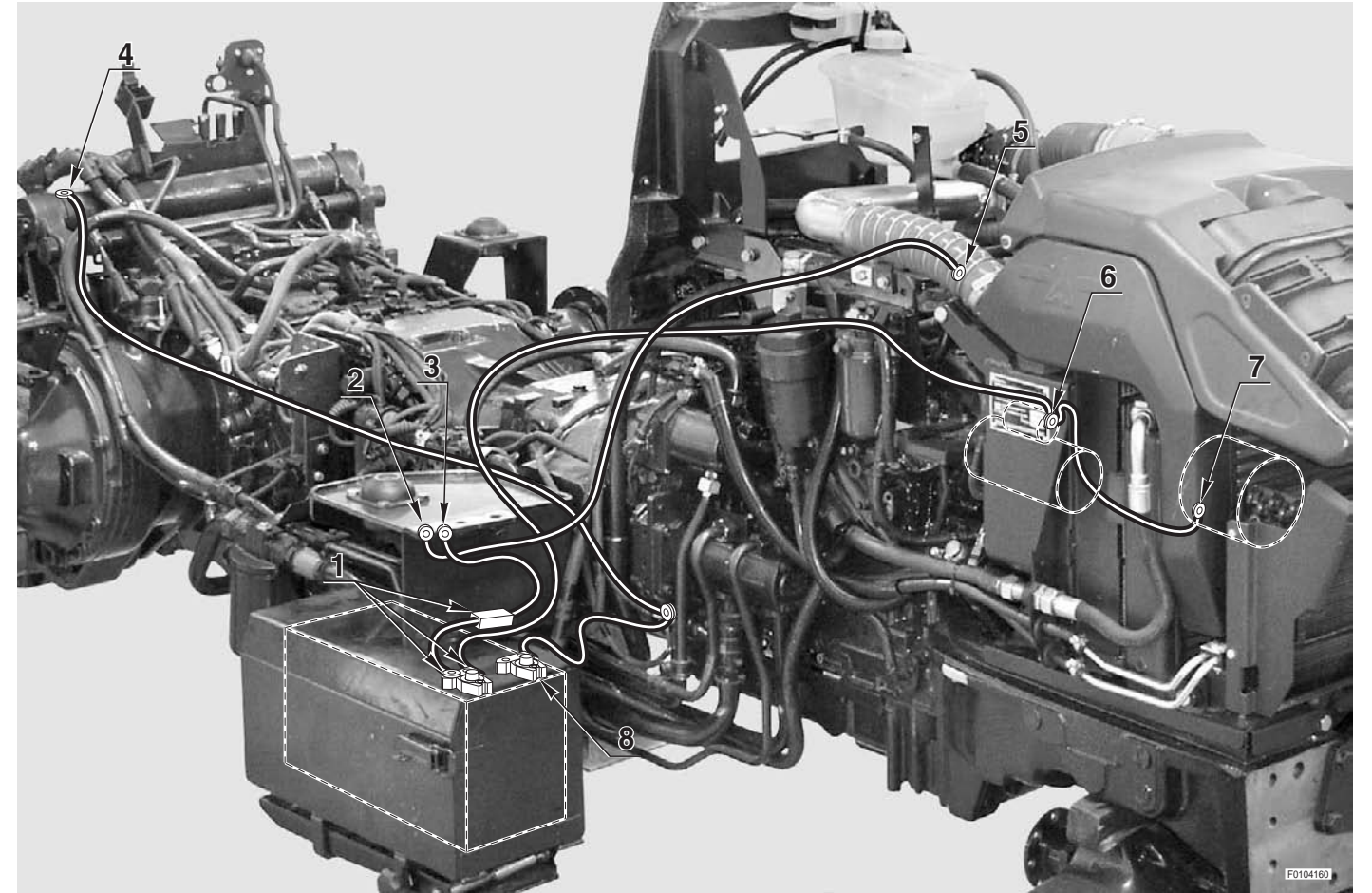
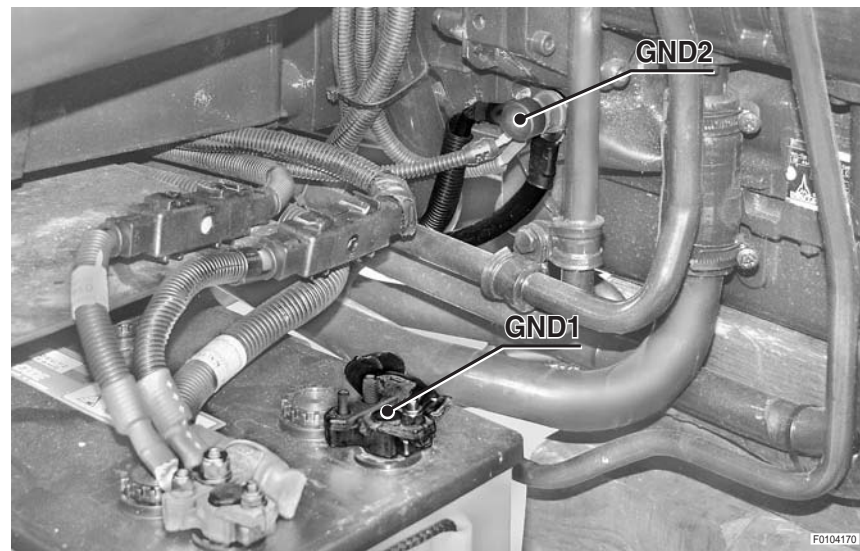


**BATTERY POSITIVE WIRING - BATTERY NEGATIVE WIRING -
SUPPLY WIRING**

7



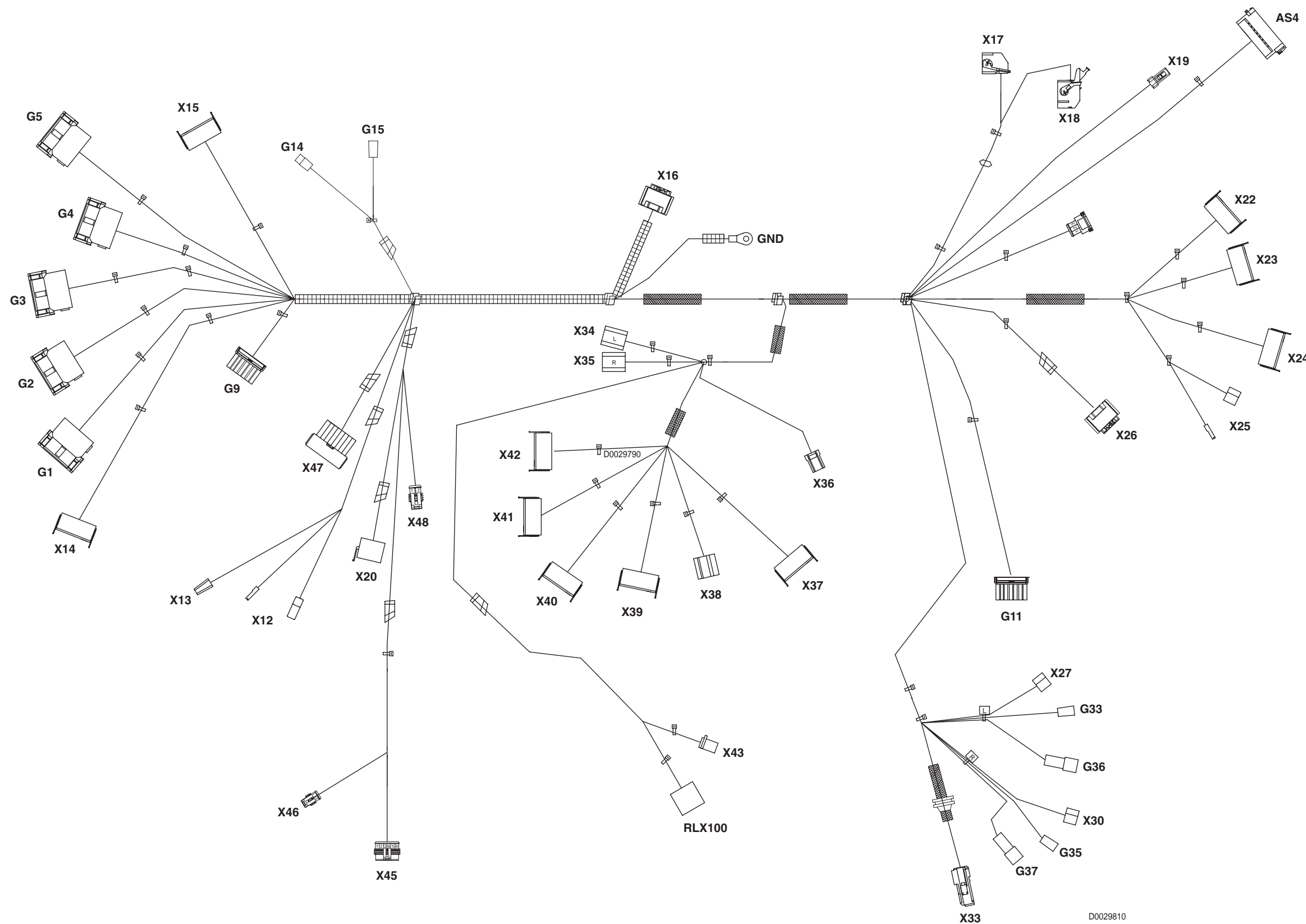
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INSTRUMENT PANEL WIRING (1/2)



- 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 wiring for upper lights/worklights on arm
- G14** To mudguard wiring
- G15** To mudguard 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 clutch engagement switch
- X15** AUTO PTO clutch engagement switch
- X16** Throttle pedal position sensor
- X17** Infocenter
- X18** Infocenter
- X19** Not utilised
- X20** Lift control switch
- X21** Proximity sensor for clutch pedal pressed
- X22** Front worklights switch
- X23** Hazard 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-hand brake pedal switch
- X35** Right-hand brake pedal switch
- X36** Not utilised
- X37** Front PTO engagement switch
- X38** Starter switch
- X39** ASM switch
- X40** Differential lock switch
- X41** 4WD engagement switch
- X42** Front axle suspension control switch
- X43** Hazard control unit
- X45** Gearbox control lever
- X46** Gearbox control lever
- X47** Lift control console
- X48** Lift lock control switch

INSTRUMENT PANEL WIRING (2/2)

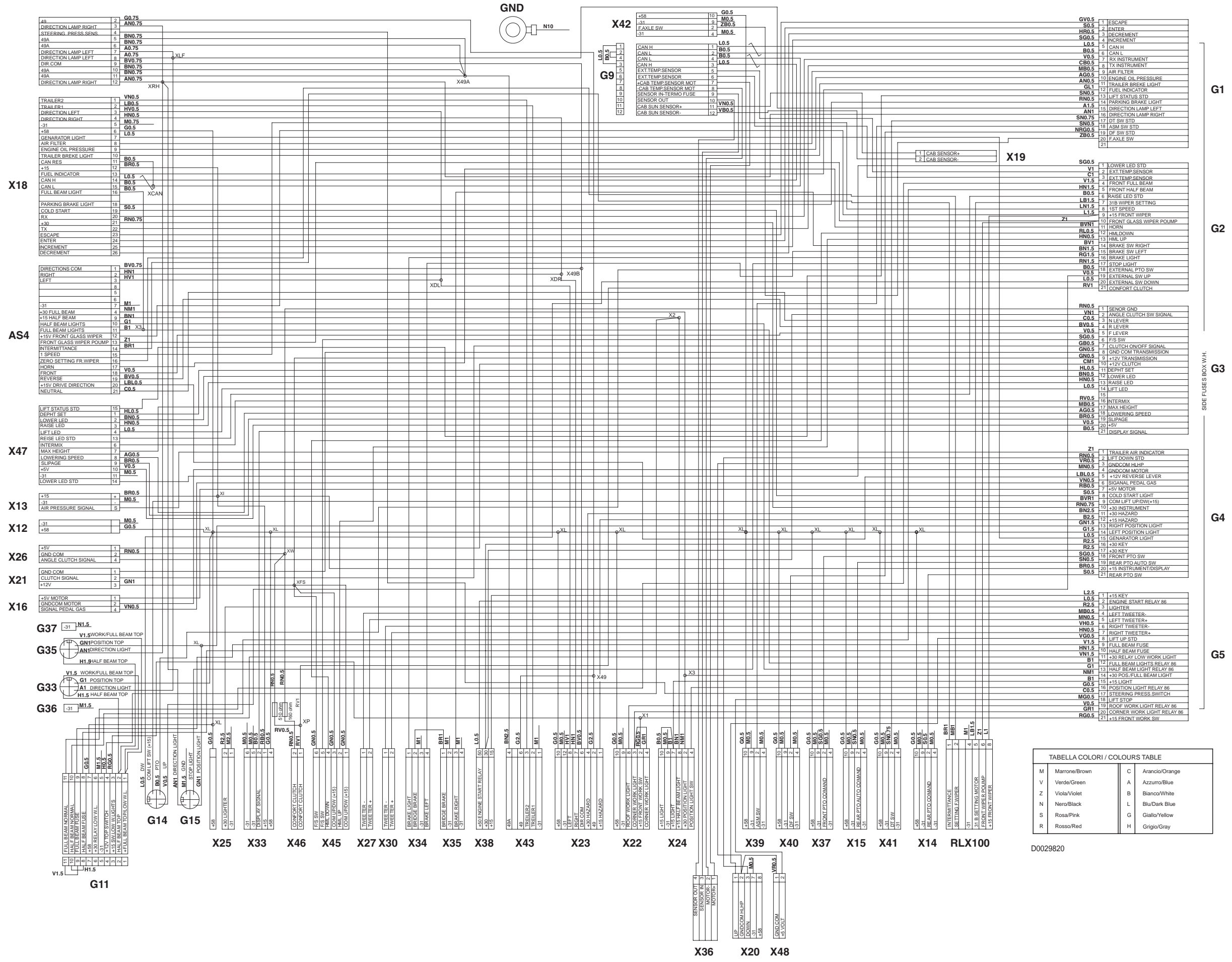


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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029820

MUDGUARD WIRING

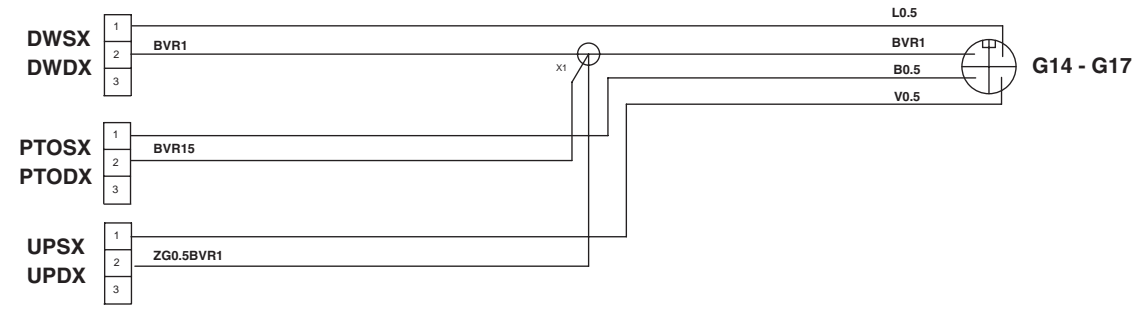
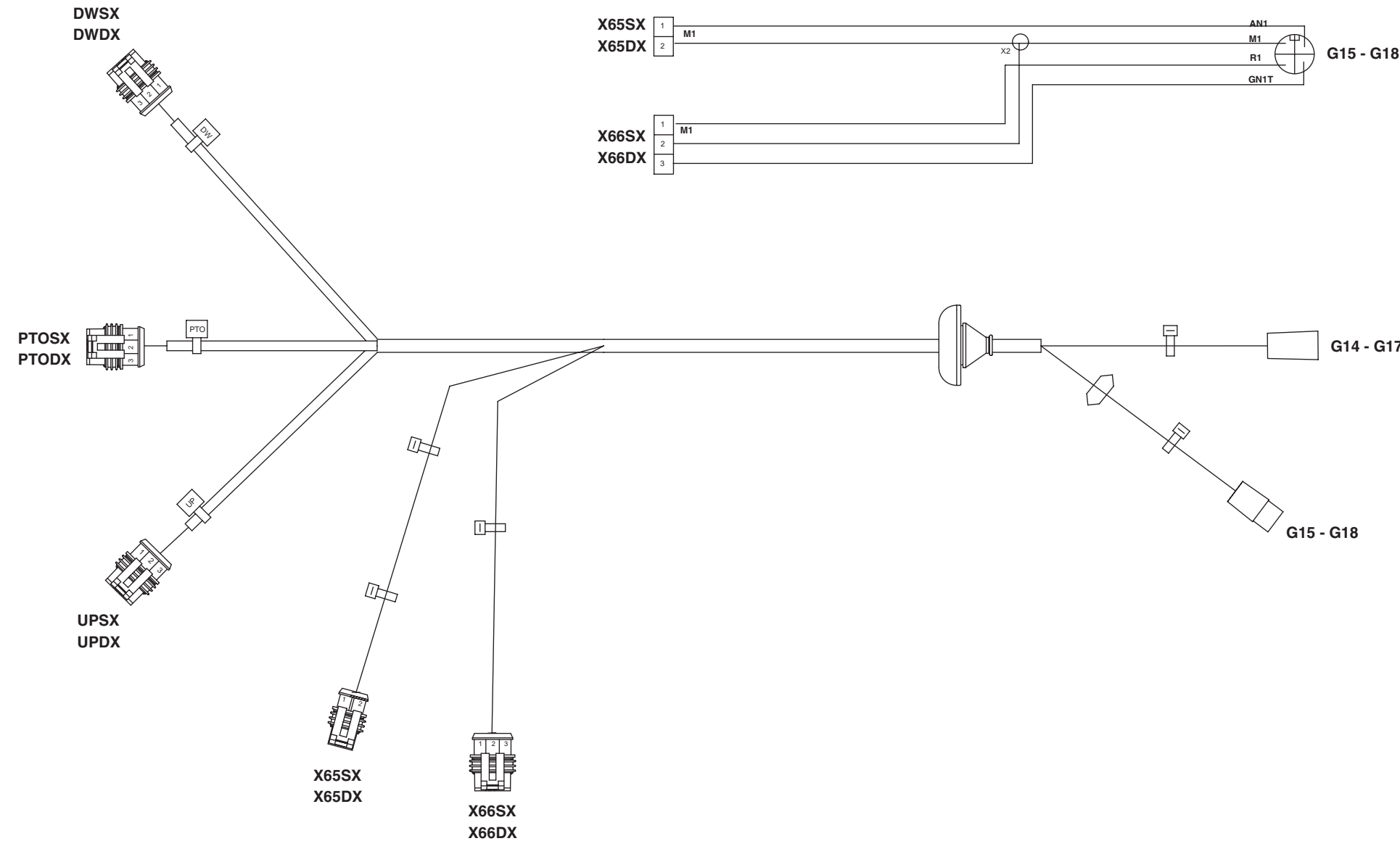
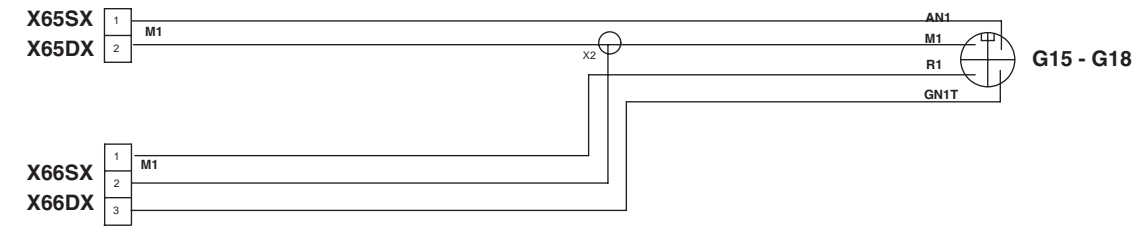


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D0029890



DW RH RH rear lift down button
DW LH LH rear lift down button
G14 To instrument panel wiring
G15 To instrument panel wiring
G17 To central wiring
G18 To central wiring

PTO RH RH rear PTO button (on mudguard)
PTO LH LH rear PTO button (on mudguard)
UP RH RH rear lift up button
UP LH LH rear lift up button
X65 RH RH rear direction indicator
X65 LH LH rear direction indicator

X66 RH RH rear sidelight and brake light
X66 LH LH rear sidelight and brake light

WIRING FOR LIGHTS ON ARMS

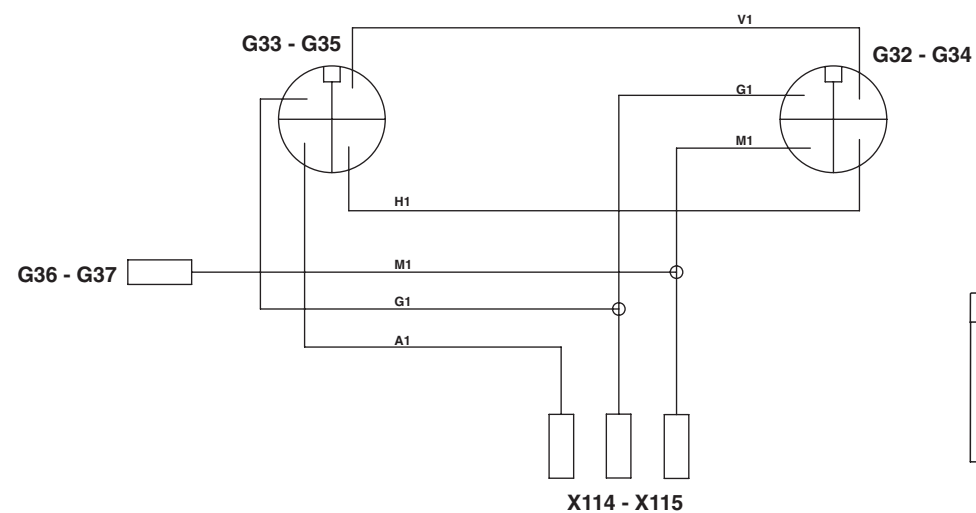
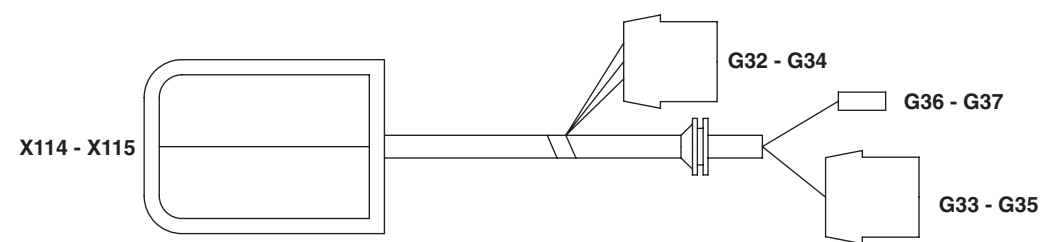


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D0030090



- 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** LH direction indicator and sidelight
- X115** RH direction indicator and sidelight

WIRING FOR SUPPLEMENTARY LIGHTS ON ARMS

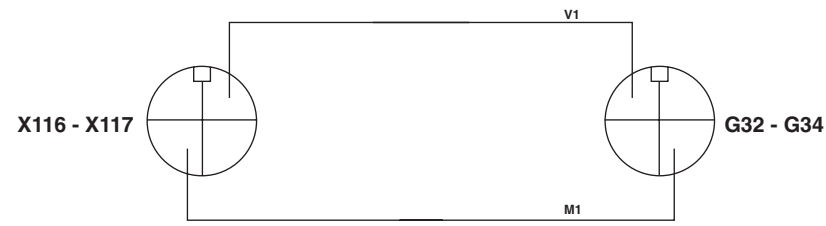
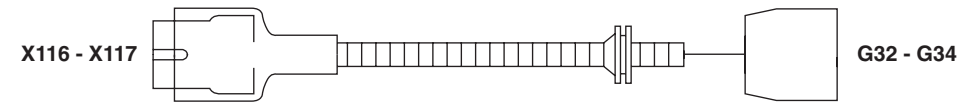


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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

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)

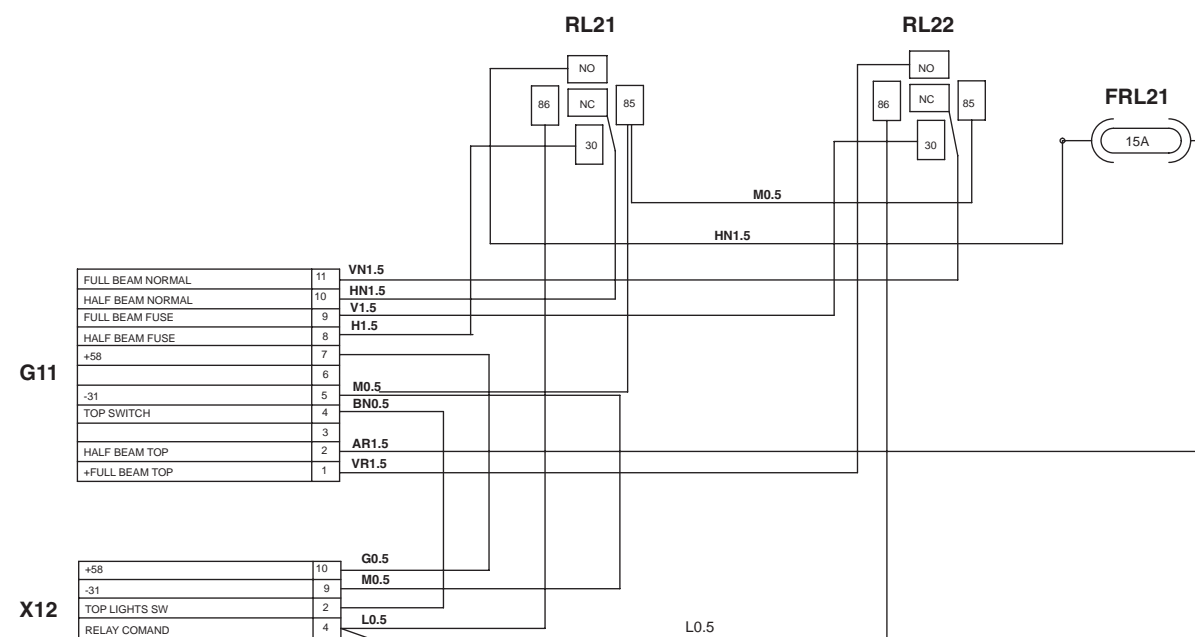
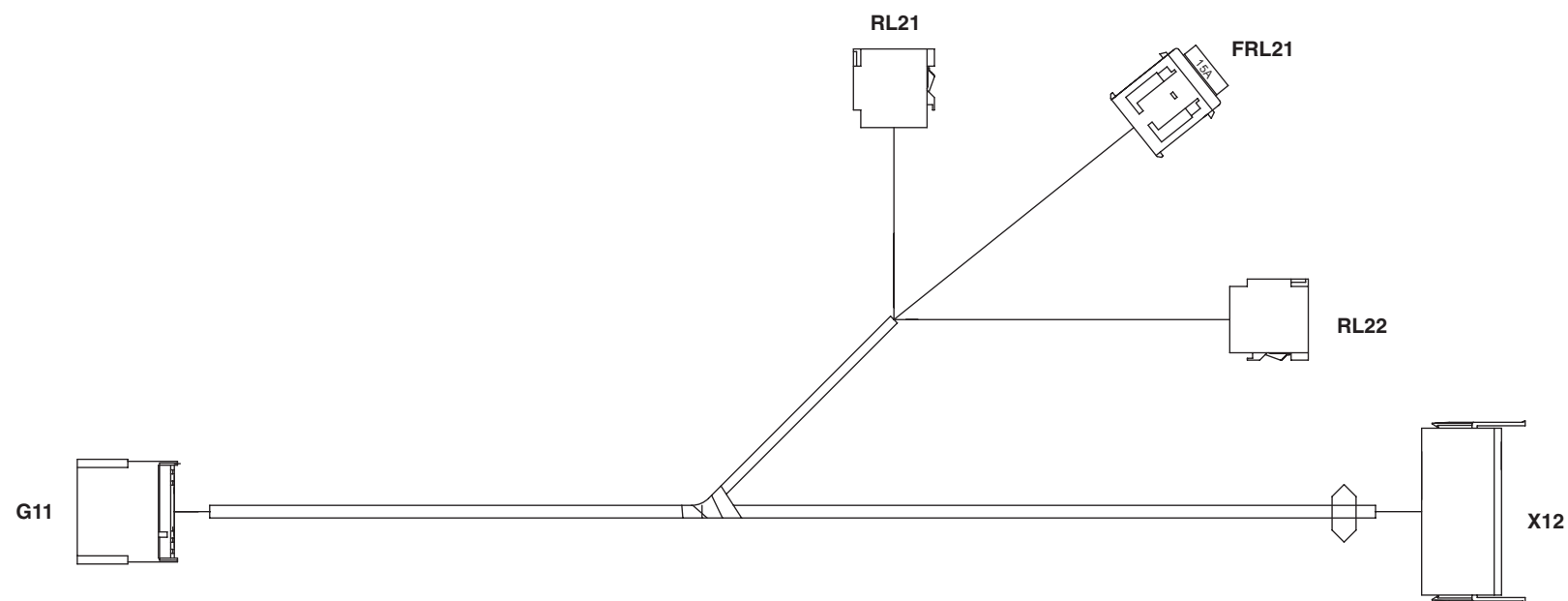


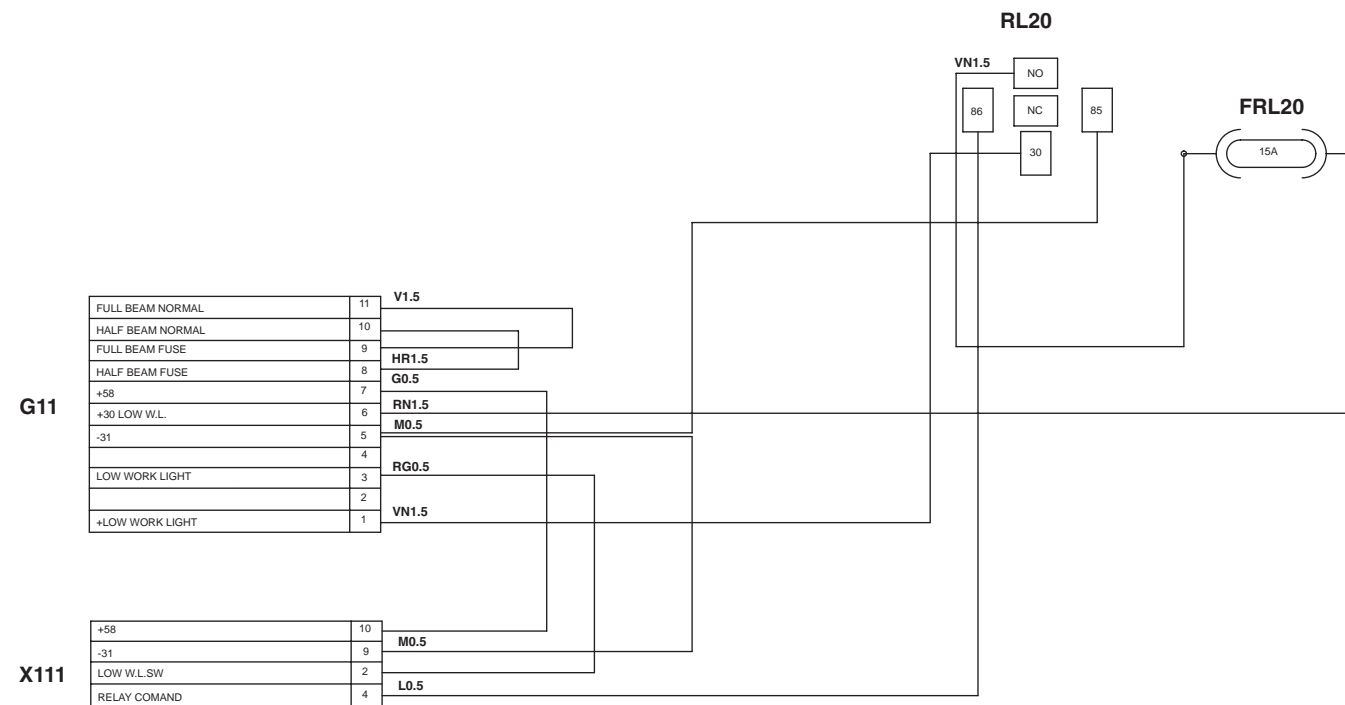
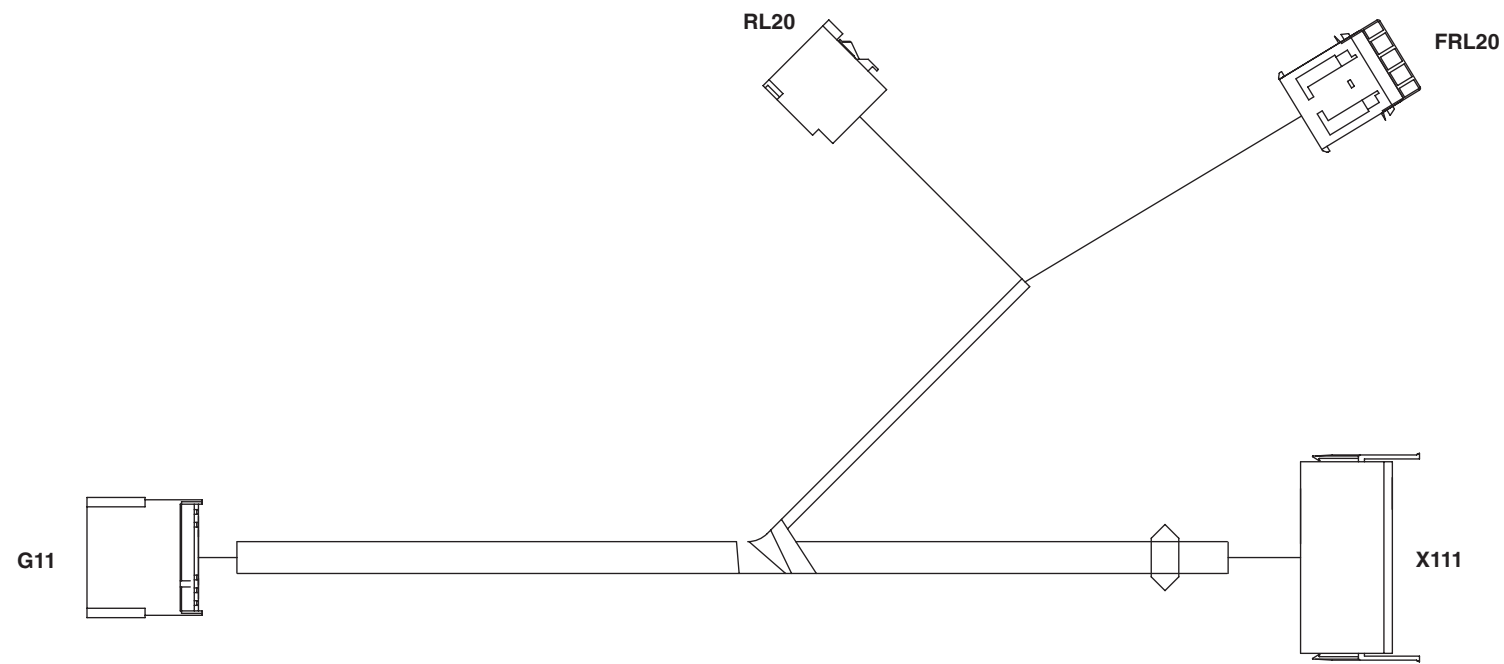
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R	Rosso/Red	H	Grigio/Gray

D0029980



- FRL21** Low beam headlights relay supply fuse
- G11** To instrument panel wiring
- RL21** Low beam headlights relay
- RL22** Full beam headlights relay
- X112** Low/full beam headlights switch

WIRING FOR WORKLIGHTS ON ARMS (VERSION WITHOUT LIFT)



FULL BEAM NORMAL	11	V1.5
HALF BEAM NORMAL	10	V1.5
FULL BEAM FUSE	9	HR1.5
HALF BEAM FUSE	8	G0.5
+58	7	RN1.5
+30 LOW W.L.	6	M0.5
-31	5	M0.5
	4	RG0.5
LOW WORK LIGHT	3	RG0.5
	2	VN1.5
+LOW WORK LIGHT	1	VN1.5

+58	10	M0.5
-31	9	M0.5
LOW W.L.SW	2	L0.5
RELAY COMAND	4	L0.5

M	Marrone/Brown	C	Arancio/Orange
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Z	Viola/Violet	B	Bianco/White
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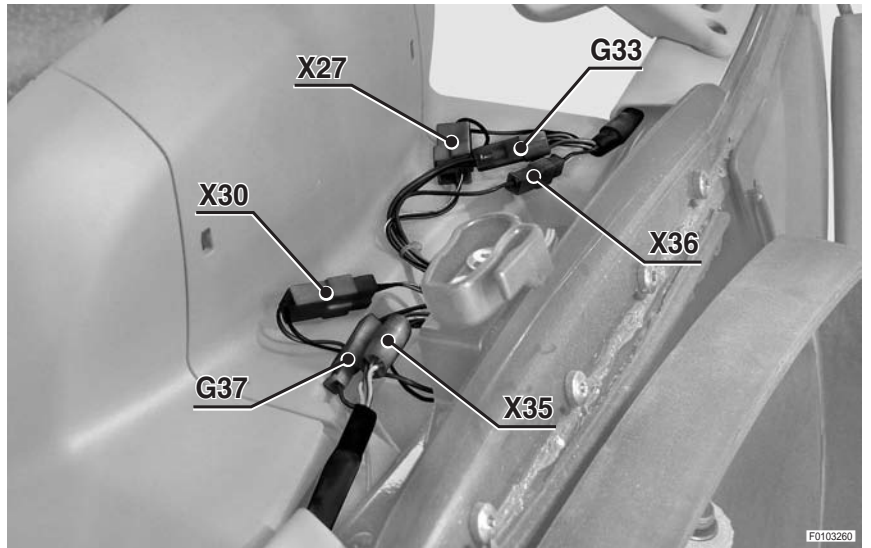
D0029970

- FRL20** Arm worklight relay supply fuse
- G11** To instrument panel wiring
- RL20** Arm worklight relay
- X111** Arm worklight switch

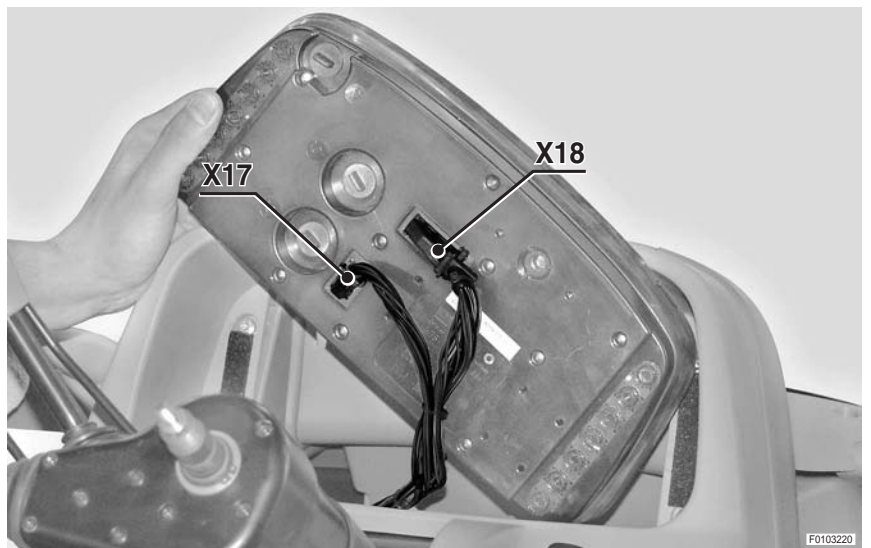
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CONNECTORS LOCATION

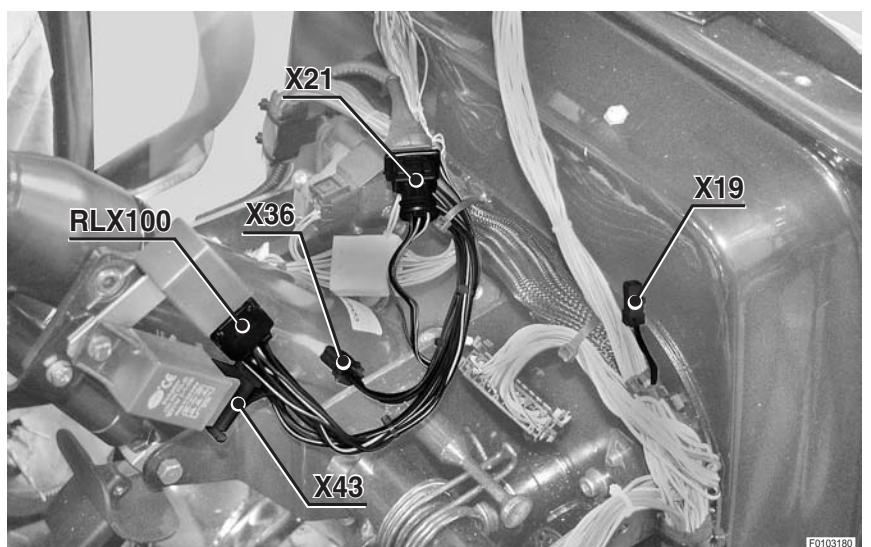
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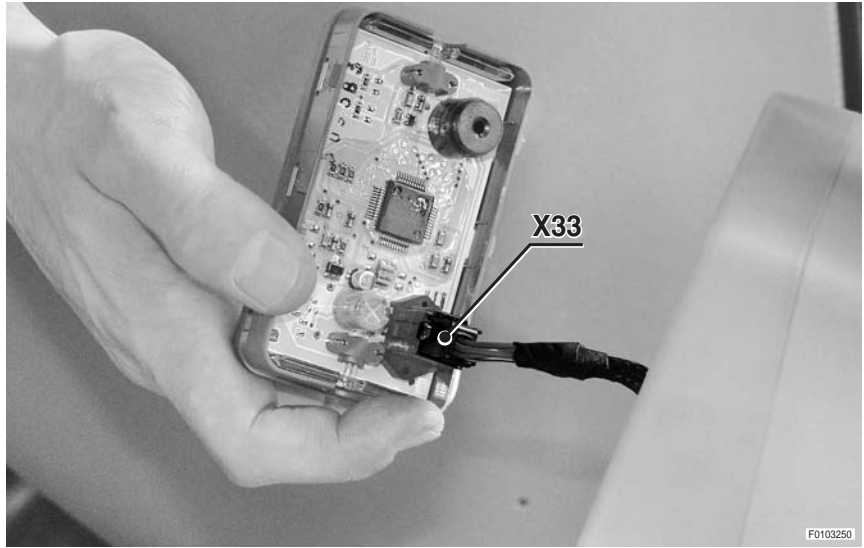
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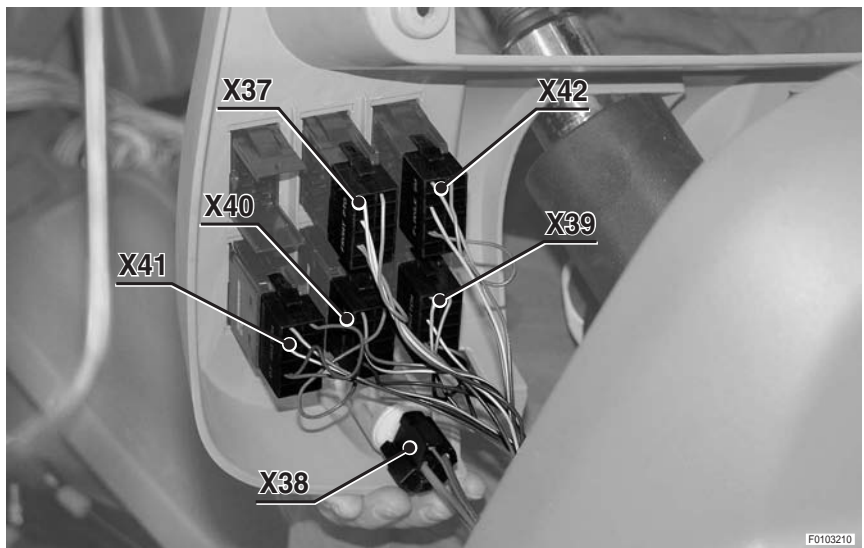
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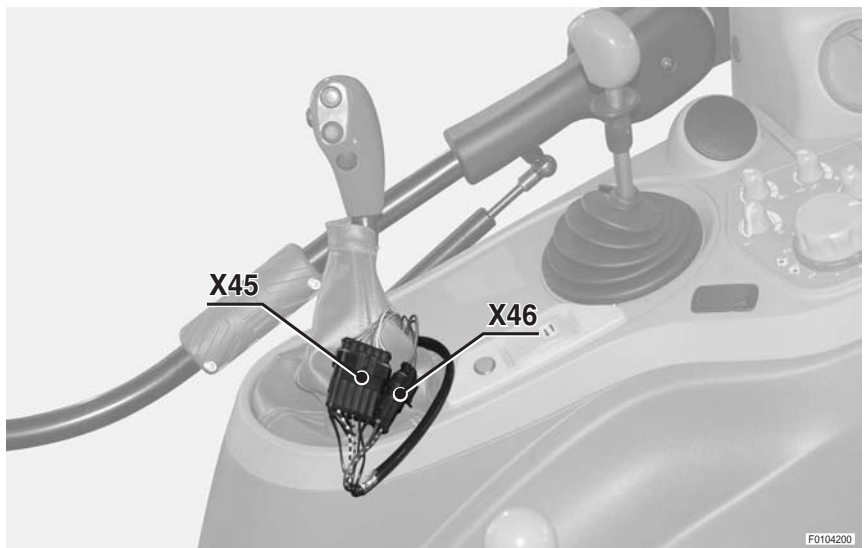
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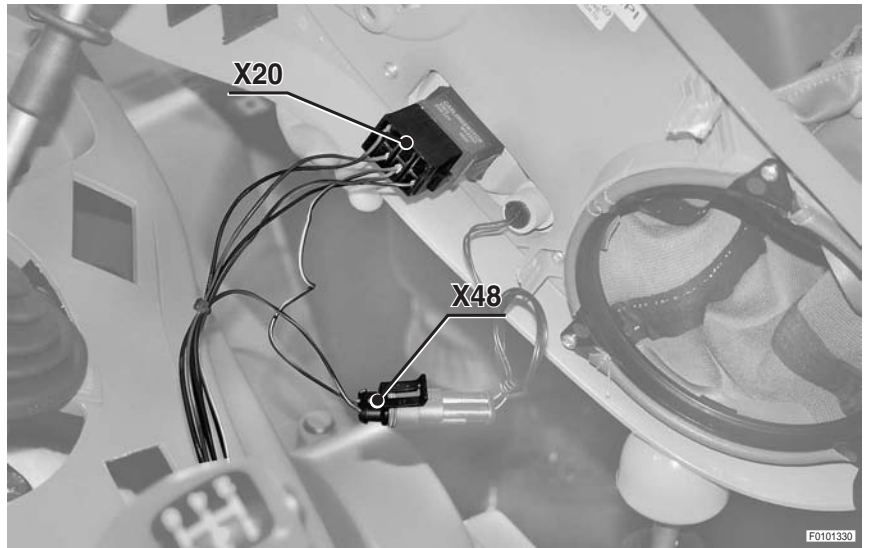
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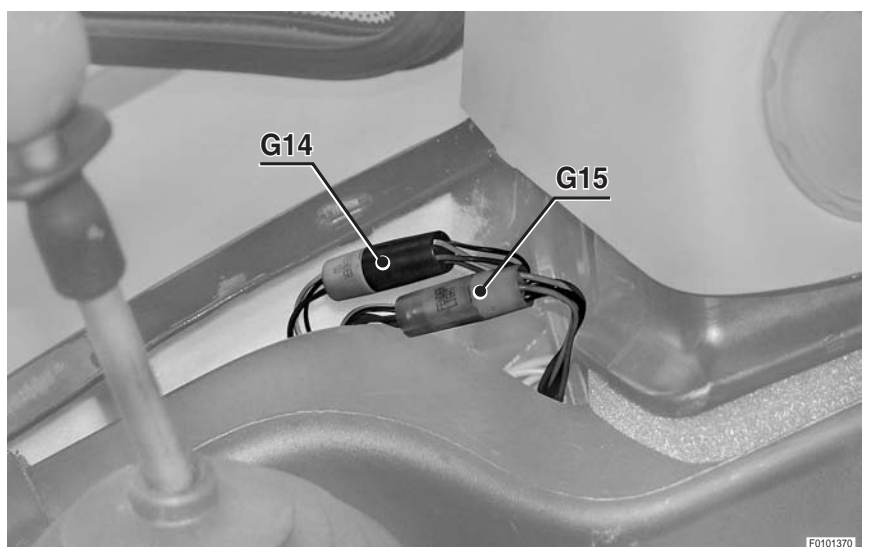
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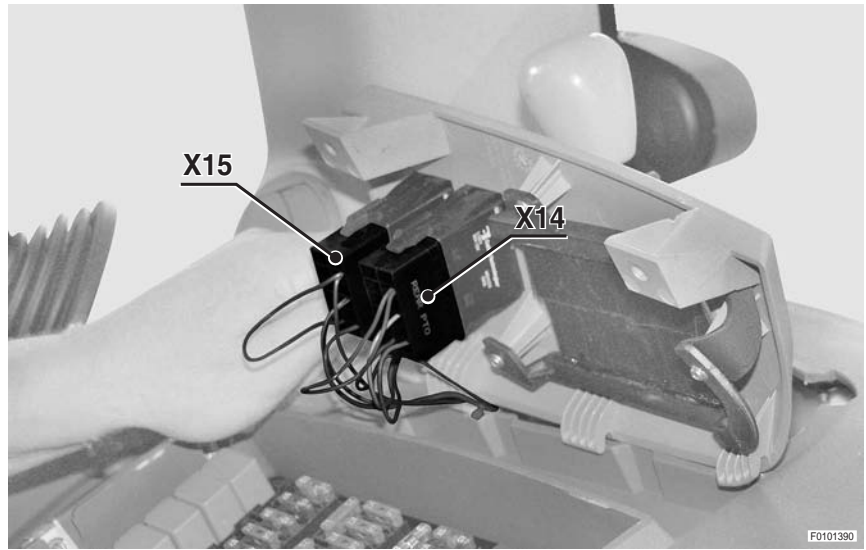
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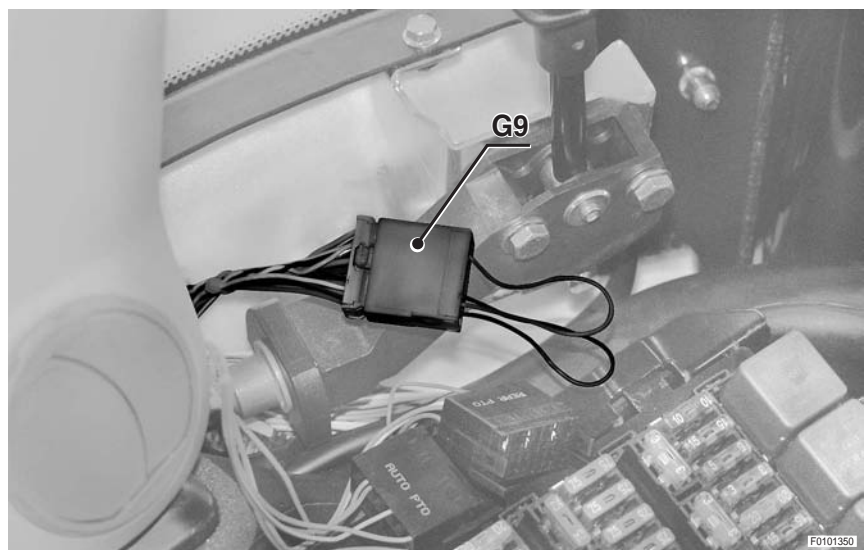
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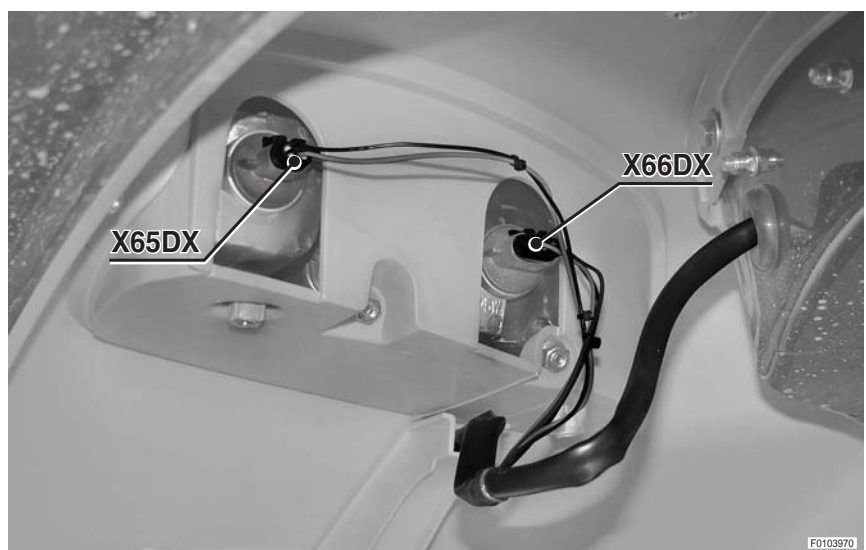
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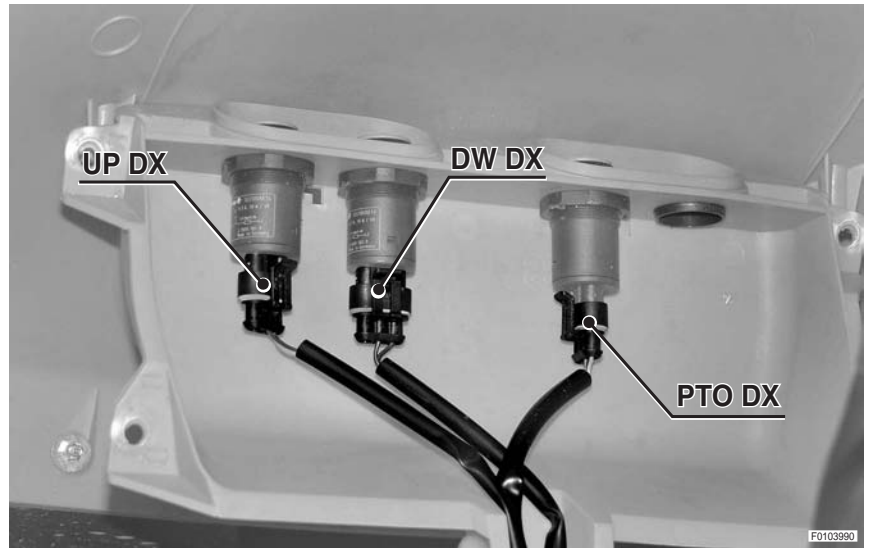
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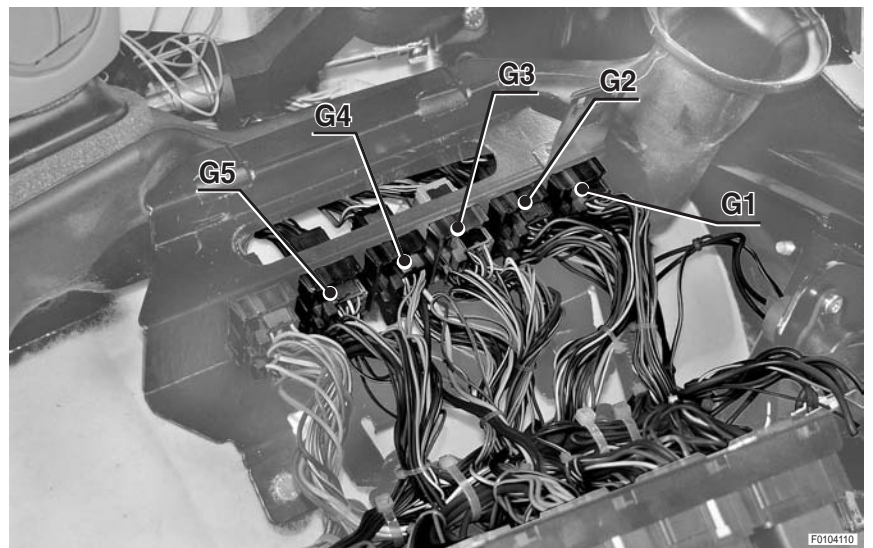
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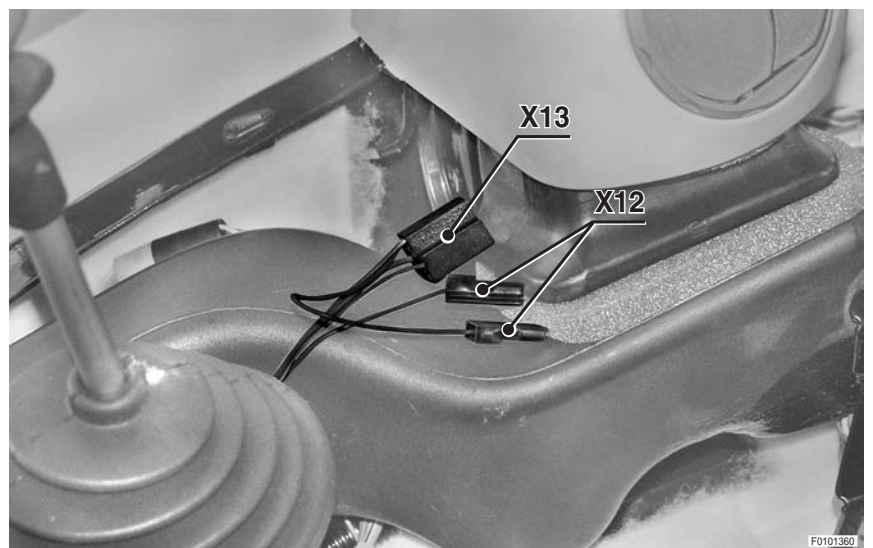
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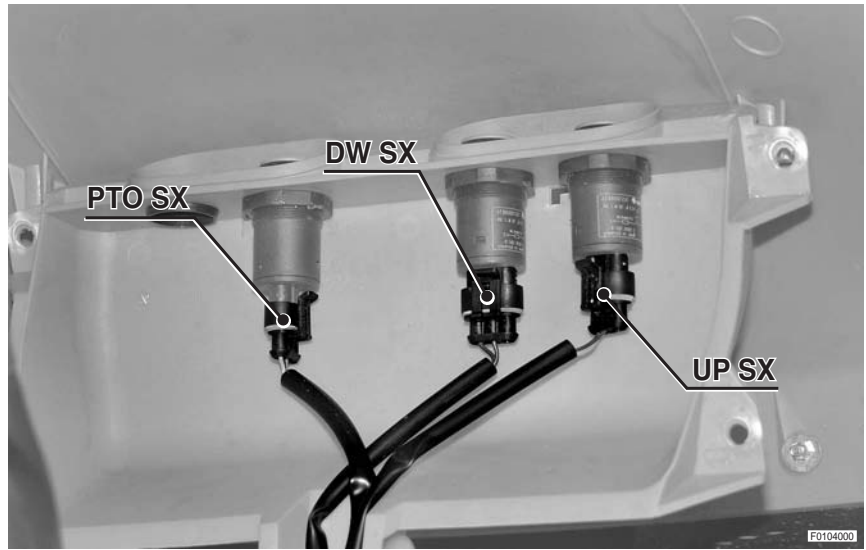
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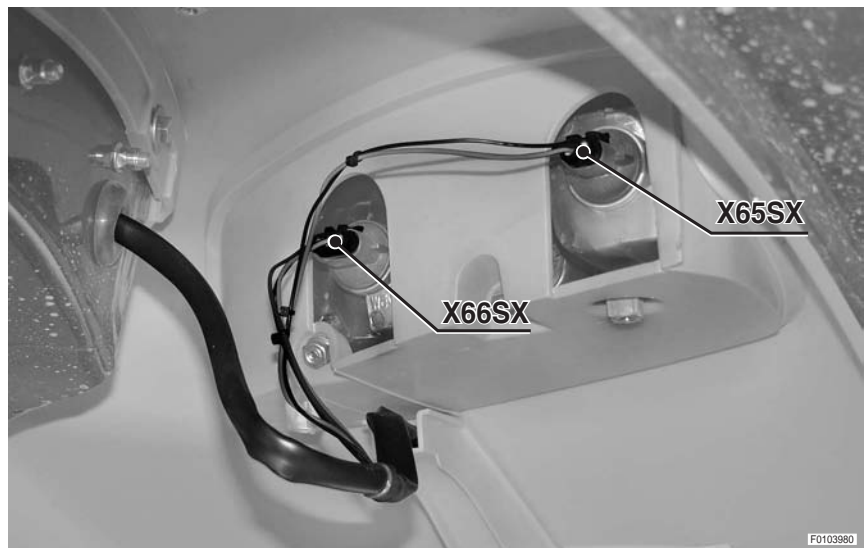
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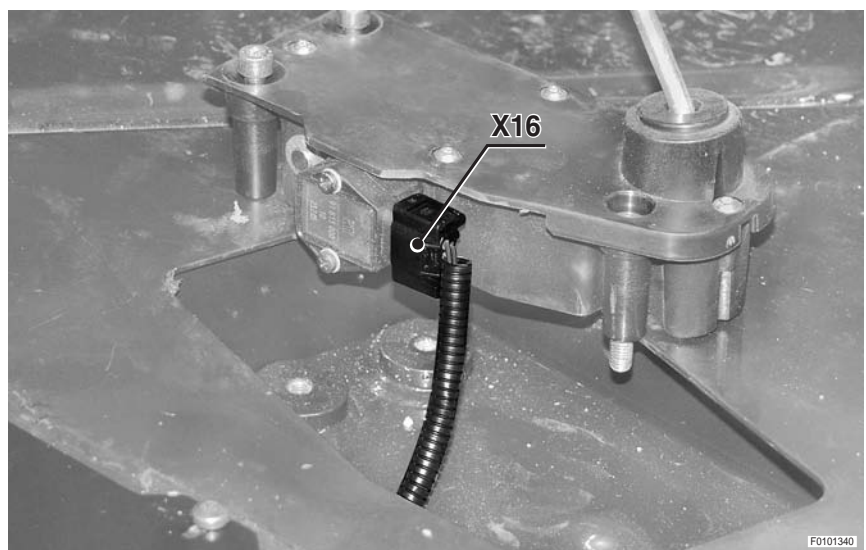
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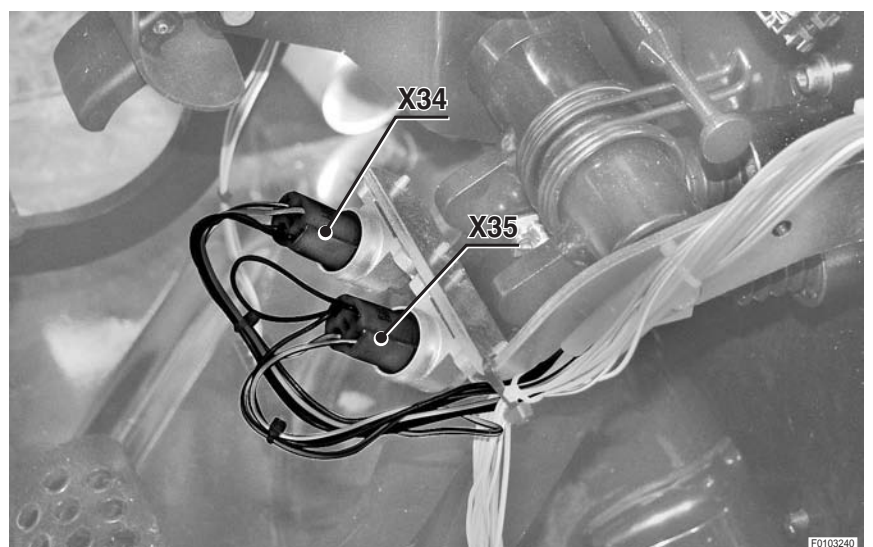
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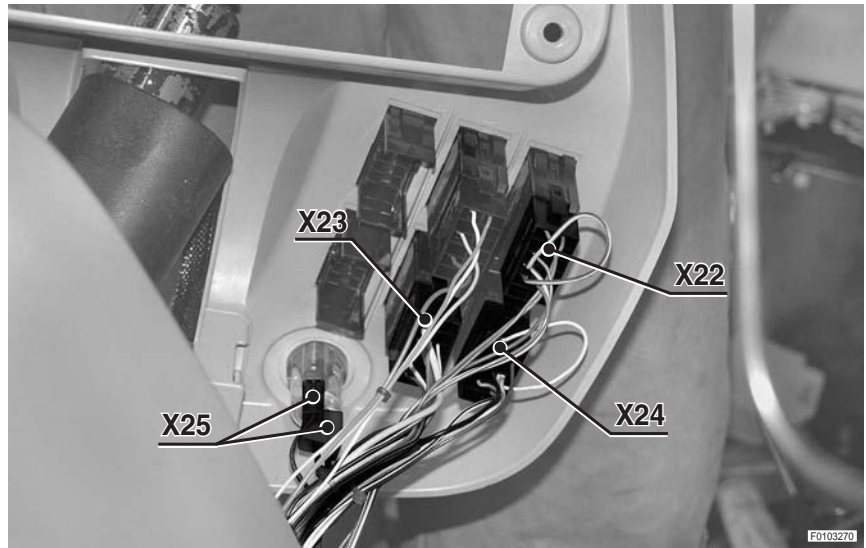
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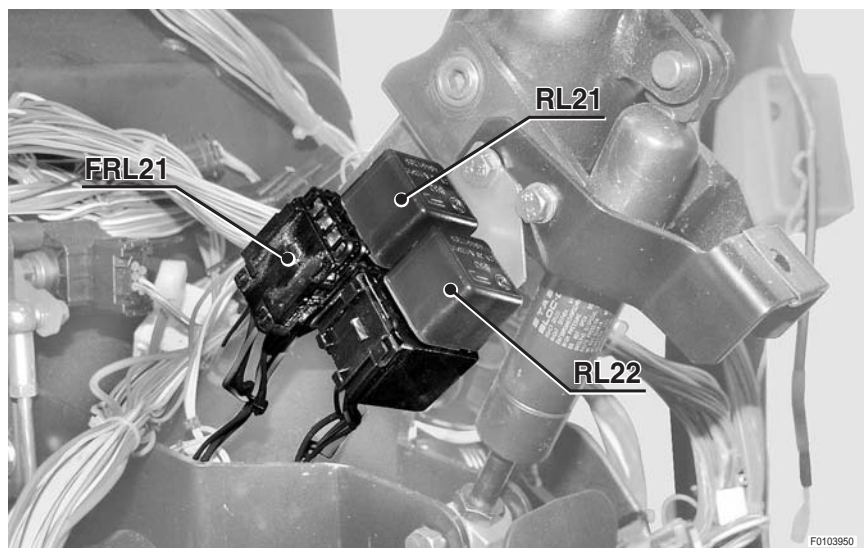
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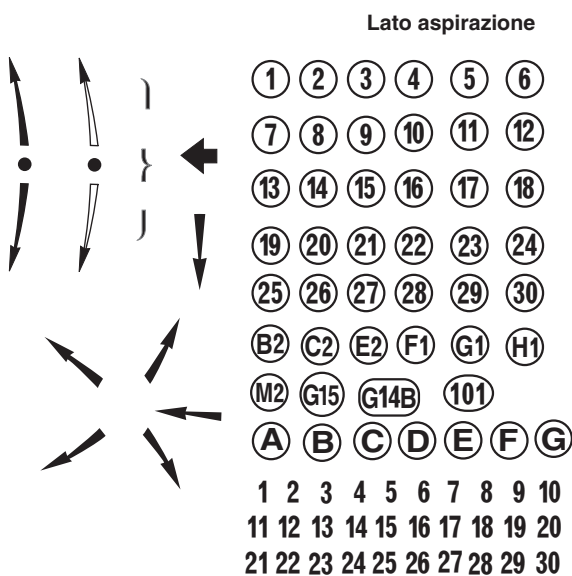
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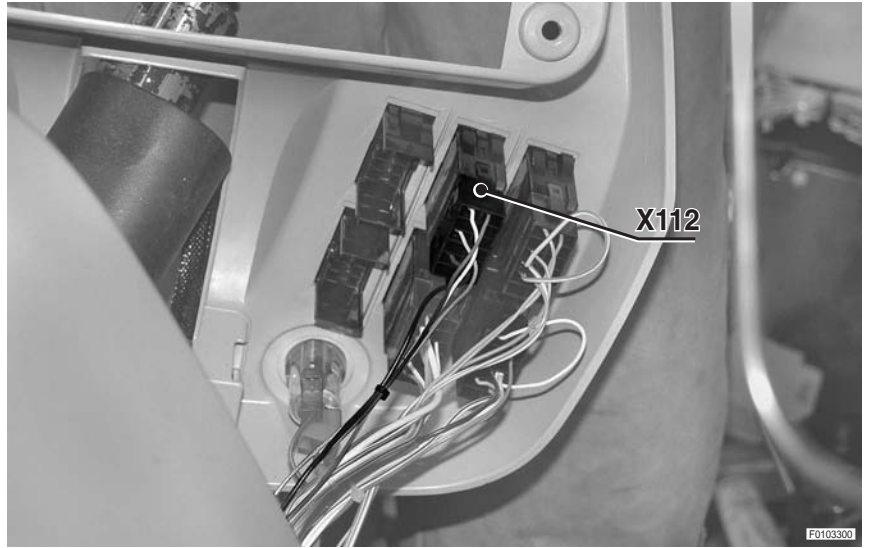


WITH LIFT



WITHOUT LIFT

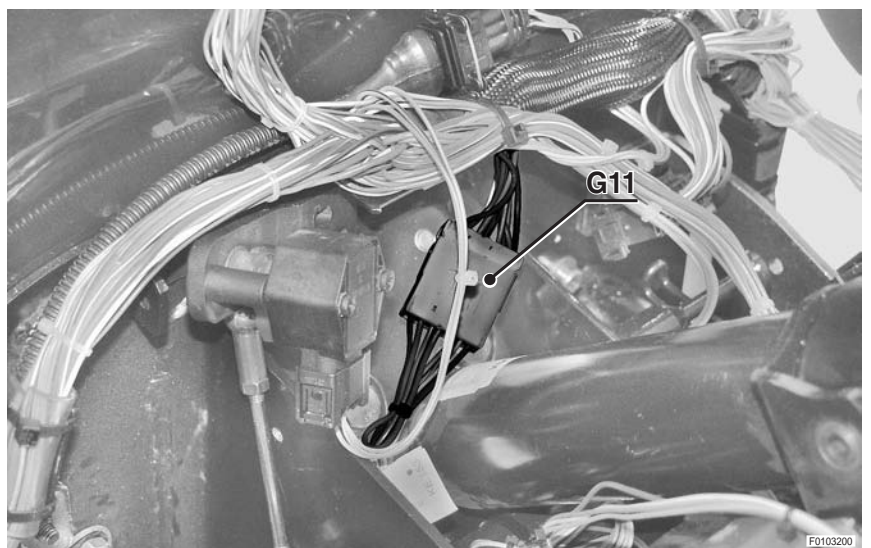
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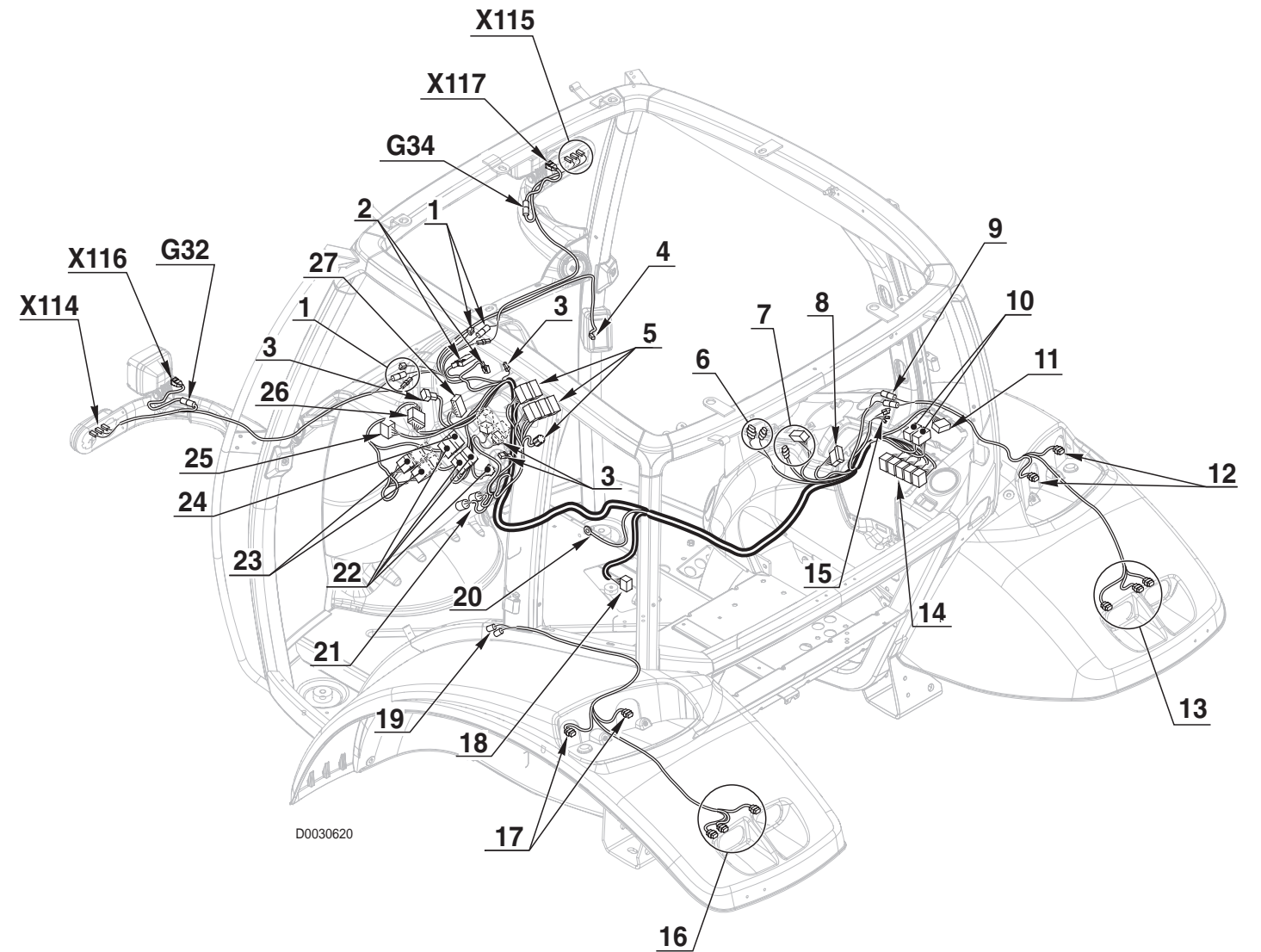


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27



**INSTRUMENT PANEL WIRING -
MUDGUARD WIRING
ARM LIGHT WIRING -
ARM SUPPLEMENTARY LIGHT WIRING-
UPPER LIGHT WIRING -
ARM WORKLIGHT WIRING**



- 0.014.3649.4/10
- 0.013.9309.4/30
- 0.014.0732.4/10
- 0.014.0002.4
- 0.014.1875.4/10
- 0.014.1874.4/10

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LIGHTS SELECTOR SWITCH WIRING

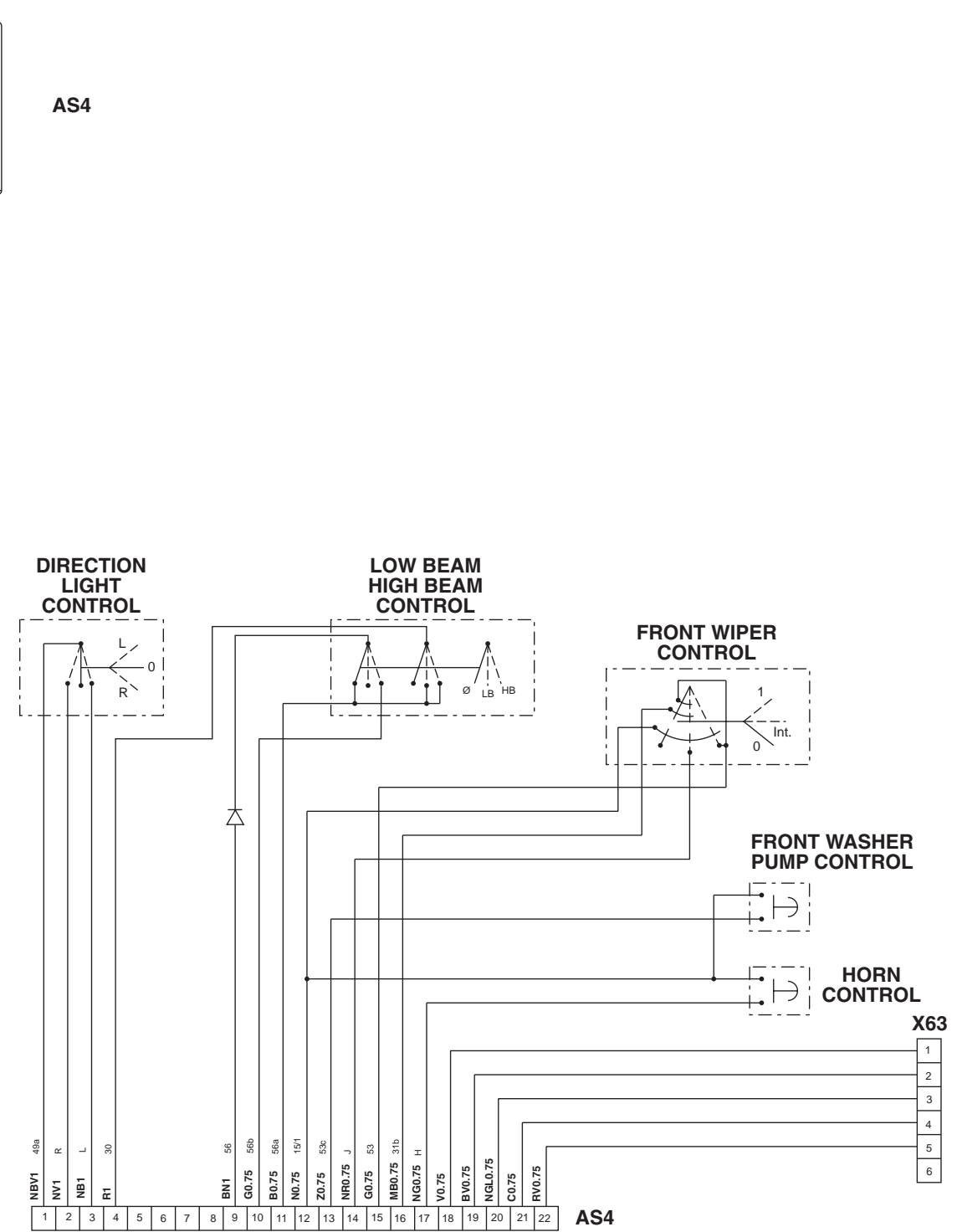
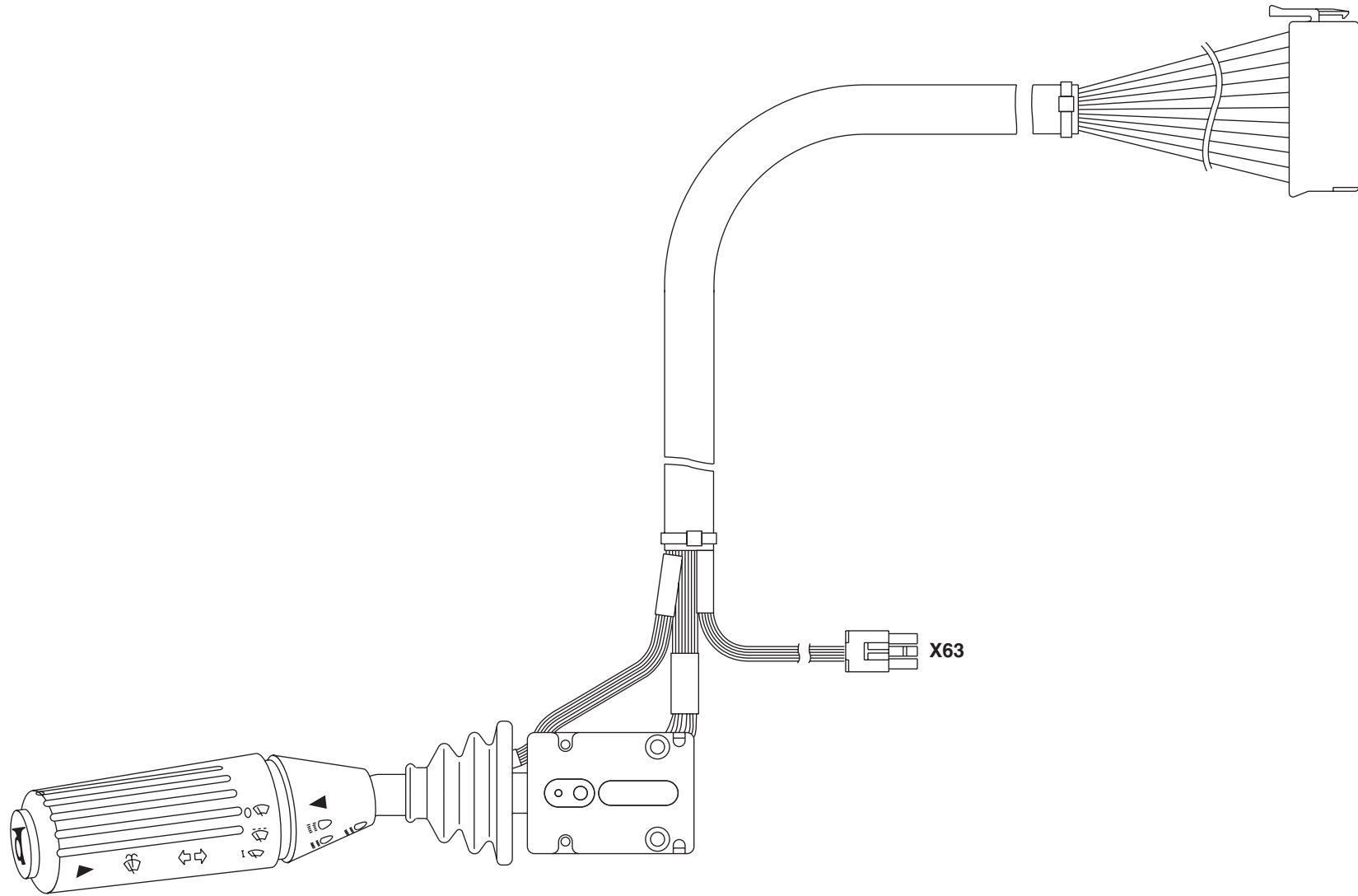


TABELLA COLORI / COLOURS TABLE

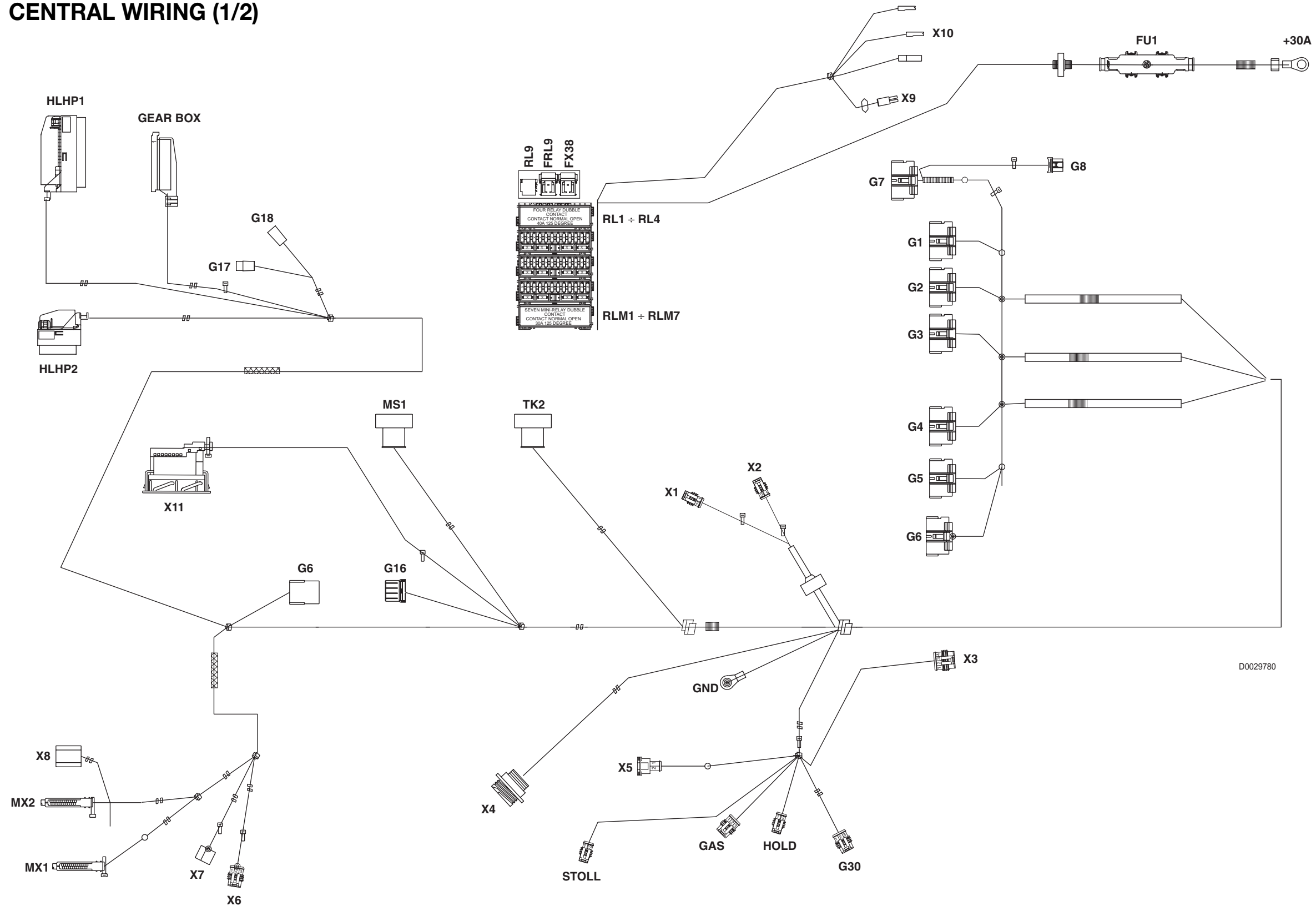
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Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030080

AS4 To instrument panel wiring
X63 Shuttle control lever

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CENTRAL WIRING (1/2)



D0029780

- MX2** Engine control unit
- RL1** Front worklights relay
- RL2** Rear worklights relay
- RL3** Key positive supply relay
- RL4** Key positive supply relay
- RL9** Engine starter relay
- RLM1** Preheating relay
- RLM2** Brake lights relay
- RLM3** Sidelights relay
- RLM4** Full beam headlights relay
- RLM5** Low beam headlights relay
- RLM6** Side worklights relay
- RLM7** Air-conditioner compressor relay
- STOLL** Not utilised
- TK2** To right-hand transmission wiring
- X1** Rear window washer pump
- X2** Windscreen washer pump
- X3** Supplementary CANBUS socket
- X4** Diagnostic socket
- X5** Creeper engagement sensor
- X6** Not utilised
- X7** Operator seat
- X8** Handbrake switch
- X9** ISO4 socket
(Power for external implements)
- X10** Power socket
- X11** Not utilised

- +30A** Battery
- FRL9** Engine starter 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 mudguard wiring
- G18** To mudguard wiring
- G30** To control valve wiring
- GAS** Hand throttle position sensor
- HOLD** "HOLD" button
- GEAR BOX** Transmission control unit

- GND4** Earthing point 4
- HLHP1** HLHP control unit
- HLHP2** HLHP control unit
- HOLD** "HOLD" button
- MS1** To left-hand transmission wiring
- MX1** Engine control unit

CENTRAL WIRING (2/2)

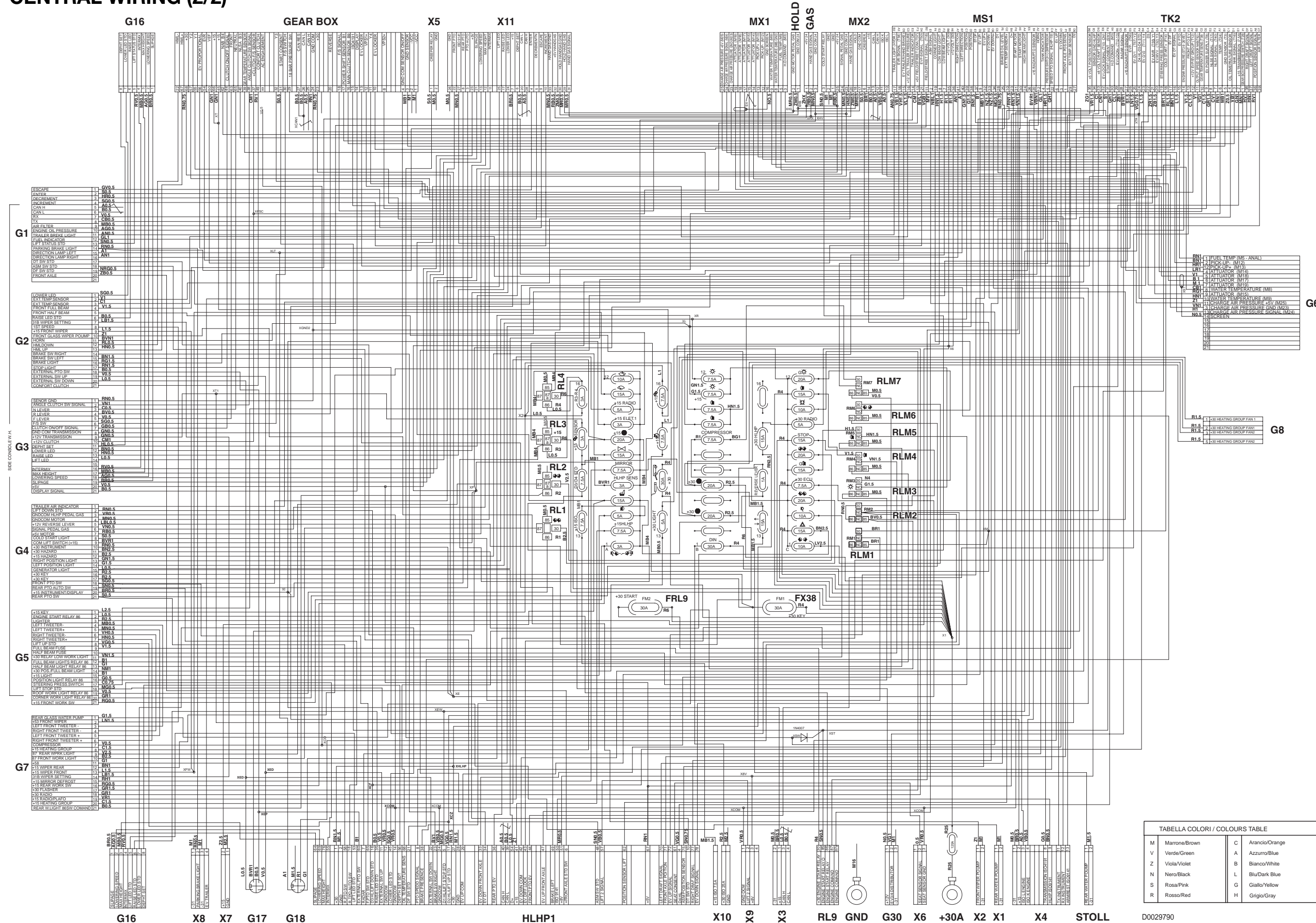
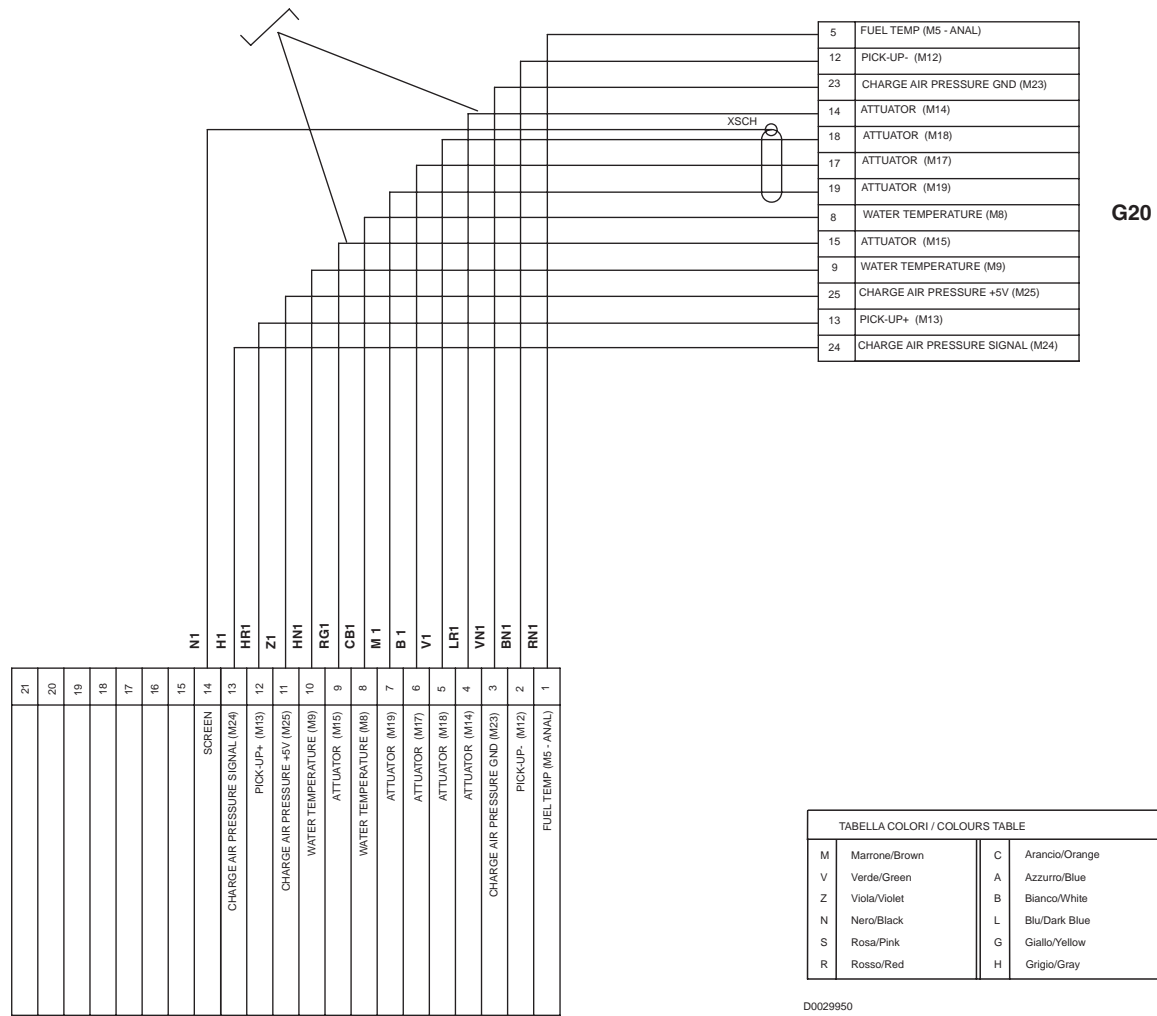
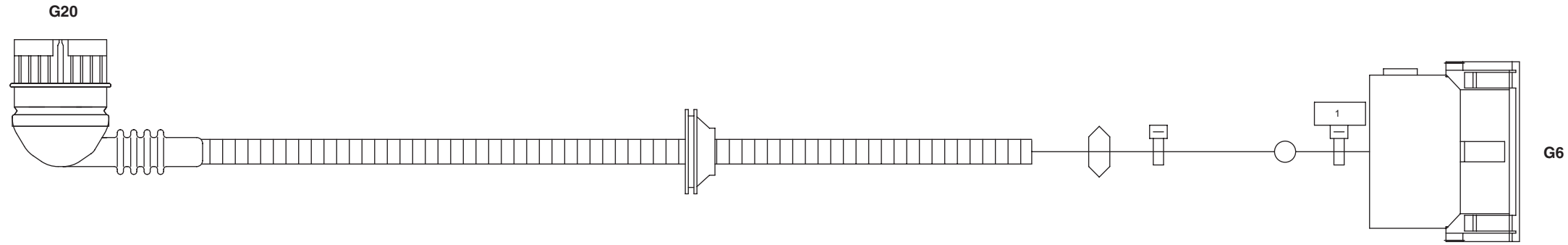


TABELLA COLORI / COLOURS TABLE

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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

ENGINE WIRING

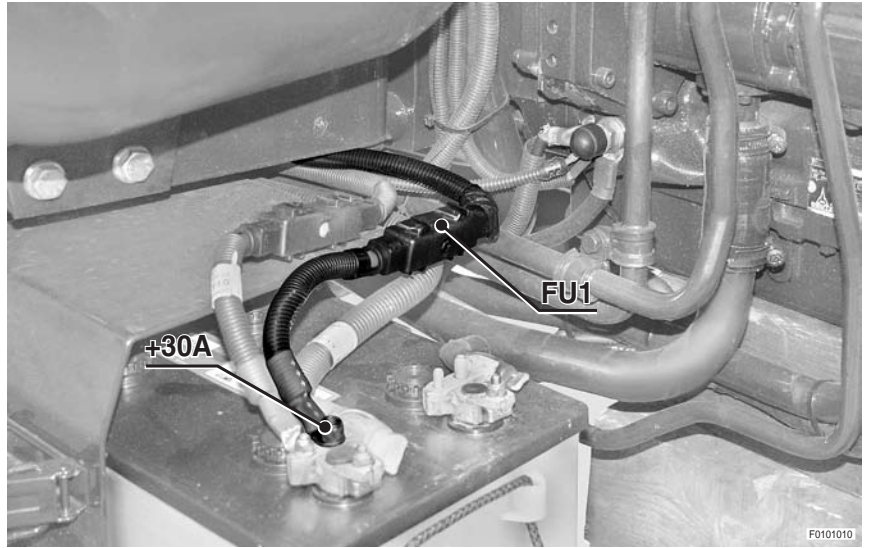


G6 To central wiring
G20 To engine wiring

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CONNECTORS LOCATION

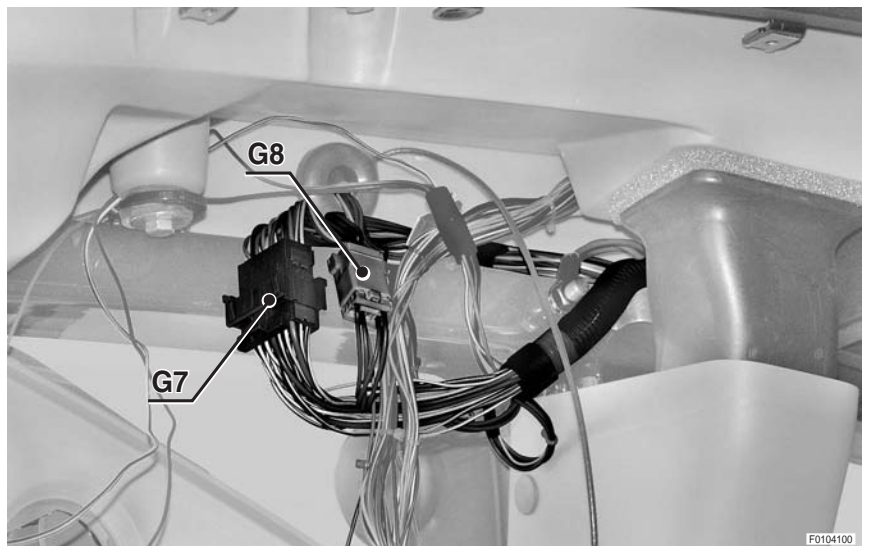
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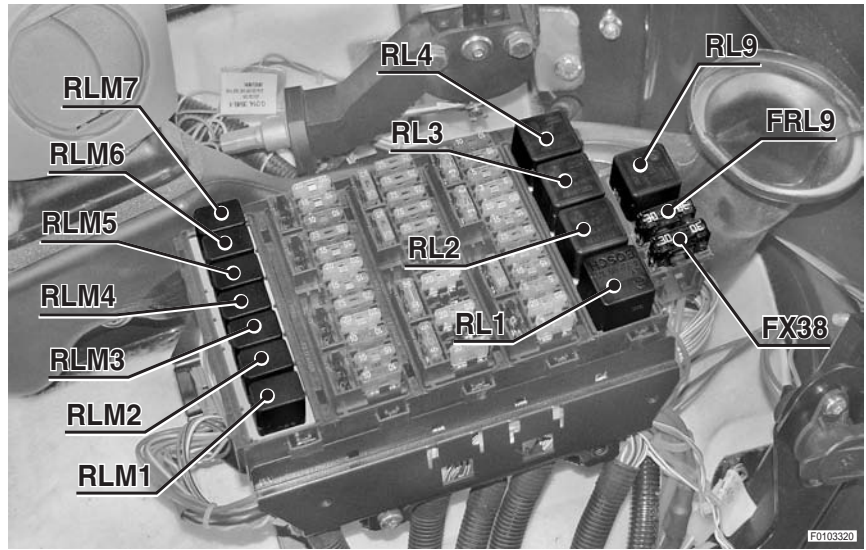
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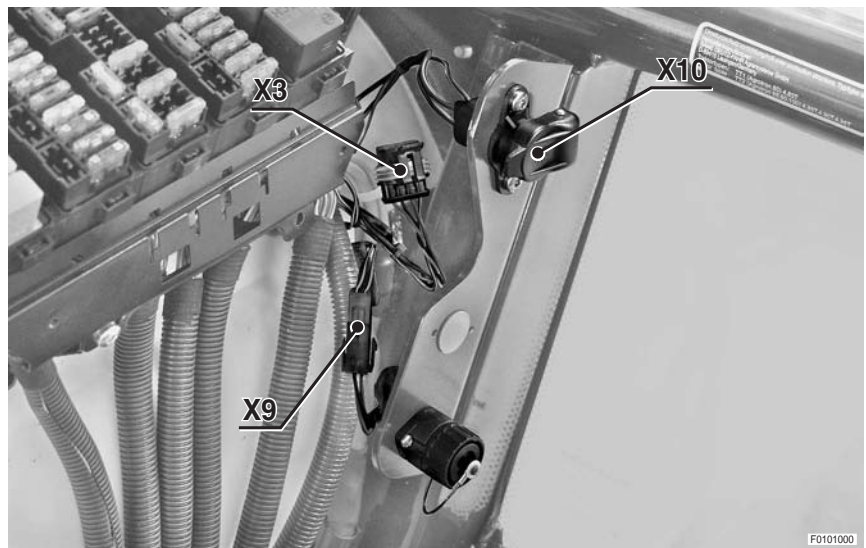
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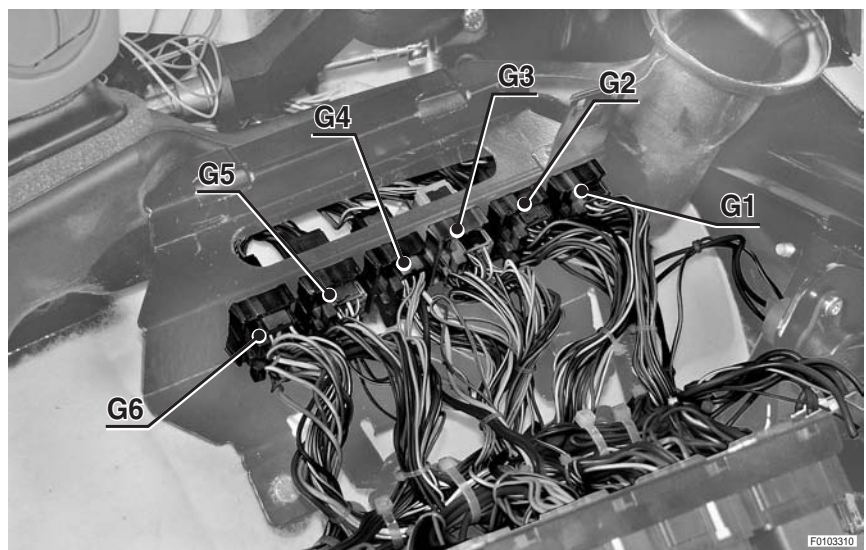
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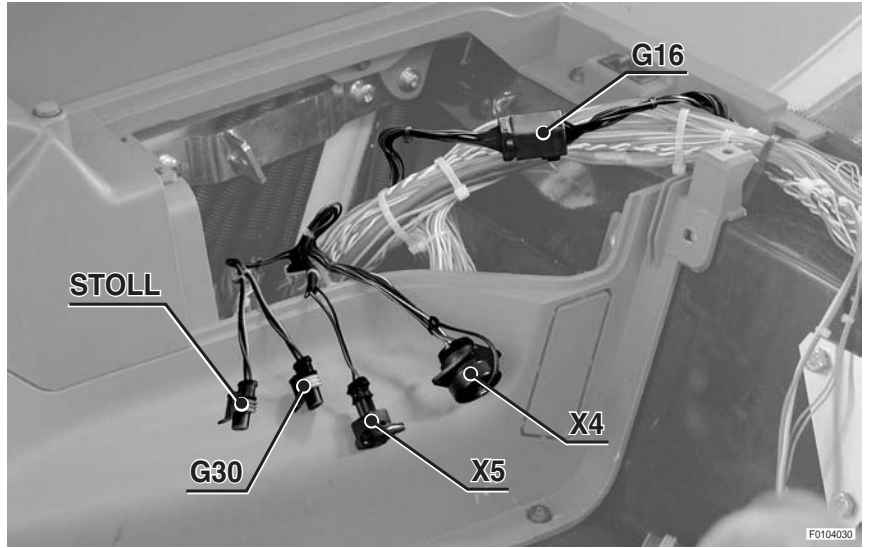
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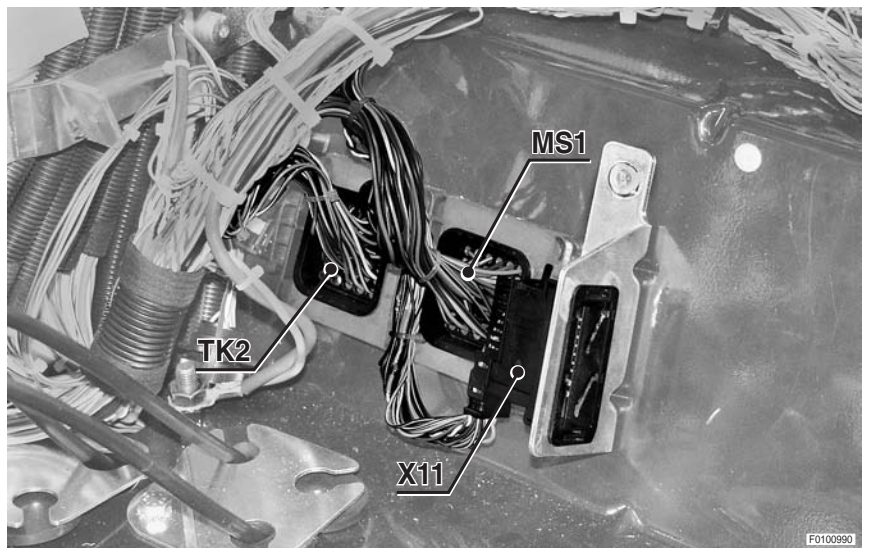
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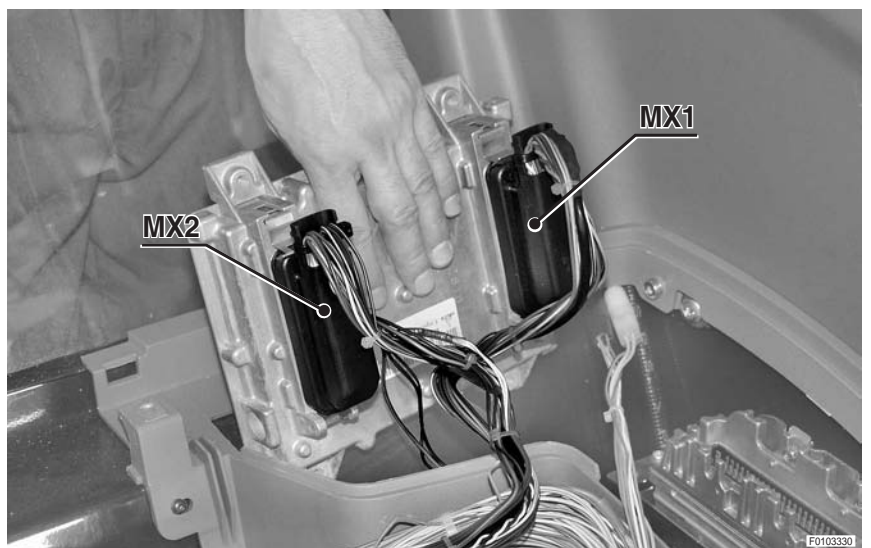
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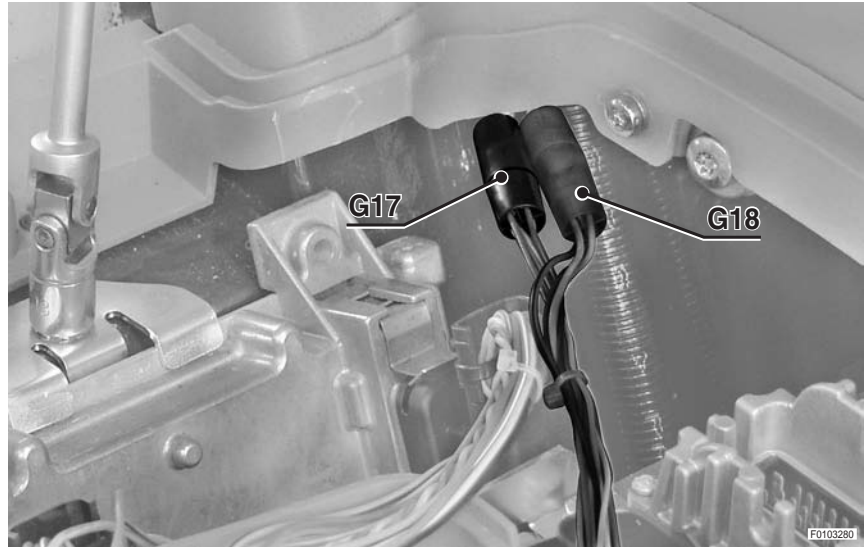
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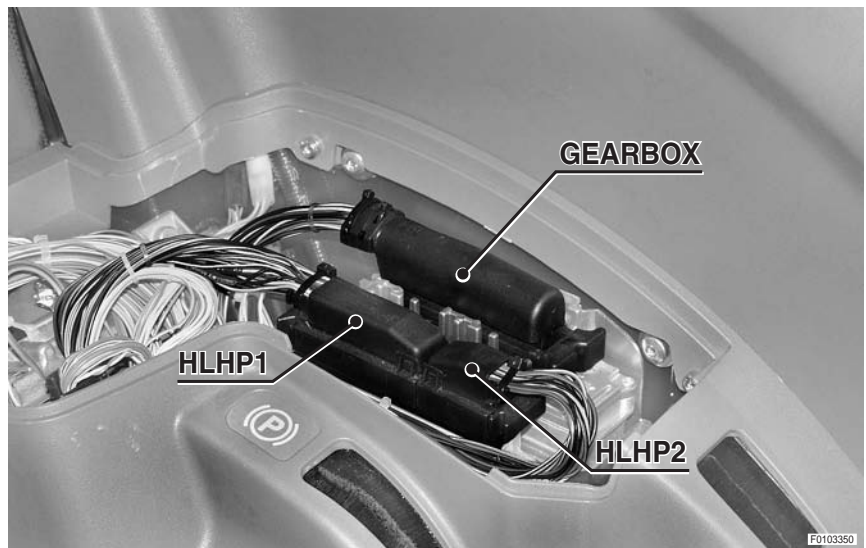
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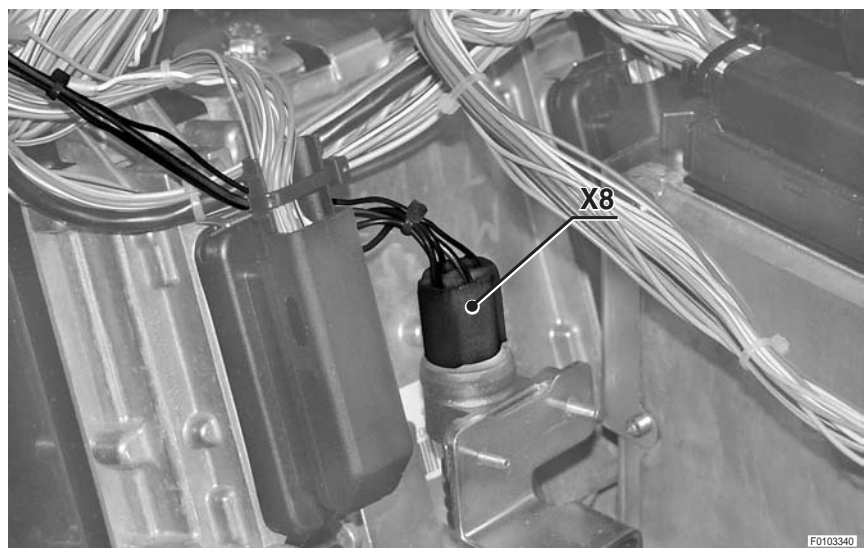
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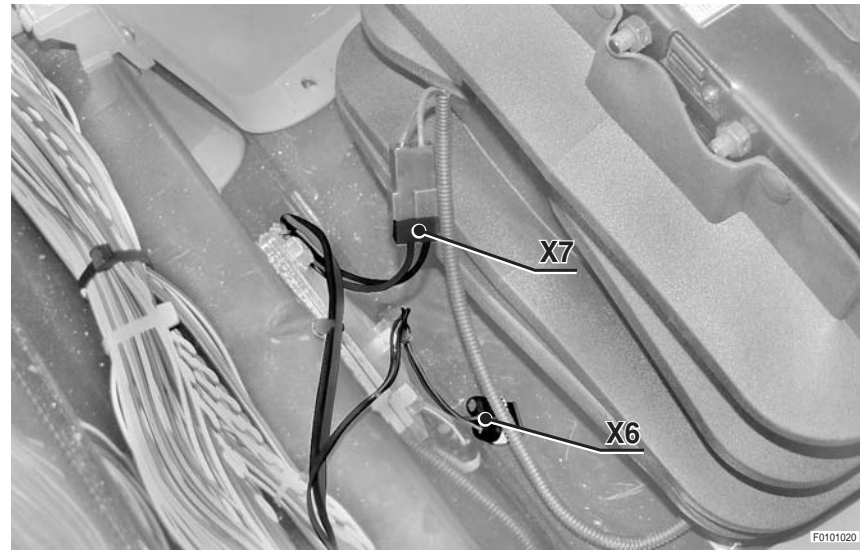
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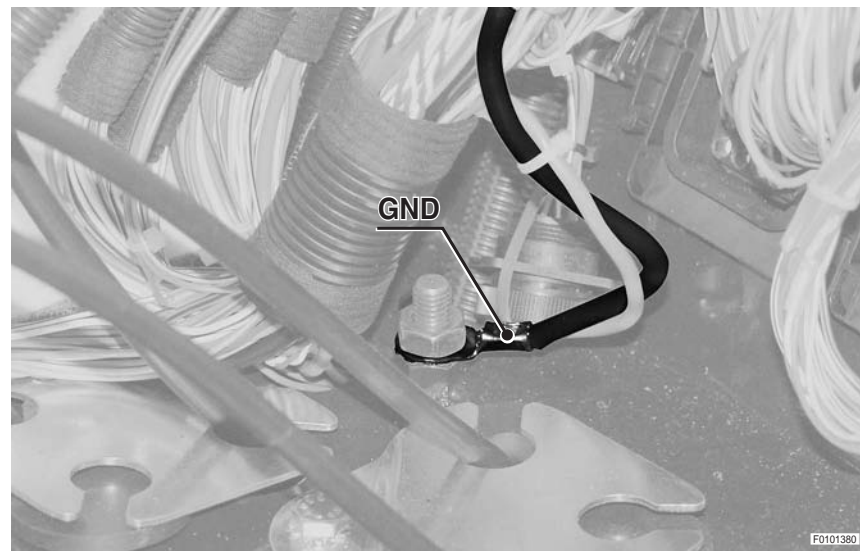
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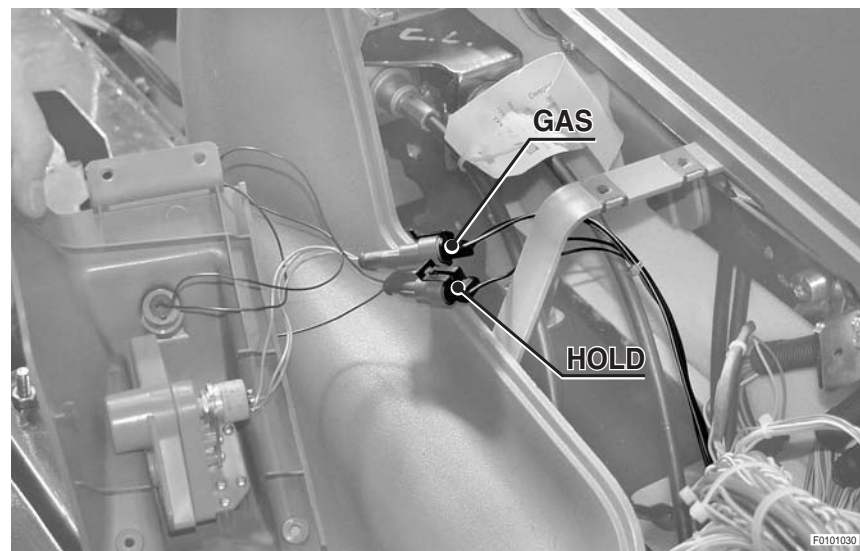
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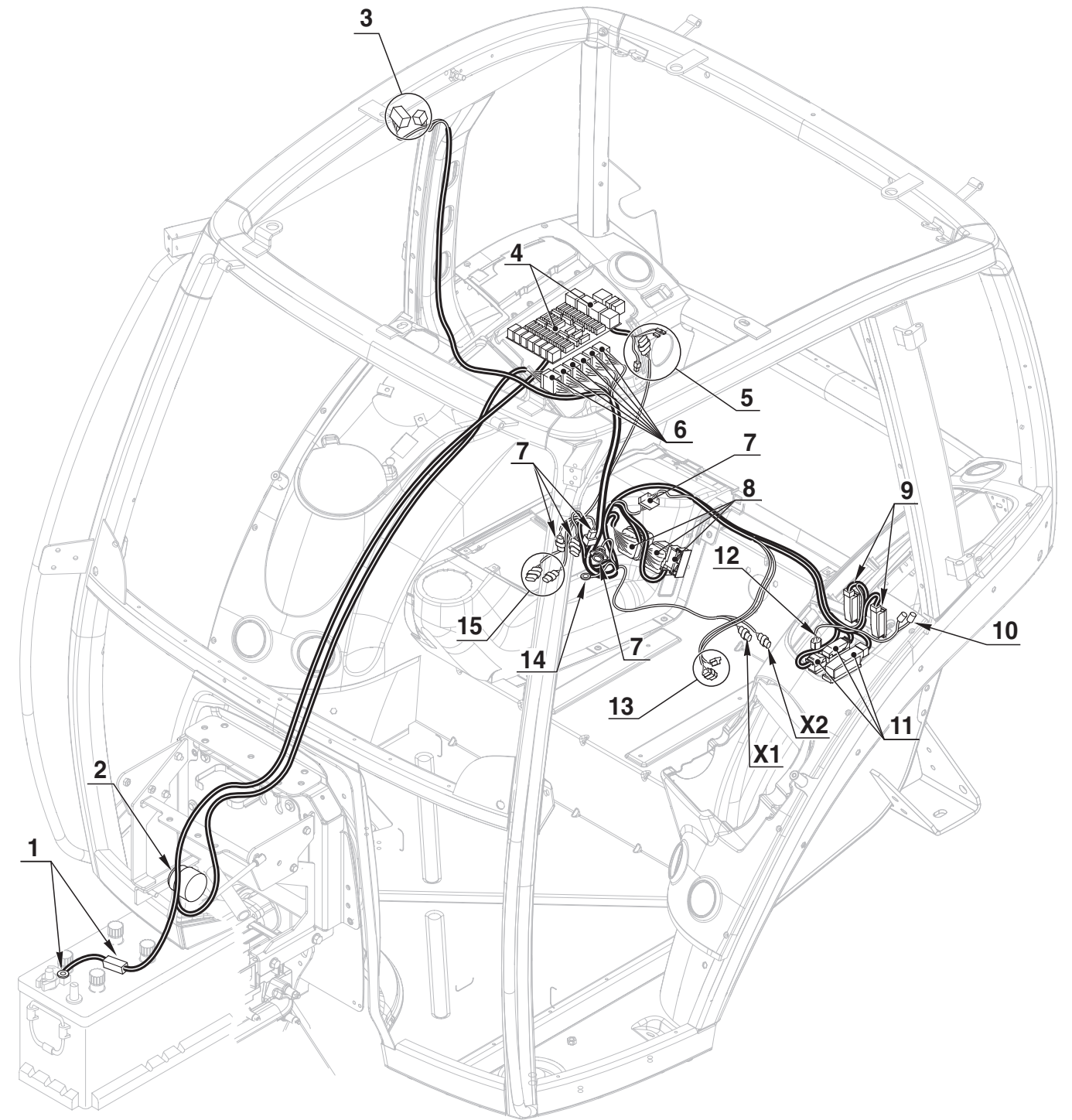
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15



CENTRAL WIRING - ENGINE WIRING

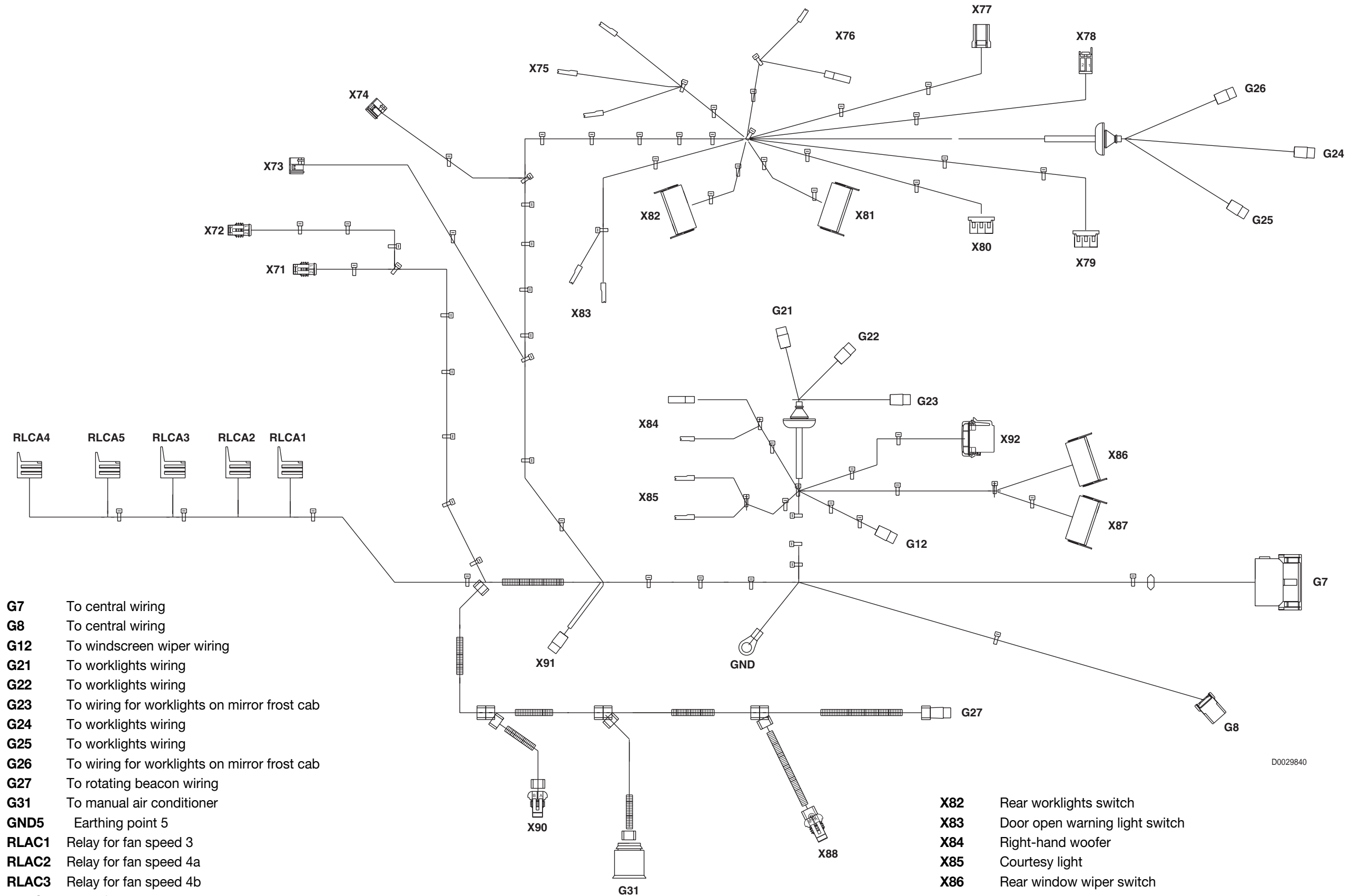


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ROOF LINE WIRING (1/2)



- G7** To central wiring
- G8** To central wiring
- G12** To windscreen wiper wiring
- G21** To worklights wiring
- G22** To worklights wiring
- G23** To wiring for worklights on mirror frost cab
- G24** To worklights wiring
- G25** To worklights wiring
- G26** To wiring for worklights on mirror frost cab
- 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** Ceiling 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

D0029840

ROOF LINE WIRING (2/2)

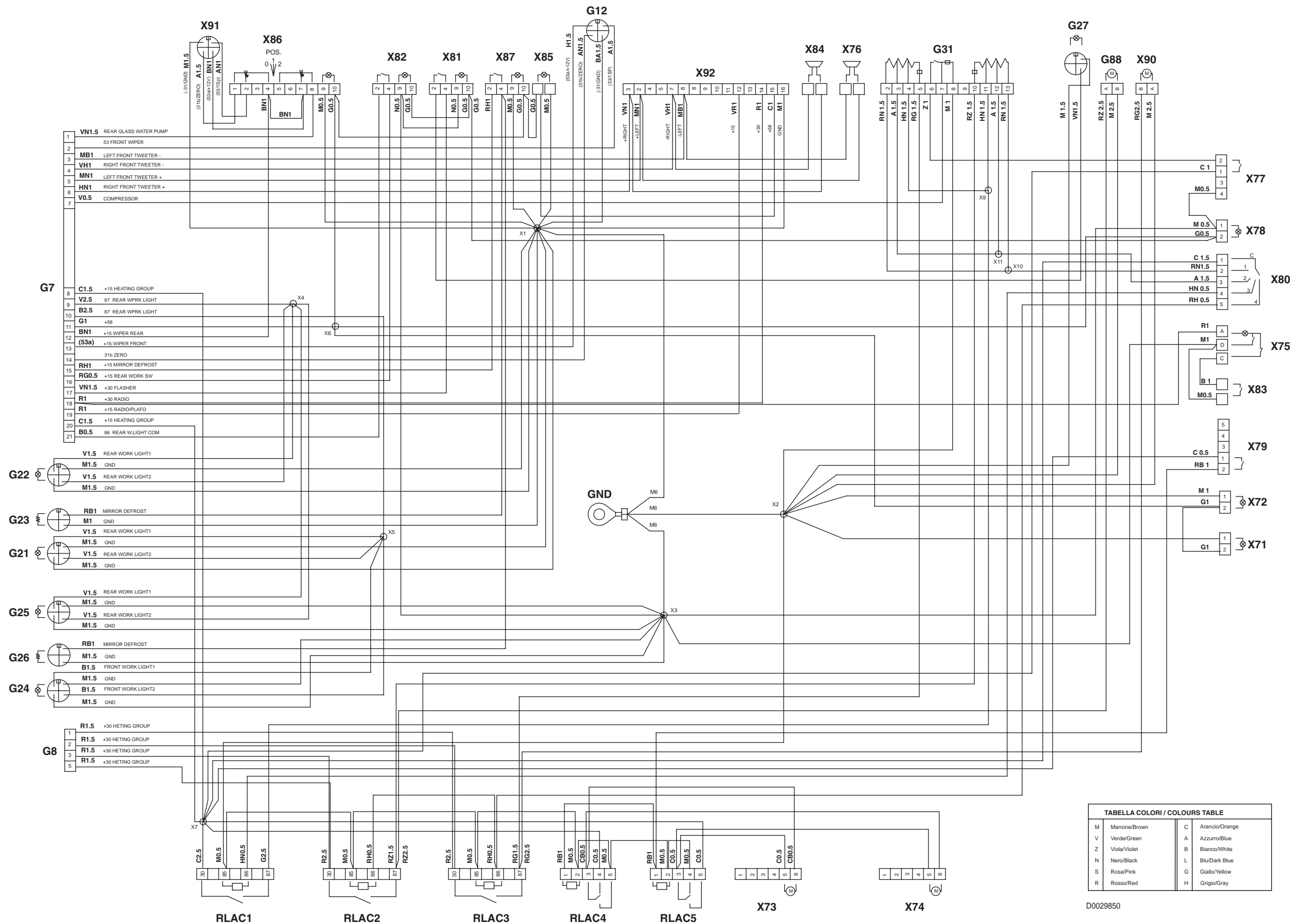
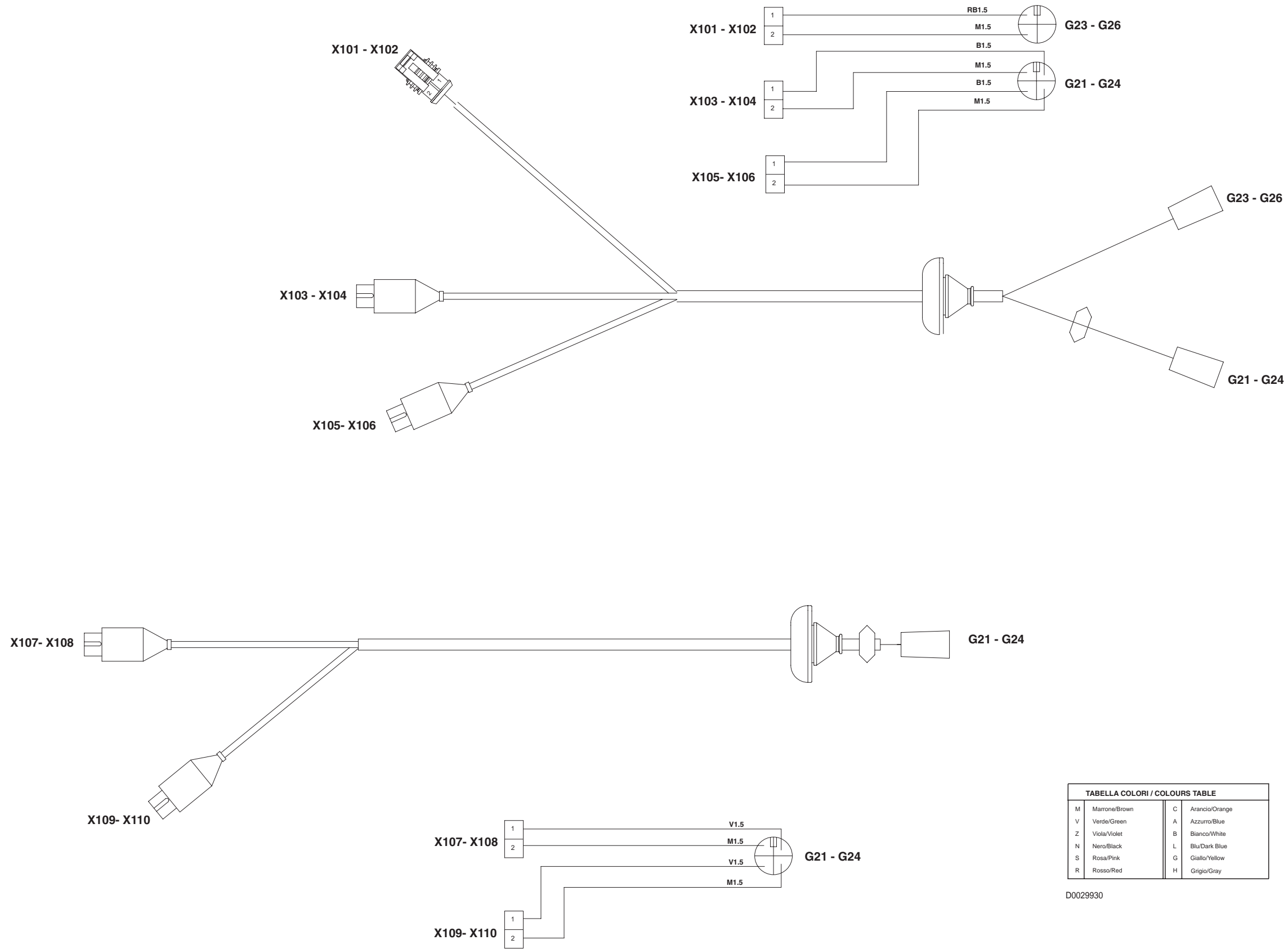


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M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029850

WIRING FOR WORKLIGHTS, DEFROST MIRROR ON CAB (HL VERSION)

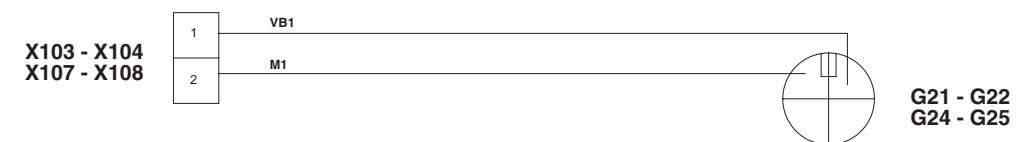
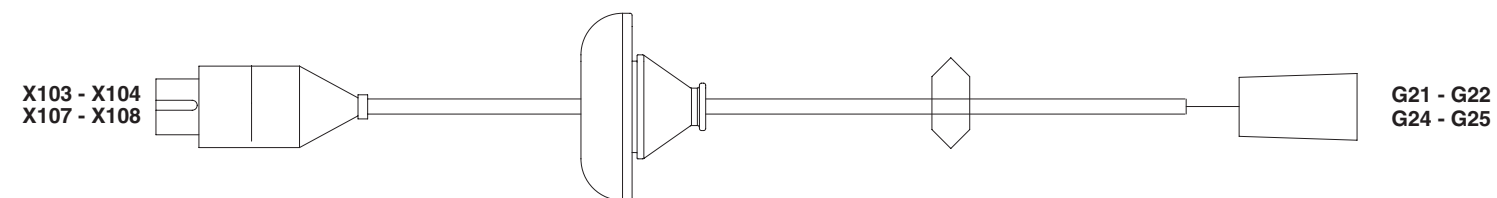


- G21** To roof line wiring
- G22** To roof line wiring
- G23** To roof line wiring
- G24** To roof line wiring
- G25** To roof line wiring
- G26** To roof line wiring
- X101** Right-hand rearview mirror with electric demisting
- X102** Left-hand rearview mirror with electric demisting
- X103** Right-hand 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

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

WIRING FOR WORKLIGHTS ON CAB (STANDARD VERSION)



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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

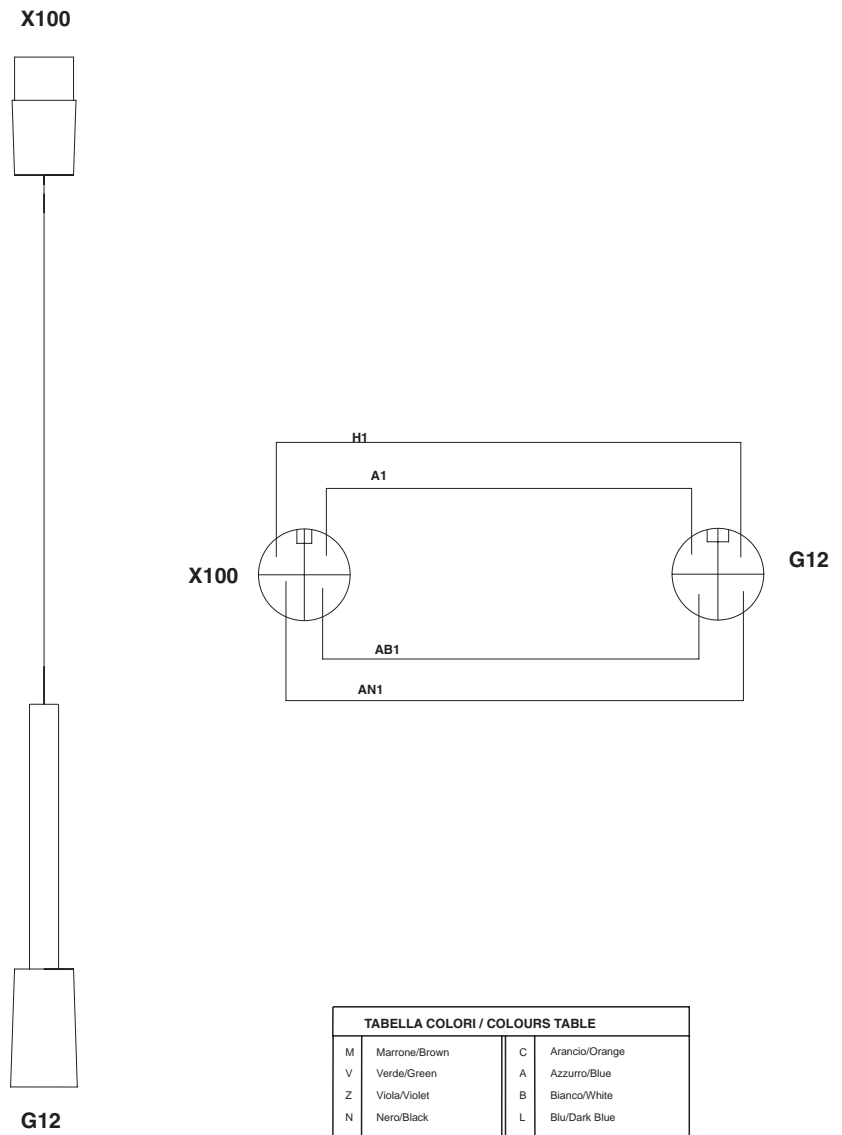


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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0029940

- G12** To roof line wiring
- X100** Windscreen wiper motor

ROTATING BEACON WIRING

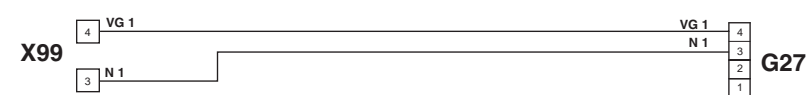
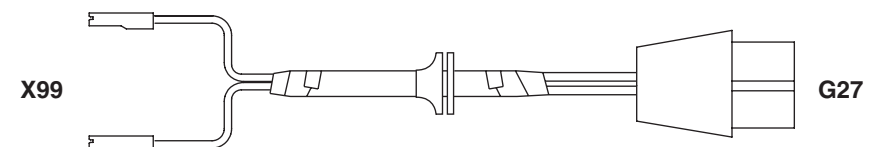


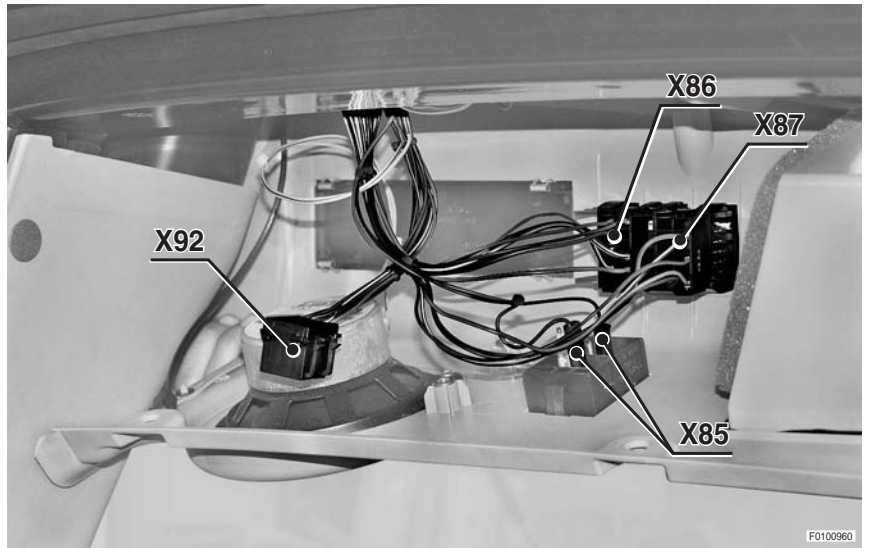
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R	Rosso/Red	H	Grigio/Gray

D0030060

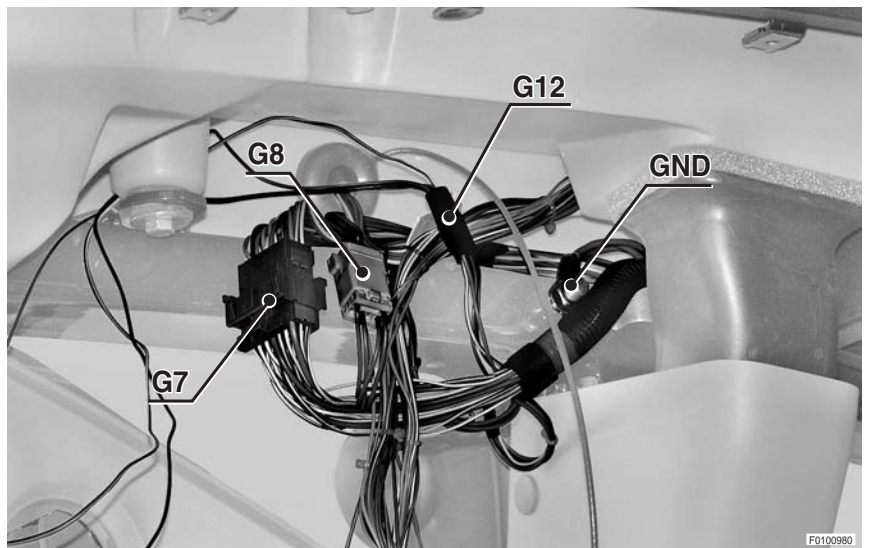
G27 To roof line wiring
X99 Rotating beacon

CONNECTORS LOCATION

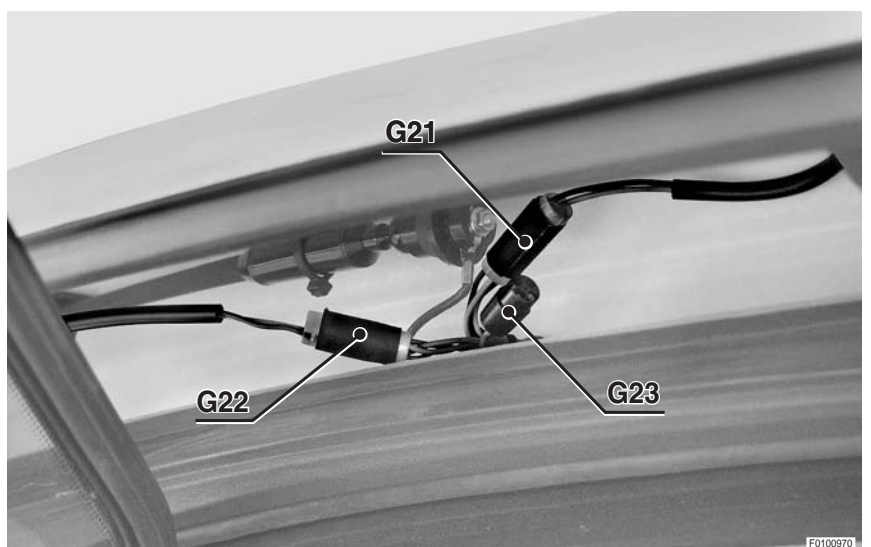
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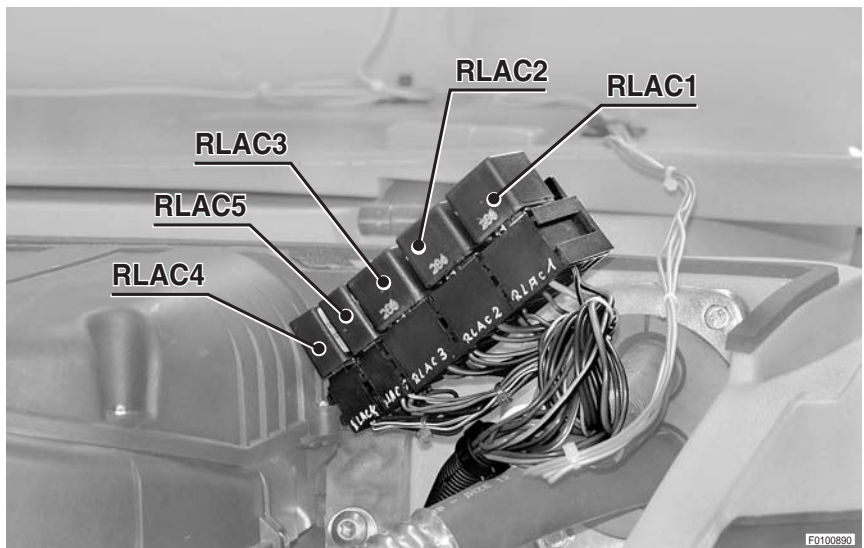
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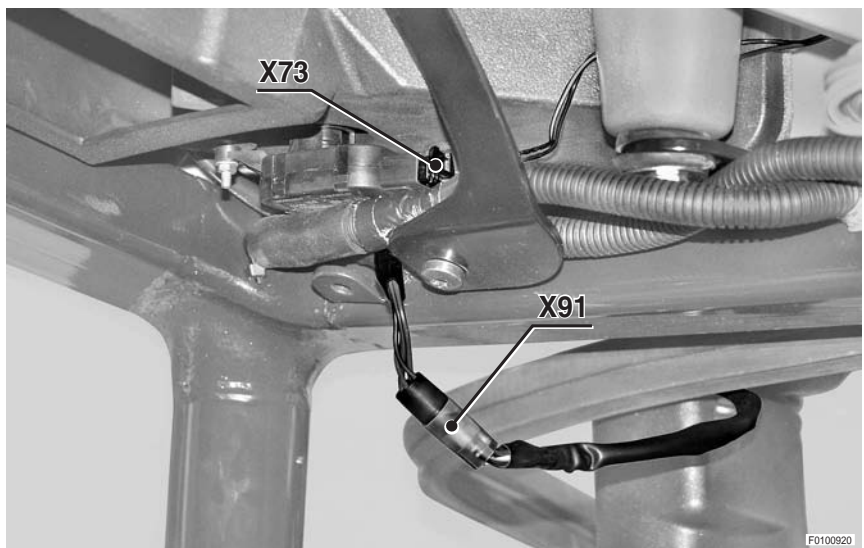
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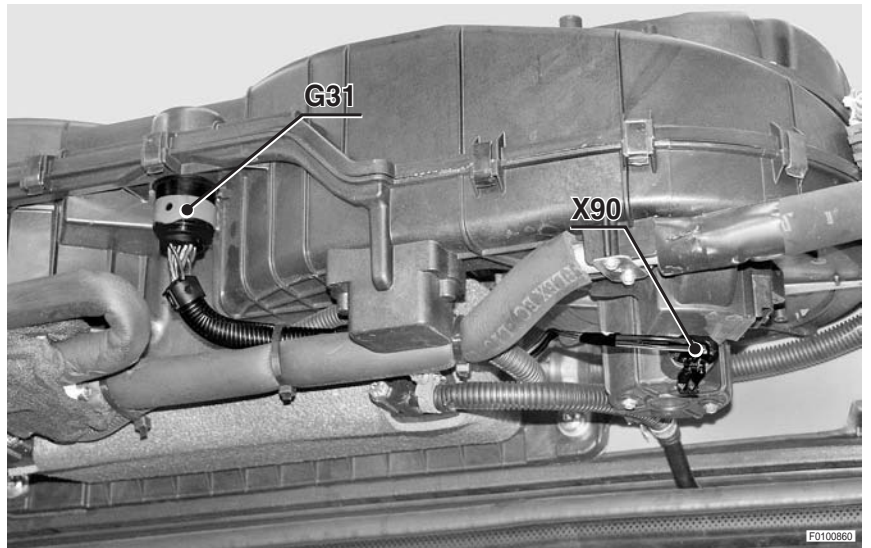
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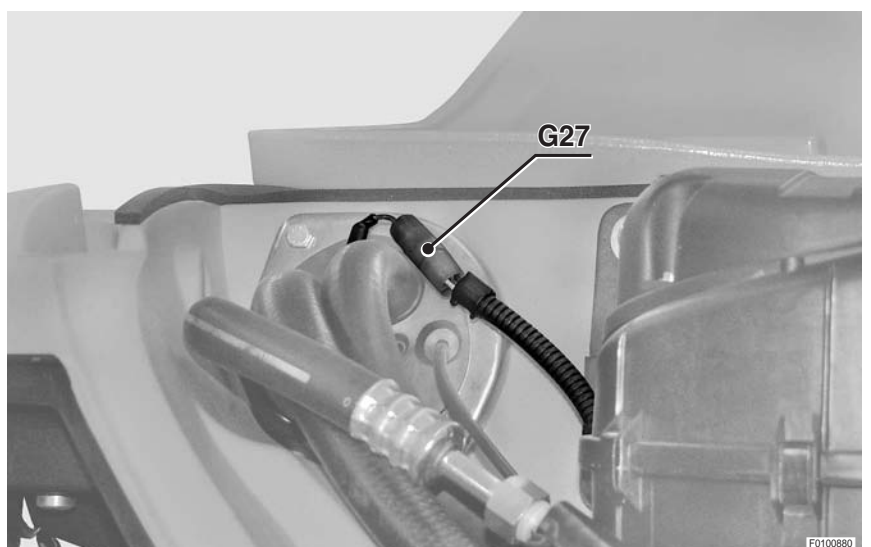
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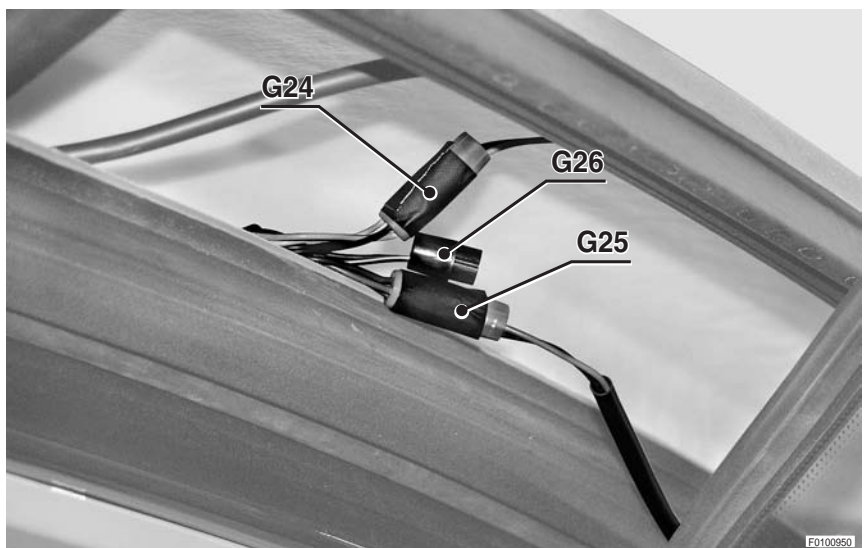
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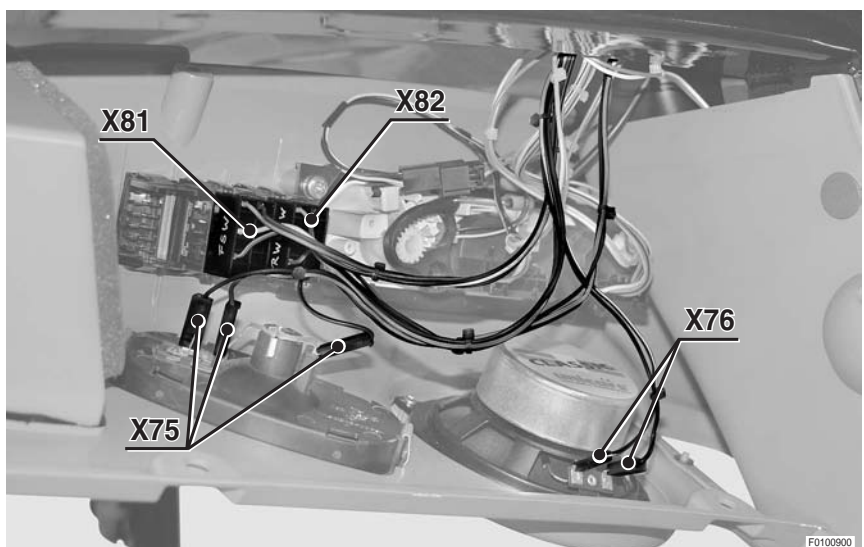
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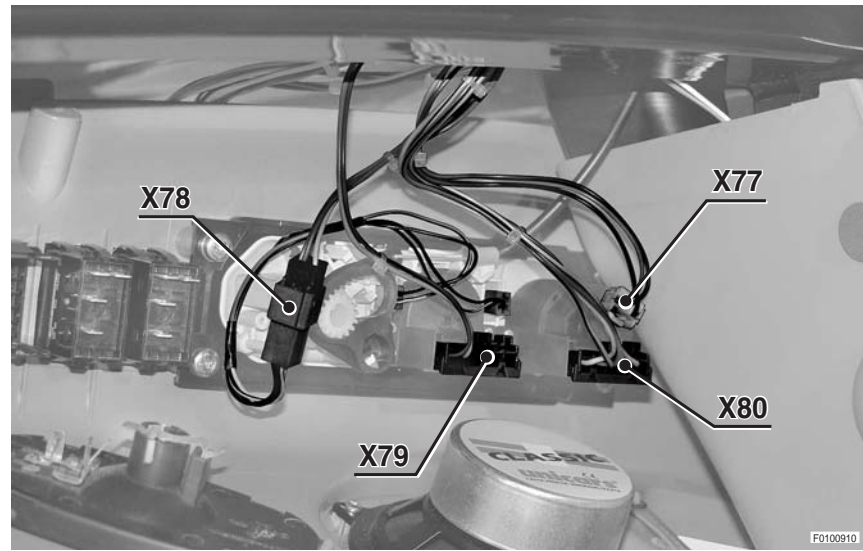
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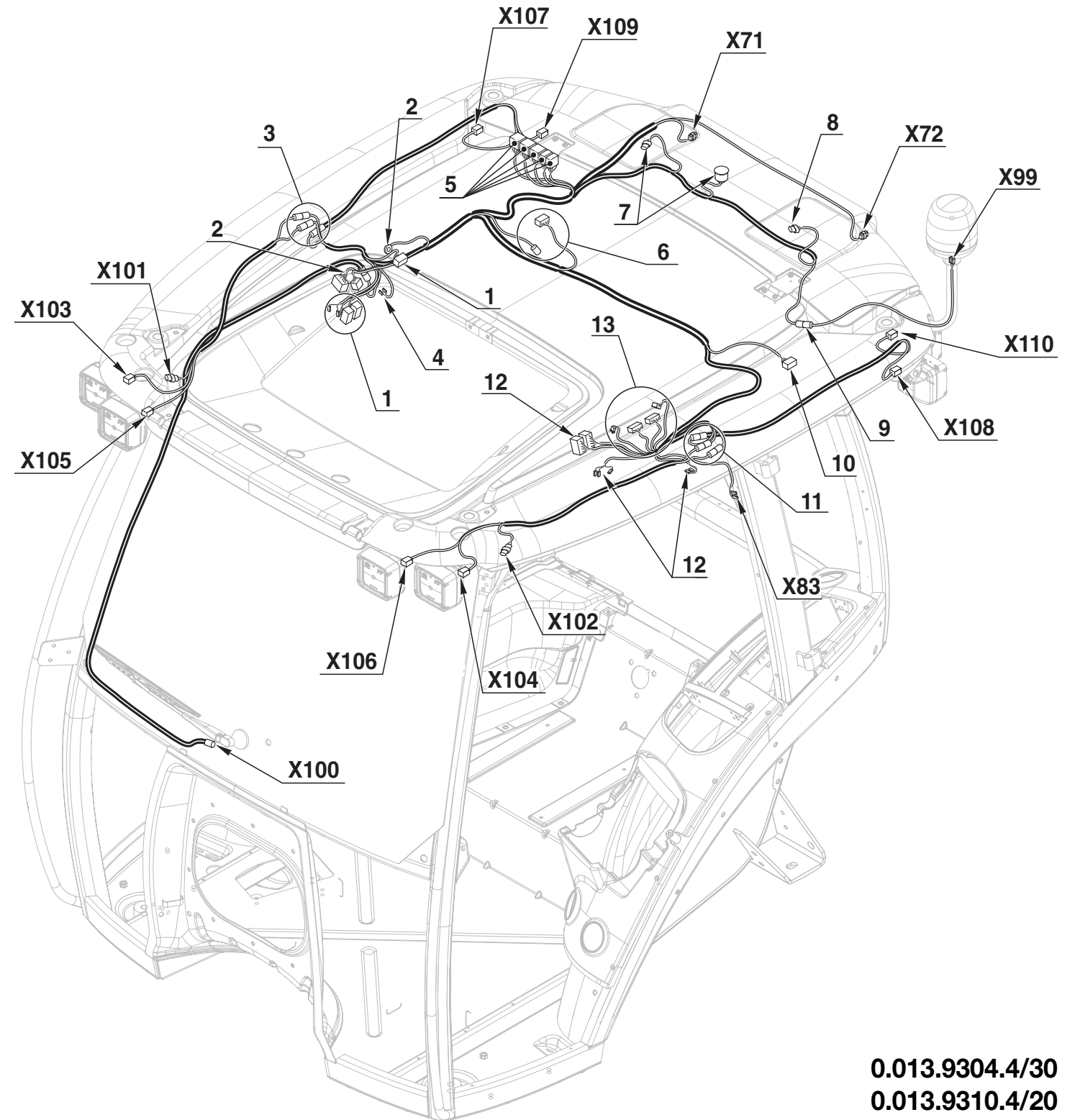
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13



**ROOF LINE WIRING -
WIRING FOR WORKLIGHTS, DEFROST MIRROR ON CAB -
WIRING FOR WORKLIGHTS ON CAB -
WINDSCREEN WIPER WIRING -
ROTATING BEACON WIRING**



0.013.9304.4/30
0.013.9310.4/20
0.014.1565.4/10
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CONTROL VALVE WIRING

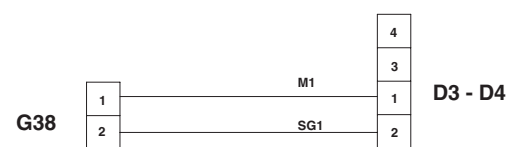
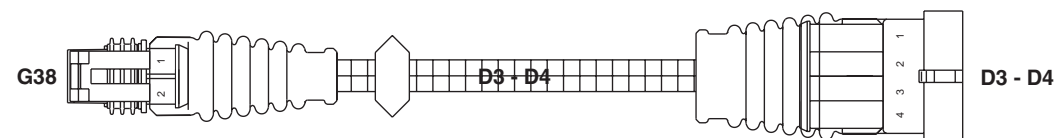


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M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030110

G28 To control valve solenoid valve wiring
D3-D4 To left-hand transmission wiring

CONTROL VALVE SOLENOID VALVE WIRING

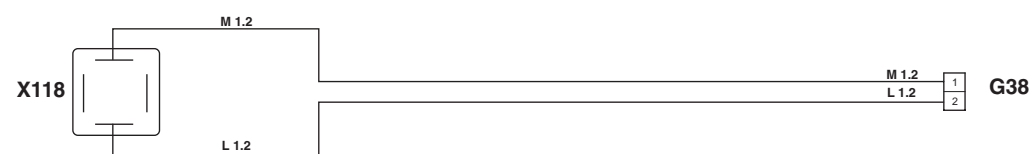
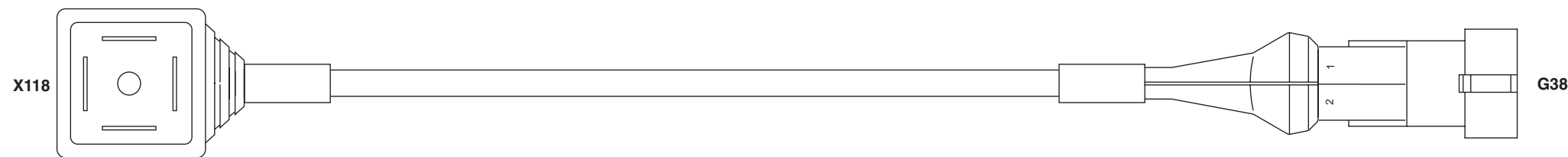
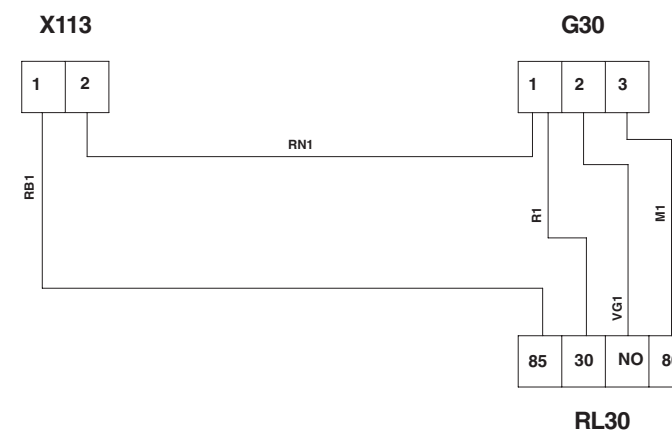
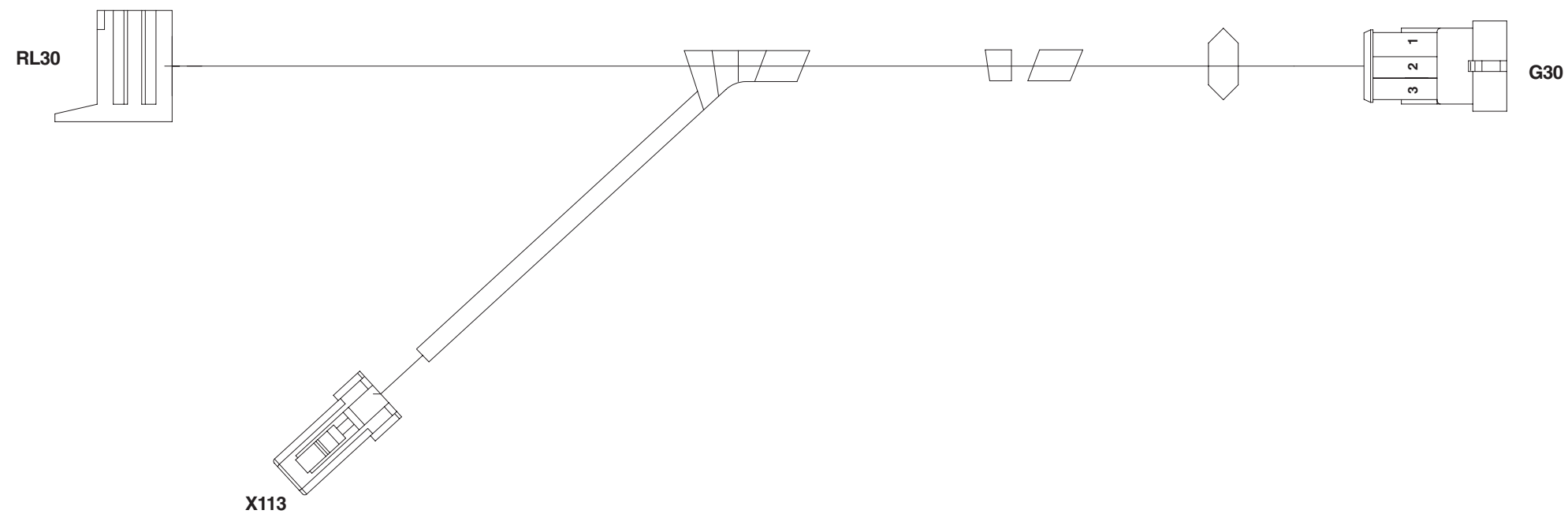


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

D0030120

- G38** To control valve wiring
- X118** Front connection mechanism solenoid valve

CONTROL VALVE WIRING



D0030020

- G30** To central wiring
- RL30** Front mechanism solenoid valve supply relay
- X113** Front mechanism solenoid valve control button

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