DEUTZ FAHR

SAME DEUTZ-FAHR DEUTSCHLAND GmbH

WORKSHOP MANUAL

AGROTRON 106 MK3
AGROTRON 110 MK3
AGROTRON 115 MK3
AGROTRON 120 MK3
AGROTRON 135 MK3
AGROTRON 150 MK3
AGROTRON 165 MK3

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; before removing these last two bolts, attach the component to suitable lifting equipment or position support blocks.

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

30 - When refitting electrical cables and wires, ensure that they are 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.

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 a guide to the use of the necessary software for machine and engine configuration and for diagnostic.

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 1012 - 1013	**0297 9771**	**Italian English French German**
Transmission ZF 7100L	**0298 6837**	**German**
	0298 6838	**English**
	0298 6839	**French**
	0298 6840	**Spanish**
Transmission 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**
Trasmission/rear axle 7200 L-S-H	**0298 6831**	**German**
	0298 6832	**English**
	0298 6833	**French**
	0298 6834	**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 ▽ 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.

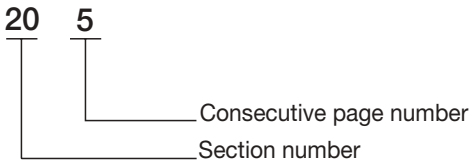
HOW TO USE AND UPDATE THE MANUAL

1. UPDATING THE MANUAL

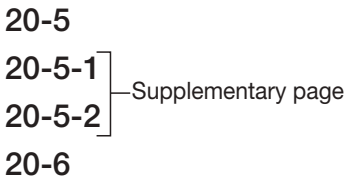
All additions, corrections or amendments to the manual will be sent to the Authorised Service Centres.
Before starting any repair or overhaul operations, check that you have the most recent updates as these may contain supplementary data not present in previous issues.

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:

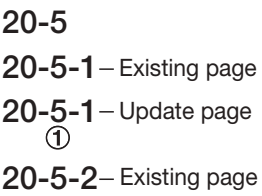


2 - **Supplementary pages:** indicated with a hyphen (-) and consecutive number after the page number. Example:



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.

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 bolts or eye bolts to remove parts, ensure they are screwed home fully.
- 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; ensure that cotter pins are bent over so that they cannot work loose.
- Ensure that circlips are correctly installed in their seatings.
- When applying threadlocking compound, first clean the part removing all oil and grease, then cover the thread evenly applying a few drops of the compound.
- When applying sealant, first clean the surface removing all traces of oil and grease and check for dirt or indentations, then apply the sealant evenly making sure that it forms a continuous film around any fixing holes.
- Clean all parts, removing dirt, oxidisation, carbon deposits, burrs and indentations.
- Coat all moving parts with a thin film of engine oil.
- When reconnecting electrical connectors, first remove all traces of oil, dust and water from the inside of the connector and then connect the two halves together firmly.
- When using eyebolts for lifting, check that they are not deformed, screw them fully home and align the eye with the lifting hook.
- 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 the variable displacement pump, before connecting the discharge pipe, fill the pump casing with oil.
- Grease stub axle housings, cylinder pivot mountings and drive shafts thoroughly after assembly.

LIFTING INSTRUCTIONS

kg

⚠ 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 kg

WIRE ROPES - SLINGS

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

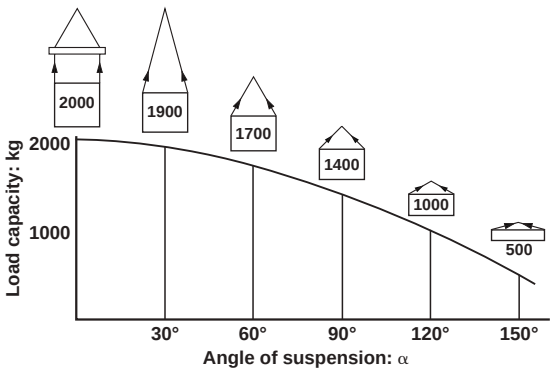
WIRE ROPES (standard twisted «S» or «Z» type)				POLYESTER SLINGS (eye-and-eye - simple loop)				
Ø rope mm	Capacity (kg)			Width (mm)	Capacity (kg)			
		60°	90°				60°	90°
8	650	620	500	25	500	400	860	700
10	1000	1740	1420	50	1000	800	1730	1410
12	1450	2500	2050	62	1250	1000	2160	1760
14	2000	3460	2820	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.

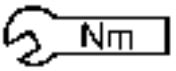
- The lifting hook should be attached to the central part of the rope or sling; if the hook is attached near the ends of the rope/sling, this could cause the load to slip during lifting.
- Never lift a heavy load using a single rope; always use two or more symmetrically arranged ropes.

⚠ 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.



STANDARD TIGHTENING TORQUES FOR 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

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 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.
	Loctite 576 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.

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.

SPECIAL TOOLS

SYMBOL	CODE	DESCRIPTION	NOTES
T1	00239496	Tool for removal of steering unit inner gasket	
T2	00239497	Tool for removal of steering unit dust seal	
T3	00239498	Tool for mounting of steering unit inner gasket	
T4	00239499	Tool for mounting of steering unit dust seal	
T5	5.9030.743.1	Test lead for checking sensors with multimeter	
T6	5.9030.743.0	Test lead for checking sensors with multimeter	
T7	5.9030.740.0	SERDIA installation disc	
T8	5.9030.741.0	Adapter cable	
T9	5.9030.740.2	Interface level III	
T10	5.9030.742.0	EDS software pack	

CONVERSION FACTORS

CONVERSION FROM BRITISH TO METRIC UNITS

mm =	inch x 25.40
m =	foot x 0.305
	yard x 0.914
km =	Eng.miles x 1.609
cm² =	Sq.in. x 6.452
m² =	Sq.ft. x 0.093
	Sq.yard x 0.835
cm³ =	Cu.in. x 16.39
m³ =	Cu.ft. x 28.36
	Cu.yard x 0.763
litres=	Imp.gall. x 4.547
	US gall. x 3.785
	pint x 0.568
	quart x 1.137
ℓ/min =	US.gpm x 3.785
kg =	oz. x 0.028
	lb. x 0.454
kgm =	lb.ft. x 0.139
kg/m =	lb.in. x 17.87
kg/cm² =	psi x 0.070
kg/ℓ=	lb./Imp.gall x 0.100
	lb./US.gall x 0.120
kg/m³ =	lb./cu.ft. x 16.21
Nm =	lb.ft. x 1.356
bar =	psi x 0.07

CONVERSION FROM METRIC TO BRITISH UNITS

inch =	mm x 0.0394
foot =	m x 3.281
yard =	m x 1.094
Eng.miles =	km x 0.622
Sq.in. =	cm² x 0.155
Sq.ft. =	m² x 10.77
Sq.yard =	m² x 1.197
Cu.in. =	cm³ x 0.061
Cu.ft =	m³ x 0.035
Cu.yard =	m³ x 1.311
Imp.gall. =	litres x 0.220
US gall. =	litres x 0.264
pint =	litres x 1.762
quart =	litres x 0.880
US.gpm =	ℓ/min x 0.2642
oz. =	kg x 35.25
lb. =	kg x 2.203
lb.ft. =	kgm x 7.233
lb.in. =	kg/m x 0.056
psi =	kg/cm² x 14.22
lb./Imp.gal. =	kg/ℓ x 10.00
lb./US.gal. =	kg/ℓ x 8.333
lb./cu.ft. =	kg/m³ x 0.062
lb.ft. =	Nm x 0.737
psi =	bar x 14.503

Example:

42 mm →???? inch

42x0.0394= 1.6548 inch

42 inch →???? mm

42x25.4=1066.8 mm

SECTION 10

CONTENTS

1. TRANSMISSION

INTRODUCTION

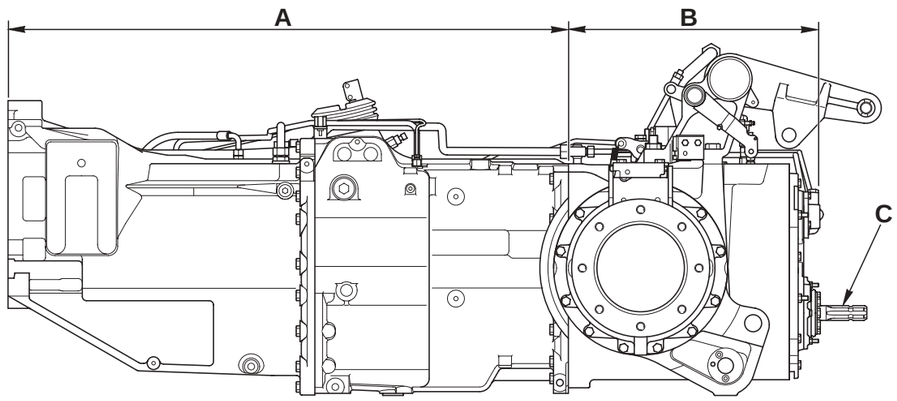
- The AGROTON MARK III series is supplied to the customer with two transmission configurations:

  a. POWER SHIFT transmission

  b. POWER SHUTTLE transmission

  The main difference between these two configurations lies in the behaviour of the electronic control unit when reversing the direction of travel.
  In the POWER SHIFT version, when the operator operates the shuttle control to change the direction of travel, the command is actually only implemented when the speed of the tractor falls below 10 km/h and when the operator depresses the clutch pedal.
  In the POWER SHUTTLE version, the reversal of the direction of travel is managed entirely by the electronic control unit without the operator having to depress the clutch pedal.
  This type of control is achieved by way of a proportional solenoid valve that directly controls the main clutch.

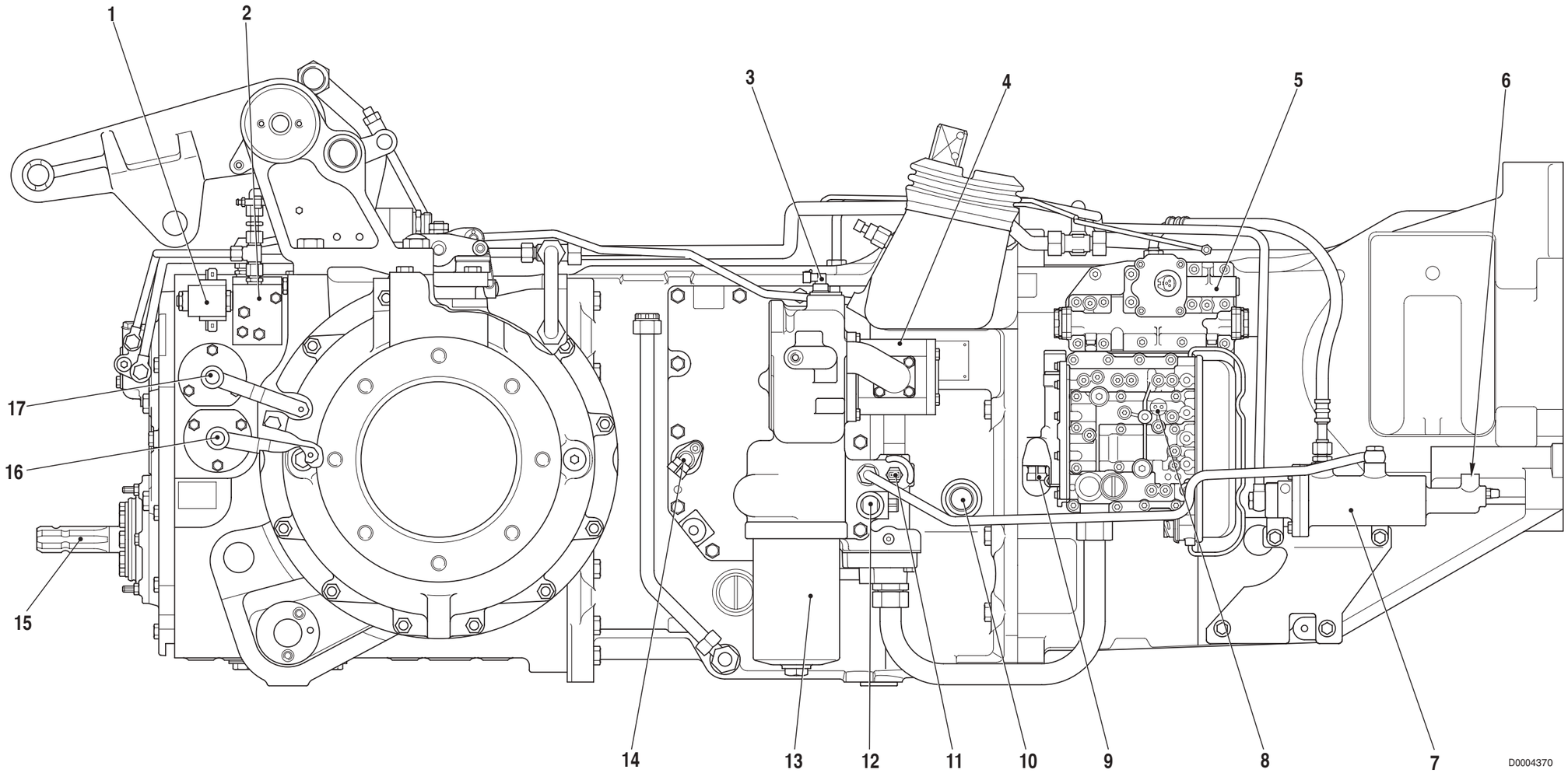
- The transmission can be divided into the following three sections:
  A. Gearbox
  B. Rear axle
  C. Rear PTO



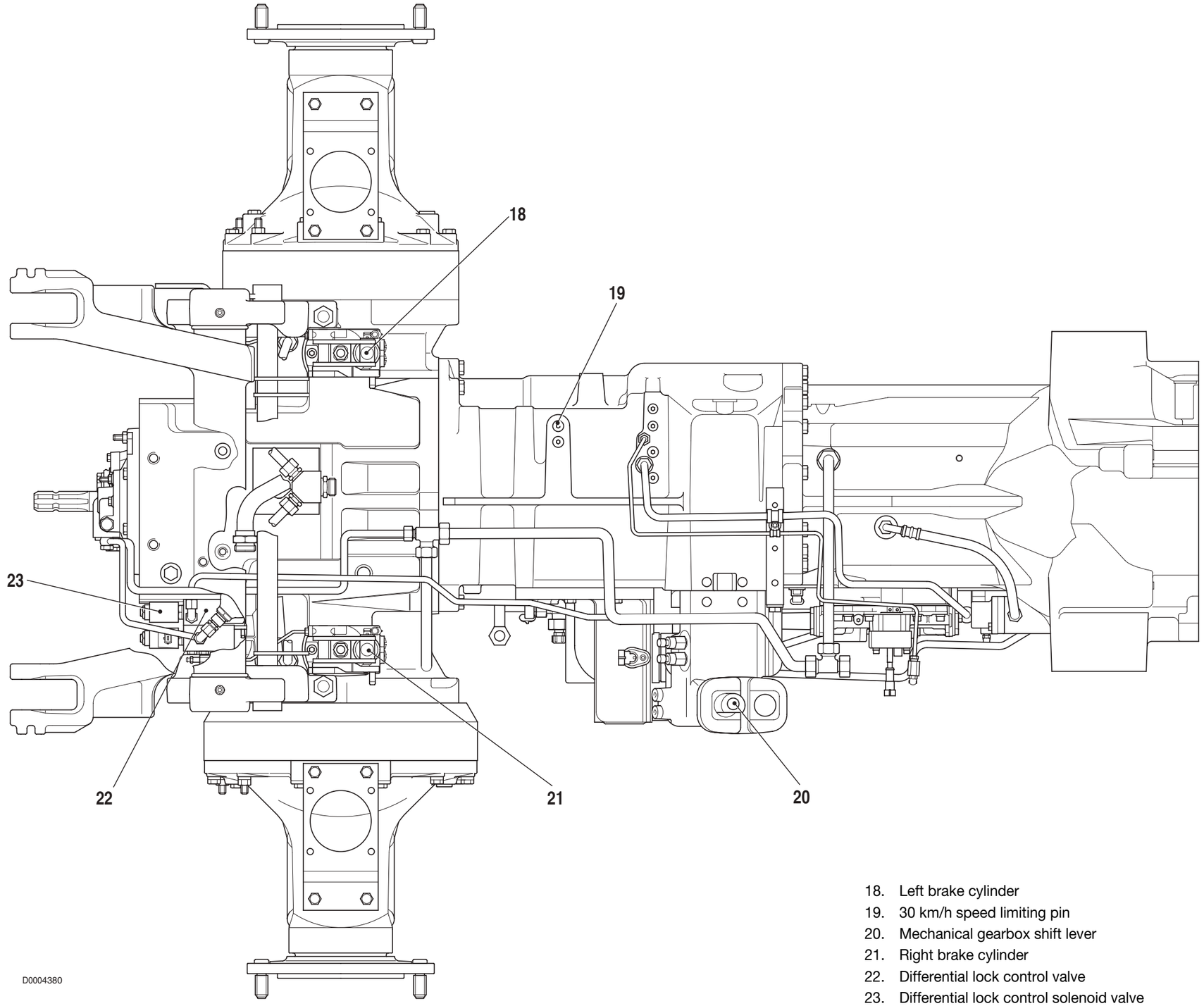
D0004360

1.1 TRANSMISSION (Power Shift version)

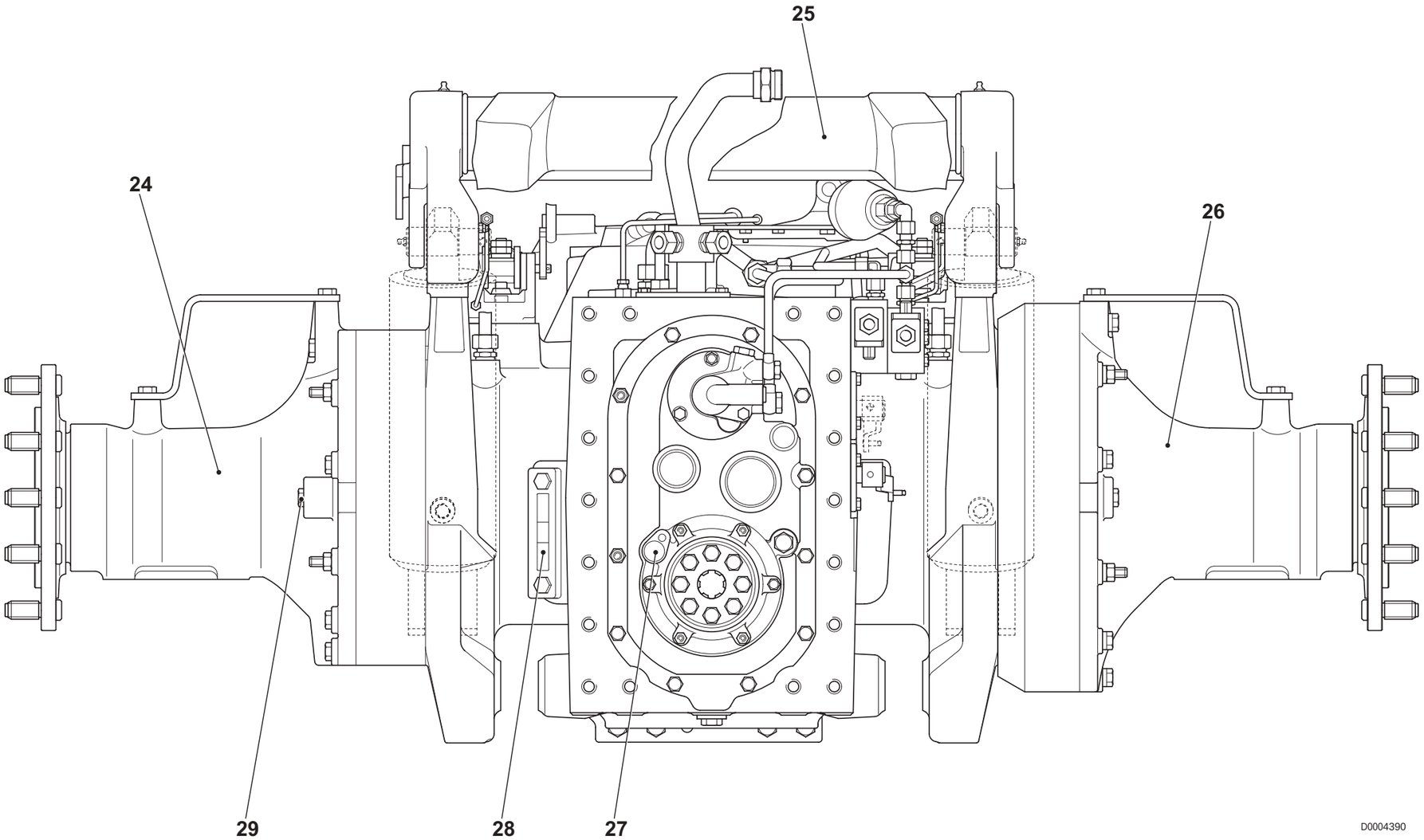
1.1.1 MAIN COMPONENTS



1. Rear PTO control solenoid valve
2. Rear PTO control valve
3. Engine speed sensor (nLse - nMot)
4. Hydraulic pump for transmission
5. Hydraulic gearbox control distribution valve
6. Pilot line fitting for main clutch
7. Main clutch control pump (Booster)
8. Transmission oil low pressure sensor
9. Gearbox output shaft speed sensor (nLsa)
10. Creeper engagement shaft
11. Transmission oil temperature sensor
12. Four-wheel drive control solenoid valve
13. Transmission oil suction line filter
14. Speed sensor for odometer (nAb)
15. Rear power take-off
16. Rear PTO speed selector lever
17. Rear PTO speed selector lever (Optional)



18. Left brake cylinder
19. 30 km/h speed limiting pin
20. Mechanical gearbox shift lever
21. Right brake cylinder
22. Differential lock control valve
23. Differential lock control solenoid valve

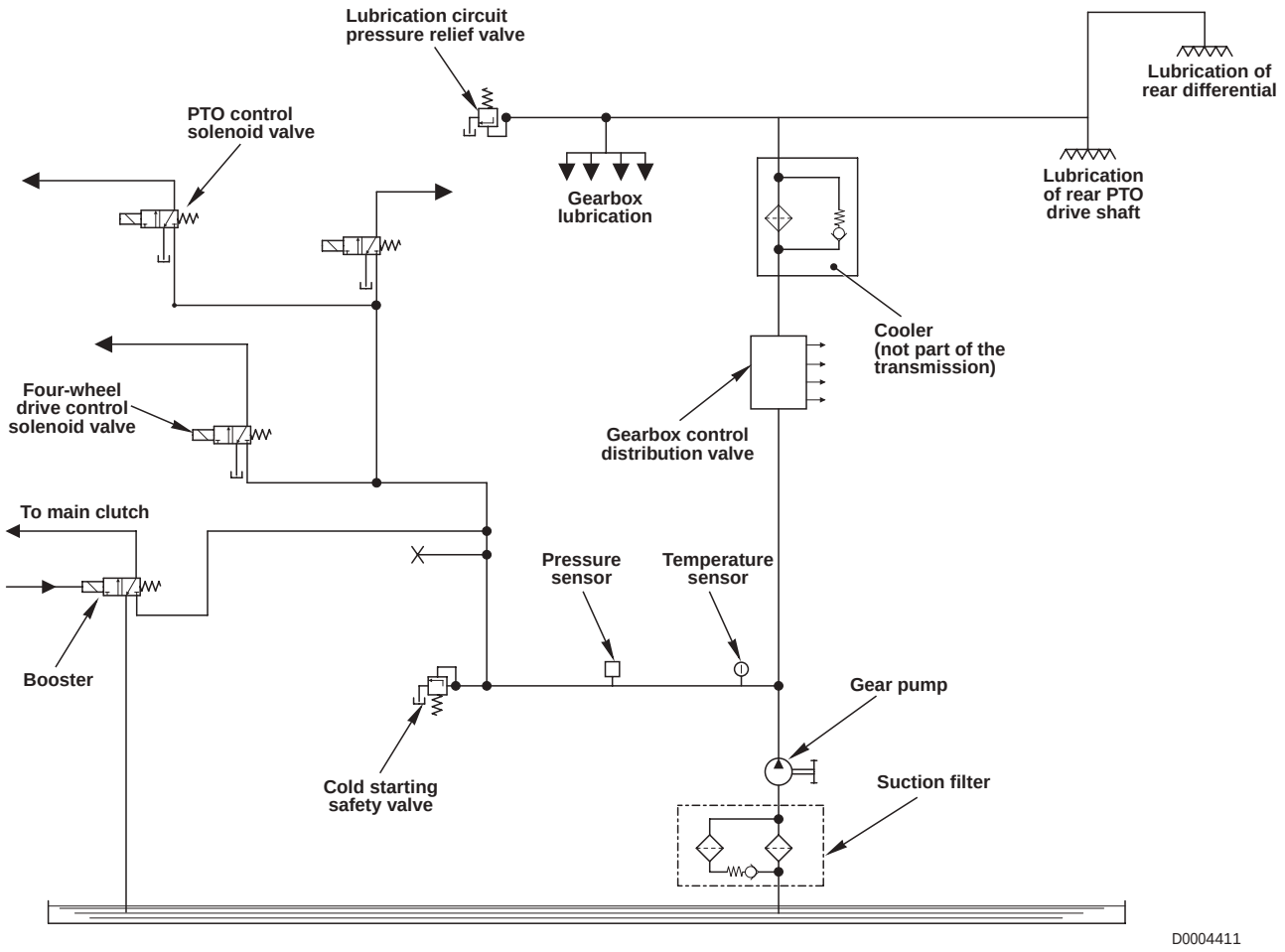


24. Left axle casing
25. Lift shaft
26. Right axle casing
27. Rear PTO speed sensor
28. Gearbox oil level indicator
29. Rear reduction unit oil level indicator

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:

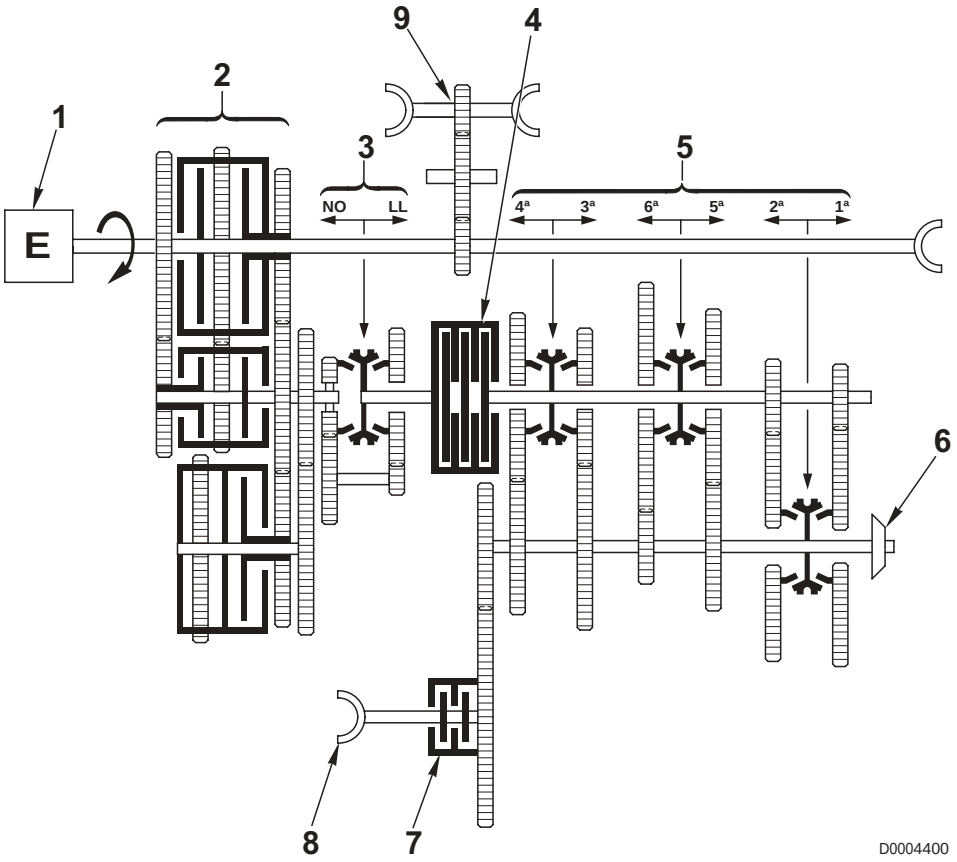
- hydraulic gearbox control valve
- forward/reverse shuttle control valve
- main clutch pump (Booster)
- 4WD control solenoid valve
- rear PTO control solenoid valve
- differential lock control solenoid valve
- lubrication of the gearbox, rear differential and rear PTO clutch control shaft.



1.1.3 GEARBOX

DESCRIPTION

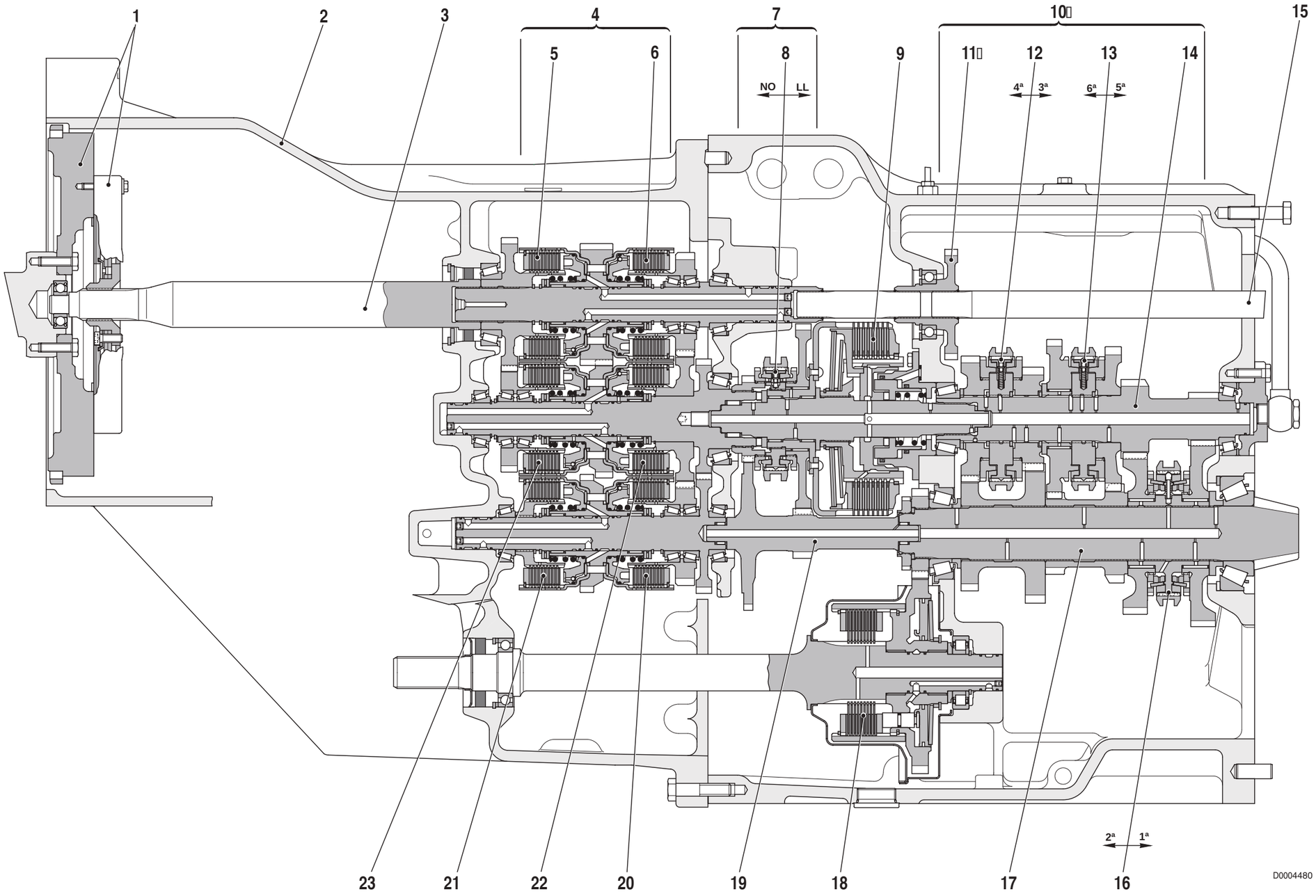
- The POWER SHIFT transmission receives drive from the engine (1) and transmits drive through the hydraulically-controlled gearbox (2), the creeper unit (3), the main clutch (4) and the 6-speed mechanical gearbox (5) to the pinion (6) and the power take-off (7) that provides the drive to the front axle .
  The POWER SHIFT transmission is equipped with a double-output power take-off (9) to drive the hydraulic system pumps.



COMPONENTS

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

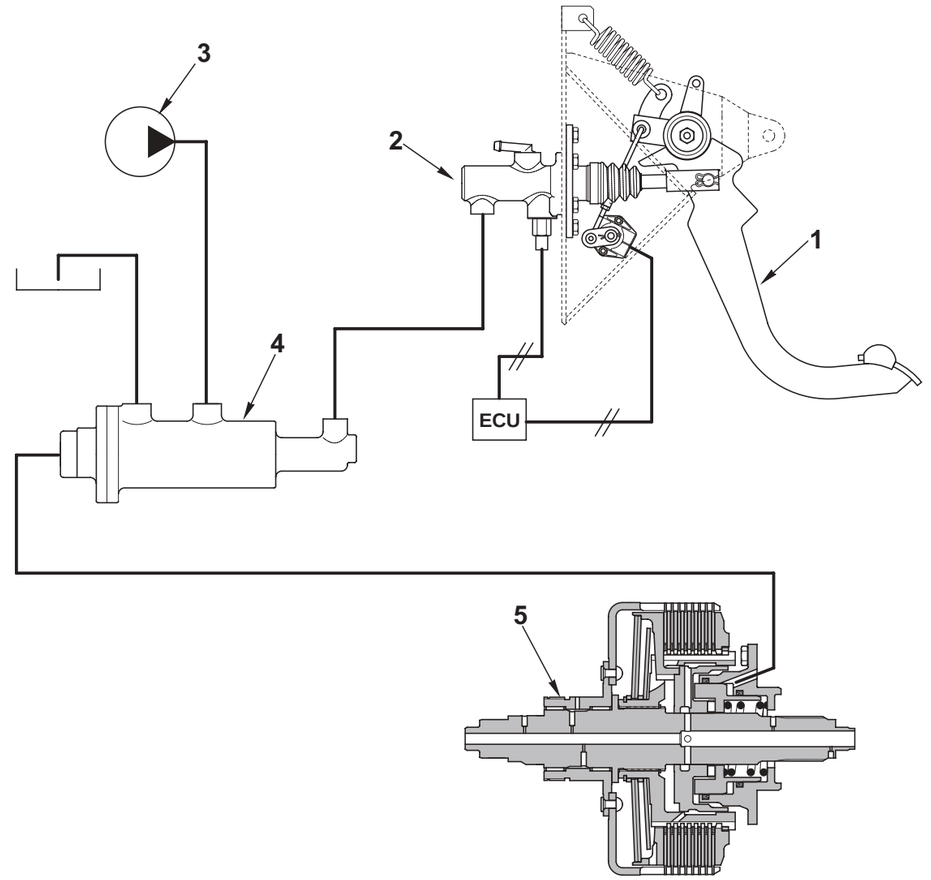
GEARBOX COMPONENTS



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

1.1.4 MAIN CLUTCH

The main clutch of the POWER SHIFT transmission is an oil-bath multiplate unit with servo-assisted engagement and hydraulic pilot system.
Clutch operation is entirely manual by way of the clutch pedal.
The system is equipped with a clutch cylinder (Booster) that directs fluid under pressure to the main clutch in accordance with the travel of the clutch pedal.



1. Clutch pedal
2. Clutch pilot cylinder
3. Transmission gear pump
4. Clutch control cylinder (Booster)
5. Main clutch

1.1.5 HYDRAULIC GEARBOX AND SHUTTLE DISTRIBUTION VALVE

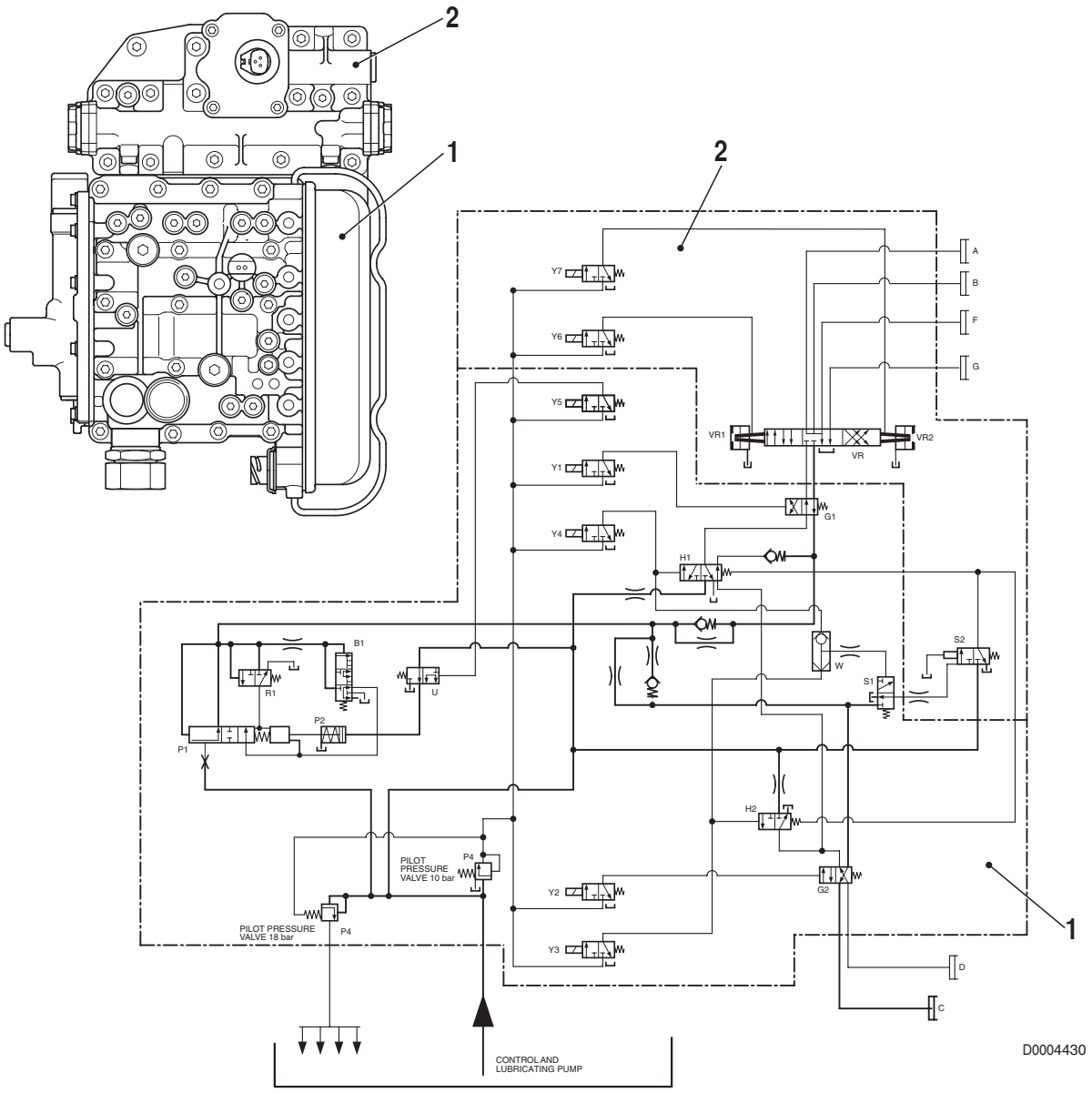
The function of the hydraulic gearbox distribution valve is to pilot and control the engagement of the gears in the hydraulically-controlled gearbox .

The distribution valve controls the operation of:

A. the hydraulic gearbox control valve (1) to select **S**, **H**, **M** and **L** ratios

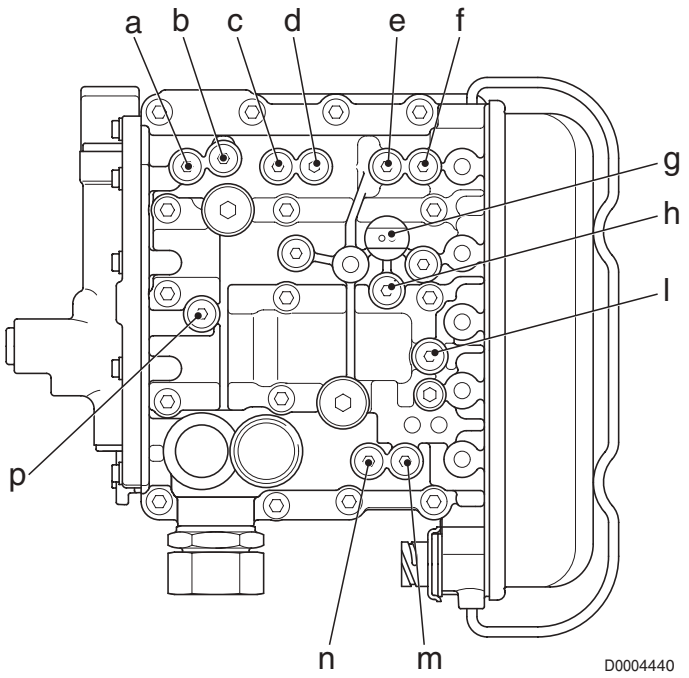
B. the shuttle control valve (2) to select FORWARD and REVERSE gears.

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



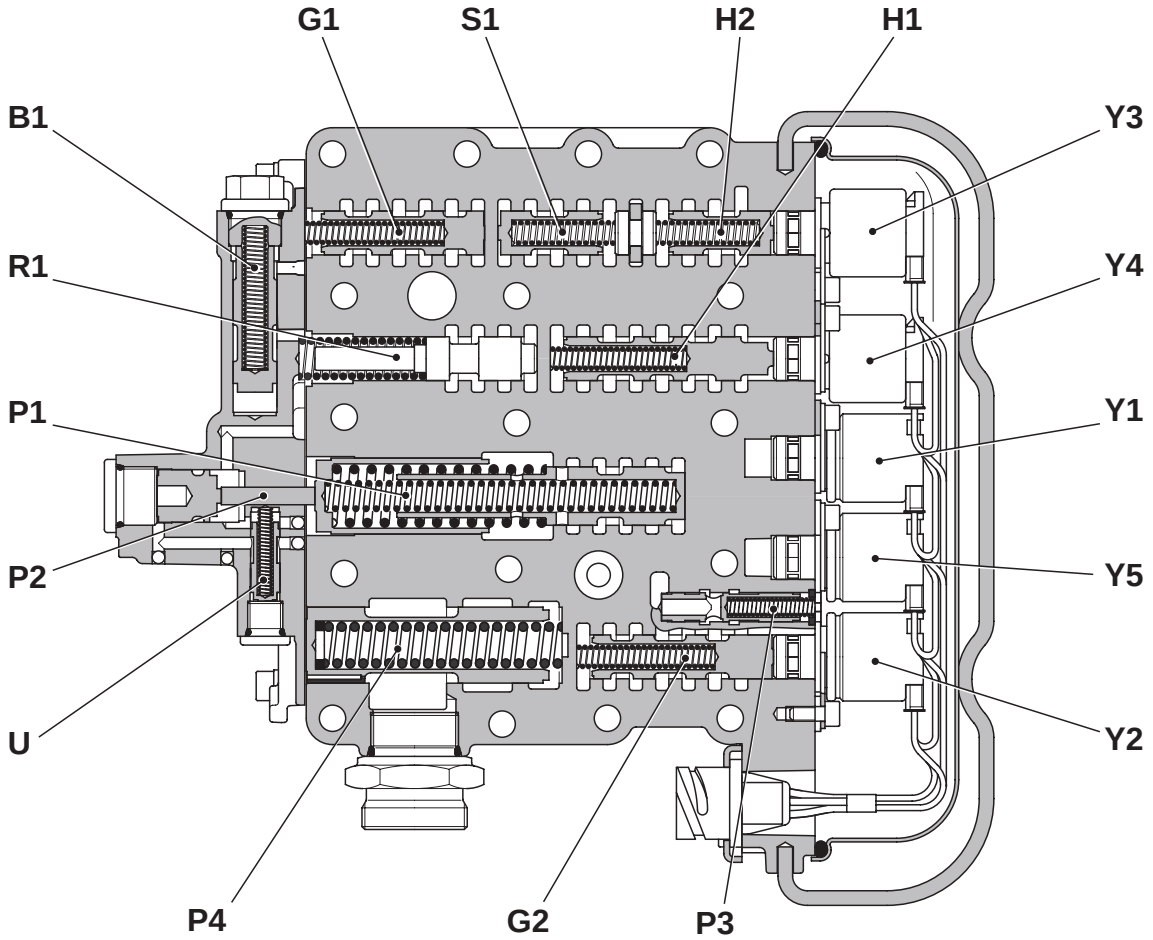
A. GEARBOX CONTROL VALVE

PRESSURE TEST POINTS



Pos.	Function	Thread size
a.	**A** or **F** clutch pressure	M10x1
b.	**B** or **G** clutch pressure	M10x1
c.	**Y3** or **Y4** solenoid valve pressure	M10x1
d.	Pressure **Pg** to relief valve	M10x1
e.	Pressure **Pr** from relief valve (18 bar)	M10x1
f.	Engagement pressure of clutch **C** or **D**	M10x1
g.	General pressure (18 bar)	M10x1
h.	Engagement pressure of clutch **A/B** or **F/G**	M10x1
l.	Pilot pressure (10 bar)	M10x1
m.	**D** clutch pressure	M10x1
n.	**C** clutch pressure	M10x1
p.	Modulated pressure	M10x1

MAIN COMPONENTS

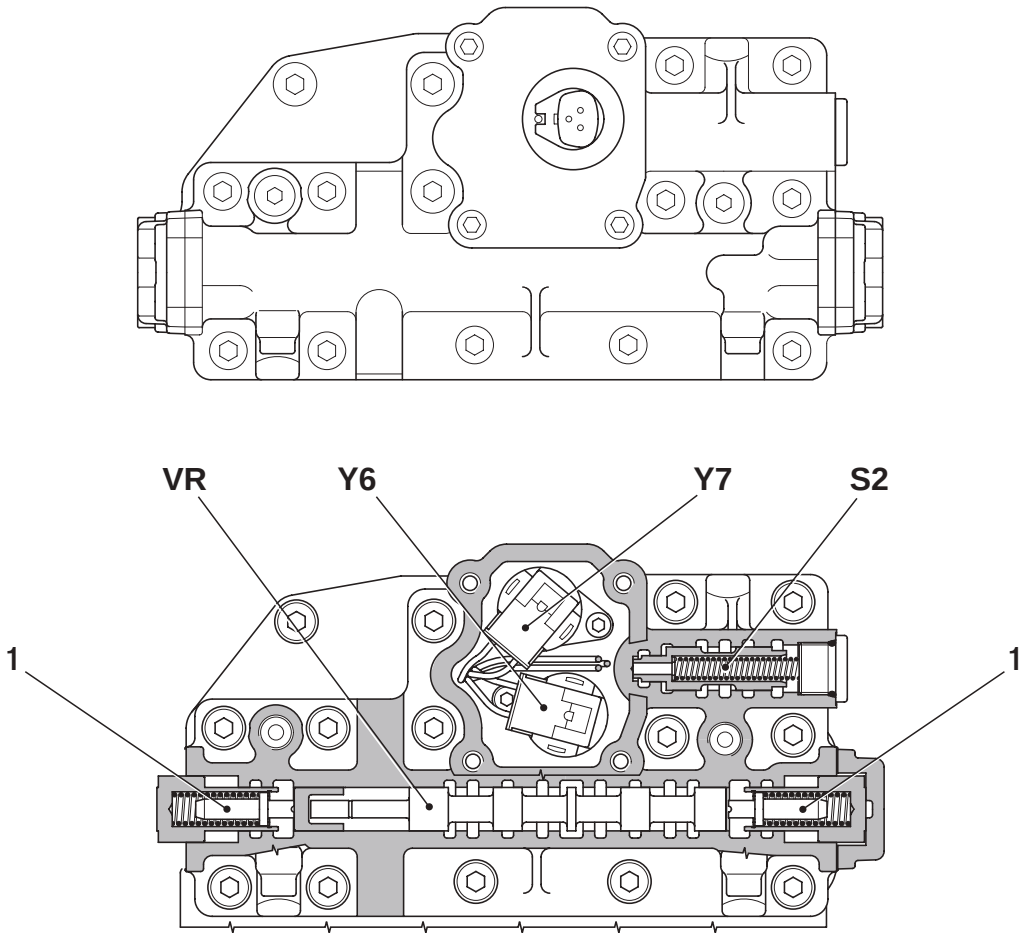


D0005320

B1 Breather valve
G1 Clutch selection valve for **A/B** or **F/G** clutches
S1 Relief valve
H2 Clutch engagement valve for **C/D clutches**
H1 Clutch engagement valve for **A/B** or **F/G clutches**
Y3 Pilot solenoid valve for engagement valve **H2**
Y4 Pilot solenoid valve for engagement valve **H1**
Y1 Pilot solenoid valve for clutch selection valve **G1**
Y5 Pilot solenoid valve for road/field selection valve
Y2 Pilot solenoid valve for C or D clutch selection valve **G2**
P3 Pilot pressure regulating valve
G2 Clutch selection valve for **C** or **D clutches**
P4 General pressure regulating valve
U Road/field operating mode selection valve
P1 Pressure modulating valve
P2 2-stage valve
R1 Null shift valve

B. SHUTTLE CONTROL VALVE

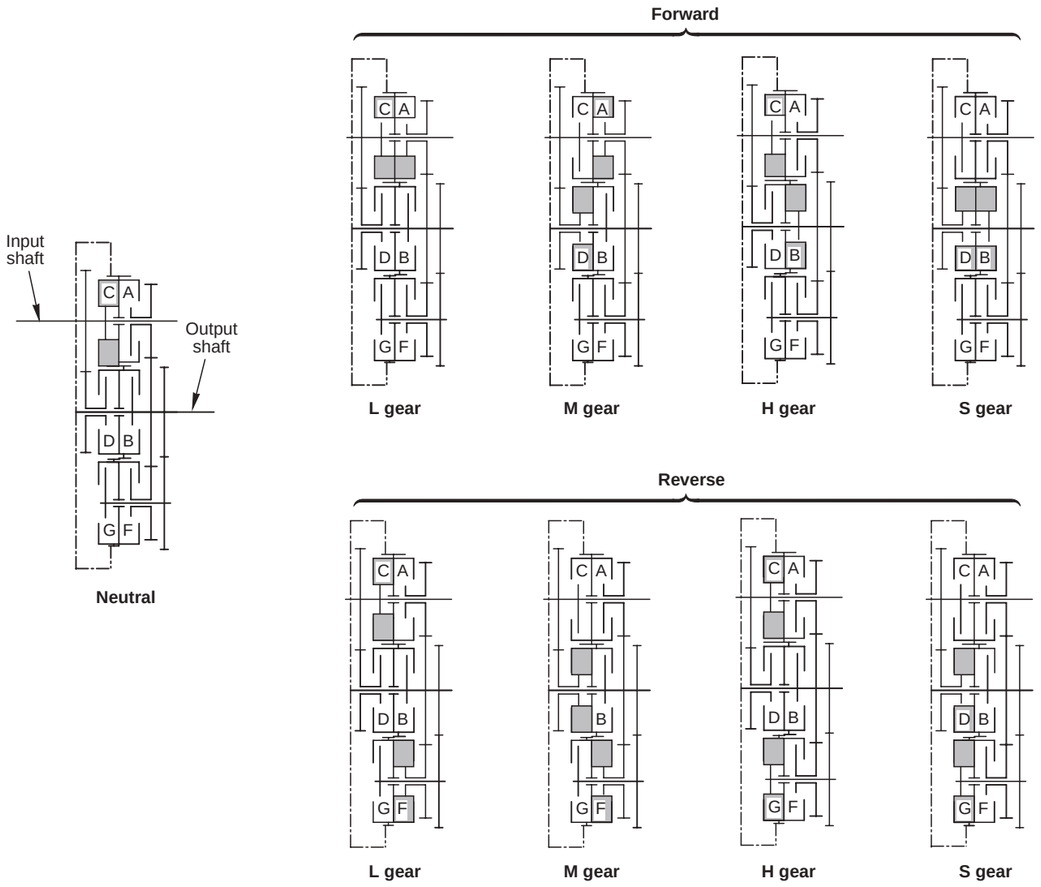
MAIN COMPONENTS



D0005330

Y6 Pilot solenoid valve for FORWARD gear
Y7 Pilot solenoid valve for REVERSE gear
VR FORWARD/REVERSE control spool valve
S2 Relief valve
1 Neutral return device

1.1.6 CLUTCH ENGAGEMENT AND SOLENOID VALVE OPERATION SCHEMATIC



Solenoid valve operation when shifting from L to S gear (L–~~M~~–~~H~~–~~S~~)

Solenoid valve	Forward				Reverse			
	L	M	H	S	L	M	H	S
Y6	●	●	●	●				
Y7					●	●	●	●
Y1	●	●			●	●		
Y2		●		●		●		●
Y3		❍	❍	❍		❍	❍	❍
Y4			❍				❍	

● = Solenoid valve energised

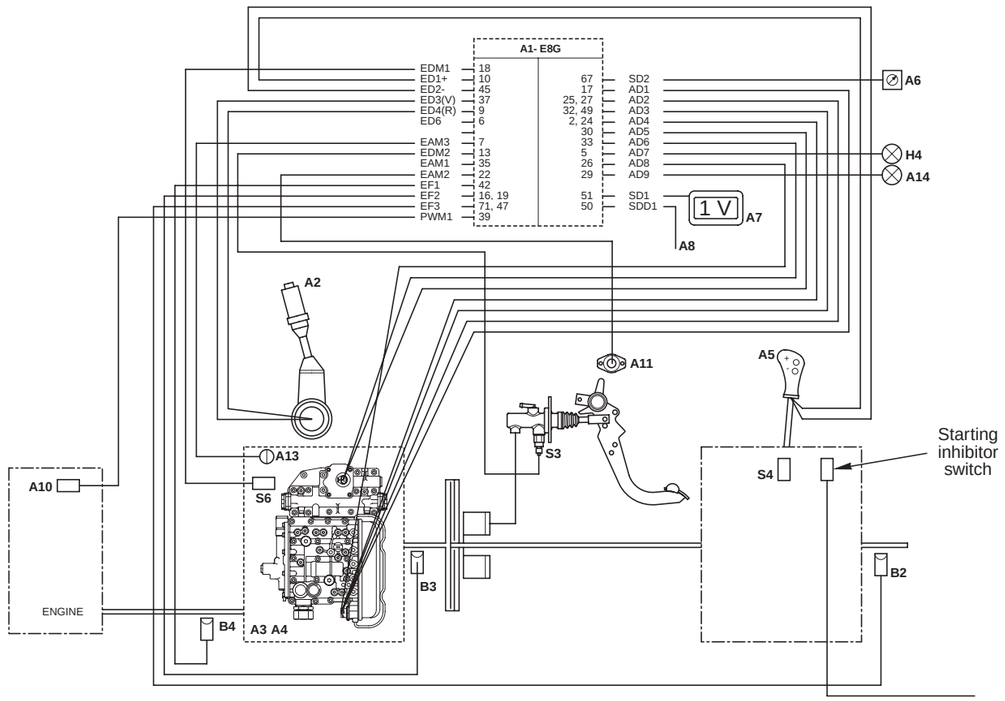
❍ = Solenoid valve briefly energised during gear change

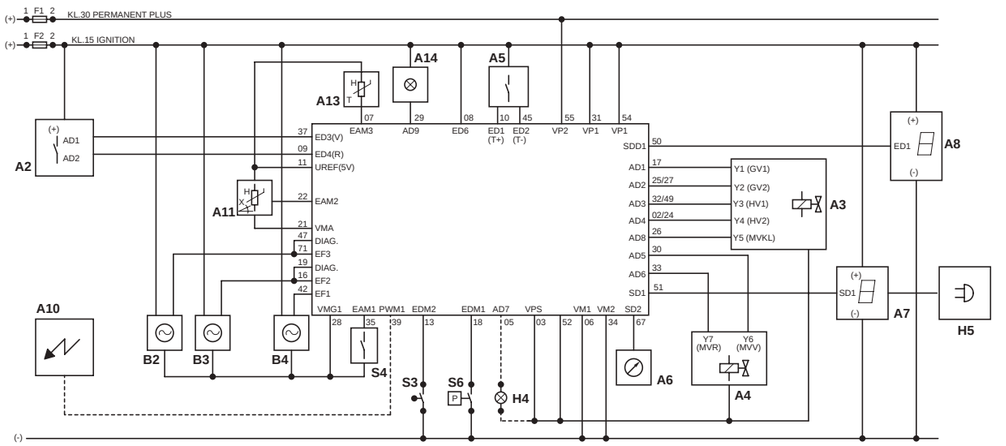
Solenoid valve operation when shifting from S to L gear (S–~~H~~–~~M~~–~~L~~)

Solenoid valve	Forward				Reverse			
	S	H	M	L	S	H	M	L
Y6	●	●	●	●				
Y7					●	●	●	●
Y1			●	●			●	●
Y2	●		●				●	
Y3		❍	❍	❍		❍	❍	❍
Y4			❍				❍	

● = Solenoid valve energised

❍ = Solenoid valve briefly energised during gear change





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1.1.7 TRANSMISSION ELECTRONIC SYSTEM SCHEMATIC

COMPONENTS

A1 Electronic transmission control unit

A2 Shuttle control lever (FORWARD/REVERSE)

A3 Gearbox control valve

A4 Shuttle control valve

A5 Range selector lever (L M H S)

A6 Provision for tachymeter connection

A7 Display

A8 Diagnostics connection

A10 Engine load sensor

A11 Clutch pedal position sensor

A13 Transmission oil temperature sensor

A14 Transmission oil low pressure indicator

B2 Pinion speed sensor (nAb) (theoretical groundspeed)

B3 Hydraulic gearbox output speed sensor (nLsa)

B4 Transmission input speed sensor (nLse - nMot)

F1 Fuse (1A)

F2 Fuse (8A)

H4 FORWARD/REVERSE indicator lamp

H5 Audible alarm

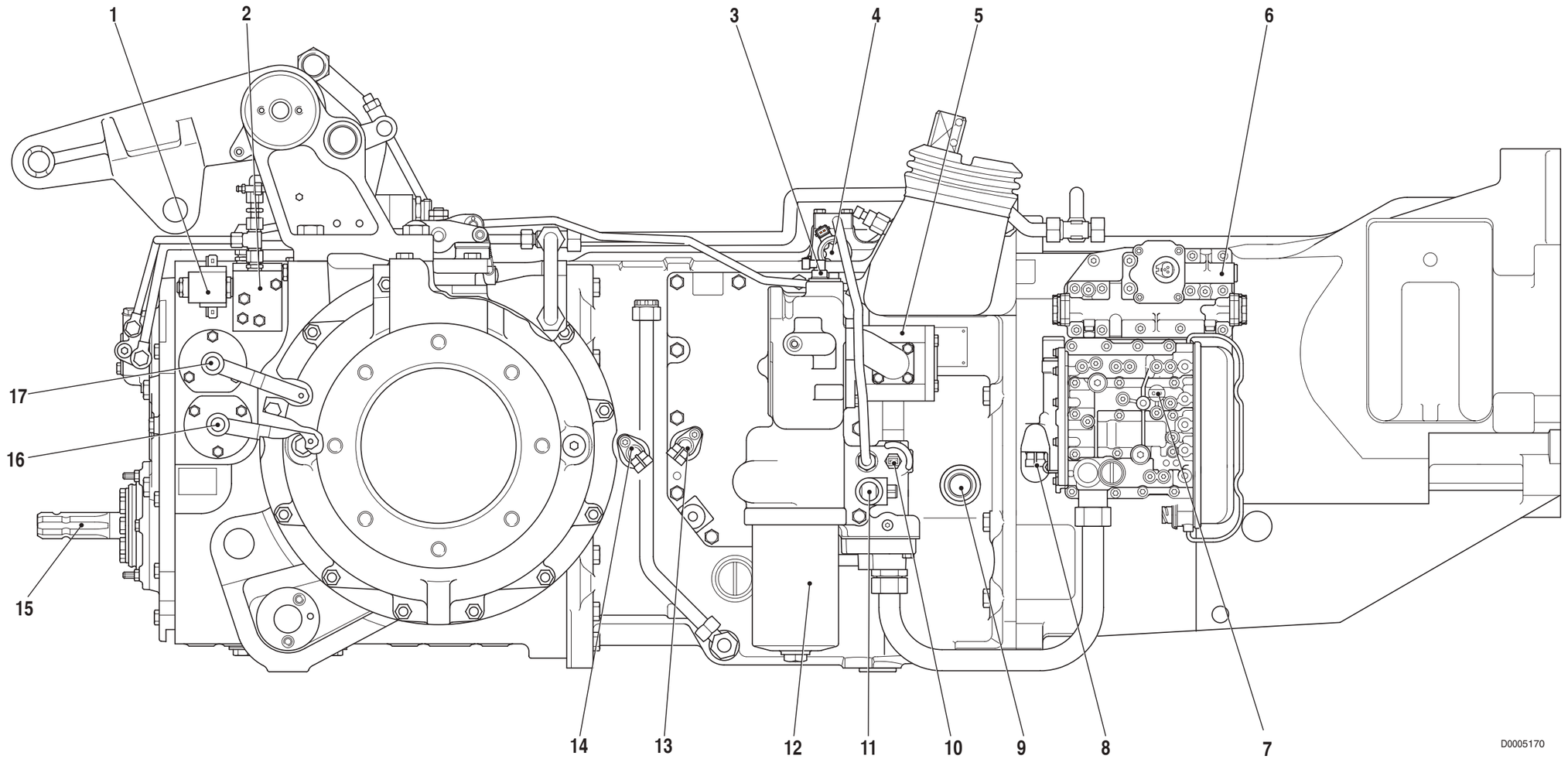
S3 Clutch pedal depressed sensor

S4 Mechanical gearbox neutral sensor

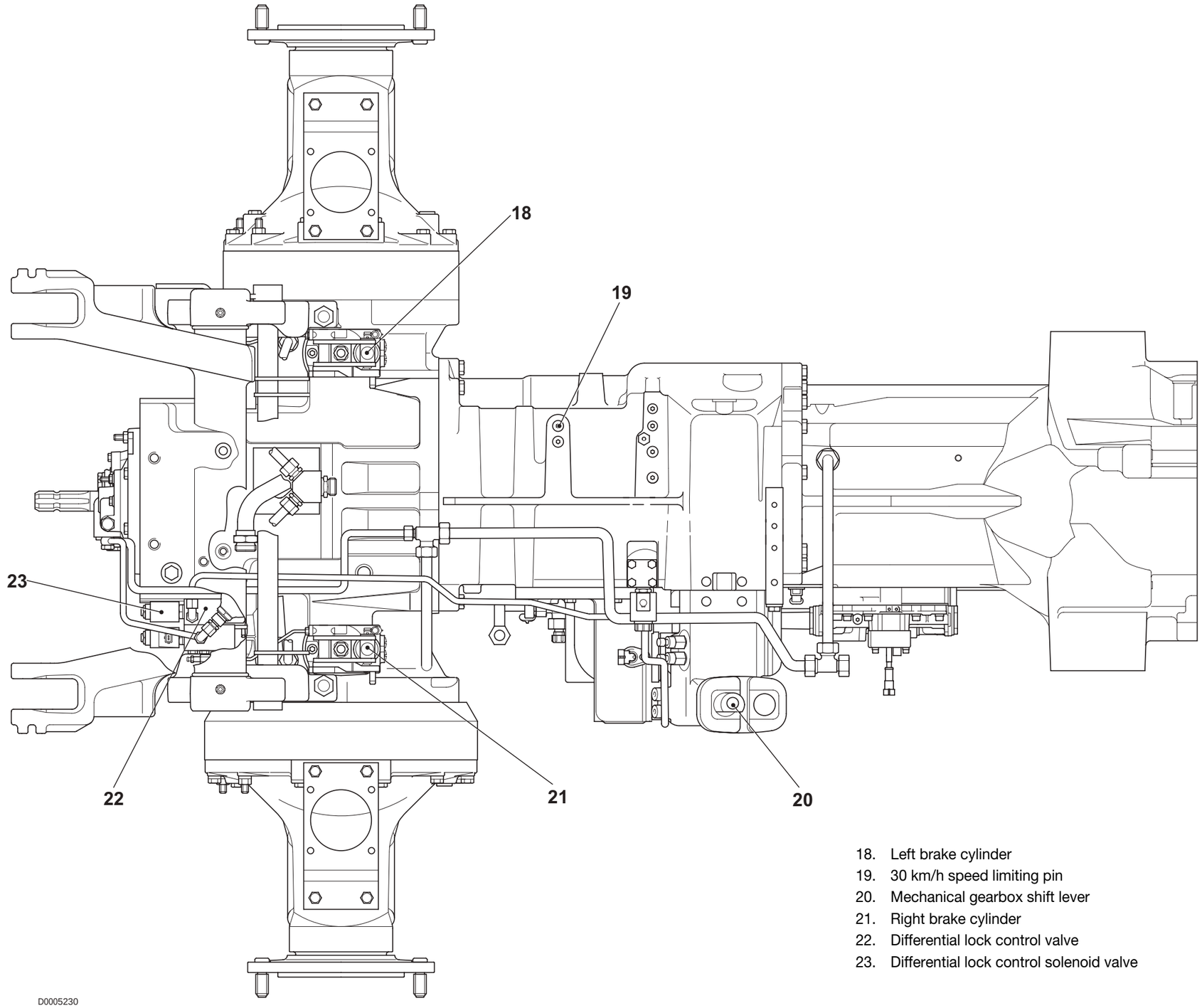
S6 Transmission oil low pressure sensor (18 bar)

1.2 TRANSMISSION (Power Shuttle version)

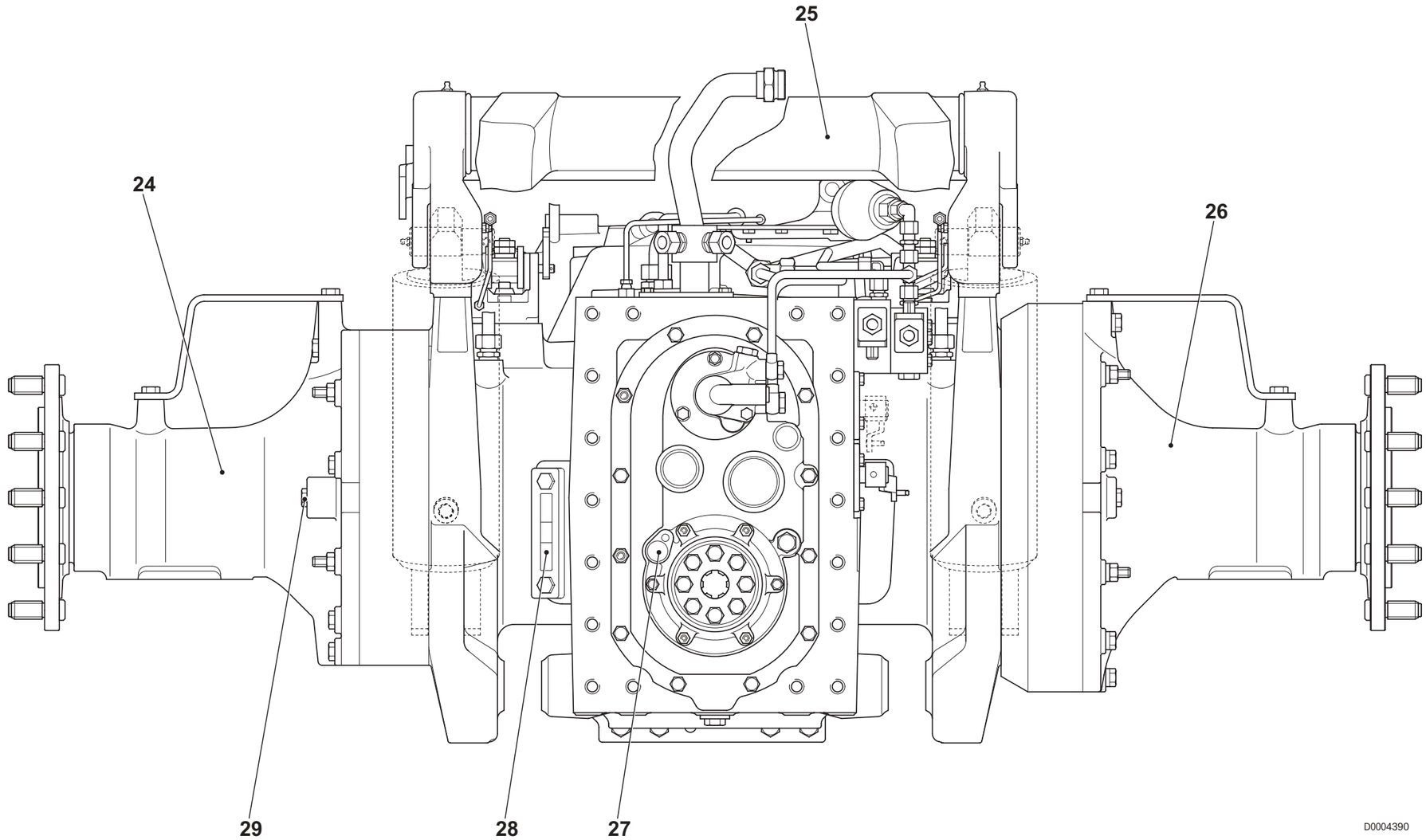
1.1.1 MAIN COMPONENTS



1. Rear PTO control solenoid valve
2. Rear PTO control valve
3. Engine speed sensor (nLse - nMot)
4. Clutch control solenoid valve
5. Hydraulic pump for transmission
6. Hydraulic gearbox distribution valve
7. Transmission oil low pressure sensor
8. Gearbox output shaft speed sensor (nLsa)
9. Creeper engagement shaft
10. Transmission oil temperature sensor
11. Four-wheel drive control solenoid valve
12. Transmission oil suction line filter
13. Speed sensor for odometer (nAb)
14. Clutch speed sensor (nHk)
15. Rear power take-off
16. Rear PTO speed selector lever
17. Rear PTO speed selector lever (Optional)



18. Left brake cylinder
19. 30 km/h speed limiting pin
20. Mechanical gearbox shift lever
21. Right brake cylinder
22. Differential lock control valve
23. Differential lock control solenoid valve

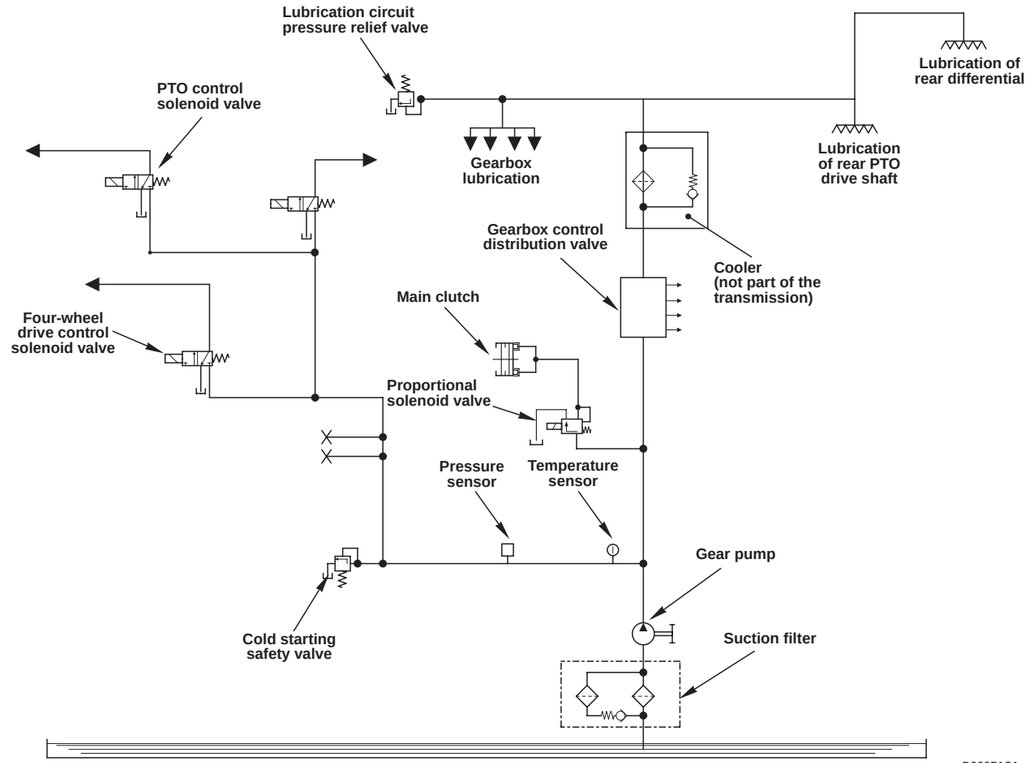


24. Left axle casing
25. Lift shaft
26. Right axle casing
27. Rear PTO speed sensor
28. Gearbox oil level indicator
29. Rear reduction unit oil level indicator

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:

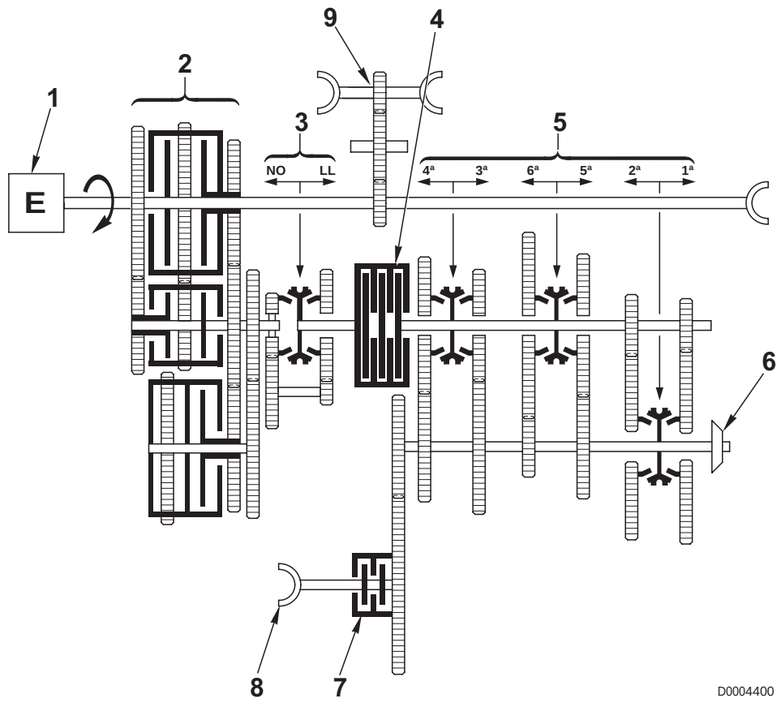
- hydraulic gearbox control valve
- forward/reverse shuttle control valve
- proportional solenoid control valve for main clutch
- 4WD control solenoid valve
- rear PTO control solenoid valve
- differential lock control solenoid valve
- lubrication of the gearbox, rear differential and rear PTO clutch control shaft.



1.2.3 GEARBOX

DESCRIPTION

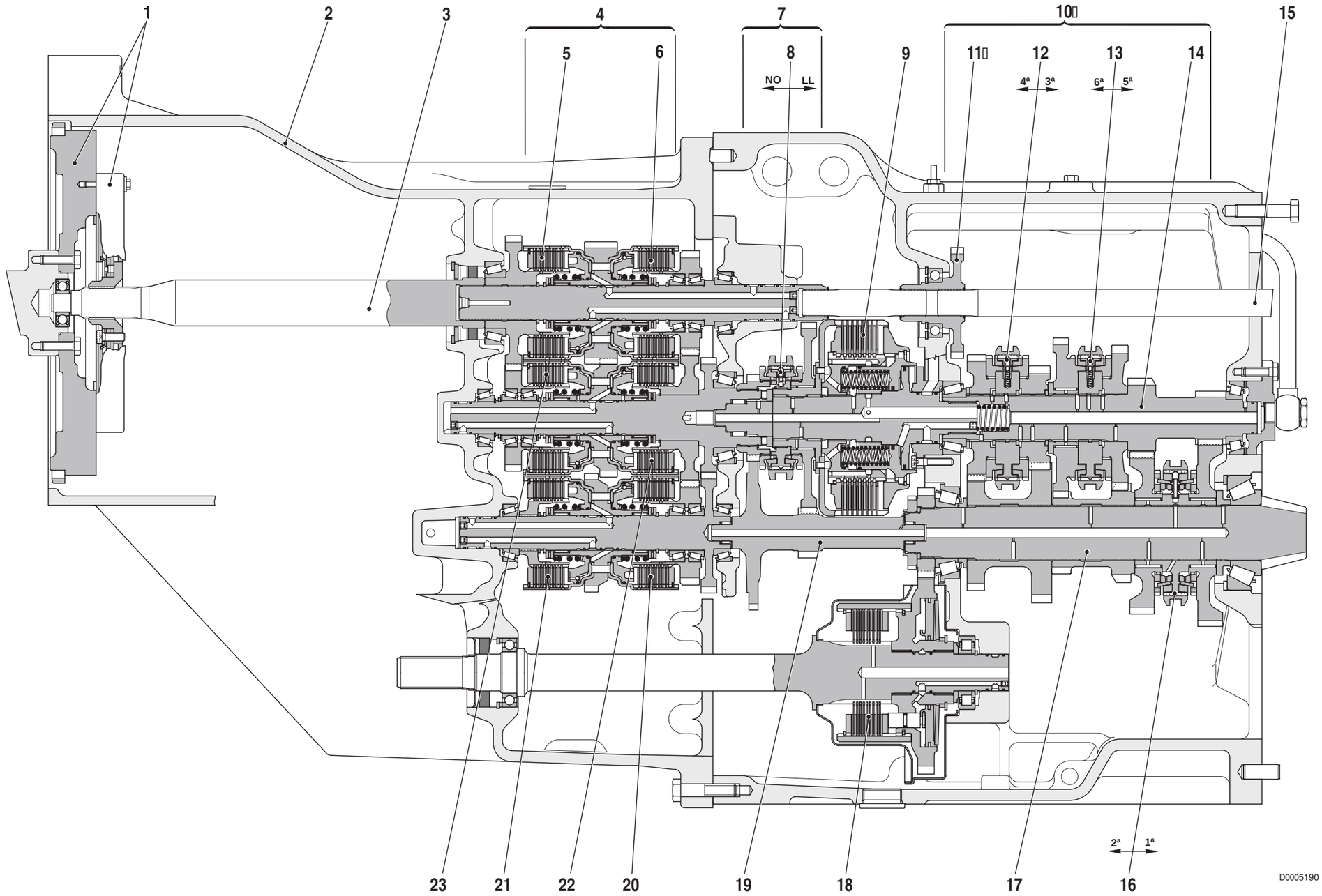
- The POWER SHUTTLE transmission receives drive from the engine (1) and transmits drive through the hydraulically-controlled gearbox (2), the creeper unit (3), the main clutch (4) and the 6-speed mechanical gearbox (5) to the pinion (6) and the power take-off (7) that provides the drive to the front axle .
  The POWER SHUTTLE transmission is also equipped with a double-output power take-off (9) to drive the hydraulic system pumps.



COMPONENTS

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

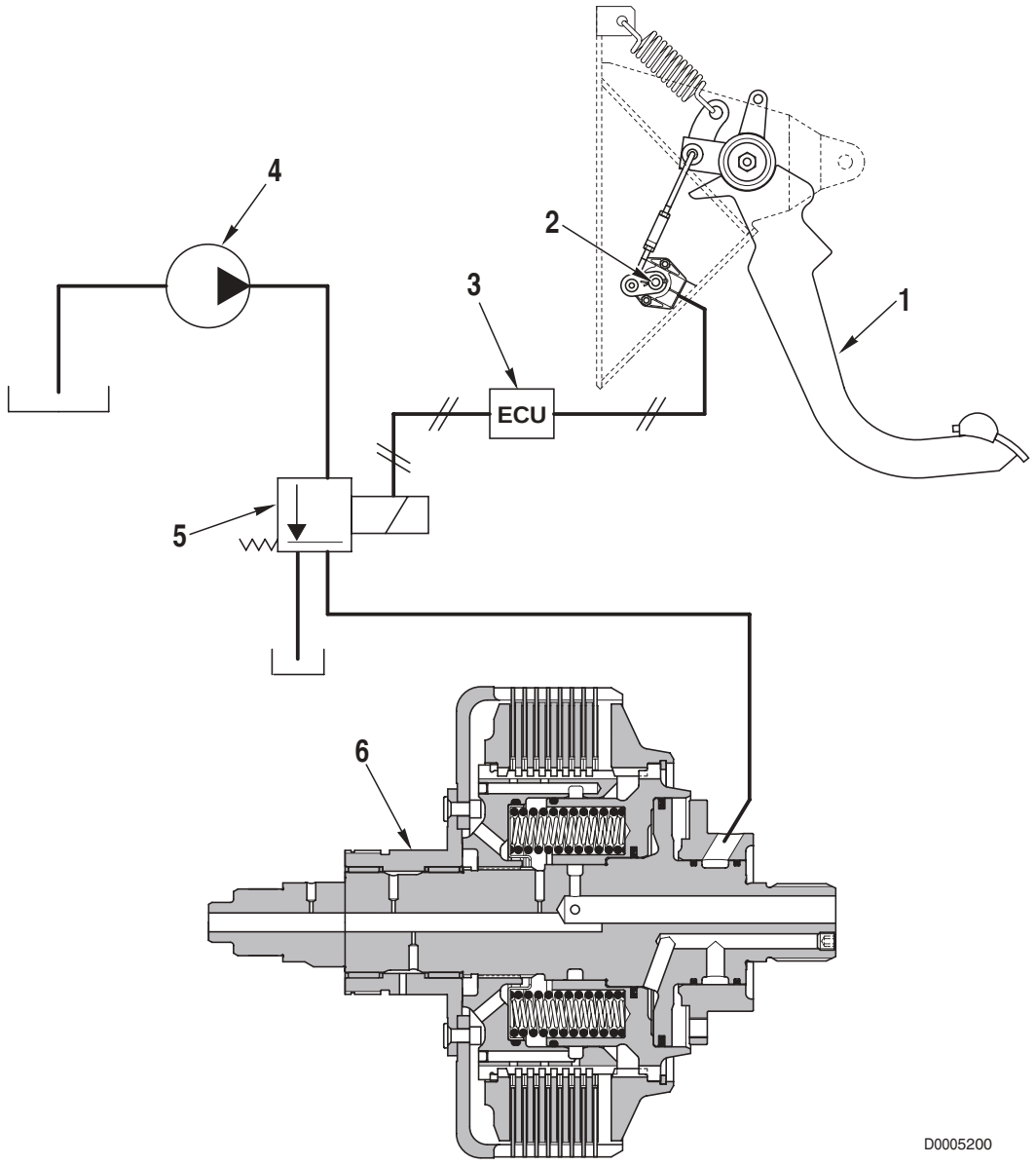
GEARBOX COMPONENTS



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

1.2.4 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

1.2.5 HYDRAULIC GEARBOX AND SHUTTLE DISTRIBUTION VALVE

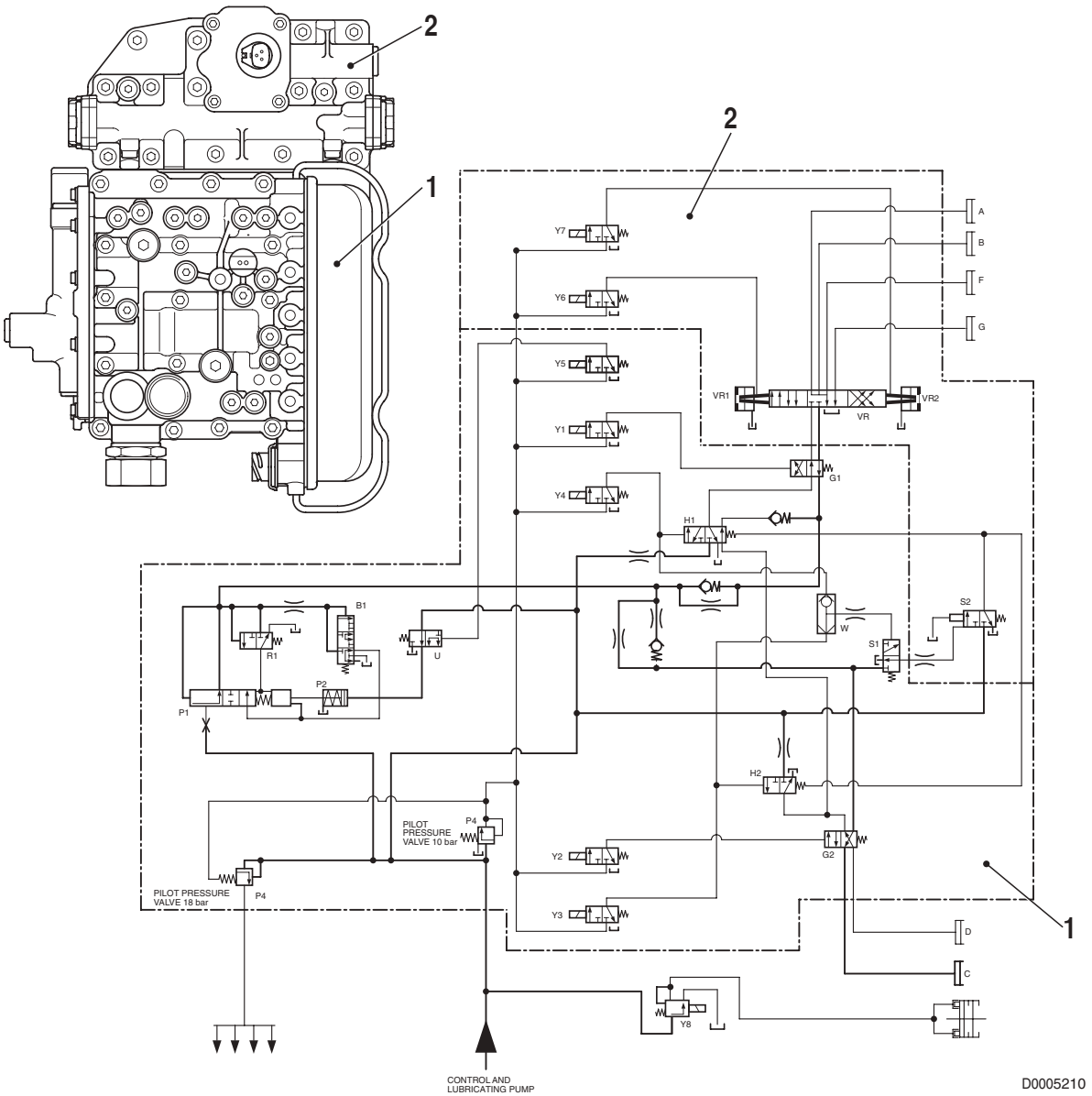
The function of the hydraulic gearbox distribution valve is to pilot and control the engagement of the gears in the hydraulically-controlled gearbox .

The distribution valve controls the operation of:

A. the hydraulic gearbox control valve (1) to select **S**, **H**, **M** and **L** ratios

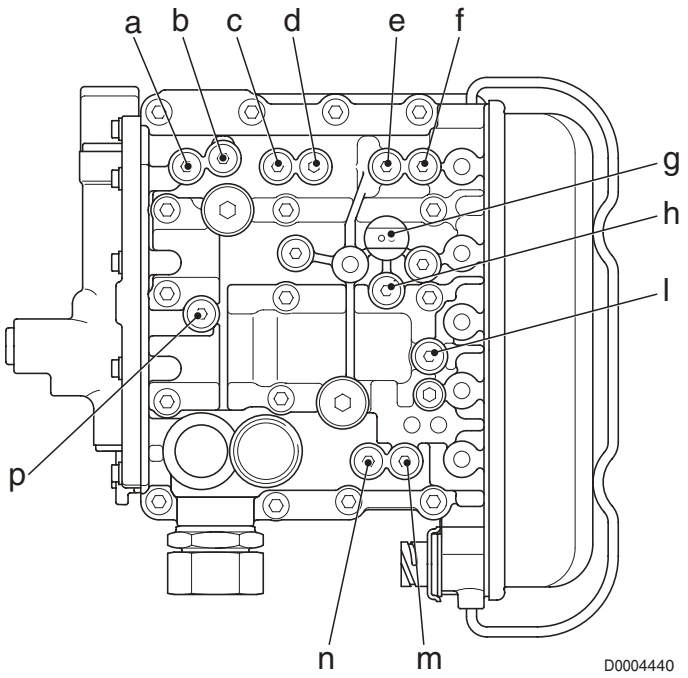
B. the shuttle control valve (2) to select FORWARD and REVERSE gears.

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



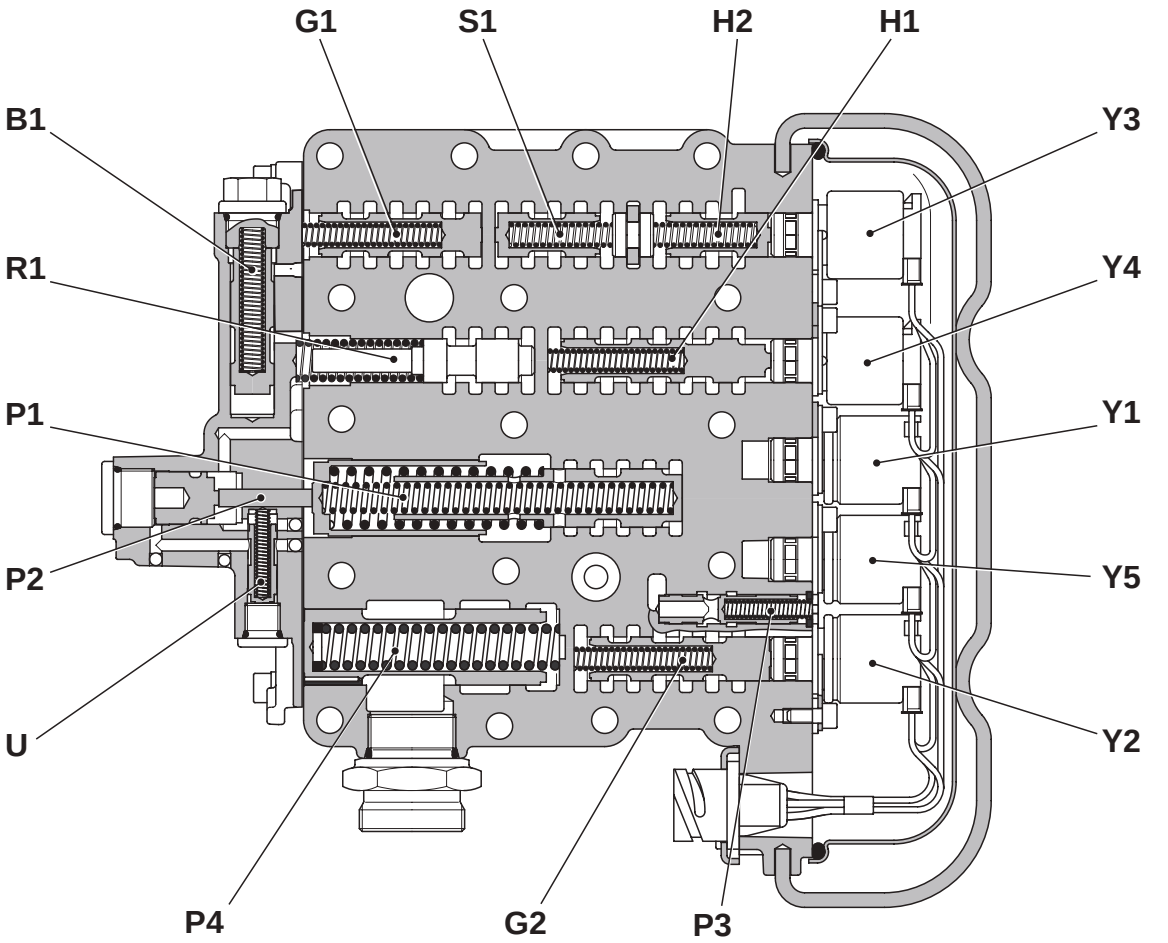
A. GEARBOX CONTROL VALVE

PRESSURE TEST POINTS



Pos.	Function	Thread size
a.	**A** or **F clutch pressure**	M10x1
b.	**B** or **G clutch pressure**	M10x1
c.	**Y3** or **Y4 solenoid valve pressure**	M10x1
d.	Pressure **Pg** to relief valve	M10x1
e.	Pressure **Pr** from relief valve (18 bar)	M10x1
f.	Engagement pressure of clutch **C** or **D**	M10x1
g.	General pressure (18 bar)	M10x1
h.	Engagement pressure of clutch **A/B** or **F/G**	M10x1
l.	Pilot pressure (10 bar)	M10x1
m.	D clutch pressure	M10x1
n.	C clutch pressure	M10x1
p.	Modulated pressure	M10x1

MAIN COMPONENTS

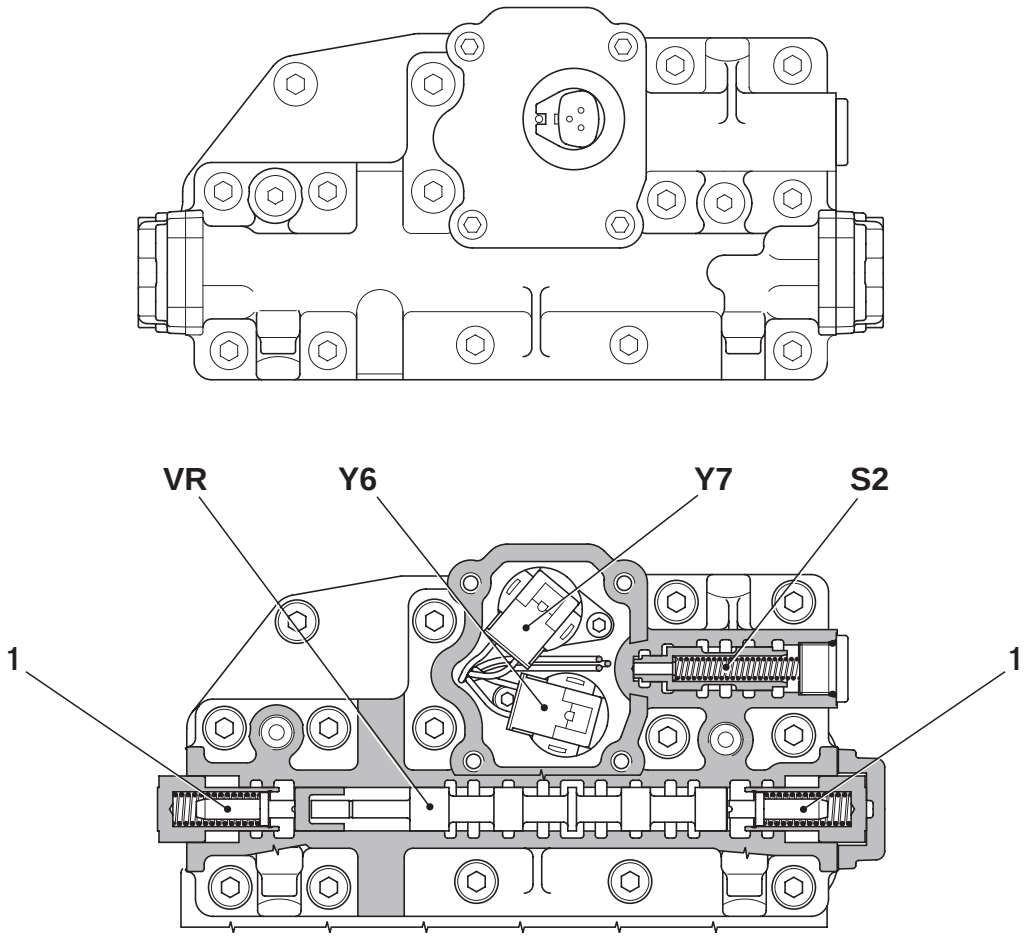


D0005320

B1 Breather valve
G1 Clutch selection valve for **A/B** or **F/G** clutches
S1 Relief valve
H2 Clutch engagement valve for **C/D** clutches
H1 Clutch engagement valve for **A/B** or **F/G** clutches
Y3 Pilot solenoid valve for engagement valve **H2**
Y4 Pilot solenoid valve for engagement valve **H1**
Y1 Pilot solenoid valve for clutch selection valve **G1**
Y5 Pilot solenoid valve for road/field selection valve
Y2 Pilot solenoid valve for **C** or **D** clutch selection valve **G2**
P3 Pilot pressure regulating valve
G2 Clutch selection valve for**C** or **D** clutches
P4 General pressure regulating valve
U Road/field operating mode selection valve
P1 Pressure modulating valve
P2 2-stage valve
R1 Null shift valve

B. SHUTTLE CONTROL VALVE

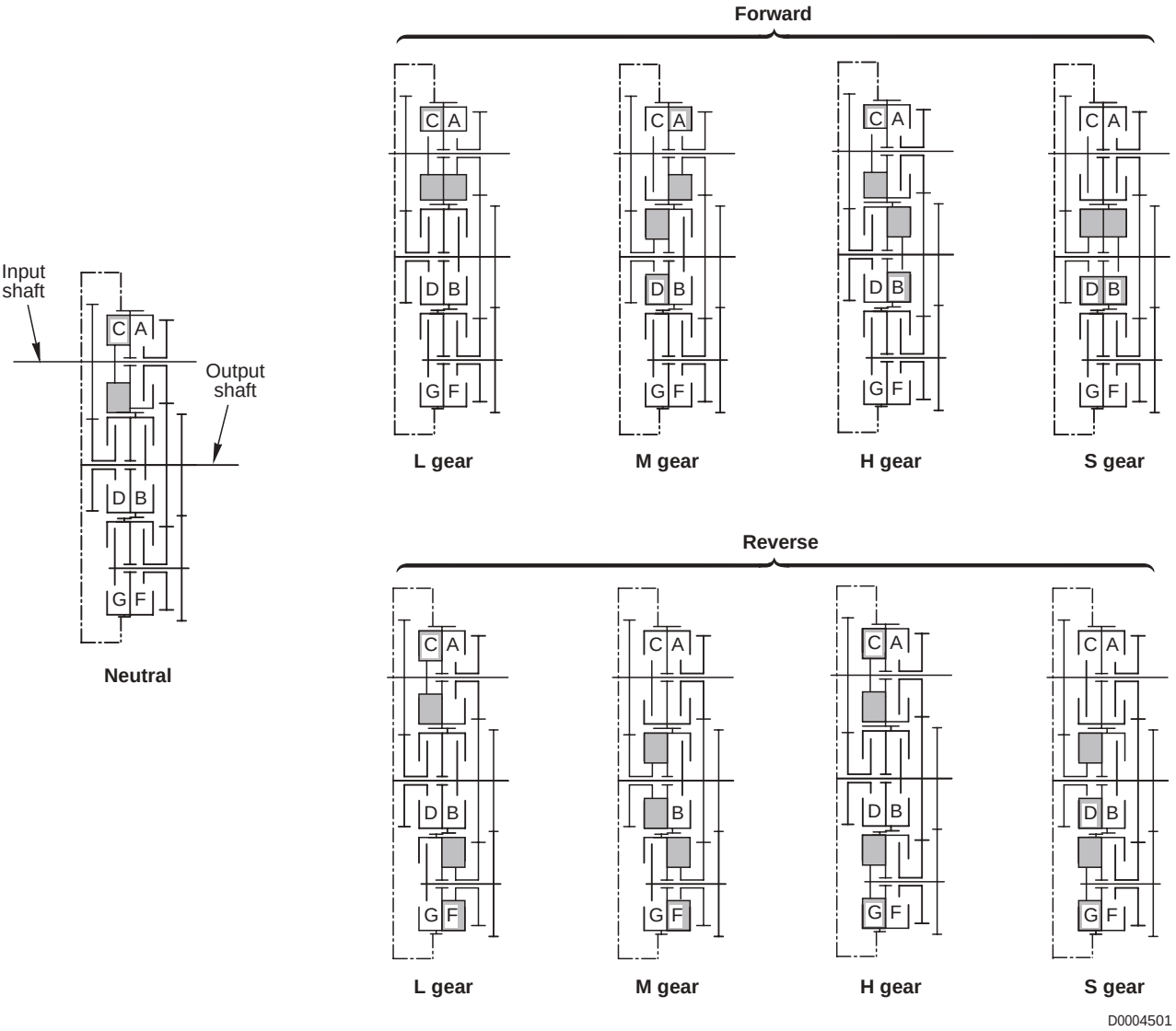
MAIN COMPONENTS



D0005330

Y6 Pilot solenoid valve for FORWARD gear
Y7 Pilot solenoid valve for REVERSE gear
VR FORWARD/REVERSE control spool valve
S2 Relief valve
1 Neutral return device

1.2.6 CLUTCH ENGAGEMENT AND SOLENOID VALVE OPERATION SCHEMATIC



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

Solenoid valve	Forward				Reverse			
	L	M	H	S	L	M	H	S
Y6	●	●	●	●				
Y7					●	●	●	●
Y1	●	●			●	●		
Y2		●		●		●		●
Y3		❍	❍	❍		❍	❍	❍
Y4			❍				❍	

● = Solenoid valve energised

❍ = Solenoid valve briefly energised during gear change

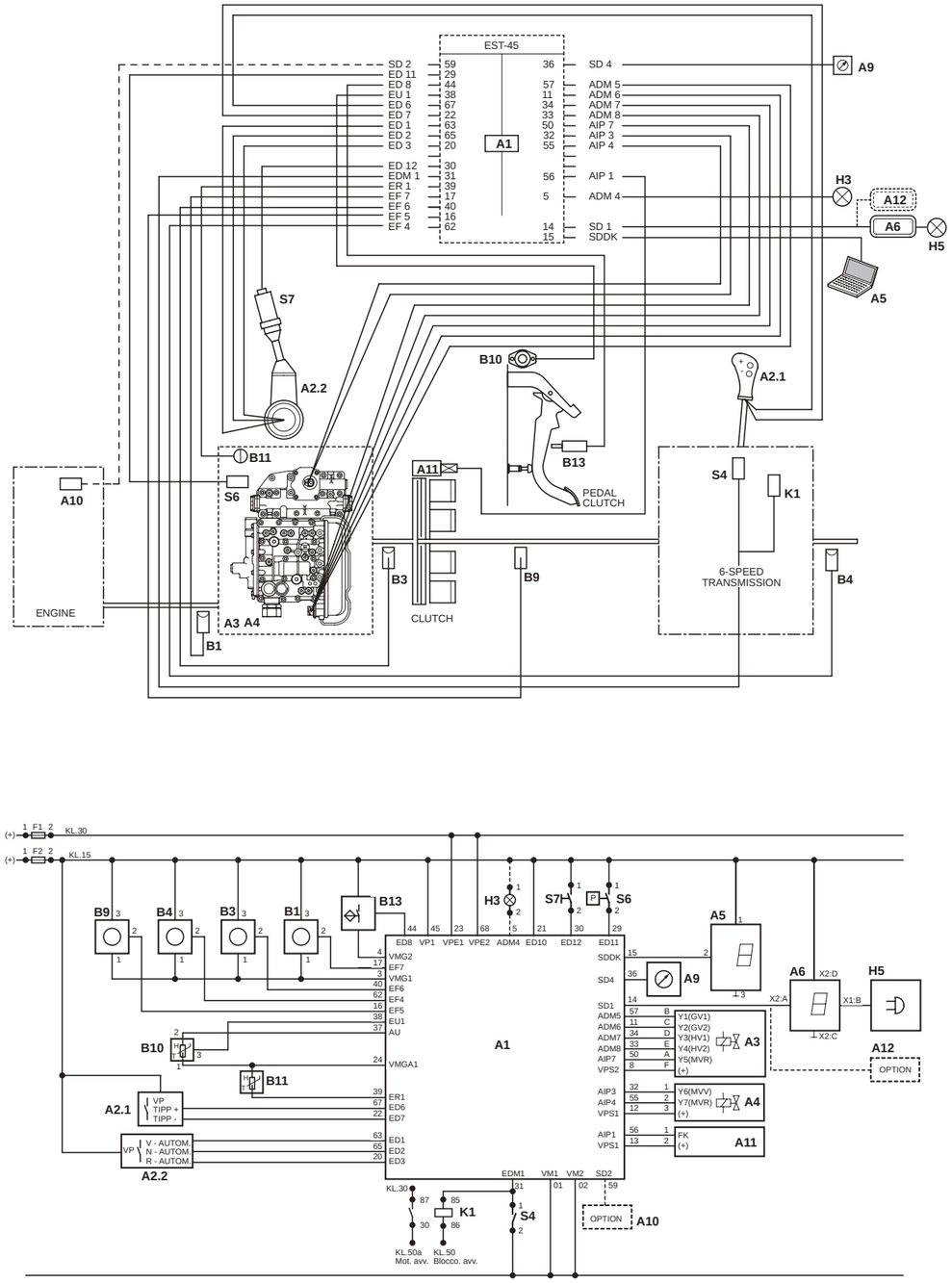
Solenoid valve operation when shifting from S to L gear (S→H→M→L)

Solenoid valve	Forward				Reverse			
	S	H	M	L	S	H	M	L
Y6	●	●	●	●				
Y7					●	●	●	●
Y1			●	●			●	●
Y2	●		●				●	
Y3		❍	❍	❍		❍	❍	❍
Y4			❍				❍	

● = Solenoid valve energised

❍ = Solenoid valve briefly energised during gear change

1.2.7 TRANSMISSION ELECTRONIC SYSTEM SCHEMATIC



D0005221

COMPONENTS

A1 Electronic transmission control unit(EST45)

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

A10 Engine load sensor

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 (8A)

F2 Fuse (8A)

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)

S7 Interlock button

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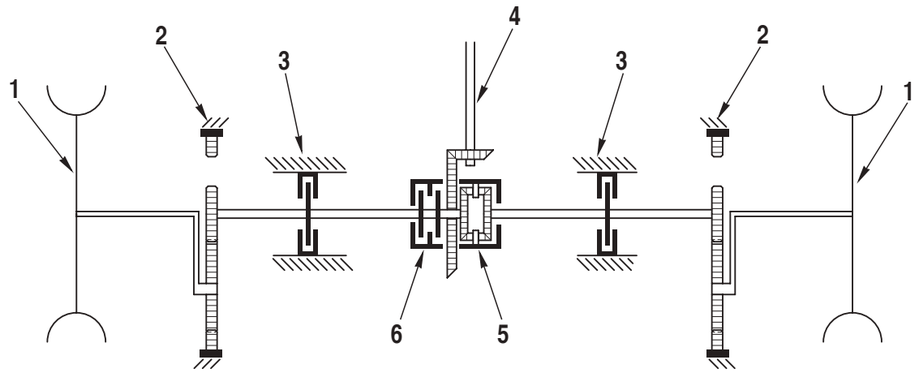
1.3 REAR AXLE

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).

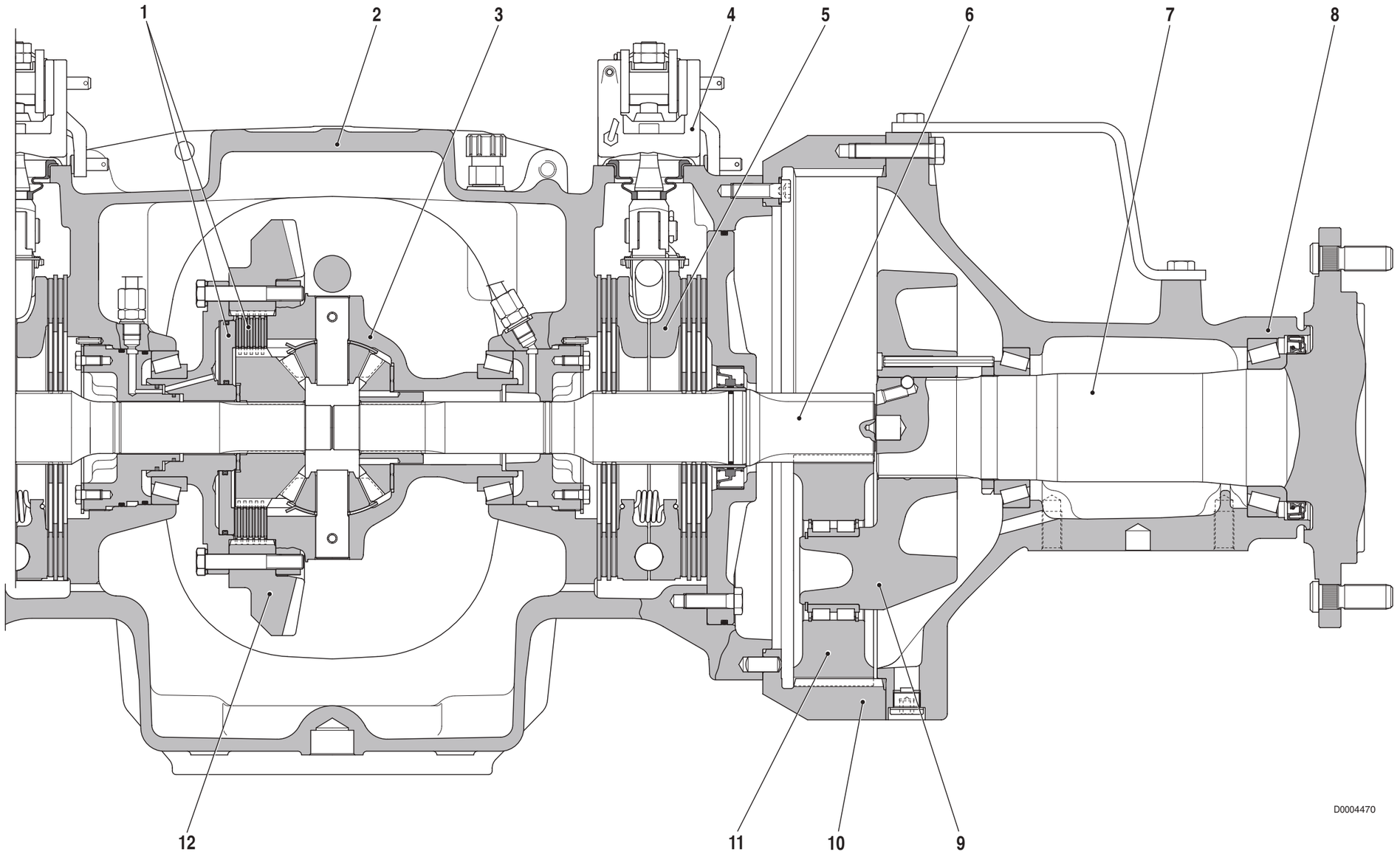


D0004450

COMPONENTS

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

COMPONENTS

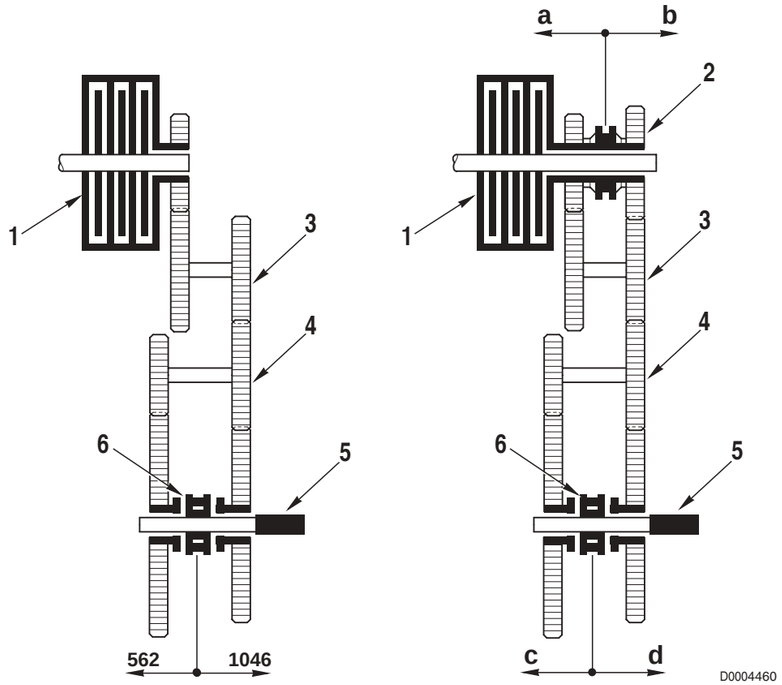


1. Differential lock
2. Central axle housing
3. Differential
4. Brake control device
5. Brake
6. Half-shaft
7. Hub
8. Axle casing
9. Planet carrier
10. Ring gear
11. Planet pinion
12. Crown wheel

1.4 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 .



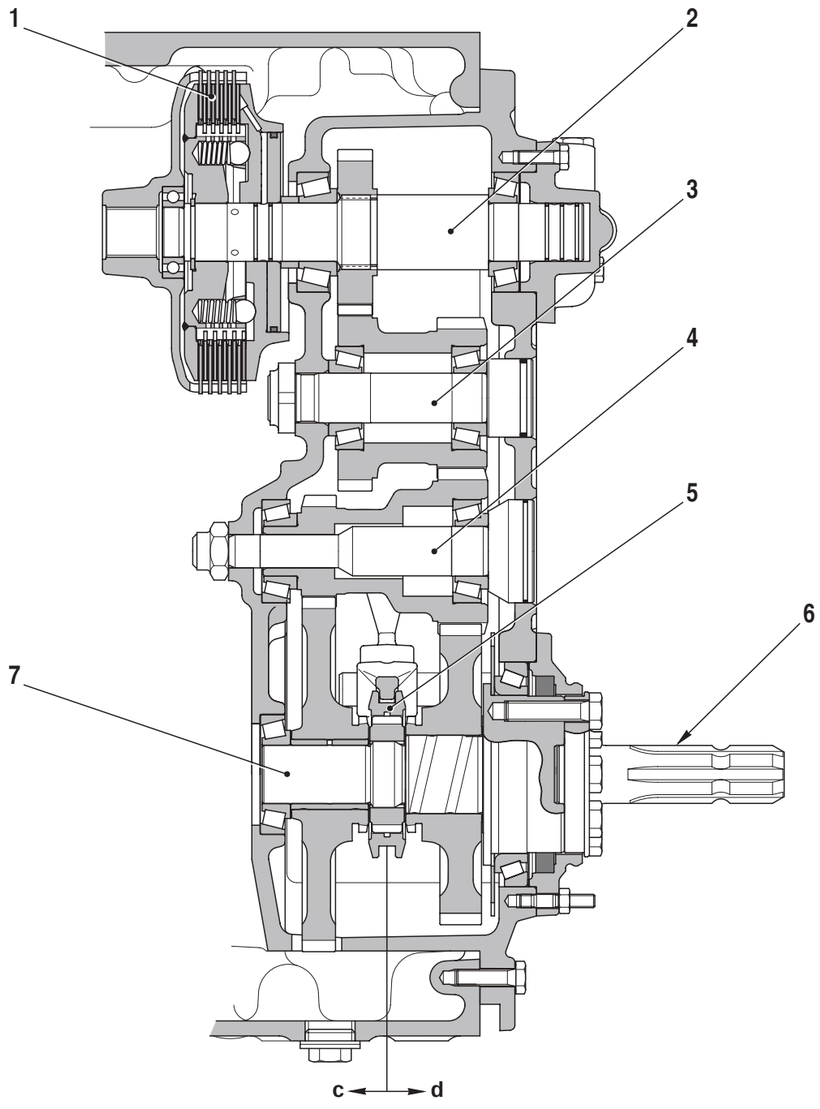
1. Clutch
2. Synchronizer 1
3. Intermediate shaft
4. Intermediate shaft
5. PTO shaft
6. Synchronizer 2

Speed of PTO output shaft - 4-speed version

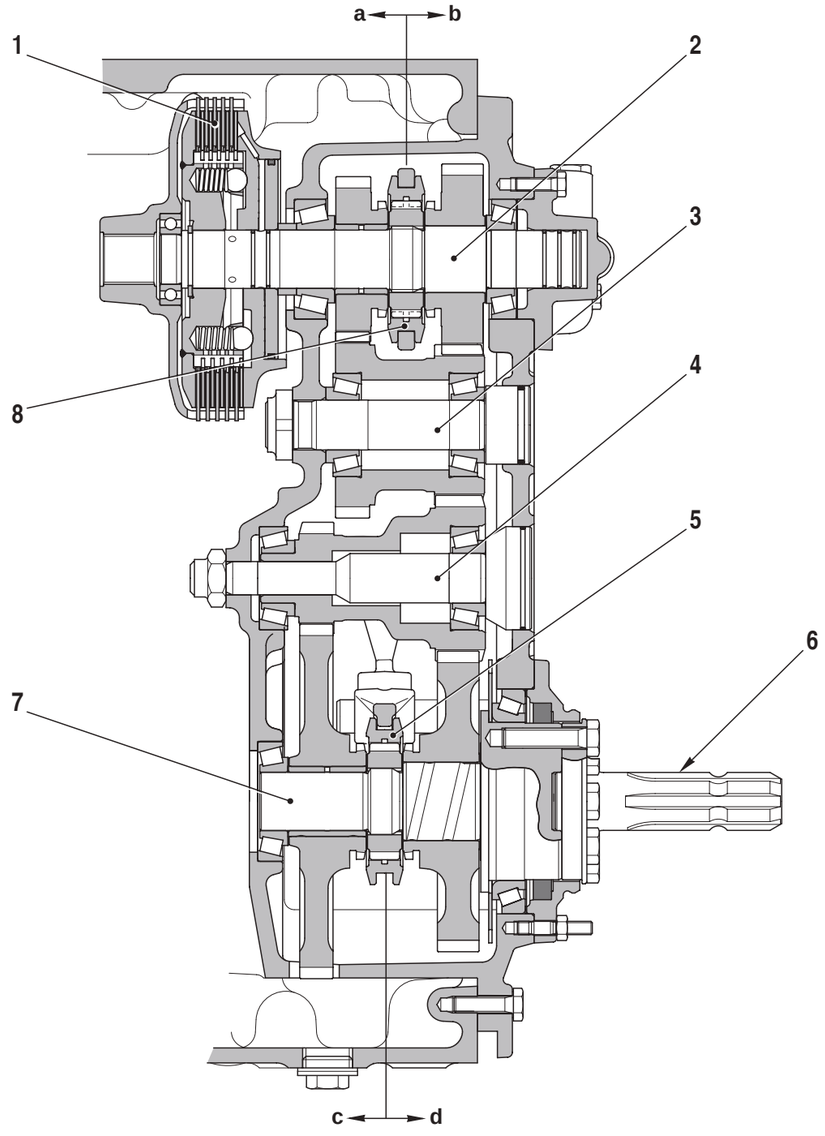
Synchronizer 1	Synchronizer 2	
	c	d
a	562	1046
b	772	1437

COMPONENTS

2 SPEED VERSION



4 SPEED VERSION



D0005340

1. PTO engagement clutch
2. PTO input shaft
3. Intermediate shaft
4. Intermediate shaft
5. Synchronizer (speeds a/b)
6. PTO end shaft
7 PTO output shaft
8. Synchronizer (speeds c/d)