DEUTZ FAHR

SAME DEUTZ-FAHR DEUTSCHLAND GmbH

WORKSHOP MANUAL

AGROTRON 80 MK3 –> 6001
AGROTRON 90 MK3 –> 6001
AGROTRON 100 MK3 –> 6001
AGROTRON 105 MK3 –> 6001

INTRODUCTION

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

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

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

SAFETY NOTES

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

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

Some of the operations described require the use of special tools and equipment: these tools have been designed for a specific purpose and may ordered directly from the Manufacturers.

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

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

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

GENERAL SAFETY RULES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

15 - The liquid (electrolyte) contained in the battery is very harmful if it comes into contact with the skin and the eyes; for this reason, always wear gloves and safety goggles with side shields when checking or topping up the battery.
Should any electrolyte accidentally come into contact with your skin, wash the affected parts immediately with 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

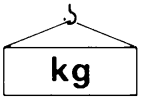
- Tighten nuts and bolts to the specified tightening torques.
- When refitting flexible pipes and wires, take care not to twist or tangle them.
- Always fit new seals, O-rings, cotter pins and safety stop rings on reassembly; make sure that the ends of the cotter pins are separated and bent back so that 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.

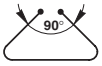
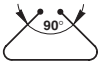
LIFTING INSTRUCTIONS



⚠ 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:

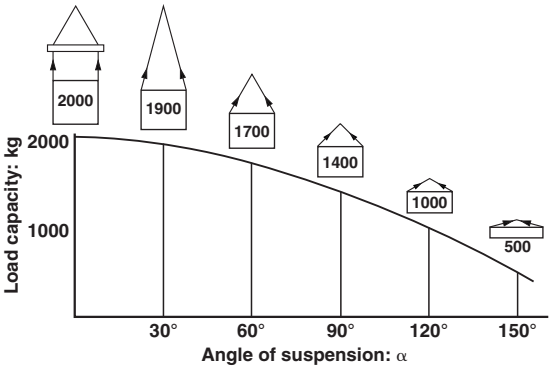
WIRE ROPES (standard twisted «S» or «Z» type)				POLYESTER SLINGS (eye-and-eye - simple loop)				
Ø rope mm	Capacity (kg)			Width (mm)	Capacity (kg)			
								
8	650	620	500	25	500	400	860	700
10	1000	1740	1420	50	1000	800	1730	1410
12	1450	2500	2050	62	1250	1000	2160	1760
14	2000	3460	2820	75	1400	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 information on the tractor's electrical and electronic systems, the procedures for putting into service, the list of alarms and a guide to the use of the software required for tractor and engine configuration and access to diagnostic codes.

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!

This manual does not contain the engine and transmision sections.
For these sections refer to the follow manuals:

Engine DEUTZ 2012	**0312 0361**	**Italian English French German**
Trasmission ZF 7100L	**0298 6837**	**German**
	0298 6838	**English**
	0298 6839	**French**
	0298 6840	**Spanish**
Trasmission ZF 7100S	**0298 6871**	**German**
	0298 6872	**English**
	0298 6873	**French**
	0298 6874	**Spanish**
Rear axle 7100	**0298 6877**	**German**
	0298 6878	**English**
	0298 9879	**French**
	0298 9880	**Spanish**
Front axle ZF 2025-2035-2045 AS	**0298 6803**	**German**
	0298 6856	**English**
	0298 6857	**French**
	0298 6858	**Spanish**

HOW TO CONSULT THE MANUAL

1. Removal and refitting of assembled units

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

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

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) ..... [※ 1] : .....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

[※ 1] :.....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 Nm denotes a specific tightening torque that has been determined experimentally and that must be adhered to.

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

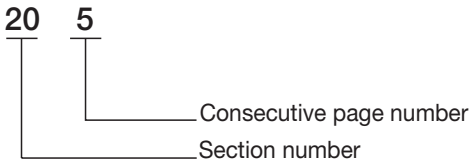
HOW TO USE AND UPDATE THE MANUAL

1. UPDATING THE MANUAL

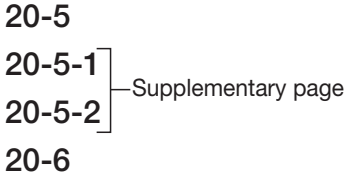
All additions, corrections or amendments to the manual will be sent to the Authorised Service Centres.
Before starting any repair or overhaul operations, check that you have the most recent updates as these may contain supplementary data not present in previous issues.

2. INSERTING UPDATES

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

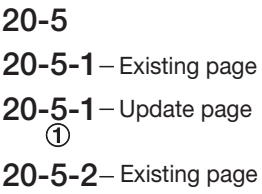


2 - **Supplementary pages:** indicated with a hyphen (-) and consecutive number after the page number. Example:



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.

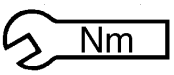
3. SYMBOLS USED IN THE MANUAL

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 precautionsto 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

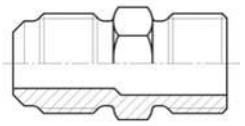
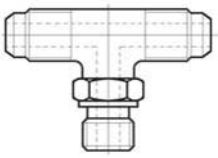
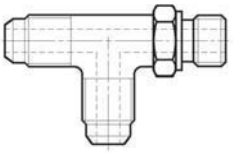
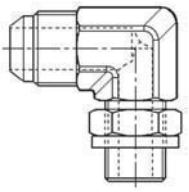
⚠ The tightening torques for certain specific components and special tightening methods are indicated in the relative assembly paragraphs.

★ 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%.

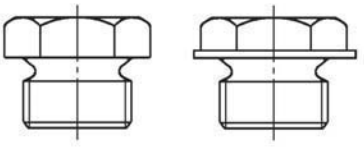
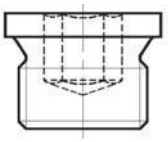
BOLT SIZE		BOLT CLASS					
		8.8		10.9		12.9	
		Nm	lb.ft.	Nm	lb.ft.	Nm	lb.ft.
COARSE THREAD	M6x1	8.0 –8.8	5.9 –6.5	11.8 – 13.0	8.7 –9.6	13.8 – 15.2	10.2 –11.2
	M8x1.25	19.4 –21.4	14.3 –15.8	28.5 – 31.5	21.0 – 23.2	33.3 – 36.9	24.5 – 27.2
	M10x1.5	38.4 – 42.4	28.3 – 31.2	56.4 – 62.4	41.6 – 46.0	67.4 – 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

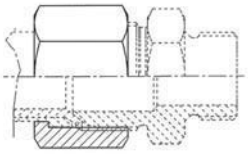
★ The tightening torques indicated below refer to fittings assembled on any material.

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

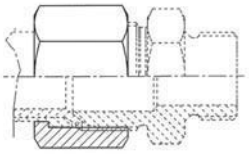
3. PLUGS

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

4. FITTINGS WITH SEAL AT 37°



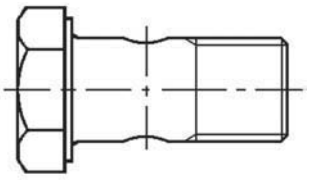
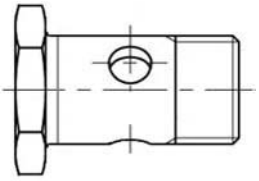
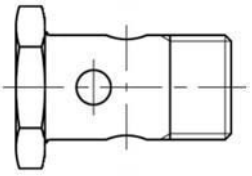
Thread size	Wrench	Torque Nm ±10%
7/16” - 20	14	13
1/2” - 20	16	19
9/16” - 18	17	28
3/4” - 16	22	47
7/8” - 14	27	76
1 1/16” - 12	32	110
	36	110



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

5. FITTINGS FOR PIPES WITH EYE ATTACHMENT

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

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

THREADLOCKERS, ADHESIVES, SEALANTS AND LUBRICANTS

FUNCTION	DESIGNATION	DESCRIPTION
THREADLOCKER	**Loctite 222** Colour: opaque fluorescent purple	Anaerobic product suitable or 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 used on lightly lubricated surfaces without prior use of activator.
	Loctite 270 Colour: fluorescent green	Anaerobic product for high-strength locking of bolts and studs that do not normally require disassembly. Parts must be heated to approximately 80°C for removal. All traces of lubricant must first be removed using the specific activator.
DEGREASERS AND ACTIVATORS	**Loctite 703**	Product used for degreasing and cleaning parts prior to application of Loctite anaerobic products; after drying, promotes uniform curing of threadlockers.
	Loctite 747	Product used for specifically for treatment of passive metals prior to use of slow-cure anaerobic threadlockers(series 5 and 6). Can also be used to increase cure speed at low temperatures or in applications where there is large gaps between the parts.
SEALANTS (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 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 micro-voids 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 a liquid thread sealant for large diameter threaded fittings (up to 2"). Very slow curing; also suitable for non-ferrous alloys and parts requiring subsequent removal.

FUNCTION	DESIGNATION	DESCRIPTION
INSTANT ADHESIVES	**Loctite 401** Colour: colourless	Cyanoacrylate instant adhesive suitable for bonding a wide range of acidic and porous materials including, ceramics, wood, rubber and plastic (excluding polyolefin). Curing takes place in a few seconds as an effect of the condensed humidity present on the surfaces to be bonded, and is independent of environmental conditions.
	Loctite 495 Colour: colourless	Cyanoacrylate instant adhesive suitable for bonding a rubber, plastics and metal in any combination.
SILICONE SEALANTS	**Silastic 738 (Dow Corning)** Colour: milky white	One-part silicone adhesive/sealant, 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	**= litres**
US gall. x 3,785	
pint x 0,568	
quart x 1,137	
US.gpm x 3,785	**= ℓ/min**
oz. x 0,028	**= kg**
lb. x 0,454	
lb.ft. x 0,139	**= kgm**
lb.in. x 17,87	**= kg/m**
psi x 0,070	**= kg/cm^2**
lb./Imp.gall x 0,100	**= kg/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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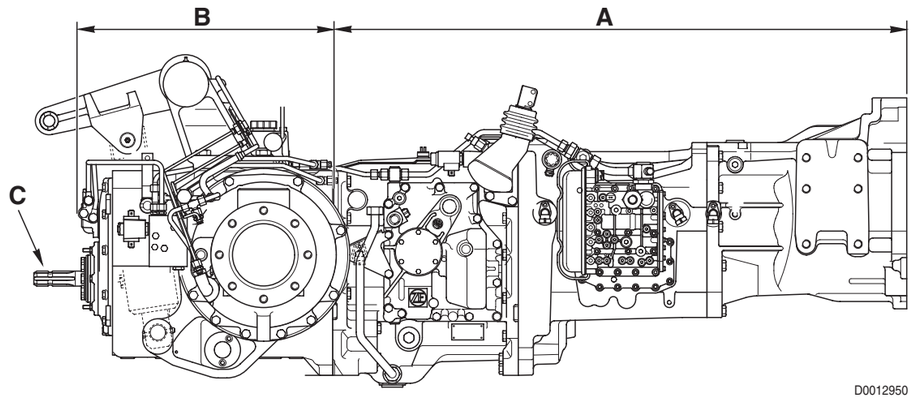
1. TRANSMISSION

INTRODUCTION

- The AGROTON 80-105 series is supplied with the 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 achieved by way of a proportional solenoid valve that directly controls the main clutch.
- The transmission can be divided into the following three sections:
  A. Transmission Power Shuttle
  B. Rear axle
  C. Rear PTO



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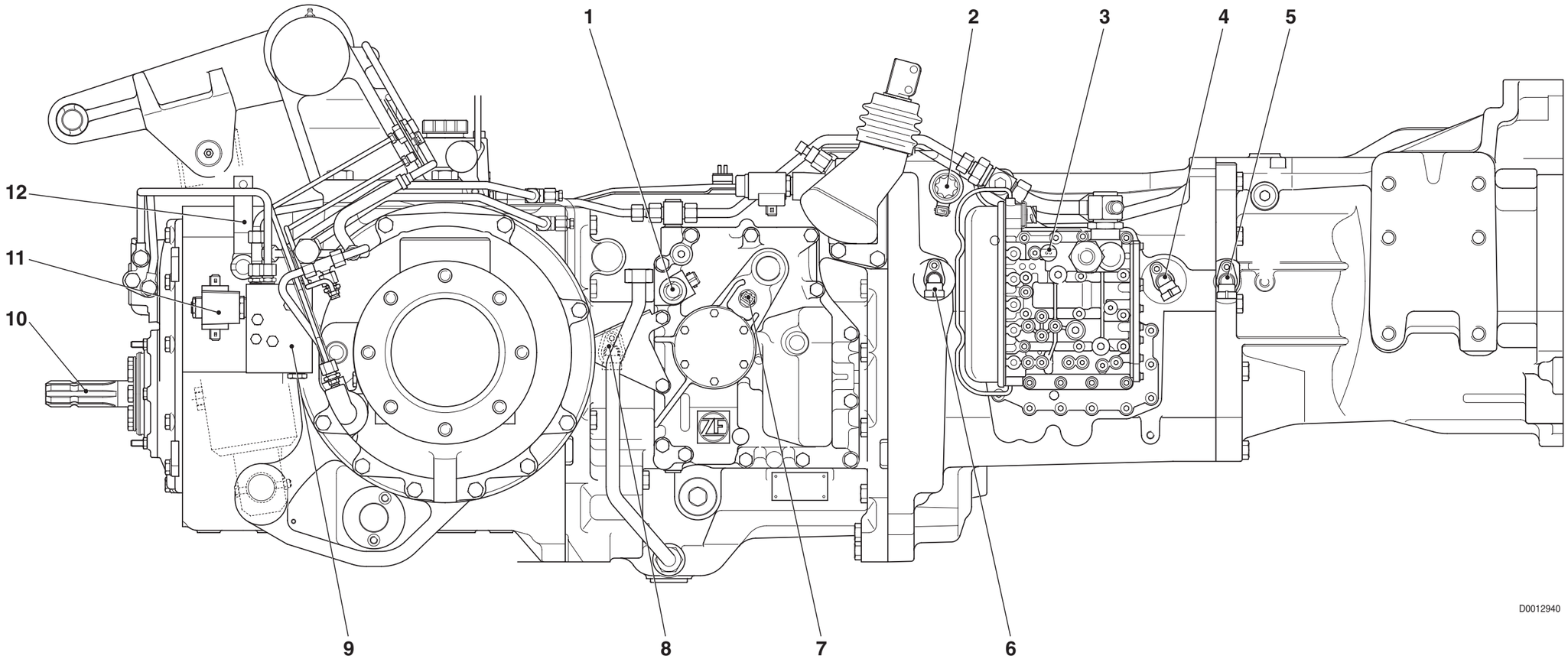
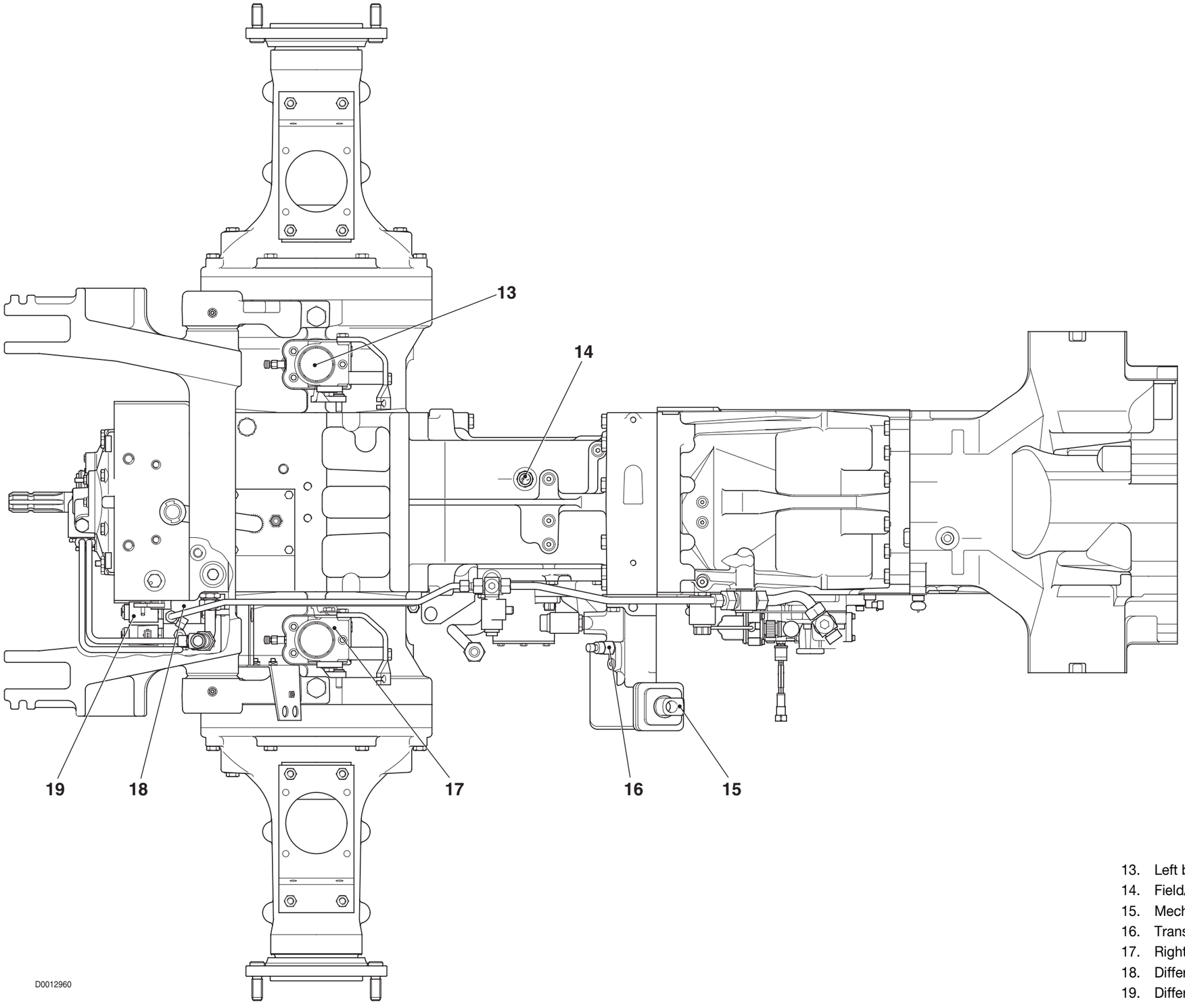
1.1 TRANSMISSION POWER SHUTTLE

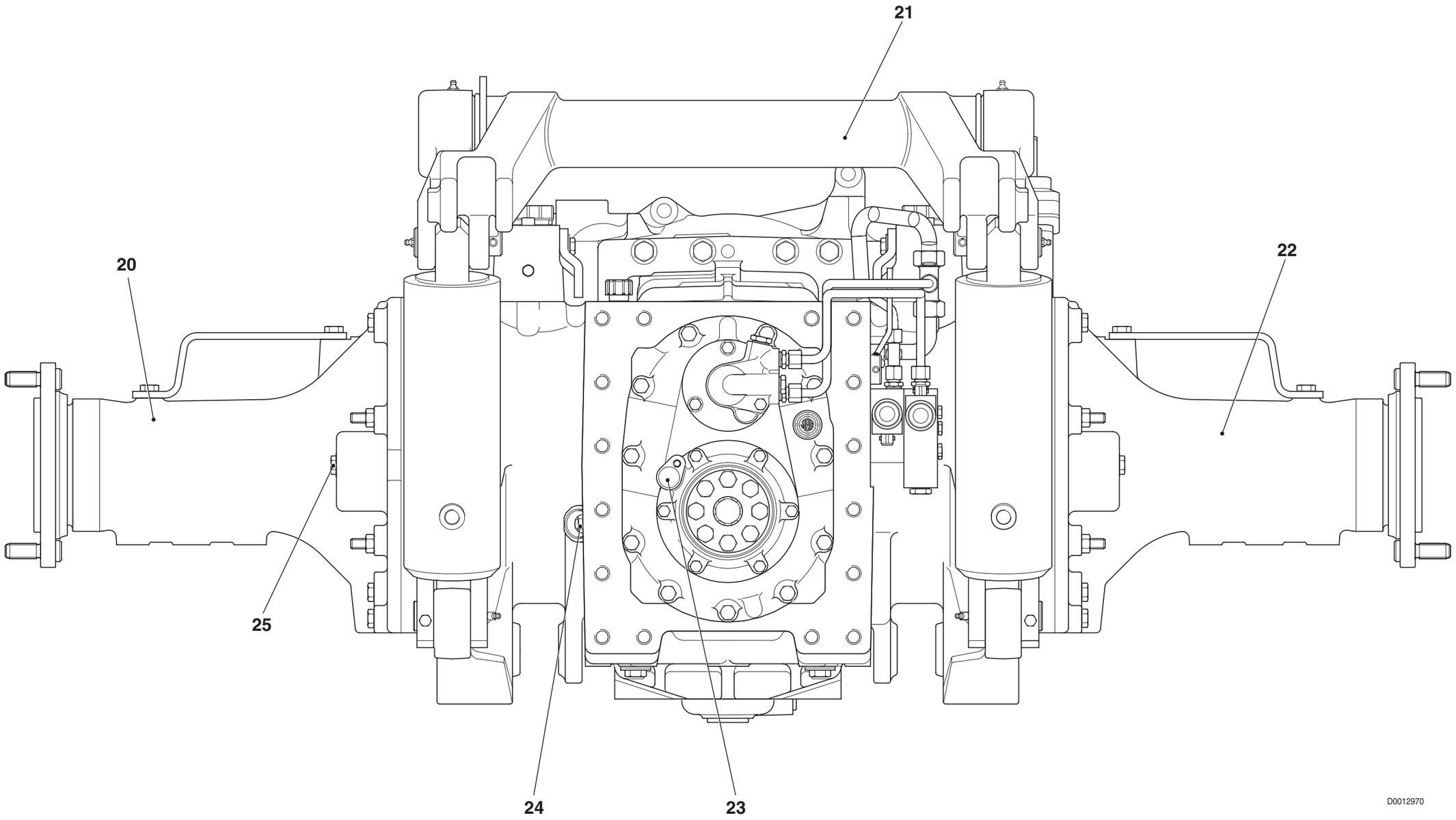
1.1.1 MAIN COMPONENTS



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



13. Left brake cylinder
14. Field/road sensor
15. Mechanical gearbox shift lever
16. Transmission in neutral sensor
17. Right brake cylinder
18. Differential lock control valve
19. Differential lock control solenoid valve

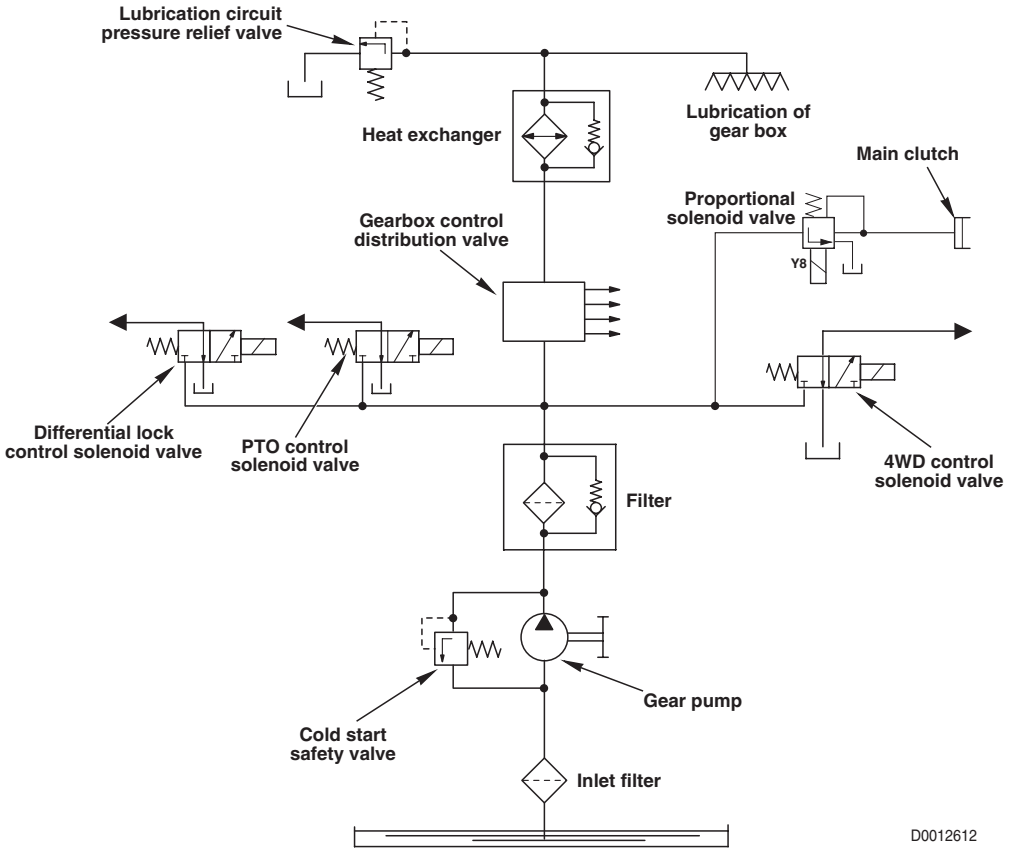


20. Left axle casing
21. Lift shaft
22. Right axle casing
23. Rear PTO speed sensor
24. Gearbox oil level indicator
25. Rear reduction unit oil level indicator

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:

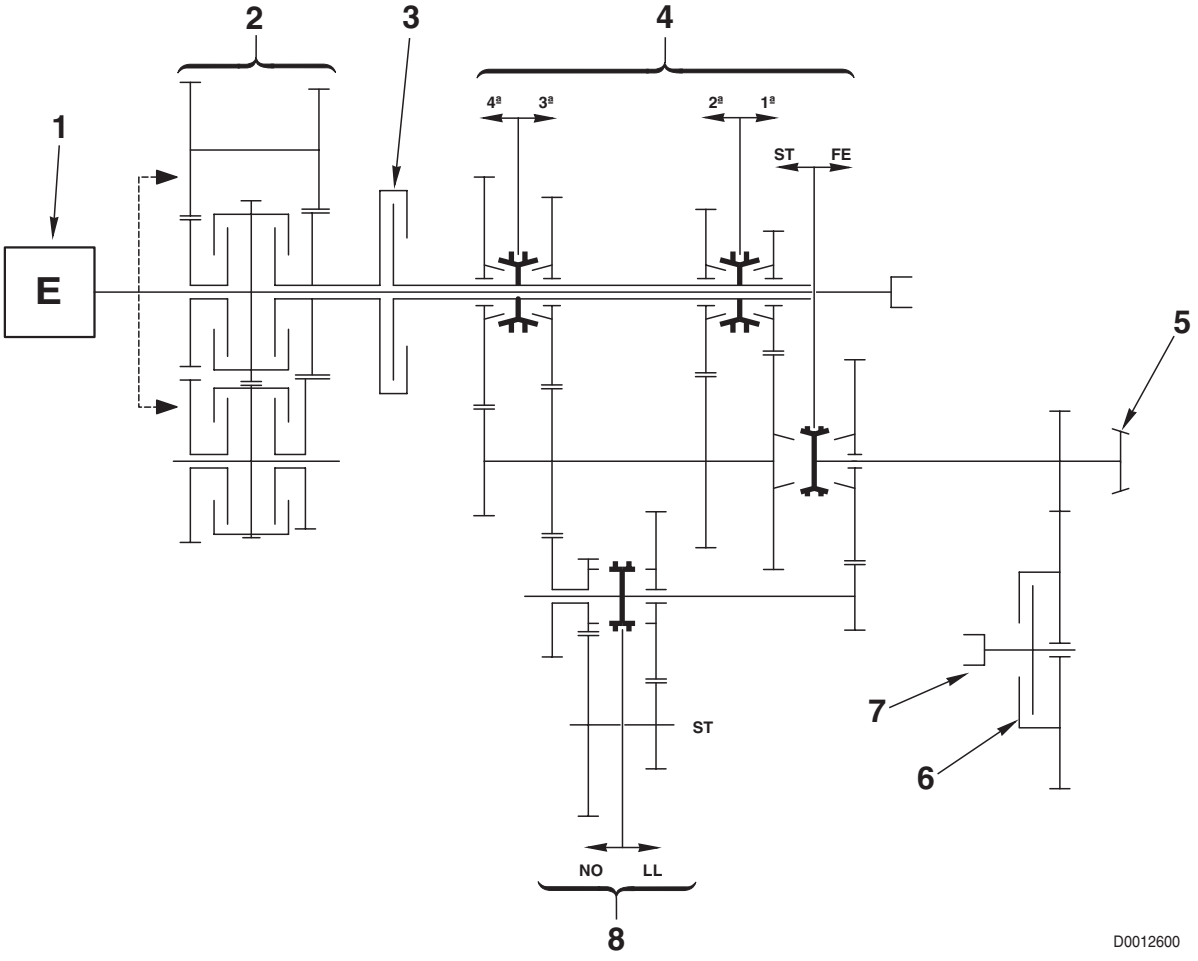
- hydraulic gearbox control valve
- 4WD control solenoid valve
- rear PTO control solenoid valve
- differential lock control solenoid valve
- lubrication of the gearbox



1.1.3 GEARBOX

DESCRIPTION

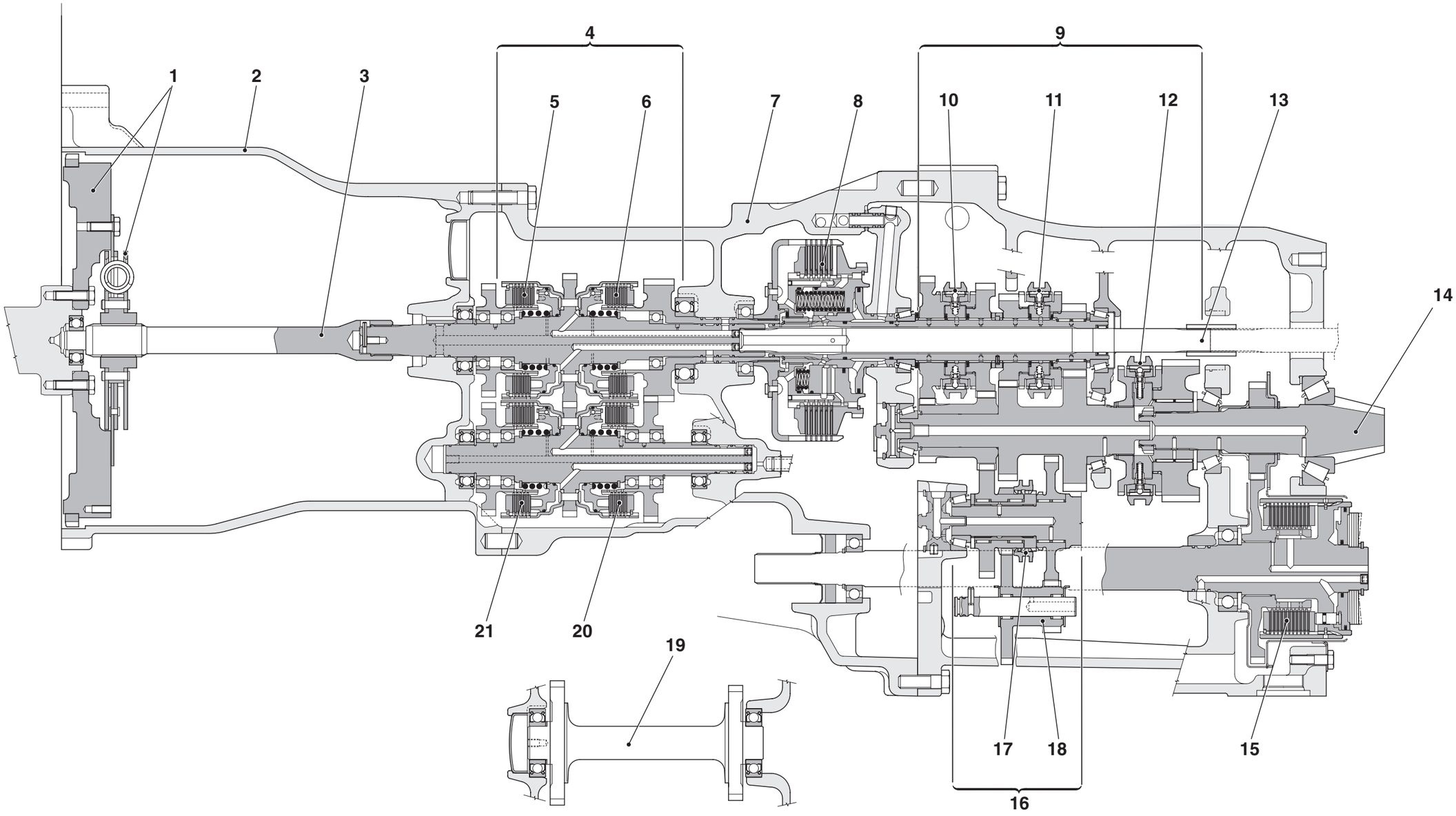
- The drive from the engine (1) is transmitted through the hydraulically-controlled gearbox (2), the main clutch (3), the 4-speed mechanical gearbox (4) and the creeper (8) to the pinion (5) and the power take-off (7), that transfers drive to the front axle.



COMPONENTS

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

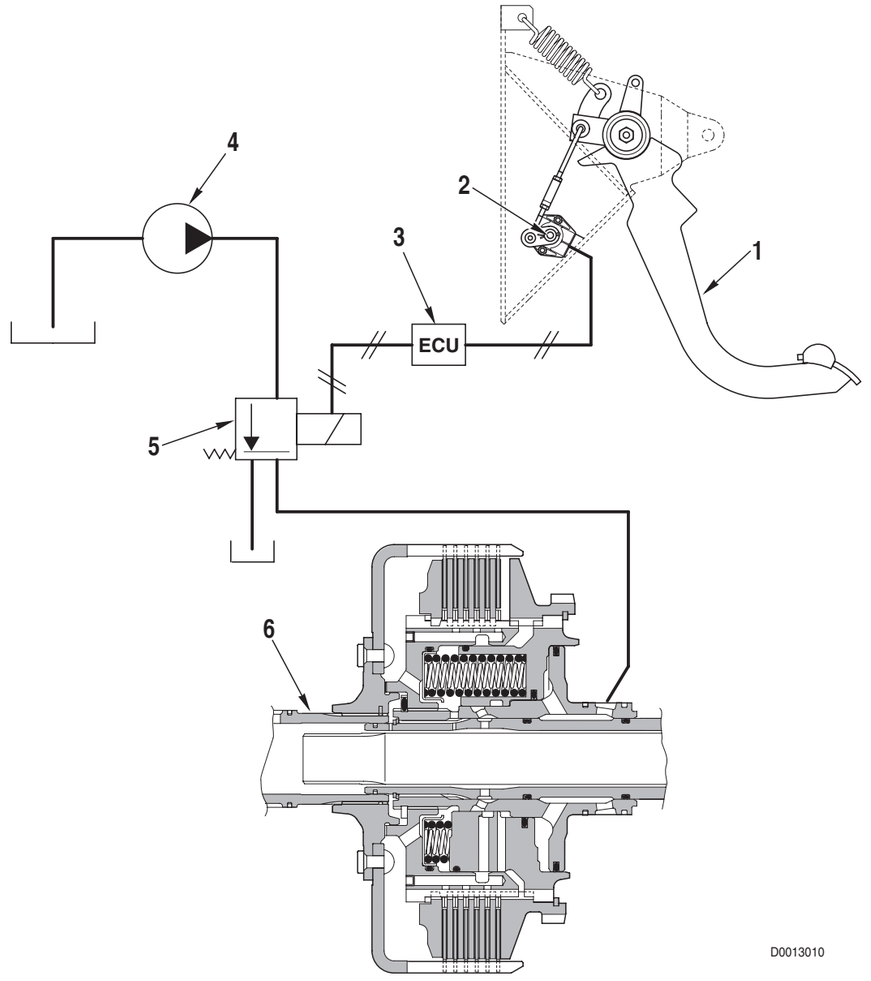
GEARBOX COMPONENTS



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

1.1.4 MAIN CLUTCH

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



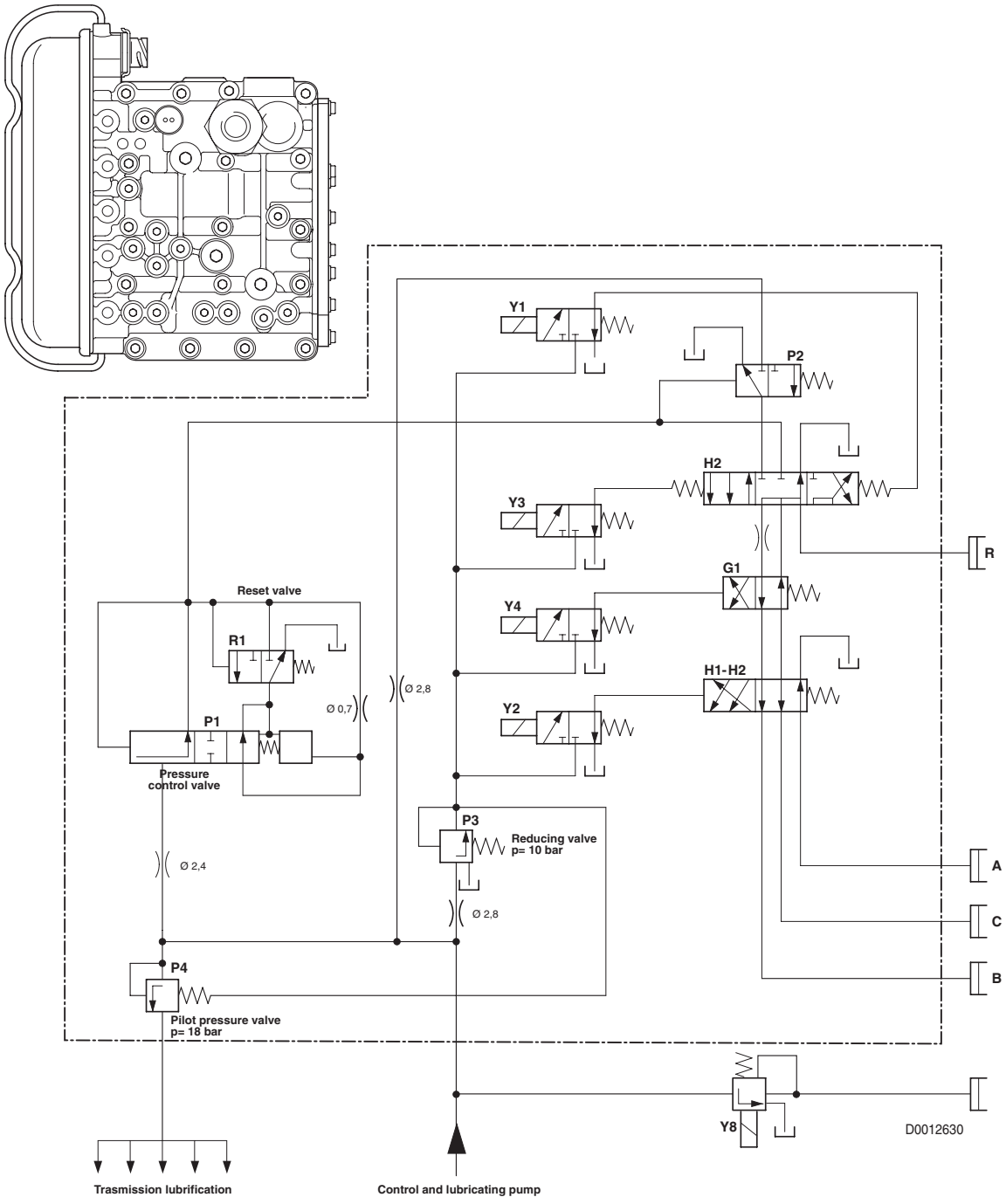
1. Clutch pedal
2. Clutch pedal position sensor
3. Electronic transmission control unit
4. Transmission gear pump
5. Clutch control proportional solenoid valve
6. Main clutch

1.1.5 HYDRAULIC GEARBOX AND SHUTTLE DISTRIBUTION VALVE

The function of the hydraulic gearbox distribution valve is to pilot and control the engagement of the gears in the hydraulically-controlled gearbox .

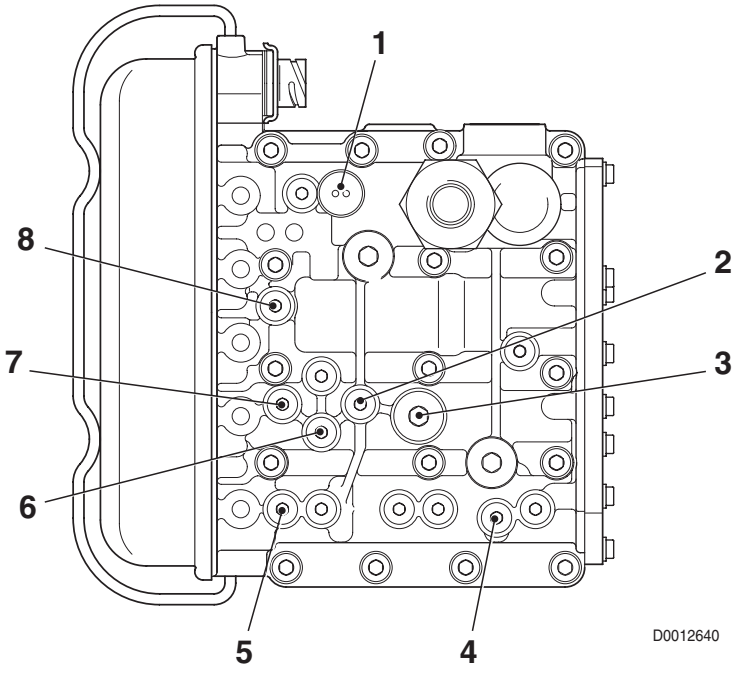
The hydraulic gearbox control valve controls the engagement of the **H**, **M** and **L** gears and the direction of travel.

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



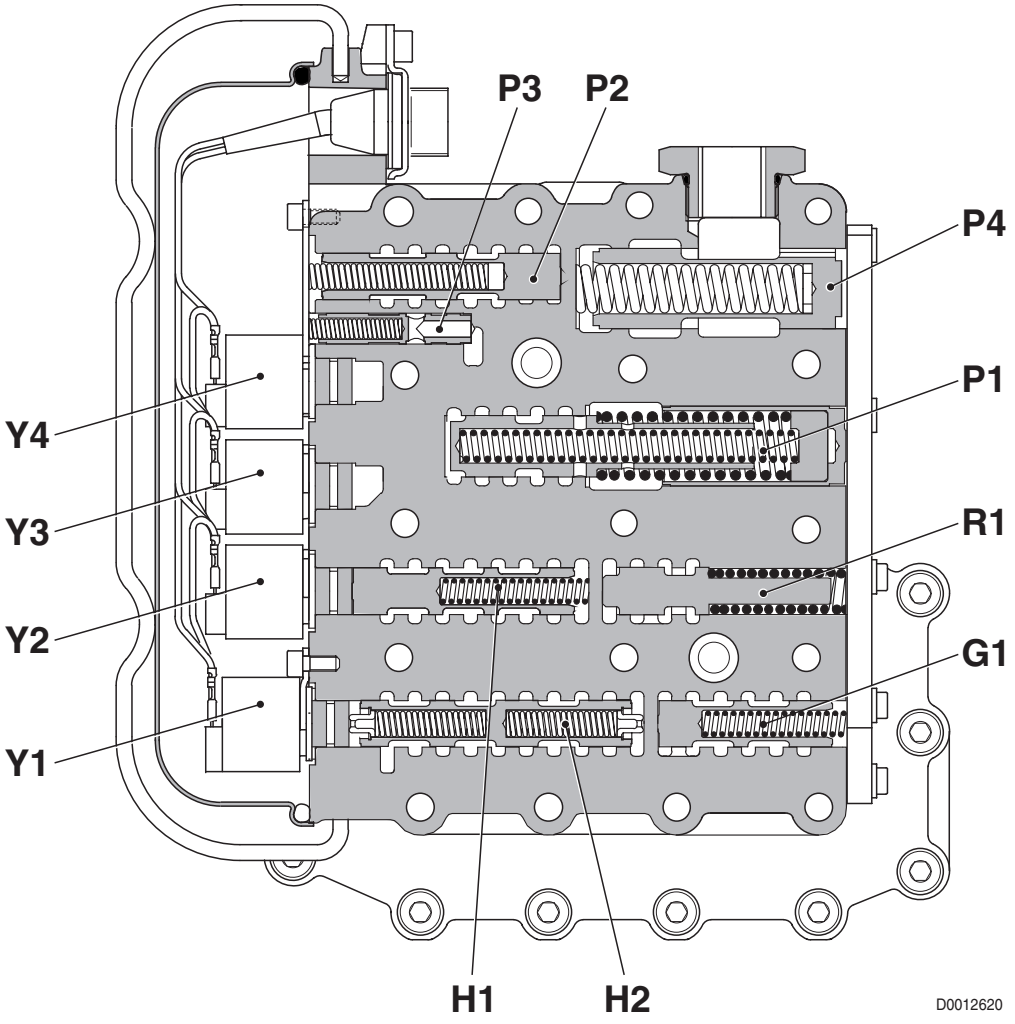
A. GEARBOX CONTROL VALVE

PRESSURE TEST POINTS



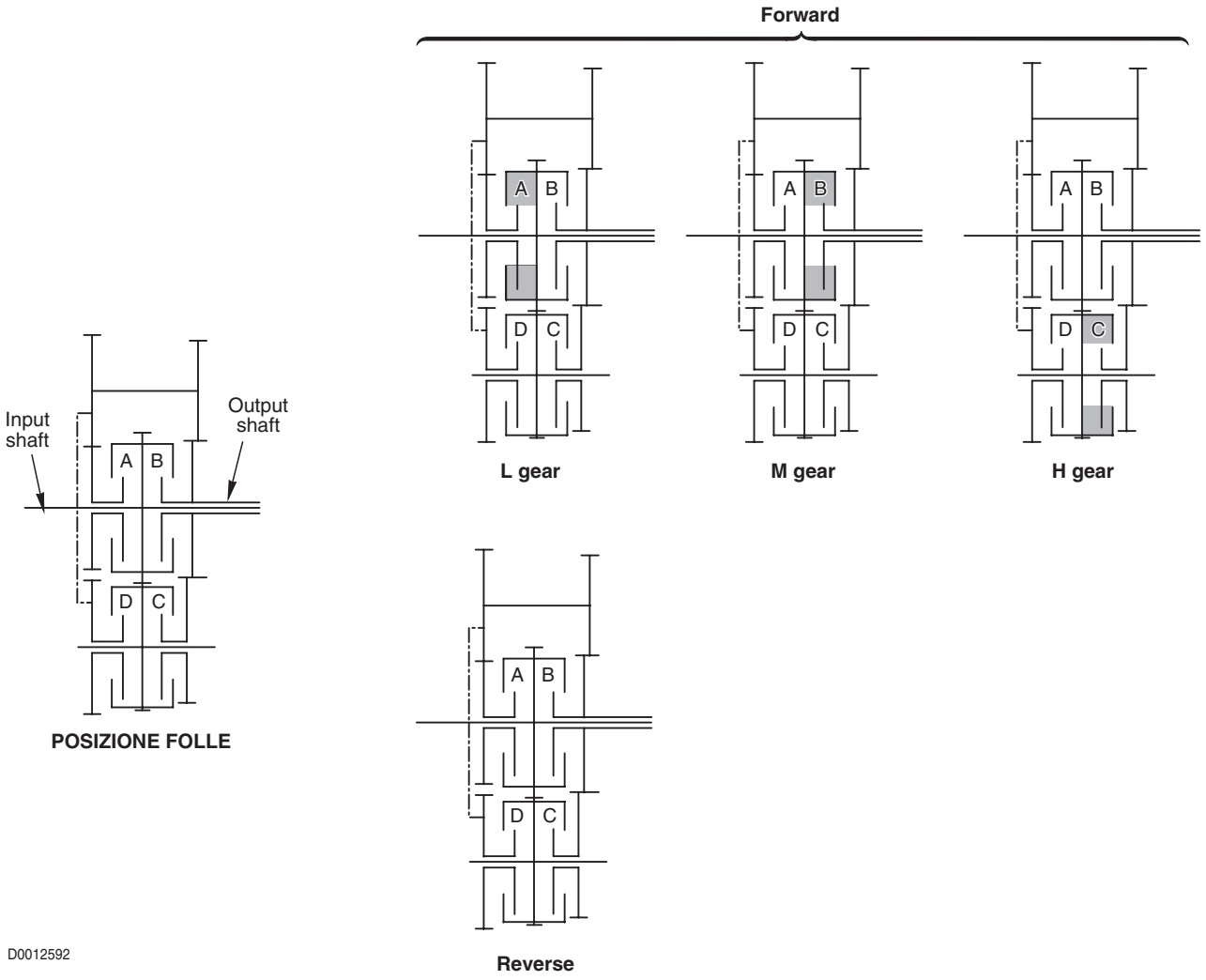
Pos.	Function	Thread size
1	General pressure (18 bar)	M10x1
2	**A** Clutch pressure	M10x1
3	Pressure **Pg** to relief valve	M10x1
4	Engagement pressure	M10x1
5	**D** clutch pressure	M10x1
6	**C** clutch pressure	M10x1
7	**B** Clutch pressure	M10x1
8	Pilot pressure (10 bar)	M10x1

MAIN COMPONENTS



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 TRASM.1)
Y3 Pilot solenoid valve for engagement valve **H2** (MVV electr. FWD)
Y4 Pilot solenoid valve for valve **G1** (GV2 valve TRASM. 2)

1.1.6 CLUTCH ENGAGEMENT AND SOLENOID VALVE OPERATION SCHEMATIC



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

Solenoid valve	Forward			Reverse
	L	M	H	
Y1				●
Y2	●	●		
Y3	●	●	●	
Y4	●			
Clutch	A	B	C	D
Point of measure	2	7	6	5

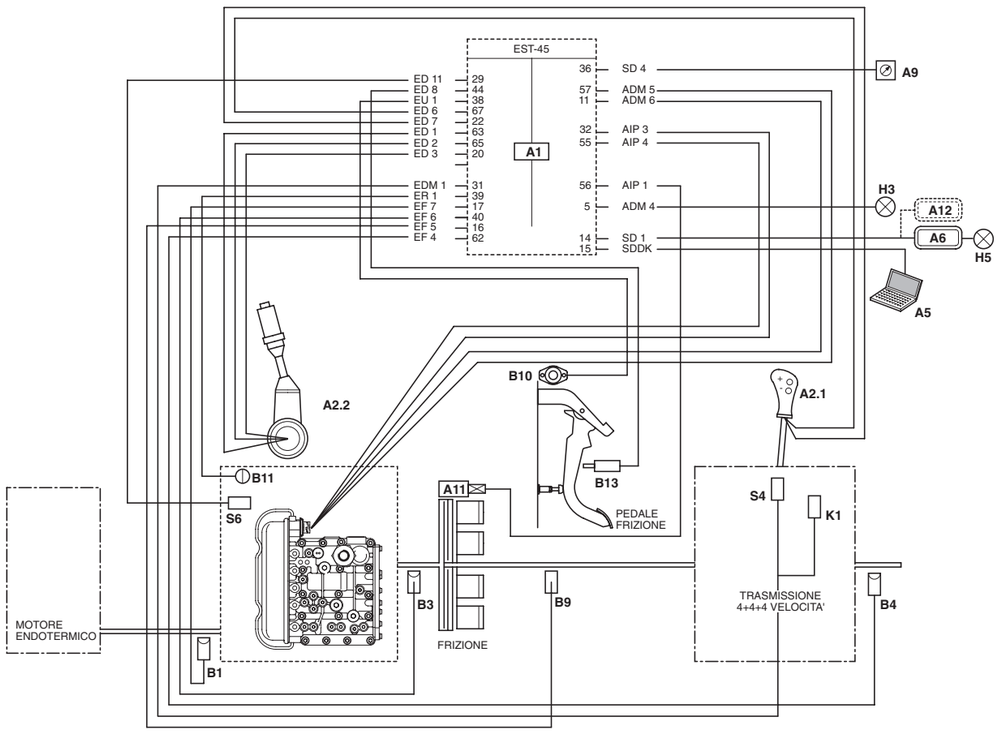
● = Solenoid valve energised

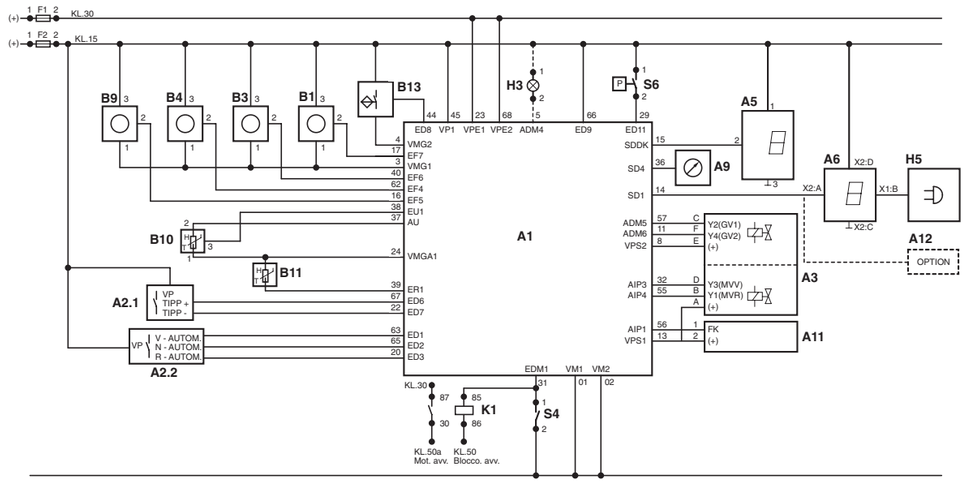
Solenoid valve operation when shifting from H to L gear (H→M→L)

Solenoid valve	Forward			Reverse
	H	M	L	
Y1				●
Y2			●	
Y3	●	●	●	
Y4		●	●	
Clutch	C	B	A	D
Point of measure	6	7	2	5

● = Solenoid valve energised

1.1.7 TRANSMISSION ELECTRONIC SYSTEM SCHEMATIC





D0012680

COMPONENTS

A1 Electronic transmission 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

A9 Tachymeter

A11 Proportional solenoid valve for main clutch control

A12 INFOCENTER

B1 Engine speed sensor (nLse - nMot)

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

F1 Fuse (7.5A)

F2 Fuse (7.5A)

H3 Low oil pressure indicator lamp

H5 Audible alarm

K1 Interlock starter relay 70A

S4 Mechanical gearbox neutral sensor

S6 Transmission oil low pressure sensor (18 bar)

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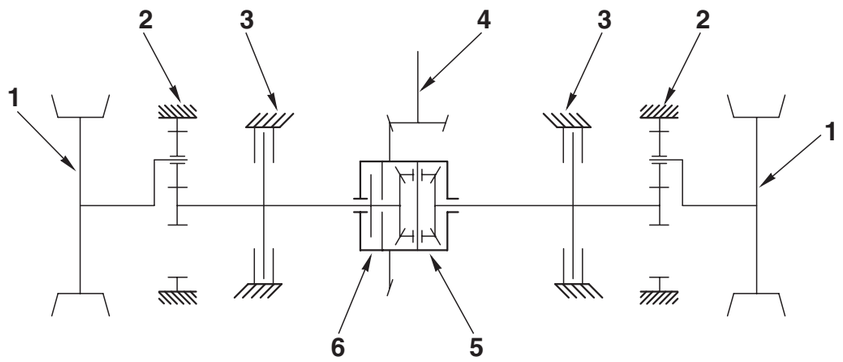
1.2 REAR AXLE

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)

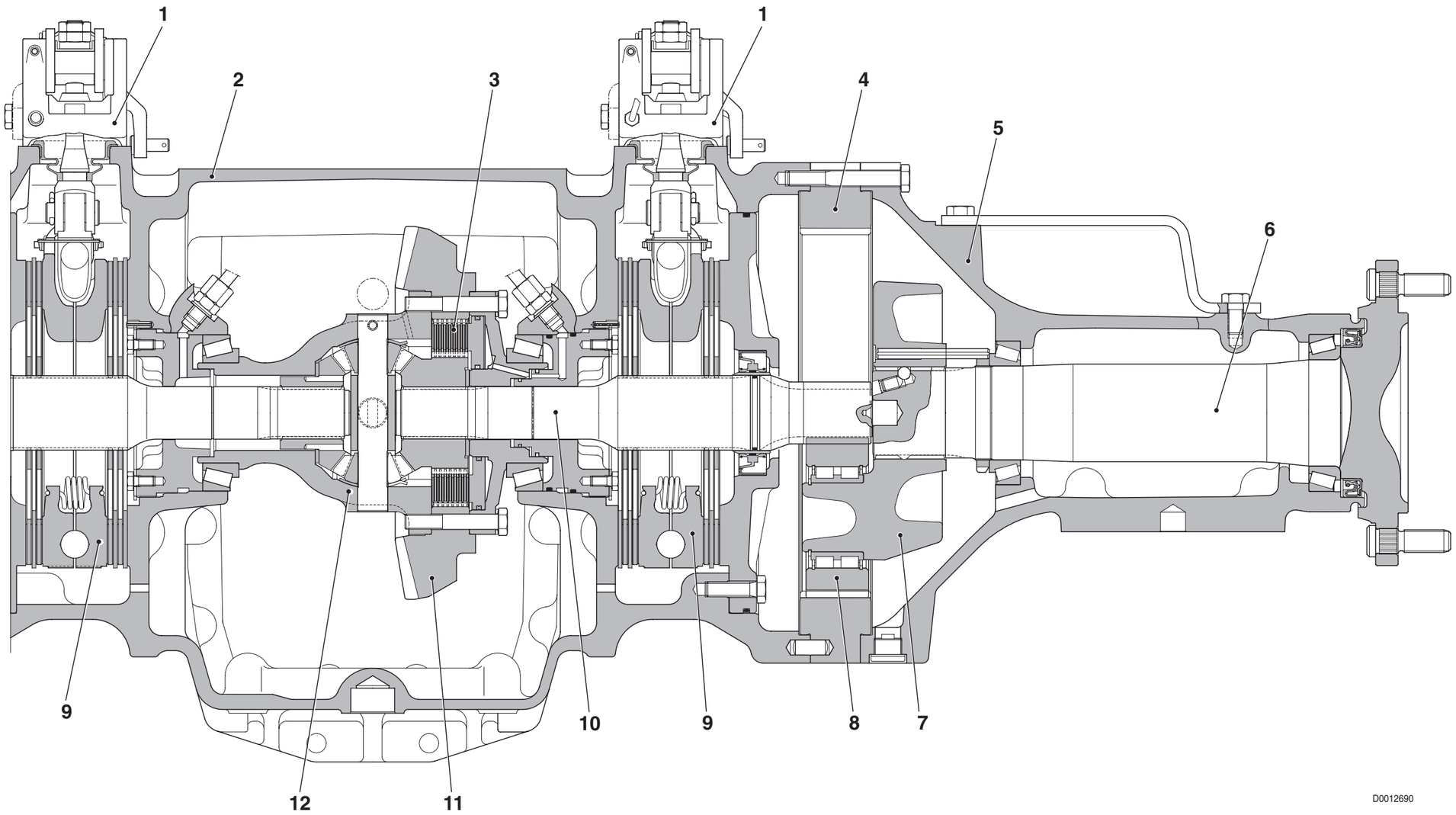


D0012670

COMPONENTS

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

COMPONENTS



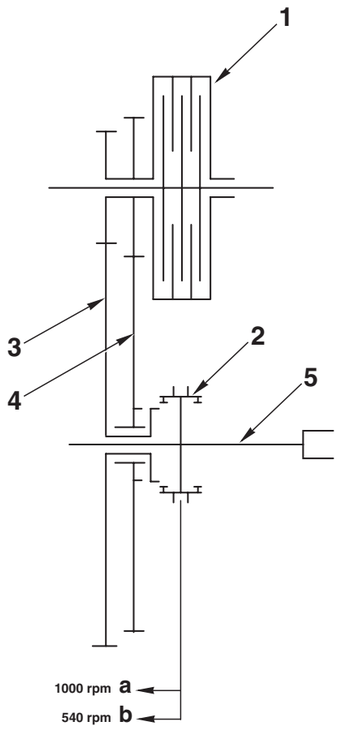
1. Brake control device
2. Central axle housing
3. Differential lock
4. Crown wheel
5. Axle casing
6. Half-shaft
7. Planet carrier
8. Planet gear
9. Brake
10. Half-shaft
11. Crown wheel
12. Differential

1.3 REAR PTO

DESCRIPTION

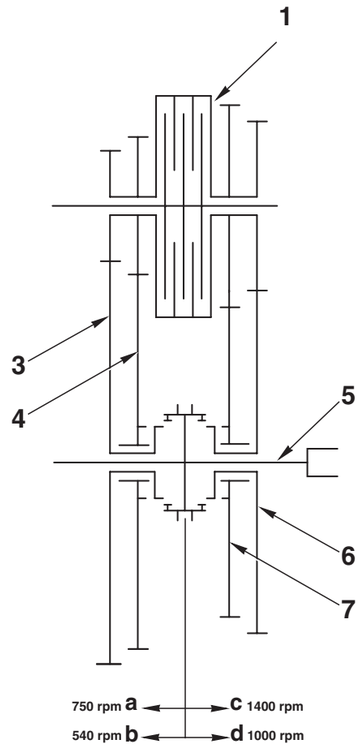
The rear PTO provides drive for external implements at a preselected rotation speed.
The rotary drive is taken directly from the engine and then reduced through a 2 -or 4-speed gearbox with manual speed selection.
The PTO is engaged by way of an electro-hydraulically controlled clutch.

2 SPEED VERSION



1. Clutch
2. Synchronizer
3. 540 rpm driven gear
4. 1000 rpm driven gear
5. PTO shaft

4 SPEED VERSION

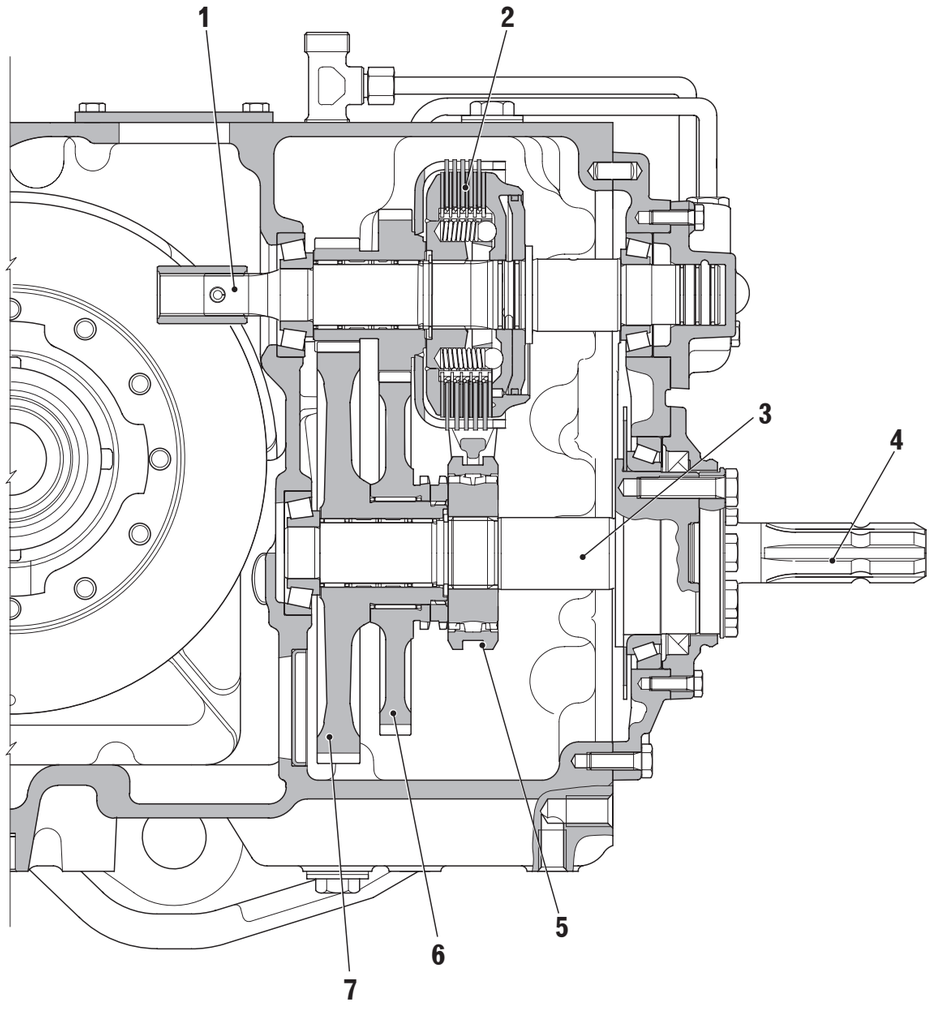


D0012700

1. Clutch
2. Synchronizer
3. 540 rpm driven gear
4. 750 rpm driven gear
5. PTO shaft
6. 1000 rpm driven shaft
7. 1400 rpm driven gear

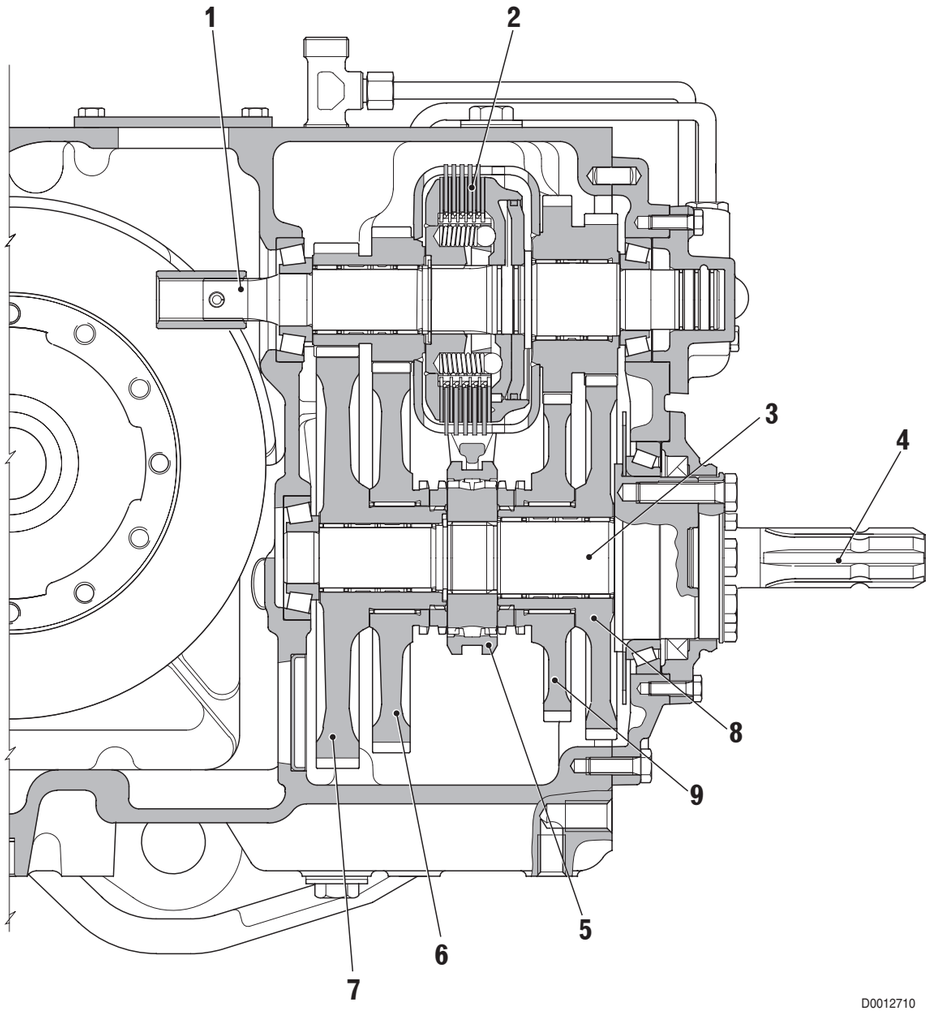
COMPONENTS

2 SPEED VERSION



1. PTO input shaft
2. PTO clutch
3. PTO output shaft
4. Power take-off
5. Synchronizer
6. 1000 rpm driven gear
7. 540 rpm driven gear

4 SPEED VERSION

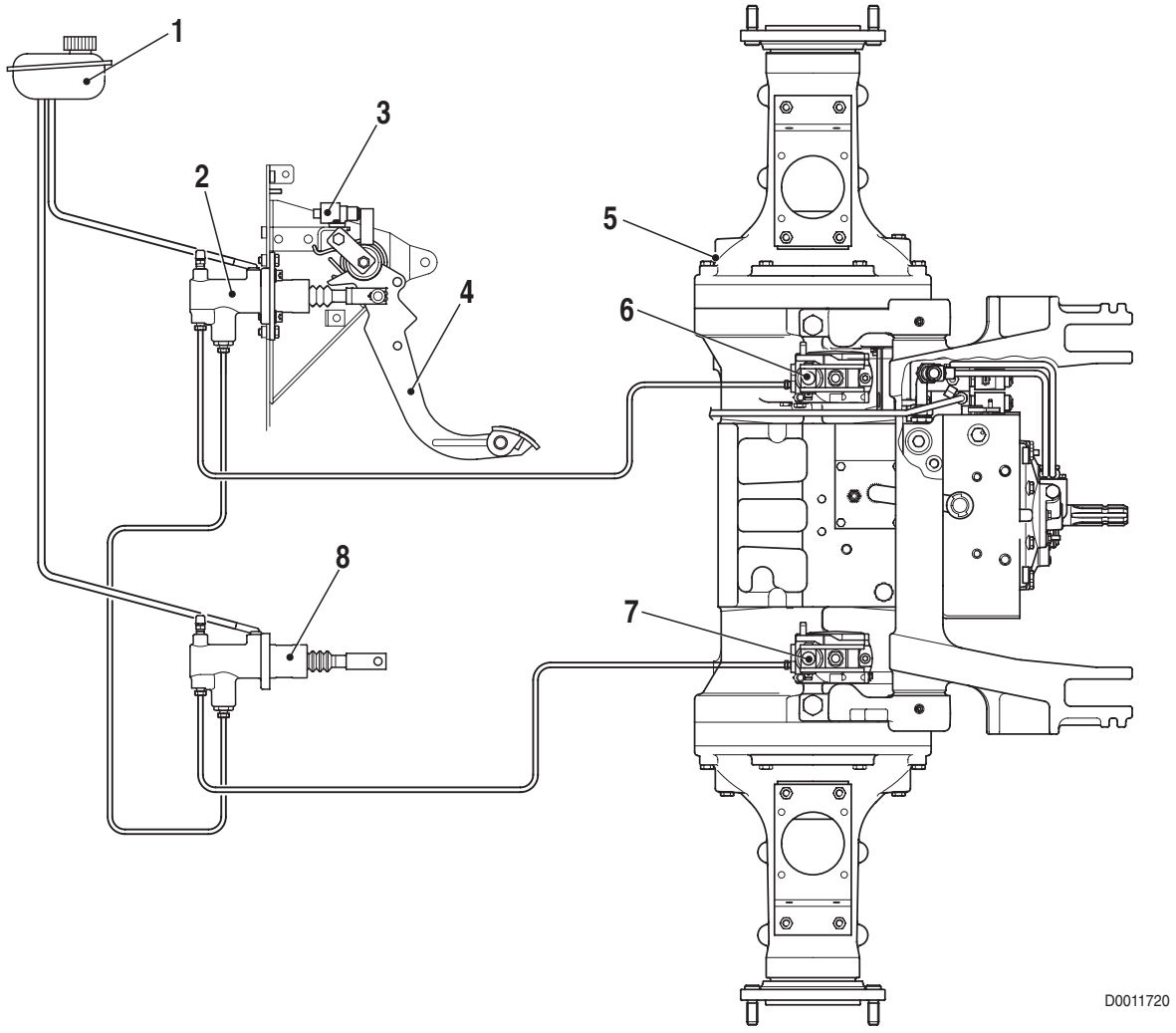


1. PTO input shaft
2. PTO clutch
3. PTO output shaft
4. Power take-off
5. Synchronizer
6. 750 rpm driven gear
7. 540 rpm driven gear
8. 1001400750 rpm driven gear

2. BRAKING SYSTEM

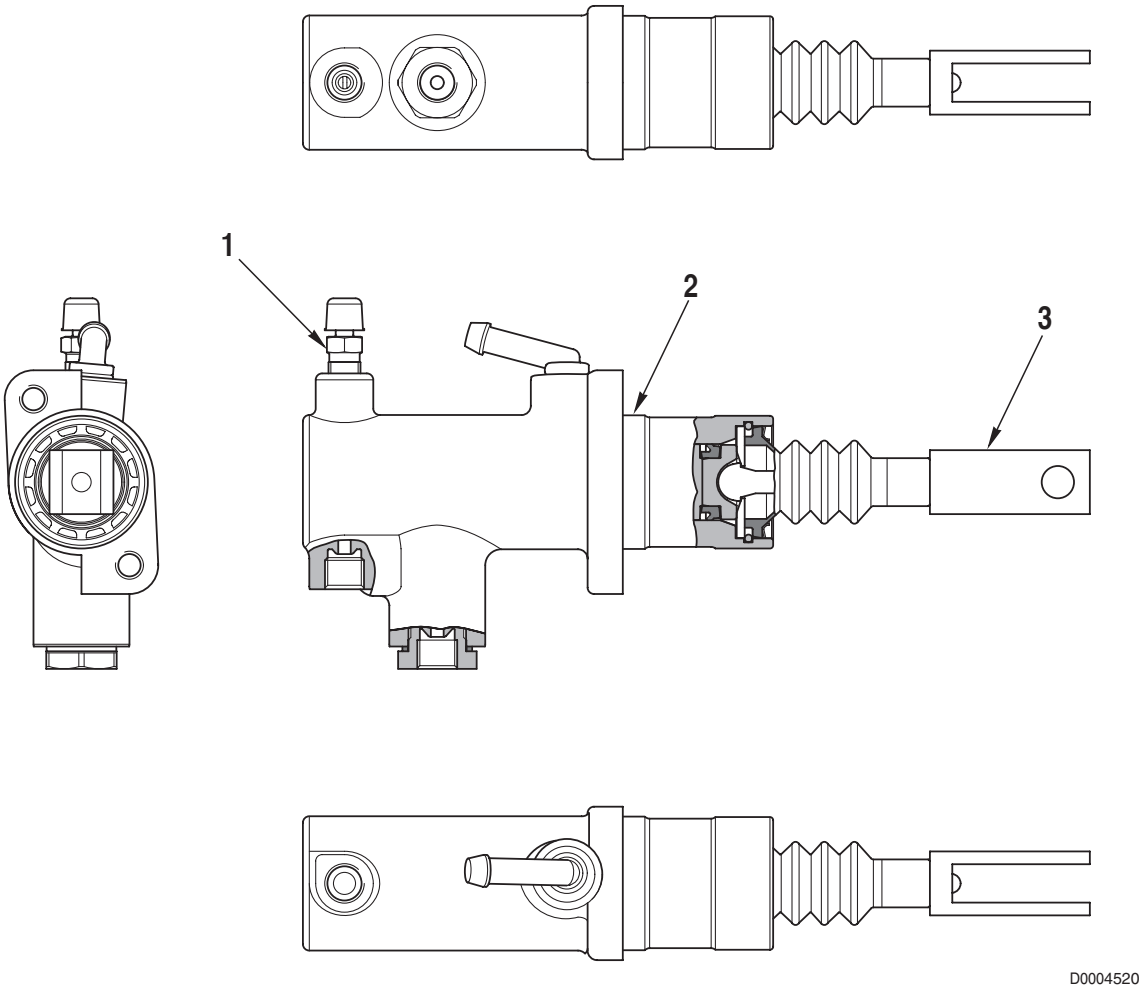
DESCRIPTION

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
2. Right master cylinder
3. Brake microswitches (n° 2)
4. Brake pedal
5. Rear axle
6. Right brake
7. Left brake
8. Left master cylinder

2.1 BRAKE MASTER CYLINDER

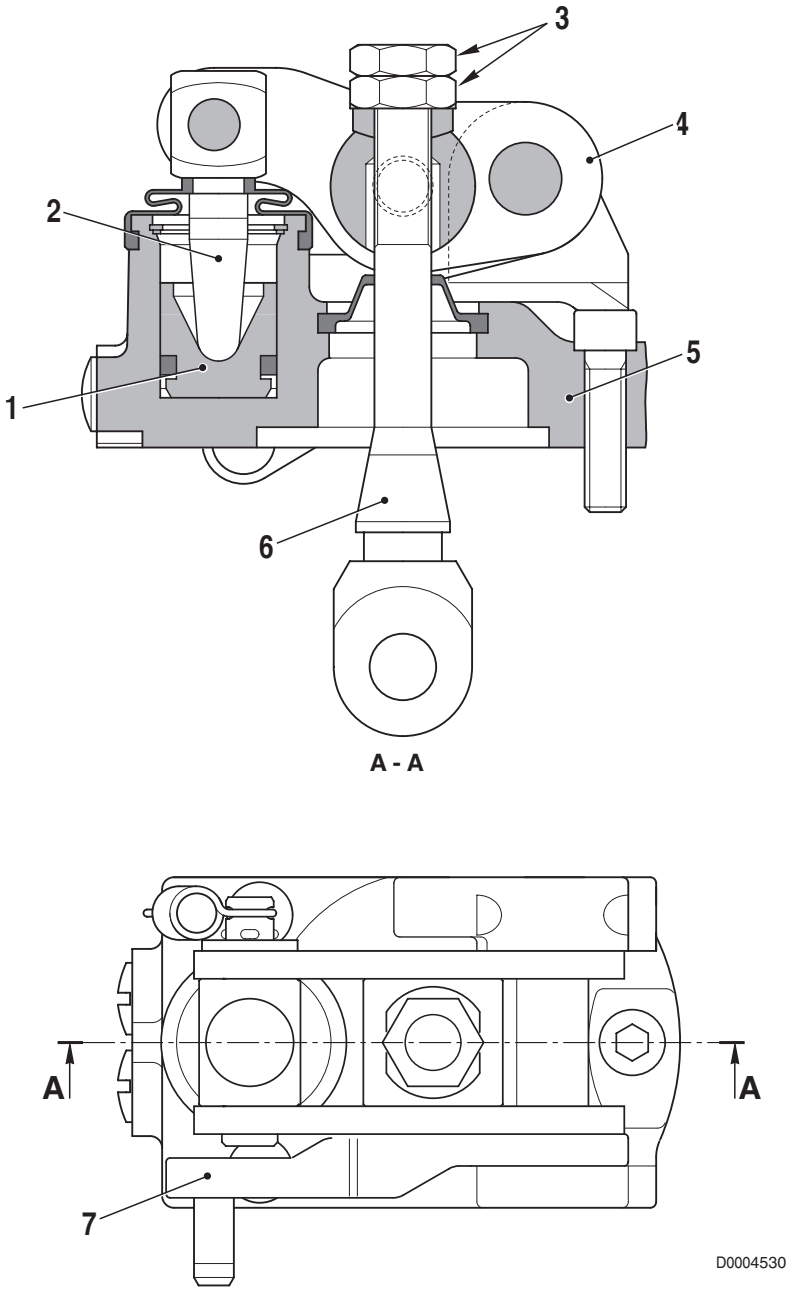


1. Bleed screw
2. Barrel
3. Push-rod

TECHNICAL DATA

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

2.2 BRAKE



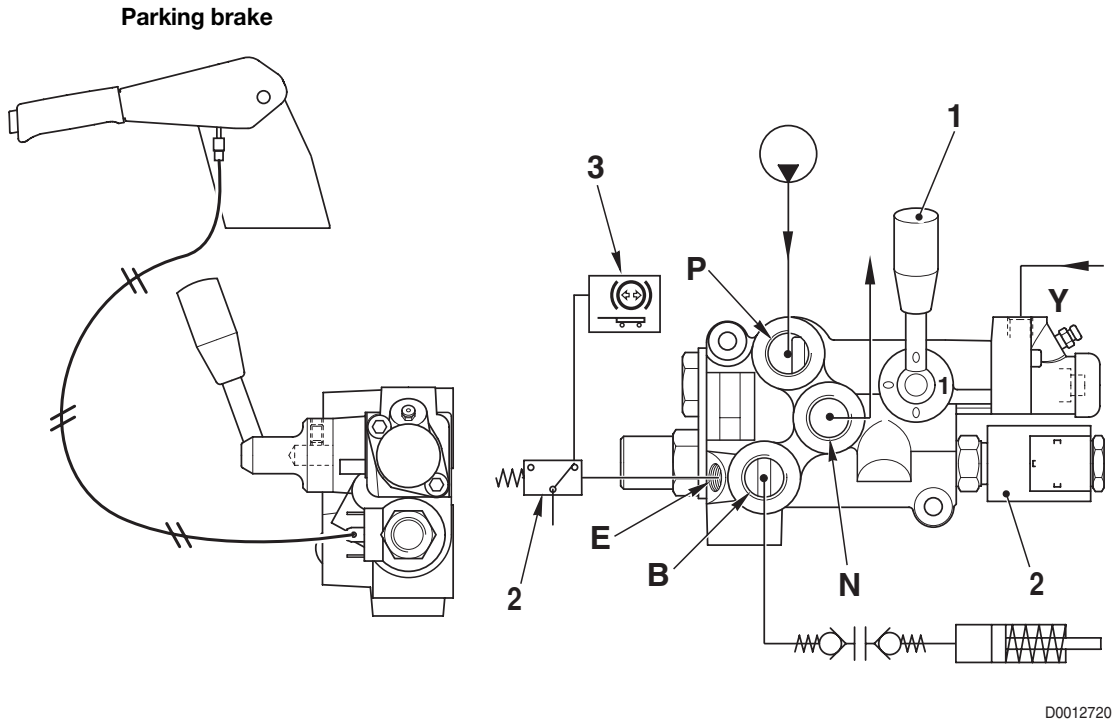
1. Piston
2. Plunger
3. Adjustment nuts
4. Lever
5. Support
6. Rod
7. Parking brake control lever

2.3 TRAILER BRAKING SYSTEM

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

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

2.3.1 HYDRAULIC TRAILER BRAKING (ITALY VERSION)

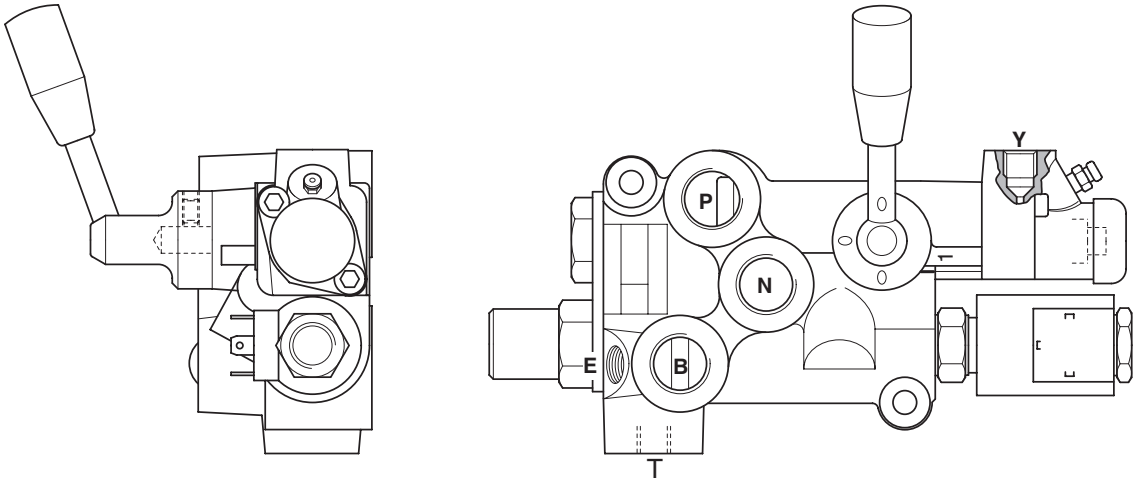


1. Valve activation lever in position “1”

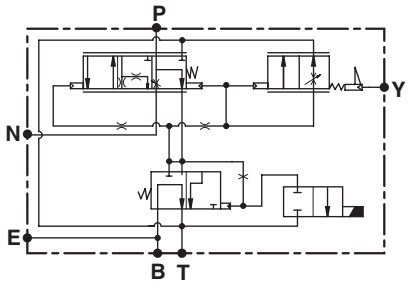
- When the lever (1) is in position “1” (valve activated) and the brake pedals are not pressed, a pressure of 12.5 bar (181.3 psi) is available at port **B**.
- This pressure is supplied constantly to the trailer to release the parking brake.
- When the operator engages the parking brake, the solenoid valve (2) is energised; this nullifies the pressure at port **B**.
- The pressure at port B is directly proportional to the pressure present in the tractor braking circuits Y.

2. Valve activation 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 is always null independently of the pressure in the tractor braking circuits.



HYDRAULIC DIAGRAM



D0012730

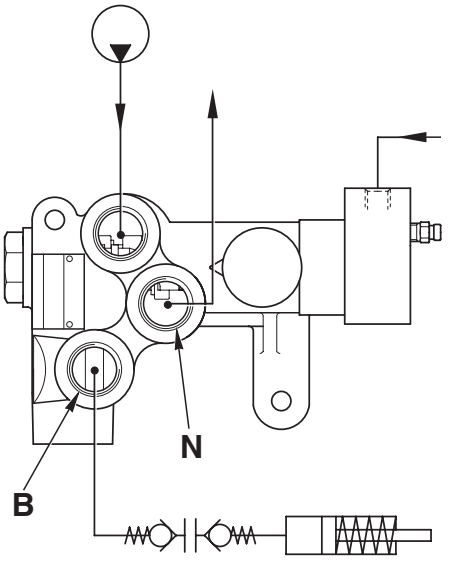
FUNCTION

Port P - Valve feed
Port N - To lubrication line
Port B - To trailer brake
Port T - Drain
Port Y - Connection to tractor braking system

TECHNICAL DATA

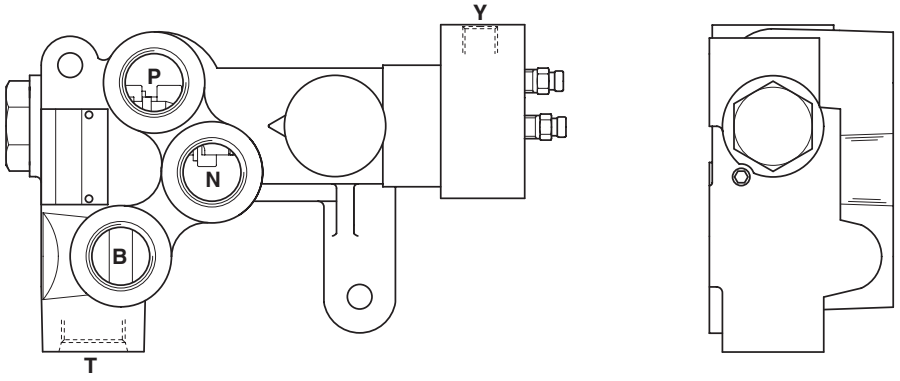
- Maximum pressure at port N:
  210 bar (3046 psi)
- Minimum constant pressure at port B::
  12.5±2 bar (181.3±29 psi)
- Maximum pressure at port B:
  135º5 bar (1957.5º72.5 psi)
- Feed flow rate:
  20–80 ℓ/min (5.3 – 21.14 US.gpm)

2.3.2 HYDRAULIC TRAILER BRAKING (EXPORT VERSION)

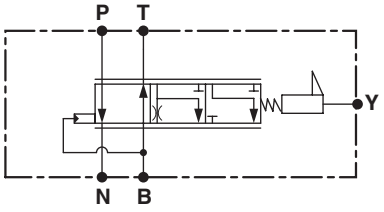


D0022940

- When the brakes are not operated the pressure at port **B** is null.
- 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



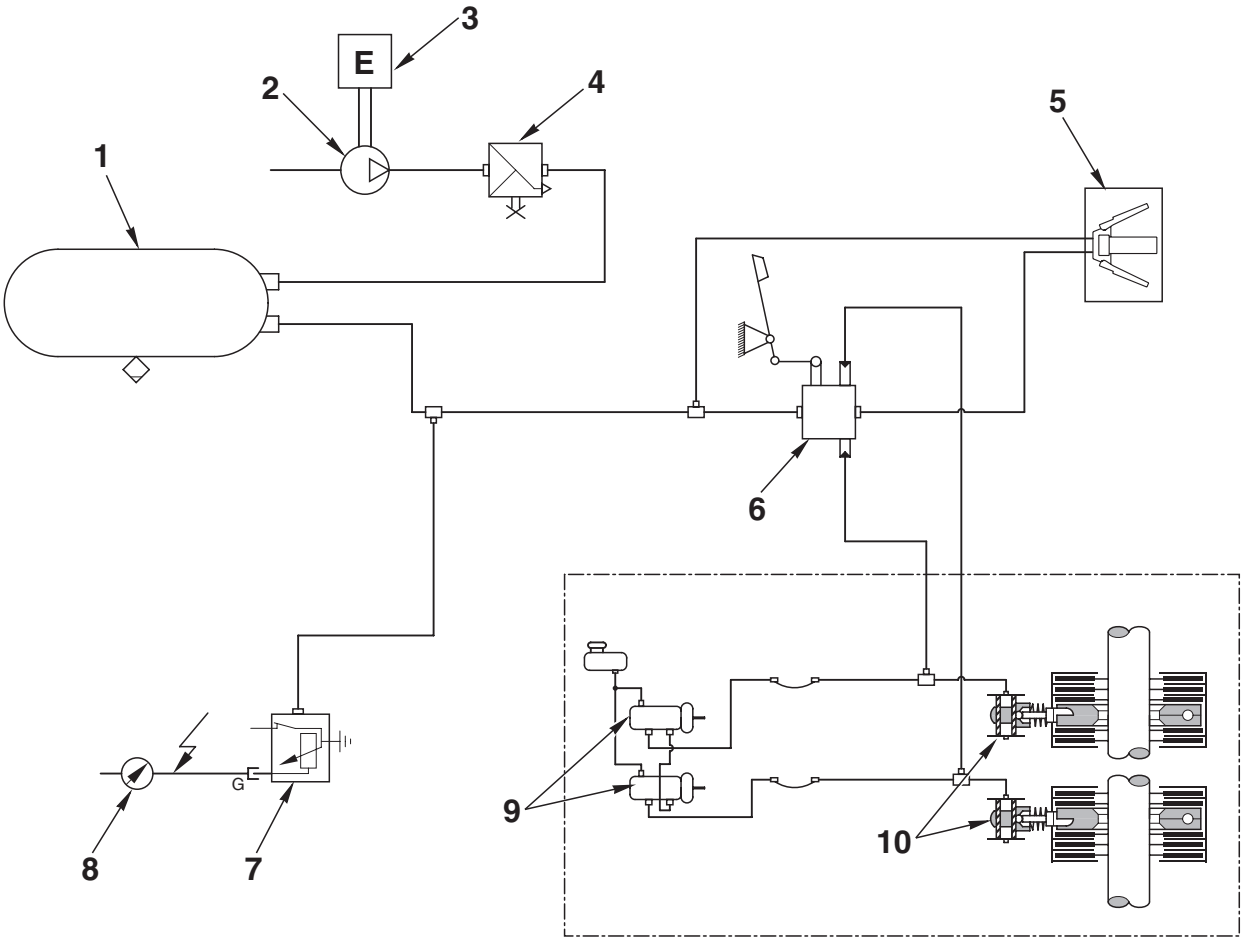
D0004570

Port P - Valve feed
Port N - To lubrication line
Port B - To trailer brake
Port Y - Connection to tractor braking system
Port T - Drain

TECHNICAL DATA

- Maximum pressure at port N: 200 bar (2900 psi)
- Minimum constant pressure at port B:
- Maximum pressure at port B: 130–150 bar (1885–2175 psi)
- Feed flow rate: 20–80 ℓ/min (5.3 – 21.14 US.gpm)

2.3.3 AIR TRAILER BRAKING (ITALY VERSION)

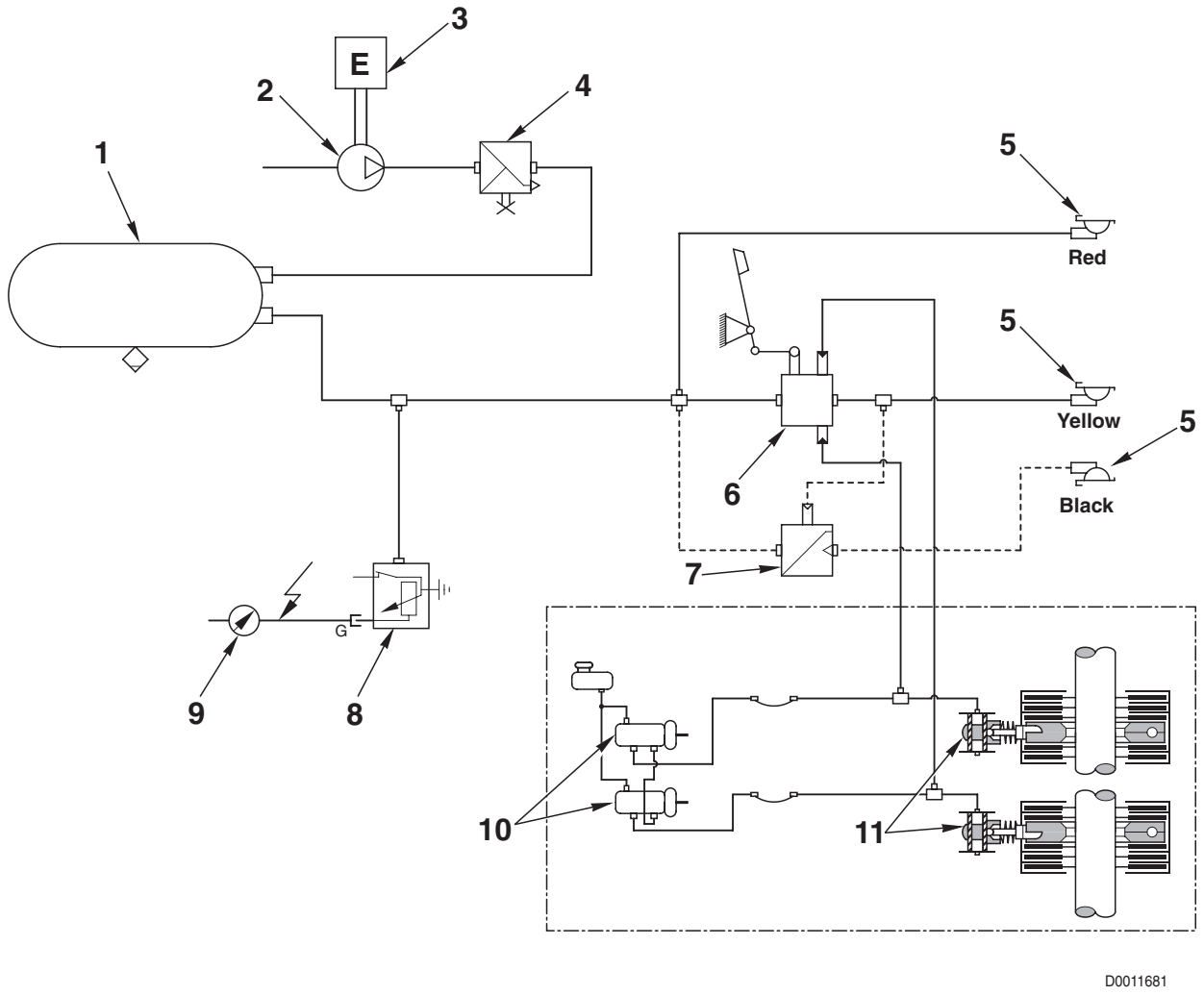


D0011690

COMPONENTS

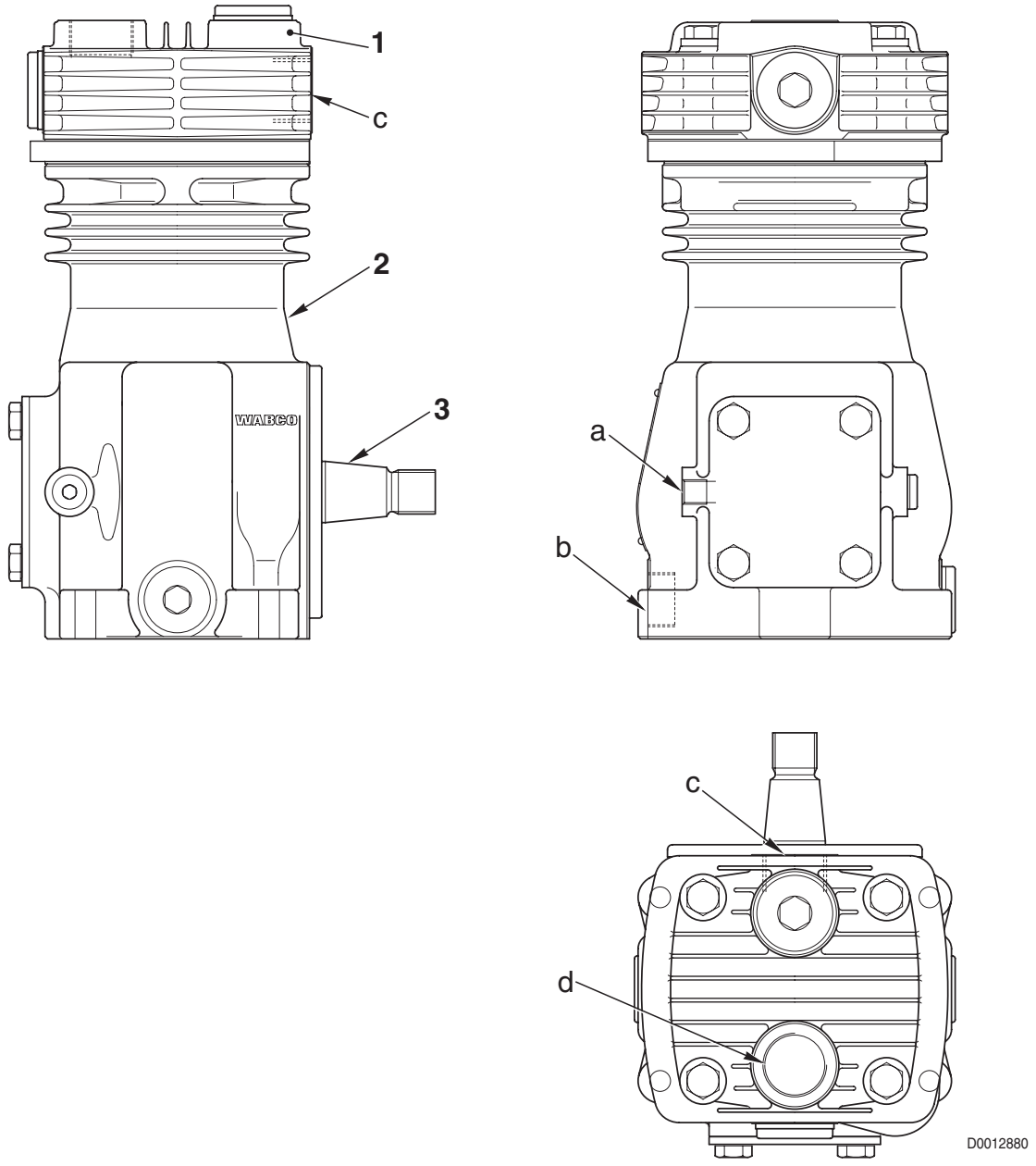
1. Compressed air reservoir
2. Air compressor
3. Engine
4. Pressure limiting valve (7.8 bar (113 psi))
5. Quick-action coupler for trailer
6. Trailer braking valve
7. Circuit pressure sensor
8. Circuit pressure indicator
9. Brake master cylinder
10. Brake

2.3.4 AIR TRAILER BRAKING (EXPORT VERSION)



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 master cylinder
11. Brake

COMPRESSOR



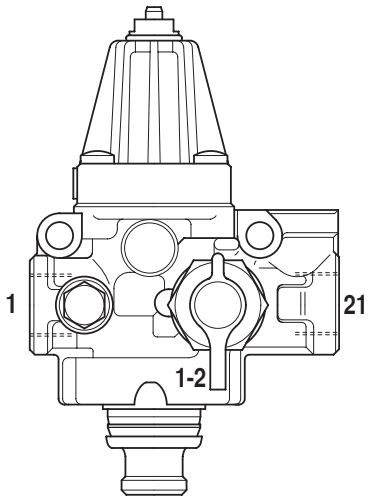
a. Compressor lubrication
b. Compressor lube oil return
c. Port 0 - Air intake
d. Port 2 - Air delivery

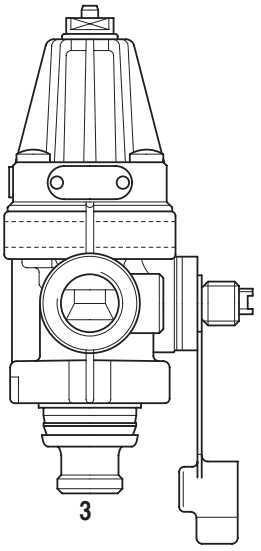
1. Cylinder head
2. Cylinder
3. Drive shaft

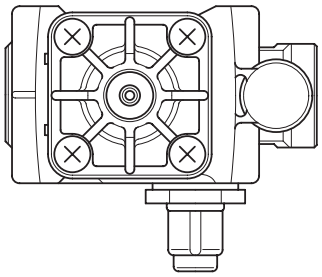
TECHNICAL DATA

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

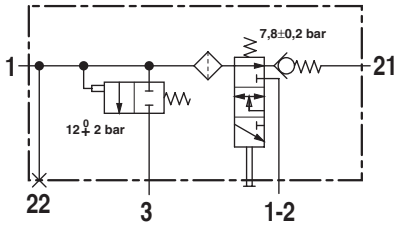
PRESSURE LIMITING VALVE







DIAGRAM



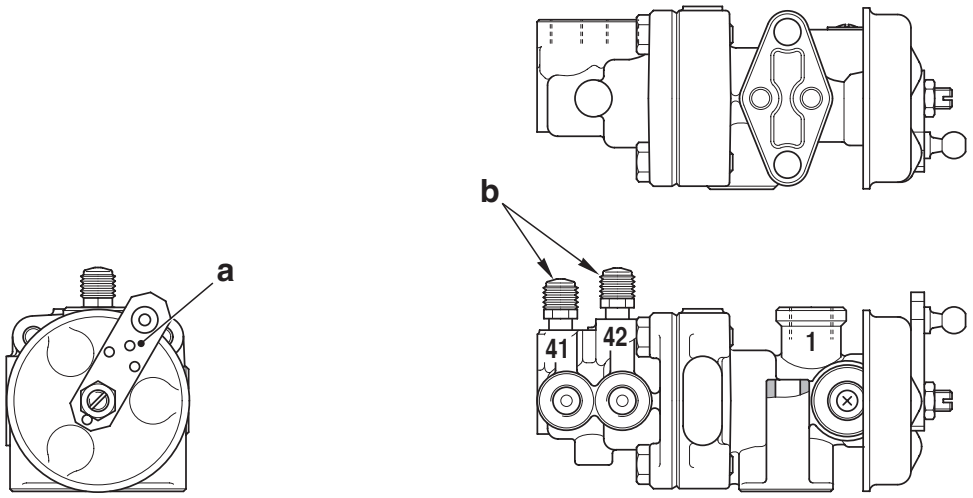
D0004690

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

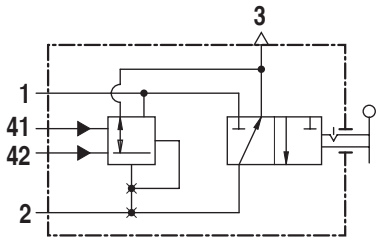
TECHNICAL DATA

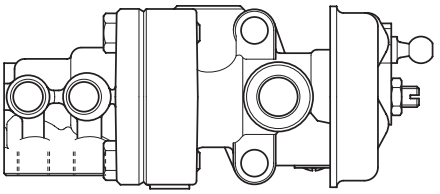
Cut-out pressure: 7.8±0,2 bar (113±2.9 psi)
Cut-in pressure: 0.6–1 bar (8.7 – 14.5 psi)
Relief valve setting: 12±2 bar (174±29 psi)

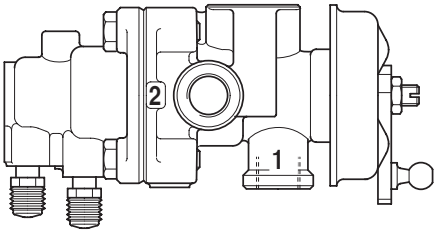
TRAILER BRAKING VALVE (2-WAY)

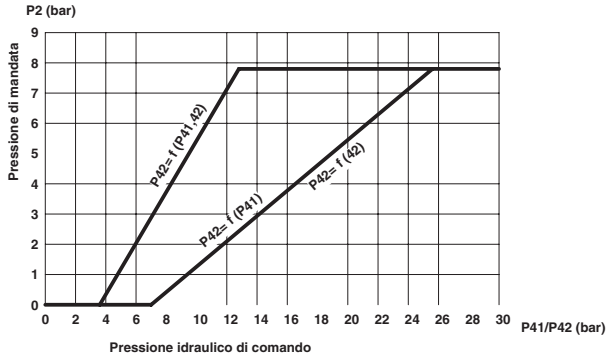


DIAGRAM







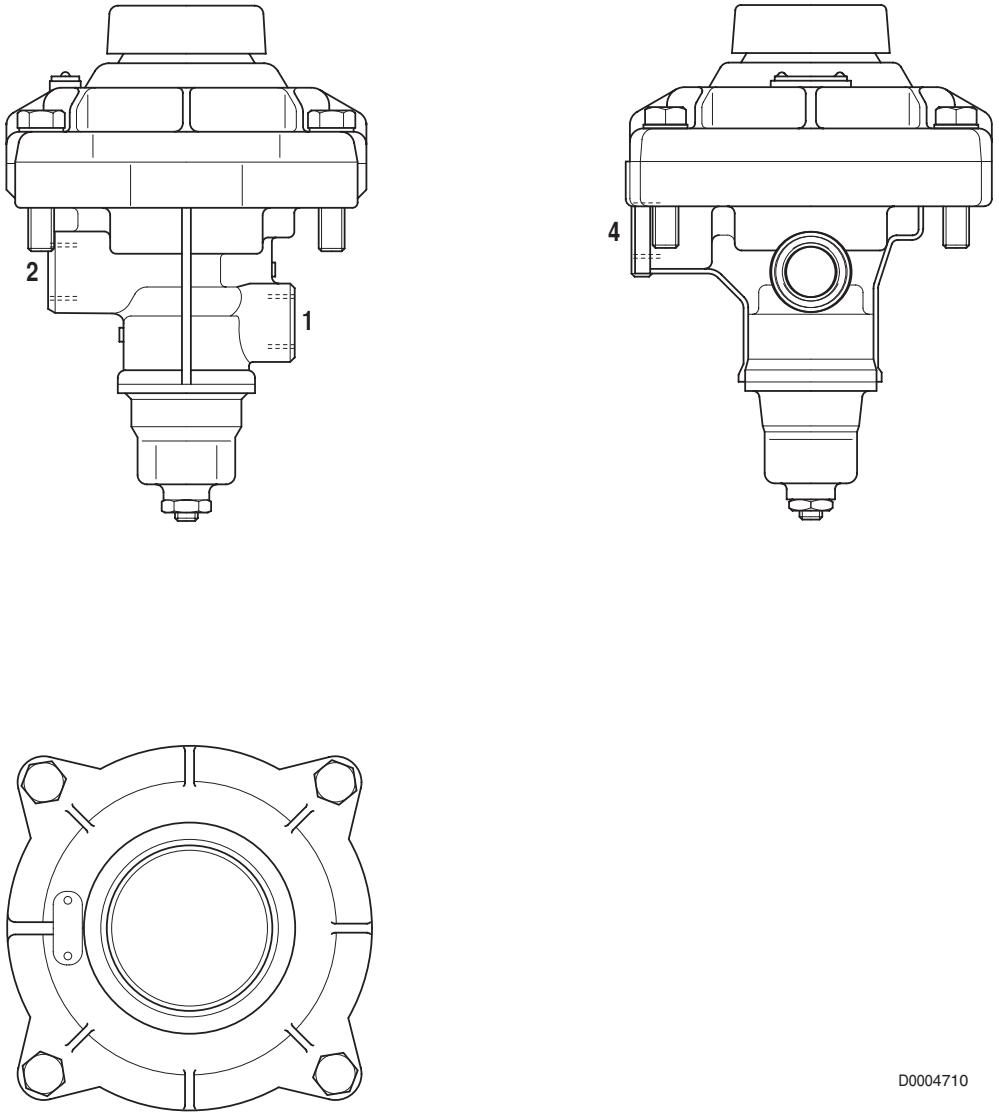


D0004760

a. Parking brake actuating lever
b. Bleed screw

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)



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

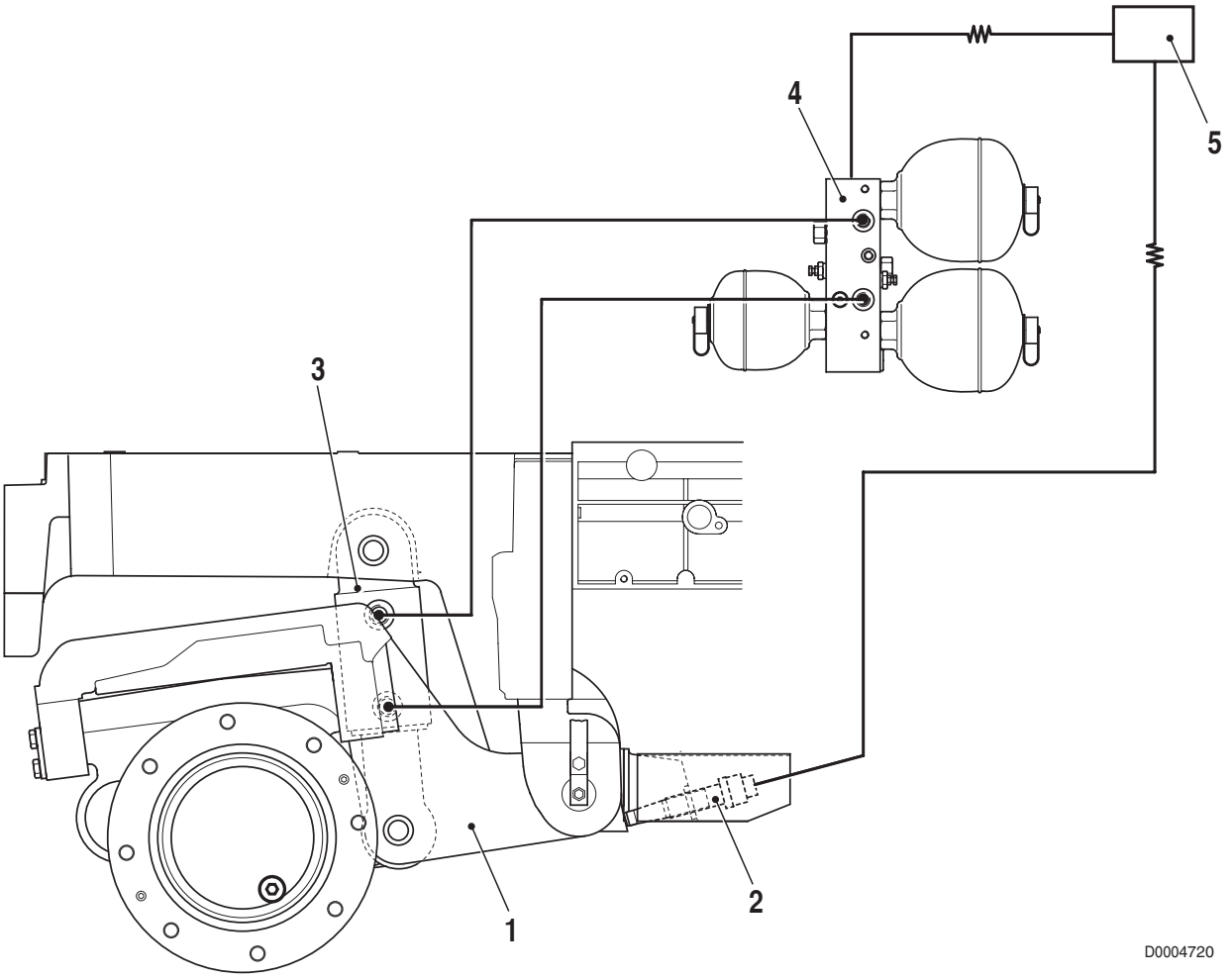
3. HYDRAULIC FRONT AXLE SUSPENSION

DESCRIPTION

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

The system comprises

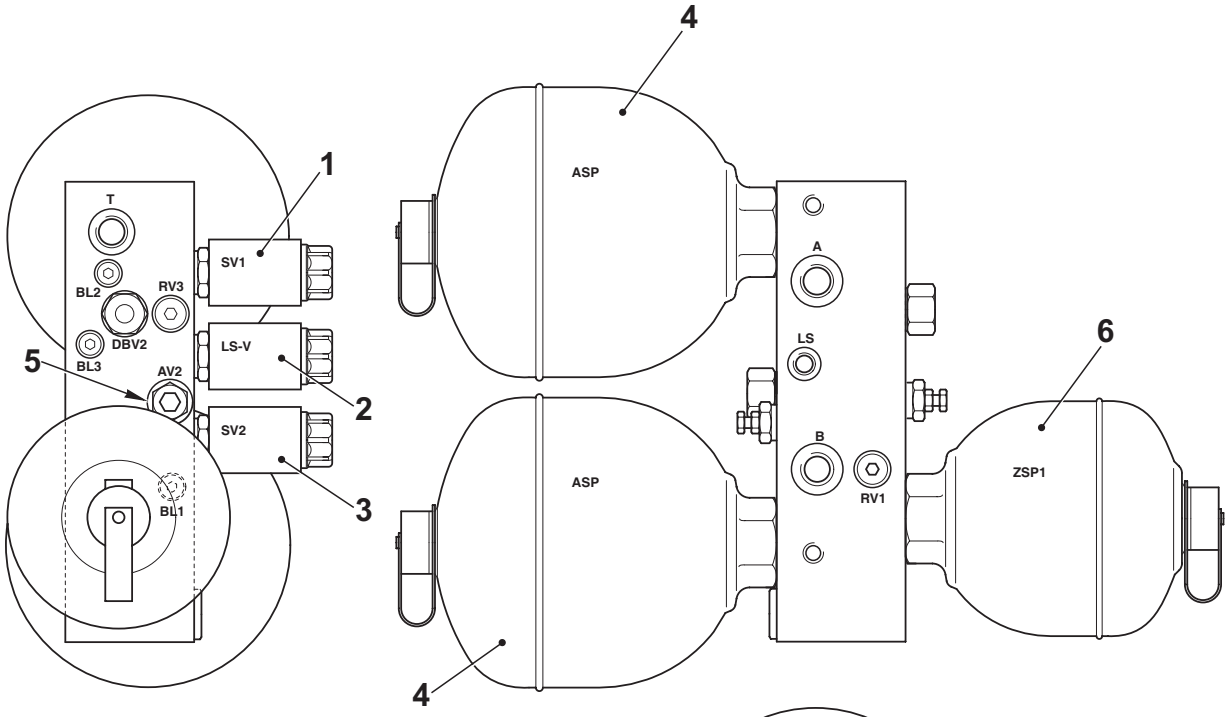
- swinging axle support arm (1)
- position sensor (2)
- 2 suspension cylinders (3)
- front suspension control valve (4)
- electronic control unit (5)



3.1 FRONT SUSPENSION CONTROL VALVE

FUNCTION

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



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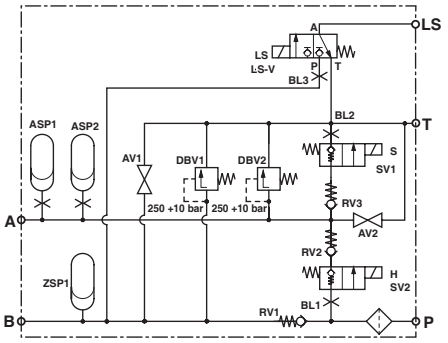
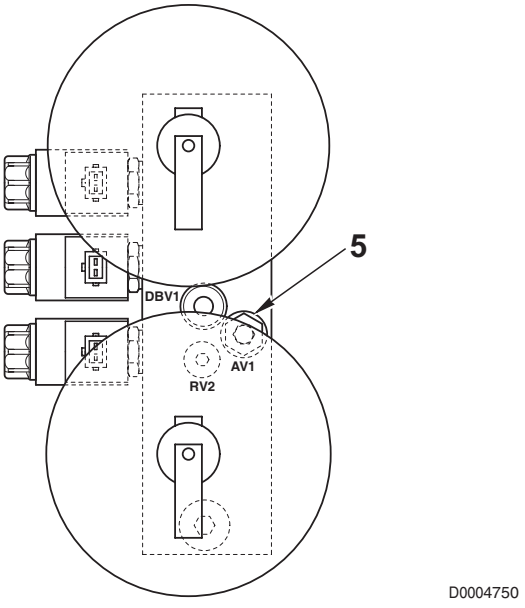
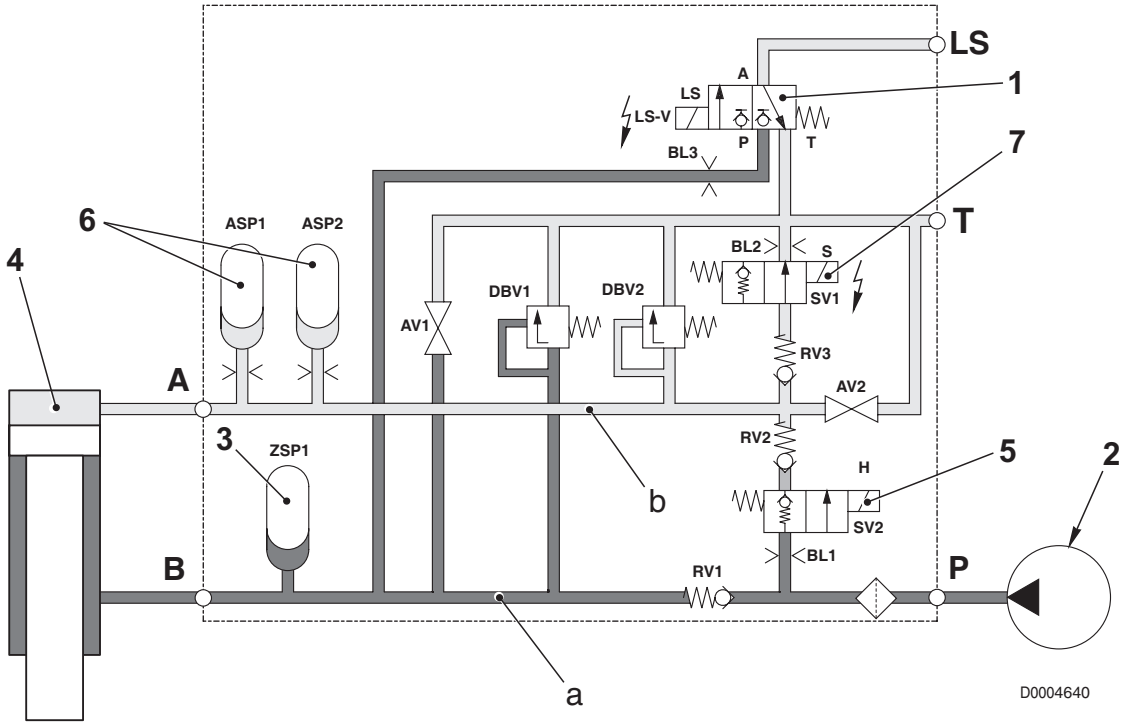




1. Cylinder retraction control solenoid valve
2. LS signal control solenoid valve
3. Cylinder extension control solenoid valve
4. Accumulator (setting: 65 bar)
5. Pressure discharge valve
6. Accumulator (setting: 140 bar)
7. Use **A** relief valve (setting: 250 bar)
8. Use **B** relief valve (setting: 250 bar)

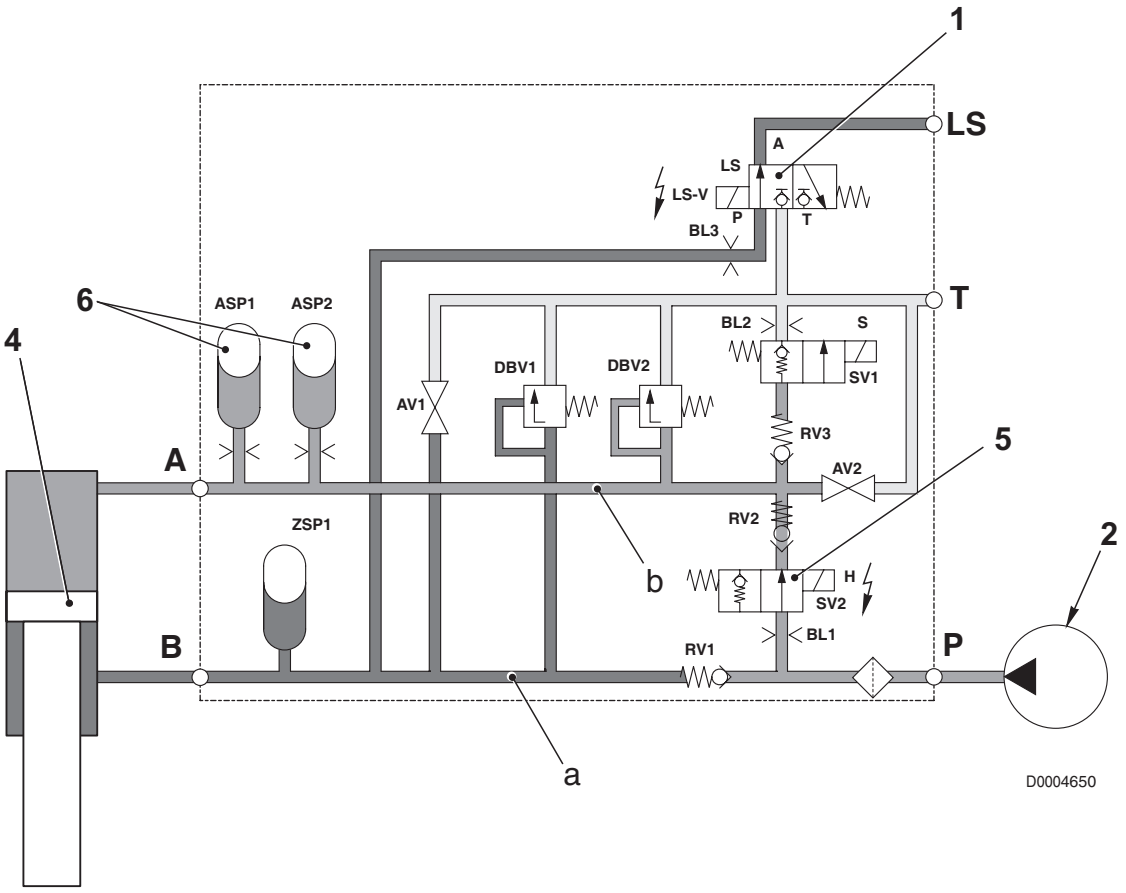
OPERATION

1. When the suspension is deactivated



- When the suspension is deactivated, the electronic control unit energises the solenoid (1) by sending an **LS** signal to the priority valve (in the case of the gear pump version) or to the variable displacement pump.
- This allows the pressurised oil from the pump (2) to flow to line **a** and compress the membrane of the accumulator (3) up to the maximum circuit pressure.
- The oil is discharged from the piston side through passage **B** and through the solenoid valve (7) which is energised.
- 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.

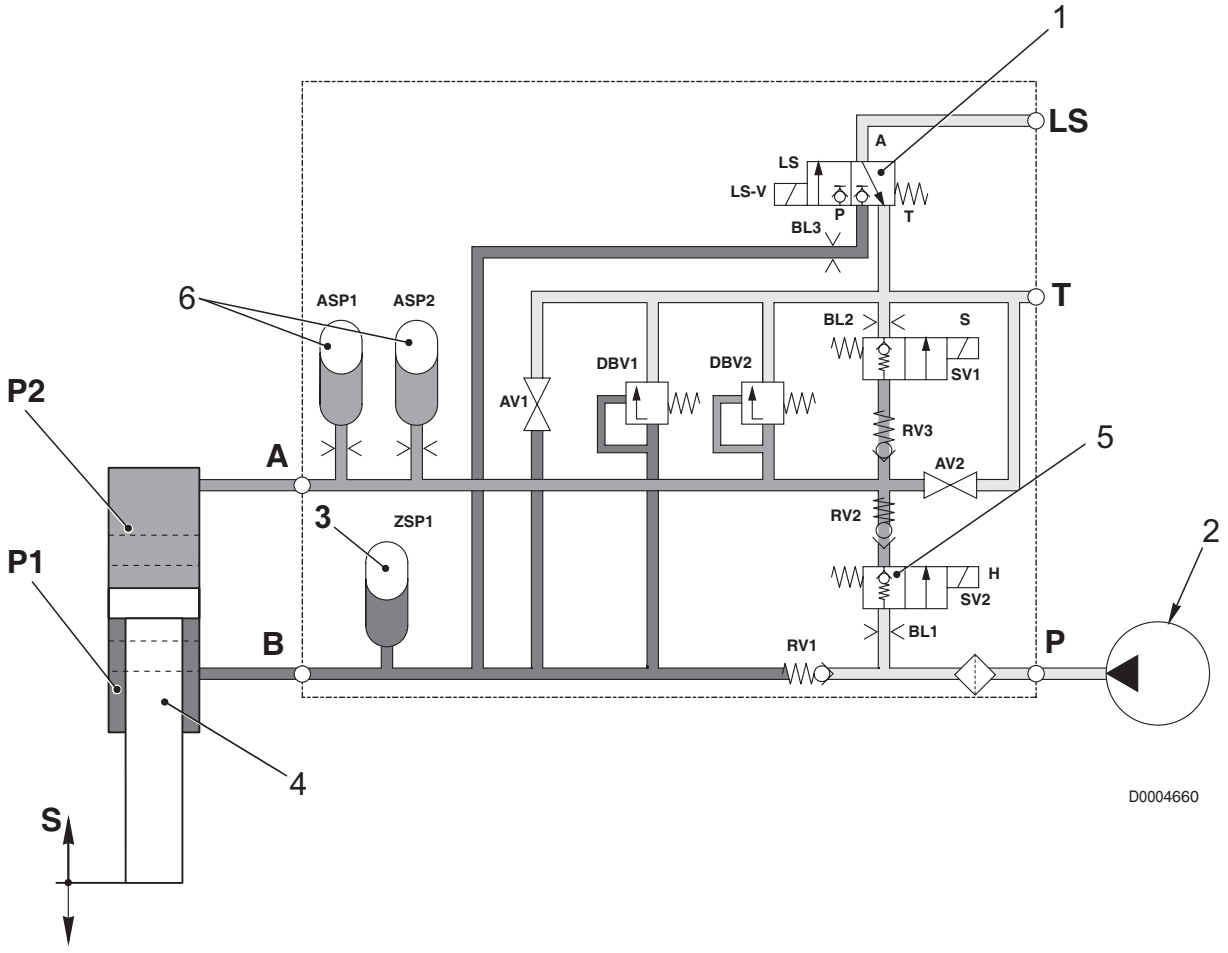
2. When the operator activates the system

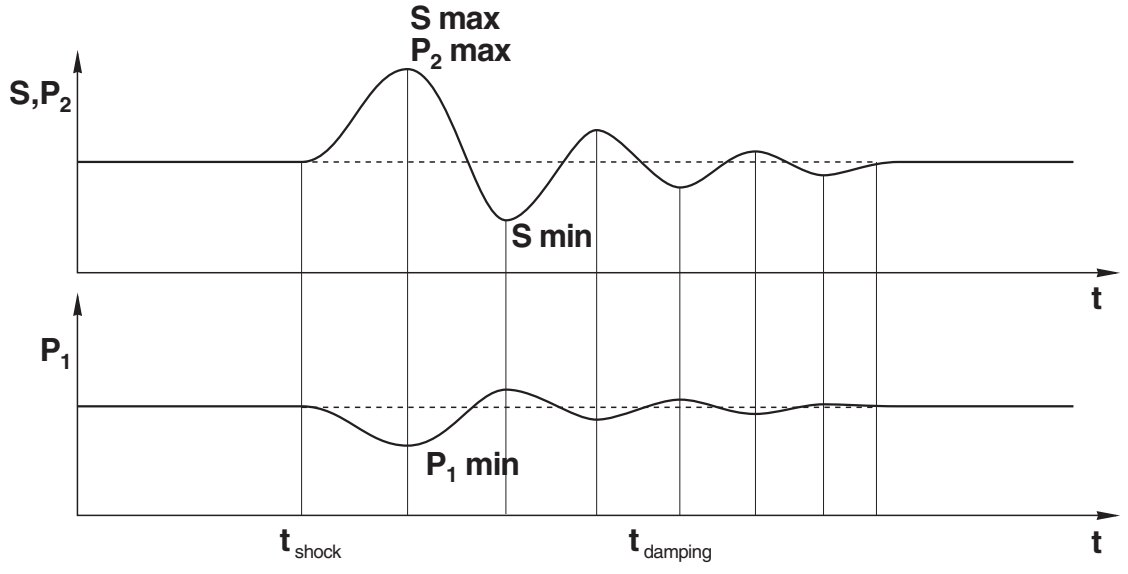


- When the operator presses the switch to activate the suspension, the electronic control unit energises the solenoids (1) and (5).
- This allows the pressurised oil from the pump (2) to flow to line **b** and thus start to push the piston (4) downwards.
- At the same time, the oil compresses the membranes of the accumulators and the oil in lines **a** and **b** increases.
- When the pressure in line **a** reaches the opening pressure of the relief valve (8), the valve opens and discharges some of the oil to the drain circuit.
- When the position sensor detects that the suspension has attained the levelling position, the electronic control unit de-activates the solenoids (1) and (5) and the part of the system containing the precharged accumulators is isolated from the rest of the system.

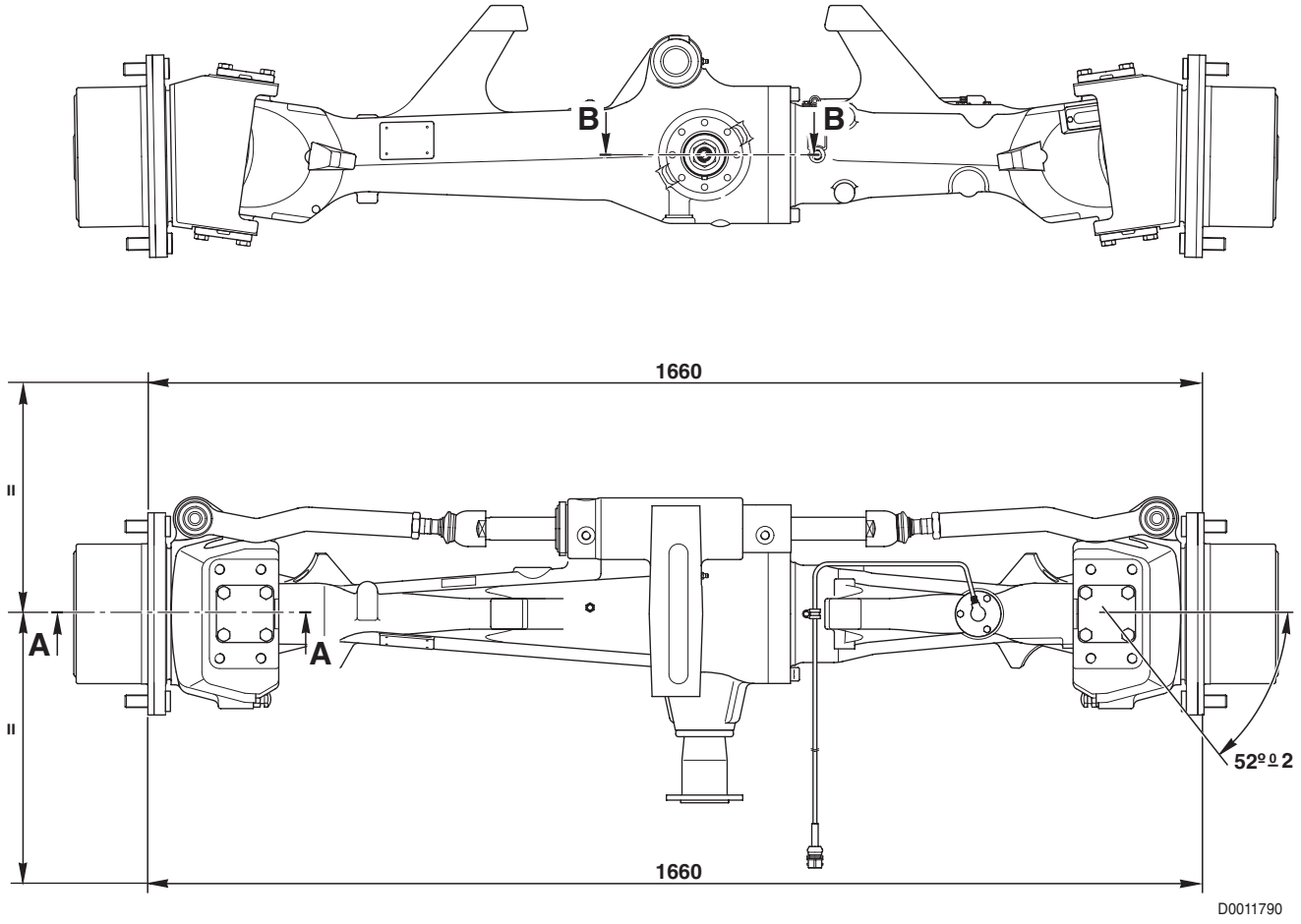
3. When the system is active

- When the tractor is in motion and the wheels encounter an obstacle, the front axle is pushed upwards.
- This causes the pressure P2 to increase (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..





4. FRONT AXLE



5. HYDRAULIC SYSTEM

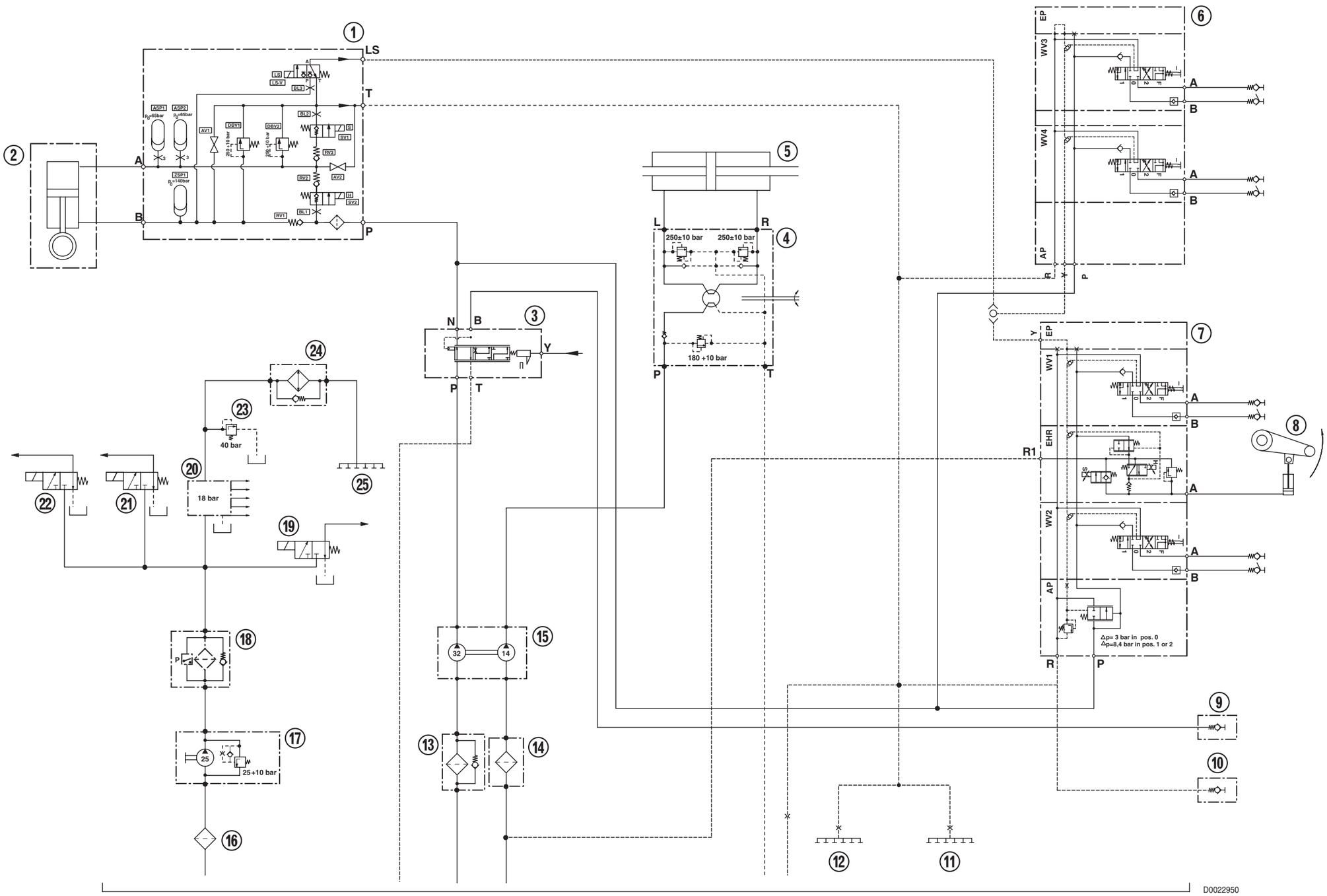
DESCRIPTION

The Agrotron series is 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.

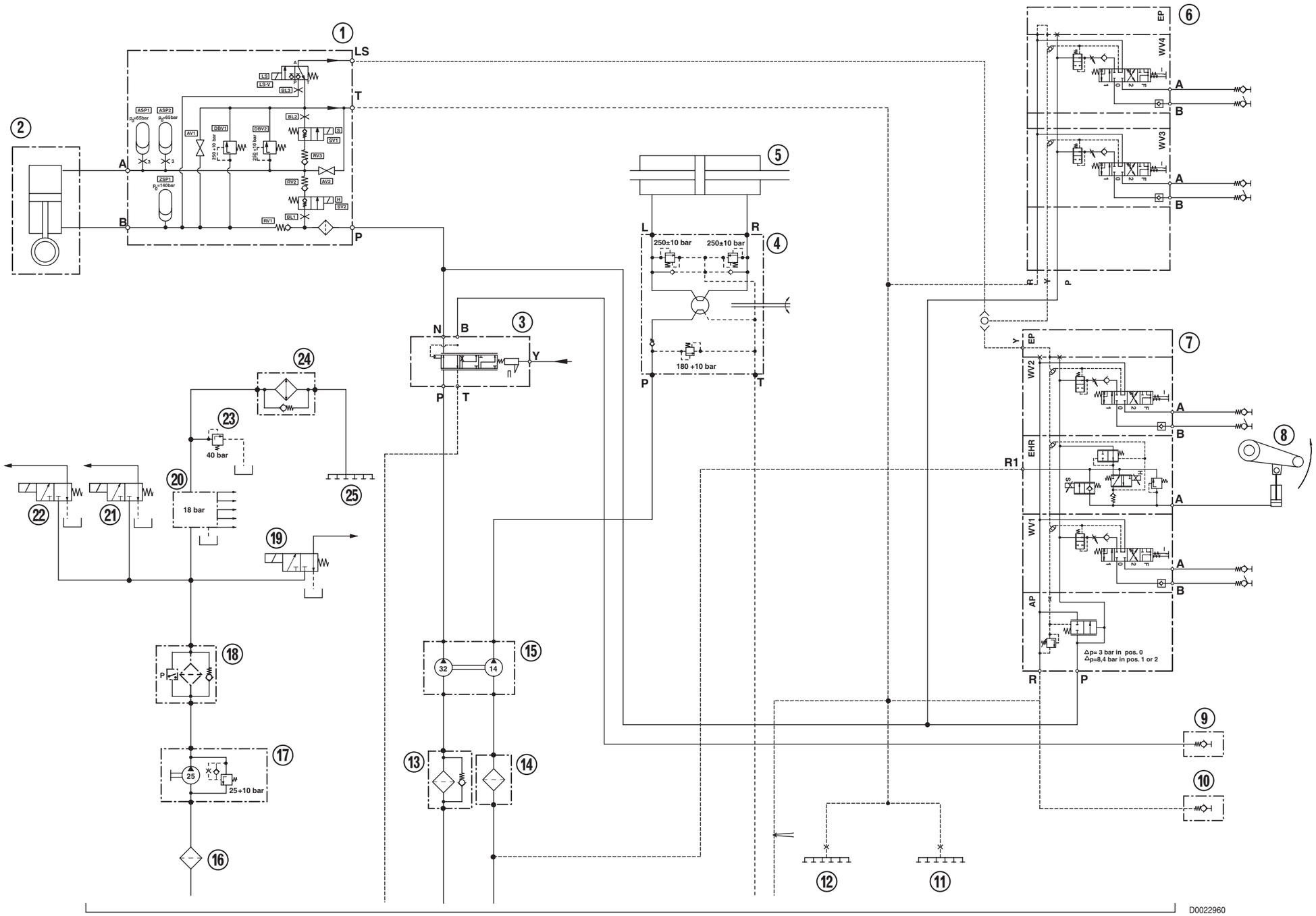
This means that when the engine is running at top speed and no hydraulic services are in operation (e.g. during road use), the pump will continue to circulate oil in the hydraulic circuit at the rate of approximately 80 litres per minute (with a consequent increase in temperature and oil consumption)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

5.1 HYDRAULIC DIAGRAM (version with remote control valves without flow control)



1. Suspension control valve Load Sensing suspension
2. Front axle suspension cylinder (2)
3. Trailer braking valve
4. Solenoid valve controlling flow to front axle control valve
5. Power steering
6. Steering cylinder
7. Auxiliary services control valve (spools 3 and 4)
8. Auxiliary services control valve (spools 1, 2 and lift)
9. Lift
10. Trailer brake connection
11. Rear PTO lubrication
12. Rear axle lubrication
13. Filter for services circuit
14. Filter for steering circuit
15. Gear pump for services and steering circuit
16. Filter for transmission circuit
17. Gear pump for transmission circuit
18. Filter for transmission circuit
19. Four-wheel drive control solenoid valve
20. Hydraulic gearbox control solenoid valve
21. Differential lock control solenoid valve
22. Rear PTO control solenoid valve
23. Lubrication circuit pressure relief valve
24. Cooler
25. Transmission lubrication

5.2 HYDRAULIC DIAGRAM (version with remote control valves with flow control)



1. Suspension control valve Load Sensing suspension
2. Front axle suspension cylinder (2)
3. Trailer braking valve
4. Solenoid valve controlling flow to front axle control valve
5. Power steering
6. Steering cylinder
7. Auxiliary services control valve (spools 3 and 4)
8. Auxiliary services control valve (spools 1, 2 and lift)
9. Lift
10. Trailer brake connection
11. Rear PTO lubrication
12. Rear axle lubrication
13. Filter for services circuit
14. Filter for steering circuit
15. Gear pump for services and steering circuit
16. Filter for transmission circuit
17. Gear pump for transmission circuit
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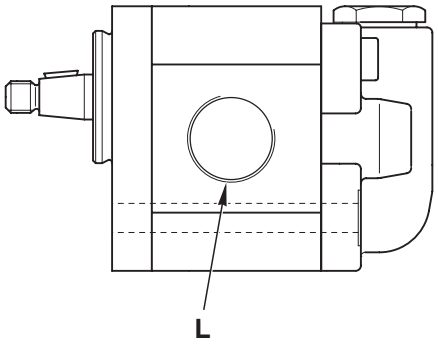
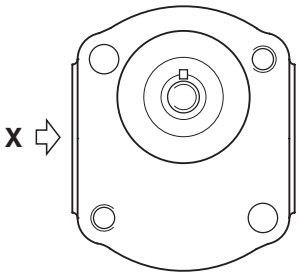
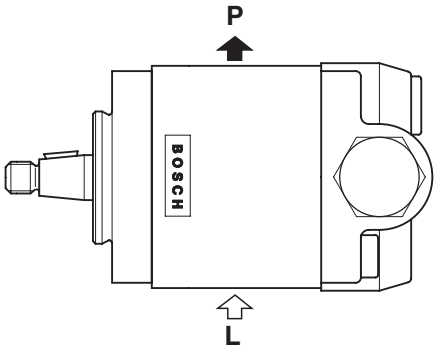
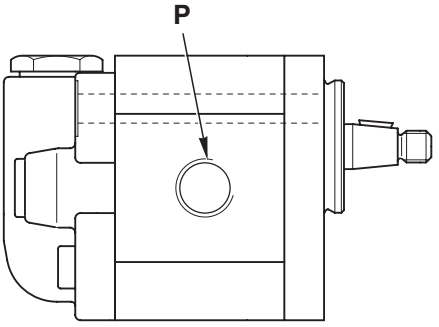
19. Four-wheel drive control solenoid valve
20. Hydraulic gearbox control solenoid valve
21. Differential lock control solenoid valve
22. Rear PTO control solenoid valve
23. Lubrication circuit pressure relief valve
24. Cooler
25. Transmission lubrication

5.3 GEAR PUMP FOR TRANSMISSION ZF 7100

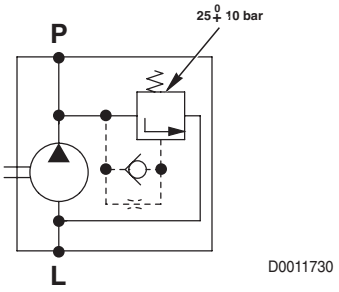








View X



FUNCTION

Port L: suction

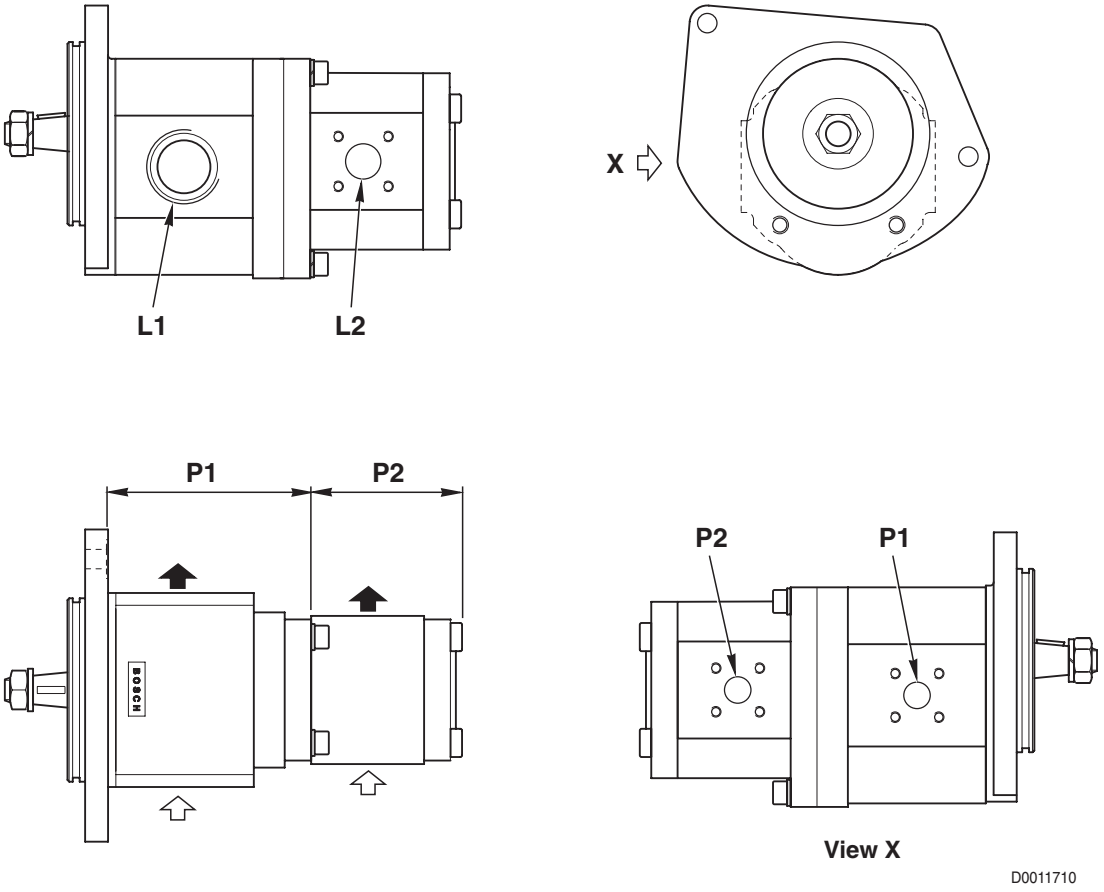
Port P: delivery

TECHNICAL DATA

Displacement: 25 cc/rev

Maximum pressure: 25 0 ± 10 bar

5.4 GEAR PUMP FOR HYDRAULIC SERVICES AND STEERING



FUNCTION

Port L1: inlet
Port L2: suction
Port P1: supply to services
Port P2: supply to power steering

CHARACTERISTICS

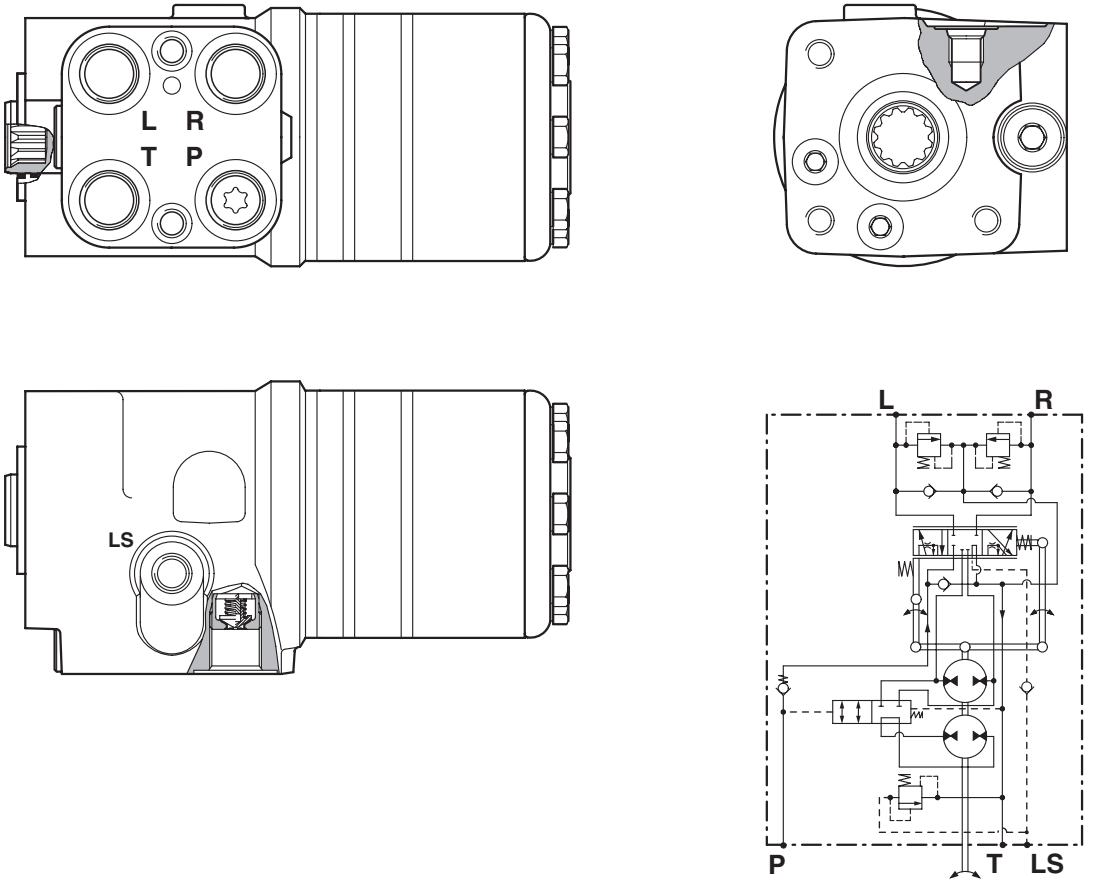
Pump P1

Displacement: 32 cc/rev
Maximum pressure: 200 bar (2900 psi)

Pump P2

Displacement: 14 cc/rev
Maximum pressure: 180 bar (2610 psi)

5.5 POWER STEERING



D0012010

FUNCTION

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

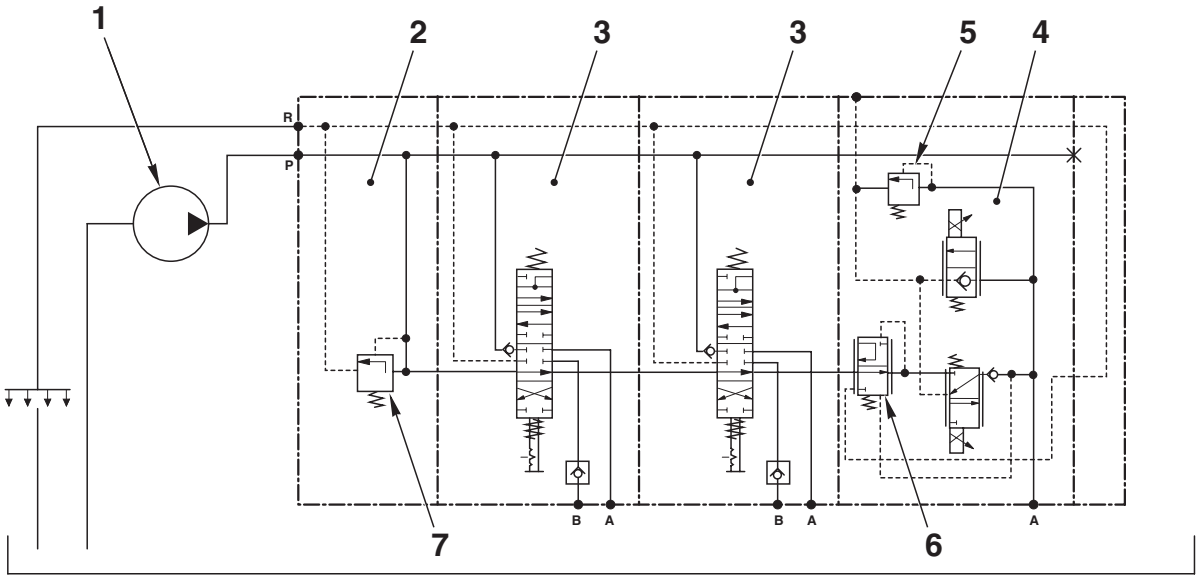
CHARACTERISTICS

Displacement: 150 cc/rev
Maximum pressure: 180–190 bar
Relief valve: 240–260 bar

5.6 AUXILIARY SERVICES CONTROL VALVE

FUNCTION

- The function of the auxiliary services control valve is to control the flow of oil to the auxiliary services and the rear lift.
- This control valve is of the serial type, i.e. it can be operated one spool at a time.



REAR GEARBOX

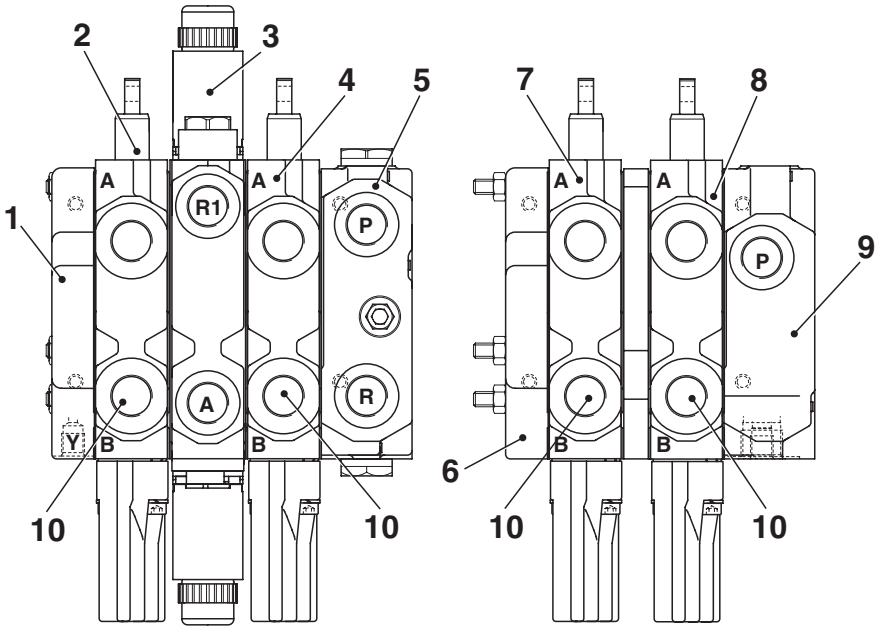
D0011800

DESCRIPTION

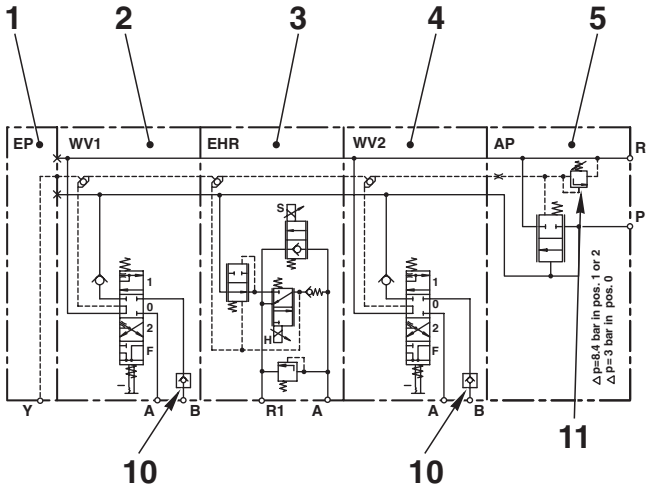
- The pressurised oil from the pump (1) enters the inlet section (2), from where it is distributed to the spools (3), (4) through the internal passages.
- The inlet section (2) has a pressure relief valve (7) that serves to prevent an excessive increase in the operating pressure of the loads.
- On the lift element (4) there is a flow control valve (6) that serves to send excess oil supplied by the pump to the lubrication circuit.
- On the lift control element (5) there is also an antishock valve (on the "up" control side), which serves to prevent any excessive pressure surges caused by jolting of the implement.

5.6.1 TYPES OF CONTROL VALVE

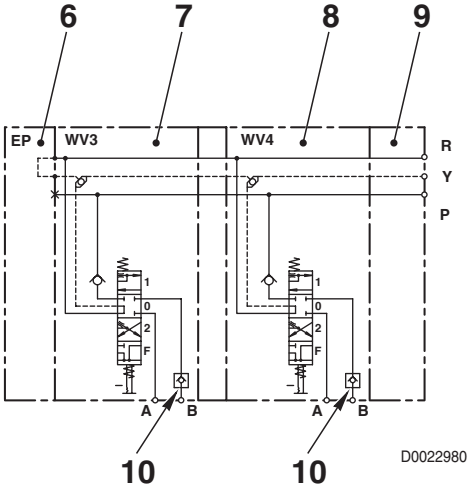
8-WAY VERSION (without flow control)



HYDRAULIC DIAGRAM

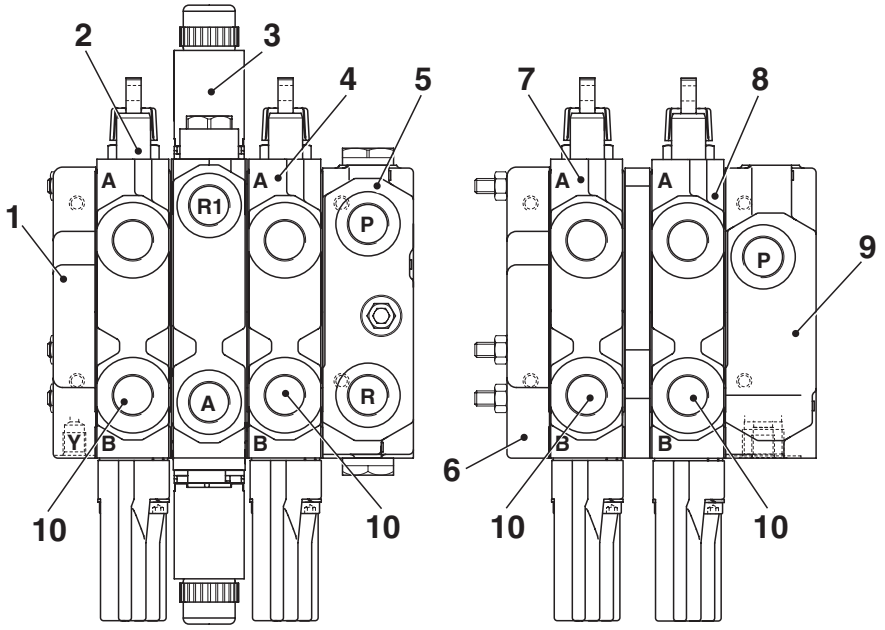


HYDRAULIC DIAGRAM

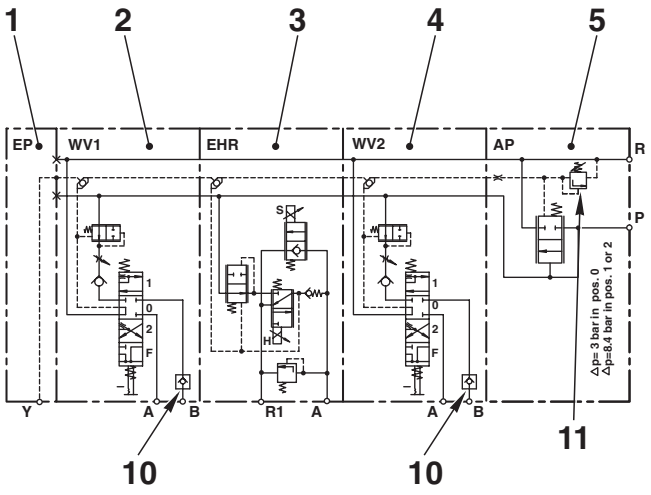


1. End cover
2. Control valve section n° 1
3. Lift control valve section
4. Control valve section n° 2
5. Inlet manifold
6. End cover
7. Control valve section n° 3
8. Control valve section n° 4
9. Inlet manifold
10. Check valve
11. Pressure relief valve

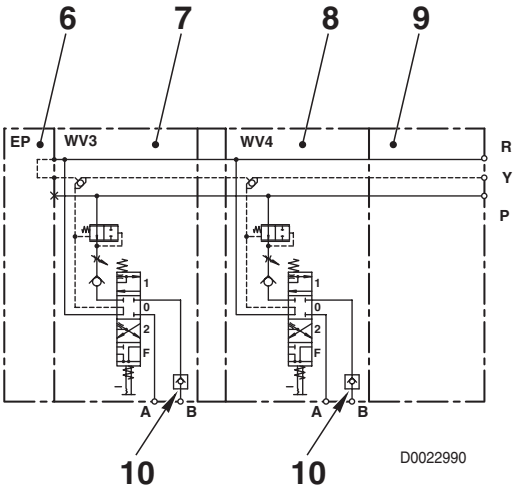
8-WAY VERSION (with flow control)



HYDRAULIC DIAGRAM

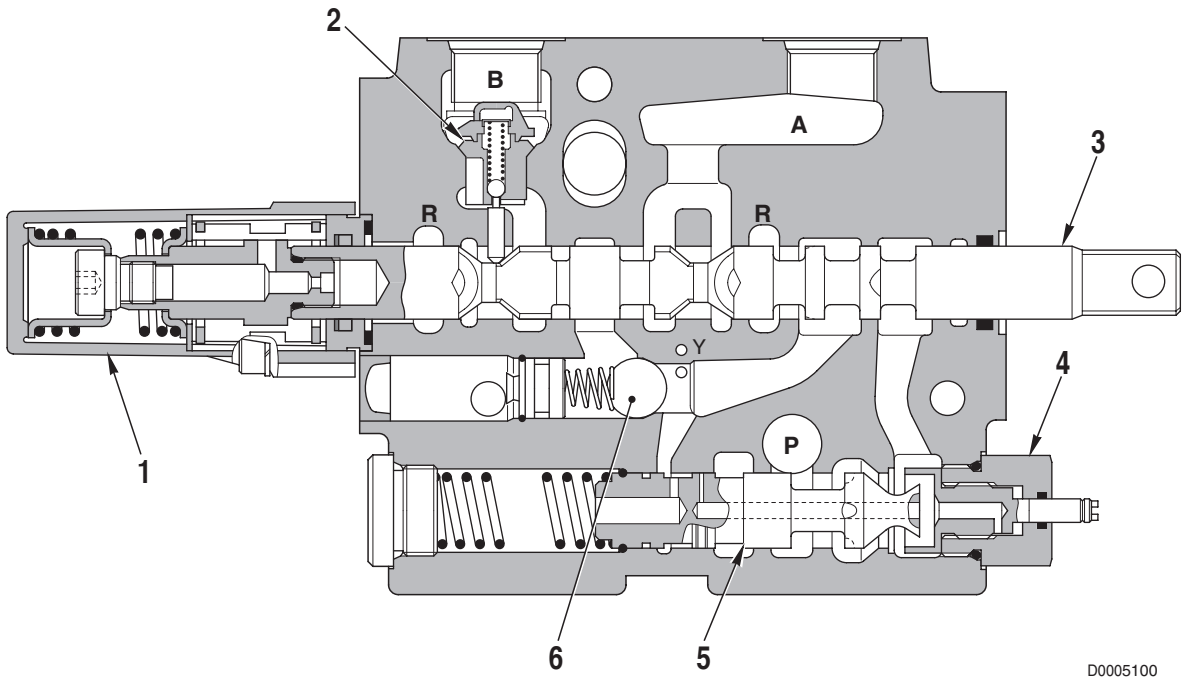


HYDRAULIC DIAGRAM



1. End cover
2. Control valve section n° 1
3. Lift control valve section
4. Control valve section n° 2
5. Inlet manifold
6. End cover
7. Control valve section n° 3
8. Control valve section n° 4
9. Inlet manifold
10. Check valve
11. Pressure relief valve

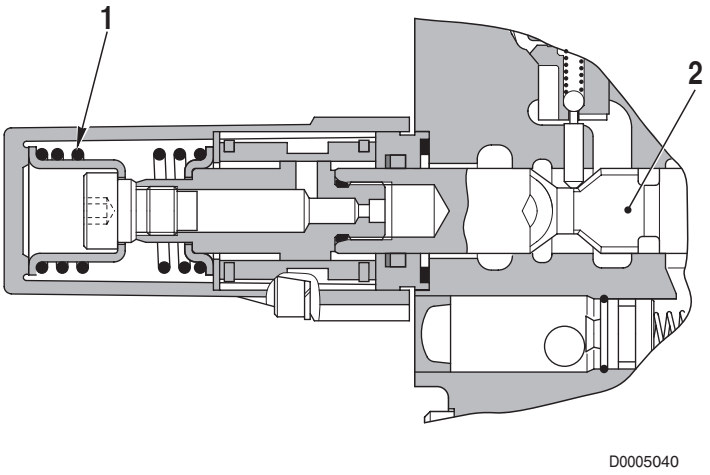
5.6.2 SERVICES CONTROL SECTION



1. Spool return device
2. Check valve
3. Spool
4. Flow control
5. Flow control spool
6. Check valve

5.6.3 DESCRIPTIONS OF COMPONENTS

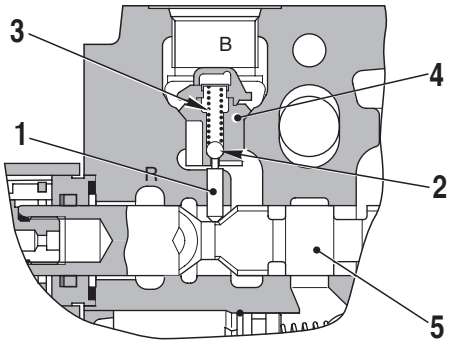
SPOOL RETURN DEVICE



D0005040

1. Spool return spring
2. Spool

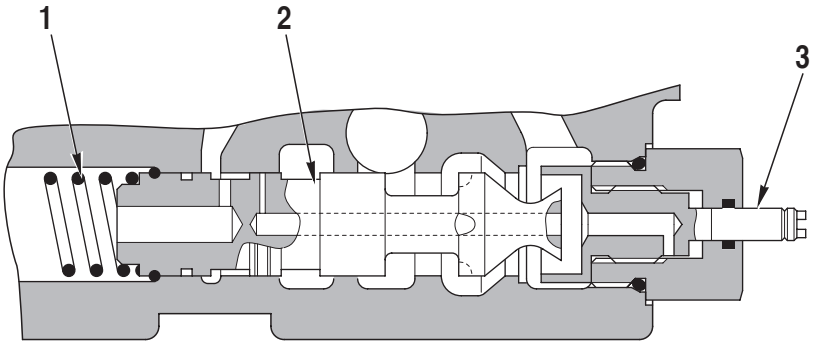
CHECK VALVE (NR)



D0005050

1. Slide
2. Ball
3. Check valve spring
4. Valve seat
5. Spool

FLOW CONTROL VALVE



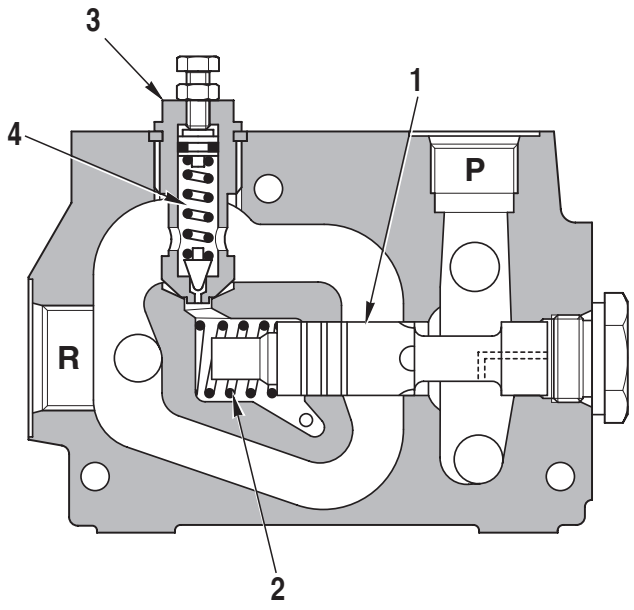
D0005060

1. Spring
2. Flow control spool
3. Control shaft

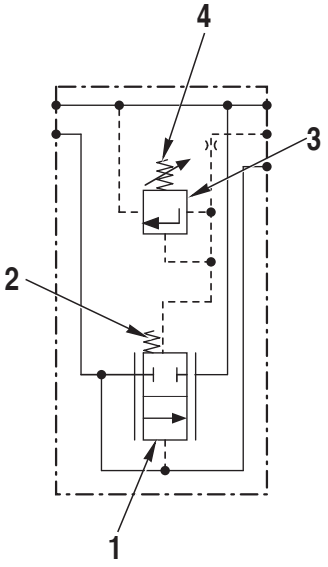
5.6.4 INLET MANIFOLD (CC version)

DESCRIPTION

The function of the inlet manifold is to send only the required amount of oil to the actuators and to send any excess oil supplied by the pump to the drain circuit.
The inlet manifold also includes a relief valve that limits the operating pressure of the actuators.



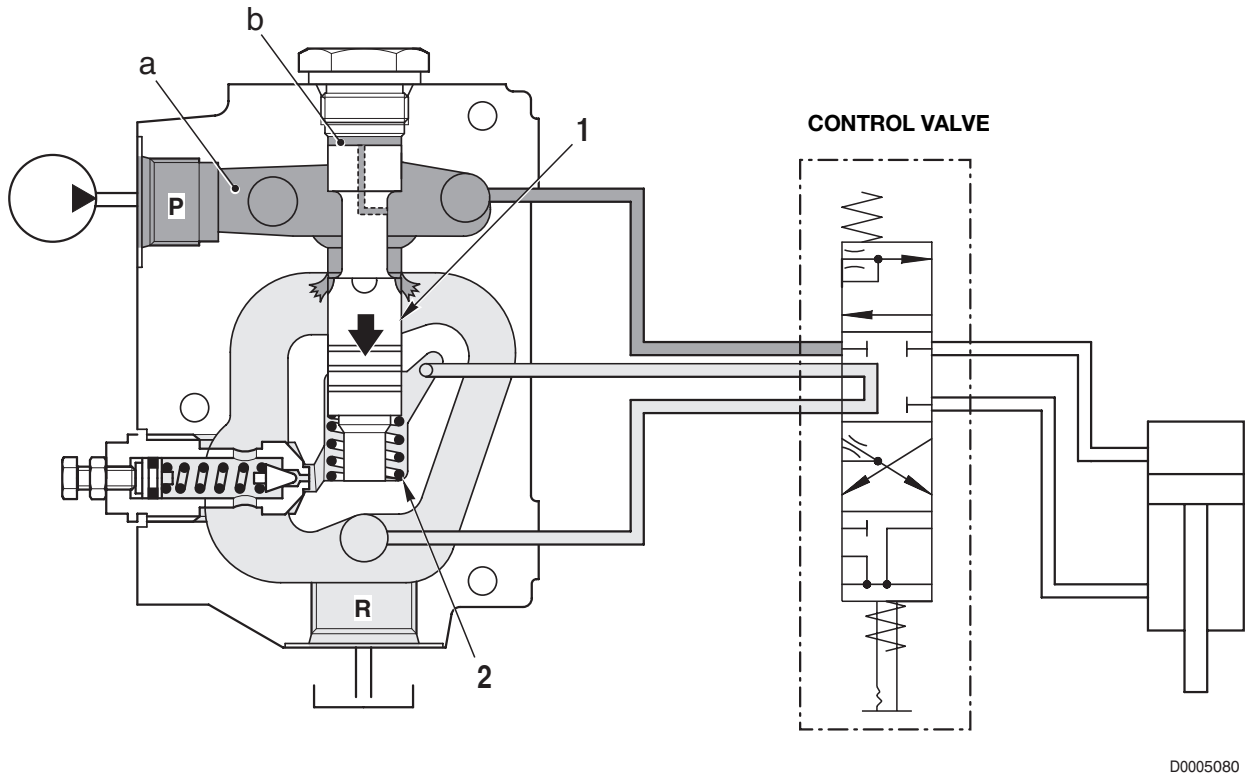
HYDRAULIC DIAGRAM



1. Pressure compensating valve spool
2. Compensating valve spring
3. Relief valve
4. Relief valve spring

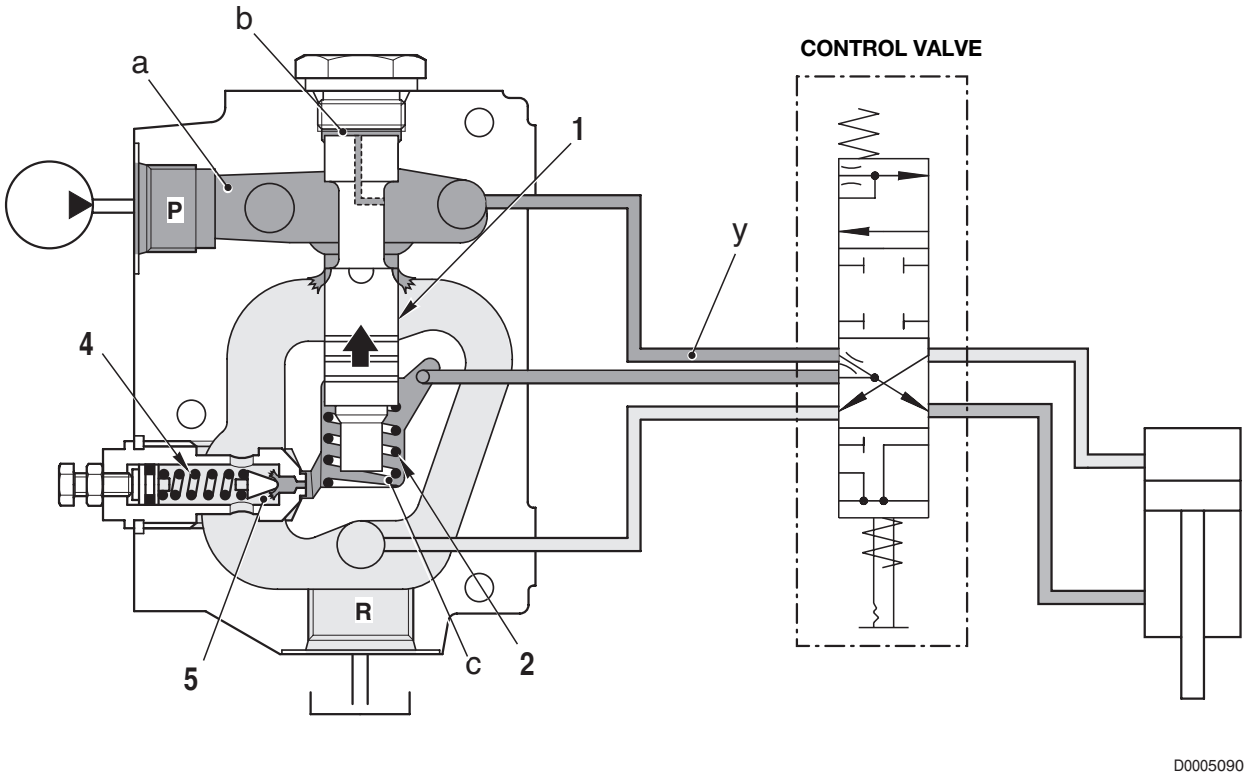
OPERATION

1. When the actuators are not operated



- When the engine is running and the driver does not operate any of the hydraulic service controls, the pump sends oil to the inlet manifold (port **P**).
- As all the actuators are stationary, the oil pressure increases in chamber **a** and consequently also in chamber **b**.
- When the oil pressure in chambers **a** and **b** exceeds the force exerted by the spring (2), the spool (1) is shifted downwards, allowing the excess oil from the pump to flow to drain.

2. When an actuator is operated



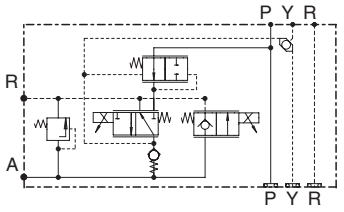
- When an actuator is operated, the pressure required for its operation is also directed to the channel **y** (Load Sensing signal channel) and then sent to chamber **c** of the manifold.
- This causes the spool (1) to shift upwards and the oil required to operate the load is sent to the control valve.
- When the load pressure balances the force of the spring (4), poppet (5) is shifted to the left, allowing limitation of the operating pressure.

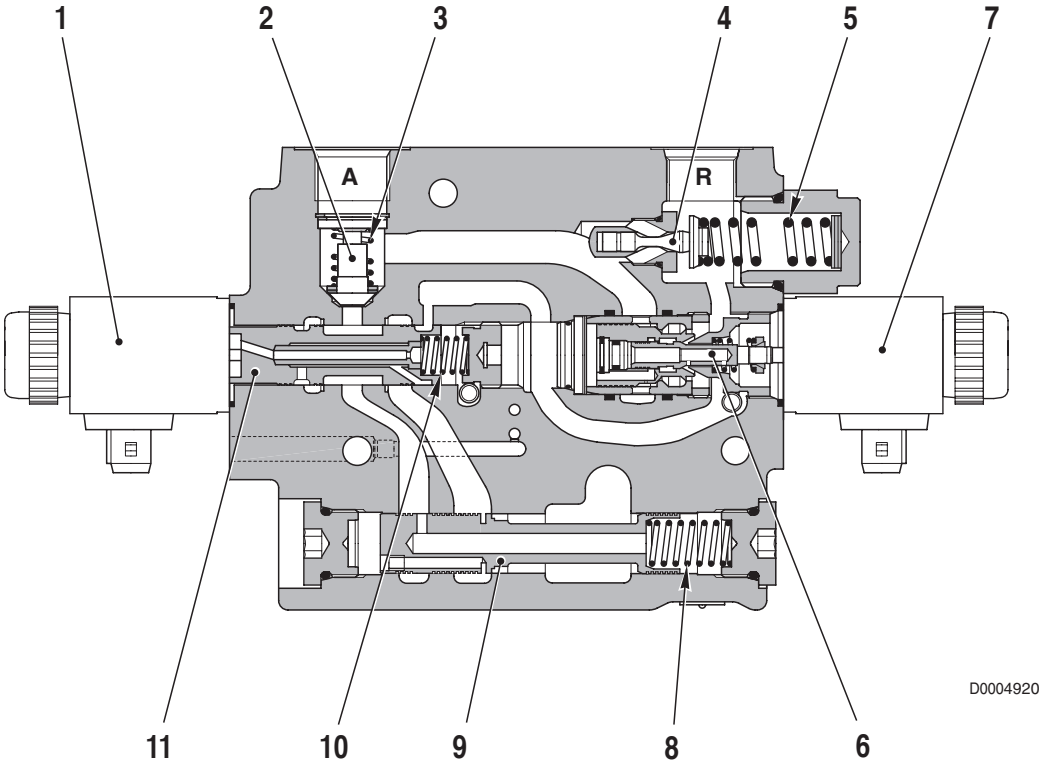
5.6.5 LIFT CONTROL VALVE SECTION

DESCRIPTION

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

HYDRAULIC DIAGRAM





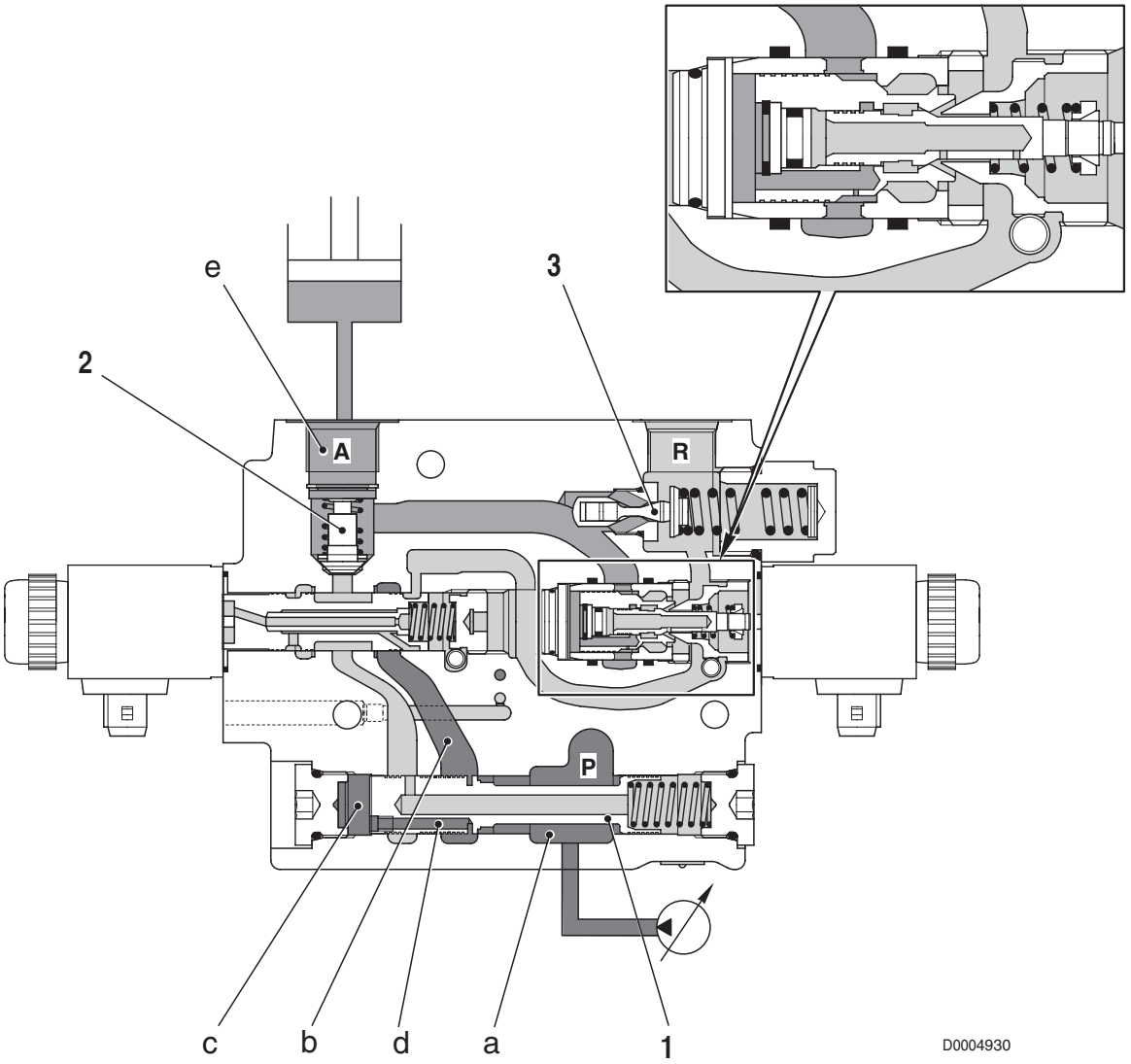
COMPONENTS

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

OPERATION

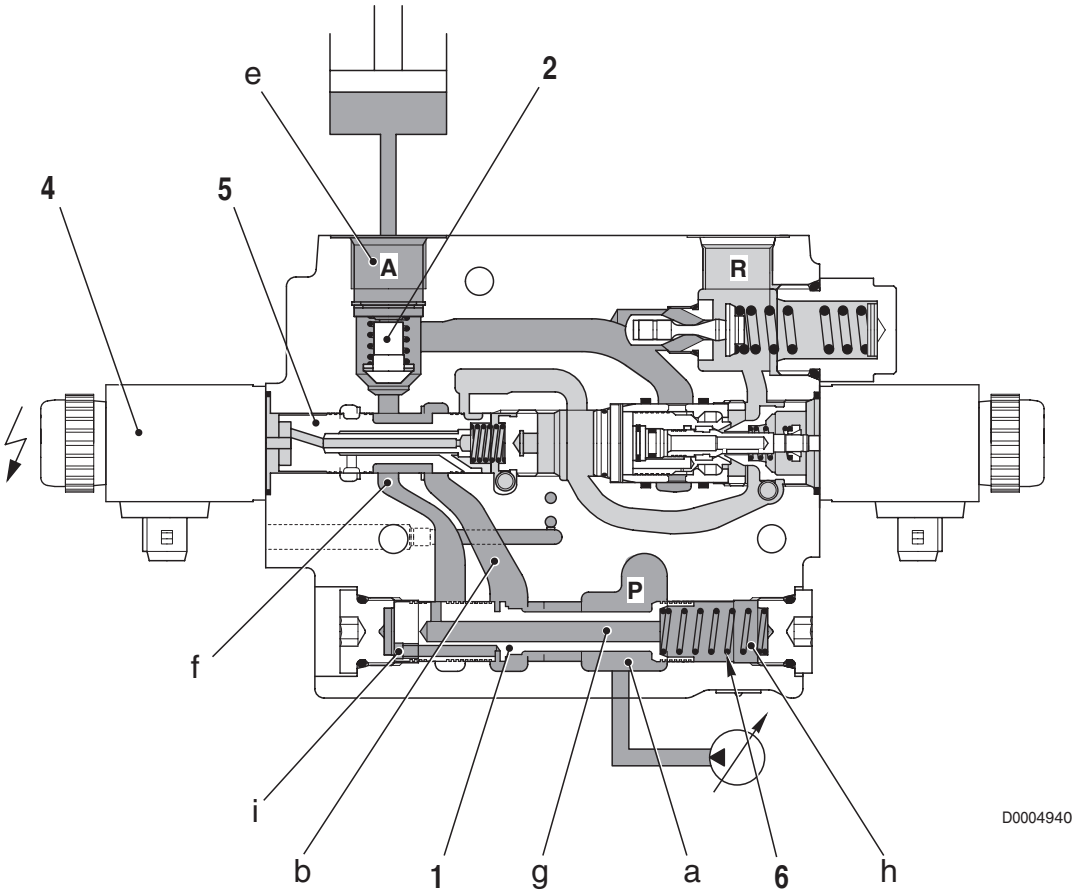
1. When the lift control is in neutral position)

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



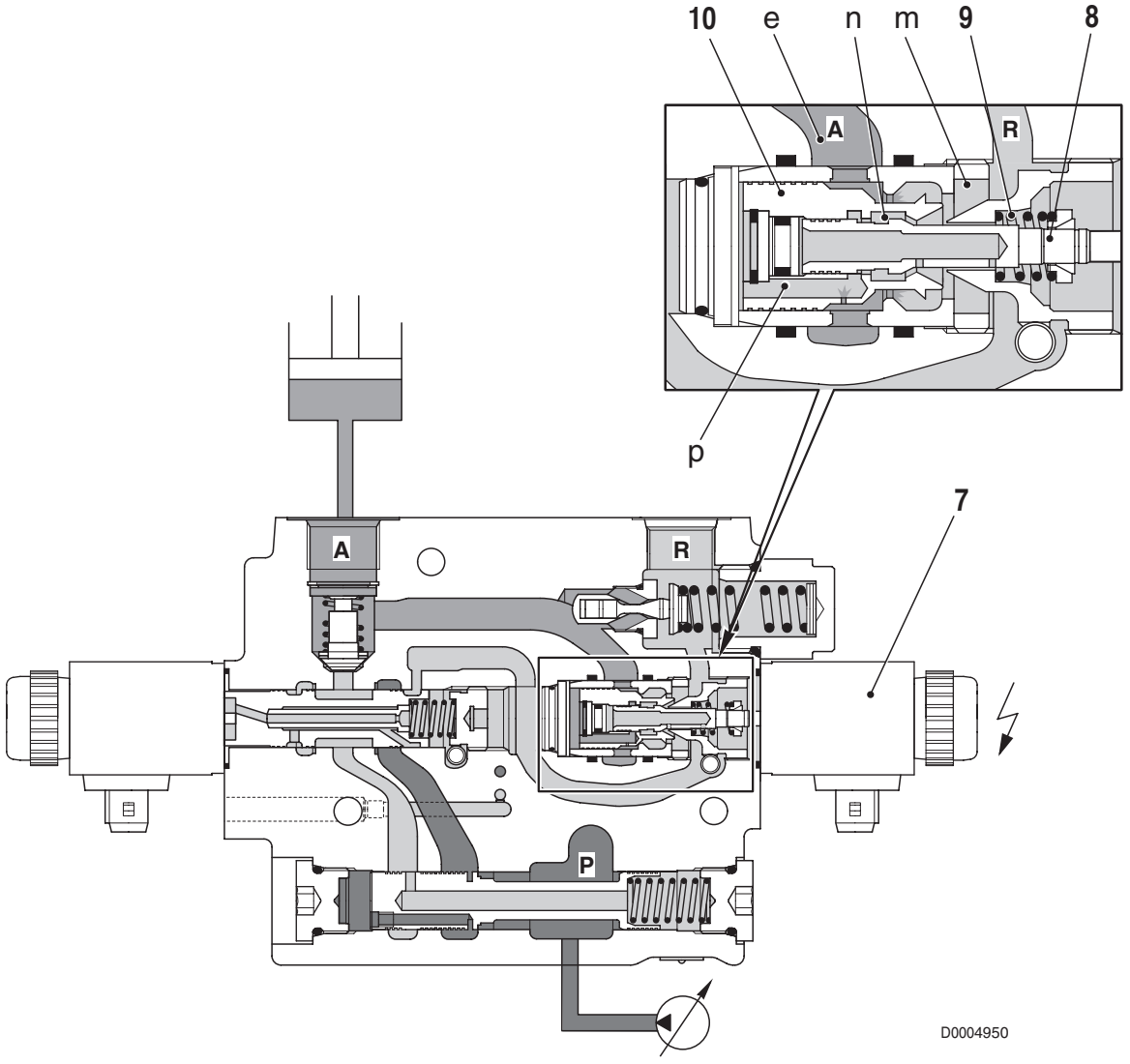
2. When the lift is raised

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



3. When the lift is lowered

- During lifting or when the lift is stationary, the spool (8) is pushed to the right by the spring (9).
- As a result, the passage between the chambers **m** and **n** is closed and the pressure in chamber **p** pushes the spool (10) to the right.
- When the lift is lowered, the electronic lift control energises the solenoid (7) that moves the spool (8) to the left.
- The oil in chamber **n** can flow into chamber **m** and the pressure in chamber **p** is reduced.
- Now the force balance coming from the pressure in the chambers **e** and **p** influencing the spool (10), is disturbed and moved to the left. Oil can flow now from **e** to **m**.
- As a result, the oil in the lift cylinders is directed to the drain circuit and the lift is lowered.
- As the solenoid is of the proportional type, the more current supplied, the more the spool (8) shifts to the left, thereby allowing more oil to flow and the lift to descend more rapidly.
- The electronic control obtains float position by energising the solenoid valve (7) and holding it fully open.
- In this condition, the oil in the lift cylinders is sent to the drain circuit so that the lift is free to move up and down and follow the contours of the terrain.



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1. DIAGNOSIS TOOLS “ALL ROUND TESTER”

1.1 ALL ROUND TESTER

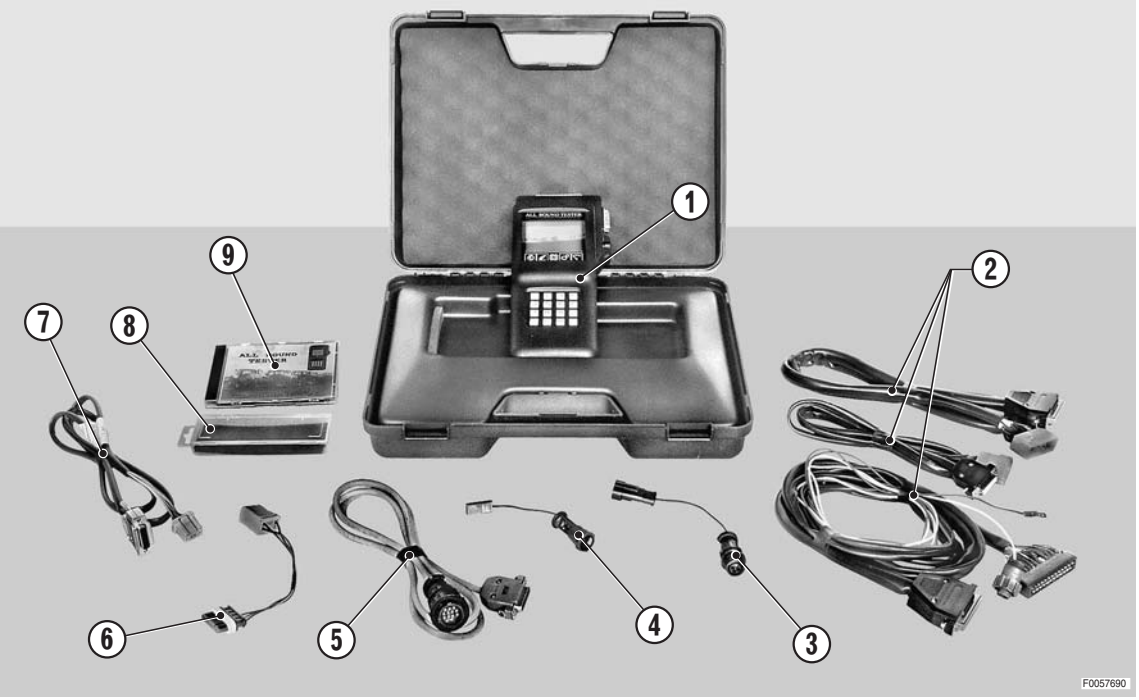
To enable a correct analysis of faults, facilitate the procedure of putting the tractor into service and verify correct operation of the electrical components used in the lift systems, front axle suspension and ASM, the service technician is provided with an instrument dubbed the All Round Tester (abbreviated 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 exchange of data between the ART and the control units occurs by way of one or more diagnosis sockets incorporated into the wiring harnesses of the tractor.
Accordingly, the ART comes with different types of interface cables for the different models and versions of tractor being serviced, which must be used as indicated in the relative workshop manuals or on the CD supplied with the kit.

1.1.1 DESCRIPTION OF THE KIT

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



Pos	Code	Description	Qty
	5.9030.730.6/30	Case, complete	1
1	5.9030.730.0	All Round Tester	1
2	5.9030.681.3	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	0.010.2145.2	EPROM box	1
9	307.1056.8/60	CD ROM	1

CAUTION

To enable connection of the ART to the tractor electronics, a further adapter cable is required: code 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, the contrast control knob may be in a position that renders the characters invisible.

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).

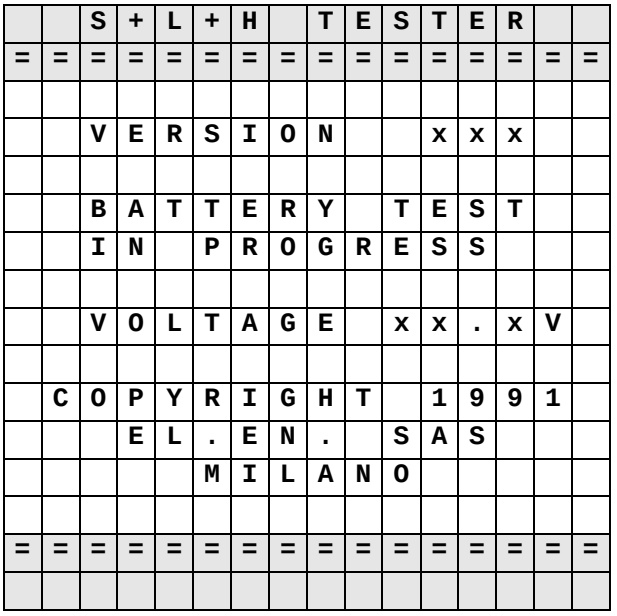
1.1.4 GENERAL NOTES ON CONNECTING AND POWERING UP THE TESTER

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 - insert the starter key and position at “**I**” (ON).

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

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



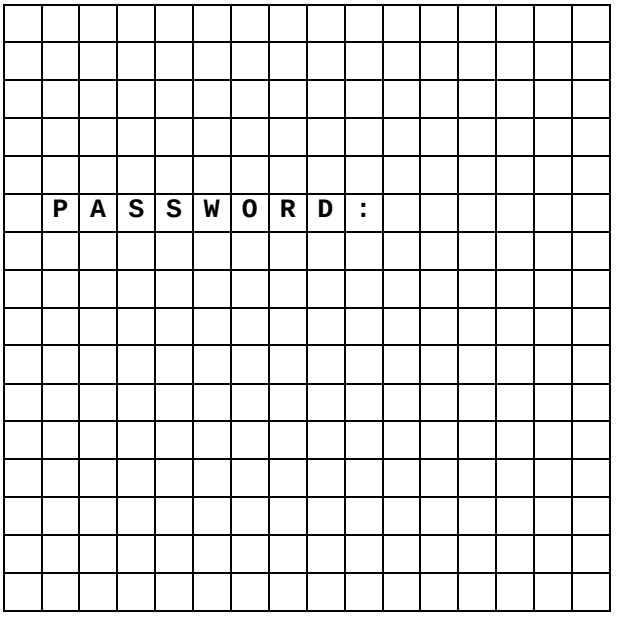
1.1.5 SELECTION OF THE DISPLAY LANGUAGE

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

To change the display language, proceed as follows.

1 - 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**.



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 select the key corresponding to the required language.
In the example illustrated, pressing **2** selects English language.

7 - Press **E** twice to exit

8 - Turn the starter key to the “**O**” (OFF) position and disconnect the ART from the diagnosis 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

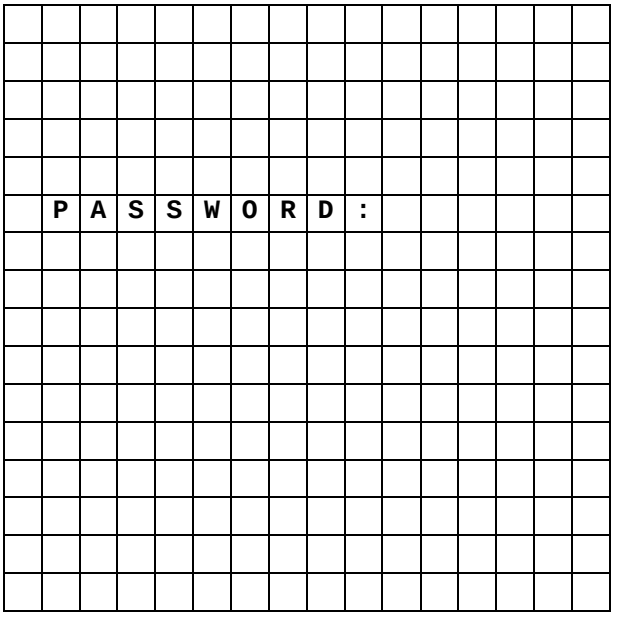
The tractor electronic systems to which the ART can be connected are different one from another and utilize different pinouts at the diagnosis socket for interfacing purposes.

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

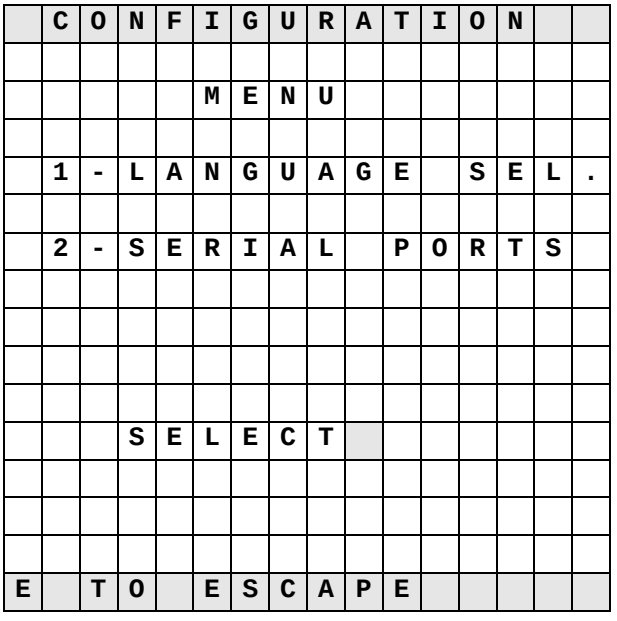
To change the serial port settings, proceed as follows.

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**.



5 - Press **2**.



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

	S	E	R	I	A	L	.	C	O	N	F	I	G	.	
P	r	e	s	e	n	t			1	0	0	0	1	1	1
S	e	r	i	a	l		N	r	7	6	5	4	3	2	1
N	e	w	c	o	n	f	i	g	1	1	1	1	1	1	1
1	-	S	e	r	i	a	l		p	o	r	t	O	N	
0	-	S	e	r	i	a	l		p	o	r	t	O	F	F
E		T	O		E	S	C	A	P	E					

1.2 “SERDIA 3.5 LEVEL III” SOFTWARE

SERDIA is the name given to a software package (code 5.9030.740.4/10) for installation on a portable computer, designed to assist the technician in making an accurate analysis of faults, setting up the tractor for service and verifying the correct operation of electrical components associated with the engine.

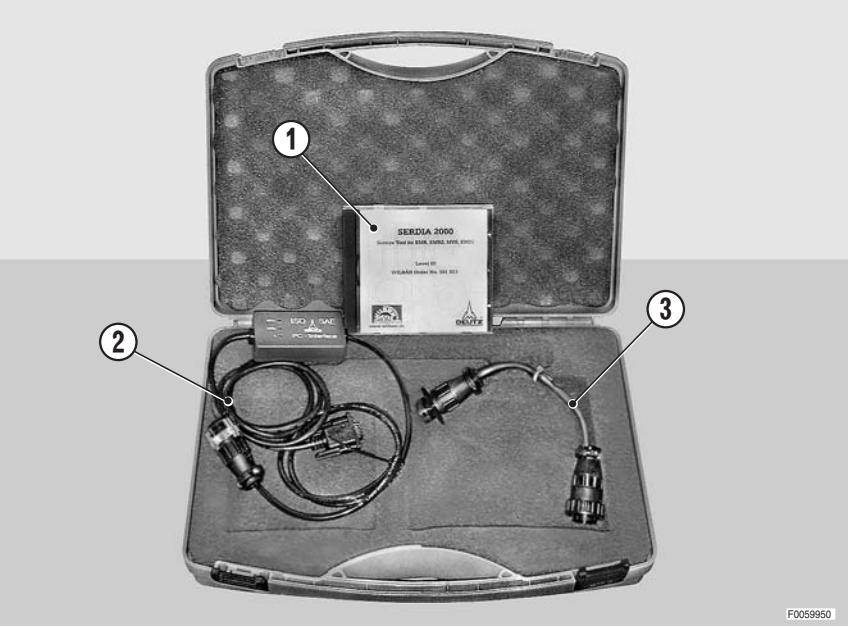
With SERDIA, the technician can:

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

1.2.1 DESCRIPTION OF THE KIT

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

The case contains:



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

The exchange of data between the SERDIA software and the control units occurs by way of a diagnosis socket incorporated into a wiring harness of the tractor.

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

1.3 “EDS EST45” SOFTWARE

EDS is the name given to a software package (code) for installation on a portable computer, designed to assist the technician in making an accurate analysis of faults, setting up the tractor for service and verifying the correct operation of transmission and Infocenter components.

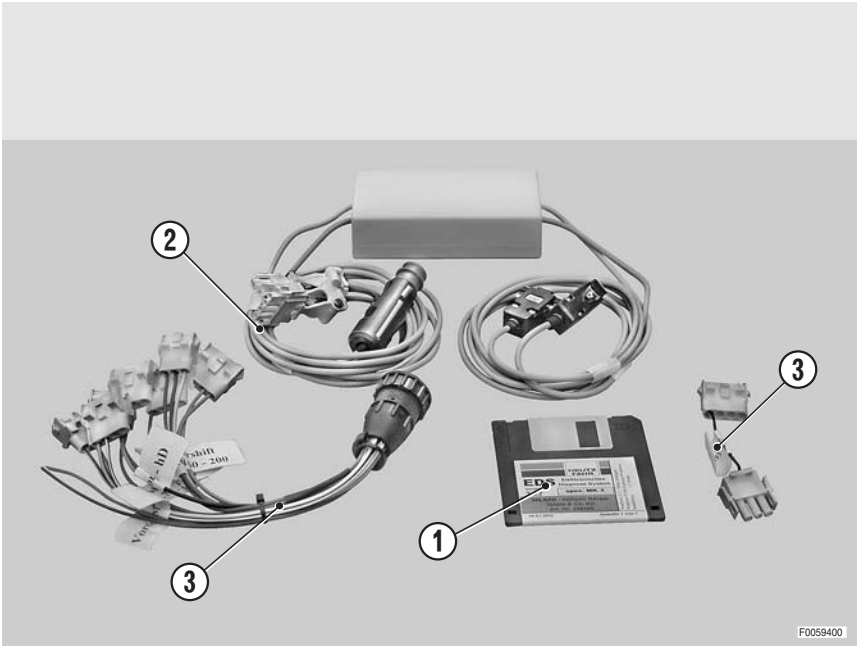
With EDS, the technician can:

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

1.3.1 DESCRIPTION OF THE KIT

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

The kit includes:



Pos.	Code	Description	Qty
	5.9030.742.0	Kit completo in lingua inglese	1
	5.9030.742.1	Kit completo in lingua tedesca	1
1	5.9030.742.2	Disco d’installazione (Rif. Wilbar 236162)	1
2	5.9030.742.3	Cavo d’interfaccia (Rif. Wilbar 0797-385)	1
3	5.9030.742.4	Cavo d’interfaccia (Rif. Wilbar KA 96-0526)	1

The exchange of data between the EDS software and the control units occurs by way of a diagnosis socket incorporated into a wiring harness of the tractor.

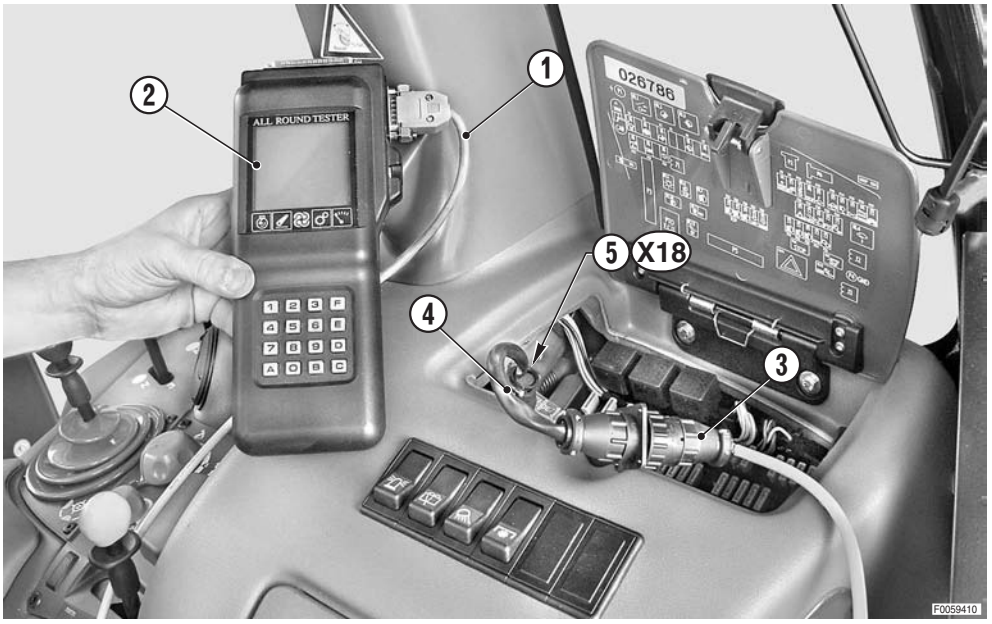
Accordingly, the EDS software comes with different types of interface cables for the different models and versions of tractor being serviced, which must be used as indicated in the relative workshop manuals.

2. CONNECTING THE TESTER TO THE ELECTRONIC CONTROL UNITS

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

2.1 CONNECTING THE ART TO THE HYDRAULIC LIFT AND FRONT AXLE SUSPENSION CONTROL UNITS

CAUTION
Before connecting the ART, switch off the engine and remove the starter key



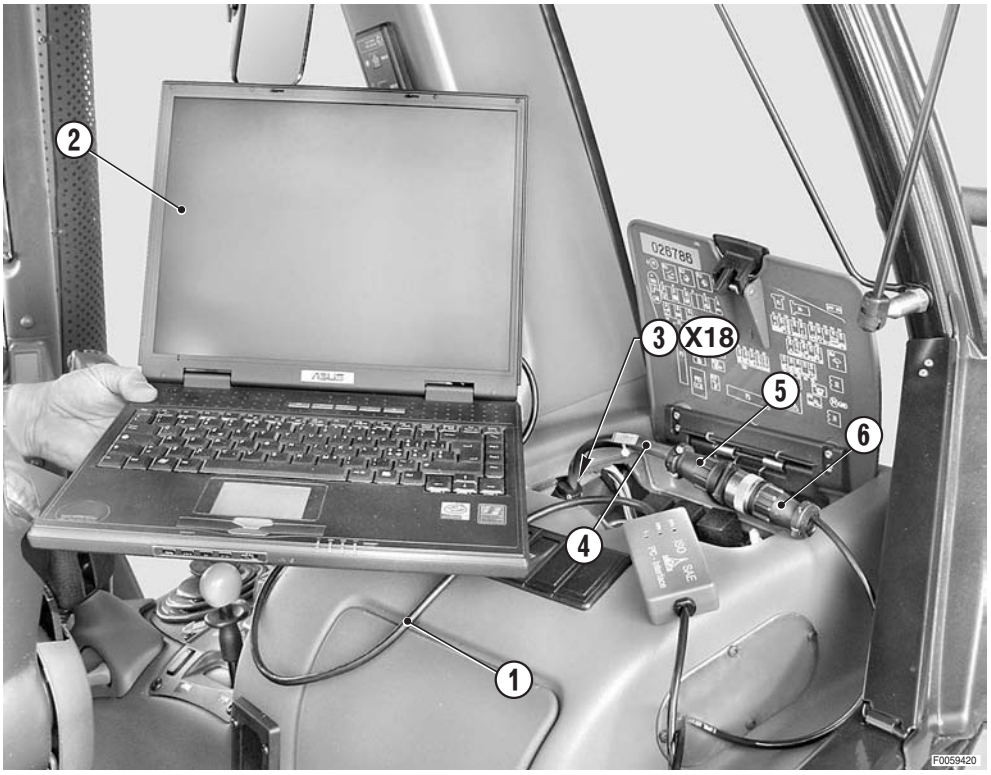
1 - Connect the cable (1) (code 5.9030.861.4) to the ART (2) (code 5.9030.730.0).
2 - Join the connector (3) of cable (2) to cable (4) (code 0.012.6655.4) and plug connector (5) into connector X18 located internally of the right hand side console.
3 - Check that connectors (5) and X18 are securely connected.
4 - Insert the starter key and turn to the "**I**" (ON) position to power up the tester.

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

CAUTION
Avoid starting the engine unless required for the purpose of diagnosis or calibrating sensors.

						T	E	S	T					
						M	E	N	U					
1	-	F	r	o	n	t		s	u	s	p	e	n	
2	-	R	e	a	r		L	i	f	t				
			C	H	O	O	S	E	_					

2.2 CONNECTING THE PORTABLE COMPUTER WITH “SERDIA 3.5” SOFTWARE TO THE ENGINE CONTROL UNIT



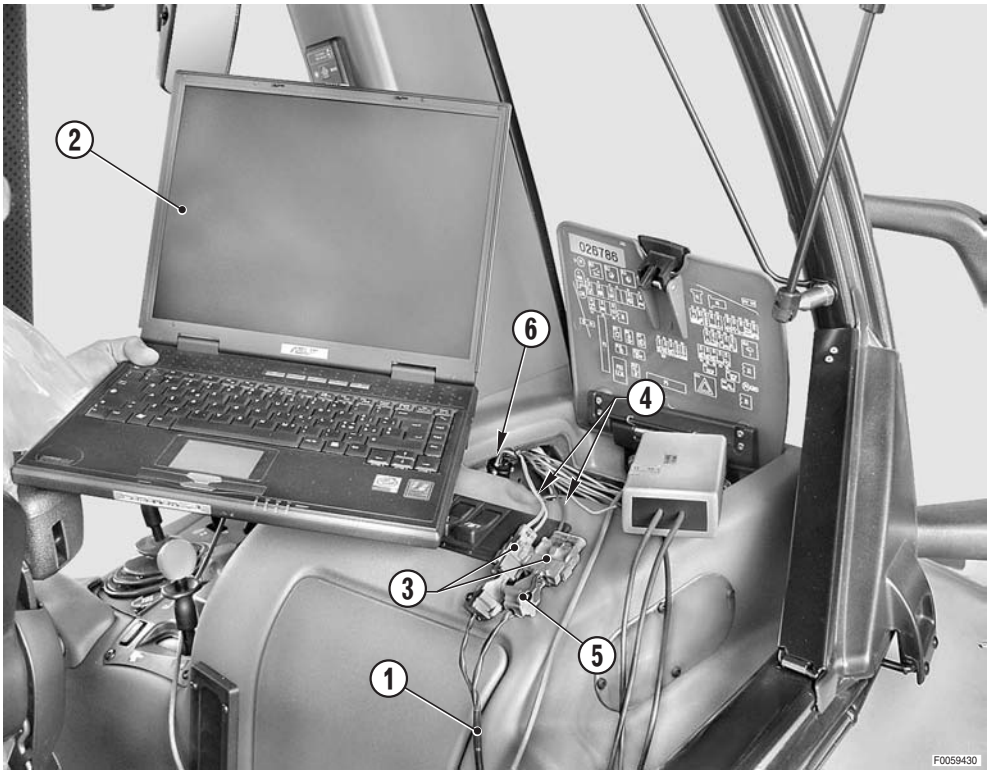
1 - Connect the cable (1) (code 5.9030.740.4/10) to the serial port of the portable computer (2).

2 - Join the connector (3) of cable (4) (code 5.9030.741.0) to the connector X18 located internally of the right hand side console.

3 - Plug in the connectors (5) and (6).

4 - With the portable computer switched on and the Serdia program running, insert the starter key and turn to the “**I**” (ON) position.

2.3 CONNECTING THE PORTABLE COMPUTER WITH "EDS" SOFTWARE TO THE TRANSMISSION CONTROL UNIT AND INFOCENTER



2.3.1 CONNECTION TO THE TRANSMISSION CONTROL UNIT

1 - Connect the lead numbered "9141" of the interface cable (1) to the serial port of the portable computer (2).
2 - Join the connector marked "Powershift Agrotron 4.70 – 6.45" (3) of the Wilbar cable (4) (Wilbar KA 96-0529) to the four-pin connector (5) of the interface cable (1).
3 - Join the connector (6) of cable (4) to the connector X18 located internally of the right hand side console.
4 - With the portable computer switched on and the EDS program running, insert the starter key and turn to the "**I**" (ON) position.

2.3.2 CONNECTION TO THE INFOCENTER

1 - Connect the lead marked "EIC" of the interface cable (1) to the serial port of the portable computer (2).
2 - Join the connector marked "Infocenter" (3) of the Wilbar cable (4) (Wilbar KA 96-0529) to the two-pin connector (7) of the interface cable (1).
3 - Join the connector (6) of cable (4) to the connector X18 located internally of the right hand side console.
4 - With the portable computer switched on and the EDS program running, insert the starter key and turn to the "**I**" (ON) position.

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3. INTRODUCTION TO THE ELECTRONIC SYSTEM OF THE TRACTOR

The electronic system of the Agrotron series includes control units by which the machine functions are managed. Each control unit is dedicated to the management of one or more systems.

The tractor's electronic system incorporates a socket used for calibration, diagnosis and programming of the control units; 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.

The ART can also be used to access a list of the alarms detected, which are stored as brief descriptive messages.

Through these messages, the technician can locate faults and, using the dedicated Test and Monitor menus, check the operation of system components.

Using the portable computer and the SERDIA and EDS software, the technician can analyse information and alarms (if any) recorded by the engine, transmission and INFOCENTER control units and verify the correct operation of components and sensors governed by these units.

3.1 ENGINE CONTROL UNIT (DEUTZ EMR2)

The function of the engine control unit is to supervise the correct operation of the engine; it receives commands from the operator by way of the hand throttle, the accelerator pedal or the MAX, MIN and MEM functions on the rpm control keypad, or on the armrest if fitted, and, according to the signal returned by the engine speed pickup, the coolant temperature and fuel temperature sensors and the turbo pressure sensor, will adjust the crankshaft speed by outputting a modulated voltage signal (PWM) to the actuator of the injection pumps.

The engine control unit also pilots the operation of the glowplugs, activating the relative relay in response to signals received from the coolant and fuel temperature sensors to ensure easy starting even in extreme weather conditions.

The engine control unit informs the operator of any malfunction affecting monitored components, by way of a warning light on the Infocenter. Faults are indicated by two types of signal:

- continuously flashing light: the control unit has detected a fault in one of the engine speed control components (accelerator pedal, hand throttle or keypad), though not a fault that affects the operation of the engine;
- light permanently on: the control unit has detected a serious fault and responded by switching the engine off, disabling the starter circuit.

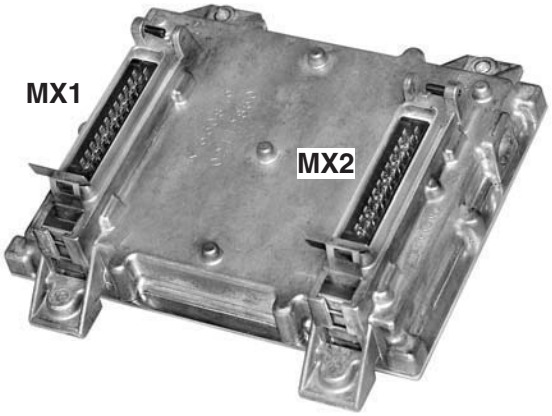
Connecting the portable computer with the SERDIA software installed, the technician can display the alarms affecting the engine.

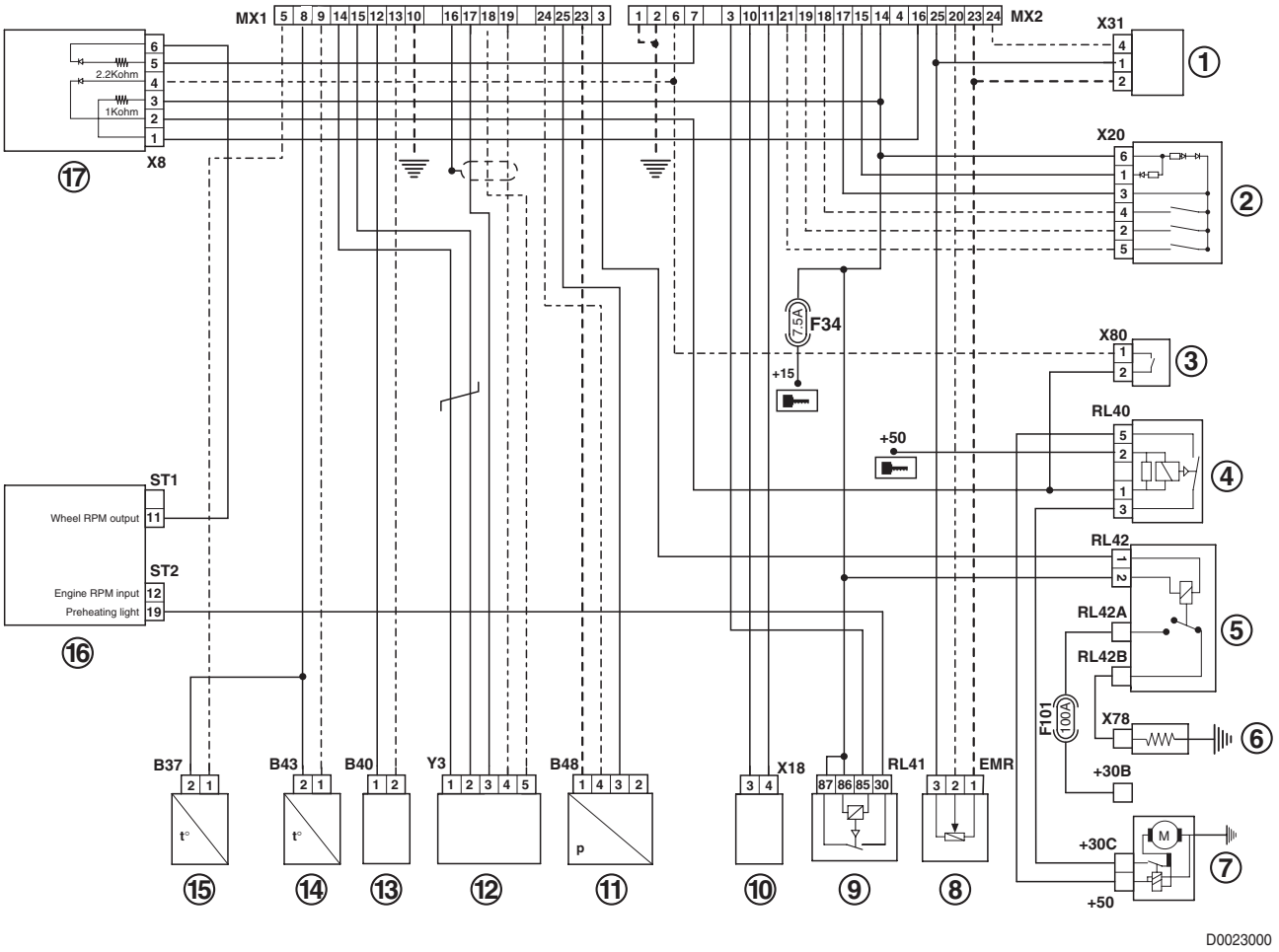
The alarms management function of the engine control unit is based on two classes of alarms, defined active and passive.

All alarms are displayed in a single window that shows information on the type of alarm detected, and the possible cause, indicating the number of recurrences and the status (active or passive).

Detected alarms are recorded in two separate memory locations:

- Error memory 1, erasable by the technician
- Error memory 2, which maintains a log of all alarms generated, indicating how many times an alarm has cut in and when was the most recent





1 - Accelerator pedal position sensor
2 - Engine speed keypad
3 - Start enable switch (Green)
4 - Engine starting relay
5 - Glowplugs relay
6 - Preheating device
7 - Starter motor
8 - Lift and hand throttle console
9 - Glowplug warning light ON relay
10 - Diagnostics connector
11 - Turbo charge pressure sensor
12 - Actuator
13 - Camshaft speed sensor (Pickup)
14 - Engine coolant temperature sensor
15 - Fuel temperature sensor
16 - Infocenter
17 - Engine ECU circuit board

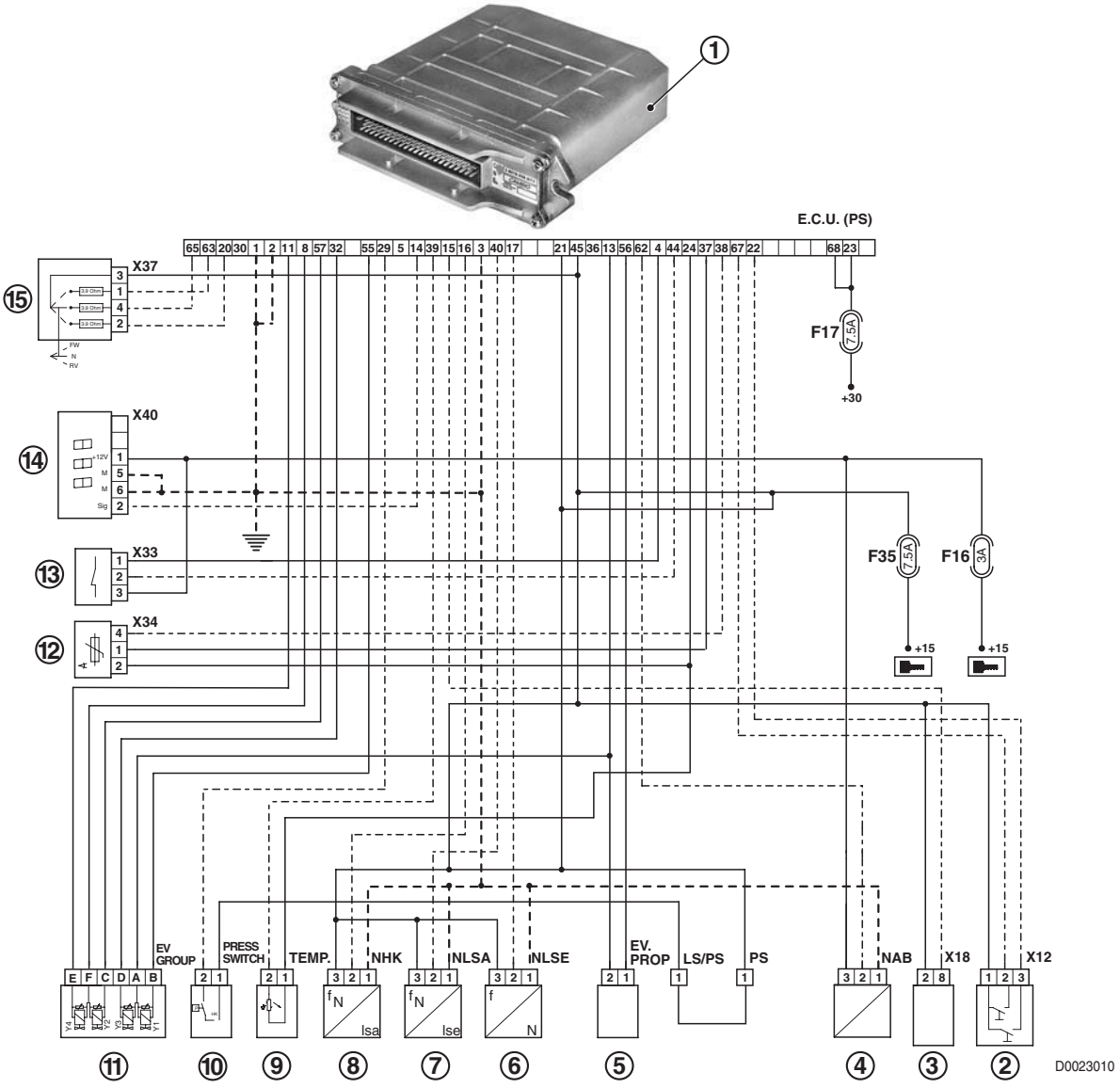
3.2 TRANSMISSION CONTROL UNIT

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

Connected to the control unit is a display that provides the operator with information on the current status of the transmission (direction of movement, range selected, etc.) and indicates any alarms detected by way of alphanumeric codes. Connecting the portable computer with the EDS software installed, the technician can display the alarms affecting the transmission.

The alarms management function of the transmission control unit is based on two classes of alarms, defined active and passive.

The EDS program displays all alarms in two windows, showing information that includes the number of the detected alarm, its status (active or passive), the number of recurrences and the hours operation clocked by the transmission when the alarm first occurred.



1 - Transmission ECU
2 - Gearshift lever
3 - Diagnostics connector
4 - Speed sensor for odometer
5 - Proportional solenoid valve coil
6 - Engine speed sensor
7 - Gearbox output shaft speed sensor
8 - Transmission speed sensor
9 - Transmission oil temperature sensor
10 - Engine oil low pressure switch
11 - Gearshift solenoid valves
12 - Clutch pedal position sensor
13 - Clutch pedal depressed proximity sensor
14 - Transmission display
15 - Shuttle control lever

3.3 POWER LIFT CONTROL UNIT

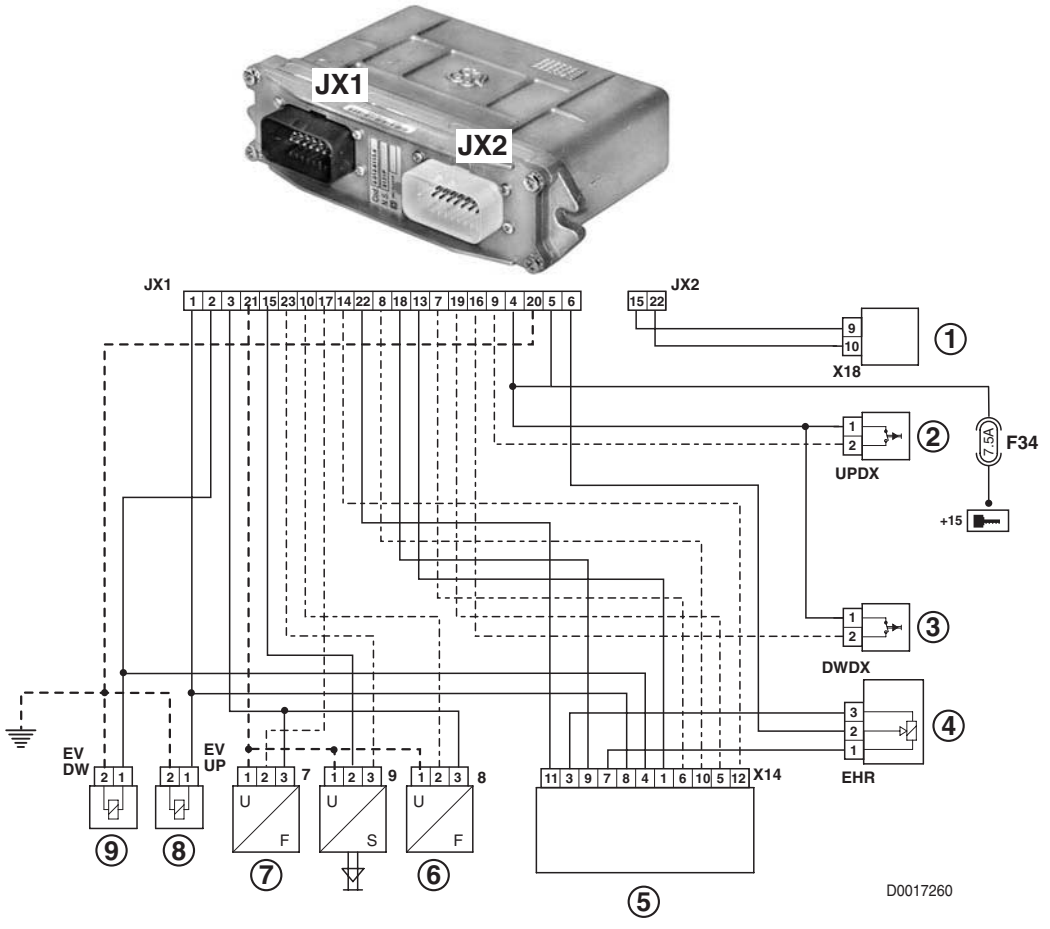
The function of the lift control unit is to supervise the correct operation of the hydraulic lift and the ASM system.

3.3.1 HYDRAULIC LIFT SYSTEM

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

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

Another function provided by the system is that of automatically activating pitch control when travelling on the highway at speeds higher than 8 km/h with the lift control lever in the transport lock position. This operating mode reduces the pitching motion of the tractor when running over uneven surfaces by allowing small compensating movements of the lift, using the mounted implement as a “ballast weight”.
The transport lock can be engaged by the operator, but for reasons of safety it will be engaged automatically by the control unit whenever the lift control is in the stop position and three minutes are allowed to elapse since the tractor was last in motion at less than 20 km/h, or whenever the ground speed of the tractor exceeds 20 km/h.
The control unit compares the command given by the operator with the signals received from the lift position sensor, the draft sensors, the wheel speed sensor and the radar, and responds by operating a directional control valve equipped with two proportional solenoid valves.
The control valve directs oil at high pressure to two hydraulic cylinders that raise or lower the implement mounted to the three-point linkage.
The signals from the control console are transmitted to the lift control, and the signals from the sensors essential to the operation of the system and the lift control pushbuttons on the rear fenders are connected directly to the control unit.



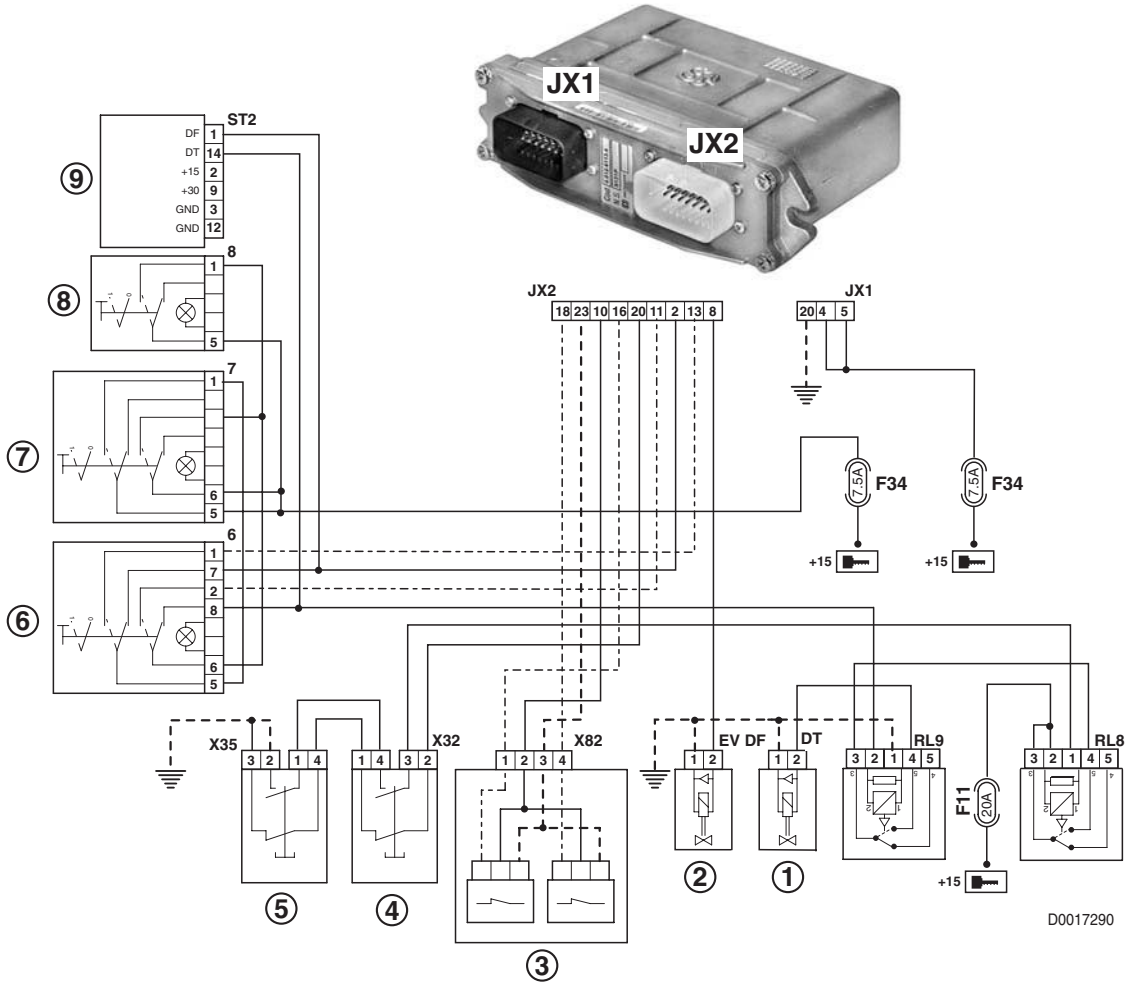
1 - Diagnostics connector
2 - Rear lift Up pushbutton
3 - Rear lift Down pushbutton
4 - Lift and hand throttle console
5 - Lift control panel
6 - 4WD switch
7 - Differential lock switch
8 - Lift Up solenoid valve
9 - Lift Down solenoid valve

3.3.2 ASM SYSTEM

The lift control unit also governs the ASM system which, when activated by the operator, manages the engagement and disengagement of the four wheel drive clutch and differential lock mechanism automatically.
The parameters used to determine exclusion of the differential lock and disengagement of the four-wheel drive are:

- wheel speed;
- steering angle;
- type of braking action (one or two pedals).

The command which activates the system, and the signals from the brake pedal, wheel speed and steering angle sensors are all routed directly to the control unit.
The control unit processes the data and, according to the status of the system and the parameter settings, activates or deactivates the solenoid valves controlling engagement of four-wheel drive and of the differential locks.
The hydraulic lift control unit warns the operator of any malfunction in monitored components by way of a red Led (lift transport lock indicator) located on the lift control console.
Faults are indicated using a system of coded flash sequences which, depending on how the control unit has been configured, will either specify the precise nature of the fault (extended alarm) or simply identify the device affected (standard alarm). Also, and likewise depending on the configuration, the unit can display only the alarm with the lowest code (rotation of alarms deactivated), or it can display all the active alarms (rotation of alarms activated).
The ART shows the 10 most recent alarms generated, and if a further alarm is triggered, the first of the ten will be eliminated.
To verify, using the ART, whether or not an alarm detected is “active”, the technician must cancel all the alarms, turn the starter key to the “**O**” (OFF) position, then make a fresh connection to the control unit.



1 - Four wheel drive (4WD) clutch solenoid valve
2 - Differential lock solenoid valve
3 - Steering angle sensor
4 - Right brake pedal switch
5 - Left brake pedal switch
6 - ASM switch
7 - Differential lock switch
8 - 4WD switch
9 - Instrument panel

3.4 INFOCENTER 2 or 3

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

The Infocenter appears as a single module incorporating one or two displays (according to the type of Infocenter installed) which provide digital information, and analog instruments indicating items such as engine revolutions, fuel level, etc.

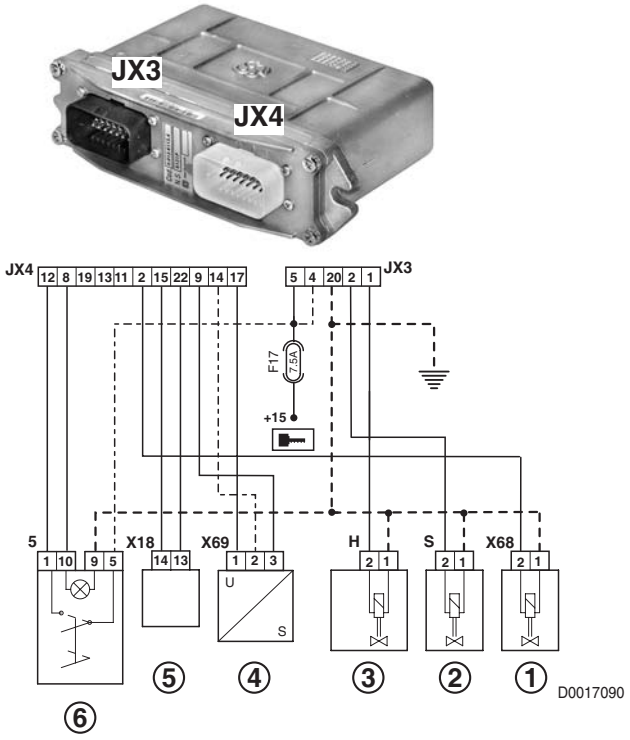
The instrument panel also incorporates indicator lights showing the operating status of various tractor systems, or the presence of faults (e.g. clogged oil filter, etc.). Some of these lights are replaced on the Infocenter 3 by a digital display showing the same alarms or items of information in the form of text messages.

The display used in both types of Infocenter provides information relating to the operation of the machine (ground speed, wheelslip, rear and front PTO shaft speeds) and hour meter reading.

Connecting a portable computer and using the EDS program, the technician can enter basic parameters for the Infocenter (language, etc.), test the operation of the panel indicator lights and check the inputs and outputs.

3.5 FRONT AXLE SUSPENSION CONTROL UNIT

The function of the suspension control unit is to supervise the correct operation of the hydraulic suspension supporting the front axle.
When the operator activates the hydraulic suspension by pressing the pushbutton on the front console, the clearance of the front end of the tractor relative to the road surface will be controlled automatically.
With the system activated, the control unit pilots the operation of the load sensing and the up and down solenoid valves, which continue to adjust until the signal received from the position sensor corresponds to the programmed setting.
At this point, the control unit deactivates the solenoid valves and the system remains active. When the position of the axle shifts due to the tractor bouncing as it moves along, the control unit responds by piloting the corrections needed to return the axle to the programmed position.
The axle suspension, used when the tractor is on the move, provides further assistance in limiting the pitching motion of the machine, increasing its stability and improving reaction in the event of emergency braking.
All the control components of the system (on/off pushbutton, position sensor and solenoid valves) are connected directly to the axle suspension control unit.
The only item of data not read directly by a sensor but supplied by the Infocenter, is ground speed (wheel speed), which is used to activate or deactivate the system according to the peripheral velocity of the wheels.
The suspension control unit warns the operator of any malfunction affecting monitored components, by way of an indicator light in the pushbutton.
Faults are indicated using a system of coded flash sequences which, depending on how the control unit has been configured, will either specify the precise nature of the fault (extended alarm) or simply identify the device affected (standard alarm).
The ART shows the 10 most recent alarms generated, and if a further alarm is triggered, the first of the ten will be eliminated.
To verify, using the ART, whether or not an alarm detected is “active”, the technician must cancel all the alarms, turn the starter key to the “**O**” (OFF) position, then make a fresh connection to the control unit.



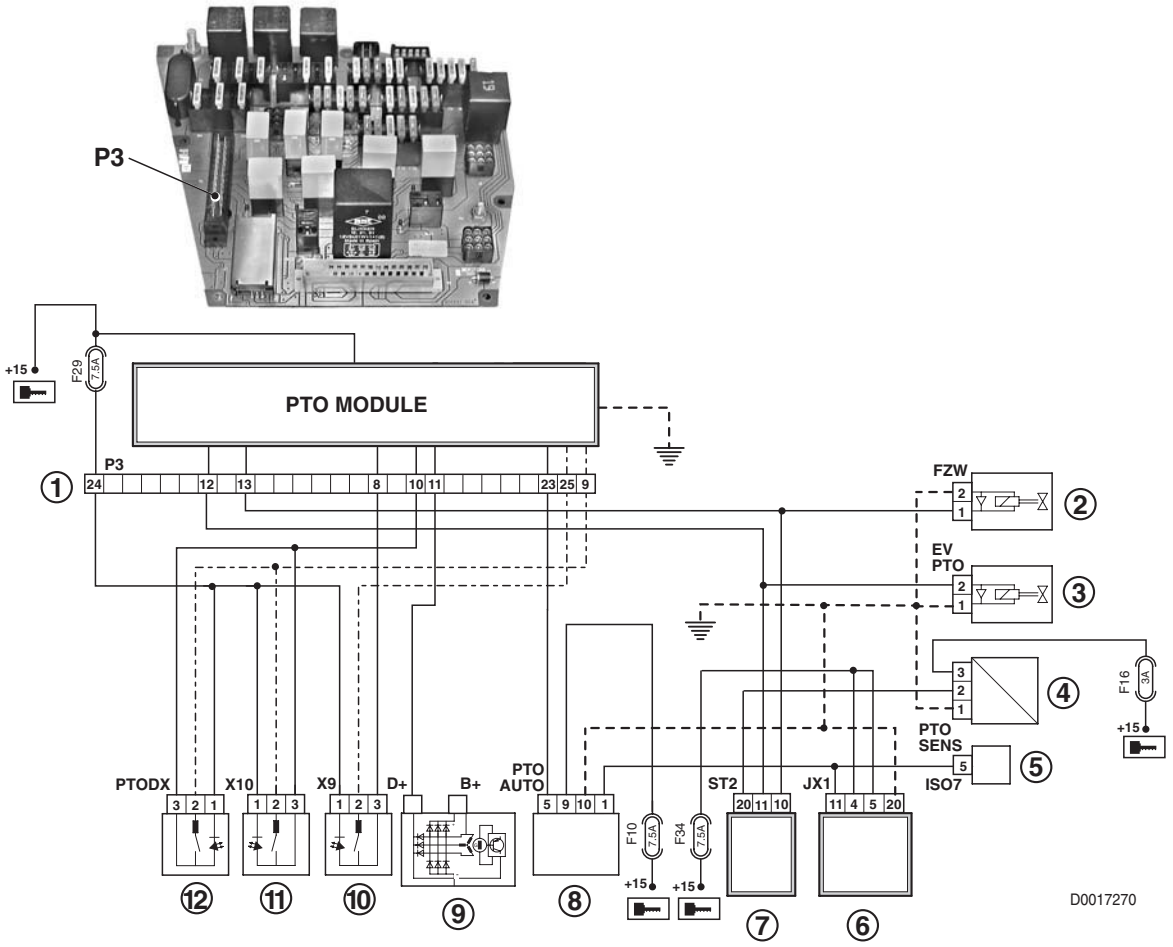
1 - Front axle suspension load sensing solenoid valve coil
2 - Axle Down control solenoid valve coil
3 - Axle Up control solenoid valve coil
4 - Front axle suspension position sensor
5 - Diagnostics connector
6 - Front suspension pushbutton

3.6 FRONT AND REAR PTO CONTROL UNIT

The PTO control unit is incorporated into the relays and fuses control unit. The electronic system controls the front PTO (if installed) and rear PTO in accordance with the commands given by the operator via the pushbuttons on the right hand console.

The PTOs can be activated or deactivated by the operator, and will in any event be inhibited automatically when the engine is switched off.

The control unit receives the command given by the operator and responds by activating the rear PTO solenoid valve, which in turn pilots the operation of the PTO clutch.



1 - Front and rear pto control unit
2 - Front PTO solenoid valve
3 - Rear PTO solenoid valve
4 - Rear PTO speed sensor
5 - ISO7 socket (implement connection)
6 - Rear lift control unit
7 - Instrument panel
8 - PTO AUTO switch
9 - Alternator
10 - Front PTO pushbutton (in cab)
11 - Rear PTO pushbutton (in cab)
12 - Rear PTO Rx pushbutton (on fender)

4. PUTTING THE TRACTOR INTO SERVICE

4.1 INTRODUCTION

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

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

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

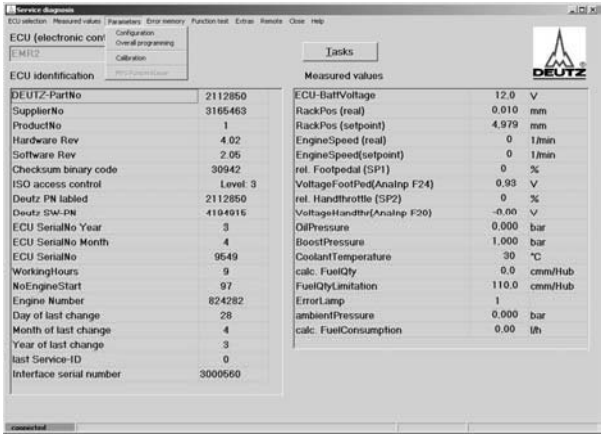
4.2 RENEWAL OF THE ENGINE CONTROL UNIT

NOTE

If possible, before renewing the engine control unit, the technician should read the program of the old control unit and save it to a file.
If the control unit is faulty and it is not possible to read the program, contact Technical Assistance and ask for the engine configuration file (quoting the engine serial number, which appears on the nameplate of the control unit and on the engine data plate) and proceed to program the new unit using this file.
The accelerator pedal and hand throttle can now be calibrated, and the maximum ground speed configured.

4.2.1 READING AND SAVING DATA

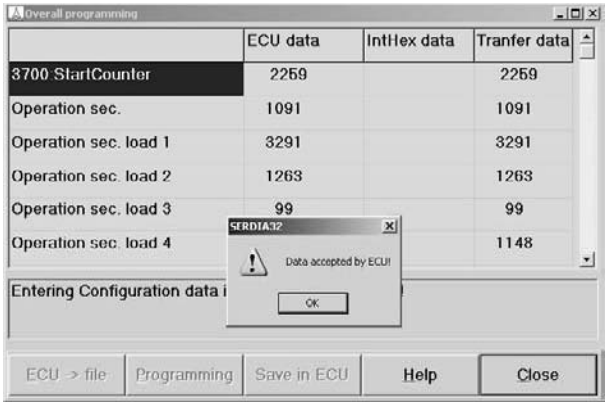
1 - Connect a portable computer with the SERDIA program installed (for details see «Connection of portable computer with "SERDIA" software to the engine control unit»).
2 - Turn the starter key to the "**I**" (ON) position and start the SERDIA program.
3 - From the "PARAMETER" menu, select the option "OVERALL PROGRAMMING".



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

NOTE

Make certain that the file has been saved.
Files are named automatically in the following way: 0044444.hex
where the numbers "44444" correspond to the serial number of the engine.

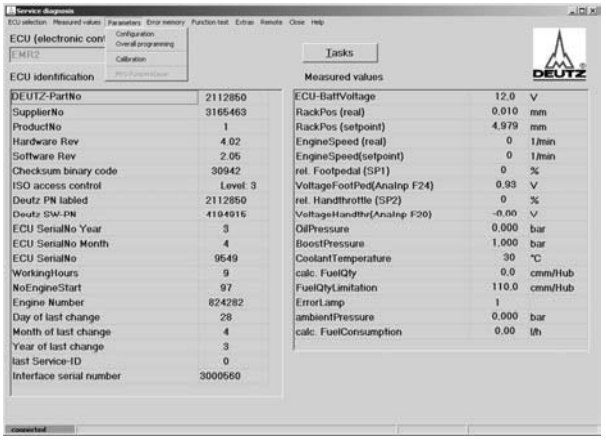


4.2.2 PROGRAMMING THE CONTROL UNIT

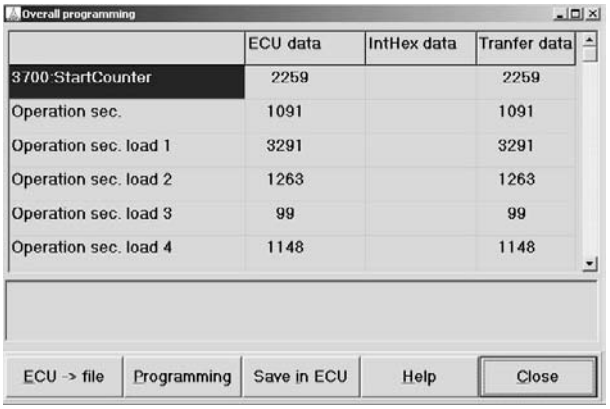
1 - Connect a portable computer with the SERDIA program installed (for details see «Connection of portable computer with "SERDIA" software to the engine control unit»).

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

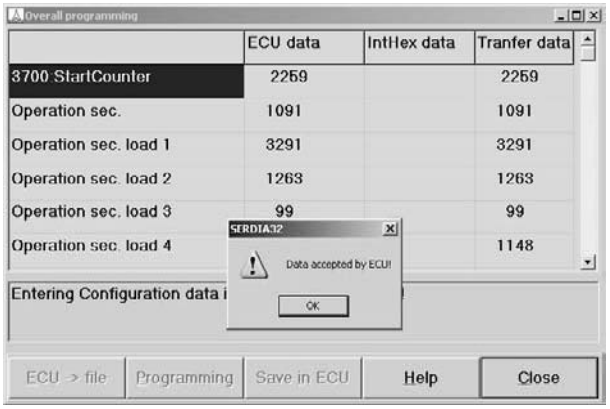
3 - From the "PARAMETER" menu, select the option "OVERALL PROGRAMMING".



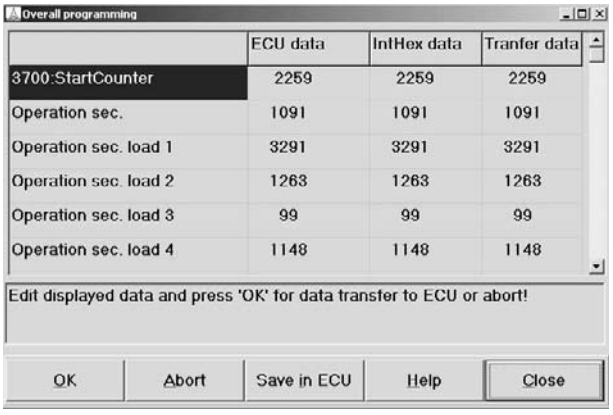
4 - Click on "PROGRAMMING" and select the file saved previously, or procured from Technical Assistance.



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



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



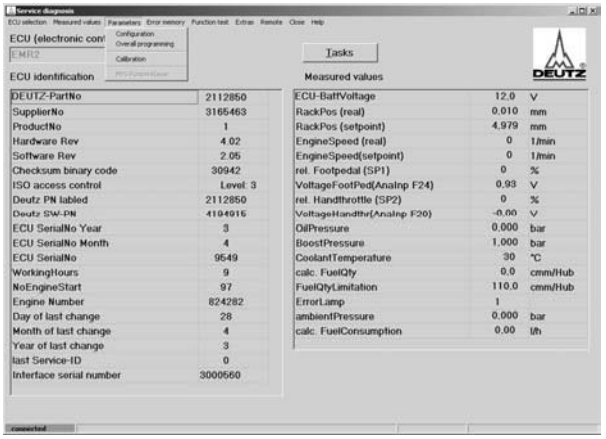
4.2.3 CALIBRATION OF THE ACCELERATOR PEDAL

NOTE

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

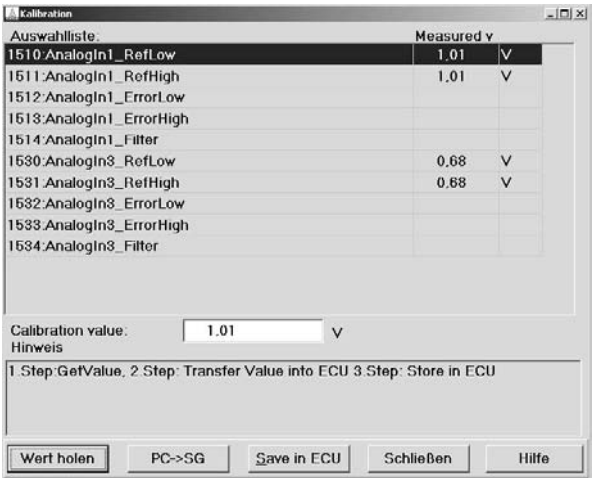
1 - Connect a portable computer with the SERDIA program installed (for details see «Connection of portable computer with "SERDIA" software to the engine control unit»), turn the starter key to the "**I**" (ON) position and start the SERDIA program.

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



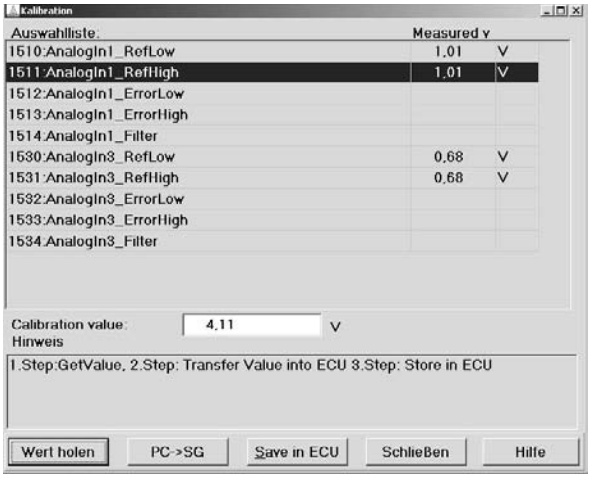
3 - Select the line containing the parameter "1510: AnalogIn1_RefLow", apply light pressure to the accelerator and release, then click on "GET VALUE" so that the software can read the value.

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



5 - Select the line containing the parameter "1511: AnalogIn1_RefHigh", apply light pressure to the accelerator and release, then click on "GET VALUE" so that the software can read the value.

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



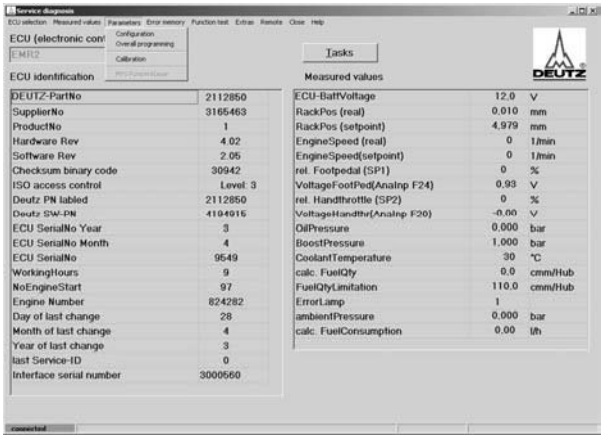
4.2.4 CALIBRATION OF THE HAND THROTTLE

NOTE

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

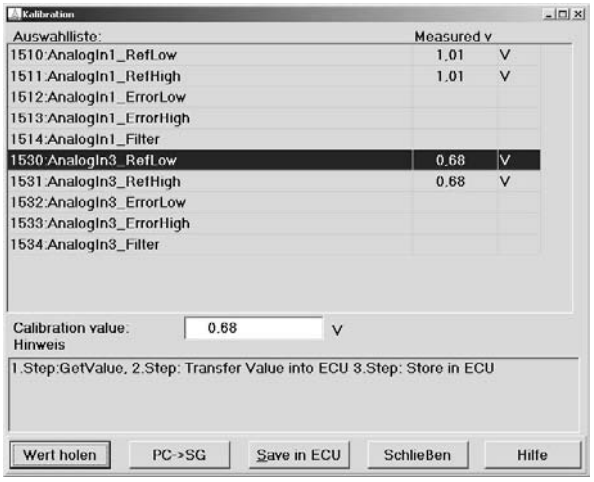
1 - Connect a portable computer with the SERDIA program installed (for details see «Connection of portable computer with "SERDIA" software to the engine control unit»), turn the starter key to the "**I**" (ON) position and start the SERDIA program.

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



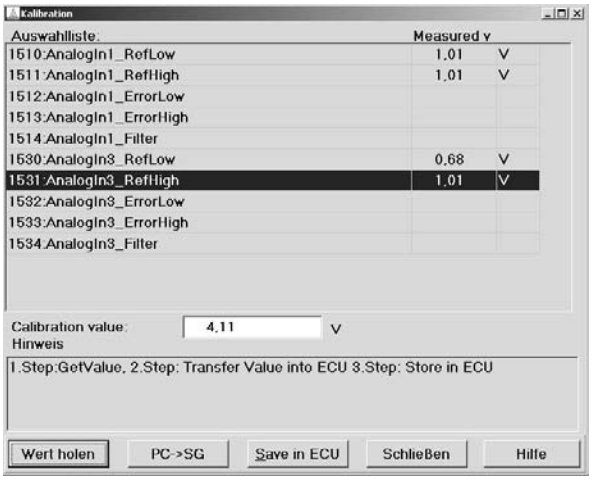
3 - Select the line containing the parameter "1530: AnalogIn3_RefLow", apply light pressure to the accelerator and release,then click on "GET VALUE" so that the software can read the value.

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



5 - Select the line containing the parameter "1531: AnalogIn3_RefHigh", apply light pressure to the accelerator and release, then click on "GET VALUE" so that the software can read the value.

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



4.3 RENEWAL OF THE TRANSMISSION CONTROL UNIT

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

1 - program the version and serial number of the tractor

2 - calibrate the clutch pedal position sensor

3 - calibrate the main clutch proportional solenoid valve

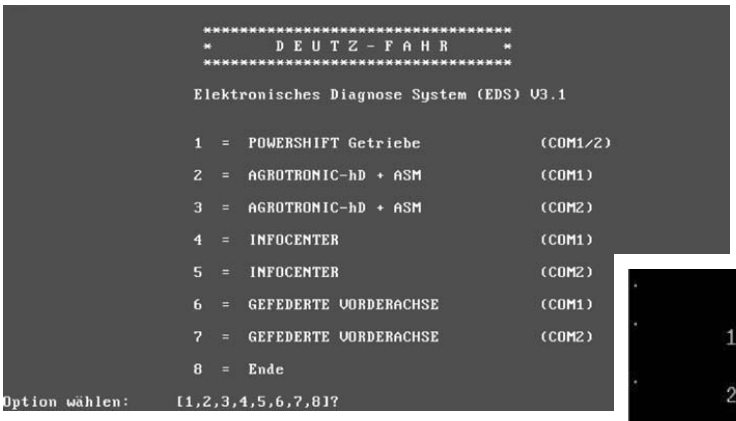
The purpose of setting the type of tractor and making calibrations is to inform the components of the control unit as to the parameters that must be used for the transmission to operate correctly.

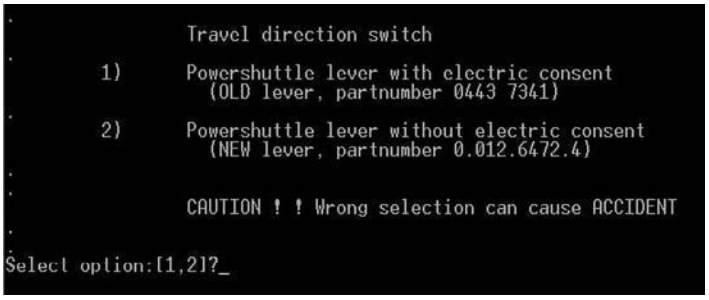
4.3.1 SETTING THE TRACTOR VERSION AND SERIAL NUMBER

1 - Connect a portable computer with the EDS program installed (for details see «Connection of a portable computer with "EDS" software to the transmission control unit»).

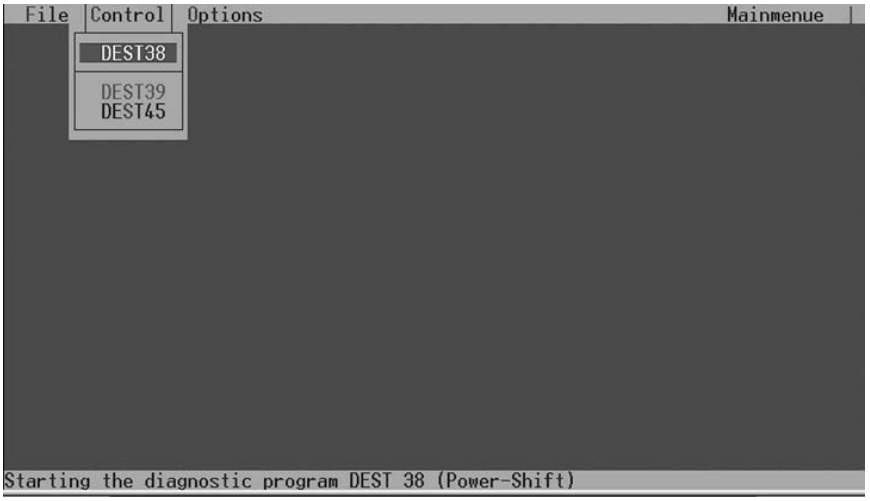
2 - Turn the starter key to the (ON) position and start the EDS program.

3 - From the introductory menu, start the transmission diagnosis program by pressing key "1" and selecting option "2"..

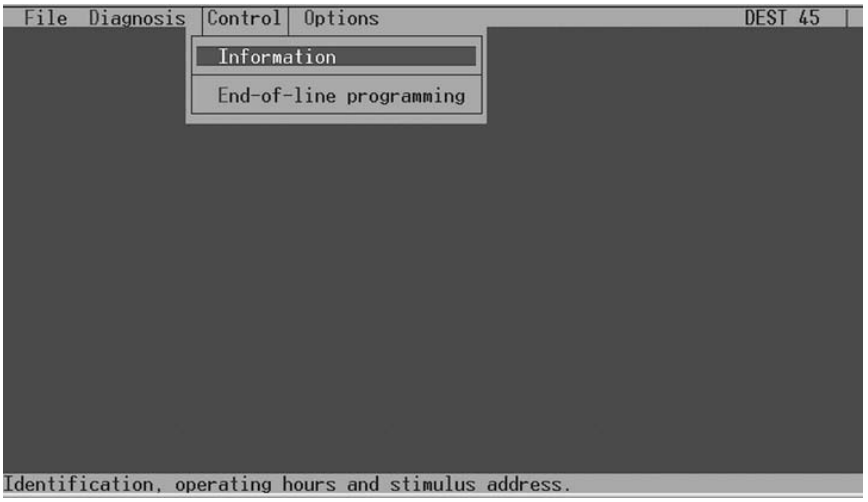




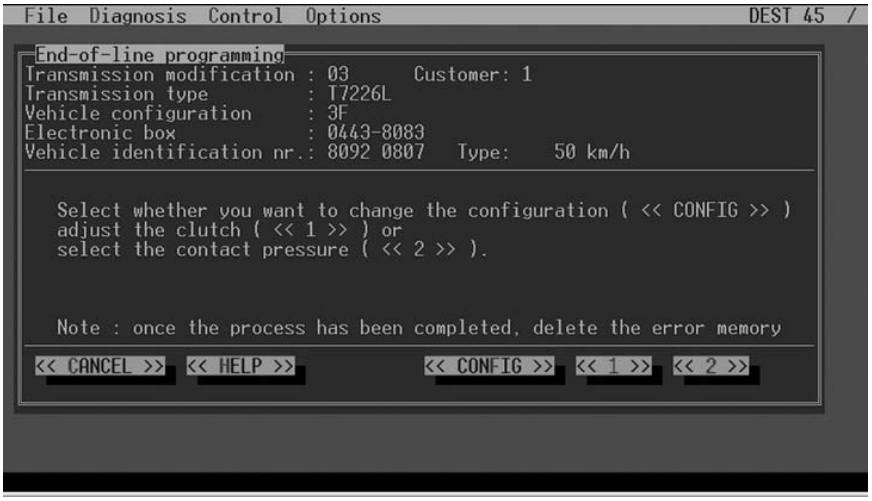
4 - From the main menu, select "DEST45" on the "CONTROL" menu.



5 - Select “END-OF-LINE PROGRAMMING” from the “CONTROL” menu..

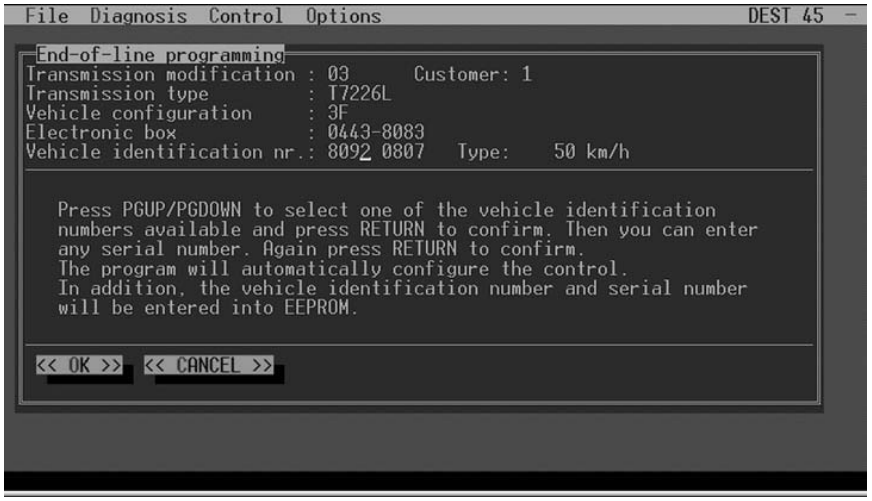


6 - Select “CONFIG”



7 - Use the “PAGE UP” or “PAGE DOWN” functions to find the identification number of the vehicle corresponding to the first four digits of the serial number, then press Enter to confirm the value and type the remaining four numbers to complete the serial number of the machine (in the example illustrated, the version is 8092 and the serial number 0807).

8 - Proceed to calibrate the clutch pedal position sensor and the main clutch as described in the following chapters..

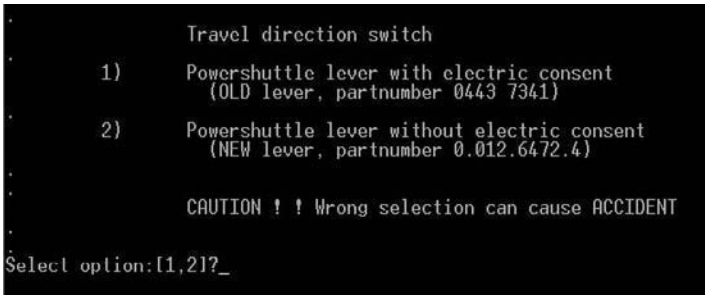


4.3.2 CALIBRATION OF THE CLUTCH PEDAL POSITION SENSOR

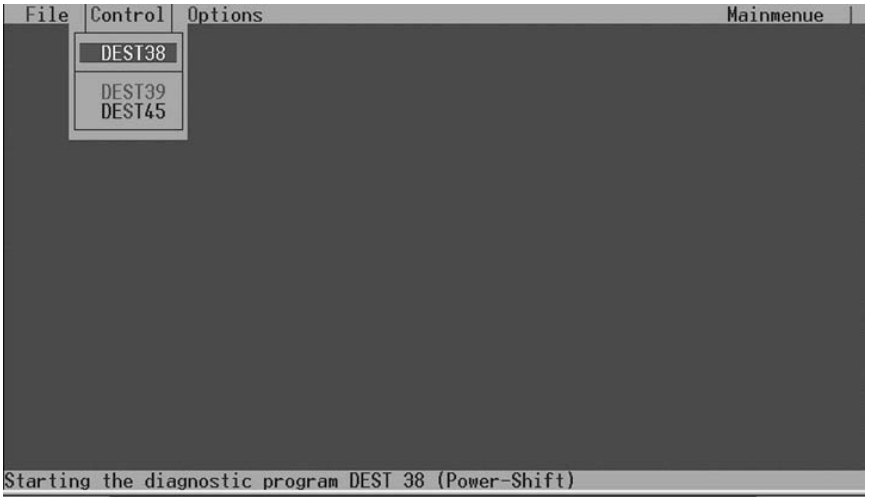
1 - Connect a portable computer with the EDS program installed (for details see «Connection of a portable computer with "EDS" software to the transmission control unit»).

2 - Turn the starter key to the (ON) position and start the EDS program.

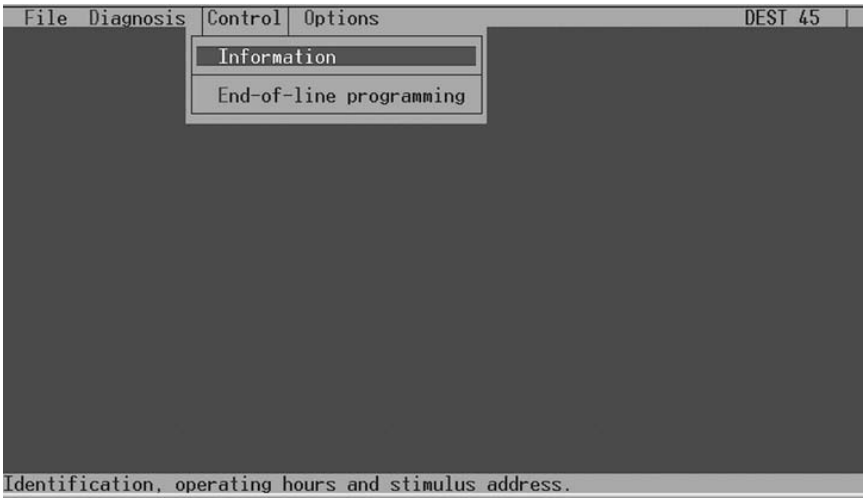
3 - From the introductory menu, start the transmission diagnosis program by pressing key "1" and selecting option "2"..



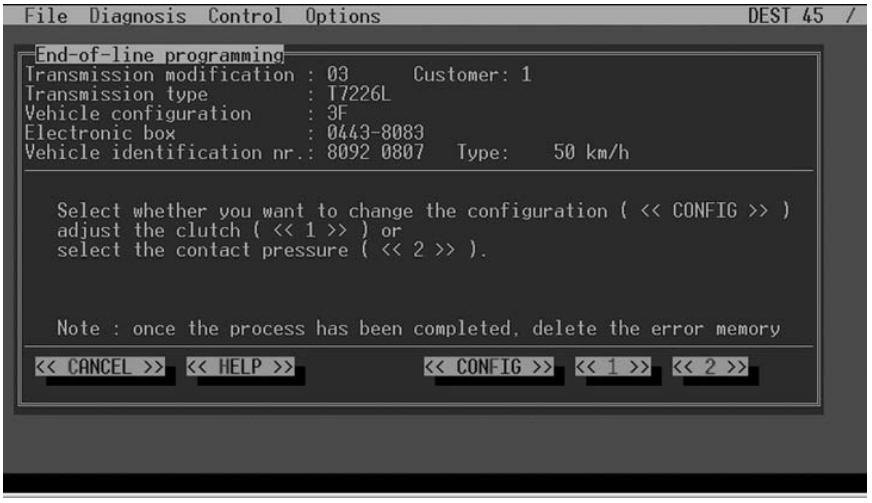
4 - From the main menu, select "DEST45" on the "CONTROL" menu.



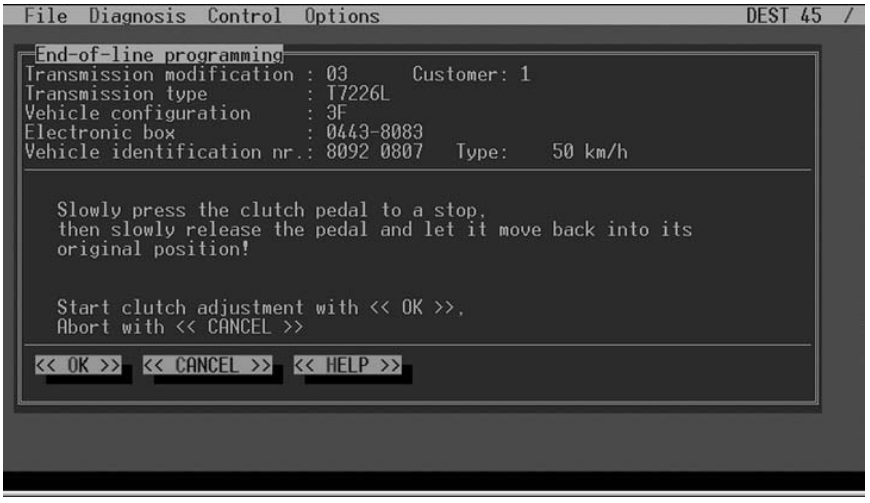
5 - Select “END-OF-LINE PROGRAMMING” from the “CONTROL” menu.



6 - Click on “1” to initiate the sensor calibration procedure.



7 - Click on “OK” and depress the clutch pedal slowly to full travel, then release slowly.



8 - At the end of the calibration procedure, a message will appear confirming calibration successfully completed; at this point, exit the EDS program.

4.3.3 CALIBRATION OF THE MAIN CLUTCH PROPORTIONAL SOLENOID VALVE

NOTE

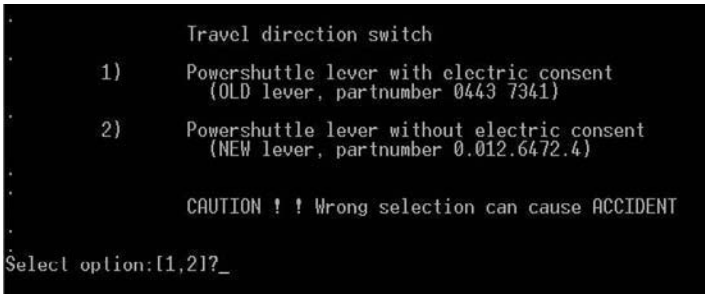
To carry out the calibration of the main clutch, warm the transmission oil to about 40 °C and position the tractor on a flat tarmac surface with at least 20 metres of free space ahead.

Put the transmission in neutral by positioning the shuttle lever at "NEUTRAL", and make certain the handbrake is released.

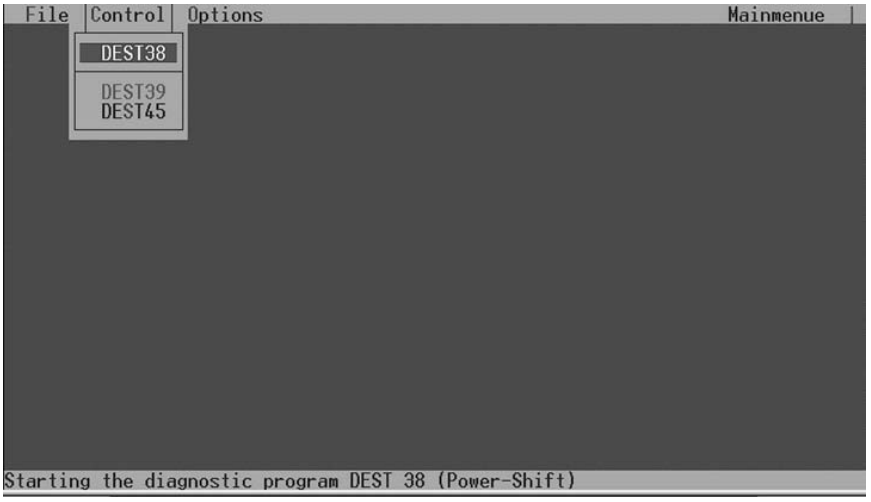
1 - Connect a portable computer with the EDS program installed (for details see «Connection of a portable computer with "EDS" software to the transmission control unit»).

2 - Turn the starter key to the (ON) position and start the EDS program.

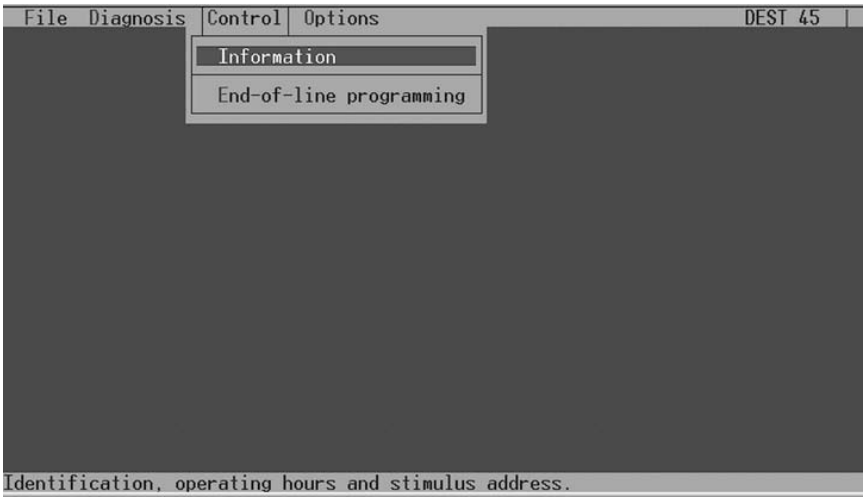
3 - From the introductory menu, start the transmission diagnosis program by pressing key "1" and selecting option "2".



4 - From the main menu, select “DEST45” on the “CONTROL” menu.

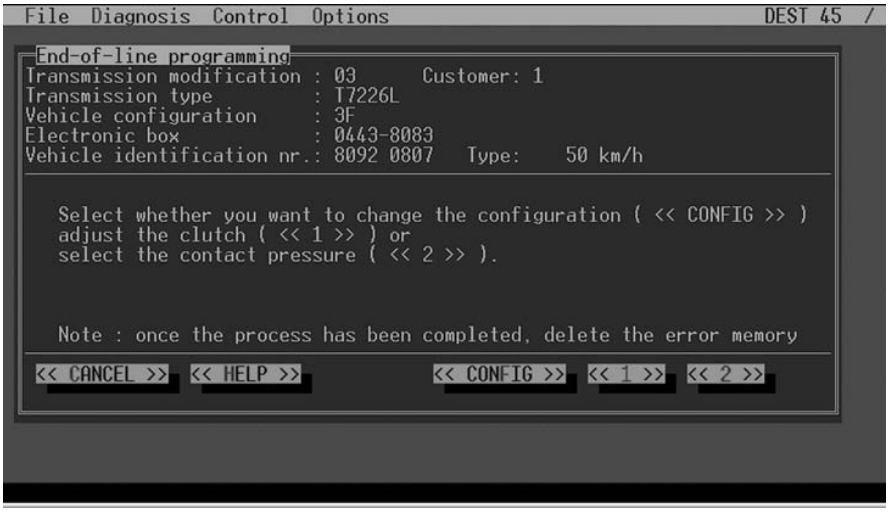


5 - Select “END-OF-LINE PROGRAMMING” from the “CONTROL” menu.



NOTE
Make certain that the transmission oil is at approximately 40 °C, using “DATA - PLAIN TEXT DISPLAY” from the DIAGNOSIS menu, and check that the shuttle lever is positioned at “NEUTRAL”.

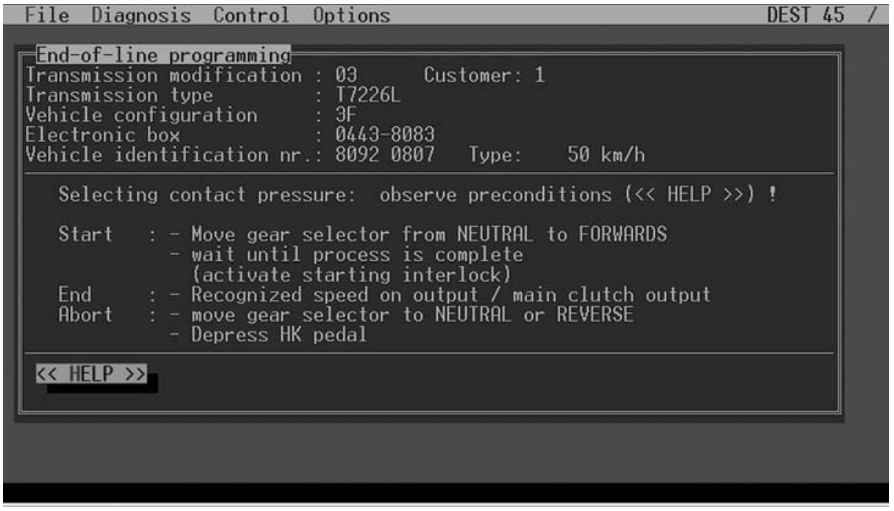
6 - Throttle the engine to 1500 rev/min., select a ratio between 3rd M and 1st L, then click “2” to initiate the sensor calibration procedure.



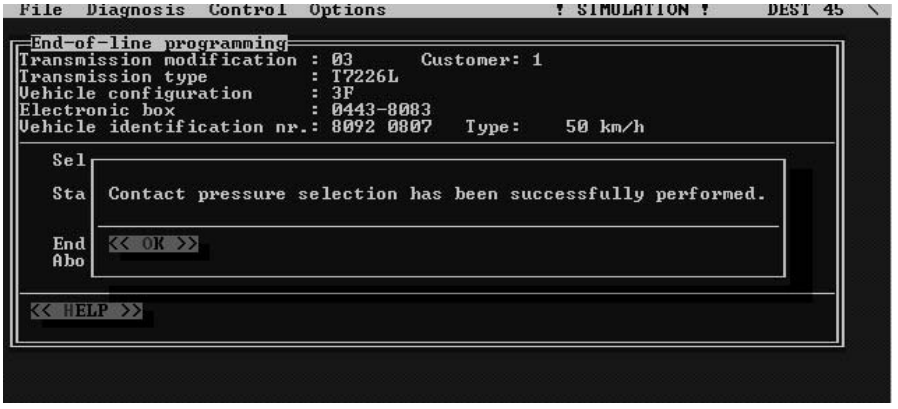
7 - Select 3rd gear, shift the shuttle lever to the “FORWARD” position and wait for the automatic procedure to finish.

CAUTION

Do not depress the clutch pedal or move the shuttle lever during the automatic procedure, as this could cause the program to abort and cancel.



8 - At the end of the calibration procedure, a message will appear confirming calibration successfully completed; at this point, exit the EDS program.



4.4 RENEWAL OF HYDRAULIC LIFT AND ASM CONTROL UNIT

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

1 - program the type of tractor;

2 - configure no radar status;

3 - calibrate the lift position sensor: up down;

4 - check and calibrate the lift control lever.

The purpose of identifying the type of tractor and calibrating the sensors is to inform the control unit of the parameters it must use to pilot and monitor the operation of the lift correctly.

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

4.4.1 PROGRAMMING THE TYPE OF TRACTOR

1 - From the main menu, press "**2**" to bring up the "PARAMETERS MENU".

```
  PARAMETERS MENU
==============
1 - Speed constant
2 - Options
[E] Exit
```

2 - Press "**2**".

```
    OPTIONS
==============
1 - ASM          1
2 - AUTODROP     0
3 - 4WD-30DEG    0
4 - ROTATEALARM  1
5 - EXTDALARM    0
6 - SENSITIV.   255

7 - TRACTOR      1
8 - EXTSENSOR    1
9 - MIX MODE     0

==============
[E] Exit
```

3 - Press "**7**".

4 - Press the key corresponding to the tractor being serviced, and confirm by pressing "**E**" to memorize the information.

5 - Press "**E**" twice in succession to return to the main menu.

```
  TRACTOR TYPE
==============
1   - 80-105 HP
2   - 106-135 HP
3   - 150-200 HP
4   - 230-260 HP

[E] Exit
```

4.4.2 CONFIGURING NO RADAR STATUS

1 - From the main menu, press“**2**” to bring up the “**PARAMETERS MENU**”.

	P	A	R	A	M	E	T	E	R	S		M	E	N	U
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	S	p	e	e	d		c	o	n	s	t	a	n	t
2	-	O	p	t	i	o	n	s							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		[	E	]		E	x	i	t						

2 - Press “**1**”.

S	P	E	E	D		C	O	N	S	T	A	N	T	.	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	R	A	D	A	R						6	5	0	0
2	-	W	H	E	E	L						3	2	5	0
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t								

3 - Press “**1**”.

4 - Select value “**0**” to configure machine without radar, or select “**6500**” for machine with radar.

5 - In the event that the parameter was not set correctly, the technician can cancel the operation by pressing “**A**” and restore the previous value, whereas pressing “**C**” will confirm the new setting and cause the “**PARAMETERS**” menu to reappear.

6 - Press “**E**” to return to the main menu.

					R	A	D	A	R						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l					:		6	5	0	0
N	e	w								:					
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

4.4.3 CALIBRATION OF THE LIFT POSITION SENSOR

NOTE
This operation must be carried out with the engine running on idle, the parking brake applied and the shuttle lever in the neutral position.

1 - From the main menu, press "**3**" to bring up the "**CALIBRATIONS**" menu.

```
  SETTING MENU
==============
1-MinHeight 0.94
2-MaxHeight 4.02
3-LockSpeed 20
4-Slipage % 10
---Main Lever---
5-Transport 5.36
6-Stop      3.66
7-Control   1.92
8-Float     1.45
==============
  [E] Exit
```

2 - Unlock the hydraulic lift by setting the control lever to the "**STOP**" position for around two seconds (after which, the indicator Led will stop blinking).

NOTE
If the lift control lever is already in the "STOP" position, move it away and then back again to the "STOP" position.

3 - Press **"1**".

```
  Min.Height
==============
Actual    : 0.94
New       : 0.92
  [D] Delete
  [E] Exit
```

4 - Press the 'Down' button to lower the lift completely (as the lift links descend, the "**Actual**" value should decrease continuously).

5 - When the lift has reached its lower travel limit, press "**E**" to memorize the value.

```
  Min.Height
==============
Actual    : 0.94
New       : 0.92
[A] Cancel
[C] Confirm
```

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

7 - Unlock the lift again by shifting the control lever away and then back again to the "**STOP**" position.

8 - Press "**2**".

			M	a	x	.	H	e	i	g	h	t			
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l					:		4	.	0	2
N	e	w								:		0	.	9	2
		[	D	]		D	e	l	e	t	e				
		[	E	]		E	x	i	t						

9 - Press the 'Up' button to raise the lift fully (as the lift links ascend, the "**Actual**" value should increase continuously).

10 - When the lift has reached its upper travel limit, press the Down button until the voltage reads approximately 0.2V less than the value registering at the travel limit, then press "**E**" to memorize the value.

			M	a	x	.	H	e	i	g	h	t			
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l					:		4	.	0	2
N	e	w								:		4	.	0	4
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

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

12 - Press "**E**" to return to the main menu.

		S	E	T	T	I	N	G		M	E	N	U		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	M	i	n	H	e	i	g	h	t		0	.	9	4
2	-	M	a	x	H	e	i	g	h	t		4	.	0	2
3	-	L	o	c	k	S	p	e	e	d				2	0
4	-	S	l	i	p	a	g	e		%				1	0
-	-	-	M	a	i	n		L	e	v	e	r	-	-	-
5	-	T	r	a	n	s	p	o	r	t		5	.	3	6
6	-	S	t	o	p							3	.	6	6
7	-	C	o	n	t	r	o	l				1	.	9	2
8	-	F	l	o	a	t						1	.	4	5
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		[	E	]		E	x	i	t						

4.4.4 CHECKING AND CALIBRATING THE LIFT CONTROL LEVER

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

1 - From the main menu, press "**1**" to bring up the "**MONITOR MENU**".

	M	o	n	i	t	o	r	s		M	e	n	u		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	L	i	f	t										
2	-	C	o	n	s	o	l	l	e						
3	-	A	S	M											
4	-	P	o	w	e	r	S	u	p	p	l	y			
5	-	S	e	n	s	o	r	s							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		[	E	]		E	x	i	t						

2 - Press "**2**".

				C	o	n	s	o	l	l	e				
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
C	t	r	l	L	e	v	e	r			3	.	7	0	v
S	e	t	P	o	i	n	t				1	.	4	1	v
M	a	x	H	e	i	g	h	t			7	.	9	4	v
C	t	r	l	M	o	d	e				7	.	7	8	v
D	r	o	p	S	p	e	e	d			7	.	5	7	v
S	l	i	p	a	g	e					0	.	0	3	v
B	u	t	t	.		U	P						O	F	F
B	u	t	t	.		D	W						O	F	F
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		[	E	]		E	x	i	t						

3 - Verify that the voltage output signal from the lift control lever in the four positions is within range, and press "**E**" twice in succession to return to the "**MAIN**" menu.

Position of lever	Minimum value	Maximum value
Transport	4,70	6,69
Stop	3,00	4,32
Control	1,61	2,59
Float	0,72	1,61

4 - In the event of one or more values being out-of-range, press “**3**” to bring up the “**CALIBRATIONS**” menu.

		S	E	T	T	I	N	G		M	E	N	U		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	M	i	n	H	e	i	g	h	t		0	.	9	4
2	-	M	a	x	H	e	i	g	h	t		4	.	0	2
3	-	L	o	c	k	S	p	e	e	d				2	0
4	-	S	l	i	p	a	g	e		%				1	0
-	-	-	M	a	i	n		L	e	v	e	r	-	-	-
5	-	T	r	a	n	s	p	o	r	t		5	.	3	6
6	-	S	t	o	p							3	.	6	6
7	-	C	o	n	t	r	o	l				1	.	9	2
8	-	F	l	o	a	t						1	.	4	5
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		[	E	]		E	x	i	t						

5 - Select the number corresponding to the position of the lever in which the value was not correct.

NOTE
This example simulates an incorrect value in the “STOP” position, in which case the technician presses “6”.

CAUTION!
When an out-of-range value is detected in any one position, calibrate the values in the other operating positions as well.

						S	T	O	P						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l					:		3	.	6	6
N	e	w								:		2	.	8	2
		[	E	]		E	x	i	t						

6 - Set the lift control lever to the “**STOP**” position, then press “**E**” to memorize the value.

						S	T	O	P						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
A	c	t	u	a	l					:		3	.	6	6
N	e	w								:		2	.	8	2
		[	A	]		C	a	n	c	e	l				
		[	C	]		C	o	n	f	i	r	m			

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

8 - Repeat the operations described in points 5, 6 and 7 for each value found to be out of range, then press "**E**" twice in succession to return to the main menu.

		S	E	T	T	I	N	G		M	E	N	U		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	M	i	n	H	e	i	g	h	t		0	.	9	4
2	-	M	a	x	H	e	i	g	h	t		4	.	0	2
3	-	L	o	c	k	S	p	e	e	d				2	0
4	-	S	l	i	p	a	g	e		%				1	0
-	-	-	M	a	i	n		L	e	v	e	r	-	-	-
5	-	T	r	a	n	s	p	o	r	t		5	.	3	6
6	-	S	t	o	p							3	.	6	6
7	-	C	o	n	t	r	o	l				1	.	9	2
8	-	F	l	o	a	t						1	.	4	5
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		[	E	]		E	x	i	t						

4.5 RENEWAL OF THE INFOCENTER

Whenever the INFOCENTER is renewed, the technician must configure the operating parameters (constants).

Configuration is needed in order to inform the Infocenter of the values that must be used for the purposes of displaying data (units of measure, and language of choice for alarm messages).

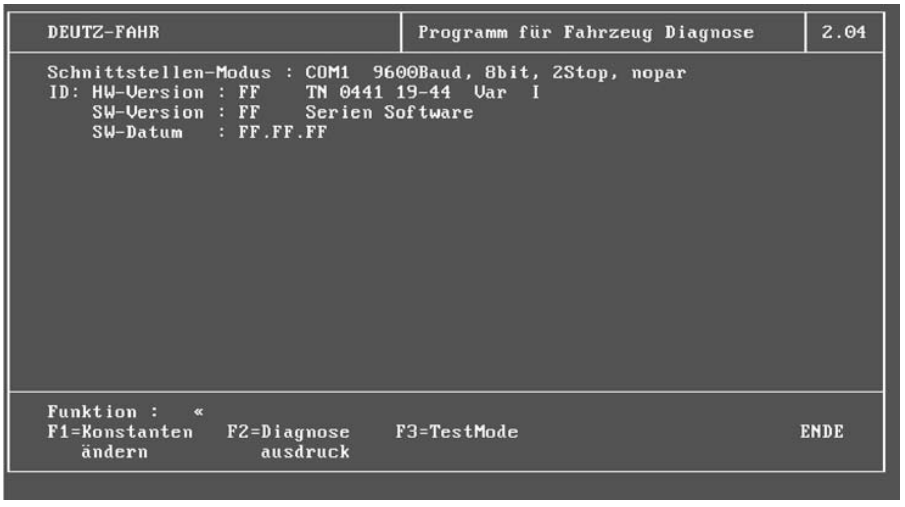
4.5.1 ENTERING CONSTANTS

1 - Connect a portable computer with the EDS program installed (for details see «Connection of a portable computer with "EDS" software to the transmission control unit»).

2 - Turn the starter key to the “I” (ON) position and start the EDS program.

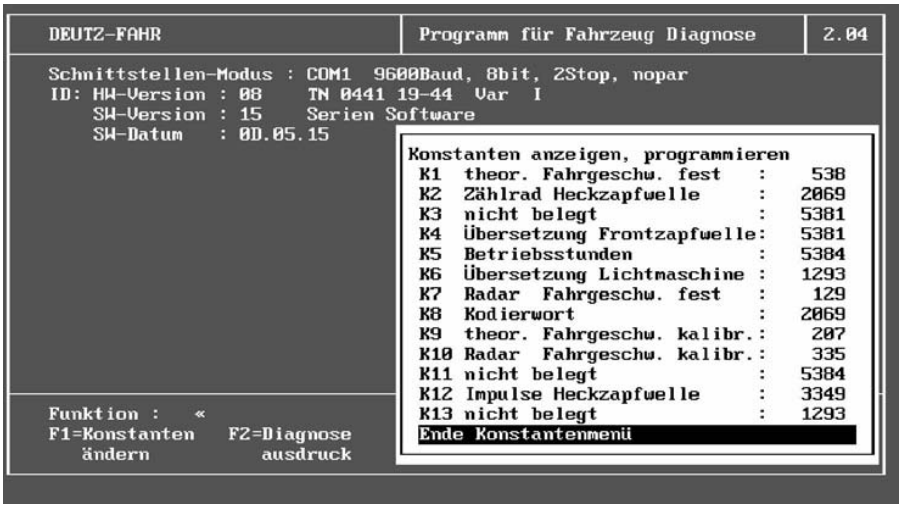
3 - From the introductory menu, start the Infocenter diagnosis program by pressing key “4” or “5”, depending on which port the cable is connected to..

4 - When the introductory page of the program appears, press “F1” to initiate the procedure of entering the operating constants.



5 - Using the arrow keys, select constant K1, press Enter, insert the new value and confirm by pressing Enter again.

6 - Repeat the procedure until all the constants have been entered, then position the cursor on the “Ende Konstantenmenü” line and press Enter.



List of values to enter

Model	Serial number root	Constants												
		K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11	K12	K13
80	8081	3809	20	0	210	(1)	4400	1000	(2)	3809	1000	0	6	0
90	8085	3809	20	0	210		4400	1000		3809	1000	0	6	0
100	8087	3809	20	0	210		4400	1000		3809	1000	0	6	0
105	8088	3675	20	0	210		4400	1000		3809	1000	0	6	0

(1): Enter the number of hours clocked by the tractor

(2): Enter the value corresponding to the preferred language and units of measure, and specify whether or not radar is installed.

Table of constants K8

Language	Unit of measure	Radar	Constant
Danish	km/h	None	75
Danish	km/h	Installed	107
French	km/h	None	69
French	km/h	Installed	101
English	km/h	None	67
English	km/h	Installed	99
English	mph	None	66
English	mph	Installed	98
Italian	km/h	None	77

Language	Unit of measure	Radar	Constant
Italian	km/h	Installed	109
Dutch	km/h	None	79
Dutch	km/h	Installed	111
Portuguese	km/h	None	73
Portuguese	km/h	Installed	105
Spanish	km/h	None	71
Spanish	km/h	Installed	103
German	km/h	None	65
German	km/h	Installed	97

4.6 RENEWAL OF AXLE SUSPENSION CONTROL UNIT

Whenever the front axle suspension control unit is renewed, the technician must verify that the axle suspension position sensor is correctly deployed.

The purpose of this verification is to inform the control unit of the voltage values generated by the sensor when the suspension is inactive, or at rest.

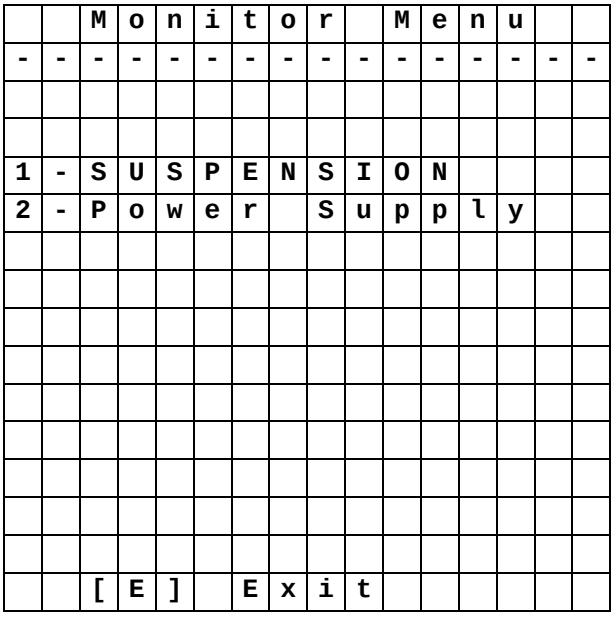
To perform the verification, connect the ART to the connector in the control units compartment of the cab, select axle suspension from the “AVAILABLE TESTS” menu and proceed as described.

4.6.1 CHECKING CALIBRATION OF THE SUSPENSION POSITION SENSOR

NOTE

This operation must be carried out with the engine running on idle, the parking brake applied, the shuttle lever in neutral and the axle suspension deactivated.

1 - From the main menu, press “**1**” to bring up the “**MONITORS MENU**”.

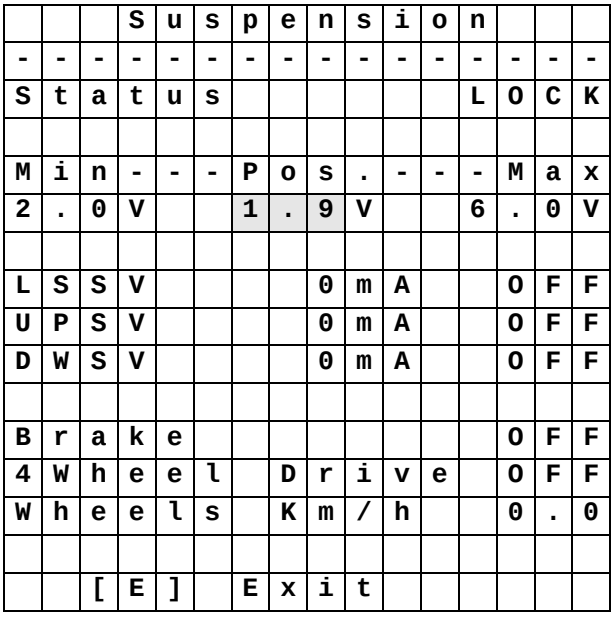


2 - Press “**1**”.

3 - Verify that the voltage output signal from the axle suspension position sensor (indicated under the item “**POSI**” is 1.9 V.

4 - In the event of the value being incorrect, proceed with calibration of the sensor as described in the chapter “REMOVAL AND POSITIONING OF THE FRONT AXLE SUSPENSION POSITION SENSOR”, section 30.

5 - Activate the axle suspension and check that the voltage output signal from the position sensor (indicated under the item “**POSI**” is approximately 3.8 V).



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5. ALARMS

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

To facilitate searches, the alarms are organized according to the control unit by which they are detected:

1 - **List of alarms displayed by the hydraulic lift and ASM control unit.**
For details of how the alarms are displayed, see the heading “Power lift control unit”.

2 - **List of alarms displayed on EDS: list of alarms detected by transmission control unit.**
For details of how the alarms are displayed, see the heading “Transmission control unit”.

3 - **List of alarms displayed on SERDIA: list of alarms detected by engine control unit.**
For details of how the alarms are displayed, see the heading “Engine control unit (DEUTZ EMR2)”.

4 - List of alarms displayed by the front axle suspension control unit.
For details of how the alarms are displayed, see the heading Front axle suspension control unit.

5.1 LIFT AND ASM CONTROL UNIT ALARMS

The hydraulic lift control unit warns the operator of any malfunction in monitored components by way of a red Led (lift transport lock indicator) located on the lift control console.

Faults are indicated using a system of coded flash sequences which, depending on how the control unit has been configured, will either specify the precise nature of the fault (extended alarm) or simply identify the device affected (standard alarm).

Also, and likewise depending on the configuration, the unit can display only the alarm with the lowest code (rotation of deactivated alarms),or it can display all the active alarms (rotation of alarms activated), whereas the ART shows the 10 most recent alarms generated, and if a further alarm is triggered, the first of the ten will be eliminated.

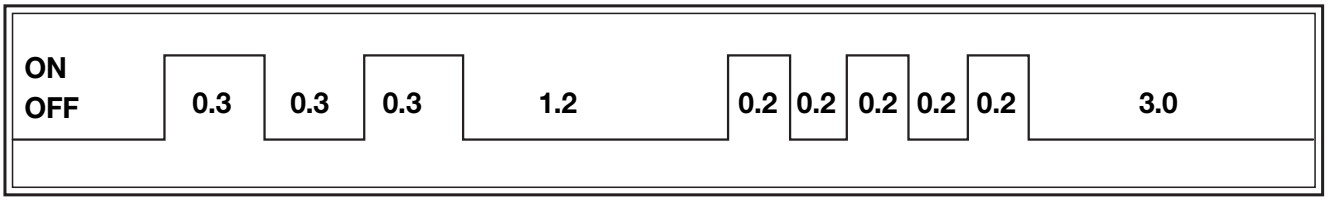
To verify, using the ART, whether or not an alarm detected is “active”, the technician must cancel all the alarms, turn the starter key to the “**O**” (OFF) position, then make a fresh connection to the control unit.

CAUTION

In the event of it no longer being possible to operate the lift, and alarm 11 is indicated, check whether or not the ART will connect to the control unit. If a connection cannot be made, the problem is identifiable as a fault affecting the EPROM, which must therefore be replaced.

5.1.1 LIST OF ALARMS BY EXTENDED CODE

Example of flash for code 23 (times expressed in seconds).

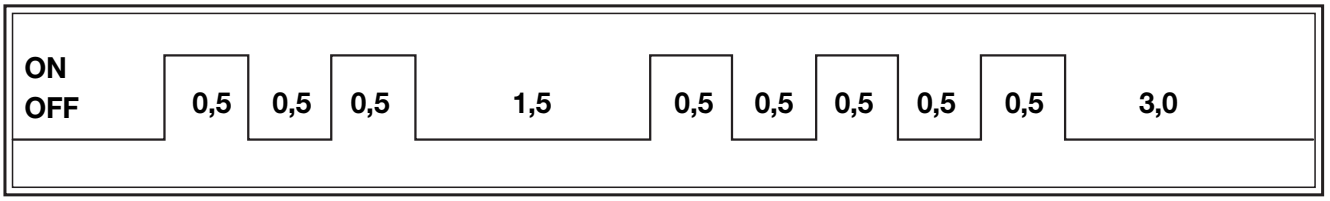


Extended flash	Standard flash	Display on ART	Description	Page
12	26	Supply Pos. Sens.	The control unit detects that the power input to the lift position sensor is not correct.	20-50
13	13	ShortCircuitPWM	The control unit detects a short circuit on the control line to the lift directional control valve.	20-51
14	53	ASM-ShortCircuit	The control unit detects that either the differential lock or four wheel drive solenoid valve is short-circuiting.	20-52
16	18	HitchControlLev.	The control unit detects incorrect data coming from the lift control lever.	20-53
18	22	Pos.Sens.NotConn	The control unit detects that the lift position sensor is not connected.	20-54
21	11	ShortCircuitEVUP	The control unit detects that the lift Up control solenoid valve is short-circuiting.	20-55
23	11	EvUpNotConnect.L	The control unit detects, in the absence of any energizing signal (static safety), that the lift Up solenoid valve coil is not connected.	20-56
24	11	EvUpNotConnect.D	The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Up solenoid valve coil is not connected.	20-57
31	12	ShortCircuitEVDW	The control unit detects that the lift Down control solenoid valve is short-circuiting.	20-58
33	12	EvDwDeconnecteeL	The control unit detects, in the absence of any energizing signal (static safety), that the lift Down solenoid valve coil is not connected.	20-59
34	12	EvDwDeconnect.D	The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Down solenoid valve coil is not connected.	20-60
41	51	ShortCircuit4WD	The control unit detects that the 4WD clutch solenoid valve relay is short-circuiting.	20-61
43	51	4WD NotConnected	The control unit detects that the 4WD clutch solenoid valve relay is disconnected.	20-62
51	52	ShortCircuitDIF -OK -	The control unit detects that the differential lock solenoid valve is short-circuiting.	20-63
53	52	EvDIFDeconnect.	The control unit detects that thedifferential lock actuator solenoid valve is disconnected.	20-64
62	31	NoRightDraftSens.	The control unit detects that the right hand draft sensor is disconnected.	20-65

Extended flash	Standard flash	Display on ART	Description	Pag.
63	32	NoLeftDraftSens.	The control unit detects that the left hand draft sensor is disconnected.	20-66
64	42	WheelSensNotConn.	The engine control unit detects that the signal from the wheel speed pickup is either non-existent or incorrect.	20-67
65	41	Radar NotConnect.	The control unit detects that the radar is disconnected.	20-68
67	26	5v Supply	The control unit detects that the 5V power input is not correct.	20-69
68	16	8v Supply	The control unit detects that the 8V power input is not correct.	20-69
71	34	DownSpeedPotent.	The control unit detects that the rate-of-drop potentiometer is disconnected or short-circuiting.	20-70
72	23	SetPoint Potent.	The control unit detects that the depth potentiometer is disconnected or short-circuiting.	20-71
73	36	CtrlMode Potent.	The control unit detects that the MIX potentiometer is disconnected or short-circuiting.	20-72
74	24	MaxHeightPotent.	The control unit detects that the maximum lift height potentiometer is disconnected or short-circuiting.	20-73
76	54	EEPROM :OPTION	The control unit detects a bad reading of data from EEPROM.	20-74
77	54	EEPROM : SPEED	The control unit detects a bad reading of data from EEPROM.	20-74
78	54	EEPROM : CALIB	The control unit detects a bad reading of data from EEPROM.	20-74
81	55	EEPROM : CTRL	The control unit detects a bad reading of data from EEPROM.	20-75
82	55	EEPROM : PWM	The control unit detects a bad reading of data from EEPROM.	20-75
83	55	EEPROM : DRAFT	The control unit detects a bad reading of data from EEPROM.	20-75
84	55	EEPROM : SLIP	The control unit detects a bad reading of data from EEPROM.	20-76
85	55	EEPROM : POS	The control unit detects a bad reading of data from EEPROM.	20-76
86	55	EEPROM : AB	The control unit detects a bad reading of data from EEPROM.	20-76
87	55	EEPROM : SFCFG	The control unit detects a bad reading of data from EEPROM.	20-77
88	55	EEPROM : SLCFG	The control unit detects a bad reading of data from EEPROM.	20-77

5.1.2 LIST OF ALARMS BY STANDARD CODE

Example of flash for code 23 (times expressed in seconds).



Standard flash	Extended flash	Display on ART	Description	Page.
11	21	ShortCircuitEVUP	The control unit detects that the lift Up control solenoid valve is short-circuiting.	20-55
	23	EvUpNotConnect.L	The control unit detects, in the absence of any energizing signal (static safety), that the lift Up solenoid valve coil is not connected.	20-56
	24	EvUpNotConnect.D	The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Up solenoid valve coil is not connected.	20-57
12	31	ShortCircuitEVDW	The control unit detects that the lift Down control solenoid valve is short-circuiting.	20-58
	33	EvDwDeconnecteeL	The control unit detects, in the absence of any energizing signal (static safety), that the lift Down solenoid valve coil is not connected.	20-59
	34	EvDwDeconnect.D	The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Down solenoid valve coil is not connected.	20-60
13	13	ShortCircuitPWM	The control unit detects a short circuit on the control line to the lift directional control valve.	20-51
16	68	8v Supply	The control unit detects that the 8V power input is not correct.	20-69
18	16	HitchControlLev.	The control unit detects incorrect data coming from the lift control lever.	20-53
22	18	Pos.Sens.NotConn	The control unit detects that the lift position sensor is not connected.	20-54
23	72	SetPoint Potent.	The control unit detects that the depth potentiometer is disconnected or short-circuiting.	20-71
24	74	MaxHeightPotent.	The control unit detects that the maximum lift height potentiometer is disconnected or short-circuiting.	20-73
26	12	Supply Pos. Sens.	The control unit detects that the power input to the lift position sensor is not correct.	20-50
	67	5v Supply	The control unit detects that the 5V power input is not correct.	20-69
31	62	NoRightDraftSens.	The control unit detects that the right hand draft sensor is disconnected.	20-65
32	63	NoLeftDraftSens.	The control unit detects that the left hand draft sensor is disconnected.	20-66

Standard flash	Extended flash	Display on ART	Description	Pag.
34	71	DownSpeedPotent.	The control unit detects that the rate-of-drop potentiometer is disconnected or short-circuiting.	20-70
36	73	CtrlMode Potent.	The control unit detects that the MIX potentiometer is disconnected or short-circuiting.	20-72
41	65	Radar NotConnect.	The control unit detects that the radar is disconnected.	20-68
42	64	WheelSensNotConn.	The engine control unit detects that the signal from the wheel speed pickup is either non-existent or incorrect.	20-67
51	41	ShortCircuit4WD	The control unit detects that the 4WD clutch solenoid valve relay is short-circuiting.	20-61
	43	4WD NotConnected	The control unit detects that the 4WD clutch solenoid valve relay is disconnected.	20-62
52	51	ShortCircuitDIF -OK -	The control unit detects that the differential lock solenoid valve is short-circuiting.	20-63
	53	EvDIFDeconnect.	The control unit detects that the differential lock actuator solenoid valve is disconnected.	20-64
53	14	ASM-ShortCircuit	The control unit detects that either the differential lock or four wheel drive solenoid valve is short-circuiting.	20-52
54	76	EEPROM :OPTION	The control unit detects a bad reading of data from EEPROM.	20-74
	77	EEPROM : SPEED	The control unit detects a bad reading of data from EEPROM.	20-74
	78	EEPROM : CALIB	The control unit detects a bad reading of data from EEPROM.	20-74
55	81	EEPROM : CTRL	The control unit detects a bad reading of data from EEPROM.	20-75
	82	EEPROM : PWM	The control unit detects a bad reading of data from EEPROM.	20-75
	83	EEPROM : DRAFT	The control unit detects a bad reading of data from EEPROM.	20-75
	84	EEPROM : SLIP	The control unit detects a bad reading of data from EEPROM.	20-76
	85	EEPROM : POS	The control unit detects a bad reading of data from EEPROM.	20-76
	86	EEPROM : AB	The control unit detects a bad reading of data from EEPROM.	20-76
	87	EEPROM : SFCFG	The control unit detects a bad reading of data from EEPROM.	20-77
	88	EEPROM : SLCFG	The control unit detects a bad reading of data from EEPROM.	20-77

5.1.3 LIST OF ALARMS DISPLAYED ON ART

Display on ART	Extended flash	Standard flash	Description	Page
4WD NotConnected	43	51	The control unit detects that the 4WD clutch solenoid valve relay is disconnected.	20-62
5v Supply	67	26	The control unit detects that the 5V power input is not correct.	20-69
8v Supply	68	16	The control unit detects that the 8V power input is not correct.	20-69
ASM-ShortCircuit	14	53	The control unit detects that either the differential lock or four wheel drive solenoid valve is short-circuiting.	20-52
CtrlMode Potent.	73	36	The control unit detects that the MIX potentiometer is disconnected or short-circuiting.	20-72
DownSpeedPotent.	71	34	The control unit detects that the rate-of-drop potentiometer is disconnected or short-circuiting.	20-70
EEPROM : AB	86	55	The control unit detects a bad reading of data from EEPROM.	20-76
EEPROM : CALIB	78	54	The control unit detects a bad reading of data from EEPROM.	20-74
EEPROM : CTRL	81	55	The control unit detects a bad reading of data from EEPROM.	20-75
EEPROM : DRAFT	83	55	The control unit detects a bad reading of data from EEPROM.	20-75
EEPROM : POS	85	55	The control unit detects a bad reading of data from EEPROM.	20-76
EEPROM : PWM	82	55	The control unit detects a bad reading of data from EEPROM.	20-75
EEPROM : SFCFG	87	55	The control unit detects a bad reading of data from EEPROM.	20-77
EEPROM : SLCFG	88	55	The control unit detects a bad reading of data from EEPROM.	20-77
EEPROM : SLIP	84	55	The control unit detects a bad reading of data from EEPROM.	20-76
EEPROM : SPEED	77	54	The control unit detects a bad reading of data from EPROM.	20-74
EEPROM :OPTION	76	54	The control unit detects a bad reading of data from EEPROM.	20-74
EvDIFDeconnect.	53	52	The control unit detects that the differential lock actuator solenoid valve is disconnected.	20-64
EvDwDeconnect.D	34	12	The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Down solenoid valve coil is not connected.	20-60
EvDwDeconnecteeL	33	12	The control unit detects, in the absence of any energizing signal (static safety), that the lift Down solenoid valve coil is not connected.	20-59

Display on ART	Extended flash	Standard flash	Description	Page
EvUpNotConnect.D	24	11	The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Up solenoid valve coil is not connected.	20-57
EvUpNotConnect.L	23	11	The control unit detects, in the absence of any energizing signal (static safety), that the lift Up solenoid valve coil is not connected.	20-56
HitchControlLev.	16	18	The control unit detects incorrect data coming from the lift control lever.	20-53
MaxHeightPotent.	74	24	The control unit detects that the maximum lift height potentiometer is disconnected or short-circuiting.	20-73
NoLeftDraftSens.	63	32	The control unit detects that the left hand draft sensor is disconnected.	20-66
NoRightDraftSens.	62	31	The control unit detects that the right hand draft sensor is disconnected.	20-65
Pos.Sens.NotConn	18	22	The control unit detects that the lift position sensor is not connected.	20-54
Radar NotConnect.	65	41	The control unit detects that the radar is disconnected.	20-68
SetPoint Potent.	72	23	The control unit detects that the depth potentiometer is disconnected or short-circuiting.	20-71
ShortCircuit4WD	41	51	The control unit detects that the 4WD clutch solenoid valve relay is short-circuiting.	20-61
ShortCircuitDIF -OK -	51	52	The control unit detects that the differential lock solenoid valve is short-circuiting.	20-63
ShortCircuitEVDW	31	12	The control unit detects that the lift Down control solenoid valve is short-circuiting.	20-58
ShortCircuitEVUP	21	11	The control unit detects that the lift Up control solenoid valve is short-circuiting.	20-55
ShortCircuitPWM	13	13	The control unit detects a short circuit on the control line to the lift directional control valve.	20-51
Supply Pos. Sens.	12	26	The control unit detects that the power input to the lift position sensor is not correct.	20-50
WheelSensNotConn.	64	42	The engine control unit detects that the signal from the wheel speed pickup is either non-existent or incorrect.	20-67

5.1.4 ANALYSIS OF LIFT AND ASM ALARMS

Extended alarm: **12**

Standard alarm: **26**

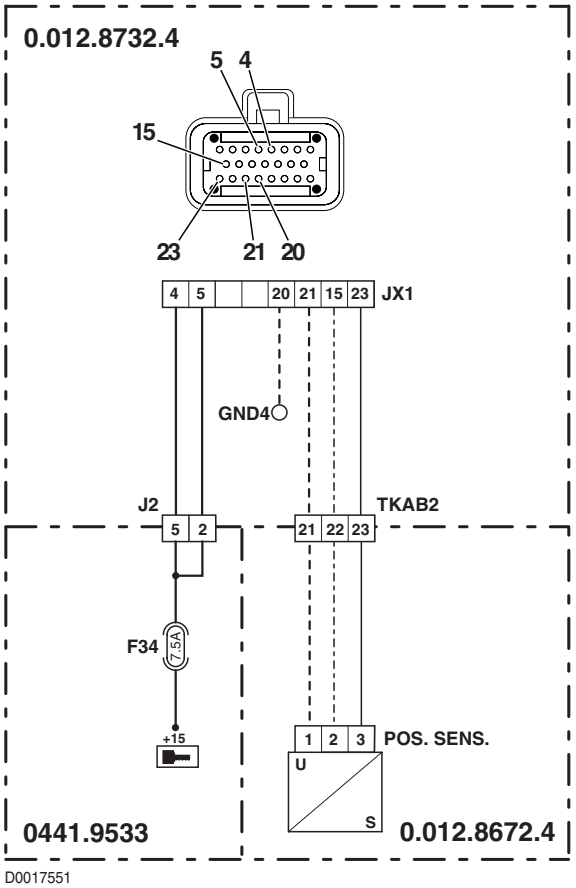
Supply Pos. Sens.

DESCRIPTION

The control unit detects that the power input to the lift position sensor is not correct.

CHECK

- Check that the contacts on connector “POS SEN” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the lift position sensor is correct (5 V approx measured between pin 3 (positive) and pin 1 (negative) of connector “POS SEN”).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 3 of connector “POS SEN” and to chassis earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “POS SEN” and to chassis earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pin 2 of connector “POS SEN” and to chassis earth, and check to ensure there are no short circuits to positive (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..



Extended alarm: **13**
Standard alarm: **13**

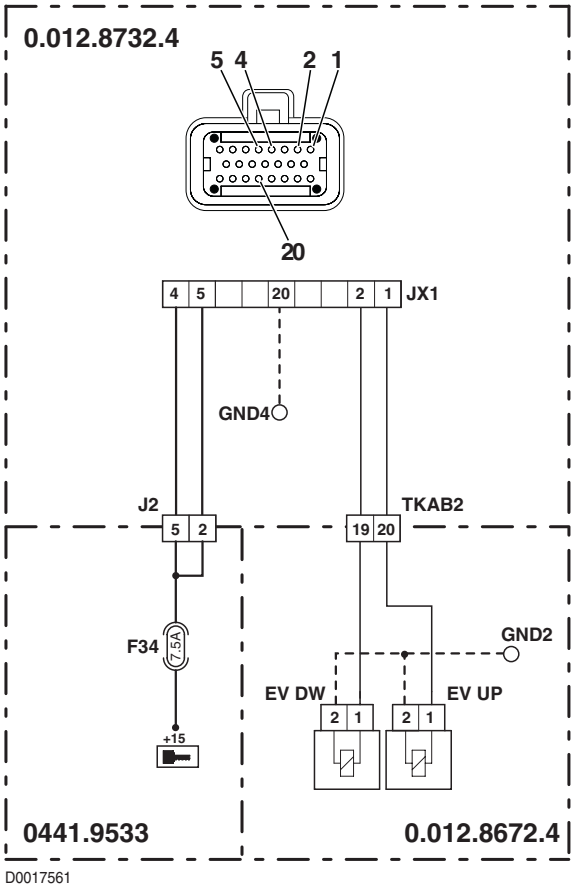
← **ShortCircuitPWM**

DESCRIPTION

The control unit detects a short circuit on the control line to the lift directional control valve.

CHECK

- Check that the contacts on connectors “EV UP” and “EV DW” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the Up and Down solenoids (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV UP” and to chassis earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV DW” and to chassis earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed..



D0017561

Extended alarm: **14**
Standard alarm: **53**

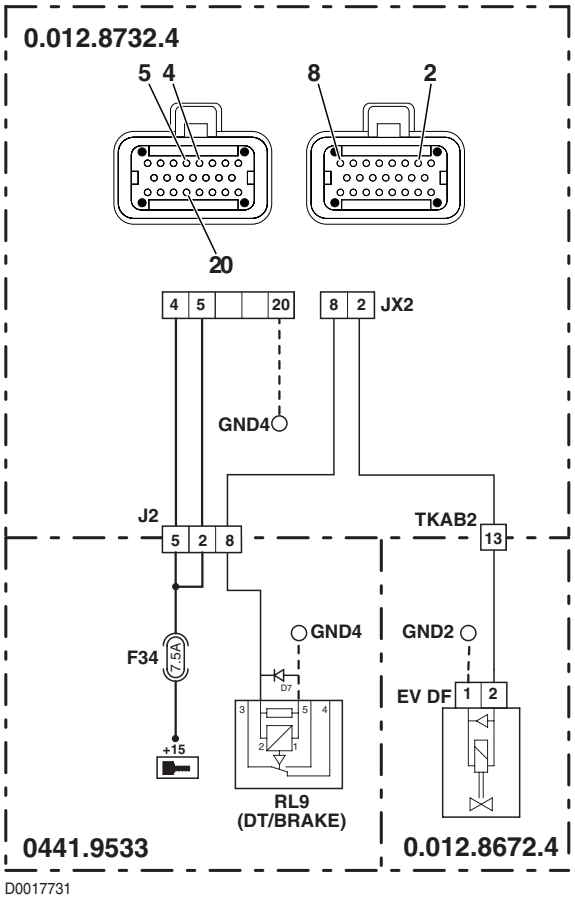
ASM-ShortCircuit

DESCRIPTION

The control unit detects that a solenoid valve operating the differential lock or four wheel drive, or the clutch relay, is short-circuiting.

CHECK

- Check that the contacts on connectors “RL9” and “EVDF” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Check that the resistance across the coil of relay RL9 is 70 Ohm approx.
- Test the internal resistance of the differential lock actuator solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 and pin 2 of the relay socket, and measure the resistance to verify that there are no short circuits (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV DF” and to chassis earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017731

Extended alarm: **16**
Standard alarm: **18**

HitchControlLev.

DESCRIPTION

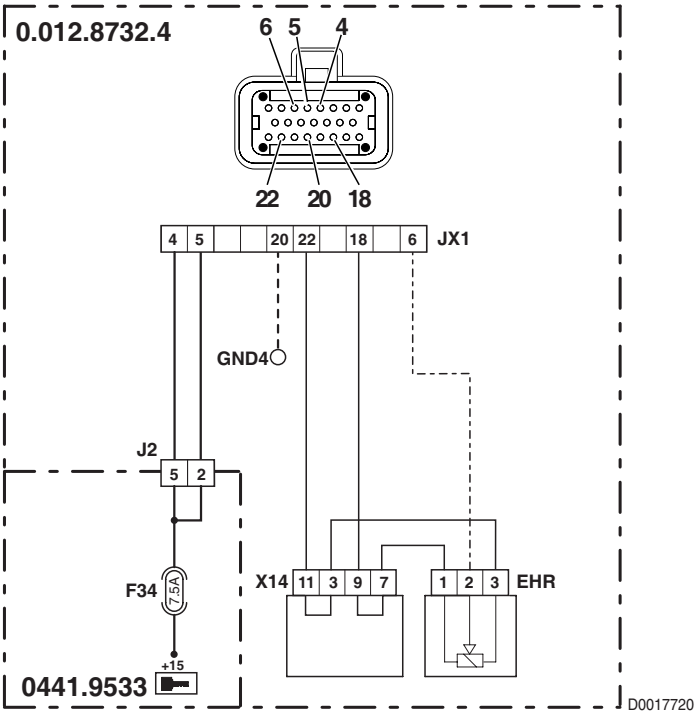
The control unit detects incorrect data coming from the lift control lever.

NOTE

In the event of the "DownSpeedPotent.", "SetPoint Potent.", CtrlMode Potent.", MaxHeightPotent." and "Hitch-ControlLev." alarms being displayed simultaneously, connect a test meter to pin 11 (positive) and pin 9 (negative) of connector "X14" on the control console and check that the voltage is between 7.5 and 8.5 V.
If the value is within range, check the continuity of the wiring and make certain there are no short circuits to earth or to a positive leg of the power harness between the lift control unit and the lift control console.

CHECK

- Check that the contacts on connector "EHR" and on those of the lift control unit, "JX1" and "JX2", are firmly attached and not oxidised.
- With the starter key in the "I" (ON) position, check that the power input to the lift control lever is correct (8 V approx measured between pin 3 (positive) and pin 1 (negative) of connector "EHR")
- Verify the correct operation of the control lever (for details see section 40).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 2 of connector "EHR" and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With the starter key in the "I" (ON) position, connect a test meter to pin 2 of connector "EHR" and to chassis earth, and check that there are no short circuits to positive (meter reading: 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 3 of connector "EHR" and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again, and if the alarm is still present, the control unit must be renewed



Extended alarm: **18**
Standard alarm: **22**

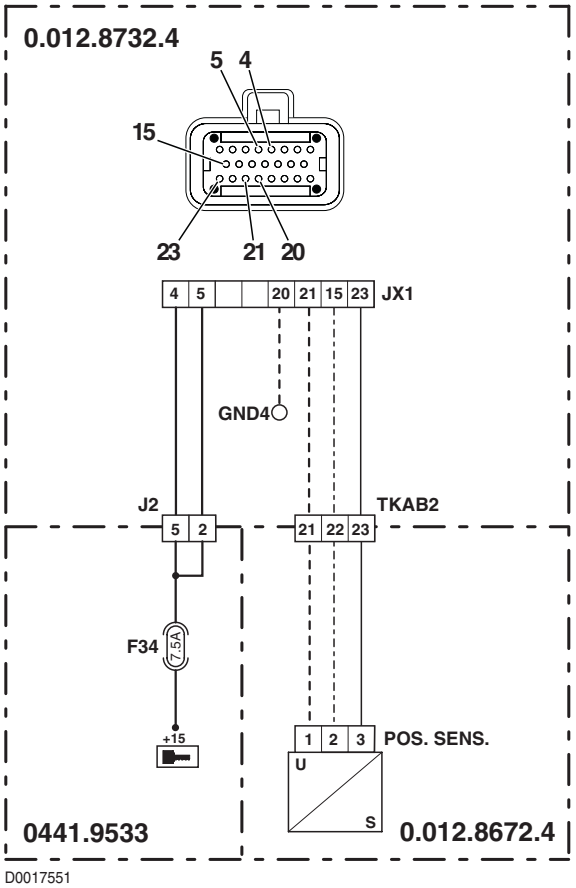
Pos.Sens.NotConn

DESCRIPTION

The control unit detects that the lift position sensor is not connected.

CHECK

- Check that the contacts on connector “POS SEN” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the lift position sensor is correct (5 V approx measured between pin 3 (positive) and pin 1 (negative) of connector “POS SEN”)
- Verify the correct operation of the position sensor (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 3 of connector “POS SEN” and to pin 23 of connector JX1, 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 3 of connector “POS SEN” and to chassis earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pin 3 of connector “POS SEN” and to chassis earth, and check to ensure there are no short circuits to positive (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.



D0017551

Extended alarm: **21**
Standard alarm: **11**

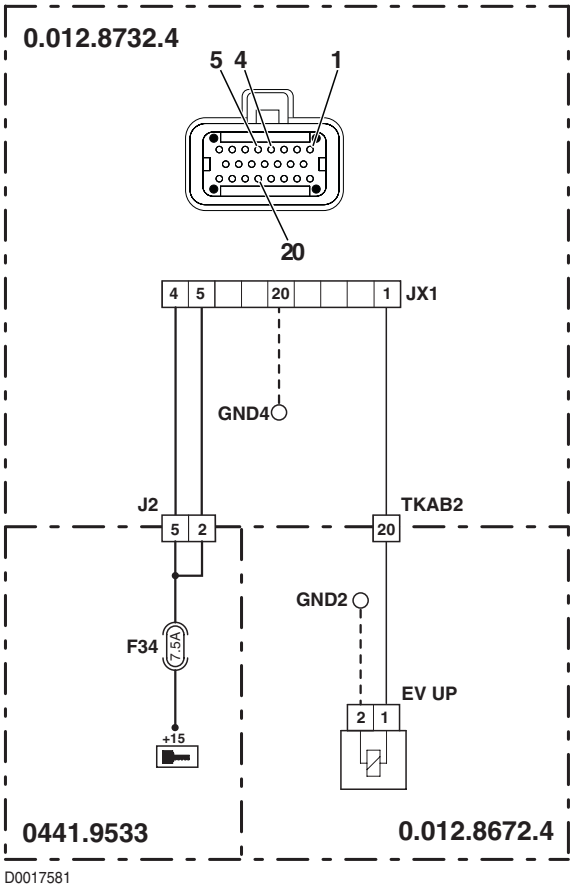
← **ShortCircuitEVUP**

DESCRIPTION

The control unit detects that the lift Up solenoid valve is short-circuiting.

CHECK

- Check that the contacts on connector “EV UP” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the lift Up control solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV UP” and to chassis earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed..



Extended alarm: **23**

Standard alarm: **11**

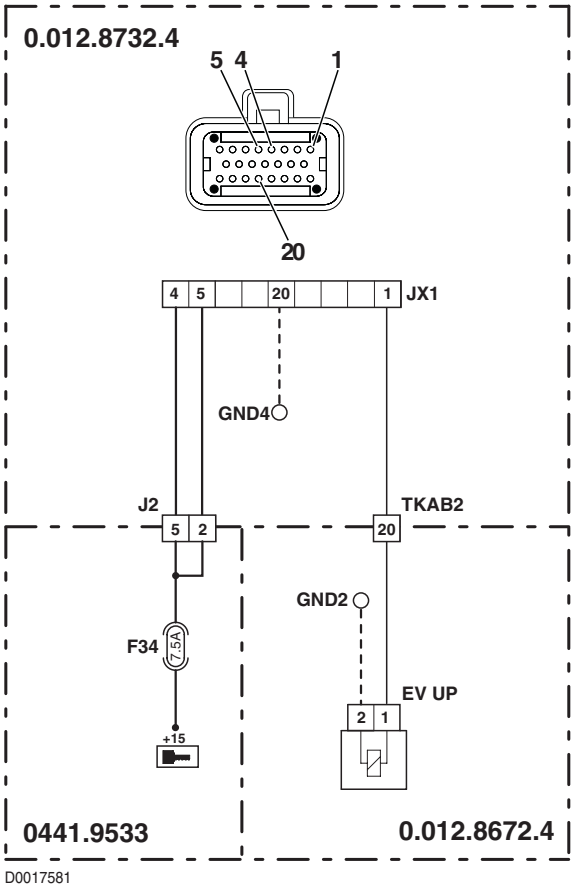
EvUpNotConnect.L

DESCRIPTION

The control unit detects, in the absence of any energizing signal (static safety), that the lift Up solenoid valve coil is not connected.

CHECK

- Check that the contacts on connector “EV UP” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the lift Up control solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV UP” and to pin 1 o connector “JX1”, and measure the resistance to check the continuity of the circuit (meter reading: 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “EV UP” and to chassis earth, 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.



Extended alarm: **24**
Standard alarm: **11**

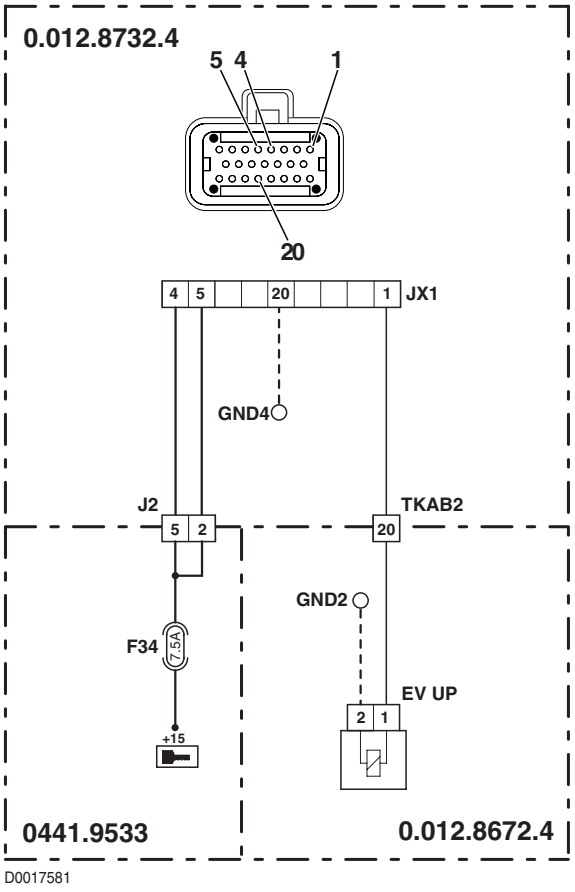
EvUpNotConnect.D

DESCRIPTION

The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Up solenoid valve coil is not connected.

CHECK

- Check that the contacts on connector “EV UP” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the lift Up control solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV UP” and to pin 1 of connector “JX1”, and measure the resistance to check the continuity of the circuit (meter reading: 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “EV UP” and to chassis earth, 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.



D0017581

Extended alarm: **31**

Standard alarm: **12**

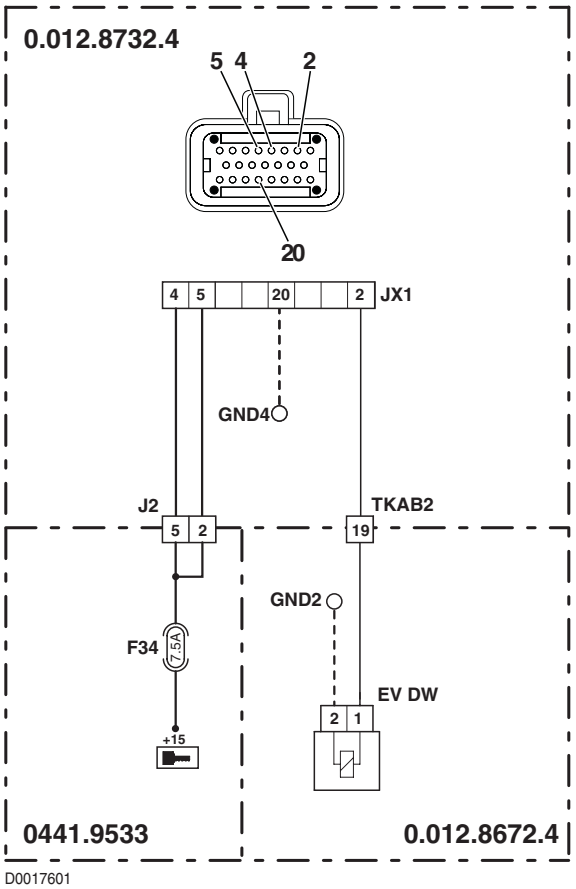
ShortCircuitEVDW

DESCRIPTION

The control unit detects that the lift Down solenoid valve is short-circuiting.

CHECK

- Check that the contacts on connector “EV DW” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the lift Down control solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV DW” and to chassis earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017601

Extended alarm: **33**
Standard alarm: **12**

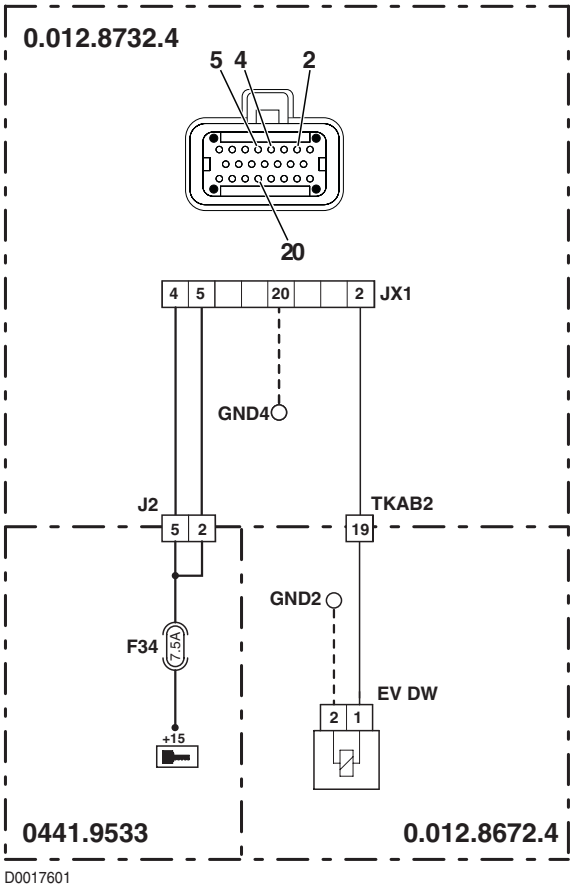
EvDwDeconnect.L

DESCRIPTION

The control unit detects, in the absence of any energizing signal (static safety), that the lift Down solenoid valve coil is not connected.

CHECK

- Check that the contacts on connector “EV DW” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the lift Up control solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV DW” and to pin 2 of connector “JX1” , 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 2 of connector “EV DW” and to chassis earth, 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.



D0017601

Extended alarm: **34**

Standard alarm: **12**

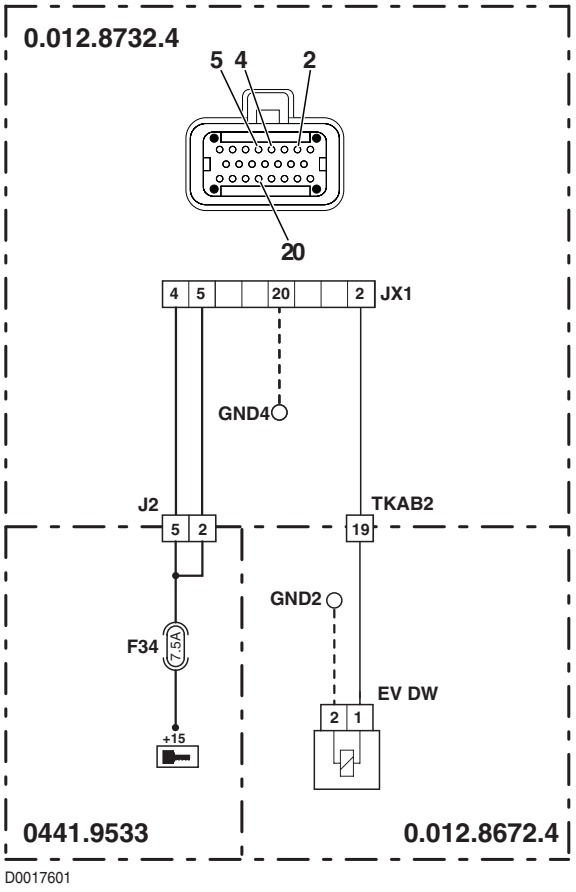
EvDwDeconnect.D

DESCRIPTION

The control unit detects, in the presence of an energizing signal (dynamic safety), that the lift Down solenoid valve coil is not connected.

CHECK

- Check that the contacts on connector “EV DW” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the lift Up control solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV DW” and to pin 2 of connector “JX1” , 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 2 of connector “EV DW” and to chassis earth, 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.



Extended alarm: **41**

Standard alarm: **51**

ShortCircuit4WD

DESCRIPTION

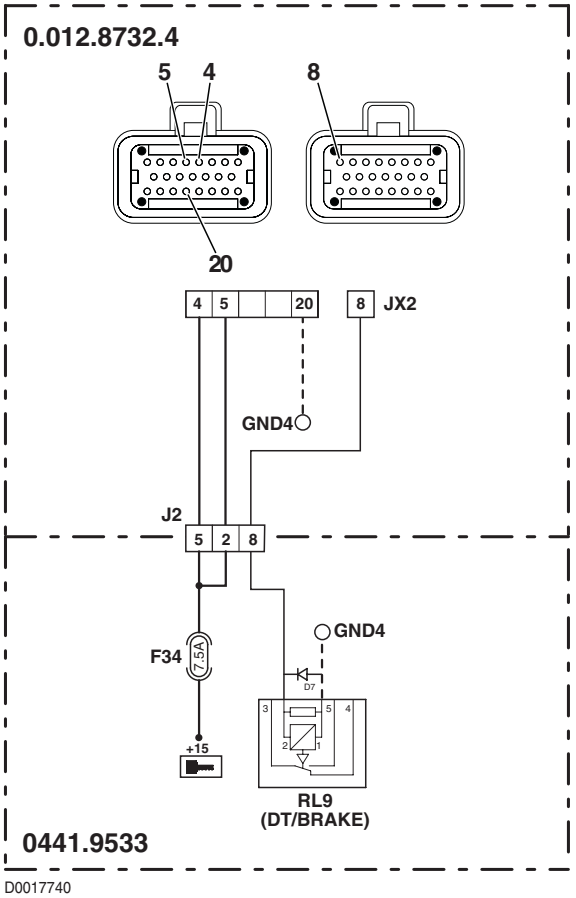
The control unit detects that the 4WD clutch solenoid valve relay is short-circuiting.

NOTE

This alarm will be displayed only when ASM is active.

CHECK

- Check that the contacts of relay "RL9" and of the connectors on the lift control unit, "JX1" and "JX2", are firmly attached and not oxidised.
- Deselect the four wheel drive, differential lock and ASM functions with the relative switches and, with the starter key in the "I" (ON) position, connect a test meter to pin 1 and pin 2 of the relay socket and check the voltage, which should measure 2.5 V approx.
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 and pin 2 of the relay socket and measure the resistance to verify that there are no short circuits (meter reading: infinity).
- Replace the relay "RL9" with a new one, 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.



D0017740

Extended alarm: **43**

Standard alarm: **51**

4WD NotConnected

DESCRIPTION

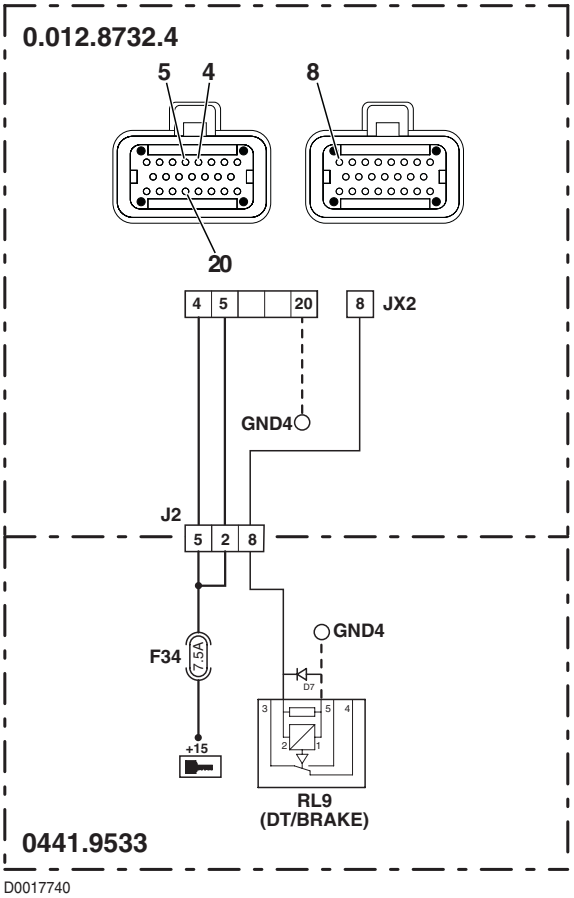
The control unit detects that the 4WD clutch solenoid valve relay is disconnected.

NOTA

This alarm will be displayed only when ASM is active.

CHECK

- Check that the contacts of relay “RL9” and of the connectors on the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Deselect the four wheel drive, differential lock and ASM functions with the relative switches and, with the starter key in the “I” (ON) position, connect a test meter to pin 1 and pin 2 of the relay socket and check the voltage, which should register 2.5 V approx.
- Replace the relay “RL9” with a new one, 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.



D0017740

Extended alarm: **51**
Standard alarm: **52**

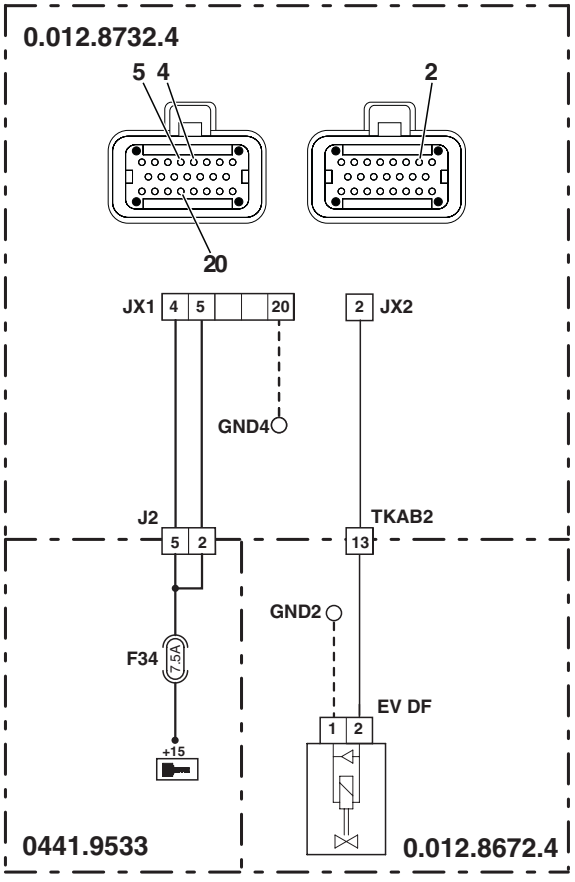
ShortCircuitDIF -OK -

DESCRIPTION

The control unit detects that the differential lock actuator solenoid valve is short-circuiting.

CHECK

- Check that the contacts on connector “EV DF” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the differential lock solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “EV DF” and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



Extended alarm: **53**

Standard alarm: **52**

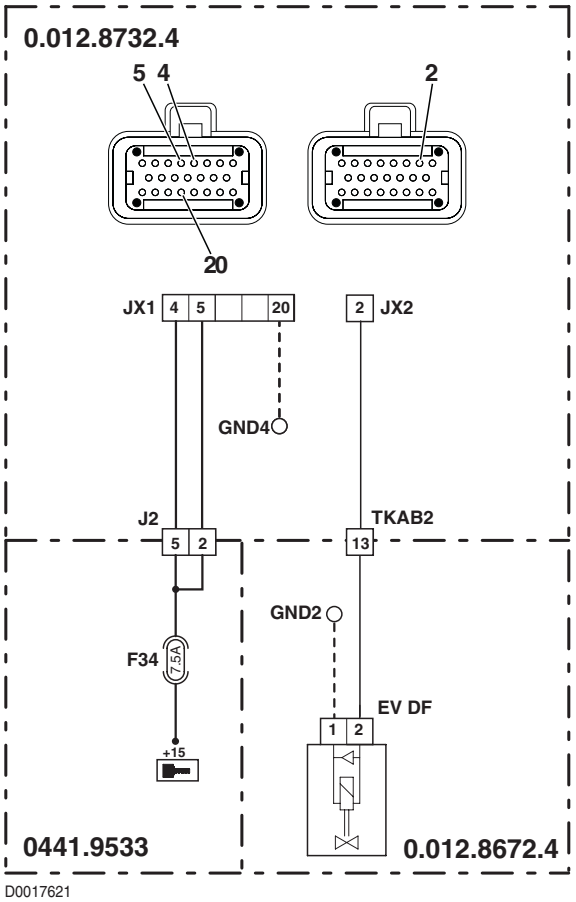
EvDIFDeconnect.

DESCRIPTION

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

CHECK

- Check that the contacts on connector “EV DF” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- Test the internal resistance of the differential lock actuator solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “EV DF” and to pin 2 of connector “JX2”, 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 “EV DF” and to chassis earth, 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..



Extended alarm: **62**

Standard alarm: **31**

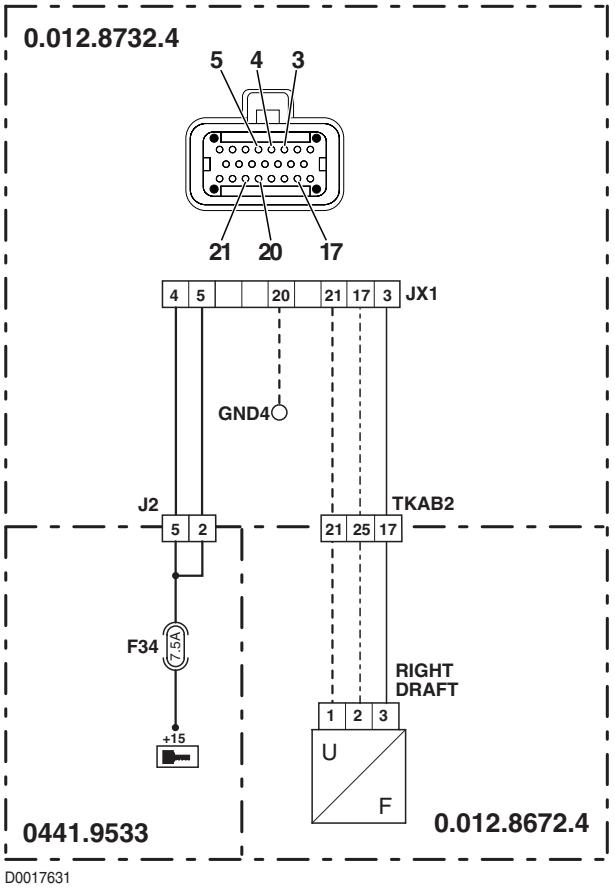
← **NoRightDraftSens.**

DESCRIPTION

The control unit detects that the right hand draft sensor is disconnected.

CHECK

- Check that the contacts on connector “RIGHT DRAFT” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the draft sensor is correct (8 V approx measured between pin 3 (positive) and pin 1 (negative) of connector “RIGHT DRAFT”)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “RIGHT DRAFT” and pin 17 of connector “JX2”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed..



Extended alarm: **63**
Standard alarm: **32**

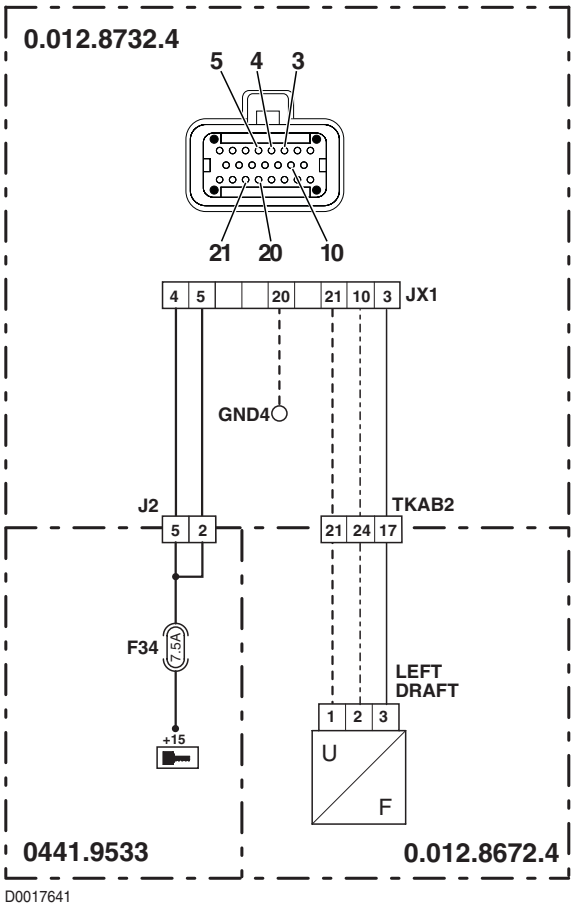
← **NoLeftDraftSens.**

DESCRIPTION

The control unit detects that the left hand draft sensor is disconnected.

CHECK

- Check that the contacts on connector “LEFT DRAFT” and on those of the lift control unit, “JX1” and “JX2”, are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the draft sensor is correct (8 V approx measured between pin 3 (positive) and pin 1 (negative) of connector “LEFT DRAFT”)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “LEFT DRAFT” and pin 10 of connector “JX2”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017641

Extended alarm: **64**

Standard alarm: **42**

WheelSensNotConn.

DESCRIPTION

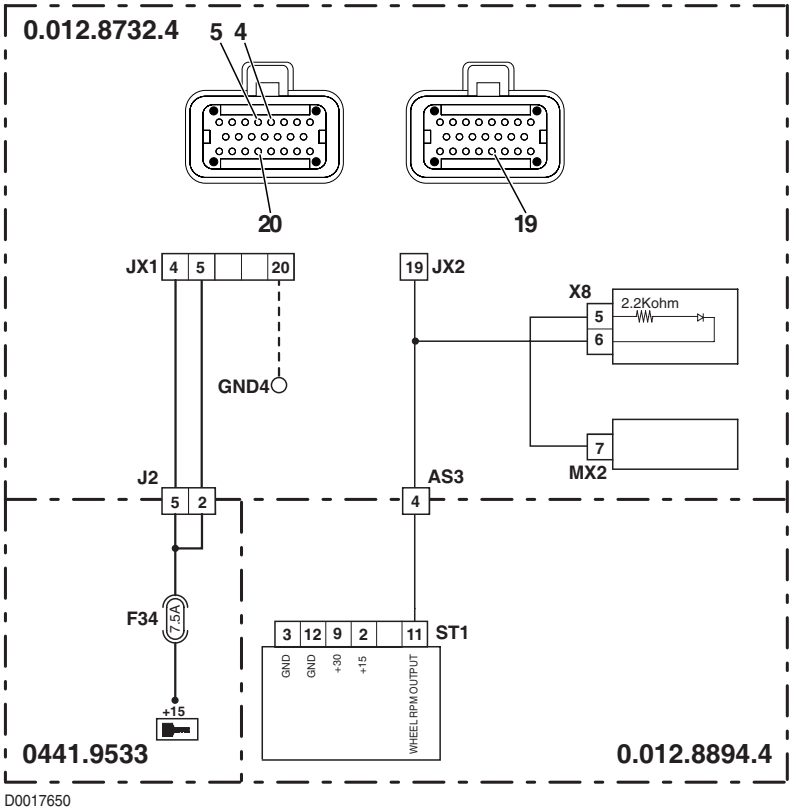
The engine control unit detects that the signal from the wheel speed pickup is either non-existent or incorrect.

NOTA

If, when this alarm is triggered, the Infocenter continues to indicate the ground speed, the fault will be on the line between the Infocenter and the transmission control unit; conversely, if the speed is not indicated with the machine in motion, the problem is in the connection between the wheel sensors, the transmission control unit and the Infocenter (for details on how to identify the fault, see transmission alarm N° 47).

CHECK

- Check that the contacts on connector “ST1” of the Infocenter, connector “X8” of the engine control unit circuit board, connector “MX2” of the engine control unit and connectors “JX1” and “JX2” of the lift control unit, are all firmly attached and not oxidised.
- Check with the SERDIA program that the engine control unit is receiving the ground speed signal. If the signal is being acknowledged, renew the lift control unit.
- Connect a test meter to pin 11 of connector “ST1” and pin 19 of connector “JX2”, 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 19 of connector “JX2” and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pin 19 of connector “JX2” and to cab earth, and check that there are no short circuits to positive (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.



Extended alarm: 65

Standard alarm: 41

← Radar NotConnect.

DESCRIPTION

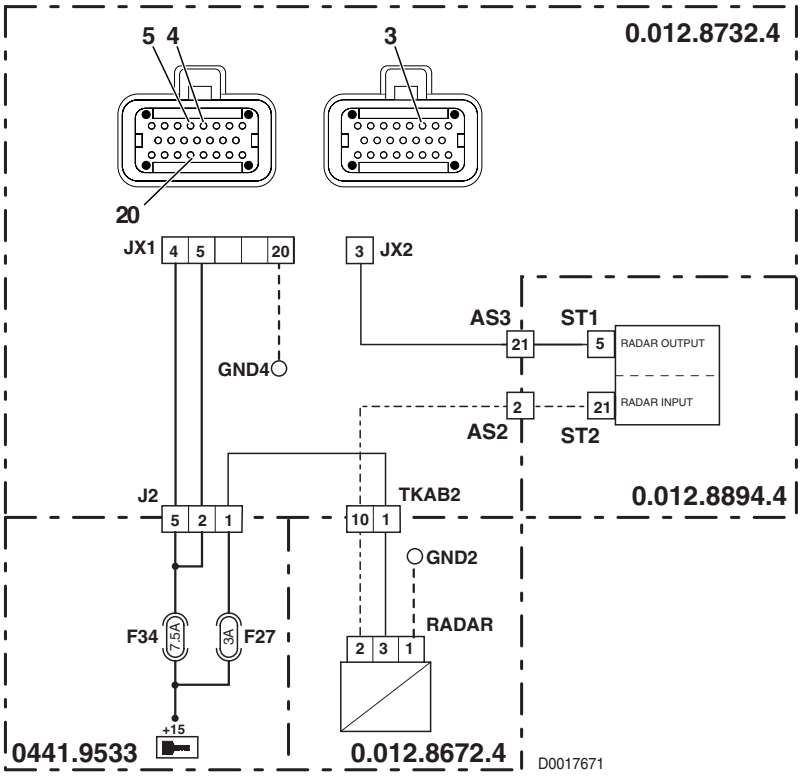
The control unit detects that the radar is disconnected.

NOTE

If, when this alarm is triggered, the Infocenter indicates a wheelslip value within normal limits (on the road, wheelslip should be zero), the fault will be on the line between the Infocenter and the transmission control unit; conversely, if an abnormally high wheelslip value is indicated with the machine in motion (e.g. 100%), the problem is in the connection between the radar and the Infocenter.

CHECK

- Check that the contacts on connector “RADAR”, on connectors “ST1” and “ST2” of the Infocenter and on connectors “JX1” and “JX2” of the lift control unit, are all firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the radar is correct (12 V measured between pin 3 (positive) and pin 1 (negative) of connector “RADAR”)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “RADAR” and to transmission earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “RADAR” and pin 21 of connector “ST2”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Connect a test meter to pin 5 of connector “ST1” and pin 3 of connector “JX2”, 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 3 of connector “JX2” and to cab earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pin 3 of connector “JX2” and to chassis earth, and check to ensure there are no short circuits to positive (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.



Extended alarm: **67**
Standard alarm: **26**

5v Supply

DESCRIPTION

The control unit detects that the 5V power input is not correct.

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.

Extended alarm: **68**
Standard alarm: **16**

8v Supply

DESCRIPTION

The control unit detects that the 8V power input is not correct.

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.

Extended alarm: **71**

Standard alarm: **34**

← **DownSpeedPotent.**

DESCRIPTION

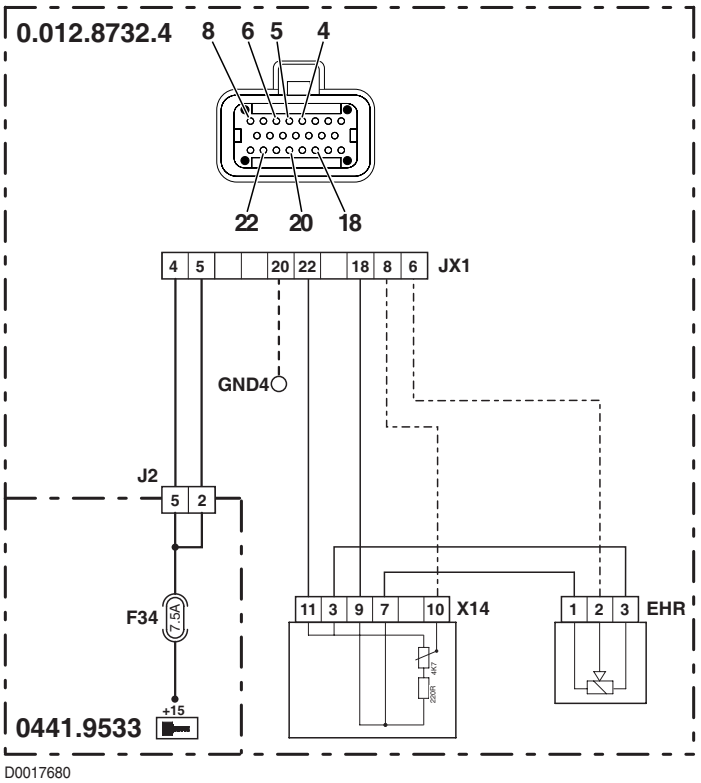
The control unit detects that the rate-of-drop potentiometer is disconnected or short-circuiting.

NOTE

In the event of the "DownSpeedPotent.", "SetPoint Potent.", “CtrlMode Potent.”, “MaxHeightPotent.” and “Hitch-ControlLev." alarms being displayed simultaneously, connect a test meter to pin 11 (positive) and pin 9 (negative) of connector “X14” at the control console and check that the voltage is between 7.5 and 8.5 V.
If the value is within range, check the continuity of the wiring and make certain there are no short circuits to earth or to a positive leg of the power harness between the lift control unit and the lift control console.

CHECK

- Check that the contacts on connector “X14” of the lift control console and on connectors “JX1” and “JX2” of the lift control unit are all firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the lift control panel is correct (8 V approx measured between pin 3 (positive) and pin 1 (negative) of connector “EHR”)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 10 of connector “X14” and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pin 10 of connector “X14” and to chassis earth, and check to ensure there are no short circuits to positive (meter reading: 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 8 and pin 18 of connector “JX1”, and measure the resistance: the reading should be between about 220 Ohm and about 1150 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..



D0017680

Extended alarm: 72

Standard alarm: 23

SetPoint Potent.

DESCRIPTION

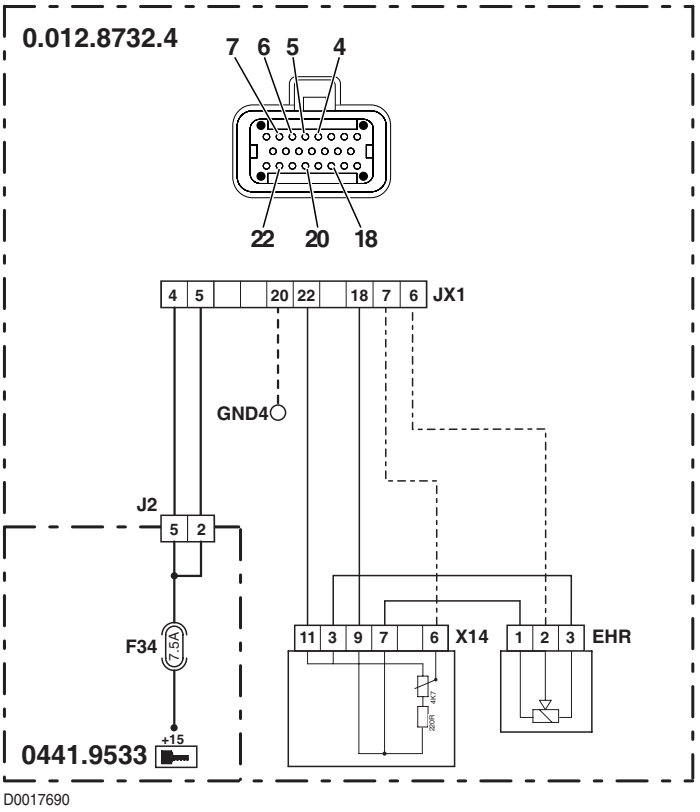
The control unit detects that the depth potentiometer is disconnected or short-circuiting.

NOTA

In the event of the "DownSpeedPotent.", "SetPoint Potent.", "CtrlMode Potent.", "MaxHeightPotent." and "Hitch-ControlLev." alarms being displayed simultaneously, connect a test meter to pin 11 (positive) and pin 9 (negative) of connector "X14" on the control unit, and check that the voltage is between 7.5 and 8.5 V.
If the value is within range, check the continuity of the wiring and make certain there are no short circuits to earth or to a positive leg of the power harness between the lift control unit and the lift control console.

CHECK

- Check that the contacts on connector "X14" of the lift control console and on connectors "JX1" and "JX2" of the lift control unit are all firmly attached and not oxidised.
- With the starter key in the "I" (ON) position, check that the power input to the lift control panel is correct (8 V approx measured between pin 3 (positive) and pin 1 (negative) of connector "EHR")
- With the starter key in the "O" (OFF) position, connect a test meter to pin 6 of connector "X14" and to cab earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With the starter key in the "I" (ON) position, connect a test meter to pin 6 of connector "X14" and to chassis earth, and check to ensure there are no short circuits to positive (meter reading: 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 7 and pin 18 of connector "JX1", and measure the resistance: the reading should be between about 220 Ohm and about 1150 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.



Extended alarm: **73**

Standard alarm: **36**

CtrlMode Potent.

DESCRIPTION

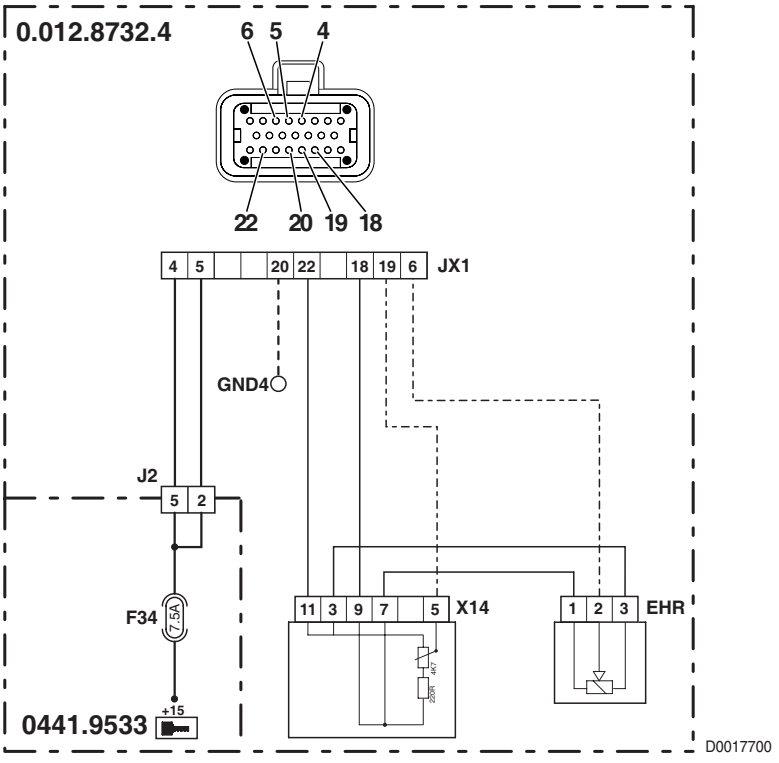
The control unit detects that the MIX potentiometer is disconnected or short-circuiting.

NOTA

In the event of the "DownSpeedPotent.", "SetPoint Potent.", “CtrlMode Potent.”, “MaxHeightPotent.” and “Hitch-ControlLev." alarms being displayed simultaneously, connect a test meter to pin 11 (positive) and pin 9 (negative) of connector “X14” at the control console and check that the voltage is between 7.5 and 8.5 V.
If the value is within range, check the continuity of the wiring and make certain there are no short circuits to earth or to a positive leg of the power harness between the lift control unit and the lift control console.

CHECK

- Check that the contacts on connector “X14” of the lift control console and on connectors “JX1” and “JX2” of the lift control unit are all firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the lift control panel is correct (8 V approx measured between pin 3 (positive) and pin 1 (negative) of connector “EHR”)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 5 of connector “X14” and to cab earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position, connect a test meter to pin 5 of connector “X14” and to chassis earth, and check to ensure there are no short circuits to positive (meter reading: 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 19 and pin 18 of connector “JX1”, and measure the resistance: the reading should be between about 220 Ohm and about 1150 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.



Extended alarm: **74**

Standard alarm: **24**

MaxHeightPotent.

DESCRIPTION

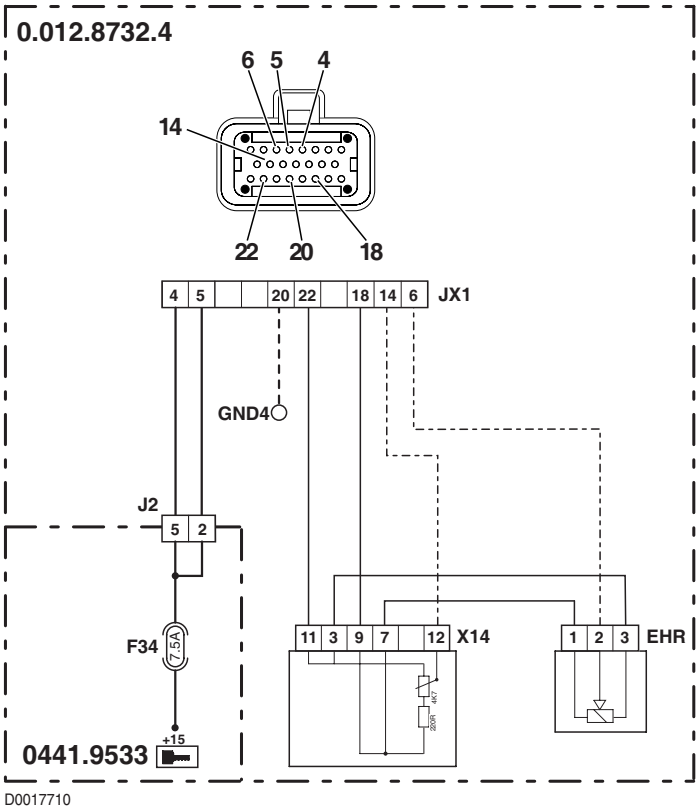
The control unit detects that the maximum lift height potentiometer is disconnected or short-circuiting.

NOTE

In the event of the "DownSpeedPotent.", "SetPoint Potent.", "CtrlMode Potent.", "MaxHeightPotent." and "Hitch-ControlLev." alarms being displayed simultaneously, connect a test meter to pin 11 (positive) and pin 9 (negative) of connector "X14" on the control unit and check that the voltage is between 7.5 and 8.5 V.
If the value is within range, check the continuity of the wiring and make certain there are no short circuits to earth or to a positive leg of the power harness between the lift control unit and the lift control console.

CHECK

- Check that the contacts on connector "X14" of the lift control console and on connectors "JX1" and "JX2" of the lift control unit are all firmly attached and not oxidised.
- With the starter key in the "I" (ON) position, check that the power input to the lift control panel is correct (8 V approx measured between pin 3 (positive) and pin 1 (negative) of connector "EHR")
- With the starter key in the "O" (OFF) position, connect a test meter to pin 12 of connector "X14" and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With the starter key in the "I" (ON) position, connect a test meter to pin 12 of connector "X14" and to chassis earth, and check that there are no short circuits to positive (meter reading: 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 14 and pin 18 of connector "JX1", and measure the resistance: the reading should be between about 220 Ohm and about 1150 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..



Extended alarm: 76
Standard alarm: 54

EEPROM :OPTION

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 77
Standard alarm: 54

EEPROM : SPEED

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 78
Standard alarm: 54

EEPROM : CALIB

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 81
Standard alarm: 55

EEPROM : CTRL

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 82
Standard alarm: 55

EEPROM : PWM

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 83
Standard alarm: 55

EEPROM : DRAFT

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 84
Standard alarm: 55

EEPROM : SLIP

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 85
Standard alarm: 55

EEPROM : POS

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 86
Standard alarm: 55

EEPROM : AB

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 87
Standard alarm: 55

EEPROM : SFCFG

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

Extended alarm: 88
Standard alarm: 55

EEPROM : SLCFG

DESCRIPTION

The control unit detects a bad reading of data from EEPROM.

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.

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5.2 LIST OF TRANSMISSION CONTROL UNIT ALARMS

The transmission control unit warns the operator of any malfunction affecting monitored components, by way of audible signals, and messages generated in the display on the right hand front upright of the cab.
A fault is indicated by the appearance of a symbol (key) in the display, accompanied by a code and in certain instances by an acoustic signal.

In the event of two or more alarms being activated simultaneously, the display will show only the one with the higher code.

All alarms presented on the display correspond directly to the alarm conditions detected via EDS, apart from a certain number associated with malfunction of the connection between the control unit and the display, which are shown on the display with the “EE” alarm code.

In addition to coded alarms, there are also conditions in which the control unit is unable to diagnose the cause of the fault; these are identifiable from abnormalities in operation of the transmission.

Depending on the severity of the fault by which it is triggered, a given alarm can have a limiting effect on the way the transmission is managed.
In many instances, where the fault is not serious, a warning appears in the display and the operation of the transmission remains substantially unaffected, whereas in other cases, the warning is displayed and operation will be totally inhibited, or in less serious cases, simply limited.

5.2.1 ABNORMALITIES NOT DETECTED BY THE TRANSMISSION CONTROL UNIT

Abnormality	Pag.
EDS software unable to connect to the transmission control unit (GEN1)	20-136
Transmission slips unexpectedly from forward or reverse drive into neutral (GEN2)	20-137
Transmission continues to shift range automatically every 1 or 2 seconds (GEN3)	20-137
Momentary loss of traction with the tractor in motion (GEN4)	20-138
Transmission stays permanently in neutral (GEN5)	20-138

5.2.2 ALARMS INDICATED ON THE TRANSMISSION DISPLAY AND BY THE EDS PROGRAM

Alarm code	Alarm description	Operating mode	Page
11	The control unit detects errors in the main clutch calibration values.		20-84
12	The control unit detects a problem with the power input to the transmission oil temperature sensor.		20-85
13	The control unit detects a problem with the power input to the temperature sensor.		20-86
14	The control unit detects a discrepancy between the speeds sensed at the main clutch input and at the transmission output, indicated by the status of the start enable sensor (which indicates whether the transmission is in neutral or gears are engaged)		20-87
15	The control unit detects that the transmission oil low pressure indicator light is disconnected		20-88

Alarm code	Alarm description	Operating mode	Page
16	The control unit detects a short circuit to earth on the control line of the Infocenter light indicating low transmission oil pressure		20-89
17	The control unit detects a short circuit to positive on the control line of the Infocenter light indicating low transmission oil pressure		20-90
18	The control unit detects a discrepancy between the oil pressure reading and the operating status of the transmission		20-91
19	The control unit detects the transmission display control signal short-circuiting to earth		20-92
20	The control unit detects the transmission display control signal short-circuiting to positive		20-93
21	The control unit detects a ground speed higher than the permissible limit		20-94
22	The control unit detects a transmission oil temperature higher than the permissible limit with the machine operating in “FIELD” mode		20-94
23	The control unit detects a transmission oil temperature higher than the permissible limit with the machine operating in “ROAD” mode.		20-94
24	The control unit detects the main clutch running overspeed.		20-95
36	The control unit detects that solenoid Y4 is either not connected or faulty.	Stand-by strategy	20-96
37	The control unit detects that the control line of solenoid Y4 is short-circuiting to earth	Stand-by strategy	20-97
38	The control unit detects that the control line of solenoid Y4 is short-circuiting to positive	Stand-by strategy	20-98
39	The control unit detects that solenoid Y2 is either not connected or faulty.	Stand-by strategy	20-99
40	The control unit detects that the control line of solenoid Y1 is short-circuiting to earth	Stand-by strategy	20-100
41	The control unit detects that the control line of solenoid Y1 is short-circuiting to positive	Stand-by strategy	20-101
47	The control unit detects that the rpm sensor nAb is disconnected or short-circuiting to positive	Limp-Home	20-102
48	The control unit detects that the rpm sensor nAb is short-circuiting to earth	Limp-Home	20-103
49	The control unit detects unreliable information coming from the rpm sensor nAb	Limp-Home	20-104
50	The control unit detects that the rpm sensor nHk is disconnected or short-circuiting to positive	Limp-Home	20-105
51	The control unit detects that the rpm sensor nHk is short-circuiting to earth	Limp-Home	20-106
52	The control unit detects unreliable information coming from the rpm sensor nHk	Limp-Home	20-107

Alarm code	Alarm description	Operating mode	Page
53	The control unit detects that the rpm sensor nLsa is disconnected or short-circuiting to positive	Limp-Home	20-108
54	The control unit detects that the rpm sensor nLsa is short-circuiting to earth	Limp-Home	20-109
55	The control unit detects unreliable information coming from the rpm sensor nLsa	Limp-Home	20-110
56	The control unit detects that the rpm sensor nLse is disconnected or short-circuiting to positive	Limp-Home	20-111
57	The control unit detects that the rpm sensor nLse is short-circuiting to earth	Limp-Home	20-112
58	The control detects unreliable information coming from the rpm sensor nLse	Limp-Home	20-113
64	The control detects a conflict in the information received from the clutch pedal position sensor and clutch pedal depressed sensor, regarding the position of the pedal	Emergency drive	20-114
65	The control unit detects that the clutch pedal position sensor is disconnected or short-circuiting to earth	Emergency drive	20-115
66	The control unit detects that the clutch pedal position sensor is short-circuiting to positive	Emergency drive oppure TC-Shutdown	20-116
67	The control unit detects that the power input to the clutch pedal position sensor is less than the prescribed value	Emergency drive oppure TC-Shutdown	20-117
68	The control unit detects that the power input to the clutch pedal position sensor is higher than the correct value	Emergency drive oppure TC-Shutdown	20-118
69	The control unit detects one or more threshold values of the clutch pedal position sensor out of range.	Emergency drive oppure TC-Shutdown	20-119
70	The control unit detects that the calibration values of the clutch pedal have not been saved correctly due to a defect in the EEPROM memory locations, or that the clutch pedal has never been calibrated	Emergency drive oppure TC-Shutdown	20-119
76	The control unit detects that the proportional solenoid valve operating the main clutch is disconnected	TC-Shutdown	20-120
77	The control unit detects that the proportional solenoid valve operating the main clutch is short-circuiting to earth	TC-Shutdown	20-121
79	The control unit detects that the forward drive solenoid valve Y3 is disconnected	TC-Shutdown	20-122
80	The control unit detects that the forward drive solenoid valve Y3 is short-circuiting to earth	TC-Shutdown	20-123
82	The control unit detects that the reverse drive solenoid valve Y1 is disconnected	TC-Shutdown	20-124
83	The control unit detects that the reverse drive solenoid valve Y1 is short-circuiting to earth	TC-Shutdown	20-125

Alarm code	Alarm description	Operating mode	Page
85	The control unit detects a problem affecting the shuttle control lever.	Transmission shutdown	20-126
87	The control unit detects that the type of vehicle has not been programmed correctly	TC-Shutdown	20-127
89	The control unit detects an abnormal level of current drawn by the main clutch and forward/reverse solenoid valves Y1 and Y3	TC-Shutdown	20-128
90	The control unit detects an abnormal level of current drawn by the powershift solenoid valves	TC-Shutdown	20-129
91	The control unit detects a conflict between values read by the nLsa and nHk sensors, the position of the clutch pedal and the position of the creeper control lever	TC-Shutdown	20-130
92	The control unit has detected an abnormally high input voltage	Transmission shutdown oppure TC-Shutdown	20-131
93	The control unit has detected an abnormally low input voltage	Transmission shutdown oppure TC-Shutdown	20-131
94	The control unit detects that the main clutch solenoid valve is short-circuiting to positive	TC-Shutdown	20-132
95	The control unit detects that the forward drive solenoid valve Y3 is short-circuiting to positive	TC-Shutdown	20-133
96	The control unit detects that the reverse drive solenoid valve Y1 is short-circuiting to positive	TC-Shutdown	20-134
97	The control unit detects that the transmission ECU software has not been programmed correctly	TC-Shutdown	20-135
98	The control unit detects that transmission configuration data have not been programmed correctly.	TC-Shutdown	20-135
99	The control unit detects that machine configuration data have not been saved correctly (CHECKSUM ERROR)	TC-Shutdown	20-135
EE	The display detects a problem of communication with the transmission control unit.		20-136

5.2.3 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 - Stand-by strategy

3 - Emergency drive

4 - Transmission shutdown

5 - TC-Shutdown

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.

Stand-by 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 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.

Emergency drive

In this mode, the operation of the transmission is limited.

Whenever Emergency Drive cuts in, the powershift can no longer be used; the gears must be shifted with the mechanical linkage only.

The engagement curve of the main clutch reverts automatically to default parameters.

The main clutch can no longer be modulated by way of the clutch pedal (any pressure applied to the pedal will cause the main clutch to engage or disengage completely).

The power supply to the solenoid valves Y1, Y2, Y3, Y4 and Y5 is cut off.

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 can move off only from a completely motionless standing start, when the shuttle control lever has been in neutral position for more than 1 second.

To bring the transmission out of this mode, the fault must be rectified and the shuttle control lever returned to the “NEUTRAL” position.

Transmission 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 solenoid valves Y6, Y7 and Y8 is cut off.

To bring the transmission out of this mode, the fault must be rectified and the shuttle control lever returned to the “NEUTRAL” position.

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 powershift solenoid valves is cut off.

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

5.2.4 ANALYSIS OF ALARMS

ALARM N° 11

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.

ALARM N° 12

DESCRIPTION

The control unit detects a problem with the power input to the transmission oil temperature sensor.

NOTE

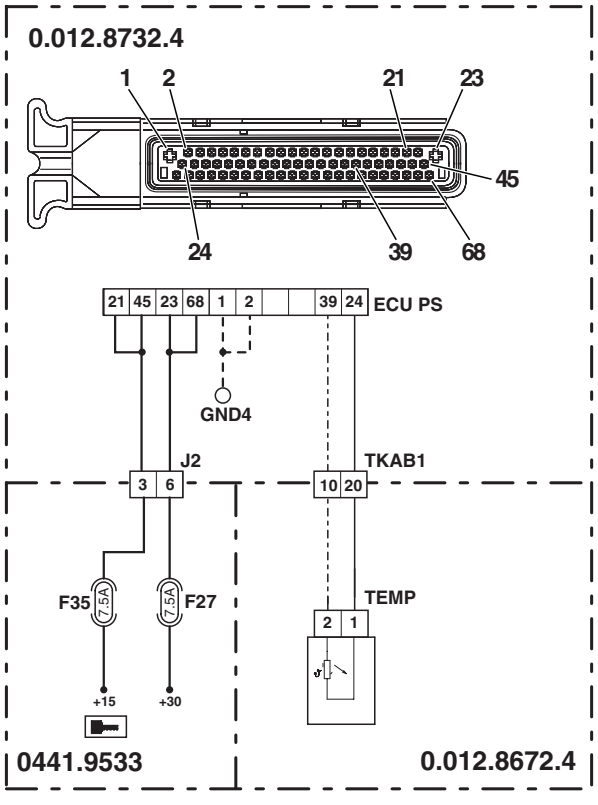
This alarm could be displayed as a result of alarms 66 and 68 being activated.

ECU RESPONSE

The control unit does not limit the operation of the transmission, but sets the transmission temperature to the "Transmission cold" default value (HK pedal holding time, splitter holding time, slip times).

CHECK

- Check that the contacts on connector "TEMP" and on that of the lift control unit, "ECU PS", are firmly attached and not oxidised.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 1 of connector "TEMP" and pin 24 of connector "ECU PS", 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 2 of connector "TEMP" and pin 39 of connector "ECU PS", and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- With connector "ECU PS" unplugged from the engine control unit and the starter key in the "I" (ON) position, connect a test meter to pin 1 of connector "TEMP" and to transmission earth, and check that there is no voltage registering (meter reading 0V).
- With connector "ECU PS" unplugged from the engine control unit and the starter key in the "I" (ON) position, connect a test meter to pin 2 of connector "TEMP" and to transmission 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 transmission control unit must be renewed.



D0017121

ALARM N° 13

DESCRIPTION

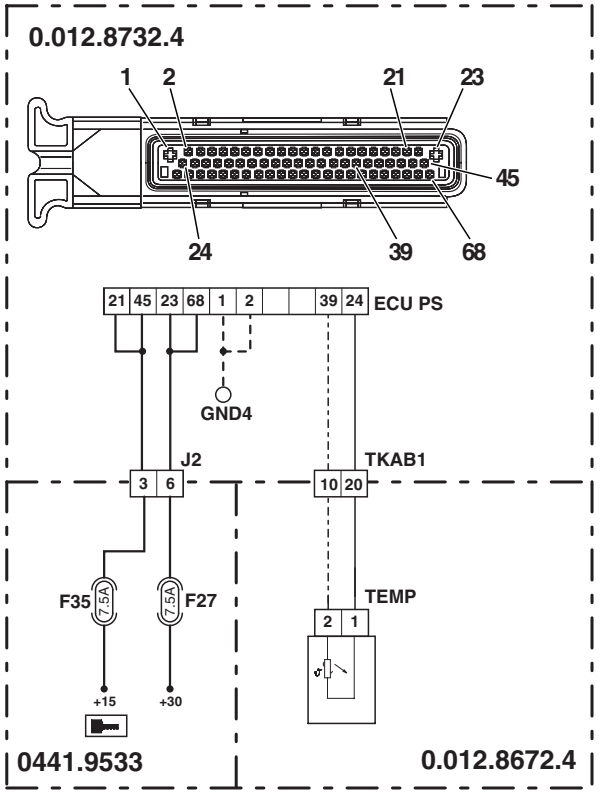
The control unit detects a problem with the power input to the temperature sensor.

ECU RESPONSE

The control unit does not limit the operation of the transmission, but sets the transmission temperature to the “Transmission cold” default value (HK pedal holding time, splitter holding time, slip times).

CHECK

- Check that the contacts on connector “TEMP” and on that of the lift control unit, “ECU PS”, are firmly attached and not oxidised.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “TEMP” and to transmission earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “TEMP” and to transmission earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0017121

ALARM N° 14

DESCRIPTION

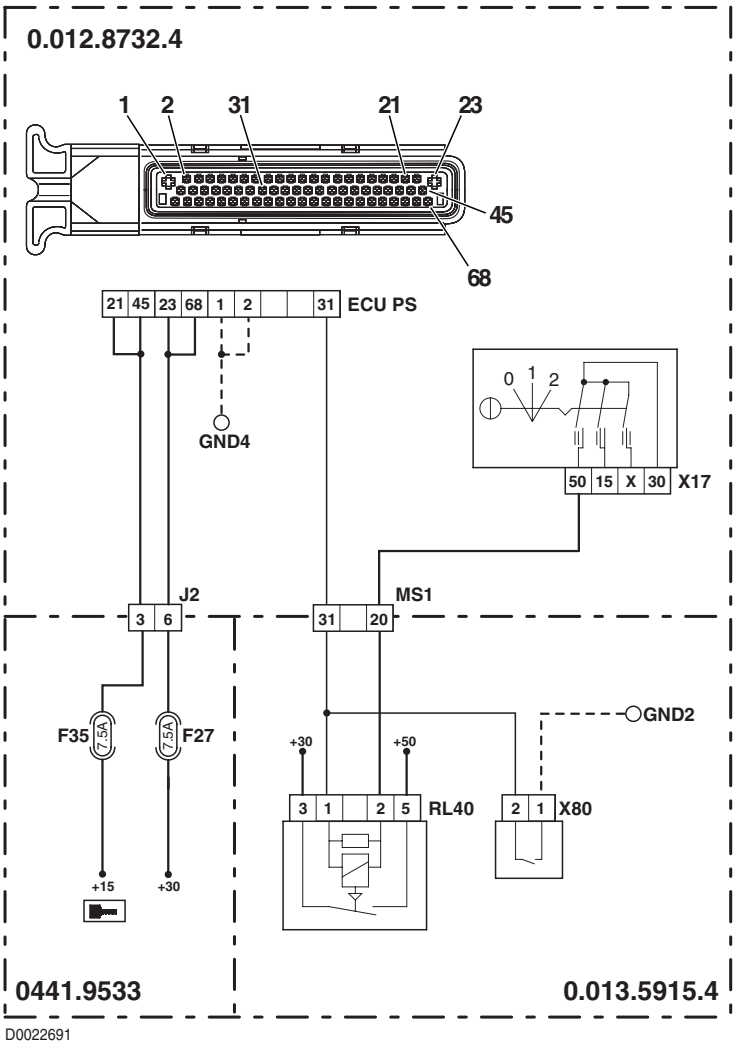
The control unit detects a discrepancy between the speeds sensed at the main clutch input and at the transmission output, indicated by the status of the start enable sensor (which indicates whether the transmission is in neutral or gears are engaged).

ECU RESPONSE

The control unit does not limit the operation of the transmission.

CHECK

- In the event that there are other alarms activated, relating to the main clutch speed sensor (nHk) and the engine speed sensor (nAb), verify the cause as described under the relative alarm headings before proceeding as follows.
- Check that the contacts on connector “X80” of the start enable switch and on the lift control unit “ECU PS” are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of relay “RL40” 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 transmission control unit must be renewed.



D0022691

ALARM N° 15

DESCRIPTION

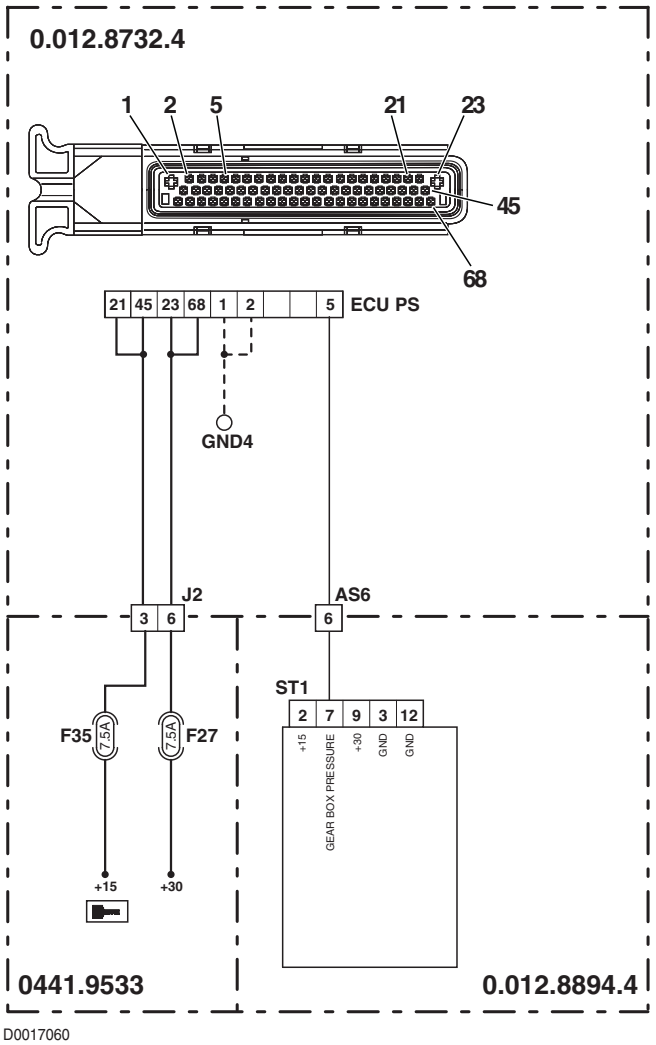
The control unit detects that the transmission oil low pressure indicator light is disconnected

ECU RESPONSE.

The control unit does not limit the operation of the transmission.

CHECK

- Check that the contacts on connector “ST1” of the Infocenter and on that of the lift control unit, “ECU PS”, are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 7 of connector “ST1” and pin 5 of connector “ECU PS”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- If the Infocenter installed is a type 2, check that the lamp of the transmission oil low pressure indicator is not burnt out.
- 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.



D0017060

ALARM N° 16

DESCRIPTION

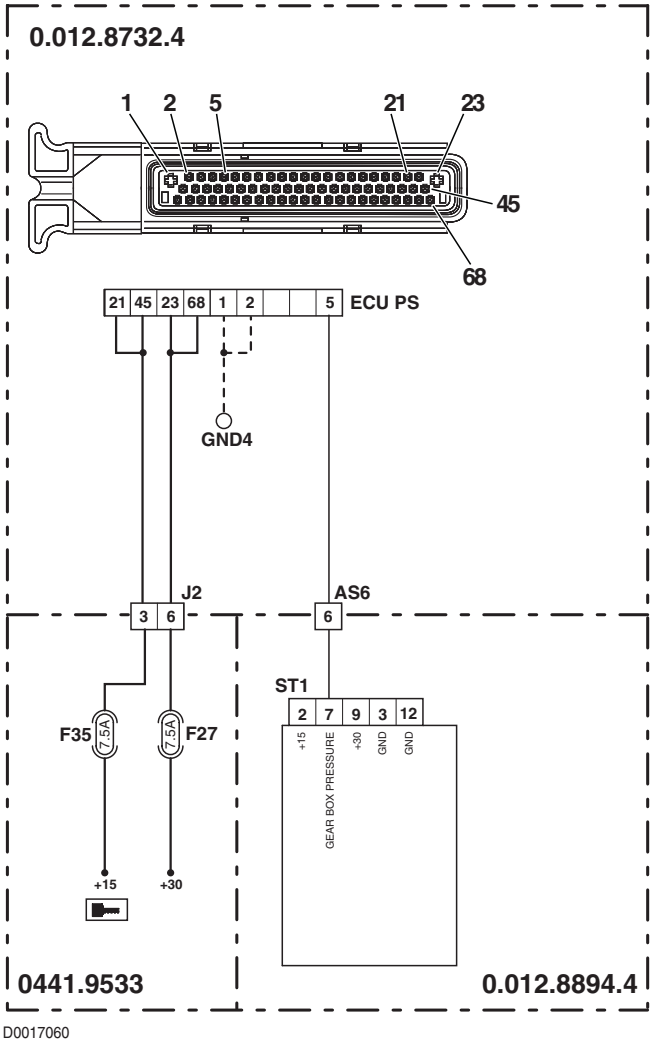
The control unit detects a short circuit to earth on the control line of the Infocenter light indicating low transmission oil pressure.

ECU RESPONSE

The control unit does not limit the operation of the transmission.

CHECK

- Check that the contacts on connector "ST1" of the Infocenter and on that of the lift control unit, "ECU PS", are firmly attached and not oxidised.
- With the starter key in the "O" (OFF) position and connector "ST1" unplugged, connect a test meter to pin 5 of connector "ECU PS" and to cab earth, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- If no short circuit to earth is discovered, fit a new Infocenter.
- 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.



D0017060

ALARM N° 17

DESCRIPTION

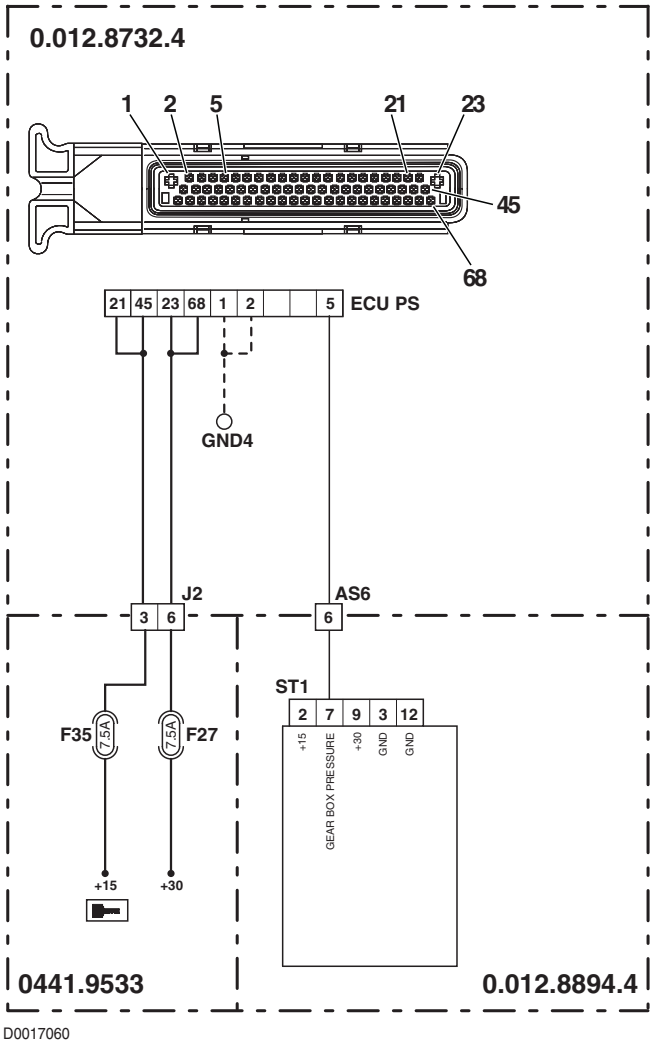
The control unit detects a short circuit to positive on the control line of the Infocenter light indicating low transmission oil pressure

ECU RESPONSE.

The control unit does not limit the operation of the transmission.

CHECK

- Check that the contacts on connector “ST1” of the Infocenter and on that of the lift control unit, “ECU PS”, are firmly attached and not oxidised.
- With the “ST1” connector unplugged from the Infocenter and the starter key in the “I” (ON) position, connect a test meter to pin 5 of connector “ECU PS” and to cab earth, and check that there is no voltage registering (meter reading 0V).
- If there is no voltage, fit a new Infocenter.
- 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.



D0017060

ALARM N° 18

DESCRIPTION

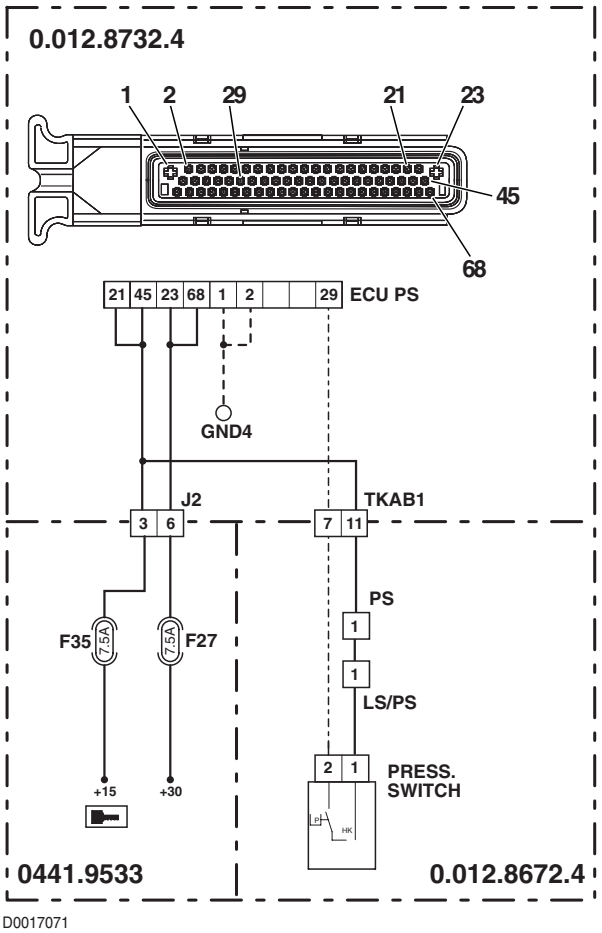
The control unit detects a discrepancy between the oil pressure reading and the operating status of the transmission

ECU RESPONSE

The control unit does not limit the operation of the transmission, but indicates the problem via the Infocenter

CHECK

- In the event that there are other alarms activated, relating to the engine rpm sensors (nLse), verify the cause as described under the relative alarm headings before proceeding as follows.
- Check that the contacts on the “PRESS. SWITCH” transmission oil pressure sensor and connector “ECU PS” of the lift control unit are firmly attached and not oxidised.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in the “I” (ON), position, check that the power input to the clutch pedal position sensor is correct (12V measured between pin 1 (positive) of connector “PRESS. SWITCH” and transmission earth)
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “PRESS. SWITCH” and pin 29 of connector “ECU PS”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Check the pressure in the hydraulic circuit of the transmission system.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the transmission control unit must be renewed.



D0017071

ALARM N° 19

DESCRIPTION

The control unit detects the transmission display control signal short-circuiting to earth

ECU RESPONSE

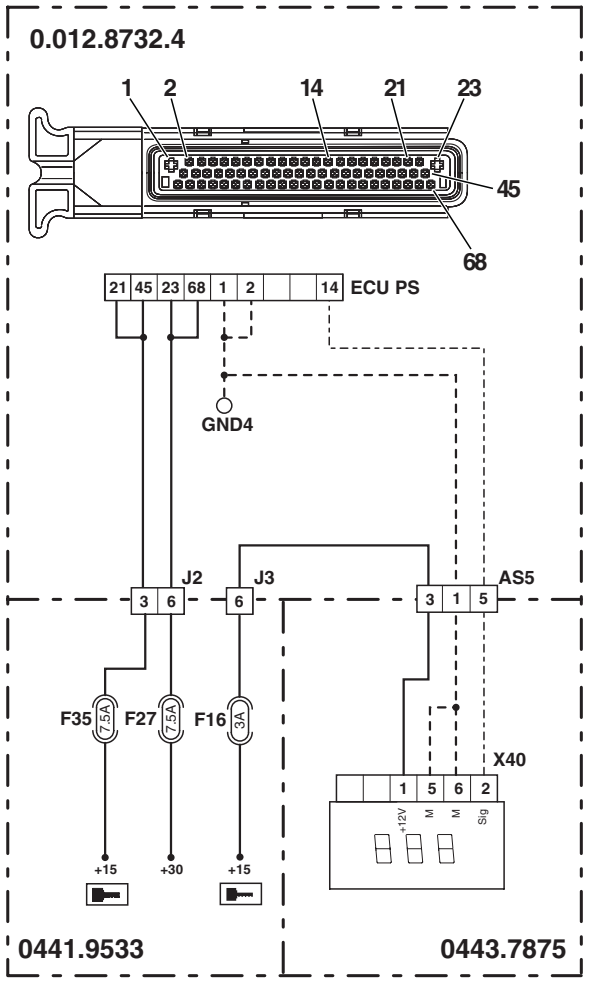
The control unit does not limit the operation of the transmission, but displays an error message “EE” and sounds a continuous beep

NOTE

Alarm code 19, detectable only by way of the EDS program.

CHECK

- Check that the contacts on connector “X40” of the display and on that of the lift control unit, “ECU PS”, are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position and connector “X40” unplugged, connect a test meter to pin 14 of connector “ECU PS” and to cab earth, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- If no short circuit to earth is discovered, fit a new display.
- 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.



D0017080

ALARM N° 20

DESCRIPTION

The control unit detects the transmission display control signal short-circuiting to positive.

ECU RESPONSE

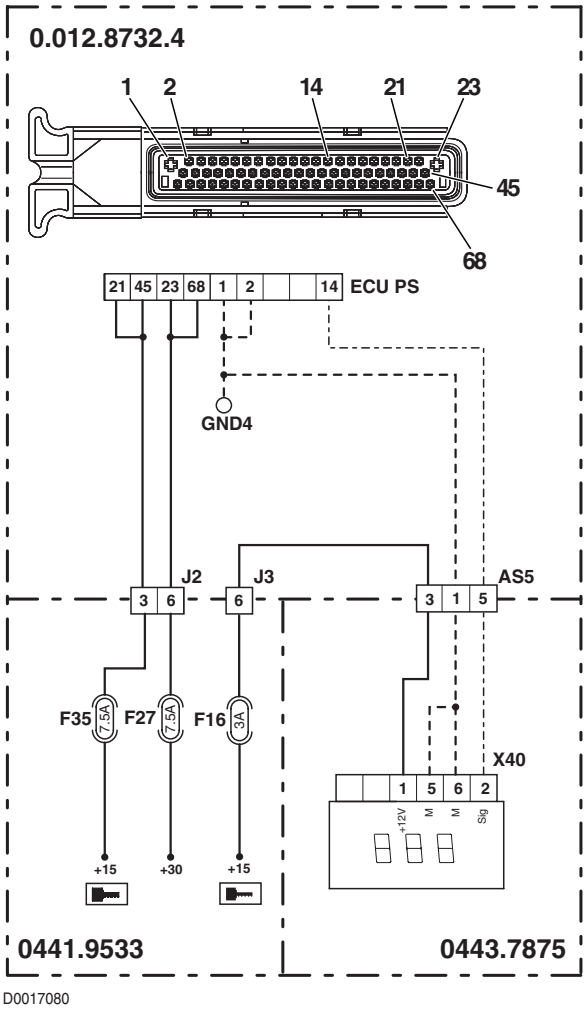
The control unit does not limit the operation of the transmission, but displays an error message “EE” and sounds a continuous beep.

NOTE

Alarm code 20, detectable only by way of the EDS program.

CHECK

- Check that the contacts on connector “X40” of the display and on that of the lift control unit, “ECU PS”, are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position and connector “X40” unplugged, connect a test meter to pin 14 of connector “ECU PS” and to cab earth, and check that there is no voltage registering (meter reading: 0V).
- If there is no voltage, fit a new display.
- 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.



D0017080

ALARM N° 21

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.

ALARM N° 22

DESCRIPTION

The control unit detects a transmission oil temperature higher than the permissible limit with the machine operating in “FIELD” mode.

ECU RESPONSE

The control unit does not limit the operation of the transmission, but when the alarm is activated, five beeps will be sounded in succession, and a single beep every two minutes thereafter.

CHECK

- Reduce the load on the transmission.
- Switch off the engine.

ALARM N° 23

DESCRIPTION

The control unit detects a transmission oil temperature higher than the permissible limit with the machine operating in “ROAD” mode.

ECU RESPONSE

The control unit does not limit the operation of the transmission, and does not display any alarm message.

CHECK

- Reduce ground speed
- fault code is not shown on the display
- temperature monitoring only if configured
- counter increments, if over temperature is pending (mark for duration)
- fault code erasable only with a special diagnostic service tool (security fault memory)

ALARM N° 24

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.

ALARM N° 36

DESCRIPTION

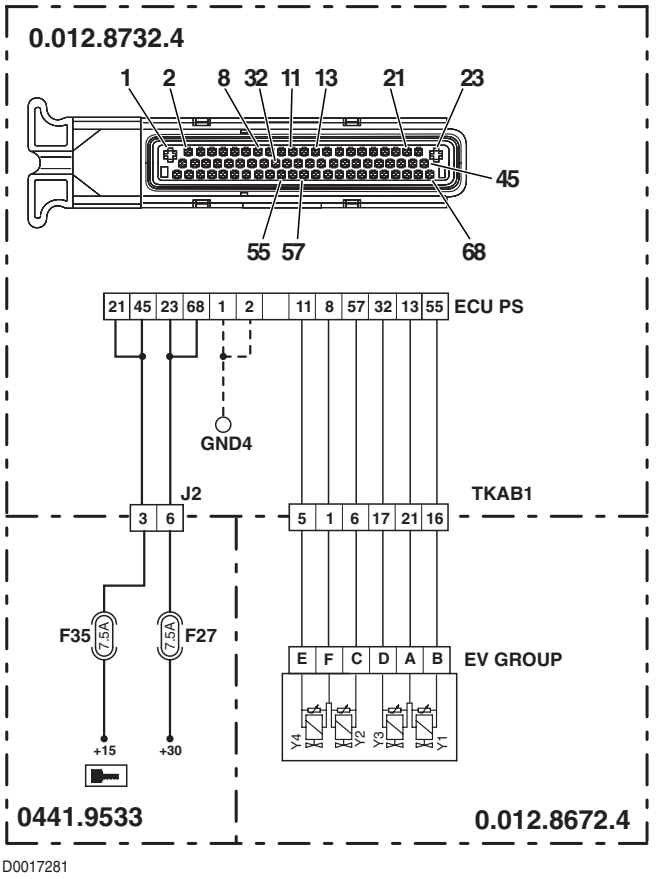
The control unit detects that solenoid Y4 is either not connected or faulty.

ECU RESPONSE

The control unit limits operation to "STAND-BY STRATEGY" mode.

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin E and pin F of connector “EV GROUP” 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 connector “EV GROUP” and pin 11 of connector “ECU PS”, 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.



D0017281

ALARM N° 37

DESCRIPTION

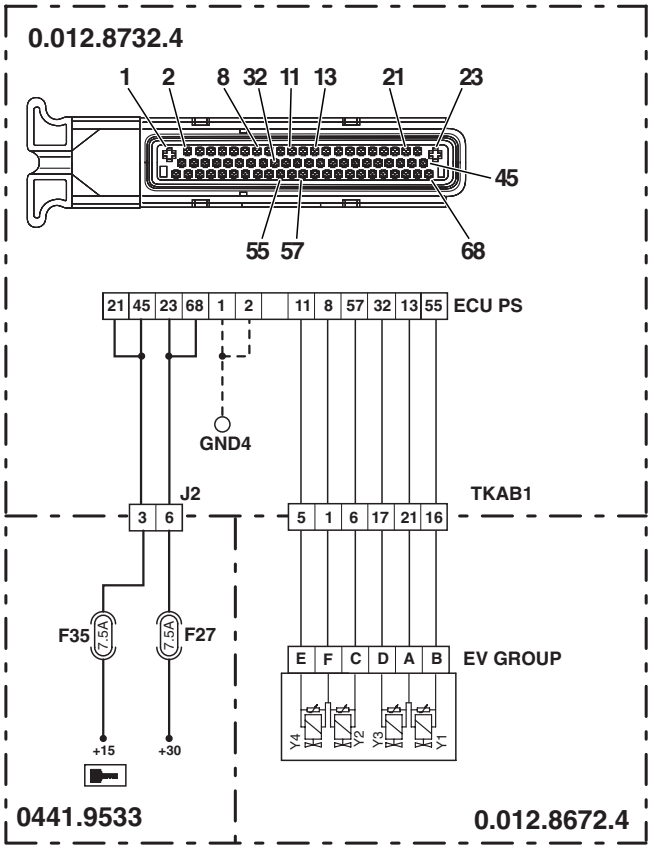
The control unit detects that the control line of solenoid Y4 is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to "STAND-BY STRATEGY" mode.

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin E and pin F of connector “EV GROUP” 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 connector “ECU PS” unplugged, connect a test meter to pin E of connector “EV GROUP” and to the frame earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin F of connector “EV GROUP” and to the frame earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin E and pin F of connector “EV GROUP”, and measure the resistance to verify that the wires are not short-circuiting one to another (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.



D0017281

ALARM N° 38

DESCRIPTION

The control unit detects that the control line of solenoid Y4 is short-circuiting to positive

ECU RESPONSE

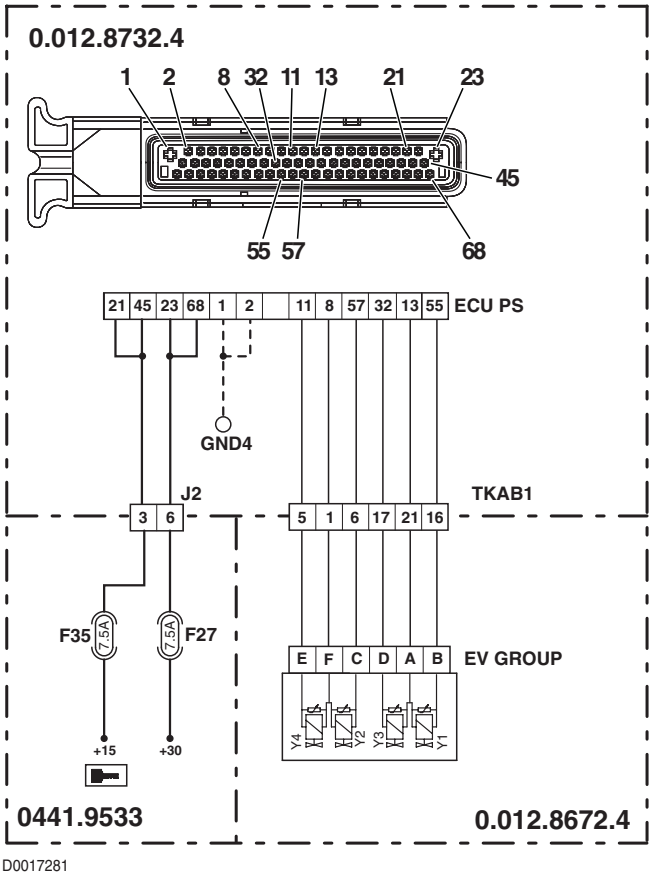
The control unit limits operation to "STAND-BY STRATEGY" mode.

NOTE

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

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, connect a test meter to pin E of connector “EV GROUP” and to transmission 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.



ALARM N° 39

DESCRIPTION

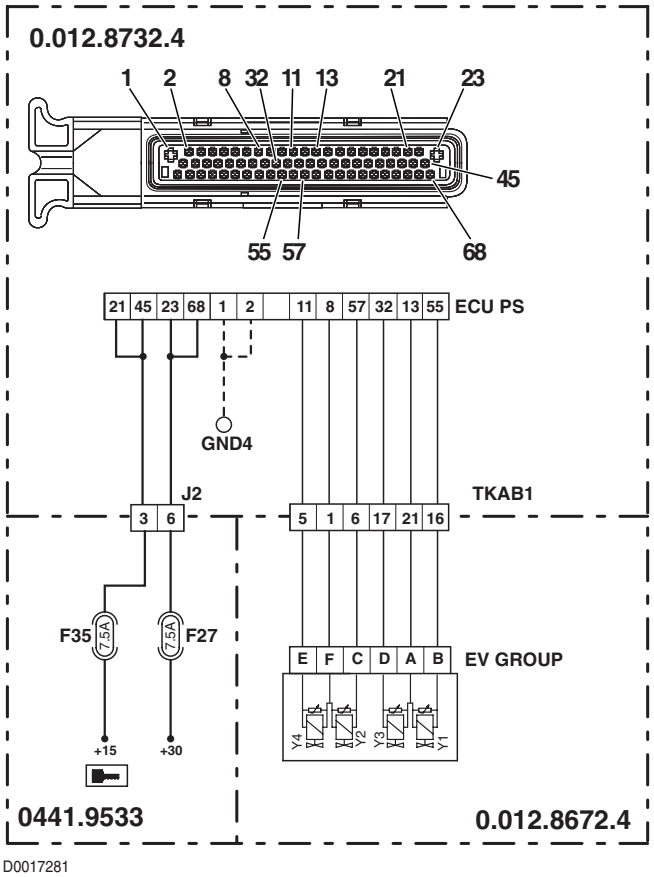
The control unit detects that solenoid Y2 is either not connected or faulty

ECU RESPONSE

The control unit limits operation to "STAND-BY STRATEGY" mode.

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin C and pin F of connector “EV GROUP” 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 connector “EV GROUP” and pin 57 of connector “ECU PS”, 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.



D0017281

ALARM N° 40

DESCRIPTION

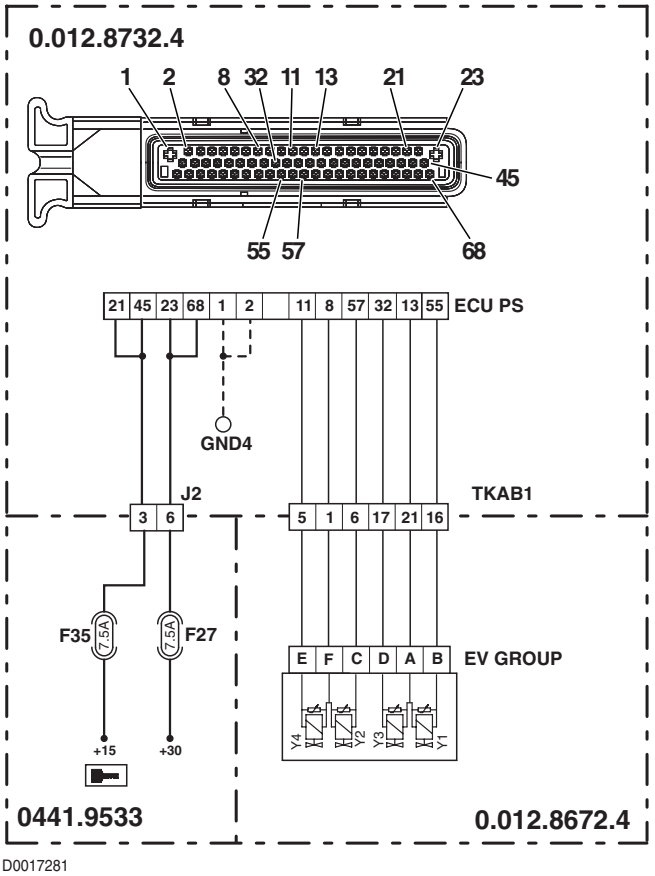
The control unit detects that the control line of solenoid Y2 is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to "STAND-BY STRATEGY" mode.

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin C and pin F of connector “EV GROUP” 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 connector “ECU PS” unplugged, connect a test meter to pin C of connector “EV GROUP” and to the frame earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin F of connector “EV GROUP” and to the frame earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin C and pin F of connector “EV GROUP”, and measure the resistance to verify that the wires are not short-circuiting one to another (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.



D0017281

ALARM N° 41

DESCRIPTION

The control unit detects that the control line of solenoid Y2 is short-circuiting to positive

ECU RESPONSE

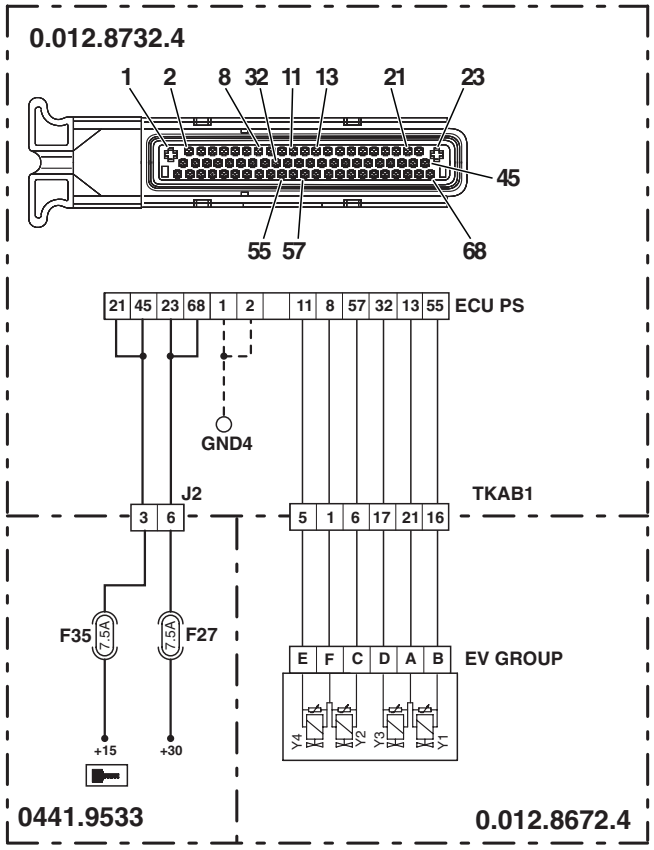
The control unit limits operation to "STAND-BY STRATEGY" mode.

NOTE

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

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, connect a test meter to pin C of connector “EV GROUP” and to transmission 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.



D0017281

ALARM N° 47

DESCRIPTION

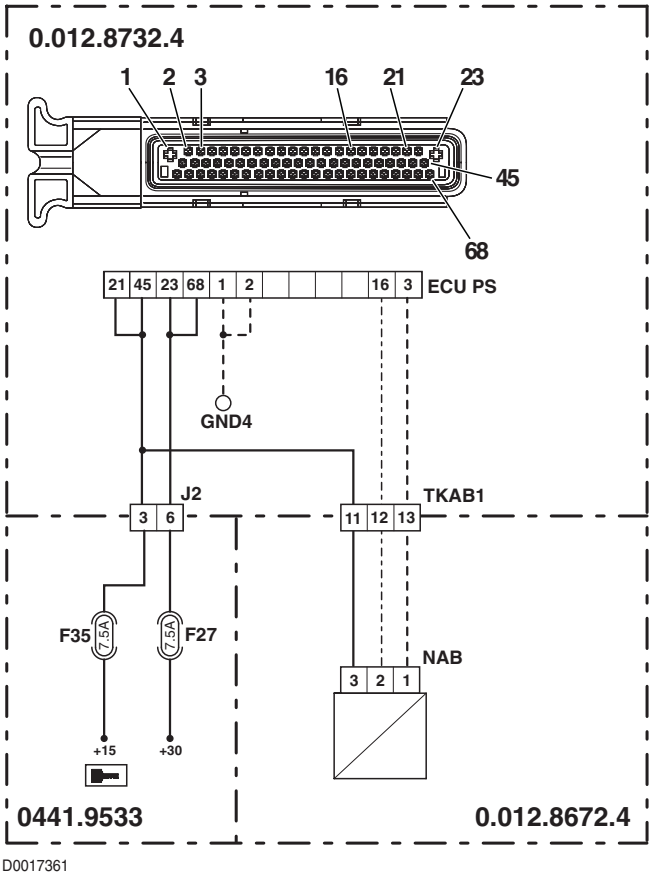
The control unit detects that the rpm sensor nAb is disconnected or short-circuiting to positive

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 connector “NAB” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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 “NAB”).
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin 1 of the“NAB” connector 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 “ECU PS”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



ALARM N° 48

DESCRIPTION

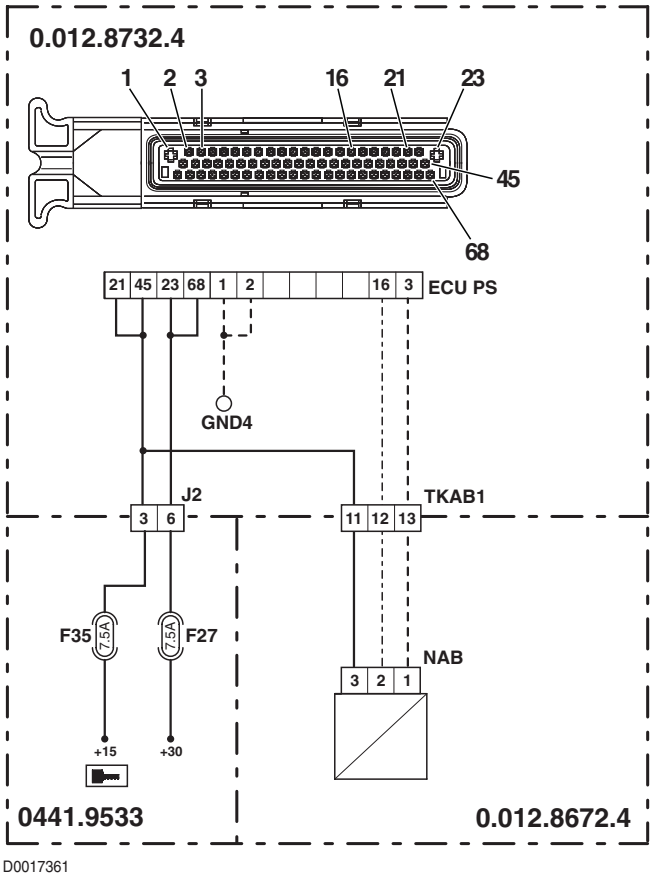
The control unit detects that the rpm sensor nAb is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NAB” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017361

ALARM N° 49

DESCRIPTION

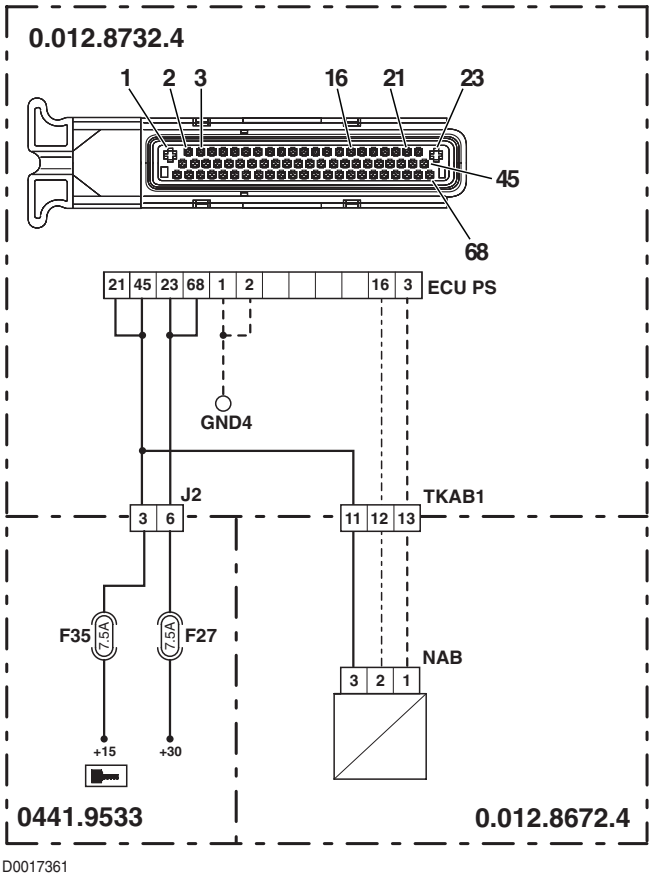
The control detects unreliable information coming from the rpm sensor nAb

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NAB” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- Verify the correct operation of the sensor (for technical details, see section 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 “NAB”).
- 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..



D0017361

ALARM N° 50

DESCRIPTION

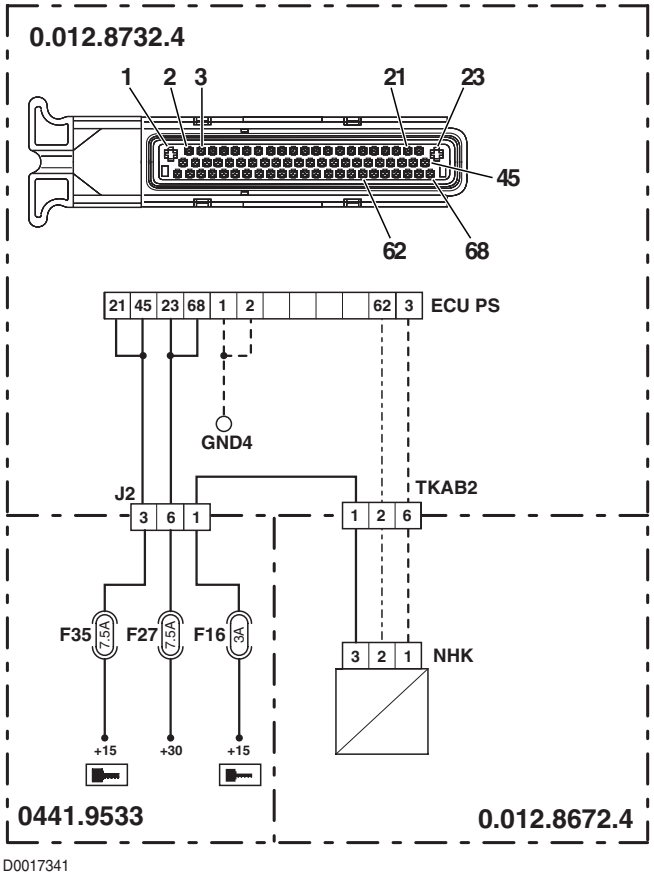
The control unit detects that the rpm sensor nHk is disconnected or short-circuiting to positive

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 connector “NHK” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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 “NHK”).
- With the starter key in the “I” (ON) position and connector “ECU PS” 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 62 of connector “ECU PS”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017341

ALARM N° 51

DESCRIPTION

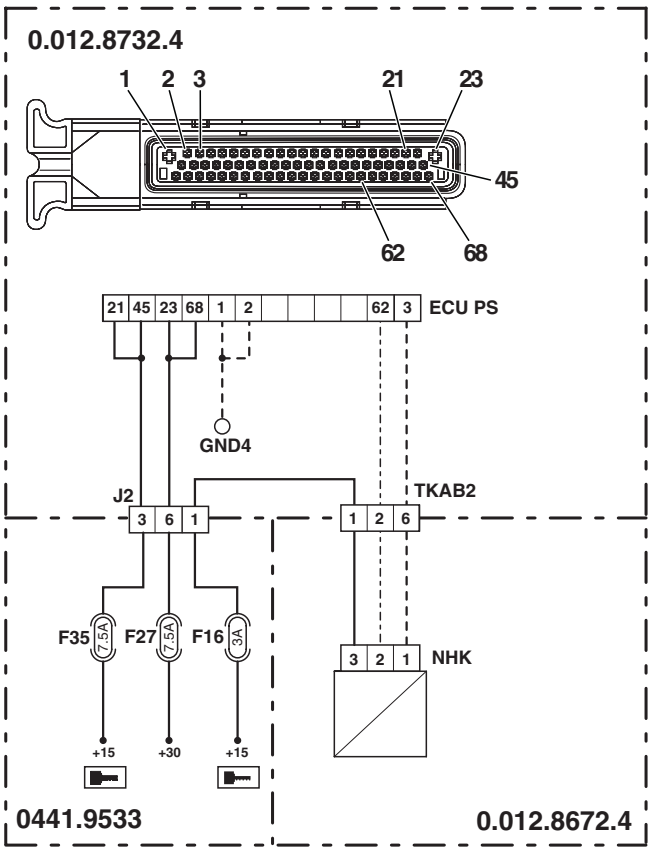
The control unit detects that the rpm sensor nHk is short-circuiting to earth.

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NHK” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017341

ALARM N° 52

DESCRIPTION

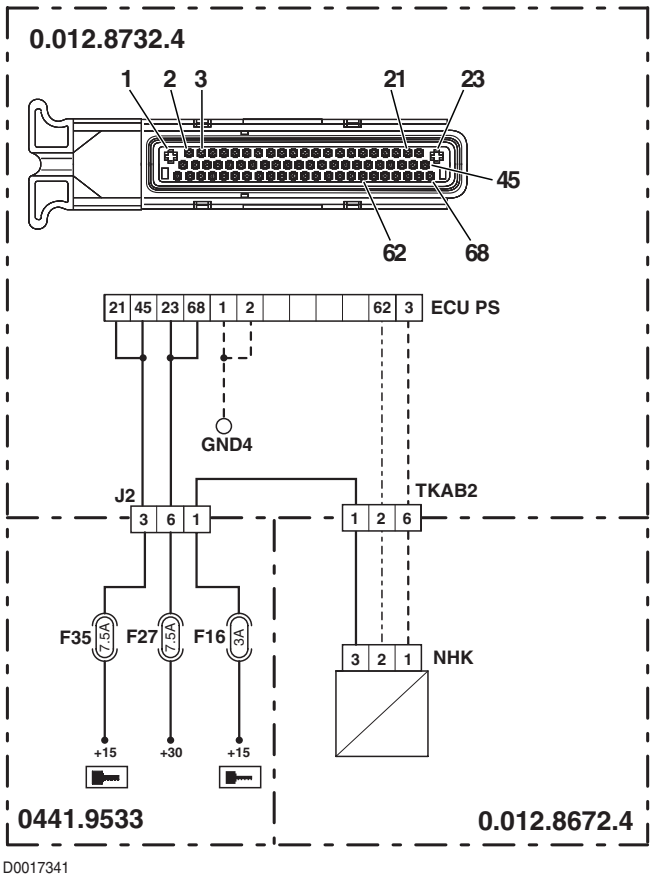
The control detects unreliable information coming from the rpm sensor nHk

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NHK” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- Verify the correct operation of the sensor (for technical details, see section 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 “NHK”).
- 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



D0017341

ALARM N° 53

DESCRIPTION

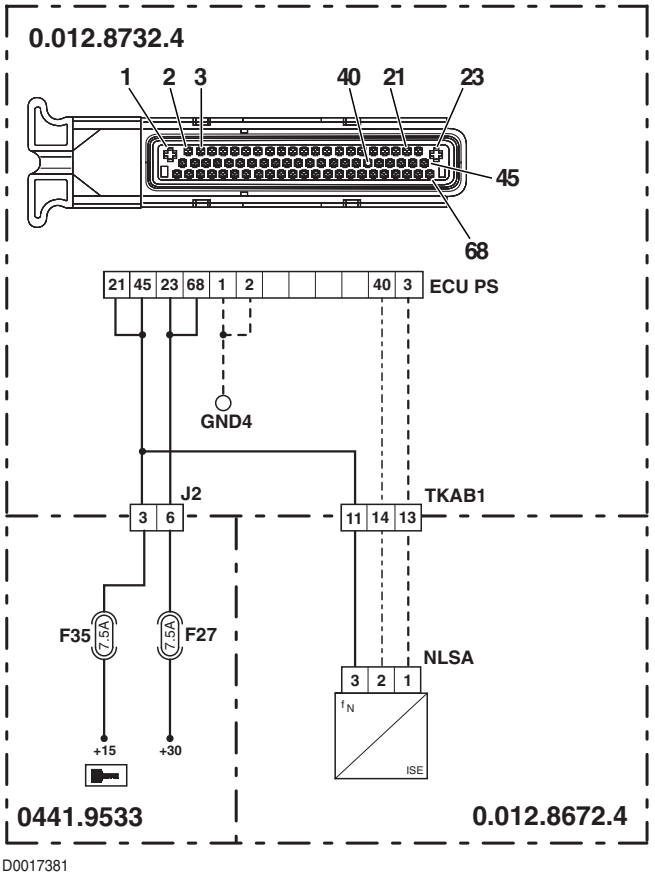
The control unit detects that the rpm sensor nLsa is disconnected or short-circuiting to positive

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 connector “NLSA” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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 “NLSA”).
- With the starter key in the “I” (ON) position and connector “ECU PS” 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 “ECU PS”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



ALARM N° 54

DESCRIPTION

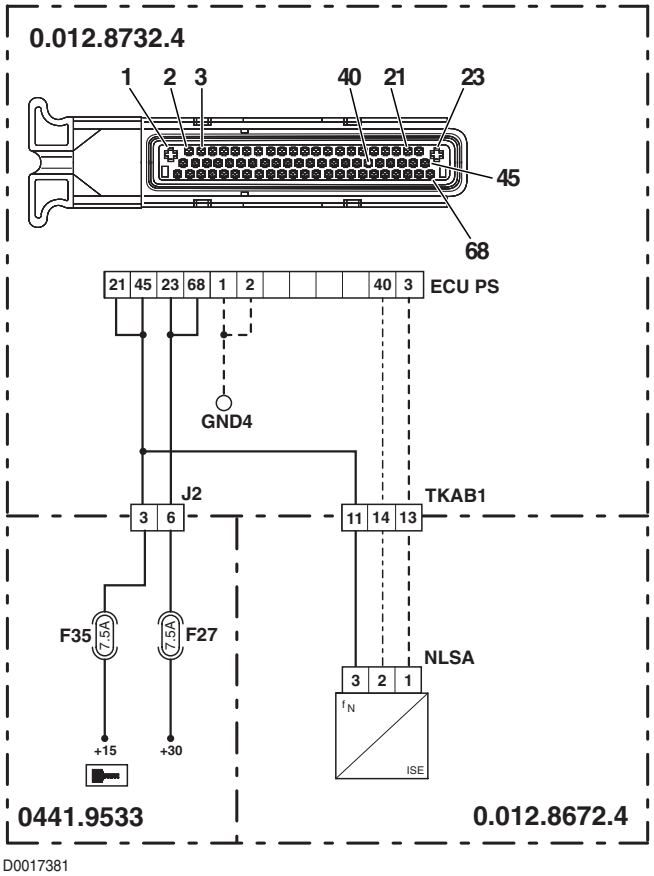
The control unit detects that the rpm sensor nLsa is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NLSA” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017381

ALARM N° 55

DESCRIPTION

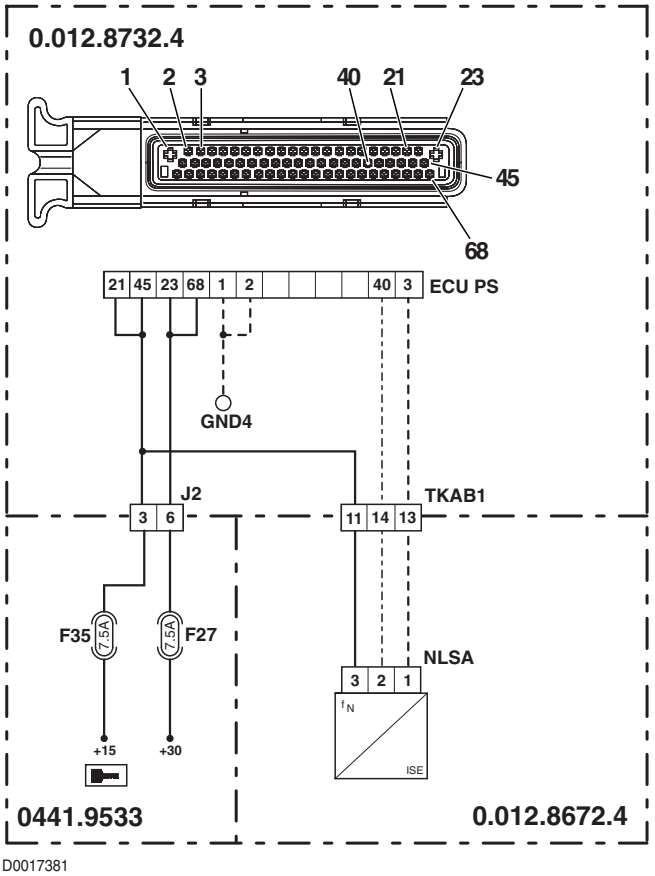
The control detects unreliable information coming from the rpm sensor nLsa

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NLSA” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in the “I” (ON) position, check that the power input to the transmission output speed sensor is correc (12V measured between pin 3 (positive) and pin 1 (negative) of connector “NLSA”).
- 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.



D0017381

ALARM N° 56

DESCRIPTION

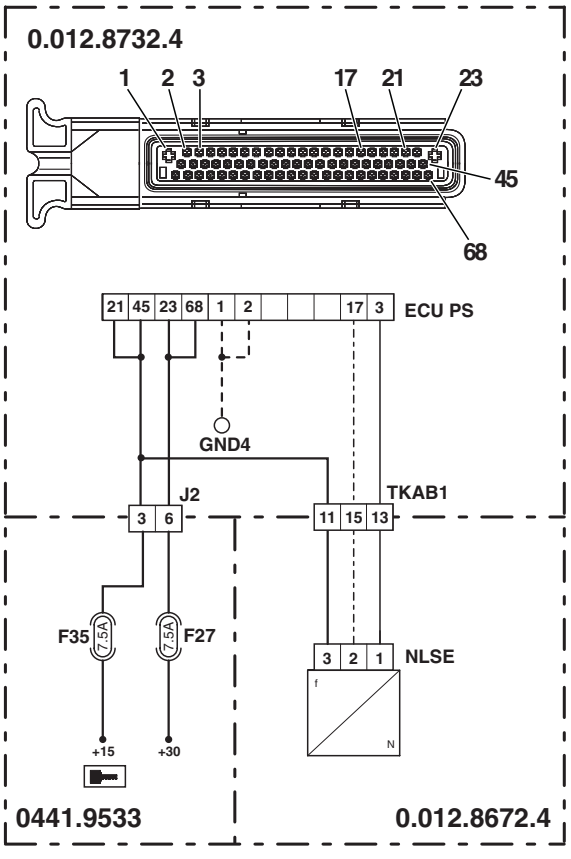
The control unit detects that the rpm sensor nLse is disconnected or short-circuiting to positive

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 connector “NLSE” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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 “ECU PS” 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 “ECU PS” , and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017541

ALARM N° 57

DESCRIPTION

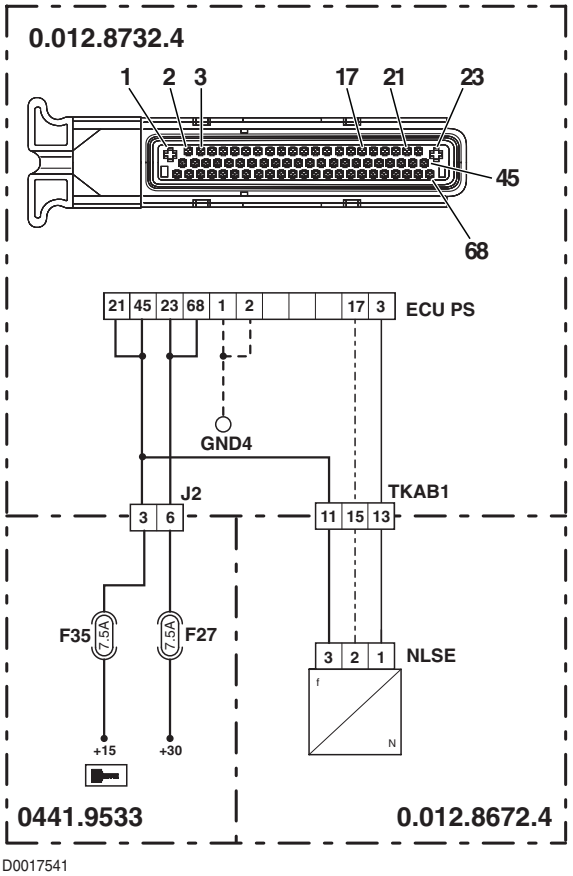
The control unit detects that the rpm sensor nLse is short-circuiting to earth

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NLSE” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “NLSE” and to transmission earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017541

ALARM N° 58

DESCRIPTION

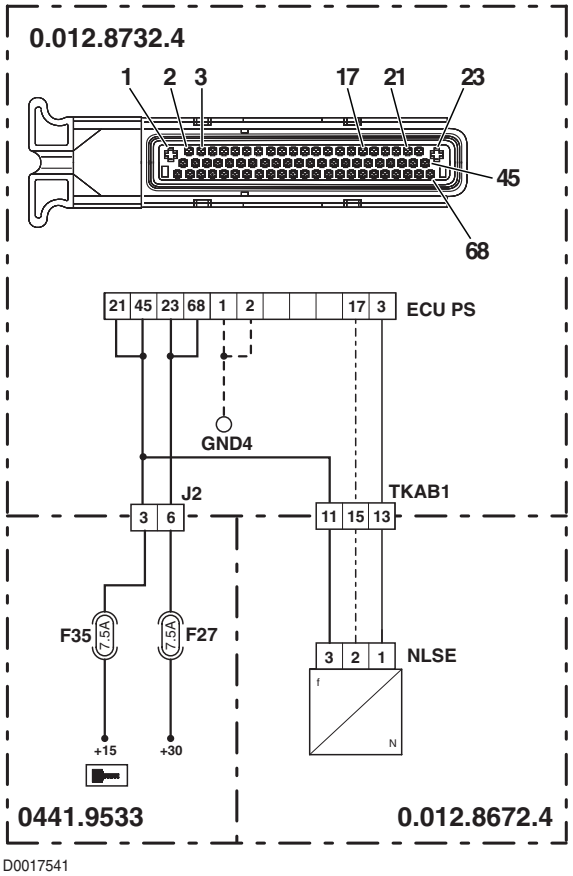
The control detects unreliable information coming from the rpm sensor nLse

ECU RESPONSE

The control unit limits operation to “LIMP-HOME” mode, and at the first attempt to shuttle in either direction, the transmission will revert to neutral, emitting a continuous beep.

CHECK

- Check that the contacts on connector “NLSE” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- Verify the correct operation of the sensor (for technical details, see section 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.



D0017541

ALARM N° 64

DESCRIPTION

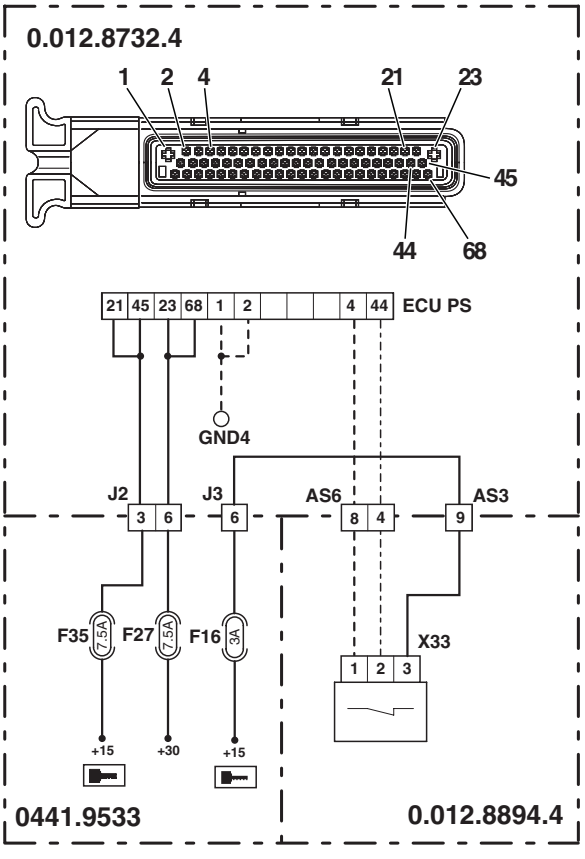
The control detects a conflict in the information received from the clutch pedal position sensor and clutch pedal depressed sensor, regarding the position of the pedal

ECU RESPONSE

The control unit limits operation to "EMERGENCY DRIVE" mode, the transmission reverts to neutral and a continuous beep is sounded.

CHECK

- In the event that there are other alarms activated, relating to the clutch pedal position sensor, verify the cause as described under the relative alarm headings before proceeding as follows.
- Check that the contacts on connector "X33" and on connector "ECU PS" of the transmission control unit are firmly attached and not oxidised.
- Perform the clutch pedal position sensor calibration procedure.
- Verify the correct operation of the clutch pedal depressed proximity sensor (for details see section 40)
- Verify the correct positioning of the clutch pedal depressed proximity sensor.
- 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.



D0017400

ALARM N° 65

DESCRIPTION

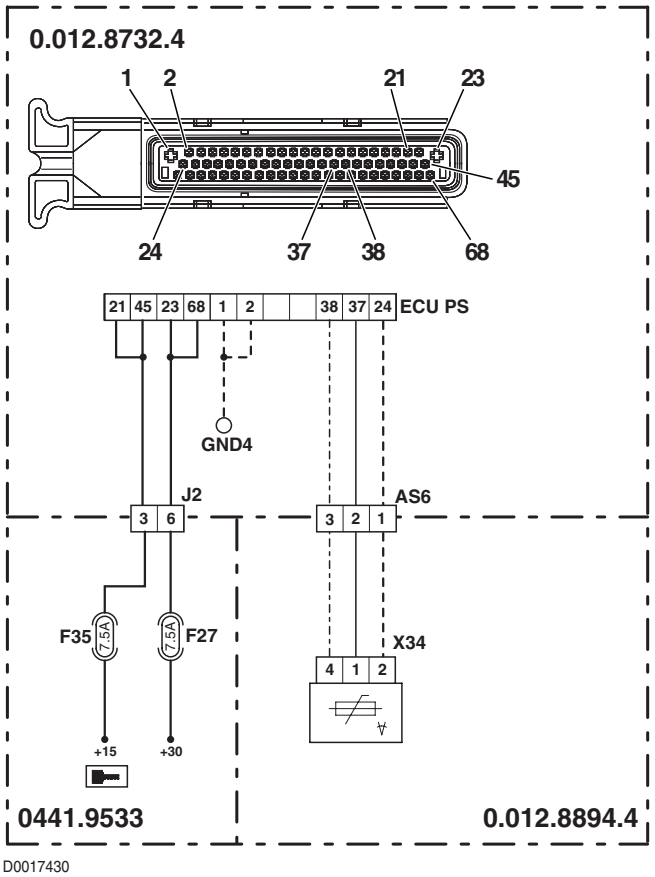
The control unit detects that the clutch pedal position sensor is disconnected or short-circuiting to earth

ECU RESPONSE

The control unit limits operation to "EMERGENCY DRIVE" mode, the transmission reverts to neutral and a continuous beep is sounded.

CHECK

- Check that the contacts on connector "X34" and on connector "ECU PS" of the transmission control unit are firmly attached and not oxidised.
- 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 connector "ECU PS" unplugged, connect a test meter to pin 2 of connector "X34" 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 4 of connector "X34" and to pin 38 of connector "ECU PS", and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017430

ALARM N° 66

DESCRIPTION

The control unit detects that the clutch pedal position sensor is short-circuiting to positive

ECU RESPONSE

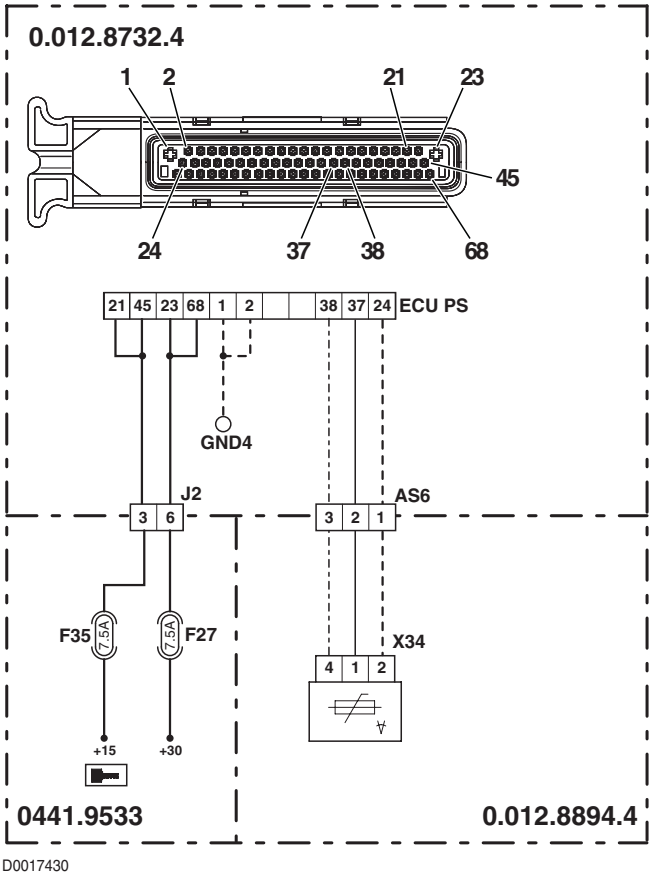
The control unit limits operation to "EMERGENCY DRIVE" mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to "TC-SHUTDOWN" mode.

NOTE

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

CHECK

- Check that the contacts on connector "X34" and on connector "ECU PS" of the transmission control unit are firmly attached and not oxidised.
- 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 2 (positive) and pin 1 (negative) of connector "X34").
- With the starter key in the "I" (ON) position and connector "ECU PS" unplugged, connect a test meter to pin 1 of connector "X34" and to cab earth, and check that there is no voltage registering (meter reading 0V).
- With the starter key in the "O" (OFF) position, connect a test meter to pin 4 of connector "X34" and to pin 38 of connector "ECU PS", and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017430

ALARM N° 67

DESCRIPTION

The control unit detects that the power input to the clutch pedal position sensor is lower than the correct value

ECU RESPONSE

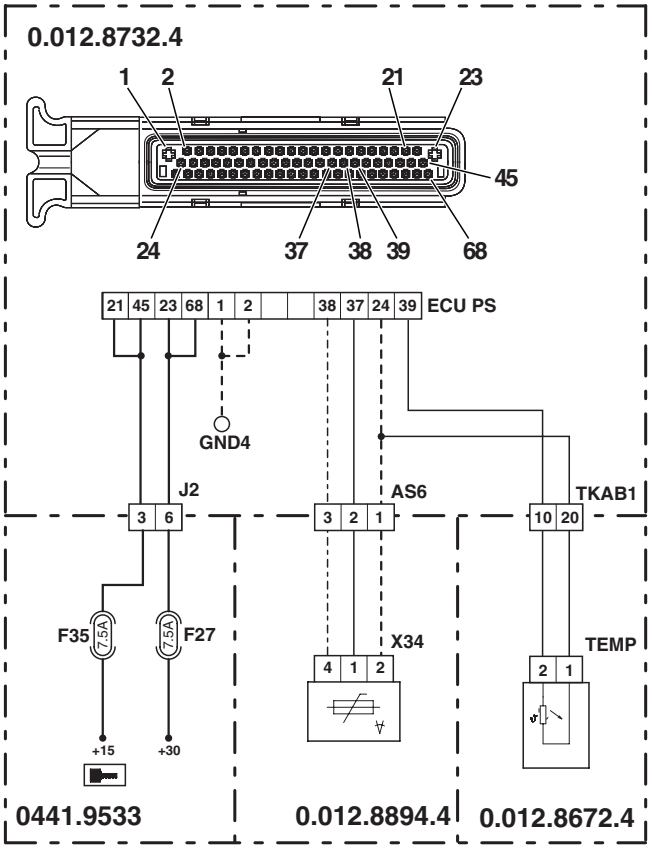
The control unit limits operation to "EMERGENCY DRIVE" mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to "TC-SHUTDOWN" mode.

NOTE

This alarm could be displayed as a result of alarm 69 being activated.

CHECK

- In the event that there are other alarms activated, relating to the clutch pedal position sensor or the transmission oil temperature sensor, verify the cause as described under the relative alarm headings before proceeding as follows.
- Check that the contacts on connector "X34" of the clutch pedal position sensor, connector "TEMP" of the transmission oil temperature sensor, and connector "ECU PS" of the transmission control unit, are all firmly attached and not oxidised.
- 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 2 (positive) and pin 1 (negative) of connector "X34").
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017441

ALARM N° 68

DESCRIPTION

The control unit detects that the power input to the clutch pedal position sensor is higher than the correct value

ECU RESPONSE

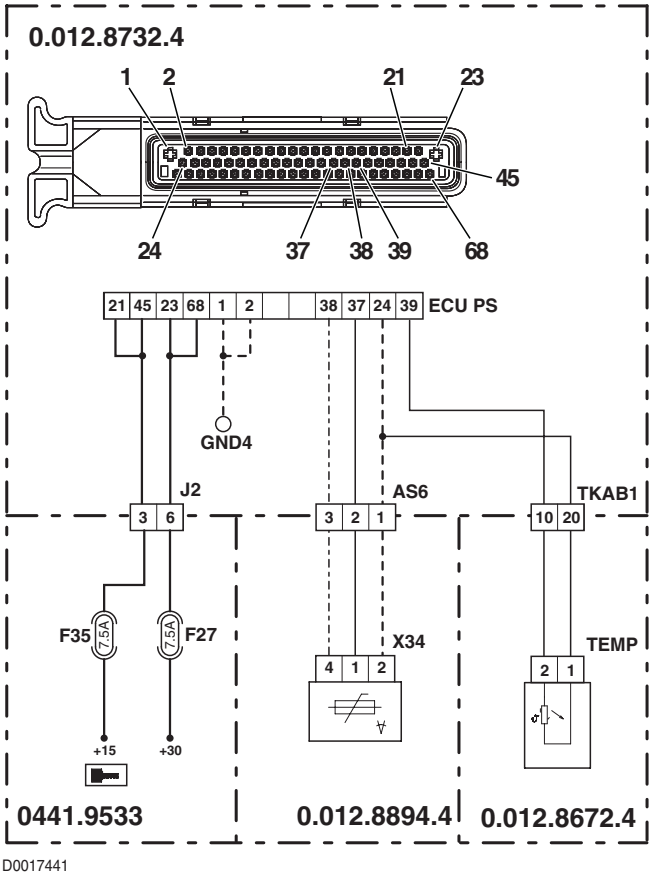
The control unit limits operation to "EMERGENCY DRIVE" mode, the transmission reverts to neutral and a continuous beep is sounded. In the event that one or more of alarms 85, 92 and 93 should also be activated, the transmission will be switched to "TC-SHUTDOWN" mode.

NOTE

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

CHECK

- In the event that there are other alarms activated, relating to the clutch pedal position sensor or the transmission oil temperature sensor, verify the cause as described under the relative alarm headings before proceeding as follows.
- Check that the contacts on connector "X34" of the clutch pedal position sensor, connector "TEMP" of the transmission oil temperature sensor, and connector "ECU PS" of the transmission control unit, are all firmly attached and not oxidised.
- 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 2 (positive) and pin 1 (negative) of connector "X34").
- Verify the correct operation of the sensor (for technical details, see section 40).
- Clear all alarms, turn the starter key first to "O" (OFF) and then back to the "I" (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017441

ALARM N° 69

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.

ALARM N° 70

DESCRIPTION

The control unit detects that the calibration values of the clutch pedal have not been saved correctly due to a defect in the EEPROM memory locations, or that the clutch pedal has never been calibrated

ECU RESPONSE

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

NOTE

This alarm could be displayed as a result of alarm 64 being activated.

CHECK

- Perform the clutch pedal 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.

ALARM N° 76

DESCRIPTION

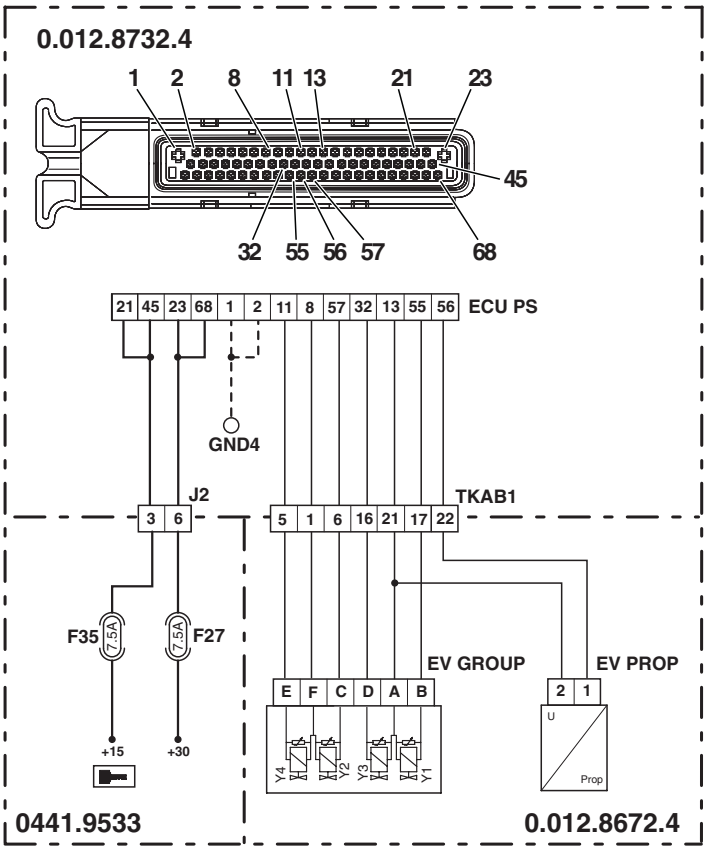
The control unit detects that the proportional solenoid valve operating the main clutch is disconnected

ECU RESPONSE

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

CHECK

- Check that the contacts on connector “EV PROP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “EV PROP” and to pin 56 of connector “ECU PS”, 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 2 of connector “EV PROP” and to pin 13 of connector “ECU PS”, and measure the resistance to verify the continuity of the circuit (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 connector “EV PROP” and 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.



D0017611

ALARM N° 77

DESCRIPTION

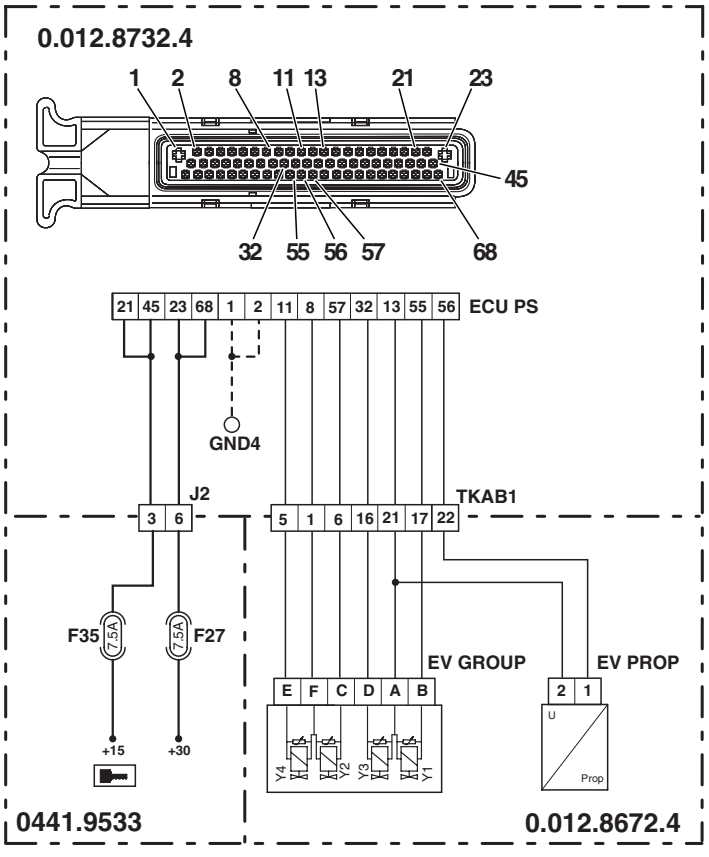
The control unit detects that the proportional solenoid valve operating the main clutch is short-circuiting to earth

ECU RESPONSE

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

CHECK

- Check that the contacts on connector “EV PROP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- Test the resistance of the solenoid (for details, see section 40).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin 2 of connector “EV PROP” and to transmission earth, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- 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 connector “EV PROP” and 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.



D0017611

ALARM N° 79

DESCRIPTION

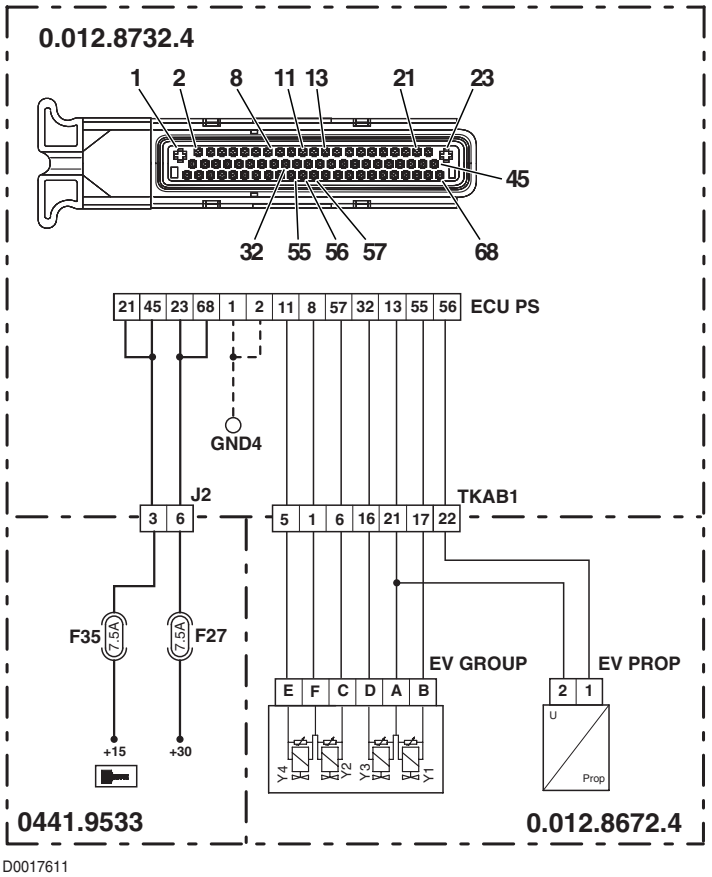
The control unit detects that the forward drive solenoid valve Y3 is disconnected.

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 connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin A and pin D of connector “EV GROUP” 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 D of connector “EV GROUP” and pin 32 of connector “ECU PS”, 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



D0017611

ALARM N° 80

DESCRIPTION

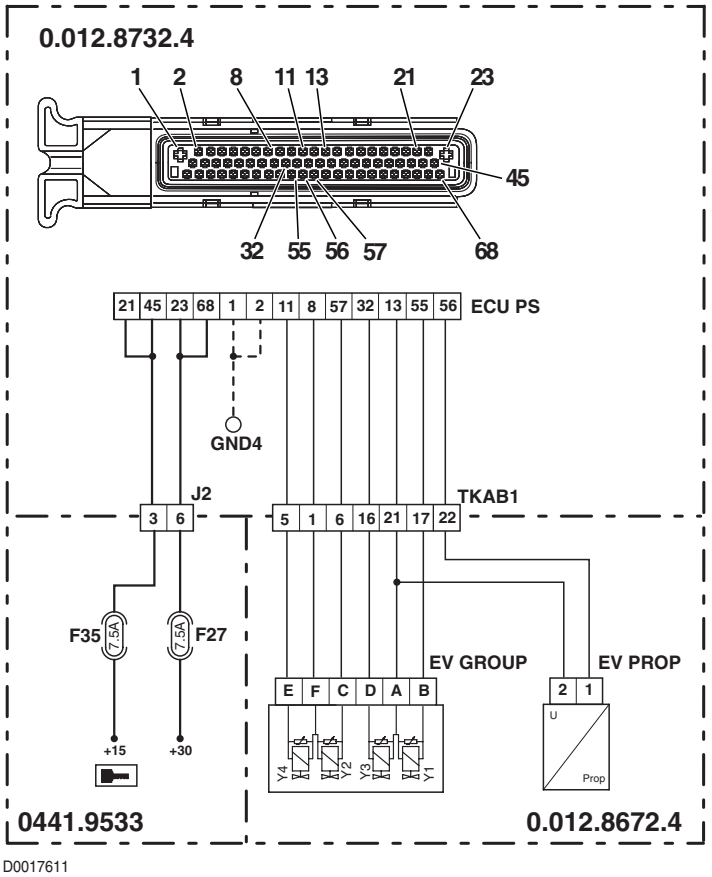
The control unit detects that the forward drive solenoid valve Y3 is short-circuiting to earth

ECU RESPONSE

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

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin A and pin D of connector “EV GROUP” 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 connector “ECU PS” unplugged, connect a test meter to pin D of connector “EV GROUP” and to the transmission earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin A of connector “EV GROUP” and to the transmission earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin 2 and pin 3 of connector “EV GROUP”, and measure the resistance to verify that the wires are not short-circuiting one to another (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.



D0017611

ALARM N° 82

DESCRIPTION

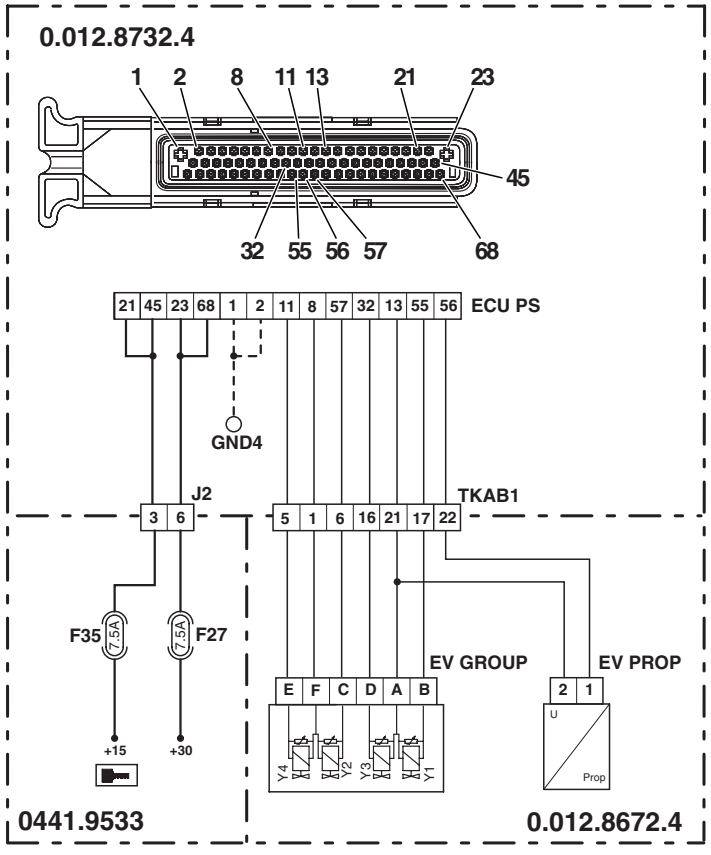
The control unit detects that the reverse drive solenoid valve Y1 is disconnected

ECU RESPONSE

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

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin A and pin B of connector “EV GROUP” 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 B of connector “EV GROUP” and to pin 55 of connector “ECU PS”, 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



D0017611

ALARM N° 83

DESCRIPTION

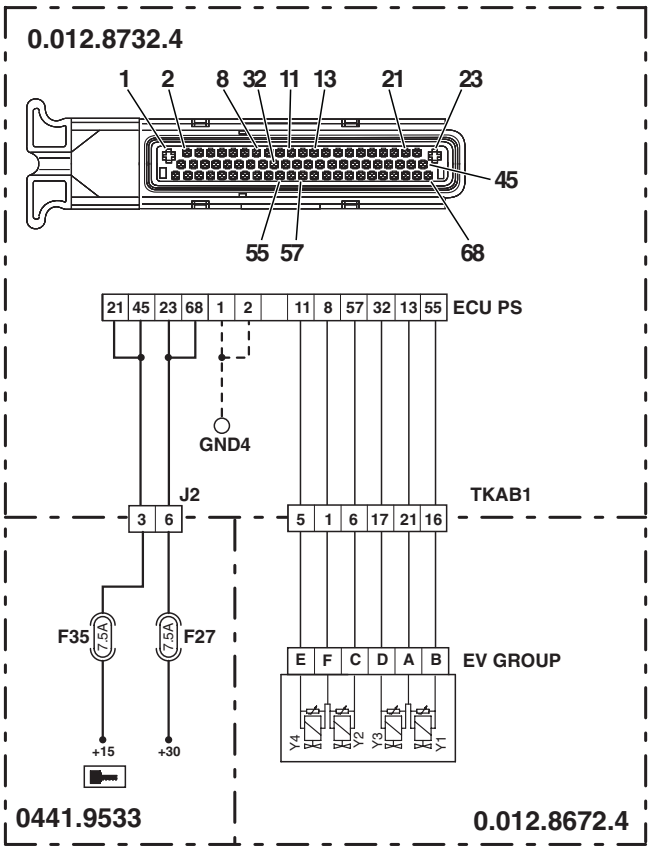
The control unit detects that the reverse drive solenoid valve Y1 is short-circuiting to earth

ECU RESPONSE

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

CHECK

- Check that the contacts on connector “EV GROUP” and connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin A and pin B of connector “EV GROUP” 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 connector “ECU PS” unplugged, connect a test meter to pin A of connector “EV GROUP” and to the transmission earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin B of connector “EV GROUP” and to transmission earth, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin A and pin B of connector “EV GROUP”, and measure the resistance to verify that the wires are not short-circuiting one to another (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.



D0017281

ALARM N° 85

DESCRIPTION

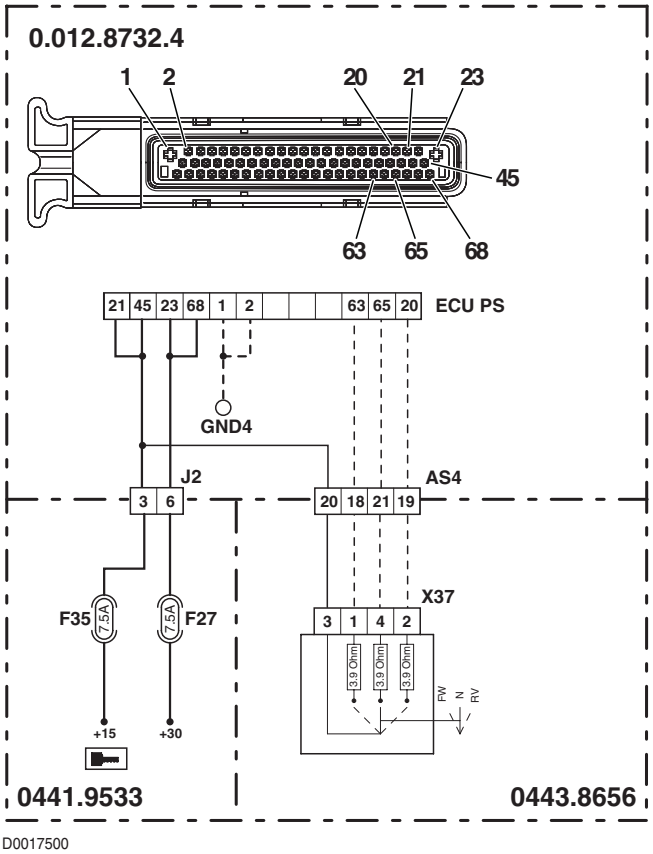
The control unit detects a problem affecting the shuttle control lever.

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 connector “X37” and on connector “ECU PS” of the transmission control unit are firmly attached and not oxidised.
- 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 “X37” and cab earth)
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter in alternation to pin 1, pin 2, pin 3 and pin 4 of connector “X37“ and to cab earth, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin 1 of connector “X37” and in alternation to pin 2, pin 3 and pin 4, and measure the resistance to verify whether or not there are short circuits (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin 2 of connector “X37” and in alternation to pin 3 and pin 4, and measure the resistance to verify whether or not there are short circuits (meter reading: infinity).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin 3 of connector “X37” and to pin 4, and measure the resistance to verify whether or not there are short circuits (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 “X37“ and to 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.



D0017500

ALARM N° 87

DESCRIPTION

The control unit detects that the type of vehicle has not been programmed correctly

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode.

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch 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.

ALARM N° 89

DESCRIPTION

The control unit detects an abnormal level of current drawn by the main clutch solenoid valves and the forward and reverse solenoid valves Y1 and Y3

ECU RESPONSE

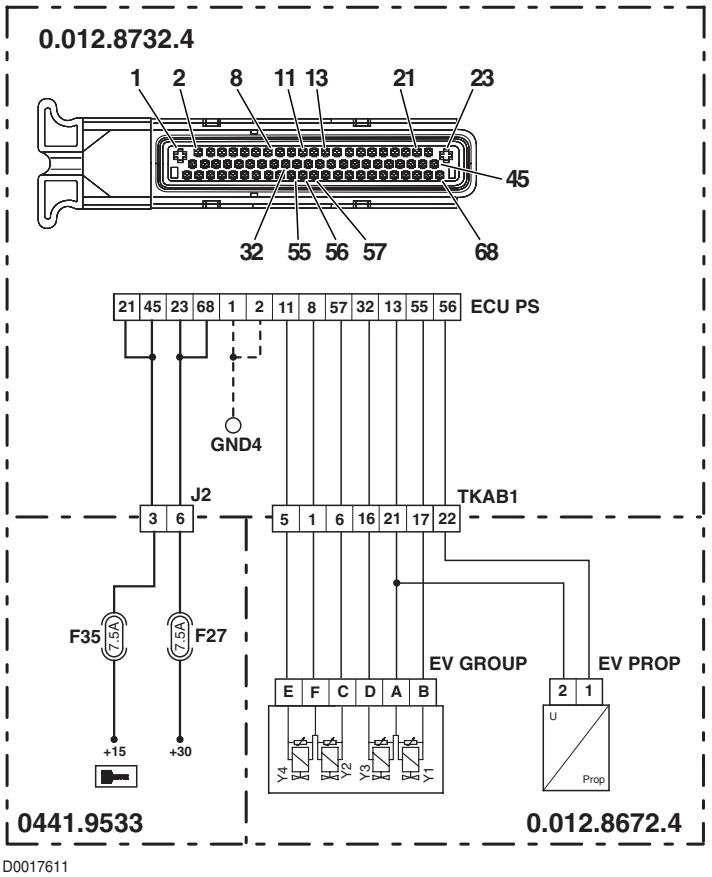
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarms 94, 95 and 96 being activated.

CHECK

- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin B of connector “EV GROUP” and to the transmission earth, and measure the resistance to check for short circuits to earth (meter reading: infinity).
  Repeat the test on pin D for connector “EVGROUP” and on pin 1 of connector “EVPROP”.
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin A of connector “EV GROUP” and the transmission earth and check that there is no voltage (meter reading: 0V).
  Repeat the test on pin D for connector “EVGROUP” and on pin 1 of connector “EVPROP”.
- 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..



D0017611

ALARM N° 90

DESCRIPTION

The control unit detects an abnormal level of current drawn by the powershift solenoid valves Y2, Y4.

ECU RESPONSE

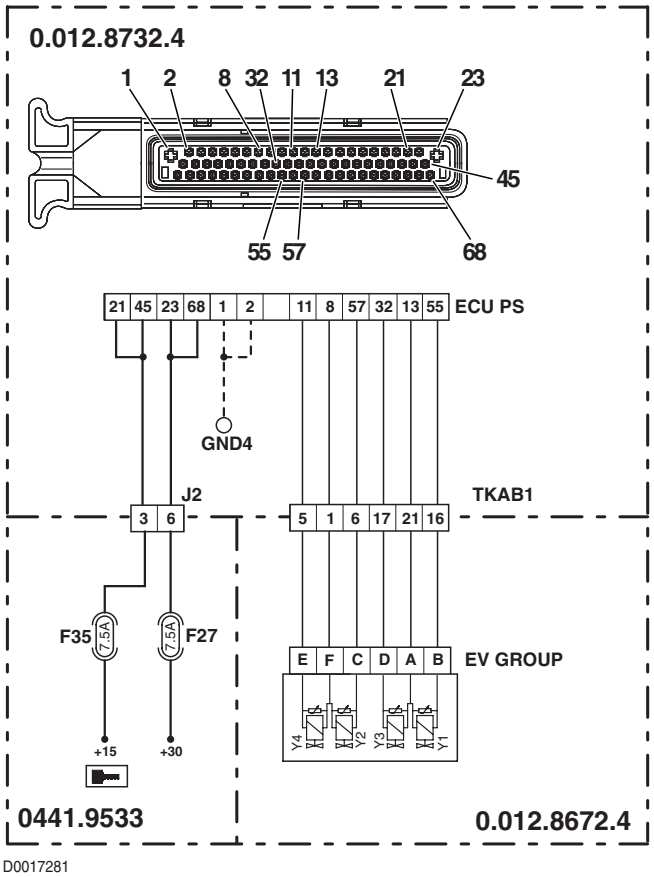
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

This alarm could be displayed as a result of alarms 38 and 41 being activated.

CHECK

- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin F of connector “EV GROUP”, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin 8 of connector “EV GROUP” and check that there is no voltage registering (meter reading: 0V).
- With the starter key in the “I” (ON) position, check that the power input to the solenoid valves is correct (12V measured between pin F (positive) of connector “EV GROUP” and transmission earth)
- 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.



D0017281

ALARM N° 91

DESCRIPTION

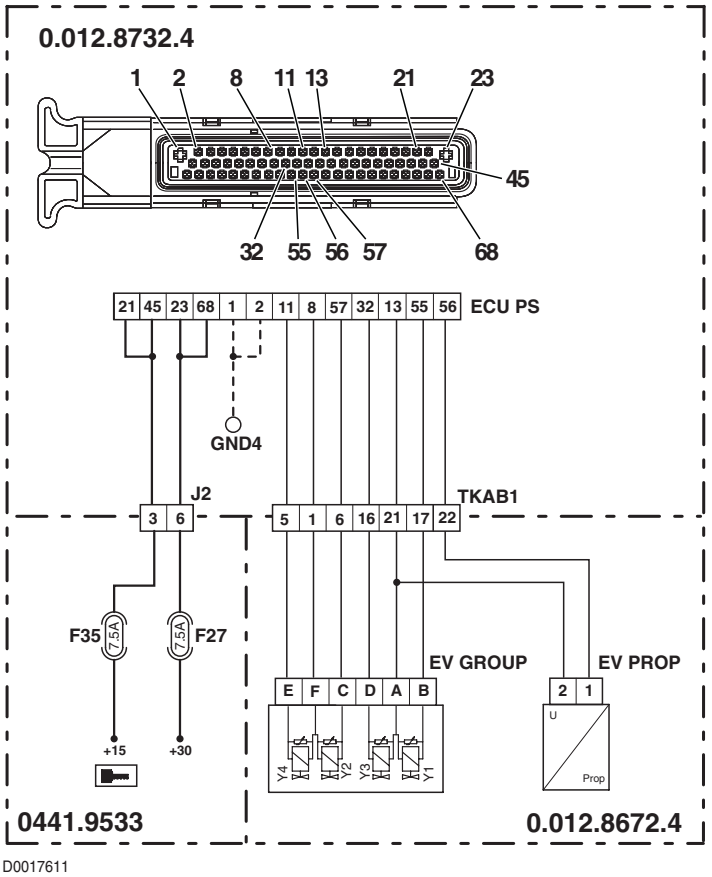
The control unit detects a conflict between values read by the nLsa and nHk sensors, the position of the clutch pedal and the position of the creeper engagement lever

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).
- Make certain that connectors “NHK” and “NAB” have not been switched.
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin A of connector “EV GROUP”, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin 1 of connector “EV PROP” and the transmission earth and check that there is no voltage (meter reading: 0V).
- 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.



D0017611

ALARM N° 92

DESCRIPTION

The control unit has detected an abnormally high input voltage

ECU RESPONSE

The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral. In the event that one or more of alarms 64, 65, 66, 67, 68, 69 or 70 should also be activated, the transmission will be switched to “TC-SHUTDOWN” mode.

NOTE

This alarm is activated generally when the alternator charging voltage is irregular, and can be tripped 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.

ALARM N° 93

DESCRIPTION

The control unit has detected an abnormally low input voltage

ECU RESPONSE

The control unit limits operation to “TRANSMISSION-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 tripped by an excessive current draw when the engine is started, or if the battery is damaged or cannot be recharged by the alternator. Accordingly, this alarm can be displayed only as a passive alarm, using the EDS program. 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.
  NOTE
  Lower voltages can register after the tractor has been standing idle for an extended period; this does 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 changing the alternator, verify its correct or incorrect operation by connecting a new battery.

ALARM N° 94

DESCRIPTION

The control unit detects that the main clutch solenoid valve is short-circuiting to positive

ECU RESPONSE

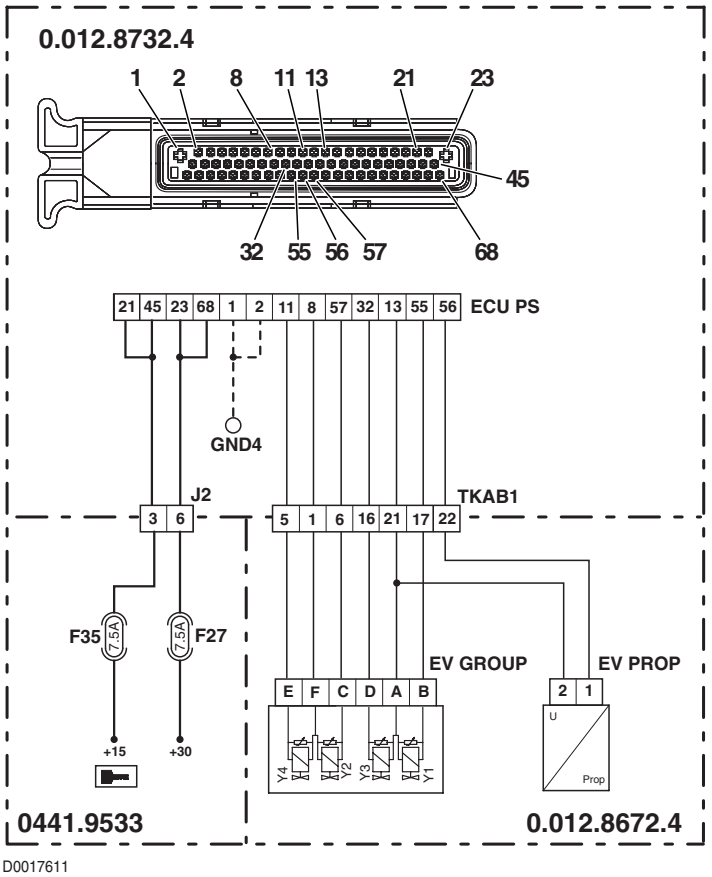
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

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

CHECK

- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin 1 of connector “EV PROP” and the transmission earth and check that there is no voltage (meter reading: 0V).
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin 2 of connector “EV PROP” and the transmission earth and check that there is no voltage (meter reading: 0V)).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017611

ALARM N° 95

DESCRIPTION

The control unit detects that the forward drive solenoid valve Y3 is short-circuiting to positive.

ECU RESPONSE

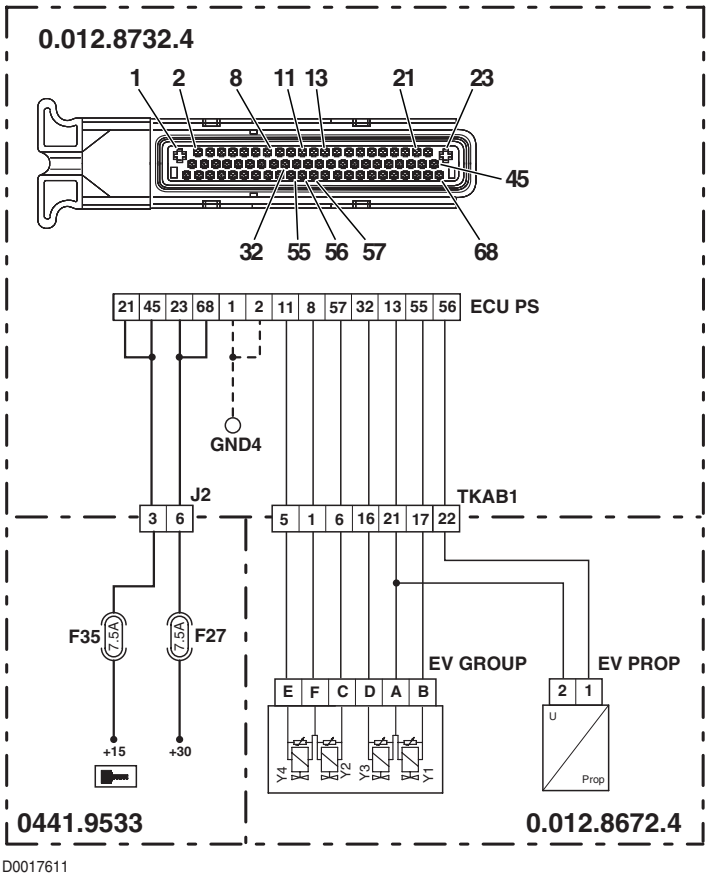
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

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

CHECK

- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin A of connector “EV GROUP” and the transmission earth and check that there is no voltage (meter reading: 0V).
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin D of connector “EV GROUP” and the transmission earth and check that there is no voltage (meter reading: 0V).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017611

ALARM N° 96

DESCRIPTION

The control unit detects that the reverse drive solenoid valve Y1 is short-circuiting to positive

ECU RESPONSE

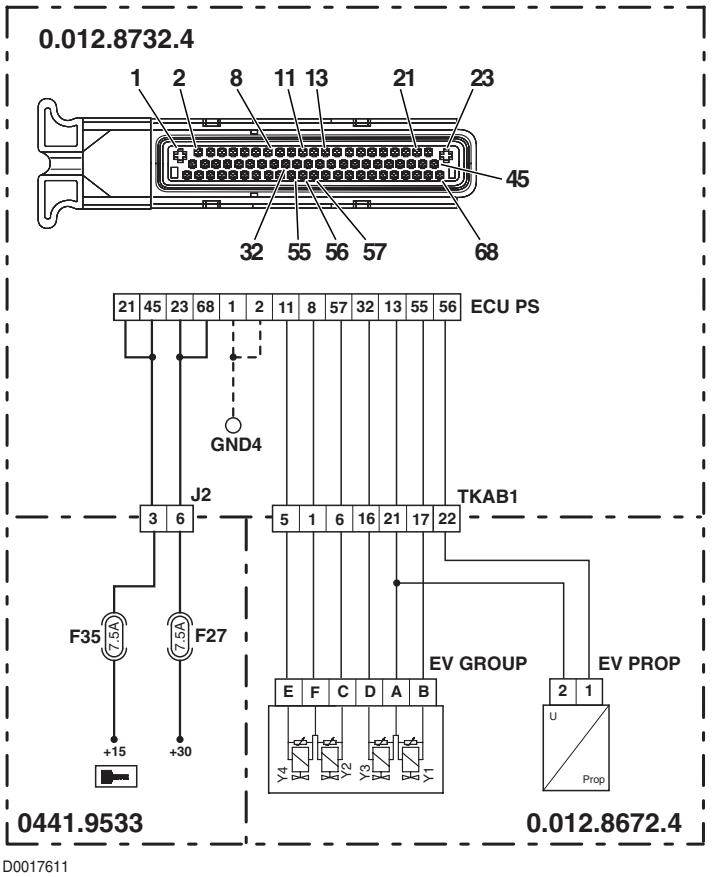
The control unit limits operation to “TC-SHUTDOWN” mode and the transmission reverts to neutral, emitting a continuous beep.

NOTE

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

CHECK

- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin A of connector “EV GROUP” and the transmission earth and check that there is no voltage (meter reading: 0V)).
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin B of connector “EV GROUP” and the transmission earth and check that there is no voltage (meter reading: 0V)).
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.



D0017611

ALARM N° 97

DESCRIPTION
The control unit detects that the transmission ECU software has not been programmed correctly

ECU RESPONSE
The control unit limits operation to “TC-SHUTDOWN” mode.

CHECK
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

ALARM N° 98

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 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.

ALARM N° 99

DESCRIPTION
The control unit detects that machine configuration data have not been saved correctly (CHECKSUM ERROR)

ECU RESPONSE
The control unit limits operation to “TC-SHUTDOWN” mode.

CHECK
- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch and the clutch pedal.
- Clear all alarms, turn the starter key first to “O” (OFF) and then back to the “I” (ON) position again, and if the alarm is still present, the control unit must be renewed.

ALARM N° EE

DESCRIPTION

The display detects a problem of communication with the transmission control unit.

CHECK

- Connecting a portable computer to the transmission control unit and using the EDS program, check whether or not alarms 19 and/or 20 have been logged, and if so, follow the procedures described for these 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.

ALARM 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 F27 and F35
- 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 “ECU PS”).
- 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 “ECU PS”).
- With the starter key in the “O” (OFF) position and connector “ECU PS” unplugged, connect a test meter to pin 8 of connector “X18” and to cab earth, and measure the resistance to verify whether or not there are short circuits to earth (meter reading: infinity).
- With the starter key in the “I” (ON) position and connector “ECU PS” unplugged, connect a test meter to pin 8 of connector “X18” and to cab 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 8 of connector “X18” and pin 15 of connector “ECU PS”, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- If the fault cannot be traced and rectified through this procedure, fit a new control unit.

ALARM GEN2

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, 56, 57 and 58.
- 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.

ALARM GEN3

DESCRIPTION

The transmission continues to shift range automatically every 1 or 2 seconds

ECU RESPONSE

None

CHECK

- Reprogram the control unit, entering the correct tractor model data, and repeat the calibration procedure for the main clutch and the clutch pedal.
- Check the wiring, following the procedures described for alarms 36, 37, 38, 39, 40 and 41.
- Check the wiring, following the procedures described for alarms 53, 54, 55, 56, 57 and 58.
- 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.

ALARM 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, 56, 57 and 58.
- 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.

ALARM GEN5

DESCRIPTION

The transmission stays in neutral

CHECK

- Check that the contacts on connector “X80” of the start enable switch and on connector “ECU PS” of the lift control unit are firmly attached and not oxidised.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of relay “RL40” 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).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of relay “RL40 and to pin 31 of connector “ECU PS”, 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 transmission control unit must be renewed.

5.3 LIST OF ALARMS DISPLAYED BY SERDIA

The engine control unit informs the operator of any malfunction affecting monitored components, both audibly and visually (fault warning light) by way of the Infocenter.

Faults are indicated by the light using two types of visual warning:

1 - fault warning light flashing: 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 - fault warning light permanently on: 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.

5.3.1 ALARMS DISPLAYED USING THE SERDIA PROGRAM

Alarm code	Alarm description	Page
1	The engine control unit detects that the signal from the engine pickup is either non-existent or incorrect	20-141
2	Alarm code available but not utilised	–
3	The engine control unit detects that the signal from the wheel speed pickup is either non-existent or incorrect.	20-142
4	Alarm code available but not utilised	–
5	The control unit detects that the connection to the accelerator pedal position sensor is either non-existent or short-circuiting.	20-143
6	The control unit detects that the connection to the hand throttle position sensor is either non-existent or short-circuiting.	20-144
7	The engine control unit has detected that the engine turbo charge pressure signal is either non-existent or unreliable.	20-145
8	Alarm code available but not utilised	–
9	The engine control unit has detected that the coolant temperature signal is either non-existent or unreliable.	20-146
10	Alarm code available but not utilised	–
11	The engine control unit has detected that the fuel temperature signal is either non-existent or unreliable.	20-147
30	Alarm code available but not utilised	–
31	The engine control unit has detected a coolant temperature higher than the alarm threshold.	20-148
32	Alarm code available but not utilised	–
34	Alarm code available but not utilised	–
35	The engine control unit detects that the engine is or has been running overspeed (above 3100 rpm).	20-149
36	The engine control unit has detected a fuel temperature higher than the alarm threshold.	20-150
40	Alarm code available but not utilised	–
41	The engine control unit has detected a coolant temperature higher than the alarm threshold.	20-151

Alarm code	Alarm description	Page
42	Alarm code available but not utilised	–
44	Alarm code available but not utilised	–
50	The engine control unit has detected that the actuator position signal does not match the requirement.	20-152
52	The engine control unit has detected that the reference signal for the position of the actuator does not match the requirement.	20-153
53	The engine control unit has detected that the difference between the command and the response of the actuator is greater than 10%.	20-154
59	Alarm code available but not utilised	–
60	Alarm code available but not utilised	–
62	Alarm code available but not utilised	–
63	Alarm code available but not utilised	–
67	The engine control unit has detected the absence of a connection to the accelerator pedal position sensor or a signal out of range.	20-155
68	Alarm code available but not utilised	–
70	Alarm code available but not utilised	–
71	Alarm code available but not utilised	–
74	Alarm code available but not utilised	–
76	The engine control unit has detected an error in writing the parameters.	20-156
77	The engine control unit has detected an error in reading the program memory during the normal control cycle.	20-156
78	The engine control unit has detected an error in reading the work memory during the normal control cycle.	20-156
80	The engine control unit detects an actuator power input outside the specified parameters.	20-156
83	The control unit detects that the power input to the accelerator pedal or hand throttle position sensor is either non-existent or incorrect.	20-157
84	The control unit detects that the power input to the turbo charge pressure sensor is non-existent or incorrect.	20-158
85	Alarm code available but not utilised	–
86	The engine control unit detects that its internal temperature is too high.	20-159
87	The engine control unit detects that atmospheric pressure is outside the permitted limits.	20-159
90	The engine control unit has detected a discrepancy between the parameters written in EEPROM.	20-159
93	The engine control unit has detected a “Stack Overflow” error during execution of the program.	20-160
94	The engine control unit has detected an internal error.	20-160

5.3.2 ANALYSIS OF ALARMS

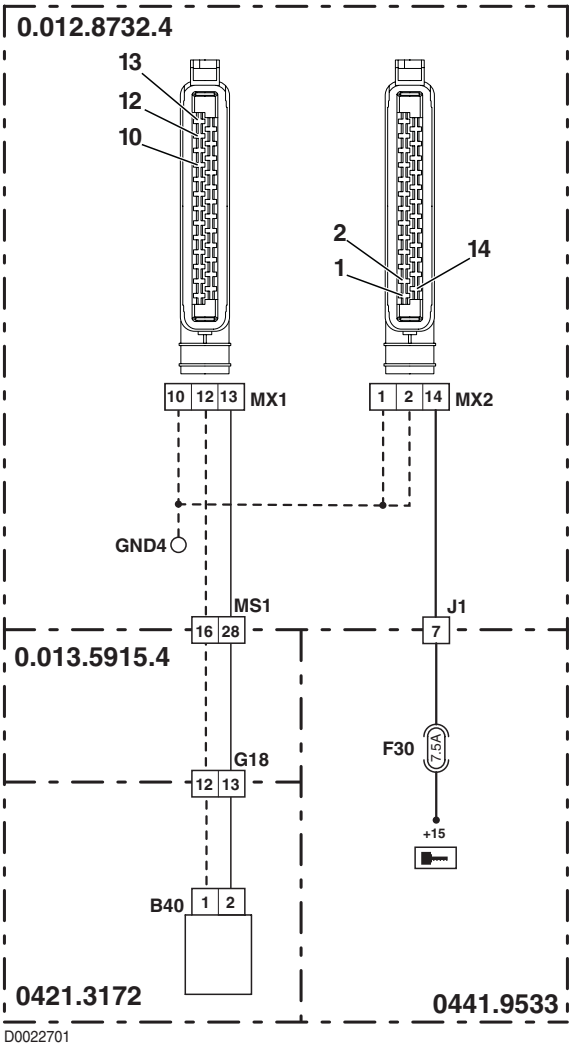
SERDIA ALARM N° 1

DESCRIPTION

The engine control unit detects that the signal from the engine pickup is either non-existent or incorrect.

CHECK

- Check that the engine speed pickup is installed correctly and at the specified distance from the pulse wheel
- Check that the internal resistance of the sensor is correct (for details, see section 40)
- Check that the contacts on connector “B40” and on connector “MX1” of the engine control unit are firmly attached and not oxidised.
- Check for electrical continuity between pin 1 of connector “B40” and pin 12 of connector “MX1”.
- Check for electrical continuity between pin 2 of connector “B40” and pin 13 of connector “MX1”.



SERDIA ALARM N° 3

DESCRIPTION

The engine control unit detects that the signal from the wheel speed pickup is either non-existent or incorrect.

CHECK

- Using the ART, check that the lift control unit is receiving the wheel speed signal, or if it has detected the “WheelSensorDisc” alarm corresponding to flash code 42 (standard) or 64 (text).
  If the lift control unit detects the alarm, check out the system following the procedure described for “WheelSensorDisc”.
- If the control unit is receiving and acknowledging the signal correctly, check for electrical continuity between pin 3 of connector “ISO7” and pin 6 of connector “X8”.
- Check that the circuit board attached to connector “X8” is not damaged (for details, see section 40).
- Check for electrical continuity between pin 5 of connector “X8” and pin 7 of connector “MX2”.
- Connect a test meter to pin 5 and pin 6 of the circuit board attached to connector “X8” and, using the diode test, check that the diode is operational (negative prod on pin 6, positive prod on pin 5).
- Connect a test meter to pin 5 and pin 6 of the circuit board attached to connector “X8” and+ measure the resistance, which should read 2200 Ohm approx (negative prod on pin 6, positive prod on pin 5).
- Check on page 24 of the “Configuration” menu that the value of “1301:VelocityFactor” is 130.
- If the fault persists, reprogram or renew the control unit.

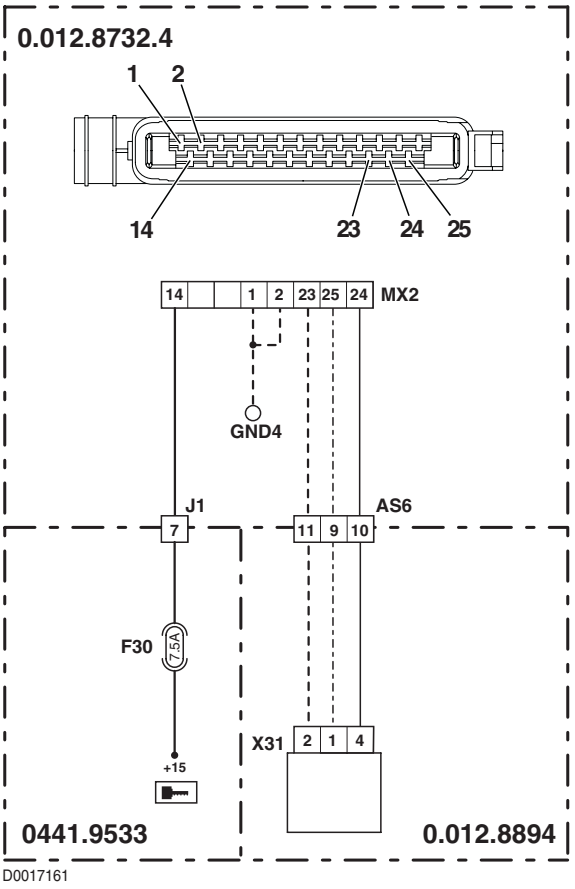
SERDIA ALARM N° 5

DESCRIPTION

The control unit detects that the connection to the accelerator pedal position sensor is either non-existent or short-circuiting.

CHECK

- Check that the contacts on connector “MX2” of the control unit and connector “X31” are firmly attached and not oxidised**.**
- 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 “X31”).
- With connector “MX2” unplugged from the engine control unit, check for electrical continuity between pin 4 of connector “X31” and pin 24 of connector “MX2”.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 4 of connector “X31” and to cab earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With connector “MX2” plugged into the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 4 of connector “X31” and to cab earth, and check that there is no voltage registering (meter reading 0V).
- Check that the resistance characteristics of the accelerator pedal position sensor are correct (for technical details see section 40)..



SERDIA ALARM N° 6

DESCRIPTION

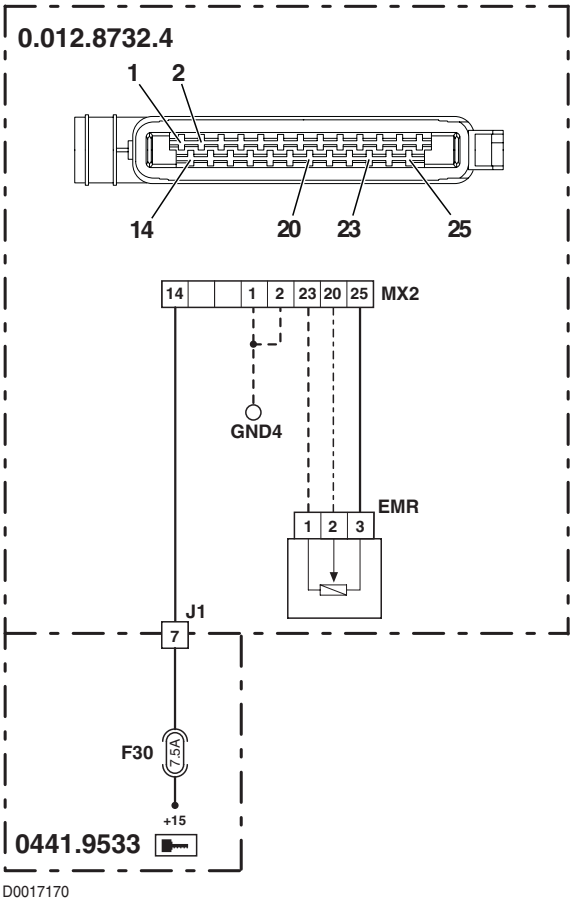
The control unit detects that the connection to the hand throttle position sensor is either non-existent or short-circuiting.

NOTE

This procedure is described for versions without armrest. If an armrest control is installed, carry out the procedure starting from the connector of the hand throttle position sensor located internally of the armrest.

CHECK

- Check that the contacts on connector “MX2” of the control unit and connector “EMR” are firmly attached and not oxidised**.**
- Check that the power input to the accelerator pedal position sensor is correct (5 Vdc approx measured between pin 3 (positive) and pin 1 (negative) of connector “EMR”).
- With connector “MX2” unplugged from the engine control unit, check for electrical continuity between pin 2 ofconnector “EMR” and pin 20 of connector “MX2”.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “EMR” and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With connector “MX2” plugged into the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 2 of connector “EMR” and to cab earth, and check that there is no voltage registering (meter reading 0V).
- Check that the resistance characteristics of the hand throttle position sensor are correct (for technical details see section 40)..



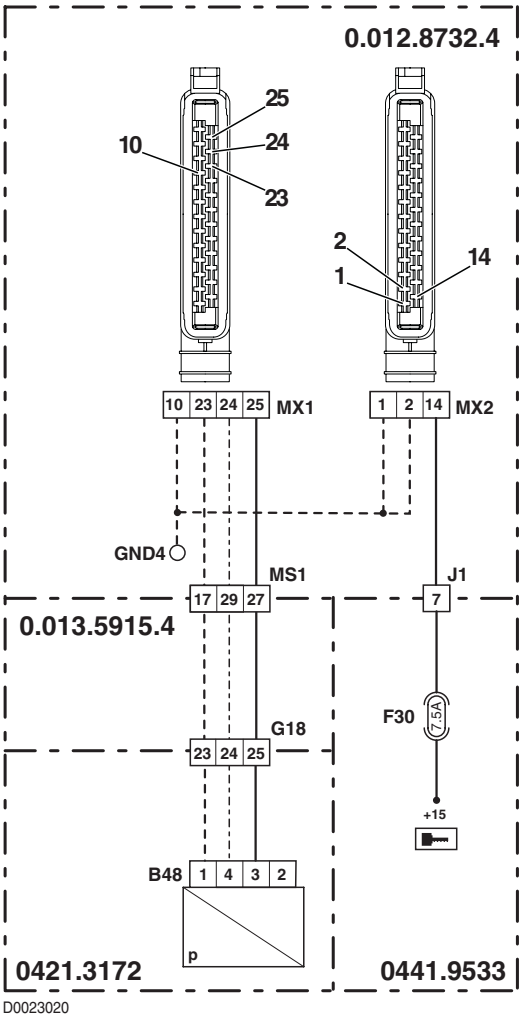
SERDIA ALARM N° 7

DESCRIPTION

The engine control unit has detected that the engine turbo charge pressure signal is either non-existent or unreliable.

CHECK

- Check for electrical continuity between pin 1 of connector “B48” and pin 23 of connector “MX1”.
- Check for electrical continuity between pin 4 of connector “B48” and pin 24 of connector “MX1”.
- Check for electrical continuity between pin 3 of connector “B48” and pin 25 of connector “MX1”.
- Verify the correct operation of the sensor (for technical details, see section 40).
- Check that the power input to the sensor is correct (5 Vdc approx measured between pin 3 (positive) and pin 1 (negative) of connector “B48”).
- With connector “MX1” unplugged 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 engine earth, and check that there is no voltage registering (meter reading 0V).
- With the starter key in position “O” (OFF), connect a test meter to pin 2 of connector “B48” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity)



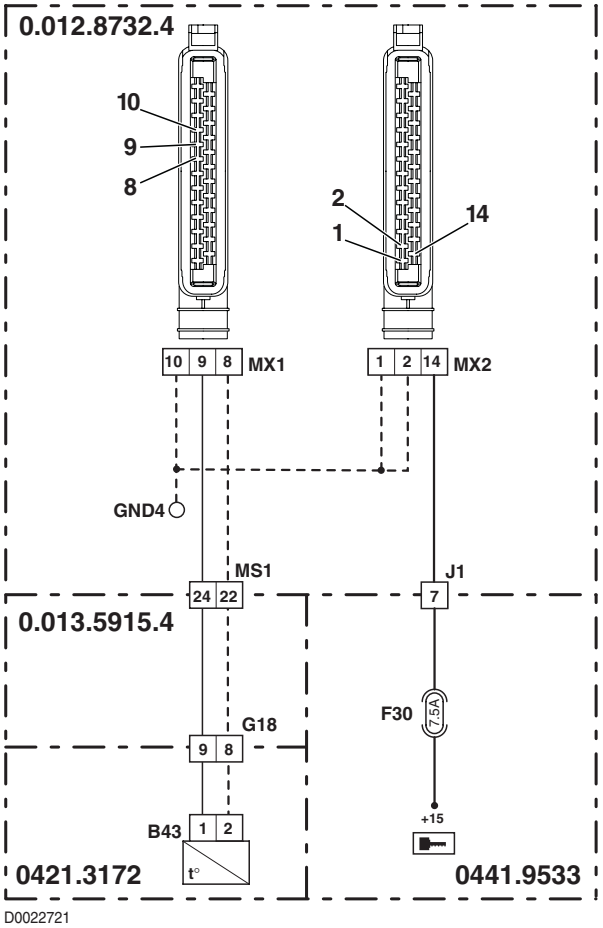
SERDIA ALARM N° 9

DESCRIPTION

The engine control unit has detected that the coolant temperature signal is either non-existent or unreliable.

CHECK

- Check for electrical continuity between pin 1 of connector “B43” and pin 9 of connector “MX1”.
- Check for electrical continuity between pin 2 of connector “B43” and pin 8 of connector “MX1”.
- Check that the temperature sensor 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 parameters “510 CoolantTempWarn” (normal value: 122 °C) and “514 CoolantTempEcy” (normal value: 130 °C) are correct.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and check that there is no voltage registering (meter reading 0V).
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 2 of connector “B43” and to engine earth, and check that there is no voltage registering (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “B43” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).



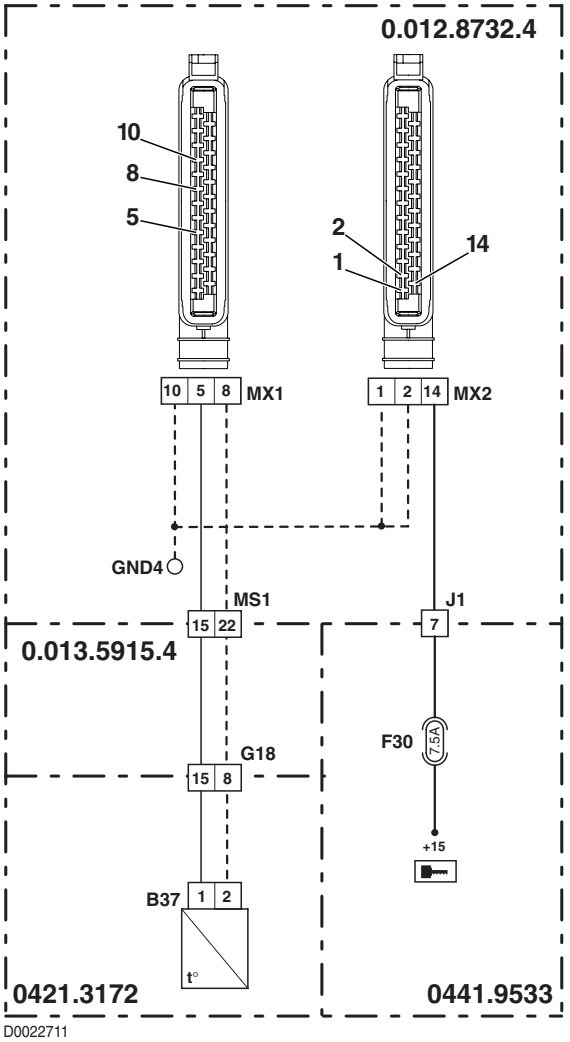
SERDIA ALARM N° 11

DESCRIPTION

The engine control unit has detected that the fuel temperature signal is either non-existent or unreliable.

CHECK

- Check for electrical continuity between pin 1 of connector “B37” and pin 5 of connector “MX1”.
- Check for electrical continuity between pin 2 of connector “B37” and pin 8 of connector “MX1”.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 1 of connector “B37” and to engine earth, and check that there is no voltage registering (meter reading 0V).
- With connector “MX1” unplugged from the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 2 of connector “B37” and to engine earth, and check that there is no voltage registering (meter reading 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B37” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “B37” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).



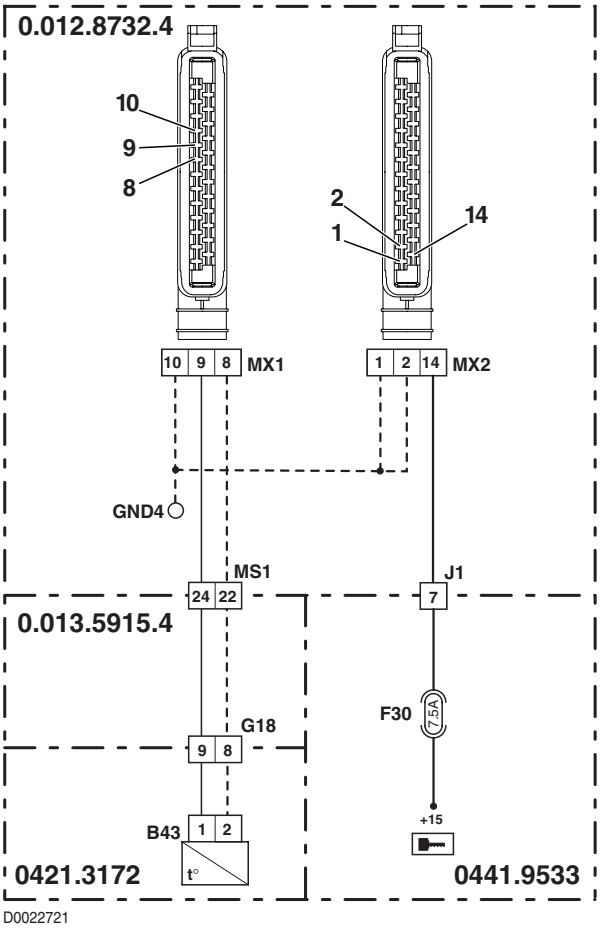
SERDIA ALARM N° 31

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: 122 °C)**.**
- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).



SERDIA ALARM N° 35

DESCRIPTION

The engine control unit detects that the engine is or has been running overspeed (above 3300 rpm).

NOTE

This alarm is activated generally when, with the tractor on a down gradient, the engine is made to operate as a brake and forced to run at higher speed.
Generally, this alarm will disappear automatically when the tractor returns to level ground.
In this case, there is no need to make any checks.

CHECK

- Check with the Serdia program that the parameter “21 Speed over” is correct (normal value: 3300 rpm).
- Check that the engine speed pickup sensor functions correctly and does not give a false reading; use an external sensor and compare the reading obtained with the value received from the pickup by the engine control unit.
- Check that the injection pumps control rod slides freely.
- Check that the internal resistance values for the actuator are correct (for details see section 40).
- Check that the parameter “1 TeethPickUp1” is correct (normal value=44).

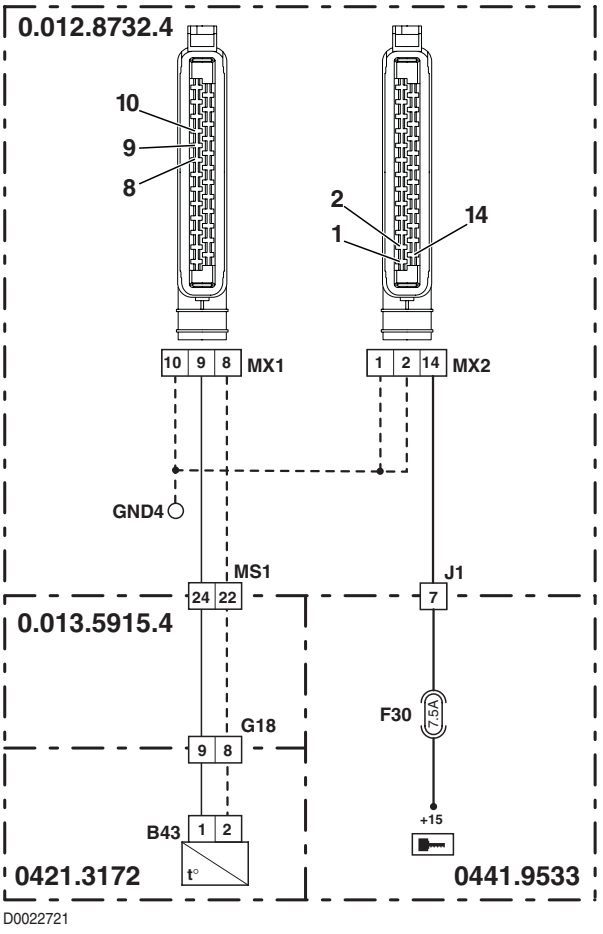
SERDIA ALARM N° 36

DESCRIPTION

The engine control unit has detected a fuel temperature higher than the alarm threshold.

CHECK

- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity)..



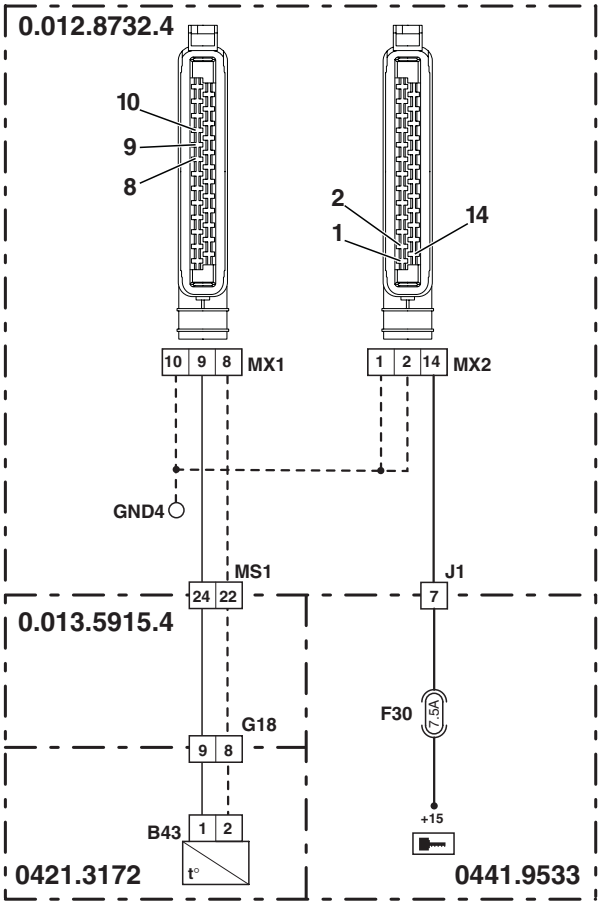
SERDIA ALARM N° 41

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.
- Verify the correct operation of the sensor (for technical details, see section 40).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “B43” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).



D0022721

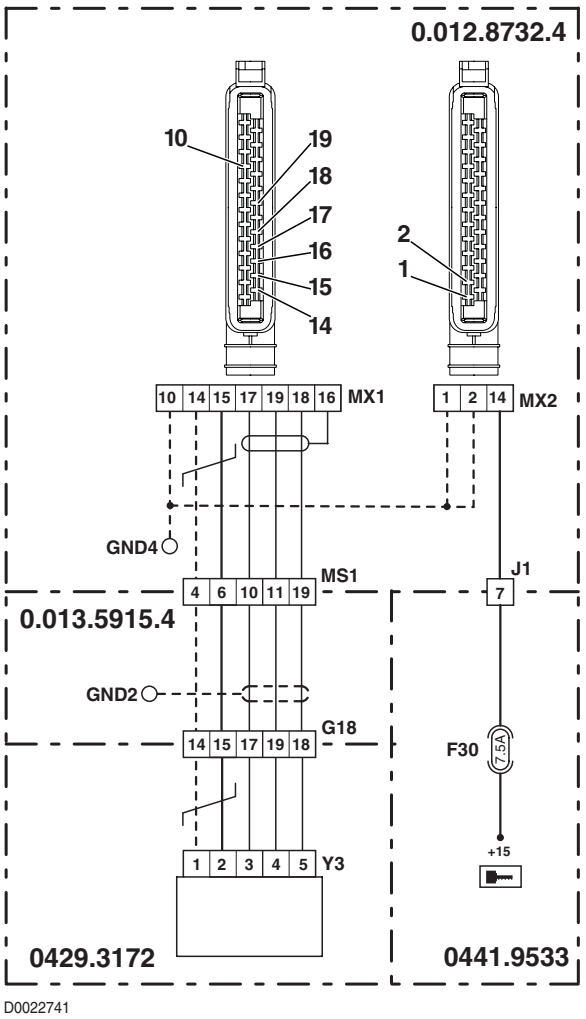
SERDIA ALARM N° 50

DESCRIPTION

The engine control unit has detected that the actuator position signal does not match the requirement.

CHECK

- Check that the contacts on connector “Y3” and on the control unit “MX1” are firmly attached and not oxidised.
- Check for electrical continuity between pin 4 of connector “Y3” and pin 19 of connector “MX1”.
- Check that the internal resistance values for the actuator are correct (for details see section 40).
- With the starter key in the “I” (ON) position and the engine 'off', connect a test meter to pin 4 of connector “Y3” and to engine earth, and check that there is no voltage registering (meter reading: 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 4 of connector “Y3” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- If the fault persists, renew the actuator.



D0022741

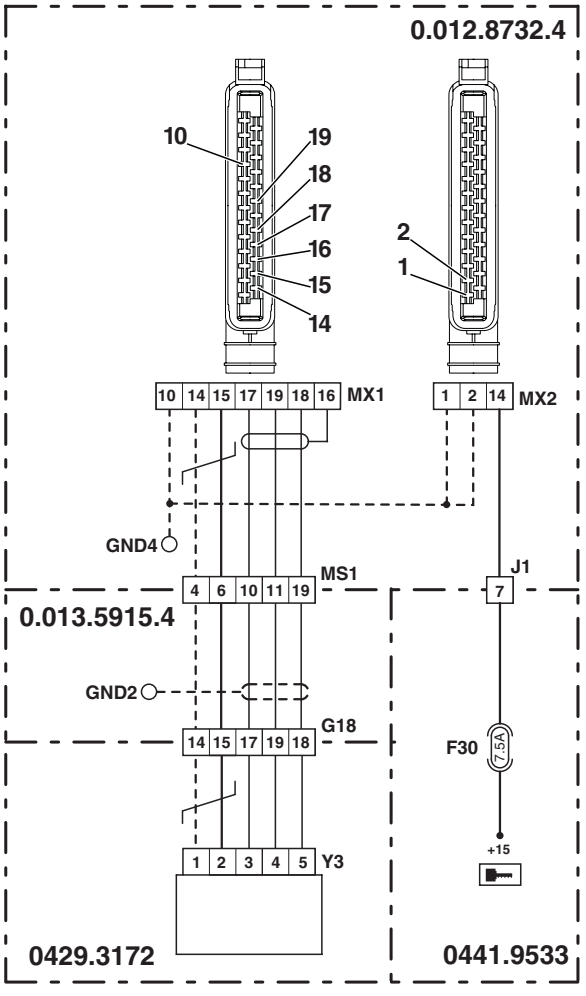
SERDIA ALARM N° 52

DESCRIPTION

The engine control unit has detected that the reference signal for the position of the actuator does not match the requirement.

CHECK

- Check that the contacts on connector “Y3” and on the control unit “MX1” are firmly attached and not oxidised.
- Check for electrical continuity between pin 5 of connector “Y3” and pin 18 of connector “MX1”.
- Check that the internal resistance values for the actuator are correct (for details see section 40).
- With the starter key in the “I” (ON) position and the engine 'off', connect a test meter to pin 5 of connector “Y3” and to engine earth, and check that there is no voltage registering (meter reading: 0V).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 5 of connector “Y3” and to engine earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- If the fault persists, renew the actuator.



D0022741

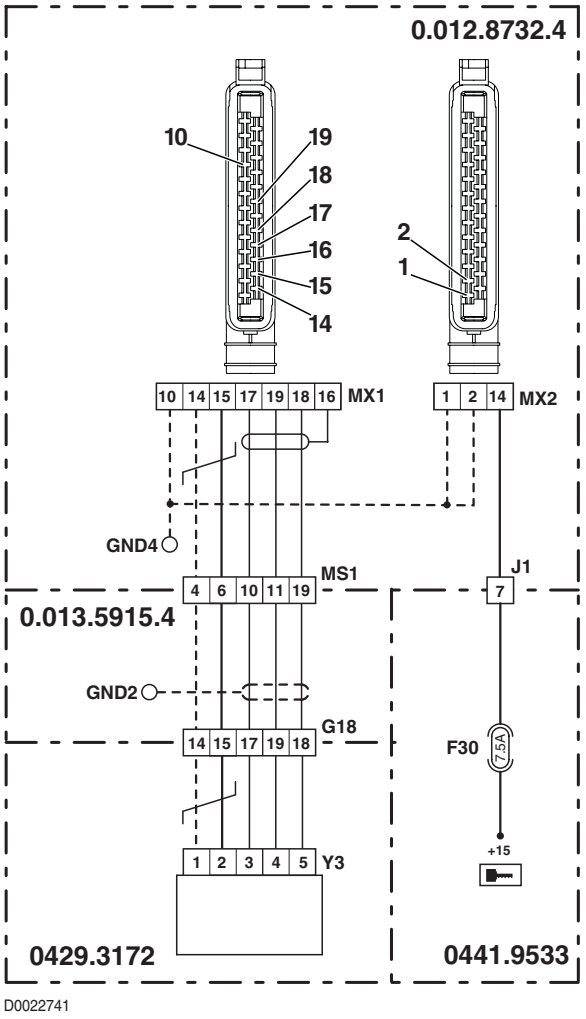
SERDIA ALARM N° 53

DESCRIPTION

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

CHECK

- Check that the internal resistance values for the actuator are correct (for details see section 40).
- Check that the injection pumps control rod slides freely.
- Check that the fuel injection pumps have not seized.
- Check that the contacts on connector “Y3” and on the control unit “MX1” are firmly attached and not oxidised.
- Check for electrical continuity between pin 4 of connector “Y3” and pin 19 of connector “MX1”.
- Check for electrical continuity between pin 5 of connector “Y3” and pin 18 of connector “MX1”.



D0022741

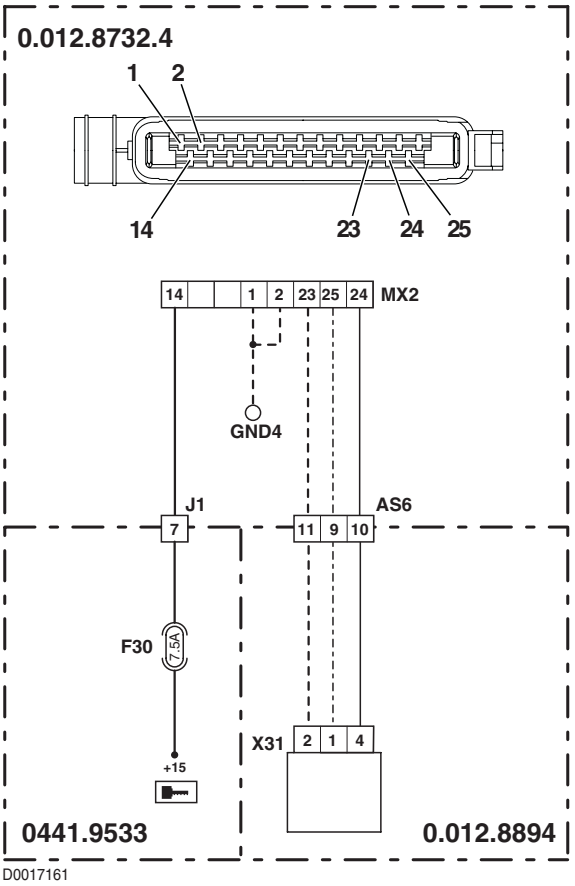
SERDIA ALARM N° 67

DESCRIPTION

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

CHECK

- Check that the contacts on connector “MX2” of the control unit and connector “X31” are firmly attached and not oxidised**.**
- Check that the resistance characteristics of the accelerator pedal position sensor are correct (for technical details see section 40).
- 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 “X31”).
- Check for electrical continuity between pin 4 of connector “X31” and pin 24 of connector “MX2”.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 4 of connector “X31” and to cab earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- With connector “MX2” plugged into the engine control unit and the starter key in the “I” (ON) position, connect a test meter to pin 4 of connector “X31” and to cab earth, and check that there is no voltage registering (meter reading 0V).



SERDIA ALARM N° 76

DESCRIPTION
The engine control unit has detected an error in writing the parameters.

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

SERDIA ALARM N° 77

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.

SERDIA ALARM N° 78

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.

SERDIA ALARM N° 80

DESCRIPTION
The engine control unit detects an actuator power input outside the specified parameters.

CHECK
- Turn the starter key first to “O” (OFF) and then back to the “I” (ON) position.
- See if the alarm is still indicated; if so, contact Technical Assistance.

SERDIA ALARM N° 83

DESCRIPTION

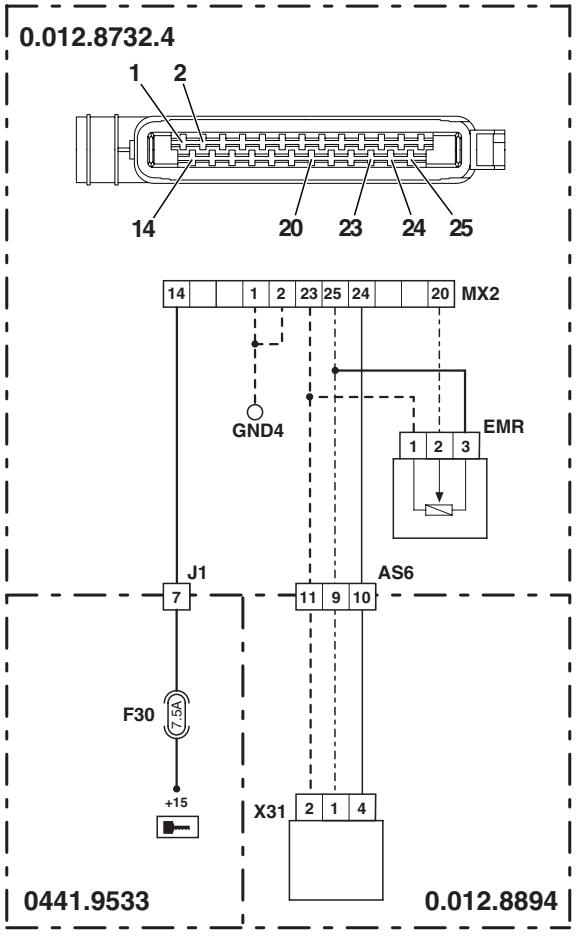
The control unit detects that the power input to the accelerator pedal or hand throttle position sensor is either non-existent or incorrect.

NOTE

If an armrest control is installed, check the hand throttle power input starting from the connector located internally of the armrest.

CHECK

- Check that the power input to the accelerator pedal and hand throttle position sensors is correct (5 Vdc approx measured between pin 1 (positive) and pin 2 (negative) of connector “X31” or pin 1 (positive) and pin 3 (negative) of connector “EMR”).
- Turn the starter key first to “O” (OFF) and then back to the “I” (ON) position.
- See if the alarm is still indicated; if so, contact Technical Assistance.



D0017201

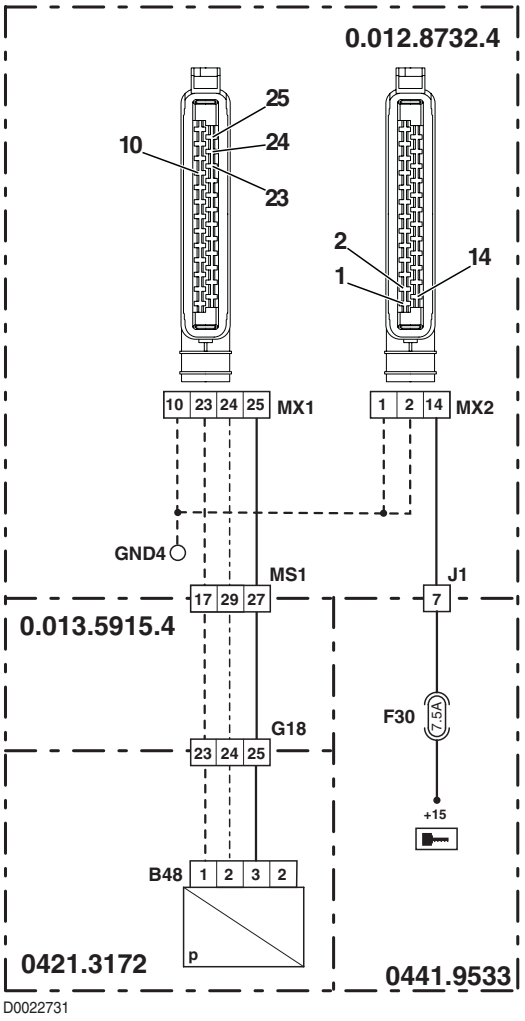
SERDIA ALARM N° 84

DESCRIPTION

The control unit detects that the power input to the turbo charge pressure sensor is non-existent or incorrect.

CHECK

- Check that the power input to the turbo charge pressure sensor is correct (5 Vdc approx measured between pin 3 (positive) and pin 1 (negative) of connector “B48”).
- Turn the starter key first to “O” (OFF) and then back to the “I” (ON) position.
- See if the alarm is still indicated; if so, contact Technical Assistance



SERDIA ALARM N° 86

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 reoccur.
- If the alarm reoccurs, contact Technical Assistance.

SERDIA ALARM N° 87

DESCRIPTION

The engine control unit detects that atmospheric pressure is outside the permissible limits.

CHECK

- Turn the starter key to “O” (OFF) and wait a few minutes.
  Turn the key back to “I” (ON) and check that the alarm does not reoccur.
- If the alarm reoccurs, contact Technical Assistance.

SERDIA ALARM N° 90

DESCRIPTION

The engine control unit has detected a discrepancy between the parameters written in EEPROM.

CHECK

- Check that the parameter values to be written in the control unit EEPROM are correct and consistent with one another.
- Send the parameters to the control unit again.
- Turn the starter key first to “O” (OFF) and then back to the “I” (ON) position.
- If the problem persists, contact Technical Assistance.

SERDIA ALARM N° 93

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.

SERDIA ALARM N° 94

DESCRIPTION

The engine control unit has detected an internal error.

CHECK

- Contact Technical Assistance.

5.4 LIST OF FRONT AXLE SUSPENSION CONTROL VALVE ALARMS

The suspension control unit warns the operator of any malfunction affecting monitored components, by way of an indicator light in the pushbutton.

Faults are indicated using a system of coded flash sequences which, depending on how the control unit has been configured, will either specify the precise nature of the fault (extended alarm) or simply identify the device affected (standard alarm).

To verify, using the ART, whether or not an alarm detected is “active”, the technician must cancel all the alarms, turn the starter key to the “**O**” (OFF) position, then make a fresh connection to the control unit.

All alarms with the exception of those indicated by the light incorporated into the pushbutton (Alarms 21 and 22) have the effect of deactivating and inhibiting the system completely.

5.4.1 LIST OF ALARMS BY TEXT CODE

Extended flash	Standard flash	Display on ART	Description	Page
11	11	As. SV Fa. or NC	The control unit detects that the front axle 'up' valve solenoid is not connected	20-164
12	12	De. SV Fa. or NC	The control unit detects that the front axle 'down' valve solenoid is not connected	20-165
13	13	LS. SV Fa. or NC	The control unit detects that the front axle load sensing valve solenoid is not connected	20-166
15	15	PO. SE. Fa. or NC	The control unit detects that the front suspension position sensor is disconnected.	20-167
16	16	PW. S. Fa. or NC	The control unit detects that the power input to the front suspension position sensor is not correct.	20-168
17	17	Battery V. High	The control unit has detected that the battery voltage is too high.	20-169
19	19	Battery V. Low	The control unit has detected that the battery voltage is too low (less than10V).	20-170
21	21	SC LAMP Ind.	The control unit has detected that the activation and faults indicator light is short-circuiting.	20-171
22	22	LAMP Ind. Disc.	The control unit has detected that the activation and faults indicator light is burnt out or disconnected.	20-172
24	11	ALL. CC EV UP	The control unit detects a short circuit in the control line of the front axle 'up' solenoid.	20-173
25	12	ALL. CC EV DW	The control unit detects a short circuit in the control line of the front axle 'down' solenoid.	20-174
26	13	ALL. CC EV LS	The control unit detects a short circuit in the control line of the front axle load sensing solenoid.	20-175

5.4.2 LIST OF ALARMS BY STANDARD CODE

Standard flash	Extended flash	Display on ART	Description	Page
11	11	As. SV Fa. or NC	The control unit detects that the front axle 'up' valve solenoid is not connected.	20-164
	24	ALL. CC EV UP	The control unit detects a short circuit in the control line of the front axle 'up' solenoid.	20-173
12	12	De. SV Fa. or NC	The control unit detects that the front axle 'down' valve solenoid is not connected.	20-165
	25	ALL. CC EV DW	The control unit detects a short circuit in the control line of the front axle 'down' solenoid.	20-174
13	13	LS. SV Fa. or NC	The control unit detects that the front axle load sensing valve solenoid is not connected.	20-166
	26	ALL. CC EV LS	The control unit detects a short circuit in the control line of the front axle load sensing solenoid.	20-175
15	15	PO. SE. Fa. or NC	The control unit detects that the front suspension position sensor is disconnected.	20-167
16	16	PW. S. Fa. or NC	The control unit detects that the power input to the front suspension position sensor is not correct.	20-168
17	17	Battery V. High	The control unit has detected that the battery voltage is too high.	20-169
19	19	Battery V. Low	The control unit has detected that the battery voltage is too low (less than10V).	20-170
21	21	SC LAMP Ind.	The control unit has detected that the activation and faults indicator light is short-circuiting.	20-171
22	22	LAMP Ind. Disc.	The control unit has detected that the activation and faults indicator light is burnt out or disconnected.	20-172

5.4.3 LIST OF ALARMS DISPLAYED BY ART

Display on ART	Standard flash	Extended flash	Description	Page
ALL. CC EV DW	12	25	The control unit detects a short circuit in the control line of the front axle 'down' solenoid.	20-174
ALL. CC EV LS	13	26	The control unit detects a short circuit in the control line of the front axle load sensing solenoid.	20-175
ALL. CC EV UP	11	24	The control unit detects a short circuit in the control line of the front axle 'up' solenoid.	20-173
De. SV Fa. or NC	12	12	The control unit detects that the front axle 'down' valve solenoid is not connected	20-165
LS. SV Fa. or NC	13	13	The control unit detects that the front axle load sensing valve solenoid is not connected	20-166
As. SV Fa. or NC	11	11	The control unit detects that the front axle 'up' valve solenoid is not connected	20-164
PO. SE. Fa. or NC	15	15	The control unit detects that the front suspension position sensor is disconnected.	20-167
LAMP Ind. Disc.	22	22	The control unit has detected that the activation and faults indicator light is burnt out or disconnected.	20-172
SC LAMP Ind.	21	21	The control unit has detected that the activation and faults indicator light is short-circuiting.	20-171
PW. S. Fa. or NC	16	16	The control unit detects that the power input to the front suspension position sensor is not correct.	20-168
Battery V. High	17	17	The control unit has detected that the battery voltage is too high.	20-169
Battery V. Low	19	19	The control unit has detected that the battery voltage is too low (less than10V).	20-170

5.4.4 ANALYSIS OF ALARMS

ALARM N° 11

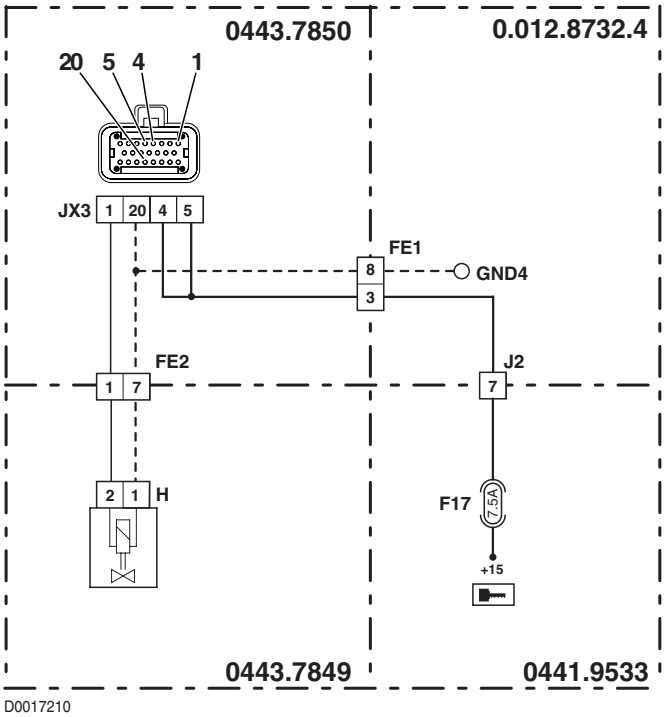
As. SV Fa. or NC

DESCRIPTION

The control unit detects that the front axle 'up' valve solenoid is not connected.

CHECK

- Test the internal resistance of the solenoid (the resistance value must be other than infinity).
- Check that the contacts on connector “JX3” of the control unit and connector “H” of the front axle up valve solenoid are firmly attached and not oxidised.
- Check for electrical continuity between pin 2 of connector “H” and pin 1 of connector “JX3”.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “H” and to chassis earth, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- If the fault persists, renew the control unit.



D0017210

ALARM N° 12

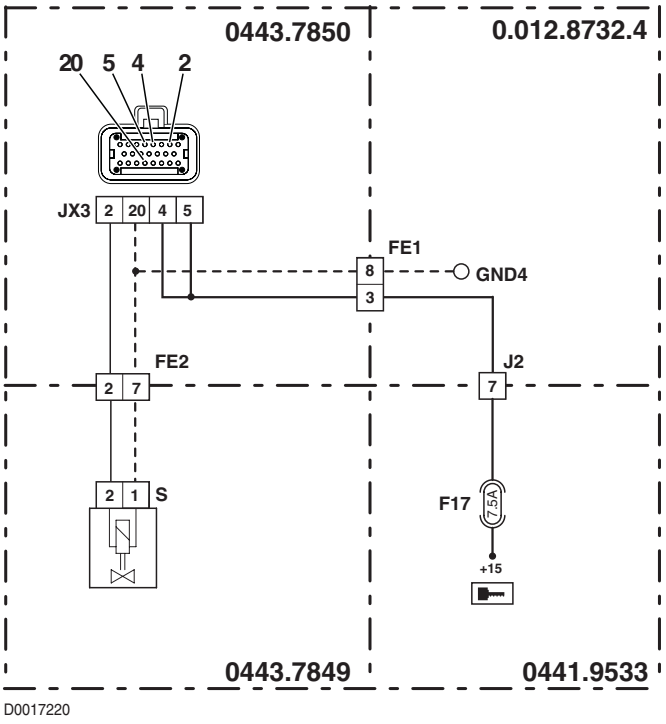
De. SV Fa. or NC

DESCRIPTION

The control unit detects that the front axle 'down' valve solenoid is not connected.

CHECK

- Test the internal resistance of the solenoid (the resistance value must be other than infinity)**.**
- Check that the contacts on connector “JX3” of the control unit and connector “S” of the front axle down valve solenoid are firmly attached and not oxidised.
- Check for electrical continuity between pin 2 of connector “S” and pin 2 of connector “JX3”.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 to connector “S” and to chassis earth, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- If the fault persists, renew the control unit.



ALARM N° 13

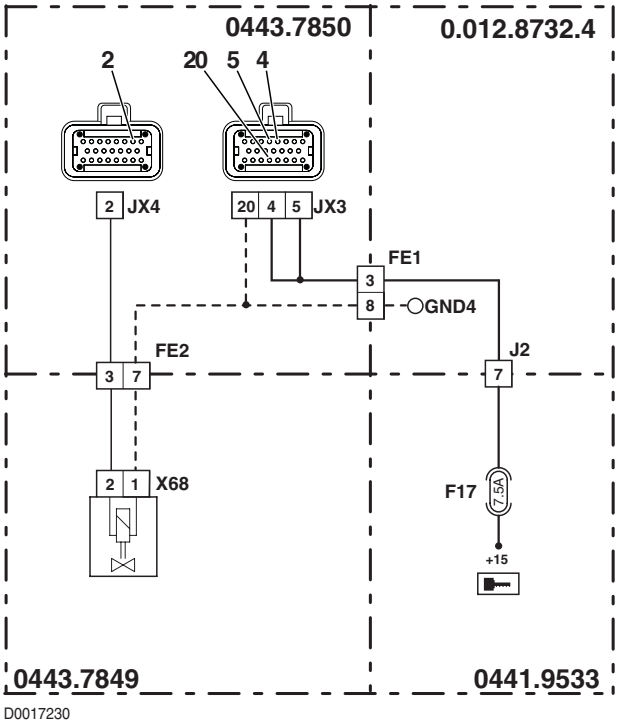
← LS. SV Fa. or NC

DESCRIPTION

The control unit detects that the front axle load sensing valve solenoid is not connected.

CHECK

- Test the internal resistance of the solenoid (the resistance value must be other than infinity).
- Check that the contacts on connector “JX3” of the control unit and connector “X68” of the front axle load sensing valve solenoid are firmly attached and not oxidised.
- Check for electrical continuity between pin 2 of connector “X68” and pin 2 of connector “JX3”.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 1 of connector “X68” and to chassis earth, and measure the resistance to verify the continuity of the circuit (meter reading: 0 Ohm).
- If the fault persists, renew the control unit.



D0017230

ALARM N° 15

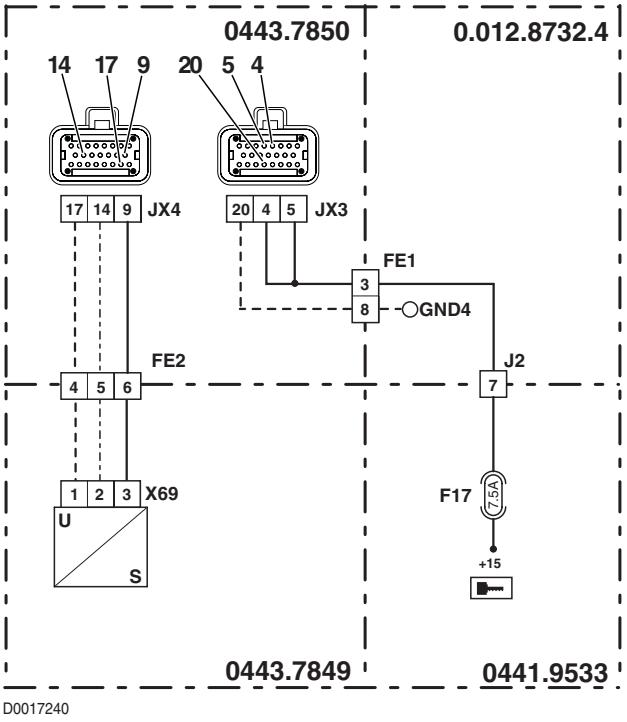
← PO. SE. Fa. or NC

DESCRIPTION

The control unit detects that the front suspension position sensor is disconnected.

CHECK

- Check that the contacts on connector “X69” of the front axle suspension position sensor and connector “JX4” of the control unit are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, check that the power input to the front suspension position sensor is correct (8 Vdc approx measured between pin 3 (positive) and pin 1 (negative) of connector “X69”).
- Check for electrical continuity between pin 14 of connector “JX4” and pin 2 of connector “X69”.
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “X69” and to transmission earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- Verify the correct operation of the sensor (for technical details, see section 40).
- If the fault persists, renew the control unit.



ALARM N° 16

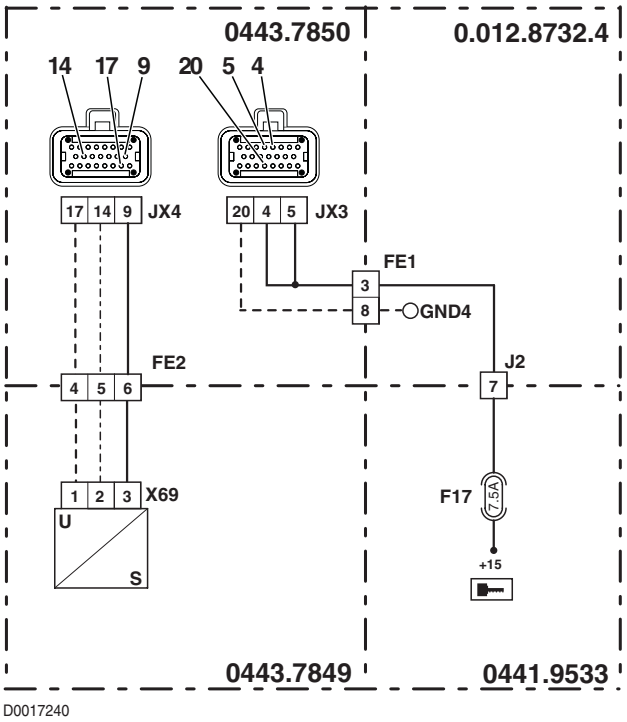
← PW. S. Fa. or NC

DESCRIPTION

The control unit detects that the power input to the front suspension position sensor is not correct.

CHECK

- With the starter key in the “I” (ON) position, check that the power input to the front suspension position sensor is correct (8 Vdc approx measured between pin 3 (positive) and pin 1 (negative) of connector “X69”).
- Turn the starter key first to “O” (OFF) and then back to the “I” (ON) position.
- See if the alarm is still indicated; if so, the ECU must be renewed.



D0017240

ALARM N° 17

← Battery V. High

DESCRIPTION

The control unit has detected that the battery voltage is too high.

NOTE

This alarm is activated generally when the alternator charging voltage is irregular, and can be tripped only by a fault affecting the alternator itself.

CAUTION

Never connect the ART with the engine running when this alarm is indicated, 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).
- 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.

ALARM N° 19

← Battery V. Low

DESCRIPTION

The control unit has detected that the battery voltage is too low (less than 10V).

NOTE

This alarm is activated generally when the battery voltage is less than 10V and can be tripped by an excessive current draw when the engine is started, or if the battery is damaged or cannot be recharged by the alternator. Accordingly, this alarm can be displayed only as a passive alarm by the ART. 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.

  NOTE

  Lower voltages can register after the tractor has been standing idle for an extended period; this does 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 changing the alternator, verify its correct or incorrect operation by connecting a new battery.

ALARM N° 21

← SC LAMP Ind.

DESCRIPTION

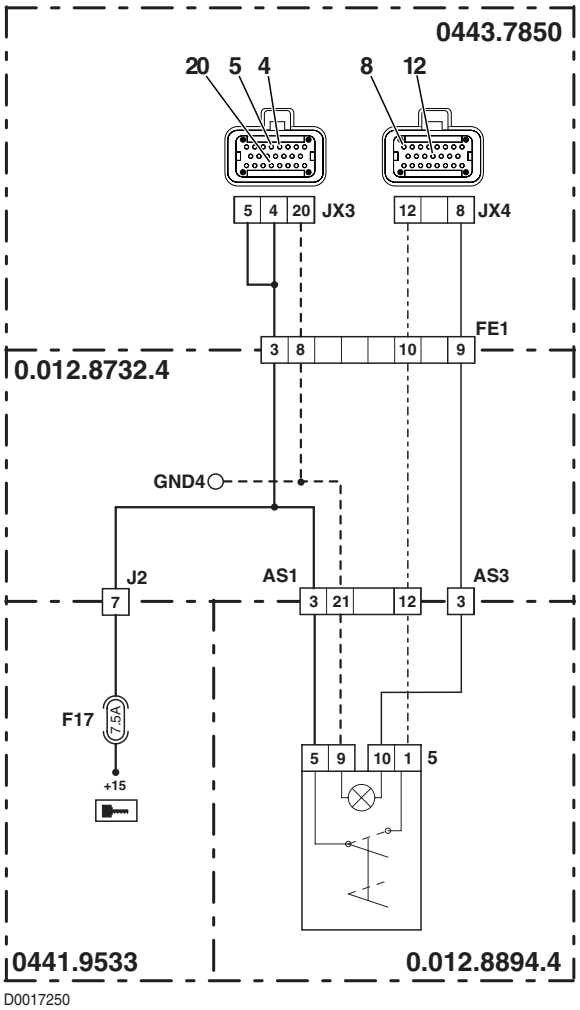
The control unit has detected that the activation and faults indicator light is short-circuiting.

NOTE

This alarm is displayed only by the ART. The operator or technician may become aware of the problem simply due to the fact that the lamp does not light up when the front axle suspension is activated or deactivated.

CHECK

- Check that the contacts on connector “5” of the activating switch and connector “JX4” of the control unit are firmly attached and not oxidised**.**
- With the starter key in the “O” (OFF) position, connect a test meter to pin 10 of connector “5” and to cab earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- If the fault persists, renew the control unit..



ALARM N° 22

← LAMP Ind. Disc.

DESCRIPTION

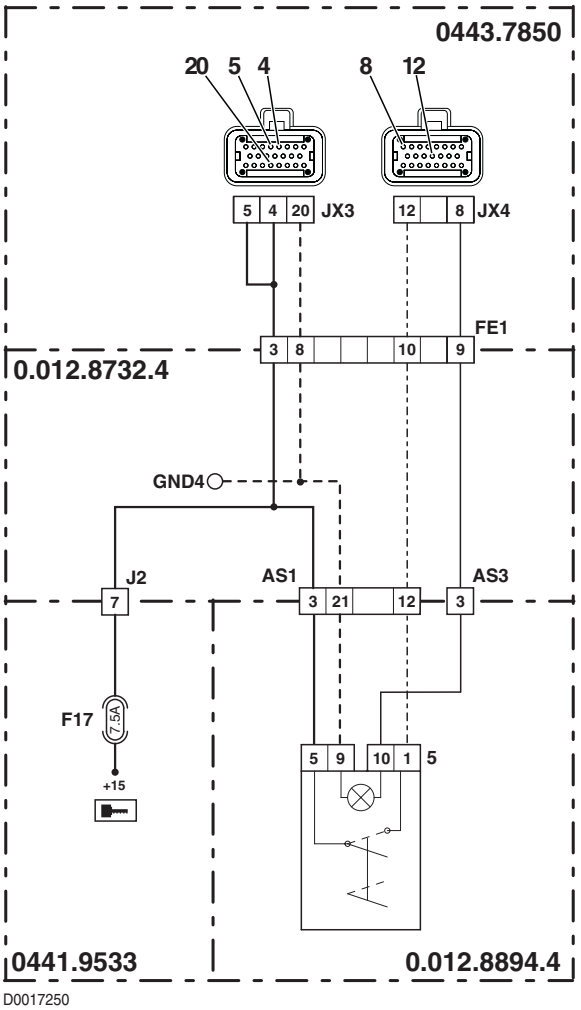
The control unit has detected that the activation and faults indicator light is burnt out or disconnected.

NOTE

This alarm is displayed only by the ART. The operator or technician may become aware of the problem simply due to the fact that the lamp does not light up when the front axle suspension is activated.

CHECK

- Check the condition of the indicator lamp.
- Check that the contacts on connector “5” of the activating switch and connector “JX4” of the control unit are firmly attached and not oxidised.
- With the starter key in the “I” (ON) position, activate the axle suspension and check that the control unit is supplying power to the indicator light, connecting a test meter to pin 9 and pin 10 of connector “5” (voltage 12V).
- Check for electrical continuity between pin 10 of connector “5” and pin 8 of connector “JX4”.
- Check for electrical continuity between pin 9 of connector “5” and the cab earth.
- If the fault persists, renew the control unit.



ALARM N° 24

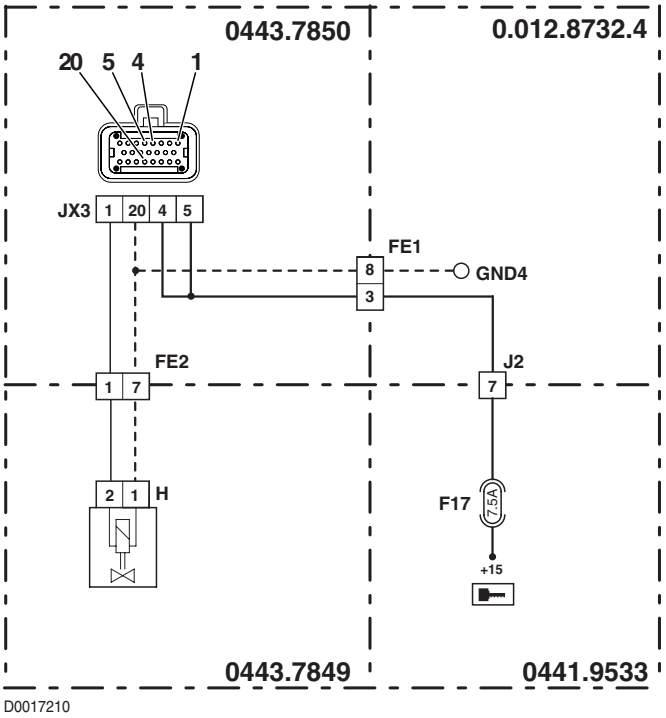
← ALL. CC EV UP

DESCRIPTION

The control unit detects a short circuit in the control line of the front axle 'up' solenoid.

CHECK

- Check that the contacts on connector “JX3” of the control unit and connector “H” of the front axle up valve solenoid are firmly attached and not oxidised**.**
- Test the internal resistance of the solenoid (the resistance value must be other than 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “H” and to chassis earth, and measure the resistance to verify that there are no short circuits to earth (meter reading: infinity).
- If the fault persists, renew the control unit.



D0017210

ALARM N° 25

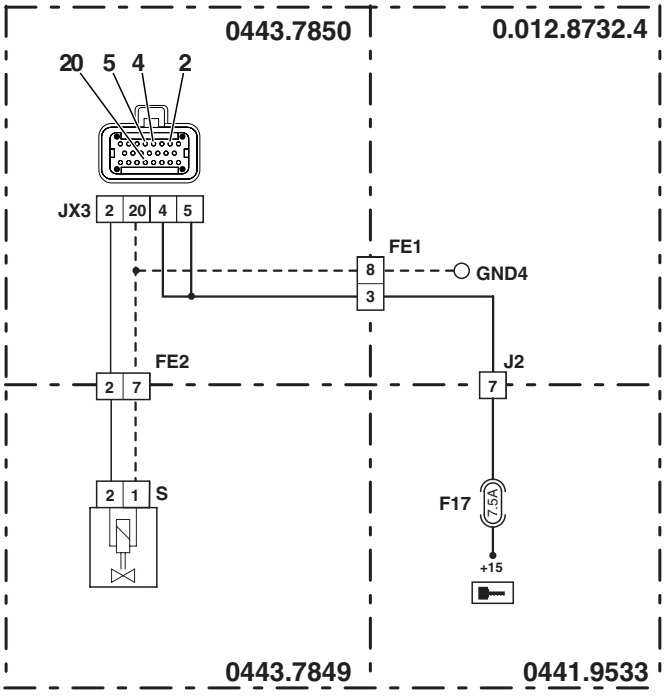
← ALL. CC EV DW

DESCRIPTION

- The control unit detects a short circuit in the control line of the front axle 'down' solenoid.

CHECK

- Check that the contacts on connector “JX3” of the control unit and connector “S” of the front axle down valve solenoid are firmly attached and not oxidised**.**
- Test the internal resistance of the solenoid (the resistance value must be other than 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “S” and to chassis earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- If the fault persists, renew the control unit.



D0017220

ALARM N° 26

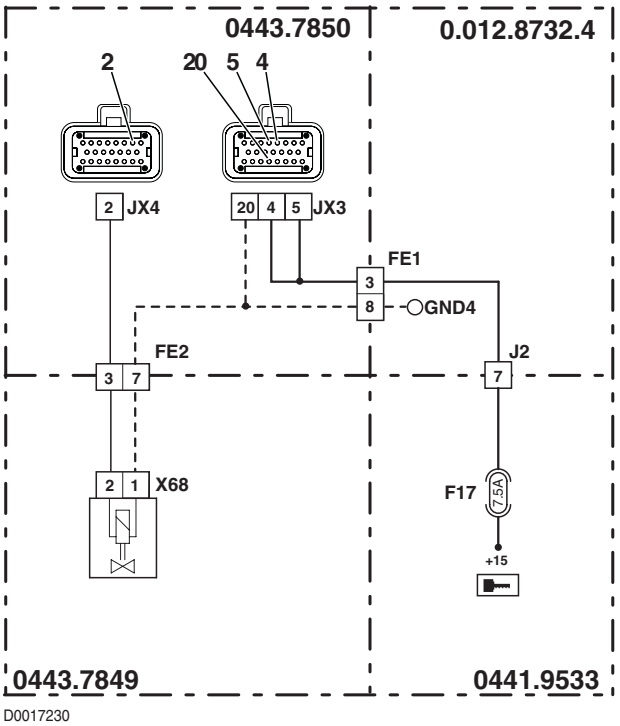
← ALL. CC EV LS

DESCRIPTION

The control unit detects a short circuit in the control line of the front axle load sensing solenoid.

CHECK

- Check that the contacts on connector “JX3” of the control unit and connector “X68” of the front axle load sensing valve solenoid are firmly attached and not oxidised**.**
- Test the internal resistance of the solenoid (the resistance value must be other than 0 Ohm).
- With the starter key in the “O” (OFF) position, connect a test meter to pin 2 of connector “X68” and to chassis earth, and measure the resistance to ensure there are no short circuits to earth (meter reading: infinity).
- If the fault persists, renew the control unit.



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6. OPERATOR'S MANUAL EDS (Electronic Diagnosis System)

1. GENERAL INTRODUCTION

The electronic components in the AGROTRON are tested and programmed by means of the Electronic Diagnosis System (EDS) from DEUTZ-FAHR.
The existing version of the EDS consists of an interface cable and an adapter cable as well as of an installation disk with the corresponding programs.
The PC program and the cables are distributed via:

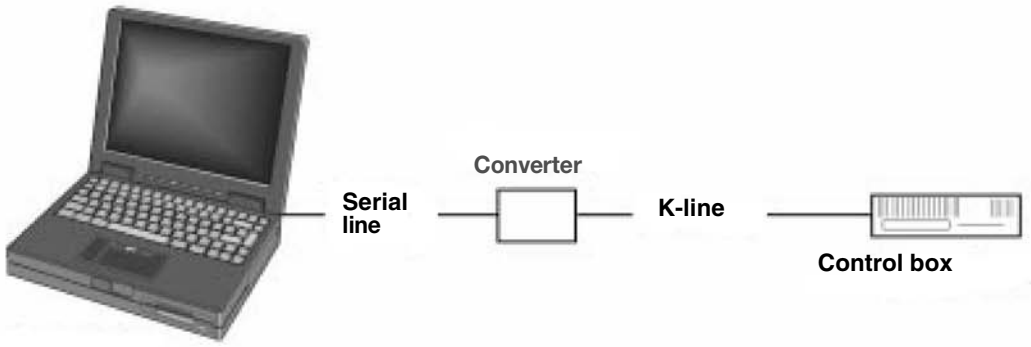
SAME-DEUTZ-FAHR ITALIA S.p.A.
Viale F. CASSANI, 15
24047 TREVIGLIO (BG) - ITALIA

1.1 FUNCTIONAL SCOPE

The EDS software includes the following subprograms:

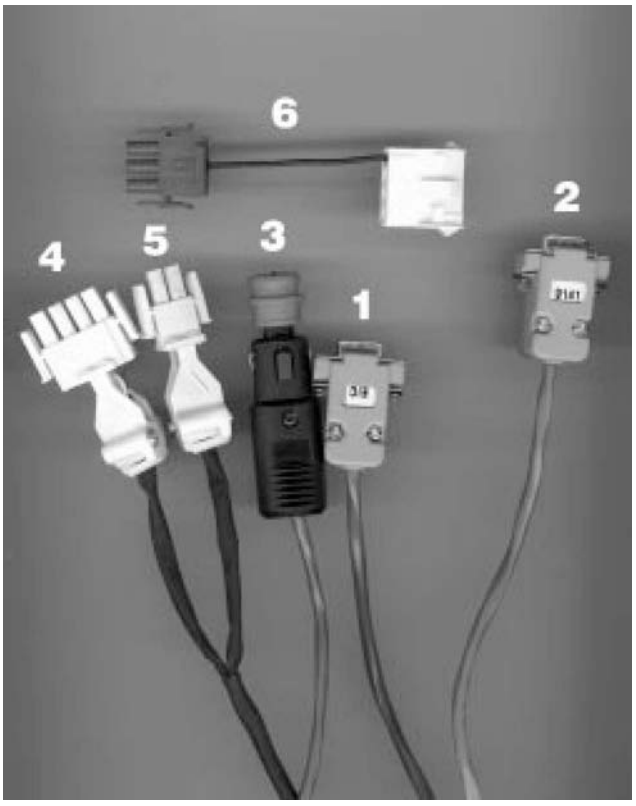
- **POWERSHIFT (not used for this tractor) and POWERSHUTTLE transmission**
  - Diagnosis
  - Readout of the gear box error memory
  - Programming of the gear box, e.g. upon replacement of the box (end-of-line programming)
  - Calibration of the sensor at the clutch pedal (end-of-line programming)
  - Evaluation of the contact pressure of the main clutch (only for power shuttle)
- **Agrotronic-hD (not used for this tractor)**
  - Diagnosis
  - Readout of the AGROTRONIC-hD box error memory
  - Calibrate valves
- **Infocenter**
  - Diagnosis
  - Programming of the constant values
- **Spring-suspended front axle (not used for this tractor)**
  - Diagnosis
  - Readout of the control box error memory
  - Reading resp. loading of the control box standard data (parameters) converter

1.2 HARDWARE REQUIREMENTS



Hardware Setup

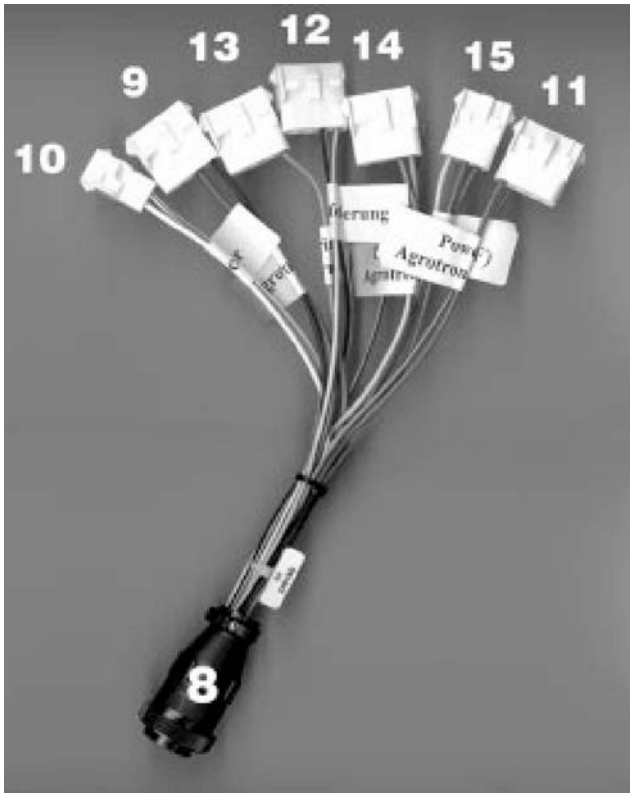
1.2.1 INTERFACE CABLE (SERIAL)



The depicted interface cable is plugged into the serial interface (COM 1 or COM 2) of the computer and connected with the corresponding connectors of the adapter cable.

1 - Plug (designation "EIC") for connection to the serial interface (RS 232) at the computer for diagnosis INFOCENTER.
2 - Plug (designation "9141") for connection to the serial interface (RS 232) at the computer for diagnosis POWERSHIFT- and POWERSHUTTLE-transmission, AGROTRONIC-hD and spring-suspended front axle.
3 - Plug for 12 V supply of the interface cable for connection to the cigar lighter.
4 - Diagnosis plug for AGROTRONIC-hD, gear box control and spring-suspended front axle, 4-pole.
5 - Diagnosis plug for INFOCENTER, 2-pole.
6 - Adapter for diagnosis POWERSHIFT transmission, old version.

1.2.2 ADAPTER CABLE FOR CENTRAL DIAGNOSIS INTERFACE



The depicted adapter cable is plugged into the diagnosis interface in the fuse box and connected with the corresponding connectors of the PC interface cable.

8 - Central plug 14-pole for connection in the fuse box
9 - Diagnosis plug for "Agrotronic-hD", 4-pole
10 - Diagnosis plug for "Infocenter", 2-pole
11 - Diagnosis plug "Powershift Agrotron 4.70 – 6.45", 4-pole
12 - Diagnosis plug "Spring-suspended front axle", 4-pole
13 - Diagnosis plug "Electronic motor control", 4-pole
14 - Diagnosis plug for "Full powershift Agrotron 160-200", 3-pole
15 - Diagnosis connection for "MOBI-DIG (ZF)", 4-pole

NOTE. Both free cable ends are not used.

1.2.3 SYSTEM REQUIREMENTS

The applied computer (notebook, laptop or portable system) needs to fulfill the following requirements in order to install and execute EDS:

- IBM compatible personal computer with at least a 80486 processor.

CAUTION!

For the use of SERDIA – SERvice DIAgnosis program for the electronic motor control from DEUTZ AG – a Pentium'-processor is recommended.

- Main memory (RAM) at least 640 kB
- Disk drive 3,5" for 1,44 MB floppy disks (HD)
- Hard disk with at least 2,5 MB of free memory space
- at least one serial interface COM 1 (RS 232)
- Operating system MS-DOS from version 6.xx on
- An additional serial/k-line converter is required for the communication with the diagnosis interface (included in the scope of supply of the company Wilbär).

1.2.4 SOFTWARE INSTALLATION

IMPORTANT!

The EDS program needs to be installed and executed in the DOS mode of the computer in order to prevent malfunctions! The installation has to be carried out according to the installation instructions included in the scope of supply.

The installation procedure valid according to the current release is shown step by step in the subsequent description:

- Start computer in DOS mode (C:_)
- Insert floppy disk in drive A
- Change to drive A (A:_) by means of entering **A**: and pressing of the **ENTER-key**
- The automatic installation procedure is launched by means of entering **install**
  Hereby a new subdirectory (C:\EDS) is created on the hard disk in which the EDS program will be installed. During the installation process the user is assisted by instructions on the screen.
- After succesful installation the EDS program is launched automatically.
- The program is terminated by selecting **Option 8** (C:\EDS_)
- The subdirectory EDS is quit (C:_) by means of entering **cd.** (resp. cd\).

1.3 STARTING AND TERMINATING OF THE EDS PROGRAM

IMPORTANT!

If Windows 95/Windows 3.1 is installed as operating system the EDS program needs to be launched in DOS mode (in case of Win'95 via the MS-DOS input prompt icon). Otherwise malfunctions may occur during the diagnosis!

1.3.1 STARTING OF THE EDS PROGRAM

- Start computer in DOS mode (C:_)
- Change into the subdirectory EDS (C:\EDS:>_) by means of entering **CD EDS**.
- The program is launched by entering **EDS**; the initial menu appears with the following select options:

Fig. 1 - Initial Menu

Within the initial menu, pressing one of the numerical keys (1 to 7) determines which component (e.g. Agrotronic-hD+ASM) is supposed to be checked and on which computer interface (COM 1 or COM 2) the signals arrive.

1.3.2 TERMINATING OF THE EDS PROGRAM

- The initial menu (see figure) appears again after terminating the selected subprogram (e.g. Agrotronic-hD+ASM)
- The EDS program is quit by means of selecting **Option 8**.
- The display **C:\EDS**:>_ shows that the operating system is still located in the subdirectory EDS which is quit by entering **cd..**, causing DOS to return to the root directory.
- If EDS was launched in DOS mode under Windows 95 (via the MS-DOS input prompt), entering **EXIT** causes Windows to close the DOS window and return to the Windows desktop.

2. TRANSMISSION DIAGNOSIS

DEST is a program for diagnosis and end-of-line programming of the transmission control units DEST 38 and DEST 45. It consists of a main menu in which the corresponding control unit is selected and the actual diagnosis programs.

The user interface of this program is realized according to the SAA standard. This means for the user:

- a uniform menu prompting system
- an online help available at any time
- mouse-support
- operation via hotkeys (designated by highlighted characters)

2.1 THE MAIN MENU

On start-up of DEST (compare part 1.1.3: "Starting and terminating of the EDS program") the last selected diagnosis control is started automatically. The corresponding diagnosis program must be quit in order to return to the main menu (DEST 38 – menu item File > End; DEST 39/45 – menu item File > main menu). From the DEST 38 diagnosis it is always possible to return to the main menu.

2.1.1 SCREEN AND MENU STRUCTURE

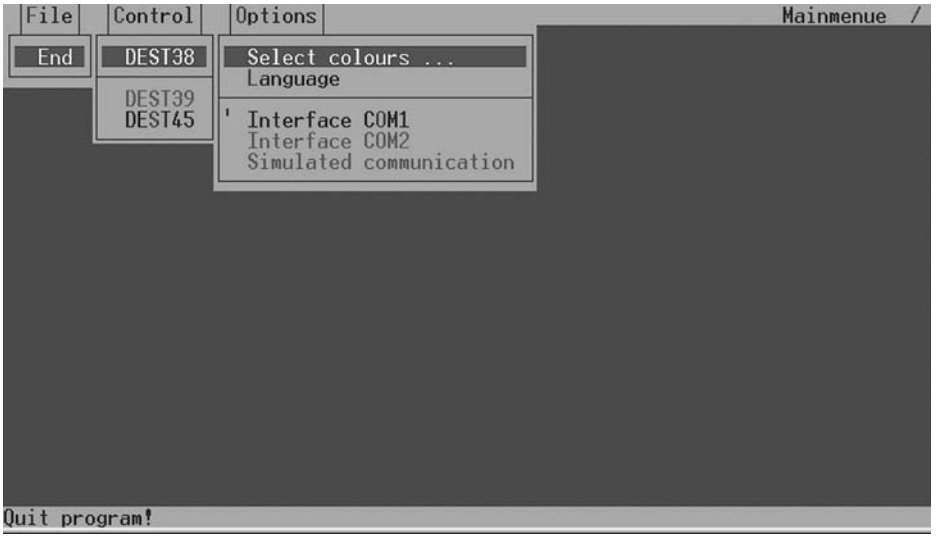


Fig. 2 - Menu structure

The screen setup with the main menu is identical for the transmission diagnosis programs; in the diagnosis programs DEST 38, 39/45 the menu line is merely supplemented by the menu item Diagnosis. Left at the top in the menu line the current program level is indicated, e.g. MAIN MENU. The rotating dash left beside it signalizes to the user that the program is working correctly on the lowest level. If this dash stands still an error has occured and the program must be restarted.

The user activates the menu by means of pressing the ALT key or the F10 key and may select a submenu by means of the cursor keys. The same goal is accomplished by means of pressing the ALT key and one of the hotkeys assigned to every menu item simultaneously.

This hotkey is a highlighted character for every menu item (e.g. the "F" for the menu item File, invoked with the combination ALT + F).

The menu may be quit by means of the ESC key (resp. the ALT key).

2.1.2 FILE

- **File >End**
  Terminates the program; altered settings (language, colour palette and interface in use) are stored. If the program is terminated directly after quitting DEST 38 the start menu of DEST 38 is invoked automatically on the next start-up; otherwise the main menu reappears.

2.1.3 CONTROL

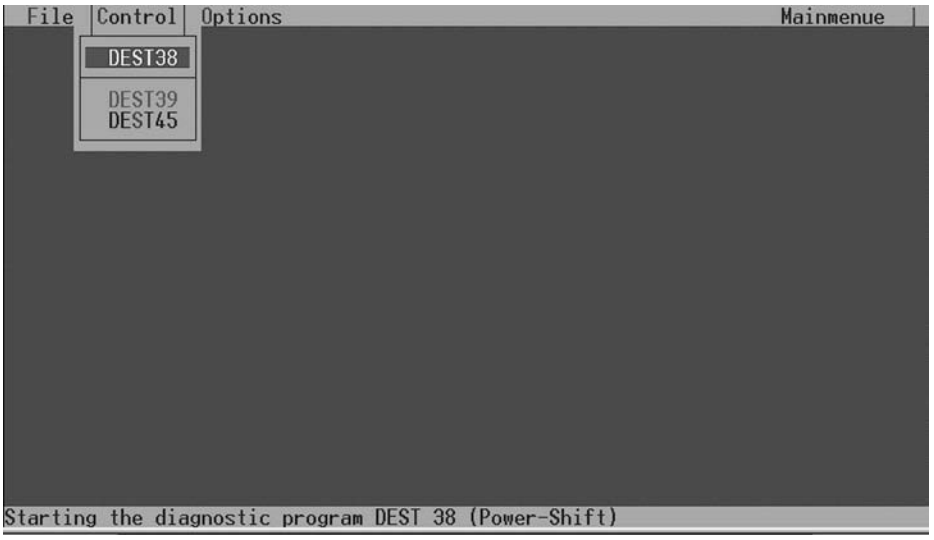


Fig. 3 - Control

- **Control > DEST38**
  Launches the diagnosis program DEST 38 after a confirmation.

  CAUTION!
  Colour, language and interface settings cannot be taken over!

- **Control > DEST39**
  Launches the diagnosis program DEST 39 after a confirmation.

  CAUTION!
  This program cannot be started if there is no file dest39.ini existing!

- **Control > DEST45**
  Launches the diagnosis program DEST 45 after a confirmation and takes over the current settings.

2.1.4 OPTIONS)

- **Options > Colour palette**
  Selection of various colour palettes for the screen display.

Fig. 4 - Menu Colour

- **Options > Language (Lingua)**
  Changes the communication language between user and program.

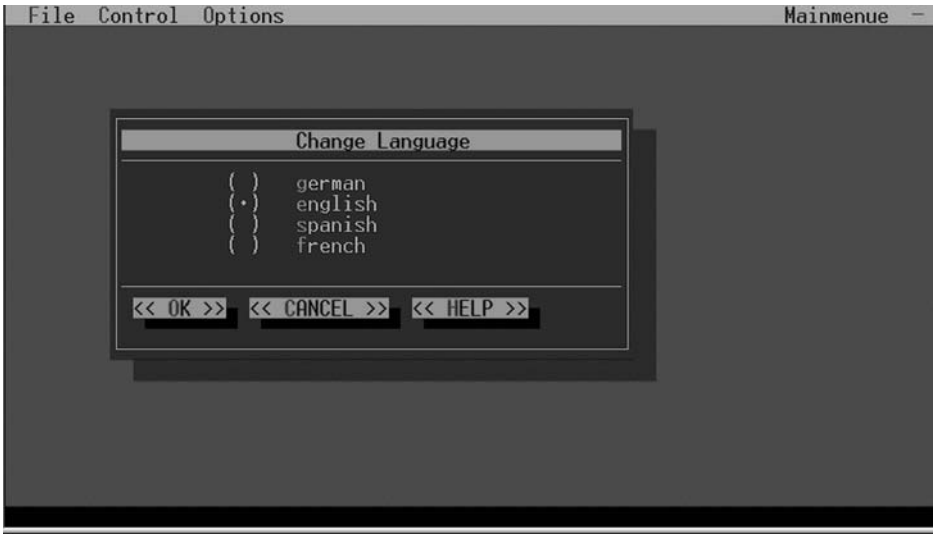


Fig. 5 - Menu Change language

- **Selection of the serial interface COM1**
  for the communication between control device and PC.

- **Options >Interface COM 2)**
  Selection of the serial interface COM2 for the communication between control device and PC.

- **Options > Simulated communication**
  This menu item is disabled due to safety reasons; the selection Simulation is not stored.

2.2 ONLINE HELP

The diagnosis program DEST offers the user help at any time about the current environment (context help) as well as help about the current key assignment. All help texts are stored as text files to be displayed at any time during the running program. Future supplements or changes of these texts can be carried out without problems by means of a text editor.

The user of the diagnosis program DEST has the opportunity to invoke an online help within the program context at any time:

- by means of pressing the F1 key
- by means of pressing ALT + H
- by means of clicking on the << HELP >> button with the mouse

The online help basically describes the operation of the currently active window. Further texts (e.g. a detailed description of specific control device data) can also be included.

The possible key combinations in the context are shown by means of pressing the F9 key.

3. POWER-SHUTTLE DIAGNOSISPROGRAMM DEST 45

3.1 PREPARATIONS FOR TRANSMISSION DIAGNOSIS WITH DEST 45

As a preparatory measure the connection between tractor and computer needs to be established so as to check the transmission control by means of DEST 45 resp. to be able to carry out the end-of-line programming.

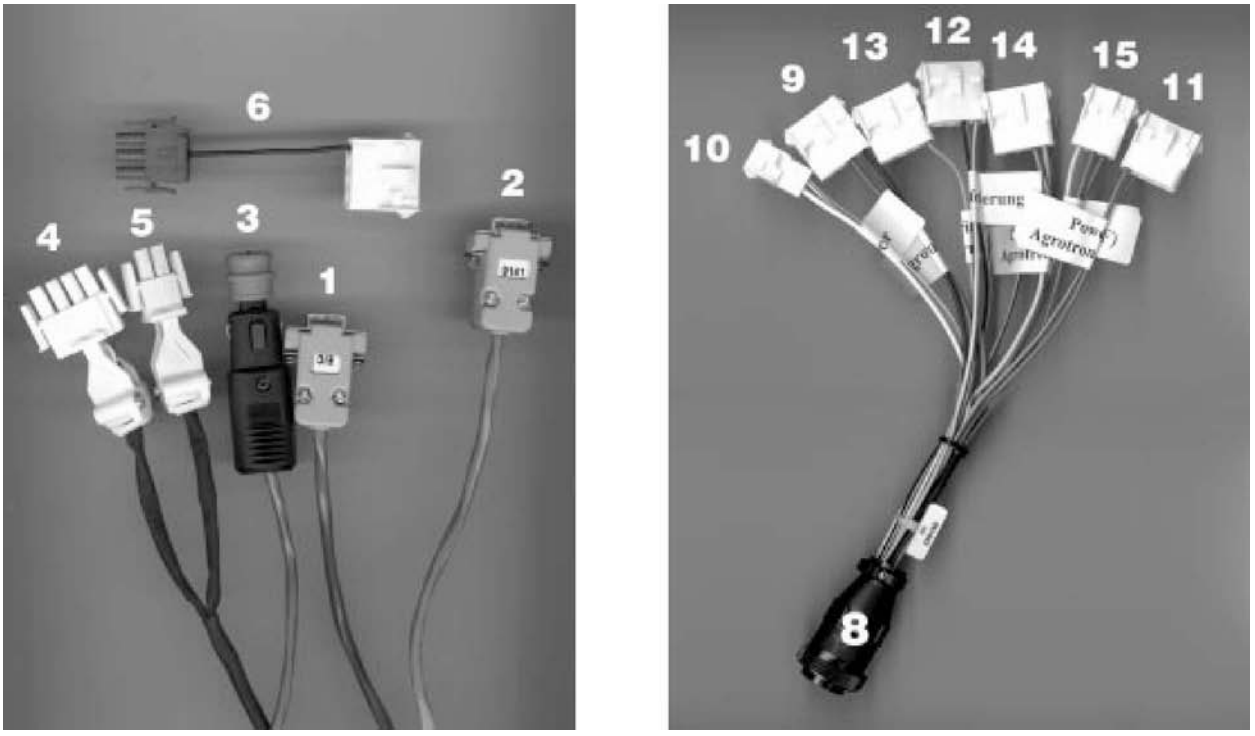


Fig. 23 - Interface cable and adapter cable

The interface cable and the adapter cable are serving for this purpose (see figure).

1 - Connect plug (2) of the interface cable with the designation ”9141” to the computer (COM interface)
2 - Connect plug (3) of the interface cable for the 12 V supply to the cigar lighter
3 - Connect the 4-pole plug (4) of the interface cable to the plug (11) – designation ”powershift Agrotron 4.70-6.45” – of the adapter cable
4 - Insert the central plug (8) of the adapter cable into the central diagnosis interface in the fuse box
5 - Switch ON ignition
6 - Start the computer and call the EDS program (compare item A 1.3 – Launching and terminating of the EDS program)
7 - Call **Option 1** in the initial menu
8 - Make sure that the right diagnosis program (DEST 345) is invoked. On the right side in the upper frame of the screen DEST 45 needs to be displayed, and below e.g. DEST 45 – V 2.2 – 16.12.97. If necessary change to the main menu and launch DEST 45 via the menu item Control > DEST 45.

CAUTION!

Before starting the diagnosis verify that the proper interface (COM 1 or COM 2) is selected in the menu item Options!

3.2 DEST 45 PROGRAM DESCRIPTION

3.2.1 FILE >MAIN MENU

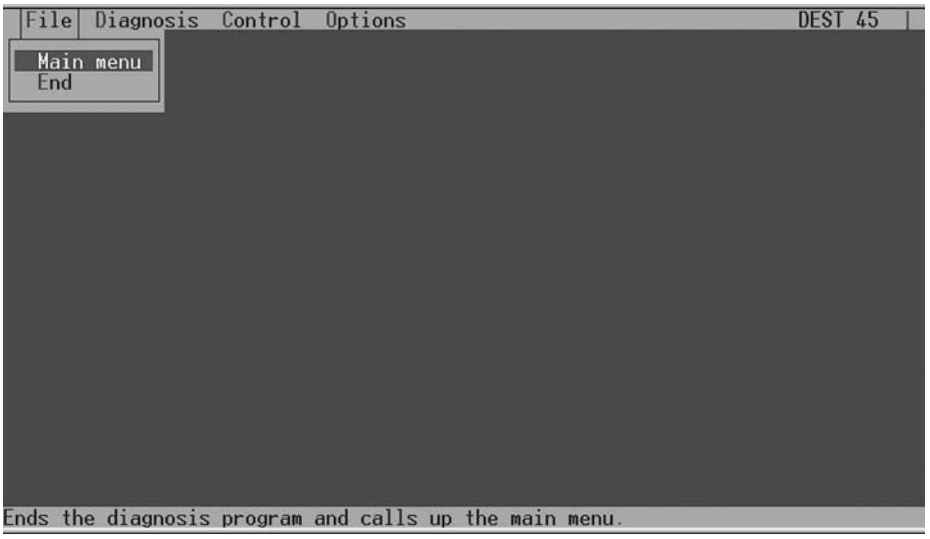


Fig. 24 - File >Main menu

- **File > Main menu**
  Selecting this menu item quits the active control and calls the main menu in which the user can select the next control to be diagnosed or quit the program. All current settings are saved and upon the next start-up the main menu reappears.
- **File > End**
  The menu item ”End” saves the settings selected under the menu item ”options” (colour palette, language and selected interface) and terminates the diagnosis program.
  Upon the next start-up of the diagnosis program the settings are automatically taken over and the diagnosis program DEST 45 is called.

3.2.2 MENU DIAGNOSIS

- **Diagnosis > Read error memory**
  The menu item ”Read error memory ” opens a window divided into two parts in which the contents of the error memory are displayed in chronological order.

Fig. 25 - Read error memory

The double frame and the highlighted lines ”Read error memory” resp. ”Error description” show which part of the window is currently active.
In the left part of the window the current operating-hours of the transmission-E-box (not to be compared with the operating hours of the infocenter!) and the number of the various errors detected by the transmission-E-box are displayed. Below the errors stored in the E-box are indicated. In the column ”Errors” the respective error codes are listed. The column ”active” indicates the corresponding error status. ”Y” stands for yes; i.e. the error is currently active – resp. ”N” for no; i.e. the error is currently not active. The third column ”Number” indicates how many times the respective error has occured. The information under ”Operating-hours” indicates when the respective error has occured.
The user can select an error with the cursor keys and cause a detailed error description to be displayed on the right side of the screen by means of clicking on OK or pressing ENTER. The error text can be scrolled by means of the cursor keys if it exceeds the size of the right window.
Pressing of ESC or C reactivates the left screen window.
If the left window is active, all errors can be saved in a text file with their detailed description by means of pressing F2. In addition to the error descriptions the current operating-hours counter, the identification data, the current date as well as the vehicle identification number and the number of the electronic box are saved. However, vehicle identification number and number of the electronic box can only be saved if the corresponding entry in the EEPROM is valid.

- **Diagnosis > Delete error memory (Cancellazione memoria errori)**
  "Delete error memory" opens a window which prompts the user to confirm the deletion of the error memory.

Fig. 26 - Delete error memory

- **Diagnosis > HEX data display**
  This menu item is not relevant for diagnosis, as only internal data in hexadecimal notation are displayed here.
  On selection of the menu item HEX data display a window appears, in which the user can enter up to four hexadecimal addresses (see figure). In addition to the address data the user has to enter the number of bytes (maximum 12) he wants to read at this start address. On confirmation with OK their contents are dumped on the screen.

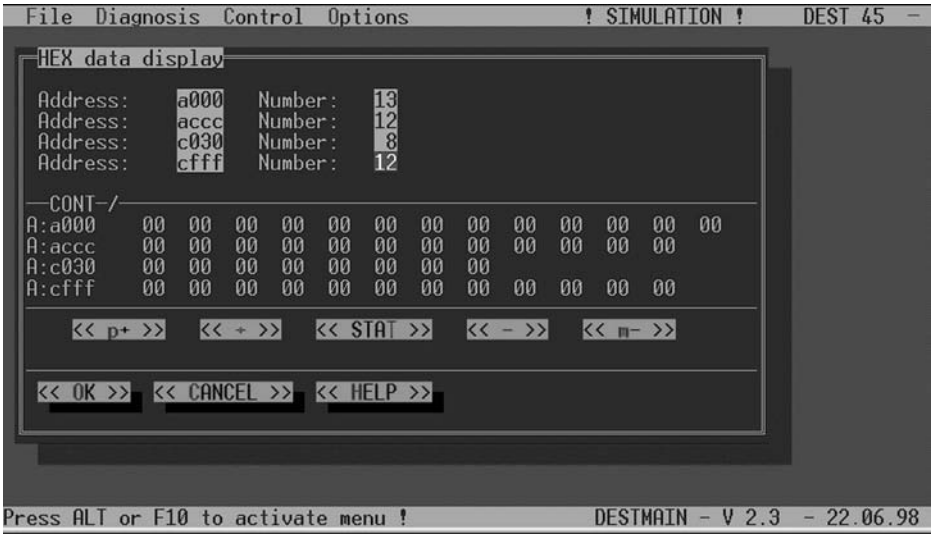


Fig. 27 - HEX data display

With << + >> / << - >> the start addresses are incremented resp. decremented by one.

With << ++ >> / << — >> the start addresses are increased resp. decreased by 12 (decimal).

With << CONT >> the contents are read continually (default). Selection of this button causes the label to change to "<< STAT >>". Reselection toggles again.

Pressing the key ESC (or ALT + C) quits this menu item.

- **Diagnosis > Plaintext data display**

CAUTION!

After selecting the menu item ”End-of-line programming” the ignition on the vehicle needs to be switched off and on again in order to update all data in the window ”Plaintext data display”!

Plain text data display opens a window in which the data are converted and displayed in their corresponding physical units. The structure and contents of the window are shown in the figure below.

By pressing the key ”T” it is possible to toggle between continuous display and static display.

The current status is indicated left at the top of the window as CONT (for continuous display) resp. STAT (for static display).

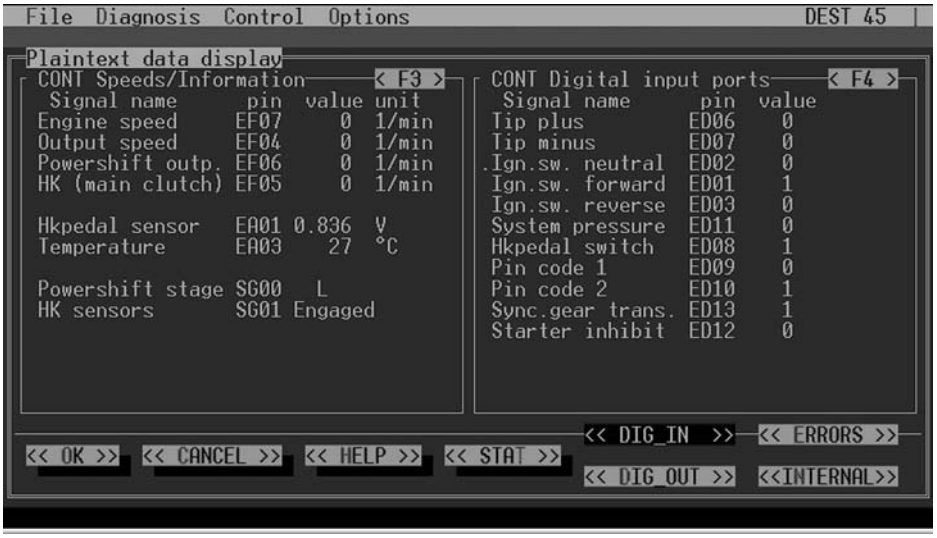


Fig. 28 - Plaintext data display

It is possible to switch between the individual windows for digital inputs, digital outputs, sensor errors and internal variables by means of the select fields (buttons) << DIG_IN >>, << DIG_OUT >>, << ERRORS >> and << INTERNAL >> (also compare ”DEST 38 program description”). The window for speeds/drive information is always visible.
Possible errors are indicated in each individual window.
In case of continuous display a rotating dot indicates which variable resp. which value is currently being refreshed.
Charts with descriptions about matching internal pin assignments and for the contacts of the E-box for the respective windows can be called by means of pressing the keys F3 and F4.
Pressing the key ESC (or C) quits this menu item.

- **<< DIG_IN >> Digital inputs**

Upon selecting << DIG_IN >> a list of the digital inputs appears on the right side of the screen together with their corresponding addresses and values. So in the continuous display mode (CONT) it is possible to check whether the respective signal is being transferred in to the E-box.

Tip plus Powershift plus at the gear lever
Tip minus Powershift minus at the gear lever
FS neutral Drive switch (power-shuttle lever) in neutral position
FS forward Drive switch (power-shuttle lever) in forward position
FS reverse Drive switch (power-shuttle lever) in reverse position
System pressure 18 bar system pressure switch
HK pedal switch Proximity switch at main clutch pedal
Pin code 1 Set to value 1 if type of transmission is T7100
Pin code 2 Set to value 1 if type of transmission is T7200
Gear sync transm Starter inhibit switch at control console
Starter inhibit Push-button switch at drive switch (POWER-SHUTTLE lever)

- **<< DIG_OUT >> Digital outputs**
  Upon selecting << DIG_OUT >> a list of the ”digital outputs” appears on the right side of the screen together with their corresponding addresses and values. So in the continuous display mode (CONT) it is possible to display the output signals of the E-box.

Fig. 29 - Digital outputs

- **<< ERRORS >> Sensor errors)**
  Upon selecting << ERRORS >> a list of the sensor errors appears on the right side of the screen.

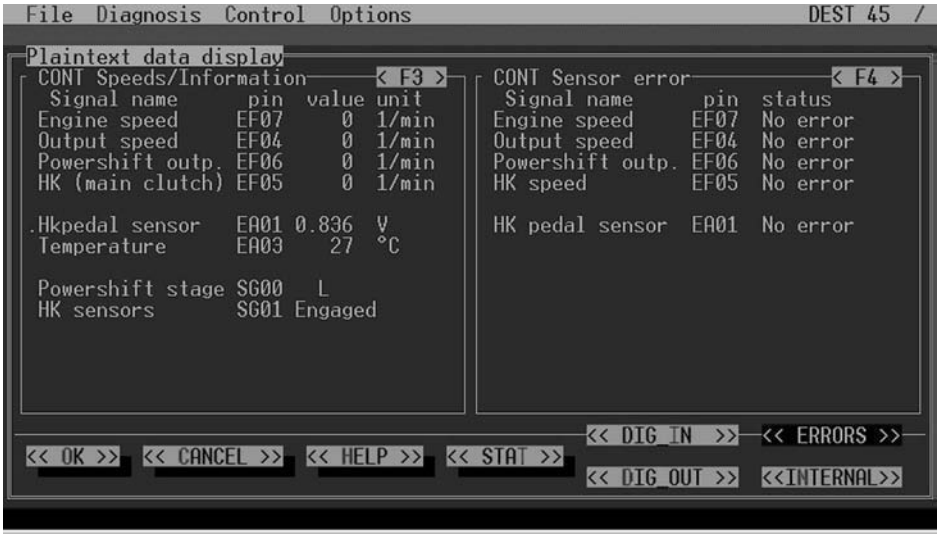


Fig. 30 - Sensor errors

- **<< INTERNAL >> Internal variables**
  Upon selecting << INTERNAL >> a list of the "internal variables" appears on the right side of the screen together with their values and physical units. All displayed values are calculated by the E-box.

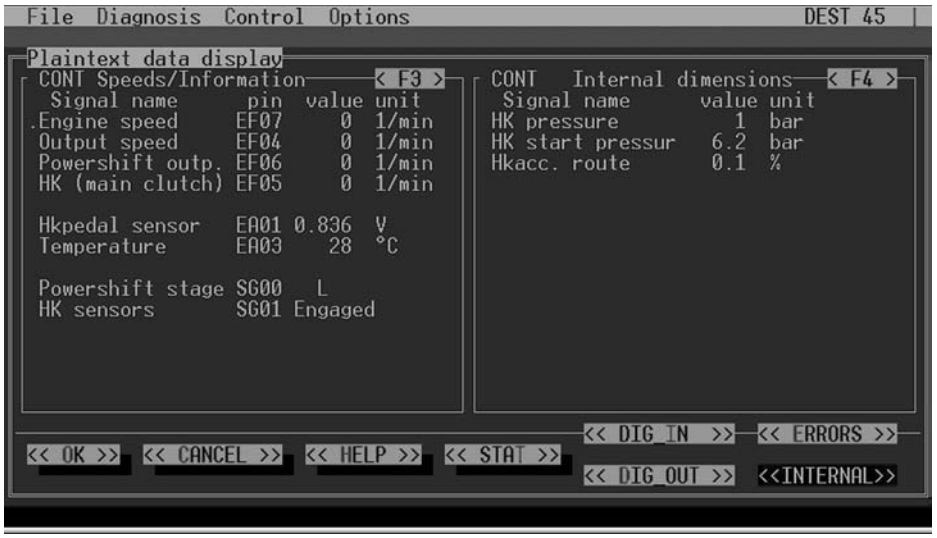


Fig. 31 - Internal variables

HK pressure Pressure at the main clutch (calculated by means of measuring the current which flows to the proportional valve)

HK contact pres Contact pressure of the main clutch evaluated during end-of-line programming

HK pedal position Position of the clutch pedal (calculated from the voltage level of the angle sensor at the clutch pedal)

- **Diagnosis > Set output ports**

CAUTION!

- **Due to safety reasons this menu item can only be selected when the engine has stopped!**
- **If the menu item "End-of-line programming" has been previously executed the ignition on the vehicle needs to be switched off and on again once. Otherwise the digital outputs cannot be activated!**

Fig. 32 - Select output ports

Via the menu item ”Select output ports” it is possible to set or reset the individual digital outputs. After calling the menu item ”Select output ports” a window appears in which the data of the individual outputs of the transmission-E-box are displayed. The outputs are indicated line by line.

Column 1: In this column the components activated by the respective output are indicated.

Column 2: In this column the internal addresses (pins) of the digital outputs are indicated.

Column 3: This column indicates the current status of the output: Hereby the indication ”1” signifies that the output is set and therefore a signal (voltage) is existing at the corresponding pin of the E-box. The indication ”0” signifies that the output is not set and therefore no signal is existing. Highlighted fields in different colours show to the user those outputs which are connected to the E-box and therefore are ready to be activated.

Column 4: In this column the user can select one of the connected outputs by means of the cursor keys, i.e. the desired field is highlighted in a different colour. This output status can be toggled (activated resp. deactivated) by pressing the ENTER key. The output will be set in the E-box and subsequently be read in again by the DEST program. Due to safety reasons the changes which have been carried out will be reset to the normal state after the menu item ”Activate outputs” has been quit.

Column 5: In this column the errors of the digital outputs are shown. Thereby the letters”KM”signify a short circuit to ground and ”LU” stands for a line interruption.

- **Diagnosis > EEPROM read/write**
  This menu item allows the user to read and edit the customer area contents of the EEPROM. On selection a window appears in which the contents are shown (see figure). The user can alter individual characters with the help of the cursor keys and confirm these changes with <<OK>> (ALT + O or ENTER). Subsequent to every writing process into the EEPROM customer area an identification (date) is saved which can be read later on via the menu item Control > Information. This menu item can be quit by means of pressing the ESC key (or ALT + C).

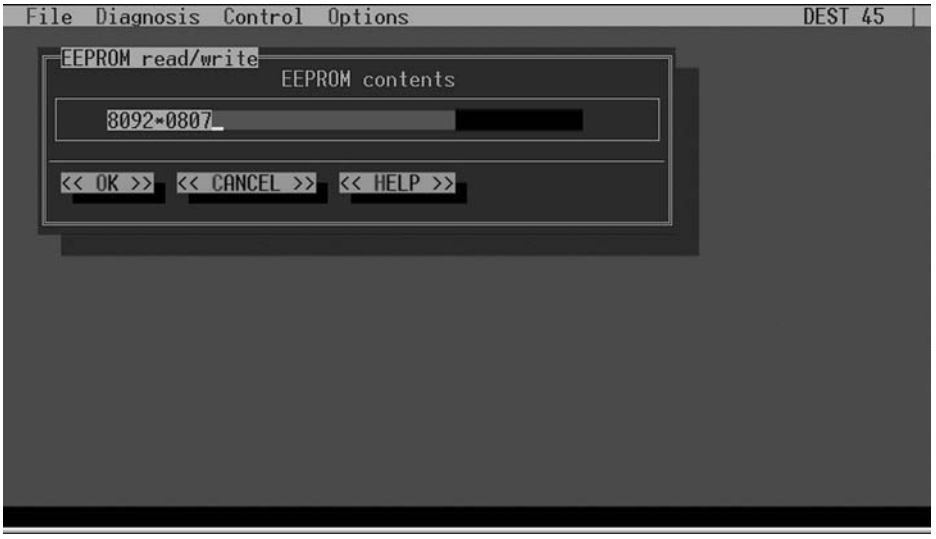


Fig. 33 - EEPROM read/write

The first nine characters of the customer area are highlighted in a different colour. The menu item ”End-of-line programming” fills in the vehicle identification number into this area.

In case of storing the contents of the error memory into a file DEST 45 checks whether the first four characters of the EEPROM customer area correspond to a valid vehicle identification prenumber. If this is the case the vehicle identification number and the corresponding number of the electronic box will also be stored into the file. Otherwise both values cannot be stored.

Due to the aforementioned reasons this area should not be edited by the user himself. Therefore, upon opening the window the cursor is located at the position on the right beside it.

- **Diagnosis > Operating-hours counter**
  This menu item enables the user to read and edit the contents of the electronic operating-hours counter. Subsequent to the initial input a window is opened in order to confirm the data. The input itself is to be carried out with decimal values in hours.

Fig. 34- Operating-hours counter

3.2.3 CONTROL

The submenu ”Control” contains the menu items ”Information” and ”End-of-line programming”

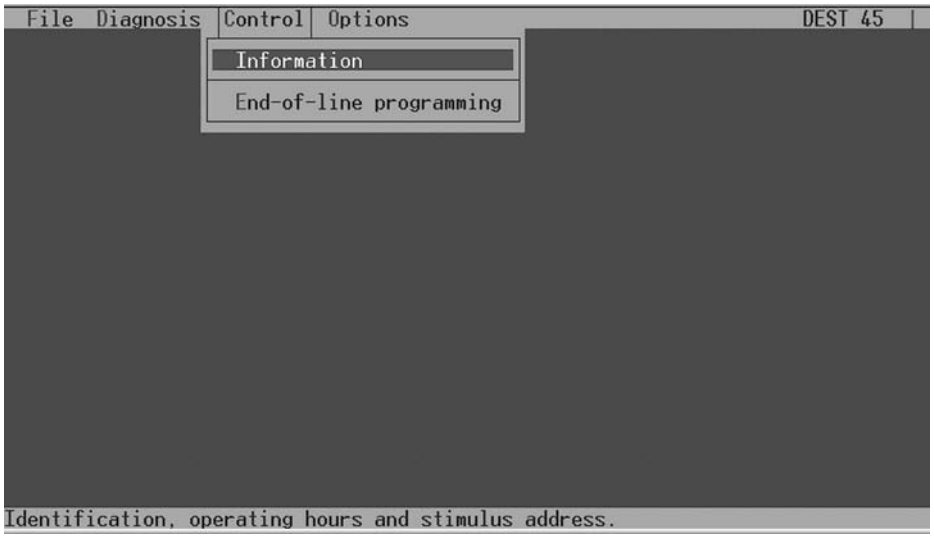


Fig. 35 - Control

- **Control > Information**
  The menu item ”Information” indicates in a window the operating-hours, the EEProm login data, the control unit login data as well as the control unit identification data. These data cannot be edited.

Fig. 36 - Information

- **Control > End of line programming**

CAUTION!

After terminating the menu item ”Activate outputs” the ignition on the vehicle needs to be switched off and on again before the menu item ”End-of-line programming” can be selected. Otherwise the call is aborted by prompting the error message ”Select transmission version not possible!”.

The menu item ”End-of-line programming” opens a divided window for the purpose of configuration of the transmission box and for adjustment of the clutch. In the upper window area the configuration data is displayed. In the lower area the user can find instructions for the end-of- line programming.

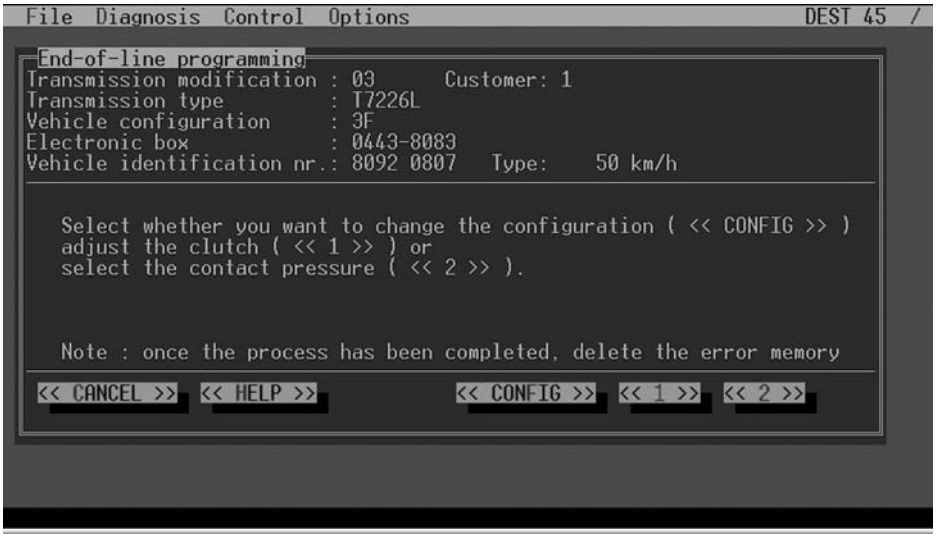


Fig. 37 - End-of-line programming

First the program reads the 8 digit vehicle identification number from the EEPROM. If the first four digits correspond to a valid vehicle identification prenumber the configuration data are read directly from the box. If the configuration data of the box are consistent to the corresponding data of the vehicle identification prenumber all data (transmission version, type of transmission, vehicle configuration, electronic box and vehicle identification number) will be displayed. If they are not consistent only the read out data from the control unit will be displayed. In addition, a warning will appear with instructions to reconfigure the box. The same applies if the vehicle identification prenumber read from the EEPROM is invalid.

The vehicle configuration can be changed by means of selecting the button << CONFIG >> or the letter ”F”. At first the vehicle identification prenumber (the first four digits of the vehicle identification number) is highlighted in a different colour. The vehicle identification number defined for the corresponding type of vehicle can be selected from a table stored in the program by means of the cursor keys. The configuration data belonging to the respective type of tractor are altered simultaneously.

Before these data are stored by pressing the ENTER key it is obligatory to compare the pre-set speed version (30 / 40 km/h or 50 km/h) with the actual speed version of the tractor. If these do not match the proper speed version has to be set by means of pressing the cursor keys again.

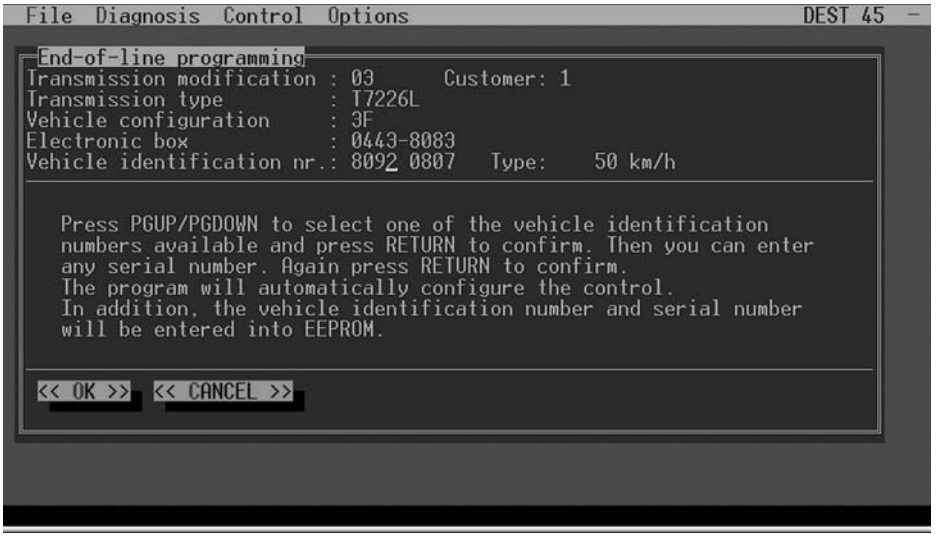


Fig. 38 - Select vehicle identification number

After pressing the ENTER key the last four digits of the vehicle identification number will be highlighted in a different colour. Here the user has to fill in the serial number of the tractor which is stored in the EEPROM by pressing the ENTER key.

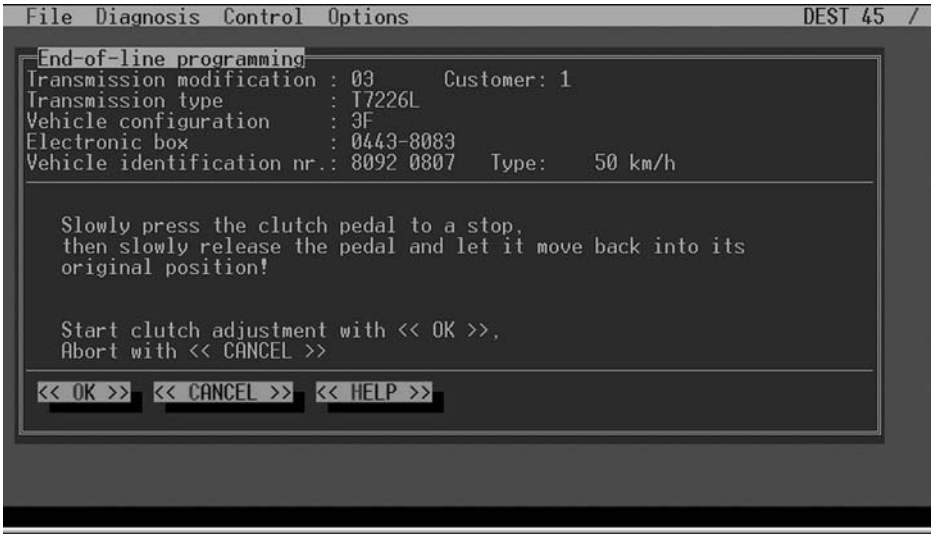


Fig. 39 - Clutch adjustment

Subsequently the transmission box will be configured with the corresponding data by activating << OK >> or pressing ENTER. In addition, the entire vehicle identification number will be written into the first nine bytes of the EEPROM customer area. If the configuration is completed the clutch can be adjusted by means of << 1 >>. If the instructions are executed the clutch adjustment is terminated with << OK >> (or ENTER) causing a message to appear whether the clutch adjustment was carried out succesfully or not.

Determination of the contact pressure of the main clutch

In order to insure engaging without a jerk upon automatical reversing, the components transmission control unit (E-box), proportional valve and main clutch are to be coordinated by means of determining the contact pressure.

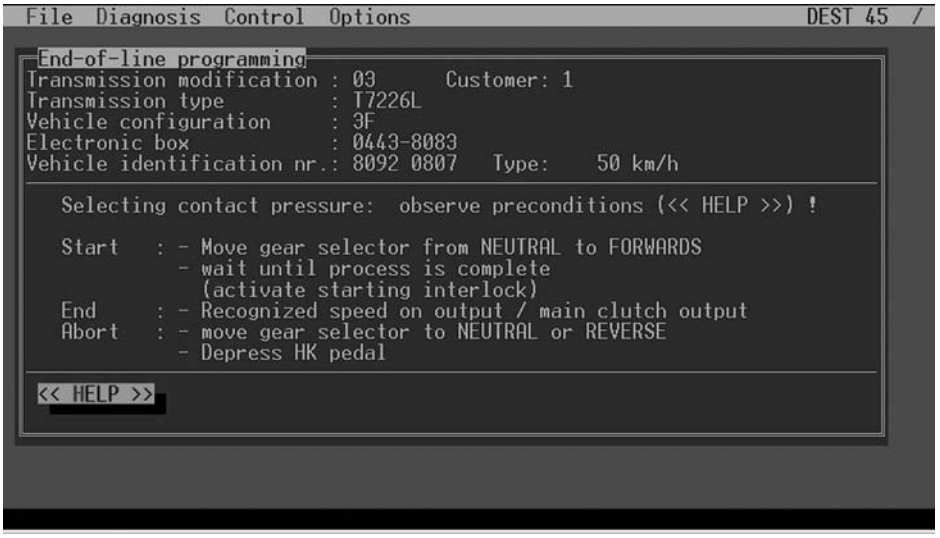


Fig. 40 - Determination of contact pressure

CAUTION!

As the vehicle starts moving on its own during the process, take care that there is sufficiently free space in front of the tractor!

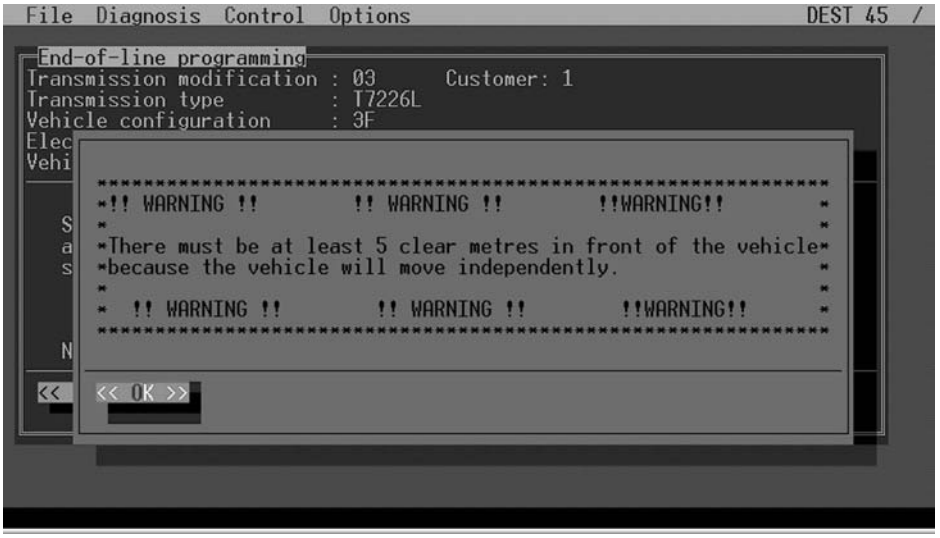


Fig. 41 - Safety note

The determination of the contact pressure is started by means of << 2 >>. For this purpose the followinf works need to be carried out:

- Remedy all pending errors at the power-shuttle system
- Warm up the tractor (transmission oil temperature at least 40 ×C).
- Place the tractor on a solid leveled surface and move the drive switch into the neutral position. Let the engine run.
- Create a safety area with a size of at least 5 meters in front of the tractor which nobody is allowed to enter!
- Engage the gear (T7100 = 2. Gear; T7200 = 3. Gear).

- Connect the computer, boot the system and call ”Control > End-of-line programming”. The determination of the contact pressure is started by means of << 2 >>.
- Further instructions can be directly taken from the <<HELP>> file stored in the computer. After quitting the help file the determination of the contact pressure is carried on according to the instruction.
- During the calibration process the pressure in the main clutch upon which frictional connection occurs is determined. Hereby the tractor moves about 0,5 m forward on ist own. Simultaneously the E-box detects the ”speed at the output of the main clutch” and terminates the determination of the contact pressure.
  > Contact pressure T 7200 5,0 – 8,0 bar
  > Contact pressure T 7100 6,0 – 9,0 bar
- The determined value is stored in the transmission control unit (E-box) by means of switching the ignition off and on again and can be looked up in the plain text display under << INTERNAL >>.

Leaving end-of-line programming:

The end-of-line mode is quit by pressing C (or ESC). The determined values are stored in the EEPROM by means of switching the ignition off and on again.

3.2.4 OPTIONS

The option menu offers the user the possibility to alter the program environment. All settings executed under this menu item are saved when the program is terminated.

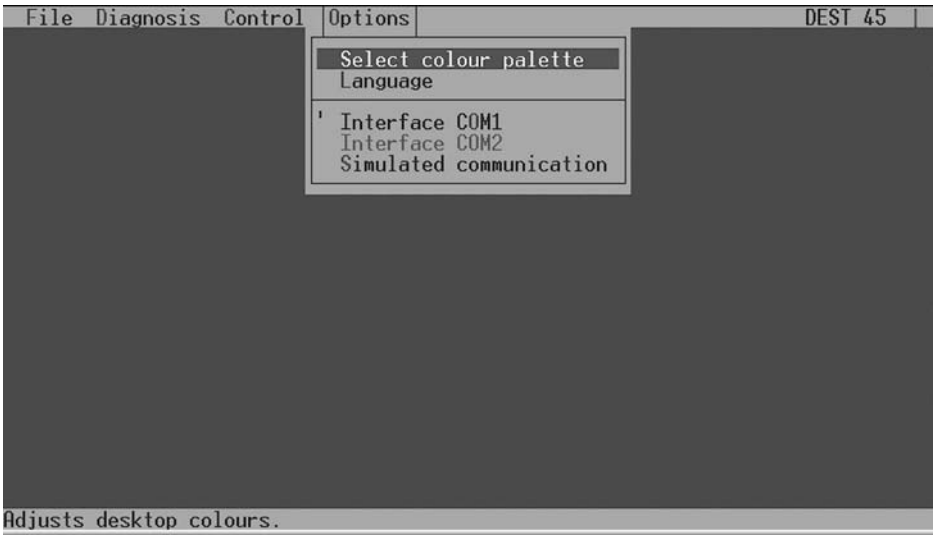


Fig. 42 - Options

- **Options > Colour palette**
  In this menu item settings for the appropriate screen colours can be selected. All possible palettes can be selected by means of the cursor keys and be shown in a preview. The selected colour palette is retained by means of pressing ENTER.

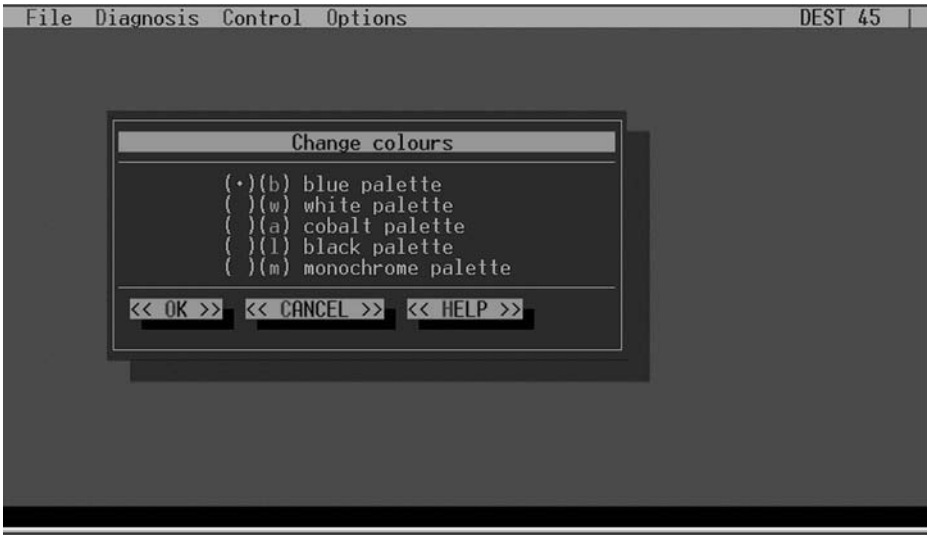


Fig. 43 - Change colours

- **Options > Language**
  In the submenu ”Options – Language” another language can be selected. After confirming with ENTER (resp. ALT + O) all screen texts are displayed in the selected language.

Fig. 44 - Change language

- **Options > Interface COM 1**
  By selecting one of the two menu items the communication with the box is carried out via the corresponding interface. The selected interface is marked.
  Only an interface actually available on the computer can be selected!

- **Options > Simulated communication**
  Selecting this menu item causes allows most of the program functions to be called without a connection to a transmission control unit. For this purpose the program EDS simulates the communication between computer and transmission box. However not all the functions are currently executable with simulated control.

3.3 ERROR CODES POWER-SHUTTLE /DEST 45

Legend error code list T7x00 V/R-auto EST 45

Validity: V410 (IV) version

General

In case of a multiple error only the error code with the highest external error number will be displayed on the screen. Simultaneously the error symbol ”wrench” appears on the display. The external error numbers are sorted according to the severity of the required reaction upon an error.

Rough sub-division of the external error number

0 ...9 reserved for operation indications

10 ...99 Operation mode normal, operation mode stand-by strategy, operation mode limp home, operation mode emergency operation, operation mode vehicle shut-down (except for EE), operation mode permanent neutral

Abbreviations

- LU Line interruption
- KM Short circuit to ground
- K+ Short circuit to vehicle electrical system plus general
- Nmot Speed at powershift gear input (=nLSE)
- nLSA Speed at powershift gear output
- nHK Speed at main clutch output
- nAB Speed at output, ground speed
- HK Main clutch
- HKPed Main clutch pedal
- ED Digital input
- EU Analog input voltage (U)
- ER Analog input resistance (R)
- EF Frequency input (F)
- AU Voltage output (U) (plus supply sensor system)
- VMG Ground supply transmitter (sensor system)
- VMGA Ground supply transmitter analog (sensor system)
- ADM Digital output ground
- AIP Current output (I) proportional
- VPS Plus supply (actuator system)

3.4 DISPLAY POWERSHUTTLE

Error code	Drive program	Significance/function
10-20	Normal driving	Non-critical error, tractor can be operated normally. Start-up / change of directions possibly delayed or only by jerks.
21	Normal driving	Ground speed too high. Reduce ground speed until error code disappears. If the error code is not disappearing contact a DEUTZ-FAHR workshop.
22	Normal driving	Transmission oil temperature too high. Reduce tractor load until error code disappears. If the error code is not disappearing contact a DEUTZ-FAHR workshop.
27-41	Limited driving	Powershift are blocked.
47-58	Stand-by program (Limp home)	Powershifts are blocked. Conditions for starting upon change of directions: Commutator switch at least 1 second in neutral position upon standstill of tractor.
64-70	Emergency program	Powershifts are blocked. Driving clutch is not working – driving only possible by means of change of directions switch. Commutator switch at least 1 second in neutral position upon standstill of tractor. Contact a DEUTZ-FAHR workshop immediately and have the error be eliminated.
76-99	No driving possible	Contact the DEUTZ-FAHR after-sales service.

3.5 ERROR CODE LIST WITH DESCRIPTION

Code	Error location/error cause	System reaction	possible remedy	Remarks
11	EEPROM end-of-line data invalid (contact pressure)	Operation mode NORMAL Default contact pressure	Carry out/repeat HK adjustment	• Generally upon ”new” electronic system • Self-preservation • Reserve value • Checks or plausibility invalid • Both EEPROM blocks defective no automatic restoration possible
12	Temperature sensor LU, K+	Default value: cold (HK pedal holding time, splitter holding time, slip times) No change of operation mode	Check cabling Check temperature sensor Check sensor supply Check vehicle electr. system voltage	• Possible sequence error from: • K+ HK sensor • K+ sensor supply AU1
13	Temperature sensor KM	Default value: cold (HK pedal holding time, splitter holding time, slip times) No change of operation mode	Check cabling Check temperature sensor Check sensor supply Check vehicle electr. system voltage	• Possible sequence error from: • K+ HK sensor • K+ sensor supply AU1
14	Synchronous neutral switch plausibility (Start interlock switch)	No change of operation mode	Check cabling Check neutral switch (Start interlock switch) Check speed sensor/cabling Nab, Nhk	• Self-preservation • Plausibility circuit • Nhk-SyncN-Nab
15	Warning light LU (Oil pressure/HK overspeed)	No change of operation mode	Check cabling Check lamp in disconnected state	• Diagnosis only if configured LU can only be diagnosed
16	Warning light KM (Oil pressure/HK overspeed)	No change of operation mode	Check cabling Check supply warning light	• Diagnosis only if configured • KM can only be diagnosed in disconnected state
17	Warning light K+ (Oil pressure/HK overspeed)	No change of operation mode	Check cabling Check supply warning light	•Diagnosis only if configured • KM can only bediagnosed in connected state

Code	Error location/error cause	System reaction	possible remedy	Remarks
18	System pressure plausibility	Warning light is lighting No change of operation mode	Check oil pressure switch Check cabling Check system pressure Check speed sensor Nmot	• Is only diagnosed if Nmot > Nmot threshold • Switch closed if pressure Is existing
19	Signal line display KM	On display ”EE”, permanent beep No change of operation mode	Check cabling Check display	• Error code is not used
20	Signal line display K+	On display ”EE”, permanent beep No change of operation mode	Check cabling Check display	• Error code is not used
21	Speed limit exceeded	Permanent beep as long as overspeed is existing No change of operation mode	Reduce driving speed	• Diagnosis only if configured
22	Temperature exceeded	Upon exceeding 5x beep, subsequently 1x beep every 2 min.	Reduce load Shut down engine	• Temperature monitoring only if configured • Error code upon exceeding of max. permissible upper limit temperature • Indication ”temperature warning” is independent of EC priority
27	Characteristic line valve LU	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • Only for T7200
28	Characteristic line valve KM	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • Only for T7200
29	Characteristic line valve K+	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • Self preservation • Can also lead to error ”VPS2-Plausi” (Int. EC:47) • Only for T7200
30	Retaining valve 2 LU	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Only for T7200 • Possibly sequence error from LU VPS2 • LU can only be diagnosed in

Code	Error location/error cause	System reaction	possible remedy	Remarks
31	Retaining valve 2 KM	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Only for T7200 • Possibly sequence error from LU VPS2 • KM can only be diagnosed in disconnected state • Self preservation
32	Retaining valve 2 K+	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Only for T7200 • Possibly sequence error from LU VPS2 • Self preservation • Can also lead to error ”VPS2-Plausi” (Int. EC:47) • K+ can only be diagnosed in connected state
33	Retaining valve 1 LU	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Only for T7200 • Possibly sequence error from LU VPS2 • LU can only be diagnosed in disconnected state
34	Retaining valve 1 KM	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Only for T7200 • Possibly sequence error from LU VPS2 • KM can only be diagnosed in disconnected state • Self preservation
35	Retaining valve 1 K+	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Only for T7200 • Possibly sequence error from LU VPS2 • Self preservation • Can also lead to error ”VPS2- Plausi” (Int. EC:47) • K+ can only be diagnosed in connected state

Code	Error location/error cause	System reaction	possible remedy	Remarks
36	Transfer valve 2 LU	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • LU can only be diagnosed in disconnected state (toggling only upon defined peed ratio)
37	Transfer valve 2 KM	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • LU can only be diagnosed in disconnected state • Self preservation
38	Transfer valve 2 K+	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • Can also lead to error “VPS2-Plausi” (CE int.: 47) • Self preservation
39	Transfer valve 1 LU	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • LU can only be diagnosed in disconnected state (toggling only upon defined speed ratio)
40	Transfer valve 1 KM	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • LU can only be diagnosed in disconnected state (toggling only upon defined speed ratio) Self preservation
41	Transfer valve 2 K+	Operation mode STAND-BY STRATEGY (Powershift blocked)	Check cabling Check valve Check valve supply (VPS2)	• Possibly sequence error from LU VPS2 • Can also lead to error “VPS2-Plausi” (CE int.: 47) • Self preservation
47	nAB speed transmitter LU, K+	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep • Upon reversing standstill is not absolutely required!

Code	Error location/error cause	System reaction	possible remedy	Remarks
48	nAB speed transmitter KM	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep • Upon reversing standstill is not absolutely required!
49	nAB speed transmitter gradient (Plausibility)	Operation mode LIMP-HOME Check cabling Check speed sensor	Ignition off/on standstill threshold	• Inadmissible speed discontinuity from transmitter failure threshold to • Upon reversing demand neutral shifting, permanent beep • Upon reversing standstill is not absolutely required!
50	nHK speed transmitter LU, K+	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep
51	nHK speed transmitter KM	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep
52	nHK speed transmitter gradient (Plausibility)	Operation mode LIMP-HOME	Ignition off/on Check cabling Check speed sensor	• Inadmissible speed discontinuity from transmitter failure threshold to standstill threshold • Upon reversing demand neutral shifting, permanent beep
53	nLSA speed transmitter LU, K+	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep
54	nLSA speed transmitter KM	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep
55	nLSA speed transmitter gradient (Plausibility)	Operation mode LIMP-HOME	Ignition off/on Check cabling Check speed sensor	• Inadmissible speed discontinuity from transmitter failure threshold to standstill threshold • Upon reversing demand neutral shifting, permanent beep
56	nMOT speed transmitter LU, K+	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep
57	nMOT speed transmitter KM	Operation mode LIMP-HOME	Check cabling Check speed sensor	• Upon reversing demand neutral shifting, permanent beep

Code	Error location/error cause	System reaction	possible remedy	Remarks
58	nMOT speed transmitter gradient (Plausibility)	Operation mode LIMP-HOME	Ignition off/on Check cabling Check speed sensor	• Inadmissible speed discontinuity from transmitter failure threshold to standstill threshold • Upon reversing demand neutral shifting, permanent beep
64	Clutch pedal sensory system plausibility Sensor/switch	Neutral shifting Operation mode EMERGENCY OPERATION HK pedal adjustment	Ignition off/on End-of-line programming Carry out/repeat permanent beep Check/adjust mechanical tolerance, Of the HK pedal sensory system Check cabling Check HK switch Check sensor supply Check sensor/switch LU, KM, K+	• Switch point out of tolerance range • Self preservation • Upon neutral shifting • HK pedal switch is closed with HK pedal in idle position • HK pedal sensor signal: Idle: LOW stepped: HIGH
65	Clutch pedal sensoryl system LU, KM	Neutral shifting Operation mode EMERGENCY OPERATION	Check cabling Check sensor mounting Check sensor Check sensor supply	• Upon neutral shifting permanent beep • Possibly sequence error from: LU sensor supply (AU1) • Limit values: Umin approx. 0,5V Umax approx. 4,5V
66	Clutch pedal sensory system K+	Neutral shifting Operation mode EMERGENCY OPERATION	Check cabling Check sensor mounting	• Possibly sequence error from: • EMERGENCY K+ temperature sensor or OPERATION K+ sensor supply AU1
66			Check sensor Check sensor supply	• Upon neutral shifting permanent beep • Limit values: Umin approx. 0,5V Umax approx. 4,5V

Code	Error location/error cause	System reaction	possible remedy	Remarks
67	Sensor supply undervoltage	Neutral shifting Operation mode EMERGENCY OPERATION	Check cabling Check cabling del sensore temperatura / sensore frizione Check cabling at temperature sensor/ clutch sensor	• Upon neutral shifting permanent beep • Possibly sequence error from: Vehicle electrical system undervoltage • Can also lead to sequence errors • Temperature sensor Clutch sensory system
68	Sensor supply overvoltage	Neutral shifting Operation mode EMERGENCY OPERATION Check cabling at temperature sensor/clutch sensor	Check cabling Check cabling at temperature sensor/clutch sensor	• Upon neutral shifting permanent beep • Possibly sequence error from: K+ HK sensor K+ temperature sensor • Can also lead to sequence errors • Temperature sensor Clutch sensory system
69	Clutch pedal sensory system plausibility End-of-line data	Neutral shifting Operation mode EMERGENCY OPERATION	Ignition off/on End-of-line programming Carry out/repeat HK pedal adjustment	• Self preservation • Programmed thresholds not logical (Idle position, switch point, disengaged)
70	EEPROM end-of-line	Neutral shifting Operation mode EMERGENCY OPERATION	Ignition off/on End-of-line programming Carry out/repeat HK pedal adjust-ment	• Self preservation • Generally upon ”new” electronic system • Both EEPROM blocks are defective (invalid checksum), no automatic restoration possible Can also lead to errors ”HK sensor/ switch plausibility” (int. code 6)
76	Proportional valve LU	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve Check valve supply (VPS1)	• Self preservation • Possibly sequence error of LU VPS1! • Upon neutral shifting permanent beep
77	Proportional valve KM	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve Check valve supply (VPS1)	• Self preservation • Upon neutral shifting permanent beep

Code	Error location/error cause	System reaction	possible remedy	Remarks
79	Forward valve LU	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve Check valve supply (VPS1)	• Self preservation • Possibly sequence error of LU VPS1! • Upon neutral shifting permanent beep
80	Forward valve KM	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve Check valve supply (VPS1)	• Self preservation • Upon neutral shifting permanent beep
82	Reverse valve LU	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve Check valve supply (VPS1)	• Self preservation • Possibly sequence error of LU VPS1 • Upon neutral shifting permanent beep
83	Reverse valve KM	Operation mode SHUT DOWN VEHICLE	Check cabling Check valve Check valve supply (VPS1)	• Self preservation • Upon neutral shifting permanent beep
85	Combining error drive switch (LU, KM, K+)	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check drive switch	• Self preservation • Upon neutral shifting permanent beep
87	Pin code not corresponding to type of vehicle (T7100/T7200)	Operation mode PERMANENT NEUTRAL	Check pin code Ignition off/on Check end-of-line data, carry out end-of-line programming (type of vehicle, vehicle version) Check cabling	• Self preservation • Pin code is evaluated only upon initialisation • Defectice pin code. Wrong type of vehicle/version programmed

Code	Error location/error cause	System reaction	possible remedy	Remarks
89	VPS1 plausibility (KM, K+)	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling (KM, K+) Check voltage at VPS 1 Check voltage at term30 Check cabling delle valvole F/R (K+)	• Self preservation • Upon neutral shifting permanent beep • EC also defective with term30 • LU VPS can also lead to sequence errors F-/R-/prop.-SV) • Possibly sequence error resulting from counter supply (K+) at F/R valve upon power on • Possibly sequence error from LU proportional valve • Possibly sequence error from: Safety processor not programmed
90	VPS2 plausibility (KM, K+)	Neutral shifting Operation mode PERMANENT NEUTRAL	Check cabling (KM, K+) Check voltage at VPS 2 Check voltage at term30 Check cabling di GV/HV/MVKI (K+)	• Self preservation • Upon neutral shifting permanent beep • EC also defective with term30 • LU VPS2 can only be detected via sequence errors • Possibly sequence error resulting from counter supply (K+) at GV/HV/ MVKI upon power on • Possibly sequence error from: Safety processor not programmed
91	HK plausibility circuit	Neutral shifting Operation mode SHUT DOWN VEHICLE	Engage/disengage creep speed lever Check cabling at proportional valve (K+) Check proportional valve Check HK Check speed sensory system Nlsa, Nhk Check hydraulic system	•HK plausibility only if configured •Self preservation •Plausibility circuit: Nisa-HK-Nhk •For T72 creep speed lever Position”N” is possible!
92	Vehicle electrical system overvoltage	Neutral shifting Operation mode SHUT DOWN VEHICLE	Ignition off/on Check vehicle electrical system Check cabling	

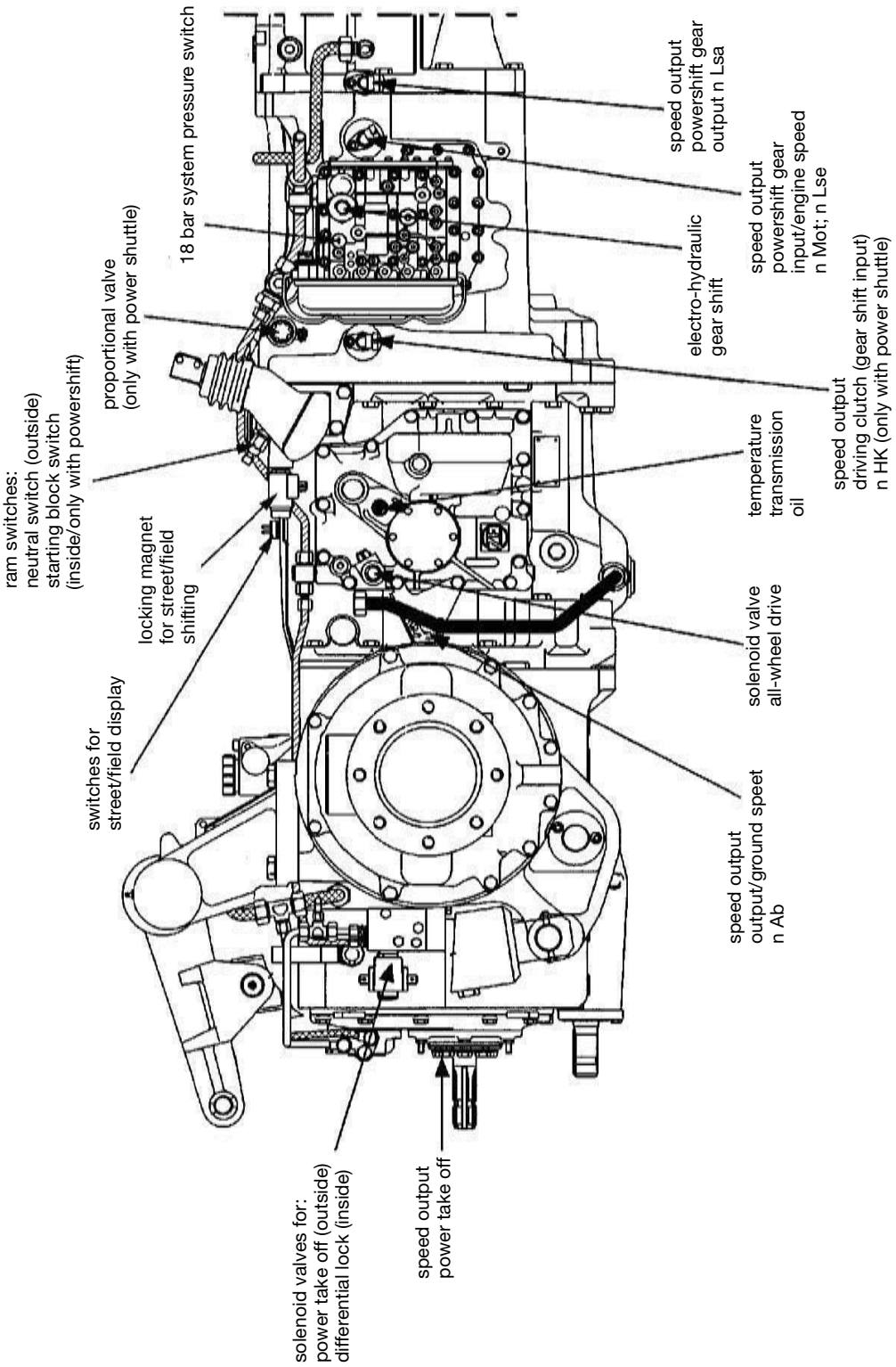
Code	Error location/error cause	System reaction	possible remedy	Remarks
93	Vehicle electrical system undervoltage	Neutral shifting Operation mode SHUT DOWN VEHICLE	Ignition off/on Check vehicle electrical system Check cabling	
94	Proportional valve K+	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve	• Self preservation • Upon neutral shifting permanent beep • Can also lead to error ”VPS1-plausibility” (int. EC 46)
95	Forward valve K+	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve	• Self preservation • Upon neutral shifting permanent beep • Can also lead to error ”VPS1-plausibility” (int. EC 46)
96	Reverse valve K+	Neutral shifting Operation mode SHUT DOWN VEHICLE	Check cabling Check valve	• Self preservation • Upon neutral shifting permanent beep • Can also lead to error ”VPS1-plausibility” (int. EC 46)
97	Application error	Operation mode PERMANENT NEUTRAL	Check application data	• Error can only occur upon wrongly programmed application controls (not upon standard controls) • Wrong parameterization of: • Slip_configuration • _LS_Plausi_Konfig • _PC_Konfig • _Diag_Disable • _Syncn_Plausi_Disable • _Kplp_Plausi_Disable • GP-ID invalid • KD-ID invalid • FD-ID invalid • KUNDE_KD_FD invalid • GP-KD-vers. Invalid • GP-FD-vers. invalid

Code	Error location/error cause	System reaction	possible remedy	Remarks
98	Configuration error	Operation mode PERMANENT NEUTRAL	Ignition off/on Check/carry out end-of-line programming (customer, version)	• Customer programming (customer, version) invalid, not existing • Basic program not suitable for end-of-line programming - by customer
99	EEPROM end-of-line data defective (vehicle configuration)	Operation mode PERMANENT NEUTRAL	Ignition off/on Repeat end-of-line programming	• Self preservation • Checksum of the EEPROM configuration data defective. No vehicle version can be selected.

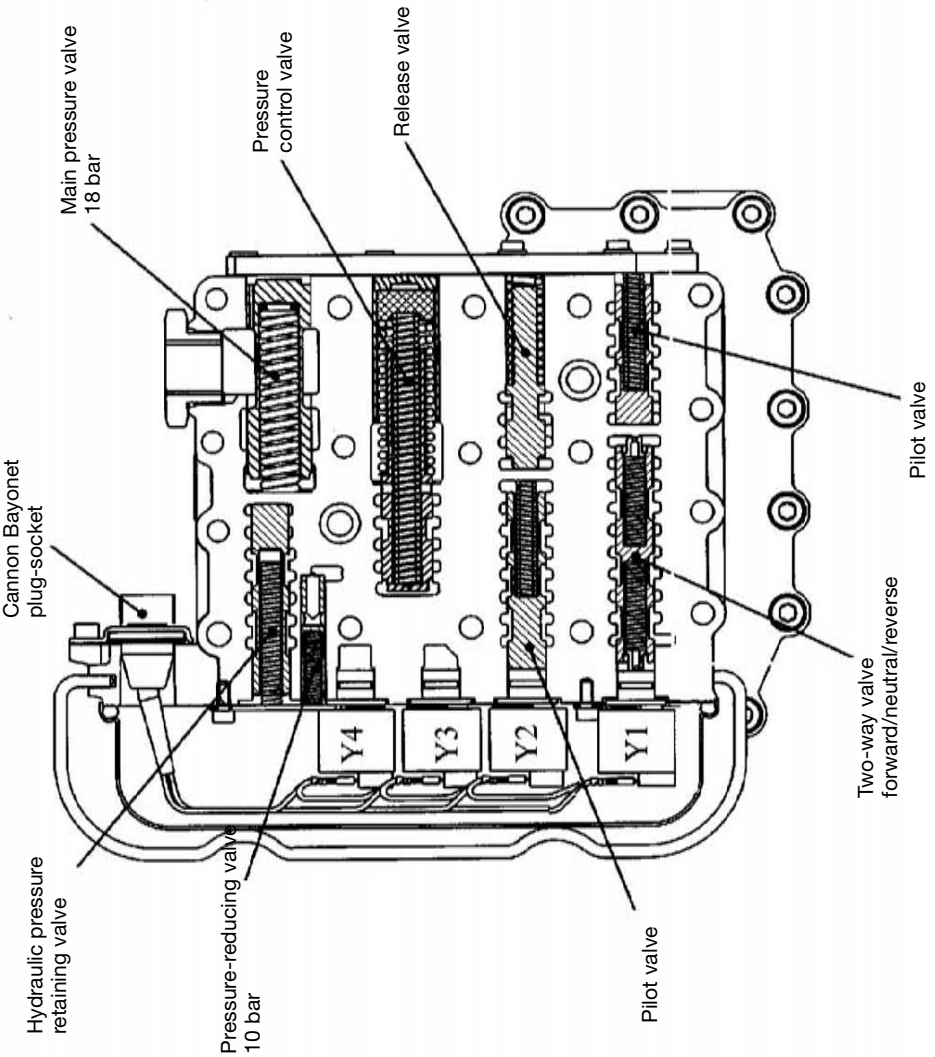
3.6 OTHER INFORMATIONS

Error consequence/System reaction	possible error cause	possible remedy
no display activation resp. display ”EE”	EST45 is not running up Communication line defective Power supply defective	Check supply paths LU, KM Check fuse (term15, term30) Check communication line (LU)
Diagnosis tool cannot establish connection	EST45 is not running up Communication line defective Power supply defective	Ignition off/on, repeat Check supply paths LU, KM Check fuse (term15, term30) Check communication line (LU)
Upon starting/reversing powershift gear shifts over to neutral (jerk can be observed). display: ”N”, FR-arrows flashing, no error code, permanent beep	Wrong vehicle version selected upon end-of-line programming vehicle version Speed sensor Nmot and Nlsa defective Fault in hydraulic system (neutral by reversing monitoring)	Check/correct end-of-line programmed in programmazione fine linea Check cabling speed sensor Nmot and Nlsa Check speed sensors Nmot and Nlsa Check hydraulic system
Automatic shifting upward/downward in the splitter, shifting noise every 1-2 sec.	Wrong vehicle version selected upon end-of-line programming Speed sensor Nmot and Nlsa defective, interchanged Transfer valves GV1/GV2 interchanged Fault in hydraulic system (pressure modulation by GV toggling)	Check/correct end-of-line programmed vehicle version Check cabling speed sensors Nmot and Nlsa Check cabling transfer valves GV1/GV2 Check speed sensors Nmot and Nlsa Check hydraulic system
Short traction force interruption during driving with Closed drive train (LS pressure modulation)	Wrong vehicle version selected upo end-of-line programming Speed sensor Nmot and Nlsa defective Fault in hydraulic system (pressure modulation by GV toggling)	Check/correct end-of-line programmed vehicle version Check cabling speed sensors Nmot and Nlsa Check speed sensors Nmot and Nlsa Check hydraulic system
Automatic starting not possible, vehicle remains in neutral	Starting block signal not existing	Check starting block signal (LU, KM, K+)

3.7 SENSORS AND SOLENOID VALVES AT THE TRANSMISSION T-7100

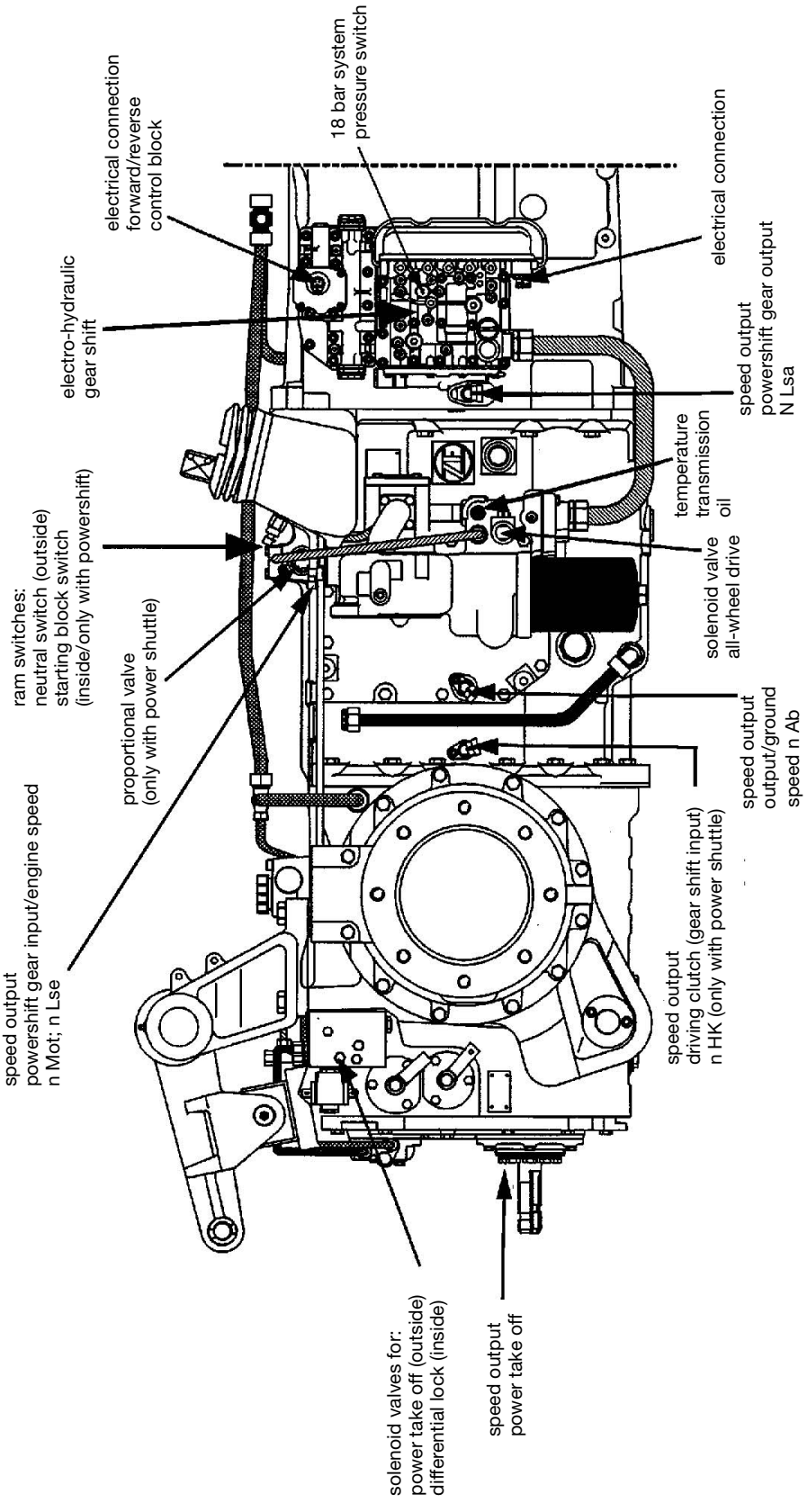


3.8 ELECTRO-HYDRAULIC GEAR SHIFT T-7100

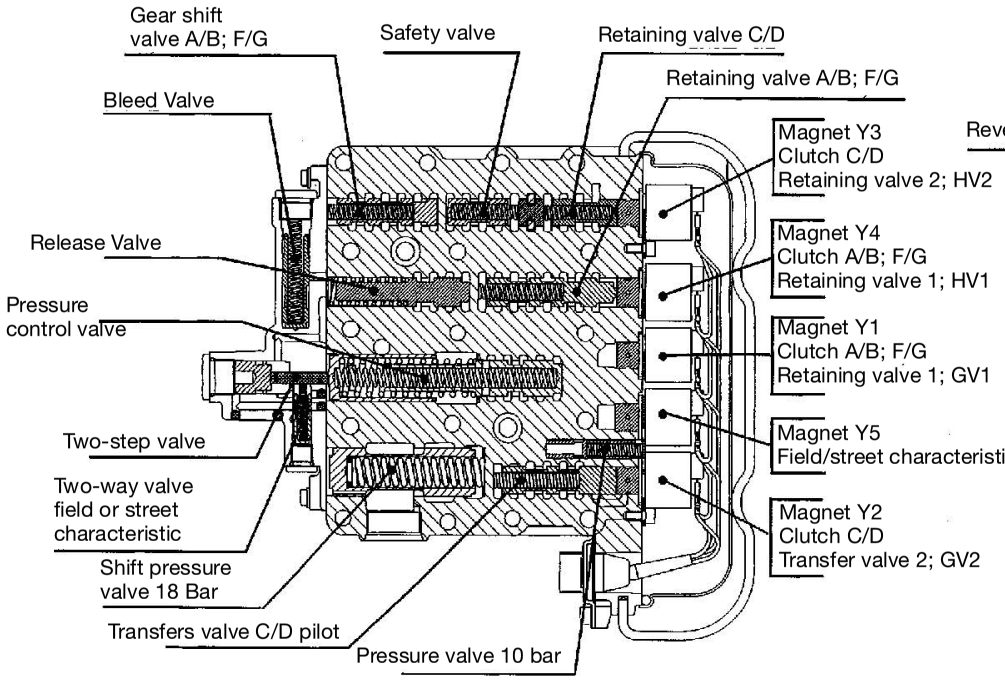


Solenoid valves Y1 – Y4:
Y1 = MVR; solenoid valve reverse
Y2 = GV1; transfer valve 1
Y3 = MVV; solenoid valve forward
Y4 = GV2; transfer valve 2

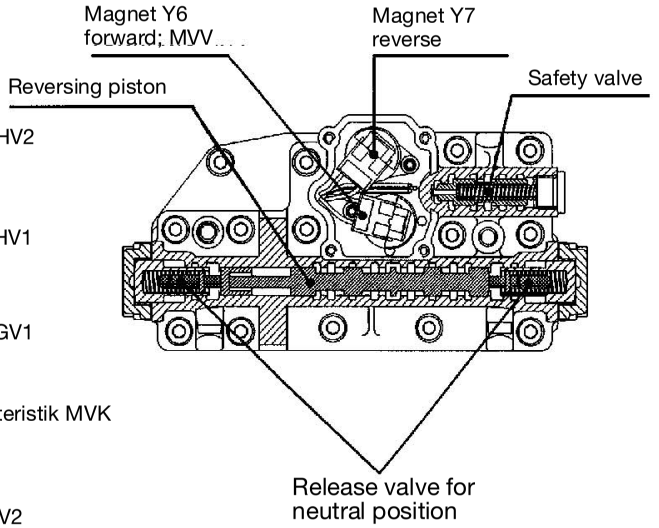
3.9 SENSORS AND SOLENOID VALVES AT THE TRANSMISSION T-7200



3.10 ELECTRO-HYDRAULIC GEAR SHIFT T-7200 / T-7300



4-GEAR POWERSHIFT CONTROL UNIT



FORWARD-REVERSE CONTROL BLOCK

3.11 ERROR ANALYSIS

Interchanging of electrical connectors at the transmission T-7100 L and T-7200 L

Various sensors/solenoid valves/switches at the transmission are located very close to each other and are equipped with the same type of connector. At these locations the electrical mating connectors at the cable harness cannot be layed in a way which ensures that accidental interchanging may be absolutely excluded.

The following consideration shows the consequences if electrical connectors are interchanged:

3.11.1 VA SOLENOID VALVE AND TEMPERATURE SENSOR T-7100 L AND T-7200 L

Both elements are equipped with Jet-Tronic connectors; distance approx. 75 mm with T-7100 and 55 mm with T-7200.

VA plug on temperature sensor and VA – SV ”OFF”

- All-wheel ”OFF” ‡ 12V voltage at temperature sensor
- Error code on display
- Electronic system shifts gear to permanent neutral

Vehicle cannot be moved any more!

VA plug on temperature sensor and VA – SV ”ON”

- All-wheel ”ON” ‡ 0V voltage at temperature sensor
- Error code on display; temperature sensor defective
- Hard gear shifts (5V supply in electronic system is overloaded, but short circuit proof)

Temperature sensor plug on VA – SV

- Error code on display; temperature sensor defective
- Hard gear shifts

3.11.2 SV DIFFERENTIAL LOCK AND SV POWER TAKE OFF CLUTCH T-7100 L AND T-7200 L

Both valves are equipped with Jet-Tronic connectors; distance approx. 40 mm

Plug differential lock on SV power take off valve

- Interchanged functions upon switch actuation in cabin
- Power take off stub is running upon diff. ”ON”

Upon ZW clutch ”ON” and differential lock ”OFF” the differential lock is engaged. Critical driving state with regard to safety, e.g. when driving in a curve, etc.

3.11.3 SPEED SENSORS INPUT/OUTPUT WITH T-7100 L

AMP superseal 3-pole connectors at both sensors, distance approx. 80 mm

Plug output on input sensor and vice versa

(both plugs are connected!)

Upon powershift step L and H

- Error is not detected
- LS transmission in neutral

Upon powershift step M

- Error is not detected

No consequences

Only one plug is connected

OUTPUT not connected

- Error code on display

Standby driving possible

INPUT not connected

- Error code on display
- Plausibility

Standby driving possible

3.11.4 LOCKING MAGNET FIELD/STREET AND TEMPERATURE SENSOR T-7100 L

Both elements are equipped with Jet-Tronic connectors; distance approx. 115 mm

Locking magnet plug on temperature sensor

3.11.5 PLUG DRIVING CLUTCH NHK ON OUTPUT/GROUND SPEED NAB AND VICE VERSA WITH T-7200 L (both plugs are connected)

- Tractor is starting for a short time
- Error message ”91” on display: Powershift gear in neutral

4. PREPARATIONS FOR DIAGNOSIS OF THE INFOCENTER

As a preparatory measure the connection between tractor (infocenter) and computer needs to be established so as to check the infocenter by means of the EDS program resp. to change the constant values. The interface cable and the adapter cable are serving for this purpose (see figure).

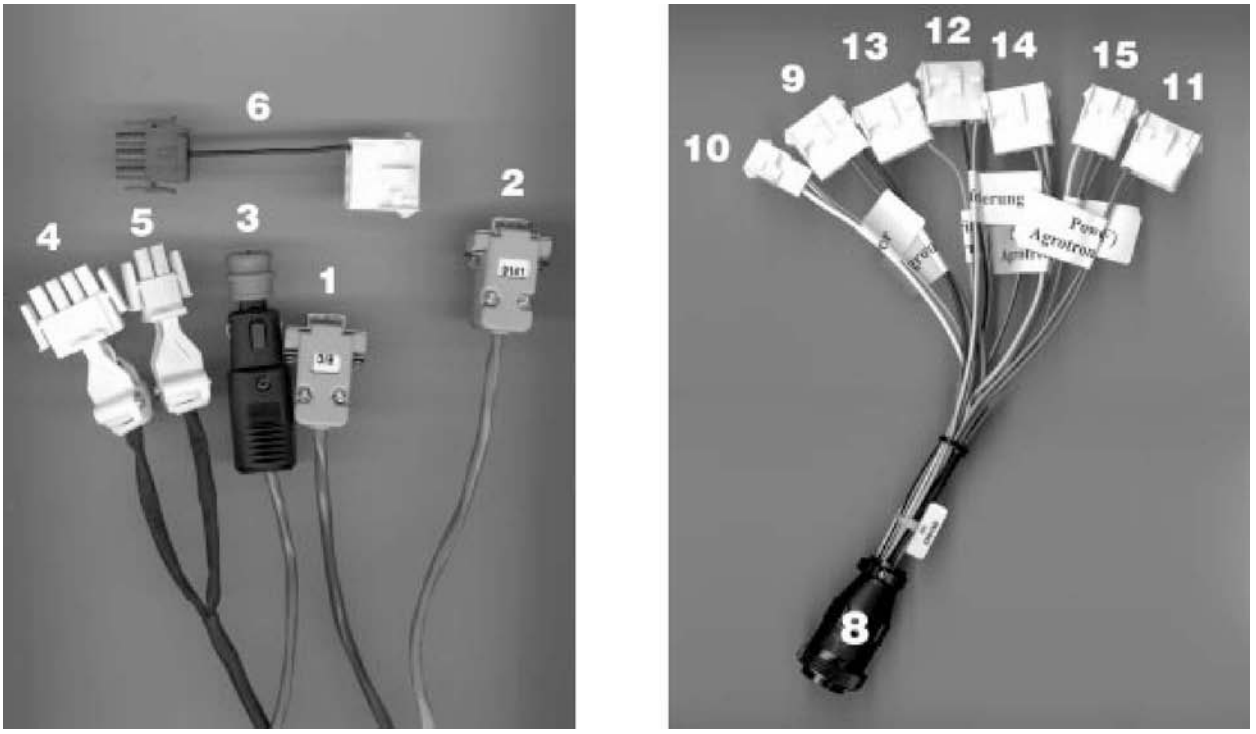


Fig. 51 - Interface cable and adapter cable

1 - Connect plug (1) of the interface cable with the designation ”EIC” to the computer (COM interface).

2 - Connect plug (3) of the interface cable for the 12 V supply to the cigar lighter

3 - Connect the 2-pole plug (4) of the interface cable to the plug (10) – designation ”Info center” – of the adapter cable

4 - Insert the central plug (8) of the adapter cable into the central diagnosis interface in the fuse box

5 - Switch on ignition

6 - Start the computer and call the EDS program (compare item A 1.3 – Launching and terminating of the EDS program)

7 - Make sure that the right option is called in the initial menu:
Option 4 -> plug (2) with the designation ”9141” to interface **COM 1**
Option 5 -> plug (2) with the designation ”9141” to interface **COM 2**

NOTE. Agrotron tractors with the vehicle identification numbers up to 80xx 1999 (i.e. green cabin) usually are not equipped with a central diagnosis interface.

To be able to check the Infocenter however, with these tractors it is necessary to connect the 2-pole plug of the interface cable directly with the diagnosis terminal of the Infocenter. The diagnosis terminal is located in the cable harness at the backside of the Infocenter.

4.1 PROGRAM DESCRIPTION

4.1.1 MAIN MENU

After selecting Option 4 resp. Option 5 (depending on the computer interface) the main menu appears:

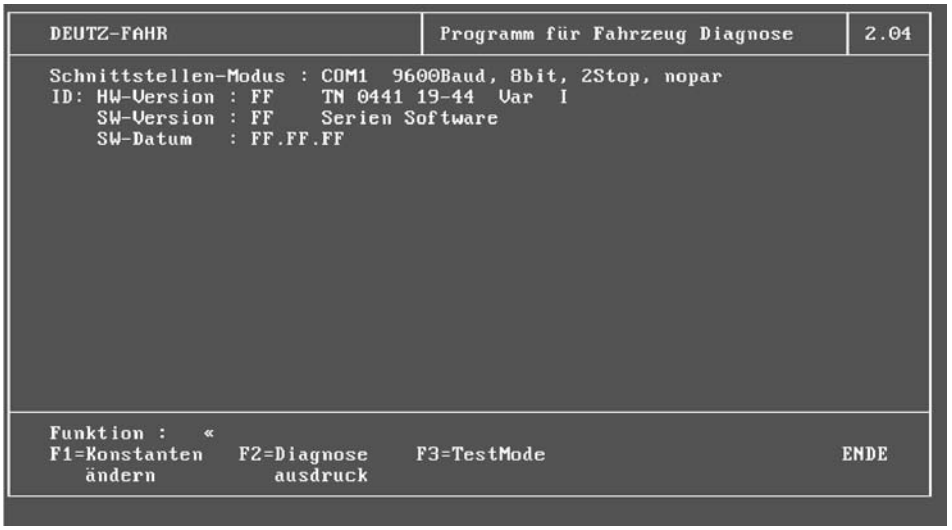


Fig. 52 - Main menu

In the upper part of the window information about the selected interface (COM 1, COM 2) as well as information about the hardware version (Infocenter) and the software can be found.

The lower part of the window contains the select menu for the subprograms of the Infocenter diagnosis. The cursor is flashing behind “function”.

The respective subprograms can be called by means of pressing the specified key:

- **F1** launches the subprogram “Change constant values”
- **F2** launches the subprogram “Diagnosis printout”
- **F3** launches the subprogram “Test mode”
- **END** terminates the Infocenter diagnosis program and calls the EDS initial menu.

4.1.2 F1 – CONSTANTS CHANGE

By pressing the key F1 an additional window headlined “display and program constants” appears:

Fig. 53 - Display and program constants

It is possible to compare the stored constants in the Infocenter with the help of the constant list (see item 3, resp. vehicle workshop manual).

- **Procedure for changing constant values:**
  Select the desired constant value by means of the cursor keys (the corresponding line is highlighted)
  - Press the ENTER key. By doing so, another window appears in which the new value can be entered.
  - Press the ENTER key again to confirm the change and return to the constant values menu.
  When the proper values are assigned to all constants, the main menu is called again by selecting the bottom line “End constant values menu” (and pressing ENTER).

CAUTION!

The realized changes are only saved after terminating the diagnosis program and subsequently switching the ignition off and on again.

4.1.3 F2 – DIAGNOSIS PRINT

Upon pressing the key F2 the diagnosis printout menu appears:

- Printer ready?
- ESC = No, abort
- Return = Yes, printout

Press the ESC key (keyboard top left) to abort the procedure and to return to the main menu.

Press the ENTER key (Return) to start the diagnosis printout:

```
K1   theor. Fahrgeschw. fest              3809
K2   Zählrad Heckzapfwelle                 20
K3   nicht belegt                          0
K4   Übersetzung Frontzapfwelle           210
K5   Betriebsstunden                       0
K6   Übersetzung Lichtmaschine           1800
K7   Radar Fahrgeschw. fest               1000
K8   Kodierwort                            65
K9   theor. Fahrgeschw. kalibr.           3809
K10  Radar Fahrgeschw. kalibr.            1000
K11  nicht belegt                          0
K12  Impulse Heckzapfwelle                 6
K13  nicht belegt                          0

Produktionsdatum                         xxxx
min. ADC-Wert Tank                       xxxx
max. ADC-Wert Tank                       xxxx
Temp. Warnung Schwelle                   xxxx
Leerdrehzahl                             xxxx
Zeiger Rücklaufwinkel                    xxxx

EEprom  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
  00    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  10    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  20    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  30    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  40    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  50    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  60    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  70    FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

Fig. 54 - Diagnosis printout

The data from “production date” are only valid for the supplier of the INFOCENTER.

4.1.4 F3 – TEST MODE

Upon pressing the key F3 the test mode appears. At the lower screen edge the **test mode menu** is displayed:

It is possible to do the following by pressing the key:

- **F1** Check the inputs into the INFOCENTER.
- **F2** Set (activate) the outputs of the INFOCENTER.
- **F3** Check the LCDs (upon INFOCENTER 2 and 3).
- **F5** Check the analog inputs into the INFOCENTER.
- **F6** Check the pointer instruments.
- **END** Leave the test mode; subsequently the main menu appears.

TEST MODE > F1 CHECK INPUTS

Upon pressing the key F1 the following window appears:
(The representation shows the example of an INFOCENTER 2 in the AGROTRON 150. The ignition is switched ON.)

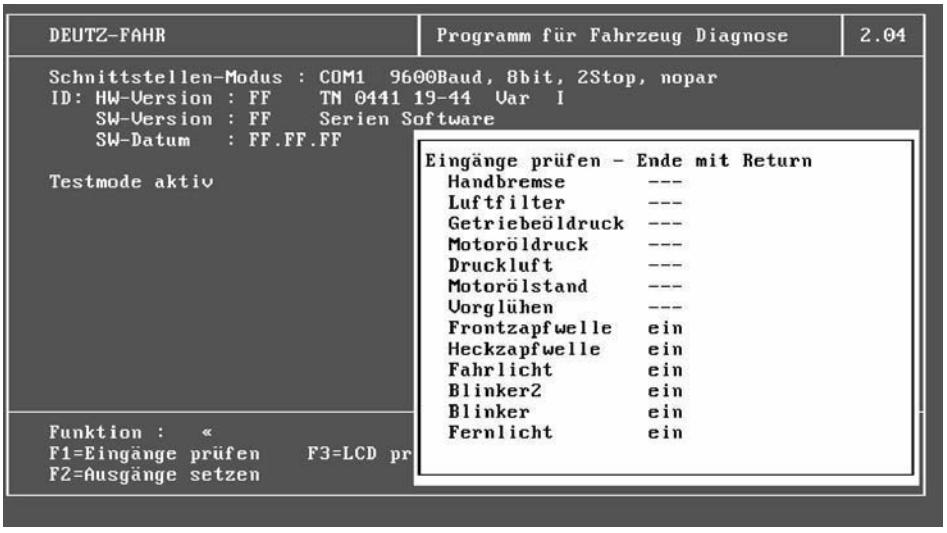


Fig. 56 - Check inputs

- **Check inputs > parking brake**
  The signal input of the hand brake control switch at plug X 130, pin 8 of the INFOCENTER (only for INFOCENTER 3) is tested.
  - Locking brake actuated: Indication hand brake ON
  - Locking brake released: Indication hand brake OFF
- **Check inputs > Air filter**
  The signal input of the negative pressure switch air filter at plug X 131, pin 8 of the INFO-CENTER (only for INFOCENTER 3) is tested.
  - Ignition on, indication air filter OFF
  - Start engine, connect cable of negative pressure switch, indication air filter ON

- **Check inputs > Transm.fl.press.**
  The signal input of the system pressure switch at plug X 130, pin 7 of the INFOCENTER (only for INFOCENTER 3) is tested.
  - Engine off, ignition on: Indication transmission oil pressure ON
  - Start engine: Indication transmission oil pressureOFF

- **Check inputs > air pressure**
  The signal input of the pressure transducer at plug X 131, pin 17 of the INFOCENTER (only for INFOCENTER 3) is tested.
  Engine off, ignition on, indication pressurized air gauge > 7 bar:
  - Indication pressurized air off
  Ignition on, reduce boiler pressure to < 5 bar by repeated braking:
  - Indication pressurized air ON

- **Check inputs > eng. oil level**
  This function cannot be tested as it is not realized (transmitter not existing).

- **Check inputs > Preheat**
  The signal input of the preheating time control unit at plug X 131, pin 19 of the INFOCENTER (only for INFOCENTER 3) is tested.
  - Ignition ON, during preheating process indication ON, subsequently indication OFF.

- **Check inputs > Front PTO**
  The signal input of the switch front power take-off at plug X 131, pin 10 of the INFOCENTER is tested.
  - Ignition ON, indication FRONT power take-off OFF
  - Start engine, front power take-off ON, indication front power take-off ON

- **Check inputs > Rear PTO**
  The signal input of the switch rear power take-off at plug X 131, pin 11 of the INFOCENTER is tested.
  - Ignition ON, indication rear power take-off OFF
  - Start engine, rear power take-off ON, indication rear power take-off ON

- **Check inputs > road lights**
  The signal input of the switch dipped beam at plug X 130, pin 4 of the INFOCENTER is tested .
  - Ignition ON, switch dipped beam OFF, indication dipped beam OFF
  - Ignition ON, switch dipped beam ON, indication dipped beam ON

- **Check inputs > turn signal 2**
  The signal input of the multifunctional switch at plug X 131, pin 2 of the INFOCENTER is tested.
  With connected trailer the indication changes between flashing indicator 2 on and flashing indicator 2 off in the rhythm of the flashing.

- **Check inputs > turn signal**
  The signal input of the multifunctional switch at plug X 131, pin 4 of the INFOCENTER is tested.
  - Ignition on, flashing indicator not actuated indication flashing indicator off
  - Ignition on, actuate flashing indicator indication changes between flashing indicator on and off.

- **Check inputs > high beam**
  The signal input of the multifunctional switch at plug X 131, pin 16 of the INFOCENTER is tested.
  - Ignition ON, Indication: Main beam OFF
  - Switch ON main beam (flash light) Indication: Main beam ON

Press the ENTER key to return to the TEST MODE.

TEST MODE > F2 SET OUTPUTS

Upon pressing the key F2 the following window appears:

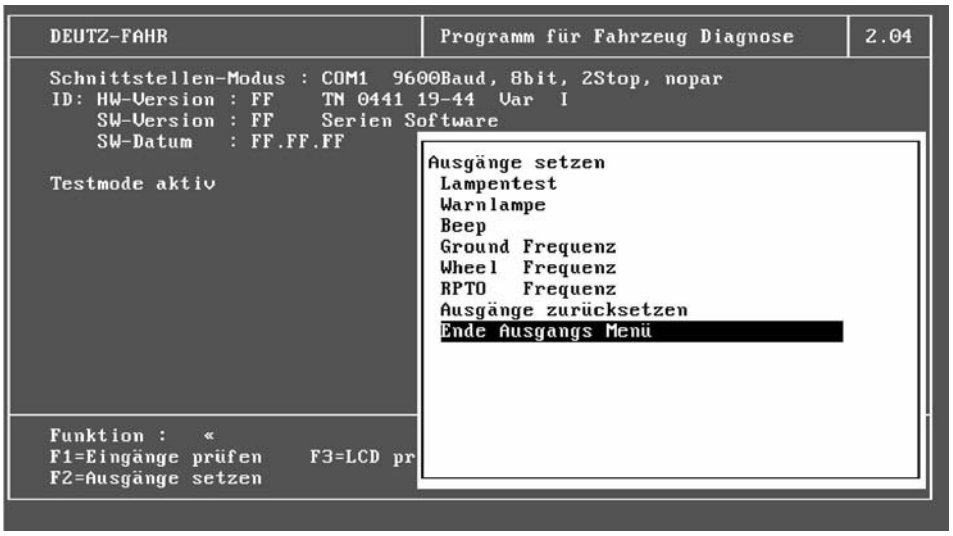


Fig. 57 - Set outputs

The last line “End output menu” is marked by a bar. Press the cursor keys to move the bar to the desired function and start the function by pressing ENTER.

- **Set outputs > Lamp test**
  All LEDs (light emitting diodes) in the INFOCENTER are tested.
  - Indication: All LEDs are lighting up.
  For terminating the test step select “Reset outputs” and press the RETURN key.
  - Indication: All LEDs are extinguishing.

- **Set outputs > Warning lamp**
  The central warning light in the INFOCENTER 3 is tested.
  - Indication: The warning light is lighting up.
  For terminating the test step select “Reset outputs” and press the RETURN key.
  - Indication: The warning light is extinguishing.

- **Set outputs > Beep**
  The acoustic alarm - beep - in the INFOCENTER 3 is tested.
  - Indication: The acoustic alarm - beep – is sounding.
  For terminating the test step select “Reset outputs” and press the RETURN key.
  - Indication: Beep stops.

- **Set outputs > true ground speed**
  With this test step a signal is transmitted from the output of the true ground speed (plug X130 pin 5) to pin 1 of the signal socket.
  - Indication: Ground frequency on.
  Now a voltage signal is existing at the 7-pole signal socket. Measuring is possible between pin 1 (true ground speed signal) and pin 7 (ground).
  - Setpoints with ground frequency on: approx. 0,8 V (DC)
    with ground frequency off: approx. 8 V (DC)

- **Set outputs > theor. ground speed**
  With this test step a signal is transmitted from the output of the theoretical ground speed (plug X130 pin 11) to pin 2 of the signal socket.
  - Indication: Wheel frequency ON.
  Now a voltage signal is existing at the 7-pole signal socket. Measuring is possible between pin 2 (theoretical ground speed signal) and pin 7 (ground).
  - Setpoints:with wheel frequency on: approx. 0,8 V (DC)
    with wheel frequency off: approx. 8 V (DC)
- **Set outputs > rear P.T.O.**
  With this test step a signal is transmitted from the output of the power take-off speed (plug X130 pin 6) to pin 3 of the signal socket.
  - Indication: RPTO frequency on.
  Now a voltage signal is existing at the 7-pole signal socket. Measuring is possible between pin 3 (power take-off speed signal) and pin 7 (ground).
  - Setpoints: with RPTO frequency on: approx. 0,8 V (DC)
    with RPTO frequency off: approx. 8 V (DC)

- **Set outputs > Reset outputs**
  All set outputs are reset and replaced by the original values.
  Select “End output menu” and press the ENTER key to reset all outputs automatically and change into the test mode.

TEST MODE > F3 CHECK LCD

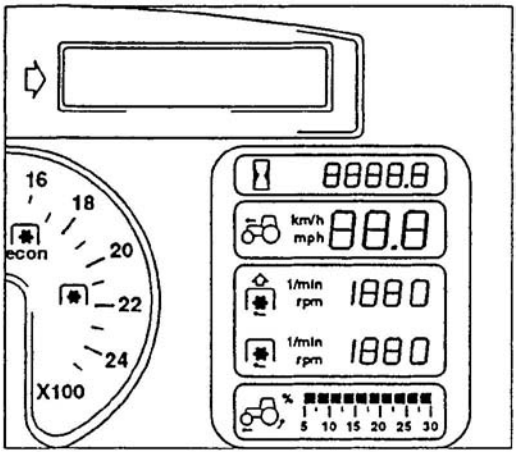
Upon pressing the key F3 the following window appears:

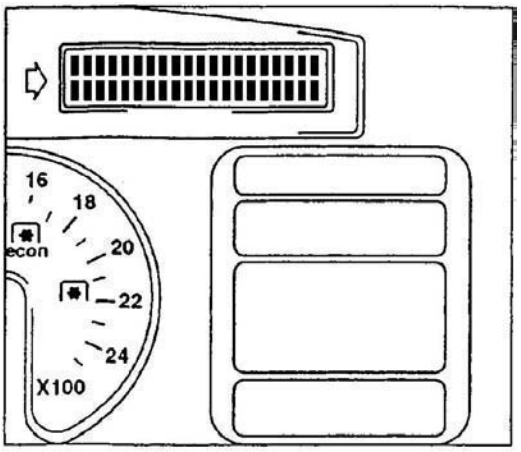
Fig. 58 - Check LCD displays

The last line “End LCD menu” is marked by a bar. Press the cursor keys to move the bar to the desired function and start the function by pressing ENTER.

•Check LCD > 7 segment all segments off
All segments are cleared in the indication fields for operating-hours, speed, etc.

- **Check LCD > 7 segment horizontal segments**
All horizontal segments appear in the indication fields.
- **Check LCD > 7 segment vertical segments**
All vertical segments appear in the indication fields.
- **Check LCD > 7 segment all segments on**
All segments appear in the indication fields.
- **Check LCD > Checkctl – all dots off**
All indications are deleted in the warning and maintenance display (only for INFOCENTER 3).
- **Check LCD > Checkctl – chess board pattern**
In the warning and maintenance display every field is filled with a weak grid (only for INFOCENTER 3).
- **Check LCD > Checkctl – all dots on**
In the warning and maintenance display every field is filled with a slightly stronger grid than in the test step “chess board pattern” (only for INFOCENTER 3).
- **Check LCD > End LCD menu**
Select this item to return to the test mode menu.





TEST MODE > F5 ANALOG INPUTS

Upon pressing the key F5 when the ignition is switched on the following window appears:

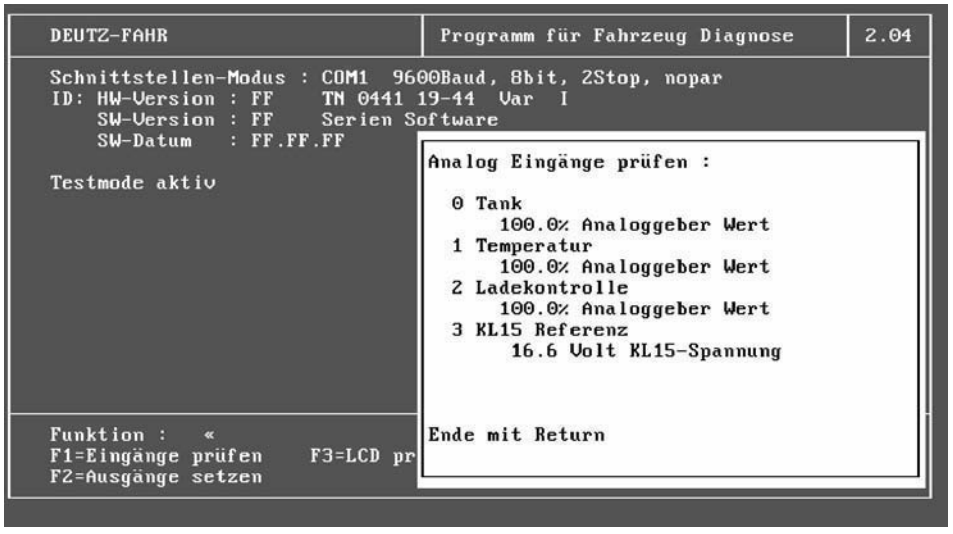


Fig. 59 - Check analog inputs

The values of charge control and terminal 15 reference will change when the engine is running:

Check analog inputs:

0	Tank	11,4%	analog value
1	Temperature	100%	analog value
2	Charge control	100%	analog value
3	Terminal15 reference	13,7 Volt	terminal15 voltage

- **Analog inputs > Tank**
  The signal of the tank transducer at plug X 131, pin 13 of the INFOCENTER is tested: The indicated % value corresponds to the actual tank level. It is the percentage of the existing terminal 15 reference. When the plug is pulled off from the tank transducer 100% will be indicated.

- **Analog inputs > Temperature**
  The signal of the temperature sensor (engine coolant) at plug X 131, pin 15 of the INFO-CENTER is tested. The relation between the input signal and the reference voltage terminal 15 is indicated in %.

- **Analog inputs > Charge control**
  The signal of the charge control for the electric generator at plug X 131, pin 7 of the INFO-CENTER is tested. When the engine is running a display of 100% indicates proper charging by the electric generator.

- **Analog inputs > Terminal 15 reference**
  The power supply on terminal 15 at plug X 130, pin 2 of the INFOCENTER is tested. The indication 13,7 V is the actual operating voltage.

Press the ENTER key to return to the TEST MODE.

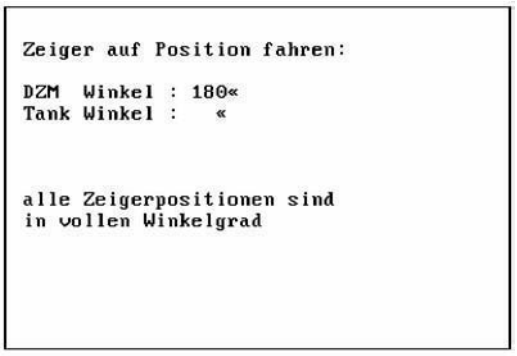
TEST MODE > F6 POINTER

Upon pressing the key F6 the following window appears: The cursor is flashing behind “engine speed angle”. Engine speed angle signifies Revolution Counter Angle.

Fig. 60 - Move pointer to position

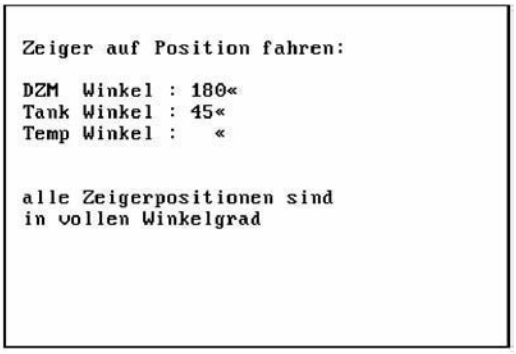
- **Pointer > Engine speed angle**
  Enter an angle, e.g. 180.
  - Display: DZM angle 180 <<
  After pressing the ENTER key the pointer of the engine speed indication will move from its 0 position by 180 (to about 1900 rpm).

- **Pointer > Tank angle**
  After having performed the previous test step the following window appears:
  - The cursor is flashing behind “Tank angle”.



  Enter an angle, e.g. 45.
  - Display: Tank angle 45 <<
  Dopo aver premuto il tasto INVIO il puntatore del serbatoio si sposterà dalla posizione 0 di 45° verso il centro dello strumento indicatore (il quale dispone di un angolo di indicazione generale di 90° ù

- **Pointer > Temperature angle**
  After pressing the ENTER key the tank pointer will move from its 0 position by 45 towards the center of the indicating instrument. (The indicating instrument has an overall indication angle of 90.)



  Enter an angle, e.g. 45.
  - Display: Temp angle 45 <<
  After pressing the ENTER key the temperature pointer will move from its 0 position by 45 o towards the center of the indicating instrument. (The indicating instrument has an overall indication angle of 90 o .) Simultaneously the pointer window is quit and the main menue reappears.

4.1.5 END =QUIT THE INFOCENTER PROGRAM

Upon pressing the “End” key the following window appears:

In case of INFOCENTER 3 a gong is sounding now and all LEDs are lighting up. Subsequently, for about three seconds the message **“Read EProm from multipurpose instrument”** appears.

The realized changes from the item “F1=change constant values” are saved. Changes like “Move pointer to position” etc. are rejected and a self-test of the INFOCENTER will be performed.
Subsequently the EDS initial menu reappears (compare part A 1.3 “Launching and terminating of the EDS program”).

4.2 CONSTANT VALUES FOR INFOCENTER

Every INFOCENTER is programmed with 14 constant values in order to take into account the design features of the tractor, which can be, e.g.

- Indication of the **ground speed** in km/h or mph
- Indication of the **power take-off speed**
- **Radar sensor:** existing or not existing

The central unit needs to be programmed with a specific progression of constant values which determines the type of tractor and the design features. Every progression of constant values has a running number (K...) which is unique.

NOTE. Upon calibration (traveling the 100 m distance) the constant values 9 and 10 will be newly determined.

The constant values are displayed by the central unit upon the following conditions:

- Ignition OFF; dipped beam OFF
- Pull the main beam switch **and** hold it
- Switch ON the ignition
- After approx. 10 sec the constant values are flashing and can thus be read; Release the main beam switch
- Return to normal indication by means off ignition OFF-ON

The number of the constant value is indicated in the “speed” display and the value is indicated in the “Operating-hours” display.

- K1 - Theoretical ground speed **above** 15 km/h
- K2 - Rear power take-off
- K3 - not occupied
- K4 - Front power take-off 100 rpm
  Upon later up-grading of the front power take-off K4 does not need to be programmed.
- K5 - Operating-hours
- K6 - (Gear ratio engine – electric generator) engine speed
- K7 - Constant value for the true ground speed (radar sensor) **above** 15 km/h
- K8 - Determination of km/h or mph, language, radar sensor existing/not existing
- K9 - Theoretical ground speed **below** 15 km/h. Determined by calibration (traveling the 100 m distance)
- K10 - True ground speed (radar sensor) **below** 15 km/h. Determined by calibration (traveling the 100 m distance)
- K11 - not occupied
- K12 - Rear power take-off
- K13 - not occupied
- K14 - not occupied

Table 1: Constant values K1 – K14

Agrotron						
Constant	**80-100 4.70 - 4095**	**105 6.01**	**106 - 135 6.00 - 6.30**	**150 6.45**	**160 - 200**	**230 - 260**
K1[1)]	3809	3675	2438	2826	1660/1440[2)]	2220/2078[3)]
K2	20				29/6[4)]	70
K3	0					
K4	210					
K5	Operating hours					
K6	1800 (mechanical engine speed controller)				4800 (electronic engine speed controller)	
K7	1000					
K8	see Table 2					
K9[1)]	3809	3675	2438	2826	1660/1440[2)]	2220/2078[3)]
K10	1000					
K11	0					
K12	6					
K13	0					
K14	0					

NOTA

1) In case of the Agrotron tractors 80 – 150 the data of K1 and K9 refer to the 30 / 40 km/h version. For the 50 km/h version these values need to be taken from **table 3** and are to be entered accordingly.
2) Until month of construction 01/99: 1660, from month of construction 01/99 on: 1440
3) The constant values K1 and K9 for Agrotron 230/260 need to be chosen according to the tyre size (group 1; group 2) as stated in **table 4**.
4) 29: with factory mounted sensor
   6: with upgraded sensor (assembly set 04426723)

Table 2: Values of constant K8

Value of constant K8	Language	Speed display	Radar sensor existing?	Flashing light - beep
75	danish	km/h	NO	ON
107	danish	km/h	SI	ON
11	danish	km/h	NO	OFF
43	danish	km/h	SI	OFF
65	german	km/h	NO	ON
97	german	km/h	SI	ON
1	german	km/h	NO	OFF
33	german	km/h	SI	OFF
66	english	km/h	NO	ON
67	english	km/h	NO	ON
98	english	km/h	YES	ON
99	english	km/h	YES	ON
2	english	km/h	NO	OFF
3	english	km/h	NO	OFF
34	english	km/h	YES	OFF
35	english	km/h	YES	OFF
69	french	km/h	NO	ON
101	french	km/h	YES	ON
5	french	km/h	NO	OFF
37	french	km/h	YES	OFF
77	italian	km/h	NO	ON
109	italian	km/h	YES	ON
13	italian	km/h	NO	OFF
45	italian	km/h	YES	OFF
79	dutch	km/h	NO	ON
111	dutch	km/h	YES	ON
15	dutch	km/h	NO	OFF
47	dutch	km/h	YES	OFF
73	portugese	km/h	NO	ON
105	portugese	km/h	YES	ON
10	portugese	km/h	NO	OFF
41	portugese	km/h	YES	OFF
71	spanish	km/h	NO	ON
103	spanish	km/h	YES	ON
7	spanish	km/h	NO	OFF
39	spanish	km/h	YES	OFF

Table 3: Constants K1; K9 for 30/40 km/h version, resp. 50 km/h version, and constant K6 depending on the engine controller

Typ	Vehicle ID no.	K1 = K9	K1 = K9	Engine version, K6	EMR**
		30/40	50 km/h	mech. controller	
8001/8002	4.70	3809	–	1800	4400
8003/8004	4.80/80	3809	–	1800	4400
8005/8006	4.85/85	3809	–	1800	4400
8007/8008	4.90/90	3809	–	1800	4400
8009/8010	4.95/100	3809	–	1800	4400
8011	6.00/106	2438	–	1800	4800
8012	6.00/106	2438	2372	1800	4800
8013	6.05/110	2438	–	1800	4800
8014	6.05/110	2438	2372	1800	4800
8015	6.15	2438	–	1800	4800
8016	6.15	2438	2372	1800	4800
8017	6.20/120	2438	–	1800	4800
8018	6.20/120	2438	2267	1800	4800
8019	6.30/135	2438	2267	1800	4800
8020	6.45/150	2826	2411	1800	4800
8028	6.01/105	3675	–	1800	4400
8029	160	1660/1440*	–	–	4800
8030	175	1660/1440*	–	–	4800
8031	200	1660/1440*	–	–	4800
8058	230	–	2220	–	4800
8058	230	–	2078	–	4800
8059	260	–	2220	–	4800
8059	260	–	2078	–	4800
8063	115	2438	2372	1800	4800
8092/8093	120/135	–	2326	–	4800

* 1660: until month of construction 01/99, 1440 from month of construction 01/99

** EMR= electronic motor controller

Table 4: Constants K1; K9 for Agrotron 230 and 260 depending on the rear wheel tyres.

Group 1 K1 = K9 =2220		Group 2 K1 = K9 =2220	
Designation	Circumferential line (mm)	Designation	Circumferential line (mm)
20.8 R 42	5783	710 / 70 R 42	6180
650 / 65 R 42	5744	650 / 65 R 46	6060
620 / 70 R 42	5810	650 / 85 R 38	6084
710 / 75 R 34	5761	620 / 70 R 46	6120
710 / 70 R 38	5780	–	–
580 / 70 R 42	5700	–	–

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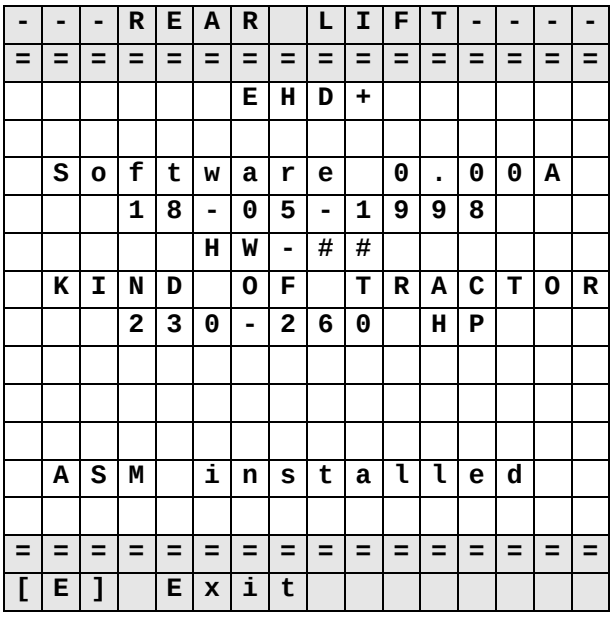
7. ALL ROUND TESTER FOR LIFT AND ASM CONTROL UNIT



PRESENTATION SCREEN

Software version.

Release date.

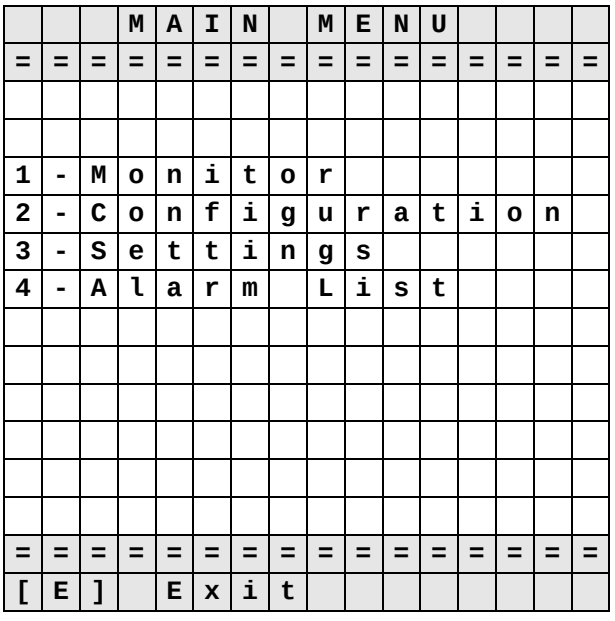
If the control unit has not been programmed or is damaged, the following message is displayed:

	C	O	N	F	.		E	R	R	O	R			

If ASM has not been installed, the following message is displayed:

A	S	M		N	o	t	I	n	s	t	a	l	l	e	d

Press **E** to continue.



MAIN MENU

1 - Monitor session:
used to display information processed by the vehicle control units from input signals returned by sensors (display of processed data).

2 - Configuration session:
for configuration of the tractor.

3 - Calibration session:
indicates procedures for putting the tractor into service (calibration of sensors, routine maintenance check) and tractor configuration information (optional devices).

4 - Alarms session:
list of active and passive alarms logged by the control units.
Active alarm: error or fault detected and still present.
Passive alarm: error or fault detected but no longer active.

Press **E** to quit this menu.

				M	O	N	I	T	O	R	S				
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
	1	-	L	I	F	T									
	2	-	C	O	N	S	O	L	L	E					
	3	-	A	S	M										
	4	-	P	O	W	E	R	S	U	P	P	L	Y		
	5	-	S	E	N	S	O	R	S						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t								

1.MONITOR

This menu is used to show the status of input signals for each function.

Press **E** to quit this menu.

						L	I	F	T						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
	S	t	a	t	u	s	.	.	.	X	X	X	X	X	X
	M	i	n		P	o	s	i	t	.		M	a	x	
		X	%			X	.	X	%			X	%		
		L	t		D	r	a	f	t			R	t		
	X	.	X	X		X	.	X	%		X	.	X	X	
					S	l	i	p	a	g	e				
	R	e	f	:		X	X	X		X	X	X	%		
	R	a	d	a	r		K	m	h		X	.	X		
	W	h	e	e	l		K	m	h		X	.	X		
	M	o	d	e	->					X	X	X	X	X	
	E	V		u	p							X	X	X	
	E	V		d	w							X	X	X	
	P	w	m		X	X	X			X	X	X	m	A	
[	E	]		E	x	i	t								

1.1 LIFT

- **Status....:** Lift status
  Possible values:
  LOCK lift locked
  STOPlift in 'stop' status
  CTRLlift in control mode (e.g. when ploughing)
  TO UPlift being raised
  SAFE lift in safety condition
- **Min Posit. Max:** Lift position
  Three columns are displayed
  Min: setting selected with the minimum height potentiometer (values from 0 to max setting).
  Posit.: indicates current position of the lift (values from 0 to 100).
  Max.: setting selected with the maximum height potentiometer (values from 0 to 100).
- **Lt Draft Rt**: Draft monitor, left, right
  Three columns are displayed:
  Lt: signal (in volts) generated by the left side draft sensor.
  Draft: the value computed as a percentage of the draft generated through the lift.
  With the tractor stationary and no implement, draft must be 50% approx.
  Rt: signal (in volts) generated by the right side draft sensor.

						L	I	F	T						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
	S	t	a	t	u	s	.	.	.	X	X	X	X	X	X
	M	i	n		P	o	s	i	t	.		M	a	x	
		X	%			X	.	X	%			X	%		
		L	t		D	r	a	f	t			R	t		
	X	.	X	X		X	.	X	%		X	.	X	X	
					S	l	i	p	a	g	e				
	R	e	f	:		X	X	X		X	X	X	%		
	R	a	d	a	r		K	m	h		X	.	X		
	W	h	e	e	l		K	m	h		X	.	X		
	M	o	d	e	->					X	X	X	X	X	
	E	V		u	p							X	X	X	
	E	V		d	w							X	X	X	
	P	w	m		X	X	X			X	X	X	m	A	
[	E	]		E	x	i	t								

- **Slipage:** Wheelslip status

  Ref: setting selected with the wheelslip potentiometer (settings: ON = active - OFF = inactive)
  The value displayed after the setting indicates actual wheelslip (0-100).
  With the tractor stationary this must be 0%.

  Radar: Ground speed detected by the radar.
  Values displayed:

-	-	-	-	: radar not active

X	X	.	X	: speed (0-50 km/h)

- **Wheel:** Wheel speed detected by sensor
  Values displayed:

X	X	.	X	: speed (0-50 km/h)

- **Mode ->**: Lift control mode selected by way of “MIX” potentiometer.
  Values displayed:

  DRAFT: lift in draft control mode

  POS: lift in position control mode

  MIX: draft and position control intermixed.

- **EV up:** Status of linkage Up solenoid valve
- **EV dw:** Status of linkage Down solenoid valve

NOTE

“Up SV” and “Dw SV" must not register **“ON”** status at the same time.

- **Pwm:** Control signal sent to “Up” or “Down” solenoid valve currently active.
  Two columns are displayed:

  0-1000 value of control signal

  0-5000 mA current

Press | E | to quit this menu.

				C	o	n	s	o	l	l	e				
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
C	t	r	l	L	e	v	e	r			X	.	X	X	V
S	e	t	P	o	i	n	t				X	.	X	X	V
M	a	x	H	e	i	g	h	t			X	.	X	X	V
C	t	r	l	M	o	d	e				X	.	X	X	V
D	r	o	p	S	p	e	e	d			X	.	X	X	V
S	l	i	p	a	g	e					X	.	X	X	V
B	u	t	t	o	n	U	P								
B	u	t	t	o	n	D	W								
[	E	]		E	x	i	t								

1.2 CONSOLE

- **CtrlLever:** Output voltage of control lever
  Possible values:
  - transport position: 4,70÷6,69
  - stop position: 3,00÷4,32
  - control position: 1,61÷2,59
  - float position: 0,72÷1,61
- **SetPoint**: output voltage from the control potentiometer (value 0 - 8V)
- **MaxHeight:** output voltage from maximum height potentiometer (valu 0 - 8V)
- **CtrlMode**: output voltage from operating mode potentiometer (value 0 - 8V)
- **DropSpeed**: output voltage from rate-of-drop potentiometer (value 0 - 8V)
- **Slipage**: output voltage from wheelslip switch (value 0 - 8V)
- **ButtonUP**: fender pushbutton - linkage Up (Values: ON=depressed - OFF= released)
- **ButtonDW**: fender pushbutton - linkage Down (Values: ON=depressed - OFF= released)

Press [E] to quit this menu.

						A	S	M							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
M	o	d	e								X	X	X	X	
W	h	e	e	l				k	m	h		X	X	.	X
S	l	i	p	a	g	e				X	X	X	.	X	%
	S	t	e	e	r										
S	1	=	X		S	2	=	X		|	-	0	0	-	|
B	r	a	k	e	s									X	
A	U	T	O		B	u	t	t	o	n				X	
D	I	F	F		B	u	t	t	o	n				X	
D	I	F	F							X	X	X	X	m	A
4	W	D								X	X	X	X	m	A
[	E	]		E	x	i	t								

1.3 ASM

- **Mode:** transmission operating mode (values AUTO - MAN)
- **Wheel:** Ground speed
- **Slipage:** wheelslip percentage value
- **Steer:** steering control is effected by way of two sensors relaying a sequence of signals from which it can be determined whether the tractor is steering left, right or straight ahead.
  The control sequence is indicated in the following table:

	Steering angle	S1	S2	Symbol
Steer left	$\alpha \geq 30$	0	1	\ - 30 - \
	$25 \leq \alpha < 30$	1	1	\ - 25 - \
	$15 \leq \alpha < 25$	1	0	\ - 15 - \
Straight ahead	$0 \leq \alpha < 15$	0	0	| - 00 - |
Steer right	$15 \leq \alpha < 25$	0	1	/ - 15 - /
	$25 \leq \alpha < 30$	1	1	/ - 25 - /
	$\alpha \geq 30$	1	0	/ - 30 - /

						A	S	M							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
M	o	d	e									X	X	X	X
W	h	e	e	l				k	m	h		X	X	.	X
S	l	i	p	a	g	e				X	X	X	.	X	%
	S	t	e	e	r										
S	1	=	X		S	2	=	X		|	-	0	0	-	|
B	r	a	k	e	s									X	
A	U	T	O		B	u	t	t	o	n				X	
D	I	F	F		B	u	t	t	o	n				X	
D	I	F	F							X	X	X	X	m	A
4	W	D								X	X	X	X	m	A
[	E	]		E	x	i	t								

- **Brakes:** when one of the brake pedals is depressed, the letter P is displayed; when the pedal is released or both pedals are depressed, the letter R is displayed.
- **AUTO Button - DIFF Button:** these pushbuttons are used to control the ASM system as indicated by the following table**:**

Console switches			Status on test meter	
ASM	**DT**	**DIFF**	**Puls.AUTO**	**Puls.DIFF**
OFF	OFF	OFF	R	R
OFF	OFF	ON	R	**P**
OFF	ON	OFF	R	R
OFF	ON	ON	R	**P**
ON	OFF	OFF	R	R
ON	OFF	ON	**P**	**P**
ON	ON	OFF	**P**	R
ON	ON	ON	**P**	**P**

- **DIFF:** current input to differential lock solenoid valve.
- **4WD:** current input to 4WD solenoid valve.

Press **E** to quit this menu.

		P	O	W	E	R		S	U	P	P	L	Y		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
+	5	V			O	U	T			V		X	X	.	X
+	8	V			O	U	T			V		X	X	.	X
B	a	t	t	e	r	y				V		X	X	.	X
[	E	]		E	x	i	t								

1.4 POWER

This menu displays the input voltages of the ECU and components connected to it.

Press **E** to quit this menu.

				S	E	N	S	O	R	S					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
				P	O	S	I	T	I	O	N				
X	.	X	X	V						X	X	X	.	X	%
		R	I	G	H	T		D	R	A	F	T			
X	.	X	X	V						X	X	X	.	X	%
		L	E	F	T		D	R	A	F	T				
X	.	X	X	V						X	X	X	.	X	%
				E	X	T	E	R	N	A	L				
X	.	X	X	V						X	X	X	.	X	%
[	E	]		E	x	i	t								

1.5 SENSORS

This menu displays the input voltages (V) to the position sensors, the right and left draft sensors and the external sensor. Also displayed are the lift position (%) and the signals from the draft sensors and the external sensor.

The values displayed are:

POSITION: 0–5 V - 0–100%

RIGHT DRAFT - LEFT DRAFT - EXTERNAL:
0–8 V - 0–100%

NOTE

With no implement attached, the percentage values for the left and right draft sensors should be approximately 50%.

Press [E] to quit this menu.

	P	A	R	A	M	E	T	E	R		M	E	N	U	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	S	p	e	e	d		C	o	n	s	t	a	n	t
2	-	O	p	t	i	o	n	s							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t								

2. CONFIGURATION

1 - Speed constant: using this menu, the technician can configure radar and tyre parameters

2 - Options: this menu can be used to enable or disable optional functions and devices on the tractor

Press [E] to quit this menu.

	S	P	E	E	D		C	O	N	S	T	A	N	T	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	R	A	D	A	R						6	5	0	0
2	-	W	H	E	E	L						3	2	5	0
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t								

2.1 SPEED CONSTANTS

1 - Radar:

- If the radar is installed, the value displayed will be 6500.
- If the radar is not installed, the value displayed will be 0.

2 - Wheel: the value is 3250 and must not be changed.

Press **E** to quit this menu.

				O	P	T	I	O	N	S					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	S	M											1
2	-	A	U	T	O	D	R	O	P						0
3	-	4	W	D	-	3	0	D	E	G					0
4	-	R	O	T	A	T	E	A	L	A	R	M			1
5	-	E	X	T	D	A	L	A	R	M					0
6	-	S	E	N	S	I	T	I	V	.			2	5	5
7	-	T	R	A	C	T	O	R							1
8	-	E	X	T	S	E	N	S	O	R					1
9	-	M	I	X		M	O	D	E						0
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t								

2.2 OPTIONS

The screen shows factory-set values for the various options.

NOTE

The ART can only display the screen pages of this menu in English.

1 - ASM: selecting this option, the ASM can be enabled or disabled.
(1 - ON: enabled / 0 - OFF: disabled)

2 - AUTODROP: selecting this option, it becomes possible to enable or disable automatic lowering of the implement at the selected rate of drop, down to the working position.
(1 - ON: enabled / 0 - OFF: disabled)

3 - 4WD - 30 DEG: selecting this option, when ASM is activated, 4WD is disengaged automatically when the steering angle becomes equal to or greater than 30°.
(1 - ON: enabled / 0 - OFF: disabled)

4 - ROTATEALARM: if this option is enabled, active alarms can be displayed in rotation via the diagnostic LED. If the option is disabled, only the alarm with the lowest code will be displayed.
(1 - ON: enabled / 0 - OFF: disabled)

				O	P	T	I	O	N	S					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	S	M											1
2	-	A	U	T	O	D	R	O	P						0
3	-	4	W	D	-	3	0	D	E	G					0
4	-	R	O	T	A	T	E	A	L	A	R	M			1
5	-	E	X	T	D	A	L	A	R	M					1
6	-	S	E	N	S	I	T	I	V	.			2	5	5
7	-	T	R	A	C	T	O	R							4
8	-	E	X	T	S	E	N	S	O	R					1
9	-	M	I	X		M	O	D	E						0
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]		E	x	i	t								

5 - EXTDALARM: enabling this option, alarm codes will be displayed in the extended format, i.e. with a different code for each alarm type.
Disabling the option, different alarms may be grouped together under a single standard code.
(1 - ON: enabled / 0 - OFF: disabled)

6 - SENSITIV.: this options allows the technician to change the response of the draft and wheelslip control functions. Decreasing the value reduces the response speed, whereas if the value is set to 0, the response can be adjusted by way of the rate-of-drop potentiometer.

7 - **TRACTOR:** this option is used to select the type of tractor.

8 - **EXTSENSOR:** this option tells the ECU whether the signal from the external sensor is to be used in the control cycle or to limit the opening of the linkage Up valve.
(1 - ON: enables Up valve limiter function /
0 - OFF: enables control by way of external sensor

9 - **MIX MODE**: allows selection of the MIX potentiometer operating mode. If the function is enabled, the MIX potentiometer is used to set the draft/position or draft/position/wheelslip mix. (1 - ON: enabled / 0 - OFF: disabled)

Press [E] to quit this menu.

		S	E	T	T	I	N	G		M	E	N	U		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	M	i	n	H	e	i	g	h	t		0	.	9	4
2	-	M	a	x	H	e	i	g	h	t		4	.	0	2
3	-	L	o	c	k	S	p	e	e	d				2	0
4	-	S	l	i	p	a	g	e		%				1	0
-	-	-	M	a	i	n		L	e	v	e	r	-	-	-
5	-	T	r	a	n	s	p	o	r	t		5	.	3	6
6	-	S	t	o	p							3	.	6	6
7	-	C	o	n	t	r	o	l				1	.	9	2
8	-	F	l	o	a	t						1	.	4	5
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
		[	E	]		E	x	i	t						

3.CALIBRATIONS

This menu contains all the calibration operations that can be performed when the lift ECU or position sensor is replaced.

1 - MinHeight: calibration of the minimum lift height.

2 - MaxHeight: calibration of maximum lift height.

3 - LockSpeed: ground speed at which the lift lock is applied

4 - Slipage: percentage threshold used to control wheelslip.

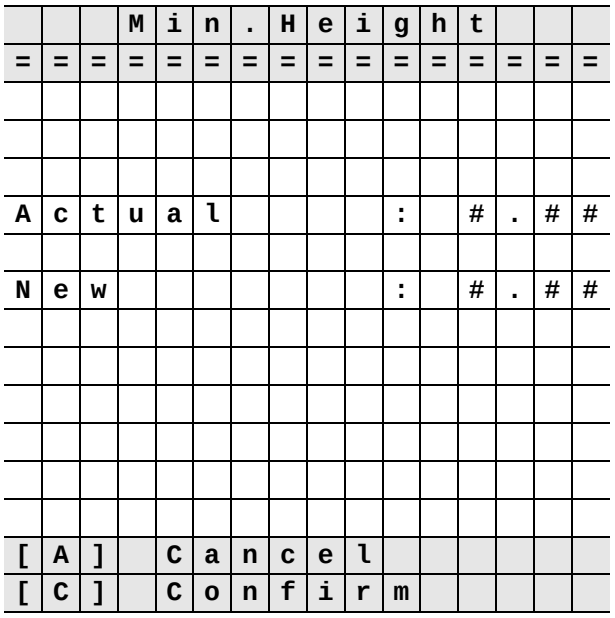
5 - Transport: output current from the lift control lever in TRANSPORT position.

6 - Stop: output current from the lift control lever in STOP position.

7 - Control: output current from the lift control lever in CONTROL position.

8 - Float: output current from the lift control lever in FLOAT position.

Press [E] to quit this menu.



3.1 MINIMUM HEIGHT

This menu can be used to set the minimum lift height.

PROCEDURE

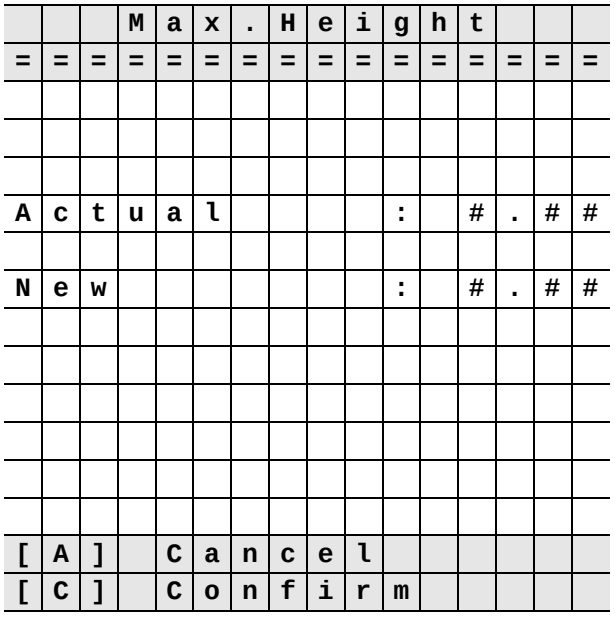
1 - Start the engine and run on idle

2 - Unlock the lift.

3 - Lower the lift completely using the fender pushbuttons.

4 - Press [E] to confirm the value.

5 - Press [C] to confirm again, or press [A] to clear.



3.2 MAXIMUM HEIGHT

This menu can be used to set the maximum lift height.

PROCEDURE

1 - Start the engine and run on idle

2 - Unlock the lift

3 - Raise the lift completely using the fender pushbuttons.

CAUTION!
Carry out these manoeuvres with the engine idling to avoid mechanical damage to the lift.

4 - When the lift has reached maximum height, lower it by 2-3 degrees (approx. 0.2 V).

5 - Press [E] to confirm the value.

6 - Press [C] to confirm again, or press [A] to clear.

			L	O	C	K		S	P	E	E	D			
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	C	T	U	A	L							2	0
2	-	N	E	W											
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

3.3 LOCK SPEED

The value in this menu **must not be changed**.

			S	L	I	P	A	G	E						
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	C	T	U	A	L							1	0
2	-	N	E	W											
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

3.4 WHEELSLIP

The value in this menu **must not be changed**.

			T	R	A	N	S	P	O	R	T				
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	C	T	U	A	L					#	#	#	#
2	-	N	E	W								#	#	#	#
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

3.5 TRANSPORT

The voltage value relative to the TRANSPORT position of the lift control lever is programmed and stored in the ECU memory.

The value can be changed by putting the lift lever in the TRANSPORT position and confirming the new value by pressing **C** .

The permissible range is 4.70V to 6.69V.

					S	T	O	P							
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	C	T	U	A	L					#	#	#	#
2	-	N	E	W								#	#	#	#
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

3.6 STOP

The voltage value relative to the STOP position of the lift control lever is programmed and stored in the ECU memory.

The value can be changed by putting the lift lever in the STOP position and confirming the new value by pressing **C** .

The permissible range is 3.00V to 4.32V.

				C	O	N	T	R	O	L					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	C	T	U	A	L					#	#	#	#
2	-	N	E	W								#	#	#	#
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

3.7 CONTROL

The voltage value relative to the CONTROL position of the lift control lever is programmed and stored in the ECU memory.

The value can be changed by putting the lift lever in the CONTROL position and confirming the new value by pressing **C** .

The permissible range is 4.70V to 6.69V.

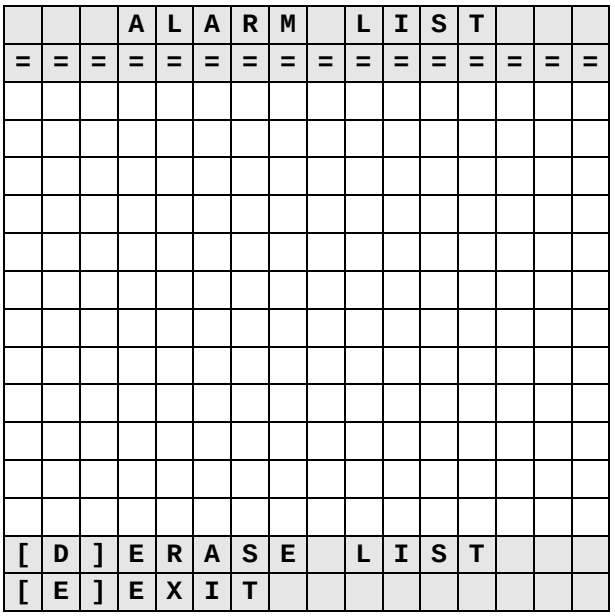
						F	L	O	A	T					
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
1	-	A	C	T	U	A	L					#	#	#	#
2	-	N	E	W								#	#	#	#
[	A	]		C	a	n	c	e	l						
[	C	]		C	o	n	f	i	r	m					

3.8 FLOAT

The voltage value relative to the FLOAT position of the lift control lever is programmed and stored in the ECU memory.

The value can be changed by putting the lift lever in the FLOAT position and confirming the new value by pressing **C** .

The permissible range is 3.00V to 4.32V.



4.ALARMS LIST

Most recent alarm

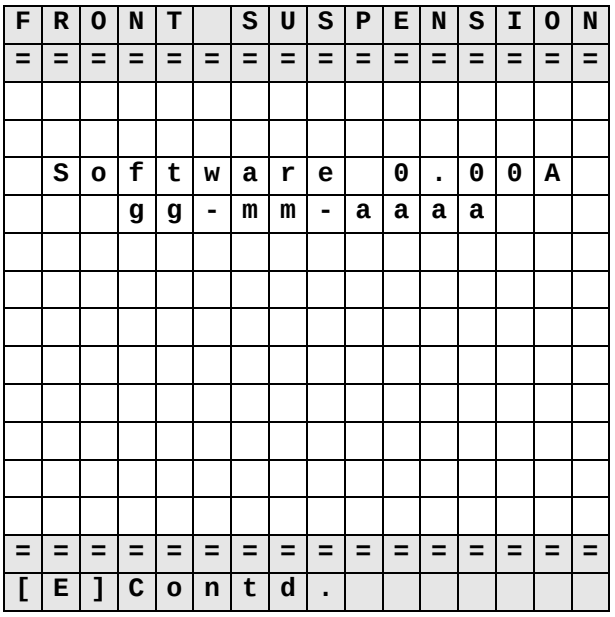
This page displays the last 10 alarm signals to be generated.

All the active alarms are displayed on the last line against a dark background.

Press [D] to cancel, or press [E] to quit.

PAGE INTENTIONALLY LEFT BLANK

8. ALL ROUND TESTER FOR AXLE SUSPENSION CONTROL UNIT

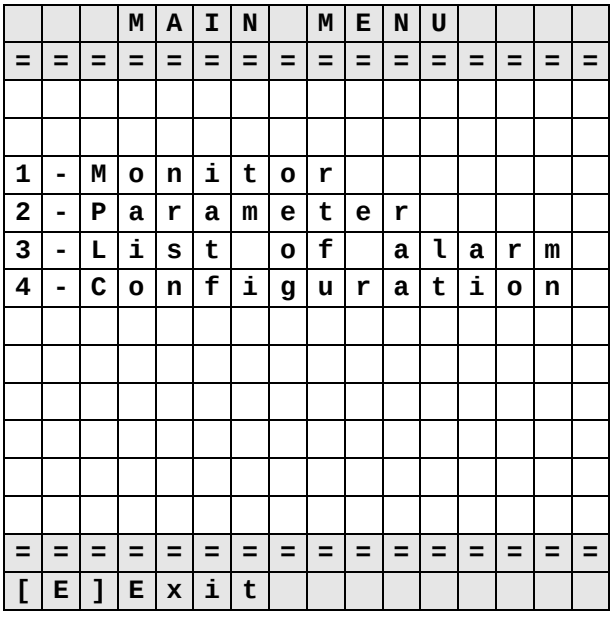


Software version..

Release date.

PRESENTATION SCREEN

Press **E** to continue.



MAIN MENU

1 - Monitor session:
used to display information processed by the sensors and by the actuators connected to the control unit.

2 - Parameters session:
used to configure the speed for automatic system enable and disable..

3 - Alarms list session:
list of alarms logged by the control units.

4 - Configuration session:
for configuration of the tractor.

Press **E** to quit this menu.

		M	O	N	I	T	O	R		M	E	N	U		
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
	1	-	S	U	S	P	E	N	S	I	O	N			
	2	-	P	O	W	E	R		S	U	P	P	L	Y	
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
[	E	]	E	x	i	t									

1.MONITOR

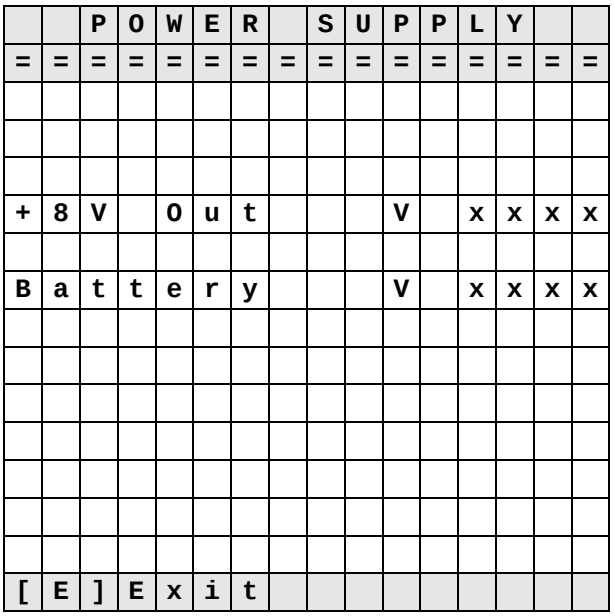
This menu is used to show the status of input signals for each function.

Press [E] to quit this menu..

			S	U	S	P	E	N	S	I	O	N			
=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
S	t	a	t	u	s	.	.	.	.	x	x	x	x	x	x
M	i	n	-	-	-	P	o	s	.	-	-	-	M	a	x
x	x	x	V			x	x	x	V			x	x	x	V
L	S	S	V		x	x	x	x	m	A			x	x	x
U	P	S	V		x	x	x	x	m	A			x	x	x
D	W	S	V		x	x	x	x	m	A			x	x	x
B	r	a	k	e									x	x	x
4	W	h	e	e	l		D	r	i	v	e		x	x	x
W	h	e	e	l	s		k	m	/	h		x	x	x	x
[	E	]	E	x	i	t									

1.1 SUSPENSION

- **Status....:** status of the suspension position
  Possible values:
  CTRL automatic position control
  LOCK suspension locked in lowered position
  STOP control disabled, position lowered
- **Min Pos. Max:** position sensor reading in Volts
  Three columns are displayed:
  Min: minimum position.
  Pos.: current position.
  Max.: maximum position.
- **LSSV**: LOAD SENSING solenoid valve
  UPSV: UP solenoid valve
  DWSV: DOWN solenoid valve
  Data will indicate output current in mA and in (ON-OFF) status.
- **Brake:** indicates brake pedal status (ON depressed - OFF released).
- **4Wheel Drive:** indicates four wheel drive status (ON engaged - OFF disengaged).
- **Wheels:** indicates ground speed (km/h) of the tractor sensed by the wheels pickup.

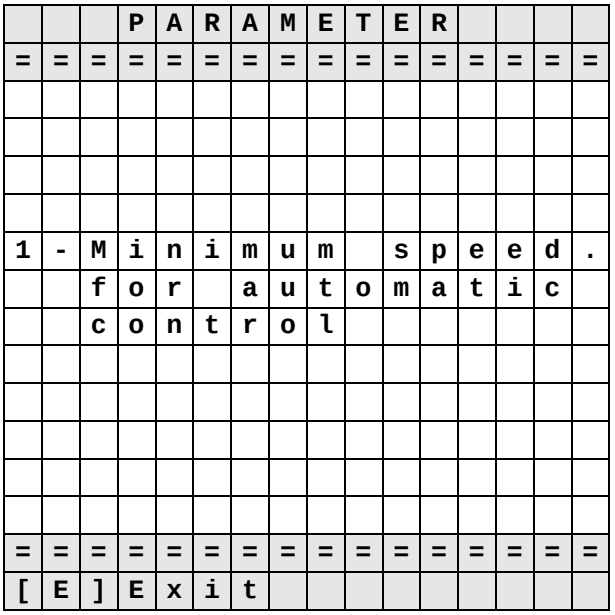


1.2 POWER

This menu displays the input voltages of the ECU and components connected to it.

- Reading of input voltages to sensors (nominal value 8V).
- Reading of battery voltage nominal value 12 V).

Press **E** to quit this menu.

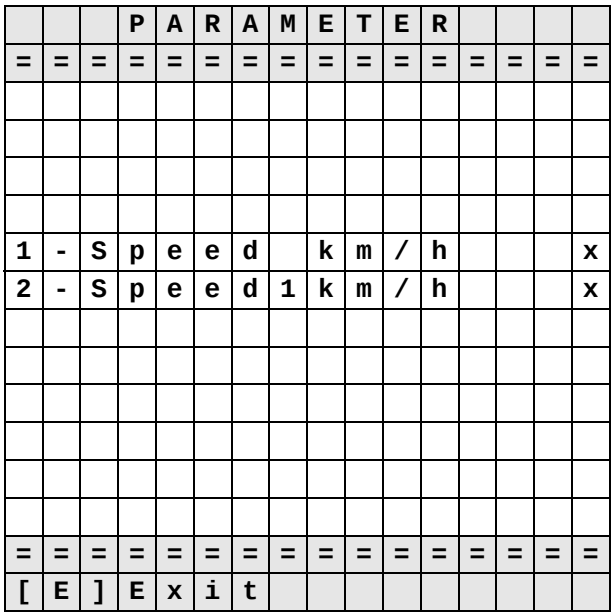


2. PARAMETERS

1 - **Minimum speed for automatic control:** used to configure the minimum speed at which automatic system enable and disable occurs.

Press **1** to continue

Press **E** to quit this menu.



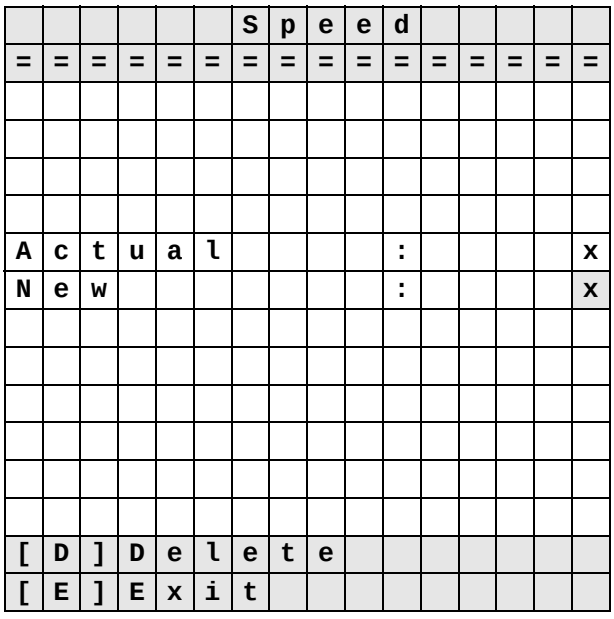
1 - Speed: parameter determining the speed at which position control is activated with the system in operation.

2 - Speed1: parameter determining the speed at which position control is activated with the system not in operation (axle suspension locked).

Press [1] or [2] to change factory settings.

Press [E] to quit this menu.

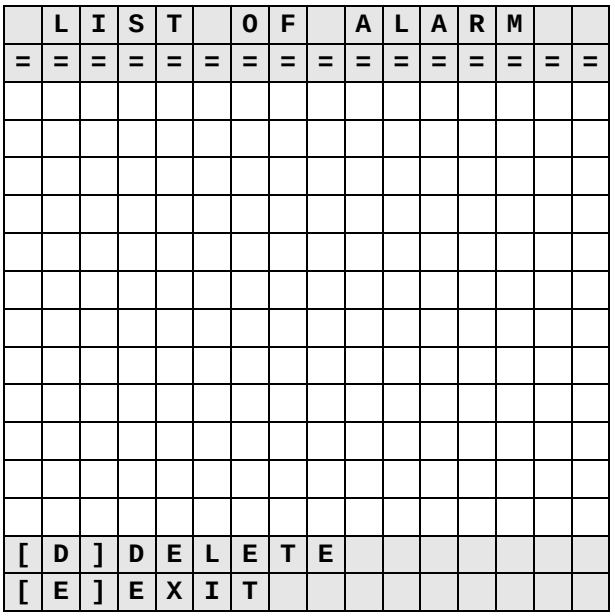
Example of how the "speed" parameter is changed



1 - Enter the value to be set.

2 - Press [E] to confirm the value.

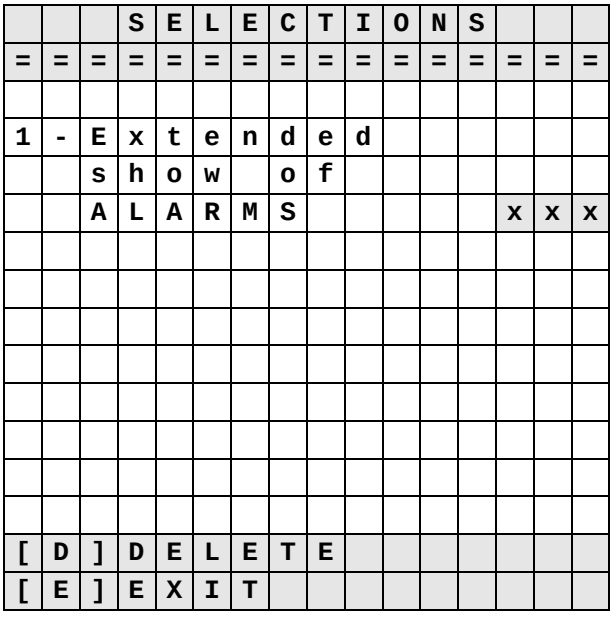
3 - Press [C] to confirm again or press [A] to clear.



3. ALARMS LIST

This screen displays the last 10 alarm signals to be generated.

Press [D] to cancel, or press [E] to quit.



4.CONFIGURATIONS

The menu is used to enable the display of solenoid valve alarms in extended format, using differentiated flashes.

Press [1] to change the type of selection:

ON: indication of extended alarms active

OFF: indication of extended alarms not active

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9. SERDIA (LEVEL III)

1. SETUP AND COMMUNICATIONS

SERDIA is a software program. Together with the notebook and the interface, it constitutes a tool which serves as an aid to communication with the engine ECUs.

SERDIA supports DEUTZ ECUs EMR, EMS and MVS. You can also communicate with three different ECUs using just one software product.

Any changes you wish to make to the ECUs as far as settings, parametrizations, error deletion and calibra-tion are concerned are only possible with SERDIA.

SERDIA runs under the MS Windows®3.11 and Windows95 (98) user surface.

You can choose English or German as the user language when carrying out program installation.

The user surface enables the user to call up the functions required simply by clicking on the appropriate buttons.

The menu points listed below are available:

- ECU selection
- Measured values
- Parameters
- Error memory
- Function test
- Extras

1.1 MINIMUM EQUIPMENT REQUIRED

To run SERDIA, the following minimum equipment configuration is required:

1.1.1 CONTROL UNITS

- EMR1, Electronic engine controller System description TN 0297 7432
- EMR2, electronic engine controller System description TN 0297 9885
- MVS, solenoid valve system System description TN 0297 7488
- EMS2, engine monitoring system System description TN 0297 7930

1.1.2 DIAGNOSTIC CONNECTOR

Serial diagnostic connector TN 0419 9615 as specified in ISO 9141 and SAE J1587

1.1.3 INTERFACE

Link from control module (engine) to PC

- Level adaptation for ISO 9141, SAE J1708 and RS 485
- Security system with dongle, copy protection
- 12-24 V voltage supply range
- Supply source: engine
- Safety switching for protection against overvoltage and incorrect pole connection
- Galvanic isolation

1.1.4 PC/ NOTEBOOK

Minimum equipment required:

- Notebook or PC with 1 RS 232 serial interface PC (IBM-AT compatible) (should not be otherwise occupied, for example, mouse or IR interface).
- Parallel interface for printer
- Graphics card VGA/SVGA

- Processor 80486 (or higher)
- Clock speed >= 100 MHz
- Installed memory >= 8 MB RAM
- Hard disk >= 15 MB (free disk space)
- Disk drive 3.5“ 1.44 MB
- Software: Operating system MS Windows 3.11, 95 or 98

Installation is also possible under Windows 3.1. However, because of a Windows problem, this can cause access conflicts with the COM1 serial interface (see Chapter, "What to do if ...". For more details, please see the "Readme" file supplied with SERDIA.).

With Windows 3.11, the standard (VGA) screen driver should be installed for correct display of SERDIA screens.

1.2 ORDERING

SERDIA can be ordered, like the DEUTZ special tools, through:

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

Viale F. CASSANI, 15

24047 TREVIGLIO (BG) - ITALIA

1.2.1 FIRST-TIME USERS

For first-time users, we recommend the SERDIA package Re-order No. 5.9030.740.4/10.

Scope of supply:

- SERDIA software (1 x 3.5' installation diskette)
- Diagnostics interface with implemented user level
- Brief instructions on installation
- A list of tools and modifications usefui when troubleshooting, is included
- Carrying case

1.2.2 ORDERING SINGLE PARTS

Part	Competence level	Re-order No.
Installation diskette		5.9030.740.0
Adapter		5.9030.741.0
Interface level III	Major overhaul	5.9030.740.2

1.2.3 ADAPTER

Some OEMs have different diagnostics plugs for certain versions. An adapter is therefore required for the interface from the 12 pole DE UTZ plug to the appropriate OEM plug.

The DEUTZ 12 pole counterpart is available as a genuine DEUTZ part.

A ready-made adapter is available, for diagnostics on engines in DE UTZ Fahr tractors (DEUTZ 12 pole -> DFA 14 pole):

DEUTZ Part No. 5.9030.741.0

1.2.4 SERDIA UPDATES

You will be informed of software updates by our service information department, as they occur.

There is no automatic exchange against older versions of the software.

When installing the update the target directory should contain the SERDIA version number.

1.3 SWITCHING ON AND INSTALLING THE SOFTWARE

1.3.1 INSTALLING MS WINDOWS

If MS Windows is not already installed on your hard disk, it must first be installed following the installation instructions supplied with MS Windows 3.1, 95, 98 o 2000.

1.3.2 INSTALLING SERDIA FROM DISKETTES

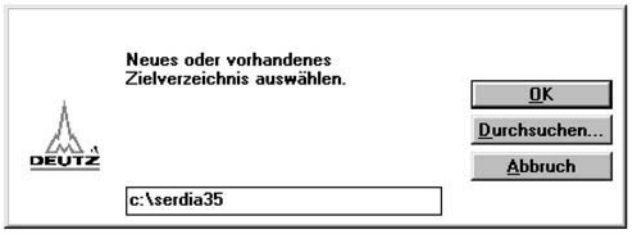
To run the SERDIA software, an interface with a connection to an engine control module is required. If this interface is not present, SERDIA can still be installed, but will only run in Off-line mode. The software limitations imposed by off-line mode are described in Chapter "Off-line mode".

Installation with Windows 3.1, 3.11:

- Start Windows.
- Insert SERDIA Installation diskette 1 in the disk drive (Drive A).
- Open "File Manager".
- Select disk drive A.
- Double-click on the "install.exe“ file to start installation.
- Follow the instructions appearing on the screen.
- When finished, remove Installation diskette 2 from the disk drive and store in a safe place together with diskette 1.
- After the computer is re-started, the SERDIA program group window opens.
- Double-click on the "Service diagnosis“ program group to start.

Installation bei Windows 95, 98:

- Start Windows.
- Insert SERDIA Installation diskette 1 in the disk drive (Drive A) einlegen.
- Open "Windows Explorer".
- Select disk drive A.
- Double-click on the "install.exe“ file to start installation.
- The Installation window opens:



•The name of the target directory should indicate the SERDIA Version number, for example "serdia35“.

- Follow the instructions appearing on the screen.
  (If installing with Windows 98, select Windows 95 as the operating system)
- When finished, remove Installation diskette 2 from the disk drive and store in a safe place together with diskette 1.
- After the computer is re-started, the SERDIA program group window opens.
- Double-click on the "Service diagnosis“ program group to start.

Special characteristic of Notebooks with Windows 98:

The ACPI entry (Advanced Configuration and Power Interface) may not appear under "Start\Settings\Control Panel\System\Device Manager\System components.
In this case, follow the instructions in the "Readme.txt" file ("Windows 98" section) included on the SERDIA Installation disk.

Proceed as follows:

- Check whether ACPI is enabled.
- If there are ACPI entries, switch off ACPI using the "disacpi.reg“ file.
  These files are in the SERDIA working directory.
  (ACPI can be switched on again using the "enacpi.reg“ file).
- Run the new hardware recognition program:
  Start\Settings\Control Panel\Add New Hardware\Next\ Search for new hardware.
  (The Installation CD may be required for Windows 98).
- Re-start the computer.

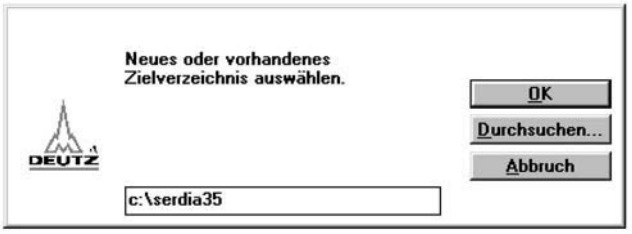
Installation with Windows 2000:

To install under Windows 2000, the 32Bit Version of SERDIA is required. This should be available from May 2002, and will be indicated in the service announcements.

1.3.3 INSTALLING SERDIA FROM THE SERPIC CD

- Start Windows.
- Insert the SERPIC CD in the CD drive.
- Open "Windows Explorer".
- Select the CD drive.
- Open the SERDIA directory.
- Open the "Disk1“ directory
- Double-click on the "install.exe“ file to start installation.

The Installation window opens:



The name of the target directory should indicate the SERDIA Version number, for example "serdia35“.
Follow the instructions appearing on the screen.
(If installing with Windows 98, select Windows 95 as the operating system)

- Remove the CD from the drive and store in a safe place.
- After the computer is re-started, the SERDIA program group window opens.
- Double-click on the "Service diagnosis“ program group to start.

1.3.4 USER LEVEL, ACCESS RIGHTS

DEUTZ Service has defined four different user levels for the SERDIA software (I, II, III, IIIa), which are pre-set in the interface.
The reason for the four different levels is to prevent unauthorised persons from accessing particular parameter settings (in the same way as the seals at injector pumps).
The use of access rights means access is only allowed to those parameters and fields authorised for a particular user level.

1.3.5 SETTING UP THE LINK BETWEEN CONTROL MODULE (ENGINE) AND NOTEBOOK

Communication characteristics:

- Serial communication
- BaudRate = 9600
- Serialport = COM1

The SERDIA interface (supplied) is used to connect the control module to a Notebook. Despite the numerous safety precautions in the interface and control module (such as protection against wrong pole connection and overvoltage, and galvanic isolation), mistakes can still happen, and the following procedure should always be applied when connecting the Notebook to the control module.

The connection is set up in the following order:

1) Switch off the engine, ignition switch (Circuit 15) is Off. Do not switch on the Notebook yet.

2) Connect the diagnostic connector to the vehicle / installation diagnostic socket.

The diagnostic connector must be provided by the customer, and can be supplied by DEUTZ on request.

3) Connect the other side (interface side) to the RS 232/COM1 serial interface. (9-pin connector on the back of your Notebook).

Note: On PCs, the COM1 interface may already be occupied by the mouse. In this case, the interface must be connected to the PC's serial interface (COM2). This must then be configured (see Chapter, "What to do if ...).

4) The ignition switch (Ct.15) and Notebook can now be switched on. The engine remains off at first.

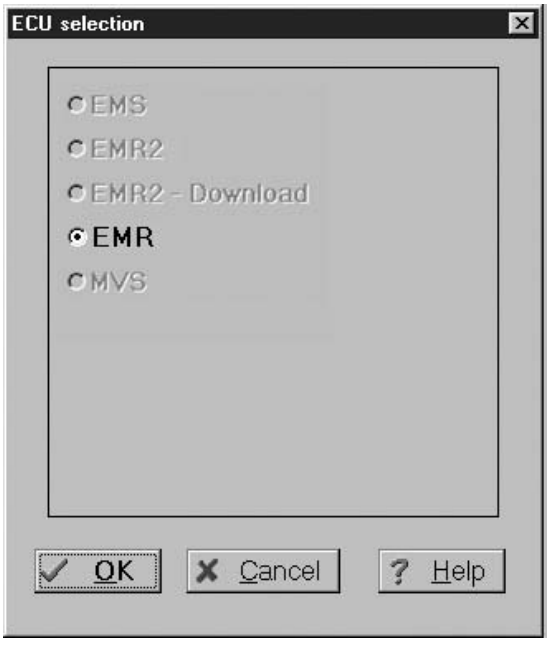
5) The SERDIA can now be started as describe in Chapter 1.8, "Starting the Program".

1.3.6 STARTING THE PROGRAM

In the Windows environment, the SERDIA program is started by clicking twice on its icon.

Starting for the first time:

When the program is started forthe first time, the control module is interrogated. SERDIA does this to find out which control modules are connected and can therefore be addressed. This process can last for about 30 seconds, as the program interrogates all the possible control modules one after the other. While this is taking place, the message "Startup routine for connected ECUs“ is displayed. The "ECU selection“ subscreen then appears, in which unidentified control units are greyed out.



- Select the desired control unit and click OK.
- The message "Initialisation is active!“ appears (and remains for about 7 seconds). Communications are then set up with the control unit.

Starting the next time:

SERDIA registers the control units identified the last time the program was started (for example the EMR2).

If this control unit is connected the second time the program is started, SERDIA skips the interrogation stage and immediately initialises the control unit. This substantially reduces the program startup time. The message "Initialisation is active!“ appears (and remains for about 7 seconds). Communications are then set up with the control unit.

If another control unit is connected the next time the program is started, the interrogation process is performed again (and lasts about 30 seconds).

In engines with two control units (for example an EMR with EMS2), the desired control unit can be selected through another interrogation (see paragraph 2.1).

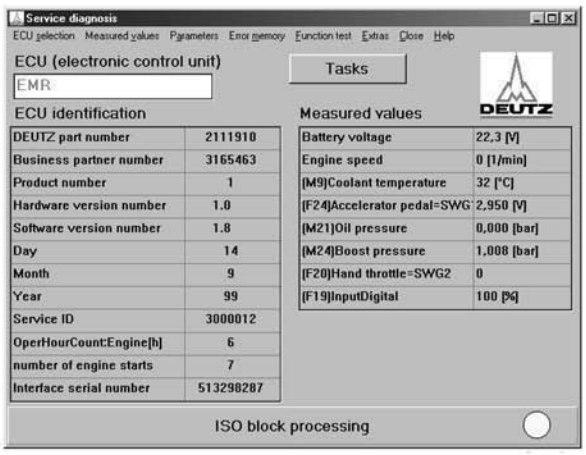
1.3.7 SETTING UP COMMUNICATIONS WITH THE CONTROL UNIT (ECU)

Communications possible:

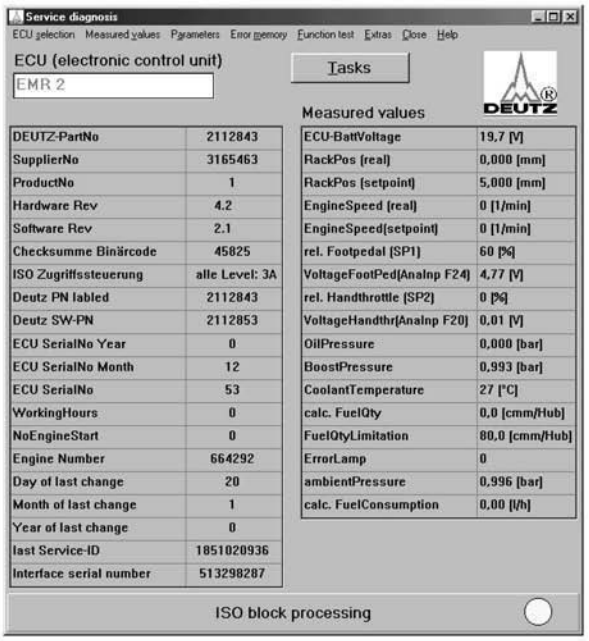
After communications have been successfully set up, the main "Service diagnosis“ screen appears, with the fields "ECU“, "ECU identification“ and "Measured values“ (see Chapter 2, "ECU selection").

This screen contains a menu, and a "Tasks“ switch (see Chapter 8 , " Tasks").

EMR1



EMR2



The communication status between the PC/Notebook and the control unit is indicated by plain text messages, and by a colour code on the status bar:

Yellow (flashing): ISO block processing, i.e. useful data (for example measurements) are being exchanged between SERDIA and the control unit.

Green (flashing): ISO connection OK, i.e. only data blocks needed for maintaining communications between SERDIA and the control unit are exchanged.

Red: Communications stopped.

Communications not possible:

It may not be possible to establish communications for the following reasons:

- No control unit connected.
- There is a communication error; see Chapter 9.1.1, "Communication errors". Setting up communications

In both cases an error message is displayed, and SERDIA offers to go into Off-line mode; see Chapter, Off-line mode.

1.3.8 OFF-LINE MODE

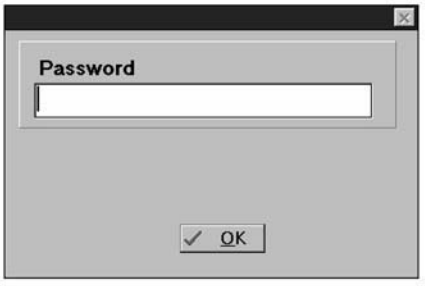
If no control unit/engine and/or interface is available, SERDIA can be run in password-protected mode or Demo mode for training purposes.

SERDIA always offers to go into password-protected mode or Demo mode when it has not been possible to establish communications successfully.

Click on "Ignore". The desired mode can be selected in the "Confirm" box.

1.3.9 PASSWORD-PROTECTED MODE

If "Yes" is selected to confirm, and there is no control unit, authorised users can enter a password (check with head office) and read and print configuration files, but not modify them.



1.3.10 DEMO MODE (TRAINING WITH NO CONTROL UNIT)

If "No" is selected in the Confirm box, the program goes into Demo mode.

1) In this mode, the user can practice working with SERDIA, without changing any values.
2) Graphic files can be read and printed. However, the graphic files must have been stored in digital form (filename extension *.egr).

Also, functional tests cannot be performed on the control units.

1.4 USING THE PROGRAM

Quick start:

1) In Windows, start the SERDIA program
2) In the main SERDIA screen, click on "ECU selection"
3) In the "ECU selection“ screen, select the desired control unit
4) In the main SERDIA screen, select the desired menu

1.4.1 MAIN SCREEN, MENU SELECTION

Menu	Control units	Explanation
ECU selection		
ECU selection	all	Selecting a control unit (only one can be selected at a time)
Print	all	Print measurements or control unit identification data on a printer or to a file
Protocol	all	Interface configuration (Level IIIa only)
Restart	all	Interrogates control unit again
Program ECU	EMR2 only	Loads operating software into the EMR2 (Level IIIa only)
Engine off	EMR2 only	Remote engine switch-off
Reset ECU	EMR2 only	Resets control unit
Measured values		
actual measured values	all	Shows current actual values (also with engine off, but with battery voltage))
RAM-Values	all	EMR1: Level IIIa only, EMR2: Level III, IIIa only
Data logger	EMS2 only	Shows content of data logger
Input/output assignment	all	Control unit pin/signal assignments
CAN Status	all	Simple CAN Monitor
MVS Measured values	MVS only	cylinder-specific measurement display
Parameters		
Configuration	all	To view or modify configuration data
Overall programming	EMR1, EMR2, EMS2	Level III, IIIa only
Calibration		Calibration of transducers, for example pedal travel sensors
MVS pump class	MVS only	pump class assignments
Error memory		
Error memory	all	Reads, displays, and clears the error memory
Error memory 2	EMR2 only	Reads, displays, and clears the error memory (Level III, IIIa only)
MVS error memory	MVS only	Cylinder-specific error display
Function test	EMR1, EMR2	To use the actuator control (Level III, IIIa only)
Extras		
Maximum speed	EMR1, EMR2	Selection of three different maximum speeds
Logistic data al	all	
Load spectrum	EMR2, EMS2	
Maintenance interval exceeded	EMS2 only	
Override memory	EMS2 only	
Maintenance data		
Help	all	General help for main screen and screen buttons.
Tasks	EMR1, EMR2	for certain service operations

1.4.2 "ECU SELECTION“ MENU

DEUTZ engines may be equipped with one or more control units (for example, an MVS/ EMS2 combination). However, SERDIA can only communicate with one control unit.

Exception: error lists and measured values can also be read from the MVS control unit through an EMS2.

The desired control unit must therefore be selected first in the "ECU selection“ menu.

For more details, see Chapter 2, "ECU selection".

1.4.3 MEASURED VALUES" ("ACTUAL MEASURED VALUES“) MENU

A number of measured values (including inputs/outputs) can be selected from a list of values and displayed.

Displayed values falling outside the maximum or minimum limit (if present) are shown on a coloured background.

Only measuring points that match the control unit are shown, with different display options:

- Read measured values
- Read measurement electronics
- Read logger data (special EMS2 menu)

arranged by

- designation
- value
- unit

Measured values are refreshed at a pre-set scan rate and can be displayed both with engine stopped and with engine running.

- For more details, see Chapter, "Measured values".

1.4.4 "PARAMETERS" MENU

The wide-ranging possibilities of DEUTZ control units require special programming to adapt them to their particular environment. Changes to parameters are necessary when access is required,

- due to customer request
- to adapt to local conditions
- to fit a replacement.

Parameters can only be changed through SERDIA!

This menu option can be used to replace the screwdriver setting (necessary with analog control units).

Some of the parameters (for example, dynamic control response) can be modified within certain pre-set limits.

Parameters are set through two screens, one for configuration and one for calibration. Access to the fields in the related screens depends on user authorisation. Unauthorised fields are not shown.

For more details, see Chapter 4, "Parameters".

1.4.5 "ERROR MEMORY" MENU

This menu is used to read any error messages stored in the control units.

Error messages are related exclusively to electrical parts of the engine, such as cable harness and transducer.

For example, one error message could be "General fault or cable cut/short-circuit“.

Only passive error messages can be deleted; active messages are saved.

Active error messages become passive messages when they have been cleared.

Error messages are saved even when the battery/voltage supply is disconnected.

Error messages contain the following information:

- Fault location
- Fault type
- Environmental data at time of fault
- Total error count (per fault location)
- Frequency
- Emergency mode (yes / no)

For fault clearing, the user can refer to the SERDIA Help screens; it may also be helpful to refer to the "Measured values“ and "Function test“ menus. For more details, see Chapter 5, "Error memory".

1.4.6 "FUNCTION TEST" MENU

SERDIA supports wide-ranging function tests, differentiating between the control units installed (for example, testing the actuator for the EMR1).

The function test option also provides valuable help, especially for troubleshooting and maintenance work.

Individual control unit outputs can be activated and checked separately. This is done by switching to Test mode.

The engine must be switched off first!

In the Function test, the control unit transmission program is bypassed and actuators are controlled by the test program.

Actuators are switched on and off by clicking on the little control box in the Actual Value column, beside the actuator's designation reference. "Actual Value" shows the response for the actuator status set by the control unit.

The actuator status test always takes place in the control unit, and can only be transferred to the SERDIA by the control unit itself. This means that if the desired actual value does not appear, there may be a wiring fault. The "Error memory“ and "Function test“ menu combination can be of help in determining the source of a fault.

Indirect indications about engine condition can also be obtained using the "Function test" menu in combination with the MVS control unit.

For more details about the function test, see Chapter, "Function test".

1.4.7 "EXTRAS" MENU

SERDIA supports wide-ranging options specific to the control unit.

These are accessed through the related submenus, which have their own screens:

- Maximum speed
- Logistic data
- Load spectrum (EMR2 and EMS2)
- Maintenance interval exceeded
- Override memory
- Maintenance data

For more details, see Chapter, "Extras".

1.4.8 HELP

The SERDIA Help function can be used in conjunction with these user instructions. In Windows, the Help function is opened by clicking on the "Help“ button.

1.5 CLOSING THE PROGRAM

Before disconnecting the cables between the Notebook and the engine control unit, go back to the main screen and click on the "Close“ button.

If parameters have been changed, in many cases it is worthwhile checking the current parameter settings.

To do this, follow the steps below:

1. Close SERDIA
2. Switch off the engine supply voltage, then switch on again
3. Re-start SERDIA
4. Activate the control unit again
5. Open the "Parameters“ menu
6. In the configuration screen, click on the "ECU->PC“ button
7. Print out the configuration data by clicking on the "Print“ button
8. Keep the printed data with the engine documentation.

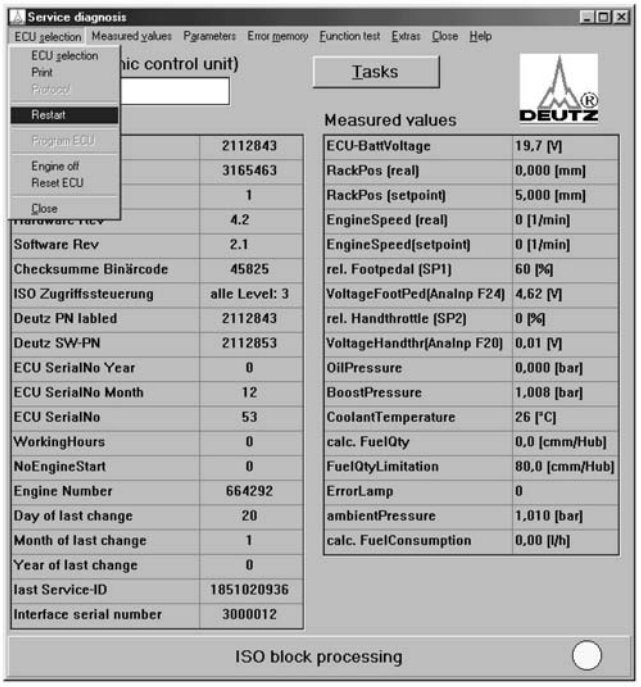
2. ECU SELECTION

2.1 SELECTING TWO CONTROL UNITS

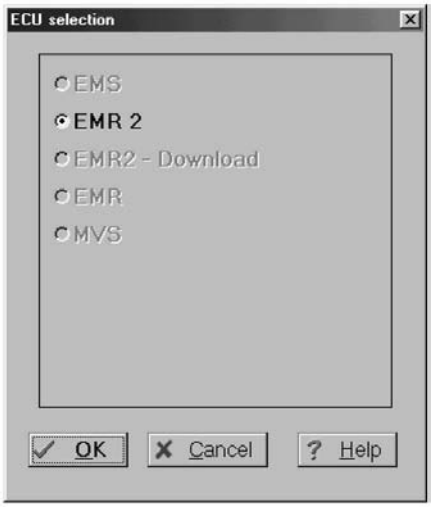
DEUTZ engines can be equipped with two control units (for example, MVS in combination with EMS2).

However, SERDIA can only communicate with one control unit. Exception: Error lists and measured values can also be read from the MVS control unit through an EMS2.

SERDIA tries to set up a connection automatically to the last control unit identified. If another control unit is to be selected, the control unit recognition process must be repeated by opening the "ECU selection/Restart“ menu (this takes about 30 seconds).



After they have been successfully recognised, the control unit selection screen is opened. Only identified control units are presented for selection. Non-selectable control units are greyed out.

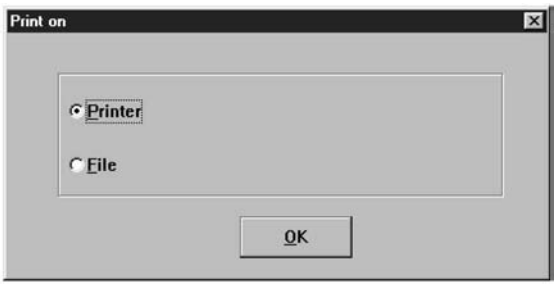


Possible control units are:

- EMR1, EMR2 (Electronic engine controller)
- MVS (Solenoid valve system)
- EMS2 (Engine Monitoring System)

2.2 PRINTING

Like the data in other windows, the identification data for the selected control unit can be printed in two ways.



1) Printing to a printer.

In this case, the correct printer driver should be selected under Windows.

At the top of all printouts are the logistics data:

- Type of control unit
- Date
- Time (as set in the Notebook system clock)
- Interface serial number

These are followed by the control unit identification data and measurement data.

2) Control unit data can also be printed to a file.

This file can then be further processed with another program, such as Excel.

The following table provides a summary of the data from the different screens, which can be saved:

- as printable files for further processing in other programs such as Excel.
- as configuration files for reporting modifications.
- as graphics files (*.egr), for viewing in SERDIA Demo mode.

From screen	Button	Filename extension	Comment
Service diagnosis	Print (file)	*.ecu	for further processing in other programs, such as Excel.
actual measured values	File	*.msv	
RAM Values	File	*.msv	for further processing in other programs, such as Excel. (EMR1: Level IIIa only, EMR2: Level III, IIIa only)
Graphics	(AscII)	*.agr	for further processing in other programs, such as Excel.
	(Binary)	*.egr	viewable in SERDIA Demo mode.
Input/Output assignment	Print (file)	*.ino	for further processing in other programs, such as Excel
Configuration	Print (file)	*.kfg	
	Save in file	*.hex	Configuration file
		*.tds	Partial data set, Level IIIa only
Overall programming	ECU -> file	*.hex	Configuration file (Complete data set, Level III and IIIa)
Error memory	Print (file)	*.err	for further processing in other programs, such as Excel.
Logistic data	Print (file)	*.dat	

2.3 PROTOCOL

This menu is for DEUTZ only, and is used for configuring the interface.

2.4 IDENTIFICATION AND MEASUREMENT DATA

2.4.1 EMR1

IDENTIFICATION DATA

ECU (electronic control unit)

EMR

ECU identification

DEUTZ part number	2111910
Business partner number	3165463
Product number	1
Hardware version number	1.0
Software version number	1.8
Day	14
Month	9
Year	99
Service ID	3000012
OperHourCount:Engine[h]	6
number of engine starts	7
Interface serial number	513298287

MEASUREMENT DATA

Measured values DEUTZ

Battery voltage	22,3 [V]
Engine speed	0 [1/min]
(M9)Coolant temperature	32 [°C]
(F24)Accelerator pedal=SWG	2,950 [V]
(M21)Oil pressure	0,000 [bar]
(M24)Boost pressure	1,008 [bar]
(F20)Hand throttle=SWG2	0
(F19)InputDigital	100 [%]

Meaning of identification data:

- **DEUTZ part number**: Part number of selected control unit.
- **Business partner number**: Product number
- Type of control unit selected:
  1 = EMR1
  2 = MVS
  3 = EMS2
- **Hardware version number**: Version number of the control unit.
- **Software version number**: Number of the EEPROM contained in the control unit. If the number before the point has changed (for example, 2.1 to 3.1), the data set will no longer match the control unit. In this case, company head office should be contacted.
- **Day, Month, Year**: Date at which the control unit parameters were last configured.
- **Service ID**: Serial number of interface used for previous access. The first digit indicates the authorised access level.
- **OperHourCount:Engine[h]:** numero delle ore di funzionamento del motore.
- **Number of engine start**
- **Interface serial number**: serial number of interface now being used.

Measured values:

The "Measured values“ field shows some of the measured values directly. This selection is not configurable.

2.4.2 EMR2

IDENTIFICATION DATA

ECU (electronic control unit)

EMR 2

DEUTZ-PartNo	2112843
SupplierNo	3165463
ProductNo	1
Hardware Rev	4.2
Software Rev	2.1
Checksumme Binärcode	45825
ISO Zugriffssteuerung	alle Level: 3A
Deutz PN labled	2112843
Deutz SW-PN	2112853
ECU SerialNo Year	0
ECU SerialNo Month	12
ECU SerialNo	53
WorkingHours	0
NoEngineStart	0
Engine Number	664292
Day of last change	20
Month of last change	1
Year of last change	0
last Service-ID	1851020936
Interface serial number	513298287

MEASUREMENT DATA

Measured values	DEUTZ
ECU-BattVoltage	19,7 [V]
RackPos (real)	0,000 [mm]
RackPos (setpoint)	5,000 [mm]
EngineSpeed (real)	0 [1/min]
EngineSpeed(setpoint)	0 [1/min]
rel. Footpedal (SP1)	60 [%]
VoltageFootPed(AnaInp F24)	4,77 [V]
rel. Handthrottle (SP2)	0 [%]
VoltageHandthr(AnaInp F20)	0,01 [V]
OilPressure	0,000 [bar]
BoostPressure	0,993 [bar]
CoolantTemperature	27 [°C]
calc. FuelQty	0,0 [cmm/Hub]
FuelQtyLimitation	80,0 [cmm/Hub]
ErrorLamp	0
ambientPressure	0,996 [bar]
calc. FuelConsumption	0,00 [l/h]

Meaning of identification data:

- DEUTZ partNo: Part number of selected control unit.
- SupplierNo
- ProductNo:
  Type of control unit selected:
  1 = EMR1
  2 = MVS
  3 = EMS2
- Hardware Rev: Version number of the control unit.
- Software Rev: numero versione software
  Number of EEPROM contained in the control unit. If the number before the point has changed (for example, 2.1 to 3.1), the data set will no longer match the control unit. In this case, company head office should be contacted.
- Binary code checksum
- ISO Access control
- Identification data Measurement data
- Deutz SW-PN: Part number of EMR2 operating software
- ECU SerialNo Year ECU SerialNo Month
- ECU SerialNo
- Engine number
- Day, Month, Year of last change: Date at which the control unit parameters were last configured.
- Lats Service ID: Serial number of interface used for previous access. The first digit indicates authorised access level.
- Interface serial number: Serial number of interface now being used.

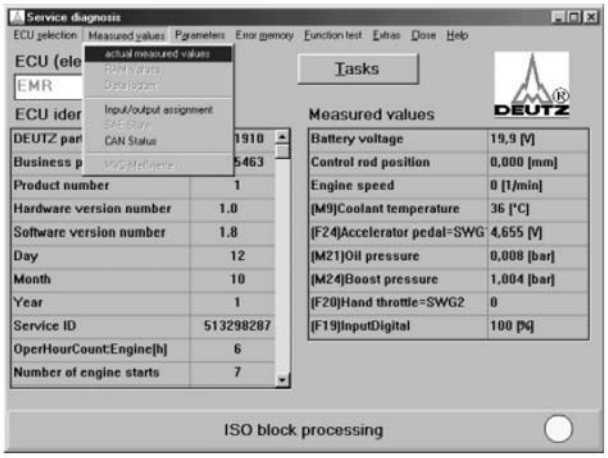
Measured values:

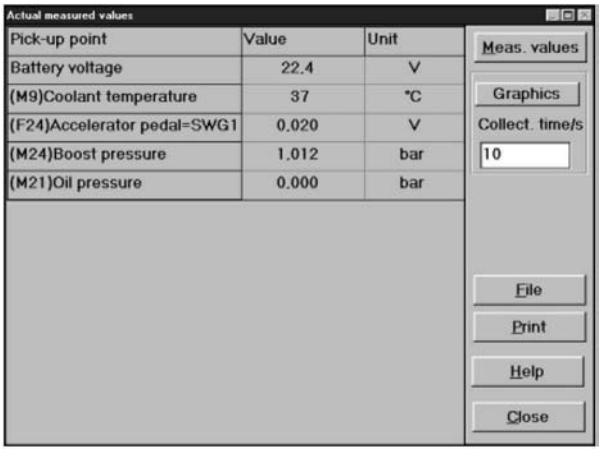
The "Measured values“ field shows some of the measured values directly. This selection is not configurable.

3. MEASURED VALUES

3.1 ACTUAL MEASURED VALUES (GENERAL)

The measured values are read out cyclically and displayed on the "Actual measured values" screen.





Values outside the sensor's measuring range have coloured backgrounds:

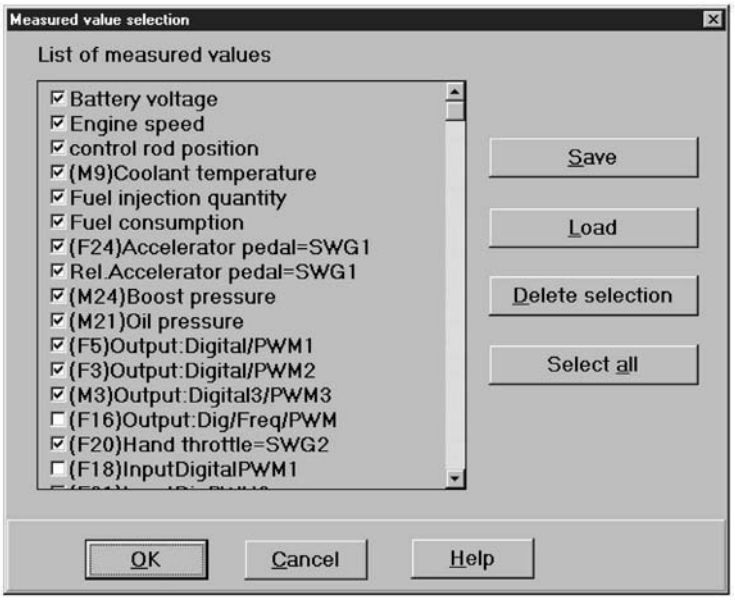
- Yellow: Measuring range is exceeded,
- Blue: Below measuring range.

EXPLANATION OF THE FUNCTION BUTTONS:

- **Meas. values**: The "Measured value selection" window containing all the available measured values is displayed. The measured values that are to be displayed can be selected from here. In general, the repeat rate of the display is increased if there are not many measured values to be displayed. The number of available measured values varies, depending on the type of control unit.
- **Graphics**: The button "Graphics" displays, in the form of a graphic, the progress over time of the selected measured values (maximum of 5). If more than 5 measured values are selected, an error message will appear.
- **Collect. time**: The recording period is displayed in the Measurement duration field in seconds. The minimum value for the recording period is one second. A few hours (expressed in seconds) can be entered for the upper measuring time. The default setting is 10 s. The shortest scanning rate is 40 ms for RAM values and 60 ms for other values.
  For a measuring period of 10s, therefore, the total number of measuring points for RAM values is: 10000 ms/40 ms = 250 and for other values: 10000 ms/60 ms = 166.
  Since the program records an approximate maximum of 2000 measuring points, the scanning rate is automatically adjusted - accordingly before the beginning of the data recording phase.
  The minimum possible scanning rate is determined by the duration of data transmission from the control unit to the PC. The more measured values that are to be displayed simultaneously, the longer the data transmission period and therefore the lower the scanning rate will be.
- **File**: The current measured values can be stored in a file and reloaded at a later date, for example for further processing in Excel.
- **Print**: The displayed measured values are printed out.
- **Close**: Return to the main window "Service diagnosis".

3.1.1 MEASURED VALUE SELECTION

The list of available measured values is displayed.



The measured values to be displayed can be selected from this list. An individual measured value is selected by clicking on the associated check box. If a graphical display is required, not more than 5 measured values can be selected (see 3.1.2 Graphics). The four buttons on the right of the list can be used to activate and de-activate a collection of measured values. These have the following functions:

- **Save**: The displayed selection of measured values is saved to a file.
- **Load**: The selected measured values are loaded from a file.
- **Delete selection**: All measured values are de-activated for display.
- **Select all**: All measured values are activated for display.
- **OK**: Return to the display of the current measured values. The changes made to the selection of measured values are saved.
- **Cancel**: Return to the display of the current measured values. The changes made to the selection of measured values are cancelled.

The following tables give an overview of the measured values which can be displayed. For some parameters, a configuration operation is also required (see Chapter 4 Parameters); this enables specific measuring points to be assigned to the inputs and outputs of the EMR1/EMR2 ("Configuration", "Page 11: assignment inputs/measured values“ and "Page 13: assignment outputs/measured values"). The values required for parameter configuration are shown in the tables. The assignment can be subsequently checked in the "Measured values" menu, with the window "Display of inputs and outputs" (see 3.4 Input/output assignment).

3.1.1.1 MEASUED VALUES EMR1

MEASURED VALUE SELECTION

Name of measuring point	Description	Associated RAM value
Battery voltage	Battery voltage	–
Engine speed	Speed 1 (camshaft) Speed 2 (crankshaft)	2000 2002
Control rod position	Control rod position	
(M9)Coolant temperature	Coolant temperature	3551
Fuel injection quantity	Fuel injection quantity	

Name of measuring point	Description	Associated RAM value
Fuel consumption	Fuel consumption	
(F24)Accelerator pedal=SWG1	Voltage of accelerator pedal potentiometer	3551
Rel.Accelerator pedal=SWG1	Pick-off point for accelerator pedal potentiometer	3551
(M24)Boost pressure	Charge air pressure	3531
(M21)Oil pressure	Oil pressure	3541
	Torque	2701
	Oil pressure warning signal	3011
	Reserve	
	Speed 1 - Speed 2	2000 2002
(F20)Hand throttle=SWG2	Hand throttle	3521
	Summary of outputs	
Selector switch	Gear selector switch	
Vehicle speed	Driving speed	

3.1.1.2 MEASURED VALUES EMR2

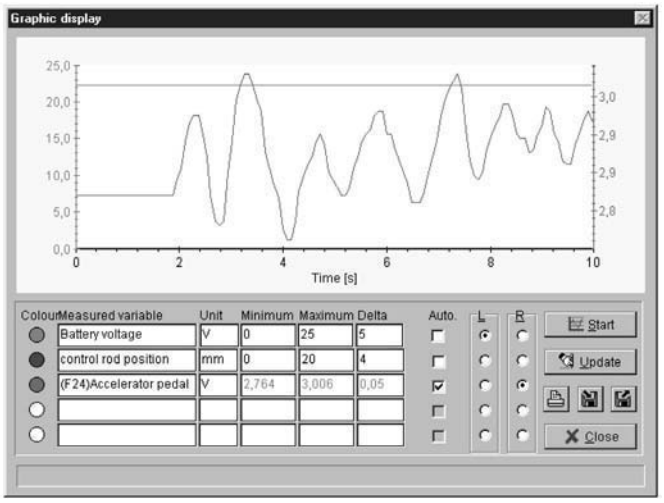
MEASURED VALUE SELECTION

Name of measuring point	Description	Corresponding RAM value
	Battery voltage	
	Speed 1 (camshaft)	2000
	Speed 1 (camshaft))	2031
	Speed 2 (crankshaft)	2002
	Control rod position	2300
	Control rod position	2330
	Coolant temperature	2904
	Fuel temperature	2906
	Charge air temperature	2905
	Voltage of accelerator pedal potentiometer	2900
	Pick-off point for accelerator pedal potentiometer	
	Hand throttle	2901
	Charge air pressure	2902
Oil pressure	Oil pressure	2903
Atmospheric pressura	Atmospheric pressur	2930
Coolant level	Coolant level	2820
Engine brake status	Engine brake status	2826
Status of gear selector switch	Status of gear selector switch	2827
Error lamp Status of error indicating lamp	Error lamp Status of error indicating lamp	2868

Name of measuring point	Description	Associated RAM value
SourceOfEngineStop		
VehicleVelocity state		
Vehicle-Velocity	Driving speed	
calc. FuelConsumption	Fuel consumption	2360
Fuel injection quantity	Fuel injection quantity	2350
FuelQtyLimitation	Fuel quantity limitation	2701
ActFuelQtyLimitng	Active fuel quantity limitation	
ActualSetpoint		
ActPowerReduction		
ActTopCurve		3145
ActSpeedLimiting		
	Oil pressure warning signal (optional)	
	Torque (optional)	
Outp:(F16)/Freq	Speed 1 - Speed 2	2000 2001 2002
Outp:(F16) Digital 7		2857
Outp:(M2) Digital 3		2853
Inp:(F6)Digital 3 3	Input	2854
Inp:(F18) Dig/PWM 1	Input	2856
Inp:(F18)Digital/PWM 1	Input	
Inp:(F19)Digital 4	Input	
Inp:(F20)Digital/Analog 3	Input	
Inp:(F21)Digital/PWM 2	Input	
	Input	
	Input	
	Charge air temperature	2905
	Fuel temperature	2906
	Input	
	Coolant temperature	2904
	Oil pressure sensor input	
	Sensor input Charge air temperature	

3.1.2 GRAPHICS

If up to any 5 measured values have been selected, the "Graphic display" window can be opened by clicking on "Graphics".



The measured values are displayed within the display range (minimum to maximum). The scaling divisions for the axes are set in the column called "Delta".

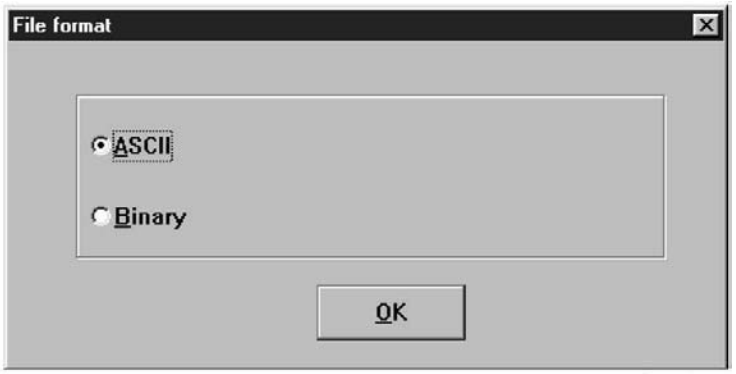
It is possible to let the program carry out automatic scaling by activating the control field called "Auto".

Because the program does this scaling based on the minimum and maximum values of the respective measured values, it is not possible to have automatic scaling for time-constant measured values.

A maximum of two axes, one on the left and one on the right side of the graph will be drawn. A measured value can be assigned to a left or right axis in the columns marked L (left) and R (right).

EXPLANATION OF THE FUNCTION BUTTONS:

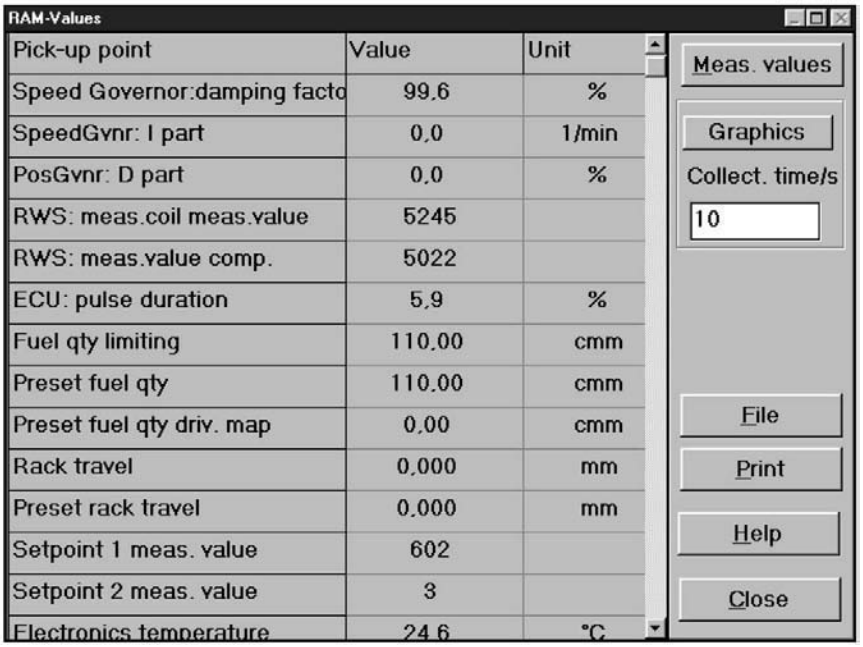
- **Start**: The data recording operation is started using this function button.
- **Update**: This function button is used to update the information displayed. This is required if a change has been made to the minimum, maximum or delta values. The update takes account of the new values.
- **Print** : Clicking on this button will commence output to a printer. The printer selection screen is displayed first, then the user has the option of entering any comments before the graph is finally printed out.
- **Save** : The information displayed can be saved to a file in two different ways:
  1) As an ASCII file (*.agr) for further processing, e.g. in Excel.
  2) As a binary file (*.egr) for display of measurement graphics in offline mode, see 1.9 Offline mode.



- **Apri: Load** : The graphics information stored in a file is loaded and displayed.

3.2 RAM-VALUES

RAM values are calculated from the measured values with the aid of the microprocessors in the control units and are made available by SERDIA as additional data.



The following tables provide an overview of the possible RAM values which are used in the EMR2 control unit.

2000Speed
2001SpeedPickUp1
2002SpeedPickUp2
2003SpeedPickUp1Value
2004SpeedPickUp2Value
2005ActivePickUp
2025SpeedGradient
2031SpeedSetp
2032SpeedSetpRamp
2033SpeedSetpSelect
2041DigitalPotOffset
2100P_CorrFactor
2101I_CorrFactor
2102D_CorrFactor
2110FuelSpeedGovernor
2111SpeedGov:P-Part
2112SpeedGov:I-Part
2113SpeedGov:D-Part
2115StaticCorrActive
2120DroopPresent

2130IMFuelSetp
2131IMFuelSetpSelect
2132IMOrAllSpeedGov
2133IMGovAtMaxOrIdle
2134IMFuelSetOrGovernor
2135IMSetpoint
2140TorqueSetpoint
2141TorqueReserveMax
2142TorqueReserveCurve
2143TorqueLimitMax
2144TorqueLimitCurve
2145TorqueLimitCurveAct
2150EngineBrakeActive
2251LimitsDelay
2280GlowPlugActive
2281FlameGlowPlugActive
2282FlameValveActive
2283PreheatActive
2284PostheatActive
2285StartReadActive

2300ActPos
2330ActPosSetpoint
2350FuelQuantity
2353FuelQuantityCorr
2360FuelConsumption
2361FuelEconomy
2400Can:Online
2401Can:RxTelActive
2402Can:RxTelTimeOut
2403Can:RxTelVoltTimOut
2404Can:RxIRCount
2405Can:TxIRCount
2406Can:BusOffCount
2407Can:RxBufOverflow
2408Can:Tx0BufOverflow
2409Can:Tx1BufOverflow
2410Can:FragBufOverflow
2411Can:SetpointPhase
2412Can:SetpointError
2533FuelTempFuelCorr

2600EngineNo:Low
2601EngineNo:High
2602FunctionSetNo:Low
2603FunctionSetNo:High
2604CanSetNo:Low
2605CanSetNo:High
2606ASAP2SetNo
2607SerdiaID:Low
2608SerdiaID:High
2609SerdiaDate:Day
2610SerdiaDate:Month
2611SerdiaDate:Year
2612EOLDate:Day
2613EOLDate:Month
2614EOLDate:Year
2701FuelLimitMax
2702FuelLimitStart
2703FuelLimitSpeed
2704FuelLimitBoost
2705FuelLimitSimBoost
2706FuelLimitVelocity
2707FuelLimitCan
2710FuelLimitMinActive
2711FuelLimitMaxActive
2712StartLimitActive
2713SpeedLimitActive
2714BoostLimitActive
2715SimBoostLimitActive
2716VelocityLimitActive
2717CanLimitActive
2720SpeedLimit1Active
2721SpeedLimit2Active
2722SpeedLimit3Active
2723ReduceCan
2724ReduceOilPressure
2725ReduceCharAirTemp
2726ReduceCoolantTemp
2727ReduceAmbientPress

2730SetpLimitCan
2731SetpLimitVelocity
2740Setp1Source:Analog
2741Setp1Source:PWM
2742Setp1Source:Subst
2743Setp1Source:Can
2750CurrSetp:Setpoint1
2751CurrSetp:Setpoint2
2752CurrSetp:SpeedFix1
2753CurrSetp:SpeedFix2
2754CurrSetp:Freeze
2755CurrSetp:FreezeSetp
2756CurrSetp:HoldButton
2757CurrSetp:MinButton
2758CurrSetp:MaxButton
2759CurrSetp:CalIdle
2761CurrSetp:VeloIdle
2810SwitchDroop2
2811SwitchDroopCurve
2812SwitchSpeedFix1
2813SwitchSpeedFix2
2814SwitchSpeedLimit2
2815SwitchSpeedLimit3
2816SwitchGovernIMOrAll
2817SwitchFreezeSpeed
2818SwitchFreezeSetp
2819SwitchOilLevel
2820SwitchCoolantLevel
2821SwitchSpeedInc
2822SwitchSpeedDec
2823SwitchMinButton
2824SwitchMaxButton
2825SwitchHoldButton
2826SwitchBrake
2827SwitchNeutral
2828SwitchGlowPlug
2829SwitchEngineStop
2851DigitalOut1

2852DigitalOut2
2853DigitalOut3
2854DigitalOut4
2855DigitalOut5
2856DigitalOut6
2857DigitalOut7
2861DigitalOut1State
2862DigitalOut2State
2863DigitalOut3State
2864DigitalOut4State
2865DigitalOut5State
2866DigitalOut6State
2867DigitalOut7State
2868StatusErrorLamp
2900Setpoint1Extern
2901Setpoint2Extern
2902BoostPressure
2903OilPressure
2904CoolantTemp
2905CharAirTemp
2906FuelTemp
2920BoostPressureCorr
2921FuelTempCorr
2930AmbientPressure
2931AmbientPressActive
3000ConfigurationError
3001ErrPickUp1
3002ErrPickUp2
3003ErrVelocity
3004ErrOverSpeed
3005ErrSetp1Extern
3006ErrSetp2Extern
3007ErrBoostPressure
3008ErrOilPressure
3009ErrCoolantTemp
3010ErrCharAirTemp
3011ErrFuelTemp
3030ErrOilPressWarn

3031ErrCoolantTempWarn
3032ErrCharAirTempWarn
3033ErrOilLevelWarn
3034ErrCoolantLevelWarn
3035ErrWarnSpeed
3036ErrFuelTempWarn
3040ErrOilPressEcy
3041ErrCoolantTempEcy
3042ErrChargeAirTempEcy
3043ErrOilLevel
3044ErrCoolantLevel
3050ErrFeedback
3052ErrRefFeedback
3053ErrActuatorDiff
3059ErrFeedbackAdjust
3060ErrDigitalOutput3
3062ErrDigitalOutput7
3063ErrOverCurrentOD3
3067ErrHardwSetp1
3068ErrCanSetp1
3070ErrCanBus
3071ErrCanComm
3076ErrParamStore
3077ErrProgramTest
3078ErrRAMTest
3080ErrPowerCurrent
3083ErrRef1
3084ErrRef2
3085ErrRef4
3086ErrIntTemp
3087ErrAmbPressure
3090ErrData
3093ErrStack
3094ExceptionNumber
3095ExceptionAddrLow
3096ExceptionAddrHigh
3097ExceptionFlag
3098ErrorActive

3099EEPROMErrorCode
3101S1ErrPickUp1
3102S1ErrPickUp2
3103S1ErrVelocity
3104S1ErrOverSpeed
3105S1ErrSetp1Extern
3106S1ErrSetp2Extern
3107S1ErrBoostPressure
3108S1ErrOilPressure
3109S1ErrCoolantTemp
3110S1ErrChargeAirTemp
3111S1ErrFuelTemp
3130S1ErrOilPressWarn
3131S1ErrCoolTempWarn
3132S1ErrChAirTempWarn
3133S1ErrOilLevelWarn
3134S1ErrCoolLevelWarn
3135S1ErrWarnSpeed
3136S1ErrFuelTempWarn
3140S1ErrOilPressEcy
3141S1ErrCoolantTempEcy
3142S1ErrCharAirTempEcy
3143S1ErrOilLevel
3144S1ErrCoolantLevel
3150S1ErrFeedback
3152S1ErrRefFeedback
3153S1ErrActuatorDiff
3159S1ErrFeedbackAdjust
3160S1ErrDigitalOut3
3162S1ErrDigitalOut6
3163S1ErrOverCurrentOD3
3167S1ErrHardwSetp1
3168S1ErrCanSetp1
3170S1ErrCanBus
3171S1ErrCanComm
3174S1ErrCanPassive
3176S1ErrParamStore
3177S1ErrProgramTest

3178S1ErrRAMTest
3180S1ErrPowerCurrent
3183S1ErrRef1
3184S1ErrRef2
3185S1ErrRef4
3186S1ErrIntTemp
3187S1ErrAmbPressure
3190S1ErrData
3193S1ErrStack
3194S1ErrIntern
3201S2ErrPickUp1
3202S2ErrPickUp2
3203S2ErrVelocity
3204S2ErrOverSpeed
3205S2ErrSetp1Extern
3206S2ErrSetp2Extern
3207S2ErrBoostPressure
3208S2ErrOilPressure
3209S2ErrCoolantTemp
3210S2ErrChargeAirTemp
3211S2ErrFuelTemp
3230S2ErrOilPressWarn
3231S2ErrCoolTempWarn
3232S2ErrChAirTempWarn
3233S2ErrOilLevelWarn
3234S2ErrCoolLevelWarn
3235S2ErrWarnSpeed
3236S2ErrFuelTempWarn
3240S2ErrOilPressEcy
3241S2ErrCoolantTempEcy
3242S2ErrCharAirTempEcy
3243S2ErrOilLevel
3244S2ErrCoolantLevel
3250S2ErrFeedback
3252S2ErrRefFeedback
3253S2ErrActuatorDiff
3259S2ErrFeedbackAdjust
3260S2ErrDigitalOut3

3262S2ErrDigitalOut6
3263S2ErrOverCurrentOD3
3267S2ErrHardwSetp1
3268S2ErrCanSetp1
3270S2ErrCanBus
3271S2ErrCanComm
3274S2ErrCanPassive
3276S2ErrParamStore
3277S2ErrProgramTest
3278S2ErrRAMTest
3280S2ErrPowerCurrent
3283S2ErrRef1
3284S2ErrRef2
3285S2ErrRef4
3286S2ErrIntTemp
3287S2ErrAmbPressure
3290S2ErrData
3293S2ErrStack
3294S2ErrIntern
3300Velocity
3350EGRValveActive
3351EGRFuelFilter
3352EGRBoostLimitActive
3353EGRFuelActive
3354EGRCoolantActive
3355EGRAmbientActive
3356EGRMapActive
3500PWMIn1
3501FrequencyIn1
3502PWMIn2
3503FrequencyIn2
3510AnalogIn1
3511AnalogIn1_Value
3520AnalogIn2
3521AnalogIn2_Value
3530AnalogIn3
3531AnalogIn3_Value
3540AnalogIn4

3541AnalogIn4_Value
3550TempIn1
3551TempIn1_Value
3560TempIn2
3561TempIn2_Value
3570TempIn3
3571TempIn3_Value
3600ServoCurrrent
3601PowerSupply
3603Reference1+5V
3604Reference2+5V
3605Reference4+5V
3606IntTemp
3700StartCounter
3701WorkingHours
3702WorkingSeconds
3720LoadWorkMap:h
3730LoadWorkMap:s
3740ElectronicTemp:T
3745ElectronicTemp:h
3750ElectronicTemp:s
3800EmergencyAlarm
3801CommonAlarm
3802EngineStop
3803EngineStopped
3804EngineStarting
3805EngineRunning
3806EngineReleased
3810ButtonActive
3821EEPROMAccess:ISO
3823EEPROMAccess:Button
3827EEPROMAccess:Memory
3828EEPROMAccess:Work
3830Phase
3840HardwareVersion
3841AddHardwareVersion
3842SoftwareVersion
3843BootSoftwareVersion

3844SerialDate
3845SerialNumber
3847BootDevelopmVersion
3850Identifier
3851LastIdentifier
3865CalculationTime
3870Timer
3895RAMTestAddr
3896RAMTestPattern
3897CStackTestFreeBytes
3898IStackTestFreeBytes
3905ServoPIDCorr
3906ServoStateStatic
3916ServoCurrentSetp
3917ServoCurrentCorr
3944EMR1ActuatorActive
3950Feedback
3955FeedbackReference
3960FeedbackCorrection

3.3 DATA LOGGER (ONLY EMS2)

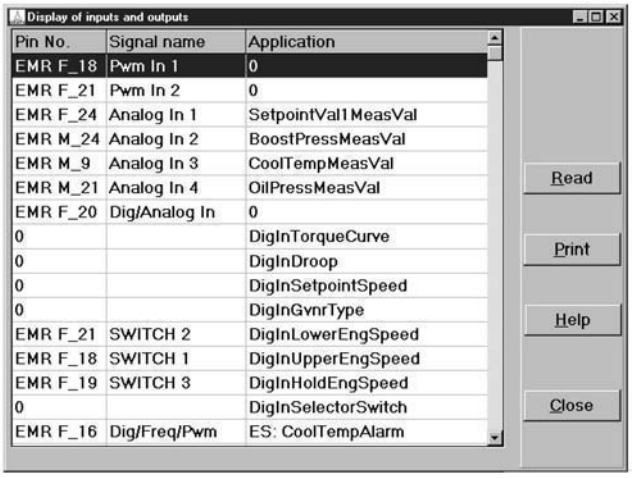
The screen for this menu item can only be selected if an EMS2 has been selected as the control unit.

3.4 INPUT/OUTPUT ASSIGNMENT

The inputs and outputs can be configured. This menu item displays the current input and output assignment.

Limitation:

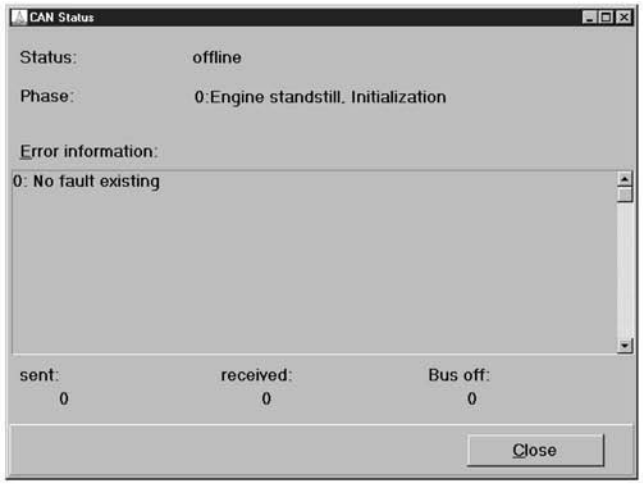
EMR1 and EMS2 control units only.



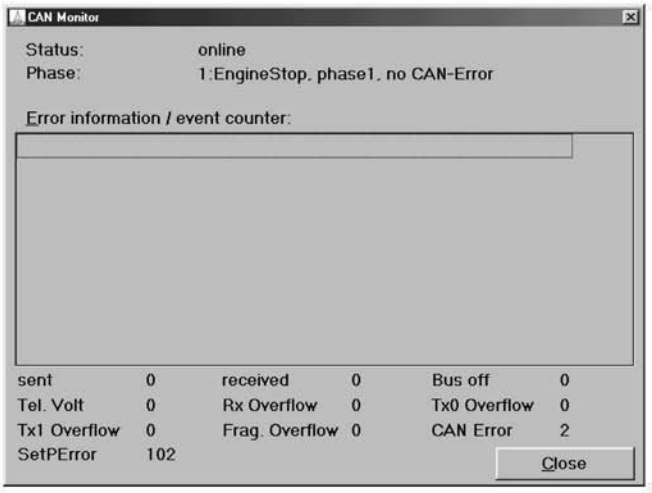
3.5 CAN STATUS

This window displays the CAN bus activities of the EMR1 or EMR2.

EMR1



EMR2



- **Sent**: Contains the information Can:TxCounter (0 to 65535, word). The value is increased with every CAN send message and displays the sending activity of the EMR1.
- **Received**: Contains the information Can:RxIrCounter (0 to 65535, word). The value is increased with every CAN send message and displays the sending activity of the EMR1.
- **Bus off**: Counter indicating how often the EMR1 has disconnected from the CAN bus because of continuous errors (CanBusOffCounter 0 to 255, bytes).
- **Status**: CanOnline indicates whether the EMR1 is active on the CAN bus. A value 1, for online and a value 0, for offline, is sent via the ISO 9141 interface. The SERDIA program displays the text "online" (for value 1) or "offline" (for value 0).

- **Phase**: The variable CanSetPointPhase (0 to 255, bytes) is sent via the ISO 9141 interface. This variable displays the time sequence of the setpoint value specification:

Code	Text
0	0:Engine standstill, initialization
1	1:Engine standstill, phase 1, no CAN error
2	2:Engine standstill, phase 2, no CAN timeout error
3	3:Engibe start, ... until idling speed is recognized
4	4:Engine runs, wait for CAN setpoint
5	5:Engine runs, setpoint preset via CAN is allright
6	6:Engine runs, emergency op., setpoint preset via CAN failed
7	7:This phase doesn't exist

ERROR INFORMATION/EVENT COUNTER:

The EMR1 sends an error number CanErrorNumber (0 to 255, bytes) via the ISO 9141 interface specially for CAN bus errors. In SERDIA, these numbers are assigned a text, which is displayed in the window of the -CAN interface.

Cod.	Testo
0	0: No fault existing
1	1: Message request not received at controller object 15
2	2: Invalid controller object
3	3:Engine start, ... until idling speed is recognized
4	4: CAN active, but no message activated
5	5: Diagnosis object not activated
6	6: Scan rate 0 in diagnosis message
7	7: Scan rate 0 in measure value telegram
8	8: preset engine speed config.6 does not match TSC2 activation
9	9: TSC1 activated, but ´Setpoint eng. speed´ not set to ´6´
10	10: ´GovernConf=6´,neither TSC1 nor function shift is activated
11	11: ´GovernConf=6 & Setp.eng.speed=6´, but TSC1 is not activated
12	12: TSC1 activated, but ´Governor config!=6´
13	13:TSC1NotAct&FunctShiftAct&´GovernConf.!=6´=>´ShiftMGovernMode!=0´
14	14:TSC1Act&FunctShiftAct&´GovernConf.=6´=>´ShiftMaskGovernMode!=0´
100	100 Receipt message failed
101	101 Setpoint telegram failed w.eng.idle (repl. value)
102	102 Setpoint telegram missing w.eng.idle due to low battery voltage
103	103 Setpoint telegram missing after eng.start due to low battery
104	104 Setpoint telegram missing after eng.start, repl.value used
105	105 Setpoint telegram missing during eng.oper., repl.value used

TimeOut errors for receipt messages require special treatment. They are all reported with an error number of 100.
To identify which message is causing a time-out error, SERDIA proceeds as follows:

- CanRxObjActive displays, in bit mode, the active messages, i.e. the messages that have actually been received.
- CanConf_bits contains the configured receipt messages, in bit mode.

SERDIA rejects CabRxObjActive in bit mode (inactive message) and then carries out a bit-mode AND logic operation with CanConf_bits. The receipt messages which are configured and inactive (CanRxTimeOutBits) are received in bit mode as a result.

A text is assigned to each bit of CanRxTimeOutBits; this text contains the name of the respective receipt messages. Because not all bits have to be used, entering "dc", for "don't care" into the text specifies that the text output for this bit is suppressed.

If the text "100 receipt message failed" appears, a list of the missing receipt messages will also be output.

Example of displayed error information:

100 Receipt message failed

Engine Temperature

Engine Fluid Level /Pressure

Function shift

Inlet / Exhaust Conditions

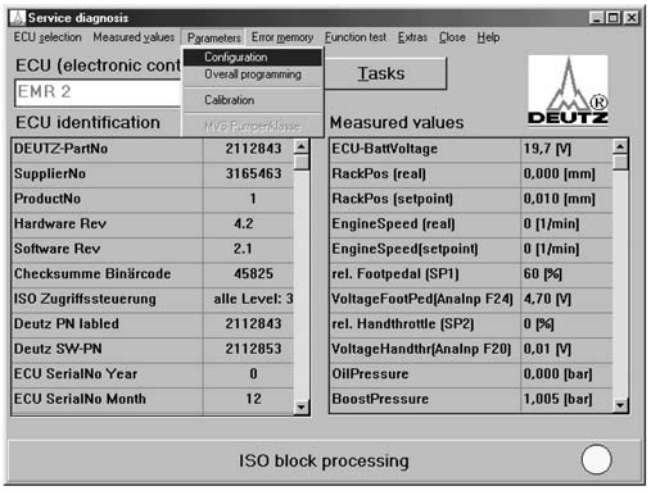
VanRxTimeOutBit	Text
0	Engine Temperature
1	Inlet / Exhaust Conditions
2	Engine Fluid Level /Pressure
3	TSC1
4	Engine protection
5	Function shift

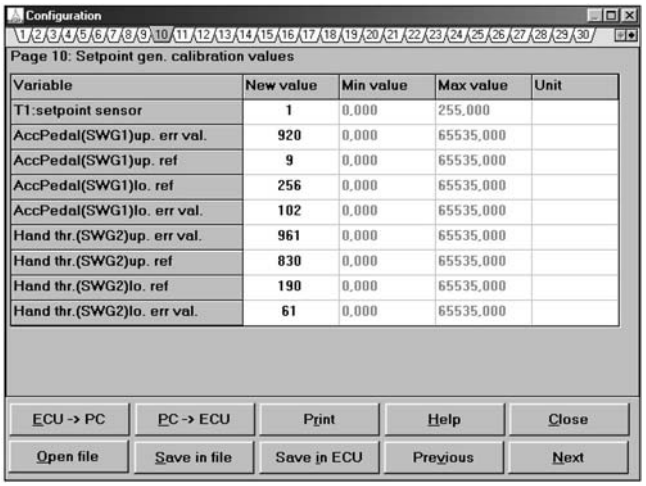
4. PARAMETERS

4.1 CONFIGURATION (GENERAL)

IMPORTANT:

1 - For safety reasons, the original data set should be saved before making any changes.
2 - Engine running tests are allowed for PID parts only, and should only be carried out by suitably qualified personnel.
3 - Incorrect settings may cause damage to the engine!





CONFIGURATION PROCEDURE

Select the "Parameters" menu on the menu bar to go into the "Configuration" screen. A configuration is carried out in the following steps:

- On the top line, click on the tab for the desired page or
- Using the "Next" and "Previous" buttons, browse to the page that contains the parameter to be set (For example: 'AccPedal (SWG1)up. ref' on page 10: Setpoint gen. calibration values).
- Click in the "New value" field, and enter the required value. This should be between the indicated minimum and maximum values.
- Click on the "PC->ECU" button. All configuration data are transferred to the control unit. The data are now in the control unit and can be used for testing the engine setting. When the supply voltage is switched off, this data is lost.

Next step

- using the "Save in ECU" button, save the data set in the control unit (the old data are overwritten).
- For checking, the data can be read and displayed by clicking the "ECU->PC" button.
- When the engine is running satisfactorily, click on the "Save in file" button to save the data on hard disk or diskette.

DESCRIPTION OF SCREEN BUTTON:

- **CENTR.->PC:** Configuration data are read from the control unit and displayed.
- **PC->CENTR.:** Modified configuration data are transferred into the control unit. In the case of the EMR1, the "Save in ECU" button must be used to store the data permanently.
- **Open file:** Configuration data are read from a file (*.hex) and displayed.
- **Save in file**:
  All configuration data are stored in a file (*.hex). When saving, the engine number is prompted as the file name - this is only a suggestion.
  Any other name can be entered. Finally, click OK to confirm.
  The file (i.e. the engine data set) is then saved under the name <Engine number>.hex.

- **Save in ECU (EMR1 only):** The configuration data are stored in the control unit.
  ATTENTION!
  - **All modifications must be reported back!**
  - **The reporting procedure is described in Service Announcement 0199-99-9287.**
- **Previous**: The data on the previous screen are displayed.
- **Next**: The data on the next screen are displayed.
- **Print**: Print the displayed configuration data on the printer. The configuration window can be printed page by page, or in sets (from Page ... to Page ...), or in full.

4.2 OVERALL PROGRAMMING

Saving data from the control unit:

- By clicking "ECU->file“ menu, read the data from the control unit. The "Save as" window opens.
- Save the data under any name, in the form <Filename>.hex.
  The default name <Engine number>.hex is suggested; this can be replaced by any other name.
  Confirm by clicking OK. The file (i.e. engine data set) is saved under the selected filename.

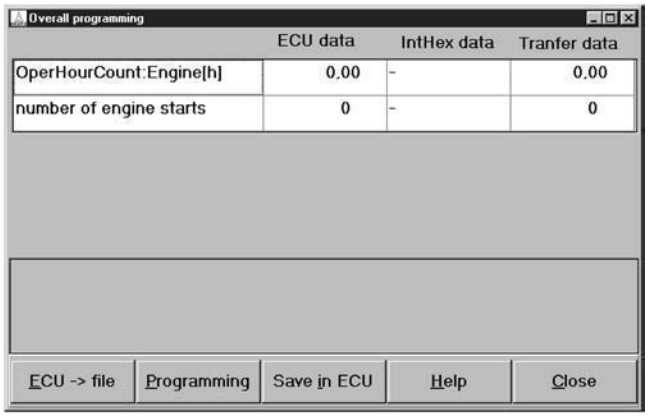
Overall control unit programming.

- Click on the "Programming" button; the "Open" window appears.
- Select the desired file and open it.
- Click on the "Save in ECU" button.

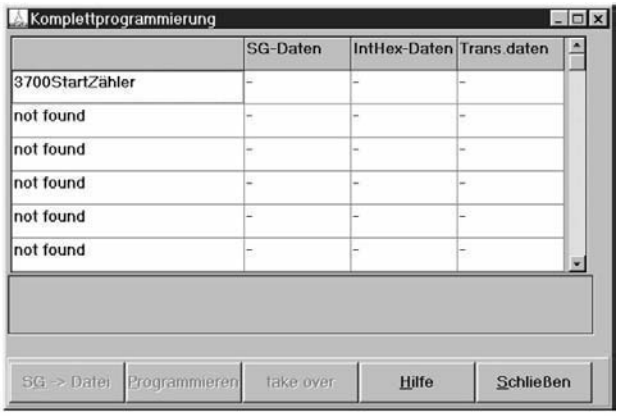
Of the configuration data, only the operating data read from the control unit (Column 2) or file (Column 3) are displayed. Before the configuration data are transferred to the control unit, the operating data can be edited in Column 4. This data is also transferred to the control unit along with the configuration data.

Overall programming is not allowed at user Level I or II.

EMR1



EMR2



DESCRIPTION OF SCREEN BUTTON:

- **ECU->file**: Configuration data are read from the control unit, displayed, and saved as a HEX file.

PROGRAMMING:

The modified configuration data, or the configuration data HEX file, is transferred to the control unit. In the case of the EMR1, the "Save in ECU" button must be used to store the data permanently.

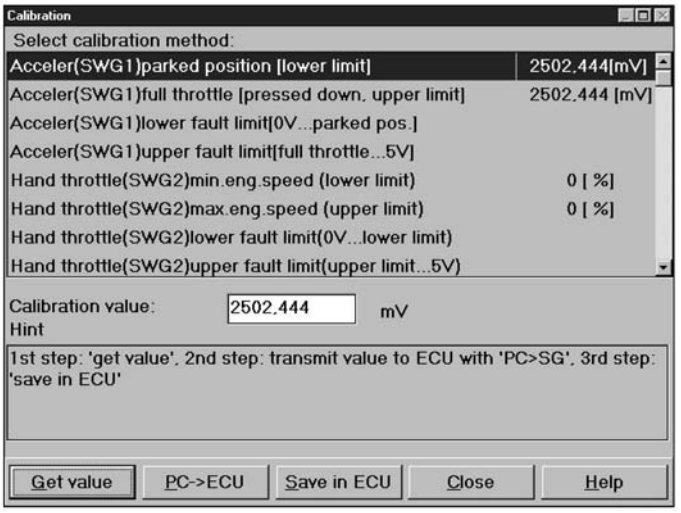
- **Save in ECU**: Configuration data are permanently stored in the control unit.

4.2 CALIBRATION

System components can only be calibrated through the diagnostic interface. The SERDIA diagnosis software is required for the calibration. Along with the EMR1, the accelerator pedal and hand throttle potentiometer (if present) must also be calibrated (does not apply to large assemblies).

Important conditions:

- Engine off
- Supply voltage (Ignition/Circuit 15) on
- Integrated accelerator pedal



EXPLANATION OF CONCEPTS (EXAMPLES):

- Acceler(SWG1) = Acc. pedal sensor (position sensor 1), Input 24 FS
- Hand throttle(SWG2) = Hand throttle pot. (position sensor 2), Input 20 FS

GENERAL CALIBRATION PROCEDURE:

- Select calibration value in the upper window.
- Place accelerator pedal/Manual throttle potentiometer in the desired position.
- "Get value“ button enabled: Click the button. The calibration value assigned to the position appears in the Edit field.
- "Get value“ button disabled: Enter the calibration value in the Edit field.
- By clicking "PC->ECU", transfer the calibration value to the control unit.
- By clicking "Save in ECU", save the calibration value in the control unit.
- Switch the ignition on and off.

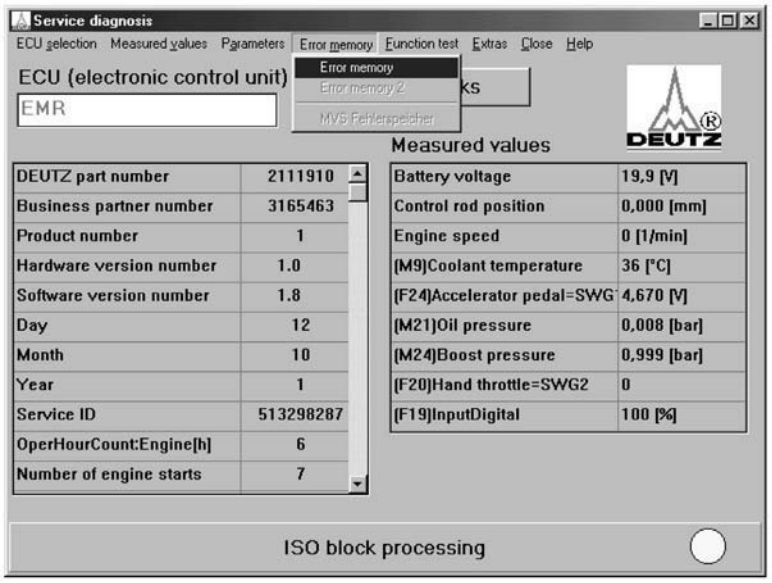
SCREEN BUTTON DESCRIPTION:

- **Get value**: If the "Get value" button is enabled, it can be used to read the calibration value for a pedal position.
- **PC->ECU**: The displayed calibration value is transferred to the control unit.
- **Save in ECU**: The calibration data are permanently stored in the control unit.

5. ERROR MEMORY

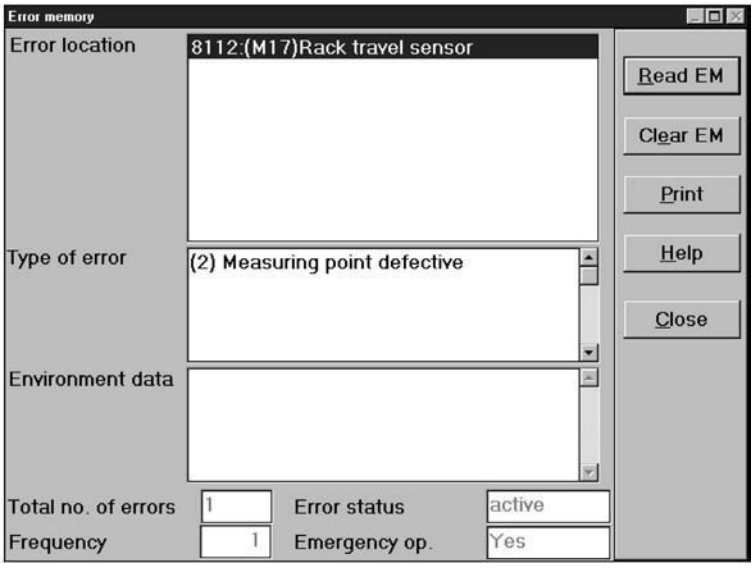
5.1 GENERAL

The error memory lists the diagnosable errors that have occurred since the last deletion. The current contents of the error memory can be displayed by selecting the menu item "Error memory".



If errors have been eliminated, the corresponding error messages can be deleted from the "Error memory" window :

- Display the error memory's error messages by clicking on the button "Read EM".
- In the "Error location" window, mark the displayed error location with the mouse. (Example: "8112:(M17)Rack travel sensor"). The background of the error location text becomes blue.
- Click on "Clear EM". The error location will be deleted, the message will disappear.
- Exit the "Error memory" by clicking on "Close".



DESCRIPTION OF THE FIELDS:

- **Error location**: List of error locations from which an individual error location can be selected for detailed information. Because there can be several causes of error for some components, this list may list some error locations several times. For example, oil pressure monitoring: Power rating and switch-off limit.
- **Type of error**: All the information contained in this field refers to the error location selected in the top field.
- **Environment data**: Additional details (e.g. measured values) which contain more information on the selected error location.
- **Total no. of errors**: Sum of all recorded error locations.
- **Frequency**: Frequency at which the selected error location occurs.
- **Error status**: Selected error active or passive.

EXPLANATION OF THE FUNCTION BUTTONS:

- **Read EM**: This function button is used to read out the error memory again from the control unit and the display is updated.
- **Clear EM**: This function button sends a request to the control unit to delete the error memory

5.2 ERROR TABLE

5.2.1 EMR1 ERROR TABLE

8002:(F18)Signal monitoring PWM-Inp1
8012:(F21)Signal monitoring PWM-Inp2
8020:ECU (positioner actuation)
8030:shutoff magnet
8112:(M17)Rack travel sensor
8120:(F24)AccelerPedal(SWG1)
8130:(F20)HandThrottle(SWG2)
8140:(M9)CoolantTempSensor
8150:(M24)BoostPressureSensor
8160:(M21)OilPressureSensor
8170:(M13)Speed 1, camshaft
8180:(M11)Speed 2, terminal W
8190:(intern)ElectronicsTemperature
81A0:(M11)Engine speed sensor
8210:Data loss EEPROM
8220:Data loss coil data
8230:EDC calibration error
8305:Speed monitoring
8343:Coolant temp. monitoring
8345:Eng.OFF->CoolantTempMonit
8363:Oil pressure monitoring
8365:Eng.OFF->OilPressMonit
8405:Actuator (positioner, travel meter, fuel rack)
8500:ISO-Bus-Error
8600:CAN-Bus-Error

The possible types of error are:

(0) Broken cable or short-circuit
(1) Broken cable or short-circuit
(2) Measuring point defective
(3) Power reduced
(4) Limit exceeded, power reduction activated
(5) Shutoff limit exceeded/ fallen below

The following table can be used to assist in the elimination of possible causes of errors which have occurred. When doing this, the status of the fault indicator must be noted:

- Permanent light: Error statuses permitting limited engine operation. The error must be eliminated as quickly as possible to avoid further damage.
- Flashing light: Error statuses resulting in the engine being shut off or preventing the engine from being started. The error must be eliminated so that the engine can be put back into operation.

ERROR MESSAGES, CAUSES AND REMEDIES

Error pilot lamp	Error messages (only readable with Serdia)		Possible causes		Remedy
	Type of error	Error location		n. O.K.	
Permanent light (Engine operation restricted)	(0)	8120:(F24)AccelerPedal(SWG1)[1]	Plug-in connection interrupted		Restore plug-in connection
		8130:(F20)HandThrottle(SWG2)[2]	OK		
		8140:(M9)CoolantTempSensor[3]	Plug-in contacts contaminated or corroded		Clean connector and replace if necessary
		8150:(M24)BoostPressureSensor	OK		
		8160:(M21)OilPressureSensor	Sensor defective		Replace sensor
		8170:(M13)Speed 1, camshaft[4]	OK		
		8180:(M11)Speed 2, terminal W	Cable harness defective		Check cable harness and replace if necessary
		8190: (intern)ElectronicsTemperature			
	(2)	8002: (F18)Signal monitoring PWMInp1	PWM signal cannot be evaluated		Check signal
		8012: (F21)Signal monitoring PWMInp2			
	(3)[5]	8343:Coolant temp. monitoring 8363:Oil pressure monitoring	Temperature warning limit exceeded too long. Fallen below oil pres-sure alarm limit for too long.		Check coolant Check oil level
			Faulty configuration.		Check data in SERDIA menu Check ”configuration” and change if necessary
	(5)[6]	8305:Speed monitoring	Overrun cond. activated.		
Flashing (Engine off)	(0)	8170:(M13)Speed 1, camshaft[7]	Plug-in connection interrupted		Restore plug-in connection
			OK		
			Plug-in contacts contaminated or corroded		Clean connector and replace if necessary
			OK		
			Sensor defective		Replace sensor
			OK		
			Cable harness defective		Check cable harness and replace if necessary

Flashing (Engine off)	(2)	8112:(M17)Rack travel sensor	Plug-in connection interrupted		Restore plug-in connection
			OK		
			Plug-in contacts contaminated or corroded		Clean connector and replace if necessary
			OK		
			Actuator defective		Replace actuator
			OK		
			Cable harness defective		Check cable harness and replace if necessary
	(5)	8305:Speed monitoring	Overspeed reached		
		8345: Eng.OFF->CoolantTempMonit. 8365: Eng.OFF->OilPressMonit	Temperature alarm limit exceeded for too long. Fallen below oil pres-sure alarm limit for too long.		Check coolant Check oil level
			Faulty configuration (e.g. overrun cond. OFF).		Check data in SERDIA menu ”Configuration” and change if necessary
		8405:Actuator (positioner, travel meter, fuel rack)	Actuator defective		Replace actuator
(Engine start not possible)	(0)	8210:Data loss EEPROM 8220:Data loss coil data 8020:ECU (positioner actuation)	Battery or cable harness defective, ECU failure		Check battery Check cable harness Replace ECU
a) Flashing			Error in central electron-ics, pro-gram in EMR was not executed		Replace ECU
b) Flashing or Permanent light c)Off	(0)	8170:(M13)Speed 1, camshaft[7]	Plug-in connection inter-rupted		Restore plug-in connection
			OK		
			Plug-in contacts contaminated or corroded		Clean connector and replace if necessary
			OK		
			Actuator defective		Replace actuator
			OK		
			Cable harness defective		Check cable harness and re-place if necessary
	(5)	8405: Actuator (positioner, travel meter, fuel rack)	Actuator defective		Replace actuator

[1] Switch to SWG 2 (if SWG 2 available). Fixed speed with 2% speed droop is set.

[2] Switch to SWG 1 (if SWG 1 available). Fixed speed with 2% speed droop is set..

[3] Electronics temperature is evaluated.

[4] Continued running with reduced rated speed, if speed sensor 2 is available.

[5] Injected fuel limitation (if activated).

[6] The measured value exceeds maximum speed.

[7] Speed sensor 2 not available or defective.

It is recommended to use a multimeter as measurement aid.

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5.1.2 EMR2 ERROR TABLE

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	Ricon. EMR	Blink codee		Cause	Remarks	Help
			short 0,4 s	long 0,8 s	horts 0,4 s			
Zero error display	-	No faults	2	-	-	No active faults present		
Revolutions / speed acquisition	01	Speed sensor 1	2	1	1	Sensor failure. Distance from gear too far. Additional fault impulses. Cable joint interrupted.	Governor in emergency operation (if sensor 2 available). Emergency switchoff (if sensor 2 not available or failed).	Check distance. Check cable connection. Check sensor and replace if required.
		Speed sensor 2	2	1	2		Governor in emergency operation (with sensor 1) Emergency switchoff (if sensor 1 not available or failed).	
	03	Speed sensor	2	1	3	Tacho failed. Additional fault impulses. Cable connection interrupted.	Governor in emergency operation. (see Chapter 4.15).	Check cable connection and tacho. Replace if required.
	04	Excess speed switch	2	1	4	Speed was/is in excess of limit. e.	Engine stop. (see Chapter 4.3.3)	Check parameter (21). Check speed settings. Check PID setting. Check rods. Check actuator and replace if required. Check cable to actuator (impulse on incorrect speed). Check no. of teeth. For vehicles check for possible thrust mode.
Sensors	05	Set point sensor 1 accelerator pedal)	2	2	1	Fault at corresponding sensor entry (e.g. short circuit or cable break).	See Chapter 4.15 influencing fault reaction. With failure of the sensor, the associated monitoring function is de-activated.	Check sensor cable. Check sensor and replace if required. Check fault limits for sensor.
	06	Set point sensor 2 (hand throttle)	2	2	2			
	07	Charge air pressure	2	2	3			
	08	Oil pressure	2	2	4			
	09	Coolant temperature	2	2	5			
	10	Charge air temperature	2	2	6			
	11	Fuel temperature	2	2	7			

Functional fault warning	30	Oil pressure warning	2	3	1	Oil pressure below speed-dependent warning line characteristic	Fault message (disappears when oil pressure is again above recovery limit).	After a delay time - fill limitation. Check engine (oil level, oil pump). Check oil pressure sensor and cable. Check oil pressure warning line characteristic.
	31	Coolant temperature warning	2	3	2	Coolant temperature has exceeded warning level.	Fault message (disappears when coolant temperature again drops below recovery level). After a delay time - fill limitation.	Check coolant. Check coolant temperature sensor and cable.
	32	Charge air temperature warning	2	3	3	Charge air temperature has exceeded warning level.	Fault message (disappears when charge air temperature again drops below recovery level). After a delay time - fill limitation.	Check charge air. Check charge air temperature sensor and cable.
	34	Coolant level warning	2	3	5	Switch input “Low coolant level” is active.	Fault message.	Check coolant level. Check coolant level sensor and cable.
Guasti funzionali, avvertenza	35	Speed warning (with thrust mode operation).	2	3	6	Revolution was/is above (top) revolution speed limit. “Thrust mode” function is active.	See Chapter 4.3.3 Excess speed protection.	Check parameters. Check speed settings (21). Check PID setting. Check rods. Check actuator and replace if required. Check cable to actuator. Check speed sensor (impulses on incorrect speed). Check no. of teeth. For vehicles check for possible thrust mode.
	36	Fuel temperature warning	2	3	7	Fuel temperature has exceeded warning level.	Fault message (disappears when fuel temperature again drops below recovery level).	Check fuel. Check fuel temperature sensor and cable.

Functional fault, switch-off	40	Oil pressure switch off	2	3	1	Oil pressure below switch-off limit	Emergency stop.	Emergency stop Check engine (oil level, oil pump). Check oil pressure sensor and cable. Check oil pressure switch-off limit.
	41	Coolant temperature switch-off	2	3	2	Coolant temperature has exceeded switch-off limit.		Check coolant level. Check coolant level sensor and cable. Check switch-off limit.
	42	Charge air tempera-ture switch-off	2	3	3	Charge air temperature has exceeded switch-off limit.		Check charge air. Check charge airtemperature sensor and cable. Check switch-off limit.
	44	Coolant level switch off	2	3	5	Switch input “Low coolant level is active.	Emergency stop. Start lock.	Check coolant level. Check coolant level sensor and cable.
Actuator	50	Feedback				Actuator not connected. Fault in actuator confirmation.	Emergency switchoff. Actuator cannot be operated.	Check actuator, replace if required. Check cable, check “Confirmation”.
	52	Reference feedback	2	5	1			Check actuator, replace if required. Check cable, check fault limits for “Rifeness confirmation”.
	53	Control travel difference				Injection pump/actuator jammed or not connected. Difference between nominal/actual control travel is > 10 % of the overall control path.	Fault message (disappears when difference is < 10 %).	Check actuator/ actuator rods / injection pump, replace if required Check actuator cable.
	59	Auto calibration BOSCH-EDC pumps faulty operation	2	5	2	No automatic actuator equalization possible. Incorrect input of the actuator reference values.	Engine stop / start lock. Governor cannot be taken into use. EDC actuator calibration required (see Chapter 8.4).	Check actuator and replaced if required. Check feedback cable. Check voltage supply/cables. Check fault limits and reference values of the feedback. Program the fault limits for feedback, save values. Switch ignition off and on again. Check again.«If faulty, inform DEUTZ-Service and carry out automatic equalization again. Set fault limits again.

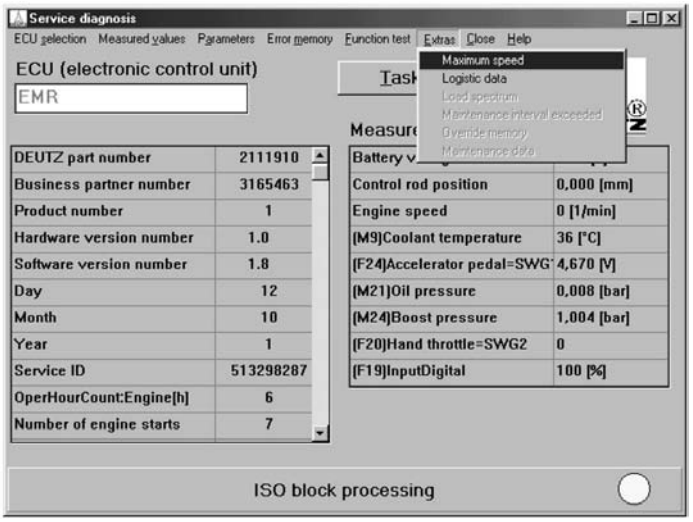
Hardware inputs/outputs	60	Digital output 3 (Switch-off solenoid, pin M 2)	2	6	1	Fault (short circuit /cable break) at digital output.	Driver level is switched off.	Check cable of digital output (cable break or short circuit).
	62	Digital output 6, pin M 7	2	6	2		Fault message.	
	63	Excess voltage switch-off solenoid	2	6	1			
	67	Error Hand Setp 1	2	6	2			
	68	Error CAN Setp 1	2	6	2			
Communication	70	CAN-Bus controller	2	7	1	CAN-controller for CAN-bus is faulty. Fault removal despite reinitialising continuously not possible	Applicationdependent.	Check CAN connection, terminating resistor (see Chapter 12.4). Check control unit.
	71	CAN interface SAE J 1939				Overflow nel buffer di ricezione oppure non è possibile un invio tramite bus.		
Memory	76	Parameter programming (write EEPROM)				Fault in parameter programming in the governor fixed value memory.	Emergency switchoff. engine cannot be started.	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service
	77	Cyclic program test	2	8	1	Constant monitoring of program memory shows error (socalled “Flash-test”).		
	78	Cyclic RAM test				Constant monitoring of working memory shows error.		Note values of parameters (3895 and 3896). Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
Control unit hardware	80	Power supply (Actuator)	2	9	1	Power supply for actuator not in the permissible range.	Fault message (disappears when power again in the normal range).	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	83	Reference voltage 1				Reference voltage for actuator not in the permissible range.	Fault message (disappears when power again in the normal range). Auxiliary value 5 V	Check voltage supply. Switch ignition off and on again. Check again. If faulty inform DEUTZ Service
	84	Reference voltage 2	2	8	2			
	85	Reference voltage 4						
	86	Internal temperature				Internal temperature for control unit not in permissible range.	Fault message (disappears when power again in the normal range).	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	87	Atmospheric pressure	2	9	2	Atmospheric pressure not in permissible range.	Fault message (disappears when power again in normal range). Atmospheric pressure monitoring function de-activated.	

Program logic	90	Parameter fault (EEPROM retrieval or checksum faulty).	2	10	1	No data found or checksum of data is faulty (note: fault only occurs during setting of parameter / saving or reset.).	Engine cannot be started.	Check data for correct settings. Save parameters. Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	93	Stack overflow	2	10	1	Internal calculation fault (so-called "Stack overflow" fault).	Emergency switchoff. Engine cannot be started.	Note parameters (3897 and 3898). Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	94	Internal fault						

5.1.3 ERROR MEMORY 2

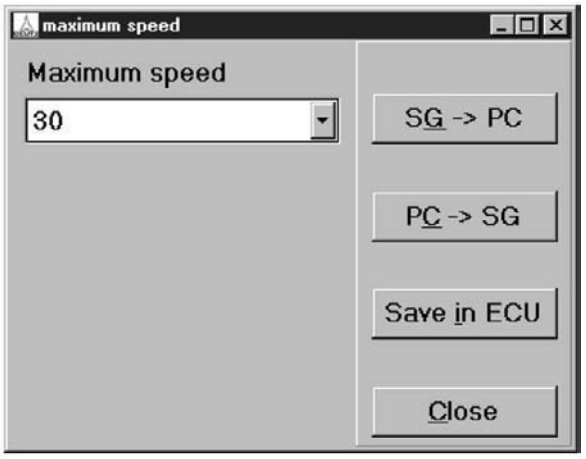
This error memory has the same functions as the error memory described previously, however errors can only be read out, displayed and deleted here with EMR2 and the interface for Level IIIa.

6. EXTRAS



6.1 MAXIMUM SPEED

This screen can be used to select from three different maximum vehicle speeds (30, 40, 50 km/h) (not implemented yet in EMR2)..



6.2 LOGISTIC DATA

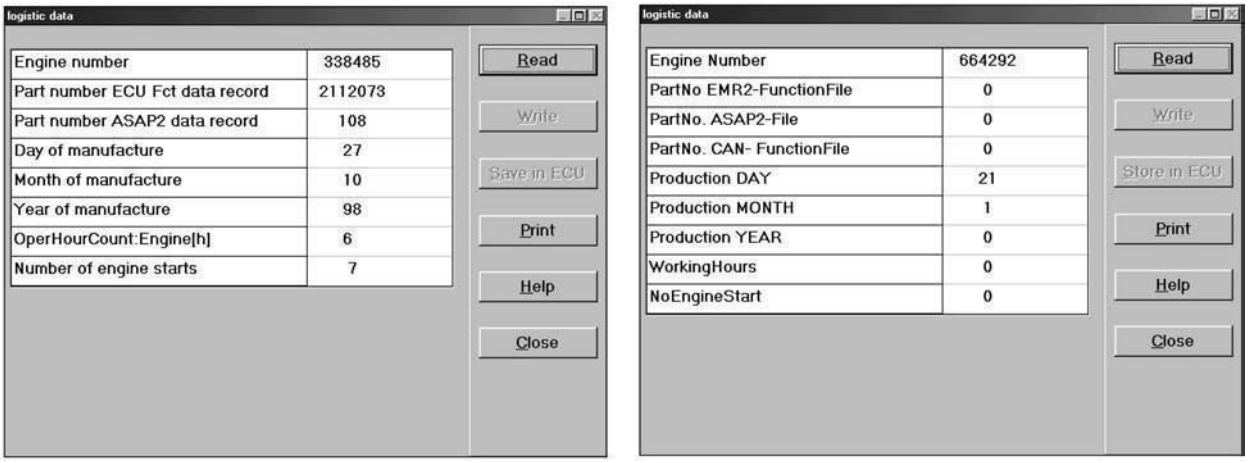
The screen is used to read and print the logistic data stored in the control unit.

EMR1/EMR2:

- Engine Serial Number
- Part number, EMR function data set
- Part number, ASAP2 data set
- Date, month and year of manufacture
- EMR2 only:
- Part number, CAN function data set
- Hours of operation
- Number of engine starts

Data can only be written and protected in the control unit by DEUTZ AG..

EMR2



6.3 LOAD SPECTRUM

This screen provides an overview of the engine speed and load ranges over which the engine has been operating. Users with the higher authorisation levels may delete entries in the control unit.

Limitation: EMR2, EMS2 only

6.4 MAINTENANCE INTERVAL EXCEEDED

This screen shows maintenance intervals that have been exceeded. Users with higher authorisation levels can delete the exceeded maintenance intervals.

Limitation: EMS2 only

6.5 OVERRIDE MEMORY

This screen shows, for certain measured quantities, any periods during which the engine was running in the alarm or shut-off range. Users with higher authorisation levels can delete the entries in the control unit.

Limitation: EMS2 only

6.6 MAINTENANCE DATA

Limitation: EMS2 only

7. TASKS

7.1 EMR1

During service operations, this button on the SERDIA main screen is used to show the screens for the individual configuration tasks:

Diagnosis and Testing

- Meas. governor performance
- Meas. start manoev.
- Meas. monitoring functions
- Meas. boost pressure
- Meas. sensors
- Meas. veh. speed
- Meas. setpoint value input
- Meas. dig. inputs/outputs

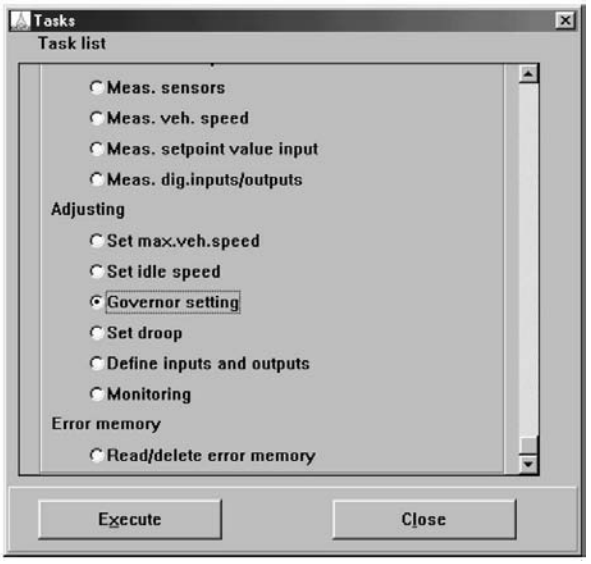
Adjusting

- Set max. veh. speed
- Set idle speed
- Governor setting
- Set droop
- Define inputs and outputs
- Monitoring

Error memory

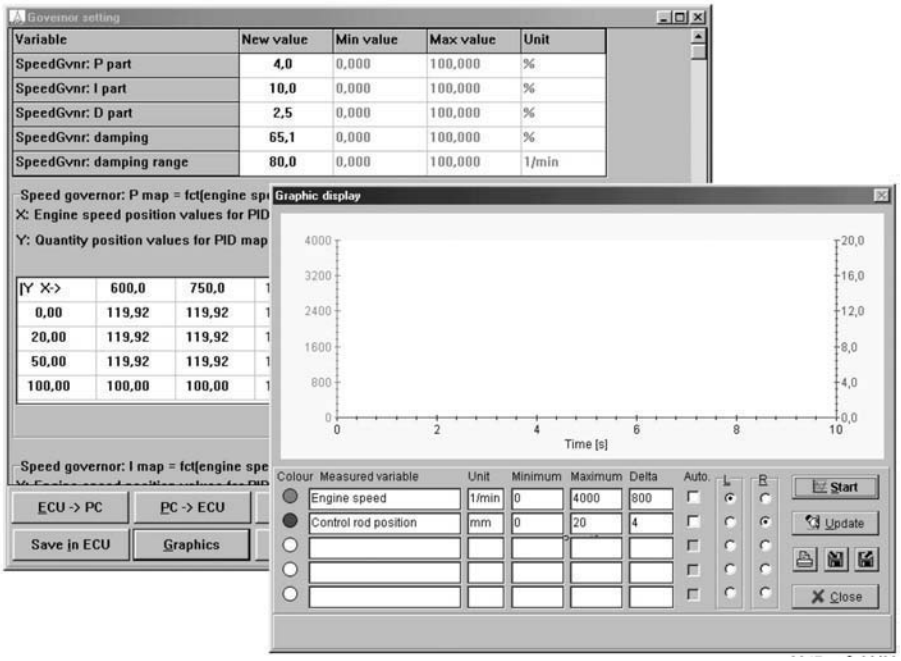
- Read/delete error memory

7.1.1 EXAMPLE GOVERNOR SETTING



Proceed as follows:

- Click on the "Tasks" button.
- Click on the "Adjusting:Governor setting" menu option. The "Governor setting" menu opens.



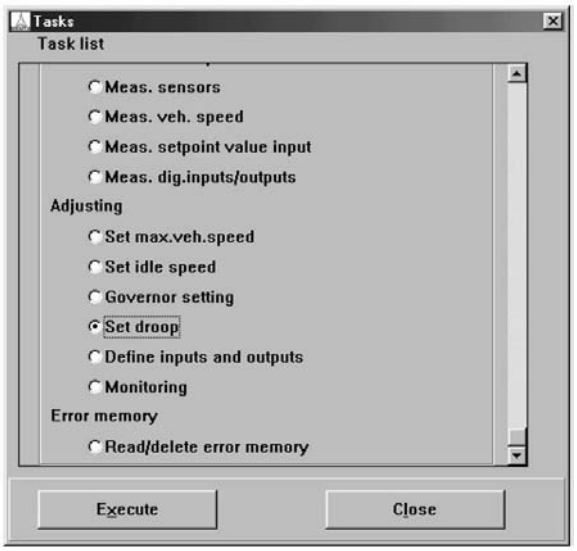
Screen button functions:

- **ECU->PC**: Configuration data are read from the control unit and displayed.
- **PC->ECU**: Modified configuration data are transferred into the control unit. To store the data permanently, use the "Save in ECU" button.
- **Save in ECU**: Configuration data are permanently stored in the control unit.

All modifications must be reported back!
The reporting procedure is described in Service Announcement 0199-99-9287.

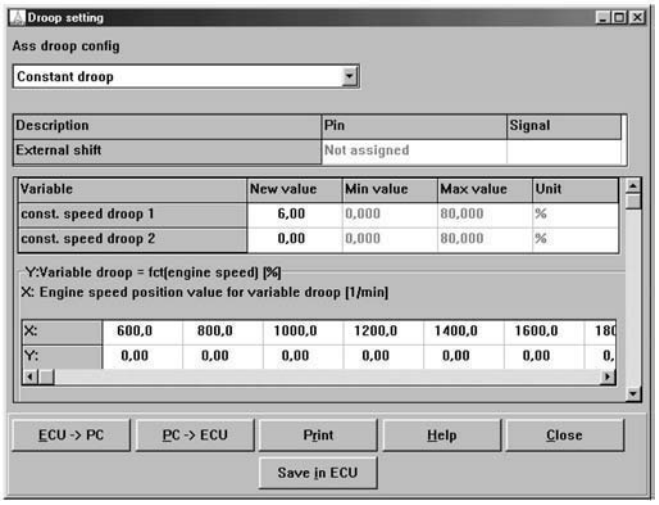
- **Graphics**: The "Graphics" button can be used to see a graphical representation of the selected measurement quantities over time (5 maximum). If more than 5 quantities are selected, an error message is displayed.
- **Collect. time**: The measurement collecting time is indicated in the "Collect. time" box, in seconds. The smallest unit of collecting time is one second. The highest time may be several hours (specified in seconds). The basic setting is 10 s.
  The shortest scan rate is
  40 ms for RAM values
  60 ms for other values.
  A measurement time of 10 s gives
  10000 ms/40 ms = 250 measurement points for RAM values
  10000 ms/60 ms = 166 measurement points for other values.
  Since the program takes around 2000 measurement points maximum, the scan rate is adapted automatically before data collection begins.
  The lowest possible scan is determined by the duration of data transfer from the control unit to the PC. The higher the number of measured quantities to be displayed at the same time, the longer the data transfer time, and the narrower the scan frequency.
- **Print**: Prints the measured values appearing on the screen.
- **Close**: Return to the "Tasks" menu.

7.1.2 EXAMPLE SPEED DROOP SETTING



Proceed as follows:

- Click on the "Tasks" button.
- Click on the "Adjusting: Set droop" menu option. The "Droop setting" menu opens.



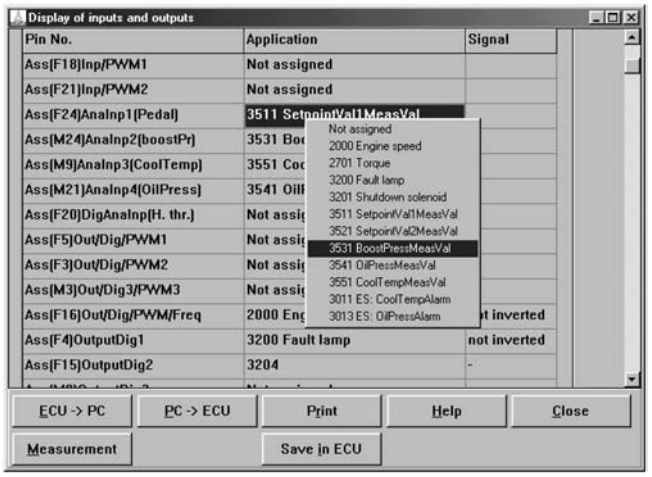
Screen button functions:

- ECU->PC: Configuration data are read from the control unit and displayed.
- PC->ECU: Modified configuration data are transferred into the control unit. To store the data permanently, use the "Save in ECU" button.
- Save in ECU: Configuration data are permanently stored in the control unit.

All modifications must be reported back!
The reporting procedure is described in Service Announcement 0199-99-9287.

- **Print**: Prints the measured values appearing on the screen.
- **Close**: Return to the "Tasks" menu.

7.1.3 DEFINE INPUTS AND OUTPUTS



Using the "Tasks" button, the possible assignments

1. are displayed with the right mouse button

2. allocated with the left mouse button

This screen also shows functions that can be inverted, and the measured values for all inputs and outputs (to view these, click on the "Measurement" button).
This configuration feature is only present with Access Level III.

8. WHAT TO DO IF...?

8.1 SERDIA GENERAL

8.1.1 ERROR WHILESETTING UP COMMUNICATIONS

If communications cannot be set up although the interface and control unit have been connected, an error message is displayed:

Possible reasons for the error message:

- No supply voltage to the control unit or interface.
- Voltage supply was cut when the engine was switched off.
- Incorrect assignment of serial interface on PC (see 9.1.2).
- Wrong pole connection on voltage supply from engine to interface.
- Not all of the 4 wires (+, -, k, l) are connected.
- Wrong control unit, or control unit faulty.

Remedy, quick checks:

- Yellow interface LED should light up when SERDIA is started.
- Measure the diagnostic connector supply voltage (the interface requires 8 - 28 V DC).
- In Windows, check the assignment of the serial interface (usually COM1).
- Connect another control unit.

Further information on operating voltages for control units, interface and PC:

- EMR control units require an operating voltage from 10 V to 30 V (typically 12-24 V).
  Power consumption: 5 A at 12 V, 7 A at 24 V
- The MVS control unit takes a voltage of 24 V only.
- The interface is supplied by the engine and takes a voltage from 12 V to 24 V.
- The control units and interface are protected against wrong pole connection and overvoltage. However, an accidental incorrect connection, to a 230 V source for example, can still cause damage.
- Using an interface with an integrated optical link, the PC (Notebook, and printer) can be connected to the vehicle battery and ground with no risk for the control unit and interface, and no risk of loss of data.

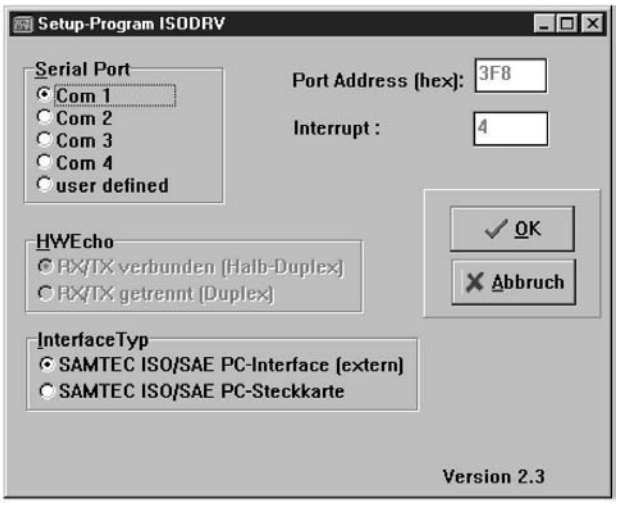
8.1.2 INTERFACE CONFIGURATION WITH ISETUP

On PCs, the COM1 interface may already be occupied by the mouse. In this case, the interface must be connected to the other serial interface (COM2). This port can then be configured with ISETUP to allow it to communicate with the interface.

Proceed as follows:

- Start the ISETUP.EXE program.
- Select the other COM port and click OK.
  The initialisation file ISODRV.INI is modified automatically.
- Re-start Windows.

Note: On many PCs, the second serial interface is the 25-pin type. In this case, a hardware adapter (25-pin to 9-pin) must be inserted to allow connection of the 9-pin diagnostic interface.



8.1.3 ACCESS CONFLICTS IN WINDOWS 3.1

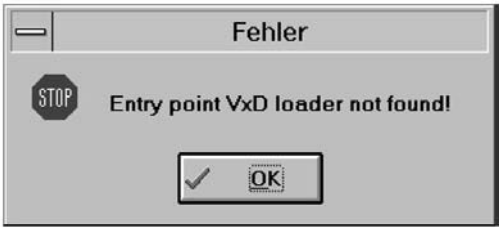
The ISODRV.386 interface driver can only be loaded statically. In the Windows SYSTEM.INI file, the ISODRV.386 driver is entered in the [386Enh] section (with the working directory path). This may cause problems with other programs that access the same serial interface.

Remedy:

- Start the ISETUP.EXE program.
- Delete the driver entry from the SYSTEM.INI file.
- Re-start Windows 3.11.

8.1.4 ERROR MESSAGE IN WINDOWS 3.11 WHEN STARTING SERDIA

When starting SERDIA in Windows 3.11, the following error message may appear:



This is because the VXDLDR.386 driver is not activated.

Remedy:

- Start the ISETUP.EXE program.
- Check the "Device VXDLDR.386 enabled“ checkbox and click OK to confirm.The appropriate driver entry is made automatically in the SYSTEM.INI file.
- Re-start Windows 3.11.

8.2 EMR1

8.2.1 ENGINE SURGES

Fault finding:

Troubleshooting with the EMR1 is done in the same way as for engines with mechanical regulators, i.e. the engine components and functions such as pump, control rod movement, fuel supply, etc, are examined. In most cases, especially if the engine was running correctly before engine surges begin to occur, the fault does not lie in the EMR1.

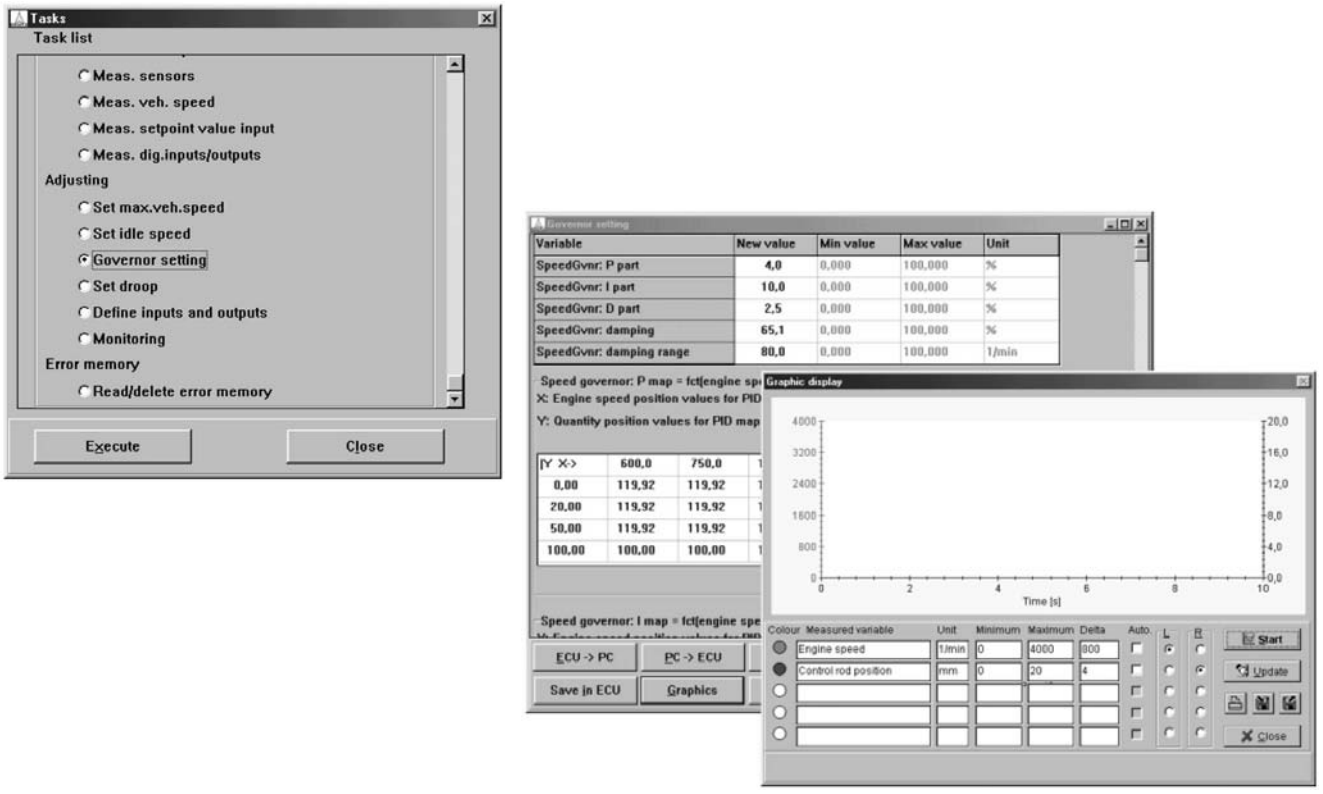
Controller setting:

Controller setting is performed mainly for new operation modes, and should be thoroughly tested and documented with the system (engine and installation) in all operating conditions.

If the new application is connected and enabled, the user-specific controller parameters must be confirmed with company headquarters. Follower engines with the same operation mode do not usually require any additional adjustments.

Opening the menus:

SERDIA main menu -> Tasks menu -> Governor setting -> Execute



General rules for setting correction:

- Setting correction is carried out with the engine running.
- Raising the P/I/D parts increases the control tolerance range.
- Enter the value to be corrected in the "new value“ field. One way of doing this is

•select the old value with the mouse, then simply type in the new value (the old value is deleted automatically).

- Click on the "PC->ECU" button to send the new value to the control unit. The governor applies the new setting, and the result will be detectable in the engine behaviour.
- After setting correction has been carried out successfully and before disconnecting the voltage supply (circuit 15), the new parameters must be stored in the EMR1.
  To do this, click on the "Save in ECU" button.

Governor basic setting:

The control unit is programmed at the end of the band with the following standard values.

Parameter (Variable)	Standard value		Comment
	Assembly	Vehicle	
SpeedGvnr: P part	18-20	4,0	Basic setting gain factors for P/I/D parts. These parameters are independent of engine status (speed, load still active) and show the main instruments for governor setting.
SpeedGvnr: I part	10,0	10,0	
SpeedGvnr: D part	5-12	2,5	
SpeedGvnr: damping	90,0	65,0	Lowering the governor parameter for the static range.
SpeedGvnr: damping range	15,0	80,0	Speed band around nominal value. Within this speed band, the engine runs smoothly and with precision, and does not respond strongly to speed variations.
PosGvnr: P part	10,0	10,0	Setting corrections should only be made after confirming
PosGvnr: I part	10-15	5,0	
PosGvnr: D part	5-10	5,0	
PosGvnr: DT2 part	8,0	8,0	
SpeedGvnr: damping	160-180	180,0	
SpeedGvnr: damping	0,25	0,25	

Standard values may vary according to engine model and application

Standard values, speed and load dependent parameters:
3 performance maps for the P, I, and D part = fkt (speed, quantity injected)..

Parameter (Variable)	Standard value	Comment
X: Engine speed position values (r.p.m.)	60…2500	7 speed values
Y: Quantity position values (cmm/str)	0, 20 …100	4 injection quantity values
Map (%)	100	Total 3 x 28 entries. A 100 % entry causes the speed governor PID parts to be accepted (Page 4). Corrections must be made at the related measurement point. EMR1

Making a setting correction:

Before modifying any parameters, we recommend saving the current configuration using the "Save in file" menu option, and/or printing configuration pages 4, 5 and 17.
The setting procedure consists of 3 stages:

1. **PID governor basic parameters** For the most part, the correction is made with the basic parameters.

- If a new governor basic setting is required, set all performance maps (Page 17) to 100%.
- The P part is the most important parameter and must be set first. Raise the parameter value for "SpeedGvnr: P part" by 10 % to begin with, until the engine accelerates under the the sudden load variation and vibration dips to f > 1 Hz. Then reduce the P part again by 25 %.
  Example: P part with vibration dip (unstable) = 12. 12-25 % of 12 = 9 (new setting value).
  The setting depends heavily on weight moment of inertia (engine + generator). For weight moments of inertia up to 8kgm2 the value range for the P part is between 10 and 45 %.
  At higher moments of inertia, the P part can be raised by up to 90 %.
  Note regarding major engine assemblies:The optimum governor values are determined at operating speed with different loads. Note the P part determined for each, and enter the average in "SpeedGvnr: P part".
  For double-frequency installations, the second frequency must be included in the average value calculation.
  Note regarding vehicle engines:The optimum governor values are determined at several engine speed and load points.

Note the P part determined for each, and enter the average in "SpeedGvnr: P part".
The different P parts given by the various load and speed points must be corrected in the PID performance map.

- The D and I parts (Page 4) are now set applying the same procedure, i.e. raising the values by 5 % first till unstable, then reduce again by 25 %.

2. Parameters for static and dynamic operation.

Setting the "SpeedGvnr: damping“ and "SpeedGvnr: damping range“ parameters (Page 4).
The "SpeedGvnr: damping range“ parameter determines the speed band in which speed is in the static range. For example, entering a value of 15 r.p.m. sets a +/-15 r.p.m. band around the nominal speed .
The "SpeedGvnr: damping" parameter determines the lowering of the governor parameter (PID parts) for the static range, i.e. if the speed is within the speed band around nominal value, the governor parameter (PID parts) falls to the value for the damping factor.
For example, SpeedGvr: P part =10 %
SpeedGvr: damping =65 %
This has the effect that, in the static engine condition of nominal speed range +/- damping range, the P part falls to 6.5 %. The aim of this step is that the engine will run smoothly and precisely within the speed band, without responding strongly to slight speed changes. If the engine runs outside of the speed band due to a fault, the set governor parameters become effectively 100 % again and the governor will quickly correct the speed error as far as possible. Standard settings - see "Governor basic setting". Setting corrections can only be made through the engine running test.

3. Speed and load dependent parameters.

For the P, I, D basic parameters there are corresponding performance maps that depend on speed and injected quantity (load) (Page 17). The effective parameters are determined by multiplying the basic parameter by the content of the performance map.
For example, SpeedGvr: P part =10 %
Map P part =200 % at 2000 r.p.m. and 50 cmm/stroke
Result: For the given operating point, the P part becomes effectively 20 %.

8.2.2 ACCELERATOR PEDAL CALIBRATION

An accelerator pedal is usually designed as a foot pedal, operated by the driver of a vehicle. However, the input provided for the accelerator pedal (vehicle connector Pin 24) can also be used as a remote input, like those used in locomotives and ships. In all cases, calibration is required.

Calibration must be carried out both at initial startup (either by the customer or by service engineers), and whenever a replacement is made.

The accelerator pedal is not always supplied by DEUTZ AG. However, we recommend the pedal value sensor (DEUTZ Part No. 0419 9457. Other accelerator pedals can also be installed by the customer, subject to confirmation with company head office.

The following are then required:

- Connection as in EMR1 System overview:
  Signal input (Pin 24/vehice connector) to GND (Pin 23/vehicle connector)
- Analog signal:
  > 0.5 V (accelerator pedal in 'parked' position), for example 1 V
  < 4.5 V (accelerator pedal at 'full throttle'), for example 4V
- The EMR1 provides a reference voltage at the vehicle connector (Pin 25, +5 V).
  This reference voltage is also intended for the manual throttle potentiometer.
  Therefore the total load current should not go over 25 mA if the pedal value sensor and manual throttle potentiometer are arranged in parallel, (i.e. total resistance $> 200\ \Omega$.)

Calibrazione acceleratore per mezzo del menu "Calibrazione":

Accelerator pedal calibration using the "Calibration" menu:

Calibration is menu-driven. Both end stops "parked position" and "full throttle" are calibrated as limit values. See "General procedure for calibration", Chapter ,"Calibration".

Accelerator pedal calibration using the "Measured values" and "Configuration" menus:

The aim of calibration is to inform the control unit of the limit values for the two end stops: "parked position" as the lower and "full throttle" as the upper reference point. Also, the "upper fault value" (+5 % from upper reference point) and "lower fault value" (-5 % from upper reference point) must be entered, relative to the two reference points.

Parameter designations

Configuration screen	Calibration screen	Value
AccPedal(SWG1)up. err val.	Acceler(SWG1)upper fault limit [full throttle...5V]	max. setpoint x 1.05+
AccPedal(SWG1)up. ref	Acceler(SWG1)full throttle [pressed down, upper limit]	max. setpoint
AccPedal(SWG1)lo. ref	Acceler(SWG1)parked position [lower limit]	Pedal at rest = Idle
AccPedal(SWG1)lo. err val.	Acceler(SWG1)lower fault limit [0V...parked pos.]	Pedal at rest - 0.05 x max. setpoint

Measuring the limit values:

- Open the "Measured values" menu, "Actual measured values".
- Measured value "(F24)Accelerator pedal=SWG1“: with pedal in parked position (lower reference) and pedal pressed (lower reference), "Get value", transfer to the control unit and save.

Configuration:

- Open the "Parameters“ menu, "Configuration" option.
- Enter values, referring to the following example table ("Acc. pedal input configuration", see below). Conversion: 5 V=1023 digits.

Example: Acc. pedal input configuration

Parameter	Factory setting		Actual value/ measured value	Calibration	Configuration
	mV	digits	mV	mV	digits
AccPedal(SWG1)up.err val.	4750	973		4357 [1]	893
AccPedal(SWG1)up. ref	4500	921	4150	4150	850
AccPedal(SWG1)lo. ref	500	102	670	670	137
AccPedal(SWG1)lo. err val.	250	51		463 [2]	95

1) Measured value "upper reference point" + 5 % (v. upper reference point)

2) Measured value "lower reference point" -5 % (v.lower reference point)

8.2.3 MANUAL THROTTLE CALIBRATION

The manual throttle (Pin 20 FS) is intended for vehicles such as agricultural machines. When ploughing, for example, a driver can make the appropriate engine speed setting and then take his/her foot off the accelerator pedal. As with the mechanical adjusting levers, the manual throttle position must be set to zero (lowest engine speed) before starting the engine.

The manual throttle positioning is combined with the accelerator pedal and determines minimum speed. In proportion to the preset nominal value, engine speed can be set between lower idle speed (for example 650 r.p.m.) and nominal engine speed (for example 2300 r.p.m.). Depending on the manual throttle setting, the engine responds in the same way as to an accelerator pedal. For example, if the speed is set with the hand throttle to 1500 r.p.m., accelerator pedal operation only becomes effective at higher speeds than this.

Manual throttle positioning is not supplied by DEUTZ, but it still has to be programmed at the factory.

A potentiometer can be used as the adjusting link, and installed by the customer.

Requirements for manual throttle nominal value setting (potentiometer) when installed by customer:

- Input Pin 20 vehicle connector
- Potentiometer supply as pedal value sensor, 5V reference voltage Pin 25, and GND Pin 23.
- Loading reference voltage together with pedal value sensor < 25 mA.
- Protection system IP65
- End stops adjusted to between 10 % and 90 % of the potentiometer value.

For example, if potentiometer resistance = 1 k., the setting range between mechanical stops must then be between 100 Ω and 900 Ω. This setting range can be achieved by

a) Narrowing the turning angle

b) Series resistors in the supply lines.

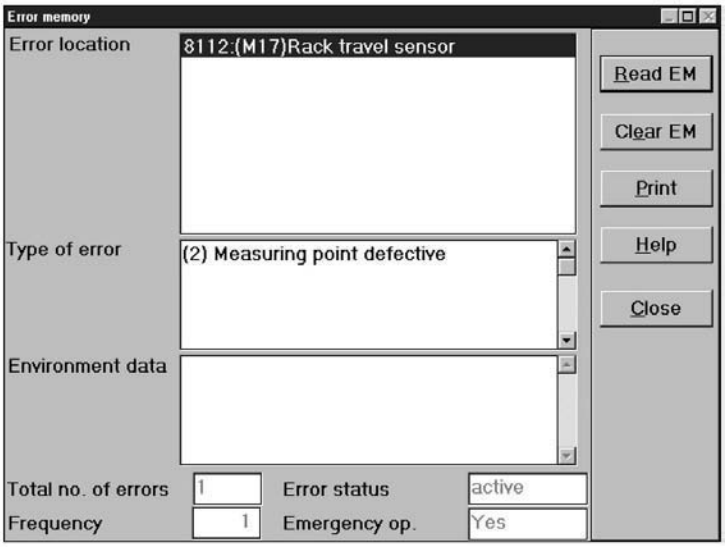
Manual throttle calibration:

The two potentiometer end stops must be calibrated.
The aim of calibration is to inform the control unit of the limit values for the two end stops: "Potentiometer stop LI speed" as the lower and "Potentiometer rated speed" as the upper reference point. Also, the "upper fault value" (+5 % from upper reference point) and "lower fault value" (-5 % from upper reference point) must be entered relative to the two reference points.

Parameter designations

Configuration screen	Calibration screen	Value
Hand thr.(SWG2)up. err val.	Hand throttle(SWG2) upper fault limit(upper limit...5V)	Rated engine speed x 1.05+
Hand thr.(SWG2)up. ref	Hand throttle(SWG2) max.eng. speed (upper limit)	Rated engine speed
Hand thr.(SWG2)lo. ref	Hand throttle(SWG2) min. eng.speed (lower limit)	Low idling engine speed
Hand thr.(SWG2)lo. err val.	Hand throttle(SWG2) lower fault limit (0V...lower limit)	LI engine speed - 0.05 x rated eng. speed

8.2.4 EXAMPLE OF FAULT FINDING



Fault finding:

Connection broken? **not OK** Restore the connection.
OK
Plug contacts dirty or corroded? **not OK** Clean plug, replace if necessary.
OK
Sensor faulty? **not OK** Replace sensor.
OK
Cable harness faulty? **not OK** Check the harness, replace if necessary.

8.2.5 ENGINE DOES NOT START

Indication	Possible cause	Remedy
Starter speed > 160 r.p.m. not reached.	Check using multimeter: terminal voltage at starter < 7V (12V system).	Replace battery. Clean earth wire connections.
Starter speed ok, fuel rack tra-vels to start position.	Faulty fuel supply.	Restore fuel supply.
Starter speed ok, fuel rack stays at zero position.	No power supply, connected to wrong pins or incorrect polarity.	Remove vehicle connector and check for correct connections: Pin 14F=+Ubatt Pin 1F=-Ubatt Pin 2F=-Ubatt
	Shutoff solenoid defective or not connected.	
	Fuel rack stiff.	Locate site causing stiffness and remedy as appropriate.
	Speed sensor faulty.	Replace sensor, check plug connection and line.
	Starting fuel charge limitation is set too low or coolant temperature is too high for the EMR.	Using SERDIA check measured value “(M9)coolant temperature” in the menu “current measured values”.
Flashing pilot light.	There is a serious fault in the EMR system. You should remedy the fault before attempting any further starts.	Locate error using SERDIA.
SERDIA error message: ”8405: Actuator (positioner, travel meter, fuel rack)”.	Identification of fuel rack travel deviation, measured value in shutdown range. Shutoff solenoid defective or not connected.	Replace actuator, see service example, actuator replacement. Additional setting is not necessary.
SERDIA error message: ”8170:(M13)Speed 1, camshaft”.	Short circuit or interruption on the speed sensor (camshaft sensor) or supply line or plug connection.	Replace sensor, check plug connection for contamination or corrosion, check lines between vehicle plug and sensor for damage.
SERDIA error message: ”8210:Data loss EEPROM” ”8220:Data loss coil data” ”8020:ECU (positioner actuation)”	Memory error in the EMR Memory error in the EMR ECU Failure	Replace ECU. Transfer data from old ECU to the new one “1:1”.
SERDIA error message: ”8160:(M21)OilPressure Sensor”	Oil pressure measured value (M21) lies outside permitted range, also with engine switched off.	Replace sensor, check plug connection for contamination or corrosion, check lines between vehicle plug and sensor for damage.
SERDIA error message: ”8140:(M9)CoolantTemp Sensor”	Coolant temperature measured value (M9) lies outside the permitted range, also with engine switched off.	Replace sensor, plug and line control
SERDIA error message: ”8120:(F24)Acceler Pedal(SWG1)”	Accelerator pedal sensor incorrectly calibrated.	Check calibration values in the menu “Calibration” and change if necessary.

8.2.6 ENGINE STOPS FOR NO KNOWN REASON

Indication	Possible cause	Remedy
Following shutdown: (Key switch not yet actuated, off/on) **Error pilot light off !**	Shutdown not initiated by error message in the EMR. Other possibilities: Fuel supply ! Speed monitoring independent of EMR. Interruption of supply voltage.	 Restore fuel system. Check whether additional speed monitoring (e.g. solenoid) is available and make relevant system check. Check EMR vehicle connector, fuse, key switch etc. for loose contact.
Following shutdown: (Key switch not yet actuated, off/on) **Error pilot light Permanent light**	Trace error location and error environment with SERDIA. Error message: Overspeed (is reached for instance upon sudden load change) !e.g. ”Oil pressure” additonal remark: “inactive”.	Carry out systematic check depending on error message: Guide value: rated speed+15% to be corrected if necessary. Check connector on oil pressure sensor for loose contact and replace sensor if necessary.
Following shutdown: (Key switch not yet actuated, off/on) **Error pilot light flashing**	There is a serious error in the EMR system. Prior to engine start, trace error location with SERDIA.	Take action according to the indicated error location. This may involve replacing the ECU, actuator or sensor. The additional remark “inactive” indicates a loose contact at the indicated error location.

8.2.7 REPLACING THE EMR1 ACTUATOR

The actuator is a purely mechanical component of the EMR1, fixed to the engine. It contains a solenoid controlled by the EMR1, which positions the control rod and thus regulates the fuel feed to the engine. A fuel rack position sensor fitted into the actuator indicates the control rod position to the EMR1.
The following error messages may make it necessary to replace the actuator:

- 8113:(M17)Rack travel sensor
- 8405:Actuator (positioner, travel meter, fuel rack)

Replacement instruction:

- Switch off the voltage supply to the EMR1 and detach the connection cable from the actuator.
  For safety reasons, the positive terminal of the battery must be disconnected.
- Remove the actuator and clean the mounting surface on the engine.

IMPORTANT: With the actuator removed, the control rod is at maximum filling position, i.e. the engine must not be started in any circumstances!

- Attach the new actuator with sealant (DEUTZ Part No. 0101 6102) to the engine.
  When fitting a new actuator, check that it is compatible with the control unit.
  At the moment, there are 3 possible combinations for replacement:

Actuator/control unit compatibility

Control unit, Part no.	Software Version No. EMR1	Related actuator, Part No.	Procedure for replacing the actuator
0211 1846		0211 1841	This combination must be completely replaced by combination 0211 1911 / 0211 1910. Confirmation from company head office is required.
0211 1910		0211 1911	
0211 2017	1.08	0211 1926	The actuator content is the same as 0211 1911. Only the attachment method for the housing is different.
0211 2017	1.11	0211 1926	
0211 2686 0211 2690	1.10	0211 1926	
0211 6178 0419 9995	1.31	Bosch EDC	EDC actuator and pump are associated with each other. EDC actuator replacement: additional settings required. 1) Self-calibration (Level 4) 2) Transfer EDC Data to the control unit (Level 3)

IMPORTANT: Special feature of the 1015. Note the pump with EDC actuator.

- Restore the connection to the control unit and start the engine.
- In SERDIA, select the "Parameters" menu ->"Configuration" and, with the "PC->ECU" button, transfer the parameters to the EMR1, and start the engine.
- When the engine is running satisfactorily, save the parameters in the control unit.
- When the tests with SERDIA are completed, clear the error memory.
- On the SERDIA main menu, print the control unit identification list, and in the "Extras" menu, print the logistics data for the documentation record.
- The document must be sent along with the old actuator to company head office.

8.2.8 CONTROL UNIT REPLACEMENT

The control unit can be replaced in two ways:

1. When the control unit is damaged, but the data are still readable (communications with SERDIA are possible).
2. A new control unit is installed with engine data set programmed at the factory.

General overview of EMR1 control units

1012/1013/2013		1015		1012/1013 for Deutz-Fahr only	
- With MN label - Programmed -SERPIC Part No.	- Without MN label - Not programmed -Part No. on control unit	- With MN label - Programmed -SERPIC Part No.	- Without MN label - Not programmed -Part No. on control unit	- With MN label - Programmed -SERPIC Part No.	- Without MN label - Not programmed -Part No. on control unit
0211 2016	0211 2017	0211 2016	0211 2017	0211 2451	0211 2088 See also: SM 130-99-9305
Replaced by 0211 2581	Replaced by 0211 2570	Replaced by 0422 6179	Replaced by 0422 6178	Replaced by 0211 2580	Replaced by 0211 2571
See also: SM 130-27-9308				See also: SM 130-27-9308	
Replaced by	Replaced by	Replaced by	Replaced by	Replaced by	Replaced by
0211 26911 1)	0211 2686 1)	0419 4043 1)	0419 9995 1)	0211 2692 1)	0211 2690 1)

1) Current Part No., supplied if ordered.

General overview of EM2 control units

All model series	
- With MN label - Programmed - SERPIC Part No	- Without MN label - Not programmed - Part No.on control unit
0211 2704	0211 2850

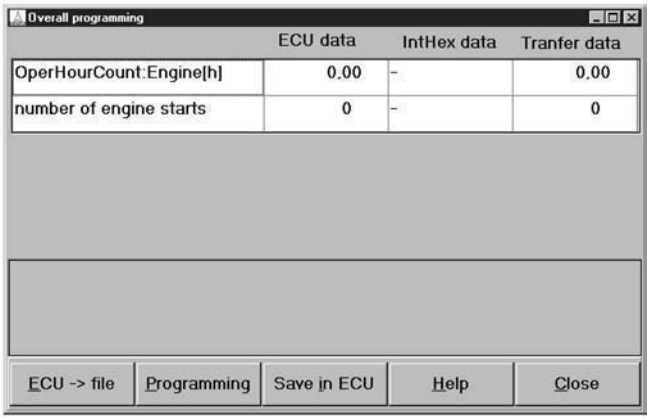
Notes on the entries above:

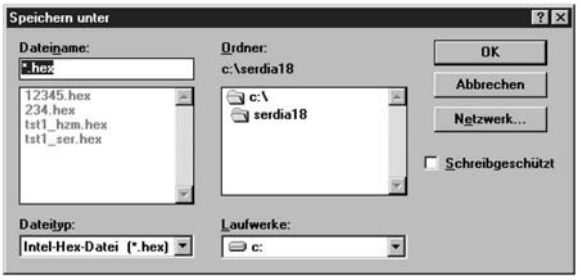
- With MN label - Programmed - SERPIC Part No.	The completed control unit. To be able to operate with the engine, each control unit must be programmed with the specific data set for the engine (it has a label with the engine number attached). In this way, the engine and control unit together form an integrated unit. Therefore, when ordering a new control unit, the engine number (MN) is indicated along with the engine model. Control units are completed by DEUTZ.
- Without MN label - Not programmed - Part No.on control unit	Unprogrammed control unit. The engine cannot be started with this control unit. For reconditioning operations, this control unit can be completed by transferring the specific engine data set from the 'old' control unit, using SERDIA Level III. See also SERDIA Manual "Complete programming". For reconditioning purposes, this means that unprogrammed control units can also be ordered from DEUTZ Service partners (Competence Class II). They are then completed (with the MN label) by the service partner. If the data set cannot be read from the 'old' control unit, this can be requested by Email in the same way, as described in SM 0199-99-9287 , "Confirming modifications to EMR data".

METHOD 1.

1. Step: Read engine data set from old control unit:

- Switch on ignition/supply voltage.
- Open the SERDIA program.
- In SERDIA, select the "Parameters“ menu ->"Overall programming".
- Click on the "ECU -> file" button. The configuration data files are read. The "Save as " window then opens.
- Give the file a name, and save.





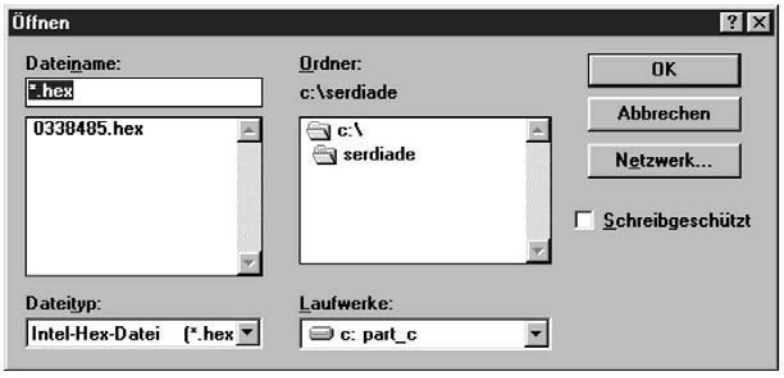
When saving, the engine number is prompted as the file name - this is only a suggestion. Any other name can be entered. Finally, click OK to confirm. The file (i.e. the engine data set) is then saved under the name <Engine number>.hex. The data transferred from the old control unit includes, among other things, indications of the number of operating hours and number of engine starts.

- Close the program. Switch off the ignition/supply voltage.

2. Step: Replacing the control unit:

Control unit compatibility must be considered, and checked against the above table (Part Numbers should be the same.). Compatibility of the control unit with the actuator must also be checked and verified.

- Switch on ignition/supply voltage.
- Open the SERDIA program.
- In SERDIA, select the "Parameters“ menu ->"Overall programming".
- Click on the "Programming" button. The "Open" window is displayed.
- Select the saved engine data set (<Engine number>.hex) by double-clicking on it.
- Transfer the engine data set to the EMR1 by clicking on the "OK" button.
- Save the data set in the control unit by clicking on the "Save in ECU" button.



3. Step: Start the engine and check that it runs satisfactorily.

- In the "Error memory" menu clear the error memory.

METHOD 2.:

Every EMR1 has a specific engine data set, which is kept in a central computer at DEUTZ AG when the engine is delivered. Any modifications to EMR1 configuration settings must be reported back to DEUTZ AG. When a new control unit is ordered, it is programmed with a data set available to DEUTZ AG under the corresponding engine number.

Therefore, if setting corrections to the engine are not reported back to DEUTZ AG, these may not be taken into account when programming a new control unit.

- Switch off the ignition/supply voltage.
- Remove both connectors from the old control unit.
- Connect the control unit with the engine and vehicle connectors (both 25-pin).
- Switch on ignition/supply voltage.
- Open the SERDIA program.
- In the "Error memory" menu, clear the error memory.
- Start the engine and check that it runs satisfactorily.

8.2.9 ERROR READING THE CONFIGURATION DATA

This error message appears if SERDIA is unable to read the Hex file. The file possibly contains Umlauts (ä, ö, ü), or other special characters not understood by SERDIA

SECTION 30

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METHOD FOR REMOVAL AND REFITTING OF RIGID PIPES AND WIRING

1 - The rigid pipes of the various systems can all be removed individually , i.e. without having to remove any pipes belonging to other systems.

2 - For particularly complex removal operations, number the pipes in the order in which they are removed, label any intermediate connections and the positions of the intermediate retaining clamps. Refit the pipes in reverse order to removal.

3 - After having repositioned the pipes in their original locations, tighten the fittings by hand and locate the retaining clamps and intermediate fixings.

4 - First tighten the fittings using also a holding wrench to the torques specified in the tables in Section 00, and then tighten the pipe clamps.

5 - To help the operator trace the routes of the rigid pipes and cables on the tractor frame, the following photos show the relative positions of pipes and cables for the version with air trailer braking.

IMPORTANT

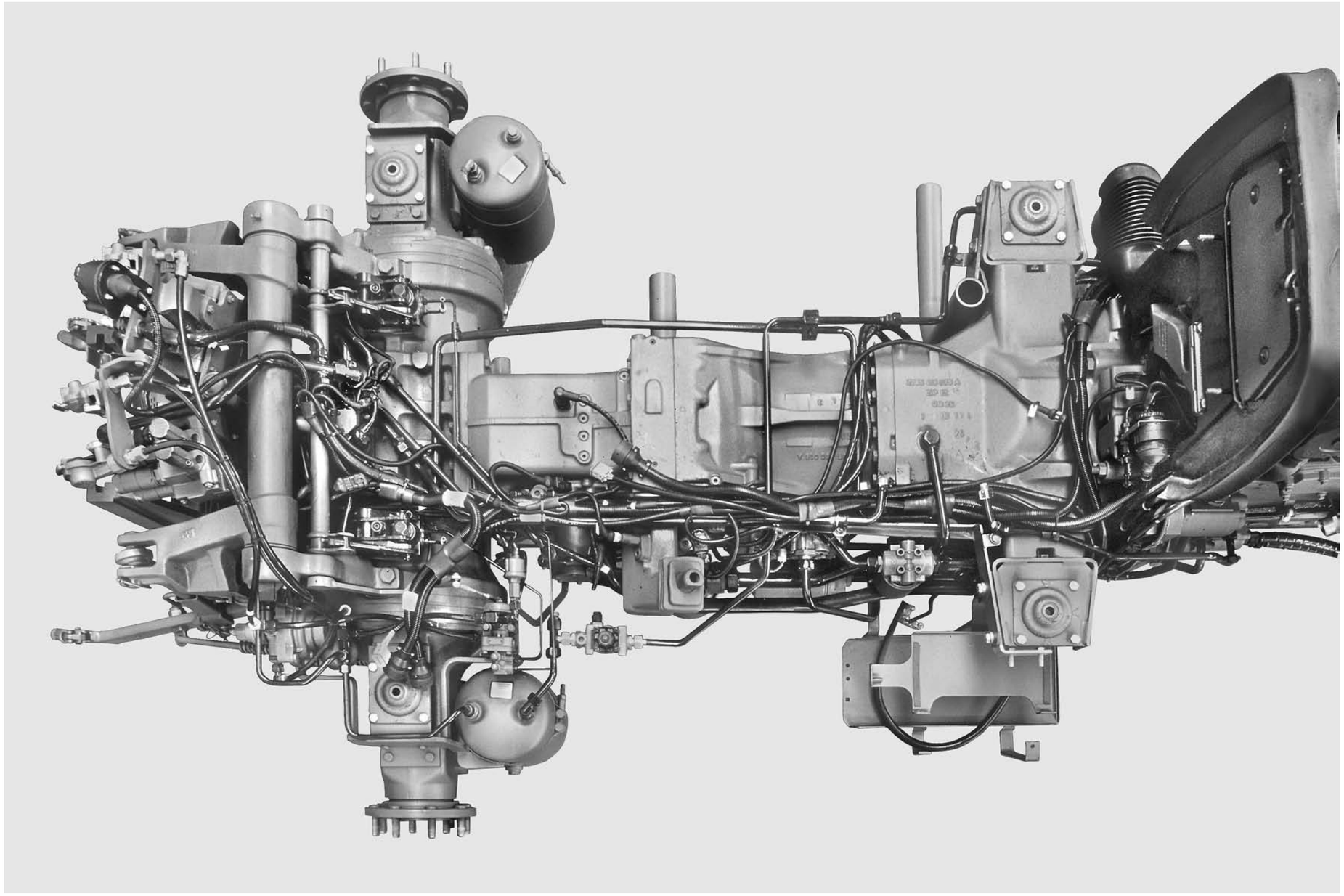
1 - After removing pipes, immediately plug the ends of the pipes and the open fittings on the components from which they were disconnected in order to prevent the entry of contaminants.

2 - After disconnecting electrical connectors, protect them against oil, dust and other contaminants by covering them in bags made of waterproof material and attach the bags to the wiring with insulating tape.

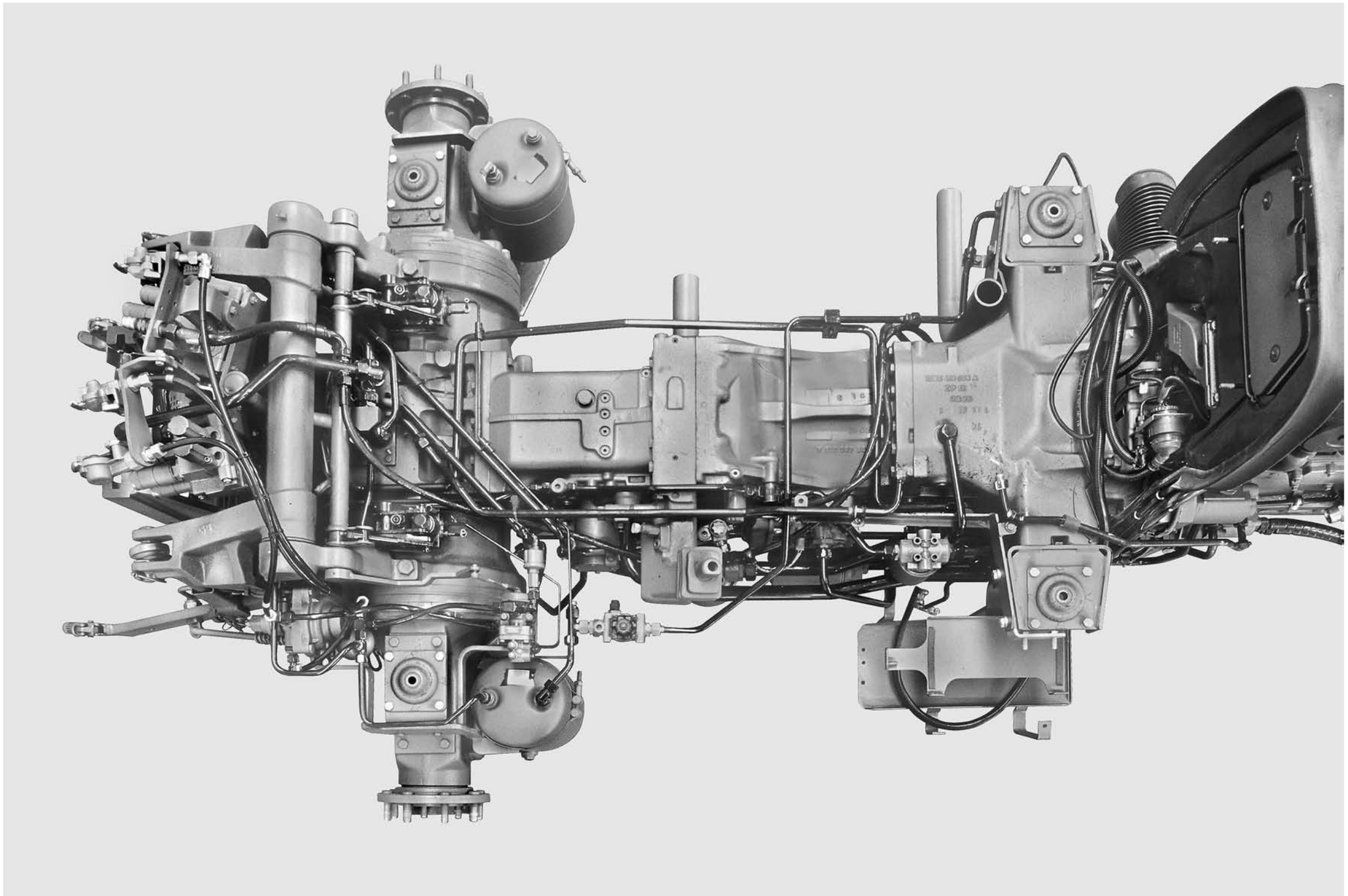
3 - Should any oil, coolant, moisture or water come into contact with the connectors, clean them with compressed air at low pressure (max. 2 bar) and clean the wires and contacts with isopropyl alcohol or a specific water-repellent product.

4 - Check wiring fixings carefully; these must not impinge on the connectors and must be positioned at regular intervals of about 30 cm to prevent vibration that could cause an interruption in current flow or signal loss.

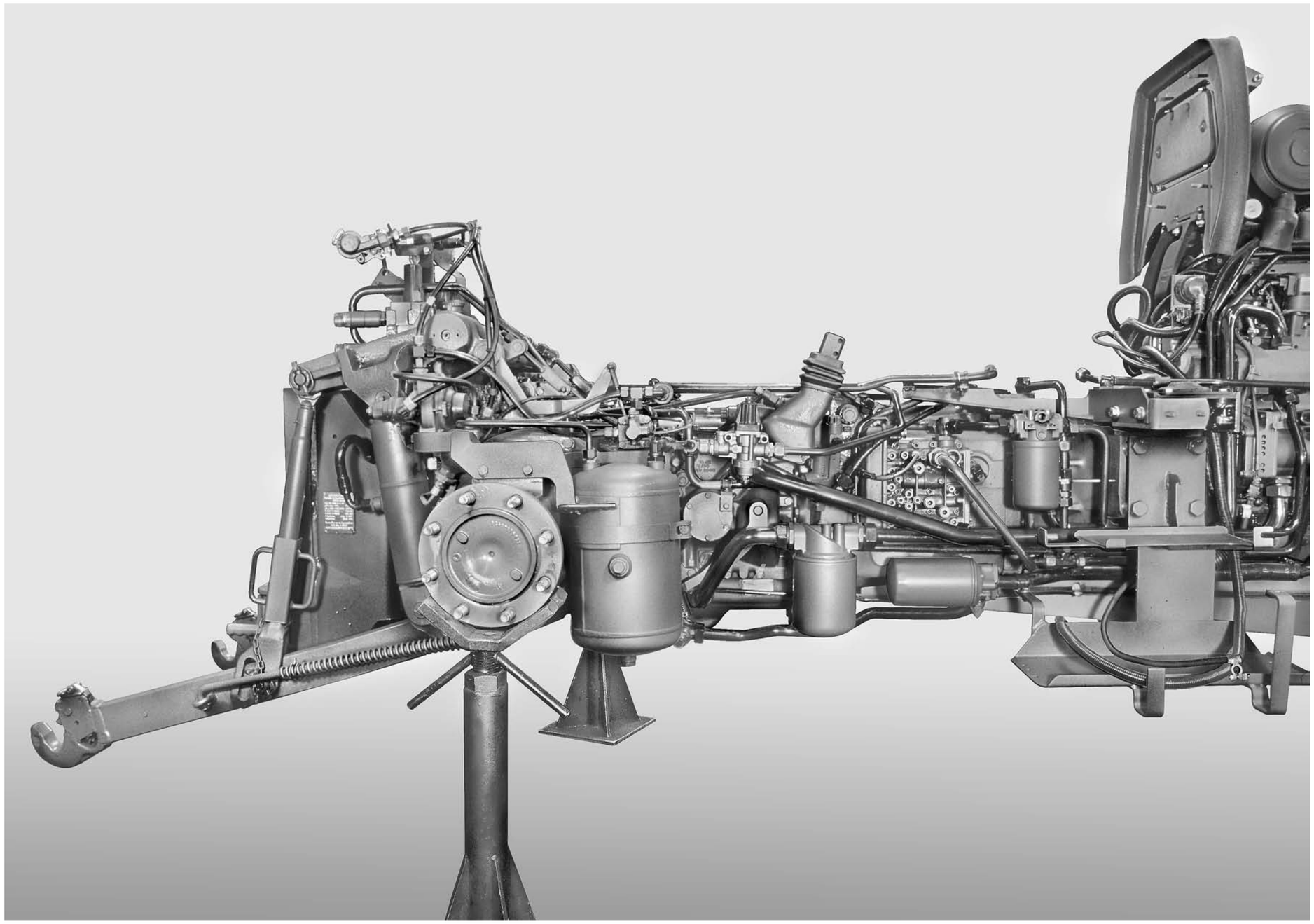
TOP VIEW OF WIRING AND PIPES



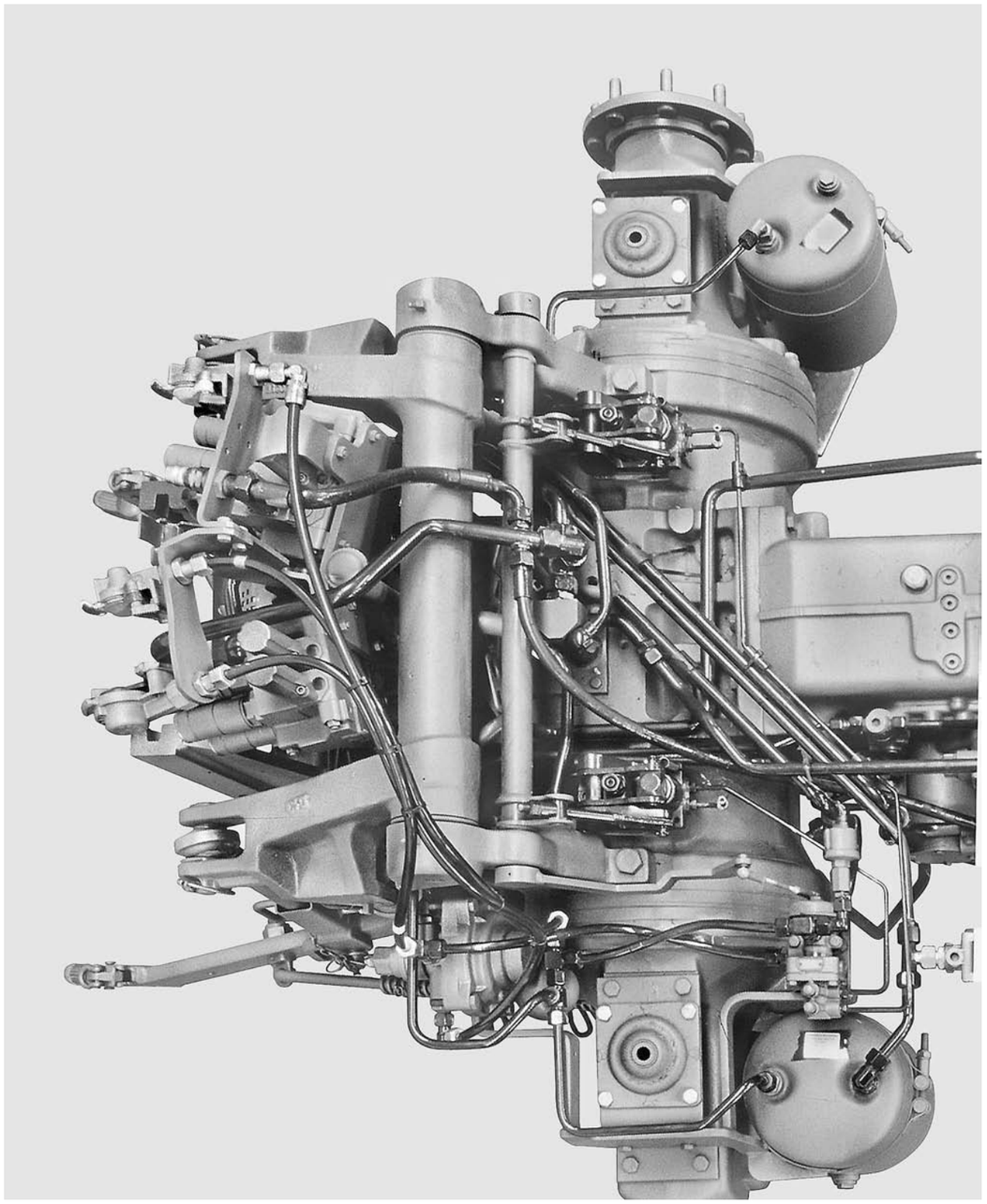
VIEW OF UPPER WIRING AND PIPES



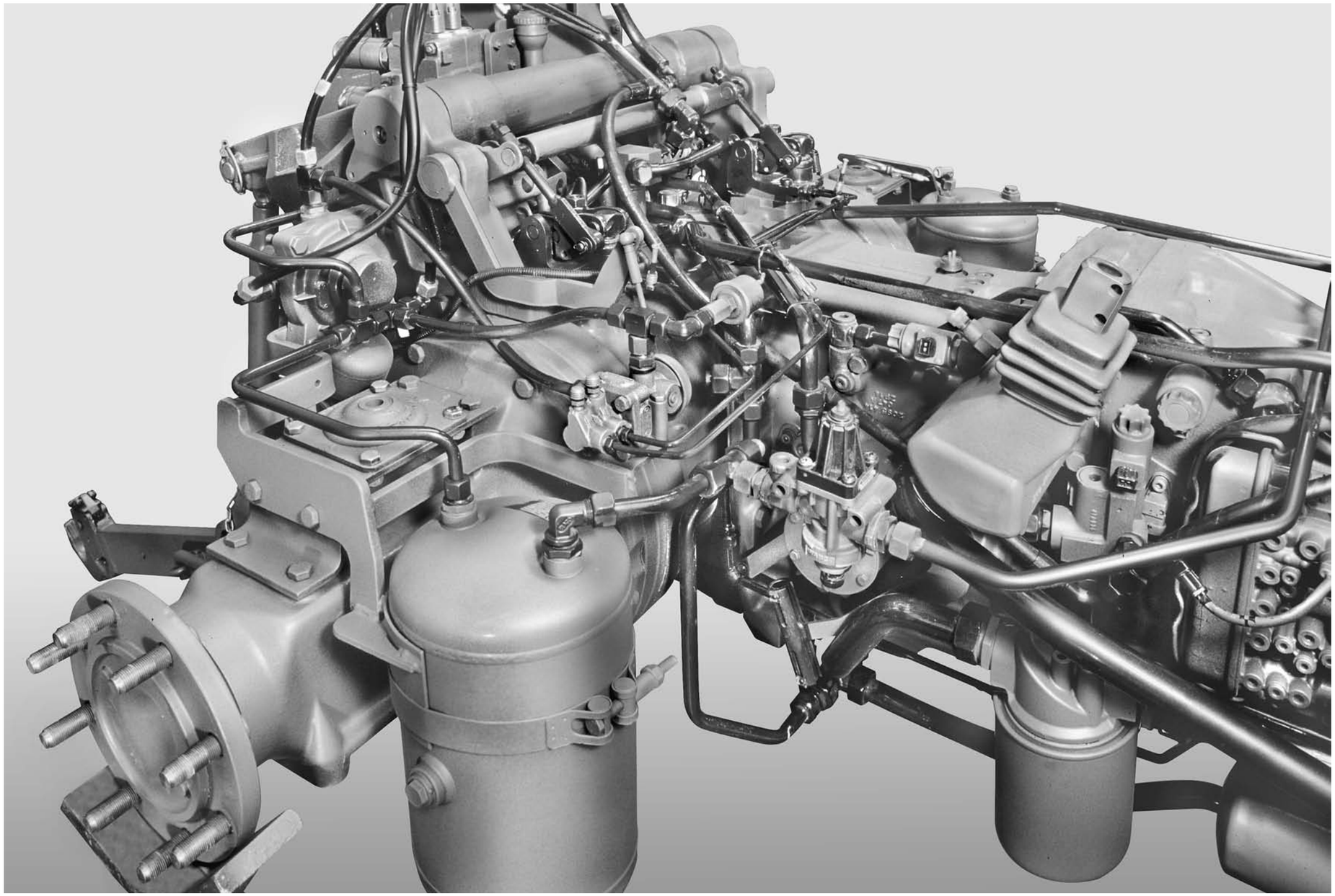
PIPES ON RIGHT-HAND SIDE



TOP VIEW OF REAR PIPES



DETAIL OF AIR TRAILER BRAKING SYSTEM



ENGINE HOOD AND LAMP ASSEMBLIES

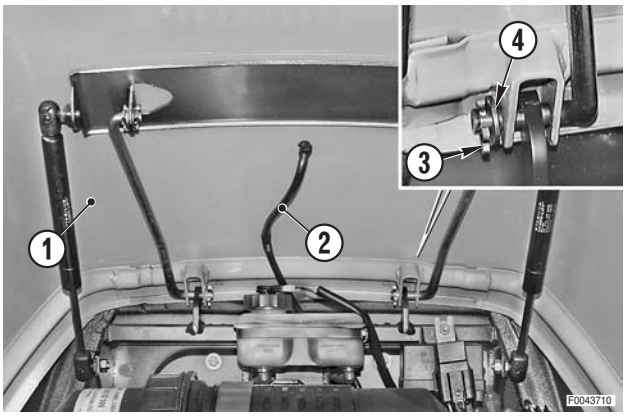
Removal

1. Removal of the hood

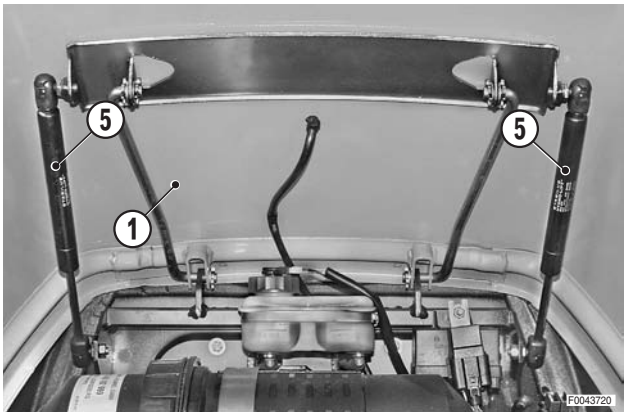
1 - Raise the hood (1) fully.

2 - Disconnect the screen washer pipe (2).

3 - While keeping the hood in the raised position, remove the cotter pins (3) and the washers (4).



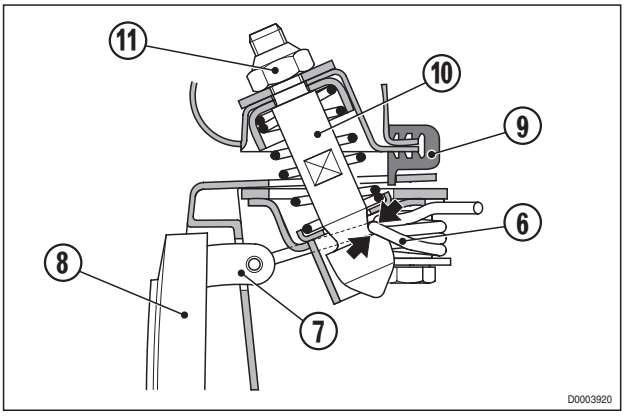
4 - Detach the gas springs (5) from the frame and remove the complete hood assembly (1).



1.1 Adjustment of the hood latch

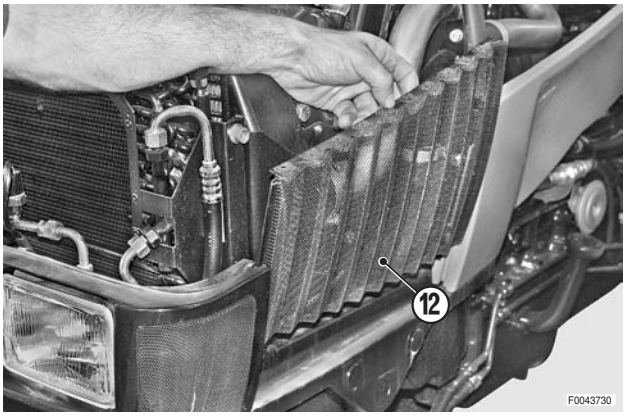
★ Before adjusting the hood latch, make sure that the hood release buttton is fitted and that the gas springs are disconnected.

1 - Check that the spring (6) is engaged with the plate (7) of the release button (8) and check that when the hood gasket (9) comes to rest on the frame, the spring (6) engages the groove on the striker (10).
If necessary, adjust the depth of the striker by way of self-locking nut (11).

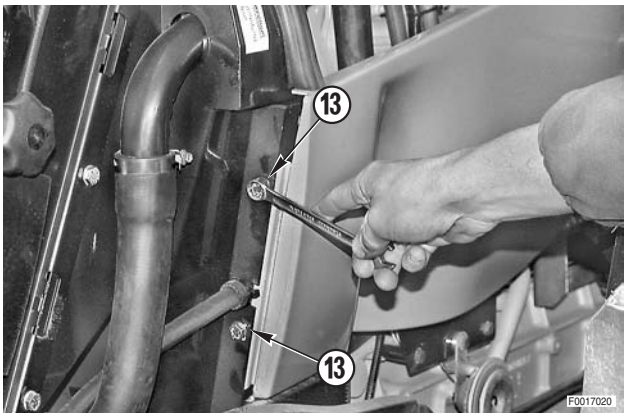


2. Removal of the side panels

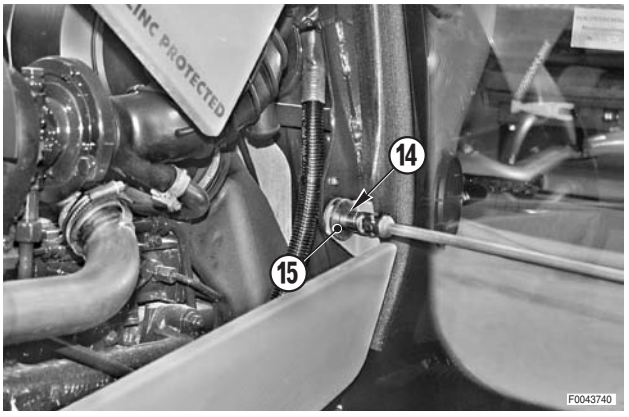
1 - Lift and remove the grilles (12).



2 - Unscrew and remove the front bolts (13).

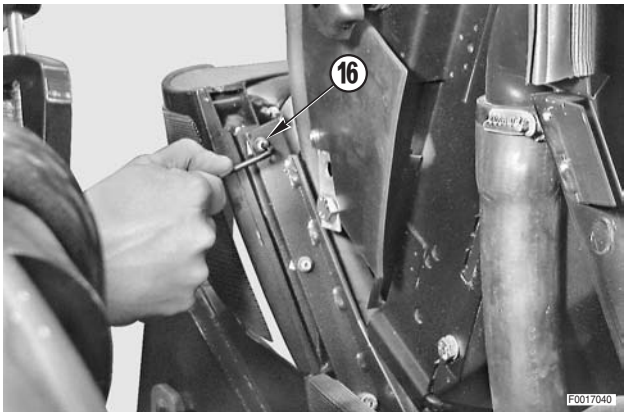


3 - Unscrew and remove the rear nut (14) and remove the washer (15).

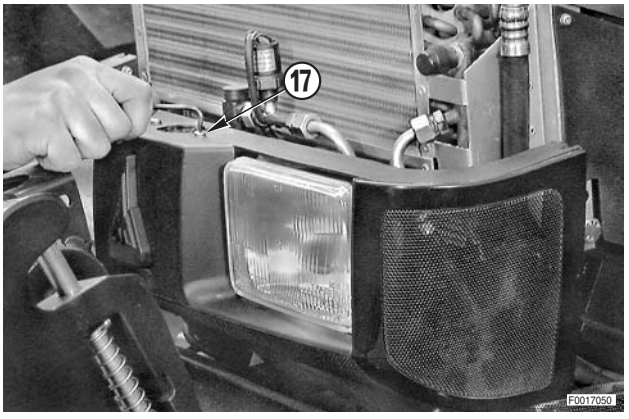


3. Removal of the lamp assemblies and hood release button

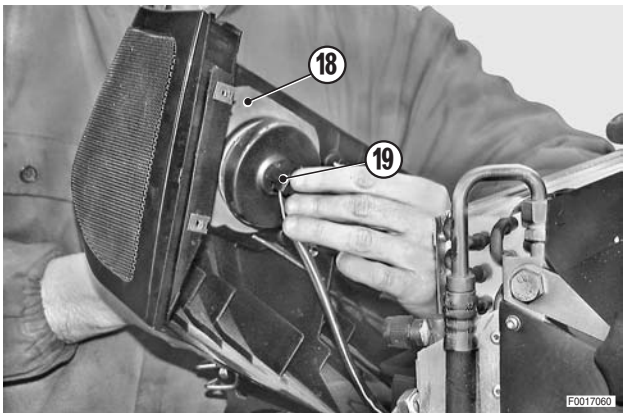
1 - Remove the lateral retaining screws (16).



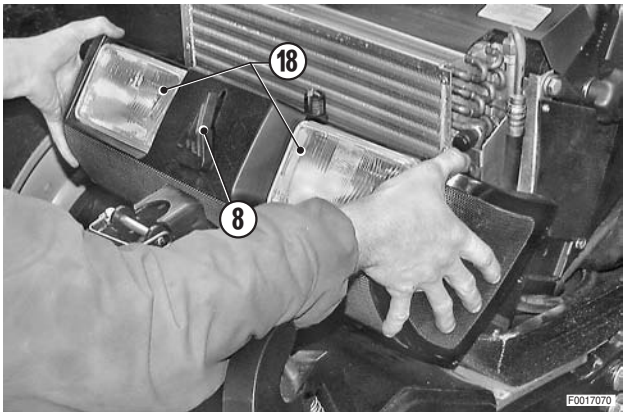
2 - Remove the central retaining screws (17).



3 - Unplug the lamp connectors (19) from the lamp assemblies (18).

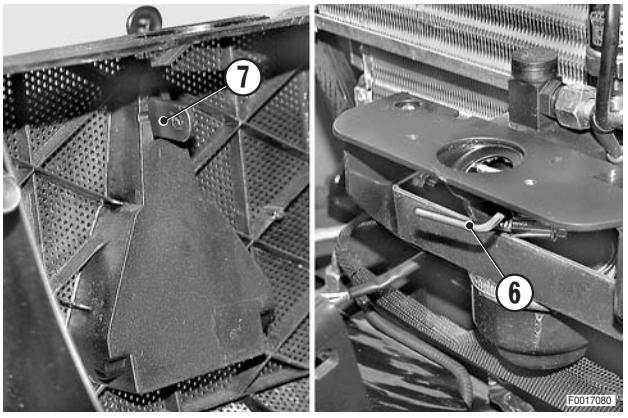


4 - Remove the lamp assemblies (18) by rotating them to the rear and moving them sideways to disengage the release button (8).



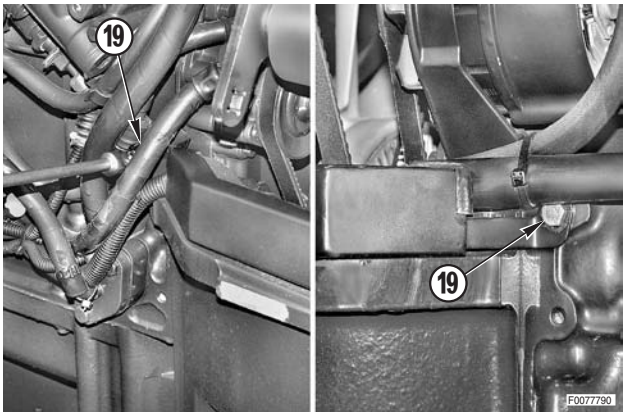
5 - If necessary, press the plate (7) of the release button (8) to help disengage the spring (6).

※ 1

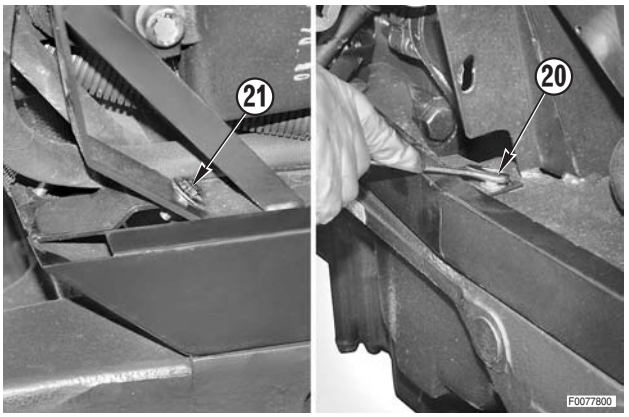


4. Removal of the lower guard

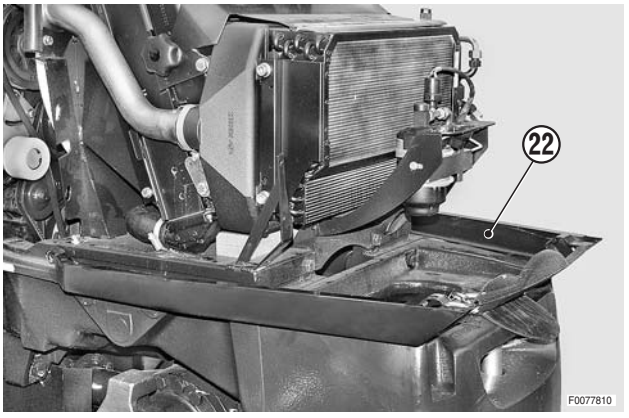
1 - Loosen and remove the bolts (19) of the rear mountings.



2 - Loosen and remove the bolts (20) and (21) of the intermediate and front mountings.



3 - Remove the lower guard (22), withdrawing it towards the front of the tractor.



Refitting

- Refitting is the reverse of removal

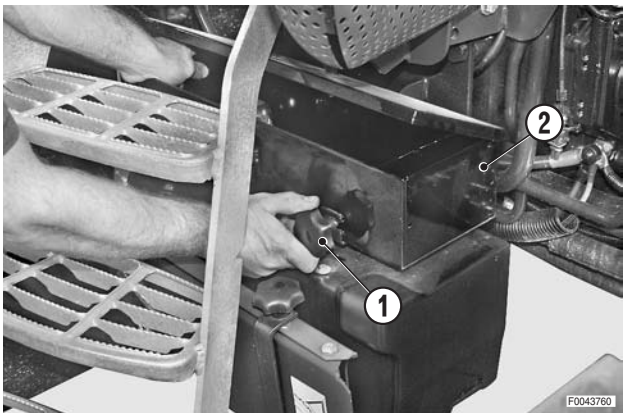
1

★ While engaging the release button with the spring (6), take care not to break the latch plate (7) by applying excessive force.

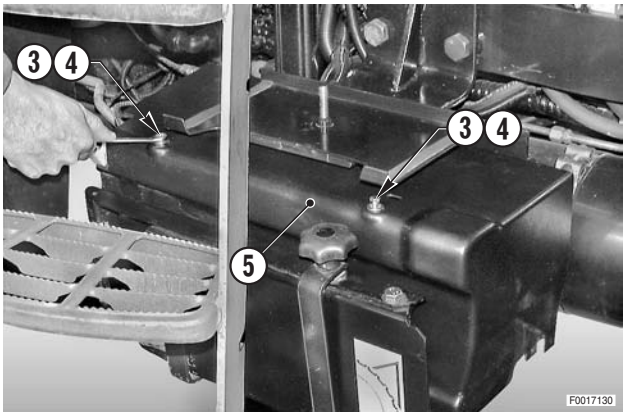
BATTERY

Removal

1 - Unscrew and remove the nut (1) securing the toolbox (2).
Remove the toolbox (2) by sliding it towards the front of the tractor.

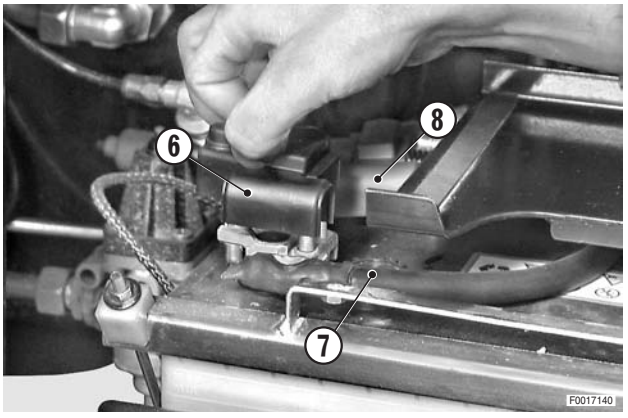


2 - Remove the bolts (3) with their washers (4) and remove the battery cover (5).

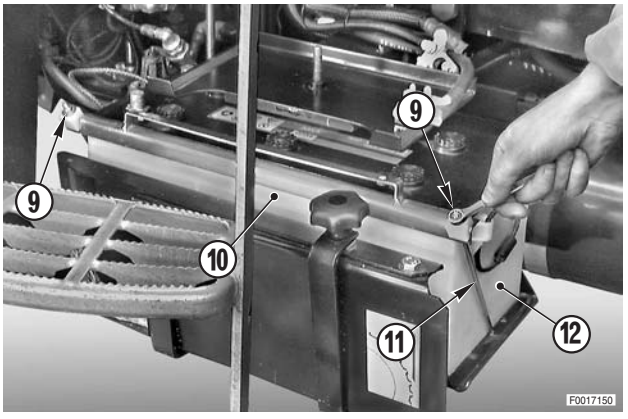


3 - Remove the terminal covers (6) and disconnect the leads (7) and (8).. 1

Always disconnect the negative lead (–) before the positive lead (+).

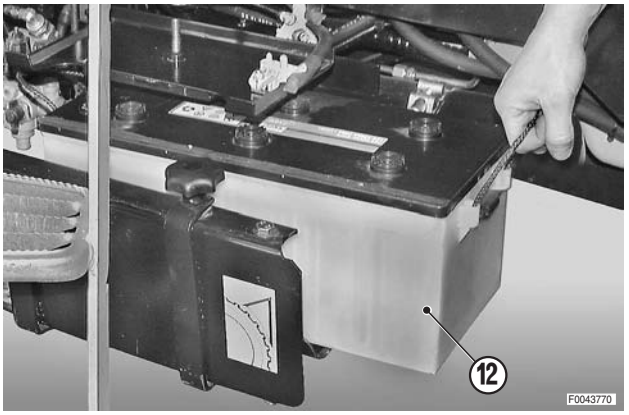


4 - Loosen off the nuts (9) sufficiently to tilt and remove the battery (12) securing clamp (10) and rods (11).



5 - Remove the battery (12) using the handles provided.

⚠ If the battery is not to be used for several days, store it in a dry, well-ventilated place at a temperature above +5°.



Refitting

- Refitting is the reverse of removal.

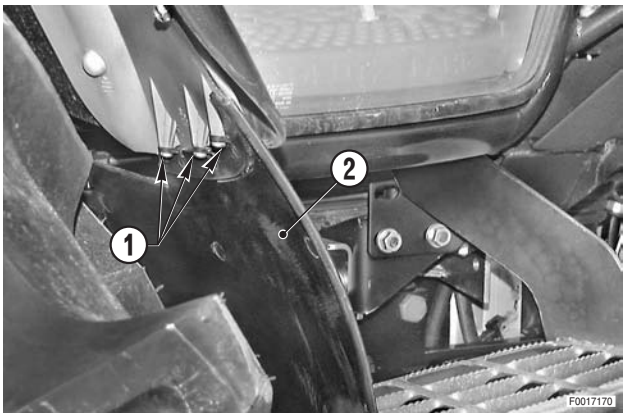
1

⚠ Always re-connect the positive lead (+) before the negative lead (–).

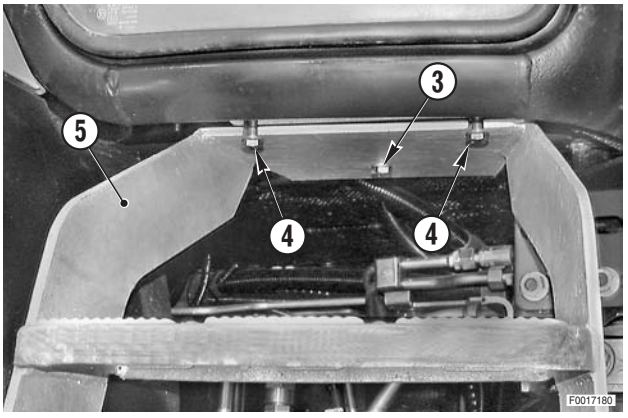
CAB ACCESS STEPS

Removal

1 - Unscrew and remove the bolts (1) securing the lower fender (2).



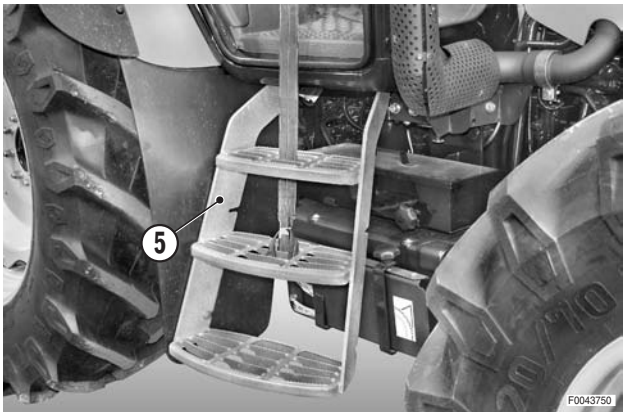
2 - Loosen the bolts (3) and (4) securing the steps (5).
★ For safety reasons, do not remove the bolts yet.



3 - Attach a hoist to the steps (5).

kg Steps: 17 kg (37.5 lb.)

4 - Remove the central bolt (3), disengage the steps (5) from the two remaining bolts (4) and remove the steps.



Refitting

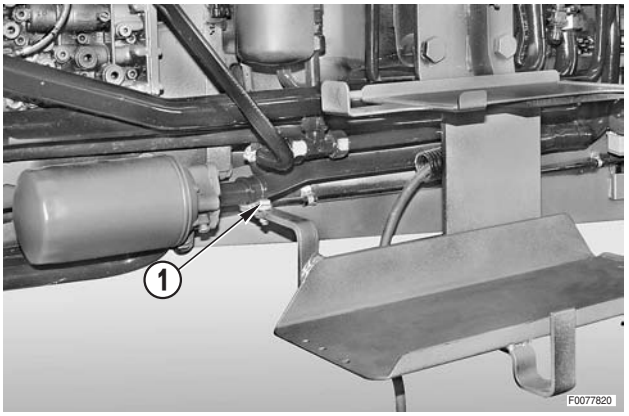
- Refitting is the reverse of removal.

BATTERY SUPPORT

Removal

1 - Remove the battery.
(For details see "BATTERY").

2 - Unscrew and remove the lateral fixing bolt (1).

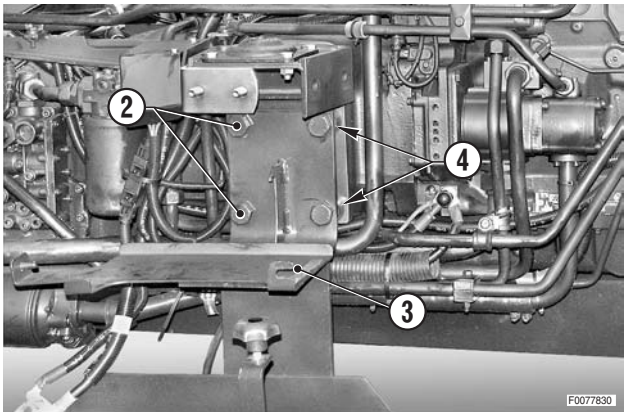


3 - Loosen the central fixing bolts (2).

4 - While supporting the battery support (3), remove the bolts (2); remove the support.

★ Recover the four spacers (4) from between the gearbox and the support (3).

NOTA On tractors equipped with a front lift, spacers are only fitted to the two upper bolts.



Refitting

- Refitting is the reverse of removal.

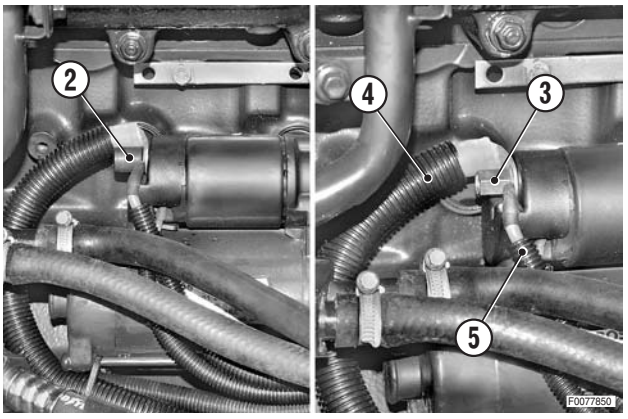
STARTER MOTOR

Removal

Remove the battery cover and disconnect the negative battery lead (–).

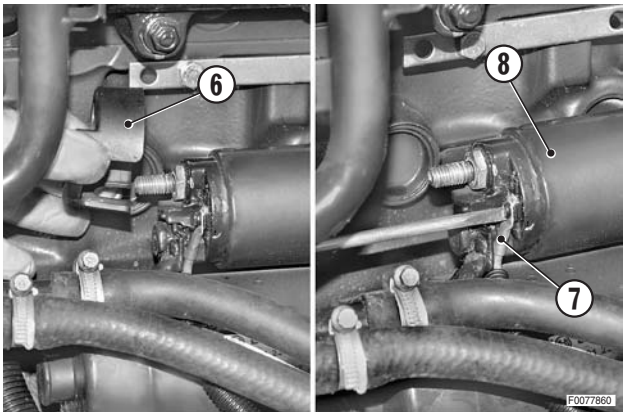
1 - Remove the left hood side panel (1) and the hood.

2 - Remove the terminal protector (2) and the nut (3) securing leads (4) and (5).



3 - Remove the terminal cover (6) and disconnect the lead (7).

4 - Remove the starter motor (8).
For details, see the engine manual.

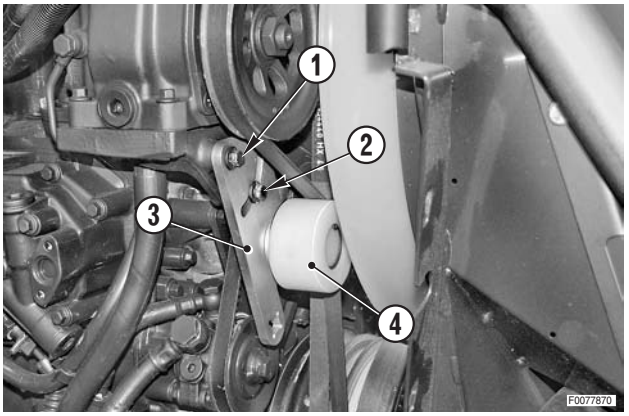


Refitting

- Refitting is the reverse of removal.

COMPRESSOR DRIVEBELT

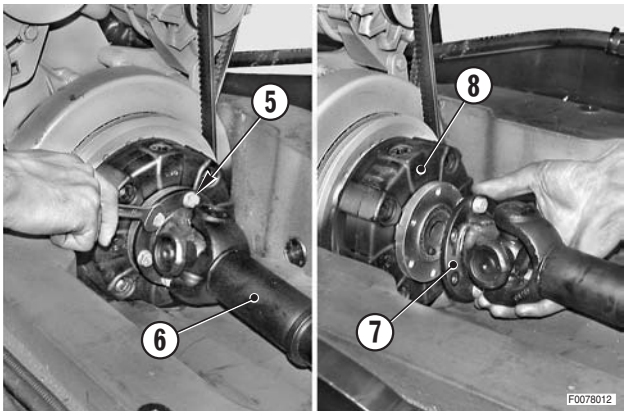
Renewal



⚠ Remove the key from the ignition and apply the parking brake.

1 - Loosen the pivot and fixing bolts (1), (2) of the bracket (3) supporting the belt tensioner pulley (4).

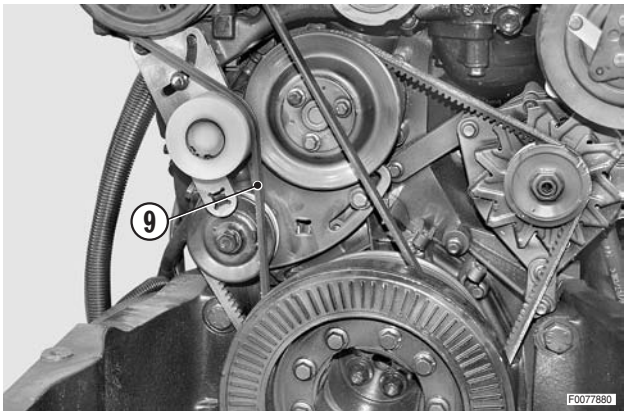
• For models with front PTO only



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 old drivebelt (9) and fit the new one.

5 - Tension the drivebelt.

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 - Remove the right-hand guard (1).

2 - Loosen the pivot and fixing bolts (2), (3) of the bracket (4) as for the belt renewal procedure.

3 - Tension the drivebelt using a “T” bar and 3/4” extension inserted in the hole in the bracket (4).

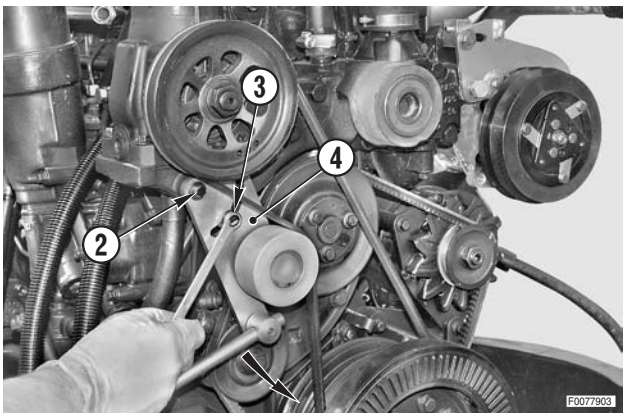
4 - To tension the drivebelt, turn the bar clockwise and then tighten the bolts (2), (3).

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.



AIR COMPRESSOR

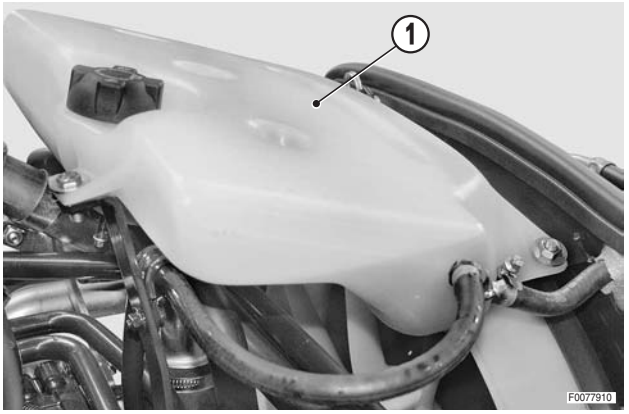
Removal

- **For 4-cylinder heroes**

1 - Partially drain the engine cooling system.

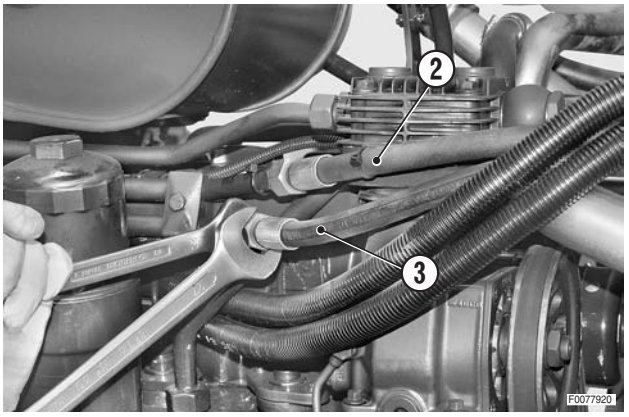
Coolant: approx. 5 ℓ
(1.32 US.gall.)

2 - Remove the expansion tank (1).
(For details, see "EXPANSION TANK").

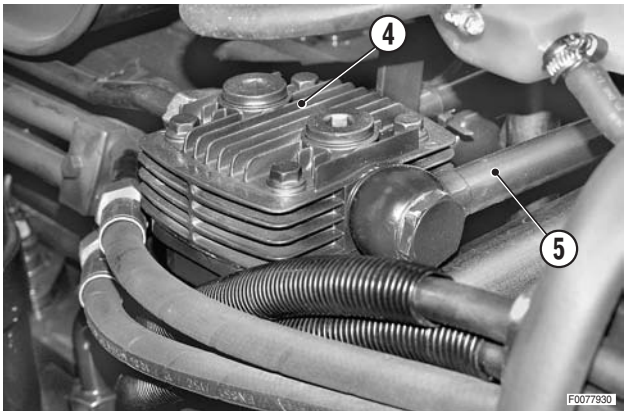


- **For all versions**

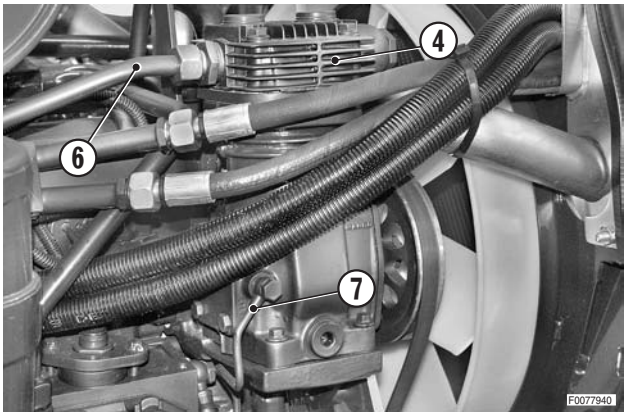
3 - Label and disconnect the transmission oil pressure and return pipes (2) and (3).
★ Immediately plug the ends of the pipes to prevent impurities from entering the system.



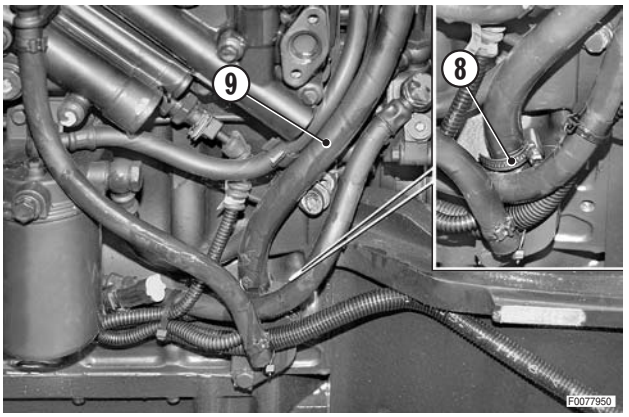
4 - Disconnect the air suction pipe (5) from the compressor (4).
★ Always renew the copper gaskets.



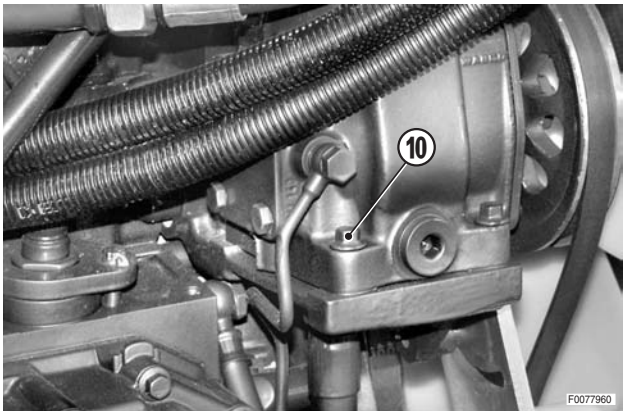
5 - Disconnect the pressure pipe (6) and lube oil pipe (7) from the compressor (4).
★ Always renew the seals of the lube oil pipe.



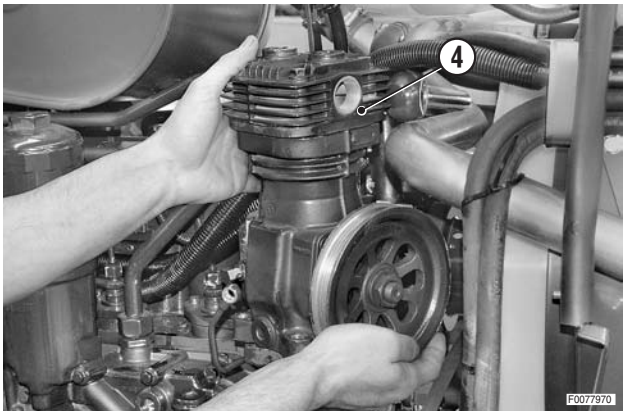
6 - Loosen the strap (8) and disconnect the lube oil recovery pipe(9).



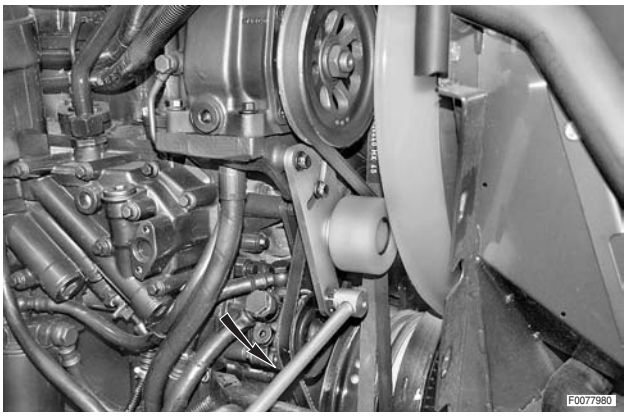
7 - Loosen and remove the bolts (10) securing the compressor.



8 - Remove the compressor (4), 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.)

1

★ Tension the drivebelt to obtain a static deflection "**A**":
immediately after fitting of = 550±50 N
after 15 minutes of operation: 400 N.

★ For details see "COMPRESSOR DRIVEBELT - Tensioning"

⚠ This check should be carried out with the engine cold

- **For 4-cylinder models**

1 - Refit the expansion tank and top up the coolant.

Coolant: approx. 5 ℓ
(1.32 US.gall.)

FAN DRIVE BELT

Renewal

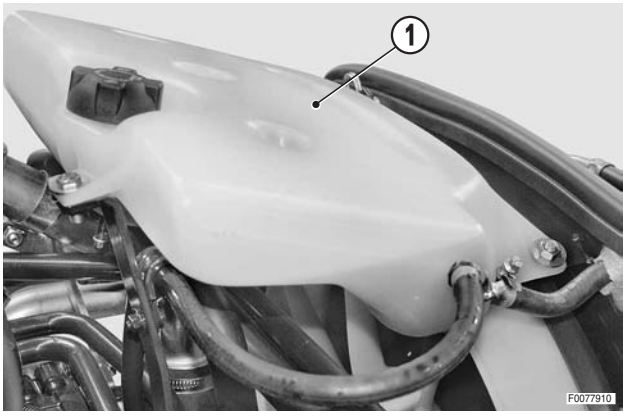
Remove the key from the ignition and apply the parking brake.

1 - Remove the drivebelt of the air compressor.
(For details, see "COMPRESSOR DRIVEBELT").

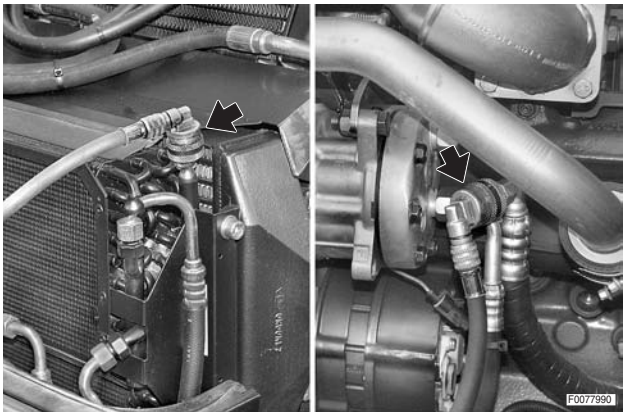
2 - Drain the engine cooling system.

Coolant: max. 17.5 ℓ
(4.62 US.gall.)

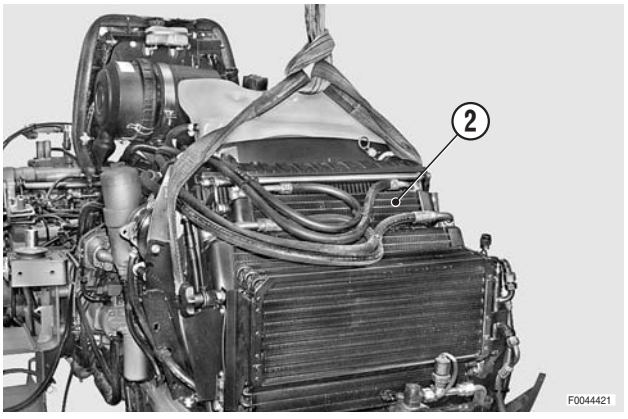
3 - Remove the expansion tank (1).
(For details, see "EXPANSION TANK").



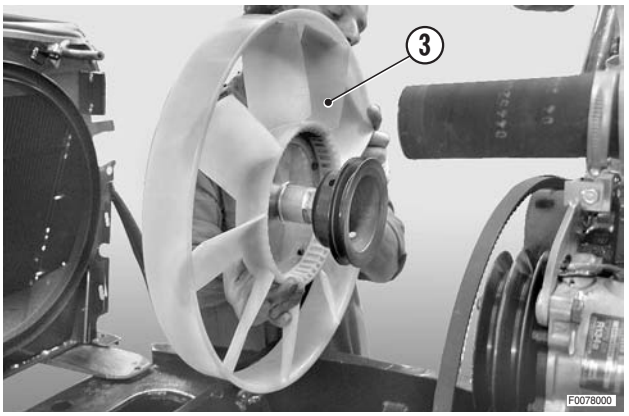
4 - Recover the refrigerant from the air conditioning system..
(For details, see "AIR CONDITIONING SYSTEM - Maintenance").



5 - Remove the complete radiator/coolers assembly (2).
(For details see "COMPLETE RADIATOR/COOLERS ASSEMBLY").

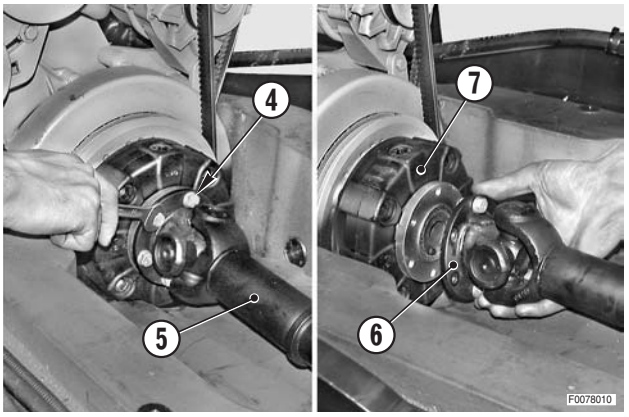


6 - Remove the fan (3).
(For details see "FAN").



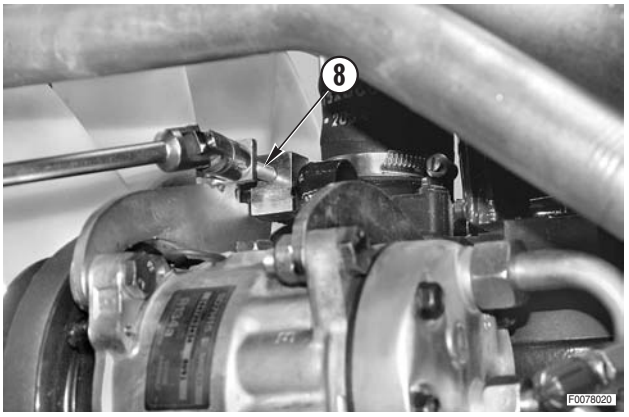
- **For models with front PTO**

7 - Loosen and fully unscrew the six bolts (4) securing the flange of the cardan shaft (5).
8 - Detach the flange (6) from the flexible coupling (7).



- **For all versions**

9 - Loosen the tensioner (8) and remove the old drive-belt.
10 - Tension the drivebelt.
(For details, see "AIR CONDITIONING SYSTEM - Tension of the compressor drivebelt").



FAN

Removal

⚠ Remove the battery cover and disconnect the negative battery lead (–).

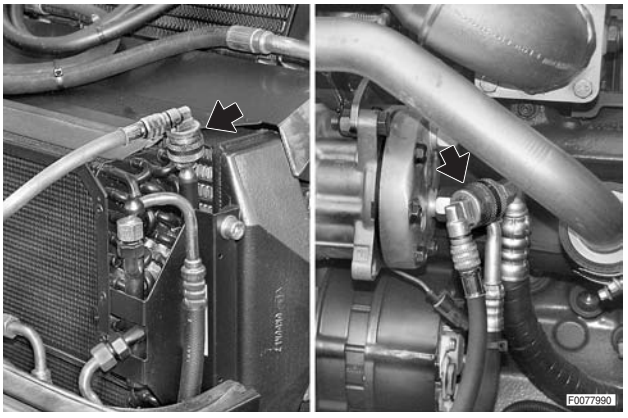
1 - Remove the side panels, the lamp assemblies and lower grille.
(For details, see "ENGINE HOOD AND LAMP ASSEMBLIES").

2 - Drain off the engine coolant.

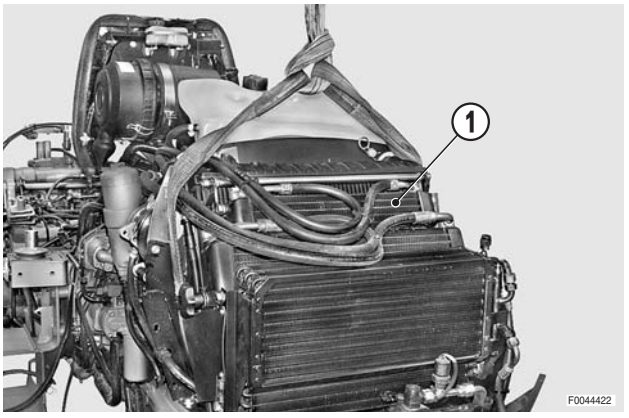
Coolant:
max. 17.5 ℓ (4.62 US. gall.)

3 - Remove the expansion tank.
(For details, see "EXPANSION TANK").

4 - Recover the refrigerant from the air conditioning system
(For details, see "AIR CONDITIONING SYSTEM - Maintenance").



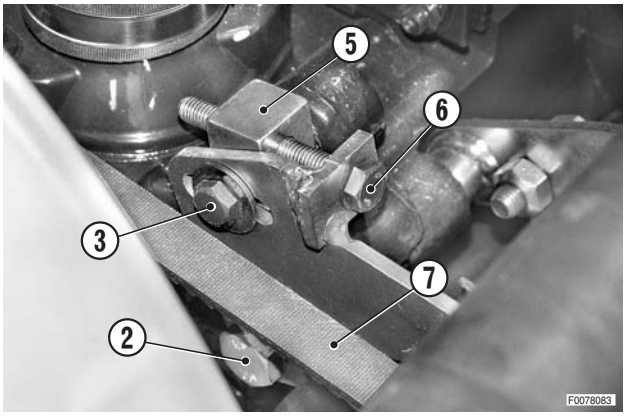
5 - Remove the radiator/coolers assembly (1).
(For details see "COMPLETE RADIATOR/COOLERS ASSEMBLY").



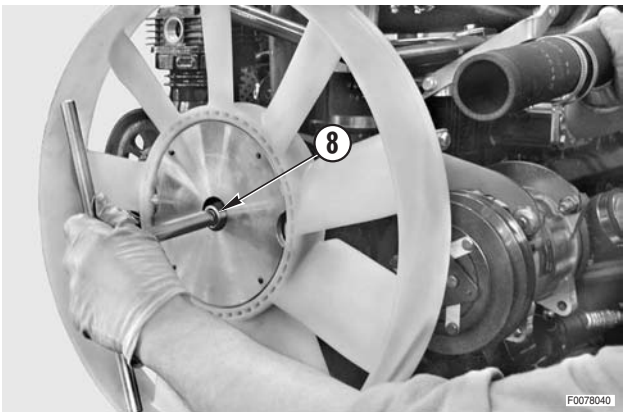
6 - Loosen the bolts (2) and (3) securing the air conditioning compressor (4) and the tensioner block (5).

7 - Turn the screw (6) anti-clockwise in order to slacken and release the fanbelt (7).

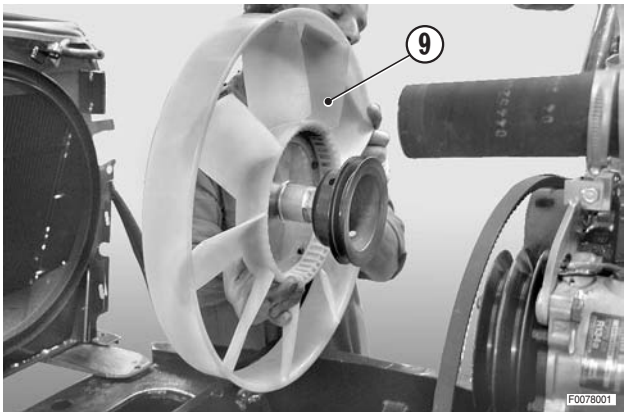
※ 1



8 - Using a hex socket wrench, loosen and remove the central screw (8) securing the fan (9) and its pulley.

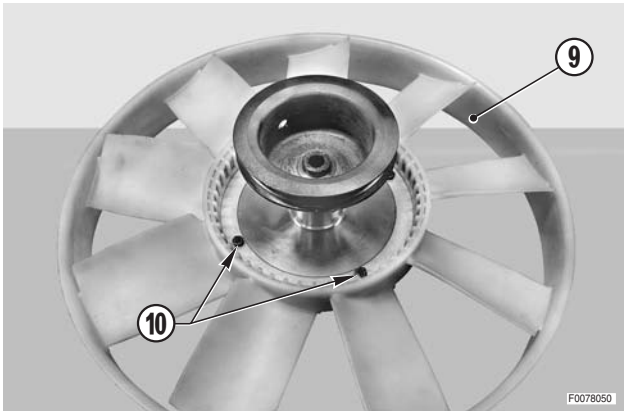


9 - Remove the complete fan assembly (9).



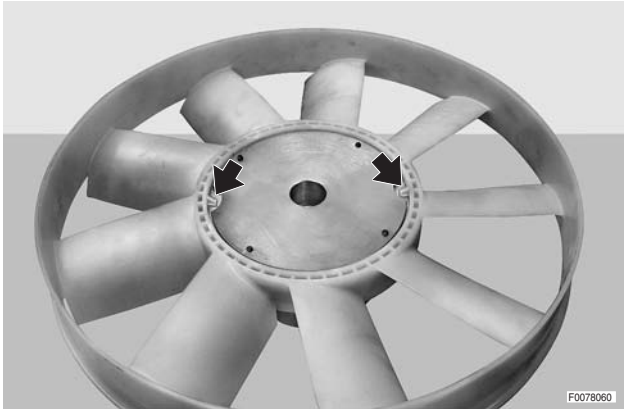
Renewal

10 - With the fan assembly (9) on a bench, loosen and remove the four retaining bolts (10) and remove the old fan.



11 - Position the new fan taking care to align the two locating marks.

12 - Tighten down the bolts (10) of the fan-pulley assembly.



Refitting

- Refitting is the reverse of removal

※ 1

★ Turn the tensioner screw (6) clockwise to tension the compressor and fan drivebelt.
(For details, see "AIR CONDITIONING SYSTEM - Tension of the compressor drivebelt").

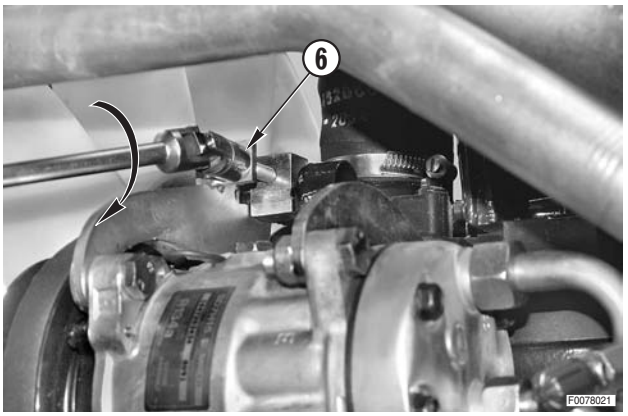
1 - Fill the engine cooling system.

Coolant:
max. 17.5 ℓ (4.62 US. gall.)

2 - Flush 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.



ALTERNATOR DRIVEBELT

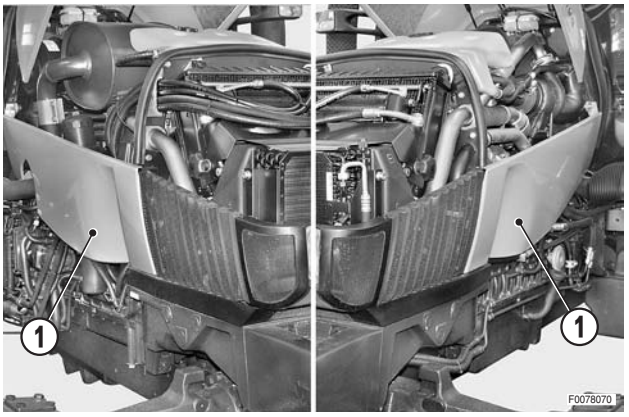
Renewal and tensioning

★ The drivebelt must be renewed at the first sign of wear. Check for fraying, cracks and separation of the belt plies.

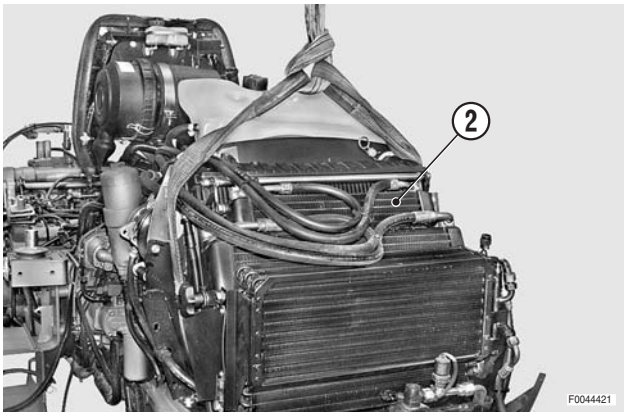
★ Some of the operations described below refer only to models equipped with front PTO and cab air conditioning.
For machines not equipped with these items, these operations should be ignored.

⚠ Remove the battery cover and disconnect the negative battery lead (–).

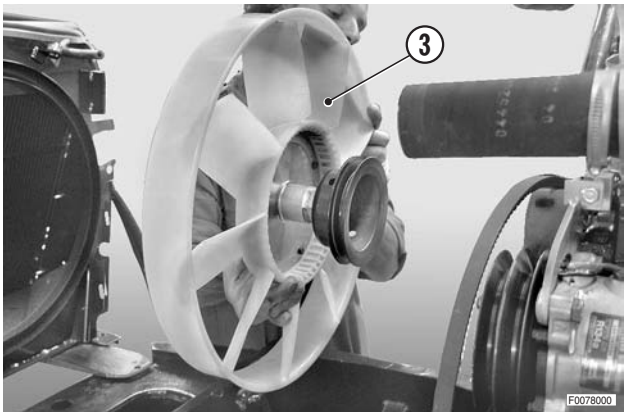
1 - Remove the side panels (1).



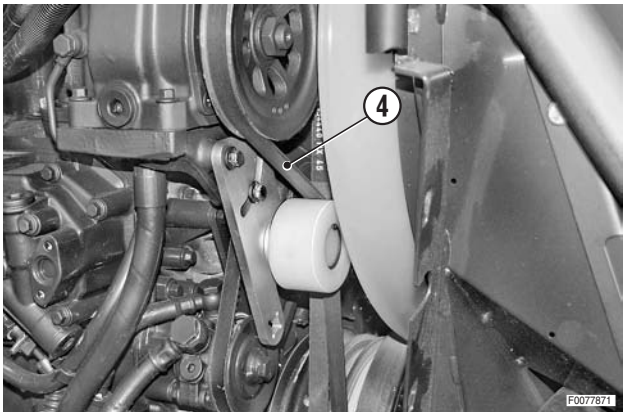
2 - Remove the radiator/coolers assembly (2).
(For details see "COMPLETE RADIATOR/COOLERS ASSEMBLY").



3 - Remove the complete fan assembly (3).
(For details see "FAN").



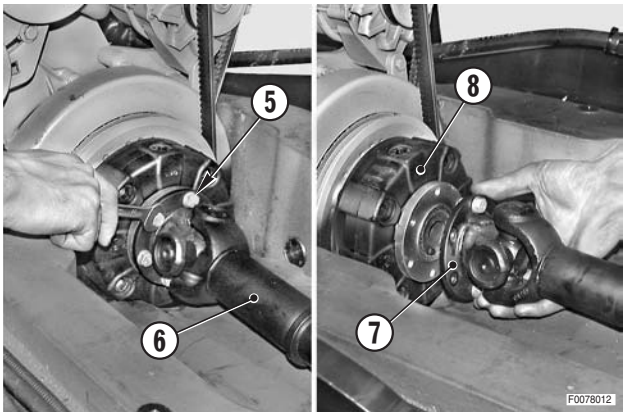
4 - Slacken the air compressor drivebelt (4).
(For details, see "COMPRESSOR DRIVEBELT").



- **For models with front PTO**

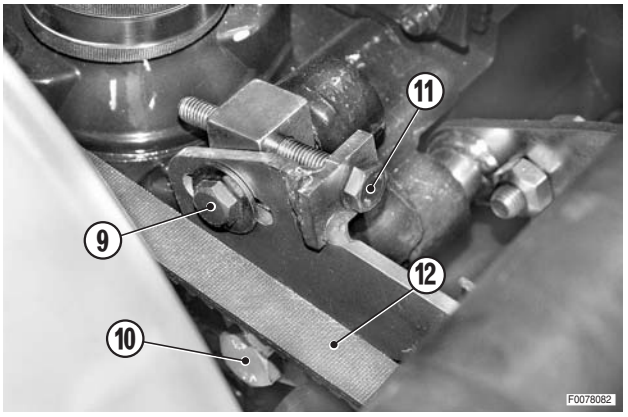
5 - Loosen and fully unscrew the six bolts (5) securing the flange of the cardan shaft (6).

6 - Detach the flange (7) from the flexible coupling (8).

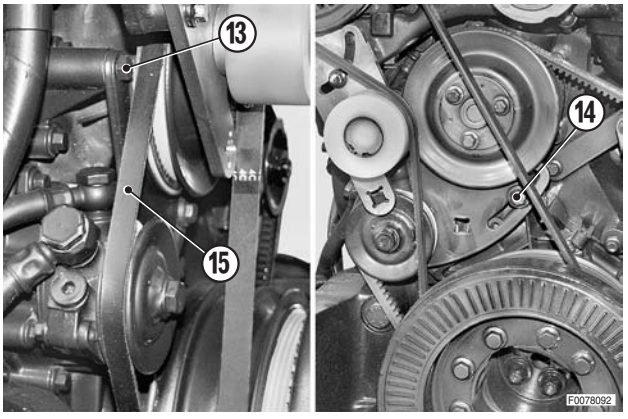


- **For all versions**

7 - Loosen the bolts (9), (10) and (11) to slacken the fan and compressor drivebelt.
Remove the drivebelt (12).

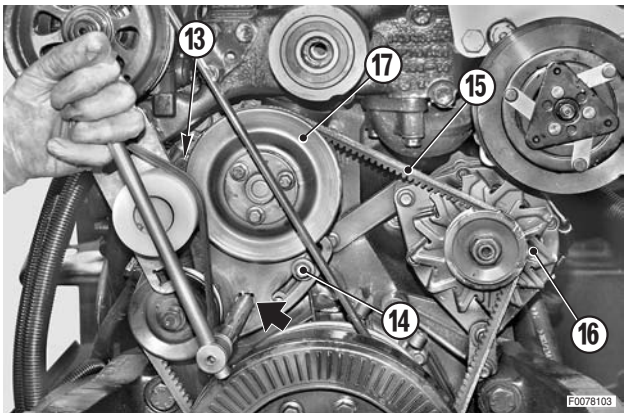


8 - Loosen the bolts (13) and (14) securing the fuel lift pump, disengage the alternator drivebelt (15) and remove it by passing it between the crankshaft pulley and the front support.



9 - Using the same method, fit the new drivebelt (15) for the alternator (16) and tension using a “**T**” bar and a 3/4” extension, or a 3/4 angle bar” inserted in the seat machined in the fuel lift pump support (17).

10 - Tension the drivebelt by turning the bar clockwise and then tighten down bolts (13) and (14).

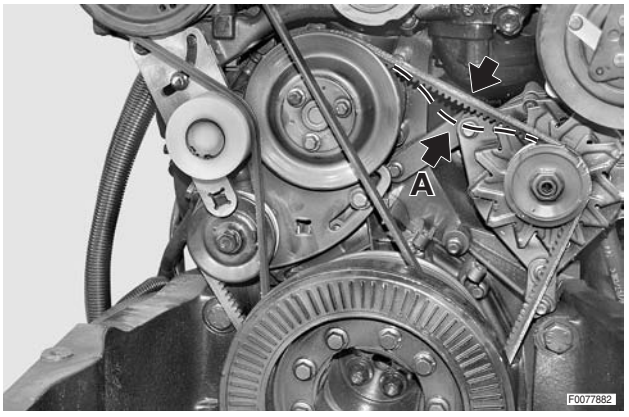


11 - To check that the tension is correct, use the tool and procedure indicated in the engine manual.

★ Static deflection ”**A**” immediately after fitting: 13 mm belt: 450±50 N

★ Static deflection”**A**” after 15 minutes: 13 mm belt: 300±50 N

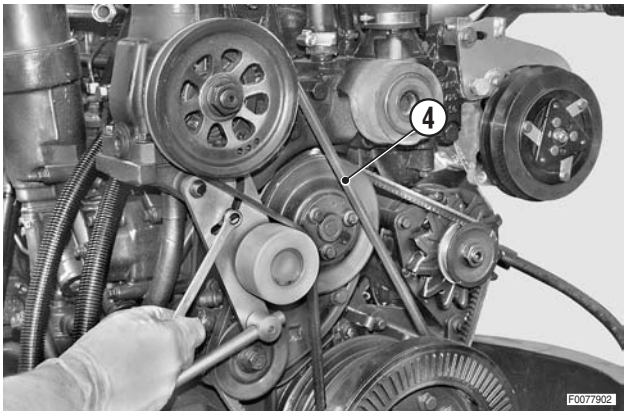
⚠ The check should be carried out with the engine cold.



12 - Fit and tension the fan drivebelt. (For details, see "FAN").

13 - Fit and tension the air compressor drivebelt (4). (For details, see "COMPRESSOR DRIVEBELT").

14 - Complete the refitting procedure by following the first steps of the removal procedure in reverse order.



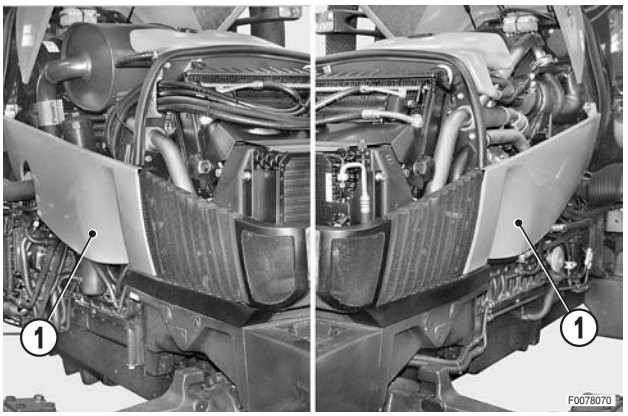
ALTERNATOR

Removal

⚠ Remove the battery cover and disconnect the negative battery lead (–).

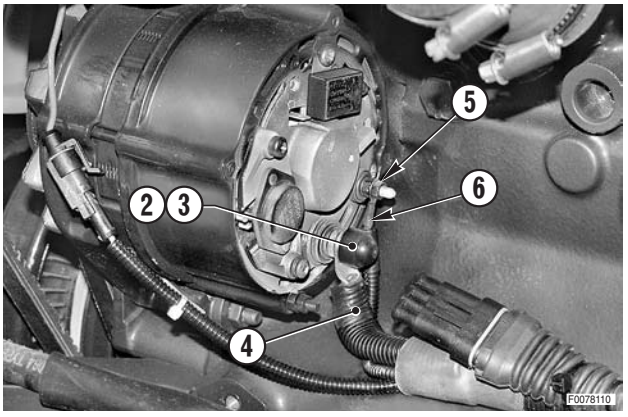
1 - Remove the left and right side panels (1).

2 - Remove the air compressor.
(For details see "AIR COMPRESSOR").



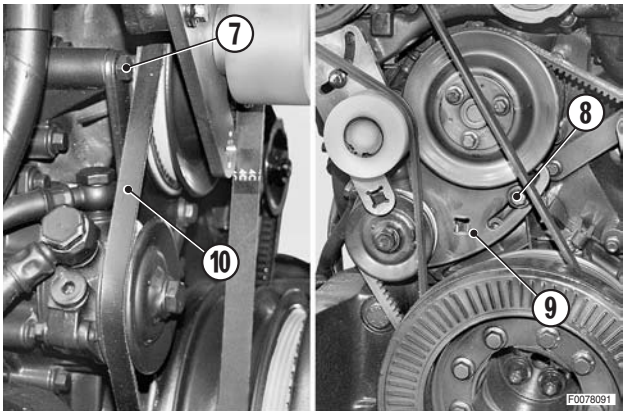
3 - Remove the terminal protector (2), remove the nut (3) and disconnect the lead (4).

4 - Remove the nut (5) and disconnect the lead (6).



5 - Loosen the bolts (7) and (8) of the fuel pump bracket (9) in order to slacken off the drivebelt (10).

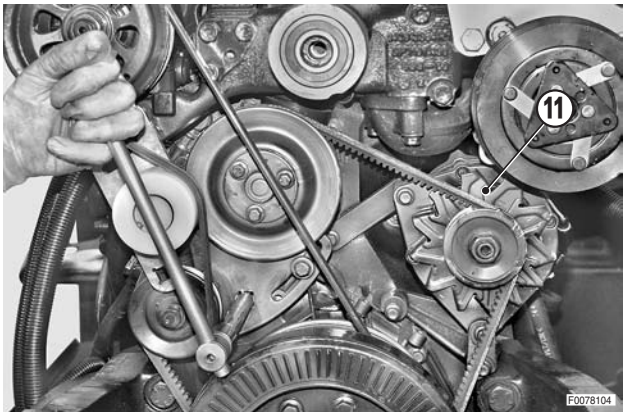
6 - Remove the alternator (11).
For details, see the engine manual.



Refitting

- Refit the alternator following the removal steps in reverse order and adjust the drivebelt tension.
(For details, see "ALTERNATOR DRIVEBELT").

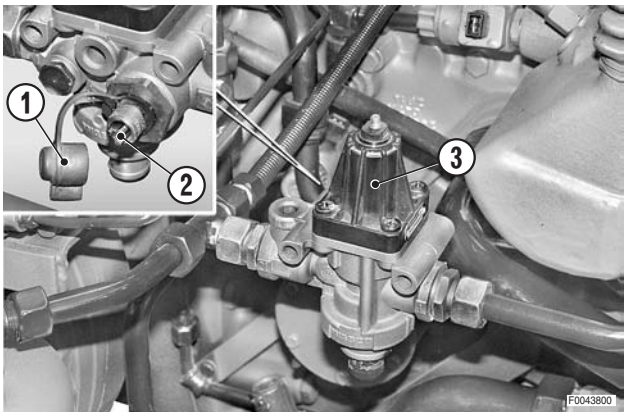
1 - Start the engine and check the compressor pipe fittings for leaks.



AIR RESERVOIRS
(for version with air trailer braking only)

Removal

Vent residual pressure from the reservoir by removing the cap (1) and pressing the button (2) on the pressure regulator valve (3).

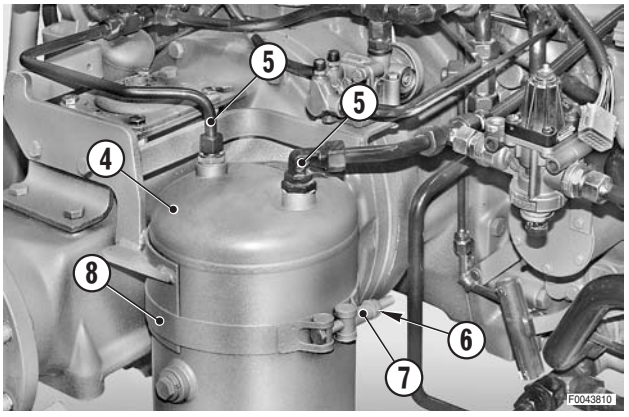


1 - Disconnect the inlet and outlet pipes (5) from the right-hand reservoir (4). ⁘ 1

★ On the left-hand reservoir, disconnect the pipe to the pressure regulator valve.

2 - While supporting the reservoir (4), unscrew and remove the nut (6) and the spacer (7) of the retaining strap (8).

3 - Remove the reservoir (4).



Refitting

- Refitting is the reverse of removal.

⁘ 1

★ Before tightening down the reservoir, tighten the fittings of the inlet and outlet pipes.

AIR BRAKING SYSTEM VALVES

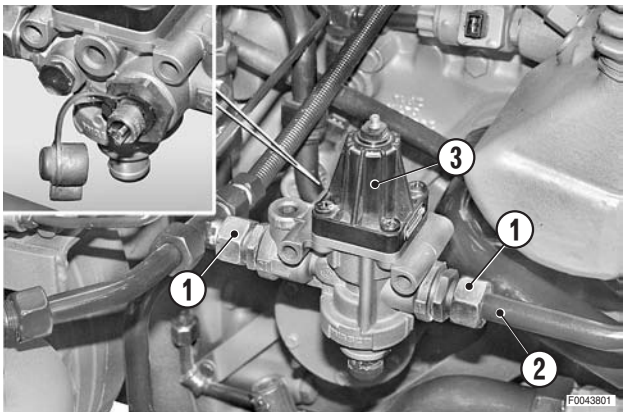
Removal

Switch off the engine and remove the key from the ignition.

Eliminate all residual pressure from the trailer air braking circuit.

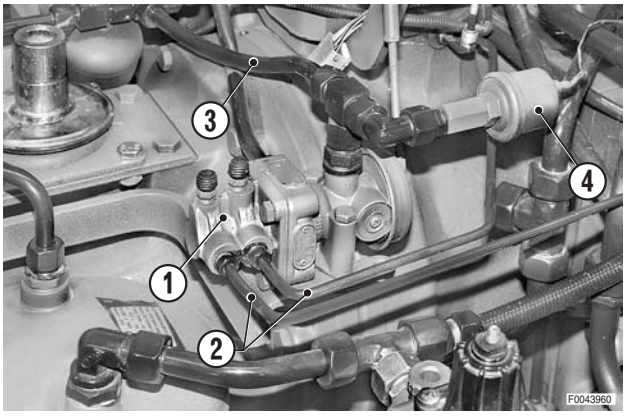
1. Pressure regulator valve

1 - Loosen the fittings (1), disconnect the pipe (2) and remove the valve (3).

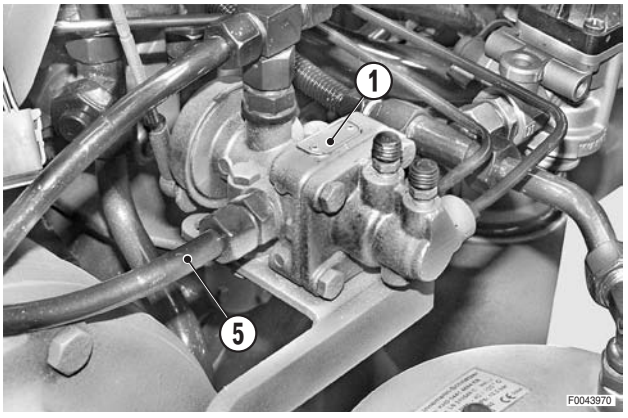


2. Parking brakes valve

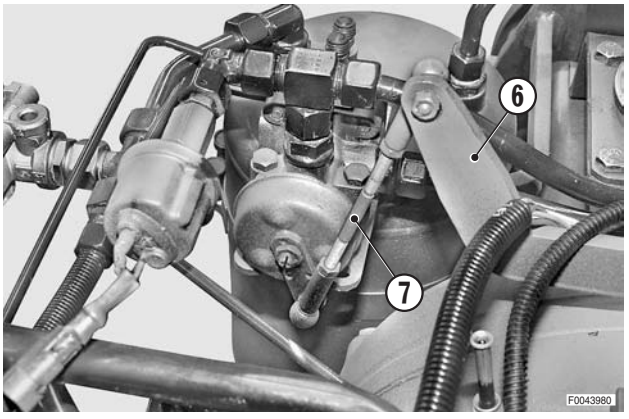
1 - Disconnect the hydraulic brakes pipes (2) and pipe (3) for the pressure switch (4) from the valve (1).



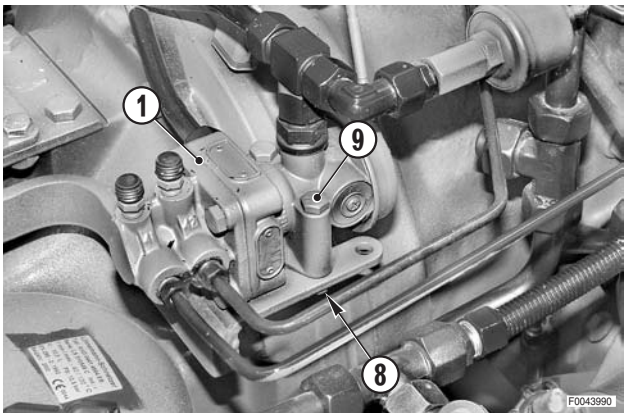
2 - Disconnect supply pipe (5) from the inner side of the valve (1).



3 - Disconnect the tie-rod (7) from the valve control lever (6). ⁘ 1



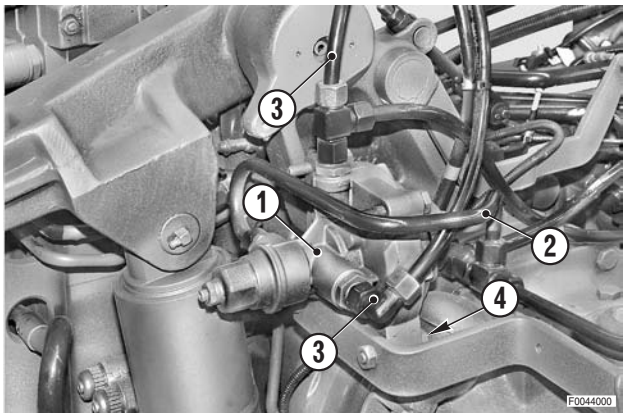
4 - Remove the lower nuts (8) and two bolts (9); remove the valve (1).



3. Service brakes (EXPORT F version)

1 - Disconnect the supply pipes (2) and the two brake control pipes (3) from the valve (1).

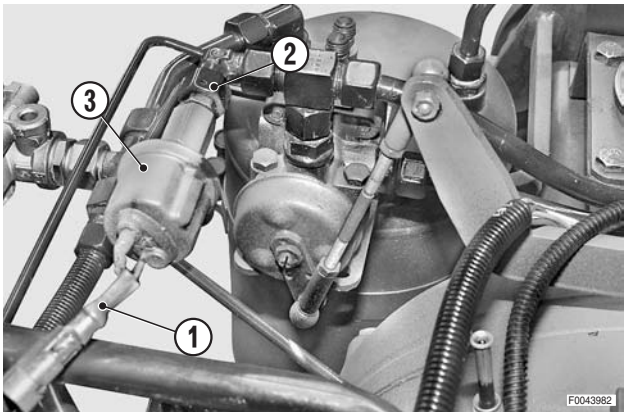
2 - Unscrew the bolts (4) and remove the valve.



4. Pressure transducer

1 - Unplug the connector (1).

2 - Loosen the fitting (2) and remove the transducer (3).



Refitting

- Refitting is the reverse of removal.

1 - Start the engine and allow the pressure to build in the air braking circuit.

2 - Check the seal at all removed fittings using a soapy solution.

3 - Bleed the brake circuit of air.
(For details, see "BRAKING SYSTEM").

4 - Check that the parking brake valve control lever operates at the correct point and, if necessary, adjust the length of the tie-rod.

Adjusting the length of the tie-rod

※ 1

1 - Check that the parking brakes are perfectly adjusted and that they are released.

2 - Raise the parking brake lever to the first notch; you should distinctly hear the parking brake valve operate in correspondence with the first notch position.

3 - If the valve operation is too ADVANCED, lengthen the control rod.
If the valve operation is too RETARDED, shorten the control rod.

4 - Operate the parking brake a few times, checking that the tractor and trailer brakes are applied simultaneously.

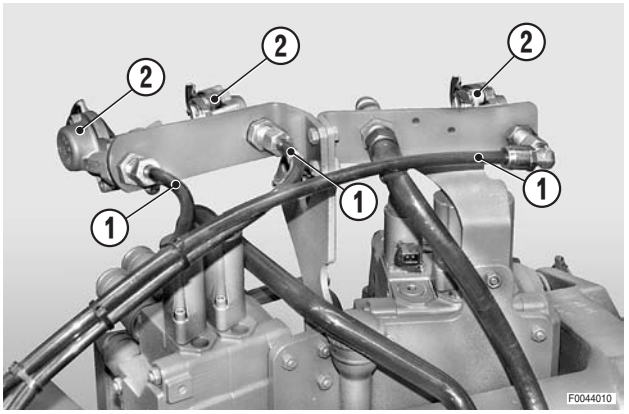
TRAILER AIR BRAKES COUPLING HEADS

Removal

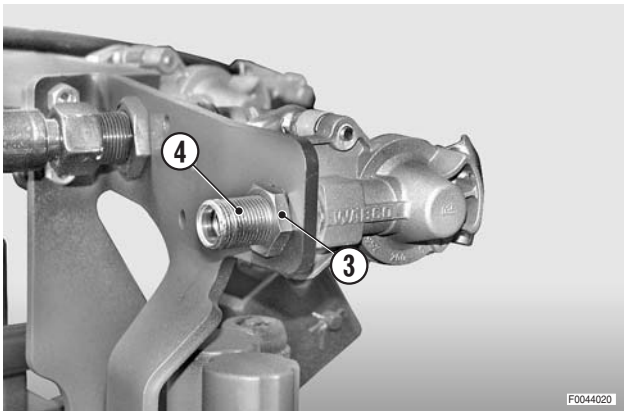
Vent residual pressure from the reservoir by pressing the button on the regulator valve.

Remove the key from the ignition and apply the parking brake.

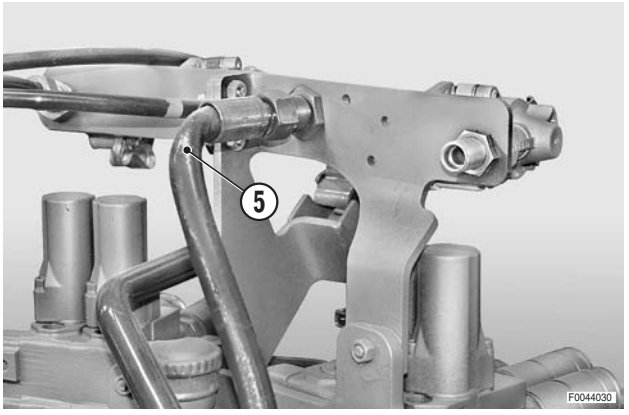
1 - Label the three pipes (1) and disconnect them from the valves (2).



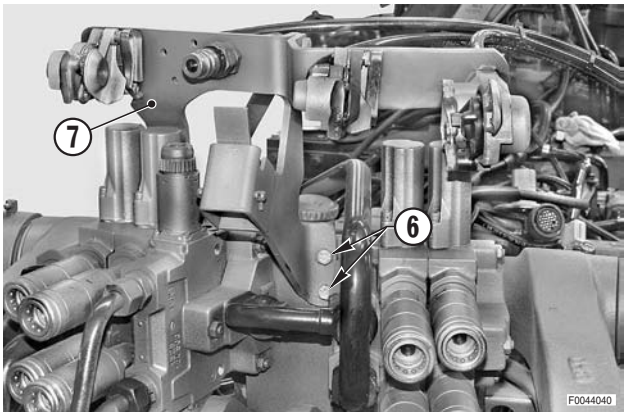
2 - Loosen the retaining nut (3) and remove the coupling head (4) that is to be replaced.



3 - Disconnect the pipe (5) from the free drain quick coupler.



4 - Unscrew and remove the bolts (6) and remove the assembly (7).



Refitting

- Refitting is the reverse of removal.

HYDRAULIC TRAILER BRAKING VALVES

Removal

Remove the key from the ignition.

1. EXPORT Version

1 - Remove the right rear wheel.
(For details, see "REAR WHEELS").

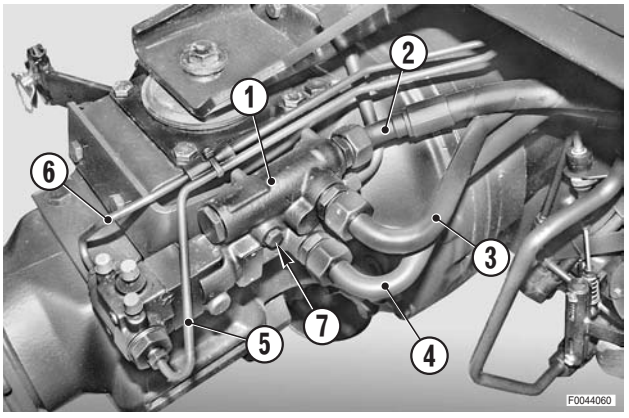
Thoroughly clean the area before commencing removal.

2 - Disconnect pipes (2), (3) and (4) from the valve (1).
★ Plug the pipelines and ports to prevent impurities getting in.

3 - Disconnect the supply pipes (5), (6) to the service brakes.

1

4 - Unscrew and remove the bolts (7) with their nuts.
Remove the valve (1).



2. Italy version

1 - Remove the right rear wheel.
(For details, see "REAR WHEELS").

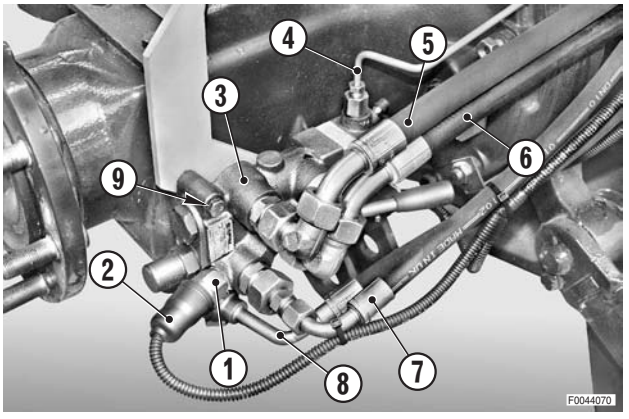
Clean the area thoroughly before starting the removal procedure.

2 - Unplug the connector (2) from the pressure switch (1).

3 - Disconnect, in the order given, pipes (4), (5), (6), (7) and (8) from the valve (3).
★ Plug the pipelines and ports to prevent impurities getting in.

1

4 - Unscrew and remove the bolts (9) with their nuts.
Remove the valve (3).



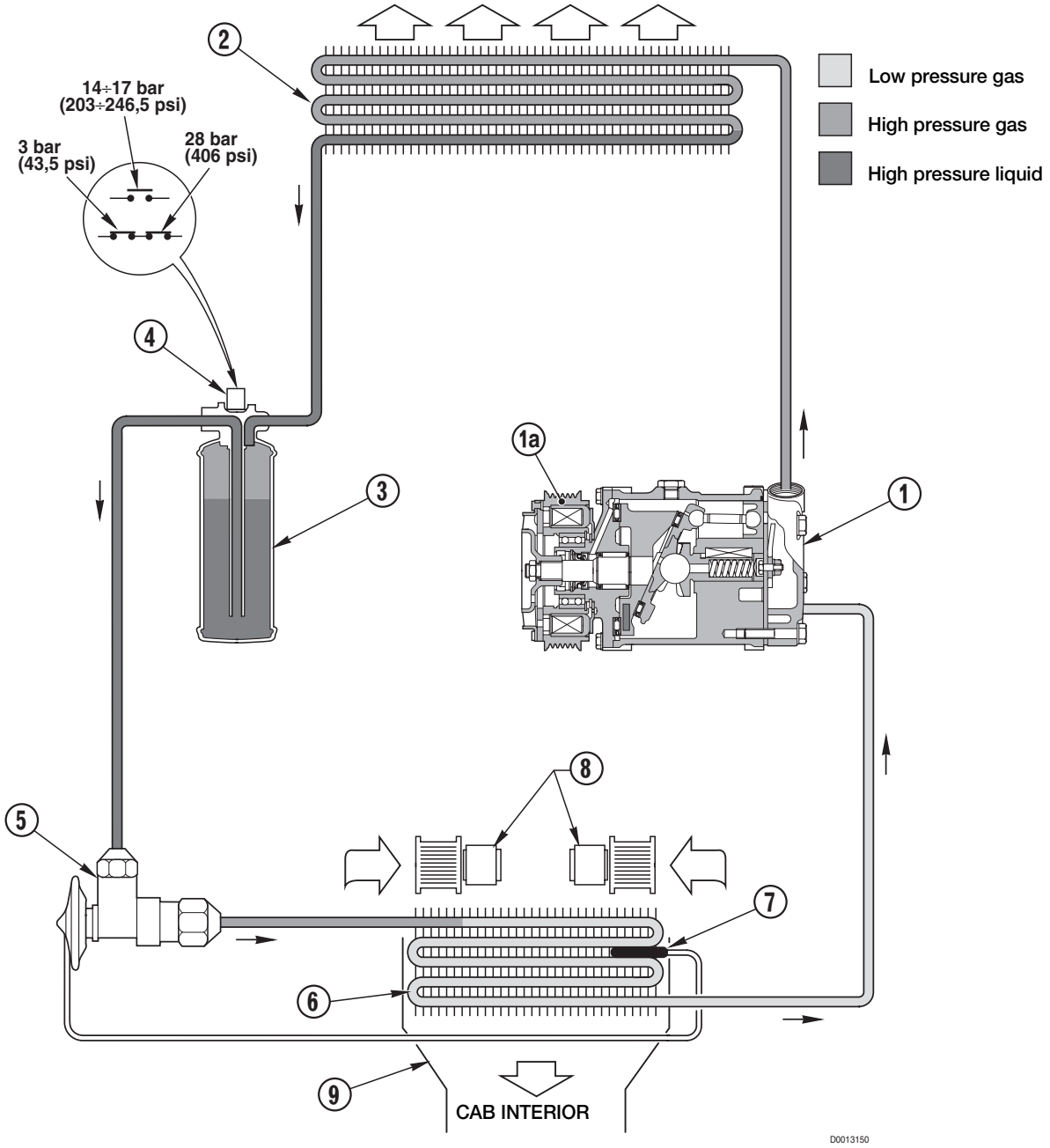
Refitting

- Refitting is the reverse of removal.

1

★ Bleed the braking system.
(For details, see "BRAKING SYSTEM").

AIR CONDITIONING SYSTEM



Description

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 specifications

- Minimum and maximum safety pressure:
  2.4 – 28.5 bar (34.8 – 413.3 psi)
- Refrigerant type: R134a
- Refrigerant quantity: 1600 g (56.4 oz.)
- Total quantity of moisture-free oil added at 1st charging:
  210 cm^3 (12.81 Cu.in.)

Operation

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 comprise 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 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.

Maintenance

The checks and servicing operations required for the air conditioning system are as follows:

1 - Checking the tension and condition of the compressor drivebelt.

2 - Discharging, flushing and recharging of the system using a specific servicing machine and R134 refrigerant.

3 - Removal and renewal of the compressor.

4 - Inspection and renewal of the electromagnetic clutch pulley (to be carried out at a specialised service centre).

5 - Removal and renewal of the receiver-drier.

6 - Removal and renewal of the condenser.

7 - Removal of the evaporator and the electronic temperature sensor.
(For these operations see "AIR CONDITIONING EVAPORATOR").

Tension of the compressor drivebelt

★ 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.

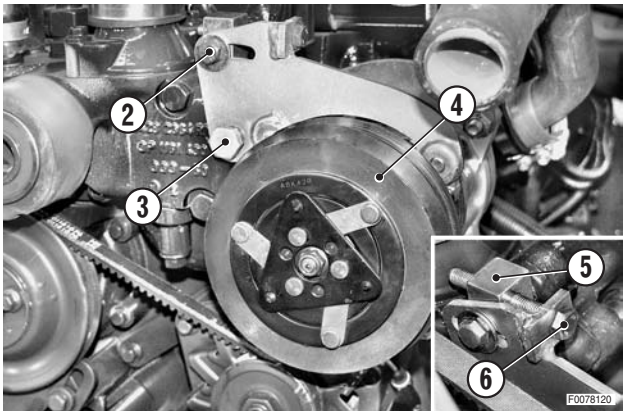
⚠ If a new belt is fitted, re-adjust the tension after approx. 15 operating hours.

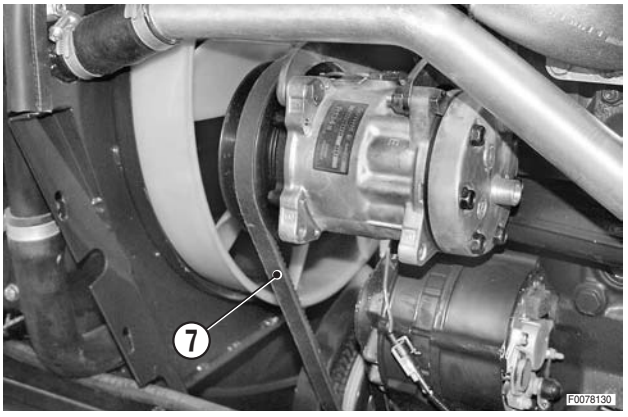
1 - Remove the right-hand grille (1).

2 - Loosen the bolts (2) and (3) securing the air conditioning compressor (4) and the tensioner block (5).

3 - Turn the tensioner screw (6) clockwise to tension drivebelt (7) 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.

4 - Tighten bolts (2) & (3).





Discharging, flushing and recharging

⚠ 1 - Before discharging, flushing and recharging the air conditioning system, inspect the system for leaks using a suitable leak detector.

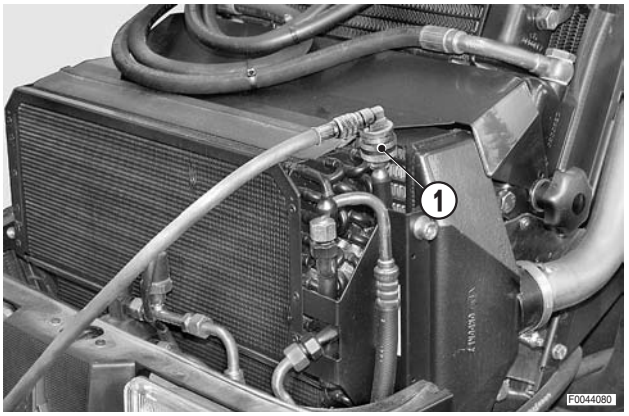
2 - In order to carry out the system servicing operations you will require a dedicated servicing machine capable of performing the following tasks:

a - Aspiration of the refrigerant fluid.
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 the 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 open ends of the system pipes as quickly as possible.**

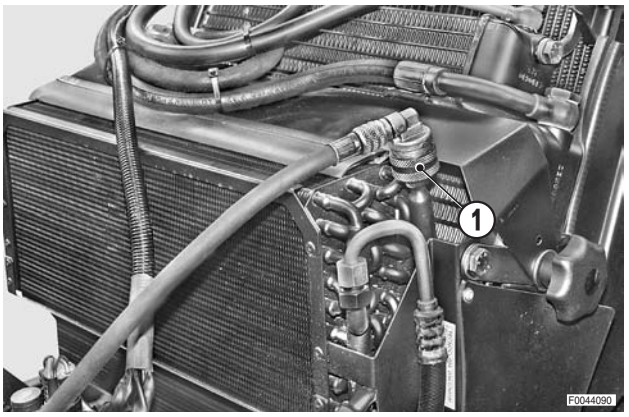


2. Flushing and recharging the system

Before each recharging, the system must be purged of all air, moisture and contaminants (oxides, deposits).
This entails creating a high vacuum within the system to evaporate any moisture present. The vapour, when extracted, draws with it any contaminants present in the system.

★ For the flushing 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.

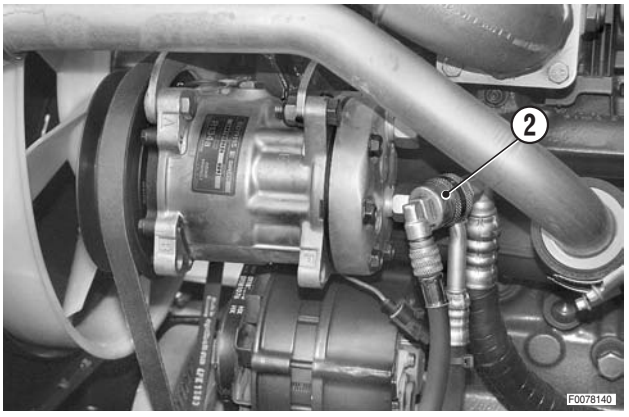


After flushing, the moisture-free oil recovered during the discharging operation must be re-introduced into the system, followed by the refrigerant.

Quantity of refrigerant (R134a): 1600 g (56.4 oz.)
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 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.



AIR CONDITIONING COMPRESSOR

Removal

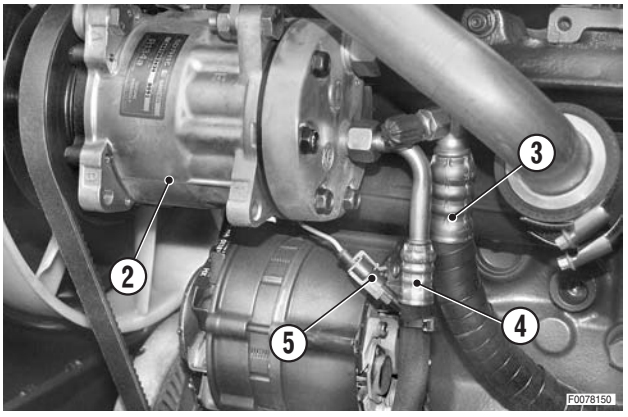
1 - Discharge the liquid refrigerant from the system. (For details, see "AIR CONDITIONING SYSTEM - Maintenance").

2 - Remove the right-hand side panel (1).

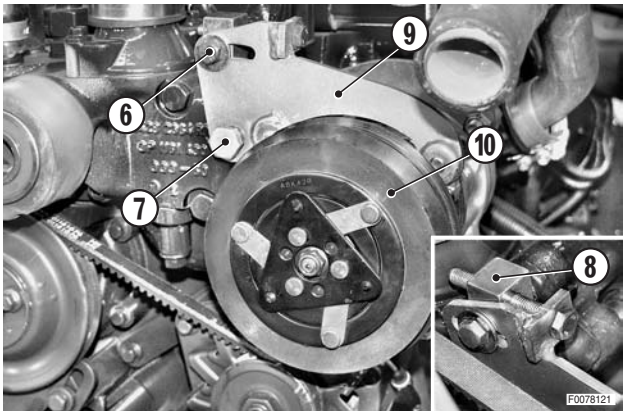
3 - Disconnect the inlet (3) and delivery (4) lines from the compressor (2).

★ Immediately plug the open fittings to prevent the entry of moisture. ※ 1

4 - Disconnect the electromagnetic clucth control connector (5).

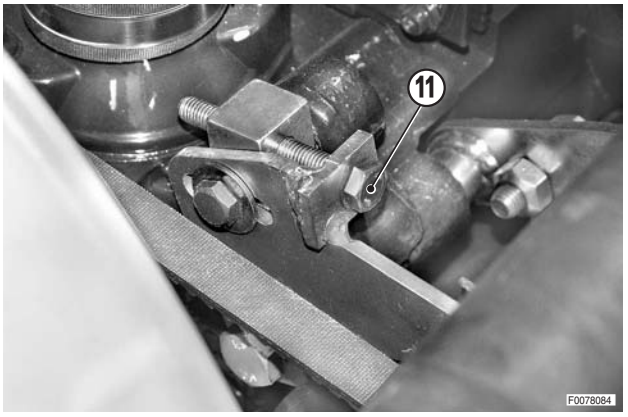


5 - Loosen the bolts (6) and (7) securing the tensioner block (8) and acting as pivot for the support (9) of the compressor (10).

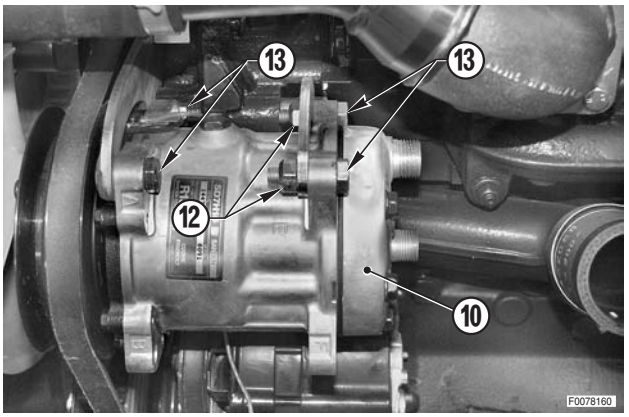


6 - Turn the tensioner screw (11) to slacken the fan and compressor drivebelt.

★ Loosen the drivebelt sufficiently to be able to slip it off the compressor pulley.



7 - Loosen and remove the self-locking nuts (12) and bolts (13); remove the compressor (10).



Refitting

- Refitting is the reverse of removal

1

★ Remove the plugs and connect the pipes immediately, fully tightening the fittings, to prevent the entry of moisture.

★ Check the condition of the O-ring seals and renew them if damaged.

1 - Adjust the tension of the compressor/fan drivebelt. (For details see "COMPRESSOR DRIVEBELT" - "FAN DRIVE BELT").

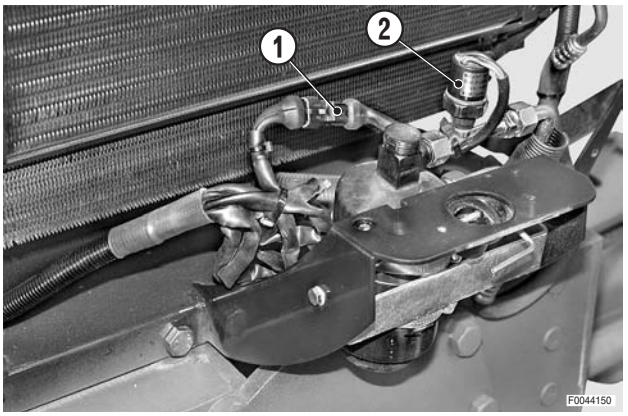
2 - Flush and recharge the system. (For details see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").

RECEIVER-DRIER

Removal

1 - Recover the refrigerant from the system.
(For details, see "AIR CONDITIONING SYSTEM - Maintenance").

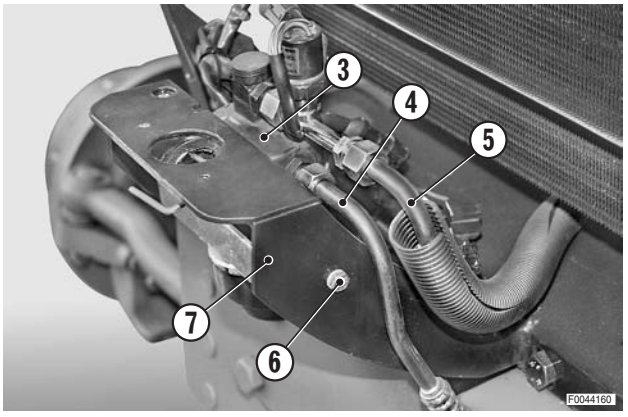
2 - Disconnect the connector (1) of the pressure switch (2).



3 - Disconnect the inlet (4) and outlet (5) pipes from the receiver-drier (3).

★ Plug the ends of the pipes immediately to prevent moisture getting into the system. ※ 1

4 - Unscrew and remove the bolts(6) securing the bracket (7) and remove the assembly.



⚠ If a new receiver-drier is to be installed, measure the quantity of oil contained in the old unit in order to determine the quantity of oil to be added to the system.

Refitting

• Refitting is the reverse of removal.

※ 1

★ Remove the plugs and connect the pipes immediately, fully tightening the fittings, to prevent the entry of moisture.

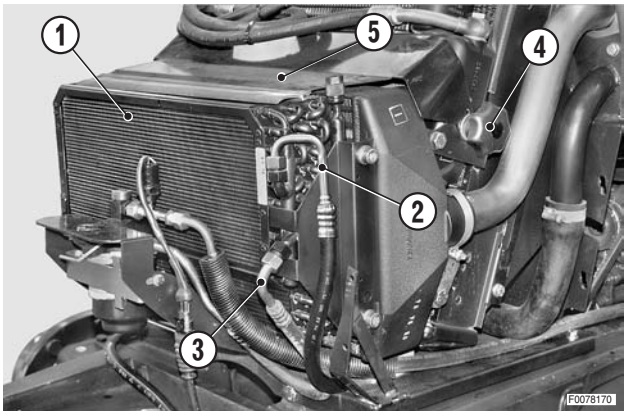
★ Check the condition of the O-rings and replace them if damaged.

1 - Flush and recharge the system.
(For details see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").

CONDENSER ASSEMBLY

(The figures depict models with 6-cylinder engines)

Removal



⚠ Remove the key from the ignition and engage the parking brakes.

1 - Remove the side panels.

2 - Recover the refrigerant from the system. (For details see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").

3 - Disconnect the pipes (2) and (3) from the condenser (1).

※ 1

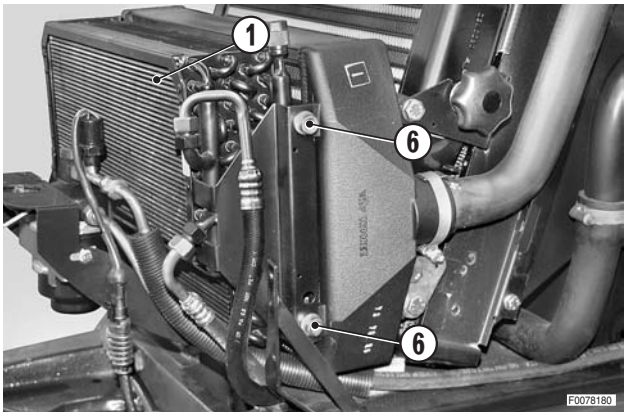
★ Immediately plug the open ends of the pipes to prevent moisture from getting into the system.

4 - Unscrew the knobs (4) and remove the cowling (5).

5 - Remove the bolts (6) (n°4).

6 - Remove the condenser assembly (1).

★ Take care not to damage the fins.



Refitting

• Refitting is the reverse of removal.

※ 1

★ Remove the plugs and connect the pipes immediately, fully tightening the fittings, to prevent moisture getting into the system.

★ Check the condition of the O-ring seals and renew them if damaged.

1 - Flush and recharge the system.
(For details see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").

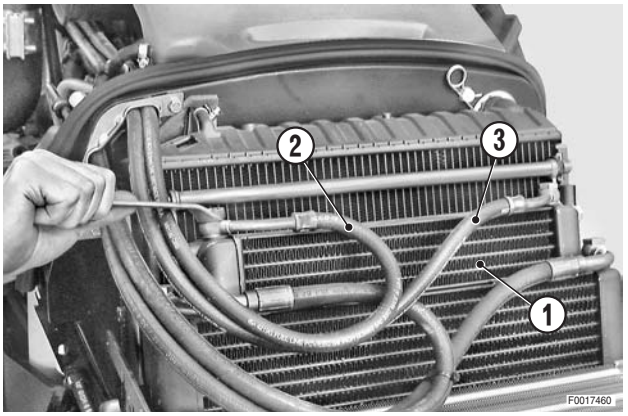
GEARBOX OIL/FUEL COOLERS

Removal

1 - Remove the side panels.

2- Disconnect the inlet and outlet pipes (2) and (3) from the fuel cooler (1).

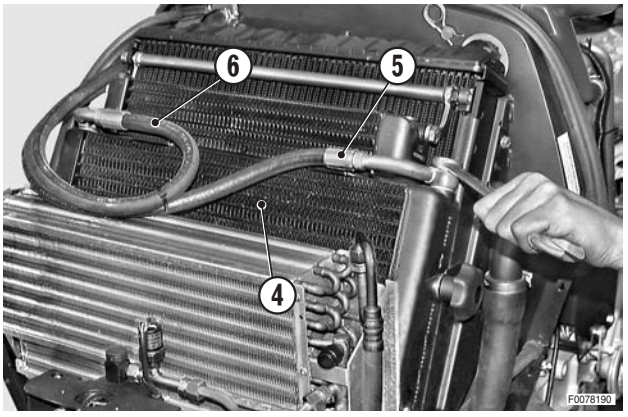
★ Label the pipes and fittings to avoid confusion on reconnection.



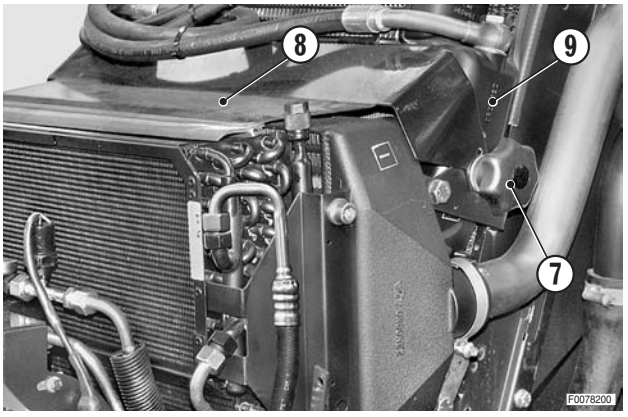
3 - Disconnect the inlet and outlet pipes (5) and (6) from the oil cooler (4).

★ Label the pipes and fittings to avoid confusion on reconnection.

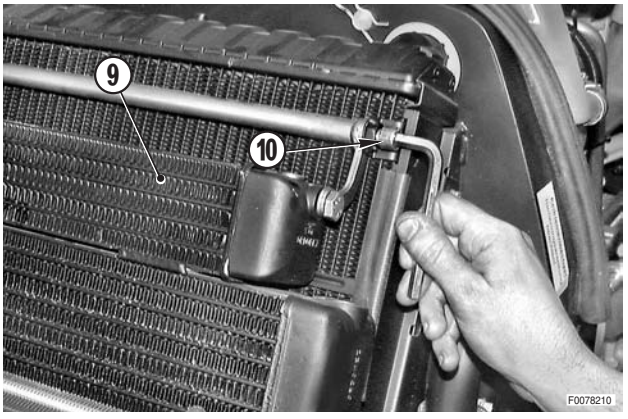
★ Plug the open ends of the pipes to prevent moisture getting into the system.



4 - Loosen the knobs (7) securing the upper cowling (8) of the heat exchangers assembly (9); remove the cowling.

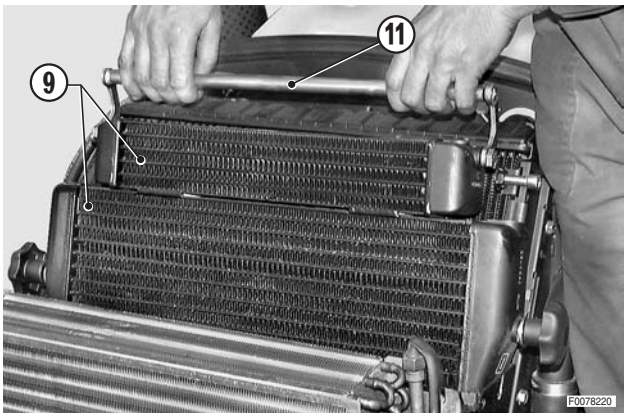


5 - Remove the two bolts (10) supporting the coolers (9).



6 - Remove the cooler assembly (9), by pulling the handle (11) upwards.

⚠ Keep the coolers vertical to prevent spillage of oil/fuel.

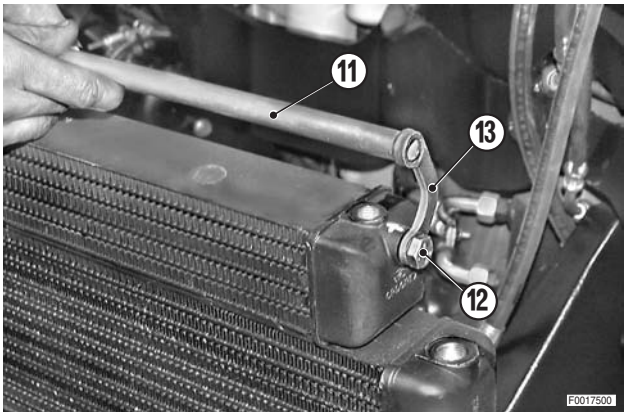


7 - **Only if the assembly is to be renewed:**

a - Draw off the fuel and oil from the coolers.

b - Recover the pivot bolts (12), the brackets (13) and the handle (11) and fit to the new assembly.

※ 1



Refitting

- Refitting is the reverse of removal.

※ 1

Bracket retaining bolts: Loctite 222

1 - Start the engine and allow the gearbox oil and fuel 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.

RADIATOR

Removal

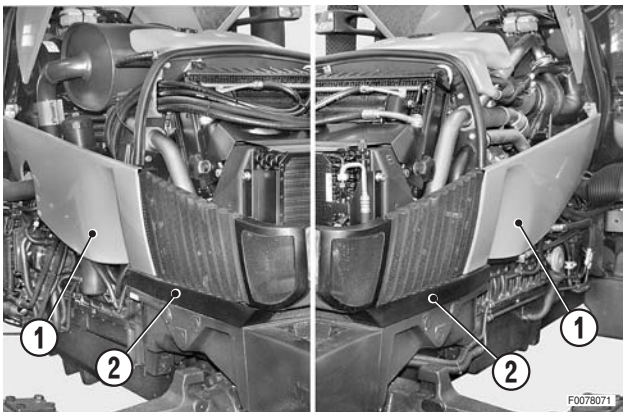
⚠ Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the side panels (1) and lower cover (2).

2 - Drain off the engine coolant.

Coolant:

Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62



3 - Remove the gearbox oil/ fuel coolers.
(For details, see "GEARBOX OIL/FUEL COOLERS").

4 - Remove the expansion tank.
(For details, see "EXPANSION TANK").

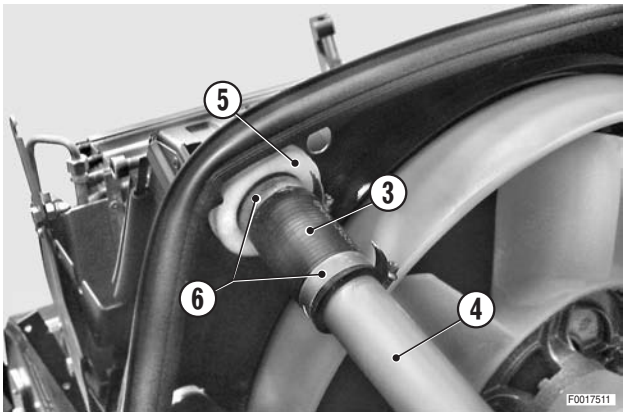
• On some 4-cylinder models only

5 - Remove the intercooler
(For details "INTERCOOLER").

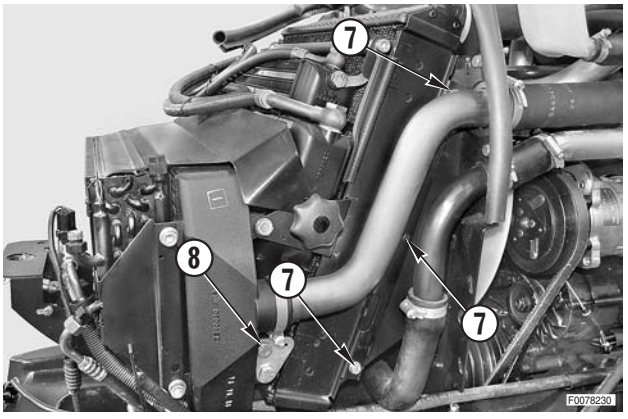
• For all versions

6 - Disconnect the hose (3) of the engine connection pipe (4) and remove the fitting (5).

★ Loosen the two clips (6) and slide the hose (3) over the pipe (4).

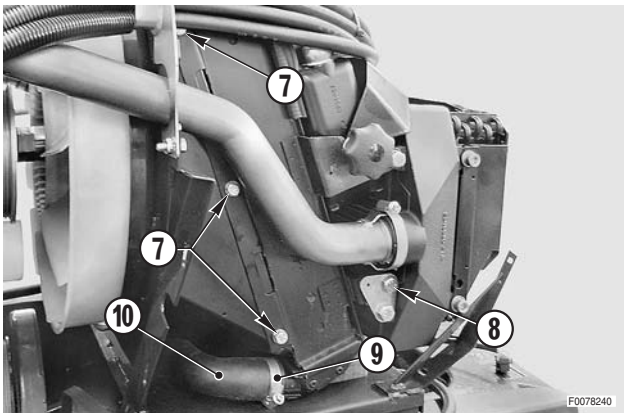


7 - Remove the three retaining bolts (7) and (8) on the left side of the radiator.

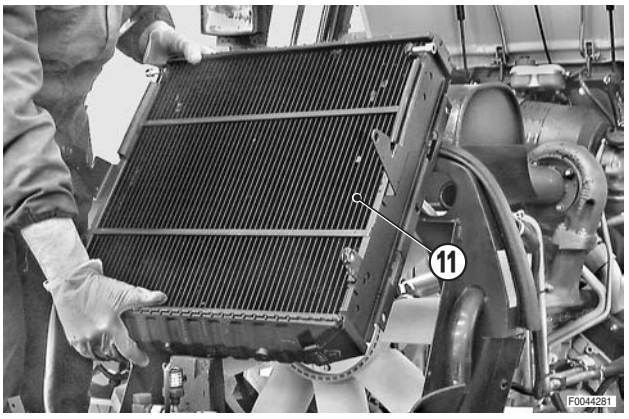


8 - Loosen the clip (9) and disconnect the hose (10).

9 - Remove the three retaining bolts (7) and (8) on the right side of the radiator.



11 - Remove the radiator (13).



Refitting

- Refitting is the reverse of removal.

1 - Fill the engine cooling system

Coolant:

Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

2 - Start the engine and run for a few minutes to allow the coolant to circulate; check the system for leaks.

3 - Stop the engine, check the coolant level in the expansion tank and top up if necessary.

EXPANSION TANK

Removal

1 - Partially drain the engine cooling system.

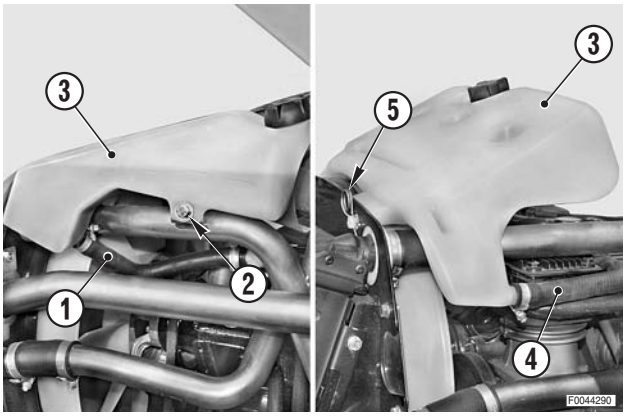
Coolant:
approx. 10 ℓ (2.64 US. gall.)

- **For 4-cylinder models**

2 - Disconnect the pipe (1) and remove the retaining nut (2) of the tank (3).

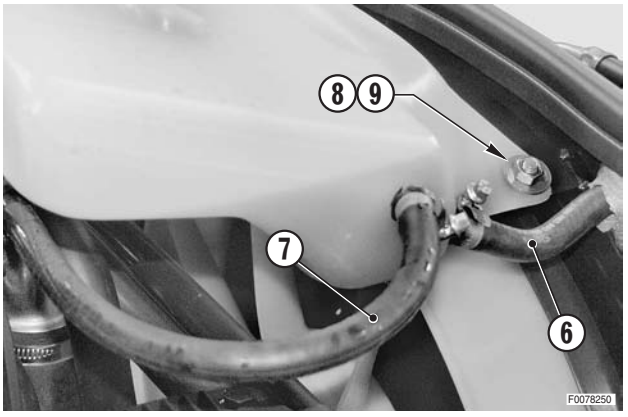
- **For 6-cylinder models**

Disconnect the pipe (4) on the left-hand side and remove the pin (5) securing the tank (3).



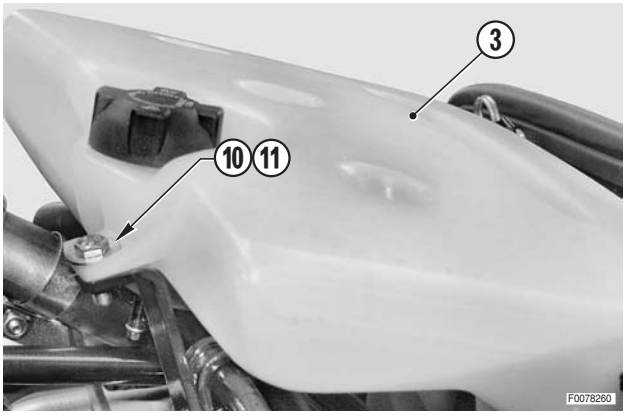
3 - Disconnect the pipes (6) and (7) on the right-hand side.

4 - Unscrew and remove the nut (8) and washer (9).



5 - Loosen and remove the bolt (10) and the washer (11).

6 - Remove the expansion tank (3).



Refitting

- Refitting is the reverse of removal.

1 - Fill the engine cooling system.

Coolant:
approx 10 ℓ (2.64 US. gall.)

2 - Start the engine and run for a few minutes to allow the coolant to circulate.

3 - Stop the engine, check the level in the expansion tank and top up if necessary.

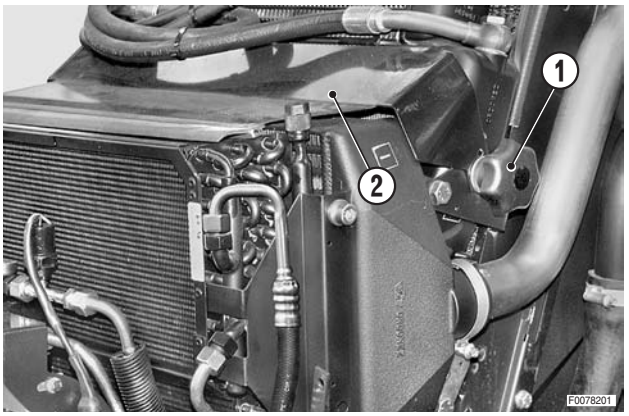
INTERCOOLER

Removal

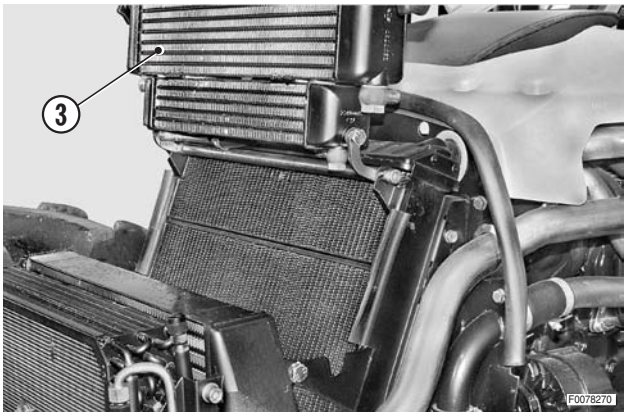
Remove the key from the ignition and apply the parking brake.

1 - Remove the side panels.

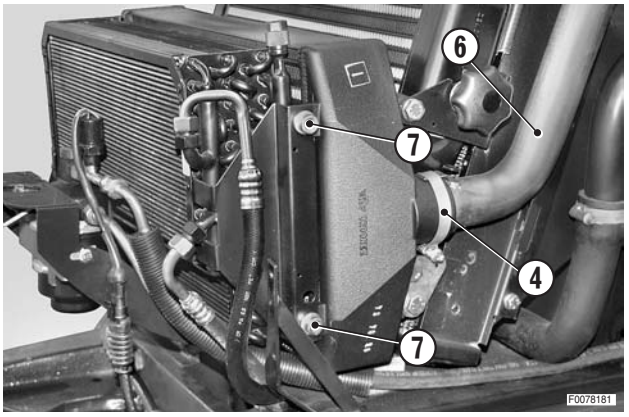
2 - Unscrew the knobs (1) and remove the cowling (2).



3 - Raise the gearbox oil/fuel cooler assembly (3).
★ Support the assembly above the radiator.

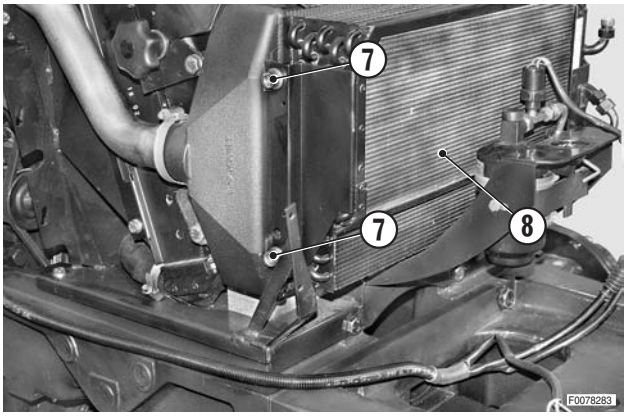


4 - Loosen the hose clamps (4) securing the air inlet (5) and outlet (6) pipes to the intercooler.

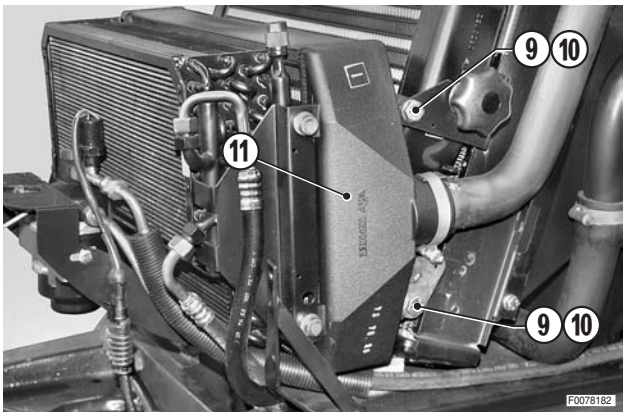


5 - Unscrew and remove the fixing bolts (7) of the condenser (8).

6 - Raise the condenser (8) and move it towards the front of the tractor, past the receiver-drier assembly.



7 - Remove the bolts (9) and the rear nuts (10) and remove the intercooler (11), moving it forwards so as to detach it from the pipes. ※ 1



Refitting

- Refitting is the reverse of removal.

※ 1

★ Carefully check the condition of the O-rings on the fittings of the air inlet and outlet pipes.

COMPLETE RADIATOR/COOLERS ASSEMBLY

Removal

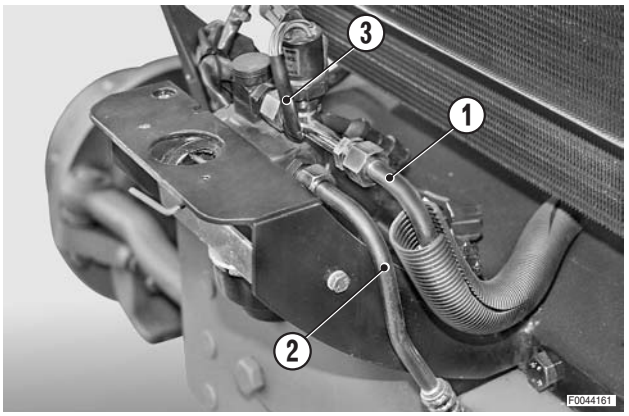
1 - Remove all the side panels, lamp assemblies and lower guards.

2 - Recover the refrigerant from the system.
(For details see "AIR CONDITIONING SYSTEM - Maintenance").

3 - Disconnect pipes (1) and (2) from the condenser and the receiver-drier and the wiring harness (3).

※ 1

★ Immediately plug the ends of the pipes and the open fittings on the condenser and receiver-drier to prevent moisture from getting into the system.

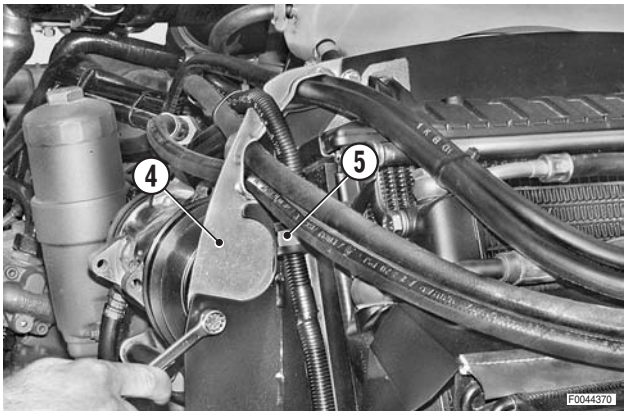


4 - Drain the coolant from the engine cooling system.

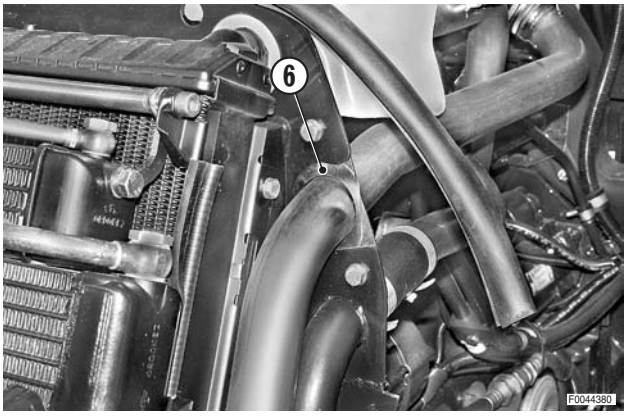
Coolant:

Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

5 - Remove the bolts and remove the right-hand pipe guide (4), the intercooler pipe (where present) and the retaining straps (5) of the front wiring loom.



6 - For models with intercooler, remove also the left-hand guide (6) for the air pipe.

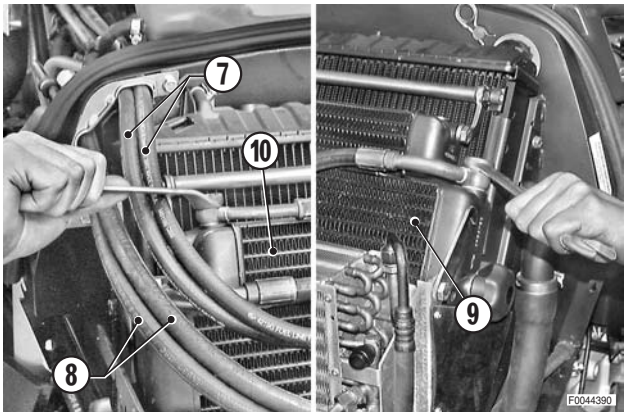


7 - Release the pipes (7), (8) and the wiring from the retaining straps

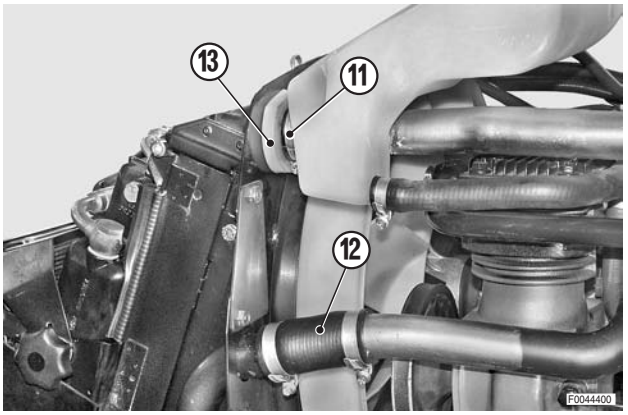
8 - Label and disconnect the pipes from oil cooler (9) and fuel cooler (10).

★ Immediately plug the ends of the pipes and the open fittings on the coolers to prevent the entry of contaminants.

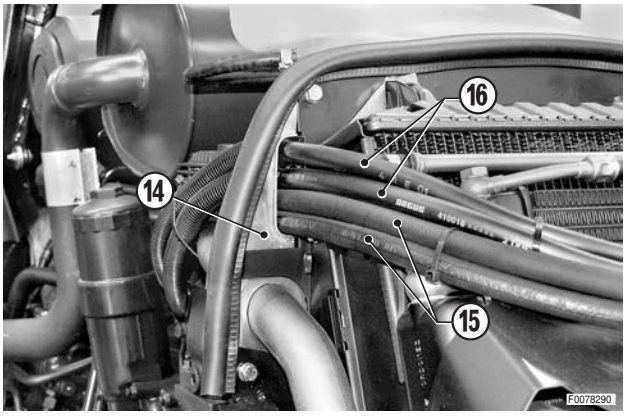
9 - Remove the expansion tank.
(For details, see "EXPANSION TANK").



10 - Disconnect the hoses (11), (12) from the radiator; recover the bulkhead fitting (13).



11 - Remove the bulkhead (14) and direct the oil and fuel cooler pipes (15) and (16) towards the rear of the tractor.

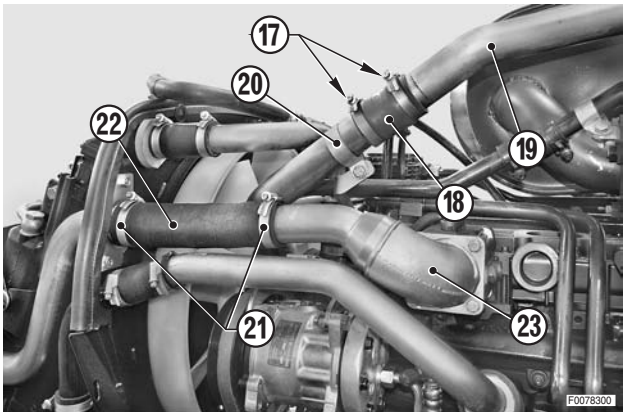


• For versions with intercooler

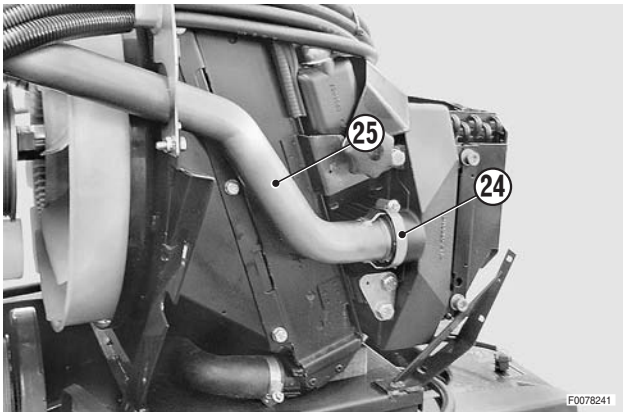
12 - Loosen the clips (17) and slide the hose (18) over the outlet pipe (19).

13 - Remove the collar (20).

14 - Loosen the clips (21) and slide the hose (22) over the suction pipe (23).



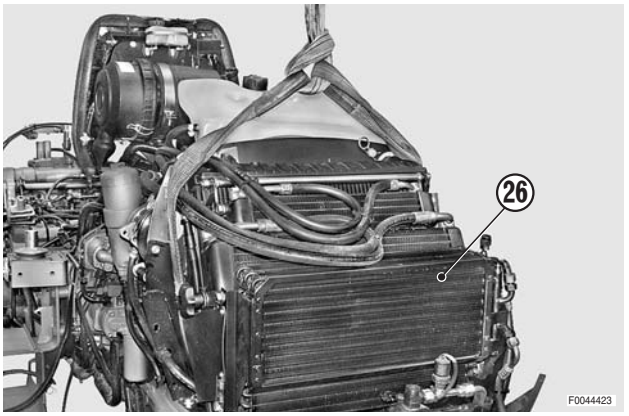
15 - Loosen the clips (24) and remove the pipe (25) to the intercooler. ⁘ 2



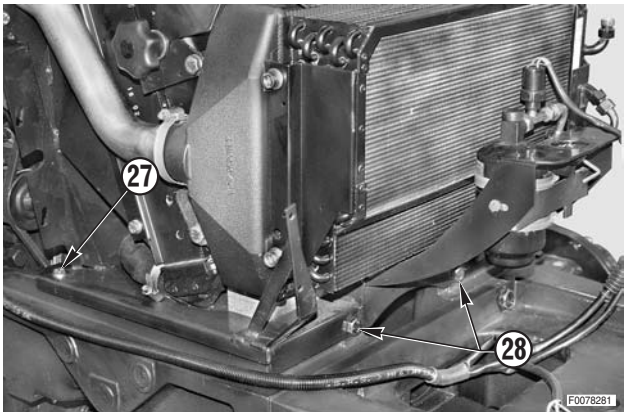
• **For all versions**

16 - Attach a hoist (26) to the complete assembly.

kg Assembly: 28 kg (61.7 lb.)



17 - Remove the front retaining bolts (27), (28) and remove the complete assembly (26).



Refitting

• Refitting is the reverse of removal.

⁘ 1

★ Remove the plugs and immediately connect the pipes, fully tightening the fittings, to prevent moisture from getting into the system.

★ Check the condition of the seals and renew them if damaged.

⁘ 2

★ Carefully check the condition of the O-ring seals on the pipes; if in the least doubt about the condition of these parts, fit new ones.

1 - Flush and recharge the air conditioning system. (For details, see "AIR CONDITIONING SYSTEM - Discharging, flushing and recharging").

2 - Fill the engine cooling system with coolant.

Coolant:

Mod.	**80**	**90**	**100**	**105**
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

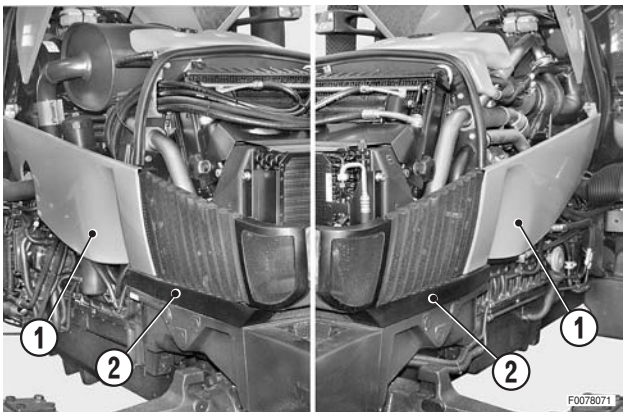
3 - Start the engine and run for a few minutes to allow the coolant to circulate.

4 - Stop the engine, check the coolant level in the expansion tank and top up if necessary.

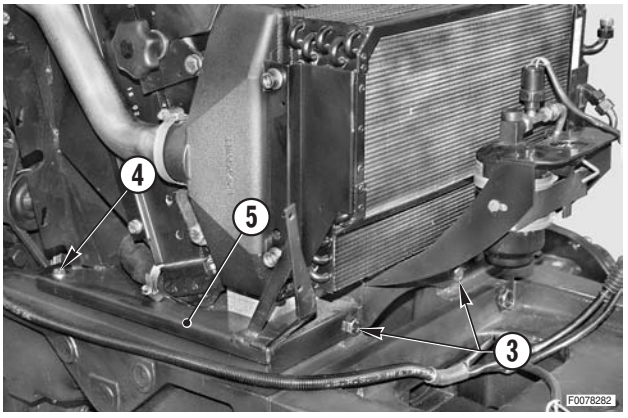
FLEXIBLE COUPLING OF THE FRONT PTO

Renewal

1 - Remove the side grilles (1), and the lower cover (2).



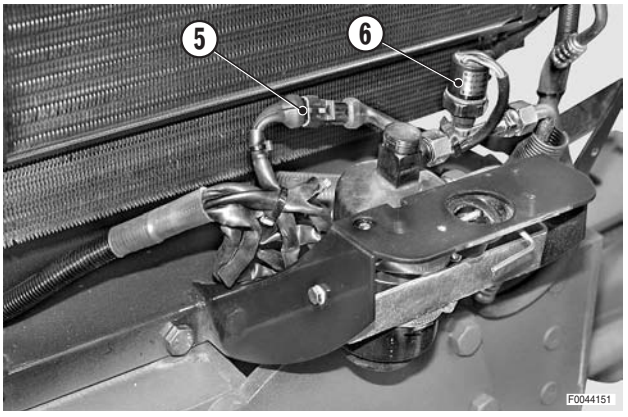
2 - Remove the front (3) and rear (4) retaining bolts of the radiator support (5).



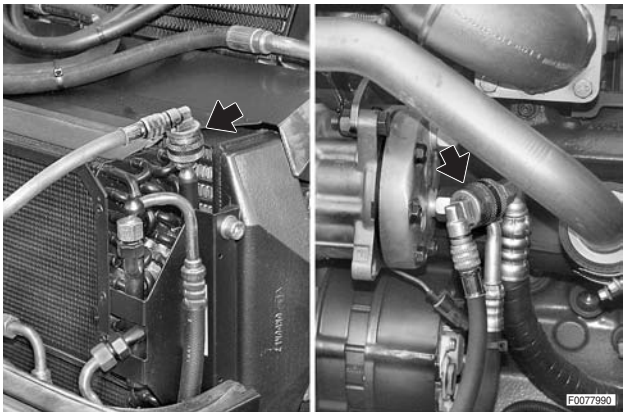
3 - Release from its clips and disconnect the wiring (5) of the air conditioning pressure switch (6).

4 - Drain the coolant from the engine cooling system.

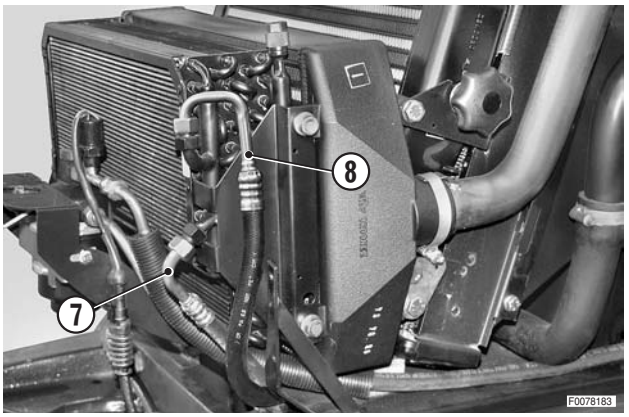
Coolant:
max. 17.5 ℓ (4.62 US. gall.)



5 - Recover the refrigerant from the air conditioning system.
(For details, see "AIR CONDITIONING SYSTEM - Maintenance").

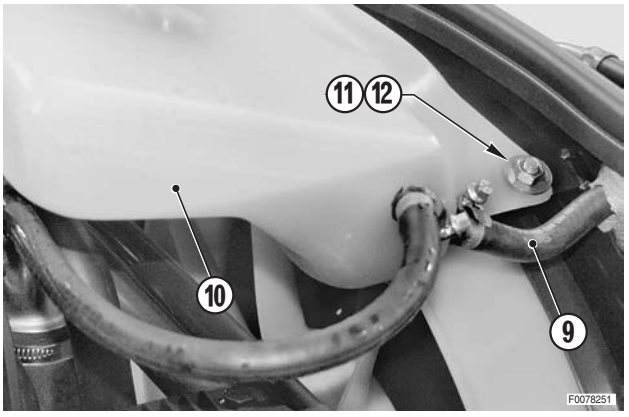


6 - Disconnect the inlet and outlet pipes (7) and (8) from the evaporator.

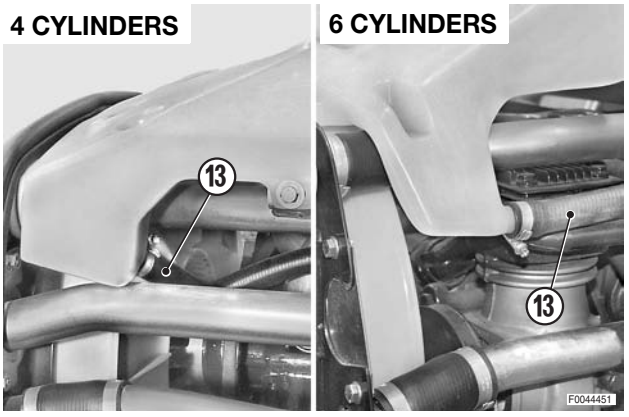


7 - Disconnect the connection pipe (9) to the expansion tank (10).

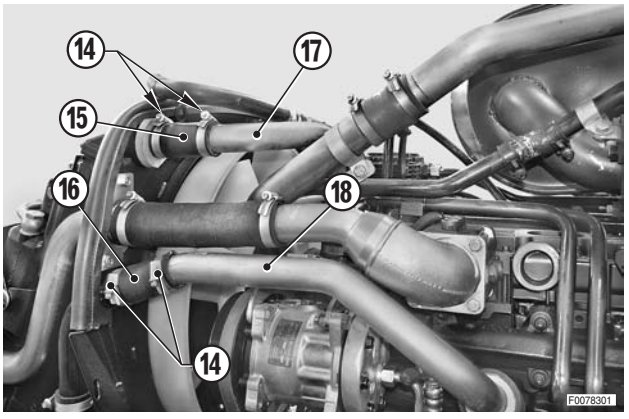
8 - Remove the nut (11) and the washer (12).



9 - Disconnect the pipe (13) from the left side of the expansion tank; remove the expansion tank.

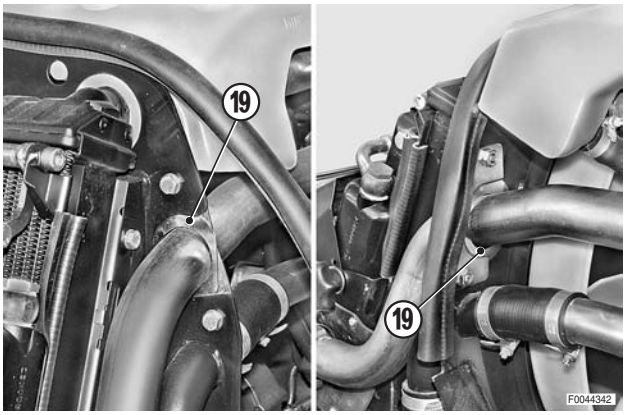


10 - Loosen the clips (14) and slide the hoses (15) and (16) on the to the pipes (17) and (18).

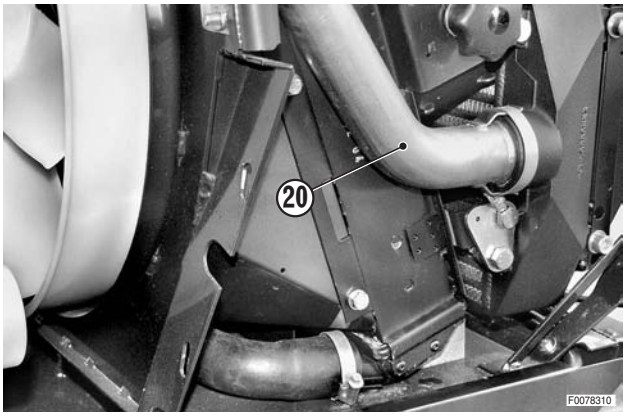


• **For models with intercooler**

11 - Also remove the guides (19) for the inlet and outlet pipes.

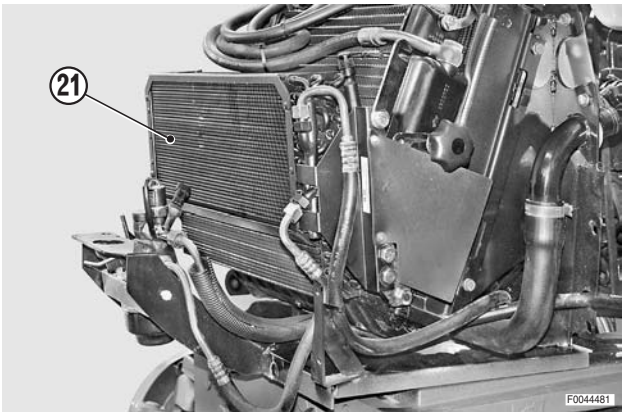


12 - Disconnect and remove the inlet pipe (20). (For details see "COMPLETE RADIATOR/COOLERS ASSEMBLY").



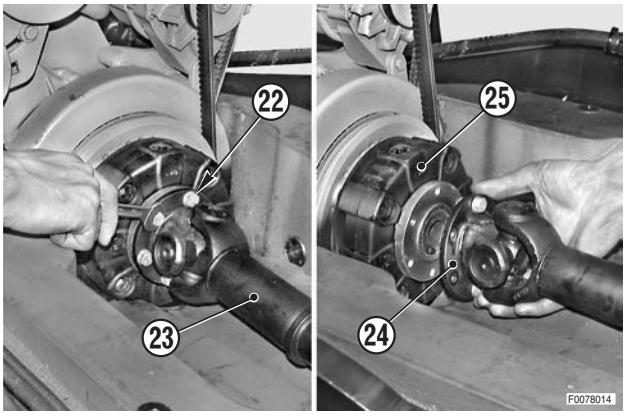
• **For all versions**

13 - Move the radiator/coolers assembly (21) toward the front of the machine.

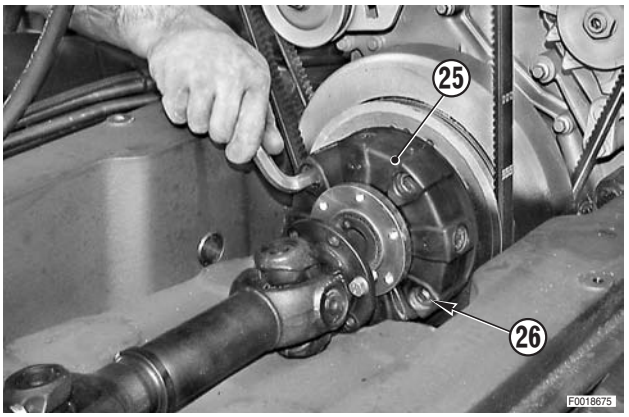


14 - Loosen and fully unscrew the six bolts (22) securing the flange of the cardan shaft (23).

15 - Detach the flange (24) from the flexible coupling (25).



16 - Loosen and remove the bolts (26) securing the coupling (25) and remove the coupling. [1]



Refitting

- Refitting is the reverse of removal.

[1]

Bolts: Loctite 243

Bolts: 139±10% Nm (102.4±10% lb.ft.)

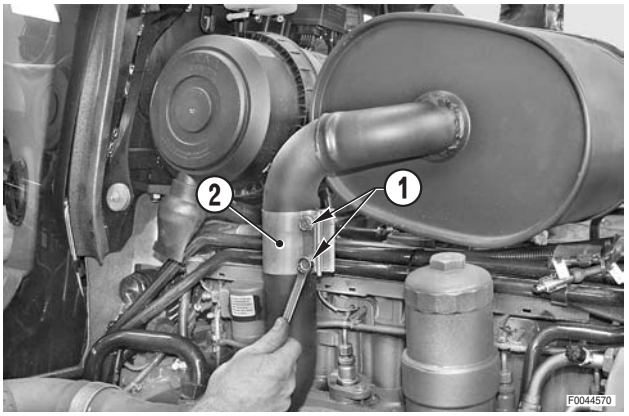
1 - Fill the engine cooling system with coolant.

Coolant:
max. 17.5 ℓ (4.62 US. gall.)

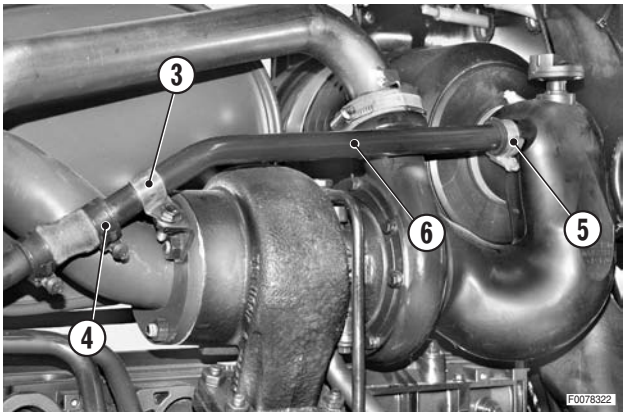
TURBOCHARGER

Removal

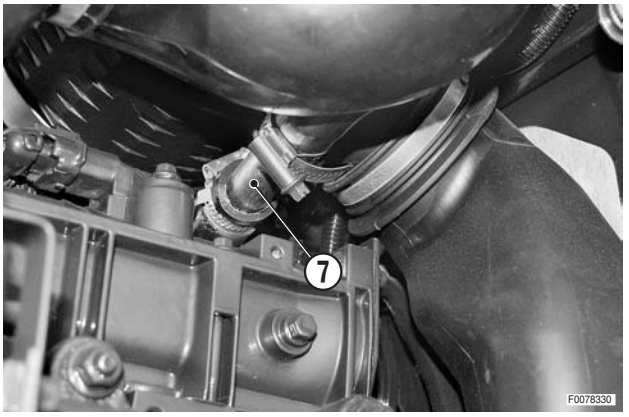
1 - Loosen the bolts (1) and move the connecting strap (2) down.



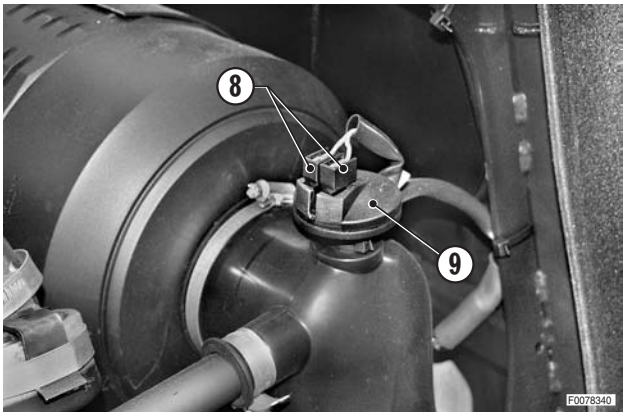
2 - Loosen the clips (3), (4) and (5) and remove the air suction pipe (6) of the trailer braking compressor.



3 - Disconnect the oil vapour suction pipe (7).

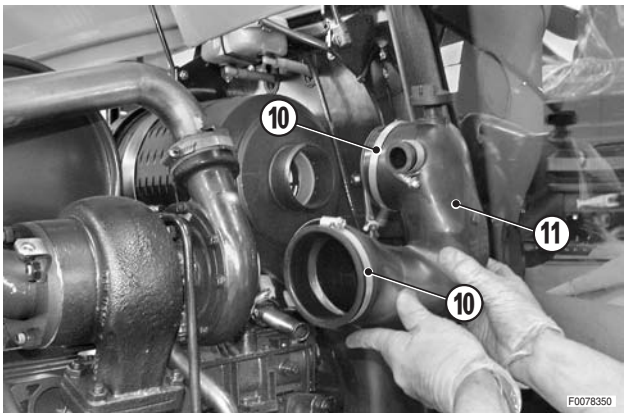


4 - Unplug the connectors (8) of the filter clogged sensor (9).



5 - Loosen the clips (10) securing the hose (11).

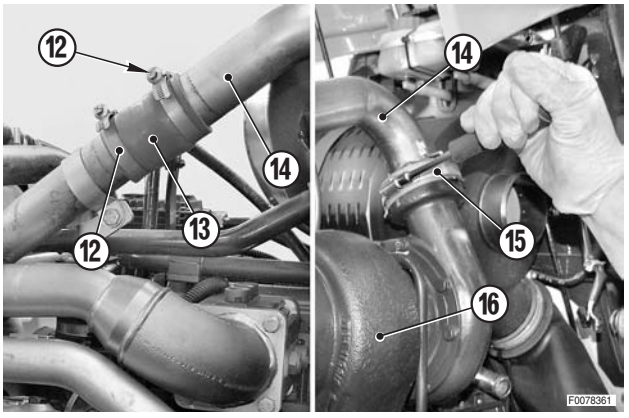
6 - Remove the hose (11).



7 - Loosen the clips (12) and push the hose (13) on to the pipe (14).

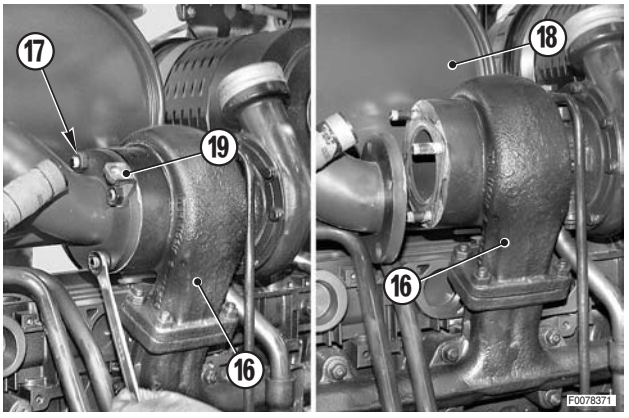
8 - Loosen the clip (15) and remove the pipe (14) supplying air to the intercooler.

9 - Remove the turbocharger (16) following the instructions in the “ENGINE WORKSHOP MANUAL”.



10 - Loosen and remove the retaining nuts (17) and detach the silencer (18) from the studs of the turbocharger (16).

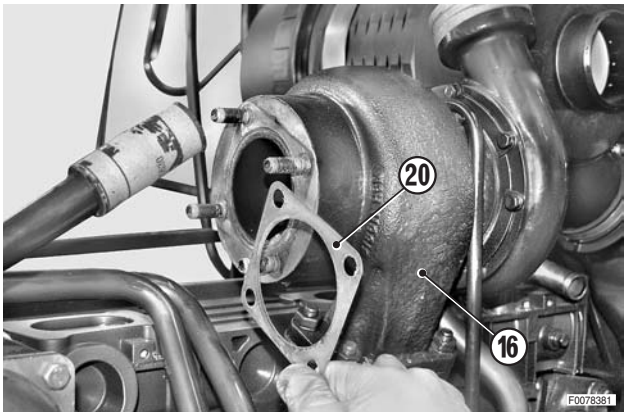
★ Recover the bracket (19).



11 - Remove the metal gasket (20).

★ Note which way round the gasket is fitted.

12 - Remove the turbocharger (16) following the procedure described in the engine workshop manual.



Refitting

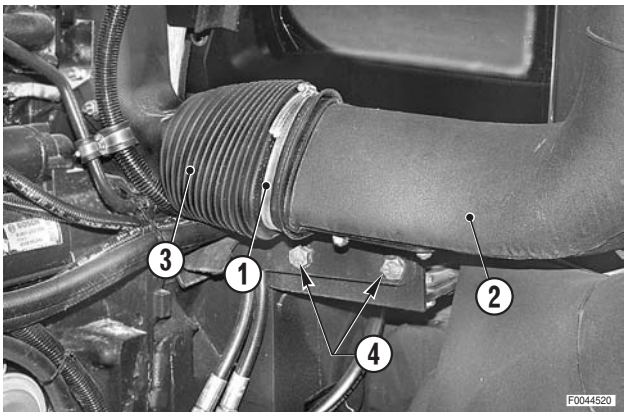
- Refitting is the reverse of removal.

AIR INLET PIPE

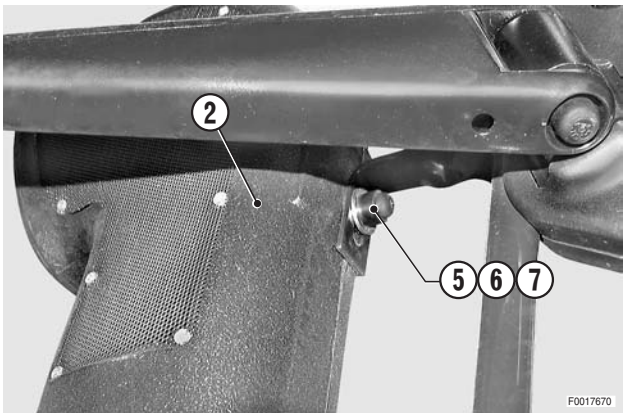
Removal

1 - Loosen the hose clamp (1) and disconnect the hose (3) from the pipe (2).

2 - Unscrew and remove the bolts (4).



3 - Remove the nut cover (5) and, while supporting the pipe (2), remove the upper retaining nut (6) and washer (7).



Refitting

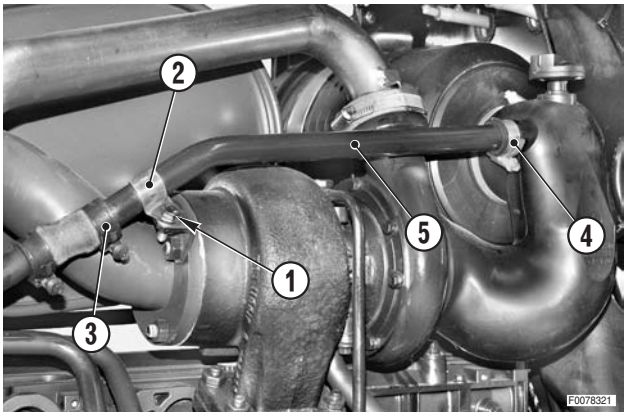
- Refitting is the reverse of removal.

AIR CLEANER

Removal

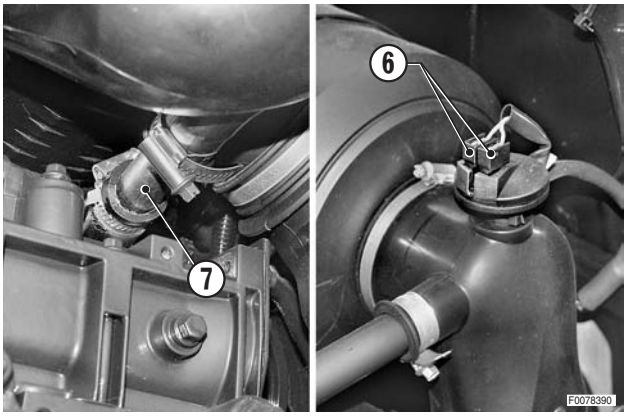
1 - Remove the screw (1) to release the clip (2).

2 - Loosen the clips (3) and (4) and remove the inlet pipe (5) of the trailer braking air compressor.

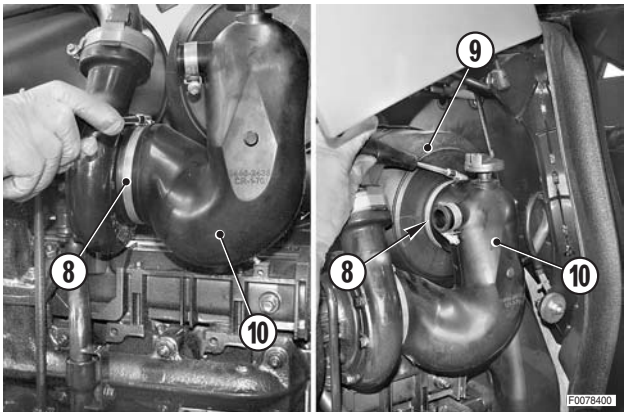


3 - Unplug the connectors (6) of the filter clogging sensor.

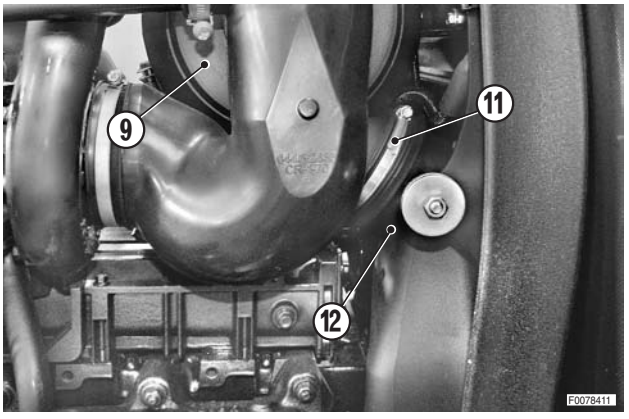
4 - Loosen the clip and disconnect the oil vapour suction pipe (7).



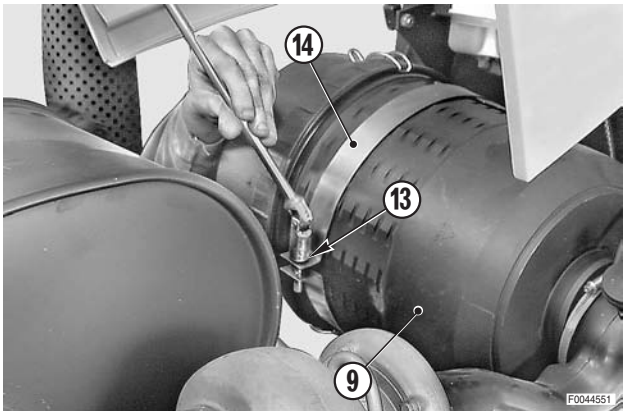
5 - Loosen the clips (8) and remove the suction hose (10) from the air cleaner (9).



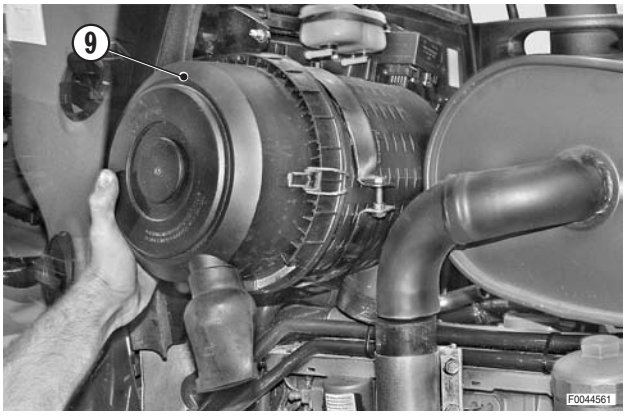
6 - Loosen the clip (11) of the suction hose (12) and disconnect the hose from the air cleaner (9).



7 - Loosen the screw (13) of the clip (14) securing the air cleaner (9).



8 - Remove the complete air cleaner assembly (9).



Refitting

- Refitting is the reverse of removal.
  - ★ Check that all the hose clamps are fully tightened.

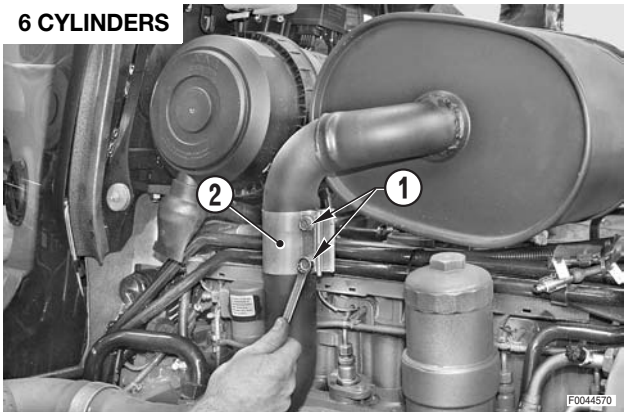
EXHAUST PIPE

Removal

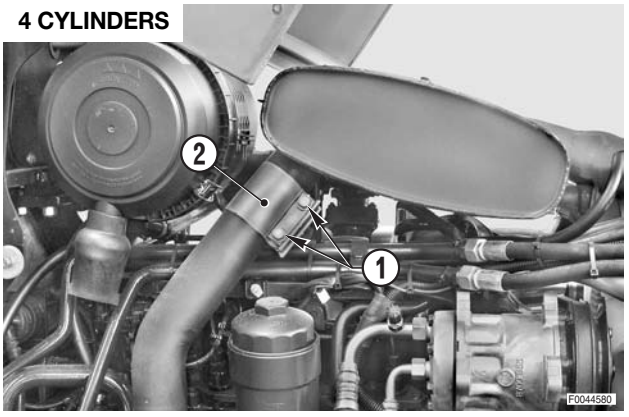
⚠ Remove the key from the ignition and apply the parking brake.

1 - Unscrew the bolts (1) and move the clamp (2) joining the exhaust and the silencer.

6 CYLINDERS



4 CYLINDERS



2 - Attach a hoist to the exhaust pipe (3) and put the lifting sling under slight tension.

kg Exhaust pipe: approx. 23 kg (50.7 lb.)

3 - Remove the bolts (4) and the nuts (5).

4 - Remove the exhaust pipe (3).

Refitting

- Refitting is the reverse of removal.

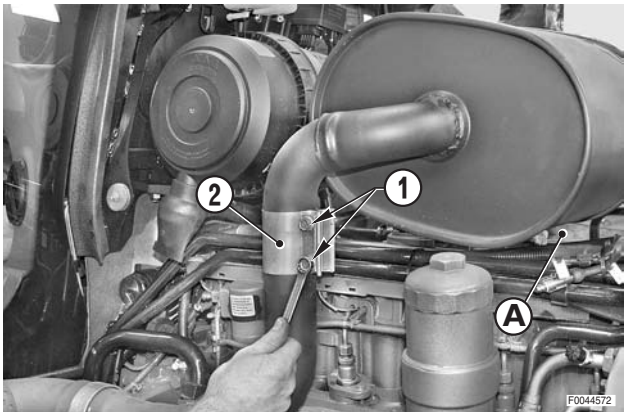
SILENCER

Removal

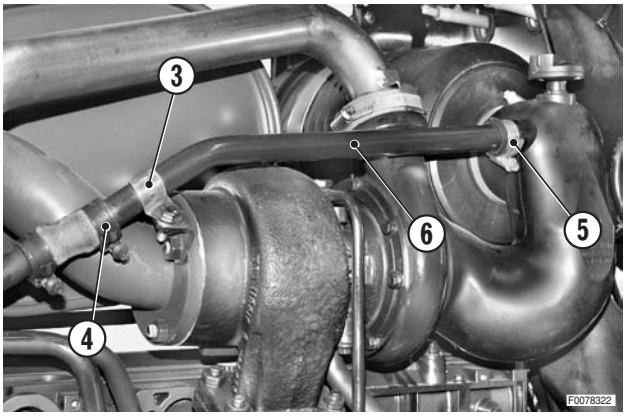
Remove the key from the ignition and apply the parking brake.

1 - Loosen the bolts (1) and move the clamp (2) joining the exhaust pipe to the silencer.

2 - Position the spacers "**A**" between the cylinder head and silencer.

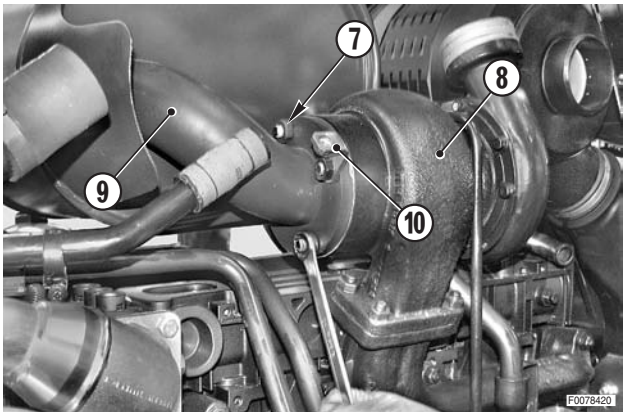


3 - Loosen the clips (3), (4) and (5) and remove the air compressor suction pipe (6).



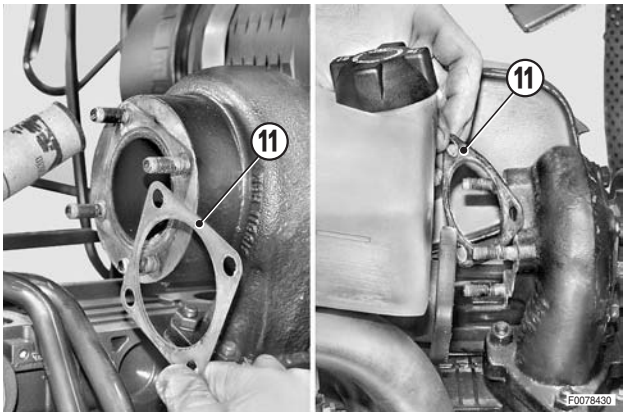
4 - Remove the nuts (7) securing the silencer to the turbocharger (8) and remove the silencer (9).

★ Recover the part (10) for fixing the clip securing the air compressor suction pipe.



5 - Remove the gasket (11).

★ Note which way round it is fitted.



Refitting

- Refitting is the reverse of removal.

4WD PROPELLER SHAFT

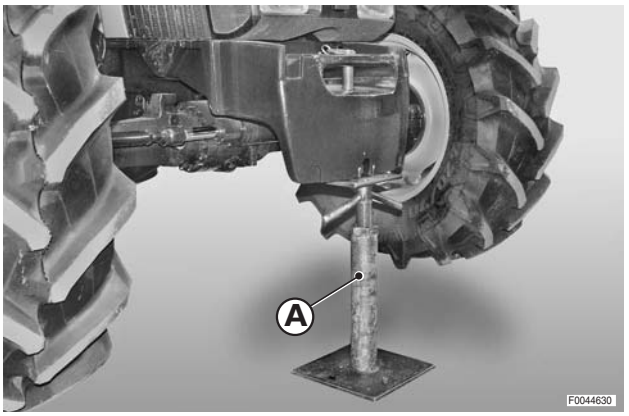
Version without front suspension

Removal

Remove the key from the ignition and apply the parking brake.

1 - Using suitable lifting equipment, raise the front of the tractor by about 10-12 cm (4-5 in.).

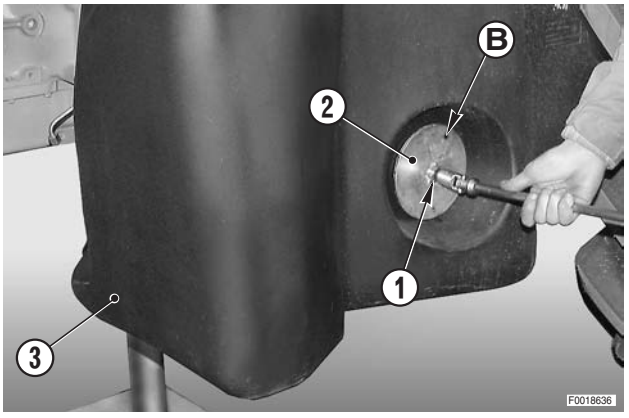
2 - Position a jack "**A** "capable of supporting the tractor's weight under the front carrier.



3 - Remove the bolts (1) and remove the locating and retaining washers (2) of the tank (3).

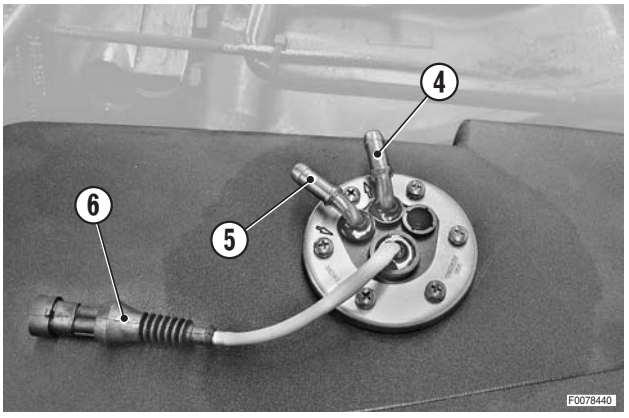
★ Mark the washers so as to avoid error when refitting the tank.

★ Note the position of the hole "**B**" as the tank is levelled by rotating the front washer.

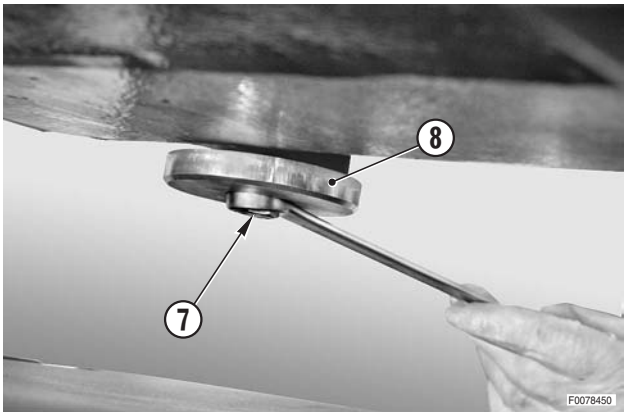


4 - Label and disconnect the fuel suction pipe (4) and return pipe (5) and the level indicator connector (6).

★ The fuel suction and return pipes are marked on the side of the connection fittings.

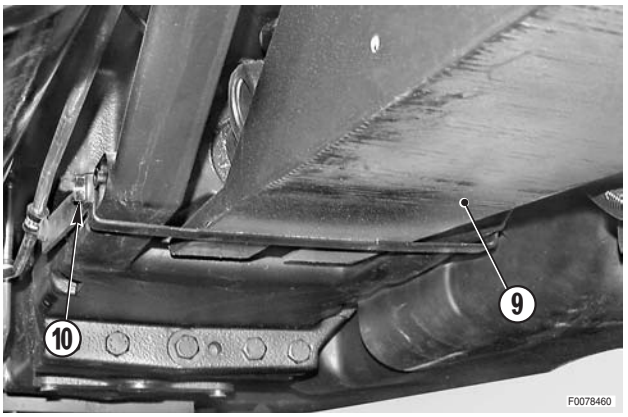


5 - Move the fuel tank 8–10 cm towards the outside. Loosen and remove the bolt (7) securing the spacer (8) and the lower guard.



6 - Support the lower guard (9) and remove the bolt (10).

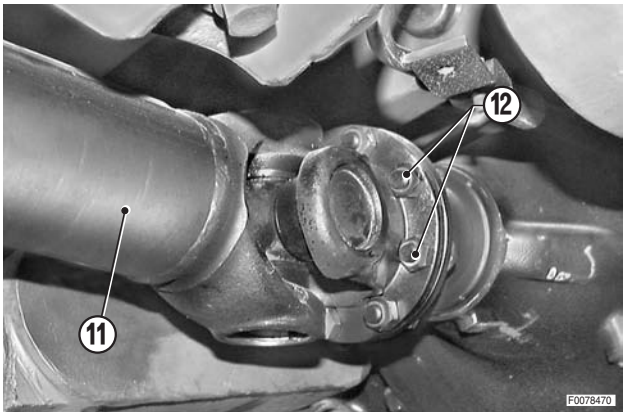
7 - Remove the front bolts and remove the guard (9).



8 - Position a jack "**C**" under the shaft (11) and remove the bolts and self-locking nuts (12).

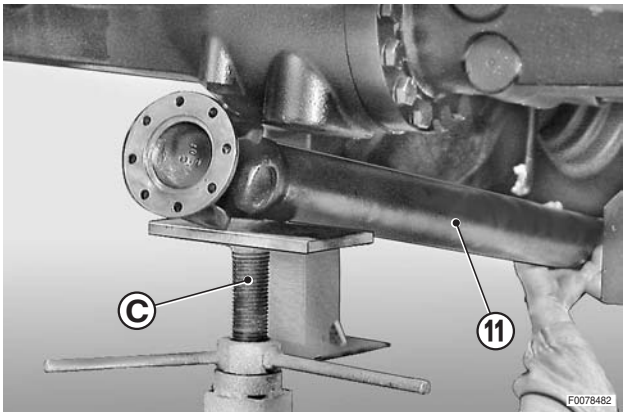
※ 1

★ To enable removal of the upper bolts, turn the wheels by hand.



9 - Disconnect the flanges, lower the jack and withdraw the shaft (11) towards the front of the tractor.

※ 2



Refitting

- Refitting is the reverse of removal.

※ 1

Nm Nuts: 43.5±10% Nm (32±10% lb.ft.)

★ Tighten the nuts in a cross-wise sequence.

※ 2

Rear coupling: Grease

4WD PROPELLER SHAFT

Version with front suspension

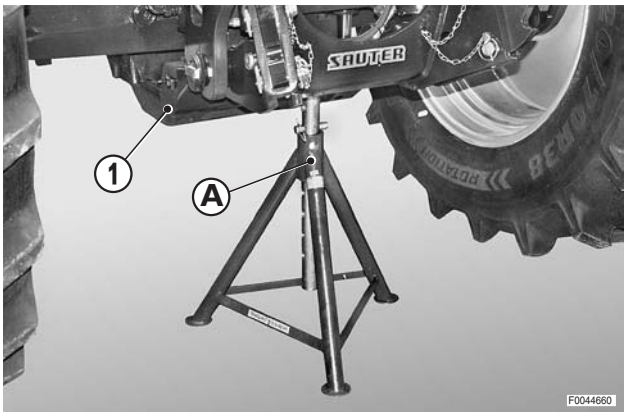
Removal

⚠ Before switching off the engine, disengage the front suspension by pressing the button in the cab for at least 20 seconds.

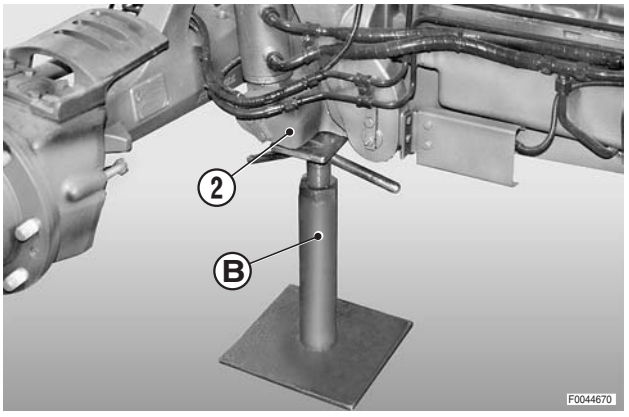
⚠ Remove the key from the ignition and apply the parking brake.

1 - Using suitable lifting equipment, lift the front of the tractor so that the wheels are raised by about 10-12 cm (4-5 in.).

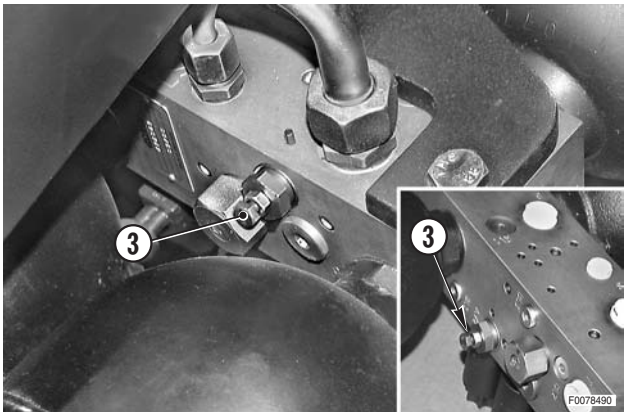
2 - Position a jack "**A** "capable of supporting the tractor's weight under the front carrier (1).



3 - Position under the swinging suspension support (2) a stand "**B** "that can be lowered through 10-12 cm (4-5 in.).



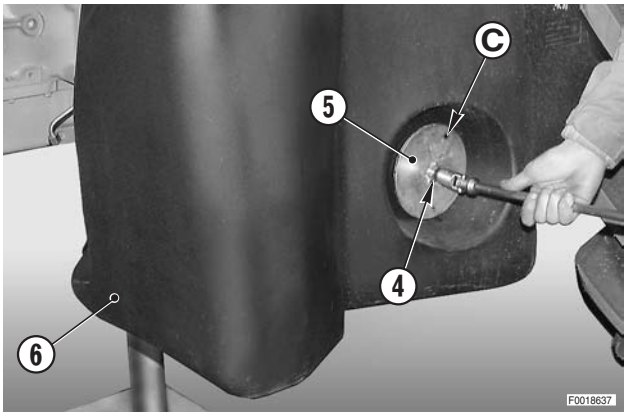
4 - Discharge the residual pressure from the suspension system by unscrewing the valve (3) two full turns.



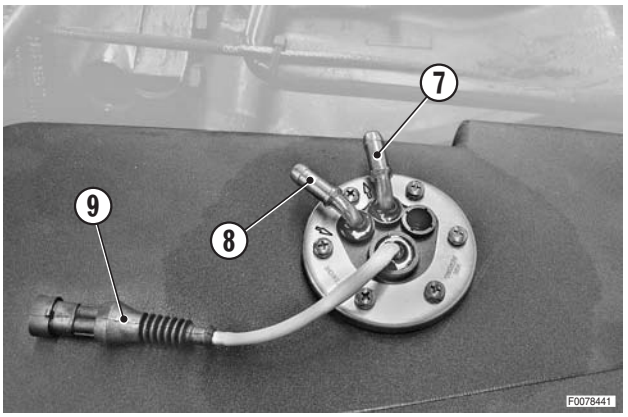
5 - Remove the bolts (4) and remove the locating and retaining washers (5) of the tank (6).

★ Mark the washers so as to avoid error when refitting the tank.

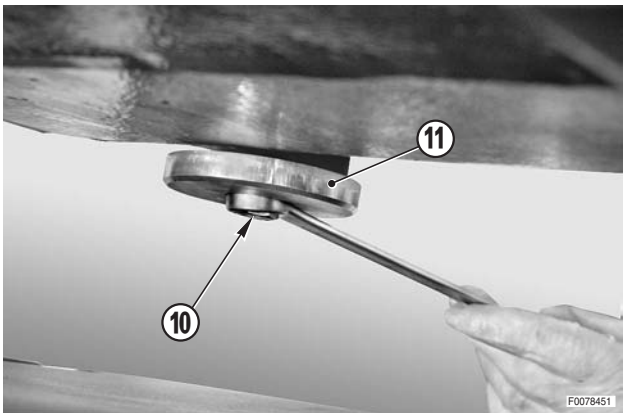
★ Note the position of the hole "**C**" as the tank is levelled by rotating the front washer.



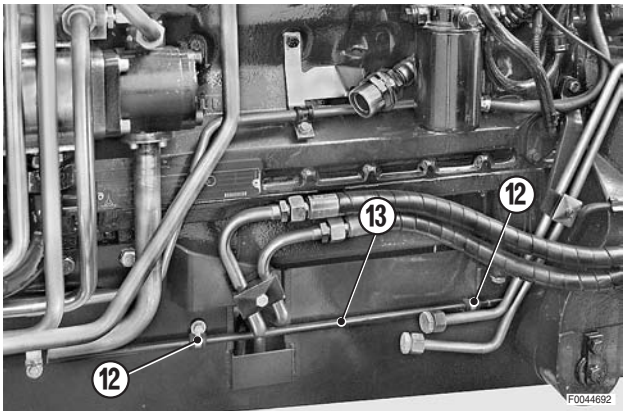
6 - Mark the fuel suction pipe (7) and return pipe (8) and disconnect them level indicator connector (9).
★ The fuel suction and return pipes are marked on the side of the connection fittings.



7 - Move the fuel tank 8–10 cm towards the outside. Loosen and remove the bolt (10) securing the spacer (11) and the lower guard.

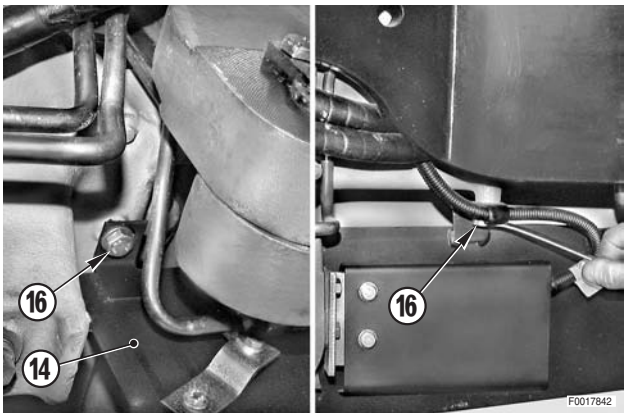


8 - Remove the straps (12) to release the differential lock pipe (13).



9 - While supporting the lower guard (14), remove the bolt (15).

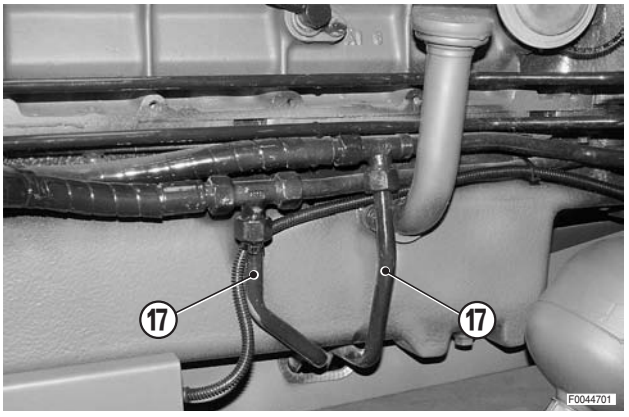
10 - Remove the front bolts (16) and remove the lower guard (14).



11 - Disconnect the pipes (17) of the left-hand suspension cylinder.

★ Plug the ends of the pipes to prevent the entry of contaminants.

Loosen the fittings of the flexible hoses by a few turns and, before removing them, push them to detach them from the couplers and thereby discharge any residual pressure from the system.

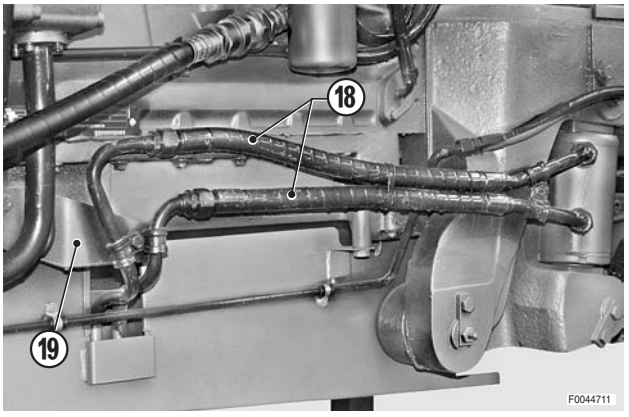


12 - Disconnect the pipes (18) from the right-hand suspension cylinder.

★ Label the pipes to avoid confusion on refitting.

★ Plug the pipes and the open fittings to prevent the entry of contaminants.

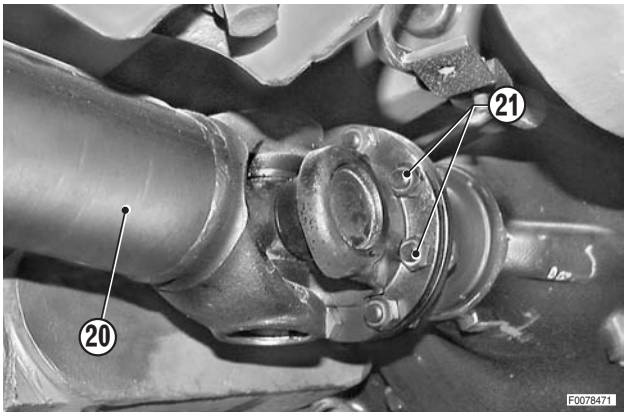
13 - Remove the bracket (19) and remove the pipes.



14 - Position a jack "**D**" under the shaft (20) and remove the flange bolts and nuts (21).

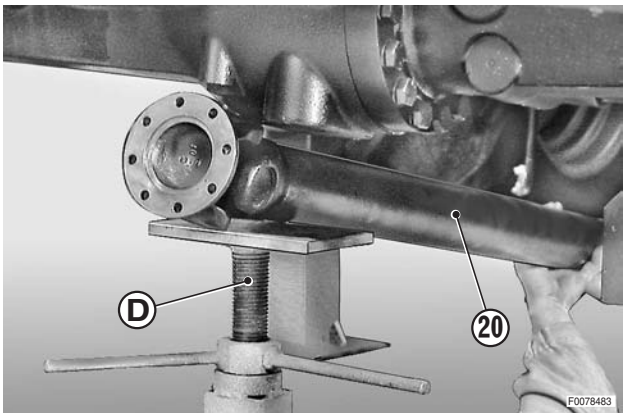
1

★ In order to remove the upper bolts, lower the jack positioned in step 3.



15 - Separate the flanges, lower the jack "**D** "and withdraw the shaft (20) towards the front of the tractor.

※ 2



Refitting

- Refitting is the reverse of removal.

※ 1

Nm Nuts: 43.5±10% Nm (32±10% lb.ft.)

★ Tighten the nuts in a cross-wise sequence.

※ 2

Rear coupling: Grease

1 - Start the engine and engage the front suspension by pressing the relative button in the cab.

2 - Wait a few seconds and then disengage the front suspension.

3 - Repeat this operation a number of times to purge the air from the system.

4 - Stop the engine, check the oil level and top up if necessary.

BRAKE MASTER CYLINDERS

Removal

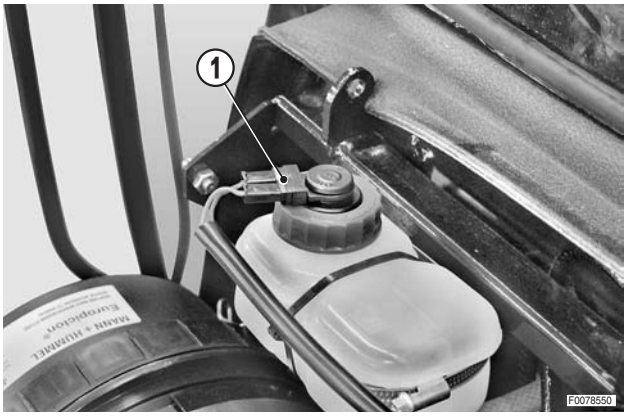
Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the console shroud. (For details, see "CENTRE CONSOLE AND SHROUD").

2 - Remove the engine hood and side panels. (For details, see "ENGINE HOOD AND LAMP ASSEMBLIES").

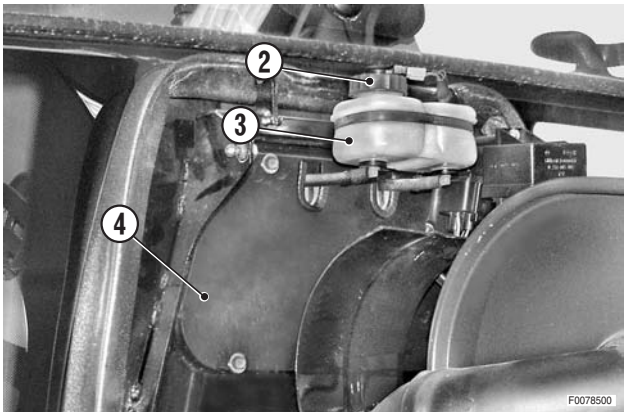
3 - Remove the air cleaner. (For details, see "AIR CLEANER").

4 - Unplug the connectors (1) of the brake fluid level warning light.

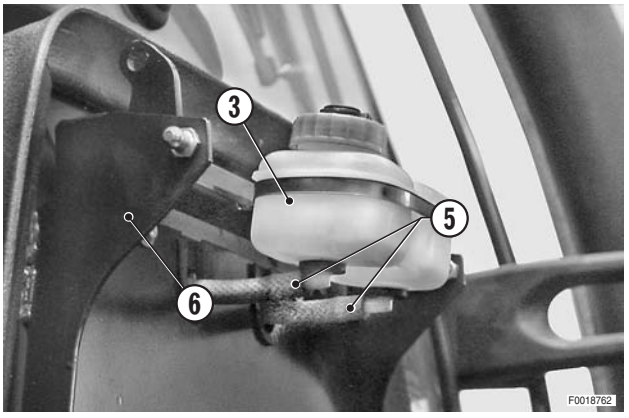


5 - Remove the cap (2) and draw off the fluid contained in the brake fluid reservoir (3).

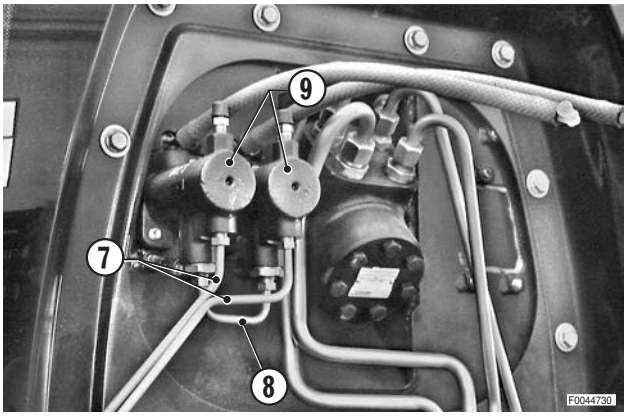
6 - Remove the screws and remove the insulation panel (4).



7 - Disconnect the pipes (5) from the reservoir (3); remove the hood support (6) complete with the reservoir.

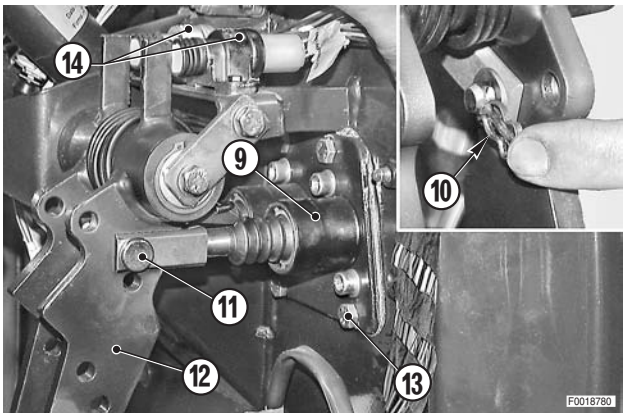


8 - Disconnect the feed pipes (7) and the by-pass pipe (8) between the cylinders (9).



9 - Remove the cotter pins (10) and remove the pins (11) connecting the pedals (12) to the cylinders (9).

10 - Unscrew and remove the three bolts (13) with their washers and remove the cylinders (9).



Refitting

- Refitting is the reverse of removal.

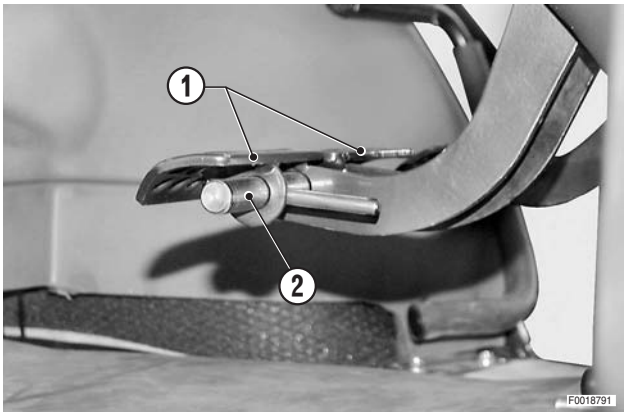
1 - Fill the brake fluid reservoir to the maximum level.

2 - Check the positions of the switches.
(For details, see "BRAKE LIGHT SWITCHES").

3 - Bleed the air from the braking system.
(For details, see "BRAKING SYSTEM").

BRAKING SYSTEM

Bleeding



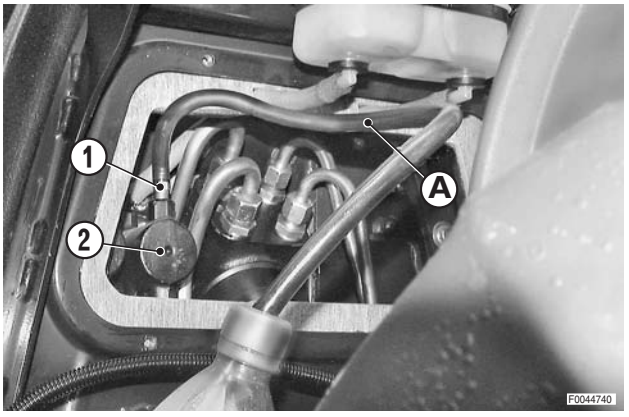
1 - Disconnect the two brake pedals (1) by disengaging the latch pin (2).

2 - Bleed the left rear brake.

3 - Bleed the right rear brake.

4 - **For tractors with hydraulic or air trailer braking only:** bleed the trailer brake valve before bleeding the service brake system.

Brake bleeding procedure



⚠ During brake bleeding operations, ensure that the fluid in the brake fluid reservoir is always above the minimum level.

1 - Remove the dust cap and attach a transparent bleed tube "**A**" to the bleed screw (1) of the cylinder (2).

2 - Fully depress the brake pedal corresponding to the brake to be bled.

3 - Slowly open the bleed screw (1) and allow the fluid and air to flow throughout the entire pedal travel.

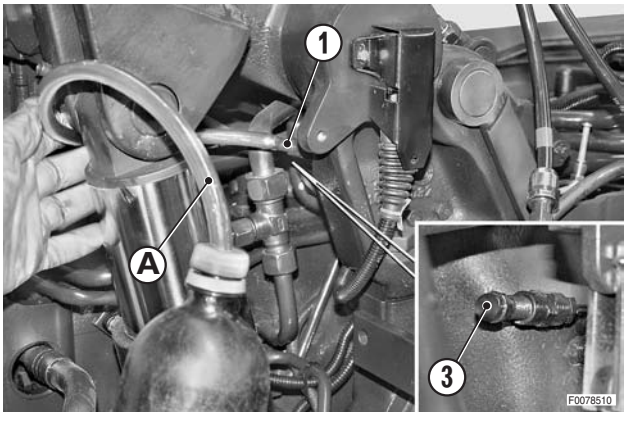
4 - While holding the pedal fully depressed, tighten the bleed screw.

5 - Repeat the operation until the fluid flowing from the bleed screw is entirely free of air bubbles.

6 - Repeat the procedure for the remaining brake cylinder.

7 - After bleeding, replace the bleed screw (1) dust caps.

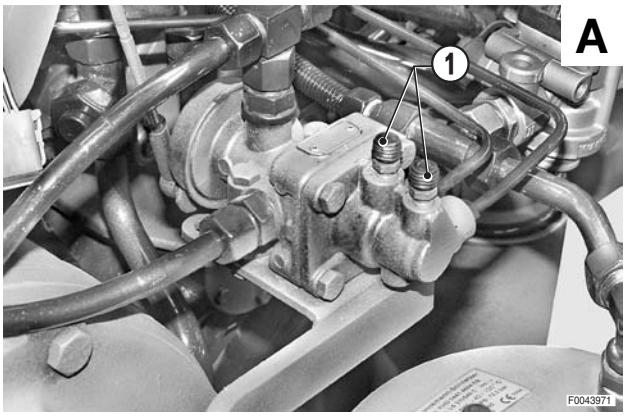
8 - Use the same method also for the service brakes.



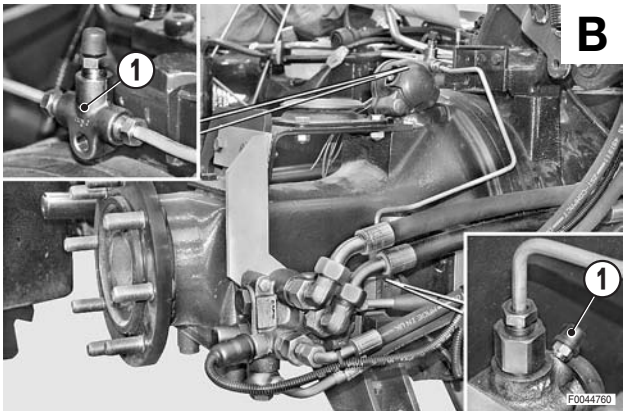
⚠ Bleed the left brake first and then the right brake.

9 - Bleed the braking valve at the bleed screws (1) (protected by caps) using the method indicated for the pumps and choosing from among the following versions:

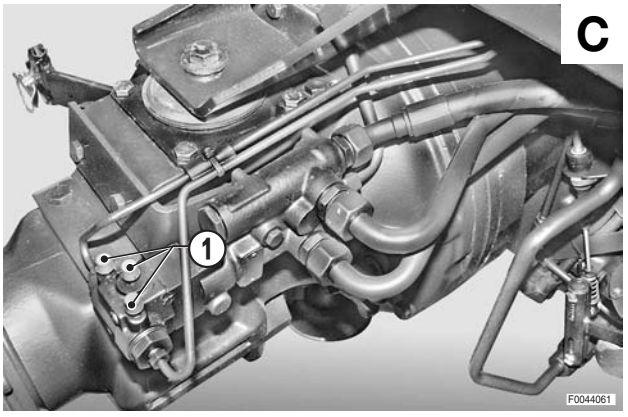
A - Pneumatic parking brake control valve.



B - Hydraulic braking valve (CUNA).



C - Hydraulic braking valve (EXPORT).

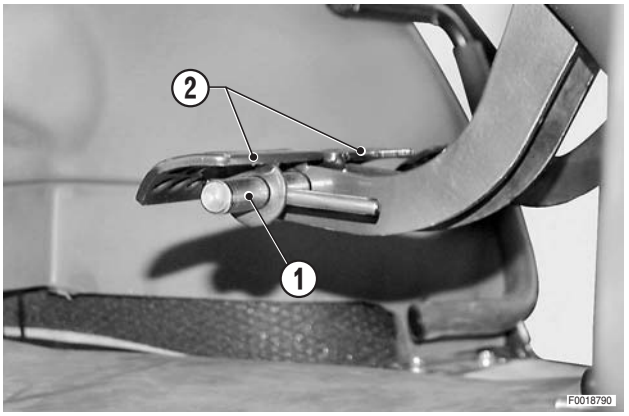


BRAKE LIGHT SWITCHES

Adjustment

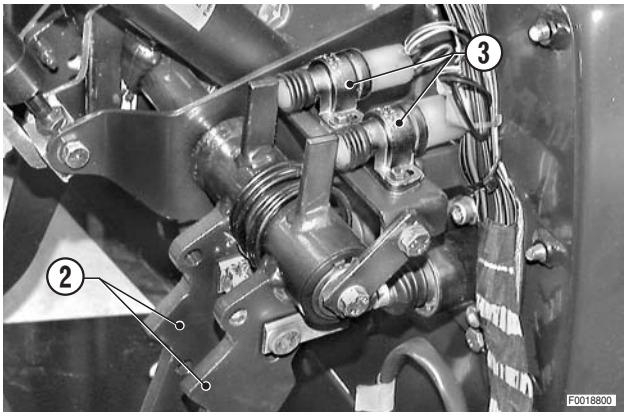
★ The switch for each pedal is adjusted separately.

1 - Check that the pedal latch pin (1) slides freely to connect and disconnect the two pedals (2).

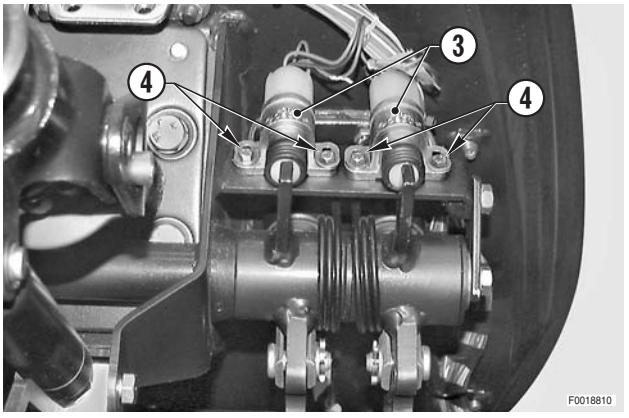


2 - Force the pedals (2) upwards and check that the brake light switches (3) have an extra opening travel of 1±0.2 mm (0.04±0.008 in.).

★ This extra travel protects the switches from impacts at the end of travel caused by sudden release of the pedals.



3 - If the switches (3) do not have this extra travel, loosen the screws (4) so that they just grip the switch; move the switch towards the front of the tractor and tighten down the screws (4) to fix it in position.



POWER STEERING UNIT

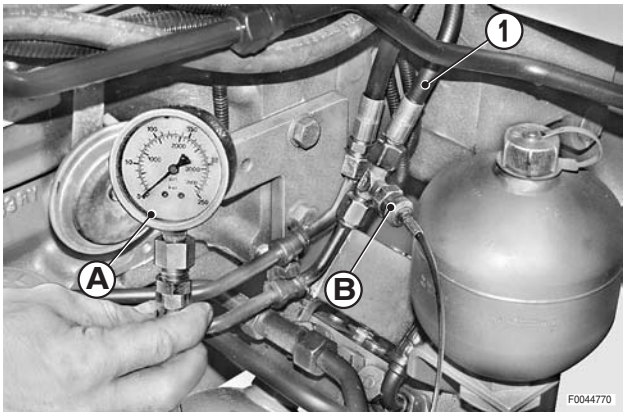
Testing

1 - Disconnect a steering pipe (1) and connect a fitting "**B**" with a 400 bar pressure gauge "**A**".

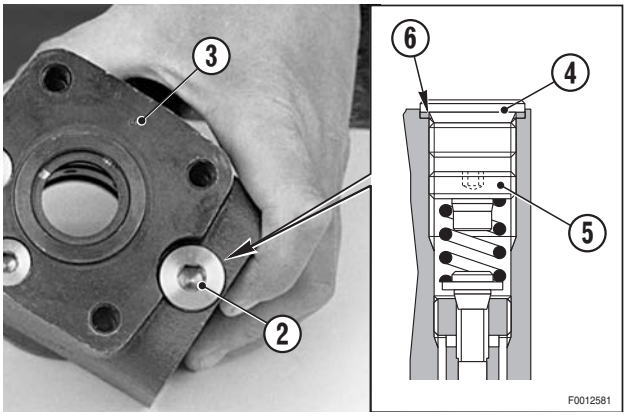
2 - Start the engine and turn the wheel back and forth between the full lock positions to eliminate all air from the system.

3 - Force the steering to full lock on the side to 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 maximum pressure valve (2) of the power steering unit (3).



Adjustment

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 COUNTER-CLOCKWISE

3 - Refit the plug (4), checking the gasket (6) is in its seating.

Nm Plug: 50±10 Nm (36.8±7.4 lb.ft.)

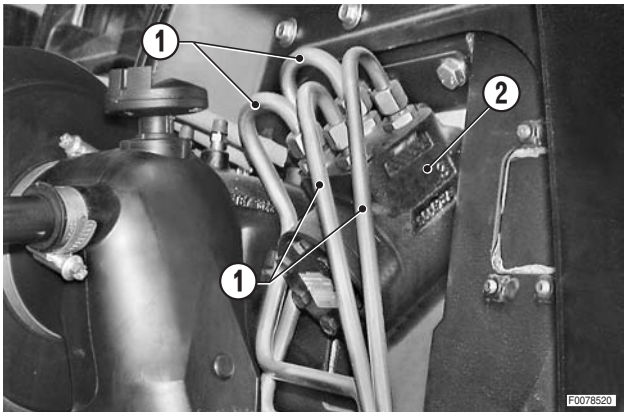
Removal

1 - Remove the console shroud. (For details, see "CENTRE CONSOLE AND SHROUD").

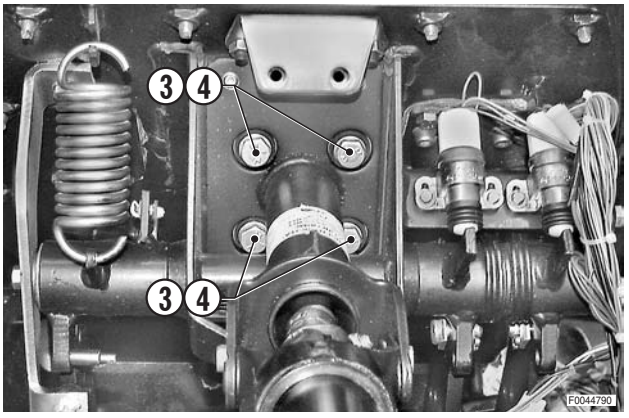
2 - Mark the hoses (1) and disconnect them from the power steering unit (2).

★ Plug the pipelines and ports to prevent impurities getting in.

※ 1



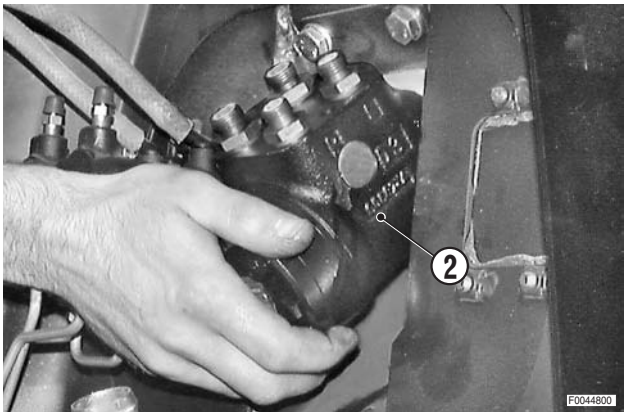
3 - Unscrew the retaining bolts (3) and washers (4).



4 - Remove the power steering unit (2).

★ If necessary, reposition the plate (5) with the relative bushes (6).

※ 2



Refitting

• Refitting is the reverse of removal.

※ 1

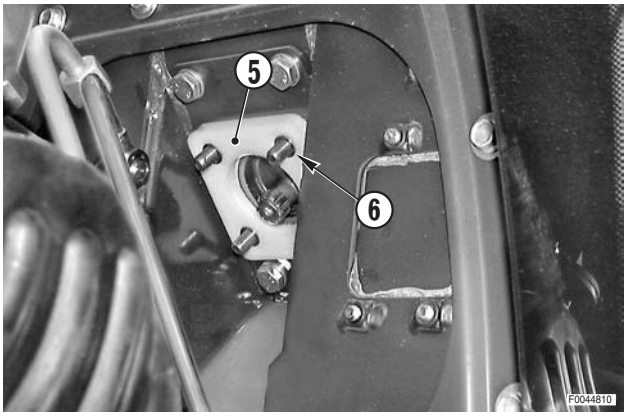
Nm Pipe fittings: 60 Nm (44.2 lb.ft.)
Eye fitting: 29 Nm (21.4 lb.ft.)

※ 2

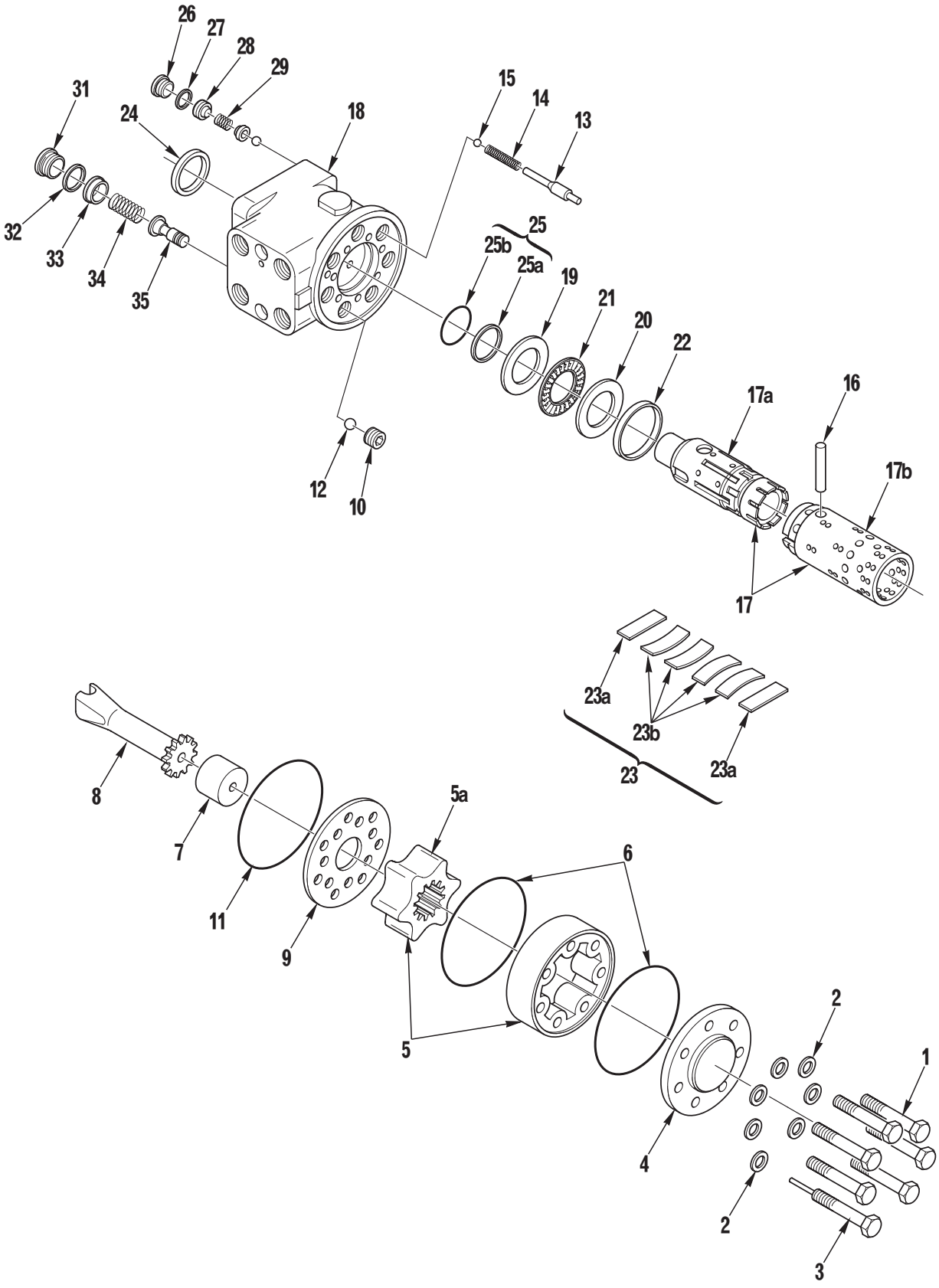
★ If the fittings have been removed, replace the seals. Torque reassembled fittings to 70 Nm (51.6 lb.ft.).

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.

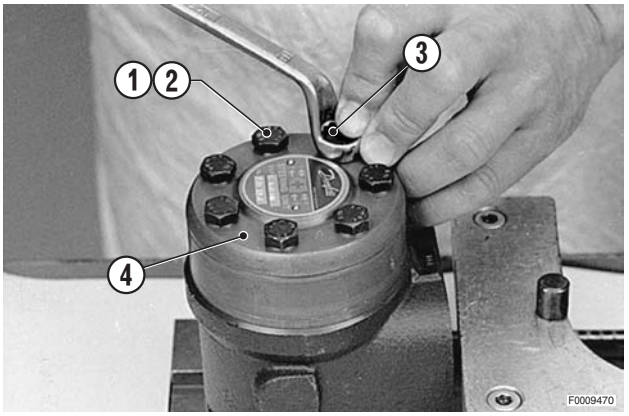


Dismantling

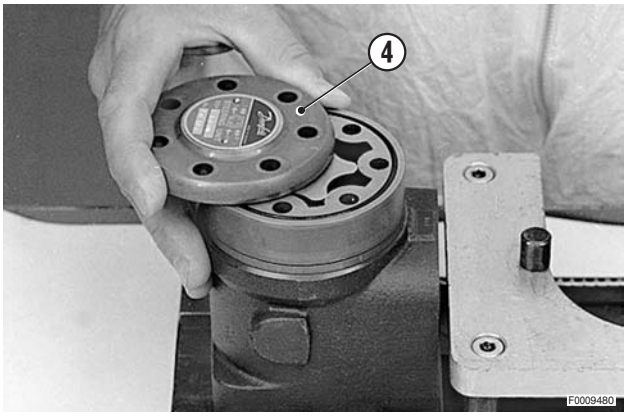


Dismantling the power steering unit

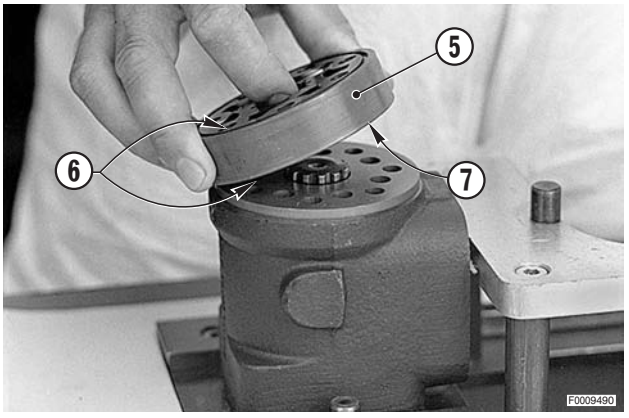
1 - Loosen and remove the screws (1) and (3) and washers (2) securing the cover (4) (6 bolts plus 1 special screw).



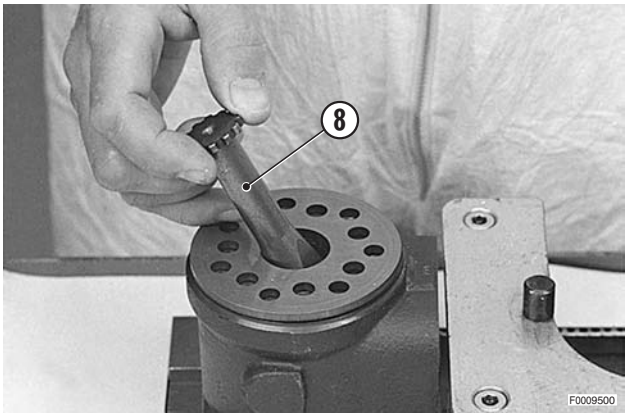
2 - Remove the cover (4) by sliding it off sideways.



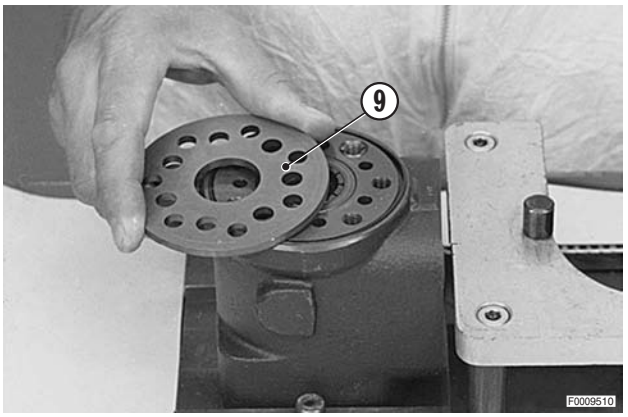
3 - Lift off the rotor assembly (5) complete with O-rings (6) and distance piece (7).



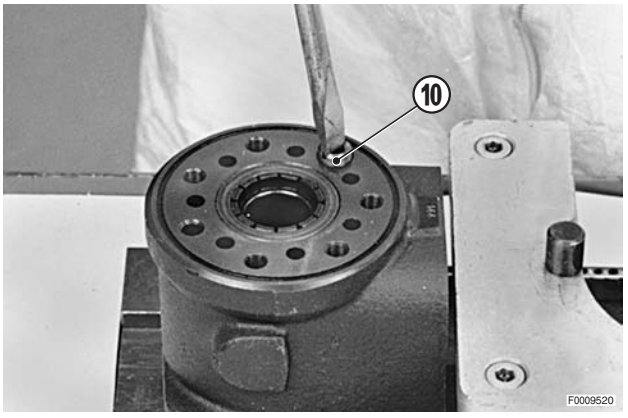
4 - Remove the shaft (8).



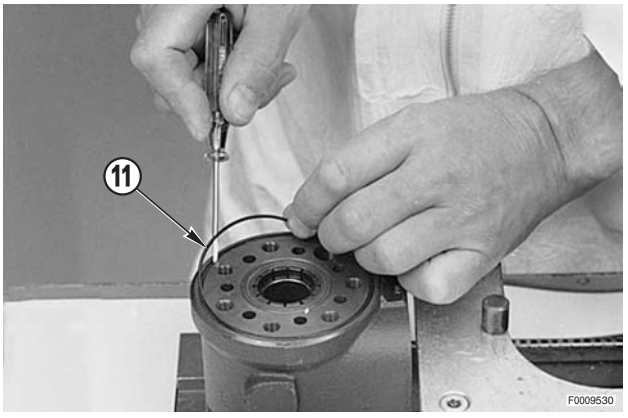
5 - Remove the distributor plate (9).



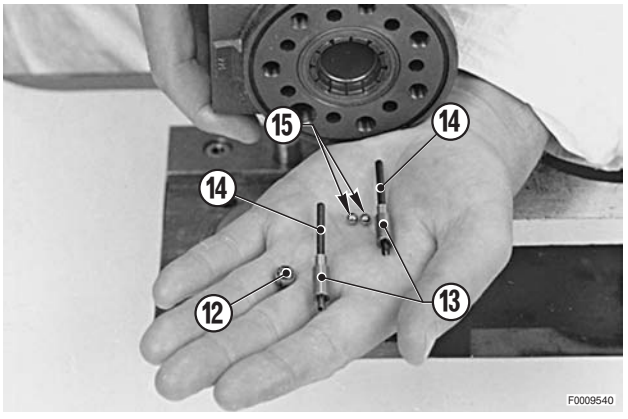
6 - Remove the stop bushing (10) of the safety valve.



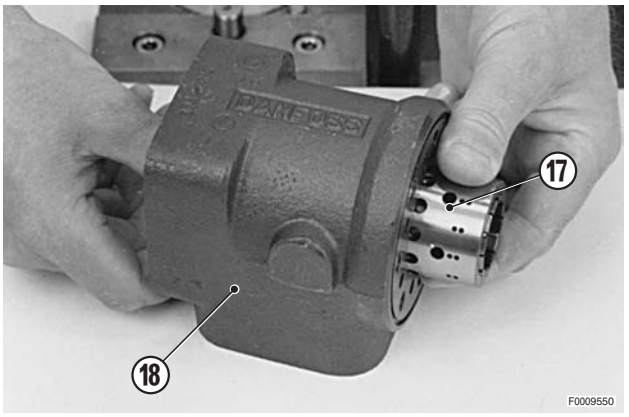
7 - Remove the O-ring (11).



8 - Withdraw the ball (12) of the check valve, the valve stems, the springs (14) and the balls (15) of the anti-cavitation valves.

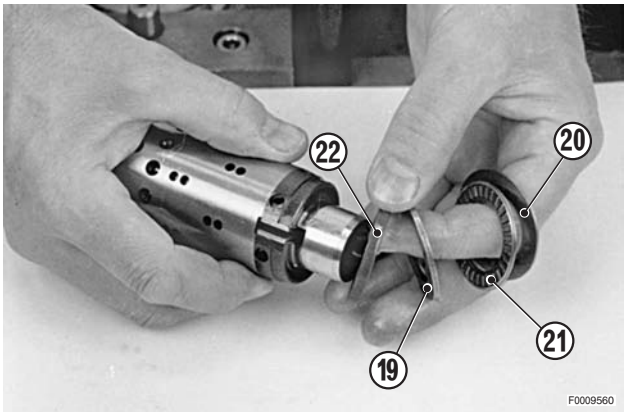


9 - Checking through the central hole of the spool valve, ensure that the pin (16) connecting the inner and outer sleeves of the spool is positioned horizontally.
Push the entire spool assembly (17) and the bearing out of the steering unit housing (18).



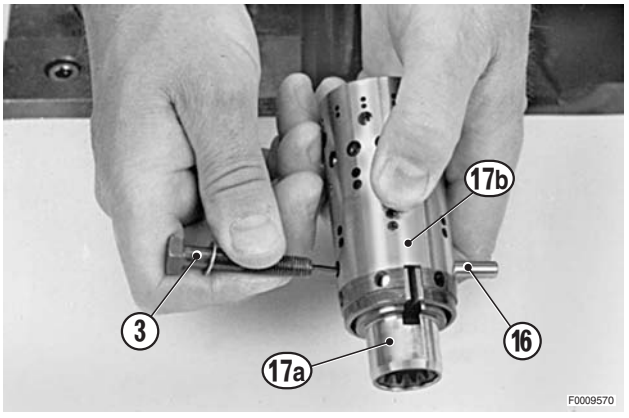
10 - Remove the outer thrust washer (19), the inner thrust washer (20) and the needle roller bearing (21) from the spool; remove also ring (22).

★ The inner thrust washer (20) (thin) can sometimes remain inside the housing; check that it is removed.

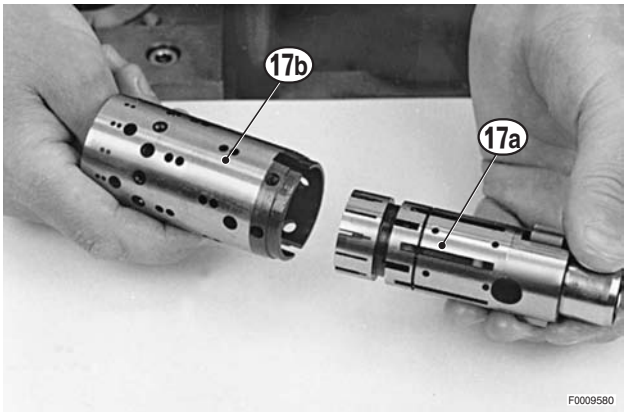


11 - Remove the trim spin (16), outer sleeve (17b) and the inner sleeve (17a).

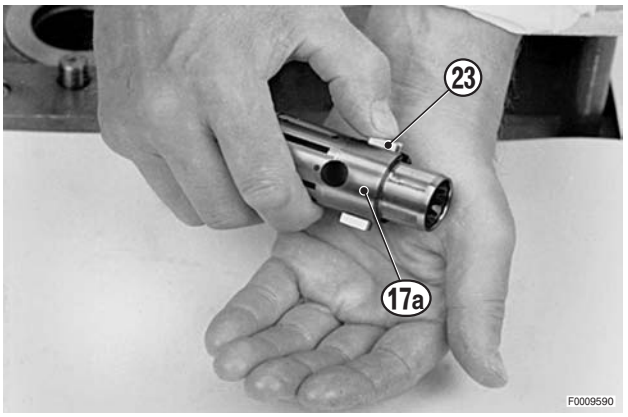
★ Use the special cover bolt (3).



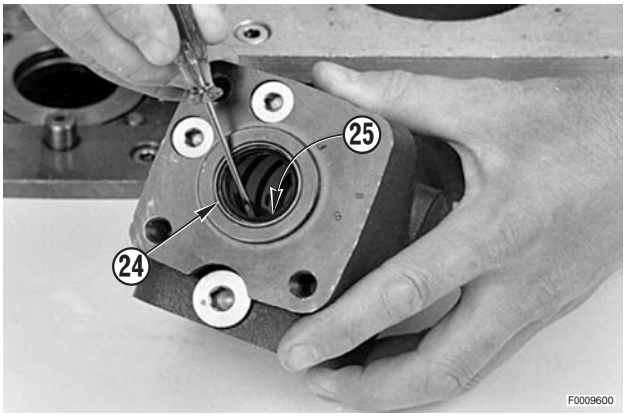
12 - Carefully slide the inner sleeve (17a) out of the outer sleeve (17b).



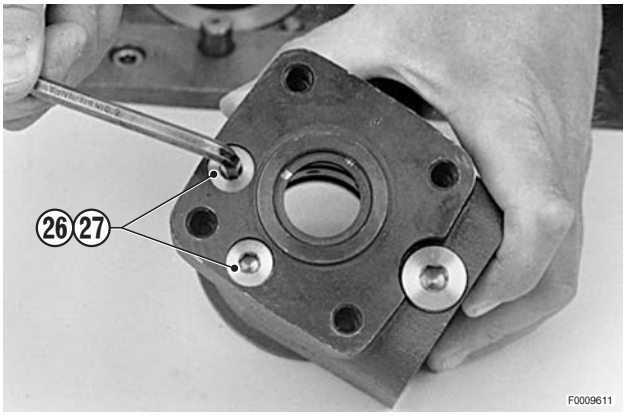
13 - Push the springs (23) into the neutral position and withdraw them from the inner sleeve (17a).



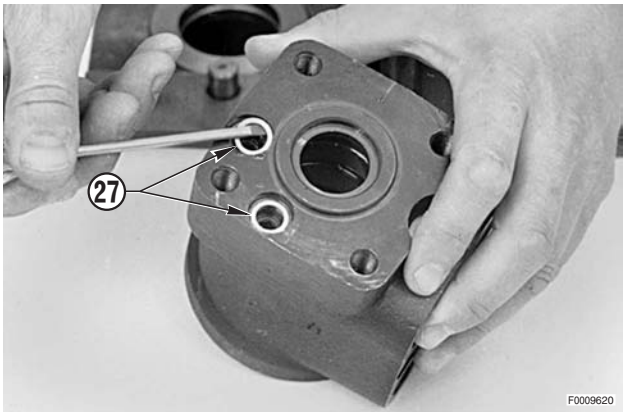
14 - Remove the dust seal (24) and the composite seal (25) (O-ring + gasket).



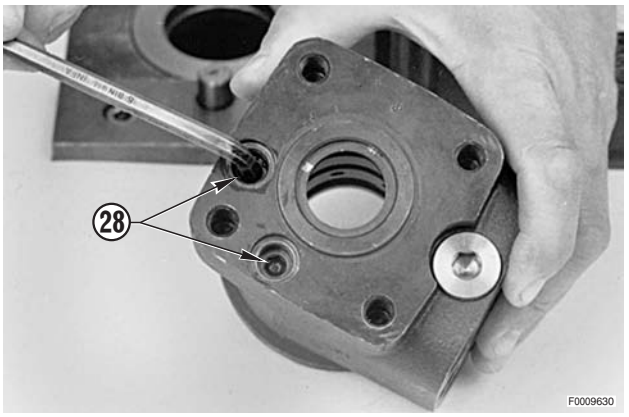
15 - Remove the plugs (26) of the anti-shock valve.



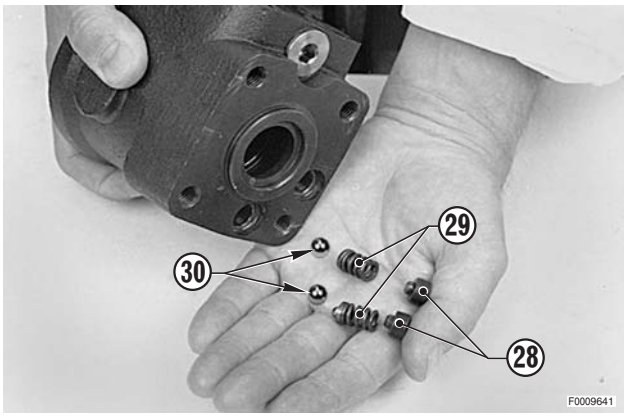
16 - Remove the seals (27).



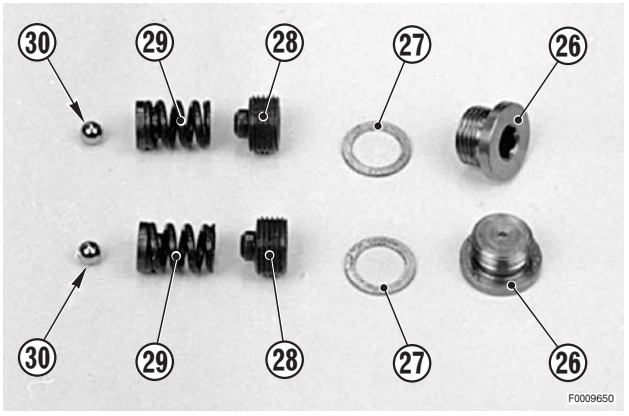
17 - Remove the calibration screws (28).



18 - Remove the springs (29) and the two balls (30).
★ The valve seats are force fit in power steering unit and cannot be removed.

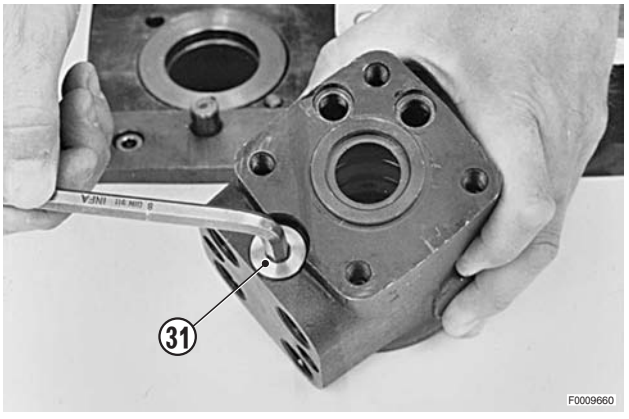


19 - Check that all the valve parts are present as show in the photo.

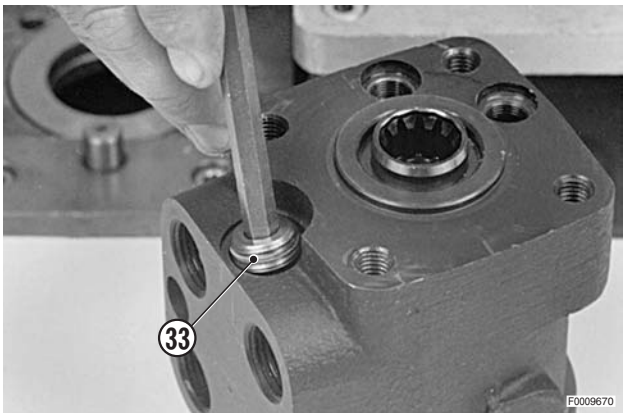


Removal of the safety valve

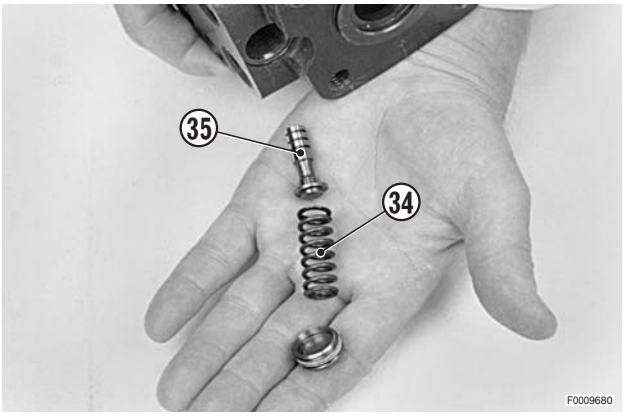
20 - Remove the plug (31) and the relative seal.



21 - Remove the maximum pressure adjustment screw (33).



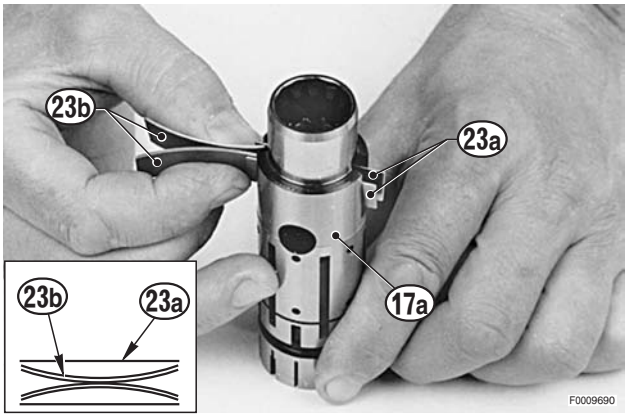
22 - Turn the power steering unit upside down and remove the spring (34) and valve (35).
★ The valve seat is a force fit in the power steering housing and cannot be removed.



Assembly

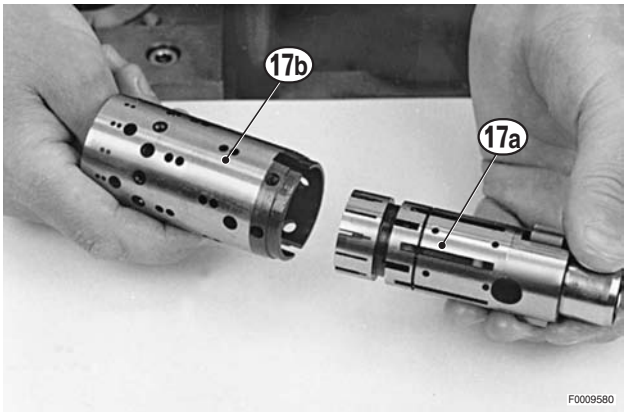
★ Before assembly, lubricate all components with gearbox oil.

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.

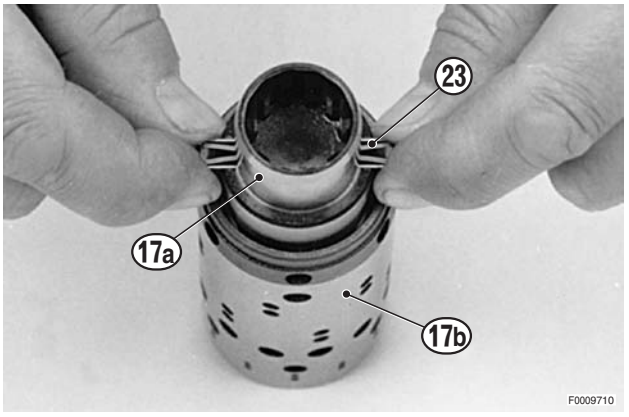


2 - Align the springs (23).

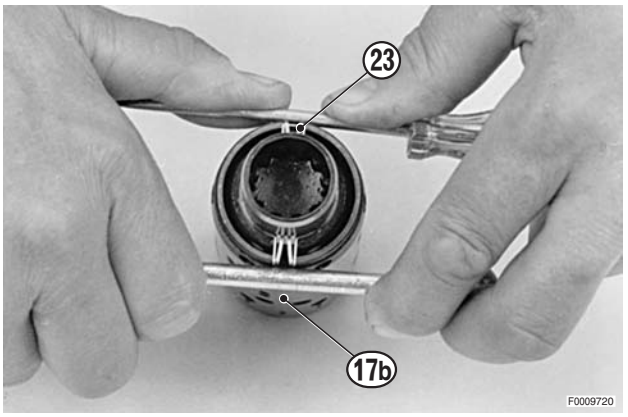
3 - Insert the inner sleeve (17a) in outer sleeve (17b).
★ Check that the relative positions of the inner and outer sleeve are as described in stage 1.



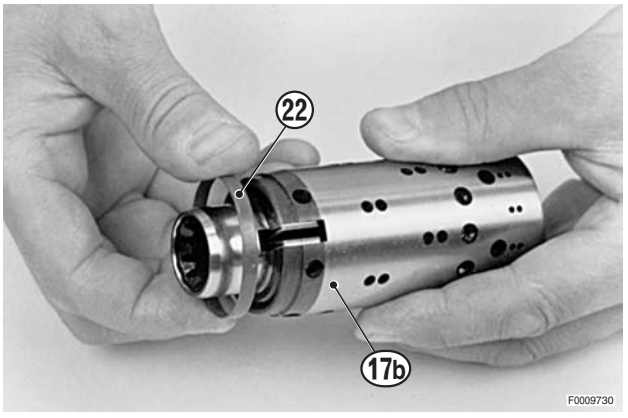
4 - Simultaneously push the springs (23) and the inner sleeve (17a) so that the springs locate in the outer sleeve (17b).



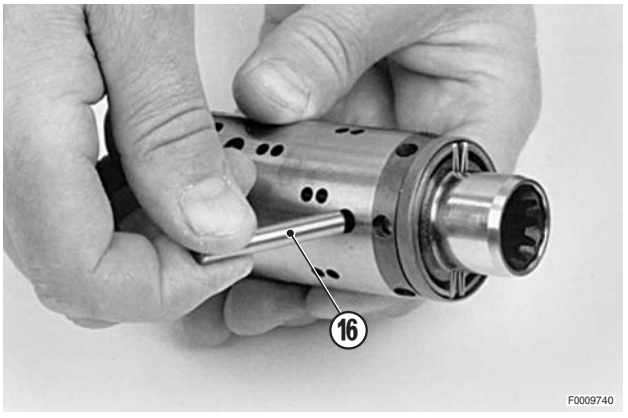
5 - Align the springs (23) and position them centrally relative to the diameter of the outer sleeve (17b).



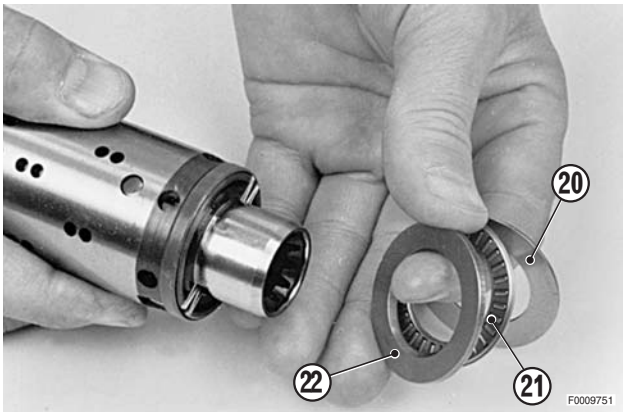
6 - Fit the ring (22) on to its seating on the outer sleeve (17b).
★ The ring (22) must rotate freely without interference with the springs (23).



7 - Insert the trim pin (16).

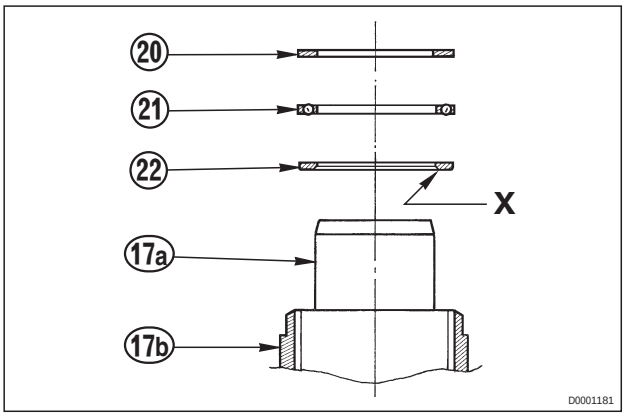


8 - Fit the thrust bearing parts in the order indicated in the assembly diagram in point 9.

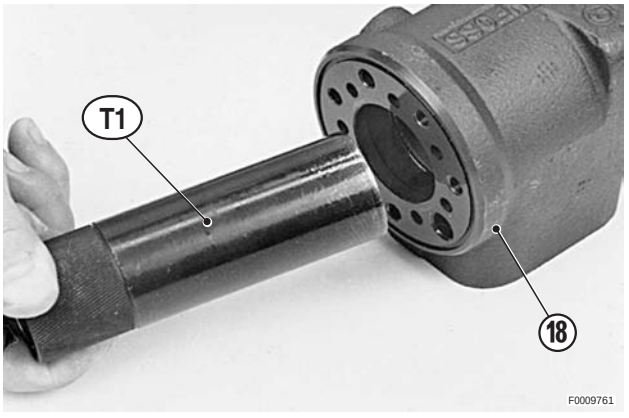


9 - Bearing assembly diagram
17a -Inner sleeve
17b -Outer sleeve
21- Needle roller bearing
20 -Inner thrust washer
22 -Outer thrust washer

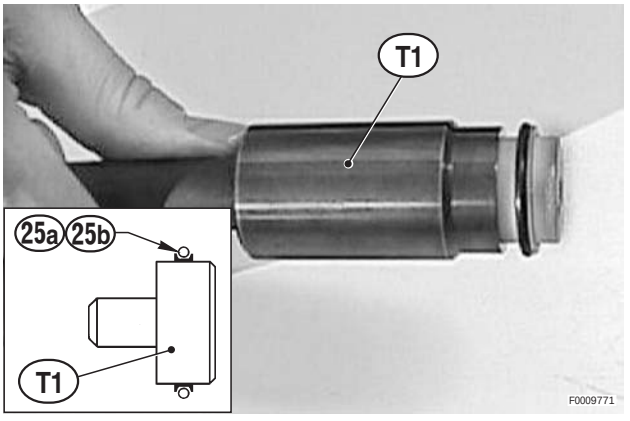
⚠ The chamfer "**X**" of the outer thrust washer must be oriented towards the shoulder on the inner sleeve.



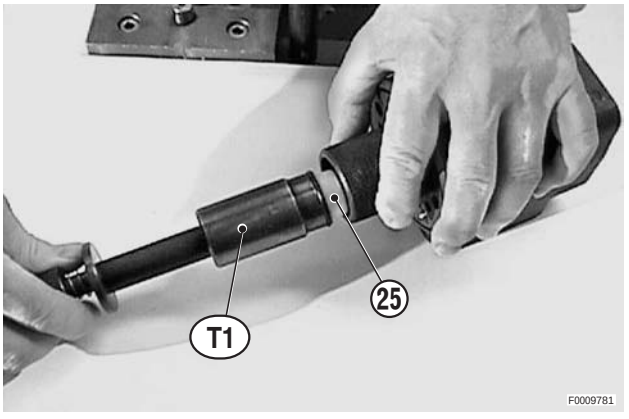
10 - Position the steering unit (18) so that the central bore is horizontal.
Insert the guide of tool **T1** (code 5.9030.480.0) into the bore of the inner/outer sleeve assembly.



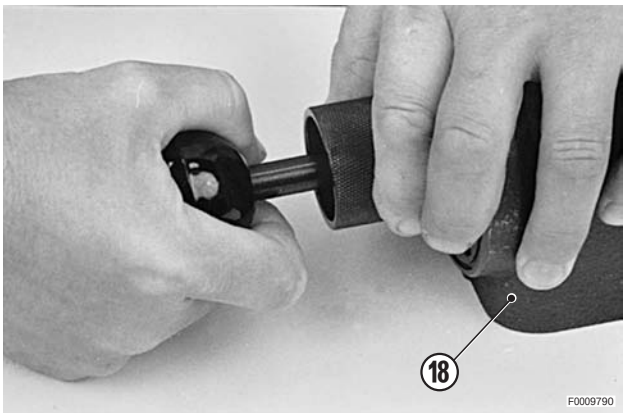
11 - Oil the seal (25a) and O-ring (25b) and fit them on the plunger of tool **T1** (code 5.9030.480.0).



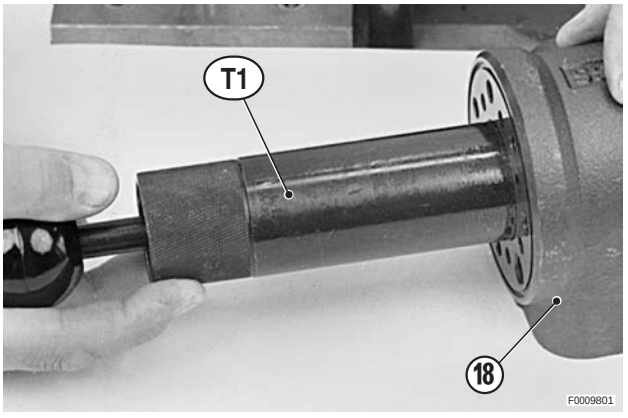
12 - Assemble tool **T1** (code 5.9030.480.0) and insert it in the guide previously inserted in the central bore of the power steering unit.



13 - Push the seal (25) into the seating in the power steering unit (18), turning it slightly to ensure correct positioning.

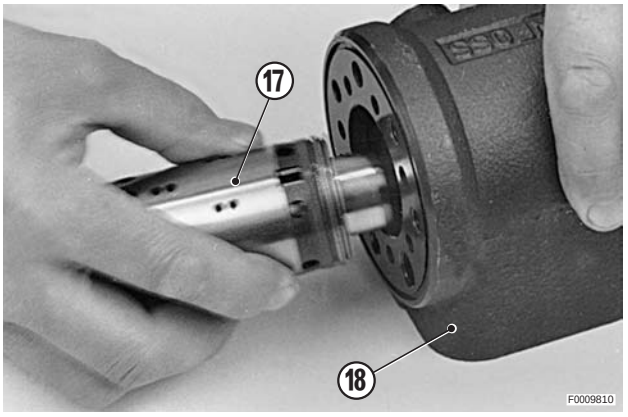


14 - Withdraw the tool **T1** (code 5.9030.480.0) and the guide from the steering unit housing, leaving the seal installer plunger in place.

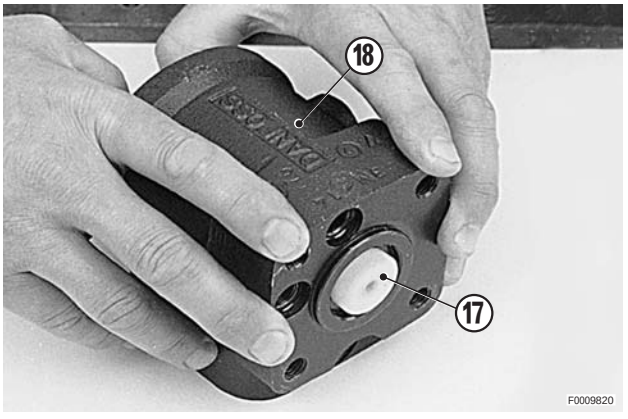


15 - Insert the spool assembly (17) in the bore of the power steering unit (18), turning its slightly to assist insertion.

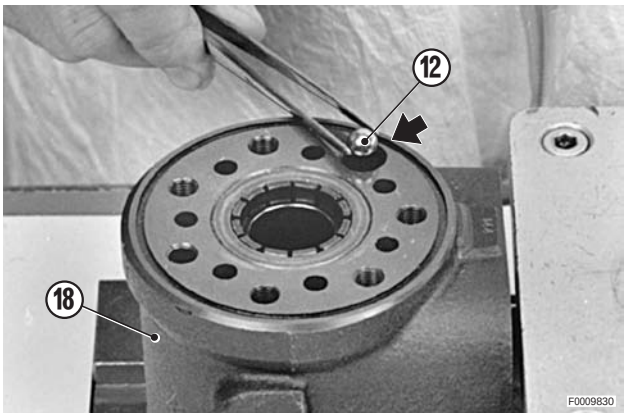
★ Insert the assembly while keeping the trim pin in a horizontal position.



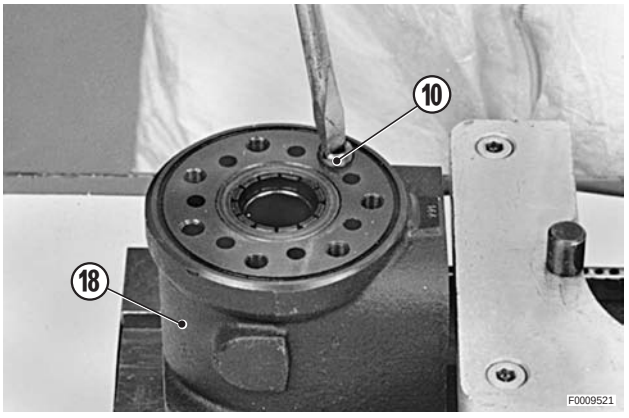
16 - Push the spool assembly (17) fully home in order to expel the seal installer plunger left in the bore in step 14.



17 - Turn over the power steering housing (18) so that the central bore is vertical.
Insert the ball (12) of the safety valve in the hole indicated in the photo.

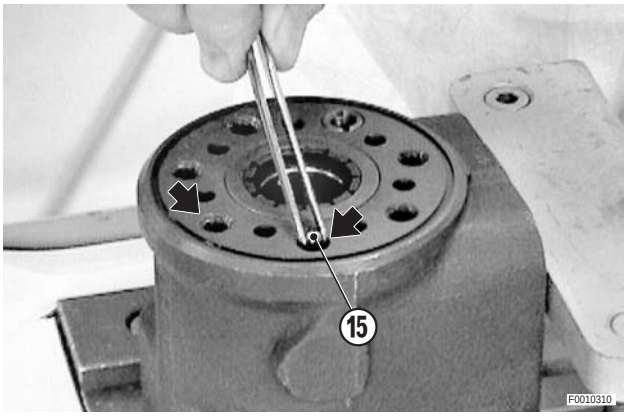


18 - Screw the stop bush (10) into the safety valve hole.
★ The top of the bush must be positioned lower than the face of the steering unit housing (18).

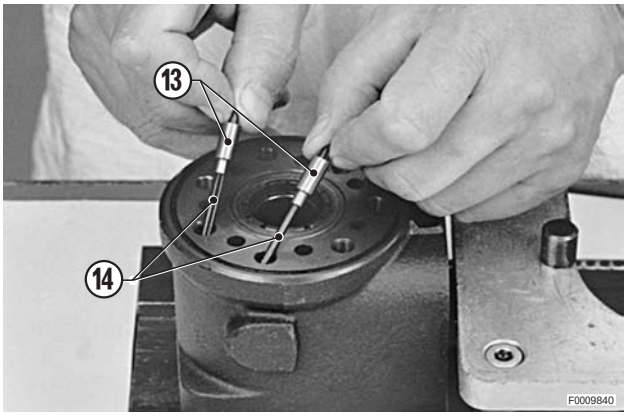


Assembly of the anti-cavitation valve

19 - Insert the balls (15) into the two holes indicated by the arrows.

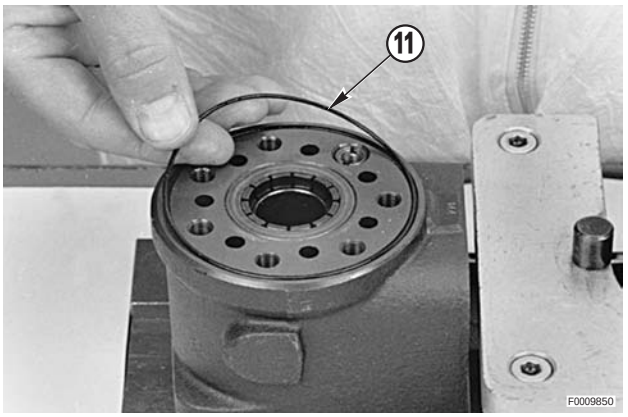


20 - Insert the valve stems (13) complete with springs (14) into the same holes.

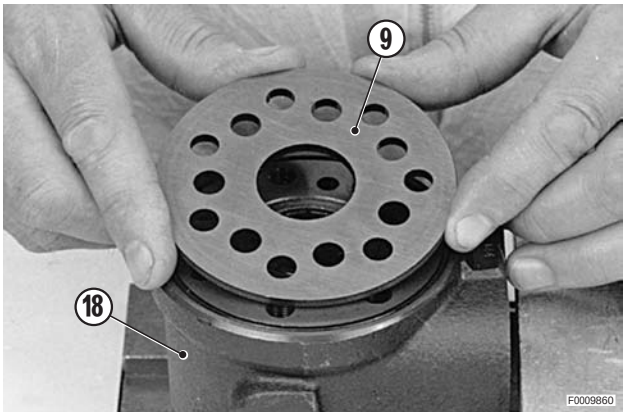


21 - Oil the O-ring (11) and fit it in its seat.

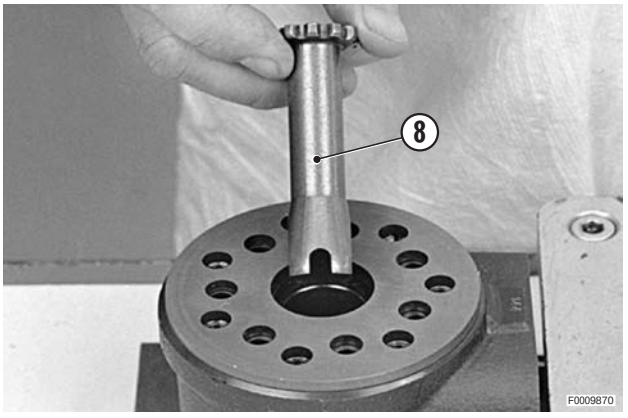
O-ring: gearbox oil



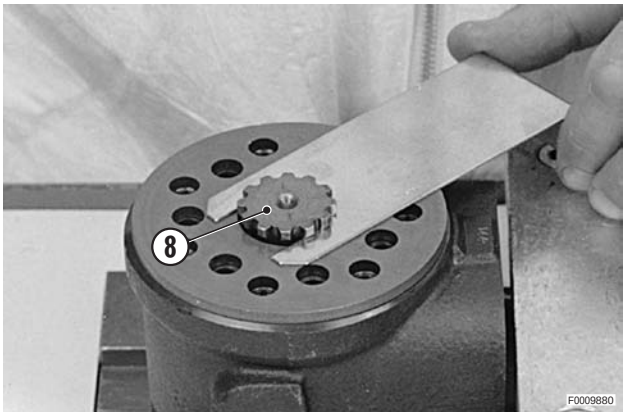
22 - Position the distributor plate (9) so that its holes are aligned with those in the power steering housing (18).



23 - Insert the shaft (8) in to the central bore so that engages the trim pin; check that trim pin engagement is parallel to the face of the power steering unit by which it is attached to the steering column.

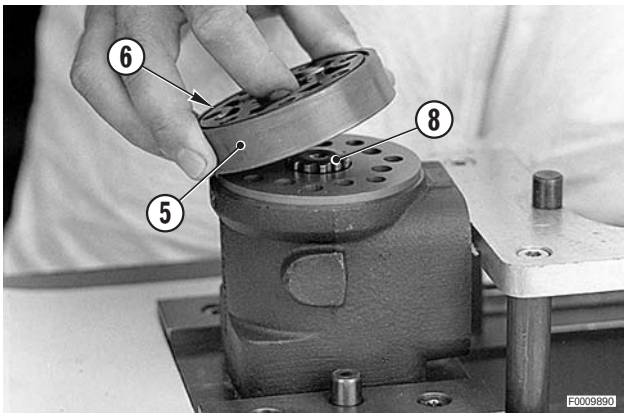


24 - Position the shaft vertically and hold it in place using the specific tool.

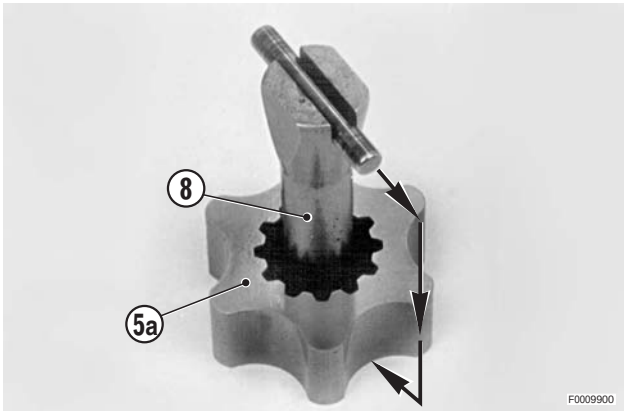


25 - Oil the two O-rings (6) and install them in the two seats in the rotor assembly (5).

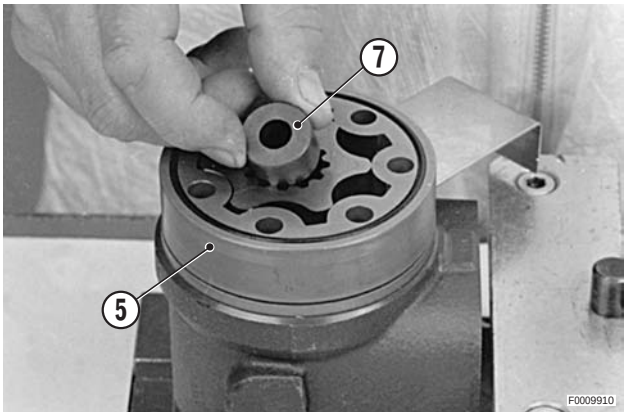
O-rings: gearbox oil



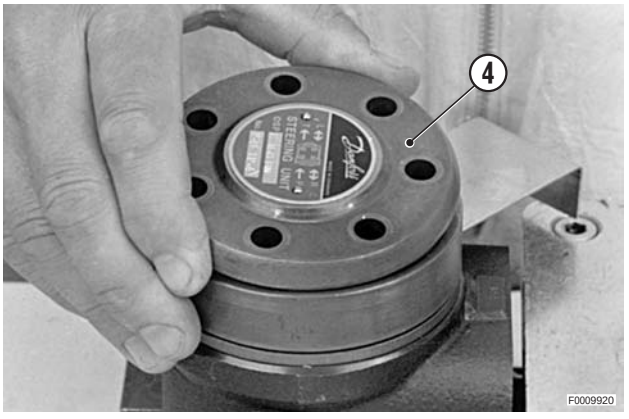
Fit the inner rotor (5a) on the shaft (8) so that the lowest part between two lobes of the rotor is aligned with the trim pin groove on the shaft. The rotate the outer rotor (5) to align the fixing holes.



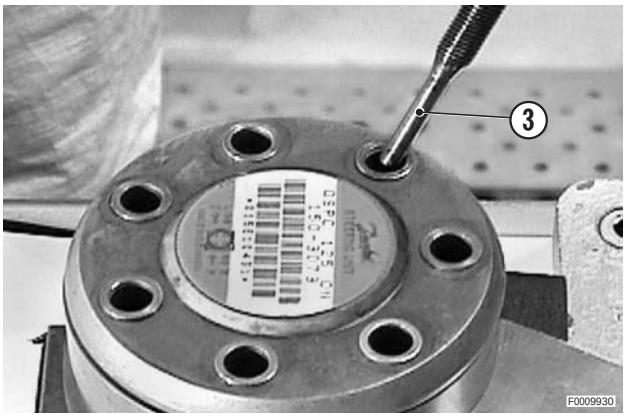
26 - Fit the distance piece (7).



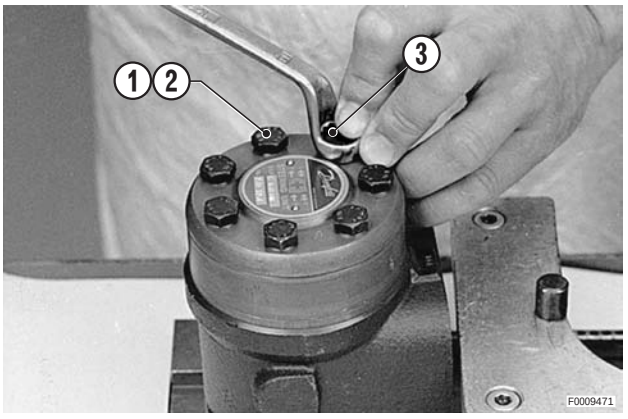
27 - Fit the cover (4).



28 - Insert the special screw (3) complete with washer (2) in the hole shown in the photo.

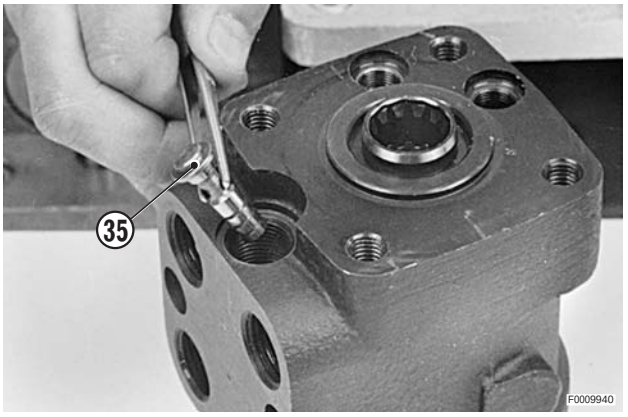


29 - Insert the six screws (1) with washers (2).
Tighten the screws(1) and (3) in crosswise pattern to a torque of 30±6 Nm (22.1±4.4 lb.ft.).

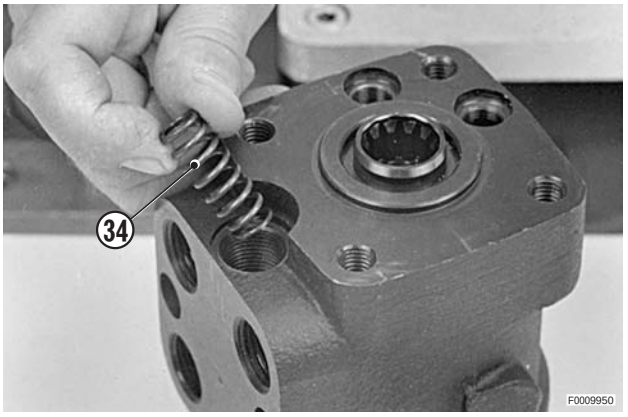


Assembly of the pressure relief valve

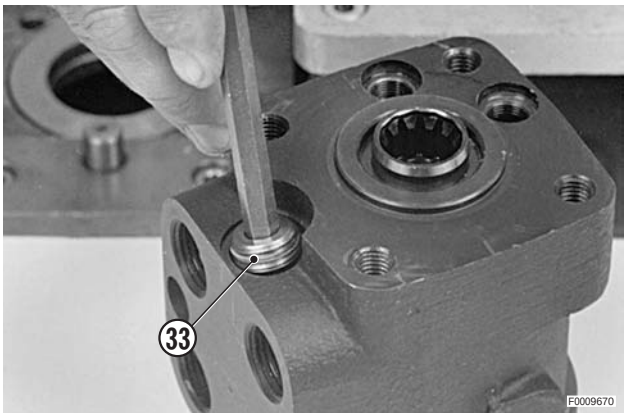
30 - Insert the valve (35).



31 - Insert the spring (34)

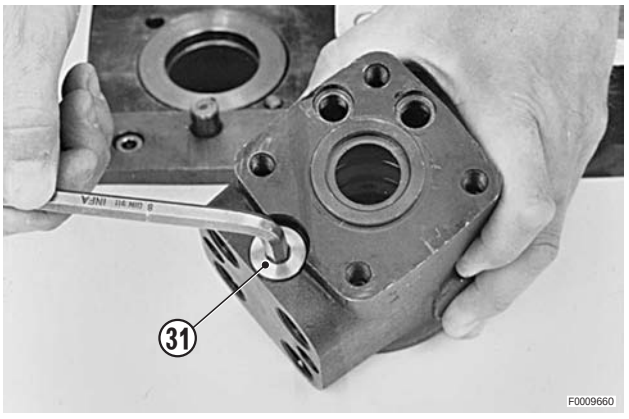


32 - Fit the pressure adjuster screw (33).
★ Set the maximum operating pressure on a test bench.
★ Pressure: 180+10 bar (2610+145 psi)

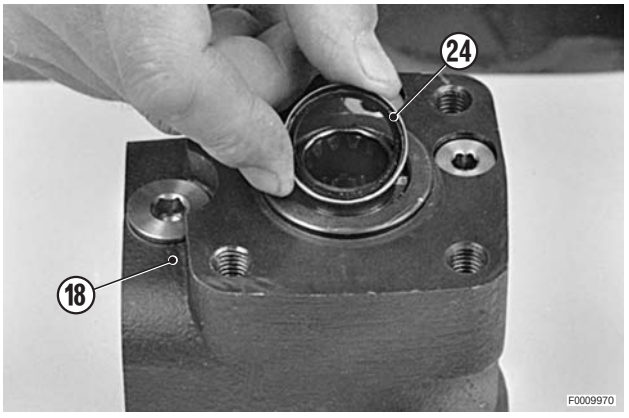


33 - Fit plug (31) complete with seal.

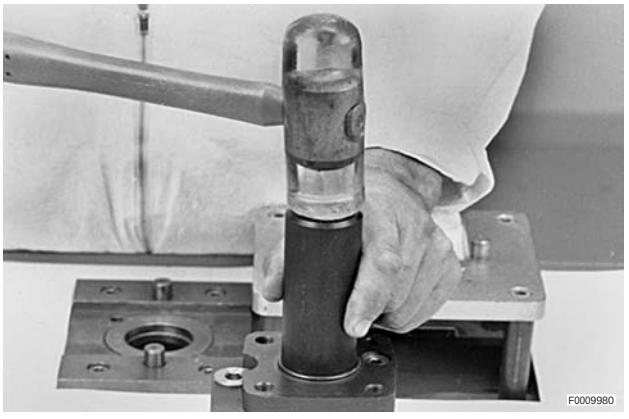
Nm Plug: 50±10 Nm (36.8±7.4 lb.ft.)



34 - Position the dust seal (24) in the power steering unit housing (18).

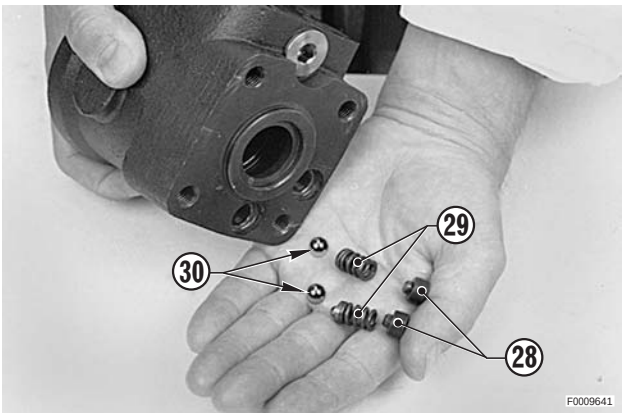


35 - Drive the dust seal (24) into its seating using a suitable drift and a plastic mallet.

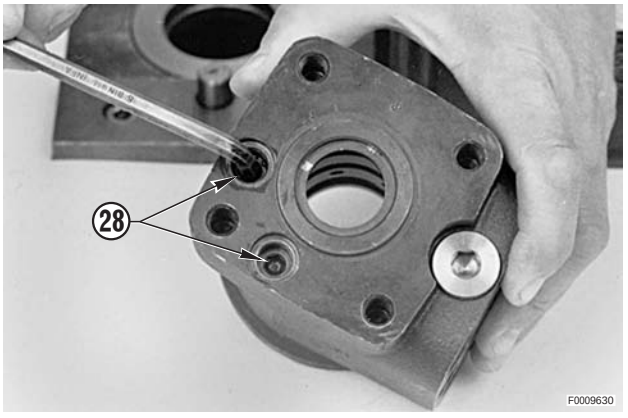


Assembly of shock valves

36 - Insert the balls (30), springs (29) and setscrews (28) in their sockets.

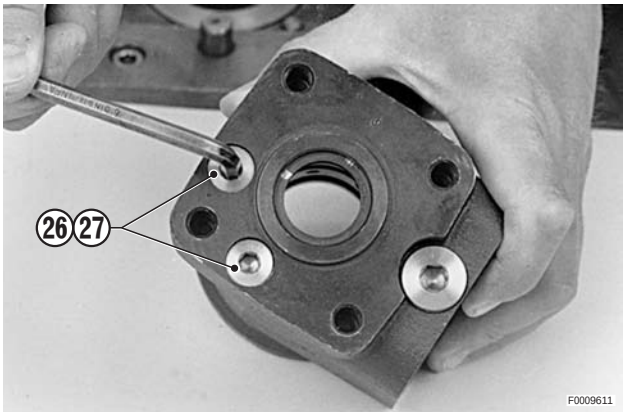


37 - Lock the setscrews (28) in their seats.



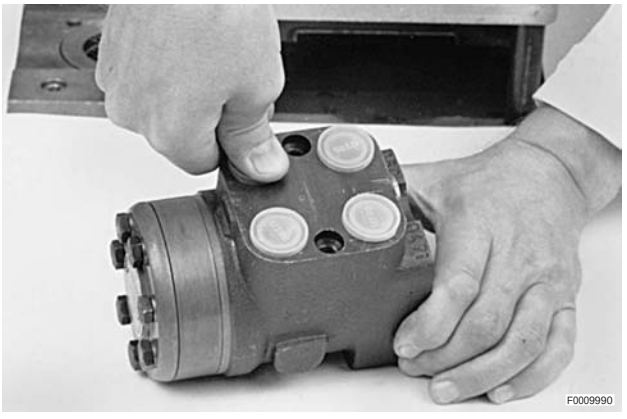
38 - Fit the seals (27) and screw in the plugs (26).

Nm Plugs: 30 Nm (22.1 lb.ft.)



39 - Close off the oil ports with plastic plugs to prevent impurities getting in.

★ Fit the plugs by hand pressure alone; do not hammer.



FRONT WHEELS

Removal

⚠ On tractors with front suspension, before stopping the engine to remove the front wheels, disengage the front axle suspension by pressing the relative button in the cab.

1 - Apply the parking brake.

- **For normal front axles**

2 - Position centrally under the pivoting support (1) a trolley jack "**A**" with a minimum lifting capacity of 5 tons and maximum lift height of at least 15 cm (6 in.).

★ Drive safety wedges between the axle and the axle support.

- **For suspended front axles**

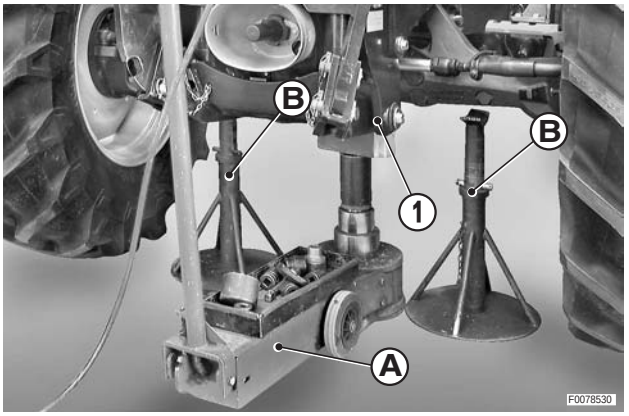
2 - Position centrally under the pivoting support (1) a trolley jack "**A**" with a minimum lifting capacity of 5 tons and maximum lift height of at least 15 cm (6 in.).

- **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 - Position two jacks "**B**" under the axle; lower the trolley jack so that the axle is supported on the jacks "B" with the wheels off the ground and then remove trolley jack "**A**".

★ Jack lifting capacity: minimum 2 tons.



5 - Slacken off all the wheel nuts (1); remove the wheel nuts, leaving one (for safety) at the top of the wheel.

1

6 - While holding the wheel vertical, remove the last nut and remove the wheel (2).

7 - Repeat the above operations to remove the other rear wheel.

Refitting

- Refitting is the reverse of removal.

1

Nm 4WD wheel nuts: 350 Nm (258 lb.ft.)

★ Tighten the wheel nuts gradually in a crosswise sequence.

FRONT FENDERS

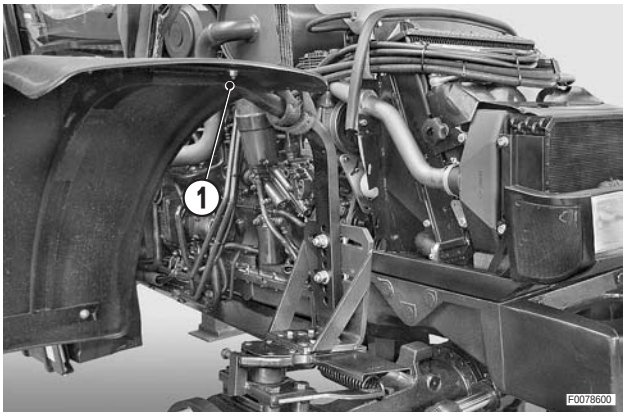
Removal

★ 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.

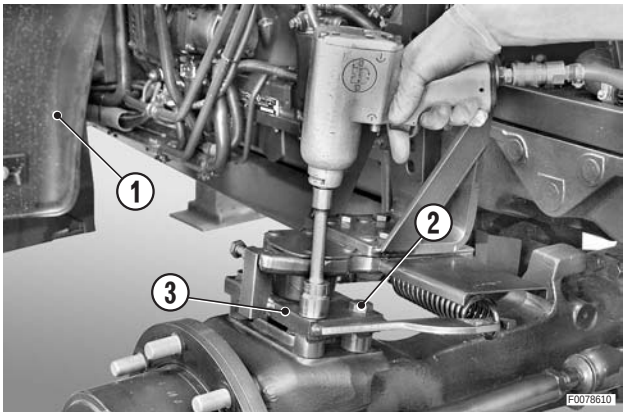
1 - Remove the front wheels.
(For details, see "FRONT WHEELS").

2 - Attach a hoist to the fender to be removed (1).

kg Fender assembly: 19 kg (42 lb.)



3 - Unscrew and remove the bolts (2) and remove the fender (1) complete with the mounting bracket (3).



Refitting

• Refitting is the reverse of removal.

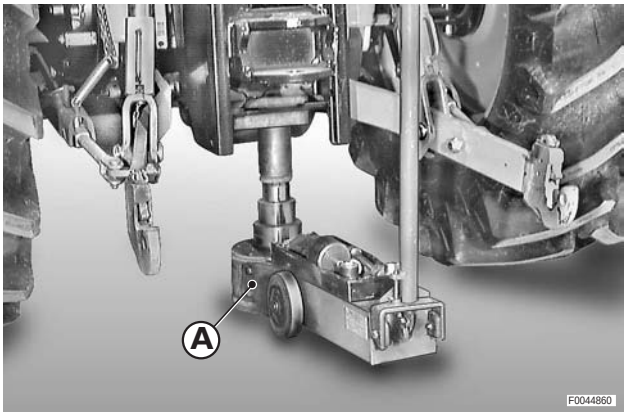
REAR WHEELS

Removal

1 - Position under the rear gearbox a trolley jack "**A**" with minimum lifting capacity of 5 tons and a maximum lifting height of at least 15 cm (6 in.).

★ Position the trolley jack "**A**" so that it is nearer to the wheel to be removed.

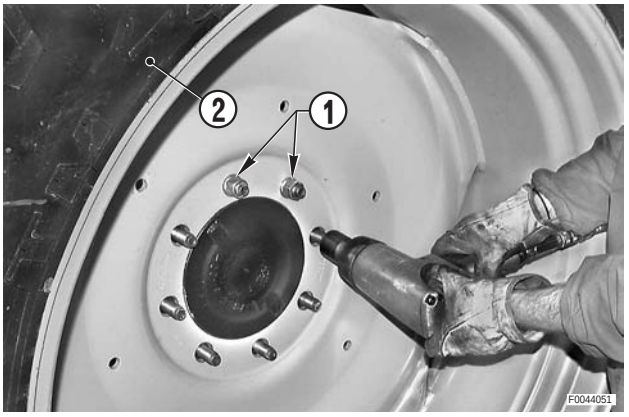
2 - Raise the tractor sufficiently to eliminate the flexure of the tyre wall.



3 - Slacken off all the wheel nuts (1); leaving one (for safety) at the top of the wheel.

※ 1

4 - While holding the wheel vertical, remove the last wheel nut and remove the wheel (2).

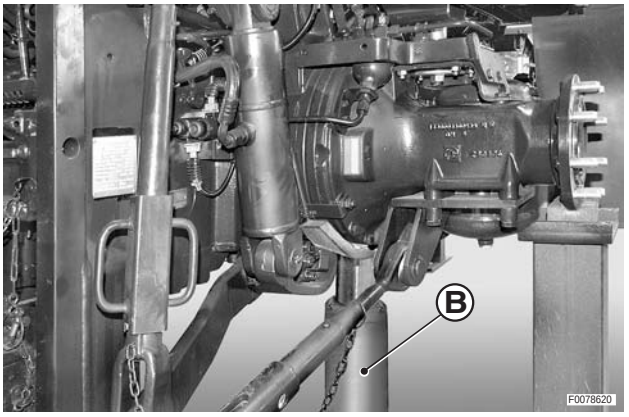


5 - Position under the rear axle an axle stand "**B**" with lateral retaining wings for safety and lower the trolley jack until the axle is resting on the axle stand.

★ Axle stand load capacity: 2 tons minimum.

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.

※ 1

Nm Wheel nuts:
M18x1.5: 350 Nm ± 10%(258 lb.ft. ± 10%)

★ Tighten the wheel nuts gradually in a crosswise sequence.

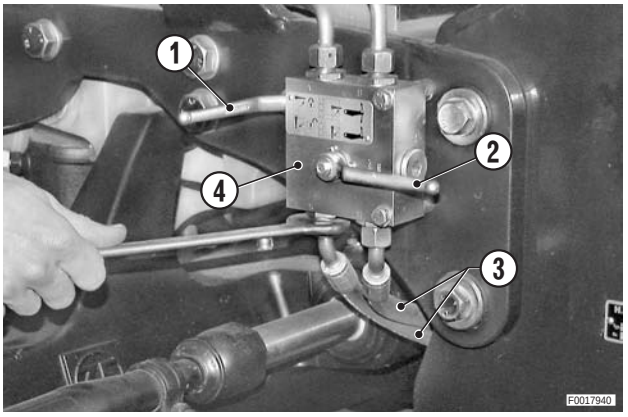
LIFT VALVE BLOCK

Removal

⚠ Fully lower the lift and switch off the engine.

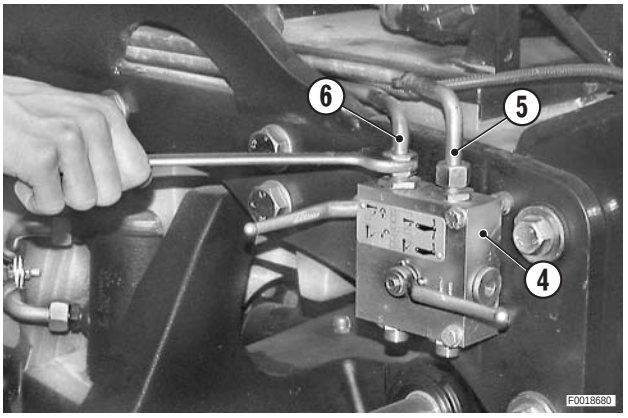
1 - With the control levers (1), (2) in the horizontal position, label the lower pipes (3) and disconnect them from the valve block (4).

★ Label the pipes to avoid confusion on reconnection.

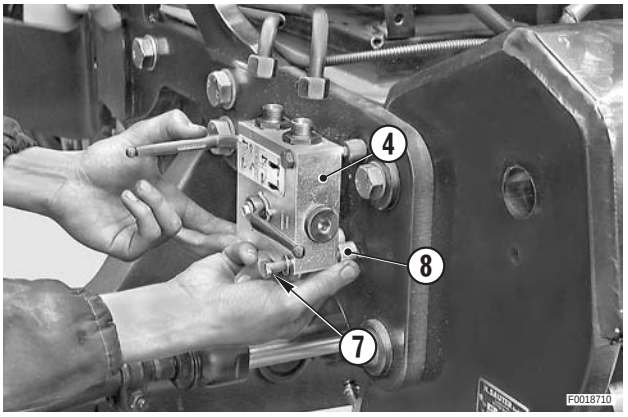


2 - Disconnect the rigid upper pipes (5), (6).

★ Plug the ends of the pipes to prevent the entry of contaminants.



3 - Unscrew the bolts (7) and remove the valve block (4) with the rear spacers (8).



Refitting

- Refitting is the reverse of removal.

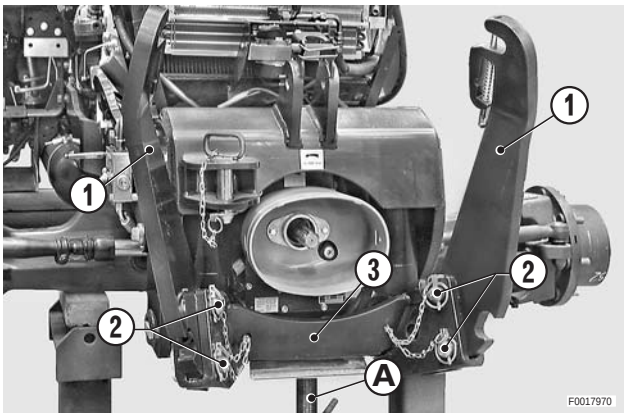
FRONT LIFT CYLINDERS

Removal

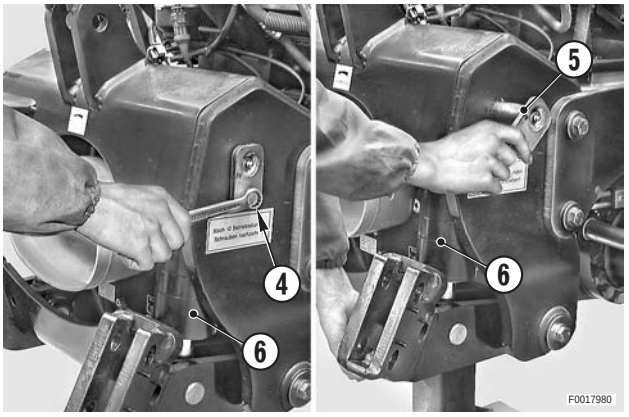
★ Raise the lift to its full height and switch off the engine.

1 - Remove the lift arms (1) and the pivot pins (2) along with their retaining chains.

2 - Position under the lift assembly (3) a jack"**A**" which can be lowered at least 10 cm (4 in.).



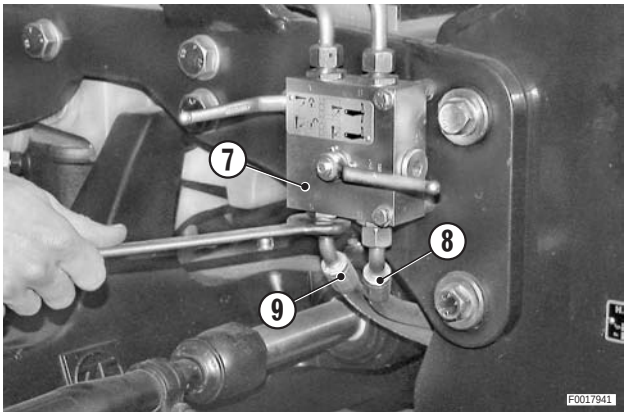
3 - Remove the bolts (4) and remove the upper pins (5) of the cylinders (6).



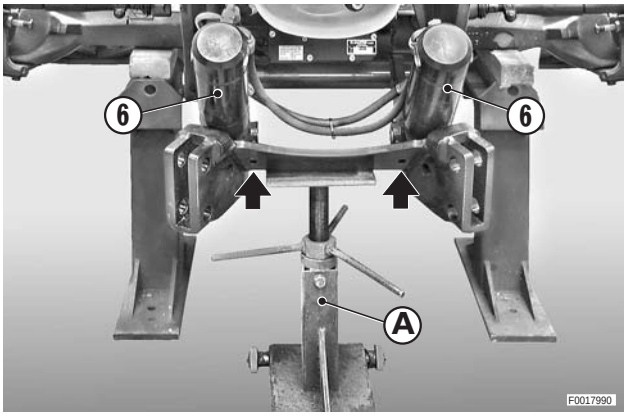
4 - Disconnect the cylinder feed pipes (8), (9) from the valve block (7).

Loosen the fitting by a few turns, but before fully disconnecting them, push them to detach them from the couplers and release any residual pressure in the system.

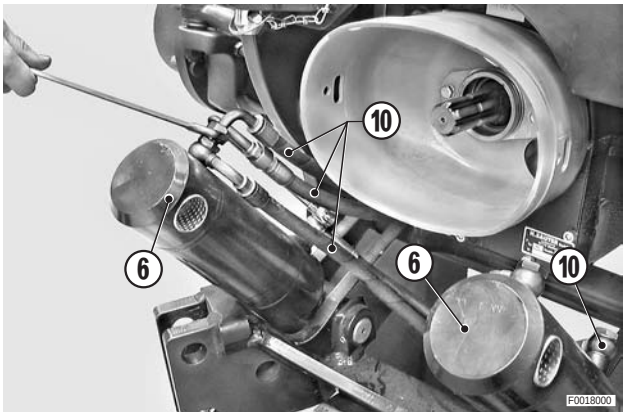
★ Label the pipes to avoid confusion on reconnection.



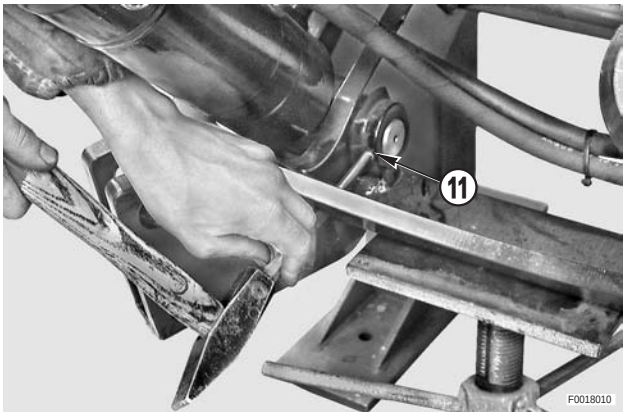
5 - Lower the jack"**A**" until the cylinders (6) can be tilted outwards in order to access the connection pipes and to align the hole provided for removal of the spring pins securing the lower pivot pins of the cylinders.



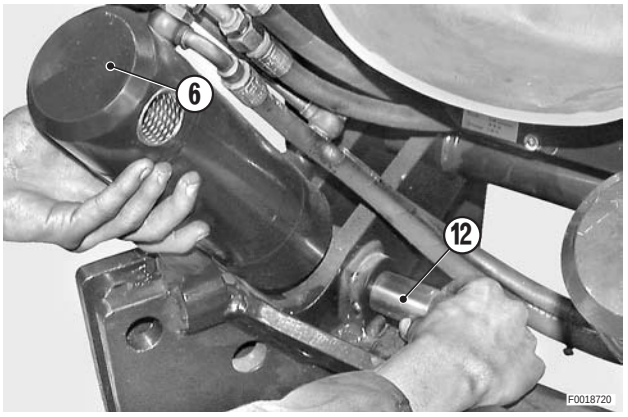
6 - Disconnect the four pipes (10) from the cylinders (6).
★ Label the pipes to avoid confusion on reconnection.



7 - Using a pin punch, remove the spring pins (11) securing the lower cylinder pivot pins.



8 - Withdraw the pivot pins (12) and remove the cylinders (6).



Refitting

- Refitting is the reverse of removal.

1 - Start the engine and repeatedly raise and lower the lift to the limit of its travel in order to bleed the system and check for leaks.

2 - Stop the engine, check the gearbox oil level and top up if necessary.

FRONT LIFT ASSEMBLY

Removal

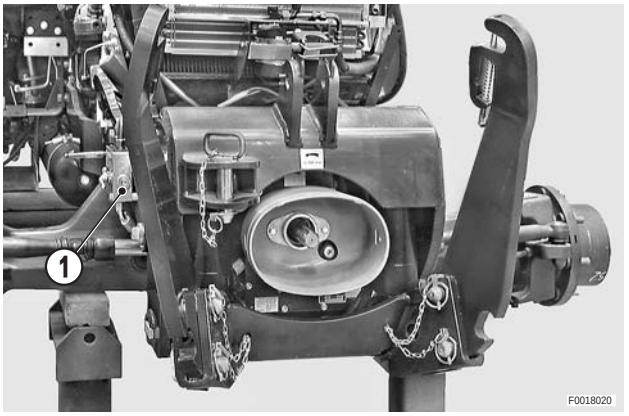
★ Raise the lift arms to the maximum height and stop the engine.

1 - Disconnect the lower pipes from the valve block (1).

Loosen the fitting by a few turns, but before fully disconnecting them, push them to detach them from the couplers and release any residual pressure in the system.

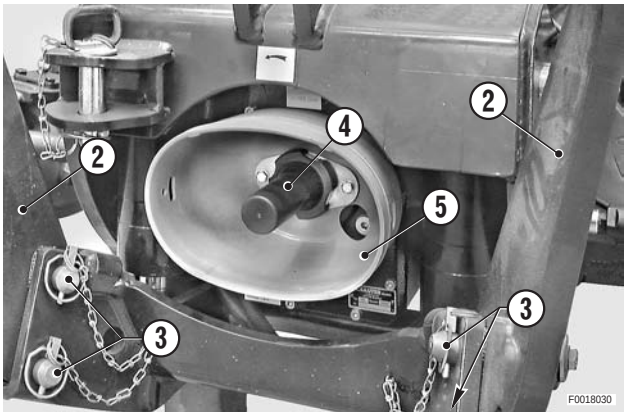
★ Label the pipes to avoid confusion on reconnection.

★ Plug the ends of the pipes and the open fittings on the valve block to prevent the entry of contaminants.

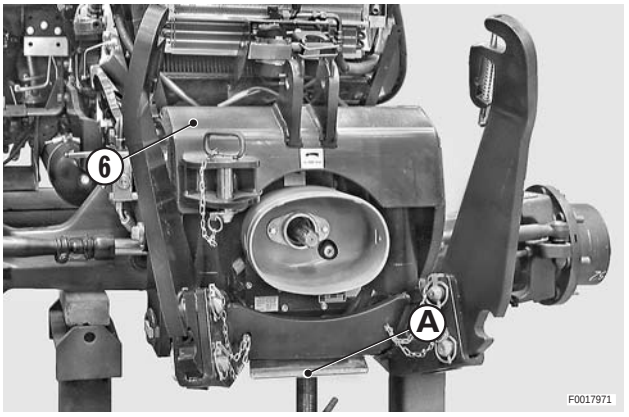


2 - Remove the lift arms (2) and the pivot pins (3) complete with their retaining chains.

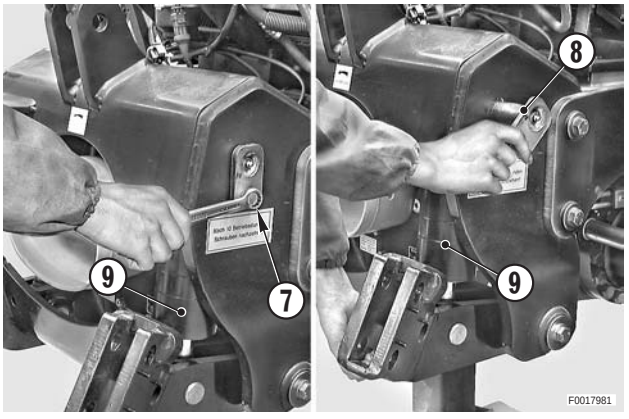
3 - Remove the shaft end cover (4) and the shield (5).



4 - Position under the lift assembly (6) a jack"**A**" that can be lowered by at least 10 cm. (4 in.).

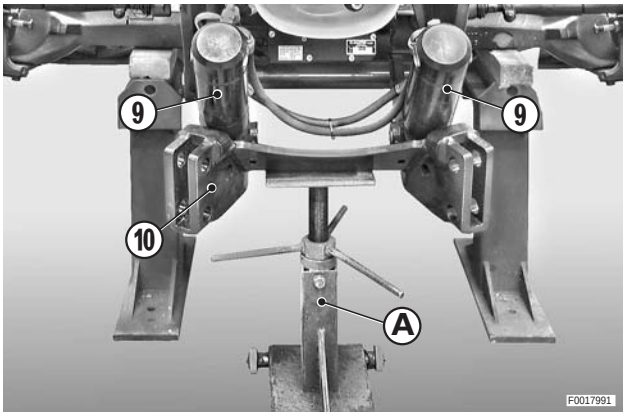


5 - Remove the bolts (7) and remove the upper pivot pins (8) of the cylinders (9).



6 - Lower the jack"**A**" so that the cylinders (9) can be tilted outwards.

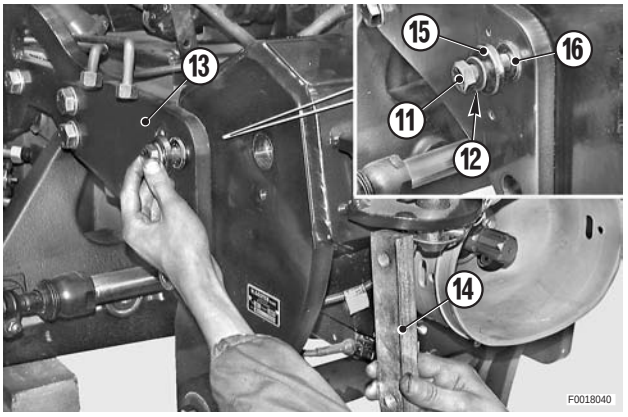
7 - Remove the jack"**A**" and guide the rocker assembly (10) to the vertical position.



8 - Unscrew and remove the bolts (11) and washers (12) securing the brackets (13); recover the inner brackets (14).

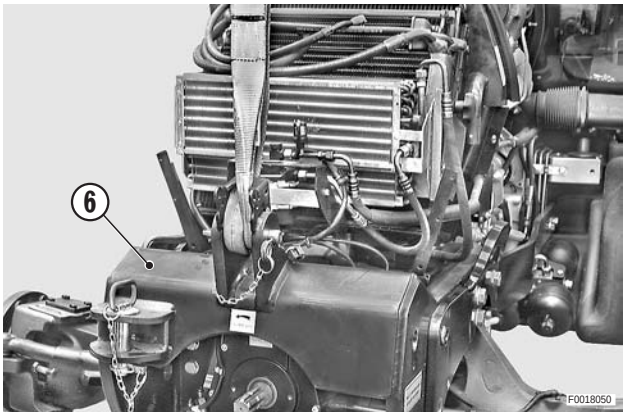
9 - Remove the spacer (15) and the lower bushes (16).

★ Do not remove the upper bushes yet for safety.



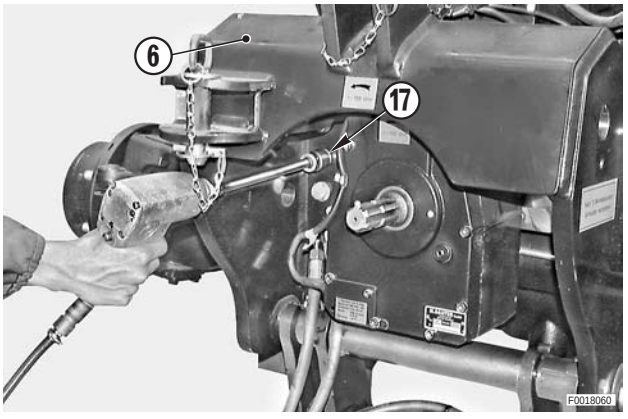
10 - Attach a hoist to the lift assembly (6) and put the lifting slings under slight tension.

kg Lift: 80 kg (176 lb.)

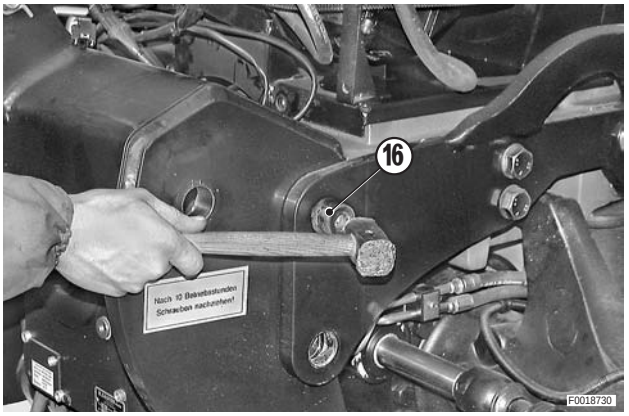


11 - Unscrew and remove the ten bolts (17) and washers securing the lift (6) to the front carrier.

※ 1



12 - Remove the upper bushes (16) but leave them in position for safety.



13 - Remove the lift assembly (6).

★ If necessary, use a lever to separate the assembly from the front locating dowels.

Refitting

- Refitting is the reverse of removal.

1

Nm Bolts M16: 214 Nm (158 lb.ft.)
Bolts M20: 455 Nm (355 lb.ft.)

1 - Start the engine, repeatedly raise and lower the lift to its maximum travel to bleed the system and check for leaks.

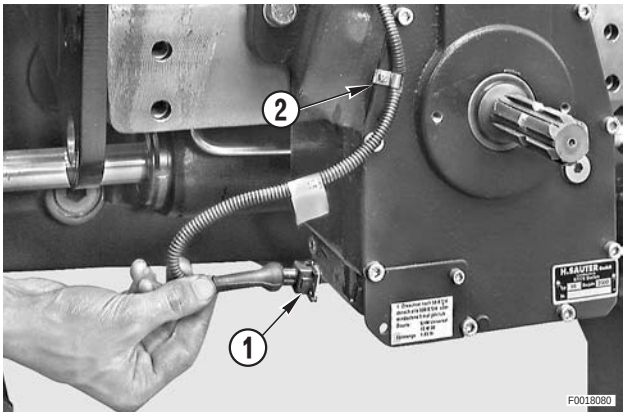
2 - Stop the engine, check the gearbox oil level and top up if necessary.

FRONT PTO ASSEMBLY

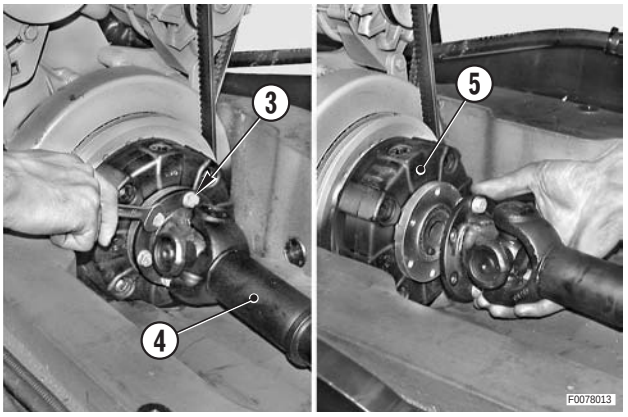
Removal

1 - Remove the front lift assembly.
(For details, see "FRONT LIFT ASSEMBLY")

2 - Unplug the connector (1) and release the wiring from the clip (2).



3 - Fully unscrew the bolts (3) securing the cardan shaft (4) to the flexible coupling (5) and detach the flange.



4 - Unscrew the four bolts (6) but only remove the two lower bolts.

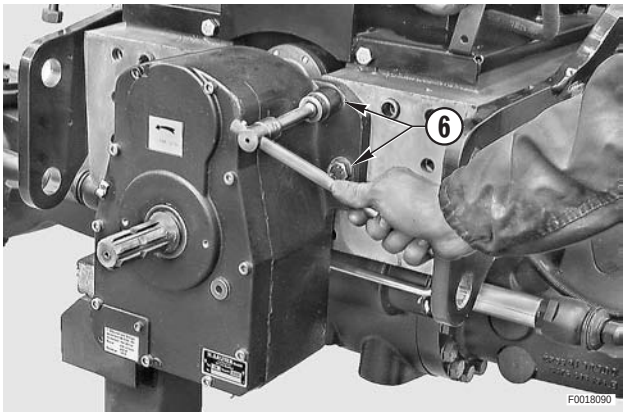
★ Leave the two upper bolts in position for safety.

※ 1

5 - Fit a non-slip block to a trolley jack; position the non-slip block under the PTO assembly.

6 - Remove the two upper bolts previously left for safety and remove the PTO assembly (7) while supporting the cardan shaft (4).

★ If neccessary, use a lever to help separate the assembly from the tractor.



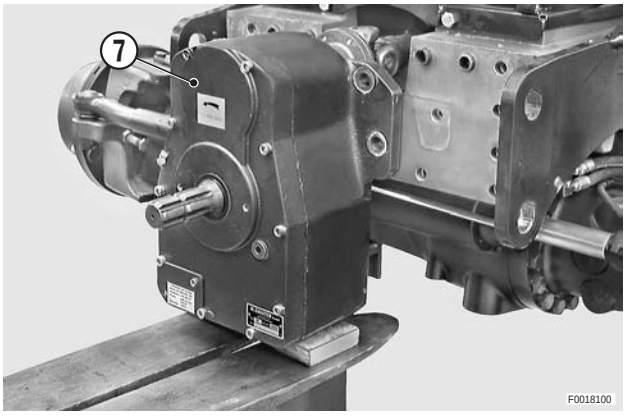
kg PTO: 70 kg (154 lb.)

Refitting

- Refitting is the reverse of removal.

※ 1

Nm Screw: 214 Nm (157.7 lb.ft.)



FRONT SUSPENSION CYLINDERS

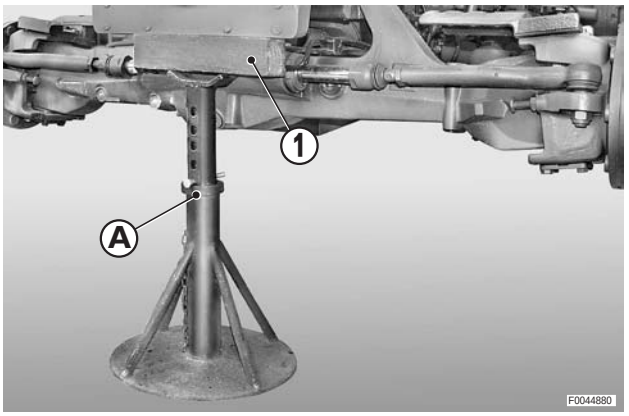
(Where fitted)

Removal

All operations must be carried out with the parking brakes applied.

1 - Operate the button in the cab to activate the front suspension, fully extending the suspension cylinders.

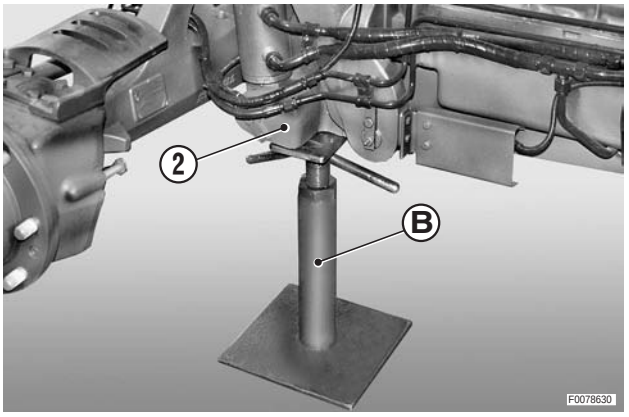
2 - Position and tighten a jack "**A**" under the front carrier (1).



3 - Deactivate the suspension so that the cylinders are fully retracted.

4 - Support the swinging support (2) on a stand "**B**" that can be lowered through10-12 cm (4- 5 in.) and switch off the engine.

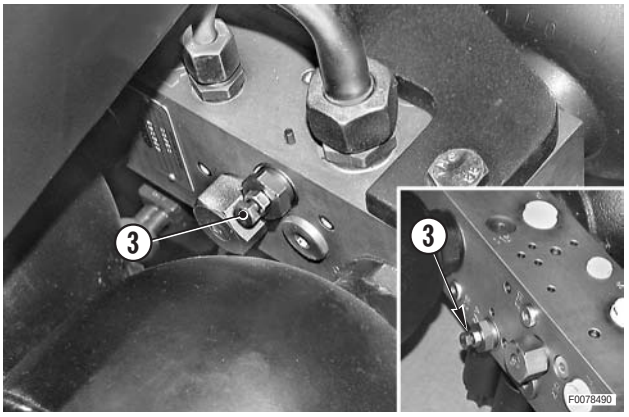
5 - Remove the front wheels.
(For details, see "FRONT WHEELS").



Discharge the residual pressure from the system by unscrewing the valve (3) about two full turns

★ Wait a few minutes after discharging the pressure, then re-close the valve.

6 - Remove the reinforcing side members.
(For details, see "REINFORCING SIDE MEMBERS").

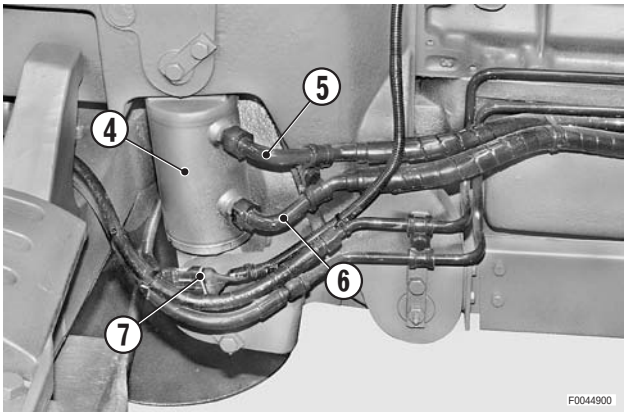


7 - Disconnect the pipes (5), (6) from the left cylinder (4).

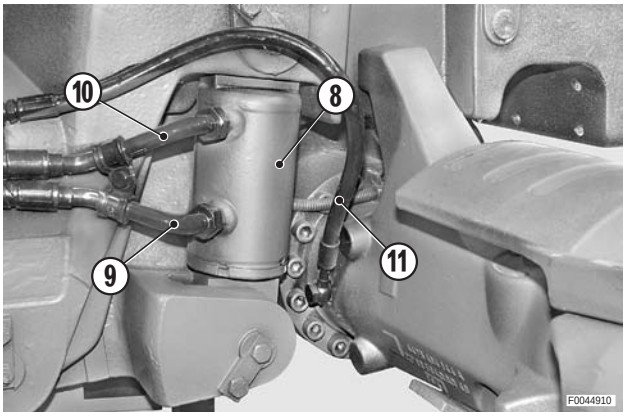
First loosen the fittings by a few turns, then, before disconnecting the pipes, push them to detach them from the couplers and release any residual pressure.

★ Plug the ends of the pipes to prevent the entry of contaminants.

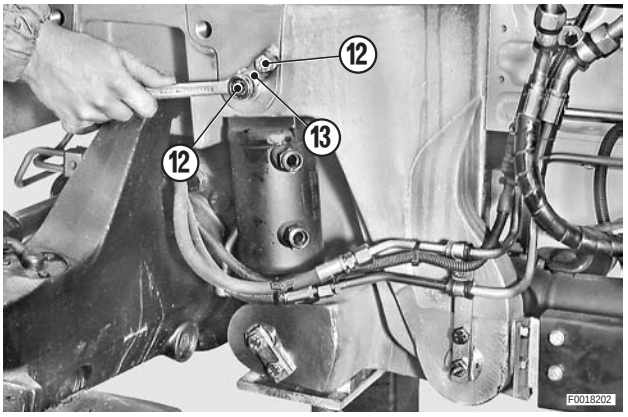
8 - Unplug the steering sensor connector (7)



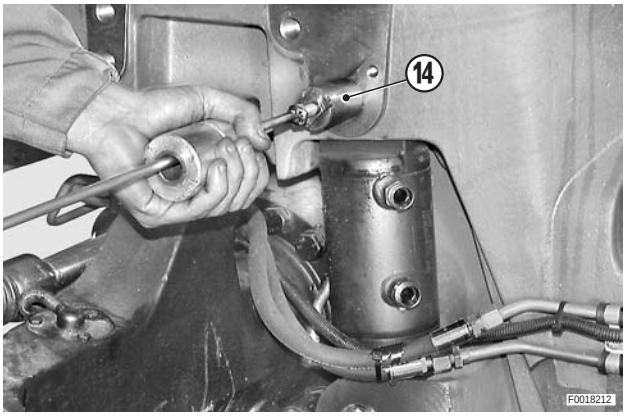
9 - Disconnect the pipes (9), 10 from the right-hand suspension cylinder (8).; disconnect the locking differential pipe (11).
★ Plug the pipes to prevent impurities getting in.



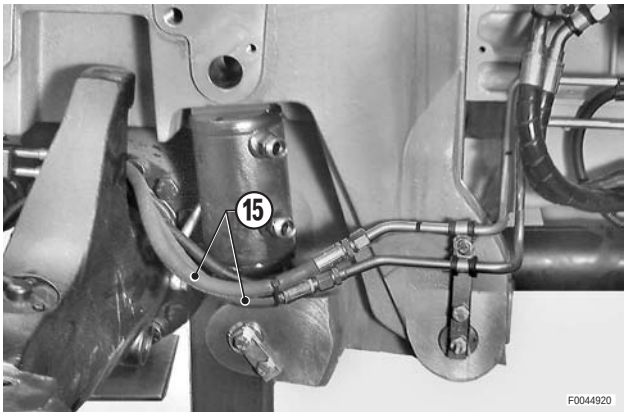
10 - Remove the bolts (12) and the plates (13) securing the upper cylinder pivot pins.



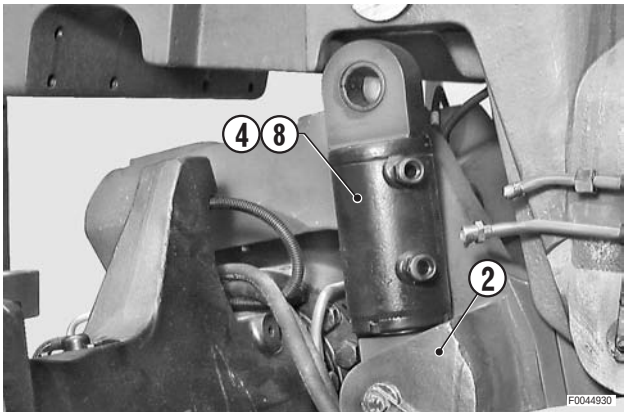
11 - Using a slide hammer puller, remove the upper pivot pins (14).



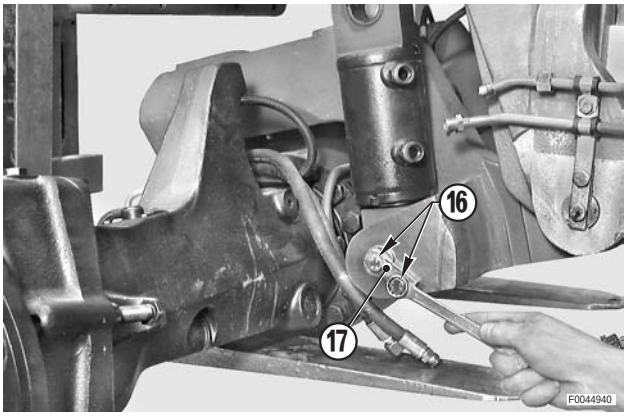
12 - Disconnect the steering cylinder pipes (15).
★ Plug the ends of the pipes to prevent the entry of contaminants.



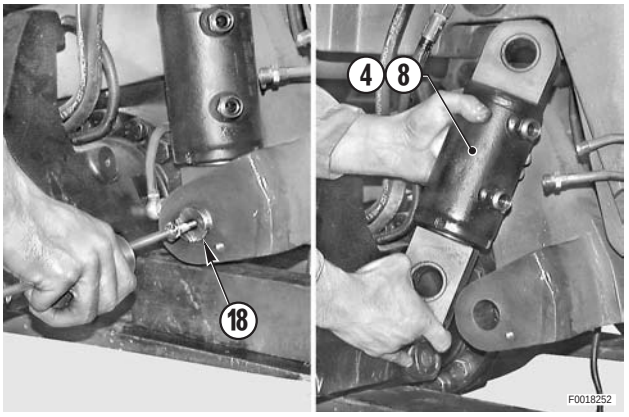
13 - Lower the support (2) to disengage the upper mountings of the cylinders (4), (8).



14 - Remove the bolts (16) and the plates (17) of the lower pivot pins.



15 - Using the slide hammer puller, remove the lower pivot pins (18) and the cylinders (4), (8).



Refitting

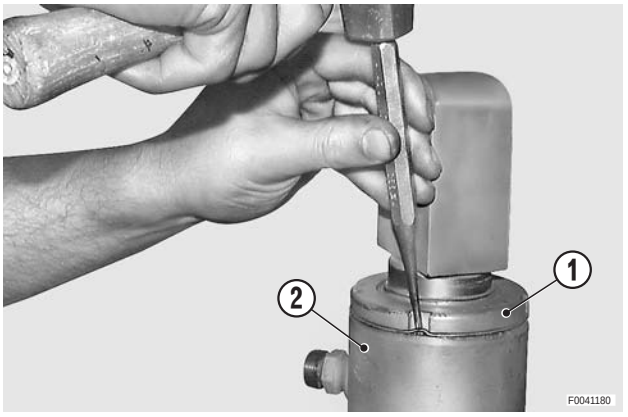
- Refitting is the reverse of removal.

1 - Start the engine and turn the steering wheel repeatedly to full lock in both directions. Activate and deactivate the suspension a number of times to expel air from the system and check for leaks.

2 - Stop the engine, check the gearbox oil level and top up if necessary.

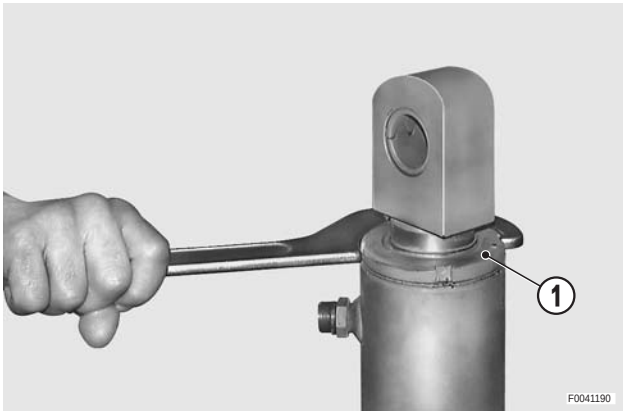
Disassembly

1 - Relieve the staking on the lock washer located between the end cap (1) and the cylinder (2).



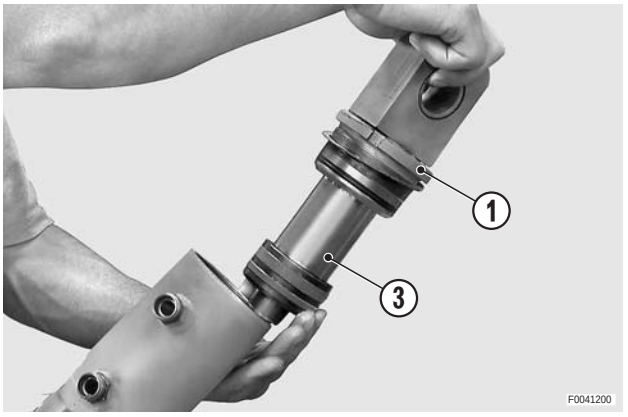
2 - Using a pin wrench, unscrew the end cap (1).

※ 1



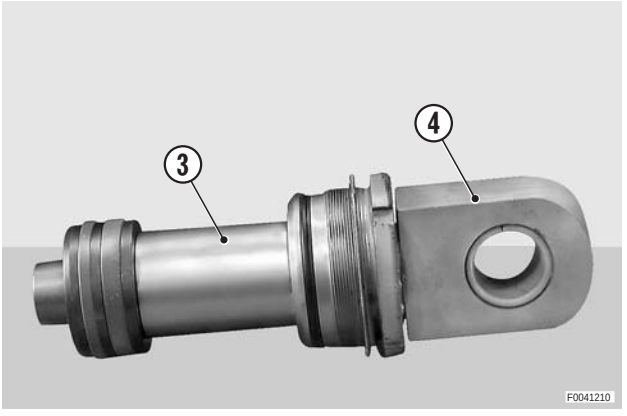
3 - Withdraw the rod (3) complete with end cap (1) and seals.

※ 2



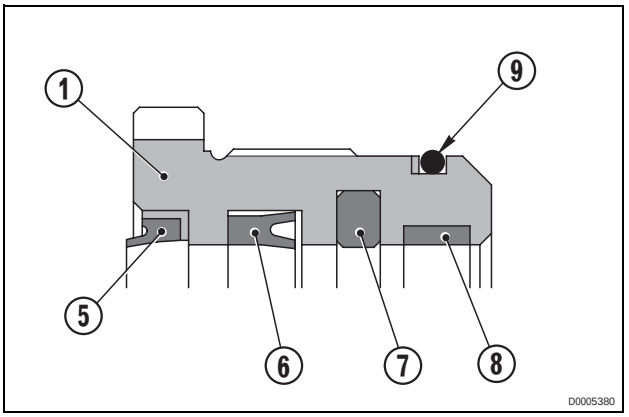
4 - Heat the eye of the piston (4) to a temperature of 100–120 °C (212–248 °F) and unscrew it from the rod (3).

※ 3

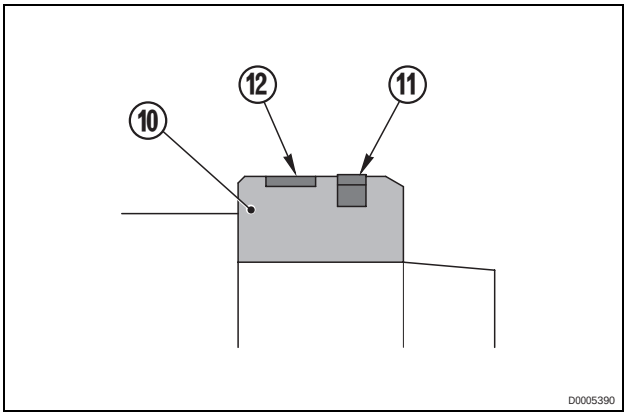


5 - Withdraw the end cap (1) from the rod and remove in order the rod wiper (5), the seals (6), (7) and the guide (8). [2]
★ Take care not to damage the seatings of the seals.

6 - Remove the O-ring seal (9).
★ Note which way round the seals are fitted.



7 - Remove the seal (11) and the guide (12) from the piston (10).
★ Take care not to damage the seal seating.



Assembly

- Assembly is the reverse of disassembly.

[1]

Nm End cap: 320–370 Nm (236–273 lb.ft.)

[2]

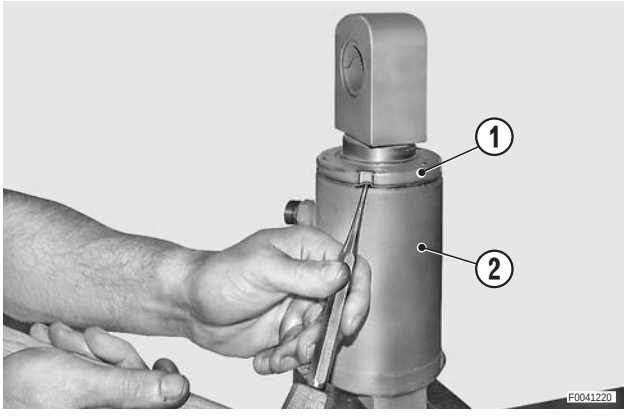
Seals: Gearbox oil

[3]

Piston eye: Loctite 638

Nm Piston eye: 50–70 Nm (37–52 lb.ft.)

1 - Stake the lock washer tabs into the notch on the cylinder (2) and into one of the notches on the end cap (1).



FRONT AXLE AND SWINGING SUPPORT

(Versions with front suspension)

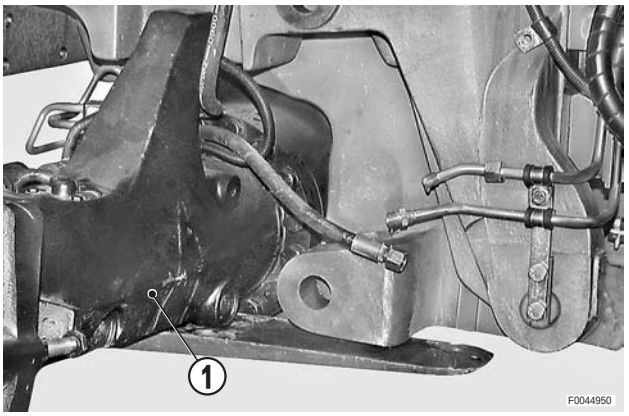
Removal

All operations are to be carried out with the parking brake applied.

1 - Remove the front suspension cylinders.
(For details, see "FRONT SUSPENSION CYLINDERS").

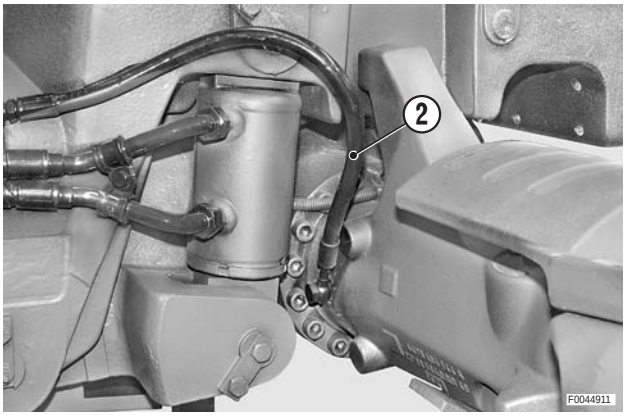
2 - Position a trolley jack under the axle (2) and the swinging support; raise the jack until it supports both the assemblies.

kg Group assembly: 302 kg (665 lb.)

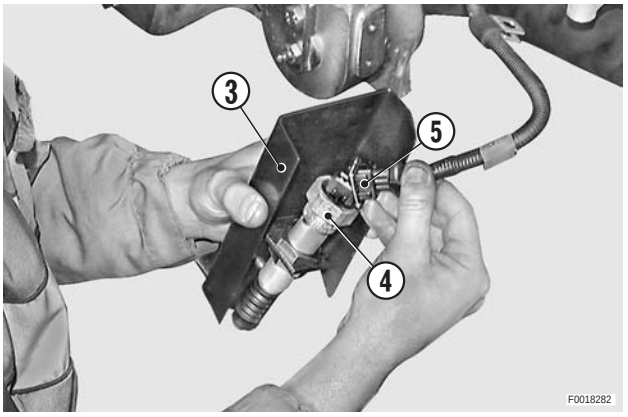


3 - Remove the cover and the 4WD shaft.
(For details, see "4WD PROPELLER SHAFT").
Disconnect the differential lock pipe (2).

★ Plug the ends of the pipes to prevent the entry of contaminants.

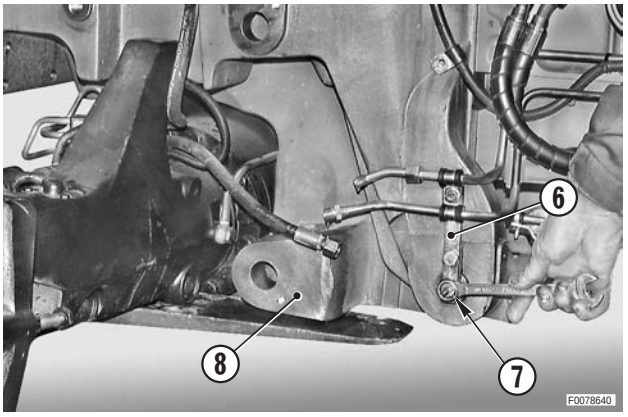


4 - Remove the support (3) of the position sensor (4) and unplug the connector (5). ※ 1

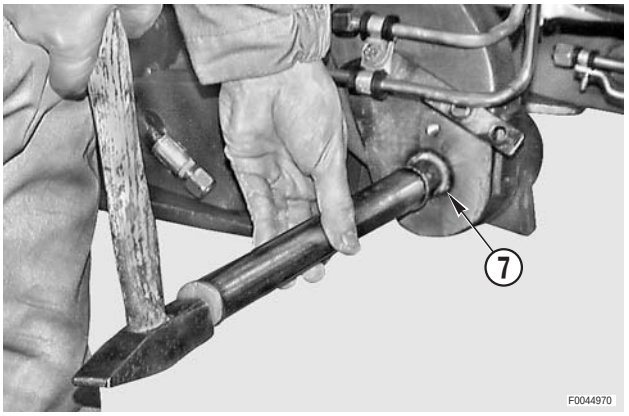


5 - Remove the plates (6) securing the pivot pins (7) of the swinging axle support (8).

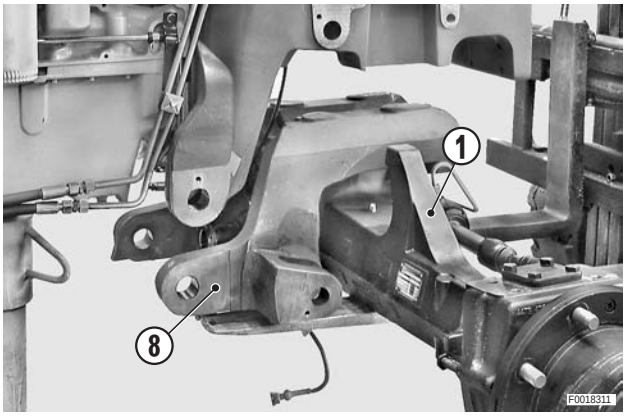
6 - Loosen the screw of the clips for the rigid steering pipes and rotate the plate (6) to the left to release the pivot pin (7).



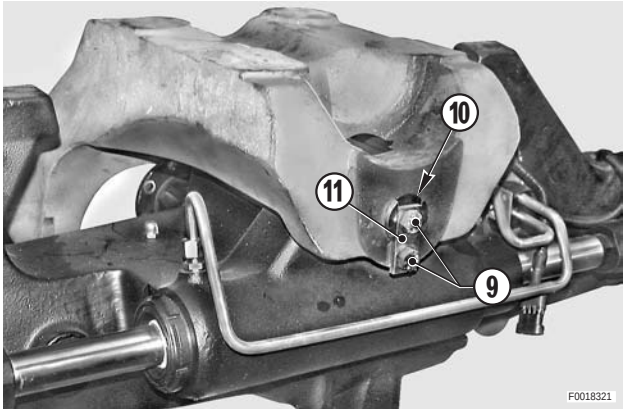
7 - Using a suitable drift made of soft material (aluminium, copper, etc.,), remove the pivot pins (7).



8 - Slowly lower the jack and remove the swinging support (8) complete with the axle (1).

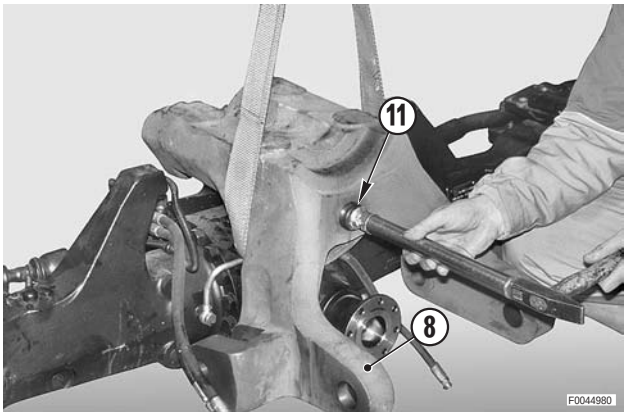


9 - Remove the screws (9) and remove the plate (10) securing the axle pivot pin (11).



10 - Attach the swinging support (8) to lifting slings and attach the slings to a hoist; put the slings under slight tension.

11 - Using a suitable drift made of soft material (aluminium, copper, etc.,), drive out the axle pivot pin (11) and remove the swinging support. ⁘ 2



Refitting

- Refitting is the reverse of removal.

※ 1

★ Check the calibration of the position sensor. (For details, see "FRONT SUSPENSION POSITION SENSOR").

※ 2

Pivot pin and plain bearings: grease

1 - On starting the engine, bleed the systems as follows:

a - turn the steering wheel repeatedly to full lock in both directions;

b - repeatedly activate and deactivate the suspension;

c - repeatedly engage and disengage the differential lock.

2 - Stop the engine, check the gearbox oil level and top up if necessary.

3 - Lubricate fully the axle pivot pins, the swinging support and cylinder and piston mountings.

FRONT SUSPENSION VALVES

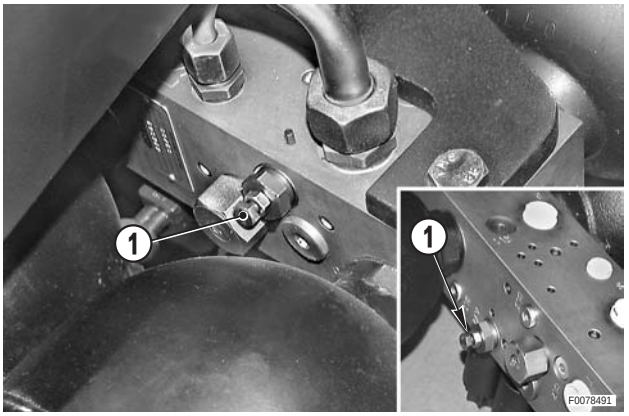
Removal

1 - Before switching off the engine, disengage the front suspension by pressing the pushbutton in the cab for at least 20 seconds.

2 - Apply the parking brake.

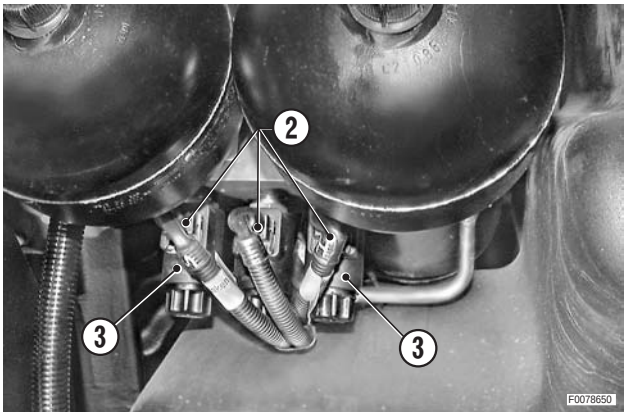
Discharge the residual pressure from the suspension system by unscrewing the valve (1) about two full turns.

★ Wait a few minutes after discharging the pressure, then re-close the valve.



1 - Unplug the connectors (2) from the solenoid valves (3).

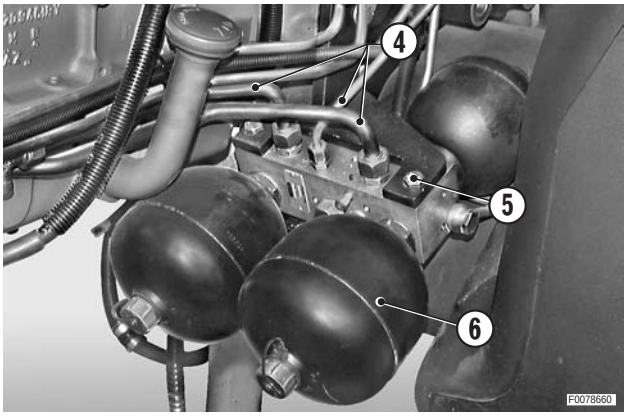
★ Label the connectors and solenoid valves to avoid confusion on reconnection.



2 - Disconnect the five connecting pipes (4).

First loosen the fittings by a few turns, then, before disconnecting the pipes, push them to detach them from the couplers and release any residual pressure.

3 - Remove the bolts (5) and remove the assembly (6).



Refitting

- Refitting is the reverse of removal.

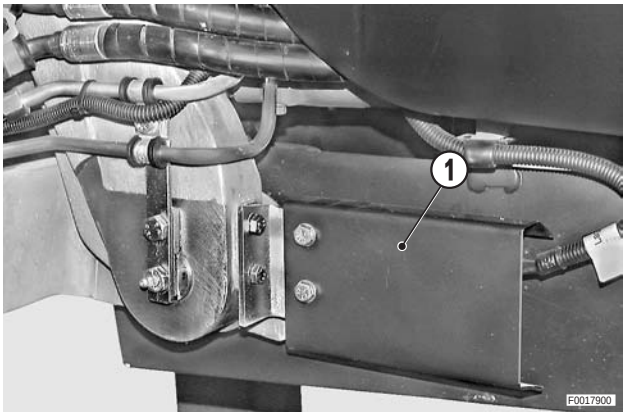
1 - Start the engine and repeatedly activate and deactivate the front suspension in order to expel any air from the system and check for leaks.

2 - Stop the engine, check the gearbox oil level and top up if necessary.

FRONT SUSPENSION POSITION SENSOR

Removal

1 - Remove the cover (1).

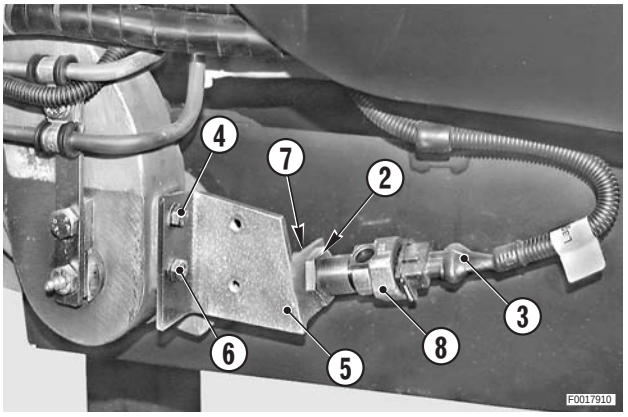


2 - Loosen the rear nut (2).

3 - Unplug the connector (3).

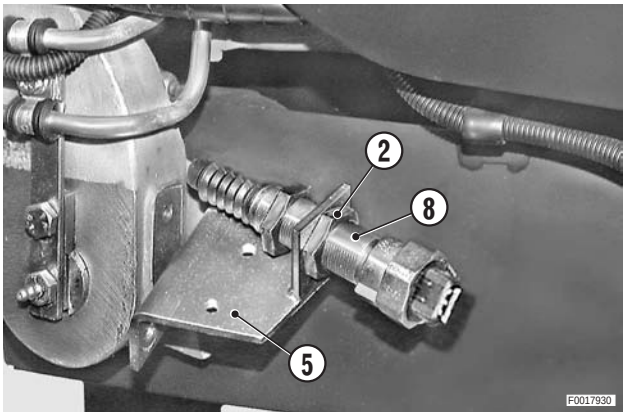
4 - Unscrew and remove the upper retaining bolt (4) of the support (5) and loosen the lower bolt (6); rotate the support (5).

5 - Remove the front nut (7) and remove the sensor (8).



Positioning

1 - Start the engine, fully extend the front suspension cylinders and fit the sensor (8) to the support (5) with the front nut (2) fully unscrewed.



2 - Fix the support (5) and push the sensor (8) in the direction "**X**" until the pin (9) is fully retracted.

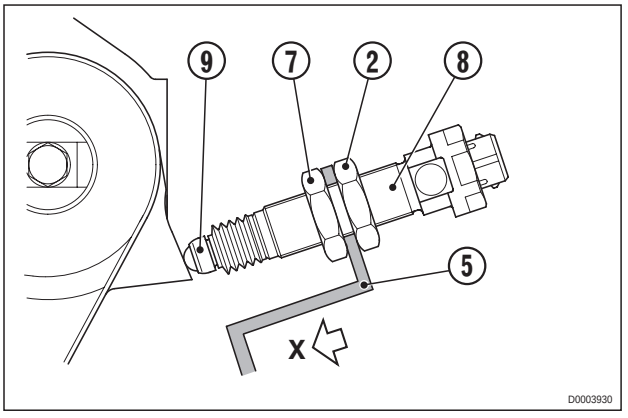
3 - Keeping the pin in this position, screw in the rear nut (2) right up to the support (5).

4 - Screw the front nut (7) up to the support (5).

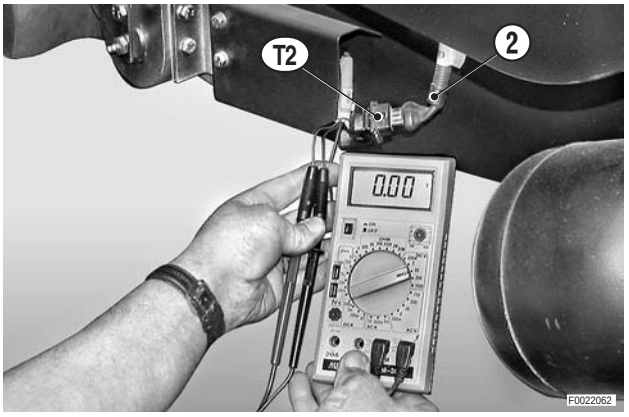
5 - Back off the nut (7) by one turn and tighten the nut (2) to secure the sensor.

★ This adjustment prevents the possibility of the sensor sustaining impact damage at the end of its travel.

Nm Nuts: 30±6 Nm (22.1±4.4 lb.ft.)



Testing



1 - Connect the test lead **T2** (code 5.9030.743.1) between the sensor (8) and the wiring (3); start the engine and, using a multimeter, check the voltage when the cylinders are in the mid-stroke position.

★ Voltage with cylinders in mid-stroke position = 3.8V

Fully retract the cylinders and check the voltage.

★ Voltage with cylinders retracted = 1.90–1.95V

★ The voltage is measured between the terminals of the brown (earth) and blue (signal) wires

NOTE. The same reading can also be taken using the suspension section of the ART program. (For details see ART in section 20)

2 - Stop the engine, disconnect the lead **T2** (code 5.9030.743.1) and reconnect the wiring to the sensor.

3 - Refit the cover (1).

REINFORCING SIDE MEMBERS

(For versions with front lift only)

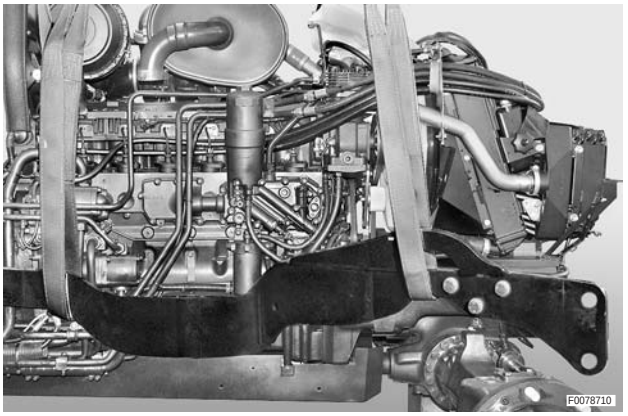
Removal

1 - Remove the front lift valve block. (For details, see "LIFT VALVE BLOCK").

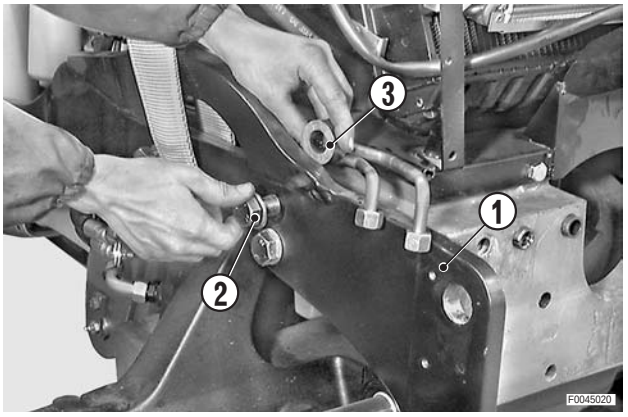
2 - Remove the air reservoir and the battery support. (For details, see "FUEL TANK")

3 - Attach a hoist to the side member to be removed and put the lifting sling under slight tension.

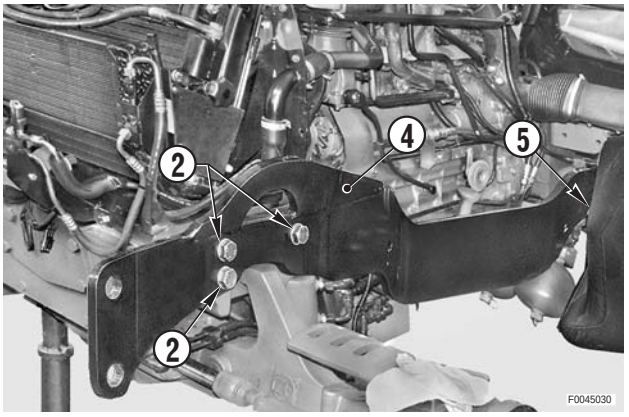
kg Side member: 45 kg (99 lb.)



4 - **Right side member (1):** Unscrew and remove the front bolts (2) complete with their washers and recover the spacers (3). ※ 1



5 - **Left side member (4)**: Unscrew and remove front bolts (2) as per the right side member and the two rear bolts (5) complete with washers. ※ 1



Refitting

- Refitting is the reverse of removal.

※ 1

Nm Bolts M16: 214±21 Nm (158±15.5 lb.ft.)
Bolts M20: 455±21 Nm (335±15.5 lb.ft.)

FRONT CARRIER

(Versions with front suspension)

Removal

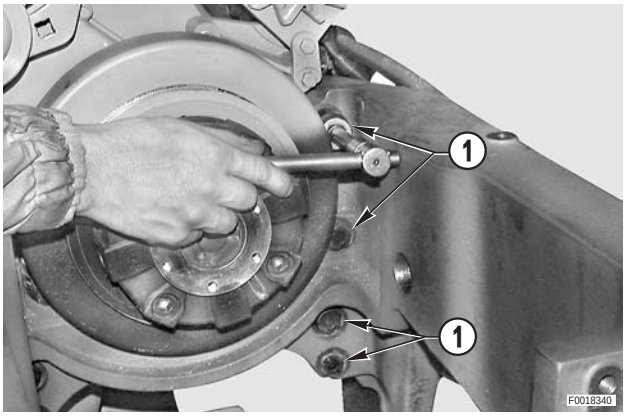
Before stopping the engine, deactivate the front suspension by pressing the relative button in the cab.

Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove:
- the radiator/coolers assembly;
- the alternator and air conditioning compressor drivebelts;
- the reinforcing side members;
- the lift assembly;
- the front PTO (if present);
- the front suspension cylinders;
- the front axle and swinging support.

(For details, see the corresponding headings).

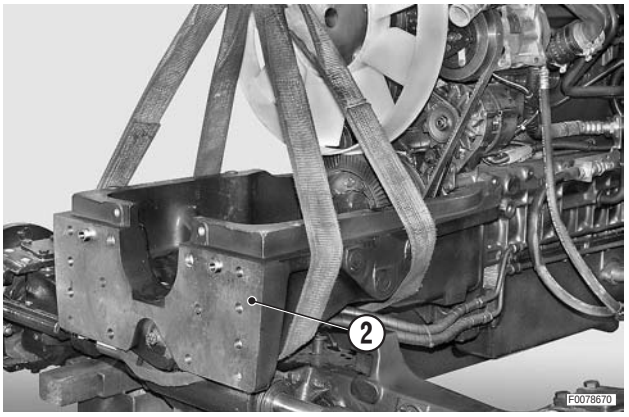
2 - Loosen the bolts (1) to eliminate the tightening torque. ⁘ 1



3 - Attach lifting slings to the front carrier (2), attach the slings to a hoist and put them under slight tension.

4 - Remove the bolts (1) with their washers and remove the front carrier (2). ⁘ 2

★ If necessary, use a lever to separate the locating dowels from the engine.



Refitting

- Refitting is the reverse of removal.

⁘ 1

Nm Bolts: 260±10% Nm (191.6±10% lb.ft.)

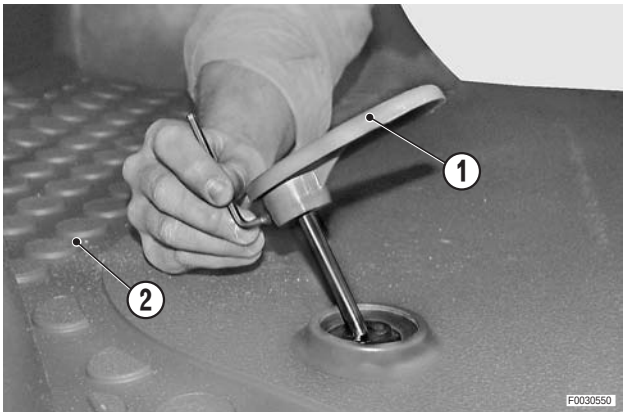
⁘ 2

Locating dowels: grease

1 - Start the engine and operate the controls to expel air from the various systems.

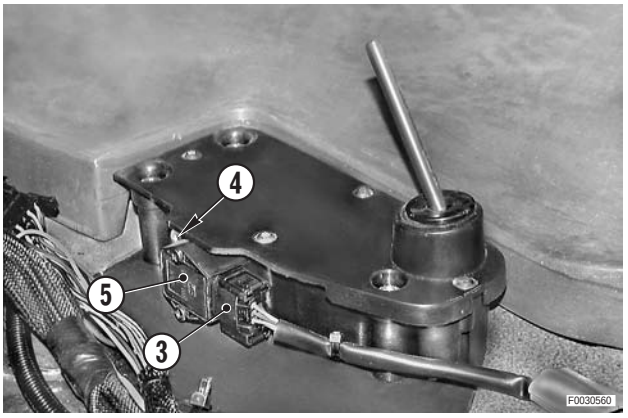
ACCELERATOR POTENTIOMETER

Renewal



⚠ Remove the battery cover and disconnect the negative battery lead (–).

1 - Loosen the grub screw, remove the accelerator pedal (1) and remove the front floor mat (2).



2 - Unplug the connector (3).

3 - Remove the screws (4) and remove the potentiometer (5).

Refitting

- Refitting is the reverse of removal.

1 - When fitting a replacement potentiometer, check the engine speed settings with the programming/diagnostics tester.

FUEL TANK

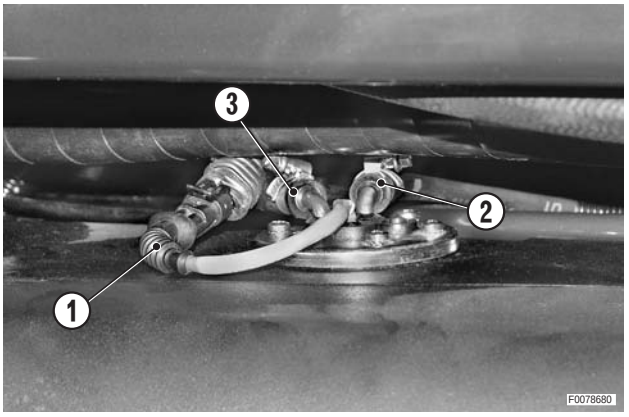
Removal

⚠ Remove the battery cover and disconnect the negative battery lead (–).

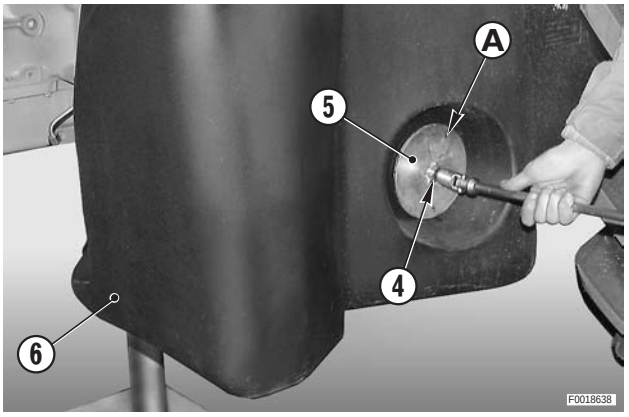
1 - Remove the left rear wheel.
(For details, see "REAR WHEELS").

2 - Unplug the fuel level sensor connector (1).

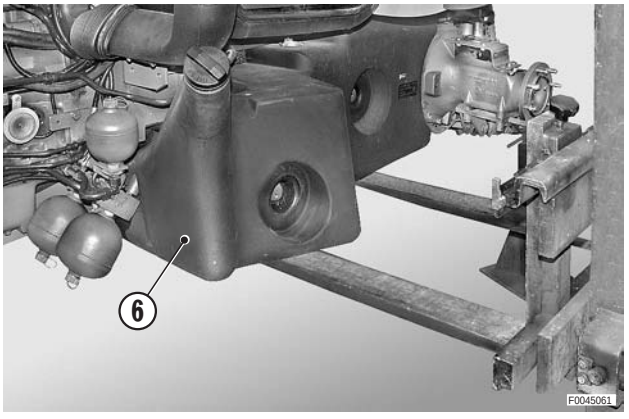
3 - Label the fuel pick-up and return pipes (2), (3).
Loosen the retaining clamps and disconnect the pipes.



4 - Remove the bolts (4) and remove the locating discs (5) of the fuel tank (6).
★ Label the discs to avoid confusion on reassembly.
★ Note the position of the hole "**A**" as the tank is levelled by rotating the front washer.



5 - Support the fuel tank (6) with lifting equipment and withdraw it from the guide tubes.



Refitting

• Refitting is the reverse of removal.

GEARBOX GEAR PUMP

Removal

⚠ 1 - Switch off the engine, remove the key from the ignition and apply the parking brake.

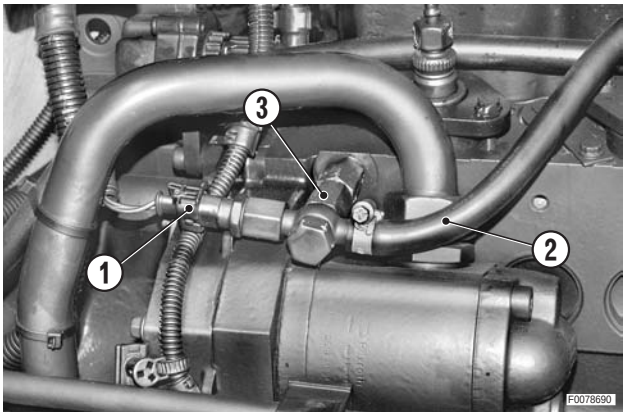
2 - Allow the engine to cool down to ambient temperature.

1 - Remove the right-hand side panel.
(For details see "ENGINE HOOD AND LAMP ASSEMBLIES").

2 - Remove the cab.
(For details see "CAB").

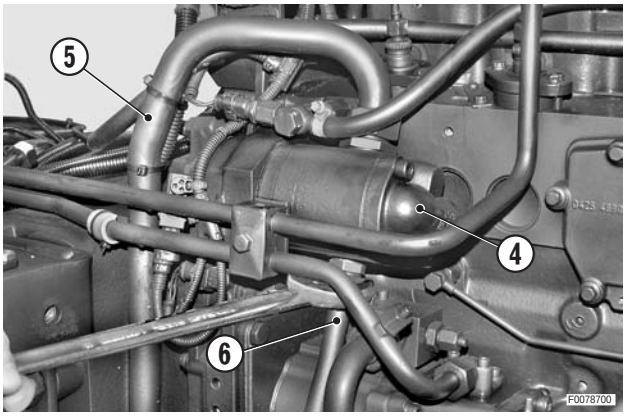
3 - Disconnect the connector (1), the pipe (2) and remove the fitting (3).

★ Plug the pipes and open fittings to prevent the entry of impurities.

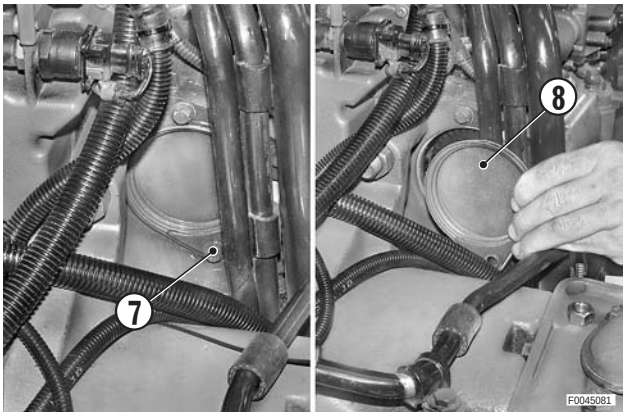


4 - Disconnect the suction and delivery pipes (5) and (6) from the pump (4).

★ Plug the pipes to prevent impurities getting in.

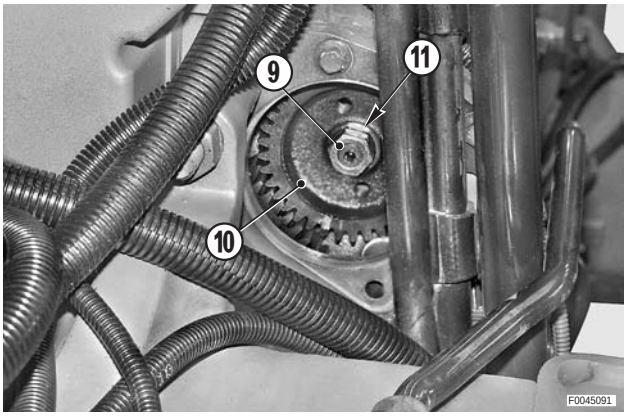


5 - Remove the screw (7) and remove the complete cover (8).



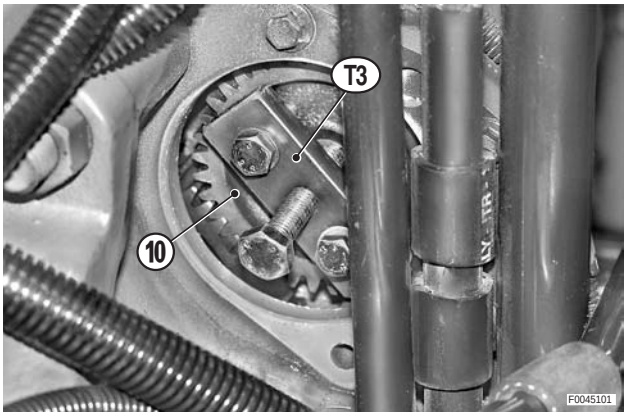
⚠ Before proceeding, close the passage between the lower part of the pump gear and the engine sump.
★ Use non-crushable material.

6 - Remove the nut (9) securing the gear (10) and the washer (11).

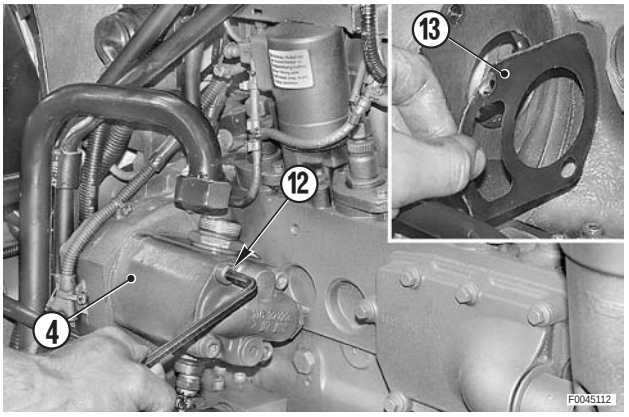


7 - Turn the engine over by hand so that the slot for the machine key is in the top position.
Using puller **T3** (code 5.9030.895.0) withdraw the pump drive gear (10).
Remove the machine key.

⚠ Take care not to drop the key into the crankcase.



8 - Unscrew and remove the bolts (12) and remove the pump (4).
★ Recover also the gasket (13) that should be renewed on reassembly.

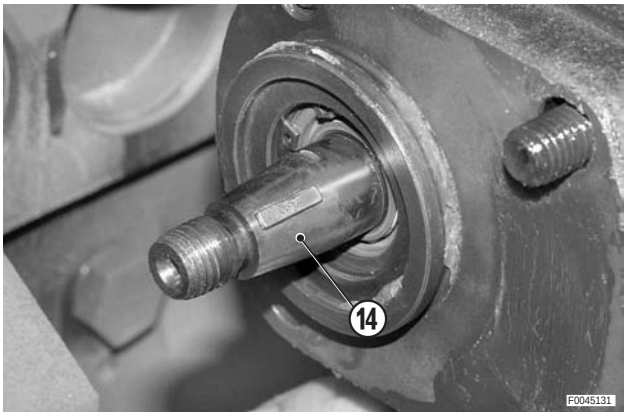


Refitting

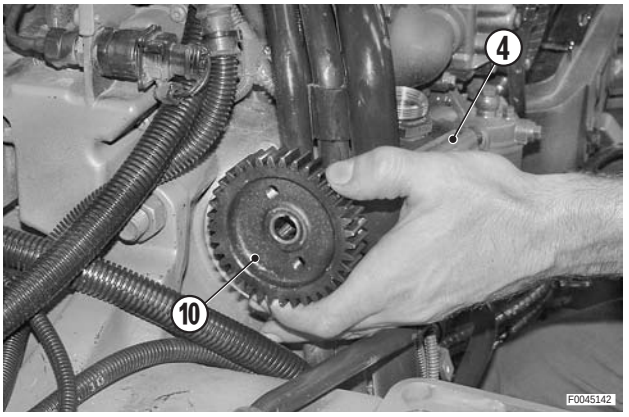
- Refitting is the reverse of removal.

1 - Position the gasket (13).
★ To hold the gasket in place, apply grease to the contact surface of the engine.

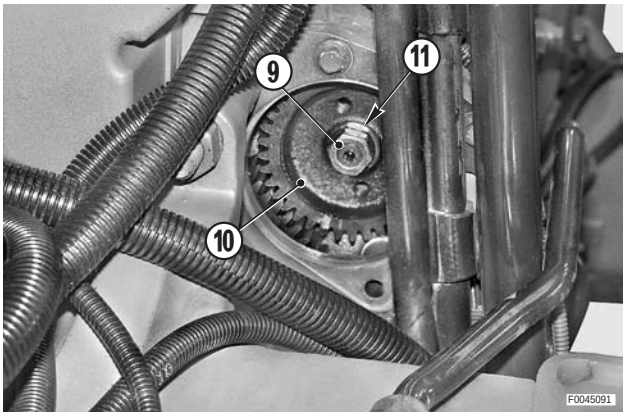
2 - Position the machine key (14) on the pump shaft with the slot facing upwards.
★ Keep the flat face of the key inclined towards the gear hub spline.



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).

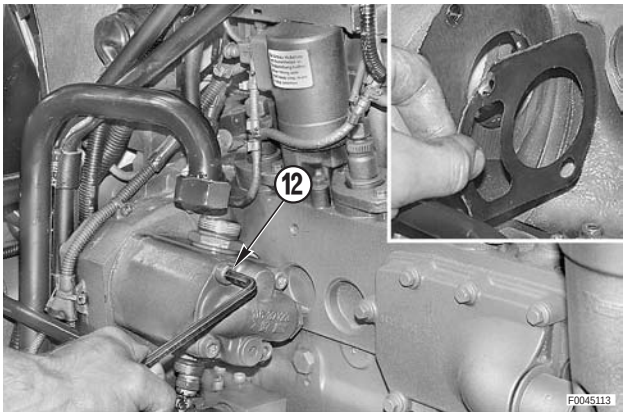


5 - Tighten down the pump with the bolts (12).
★ Tighten alternate bolts gradually in sequence.

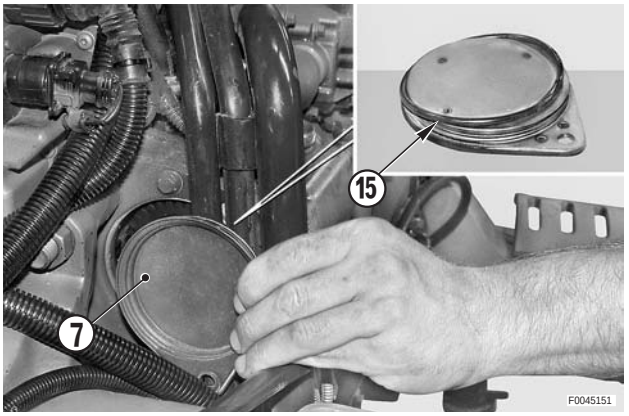
Nm M10 bolts: 50±10 Nm (36.9±7.4 lb.ft.)

6 - Secure the gear (10) with the nut (9).

Nm M12x2.5 nut: 50±10 Nm (36.9±7.4 lb.ft.)



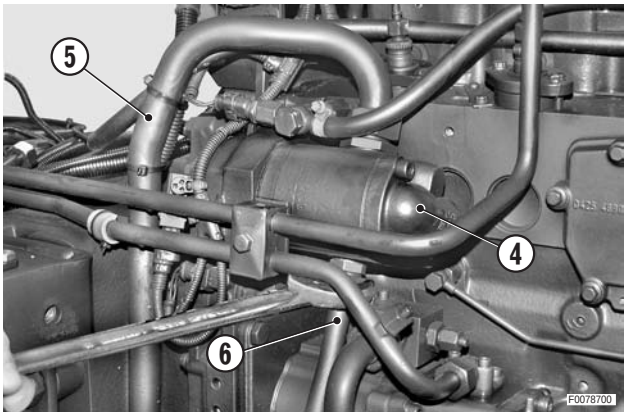
7 - Remove the material closing the passage between the engine sump and fit the cover (8).
★ Carefully check the condition of the O-ring (15).



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.



POWER STEERING - LIFT AND HYDRAULIC SERVICES PUMPS

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.

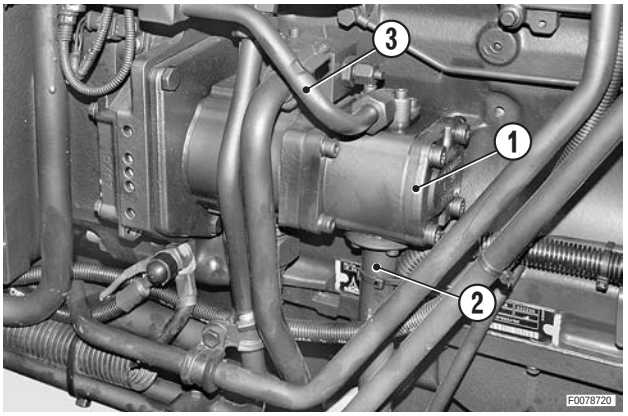
1 - Remove the righthand hood side panel (1).
(For details see "ENGINE HOOD AND LAMP ASSEMBLIES").

1. Removal of the power steering pump

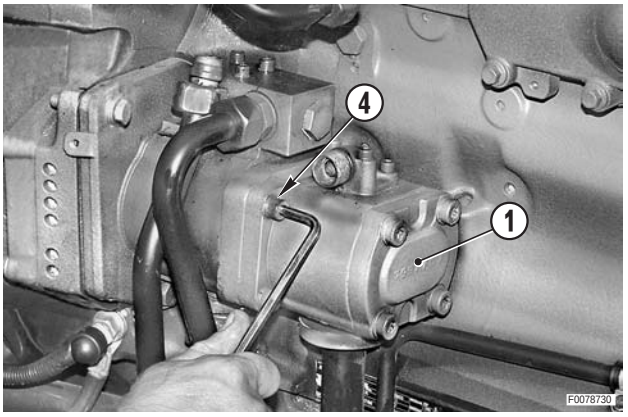
1 - Disconnect the suction and delivery pipes (2) and (3) from the pump (1).

★ Plug the pipes to prevent impurities getting in.

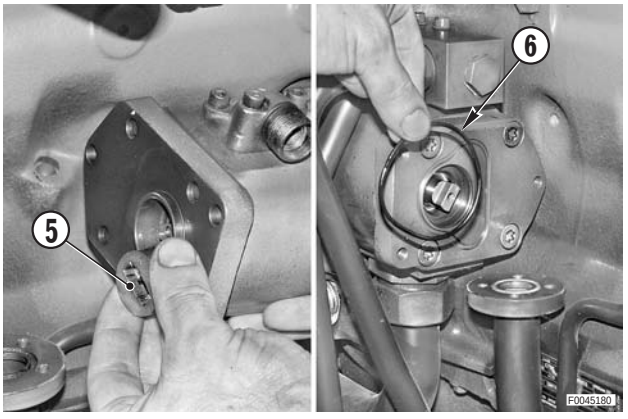
★ Renew the O-ring on the suction pipe flange on reassembly.



2 - Unscrew and remove the bolts (4) and remove the pump (1).



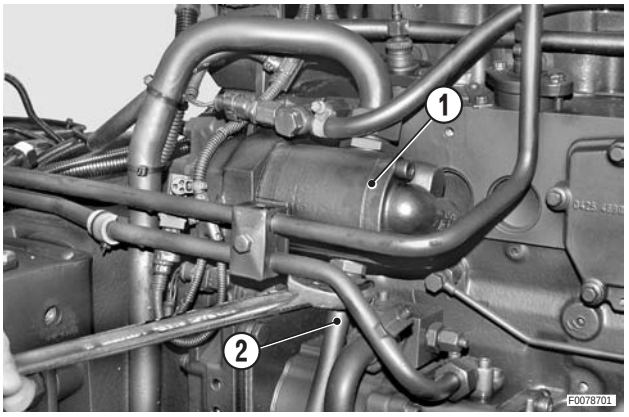
3 - Remove the pumps coupling (5) and the O-ring (6).
※ 1



2. Removal of the lift and hydraulic services pump

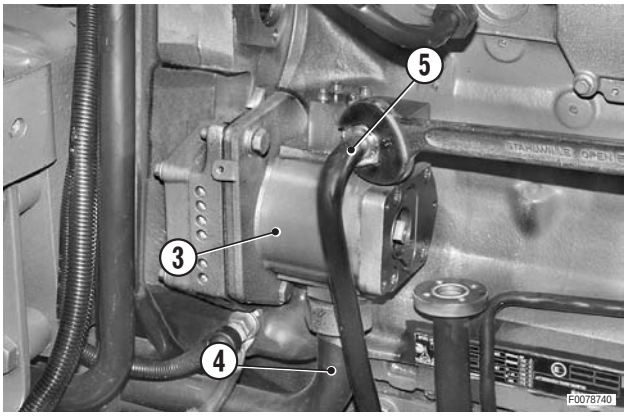
1 - Remove the power steering pump as described under the previous heading.

2 - Disconnect the delivery pipe (2) from the gearbox pump (1).

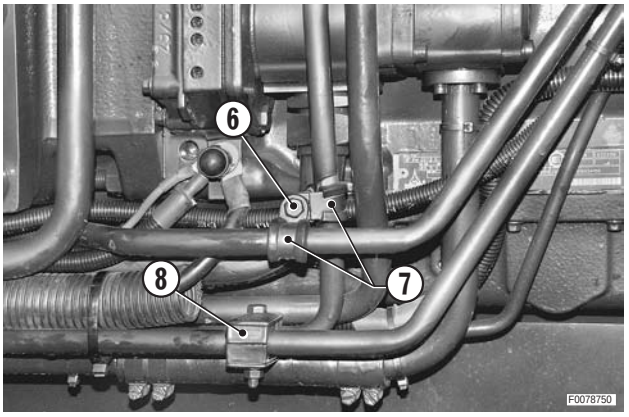


3 - Disconnect the suction and delivery pipes (4) and (5) from the pump (3).

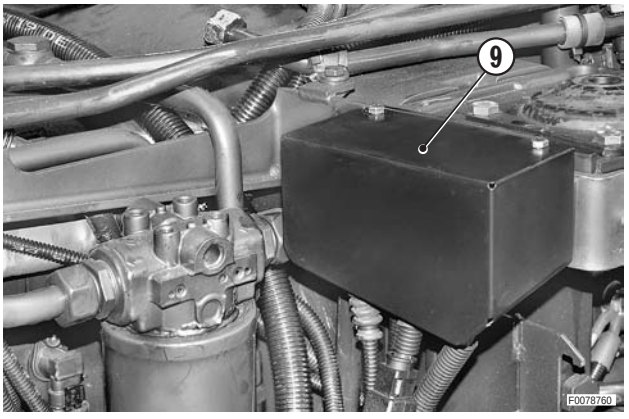
★ Renew the O-ring on the suction flange on re-assembly.



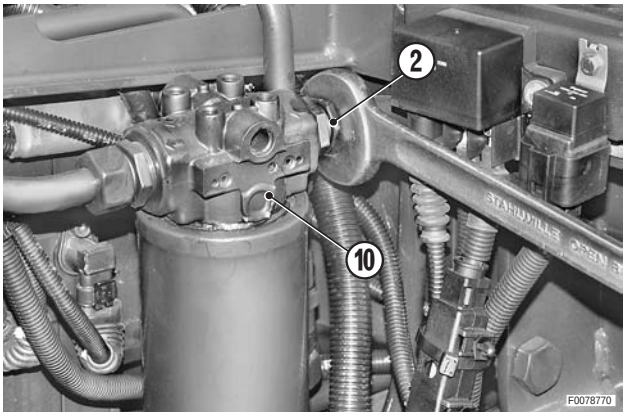
4 - Loosen and remove the connecting bolt (6) of the straps (7) and remove the terminal (8).



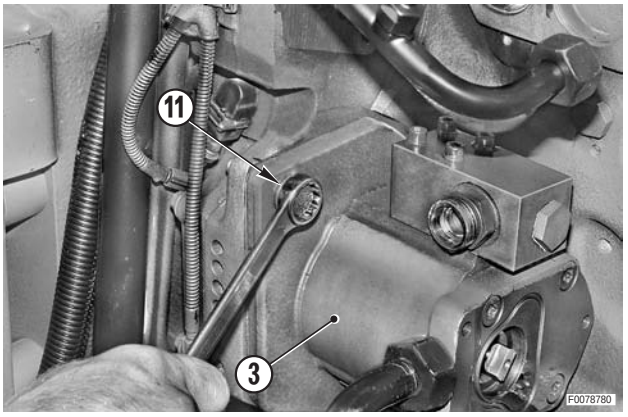
5 - Remove the relay cover (9).



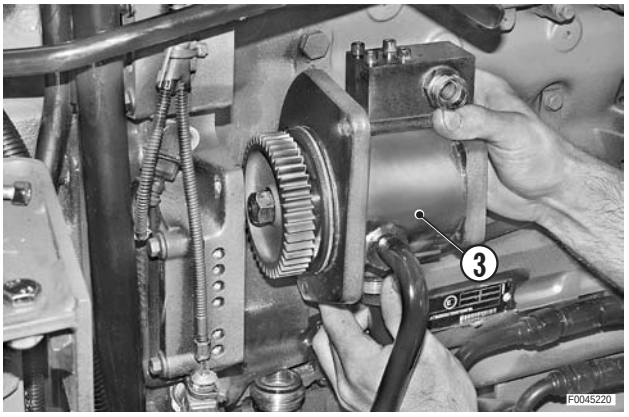
6 - Disconnect the gearbox supply pipe (2) from the filter cap (10).
Remove the pipe (2).



7 - Loosen and remove the bolts (11) securing the pump (3).

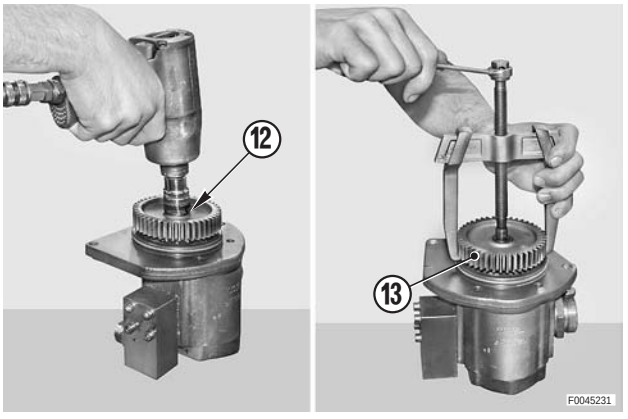


8 - Remove the complete pump assembly (3).

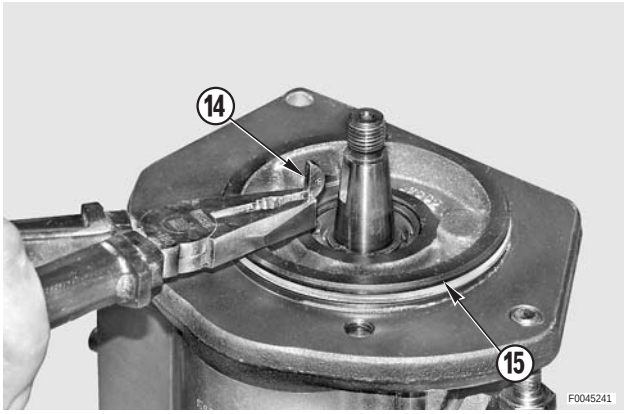


9 - Remove the self-locking nut (12).

10 - Using a puller, remove the drive gear (13).



11 - Remove the key (14) and the O-ring (15).
★ Renew the O-ring on reassembly.



Refitting

- Refitting is the reverse of removal.

1

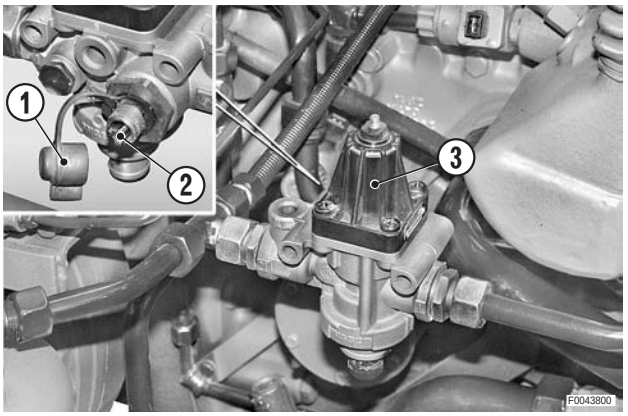
Coupling: grease

REMOTE CONTROL VALVES

Removal

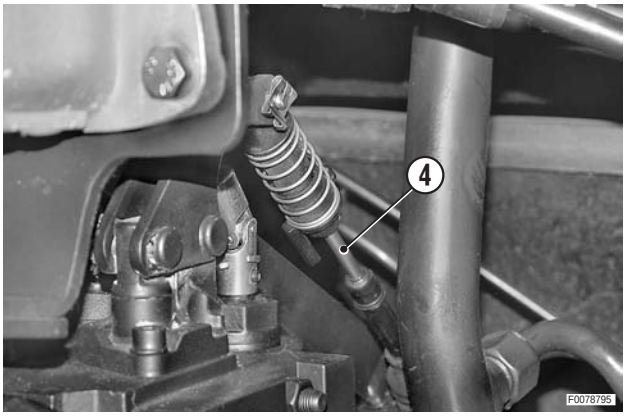
Remove the key from the ignition and apply the parking brake.

Vent residual pressure from the reservoir by removing the cap (1) and pressing the button (2) on the pressure regulator valve (3).



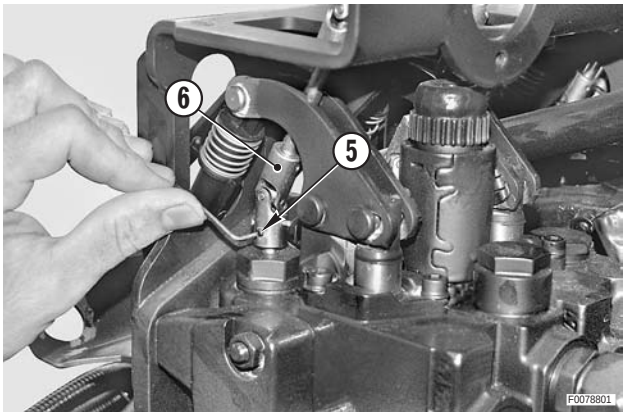
1 - Disconnect the control cable (4) from the remote control valve to be removed.

★ Mark the positions to avoid confusion on reassembly.

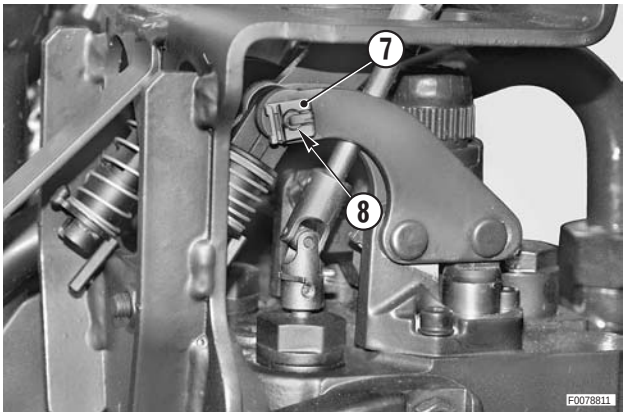


- **Only if the flow control knobs are fitted.**
  Remove only those knobs relative to the remote control valve to be removed.

2 - Unscrew and remove the grub screws (5) securing the joints (6).

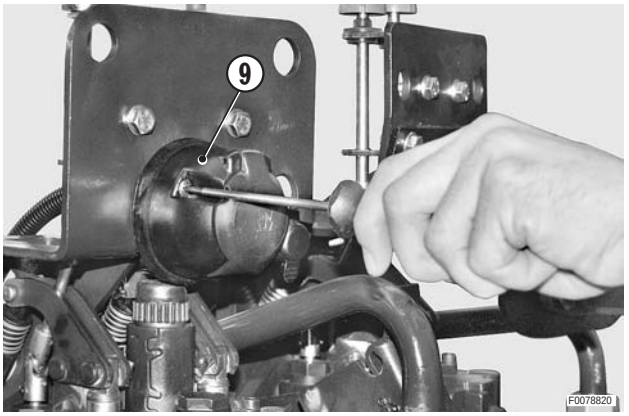


3 - Remove the plates (7) and drive out the pins (8).



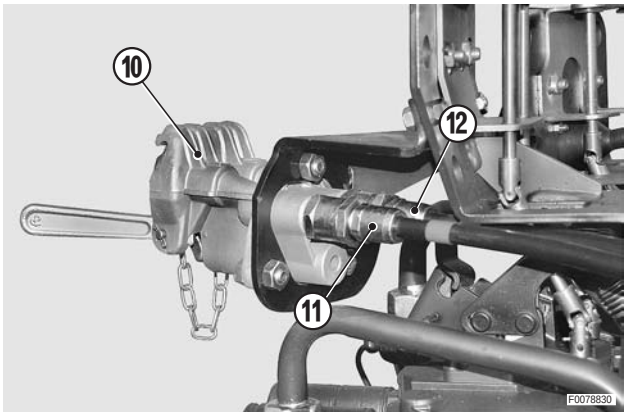
- **For left-hand remote control valve only**

4 - Remove the external outlet socket (9) and place it to one side.



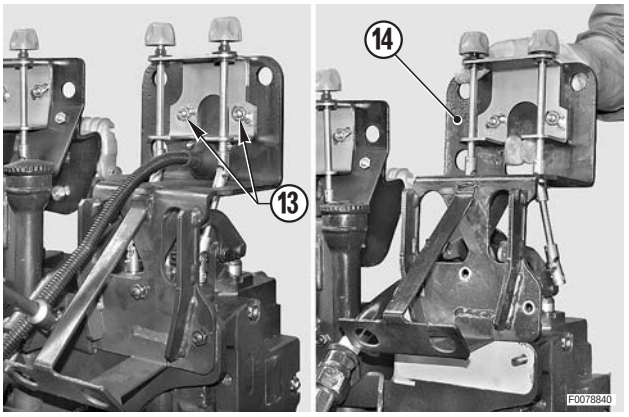
5 - Disconnect the pipes (11) and (12) from the air braking valves (10).

⚠ If auxiliary pressure couplers are provided, disconnect the supply, return and, if present, the load sensing pipes.

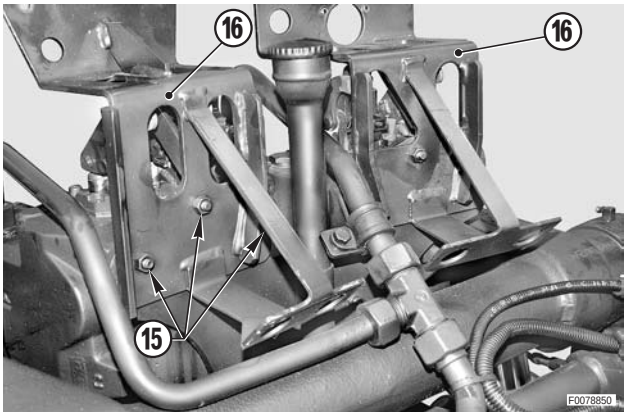


6 - Remove the two bolts (13).

7 - Remove the adjustment knobs assembly (14).

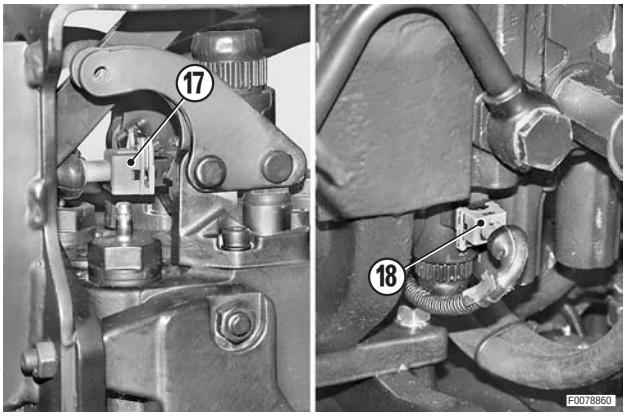


8 - Unscrew and remove the three nuts (15) and remove the support (16) mounted above the valve to be removed.

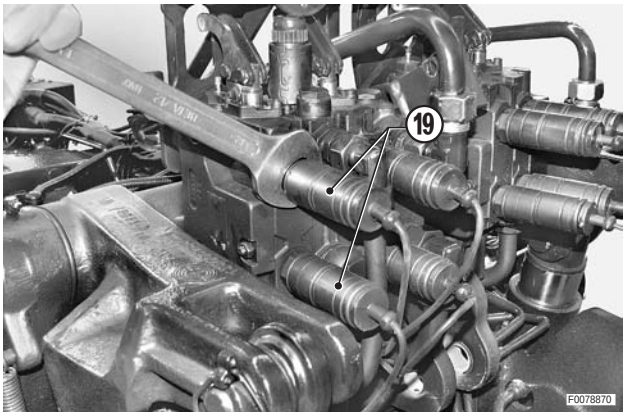


CAUTION!
The instructions refer to removal of the left-hand remote control valve; to remove the right-hand valve, follow the same procedure.

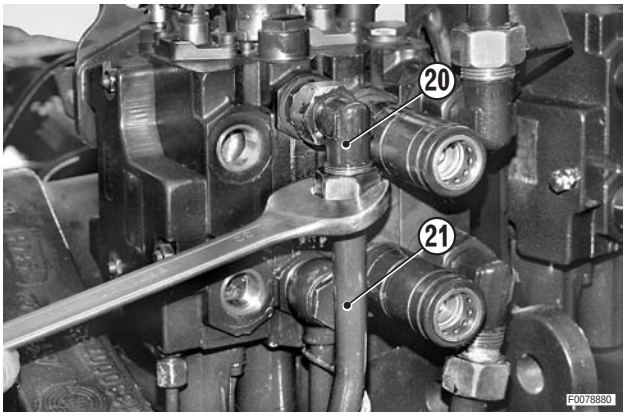
9 - Disconnect the connectors (17) and (18) from the proportional lift control valve. ⁘ 1



10 - Loosen and remove the quick couplers (19) in order to access the pipes to be disconnected. ⁘ 2
- ★ Renew the copper gaskets on reassembly.
- ★ Plug the holes to prevent the entry of impurities.

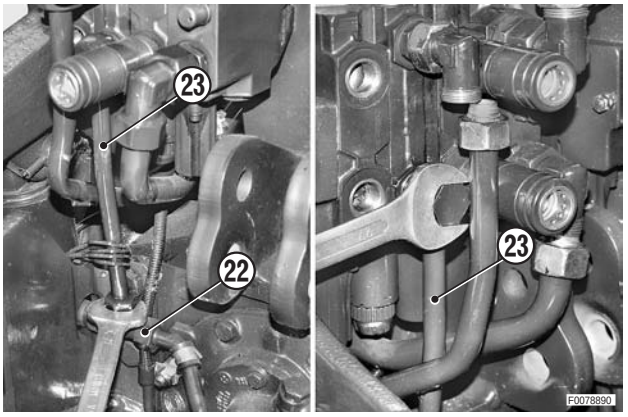


11 - Disconnect the lift return pipe (21) from the fitting (20).
- ★ Plug the pipe to prevent the entry of impurities.

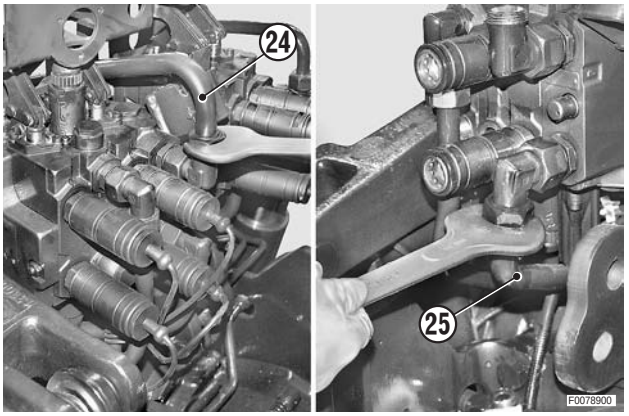


12 - Disconnect the lift supply pipe (23) from the Tee fitting (22) and from the control valve.
- ★ Renew the copper gaskets on reassembly.
- ★ Plug the holes to prevent the entry of impurities.

13 - Remove the pipe (23).

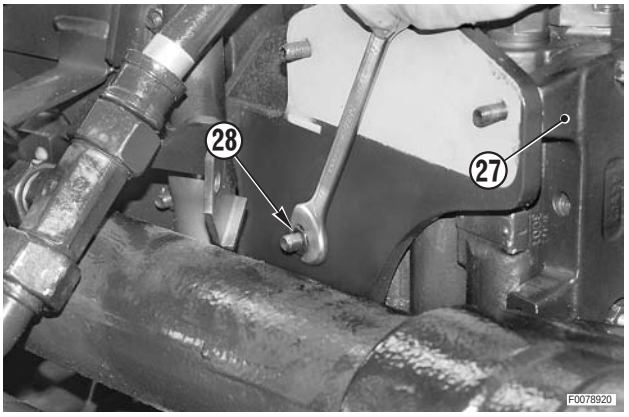


14 - Disconnect the oil supply and return pipes (24) and (25) from the fittings on the remote valve end cap.

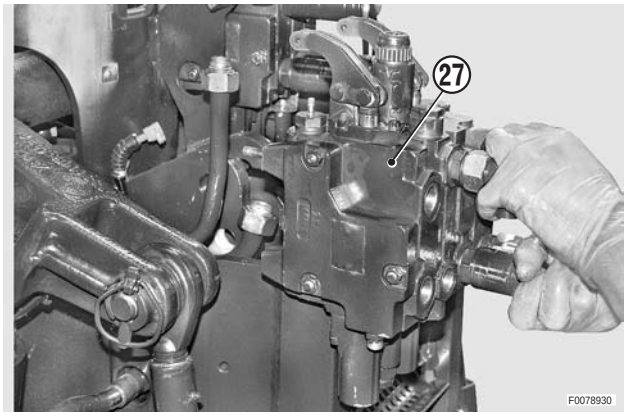


15 - Disconnect the load sensing signal pipe (26).

16 - While supporting the remote valve (27), remove the nut (28).



17 - Remove the remote control valve (27).



Refitting

- Refitting is the reverse of removal

1

★ Attach the connectors to the solenoids of the lift control valve:
DW upper
UP lower

2

Nm Quick couplers: 60–66 Nm (44.2–48.6 lb.ft.)

1 - Start the engine and fully raise and lower the lift a number of times to expel air from the circuits and check for leaks.

Disassembly

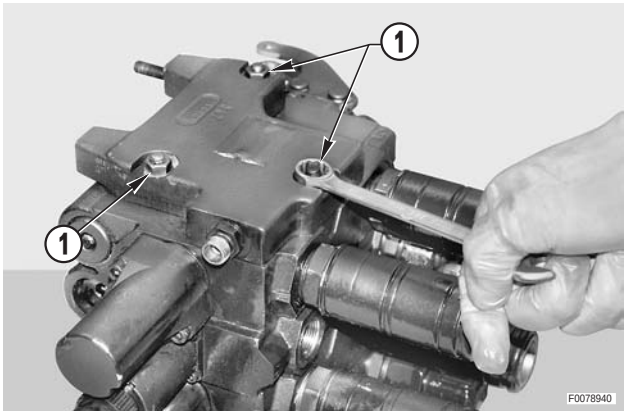
★ The remote control valves are assembled in stacks, which should only ever be disassembled if a component needs to be replaced; overhauls should be carried out by the Manufacturer or by an Approved Service Centre.

★ To disassemble the right control valve, follow the same procedure.

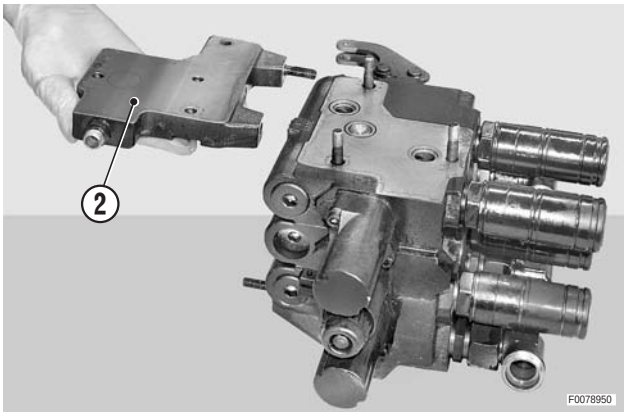
1 - Unscrew and remove the nuts (1) securing the valve sections.

★ Loosen the nuts gradually and sequentially to accommodate the expansion of the seals between the sections.

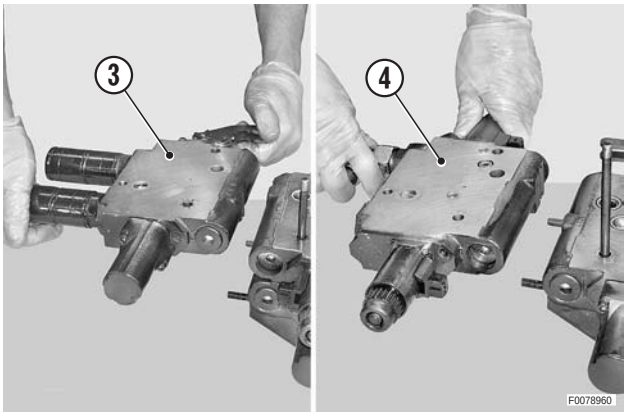
※ 1



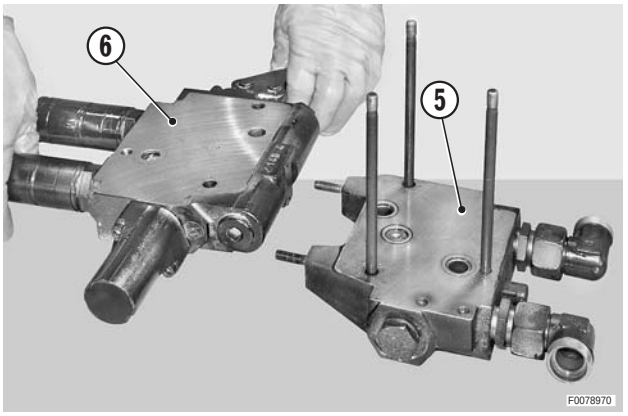
2 - Remove the end cap (2).



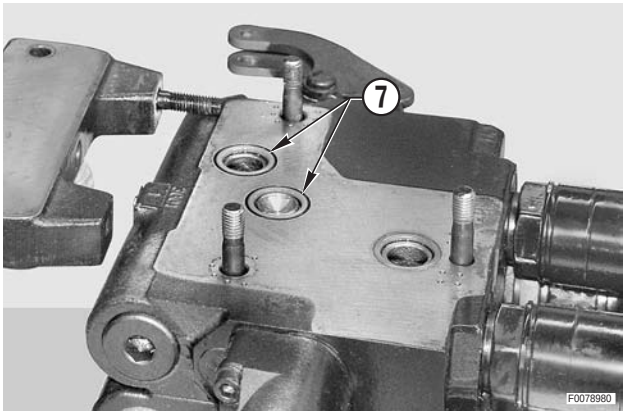
3 - Remove the valve section 1 (3) and the proportional lift control section (4). ※ 2



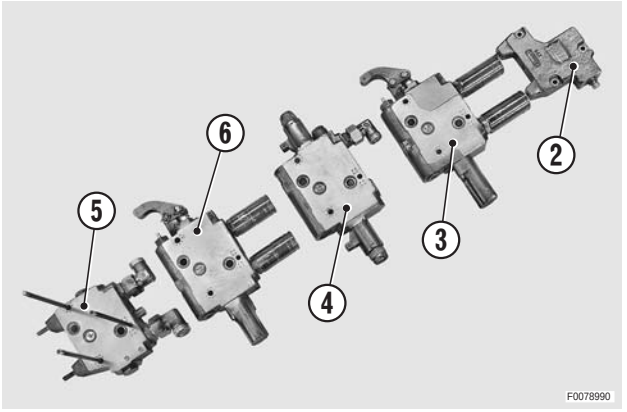
4 - Remove the valve section 3 (6) from the end cap (5). ⁘ 2



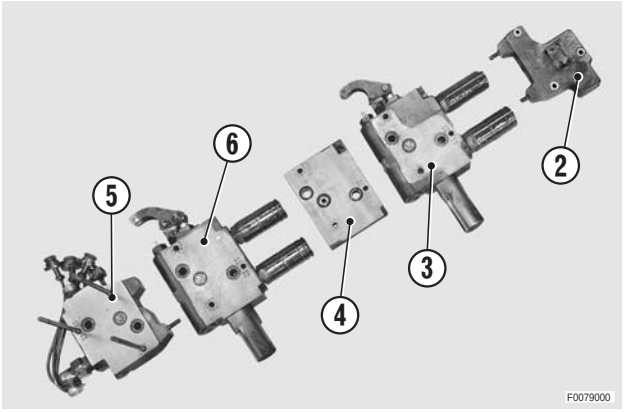
5 - Before removing the seals, note the positions of the O-rings (7) which require the installation of backup rings in correspondence with the pressure ports.



- **Left-hand remote control valve.**



- **Right-hand remote control valve.**



Assembly

- Refitting is the reverse of removal

⁘ 1

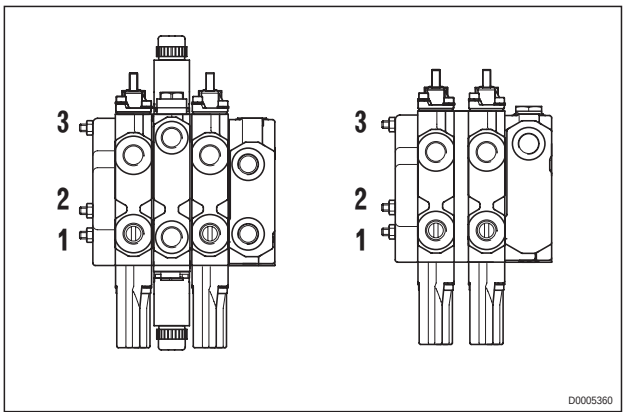
★ Tighten the nuts gradually and in sequence to bring the valve sections together.

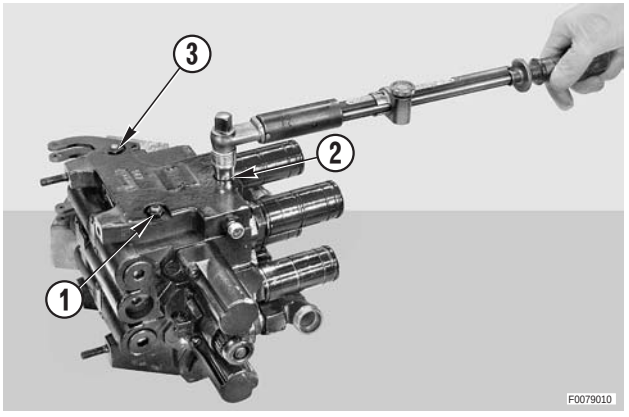
Nm Final tightening torque for nuts:
30±3 Nm (22±2.2 lb.ft.)

★ Nut tightening sequence: 1-2-3

⁘ 2

★ Ensure that the O-ring seals are correctly positioned before fitting the sections together



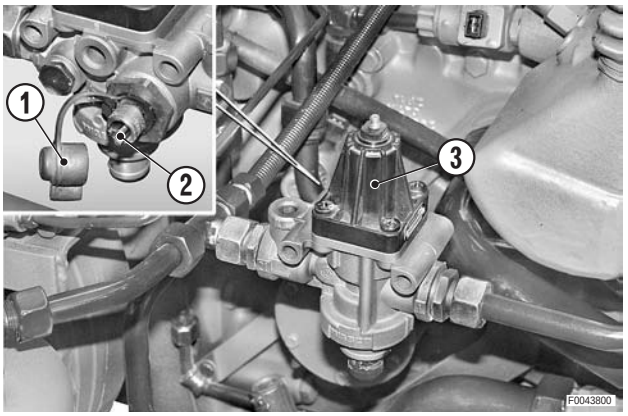


REMOTE CONTROL VALVES ASSEMBLY

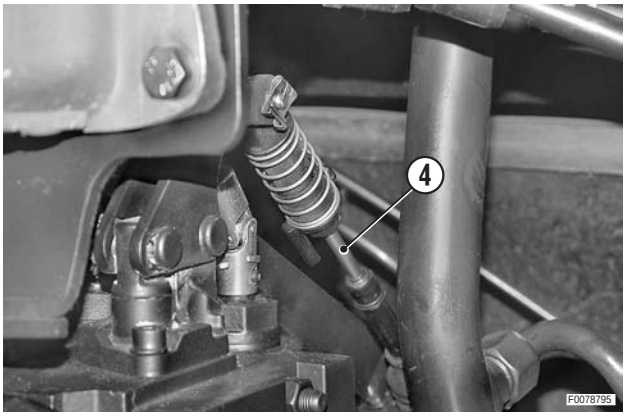
Removal

Remove the key from the ignition and apply the parking brake.

Vent residual pressure from the reservoir by removing the cap (1) and pressing the button (2) on the pressure regulator valve (3).

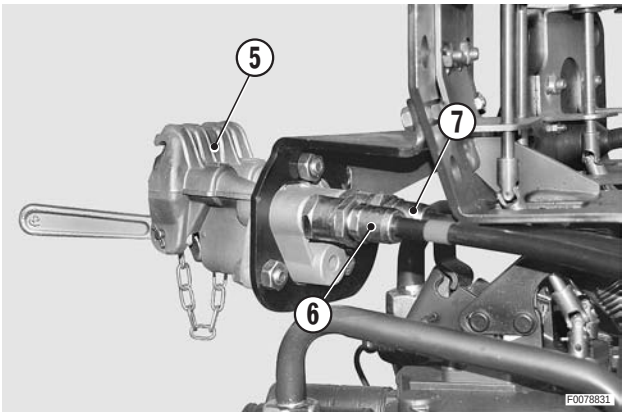


1 - Disconnect the control cables (4) from the remote valves assembly.
   ★ Mark the positions to avoid confusion on reconnection.

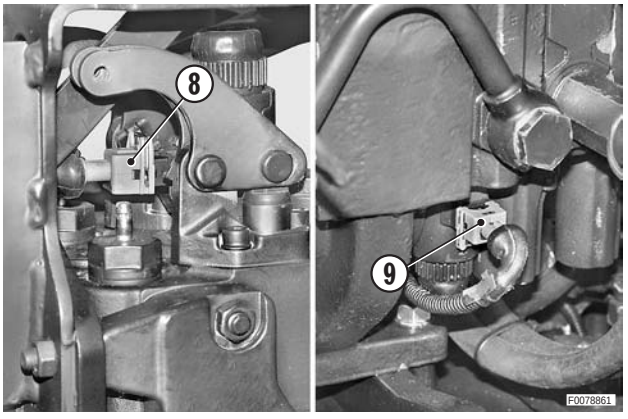


2 - Disconnect the pipes (6) & (7) from the trailer brakes coupling heads (5).

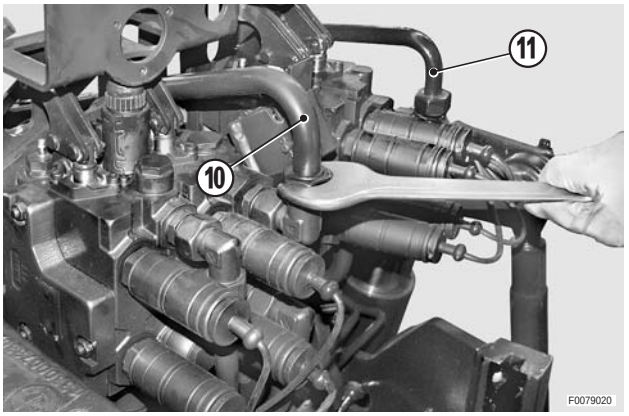
   If auxiliary pressure couplers are fitted, disconnect the return pipe and, if present, the load sensing pipe.



3 - Disconnect the connectors (8) and (9) from the proportional lift control valve. ※ 1

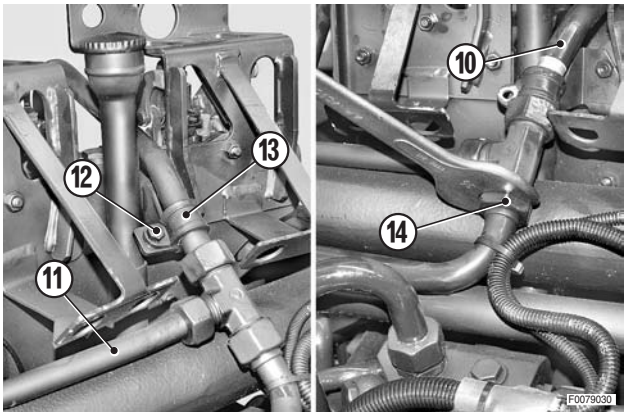


4 - Disconnect the supply pipes (10) and (11) from the remote valves



5 - Remove the fixing bolt (12) of the strap (13).

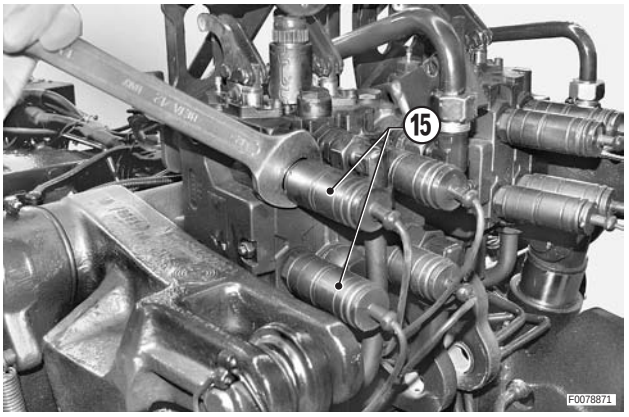
6 - Disconnect the supply pipes (10) and (11), loosening the fitting (14).



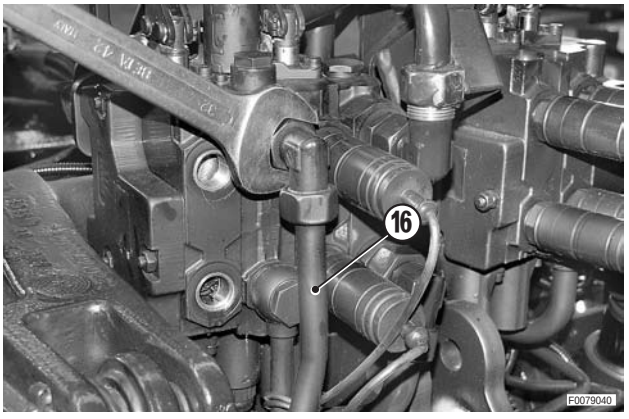
7 - Loosen and remove the quick couplers (15) in order to access the pipes to be removed. ⁘ 2

★ Renew the copper gaskets on reassembly.

★ Plug the holes to prevent the entry of impurities.

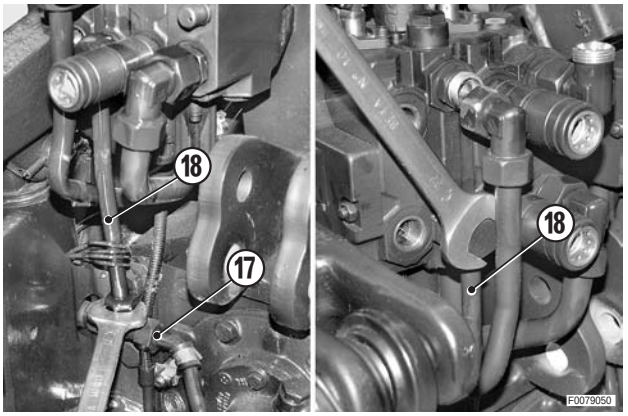


8 - Disconnect the lift return pipe (16) from the left remote valve.

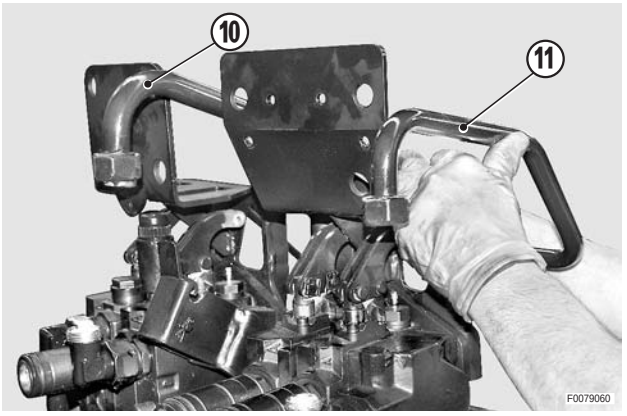


9 - Disconnect the lift pipe (18) from the Tee fitting (17) and from the remote valve.
- ★ Always renew the copper gaskets.
- ★ Plug the pipes to prevent dirt from entering the system.

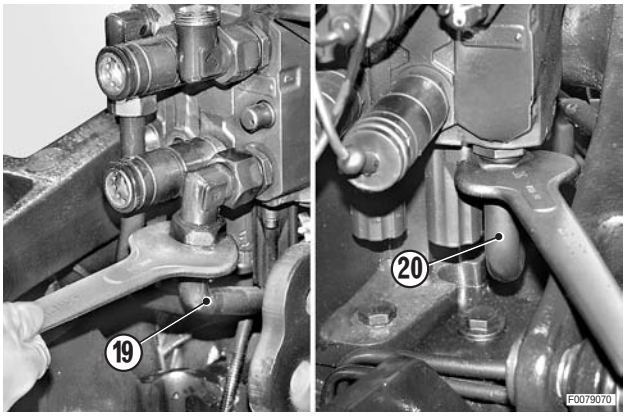
10 - Remove the pipe (18).



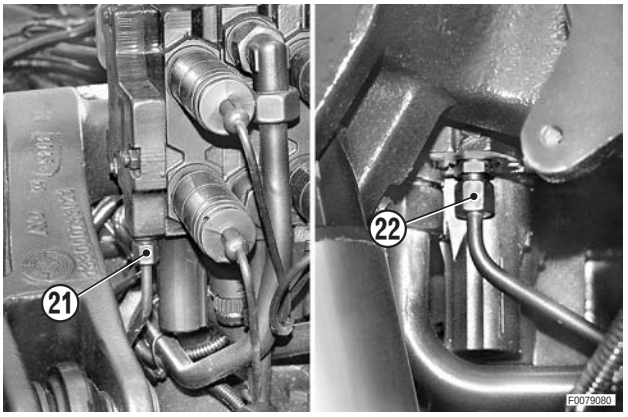
11 - Remove the supply pipes (10) and (11).



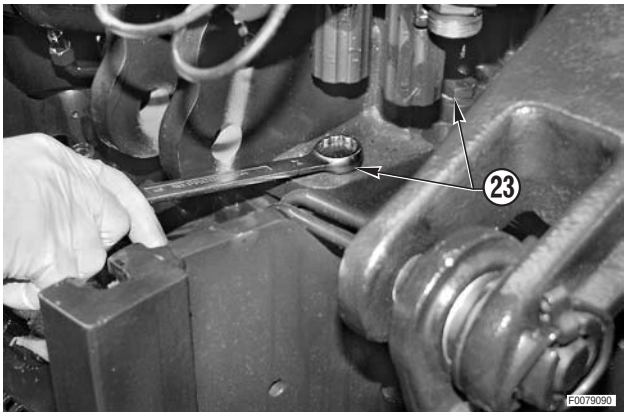
12 - Disconnect the return pipes (19) and (20) from the remote valves.



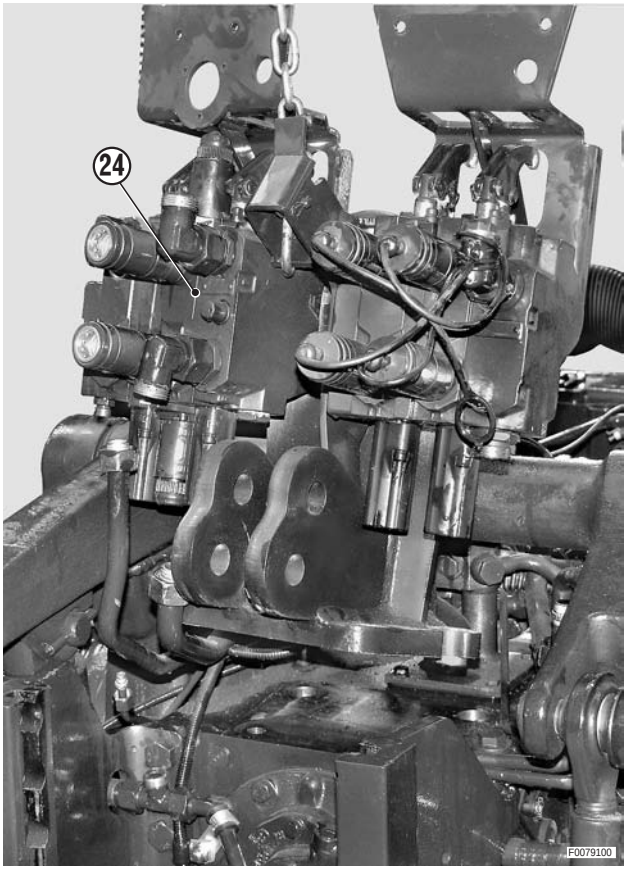
13 - Disconnect the load sensing signal pipes (21) and (22) from the remote valve end caps.



14 - Loosen the fixing bolts (23) of the remote valve assembly.



15 - Attach the remote valves assembly to a hoist; remove the bolts (23) and remove the complete assembly (24).



Refitting

- Refitting is the reverse of removal

1

★ Attach the connectors to the solenoids of the lift control valve:
DW upper
UP lower

2

Nm Quick couplers: 60–66 Nm (44.2–48.6 lb.ft.)

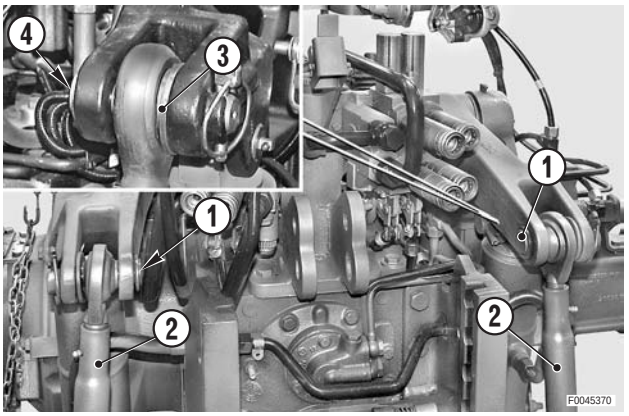
1 - Start the engine and fully raise and lower the lift a number of times to expel air from the circuits and check for leaks.

LIFT CYLINDERS

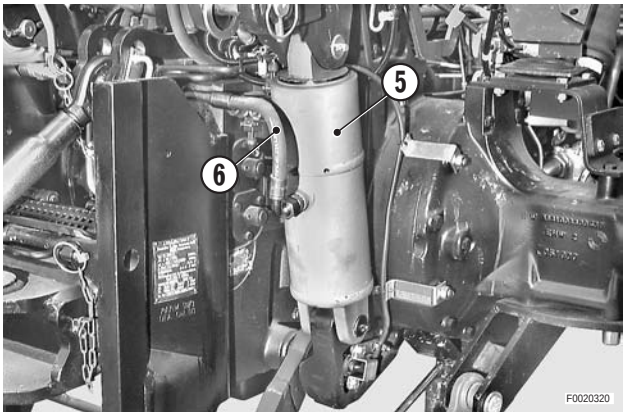
Removal

⚠ Switch off the engine and remove the key from the ignition.

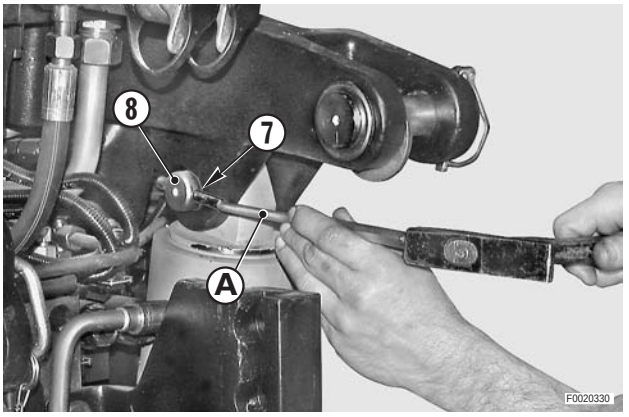
1 - Remove the pins (1) and lower the lift rods (2) towards the rear of the tractor.
★ Recover the spacers (3) and washers (4); make a note of their postions.



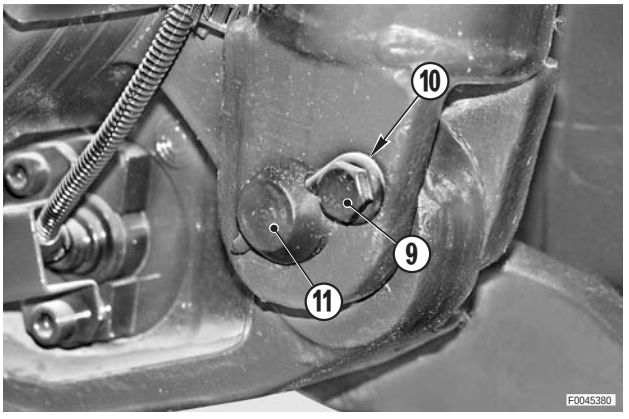
2 - Disconnect the pipes (6) from the cylinders (5).
★ Plug the ends of the pipes to prevent the entry of contaminants.



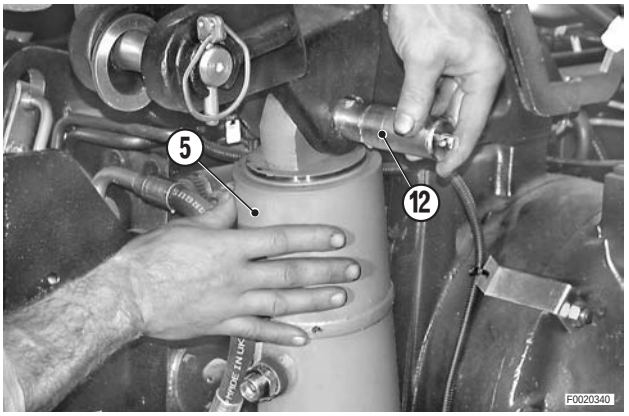
3 - Using a pin punch "**A**", remove the spring pin (7) securing the upper pivot pin (8).



4 - Remove the screws (9) and remove the bracket (10) securing the lower pivot pin (11).



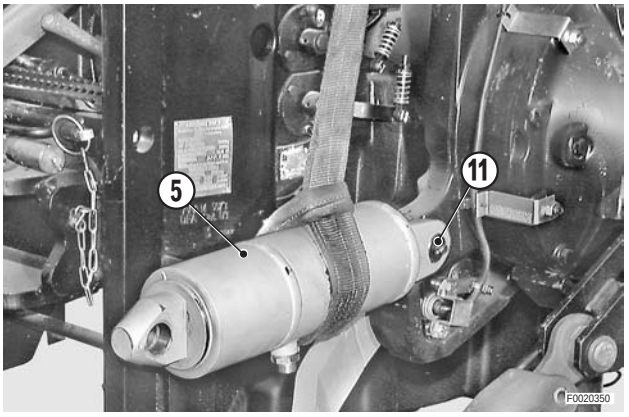
5 - Support the cylinder (5) while removing the upper pivot pin (12). ※ 1



6 - Rotate the cylinder (5) so that it is horizontal and attach it to a hoist.

kg Cylinder: approx. 55 kg (121.2 lb.)

7 - Remove the lower pivot pin (11) and the cylinder. ※ 1



Refitting

- Refitting is the reverse of removal.

※ 1

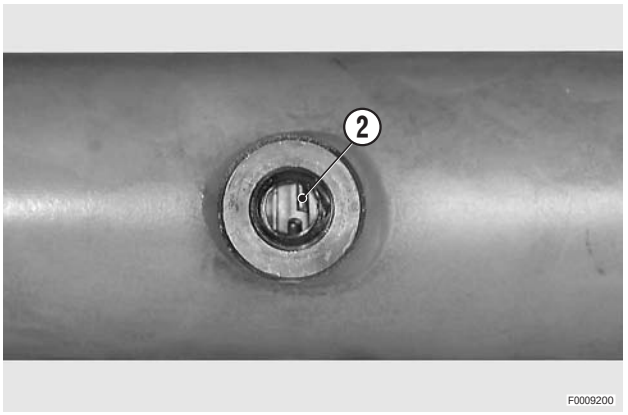
★ Lubricate the pivot pins.

1 - Start the engine and repeatedly extend the cylinders to their full extent in order to expel air from the system.

Disassembly

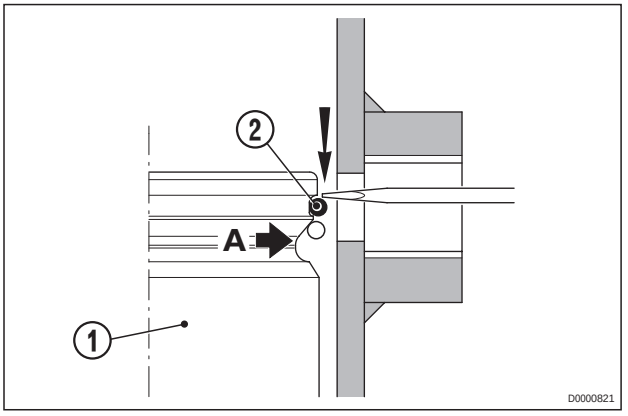
1 - Withdraw the piston (1) to the point where the circlip (2) is visible through the hole of the delivery pipe fitting.

2 - Rotate the rod so that the gap in the circlip (2) is visible.



3 - Using a screwdriver through the delivery line hole, push one end of the circlip (2) towards the groove "**A**" in the piston (1) while simultaneously rotating the piston (1) in order to release the circlip (2).

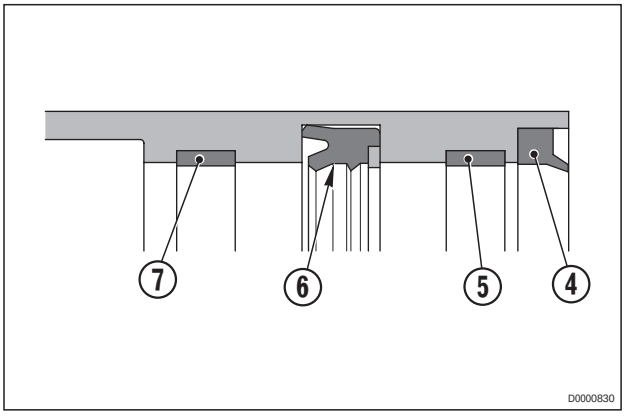
4 - Withdraw the complete piston assembly (1).



5 - Remove in sequence the wiper seal (4), the guide (5), the seal (6) and the second guide (7).

※ 1 ※ 2

★ Note which way round the seal is fitted.



Assembly

- Assembly is the reverse of disassembly.

※ 1

Seal and guides: Gearbox oil.

※ 2

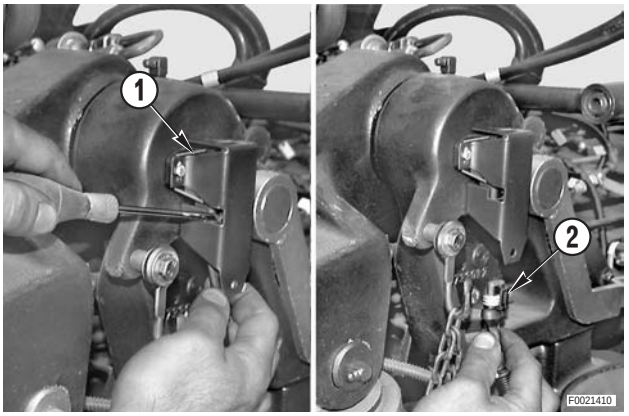
★ Before inserting the piston, check that the guides are correctly positioned in the seatings in the cylinder.

LIFT POSITION SENSOR

Testing

⚠ Switch off the engine and remove the key from the ignition.

1 - Cut the retaining strap and, using a thin blade, disconnect the connector (2) from the position sensor (1).

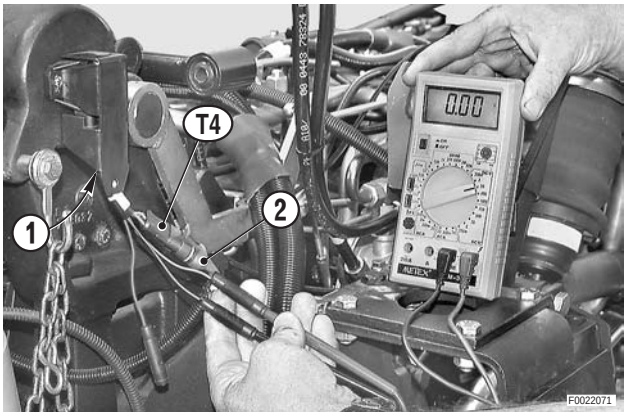


2 - Connect the test lead **T4** (code 5.9030.743.0) between the connector (2) and the sensor (1).

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±1V (DC)
- ★ Signal voltage with lift raised (brown-blue wires): equal to or greater than 0.5Vdc
- ★ Signal voltage with lift lowered (brown-blue wires): less than or equal to 4.5Vdc

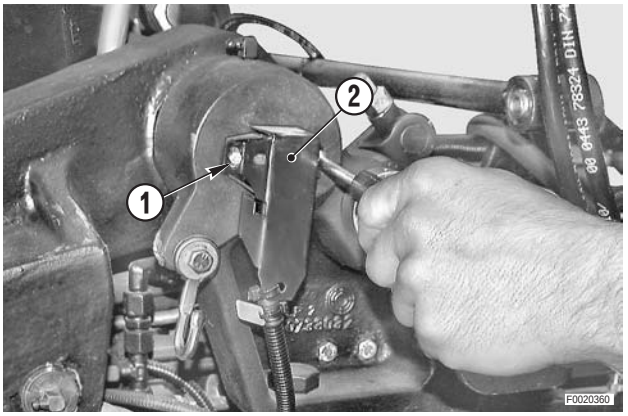
★ If the voltage readings are not within the specified ranges, renew the sensor.



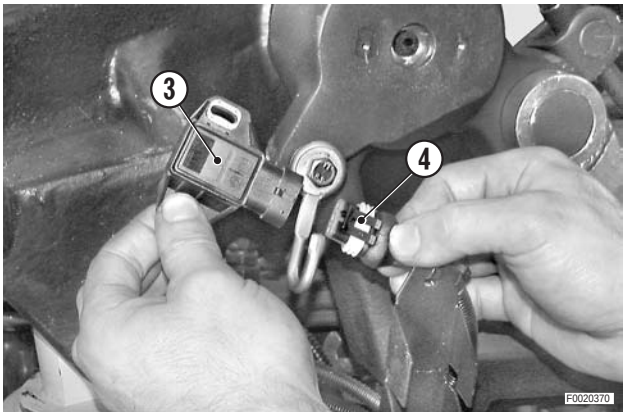
Renewal

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 unplug the connector (4).



Renewal of the position sensor bush (only if necessary)

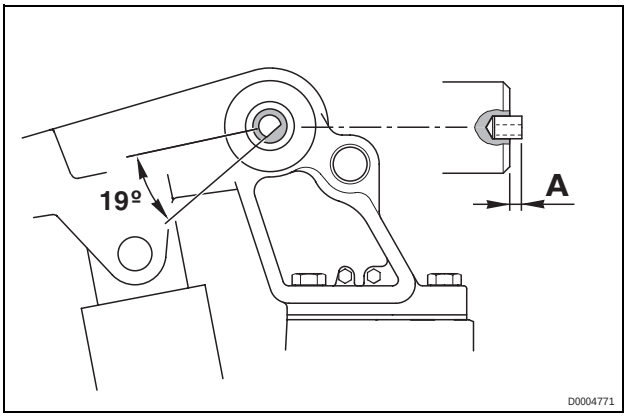
1 - After removing the worn bush, clean and activate the seating.

Activator: Loctite 7649

2 - Apply sealant to the surfaces of the hole and fit the new bush, aligning the machined guide surfaces of 19° manteining the protusion “A” of 4.5º–0.5 mm.

Sealant: Loctite 648

3 - Allow the sealant to cure for at least 30 minutes before fitting the sensor.



Refitting

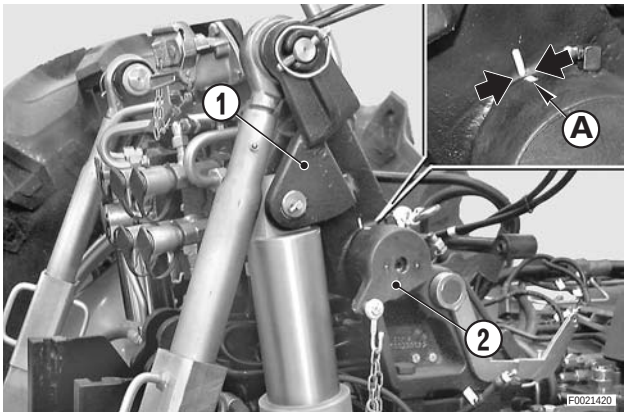
- Refitting is the reverse of removal.
  - ★ Before finally tightening the screws, rotate the sensor fully in a counter-clockwise direction; adjust the position sensor as described in the following paragraph.

Adjusting

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.

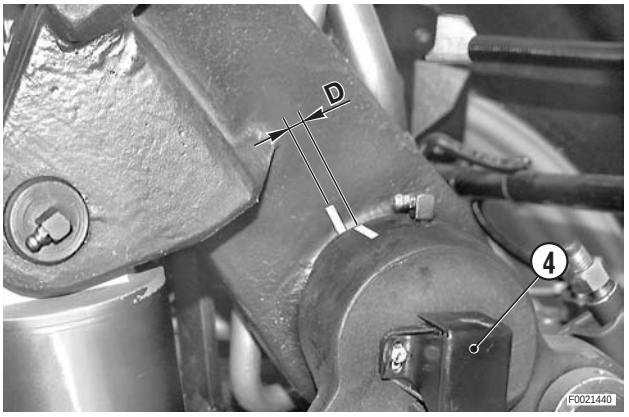
3 - Make reference marks on the lever (1) and on the bearing support (2).



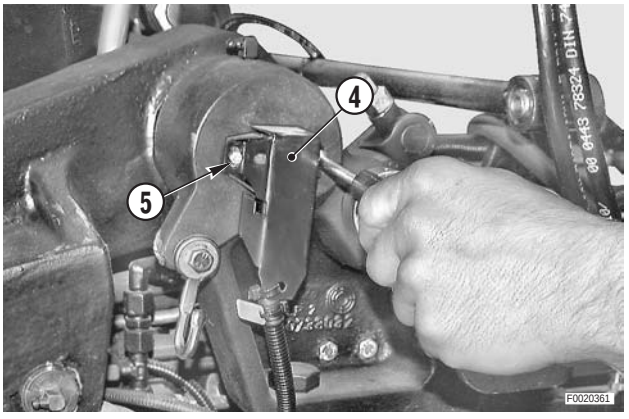
4 - Lower the lift to its maximum depth position.

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.

6 - As the sensor (4) is rotated, the lift will start to rise; top rotating the sensor and release the pushbutton (3) when the reference marks made in step 3 are apart a distance of "**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.

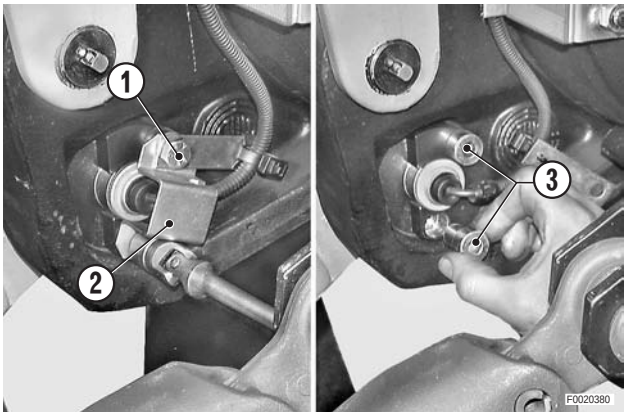
⚠ If the hydraulic system is maintained at maximum pressure for more than 30 seconds during the adjustment procedure, the system will automatically switch to neutral and the error code "37" will be signalled. In this case, before repeating the adjustment procedure, first turn the ignition key to the "**O**" position.

9 - If necessary, alter the position of the sensor by turning it a few degrees in a counter-clockwise direction.

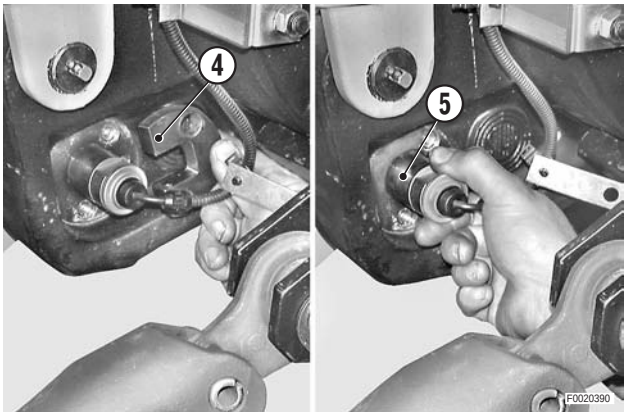
LIFT DRAFT SENSOR

Removal

1 - Remove the screws (1) and remove the cover (2) and the spacers (3).



2 - Support the lever and remove the bracket (4) and then the sensor (5).



3 - Release the wiring from the retaining straps and unplug the sensor connector (6).

★ The 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.

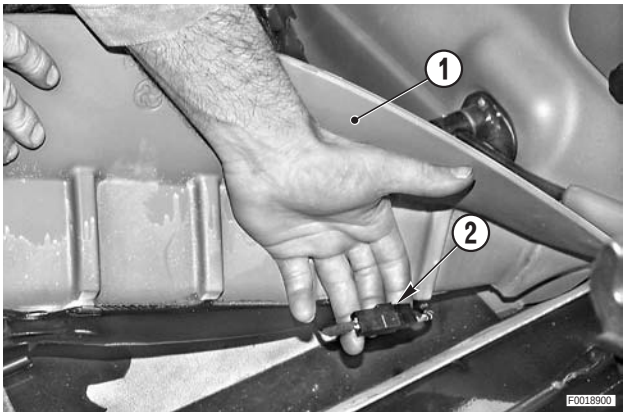
★ Make sure the sensor is installed the right way round.

DRIVER'S SEAT

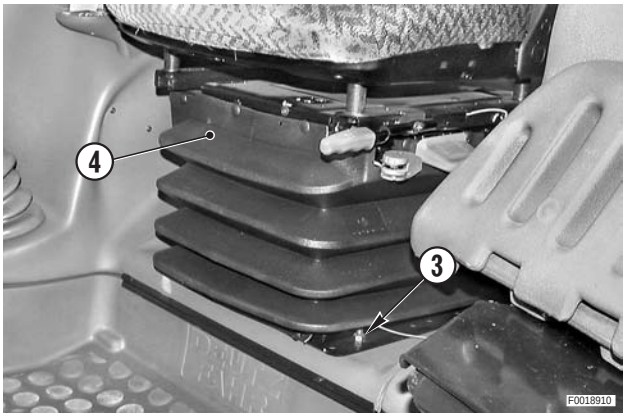
Removal

Remove the battery cover and disconnect the negative battery lead (–).

1 - Lift the rear floor mat (1) and withdraw the feed wire (2) for the compressor for the seat.



2 - Remove the four nuts (3) and remove the complete seat assembly (4).



Refitting

- Refitting is the reverse of removal.

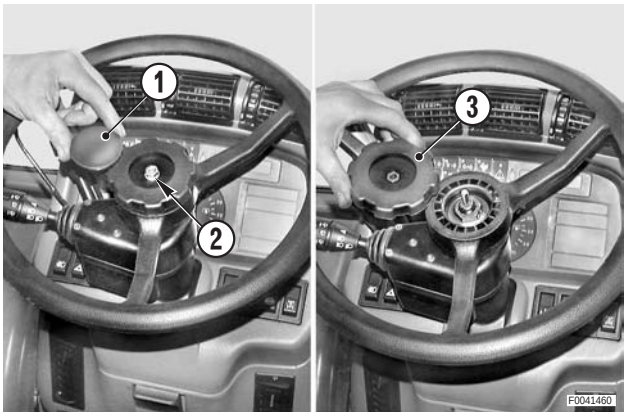
STEERING WHEEL, STEERING COLUMN SWITCH UNIT AND INSTRUMENT PANEL

Removal

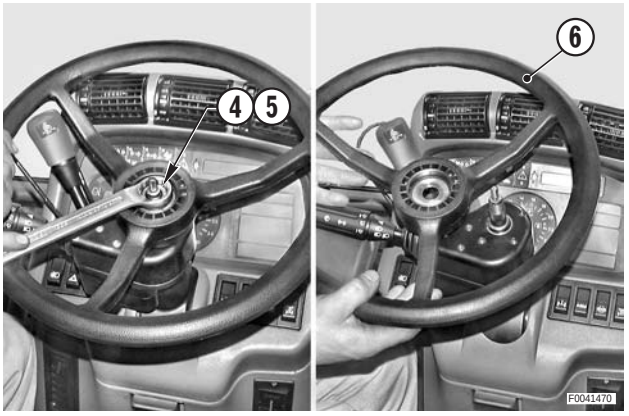
Remove the battery cover and disconnect the negative battery lead (–).

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.



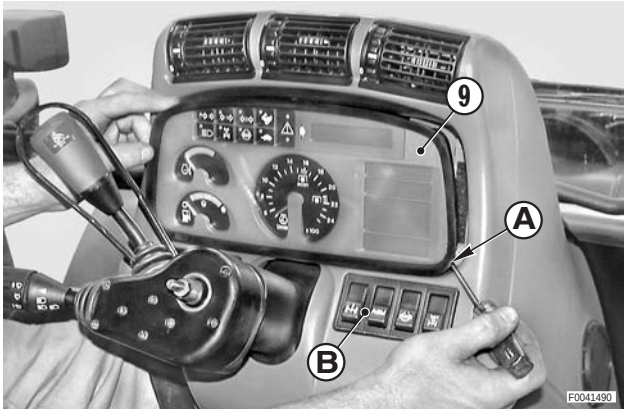
3 - Remove the nut (4), the toothed washer (5) and remove the steering wheel (6). ※ 1



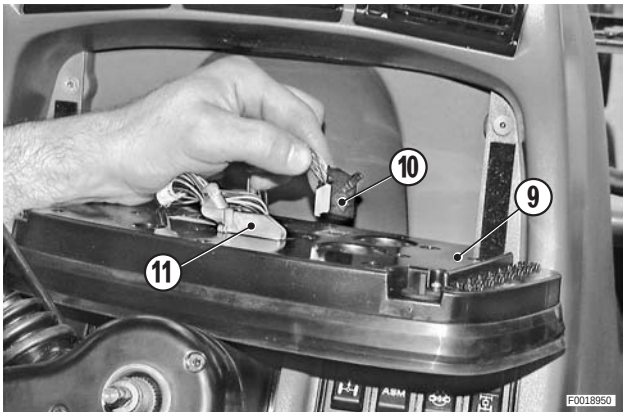
4 - Remove the circlip (7) and remove the steering column switch unit (8) from the steering column.

5 - Insert a thin blade "**A**" under the gasket and prise off the instrument panel (9).

★ Alternatively, withdraw the right and left switch groups "**B**" and push the instrument panel from the inside.



6 - Unplug the connectors (10) and (11) from the instrument panel (9); remove the assembly.



Refitting

- Refitting is the reverse of removal.

※ 1

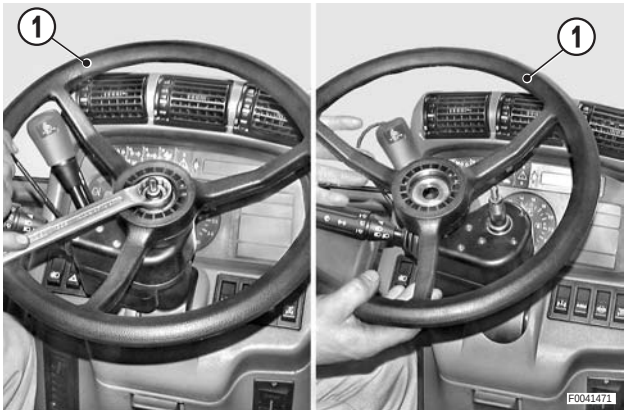
Nm Steering wheel nut:
M18x1.5: 40±10% Nm (29.5±10% lb.ft.)
M8: 10‡2 Nm (7.4‡1.5 lb.ft.)

STEERING COLUMN SWITCH UNIT AND THE SHUTTLE CONTROL LEVER

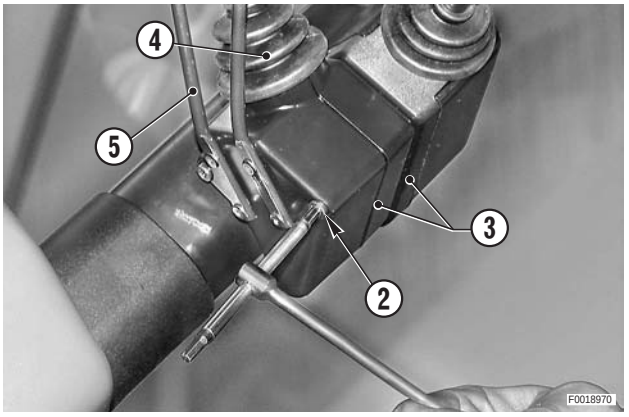
Removal

⚠ Remove the battery cover and disconnect the negative battery lead (–).

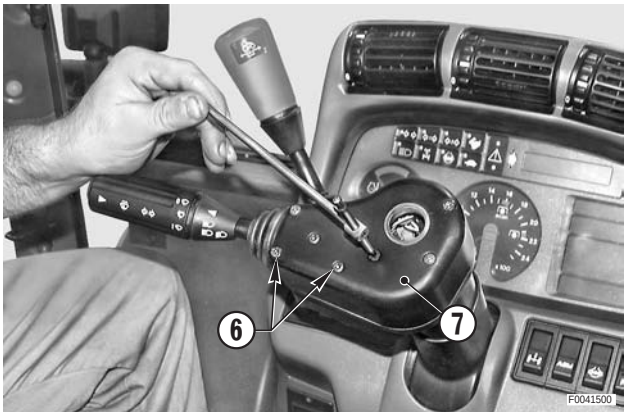
1 - Remove the steering wheel (1).
(For details, see "STEERING WHEEL, STEERING COLUMN SWITCH UNIT AND INSTRUMENT PANEL").



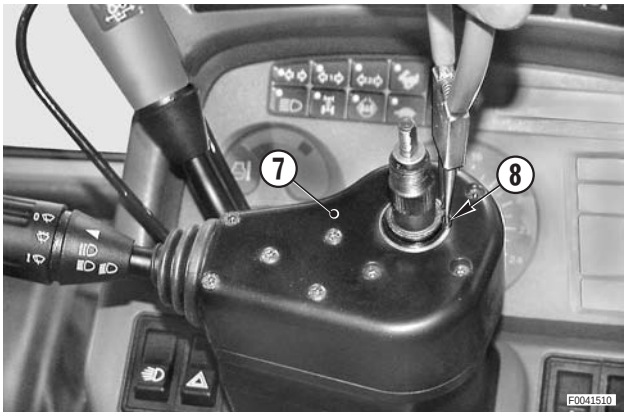
2 - Remove the lower screws (2) joining the shrouds (3) of the shuttle control lever (4) and remove the safety bar (5).



3 - Unscrew and remove six screws (6) securing the shrouds of the steering column switch unit (7).

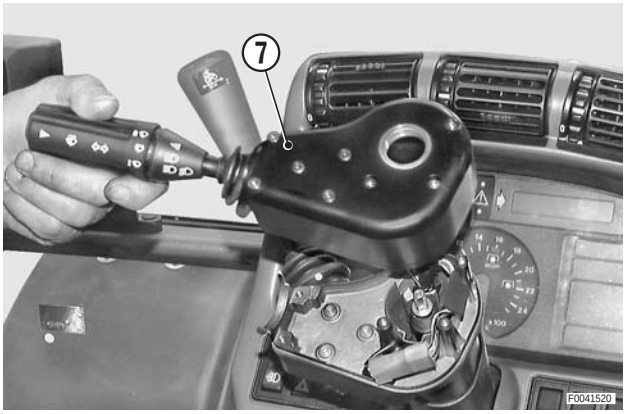


4 - Remove the circlip (8) of the steering column switch unit (7).

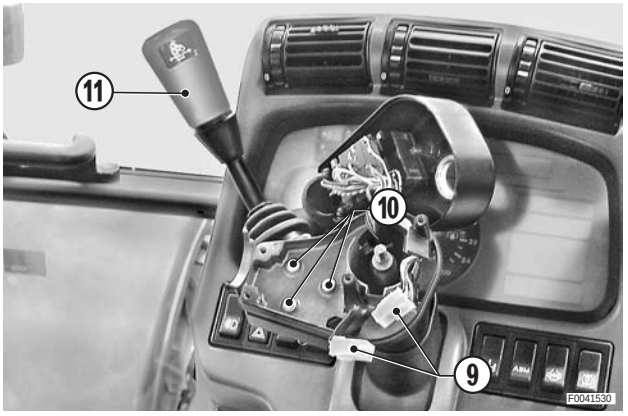


5 - Lift off the switch unit (7) and place it to one side.

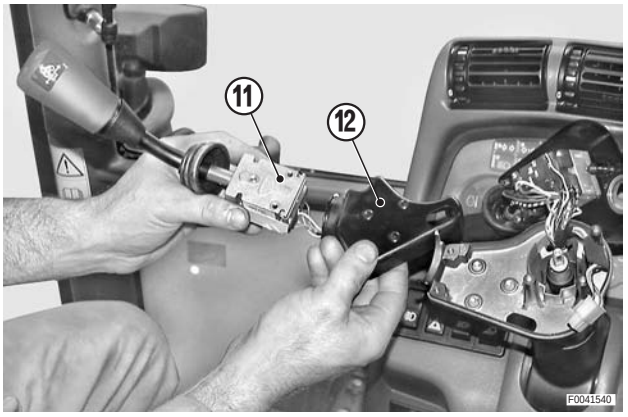
⚠ The contacts of the switch unit are protected by adhesive insulation material; recover this insulation as it will have to be repositioned.



6 - Unplug the connector (9), remove the screws (10) and detach the shuttle control lever assembly (11).



7 - Remove the shuttle control lever (11), detaching it from the cover (12).



Refitting

- Refitting is the reverse of removal.

1 - Turn the ignition key to position "**I**" and check operation of the direction indicators, lights and windscreen wiper.

2 - Start the engine and run it at idle speed ; engage a gear and check that the shuttle control lever functions correctly.

CENTRE CONSOLE AND SHROUD

Removal

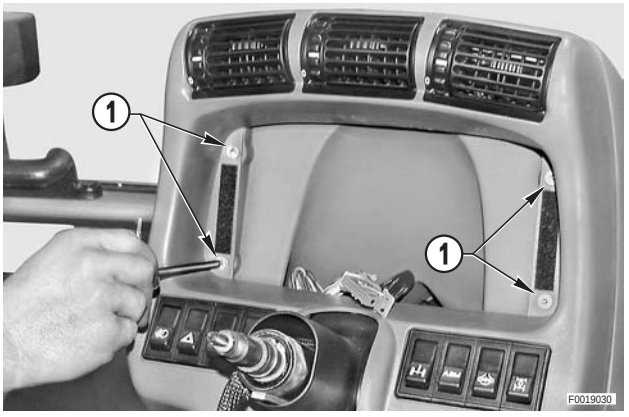
⚠ Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the seat.
(For details, see "DRIVER'S SEAT".

2 - Remove the floor mats.

3 - Remove the steering wheel and steering column switch unit.
(For details, see "STEERING WHEEL, STEERING COLUMN SWITCH UNIT AND INSTRUMENT PANEL").

4 - Unscrew and remove the screws (1).



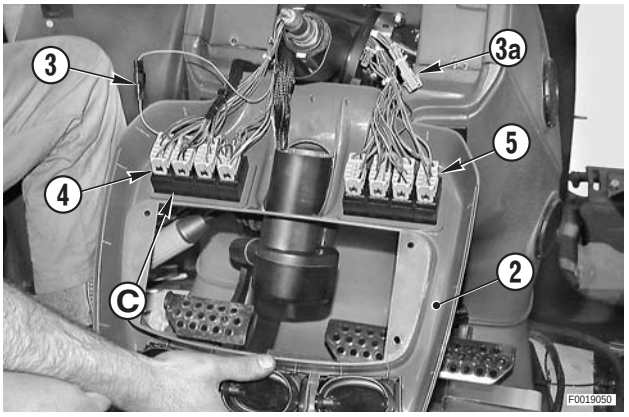
5 - Remove the upper centre console (2) by lifting it upwards.

6 - Rotate the console (2) towards the rear of the tractor and unplug the connectors (3), (4) and (5).

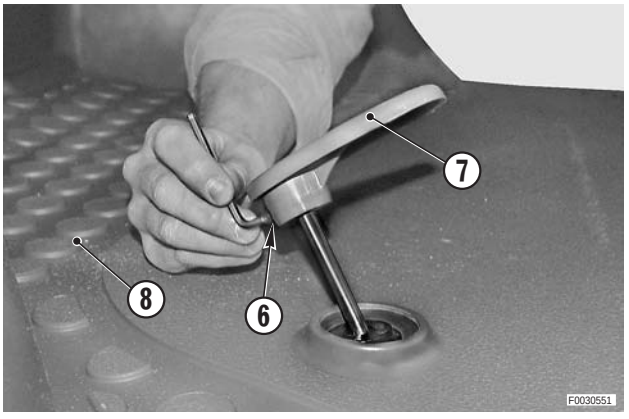
★ Note that connectors and pushbuttons all bear identification marks with the exception of the 2nd pushbutton "**C**" from the left.

★ The unmarked pushbutton is to be connected to its connector **only on models equipped with a front lift.**

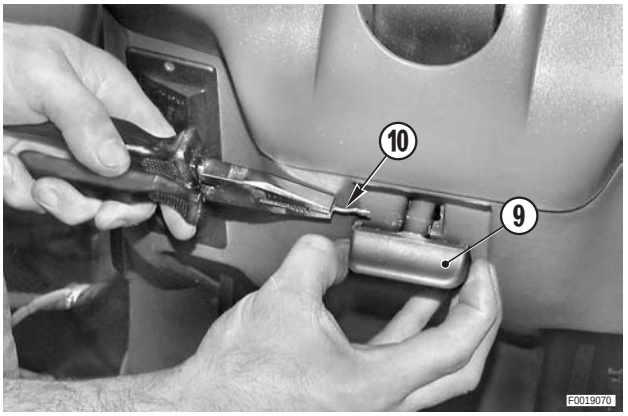
★ The connector marked **3a** is not to be connected.



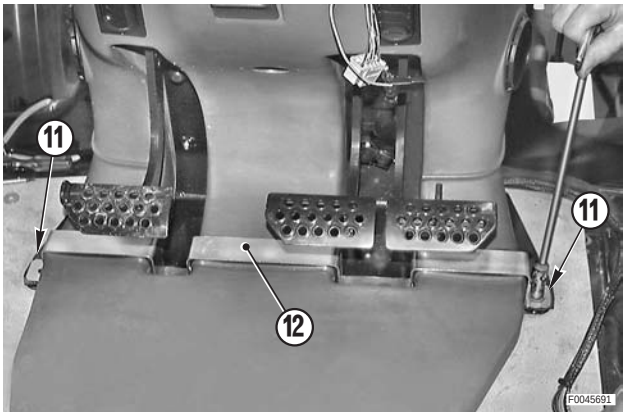
7 - Loosen the grub screw (6), remove the accelerator pedal (7) and remove the front floor mat (8).



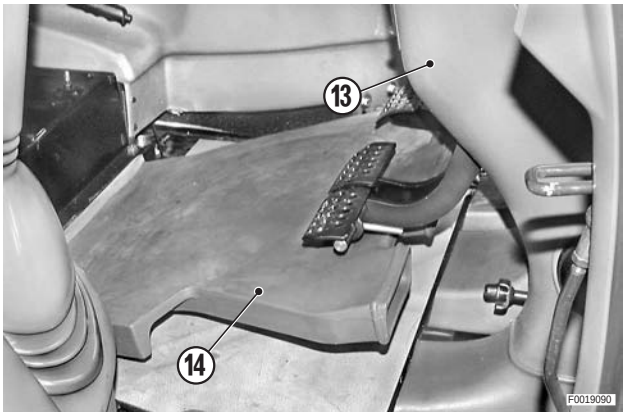
8 - Fully lower the steering column.
Pull outwards the lock handle (9) of the steering tilt adjustment; remove the cotter pin (10) and remove the handle.
★ Renew the cotter pin at each reassembly.



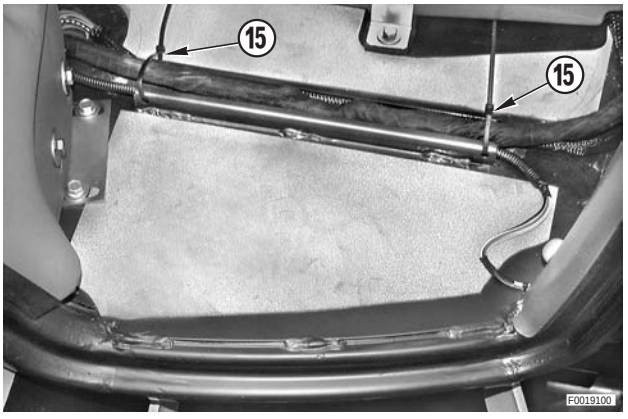
9 - Unscrew and remove the retaining screws (11) of the air duct fascia (12).



10 - Detach the air duct (14) from the centre shroud (13) and remove it.

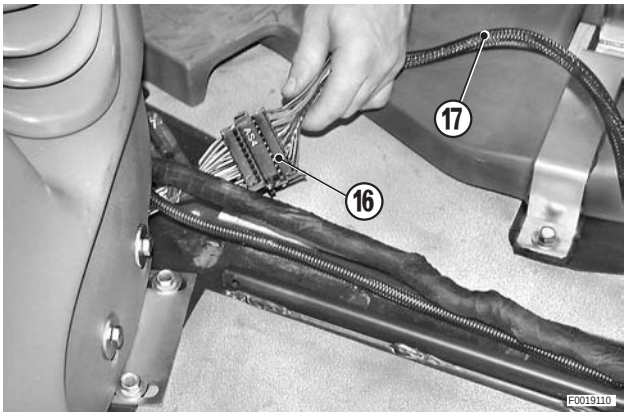


11 - Remove the cable ties (15) to release the wiring from the guide fixed to the footplate.
★ Note that the cable ties are located in grooves.

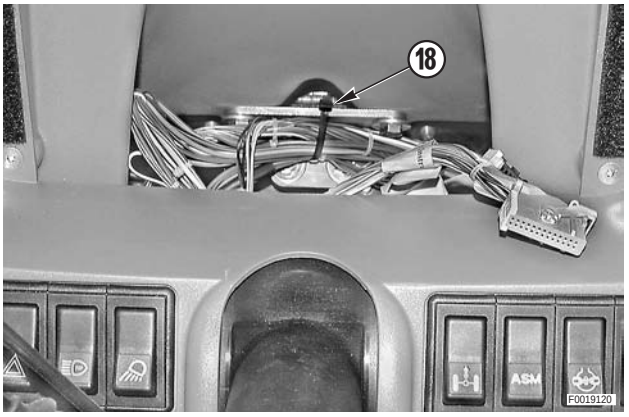


12 - Withdraw the wiring (17) from the right-hand console (16).

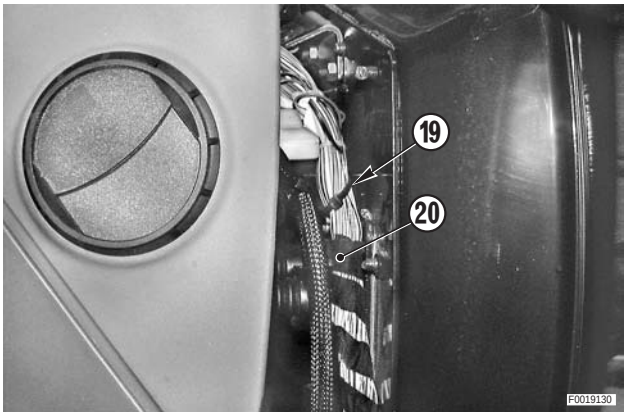
⁘ 1



13 - Release the wires of the pushbutton connectors from the cable ties (18).

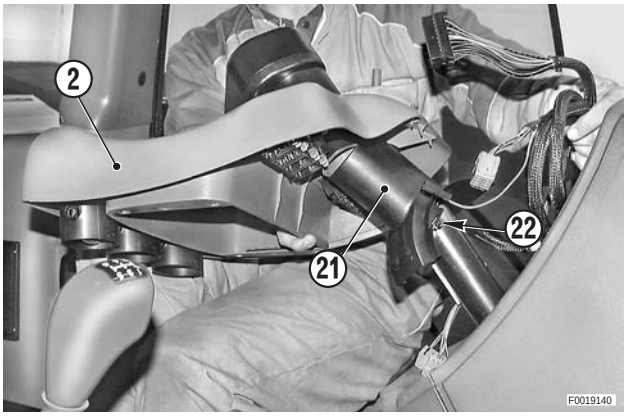


14 - Release the vertical wiring (20) from the cable tie (19); withdraw the complete wiring harness through the aperture exposed by tilting the console forwards.

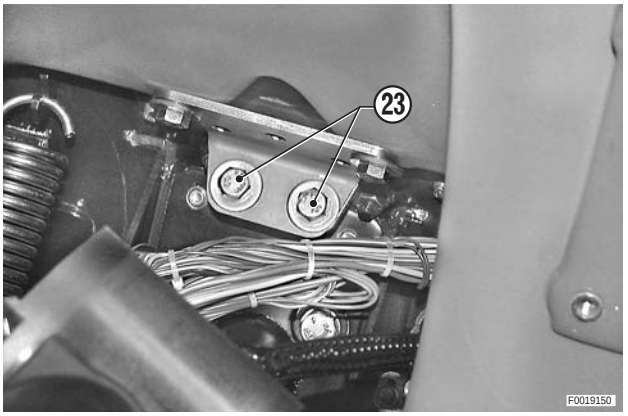


15 - Rotate the shroud (21) to align the rotation lock key with the spring (22); remove the shroud (21).

16 - Remove the complete console assembly (2).



17 - Remove the screws (23).



18 - Lift and tilt the console shroud (13) towards the rear of the tractor to disengage it from the clutch and brake pedals.

Refitting

- Refitting is the reverse of removal.

※ 1

★ Check the condition of the fascia gasket; renew it if damaged.

RIGHT-HAND CONSOLE

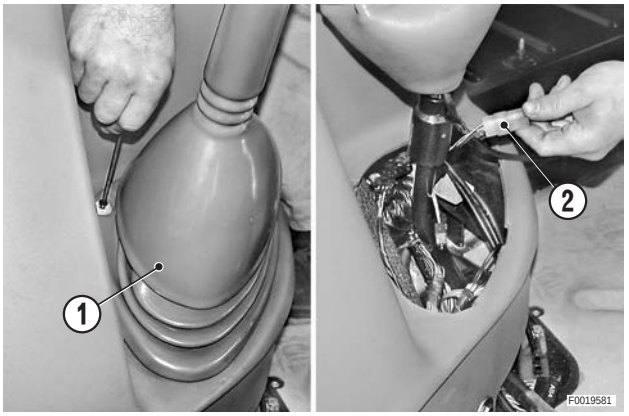
Removal e opening

- The right-hand console can be partially opened to inspect the wiring and the air conditioning blower and for removal of the hand throttle assembly.

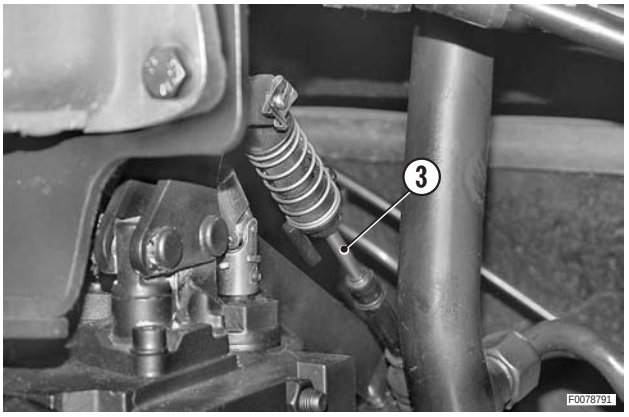
⚠ Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the seat.
(For details, see "DRIVER'S SEAT").

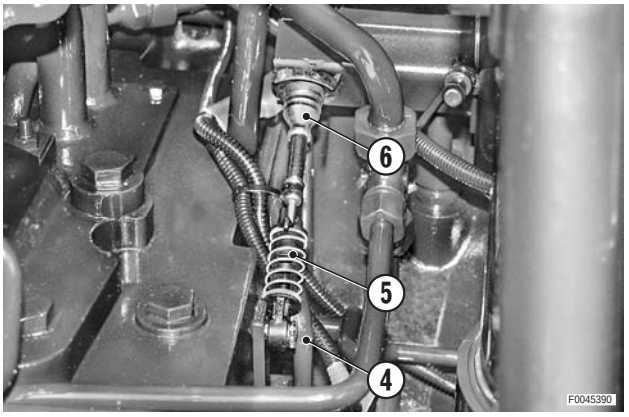
2 - Remove the gaiter (1) and unplug the connector (2).



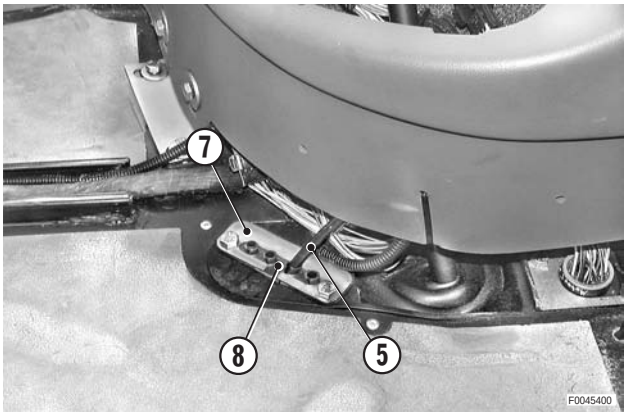
3 - **In case of removal only**: disconnect the control cables (3) from the auxiliary service control valves.
※ 1



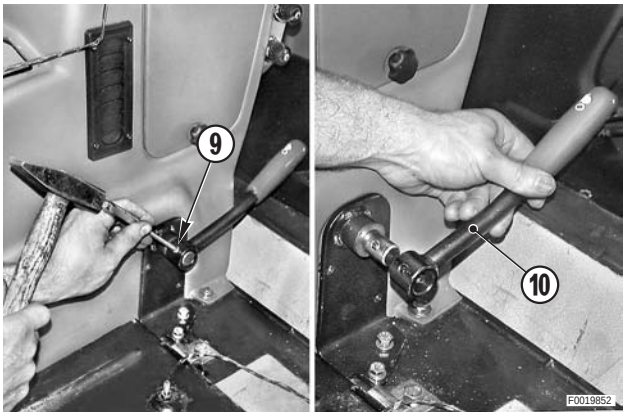
4 - Disconnect the control cable (5) from the lever (4). Detach also the cable sleeve (6).



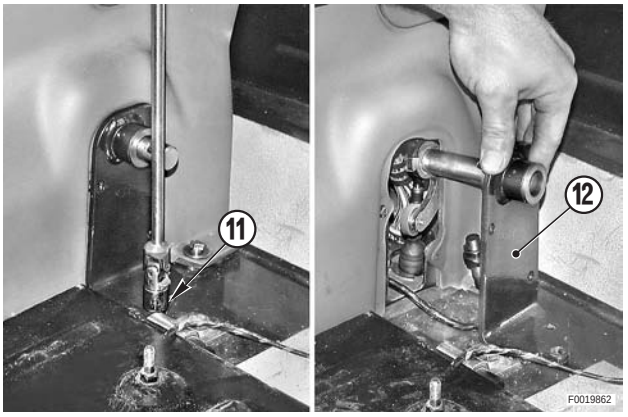
5 - Remove the front floor mat and remove the plate (7) of the cable guide (8) in order to free the control cables (5).



6 - Drive out the spring pin (9) and remove the creeper engagement lever (10).

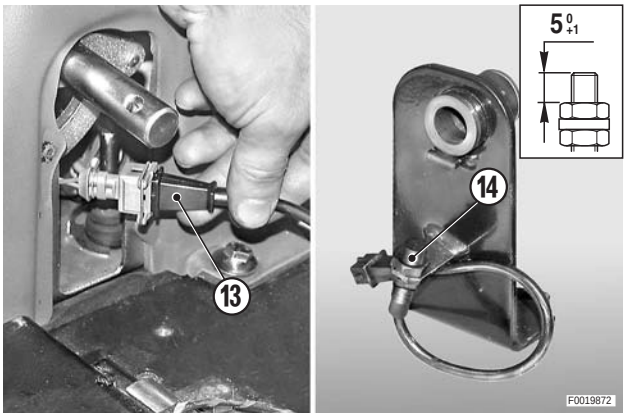


7 - Remove the screw (11) move the support (12).

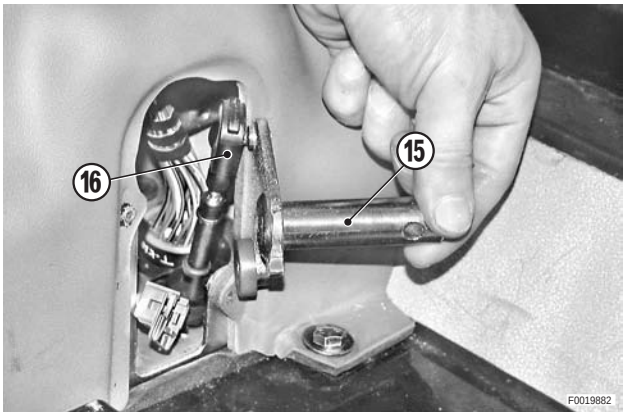


8 - Unplug the connector (13) of the lever position sensor (14).

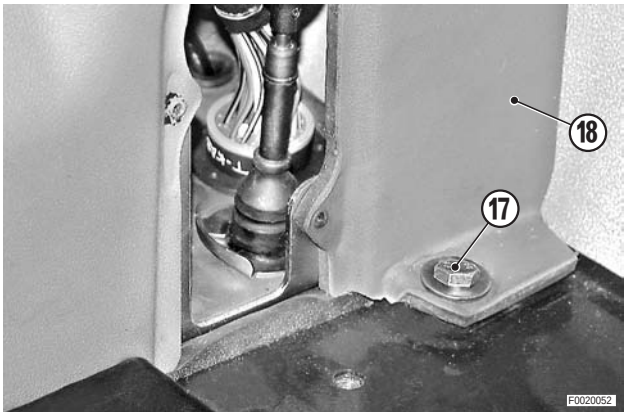
⚠ If the sensor (14) has been removed or replaced, on refitting adjust the protrusion to 5±1 mm (0.197±0.04 in.) relative to the tightened nut.



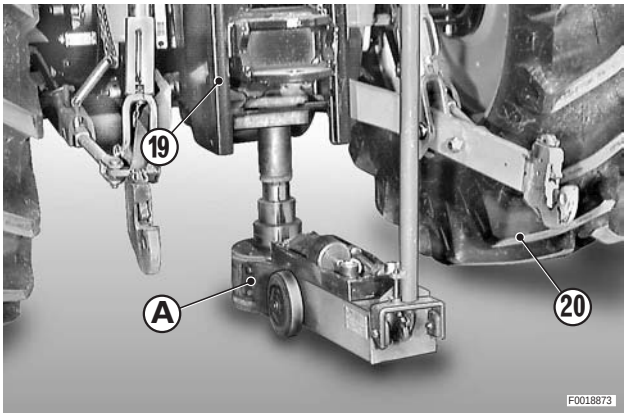
9 - Withdraw the pin (15) and disconnect the creeper control cable (16). ※ 1



10 - Unscrew and remove the lower bolt (17) of the console (18).



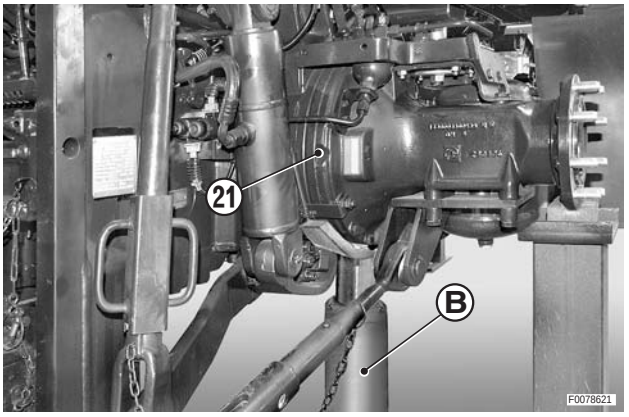
11 - Position a hydraulic jack "**A**" with a non-slip block under the tow hook (20) so that it is inclinded towards the right-hand wheel; raise the tractor so that the right wheel is off the ground (20).



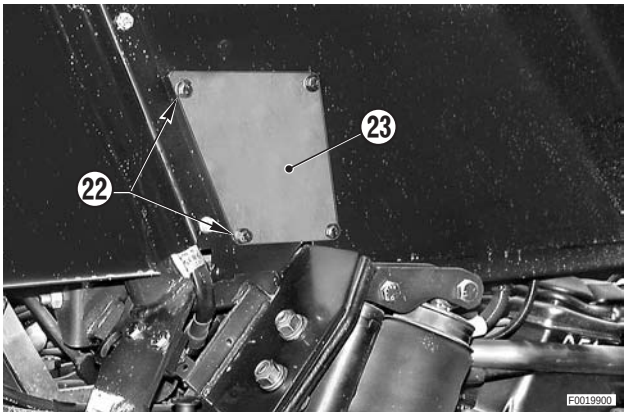
12 - Position a jack "**B**" with safety wings under the right brake assembly; remove the right wheel and lower the tractor onto the stand.

※ 1

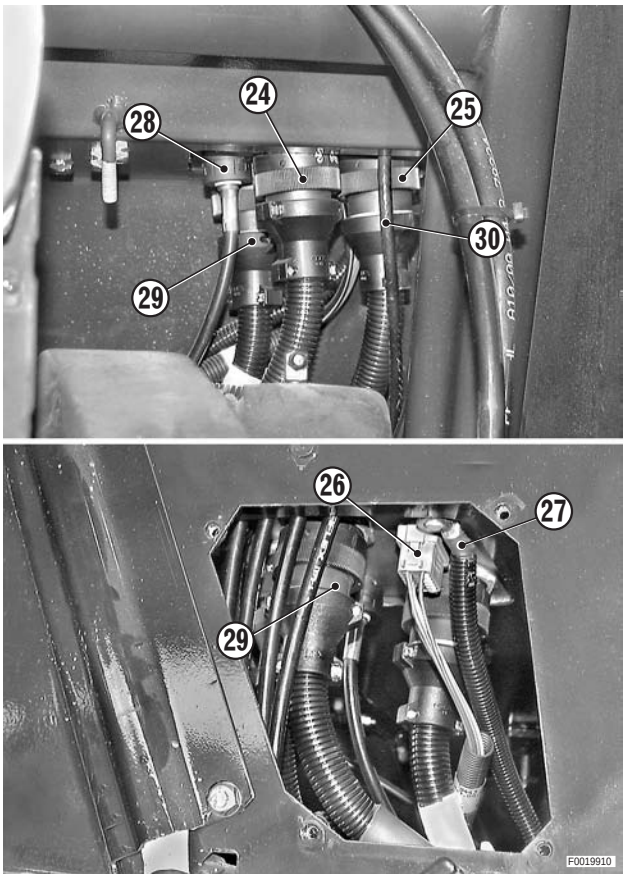
★ Stand load capacity: minimum 2 tons.



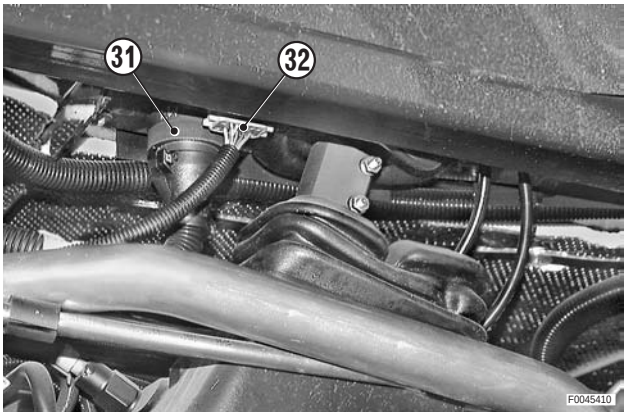
13 - **In case of console removal only**:
Remove the four screws (22) and remove the cover plate (23).



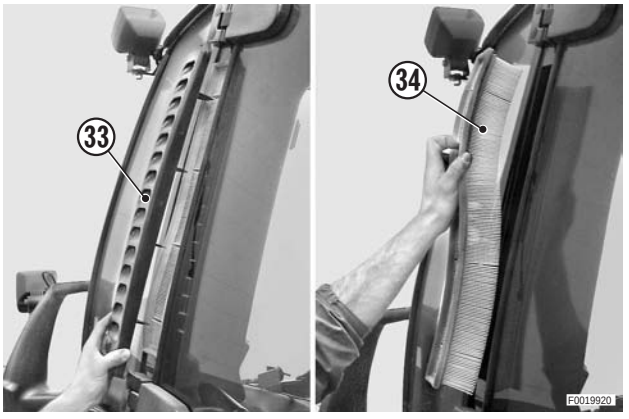
14 - **In case of console removal only**: disconnect from the bulkhead fitting the connectors of the lift line (24) (TKAB2), the transmission (25) (TKAB1), the front suspension (26), the feed cable (27), the creeper engagement indicator cable (28),the cab lights connector (29) and the feed cable (30).



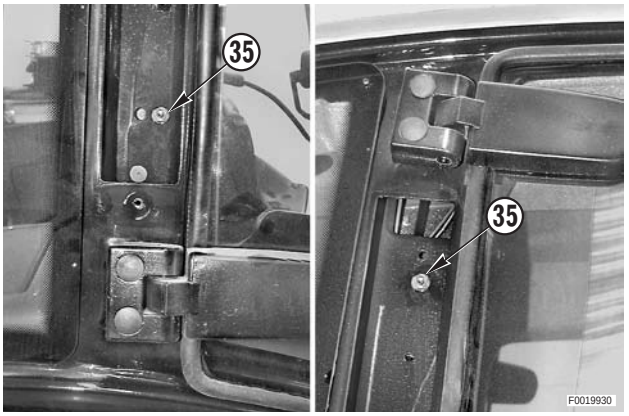
15 - Disconnect the engine line connector (31) and the connector (32) from the bulkhead fitting.



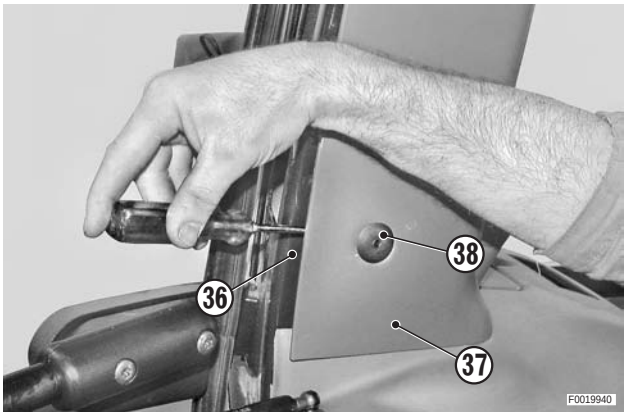
16 - Remove the grille (33) and the filter (34) from the right-hand cab pillar.



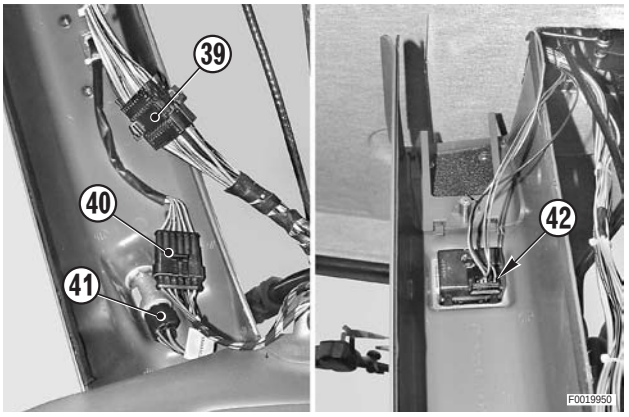
17 - Unscrew and remove the trim panel retaining screws (35).



18 - Insert a thin blade between the cab pillar (36) and the interior trim (37) and detach the clips (38) from the pillar and the trim.
Remove the trim (37).



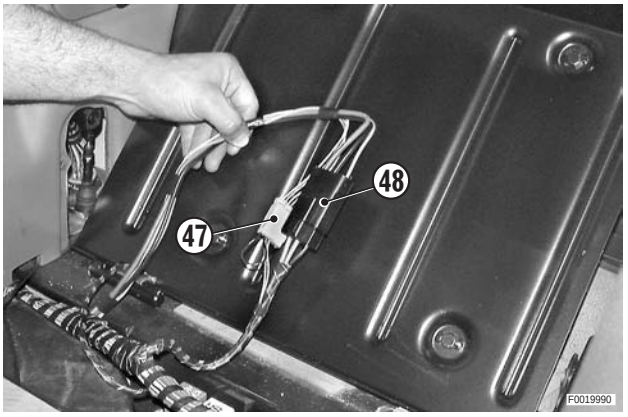
19 - Unplug the lower connectors (39), (40) and (41) and the upper connector (42).



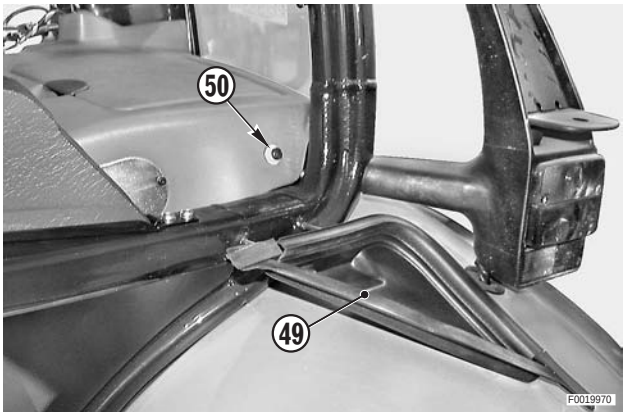
20 - Disconnect the gas spring (43) of the right-hand door and remove the mounting pin (44).

21 - Remove the bolts, lift the seat support (45) and disconnect the hose (46).

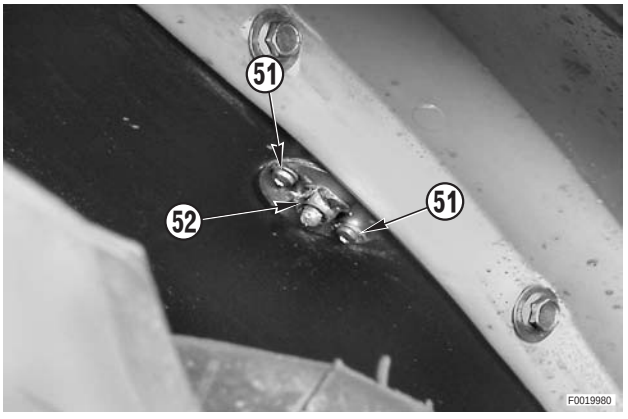
22 - **In case of console removal only**: unplug the connectors (47) and (48).



23 - Open the rear right cable hatch (49) to access the screw (50).



24 - Remove the screws (51) and remove the flanged nut (52) located under the right fender.



25 - Loosen and remove the bolt (53).

26 - Unscrew and remove the front retaining screws (54).

27 - Raise the front of the right-hand console (55) and move it away from the side of the cab; if necessary, remove the console.

★ When removing the console, support the electrical wiring and control cables.

Refitting

- Refitting is the reverse of removal.

⁘ 1

★ Connect the control cables following the operations described in the heading "PTO ENGAGEMENT AND SELECTION CONTROL CABLES" e "AUXILIARY SERVICE VALVE CONTROL CABLES").

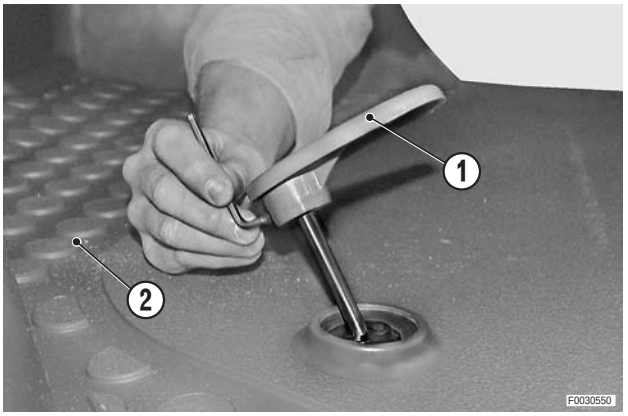
LEFT-HAND CONSOLE

Removal

⚠ Remove the battery cover and disconnect the negative battery lead (–).

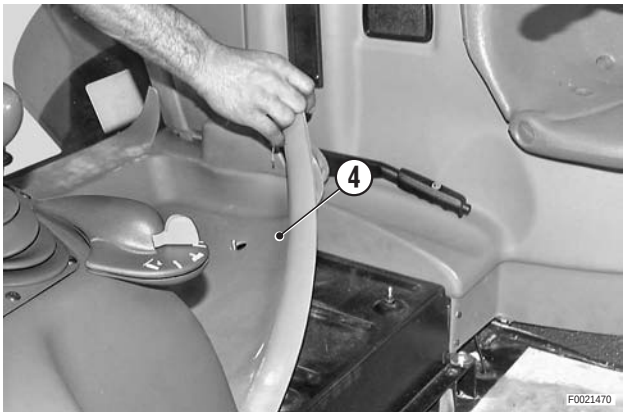
1 - Remove the seat. (For details, see "DRIVER'S SEAT").

2 - Remove the accelerator pedal (1) and remove the front floor mat (2).



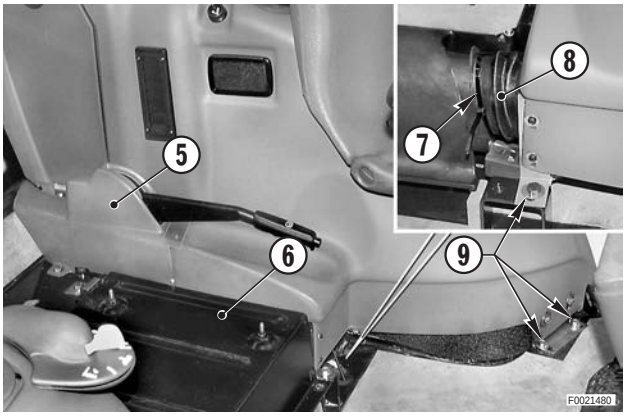
3 - **Only where fitted.**
Remove the passenger seat (3).

4 - Remove the rear floor mat (4).



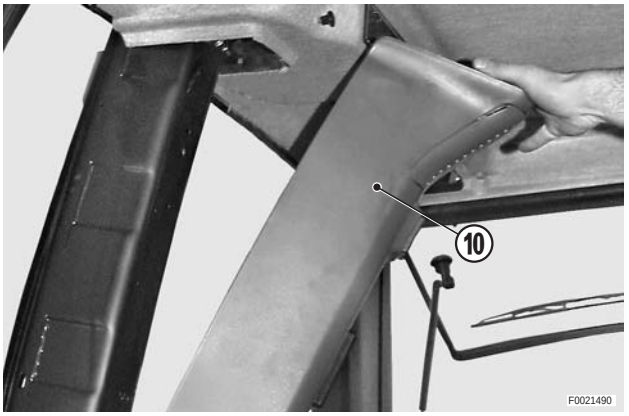
5 - Remove the parking brake cover (5).

6 - Remove the seat support (6) and remove the strap (7) to disconnect the hose (8).
Remove the screw (9).

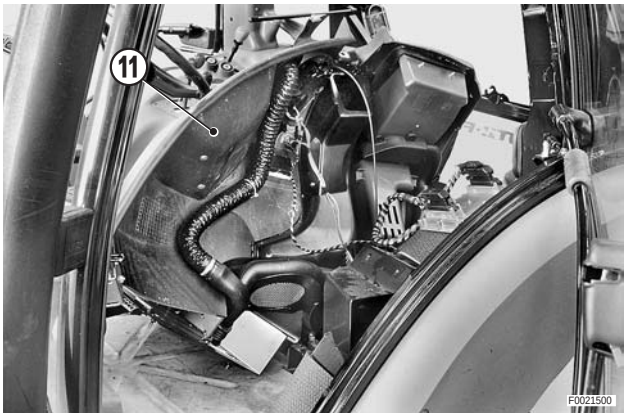


7 - Remove the interior trim (10) from the cab pillar.

8 - Disconnect the gas spring of the left door and remove the mounting pin.
(For details, see "RIGHT-HAND CONSOLE").



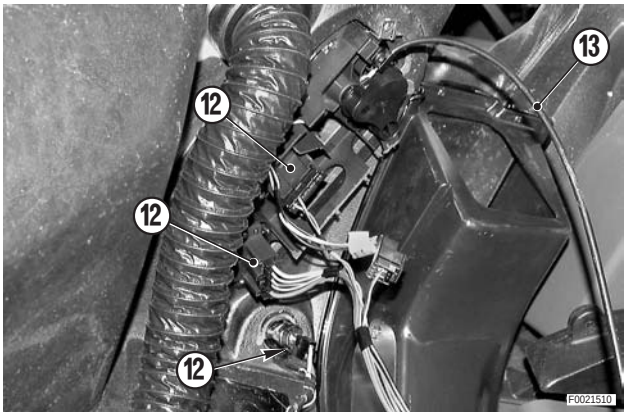
9 - Remove the fixing screws and move the left-hand console (11) away from the side of the cab.



10 - Unplug the four connectors (12).

11 - Disconnect the heating valve control cable (13).

12 - Remove the left-hand console (11).



Refitting

- Refitting is the reverse of removal.

LIFT, FRONT SUSPENSION AND TRANSMISSION ELECTRONIC CONTROL UNITS

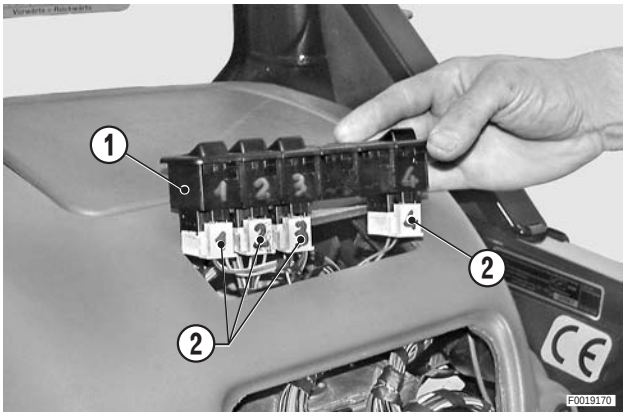
Removal

Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the rear hatch of the right-hand console.

2 - Withdraw the switch assembly (1).

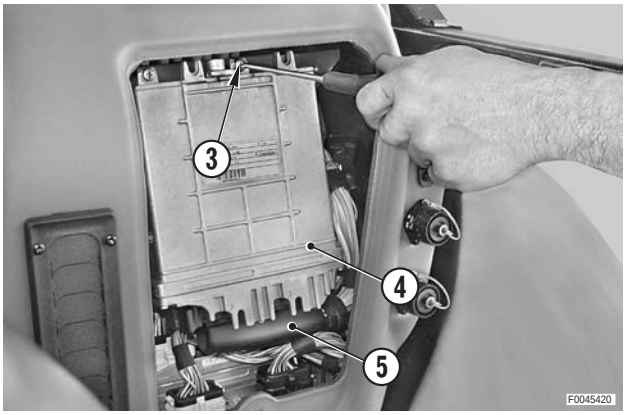
3 - Label the switches and the corresponding connectors to avoid confusion on reconnection; unplug the connectors (2) and remove the switches.



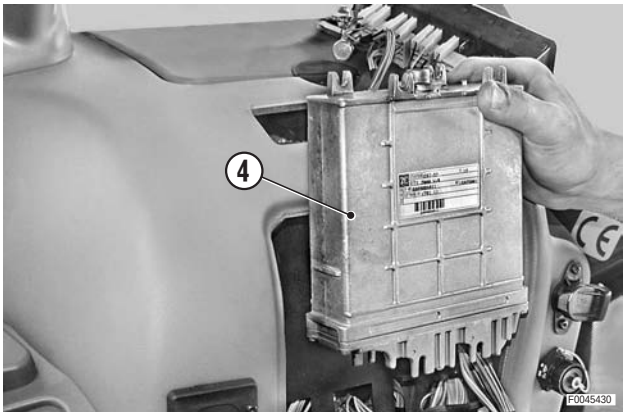
1. Transmission ECU

1 - Unscrew and remove the screws (3) securing the ECU (4).

2 - Unplug the connector (5).

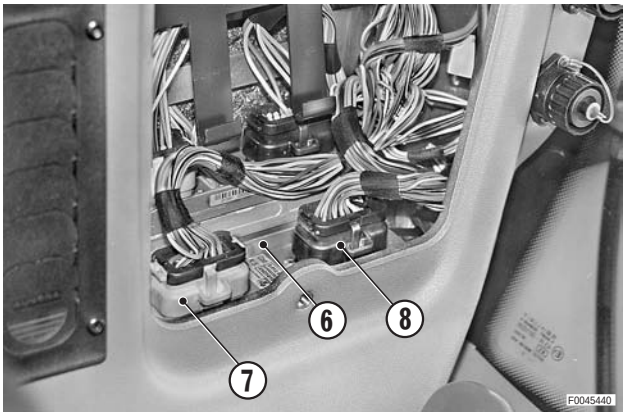


2 - Withdraw the ECU (4).



2. Lift ECU

1 - Unplug the connectors (7) and (8) from the ECU (6).

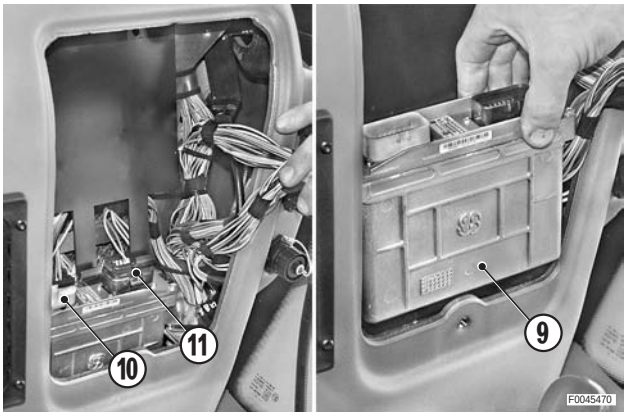


2 - Unscrew and remove the fixing screws and withdraw the ECU (6).

3. Front suspension ECU

1 - Unscrew and remove the fixing screws (9).

2 - Unplug the connectors (10), (11) and withdraw the ECU.



Refitting

- Refitting is the reverse of removal.

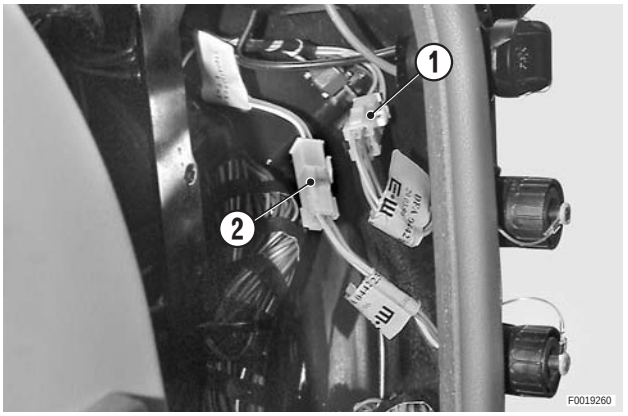
FUSE AND RELAY BOARD

Removal

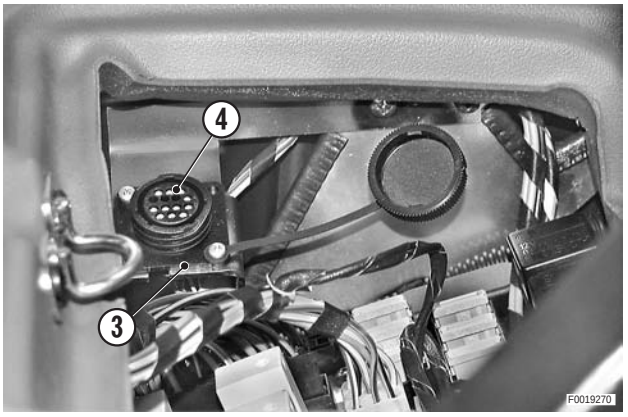
⚠ Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the ECUs of the lift, the front suspension and the transmission.
(For details, see "LIFT, FRONT SUSPENSION AND TRANSMISSION ELECTRONIC CONTROL UNITS").

2 - Unplug the connectors (1) and (2) from the signal outlet sockets and the external outlet socket for trailer-mounted implements.

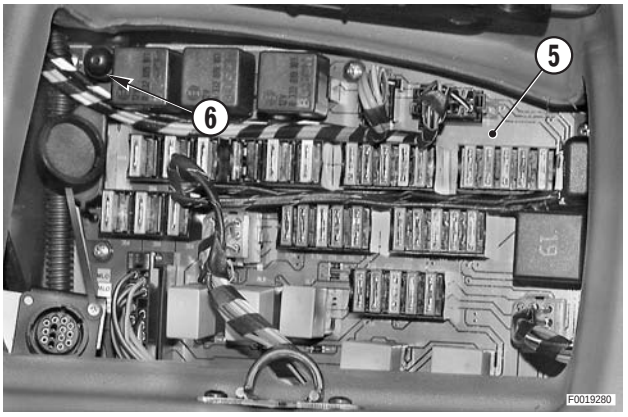


3 - Remove the bracket (3) of the diagnostics outlet (4) and place it to one side.

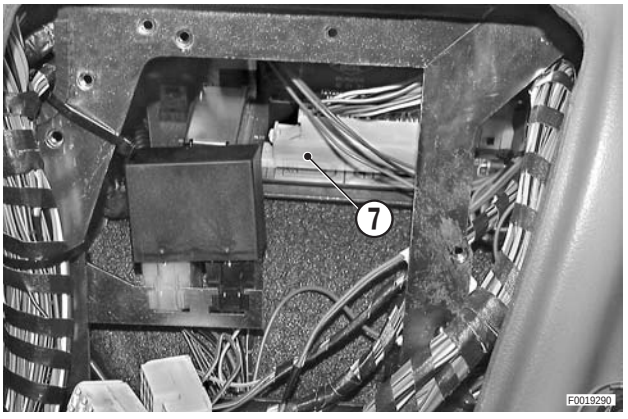


4 - Disconnect the connectors (P2), (P6), (P3), (P5), (J1), (J2) and (J3) from the fuse/relay board.
★ The connectors are marked with the same symbols as the sockets on the circuit board.

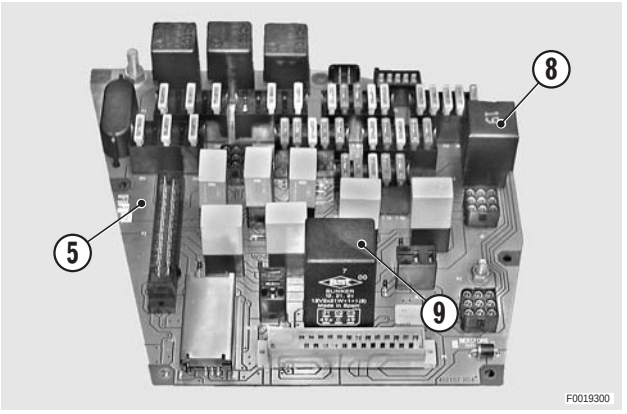
5 - Remove the cover and disconnect the earth lead (6).



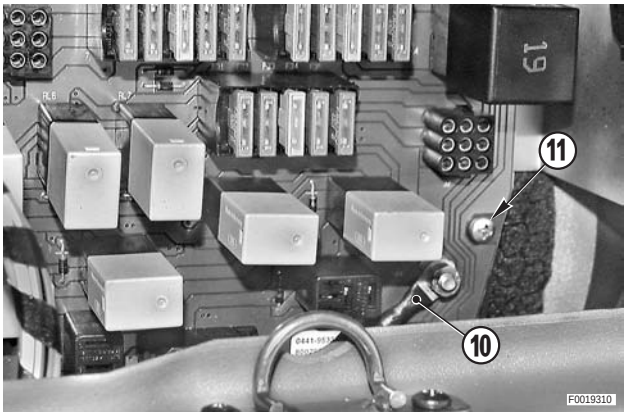
6 - Disconnect the connector (7) (P5), which is accessed through the ECU compartment.



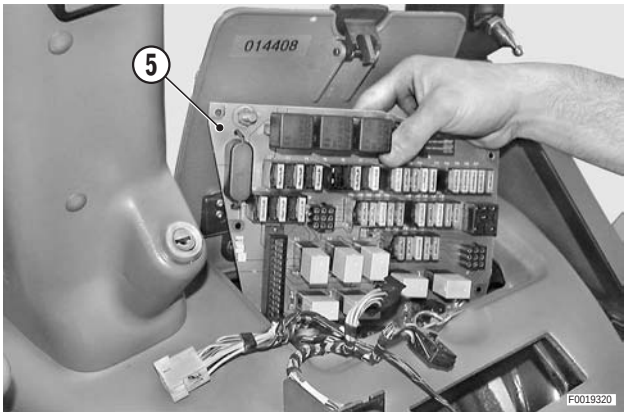
7 - Remove the relays from the board (5) which prevent its removal
RL4 - front windscreen (8)
RL14 - direction indicators (9)



8 - Disconnect the lead (10) and remove the five fixing screws (11).



9 - Remove the board (5).



Refitting

- Refitting is the reverse of removal.

ENGINE ECU

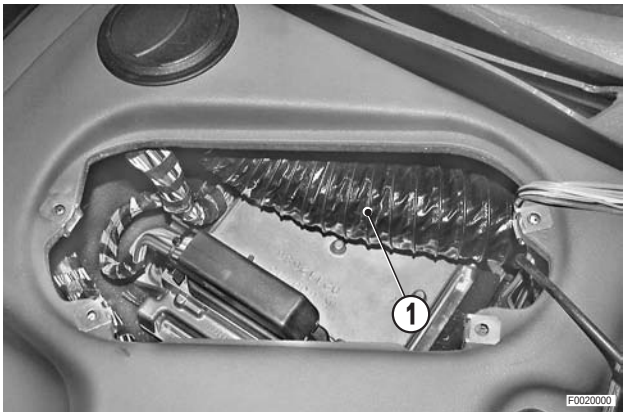
Removal

⚠ Remove the battery cover and disconnect the negative battery lead (–).

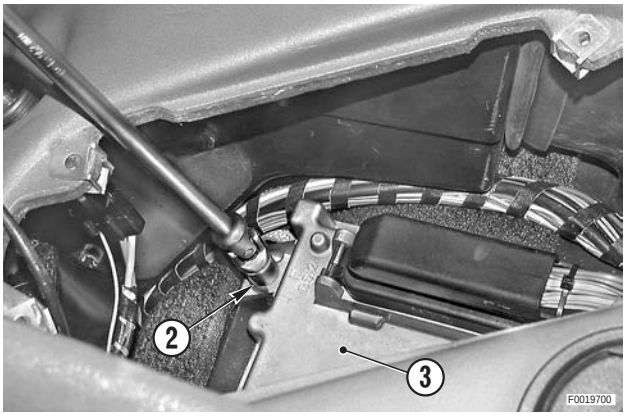
1 - Remove the ventilation and heater control panel. (For details, see "CLIMATE CONTROL PANEL").

2 - Disconnect the air hose (1) from the outlet vent and position it to one side.

※ 1

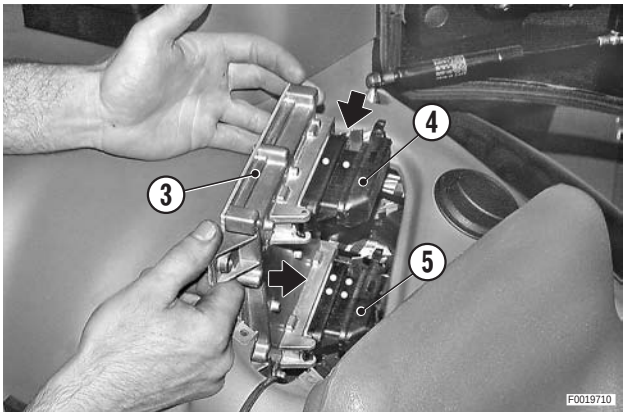


3 - Loosen the fixing screws (2) and partially withdraw the ECU (3).



4 - Label and unplug the connectors (4) and (5).

5 - Remove the ECU (3).



Refitting

- Refitting is the reverse of removal.

※ 1

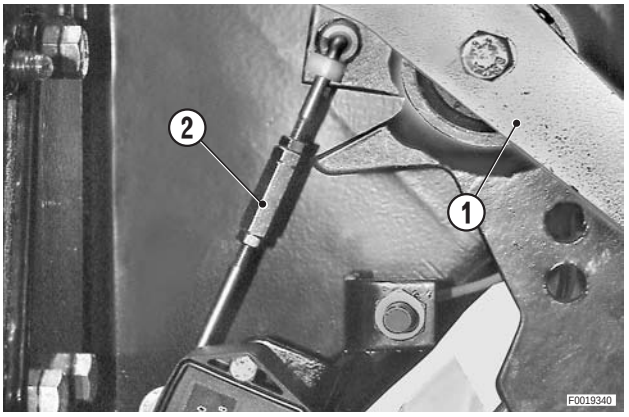
★ The air hose must be routed over the top of the ECU between the two connectors.

CLUTCH PEDAL AND RELATED DEVICES

Removal of the potentiometer

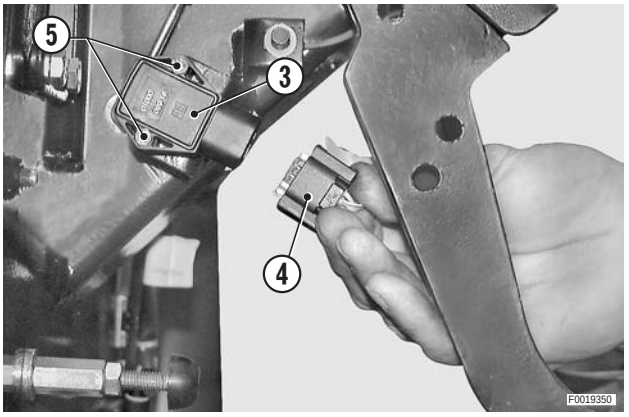
1 - Remove the centre console and console shroud. (For details, see "CENTRE CONSOLE AND SHROUD").

2 - Disconnect the tie-rod (2) from the clutch pedal (1).



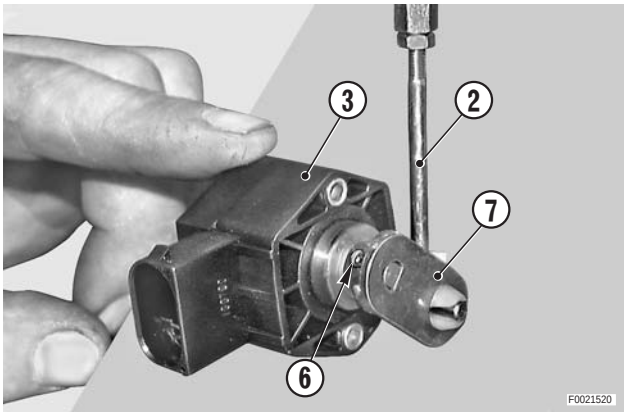
3 - Unplug the connector (4) from the potentiometer (3).

4 - Remove the screws (5) and remove the potentiometer complete with the tie-rod.



★ If a new potentiometer is to be fitted, disconnect the tie-rod (2), remove the cotter pin (6) and the lever (7).

★ Renew the cotter pin at each re-assembly.



Refitting the potentiometer.

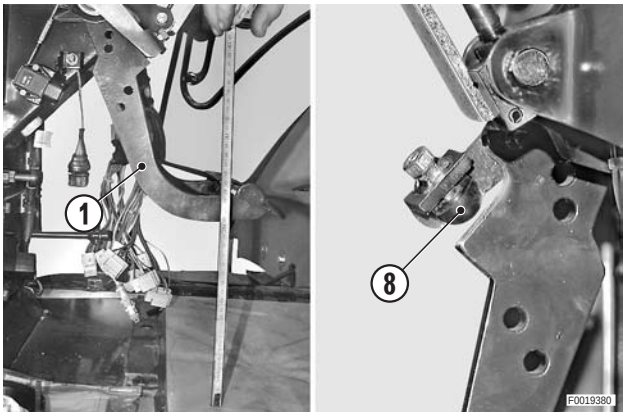
- Refitting is the reverse of removal.

  ⚠ After refitting the potentiometer, check the position of the pedal and its travel; check also the calibration values using the programming/diagnostics tester.

  NOTE. After adjusting the height of the clutch pedal, check using the EDS program in section 20 that the output voltage of the potentiometer is 4.3V. If necessary, adjust the length of the tie-rod (2) to obtain this value

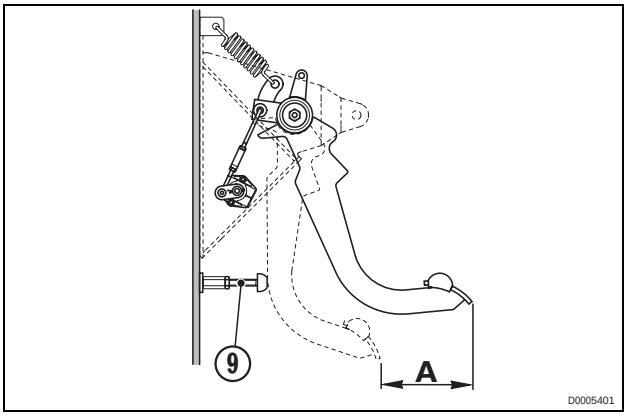
Adjustment of the clutch pedal position and travel

1 - Check that the distance between the top edge of the clutch pedal (1) and floor is the same as that of the brake pedals.
If necessary, adjust the pedal height by adjusting the buffer (8).



2 - Adjust the stop (9) so that the pedal travel "**A**" of 155^{+5}_{0} mm ($6.107^{+0.197}_{0}$ in.)

NOTE. With the EDS program in section 20, check that the voltage reaches a value of 0.9–1.1V.

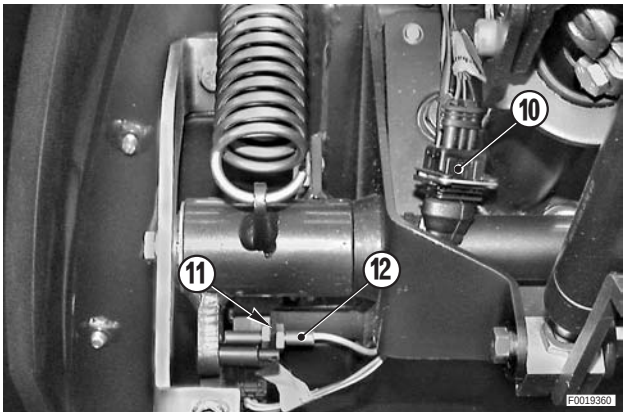


Renewal of the proximity sensor

1 - Unplug the connector (10).

2 - Unscrew the nut (11) sufficiently to disengage it from the sensor (12).

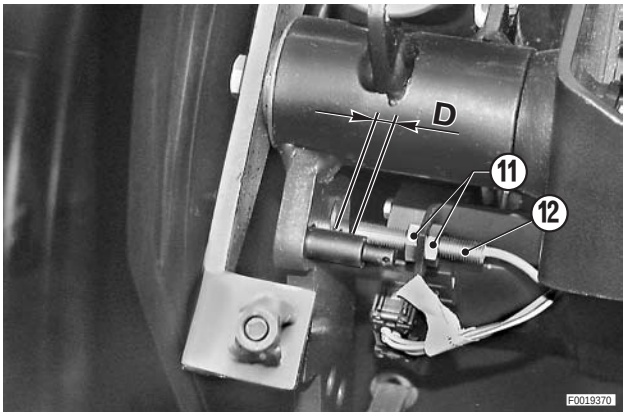
3 - Check that the axial play of the pedal is within the range of 0.1–0.6 mm (0.004 – 0.024 in.); if the play exceeds the permitted maximum, adjust it before adjusting the position sensor (12).



4 - Fit the new sensor (12) following the removal procedure in reverse.
Fully depress the clutch pedal.

5 - Adjust the position of the sensor relative to the lever by way of the adjuster nuts (11).

★ Distance "**D**" between the lever and the sensor: 0.5–1 mm (0.02 – 0.04 in.)



CONTROL PANELS AND LEVERS OF THE AUXILIARY SERVICE VALVES AND THE PTO

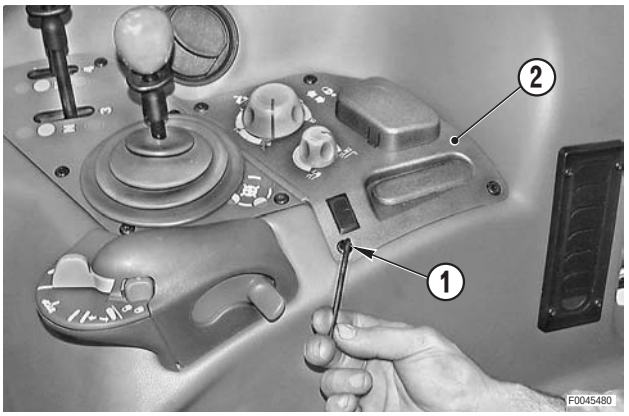
- **The illustrations refer to a model equipped with a front PTO.**

⚠ Disconnect the negative lead (-) from the battery.

Removal

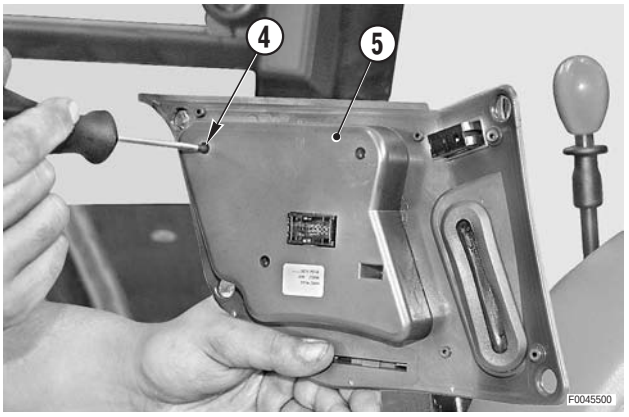
1. Remove the lift control panel

1 - Unscrew and remove fixing screws (1) of the lift control panel (2).



2 - Unplug the connector (3) and remove the assembly (2).

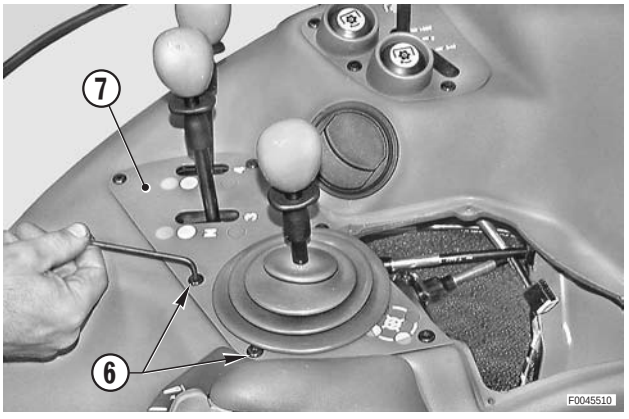
3 - **Only in the case of testing or renewal of the potentiometers**.
Unscrew and remove the screws (4) and remove the lower cover (5).



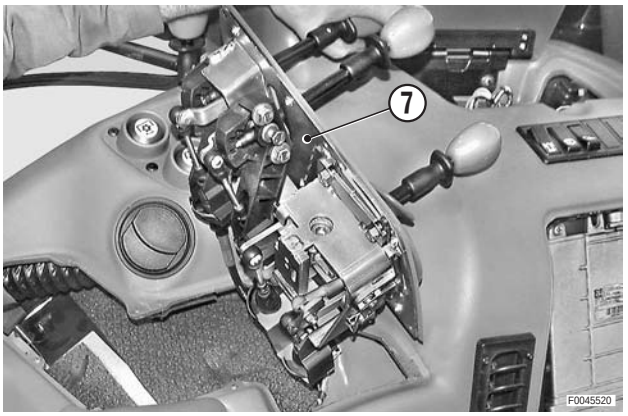
2. Removal of the auxiliary service valve control levers

1 - Remove the lift control panel as described in the previous paragraph.

2 - Unscrew and remove fixing screws (6) of the control levers assembly (7).



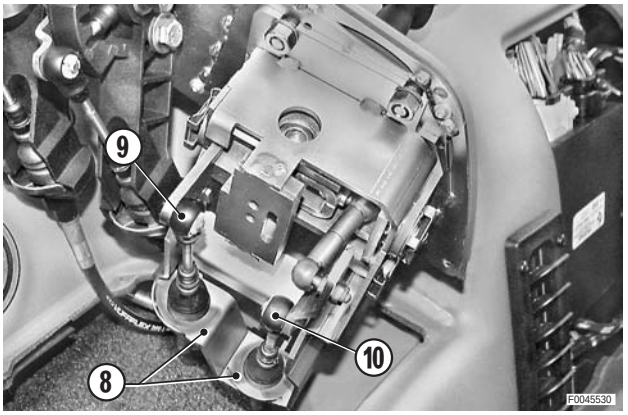
3 - Lift the assembly (7) and rotate it through 90°.



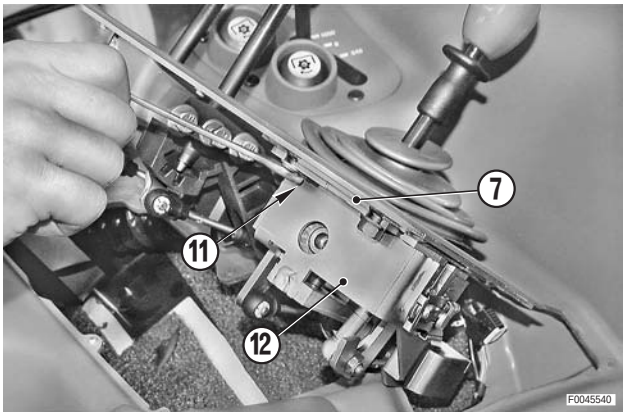
3. Removal of the cross-gate control lever assembly

1 - Remove the yokes (8) securing the outer cables and disconnect the cables (9) and (10). ※1

★ Label the control cables to avoid confusion on reconnection.



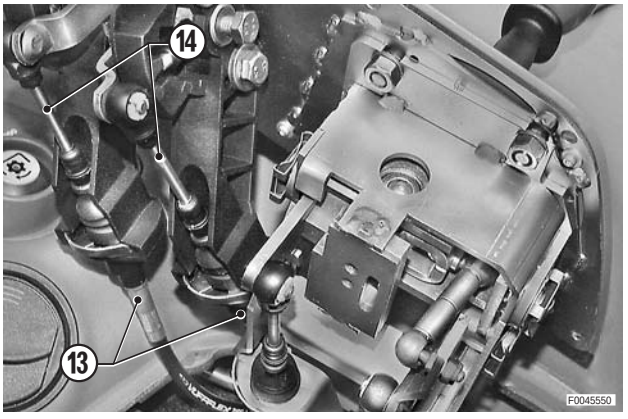
2 - Unscrew and remove the nuts (11) with their washers; withdraw the control assembly (12) from the panel (7).



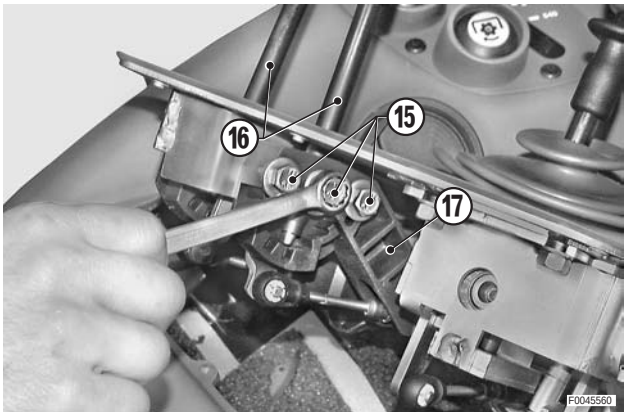
4. Removal of the individual service valve control levers

1 - Remove the yokes (13) securing the outer cables and disconnect the inner cables (14). ※1

★ Label the cables to avoid confusion on reconnection.

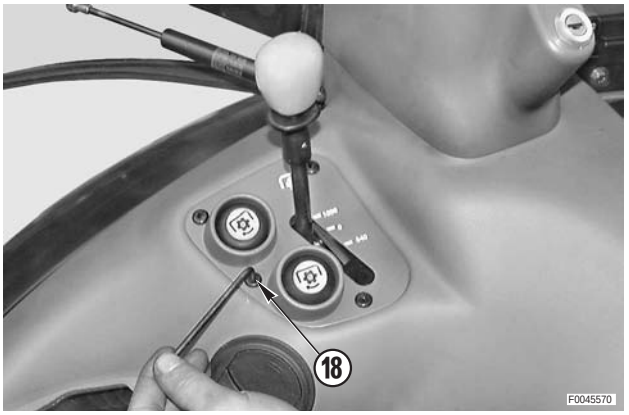


2 - Unscrew and remove bolts(15) with their washers and remove the levers (16) and the lever pivot supports (17).



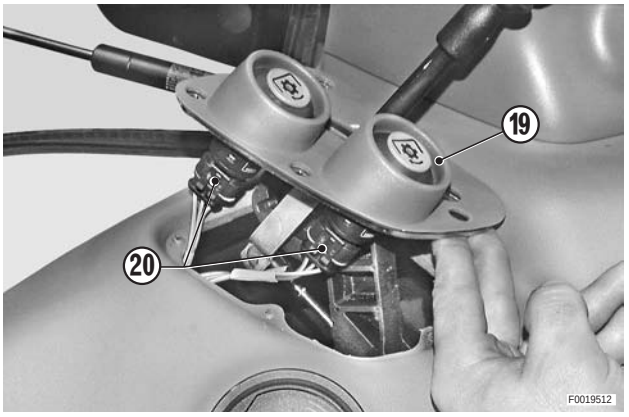
5. Removal of the PTO control panel

1 - Unscrew and remove the screws (18).



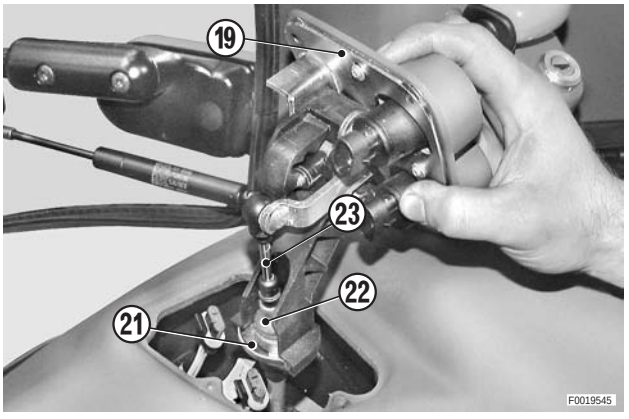
2 - Lift the control panel (19) and unplug the connectors (20).

★ Label the connectors to avoid confusion on reconnection.



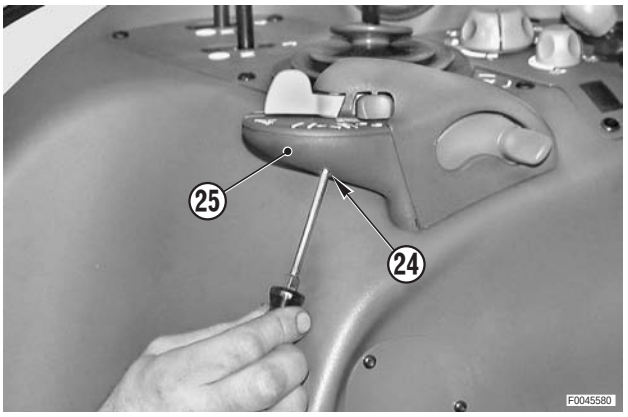
3 - Remove the yoke (21) securing the outer cable (22), disconnect the cable (23) and remove the assembly (19).

※ 1



6. Removal of the lift control assembly and the hand throttle

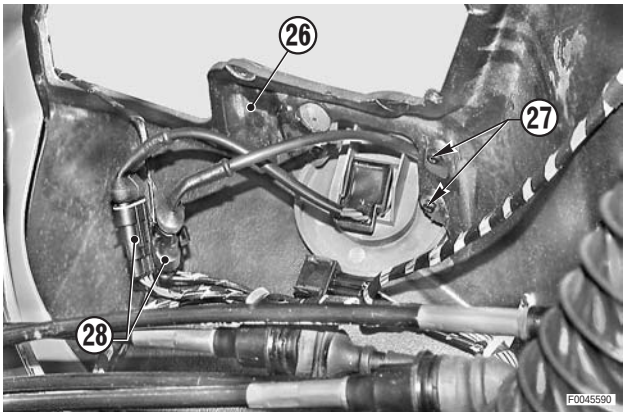
1 - Unscrew and remove the two outer fixing screws (24) of the assembly (25).



2 - Release the right-hand console (26) from its fixings and tilt it towards the centre of the cab in order to remove the inner screws (27) and unplug the connectors (28).

★ (For details, see "RIGHT-HAND CONSOLE").

3 - Remove the lift control assembly. ※ 2



Refitting

- Refitting is the reverse of removal.

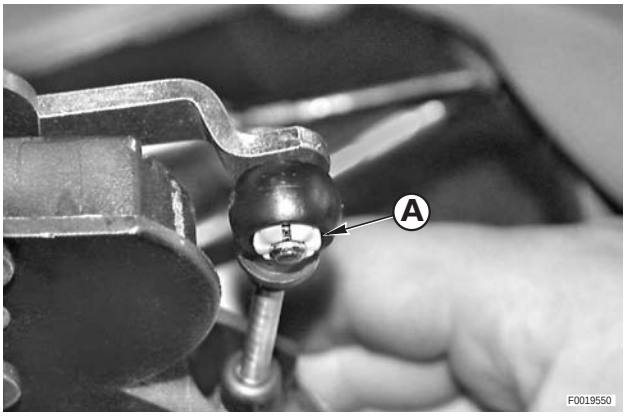
※ 1

★ The slotted bush "**A**" securing the cable must be oriented towards the outer end of the fixing pin.

1 - Adjust the length of the control cables.
(For details, see "AUXILIARY SERVICE VALVE CONTROL CABLES").

※ 2

★ If a new hand throttle is fitted, it will have to be calibrated. (See the SERDIA program in section 20).



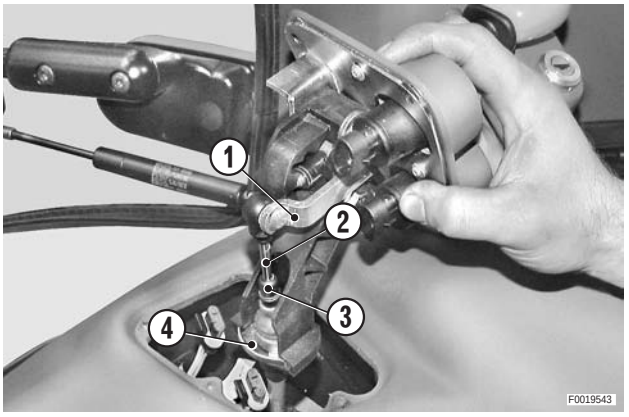
PTO ENGAGEMENT AND SELECTION CONTROL CABLES

Removal

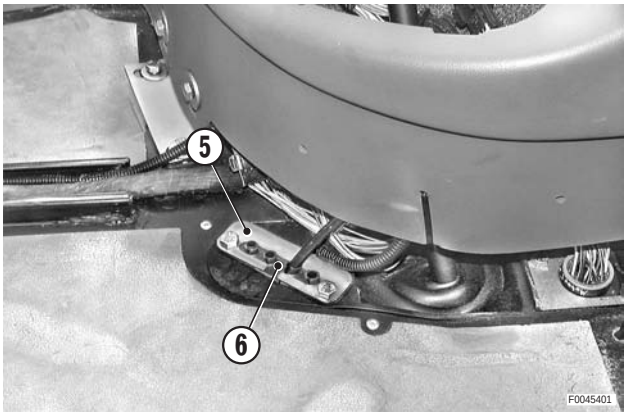
• Figures refer to the speed selector

1 - Remove the lever assembly relative to the cable to be renewed.
(For details, see "AUXILIARY SERVICE VALVE CONTROL CABLES").

2 - Disconnect the control cable (1) from the control lever (2) and remove the yoke (3) to remove the outer cable (4).

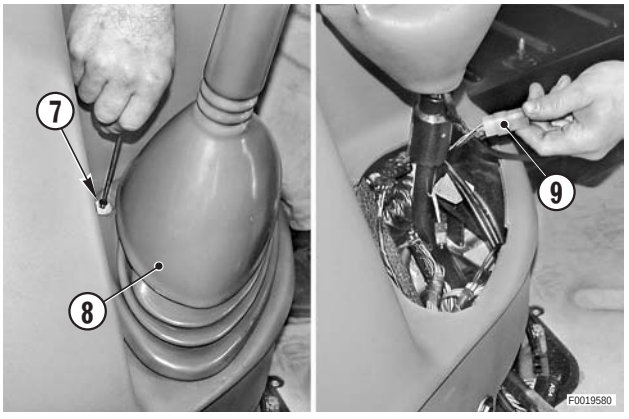


3 - Remove the front floor mat and remove the plate (5) of the cab guide (6) in order to release the outer cable to be renewed.

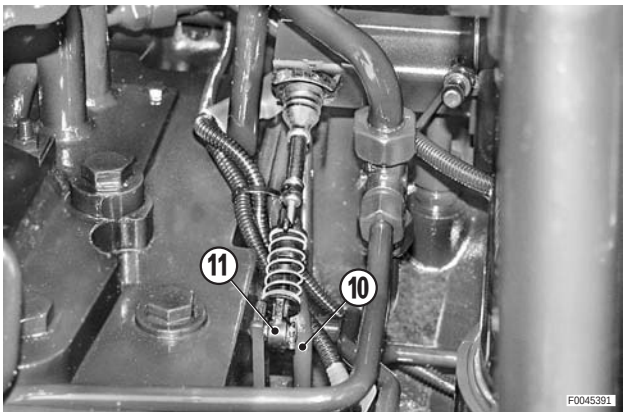


4 - Loosen the fixing screw (7) of the gear lever gaiter (8).

5 - Raise the gaiter (8), unplug the connector (9) and withdraw the control cable to be renewed.



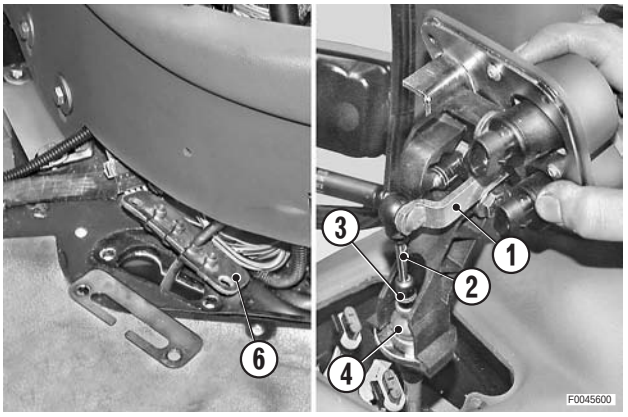
6 - Disconnect the control cable end (11) from the lever (10); remove the outer cable retaining yoke and remove the controlcable.



Refitting

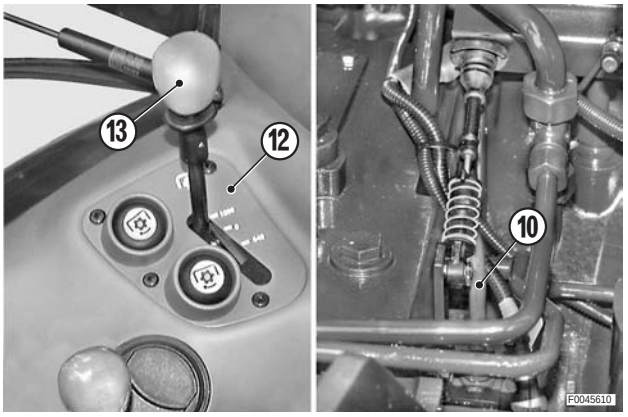
1 - Extend the new cable and engage it in the cable guide (6).

2 - Connect the end fitting of the inner control cable (2) to the control lever (1) and secure the outer cable (3) with the yoke (4).



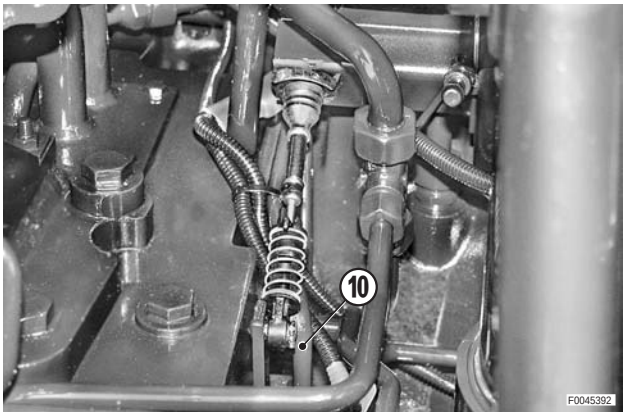
3 - Fix the lever assembly (12) to the right-hand console.

4 - Move lever (13) to the position corresponding to the position of lever (10).

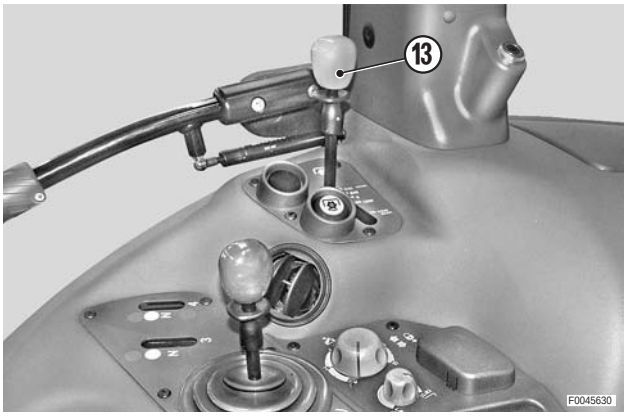


5 - Secure the outer cable with the yoke.

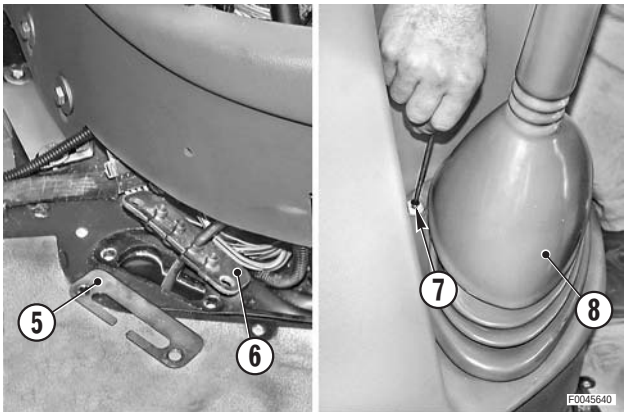
6 - Stretch the cable slightly to connect it to the fitting on the lever (10), making sure that the lever on the console is still in the correct position.



7 - Move the lever (13) in the cab and make sure that the selector lever on the transmission moves through its full travel distance and effects the gear change.
★ Check that the travel of the new lever (13) is properly centred relative to the symbols stamped on the console.



8 - Secure the outer cable in the cab guide (6) with the yoke (5).
9 - Reconnect the connector, position the gaiter (8) and tighten the screw (7)

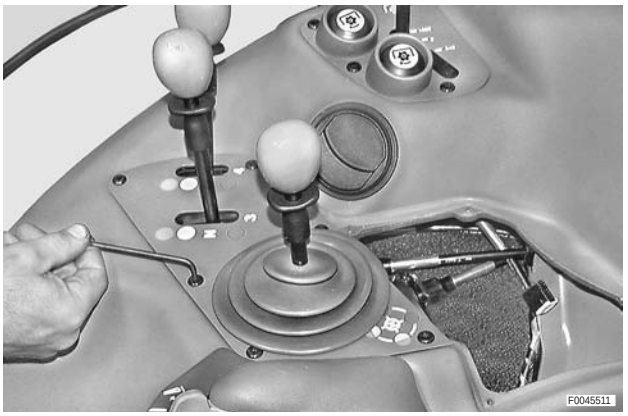


AUXILIARY SERVICE VALVE CONTROL CABLES

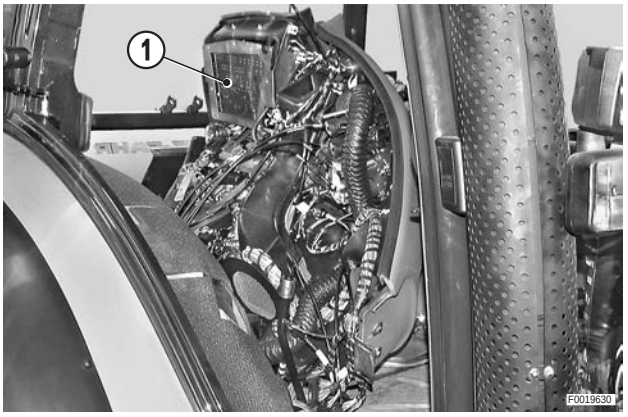
Removal

1 - Remove the seat.
(For details, see "DRIVER'S SEAT").

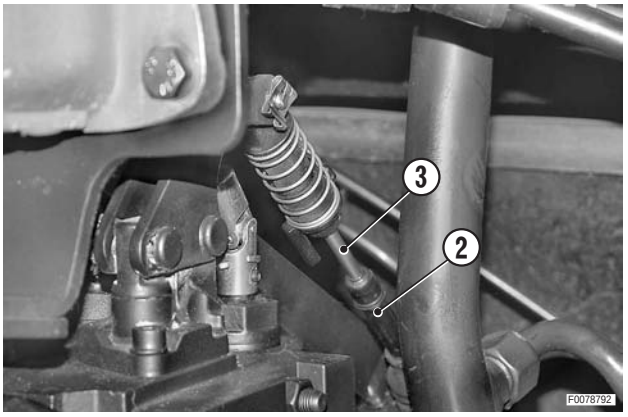
2 - Remove the control levers assembly and disconnect the control cables to be renewed from the levers.
(For details, see "CONTROL PANELS AND LEVERS OF THE AUXILIARY SERVICE VALVES AND THE PTO").



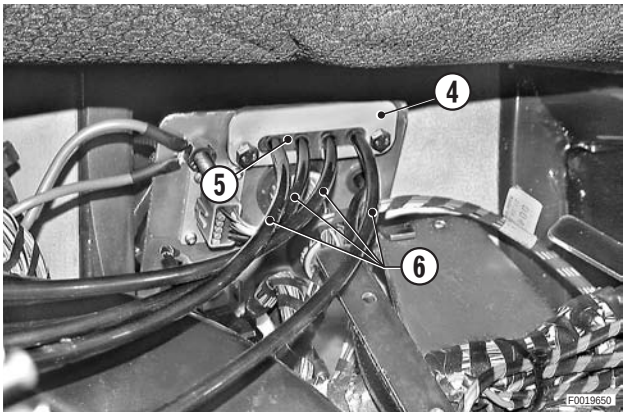
3 - Detach the right-hand console (1) from the cab, but do not unplug any of the connectors.
(For details, see "RIGHT-HAND CONSOLE").



4 - Disconnect the outer cables (2) and inner cables (3) from the control valve assembly.



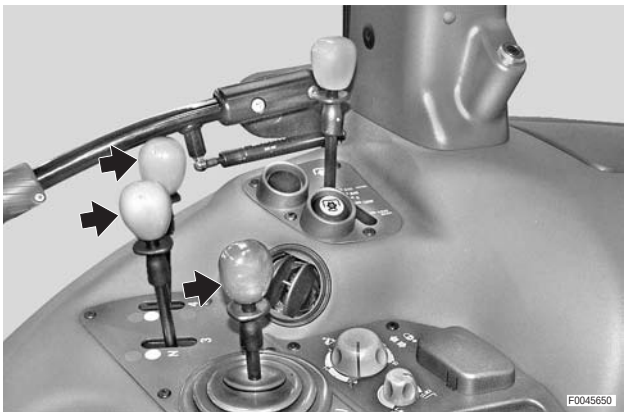
5 - Remove the screws and remove the plate (4) securing the bulkhead gasket (5).
Release the control cables (6) from the bulkhead fitting and withdraw them towards the rear of the tractor.



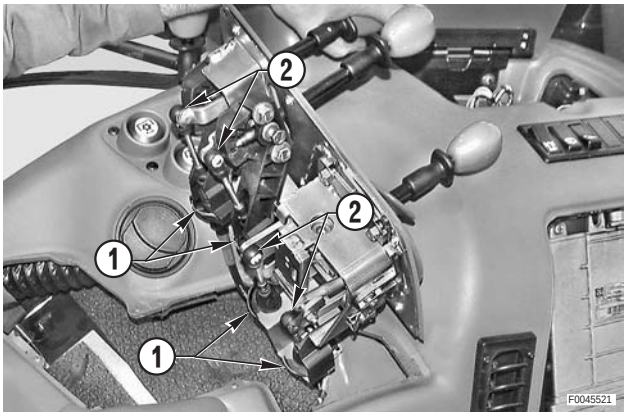
Refitting

- Refitting is the reverse of removal.

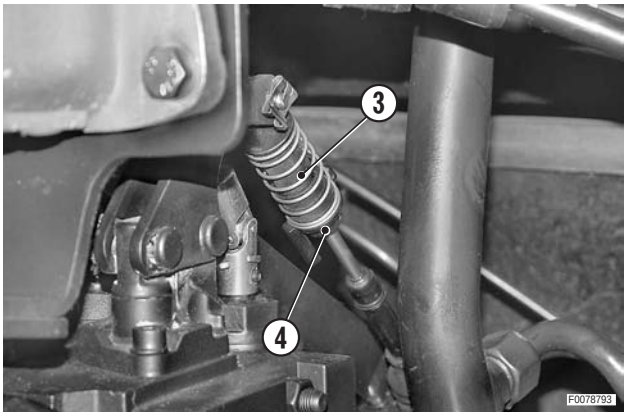
1 - Check that the control cable lever and the corresponding control valve lever are both in neutral.



2 - Fix the outer cables with the yokes (1).
3 - Connect the inner cables (2) to the control levers.



4 - With the control lever in neutral position, lift the retaining bush (3) and, while keeping the cable under slight tension, insert the end in the fitting (4).

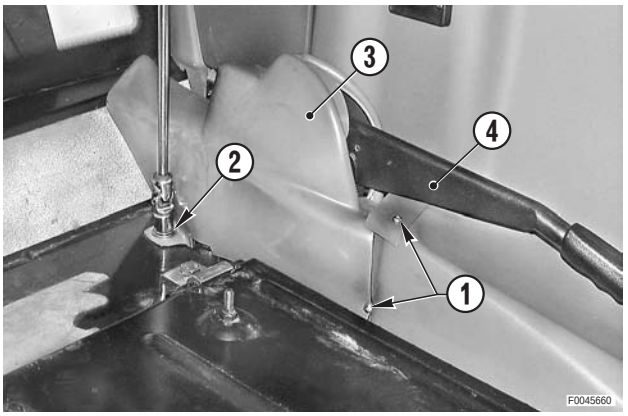


5 - Lower the retaining bush (3); check that the control valve spool travels through its full stroke and that the control lever is positioned centrally in its slot when the control valve is in neutral.
   ★ For the cross-gate control lever, check the spool travel for both side-to-side and vertical movements of the lever.

PARKING BRAKE SWITCH

Adjustment

1 - Remove the screws (1) and (2) and remove the shroud (3).

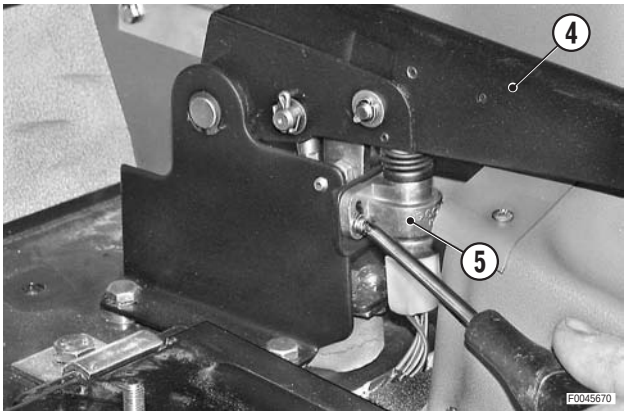


2 - Operate the lever (4) repeatedly to eliminate any play in the mechanism.

3 - With the lever (4) fully lowered, adjust the height of the microswitch (5) by raising it to its maximum height and then lowering it to obtain the correct amount of residual travel.

★ Residual travel: 1 mm (0.04 in.)

4 - Replace the shroud (3).

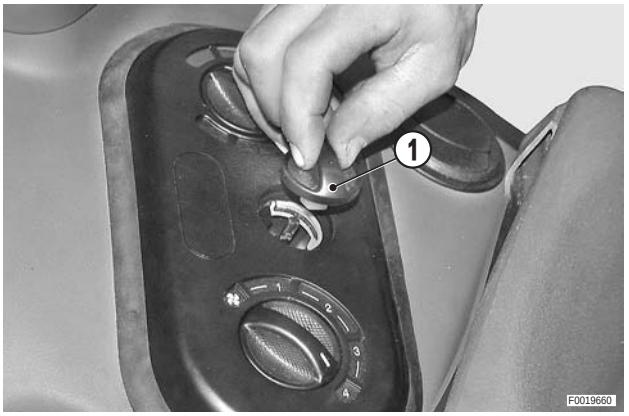


CLIMATE CONTROL PANEL

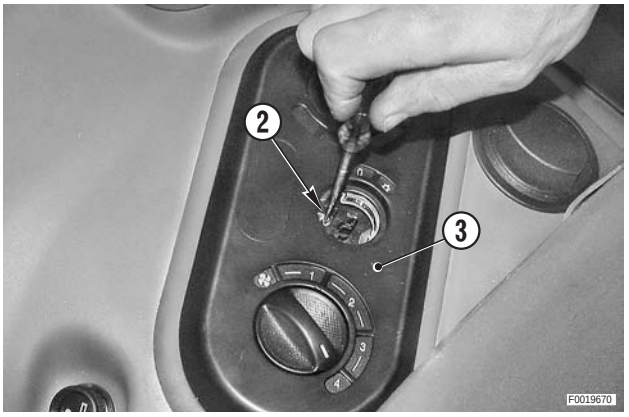
Removal

⚠ Remove the battery cover and disconnect the negative battery lead (–).

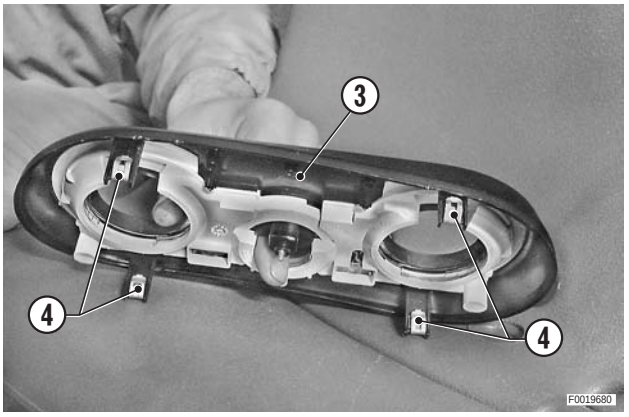
1 - Pull off the air conditioning on/off knob (1).



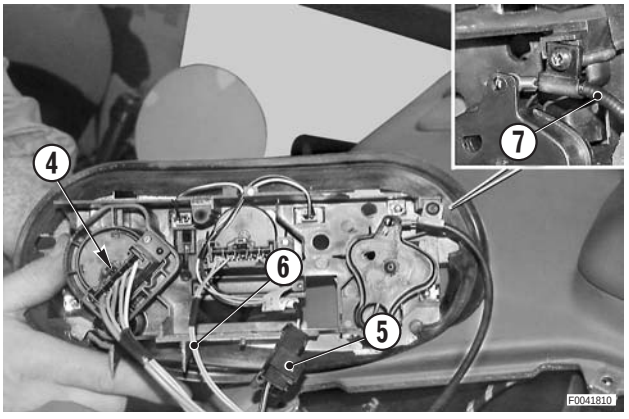
2 - Unscrew and remove the fixing screws (2) of the control panel (3).



3 - Detach the control panel (3) by pressing the spring clips (4) securing it to the left-hand console.



4 - Lift the panel (3), disconnect the connectors (4) and (5), the wiring (6), and the heater control cable (7).



Refitting

- Refitting is the reverse of removal.

HEATER VALVE

Removal

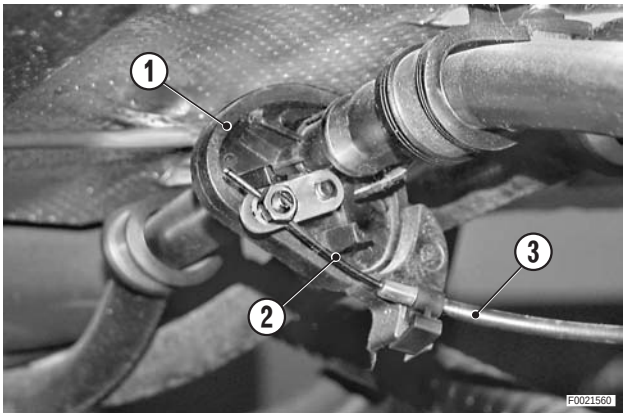
Switch off the engine and remove the key from the ignition.

1 - Drain the coolant from the engine cooling system.

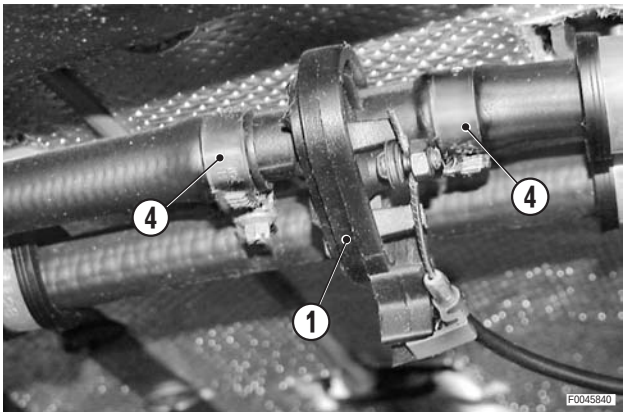
Coolant:

Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

2 - Disconnect the inner control cable (2) and the outer cable (3) from the valve (1). ※ 1



3 - Loosen the retaining straps (4) and remove the valve (1).



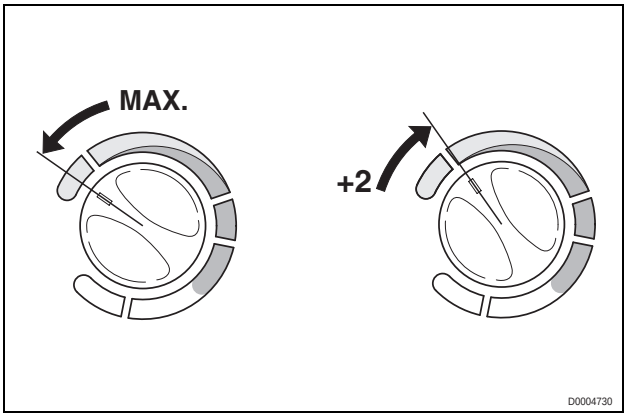
Refitting

- Refitting is the reverse of removal.

※ 1

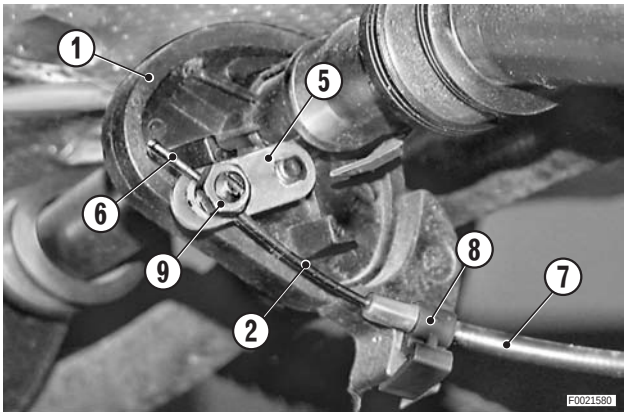
★ Connect the heating valve control cable as follows:

a - Turn the heater control knob fully to the left (blue section) and then two notches back to the right (red section).



b - Turn the lever (5) of the heater valve (1) up to the stop (6).

c - Fix the outer part (7) of the control cable (2) with the spring clip (8) and the inner cable (2) with the screw (9).



1 - Fill the cooling system.

Coolant:

Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

2 - Fully open the heater valve.

3 - Start the engine: allow the coolant to circulate and check for leaks.

4 - Stop the engine and top up the coolant level.

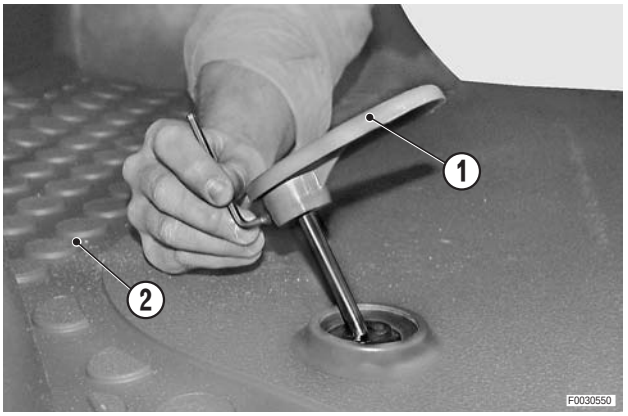
HEATER MATRIX

Removal

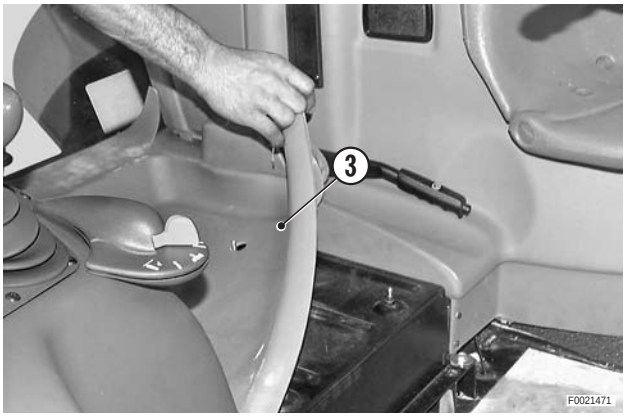
Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the seat. (For details, see "DRIVER'S SEAT").

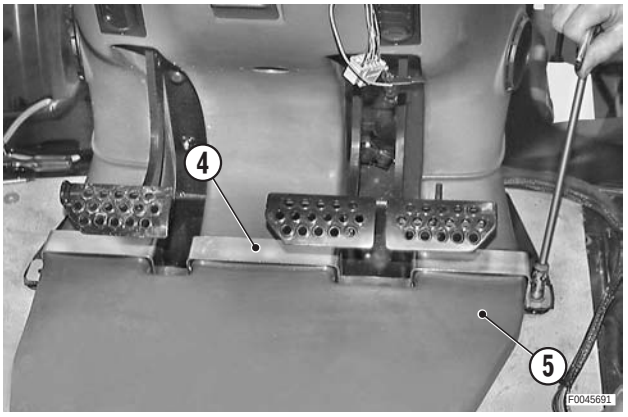
2 - Loosen the grub screw, remove the accelerator pedal (1) and remove the front floor mat (2).



3 - Remove the rear floor mat (3).

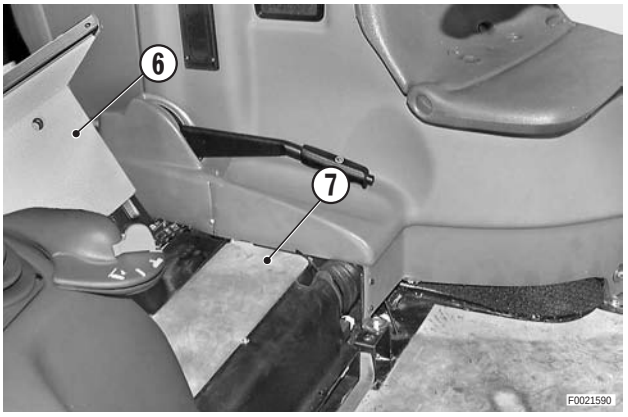


4 - Remove the retaining strap (4) and the air hose (5).



5 - Remove the bolts and lift the seat support (6).

6 - Remove the bolts and remove the upper cover (7) of the air conditioning assembly.

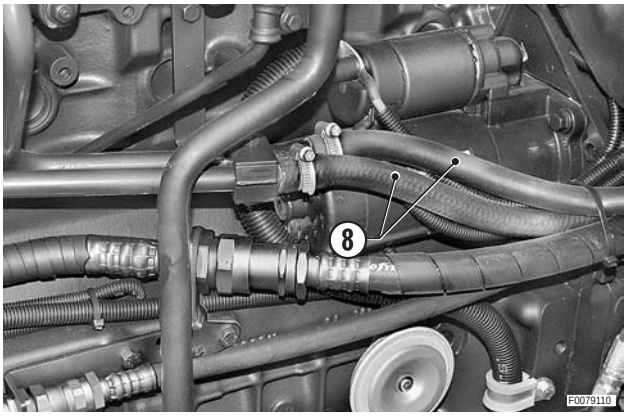


7 - Turn the heater control knob to the MAX position (red section).
Drain the coolant from the engine and the heater matrix by disconnecting the pipes (8).

Coolant:

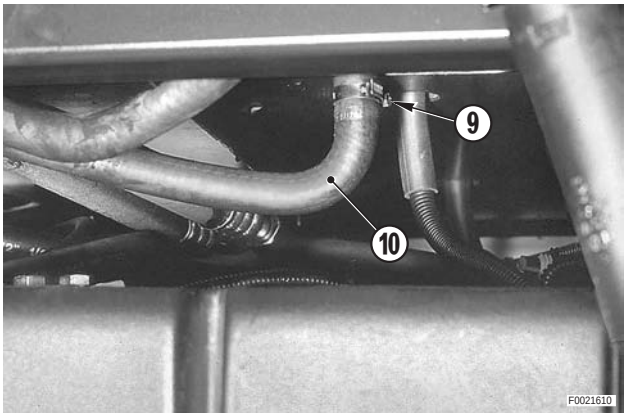
Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

★ After draining the system, reconnect the pipes (8).

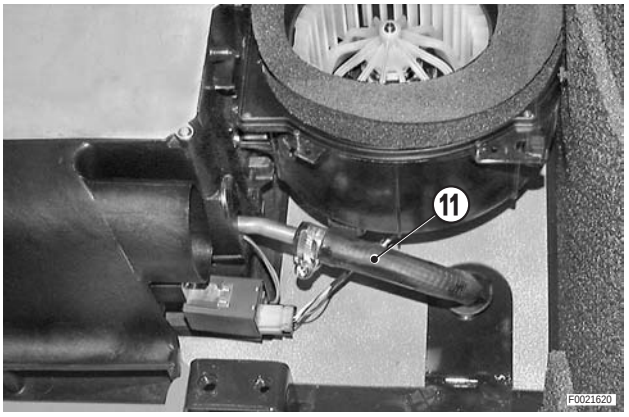


8 - Remove the evaporator.
(For details, see "AIR CONDITIONING EVAPORATOR").

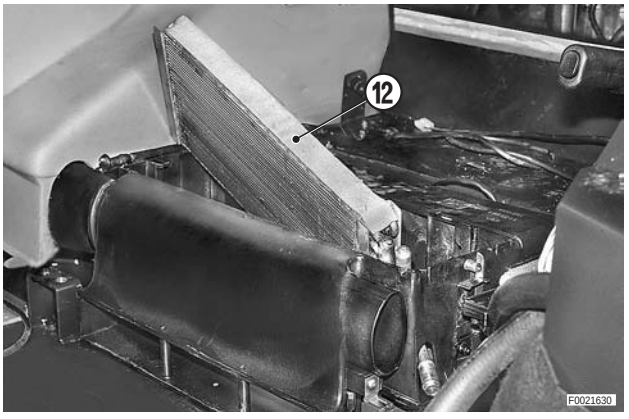
9 - Remove the hose clamp (9) and disconnect the vertical return hose (10) from the matrix.



10 - Remove the hose clamp and disconnect the horizontal delivery pipe (11) from the matrix.



11 - Remove the matrix (12) by lifting the right side vertically and then rotating it towards the rear of the tractor.



Refitting

- Refitting is the reverse of removal.

1 - Fill the cooling system.

 Coolant:

Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

2 - Start the engine: allow the coolant to circulate and check for leaks.

3 - Stop the engine and top up the coolant level.

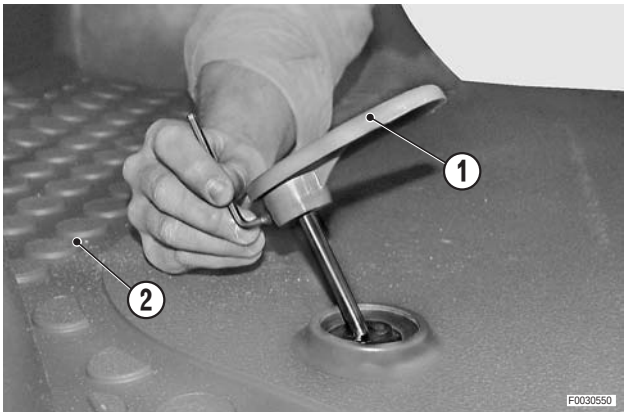
AIR CONDITIONING EVAPORATOR

Removal

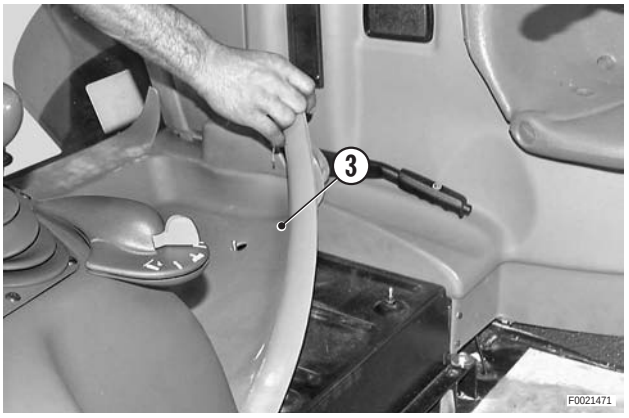
⚠ Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the seat. (For details, see "DRIVER'S SEAT").

2 - Loosen the grub screw, remove the accelerator pedal (1) and remove the front floor mat (2).

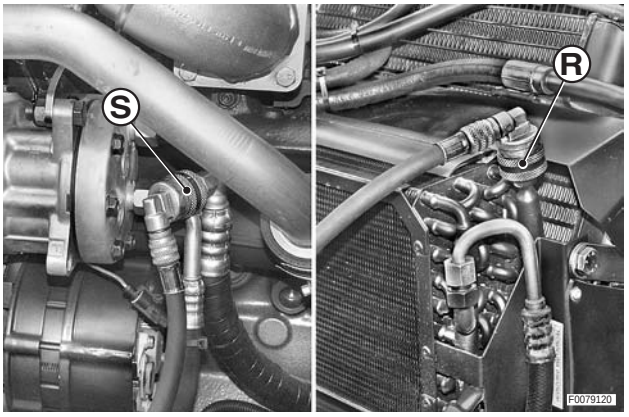


3 - Remove the rear floor mat (3).

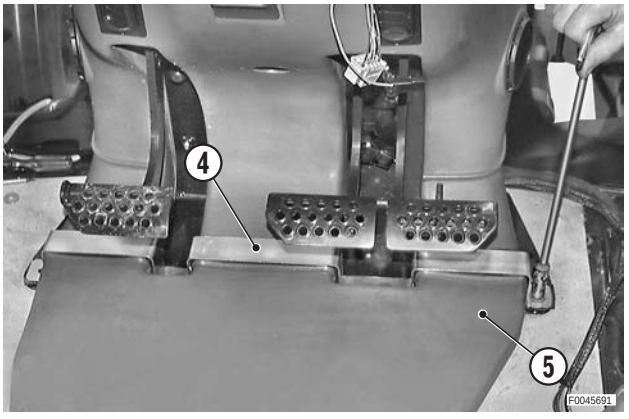


4 - Connect the quick-fit couplers of the high (R) and low (S) pressure pipes to the refrigerant (R134A) charging, testing and recovery machine.
Set the machine for recovery operation and start it; allow the machine to run until all the refrigerant has been recovered, then disconnect it. ⁘ 1

★ Measure the quantity of oil recovered and consequently to be reintroduced into the system.

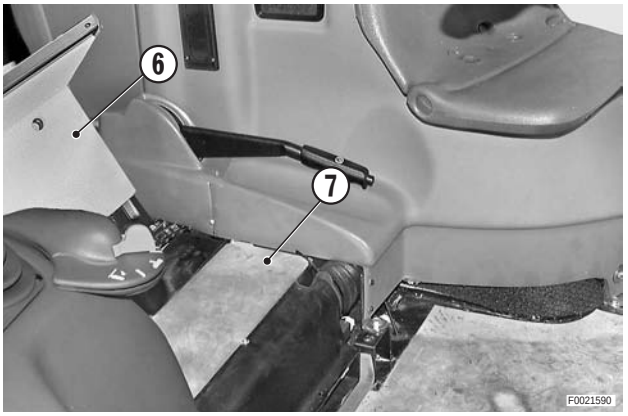


5 - Remove the hose clamp (4) and the air hose (5).



6 - Remove the bolts and lift the seat support (6).

7 - Remove the screws and remove the cover (7) of the air conditioning assembly.



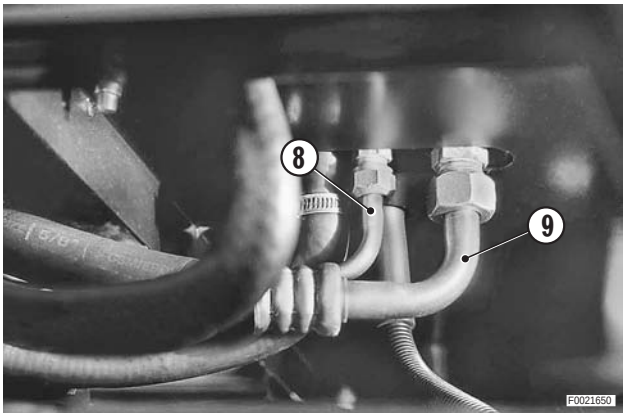
8 - Disconnect the inlet (8) and outlet (9) pipes from the evaporator. ※ 2

Immediately seal the ends of the pipes (8) and (9) to prevent atmospheric moisture from getting into the air conditioning system.

9 - Release the rubber diaphragm (10).

10 - Lift up the evaporator (11); remove the temperature sensor (12) and place it on one side. ※ 3

11 - Remove the evaporator (11).



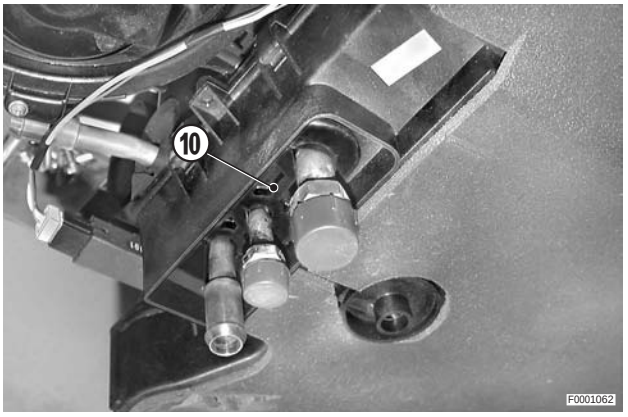
Refitting

- Refitting is the reverse of removal.

※ 1

★ Quantity of R134a: 1600 g (56.4 oz.)

★ After recharging the system, check the seals on the pipes (R and S) and throughout the system using a leak detector.



※ 2

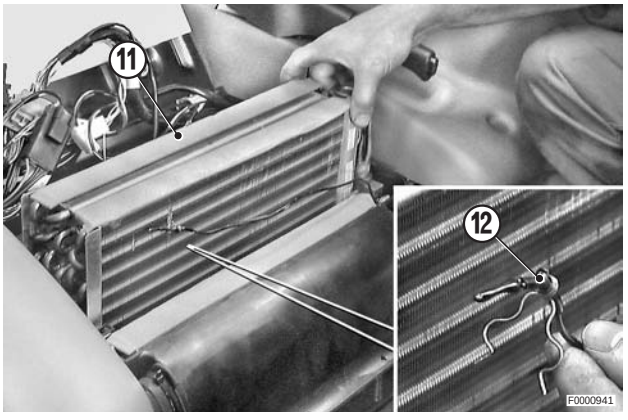
Nm High pressure fitting (5/8’ - 18UNF): 13.6–20.3 Nm (10 – 15 lb.ft.)

Nm Low pressure fitting (7/8’ - 14UNF): 35.3–42 Nm (26 – 31 lb.ft.)

※ 3

★ Check that the temperature sensor is securely fixed.

1 - Carefully check the seal around the upper cover (7).



RIGHT-HAND AIR CONDITIONING FAN

Removal

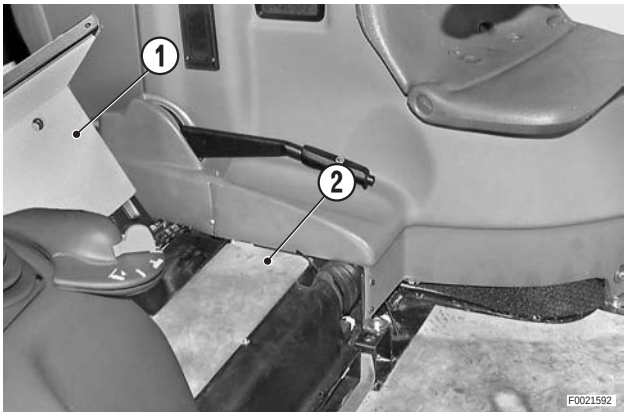
Remove the battery cover and disconnect the negative battery lead (–).

1 - Remove the seat.
(For details, see "DRIVER'S SEAT".

2 - Remove the centre console shroud. (For details, see "CENTRE CONSOLE AND SHROUD").

3 - Remove the fixing screws of the right-hand console (For details, see "RIGHT-HAND CONSOLE").

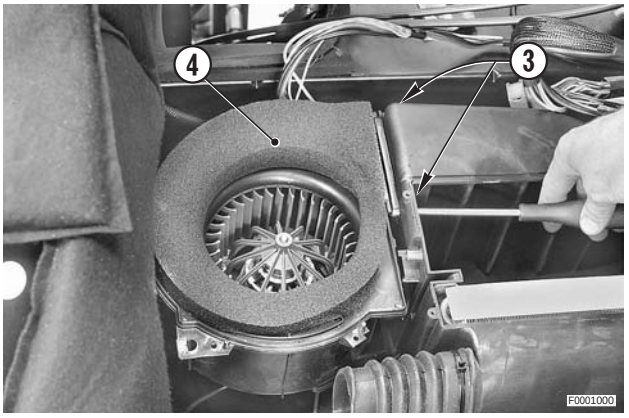
4 - Remove the seat support (1) and upper cover (2) of the air conditioning assembly.



5 - Remove the evaporator. (For details, see "AIR CONDITIONING EVAPORATOR").

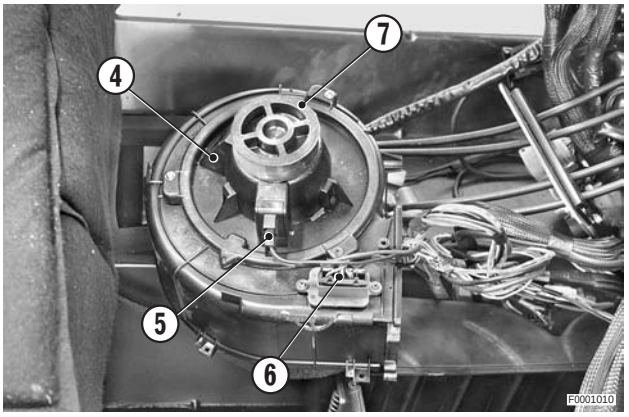
6 - Remove four bolts (3) securing the fan (4).

7 - Remove the fan (4) and turn it over.



8 - Unplug the connectors (5) and (6). ※ 1

If a new fan is to be fitted, the support block (7) should also be renewed.



Refitting

- Refitting is the reverse of removal.

※ 1

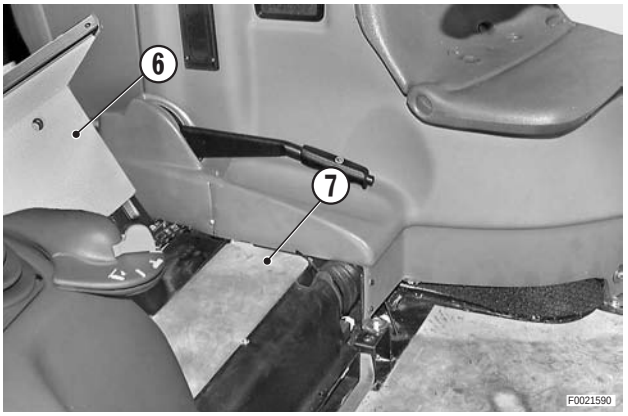
★ Stick the support block on to the fan screw before positioning the fan

Block: Loctite 401

1 - Carefully check the seal around the upper cover.

LEFT-HAND AIR CONDITIONING FAN

Removal



⚠ Remove the battery cover and disconnect the negative battery lead (–).

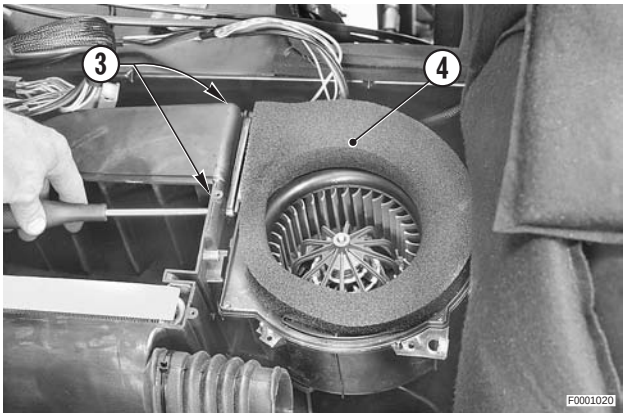
1 - Remove the seat.
(For details, see "DRIVER'S SEAT").

2 - Remove the left-hand console without disconnecting the control cable of the heater valve. (For details, see "LEFT-HAND CONSOLE").

3 - Remove the seat support (1) and the upper cover (2) of the air conditioning assembly

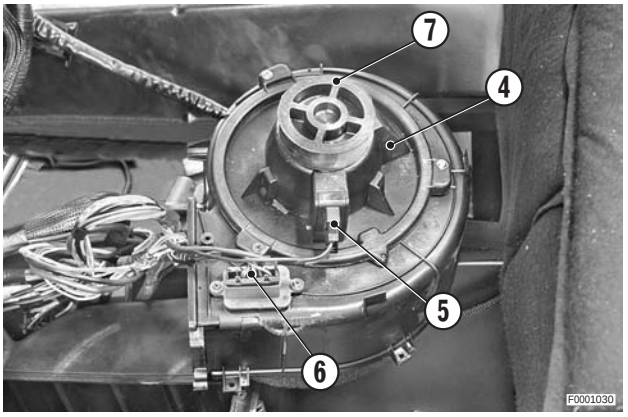
4 - Withdraw the evaporator. (For details, see (For details, see "AIR CONDITIONING EVAPORATOR").

5 - Remove the four screws (3) securing the fan (4)



6 - Remove the fan (4) and turn it over.

7 - Unplug the connectors (5) and (6). ※ 1



⚠ If a new fan is to be fitted, the support block (7) should also be renewed.

Refitting

- Refitting is the reverse of removal.

※ 1

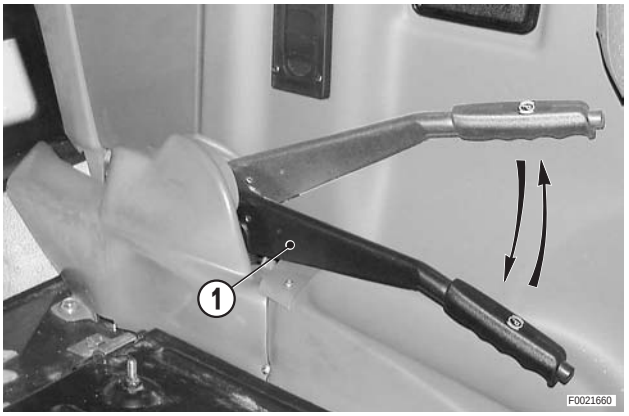
★ Stick the block to the fan screw before positioning the fan.

Block: Loctite 401

1 - Carefully check the seal around the upper cover.

PARKING BRAKES

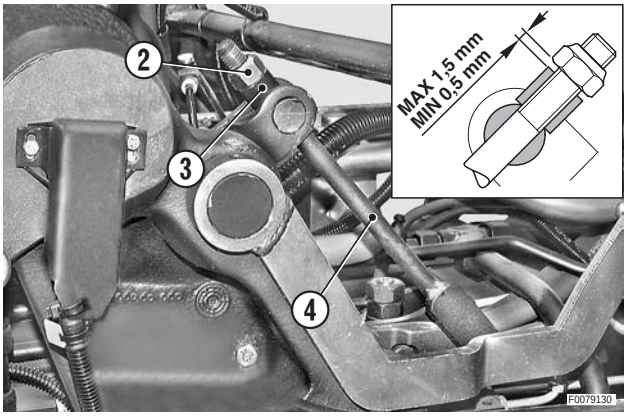
Adjustment



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 force: 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 apshalted 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.

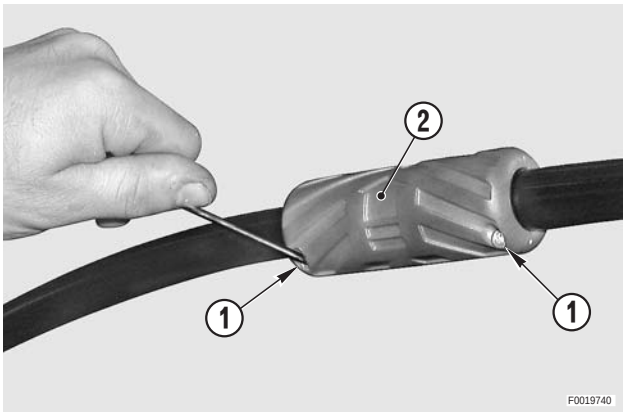
★ Lever travel: max. 5 notches

If adjustment is required, turn the two nuts (2) by equal amounts.

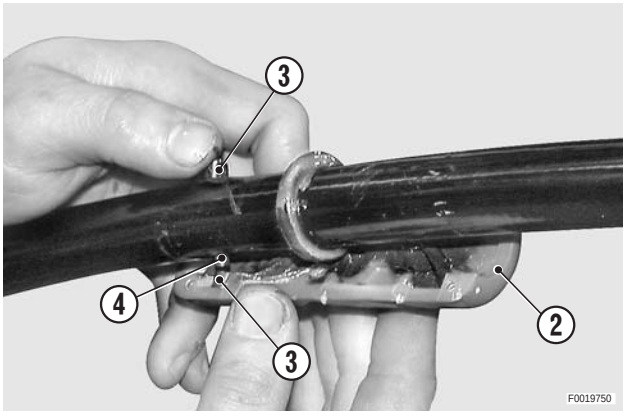
CAB DOOR CABLE

Renewal

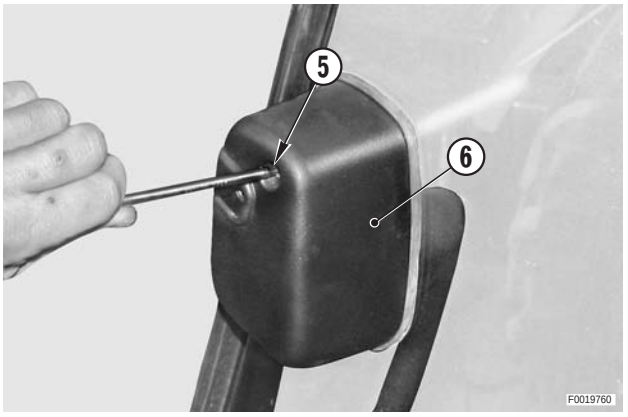
1 - Unscrew and remove the four screws (1) securing the two halves of the handle (2).



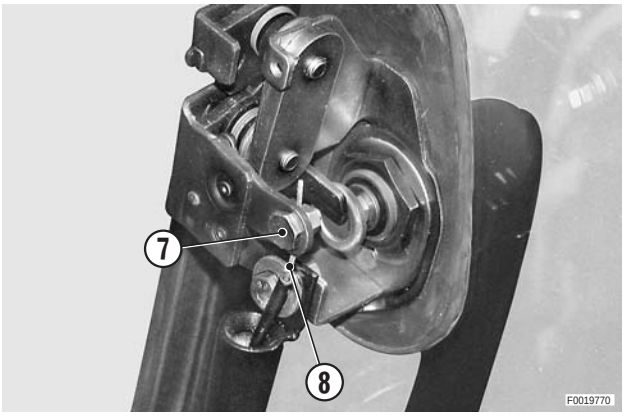
2 - Remove the two halves of the handle and recover the bushes (3) and the pin (4).



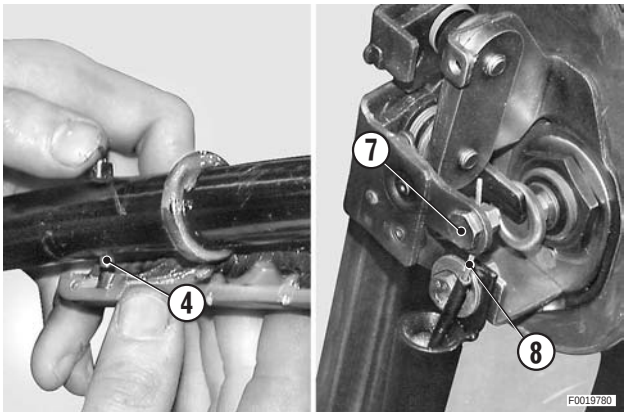
3 - Unscrew and remove the fixing screws (5) of the door lock cover (6).



4 - Loosen the clamp nut (7) and withdraw the cable (8).



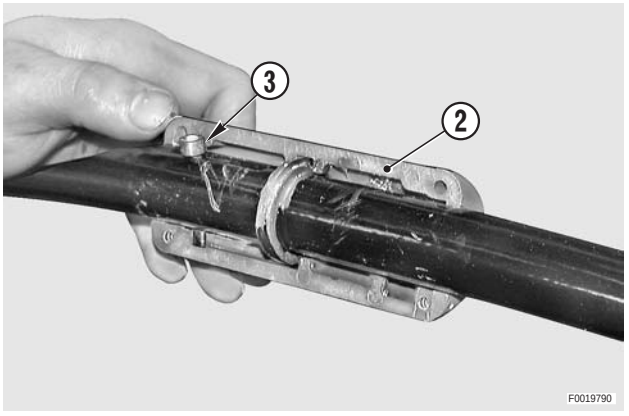
5 - Feed the new cable starting from the handle side; engage it with the pin (4) and the clamp nut (7).
With the cable under slight tension, tighten down the clamp nut.



6 - Lubricate the bushes (3) and the slide ways for the handle; fit the bushes to the pin and refit the handle (2).

Slide ways and bushes: Molikote

7 - Check that the door opens correctly and complete the refitting procedure.

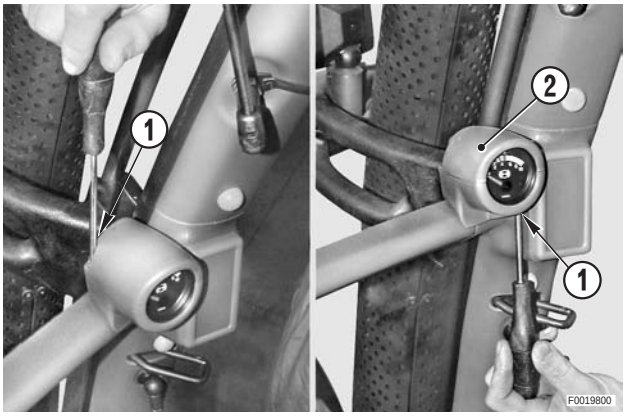


TRAILER BRAKING AIR PRESSURE GAUGE

Removal

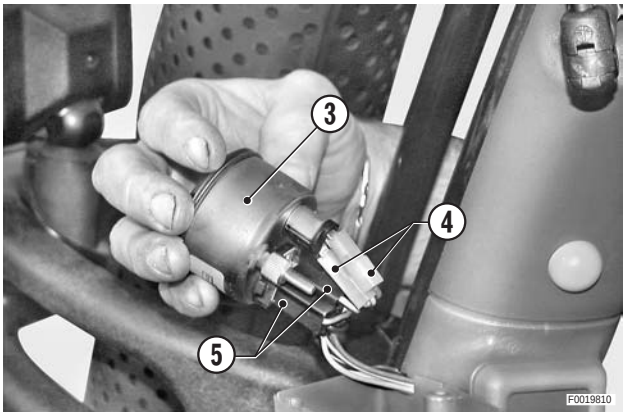
⚠ Remove the key from the ignition.

1 - Unscrew and remove fixing screws (1) of the upper cover (2); remove the cover.



2 - Remove the gauge (3); if a new gauge is to be fitted, unplug the connectors (4) and (5).

★ Label the connectors (5) to avoid confusion on re-connection.



3 - To replace the bulb, unplug the connectors (4) and withdraw the bulb holder (6).

Refitting

- Refitting is the reverse of removal.

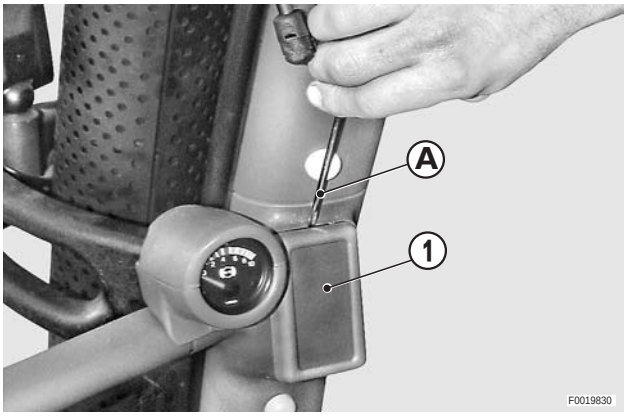
TRANSMISSION STATUS DISPLAY

Removal

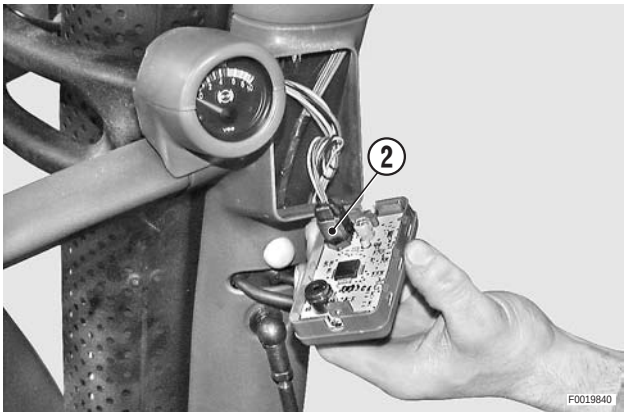
Remove the key from the ignition switch.

1 - Insert a thin blade “**A**” between the cab pillar and the display unit (1).

2 - Prise off the display (1).



3 - Unplug the connector (2).



Refitting

- Refitting is the reverse of removal.

CAB

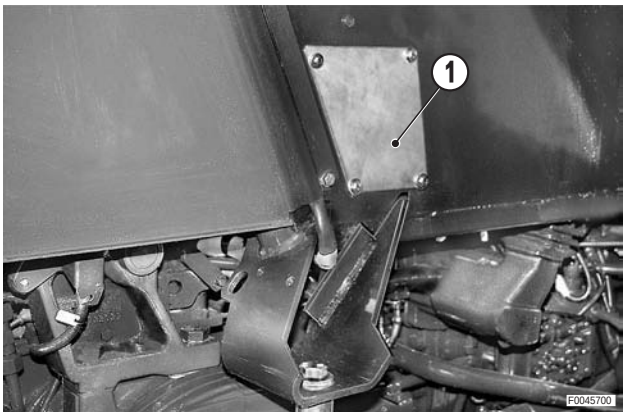
Removal

Remove the battery cover and disconnect the negative battery lead (–).

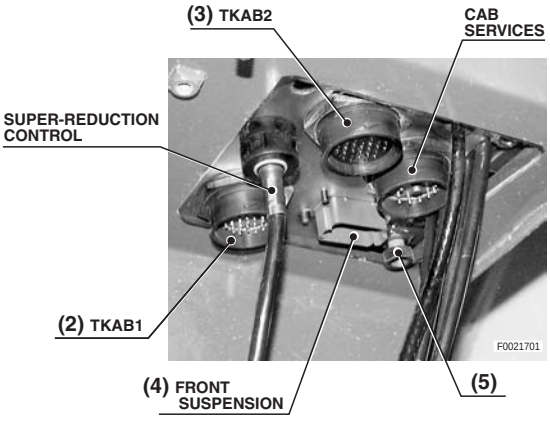
Discharge any residual pressure from the trailer braking air reservoir and the cab suspension system.

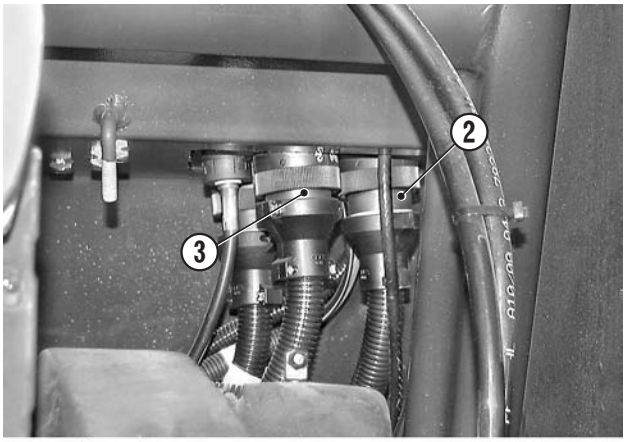
1 - Remove the rear wheels.
(For details, see "CAB").

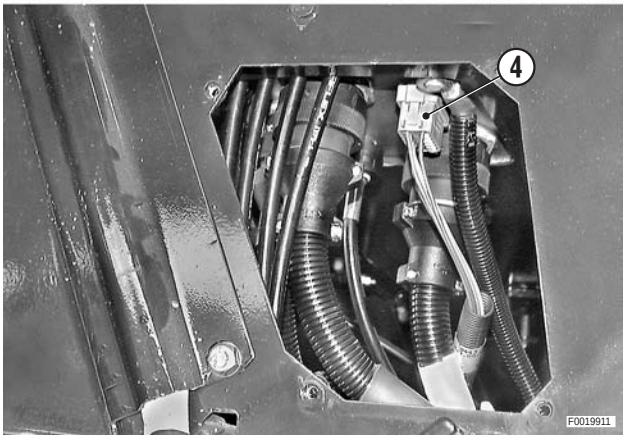
2 - Remove the air cleaner.
(For details, see "AIR CLEANER").



3 - Remove the cover plate (1) and disconnect from the bulkhead fitting the connectors of the electrical leads of the transmission (2) (TKAB1), the lift (3) (TKAB2) and the connector (4) and power supply lead (5) for the front axle (if present)

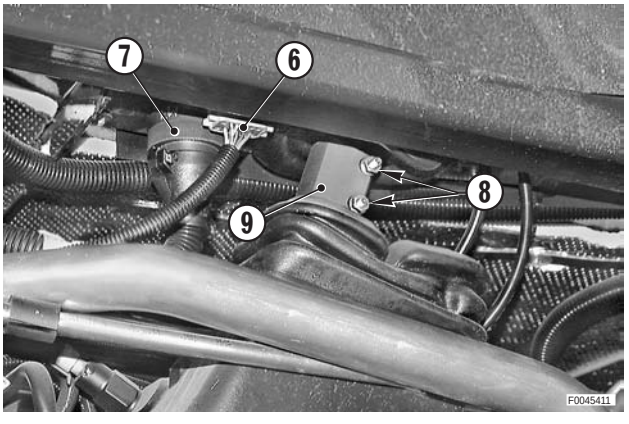




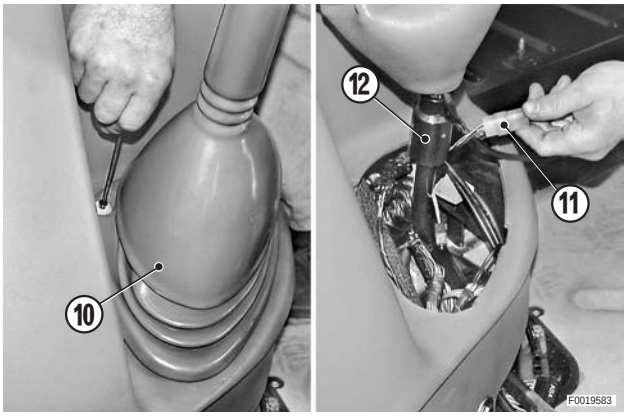


4 - Disconnect from the front bulkhead plate the connector (6) and the connector (7) of the engine wiring.

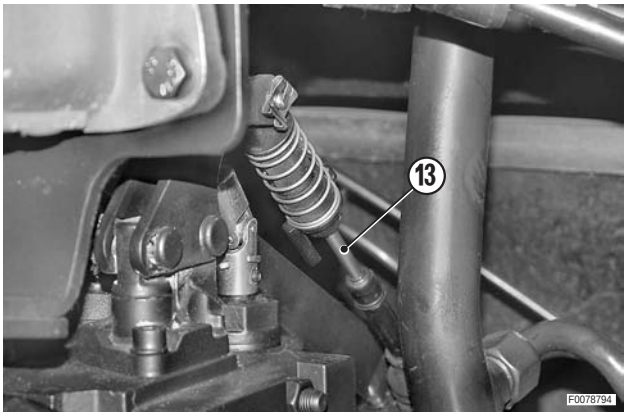
5 - Remove the bolts and nuts (8) of the gear lever (9).



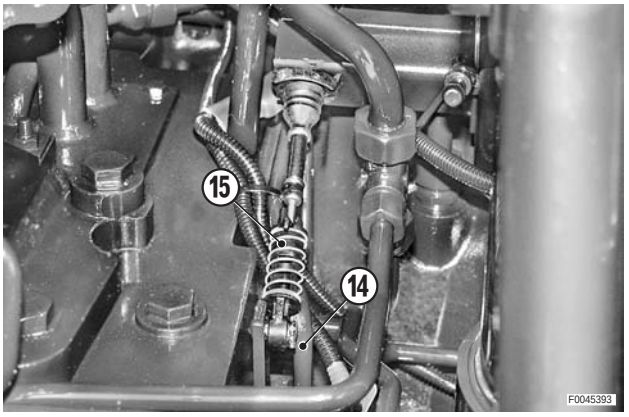
6 - Remove the gear lever gaiter (10), unplug the connector (11) and remove the complete lever assembly (12).



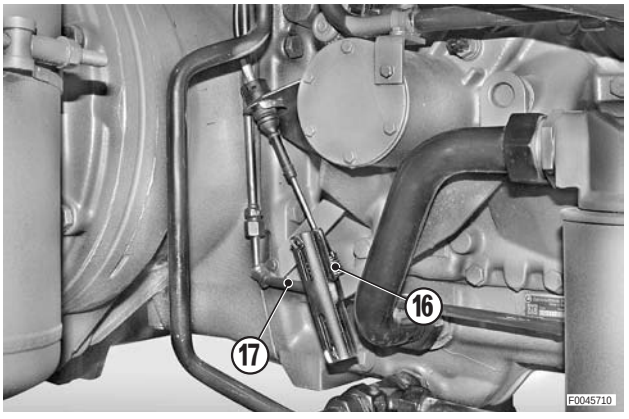
7 - Disconnect the control cables (13) from the auxiliary service control valves.
- ★ Label the cables to avoid confusion on reconnection.
- ★ Disconnect also the outer cables.



8 - Disconnect the control cable (15) from the PTO speed and operating mode selector lever (14).
- ★ Disconnect also the outer cables.

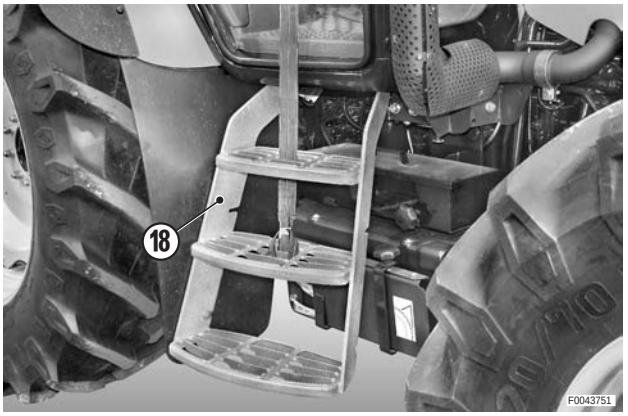


9 - Disconnect the control cable (16) from the creeper control lever (17).
- ★ Disconnect also the outer cable.

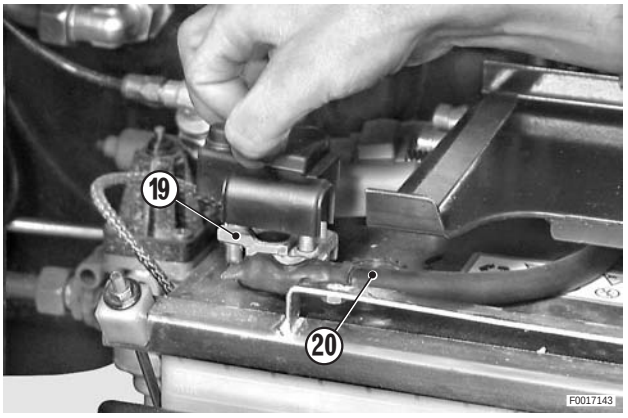


10 - Remove the cab access steps (18).

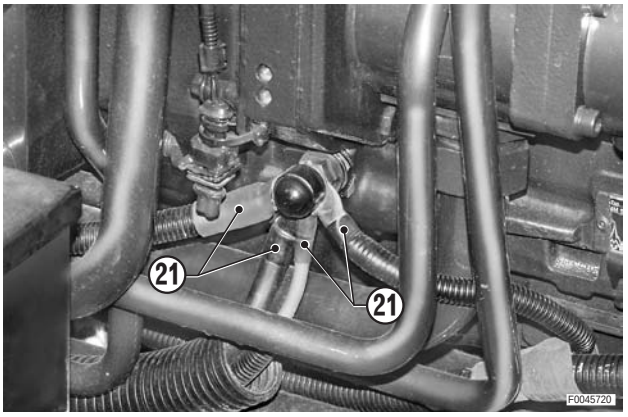
11 - Remove the fuel tank.
(For details, see "FUEL TANK").



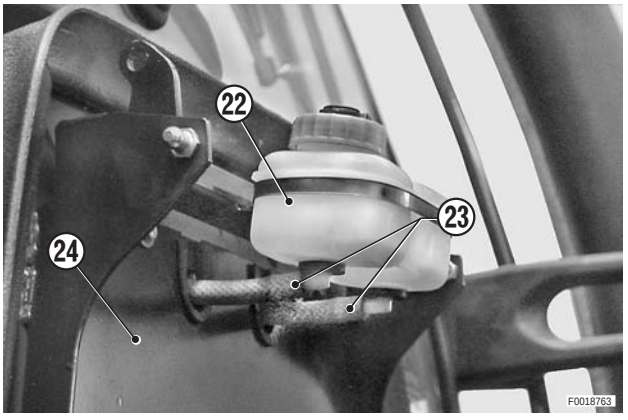
12 - Disconnect the system feed wire from the positive terminal (19) (+) of the battery (20).



13 - Disconnect the earth leads (21) from the engine.

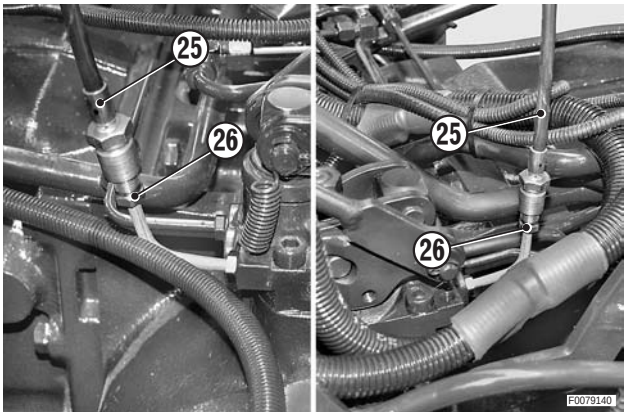


14 - Draw the fluid out of the brake fluid reservoir (22); disconnect the suction pipes (23) and remove the panel (24).



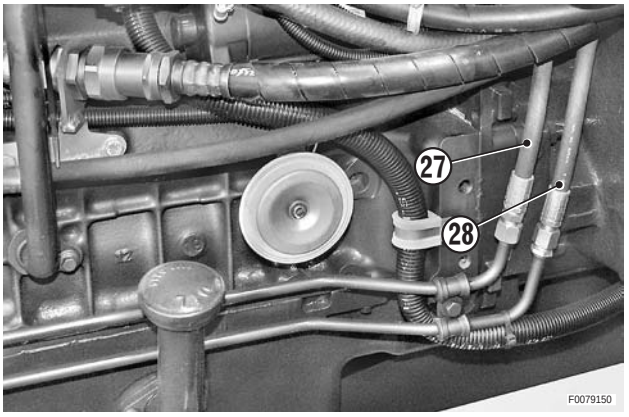
15 - Disconnect the delivery pipes (25) of the brake cylinders (26) and remove them by disconnecting the lower coupling.

★ Plug the ends of the pipes to prevent the entry of contaminants.



16 - Disconnect the pipes (27) and (28) coming from the power steering.

★ Plug the pipes and the open fittings to prevent the entry of impurities.

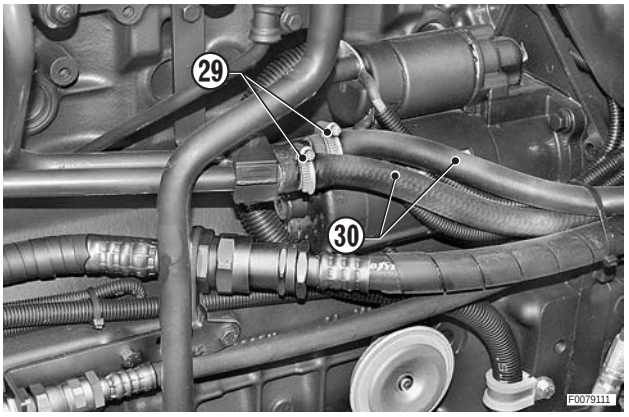


17 - Drain off the engine coolant.

Coolant:

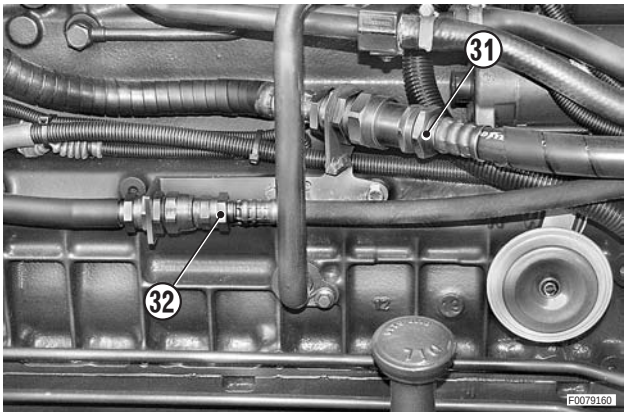
Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

18 - Loosen the clips (29) and disconnect the cab heater pipes (30).

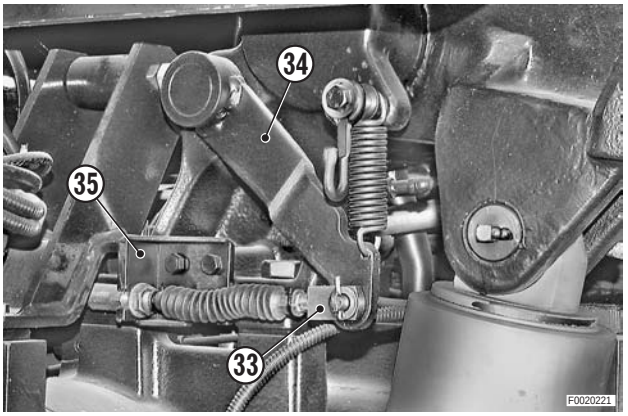


19 - Disconnect the suction pipe (31) of the air conditioning compressor and the outlet pipe (32).

※ 1

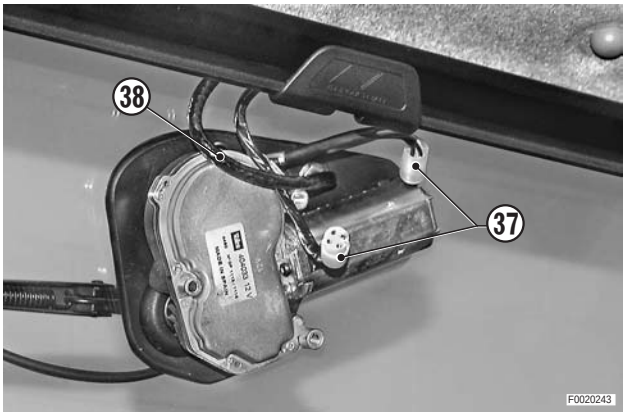


20 - Disconnect the control cable (33) from the parking brake lever (34).
★ Disconnect also the outer cable from the support (35).

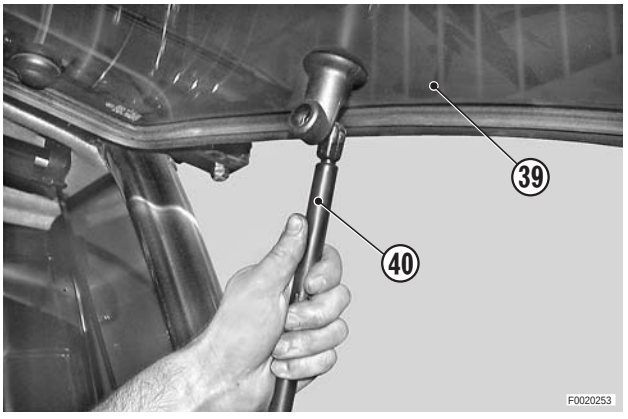


21 - Remove the exhaust pipe end fitting (36) from the cab. (For details, see "EXHAUST PIPE").

22 - Remove the cover of the rear screen wiper and unplug the connector (37) and the screen wash pipe (38).

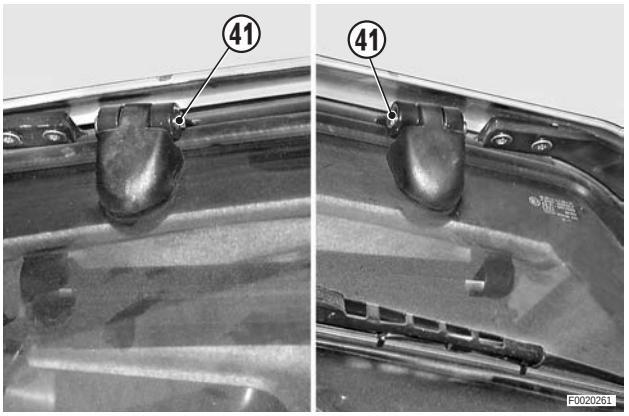


23 - Disconnect the gas springs (40) from the rear window (39); lower the window (39).

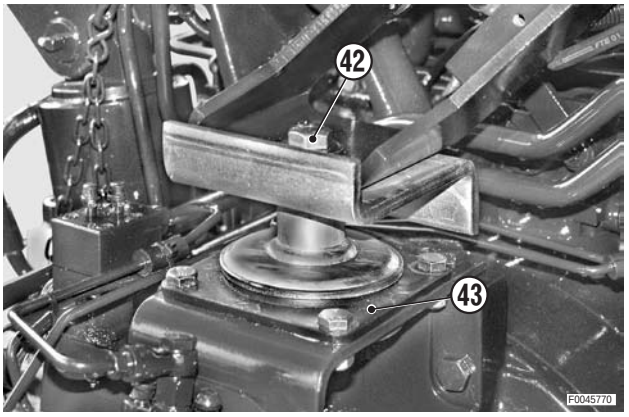


24 - While supporting the rear window, remove the hinge pins (41) with a pin punch.

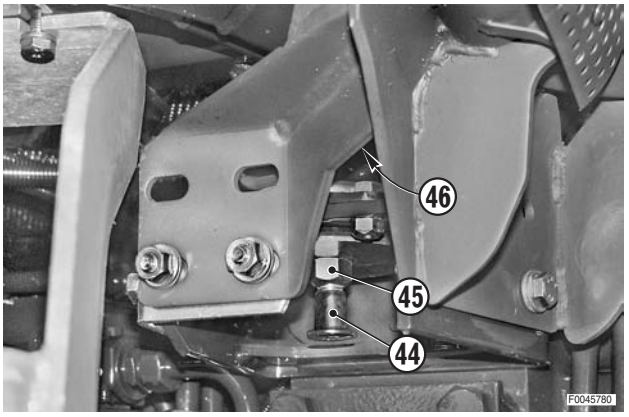
25 - Remove the complete rear window assembly (39).



26 - Remove the front centre screws fixing the cab to the vibration damping mountings (43).

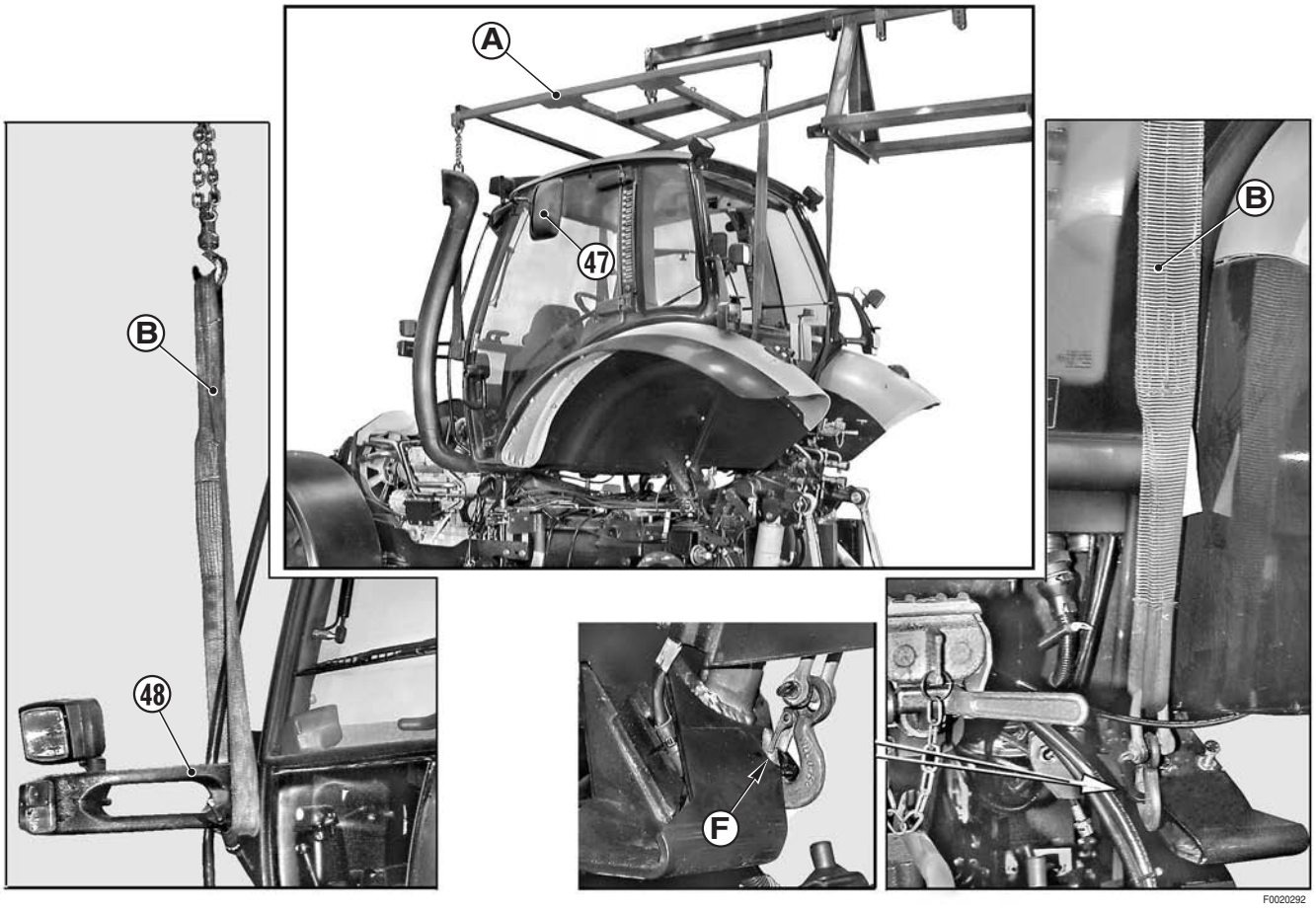


27 - Remove the covers (44), nuts (45) and front fixing bolts (46) of the cab.



28 - Fold the rearview mirrors (47) against the cab windows.

29 - Attach the cab lifting frame "**A**" to a hoist.
Attach slings "**B**" of different length to the cab using the holes "**F**" provided on the rear supports and the supports (48) for the work lights and direction indicators.



30 - Slowly raise the cab by about 15 cm and check that all the lower cables and connection pipes are disconnected.

kg Complete cab assembly:
approx 780 kg (1718 lb.)

31 - Release the wiring from all the clips and remove the cab while guiding the pipes and control cables.

Refitting

- Refitting is the reverse of removal.

1

Air conditioning pipes fittings:
delivery (5/8” - 18UNF):13.6–20.3 Nm (10–15 lb.ft.)
suction (7/8” - 14UNF): 35.3–42 Nm (26–31 lb.ft.)

1 - Fill the engine cooling system.

Coolant:

Mod.	80	90	100	105
ℓ	15.5	15.5	15.5	17.5
US.gall.	4.10	4.10	4.10	4.62

2 - Fully open the cab heater valve.

3 - Start the engine and check the hydraulic, pneumatic and heating systems for leaks.

4 - Turn the steering wheel back and forth between the full lock positions to expel any air from the power steering circuit.

5 - Switch off the engine; check the coolant level and top up if necessary.

6 - Bleed the hydraulic brake system.
(For details, see "BRAKING SYSTEM").

ENGINE -TRANSMISSION

Separation

There are two methods used for separating the engine and transmission according to the operation to be carried out:

1 - Renewal of the front crankshaft oil seal.

2 - Overhaul of the clutch or renewal of the rear crankshaft oil seal.

3 - Removal of the engine for overhaul or renewal.

CAUTION!

- **The illustrations depict the basic machine without optional front-mounted equipment (Pto, lift, front axle suspension).**
- **For removal of individual components, see the specific paragraphs in this manual.**

1. Renewal of the front crankshaft oil seal.

For this operation it is sufficient to remove the front support complete with the front axle, radiator/coolers assembly, front Pto (if present), front axle suspension (if present) and front lift (if present).

To do this:

1 - Remove the guard and disconnect the front axle drive shaft.

2 - Remove the battery and its support.

3 - Disconnect the pipes of the valves of the front lift (if present) and remove the side members.

4 - Disconnect the connection pipes of the radiator/coolers assembly.

5 - Disconnect the wiring looms and pipes, and direct them towards the rear of the tractor.

6 - Disconnect the steering pipes, the front suspension cylinder pipes (if present), the wiring for the front PTO (if present) and for the sensor for the suspension (if present).

7 - Disconnect the drive coupling of the front PTO (if present).

8 - Position a stand capable of supporting the weight of the gearbox assembly under the engine sump.

9 - Position two trolley jacks under the front support to prevent any rotation of the support.

10 - Loosen and remove the bolts securing the front support to the engine.

11 - Move the complete front support assembly on the front wheels away from the rear of the tractor.

NOTE - if necessary use a lever to separate the parts.

12 - Renew the oil seal following the procedure indicated in the engine workshop manual.

2. Overhaul of the clutch or renewal of the rear crankshaft oil seal.
For these operations it is sufficient to separate the engine from the gearbox.
To do this:

1 - Remove the guard and remove the front axle drive shaft.

2 - Remove the battery and its support.

3 - Disconnect the pipes of the valves of the front lift (if present) and remove the side members.

4 - Disconnect the steering pipes, the air conditioning, the gearbox oil cooler and the fuel pipes.

5 - Remove the intake pipe and the air cleaner connection manifold.

6 - Detach the silencer and remove the exhaust pipe.

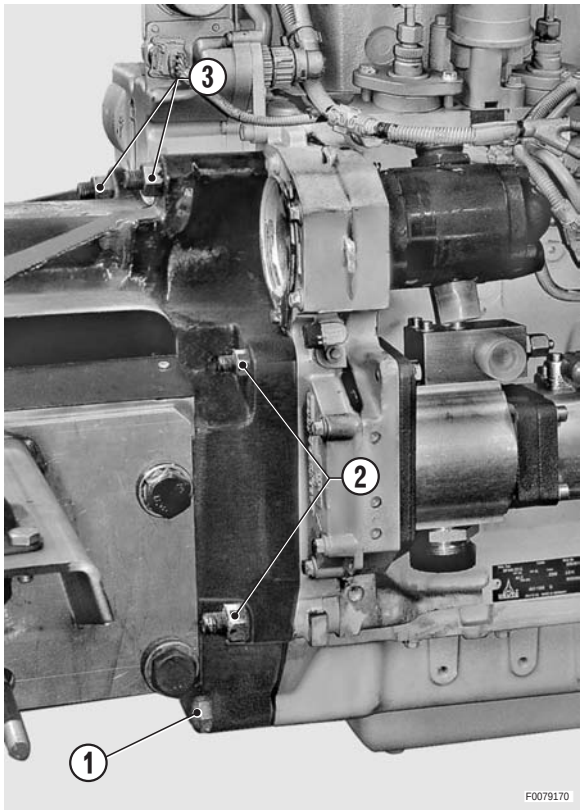
7 - Disconnect the supply and return pipes from the gear pump and remove them.

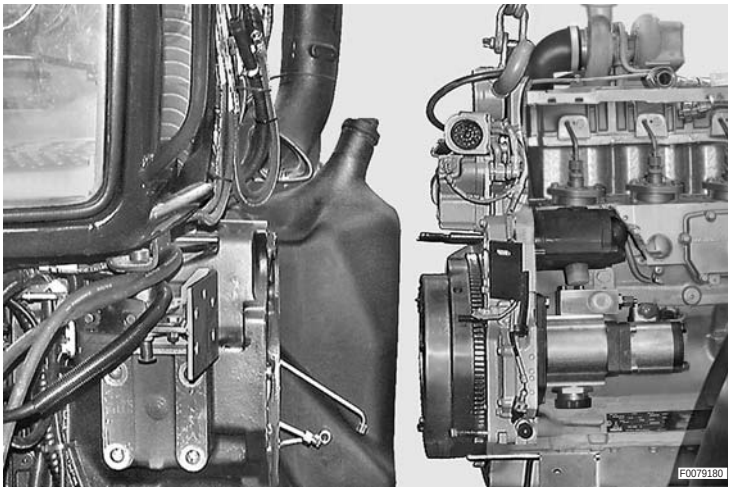
8 - Remove the outlet pipe from the air compressor.

9 - Disconnect the earth leads, the main connector and the temperature sensor connector from the engine.

10 - Position a stand tight under the transmission and a trolley jack under the engine.

11 - Loosen and remove the bolts (1), the nuts (2) and (3); separate the engine from the transmission, moving the complete front assembly on the front wheels away from the rear of the tractor.
NOTE - If necessary, use a lever to separate the engine from the transmission.





12 - Overhaul the clutch or renew the crankshaft oil seal following the procedures indicated in the engine workshop manual.

3. Removal of the complete engine

This operation requires the prior separation of the front assembly (described in paragraph “1. Renewal of the front crankshaft oil seal" and then removal of the engine using the procedure described in paragraph "2. Overhaul of the clutch or renewal of the rear crankshaft oil seal" up to step 10); then:

1 - Apply the lifting brackets or support the engine using a hoist.

2 - Remove the nuts and bolts securing the engine to the transmission and remove the engine (for details, see paragraph "2. Overhaul of the clutch or renewal of the rear crankshaft oil seal").
NOTE - if necessary use a lever to separate the engine from the transmission.

Reconnection

- Refitting is the reverse of removal

1 - Bleed the braking system.
(For details, see "BRAKING SYSTEM").

2 - First tighten the nuts, then the bolts, proceeding in and alternate diagonal sequence.

Nm M12 nuts and bolts: 110±10% Nm (81±10% lb.ft.)

Nm M16 nuts and bolts: 260±10% Nm (191.7±10% lb ft.)

3 - Clean mating faces thoroughly; lubricate faces and locating dowels.

Locating dowels: Engine oil

4 - Fill all the systems with the appropriate fluids. Start the engine and run for a few minutes to allow the fluids to circulate, then check for leaks.

5 - Expel the air from the dismantled hydraulic circuits by performing a few manoeuvres

6 - Stop the engine, check all fluid levels and top up if necessary.

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.

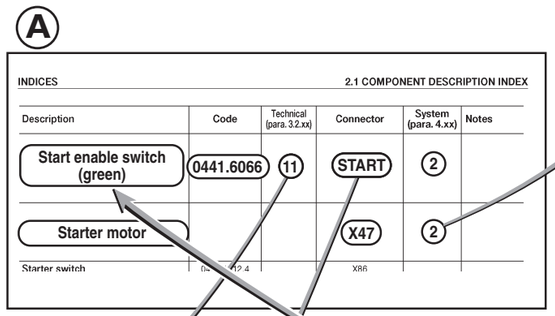
4. Systems

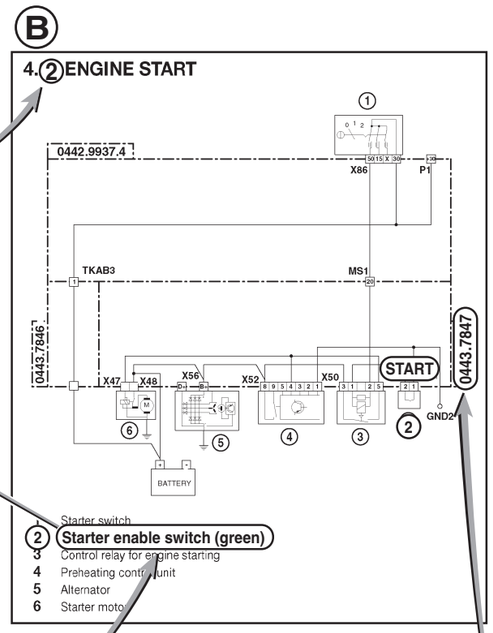
Contains the electrical diagrams of the tractor's systems.

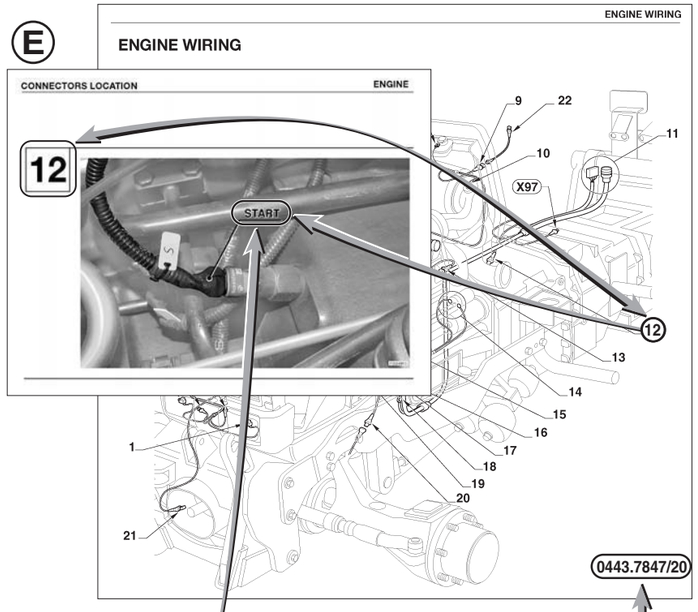
5. Wiring harnesses

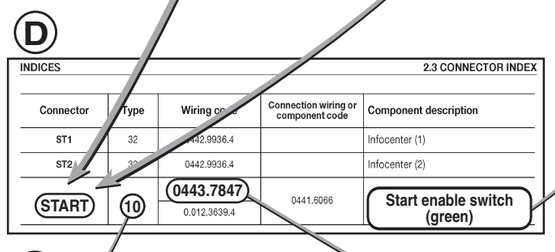
Contains the layouts, the wiring diagrams and the positioning of connectors on the tractor.

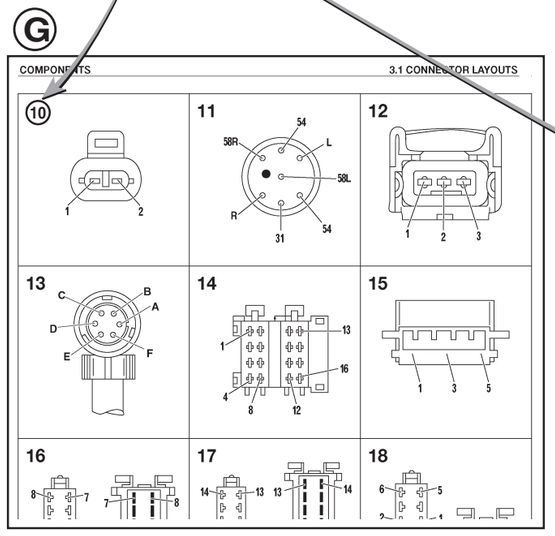
HOW TO CONSULT THE UNIT

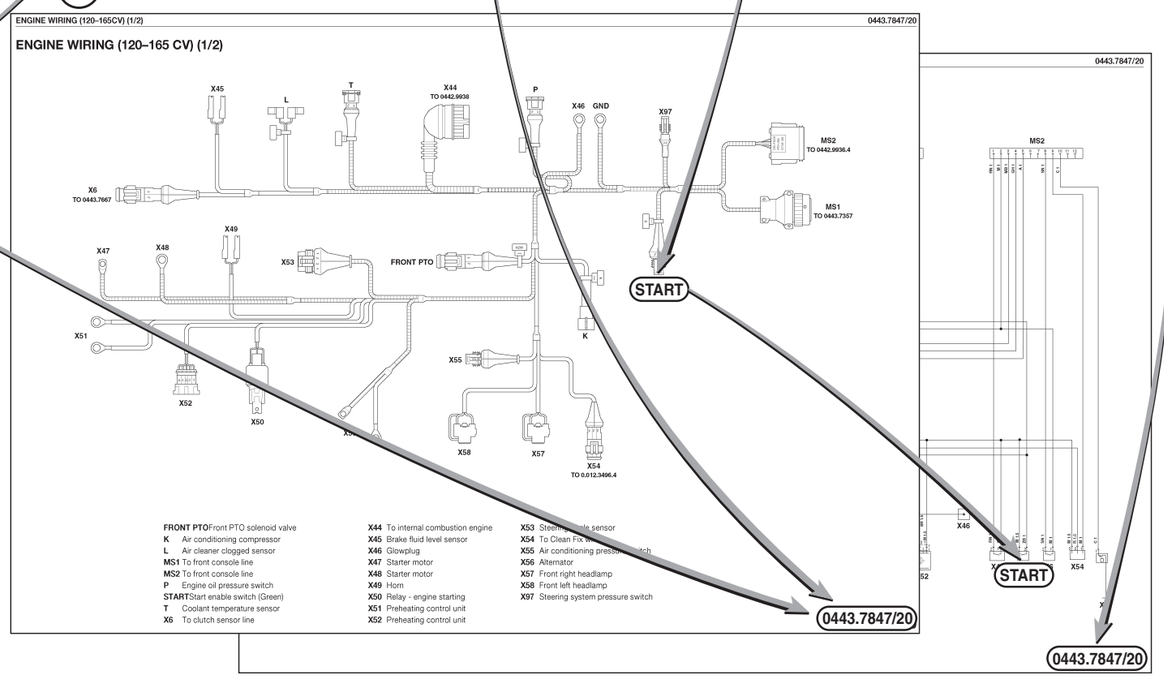












How to consult the table

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 HARNESSES

DESCRIPTION	CODE	PAGE
Cab power supply wiring	0443.7846/20	40-107
Air conditioning wiring	0.010.2562.2	40-139
Armrest wiring	0443.7354.4	40-169
Front console wiring	0.012.8894.4/30	40-123
Side console wiring	0.012.8732.4/40	40-129
Lights selector switch wiring	0443.8656	40-165
Display wiring	0443.7875	40-145
Cab lower headlights wiring	0441.1923.4	40-157
Cab roof front and rear worklights wiring	0443.4993	40-159
Cab lower front worklights wiring (machine without front lift)	0442.5602	40-158
Trailer brake wiring	0443.7355.4	40-100
Trailer brake wiring (Italy)	0443.7356.4	40-99
Engine wiring	0.013.5915.4/20	40-79
Number plate light wiring (Narrow fenders)	0441.4114	40-118
Cab full and dipped beam headlights (with front lift)	0441.6727	40-158
Engine wiring (4 cylinders)	0421.3182	40-71
Engine wiring (6 cylinders)	0421.3172	40-73
Windscreen wiper motor wiring	0441.2045	40-157
Fender wiring - narrow	0442.9835/10	40-117
Front axle suspension wiring (cab)	0443.7850/10	40-113
Front axle suspension wiring (ROPS)	0443.7849	40-103
Roof wiring	0443.7851/10	40-149
Transmission wiring	0.012.8672.4	40-89
Fuses and relays control unit	0441.9533.4/10	40-171

1.2 DEFINITION OF COMPONENTS AND SYMBOLS

To prevent any misunderstanding or ambiguity, listed below are definitions for some of the key terms used in this unit..

TERM	DESCRIPTION
Connector	Element used to connect two components (e.g. wiring-switch. wiring-wiring)
Temperature sensor	Electrical component that converts the temperature of a medium (air, water, oil, etc.) into a voltage or resistance
Pressure sensor	Electrical component that converts the pressure of a medium (air, water, etc.) into a voltage or resistance
Position sensor	Electrical component that converts the angular or linear position of an object into a voltage
Pressure switch	Switch that changes state (opens or closes a contact) according to the operating pressure in the circuit in which it is installed
Thermostat	Switch that changes state (opens or closes a contact) according to the temperature of the medium in which it is immersed.
Switch	Mechanical component that opens or closes one or more electrical contacts.
Solenoid valve	Valve operated by applying electrical current to a coil (or solenoid)

Chapter “3.2 Description of components” shows the wiring diagrams for certain switches and buttons. The following symbols are used for ease of 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 applicances or components.

In particular, if it is discovered that the electrical system or a component has been modified without authorisation, the manufacturer will accept no liability for any damage to the vehicle and the vehicle warranty will be invalidated.

1.3.2 MAIN WIRING FAULTS

a. Poor contact between connectors

The main causes of poor contact between connectors are incorrect insertion of the male into the female connector, deformation of one or both connectors, and corrosion or 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 togther, 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 connectorsi; 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 standards and in particular:

  - fuse F1 (100A) DIN 72581/2

  -bayonet fuse (F2, F3, ecc.) DIN 72581/3C

  - fuse F51 (100A) e F52 (200A) ISO 8820

  The fitting of replacement fuses that do not comply with these standards will invalidate the warranty with immediate effect and release the manufacturer from 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 tne 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**"

3 - **All Round Tester**

1.5 WIRE COLOUR CODES

COLOUR CODES	
A	Light blue
B	White
C	Orange
G	Yellow
H	Grey
L	Dark blue

COLOUR CODES	
M	Brown
N	Black
R	Red
S	Pink
V	Green
Z	Purple

2. INDICES

2.1 INDEX BY PART DESCRIPTION

Component description	Code Component	Technical. descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)
4WD switch	0441.1496.4	38	8	19
50S lights switch	0441.1496.4	37	4	8-9
Accelerator pedal position sensor	2.7099.740.0/10	23	X31	4
Actuator	0211.2588	4	Y3	4
Air cleaner clogged sensor	0441.9014		L	11
Air conditioning compressor	0443.7338		K	14
Air conditioning control panel illumination connector			X24	14
Air conditioning on/off switch	0.010.2532.0		X26	14
Air conditioning thermostat	0.010.2537.1		X25	14
Alternator	0117.8607		B+ D+	2 - 21
Armrest	0443.8670.4		X21	4-8-20
ASM switch	0441.1498	42	6	19
Auxiliary power socket	0114.3529		X15	12
Auxiliary power supply connector (in cab)			X19	12
Axle Down solenoid	0442.3803		S	17
Axle Up solenoid	0442.3803		H	17
Battery			+30	
Brake fluid level sensor			X81	15
Brake pedal switch	0439.1395	8	X32 - X35	15-17-19
Camshaft speed sensor (pickup)	0419.9792	5	B40	4
CB power connector			X44	13
Cigar lighter	0441.2338		X7	7
Clock	0441.2337		X49	7
Clutch pedal depressed proximity sensor	0442.4165/10	19	X33	18
Clutch pedal position sensor	0443.2708	24	X34	18
Compressed air pressure gauge	0442.5709	20	X39	16
Compressed air pressure gauge light			X38	5-6
Compressed air pressure sensor for trailer braking system	0.011.9428.0	2	X71	16
Compressor and condenser fan pressure switch	0442.3185		X74	14
Configuration connector			(LS/PS)	
Configuration connector (Powershuttle)			PS	
Diagnostics connector			X18	4-17-18-20
Differential lock solenoid valve	0442.3824		EVDF	19
Differential lock switch	0441.1498	43	7	19
Direction indicators flasher unit	0441.9531		X1-X2	5-6
Door open warning signal switch	0441.4097		X45	7
Driver seat air suspension compressor	0.010.2274.1		X5	7
Engine boost pressure sensor	0419.4078		B48	4

Component description	Code Component	Technical. descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)
Engine control unit	0419.4998		MX1 - MX2	2-3-4-12
Engine coolant temperature sensor	0419.9410		B43	4
Engine coolant temperature sensor (for Infocenter)	0419.9809	7	T	11
Engine ECU circuit board	0.010.3627.1		X8	2-4
Engine oil pressure switch	0118.2227	3	P	11
Engine speed keypad	0443.7505		X20	
Engine speed sensor	0443.8438	1	NLSE	18
Engine starter relay			RL40	2
Fan speed selector switch	0.010.2528.1		X27	14
Field/road selection solenoid valve	0.010.3343.0	49	EV F/S	18
Field/road sensor	0441.6157	50	F/S SWITCH	18
Four wheel drive (4WD) solenoid valve	0443.1661	21	EVDT	15-19
Front axle suspension ECU	2.8519.008.0/10		JX3-JX4	12-17
Front axle suspension load sensing solenoid	0442.3803		X68	17
Front axle suspension position sensor	0439.1530	10	X69	17
Front left side lights direzione anteriore sinistro	0441.1920.4		X59	5-6
Front left sidelights connector			G7	
Front left worklight on cab (with front lift)	0441.4087.4		X63	6
Front left worklight on cab (without front lift)	0442.5599.4		X61	8-9
Front PTO pushbutton (in cab)	0441.1533	13	X9	21
Front PTO solenoid valve			HZW	21
Front right side lights and direction indicators	0441.1921.4		X60	5-6
Front right sidelights connector			G9	
Front right worklight on cab (without front lift)	0442.5599.4		X62	8-9
Front right worklight on cab (with front lift)	0441.4087.4		X64	6
Front suspension pushbutton	0442.2763	46	5	17
Fuel level sensor	0445.2016		FUEL	11
Fuel temperature sensor	0419.9552	6	B37	4
Gearbox control lever			F/S LEVER	18
Gearbox output shaft speed sensor	0443.8449	27	NLSA	18
Gearshift lever	0445.0961.4		X12	18
Gearshift solenoid valves (Y1, Y2, Y3, Y4)	0441.6685	18	EVGROUP	18
Glowplug warning light ON relay			RL41	3
Handbrake switch	0439.1395	9	X6	15-16
Hazard warning lights on/off switch	0442.9401	47	X36	5-6
Headlights low beam switch (on cab) (with front lift)	0441.1496.4	35	3	6
Heater fan speed 1 relay			RL32	14

Component description	Code Component	Technical. descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)
Heater fan speed 3 relay			RL30	14
Heater fan speed 4 relay			RL31	14
Horn	0116.9304		X87	5-6
Instrument panel	0443.7488/10		ST1-ST2	3-4-5-6-11-15-16-18-20-21
Interior roof light	0442.6316		X46	7
ISO4 socket (power supply to implements)	0442.2323.4		ISO4	12
ISO7 socket (implement connection)	0442.2324.4		ISO7	4-12-21
Left front loudspeaker	0.012.1725.0		X50	13
Left headlamp	0443.5914.4		X86	5-6
Left headlamp (UK)	0443.5913.4		X86	5-6
Left rear loudspeaker	0.012.1726.0		X41	13
Lh heater fan	0.010.2537.0		X22	14
Lh heater fan resistor	0.010.2535.1		X23	14
LH rear lift Down pushbutton	0441.2688	14	DWSX	20
LH rear lift Up pushbutton	0441.2688	14	UPSX	20
Lift and hand throttle console	0441.9425.4/10	48	EHR-EMR	4-20
Lift control panel	0442.9597.4		X14	20
Lift Down solenoid valve			EVDW	20
Lift draft sensor (left)	0441.5586.4	15	LEFT DRAFT	20
Lift Up solenoid valve			EVUP	20
Lower front worklights switch (on cab) (without front lift)	0441.1496.4	36	3A	8
Lower rear left worklights			X65SX	8-9
Lower rear right worklights			X65DX	8-9
Main heating fuse			FU131	14
Main power supply fuse			FU100	
Number plate light	0441.4115		X67	5-6
Preheating device	0425.8670		X78	3
Preheating relay	0419.4081		RL42 - RL42A RL42B	3
Preheating relay power fuse			FU101	
Proportional valve solenoid	0443.4425	25	EVPROP	18
PTO AUTO switch	0441.1496.4	40	PTO AUTO	21
Radar	0443.8654	29	RADAR	20
Radar (UK)	0443.8655	30	RADAR	20
Radar control switch	0441.4584		X13	20
Radio			X51 - X52	5-6-13
Rear left side lights and direction indicators	0442.9833.4/30		X66SX	5-6-15
Rear lift control unit	2.8519.013.0		JX1-JX2	12-15-17-19-20-21

Component description	Code Component	Technical. descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)
Rear lift draft sensor (Right)	0441.5586.4	15	RIGHT DRAFT	20
Rear lift position sensor	0443.8667.0	31	POS SEN	20
Rear PTO pushbutton (in cab)	0441.1533	12	X10	21
Rear PTO solenoid valve	0.010.2628.2		EVPTO	21
Rear PTO speed sensor	0443.8352		PTO SEN	21
Rear right side lights and direction indicators	0442.9833.4/30		X66DX	5-6-15
Rear screen washer pump	0441.4105		RP	10
Rear screen wiper motor	0441.3192		X42	10
Rear screen wiper switch	0441.9283	45	REAR WIPER	10
Rear worklights switch	0441.1496.4	34	WORK LIGHT	8-9
Relay for front upper worklights on cab (50S)			RL21	6-8-9
Rh heater fan	0.010.2535.0		X29	14
Rh heater fan resistor	0.010.2535.1		X28	14
RH rear lift Down pushbutton	0441.2688	14	DWDX	20
RH rear lift Up pushbutton	0441.2688	14	UPDX	20
RH rear PTO control button (on fender)	0441.1533	11	PTODX	21
Right front loudspeaker	0.012.1725.0		X48	13
Right headlamp	0443.5914.4		X88	5-6
Right headlamp (UK)	0443.5913.4		X88	5-6
Right rear loudspeaker	0.012.1726.0		X43	13
Rotating beacon			X47	8-9
Rotating beacon on/off switch	0441.1496.4	39	FLASHING LIGHT	8-9
Shuttle control lever	0.012.6472.4	33	X37	18
Side console courtesy light	0441.2616		X53	7
Sidelights switch	0441.1497	41	1	5-6
Speed sensor for odometer	0443.8450	26	NAB	18
Start enable switch (Green)	0441.6066	16	X80	2
Starter motor	0118.0928		+30C +50	2
Starter switch	0441.1512.4	44	X17	2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21
Steering angle sensor	0441.5266	32	X82	19
Steering column switch unit	0443.8656		AS4	5-6-10
Trailer brake lights fuse			FU121	15
Trailer braking low pressure switch			X73	16
Trailer parking brake solenoid			X72	16
Trailer socket (for lights and auxiliary power)	0442.4116		X70	12-15
Transmission display	0441.9280.4		X40	5-6-18
Transmission ECU	0443.8083/10		ECU PS	2-18

Component description	Code Component	Technical. descr'n (Chap. 3.2.xx)	Connector	System (Chap. 4.xx)
Transmission oil low pressure switch	0441.1690	22	PRESS SWITCH	18
Transmission oil temperature sensor	0441.6649	17	TEMP	18
Transmission speed sensor	0.010.3342.2	28	NHK	18
Upper front left worklight	0445.0666		X56	8-9
Upper front right worklight	0445.0666		X57	8-9
Upper rear left worklights	0445.0666		X55	8-9
Upper rear right worklights	0445.0666		X54	8-9
Windscreen washer pump	0441.4105		FP	10
Windscreen wiper motor	0441.3192		X58	10

2.2 INDEX BY PART CODE

Code	Description	Technical. descr'n (Chap. 3.2.xx)	Connector	System (para. 4.xx)
0114.3529	Auxiliary power socket		X15	12
0116.9304	Horn		X87	5-6
0117.8607	Alternator		B+ D+	2 - 21
0118.0928	Starter motor		+30C +50	2
0118.2227	Engine oil pressure switch	3	P	11
0211.2588	Actuator	4	Y3	4
0419.4078	Engine boost pressure sensor		B48	4
0419.4081	Preheating relay		RL42 - RL42A RL42B	3
0419.4998	Engine control unit		MX1 - MX2	2-3-4-12
0419.9410	Engine coolant temperature sensor		B43	4
0419.9552	Fuel temperature sensor	6	B37	4
0419.9792	Camshaft speed sensor (pickup)	5	B40	4
0419.9809	Coolant temperature sensor (for Infocenter)	7	T	11
0425.8670	Preheating device		X78	3
0439.1395	Brake pedal switch	8	X32 - X35	15-17-19
0439.1395	Handbrake switch	9	X6	15-16
0439.1530	Front axle suspension position sensor	10	X69	17
0441.1497	Sidelights switch	41	1	5-6
0441.1498	ASM switch	42	6	19
0441.1498	Differential lock switch	43	7	19
0441.1533	RH rear PTO control button (on fender)	11	PTODX	21
0441.1533	Rear PTO pushbutton (in cab)	12	X10	21
0441.1533	Front PTO pushbutton (in cab)	13	X9	21
0441.1690	Transmission oil low pressure switch	22	PRESS SWITCH	18
0441.2337	Clock		X49	7
0441.2338	Cigar lighter		X7	7
0441.2616	Side console courtesy light		X53	7
0441.2688	RH rear lift Down pushbutton	14	DWDX	20
0441.2688	LH rear lift Down pushbutton	14	DWSX	20
0441.2688	RH rear lift Up pushbutton	14	UPDX	20

Code	Description	Technical. descr'n (Chap. 3.2.xx)	Connector	System (para. 4.xx)
0441.2688	LH rear lift Up pushbutton	14	UPSX	20
0441.3192	Rear screen wiper motor		X42	10
0441.3192	Windscreen wiper motor		X58	10
0441.4097	Door open warning signal switch		X45	7
0441.4105	Windscreen washer pump		FP	10
0441.4105	Rear screen washer pump		RP	10
0441.4115	Number plate light		X67	5-6
0441.4584	Radar control switch		X13	20
0441.5266	Steering angle sensor	32	X82	19
0441.6066	Start enable switch (Green)	16	X80	2
0441.6157	Field/road sensor	50	F/S SWITCH	18
0441.6649	Transmission oil temperature sensor	17	OC	18
0441.6685	Gearshift solenoid valves (Y1, Y2, Y3, Y4)	18	EVGROUP	18
0441.9014	Air cleaner clogged sensor		L	11
0441.9283	Rear screen wiper switch	45	REAR WIPER	10
0441.9531	Direction indicators flasher unit		X1-X2	5-6
0442.2763	Front suspension pushbutton	46	5	17
0442.3185	Compressor and condenser fan pressure switch		X74	14
0442.3803	Axle Up control solenoid		H	17
0442.3803	Axle Down control solenoid		S	17
0442.3803	Front axle suspension load sensing solenoid		X68	17
0442.3824	Differential lock solenoid valve		EVDF	19
0442.4116	Trailer socket (for lights and auxiliary power)		X70	12-15
0442.5709	Compressed air pressure gauge	20	X39	16
0442.6316	Interior roof light		X46	7
0442.9401	Hazard warning lights on/off switch	47	X36	5-6
0443.1661	Four wheel drive (4WD) solenoid valve	21	EVDT	15-19
0443.2708	Clutch pedal position sensor	24	X34	18
0443.4425	Proportional solenoid valve	25	EVPROP	18
0443.7338	Air conditioning compressor		K	14
0443.7505	Engine speed keypad		X20	
0443.8352	Rear PTO speed sensor		PTO SEN	21
0443.8438	Engine speed sensor	1	NLSE	18

Code	Description	Technical. descr'n (Chap. 3.2.xx)	Connector	System (para. 4.xx)
0443.8449	Gearbox output shaft speed sensor	27	NLSA	18
0443.8450	Speed sensor for odometer	26	NAB	18
0443.8654	Radar	29	RADAR	20
0443.8655	Radar (UK)	30	RADAR	20
0443.8656	Steering column switch unit		AS4	5-6-10
0445.0666	Upper rear right worklights		X54	8-9
0445.0666	Upper rear left worklights		X55	8-9
0445.0666	Upper front left worklight		X56	8-9
0445.0666	Upper front right worklight		X57	8-9
0445.2016	Fuel level sensor		FUEL	11
0.010.2274.1	Driver seat air suspension compressor		X5	7
0.010.2528.1	Fan speed selector switch		X27	14
0.010.2532.0	Air conditioning on/off switch		X26	14
0.010.2535.0	Rh heater fan		X29	14
0.010.2535.1	Lh heater fan resistor		X23	14
0.010.2535.1	Rh heater fan resistor		X28	14
0.010.2537.0	Lh heater fan		X22	14
0.010.2537.1	Air conditioning thermostat		X25	14
0.010.2628.2	Rear PTO solenoid valve		EVPTO	21
0.010.3342.2	Transmission speed sensor	28	NHK	18
0.010.3343.0	Field/road selection solenoid valve	49	EV F/S	18
0.010.3627.1	Engine ECU circuit board		X8	2-4
0.011.9428.0	Compressed air pressure sensor trailer braking system	2	X71	16
0.012.1725.0	Right front loudspeaker		X48	13
0.012.1725.0	Left front loudspeaker		X50	13
0.012.1726.0	Left rear loudspeaker		X41	13
0.012.1726.0	Right rear loudspeaker		X43	13
0.012.6472.4	Shuttle control lever	33	X37	18
0441.1496.4	Headlights low beam switch (on cab) (with front lift)	35	3	6
0441.1496.4	50S lights switch	37	4	8-9
0441.1496.4	4WD switch	38	8	19
0441.1496.4	Lower front worklights switch (on cab) (without front lift)	36	3A	8
0441.1496.4	Rotating beacon on/off switch	39	FLASHING LIGHT	8-9
0441.1496.4	PTO AUTO switch	40	PTO AUTO	21

Code	Description	Technical. descr'n (Chap. 3.2.xx)	Connector	System (para. 4.xx)
0441.1496.4	Rear worklights switch	34	WORK LIGHT	8-9
0441.1512.4	Starter switch	44	X17	2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21
0441.1920.4	Front left sidelight and direction indicator		X59	5-6
0441.1921.4	Front right sidelight and direction indicator		X60	5-6
0441.4087.4	Front left worklight on cab (with front lift)		X63	6
0441.4087.4	Front right worklight on cab (with front lift)		X64	6
0441.5586.4	Lift draft sensor (left)	15	LEFT DRAFT	20
0441.5586.4	Rear lift draft sensor (Right)	15	RIGHT DRAFT	20
0441.9280.4	Transmission display		X40	5-6-18
0441.9425.4/10	Lift and hand throttle console	48	EHR-EMR	4-20
0442.2323.4	ISO4 socket (power supply to implements)		ISO4	12
0442.2324.4	ISO7 socket (implement connection)		ISO7	4-12-21
0442.4165/10	Clutch pedal depressed proximity sensor	19	X33	18
0442.5599.4	Front left worklight on cab (without front lift)		X61	8-9
0442.5599.4	Front right worklight on cab (without front lift)		X62	8-9
0442.9597.4	Lift control panel		X14	20
0442.9833.4/30	Rear right sidelight and direction indicator		X66DX	5-6-15
0442.9833.4/30	Rear left sidelight and direction indicator		X66SX	5-6-15
0443.5913.4	Left headlamp (UK)		X86	5-6
0443.5913.4	Right headlamp (UK)		X88	5-6
0443.5914.4	Left headlamp		X86	5-6
0443.5914.4	Right headlamp		X88	5-6
0443.7488/10	Instrument panel		ST1-ST2	3-4-5-6-11-15-16-18-20-21
0443.8083/10	Transmission ECU		ECU PS	2-18
0443.8667.0	Rear lift position sensor	31	POS SEN	20
0443.8670.4	Armrest		X21	4-8-20
0445.0961.4	Gearshift lever		X12	18
2.7099.740.0/10	Accelerator pedal position sensor	23	X31	4
2.8519.008.0/10	Front axle suspension control unit		JX3-JX4	12-17
2.8519.013.0	Rear lift control unit		JX1-JX2	12-15-17-19-20-21

2.3 INDEX BY CONNECTOR

Connector	Type	Wiring code	Connection wiring or component code	Component description
+30				Battery
+30A		0443.7846		Battery
+30B				Battery
+30C		0.013.5915.4/20	0118.0928	Starter motor
+50		0.013.5915.4/20	0118.0928	Battery
1	28	0.012.8894.4/30	0441.1497	Sidelights switch
3	28	0.012.8894.4/30	0441.1496.4	Cab headlights low beam switch
3A	28	0.012.8894.4/30	0441.1496.4	Lower front worklights switch (on cab)
4	28	0.012.8894.4/30	0441.1496.4	50S lights switch
5	28	0.012.8894.4/30	0442.2763	Front suspension pushbutton
6	28	0.012.8894.4/30	0441.1498	ASM switch
7	28	0.012.8894.4/30	0441.1498	Differential lock switch
8	28	0.012.8894.4/30	0441.1496.4	4WD switch
APS	28	0.012.8732.4/40		Not utilised
AS1	20	0.012.8732.4/40	0.012.8894.4/30	
AS2	19	0.012.8732.4/40	0.012.8894.4/30	
AS3	18	0.012.8732.4/40	0.012.8894.4/30	
AS4	20	0.012.8732.4/40	0443.8656	Steering column switch unit
AS5	14	0.012.8732.4/40	0443.7875	
AS6	15	0.012.8732.4/40	0.012.8894.4/30	
B+		0.013.5915.4/20	0117.8607	Alternator (B+)
B1		0421.3172		Not utilised
		0421.3182		
B37		0421.3172	0419.9552	Fuel temperature sensor
		0421.3182		
B40		0421.3172	0419.9792	Camshaft speed sensor (Pickup)
		0421.3182		
B43		0421.3172	0419.9410	Coolant temperature sensor
		0421.3182		
B48		0421.3172	0419.4078	Engine boost pressure sensor
		0421.3182		
B6		0421.3172		Not utilised
		0421.3182		

Connector	Type	Wiring code	Connection wiring or component code	Component description
CLEANFIX	28	0.012.8732.4/40		Not utilised
D+		0.013.5915.4/20	0117.8607	Alternator (D+)
DS1	15	0.012.8732.4/40	0443.7851	
DWDX	3	0442.9835	0441.2688	RH lift Down pushbutton
DWSX	3	0442.9835	0441.2688	LH lift Down pushbutton
ECU PS	44	0.012.8732.4/40	0443.8083/10	Transmission ECU
EHR	3	0.012.8732.4/40	0443.7354.4	
			0441.9425.4/10	Lift and hand throttle console (EHR)
EMR	3	0.012.8732.4/40	0443.7354.4	
			0441.9425.4/10	Lift and hand throttle console (EMR)
EV F/S		0.012.8672.4/10	0.010.3343.0	Field/road selection solenoid valve
EVDF	12	0.012.8672.4/10	0442.3824	Differential lock solenoid valve
EVDT	12	0.012.8672.4/10	0443.1661	Four-wheel drive control solenoid valve (4WD)
EVDW	12	0.012.8672.4/10		Lift Down solenoid valve
EVGROUP	11	0.012.8672.4/10	0441.6685	Gear change solenoid valves (Y1, Y2, Y3, Y4)
EVPROP	12	0.012.8672.4/10	0443.4425	Proportional solenoid valve
EVPTO	12	0.012.8672.4/10	0.010.2628.2	Rear PTO solenoid valve
EVUP	12	0.012.8672.4/10		Lift Up solenoid valve
F/S LEVER	1	0.012.8732.4/40		Gearbox control lever
F/S SWITCH		0.012.8672.4/10	0441.6157	Field/road sensor
F30		0421.3172		Not utilised
		0421.3182		
FE1	16	0.012.8732.4/40	0443.7850	
FE2		0443.7850	0443.7849	
FLASHING LIGHT	28	0.012.8732.4/40	0441.1496.4	Rotating beacon on/off switch
FP		0.012.8672.4/10	0441.4105	Windscreen washer pump
FU100		0443.7846		Main power supply fuse
FU101		0.013.5915.4/20		Preheating relay power fuse
FU121		0.012.8732.4/40		Trailer brake lights fuse
FU131		0.012.8732.4/40		Main heating fuse
FUEL	2	0.012.8672.4/10	0445.2016	Fuel level sensor
G1		0.012.8732.4/40	0.010.2562.2	

Connector	Type	Wiring code	Connection wiring or component code	Component description
G2	32	0.012.8732.4/40	0.010.2562.2	
G3	33	0.012.8732.4/40	0443.7354.4	
G4		0.012.8894.4/30	0443.8656	
G5	1	0443.7851	0443.4993	
G6	1	0443.7851	0443.4993	
G7	5	0443.7851	0441.1923.4	Front left sidelights connector
G8	5	0443.7851	0443.4993	
G9	5	0443.7851	0441.1923.4	Front right sidelights connector
G10	6	0443.7851	0441.2045	
G11	5	0443.7851	0443.4993	
G12	5	0441.6727	0441.1923.4	
		0442.5602		
G13	5	0441.6727	0441.1923.4	
		0442.5602		
G14		0443.7846	0442.9835	
G15		0443.7846	0442.9835	
G16		0442.9835	0441.4114	
G17	4	0.012.8672.4/10	0443.7355.4	
			0443.7356.4	
G18		0.013.5915.4/20	0421.3172	
			0421.3182	
H	12	0443.7849	0442.3803	Axle Up control solenoid
HZW	2	0.013.5915.4/20		Front PTO solenoid valve
ISO4	24	0.012.8732.4/40	0442.2323.4	ISO4 socket (power supply to implements)
ISO7	25	0.012.8732.4/40	0442.2324.4	ISO7 socket (implement connection)
J1	9	0.012.8732.4/40		To fuses
J2	3	0.012.8732.4/40		To fuses
J3	3	0.012.8732.4/40		To fuses
JX1	31	0.012.8732.4/40	2.8519.013.0	Rear lift control unit
JX2	31	0.012.8732.4/40	2.8519.013.0	Rear lift control unit
JX3	31	0443.7850	2.8519.008.0/10	Front axle suspension control unit
JX4	31	0443.7850	2.8519.008.0/10	Front axle suspension control unit

Connector	Type	Wiring code	Connection wiring or component code	Component description
K		0.013.5915.4/20	0443.7338	Air conditioning compressor
L		0.013.5915.4/20	0441.9014	Air cleaner clogged sensor
LEFT DRAFT	13	0.012.8672.4/10	0441.5586.4	Lift draft sensor (left)
LS		0.012.8672.4/10		Not utilised
LS/PS	2	0.012.8672.4/10		Configuration connector
MS1	41	0.012.8732.4/40	0.013.5915.4/20	
MS2	29	0.012.8894.4/30	0.013.5915.4/20	
MX1	43	0.012.8732.4/40	0419.4998	Engine control unit
MX2	43	0.012.8732.4/40	0419.4998	Engine control unit
NAB	3	0.012.8672.4/10	0443.8450	Speed sensor for odometer
NEUTRAL LS		0.012.8672.4/10		Not utilised
NHK	3	0.012.8672.4/10	0.010.3342.2	Transmission speed sensor
NLSA	3	0.012.8672.4/10	0443.8449	Gearbox output shaft speed sensor
NLSE	3	0.012.8672.4/10	0443.8438	Engine speed sensor
P	12	0.013.5915.4/20	0118.2227	Engine oil pressure switch
P1		0.012.8732.4/40		To fuses
P2	14	0.012.8732.4/40		To fuses
P3	22	0.012.8732.4/40		To fuses
P4		0.012.8732.4/40		To fuses
P5	22	0.012.8732.4/40		To fuses
P6	16	0.012.8732.4/40		To fuses
POS SEN	3	0.012.8672.4/10	0443.8667.0	Lift position sensor switch
PRESS SWITCH	2	0.012.8672.4/10	0441.1690	Transmission oil sensor
PS	2	0.012.8672.4/10		Configuration connector (Powershuttle)
PTO AUTO	28	0.012.8732.4/40	0441.1496.4	PTO AUTO switch
PTO SEN	3	0.012.8672.4/10	0443.8352	Rear PTO speed sensor
PTODX	3	0442.9835	0441.1533	RH rear PTO control button (on fender)
PTOSX	3	0442.9835		Not utilised
RADAR	13	0.012.8672.4/10	0443.8654	Radar
			0443.8655	Radar (UK)
REAR WIPER	28	0.012.8732.4/40	0441.9283	Rear screen wiper switch
RIGHT DRAFT	13	0.012.8672.4/10	0441.5586.4	Rear lift draft sensor (Right)
RL21		0443.7851		Front upper worklights on cab relay (50S)

Connector	Type	Wiring code	Connection wiring or component code	Component description
RL30		0.010.2562.2		3rd heater fan speed relay
RL31		0.010.2562.2		4th heater fan speed relay
RL32		0.010.2562.2		1st heater fan speed relay
RL40	27	0.013.5915.4/20		Engine starter relay
RL41		0.012.8732.4/40		Preheating warning light ON relay
RL42	2	0.013.5915.4/20	0419.4081	Preheating relay
RL42A		0.013.5915.4/20	0419.4081	Preheating relay
RL42B		0.013.5915.4/20	0419.4081	Preheating relay
RP		0.012.8672.4/10	0441.4105	Rear screen washer pump
S	12	0443.7849	0442.3803	Front axle Down solenoid
ST1	17	0.012.8894.4/30	0443.7488/10	Instrument panel
ST2	21	0.012.8894.4/30	0443.7488/10	Instrument panel
T	12	0.013.5915.4/20	0419.9809	Coolant temperature sensor (for Infocenter)
OC	12	0.012.8672.4/10	0441.6649	Transmission oil temperature sensor
TKAB1	42	0.012.8732.4/40	0.012.8672.4/10	
TKAB2	41	0.012.8732.4/40	0.012.8672.4/10	
TKAB3		0.012.8732.4/40	0443.7846	
UPDX	3	0442.9835	0441.2688	RH rear lift Up pushbutton
UPSX	3	0442.9835	0441.2688	LH rear lift Up pushbutton
WORK LIGHT	28	0.012.8732.4/40	0441.1496.4	Rear worklights switch
X1		0.012.8732.4/40	0441.9531	Direction indicators flasher unit (Red)
X2		0.012.8732.4/40	0441.9531	Direction indicators flasher unit (black)
X4	12	0.012.8732.4/40		Not utilised
X5	1	0.012.8732.4/40	0.010.2274.1	Driver seat air suspension compressor
X6		0.012.8732.4/40	0439.1395	Handbrake switch
X7	1	0.012.8732.4/40	0441.2338	Cigar lighter
X8		0.012.8732.4/40	0.010.3627.1	Engine ECU circuit board
X9	3	0.012.8732.4/40	0441.1533	Front PTO button (in cab)
X10	3	0.012.8732.4/40	0441.1533	Rear PTO button (in cab)

Connector	Type	Wiring code	Connection wiring or component code	Component description
X11	34	0.012.8732.4/40		Not utilised
X12	1	0.012.8732.4/40	0445.0961.4	Gearshift lever
X13		0.012.8732.4/40	0441.4584	Radar control switch
X14	26	0.012.8732.4/40	0442.9597.4	Lift control panel
X15		0.012.8732.4/40	0114.3529	Auxiliary power socket
X16	1	0.012.8732.4/40		Not utilised
X17	7	0.012.8732.4/40	0441.1512.4	Starter switch
X18	8	0.012.8732.4/40		Diagnostics connector
X19	1	0.012.8732.4/40		Auxiliary power supply connector (in cab)
X20		0.012.8732.4/40	0443.7354.4	
			0443.7505	Engine speed keypad
X21		0443.7354.4	0443.8670.4	Armrest
X22		0.010.2562.2	0.010.2537.0	Lh heater fan
X23		0.010.2562.2	0.010.2535.1	Lh heater fan resistor
X24		0.010.2562.2		Air conditioning control panel illumination connector
X25		0.010.2562.2	0.010.2537.1	Air conditioning thermostat
X26		0.010.2562.2	0.010.2532.0	Air conditioning on/off switch
X27		0.010.2562.2	0.010.2528.1	Fan speed selector switch
X28		0.010.2562.2	0.010.2535.1	Rh heater fan resistor
X29		0.010.2562.2	0.010.2535.0	Rh heater fan
X30	30	0.012.8894.4/30		Not utilised
X31	30	0.012.8894.4/30	2.7099.740.0/10	Accelerator pedal position sensor
X32	36	0.012.8894.4/30	0439.1395	Right brake pedal switch
X33	13	0.012.8894.4/30	0442.4165/10	Clutch pedal depressed proximity sensor
X34	30	0.012.8894.4/30	0443.2708	Clutch pedal position sensor
X35	36	0.012.8894.4/30	0439.1395	Left brake pedal switch
X36		0443.8656	0442.9401	Hazard warning lights on/off switch
X37		0443.8656	0.012.6472.4	Shuttle control lever
X38		0443.7875		Compressed air pressure gauge light
X39		0443.7875	0442.5709	Compressed air pressure gauge
X40		0443.7875	0441.9280.4	Transmission display
X41		0443.7851	0.012.1726.0	Left rear loudspeaker
X42		0443.7851	0441.3192	Rear screen wiper motor
X43		0443.7851	0.012.1726.0	Right rear loudspeaker

Connector	Type	Wiring code	Connection wiring or component code	Component description
X44		0443.7851		CB power connector
X45		0443.7851	0441.4097	Door open warning signal switch
X46		0443.7851	0442.6316	Interior roof light
X47		0443.7851		Rotating beacon
X48	1	0443.7851	0.012.1725.0	Right front loudspeaker
X49	10	0443.7851	0441.2337	Clock
X50	1	0443.7851	0.012.1725.0	Left front loudspeaker
X51	23	0443.7851		Radio (grey)
X52	23	0443.7851		Radio (brown)
X53		0443.7851	0441.2616	Side console courtesy light
X54	2	0443.4993	0445.0666	Upper rear right worklights
X55	2	0443.4993	0445.0666	Upper rear left worklights
X56	2	0443.4993	0445.0666	Upper front left worklight
X57	2	0443.4993	0445.0666	Upper front right worklight
X58	5	0441.2045	0441.3192	Windscreen wiper motor
X59		0441.1923.4	0441.1920.4	Front left sidelight and direction indicator
X60		0441.1923.4	0441.1921.4	Front right sidelight and direction indicator
X61		0442.5602	0442.5599.4	Front left worklight on cab
X62		0442.5602	0442.5599.4	Front right worklight on cab (without front lift)
X63		0441.6727	0441.4087.4	Front left worklight on cab
X64		0441.6727	0441.4087.4	Front right worklight on cab (with front lift)
X65DX		0442.9835		Rear right lower worklights
X65SX		0442.9835		Rear left lower worklights
X66DX		0442.9835	0442.9833.4/30	Rear right sidelight and direction indicator
X66SX		0442.9835	0442.9833.4/30	Rear left sidelight and direction indicator
X67		0441.4114	0441.4115	Number plate light
X68		0443.7849	0442.3803	Front axle suspension load sensing solenoid
X69		0443.7849	0439.1530	Front axle suspension position sensor

Connector	Type	Wiring code	Connection wiring or component code	Component description
X70	39	0.012.8672.4/10	0442.4116	Trailer socket (for lights and auxiliary power)
X71	40	0443.7355.4	0.011.9428.0	Compressed air pressure sensor trailer braking system
		0443.7356.4		
X72	35	0443.7356.4		Solenoid valve for trailer parking brake
X73		0443.7356.4		Trailer braking low pressure switch
X74		0.013.5915.4/20	0442.3185	Compressor and condenser fan pressure switch
X78		0.013.5915.4/20	0425.8670	Preheating device
X79		0.013.5915.4/20		Not utilised
X80	2	0.013.5915.4/20	0441.6066	Start enable switch (Green)
X81		0.013.5915.4/20		Brake fluid level sensor
X82	4	0.013.5915.4/20	0441.5266	Steering angle sensor
X86	37	0.013.5915.4/20	0443.5914.4	Left headlamp
			0443.5913.4	Left headlamp (UK)
X87		0.013.5915.4/20	0116.9304	Horn
X88	37	0.013.5915.4/20	0443.5914.4	Right headlamp
			0443.5913.4	Right headlamp (UK)
Y3		0421.3172	0211.2588	Actuator
		0421.3182		

3. COMPONENTS

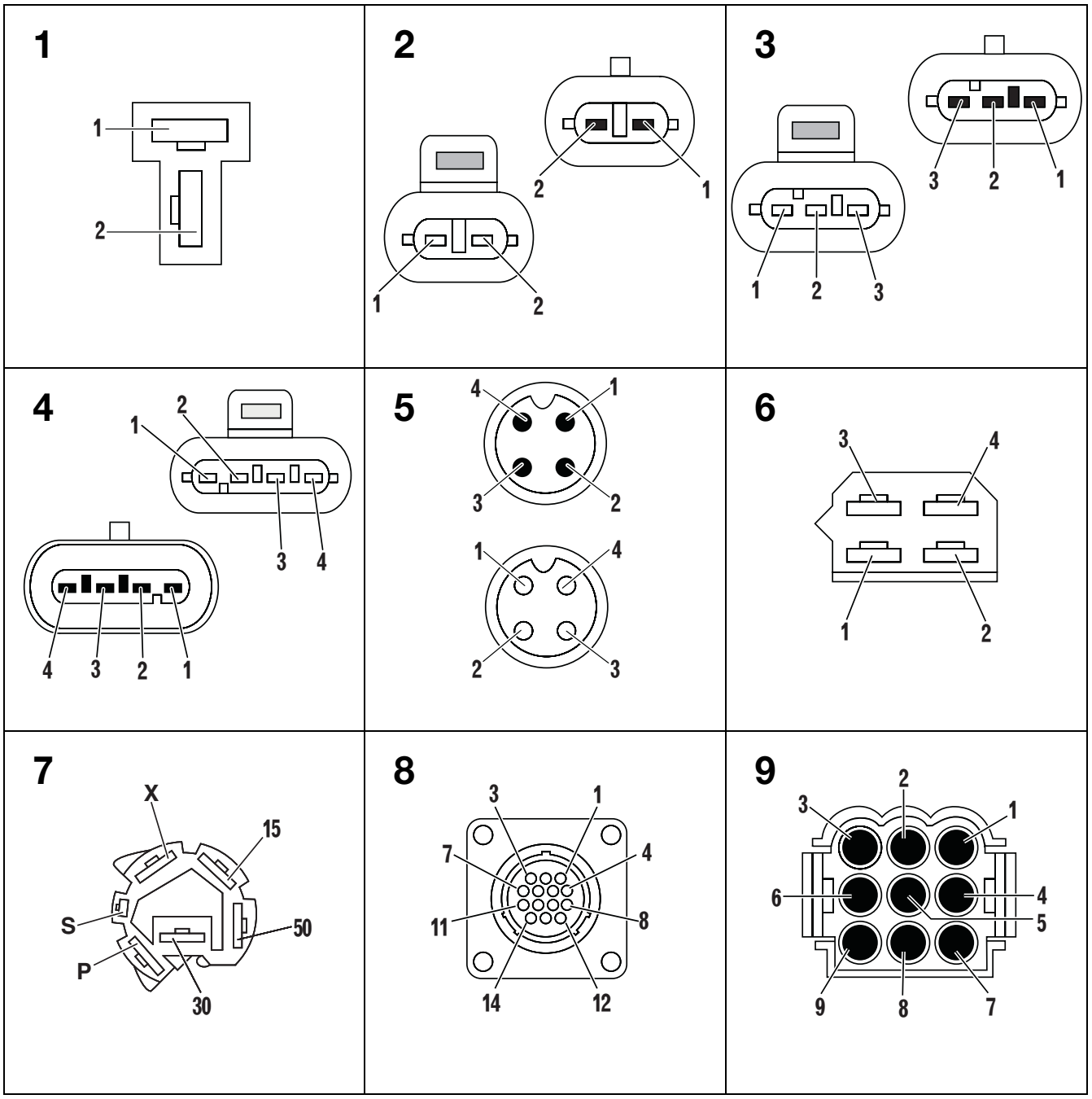
This chapter contains:

1 - Connectors table: the shapes and pinouts of the connectors

2 - Components table: technical and functional description of the components

3 - Pinouts of the electronic control units

3.1 CONNECTOR LAYOUTS



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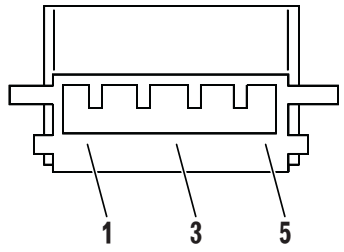

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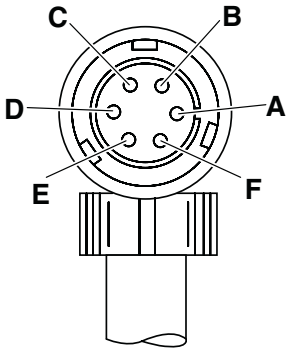

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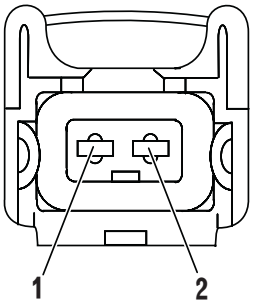

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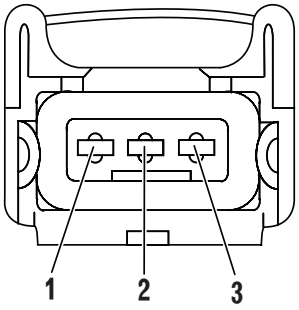

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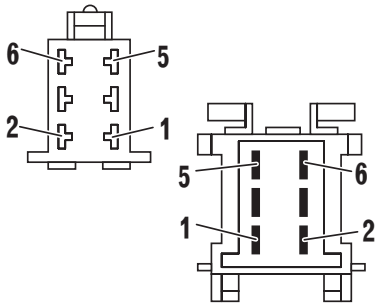

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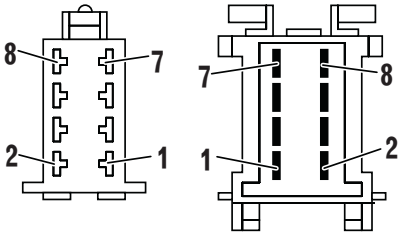

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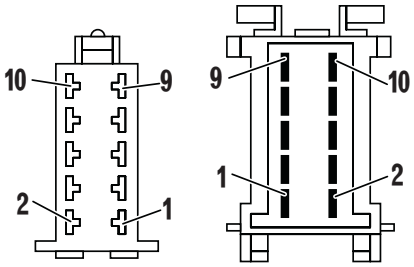

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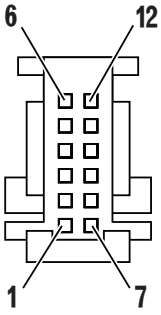

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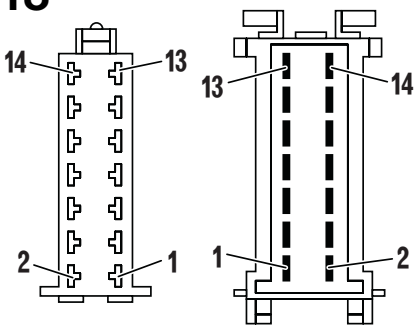

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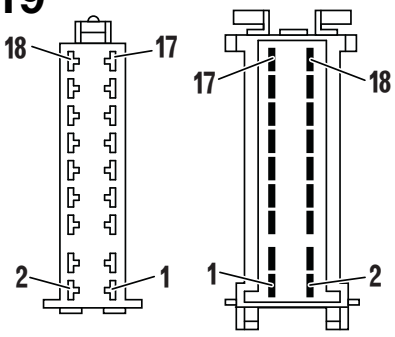

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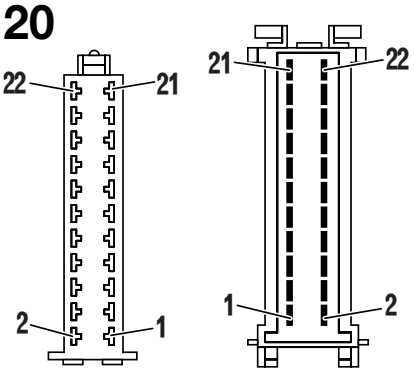

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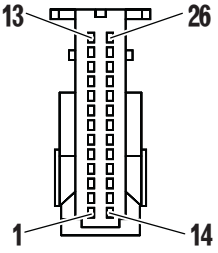

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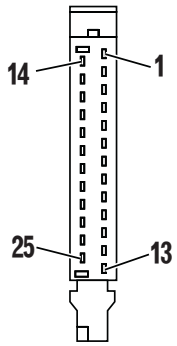

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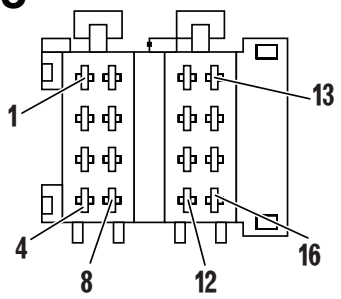

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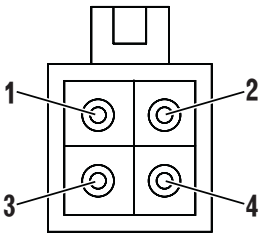

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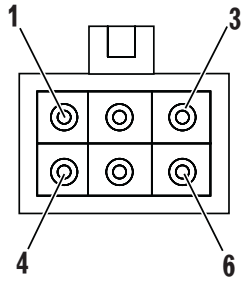

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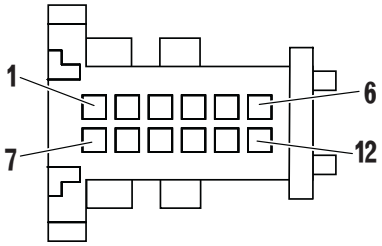

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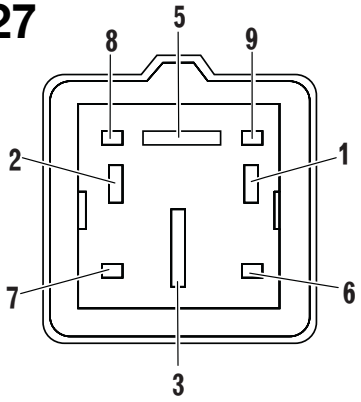

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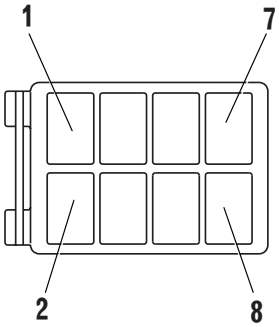

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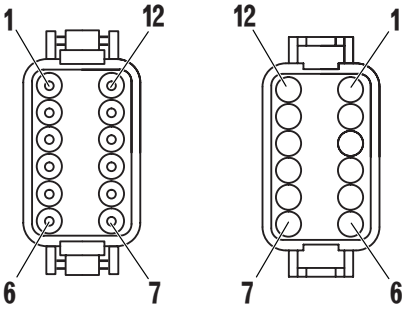

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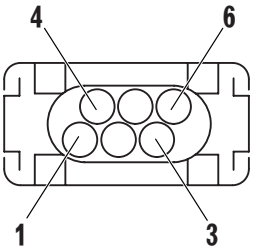

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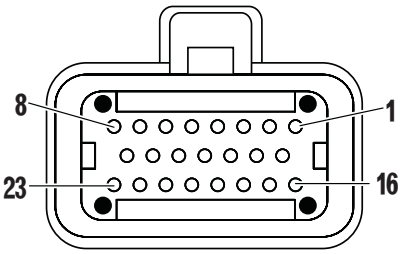

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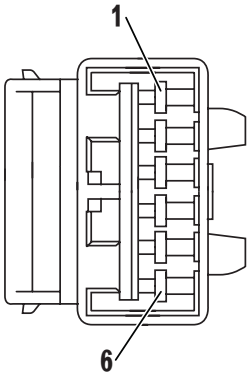

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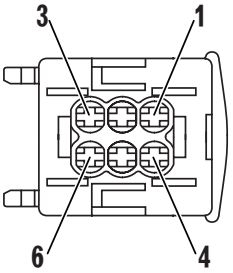

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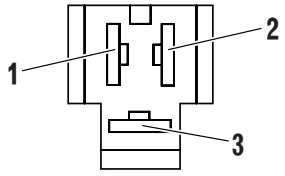

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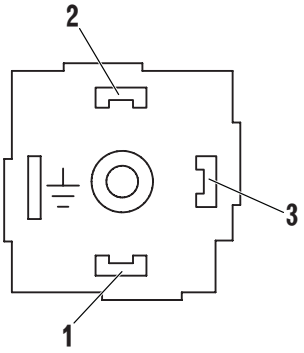

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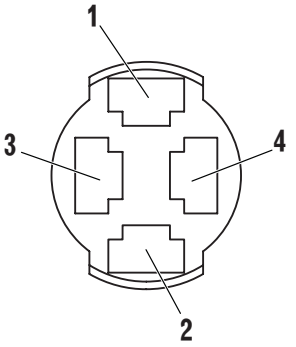

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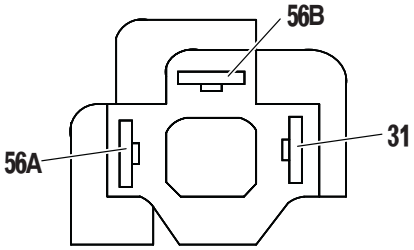

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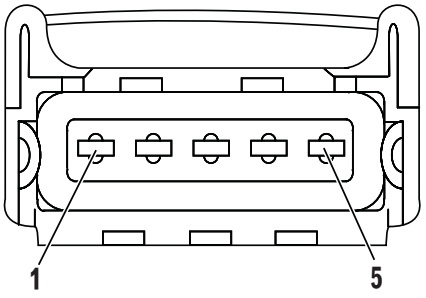

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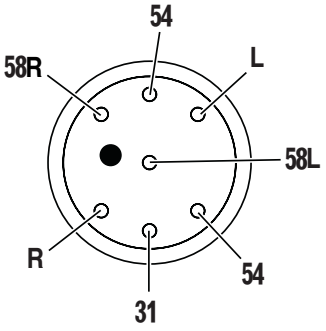

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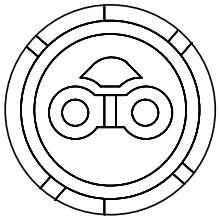

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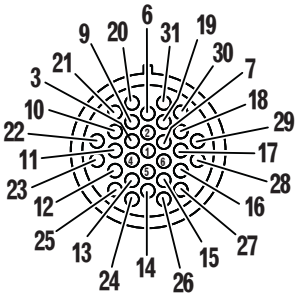

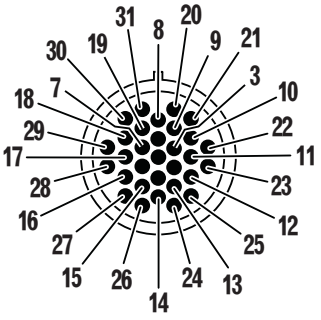

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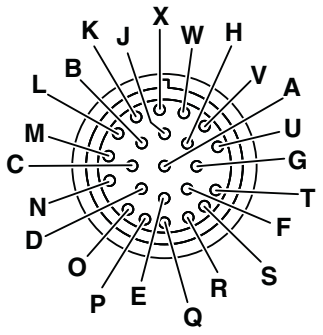

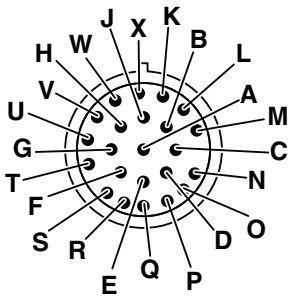

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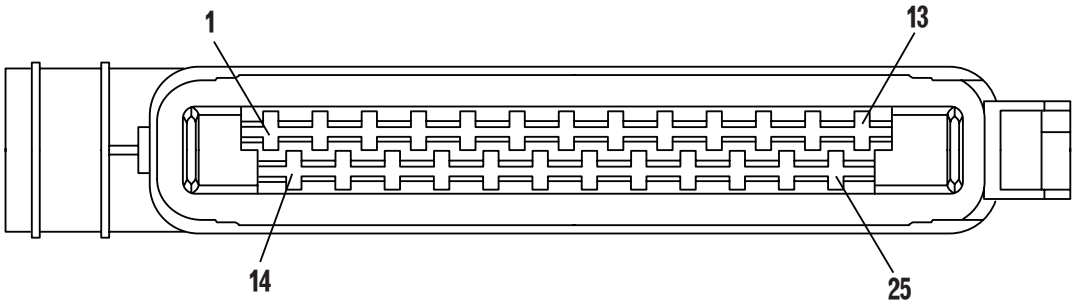

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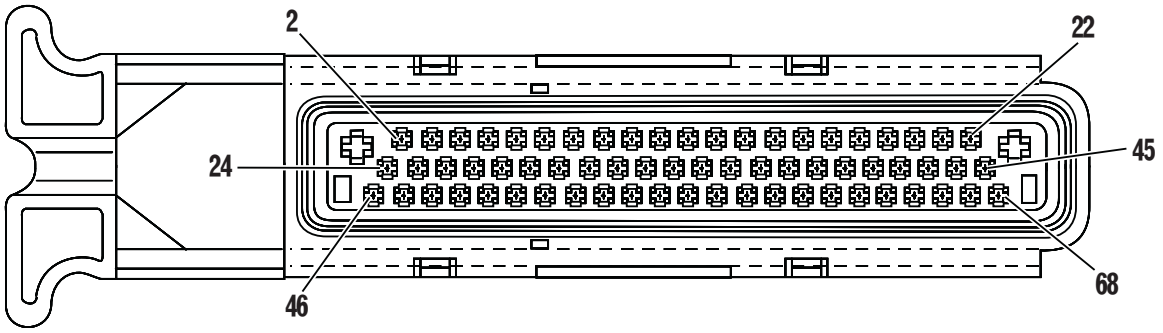
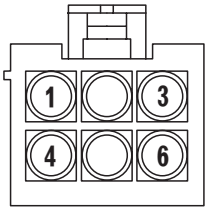
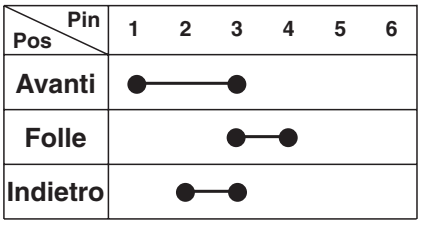
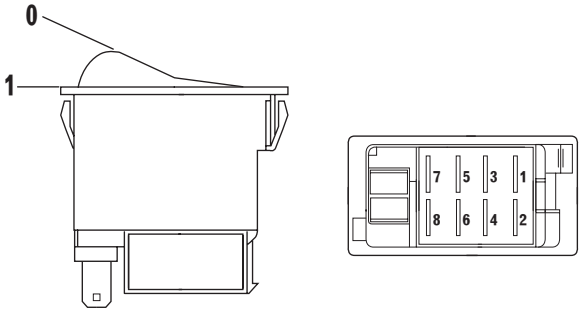
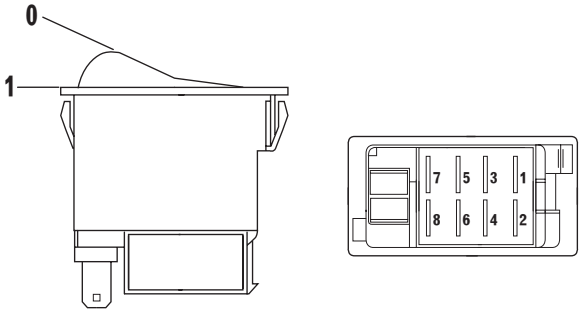
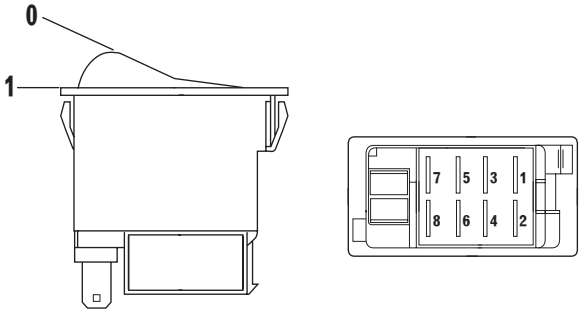


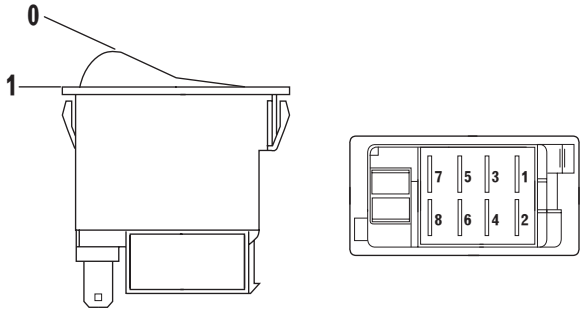
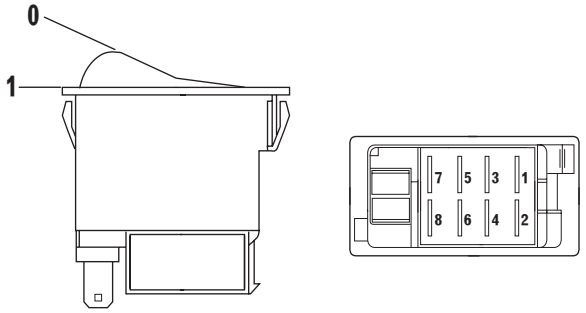
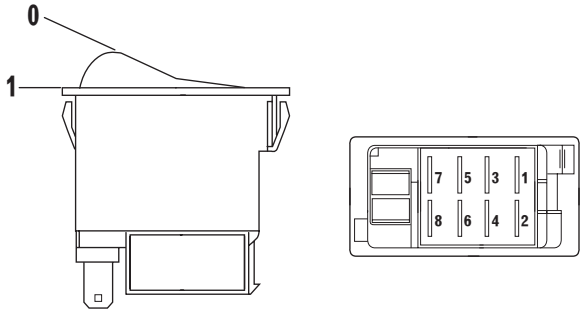
3.2 COMPONENT TECHNICAL DATA

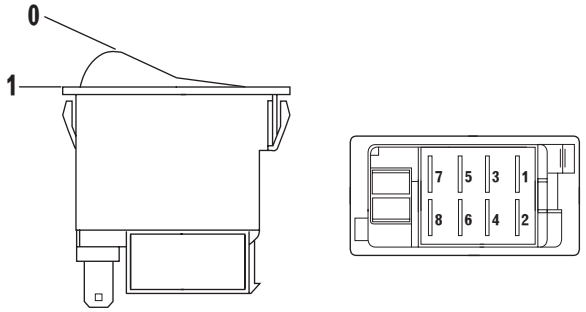
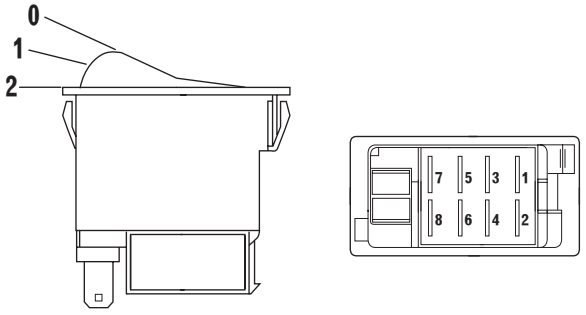
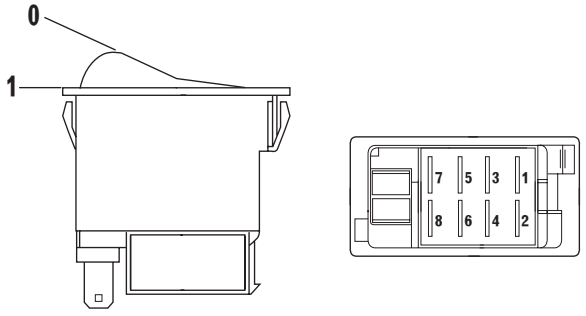
N°	Description	Code	Characteristics	Connector
1	Engine speed sensor	0443.8438	Pin1 = earth Pin2 = square wave signal Pin3 = 12V power High level: 3.5-4.3 V Low level: 0.6-1.2 V	NLSE
2	Trailer braking air pressure sensor	0.011.9428.0	12 Vdc power Resistance at 0 bar 10-13 Ohm Resistance at 6 bar 119-129 Ohm	X71
3	Engine oil pressure switch	0118.2227	Normally closed contact (NC) Operating pressure: 0.5 ± 0.2 bar to 90 ± 5 °C	P
4	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
5	Camshaft speed sensor (Pickup)	0419.9792	Resistance: 336 ± 34 Ohm Inductance: 128.8 ± 13 mH	B40
6	Fuel temperature sensor	0419.9552	Resistance at 21.5 °C: ~2.3 kOhm	B37
7	Engine coolant temperature sensor (for Infocenter)	0419.9809	Resistance at 21.5 °C: ~2.3 kOhm	T
8	Brake pedal switch	0439.1395	Across Pin 1 and Pin 2: Normally closed contact (NC) Resistance with contact closed 3.9 Ohm Across Pin 3 and Pin 4: Normally open contact (NO) Resistance with contact closed 3.9 Ohm	X32 X35
9	Handbrake switch	0439.1395	Across Pin 1 and Pin 2: Normally closed contact (NC) Resistance with contact closed 3.9 Ohm Across Pin 3 and Pin 4: Normally open contact (NO) Resistance with contact closed 3.9 Ohm	X6
10	Front axle suspension position sensor	0439.1530	Pin1 = earth Pin2 = analog signal Pin3 = 8VDC power Output 1.8 +0.1V (Cylinders fully retracted)	X69
11	Rear PTO pushbutton (on fender)	0441.1533	Resistance between pin 1 and pin 2 with switch depressed: ~160 Ohm Diode test between pin 1 (positive) and pin 3 (negative)	PTODX
12	Rear PTO pushbutton (in cab)	0441.1533	Resistance between pin 1 and pin 2 with switch depressed: ~160 Ohm Diode test between pin 1 (positive) and pin 3 (negative)	X10
13	Front PTO pushbutton (in cab)	0441.1533	Resistance between pin 1 and pin 2 with switch depressed: ~160 Ohm Diode test between pin 1 (positive) and pin 3 (negative)	X9
14	Rear lift pushbutton	0441.2688	Normally open contact (NO)	DWDX DWSX UPDX UPDX
15	Lift draft sensor	0441.5586.4	Pin1 = earth Pin2 = analog signal Pin3 = 8V power Signal with no implement hitched: 4V ± 0.2 V	LEFT DRAFT RIGHT DRAFT

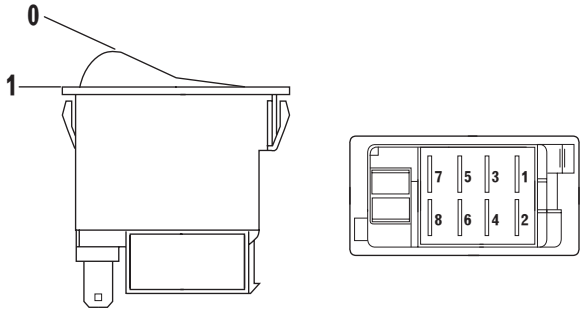
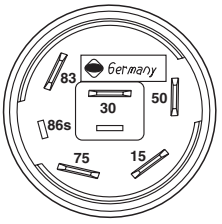
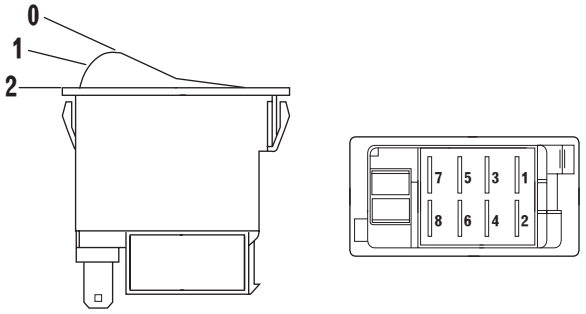
N°	Description	Code	Characteristics	Connector
16	Start enable switch	0441.6066	Normally closed switch (NC) resistance with contact closed 3.9 Ohm Colour: Green	X80
17	Transmission oil temperature sensor	0441.6649	Resistance between pin 1 and pin 2: at 25°C 1000 ±15 Ohm at 100°C 1696 ±35 Ohm at 150°C 2211 ±80 Ohm	TEMP
18	Gearshift solenoid valves (Y1, Y2, Y3, Y4)	0441.6685	Pin1 = earth Pin2 = power Resistance between pin 1 and pin 2: 28 ± 2 Ohm	EVGROUP
19	Clutch pedal depressed proximity sensor	0442.4165/10	Pin1 = earth Pin2 = analog signal: 0 Volt with sensor covered by metal 12 Volt with sensor exposed Pin3 = 12V power	X33
20	Compressed air pressure gauge	0442.5709	Pin G = input from sensor Pin + = 12V power Pin - = earth	X39
21	Four wheel drive (4WD) clutch solenoid valve	0443.1661	Pin1 = earth Pin2 = power Resistance between pin 1 and pin 2: 10 Ohm	EVDT
22	Engine oil low pressure switch	0443.1690	Normally open contact (NO) Operating pressure: 18 bar Colour: red	PRESS SWITCH
23	Accelerator pedal position sensor	2.7099.7400/10	Pin1 = 5.0V DC power Pin2 = earth Pin4 = analog signal Output 0.5V DC (Pedal fully released) Output 4.5V DC (Pedal fully depressed)	X31
24	Clutch pedal position sensor	0443.2708	Pin1 = 5.0V DC power Pin2 = earth Pin4 = analog signal Output 0.5V DC (Pedal fully released) Output 4.5V DC (Pedal fully depressed)	X34
25	Proportional solenoid valve coil	0443.4425	Pin1 = earth Pin2 = power Resistance between pin 1 and pin 2: ~ 5 Ohm	EV PROP
26	Speed sensor for odometer	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
27	Gearbox output shaft speed sensor	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
28	Transmission speed sensor	0.010.3342.2	Pin1 = earth Pin2 = square wave signal Pin3 = 12V power High level: 3.5-4.3 V Low level: 0.6-1.2 V	NHK

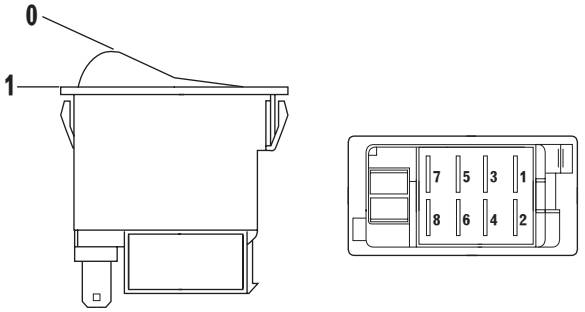
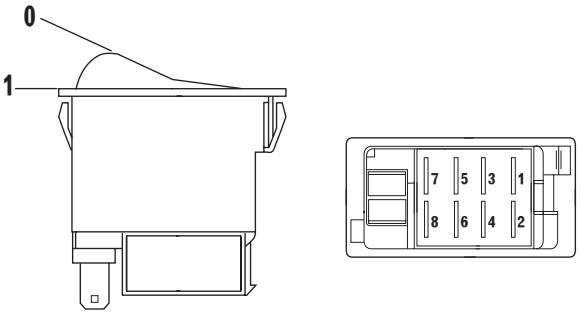
<table>
<tr><th>N°</th><th>Description</th><th>Code</th><th>Characteristics</th><th>Connector</th></tr>
<tr><td>29</td><td>Radar Italy</td><td>0443.8654</td><td>Pin 1 = earth
Pin 2 = square wave signal (100 pulses per metre)
Pin 3 = 12 V power supply
With the radar powered up, a variation in voltage should register at pin 2 when a hand is passed over the sensing element
Nominal radar frequency: 24125 GHz ± 25 MHz</td><td>RADAR</td></tr>
<tr><td>30</td><td>Radar (UK)</td><td>0443.8655</td><td>Pin 1 = earth
Pin 2 = square wave signal (100 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 ± 25 MHz</td><td>RADAR</td></tr>
<tr><td>31</td><td>Rear lift position sensor</td><td>0443.8667.0</td><td>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)</td><td>POS SEN</td></tr>
<tr><td>32</td><td>Steering angle sensor</td><td>0441.5266</td><td>Pin1 = signal 1
Pin2 = 8V power
Pin3 = earth
Pin4 = signal 2
<table><tr><td rowspan="2">PIN</td><td colspan="4">Steering angle right</td></tr><tr><td>0°÷15°</td><td>15°÷25°</td><td>25°÷30°</td><td>>30°</td></tr><tr><td>1</td><td>0V</td><td>8V</td><td>8V</td><td>8V</td></tr><tr><td>4</td><td>0V</td><td>0V</td><td>8V</td><td>8V</td></tr></table><table><tr><td rowspan="2">PIN</td><td colspan="4">Steering angle left</td></tr><tr><td>0°÷15°</td><td>15°÷25°</td><td>25°÷30°</td><td>>30°</td></tr><tr><td>1</td><td>0V</td><td>8V</td><td>8V</td><td>8V</td></tr><tr><td>4</td><td>0V</td><td>8V</td><td>8V</td><td>0V</td></tr></table></td><td>X82</td></tr>
<tr><td>33</td><td>Shuttle control lever</td><td>0.012.6472.4</td><td> 
 
NOTE: In every position the resistance must be 3.9 Ohm</td><td>X37</td></tr>
</table>

N°	Description	Code	Characteristics	Connector
34	Rear worklights switch	0441.1496.4	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 ● — ●	WORK LIGHT
35	Cab headlights dipped beam switch	0441.1496.4	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 ● — ●	3
36	Lower front worklights (on cab) switch	0441.1496.4	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 ● — ●	3A

N°	Description	Code	Characteristics	Connector
37	50S lights switch	0441.1496.4	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 ● — ●	4
38	4WD switch	0441.1496.4	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 ● — ●	8
39	Rotating beacon on/off switch	0441.1496.4	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 ● — ●	FLASHING LIGHT

N°	Description	Code	Characteristics	Connector
40	PTO AUTO switch	0441.1496.4	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 — — — —	PTO AUTO
41	Sidelights switch	0441.1497	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 — — — 2 — — —	1
42	ASM switch	0441.1498	 Pin / Pos: 1 2 3 4 5 6 7 8 0 — — 1 — — —	6

N°	Description	Code	Characteristics	Connector
43	Differential lock switch	0441.1498	 Pin / Pos: 1 2 3 4 5 6 7 8 0: ● 6 ● 8 ● 5 ● 7 1: ● 2 ● 6 ● 1 ● 5	7
44	Starter switch	0441.1512.4	 Pin / Pos: 30 15 50 75 83 0: ● ● ● ● ● 1: ● ● ● ● ○ 2: ○ ○ ○ ○ ○	X17
45	Rear screen wiper switch	0441.9283	 Pin / Pos: 1 2 3 4 5 6 7 8 0: ○ ○ ○ ○ ● 6 ● 7 ○ 1: ○ 2 ● ○ ● ○ ○ ○ 2: ○ 2 ● ○ ● ○ ○ ○	REAR WIPER

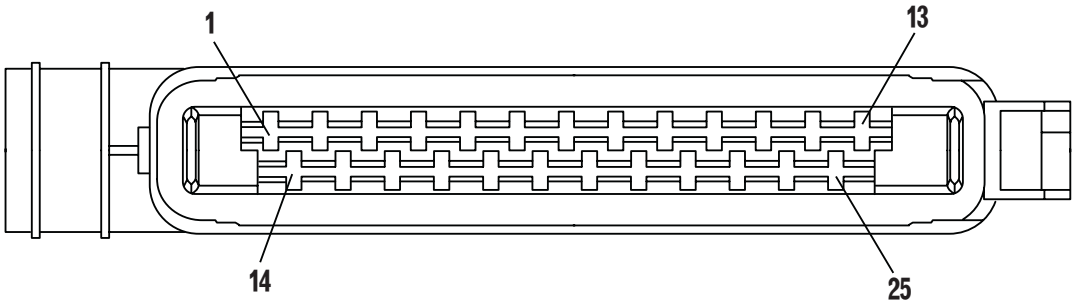
N°	Description	Code	Characteristics	Connector
46	Front suspension pushbutton	0442.2763	 Pin / Pos: 1 2 3 4 5 6 7 8 0 1 — O——O	5
47	Hazard warning lights on/off switch	0442.9401	 Pin / Pos: 1 2 3 4 5 6 7 8 9 10 0 1	X36

N°	Description	Code	Characteristics	Connector
48	Lift control console	0441.9425.4/10	Hand throttle lever (EMR) Pin1 = earth Pin2 = analog signal Pin3 = 8V power Resistance between pin 1 and pin 3: ~ 4.5 kOhm With throttle lever on minimum: - Resistance between pin 2 and pin 3: ~ 3.9 kOhm - Resistance between pin 1 and pin 2: ~ 0.6 kOhm With throttle lever on maximum: - Resistance between pin 2 and pin 3: ~ 0.6 kOhm - Resistance between pin 1 and pin 2: ~ 3.9 kOhm Lift control lever (EHR) Pin1 = earth Pin2 = analog signal Pin3 = 8V power Resistance between pin 1 and pin 3: ~ 5.0 kOhm Lever in “UP” position: - Resistance between pin 2 and pin 3: ~ 1.45 kOhm Lever in “STOP” position: - Resistance between pin 2 and pin 3: ~ 2.6 kOhm Lever in “DOWN” position: - Resistance between pin 2 and pin 3: ~ 3.8 kOhm Lever in “FLOAT” position: - Resistance between pin 2 and pin 3: ~ 4.2 kOhm	EMR EHR
49	Field/road selection solenoid valve (T7100)	0.010.3343.0	Resistance between Pin1 e Pin2: 6,0±0.3 Ohm (a 20°C)	EV F/S
50	Field/road sensor	0441.6157	Normally closed contact (NC)	F/S SWITCH

3.3 PINOUTS AND DESCRIPTIONS OF ELECTRONIC CONTROL UNITS

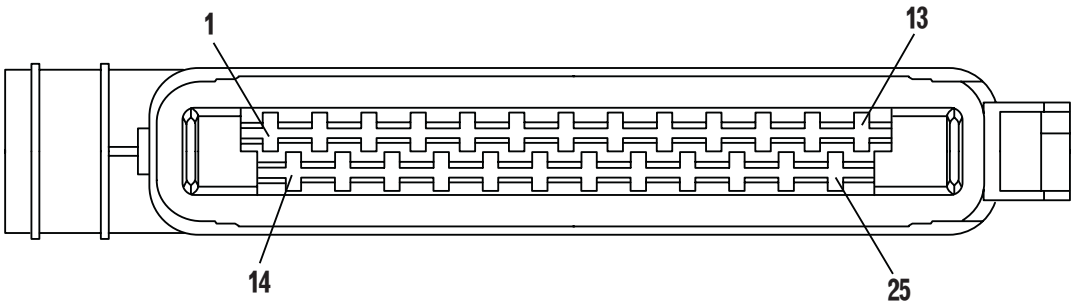
3.3.1 ENGINE CONTROL UNIT (0419.4998)

CONNECTOR MX1



Pin	Volts.	Code	Description
1			Not utilised
2			Not utilised
3			Power, relay power fuse
4			Not utilised
5			Input, fuel temperature signal
6			Not utilised
7			Not utilised
8	0V	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

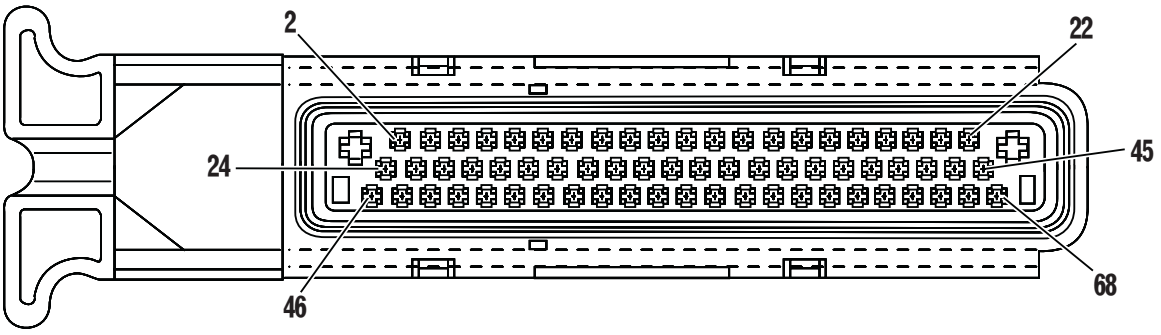
CONNECTOR MX2



Pin	Volts.	Code	Description
1	0V	–31	Battery negative
2	0V	–31	Battery negative
3			Digital output, glowplugs control light
4			Not utilised
5			Not utilised
6			Input, gearbox in neutral
7			Input, wheel speed signal
8			Not utilised
9			Not utilised
10		L	ISO 9141 serial interface (Diagnostics connector)
11		K	ISO 9141 serial interface (Diagnostics connector)
12			Not utilised
13			Not utilised
14	+12V	+15	Battery positive (15+)
15			Engine memory LED
16			Engine speed output
17	0V	GND	Reference voltage for signal on pins 18, 19, 20, 21
18			“MAX” key signal
19			“HOLD” key signal
20			Hand throttle signal
21			“MIN” key signal
22			Not utilised
23	0V	GND	Reference voltage for signal on pin 24
24			Analog input, signal from accelerator pedal sensor (SWG)
25	+5V	+5V REF	5V reference voltage for signal on pin 24

3.3.2 TRANSMISSION CONTROL UNIT (0443.8083/10)

ECU CONNECTOR (PS)

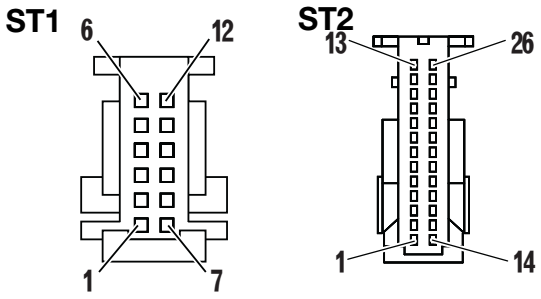


Pin	Volts.	Code	Description
1	0V	VM1	Battery negative
2	0V	VM2	Battery negative
3	0V	VMG1	Reference voltage for signal on pins 16, 17, 40 and 62
4	0V	VMG2	Reference voltage for signal on pin 44
5		ADM4	Output for fault warning light
6			Not utilised
7			Not utilised
8		VPS2	Power (–) common, solenoid valves Y2, Y4
9			Not utilised
10			Not utilised
11		ADM6	Power, solenoid valve Y4
12			Not utilised
13	+12V	VPS1	Power (+), proportional solenoid valve and solenoid valves Y1, Y3
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			Not utilised
19			Not utilised
20		ED3	Analog input, reverse drive control signal
21		ED10	Not utilised
22		ED7	Digital signal, range downshift pushbutton
23		VPE1	Battery positive (+30)
24		VMGA1	Power (-), clutch pedal position sensor and temperature sensor
25			Not utilised
26			Not utilised
27			Not utilised
28			Not utilised

29		ED11	Analog input, low transmission oil pressure signal
30			Not utilised
Pin	**Volts.**	**Code**	**Description**
31		EDM1	Signal, mechanical gearbox neutral
32		AIP3	Power, solenoid valve Y3
33		ADM8	Not utilised
34		ADM7	Not utilised
35			Not utilised
36		SD4	Vehicle speed output
37		AU	Power (+) clutch pedal angular position sensor
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			Not utilised
50		AIP7	Not utilised
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	+12V	ADM5	Power, solenoid valve Y2
58			Not utilised
59			Not utilised
60			Not utilised
61			Not utilised
62		EF4	Digital input, rpm sensor (nHk)
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+)

3.3.3 INFOCENTER (0443.7488/10)



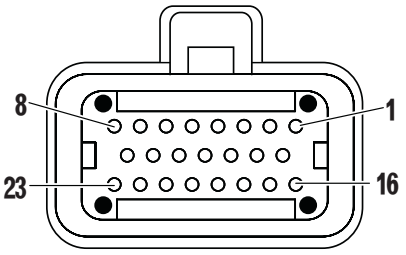
CONNECTOR ST1			
Pin	**Volts.**	**Code**	**Description**
1		TXD	Diagnostics interface transmission
2	+12V	KL15-ST	+15 key
3		KL31	Lamps earth
4	+12V	KL58	+58 lights
5		GROUT	Actual vehicle speed output (radar)
6		RPOUT	Rear PTO speed output
7		GETOEL	Transmission oil pressure
8		HANDBR	Handbrake on and brake fluid warning light
9	0V	KL30-ST	Vehicle earth
10		RXD	Diagnostic interface reception
11		VHOUT	Theoretical vehicle speed output (wheels)
12	0V	KL31E	Electronics earth

CONNECTOR ST2			
Pin	**Volts.**	**Code**	**Description**
1		DIFF	Differential lock indicator light
2		BLINK2	2nd trailer flasher indicator light
3		BLINK1	1st trailer flasher indicator light
4		BLINK	Tractor flasher indicator light
5			SLOW GEAR indicator light
6			HIGH GEAR indicator light
7		LADEK	Battery charge indicator light
8		LUFTF	Air cleaner clogged
9		MOTOEL	Engine oil pressure warning light
10		FRONTZ	Front PTO indicator light
11		HECKZ	Rear PTO indicator light
12		MOTOR	Engine rpm
13		TANK	Fuel gauge
14		ALLRAD	4WD indicator light
15		KUEHLT	Engine coolant temperature

Pin	Volts.	Code	Description
16		FERNL	Main beam indicator light
17			Not utilised
18			Not utilised
19		VORGL	Glowplugs test
20		RPTO	Rear PTO rpm
21		GROUND	Input, actual ground speed (radar)
22		WHEEL	Input, theoretical vehicle speed
23		TRAILER	Input, trailer braking indicator light (Italy)
24			Not utilised
25		EMR	Input, engine indicator light
26			Not utilised

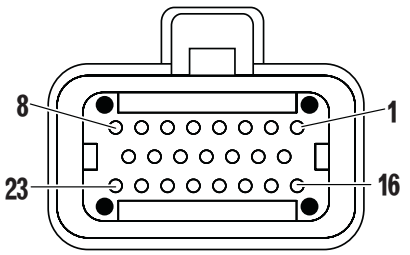
3.3.4 HPSA CONTROL UNIT (2.8519.013.0)

CONNECTOR JX1 (BLACK)



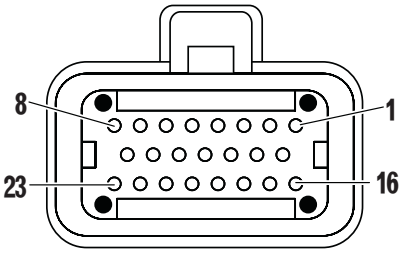
Pin	Volts.	Code	Description
1			Up solenoid valve
2			Down solenoid valve
3	8V		Power input to draft sensors
4	12V		Power input to ECU (F34)
5	12V		Power input to ECU (F34)
6			Control lever: Transport 5.5 V
			Stop: 3.8 V
			Control: 2.1 V
			Float: 1.7 V
7	0.3–8.0V		Depth potentiometer
8	0.3–8.0V		Lowering speed potentiometer
9			Manual UP key
10	0–8.0V		Input, left draft sensor
11			PTO AUTO switch output
12			Not utilised
13			Output, status indicator LED
14	0.3–8.0V		Maximum height potentiometer
15	5.0 V		Power input to position sensor
16			Manual DOWN key
17	0–8.0V		Input, right draft sensor
18	0V		Earth for potentiometer panel
19	0.3–8.0V		Mix potentiometer
20	0V		Control unit earth
21	0V		Sensors earth
22	8V		Power input to panel and lever
23			Lift position sensor: High position: 0.6V (± 0.1V) low position: 4.5V (± 0.1V)

CONNECTOR JX2 (WHITE)



Pin	Volts.	Code	Description
1			Not used
2			Differential output
3			Radar input
4			Not used
5			Not used
6			Not used
7			Not used
8			4WD output
9	8V		External sensor power (ISO4 socket)
10	8V		Steering sensors power
11			ASM AUTO input
12			Wheelslip control input
13			Differential input
14			External sensor input (ISO4 socket)
15			ISO9141 K Line
16			Steering sensor 1 input
17	0V		External sensor earth (ISO4 socket)
18			Steering sensor 2 input
19			Wheel speed input
20			Brakes input
21			Not used
22			ISO9141 L Line
23	0V		Steering sensors earth

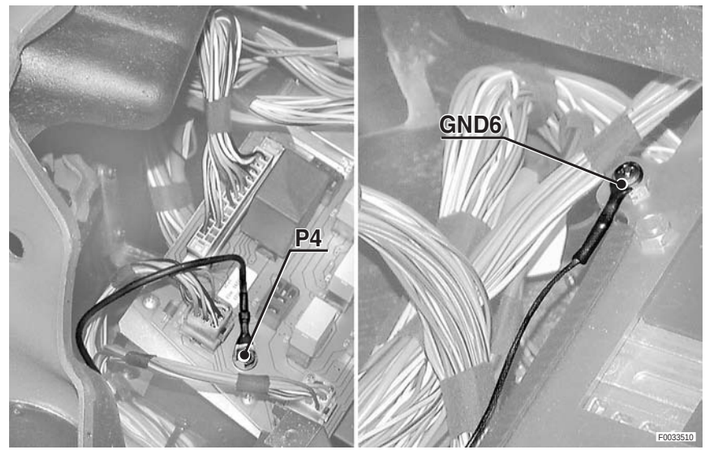
3.3.5 FRONT SUSPENSION CONTROL UNIT (2.8519.008.0/10)

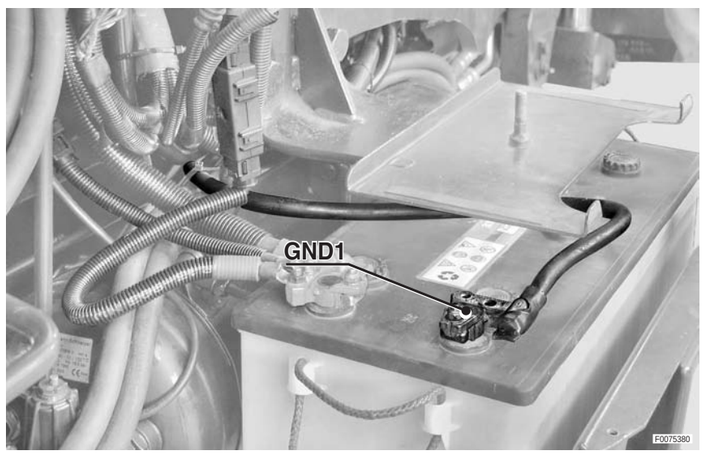


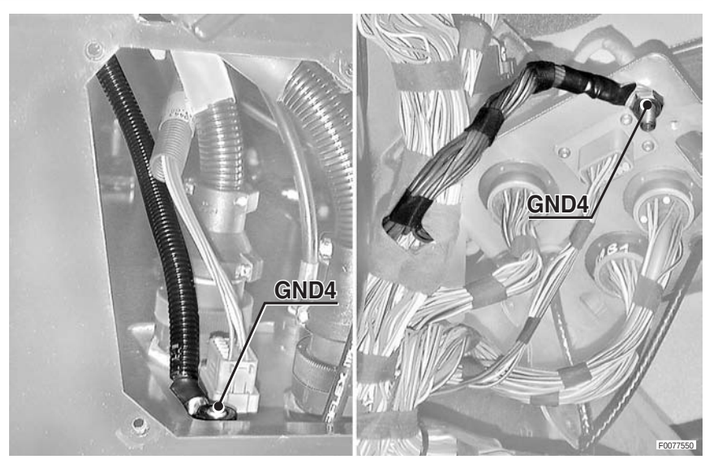
CONNECTOR JX3 (BLACK)			
Pin	**Volts.**	**Code**	**Description**
1			Output, Up solenoid valve
2			Output, Down solenoid valve
3			Not utilised
4	+12 V		+12 V
5	+12 V		+12 V
6–19			Not utilised
20	0V		Control unit earth

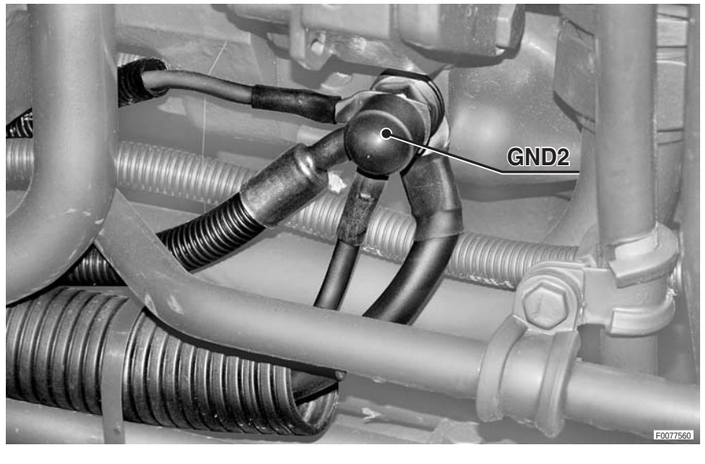
CONNECTOR JX4 (WHITE)			
Pin	**Volts.**	**Code**	**Description**
1			Not utilised
2			Output, load sensing solenoid valve
3–7			Not utilised
8			Control light output
9			Power input to external sensor
10			Not utilised
11			Input, 4WD status
12			Input, control button
13			Input, brakes switches
14			Input, position sensor
15			ISO 9141 K diagnostic line
16			Not utilised
17	0V		Earth for external sensor
18			Not utilised
19			Input, wheel speed
20			Not utilised
21			Not utilised
22			ISO 9141 L diagnostic line
23			Not utilised

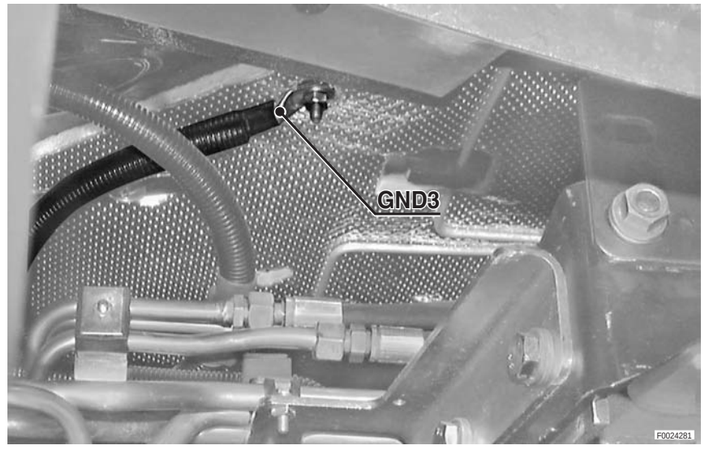
4. SYSTEMS
4.1 GROUND POINTS



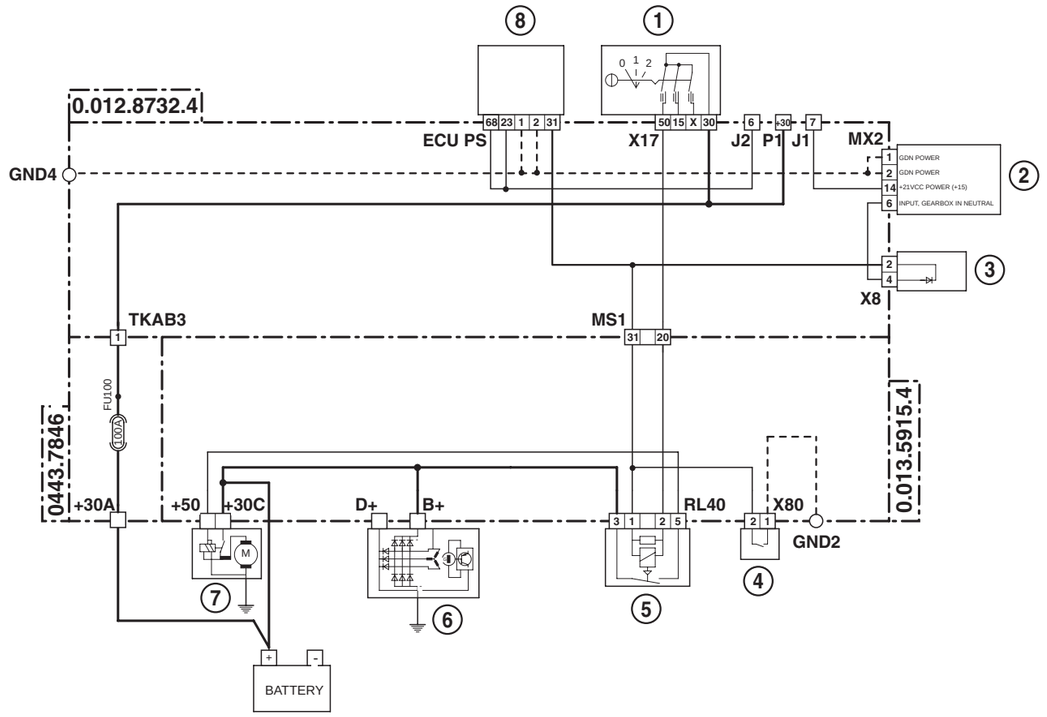






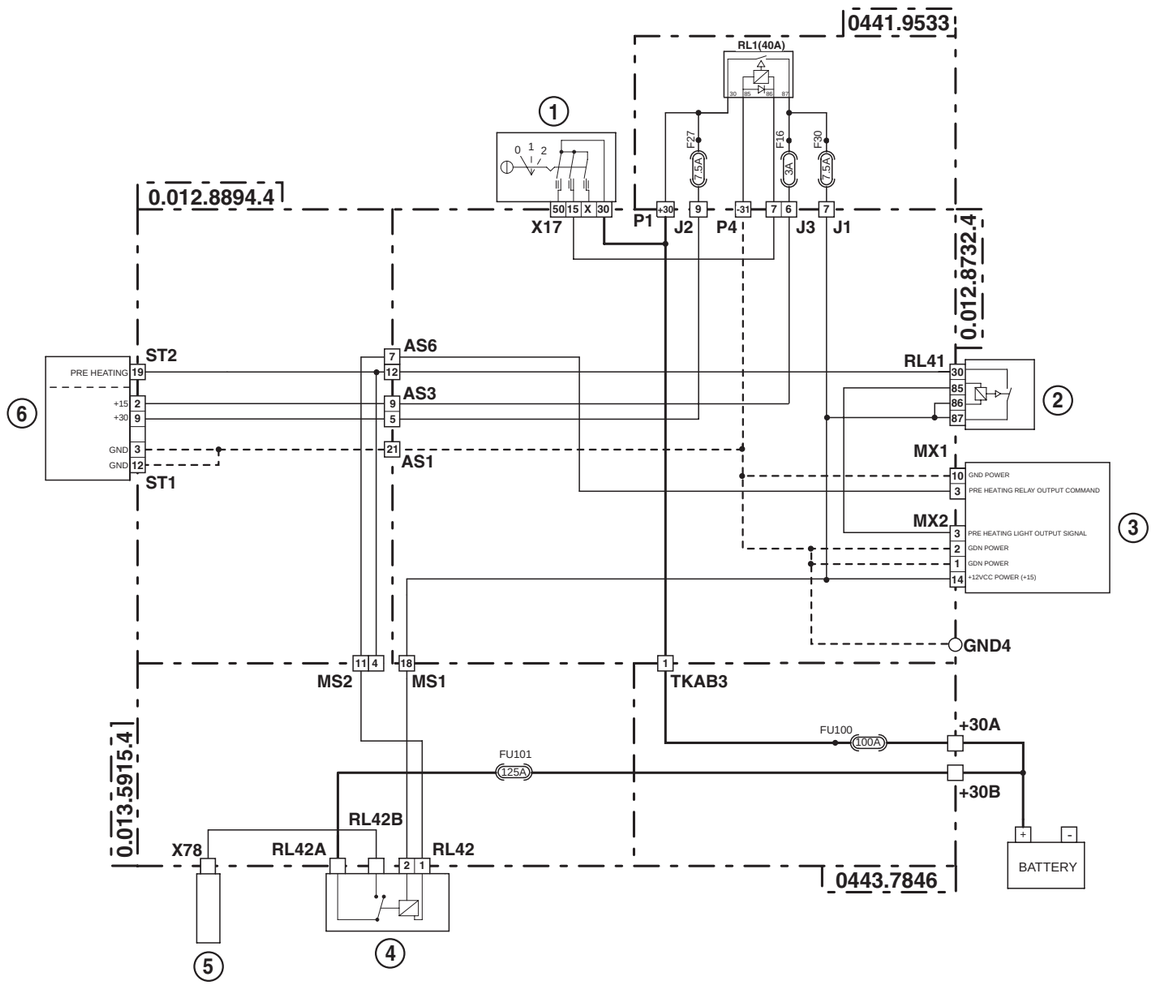


4.2 ENGINE START



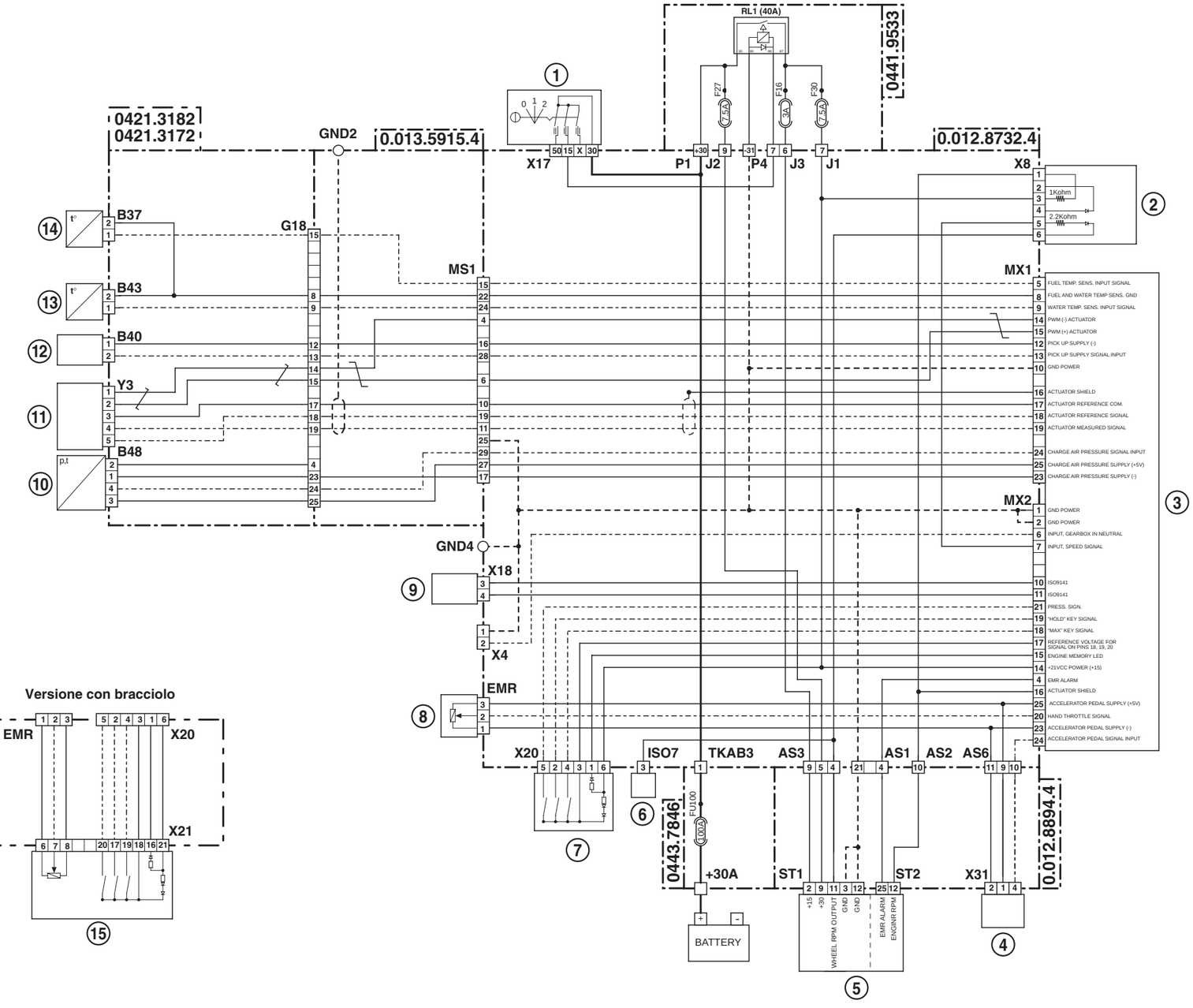
1 Starter switch
2 Engine control unit
3 Engine ECU circuit board
4 Start enable switch
5 Engine starter relay
6 Alternator
7 Starter motor
8 Transmission ECU

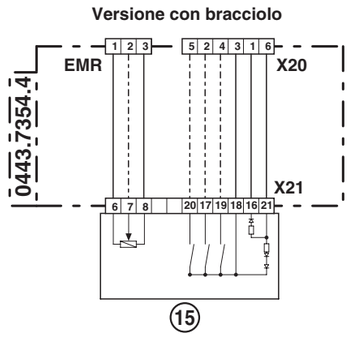
4.3 PREHEATING



1 Starter switch
2 Glowplug warning light ON relay
3 Engine control unit
4 Preheating relay
5 Preheating device
6 Instrument panel

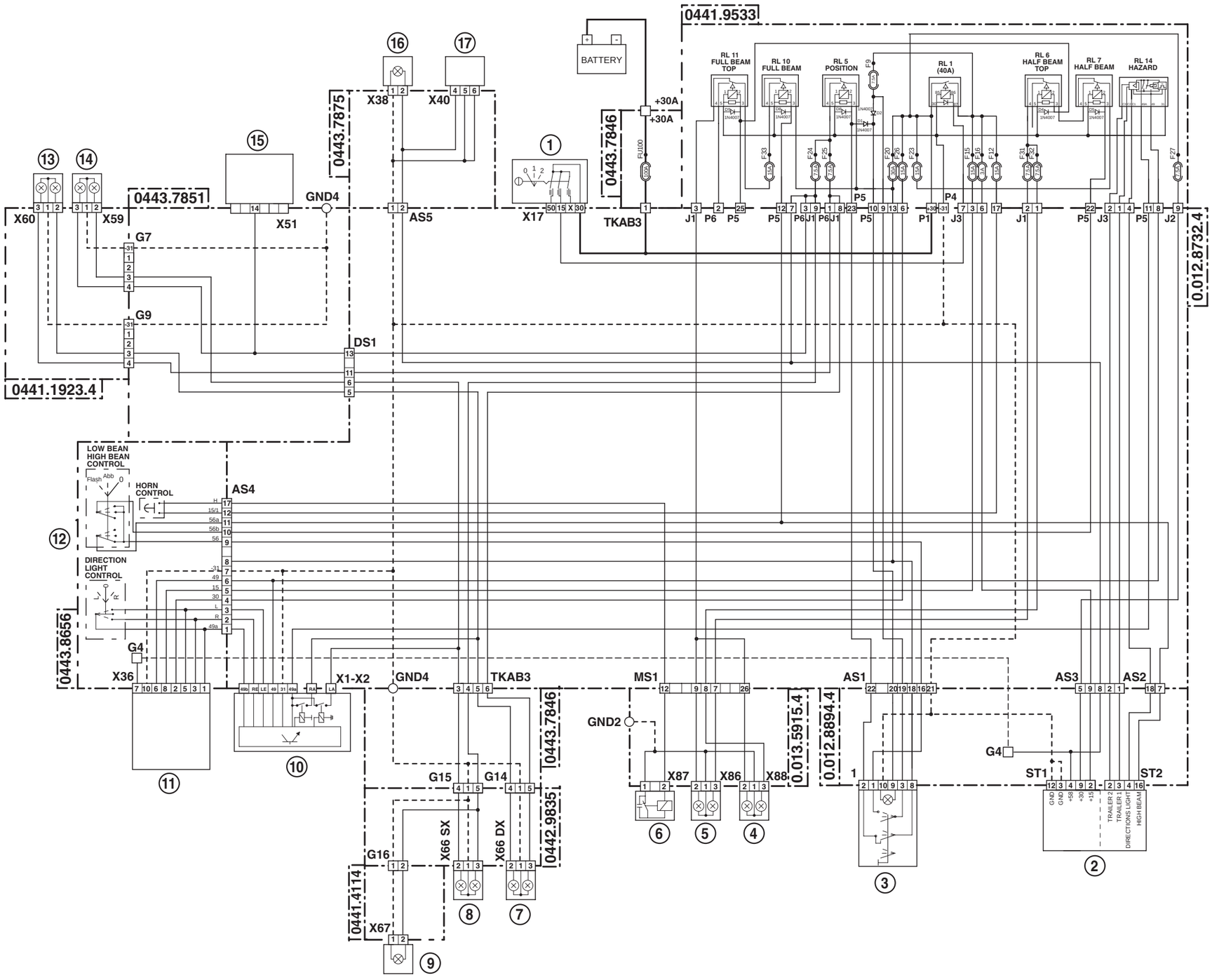
4.4 ELECTRICAL ENGINE CONTROL





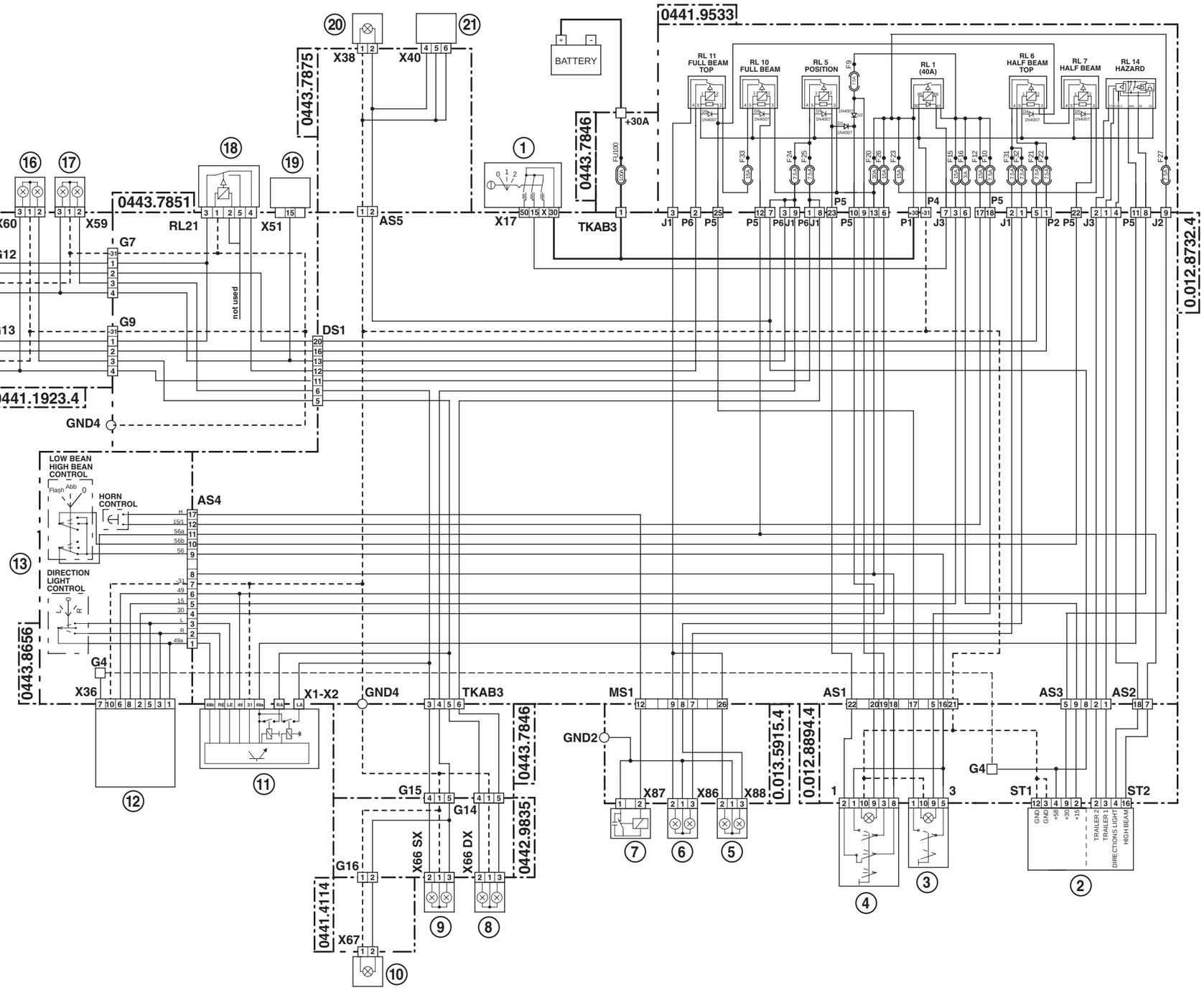
1 Starter switch
2 Engine ECU circuit board
3 Engine control unit
4 Accelerator pedal position sensor
5 Instrument panel
6 ISO7 socket (implement connection)
7 Engine speed keypad
8 Lift and hand throttle console
9 Diagnostics connector
10 Turbo charge pressure sensor
11 Actuator
12 Camshaft speed sensor (Pickup)
13 Engine coolant temperature sensor
14 Fuel temperature sensor
15 Armrest

4.5 LIGHTS - LIGHT SELECTOR SWITCH (MACHINE WITHOUT FRONT LIFT)



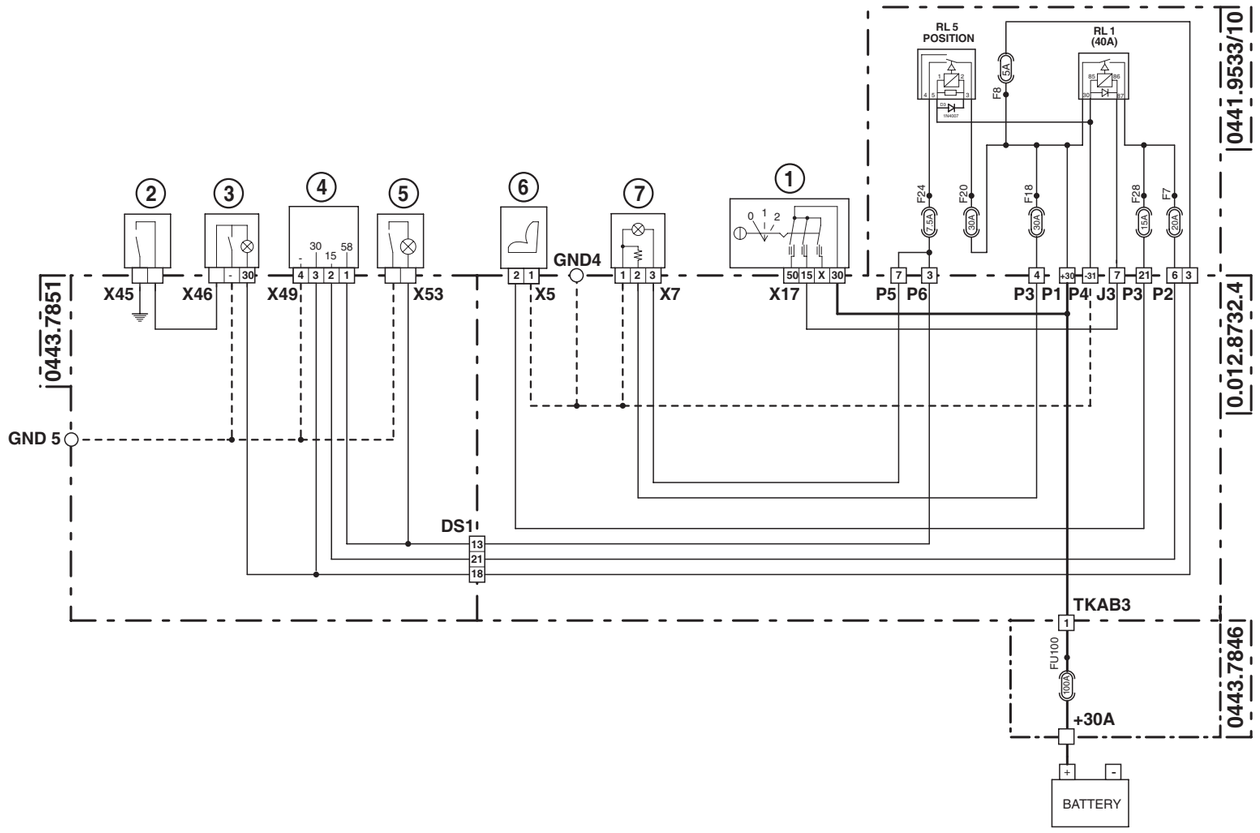
1 Starter switch
2 Instrument panel
3 Sidelights switch
4 Right headlamp
5 Left headlamp
6 Horn
7 Rear right tail light and direction indicator
8 Rear left tail light and direction indicator
9 Number plate light
10 Direction indicators flasher unit
11 Hazard warning lights on/off switch
12 Steering column switch unit
13 Front right sidelight and direction indicator
14 Front left sidelight and direction indicator
15 Radio
16 Compressed air pressure gauge light
17 Transmission display

4.6 LIGHTS - LIGHT SELECTOR SWITCH (MACHINE WITH FRONT LIFT)



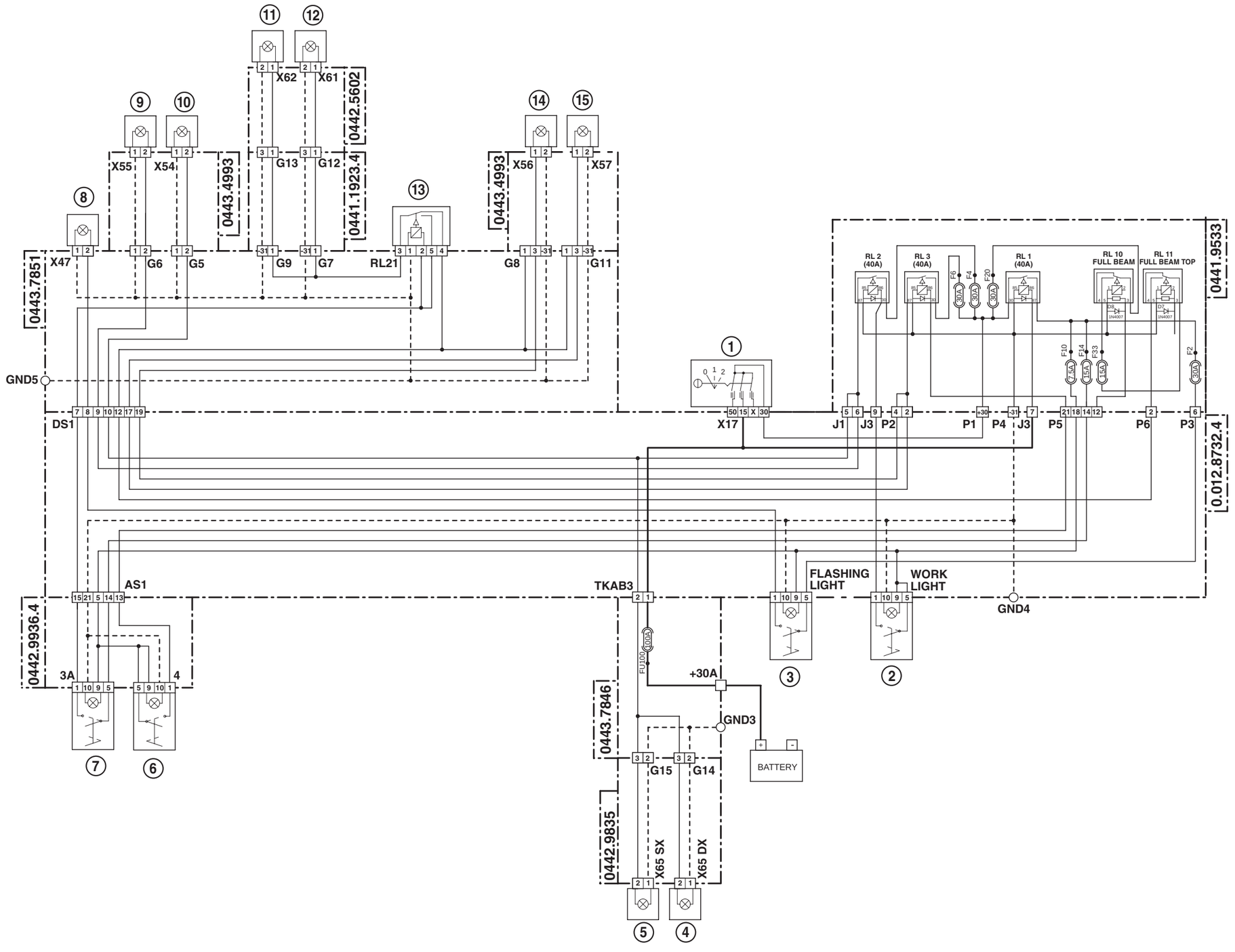
1 Starter switch
2 Instrument panel
3 Cab headlights dipped beam switch
4 Sidelights switch
5 Right headlamp
6 Left headlamp
7 Horn
8 Rear right tail light and direction indicator
9 Rear left tail light and direction indicator
10 Number plate light
11 Direction indicators flasher unit
12 Hazard warning lights on/off switch
13 Steering column switch unit
14 Front right worklight on cab
15 Front left worklight on cab
16 Front right sidelight and direction indicator
17 Front left sidelight and direction indicator
18 Front upper cab (50S) worklights relay
19 Radio
20 Compressed air pressure gauge light
21 Transmission display

4.7 CAB ACCESSORY



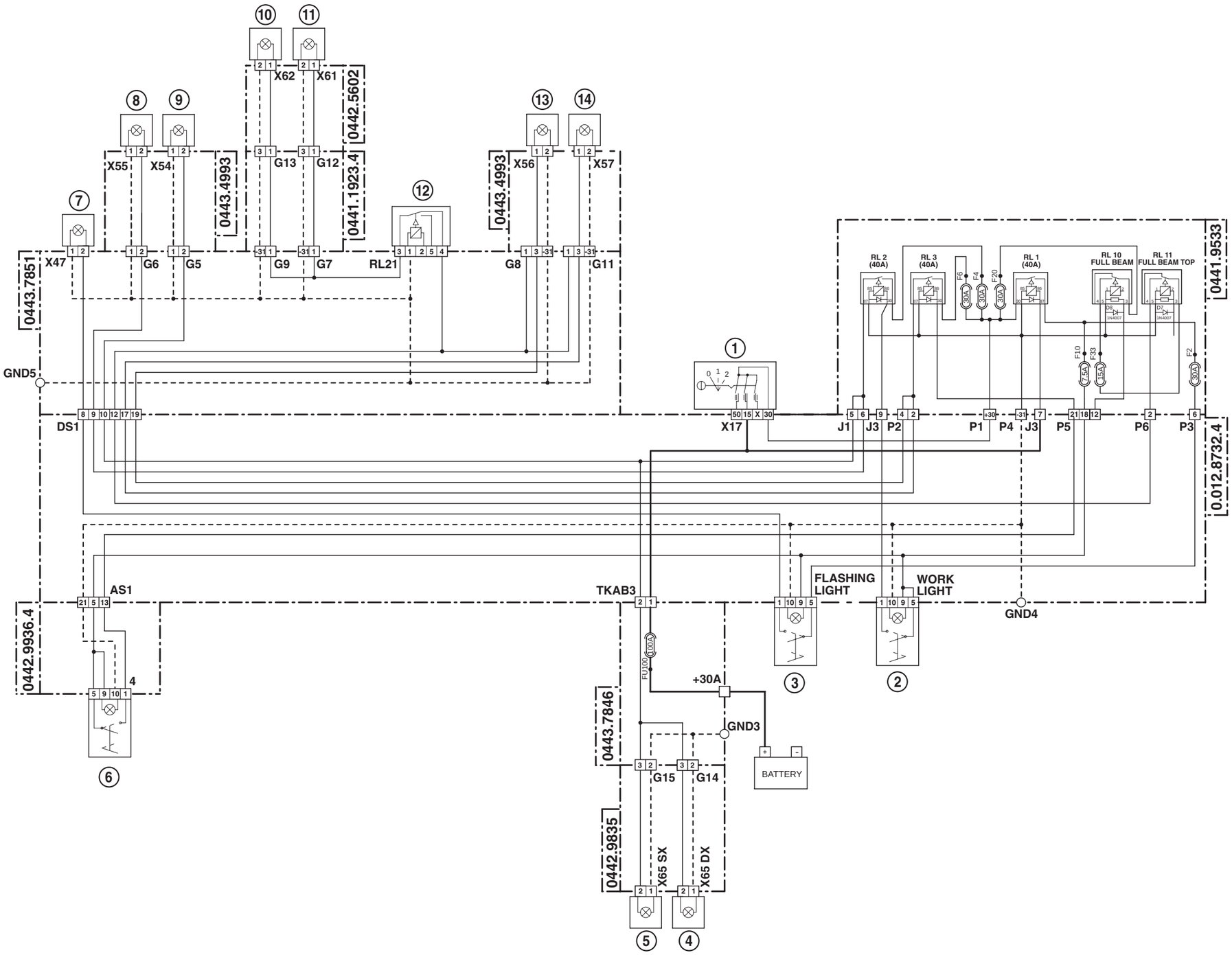
1 Starter switch
2 Door open warning signal switch
3 Interior roof light
4 Clock
5 Side console courtesy light
6 Driver seat air suspension compressor
7 Cigar lighteri

4.8 WORKING LIGHTS (MACHINE WITHOUT FRONT LIFT)



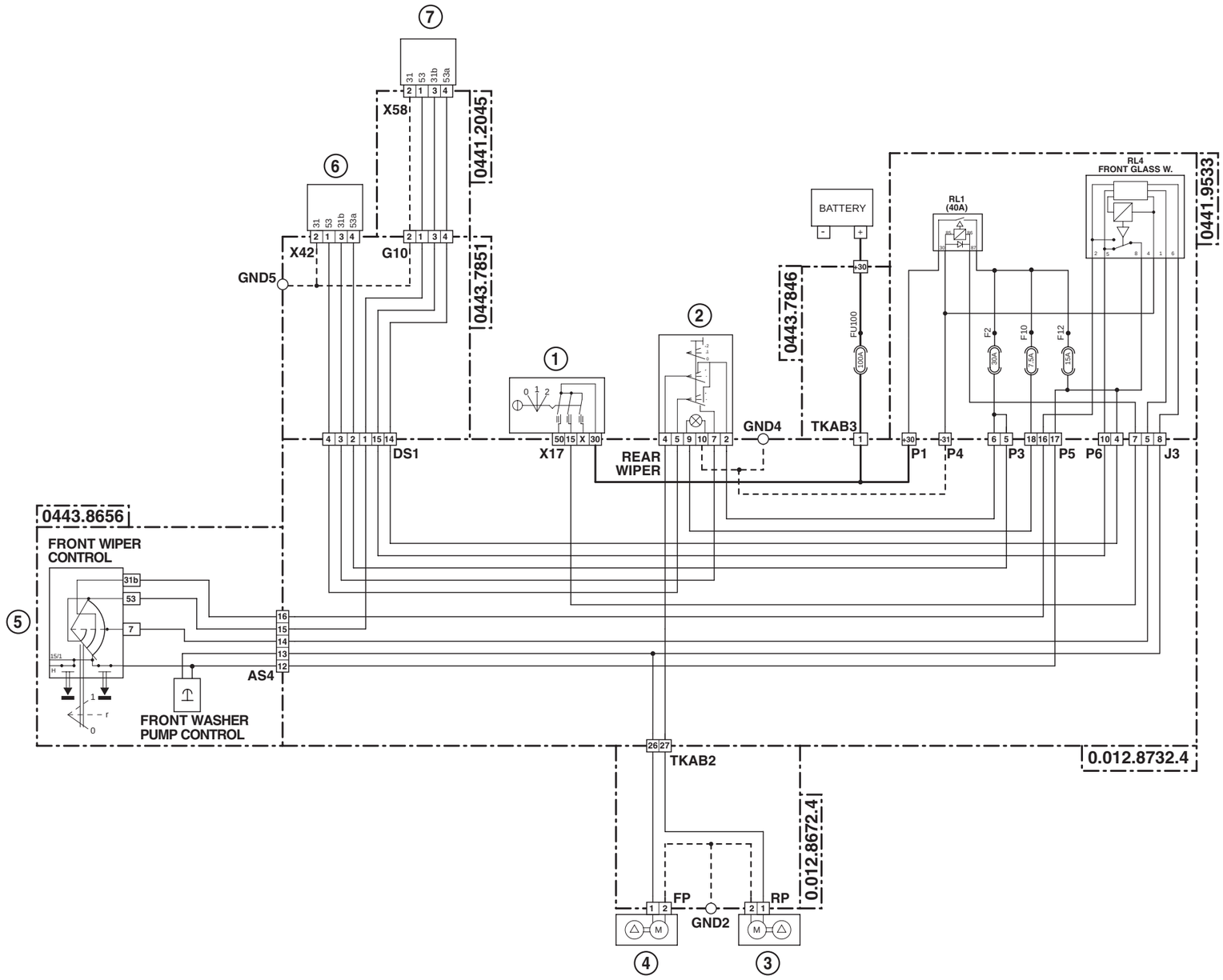
1 Starter switch
2 Rear worklights switch
3 Rotating beacon on/off switch
4 Lower rear right worklights
5 Lower rear left worklights
6 50S lights switch
7 Lower front worklights (on cab) switch
8 Rotating beacon
9 Upper rear left worklights
10 Upper rear right worklights
11 Front right worklight on cab
12 Front left worklight on cab
13 Front upper cab (50S) worklights relay
14 Upper front left worklight
15 Upper front right worklight

4.9 WORKING LIGHTS (MACHINE WITH FRONT LIFT)



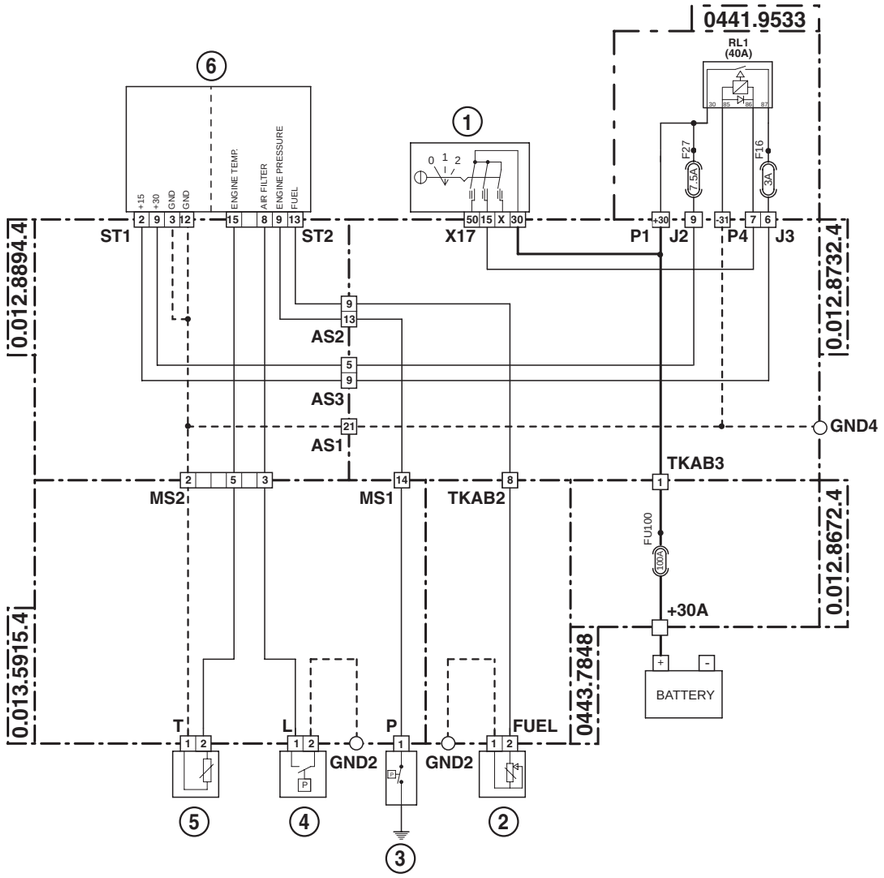
1 Starter switch
2 Rear worklights switch
3 Rotating beacon on/off switch
4 Lower rear right worklights
5 Lower rear left worklights
6 50S lights switch
7 Rotating beacon
8 Upper rear left worklights
9 Upper rear right worklights
10 Front right worklight on cab
11 Front left worklight on cab
12 Front upper cab (50S) worklights relay
13 Upper front left worklight
14 Upper front right worklight

4.10 WINDSCREEN WIPER



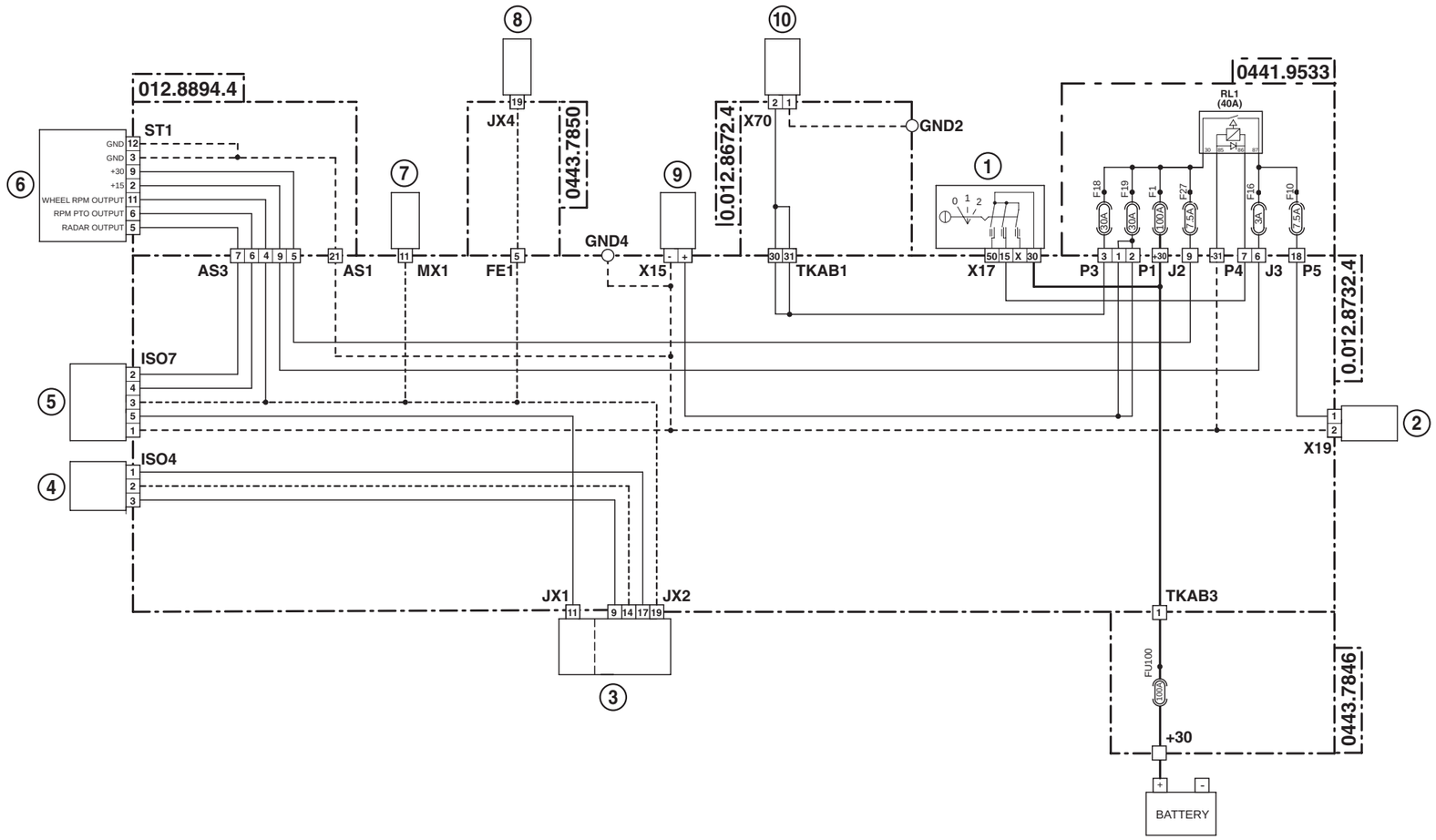
1 Starter switch
2 Rear screen wiper switch
3 Rear screen washer pump
4 Windscreen washer pump
5 Steering column switch unit
6 Rear screen wiper motor
7 Windscreen wiper motor

4.11 INFOCENTER



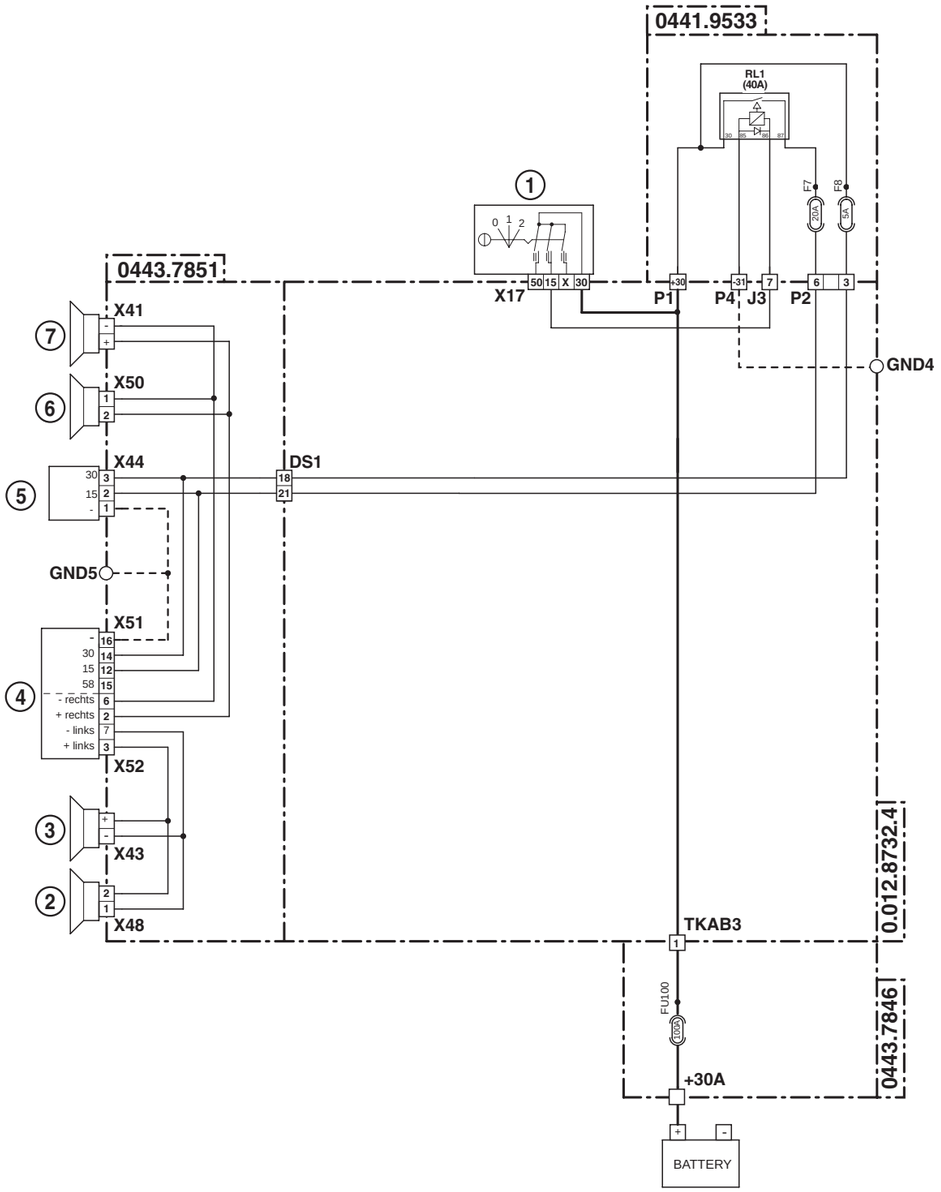
1 Starter switch
2 Fuel level sensor
3 Engine oil pressure switch
4 Air cleaner clogged sensor
5 Engine coolant temperature sensor (for Infocenter)
6 Instrument panel

4.12 ELECTRICAL POWER SUPPLY



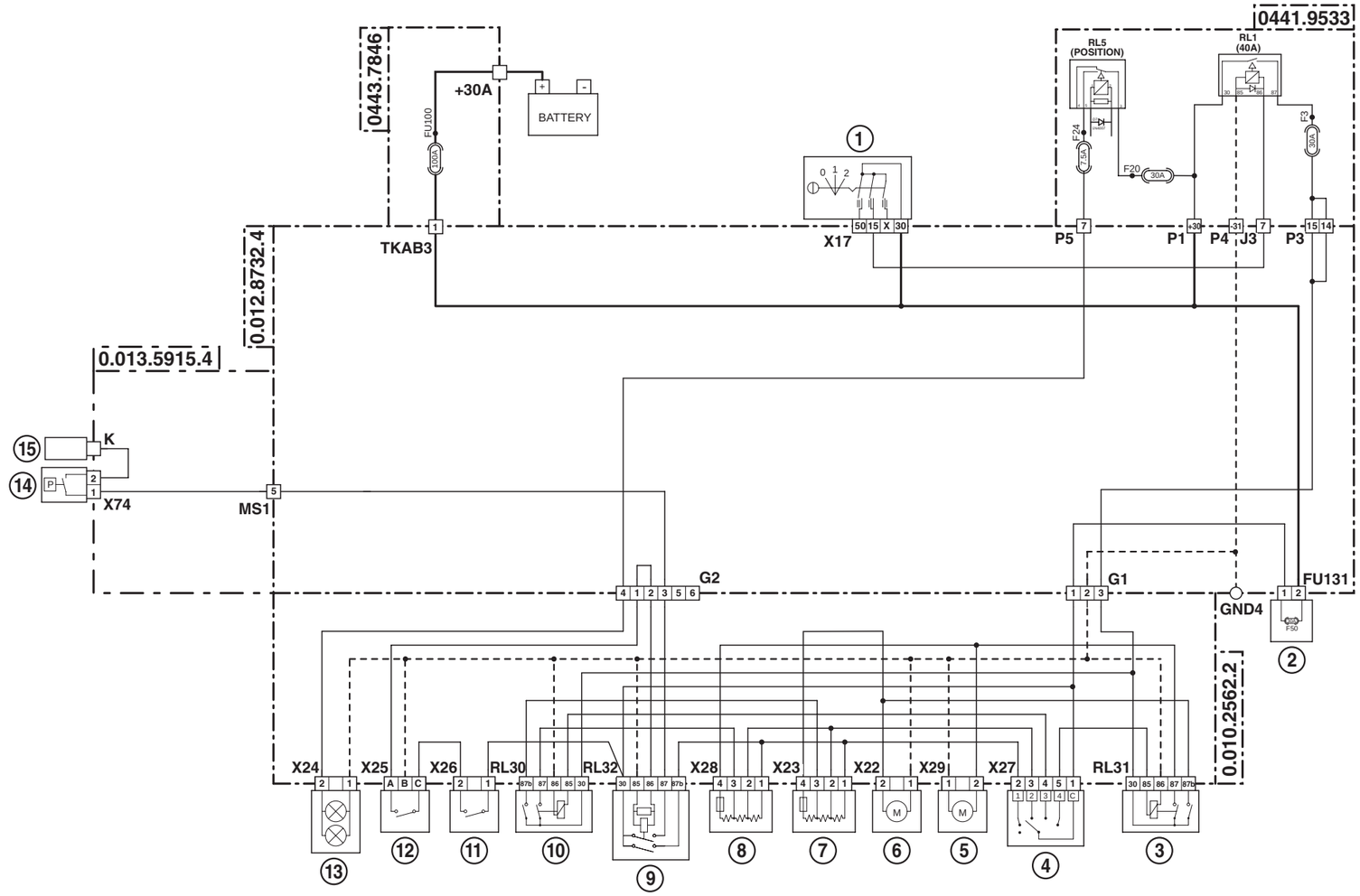
1 Starter switch
2 Auxiliary power supply connector (In cab)
3 Rear lift control unit
4 ISO4 socket (power supply to implements)
5 ISO7 socket (implement connection)
6 Instrument panel
7 Engine control unit
8 Front axle suspension control unit
9 Auxiliary power socket
10 Trailer socket (lights and auxiliary power)

4.13 RADIO - CB



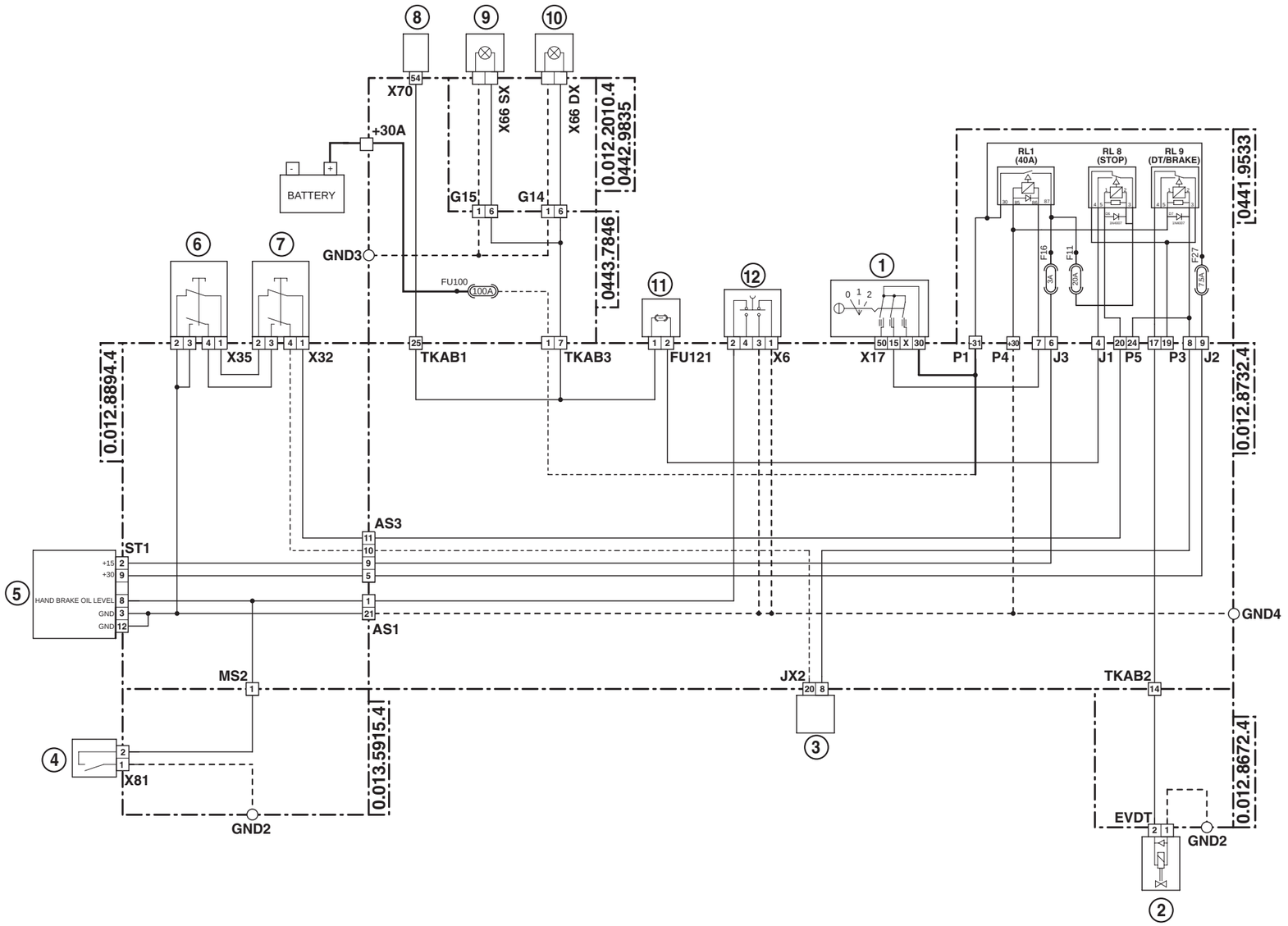
1 Starter switch
2 Right front loudspeaker
3 Right rear loudspeaker
4 Radio
5 CB power connector
6 Left front loudspeaker
7 Left rear loudspeaker

4.14 AIR CONDITIONING - HEATING FAN



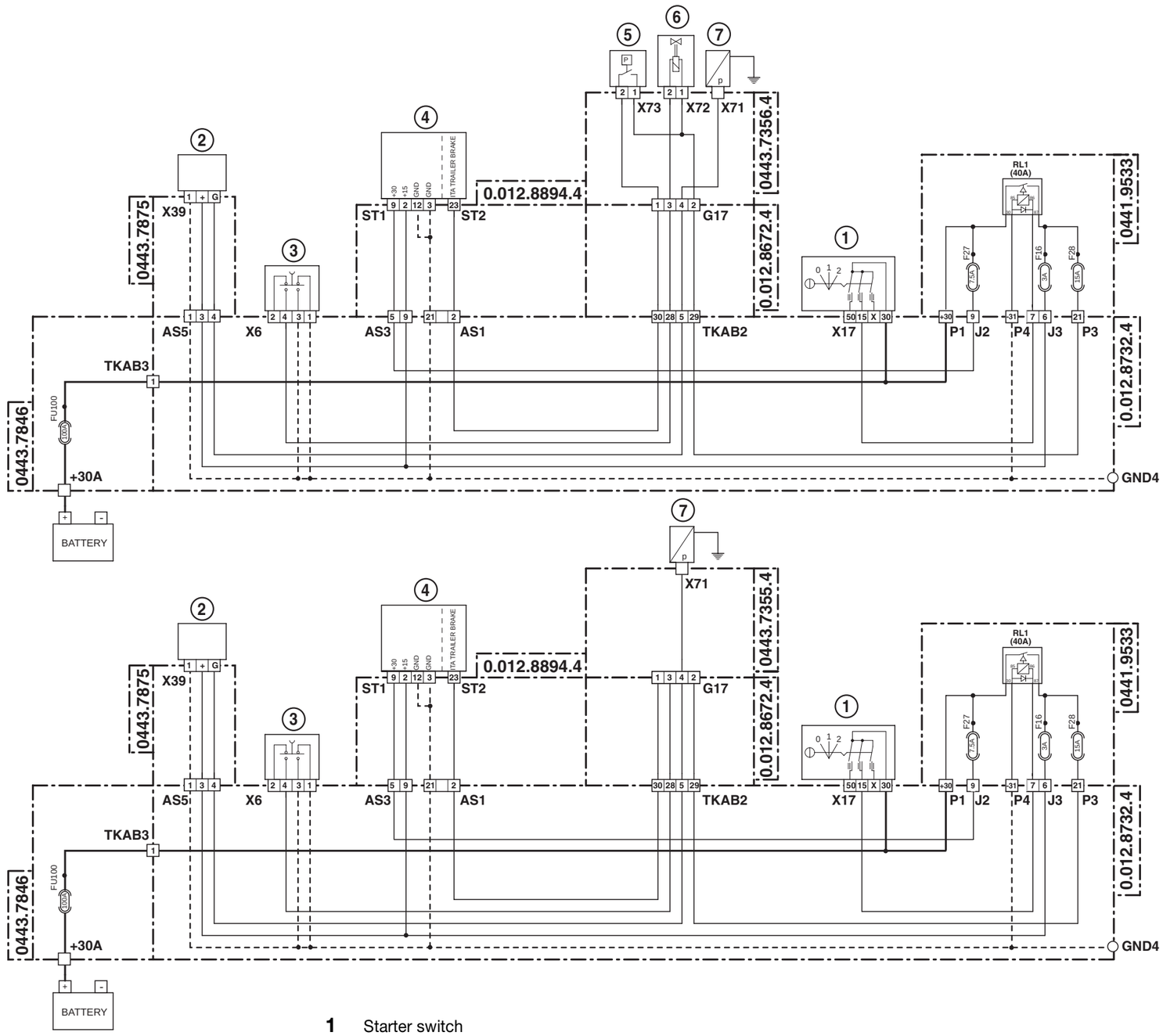
1 Starter switch
2 Main heating fuse
3 Heater fan speed 4 relay
4 Fan speed selector switch
5 Rx heater fan
6 Lx heater fan
7 Lx heater fan resistor
8 Rx heater fan resistor
9 Heater fan speed 1 relay
10 Heater fan speed 3 relay
11 Air conditioning on/off switch
12 Air conditioning thermostat
13 Air conditioning control panel illumination connector
14 Compressor and condenser fan pressure switch
15 Air conditioning compressor

4.15 BRAKES



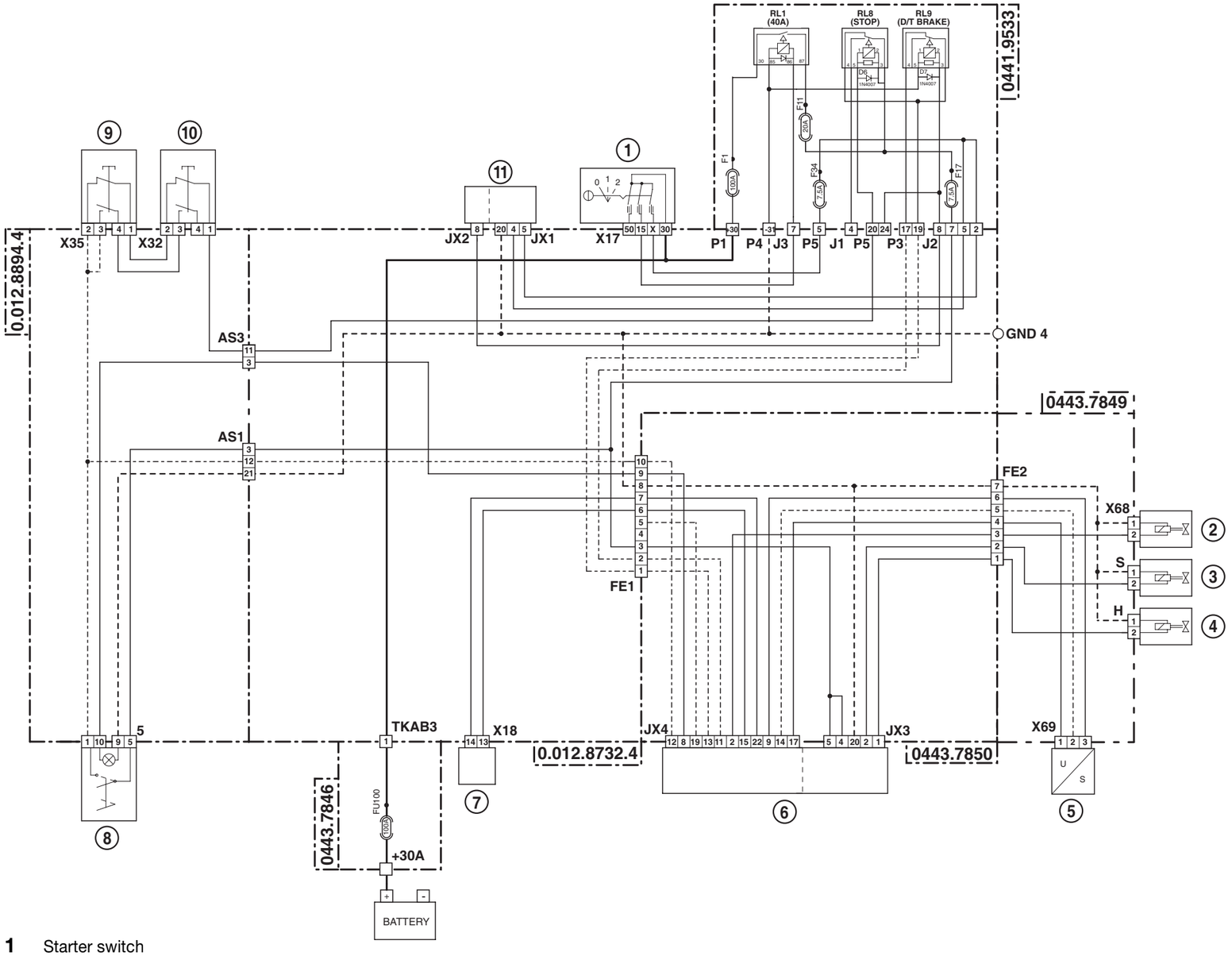
1 Starter switch
2 Four wheel drive (4WD) clutch solenoid valve
3 Rear lift control unit
4 Brake fluid level sensor
5 Instrument panel
6 Brake pedal switch (Left)
7 Brake pedal switch (Right)
8 Trailer socket (lights and auxiliary power)
9 Rear left tail light and direction indicator
10 Rear right tail light and direction indicator
11 Trailer brake lights fuse
12 Handbrake switch

4.16 TRAILER BRAKES



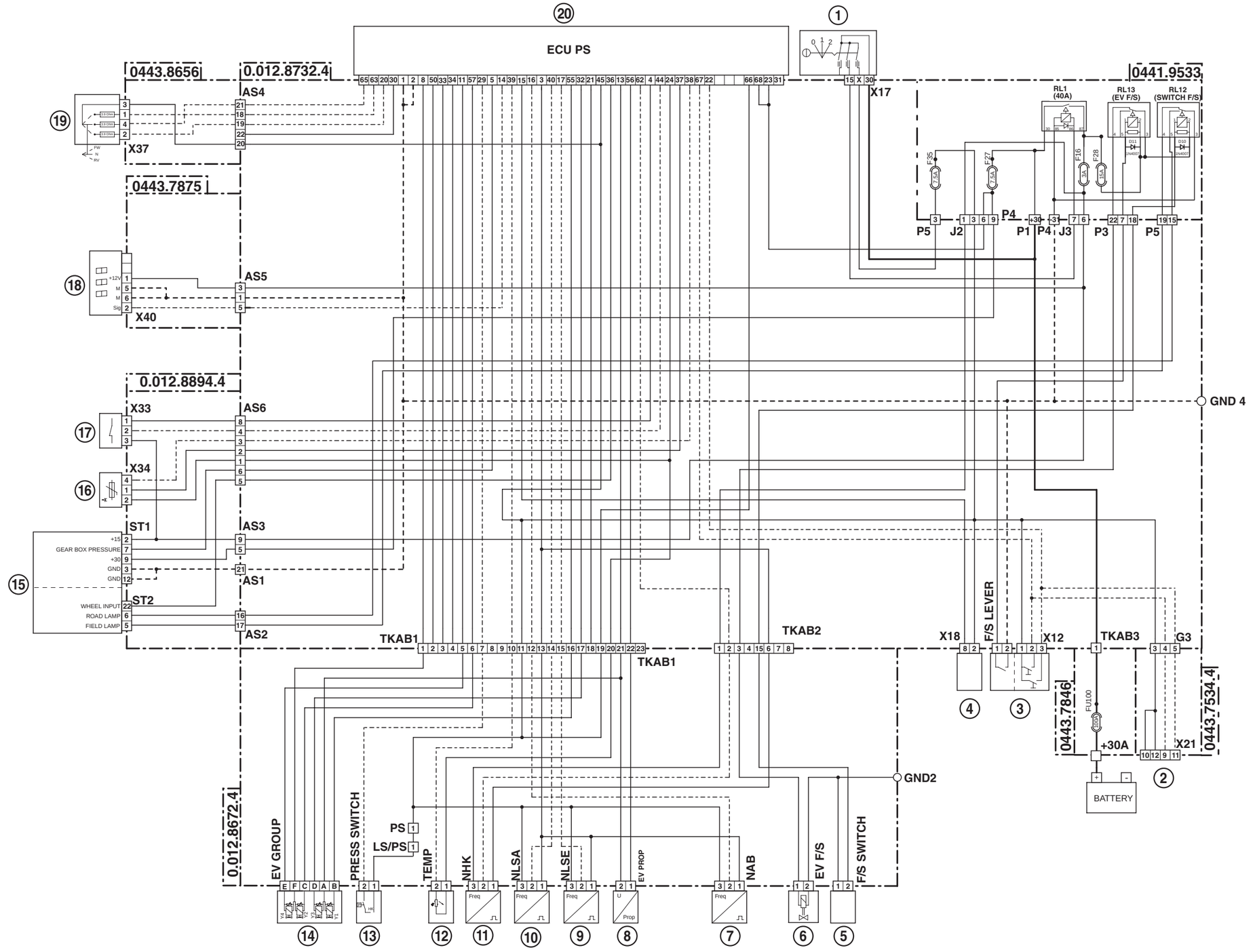
1 Starter switch
2 Compressed air pressure gauge
3 Handbrake switch
4 Instrument panel
5 Trailer braking low pressure switch
6 Trailer parking brake solenoid valve coil
7 Trailer braking air pressure sensor

4.17 FRONT AXLE SUSPENSION



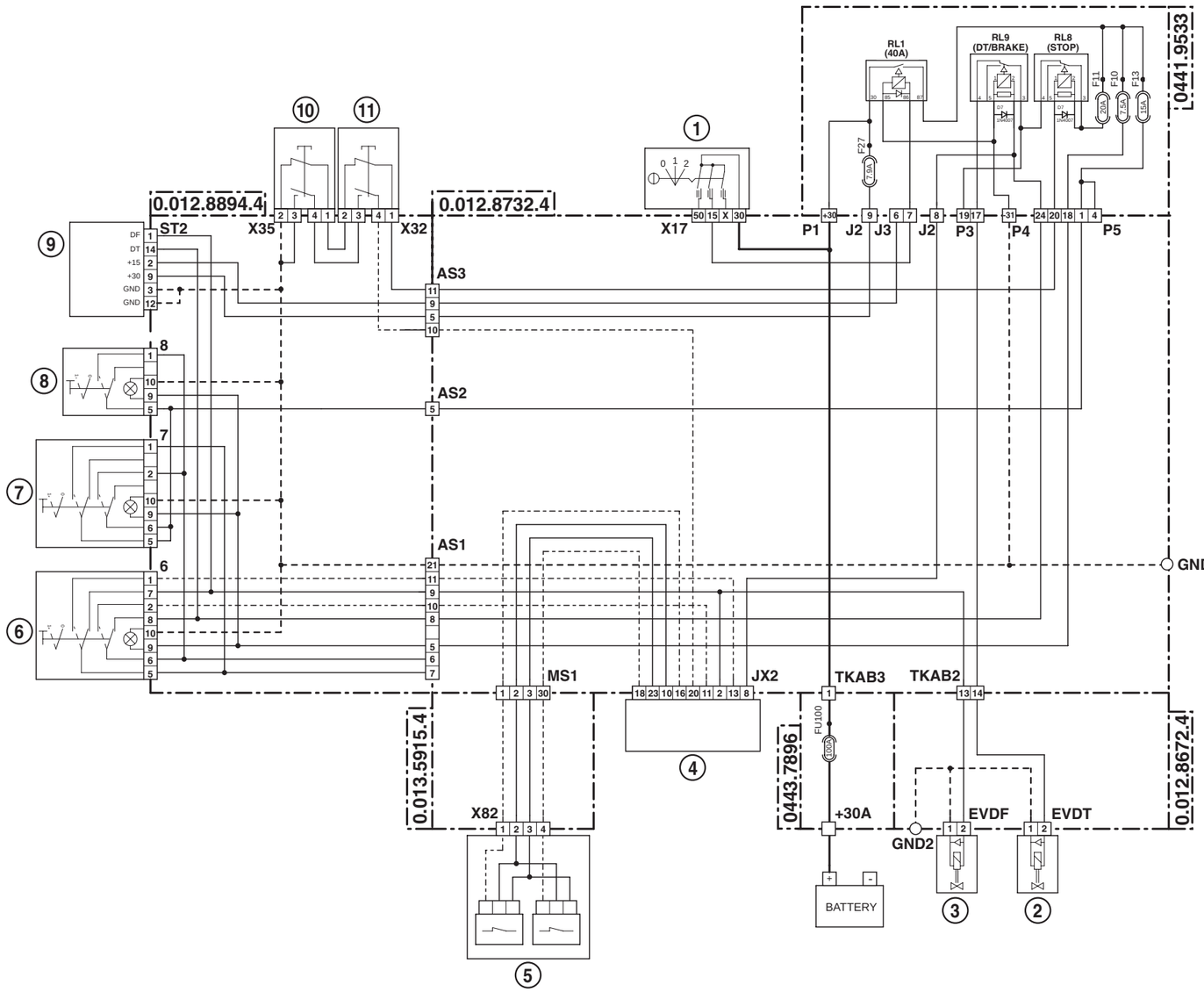
1 Starter switch
2 Front axle suspension load sensing solenoid valve coil
3 Axle Down control solenoid valve coil
4 Axle Up control solenoid valve coil
5 Front axle suspension position sensor
6 Front axle suspension control unit
7 Diagnostics connector
8 Front suspension pushbutton
9 Brake pedal switch (Left)
10 Brake pedal switch (Right)
11 Rear lift control unit

4.18 TRANSMISSION



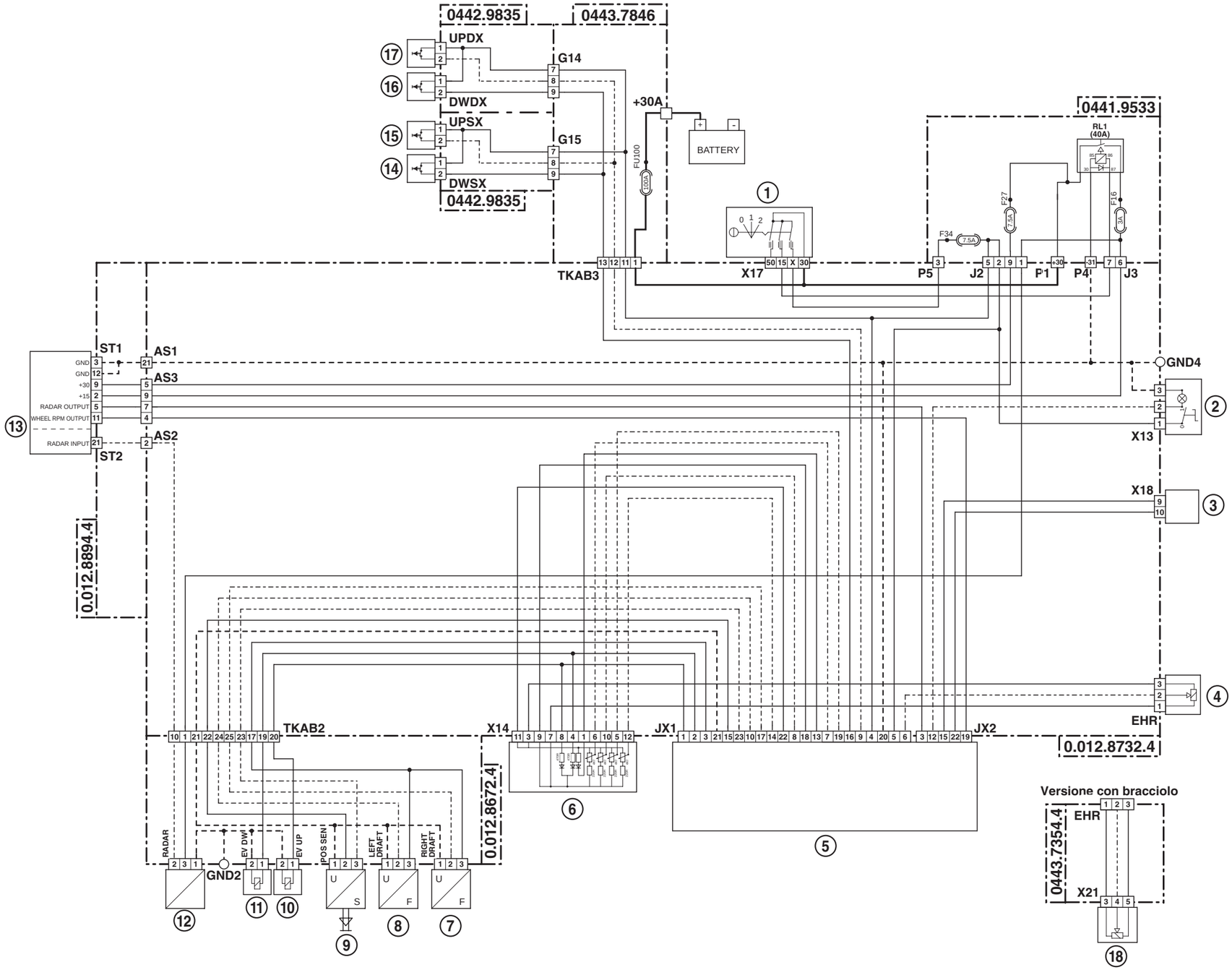
1 Starter switch
2 Armrest
3 Gearbox control lever
4 Diagnostics connector
5 Field/road sensor
6 Field/road selection solenoid valve
7 Speed sensor for odometer
8 Proportional valve solenoid
9 Engine speed sensor
10 Gearbox output shaft speed sensor
11 Transmission speed sensor
12 Transmission oil temperature sensor
13 Transmission oil low pressure switch
14 Gearshift solenoid valves (Y1, Y2, Y3, Y4)
15 Instrument panel
16 Clutch pedal position sensor
17 Clutch pedal depressed proximity sensor
18 Transmission display
19 Shuttle control lever
20 Transmission ECU

4.19 ASM - 4WD - DIFFERENTIAL



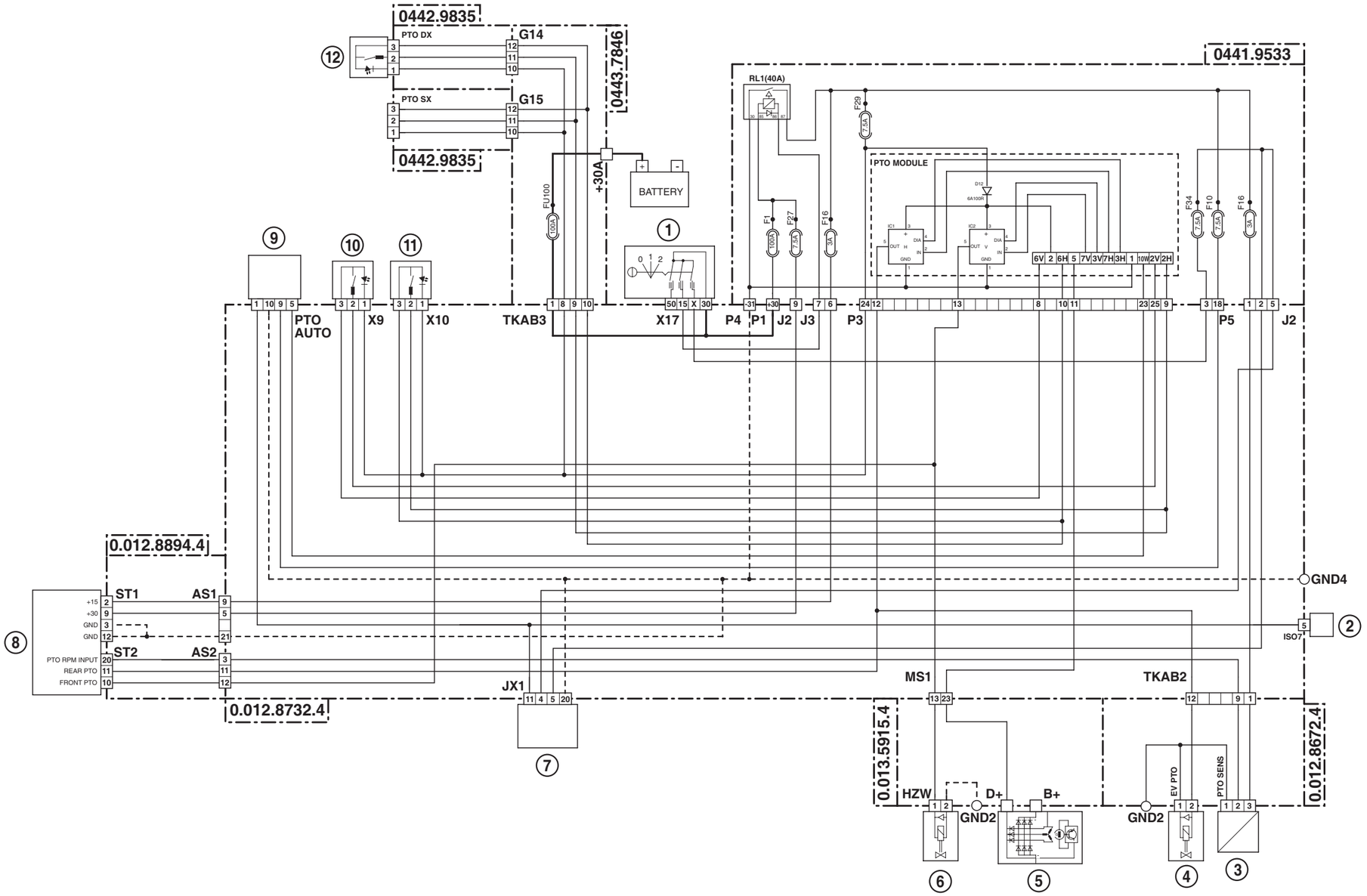
1 Starter switch
2 Four wheel drive (4WD) clutch solenoid valve
3 Differential lock solenoid valve
4 Rear lift control unit
5 Steering angle sensor
6 ASM switch
7 Differential lock switch
8 4WD switch
9 Instrument panel
10 Brake pedal switch (Left)
11 Brake pedal switch (Right)

4.20 REAR LIFTER



1 Starter switch
2 Radar control switch
3 Diagnostics connector
4 Lift and hand throttle console
5 Rear lift control unit
6 Lift control panel
7 Lift draft sensor (Right)
8 Lift draft sensor (Left)
9 Rear lift position sensor
10 Lift Up solenoid valve
11 Lift Down solenoid valve
12 Radar
13 Instrument panel
14 Rear lift Down Lx pushbutton
15 Rear lift Up Lx pushbutton
16 Rear lift Down Rx pushbutton
17 Rear lift Up Rx pushbutton
18 Armrest

4.21 FRONT AND REAR PTO



1 Starter switch
2 ISO7 socket (implement connection)
3 Rear PTO speed sensor
4 Rear PTO solenoid valve
5 Alternator (D+)
6 Front PTO solenoid valve
7 Rear lift control unit
8 Instrument panel
9 PTO AUTO switch
10 Front PTO pushbutton (in cab)
11 Rear PTO pushbutton (in cab)
12 Rear PTO Rx pushbutton

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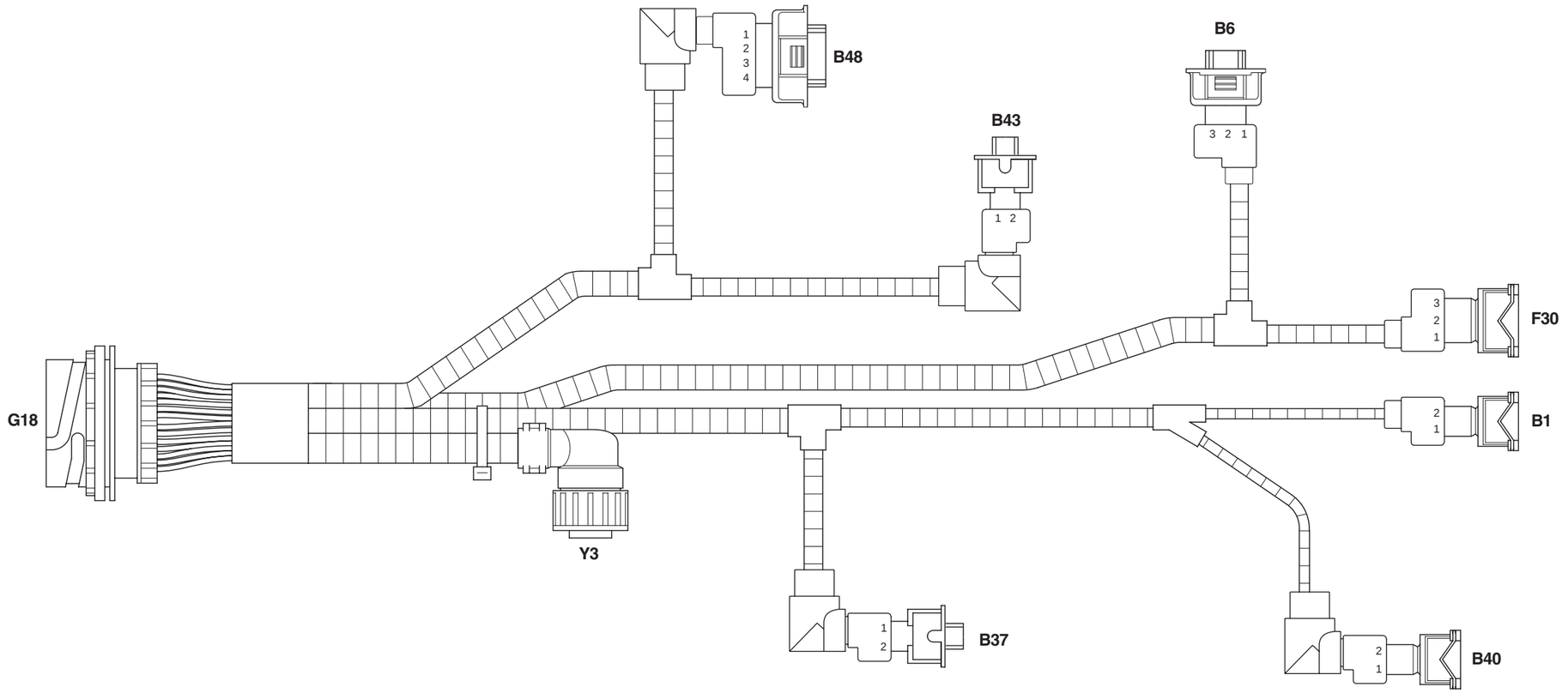
5. WIRING
ENGINE WIRING (4 CYLINDERS) (1/2)



B1 Not utilised
B6 Not utilised
B37 Fuel temperature sensor
B40 Camshaft speed sensor (Pickup)
B43 Coolant temperature sensor
B48 Engine boost pressure sensor
F30 Not utilised
G18 To engine wiring
Y3 Actuator

D023200

ENGINE WIRING (4 CYLINDERS) (2/2)

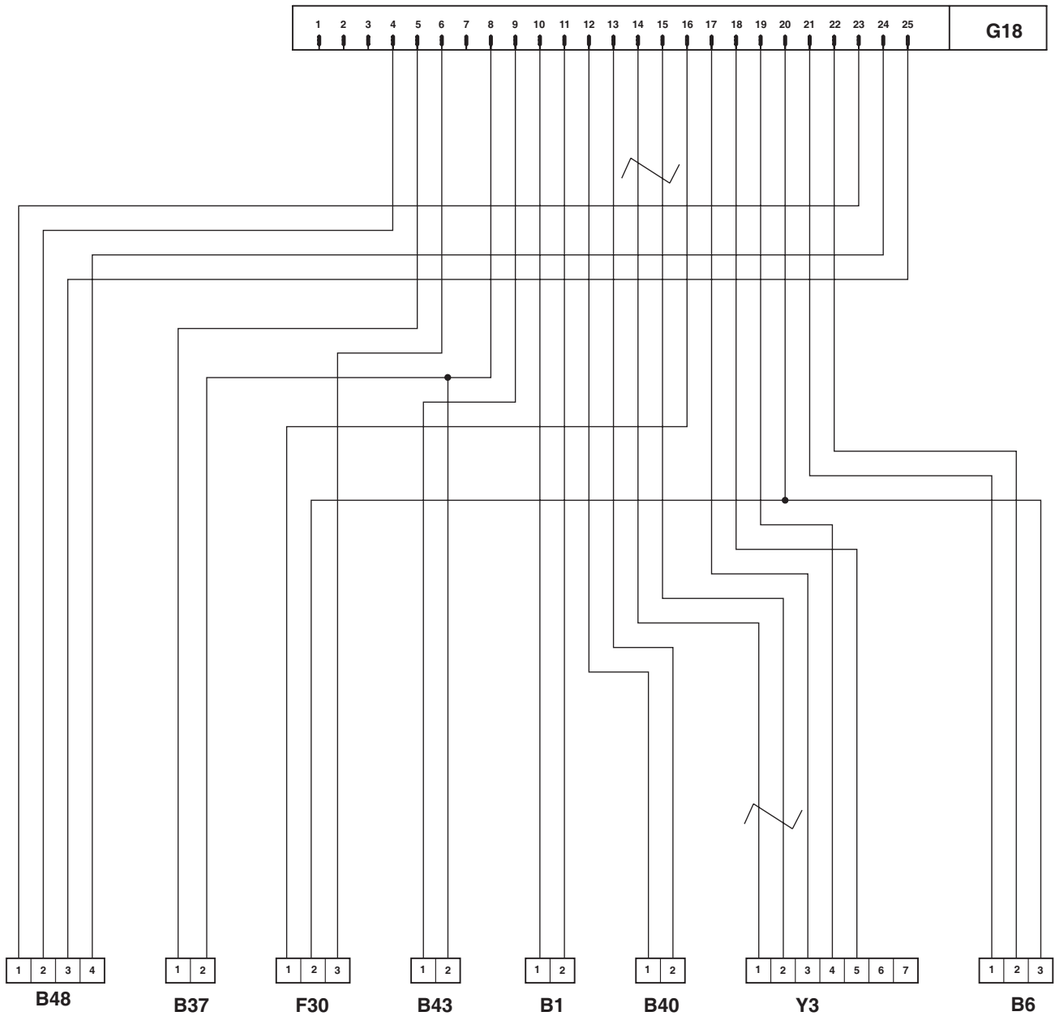
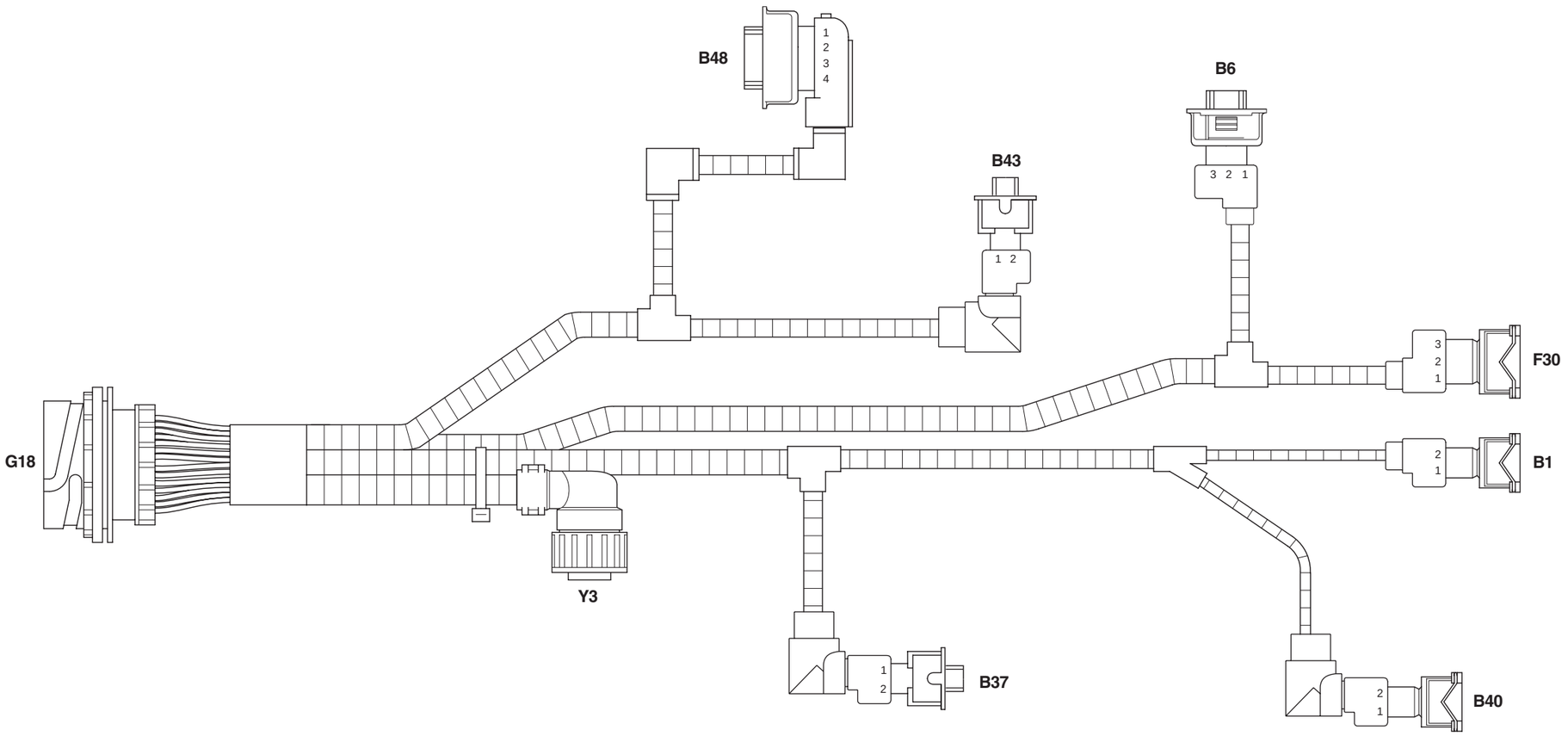


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

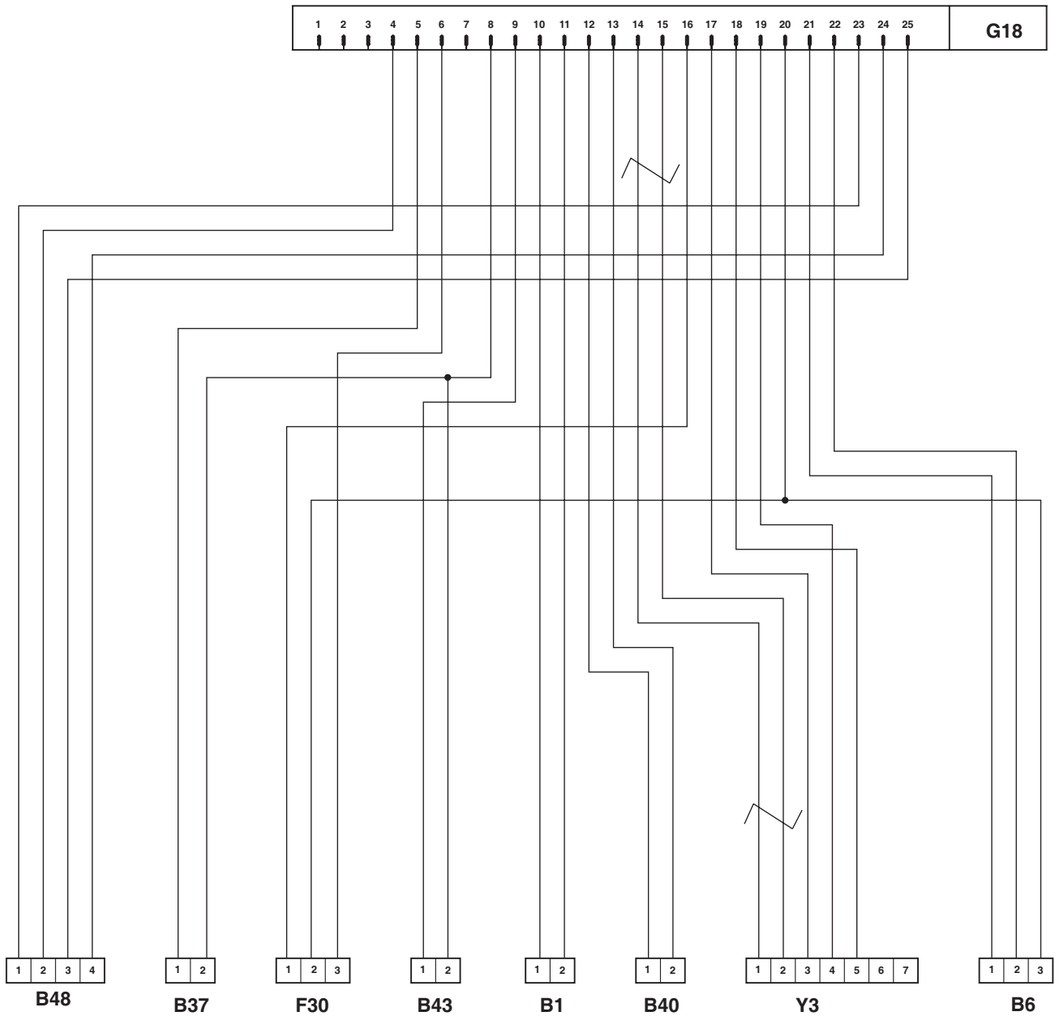
ENGINE WIRING (6 CYLINDERS) (1/2)



B1 Not utilised
B6 Not utilised
B37 Fuel temperature sensor
B40 Camshaft speed sensor (Pickup)
B43 Coolant temperature sensor
B48 Engine boost pressure sensor
F30 Not utilised
G18 To engine wiring
Y3 Actuator

D0023210

ENGINE WIRING (6 CYLINDERS) (2/2)



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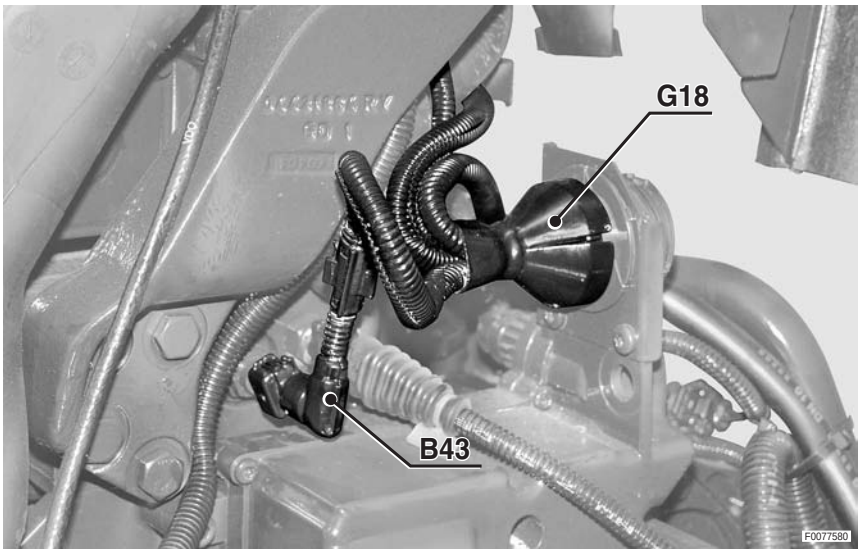
R	Rosso/Red	H	Grigio/Gray

CONNECTORS LOCATION

1



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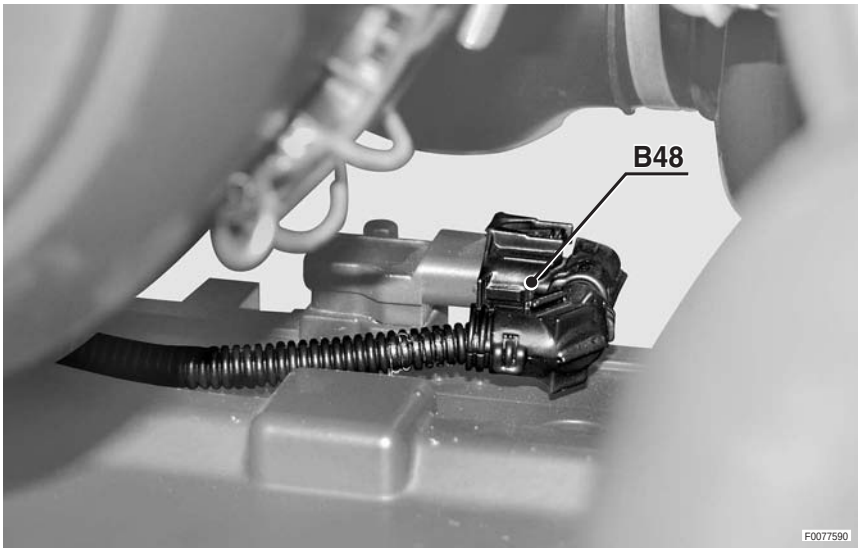

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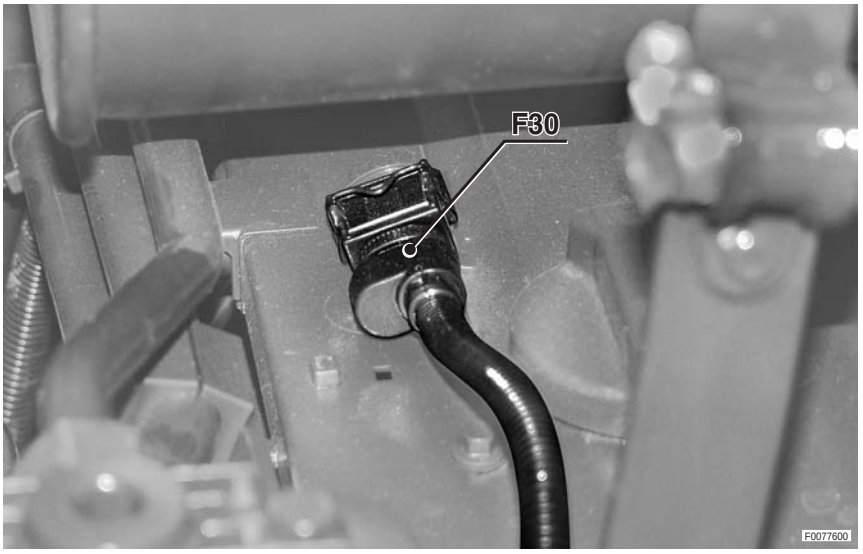

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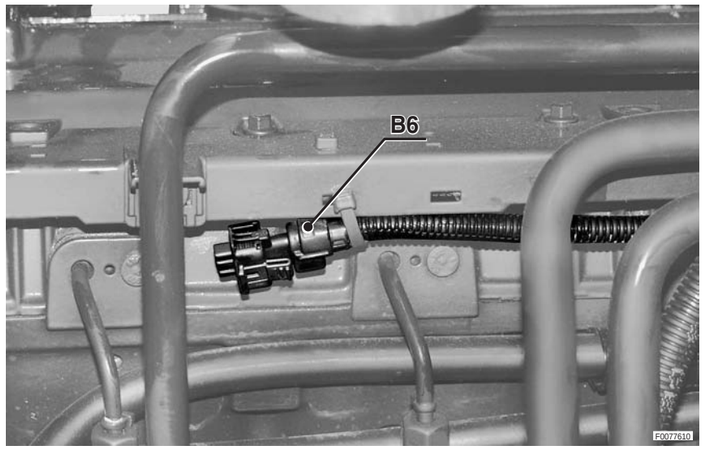
ENGINE WIRING

4



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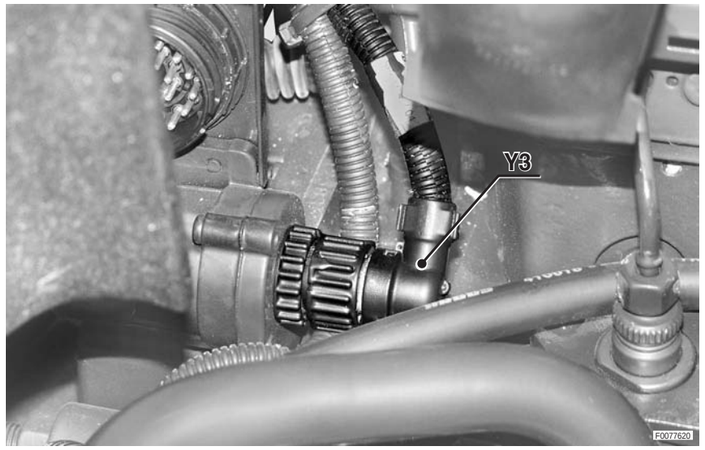

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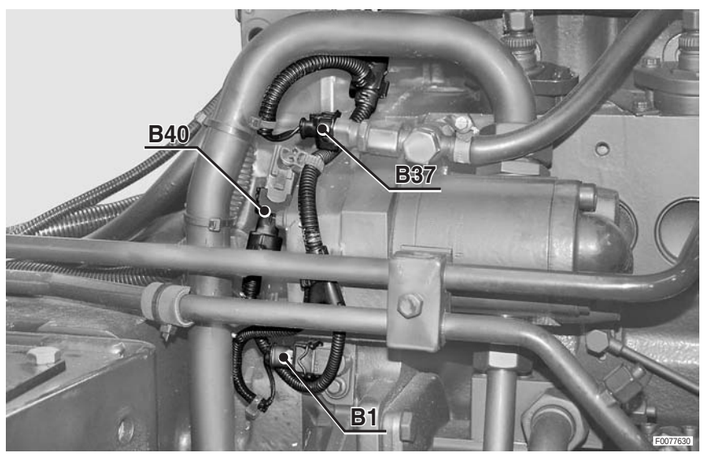

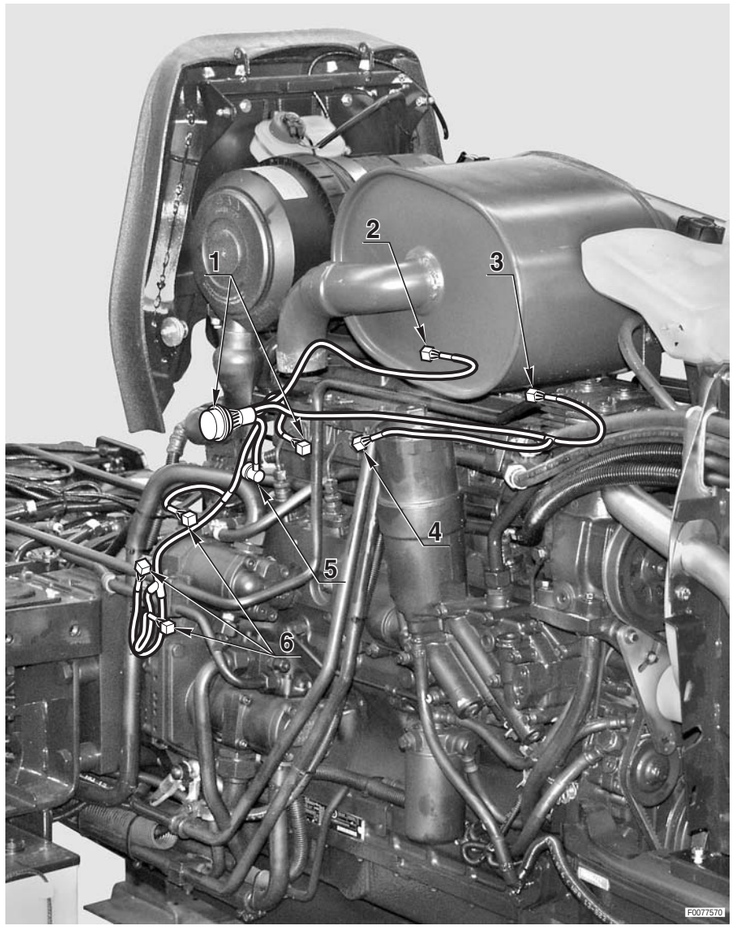

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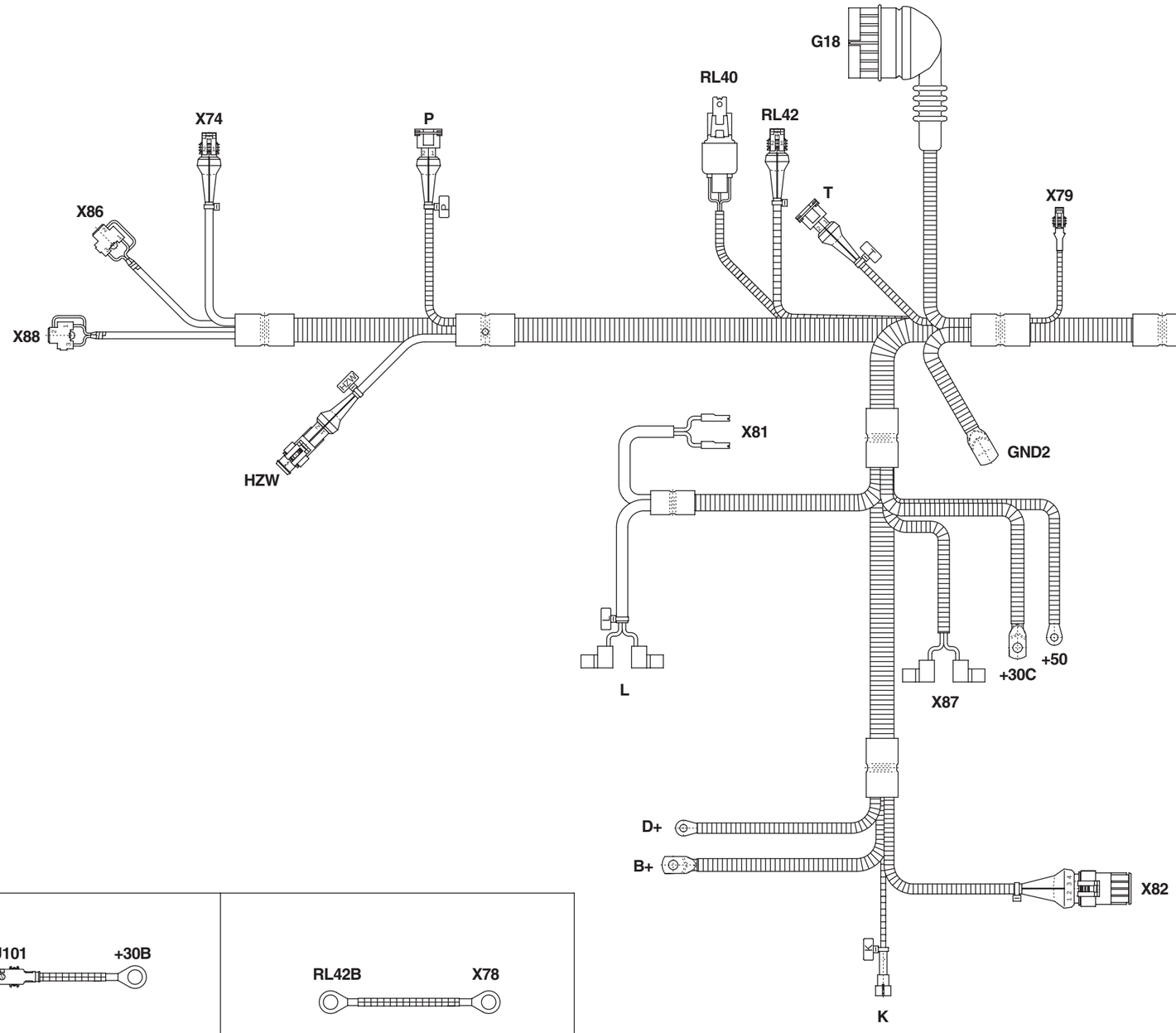
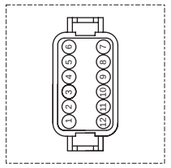
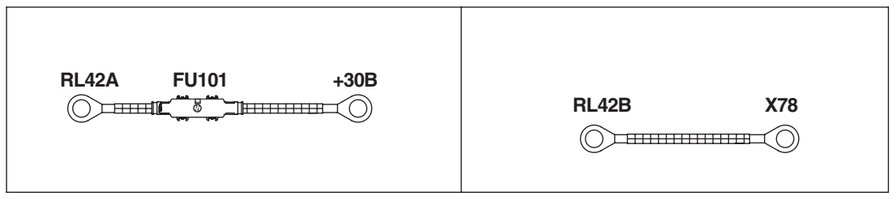
ENGINE WIRING (1/2)

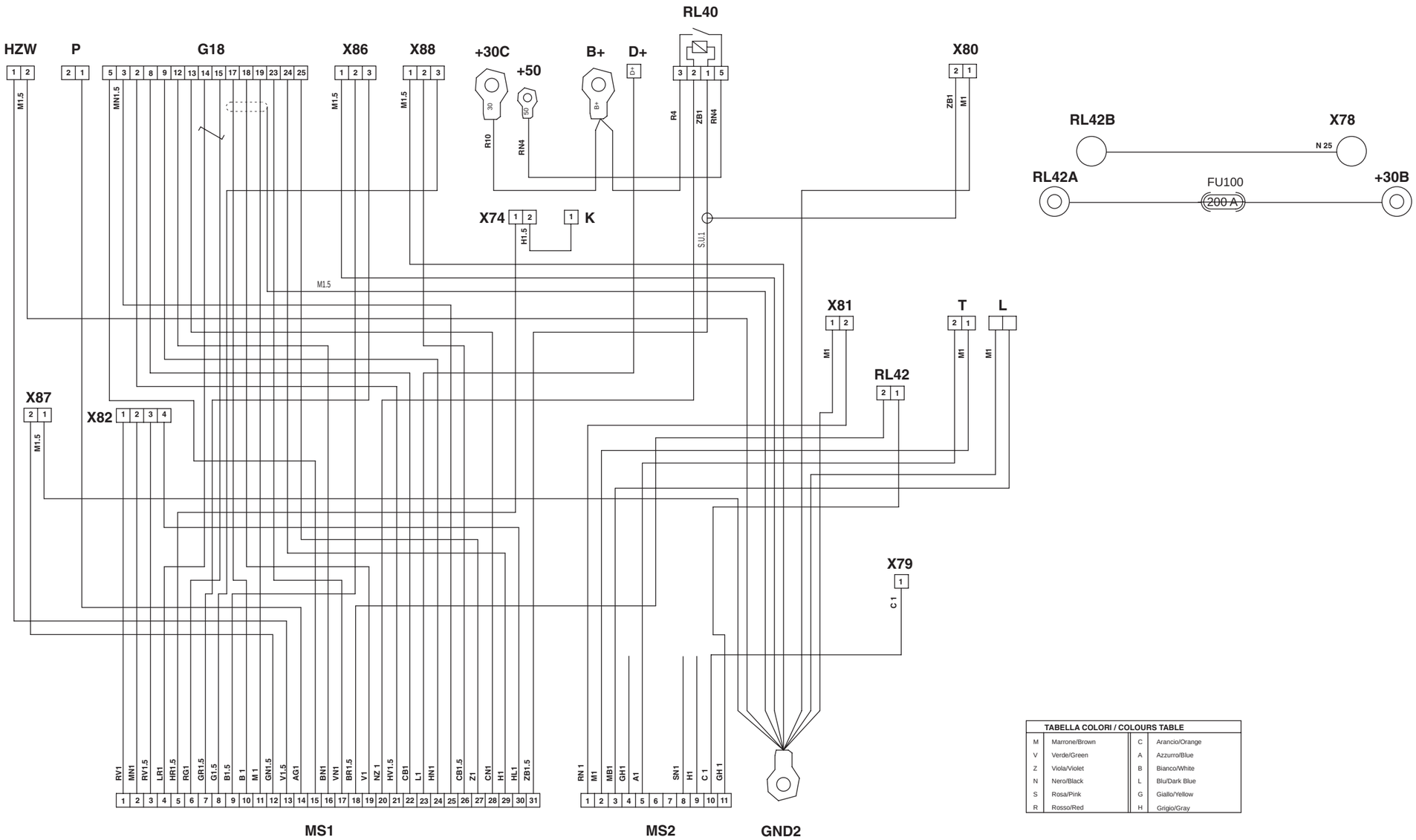




+30C Starter motor (+30)
+50 Battery (+50)
B+ Alternator (B+)
D+ Alternator (D+)
FU101 Preheating relay power fuse
G18 To engine wiring (Deutz)
HZW Front PTO solenoid valve
K Air conditioning compressor
L Air cleaner clogged sensor
MS1 To side console wiring
MS2 To front console wiring
P To fuses
RL40 Engine starter relay
RL42A Preheating relay
RL42B Preheating relay
RL42 Preheating relay
T Coolant temperature sensor (for Infocenter)
X74 Compressor and condenser fan pressure switch
X78 Preheating device
X79 Not utilised
X80 Start enable switch (Green)
X81 Brake fluid level sensor
X82 Steering angle sensor
X86 Left headlamp
X87 Horn
X88 Right headlamp



ENGINE WIRING (2/2)



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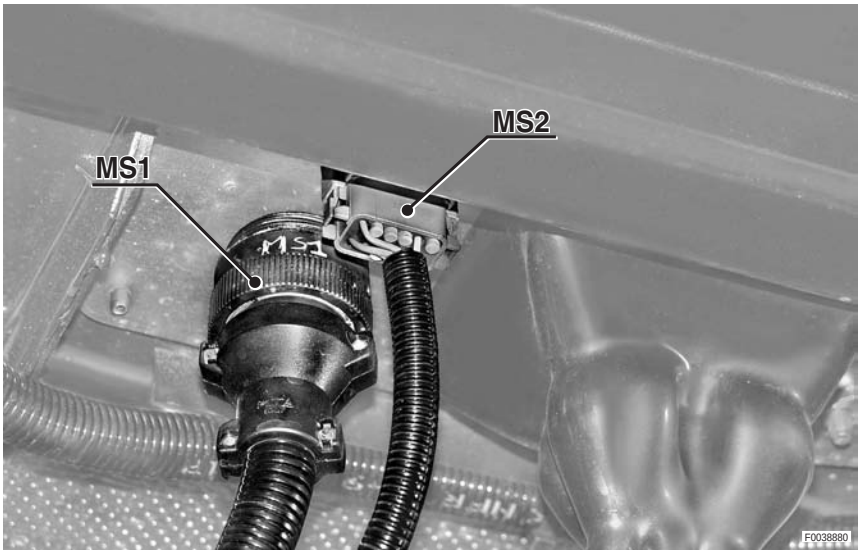
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

CONNECTORS LOCATION

1



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3

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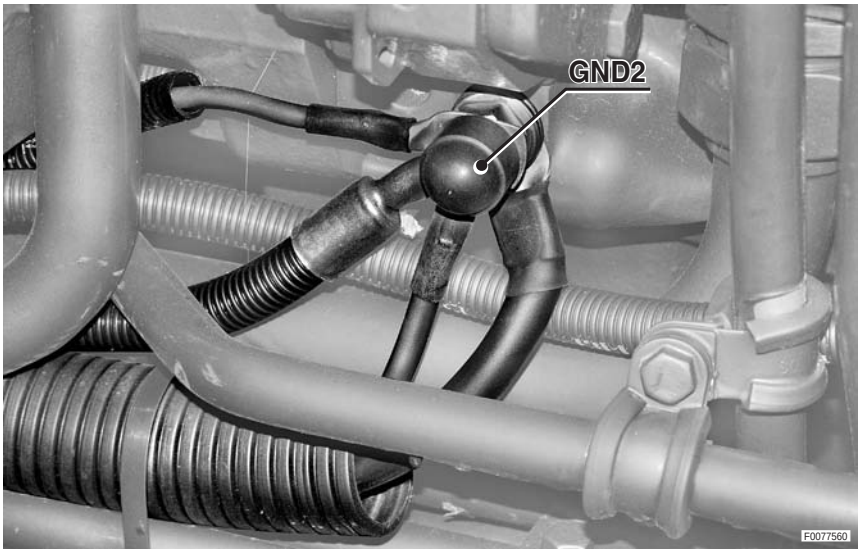

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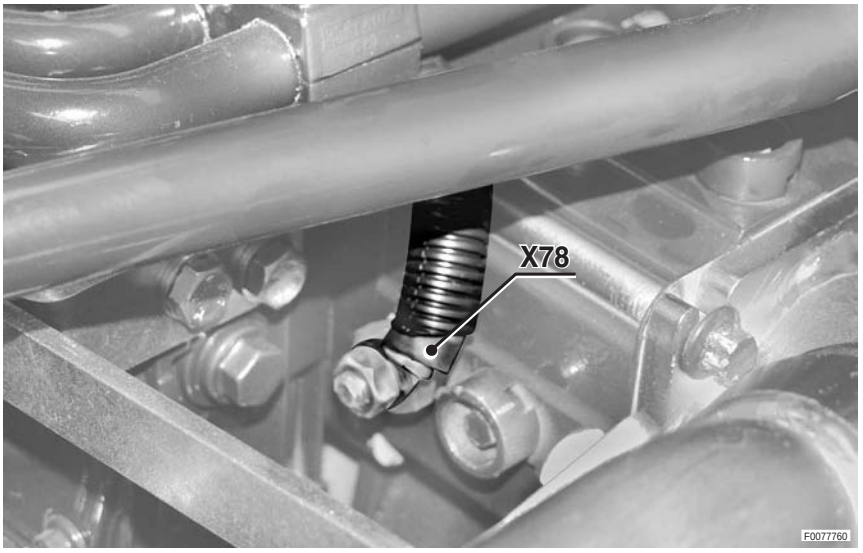

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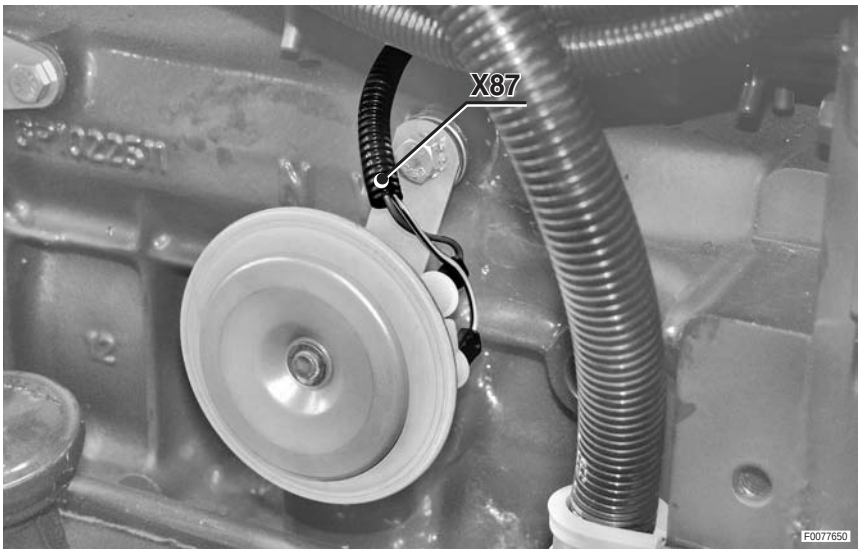

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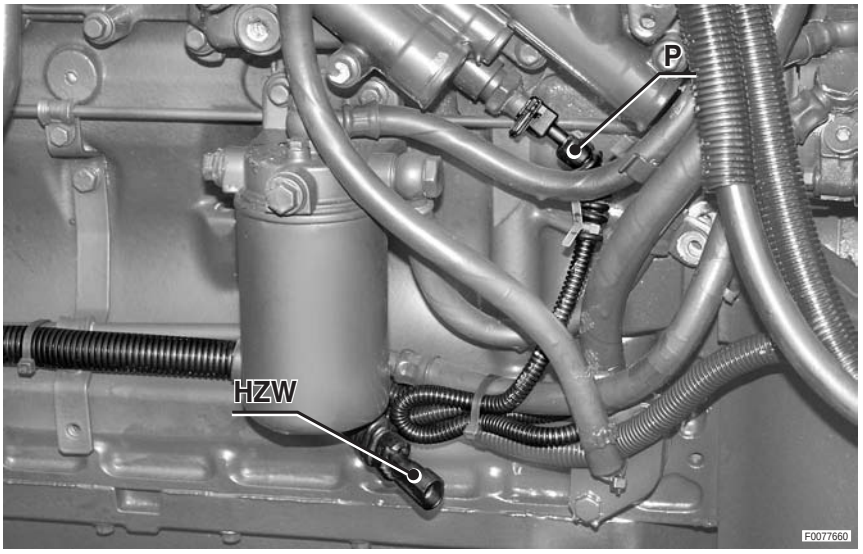

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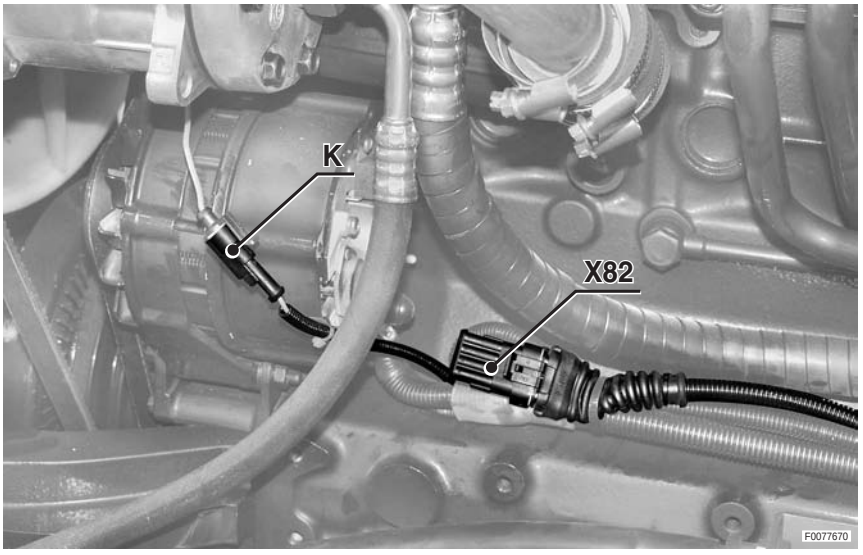

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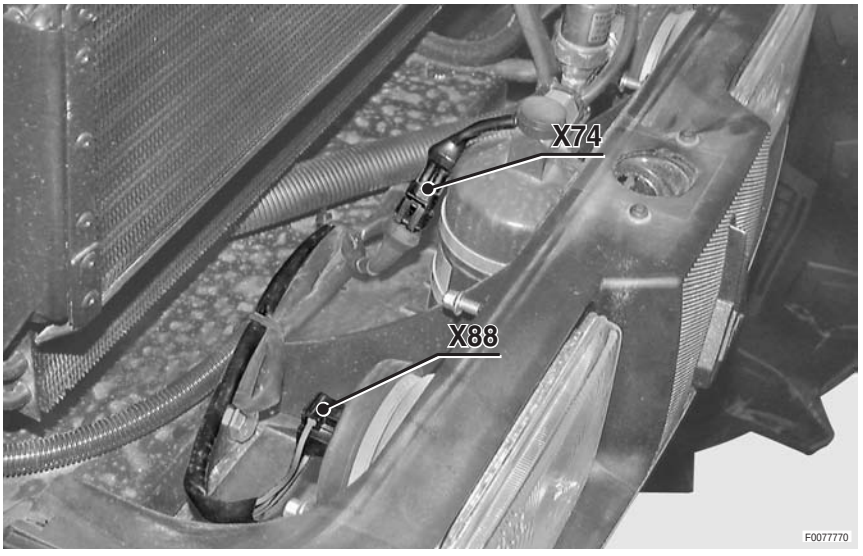

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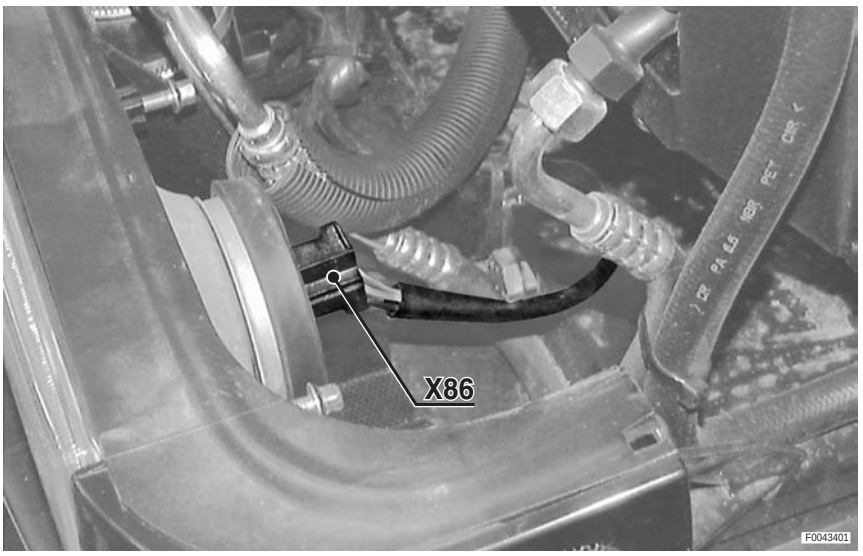

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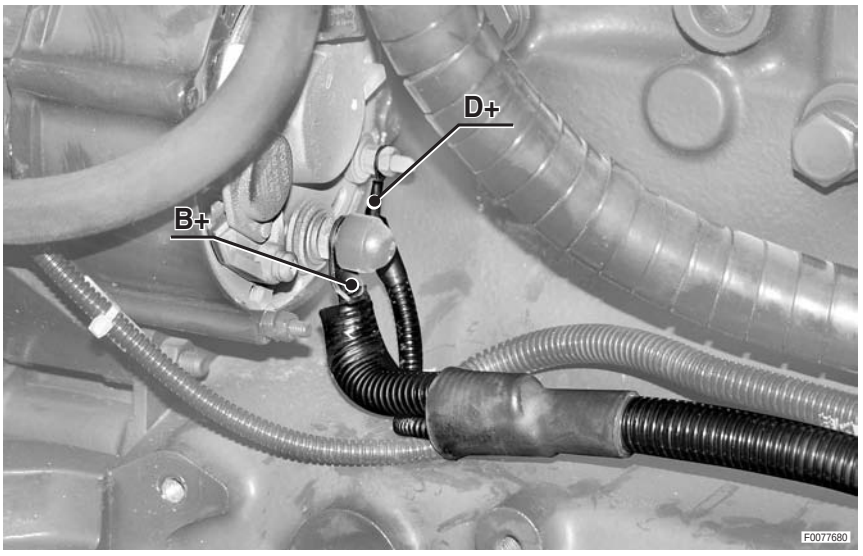

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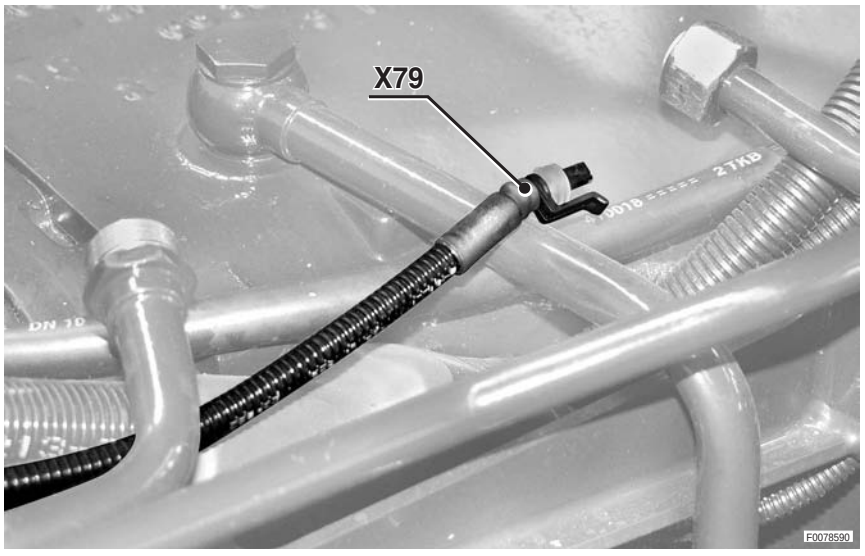

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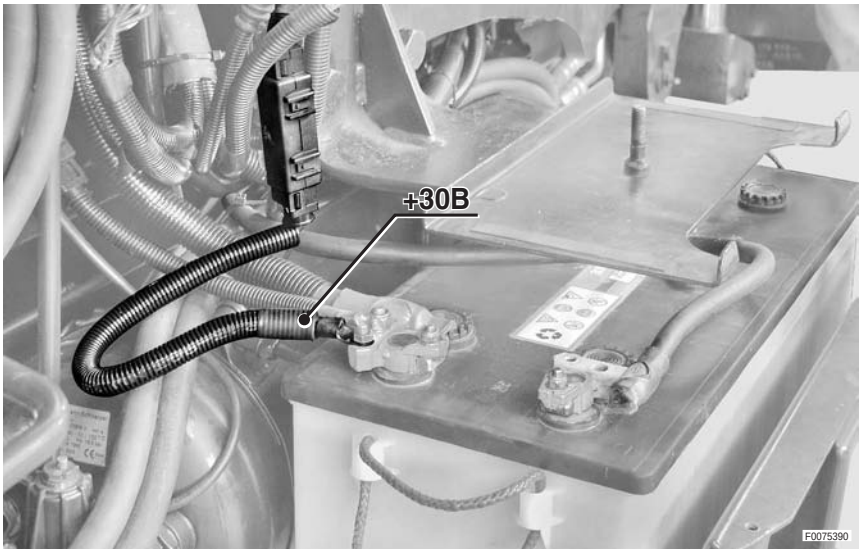

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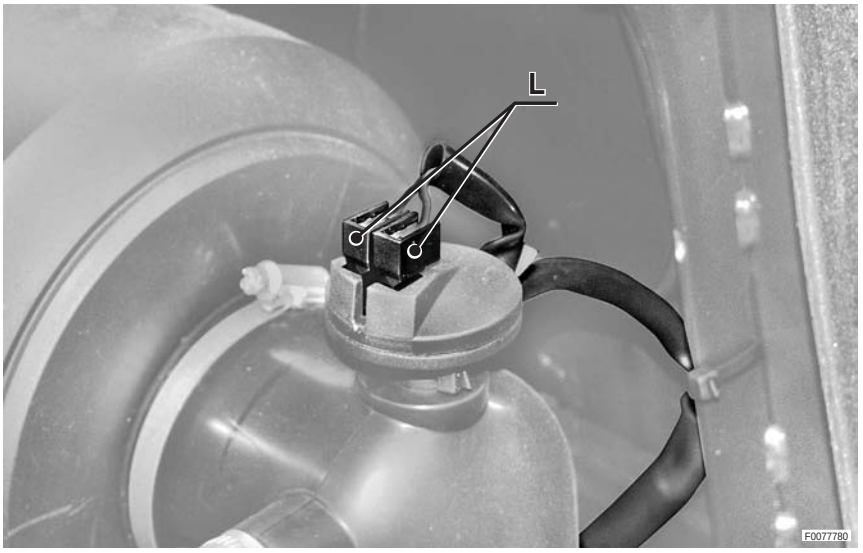

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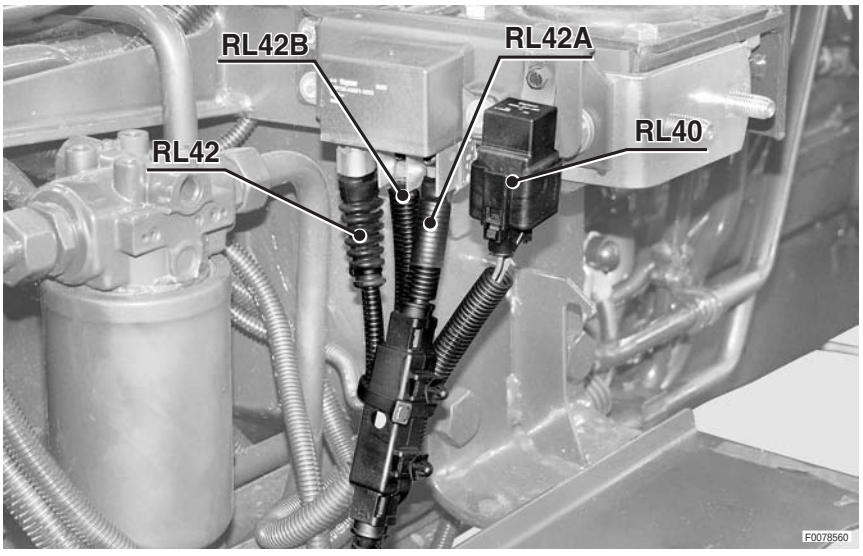

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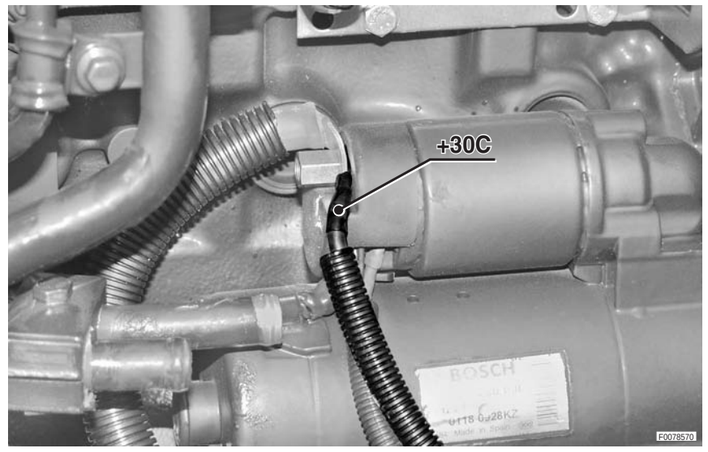

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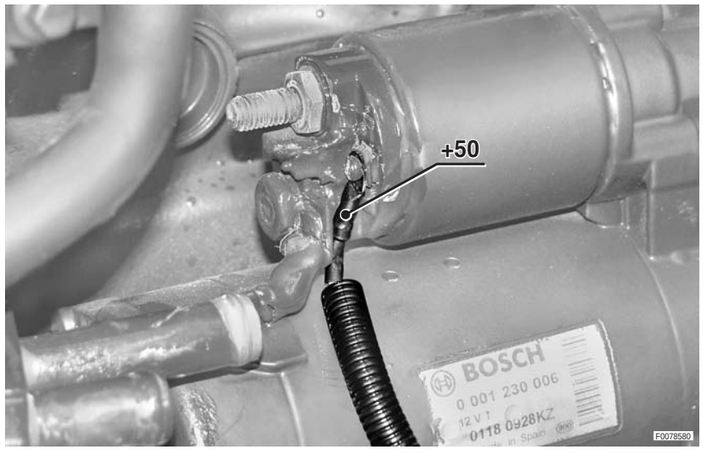
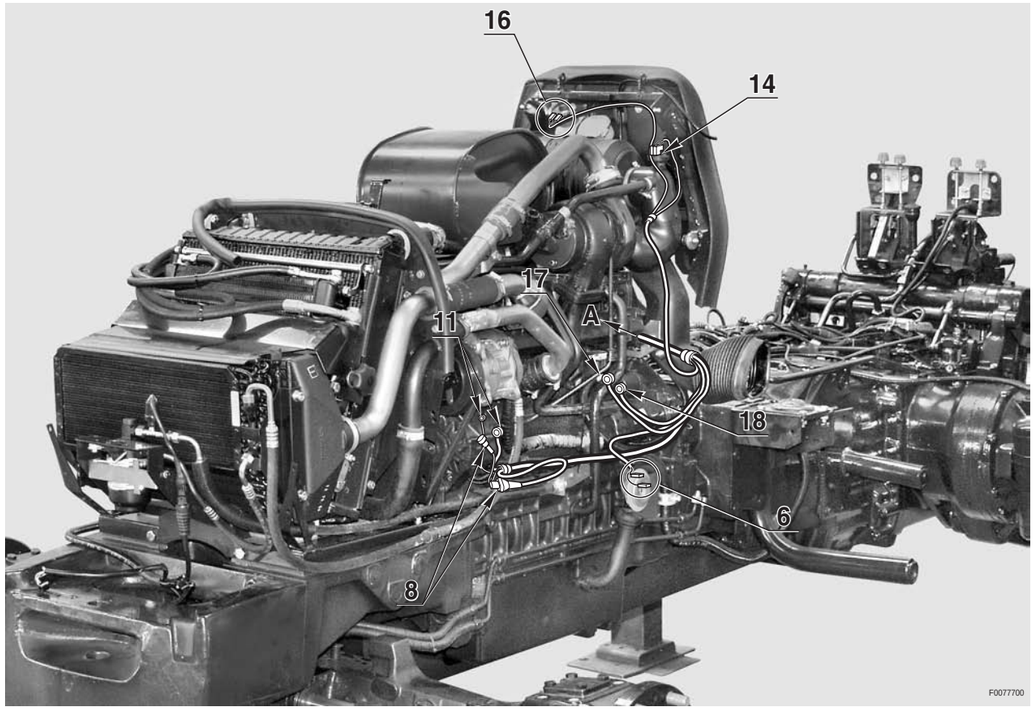
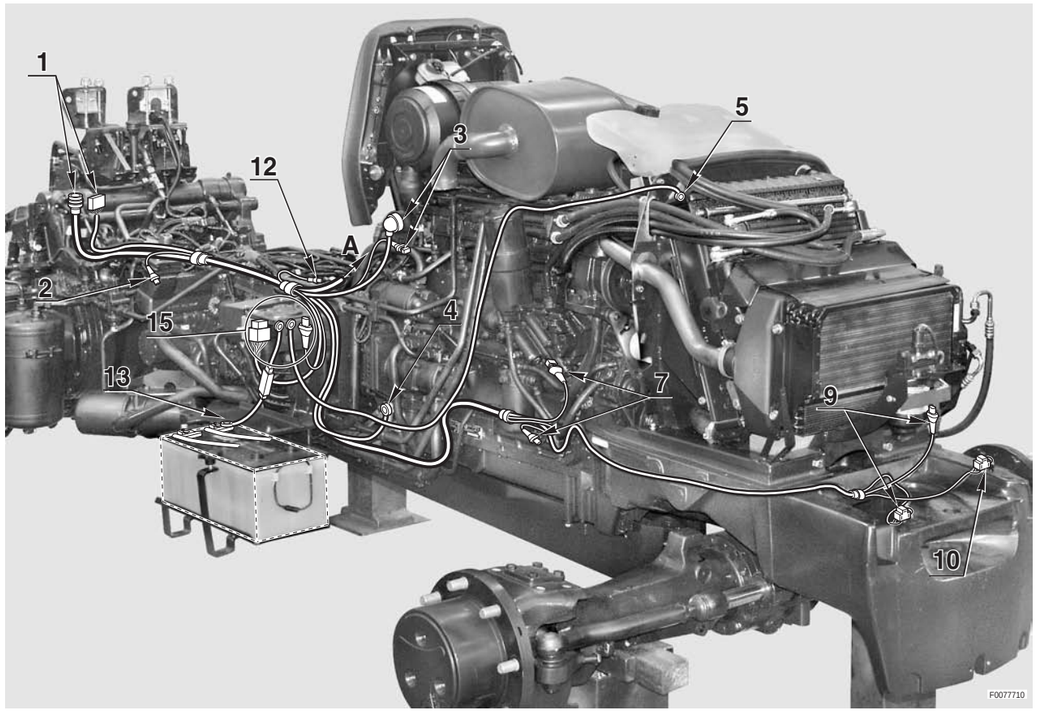


CONNECTORS LOCATION





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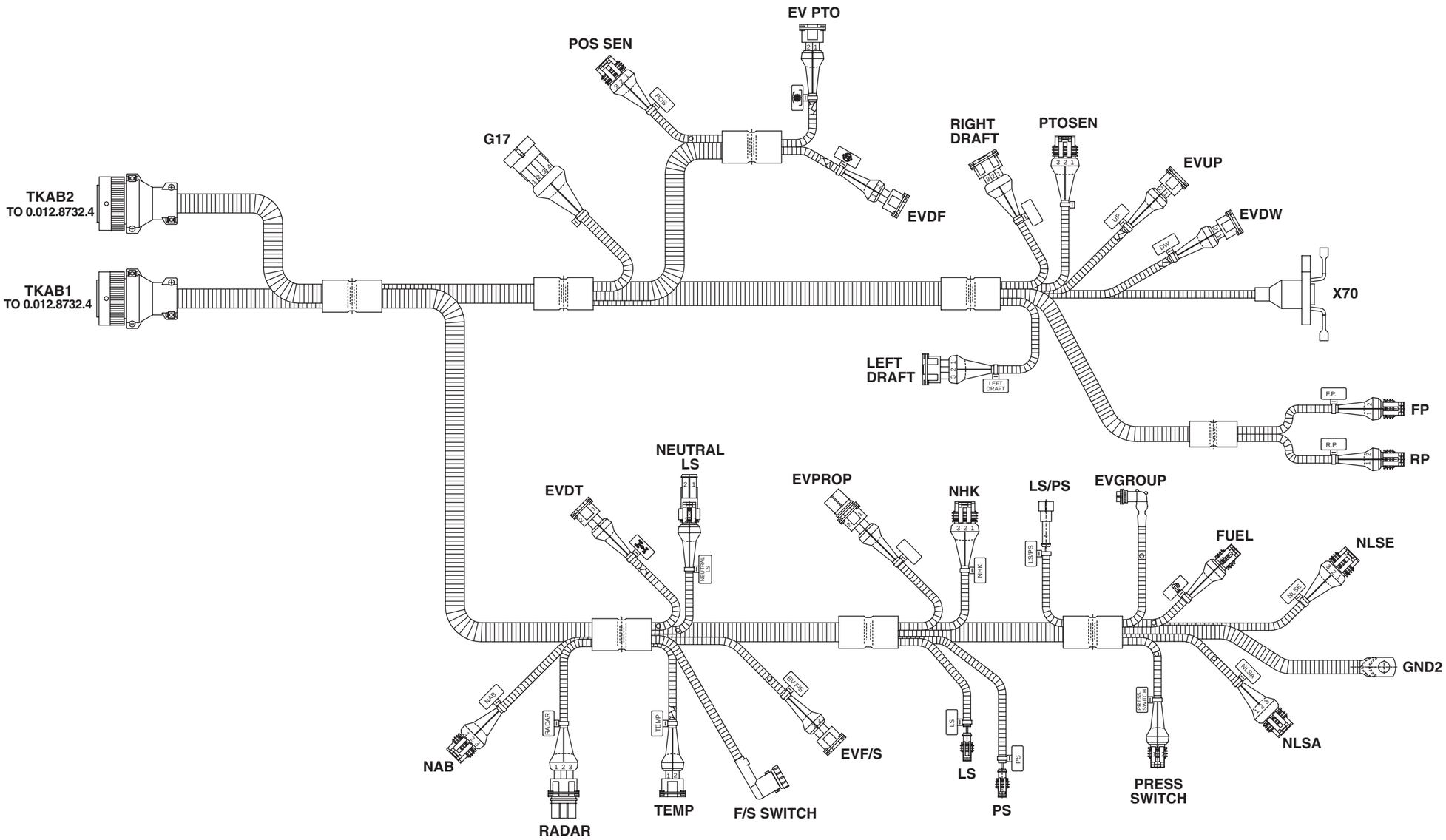
TRANSMISSION WIRING (1/2)

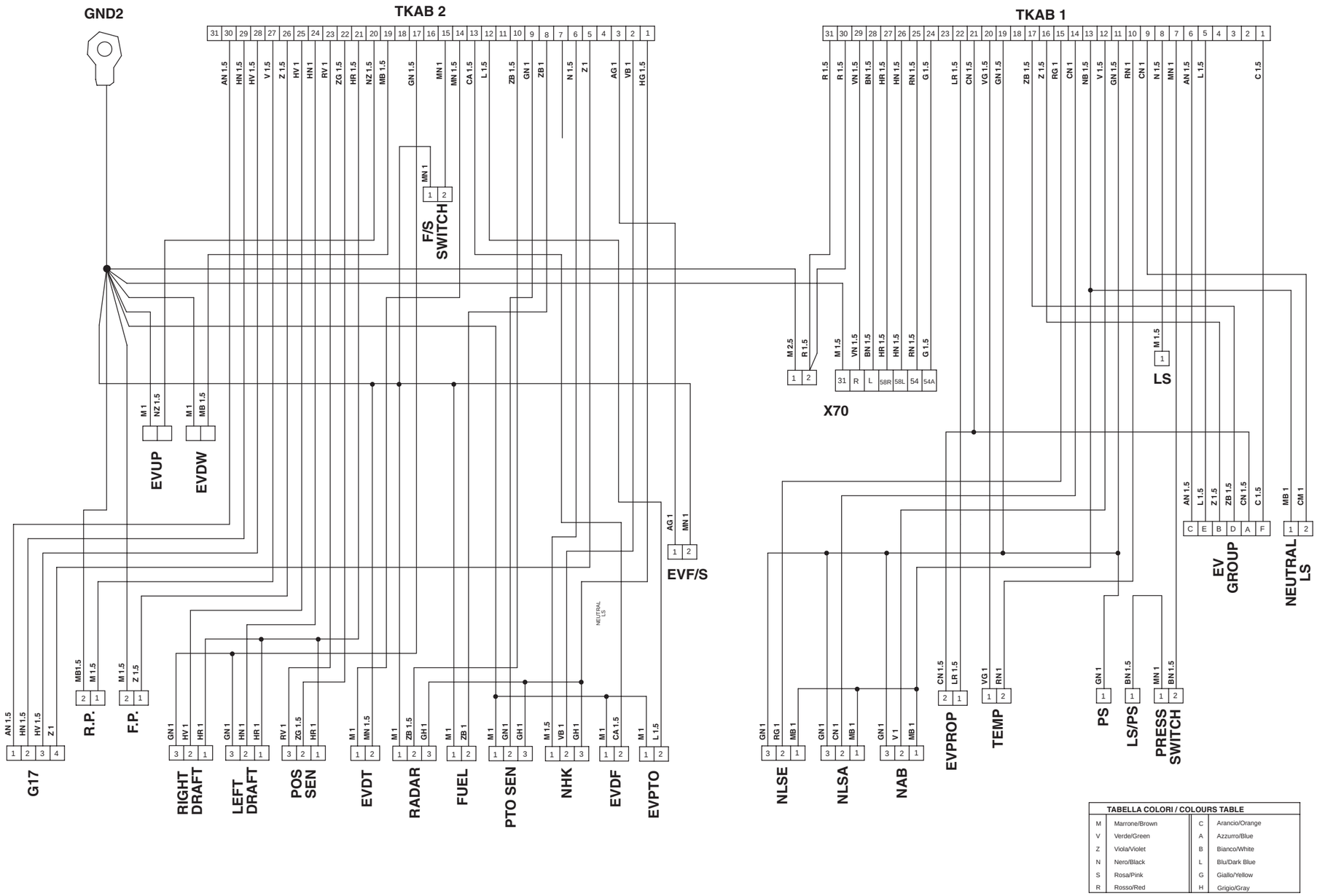


EVDF Differential lock solenoid valve
EVDTFour-wheel drive control solenoid valve (4WD)
EVDW Lift Down solenoid valve
EVGROUP Gear change solenoid valves (Y1, Y2, Y3, Y4)
EVPROP Proportional solenoid valve
EVPTO Rear PTO solenoid valve
EVUP Lift Up solenoid valve
EV F/S Field/road selection solenoid valve
F/S SWITCH Field/road sensor
FP Windscreen washer pump
FUEL Fuel level sensor

G17 To trailer brake wiring
LEFT DRAFT Lift draft sensor (left)
LS Not utilised
LS/PS Configuration connector
NAB Speed sensor for odometer
NEUTRAL LS Not utilised
NHK Transmission speed sensor
NLSA Gearbox output shaft speed sensor
NLSE Engine speed sensor
POS SEN Lift position sensor switch
PRESS SWITCH Transmission oil sensor

PS Configuration connector (Powershuttle)
PTO SEN Rear PTO speed sensor
RADAR Radar
RIGHT DRAFT Rear lift draft sensor (Right)
RP Rear screen washer pump
TEMP Transmission oil temperature sensor
TKAB1 To side console wiring
TKAB2 To side console wiring
X70 Trailer socket (for lights and auxiliary power)

TRANSMISSION WIRING (2/2)



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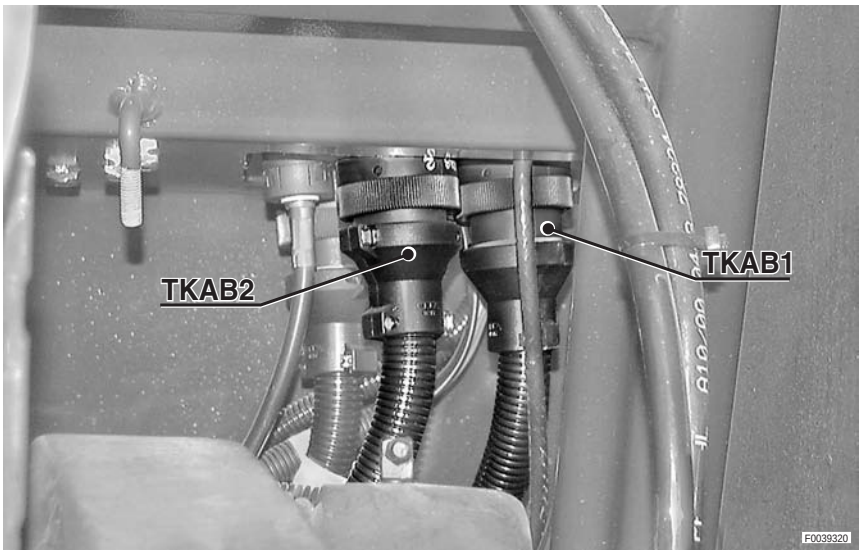
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

CONNECTORS LOCATION

1



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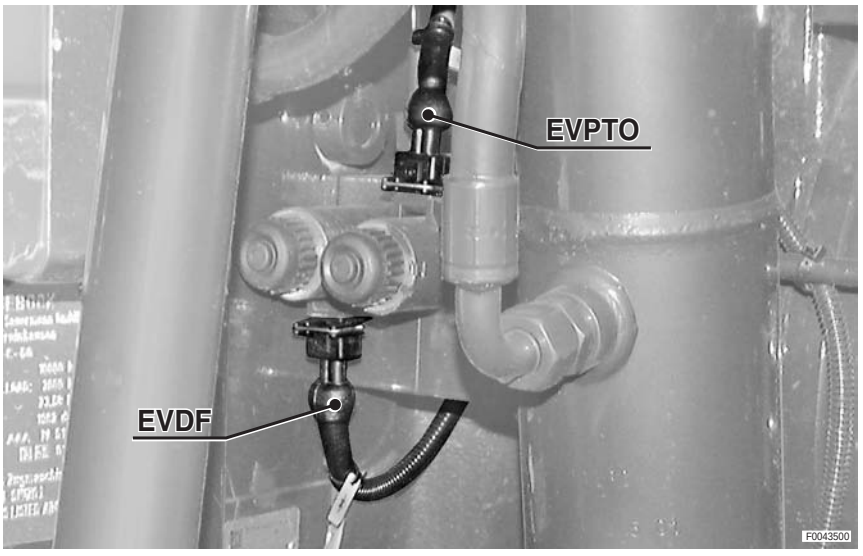

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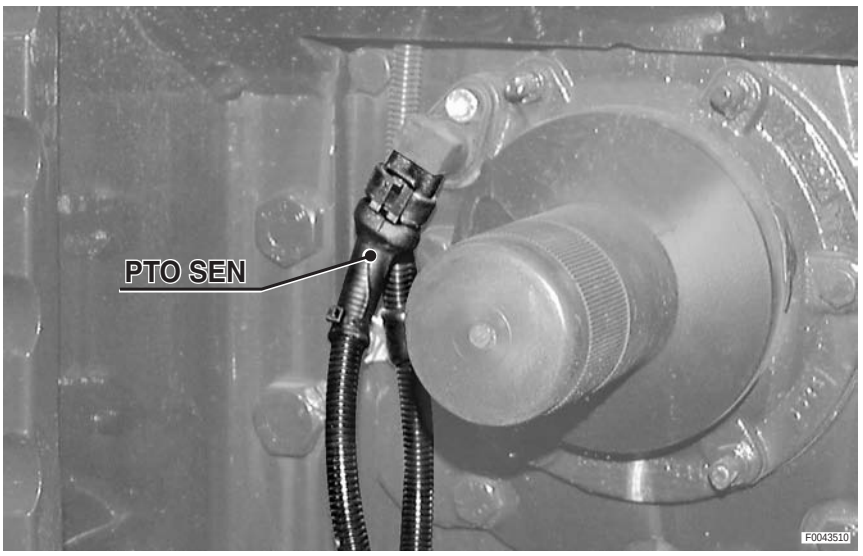

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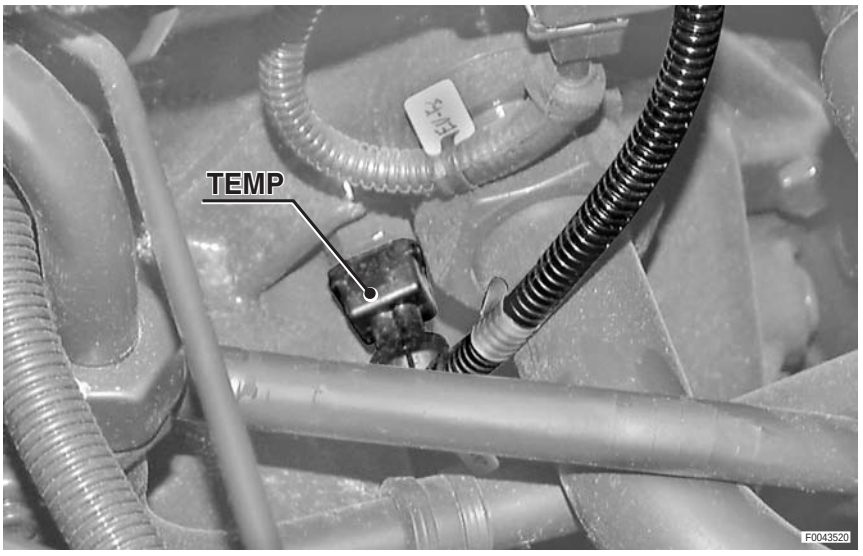

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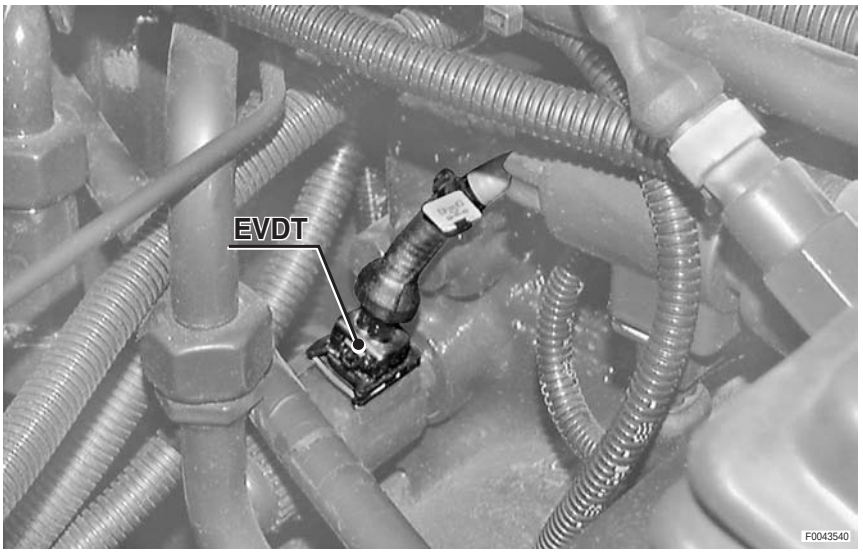

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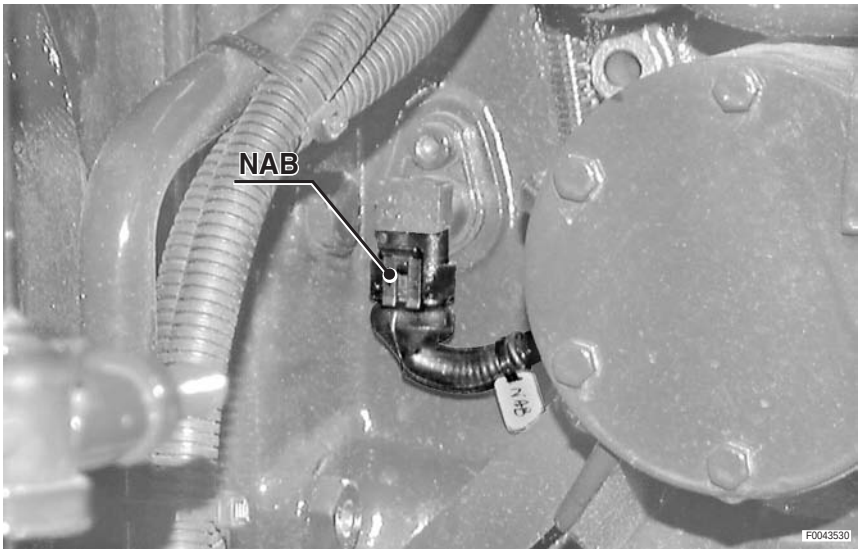

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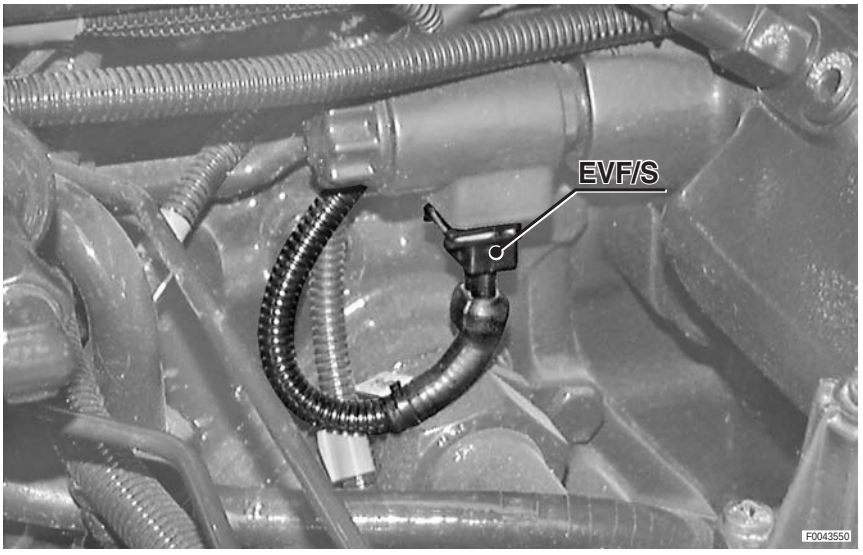

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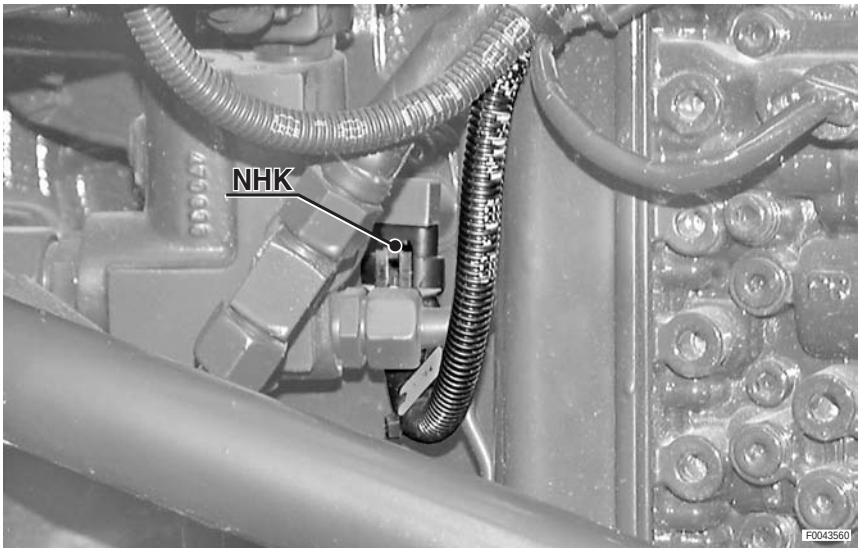

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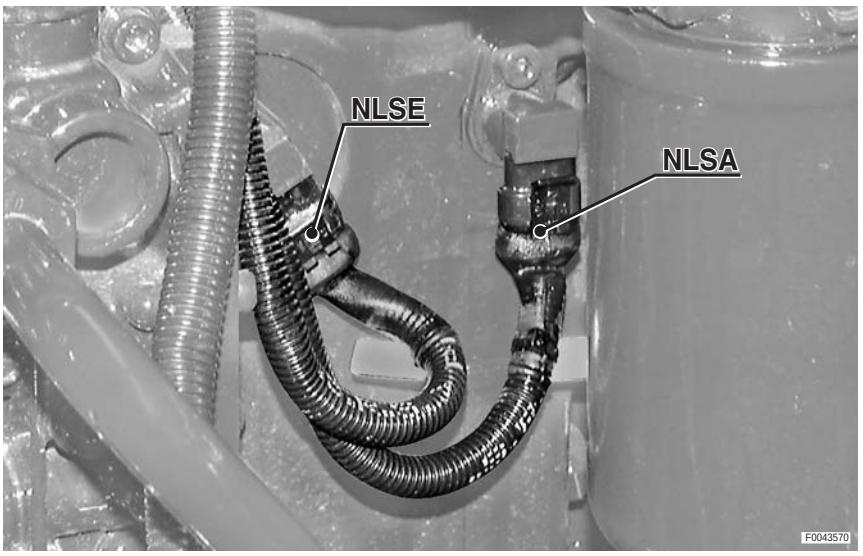
NLSE
NLSA
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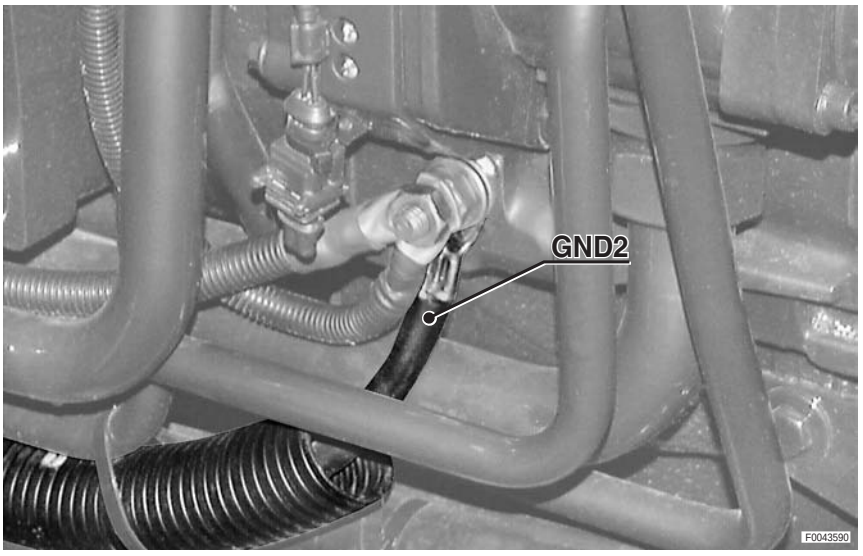
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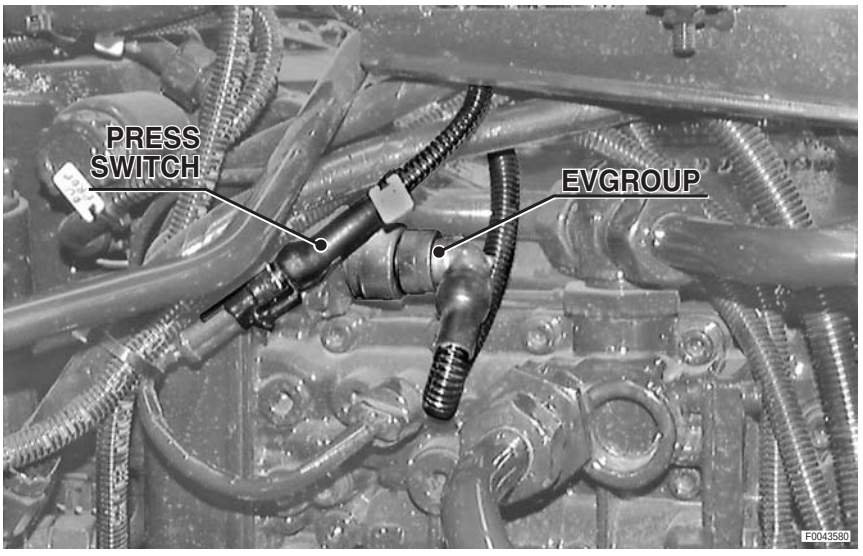
PRESS SWITCH
EVGROUP
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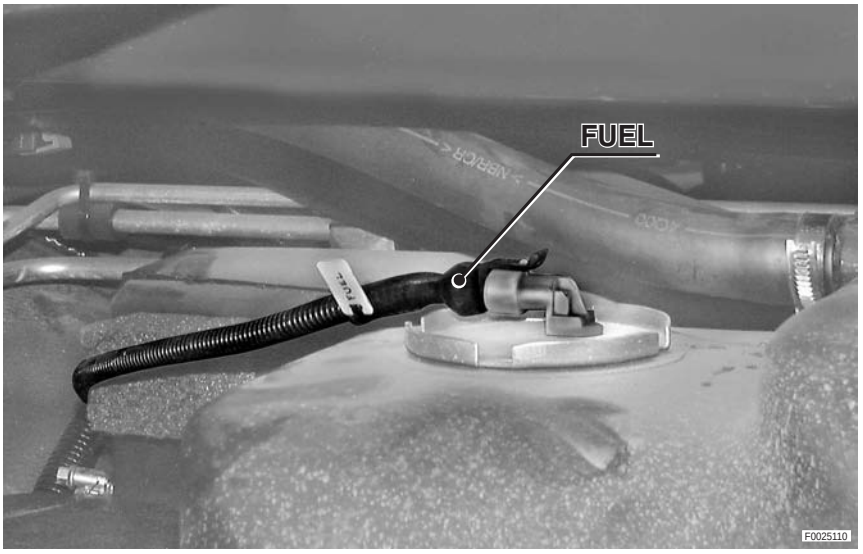

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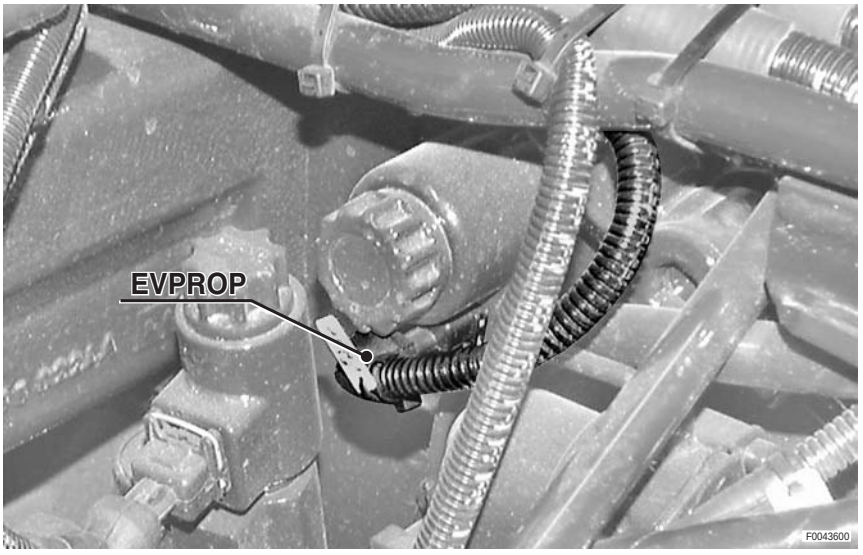

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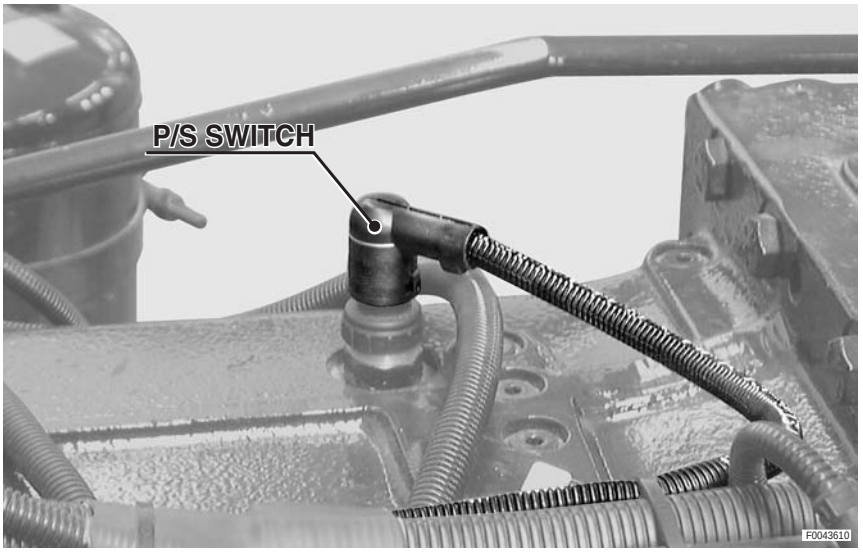

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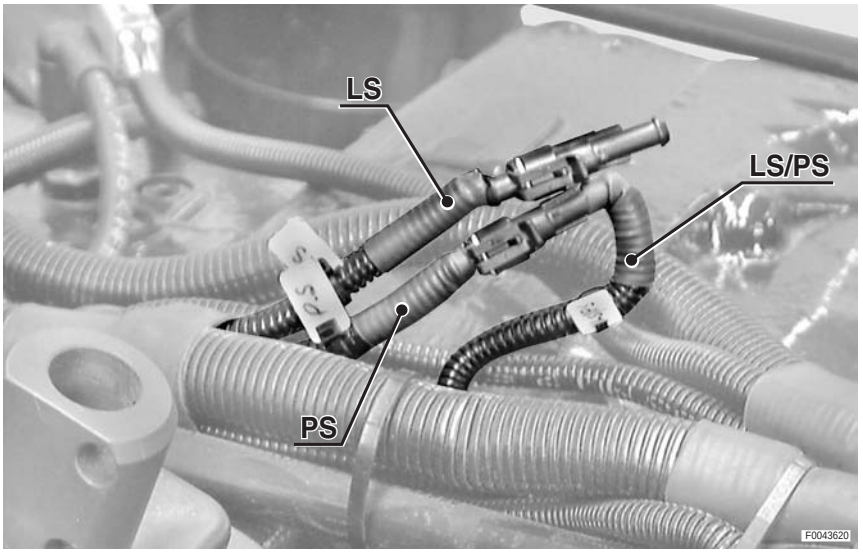
LS
LS/PS
PS
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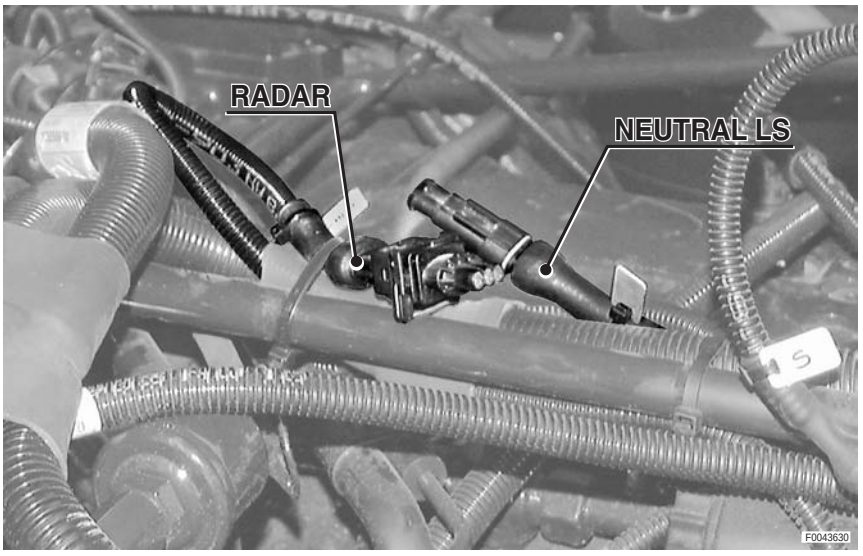
RADAR
NEUTRAL LS
F0043630

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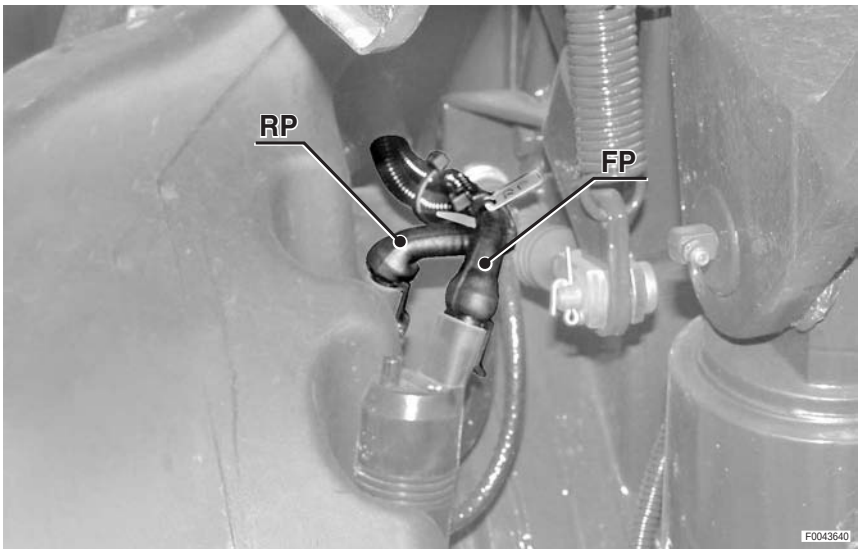
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FP
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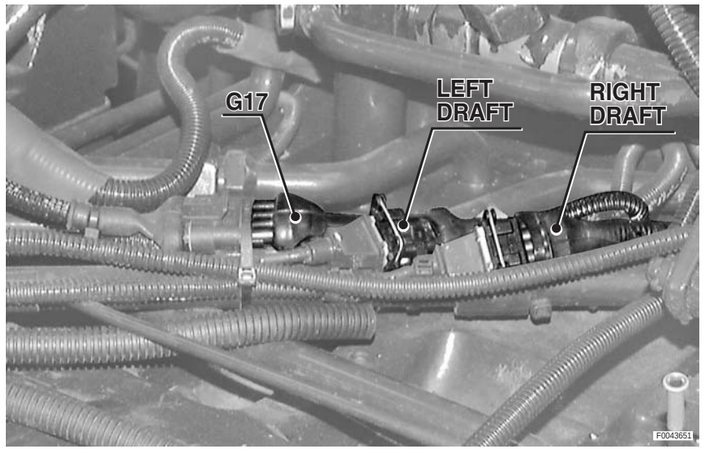

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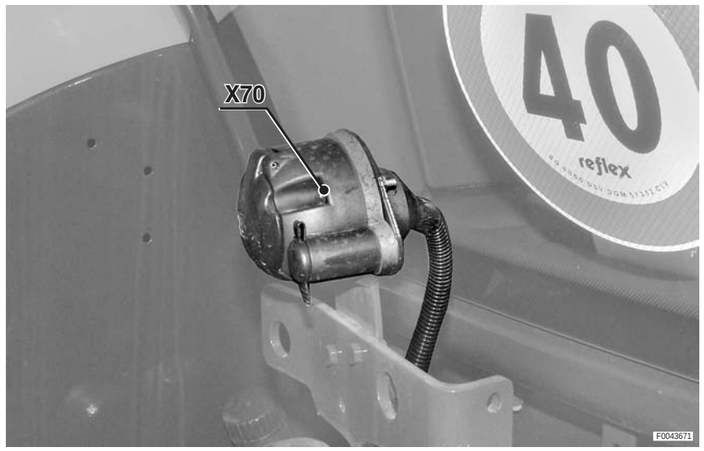

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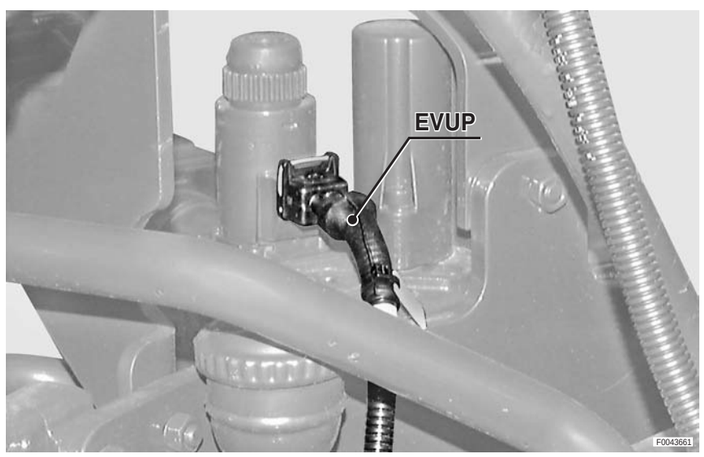
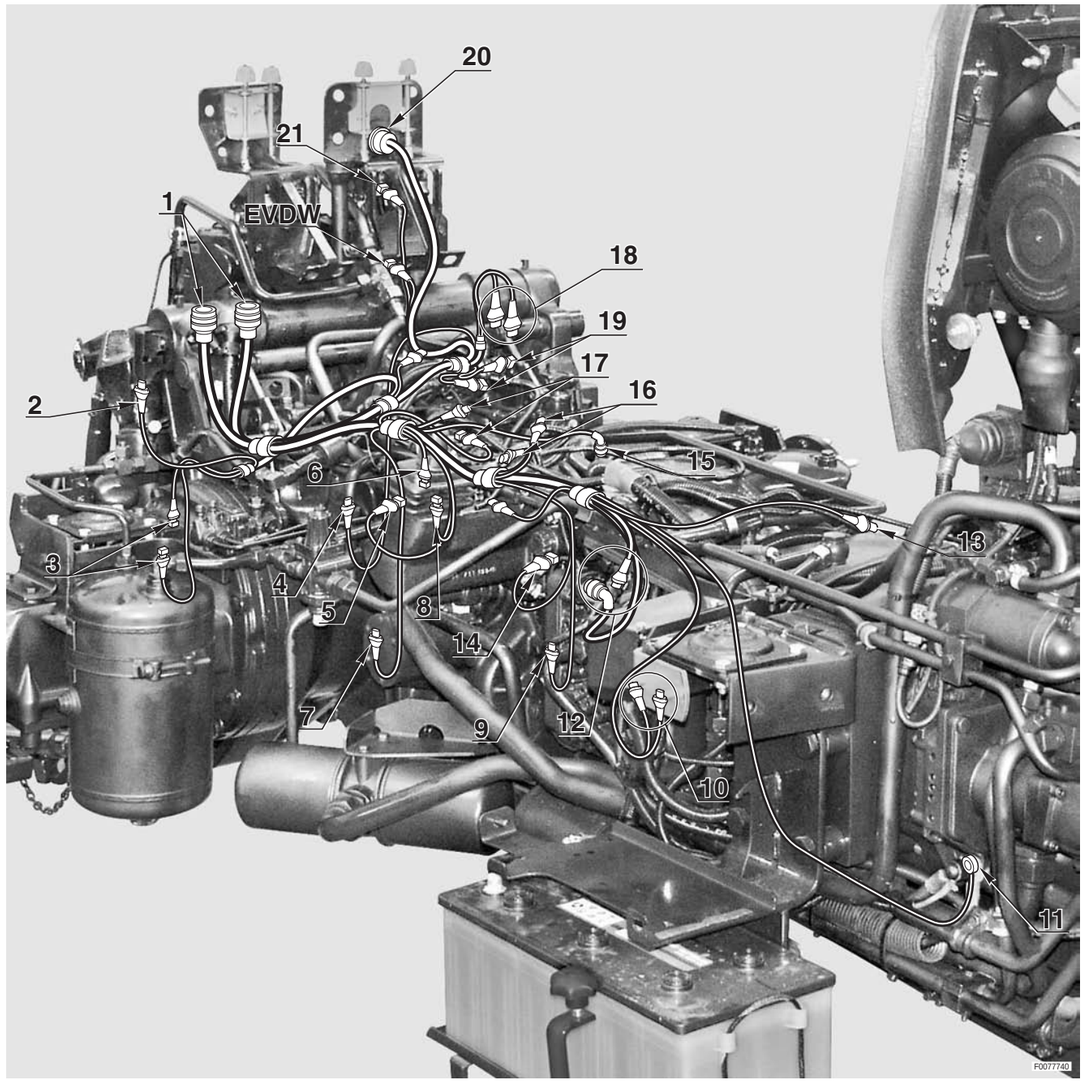


TRANSMISSION WIRING



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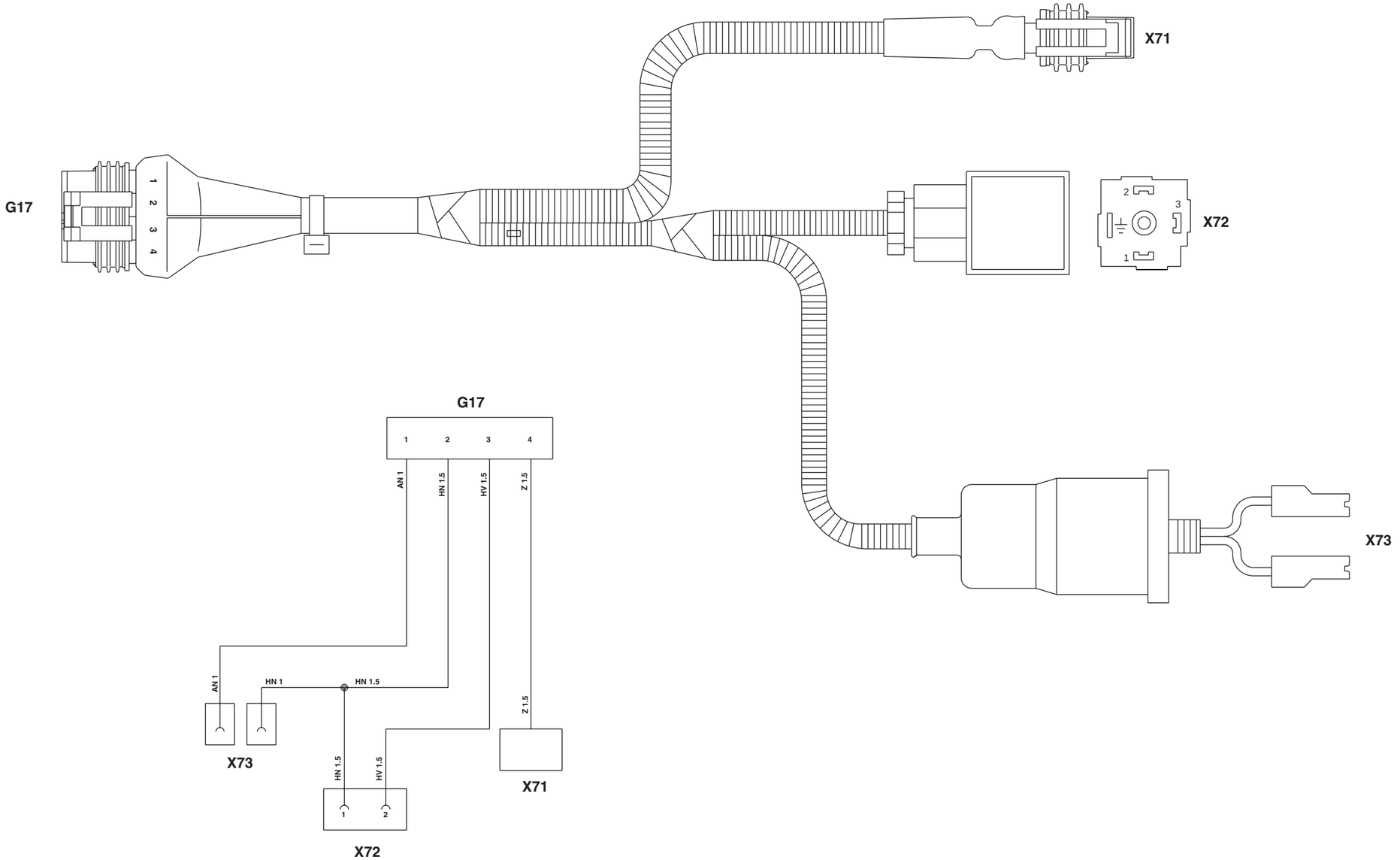
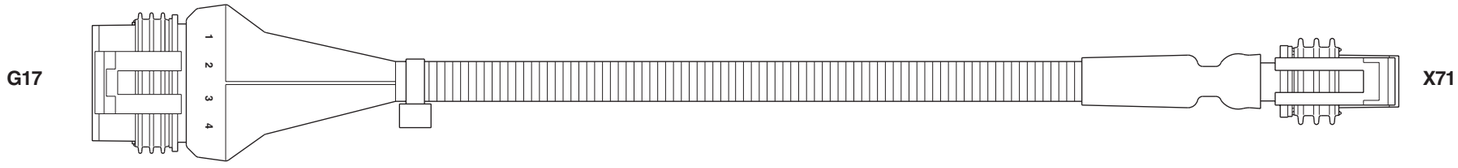
TRAILER BRAKE WIRING (ITALY)



G17 To transmission wiring
X71 Compressed air pressure sensor trailer braking system
X72 Solenoid valve for trailer parking brake
X73 Trailer braking low pressure switch

TRAILER BRAKE WIRING



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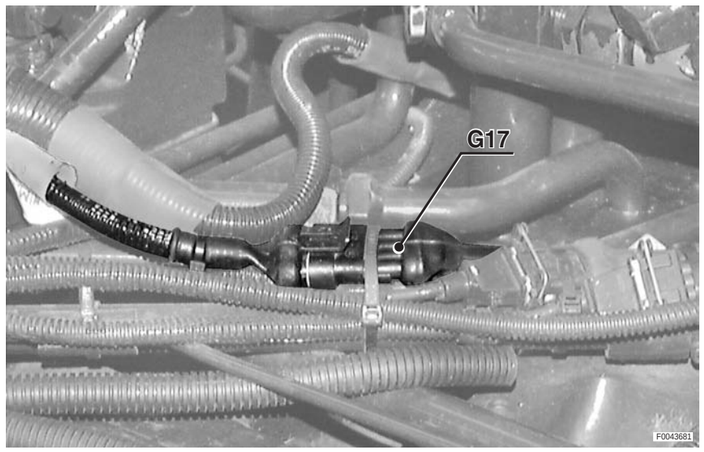
R	Rosso/Red	H	Grigio/Gray

G17 To transmission wiring
X71 Compressed air pressure sensor trailer braking system

TRAILER BRAKE WIRING

1



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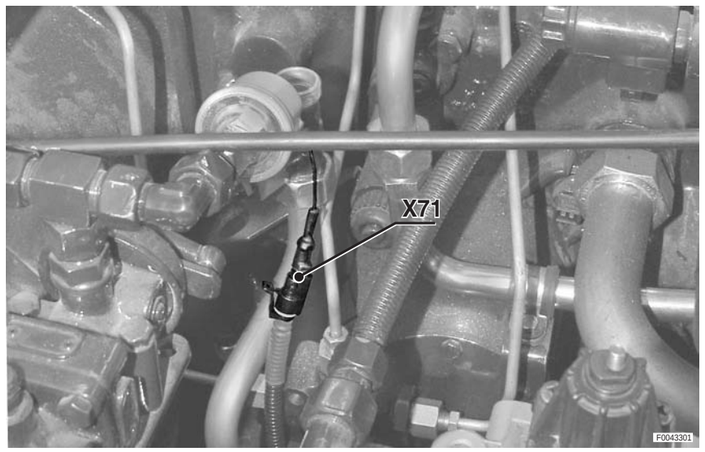

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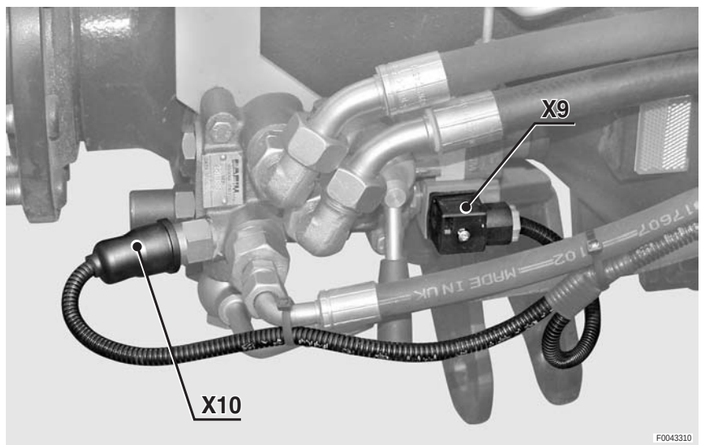
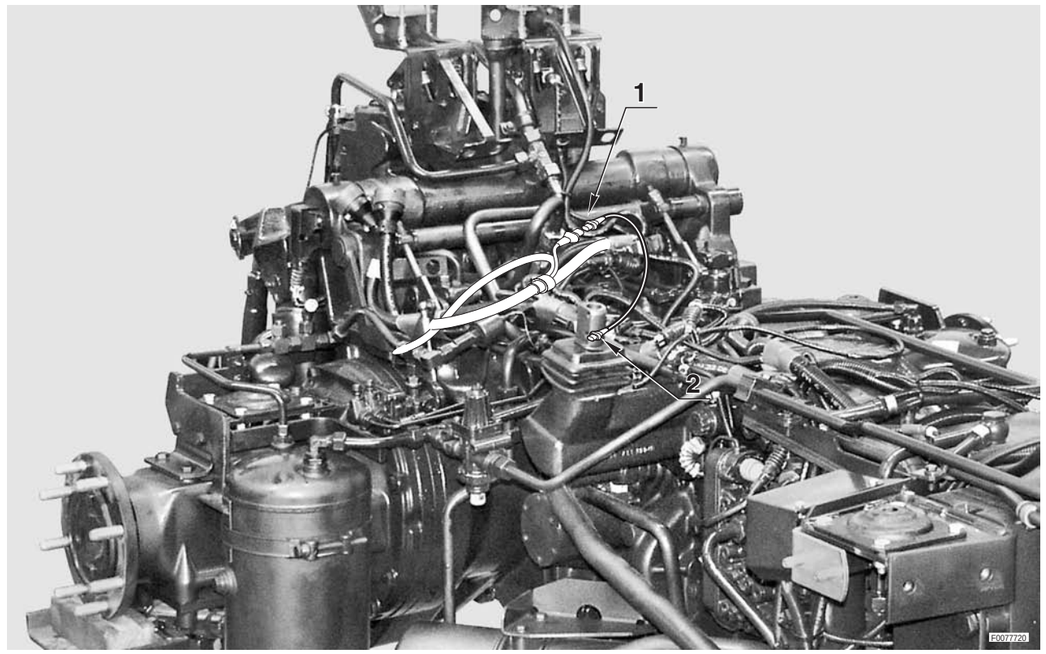
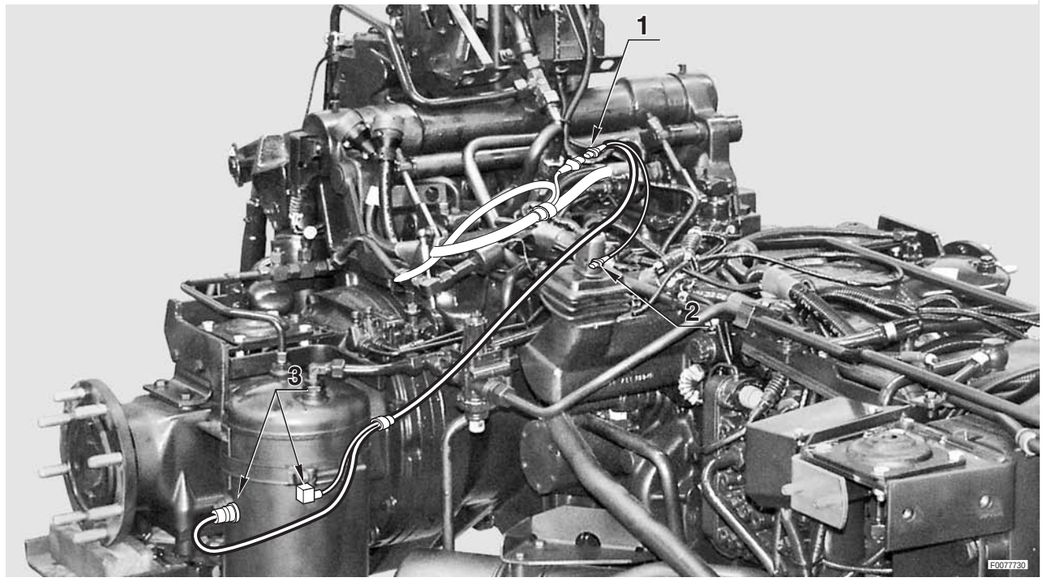




ITALY VERSION



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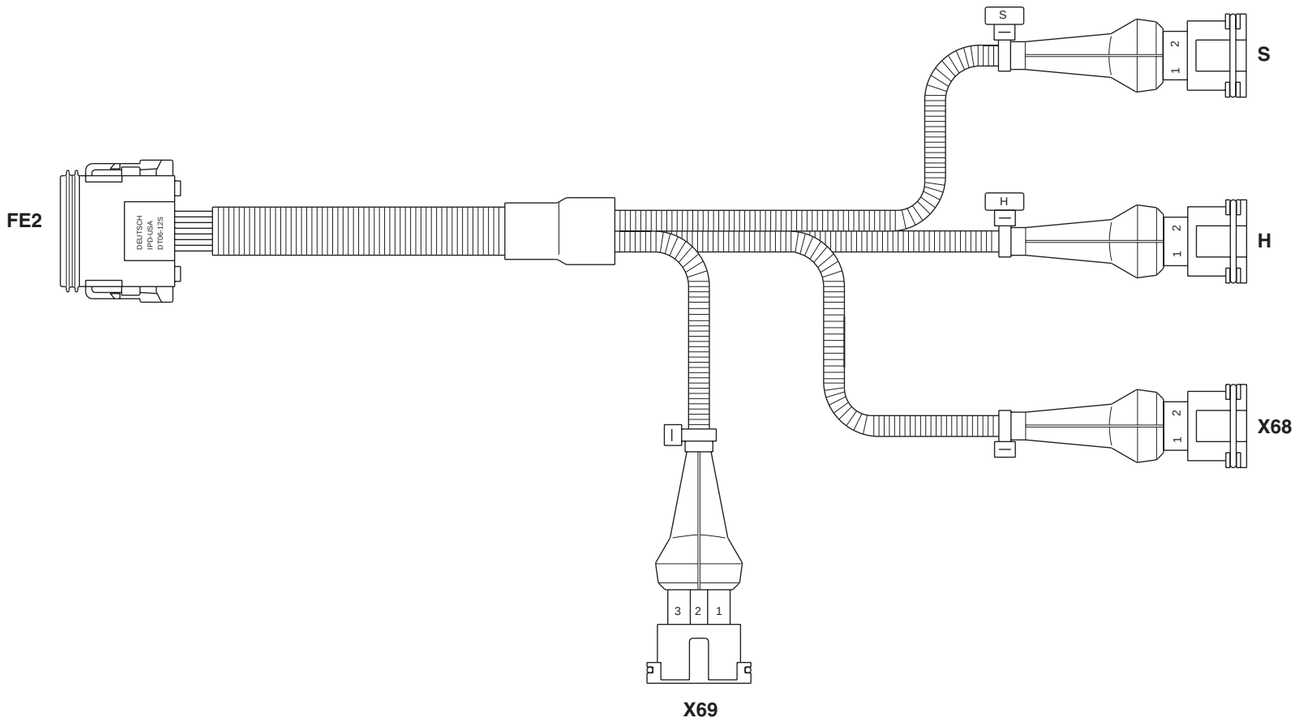
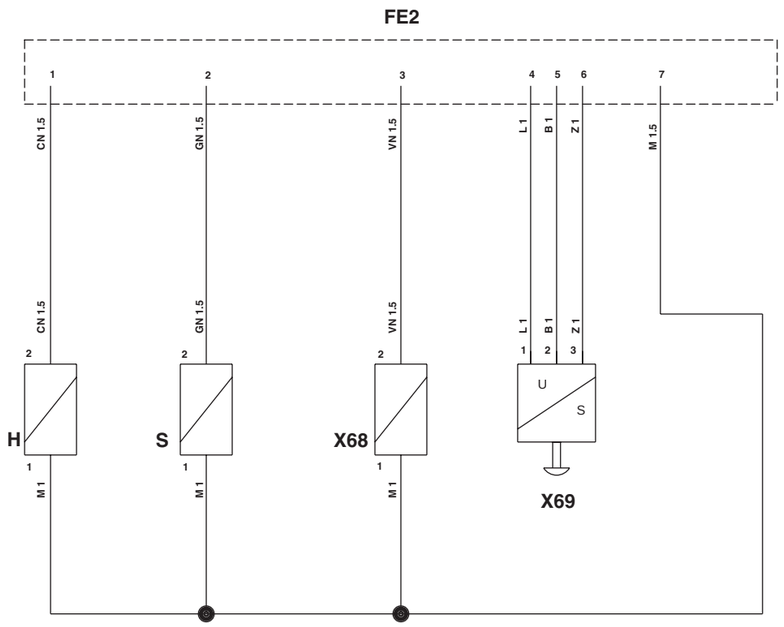
FRONT AXLE SUSPENSION WIRING (CAB)





FE2 To front axle suspension wiring (cab)
H Axle Up control solenoid
S Front axle Down solenoid
X68 Front axle suspension load sensing solenoid
X69 Front axle suspension position sensor

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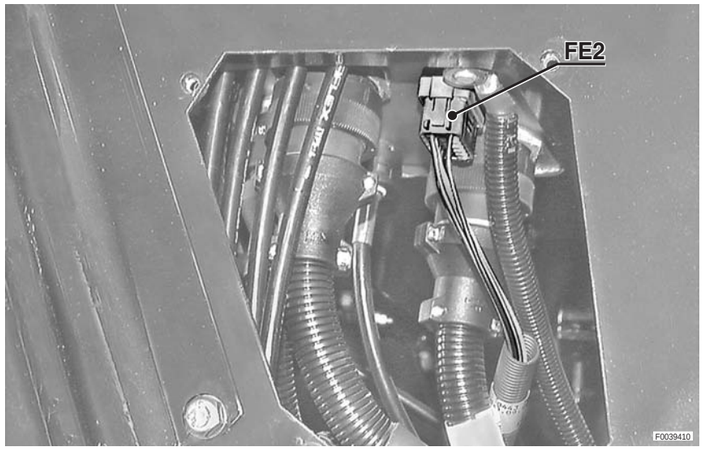
FRONT AXLE SUSPENSION WIRING

1



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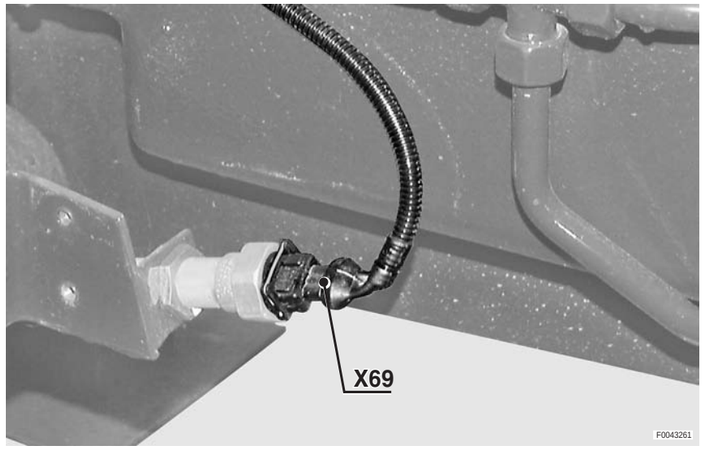

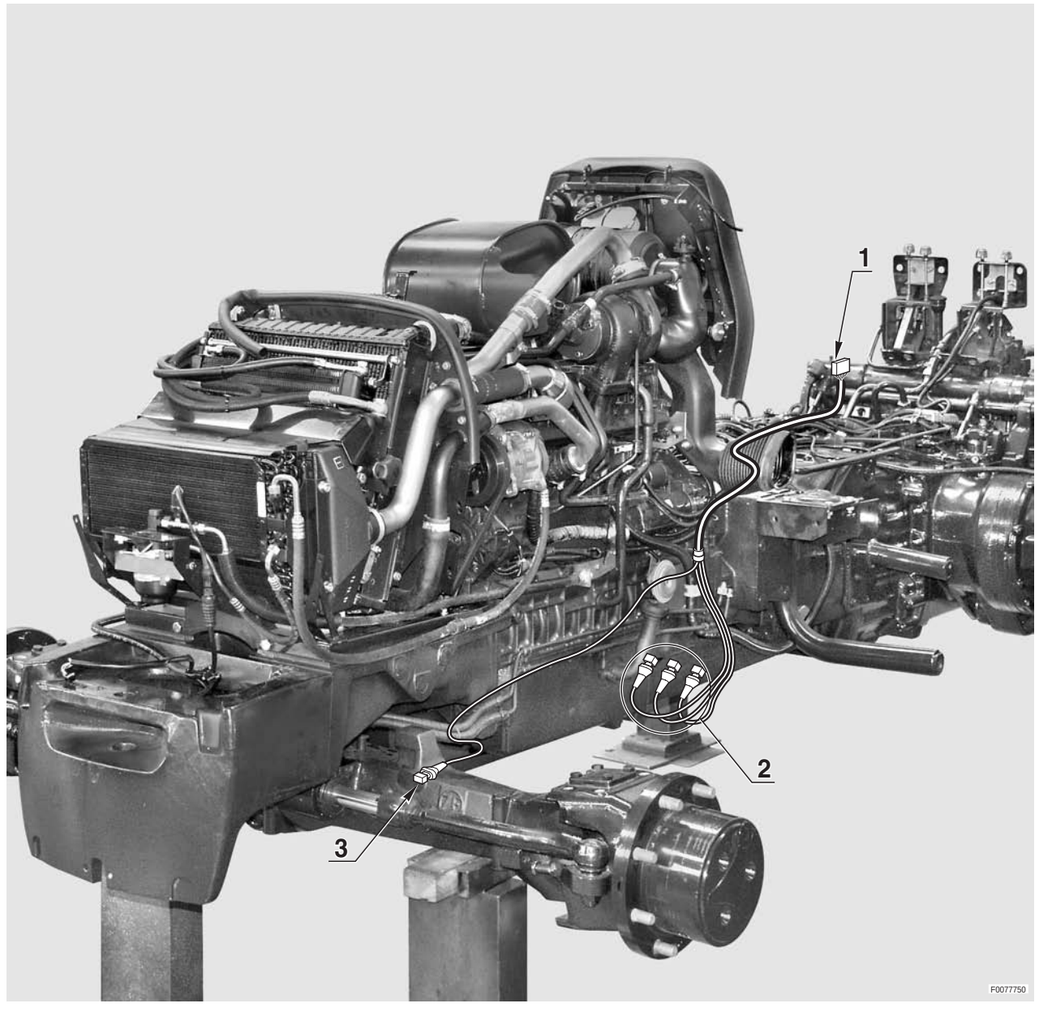

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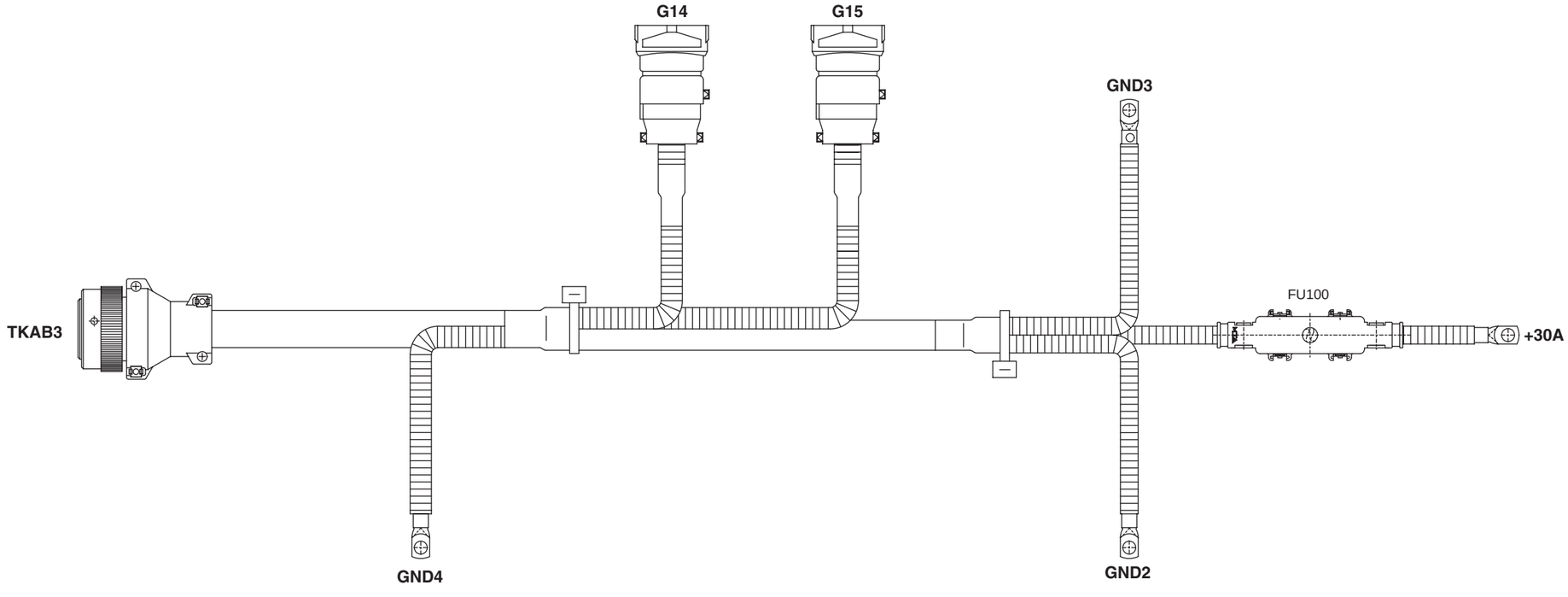
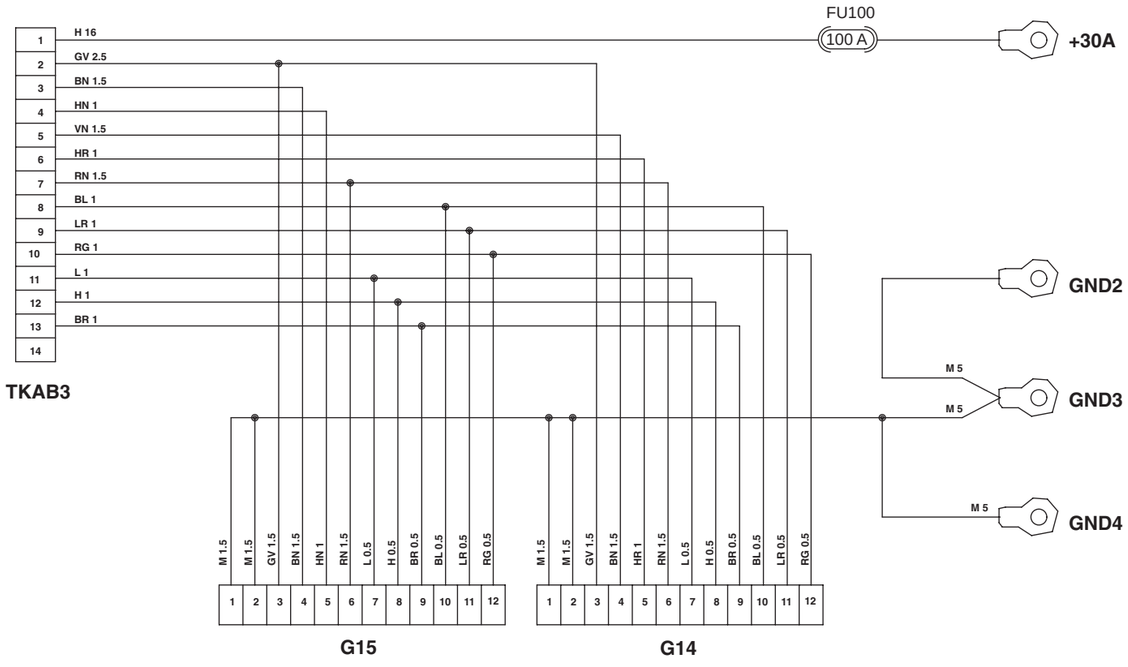
CAB POWER SUPPLY WIRING





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N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

+30A Battery
FU100 Main power supply fuse
G14 To fender wiring - narrow
G15 To fender wiring - narrow
TKAB3 To side console wiring

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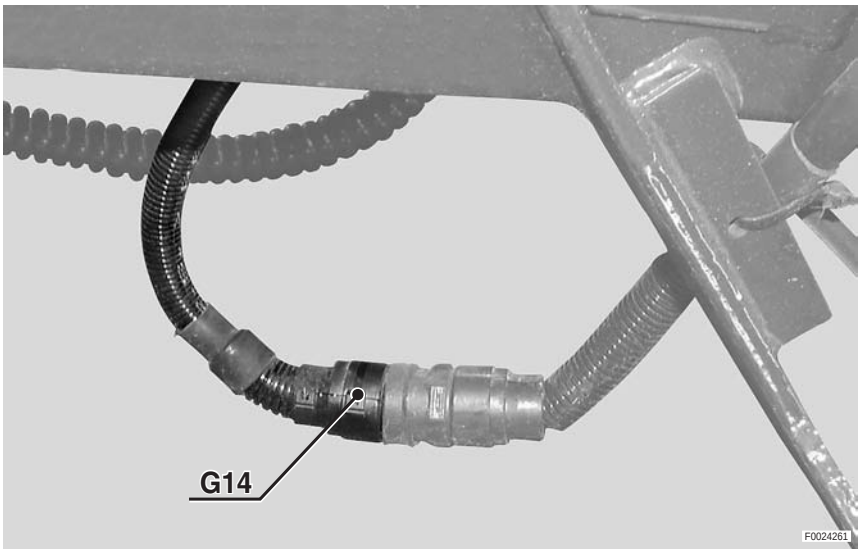
CONNECTORS LOCATION

1



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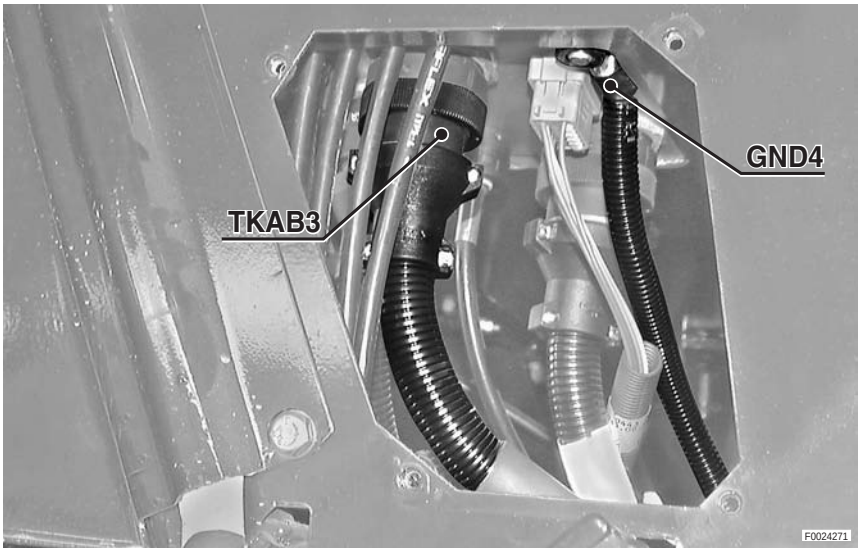

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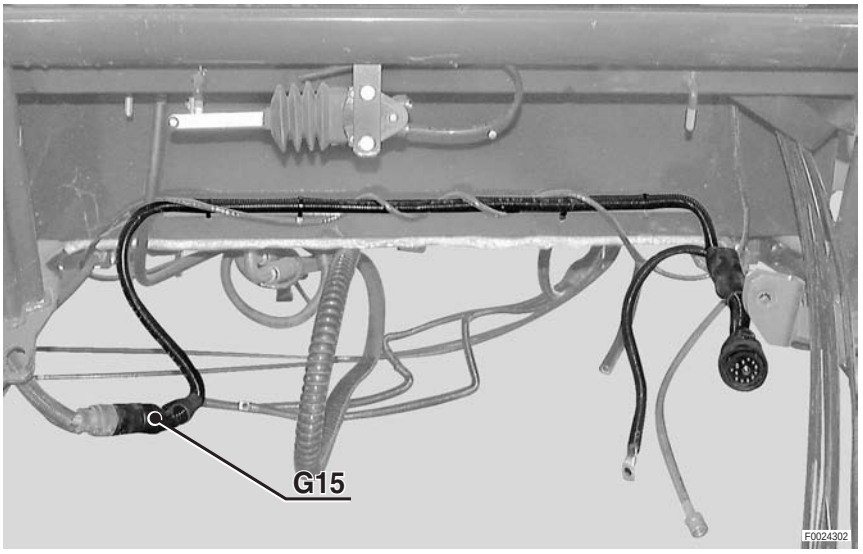

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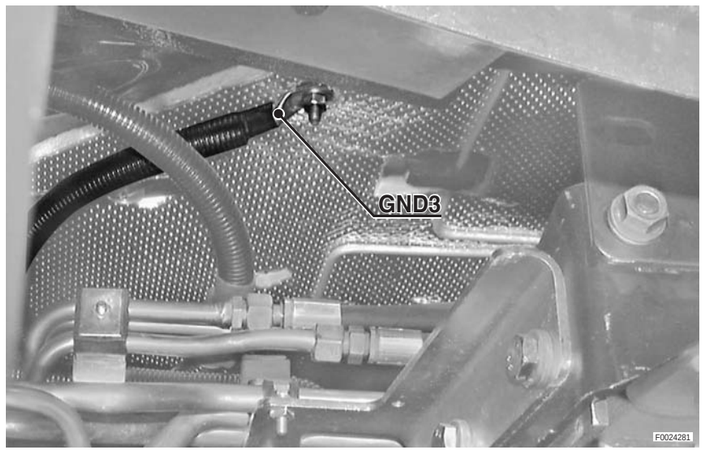
CAB POWER SUPPLY WIRING

4



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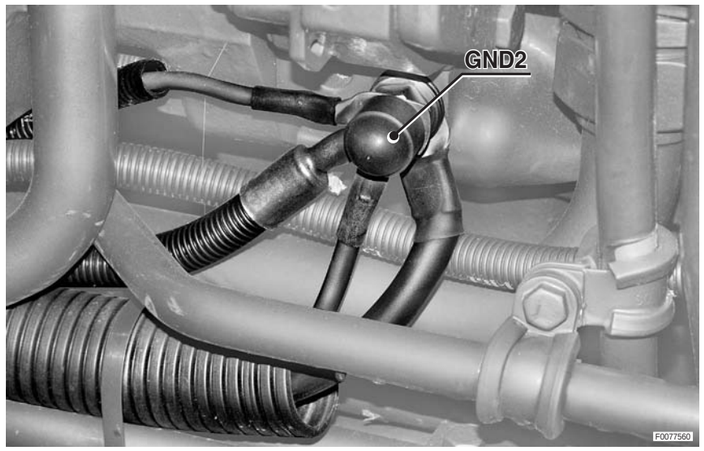

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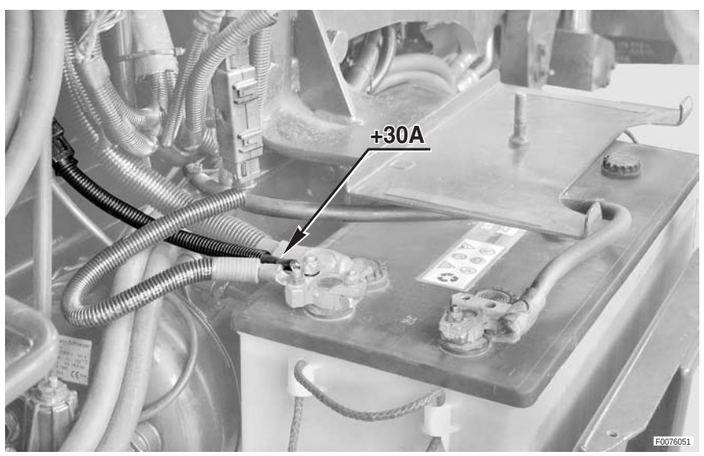

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FRONT AXLE SUSPENSION WIRING

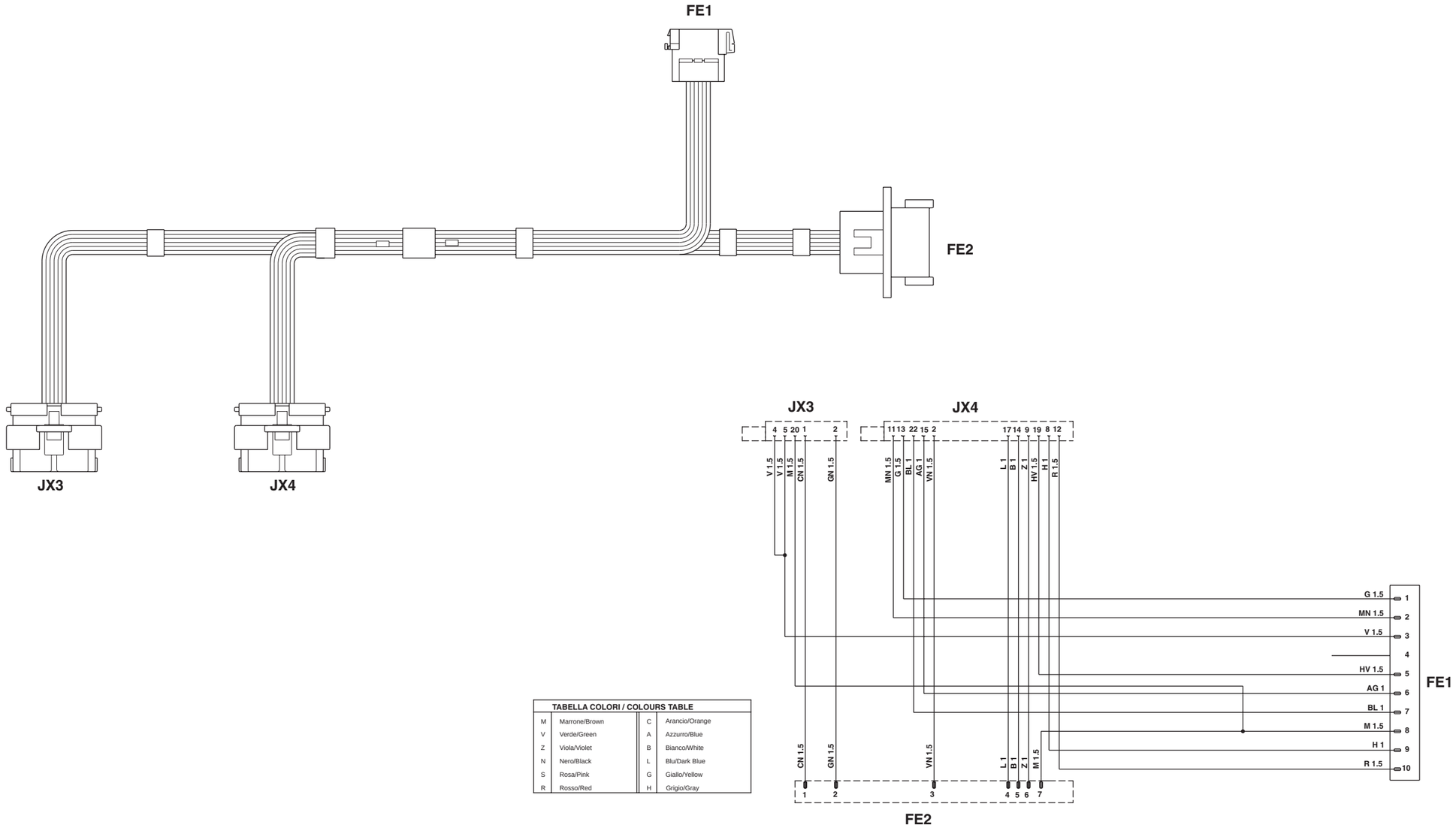

TABELLA COLORI / COLOURS TABLE			
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Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

FE1 To side console wiring
FE2 To front axle suspension wiring
JX3 Front axle suspension control unit
JX4 Front axle suspension control unit

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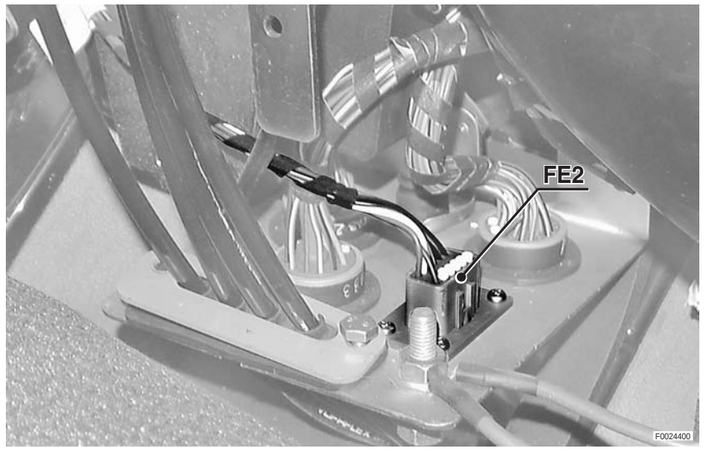
1



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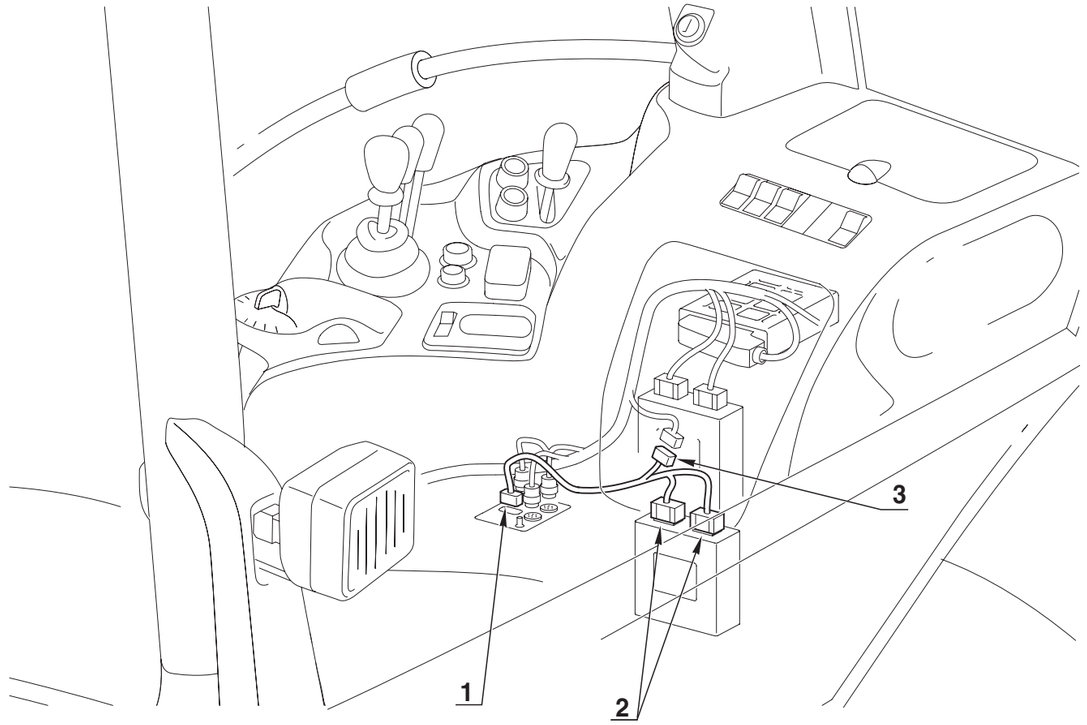
3

FRONT AXLE SUSPENSION WIRING



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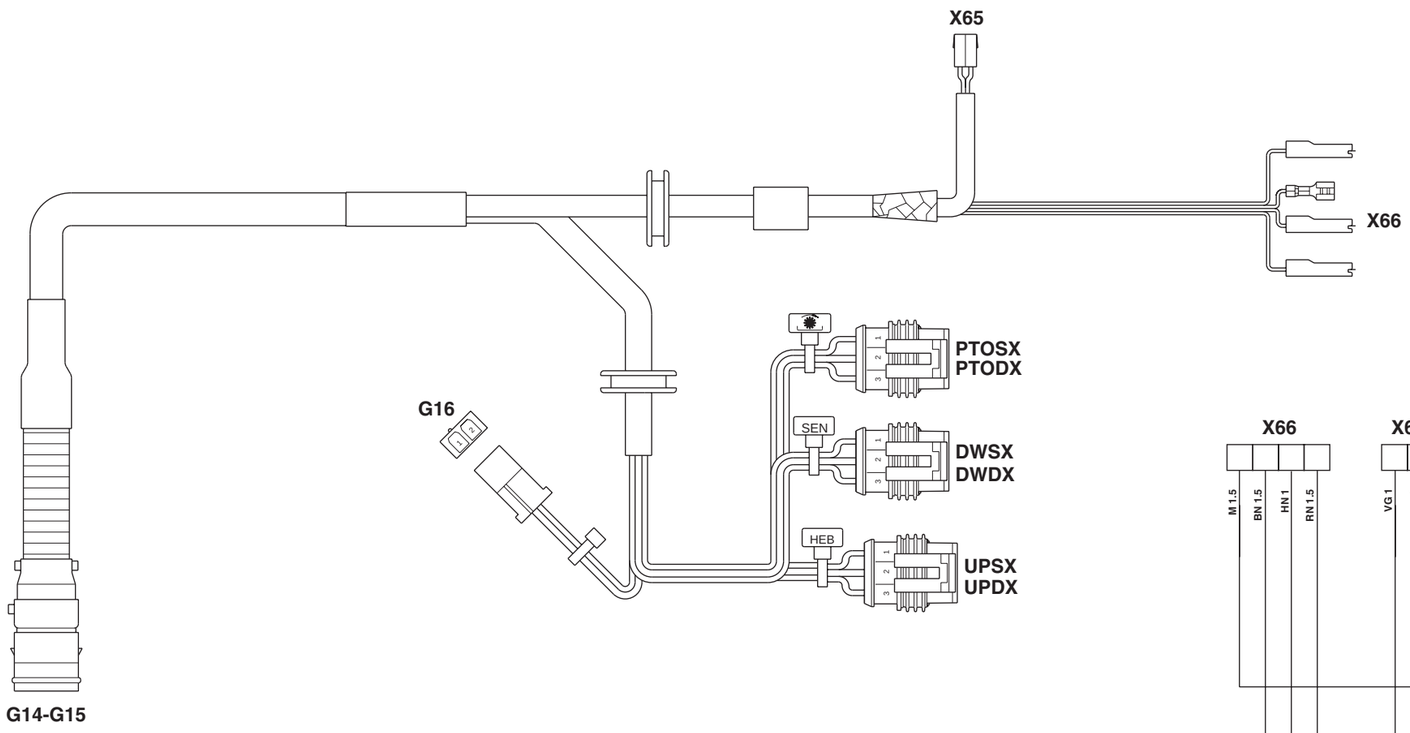
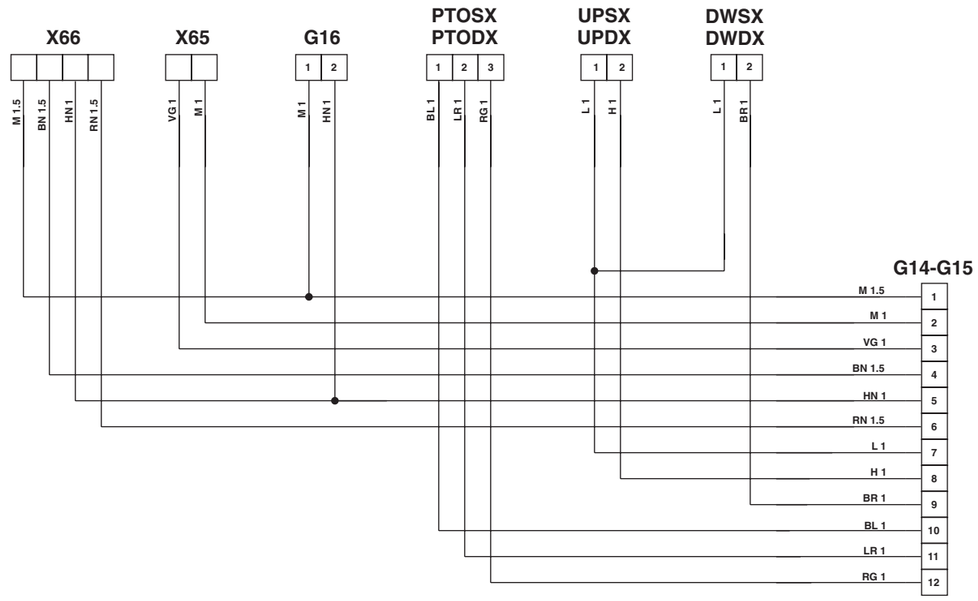
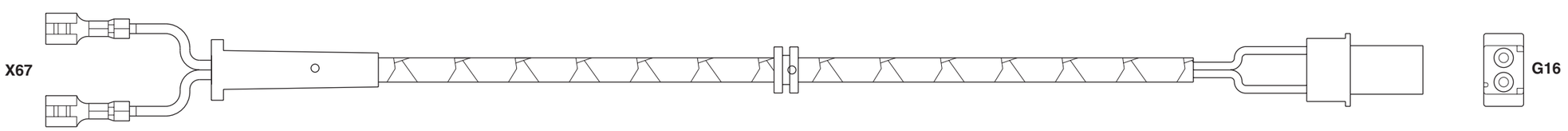
FENDER WIRING - NARROW

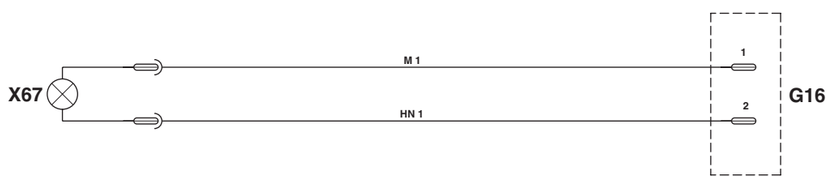




DWDXRH lift Down pushbutton
DWSXLH lift Down pushbutton
G14 To cab power supply wiring
G15 To cab power supply wiring
G16 To number plate light wiring
PTODXRH rear PTO control button (on fender)
PTOSXNot utilised
UPDXRH rear lift Up pushbutton
UPSXLH rear lift Up pushbutton
X65 Rear right lower worklights
X66SX Rear left sidelight and direction indicator
X66DX Rear right sidelight and direction indicator

NUMBER PLATE LIGHT WIRING





G16 To fender wiring - narrow
X67 Number plate light

CONNECTORS LOCATION

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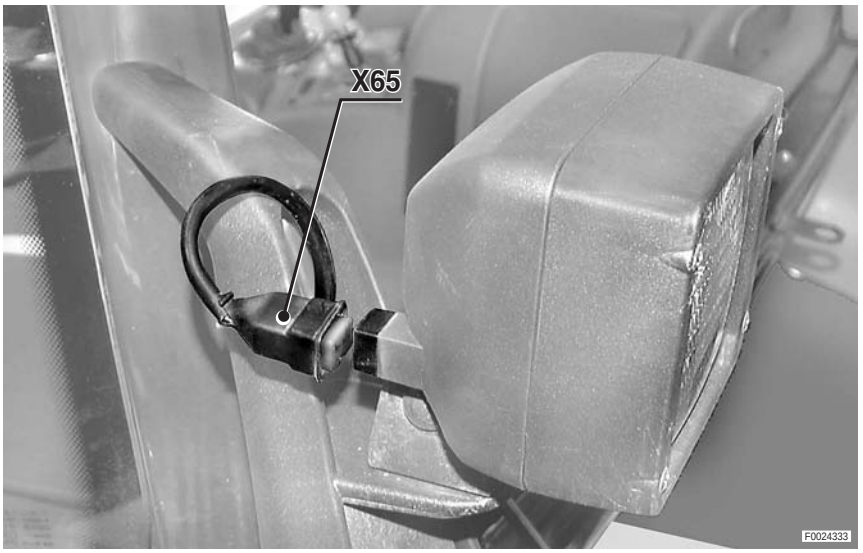

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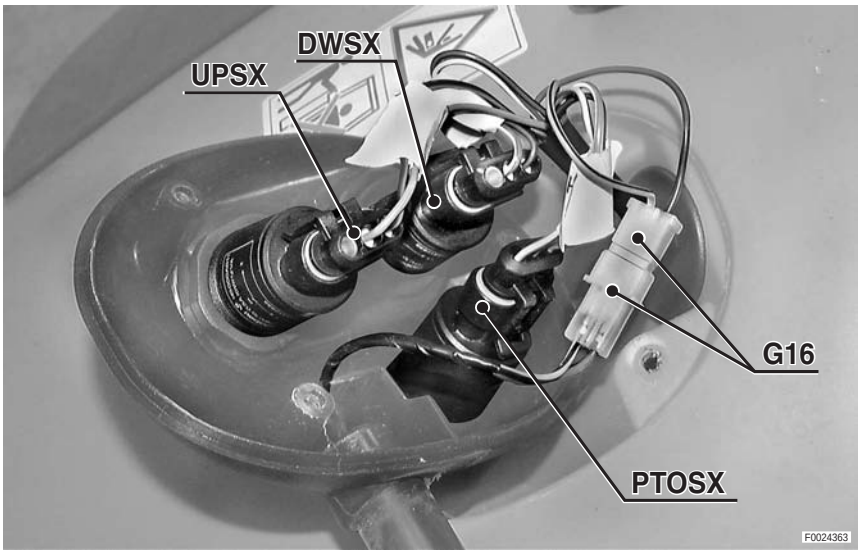

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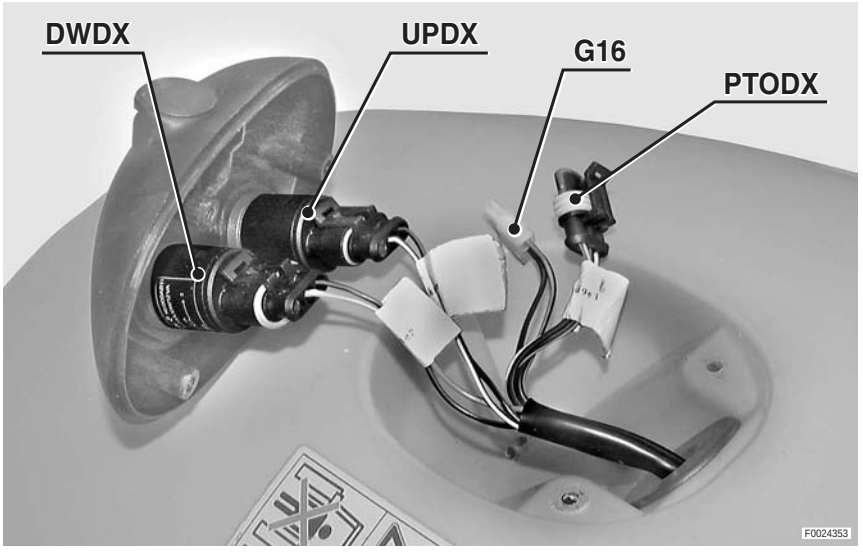

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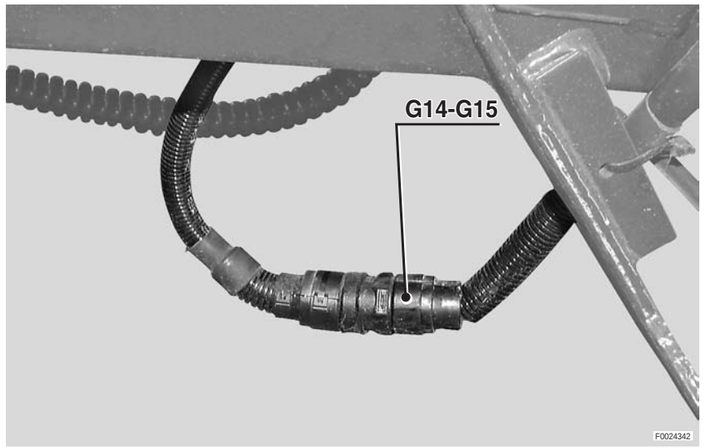
FENDER NARROW WIRING - PLATE LIGHT WIRING

4



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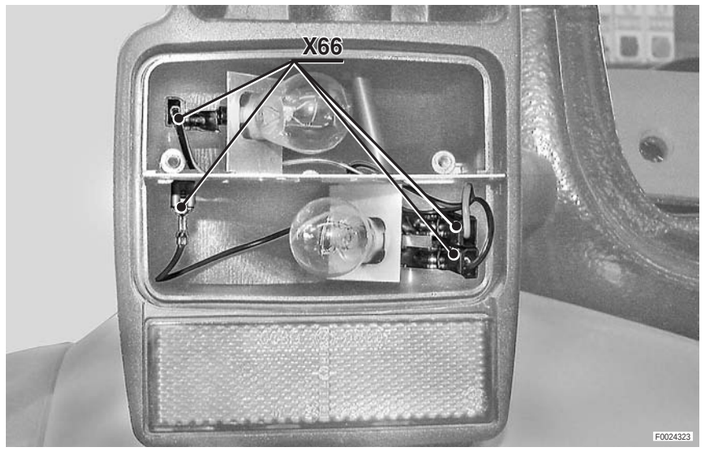

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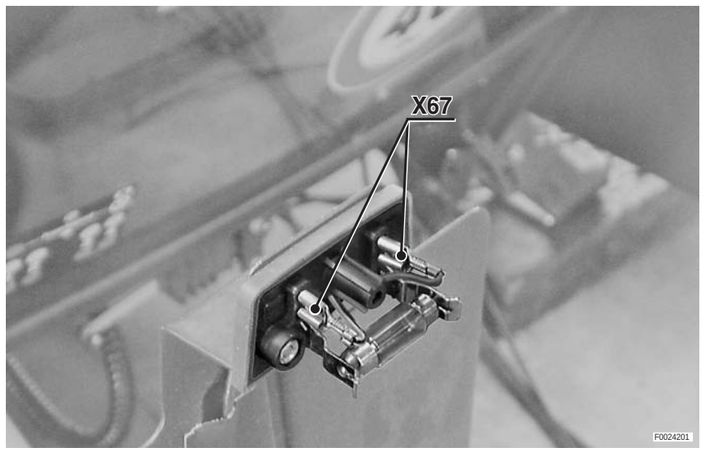

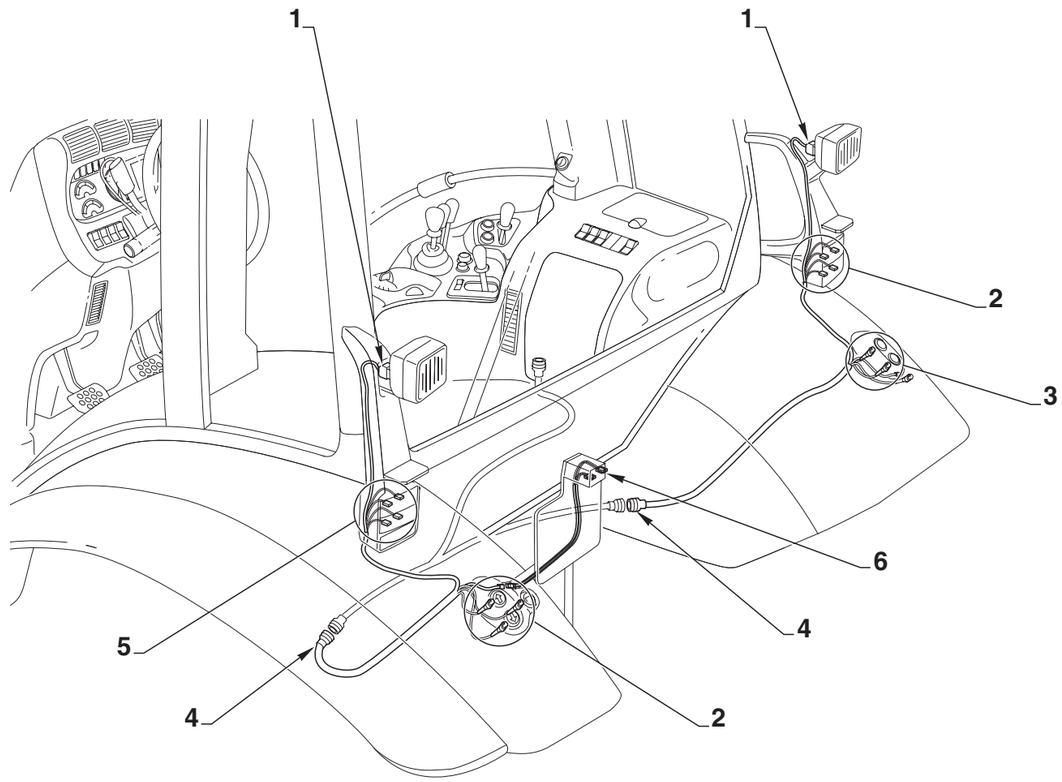

FENDER 0442.9835 | **PLATE LIGHT** 0441.4114

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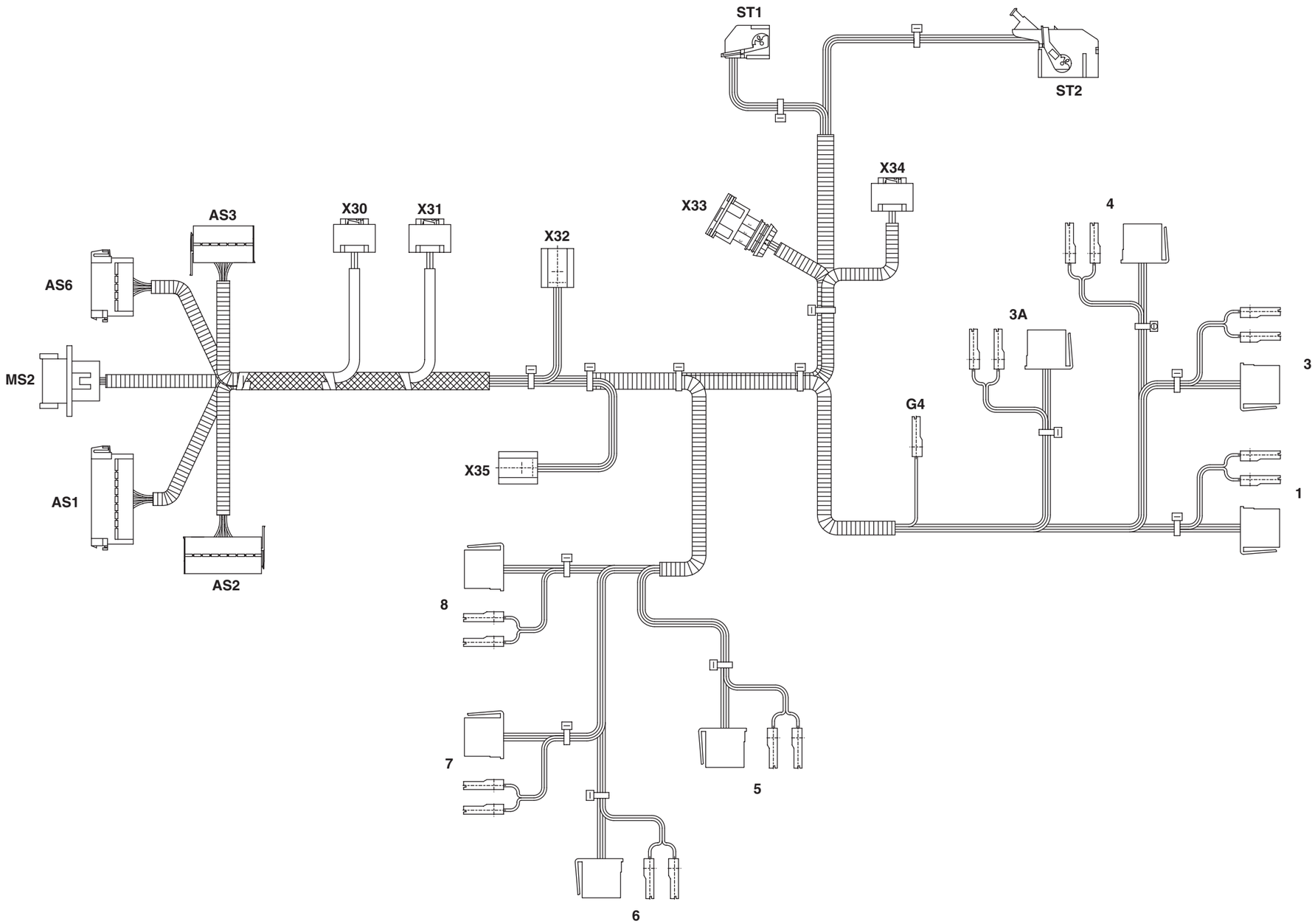
FRONT CONSOLE WIRING (1/2)



1 Sidelights switch
3 Cab headlights low beam switch
3A Lower front worklights switch (on cab)
4 50S lights switch
5 Front suspension pushbutton
6 ASM switch
7 Differential lock switch
8 4WD switch

AS1 To side console wiring
AS2 To side console wiring
AS3 To side console wiring
AS6 To side console wiring
G4 To lights selector switch wiring
MS2 To engine wiring
ST1 Instrument panel
ST2 Instrument panel

X30 Not utilised
X31 Accelerator pedal position sensor
X32 Right brake pedal switch
X33 Clutch pedal depressed proximity sensor
X34 Clutch pedal position sensor
X35 Left brake pedal switch

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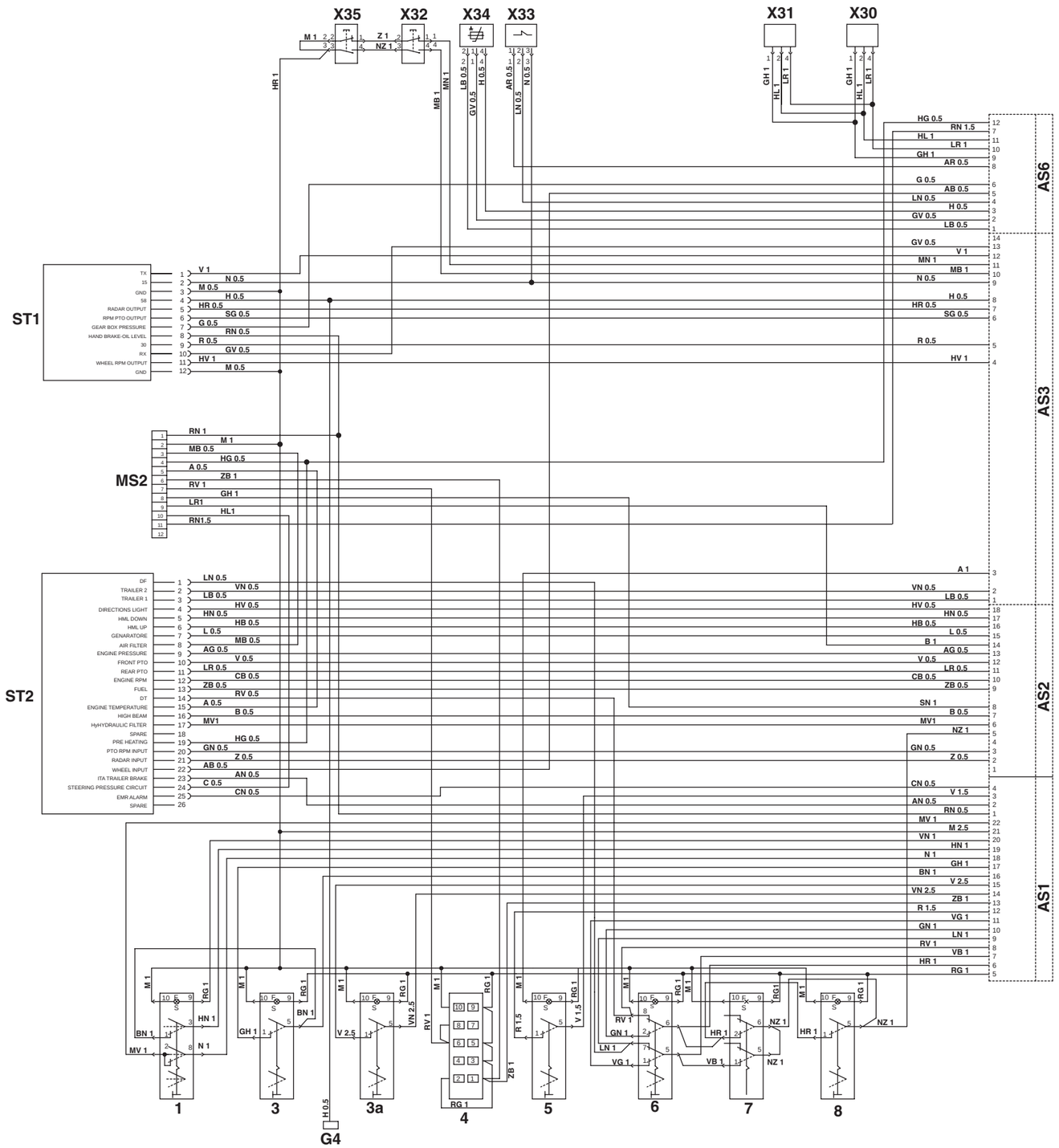
FRONT CONSOLE WIRING (2/2)



CONNECTORS LOCATION

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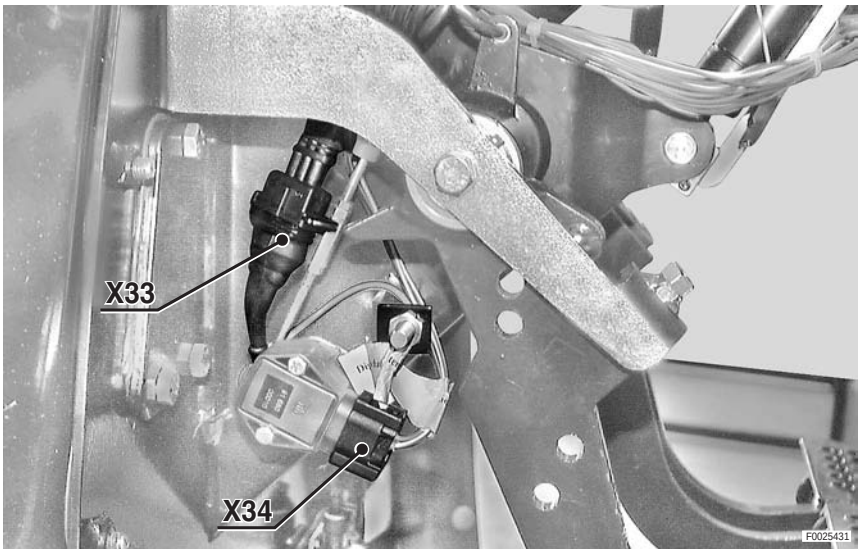

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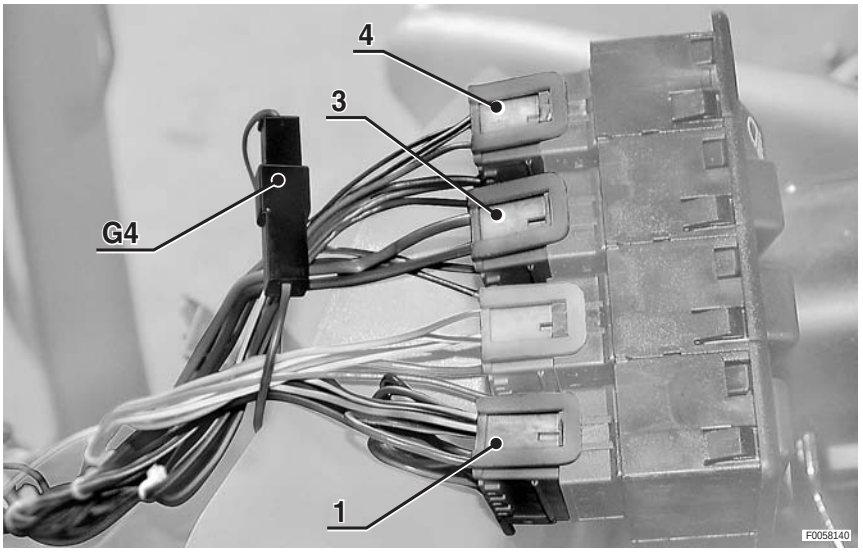

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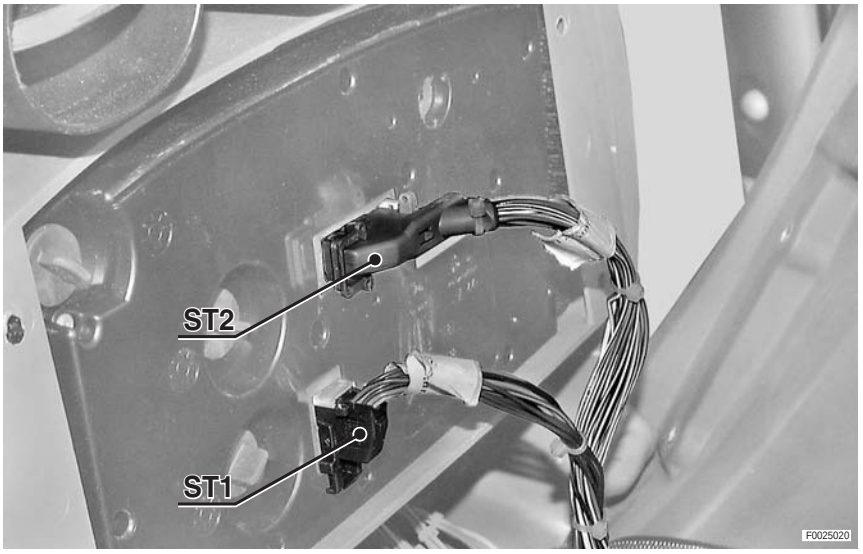

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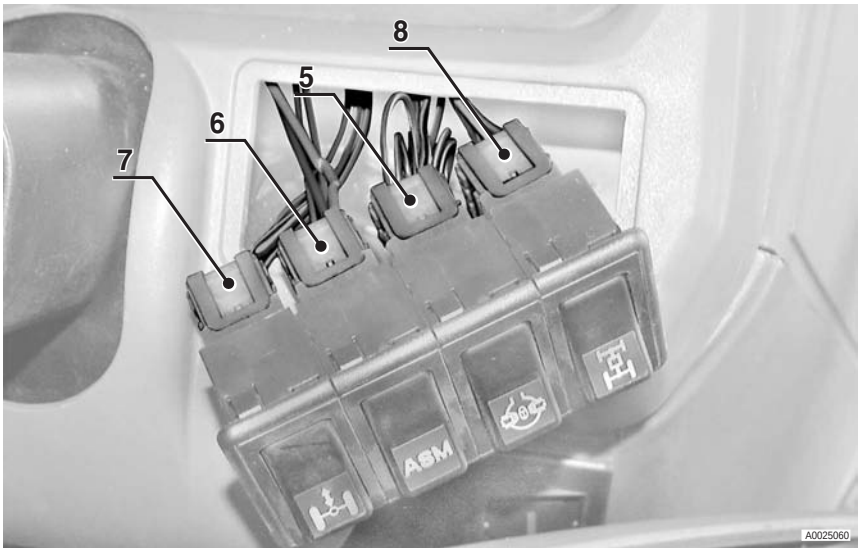

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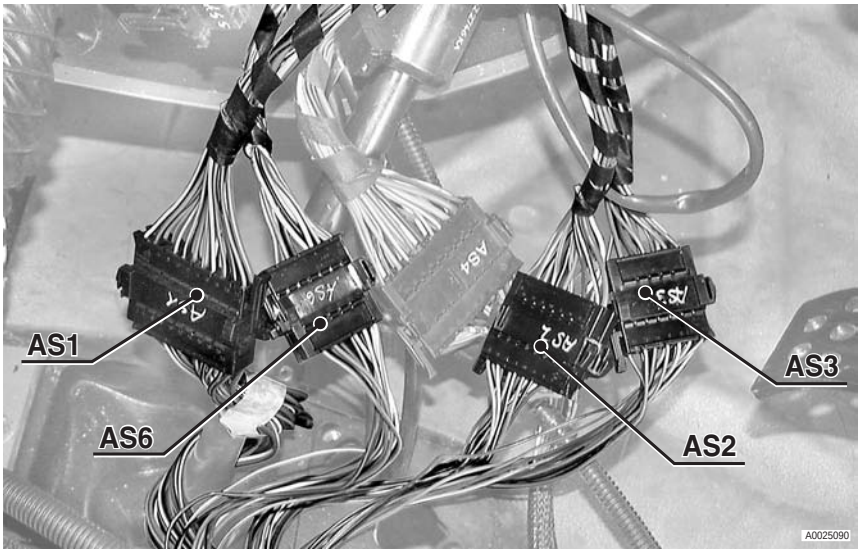

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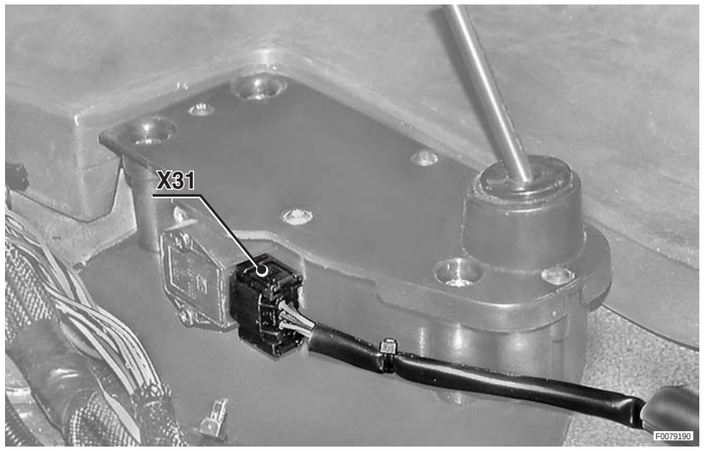

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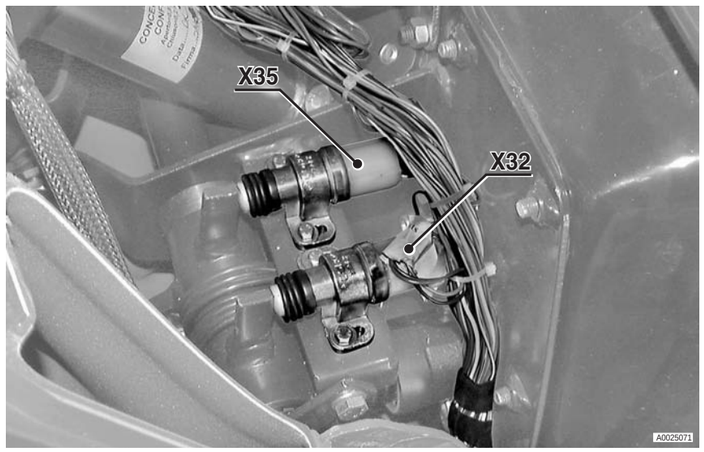
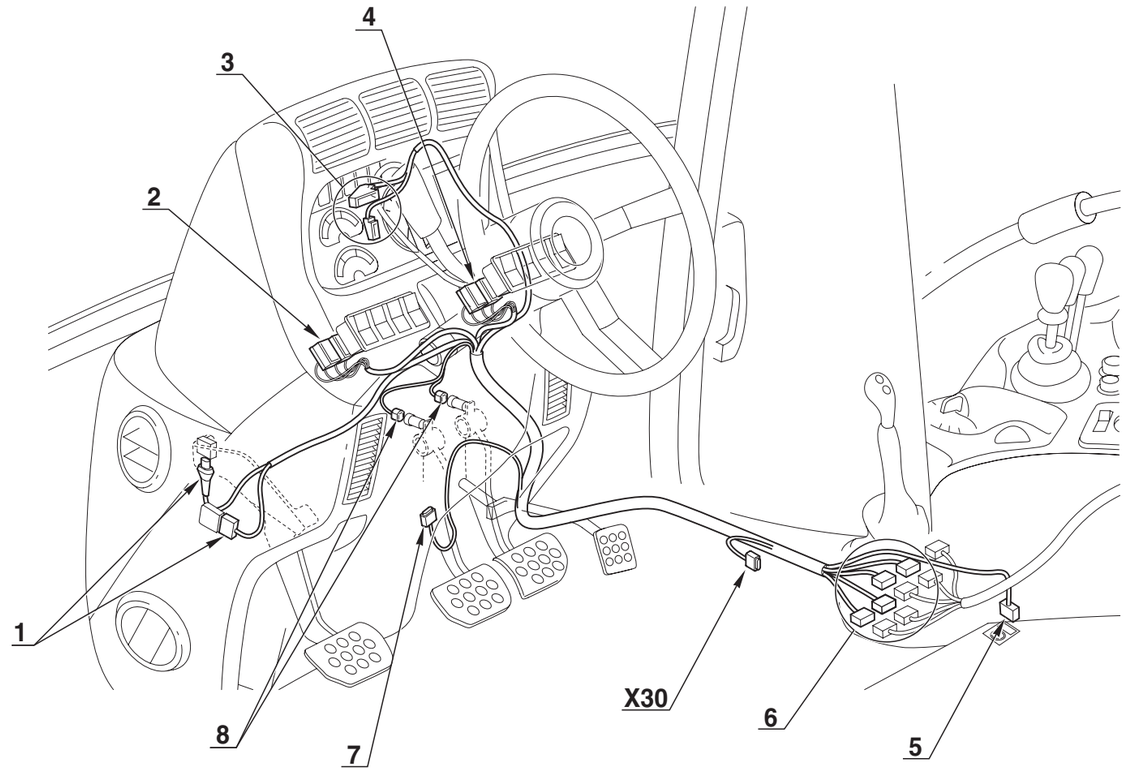


FRONT CONSOLE WIRING



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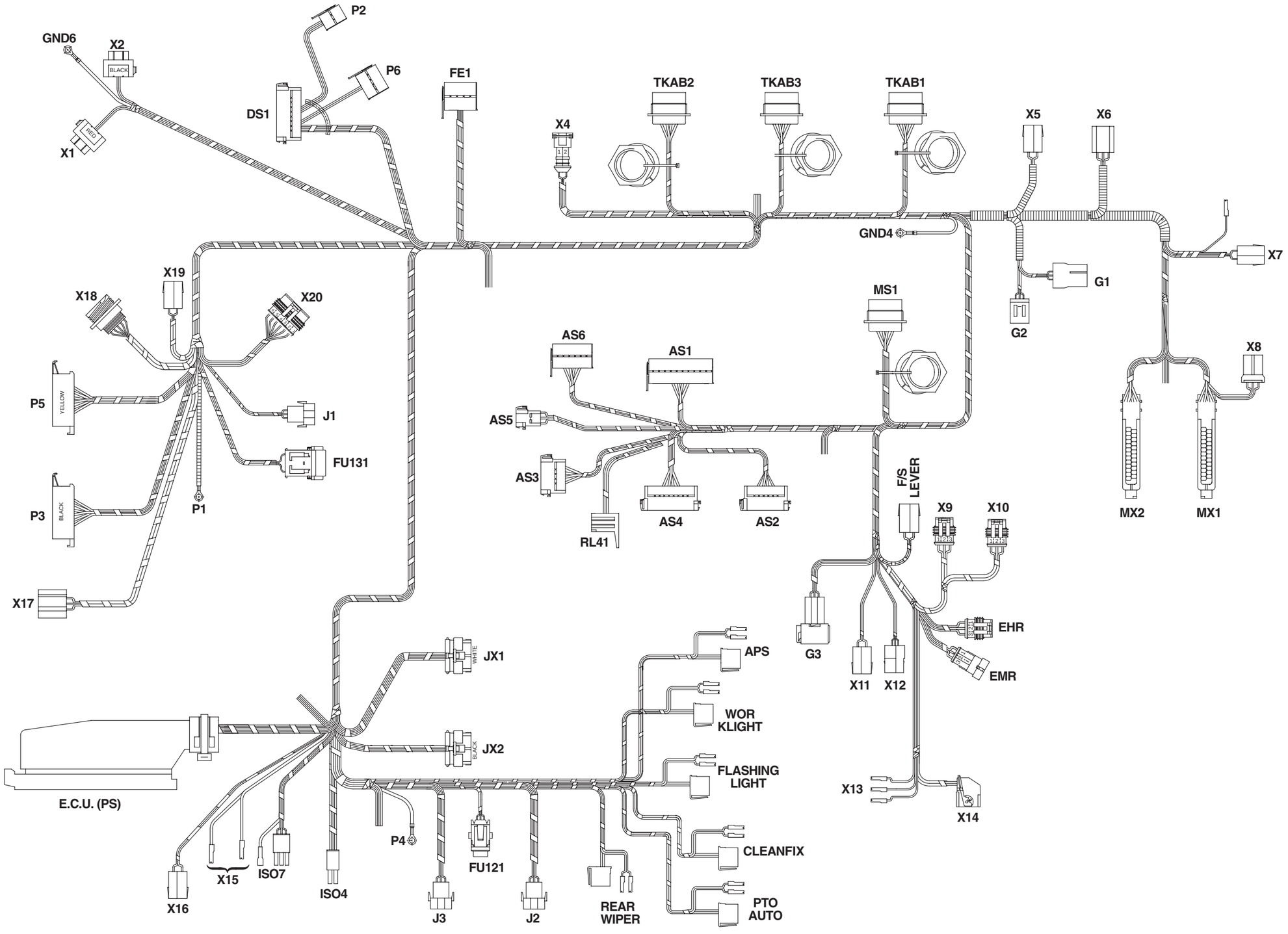
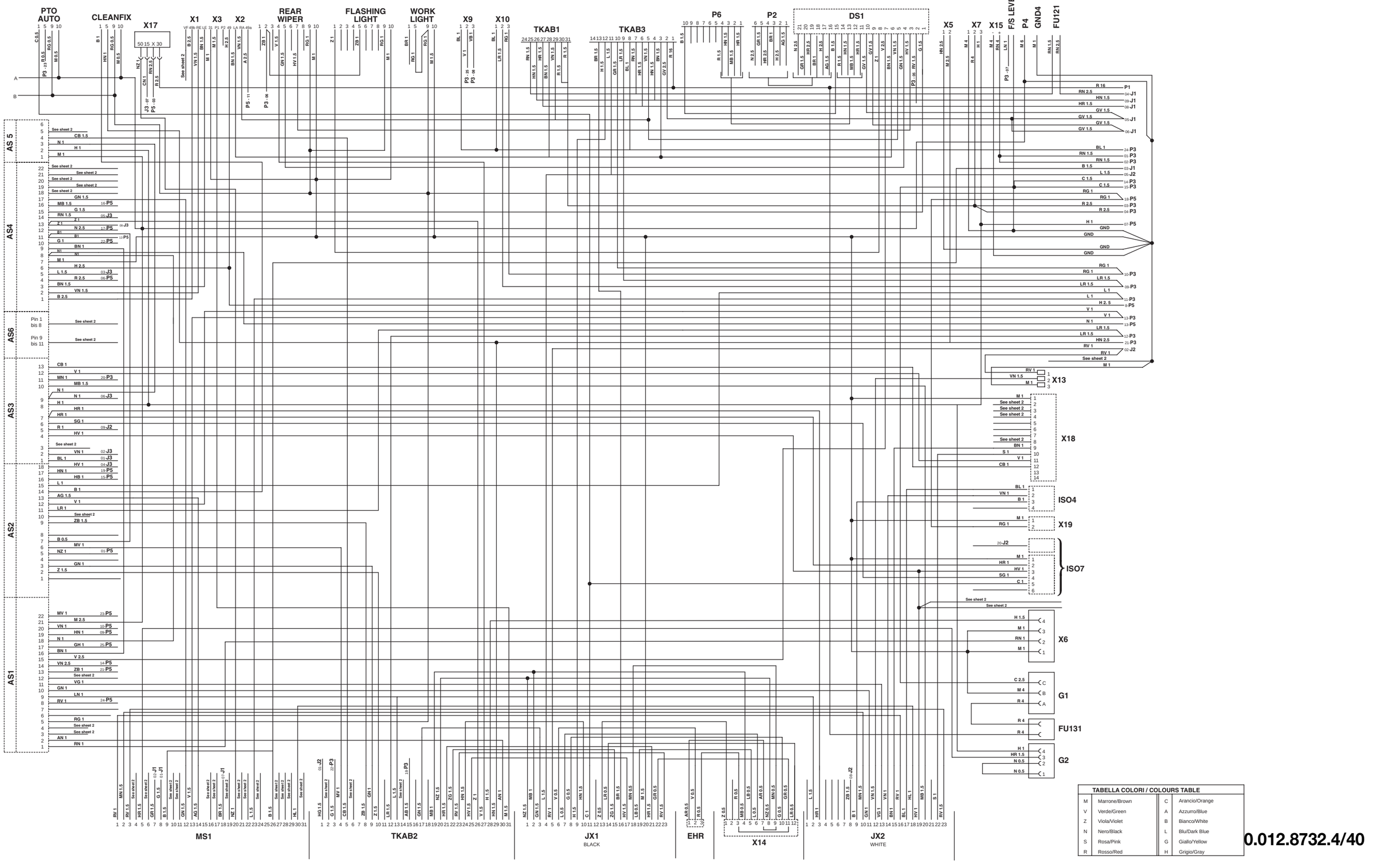
SIDE CONSOLE WIRING (1/2)



MS1 To engine wiring
MX1 Engine control unit
MX2 Engine control unit
P1 To fuses
P2 To fuses
P3 To fuses
P4 To fuses
P5 To fuses
P6 To fuses
PTO AUTO PTO AUTO switch
REAR WIPER Rear screen wiper switch
RL41 Preheating warning light ON relay
TKAB1 To transmission wiring
TKAB2 To transmission wiring
TKAB3 To cab power supply wiring
WORK LIGHT Rear worklights switch
X1 Direction indicators flasher unit (Red)
X2 Direction indicators flasher unit (black)
X4 Not utilised
X5 Driver seat air suspension compressor
X6 Handbrake switch
X7 Cigar lighter
X8 Engine ECU circuit board
X9 Front PTO button (in cab)
X10 Rear PTO button (in cab)
X11 Not utilised
X12 Gearshift lever
X13 Radar control switch
X14 Lift control panel
X15 Auxiliary power socket
X16 Not utilised
X17 Starter switch
X18 Diagnostics connector
X19 Auxiliary power supply connector (in cab)
X20 To armrest wiring
X20 Engine speed keypad

D0023260

SIDE CONSOLE WIRING (2/2)



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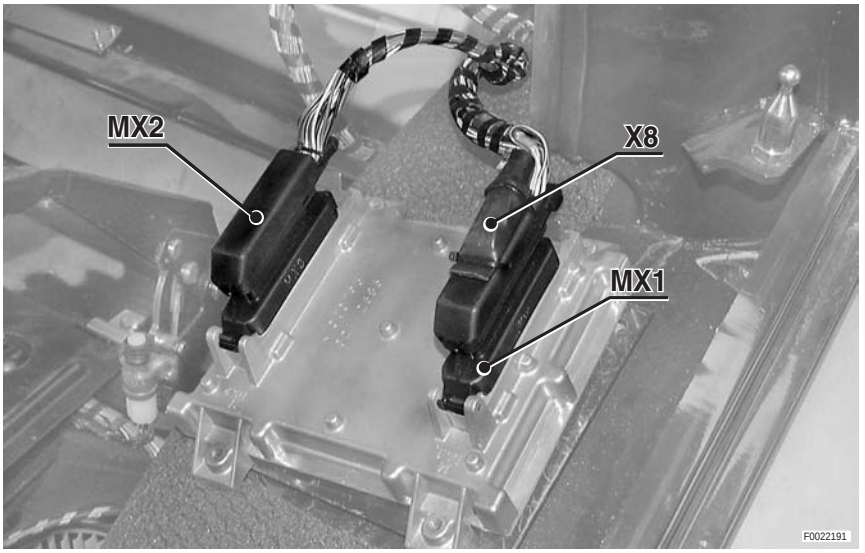
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

CONNECTORS LOCATION

1



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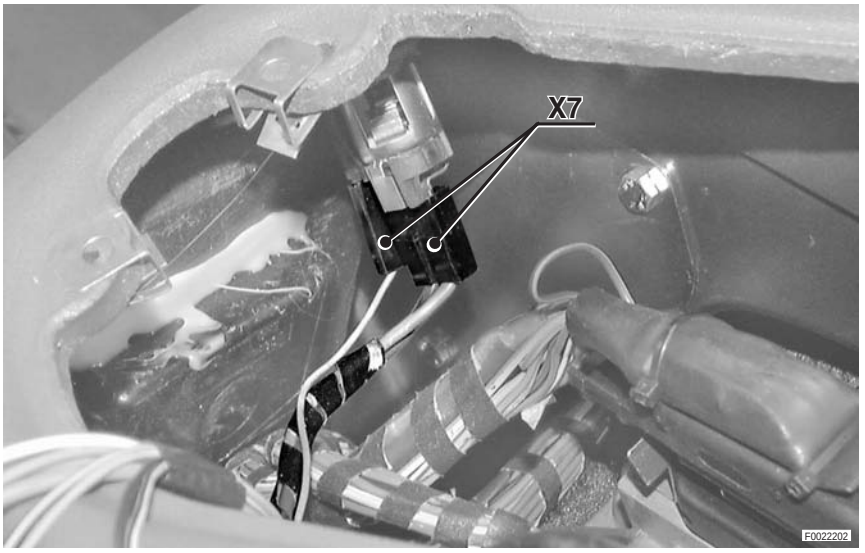

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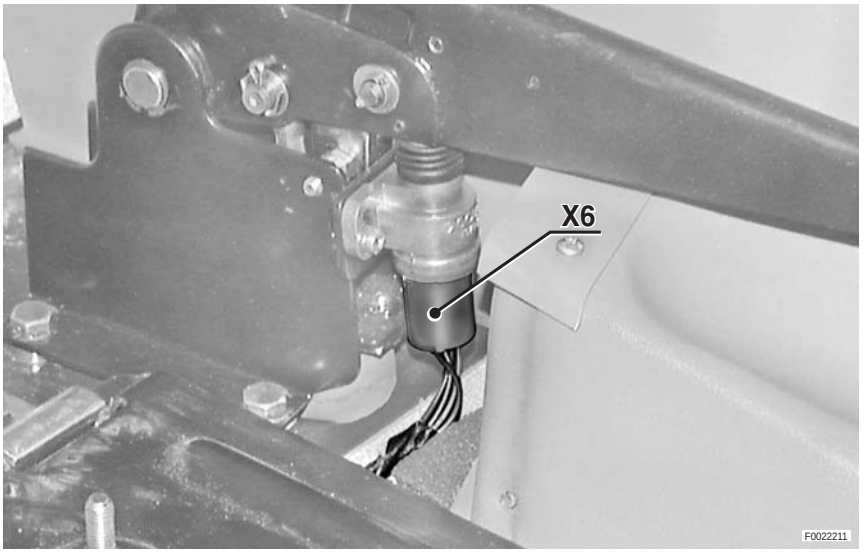

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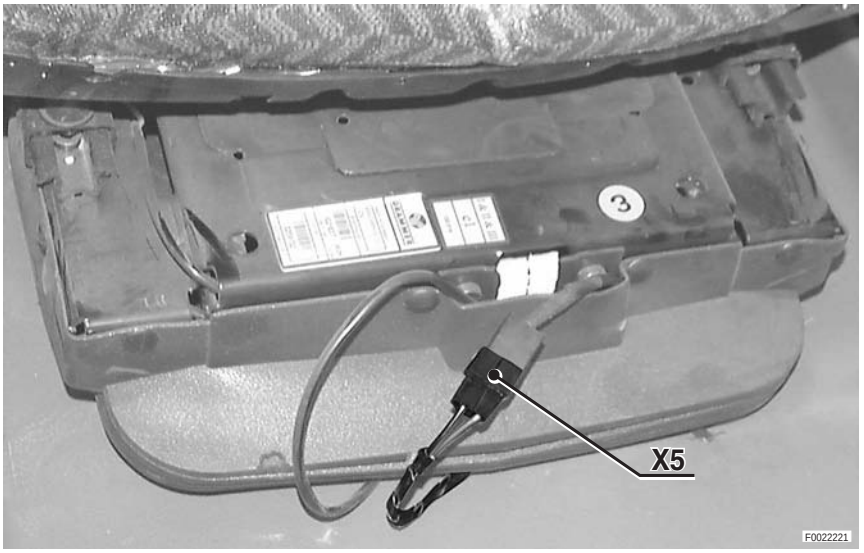

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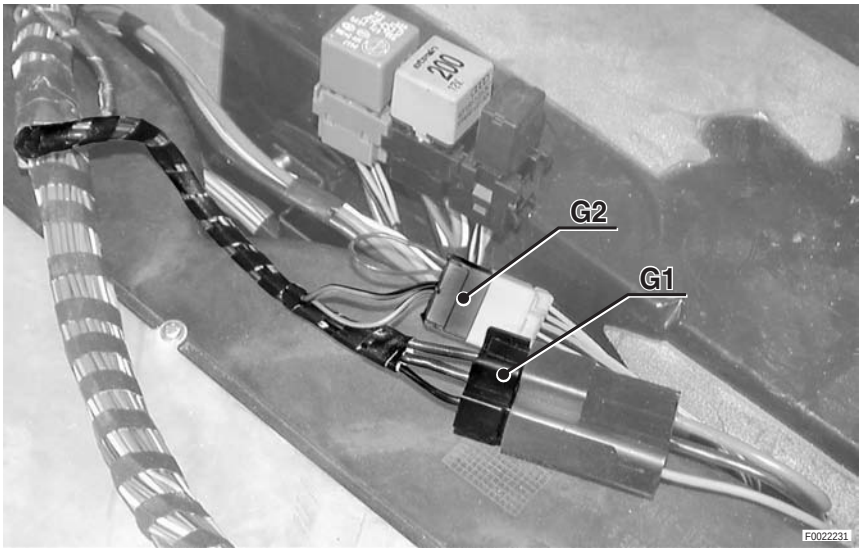

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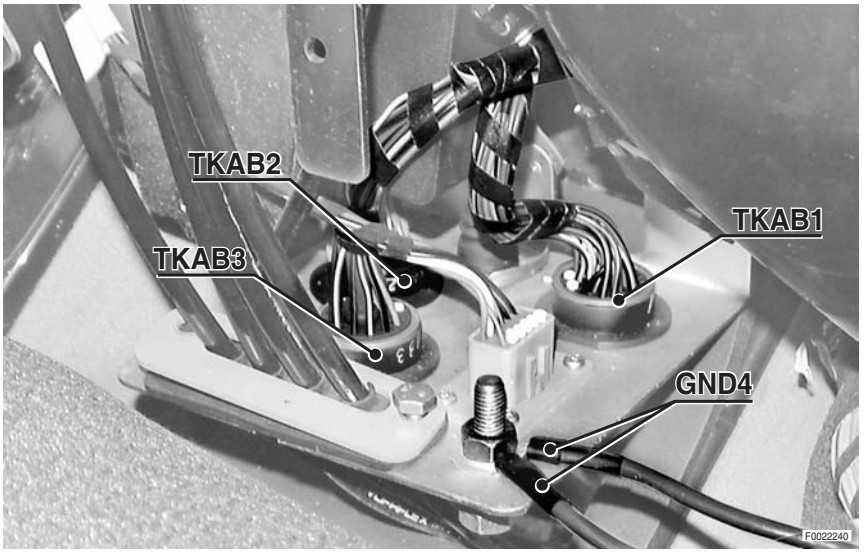

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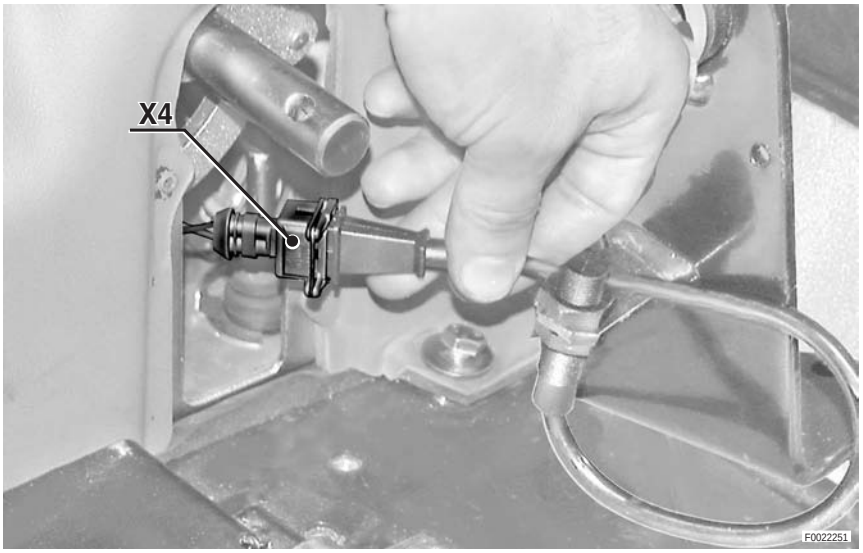

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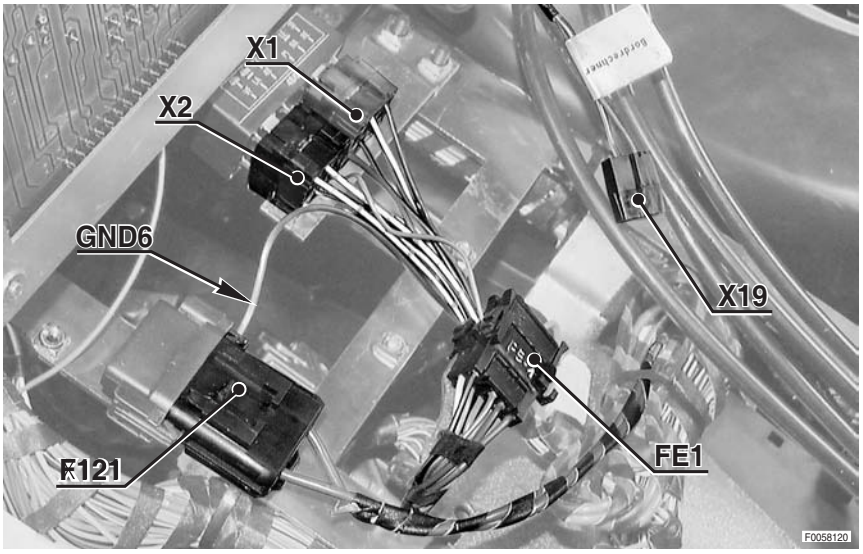

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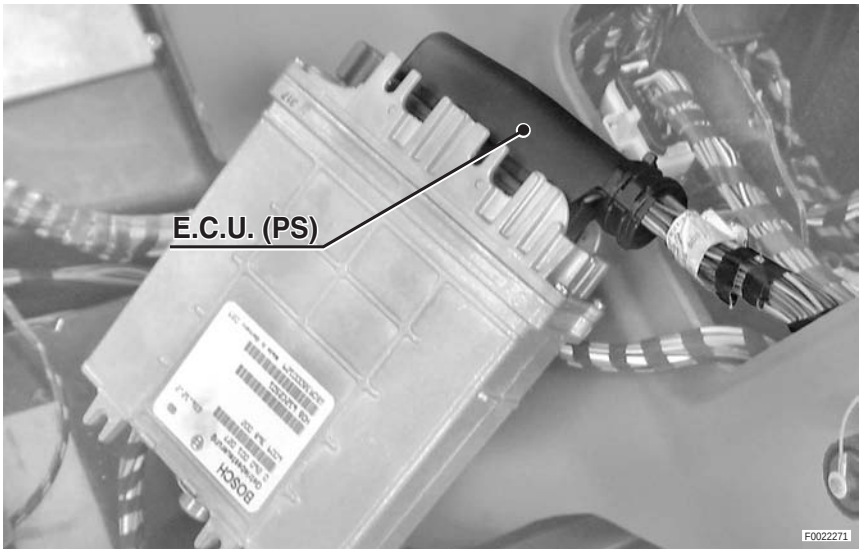

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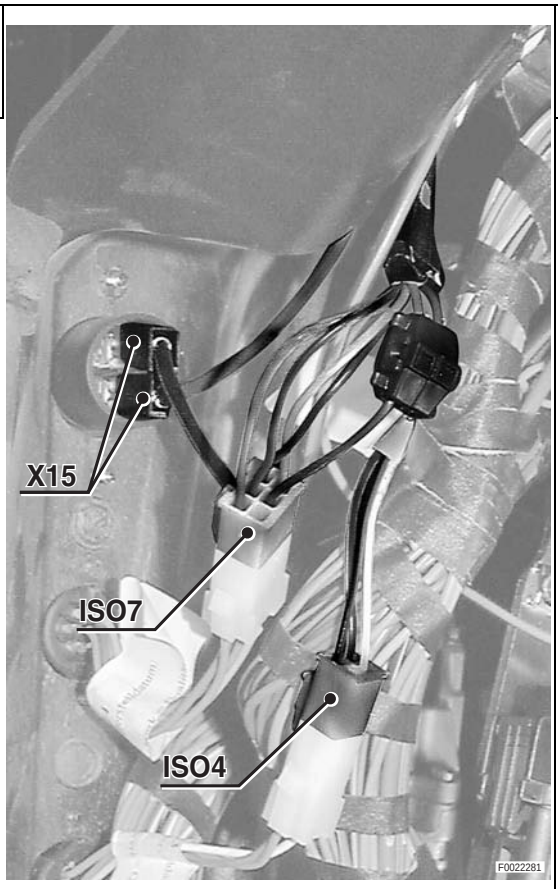
X15
ISO7
ISO4
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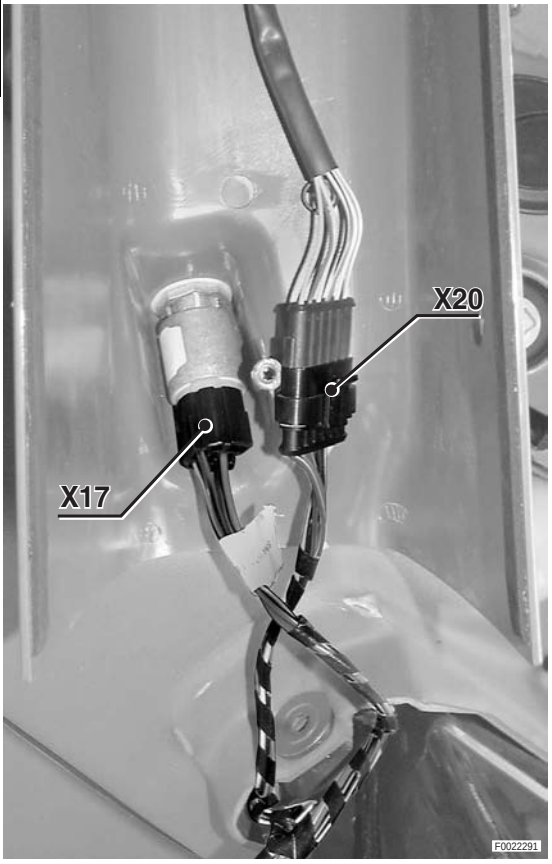
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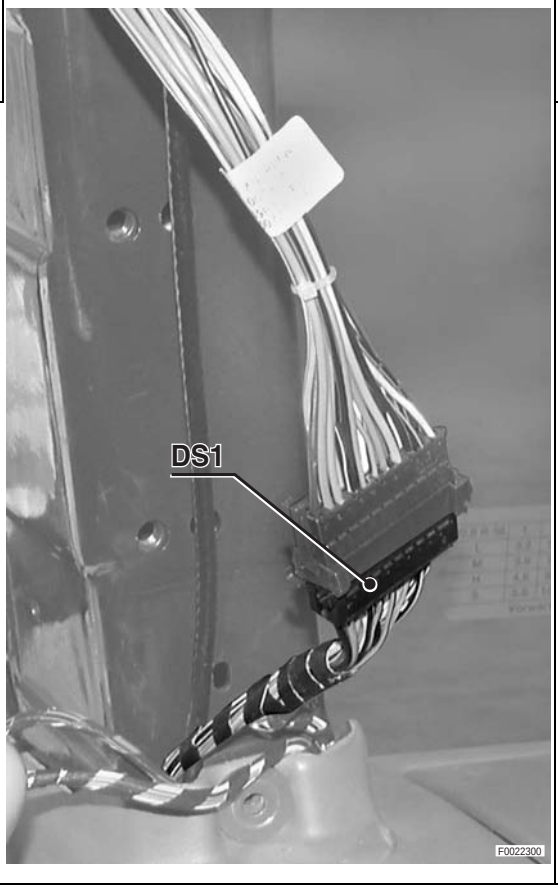
DS1
F0022300

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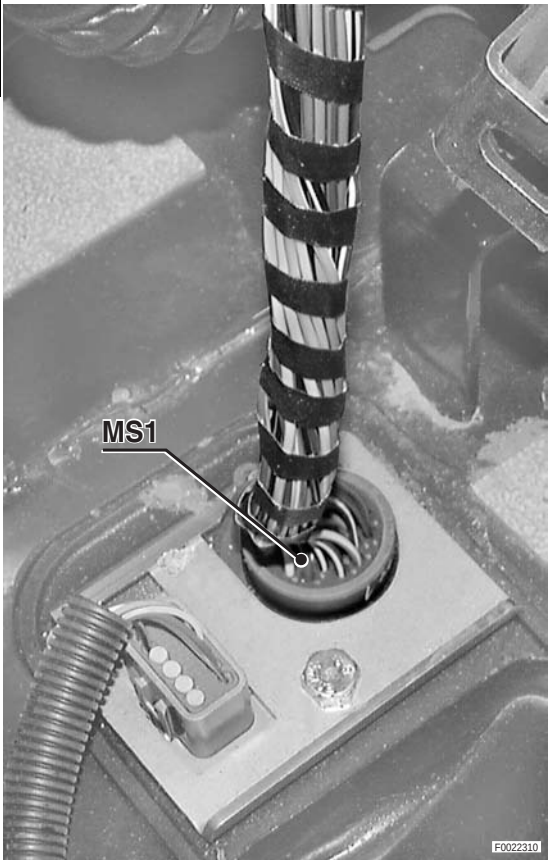
MS1
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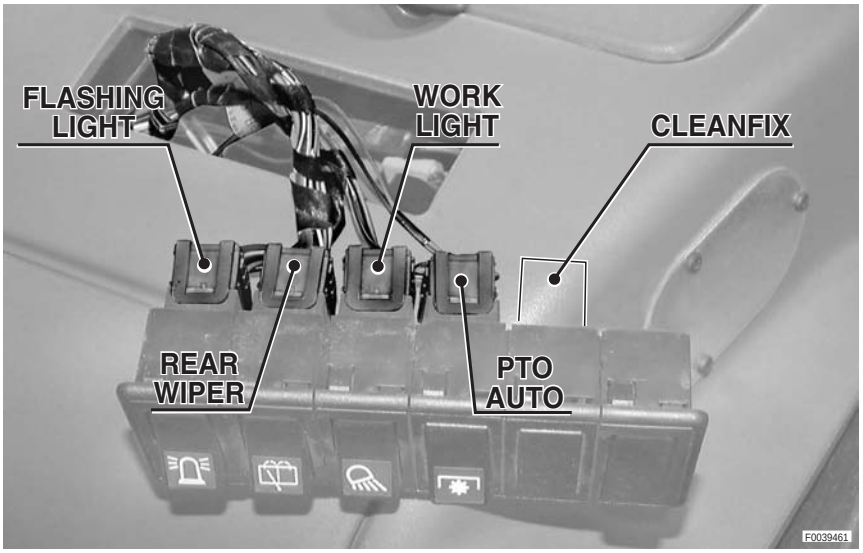
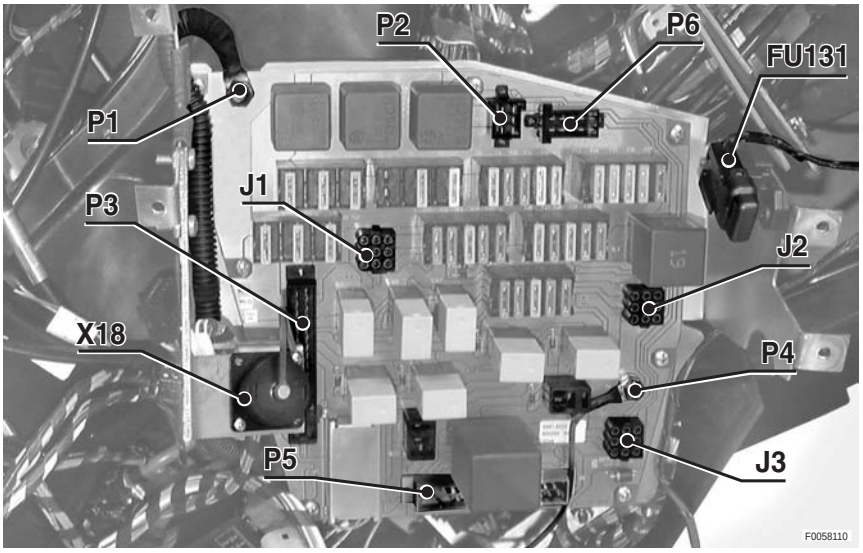

FLASHING LIGHT
WORK LIGHT
CLEANFIX
REAR WIPER
PTO AUTO
F0039461

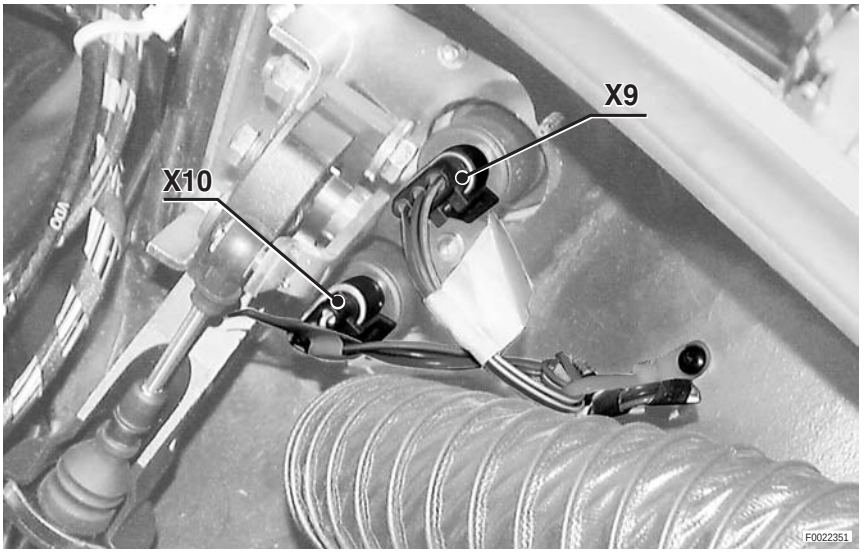
15


P2
P6
FU131
P1
J1
P3
J2
X18
P4
P5
J3
F0058110

16


JX1
JX2
F0022341

17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X10
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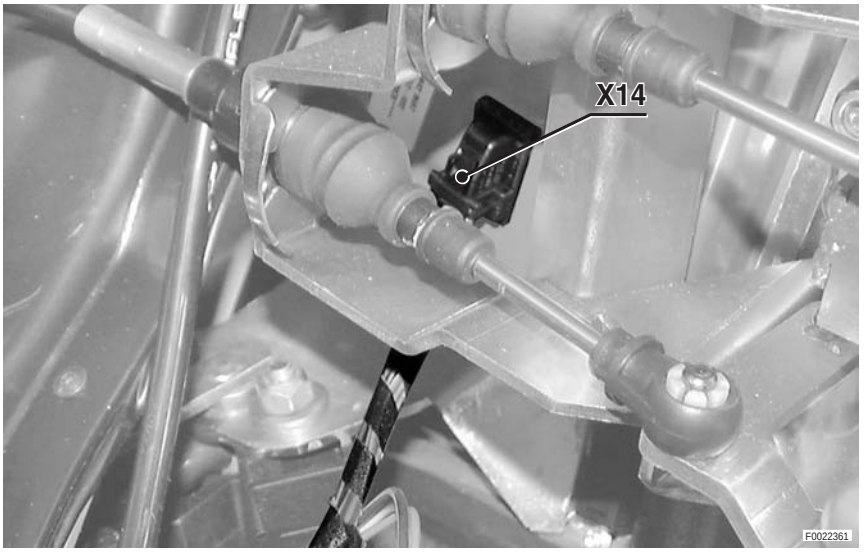
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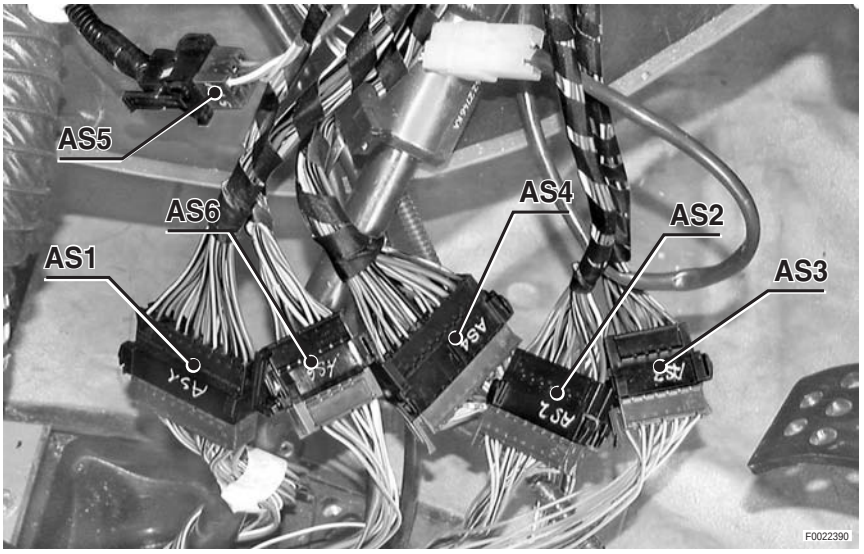
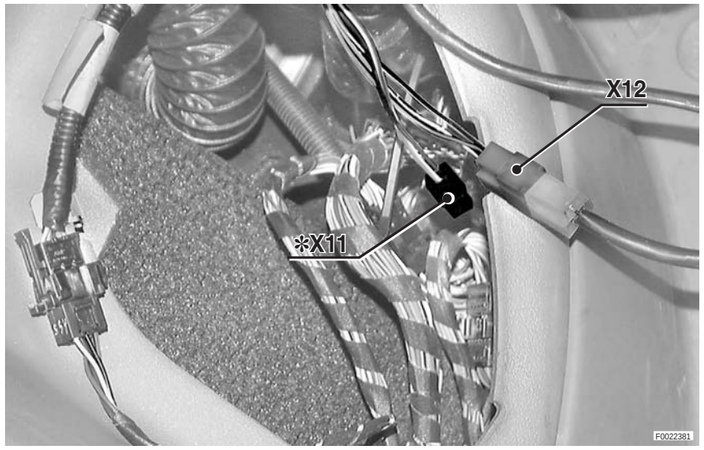
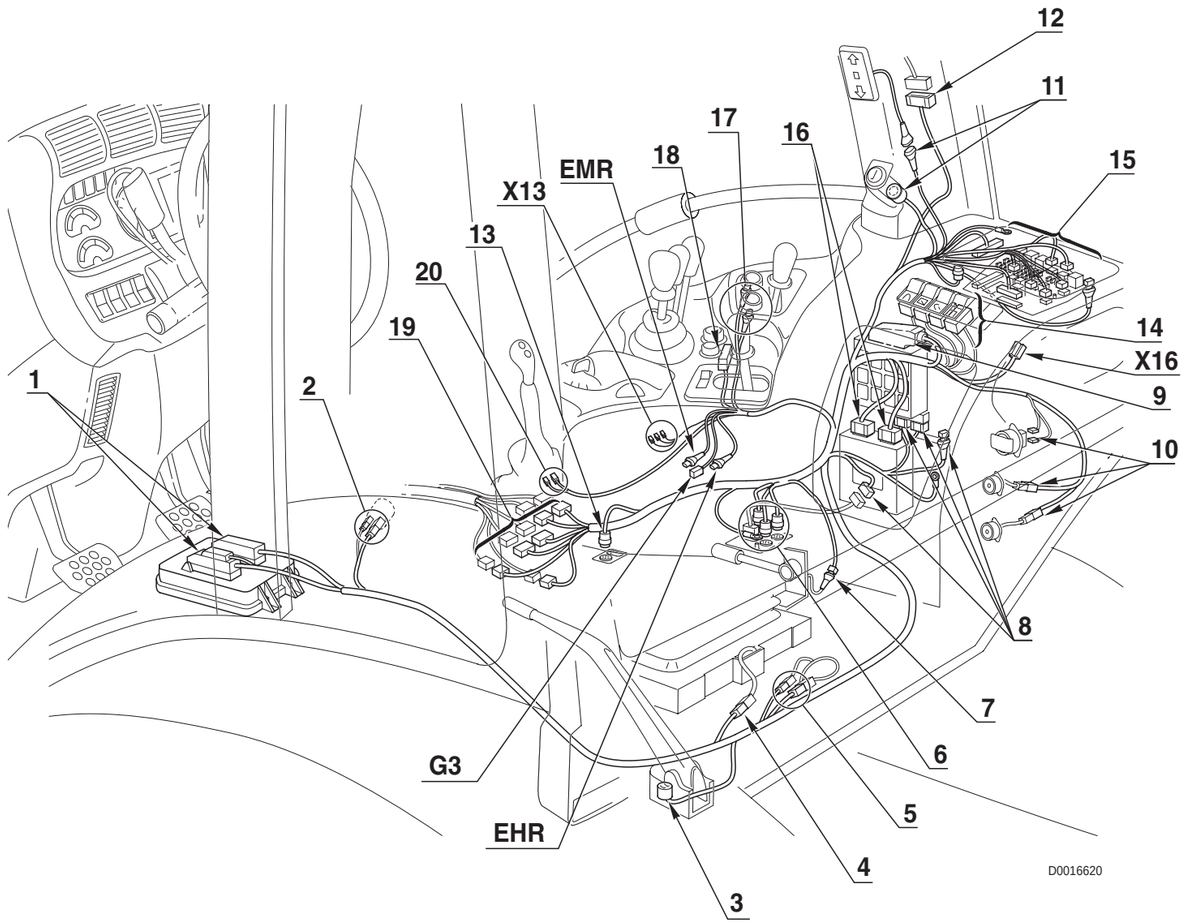

AS5
AS6
AS1
AS4
AS2
AS3
F0022390

20



X11: NOT UTILISED

SIDE CONSOLE WIRING



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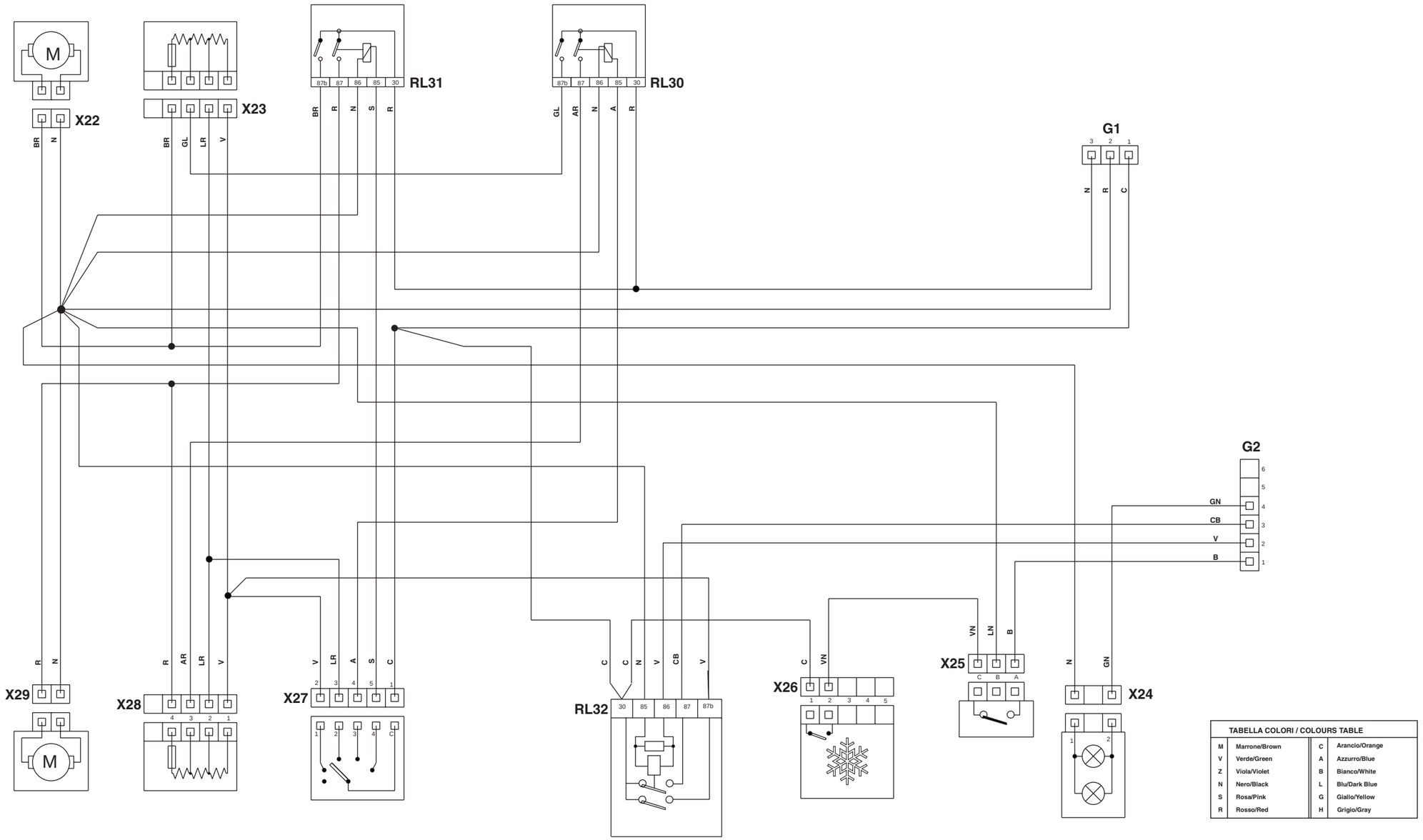
AIR CONDITIONING WIRING (CAB)



G1 To side console wiring
G2 To side console wiring
RL30 3rd heater fan speed relay
RL31 4th heater fan speed relay
RL32 1st heater fan speed relay
X22 Lh heater fan
X23 Lh heater fan resistor
X24 Air conditioning control panel illumination connector
X25 Air conditioning thermostat
X26 Air conditioning on/off switch
X27 Fan speed selector switch
X28 Rh heater fan resistor
X29 Rh heater fan

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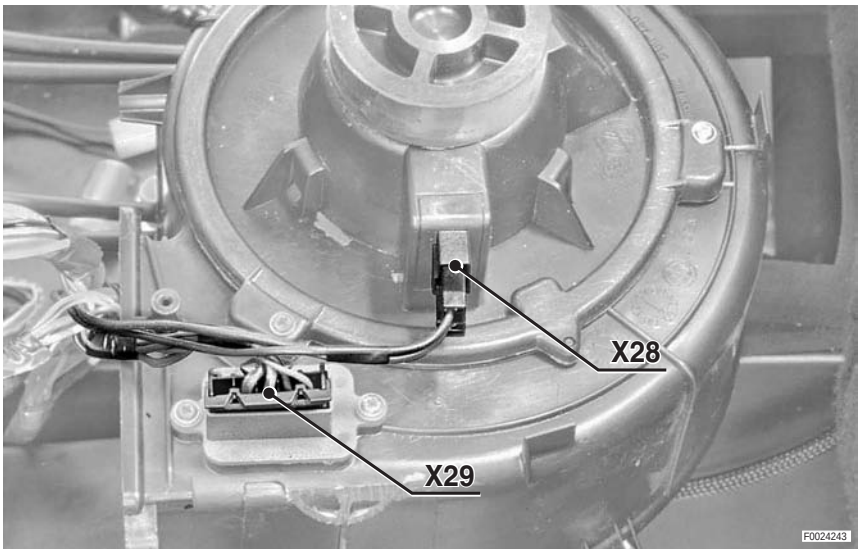
CONNECTORS LOCATION

1



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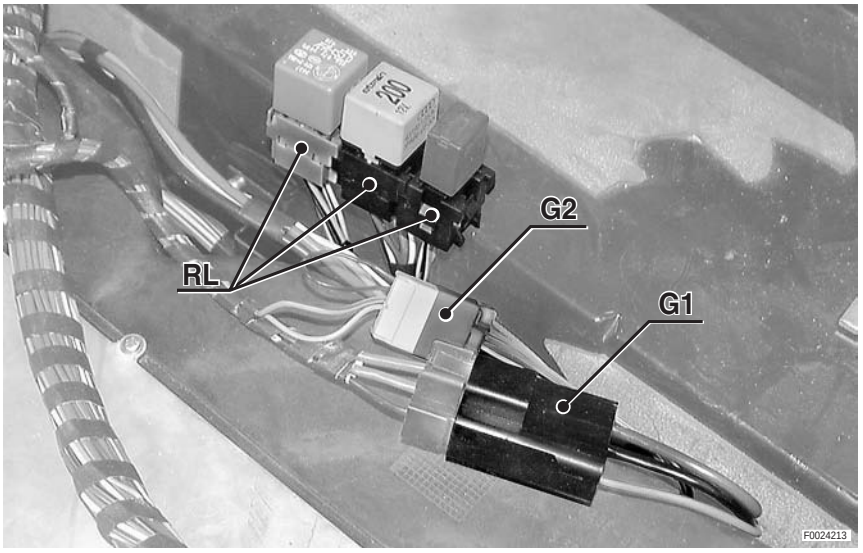

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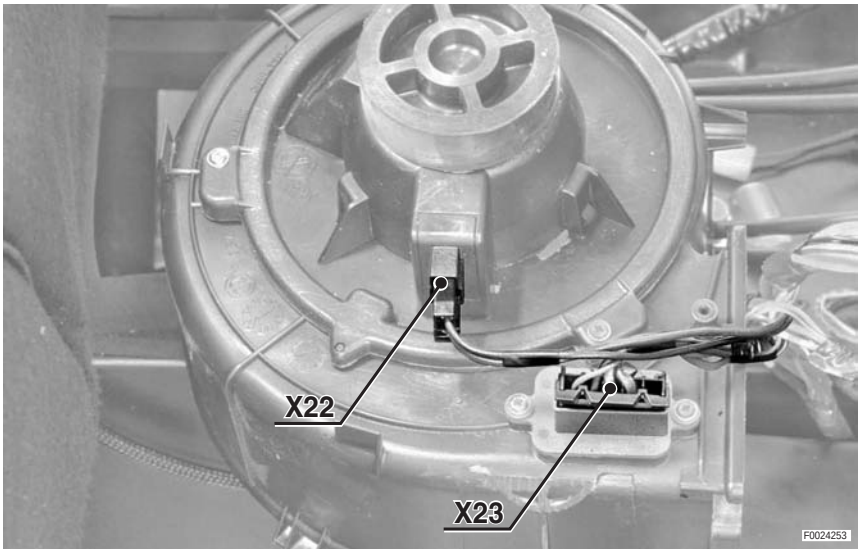

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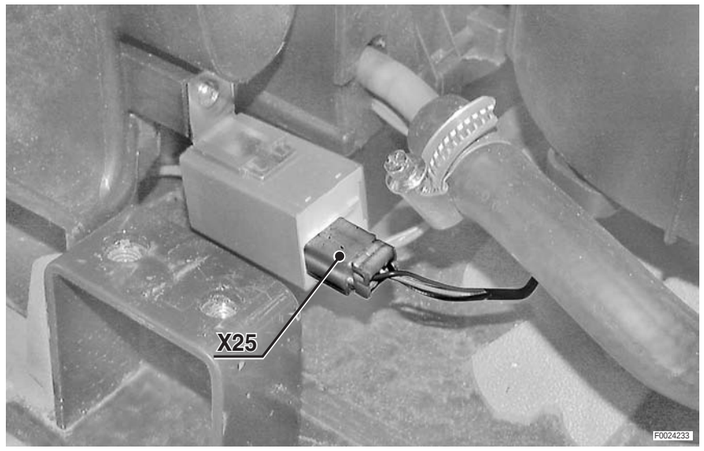

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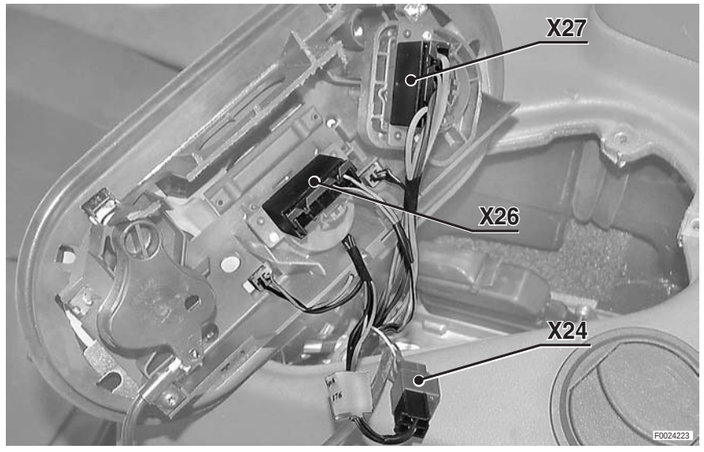
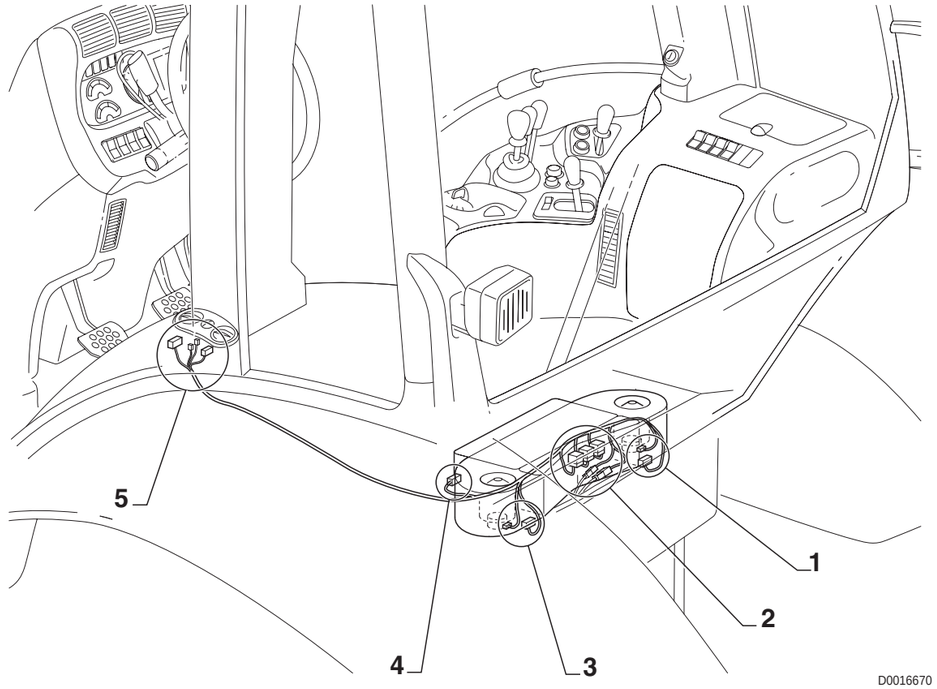


AIR CONDITIONING WIRING



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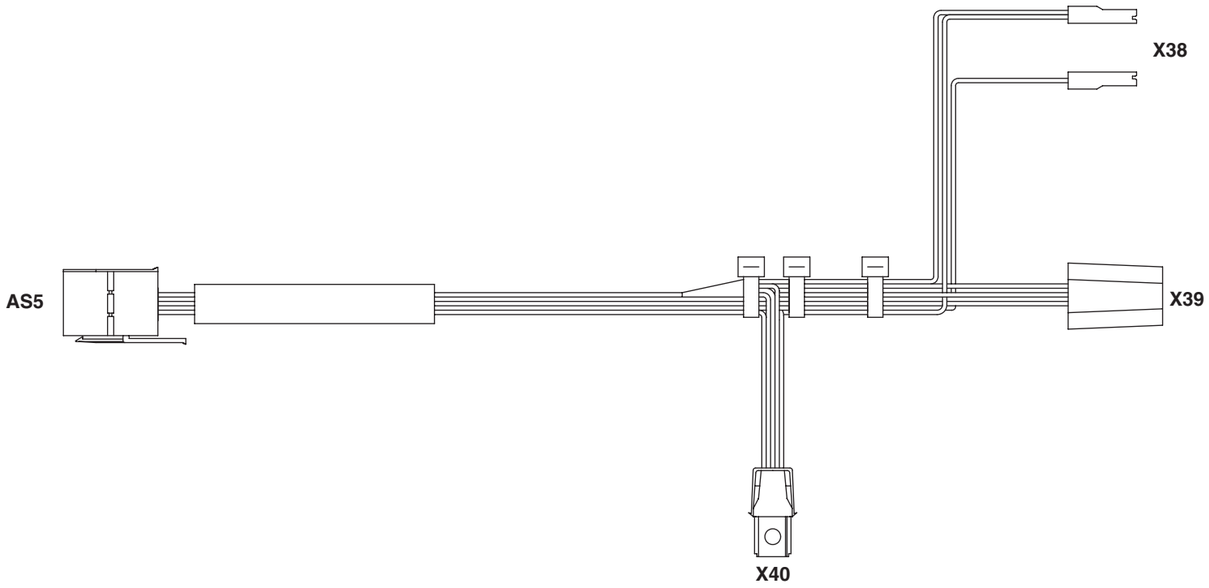
DISPLAY WIRING



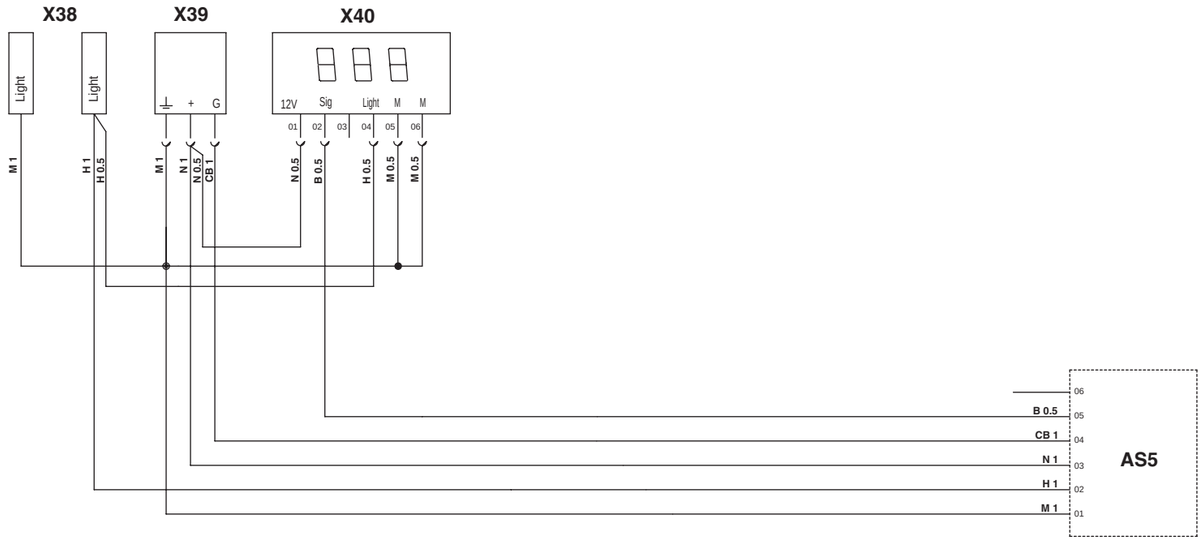


TABELLA COLORI / COLOURS TABLE			
M	Marrone/Brown	C	Arancio/Orange
V	Verde/Green	A	Azzurro/Blue
Z	Viola/Violet	B	Bianco/White
N	Nero/Black	L	Blu/Dark Blue
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

AS5 To side console wiring
X38 Compressed air pressure gauge light
X39 Compressed air pressure gauge
X40 Transmission display

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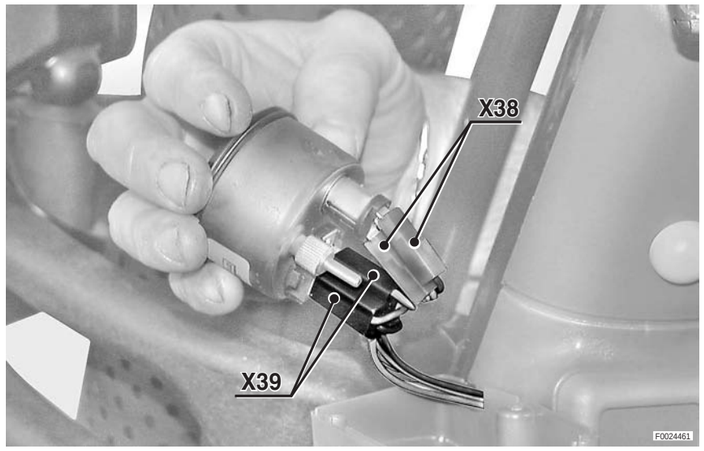
1



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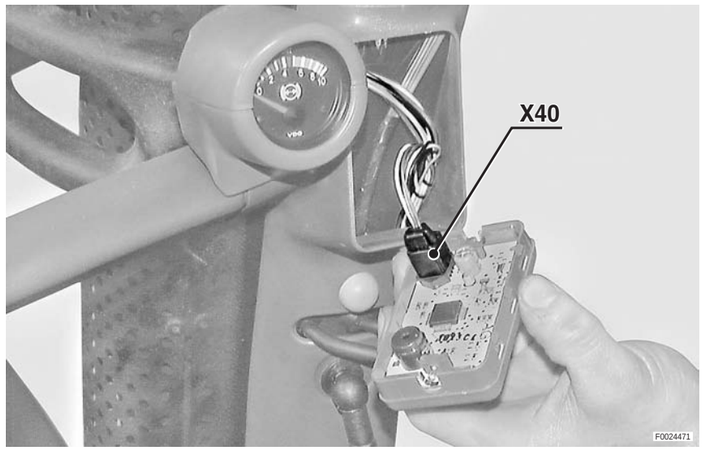

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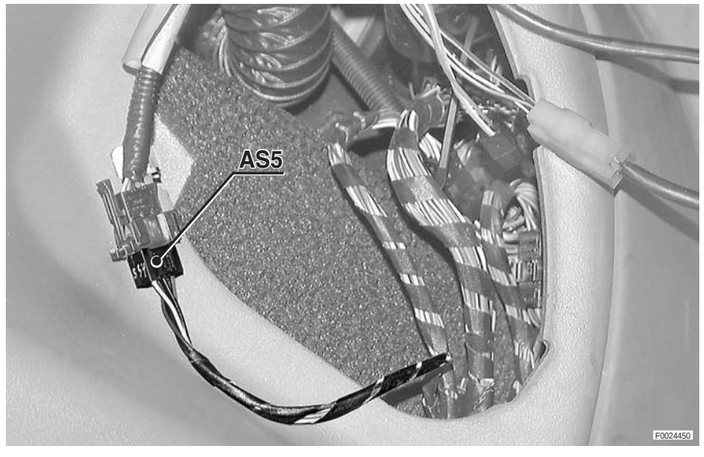
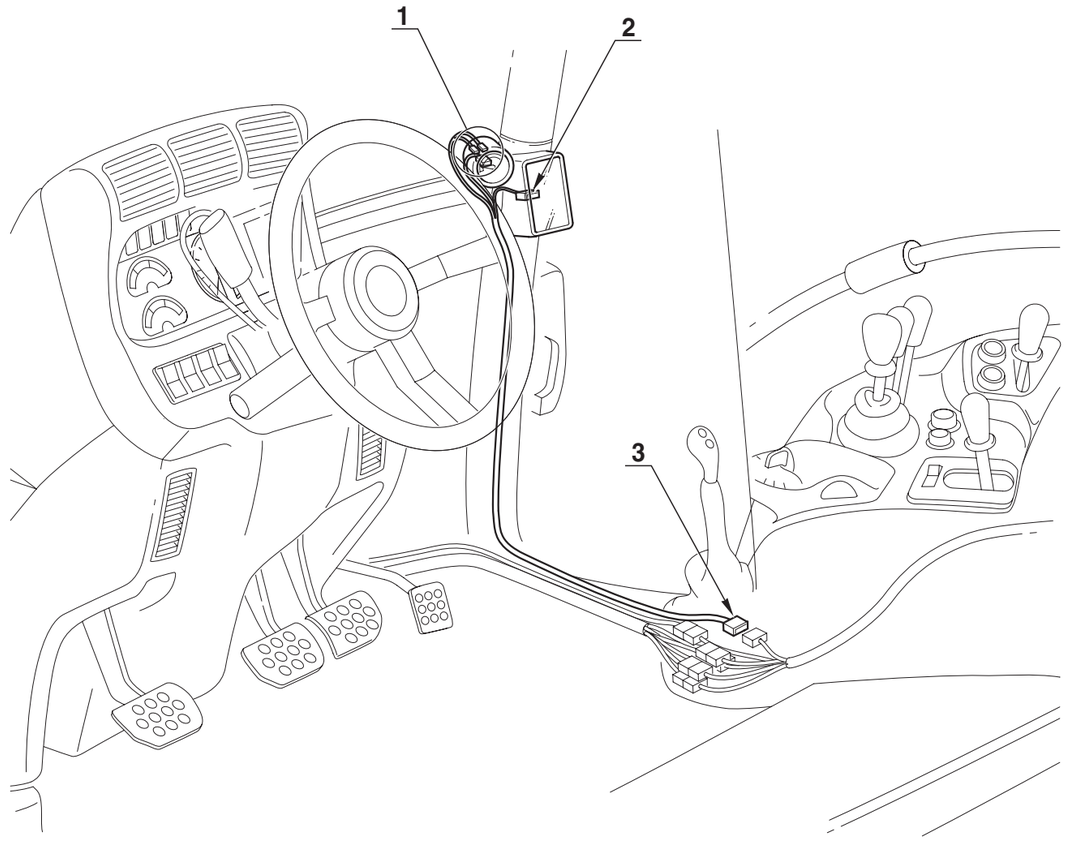


DISPLAY WIRING



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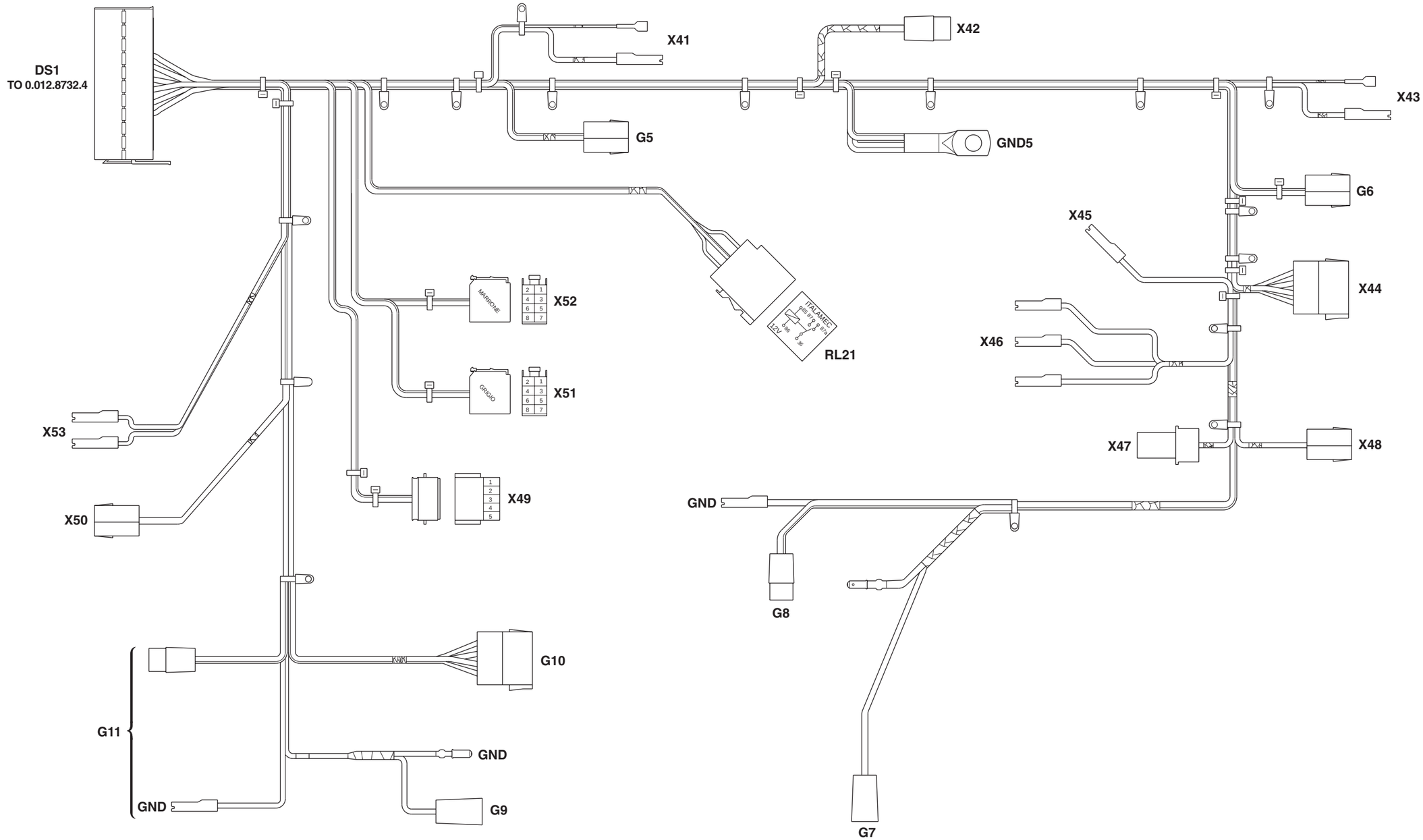
ROOF WIRING (1/2)



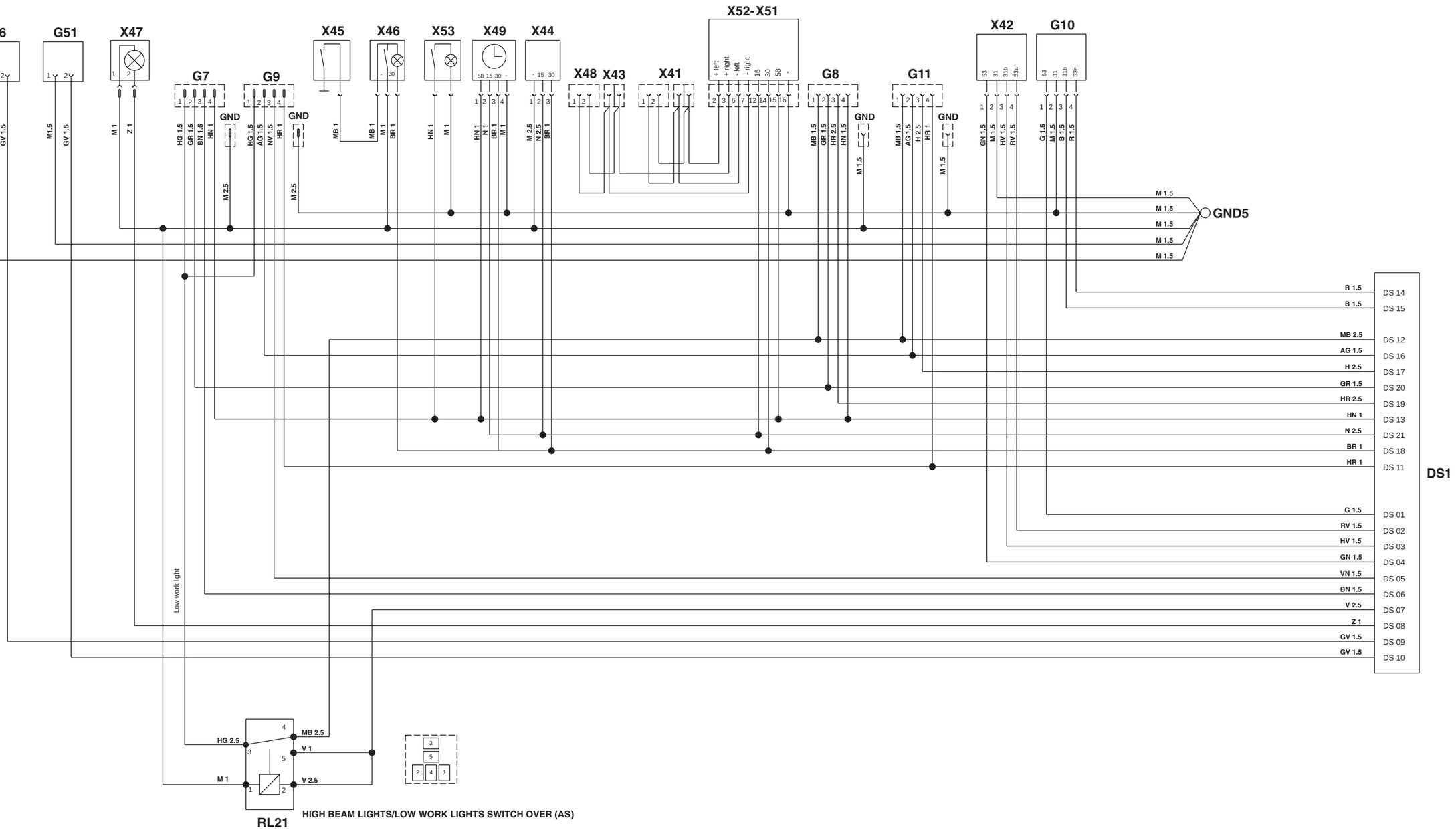
DS1 To side console wiring
G5 To cab roof front worklights wiring
G6 To cab roof front worklights wiring
G7 Front left sidelights connector
G8 To cab roof front worklights wiring
G9 Front right sidelights connector
G10 To windscreen wiper motor wiring
G11 To cab roof front worklights wiring

RL21 Front upper worklights on cab relay (50S)
X41 Left rear loudspeaker
X42 Rear screen wiper motor
X43 Right rear loudspeaker
X44 CB power connector
X45 Door open warning signal switch
X46 Interior roof light
X47 Rotating beacon

X48 Right front loudspeaker
X49 Clock
X50 Left front loudspeaker
X51 Radio (grey)
X52 Radio (brown)
X53 Side console courtesy light

D0004253

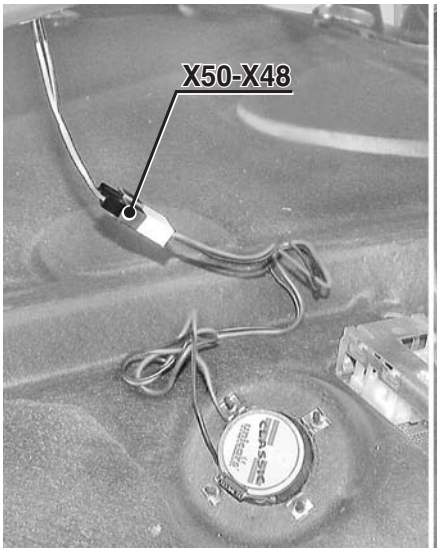
ROOF WIRING (2/2)

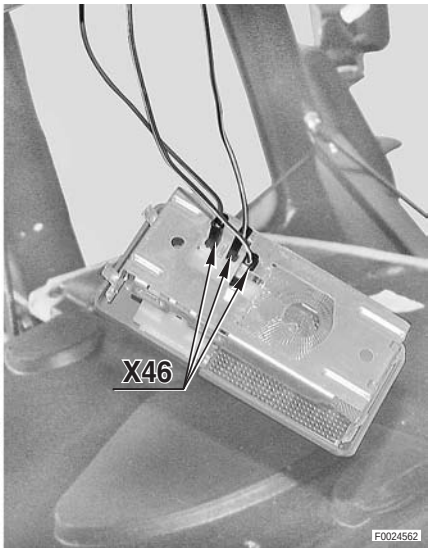


CONNECTORS LOCATION

1

2





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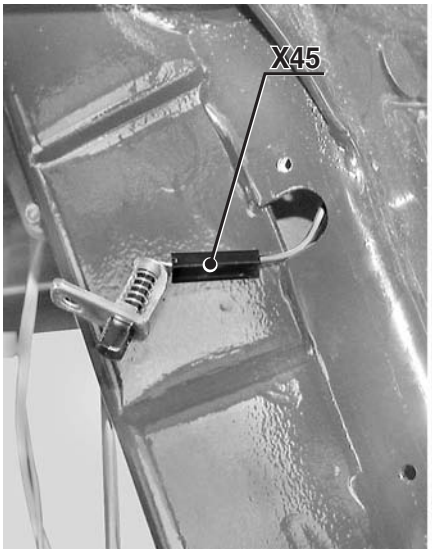

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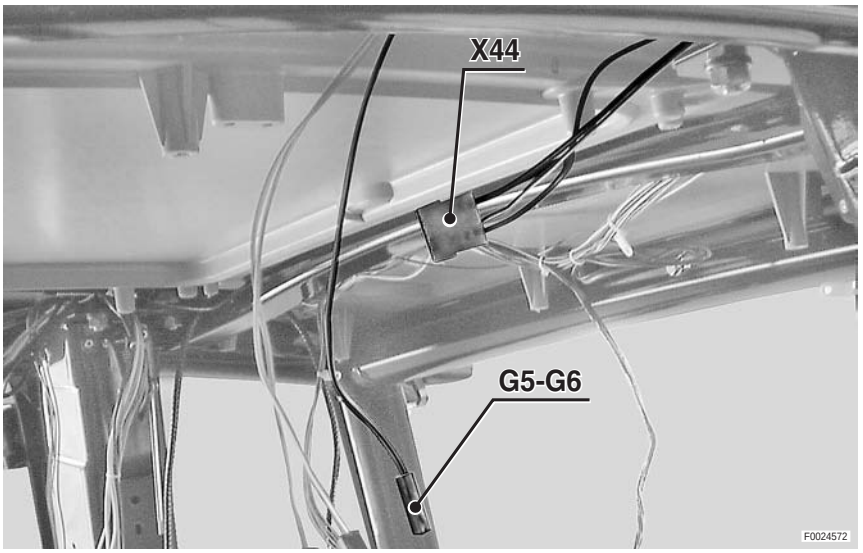

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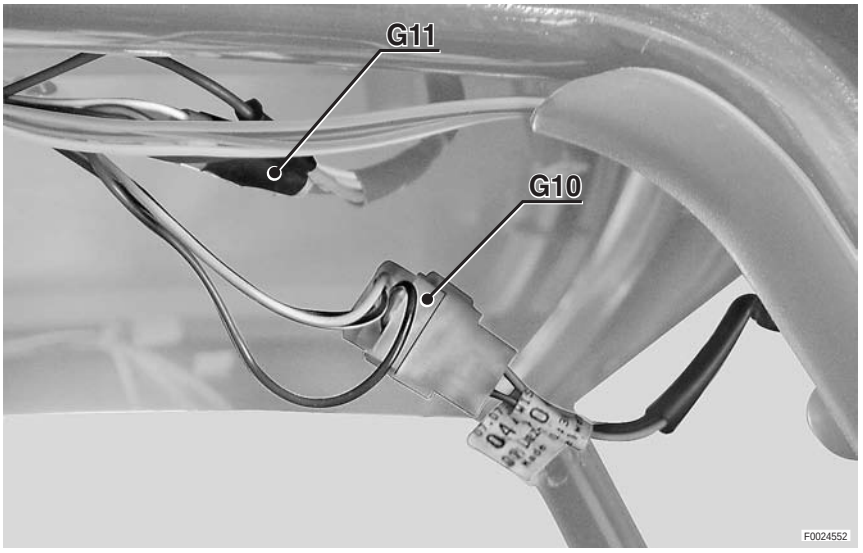

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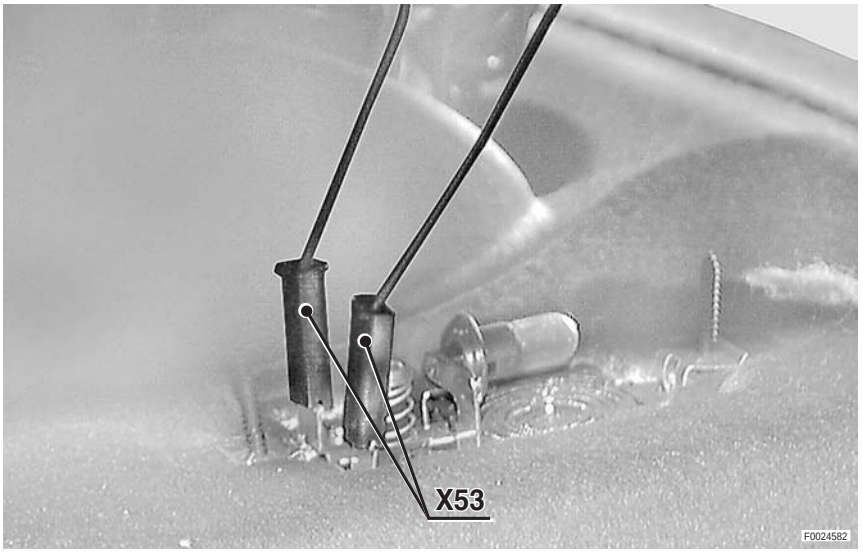

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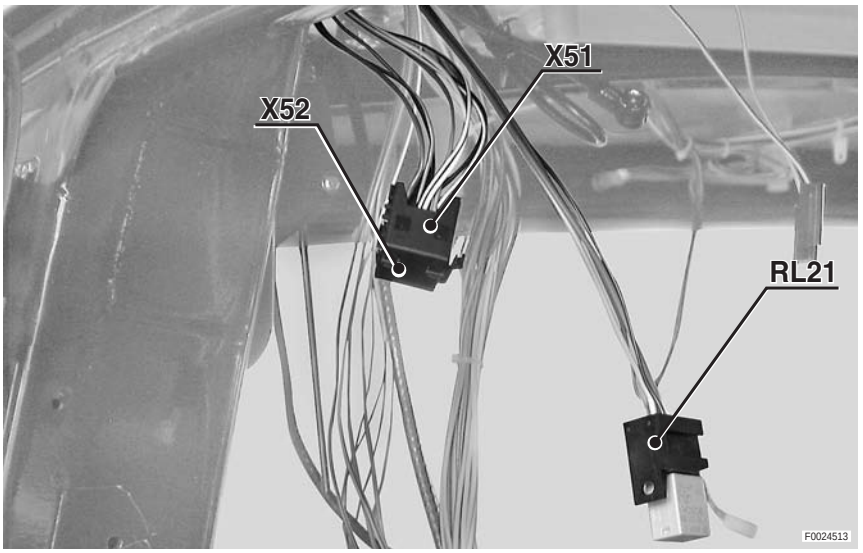

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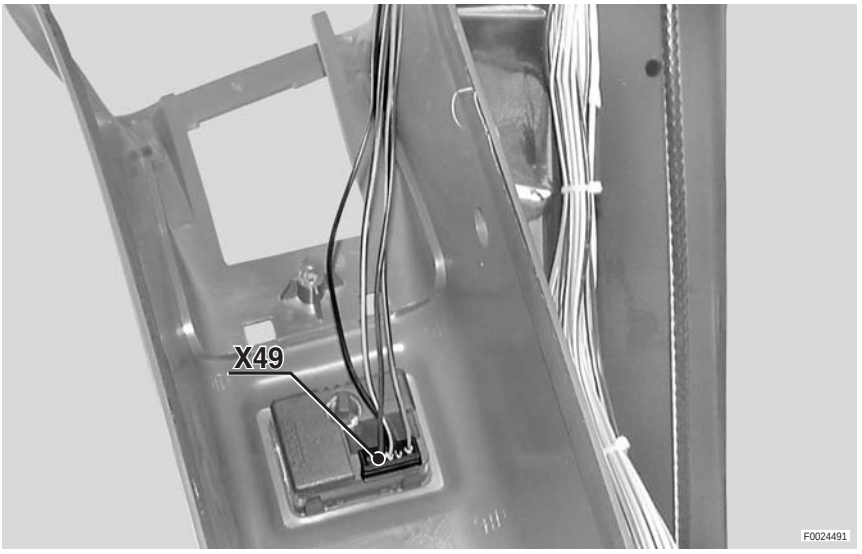

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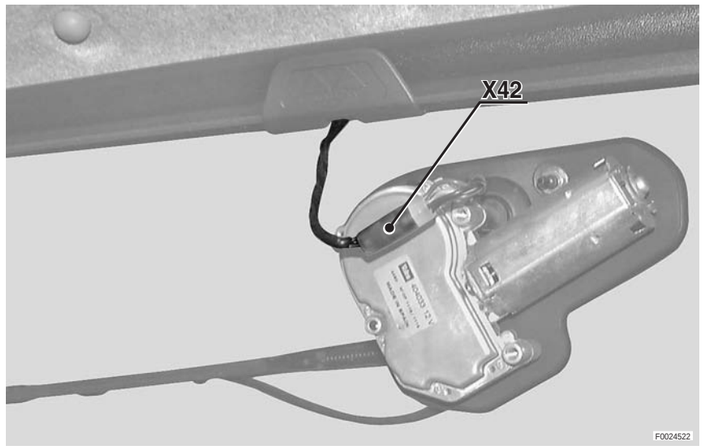

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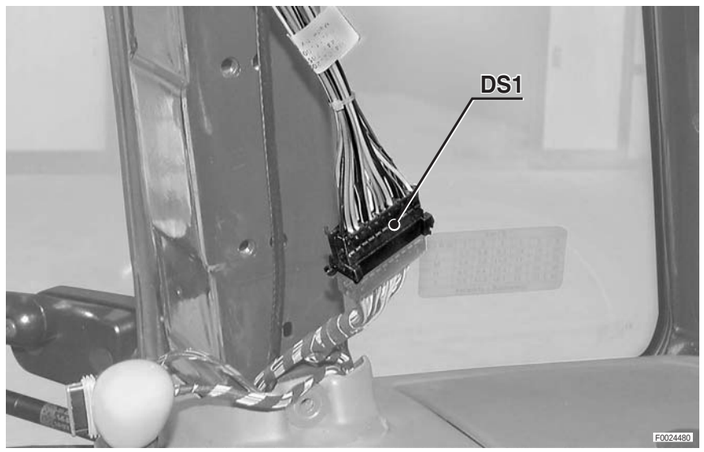

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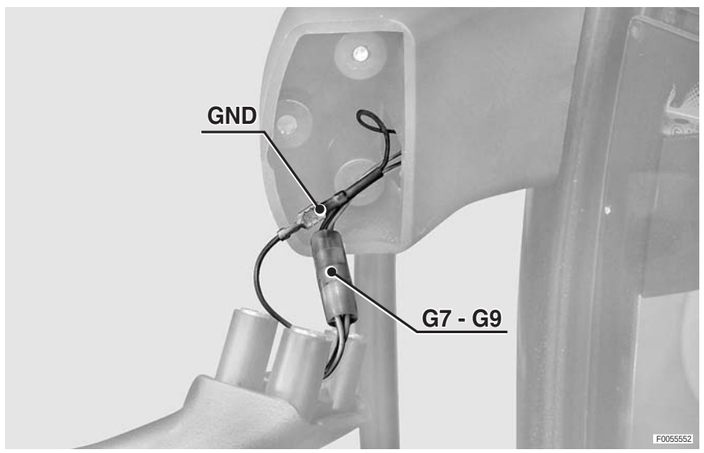
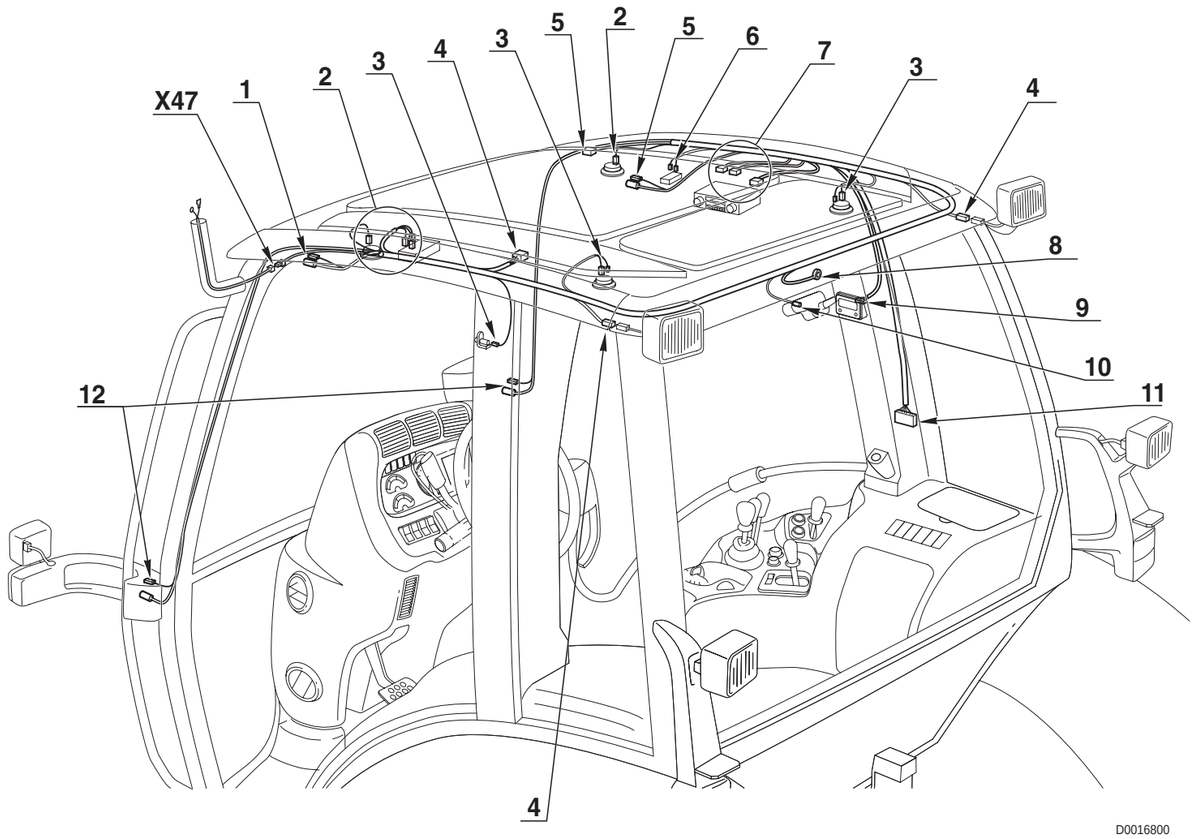


ROOF WIRING



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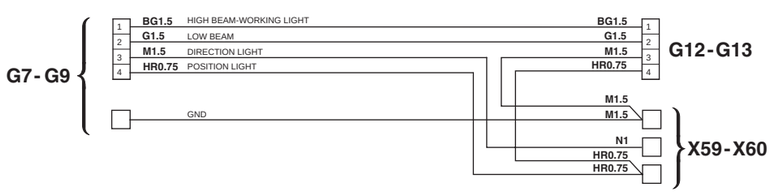
CAB LOWER HEADLIGHTS WIRING



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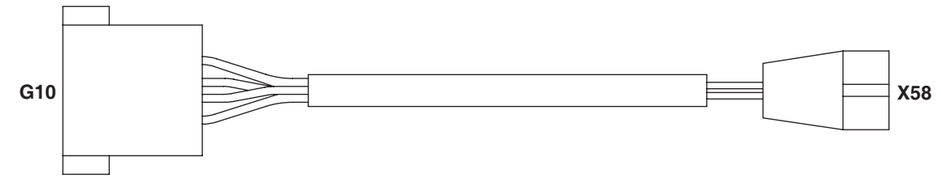
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

G7 To roof wiring
G9 To roof wiring
G12 To cab lower front worklights wiring (machine without front lift)
G12 To cab lower front worklights wiring (machine with front lift)
G13 To cab lower front worklights wiring (machine without front lift)
G13 To cab lower front worklights wiring (machine with front lift)
X59 Front left sidelight and direction indicator
X60 Front right sidelight and direction indicator

WINDSCREEN WIPER MOTOR WIRING



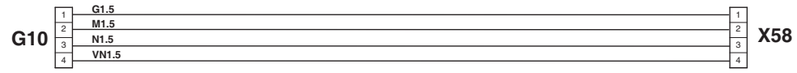


TABELLA COLORI / COLOURS TABLE			
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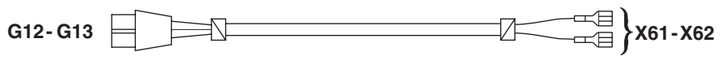
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

G10 To roof wiring
X58 Windscreen wiper motor

CAB LOWER FRONT WORKLIGHTS WIRING (MACHINE WITHOUT FRONT LIFT)



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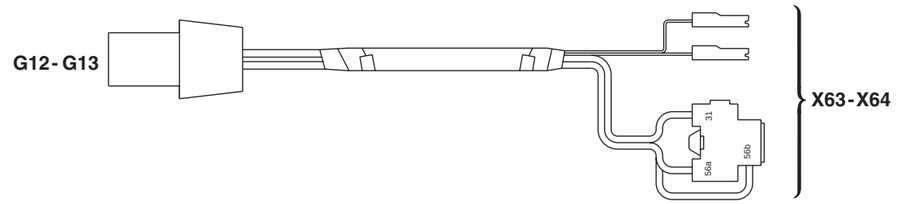
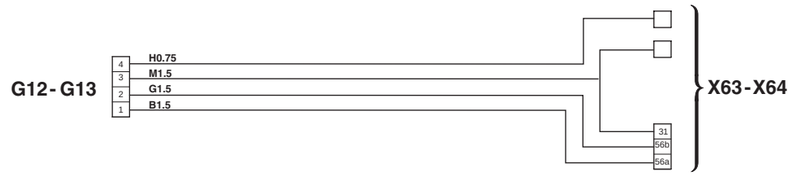
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

G12 To cab lower headlights wiring
G13 To cab lower headlights wiring
X61 Front left worklight on cab
X62 Front right worklight on cab (without front lift)

0442.5602

CAB LOWER FRONT WORKLIGHTS WIRING (WITH FRONT LIFT)





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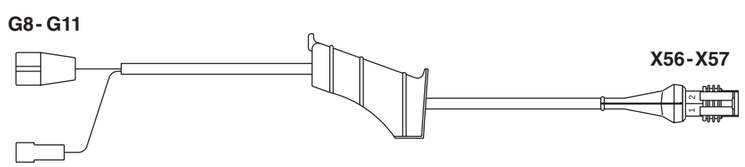
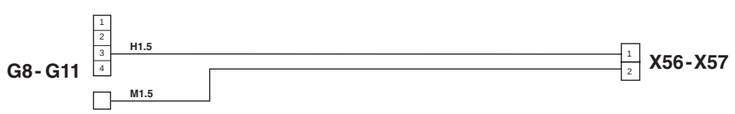
S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

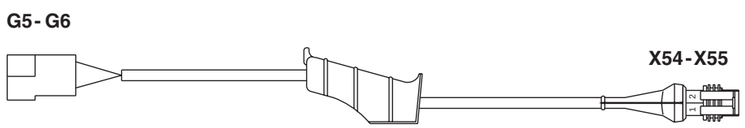
G12 To cab lower headlights wiring
G13 To cab lower headlights wiring
X63 Front left worklight on cab
X64 Front right worklight on cab (with front lift)

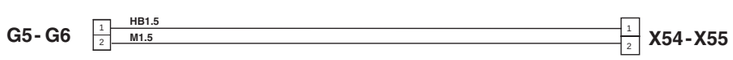
0441.6727

CAB ROOF FRONT AND REAR WORKLIGHTS WIRING









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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

G5 To roof wiring
G6 To roof wiring
G8 To roof wiring
G11 To roof wiring
X54 Upper rear right worklights
X55 Upper rear left worklights
X56 Upper front left worklight
X57 Upper front right worklight

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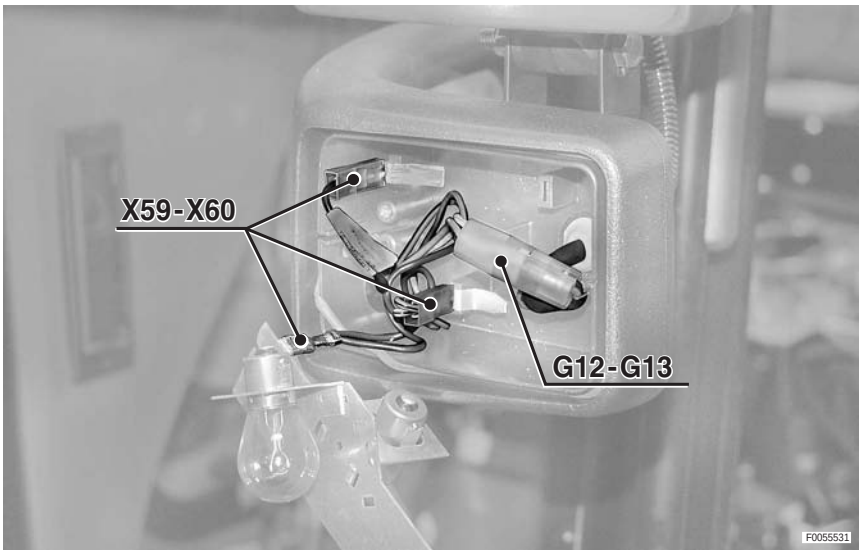
CONNECTORS LOCATION

1



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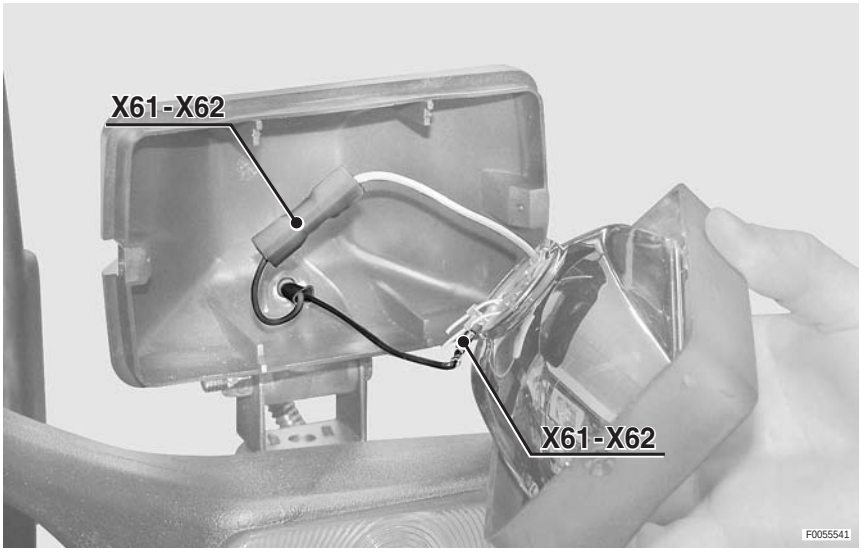

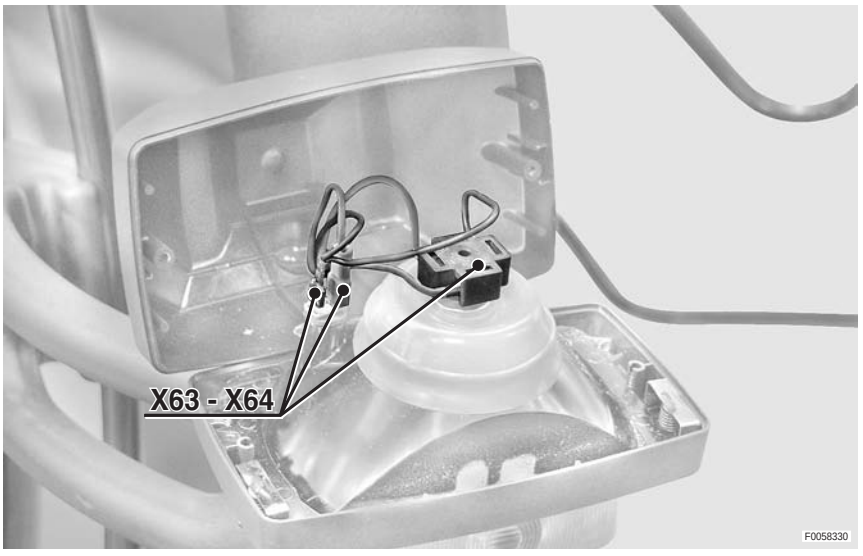

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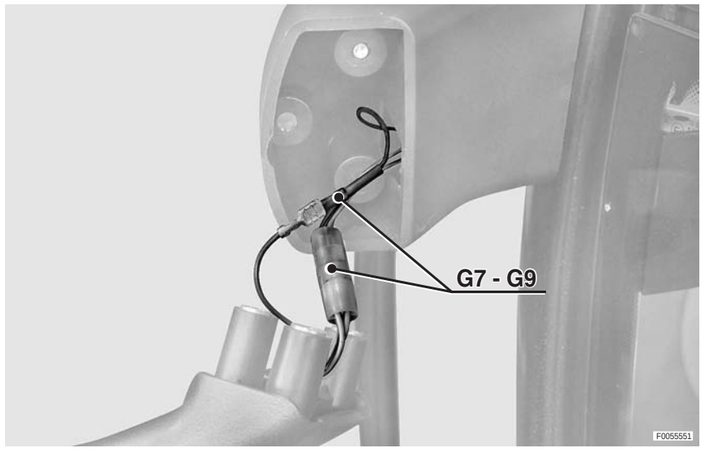

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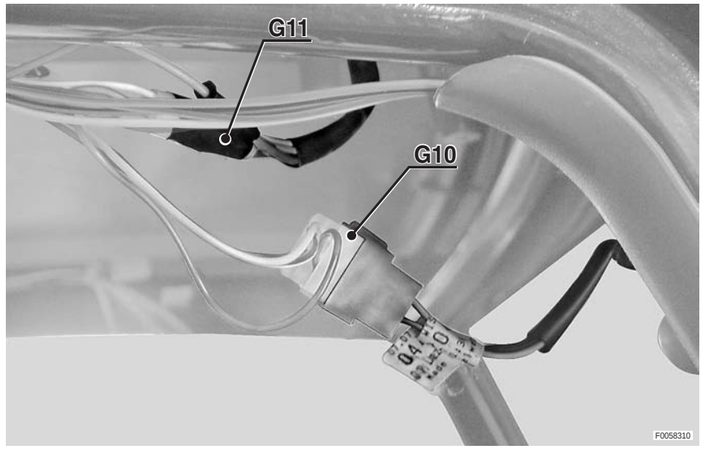
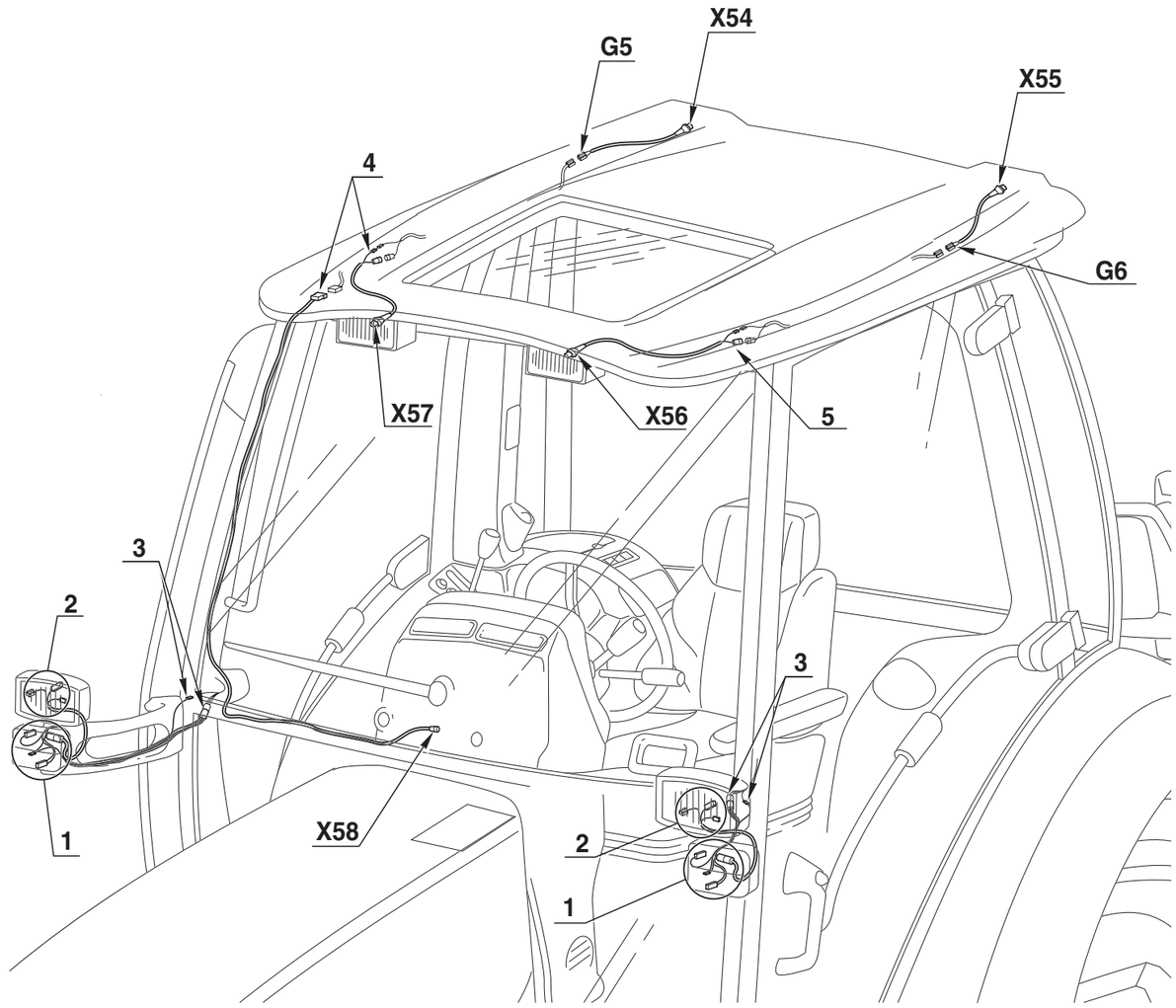


5

CAB WORKLIGHTS AND WINDSCREEN WIRING



0441.1923.4 **0441.2045**
0442.5602 **0443.4993**
0441.6727

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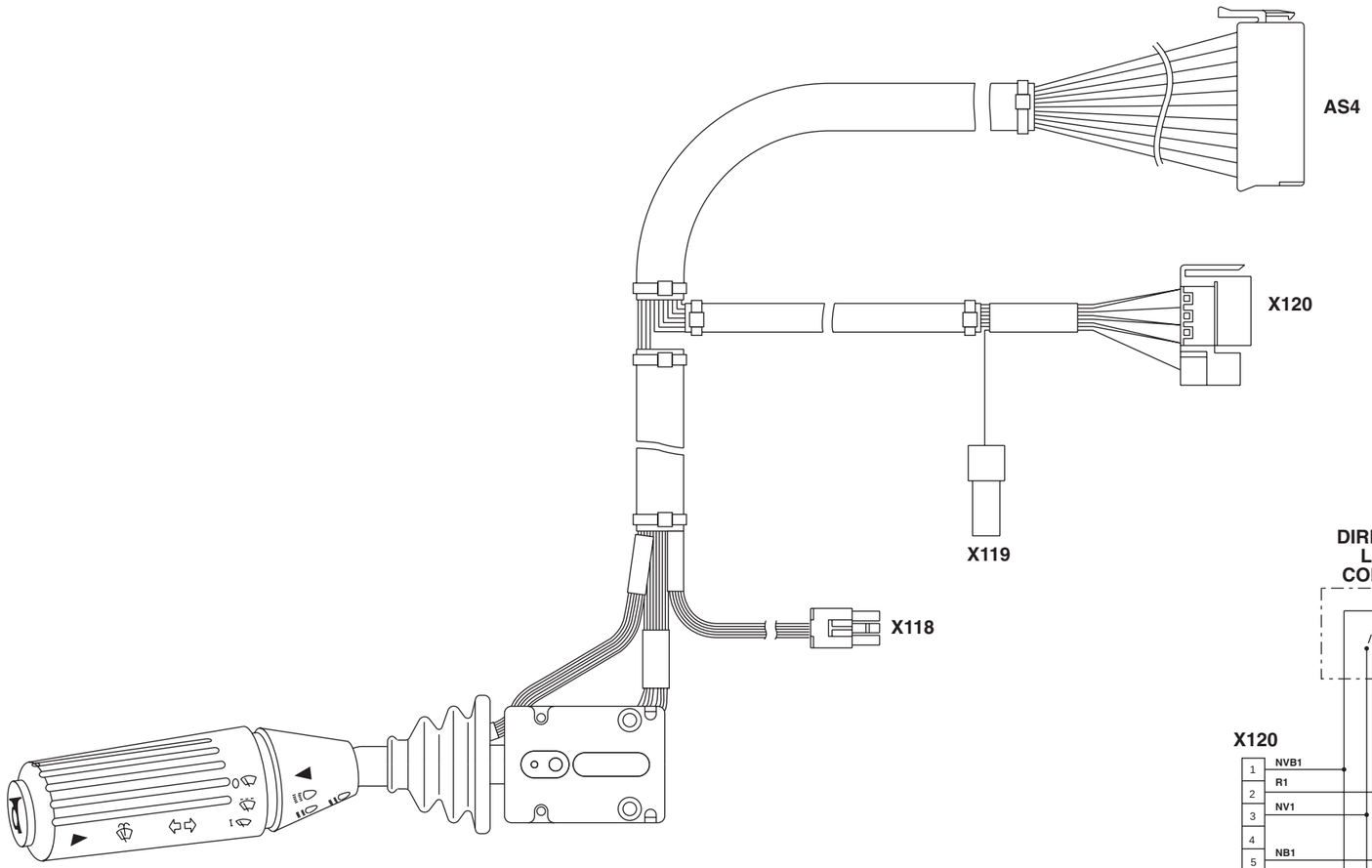
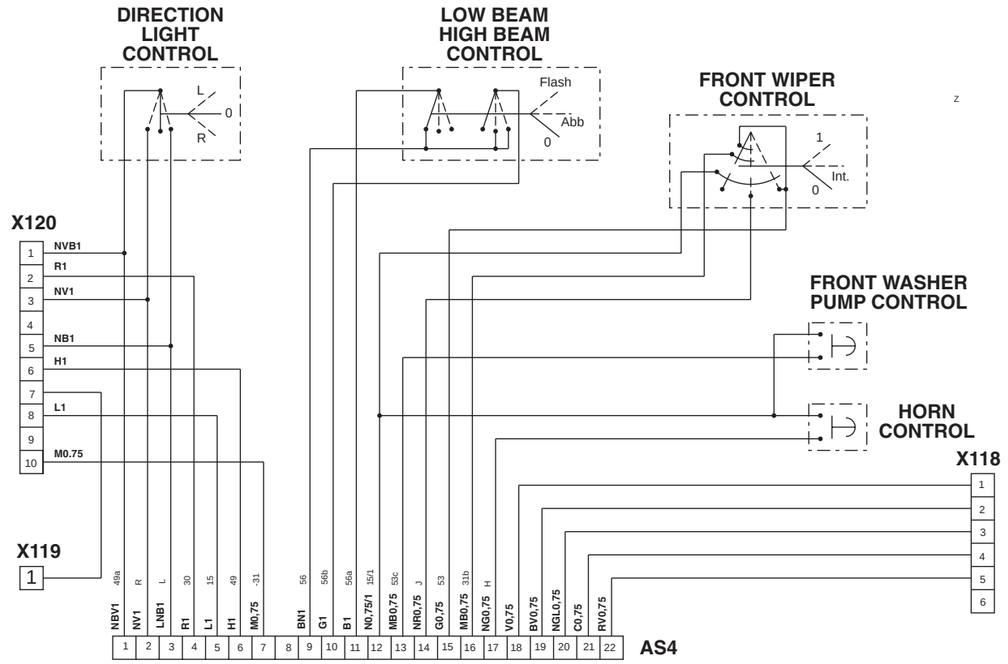
LIGHTS SELECTOR SWITCH





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S	Rosa/Pink	G	Giallo/Yellow
R	Rosso/Red	H	Grigio/Gray

AS4 To side console wiring
G4 To side console wiring
X36 Hazard warning lights on/off switch
X37 Shuttle control lever

D0015103

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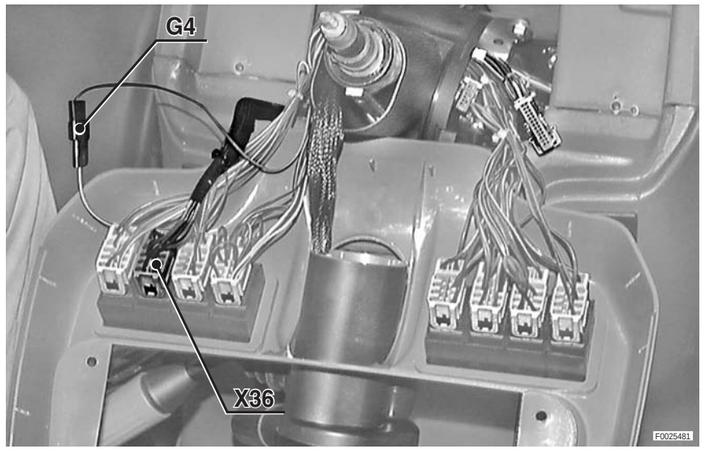
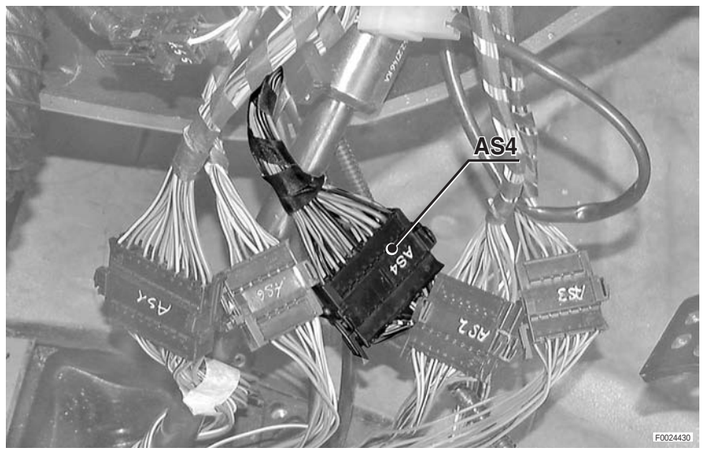
1

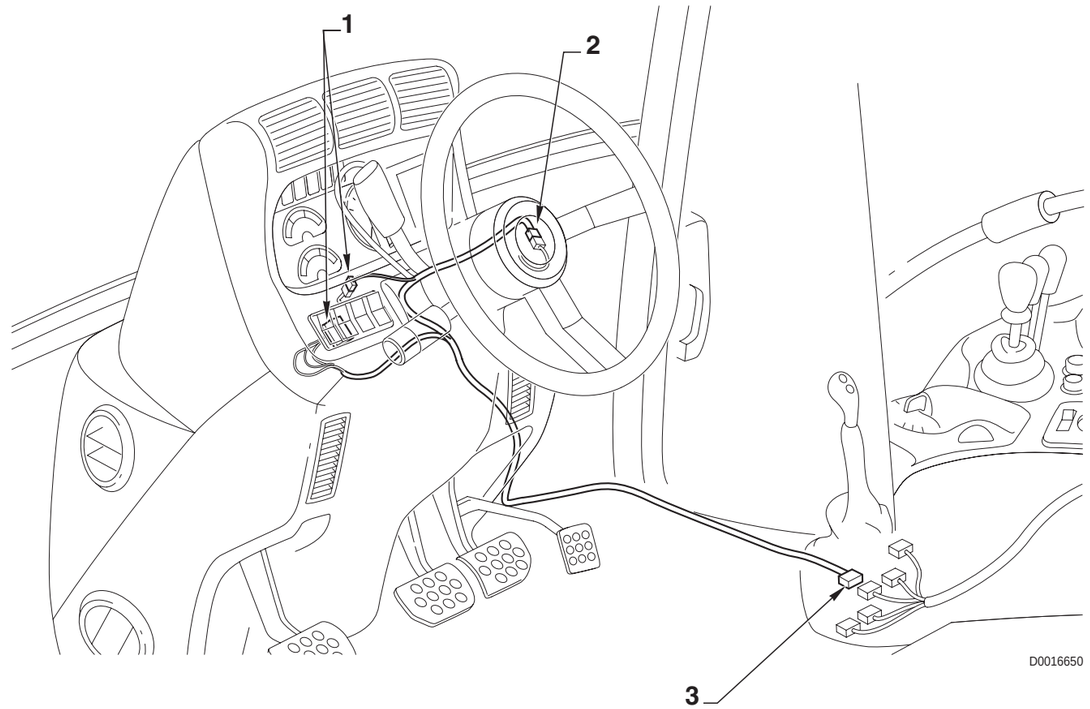


2

3



LIGHTS SELECTOR SWITCH WIRING



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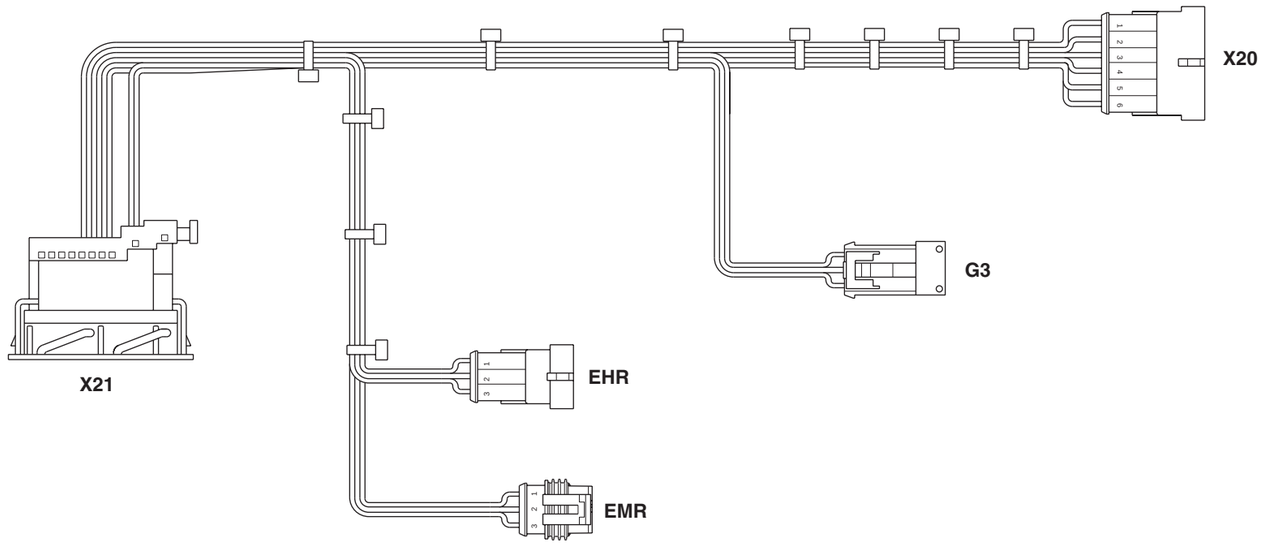
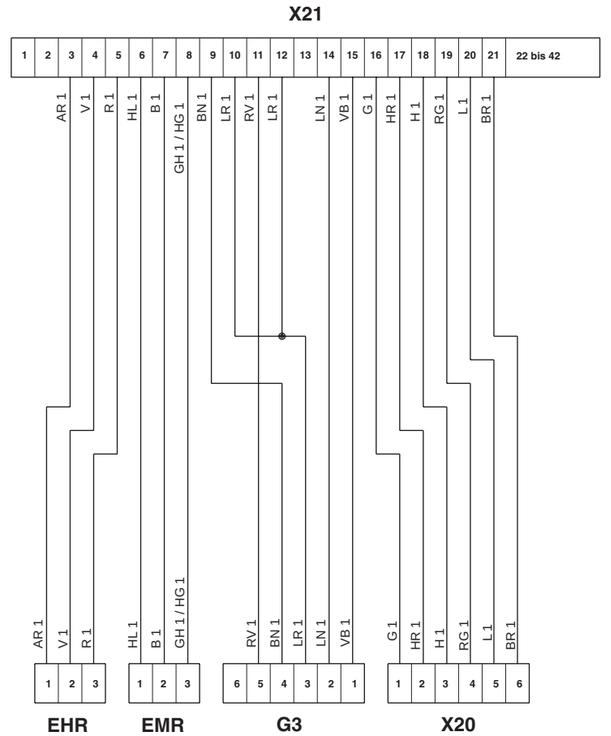
ARMREST WIRING





EHR To side console wiring
EMR To side console wiring
G3 To side console wiring
X20 To side console wiring
X21 Armrest

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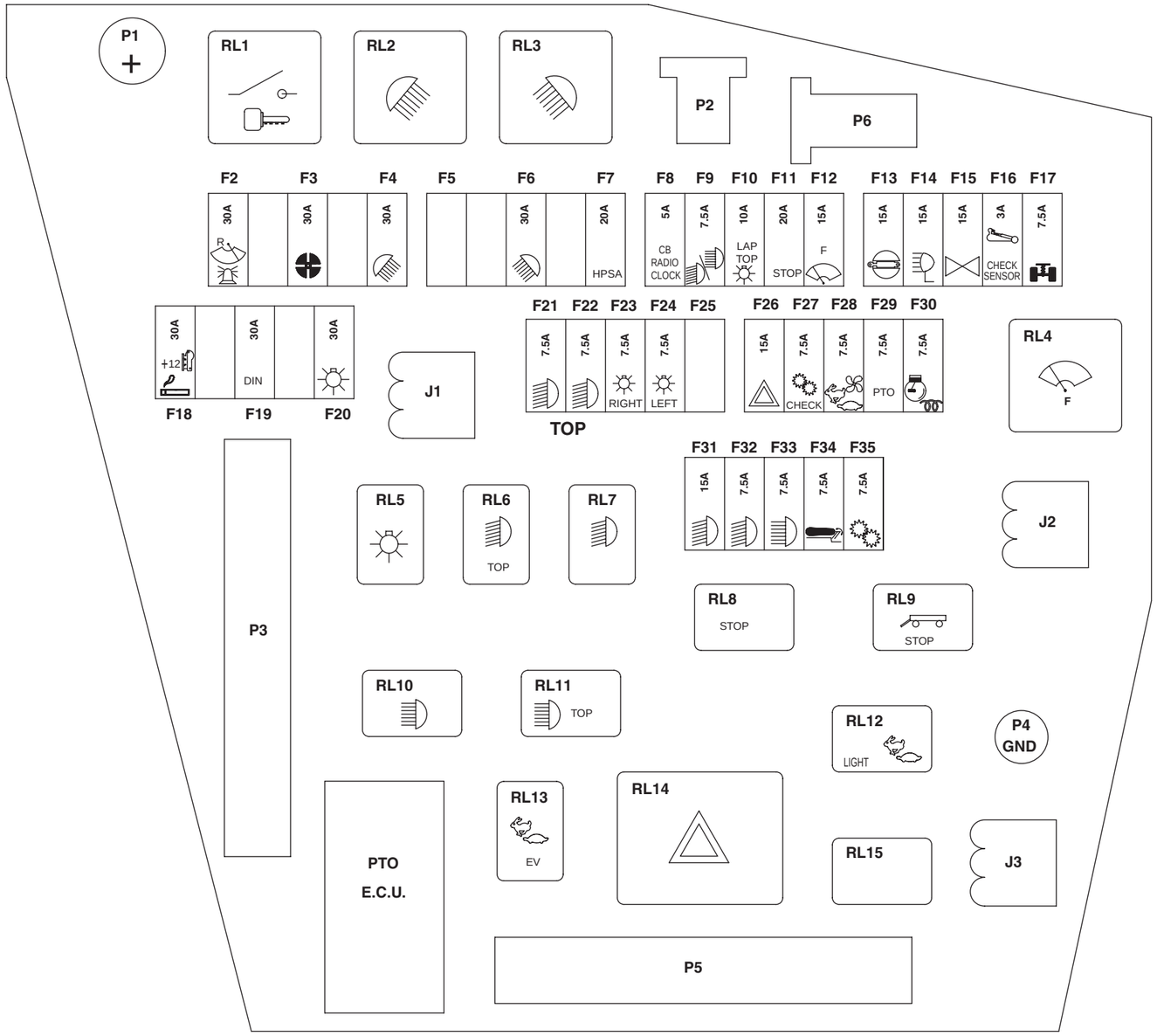
FUSES AND RELAYS CONTROL UNIT (1/2)



FUSES

- **F2** Rotating beacon - Rear screen wiper (30A)
- **F3** Fan - Air conditioning system (30A)
- **F4** Rear worklights (see F10 too) (30A)
- **F5** Not used
- **F6** Front worklights (see F10 too) (30A)
- **F7** Radio - CB - terminal +15 (20A)
- **F8** Radio - clock - CB - courtesy light - terminal +15 (5A)
- **F9** Lower beam - lower beam including lights switch (see F21 - F22 - F23 too) (7.5A)
- **F10** Computer - lights switch lighting (7.5A)
- **F11** Stop lights - 4WD (15A)
- **F12** Front screen wiper - Horn (15A)
- **F13** 4WD - diff. locking (15A)
- **F14** Front worklights on the flashing pilot lamp (15A)
- **F15** Direction indicators lights (15A)
- **F16** INFOCENTER - Transmission speed sensor - Rear PTO - Transmission display - air compressed generator - Radar sensor - Switchs pilot lamp (3A)
- **F17** Front axle suspension (see F11 too) (7.5A)
- **F18** Cigar lighter - Connection socket (30A)
- **F19** Electric socket (30A)
- **F20** Lower beam including lights switch - High lights (see F24 - F25 too) (30A)
- **F21** Upper left high light (see F23 - F9 too) (7.5A)
- **F22** Upper right high light (see F23 - F9 too) (7.5A)
- **F23** High lights (15A)
- **F24** Left lower beam - light - Rear left side lights - Trailer socket terminal 58L - Left number plate light (7.5A)
- **F25** Right lower beam - Right number plate light - Rear right side lights - railer socket terminal 58 right
- **F26** Emergency lights (15A)
- **F27** Power Shift - Infocenter (7.5A)
- **F28** Operator's seat(15A)
- **F29** PTO control - PTO keypad (7.5A)
- **F30** Electronic control engine speed (7A)
- **F31** Left lower beam (see F23 too) (7.5A)
- **F32** Right lower beam (see F23 too) (7.5A)
- **F33** Lower and upper lower beam (15A)
- **F34** Agronotric h - hD (7.5A)
- **F35** Power Shift terminal 15 (7.5A)

RELAYS

- **RL1** Terminal 15 (40A)
- **RL2** Rear worklights (40A)
- **RL3** Front worklights (40A)
- **RL4** Front screen wiper (10A)
- **RL5** Lights (10A)
- **RL6** Upper and lower lower beacon (10A)
- **RL7** Lower beacon (10A)
- **RL8** Stop lights - 4WD (10A)
- **RL9** 4WD solenoid valve (10A)
- **RL10** High lights
- **RL11** High lights(10A)
- **RL12** Field/road indicator (10A)
- **RL13** 4WD solenoid valve (10A)
- **RL14** Direction indicators - emergency lights (10A)
- **RL15** High lights commutator (10A)

CONNECTORS

- **J1** To side console wiring
- **J2** To side console wiring
- **J3** To side console wiring
- **P1** To side console wiring
- **P2** To side console wiring
- **P3** To side console wiring
- **P4** To side console wiring
- **P5** To side console wiring
- **P6** To side console wiring

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FUSES AND RELAYS CONTROL UNIT (2/2)