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60-90 90-90
70-90 100-90

WORKSHOP MANUAL

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S E R V I Z I T E C N I C I D I A S S I S T E N Z A

FOREWORD

- *The manual is divided into separately numbered sections.*
- *Two-digit sections (with 2nd digit = 0) contain:*
 - *tractor specification (00);*
 - *tractor sub-assembly specification and data (10 - Engine, 20 - Power Train, etc.).*
- *Two-digit sections (with 2nd digit = 1 ts 9) deal with the overhaul of the sub-assemblies whose data are listed in the above sections. The first digit is the same as that of the associated data sections. (e.g. 20 - Power Train; 22 - Clutch; 23 - Transmission, splitter etc.).*
- *A contents list is provided to facilitate retrieval of desired information.*
- *Each sheet carries the print number of the manual and the date of issue in the bottom right-hand corner of the front page.*
- *Revised sheets will carry the same print number followed by a 2-digit number (e.g. first revision 603.54.241.01; second revision 603.54.241.02 etc.) and date of issue.*

Revised sheets will be accompanied by the updated contents sheet.
- *All information herein is correct at the time of printing but is subject to alteration without prior notice. In case of discrepancies contact the nearest dealer, distributor or branch.*

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GENERAL: General Instructions

SHIMS

When adjusting, measure each shim with a micrometer gauge and add the values obtained. Do not rely on overall shim thickness or the nominal value indicated for each shim.

ROTARY SHAFT SEALS

To fit rotary shaft seals proceed as follows:

- Prior to fitting, soak the seals for at least half an hour in the fluid to be retained.
- Carefully clean the shaft and ensure that the contact surface is free from damage.
- Turn the end of the sealing lip towards the fluid. If of the thrower lip type, turn the grooves so that during shaft rotation the fluid tends to be thrown back.
- Smear the sealing lip with a very thin coat of lubricant (oil is better than grease) and pack the space between sealing lip and dust shield with grease. (applicable to double-lip seals).
- Fit the seals into their housing using a flat-ended tool or ram. Under no circumstances fit with a mallet or hammer.
- Avoid entry of the seal into the recess in a tilted position. Exert a firm and uniform pressure squarely on it and ensure that the seal is pressed fully home.
- To prevent sealing lip damage during fitting, use some sort of protection before sliding over the shaft.

O-RINGS

Lubricate each ring prior to fitting and, on reassembly, slide over the part but do not twist, otherwise leakage will result.

SEALING COMPOUNDS

On the mating surfaces indicated with X apply one of the following sealing compounds: RTV SILMATE, RHODOR-SIL CAF 1 or LOCTITE PLASTIC GASKET.

Before applying the sealing compound, prepare the surfaces as follows:

- Using a wire brush, remove any deposits.
- Thoroughly degrease using one of the following detergents: Solvent, kerosene or hot water/soda solution.

BEARINGS

To fit bearings:

- Before installing on shafts, heat to 80° C to 90° C.
- Cool before pressing them into their seats.

ROLL PINS

When fitting straight roll pins ensure that they face in direction of work to stress the pin. Coil roll pins can be installed in any position.

SPARE PARTS

Use exclusively **FIATAGRI spare parts**, bearing the trade mark indicated below.



These are the only spares that ensure the quality, durability and safety of original parts as they are the same as those fitted in production.

Only **FIATAGRI spare parts** can offer this guarantee.

When ordering spare parts please state:

- tractor model (marketing code) and frame number;
- engine type and number;
- part number (given on "Microfiches" or Spare Parts Catalogue).

SERVICE TOOLS

The service tools indicated in this manual are:

- designed specifically for tractors of the FIAT range;
- essential for reliable repair work;
- manufactured and tested to offer efficient and durable service.

Mechanics are also reminded that being equipped means:

- operating in optimum working conditions;
- obtaining the best results;
- saving time and energy;
- working in more safety.

NOTICE

Wear limits recommended for some parts are not binding, being given for guidance only. "Front", "rear", "right" and "left" references are with operator facing direction of forward travel.

GENERAL: Safety Precautions

WARNING



This symbol is your safety alert sign.
It means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



AVOID ACCIDENTS

Most accidents occurring in the workshop are caused by the failure of some individual to follow simple and fundamental safety rules or precautions. For this reason **MOST ACCIDENTS CAN BE PREVENTED** by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and production of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many thousand serious injuries each year.

That rule is:

ATTENTION: Never attempt to clean, oil or adjust a machine while it is in motion.

SAFETY PRECAUTIONS

GENERAL

- Study the Operator's Manual before starting, operating, maintaining, fuelling or servicing machine.
- Do not wear rings, wrist watches, jewelry or loose or hanging apparel, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as authorized for the job. Examples: Hard hats, safety shoes, heavy gloves, ear protectors, safety glasses or goggles.
- Machine should not be serviced with anyone in the operator's seat unless they are qualified to operate the machine and are assisting in the service.
- Never attempt to operate the machine or its tools from any other position than seated in the operator's seat.
- Never lubricate, service or adjust a machine with the engine running, except as called for in the Operator's Manuals.
- Shut off engine and check that hydraulic oil is no longer under pressure before removing caps and covers.
- Carry out all servicing operations with maximum care and attention.
- Shop or field service platforms and ladders used to maintain or service machinery should be constructed and maintained according to local or national requirements.
- Disconnect batteries and label all controls to indicate operation in progress. Restrain machine and any equipment to be lifted.
- Never check or fill fuel tanks, storage batteries or use starter fluid while smoking or near open flames, due to the presence of flammable fluid.
- Brakes are inoperative when manually released for servicing. Provision must be made to maintain control of the machine by blocking or other means.
- Ensure that the fuel gun is in contact with the filler when refuelling. To reduce the chance of a static electricity sparking maintain contact until after fuel flow is cut off.
- Use only designated towing or pulling attachment points. Use care in making attachment. Be sure pins and locks as provided are secure before pulling. Stay clear of drawbars, cables or chains under load.
- To move a disabled machine, use a trailer or low body truck if available.
- Load and unload on level ground affording full support to the trailer wheels.
- Anchor tractor to truck or trailer loading platform and block wheels as requested by carrier.
- Use only grounded auxiliary power source for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shock.

- Lift and handle all heavy parts with a lifting device of proper capacity.
- Watch out for people in the vicinity.
- Never place gasoline or diesel fuel in an open pan.
- Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flammable non-toxic solvents.
- When cleaning parts with compressed air use safety glasses with side shields or goggles.
- Limit the pressure to 2.1 bar (30 psi) according to local or national requirements.
- Do not run engine in a closed building without adequate ventilation.
- Do not smoke or permit any open flame or spark near when refuelling or handling highly flammable materials.
- Do not use an open flame as a light source to look for leaks or for inspection anywhere on the tractor.
- Move carefully when under, in or near machine or implements. Wear required protective equipment, such as hard hat, safety glasses, safety shoes, ear protectors.
- When making equipment checks that require engine running, an operator should be in the operator's seat at all times with the mechanic in sight.
- For field service, move machine to level ground if possible and block machine. If work is absolutely necessary on a gradient, block machine and its attachments securely. Move the machine to level ground as soon as possible.
- Guard against kinking chains or cables. Do not lift or pull through a kinked chain or cable. Always wear heavy gloves when handling chain or cable.
- Be sure cables are anchored and the anchor point is strong enough to handle the expected load. Keep exposed personnel clear of anchor point and cable or chain.
- Keep maintenance area CLEAN and DRY. Remove water or oil puddles immediately.
- Do not pile oily, greasy rags - they are a fire hazard. Store in a closed metal container. Before starting machine or moving attachment check and adjust and lock operator's seat. Be sure all personnel in the area are clear before starting or moving machine and any of its attachments.
- Do not carry loose objects in pockets that might fall unnoticed into open compartments.
- Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves where metal or other particles are apt to fly or fall.
- Wear welders's protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes when welding. Dark safety glasses must be worn by anyone standing by when welding is in progress. **DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.**
- Wire rope develops steel slivers. Use authorized protective equipment such as heavy gloves and safety glasses when handling.
- Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.

START UP

- Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.
- Do not place head, body, limbs, feet, fingers or hands near a rotating fan or belts. Be especially alert around a pusher fan.

ENGINE

- Turn radiator cap slowly to relieve pressure before removing. Add coolant only with engine stopped or idling if hot.
- Do not run engine when refuelling and use care if engine is hot due to the increased possibility of fire if fuel is spilled.
- Never attempt to check or adjust fan belts when engine is running. Do not adjust engine fuel pump when the machine is in motion.
- Never lubricate a machine with the engine running.

GENERAL Safety Precautions

ELECTRICAL

- When auxiliary batteries are used, connect both cable ends to the terminals as specified: (+) with (+) and (-) with (-). Do not short circuit terminals. **BATTERY GAS IS HIGHLY INFLAMMABLE.** Leave battery box open to improve ventilation when charging batteries. Never check charge by placing metal objects across the posts. Keep sparks or open flame away from batteries. Do not smoke near battery to guard against the possibility of accidental explosion.
- Check for fuel or battery electrolyte leaks before starting service or maintenance work. Eliminate leaks before proceeding.
- Do not charge batteries in a closed area. Provide proper ventilation to guard against an accidental explosion from an accumulation of explosive gases given off in the charging process.
- Disconnect batteries before working on electrical system, or starting repair work of any kind.

HYDRAULIC

- Fluid escaping under pressure from a very small hole can almost be invisible and can have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected pressure leaks. **DO NOT USE HANDS.** If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.
- When making pressure checks use the correct gauge for expected pressure.

WHEELS AND TYRES

- Be sure tyres are properly inflated to the manufacturer's specified pressure. Inspect for damage periodically.
- Stand to one side when changing inflation of tyres.
- Check tyres only when the machine is empty and tyres are cool to avoid overinflation. Do not use re-worked wheel parts. Improper welding, heating or brazing weakens them and can cause failure.
- Never cut or weld on the rim of an inflated tyre.
- When servicing tyres block the machine in front and back of all wheels. After jacking up, place blocking under machine to protect from falling according to local or national requirements.
- Deflate tyres before removing objects from the tread.
- Never inflate tyres with flammable gases. Explosion and personal injury could result.

ATTACHMENTS

- Lift and handle all heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch out for people in the vicinity.
- Handle all parts with extreme care. Keep hands and fingers from between parts. Wear authorized protective equipment such as safety glasses, heavy gloves, safety shoes.
- Guard against kinking chains or cables. Always wear heavy gloves when handling chain or cable.

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SPECIFICATION

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IDENTIFICATION DATA

Marketing code:

- 2-wheel drive
- 4-wheel drive

Engineering code:

- 12-speed, 2-wheel drive
- 15-speed, 2-wheel drive
- 20-speed, 2-wheel drive
- 12-speed, 2-wheel drive
with reverser
- 12-speed, 4-wheel drive
- 15-speed, 4-wheel drive
- 20-speed, 4-wheel drive
- 12-speed, 4-wheel drive
with reverser

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	669.200.000	670.200.000	671.200.00	672.200.00	—	—
	—	—	—	—	656.300.000	657.200.000
	669.200.000 variant 700.111.530	670.200.000 variant 700.111.530	671.200.000 variant 700.111.530	672.200.000 variant 700.111.530	656.300.000 variant 700.111.560	657.200.000 variant 700.111.560
	669.200.000 variant 700.111.100	670.200.000 variant 700.110.100	671.200.000 variant 700.110.100	672.200.000 variant 700.110.100	—	—
	669.227.000	670.227.000	671.227.000	672.227.000	—	—
	—	—	—	—	656.327.000	657.227.000
	669.227.000 variant 700.111.530	670.227.000 variant 700.111.530	671.227.000 variant 700.111.530	672.227.000 variant 700.111.530	656.327.000 variant 700.111.560	657.227.000 variant 700.111.560
	669.227.000 variant 700.110.100	670.227.000 variant 700.110.100	671.227.000 variant 700.110.100	672.227.000 variant 700.110.100	—	—



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SPECIFICATION

		55-90 55-90 DT	60-90 60-90 DT	70-90 70-90 DT	80-90 80-90 DT	90-90 90-90 DT	100-90 100-90 DT
Engine type (all versions)	{	FIAT	FIAT	FIAT	FIAT	FIAT	FIAT
		8035.06.300 (C.A.V. pump)	8035.05.300 (C.A.V. pump)	8045.06.300 (C.A.V. pump)	8045.05.305 (C.A.V. pump)	—	8065.06.300 (C.A.V. pump)
		8035.06.200 (BOSCH pump)	8035.05.200 (BOSCH pump)	8045.06.200 (BOSCH pump)	8045.05.205 (BOSCH pump)	8055.05.200 (BOSCH pump)	8065.06.200 (BOSCH pump)
WEIGHTS							
Operating weight (including lift, implement attachment, tow hook, swinging drawbar and comfort cab:							
- 2-wheel drive	kg.	2780	2810	3040	3100	3560 (o)	4065 (o)
	l.	6130	6196	6703	6835	7850 (o)	8963 (o)
- 4-wheel drive	kg.	2980	3020	3330	3420	3880 (o)	4415 (o)
	lb.	6571	6659	7343	7541	8555 (o)	9735 (o)

(o) Weight with supercomfort cab.

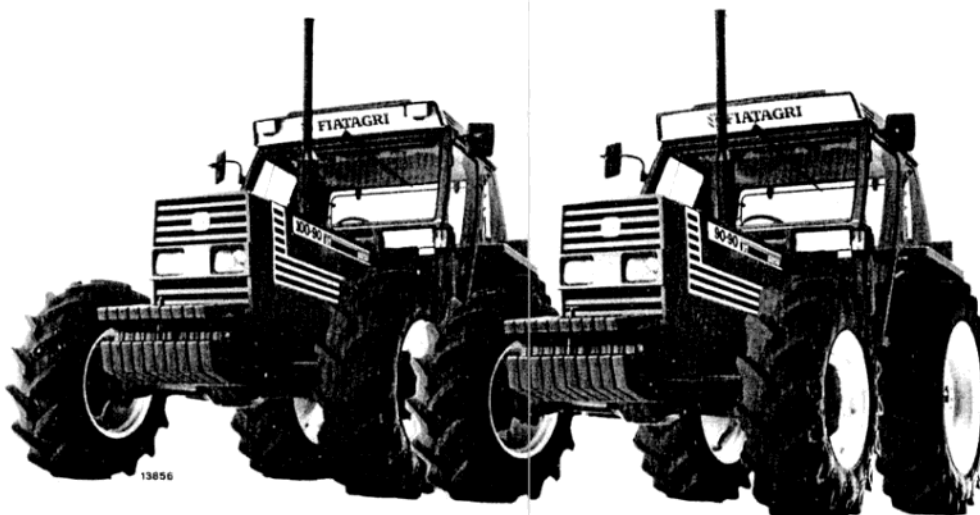


55-90 60-90
70-90 80-90
90-90 100-90

SPECIFICATION

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page 3



Fiat Trattori

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SPECIFICATION**ENGINE**

Type

4-stroke diesel, naturally aspirated

Injection

Direct

Number of cylinders

3 | 4 | 5 | 6

Sleeves

Dry, pressed in engine block

Bore and stroke

100x115 mm. (3.94x4.53 in) | 104x115 mm. (4.09x4.53 in) | 100x115 mm. (3.94x4.53 in) | 104x115 mm. (4.09x4.53 in) | 104x115 mm. (4.09x4.53 in) | 100x115 mm. (3.94x4.53 in)

Displacement

2710 cm³ | 2931 cm³ | 3613 cm³ | 3908 cm³ | 4885 cm³ | 5419 cm³

Compression ratio

17:1

Max. horsepower
DGM/DIN

40,5 kW (55 Hp) | 44 kW (60 Hp) | 51,5 kW (70 Hp) | 58,9 kW (80 Hp) | 66,2 kW (90 Hp) | 73,6 kW (100 Hp)

Max. output speed

2500 rpm | 2500 rpm | 2500 rpm | 2500 rpm | 2500 rpm | 2500 rpm

Max. torque speed

1500 rpm | 1500 rpm | 1500 rpm | 1500 rpm | 1500 rpm | 1500 rpm

Main bearings

4 | 5 | 6 | 7

Oil pan

Iron

Balancer

— | Flyweight, engine oil pan | —

Valve Gear

OH valves, push rod operated

Inlet { Opens: BTDC
Closes: ABDC3°
23°Exhaust { Opens: BBDC
Closes: ATDC48°30'
6°Valve clearanc
— for timing check

0.45 mm (0.018 in)

— Normal
- Inlet
- Exhaust0.25 mm (0.010 in)
0.35 mm (0.014 in)**Fuel System**
Air cleaner

Oil bath or dry, automatic drain centrifugal precleaner

Fuel filters
(on feed pump delivery)

Two, in line

replaceable paper cartridge, water
separator integral
with first filterIntegral cartridge
both with water
separator.

Feed pump

Double diaphragm

— Operation

Cam

Injection pump

Distributor

	55-90 55-90 DT	60-90 60-90 DT	70-90 70-90 DT	80-90 80-90 DT	90-90 90-90 DT	100-90 100-90 DT	
Injection pump	Distributor						
— Type	BOSCH C.A.V.	VE 3/11 F 1250 L 163-1- 4794587- 4800682 DPS 8522A 010A- 4797414	VE 3/11 F 1250 L 163 - 4794586 DPS 8522A 000A- 4797413	VE 4/11 F 1250 L 164-1- 4794589 DPS 8520A 100A- 4797416	VE 4 /11 F 1250 L 164- 4794588 DPS 8520A 090A- 4797415	VE 5/11 F 1250 R 165 - 4794590 —	VE 6/11 F 1250 R 181 - 4798834 —
— Integral all-speed governor	BOSCH C.A.V.	Centrifugal					
— Integral advance device	BOSCH C.A.V.	Hydraulic					
— Pump timing, BTDC	BOSCH C.A.V.	6° ± 1° 0° ± 1°	6° ± 1° 0° ± 1°	4° ± 1° 0° ± 1°	4° ± 1° 0° ± 1°	6° ± 1° —	4° ± 1° —
Injectors	4-orifice	3-orifice	4-orifice	3-orifice	3-orifice	4-orifice	
— Type	See page 10, Section 10						
— Release pressure	230 to 238 bar (235 to 243 kg/cm², 3336 to 3452 psi)						
Firing order	1-2-3		1-3-4-2		1-2-4-5-3	1-5-3-6-2-4	
Lubrication System	Forced feed, gear pump						
Pump drive	Crankshaft						
Oil filters	Strainer on pump inlet Full flow cartridge on outlet				two full flow cartridges on outlet		
Relief valve	In pump body						
— Oil pressure at governed speed	2.9 to 3.9 bar (3 to 4 kg/cm², 42.6 to 56.9 psi)						
Cooling System	Water, centrifugal pump						
Radiator	3 or 4 deep core vertical tube						
Expansion tank	Translucent plastic						
Fan, water pump pulley mounted	Suction, steel						
Temperature control	Wax thermostat						

SPECIFICATION**Tractor Meter**

— Drive

Hourmeter activation speed

Meter drive ratio

55-90 55-90 DT	60-90 60-90 DT	70-90 70-90 DT	80-90 80-90 DT	90-90 90-90 DT	100-90 100-90 DT
On instrument panel					
Oil pump gear			Camshaft pinion		
1800 rpm					
1 to 2					

POWER TRAIN**Clutch (55-90, 60-90, 70-90 and 80-90)**

Type LUK, O.M.G. or VALEO 11"

Construction Twin, dry single plate

Control

— Transmission Pedal

— PTO Manual lever

Plate material:

— Transmission:

● 55-90, 60-90 and 70-90 (standard) . Organic

● 80-90 (standard) and 55-90, 60-90 and 70-90 (optional) . . Cerametallic compound

— PTO Organic

Clutch (90-90 and 100-90)

Type VALEO or LUK 12"

Construction Twin, dry single plate

Control

— Transmission Pedal

— PTO Manual lever

Plate material:

— Transmission Cerametallic compound

— PTO Organic

Transmission (55-90, 60-90, 70-90 and 80-90)

Type Constant mesh full synchro-mesh

Gear Helical

Splitter Pinion drive, 3 forward and 1 reverse range for 12 forward and 4 reverse speeds

Creeper 20 forward and 8 reverse speeds

Reverser Mechanical, 12 forward, 12 reverse speeds

(Tractors cannot be equipped with both creeper and reverser, as they are installed in the same position between clutch and transmission).

Transmission and splitter control Separate levers to right of operator

Creeper or reverser control Lever to left of operator

Transmission (90-90 and 100-90)

Type Constant mesh, full-synchro-mesh (reverse included), 5 forward and 1 reverse ratio

Gear Helical

Splitter Planetary, downstream of transmission, 3 ranges for 15 forward and 3 reverse speeds.

Creeper In line with splitter, 20 forward and 4 reverse speeds.

Transmission and splitter control Separate levers to right of operator

Creeper control Lever (same as splitter)

Bevel drive On differential**Differential** Two pinion

Differential lock Pedal controlled, self-maintaining, with hydraulic safety release actuated by brake pedals.

Final drives Planetary, three pinion**BRAKES****Service**

Type Disc, oil-bath, axle shaft mounted

Operation Hydrostatic, divided circuit

Control Separate latched pedals.

55-90 60-90
70-90 80-90
90-90 100-90

SPECIFICATION

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page 7

Parking and emergency (55-90, 60-90, 70-90 and 80-90)

Triple oil-bath discs, fully independent, acting on bevel pinion shaft through gear, hand lever operated.

Parking and emergency (90-90 and 100-90)

Twin oil-bath discs, fully independent, fitted directly on bevel pinion shaft, hand lever operated.

STEERING

Independent circuit hydrostatic steering with anti-shock valves and flow proportioning pump.

Linkage joints Sealed for life

Turning radius (no brakes):

- 55-90 and 60-90 3900 mm (11 ft 3 in)
- 55-90 DT, front wheel drive out 5100 mm (16 ft 9 in)
- 60-90 DT, front wheel drive out 5200 mm (17 ft)
- 70-90 and 80-90 4100 mm (13 ft 5 in)
- 70-90 DT and 80-90 DT, front wheel drive out 5300 mm (17 ft 4 in)
- 90-90 and 100-90 5000 mm (16 ft 5 in)
- 90-90 DT and 100-90 DT, front wheel drive out 5700 mm (18 ft 8 in)

FRONT AXLE (55-90, 60-90, 70-90, 80-90, 90-90 and 100-90).

Type	Inverted U, telescoping, center pivoting
Track adjustment	Sliding axle ends
Track widths	6 off

FRONT WHEEL DRIVE (55-90 DT, 60-90 DT, 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT).

Type	Full floating, center pivoting, unjointed drive shaft and articulations on tractor centerline.
Differential	Two pinion, no spin unit optional
Final drives	Planetary
Track widths	Disc/Rim/Hub
Repositioning	5 off

REAR WHEELS

Track widths	Disc/Rim/Hub
Repositioning	
- 55-90, 60-90, 70-90 and 80-90	7 off
- 90-90 and 100-90	8 off

POWER TAKE-OFF

Type	Fully independent
540 rpm	55-90, 60-90, 70-90, 80-90 and 90-90
540-1000 rpm	100-90

Shaft	{ 540 rpm 1000 rpm 1³/₈" - 6 spline 1³/₈" - 6 spline
-------	---

Control	Hand lever operated single dry plate clutch
---------	---

Standard speed selection:

- Lever on PTO housing (55-90, 60-90, 70-90 and 80-90)
- Automatic upon changing splined ends (90-90 and 100-90)

Engine speed with PTO at standard speeds:

- 540 rpm:
 - 2198 rpm (55-90, 60-90, 70-90 and 80-90);
 - 2126 rpm (90-90 and 100-90);
- 1000 rpm:
 - 2380 rpm (55-90, 60-90, 70-90 and 80-90)
 - 2410 rpm (90-90 and 100-90)

Rotation	Clockwise (tractor viewed from rear).
----------	---------------------------------------

Ground speed PTO

Control	Same as independent
Rotation	PTO

Shaft drive ratio	
- 540 rpm	{ 55-90 and 60-90 70-90 and 80-90 90-90 and 100-90 8.2 revs per rear wheel turn 8.9 revs per rear wheel turn 17.3 revs per rear wheel turn
- 1000 rpm	{ 55-90 and 60-90 70-90 and 80-90 90-90 and 100-90 14.1 revs per rear wheel turn 15.2 revs per rear wheel turn 28.2 revs per rear wheel turn

LIFT

Type	Hydraulic, draught, position and combined draught/position control
Draught control	Lower links through oil-bath sensing bar
Control from operator's seat	Two independent levers
Control from ground	Outer lever
Variospeed sensitivity control	4-position lever on control valve
Response control	Knob on control valve
Pump	Gear, engine valve gear driven.

SPECIFICATION

Main cylinder	Single acting
Auxiliary outer cylinder	Standard for 100-90, optional for 90-90.
LIFT-O-MATIC push-button	Lower link raising and lowering with automatic return to selected working depth.
Hydraulic fluid	Rear transmission oil
Max. lift capacity and max. lift stroke	See section 50, page 4
Implement attachment	
— 55-90 and 60-90	Categories 1 and 2
— 70-90, 80-90, 90-90 and 100-90	Category 2
Side sway restrictors:	
— Check chains (55-90 and 60-90)	
— Check links (standard for 70-90, 80-90, 90-90 and 100-90, optional for 55-90 and 60-90)	

Remote control valves

Number	One, two or three
Type	— Convertible from single to double-acting — Double-acting, with float position

Trailer power braking remote control valve activated by tractor brake pedals (optional)

TOWING ATTACHMENTS**Rear**

Drilled crossmember
Swinging drawbar
Tow hook, adjustable for height
Support with semi-trailer hitch
Rockinger jaw hook, revolving on longitudinal axis and including automatic hitch pin coupler with lock
Lemoine hook

Front

Fixed pull hook

BALLASTING**Front axle**

Support	130 kg (286.6 lb)
Plates	
— Six, 40 kg (88.2 lb) each	370 kg (815.8 lb) total
— Ten, 40 Kg (88.2 lb) each	530 kg (1168.6 lb) total

Rear wheels**Rings**

— Four, 55 kg (121.3 lb) each	220 kg (485.1 lb) total
— Six, 55 kg (121.3 lb) each	330 kg (727.6 lb) total

Additional rear wheel ballasting	Cast iron discs for spiral guide rail type rims, 150 kg or 330.7 lb each for a total of 300 kg or 661.5 lb (standard for 100-90 and optional for 70-90, 80-90 and 90-90)
----------------------------------	--

BODY

Platform fully suspended, mounted on 4 or 6 rubber buffers. Integral structure including footboards, fenders and dashboard. Compact, rigid, vibration-free. Provision for ROP frame or cab installation. Fuel tank located behind operator's seat, boxed between fenders. Operator's seat de luxe, padded with tiltable arm rests. Parallelogram suspension, hydraulic dampers, manual adjustment for height and ride. Multi function instrument panel with check control plus control board.

Hood

Fully enclosed, in 4 sections.

LH panels	access to oil filters (2 off for 90-90 and 100-90), dipstick
RH panels	access to fuel filters, feed pump, injection pump, power steering fluid reservoir, lift filters

Cab

Comfort and Supercomfort cab versions available.

Both feature:

Visibility	all round
Accessibility	on both sides
Rear and side windows	adjustable
Safety hatch	in cab roof
Heating and ventilation	3-speed fan
Air conditioner	optional for Supercomfort cab
Protection	fully insulated against dust, cold, heat, etc.
Windshield washer and wiper	standard
Courtesy lights	standard

ELECTRICAL SYSTEM

Voltage 12 V

Alternator:

- 45 A, with integral electronic voltage regulator, MARELLI 4787598 (55-90, 60-90, 70-90 and 80-90)
- 65 A, with integral electronic voltage regulator, MARELLI 4787673 or BOSCH 4765725 (90-90 and 100-90).

Starter

- 55-90 and 60-90 { MARELLI MT 71AA
BOSCH JF→ 12 V
LUCAS M45 G 26390/D
- 70-90 and 80-90 { MARELLI MT 68AB
BOSCH JD→ 12 V
- 90-90 and 100-90 { MARELLI MT68LB
BOSCH JD→ 12 V

Lighting

Headlamps Twin, high and asymmetric low beams, 45/40 W

Front lights

- Parking 5 W
- Turn signal 21 W

Tail lights

- Parking 5 W
- Turn signal 21 W
- Stop 21 W
- License plate

Instruments and accessories

Instrument panel multi-function with check control (see section 60, page 20)

Control board (see section 60, page 19)

Floodlight 35 W

Rear power point DIN, 7-pole

Dash power point Single-pole, control board-mounted

Horn push

Cold starting thermostarter or start-pilot

Cigar lighter dash-mounted

Fuses up to 12 (see Section 60, page 20)

Hazard warning lights tractor and trailers

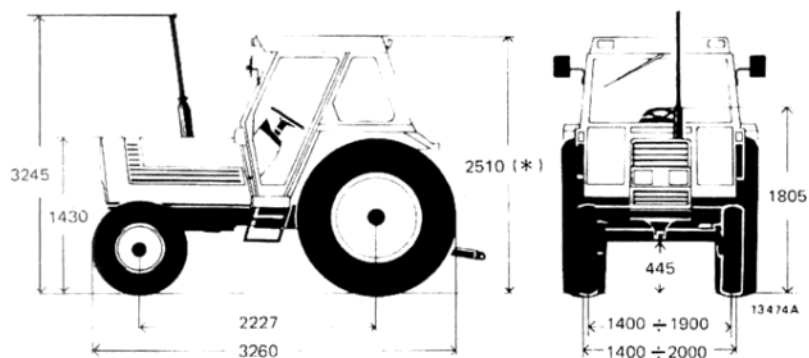
TYRE SIZES

	55-90	60-90	70-90	80-90
Front {	6.00-16 7.50-16	6.00-16 7.50-16	7.50-16 7.50-18 9.00-16	7.50-16 7.50-18 9.00-16
Rear {	14.9/13-30 14.9/13-28 12.4/11-36	16.9/14-28 14.9/13-30 16.9/14-30 12.4/11-36 13.6/12-36	16.9/14-30 18.4/15-30 16.9/14-34 13.6/12-38	18.4/15-30 16.9/14-34 13.6/12-38

	55-90DT	60-90DT	70-90DT	80-90DT
Front {	9.5/9-24 (1) 11.2/10-20 (2) 12.4R20 (1) 11.2/10-24 (3)	9.5/9-24 (1)(2) 12.4R20 (3)(4) 11.2/10-24 (5)(6)(7)	11.2/10-24 (1) 12.4/11-24 (3) 13.6/12-24 (4) 11.2/10-28 (2)	12.4/11-24 (1) 13.6/12.24 (2) 11.2/10-28 (3)
Rear {	14.9/13-28 (2) 14.9/13-30 (1) 12.4/11-36 (3)	16.9/14-28 (2)(4) 14.9/13-30 (1)(3) 16.9/14-30 (5) 12.4/11-36 (6) 13.6/12-36 (7)	16.9/14-30 (1) 18.4/15-30 (3) 16.9/14-34 (4) 13.6/12-38 (2)	18.4/15-30 (1) 16.9/14-34 (2) 13.6/12-38 (3)

	90-90	90-90DT	100-90	100-90DT
Front {	7.50-18 7.50-20 9.00-16 10.00-16	13.6/12-24 (1) 14.9/13-24 (2) 11.2/10-28 (3) 12.4/11-28 (4)	7.50-20 9.00-16 10.00-16	14.9/13-24 (1) 12.4/11-28 (2)
Rear {	16.9/14-34 18.4/15-34 13.6/12-38 16.9/14-38	16.9/14-34 (1) 18.4/15-34 (2) 13.6/12-38 (3) 16.9/14-38 (2)(4)	18.4/15-34 16.9/14-38	18.4/15-34 (1) 16.9/14-38 (1)(2)

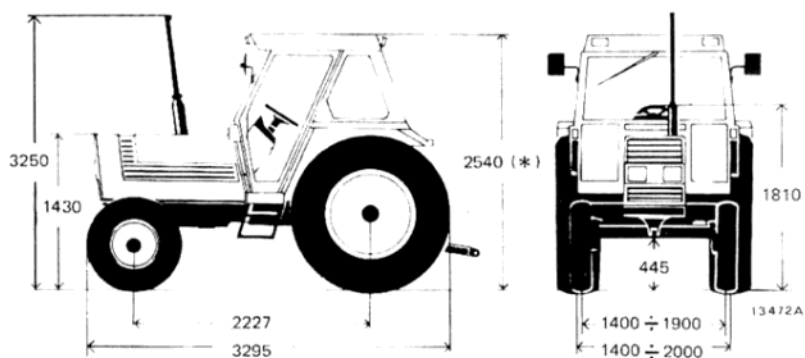
(1) (2) (3) (4) (5) (6) (7) Tyre matching references.

SPECIFICATION**DIMENSIONS (in mm)**

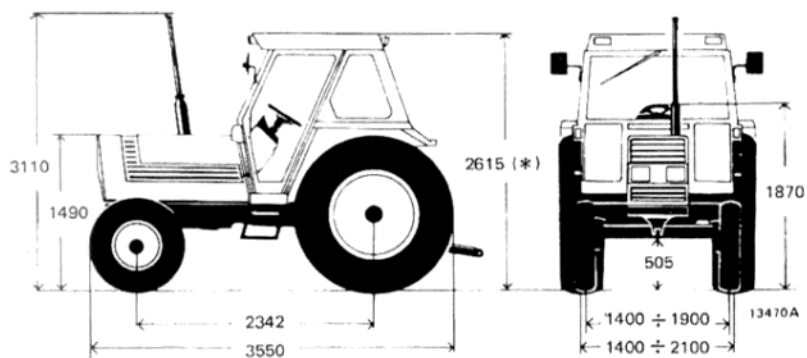
55-90
(6.00-16 front and 14.9/13-28 rear
tyres)

(*) 2495 with ROPS frame

60-90
(6.00-16 front and 16.9/14-28 rear
tyres)



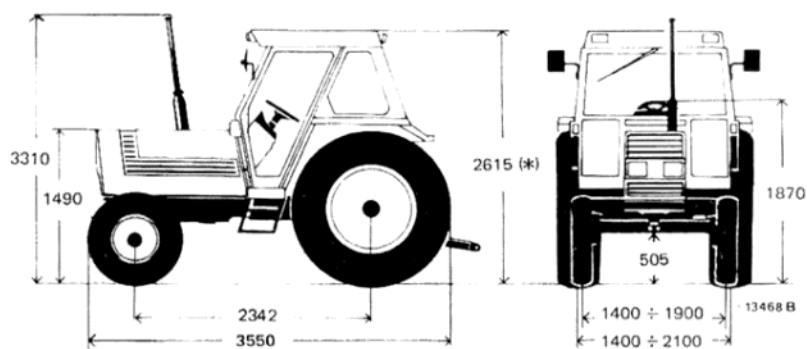
(*) 2525 with ROPS frame



70-90
(7.50-18 front and 13.6/12-38 rear
tyres)

(*) 2600 with ROPS frame

80-90
(7.50-18 front and 13.6/12-38 rear
tyres)



(*) 2600 with ROPS frame

55-90 60-90
70-90 80-90
90-90 100-90

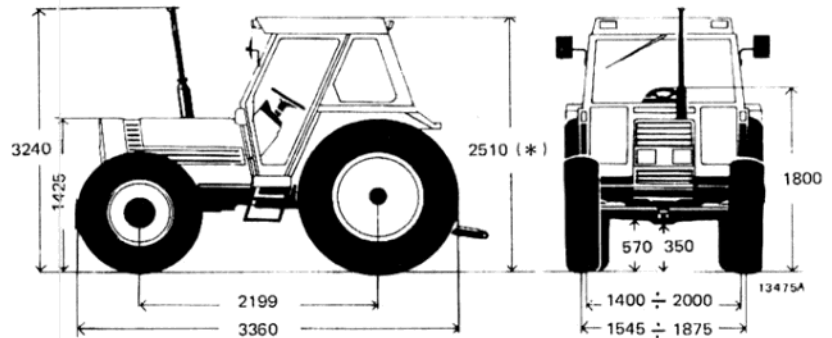
SPECIFICATION

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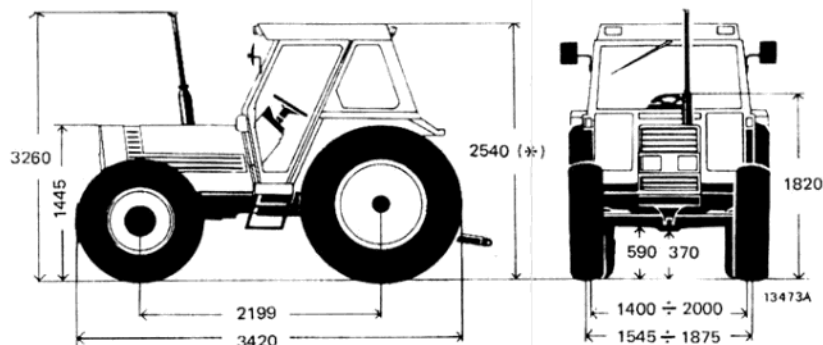
page 11

DIMENSIONS (in mm)

55-90DT
(11.2/10-20 front and 14.9/13-2 rear tyres)

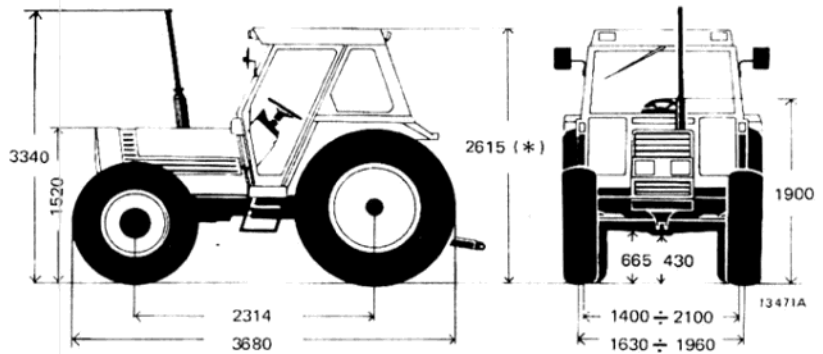


(*) 2495 with ROPS frame



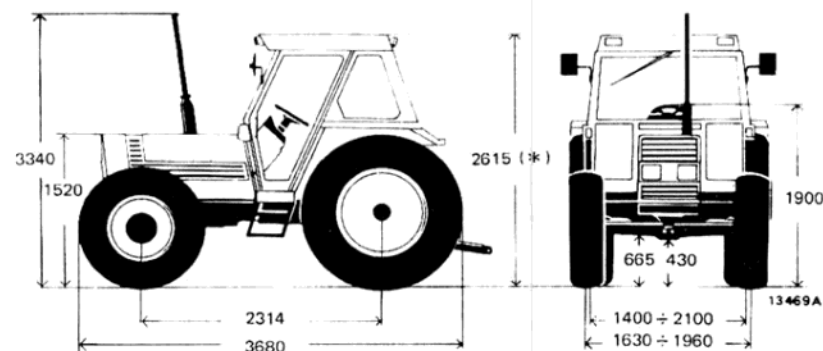
(*) 2525 with ROPS frame

60-90DT
(9.5/9-24 front and 16.9/14-28 rear tyres)



(*) 2600 with ROPS frame

70-90DT
(11.2/10-28 front and 13.6/12-38 rear tyres)

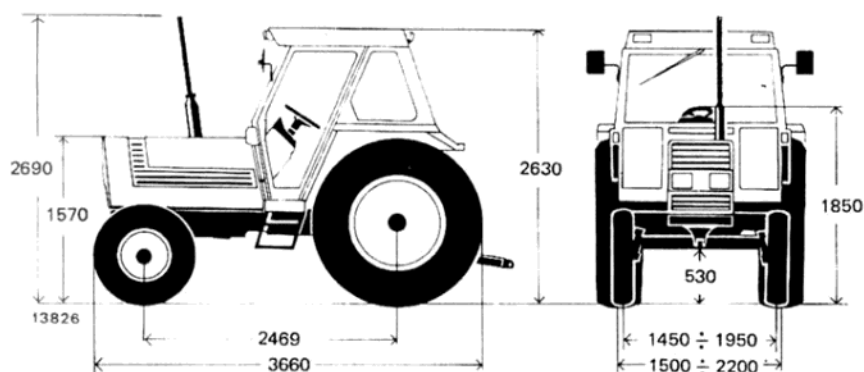


(*) 2600 with ROPS frame

80-90DT
(11.2/10-28 front and 13.6/12-38 rear tyres)

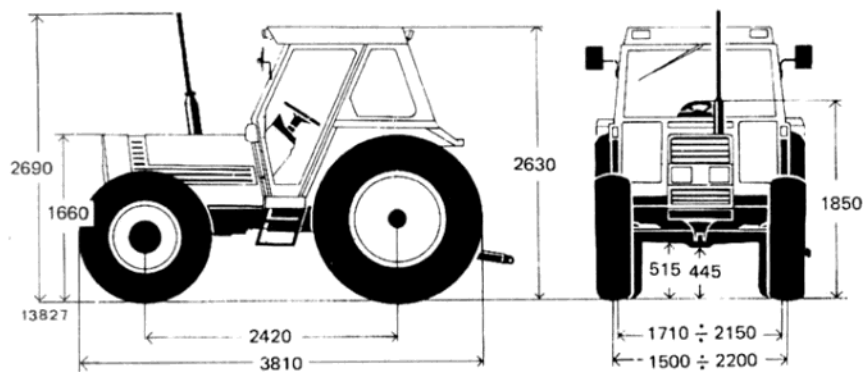
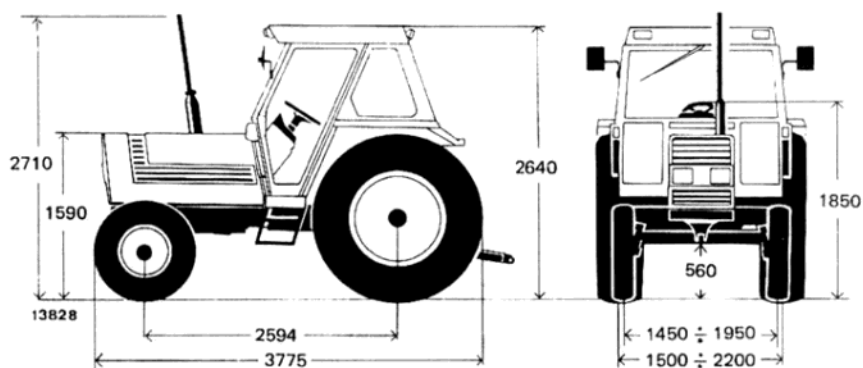
Fiat Trattori

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SPECIFICATION**DIMENSIONS (in mm)**

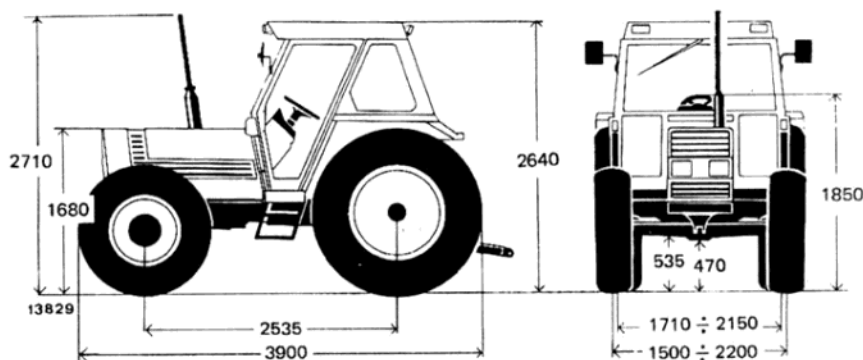
90-90
(7.50-20 front and 16.9/14-38 rear
tyres)

100-90
(7.50-20 front and 16.9/14-38 rear
tyres)



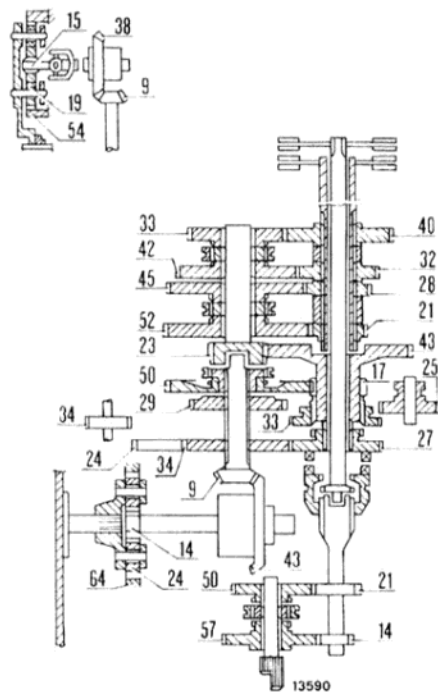
90-90DT
(13.6/12-24 front and 16.9/14-34
rear tyres)

100-90DT
(12.4/11-28 front and 16.9/14-38
rear tyres)

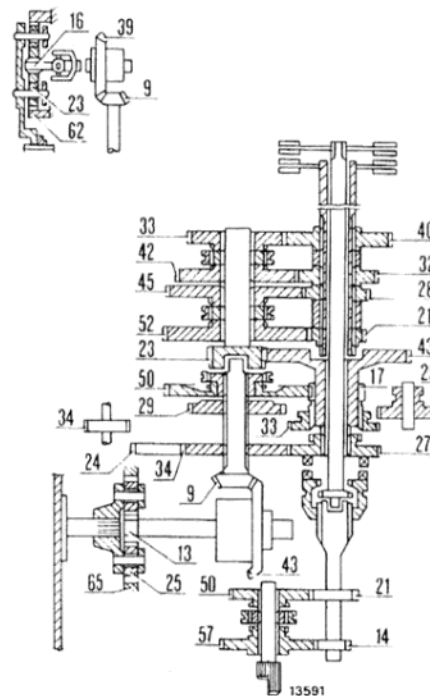


POWER TRAIN SCHEMATICS (standard 12 speed transmission)

55-90, 55-90DT, 60-90 and 60-90DT

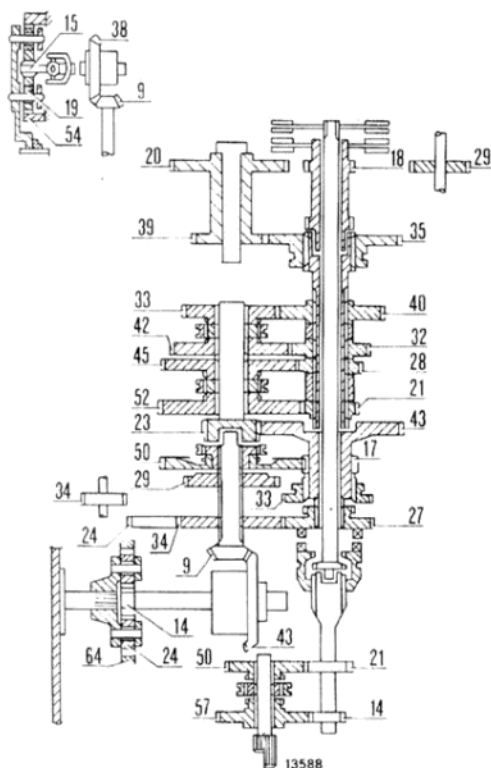
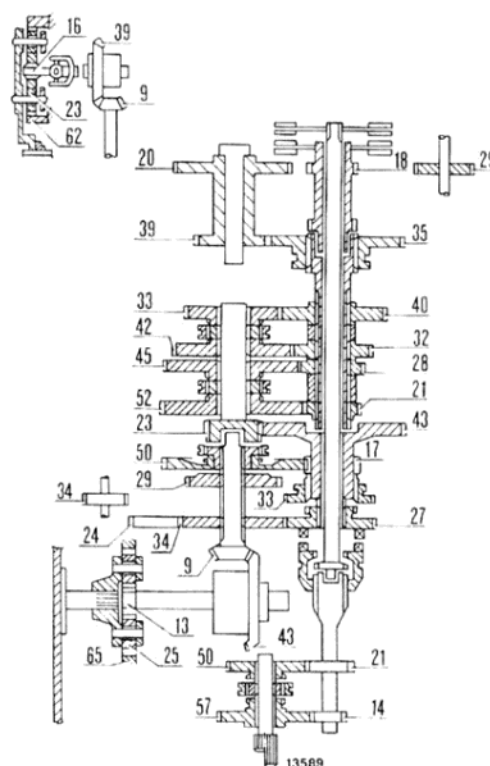


70-90, 70-90DT, 80-90 and 80-90DT



Tractor speed, at max. engine output speed

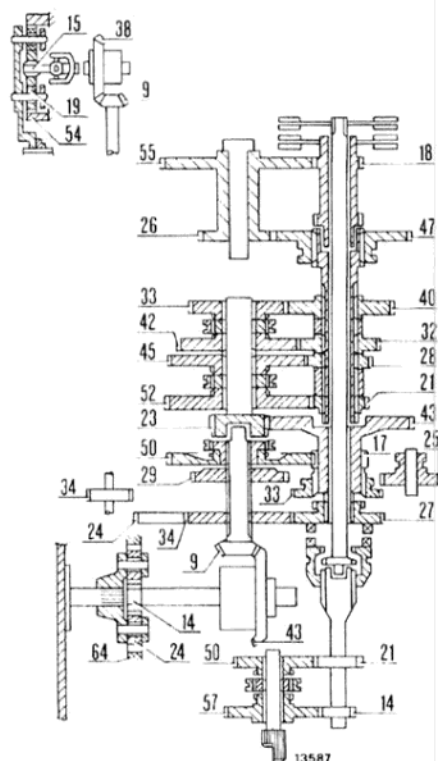
Tractor speed, at max. engine output speed																
GEAR	55-90, 55-90DT		55-90, 55-90DT, 60-90, 60-90DT						60-90, 60-90DT		70-90, 70-90DT		70-90, 70-90DT, 80-90, 80-90DT			
	REAR TYRES															
	14.9/13-28		14.9/13-30		16.9/14-28		12.4/11-36		16.9/14-30		16.9/14-30		18.4/15-30		16.9/14-34 13.6/12-3	
	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph
1 Low	1.7	1.0	1.7	1.0	1.7	1.0	1.8	1.1	1.8	1.1	1.7	1.0	1.7	1.0	1.8	1.1
2 "	2.6	1.6	2.6	1.6	2.7	1.7	2.8	1.7	2.8	1.7	2.6	1.6	2.7	1.7	2.8	1.7
3 "	3.1	1.9	3.2	2.0	3.3	2.0	3.4	2.1	3.4	2.1	3.1	1.9	3.3	2.0	3.4	2.1
4 "	5.0	3.1	5.1	3.2	5.2	3.2	5.4	3.3	5.4	3.3	5.0	3.1	5.2	3.2	5.4	3.3
1 Normal	3.9	2.4	4.0	2.5	4.1	2.5	4.2	2.6	4.2	2.6	3.9	2.4	4.1	2.5	4.2	2.6
2 "	6.0	3.7	6.2	3.8	6.3	3.9	6.5	4.0	6.4	4.0	6.0	3.7	6.3	3.9	6.5	4.0
3 "	7.3	4.5	7.6	4.7	7.7	4.8	8.0	5.0	7.9	4.9	7.3	4.5	7.7	4.8	7.9	4.9
4 "	11.7	7.3	12.0	7.4	12.2	7.6	12.7	7.9	12.6	7.8	11.7	7.3	12.3	7.6	12.6	7.8
1 High	9.1	5.6	9.4	5.8	9.6	6.0	9.9	6.1	9.9	6.1	9.2	5.7	9.6	6.0	9.9	6.1
2 "	14.1	8.8	14.5	9.0	14.8	9.2	15.3	9.5	15.2	9.4	14.1	8.8	14.8	9.2	15.2	9.4
3 "	17.3	10.7	17.8	11.1	18.1	11.2	18.7	11.6	18.6	11.5	17.3	10.7	18.2	11.3	18.7	11.6
4 "	27.5	17.1	28.3	17.6	28.7	17.8	29.8	18.5	29.6	18.4	27.5	17.1	28.9	18.0	29.7	18.4
1 Reverse	4.3	2.7	4.4	2.7	4.5	2.8	4.7	2.9	4.6	2.8	4.3	2.7	4.5	2.8	4.6	2.8
2 "	6.6	4.1	6.8	4.2	6.9	4.3	7.2	4.5	7.1	4.4	6.6	4.1	7.0	4.3	7.2	4.5
3 "	8.1	5.6	8.4	5.2	8.5	5.3	8.8	5.5	8.7	5.4	8.1	5.0	8.5	5.3	8.8	5.5
4 "	12.9	8.0	13.3	8.3	13.5	8.4	14.0	8.7	13.9	8.6	12.9	8.0	13.6	8.4	13.9	8.6

SPECIFICATION**POWER TRAIN SCHEMATICS (with reverser)****55-90, 55-90DT, 60-90 and 60-90DT****70-90, 70-90DT, 80-90 and 80-90DT****Tractor speed, at max. engine output speed**

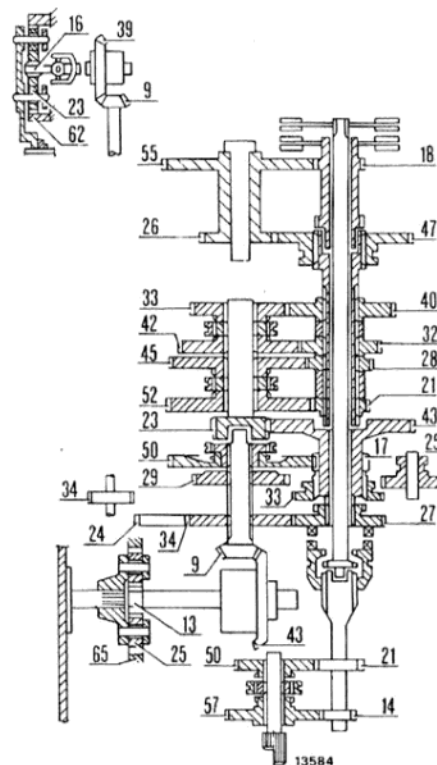
GEAR	55-90, 55-90DT		55-90, 55-90DT, 60-90, 60-90DT						60-90, 60-90DT		70-90, 70-90DT		70-90, 70-90DT, 80-90, 80-90DT			
	REAR TYRES															
	14.9/13-28		14.9/13-30		16.9/14-28		12.4/11-36		16.9/14-30		16.9/14-30		18.4/15-30		16.9/14-34 13.6/12-38	
	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph
1 Low	1.7	1.0	1.7	1.0	1.7	1.0	1.8	1.1	1.8	1.1	1.7	1.0	1.8	1.1	1.8	1.1
2 "	2.6	1.6	2.6	1.6	2.7	1.7	2.8	1.7	2.8	1.7	2.6	1.7	2.7	1.7	2.8	1.7
3 "	3.1	1.9	3.2	2.0	3.3	2.0	3.4	2.1	3.4	2.1	3.1	1.9	3.3	2.0	3.4	2.1
4 "	5.0	3.1	5.2	3.2	5.2	3.2	5.4	3.3	5.4	3.3	5.0	3.1	5.3	3.3	5.4	3.3
1 Normal	3.9	2.4	4.0	2.5	4.1	2.5	4.2	2.6	4.2	2.6	3.9	2.4	4.1	2.5	4.2	2.5
2 "	6.0	3.7	6.2	3.8	6.3	3.9	6.5	4.0	6.5	4.0	6.1	3.8	6.3	3.9	6.5	4.0
3 "	7.3	4.5	7.6	4.7	7.7	4.8	8.0	5.0	7.9	4.9	7.4	4.6	7.7	4.8	7.9	4.9
4 "	11.7	7.3	12.1	7.5	12.2	7.6	12.7	7.9	12.6	7.8	11.7	7.3	12.3	7.6	12.6	7.8
1 High	9.2	5.7	9.5	5.9	9.6	6.0	10.0	6.2	9.9	6.1	9.2	5.7	9.6	6.0	9.9	6.1
2 "	14.1	8.8	14.6	9.1	14.8	9.2	15.4	9.6	15.2	9.4	14.2	8.8	14.9	9.2	15.3	9.5
3 "	17.3	10.7	17.9	11.1	18.1	11.2	18.8	11.7	18.7	11.6	17.3	10.7	18.2	11.3	18.7	11.6
4 "	27.5	17.1	28.4	17.6	28.8	17.9	29.9	17.9	29.7	18.4	27.6	17.1	29.0	18.0	29.8	18.5

POWER TRAIN SCHEMATICS (creeper version)

55-90, 55-90DT, 60-90 and 60-90DT



70-90, 70-90DT, 80-90 and 80-90DT

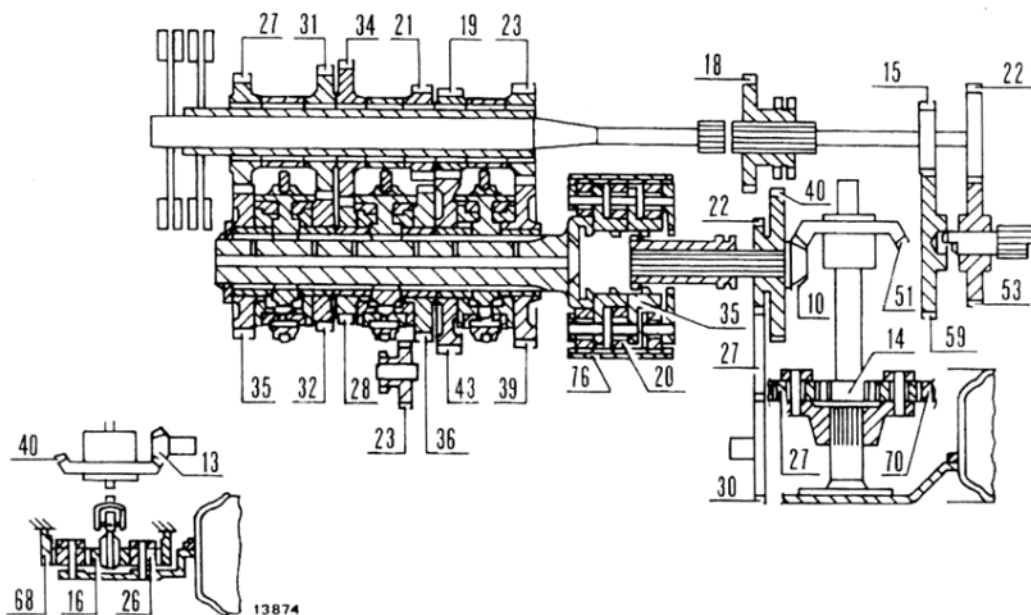


Tractor speed, at max. engine output speed

Tractor speed, at max. engine output speed																
GEAR	55-90, 55-90DT		55-90, 55-90DT, 60-90, 60-90DT						60-90, 60-90DT		70-90, 70-90DT		70-90, 70-90DT, 80-90, 80-90DT			
	REAR TYRES															
	14.9/13-28		14.9/13-30		16.9/14-28		12.4/11-36		16.9/14-30		16.9/14-30		18.4/15-30		16.9/14-34 13.6/12-38	
	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph	kph	mph
1 Low creeper	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2
2 *	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3	0.5	0.3
3 *	0.6	0.4	0.6	0.4	0.6	0.4	0.6	0.4	0.6	0.4	0.6	0.4	0.6	0.4	0.6	0.4
4 *	0.9	0.5	0.9	0.5	0.9	0.5	1.0	0.5	1.0	0.6	0.9	0.5	0.9	0.5	1.0	0.6
1 Normal creeper	0.7	0.4	0.7	0.4	0.7	0.4	0.8	0.5	0.7	0.4	0.7	0.4	0.7	0.4	0.8	0.5
2 *	1.1	0.7	1.1	0.7	1.1	0.7	1.2	0.7	1.2	0.7	1.1	0.7	1.1	0.7	1.2	0.7
3 *	1.3	0.8	1.4	0.9	1.4	0.9	1.4	0.9	1.4	0.9	1.3	0.8	1.4	0.9	1.4	0.9
4 *	2.1	1.3	2.2	1.4	2.2	1.4	2.3	1.4	2.3	1.4	2.1	1.3	2.2	1.4	2.3	1.4
1 Low	1.7	1.0	1.7	1.0	1.7	1.0	1.8	1.1	1.8	1.1	1.7	1.0	1.7	1.0	1.8	1.1
2 *	2.6	1.6	2.6	1.6	2.7	1.7	2.8	1.7	2.8	1.7	2.6	1.6	2.7	1.7	2.8	1.7
3 *	3.1	1.9	3.2	2.0	3.3	2.0	3.4	2.1	3.4	2.1	3.1	1.9	3.3	2.0	3.4	2.1
4 *	5.0	3.1	5.1	3.2	5.2	3.2	5.4	3.3	5.4	3.3	5.0	3.1	5.2	3.2	5.4	3.3
1 Normal	3.9	2.4	4.0	2.5	4.1	2.5	4.2	2.6	4.2	2.6	3.9	2.4	4.1	2.5	4.2	2.5
2 *	6.0	3.7	6.2	3.8	6.3	3.9	6.5	4.0	6.4	4.0	6.0	3.7	6.3	3.9	6.5	4.0
3 *	7.3	4.5	7.6	4.7	7.7	4.8	8.0	5.0	7.9	4.9	7.3	4.5	7.7	4.8	7.9	4.9
4 *	11.7	7.3	12.0	7.4	12.2	7.6	12.7	7.9	12.6	7.8	11.7	7.3	12.3	7.6	12.6	7.8
1 High	9.1	5.6	9.4	5.8	9.6	6.0	9.9	6.1	9.9	6.1	9.2	5.7	9.6	6.0	9.9	6.1
2 *	14.1	8.8	14.5	9.0	14.8	9.2	15.3	9.5	15.2	9.4	14.1	8.8	14.8	9.2	15.2	9.4
3 *	17.3	10.7	17.8	11.1	18.1	11.2	18.7	11.6	18.6	11.5	17.3	10.7	18.2	11.3	18.7	11.6
4 *	27.5	17.1	28.3	17.6	28.7	17.8	29.8	18.5	29.6	18.4	27.5	17.1	28.9	18.0	29.7	18.4
1 Low reverse	0.8	0.5	0.8	0.5	0.8	0.5	0.8	0.5	0.8	0.5	0.8	0.5	0.8	0.5	0.8	0.5
2 *	1.2	0.7	1.2	0.7	1.2	0.7	1.3	0.8	1.3	0.8	1.2	0.7	1.3	0.8	1.3	0.8
3 *	1.5	0.9	1.5	0.9	1.5	0.9	1.6	1.0	1.6	1.0	1.5	0.9	1.5	0.9	1.6	1.0
4 *	2.3	1.4	2.4	1.5	2.4	1.5	2.5	1.5	2.5	1.5	2.3	1.4	2.4	1.5	2.5	1.5
1 High reverse	4.3	2.7	4.4	2.7	4.5	2.8	4.7	2.9	4.6	2.8	4.3	2.7	4.5	2.8	4.6	2.8
2 *	6.6	4.1	6.8	4.2	6.9	4.3	7.2	4.5	7.1	4.4	6.6	4.1	7.0	4.3	7.2	4.5
3 *	8.1	5.6	8.4	5.2	8.5	5.3	8.8	5.5	8.7	5.4	8.1	5.0	8.5	5.3	8.8	5.5
4 *	12.9	8.0	13.3	8.3	13.5	8.4	14.0	8.7	13.9	8.6	12.9	8.0	13.6	8.4	13.9	8.6

SPECIFICATION

POWER TRAIN SCHEMATICS (creeper version)
90-90, 90-90DT, 100-90 and 100-90DT



Tractor speed, at max. engine output speed:							
GEAR		90-90, 90-90 DT		90-90, 90-90 DT, 100-90, 100-90DT			
		REAR TYRES					
		16.9/14-34		18.4/15-34		16.9/14-38	
		kpm	mph	kpm	mph	kpm	mph
Creeper ⁽⁰⁾	1	0.3	0.2	0.3	0.2	0.3	0.2
	2	0.4	0.2	0.4	0.2	0.4	0.2
	3	0.5	0.3	0.6	0.4	0.6	0.4
	4	0.6	0.4	0.7	0.4	0.7	0.4
	5	0.8	0.5	0.9	0.5	0.9	0.5
	REV	0.4	0.2	0.4	0.2	0.4	0.2
1Low	1	1.0	0.6	1.1	0.7	1.1	0.7
	2	1.3	0.8	1.3	0.8	1.4	0.9
	3	1.8	1.1	1.8	1.1	1.9	1.2
	4	2.2	1.4	2.3	1.4	2.4	1.5
	5	2.8	1.7	2.9	1.8	3.0	1.9
	REV	1.3	0.8	1.3	0.8	1.4	0.9
Normal	1	3.2	2.0	3.3	2.0	3.4	2.1
	2	4.3	2.7	4.4	2.7	4.6	2.8
	3	5.6	3.5	5.8	3.6	6.0	3.7
	4	7.0	4.3	7.3	4.5	7.5	4.7
	5	8.7	5.4	9.1	5.6	9.4	5.8
	REV	4.2	2.6	4.3	2.7	4.5	2.8
High	1	10.1	6.3	10.5	6.5	10.9	6.8
	2	13.5	8.4	14.0	8.7	14.5	9.0
	3	17.7	11.0	18.5	11.5	19.1	11.9
	4	22.2	13.8	23.1	14.3	23.9	14.8
	5	27.8	17.3	29.0	18.0	29.9	18.6
	REV	13.4	8.3	13.9	8.6	14.4	8.9

⁽⁰⁾ Creeper version only.

(°) Creeper version only.

55-90 60-90
70-90 80-90
90-90 100-90

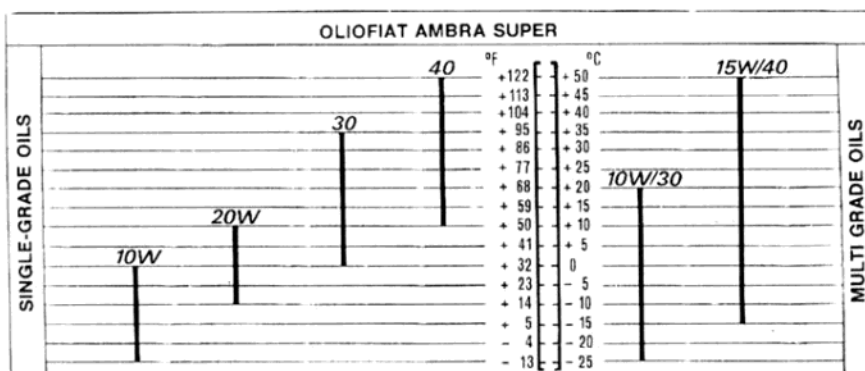
SPECIFICATION

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DESCRIPTION	FIAT RECOMMENDED PRODUCTS	LIQUID AND LUE									
		CAPACIT									
		55-90			60-90			70-90			dm ³ (litre)
		dm ³ (litres)	gall.	kg	dm ³ (litres)	gall.	kg	dm ³ (litres)	gall.	kg	
Sump and filter oil	Olio fiat AMBRA SUPER (see table below)	7.5	1½	6.8	7.5	1½	6.8	11.7	2½	10.5	11
Sump oil		6.7	1½	6	6.7	1½	6	10.5	2⅓	9.5	10
Air cleaner oil		0.8	1⅓ pints	0.7	0.8	1⅓ pints	0.7	0.8	1⅓ pints	0.7	0
Power steering circuit oil	Olio fiat TUTELA MULTI F	2.0	½	1.8	2.0	½	1.8	2.0	½	1.8	2
Transmission oil		—	—	—	—	—	—	—	—	—	—
Live front axle oil:											
— Axle casing		4.3	¾	3.9	4.3	¾	3.9	6.1	1⅓	5.5	6
— Planetary drives (each)		0.8	1⅓ pints	0.7	0.8	1⅓ pints	0.7	1.2	½	1.1	1
Rear transmission (transmission, bevel drive, brakes, final drives and lift oil) for 55-90, 60-90, 70-90 and 80-90 or (Bevel drive, brakes, final drives and lift oil for 90-90 and 100-90).											
— 2-wheel drive		50	11	45	50	11	45	54	11¼	48.5	5
— 4-wheel drive		50.5	11⅓	45.5	50.5	11⅓	45.5	54.4	11¼	49	5
Brake fluid	AMBRA SUPER 10 W	0.45	¾ pint	0.4	0.45	¾ pint	0.4	0.45	¾ pint	0.4	0
Front wheel hub oil	Grassofiat TUTELA G9	—	—	—	—	—	—	—	—	—	—
Pressure lubricators		—	—	—	—	—	—	—	—	—	—
Coolant (1)	Water and FIAT "PARAFU 11"	12	2½	—	12	2½	—	14	3	—	—
Windshield washer fluid	Water and "DP1" (2)	2	½	—	2	½	—	2	½	—	—
Fuel	Diesel oil										
— Main tank		~ 95	20¾	—	~ 95	20¾	—	~ 95	20¾	—	~
— Auxiliary tank		—	—	—	—	—	—	—	—	—	—

(1) Including expansion tank. Cab versions: add 2 litres or 3 pints for 55-90, 60-90, 70-90 and 80-90, or 3 litres (5 pints) for 90-90 and 100-90
(2) Detergent fluid effective down to -10°C in 50-50 mixture. For temperatures below -1 use DPI without water.



LIQUID AND LUBRICANTS												International Designation
CAPACITY												
70-90			80-90			90-90			100-90			
dm ³ (litres)	gall	kg	dm ³ (litres)	gall	kg	dm ³ (litres)	gall	kg	dm ³ (litres)	gall	kg	
11.7	2½	10.5	11.7	2½	10.5	13.7	3	12.4	13.6	2¾	12.2	Diesel engine oil to MIL-L-2104 D and Service API CD
10.5	2⅓	9.5	10.5	2⅓	9.5	12.1	2½	10.9	11.7	2½	10.5	
0.8	1⅔ pints	0.7	0.8	1⅔ pints	0.7	1.9	½	1.7	1.9	½	1.7	
2.0	½	1.8	2.0	½	1.8	1.7	½	1.5	1.7	½	1.5	Transmission, oil bath, brakes and lift oil to Massey Ferguson MF1135 and Ford M2C 86A
—	—	—	—	—	—	11.7	2 ½	10.5	11.7	2 ½	10.5	
6.1	1⅓	5.5	6.1	1⅓	5.5	6	1⅓	5.4	6	1⅓	5.4	
1.2	½	1.1	1.2	½	1.1	1.7	½	1.5	1.7	½	1.5	
54	11¾	48.5	54	11¾	48.5	44.5	9¾	40	44.5	9¾	40	
54.4	11¾	49	54.4	11¾	49	45.6	10	41	45.6	10	41	
0.45	¾ pint	0.4	0.45	¾ pint	0.4	0.8	1⅔ pints	0.7	0.8	1⅔ pints	0.7	Oil to MIL-L-2104 D and API CD-SAE 10 W
—	—	—	—	—	—	—	—	—	—	—	—	Lithium - calcium grease to NLGI No. 2
—	—	—	—	—	—	—	—	—	—	—	—	
14	3	—	14	3	—	18	3¾	—	20	4½	—	—
2	½	—	2	½	—	2	½	—	2	½	—	—
~ 95	20¾	—	~ 95	20¾	—	~ 95	20¾	—	~ 95	20¾	—	—
—	—	—	—	—	—	37	—	—	37	—	—	

ts) for 90-90 and 100-90.

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SPECIFICATION

ENGINE BLOCK - CYLINDER HEAD

Engine Block		mm	
		55-90, 70-90, 100-90	60-90, 80-90, 90-90
		102.850 to 102.900 mm (4.049 to 4.051 in)	106.850 to 106.900 mm (4.206 to 4.208 in)
Cylinder bore diameter in engine block		103.020 to 103.050 mm (4.056 to 4.057 in)	107.020 to 107.050 mm (4.213 to 4.215 in)
Sleeve O.D.		0.120 to 0.200 mm (0.005 to 0.008 in)	
Sleeve interference fit in block		0.2 mm (0.008 in)	
Sleeve diameter oversize			

	mm		in	
	55-90, 70-90, 100-90	60-90, 80-90, 90-90	55-90, 70-90, 100-90	60-90, 80-90, 90-90
	100.000 to 100.024 ⁽¹⁾	104.000 to 104.024 ⁽¹⁾	3.937 to 3.938	4.094 to 4.095
Sleeve bore diameter				
Maximum ovality and taper due to wear ⁽²⁾	0.12		0.005	
Sleeve bore oversize	0.4 - 0.8		0.016 - 0.031	

Camshaft bushing housing bore diameter			
55-90, 60-90, 70-90 and 80-90	Front	54.780 to 54.805	2.1567 to 2.1577
	Intermediate	54.280 to 54.305	2.1370 to 2.1379
	Rear	53.780 to 53.805	2.1173 to 2.1183
90-90 and 100-90	Front	55.280 to 55.305	2.1764 to 2.1774
	Intermediate front	54.780 to 54.805	2.1567 to 2.1577
	Intermediate rear	54.280 to 54.305	2.1370 to 2.1379
	Rear	53.780 to 53.805	2.1173 to 2.1183

Tappet housing bore diameter		15.000 to 15.018	0.590 to 0.591
Tappet oversize		0.1 - 0.2 - 0.3	0.004 - 0.008 - 0.012

Main bearing housing bore diameter		84.200 to 84.230	3.3149 to 3.3161
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Cylinder head			
Valve guide housing bore diameter in head		13.950 to 13.983	0.5492 to 0.5505
Valve guide oversize		0.2	0.0079
Valve seat dimensions		Section 12, page 2	

Valve stand-in		0.7 to 1.0	0.027 to 0.039
— Maximum stand-in allowed		1.3	0.051
Injector stand-out		0.05 to 0.7	0.002 to 0.027
— Maximum stand-out allowed		1.0	0.039
Cylinder head height		92	3.622
Maximum head skimming depth		0.5	0.020

(1) After reaming.

(2) Measure in ring swept area, parallel and perpendicular to engine centerline.

ENGINE: Specification and Data

CRANK GEAR

	mm		in	
	55-90, 70-90, 100-90	60-90, 80-90, 90-90	55-90, 80-90, 100-90	60-90, 80-90, 90-90
Crankshaft - Bearings				
Main journal diameter	79.791 to 79.810 (¹)		3.1413 to 3.1421	
Main journal undersize	0.254-0.508-0.762-1.016		0.0099 - 0.0199 - 0.0299 - 0.0399	
Main bearing wall thickness	2.168 to 2.178		0.0853 to 0.0857	
Main bearing undersize	0.254-0.508-0.762-1.016		0.0099 - 0.0199 - 0.0299 - 0.0399	
Main journal clearance in bearings	0.034 to 0.103		0.0013 to 0.0040	
— Maximum wear clearance	0.180		0.0071	
Crankpin diameter	63.725 to 63.744 (¹)		2.5088 to 2.5096 (¹)	
Crankpin undersize	0.254-0.508-0.762-1.016		0.0099 - 0.0199 - 0.0299 - 0.0399	
Big end bearing wall thickness	1.805 to 1.815		0.0710 to 0.0715	
Big end bearing undersize	0.254-0.508-0.762-1.016		0.0099 - 0.0199 - 0.0299 - 0.0399	
Crankpin clearance in big end bearing	0.033 to 0.087		0.0012 to 0.0034	
— Maximum wear clearance	0.180		0.0071	
Crankshaft thrust washer thickness			3.378 to 3.429 mm (0.1329 to 0.1349 in)	
Thrust washer oversize			0.127-0.254-0.381-0.508 (0.0049 -0.0099 - 0.0149 - 0.0199)	
Width of main bearing housing over thrust washers			31.766 to 31.918 mm (1.2506 to 1.2566 in)	
Length of corresponding main journal			32.000 to 32.100 mm (1.2598 to 1.2638 in)	
Crankshaft end float			0.082 to 0.334 mm (0.0032 to 0.0131 in)	
— Maximum wear end float			0.40 mm (0.016 in)	
Maximum main journal and crankpin ovality or taper after grinding			0.01 mm (0.0004 in)	
Maximum main journal and crankpin ovality or taper due to wear			0.05 mm (0.0019 in)	
Maximum main journal misalignment with crankshaft resting on end journals			0.10 mm (0.0039 in)	

(follows)

(¹) 0.1 mm undersize crankpin and main journal crankshafts may be fitted in production coupled to corresponding undersize bearings.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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CRANK GEAR

(continued)

	55-90, 70-90, 100-90	60-90, 80-90, 90-90
Maximum misalignment of crankpins (mods. 55-90, 60-90 and 90-90) or of every pair of crankpins (mods 70-90, 80-90 and 100-90) relative to main journals (in either direction)	0.25 mm (0.0098 in)	
Maximum tolerance on distance from outer crankpin edge	± 0.10 mm (± 0.0039 in)	
Maximum crankshaft flange run-out with stylus in A, (section 14, page 2) over 108 mm (4.25 in) diameter, T.I.R.	0.025 mm (0.0009 in)	
Maximum flywheel seat eccentricity relative to main journals (see B, section 14, page 2) T.I.R.	0.04 mm (0.0016 in)	
Connecting Rods		
Small end bore diameter	41.846 to 41.884 mm (1.6474 to 1.6489 in)	
Small end bushing OD	41.979 to 42.017 mm (1.6527 to 1.6542 in)	
Bushing interference fit in small end	0.095 to 0.171 mm (0.0037 to 0.0067 in)	
Small end bushing fitted ID	38.004 to 38.014 mm (1.4962 to 1.4966 in)	
Big end bore diameter	67.407 to 67.422 mm (2.6538 to 2.6544 in)	
Maximum connecting rod axis misalignment at 125 mm (5 in)	± 0.07 mm (± 0.003 in)	
Maximum connecting rod weight difference over a complete set of the same engine	25 grams (0.88 oz.)	

(follows)

ENGINE: Specification and Data

CRANK GEAR

(continued)

	55-90, 70-90, 100-90	60-90, 80-90, 90-90
Pistons		
Piston diameter 57 mm (2 in) from base of skirt, at right angles to pin	99.827 to 99.841 mm (3.9301 to 3.9307 in)	103.812 to 103.826 mm (4.0870 to 4.0876 in)
Piston clearance in sleeve	0.159 to 0.197 in 0.0062 to 0.0077	0.174 to 0.212 mm (0.0068 to 0.0083 in)
— Maximum wear clearance	0.30 mm (0.012 in)	
Piston oversize range	0.4 - 0.8 mm (0.016 - 0.032 in)	
Piston standout from block at T.D.C.	0.355 to 0.761 mm (0.0139 to 0.0299 in)	
Piston pin diameter	37.983 to 37.990 mm (1.4953 to 1.4956 in)	
Piston pin housing bore in piston	37.993 to 38.000 mm (1.4957 to 1.49606 in)	
Piston pin clearance in piston	0.003 to 0.017 mm (0.0001 to 0.0007 in)	
Piston pin clearance in small end bushing	0.014 to 0.031 mm (0.0005 to 0.0012 in)	
— Maximum wear clearance	0.06 mm (0.0024 in)	
Maximum weight difference over a complete set of pistons	20 grams (2/3 oz.)	
Piston ring clearance in groove		
— Top	0.090 to 0.122 mm (0.0035 to 0.0048 in)	
— 2nd	0.058 to 0.095 mm (0.0022 to 0.0038 in)	0.060 to 0.092 mm (0.0023 to 0.0036 in)
— 3rd	0.040 to 0.075 mm (0.0016 to 0.0029 in)	
Maximum wear clearance		
— Top	0.50 mm (0.008 in)	
— 2nd and 3rd	0.20 mm (0.019 in)	
Piston ring gap		
— Top	0.35 to 0.55 mm (0.0138 to 0.0216 in)	0.40 to 0.65 mm (0.0157 to 0.0255 in)
— 2nd	0.35 to 0.55 mm (0.0138 to 0.0216 in)	0.30 to 0.55 mm (0.0118 to 0.0216 in)
— 3rd	0.30 to 0.60 mm (0.0118 to 0.0236 in)	
Maximum wear gap	1.20 mm (0.047 in)	

(follows)

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

10

page 5

CRANK GEAR

(continued)

	mm	in
Dynamic balancer (70-90 and 80-90)		
Idler gear jack shaft clearance in gear bushing (see 19, page 5, section 14) ⁽¹⁾	0.050 to 0.100	0.002 to 0.004
Flyweight gear shaft clearance in front bushing (see 11) ⁽¹⁾	0.050 to 0.100	0.002 to 0.004
Drive pinion clearance in bushings (see 18) ⁽¹⁾	0.050 to 0.100	0.002 to 0.004
Connecting sleeve spline backlash (see 13)	0.038 to 0.106	0.0015 to 0.0042
Flyweight gear shaft clearance in rear bushing (see 11) ⁽²⁾	0.013 to 0.061	0.0005 to 0.0024
Pivot clearance in flyweight bushings (see 26 and 27)	0.020 to 0.073	0.0008 to 0.0029
Flyweight bushing interference fit in housing	0.040 to 0.100	0.0016 to 0.0040
Idler gear jack shaft clearance in bushing (see 34) ⁽²⁾	0.013 to 0.061	0.0005 to 0.0024
Gear backlash	0.080	0.0031
Flyweight balancer timing	See page 7, section 14	

⁽¹⁾ Bushing interference fit in housing, 0.063 to 0.140 mm (0.0025 to 0.0055 in)

⁽²⁾ Bushing interference fit in housing, 0.037 to 0.101 mm (0.0014 to 0.0040 in)

VALVE GEAR

	55-90, 70-90, 100-90	60-90, 80-90, 90-90
Valve Timing Gears		
Timing gear backlash	0.160 mm (0.0062 in)	
Idler gear jack shaft diameter	36.975 to 37.000 (1.4557 to 1.4567 in)	
Idler gear bushing fitted I.D. after reaming	37.050 to 37.075 (1.4586 to 1.4596 in)	
Jack shaft journal clearance in bushing	0.050 to 0.100 mm (0.0019 to 0.0039 in)	
— Maximum wear clearance	0.15 mm (0.0059 in)	
Bushing interference fit in idler gear	0.063 to 0.140 mm (0.0025 to 0.0055 in)	
Lift and power steering pump drive gear shaft diameter	36.975 to 37.000 mm (1.4557 to 1.4567 in)	
Bushing fitted I.D. after reaming	37.050 to 37.075 mm (1.4586 to 1.4596 in)	
Shaft clearance in bushing	0.050 to 0.100 mm (0.0019 to 0.0039 in)	
Bushing interference fit in housing	0.063 to 0.140 in (0.0025 to 0.0055 in)	
Pump drive gear thrust washer thickness	1.45 to 1.50 mm (0.0571 to 0.0591 in)	

(follows)

ENGINE: Specification and Data

VALVE GEAR

(continued)

	mm	
	55-90, 70-90, 100-90	60-90, 80-90, 90-90
Camshaft		
Camshaft bushing O.D.:		
— 55-90, 60-90, 70-90 and 80-90	Front Intermediate Rear	54.875 to 54.930 mm (2.1604 to 2.1626 in) 54.375 to 54.430 mm (2.1407 to 2.1429 in) 53.875 to 53.930 mm (2.1210 to 2.1232 in)
— 90-90 and 100-90	Front Front intermediate Rear intermediate Rear	55.375 to 55.430 mm (2.180 to 2.182 in) 54.875 to 54.930 mm (2.1604 to 2.1626 in) 54.375 to 54.430 mm (2.1407 to 2.1429 in) 53.875 to 53.930 mm (2.1211 to 2.1232 in)
Bushings interference fit in housing		0.070 to 0.150 mm (0.0028 to 0.0059 in)
Camshaft bushing fitted I.D. after reaming		
— 55-90, 60-90, 70-90 and 80-90	Front Intermediate Rear	51.080 to 51.130 mm (2.011 to 2.013 in) 50.580 to 50.630 mm (1.9913 to 1.9933 in) 50.080 to 50.130 mm (1.9716 to 1.9736 in)
— 90-90 and 100-90	Front Front intermediate Rear intermediate Rear	51.580 to 51.630 mm (2.030 to 2.032 in) 51.080 to 51.130 mm (2.0110 to 2.0130 in) 50.580 to 50.630 mm (1.9913 to 1.9933 in) 50.080 to 50.130 mm (1.9716 to 1.9736 in)
Camshaft journal diameter		
— 55-90, 60-90, 70-90 and 80-90	Front Intermediate Rear	50.970 to 51.000 mm (2.0067 to 2.0079 in) 50.470 to 50.500 mm (1.9870 to 1.9882 in) 49.970 to 50.000 mm (1.9673 to 1.9685 in)
— 90-90 and 100-90	Front Front intermediate Rear intermediate Rear	51.470 to 51.500 mm (2.0264 to 2.0275 in) 50.970 to 51.000 mm (2.0067 to 2.0079 in) 50.470 to 50.500 mm (1.9913 to 1.9933 in) 49.970 to 50.000 mm (1.9716 to 1.9736 in)
Camshaft journal clearance in bushing		0.080 to 0.160 mm (0.0031 to 0.0063 in)
Maximum wear clearance		0.20 mm (0.0079 in)
Camshaft end float (thrust plate to associated seat in camshaft)		0.070 to 0.220 mm (0.0028 to 0.0087 in)
Tappets		
Tappet O.D.		14.950 to 14.970 mm (0.5886 to 0.5894 in)
Tappet clearance in housing on engine block		0.030 to 0.068 mm (0.0012 to 0.0027 in)
Maximum wear clearance		0.15 mm (0.0059 in)
Tappet oversize		0.1-0.2-0.3 mm (0.004-0.008-0.012 in)
Rockers		
Rocker bushing O.D.		21.006 to 21.031 mm (0.8270 to 0.8280 in)
Rocker bore diameter		20.939 to 20.972 mm (0.8244 to 0.7902 in)
Bushings interference fit in rocker		0.034 to 0.092 mm (0.0013 to 0.0036 in)
Rocker bracket bore diameter		18.016 to 18.034 mm (0.7093 to 0.7100 in)
Rocker shaft diameter		17.982 to 18.000 mm (0.7079 to 0.7087 in)
Rocker shaft clearance in bracket		0.016 to 0.052 mm (0.0006 to 0.0020 in)
Maximum wear clearance		0.15 mm (0.006 in)

(follows)

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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page 7

VALVE GEAR

(continued)

		mm	
		55-90, 70-90, 100-90	60-90, 80-90, 90-90
Rocker spacer spring length			
— Free		59.5 mm (2.3425 in)	
— Under 46 to 52 N (4.7 to 5.3 Kg, 10.4 to 11.7 lb)		44 mm (1.7323 in)	
Valves, Guides and Springs			
Valve dimensions			
Head dia.	{ Inlet Exhaust	45.300 to 45.500 mm (1.7834 to 1.7913 in) 37.500 to 37.750 mm (1.4763 to 1.4862 in)	
Stem dia.		7.985 to 8.000 mm (0.3144 to 0.3150 in)	
Valve face angle	{ Inlet Exhaust	60° 30' ± 7' 45° 30' ± 7'	
Valve clearance	{ Timing check Normal (cold or warm) { Inlet Exhaust	0.45 mm (0.0177 in) 0.25 mm (.0010 in) 0.35 mm (0.0138 in)	
Cam lift	{ Inlet Exhaust	5.250 mm (0.2067 in) 5.677 mm (0.2235 in)	
Valve lift	{ Inlet Exhaust	9.31 mm (0.3665 in) 10.06 mm (0.3960 in)	
Valve guide O.D.		13.993 to 14.016 mm (0.5509 to 0.5518 in)	
Valve guide oversize		0.2 mm (0.0079 in)	
Valve guide interference fit in housing on cylinder head		0.005 to 0.050 mm (0.0002 to 0.0020 in)	
Valve guide fitted I.D. after reaming		8.023 to 8.043 mm (0.3159 to 0.3166 in)	
Valve stem clearance in guide		0.023 to 0.058 mm (0.0009 to 0.0022 in)	
— Maximum wear clearance		0.13 mm (0.0051 in)	
Maximum valve stem eccentricity over one revolution with stylus on sealing face		0.03 mm (0.0011 in)	
Inlet and exhaust valve spring length			
— Free		44.6 mm (1.7559 in)	
— Valve closed, under 256 to 284 N (26.1 to 28.9 Kg, 57.5 to 63.7 lb)		34 mm (1.33858 in)	
— Valve open, under 502 to 554 N (51.2 to 56.5 Kg, 113 to 125 lb)		23.8 mm (0.9370 in)	

ENGINE: Specification and Data

LUBRICATION SYSTEM

	55-90, 60-90, 70-90, 80-90	90-90 100-90
Oil Pump	Gear, crankshaft driven	Gear, camshaft driven
Oil pump drive ratio	2 to 1	1.27 to 1
Oil pressure, warm at governed speed	2.9 to 3.9 bar (3 to 4 kg/cm ² , 42.6 to 56.9 psi)	
Relief valve crack-off setting	3.5 bar (3.6 kg/cm ² , 51.2 psi)	
Shaft clearance in bushing	0.016 to 0.055 mm (0.0006 to 0.0022 in)	—
Shaft clearance in driven gear	0.033 to 0.066 mm (0.0013 to 0.0026 in)	—
Gear backlash	0.100 mm (0.0039 in)	—
Gear clearance in pump body	0.060 to 0.170 (0.0024 to 0.0067 in)	—
Drive and driven gear width	40.961 to 41.000 mm (1.6126 to 1.6142 in)	—
Gear housing depth in pump body	41.025 to 41.087 mm (1.6152 to 1.6176 in)	—
Drive and driven gear end float	0.025 to 0.126 mm (0.0009 to 0.0049 in)	0.016 to 0.107 mm (0.006 to 0.042 in)
Drive gear shaft diameter	—	17.989 to 18.000 mm (.7082 to .7087 in)
Shaft bushing fitted I.D. after reaming	—	18.016 to 18.059 mm (.709 to .711 in)
Shaft clearance in support	—	.016 to .070 mm (.0006 to .0027 in)
Bushing interference fit in housing	—	.023 to .091 mm (.0009 to .0036 in)
Driven gear shaft interference fit in cover	—	.012 to .050 mm (.0005 to .0020 in)
Driven gear shaft diameter	—	14.989 to 15.000 mm (.5901 to .5905 in)
Bushing fitted I.D.	—	15.016 to 15.043 mm (.5912 to .5922 in)
Driven gear shaft clearance in support	—	.016 to .054 mm (.0006 to .0021 in)
Bushing interference fit in housing	—	.051 to .073 mm (.0020 to .0029 in)
Pressure relief valve spring length:		
— Free	45 mm (1.77 in)	
— Under 88 to 94 N (9 to 9.6 kg, 19.8 to 21 lb.)	30.5 mm (1.20 in)	
Oil Filters	Gauze on suction and main cartridge on delivery	

(1) Fitted and reamed

COOLING SYSTEM

	55-90, 70-90, 100-90	60-90, 80-90, 90-90
Water Pump	Centrifugal, vane	
Water pump drive ratio	1.403 to 1	
Shaft interference fit in impeller	0.017 to 0.059 mm (0.0006 to 0.0023 in)	
Shaft interference fit in fan hub	0.024 to 0.058 mm (0.0009 to 0.0022 in)	
Face sealing bushing interference fit in impeller	0.012 to 0.058 mm (0.0005 to 0.0023 in)	

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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COOLING SYSTEM

(continued)

	55-90, 70-90 100-90	60-90, 80-90 90-90
Thermostat		
Type	Wax	
Opening temperature	79 ± 2°C	
Fully open at	94°C	
Valve travel when fully open	7.5 mm (0.295 in)	
Radiator	Vertical tube, 3-deep (55-90, 60-90, 70-90 and 80-90) or 4-deep (90-90 and optional for 70-90 and 80-90) steel fins, or 4-deep copper fins (100-90)	
Fan	Suction, steel, 4-bladed	
Water Temperature Gauge	Three coloured sectors	
Temperature range		
— White sector	30° to 65°C	
— Green sector	65° to 105°C	
— Red sector	105° to 115°C	

FUEL SYSTEM

	55-90, 70-90 100-90	60-90, 80-90 90-90
Feed Pump		
Operation	Double diaphragm	
Minimum fuel flow at 1.600 rpm shaft speed	Valve gear driven	
Drive shaft eccentricity	100 litre/hour (22 Gall/hour)	
	3 mm (0.118 in)	
Feed Pump Drive		
Shaft journal diameter	31.975 to 32.000 mm (1.2588 to 1.2598 in)	
Bushing fitted I.D. after reaming	32.050 to 32.075 mm (1.2618 to 1.2628 in)	
Shaft clearance in bushing	0.050 to 0.100 mm (0.0020 to 0.0040 in)	
Bushing interference fit in housing	0.063 to 0.140 mm (0.0025 to 0.0055 in)	
Inner washer thickness	1.45 to 1.50 mm (0.0570 to 0.0590 in)	
Outer washer thickness	2.93 to 3.00 mm (0.1153 to 0.1181 in)	

(follows)

ENGINE: Specification and Data

FUEL SYSTEM

(continued)

Injection Pump — BOSCH { 55-90 60-90 70-90 80-90 90-90 100-90 — C.A.V. { 55-90 60-90 70-90 80-90 Direction of rotation { 55-90, 60-90, 70-90 and 80-90 90-90 and 100-90 Firing order: { 55-90 and 60-90 70-90 and 80-90 90-90 100-90		Distributor, integral governor and advance device VE 3/11 F 1250 L163-1 - 4794587 - 4800682 VE 3/11 F 1250 L163 - 4794586 VE 4/11 F 1250 L164-1 - 4794589 VE 4/11 F 1250 L164 - 4794588 VE 5/11 F 1250 R 165 - 4794590 VE 6/11 F 1250 R 181 - 4798834 DPS 8522A 010A - 4797414 DPS 8522A 000A - 4797413 DPS 8520A 100A - 4797416 DPS 8520A 090A - 4797415 Anticlockwise Clockwise 1-2-3 1-3-4-2 1-2-4-5-3 1-5-3-6-2-4	
Fuel injectors — type { W ALTECNA BOSCH O.M.A.P. — W ALTECNA { Nozzle holder Spray nozzle — BOSCH { Nozzle holder Spray nozzle — O.M.A.P. { Nozzle holder Spray nozzle Number of spray orifices Spray orifice diameter Release pressure		55-90, 70-90 100-90 4802391 4792442 4800032 KBEL 83S1W200-4802392 DLL 124S500W-4802393 KBEL 83S35-4791124 DLLA 124S1001-4792443 OKLL 83S3392-4796644 OLL 124S3990-4792447 4 0.31 mm (0.0122 in)	60-90, 80-90 90-90 4802394 4800029 4800031 KBEL 83S1W200-4802392 DLL 136S501W-4802395 KBEL 83S35-4791124 DLLA 136S1000-4800030 OKLL 83S3392-4796644 OLL 136S9119-4776715 3 0.35 mm (0.0137 in)
Delivery pipes with BOSCH pump: — 55-90 and 60-90 — 70-90 and 80-90 — 90-90 — 100-90 Delivery pipes with C.A.V. pump: — 55-90 and 60-90 — 70-90 and 80-90		type 4797506 4797516 4797534 4799109 4797511 4797522	size mm 6x1.5x475 6x1.5x530 6x1.5x570 6x1.75x650 6x2x475 6x2x530

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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page 11

MODEL 55-90 - CALIBRATION DATA BOSCH INJECTION PUMP TYPE VE 3/11F 1250 L 163-1-4794587 - 4800682 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-2-3
Plunger lift to spill cut-off 0.2 ± 0.02 mm (0.008 ± 0.0008 in)
Plunger lift for pump timing on engine 1 mm (.039 in)
Pump timing $6^\circ \pm 1^\circ$ B.T.D.C., cylinder No. 1 in compression stroke
Delivery connection of cylinder
No. 1: Marked with letter A.

TEST PLAN

Test machine complying with ISO 4008.
Injectors complying with ISO 4010: 1688901020 with pad 1680 103 096.
Release pressure
172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Fuel pressure 0.2 bar (0.2 kg/cm², 2.8 psi).
Lines (as per ISO 4093.2) 6x2x840 mm.
Graduate drain time 30".
Test fluid ISO 4113 at $40^\circ \pm 2^\circ$ C.

ADJUSTMENT VALUES						
Operation description		Advance piston stroke	Fuel pressure	Delivery	Transfer pressure bar	Spread
	rpm	mm	bar (kg/cm ²)	cm ³ /1000 shots	(kg/cm ²)	cm ³ /1000 shots
Full load delivery	800	0.8 to 1.2	3.8 to 4.4	64.5 to 65.5	0.2	3.5
Idle speed limit	350	—	—	21 to 25	0.2	3
Starting delivery	150	—	—	100 to 120	0.2	—
Full throttle limit	1350	—	—	32 to 38	0.2	—

TEST VALUES								
Advance device check			Fuel pressure check			Back leakage		
	rpm	mm		rpm	bar (kg/cm ²)		rpm	cm ³ /100 shots
	600 800 1200	0 to 0.6 0.8 to 1.2 4.4 to 5.2		600 800 1200	3.0 to 3.6 (2.8 to 3.8) (3.8 to 4.4) 5.6 to 6.2			

DELIVERY CHECK							
Full throttle stop		Delivery	Transfer pressure	Idle speed shut-off		Delivery	Transfer pressure
	rpm	cm ³ /1000 shots	bar (kg/cm ²)		rpm	cm ³ /1000 shots	bar (kg/cm ²)
	1400 to 1460 1350 1250 800 500 250	0 32 to 38 62.5 to 65.5 64.5 to 65.5 56.5 to 59.5 ≤ 55	0.2 0.2 0.2 0.2 0.2 0.2		475 425 350	≤ 2 4 to 10 21 to 25	0.2 0.2 0.2

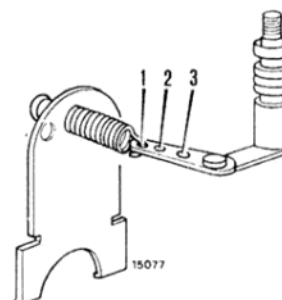
Note - Check values are shown in brackets.

ENGINE: Specification and Data

MODEL 55-90 - CALIBRATION DATA C.A.V. INJECTION PUMP TYPE DPS 8522A 010A - 4797414 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-2-3
Governor control stud to metering valve lever pin
41 to 42 mm (1.61 to 1.65 in)
Pump timing
0° ± 1° B.T.D.C., cylinder No. 1 compression stroke
Flange guide dia 50 mm (1.96 in)
Delivery connection of cylinder No. 1: Marked with letter **U**.



Control spring hole 2.

Test machine complying with ISO 4008.
Injectors complying with ISO 4010.
Test fluid: ISO 4113 at 40° ± 2°C
Fuel pressure: 0.1 bar (kg/cm² or 1.4 psi).
Graduate drain time 30".
Release pressure: 172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Lines: 6x2x845 mm (ISO 4093.2).
Adjust maximum speed screw to protrude 7.5 mm (0.92 in) from surface of associated nut.

Fully slacken fuel pressure adjusting screw, then tighten through 3 1/2 turns.
Position valve adjusting screw so that it is just beneath the surface of the associated nut.
Fully slacken maximum speed, idle speed and anti-stall screw.
A 2.5 mm (0.098 in) shim is installed on the advance device spring side plug; no other shims are required.

Test No.	Lever position	Speed	Advance	Transfer pressure	Injector delivery	Spread	Back leakage
		rpm	degrees	bar (kg/cm²)	cm³/200 shots	cm³/200 shots	cm³/100 shots
1 (¹)	max	200	—	—	—	—	—
2 (²)		1000	—	—	—	—	—
3		100	—	≥ 0.4	—	—	—
4 (+)		850	—	—	—	—	—
5 (³)-6		900	3	4.2 to 5.2	—	—	—
7 (⁴)		1250	4.8 to 5.3	—	—	—	—
8 - 9		750	—	—	8.9 to 9.1 (●)	≤ 0.8	40 to 80 (○)
10 (⁵)		1250	—	—	—	—	—
11 (⁶)		1420	—	—	1.5 ÷ 2	—	—
12 (⁷)		1250	—	—	—	—	—
13 (⁸)		350	—	—	≤ 12	—	—
14 (⁹)		250	0	—	≥ 16	—	—
15 (¹⁰)	min	850	—	—	—	—	—
16 (¹¹)		325	—	—	2 to 2.5	—	—
17 (¹²)		325	—	—	≤ 0.8	—	—
18 (¹³)		325	—	—	≤ 0.5	—	—
19 (¹⁴)		—	—	—	—	—	—

¹) Delivery to all injectors.

²) Run pump for 3'.

³) Set pressure adjusting screw for specified advance and check that pressure is as specified.

⁴) Stop test machine, disconnect transfer pressure gauge and install shut-off device. Activate shut-off device and start test machine.

⁵) Record average delivery.

⁶) Adjust max speed screw and block in position.

⁷) Delivery shall not be less than in test 10 by more than 0.4 cm³/200 shots.

⁸) Prior to test, bring machine speed to 100 revs and stop machine. Fully tighten valve adjusting screw, start machine and slacken screw until reaching specified values.

⁹) Prior to test, bring machine speed to 100 revs, stop and restart machine.

¹⁰) Adjust anti-stall screw for a delivery of 2 to 3 cm³/2000 shots. Block screw in position.

¹¹) Adjust idling speed screw.

¹²) Shut-off lever closed.

¹³) With shut-off device deactivated and shut-off lever open, wait 5" before performing test.

¹⁴) Connect delivery fitting "U" to injector tester and maintain 54 bar (757 psi) pressure. Using timing tool, bring about hydraulic lockup, then position pump timing plate at + 14°.

(●) Take reading after 15". (○) Flow 300 to 600 cm³/minute.

(+) Pump body pressure as measured with gauge connected at vent screw hole shall be 0.1 to 0.3 bar (0.1 to 0.3 kg/cm² or 1.4 to 4.2 psi).

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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page 13

MODEL 60-90 - CALIBRATION DATA BOSCH INJECTION PUMP TYPE VE 3/11 F 1250 L 163-1-4794586 - (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-2-3
Plunger lift to spill cut-off 0.2 ± 0.02 mm (0.008 ± 0.0008 in)
Plunger lift, pump timing on engine 1 mm (.039 in)
Pump timing $6^\circ \pm 1^\circ$ B.T.D.C., cylinder No. 1 in compression stroke
Delivery connection of cylinder No. 1: Marked with letter A.

TEST PLAN

Test machine complying with ISO 4008.
Injectors complying with ISO 4010: 1688901020 with pad 1680 103 096.
Release pressure 172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Fuel pressure 0.2 bar (0.2 kg/cm², 2.8 psi).
Lines (as per ISO 4093.2) 6x2x840 mm.
Graduate drain time 30".
Test fluid ISO 4113 at $40^\circ \pm 2^\circ$ C.

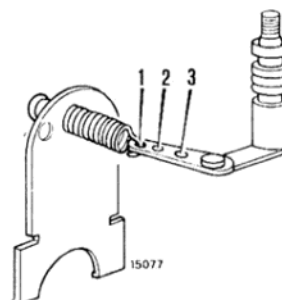
ADJUSTMENT VALUES								
Operation description		Advance piston stroke	Fuel pressure	Delivery	Transfer pressure bar	Spread		
	rpm	mm	bar (kg/cm ²)	cm ³ /1000 shorts	(kg/cm ²)	cm ³ /1000 shots		
Full load delivery	800	2.3 to 2.7	3.4 to 4.0	72 to 73	0.2	3.5		
Idle speed limit	350	—	—	19 to 23	0.2	3		
Starting delivery	150	—	—	100 to 120	0.2	—		
Full throttle limit	1350	—	—	41 to 47	0.2	—		
TEST VALUES								
Advance device check			Fuel pressure check		bar (kg/cm ²)	Back leakage		cm ³ /100 shots
	rpm	mm		rpm			rpm	
	600	0.2 to 0.8		600			2.4 to 3.0	
	800	2.3 to 2.7		800			3.4 to 4.0	
	1200	6.1 to 6.9		1200	5.7 to 6.5			
DELIVERY CHECK								
Full throttle stop		Delivery	Transfer pressure	Idle speed shut-off		Delivery	Transfer pressure	
	rpm	cm ³ /1000 shots	bar (kg/cm ²)		rpm	cm ³ /1000 shots	bar (kg/cm ²)	
	1400 to 1460	0	0.2					
	1350	41 to 47	0.2		475	≤2	0.2	
	1250	69.5 to 72.5	0.2		350	19 to 23	0.2	
	800	72 to 73	0.2					
	500	62.5 to 65.5	0.2					

ENGINE: Specification and Data

MODEL 60-90 - CALIBRATION DATA C.A.V. INJECTION PUMP TYPE DPS 8522A 000A - 4797413 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-2-3
Governor control stud to metering valve lever pin
41 to 42 mm (1.61 to 1.65 in)
Pump timing
0° ± 1° B.T.D.C., cylinder No. 1 in compression stroke
Flange guide dia 50 mm (1.96 in)
Delivery connection of cylinder No. 1: Marked with letter **U**.



Control spring hole 2.

Test machine complying with ISO 4008.
Injectors complying with ISO 4010.
Test fluid: ISP 4113 at 40° ± 2°C
Fuel pressure: 0.1 bar (0.1 kg/cm² or 1.4 psi).
Graduate drain time 30".
Release pressure: 172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Lines: 6x2x845 mm (ISO 4093.2).
Adjust maximum speed screw to protrude 9.5 mm (0.92 in) from surface of associated nut.

Fully slacken fuel pressure adjusting screw, then tighten through 3 1/2 turns.
Position valve adjusting screw so that it is just beneath the surface of the associated nut.
Fully slacken maximum speed, idle speed and anti-stall screw.
A 2.5 mm (0.098 in) shim is installed on the advance device spring side plug; no other shims are required.

Test No.	Lever position	Speed rpm	Advance degrees	Transfer pressure bar (kg/cm²)	Injector delivery	Spread	Back leakage
					cm³/200 shots	cm³/200 shots	cm³/100 shots
1 (¹)	max	200	—	—	—	—	—
2 (²)		1000	—	—	—	—	—
3		100	—	≥ 0.4	—	—	—
4 (+)		850	—	—	—	—	—
5(³)-6		850	5.5	3.8 to 4.8	—	—	—
7 (⁴)		1250	10.3 to 10.5	—	—	—	—
8 - 9		750	—	—	8.9 to 9.1 (●)	≤ 0.8	40 to 80 (○)
10 (⁵)		1250	—	—	—	—	—
11 (⁶)		1420	—	—	1.5 ÷ 2	—	—
12 (⁷)		1250	—	—	—	—	—
13 (⁸)		300	1.8 to 2.8	—	—	—	—
14 (⁹)		250	0	—	≥ 16	—	—
15 (¹⁰)		850	—	—	—	—	—
16 (¹¹)	min	325	—	—	2 to 2.5	—	—
17 (¹²)		325	—	—	≤ 0.8	—	—
18 (¹³)		325	—	—	≤ 0.5	—	—
19 (¹⁴)		—	—	—	—	—	—

¹) Delivery to all injectors.

²) Run pump for 3'.

³) Set pressure adjusting screw for specified advance and check that pressure is as specified.

⁴) Stop test machine, disconnect transfer pressure gauge and install shut-off device. Activate shut-off device and start test machine.

⁵) Record average delivery.

⁶) Adjust max. speed screw and block in position.

⁷) Delivery shall not be less than in test 10 by more than 0.4 cm³/200 shots.

⁸) Prior to test, bring machine speed to 100 revs and slacken screw until reaching specified values.

⁹) Prior to test, bring machine speed to 100 revs, stop and restart machine.

¹⁰) Adjust anti-stall screw for a delivery of 2 to 3 cm³/2000 shots. Block screw in position.

¹¹) Adjust idling speed screw.

¹²) Shut-off lever closed.

¹³) With shut-off deactivated and shut-off lever open, wait 5" before performing test.

¹⁴) Connect delivery fitting "U" to injector tester and maintain 54 bar (757 psi) pressure. Using timing tool, bring about hydraulic lockup, then position pump timing plate at + 12.5°.

(●) Take reading after 15". (○) Flow 300 to 600 cm³/minute.

(+) Pump body pressure as measured with gauge connected at vent screw hole shall be 0.1 to 0.3 bar (0.1 to 0.3 kg/cm² or 1.4 to 4.2 psi).

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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MODEL 70-90 - CALIBRATION DATA BOSCH INJECTION PUMP TYPE VE 4/11F 1250 L 164-1-4794589 - (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-2-3-4
Plunger lift to spill cut-off
0.2 ± 0.02 mm (0.008 ± 0.0008 in)
Plunger lift, pump timing on engine 1 mm (.039 in)
Pump timing 4° ± 1° B.T.D.C., cylinder No. 1 in compression stroke
Delivery connection of cylinder
No. 1: Marked with letter A.

TEST PLAN

Test machine complying with ISO 4008.
Injectors complying with ISO 4010: 1688901020 with pad 1680 103 096.
Release pressure
172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Fuel pressure 0.2 bar (kg/cm², 2.8 psi).
Lines (as per ISO 4093.2) 6x2x840 mm.
Graduate drain time 30".
Test fluid ISO 4113 at 40° ± 2°C.

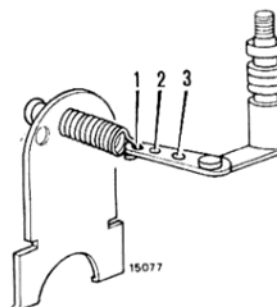
ADJUSTMENT VALUES								
Operation description		Advance piston stroke	Fuel pressure	Delivery	Transfer pressure bar	Spread		
	rpm	mm	bar (kg/cm²)	cm³/1000 shots	(kg/cm²)	cm³/1000 shots		
Full load delivery	800	2.0 to 2.4	3.8 to 4.4	67 to 68	0.2	3.5		
Idle speed limit	350	—	—	21 to 25	0.2	3		
Starting delivery	150	—	—	100 to 120	0.2	—		
Full throttle limit	1350	—	—	30 to 36	0.2	—		
TEST VALUES								
Advance device check			Fuel pressure check		Back leakage			
	rpm	mm		rpm		bar (kg/cm²)	rpm	cm³/100 shots
	600	0 to 0.6		600		2.9 to 3.5		
	800	2.0 to 2.4		800		3.8 to 4.4		
	1200	5.3 to 6.1		1250	6.0 to 6.6			
DELIVERY CHECK								
Full throttle stop		Delivery	Transfer pressure	Idle speed shut-off		Delivery	Transfer pressure	
	rpm	cm³/1000 shots	bar (kg/cm²)		rpm	cm³/1000 shots	bar (kg/cm²)	
	1400 to 1460	0	0.2					
	1350	30 to 36	0.2		475	≤ 2	0.2	
	1250	60 to 63	0.2		425	4 to 10	0.2	
	800	67 to 68	0.2		350	21 to 25	0.2	
	250	≤ 60	0.2					

ENGINE: Specification and Data

MODEL 70-90 - CALIBRATION DATA C.A.V. INJECTION PUMP TYPE DPS 8520A 100A - 4797416 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-2-4-3
Governor control stud to metering valve lever pin
41 to 42 mm (1.61 to 1.65 in)
Pump timing
0° ± 1° B.T.D.C., cylinder No. 1 in compression stroke
Flange guide dia 50 mm (1.96 in)
Delivery connection of cylinder No. 1: Marked with letter U.



Control spring hole 2.

Test machine complying with ISO 4008.
Injectors complying with ISO 4010.
Test fluid: ISO 4113 at 40° ± 2°C
Fuel pressure: 0.1 bar (0.1 kg/cm² or 1.4 psi).
Graduate drain time 30".
Release pressure: 172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Lines: 6x2x845 mm (ISO 4093.2).
Adjust maximum speed screw to protrude 9.5 mm (0.92 in) from surface of associated nut.

Fully slacken fuel pressure adjusting screw, then tighten through 3 1/2 turns.
Position valve adjusting screw so that it is just beneath the surface of the associated nut.
Fully slacken maximum speed, idle speed and anti-stall screw.
A 3 mm (0.118 in) shim is installed on the advance device spring side plug; no other shims are required.

Test No.	Lever position	Speed	Advance	Transfer pressure	Injector delivery	Spread	Back leakage
		rpm	degrees	bar (kg/cm²)	cm³/200 shots	cm³/200 shots	cm³/100 shots
1 (¹)	max	200	—	—	—	—	—
2 (²)		1000	—	—	—	—	—
3		100	—	≥ 0.4	—	—	—
4 (³)-5		950	4.5	4.2 ÷ 5.4	—	—	—
6 (⁴)		1250	6.8 ÷ 7.8	—	—	—	—
7-8		750	—	—	9.1 ÷ 9.3 (●)	≤ 0.8	40 ÷ 80 (○)
9 (⁵)		1250	—	—	—	—	—
10 (⁶)		1420	—	—	1.5 ÷ 2	—	—
11 (⁷)		1250	—	—	—	—	—
12 (⁸)		300	1.8 ÷ 2.8	—	—	—	—
13 (⁹)		250	0	—	≥ 16	—	—
14 (¹⁰)		850	—	—	—	—	—
15 (¹¹)	min	350	—	—	2 to 2.5	—	—
16 (¹²)		350	—	—	≤ 0.8	—	—
17 (¹³)		350	—	—	≤ 0.5	—	—
18 (¹⁴)		—	—	—	—	—	—

¹) Delivery to all injectors.

²) Run pump for 3'.

³) Set pressure adjusting screw for specified advance and check that pressure is as specified.

⁴) Stop test machine, disconnect transfer pressure gauge and install shut-off device. Activate shut-off device and start test machine.

⁵) Record average delivery.

⁶) Adjust max. speed screw and block in position.

⁷) Delivery shall not be less than in test 9 by more than 0.4 cm³/200 shots.

⁸) Prior to test, bring machine speed to 100 revs and stop machine. Fully tighten valve adjusting screw, start machine and slacken screw until reaching specified values.

⁹) Prior to test, bring machine speed to 100 revs, stop and restart machine.

¹⁰) Adjust anti-stall screw for a delivery of 2 to 3 cm³/2000 shots. Block screw in position.

¹¹) Adjust idling speed screw.

¹²) Shut-off lever closed.

¹³) With shut-off device deactivated and shut-off lever open, wait 5" before performing test.

¹⁴) Connect delivery fitting "U" to injector tester and maintain 54 bar (757 psi) pressure. Using timing tool, bring about hydraulic lockup, then position pump timing plate at + 8.5°.

(●) Take reading after 15". (○) Flow 300 to 600 cm³/minute.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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MODEL 80-90 - CALIBRATION DATA BOSCH INJECTION PUMP TYPE 4/11F 1250 L 164-4794588 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-3-4-2
Plunger lift to spill cut-off 0.2 ± 0.02 mm (0.008 ± 0.0008 in)
Plunger lift, pump timing on engine 1 mm (.039 in).
Pump timing $4^\circ \pm 1^\circ$ B.T.D.C., cylinder No. 1 in compression stroke
Delivery connection of cylinder No. 1: Marked with letter **A**.

TEST PLAN

Test machine complying with ISO 4008.
Injectors complying with ISO 4010: 1688901020 with pad 1680 103 096.
Release pressure 172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Fuel pressure: 0.2 bar (kg/cm² 2.8 psi).
Lines (as per ISO 4093.2) 6x2x840 mm.
Graduate drain time 30".
Test fluid ISO 4113 AT 40⁰ $\pm$ 2⁰C.

ADJUSTMENT VALUES						
Operation description		Advance piston stroke	Fuel pressure	Delivery	Transfer pressure bar	Spread
	rpm	mm	bar (kg/cm²)	cm³/1000 shots	(kg/cm²)	cm³/1000 shots
Full load delivery	800	3.8 to 4.2	3.8 to 4.4	71.5 to 72.5	0.2	3.5
Idle speed limit	350	—	—	21 to 25	0.2	3
Starting delivery	150	—	—	100 to 120	0.2	—
Full throttle limit	1350	—	—	32 to 38	0.2	—

TEST VALUES								
Advance device check			Fuel pressure check			Back leakage		
	rpm	mm		rpm	bar (kg/cm²)		rpm	cm³/100 shots
	500	1.3 to 2.0		500	2.3 to 2.9			
	800	3.8 to 4.2	800	3.8 to 4.4				
	1250	7.6 to 8.4	1250	5.7 to 6.3				

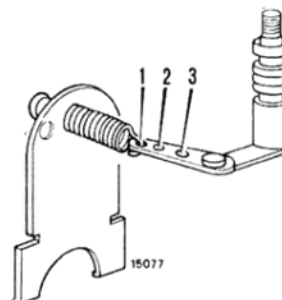
DELIVERY CHECK							
Full throttle stop		Delivery	Transfer pressure	Idle speed shut-off		Delivery	Transfer pressure
	rpm	cm³/1000 shots	bar (kg/cm²)		rpm	cm³/1000 shots	bar (kg/cm²)
	1400 to 1460	0	0.2		475	≤ 2	0.2
	1350	32 to 38	0.2		425	4 to 10	0.2
	1250	63.5 to 66.5	0.2		350	21 to 25	0.2
	800	71.5 to 72.5	0.2				
	250	≤ 65	0.2				

ENGINE: Specification and Data

MODEL 80-90 - CALIBRATION DATA C.A.V. INJECTION PUMP TYPE DPS 8520 A 090A - 4797415 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) Anti-clockwise
Firing order 1-3-4-2
Governor control stud to metering valve lever pin
41 to 42 mm (1.61 to 1.65 in)
Pump timing
0° ± 1° B.T.D.C., cylinder No. 1 in compression stroke
Flange guide dia 50 mm (1.96 in)
Delivery connection of cylinder No. 1: Marked with letter **U**.



TEST CONDITIONS

Test machine complying with ISO 4008.
Injectors complying with ISO 4010.
Test fluid: ISO 4113 at 40° ± 2°C
Fuel pressure: 0.1 bar (0.1 kg/cm² or 1.4 psi).
Graduate drain time 30".
Release pressure: 172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Lines: 6x2x845 mm (ISO 4093.2).
Adjust maximum speed screw to protrude 10.5 mm (0.92 in) from surface of associated nut.

Control spring hole 2.

Fully slacken fuel pressure adjusting screw, then tighten through 3 1/2 turns.
Position valve adjusting screw so that it is just beneath the surface of the associated nut.
Fully slacken maximum speed, idle speed and anti-stall screw.
A 2.5 mm (0.098 in) shim is installed on the advance device spring side plug; no other shims are required.

Test No.	Lever position	Speed	Advance	Transfer pressure	Injector delivery	Spread	Back leakage
		rpm	degrees	bar (kg/cm²)	cm³/200 shots	cm³/200 shots	cm³/100 shots
1 (1)	max	200	—	—	—	—	—
2 (2)		1000	—	—	—	—	—
3		100	—	—	—	—	—
4 (3)-5		950	5.5	4.2 to 5.4	—	—	—
6 (4)		1250	7.8 to 8.8	—	—	—	—
7-8		750	—	—	10.3 to 10.5 (●)	≤ 0.8	40 to 80 (○)
9 (5)		1250	—	—	—	—	—
10 (6)		1420	—	—	1.5 to 2	—	—
11 (7)		1250	—	—	—	—	—
12 (8)		300	0.8 to 1.3	—	—	—	—
13 (9)		250	0	—	≥ 16	—	—
14 (10)		850	—	—	—	—	—
15 (11)	min	350	—	—	2 to 2.5	—	—
16 (12)		350	—	—	≤ 0.8	—	—
17 (13)		350	—	—	≤ 0.5	—	—
18 (14)		—	—	—	—	—	—

1) Delivery to all injectors.

2) Run pump for 3'.

3) Set pressure adjusting screw for specified advance and check that pressure is as specified.

4) Stop test machine, disconnect transfer pressure gauge and install shut-off device. Activate shut-off device and start test machine.

5) Record average delivery.

6) Adjust max speed screw and block in position.

7) Delivery shall not be less than in test 9 by more than 0.4 cm³/200 shots.

8) Prior to test, bring machine speed to 100 revs and stop machine. Fully tighten valve adjusting screw, start machine and slacken screw until reaching specified values.

9) Prior to test, bring machine speed to 100 revs, stop and restart machine.

10) Adjust anti-stall screw for a delivery of 2 to 3 cm³/2000 shots. Block screw in position.

11) Adjust idling speed screw.

12) Shut-off lever closed.

13) With shut-off device deactivated and shut-off lever open, wait 5" before performing test.

14) Connect delivery fitting "U" to injector tester and maintain 54 bar (757 psi) pressure. Using timing tool, bring about hydraulic lockup, then position pump timing plate at + 8.5°.

(●) Take reading after 15". (○) Flow 300 to 600 cm³/minute.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Specification and Data

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MODEL 90-90 - CALIBRATION DATA BOSCH INJECTION PUMP TYPE VE 5/11F 1250 R 165 - 4794590 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) clockwise
Firing order 1-2-4-5-3
Plunger lift to spill cut-off
0.2 ± 0.02 mm (0.008 ± 0.0008 in)
Plunger lift, pump timing on engine 1 mm (039 in).
Pump timing
6° ± 1° B.T.D.C., cylinder No. 1 in compression stroke
Delivery connection of cylinder No. 1: Marked with letter **A**.

TEST PLAN

Test machine complying with ISO 4008.
Injectors complying with ISO 4010: 1688901020 with pad 1680 103 096.
Release pressure
172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
Fuel pressure: 0.2 bar (0.2 kg/cm² 2.8 psi).
Lines (as per ISO 4093.2) 6x2x840 mm.
Graduate drain time 30".
Test fluid ISO 4113 AT 45° ± 1°C.

ADJUSTMENT VALUES							
Operation description	rpm	Advance piston stroke mm	Fuel pressure bar (kg/cm²)	Delivery cm³/1000 shots	Transfer pressure bar (kg/cm²)	Spread cm³/1000 shots	
Full load delivery	800	2.5 to 2.9	3.8 to 4.4	70 to 71	0.2	3.5	
Idle speed limit	350	—	—	8 to 14	0.2	3	
Starting delivery	150	—	—	100 to 120	0.2	—	
Full throttle limit	1360	—	—	42,5 to 49,5	0.2	—	
TEST VALUES							
Advance device check	rpm	mm	Fuel pressure check	rpm	bar (kg/cm²)	Back leakage	rpm
	600	0.6 to 1.4		400	2.0 to 2.6		
	800	2.5 to 2.9		800	3.8 to 4.4		
	1200	6.0 to 6.8		1200	5.6 to 6.2		
DELIVERY CHECK							
Full throttle stop	rpm	Delivery cm³/1000 shots	Transfer pressure bar (kg/cm²)	Idle speed shut-off	rpm	Delivery cm³/1000 mandate	Transfer pressure bar (kg/cm²)
	1400	16.5 to 22.5	0.2		400	< 2	0.2
	1450	< 2	0.2		350	8 to 14	0.2
	1360	42.5 to 49.5	0.2		300	16 to 20	0.2
	1250	63.5 to 66.5	0.2				
	800	70 to 71	0.2				
	500	63 to 66	0.2				
	250	< 60	0.2				

ENGINE: Specification and Data

MODEL 100-90 - CALIBRATION DATA BOSCH INJECTION PUMP TYPE VE 6/11F 1250 R 181 - 4798834 (Provisional data)

ASSEMBLY DATA

Pump rotation (drive side) clockwise
 Firing order 1-5-3-6-2-4
 Plunger lift to spill cut-off mm 0
 Plunger lift, pump timing on engine 1 mm (.039 in)
 Pump timing $4^{\circ} \pm 1^{\circ}$ B.T.D.C., cylinder No. 1 in compression stroke
 Delivery connection of cylinder
 No. 1: Marked with letter **A**.

TEST PLAN

Test machine complying with ISO 4008.
 Injectors complying with ISO 4010: 1688901020 with pad 1680 103 096.
 Release pressure
 172 to 175 bar (175 to 178 kg/cm² or 2483 to 2492 psi).
 Fuel pressure 0.2 bar (0.2 kg/cm², 2.8 psi).
 Lines (as per ISO 4093.2) 6x2x840 mm.
 Graduate drain time 30".
 Test fluid ISO 4113 at $45^{\circ} \pm 1^{\circ}\text{C}$.

ADJUSTMENT VALUES									
Operation description		Advance piston stroke	Fuel pressure	Delivery	Transfer pressure bar	Spread			
	rpm	mm	bar (kg/cm ²)	cm ³ /1000 shots	(kg/cm ²)	cm ³ /1000 shots			
Full load delivery	800	2.6 to 3.0	4.4 to 5.0	62.5 to 63.5	0.2	3.5			
Idle speed limit	350	—	—	13 to 17	0.2	3			
Starting delivery	150	—	—	100 to 120	0.2	—			
Full throttle limit	1350	—	—	33 to 39	0.2	—			
TEST VALUES									
Advance device check			Fuel pressure check		bar (kg/cm ²)	Back leakage		rpm	cm ³ /100 shots
	rpm	mm		rpm					
	600	0.8 to 1.4		500			3.1 to 3.7		
	800	2.6 to 3.0		800			4.4 to 5.0		
	1200	5.4 to 6.2		1250	6.3 to 6.9				
DELIVERY CHECK									
Full throttle stop		Delivery	Transfer pressure	Idle speed shut-off		Delivery	Transfer pressure		
	rpm	cm ³ /1000 shots	bar (kg/cm ²)		rpm	cm ³ /1000 shots	bar (kg/cm ²)		
	1400	5.2 to 5.8	0.2		450	< 1.5	0.2		
	1450	< 2	0.2						
	1350	33 to 39	0.2						
	1250	52.5 to 55.5	0.2						
	800	62.5 to 63.5	0.2						
	500	57.5 to 60.5	0.2						
	250	< 60	0.2						
			400	4.5 to 10.5				0.2	
			350	13 to 17	0.2				

55-90 60-90
70-90 80-90
90-90 100-90

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ANGULAR TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread size	Pre-torque			Angle
		Nm	kg-m	ft. lb	
Cap screw, cylinder head (C ₁ , pages 23, 24, 25 and 26) (*)	M12 × 1.25	60	6.1	44	90° + 90°
Cap screw, main bearing caps (C ₂) (*)	M14 × 1.5	80	8.2	59	90°
Cap screw, con rod caps (C ₃) (*)	M11 × 1.5	40	4.1	29	60°
Cap screw, flywheel (C ₄) (*)	M12 × 1.25	40	4.1	29	60°

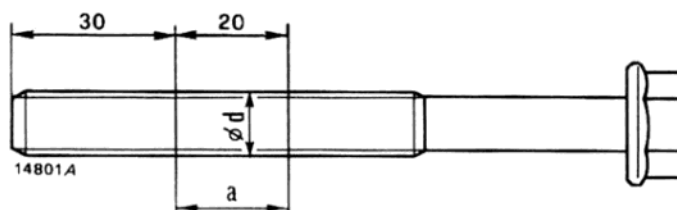
(*) Where screws are to be re-used, see drawings and notes, page 22.

TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread size	Tightening torque		
		Nm	kg-m	ft. lb
Cap screw, rocker bracket (C ₅ , pages 23, 24, 25 and 26)	M8 × 1.25	24	2.5	18
Nut, crankshaft pulley hub (C ₆)	M30 × 1.5	294	30	217
Capscrew, balancer flyweights (70-90 and 80-90)	M12 × 1.25	110	11.2	8.11

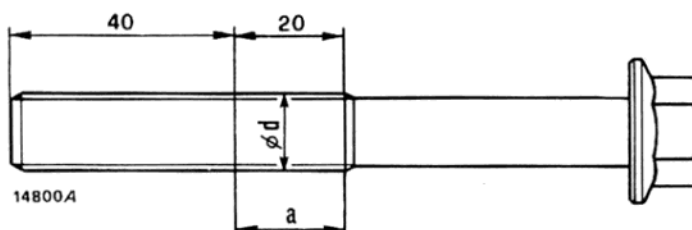
ENGINE: Specification and Data

FASTENER INSPECTION: CYLINDER HEAD, MAIN BEARING CAP, CONNECTING ROD CAP AND FLYWHEEL CAPSCREWS (Dimensions in mm).



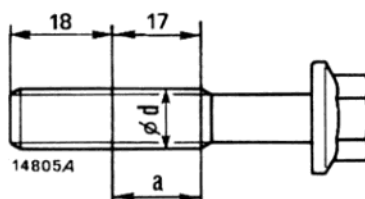
Cylinder head cap screw (C₁, pages 23, 24, 25 and 26)

Before re-using screws, check that diameter d (measured as shown above, zone a) exceeds 11.5 mm or 0.4527 in. If not, scrap screw.



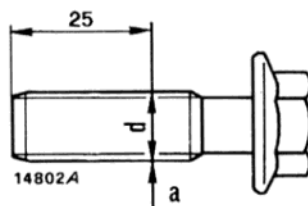
Main bearing cap cap screw (C₂, pages 23, 24, 25 and 26)

Before re-using, screws, check that diameter d (measured as shown above, zone a) exceeds 13.5 mm or 0.5315 in. If not, scrap screw.



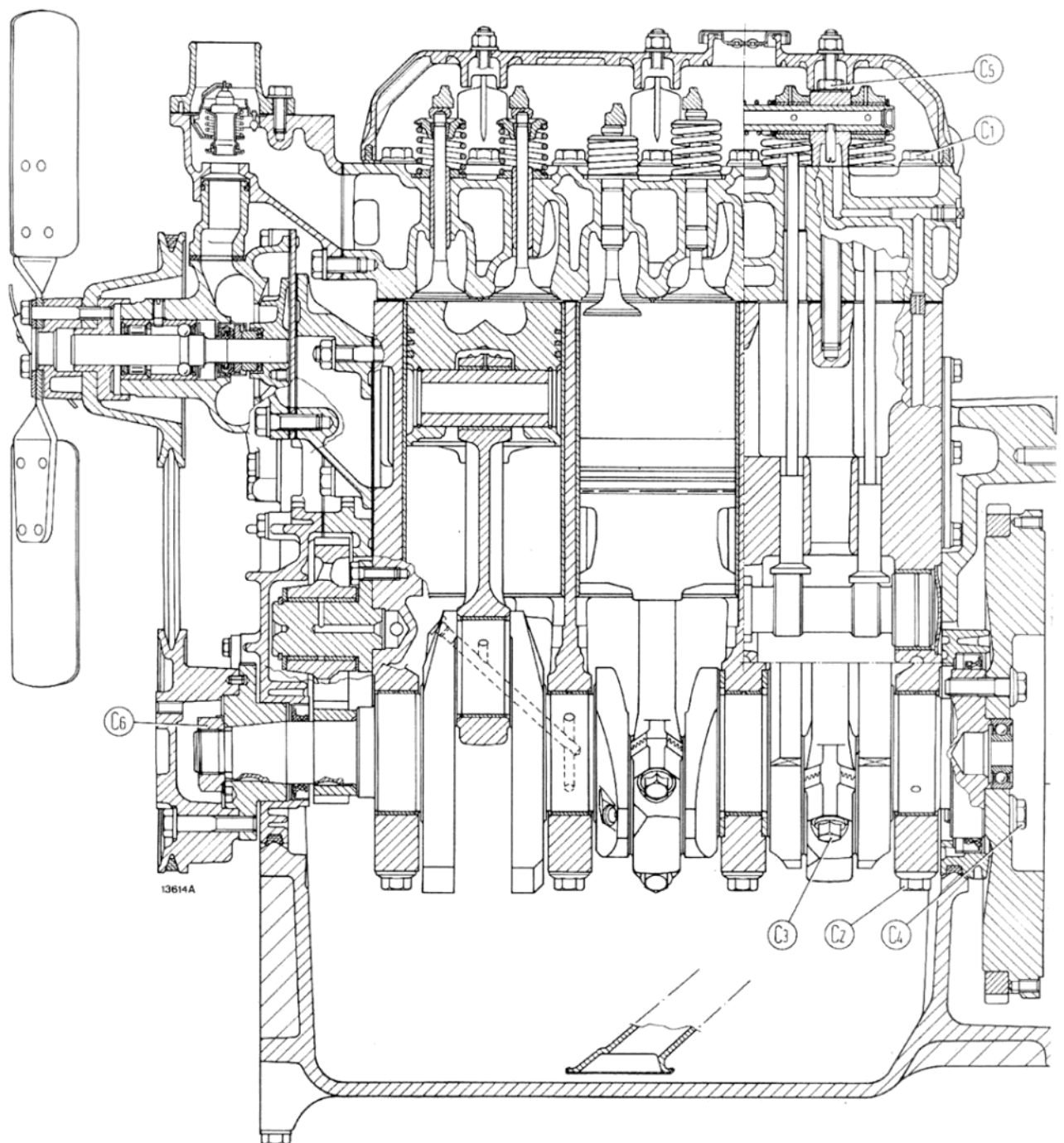
Connecting rod cap cap screw (C₃, pages 23, 24, 25 and 26)

Before re-using screws, check that diameter d (measured as shown above, zone a) exceeds 10.5 mm or 0.4134 in. If not, scrap screw.



Flywheel cap screw (C₄, pages 23, 24, 25 and 26)

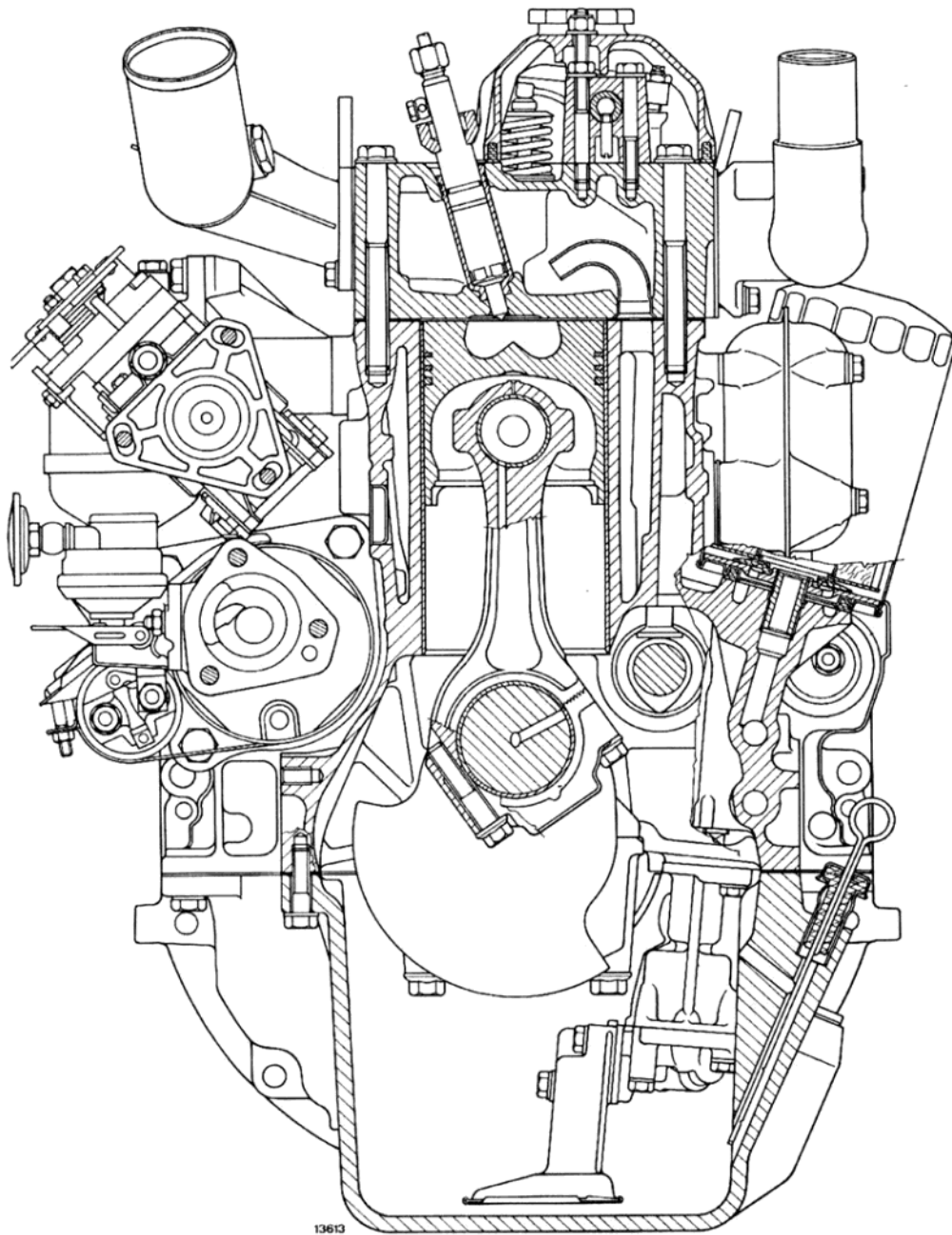
Before re-using screws, check that diameter d (measured as shown above, zone a) exceeds 11.5 mm or 0.4527 in. If not, scrap screw.



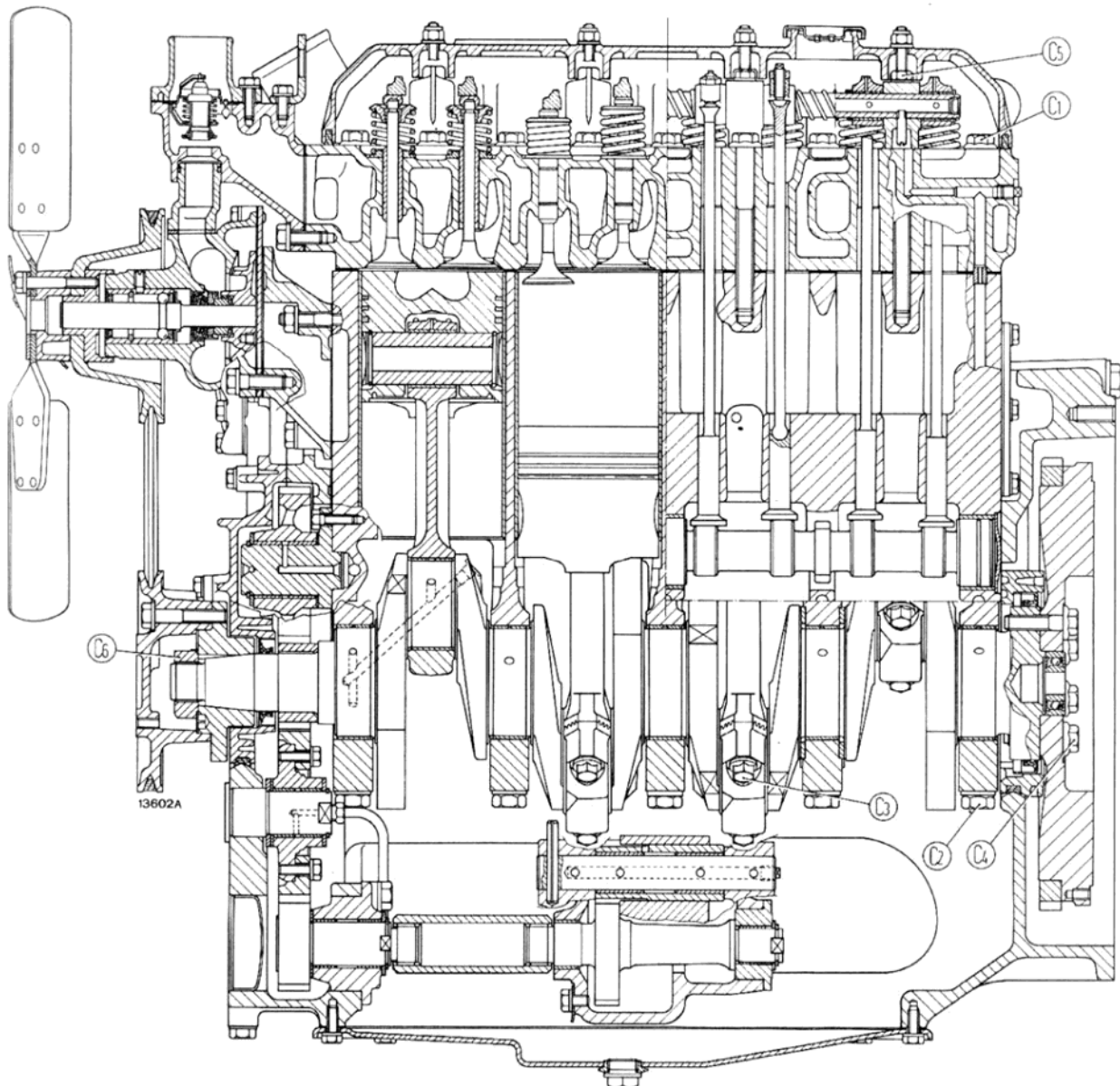
Longitudinal and cross sections through

Fiat Trattori

Print No. 603.54.241.00 - III - 1986

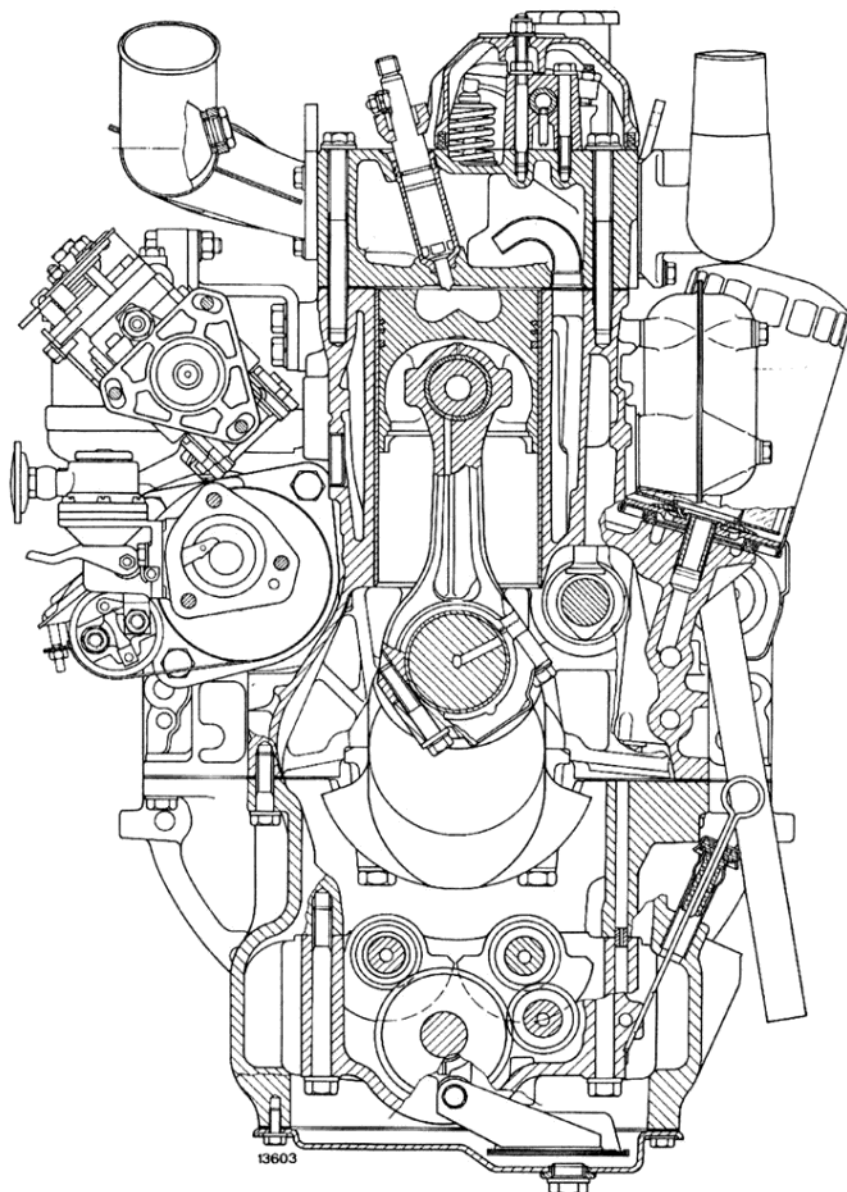


10 and 60-90 engines



Longitudinal and cross sections through 70-90 and 80-90

ENGINE: Sections

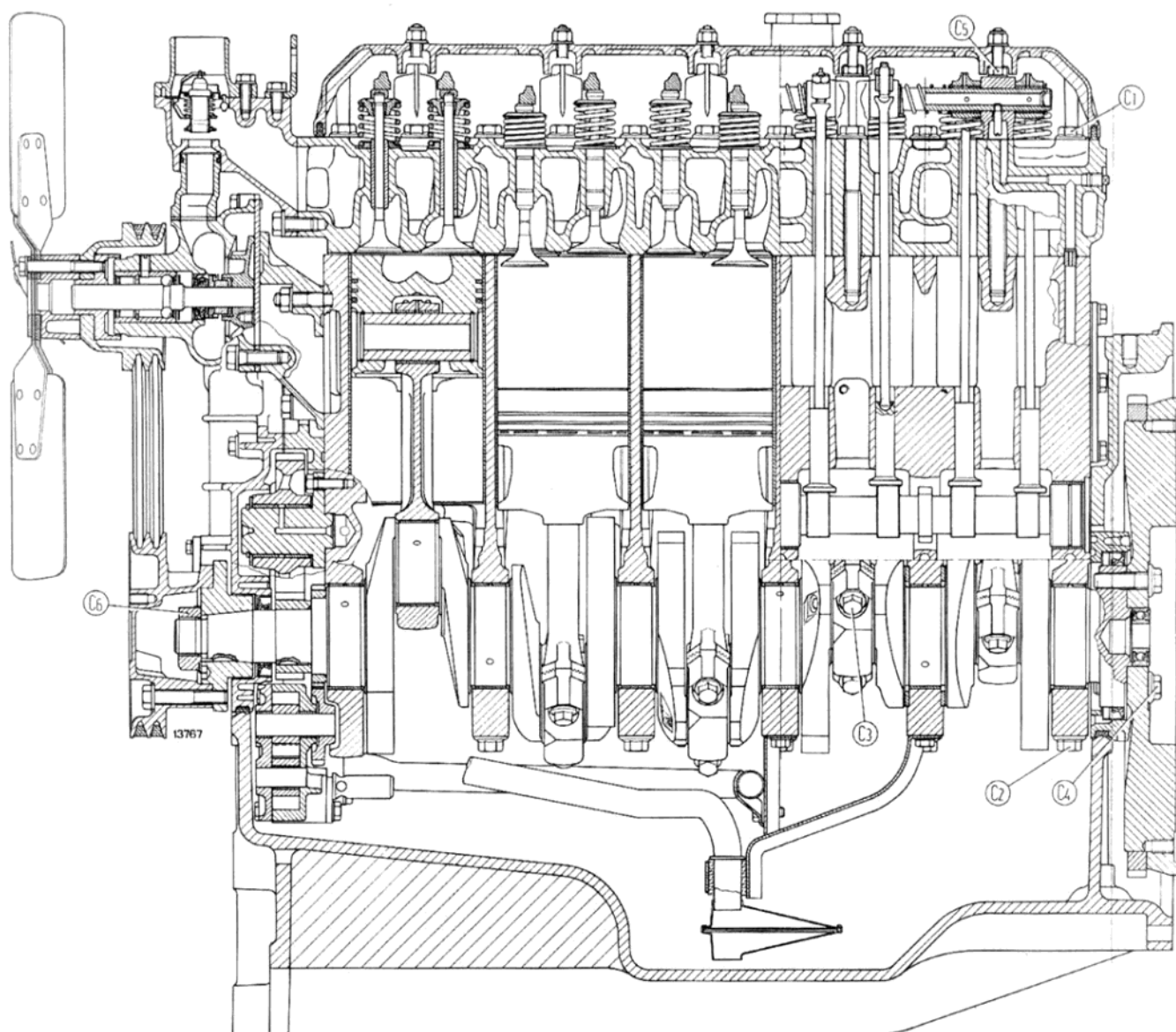


55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Sections

10

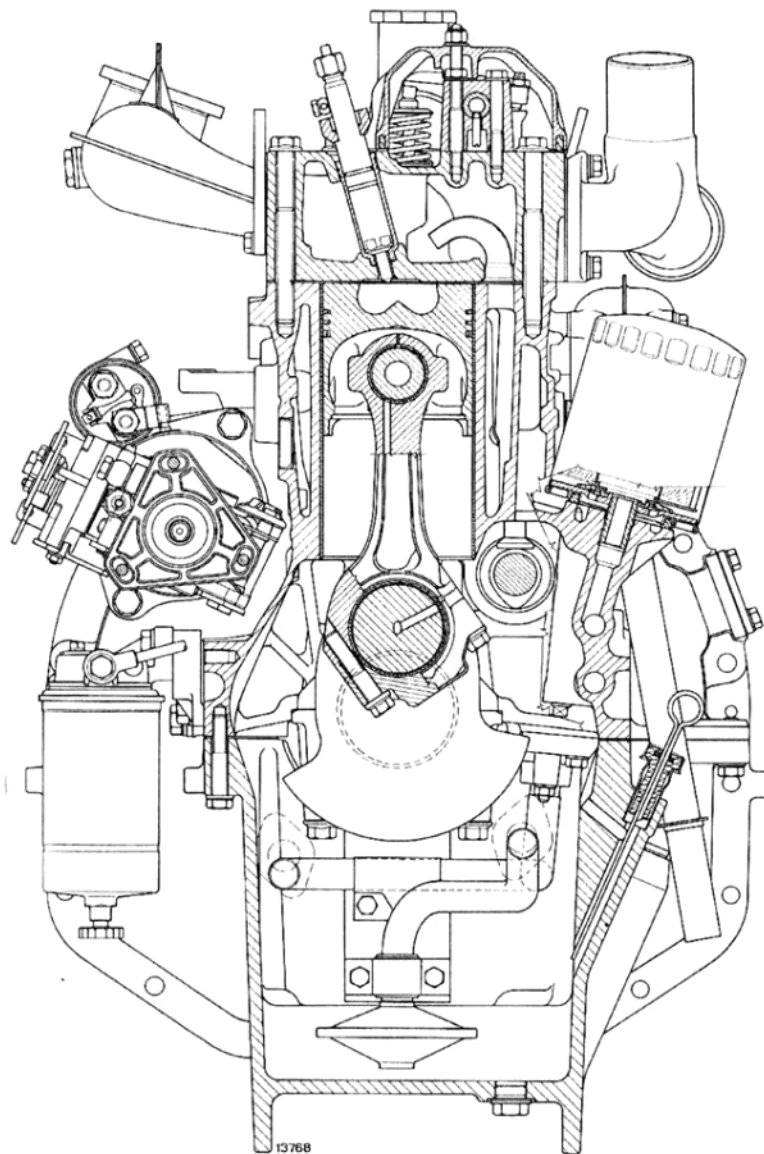
page 25



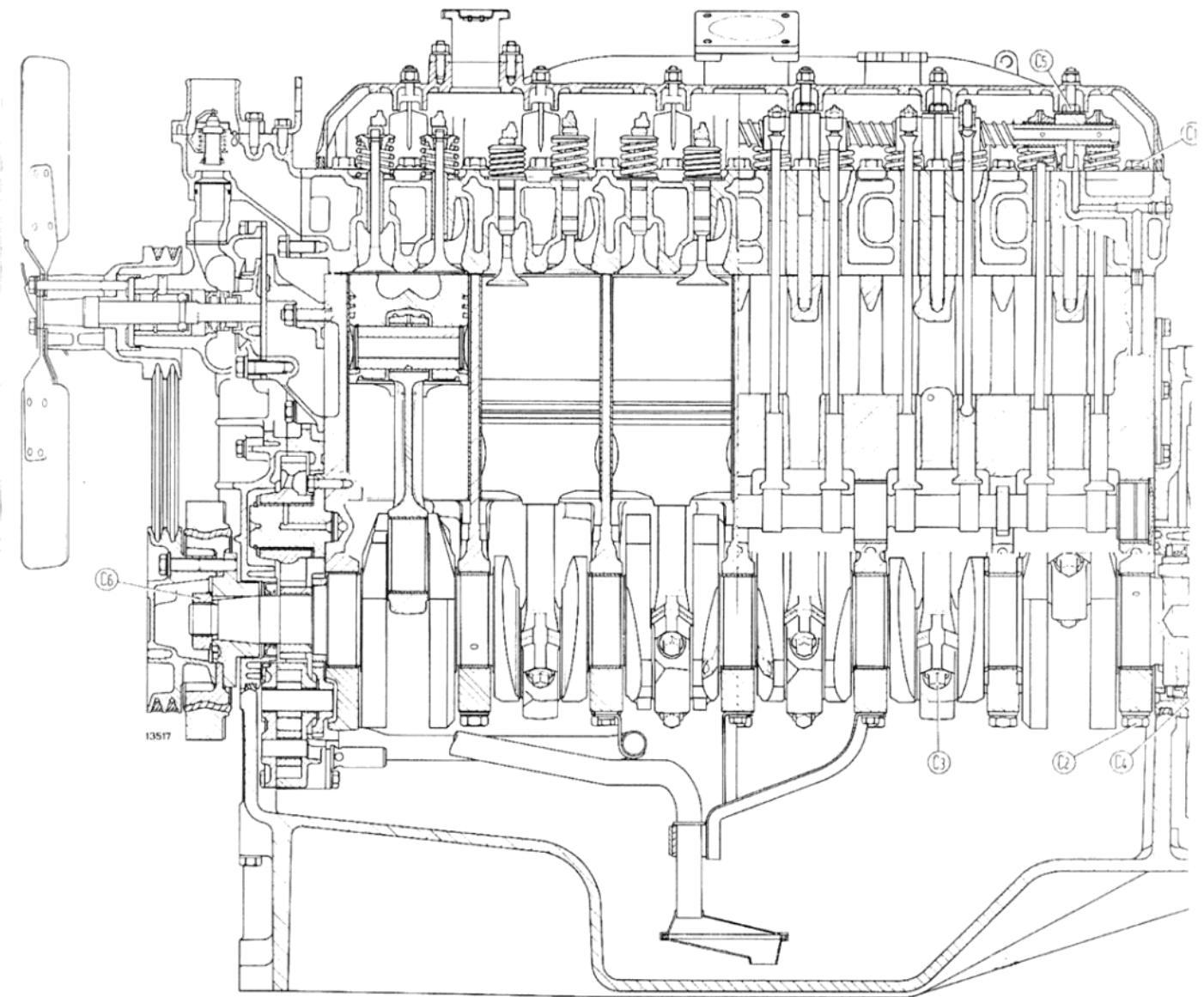
Longitudinal and cross sections

Fiat Trattori

Print No. 603.54.241.00 - III - 1986



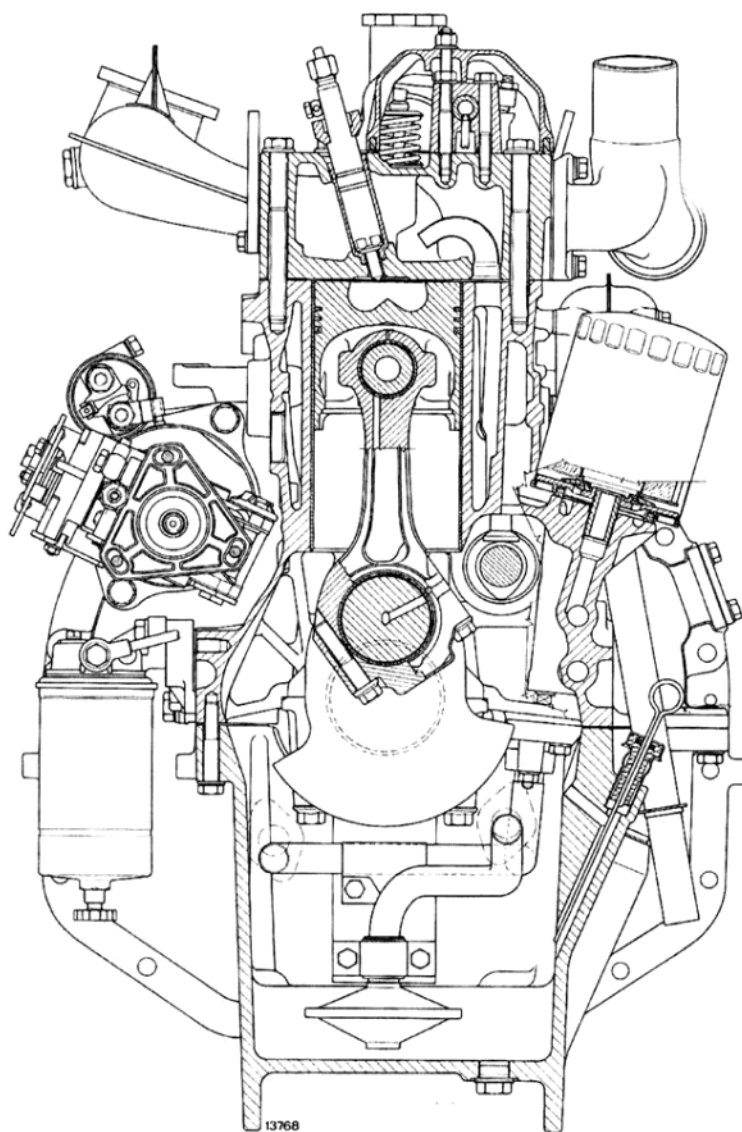
through 90-90 engine.



Longitudinal and cross sections through 100-90

Print No. 603.54.2

ENGINE: Sections

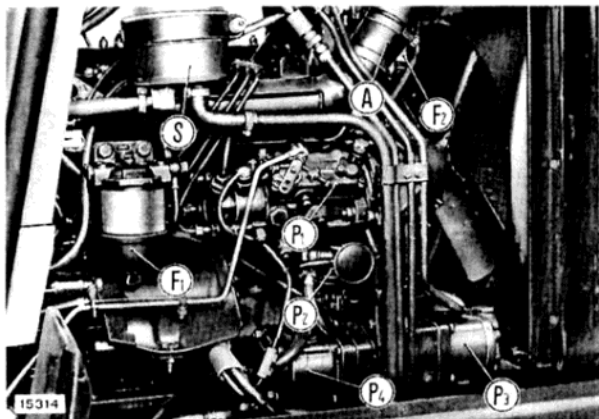


55-90 60-90
70-90 80-90
90-90 100-90

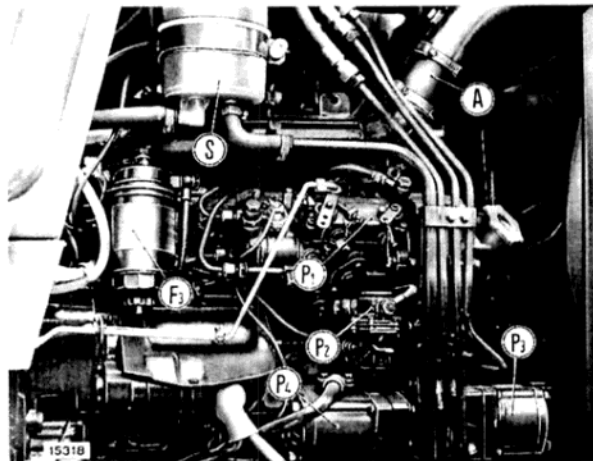
ENGINE: Description

11

Page 1



a



b

RH Side View of Engine

a. Early models 55-90 and 60-90 - b. Late models 55-90 and 60-90 - A. Inlet manifold - F₁. First fuel filter (early model) - F₂. Second fuel filter (early model) - F₃. Integral cartridge filter (late model) - P₁. C.A.V. distributor injection pump - P₂. Diaphragm-type fuel lift pump - P₃. Steering pump - P₄. Lift pump - S. Steering fluid reservoir.

DESCRIPTION

FIAT engines installed on 55-90, 60-90, 70-90, 80-90, 90-90 and 100-90 models are high-speed, 4-stroke, direct injection, in-line Diesel units.

Engine block - Single iron casting, dry sleeve, crankshaft, camshaft and valve tappet seats.

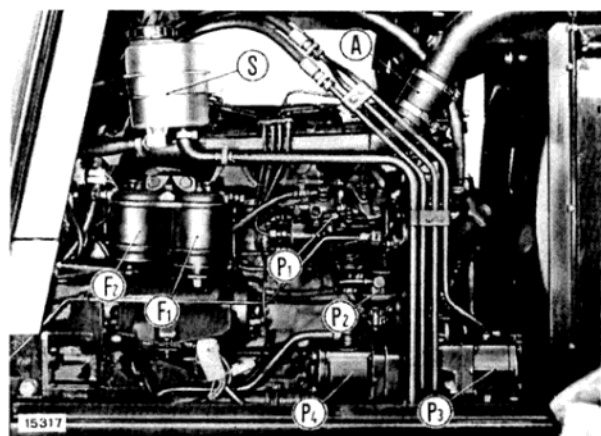
Cylinder head - Integral valve seats.

Valve gear - Pushrod operated valves, helical gear

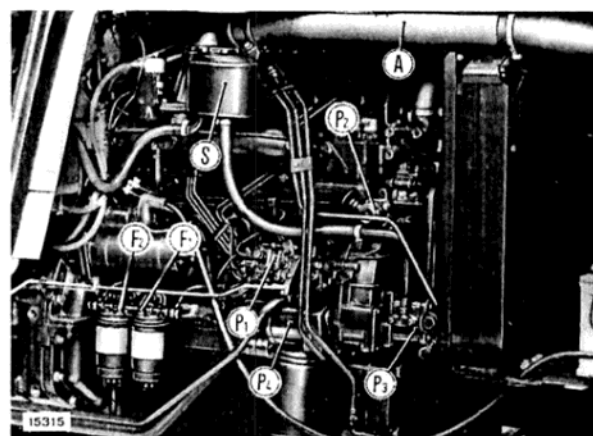
driven camshaft.

Crank gear - Crankshaft running on 4 bearings (55-90 and 60-90), on 5 bearings (70-90 and 80-90), on 6 bearings (90-90) or on 7 bearings (100-90). Light alloy pistons feature one compression ring and two oil scraper rings.

A flyweight - type dynamic balancer in the oil pan (70-90 and 80-90) reduces engine and engine-induced vibrations.



c



d

RH Side View of Engine

c. Models 70-90 and 80-90 - d. Models 90-90 and 100-90 - A. Inlet manifold - F₁. First fuel filter - F₂. Second fuel filter - P₁. BOSCH distributor injection pump - P₂. Diaphragm-type fuel lift pump - P₃. Steering pump - P₄. Lift pump - S. Steering fluid reservoir.

ENGINE: Description - Performance Data

Air induction system - Through oil-bath or dry air cleaner.

full-flow oil filter (55-90, 60-90, 70-90 and 80-90) or two full-flow oil filters (90-90 and 100-90) with pressure relief valve.

Fuel system - Rotating distributor injection pump, three-orifice injectors (60-90, 80-90 and 90-90) or four-orifice injectors (55-90, 70-90 and 100-90).

Cooling system - Water, centrifugal pump, wax thermostat.

Lubrication system - Forced-feed, gear pump, one

Engine starting - 12 V, electromagnetically operated starter and thermostarter (if applicable).

ON-BENCH PERFORMANCE DATA

Test plan

Pump timing, B.T.D.C. cylinder No. 1 in compression stroke:

Engine without fan, air cleaner and exhaust silencer.

— 55-90 BOSCH $6^0 \pm 1^0$

— 55-90 C.A.V. $0^0 \pm 1^0$

Barometric pressure 740 ± 5 mm Hg at 239 metres (785 ft) above sea level.

— 60-90 BOSCH $6^0 \pm 1^0$

— 60-90 C.A.V. $0^0 \pm 1^0$

Ambient temperature: $20 \pm 3^0\text{C}$.

— 70-90 BOSCH $4^0 \pm 1^0$

— 70-90 C.A.V. $0^0 \pm 1^0$

Fuel density, 830 ± 10 g/l.

— 80-90 BOSCH $4^0 \pm 1^0$

— 80-90 C.A.V. $0^0 \pm 1^0$

R.H. 70%.

— 90-90 BOSCH $6^0 \pm 1^0$

— 100-90 BOSCH $4^0 \pm 1^0$

55-90 BOSCH INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 36.7 (50 HP)	≥ 38.2 (52 HP)	9 to 9.4
Maximum	To produce max. torque	1500	≥ 25.6 (34.8 HP)	≥ 26.7 (36.3 HP)	5.8 to 6.2
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

55-90 C.A.V. INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 36.7 (50 HP)	≥ 38.2 (52 HP)	9 to 9.4
Maximum	To produce max. torque	1500	≥ 25.6 (34.8 HP)	≥ 26.7 (36.3 HP)	5.8 to 6.2
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Performance Data

11**Page 3****60-90 BOSCH INJECTION PUMP**

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 40.4 (55 HP)	≥ 41.9 (57 HP)	9.7 to 10.2
Maximum	To produce max. torque	1500	≥ 28.3 (38.5 HP)	≥ 29.4 (40 HP)	6.4 to 6.8
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

60-90 C.A.V. INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 40.4 (55 HP)	≥ 41.9 (57 HP)	9.7 to 10.2
Maximum	To produce max. torque	1500	≥ 28.3 (38.5 HP)	≥ 29.4 (40 HP)	6.4 to 6.8
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

70-90 BOSCH INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 49.6 (67.5 HP)	≥ 51.5 (70 HP)	11.8 to 12.3
Maximum	To produce max. torque	1500	≥ 34.5 (47 HP)	≥ 35.7 (48.5 HP)	7.7 to 8.2
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

70-90 C.A.V. INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 49.6 (67.5 HP)	≥ 51.5 (70 HP)	11.8 to 12.3
Maximum	To produce max. torque	1500	≥ 34.5 (47 HP)	≥ 35.7 (48.5 HP)	7.7 to 8.2
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

80-90 BOSCH INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 54.8 (74.5 HP)	≥ 56.6 (77 HP)	13.1 to 13.6
Maximum	To produce max. torque	1500	≥ 37.8 (51.5 HP)	≥ 39 (53 HP)	8.5 to 9.0
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

ENGINE: Performance Data - Compression Test

80-90 C.A.V. INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 54.8 (74.5 HP)	≥ 56.6 (77 HP)	13.1 to 13.6
Maximum	To produce max. torque	1500	≥ 37.8 (51.5 HP)	≥ 39 (53 HP)	8.5 to 9
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

90-90 BOSCH INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 67.6 (92 HP)	≥ 69.9 (95 HP)	15.8 to 16.4
Maximum	To produce max. torque	1500	≥ 46.7 (63.5 HP)	≥ 48.1 (65.5 HP)	10.3 to 10.9
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

100-90 BOSCH INJECTION PUMP

Throttle	Engine braking load	rpm	kW		Fuel consumption kg/h
			2-hour run-in	50-hour run-in	
Maximum	To produce max. output	2500	≥ 72.1 (98 HP) ^(°)	≥ 73.5 (100 Hp)	17 to 17.6
Maximum	To produce max. torque	1500	≥ 49.3 (67 HP) ^(°)	≥ 50.7 (69 HP)	11 to 11.6
Maximum	No-load	2750 to 2790	—	—	—
Minimum	No-load	625 to 675	—	—	—

^(°) Projected valves.

COMPRESSION TEST

If engine performance is found to be unsatisfactory, check the injection system (nozzle and injection pump overhaul) and the compression in each cylinder.



Highly flammable fluids. Do not use matches, cigarette lighters or other burning materials as a source of light.

To check engine compression use tester **291309/1** proceeding as follows:

- Remove the fuel injectors;
- Fit dummy injector **293862**, in place of the injector of the cylinder under test, together with the associated copper washer;
- Hold the injection pump in shut-off condition and take the readings cranking the engine through the starter.

Compression should be 25.5 to 27.5 bar (26 to 28 kg/cm², 370 to 398 psi) as recorded at 40°C sump oil

temperature, 760 mm Hg (sea level) barometric pressure with the engine running at 200 to 280 rpm. The minimum acceptable compression is 21.6 bar 22 kg/cm² (330 psi).

The maximum compression differential between cylinders is not to exceed 3 kg/cm² (24.7 psi).

In this connection it should be noted that every 100 metres (328 ft) altitude increase from sea level results in approximately 1% decrease in compression.

Insufficient compression may be due to faulty valves and seats, pistons and associated rings, cylinder sleeves or cylinder head gaskets.

Note — The purpose of the compression test is merely to assess the consistency of compression in the cylinders and obtain an indication of the degree of wear affecting the parts which help to seal the combustion chambers, and the results should not be taken as an absolute indication of engine efficiency.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Removal - Installation

11

Page 5

REMOVAL



CAUTION

Lift and handle all heavy parts by means of a suitable lift. Ensure that assemblies or parts are supported by suitable slings and hooks. Ensure that no one is in the vicinity of load to be lifted.

Proceed as follows:

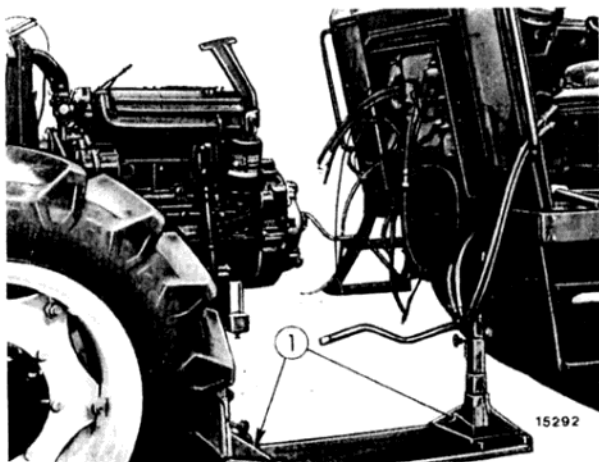
- Engage handbrake and chock rear wheels. If possible, remove front ballast weights.
- Remove side panels, side reinforcements, top hood and exhaust silencer.
- Disconnect and isolate battery negative lead. Disconnect throttle link, engine shut-off cable, starter leads, dashboard leads and tractor meter leads.
- Shut off fuel cock and disconnect fuel lines from lift pump, filters and injector leak-off. Drain power steering reservoir and disconnect steering lines. Drain oil from transmission/rear transmission housing (55-90, 60-90, 70-90 and 80-90) or from rear transmission (90-90 and 100-90) and disconnect hydraulic lift lines from oil pump.
- Disconnect brake lines and plug holes.
- On 4-wheel drive tractors, remove front drive shafts and associated guard.
- On cab versions, drain engine coolant and disconnect heater inlet lines. On air conditioned versions, disconnect refrigerant pipes from hoses.
- Disconnect hoses from radiator and intake manifold.
- Position trolley with guides **292320** so that stationary section is under clutch bell housing and mobile section is under the oil pan. For 70-90 and 80-90, take care not to damage the sheet metal bottom of the pan. Chock the front axle to prevent it from swinging and make sure the entire unit is firmly supported.
- Where front ballast weights cannot be removed, they should be supported with a hoist to prevent the engine from pitching forward.
- Remove clutch bell housing capscrews and separate engine together with front axle from tractor (to remove the three top screws, take off the plastic plug under the control board and work through the slot).
- Hoist the engine using hook **290740/1**, jack up the front axle, remove the screws retaining engine to axle assembly and separate engine.
- Remove water pump and fan and secure engine to rotary stand **290090** using bracket set **293860** (A, B, and D, page 6)

INSTALLATION

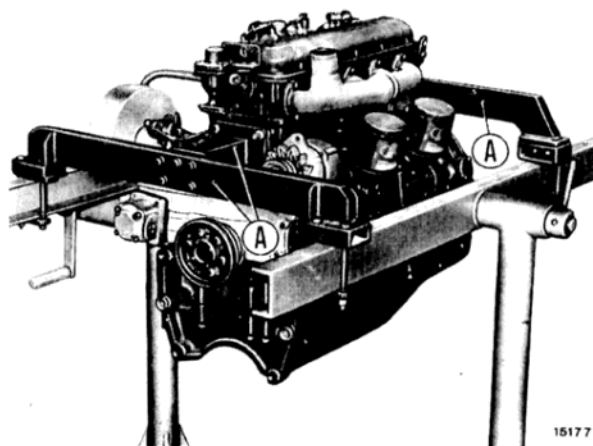


CAUTION

Use suitable tools to align holes. Never use fingers or hands.



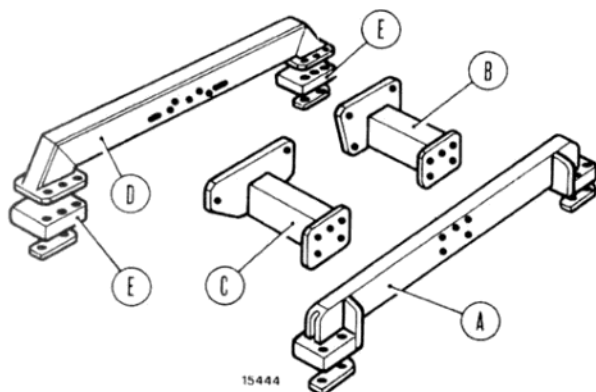
Removing - Installing Engine.
1. Trolley with guides **292320**.



Engine in Position on Rotary Stand **290090**.
(90-90).

A. Bracket set **293860**.

ENGINE: Installation



Bracket set **293860** - Use parts A, B and D.

Reverse the removal procedure and note the following points:

- When offering up the engine into the transmission mesh the transmission and PTO clutch shaft splines without forcing.
- Strictly adhere to the specified tightening torque figures.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Engine Block

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page 1

CYLINDER SLEEVES

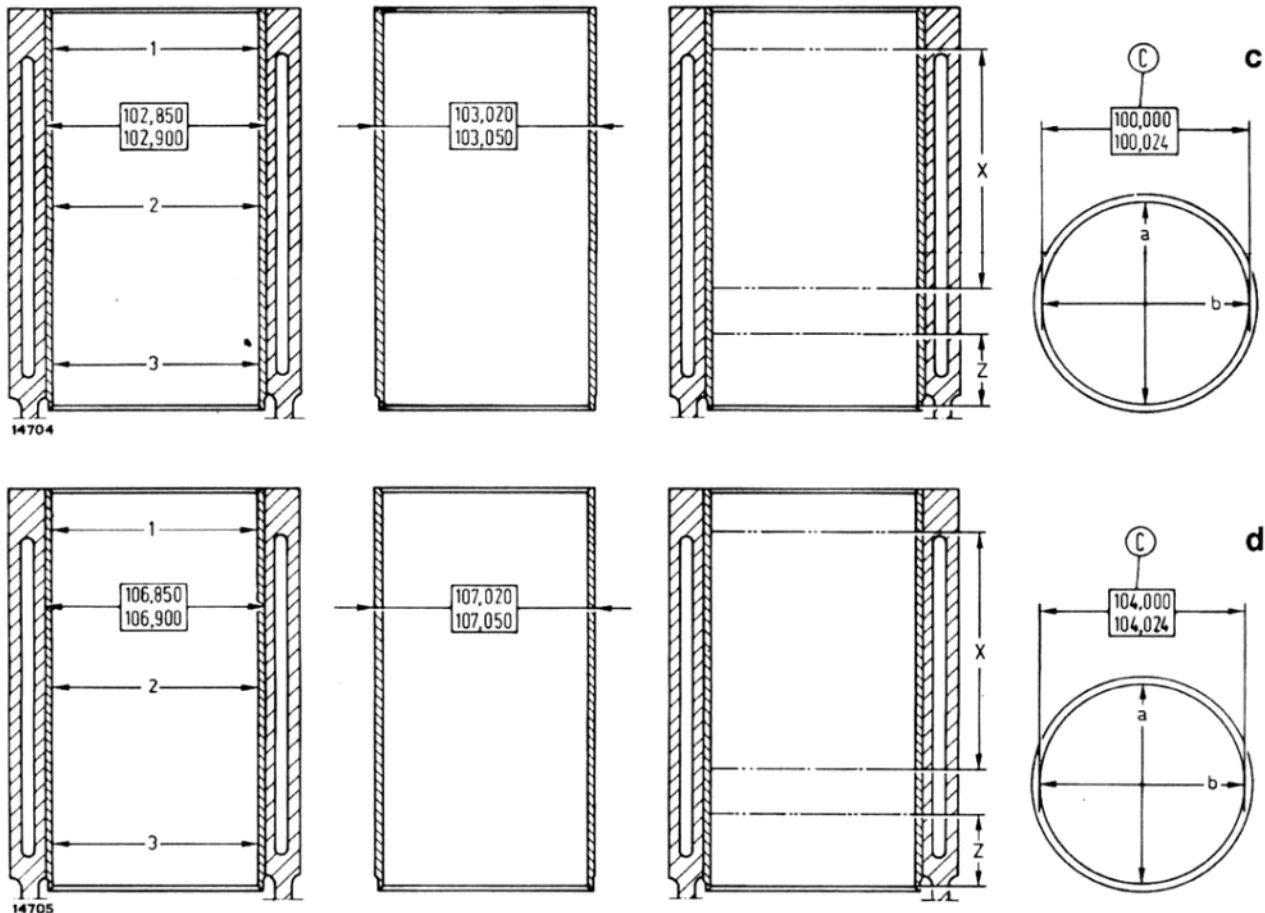
To inspect for wear proceed as follows:

- Measure the sleeve bore diameter over the swept area (X).
- The diameter reading should be taken in both the upper and lower part of the swept area in plane (a) parallel to the crankshaft and in plane (b) at right angles to it.
- Compare the readings to establish the amount of sleeve ovality and taper.

To check the piston working clearance measure the sleeve bore diameter over (Z) in plane (b) only.

If ovality or taper in excess of .12 mm (.0048 in), or piston working clearance in excess of .3 mm (.012 in) is detected, rebores (or renew) the sleeves to the oversize values envisaged (see page 1, Section 10). After machining, check the size by taking 2 dial gauge readings at right angles (a and b) and at 3 depths (1, 2 and 3).

Subsequently, fit replacement pistons of suitable size and weight (see page 4, section 10).



Sleeve and Block Inspection Data.

a. b. Sleeve bore measurements at right angles - c. Models 55-90, 70-90 and 100-90 - d. Models 60-90, 80-90 and 90-90 - C. Sleeve fitted bore diameter - Z. Sleeve wear inspection length for assessment of piston fit on plane b at right angles to crankshaft - X. Sleeve wear inspection length (swept area) for assessment of ovality and taper on planes a and b - 1, 2, 3. New or rebored sleeve bore measuring depth on planes a and b.

ENGINE: Engine Block - Cylinder Head

For sleeve removal and installation, do not heat sleeves, use a suitable press and proceed as follows:

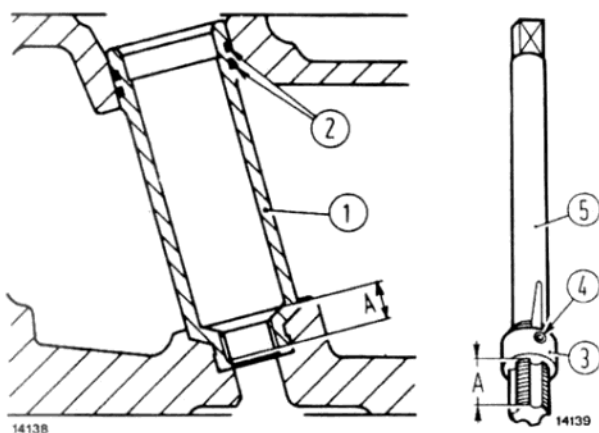
- Withdraw the worn sleeve from the bottom of the engine block using plate **293864** for models 60-90, 80-90 and 90-90 and plate **292507** for models 55-90, 70-90 and 100-90;
- Check engine block bore ovality and if necessary rebore to 0.2 mm (0.008 in) oversize.
- Press a new sleeve (0.2 mm oversize if necessary) from the top of the block using plate **291501**;
- Skim the sleeve to the specified diameter.

CYLINDER HEAD

The cylinder head face may be skimmed if necessary, removing not more than 0.5 mm (0.02 in).

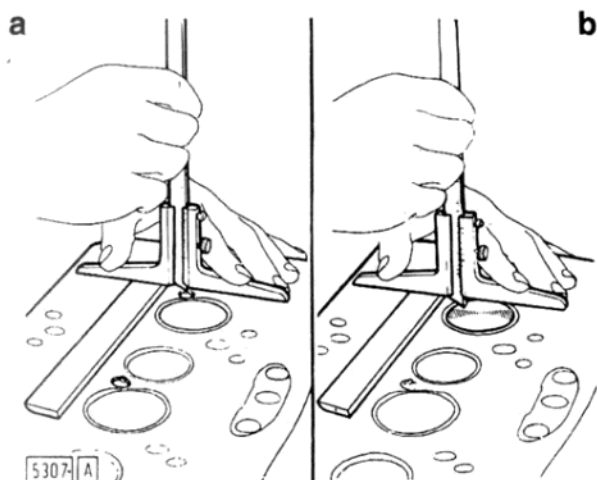
After skimming, check that fuel injector stand-out is as specified in the illustration. If stand-out is more than 1.0 mm (0.03937) replace injector sleeve as follows:

- Adjust dimension (A) on tool (5) **292240 (IVECO 390425)** to 9 mm or 0.3543 in through lock ring (3). Secure lock ring through screw (4).
- Thread inner seat of old sleeve using tool **292240 (IVECO 390425)** (M12x1.75), taking care that threads do not extend past bottom of sleeve.
- Secure tool **293784 (IVECO 342137)** (B, fig. e page 3) to cylinder head by tightening nuts (E) on injector retaining studs.



Threading injector sleeve

A $\approx$ 9 mm. (0.03543 in) depth of thread (M12x1.75) for sleeve removal - 1. Sleeve - 2. O-rings - 3. Lock ring - 4. Screw - 5. Tool **292240 (IVECO 390425)**.

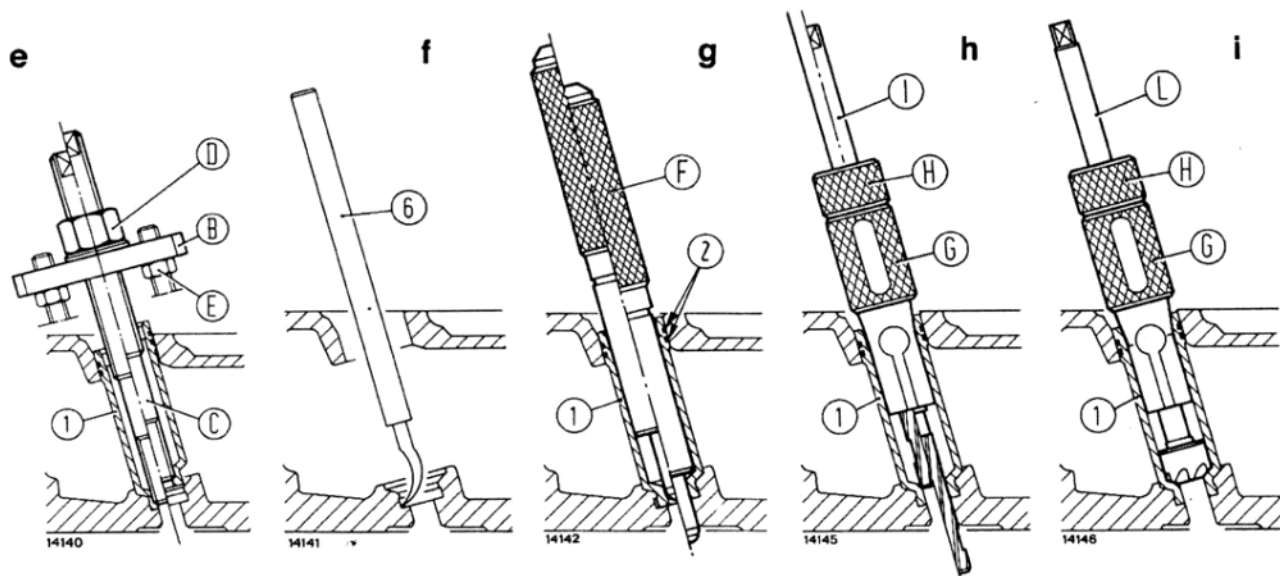


55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Cylinder Head

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page 3



Sleeve removal (e), seat clean-up (f), sleeve installation (g) and dressing (h, i) on cylinder head using set 293742/2.

B, C, D. Sleeve puller **293784 (IVECO 342137)** - E. Injector nuts M8x1.25 - F. Burnisher **293861** - G, H. Guide bushing **293746/1** - I. Dresser **293747** - L. Cutter **293790/1** - 1. Sleeve - 2. O-rings - 6. Tool **292243 (IVECO 390771)**.

- Fully tighten part (C) on thread and turn nut (D) to remove sleeve (1) from cylinder head.
 - Remove any traces of copper left in sleeve seat using tool **292243 (IVECO 390771)** (6, fig. f).
 - Install O-rings (2, fig. g) on sleeve, insert sleeve in housing and ensure that lower part contacts seat in cylinder head. Burnish using tool **293861** (F, fig. g).
 - Position bushing (G) **293746/1** in new sleeve (1, fig. g). Secure bushing in seat by tightening ring (H) clockwise, insert dresser (I) **293747** in bushing (G) and dress bottom of sleeve.
 - Remove dresser (I) and back off ring (H) by approximately 10 mm.
 - Free inner bushing **293746/1**; operation may be facilitated by tapping ring (H) with a soft hammer.
 - Remove bushing and insert cutter (L, fig. i) **293790/1** in bushing (G). Position bushing in sleeve (1) and secure by tightening part (H) clockwise.
 - Using cutter, remove material until seat is perfectly smooth and free from burrs or tool marks.
- After dressing insert injector in sleeve (1, page 3) and check that standout is 0.05 to 0.7 mm or 0.0019 to 0.0275 in (fig. a, page 2).

Note - Cutter **293790** of set **293742/1** must be ground down to 20.9 to 21 mm or 0.8228 to 0.8268 in as shown below in order to produce cutter **293790/1** (original width of cutter **293790** was 21.9 to 22 mm or 0.8622 to 0.8661 in).

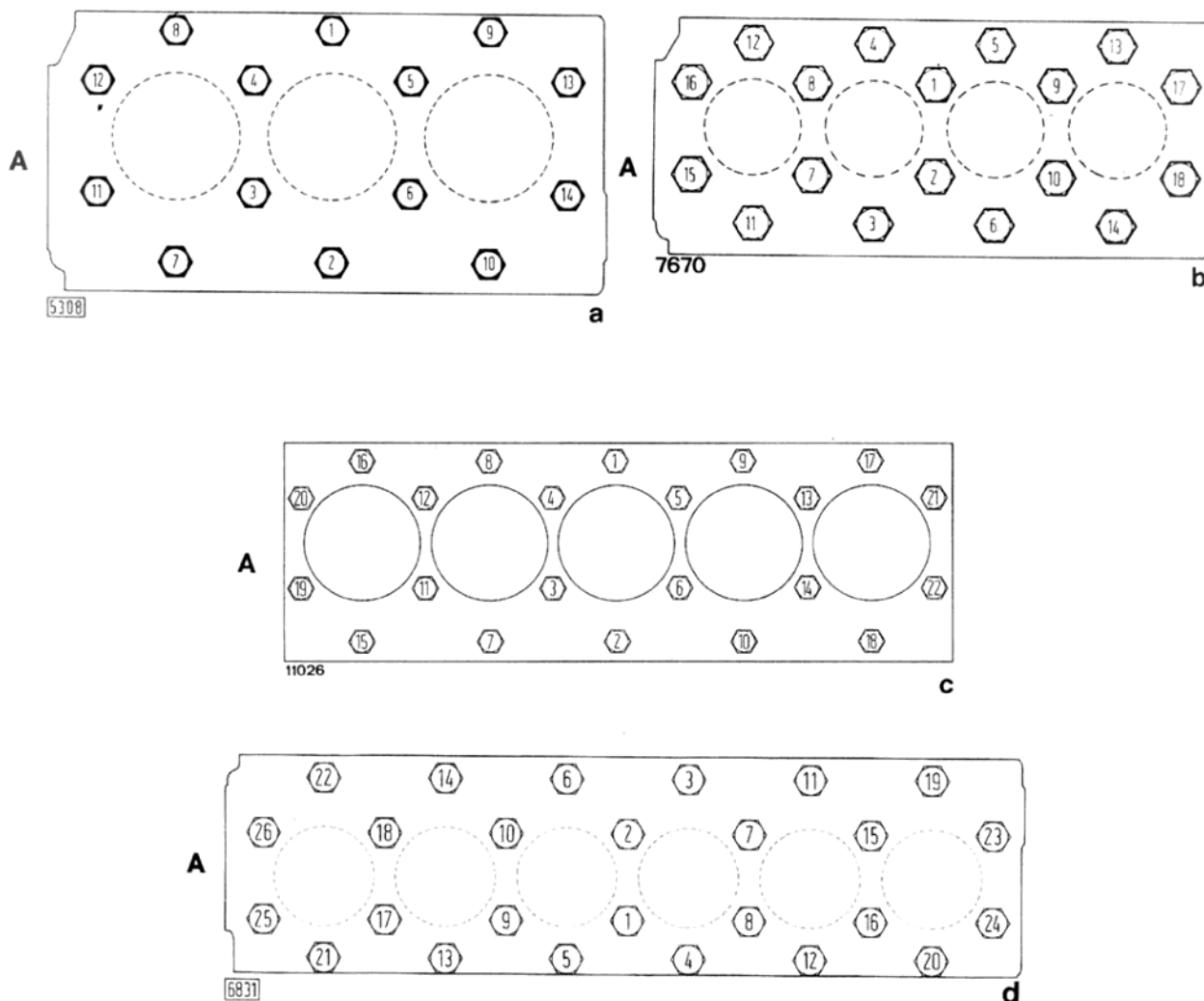
To recut the valve seats, use fixture **291113** and hand lathe **292913**.



Cutter 293790/1 (produced by grinding down cutter 293790).

20,9 to 21 mm or 0.8228 to 0.8268 in = width of cutter **293790/1** (was 21.9 to 22 mm or 0.8622 to 0.8661 in on cutter **293790**).

ENGINE: Cylinder Head



Cylinder head tightening diagram.

a. 55-90 and 60-90 - b. 70-90 and 80-90 - c. 90-90 - d. 100-90 - A = Fan side.

Check that valve stand-in as shown in figure (b) on page 2.

down bolts in the order shown in figures a, b, c, and d.

When installing the cylinder head, thoroughly clean the mating surfaces and position the gasket on the block with the mark "Alto" facing towards the cylinder head. Offer up the cylinder head and tighten the hold-

Note - Cylinder head hold-down bolts are to be tightened in four successive stages (tighten to an initial torque of 60 Nm - 6.1 kgm - 44 16ft, check initial torque, tighten through 90°, and then through a further 90°) as shown in the table below.

STAGE	1	2	3	4
All models	Initial torque	Initial torque check	Tightening angle	
	60 Nm (6.1 kgm or 44 16ft)	60 Nm (6.1 kgm or 44 16ft)	90°	90°

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Valve Gear

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page 1

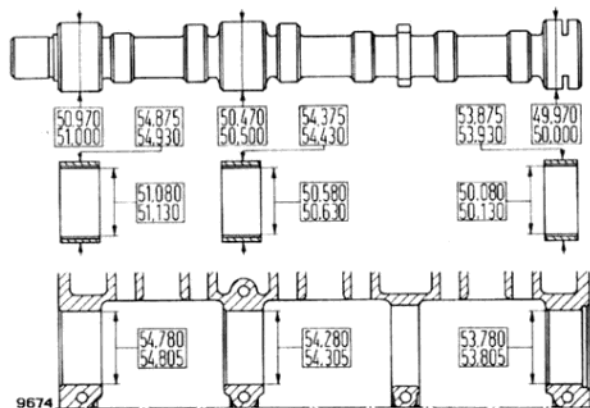
CAMSHAFT

To remove the camshaft back off screws (5, page 2) securing thrust plate (7).

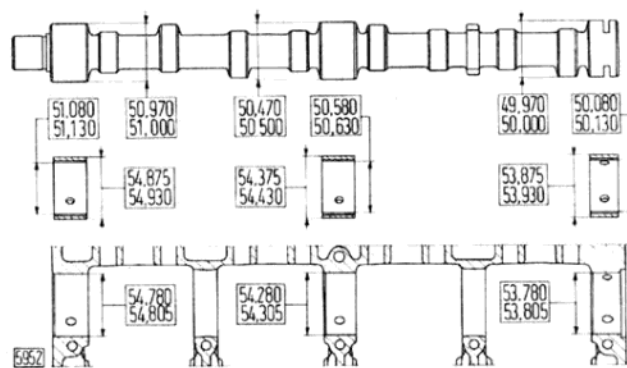
To inspect, place the camshaft over V-blocks and check journal eccentricity using a suitable dial gauge.

Maximum allowance is 0.02 mm (0.0008 in).

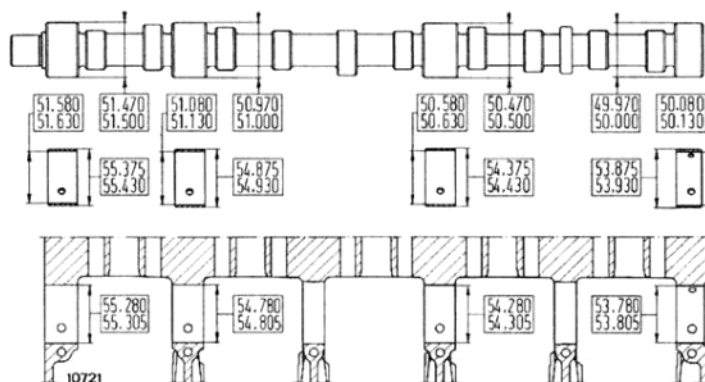
To straighten the camshaft use a press for up to 0.2 mm (0.008 in) distortion. If distortion exceeds 0.2 mm (0.008 in), replace the camshaft.



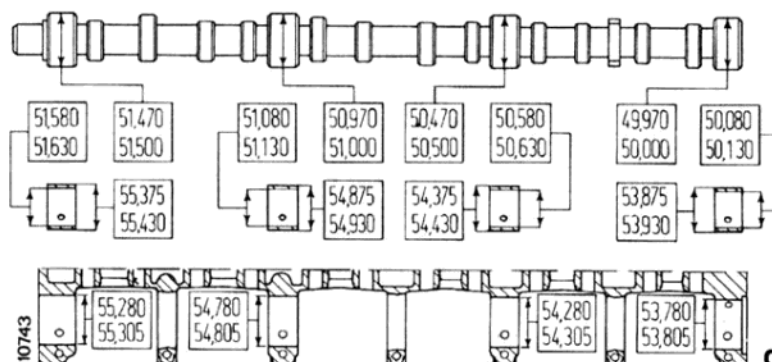
a



b



c

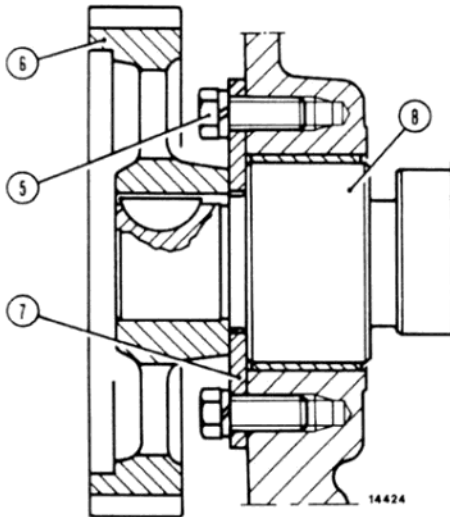


d

Camshaft, Journal and Housing Details.

Note - Bushing fitted I.D. given - a. 55-90 and 60-90 - b. 70-90 and 80-90 - c. 90-90 - d. 100-90.

ENGINE: Valve Gear



Section through Camshaft Drive.

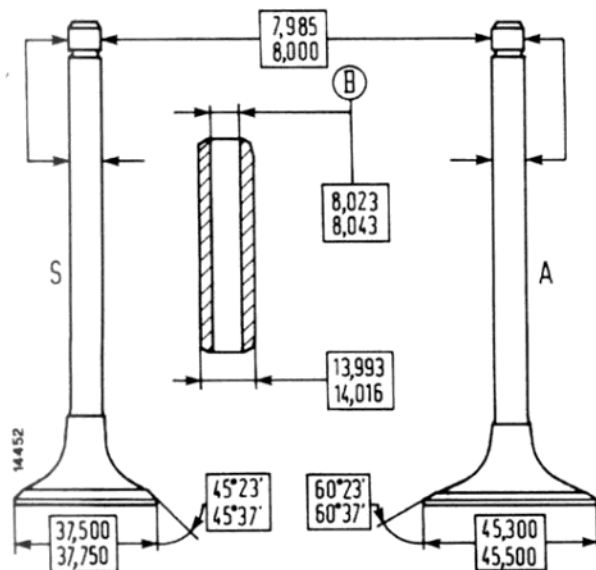
5. Retaining screw - 6. Drive gear - 7. Thrust plate - 8. Camshaft.

Replace worn bushings using suitable pullers and installation tools

After installation, the new bushings must be reamed to size shown in figure using reamer **A. 390363 (293269)**.

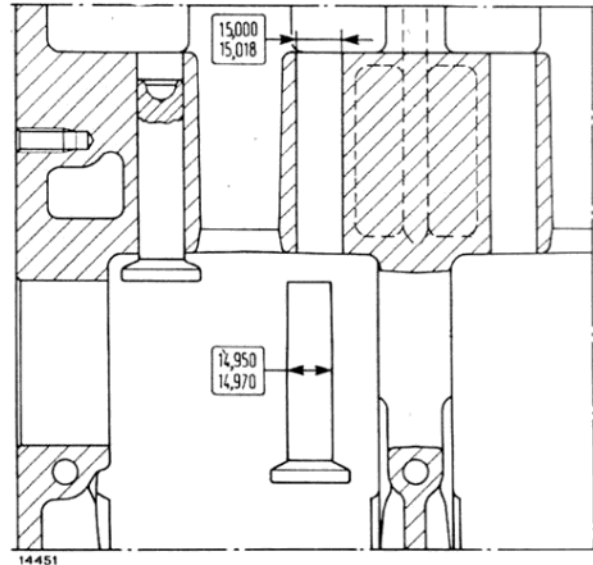
VALVES, GUIDES AND SPRINGS

To remove and install the valves use tool **291050**.



Valve and Guide Details.

A. Inlet - B. Fitted diameter after reaming - S. Exhaust.

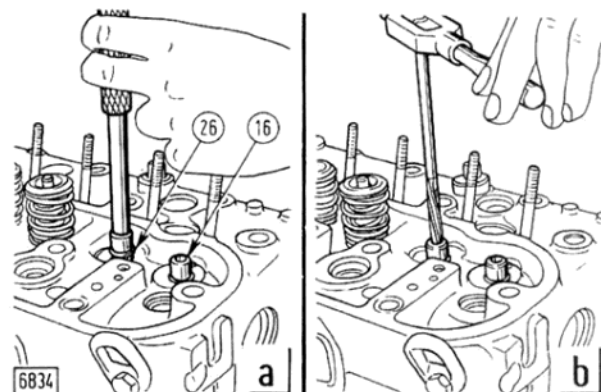


Tappet and Housing Details

If sealing is defective grind valves together with seats using air grinder **290064** or hand grinder **290891**. If necessary, re-cut the valve seats as directed and grind the valves (page 2).

After grinding, check that the minimum land below valve head chamfer is not less than 0.5 mm (0.020 in).

To remove and install the valve guides, use driver **291046/1**, as shown and socket wrench **291780 (A. 360409/3)**.



Installing and Reaming Valve Guide (16).

a. Pressing guide using driver **291046/1** - b. Dressing guide bore using dresser **291177** - 26. Retaining ring.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Valve Gear

13

page 3

Valve guides should be a drive fit in their housings. If loose, they should be renewed without hesitation using oversize guides.

After installation each guide should be reamed with tool **291177** as shown in figure b, page 2.

TAPPETS, PUSHRODS AND ROCKERS

Ensure that the tappets slide smoothly in their housings without excessive clearance.

If excessive clearance is detected, replace with oversize tappets and open out the associated housing bores.

The pushrods should be perfectly straight and the rocker screw seat should not show signs of pick-up or undue wear. Replace as necessary.

Prior to removing the rocker end brackets take off the bracket-to-shaft retaining screw.

Inspect the rocker and screw working surfaces. When dressing becomes necessary, remove as little material as possible.

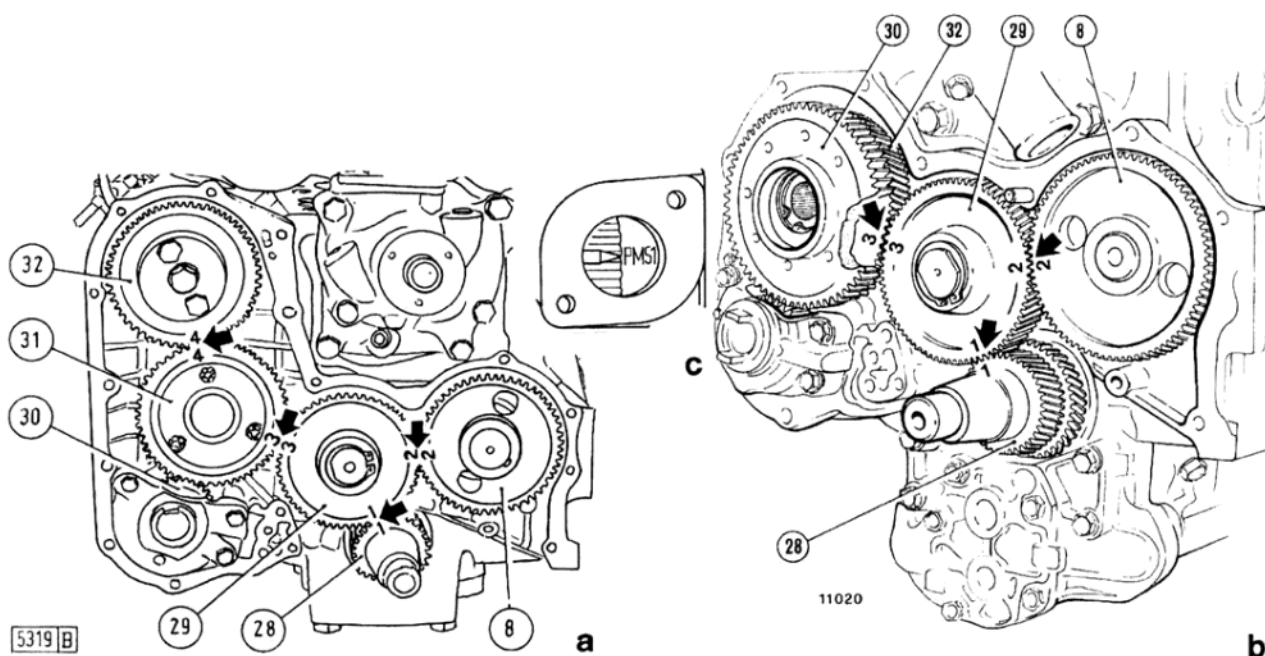
Valve Clearance Adjustment

To adjust, use feeler gauge and wrench **290886**, or **291833 (A - 350108)**. For the correct clearance see section 10, page 7.

To adjust on models 55-90 and 60-90 proceed as follows:

- Turn the crankshaft to bring piston No. 1 to T.D.C. position (inlet) as shown by flywheel timing mark.
- Turn the crankshaft through 360° and check that valve clearance is as shown in table (page 7, section 10).
- Adjust other valves bearing in mind that T.D.C. mark is not the same for pistons No. 2 and 3. In condition of balance, mark flywheel or pulley.

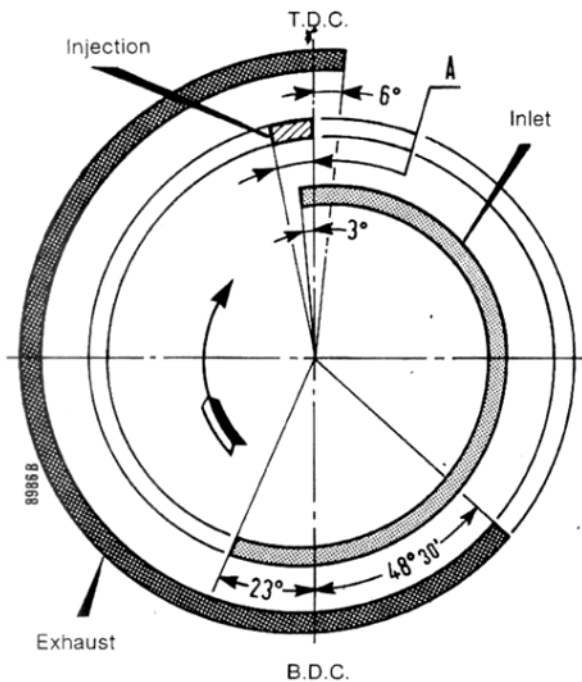
For models 70-90 and 80-90 check clearance with valves of matching cylinder in condition of balance (inlet just open). Cylinder matching is 1-4 and 2-3.



Valve timing.

Note: Timing marks to line up with piston No. 1 at T.D.C. on compression stroke arrowed (inset c.).
a. 55-90, 60-90, 70-90 and 80-90 - b. 90-90 and 100-90 - c. Flywheel timing mark and pointer (P.M.S.1. = Piston No. 1 at T.D.C.) - 8. Camshaft gear - 28. Crankshaft gear - 29 and 31. Idler gear - 30. Lift pump and power steering pump gear - 32. Injection pump drive gear.

ENGINE: Valve Gear



Valve Timing Diagram.

- a. Static advance according to injection pump type and tractor model (see section 11, page 2).

For model 90-90, adjust valve clearance as shown in table.

Balance valves of cylinder No:	Adjust clearance for cylinder No:
1	5
2	3
4	1
5	2
3	4

For model 100-90, check clearance with valves of matching cylinder in condition of balance (inlet just open). Cylinder matching is 1-6, 2-5 and 3-4.

VALVE TIMING GEAR TRAIN

For valve timing, proceed as follows:

- Turn the crankshaft to bring piston No. 1 to T.D.C. position on compression stroke.
- Install the drive gears and align as indicated in figure on page 3.

For valve timing check during overhaul, adjust valve clearance provisionally to 0.45 mm (0.018 in). Turn crankshaft and, using an angle gauge, check that valve opening and closing angles are as specified in the diagram.

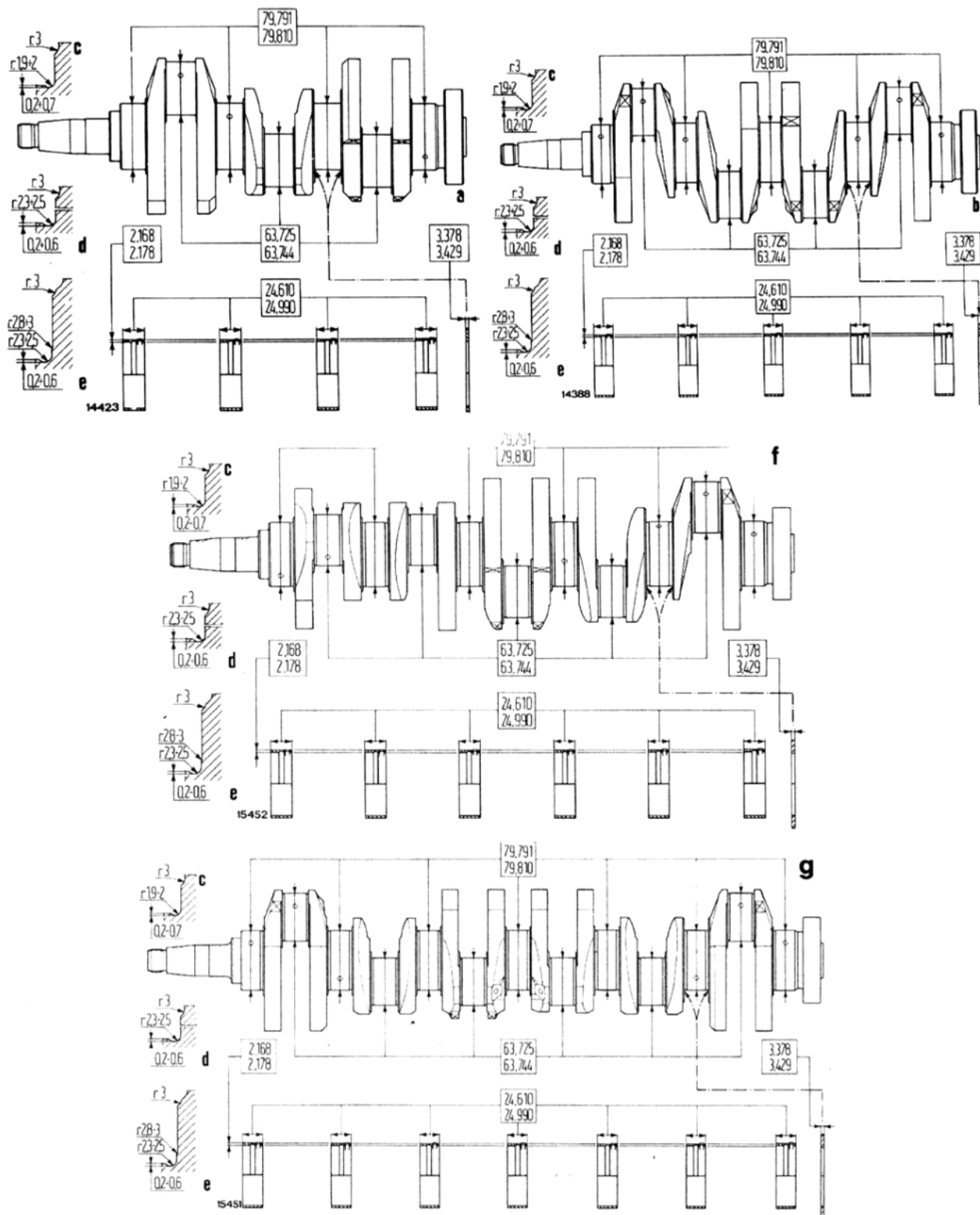
Subsequently, adjust valve clearance to the valve specified on page 7, Section 10.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Crank Gear

14

page 1



Crankshaft, bearings and thrust washers. Dimensions in mm.

a. Models 55-90 and 60-90 - b. Models 70 and 80 - c. Crankpin fillet radius details - d. Main journal fillet radius details - e. Main journal fillet radius details (with thrust washers) - f. 90-90 - g. 100-90.

ENGINE: Crank Gear

CRANKSHAFT

Remove the pulley hub using tool **291504**.

Carefully inspect the crankshaft. Remember that even the slightest crack necessitates crankshaft replacement.

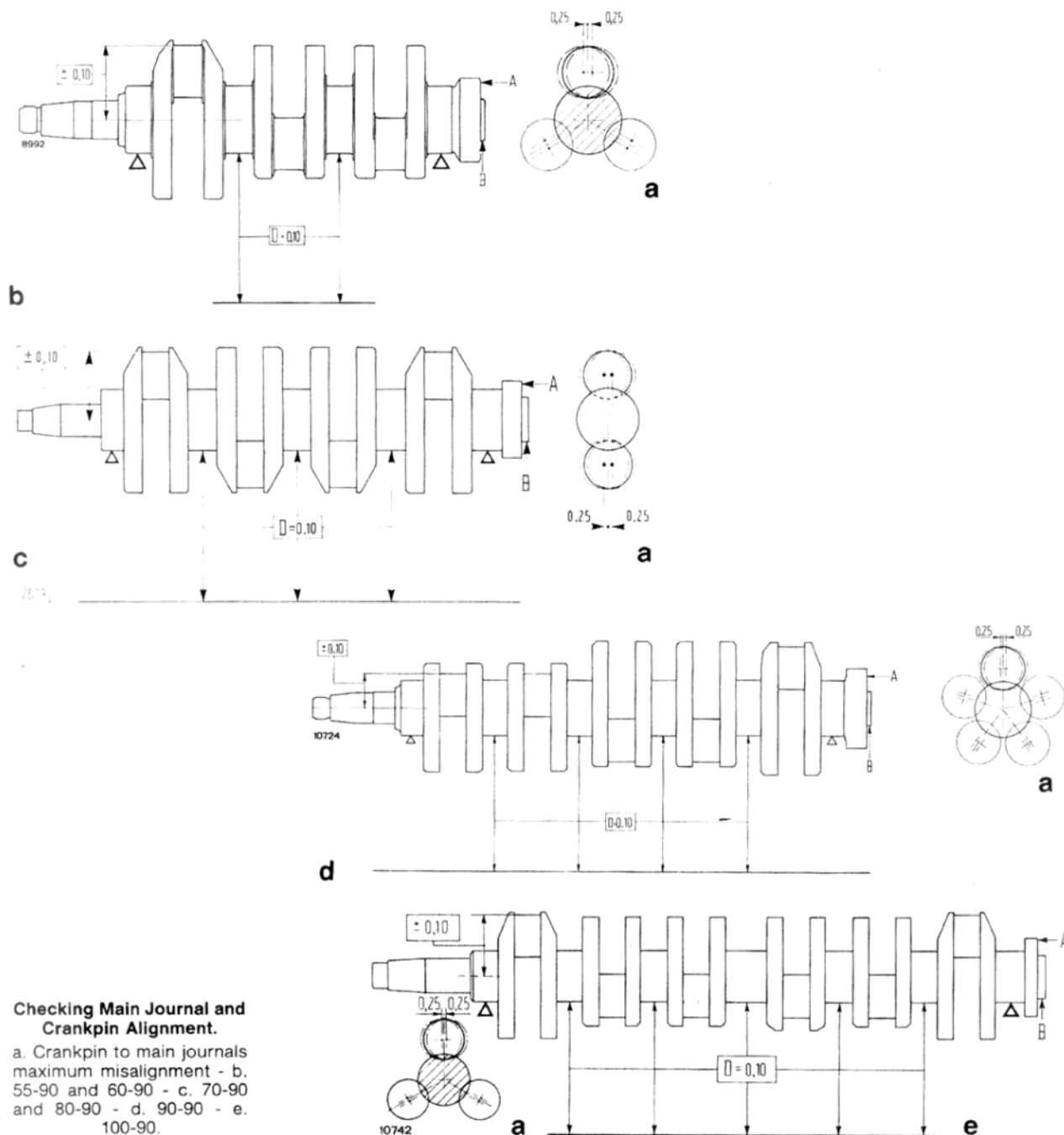
Check both main journals and crankpins noting the following points:

- Pick-up and scratch marks may be remedied using extra-fine emery paper.
- Score marks, ovality and taper in excess of 0.05

mm (0.002 mm) necessitate journal dressing to the nearest undersize dimension (see table).

After dressing blend the journal fillet radii as shown in figures a, b, f and g, page 1, and inspect the crankshaft to ensure that:

- Journal ovality does not exceed 0.008 mm (0.0003 in).
- Journal taper does not exceed 0.01 mm (0.0004 in)



Checking Main Journal and Crankpin Alignment.

a. Crankpin to main journals maximum misalignment - b. 55-90 and 60-90 - c. 70-90 and 80-90 - d. 90-90 - e. 100-90.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Crank Gear

14

page 3

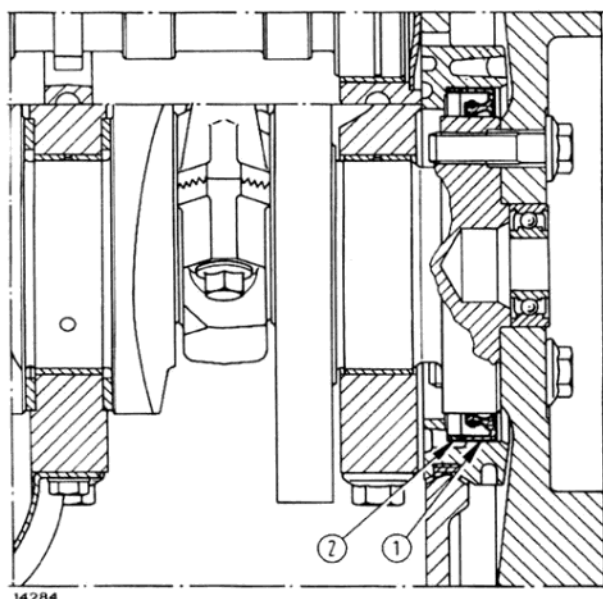
- Maximum main journal misalignment with the shaft over V-blocks does not exceed 0.10 mm or 0.004 in (D, page 2).
- Maximum misalignment of crankpin centerlines (55-90, 60-90 and 90-90) or each pair of crankpins (70-90, 80-90 and 100-90) with respect to main journals does not exceed ± 0.25 mm (± 0.010 in) (a, b).
- The distance from top of crankpin to crankshaft centerline does not exceed ± 0.10 mm (± 0.004 in).
- Run-out and eccentricity, as measured with the dial gauge stylus at (A) and (B) respectively, does not exceed the limits specified in the table on page 3, Section 10.

Check the core plugs for leakage with oil at 14.7 bar, 15 kg/cm², 230 psi. Replace core plugs as necessary, peen in position and recheck for leakage.

After installing the crankshaft and tightening the bearing caps, check the end float at the last but one cap. If play is excessive (see table) install oversize thrust washers.

Crankshaft Front and Rear Seals.

Check the metal-caged, double-lip spring-loaded rubber seals (pages 23, 24, 25 and 26. Section 10).



Replacing crankshaft seal.

1. Seal - 2. Spacer.

Note - When replacing seal (1), scrap spacer (2) and install new seal without spacer to provide a new sealing face.

When replacing the seals note the following points:

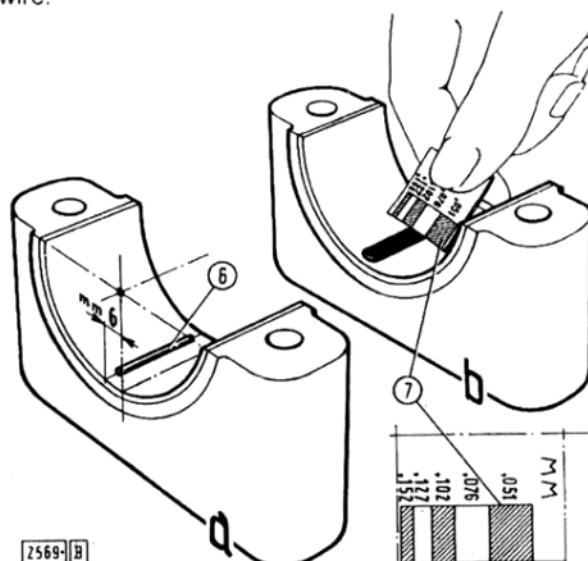
- Wipe off all traces of oil and thoroughly clean the seal seat.
- Soak the seal in engine oil for 30 minutes and install, applying a steady even pressure all round using a suitable drift.
- Smear the lips with a film of thick oil and pack the cavity with grease to prevent the seal from running dry when the engine is started for the first time.

MAIN AND BIG END BEARINGS AND CAPS

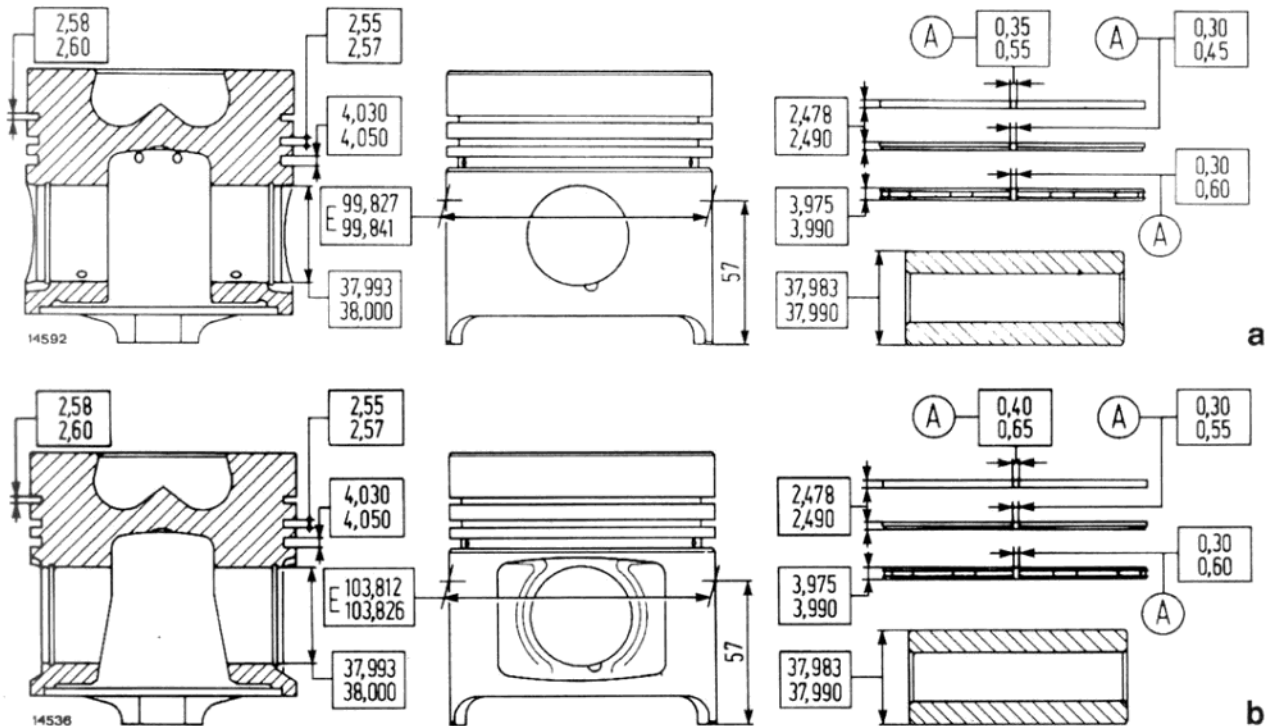
The bearing caps with attached thin shell bearing are numbered for correct installation.

The cap identification number should tally with that stamped on the engine block.

The crankshaft bearing running clearance may be checked using Perfect Circle Plastigage calibrated wire.



ENGINE: Crank Gear



Piston, Pin and Ring Dimensions in mm.

a. 55-90, 70-90 and 100-90 - b. 60-90, 80-90 and 90-90 - A. Piston ring fitted gap - E. Piston diameter as measured 57 mm (2 in) from base of skirt.

PISTONS AND RINGS

Assess piston and sleeve wear as directed on page 1, Section 12 and in the figures on this page.

If the clearance is found to be in excess of 0.30 mm (0.012 in), rebore the sleeves and fit oversize pistons and rings (see table).

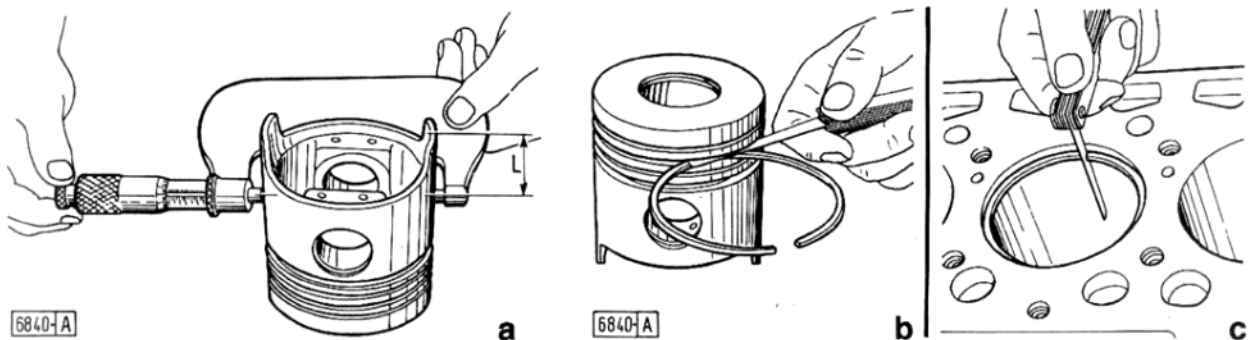
When replacing pistons, note that the weight differ-

ence between pistons of the same engine should not exceed 20 grams ($\frac{2}{3}$ oz.)

To remove and install piston rings use tool **291160**.

Check that ring side clearance (b) and fitted gap (c) do not exceed specified limits.

If the ring gap is found to be less than specified, grind the ring ends as necessary.



Inspecting Pistons and Rings.

a. Measuring piston diameter at distance (L) from base of skirt - b. Measuring piston ring side clearance - c. Measuring piston ring gap - L. Measuring distance from skirt base, 57 mm (2.24 in).

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Crank Gear

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page 5

Install the rings in the order shown in figures on page 4.

When inserting the pistons in the cylinder sleeves ensure that the rings gaps are staggered at 180° from one another.

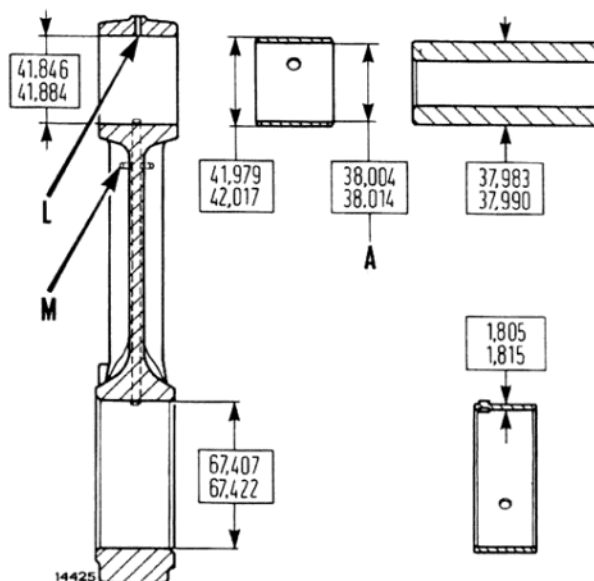
CONNECTING RODS

Check the small end bushings for looseness and displacement. They should be flush with connecting rod sides.

If necessary, replace bushings and ream to the specified dimension (A).

Use gauge **293459** to check connecting rod axis alignment. Maximum misalignment of big and small end axis at 125 mm (5 in) away from the rod centreline should be as specified in the table. Any slight distortion may be remedied using a suitable press; however, if distortion is serious replace the connecting rod.

Replacement rods should be stamped with the reference numbers of the cylinder to which they belong. Also ensure that the weight difference between rods of the same engine does not exceed 25 grams (1 oz).

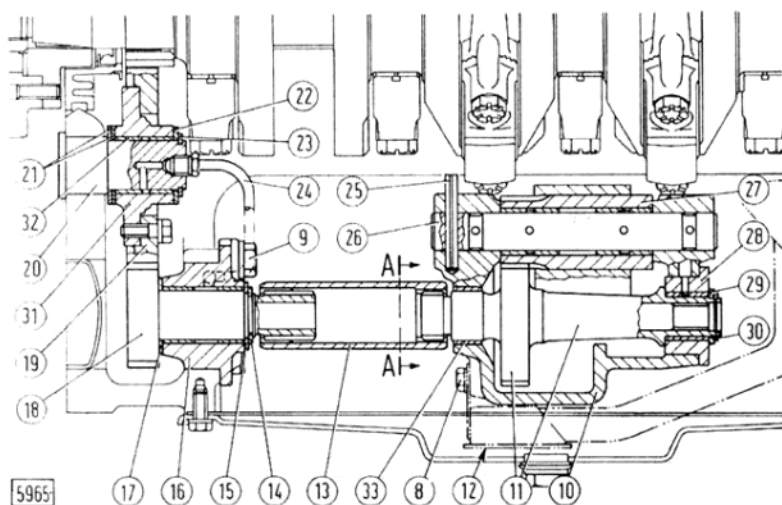


Connecting Rod, Bearing, Bushing and Pin Details. Dimensions in mm.

A. Fitted dimension after reaming - L and M Lubricant ports.

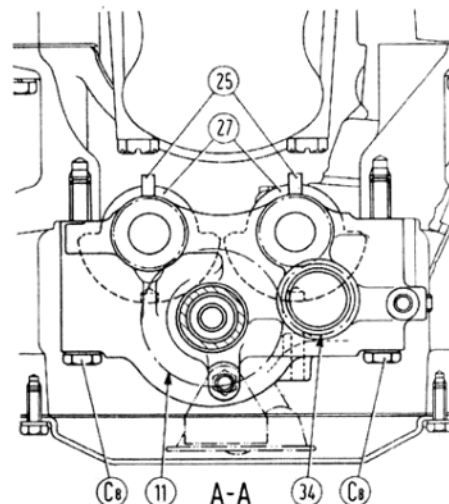
Ensure that the connecting rod lubricating ports (L and M) are unobstructed.

Note - When disassembling connecting rods, scrap and replace the cap capscrews.



Section through Dynamic Balancer (70-90 and 80-90)

Cs. Flywheel housing capscrew - 8. Oil scoop capscrew - 9. Flange capscrew - 10. Housing - 11. Flyweight drive gear - 12. Oil scoop - 13. Sleeve - 14. Retaining ring - 15. Thrust washer - 16. Drive gear flange - 17. Thrust washer - 18. Drive pinion - 19. Intermediate gear - 20. Intermediate gear carrier - 21. Thrust washer - 22. Thrust washer - 23. Retaining ring - 24. Lubricating pipe (32) - 25. Roll pin - 26. Flyweight carrier - 27. Flyweights - 28. Flyweight drive gear flange - 29. Thrust washer - 30. Retaining ring - 31. Intermediate gear flange - 32. Bushing - 33. Bushing - 34. Idler gear.



ENGINE: Crank Gear

Connecting rod/piston installation

Introduce the pistons with attached rings and connecting rods in the associated sleeves, preferably using ring compressor **291048**, and positioning each assembly so that reference marks on the connecting rods face towards the side opposite the camshaft.

Installed piston T.D.C. stand-out from engine block should be 0.355 to 0.761 mm (0.013 to 0.029 in).

FLYWHEEL

Flywheel is secured to crankshaft by means of self locking capscrews. Starter ring gear is shrunk on flywheel.

When replacing starter ring gear, heat in oil to 80-90°C and locate tooth chamfers facing inwards.

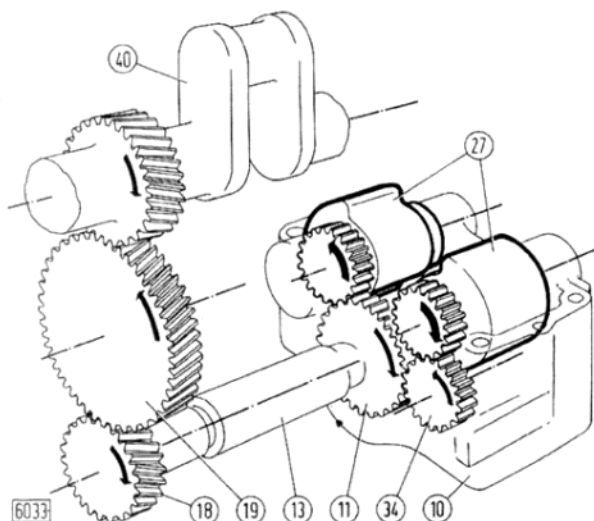
Flywheel capscrew holes are staggered to ensure correct flywheel positioning on crankshaft.

DYNAMIC BALANCER

Balancer Overhaul (70-90 and 80-90).

When removing the dynamic balancer note the following points:

- Drain the engine oil pan and remove the bottom cover.



Dynamic Balancer Schematics (70-90 and 80-90).

10. Housing - 11. Flyweight drive gear - 13. Sleeve - 18. Drive pinion - 19. Intermediate gear - 27. Flyweights 0 34. Idler gear - 40. Crankshaft.

- Take off the suction scoop, remove screws (C8, page 5) and take off the flyweight assembly.

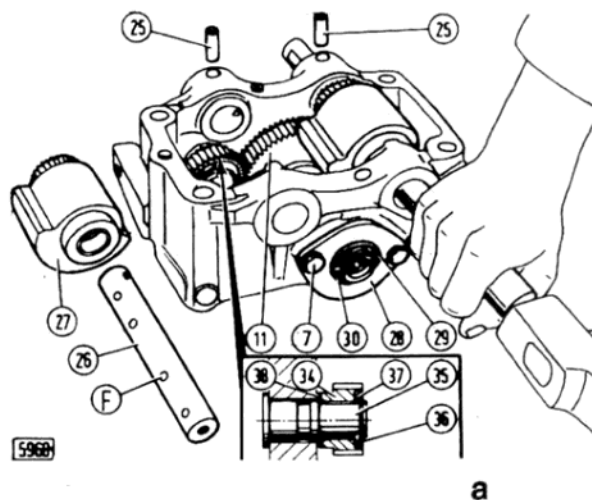
- If necessary, remove gear (18) with attached flange (16, page 5), withdrawing oil pipe (24) and capscrews (9).

To disassemble the flyweight assembly proceed as follows:

- Withdraw roll pins (25) and take off the weight carriers using a suitable driver.
- Remove flange retaining screws (7), retaining ring (30) and flyweight drive gear (11).
- Remove retaining ring (36) and idler gear (34).

Check for wear, replace any defective parts, and ream the new bushings using expansion blade reamers **290001** and **291242**.

To install bushings, heat the weights in oil at 140° to 160°C.



Removing Flyweight Carriers (70-90 and 80-90)

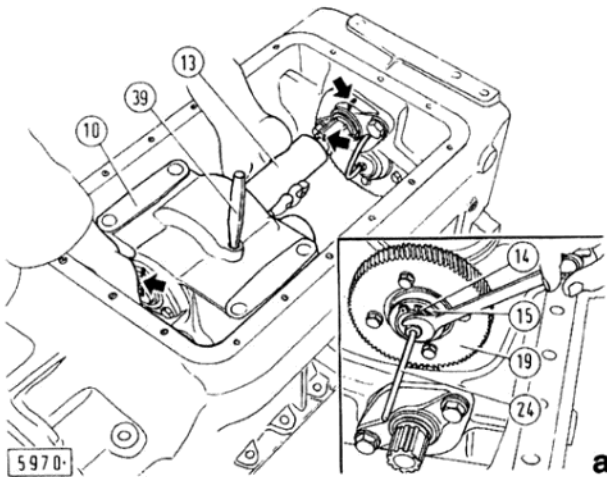
a. Section through idler gear - F. Oil ports - 7. Flange cap-screw - 11. Flyweight drive gear - 25. Roll pins - 26. Flyweight carrier - 27. Flyweight - 28. Flange - 29. Thrust washer - 30. Retaining ring - 35. Idler gear carrier - 36. Retaining ring - 37. Thrust washer - 38. Thrust washer.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Crank Gear

14

page 7



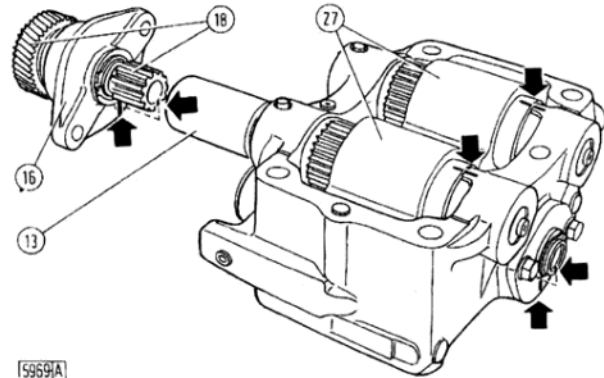
Installing Dynamic Balancer (10) with Sleeve (13) (70-90 and 80-90).

Timing marks arrowed.

- a. Installing oil pipe - 14. Retaining ring - 15. Thrust washer - 19. Intermediate gear - 39. Locking pin.

When assembling parts, make sure that flyweight drive gear (11, page 6) and flyweights (27) are positioned so that all reference marks are as arrowed. Note that:

- Idler gear (34, page 6) should be positioned with the longer end of hub facing towards the housing wall.
- Roll pin holes (26, page 6) in flyweight carriers should be aligned with associated holes in the housing.



Dynamic Balancer Timing Marks (70-90 and 80-90)

13. Sleeve - 16. Flange - 18. Drive pinion and gear - 27. Flyweights.

When installing the flyweights, adjust timing as follows:

- Bring piston No. 1 to T.D.C. position.
- Secure drive pinion (18) to the oil pan, with reference marks aligned as shown.
- Lock the flyweights in position with pin (39) and check reference mark alignment.
- Position sleeve (13) and tighten the capscrews to the specified torque.

14

page 8

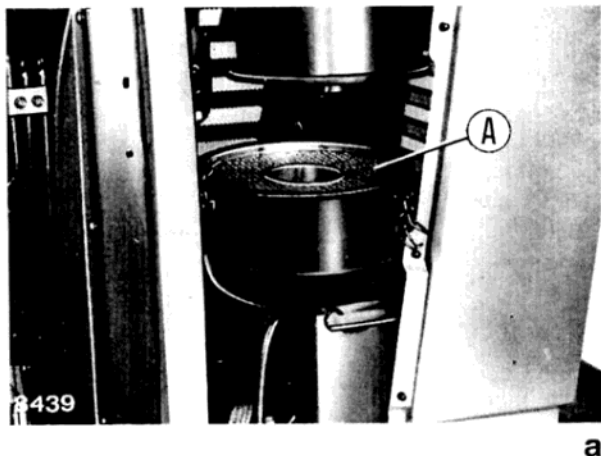
ENGINE

55-90 60-90
70-90 80-90
90-90 100-90

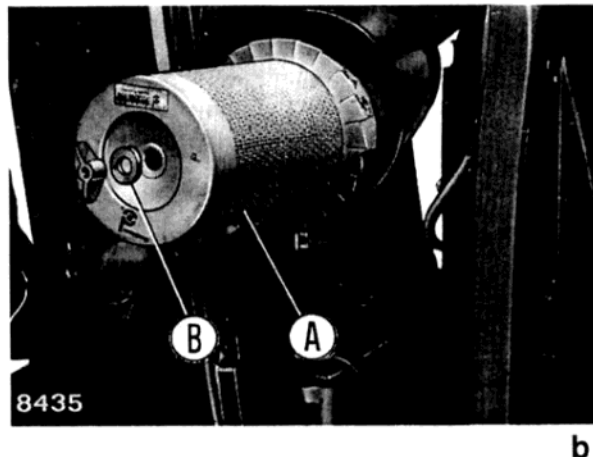
ENGINE: Fuel system

15

page 1



Oil bath air cleaner.
A. Filter element.



Dry-type air cleaner.
A. Cartridge - B. Seal.

AIR CLEANER

Oil bath air cleaner (figure a).

Periodically press rubber end of dust evacuator to check for clogging.

Also check that oil level is correct.

Every 200 hours, remove filter element (A) and clean with kerosene. Before installation, wet element with specified oil.

Every 400 hours, clean all air cleaner components. Soak filter element (A) in kerosene for half an hour, then drain, wet with oil and reinstall.

When the tractor is used in very dusty conditions, the above operations should be performed more frequently.

Dry-type air cleaner (figure b).

When the red condition indicator lights up on the instrument panel, remove cartridge (A, fig. b) and clean as follows:

- with a jet of dry compressed air at less than 5.9 bar (6 kg/cm² or 85.574 psi), blowing from inside outwards.

or:

- with water and foamless detergent, rinsing with a jet at less than 2.9 bar (3 kg/cm² or 42.062 psi). Subsequently blow dry with compressed air at less than 50°C.

Moreover, note the following:

- never clean the cartridge by striking against a hard surface;

- replace seal (B) if damaged;

- do not separate plastic fins from filter element body;

- clean sheet metal container interior using a damp cloth;

- do not wash or blow the inner cartridge; replace after the outer cartridge has been cleaned three times, or every 400 hours.

FUEL TANK

Clean the fuel tank during tractor overhaul.

Periodically drain the condensate and any deposits by backing off the fuel outlet connection on the underside of the main tank, or of auxiliary tank where fitted.

Condensate draining must be carried out with the engine stationary, tractor on level ground and tank almost empty.

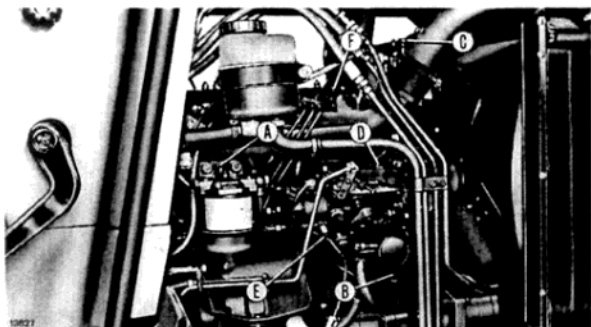
FUEL FILTERS

Every 50 hours, drain condensate from filters through the screw provided.

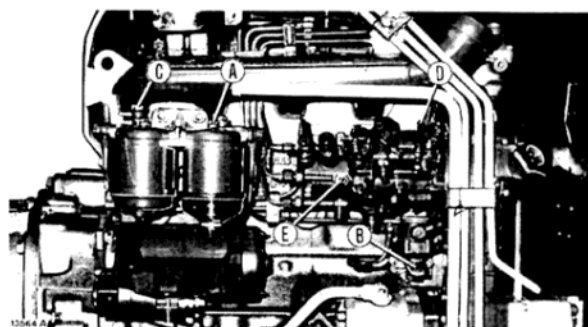
Every 200 hours, replace first filter cartridge (70-90, 80-90 and early model 55-90 and 60-90 tractors), single integral cartridge (late model 55-90 and 60-90 tractors), or first integral cartridge (90-90 and 100-90 tractors).

Every 800 hours, replace second filter cartridge (70-90, 80-90 and early model 55-90 and 60-90 tractors) or second integral cartridge (90-90 and 100-90).

ENGINE: Fuel system



a



b

Fuel circuit venting (C.A.V. pump).

a. Early model 55-90 and 60-90 - b. 70-90 and 80-90.

FUEL CIRCUIT VENTING

Engine with C.A.V. pump

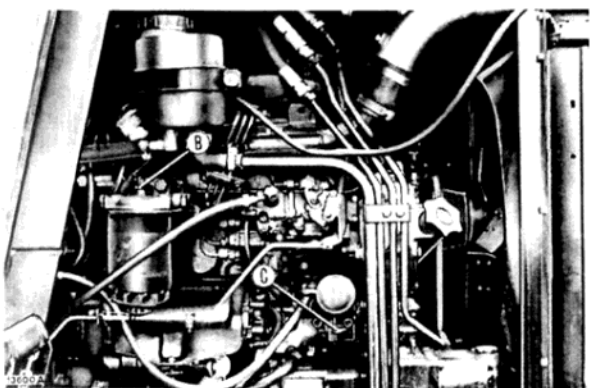
Proceed as follows:

- Check that fuel tank is full and that fuel pump suction cock is open.
- Back off plug (A, figures a and b) and actuate lever (B) until fuel issuing from the plug is free from air bubbles. Tighten plug (A).

- Repeat the above sequence for plug (C, figures a and b).

Back off screw (D, figures a and b) and actuate lever (B) or crank starter until fuel issuing from screw (D) is free from air bubbles.

- Repeat the above sequence for socket head cap-screw (E, figures a and b, or 3, page 5) and start engine.



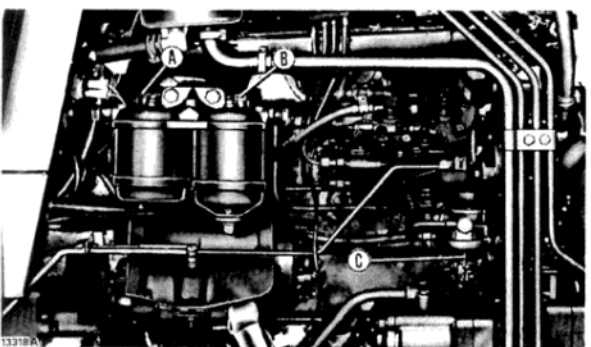
c

Engine with BOSCH pump

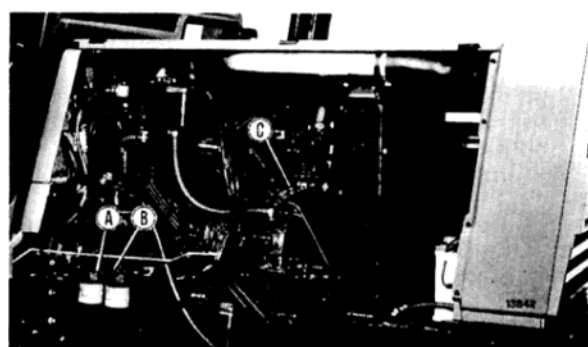
Proceed as follows:

- Check that fuel tank is full and that fuel pump suction cock is open.
- Back off plug (B, figures c, d and e) and actuate lever (C) until fuel issuing from plug is free from air bubbles. Tighten plug.
- Repeat the above sequence for plug (A, figures c, d and e). After tightening plug, actuate lever (C) several times.

Note - Late model 55-90 and 60-90 tractors feature a single filter cartridge.



d



e

Fuel system venting (BOSCH pump)

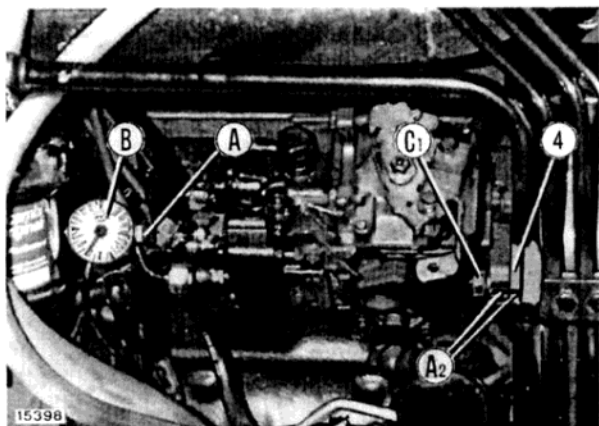
c. Early model 55-90 and 60-90 - d. 70-90 and 80-90 - e. 90-90 and 100-90.

55-90 60-90
70-90 80-90
90-90 100-90

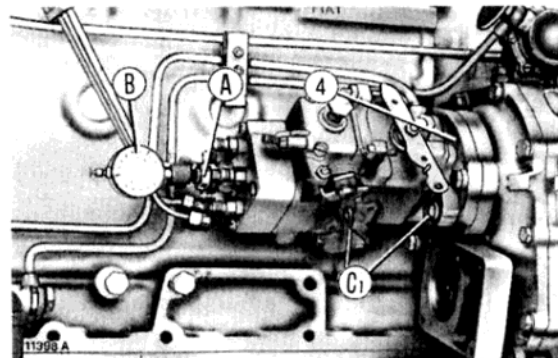
ENGINE: Fuel system

15

page 3



a



b

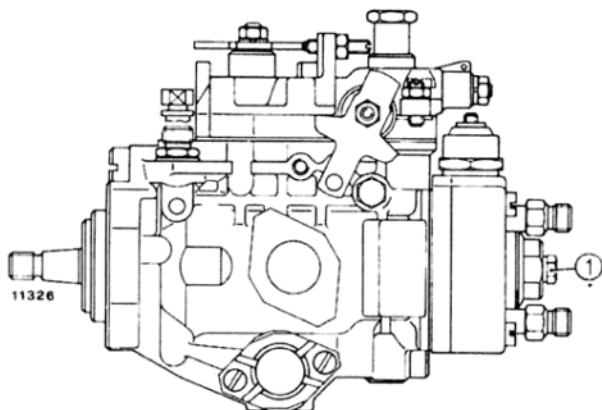
Adjusting BOSCH pump timing on engine

a. 55-90, 60-90, 70-90 and 80-90 - b. 90-90 and 100-90 - A. Tool **291755** - A₂. Timing mark - B. Gauge **291754** - C₁. Pump nut or capscrew - 4. Spacer.

INJECTION PUMP REMOVAL, INSTALLATION AND TIMING – BOSCH VE TYPE

Remove injection pump as follows:

- Close fuel pump suction cock.
- Remove front cover for access to injection pump timing gear (55-90, 60-90, 70-90 and 80-90 only).
- Disconnect fuel suction and leak-back lines, delivery pipes, throttle link and engine shut-off connection.
- If necessary, disconnect fuel pump and filters (55-90, 60-90, 70-90 and 80-90) or hydraulic lift pump (90-90 and 100-90).
- Slacken capscrews or nuts (C₁) and drive shaft nut. Remove injection pump.

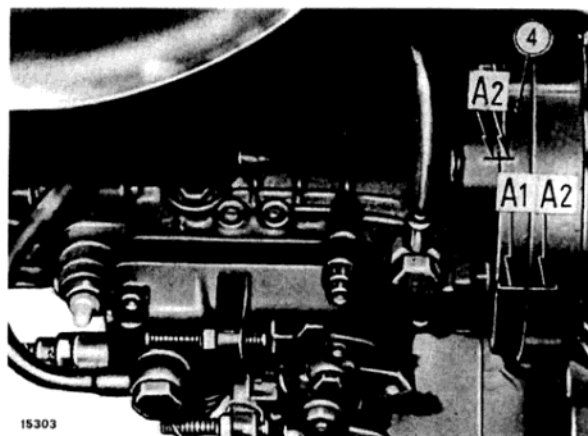


View of injection pump with plug (1).

Note - To remove injection pump on 90-90 and 100-90 tractors, remove screws (C₁) together with drive sleeve and associated nut.

Install injection pump as follows:

- Position gasket between pump flange and spacer.
- For models 55-90, 60-90, 70-90 and 80-90, insert shaft in drive gear and secure through associated nut. Start pump nuts (C₁).
- For models 90-90 and 100-90, install pump shaft together with drive sleeve and associated nut in drive gear. Start pump capscrews (C₁).
- Turn pump body to align timing marks (A₁ and A₂) or pump and spacer (4).



Applying timing marks (A).

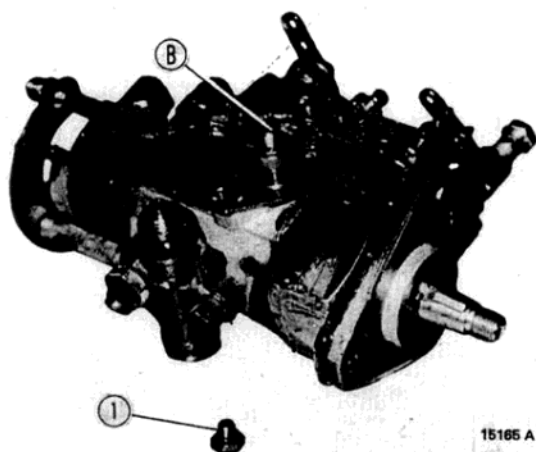
A₁. Existing mark - 4. Spacer.

ENGINE: Fuel system

- Tighten pump nuts or capscrews (C₁) and connect fuel and delivery lines. Also connect fuel pump and filters (55-90, 60-90, 70-90 and 80-90) or hydraulic lift pump (90-90 and 100-90).
- Vent circuit as described in the relevant section.

If timing marks (A₁ and A₂) are missing or are suspected to be incorrect, adjust timing as follows:

- Bring piston No. 1 to T.D.C. in compression stroke (valves closed) and turn flywheel counterclockwise (as viewed from fan side) until timing pointer is aligned with INIEZ. BOSCH mark.
- With injection pump installed, remove plug (I) and install tool **291755** (A) together with gauge **291754** (B) and apply a 2.5 mm or 100 in preload to spindle.
- Turn flywheel slowly in the opposite direction until gauge reading stops dropping, indicating that plunger No. 1 is at bottom of stroke at commencement of injection.
- Zero gauge and turn flywheel slowly clockwise until timing pointer is aligned with INIEZ. BOSCH mark.
- Check that plunger stroke as indicated on gauge is 1 mm or 039 in. To adjust, slacken pump nuts (C₁, 55-90, 60-90, 70-90 and 80-90) or screws (C₁) and spacer screws (90-90 and 100-90).
- If plunger stroke is less than specified, turn pump clockwise (as seen from drive side) for 55-90, 60-90, 70-90 and 80-90 tractors, or counterclockwise for 90-90 and 100-90 tractors. If plunger stroke is greater, turn pump counterclockwise for 55-90, 60-90, 70-90 and 80-90 tractors or clockwise for 90-90 and 100-90 tractors.
- Tighten pump nuts (55-90, 60-90, 70-90 and 80-90) or pump capscrews and spacer nuts (90-90 and 100-90). Apply timing marks to pump flange and spacer (55-90, 60-90, 70-90 and 80-90) or to pump flange, spacer and to support alongside mark A₁, page 3 on spacer (90-90 and 100-90).
- Remove gauge (B) and tool (A). Install plug (I) and tighten to 8 to 10 Nm (0.8 to 1 kgm or 5.7 to 7.2 ft. lb).
- Connect fuel and delivery lines with fuel filters (55-90, 60-90, 70-90 and 80-90) or hydraulic lift pump (90-90 and 100-90).
- Vent circuit as described in the relevant section.



Installing timing tool 292411 (B) on C.A.V. DPS injection pump.
1. Plug.

INJECTION PUMP REMOVAL, INSTALLATION AND TIMING - C.A.V. DPS TYPE

Remove injection pump as follows:

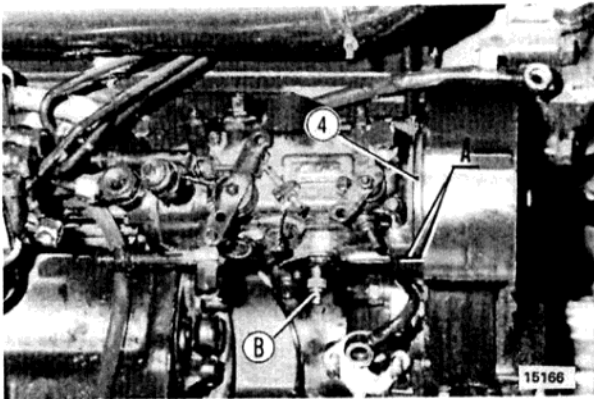
- Close fuel pump suction cock;
- Remove front cover for access to injection pump timing gear;
- Disconnect fuel suction and leak-back lines, delivery pipes, throttle link and engine shut-off connection.
- If necessary, disconnect fuel pump.
- Remove nuts (C₁, page 5) and drive shaft nut. Remove injection pump. Install injection pump as follows:
- Position gasket between pump flange and spacer (4, pag 5).

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Fuel system

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page 5



Adjusting C.A.V. DPS injection pump timing
A. Timing marks - B. Tool 292411 - 4. Spacer.

- Insert shaft in drive gear and secure through associated nut. Start nuts (C₁).
- Turn pump body to align timing marks (A) on pump and spacer (4).
- Tighten pump nuts (C₁). Install fuel pump, connect fuel lines and vent circuit as described in the relevant section.

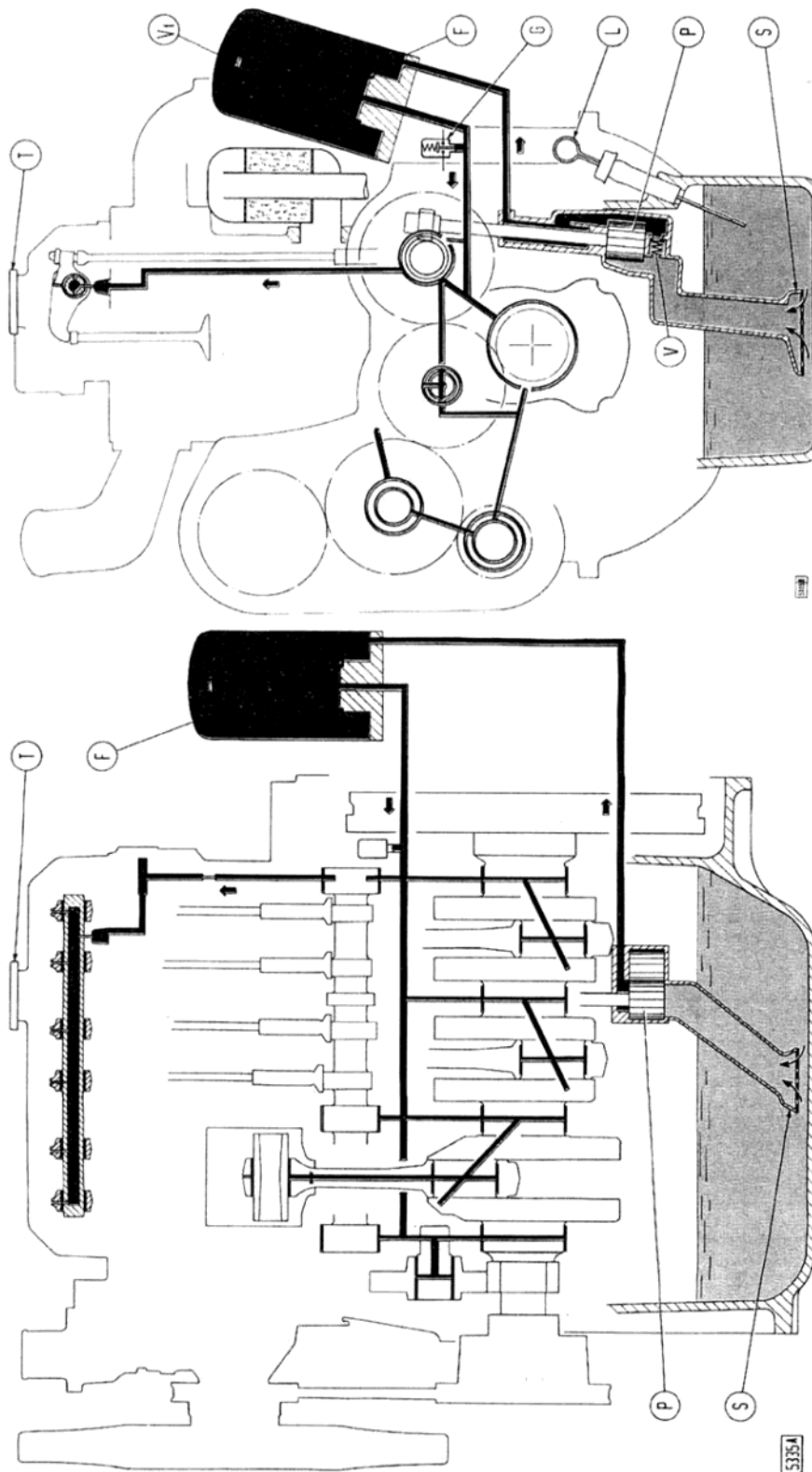
If timing marks (A) are missing or are suspected to be incorrect, adjust as follows:

- Bring piston No. 1 to T.D.C. in compression stroke (valves closed); in this position, timing pointer is aligned with INIEZ. C.A.V. mark.
- Remove plug (1, page 4) from side cover and install timing tool 292411 (B).
- Install shaft in drive gear, secure through associated nut and start pump nuts (C₁).



View of injection pump on engine.
C₁. Nuts - 3. Vent screw.

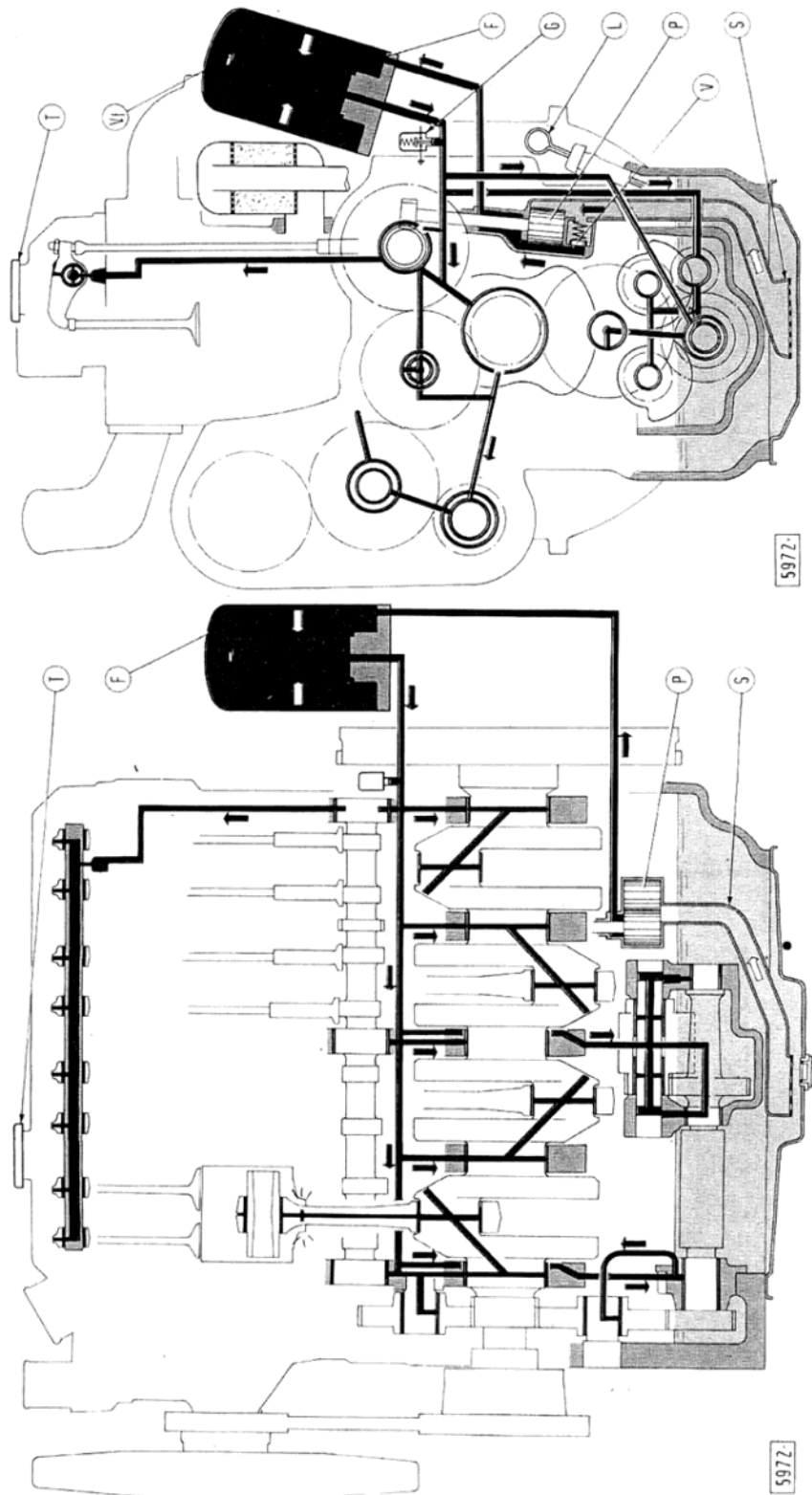
- Turn pump body until spindle of tool 292411 (B) enters notch on pump shaft, i.e., until spindle moves towards pump.
- Tighten pump nuts (C₁), apply timing marks (A) on pump flange and spacer (4), and install fuel pump.
- Remove tool 292411 (B) from cover hole and tighten plug (1) to 4.5 Nm (0.45 kgm or 3.25 ft.lb).
- Connect fuel lines and vent circuit as described in the relevant section.



Lubrication System Diagram (55-90 and 60-90).

F. Filter - G. Oil pressure sending unit - L. Dipstick - P. Pump - S. Suction filter - T. Oil filler cap - V. Relief valve - Vf. By-pass valve (cuts in when inlet pressure is 1.5 to 1.7 bar or 22 to 25 psi higher than outlet pressure).

ENGINE: Lubrication system



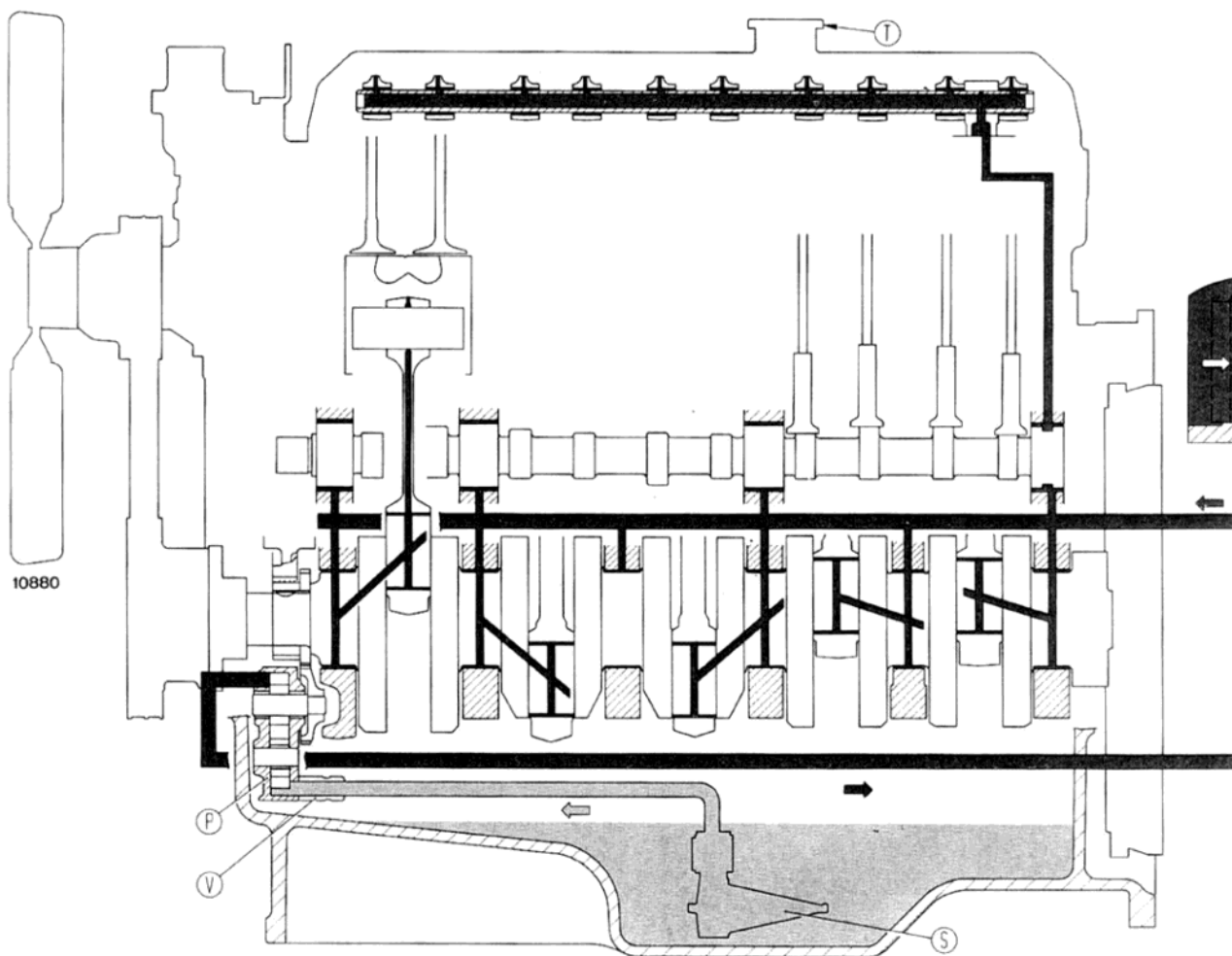
Lubrication System Diagram (70-90 and 80-90).
 F. Filter - G. Oil pressure sending unit - L. Dipstick - P. Pump - S. Suction filter - T. Oil filter cap - V. Relief valve (cuts in when inlet pressure is 1.5 to 1.7 bar or 22 to 25 psi higher than outlet pressure).

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Lubrication system

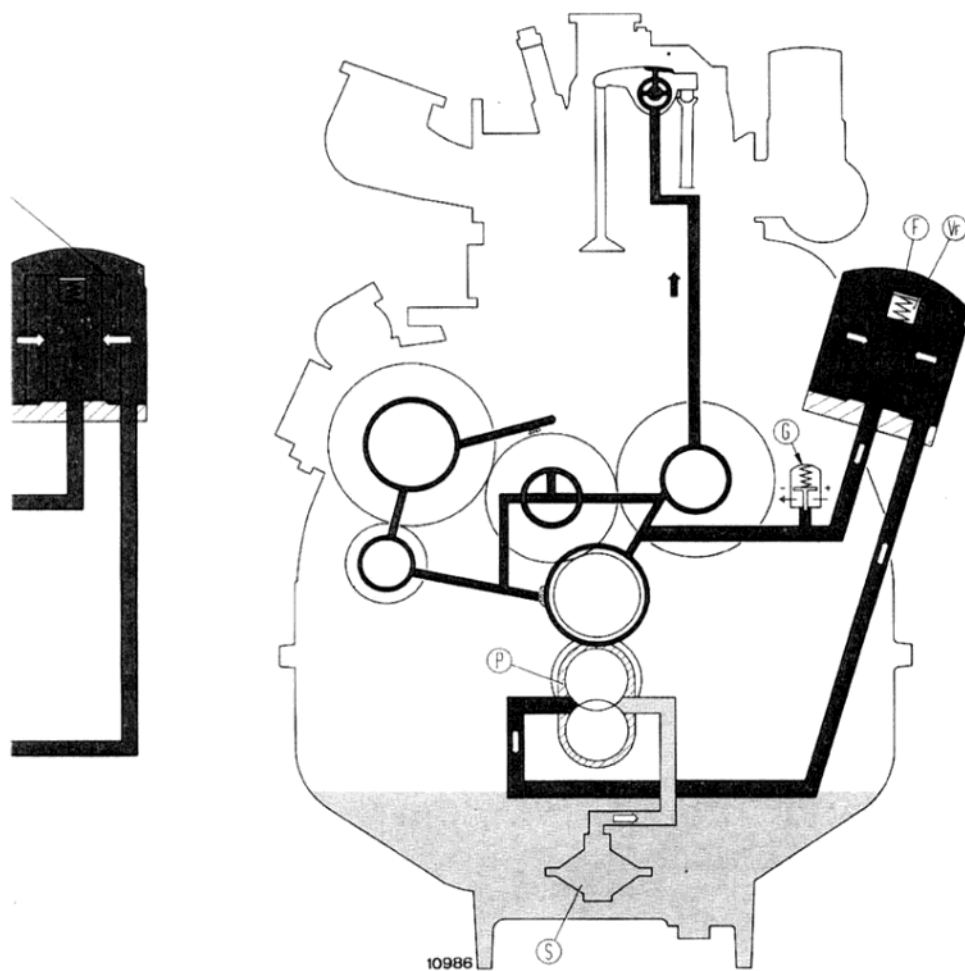
16

page 3



Lubrication System

F. Filters - G. Low engine oil pressure sending unit - P. Pressure valve (cuts in when inlet pressure is 1.5 to 1.0 bar)



am (90-90).

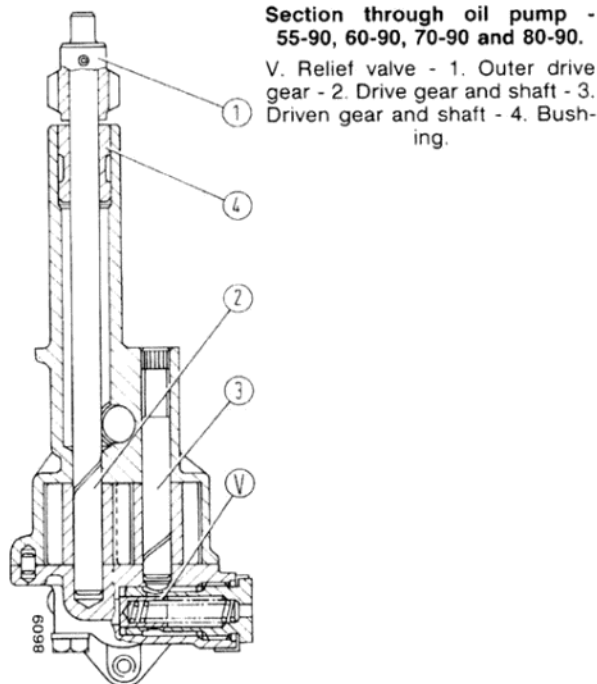
tion filter - T. Oil filler cap - V. Relief valve - Vf. By-pass
22 to 25 psi higher than outlet pressure).

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Lubrication system

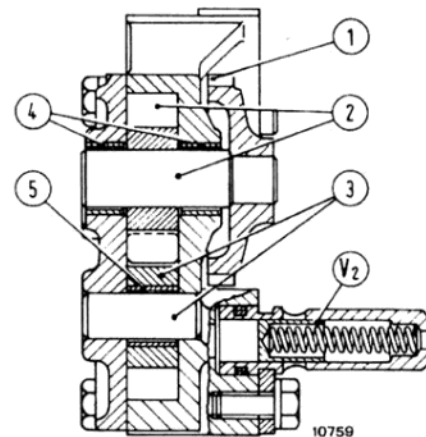
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page 5



Section through oil pump -
55-90, 60-90, 70-90 and 80-90.

V. Relief valve - 1. Outer drive
gear - 2. Drive gear and shaft - 3.
Driven gear and shaft - 4. Bush-
ing.



Section through oil pump - 90-90 and 100-90.

V₂. Relief valve - 1. Outer drive gear - 2. Drive gear and shaft
- 3. Driven gear and shaft - 4. Bushing - 5. Bushing.

OIL PUMP

The oil pump is accessible after removing the engine oil pan.

In the course of overhaul, assess the amount of wear affecting the various components by comparison to the dimensions given in the table.

Drive shaft (2) and associated gear are to be replaced together as gear is shrunk on shaft.

- Fit the cartridge by turning until contact with the mounting flange is established.
- Turn the cartridge by hand through a further $\frac{3}{4}$ turn.

OIL FILTER

The paper cartridge oil filter (F, pages 1, 2, 3 and 4) is a full-flow unit fitted on the outlet side of the pump. A by-pass valve (Vf) will enable unfiltered oil to enter the engine should the filter become obstructed.

Every 400 working hours, replace the cartridge noting the following points:

- Smear the external seal with engine oil.

OIL PRESSURE WARNING SYSTEM

The oil pressure warning system includes a sending unit (G, pages 1, 2 and 3 or I, page 4) and a dash-mounted warning light which comes on if:

- Oil pressure is low. The light may come on when the engine runs hot at low rpm; however, this is normal.
- Sending unit is inefficient.

If the warning light fails to come on when the master switch is operated, the possible causes are:

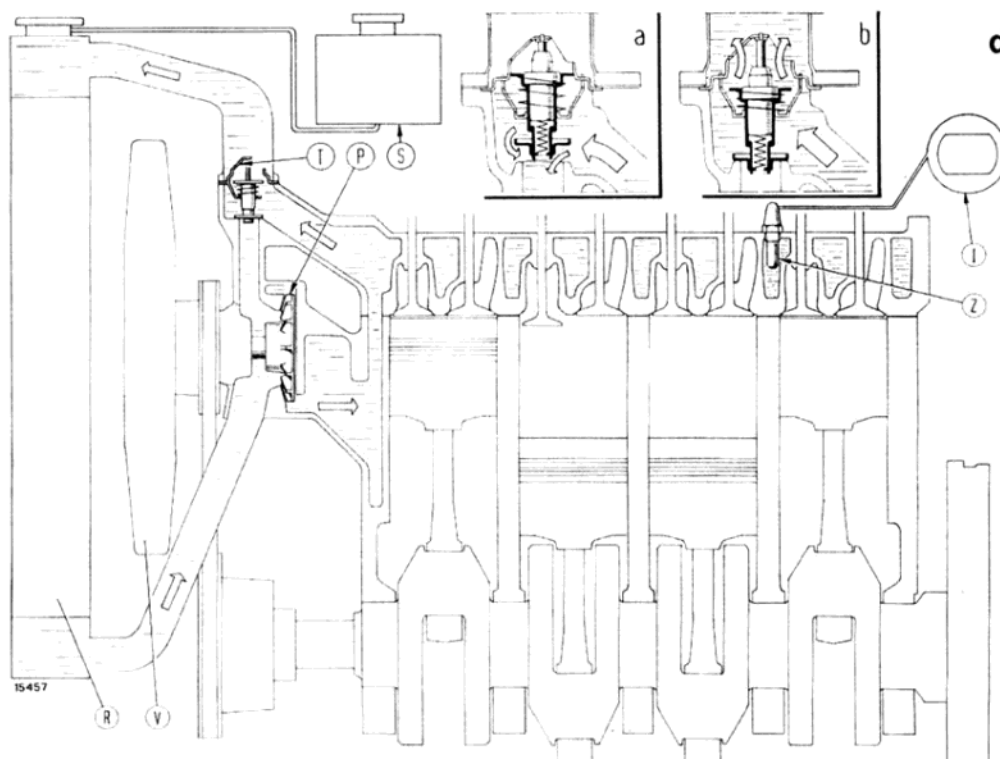
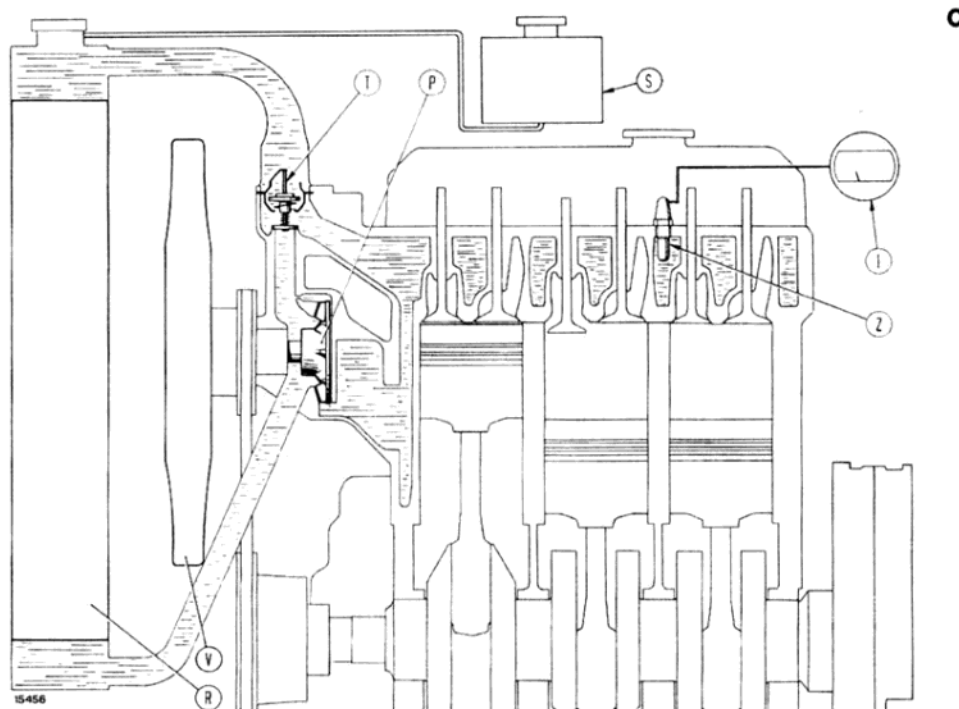
- Blown fuse.
- Burnt warning light bulb filament.
- Open circuit across sending unit and warning light.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Cooling system

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page 1



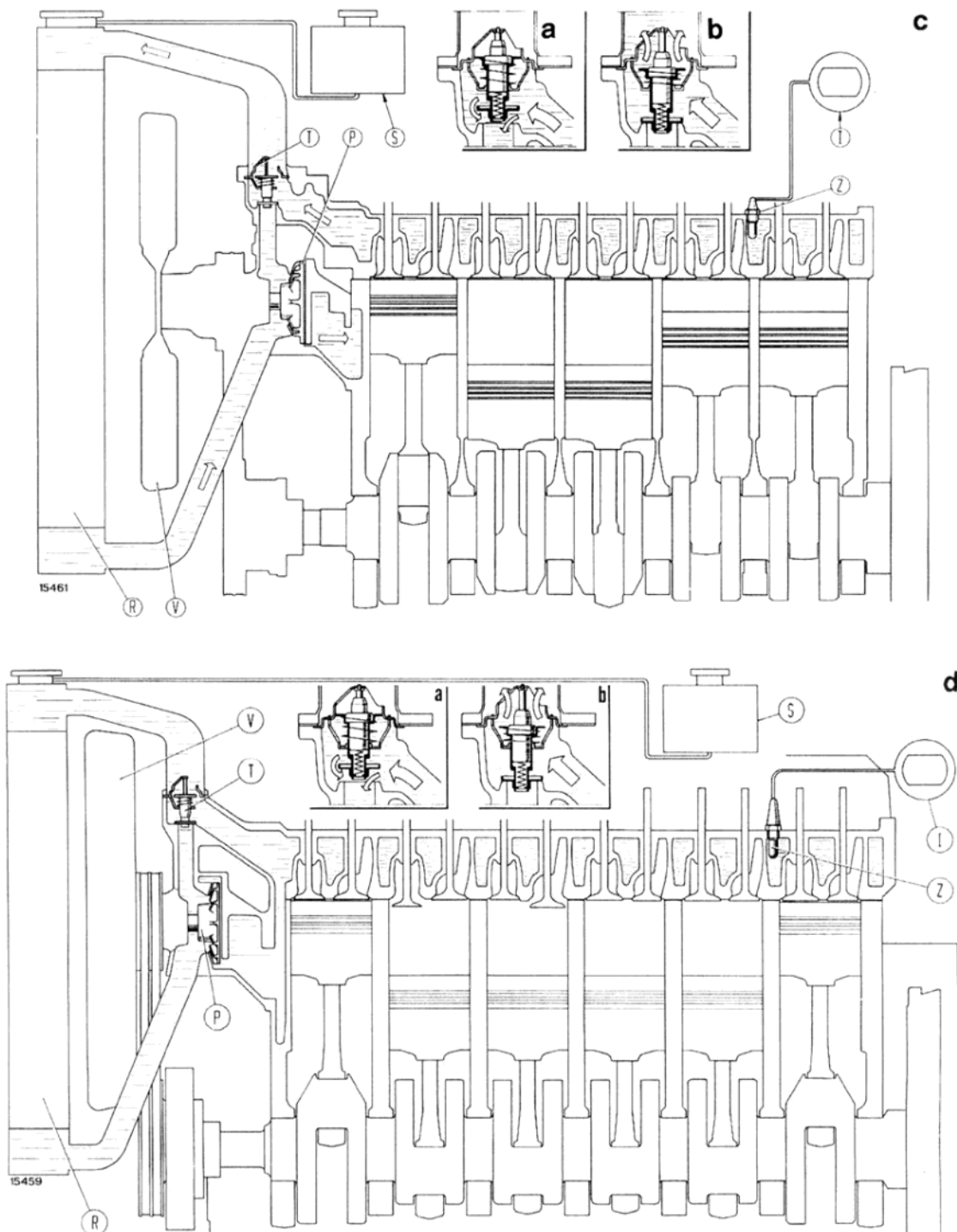
Cooling System Diagram.

a. Thermostat closed - b. Thermostat open - c. Models 55-90 and 60-90 - d. Models 70-90 and 80-90 - I. Water temperature gauge - P. Pump - R. Radiator - S. Expansion tank - T. Thermostat - V. Fan - Z. Sending unit.

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ENGINE: Cooling system



Cooling System Diagram.

a. Thermostat closed - b. Thermostat open - c. Model 90-90 - d. Model 100-90 - I. Water temperature gauge - P. Pump - R. Radiator - S. Expansion tank - T. Thermostat - V. Fan - Z. Sending unit.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: Cooling system

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page 3

DESCRIPTION

The cooling system of 55-90, 60-90, 70-90, 80-90, 90-90 and 100-90 tractors is filled with a mixture of water and **FIAT «PARAFU 11»** anti-freeze (50-50 volume) incorporating oxidation, corrosion, foam and scale control properties.

Mixture strengths of 20%, 30%, 40% and 50% give protection down to -8°C , -15°C , -25°C and -35°C , respectively.

An expansion tank (S, pages 1 and 2) connected to the radiator header tank is used to contain the liquid expelled by system upon heating; the liquid is subsequently returned to the system as the temperature decreases.

Periodically check the coolant level in the transparent expansion tank (S); if the level remains constant it means that the system is free from leakage.

When topping up through the expansion tank, also ensure that the radiator is full by removing the radiator cap with a cold engine.

Your coolant is effective for a period of **2 years** or **1600 hours**, after which time the system should be drained, flushed and refilled with fresh coolant.

WATER PUMP

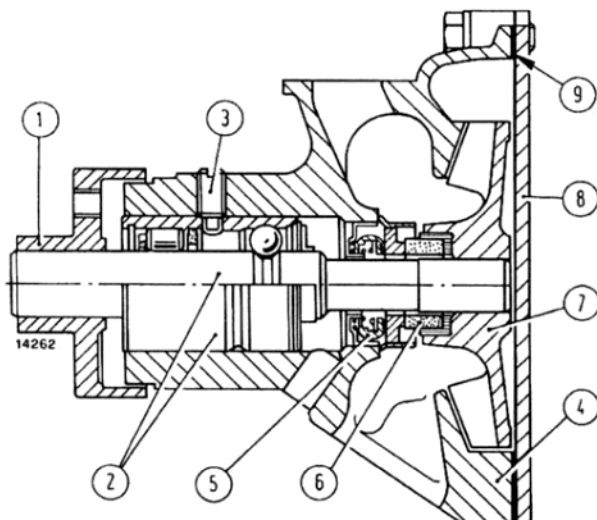
To overhaul pump proceed as follows:

- Remove cover (8) and shaft retaining screw (3).
- Tap end of shaft (2) lightly to break the film of oxide between shaft and impeller. Remove impeller using puller **291182/1**.
- Using a suitable punch, withdraw shaft complete with bearing and fan hub.

Remove seal (5) only if replacement is necessary, i.e. when graphitized surface in contact with impeller bushing is no longer sufficiently smooth to prevent leakage.

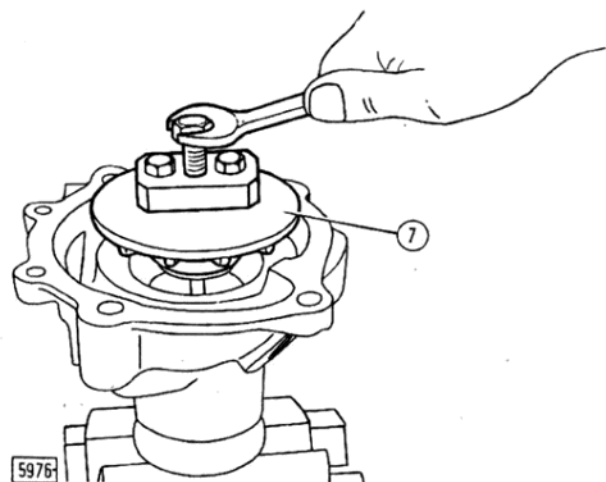
Reassemble parts bearing the following in mind:

- Bearing (2) requires no lubrication.
- Impeller (7) must be installed flush with end of drive shaft.



Section through Water Pump.

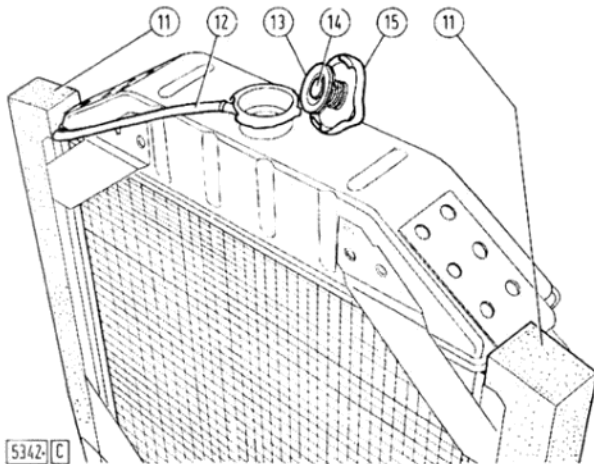
1. Pump and fan drive hub - 2. Drive shaft assembly - 3. Retaining screw - 4. Pump body - 5. Seal - 6. Bushing - 7. Impeller - 8. Cover - 9. Gasket.



Removing Water Pump Impeller using Puller 291182/1.

7. Impeller.

ENGINE: Cooling system



Radiator .

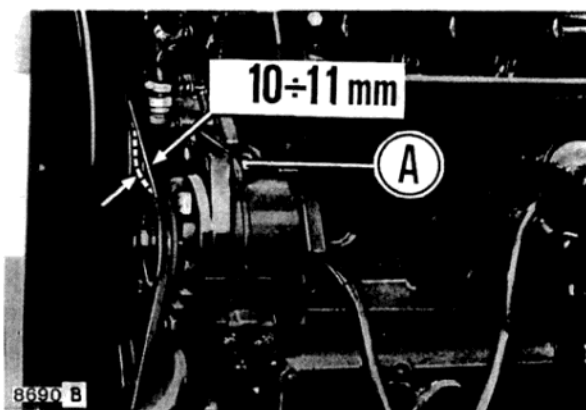
11. Sealing strips - 12. Vapour exhaust pipe - 13. Pressure release valve (calibrated at 0.7 bar - 0.7 kg/cm² - 10.15 psi)
- 14. Vacuum release valve - 15. Radiator cap.

RADIATOR

Radiator cap incorporates two valves: a pressure release valve (13) calibrated at 0.7 bar (0.7 kg/cm², 10.15 psi), and a vacuum release valve (14). Periodically check that valves operate correctly.

On overhaul, eliminate scale in radiator proceeding as follows:

- Prepare and filter a solution of warm water and sodium bicarbonate (30 grams/litre), or use FIAT flushing solution in quantity indicated on container.
- Pour solution in radiator, drain and rinse with abundant running water.



To check for radiator leakage, submerge radiator in a tank of water at 30 ± 10 °C (86 ± 50 °F) and introduce internal air pressure of 0.98 bar (1 kg/cm², 14.2 psi) for 2 minutes. Repeat test at least three times.

When flushing the radiator, also flush the rest of the cooling system using the solution and procedures indicated above.

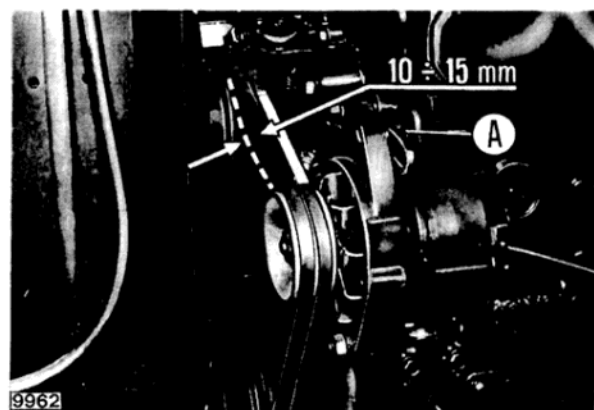
Operate tractor for about 1 hour before draining solution with the engine off.

BELT TENSION ADJUSTMENT

To check tension of fan, water pump and alternator drive belt, apply a 78 to 98 N (8 to 10 Kg, 17.64 to 22.05 lb) load on belt section between alternator and water pump pulley. Belt should deflect by 10 to 11 mm (0.4 to 0.433 in) for 55-90, 60-90, 70-90 and 80-90, or 10 to 15 mm (0.4 to .6 in) for 90-90 and 100-90.

If necessary, adjust as follows:

- Slacken nut (A) securing alternator to belt tensioner.
- Move alternator along bracket to obtain the desired tension and tighten nut (A).



b

Adjusting Fan, Water Pump and Alternator Drive Belt Tension.

a. 55-90, 60-90, 70-90 and 80-90 - b. 90-90 and 100-90 - A. Alternator nut on belt tensioner.

55-90 60-90
70-90 80-90
90-90 100-90

ENGINE: **Cooling system**

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page 5

WATER TEMPERATURE GAUGE

The water temperature gauge scale is divided into three coloured sectors corresponding to the following temperatures:

- White sector 30 to 65 °C (86 to 149 °F)
- Green sector 65 to 105 °C (149 to 222 °F)
- Red sector 105 to 115 °C (222 to 239 °F)

In normal conditions, pointer should be over green sector.

To test instrument, submerge bulb in water and check scale with a reference thermometer; repeat test several times.

THERMOSTAT

Thermostat (T, page 1) is installed in cylinder head water outlet pipe. Since calibration is not possible, replace thermostat assy when temperature data specified in table are not met.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Specification and Data

20*page 1*

CLUTCH - LUK 11"/11" (55-90, 60-90, 70-90, 80-90)

Type	Twin, single dry plate
Control	Pedal
— Transmission	Manual
— PTO	
Release mechanism	Dished spring
Plate material	
— Transmission:	Organic compound
● Model 55-90, 60-90, 70-90 (standard)	
● Standard for model 80-90 and optional for model 55-90, 60-90, 70-90	Ceramic compound
— PTO (all models)	Organic compound
Plate thickness:	
— Transmission:	8.4 to 9.0 mm (0.331 to 0.354 in)
● Models 55-90, 60-90, 70-90 (organic compound)	9.2 to 10 mm (0.362 to 0.394 in)
● Models 55-90, 60-90, 70-90, 80-90 (ceramic compound)	8.3 to 8.9 mm (0.327 to 0.350 in)
— PTO (all models)	See page 17, section 22
— Wear limit	
Transmission clutch control sleeve working clearance	0.050 to 0.151 mm (0.0020 to 0.0060 in)
PTO clutch control sleeve working clearance	0.060 to 0.180 mm (0.0023 to 0.0071 in)
Release lever alignment	See page 18 & 19, section 22
Clutch linkage adjustment	See page 19 & 20, section 22

CLUTCH-VALEO 11"/11" (55-90, 60-90, 70-90, 80-90)

Type	Twin, single dry plate
Control	Pedal
— Transmission	Manual Lever
— PTO	
Release mechanism	
— Late model	Single dished spring
— Early model { Transmission	Dished spring
PTO	Dished spring
Plate material	
— Transmission:	Organic compound
● Models 55-90, 60-90, 70-90 (standard)	
● Standard for model 80-90 and optional for models 55-90, 60-90, 70-90	Ceramic compound
— PTO (all models)	Organic compound

(follows)

POWER TRAIN: Specification and Data

CLUTCH – VALEO 11"/11" (55-90, 60-90, 70-90, 80-90)

(continued)

Plate thickness: — Transmission: • Models 55-90, 60-90, 70-90 (organic compound) • Models 55-90, 60-90, 70-90, 80-90 (cerametallic compound) — PTO (all models) — Wear limit { — early models — late models	9.4 to 10 mm (0.37 to 0.39 in) 9.7 to 10.2 mm (0.38 to 0.40 in) 8.5 to 8.9 mm (0.33 to 0.35 in) See page 4, section 22 See page 9, section 22
Transmission clutch control sleeve working clearance PTO clutch sleeve working clearance	0.050 to 0.151 mm (0.0020 to 0.0060 in) 0.060 to 0.180 mm (0.0023 to 0.0071 in)
Release lever alignment { — early models — late models Clutch linkage adjustment	See pages 4, 5 & 6, section 22 See pages 10 & 11, section 22 See pages 19 & 20, section 22

CLUTCH - O.M.G. 11"/11" (55-90, 60-90, 70-90, 80-90)

Type Control — Transmission — PTO Release mechanism	Twin, single dry plate Pedal Manual lever Single dished spring
Plate material: — Transmission: • Models 55-90, 60-90, 70-90 (standard) • Standard for model 80-90 and optional for models 55-90, 60-90, 70-90 — PTO (all models) Plate thickness: — Transmission: • Model 55-90, 60-90, 70-90 (organic compound) • Models 55-90, 60-90, 70-90, 80-90 (cerametallic compound) — PTO (all models) — Wear limit	Organic compound Cerametallic compound Organic compound 8.5 to 9.1 mm (0.3346 to 0.3583 in) 8.9 to 9.5 mm (0.3504 to 0.3740 in) 8.7 to 9 mm (0.3425 to 0.3543 in) See page 17, section 22
Transmission clutch control sleeve working clearance PTO clutch control sleeve working clearance	0.050 to 0.151 mm (0.0020 to 0.0059 in) 0.060 to 0.180 mm (0.0023 to 0.0071 in)
Release lever alignment Clutch linkage adjustment	See pages 18 & 19, section 22 See pages 19 & 20, section 22

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Specification and Data

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page 3

CLUTCH - LUK 12"/12" (90-90, 100-90)

Type	twin, single dry plate
Control	transmission clutch pedal and PTO clutch hand lever
Release mechanism	single dished spring
Plate material: — Transmission clutch — PTO clutch Plate thickness: — Transmission clutch — PTO clutch — Wear limit	cerametallic compound organic compound 9.2 to 10 mm (.362 to .397 in) 9.35 to 10.05 mm (.368 to .395 in) see page 17, section 22
Transmission clutch control sleeve working clearance PTO clutch control sleeve working clearance	.060 to .180 mm (.002 to .007 in) .060 to .180 mm (.002 to .005 in)
Release lever alignment	see pages 18 and 19, section 22
Clutch linkage adjustment	see page 19 and 20, section 22

CLUTCH - VALEO 12"/12" (90-90, 100-90)

Type	twin, single dry plate
Control	transmission clutch pedal and PTO clutch hand lever
Release mechanism: — Transmission clutch — PTO clutch	diaphragm spring dished spring
Plate material: — Transmission clutch — PTO clutch Plate thickness: — Transmission clutch — PTO clutch — Wear limit	cerametallic compound organic compound 9.6 to 10.2 mm (.377 to .401 in) 8.9 to 9.3 mm (.350 to .366 in) see page 12, section 22
Transmission clutch control sleeve working clearance PTO clutch control sleeve working clearance	.060 to .180 mm (.002 to .007 in) .060 to .180 mm (.002 to .007 in)
Release lever alignment	see pages 13 and 14, section 22
Clutch linkage adjustment	see pages 19 and 20, section 22

POWER TRAIN: Specification and Data

CLUTCH - VALEO, LUK and O.M.G. (all models)

Transmission clutch pedal support	
Pivot shaft dia.	21.967 to 22.000 mm (.864 to .866 in)
Bushing fitted I.D. (reamed)	22.000 to 22.030 mm ^(*) (.866 to .867 in)
Pivot clearance in bushing	0.000 to .063 mm ^(*) (.000 to .002 in)
Support bore dia.	25.939 to 25.972 mm (1.021 to 1.022 in)
Bushing O.D.	25.979 to 26.000 mm (1.031 to 1.023 in)
Bushing interference fit in housing	0.007 to 0.061 mm (.0002 to .0024 in)

(*) Metallic compound bushing only.

TRANSMISSION AND SPLITTER (55-90, 60-90, 70-90, 80-90)

Transmission type	4-speed constant mesh helical gears with speed range synchromesh shift
Splitter	Pinion drive, 3 forward ranges and 1 reverse range, for a total of 12 forward 4 reverse speeds.
— Gears	Spur
— Reduction ratios	
● Low	$\frac{23 \times 17}{43 \times 50} = 1 \text{ to } 5.49$
● Normal	$\frac{23 \times 27}{43 \times 34} = 1 \text{ to } 2.35$
● High	1
Transmission and splitter controls	Separate manual levers to operator's right
Transmission shaft thrust bearing thickness (S, page 5, section 23)	3.00-3.25-3.50-3.75-4.00 mm (0.1181-0.1279-0.1378-0.1476-0.1575 in)-
Driven gear I.D.	50.050 to 50.075 mm (1.9705 to 1.9714 in)
Bushing O.D.	49.925 to 49.950 mm (1.9655 to 1.9665 in)
Bushing clearance in gear	0.100 to 0.150 mm (0.0039 to 0.005 in)
Driven shaft dia.	39.175 to 39.191 mm (1.5423 to 1.5429 in)
Bushing I.D.	39.200 to 39.239 mm (1.5433 to 1.5448 in)
Shaft clearance in bushing	0.009 to 0.064 mm (0.0003 to 0.0025 in)
PTO clutch shaft dia.	24.979 to 25.000 mm (0.983 to 0.984 in)
Bushing fitted I.D.	25.040 to 25.092 mm ⁽¹⁾ (0.9858 to 0.9879 in) ⁽¹⁾
Shaft clearance in bushing	0.040 to 0.113 mm (0.002 to 0.004 in)
Bushing interference fit with drive shaft	0.037 to 0.091 mm (0.0014 to 0.0035 in)

(1) Not reamed

(follows)

TRANSMISSION AND SPLITTER (55-90, 60-90, 70-90, 80-90)*(continued)*

Selector shaft detent ball spring length:	
— Free	30 mm (1.181 in)
— Under 50 to 56 N (5.13 to 5.67 kg, 11.3 to 12.5 lb)	25.5 mm (1.004 in)
Lever spring length:	
— Free	75 mm (2.9527 in)
— Under 94 to 104 N (9.6 to 10.6 kg, 19.6 to 21.7 lb)	42 mm (1.653 in)

TRANSMISSION AND SPLITTER (90-90, 100-90)

Transmission type	Constant mesh with speed range synchromesh shift
Gears	Helical (spur reverse)
Splitter	Planetary, 3 ranges for a total of 15 forward and 3 reverse speeds
— Gears	Spur
— Reduction ratios:	
● Low	$\frac{35}{35+76} = 1 \text{ to } 3.17$
● Normal	$\frac{35}{35+76} = 1 \text{ to } 3.17$
● High	1
Transmission and splitter controls	Separate manual levers to operator's right
Driven gear dia.	57.060 to 57.090 mm (2.246 to 2.247 in)
Bushing O.D.	56.951 to 56.970 mm (2.2421 to 2.2429 in)
Bushing clearance in gear	0.090 to 0.139 mm (.003 to .005 in)
Driven shaft dia.	47.575 to 47.591 mm (1.8730 to 1.8736 in)
Bushing I.D.	47.600 to 47.625 mm (1.8740 to 1.8749 in)
Shaft clearance in bushing	0.009 to 0.050 mm (0.0003 to .0019 in)
PTO clutch shaft dia.	27.979 to 28.000 mm (1.1015 to 1.1023 in)
Bushing fitted I.D.	28.040 to 28.092 mm (*) (1.1039 to 1.1059 in)
Shaft clearance in bushing	0.040 to 0.113 mm (.002 to .004 in)
Bushing interference fit with drive shaft	0.043 to 0.103 mm (.0016 to .004 in)

(follows)

(*) Not reamed.

POWER TRAIN: Specification and Data

TRANSMISSION AND SPLITTER (90-90, 100-90)

(continued)

Splitter driven gear thrust washers	1.465 to 1.535 mm (.057 to .060 in)
Transmission driven shaft bearing adjustment	see pages 17 and 18, section 23
Transmission driven shaft bearing shim thickness range	8.00 - 8.10 - 8.20 - 8.30 - 8.40 - 8.50 - 8.60 - 8.70 - 8.80 - 8.90 - 9.00 - 9.05 - 9.10 - 9.15 - 9.20 - 9.25 - 9.30 - 9.35 - 9.40 - 9.45 - 9.50 - 9.55 - 9.60 - 9.65 - 9.70 mm (.314 - .318 - .322 - .326 - .330 - .334 - .338 - .342 - .346 - .350 - .354 - .356 - .358 - .360 - .362 - .364 - .366 - .368 - .370 - .372 - .374 - .376 - .377 - .379 - .381 in)
Transmission drive shaft bearing adjustment	see page 19, section 23
Transmission drive shaft bearing shim thickness range	2.00 - 2.10 - 2.20 - 2.30 - 2.40 - 2.50 - 2.55 - 2.60 - 2.65 - 2.70 - 2.75 - 2.80 - 2.85 - 2.90 - 2.95 - 3.00 - 3.10 - 3.20 - 3.30 - 3.40 - 3.50 - 3.60 mm (.078 - .082 - .086 - .090 - .094 - .098 - .100 - .102 - .104 - .106 - .108 - .110 - .112 - .114 - .116 - .118 - .122 - .125 - .129 - .133 - .137 - .141 in)
Selector quadrant return spring length:	
— Free	115 mm (4.52 in)
— Under 204 to 225 N (20.8 to 23 kg or 45.8 to 50.7 lb)	45 mm (1.77 in)
Selector shaft detent spring length:	
— Free	30 mm (1.18 in)
— Under 50 to 56 N (5.13 to 5.67 kg or 11.3 to 12.5 lb)	25.5 mm (1.003 in)
Splitter detent spring length:	
— Free	20 mm (.78 in)
— Under 52 to 58 N (5.3 to 5.9 kg or 11.6 to 13 lb)	16.5 mm (.64 in)

CREEPER (55-90, 60-90, 70-90, 80-90)

Type	Pinion drive, spur gear, between clutch and transmission.
Reduction ratio	20 forward and 8 reverse speeds. $\frac{18 \times 26}{55 \times 47} = 1 \text{ to } 5.524$
Control	Lever on operator's left

CREEPER (90-90, 100-90)

Type	Planetary, spur gear, in line with splitter, 20 forward and 4 reverse
Reduction ratio	$\frac{35}{35 + 76} = 1 \text{ to } 3.17$
Control	Splitter lever
Thrust washers	1.465 to 1.535 mm (.057 to .060 in)

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Specification and Data

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page 7

REVERSER (55-90, 60-90, 70-90, 80-90)

Type	Manual, spur gear, between clutch and transmission. 1 driven gear, 1 intermediate gear, 1 relay gear.
Control	Lever on operator's left

REAR BEVEL DRIVE AND DIFFERENTIAL

	55-90, 60-90	70-90, 80-90	90-90, 100-90
Bevel drive ratio	9/43 = 1 to 4.8		10/51 = 1 to 5.1
Bevel drive backlash	0.18 to 0.23 mm (0.006 to 0.009 in)		
Differential	2-pinion		
Differential lock	Pedal controlled		
Lock release	Hydraulic, brake pedal controlled		
Differential pinion bore dia.	24.040 to 24.061 mm (0.9465 to 0.9473 in)	25.040 to 25.061 mm (0.9858 to 0.9867 in)	30.040 to 30.061 mm (1.182 to 1.183 in)
Differential pinion journal dia.	23.939 to 23.960 mm (0.9423 to 0.9433 in)	24.939 to 24.960 mm (0.9818 to 0.9827 in)	29.939 to 29.960 mm (1.178 to 1.179 in)
Differential pinion running clearance on journal	0.080 to 0.122 mm (0.0031 to 0.0048 in)	0.080 to 0.122 mm (0.0031 to 0.0048 in)	0.080 to 0.122 mm (.003 to .004 in)
Side gear boss housing dia. in differential case	44.080 to 44.119 mm (1.7354 to 1.7369 in)	51.100 to 51.146 mm (2.0118 to 2.0136 in)	60.100 to 60.146 mm (2.366 to 2.367 in)
Side gear boss dia.	43.961 to 44.000 mm (1.7307 to 1.7323 in)	50.954 to 51.000 mm (2.0061 to 2.0079 in)	59.954 to 60.000 mm (2.360 to 2.362 in)
Side gear boss clearance in case	0.080 to 0.158 mm (0.0031 to 0.0062 in)	0.100 to 0.192 mm (0.0040 to 0.0075 in)	0.100 to 0.192 mm (.003 to .007 in)
Bevel pinion adjustment	See pages 3 and 4, section 25		See pages 7, 8 and 10, section 25
Bevel pinion shim thickness range	1.85 - 1.90 - 1.95 - 2.00 - 2.05 - 2.10 - 2.15 - 2.20 2.25 - 2.30 - 2.35 - 2.40 - 2.45 - 2.50 - 2.55 - 2.60 - 2.65 - 2.70 mm (.072 - .074 - .076 - .078 - .080 - .082 - .084 - .086 .088 - .090 - .092 - .094 - .096 - .098 - .100 - .102 .104 - .106 in)		1.40 - 1.45 - 1.50 - 1.55 - 1.60 1.65 - 1.70 - 1.75 - 1.80 - 1.85 1.90 - 1.95 - 2.00 - 2.05 - 2.10 2.15 - 2.20 - 2.25 - 2.30 - 2.35 2.40 - 2.45 - 2.50 mm (0.55 - .057 - .059 - .061 - .062 .064 - .066 - .068 - .070 - .072 .074 - .076 - .078 - .080 - .082 .084 - .086 - .088 - .090 - .092 .094 - .096 - .098 in)
Bevel pinion bearing adjustment	See page 4 and 5, section 25		see pages 8, 9 and 11, section 25
Bevel pinion bearing shim thickness range	—		1.00 - 1.05 - 1.10 - 1.15 - 1.20 1.40 - 1.50 - 1.70 - 1.75 - 1.80 1.85 - 1.90 - 1.95 - 2.00 - 2.05 2.10 - 2.15 - 2.50 - 2.55 - 2.60 2.65 - 2.70 - 2.75 - 2.80 - 2.85 2.90 - 2.95 - 3.00 - 3.05 - 3.10 3.15 - 3.20 - 3.25 - 3.30 - 3.35 3.40 - 3.45 - 3.50 mm (.039 - .041 - .043 - .045 - .047 .055 - .059 - .066 - .068 - .070 .072 - .074 - .076 - .078 - .080 .082 - .084 - .098 - .100 - .102 .104 - .106 - .108 - .110 - .112 .114 - .116 - .118 - .120 - .122 .124 - .1259 - .1279 - .1299 .1318 - .1338 - .1358 - .1377 in)

(follows)

POWER TRAIN: Specification and Data

REAR BEVEL DRIVE AND DIFFERENTIAL

(continued)

	55-90, 60-90	70-90, 80-90	90-90, 100-90
Differential bearing and bevel drive backlash adjustment	See pages 6 and 7, section 25		see pages 11, 12 and 13, section 25
Differential bearing and bevel drive backlash shim thickness (early models)	0.15 - 0.20 - 0.50 mm (.005 - 1.00 - 1.30 in)		
Side gear and differential pinion backlash	0.15 mm (0.006 in)	0.18 mm (0.008 in)	0.20 mm (0.010 in)
Side gear thrust washer thickness	1.5-1.6 mm (0.059-0.063 in)		
Differential pinion thrust washer thickness	1.470 to 1.530 mm (0.0579 to 0.0602 in)		
Backlash adjustment	See page 15, section 25		
Differential lock adjustment	See page 17, section 25		
Differential lock fork shim thickness	0.5 mm (0.020 in)		
Differential lock fork spring length:			
— Free	220 mm (8.66 in)		212.5 mm (8.37 in)
— Under 168 to 185 N (17.1 to 18.9 kg, 37.6 to 41.6 lb)	—		123.5 mm (4.86 in)
— Under 177 to 195 N (18.1 to 19.9 kg, 40 to 44 lb)	157.5 mm (6.201 in)		—

BRAKES

Type:	Disc, oil bath, axle shaft mounted	
— Service	Disc, oil bath, fully independent, acting on bevel pinion shaft through gear	Disc, oil bath, bevel pinion shaft mounted through gear
— Parking		
Control:	Hydrostatic, split circuit, latched pedals.	
— Service	Mechanical, manual lever	
— Parking		
Service brake disc material	Sintered	
Parking brake disc material	Steel	
Parking brake lining material	Sintered or graphite compound	
Parking brake relay lever shim thickness range	0.5-1-1.5-2 (.019 - .039 - .059 - .078 in)	

(follows)

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Specification and Data

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page 9

BRAKES

(continued)

	55-90, 60-90	70-90, 80-90	90-90, 100-90
Piston length	35.5 mm (1.39 in)		37 mm (1.45 in)
Piston machining allowance	1 mm (.039 in)		
Brake wear plate thickness	5 mm (.196 in)		
Disc thickness:			
— Service	10 mm (.393 in)		
— Wear limit	9 mm (.354 in)		
— Parking	4 mm (.157 in)		7 mm (.275 in)
Parking brake lining thickness:			
— Side linings	3.1 to 3.4 mm (.122 to .134 in)		
— Intermediate linings	4.2 to 4.5 mm (.165 to .177 in)		
Brake pedal support			
Right brake shaft journal diameter (4, page 2, section 26)	16.973 to 17.000 mm (.6682 to .6693 in)		
Bushing I.D. (4) (●)	17.100 to 17.150 mm ^(°) (.6732 to .6752 in) ^(°)		
Shaft clearance in bushing (●)	.100 to .177 mm (.004 to .007 in)		
Right brake shaft journal diameter (5 and 7)	20.967 to 21.000 mm (.8255 to .8268 in)		
Bushing I.D. (5 and 7) (●)	21.100 to 21.150 mm ^(°) (.8307 to .8327 in) ^(°)		
Shaft clearance in bushing (●)	.100 to .183 mm (.004 to .007 in)		
Left brake shaft journal diameter (6)	39.961 to 40.000 mm (1.5733 to 1.5748 in)		
Bushing I.D. (6) (●)	40.100 to 40.150 mm ^(°) (1.5787 to 1.5807 in) ^(°)		
Shaft clearance in bushing (●)	.100 to .189 mm (.004 to .007 in)		
Hydrostatic control			
Hydraulic pump	two master cylinders operated by separate brake pedals		
Operating pressure	17.6 bar, 18 kg/cm ² , 256 psi		
Master cylinder piston diameter	24.967 to 25.000 mm (.9829 to .9842 in)		
Master cylinder bore diameter	25.020 to 25.041 mm (.9850 to .9859 in)		
Working clearance in cylinder	.020 to .074 mm (.0008 to .0029 in)		
Piston return spring length:			
— free	190 mm (7.48 in)		
— under 97 to 107 N, 9.9 to 10.9 kg, 21.8 to 24 lb.	128 mm (5.04 in)		
— under 143 to 159 N, 14.6 to 16.2 kg, 32.2 to 35.7 lb.	98 mm (3.86 in)		

(follows)

(●) Metallic compound bushings only.
(°) Not reamed.

POWER TRAIN: Specification and Data

BRAKES

(continued)

	55-90, 60-90	70-90, 80-90	90-90, 100-90
Pedal adjustment	see page 4, section 26		
Brake system bleeding	see page 5, section 26		

FINAL DRIVES

	55-90, 60-90	70-90, 80-90	90-90, 100-90
Type	planetary, 3-planet, spur		
Reduction ratio	14 to (14 + 67) = 1 to 5,57	13 to (13 + 65) = 1 to 6	14 to (14 + 70) = 1 to 6
Planet thrust washer thickness	1 mm (.04 in)		
Planet carrier end play adjustment	See page 2, section 27		
Planet carrier shim thickness range	3,5 - 3,6 - 3,7 - 3,8 - 3,9 - 4,0 - 4,1 - 4,2 - 4,3 - 4,4 - 4,5 - 4,6 - 4,7 - 4,8 mm (.137 - .141 - .145 - .149 - .153 - .157 - .161 - .165 - .169 - .173 - .177 - .181 - .185 - .188 in)	4,5 - 4,6 - 4,7 - 4,8 - 4,9 - 5,0 - 5,1 - 5,2 - 5,3 - 5,4 - 5,5 - 5,6 - 5,7 - 5,8 mm (.177 - .181 - .185 - .188 - .192 - .196 - .200 - .204 - .208 - .212 - .216 - .220 - .224 - .228 in)	

POWER TAKE-OFF

	55-90, 60-90	70-90, 80-90	90-90, 100-90
540 rpm PTO	{ Ground speed or independent Manual lever Clockwise		
Type			
Control			
Rotation (as viewed from rear)			
Engine speed with PTO at 540 rpm (all models):	2198 rpm		2126 rpm
PTO speed with engine at full load rpm:	614 rpm		635 rpm
Output shaft diameter	1 $\frac{1}{8}$ (6 spline)		

(follows)

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Specification and Data

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page 11

POWER TAKE-OFF

(continued)

	55-90, 60-90	70-90, 80-90	90-90, 100-90
540/1000 rpm PTO	} As 540 rpm PTO		
Type Control Rotation (as viewed from rear)			
Speed selection	PTO housing mounted lever		splined extension replacement
Engine speed with PTO at 540 rpm	2198 rpm		2126 rpm
Engine speed with PTO at 1000 rpm	2380 rpm		2410 rpm
PTO speed at full load engine rpm:			
— 540 rpm	614 rpm		635 rpm
— 1000 rpm	1050 rpm		1037 rpm
Ground speed PTO speed:			
— 540 rpm	8,2 revs/wheel turn	8,9 revs/wheel turn	17,3 revs/wheel turn
— 1000 rpm	14,1 revs/wheel turn	15,2 revs/wheel turn	28,2 revs/wheel turn
Output shaft dia.:			
— 540 rpm	1 3/8" (6-spline)		
— 1000 rpm	1 3/8" (21-spline)		
Driven gear bushing O.D. (14, page 2, section 28)	49.925 to 49.950 mm (1.9655 to 1.9665 in)		56.910 to 56.940 mm (2.2405 to 2.2417 in)
Driven gear I.D. (10 and 11)	50.050 to 50.089 mm (1.9705 to 1.9720 in)		57.060 to 57.106 mm (2.2464 to 2.2483 in)
Gear clearance in bushings	0.100 to 0.164 mm (0.0039 to 0.0065 in)		0.120 to 0.196 mm (.005 to .008 in)
Driven shaft diameter	39.166 to 39.191 mm (1.5420 to 1.5429 in)		47.566 to 47.591 mm (1.8727 to 1.8737 in)
Bushing I.D. (14)	39.200 to 39.239 mm (1.5433 to 1.5448 in)		47.600 to 47.639 mm (1.8740 to 1.8755 in)
Shaft clearance in bushings	0.009 to 0.073 mm (0.0003 to 0.0029 in)		0.009 to 0.073 mm (.0003 to .0029 in)

POWER TRAIN: Specification and Data

TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread size	Torque		
		Nm	kgm	ft lb
Clutch-Section 22 Capscrew, clutch to flywheel (C ₁ , pages 1 and 2):				
— 55-90, 60-90, 70-90, 80-90	M 8x1.25	25	2,6	19
— 90-90, 100-90	M 10x1.25	59	6	43
Capscrew, withdrawal fork (C ₃ , pages 6, 7, 11, 16 and 17)	M 16x1.5	157	16	116
Capscrew, clutch housing to transmission housing:				
— 55-90, 60-90, 70-90, 80-90	M 12x1.25	98	10	72
— 90-90, 100-90	M 14x1.5	147	15	108
Capscrew, clutch housing to engine (C ₂ , pages 6,7, 16 - 55-90, 60-90, 70-90, 80-90)	M 12x1.25	98	10	72
Capscrew, clutch housing to engine (C ₄ , pages 11 and 16 - 90-90, 100-90)	M 12x1.25	98	10	72
Nut, spacer to engine (C ₅ , pages 11 and 16 - 90-90, 100-90)	M 12x1.25	98	10	72
Nut, sleeve cover (C ₆ , page 6 - 55-90, 60-90, 70-90, 80-90)	M 8x1.25	17	1.7	12
Nut, clutch pedal support (90-90, 100-90)	M 8x1.25	20	2	15
Transmission and splitter - Section 23 Nut, driven gear shaft:				
— 55-90, 60-90, 70-90, 80-90 (C ₁ , page 6)	M 32x1.5	294	30	217
— 90-90, 100-90 (C ₁ , page 14)	M 36x1.5	245	25	180
Capscrew or nut, transmission shaft bearing cover:				
— 55-90, 60-90, 70-90, 80-90 (C ₂ , page 6)	M 8x1.25	28	2.9	21
— 90-90, 100-90 (C ₂ , page 14)		12	1.2	9
Capscrew, upper transmission housing cover (C ₃ , page 6 - 55-90, 60-90, 70-90, 80-90)	M 10x1.25	59	6	43
Capscrew, transmission housing cover (C ₄ , page 14 - 90-90, 100-90)	M 10x1.25	59	6	43
Capscrew, splitter flange (C ₅ , page 14 - 90-90, 100-90)	M 10x1.25	61	6.2	45
Capscrew, ring gear hub (C ₅ , page 14 - 90-90, 100-90)	M 10x1.25	64	6.5	47
Creeper - Reverser-Section 24 (55-90, 60-90, 70-90, 80-90). Capscrew, creeper driven shaft retaining plate or reverser intermediate gear journal and driven shaft (C ₁ , pages 1 and 5)	M 12x1.25	67	6.8	49
Bevel drive and differential - Section 25 Capscrew, ring gear (C ₁ page 6 - 55-90, 60-90, 70-90, 80-90)	M 12x1.25	123	12.5	90
Nut, self-locking, ring gear (C ₁ , page 14 - 90-90, 100-90)	M 12x1.25	123	12.5	90
Capscrew, self locking, differential - ring gear supports (C ₂ , pages 6 and 14)	M 10x1.25	61	6.2	45

(follows)

55-90 60-90
70-90 80-90
90-90 100-90

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page 13

TIGHTENING TORQUE FIGURES

(continued)

DESCRIPTION	Thread size	Torque			
		Nm	kgm	ft lb	
Nut, bevel pinion shaft (C ₃ , page 14 - 90-90, 100-90)	M 50x1.5	294	30	217	
Capscrew, differential lock fork (C ₄ , page 16 - 90-90, 100-90)	M 12x1.25	62	6.3	46	
Capscrew, transmission housing cover (90-90, 100-90)	M 10x1.25	59	6	43	
Brakes - Section 26					
Capscrew, support, parking brake (C ₁ , page 8):					
— 55-90, 60-90, 70-90, 80-90	M 12x1.25	98	10	72	
— 90-90, 100-90	M 10x1.25	59	6	43	
Capscrew, guide, parking brake (12)					
— 55-90, 60-90, 70-90, 80-90	M 12x1.25	24	2.5	18	
— 90-90, 100-90	M 14x1.5	24	2.5	18	
Capscrew, parking brake driven gear shaft (C ₂) (2-wheel drive 55-90, 60-90, 70-90, 80-90)	M 10x1.25	64	6.5	47	
Nut, hand lever support	M 8x1.25	16	1.7	12.2	
Nut, adjusting sleeve (90-90, 100-90)	M 10x1.25	39	4	28	
Capscrew, master cylinder	M 16x1.5	176	18	130	
Final drives - Section 27					
Nut, final drive housing (C ₁ , page 1)	M 14x1.5	176	18	130	
Capscrew, wheel shaft (C ₂):					
— 55-90, 60-90, 70-90, 80-90	M 16x1.5	250	25.5	184	
— 90-90, 100-90	M 18x1.5	260	26.5	192	
Nut, disc to wheel rim (C ₃):					
— Pressed discs	M 16x1.5	245	25	180	
— Spiral guide rail discs	M 20x1.5	245	25	180	
Nut, disc to wheel hub (C ₄)	M 18x1.5	255	26	188	
Nut, cast disc	M 18x1.5	314	32	231	
Nut, wheel ballast ring (C ₅)	M 14x1.5	98	10	72	
Power take-off - Section 28					
Nut, driven gear shaft:					
— 55-90, 60-90, 70-90, 80-90 (C ₁ , page 2)	M 32x1.5	294	30	217	
— 90-90 and 100-90 (C ₁ , page 3) {	540 rpm	M 32x1.5	211	21.5	156
	540/1000 rpm	M 36x1.5	245	25	180
Nut, self-locking, spline extension (540/1000 rpm PTO) (C ₂)	M 12x1.25	162	16.5	119	

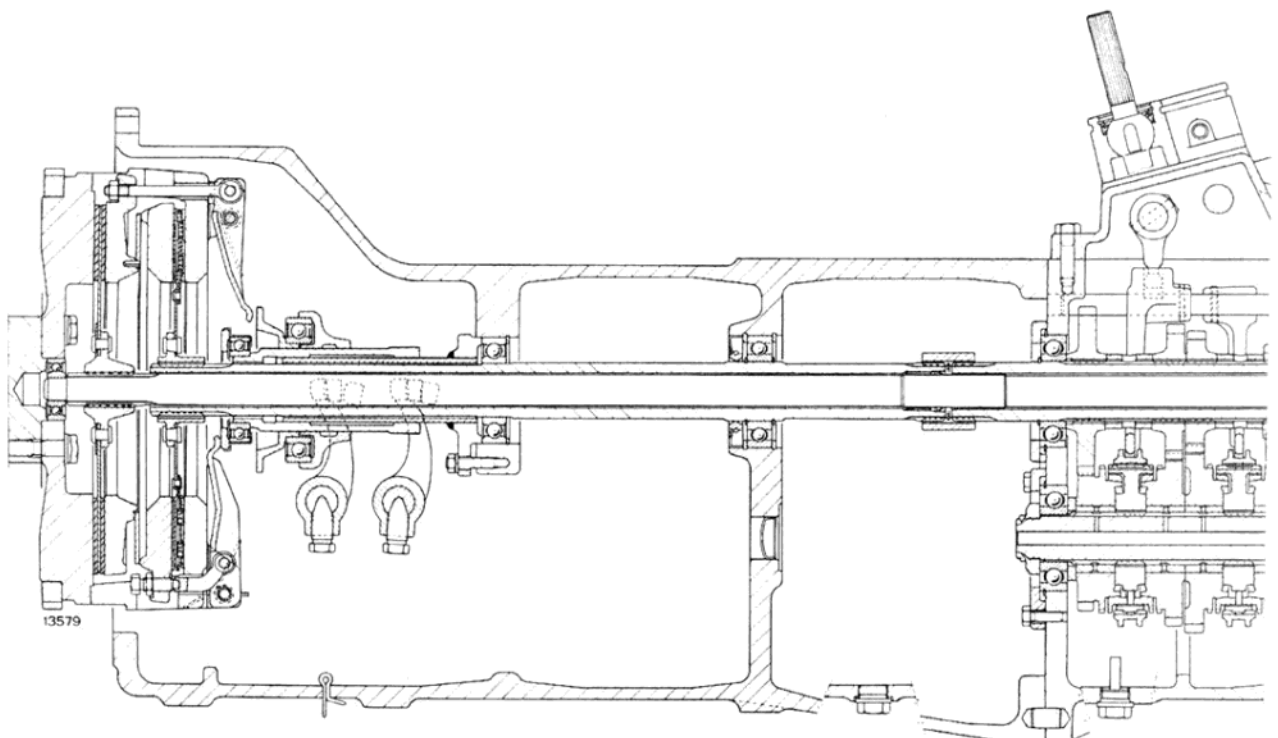
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55-90 60-90
70-90 80-90
90-90 100-90

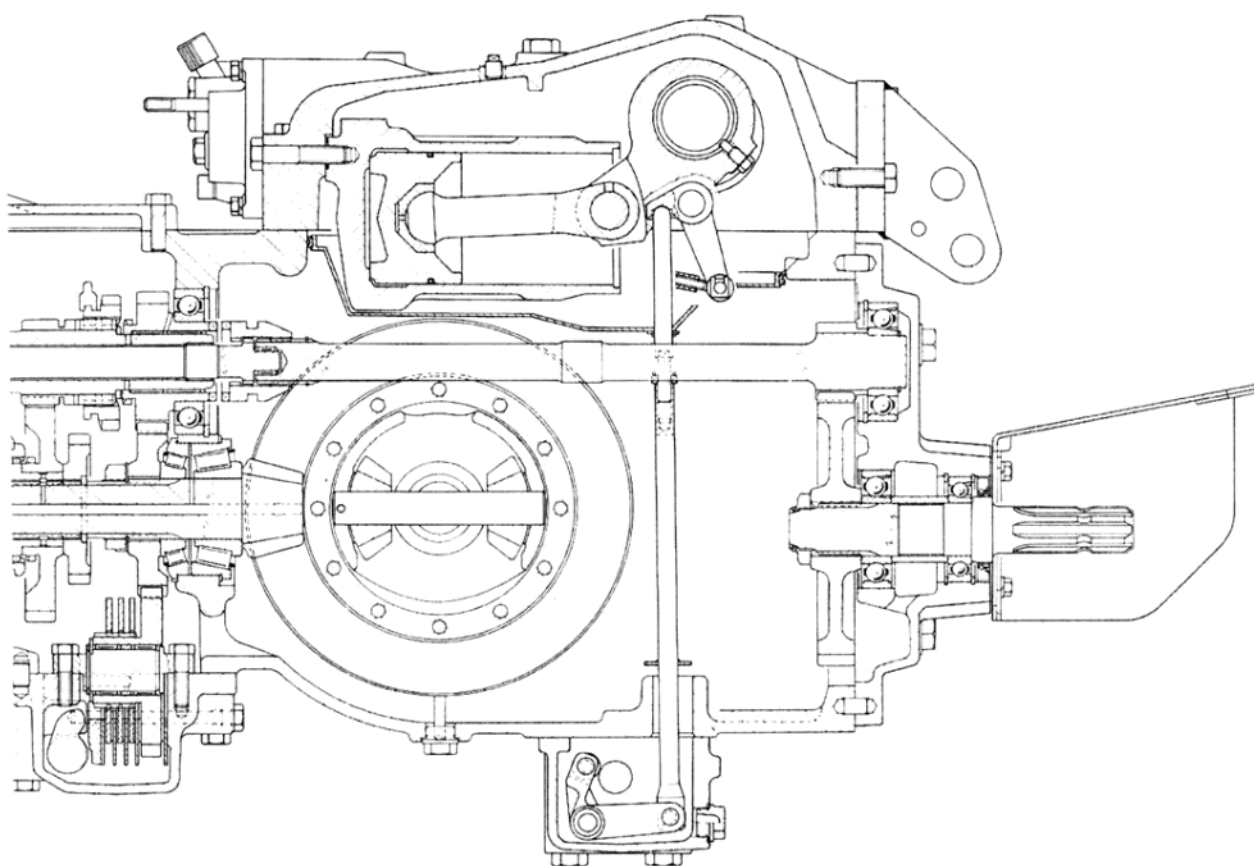
POWER TRAIN: Specification and Data

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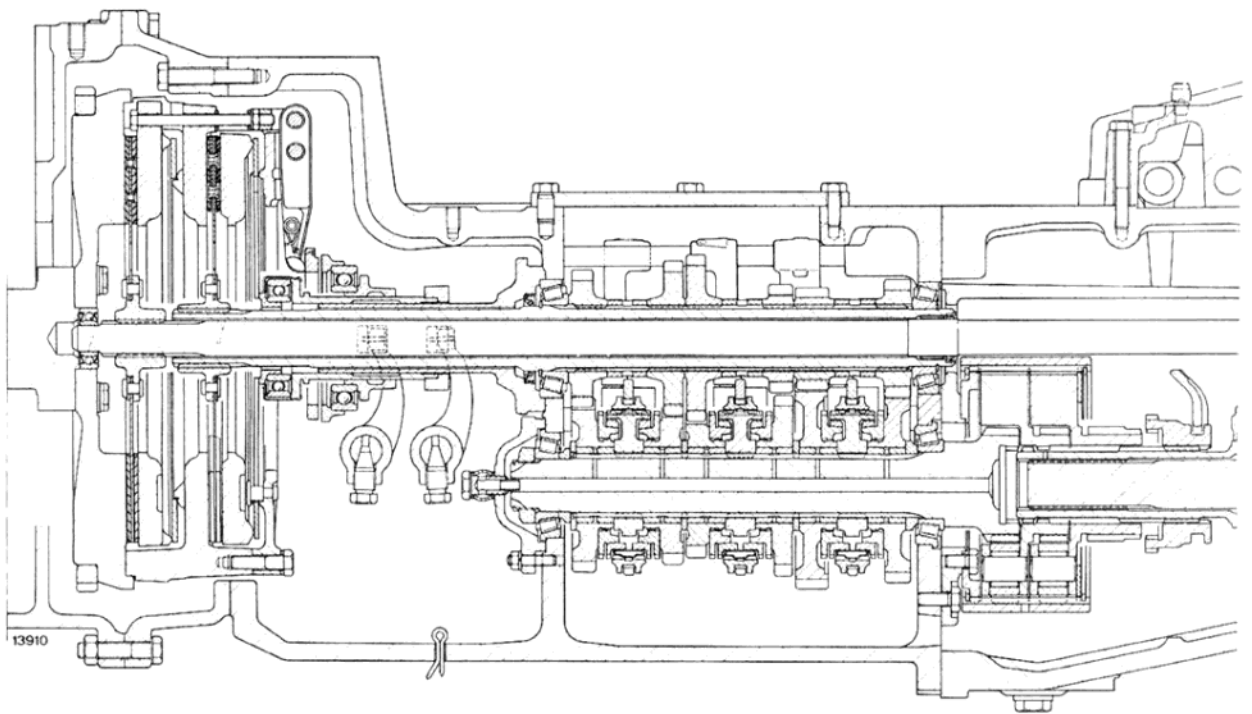
page 15



Longitudinal section through power t

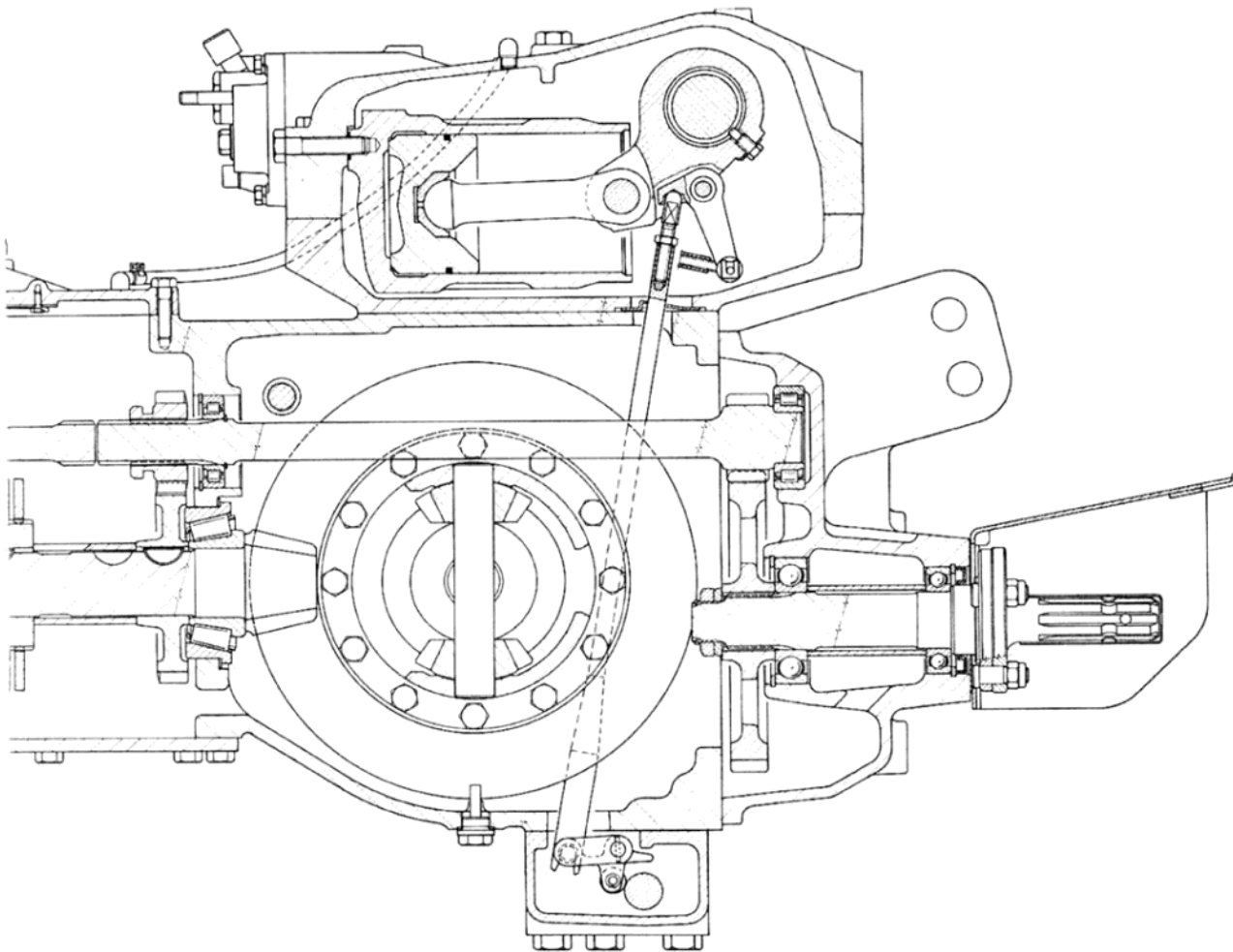


60-90, 70-90, 80-90 tractors



Longitudinal section

POWER TRAIN: Specification and Data



ver train - 90-90, 100-90 tractors.

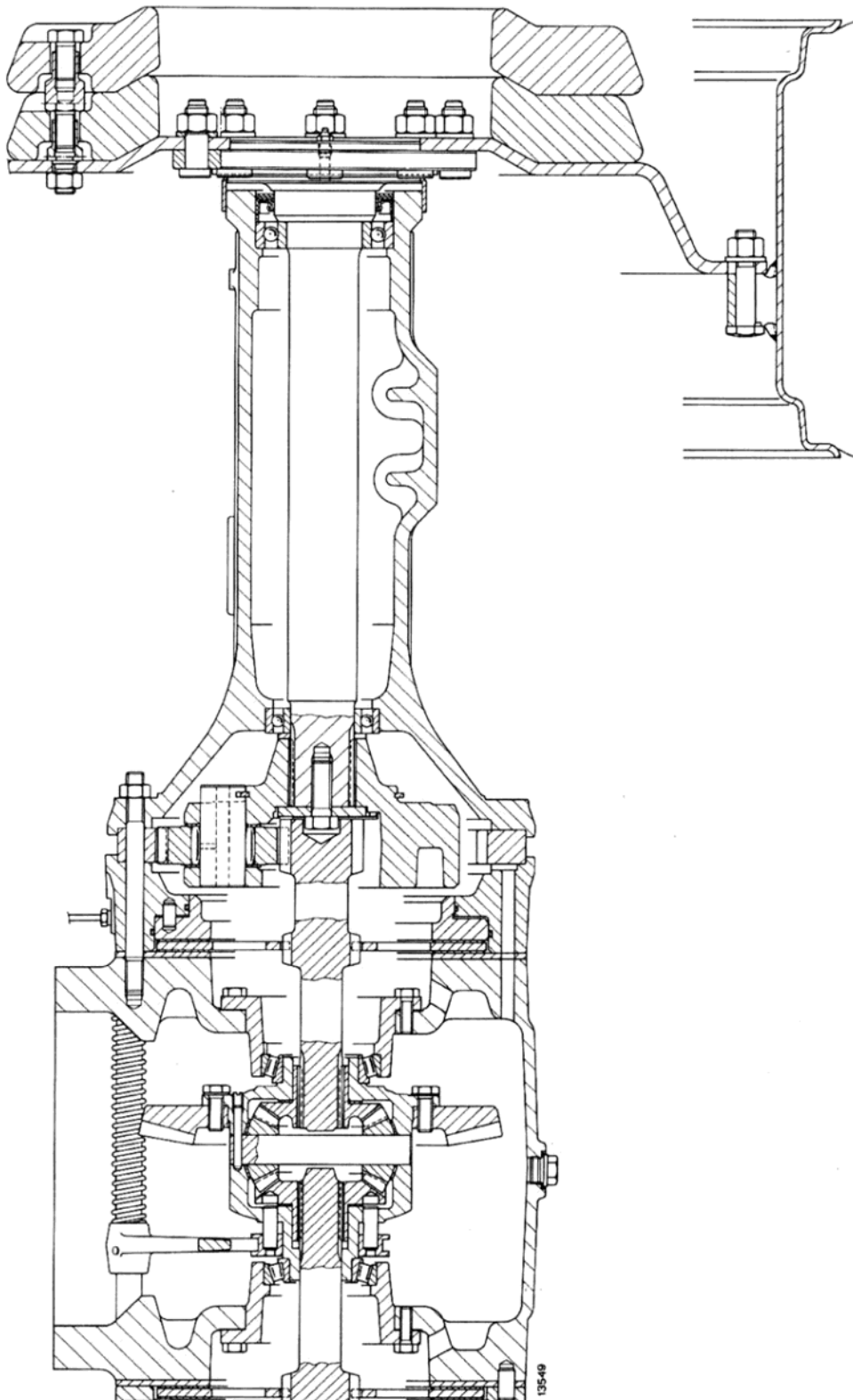
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55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Specification and Data

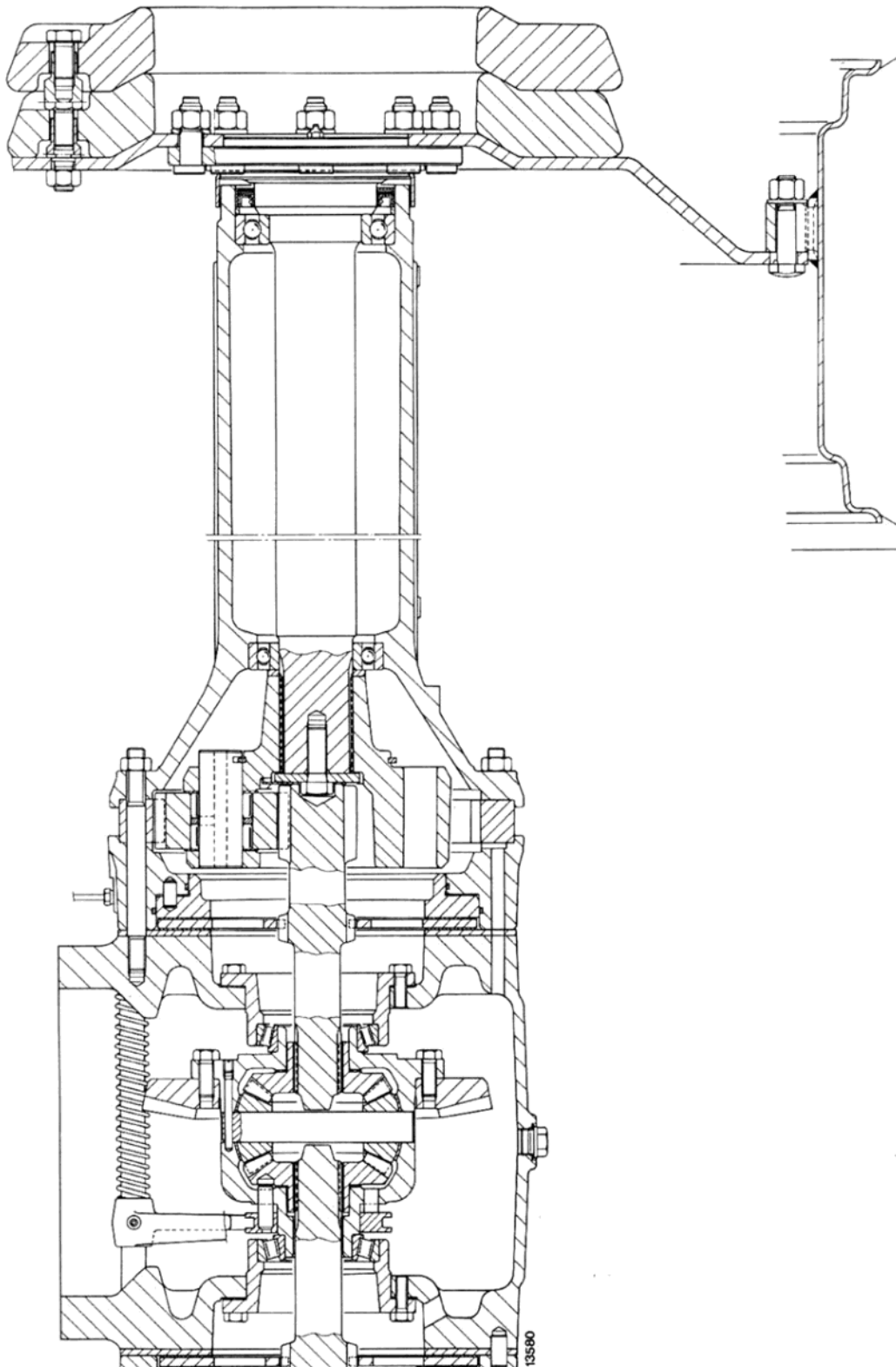
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page 17



Cross section through rear transmission - 55-90, 60-90 tractors.

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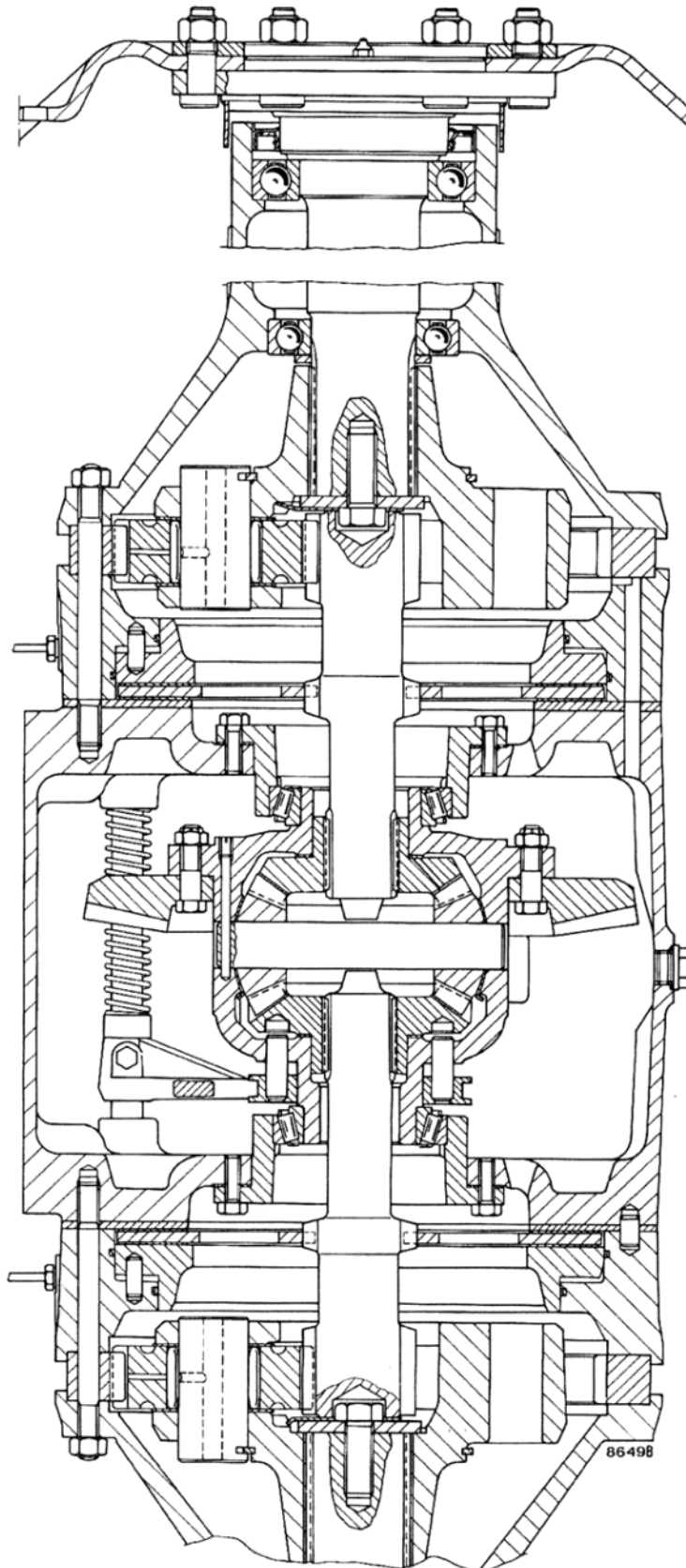
Cross section through rear transmission - 70-90, 80-90 tractors.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Specification and Data

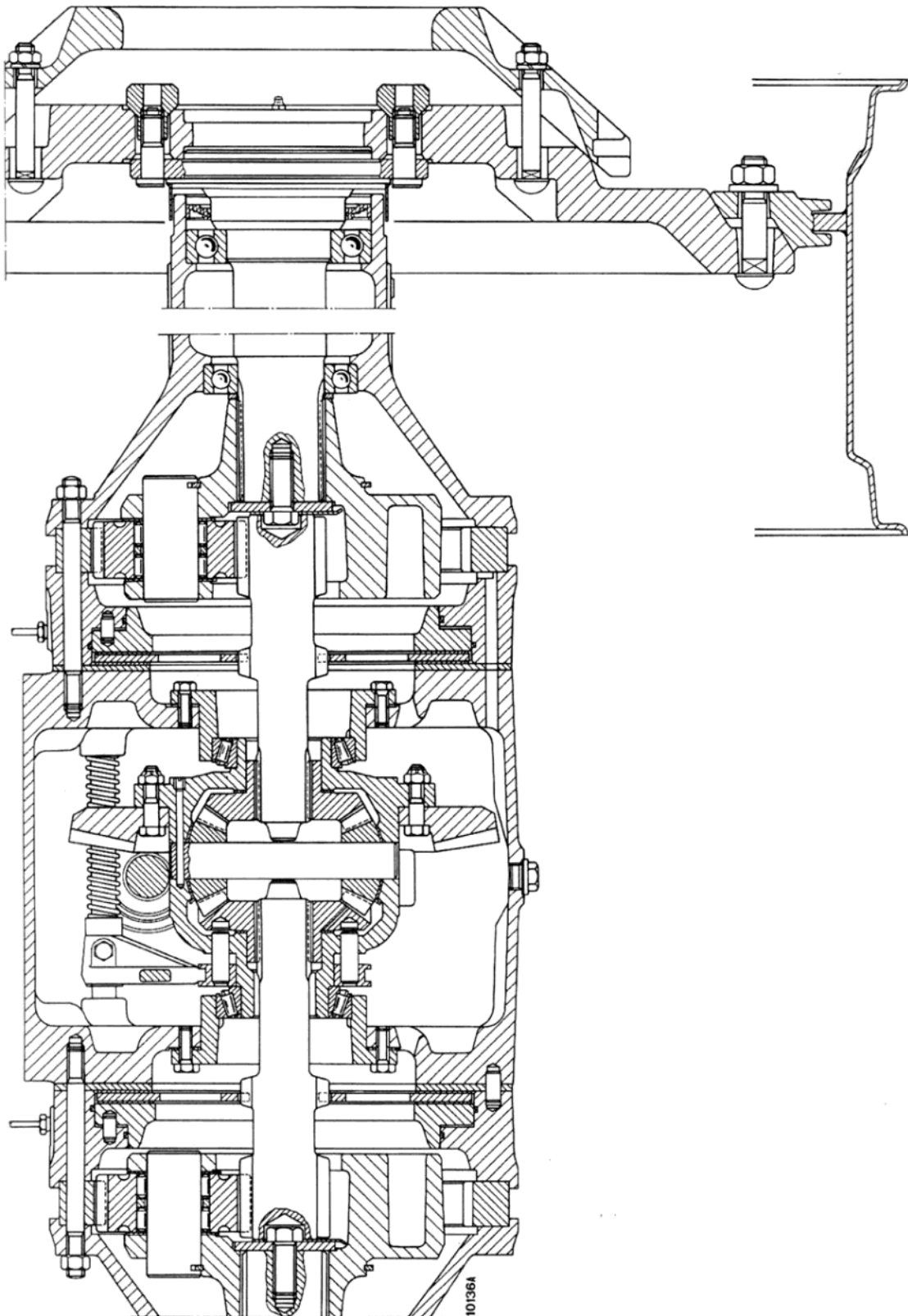
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page 19



Cross section through rear transmission - 90-90 tractors.

POWER TRAIN: Specification and Data



Cross section through rear transmission - 100-90 tractors

PLATFORM REMOVAL AND INSTALLATION

For platform removal, proceed as follows:

- Take off side panels, exhaust pipe and hood. Disconnect battery ground cable, starter cable, front lighting leads, tractormeter cable and all electrical connections to dashboard instruments and indicators.
- Disconnect power steering hoses from pipes. Disconnect rubber hose from steering fluid reservoir, draining the reservoir and brake lines.
- Disconnect throttle link and engine shut-off cable.
- Shut off fuel suction cock and disconnect suction and return lines.
- Disconnect lift and remote control valve lines. Remove quick-release coupling flange.
- Disconnect lift control link, sensitivity lever link, response control link, LIFT-O-MATIC link, front wheel drive lever link, parking brake link, differential lock link, transmission and PTO clutch links, creeper or reverser link (if fitted) and PTO lever link.
- Remove transmission and splitter levers.

Remove 4 or 6 capscrews retaining platform to cushion mountings and lift off the platform using nylon rope **293769** attached to the top of the ROPS frame.

Note. If the platform is not provided with a ROPS frame, use a hook as shown on page 2. Hook should be passed through the front ROPS frame mounting holes to prevent damage to the mudguards.

PLATFORM REMOVAL AND INSTALLATION TOGETHER WITH FIAT CAB

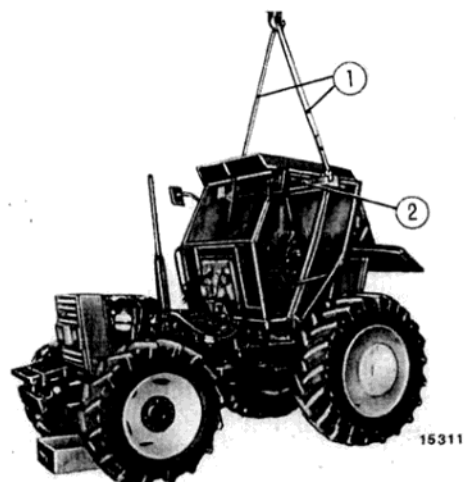
To remove the platform together with the FIAT cab, proceed as directed for platform removal, noting the following points:

- disconnect all electrical wiring to dashboard instruments and indicators;
- disconnect water delivery and return lines to cab after draining the radiator and the air conditioning pipes from the associated couplings with integral valves;

Note: When draining the radiator, move heater control lever to maximum position (lever horizontal).

- Remove 4 or 6 capscrews retaining platform to cushion mountings.
- Lift off the cab using nylon ropes **293769**, using a board for support.

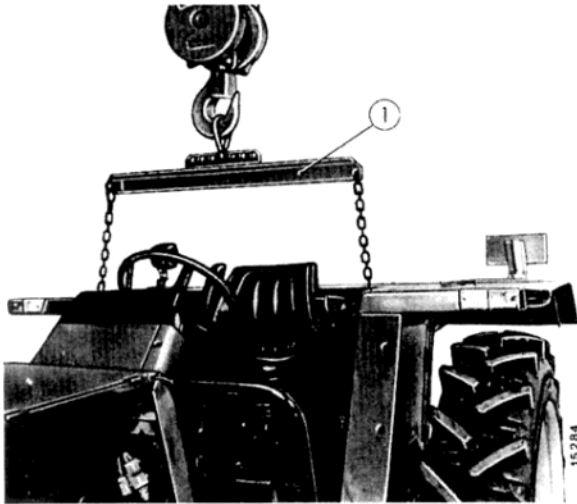
For platform installation, reverse the removal sequence. Top up brake fluid and power steering fluid and vent circuits. If necessary, adjust clutch, parking brake, lift and differential lock links.



Removing or installing the control platform together with FIAT cab.

1. Nylon ropes **293769** - 2. Board.

POWER TRAIN: Removal and installation



Removing or installing platform without ROPS frame.

1. Hook.

FIAT CAB REMOVAL AND REPLACEMENT WITHOUT PLATFORM

To remove the cab without platform, proceed as follows:

- take off front and rear side panels, disconnect battery ground lead and electrical wiring of instruments and cab windshield washer system;
- drain the radiator and disconnect the heating and ventilating system pipes from the associated connection, the windshield washer pipe from the reservoir and the air conditioner pipes from couplings with integral valve;

- from inside the cab, remove 2 black plastic panels from the sides of the dashboard (where fitted);
- remove 2 capscrews retaining oddments tray to cab and slightly slacken the 2 capscrews for retention to dashboard frame;
- from inside the cab, remove 4 screws for retention to side mudguards and 4 capscrews for retention to rear mudguards;
- from outside the cab, remove 4 capscrews (2 on each side) for front end retention situated below the access steps, 12 capscrews for side retention from the bottom of the mudguards and 6 capscrews for retention to vertical mudguards;
- Slightly raise the cab using a board and two nylon ropes **293769**. Check that there is no fouling and lift off cab.

For cab installation, reverse the removal sequence, taking care not to interchange heating or air conditioner lines. Top up brake fluid, power steering fluid and expansion tank, and vent circuits. If necessary, adjust control links.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

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page 1

VALEO, O.M.G. OR LUK CLUTCH REMOVAL AND INSTALLATION

Separate engine with front axle from transmission to gain access to clutch. Proceed as follows:



CAUTION

Lift and handle all heavy components using a suitable lift.

Ensure that units or parts are supported by suitable slings or hooks.

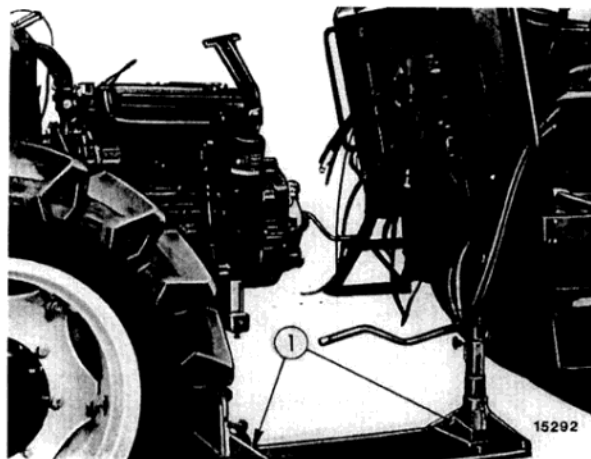
Ensure that no one is in the vicinity of the load to be lifted.

- Remove side panels, side members, hood and exhaust silencer.
- Disconnect and insulate battery negative lead. Disconnect accelerator and engine shut-off link from injection pump, starter leads, dashboard cables, and tractor meter cable.
- Shut off cock and disconnect fuel pipes from fuel pump, filters and injector return. Drain power steering tank and disconnect power steering lines. Drain transmission housing and disconnect hydraulic lift line from oil pump.
- For DT models, remove front axle drive shafts and associated guard.
- For cab versions, drain engine coolant and disconnect heater delivery lines. Where fitted, disconnect air conditioner refrigerant lines from hose.
- Position trolley with guides **292320** with stationary section under clutch housing and moveable section under oil pan. For 70-90, 80-90 tractors, take care to prevent damage to sheet metal bottom of oil pan. Ensure that unit is steady.
- Apply parking brake and chock rear wheels. Wedge front axle to keep it from swinging.

If tractor is equipped with ballast weights which cannot be removed, connect weights to a hoist to prevent engine from pitching forwards.

- Remove capscrews securing clutch housing to engine and separate engine with front axle from the rest of the tractor.

To gain access to the three top screws, remove the plastic cover on control board and work through the slot.

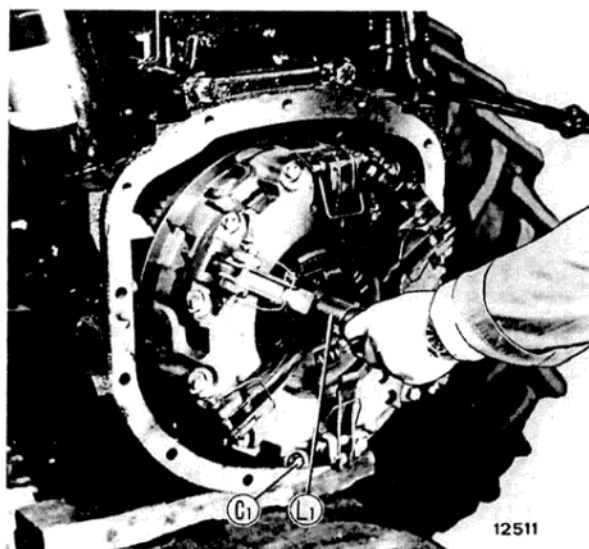


Removing (installing) clutch housing.

1. Trolley with guides **292320**.

Remove clutch assy from flywheel proceeding as follows:

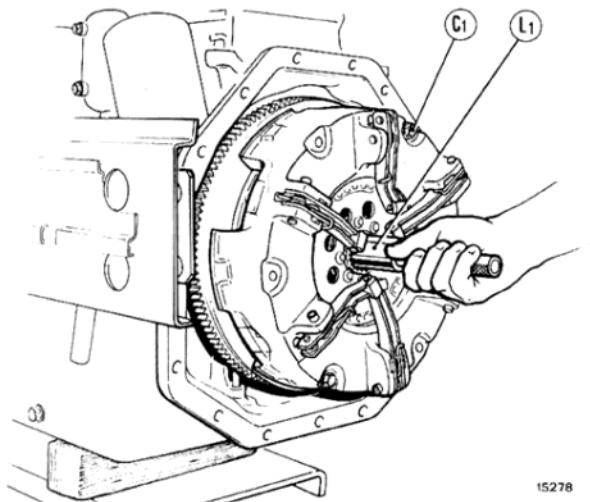
- For 55-90, 60-90, 70-90, 80-90 tractors, remove ten O.M.G. 11"/11" or LUK 11"/11" clutch capscrews (C₁) or seven VALEO 11"/11" clutch capscrews and slacken the two remaining capscrews.
- For 90-90, 100-90 tractors, remove four LUK 12"/12" or VALEO 12"/12" clutch capscrews (C) and slacken the two remaining capscrews.
- Insert centering pin **291184** (L₁) (55-90, 60-90, 70-90, 80-90) or **293375** (L₁, page 2) (90-90, 100-90) in clutch plate shaft seats. Back off the two remaining capscrews and remove assy with PTO driven disc.



Removing (installing) clutch (55-90, 60-90, 70-90, 80-90).

C₁. Clutch retaining capscrews - L₁. Centralizing pin **291184**.

POWER TRAIN: Clutch



Removing (installing) clutch (90-90, 100-90).

C1. Clutch retaining capscrows - L1. Centralizing pin 293375.

On reassembly bear the following points in mind:

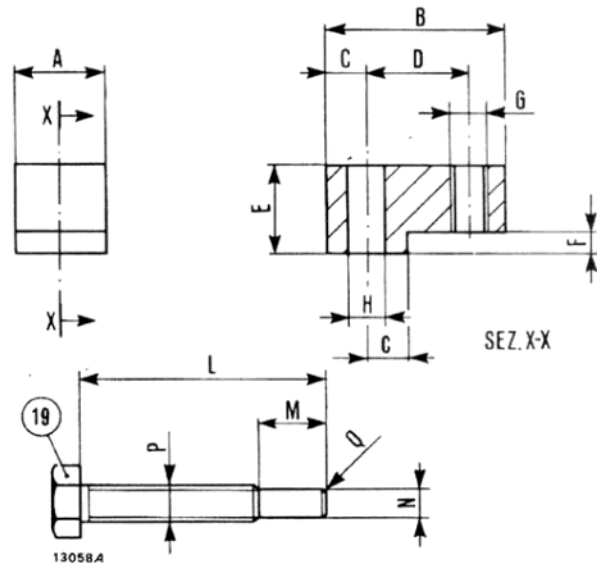
- Check condition of ball bearings pressed in flywheel; scrap and replace in the event of excessive noise or binding. To install a new bearing, pack seat with **grassofiat TUTELA G9** grease.
- Use centralizing pin to install clutch assy with clutch PTO driven disc on flywheel.
- Tighten capscrows (C1) to specified torque.
- Connect power train to engine-front axle unit after smearing **grassofiat TUTELA G9** grease in clutch driven disc slots and jointing compound as per Section A, page 6, on clean mating surfaces.

To facilitate installation, screw two centralizing pins 292888 on transmission housing, ensuring that pins do not foul starter.

VALEO 11"/11" CLUTCH OVERHAUL (early model)

Remove, install and adjust clutch using kit 291291/2 (page 4) or universal kit 293650.

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Adapter to be made in workshop for 11"/11" VALEO transmission clutch driven plate and dish spring removal (early model) (Mark 50012).

A = 20 mm (0.787 in) - B = 40 mm (1.565 in) - C = 9 mm (0.354 in) - D = 23 mm (0.905 in) - E = 20 mm (0.787 in) - F = 6 mm (0.236 in) - G = M8x1.25 - H = Ø 8.5 mm (0.335 in) dia. - L = 55 mm (2.165 in) - M = 15 mm (0.590 in) - N = Ø 6 mm (0.236 in) - P = M8x1.25 - Q = Chamfer 1 mm (0.0039 in) - 19. M8x1.25x55 capscrows (R50) to be modified as shown.

Note: Adapter material: FE 510.



CAUTION

Use suitable tools to align holes. DO NOT USE FINGERS OR HANDS.

To install clutch on kit 291291/2, proceed as follows:

- Install central spacer (B, page 4) on base plate (A) together with three spacers 292350 on circumference of 241 mm (9.5 in). Spacers prevent clutch levers from resting directly on plate.
- Install clutch assy with top facing base plate (A, page 4). Ensure that clutch rests on spacers 292350 and secure through three fasteners (F).
- Install crossbar 292343 and secure through nut (D).
- Remove PTO clutch release lever adjusting link nuts (8, page 6) and slowly back off nut (D, page 4) to release load on dish spring (1).

Note - To remove transmission clutch dish spring (2, page 6), make three adaptors as shown and add three screws M8x1.25x55 (R50) modified as shown in figure.

- Install three adaptors on clutch housing using one screw M8x1.25x55 (17, page 3) and one nut M8x1.25x8 (18) for each adaptor.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

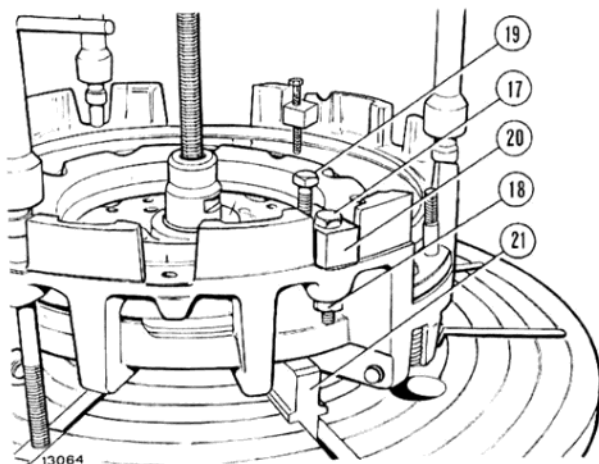
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page 3

- Tighten adapter screws (19, page 2) until transmission clutch spring is slightly compressed, remove roll pin and using two screwdrivers as shown take off ring (16).
- Slowly back off three screws (19) to release load on dish spring (2, page 6). Retrieve transmission clutch pressure plate and driven plate (10).

To install clutch on universal kit **293650** proceed as follows:

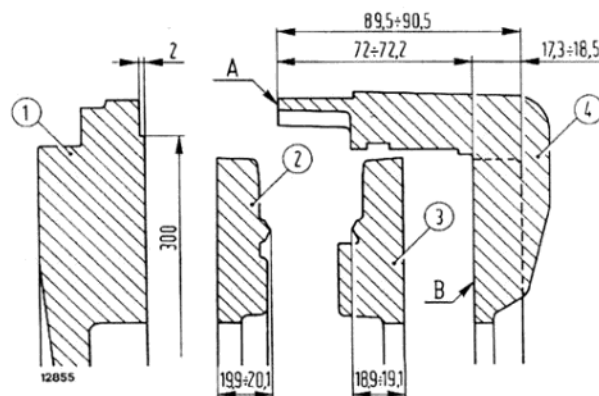
- Install central spacer (B, page 4) on base plate (A). Position spacer at a height of 123 mm (4.84 in) through register and secure through locknut (D).
- Tighten three pins **293722** by the same amount on three spacers **293744**. Install spacers on base plate circumference of 240 mm (9.45 in). Spacers prevent clutch levers from resting directly on base plate.
- Install clutch assy with top facing plate (A, page 4). Ensure that clutch rests on pins **293722** and secure through three fasteners (F) with bushings **293736**.
- Install crossbar **292343** and secure through hand-wheel (L).
- Remove PTO clutch release lever adjusting link nuts (8, page 6) and back off hand-wheel (L, page 4) to release load on dish spring (1, page 6).



Installing adapters (20) on clutch housing.

17. M8x1.25x55 capscREW - 18. M8x1.25x8 nut - 19. M8x1.25x55 capscREW (R50) to be modified as indicated in figure above - 20. Adapters to be made in workshop - 21. Spacers **292350** for kit **291291/2** or spacers **293744** with pins **293722** for universal kit **293650** (install these spacers to prevent clutch levers from resting directly on base plate).

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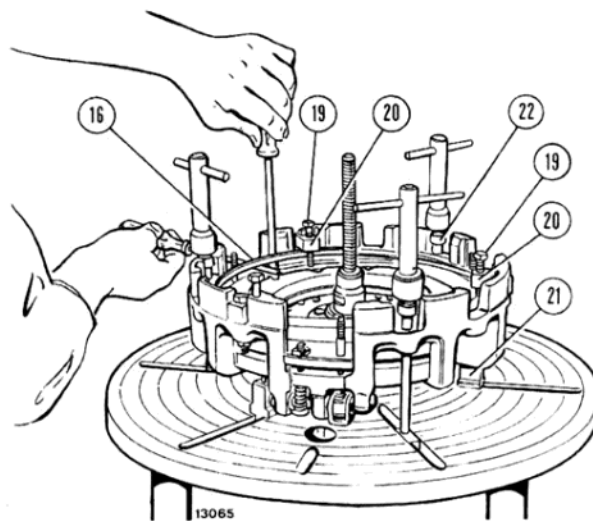


PTO clutch (2) and transmission clutch (3) pressure plate and housing (4). Original dimensions in mm.

A, B. See text - 1. Flywheel.

Note: To remove transmission clutch dish spring (2, page 6) make three adapters as described in note on page 2 as shown on drawing alongside.

- Install three adapters on clutch housing using one M8x1.25x55 capscREW (17) and one M8x1.25x8 nut (18) for each adapter.
- Tighten adapter screws (19) until transmission clutch spring (2, page 6) is slightly compressed, remove roll pin and using two screwdrivers as shown in figure a on page 3, take off ring (16).



Removing clutch dish spring retaining ring (16)

19. M8x1.25x55 capscREWS (R50) to be modified as shown in figure above - 20. Adapters to be made in workshop - 21. Spacers **292350** for kit **291291/2** or spacers **293744** with pins **293722** for universal kit **293650** - 22. Bushings **293736** (use only for clutch removal/installation with universal kit **293650**).

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POWER TRAIN: Clutch

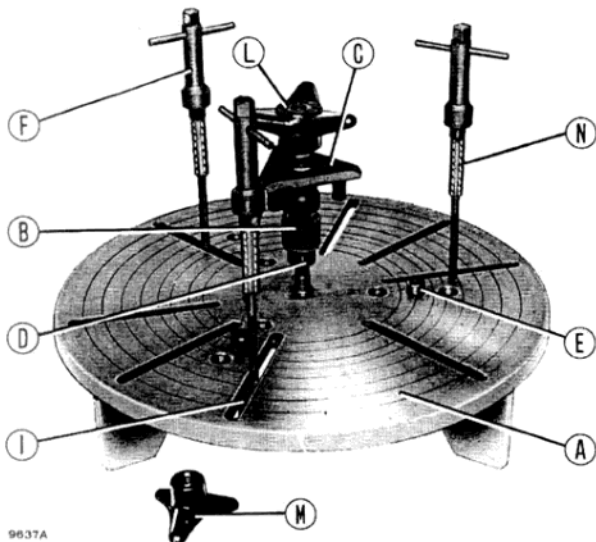
- Slowly back off three screws (19, page 3), to release load on dish spring (2, page 6). Retrieve transmission clutch pressure plate and driven plate (10).

Check for clutch driven plate wear and replace if rivets are near to or flush with top of facings. Plates are also to be replaced if the organic facings are found to be soaked with oil.

Check pressure plate and clutch housing friction faces. If necessary dress, noting original dimensions shown in figure on page 3 and the following instructions:

1. PTO clutch pressure plate (2, page 3). Dress friction face to a maximum depth of 0.5 mm (0.02 in).

2. Transmission clutch pressure plate (3, page 3). Dress friction face to a maximum depth of 0.5 mm (0.02 in).



Component parts of universal kit 293650 for VALEO, LUK or O.M.G. clutch adjustment.

A. Base plate 293332/1 - B. Central spacer 293728 - C. Register 293731 - D. Central spacer locknut 293730 - E. Locators 293726 - F. Fasteners 293725 - I. Pads 293755 - L. Register retaining handwheel 293739 - M. Locator handwheels 293740 - N. Fastener spacers 293345.

Note - On early model 11"/11" VALEO transmission clutch dish spring and transmission driven plate removal and installation, use three spacers 293744, three pins 293722, three bushings 293736 and crossbar 292343.

3. Clutch housing (4 page 3). Dress surface (B) to a maximum depth of 0.5 mm (0.02 in).

If necessary, dress flywheel friction face and restore external undercut of 2 mm (0.08 in).

Note: - Housing thickness must not fall below 16.8 mm (0.66 in).

Reassemble parts reversing the removal procedure and adjust clutch as described in the following paragraphs.

VALEO 11"/11" CLUTCH ADJUSTMENT (EARLY MODEL)

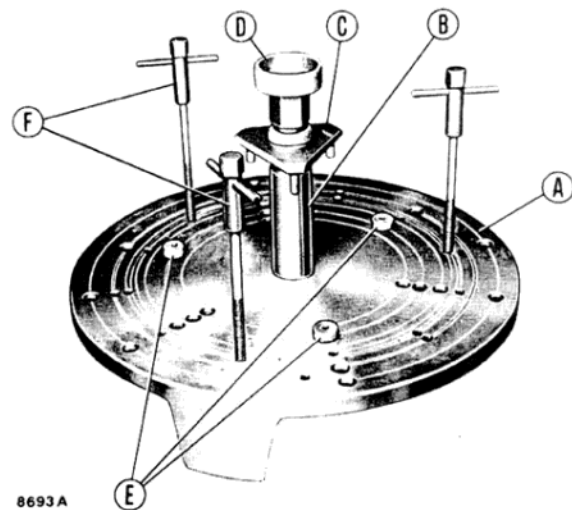
For correct clutch adjustment, release levers must be correctly aligned at the dimensions given (D and D₁, page 6) relative to flywheel face.

Clutch adjustment may be carried out with clutch on bench or fitted to flywheel.

On-bench clutch adjustment with kit 291291/2.

Remove spacers 292350 used on removal from base plate and proceed as follows:

- Install three spacers 293454 (E) on 241 mm (9.5 in) circumference.



Component parts of kit 291291/1 for VALEO, LUK, or O.M.G. clutch adjustment.

A. Base plate 292598 - B. Central spacer 292342 - C. Register 291299 - D. Spacer and register retaining nut 292344 - E. Locators 293454 - F. Fasteners 291292/1.

Note - On early model 11"/11" VALEO transmission clutch dish spring and transmission driven plate removal and installation, use three spacers 292350 and crossbar 292343.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

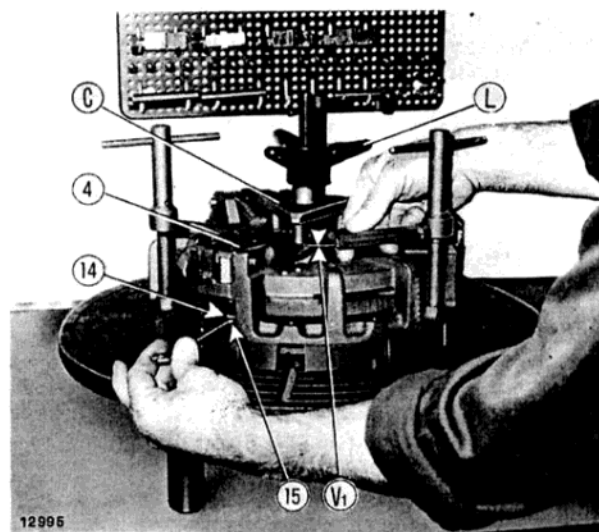
22

page 5

- Install clutch assy without PTO driven plate on base plate and secure through three fasteners (F, page 4). In this phase, PTO clutch pressure plate must be supported by three spacers **293454**;
- Install register (C, page 4) and secure through nut (D).
- Tighten or back off screws (15, page 6) to obtain correct gap between transmission clutch release lever and register pin (V₁). Tighten screws through nuts (14).
- Tighten or back off PTO clutch release lever adjusting link nuts (8) to obtain correct gap between register face and release lever (V₂).

On bench adjustment using universal kit 293650.

Remove three spacers **293744** with pins **293722** used on removal from base plate and proceed as follows:



On-bench inspection and adjustment of transmission clutch release lever height using universal kit 293650 or kit 291291/2.

C. Register **293731** (for universal kit **293650**) or **291299** (for kit **291291/2**) - L. Handwheel **293739** (for universal kit **293650**) or nut **292344** (for kit **291291/2**) - V₁ = 0.1 mm (0.004 in) - Release lever to register pin gap. - 4. Release levers - 14 and 15. Transmission clutch release lever adjusting screw and locknut.

- Measure clutch PTO driven plate thickness (S) and install adjustable locators (E, page 4) on circumference of 240 mm (9.45 in) and at height (h) given by:

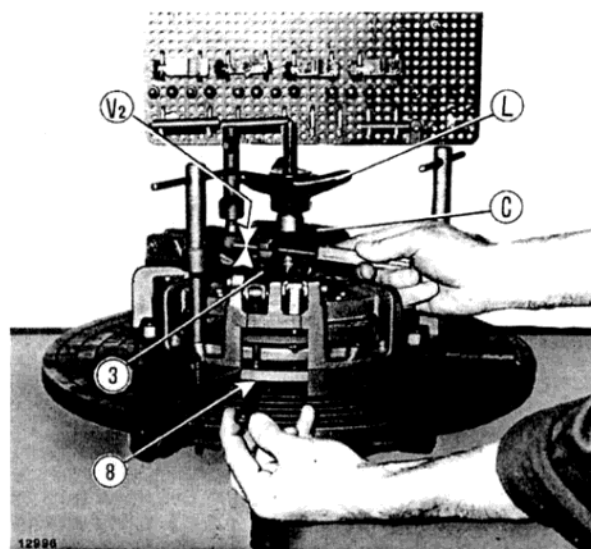
$$h = 2 \text{ mm} + S$$

where:

2 mm = Constant dimension

S = Measured PTO driven plate thickness.

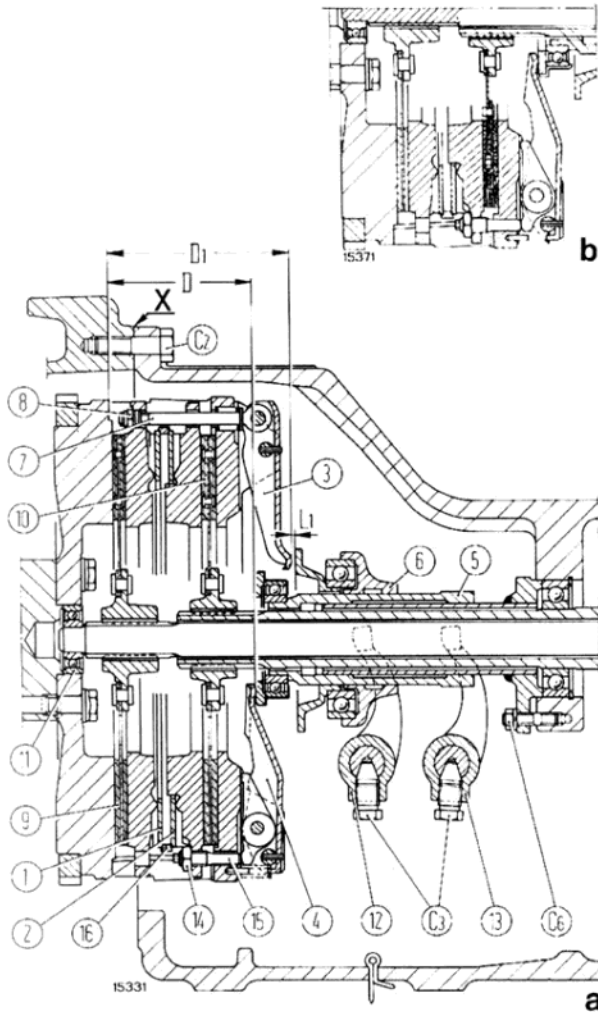
- Subsequently secure adjustable locators (E, page 4) through associated handwheels (M).
- Install clutch assy without PTO driven plate on base plate and secure through three fasteners (F, page 4). In this phase, PTO clutch pressure plate must be supported by three adjustable spacers **293726**;
- Install register (C, page 4) and secure through handwheel (L).
- Tighten or back off screws (15) to obtain correct gap between transmission clutch release lever and register pin (V₁). Tighten screws through nuts (14).
- Tighten or back off PTO clutch release lever adjusting link nuts (8) to obtain the correct gap between register face (C) and release lever (V₂).



On-bench inspection and adjustment of PTO clutch release lever height using universal kit 293650 or kit 291291/2.

C. Register **293731** (for universal kit **293650**) or **291299** (for kit **291291/2**) - L. Handwheel **293739** (for universal kit **293650**) or nut **292344** (for kit **291291/2**) - V₂ = 0.1 mm (0.004 in). Register to release lever gap - 3. Release levers - 8. Adjusting nut.

POWER TRAIN: Clutch

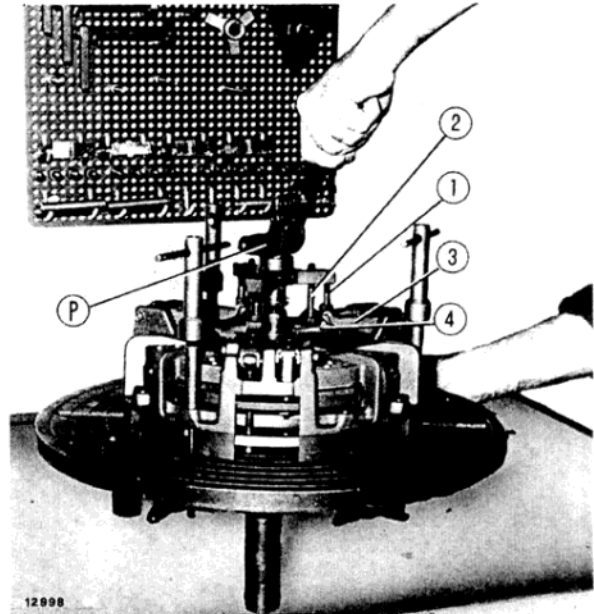


Longitudinal section through 11"/11" VALEO clutch (early model).

a. Clutch with organic compound transmission driven plate - b. Clutch with cerametallic transmission driven plate. - C₂. Clutch housing capscrews - C₃. Fork lever capscrews - C₆. Sleeve cover retaining nuts - D = 98 mm (3.852 in). Nominal distance of transmission clutch release levers from flywheel face - D₁ = 123 mm (4.842 in). Nominal distance of PTO clutch release levers (2) from flywheel face - L₁ = 2.5 mm (0.0098 in). Nominal PTO clutch release lever clearance - 1. PTO clutch dish spring - 2. Transmission clutch dish spring - 3. PTO clutch release levers - 4. Transmission clutch release levers - 5 and 6. Release control sleeves with thrust bearings - 7 and 8 PTO clutch release lever locknut and adjusting link - 9. PTO clutch plate - 10. Transmission clutch plate - 11. Flywheel bearing - 12 and 13. Sleeve control forks - 14 and 15. Transmission clutch release lever adjusting screw and locknut - 16. Dish spring retaining ring.

Warning - On clutch assembly, ensure that clutch plates are positioned as shown in figure.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply jointing compound as per section A, page 6



Checking clutch lever release action

P. Presser **292176** - 1 and 2. Presser screws - 3. PTO clutch release levers - 4. Transmission clutch release levers.

Note - After clutch lever adjustment, remove hand-wheel (L, page 4) for universal kit **293650** or nut (D) for kit **291291/2** and register (C). Install presser **292176** (P) on kit base plate, adjust screw length (1) as shown in figure, checking that they contact PTO clutch release levers (3). Then, actuate lever of presser (P) and check that PTO clutch is released. Subsequently, rest screws (2) on transmission release levers (4) and check clutch release.

2. On-flywheel clutch adjustment.

Insert pin **291184** (L₁, page 7) in clutch driven plate shaft seats, ensuring that end is in contact with bearing (11) and push register (L₂, page 7).

Adjust gaps (V₁ and V₂) as indicated in preceding paragraph.

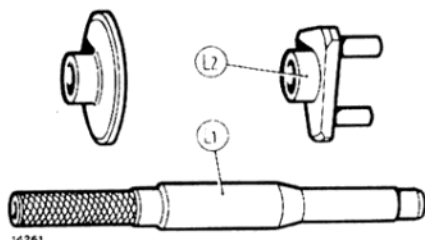
Note - Universal kit **293650** or kit **291291/2** and onfly-wheel clutch adjustment may result in quite considerable differences in terms of positioning, a fact which does not affect clutch efficiency, being due to varying PTO clutch plate thickness owing to machining tolerance build-up or wear, plus the magnification inherent in the high leverage ratio.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

22

page 7



Tool 291184.

L₁. Centralizer **291184** - L₂. Register **291184** for on-flywheel VALEO 11"/11" and LUK 11"/11" K clutch adjustment.

Nota - Centralizer (L₁) and register (L₂) are also used adjust early model VALEO 11"/11", LUK 11"/11" and O.M.G. 11"/11"clutches.

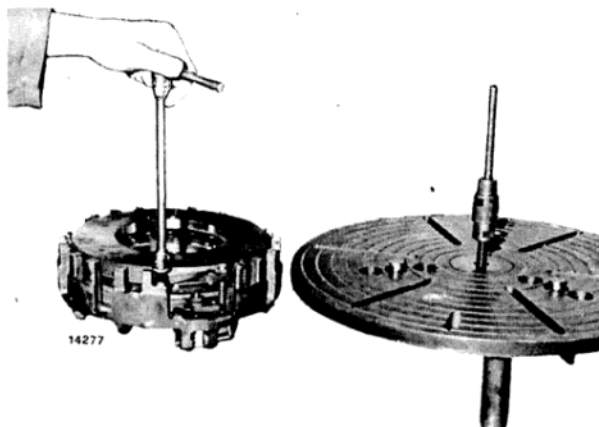
VALEO 11"/11" CLUTCH OVERHAUL (LATE MODEL)

Remove, install and adjust clutch using universal kit **293650** (page 8) or kit **291291/2**.

To install clutch on kit **291291/2**, proceed as follows:

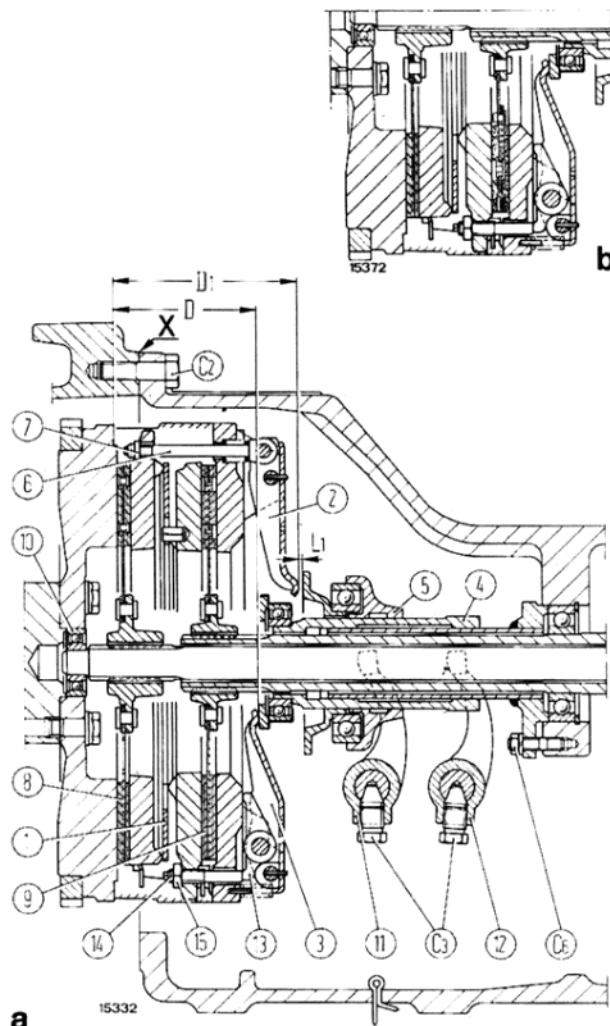
Note - Before installing clutch on kit **291291/2**, or universal kit **293650**, remove the three PTO clutch pressure plate tab retaining screws from clutch housing.

— Install central spacer (B, page 8) on base plate (A) together with three locators (E) on 241 mm (9.5 in) circumference.



Removing PTO clutch pressure plate tab retaining screws.

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Longitudinal Section through 11"/11" VALEO clutch (late model).

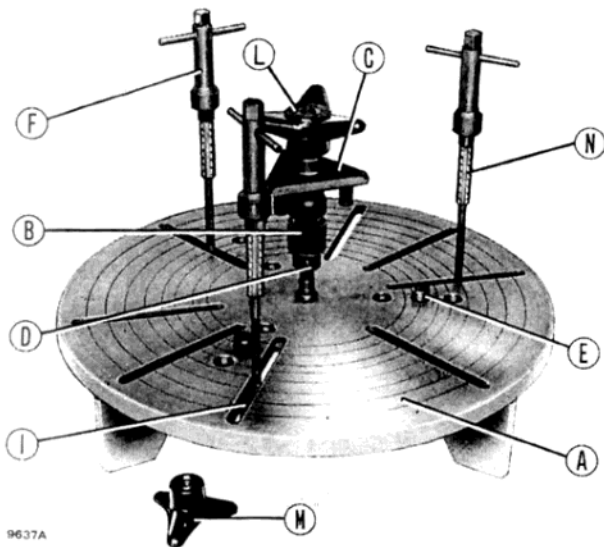
a. Clutch with organic compound plate - b. Clutch with ceramic compound plate - C₂. Clutch housing capscrow - C₃. Fork lever capscrows - C₄. Sleeve cover retaining nuts - D = 98 mm (3.852 in). Nominal distance of transmission clutch levers from flywheel face - D₁ = 123 mm (4.842 in). Nominal distance of P.T.O. clutch release levers (2) from flywheel face - L₁ = 2.5 mm (0.0098 in). Nominal P.T.O. clutch release lever clearance - 1. Dish spring - 2. PTO clutch release levers - 3. Transmission clutch release levers - 4 and 5. Release control sleeves with thrust bearings - 6 and 7. PTO clutch release lever locknut and adjusting link - 8. PTO clutch plate 9. Transmission clutch plate - 10. Flywheel bearing - 11 and 12. Sleeve control forks - 13, 14 and 15. Transmission clutch release lever, adjusting screw and locknut.

Warning - On clutch assembly, ensure that clutch plates are positioned as shown in figure.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply jointing compound as per section A, page 6.

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POWER TRAIN: Clutch



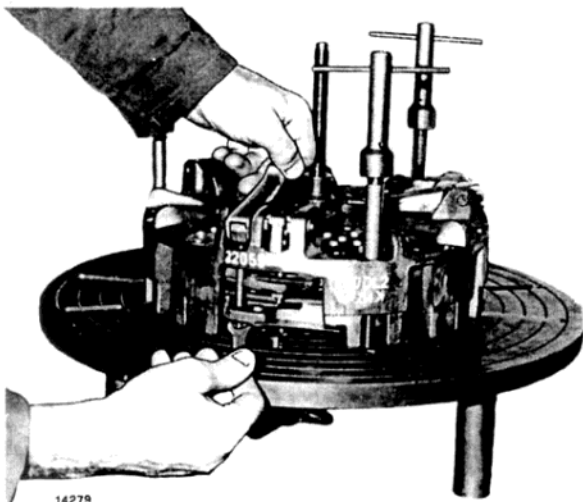
Component parts of universal kit 293650 for VALEO or LUK clutch adjustment.

A. Base plate 293332/1 - B. Central spacer 293728 - C. Register 293731 - D. Central spacer locknut 293730 - E. Locators 293726 - F. Fasteners 293725 - I. Pads 293755 - L. Register retaining handwheel 293739 - M. Locator handwheels 293740 - N. Fastener spacers 292345.

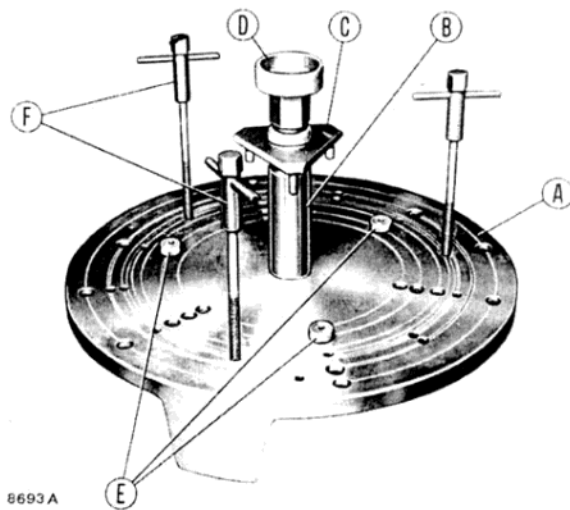
- Install clutch assy (less PTO driven plate) on base plate and secure through fasteners (F).

To install clutch on universal kit 293650, proceed as follows:

- Install central spacer (B) on base plate (A). Position spacer at a height of 123 mm (4.84 in) through register and secure through locknut (D).



Removing locknuts from PTO clutch release lever adjusting links.



Component parts of kit 291291/2 for VALEO or LUK clutch adjustment

A. Base plate 292598 - B. Central spacer 292342 - C. Register 291299 - D. Spacer and register retaining nut 292344 - E. Locators 293454 - F. Fasteners 291292/1.

- Measure PTO clutch driven plate thickness (S) and install adjustable locators (E) on circumference of 240 mm (9.45 in) and at height (h) given by:

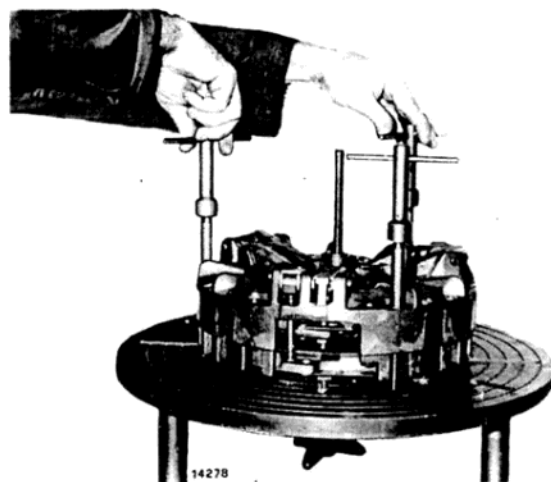
$$h = 2 \text{ mm} + S$$

where:

2 mm = constant dimension

S = measured PTO driven plate thickness.

- Subsequently secure adjustable locators (E) through associated handwheels (M).



Disassembling clutch on universal kit 293650.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

22

page 9

- Install clutch assy without PTO driven plate on base and secure through three fasteners (F, page 8) provided with pads (I) and spacers (N).

Remove PTO clutch release lever adjusting link nuts (7, page 7) and slowly back off fasteners (F, page 8) to release load on dish spring.

Remove the three PTO clutch pressure plate tab retaining screws from clutch housing and retrieve pressure plate.

Note - During clutch removal, overhaul and installation, particular care must be taken to prevent moving PTO and transmission clutch pressure plate tabs out of position.

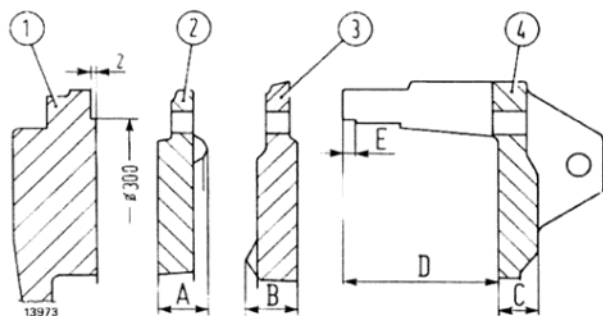
Check clutch driven plates for wear and replace if rivets are near to or flush with top facings. Plates are also to be replaced if the organic facings are found to be soaked with oil.

Check condition of clutch housing and pressure plate friction surfaces.

If necessary, dress noting that dimensions (A, B, C and D) of each part must not be reduced below the limits shown below. Otherwise, replace as necessary.

Proceed as follows:

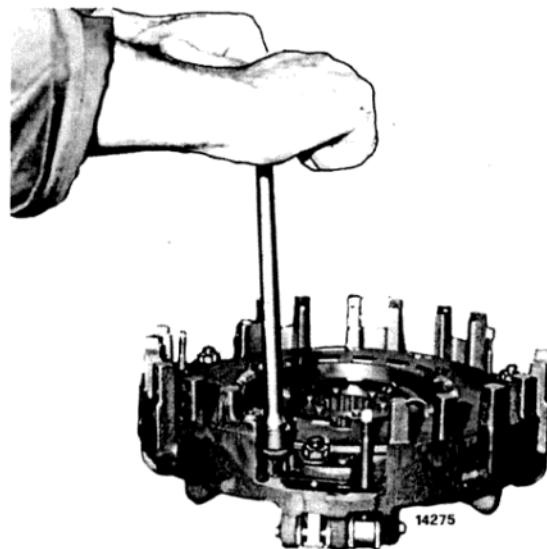
- Dress pressure plate surfaces.
- Replace damaged or worn plates.



Minimum dimensions after dressing VALEO clutch.

A ≥ 21.5 mm (0.791 in); B ≥ 21.5 mm (0.791 in); C ≥ 17 mm (0.67 in); D ≥ 67.5 mm (2.484 in); E ≥ 2.5 mm (0.092 in). 1. Flywheel - 2. PTO clutch pressure plate - 3. Transmission clutch pressure plate - 4. Housing.

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Removing retaining screws from transmission clutch pressure plate tabs.

- Dress clutch housing face.
- Calculate dimension (D) as follows:

$$D = A + B + S_1 + S_2 + P + L$$

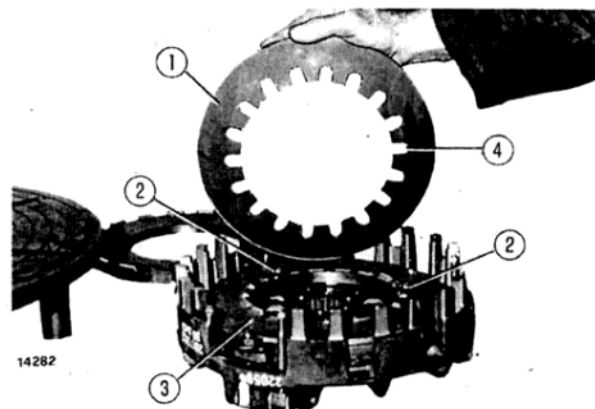
where:

A and B = Measured dimensions of two pressure plates after dressing.

S₁ and S₂ = Measured dimensions of PTO and transmission clutch plates.

L = 2 mm (0.08 in). Flywheel undercut.

P = 4.2 to 4.4 mm (0.1654 to 0.1732 in). Spring dimensions to restore original load.

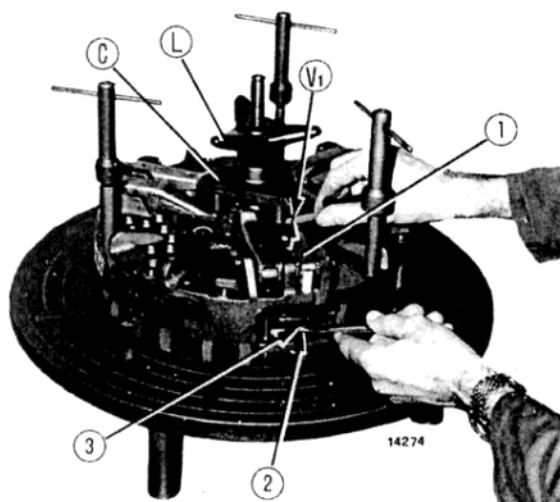


Transmission clutch pressure plate and dish spring alignment

1. Dish spring - 2. Spring dowels - 3. Pressure plate - 4. Notches.

Print No. 603.54.241.00 - III - 1986

POWER TRAIN: Clutch



On-bench inspection and adjustment of transmission clutch release lever height using universal kit 293650.

C. Register - L. Handwheel **293739** - $V_1 = 0.1 \text{ mm}$ (0.004 in). Release lever to register pin gap - 1. Release levers - 2 and 3. Adjusting screw and locknut.

- Check that value (D, page 9), is greater than or equal to that shown in figure on page 9. In restoring value (D), check that housing dimension (C) does not fall below the values given. If necessary, replace one or both pressure plates.

Check that undercut (E) is deeper than indicated on page 9 and restore as necessary. If necessary, dress friction face on flywheel and restore external undercut of 2 mm (0.08 in).

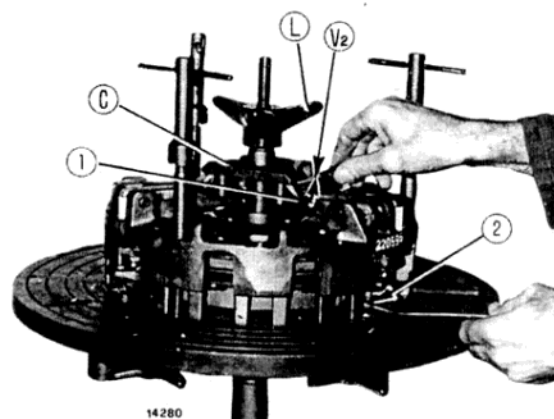
Reassemble clutch using suitable tools of kit **291291/2** or universal kit **293650** and noting the following points:

- Correctly position dish spring (1, page 7) on transmission clutch pressure plate (3, page 9) ensuring that centralisers (2) are in register with notches (4).
- Adjust clutch as directed below.

Note - Upon assembly, tighten the six screws retaining transmission and PTO pressure plate tabs to housing to 1.5 da Nm-kgm (11.064 ft lb).

VALEO 11"/11" CLUTCH ADJUSTMENT (LATE MODEL)

For correct clutch adjustment, release levers must be aligned at the dimensions given (D and D_1 , page 7) relative to flywheel face. Clutch adjustment may be carried out with clutch on bench or fitted to the flywheel.



On bench inspection and adjustment of PTO clutch release lever height using universal kit 293650.

C. Register - L. Handwheel **293739** - $V_2 = 0.1 \text{ mm}$ (0.004 in). Register to release lever gap - 1. Release levers - 2. Adjusting nut.

1. On-bench clutch adjustment.

Install clutch on base plate of universal kit **293650** or kit **291291/2** and secure using parts as described for disassembly.

Install register (C) and secure through handwheel (L) for universal kit **293650**, or nut (D, page 8) for kit **291291/2**.

Tighten or back off transmission clutch release lever adjusting screws (2) to obtain correct gap (V_1) between register pin ends and transmission clutch release levers. Secure screws in position through nuts (3).

Tighten or back off PTO clutch release lever adjusting link nuts (2) to obtain correct gap (V_2) between release lever ends and register face (C).

Note - After clutch lever adjustment, remove handwheel (L) for universal kit **293650** or nut (D) for kit **291291/2** and register (C). Install presser **292176** on kit base plate and check PTO and transmission clutch release as indicated on page 6.

2. On-flywheel clutch adjustment.

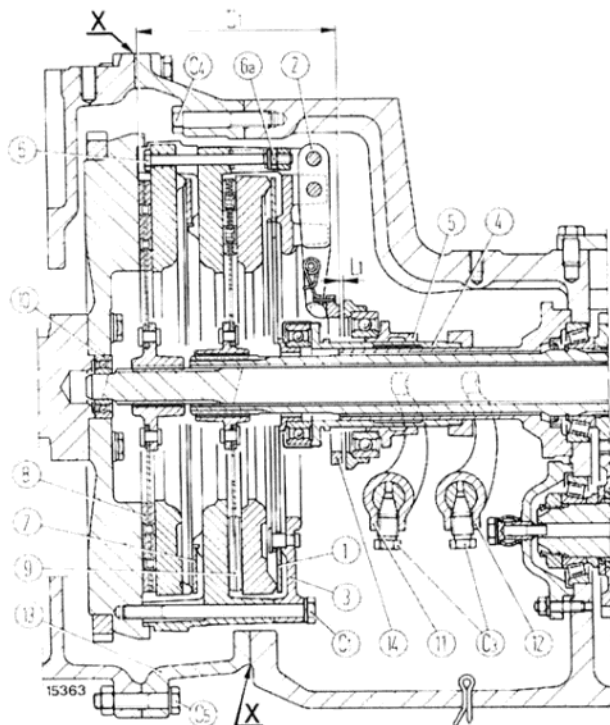
Insert pin **291184** (L_1 , page 7) in clutch driven plate shaft seats, ensuring that end is in contact with bearing (10) and press associated register against pin. Adjust gaps (V_1 and V_2) as indicated above.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

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page 11



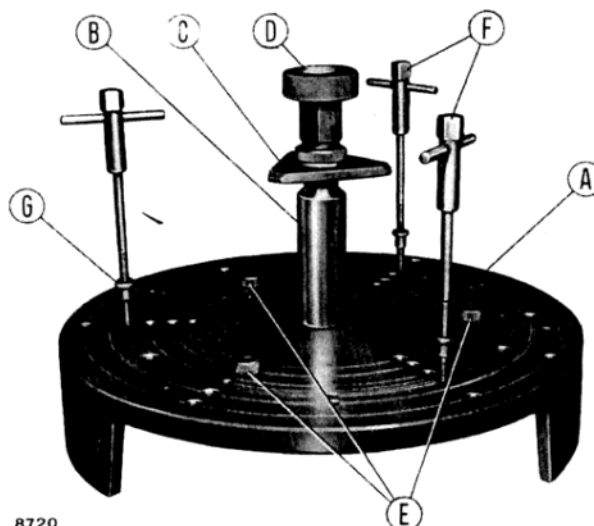
Longitudinal section through 12"/12" VALEO clutch.

C₁. Clutch housing capscrews - C₃. Fork lever capscrews - C₄ and C₅. Spacer capscrews - D₁ - 147 mm (5.78 in) Nominal distance between ring (14) and flywheel - L₁ = 2.5 mm (.0098 in) Nominal distance between PTO clutch release lever ring and thrust plate - 1. Diaphragm spring - 2. PTO clutch release levers - 3. Cover - 4 and 5. Release control sleeves with thrust bearings - 6 and 6a. PTO release lever lock nut and adjusting screw - 7. Dish spring - 8. PTO clutch plate - 9. Transmission clutch plate - 10. Flywheel bearing - 11 and 12. Sleeve control forks - 13. Spacer - 14. Release lever ring.

Warning - On clutch assembly, ensure that transmission clutch plate (9) is positioned as shown, i.e. with short side of boss facing flywheel.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply jointing compound as per Section A, page 6.

Note - Universal kit 293650 or kit 291291/2 and on-flywheel clutch adjustment may result in quite considerable differences in terms of positioning, a fact which does not affect clutch efficiency, being due to varying PTO clutch plate thickness owing to machining tolerance build-up or wear, plus the magnification inherent in the high leverage ratio.



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Component parts of VALEO 12"/12" clutch adjuster 291291/2

A. Base plate 292598 - B. Central spacer 291294 - C. Register 292347 - D. Nut 292344 securing spacer and register - E. Locators 293683 - F. Fasteners 291292/1 - G. Fastener guide bushings 291293/1.

⚠ WARNING ⚠

Use suitable tools to align holes. Never use fingers or hands.

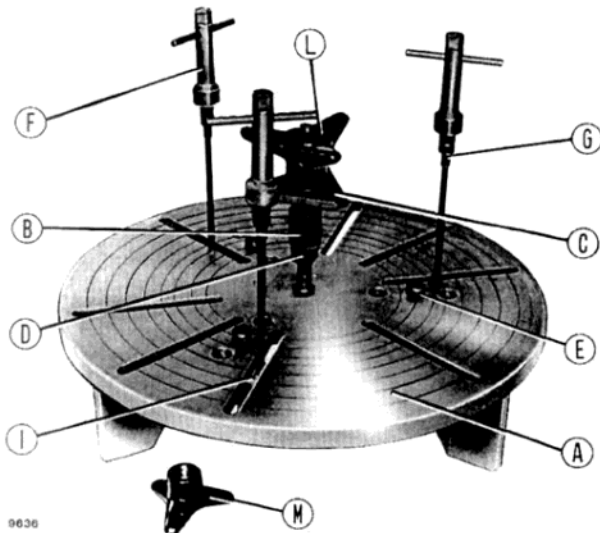
VALEO 12"/12" CLUTCH OVERHAUL

For clutch removal, assembly and adjustment, use tool 291291/2 or universal tool 293650.

To install clutch on tool 291291/2 proceed as follows:

- place central spacer (B) on base plate (A) and three locators (E) over 241 mm (9.5 in) circumference.
- rest the clutch assembly without PTO clutch driven plate on the base plate and secure by means of three fasteners (F) provided with guide bushings (G).

POWER TRAIN:
Clutch



**Component parts of VALEO 12"/12" clutch universal
adjuster 293650.**

A. Base plate **293332/1** - B. Central spacer **293729** - C. Register **293732** - D. Spacer locknut **293730** - E. Locators **293726** - F. Fasteners **293725** - G. Fastener guide bushings **293734** - I. Clamps **293755** - L. Knob **293739** - M. Knobs **293740**.

To install clutch on universal tool **293650** proceed as follows:

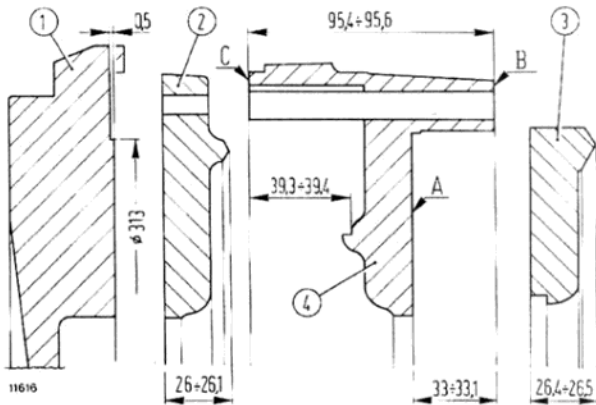
- position spacer (B) on base plate (A), with register contact surface 137.5 mm (5.4 in) above base plate and tighten looknut (D);
- Measure PTO clutch driven plate thickness (S) and install adjustable locators (E) on circumference of 240 mm (9.45 in) and at height (h) given by:

$$h = 0.5 \text{ mm} + S$$

where:

0.5 mm = Constant dimension

S = Measured PTO driven plate thickness.



PTO clutch pressure plate (2), transmission clutch pressure plate (3) and support housing (4) original dimensions in mm.

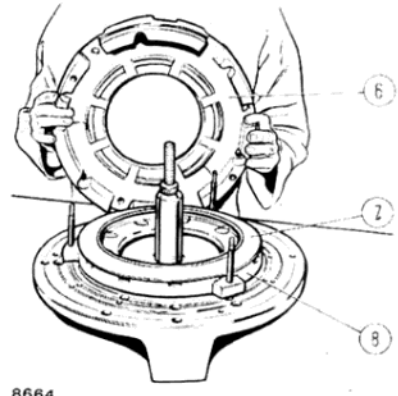
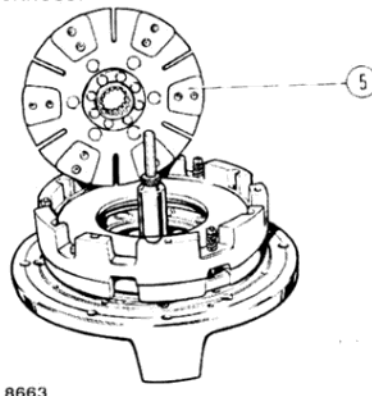
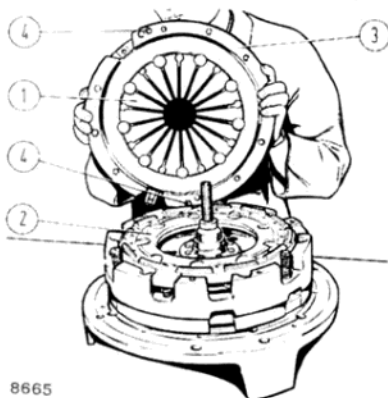
A. B. C. See text - 1. Engine flywheel.

- Rest clutch assembly without PTO driven plate on base plate and secure by means of three fasteners (F) with guide bushings (G) and pads (I).

Slacken nuts (6a, page 11) and fully back off adjusting screws (6) using wrench from set **293763**. Remove cover capscrew (3) and gradually back off fasteners (F), to allow spring unloading and subsequent clutch disassembly.

Check clutch driven plates for wear and replace if the rivets are found to be flush with or near to top of facings. Also replace if the organic facings are found to be soaked with oil.

Check the pressure plate and clutch housing contact surfaces; if necessary, these surfaces may be dressed referring to the dimensions given in the illustration on page 12 and noting the following points:



Disassembling (assembling) clutch using tool kit 291291/2.

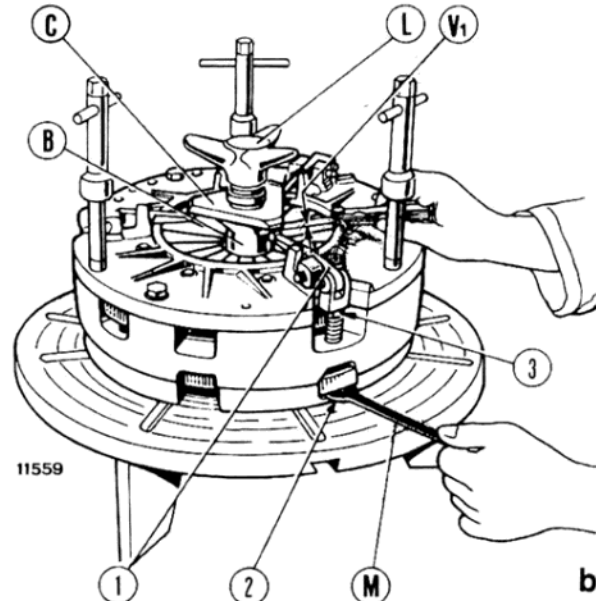
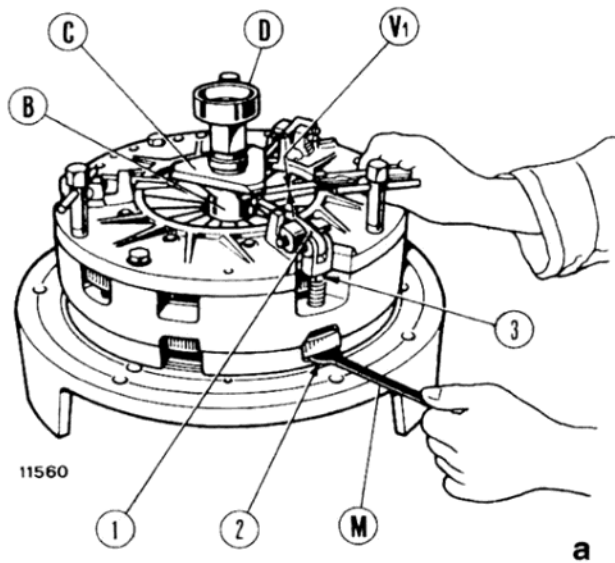
1. Diaphragm spring - 2. Transmission clutch pressure plate - 3. Clutch cover - 4. Clutch cover centralisers - 5. Transmission clutch plate - 6. Support housing - 7. Dished spring - 8. PTO clutch pressure plate.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

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page 13



Checking and adjusting PTO clutch release lever alignment on the bench using tool 291291/2 (fig. a) or universal tool 293650 (fig. b).

B. Spacer - C. Register - D. Nut - L. Knob - M. Wrench from set 293763 - $V_1 = .1 \text{ mm } (.004 \text{ in})$ for universal 293650 or $1.2 \text{ mm } (.06 \text{ in})$ for tool 291291/2. Clearance to be obtained between release lever ends (1) and register (C) - 1. Release levers - 2 and 3. Adjusting screw and lock nut.

1. PTO clutch pressure plate (2, page 12). Dress contact surface to a maximum depth of $1 \text{ mm } (.04 \text{ in})$. Subsequently dress the clutch housing (C) removing an equivalent amount of material.

— position dish spring (7, page 12) on PTO clutch pressure plate with the convex side uppermost;

— adjust clutch as directed below.

2. Transmission clutch pressure plate (3, page 12). Proceed as described above and remove the same amount of material from clutch housing (B).

3. Clutch housing (4, page 12). Dress surface (A) to a maximum depth of $.5 \text{ mm } (.02 \text{ in})$. Remove the same amount of material from (B).

VALEO 12"/12" CLUTCH ADJUSTMENT

For correct clutch adjustment the PTO clutch release levers should be aligned and ring (14, page 11) should be positioned at dimension (D₁) relative to the flywheel surface.

Clutch adjustment may be carried out with the clutch on the bench or installed on the flywheel.

If necessary, dress engine flywheel contact surface to restore external undercut of $.5 \text{ mm } (.02 \text{ in})$.

1. On-bench clutch adjustment.

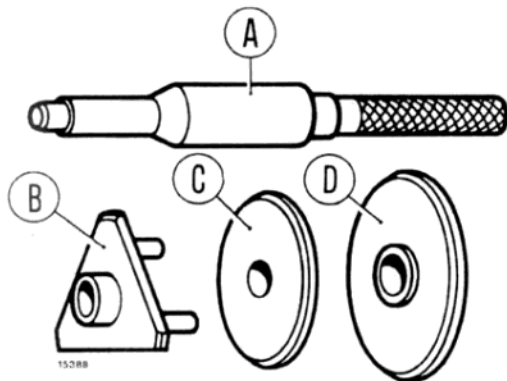
Should diaphragm spring replacement be necessary (1, page 11) note that the spring is supplied together with cover (3) to which it is rivetted.

Position the clutch over the base plate of tool 291291/2 or universal tool 293650 and tighten using fasteners as directed for disassembly (pages 11 and 12).

Assemble clutch parts using tools from tool kit 291291/2 or from universal tool kit 293650 noting the following points:

Remove ring (14, page 11), install register (C, page 12) and lock with nut (D), tool 291291/2 or knob (L), universal tool 293650.

POWER TRAIN: Clutch



Tool 293375.

A, C. Pin and washer for VALEO 12"/12" clutch adjustment

Using wrench (M, page 13), tighten or slacken PTO clutch release lever adjusting screws (2) to obtain clearance (V₁) between the end of each release lever and register (C). Subsequently, tighten the screws through nuts (3).

Note - See note on page 19.

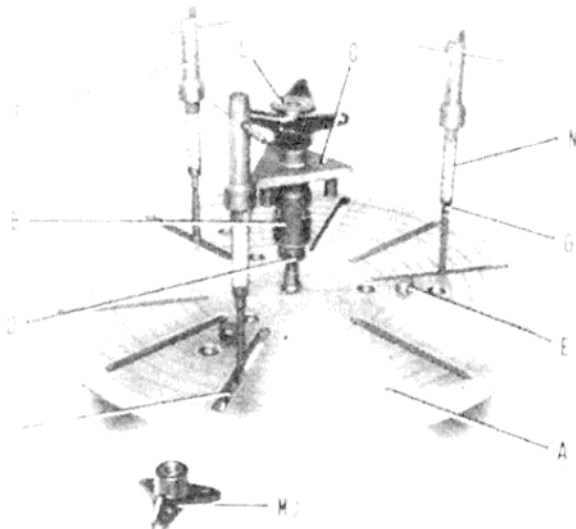
2. On-flywheel clutch adjustment.

Insert centraliser **293375** (A) in clutch drive plate bores ensuring that the end is in contact with bearing (10, page 11). Press washer against centraliser. Adjust clearance between release lever ends and register to .1 mm (.004 in) as directed above for clearance (V₁) adjustment.

Note - On-bench and on-flywheel clutch adjustment may result in quite considerable differences in terms of positioning, a fact which does not affect clutch efficiency being due to varying PTO driven plate thickness owing to machining tolerance build-up or wear, plus the magnification inherent in the high leverage ratio.

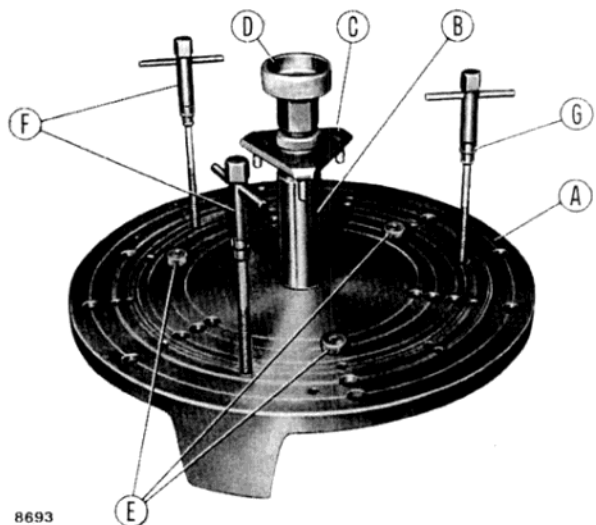
LUK OR O.M.G. 11"/11" CLUTCH OR LUK 12"/12" CLUTCH OVERHAUL

Disassemble, assemble and adjust clutch using universal kit **293650** or kit **291291/2**.



Component parts of universal kit 293650 for LUK or O.M.G. clutch adjustment.

A. Base plate **293332/2** - B. Central spacer **293728** (11"/11" clutch) or **293729** (12"/12" clutch) - C. Register **293731** - D. Central spacer locknut **293730** - E. Locators **293726** - F. Fasteners **293725** - G. Guide bushings **293734** (12"/12" clutch) - H. Pads **293755** - I. Register handwheel **293739** - J. Locator handwheels **293740** - K. Fastener spacers **293737** (11"/11" clutch) or **292345** (12"/12" clutch).



Component parts of kit 291291/2 for LUK or O.M.G. clutch adjustment

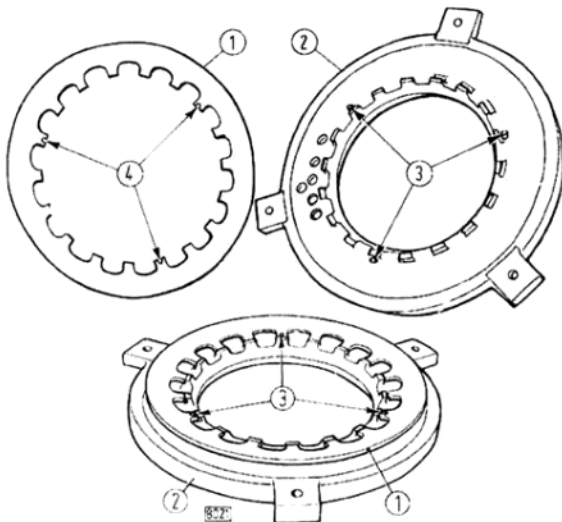
A. Base plate **292598** - B. Central spacer **292342** (11"/11" clutch) or **291294** (12"/12" clutch) - C. Register **291299** (11"/11" clutch) or **292939/1** (12"/12" clutch) - D. Spacer and register nut **292344** - E. Locators **293454** (11"/11" clutch) or **293733** (12"/12" clutch) - F. Fasteners **291292/1** - G. Guide bushings **291293/1** (12"/12" clutch).

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

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page 15



PTO clutch pressure plate and dish spring alignment (LUK 11"/11" clutch only).

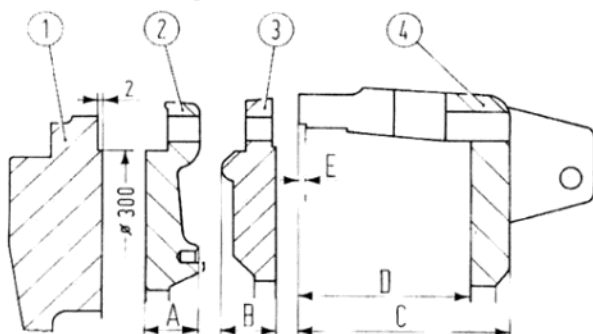
1. Dish spring - 2. Pressure plate - 3. Spring dowels - 4. Notches.

To install clutch on tool **291291/2**, proceed as follows:

- place spacer (B) on base plate (A page 14) and three locators (E) over 241 (9.5 in) circumference.
- rest clutch assembly without PTO driven plate on base plate and secure by means of three fasteners (F) provided with guide bushings (G, LUK 12"/12" clutch only).

To install clutch on universal tool **293650**, proceed as follows:

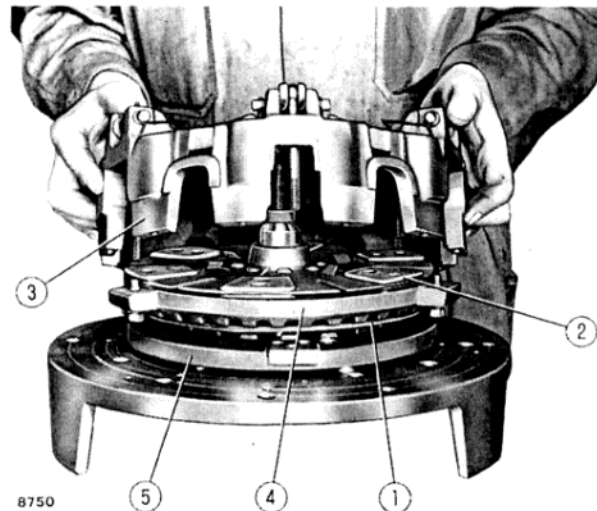
- place spacer (B) on base plate (A, page 14), position register at a height of 123 mm (4.84 in) for 11"/11" clutch or 128 mm (5.04 in) for 12"/12" clutch and tighten locknut (D);



95318

Minimum dimensions after dressing LUK 11"/11" clutch.

A ≥ 22 mm (0.866); B ≥ 24 mm (0.945 in); C ≥ 87 mm (3.425 in); D = 70 ± 0.15 mm (2.756 ± 0.006 in); E ≥ 2.5 mm (0.092 in) - 1. Flywheel - 2. PTO clutch pressure plate - 3. Transmission clutch pressure plate - 4. Housing



8750

Removing (installing) housing with levers

1. Dish spring - 2. Transmission clutch plate - 3. Clutch housing - 4. Transmission clutch pressure plate - 5. PTO clutch pressure plate.

- Measure PTO clutch driven plate thickness (S) and place adjustable locators (E) over 240 mm (9.4 in) circumference with top face at a height (h) given by:

$$h = 2 \text{ mm} + S \text{ (11"/11" clutch)}$$

$$h = 2.9 \text{ mm} + S \text{ (12"/12" clutch)}$$

where:

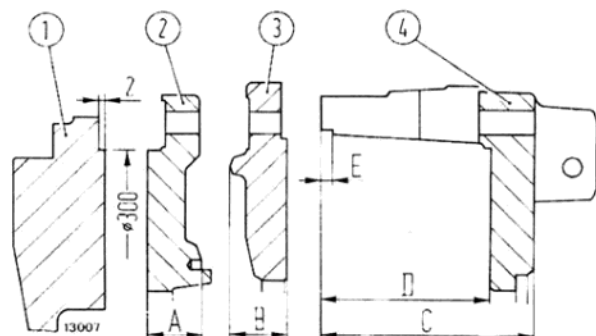
2 mm = Constant dimension (11"/11" clutch)

2.9 mm = Constant dimension (12"/12" clutch)

S = **Measured** PTO clutch driven plate thickness.

- Secure adjustable locators (E, page 14) through associated handwheels (M).
- Install clutch assy without PTO driven plate on base plate and secure through three fasteners (F) provided with pads (I) and spacers (N) for LUK and O.M.G. clutches.

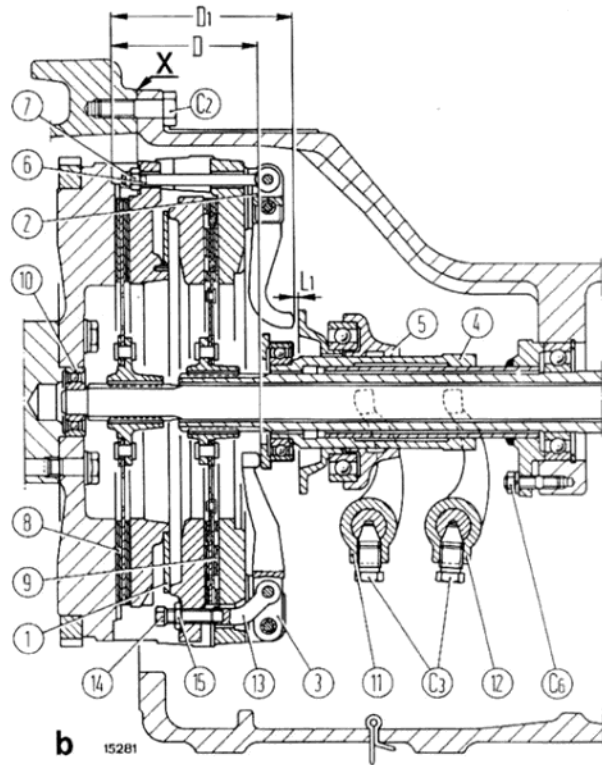
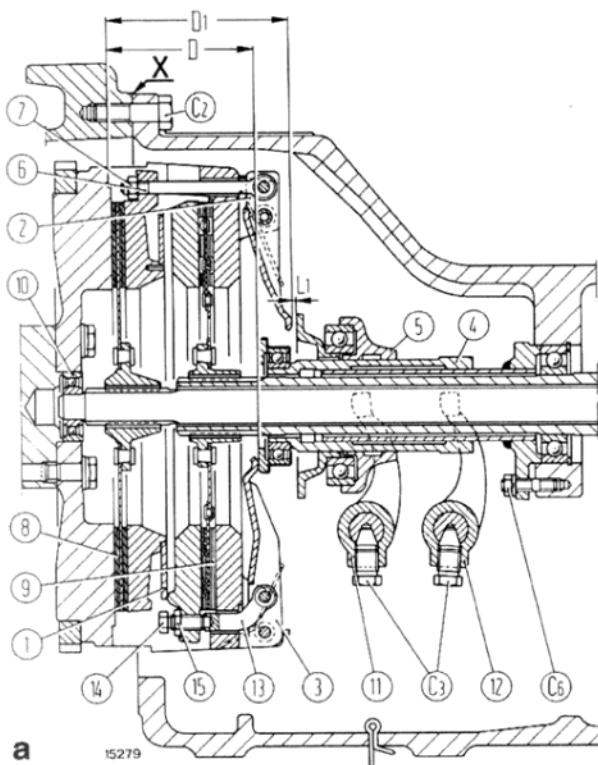
(continued on page 17)



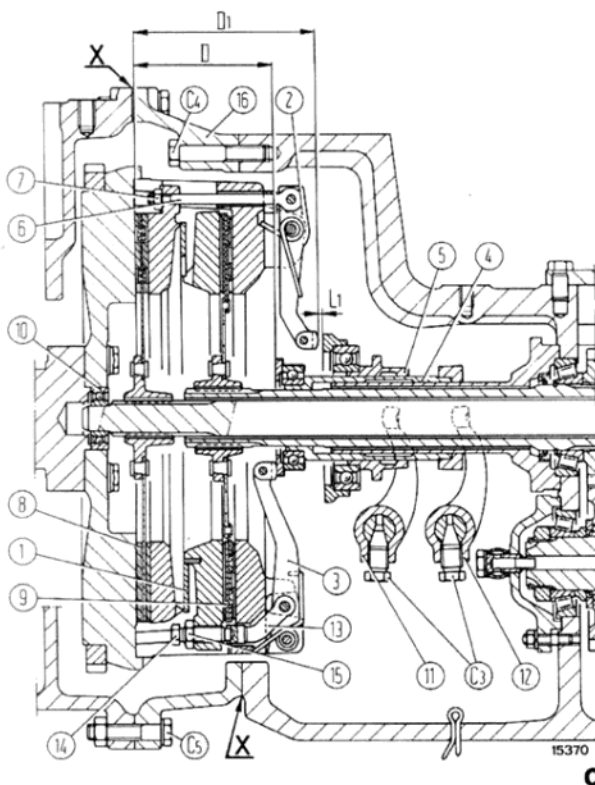
Minimum dimensions after dressing O.M.G. 11"/11" clutch.

A ≥ 22 mm (0.866); B ≥ 24 mm (0.945 in); C ≥ 87 mm (3.425 in); D = 70 ± 0.15 mm (2.756 ± 0.006 in); E ≥ 2.5 mm (0.092 in) - 1. Flywheel - 2. PTO clutch pressure plate - 3. Transmission clutch pressure plate - 4. Housing

POWER TRAIN: Clutch



Longitudinal section through 11 1/4" LUK or O.M.G. clutch



Longitudinal section through LUK 12 1/2" clutch.

a. LUK 11 1/4" clutch with organic compound transmission clutch plate - b. O.M.G. 11 1/4" clutch with organic compound transmission clutch plate - c. LUK 12 1/2" clutch - C². Clutch housing capscrews - C₃. Fork lever capscrews - C₄ and C₅. Spacer capscrews - C₆. Sleeve cover nuts - D = 98 mm, 3.9 in (11 1/4" clutch) or 103 mm, 4 in (12 1/2" clutch). Nominal distance of transmission clutch release levers from flywheel face - D₁ = 123 mm, 4.8 in (11 1/4" clutch) or 137 mm, 5.4 in (12 1/2" clutch). Nominal distance between PTO clutch release levers and flywheel face - L₁ = 2.5 mm (0.098 in) Nominal clearance between PTO clutch release levers and thrust bearing.

1. Dish spring - 2. PTO clutch release levers - 3. Transmission clutch release levers - 4 and 5. Release control sleeves with thrust bearings - 6 and 7. PTO clutch release lever locknut and adjusting link - 8. PTO clutch plate - 9. Transmission clutch plate - 10. Flywheel bearing - 11 and 12. Sleeve control forks - 13, 14 and 15. Transmission clutch release lever locknut, adjusting screw and lever - 16. Spacer.

Warning - On clutch reassembly, ensure that clutch plates are positioned as shown in figure.

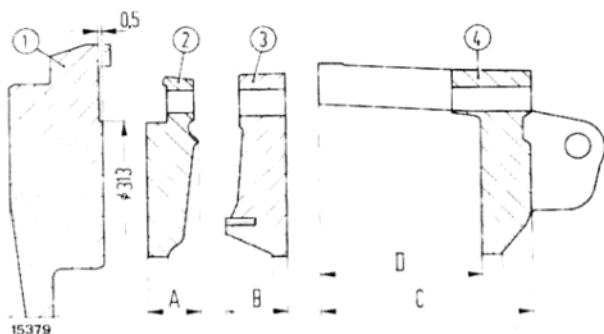
Note - On assembly, thoroughly clean and degrease mating surfaces X and apply jointing compound as per section A, page 6.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

22

page 17



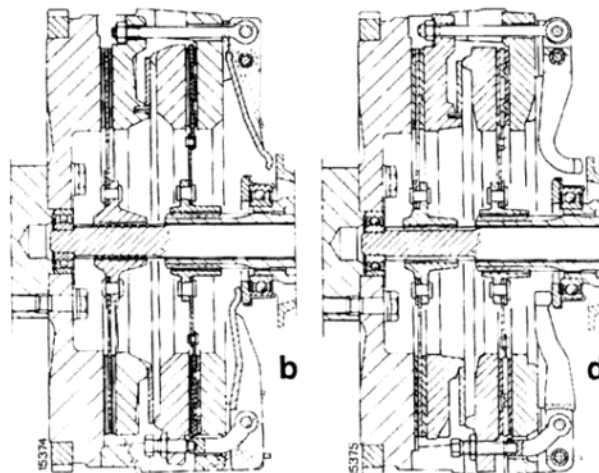
Minimum dimensions after dressing LUK 12"/12" clutch.

A $\geq$ 22 mm (0.866 in) - B $\geq$ 24 mm (0.945 in) - C $\geq$ 94.3 mm (3.71 in) - D = 71.3 mm (2.81 in). 1. Flywheel - 2. PTO clutch pressure plate - 3. Transmission clutch pressure plate - 4. Support housing.

or spacers (N) and bushing (G) for 12"/12" clutches.

Remove PTO clutch release lever adjusting link nuts (7, page 16) and slowly back off fasteners (F, page 14) to release load on dish spring. Disassemble clutch as shown on page 15.

Check clutch driven plates for wear and replace if rivets are near to or flush with top facings. Plates are also to be replaced if the organic facings are found to be soaked with oil.



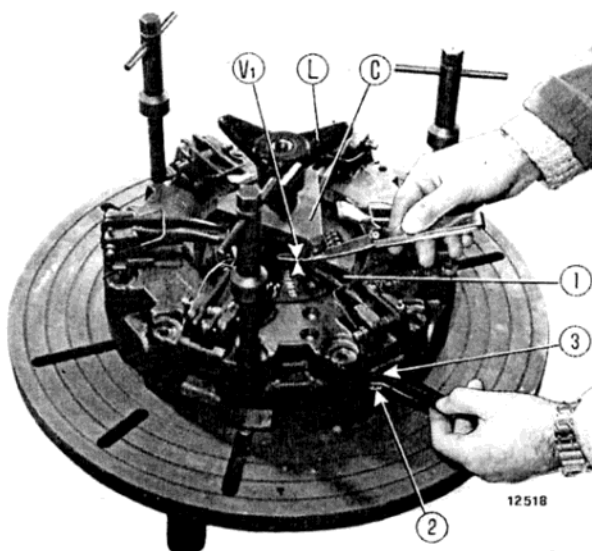
Detail of LUK (fig. b) and O.M.G. (fig. d) 11"/11" clutch with cerametallic transmission clutch plate (standard for 80-90 and optional for 55-90, 60-90 and 70-90).

Check condition of clutch housing and pressure plate friction surfaces.

If necessary, dress noting that dimensions (A, B, C and D) of each part must not be reduced below the limits given in figures on page 15 (11"/11" clutch) or alongside (12"/12" clutch). Otherwise, replace as necessary.

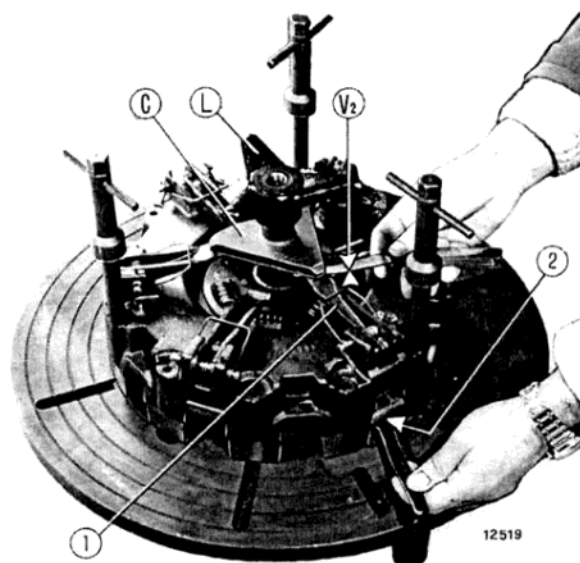
Proceed as follows:

- Dress pressure plate surfaces.
- Replace damaged or worn plates.



On-bench inspection and adjustment of transmission clutch release lever height using universal kit 293650.

C. Register - L. Handwheel 293739 - $V_1 = 0.1$ mm (0.004 in). Release lever to register pin gap - 1. Release levers - 2 and 3. Adjusting screw and locknut.



On-bench inspection and adjustment of PTO clutch release lever height using universal kit 293650.

C. Register - L. Handwheel 293739 - $V_2 = 0.1$ mm (0.004 in). Register to release lever gap - 1. Release levers - 2. Adjusting nut.

POWER TRAIN: Clutch

- Dress clutch housing face.
- Calculate dimension (D, pages 15 and 17) as follows:

$$D = A + B + S_1 + S_2 + P + L$$

where:

A and B = Measured dimensions of two pressure plates after dressing.

S₁ and S₂ = Measured dimension of PTO and transmission clutch plates.

L = 2 mm, 0.08 in (11"/11" clutch) or 0.5 mm, 0.019 in (12"/12" clutch). Flywheel undercut.

P = 4 mm, 0.16 in (12"/12" O.M.G. or LUK clutch) or 4.5 mm, 0.12 in (LUK 11"/11" clutch). Spring dimensions to restore original load.

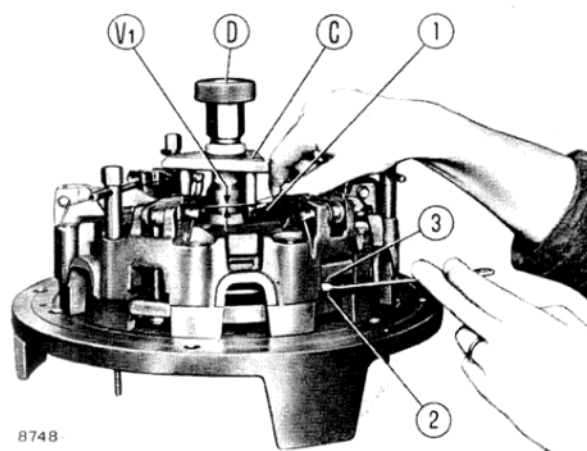
- Check that value (D) is greater than or equal to that shown in figure on pages 15 and 17. In restoring value (D), check that housing dimension (C) does not fall below the values given. If necessary, replace one or both pressure plates, bearing in mind the following note.

Note: Clutch housing thickness should not fall below 17 mm (0.67 in) for 11"/11" clutch, or 23 mm (0.905 in) for 12"/12" clutch; therefore, ensure that the following condition exists at all times:

C - D ≥ 17 mm min. (11"/11" clutch)

C - D ≥ 23 mm min. (12"/12" clutch)

Check that undercut (E, page 15) is deeper than indicated in figure and restore as necessary. If necessary, dress friction face on flywheel and restore external undercut of 2 mm (0.08 in) for 11"/11" clutch or 0.5 mm (0.019 in) for 12"/12" clutch.



8748 - On-bench inspection and adjustment of transmission clutch release lever height using kit 291291/2.

C. Register - D. Nut 292344 - V₁ = 0.1 mm (0.004 in) - Release lever to register pin gap - 1. Release levers - 2 and 3. Adjusting screw and locknut.

Reassemble clutch using suitable tools of kit 291291/2 or universal kit 293650 and noting the following points:

- Correctly position dish spring (1, page 15) on PTO clutch pressure plate (2), ensuring that centralisers (3) are in register with slots (4).

- Adjust clutch as directed below.

LUK OR O.M.G. 11"/11" OR LUK 12"/12" CLUTCH ADJUSTMENT

For correct clutch adjustment, release levers must be aligned at the dimensions given (D and D₁, page 16) relative to flywheel face.

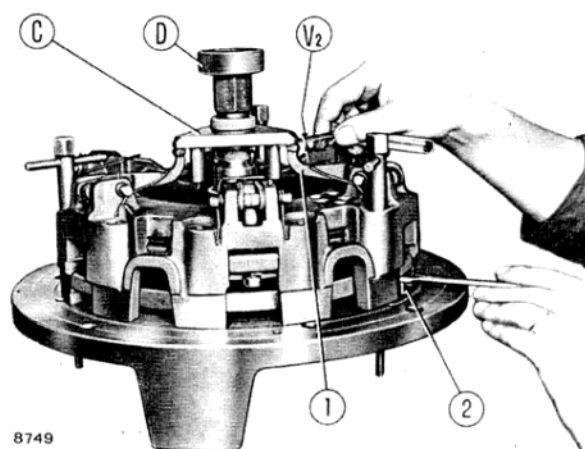
Clutch adjustment may be carried out with clutch on bench or fitted to the flywheel.

1. On-bench clutch adjustment.

Install clutch on base plate of universal kit 293650 or kit 291291/2 and secure using parts as described for disassembly (pages 14, 15 and 16).

Install register (C) and secure through handwheel (L) for universal kit 293650, or nut (D) for kit 291291/2.

Tighten or back off transmission clutch release lever adjusting screws (2) to obtain correct gap (V₁) between register pin ends and transmission clutch release levers. Secure screws in position through nuts (3).



8749 - On-bench inspection and adjustment of PTO clutch release lever height using kit 291291/2.

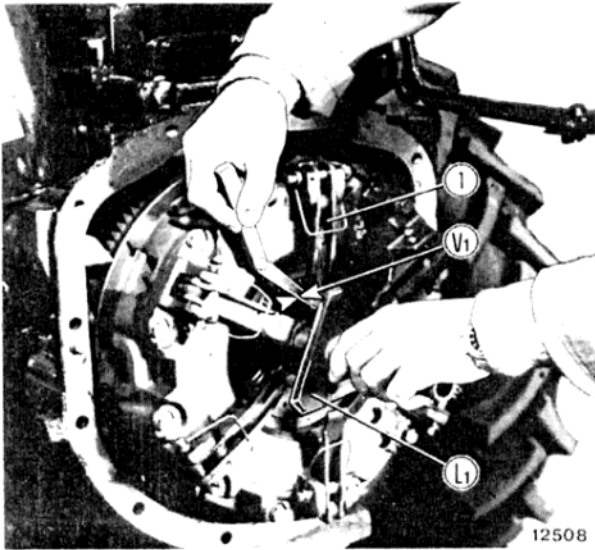
C. Register - D. Nut 292344 - V₂ = 0.1 mm (0.004 in) - Register to release lever gap - 1. Release levers - 2. Adjusting nut.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch

22

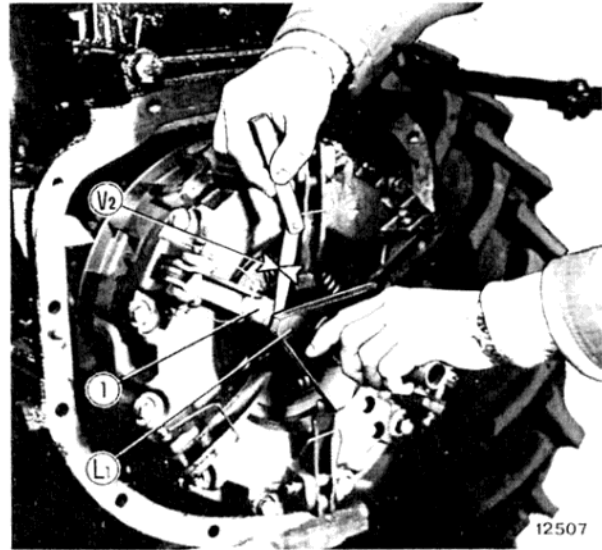
page 19



On-flywheel inspection of transmission clutch release lever height.

L1. Pin 291184 - $V_1 = 0.1 \text{ mm (0.004 in)}$. Release lever to register pin gap - 1. Transmission clutch release levers.

Tighten or back off PTO clutch release lever adjusting link nuts (2, page 18) to obtain correct gap (V_2) between release lever ends and register face (C).



On-flywheel inspection of PTO clutch release lever height

L1. Pin 291184 - $V_2 = 0.1 \text{ mm (0.004 in)}$. Register face to release lever gap. - 1. PTO clutch release levers.

PTO clutch plate thickness owing to machining tolerance build-up or wear, plus the magnification inherent in the high leverage ratio.

Note: After clutch lever adjustment, remove hand-wheel (L, page 14) for universal kit 293650 or nut (D) for kit 291291/2 and register (C). Install presser 292176 on kit base plate and check PTO and transmission clutch release as indicated on page 6.

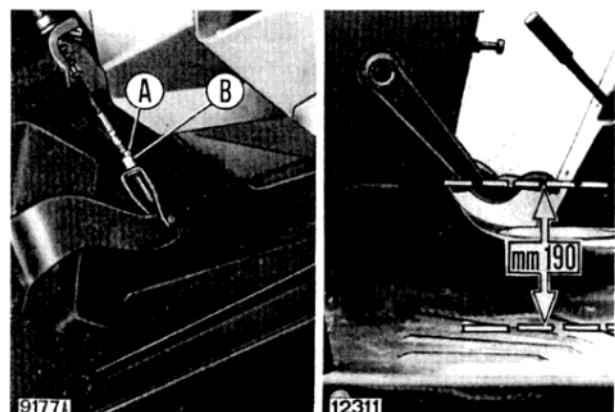
TRANSMISSION CLUTCH LINKAGE ADJUSTMENT (ALL MODELS)

Transmission clutch linkage should be adjusted when pedal position becomes uncomfortable (i.e., too high). Proceed as follows:

2. On-flywheel clutch adjustment.

Insert pin 291184 (L1, page 7) for 11"/11" clutch, or pin 293375 with register 293802 for 12"/12" clutch in clutch driven plate shaft seats, ensuring that end is in contact with bearing (10, page 16) and press associated register against pin. Adjust gaps (V_1 and V_2) as indicated above.

Note: Universal kit 293650 or kit 291291/2 and on-flywheel clutch adjustment may result in quite considerable differences in terms of positioning, a fact which does not affect clutch efficiency, being due to varying



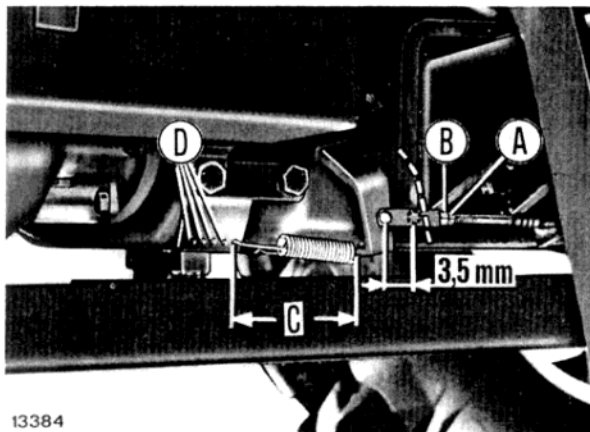
Adjusting transmission clutch linkage.

A. Locknut - B. Adjusting nut.

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POWER TRAIN: Clutch



13384

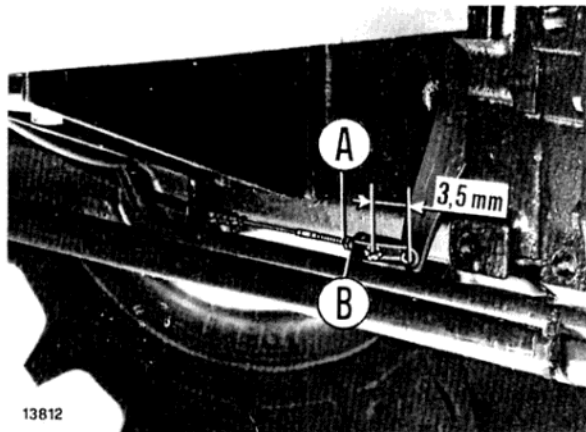
Adjusting PTO clutch control lever free travel (55-90, 60-90, 70-90, 80-90).

A. Locknut - B. Adjusting nut - C. Spring length - D. Spring mounting holes

- Back off locknut (A, page 19) and turn nut (B) counterclockwise (each nut turn is equivalent to 9 mm or 0.354 in pedal displacement).
- Tighten locknut (A).
- Ensure that pedal in rest position lies 190 mm or 7.5 in from platform (170 mm or 6.7 in for cab versions).

PTO CLUTCH LINKAGE ADJUSTMENT (ALL MODELS)

Check that lever free travel is 3.5 mm or 0.13 in (55 to 60 mm or 2.16 to 2.36 in measured at lever grip).



13812

Adjusting PTO clutch control lever free travel (90-90, 100-90).

A. Locknut - B. Adjusting nut.

When free travel is down to 1.5 mm or 0.059 in adjust as follows:

- Back off locknut (A) and turn nut (B) counterclockwise (each turn is equivalent to 1 mm or 0.4 in lever displacement).
- Tighten locknut (A).
- Ensure that lever free travel is 3.5 mm or 0.13 in.

After adjustment, check that length (C) of return spring is around 140 mm or 5.5 in. To adjust, change mounting hole (D).

Important - For immediate identification of clutch type installed on tractors, the following numbers are marked on cylinder head rear L.H. side:

- No. 1: VALEO clutch
- No. 2: LUK clutch
- No. 3: O.M.G. clutch.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Transmission

23

page 1

REMOVAL - INSTALLATION

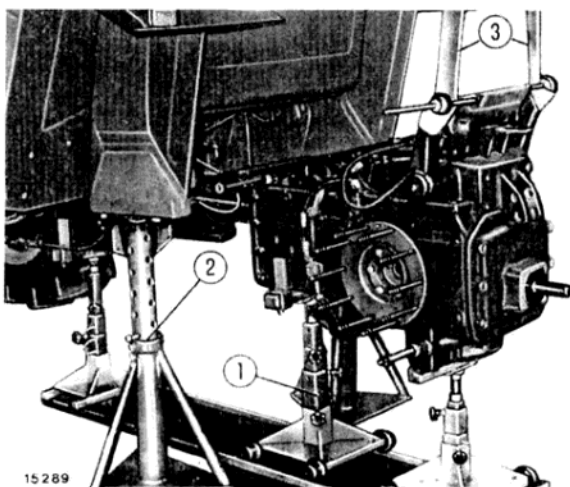


Lift and handle all heavy parts using a suitable lift. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of load to be lifted.

Removal - Installation 55-90, 60-90, 70-90 and 80-90 tractors

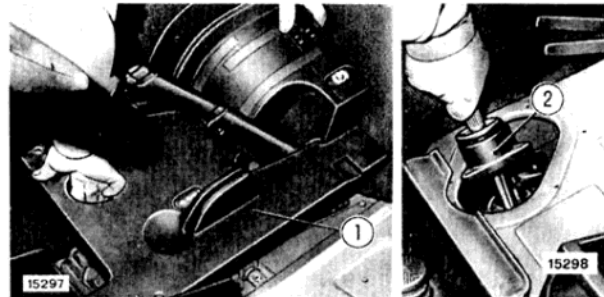
Drain transmission-rear transmission oil and proceed as follows:

- Disconnect and insulate battery negative lead. Disconnect lift lines and control levers.
- Disconnect differential lock link, parking brake link, sensitivity control lever, response control lever and LIFT-O-MATIC link.
- Remove PTO lever and disconnect power point leads and service brake lines.
- For DT models, remove front wheel drive lever and take off guard, drive shafts and center bearing.
- Where fitted, remove creeper or reverser relay lever.
- Position trolley **292320** under tractor with the stationary section level with clutch housing and settle unit.
- Remove transmission and splitter levers from platform (or cab). Also remove seat, two plastic guards (1), two boots and associated relay shafts (2).



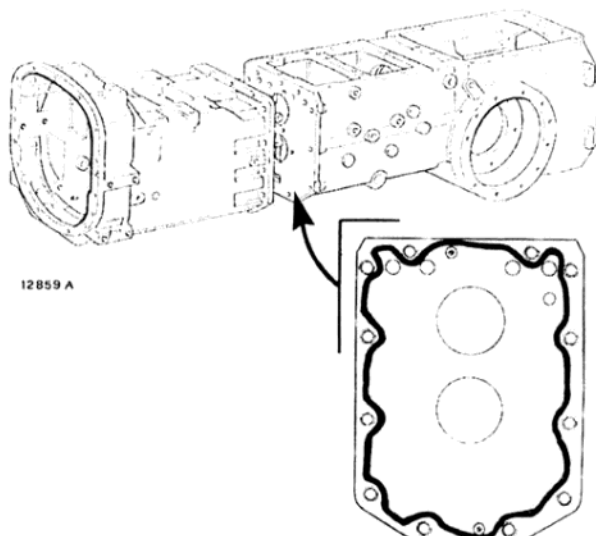
Removing transmission-rear transmission housing - 55-90, 60-90, 70-80 and 80-90.

1. Trolley with guides **292320** - 2. Jacks **292661** - 3. Nylon rope **293769**.



Removing plastic guards (1) and relay shafts (2).

- Remove rear screws securing platform to rear final drive housings and loosen front screws.
- Raise platform sufficiently to back off top screws securing clutch housing to transmission-rear transmission housing.
- Remove wheels and rear final drives. Check that brake lines are disconnected and remove brake unit.
- Remove check links, lifting arms, lift links, implement attachment, PTO guard, top link and, where necessary, remove windshield washer fluid reservoir.
- Position two jacks **292661** under platform, back off screws securing clutch housing to rear transmission housing. Check that there are no fouled or blocked parts and withdraw transmission-rear transmission housing using a suitable hoist.



Applying jointing compound on assembly of transmission-rear transmission housing to clutch housing. (55-90, 60-90, 70-90 and 80-90)

Jointing compound types to be used are indicated on page 6, section A.

POWER TRAIN: Transmission

CAUTION

Use suitable tools to align holes. DO NOT USE FINGERS OR HANDS.

Before installing transmission housing on clutch housing after overhaul, thoroughly clean and degrease mating surfaces and apply 2 mm (0.08 in) jointing compound as indicated in figure on page 1.

Jointing compound types to be used are indicated on page 6, section A.

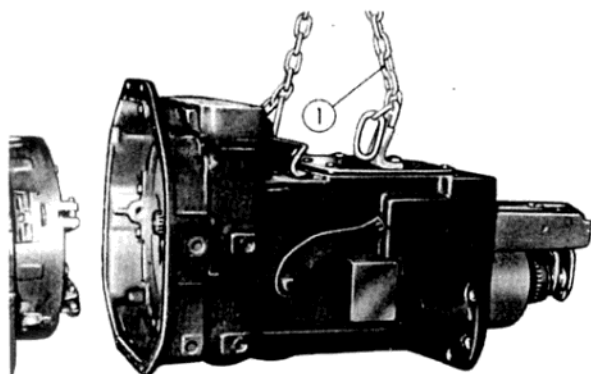
Removal - Installation - 90-90 and 100-90.

In order to remove the transmission, the platform must first be removed as described on pages 1 and 2, section 21. Separate engine from clutch housing as described on pages 1 and 2, section 22. Subsequently proceed as follows:

- Drain oil from transmission housing and remove associated cover.
- Check that rear transmission housing is firmly secured to stands and take off the transmission and splitter relay lever support cover.
- Back off screws retaining rear transmission housing to transmission housing and check that all connections are free. Using a hoist and lift hook, remove transmission housing.

CAUTION

Use suitable tools to align holes. Do not use fingers or hands.



Removing clutch - transmission housing (90-90 and 100-90).

1. Lift hook 291517.

Before installing transmission housing on rear transmission housing after overhaul, thoroughly clean and degrease mating surfaces and apply 1 a 2 mm (0.08 in) bead of jointing compound as indicated in figure below.

Jointing compound types to be used are indicated on page 6, section A.

DISASSEMBLY (55-90, 60-90, 70-90 and 80-90)

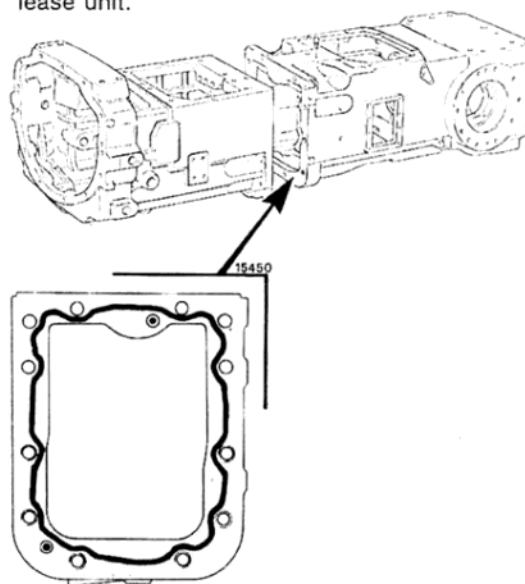
CAUTION

Handle all parts with care. Do not put hands or fingers between parts. Wear safety equipment such as goggles, gloves and safety shoes.

To facilitate subsequent operations, install transmission-rear transmission housing on rotary stand 290086 and secure through brackets 293868.

Proceed as follows:

- Remove lift, transmission and splitter relay cover, PTO housing and sensing bar support. Withdraw differential ring gear from rear to remove differential bearing supports. Remove differential lock release unit.



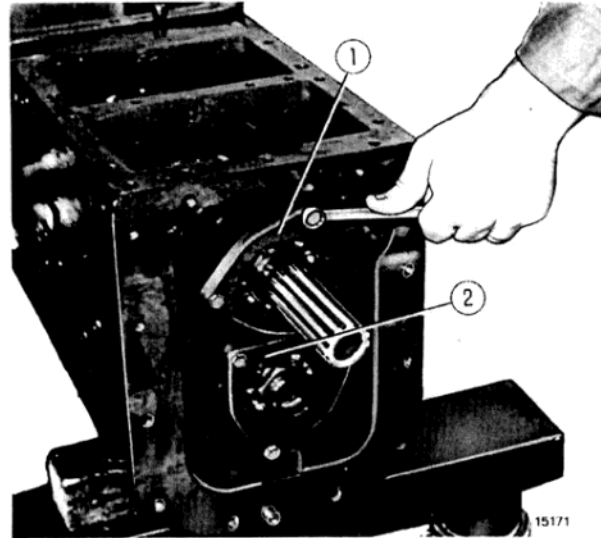
Applying jointing compound on assembly of clutch-transmission housing to rear transmission housing (90-90 and 100-90).

Jointing compound types to be used are indicated on page 6, section A.



Removing transmission and splitter shifter fork and gate roll pins.

- Remove PTO control lever and transmission and splitter rods, retrieving detent springs and balls. Remove differential lock and two screws on transmission housing sides, retrieving the two shifter rod detents.
- Remove front transmission bearing covers (1 and 2), engage two gears and back off driven shaft bearing retaining nut.
- Proceeding as shown in figure, remove splitter driven shaft rear bearing retaining ring (13, page 6), and normal range drive gear (14) with ball and needle roller bearings. Withdraw low range shaft (9, page 4) together with normal and rev. range sliding gear (11).

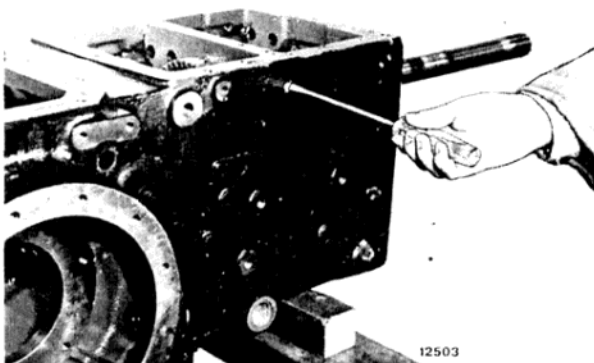


Removing front transmission bearing covers.

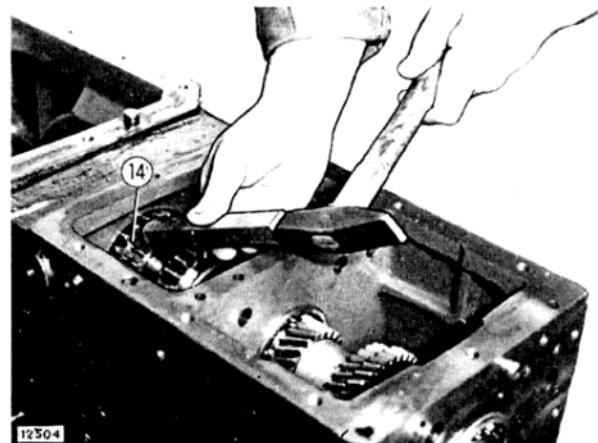
1. Drive shaft bearing cover - 2. Driven shaft bearing cover.

- Remove transmission drive shaft rear bearing retaining ring (15, page 6) and tighten three M 8x1.25 screws (1, page 4) in front bearing cover retaining holes so that screws press against three 4th gear teeth. This is necessary to prevent drive shaft rear ball bearing outer race from fouling 1st gear on transmission driven shaft.

Note - To facilitate transmission drive shaft removal, make a punch as shown in figure on page 4.

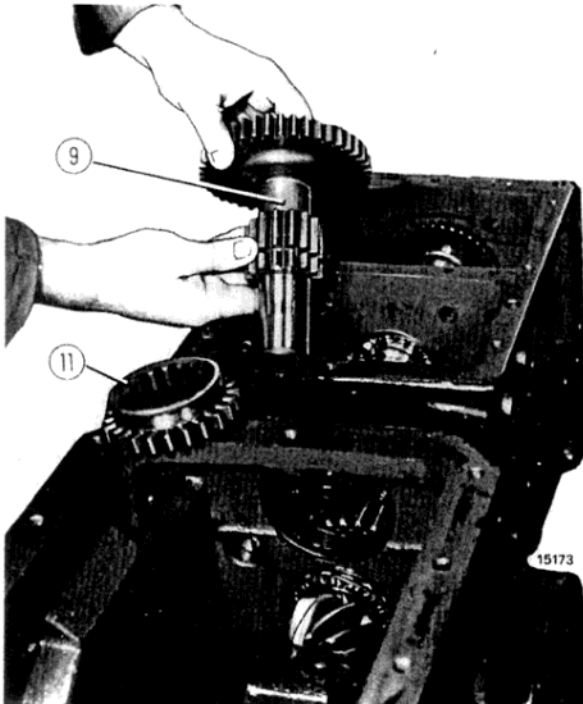


Removing (installing) screws on transmission housing for access to shifter rod detents.



Removing normal range gear (14).

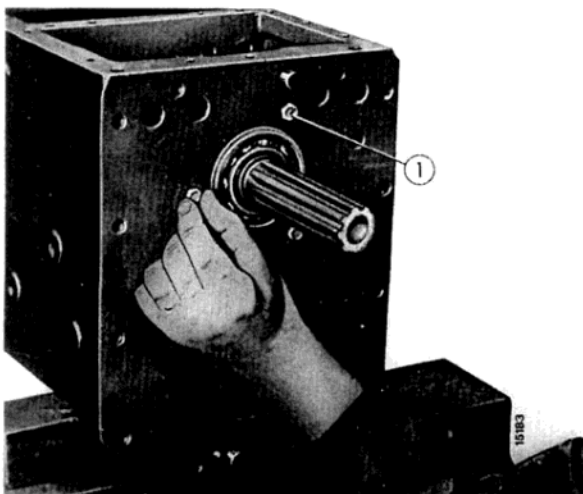
POWER TRAIN: Transmission



Removing low range shaft (9).

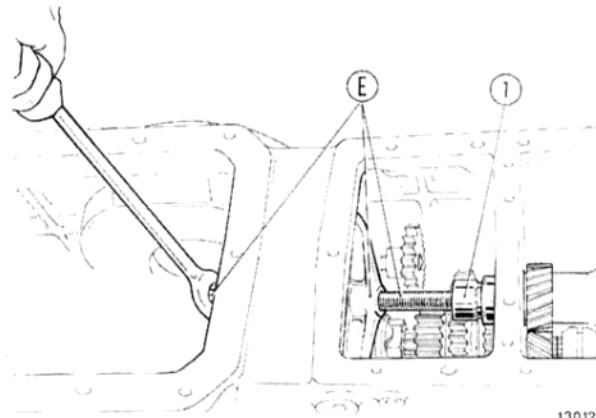
11. Normal and rev. range sliding gear.

- Insert punch in drive shaft hole and remove drive shaft using universal puller as shown. Retrieve gears from inside housing and withdraw shifter forks.



Removing transmission drive shaft.

1. M 8x1.25 capscrews.

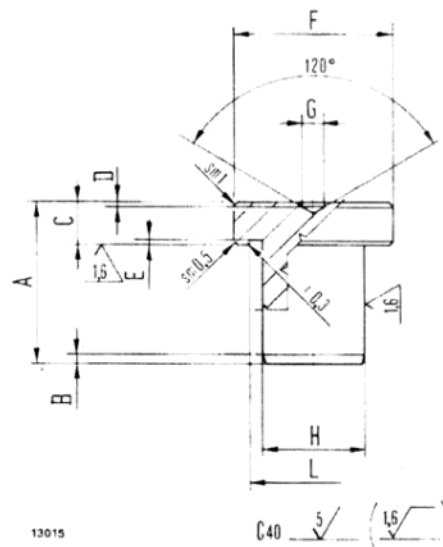


Removing transmission drive shaft.

E. Universal puller - 1. Punch (made in workshop).

Note: For rev. relay gear jackshaft and bevel pinion shaft removal, make an adapter as shown in drawing on page 5.

- Back off rev. relay gear jackshaft retaining screw, remove gear retaining ring, install adapter (1, page 5) on jackshaft (3) and secure to slide hammer puller (2). Pull out jackshaft.



Punch for transmission drive shaft removal (mark 50006).

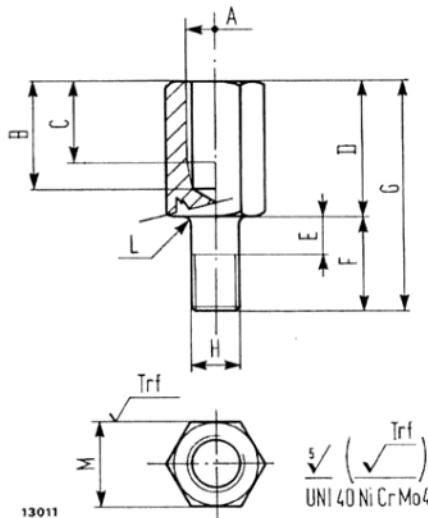
A = 40 mm (1.57 in) - B = Chamfer 2.5 mm (0.10 in) x 15° - C = 10 mm (0.39 in) - D = 1 mm (0.04 in) - E = 1.5 mm (0.06 in) - F = 39.5 mm (1.55 in) dia - G = 5 mm (0.20 in) dia - H = 24.85 to 24.95 mm (0.978 to 0.982 in) dia - L = 31.5 mm (1.24 in) dia - sm. 0.5 = Chamfer 0.5 mm (0.02 in) - sm. 1 = Chamfer 1 mm (0.04 in) - r 0.3 = radius 0.3 mm (0.01).

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Transmission

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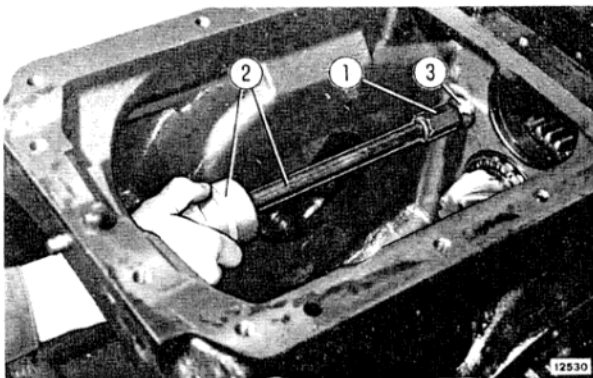
page 5



Adapter for rev. relay gear jackshafts and bevel pinion shaft removal (mark 50008).

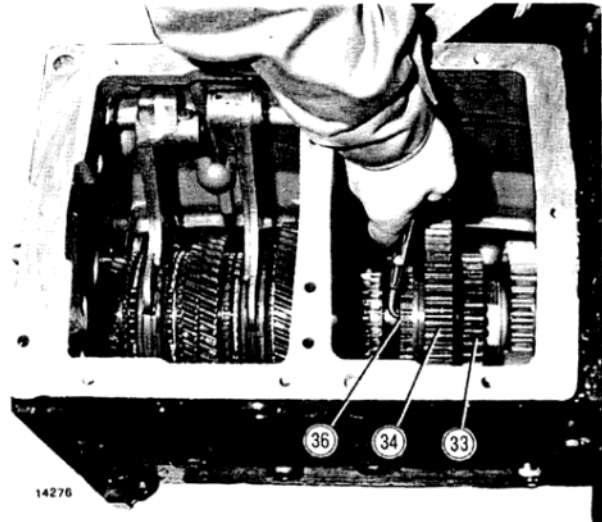
A = M 14x1.5 - B = 28 mm (1.10 in) - C = 21 mm (0.83 in) - D = 35 mm (1.38 in) - E = 10 mm (0.39 in) - F = 25 mm (0.98 in) - G = 60 mm (2.36 in) - H = M 12x1.25 - L = radius 2.5 mm (0.10 in) - M = 22 mm (0.87 in) h 11.

- Partially slacken bevel pinion shaft bearing adjusting nut, install adapter constructed as directed above, and secure to slide hammer puller.
- Pull pinion partially outwards and remove retaining ring (36). Move gears (33 and 34) towards wall of transmission housing and remove thrust rings (37, page 6).



Removing rev. relay gear jackshaft.

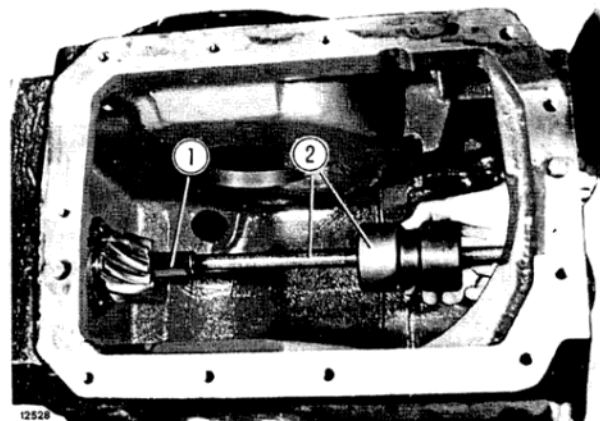
1. Adapter - 2. Slide hammer puller - 3. Rev. relay gear jackshaft



Removing bevel pinion shaft.

33. Reverse gear - 34. Low range driven gear - 36. Retaining ring.

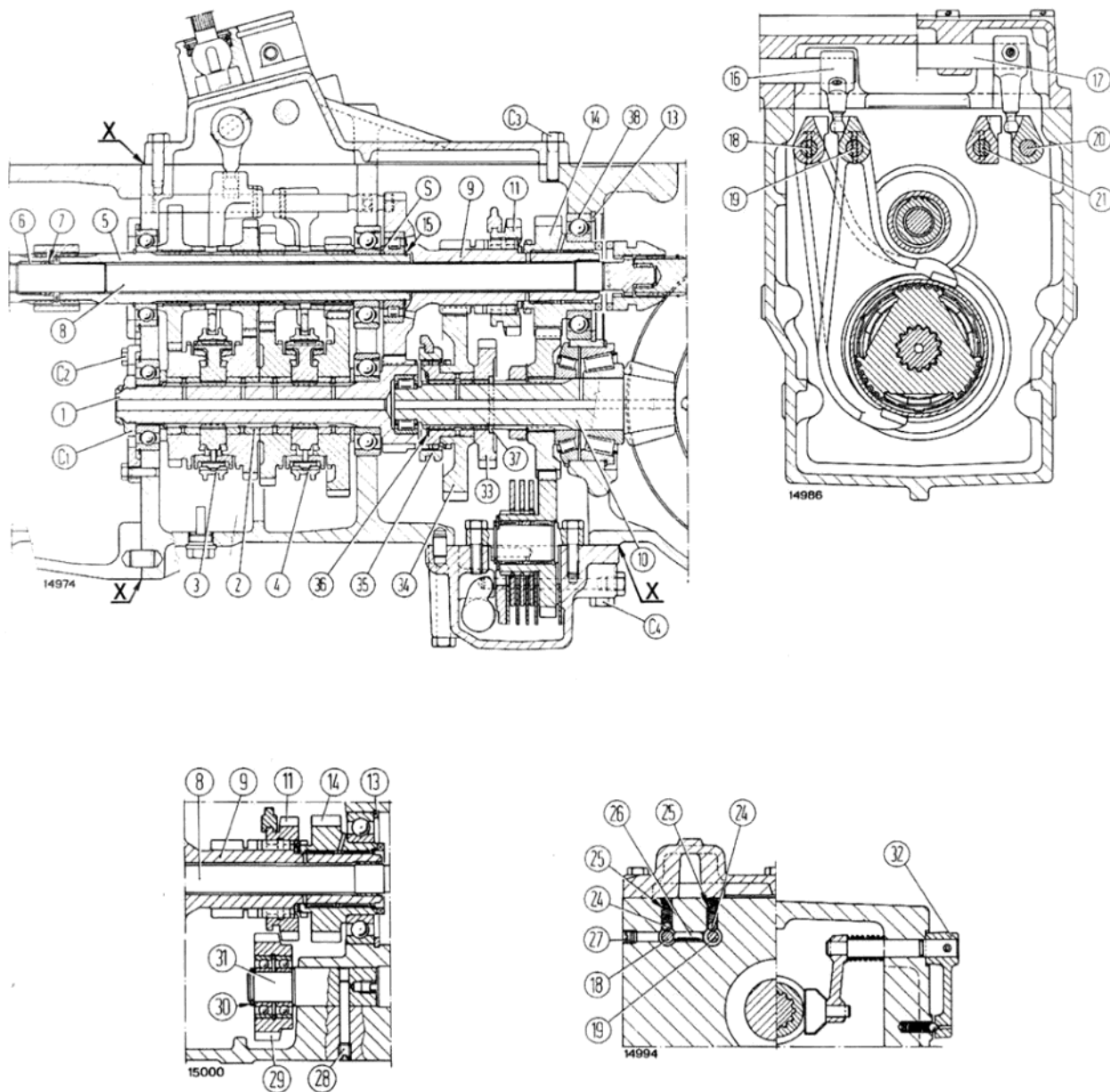
- Fully slacken bevel pinion shaft bearing adjusting nut and remove pinion, retrieving gears from inside housing. To retrieve pinion shims, first remove pinion end bearing cup from transmission housing.
- Slacken countershaft retaining nut, strike front end of transmission driven shaft and remove gears from housing. Then remove driven shaft as shown in figure on page 7.



Removing bevel pinion shaft.

1. Adapter - 2. Slide hammer puller.

POWER TRAIN: Transmission



Longitudinal and cross sections through transmission and splitter.

C₁. Driven gear shaft locking - C₂. Bearing cover retaining screws - C₃. Top cover retaining screws - C₄. Parking brake retaining screws - S. Drive shaft bearing shim - 1. Transmission driven shaft - 2. Transmission driven gear support bushings - 3. 3rd and 4th sliding sleeve - 4. 1st and 2nd sliding sleeve - 5. Transmission drive shaft - 6. PTO shaft support bushing - 7. Seal - 8. PTO shaft - 9. Direct drive and low range shaft - 10. Bevel pinion shaft - 11. Rev. and normal range sliding gear - 13, 15, 30 and 36. Retaining rings - 14. Normal range drive gear - 16. Transmission rod - 17. Splitter rod - 18. 1st/2nd speed shifter rod - 19. 3rd/4th shifter rod - 20. Low/high range shifter rod - 21. Normal/rev. range shifter rod - 24 and 25. Shifter rod detent balls and springs - 26. Detent plunger - 27. Plug - 28. Screw - 29. Rev. relay gear - 31. Jackshaft - 32. PTO outer control lever. - 33. Reverse gear - 34. Low range driven gear - 35. Direct drive/low range sliding sleeve - 37. Thrust rings - 38. Bearing.

Note: - Tighten plug (27) and screw (28) using one of the jointing compounds indicated on page 6, section A. After installation, check for oil leakage.

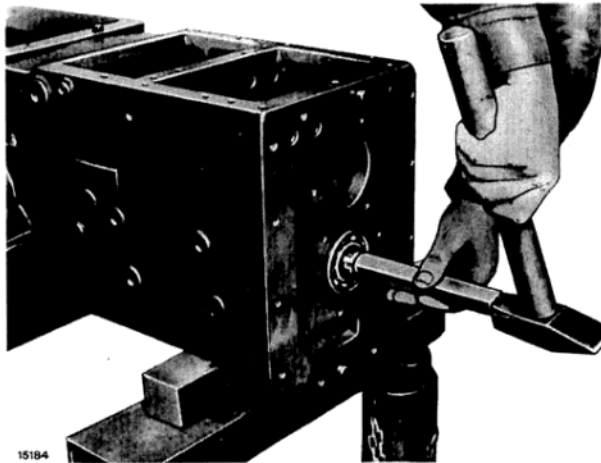
Note: - On installation, apply jointing compound to surfaces X as directed on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

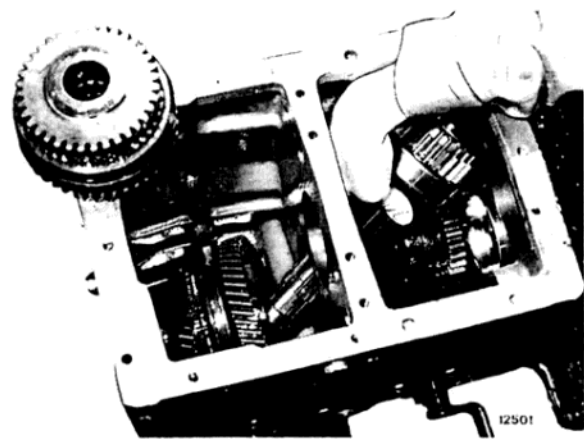
POWER TRAIN: Transmission

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page 7



Removing transmission driven shaft.



Removing transmission driven shaft.

INSPECTION



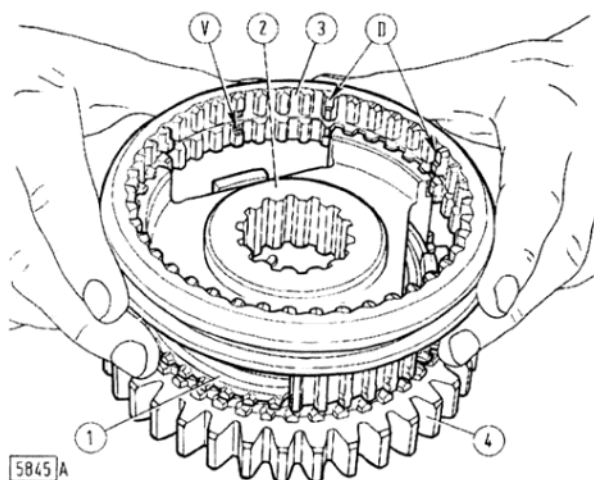
CAUTION

Never use gasoline or other flammable fluids to clean parts. Use non-toxic, non-flammable solvents only.

Check seals for score marks, lip damage and distortion and replace as necessary.

Check synchromesh spring efficiency as follows:

- Place spring on a flat surface (see detail a), depress spring in the centre applying a 31 to 34 N (3.2 to 3.5 kg or 7 to 7³/₄ lb) load (P) and check that deflection is 1.4 mm (0.05 in).



Installing synchromesh sliding sleeve.

D. Stepped teeth - V. Shifting plate recess - 1. Synchrocone - 2. Synchrohub - 3. Sliding sleeve - 4. Driven gear.

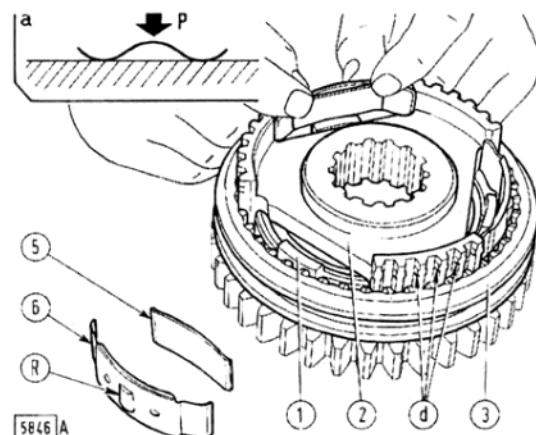
Check that shifting plates (6) are free from distortion or dents, especially on the center relief (R).

ASSEMBLY

Refer to figures on page 6 for correct part positioning and note the points below.

Install 3rd/4th synchromesh:

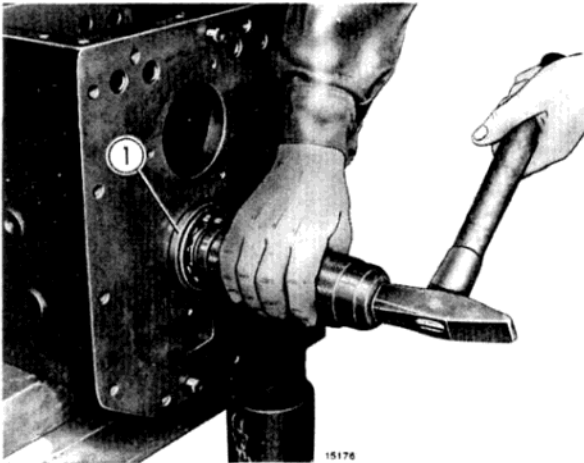
- Fit a synchrocone (1) and synchrohub (2) on 3rd driven gear (4) with attached baulk ring so that the three toothed sectors match the recesses in the baulk ring and the lead-in chamfer on the splines faces towards the gear.



Installing shifting plate and spring.

a. Checking shifting plate spring - d. Detent pips - P. = 31 to 34 N (3.2 to 3.5 kg or 7 to 7³/₄ lb), test load - R. Shifting plate relief - 1. Synchrocone - 2. Synchrohub - 3. Sliding sleeve - 5. Spring - 6. Shifting plate.

POWER TRAIN: Transmission



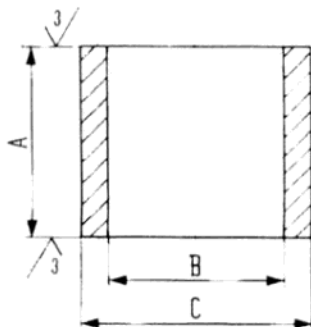
Installing transmission driven shaft front bearing (1).

- Install sliding sleeve (3, page 7) so that the three toothed synchrohub sectors (2) are included in the width spanning stepped teeth (D);
- Position springs (5, page 7), on shifting plate (6) as shown and refit in their recesses.
- Install the second synchrocone with the three front fins in register with those of the first synchrocone previously fitted and position the fourth driven gear.
- Test synchromesh effectiveness by operating the sliding sleeve by hand in either direction.

Install transmission drive shaft with rear bearing; slide gears, associated bushings and synchromesh assemblies over shaft from inside the housing and lubricate contact surfaces with engine oil.

Position front bearing (1) on housing and press in using a suitable driver. Tighten locking (C, page 6) to the specified torque.

Insert two shifter forks without connecting to associated shifter rods.



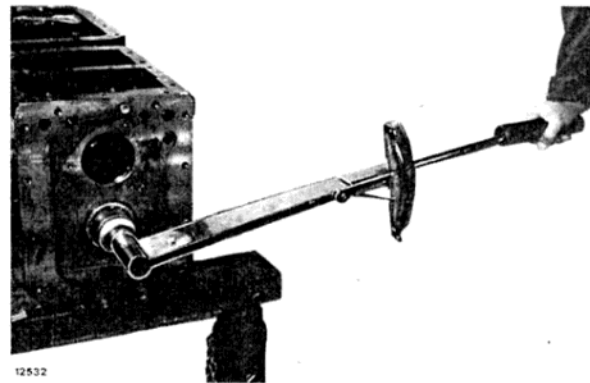
13014

Aq45 $\sqrt{6}$ $\sqrt{3}$

Tool for transmission drive shaft bearing adjustment (Mark 50007).

A = 43.3 to 43.5 mm (1.70 to 1.71 in) - B = 40.5 mm (1.59 in) dia - C = 52 mm (2.05 in) dia.

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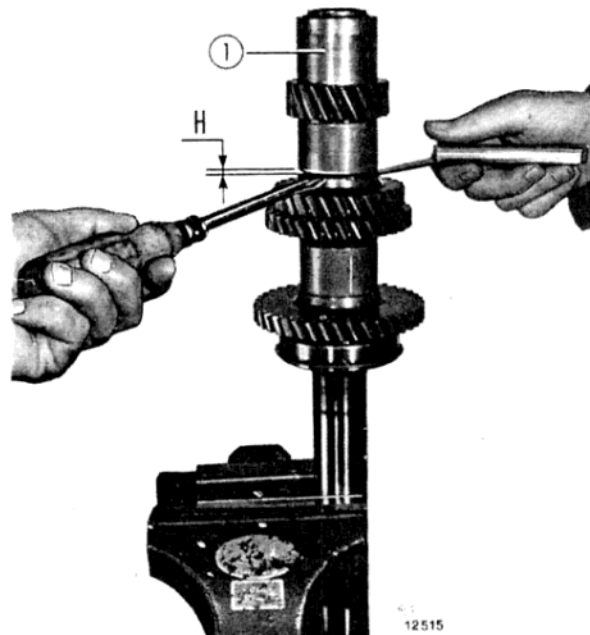


Tightening driven gear shaft locking.

Install drive shaft and associated gears.

Note - Drive shaft gear end float must be 0 to 0.25 mm (0 to 0.010 in). Consequently, adjust bearings so that they are installed without preload. To facilitate bearing adjustment, make a fixture as shown in drawing below.

- Assemble transmission drive shaft on bench with front bearing and gears but without shims (S, page 6) and two rear bearings (one ball and one roller bearing).



Adjusting transmission drive shaft bearings.

H. Clearance (measured with feeler gauge) - 1. Fixture (made in workshop).

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Transmission

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page 9

- Install tool. Insert one or two screwdrivers between a gear and associated bushing to maintain tool in contact with rear retaining ring as shown on page 8.
- Using a feeler gauge, measure the gap (H, page 8) between gear and bushing.
- Measure tool thickness (A) and thickness of both bearing cones.
- Shim to be installed will be given by:

$$S = H + A - S_1 - S_2$$

where:

H = Measured clearance

A = Tool thickness

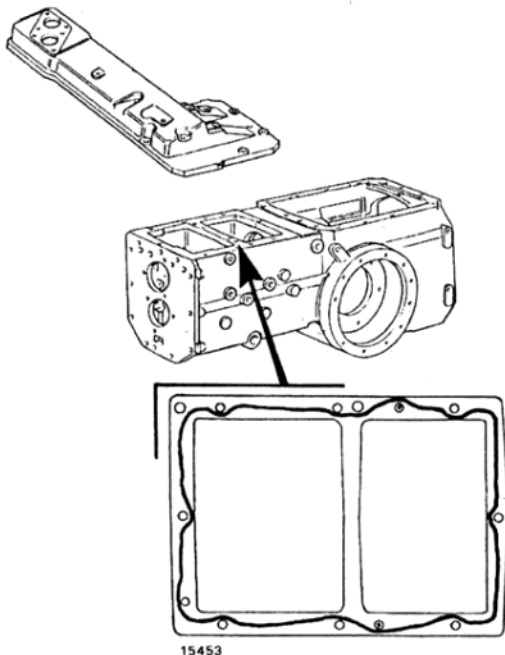
S₁ and S₂ = Measured bearing thickness

Example:

- Measured clearance H = 1.3 mm (0.05 in)
- Tool thickness A = 43.5 mm (1.71 in)
- Ball bearing thickness S₁ = 22.9 mm (0.90 in)
- Roller bearing thickness S₂ = 18 mm (0.70 in)
- Shim thickness:

$$S = 1.3 + 43.5 - 22.9 - 18 = 3.9 \text{ mm (0.15 in)}$$

Note: Since gear end float must be 0 to 0.25 mm (0 to 0.10 in), shim (S) to be installed in this case will be 3.75 mm (0.15 in) and end float will be 3.9-3.75 = 0.15 mm (0.006 in).



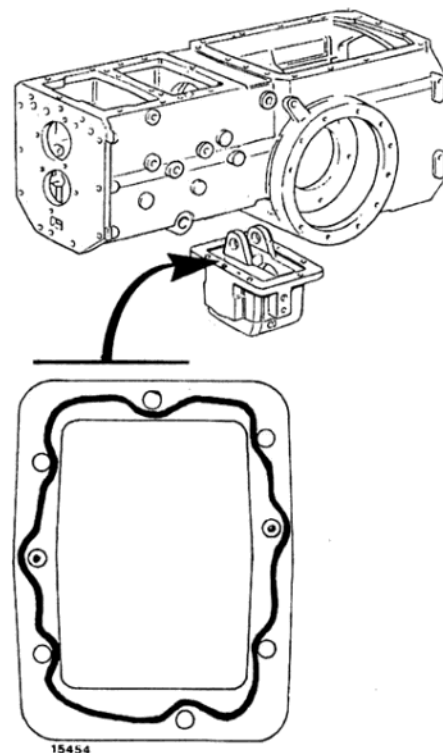
Applying jointing compound for top cover and parking brake installation on transmission housing.

Types of jointing compound to be applied are indicated on page 6, section A.

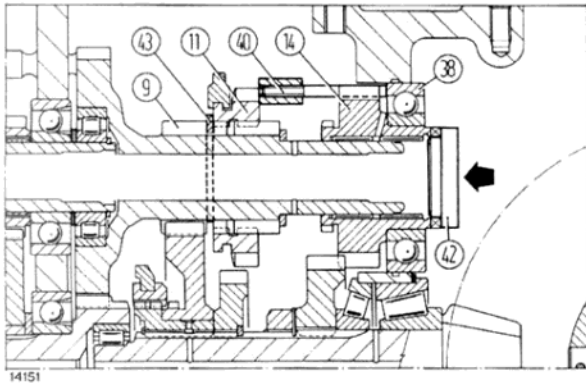
- Install shaft, gears and shim in transmission housing. 4th gear must be installed with shaft lead - in chamfer facing front bearing.
- Install transmission shifter rods together with detent balls, springs and plunger.
- Install bevel pinion shaft with gears after position and bearing preload adjustments as described in the relevant sections.

Note: Direct drive/low range sliding sleeve (35) must be positioned on assembly as shown in the figure on page 6.

- Install reverse gear and fork on pinion.
- Install splitter drive shaft assy.
- Install shifter fork and range change shifter rods together with detent balls, springs and plunger.



POWER TRAIN: Transmission



Removing rear splitter drive shaft bearing and normal range drive gear with bevel drive/differential unit on tractor.

9. Direct drive/Low range shaft - 11. Reverse/normal range sliding gear - 14. Normal range drive gear - 38. Rear splitter drive shaft bearing - 40, 42 and 43. Tools to be made in workshop.

- Install bevel ring gear after bearing adjustment as described in the relevant section.

Install top cover and parking brake (if previously removed) on transmission-rear transmission housing, after cleaning and degreasing mating surfaces and applying a 2 mm (0.08 in) bead of jointing compound as shown in figures on page 9.

Assemble P.T.O. housing to transmission housing as directed on page 1, section 28.

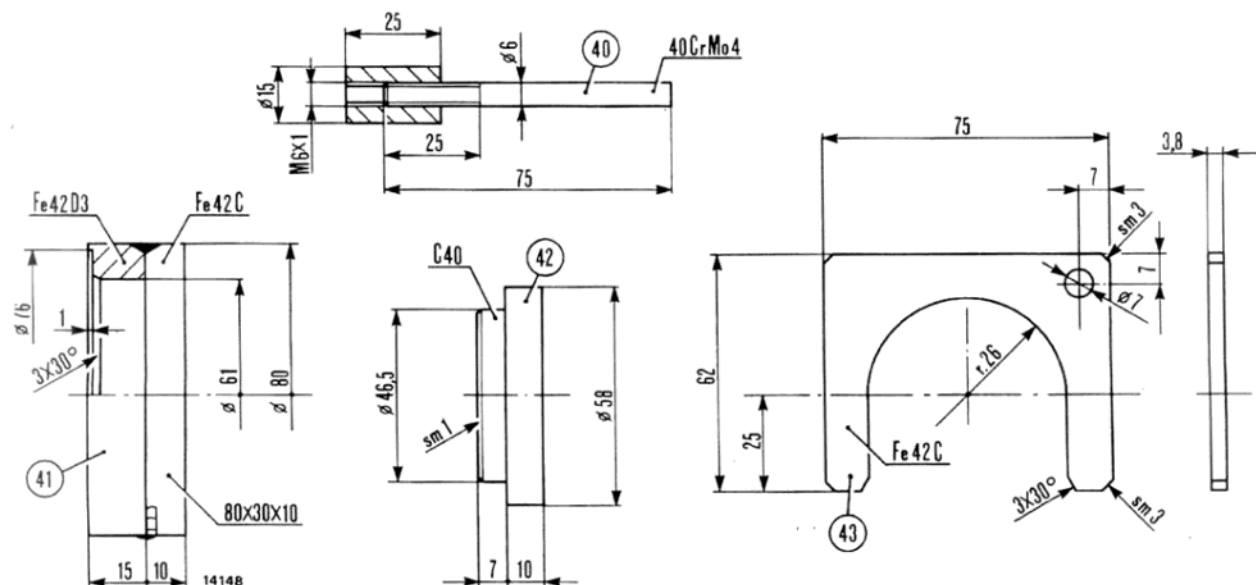
Assemble lift to transmission housing as directed on page 7, section 51.

Install final drives on transmission housing as directed on pages 1, 2 and 3, Section 27.

Jointing compound types are indicated on page 6, section A.

Note - Splitter drive shaft bearing (38, page 1) and normal range drive gear (14) may be removed and installed without disassembling bevel drive/differential unit, should it be necessary to replace only these parts. Proceed as follows:

- Make a set of tools as shown in the drawing below.
- Remove platform (or cab) as directed on page 1, section 21. Remove lever support cover, PTO housing and PTO shaft. If necessary, also remove hydraulic lift.
- Remove bearing retaining ring (13, page 6),
- Push gear (14) with bearing (38) towards rear of transmission housing. Install tool (43) on direct drive/low range shaft (9) and force gear (11) into contact with tool as shown in figure above.



Tools for rear splitter drive shaft bearing and low range drive gear removal (stamp tools with number: 50028) dimensions in mm.

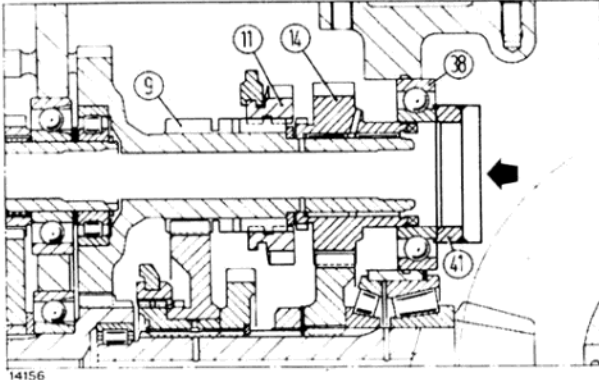
Note - Make two examples of tool No. 40.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Transmission

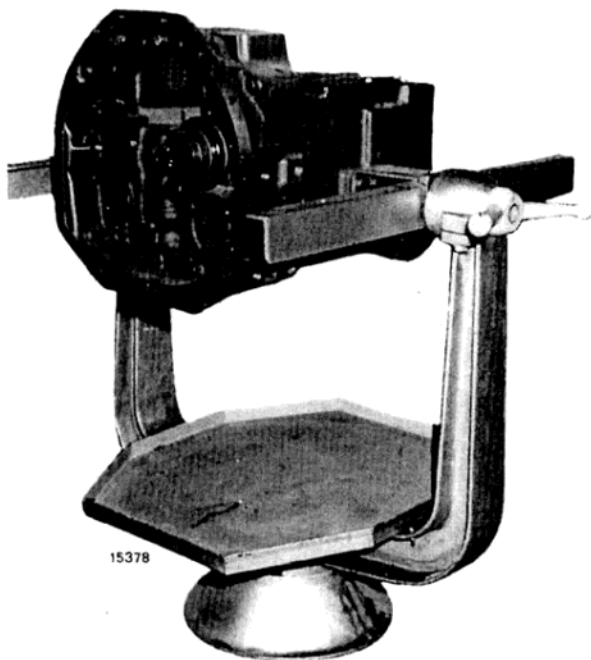
23

page 11



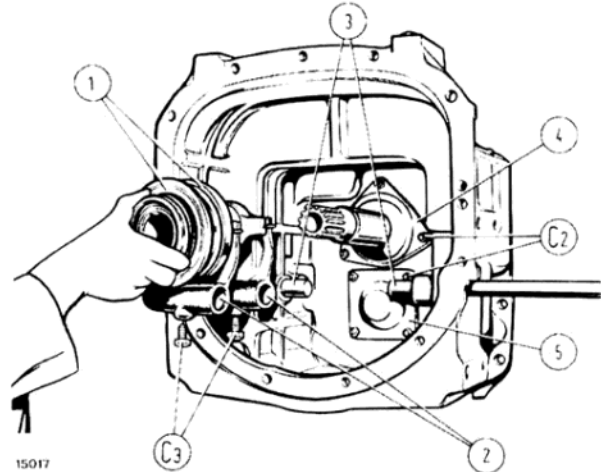
Installing rear splitter drive shaft bearing and normal range drive gear with bevel drive/differential unit on tractor 9. Direct drive/Low range shaft - 11. Reverse/normal range sliding gear - 14. Normal range drive gear - 38. Rear splitter drive shaft bearing - 41. Tool to be made in workshop.

- Install two tools (40, page 10) in diametrically opposed positions and adjust length so that they press against both gear (11) and outer race of bearing (38).
- Install tool (42, page 10) and, using a hammer, strike tool to remove gear (14) from bearing (38).
- Retrieve bearing (38) and, if necessary, gear (14) from rear of housing.
- Install new bearing using tool (41) as shown alongside.



Installing transmission housing on revolving stand.

Fiat Trattori



Installing (Removing) clutch sleeves and forks.

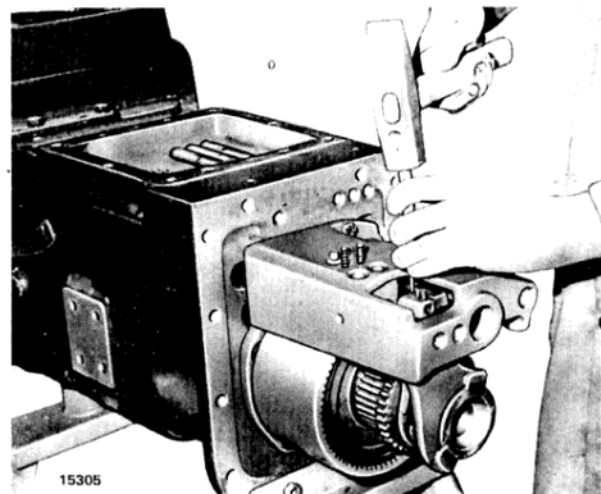
C2. Cover stud nuts - C3. Fork capscrews - 1. Withdrawal sleeves - 2. Fork - 3. Outer levers - 4 and 5. Bearing covers.

DISASSEMBLY (90-90 and 100-90)

To facilitate disassembly, place clutch transmission housing on revolving stand 290086 and secure through brackets 290092.

Subsequently, proceed as follows:

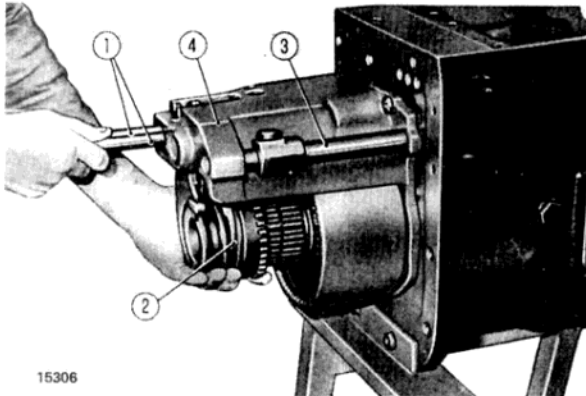
- Remove transmission and PTO clutch sleeves (1), forks (2) and outer levers.
- Remove transmission cover (26, page 14).
- Remove plugs, springs and splitter shifter rod detent balls.



Removing roll pins from splitter shifter forks.

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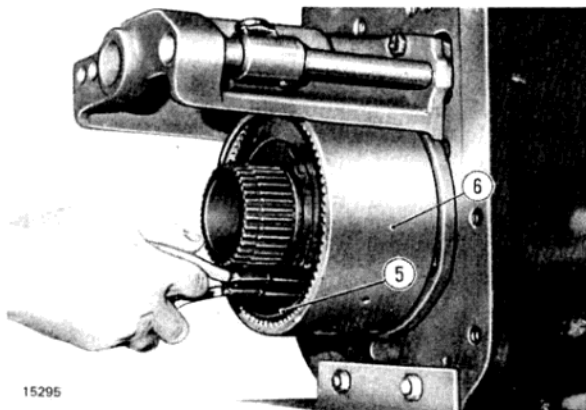
POWER TRAIN: Transmission



Removing splitter shifter rods.

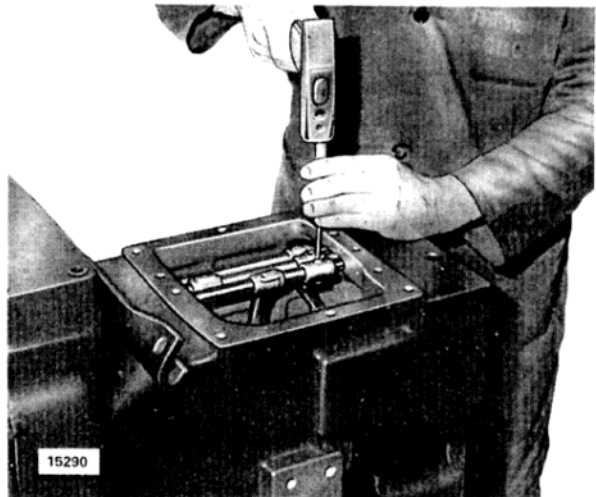
1. Shifter rods - 2. Engagement sleeve - 3. Transmission relay rod - 4. Shifter rod support.

- Withdraw roll pin and take out shifter rods (1) together with sleeves (2).
- Remove retaining ring (5) from splitter and take out all gears.
- Back off capscrews and remove splitter housing (6).
- Back off capscrews and remove splitter rod support (4), retrieving shim (S, page 14).
- Remove roll pins from relay rods and remove forks, retrieving plug (13, page 20) and detent balls.
- Remove driven shaft lube pipe, back off capscrews retaining driven shaft and drive shaft covers (1 and 2) and remove drive shaft cover (1). Then, using a slide hammer puller, remove driven shaft cover (2).



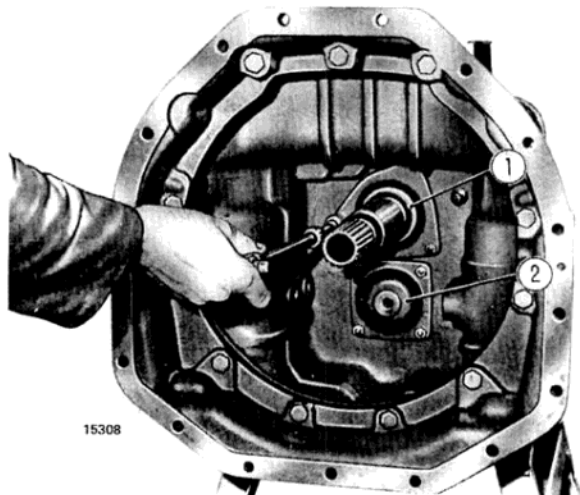
Removing retaining ring from splitter gears.

5. Retaining ring - 6. Splitter housing.



Removing roll pins from relay rods.

- Remove transmission drive shaft retaining ring (1, page 13) from the rear. Take off seal and withdraw shaft using tool (A) **293662**, from the rear, retrieving gears and associated spacer from the top.
- Remove rear bearing outer race using a brass driver.
- Withdraw rod (9, page 21) and retrieve associated detent balls and springs.
- Remove spacer (32, page 14) from reverse relay assy, release two bearing retaining rings, remove shaft (30) and retrieve reverse gear (29).



Removing transmission drive and driven shaft covers.

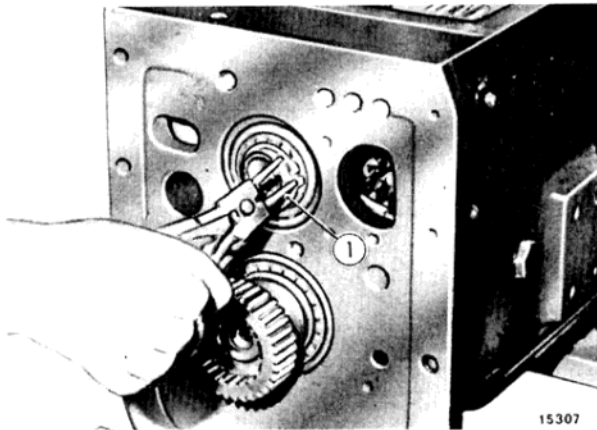
1. Drive shaft cover - 2. Driven shaft cover.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Transmission

23

page 13



Removing retaining ring from transmission drive shaft.
1. Retaining ring.

- Back off transmission driven shaft nut and, working from the front, remove the shaft and retrieve gears, synchromesh assemblies, washers, bushings and bearings.

INSPECTION

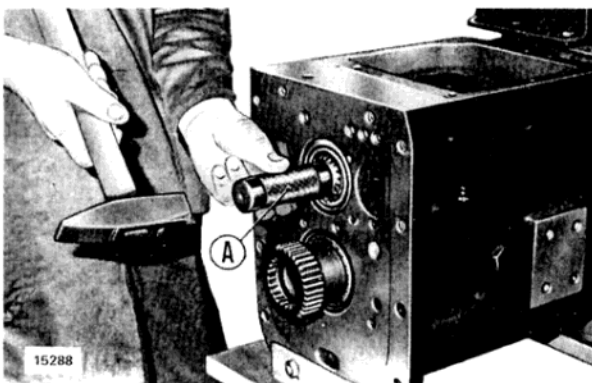


CAUTION

Never use gasoline or other flammable fluids to clean parts. Use non-toxic, non-flammable solvents only.

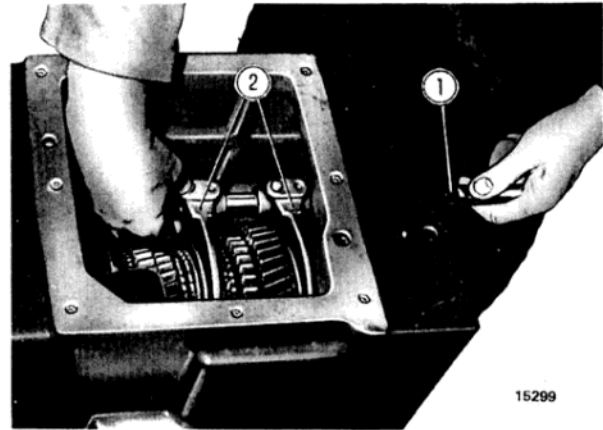
- Check seals for score marks, lip damage and distortion and replace as necessary.

Check synchromesh spring (5, page 7) efficiency as follows:



Removing transmission drive shaft using driver 293662
A. Driver.

Fiat Trattori



Removing shifter rods and forks.
1. Shifter rods - 2. Shifter forks.

- Place spring on a flat surface (see detail a, page 7), depress spring in the centre applying a 31 to 34 N (3.2 to 3.5 kg or 7 to 7³/₄ lb) load (P) and check that deflection is 1.4 mm (0.05 in).

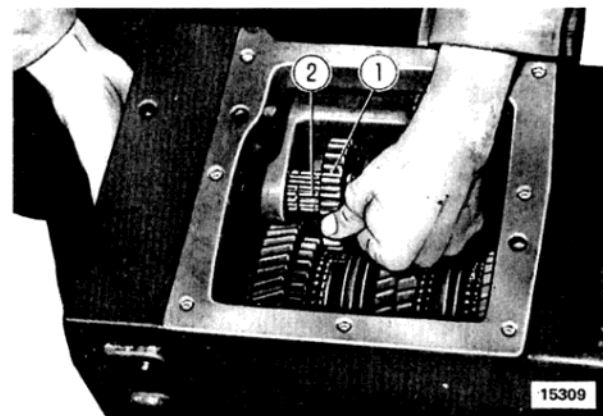
Check that shifting plates (6, page 7) are free from distortion or dents, especially on the center relief (R).

ASSEMBLY

Refer to figures on page 14 for correct part positioning and note the points below.

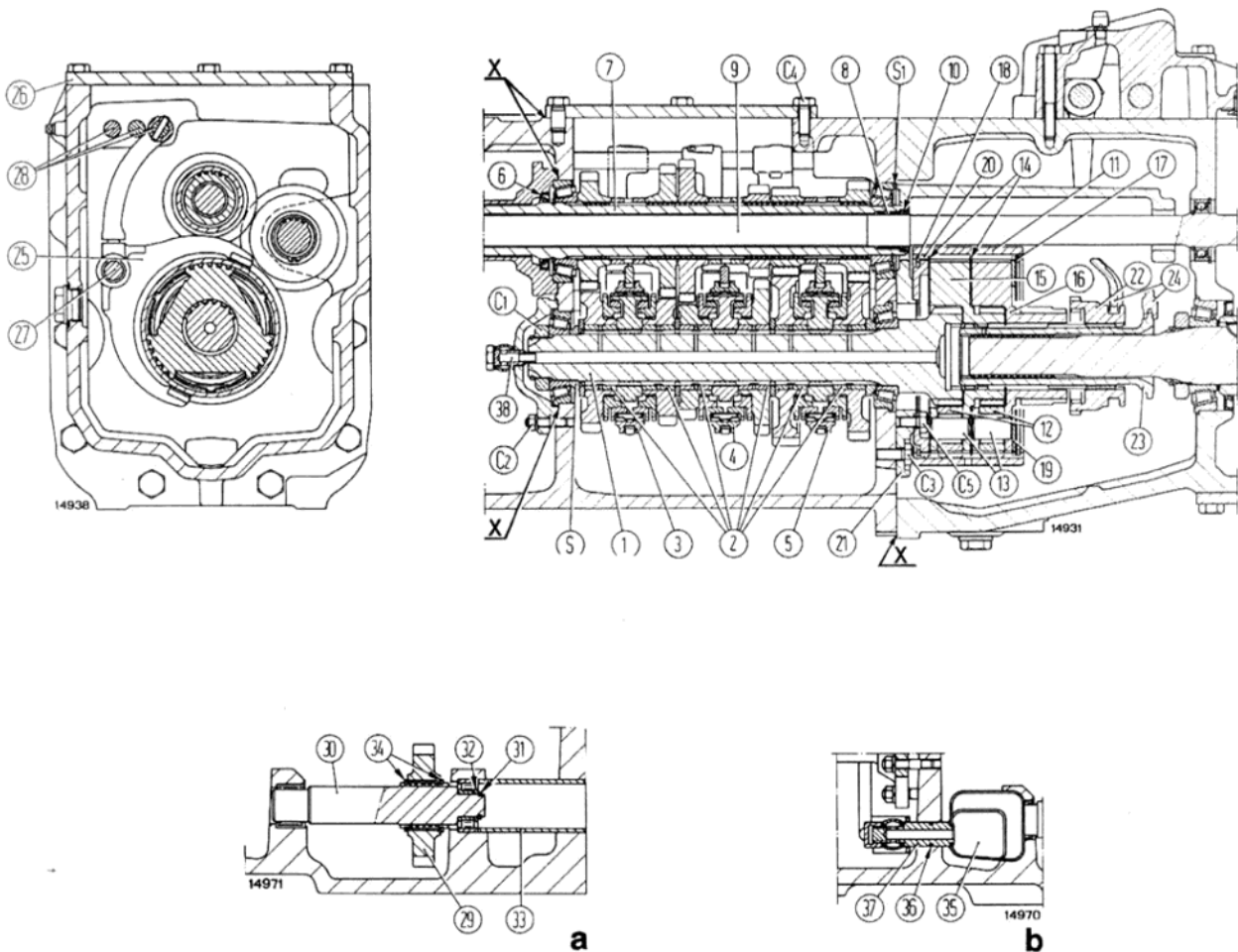
Install 3rd/4th synchromesh:

- Fit a synchrocone (1, page 7) and synchrohub (2) on 3rd driven gear (4) with attached baulk ring so that the three toothed sectors match the recesses in the baulk ring and the lead-in chamfer on the splines faces towards the gear.



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POWER TRAIN: Transmission

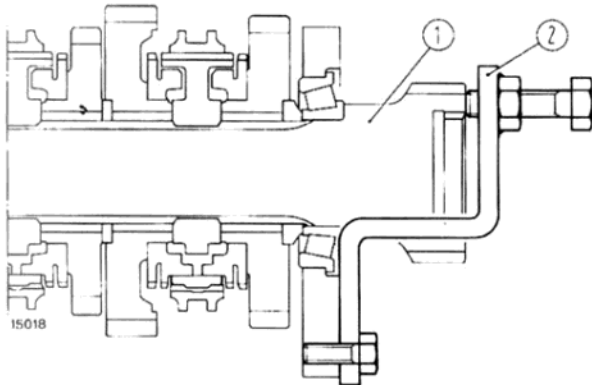


Longitudinal and cross section through transmission.

a. Section through rev. relay shaft - b. Detail of driven shaft lubrication - C₁. Driven gear shaft nut - C₂. Bearing cover nuts - C₃. Flange capscrews - C₄. Transmission housing cover capscrews - C₅. Splitter ring gear hub capscrews - S. Driven shaft bearing shim - S₁. Drive shaft bearing shim - 1. Driven shaft - 2. Driven gear bushings - 3. 3rd and 4th sliding sleeve - 4. 5th and reverse sliding sleeve - 5. 1st and 2nd sliding sleeve - 6. Seal - 7. Drive shaft - 8. PTO shaft support bushing - 9. PTO shaft - 10. Seal - 11. Ring gear - 12. Drive gears - 13. Driven gear journals - 14. Thrust washers - 15. Front support - 16. Rear support - 17 and 18. Retaining rings - 19. Retainer - 20. Ring gear hub - 21. Splitter support flange - 22. Low range sliding sleeve - 23. Normal/High range sliding sleeve - 24. Shifter forks - 25. Reverse shifter fork - 26. Transmission housing cover - 27. Fork support rod - 28. Transmission shifter rods - 29. Rev. relay gear - 30. Reverse shaft - 31. Retaining ring - 32. Washer - 33. Spacer - 34. Retaining rings - 35. Drive shaft lube reservoir - 36. O-rings - 37. Oil filler - 38. Fitting.

Note - On installation, apply jointing compound to surfaces X as directed on page 6, section A.
When replaced, drive and driven shaft bearing cover studs should also be installed with jointing compound.

POWER TRAIN: Transmission

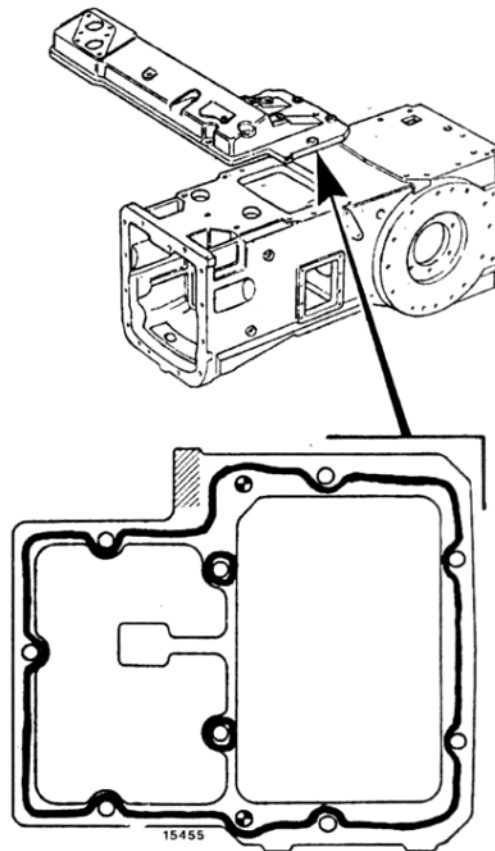


Supporting transmission driven shaft with tool 50026.

1. Driven shaft - 2. Tool 50026.

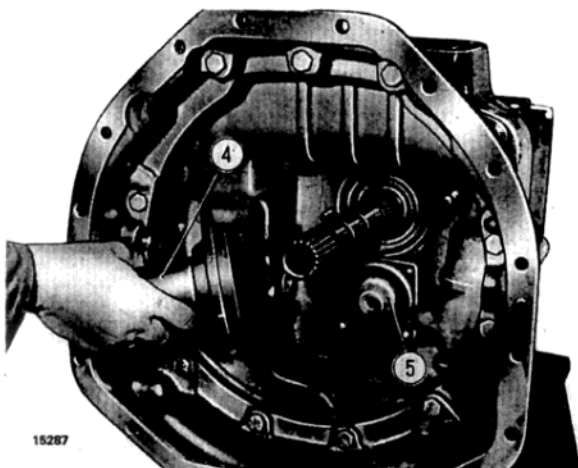
Install drive shaft and associated gears as follows:

- Install transmission driven shaft cover (5).
- Install transmission drive shaft (7, page 14) with gears; bushings, bearings, and shim (S₁); shim thickness is determined as described on page 19. Install front cover (4) and flange (21, page 14), tightening capscrews to the specified torque.
- Assemble driven gears (12, page 14) and support on bench, using **grassofiat TUTELA G9** or other approved grease to hold rollers in seats on gears.
- Install splitter assy as shown on pages 14 and 20. Install shifter rods, relay rods, detent lube pipe, forks, sliding sleeves and transmission and PTO clutch engagement rods.



Applying jointing compound for relay lever support cover installation on rear transmission housing.

Jointing compound types are indicated on page 6, section A.



Installing transmission drive shaft cover

4. Drive shaft - 5. Cover.

Note - Cross hatched area must be left free from jointing compound.

- Clean and degrease mating surfaces and install transmission cover, applying one of the jointing compounds indicated on page 6, section A.

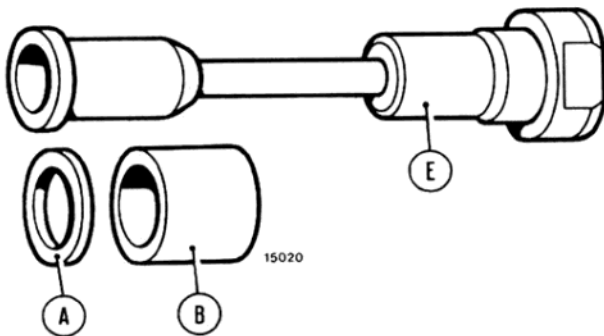
Assemble transmission housing with rear transmission housing, clean and degrease mating surfaces, and install transmission and splitter outer relay lever support cover, applying one of the jointing compounds indicated on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Transmission

23

page 17



Tool 293339/1.

A, E. Spacer and bearing adjustment tool.

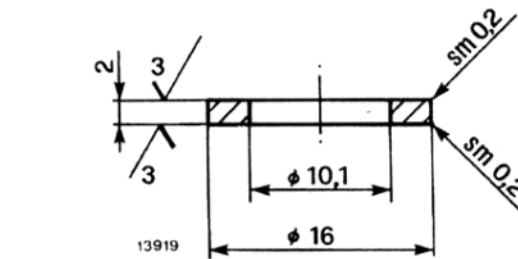
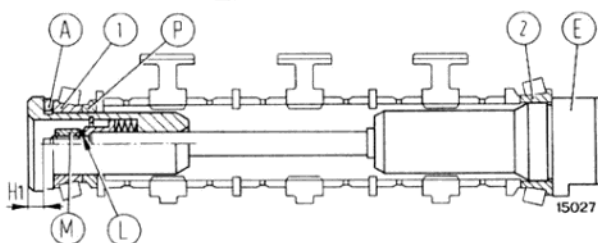
Transmission driven shaft taper roller bearing adjustment with tool 293339/1

Install spacer (A), bearing cones (1 and 2), and a provisional shim (P) to prevent fouling between spacer and bearing cage. Then install tool **293339/1** (E).

Install a shim (L) made in the workshop under nut (M). Tighten nut on tool (E) and measure dimension (H₁) using a depth gauge.

Disassemble the pack, lubricate the bearings with engine oil and assemble the tool together with spacer (A) on transmission housing.

Tighten nut (M) with shim (L) while rotating tool to settle the bearings. Measure dimension (H₂).



Shim to be used with tool 293339/1 (Stamp shim with number 50031) - Dimensions in mm.

Material: C40.

The thickness of shim (S, page 14) to be fitted will be given by:

$$S = H_2 + P - H_1 + 0.1$$

where:

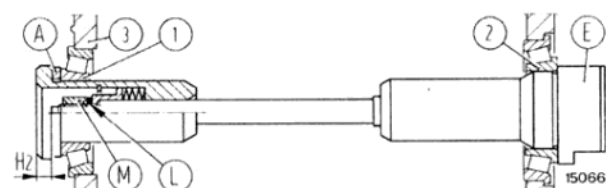
.1 mm = compensation factor to offset increase in bearing preload generated by shaft nut tightening.

If necessary, round up (S) to the nearest .05 mm.

Example

- Provisional shim thickness: P = 8.00 mm.
- Dimension read off depth gauge H₂ = 15.00 mm.
- Dimension read off depth gauge H₁ = 14,10 mm.
- Shim thickness:

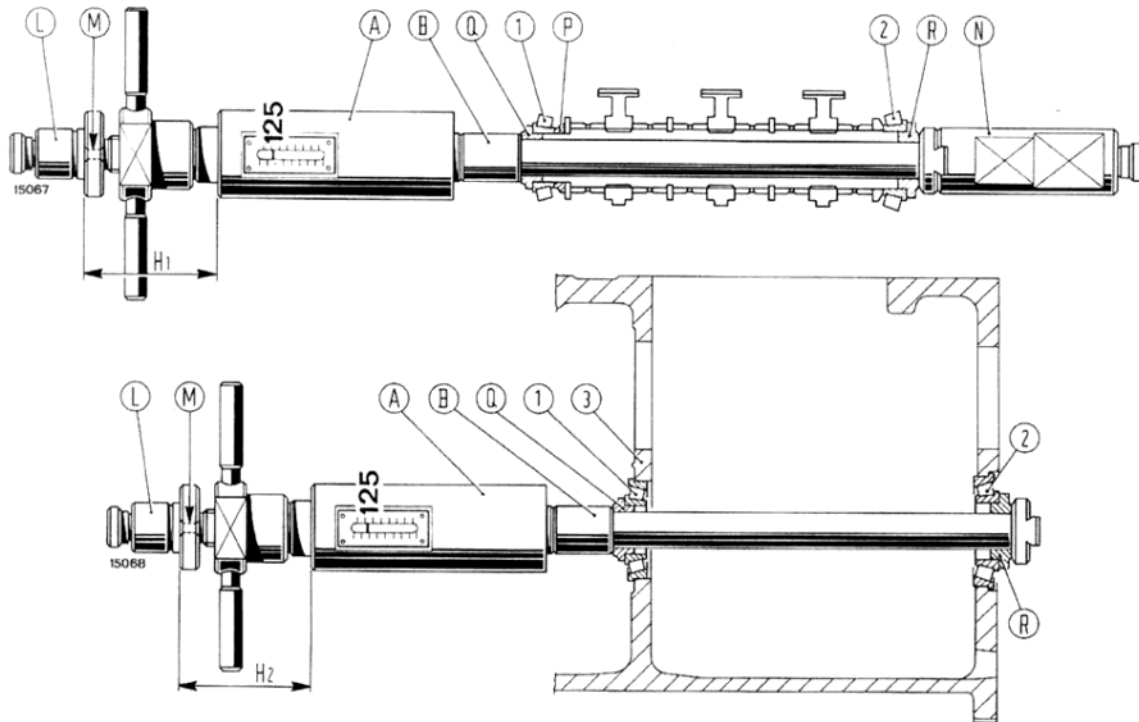
$$S = 15.00 + 8.00 - 14.10 + 0.1 = 9.00 \text{ mm}$$



Assessing driven shaft taper roller bearing shim thickness (S, page 14).

A. Spacer of tool **293339/1** - E. Adjustment tool **293339/1** - H₁ and H₂. Dimensions to be measured with depth gauge - L. Shim made in workshop - M. Tool nut - P. Provisional spacer - 1 and 2. Bearing cones - 3. Transmission housing.

POWER TRAIN: Transmission



Assessing driven shaft bearing shim thickness (S, page 14) using universal tool 293510.

A. Universal tool 293510 - B. Spacer 293618 - H₁ and H₂. Dimensions to be measured with depth gauge - L. Register 293624 - M. Register holes - N. Adapter 293617 - P. Provisional shim - Q. Bushing 293632 - R. Bushing 293637 - 1 and 2. Bearing cones - 3. Transmission housing.

Driven shaft taper roller bearing adjustment using universal tool 293510

- Install bushing 293632 (Q) and 293637 (R) plus spacer 293618 on universal tool 293510 (A).
- Also install adapter 293617 (N) to facilitate clamping in the vice, and install bearing cones (1 and 2), a provisional shim (P) to prevent interference between spacer and bearing cage (1), plus parts indicated in fig. a.
- Turn tool handwheel to bring graduated scale pointer gradually to 125 kg.
- Install register 293624 (L), positioning holes (M) in line with flats on handwheel.
- Using a suitable depth gauge, measure the resulting dimension (H₁).
- Disassemble the pack, lubricate the bearings with engine oil and install the tool with attached bushings (Q and R) and spacer (B) on transmission housing as shown in fig. b.

- Progressively return graduated scale pointer to 125 kg, simultaneously turning the tool to settle the bearings, and read dimension (H₂) as directed above.

The thickness of shim (S, page 14) to be fitted will be given by the following:

$$S = H_1 + P - H_2 + .1$$

where:

.1 mm = compensation factor to offset the increase in bearing preload generated by shaft nut tightening.

If necessary, round up (S) to the nearest .5 mm.

Example

- Provisional shim thickness: P = 8.00 mm.
- Dimension read off depth gauge H₁ = 92.10 mm.
- Dimension read off micrometer: H₂ = 92.10 mm.
- Shim thickness:

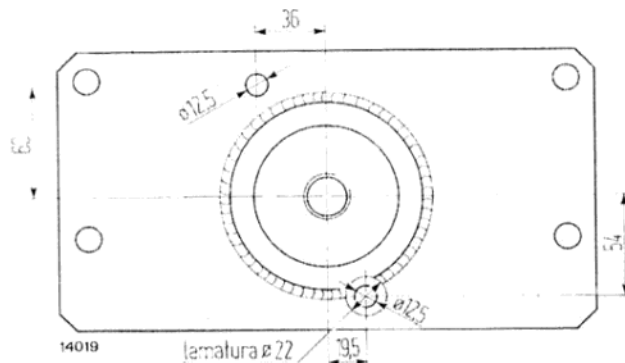
$$S = 93.00 + 8.00 - 92.10 + 0.1 = 9.00 \text{ mm.}$$

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Transmission

23

page 19



Changing tool 293659 into tool 293659/1.

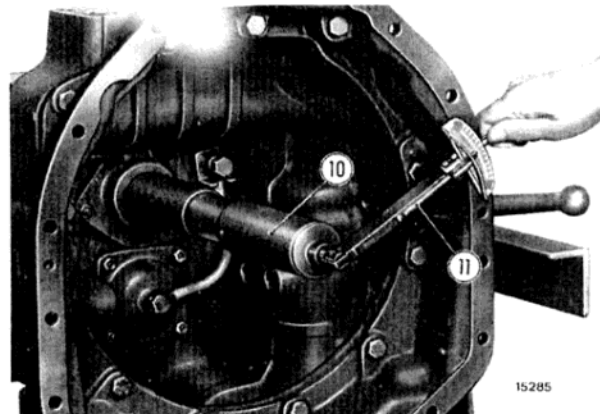
Drive shaft taper roller bearing adjustment.

Install drive shaft (6) together with bearings (1 and 2), gears, spacers, and cover (8), and tighten capscrews to the specified torque.

Position tool (A) 293659/1 without shim (S_1 , page 14) on transmission housing and secure through capscrews (7).

Note - To prevent tool 293659/1 from bending, it should be secured to housing through all six holes, including those drilled as shown in figure above.

Tighten tool nut (5) until rotating torque measured at the end of the drive shaft using torque wrench 293512 (11) and back-up wrench 293427/1 is 0.8 to 1.2 Nm (0.080 to 0.120 kgm or .57 to .86 ft.lb) after settling bearings.



Checking drive shaft rotating torque.

10. Back-up wrench 293427/1 - 11. Torque wrench 293512.

Torque is measured using a spring balance and a cord wrapped around one of the drive gear spacers, and is equivalent to a spring balance pull of 27 to 40 N (2.7 to 4.1 kg or 5.97 to 9 lb).

Measure dimension H_3 using a depth gauge.

The thickness of shim (S_1 , page 14) to be fitted will be:

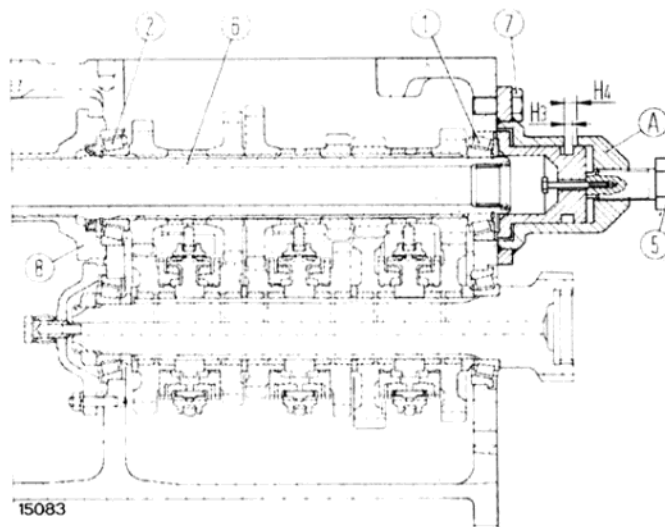
$$S_1 = H_4 - H_3$$

where:

H_3 = Dimension read off depth gauge.

H_4 = 10 mm - Nominal size of tool slot.

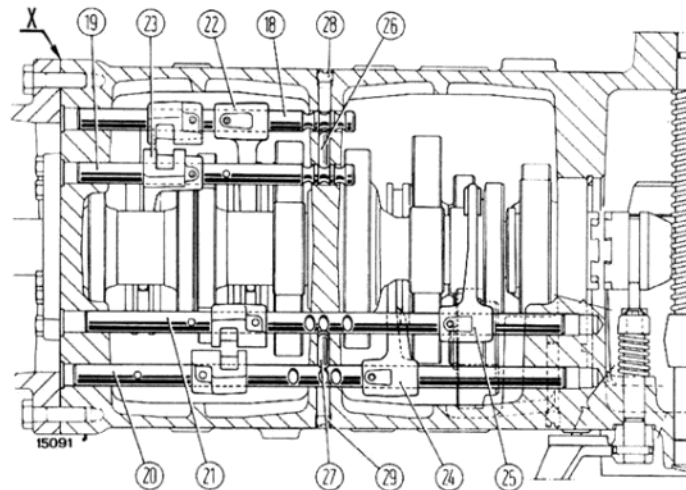
If necessary, round down (S_1) to the nearest 0.05 mm.



Assessing drive shaft bearing shim thickness (S_1 , page 14).

A. Tool 293659/1 - H_3 Dimension measured with depth gauge - H_4 = 10 mm. Nominal size of tool slot - 1 and 2. Taper roller bearings - 5. Nut - 6. Drive shaft - 7. Tool retaining screws - 8. Bearing cover.

POWER TRAIN: Transmission

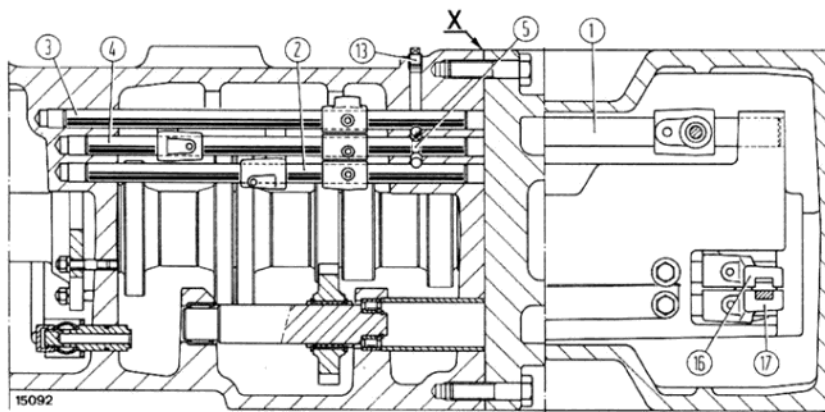


Plan view of transmission and splitter 55-90, 60-90, 70-90 and 80-90.

18. 1st and 2nd shifter rod - 19. 3rd and 4th shifter rod - 20. Low and high range shifter rod - 21. Normal and rev. range shifter rod - 22. 1st and 2nd shifter fork - 23. 3rd and 4th shifter fork - 24. Low and rev. range shifter fork - 25. Normal and rev. range shifter fork - 26. Gear shift detent plunger - 27. Range change detent plunger - 28 and 29. Plugs.

Note - Install plugs (28 and 29) using one of the jointing compounds indicated on page 6, section A. After installation, check for oil leakage.

Note - On assembly, thoroughly clean and degrease mating surfaces **X** and apply one of the jointing compounds indicated on page 6, section **A**.



Plan view of transmission and splitter - 90-90 and 100-90 tractors.

1. Transmission relay rod - 2. 5th and rev. shifter rod - 3. 1st and 2nd shifter rod - 4. 3rd and 4th shifter rod - 5. Gear shift detent plunger - 13. Plug - 16. Low range shifter fork - 17. Normal and high range shifter fork.

Note - Install plug (13) using one of the jointing compounds indicated on page 6, section A. After installation, check for oil leakage.

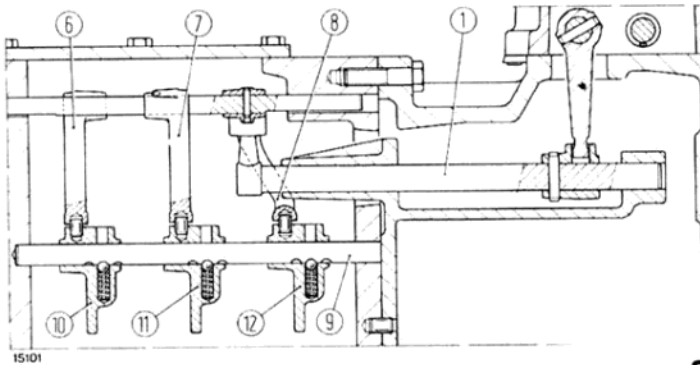
Note - On assembly, thoroughly clean and degrease mating surfaces **X** and apply one of the jointing compounds indicated on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

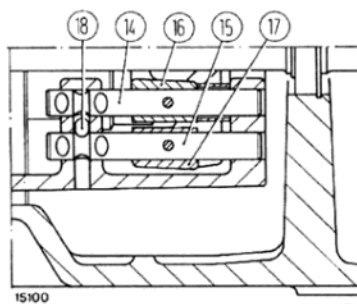
POWER TRAIN: Transmission

23

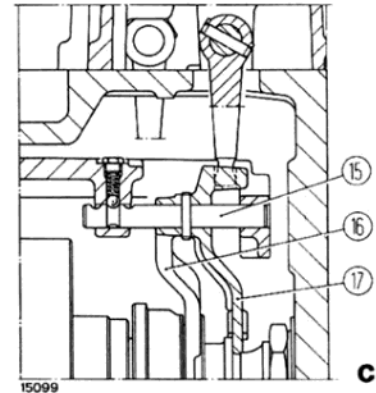
page 21



a



b

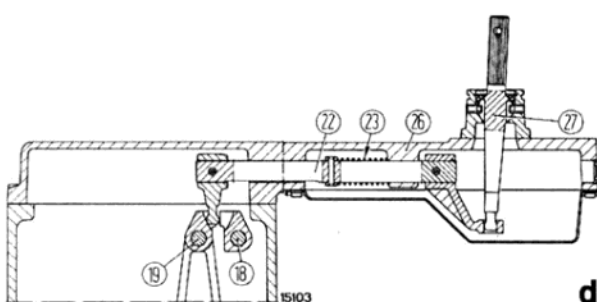


c

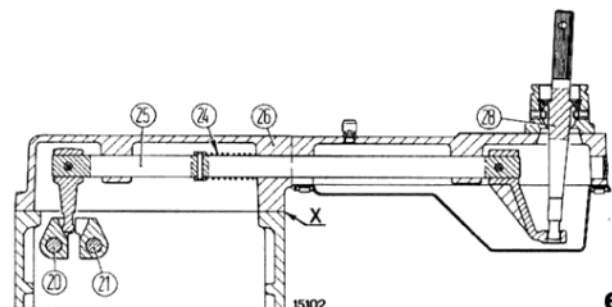
Sections through transmission and splitter rods - 90-90 and 100-90.

a. Section through transmission inner relay and shifter rods - b and c. Section through splitter shifter rods - 1. Inner transmission relay rod - 6. 3rd and 4th relay fork - 7. 5th and rev. relay fork - 8. 1st and 2nd relay fork - 9. Transmission shifter fork support rod - 10. 3rd and 4th shifter fork - 11. 5th and rev. shifter fork - 12. 1st and 2nd shifter fork - 14. Low range shifter rod - 15. Normal and high range shifter rod - 16. Low range shifter fork - 17. Normal and high range shifter fork - 18. Range change detent plunger.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply one of the jointing compounds indicated on page 6, section A.



d



e

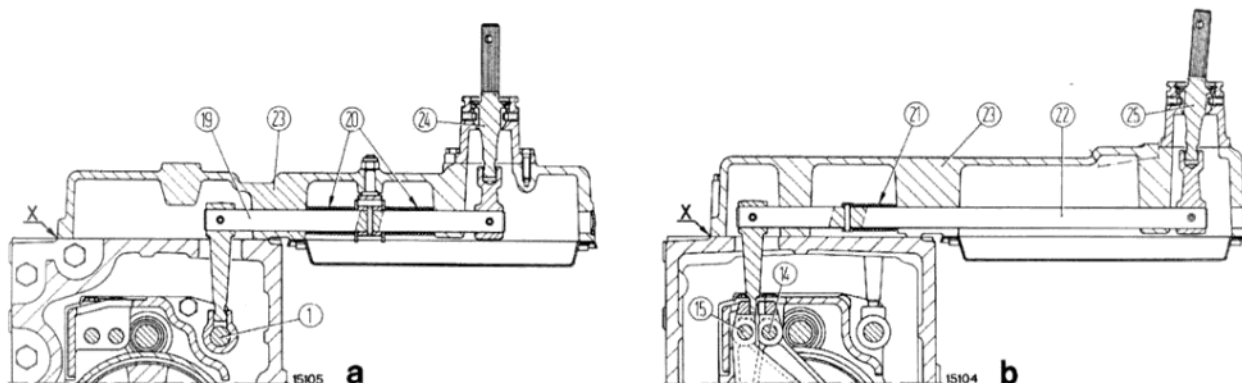
Sections through transmission and splitter outer relay rods 55-90, 60-90, 70-90 and 80-90.

d. Section through transmission outer relay rod - e. Section through splitter outer relay rod. - 18. 1st and 2nd shifter rod - 19. 3rd and 4th shifter rod - 20. Low and high range shifter rod - 21. Normal and reverse range shifter rod - 22. Outer transmission relay rod - 23 and 24. Springs - 25. Outer splitter relay rod - 26. Support cover - 27. Transmission pivot lever - 28. Splitter pivot lever.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply one of the jointing compounds indicated on page 6, section A.

Note - If unit is disassembled, surfaces rods (22 and 25) must be thoroughly cleaned and coated with **grassofiat TUTELA G9** prior to reassembly.

POWER TRAIN: Transmission



Section through transmission and splitter outer relay rods 90-90 and 100-90.

a. Section through transmission outer relay rod - b. Section through splitter outer relay rod - 1. Transmission inner relay rod - 14. Low range shifter rod - 15. Normal and high range shifter rod - 19. Transmission outer relay rod - 20 and 21. Springs - 22. Splitter outer relay rod - 23. Support cover - 24. Transmission pivot lever - 25. Splitter pivot lever.

Note - On assembly, thoroughly clean and degrease mating surfaces **X** and apply one of the jointing compounds indicated on page 6, section A.

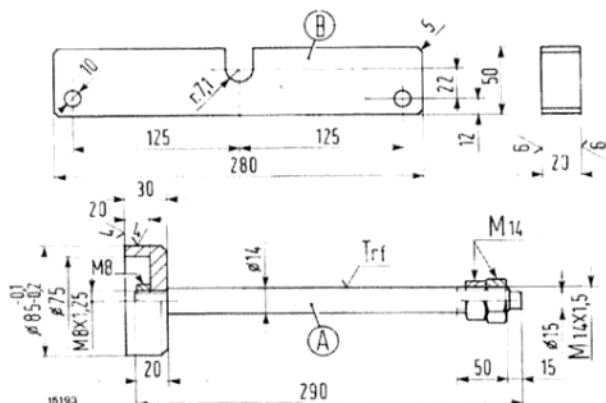
Note - If unit is disassembled, surfaces of rods (19 and 22) must be thoroughly cleaned and coated with **grassofiat TUTELA G9** prior to reassembly.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Clutch/Splitter Shaft

23

page 23



Clutch/splitter shaft seal replacer (stamp tool with number: 50043) - Dimensions in mm.

A. Replacer - B. Bracket.
Material: C40.

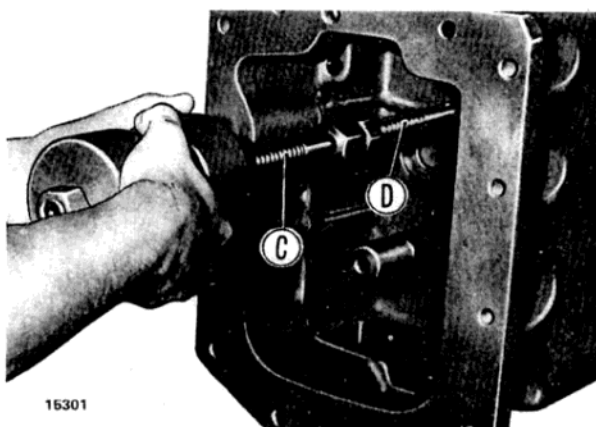
CLUTCH/SPLITTER SHAFT SEAL REPLACEMENT (55-90, 60-90, 70-90 and 80-90)



Lift and handle all heavy parts using a suitable lift. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of load to be lifted.

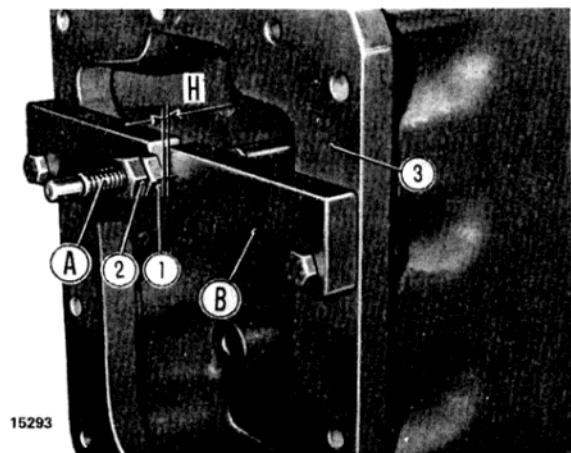
To change seal, proceed as follows:

- Separate clutch housing from rear transmission housing as described on pages 1 and 2, section 24.



Removing seal.

C. Slide hammer puller - D. Pliers 291205.

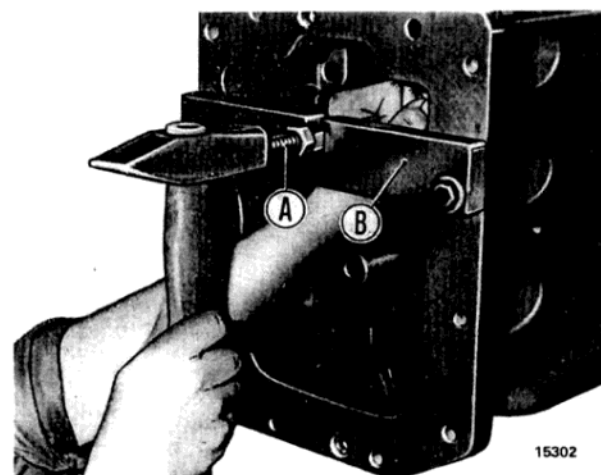


Adjusting replacer.

A. Replacer - B. Bracket - H. = 3.3 to 3.6 mm (0.129 to 0.141 in). Distance between nut (1) and bracket - 1. Adjusting nut - 2. Locknut - 3. Clutch housing.

- Remove retaining ring (14, page 1, section 24) and withdraw shaft (4) together with bearing (22).
- Where provided, remove crawler or reverser gears.
- Install bracket (B) on clutch housing (3) and install replacer (A) in seat housing seal (34, page 1, section 24) so that it contacts retaining ring (10).
- Tighten nut (1) until distance (H) between bracket and nut is 3.3 to 3.6 mm or 0.129 to 0.141 in. Secure nut through locknut (2).

Note - Leave replacer (A) with nut so positioned after replacement. In subsequent replacements, it is only necessary to check that dimension (H) is as specified.



Installing seal.

A. Replacer - B. Bracket.

POWER TRAIN: Clutch/Splitter Shaft

- Remove replacer (A), bracket (B) and retaining ring (10, page 1, section 24).
- Using pliers **291205** (D) and a slide hammer puller (C), remove old seal (34, page 1, section 24).
- Position new seal in seat, install bracket (B) on clutch housing (3). Fit replacer (A) on bracket and drive in seal until nut (1) is flush with bracket.
- Remove bracket (B) and replacer (A). Install

seal (10, page 1, section 24), clutch/splitter shaft (4), bearing (22) and retaining ring (14).

- Install creeper or reverser gears (where provided).



CAUTION



Use suitable tools to align holes. NEVER USE FINGERS.

- Install clutch housing on rear transmission housing, reversing the removal sequence.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Creeper

24

page 1

CREEPER (55-90, 60-90, 70-90 and 80-90)

DESCRIPTION

Spur pinion drive creeper is installed between clutch unit and transmission and provides 20 forward and 8 reverse speeds. Creeper is operated through a hand lever on platform to operator's left.

CREEPER REMOVAL, INSTALLATION AND DISASSEMBLY

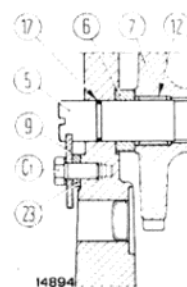
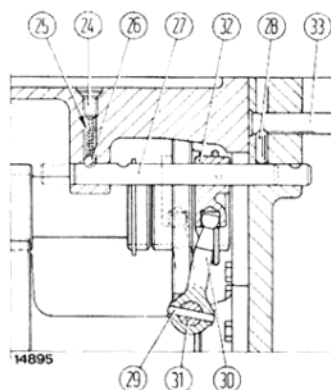
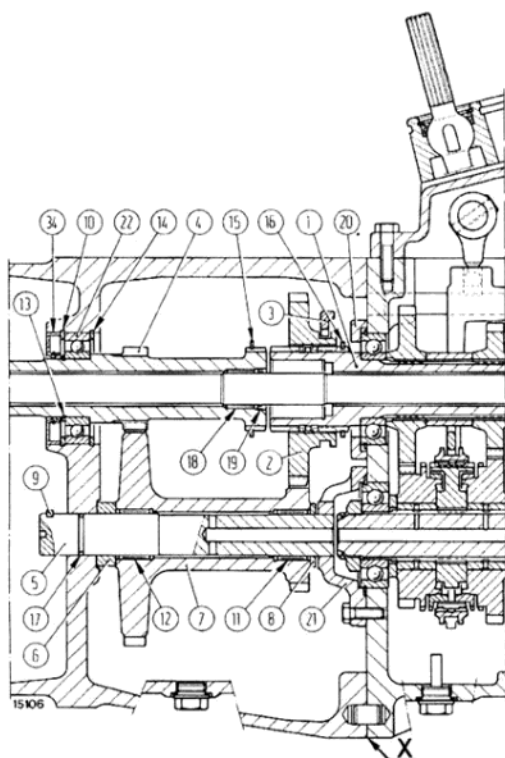


Lift and handle all heavy components using a suitable lift.
Ensure that units or parts are supported by suitable slings or hooks.
Ensure that no one is in the vicinity of the load to be lifted.

Separate clutch housing from transmission-rear

transmission housing to gain access to creeper. To this end, proceed as follows:

- Remove side panels, sidemembers, hood and exhaust silencer.
- Disconnect and insulate battery negative lead. Disconnect throttle link, engine shut-off cable from injection pump, starter leads, dashboard instrument cables and tractor meter lead.
- Shut off cock and disconnect fuel lines from pump, filters and injector leak-off. Drain power steering reservoir and disconnect power steering lines. Drain transmission and rear transmission housing and disconnect hydraulic lift lines.
- If necessary, disconnect brake lines and plug holes.
- Disconnect transmission clutch link, PTO clutch link and creeper link.
- For DT models, remove front axle drive shaft and associated guard.
- Engage parking brake, chock rear wheels and insert wooden blocks between front axle and support to prevent axle from swinging.
- For cab versions, drain engine coolant and disconnect radiator inlet lines.



Sections through creeper (55-90, 60-90, 70-90 and 80-90)

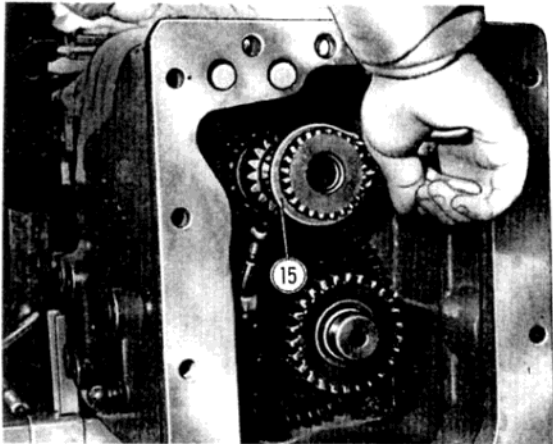
C1. Stop plate retaining screw - 1. Transmission-creeper shaft - 2. Creeper drive gear - 3. Creeper shifter fork - 4. Clutch-creeper shaft - 5. Driven gear jackshaft - 6. Driven gear front thrust washer - 7. Creeper driven gear - 8. Driven gear rear thrust washer - 9. Jackshaft stop plate - 11 and 12. Needle roller bearings - 10, 13, 14, 15 and 16. Retaining rings - 17. O-ring - 18. P.T.O. shaft support bushing - 19. Seal - 20. Transmission drive shaft bearing cover - 21. Transmission driven shaft bearing cover - 22. Ball bearing - 23. Stop plate spacer - 24. Screw - 25 and 26. Detent ball and spring - 27. Creeper shifter rod - 28. High range detent plunger - 29. Roll pin - 30. Fork control lever - 31. Creeper control shaft assy - 32. Creeper control fork - 33. Spitter high and low range shifter rod - 34. Scal.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply one of the jointing compounds listed on page 6, section A.

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POWER TRAIN: Creeper



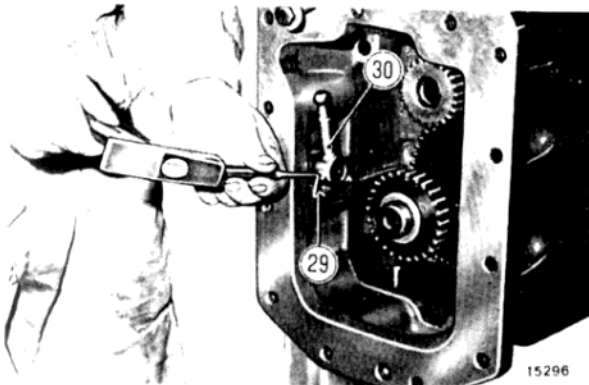
Removing creeper drive shaft retaining ring

15. Retaining ring.

- For air conditioned versions, disconnect refrigerant delivery lines from inlet hose.
- Position trolley **292320** with stationary section under transmission-rear transmission housing, and with one of the moveable sections under the engine oil pan (for 70-90 and 80-90 tractors, take care to prevent damaging sheet metal bottom). The other moveable section should be placed under the clutch housing.
- Position a telescoping stand under tow bar support to prevent the transmission-rear transmission housing from overturning.

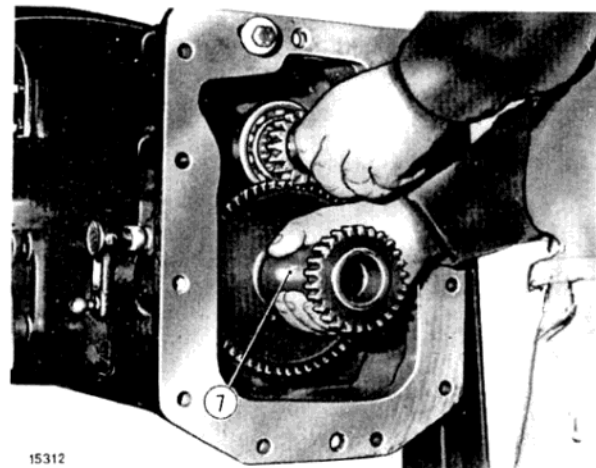
If tractor is equipped with ballast weights which cannot be removed, connect weights to a hoist to prevent engine from pitching forwards.

- Remove front platform retaining screws and slacken rear screws.
- Raise platform slightly using a hoist and hold in this position with a pair of telescoping stands.
- Remove capscrews retaining transmission-rear transmission housing to clutch housing and separate engine with front axle and clutch housing from tractor.



Removing fork control lever.

29. Roll pin - 30. Lever.



Removing creeper driven gear

7. Driven gear.

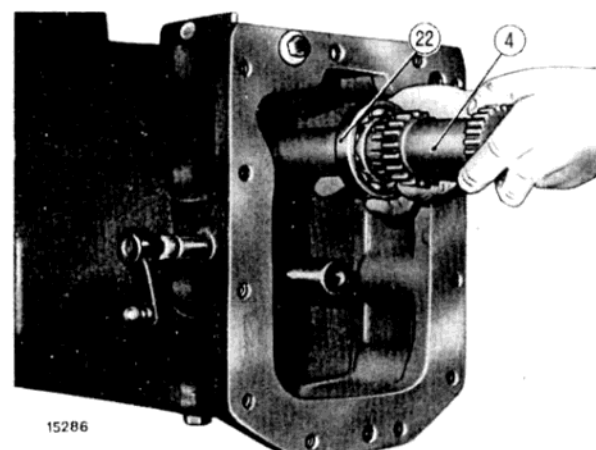
Make sure all lines or cables have been disconnected.

Note - To facilitate clutch housing removal or installation on transmission-rear transmission housing, the creeper and transmission should be in neutral, while splitter low range should be engaged.

Back off screw (24, page 1) and remove creeper drive gear (2) together with fork (3), retrieving detent spring (25) and ball (26). Remove retaining ring (15), roll pin (29) and lever (30). Partially withdraw shaft (31, page 1).

Remove retaining ring (14, page 1) and partially withdraw clutch-splitter shaft (4) together with bearing and retaining ring (13, page 1). Then remove gear (7) and shaft (4). If it is difficult to remove clutch-creeper shaft (4) as described above, separate engine from clutch housing, proceeding as follows:

Note - The operations detailed above concern overhaul of creeper only.



Removing clutch-creeper shaft.

4. Clutch-creeper shaft - 22. Ball bearing.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Creeper

24

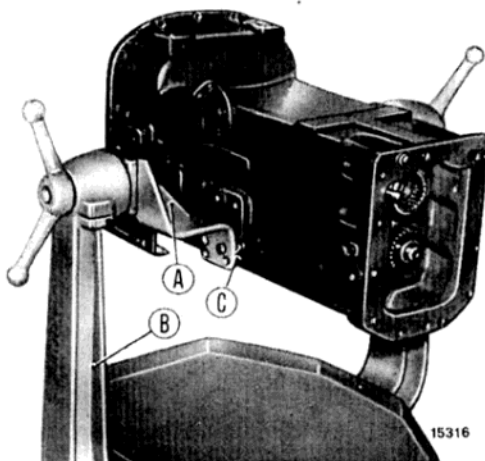
page 3

If driven gear jackshaft (5, page 1) replacement is necessary or if it is not possible to remove clutch-creeper shaft (4) as described above, separate engine from clutch housing. To this end, proceed as follows:

- Remove the two front platform supports from clutch housing.
- Using chain **291517**, attach clutch housing to a hoist and take up slack. Move trolley of tool **292320** under engine and secure.
- Remove screws retaining clutch housing to engine and separate clutch housing.
- Position clutch housing on revolving stand **290086** and secure through brackets **293868** and four 18 mm spacers (made in workshop).
- Remove capscrews (C, page 1) and take out jackshaft (5).
- Remove clutch release sleeve (1) together with thrust bearings, forks (2) and rods.
- Remove capscrews (C₆, page 6, section 22) retaining front bearing cover and remove cover.
- Working from the clutch side, remove shaft (4, page 1) together with retaining ring (13) and bearing (22).

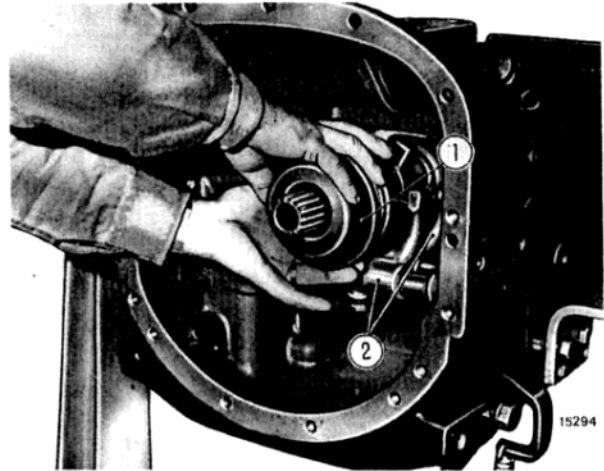
On assembly, ensure that high range detent plunger (28, page 1) is held in place with **grassofiat TUTELA G9** or other approved grease.

Tighten screw (24, page 1) using one of the following jointing compounds: RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET.



Installing clutch housing on revolving stand.

A. Bracket **293868** - B. Revolving stand **290086** - C. 18 mm spacer.



Removing transmission and PTO clutch sleeves.

1. Sleeve-bearing Assy - 2. Clutch forks.

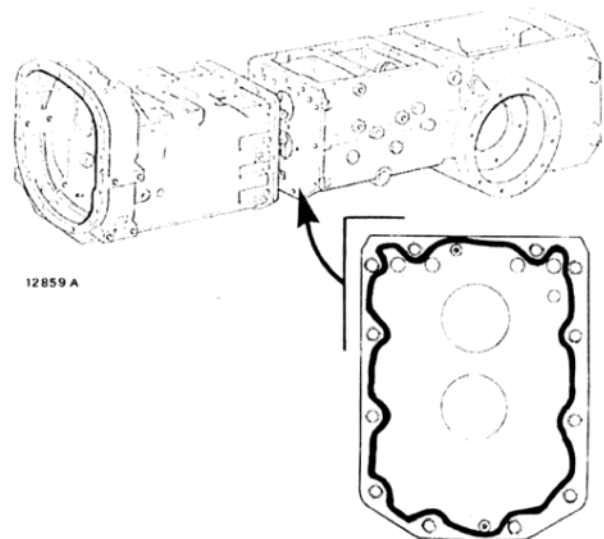
CAUTION

Use suitable tools to align holes. DO NOT USE FINGERS OR HANDS.

Before assembling transmission housing to clutch housing, thoroughly clean and degrease mating surfaces and apply a 2 mm (0.08 in) bead of jointing compound as shown in figure below.

Jointing compound types are indicated on page 6, section A.

If units have been disassembled, install clutch housing on engine-front axle Assy after smearing **grassofiat TUTELA G9** in clutch drive disc slots. Clean and degrease mating surface and apply one of the jointing compounds indicated on page 6, section A.



Applying jointing compound for transmission housing installation on clutch housing.

Jointing compound types are indicated on page 6, section A.

POWER TRAIN: Creeper

CREEPER (90-90 and 100-90)

DESCRIPTION

The planetary creeper is fitted in-line with the double reduction planetary splitter (which on these models features a longer ring gear and a revised rear driven gear support) and provides a further five forward and on reverse ratios for a total of 20 forward and 4 reverse speeds.

The creeper is controlled through the splitter lever.

CREEPER REMOVAL, INSTALLATION AND DISASSEMBLY



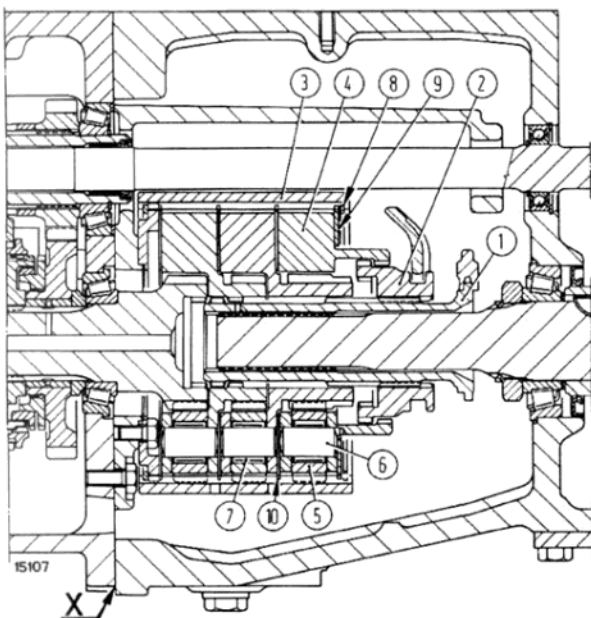
CAUTION

Lift and handle all heavy components using a suitable lift.

Ensure that units and parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the load to be lifted.

To gain access to the creeper, separate front and rear transmission housings as follows:

- Remove platform as described on pages 1 and 2, section 21.
- Drain oil from transmission housing and remove transmission/splitter outer relay rod support cover.
- Chock wheels and position stationary section of tool **292320** under rear transmission housing, and trolleys under engine and transmission housing.
- Remove housing capscrews, check that all connections are free, and separate housings.



If tractor is equipped with ballast weights which cannot be removed, connect weights to a hoist to prevent engine from pitching forwards.

Remove plugs and creeper shifter rod detent spring and balls. Remove rod roll pins and take out rods together with sliding sleeves.

Remove retaining ring (8), hub (9), driven gear carrier and thrust ring (10).

Disassemble driven gear supports by removing jackshafts (6). Retrieve driven gears (5) and rollers (7).



CAUTION

Use suitable tools to align holes. **DO NOT USE FINGERS OR HANDS.**

Reassemble creeper referring to the figure and noting the following points:

- Assemble driven gears (5) on bench, using **grasofiat G9** or other approved grease to hold rollers in seats on gears.

Install remote control top cover after cleaning and degreasing mating faces and applying a 2 mm dia. bead of jointing compound as illustrated on page 16, Section 23.

Thoroughly clean and degrease mating surfaces, apply a 2 mm (0.08 in) bead of jointing compound as shown in figure on page 2, section 23, and assemble transmission housing to rear transmission housing.

Jointing compound types are indicated on page 6, section A.

Section through creeper - 90-90 and 100-90.

1. High and normal range sliding sleeve - 2. Low and low creeper range sliding sleeve - 3. Ring gear - 4. Driven gear support - 5. Driven gears - 6. Jackshafts - 7. Rollers - 8. Retaining ring - 9. Hub - 10. Thrust ring.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply jointing compound as indicated on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Mechanical Reverser

24

page 5

MECHANICAL REVERSER (55-90, 60-90, 70-90 and 80-90 only)

DESCRIPTION

Mechanical reverser is installed between clutch unit and transmission (on tractors equipped with reverser, transmission does not feature reverse gears) and provides 12 forward and 12 reverse ratios. Reverser is controlled through an hand lever on platform to operator's left.

REMOVAL-INSTALLATION AND DISASSEMBLY



CAUTION

Lift and handle all heavy components using a suitable lift.

Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the load to be lifted.

Separate clutch housing from transmission-rear transmission housing as described on pages 1 and 2 to gain access to reverser.

Remove reverser drive gear (2, page 3) and relay gear (7).

If necessary, remove retaining ring (14) and withdraw clutch/reverser shaft (4) together with bearing (22)

and retaining ring (13). If clutch/reverser shaft removal is difficult, separate clutch housing from engine as described below.

Note - The operations detailed above concern overhaul of reverser unit only.

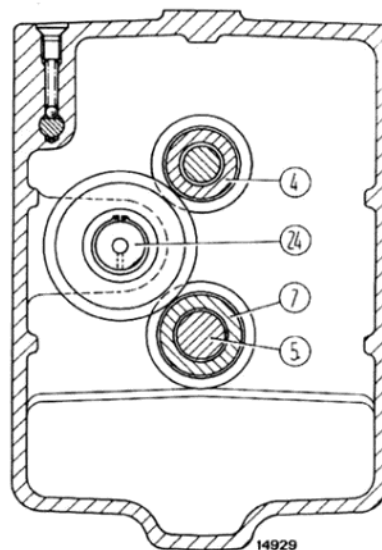
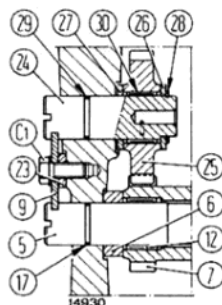
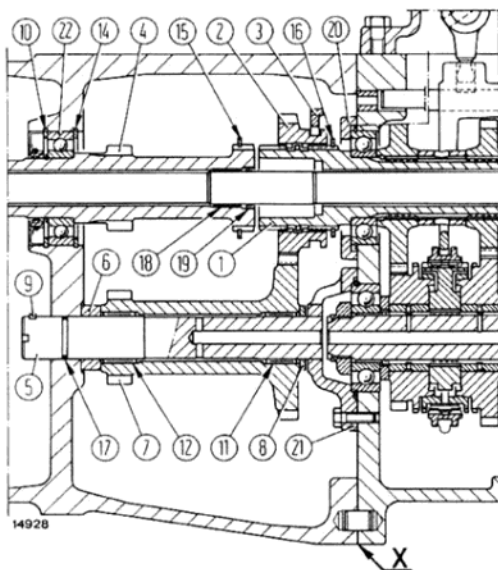
If jackshafts (5 and 24, page 3) must be replaced, or if it has not been possible to remove clutch/reverser shaft as described above, separate engine from clutch housing as described on page 3. Then:

- Remove screw (C1, page 3) and jackshafts (5 and 24).
- Remove clutch release sleeves together with thrust bearings, forks and rods.
- Remove capscrews (C, page 6, section 22) retaining front bearing cover and take off cover.
- Working from the clutch side, remove shaft (4) together with retaining ring (13) and bearing (22).



CAUTION

Use suitable tools to align holes. DO NOT USE FINGERS OF HANDS.



Sections through reverser

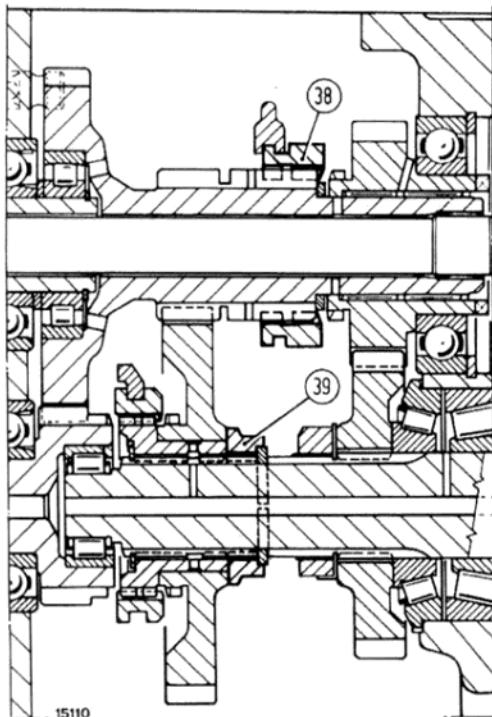
C1. Stop plate retaining screw - 1. Transmission-reverser shaft - 2. Reverser drive gear - 3. Reverser fork - 4. Clutch/reverser shaft - 5. Relay gear jackshaft - 6. Relay gear front thrust washer - 7. Reverser relay gear - 8. Relay gear rear thrust washer - 9. Jackshaft stop plate - 11 and 12. Needle roller bearings - 10, 13, 14, 15 and 16. Retaining rings - 17. O-ring - 18. P.T.O. shaft support bushing - 19. Seals - 20. Transmission drive shaft bearing cover - 21. Transmission drive shaft bearing cover - 22. Ball bearing - 23. Stop plate spacer - 24. Intermediate gear jackshaft - 25. Reverser intermediate gear - 26 and 27. Intermediate gear thrust washers - 28. Retaining ring - 29. O-ring - 30. Needle roller bearing.

Note - On assembly, thoroughly clean and degrease mating surfaces X and apply one of the jointing compounds listed on page 6, section A.

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POWER TRAIN: Mechanical Reverser



Detail of splitter for tractors equipped with reverser.

38. Normal range drive gear - 39. Spacer.

Before assembling transmission housing to clutch housing, thoroughly clean and degrease mating surface and apply a 2 mm (0.08 in) bead of jointing compound as shown in figure on page 3.

Jointing compound types to be applied are indicated on page 6, section A.

If units have been disassembled, install clutch housing on engine-front axle assy after smearing **grasso-fiat TUTELA G9** in clutch driven disc slots. Clean and degrease mating surfaces and apply one of the jointing compounds indicated on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

25

page 1

BEVEL DRIVE - DIFFERENTIAL REMOVAL - INSTALLATION (55-90, 60-90, 70-90, 80-90)



CAUTION

Lift and handle all heavy components using a suitable lift.

Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the load to be lifted.

For 55-90, 60-90, 70-90 and 80-90 tractors, bevel drive and differential may be removed either with transmission-rear transmission housing in situ or separated from clutch housing. To separate transmission-rear transmission housing proceed as directed on pages 1 and 2, section 23, positioning housing on revolving stand **290086** and securing through brackets **293868**.

If transmission-rear transmission housing is to be left in place, the platform must be removed as directed on pages 1 and 2, section 21. Then proceed as follows:

- Drain rear transmission housing oil.
- Place a jack under the rear transmission housing and remove wheels, rear final drives and brake units.

Then proceed as follows for the two situations indicated above:

- Remove hydraulic lift, transmission/splitter outer relay rod support cover, PTO housing and sensing bar support.
- Take off bearing supports, retrieve shims and remove bevel drive-differential unit from rear of housing.

Disassemble unit as follows:

- Remove capscrews (C₁, page 6) and separate ring gear from differential carrier.
- Remove screw (11) and journal (10), retrieving differential pinions and side gears.
- Check wear and efficiency of parts against data in table on pages 7 and 8, section 20.

On reassembly, proceed as follows:

- Smear **grasso fiat TUTELA G9** grease on differential pinion washers.
- Tighten screws (C₁, page 6) to the specified torque.
- Adjust taper roller bearings as indicated in relevant sections.

- Adjust differential lock as indicated in relevant section.



CAUTION

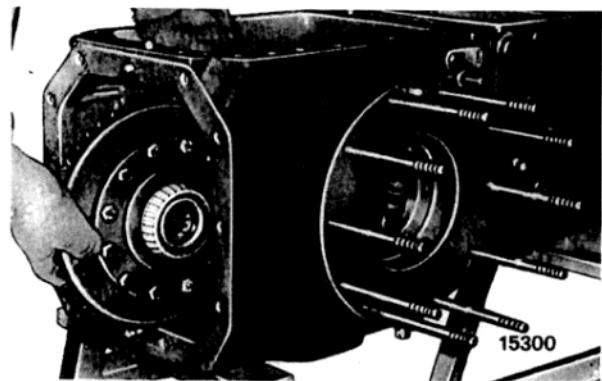


Handle all parts carefully. Do not put hands and fingers between parts. Wear safety equipment such as goggles, gloves and safety shoes.

BEVEL DRIVE - DIFFERENTIAL REMOVAL - INSTALLATION (90-90 and 100-90)

For 90-90 and 100-90 tractors, rear transmission housing must be removed in order to overhaul bevel drive and differential. Proceed as follows:

- Remove platform as described on pages 1 and 2, section 21.
- Drain oil from transmission housing and from rear transmission housing; do not mix the two oil types.
- Position tool **292320** with stationary section under the clutch housing and the two moveable sections under the rear transmission housing. Ensure that tool is steady.
- Remove wheels, rear final drives, brake units and transmission/splitter relay rod support cover.
- Remove check links, lift arms, lower links, implement attachment, PTO guard and top link.
- Remove capscrews and separate transmission housing from clutch housing.
- Position transmission housing on a support stand to facilitate subsequent operations.
- Remove hydraulic lift together with spacer, PTO housing and sensing bar support.
- Take off bearing supports, retrieve shims and remove bevel drive-differential unit from rear of housing.



Removing (installing) bevel drive-differential unit.

POWER TRAIN: Bevel drive and differential

Disassemble unit as follows:

- Remove capscrews (C₁, page 14) and separate ring gear from differential carrier.
- Remove screw (15) and journal (13), retrieving differential pinions and side gears.
- Check wear and efficiency of parts against data in table in pages 7 and 8, section 20.

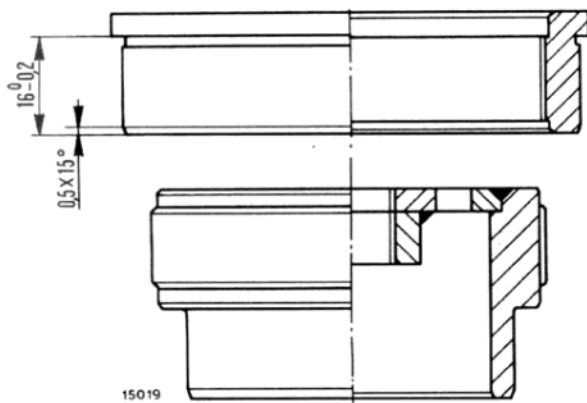
On reassembly, proceed as follows:

- Smear **grassofiat TUTELA G9** grease on differential pinion washers.
- Tighten screws (C₁, page 14) to the specified torque.
- Adjust taper roller bearings as indicated in relevant sections.
- Adjust differential lock as indicated in relevant section.

BEVEL PINION SHAFT REMOVAL - INSTALLATION (55-90, 60-90, 70-90 and 80-90)

Proceed as follows:

- Remove P.T.O. control lever and differential lock.
- Remove splitter drive shaft rear bearing retaining ring (20, page 6). Take out normal range gear together with ball bearing and roller bearing, proceeding as indicated on page 3, section 23, and remove splitter drive shaft with reverse sleeve.
- Partially slacken bevel pinion shaft bearing adjusting nut, install adapter made in workshop as shown on page 5, Section 23. Secure adapter to slide hammer puller.
- Pull pinion partially out and remove retaining ring (36, page 6). Move gears (33 and 34) towards wall of transmission housing and remove thrust washers (37).



Changes to tool 293757/1 for bevel pinion seal installation.

- Fully slacken bevel pinion shaft bearing adjusting nut and withdraw pinion, retrieving gears from inside housing. To retrieve pinion positioning shims, first remove pinion end bearing cup from inside housing.

On assembly, adjust bevel pinion position and taper roller bearing preload as indicated in relevant sections.



CAUTION



Use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.

Assemble parts as directed in the relevant sections and applying a 2 mm. (0.08 in) bead of jointing compound as shown in figures.

Jointing compound types are indicated on page 6, section A.

BEVEL PINION SHAFT REMOVAL-INSTALLATION (90-90 and 100-90)

Proceed as follows:

- Fully slacken pinion nut and remove pinion using a punch applied to the splined end of the shaft. Also remove parking brake hub key and ground speed PTO. For DT models, also remove front wheel drive relay gear key.
- Remove bearing cups using suitable universal pullers.

On assembly, adjust bevel pinion position and taper roller bearing preload as indicated in relevant sections.



CAUTION



Use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.

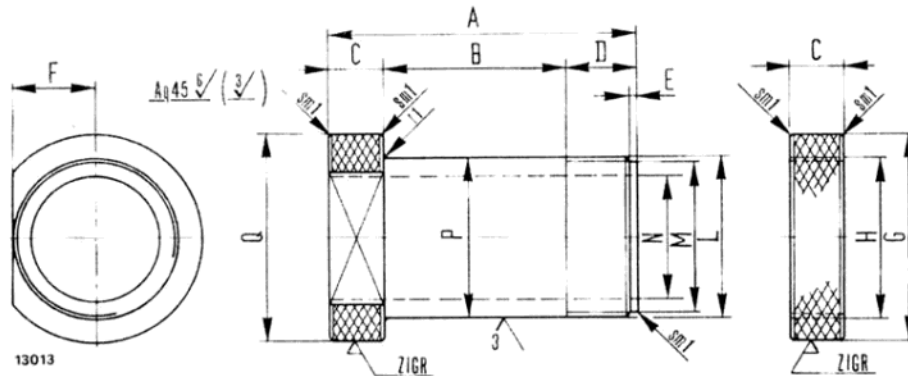
Note - Tool 293757/1 may be modified as shown alongside. Stamp modified tool with number 293757/2.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

25

page 3



Tool for bevel pinion shaft assembly position adjustment. (Stamp tool with number 50004)

A = 85 mm (3.35 in) - B = 50 mm (1.97 in) - C = 15 mm (0.59 in) - D = 20 mm (0.79 in) - E = 2 mm (0.08 in) - F = 22.5 mm (0.89 in) - G = 58 mm (2.28 in) dia - H = M45x2 - L = M45x2 - M = 42.5 mm (1.67 in) dia - N = 35 mm (1.38 in) dia - P = 44.7 to 44.8 mm (1.760 to 1.764 in) dia - Q = 58 mm (2.28 in) dia - r1 = Radius 1 mm (0.04 in) - sm 1 = Chamfer 1 mm (0.04 in) - ZIGR = Knurled.

In the event of seal (20, page 14) replacement, install using punch **293757/2** (where available, tool **293757/1** may be adapted for the purpose as shown on page 2).

Install parts as directed in the relevant sections, applying a 2 mm (0.08 in) bead of jointing compound as shown in figures.

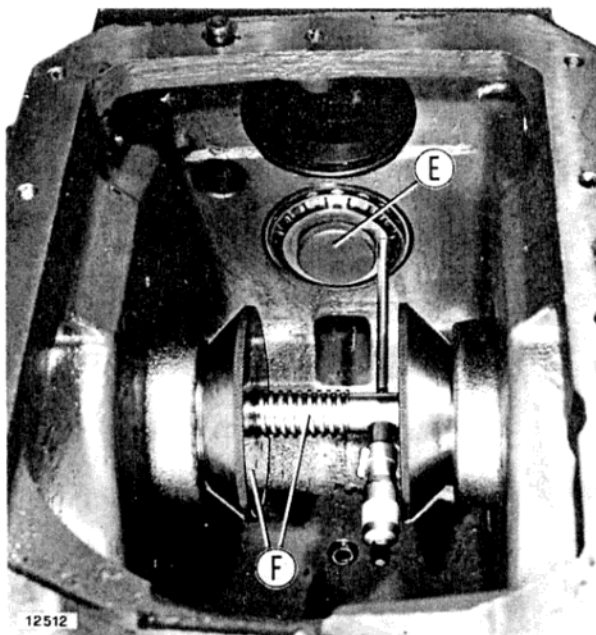
Jointing compound types are indicated on page 6, section A.

BEVEL DRIVE ADJUSTMENT (55-90, 60-90, 70-90 and 80-90).

Bevel pinion position adjustment and shim thickness measurement.

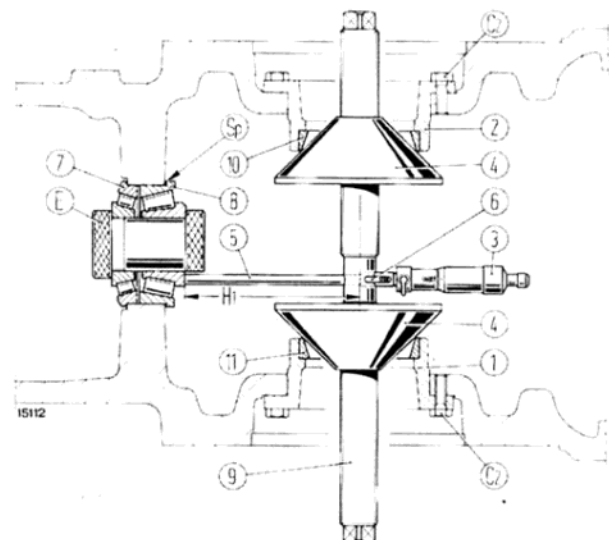
Note: To adjust bevel pinion shaft position, make a tools as shown in the drawing above.

- Install tool (E) together with bevel pinion bearing cones on transmission housing with bearing cups (7 and 8) and shim (Sp).
- Install tool **293400/1**, (F) on differential supports (1 and 2) with bearing cups (10 and 11).



Installation schematics for bevel pinion position check tool.

C2. Support retaining screws (1 and 2) - E. Tool (make in workshop) - F. Universal tool **293400/1** - H: Dimensions measured with tool- Sp. Shim - 1 and 2. Differential supports - 3. Micrometer gauge - 4. Centralizing cones - 5. Micrometer spindle - 6. Micrometer screw - 7 and 8. Bevel pinion bearings - 9. Threaded shaft - 10 and 11. Taper roller bearing cups.



POWER TRAIN: Bevel drive and differential

- Tighten or back off two cones (4, page 3) to bring micrometer spindle (5) to bevel pinion shaft bearing (7);
- Turn cones (4, page 3) by hand or using locking wrench **293446** to bring tool firmly up against bearing cups (10 and 11), thus eliminating tool end play.
- Lock micrometer gauge with spindle through screw (6, page 3)
- Bring micrometer spindle (5, page 3) in contact with bearing (7) and measure dimension (H_1).
- Establish correct nominal dimension (H_3) between ring gear centerline and back of pinion:

$$H_3 = H_2 \pm C$$

where:

$H_2 = 145,5 \text{ mm (5.7283 in)}$. Nominal dimension between ring gear centerline and back of pinion.

C = Correction factor stamped on pinion, expressed in mm and preceded by + or —, if different from 0, to be added to or subtracted from nominal dimension (H_2) according to sign.

- Shim thickness (S , page 6) will be given by:

$$S = H_1 + Sp - H_3$$

where:

H_1 = Dimension measured with micrometer gauge.

H_3 = Corrected nominal dimension between ring gear centerline and back of pinion.

Sp = Shim.

Example

Dimension measured with micrometer gauge $H_1 = 145.9 \text{ mm (5.7441 in)}$.

Shim thickness $Sp = 1.90 \text{ mm (0.075 in)}$

Nominal dimension between ring gear centerline and back of pinion $H_2 = 145.5 \text{ mm (5.7283 in)}$

Correction factor $C = + 0.2 \text{ mm (0.008 in)}$

Corrected nominal dimension $H_3 = 145.5 + 0.2 \text{ mm} = 145.7 \text{ mm (5.7362 in)}$

Shim thickness $S = 145.9 + 1.90 - 145.7 = 2.10 \text{ mm (0.07 in)}$.

Correction factor $C = - 0.2 \text{ mm (0.008 in)}$.

Corrected nominal dimension $H_3 = 145.5 - 0.2 = 145.3 \text{ mm (5.7204 in)}$.

Shim thickness $S = 145.9 + 1.90 - 145.3 = 2.50 \text{ mm (0.0984 in)}$.

Correction factor $C = 0 \text{ mm}$.

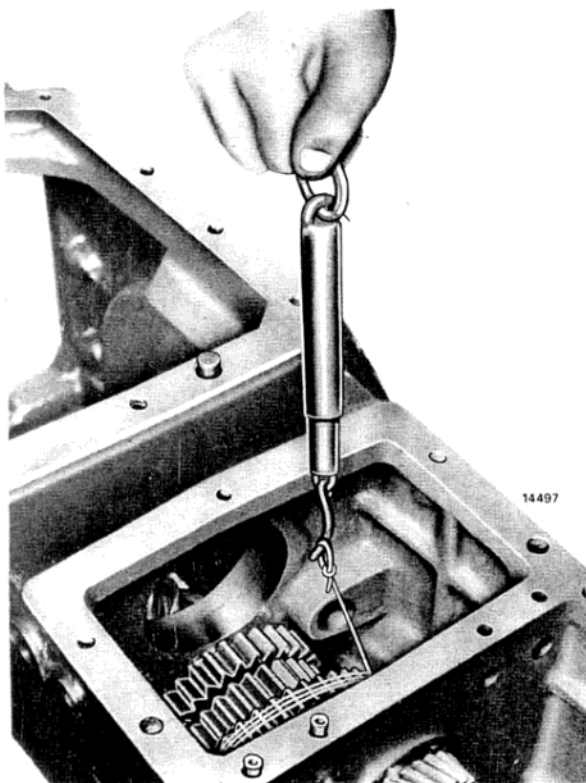
Corrected nominal dimension $H_3 = H_2 = 145.5 \text{ mm (5.7283 in)}$.

Shim thickness $S = 145.9 + 1.90 - 145.5 = 2.30 \text{ mm (0.0905 in)}$.

Pinion shaft bearing adjustment.

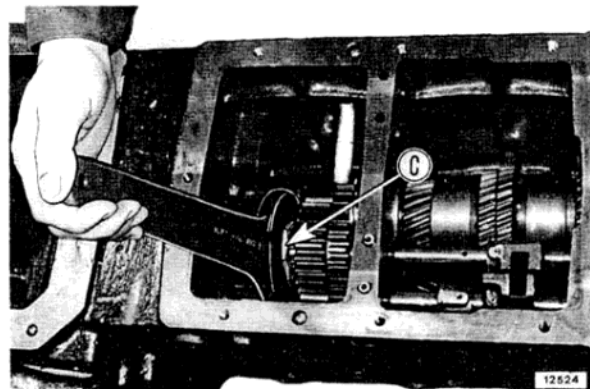
- Install pinion shaft on housing together with bearing cones, positioning shim (S , page 6) as determined above, gears and bearing adjusting nut (C).
- Rotate pinion shaft to settle bearings and simultaneously tighten adjusting nut (C) until rotating torque is 1.50 to 2 Nm (0.150 to 0.200 kgm, 1 to 1.4 ft lb). Measure torque with spring balance and cord wrapped round low range gear and ensure that transmission shafts are not dragged into motion.

Specified rotating torque is equivalent to a spring balance pull of 17.6 to 23.5 N (1.8 to 2.4 kg, 4 to 6 lb).



Adjusting pinion shaft bearings.

C. Bearing adjusting nut.

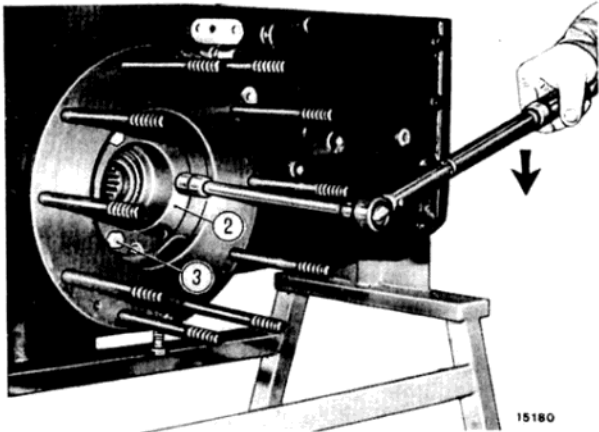


55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

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page 5

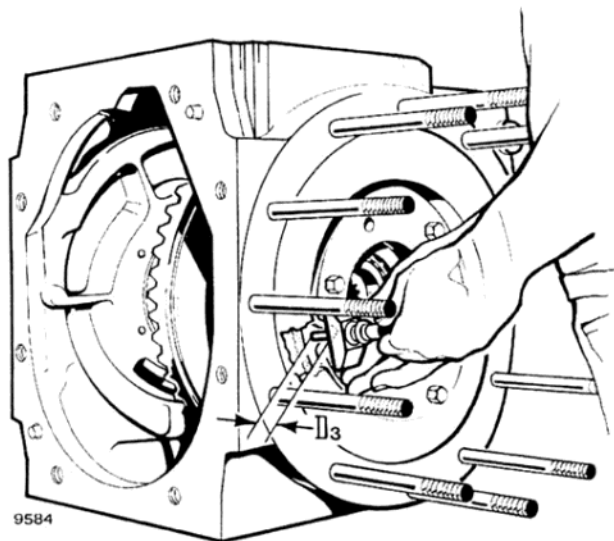


Tightening R.H. support retaining screws (3) for differential bearing adjustment.

Note - After adjustment, bend lockwasher tab (21, page 6) over bearing adjusting nut to prevent workout.

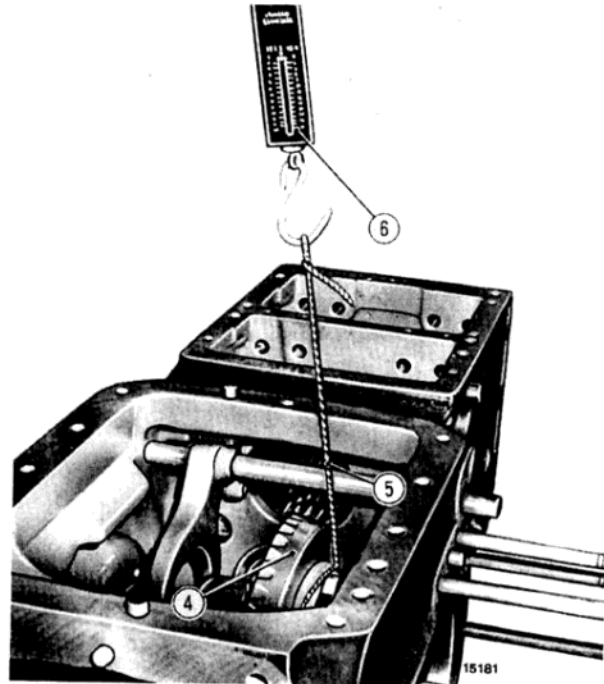
Differential bearing adjustment and bevel drive backlash check.

- With bevel pinion installed, install differential unit with bevel ring gear.
- Secure L.H. support (1, page 6), without shims by tightening three screws (C₂) spaced 90° apart to 59 Nm (6 kgm or 43 ft. lb.) and install differential complete with ring gear.
- Measure thickness (D₁, page 12) of R.H. support and install (without shims) with three equi-spaced and lubricated screws (3).
- Progressively tighten screws (3) in a staggered fashion while simultaneously rotating ring gear to settle bearings until pinion-ring gear rotating



Measuring dimension (D₃) for differential bearing adjustment.

Fiat Trattori



Checking differential bearing rotating torque.

4. Bevel ring gear - 5. Cord - 6. Spring balance.

torque is 9.8 to 14.7 Nm (1 to 1.5 kgm, 7.23 to 10.8 ft lb). Measure torque using a spring balance (6) and a cord (5) wrapped round differential carrier flange. Specified rotating torque is equivalent to a spring balance pull of 98 to 147 N (10 to 15 kg, 22 to 33 lb).

- Apply a depth gauge to the two recesses in the right support and measure dimension (D₃) from the rear transmission housing boss and calculate the arithmetic average of the two readings.
- Total shim pack (S, page 6) to be interposed between housing and right and left supports is calculated as follows:

$$S = D_3 - D_1 + .05$$

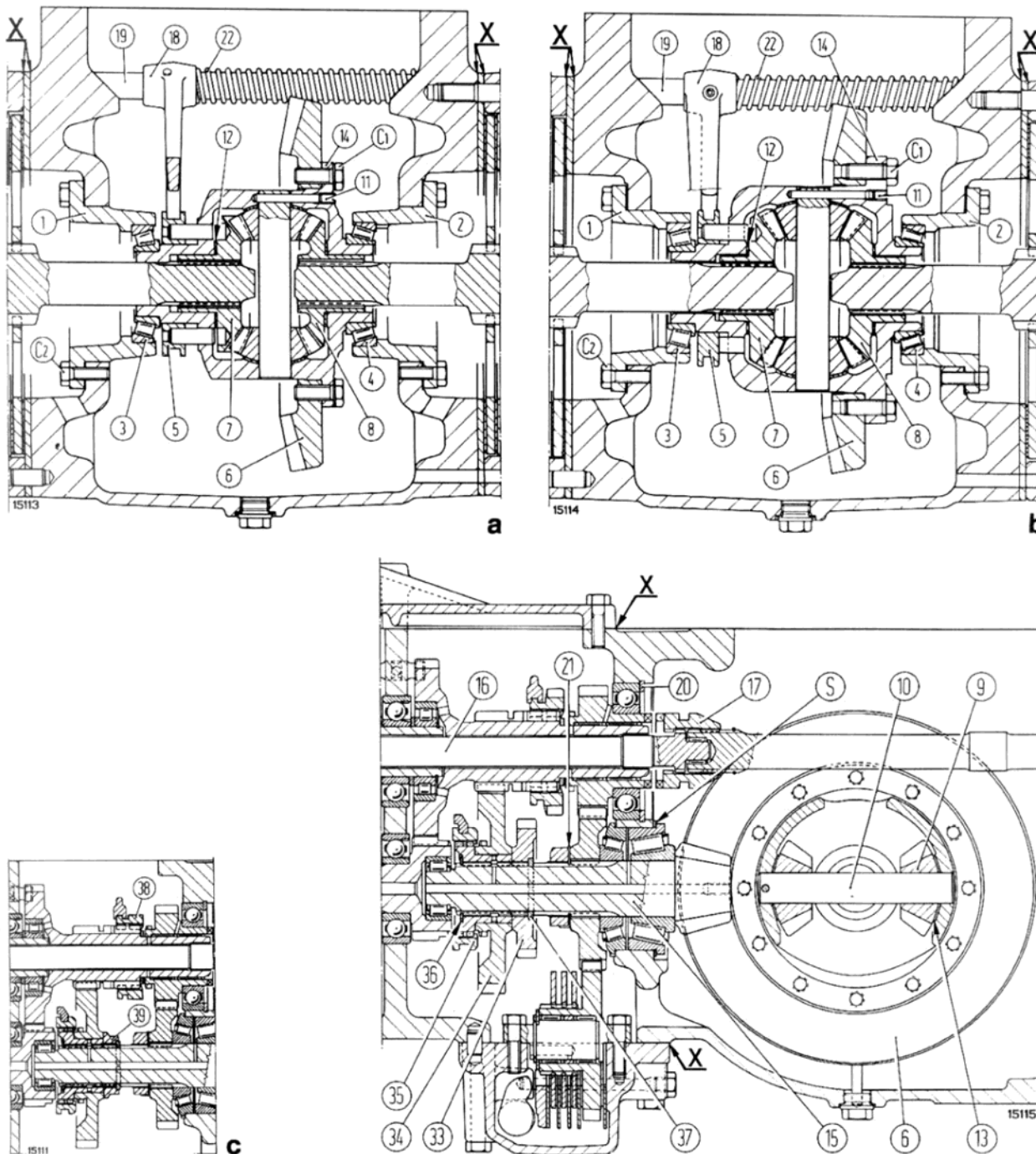
where:

.05 mm = increase needed to reduce preload on bearings generated by capscrews (3). If necessary, round thickness (S) up to the nearest .05 mm.

- Using a suitable dial gauge, measure bevel drive backlash (G) at three equi-spaced points, and average the three readings arithmetically.
- Normal bevel drive backlash is 0.18 to 0.23 mm (0.007 to 0.009 in) (average 0.21 mm, 0.008 in). To compensate for excessive or insufficient backlash, note that the average ratio of normal backlash to equivalent ring gear axial displacement is 1 to 1.4.

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POWER TRAIN: Bevel drive and differential



Longitudinal and cross sections through bevel drive (55-90, 60-90, 70-90 and 80-90).

a. Cross section, 55-90 and 60-90 tractors - b. Cross section, 70-90 and 80-90 tractors - c. Detail of reverser version - C₁. Bevel ring gear retaining screws - C₂. Differential support retaining screws - S. Bevel pinion positioning shims - 1 and 2. Differential supports - 3 and 4. Taper roller bearings - 5. Differential lock sleeve - 6. Bevel ring gear - 7 and 8. Side gears - 9. Differential pinion - 10. Journal - 11. Differential pinion journal retaining screw - 12 and 13. Shims - 14. Differential carrier - 15. Bevel pinion shaft - 16. P.T.O. shaft - 17. P.T.O. control sleeve - 18. Fork - 19. Differential lock shaft - 20. Retaining ring - 21. Lockwasher - 22. Spring - 33. Reverse gear - 34. Low range driven gear - 35. Direct drive/low range sliding sleeve - 36. Retaining ring - 37. Thrust washer - 38. Normal range gear - 39. Spacer.

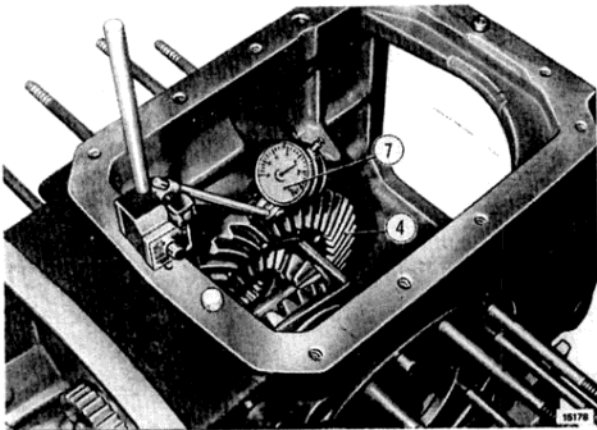
Note - On assembly, thoroughly clean and degrease mating surfaces **X** and apply one of the jointing compounds indicated on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

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page 7



Checking normal bevel drive backlash (specified backlash = 0.18 to 0.23 mm, 0.007 to 0.009 in).

4. Bevel ring gear - 7. Dial gauge.

Consequently, end play (Z) will be:

$$Z = (G - 0.21) \times 1.4$$

where:

G = Bevel drive backlash as measured previously.

- Shim packs (Sd and Ss, page 12) to be inserted on right and left supports are calculated as follows:

$$\begin{aligned} S_d &= S - Z \\ S_s &= Z \end{aligned}$$

where:

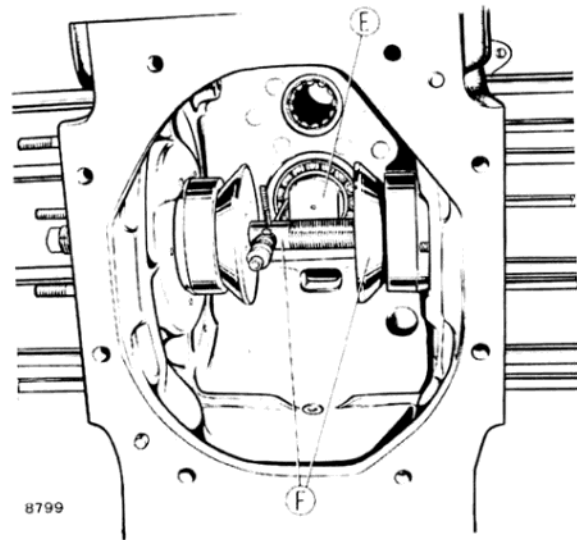
S = total shim thickness.

Z = ring gear end play as assessed above.

- Install the shim packs on the associated supports and check pinion/ring gear assembly rotating torque and bevel drive backlash as directed above.

Example

- Bevel pinion shaft rotating torque = 2.0 Nm (.2 kgm) (23.5N or 2.4 kg at spring balance).
- Right support thickness (D₁) = 12.05 mm
- Pinion/ring gear rotating torque = 9.8 Nm (1.0 kgm) (98N or 10 kg at spring balance).
- Distance (D₃) from right support to rear transmission housing boss: 12.90 mm; 12.70 mm.
- $D_2 = \text{average} = \frac{12.90 + 12.70}{2} = 12.80 \text{ mm.}$
- Total shim thickness:
 $S = 12.80 - 12.05 + .05 = .80 \text{ mm}$
- Bevel drive backlash reading: .43 mm; .45 mm; .41 mm;



Measuring bevel pinion shaft position shim thickness (S, page 14) using universal tool 293510 or special purpose tool 293340/1.

E. Special purpose tool 293340/1 or universal tool 293510 -
F. Universal tool 293400/1.

$$G = \text{average} = \frac{.43 + .45 + .41}{3} = .43 \text{ mm.}$$

- End play (Z) equivalent to shim pack to be installed on left support: $Z = (.43 - .29) \times 1.4 \approx .20 \text{ mm approx.}$
- Shim thickness for right support $S_d = .80 - .20 = .60 \text{ mm.}$ Shim thickness for left support $S_s = .20 \text{ mm.}$

BEVEL DRIVE ADJUSTMENT (90-90, 100-90)

Bevel pinion position adjustment and shim thickness (S, page 14) measurement using universal tool 293510.

- Install universal tool 293510 (A, page 8), with attached bushings 293637 (Q) and (R) plus spacers 293619 (B) and 293625 (C) on rear transmission housing (3) with taper roller bearings (1 and 2) in position; the bearings must be lubricated with engine oil;
- turn tool handle and progressively bring the graduated scale pointer to 200 kg, simultaneously turning the tool to settle the bearings;
- install tool 293400/1 (F) on differential supports (4 and 5, page 8) with attached bearing cups (6 and 7).

POWER TRAIN: Bevel drive and differential

- screw in or back off the two centralizer cones (11) to bring spindle (9) of micrometer (8) in contact with bevel pinion shaft bearing (2);
- adjust centralizer cones (11) by hand or using lock ring wrench **293446** and hand tighten the tool on bearing cups (6 and 7) to take up any end play;
- move micrometer spindle (9) in contact with bearing (2) and measure dimension (H_1);
- establish the corrected nominal dimension (H_2) from ring gear centerline to back of pinion:

$$H_2 = H_7 \pm C$$

where:

$H_7 = 176.5$ mm, nominal distance from ring gear centerline to back of pinion;

C = correction factor stamped on pinion expressed in mm and preceded by + or -, if different from zero, to be added to or subtracted from nominal distance (H_7) depending on sign.

- Shim thickness (S) will be:

$$S = H_1 - H_2$$

where:

H_1 = dimension read off micrometer;

H_2 = corrected nominal distance from ring gear centerline to back of pinion.

Example

- Dimension read off micrometer: $H_1 = 178.8$ mm.
- Nominal distance from ring gear centerline to back of pinion: $H_7 = 176.5$ mm.

- Correction factor: $C = + .1$ mm.

- Corrected nominal dimension: $H_2 = 176.5 + .1 = 176.6$ mm.

- Shim thickness: $S = 178.8 - 176.6 = 2.2$ mm.

- Correction factor: $C = - .1$ mm.

- Corrected nominal dimension: $H_2 = 176.5 - .1 = 176.4$ mm.

- Shim thickness: $S = 178.8 - 176.4 = 2.4$ mm.

- Correction factor: $C = 0$ mm.

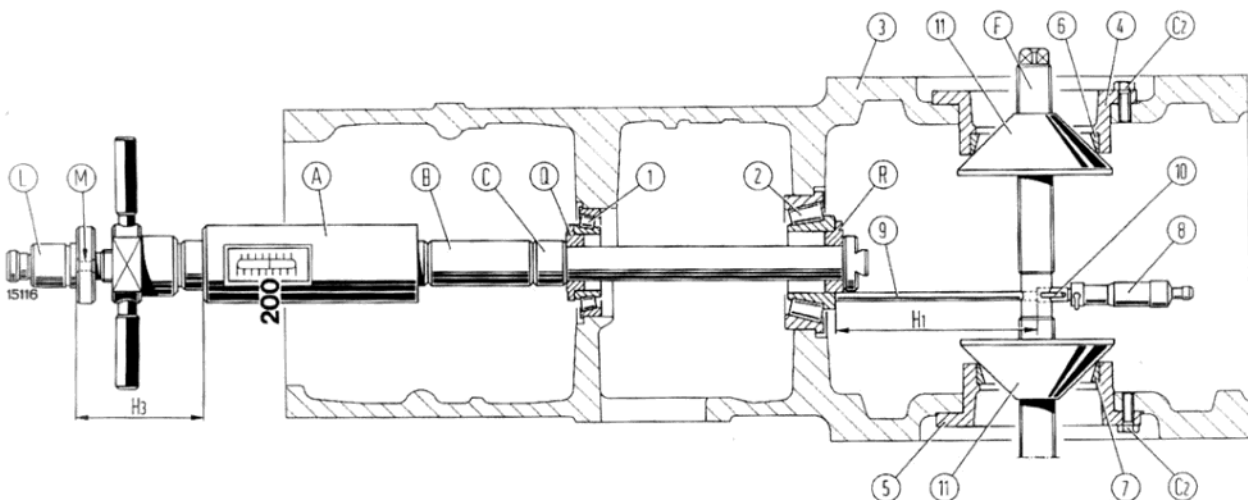
- Corrected nominal dimension: $H_2 = H_7 = 176.5$ mm.

- Shim thickness: $S = 178.8 - 176.5 = 2.3$ mm.

Bevel pinion bearing adjustment using universal tool **293510**

After assessing shim thickness (S , page 14) as directed above, remove universal tool **293400/1** from the rear transmission housing and proceed as follows:

- measure dimension (H_3) using a suitable depth gauge;
- remove tool **293510** (A) from rear transmission housing and reassemble on bench together with adapter **293617** (N, page 9) for clamping in the vice;



Determining bevel pinion shaft position shim thickness (S , page 14) using universal tool **293510**.

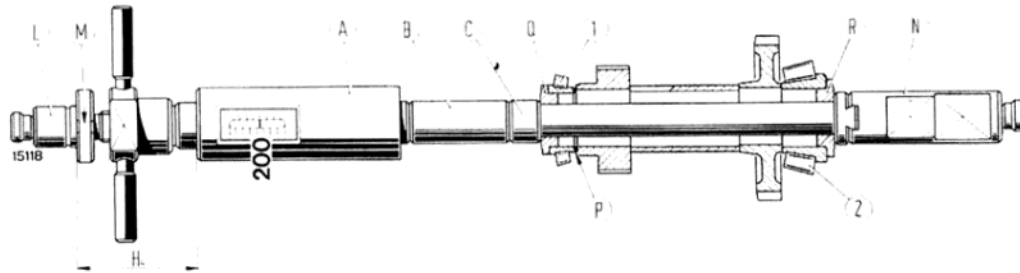
A. Universal tool **293510** - B. Spacer **293619** - C. Spacer **293625** - C2. Capscrew - F. Universal tool **293400/1** - H1. Dimension to be measured with tool - H3. Dimension to be measured with depth gauge - L. Register **293624** - M. Register holes - Q. Bushing **293637** - R. Bushing **293637** - 1. Bearing cone - 2. Bearing cone - 3. Rear transmission housing - 4. Ring gear and differential support - 5. Ring gear and differential support - 6. Bearing cup - 7. Bearing cup - 8. Micrometer - 9. Micrometer spindle - 10. Retaining screw - 11. Centralizer cone.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

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page 9



Measuring bevel pinion bearing shim thickness (Sp, page 14) using universal tool 293510.

A. Universal tool 293510 - B. Spacer 293619 - C. Spacer 293625 - H₄. Dimension to be measured with depth gauge - L. Register 293624 - M. Register holes - N. Adapter 293617 - P. Test shim - Q. Bushing 293637 - R. Bushing 293637 - 1. Bearing cone - 2. Bearing cone.

- install bushing 293637 (Q) and (R), spacers 293619 (B) and 293625 (C), bearing cones (1 and 2), a provisional shim (P) to prevent fouling between spacer, bearing cone (1) and the parts shown;
- return graduated scale pointer of tool to 200 kg and, using a depth gauge, measure dimension (H₄).

Shim thickness (Sp, page 14) to be fitted will be given by the following formula:

$$Sp = H_4 + P + S - H_3 + .05$$

where:

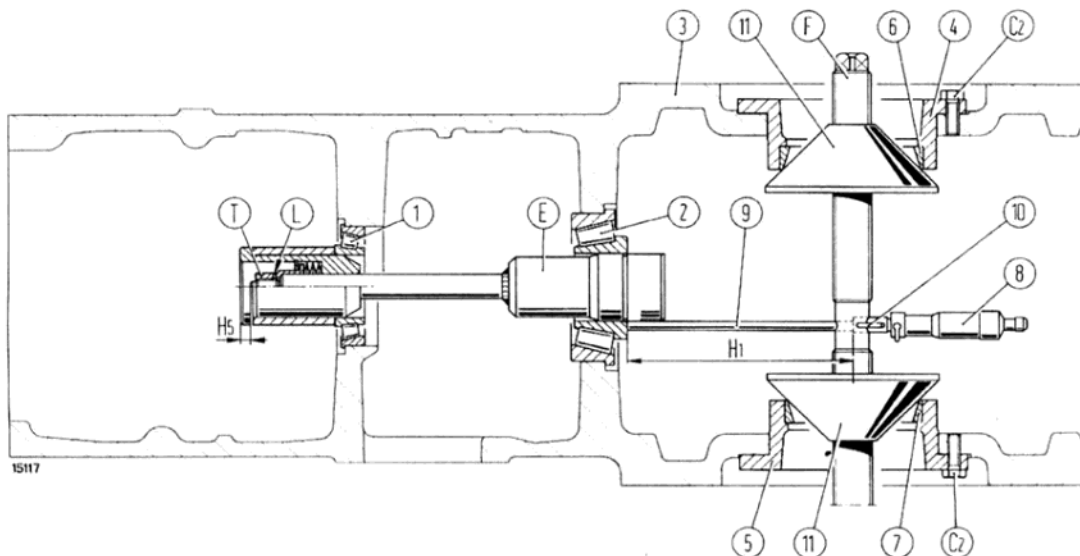
S = bevel pinion position shim thickness determined above;

.05 mm = correction factor for offsetting the increase in bearing preload generated upon pinion shaft nut tightening.

If necessary, round up the value of (Sp) to the nearest .05 mm.

Example:

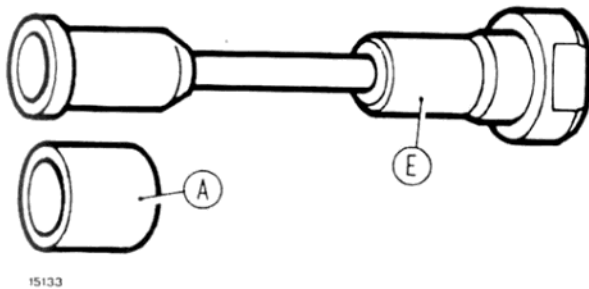
- Bevel pinion position shim thickness determined as directed above: S = 2.4 mm.
- Dimension read off micrometer: H₃ = 89.80 mm.
- Provisional shim thickness: P = 2 mm.
- Dimension read off micrometer: H₄ = 88.60 mm.
- Shim thickness: Sp = 88.60 + 2 + 2.4 - 89.8 + .05 = 3.25 mm.



Measuring bevel pinion shaft position shim thickness (S, page 14) using special purpose tool 293340/1.

C₂. Capscrew - E. Adjuster tool 293340/1 - F. Universal tool 293400/1 - H₁. Dimension measured with tool - H₂. Dimension to be measured with depth gauge - L. Shim (make in workshop) - T. Nut - 1. Bearing cone - 2. Bearing cone - 3. Rear transmission housing - 4. Differential support - 5. Differential support - 6. Bearing cup - 7. Bearing cup - 8. Micrometer - 9. Micrometer spindle - 10. Capscrew - 11. Centraliser cones.

POWER TRAIN: Bevel drive and differential



Parts of tool 293340/1.

A. Spacer - E. Tool.

Bevel pinion position adjustment and shim thickness assessment (S, page 14) using special purpose tool 293340/1.

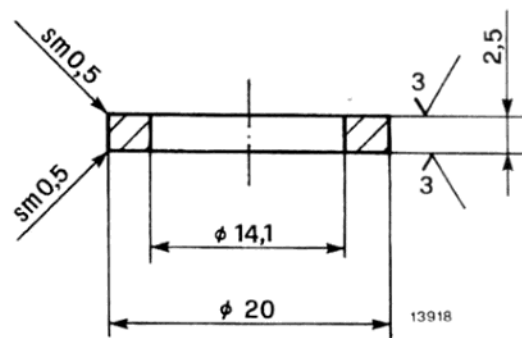
- Install special purpose tool **293340/1** (E) with attached bushing to the rear transmission housing with taper roller bearings (1 and 2, page 9) in position and lubricated with engine oil.
- Install shim made in workshop as above under nut (T, page 9).
- Tighten nut (T), simultaneously turning the tool to settle the bearings.
- Install universal tool **293400/1** (F, page 9) on differential supports (4 and 5) with bearing cups (6 and 7) in position.
- Screw in or back off the two centralizer cones (11, page 9) to return spindle (9) of micrometer (8) in contact with bevel pinion bearing (2).
- Adjust cones (11, page 9) manually or using lock ring wrench **293446** and hand tighten the tool on cups (6 and 7) to eliminate all end play.
- Bring spindle (9, page 9) of micrometer in full contact with bearing (2) and measure dimension (H_1).
- Calculate the correct nominal dimension (H_2) from ring gear centerline to back of pinion as follows:

$$H_2 = H_7 \pm C$$

where:

$H_7 = 176.5$ mm, nominal distance from ring gear centerline to back of pinion;

C = correction factor stamped on pinion, expressed in mm and preceded by + or - sign if diffe-



Shim for tool 293340/1 (stamp tool with number 50025) - dimensions in mm.

Material - C40.

rent from zero, to be added to or subtracted from nominal dimension (H_7) depending on sign.

- Shim thickness (S) will be given by the following formula:

$$S = H_1 - H_2$$

where:

H_1 = dimension read off micrometer;

H_2 = corrected nominal dimension from ring gear centerline to back of pinion.

Example

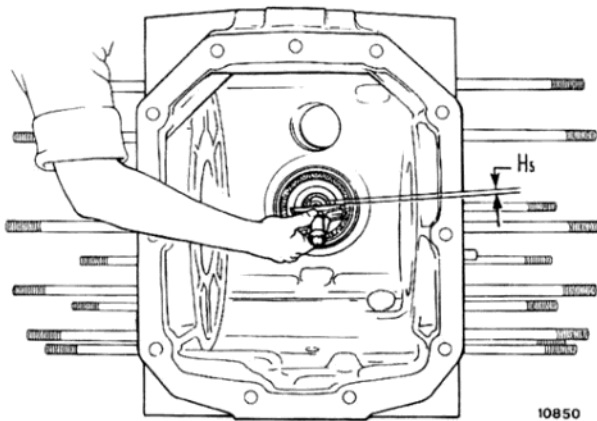
- Dimension read off micrometer: $H_1 = 178$ mm.
- Nominal distance from ring gear centerline to back of pinion: $H_7 = 176.5$ mm.
- Correction factor: $C = + .1$ mm.
- Corrected nominal dimension: $H_2 = 176.5 + .1 = 176.6$ mm.
- Shim thickness: $S = 178 - 176.6 = 1.4$ mm.
- Correction factor: $C = - .1$ mm.
- Corrected nominal dimension: $H_2 = 176.5 - .1 = 176.4$ mm.
- Shim thickness: $S = 178 - 176.4 = 1.6$ mm.
- Correction factor: $C = 0$ mm.
- Corrected nominal dimension: $H_2 = H_7 = 176.5$ mm.
- Shim thickness: $S = 178 - 176.5 = 1.5$ mm.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

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page 11



Measuring bevel pinion bearing (Sp, page 14) using special purpose tool 293340/1.

Hs. Dimension to be read off depth gauge.

Bevel pinion bearing adjustment using special purpose tool 293340/1.

Following assessment of shim thickness (S, page 14) as directed above, remove universal tool 2934001/1 from rear transmission housing and proceed as follows:

- measure dimension (Hs) using a depth gauge;
- remove tool 293340/1 (E) from rear transmission housing and reassemble on the bench using bushing (A) bearing cones (1 and 2) one provisional shim (P) to prevent spacer from fouling bearing cage (1), plus the parts shown;
- tighten nut (T) on tool with shim and measure dimension (H6) using a depth gauge.

Shim thickness (Sp, page 14) is given by the following formula:

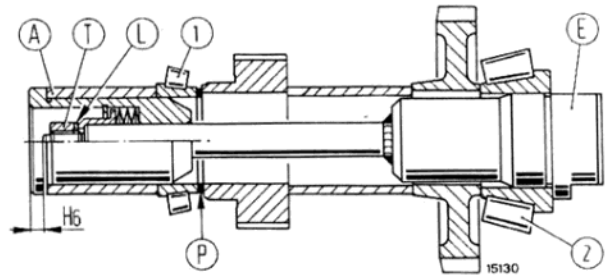
$$Sp = Hs + S + P - H6 + .05$$

where:

S = pinion position shim thickness determined as directed above;

.05 mm = correction factor for offsetting the increase in bearing preload generated upon pinion shaft nut tightening.

If necessary, round up the value of (Sp) to the nearest .05 mm.



Measuring bevel pinion bearing shim thickness (Sp, page 14) using special purpose tool 293340/1.

A. Spacer - E. Adjuster tool 293340/1 - L. Shim - H6. Dimension to be read off depth gauge - P. Test shim - T. Nut - 1. Bearing cone - 2. Bearing cone.

Example

- Bevel pinion position shim thickness assessed as above: $S = 1.6 \text{ mm}$.
- Dimension read off micrometer: $Hs = 10.8 \text{ mm}$.
- Provisional shim thickness: $P = 2 \text{ mm}$.
- Dimension read off micrometer: $H6 = 12.25 \text{ mm}$.
- Shim thickness: $Sp = 10.8 + 1.6 + 2 - 12.25 + .05 = 2.2 \text{ mm}$.

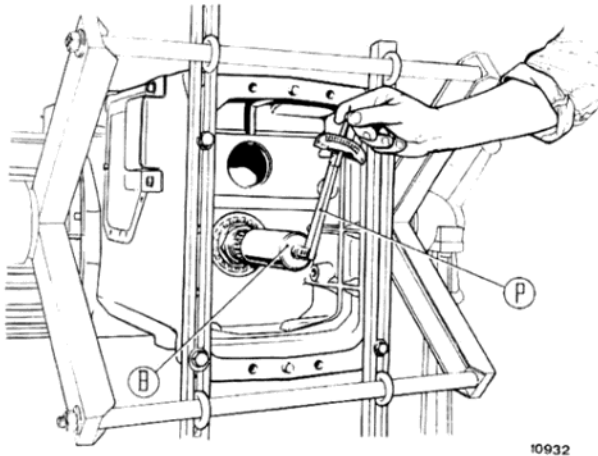
Differential bearing adjustment and bevel drive backlash check.

- Install bevel pinion with shims (S and Sp, page 14) and tighten nut (Cs, page 14) to 294 Nm (30 kgm - 215 ft.lb.), simultaneously turning the bevel pinion shaft to settle the bearings.
- Check bevel pinion shaft rotating torque; the correct torque is 1 to 2 Nm (.100 to .200 kgm - .72 to 1.44 ft.lb.) as measured at the end of the shaft using wrench 293806/1 (B, page 12) and torque wrench 293512 (P). This corresponds to a spring balance pull at spacer (23, page 14) of 30 to 61N (3.1 to 6.2 kg, 6.8 to 13.6 lb.).

Note - If necessary, adjust rotating torque through shims (Sp, page 14).

- Install the differential assembly with attached ring gear and fasten left support (1, page 12) without shims, tightening only 4 capscrews (C2) to 61 Nm (6.2 kgm - 45 ft.lb.).

POWER TRAIN: Bevel drive and differential



Measuring bevel pinion rotating torque.

B. Wrench 293806/1 - P. Torque wrench 293512.

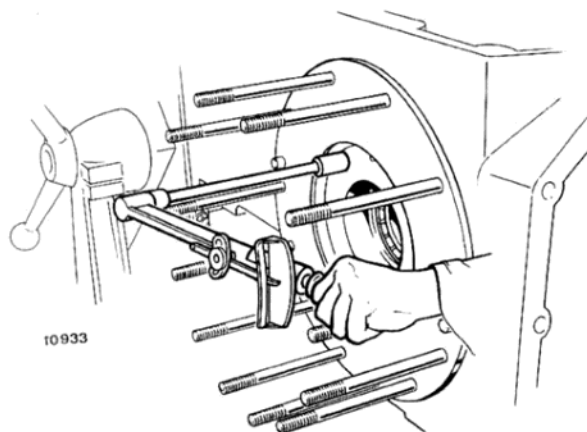
- Measure thickness (D_1) of right support flange (2) and install the support without shims using three capscrews (3) wet and staggered at 90° .
- Tighten capscrews (3) progressively and in staggered sequence, simultaneously turning the ring gear to settle the bearings, until the pinion/ring gear assembly rotating torque is (1.0 to 1.5 Nm) + Rp, (.100 to .150 kgm) + Rp, or (.72 to 1.08 ft.lb.) + Rp; measure the rotating torque at the end of the bevel pinion shaft using wrench 293806/1 (B) and torque wrench 293512 (P);

Rp = torque determined previously for pinion only.

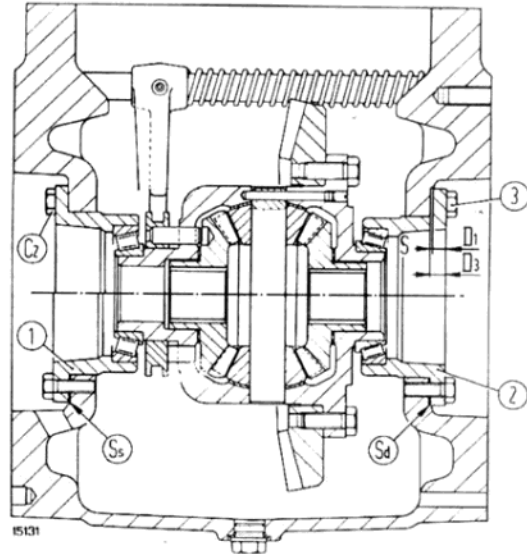
This torque corresponds to a spring balance pull at spacer of (30 to 46 N) + Fp, (3.1 to 4.7) + Fp, or (6.8 to 10.35 lb) + Fp.

Fp = pull determined previously for pinion only.

- Apply a depth gauge to the two recesses in the right support and measure dimension (D_3) from



Tightening left support capscrews for differential bearing adjustment.



Adjusting differential bearings.

C2. Capscrews - D_1 . R.H. support thickness - D_3 . Dimension measured with depth gauge - S. Final R.H. shim - Sd. Final L.H. shim - 1. Left differential support - 2. Right differential support - 3. Capscrews.

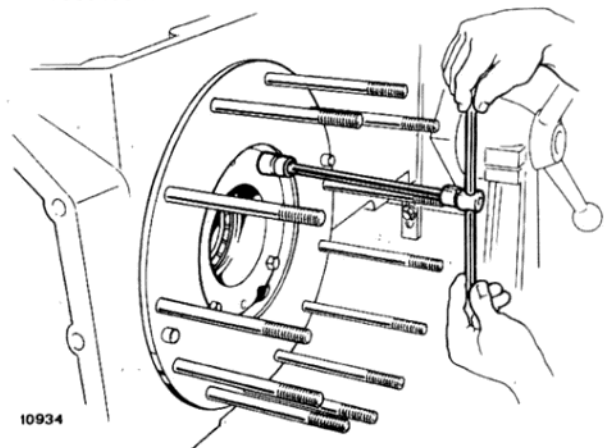
the rear transmission housing boss and calculate the arithmetic average of the two readings.

- Total shim pack (S) to be interposed between housing and right and left supports is calculated as follows:

$$S = D_3 - D_1 + .05$$

where:

.05 mm = increase needed to reduce preload on bearings generated by capscrews (3).
If necessary, round thickness (S) up to the nearest .05 mm.



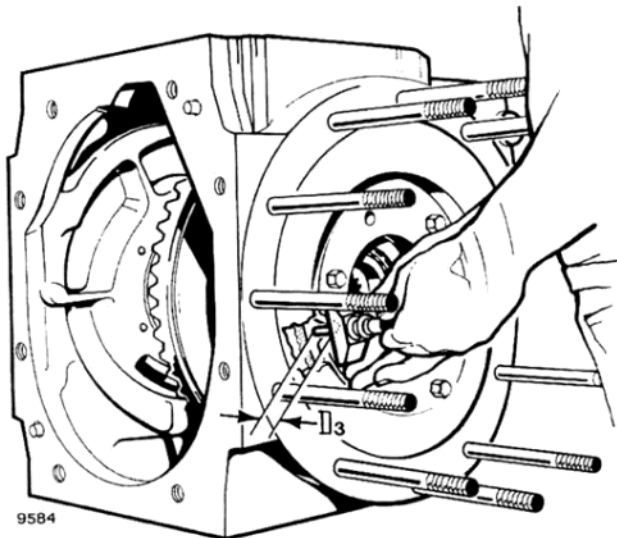
Tightening right support capscrews for differential bearing adjustment.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

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page 13



Measuring dimension (D_3) for differential bearing adjustment.

- Using a suitable dial gauge, measure bevel drive backlash (G) at three equi-spaced points, and average the three readings arithmetically.
- Normal bevel drive backlash is 0.18 to 0.23 mm (0.007 to 0.009 in) (average 0.21 mm, 0.008 in). To compensate for excessive or insufficient backlash, note that the average ratio of normal backlash to equivalent ring gear axial displacement is 1 to 1.4.

Consequently, end play (Z) will be:

$$Z = (G - 0.21) \times 1.4$$

where:

G = Bevel drive backlash as measured previously.

- Shim packs (S_d and S_s , page 12) to be inserted on right and left supports are calculated as follows:

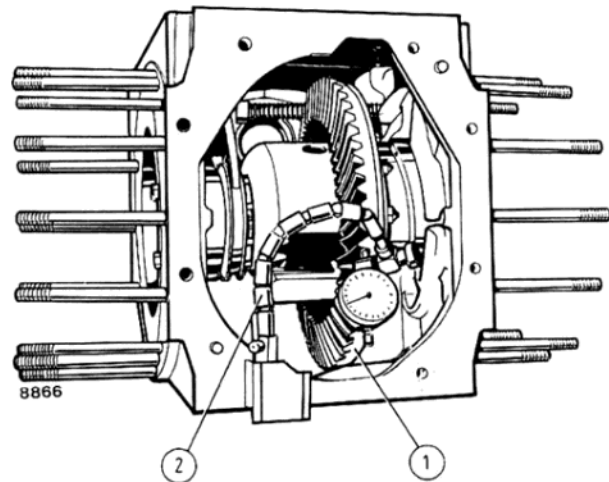
$$\begin{aligned} S_d &= S - Z \\ S_s &= Z \end{aligned}$$

where:

S = total shim thickness.

Z = ring gear end play as assessed above.

- Install the shim packs on the associated supports and check pinion/ring gear assembly rotating torque and bevel drive backlash as directed above.



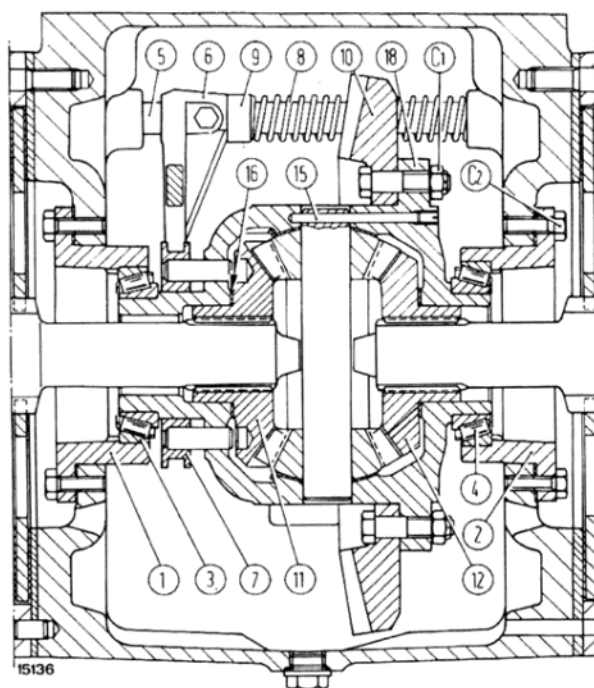
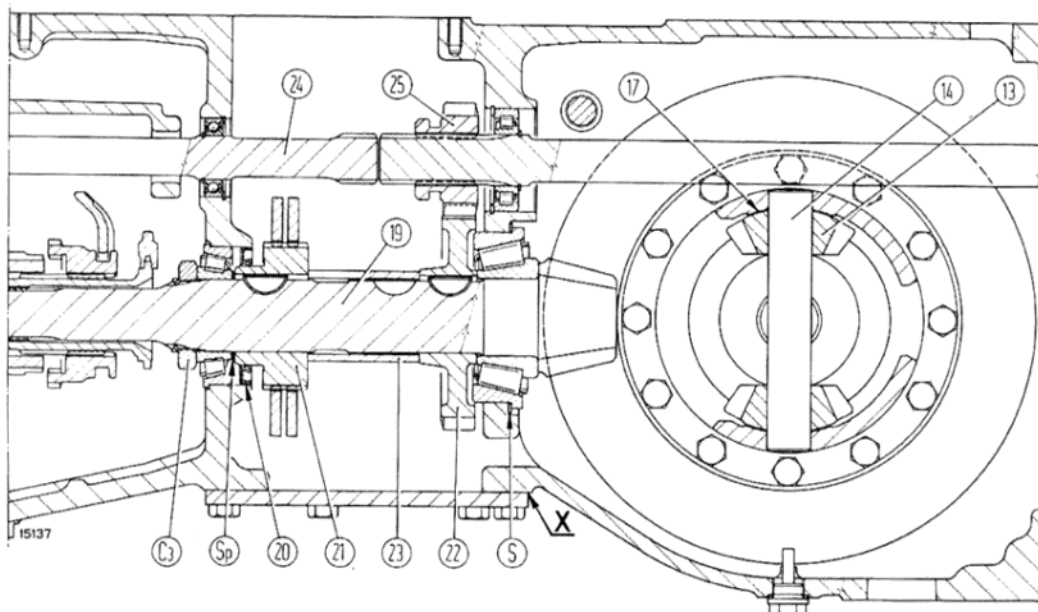
Checking normal bevel drive backlash (specified backlash = 0.18 to 0.23 mm, 0.007 to 0.009 in).

1. Bevel ring gear - 2. Dial gauge.

Example

- Bevel pinion shaft rotating torque = 2.0 Nm (.200 kgm) (61 N or 6.2 kg at spring balance).
- Right support thickness (D_1) = 12.05 mm.
- Pinion/ring gear rotating torque = 3 Nm (0.3 kgm) (91 N - 9.3 kg at spring balance).
- Distance (D_3) from right support to rear transmission housing boss: 12.90 mm; 12.70 mm.
 $D_2 = \text{average} = \frac{12.90 + 12.70}{2} = 12.80 \text{ mm.}$
- Total shim thickness:
 $S = 12.80 - 12.05 + .05 = .80 \text{ mm}$
- Bevel drive backlash reading: .43 mm; .45 mm; .41 mm;
 $G = \text{average} = \frac{.43 + .45 + .41}{3} = .43 \text{ mm.}$
- End play (Z) equivalent to shim pack to be installed on left support: $Z = (.43 - .29) \times 1.4 \approx .20 \text{ mm approx.}$
- Shim thickness for right support $S_d = .80 - .20 = .60 \text{ mm.}$
 Shim thickness for left support $S_s = .20 \text{ mm.}$

POWER TRAIN: Bevel drive and differential



Longitudinal and cross sections through bevel drive and differential.

C₁. Ring gear nut - C₂. Capscrews - C₃. Bevel pinion nut - S. Bevel pinion positioning shim - Sp. Differential bearing shim - 1 and 2. Differential supports - 3 and 4. Taper roller bearings - 5. Differential lock shaft - 6. Shaft - 7. Differential lock sleeve - 8. Spring - 9. Spacer - 10. Bevel ring gear - 11 and 12. Side gears - 13. Differential pinion - 14. Journal - 15. Differential pinion journal retaining screw - 16 and 17. Shims - 18. Differential carrier - 19. Bevel pinion shaft - 20. Seal - 21. Parking brake hub - 22. Ground speed PTO drive gear - 23. Spacer - 24. PTO shaft - 25. PTO engagement sleeve.

Note — On assembly, thoroughly clean and degrease mating surfaces **X** and apply one of the jointing compounds indicated on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

25

page 15

DIFFERENTIAL PINION AND SIDE GEAR BACKLASH ADJUSTMENT (all models)

Install two side gears (7 and 8, page 6 for 55-90, 60-90, 70-90 and 80-90) or (11 and 15, page 14, 90-90 and 100-90) on differential carrier without shims (12, 55-90, 60-90, 70-90 and 80-90) or (16, 90-90 and 100-90).

Install differential pinions (9, 55-90, 60-90, 70-90 and 80-90) or (13, 90-90 and 100-90) with washers and journals.

Tighten journal retaining screws by a few turns to prevent work out.

Bring L.H. side gear into full contact with differential pinion and using a depth gauge, measure dimension (H_1) at two diametrically opposed points and average the two readings.

Then push side gear into contact with differential carrier and measure dimension (H_2).

Repeat the same operations on R.H. side gear.

End float of each side gear without shim will be given by:

$$G_s \text{ or } G_d = H_1 - H_2$$

where:

G_s = L.H. side gear end float.

G_d = R.H. side gear end float.

H_1 and H_2 = Dimensions measured on L.H. or R.H. side gears.

Normal differential pinion and side gear backlash is 0.15 mm (0.006 in) for models 55-90 and 60-90, 0.18 mm (0.007 in) for models 70-90 and 80-90, and 0.20 mm (0.0078 in) 90-90 and 100-90.

Note that average ratio of normal backlash to the equivalent side gear end float is **1 to 1.7**.

Side gear end float corresponding to normal backlash will be:

$0.15 \times 1.7 = 0.25 \text{ mm}$ (0.010 in) for models 55-90 and 60-90;

$0.18 \times 1.7 = 0.30 \text{ mm}$ (0.012 in) for models 70-90 and 80-90;

$0.20 \times 1.7 = 0.34 \text{ mm}$ (0.013 in) for models 90-90 and 100-90.

Consequently, thickness of shims to be installed on differential carrier will be given by:

$S_s = G_s - 0.25 \text{ mm}$ (0.010 in) (for L.H. side gear, models 55-90 and 60-90);

$S_d = G_d - 0.25 \text{ mm}$ (0.010 in) (for R.H. side gear, models 55-90 and 60-90);

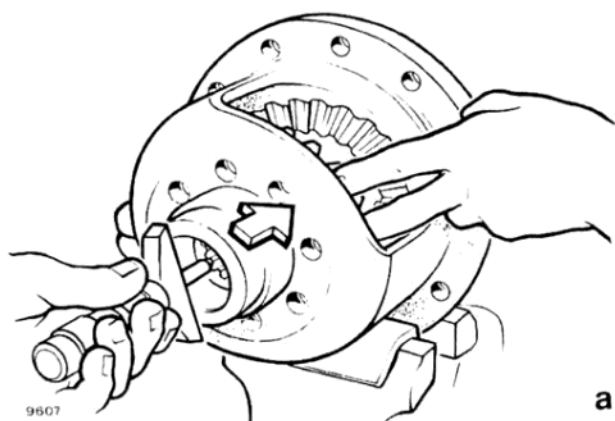
$S_s = G_s - 0.30 \text{ mm}$ (0.012 in) (for L.H. side gear, models 70-90 and 80-90);

$S_d = G_d - 0.30 \text{ mm}$ (0.012 in) (for R.H. side gear, models 70-90 and 80-90);

$S_s = G_s - 0.34 \text{ mm}$ (0.013 in) (for L.H. side gear, models 90-90 and 100-90);

$S_d = G_d - 0.34 \text{ mm}$ (0.013 in) (for R.H. side gear, models 90-90 and 100-90);

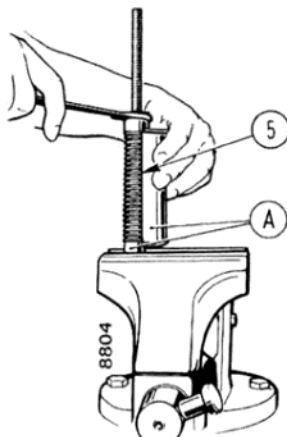
Available shims are 1.5 and 1.6 mm (0.059 and 0.063 in). Install shim which is closest to the calculated thickness.



Determining side gear shim thickness (12, page 6, 55-90, 60-90, 70-90 and 80-90) or (16, page 14, 90-90 and 100-90).

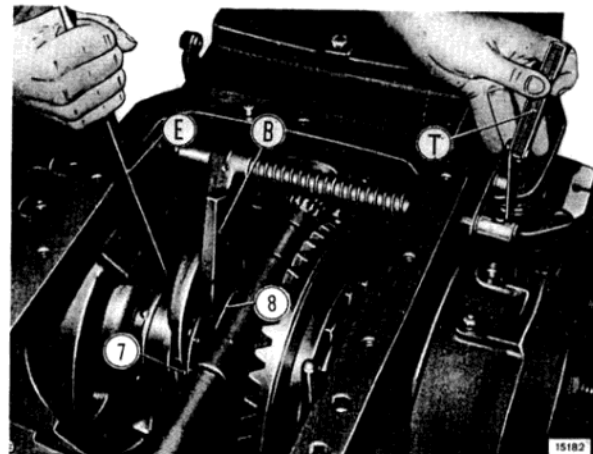
a. Measuring dimension (H_1) - b. Measuring dimension (H_2).

POWER TRAIN: Bevel drive and differential



Installing differential lock.

A. Tool 293452 - 5. Spring.



Adjusting differential lock sleeve stroke.

B. Gauge made in workshop - E. Lever G. Sleeve stroke - T. Feeler gauge - 7. Sleeve - 8. Differential carrier.

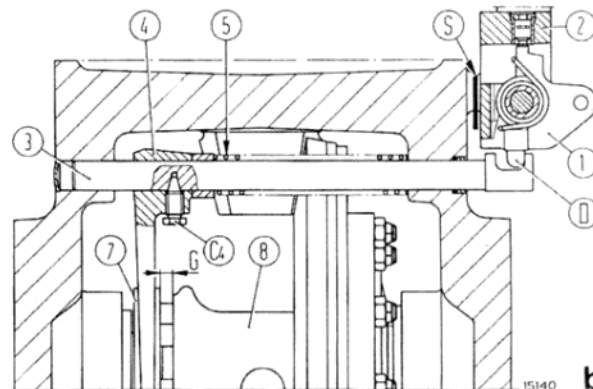
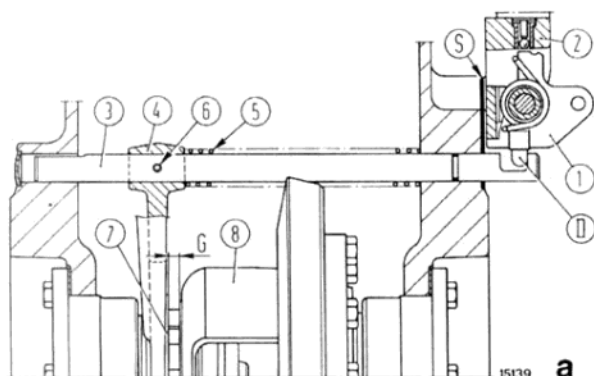
DIFFERENTIAL LOCK INSTALLATION AND ADJUSTMENT

Assemble differential lock using tool 293452 (A) to compress return spring (5) and to insert roll pin (6) 55-90, 60-90, 70-90 and 80-90) or screw (C₄, 90-90 and 100-90) which secures fork (4) in its seat on shaft (3).

Check that clearance (i.e., sleeve stroke) between engagement sleeve and differential carrier is 8.1 to 8.2 mm (0.31 to 0.32 in) for all models.

To check clearance, make a gauge as shown on page 17 and proceed as follows:

- Install hydraulic lock release unit (2) without shim (S);
- Insert gauge (B) with 8.1 to 8.2 mm shim between sleeve (7) and differential carrier (8) to contact sleeve working surface on carrier.
- Using a lever (E) bring sleeve (7) in contact with gauge (B) and carrier (8). Lever should be applied adjacent to gauge.



Sections through differential lock sleeve.

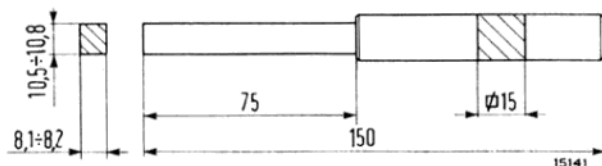
a. 55-90, 60-90, 70-90 and 80-90 - b. 90-90 and 100-90 - C₄. Fork capscrew (90-90 and 100-90) - D. Pivot - G = 8.1 to 8.2 mm. (0.31 to 0.32 in) Sleeve stroke - S. Shim - 1. Differential lock lever - 2. Hydraulic lock release unit - 3. Fork shaft - 4. Fork - 5. Spring - 6. Roll pin (55-90, 60-90, 70-90 and 80-90) 7. Differential lock sleeve - 8. Differential carrier.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Bevel drive and differential

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page 17



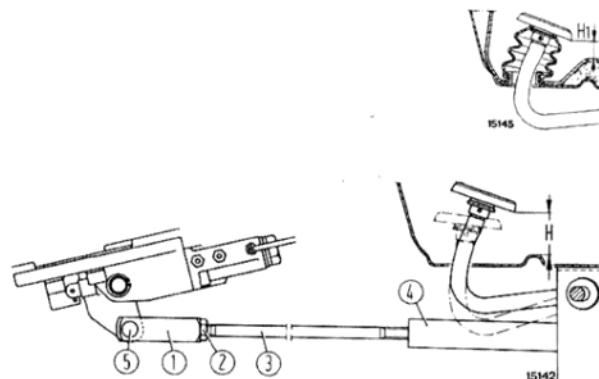
Differential lock sleeve stroke gauge - Dimensions in mm
(Stamp gauge with number 50041).

Material - 40 Cr Mo4.

- Using feeler gauge (T, page 16), measure clearance between pivot (1) and associated seat on shaft (3).
- Install a shim (S, page 16) of thickness equal to the measured clearance beneath the hydraulic lock release unit.

Differential lock pedal adjustment.

Pedal distance (H) from platform must be 35 to 40 mm (1.37 to 1.57 in) in order to secure differential



Adjusting differential lock pedal.

- a. Detail of cab version - $H = 35$ to 40 mm (1.37 to 1.57 in)
Pedal distance from platform rib - $H_1 = 15$ to 20 mm (0.59 to 0.78 in)
Pedal distance from cab floor - 1. Adjusting fork - 2. Lock nut - 3. Link - 4. Adjusting fork - 5. Pivot.

lock sleeve engagement. For tractors with cab, distance (H_1) from pedal to floor must be 15 to 20 mm (0.59 to 0.78 in).

To adjust this distance, withdraw pivot (5), slacken locknut (2) and tighten or back off link (3) on fork (1) as necessary.
After adjustment, secure pivot through cotter pin and lock nut (2).

POWER TRAIN

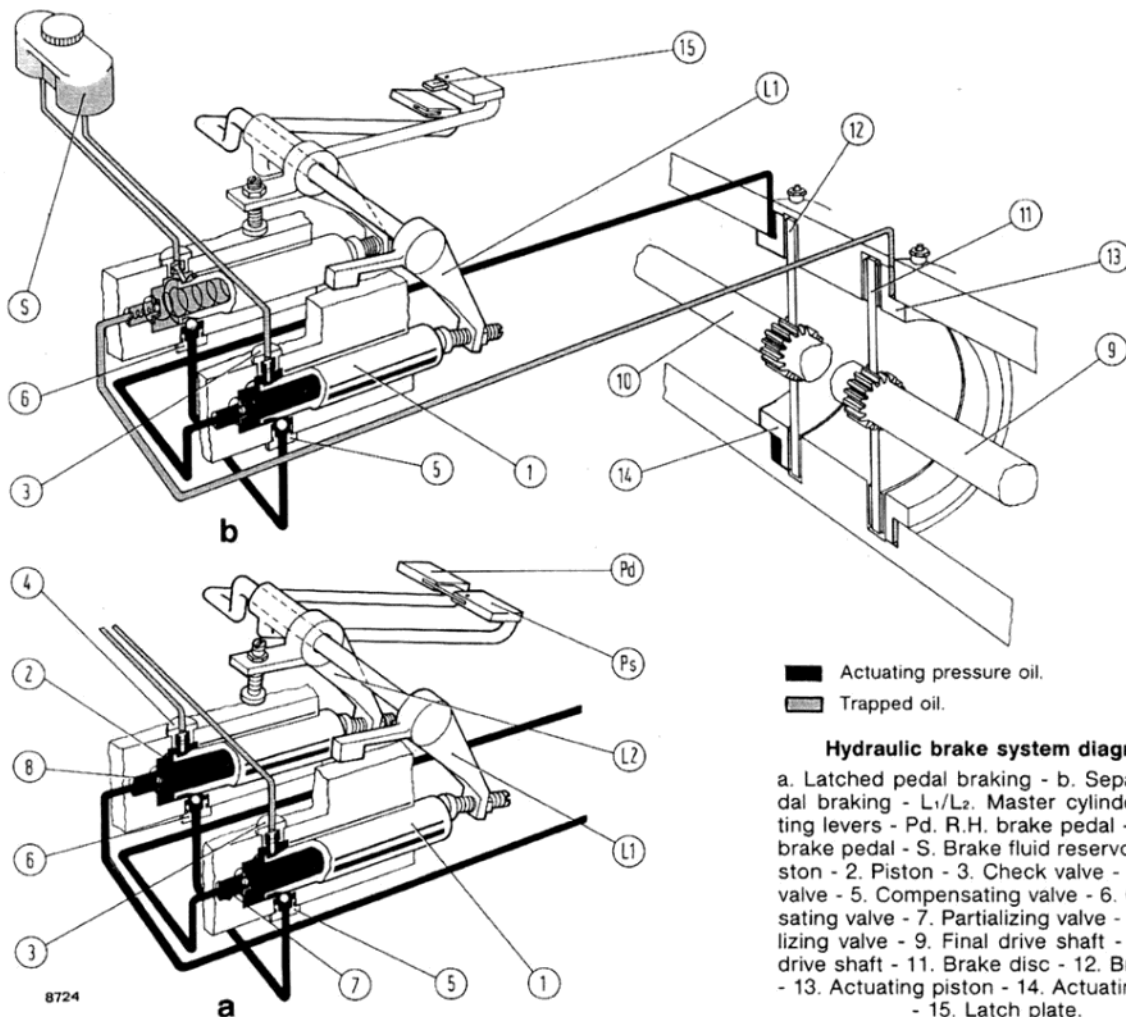
55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Brakes

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page 1

HYDRAULIC SYSTEM OPERATION



Latched pedal braking.

Upon brake application, actuating levers (L₁ and L₂) activate pistons (1 and 2).

Piston operation causes check valves (3 and 4) to cut off the fluid line from the reservoir (S) and simultaneously opens compensating valves (5 and 6) which keep the pressure uniform throughout the circuit. During their stroke, the pistons compress the fluid inside the master cylinder body which, through partializing valves (7 and 8), acts on brake actuating pistons.

On full braking, the circuit pressure is approximately 17.6 bar (18 kg/cm², 256 psi).

When the brake pedals are released, oil pressure flows from the annular actuating cylinder chambers to the master cylinder body through the restrictions in the partializing valve cups.

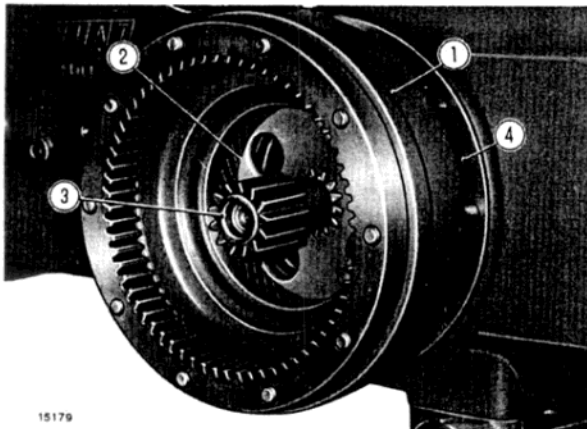
The small restriction cause the oil pressure to flow slowly, thereby resulting in a gradual return of the brake pedals.

The actuating pistons return to their rest position, the check valve plates are displaced, the line to the reservoir is opened and the compensating valves close.

Individual pedal braking.

Master cylinder piston (1) actuated by lever (L₁), moves the plate of check valves (3) to close the line from the reservoir, opens the associated compensating valve (5) and causes a pressure build-up in the relevant actuating cylinder. In these conditions, compensating valve (6), which remained closed, prevents oil pressure from reaching the other actuating cylinder.

POWER TRAIN: Brakes



Disassembling/assembling brake unit.

1. Brake cylinder - 2. Brake disc - 3. Final drive shaft - 4. Brake wear plate.

Note - The twin section fluid reservoir supplies the two master cylinders separately to maintain brake effectiveness in the event of brake line failure.

housing retrieving disc (2), shaft (3) and wear plate (4);

- check brake discs (4) and (2) for wear and replace if sintered coat is excessively worn (see wear limits, page 9, section 20).

Overhaul brake unit referring to the illustration and noting the following points:

- before disassembling brake piston (2), apply reference marks on both piston and cylinder (1) for correct matching of dowels (5) to seats (6) on assembly;
- should seals (3 and 4) need replacing, smear with **grassofiat TUTELA G9** before installation. Ensure that they are correctly seated to prevent damage on piston installation;
- degrease and thoroughly clean wear plate and brake cylinder mating surfaces and apply one of the jointing compounds mentioned on page 6, section A, before installation on rear transmission housing as shown on page 3, section 27.

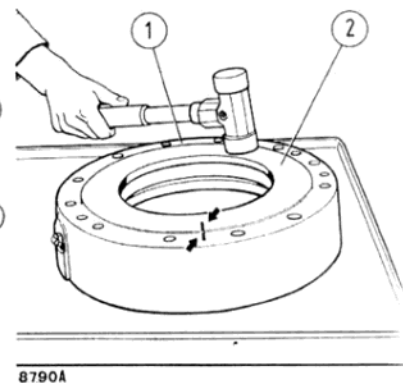
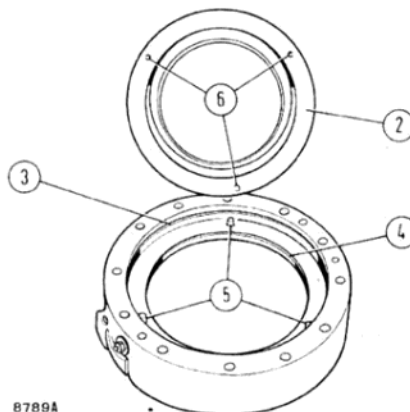
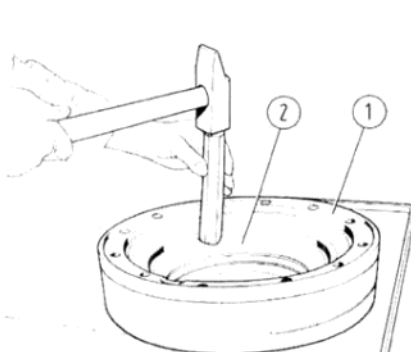
BRAKE UNIT ASSEMBLY AND DISASSEMBLY

To disassemble the brake unit:

- remove final drive ssembly;
- disconnect oil line union;
- remove brake cylinder (1) from transmission

To gain access to the master cylinder:

- remove RH side panel;
- disconnect battery negative lead;
- drain oil from brake circuit;



Disassembling/assembling brake cylinder piston.

1. Cylinder - 2. Piston - 3/4. Seal - 5/6. Dowels and seats

Note - Reference marks to be applied for correct assembly arrowed.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Brakes

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page 3

- Remove panel from dashboard frame;
- disconnect the master cylinder inlet lines, slackening the associate clips;
- disconnect the master cylinder outlet line unions;
- remove the capscrews and master cylinder with attached pedals;
- remove retaining rings (2 and 3) and withdraw right and left brake pedals (Pd and Ps).

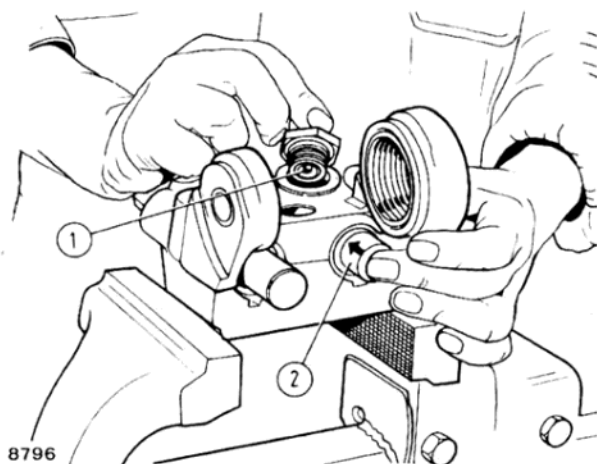
On master cylinder disassembly, note that pistons (8 and 9, page 4) should be withdrawn from outlet line side.

Check master cylinder bore and piston working surfaces for oxidation and roughness; piston clearance in the master cylinder should be as specified on page 9, section 20.

Check seals and replace if necessary.

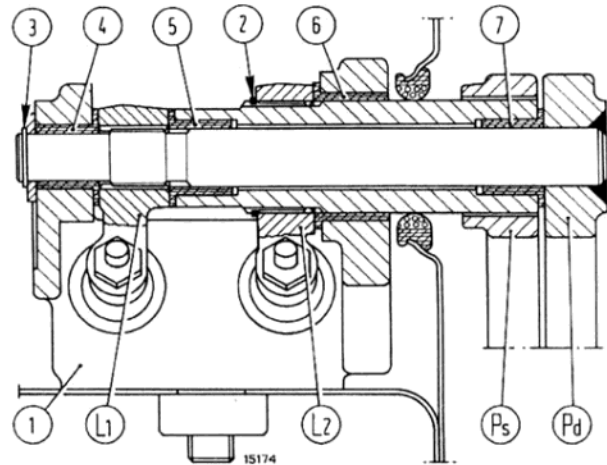
On assembly, install check valves on master cylinder before introducing the pistons to prevent piston from fouling check valve plate.

Note - When installing a check valve on a master cylinder with piston already in position, move the piston forward to prevent check valve plate damage.



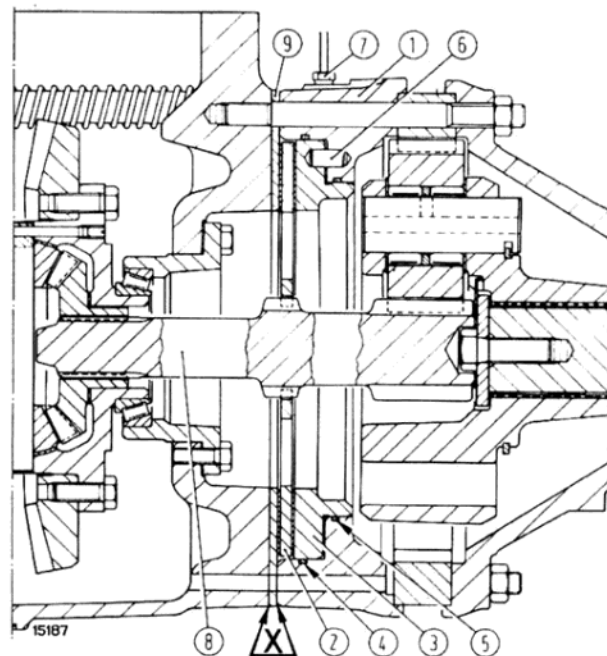
Installing check valve on master cylinder.

1. Valve plate. - 2. Master cylinder piston.



Section through pedal linkage and master cylinder control lever.

L1/L2. Master cylinder control levers - Pd. RH brake pedal - Ps. LH brake pedal - 1. Master cylinder body - 2/3. Retaining rings - 4/5/6/7. Bushings.

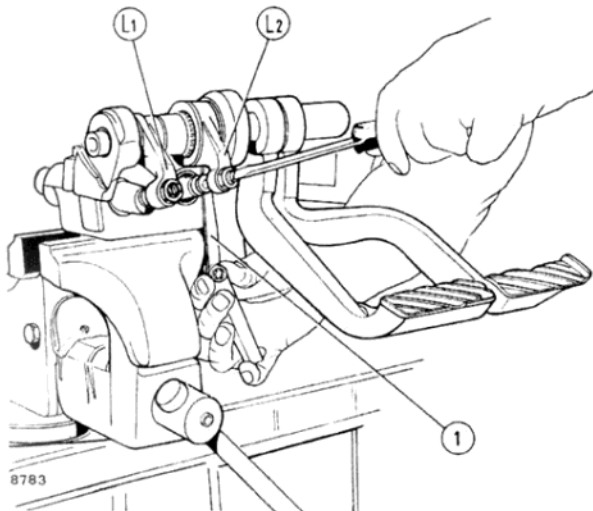


Longitudinal section through brake unit.

1. Brake cylinder - 2. Disc installed on RH final drive shaft - 3. Brake piston - 4/5. Seals - 6. Dowel - 7. Brake oil line union - 8. RH final drive shaft - 9. Brake wear plate.

Note - On assembly, thoroughly clean faces X to be mated and smear with jointing compound (see page 6, section A).

POWER TRAIN: Brakes



Adjusting pedals on bench.

1. Feeler gauge - L₁/L₂. Master cylinder actuating levers.

BRAKE PEDAL ADJUSTMENT

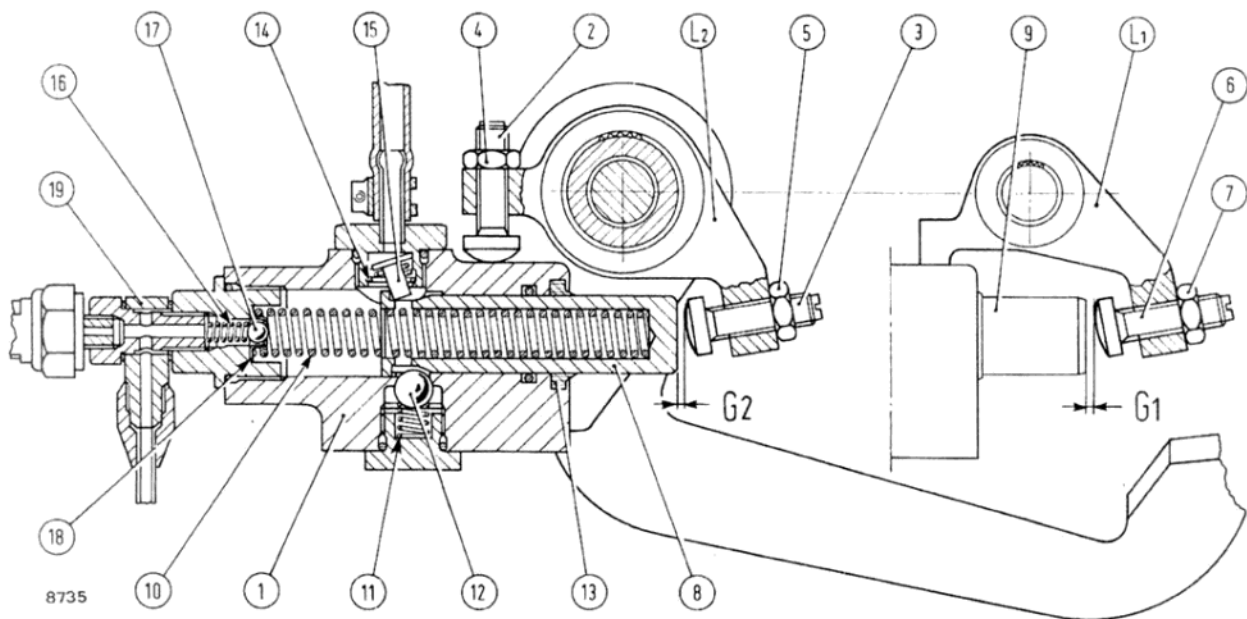
Install the LH brake pedal with attached bushings on the master cylinder body (1) followed by lever (L₂) with adjusting screws (2 and 3) and lock in position using retaining ring (2, page 3). Install RH pedal on lever (L₁) so that the front of the lever rests on master cylinder body and reference marks on lever (L₁) and RH pedal pivot are aligned.

Turn adjusting screw (6) until .1 to .2 mm (.004 to .008 in) clearance (G₁) is obtained and lock in position using lock nut (7). Align the two pedals through the latch plate.

Turn adjusting screw (2) until it contacts the master cylinder body and lock in position by means of lock nut (4).

Tighten adjusting screw (3) to obtain a .1 to .2 mm (.004 to .008 in.) clearance (G₂) and lock in position using lock nut (5).

Note - This adjustment may be carried out with the master cylinder in position on the tractor or on the bench.



Section through master cylinder.

G₁/G₂ = .1 to .2 mm. (.004 to .008 in.) piston clearance - L₁/L₂. Control levers - 1. Master cylinder body - 2/3. Adjusting screws - 4/5. Lock nuts - 6. Adjusting screw - 7. Lock nut - 8/9. Pistons - 10. Piston return spring - 11/12. Compensating valve spring and ball - 13. Seal - 14/15. Check valve spring and plate - 16/17/18. Partialising valve spring, ball and cup - 19. Outlet union.

55-90 60-90
70-90 80-90
90-90 100-90

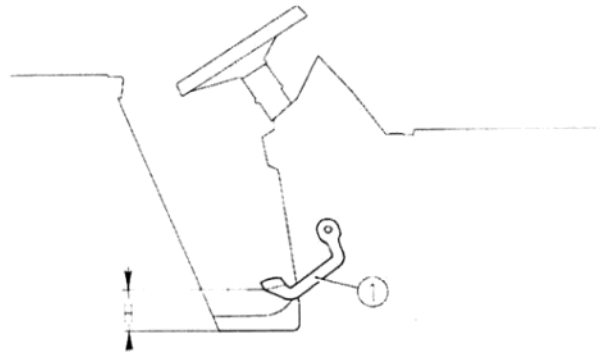
POWER TRAIN: Brakes

26

page 5

BRAKE PEDAL INSTALLATION

On installation, mate the splined pedal shafts with the associated levers to obtain dimension (H) shown in diagram.

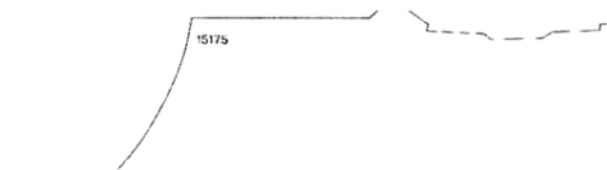


BRAKE SYSTEM BLEEDING

Brake bleeding becomes necessary whenever the brake hydraulic lines have been disconnected or uneven braking is detected.

When bleeding the system note the following points:

- thoroughly clean the area surrounding the bleed screws and the hydraulic oil reservoir cover;
- ensure that the fluid level in brake reservoir is topped up prior to and during bleeding;
- depress LH brake pedal **slowly through full stroke** to build up fluid pressure;
- hold the pedal depressed, back off bleed screw (C) through half a turn and allow the air to escape;
- screw in the bleed screw (C) and repeat the above operation until the issuing fluid is free from air bubbles;

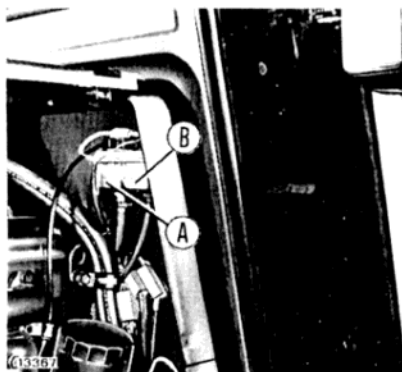


Installing brake pedals.

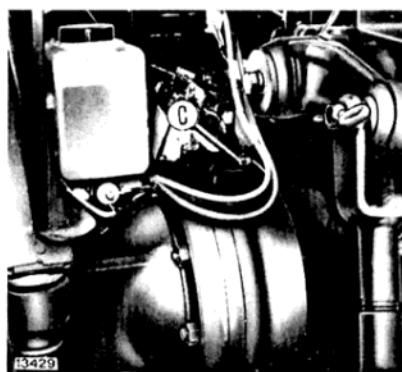
H = 150 mm (5.9 in.) height of brake pedals above control platform floor - 1. Brake pedals.

- operate the brake pedal again and check that the pressure builds up without erratic pedal movement;
- repeat the above sequence on the RH brake circuit;
- finally, top up the fluid reservoirs.

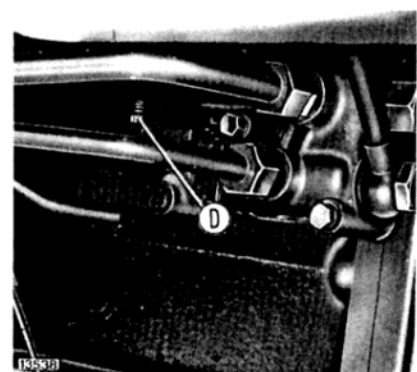
Note: For tractors equipped with trailer brake remote control valve, bleed air first from screw (C, fig. b) and then through screw (D, fig. c) located on valve.



a



b



c

Bleeding brake system (figs. a and b) and trailer brake remote control valve (fig. c).

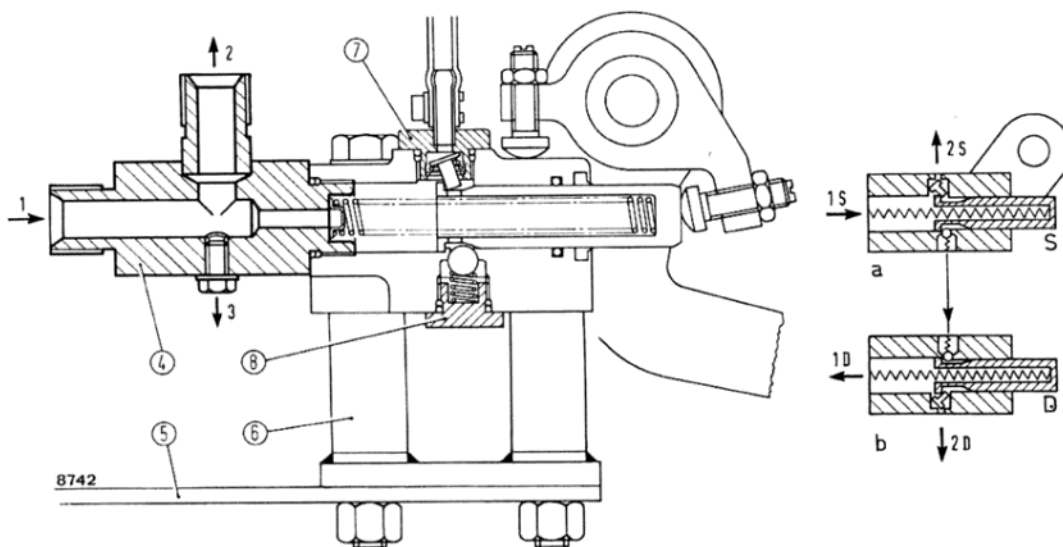
A/B. Right and left brake fluid reservoirs - C/D. Bleed screws.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Brakes

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page 7



Three-way fitting 293534 in position on master cylinder under test.

a. Master cylinder with 3-way fitting - b. Master cylinder not under test - D/S. Master cylinder pistons - 1D/2D/1S/2S. Ports - 1. Flow control valve outlet - 2. Return to tester - 3. Pressure gauge connection point - 4. 3-way fitting 293534 - 5. Master cylinder support plate 290488/2 - 6. Master cylinder support 293560 - 7. Check valve - 8. Compensating valve.

1. Check valve leakage test.

Place piston (S) in operating position (i.e. 5 mm or .197 in stroke) and bring circuit pressure to 14.5 bar (15 kg/cm², 213 psi).

Check the amount of leaking fluid in the graduate; the amount of fluid should be less than 2.5 cu.cm/min). Return the piston to its rest position.

2. Check valve cut-off test.

Slowly move piston (S) forward and check the distance at which the fluid ceases to issue from fitting 293535; the correct stroke is 2.2 to 2.8 mm (.087 to .110 in).

3. Compensating valve cut-in test (on master cylinder not under test).

Move pistons (S) of master cylinder under test to 5 mm or .197 in stroke (equivalent to the operation position) and slowly move piston (D) forward by 2 to 4 mm (.079 to .157 in); in these conditions, the fluid should issue from port (1D).

Repeat operations 1, 2 and 3 on the second master cylinder to be tested.

TRANSMISSION BRAKE - REMOVAL AND INSTALLATION (50-90, 60-90, 70-90 and 80-90)

Disassemble transmission brake unit as follows:

- Drain transmission housing oil;

- For four-wheel drive models, remove drive shaft as described on page 1, section 42 and remove link (64, page 3, section 42) from outer front-wheel drive relay lever (19);

Remove two-wheel drive model brake unit on bench as follows:

- Take out capscrews (C₂, page 8) and remove shaft (24) together with gear (22) and brake driven discs (17);
- Remove guide screws (26) and retrieve linings (16).

Disassemble four-wheel drive model brake unit on bench as follows:

- Remove roll pin (45, page 3, section 42) using a suitable punch;
- Withdraw intermediate shaft (46) and remove gear (48) together with needle roller bearing (47) and thrust washers.
- Remove dust seal (28), seal (39) and retaining ring (40) from axle drive housing and take out driven shaft (43) with ball bearing and oil seal.
- Remove guide screws (54) and retrieve linings (53).

Check linings (16, page 8) for wear and inspect driven disc surfaces (17, for two-wheel drive models) or lining (53, page 3, section 42) and driven disc (57) surfaces for four-wheel drive models.

POWER TRAIN: Brakes

On reassembly, refer to figure below (2-wheel drive) or on page 3, section 42 (4-wheel drive) for correct part positioning.

Before installing brake support on transmission housing, thoroughly clean and degrease mating surfaces and apply a 2 mm (0.08 in) bead of jointing compound as shown in figure on page 9.

Jointing compound types are indicated on page 6, section A.

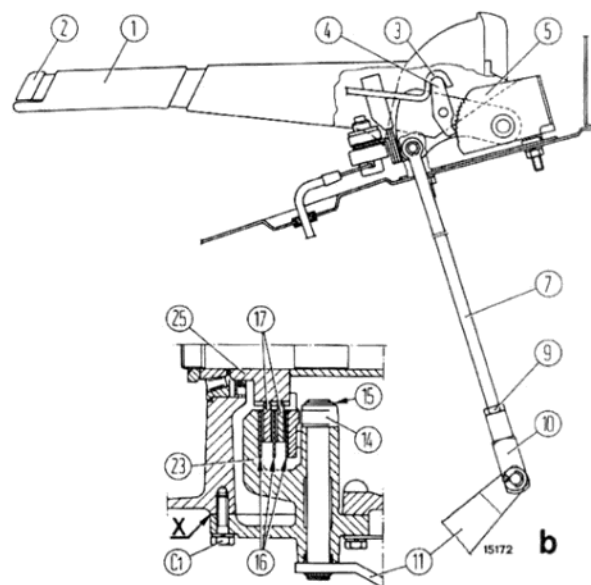
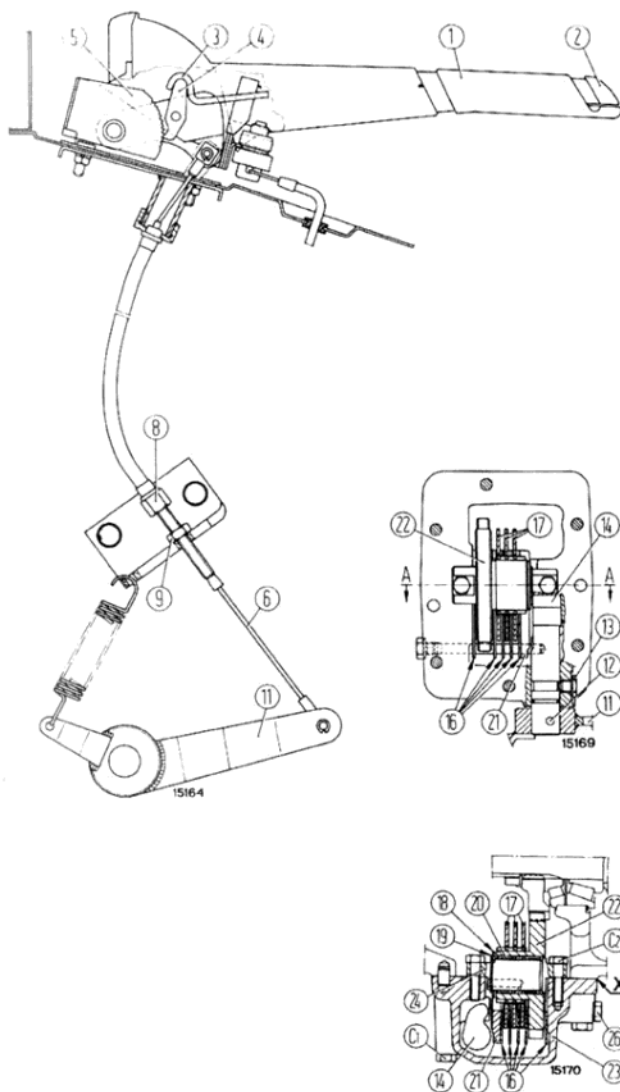
TRANSMISSION BRAKE REMOVAL AND INSTALLATION (90-90 and 100-90)

Disassemble transmission brake unit as follows:

- Drain transmission housing oil.
- Remove left rear wheel.
- Remove link (7) from outer lever (11) take off cap-screws (C₁) and remove support (23).

Check linings (16) for wear and inspect driven disc surfaces (17).

Note - To replace driven discs (17), remove bevel pinion shaft as directed on pages 2 and 3, section 25.



Sections through transmission brake.

a. 55-90, 60-90, 70-90 and 80-90 - b. 90-90 and 100-90 - C₁. Support cap screws - C₂. Driven gear shaft cap screws - 1. Hand grip - 2. Release pushbutton - 3. Release link - 4. Pawl - 5. Ratchet - 6. Remote control cable - 7. Link - 8. Lever travel adjusting nut - 9. Lock nut - 10. Lever travel adjusting fork - 11. Outer rearm lever - 12. Roll pin - 13. Lever cap screw - 14. Brake lever - 15. Retaining ring - 16. Linings - 17. Driven discs - 18. Thrust washer - 19. Retaining ring - 20. Needle roller bearing - 21. Shoe - 22. Driven gear - 23. Support - 24. Driven gear shaft - 25. Hub - 26. Guide screws.

Note: When installing brake support on transmission housing, apply jointing compound to surfaces X as directed in text and figure on page 9.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Brakes

26

page 9

When installing outer relay lever, align the two reference marks on the end of brake lever (14) and associated shaft as shown alongside.

Before installing brake support on transmission housing, thoroughly clean and degrease mating surfaces and apply a 2 mm (0.08 in) bead of jointing compound as shown in figure.

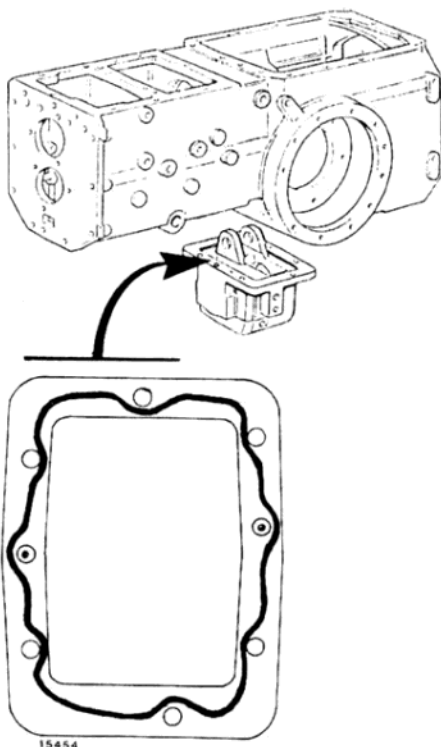
Jointing compound types are indicated on page 6, section A.

TRANSMISSION BRAKE LEVER ADJUSTMENT (all models)

From rest position, transmission brake hand lever must move by three clicks to fully restrain tractor.

If not, slacken lock nut and proceed as follows:

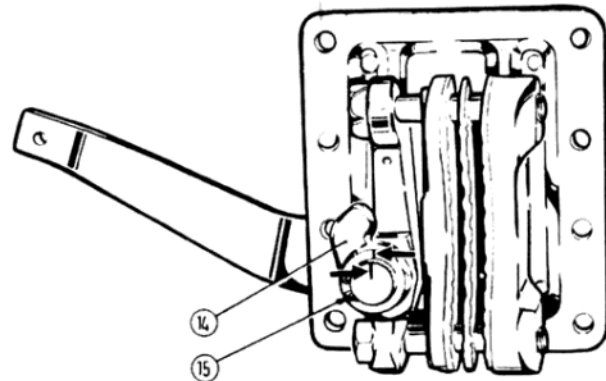
- 55-90, 60-90, 70-90 and 80-90: tighten or back off adjusting nut (8, page 8) as necessary.
- 90-90 and 100-90: withdraw pivot from adjusting



Applying jointing compound on installation of parking brake support on transmission housing (55-90, 60-90, 70-90 and 80-90).

Jointing compound types are indicated on page 6, section A.

Fiat Trattori

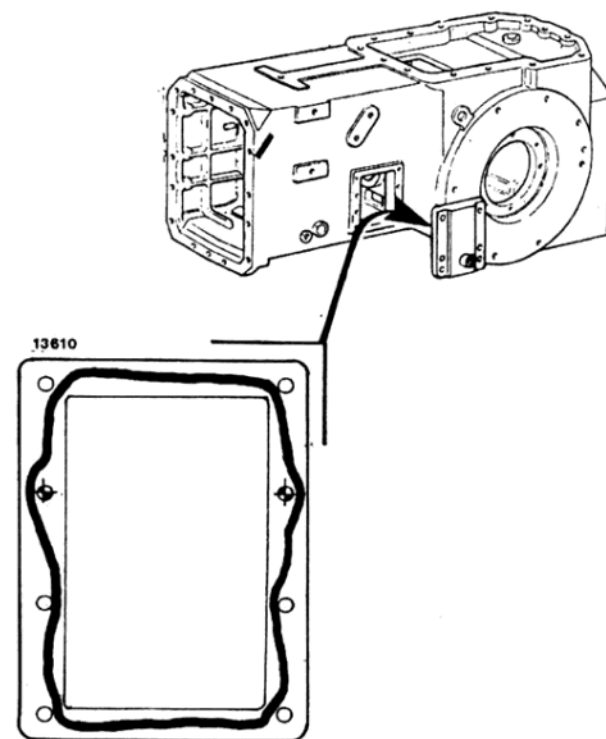


Disassembling (assembling) parking brake actuating lever (90-90 and 100-90).

Note: Arrows indicate notches on lever (14) and shaft to be aligned on assembly.

14. Inner lever - 15. Retaining ring.

fork (10, page 8) and tighten or back off fork as necessary.
Tighten locknut.



Applying jointing compound on installation of parking brake support on transmission housing (90-90 and 100-90).

Jointing compound types are indicated on page 6, section A.

Print No. 603.54.241.00 - III - 1986

POWER TRAIN

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Final drives

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page 1

REMOVAL

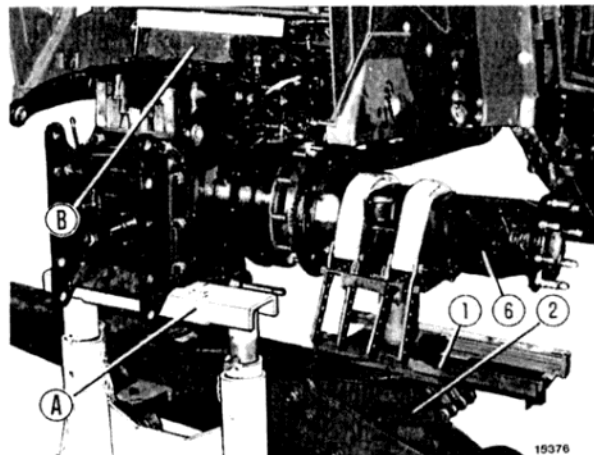


CAUTION

Raise and handle all heavy components using a suitable lift. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the load to be lifted.

Remove final drives as follows:

- Drain oil from rear transmission housing.
- Position a support stand (A) under rear transmission housings.
- Remove capscrews retaining platform to cushion pads and final drive housing.
- Place wooden spacers (B) between lift body and fuel tank to keep the platform in raised position;
- If necessary, disconnect control linkage from lift, PTO, front wheel drive, transmission brake, etc.
- Remove associated rear wheel, place support 293781 (1) on a trolley mounted hydraulic jack (2)

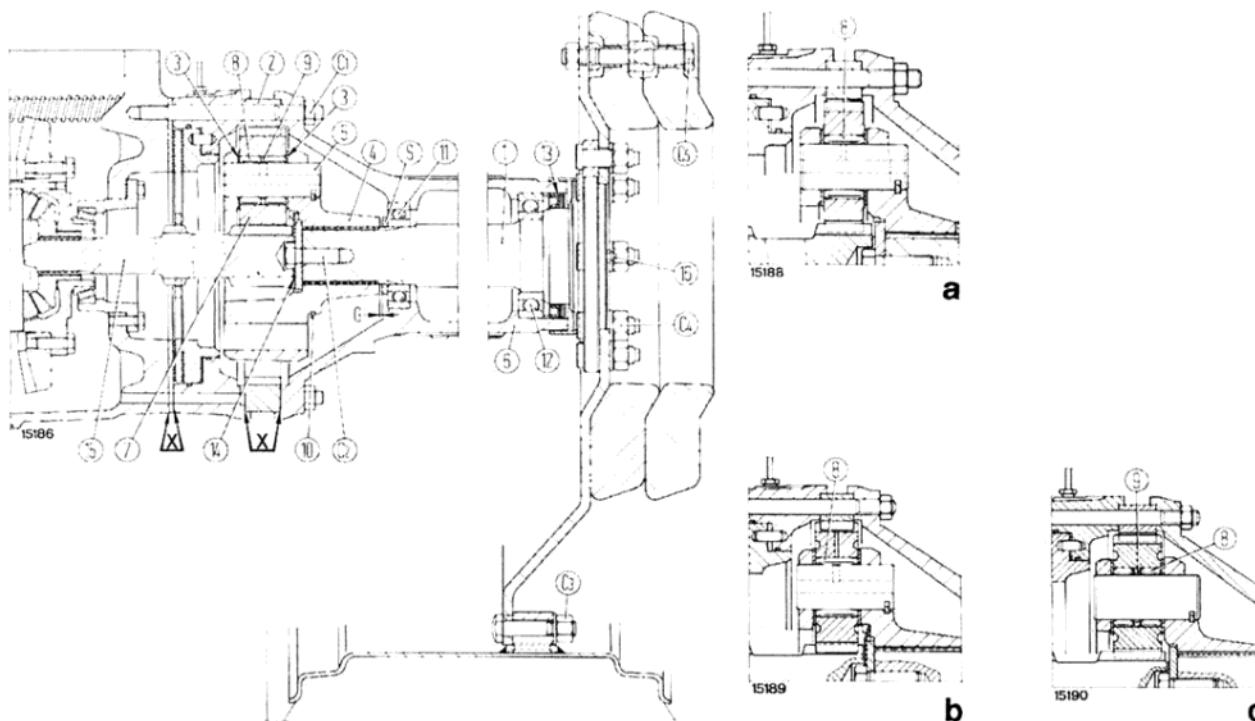


Removing (installing) final drive housing assy.

A. Support stand - B. Wooden spacers - 1. Support 293781 - 2. Trolley mounted jack - 6. Final drive housing.

and firmly secure the final drive unit (6);

- Remove nuts (C₁) and take off final drive housing with attached ring gear without separating brake cylinder from transmission housing.

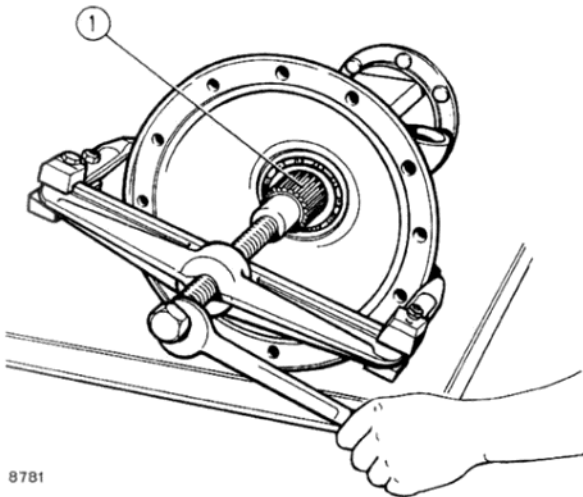


Longitudinal section through RH final drive unit (70-90 and 80-90).

a. Detail 55-90 and 60-90 - b. Detail 90-90 - c. Detail 100-90 - C₁. Nuts retaining final drive housing - C₂. Wheel shaft capscrew - C₃. Nut retaining pressed disc to rim - C₄. Nut retaining pressed disc to hub - C₅. Ballast ring capscrew - G = 0.2 ÷ 0.4 mm (.007 to .015 in). Carrier end play - S. Shim - 1. Wheel shaft - 2. Ring gear - 3. Thrust washers - 4. Planet carrier - 5. Planet journal - 6. Final drive housing - 7. Planet gear - 8. Needle roller bearings - 9. Needle roller spacer - 10. Journal retaining ring - 11/12. Ball bearings - 13. Seal - 14. Lock washer - 15. RH final drive shaft - 16. Lube fitting.

Note - On assembly, apply jointing compound to surfaces X as directed on page 6, section A.

POWER TRAIN: Final drives



8781
Removing wheel shaft using universal puller
1. Wheel shaft.

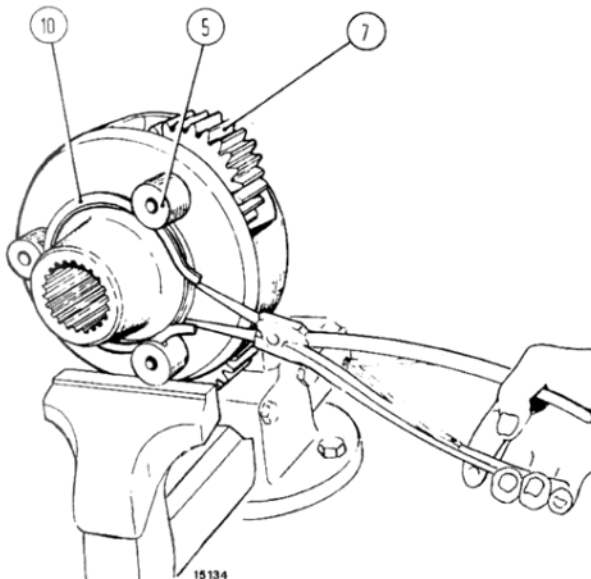
DISASSEMBLY



CAUTION

Handle all parts with care. Do not put hands and fingers between parts. Wear safety items such as goggles, gloves and safety shoes.

Remove lock washer (14, page 1), back off screw (C₂), retrieve shim (S) and remove planet gear carrier.



15134
Removing (installing) planet gear journals
5. Journals - 7. Planet gears - 10. Retaining ring

- withdraw wheel shaft (1) using a suitable universal puller;
- open out retaining ring (10), withdraw journals (5) and planet gears (7), retrieving needle roller bearings (8, page 1).

If necessary, replace seal (13) using a suitable driver to position the new seal at the correct depth.

ASSEMBLY

Place housing in upright position and assemble noting the following points:

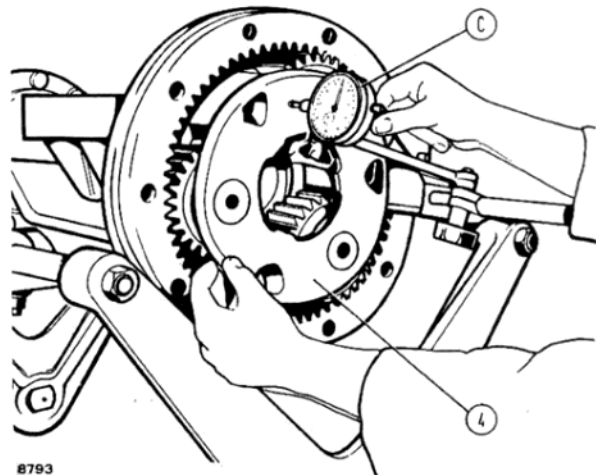
- Following seal (13, page 1) assembly, insert wheel shaft and press on flange until shaft is flush with bearing (12).
- Position bearing (11) and install planet carrier (4) with shim (4) with shim (S).
- Tighten capscrew (C₂, page 1) to the specified torque and check that carrier end play (G) is 0.2 to 0.4 mm (.007 to .015 in). To adjust, change shim (S).



CAUTION

Use suitable tools to align holes. NEVER USE HANDS OR FINGERS.

Before installing final drive housing on transmission housing, and cover on final drive housing, thoroughly clean and degrease mating surfaces and apply a



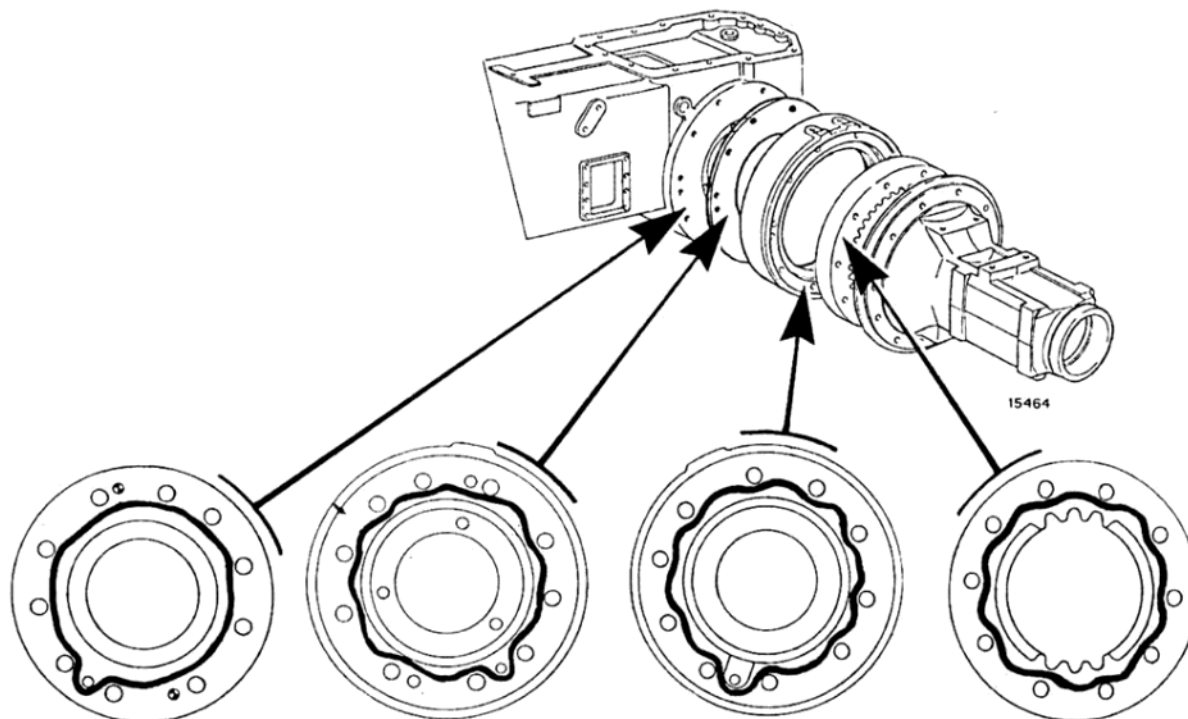
8793
Checking planet carrier end play.
C. Dial gauge - 4. Planet carrier.

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Final drives

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page 3



Applying jointing compound for brake and final drive installation on transmission housing.

Jointing compound types are indicated on page 6, section A.

2 mm (0.08 in) bead of jointing compound as shown in figure above.

Jointing compound types are indicated on page 6, section A.

— Tighten capscrews (C₁, page 1) to the specified torque and inject **grassofiat TUTELA G9** grease through lubricator (16).

Turn hub to ensure that lubricant is evenly distributed.

POWER TRAIN

55-90 60-90
70-90 80-90
90-90 100-90

POWER TRAIN: Power take-off

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page 1

REMOVAL-INSTALLATION

CAUTION

Handle all parts with care. Do not put hands and fingers between parts. Wear safety items such as goggles, gloves and safety shoes.

Note - To gain access to drive gear on 90-90 and 100-90, remove top cover from rear transmission housing or, with platform or cab installed, remove transmission brake support side cover.

Remove P.T.O. housing as follows:

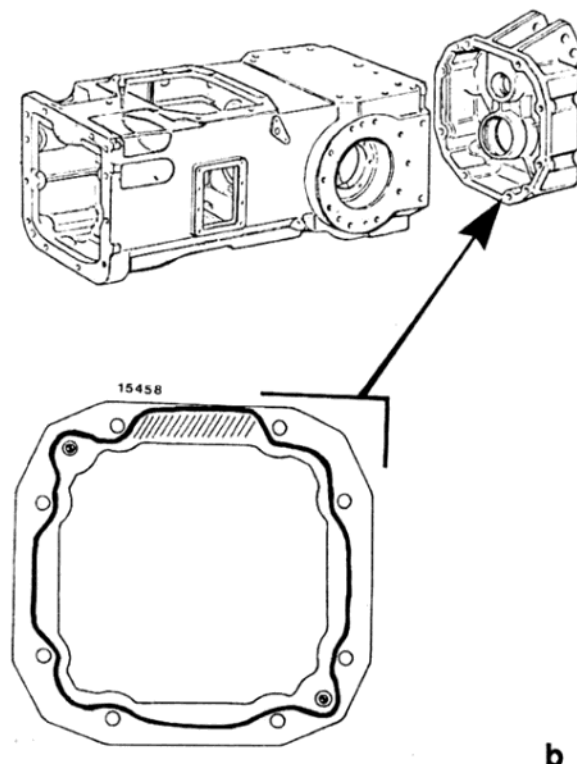
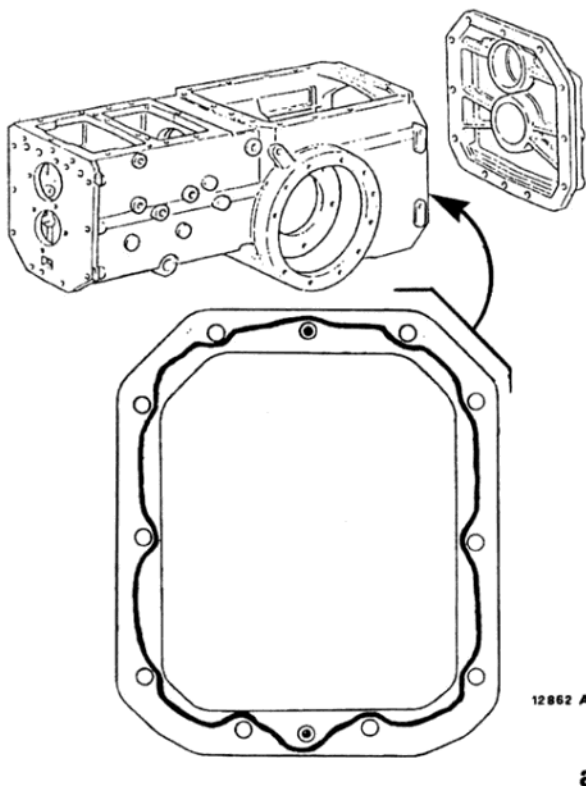
- Drain rear transmission housing oil.
- Remove drawbar, support and tow hook (if fitted).
- Remove implement attachment top link (90-90 and 100-90).
- Apply lift chain, remove capscrews, and engage ground speed P.T.O. (55-90, 60-90, 70-90 and 80-90) or independent P.T.O. (90-90 and 100-90)

Before reinstalling P.T.O. housing on transmission housing, clean and degrease mating surfaces and apply a 2 mm (0.08 in) bead of jointing compound as shown for the model concerned.

Jointing compound types are indicated on page 6, section A.

CAUTION

Use suitable tools to align holes. NEVER USE HANDS OR FINGERS.



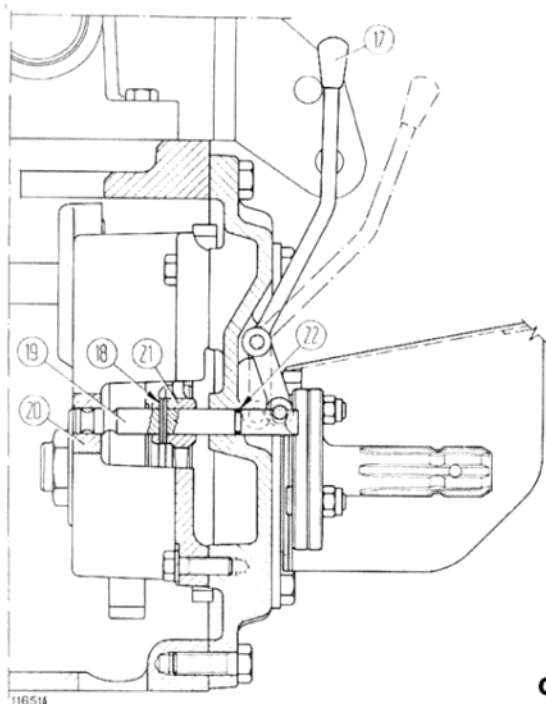
Applying jointing compound for P.T.O. housing installation on transmission housing.

Jointing compound types are indicated on page 6, section A.

a. 55-90, 60-90, 70-90 and 80-90 - b. 90-90 and 100-90

Note - Cross hatched area must not be covered with jointing compound.

POWER TRAIN: Power take-off



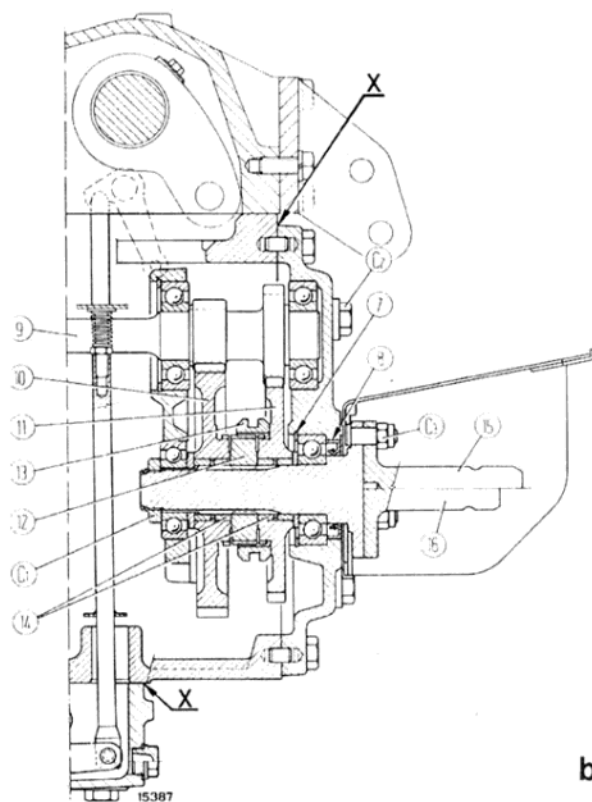
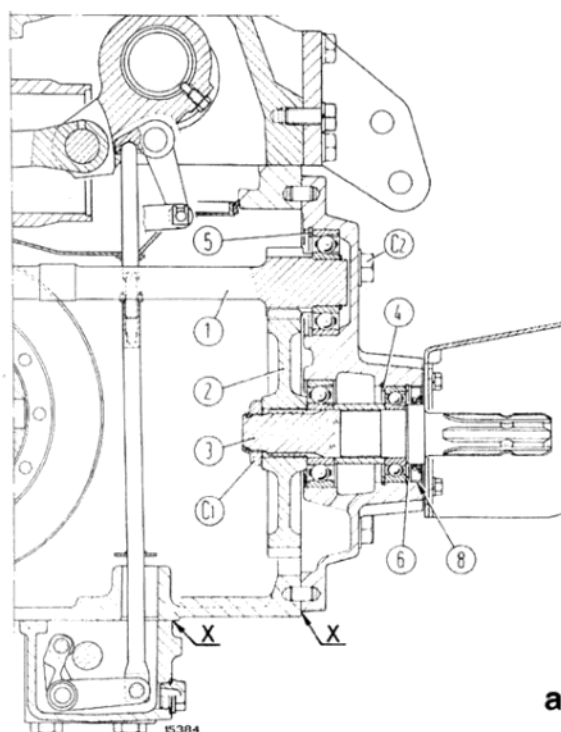
DISASSEMBLY - ASSEMBLY (55-90, 60-90, 70-90 and 80-90)

Install P.T.O. housing on rotary stand and disassemble referring to illustrations.

To disassemble 540 rpm P.T.O., back off nut (C₁), remove gear (2) and withdraw drive shaft (3).

To disassemble 540/1000 rpm P.T.O., proceed as follows:

- Remove roll pin and speed selector lever pivot. Remove speed selector lever (17).
- Remove roll pin (18) retaining shaft (19) to fork (21) and withdraw shaft, retrieving detent ball and spring.
- Remove capscrews and rear cover (20).



Longitudinal section through P.T.O. (55-90, 60-90, 70-90 and 80-90).

a. Section through 540 rpm P.T.O. - b. Section through 540/1000 rpm P.T.O. - c. Section through speed control - C₁. Driven shaft nut - C₂. Self-locking nut - 1. Drive gear - 2. Driven gear - 3. Driven shaft - 4, 5, 6 and 7. Retaining rings - 8. Seal - 9. Double drive gear - 10. 540 rpm driven gear - 11. 1000 rpm driven gear - 12. Fixed gear - 13. Engagement sleeve - 14. Driven gear support bushings - 15. 540 rpm splined extension - 16. 1000 rpm splined extension - 17. Speed selector lever - 18. Roll pin - 19. Shaft - 20. Rear cover - 21. Fork - 22. O-ring.

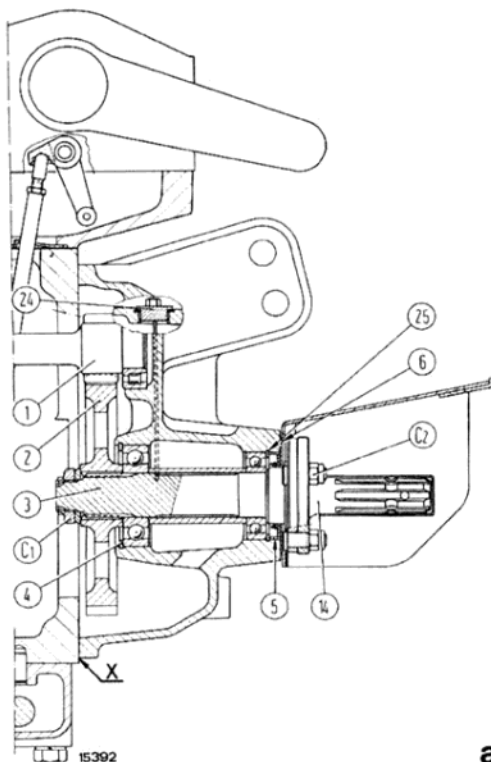
Note - On assembly, apply jointing compound to surface X as directed in notes and in diagram on page 1.

55-90 60-90
70-90 80-90
90-90 100-90

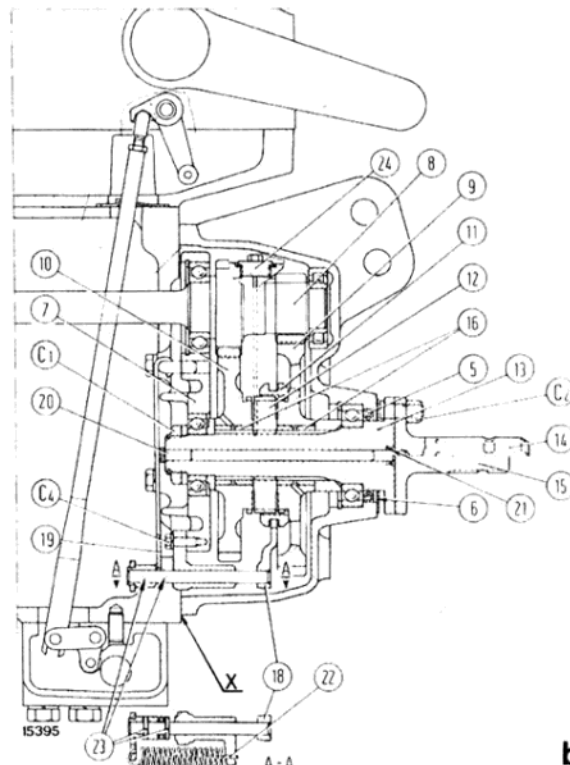
POWER TRAIN: Power take-off

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page 3



a



b

Longitudinal section through PTO (90-90 and 100-90).

a. Section through 540 rpm P.T.O. - b. Section through 540/1000 rpm P.T.O. - C₁. Driven shaft nut - C₂. Splined adapter self-locking nut - C₄. Shifter rod support capscrews - 1. Drive gear - 2. Driven gear - 3. Driven shaft - 4. Retaining ring - 5. Seal - 6. Seal shield - 7. Rear support cover - 8. Double drive gear - 9. 540 rpm driven gear - 10. 1000 rpm driven gear - 11. Engagement sleeve - 12. Hub - 13. Driven shaft - 14. 540 rpm splined extension - 15. 1000 rpm splined extension - 16. Driven gear support bushings - 18. Sleeve actuating fork - 19. Spring - 20. Spring pin - 21. Seal - 22. Spring - 23. Roll pin - 24. Dipstick - 25. Retaining ring.

Note - On assembly apply jointing compound to surfaces X as directed in notes and diagram on page 1.

- Remove nut (C₁, page 2) and gear (10), sleeve (13), gear (12) and gear (11).

Replace damaged bearings using universal pullers and suitable drivers. Check gear support bushings (14) for wear and check clearances against table in section 20.

Replace worn seals (8, page 2) and O-ring (22).

When assembling P.T.O. parts, refer to figures above and tighten fasteners to the torques specified in table, section 20.

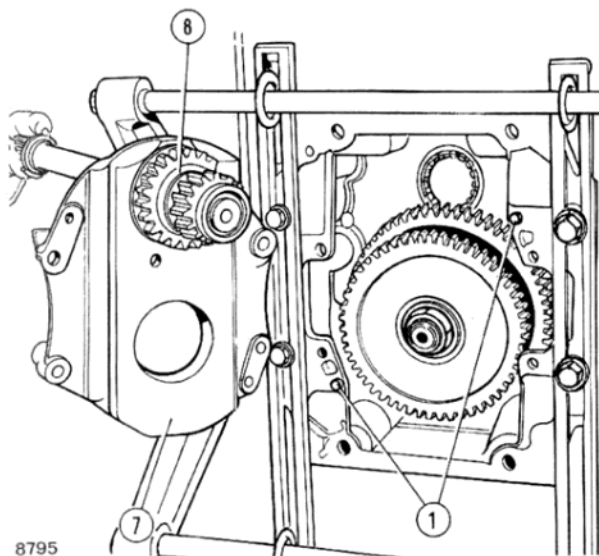
DISASSEMBLY - ASSEMBLY (90-90 and 100-90)

Install P.T.O. housing on rotary stand and disassemble referring to illustrations.

To disassemble 540 rpm P.T.O., proceed as follows:

- Back off nuts (C₂) and remove splined extension (14).
- Remove nut (C₁), withdraw gear (2) and take out driven shaft (3) using a suitable puller applied to shaft (3) using a suitable puller applied to shaft flange and forcing against P.T.O. housing.
- Remove seal (5) and retaining rings (4 and 25). Remove bearings using suitable universal puller.

POWER TRAIN: Power take-off

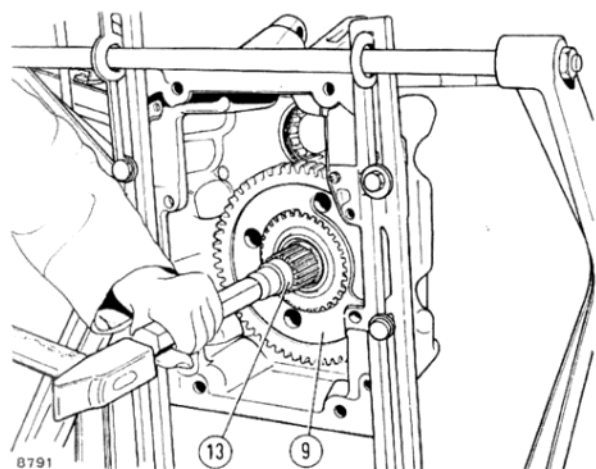


Removing 540/1000 rpm P.T.O. support cover.

1. Dowels - 7. Support cover - 8. Double drive gear

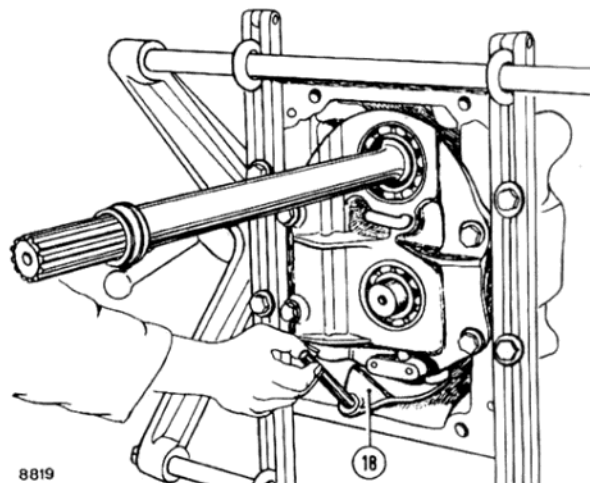
To disassemble 540/1000 rpm P.T.O., refer to the operation sequence shown in figures and proceed as follows:

- Remove spring (22, page 3) and take out roll pin (23).



Removing 540/1000 rpm P.T.O. driven shaft.

9. Driven gear - 13. Driven shaft.



Installing 540/1000 rpm P.T.O. actuating fork.
18. Fork.

- Back off nut (C₁, page 3) by a few turns, remove capscrews and take off rear support cover (7).

- Remove nut (C₁, page 3) and withdraw gear (10), sleeve (11) and hub (12).

- Remove driven shaft (13) using a suitable driver and retrieve gear (9).

Replace any damaged bearings using suitable universal pullers and drivers. Check gear support bushings (16, page 3) for wear and compare fitted clearance with data of page 11, section 20.

Replace seals (5 and 21, page 3) as necessary.

When assembling P.T.O., refer to figures and adhere to torque data specified on pages 13 and 14, section 20. Fork (18) must be installed as shown above.



CAUTION



Use suitable tools to align holes. NEVER USE FINGERS OR HANDS.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Specification and Data

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page 1

FRONT AXLE

Type	55-90 60-90 70-90 80-90	90-90 100-90
	Inverted U, telescoping, centre pivoting	
Tracks (six)	1400 - 1500 - 1600 - 1700 - 1800 - 1900 mm (55 - 59 - 63 - 67 - 71 - 75 in)	1450 - 1550 - 1650 - 1750 - 1850 - 1950 mm (57 - 61 - 65 - 69 - 73 - 77 in)
Camber	2°, equivalent to 15 mm (0.590 in) for 16 in rims, 17 mm (0.669 in) for 18 in rims, 18 mm (0.709 in) for 20 in rims at outermost edge of rim.	
Toe-in	0 to 5 mm (0 to 0.197 in)	
Steering Knuckle Articulation		
King pin journal dia. (2, pages 1 and 2, Section 31)	37.961 to 38.000 (1.4945 to 1.4961 in)	44.961 to 45.000 (1.770 to 1.771 in)
Bushing fitted I.D. (3)	38.050 to 38.140 ⁽¹⁾ (1.4980 to 1.5016)	45.050 to 45.140 ⁽¹⁾ (1.773 to 1.777)
King pin clearance in bushings	0.050 to 0.179 mm (0.0020 to 0.0047 in)	
Bronze thrust washer thickness (6, page 1, Section 31)	3.935 to 4.065 (0.1545 to 0.1600 in)	—
Steel washer thickness (5)	3.925 to 4.000 (0.1545 to 0.1575 in)	—
Axle Pivot		
Pivot dia. (10, pages 1 and 2, Section 31)	37.961 to 38.000 (1.4945 to 1.4961 in)	
Bushing fitted I.D. (14)	38.050 to 38.140 ⁽¹⁾ mm (1.4980 to 1.5016 in)	
Pivot clearance in bushing	0.050 to 0.179 mm (0.0020 to 0.0047 in)	

(1) Not reamed

POWER STEERING

Type	Hydrostatic
Make	DANFOSS
Hydraulic circuit	Independent, separate pump
Oil reservoir	Transparent plastic (55-90, 60-90, 70-90, 80-90) or steel (90-90, 100-90), on R.H. side of engine
Oil filter	In oil reservoir, gauze

(follows)

FRONT AXLE - STEERING: Specification and Data

POWER STEERING

(continued)

Hydraulic pump Type Model: Make Drive	gear C 25 XRP FIAT from engine valve gear
Rotation (seen from drive side) Drive ratio: $\begin{cases} 55-90, 60-90, 70-90 \text{ and } 80-90 \\ 90-90 \text{ and } 100-90 \end{cases}$	Clockwise 0.910 to 1 1.166 to 1
Rated speed (at engine governed speed): — 55-90, 60-90, 70-90 and 80-90 — 90-90 and 100-90 Rated output speed — 55-90, 60-90, 70-90 and 80-90 — 90-90 and 100-90	2328 rpm 2917 rpm 1289 rpm 1028 rpm
Rated output (all models) On bench output at 1450 rpm and 100 bar (102 kg/cm ² or 1451 psi): — New or reconditioned pump — Test oil temperature — Test oil viscosity	13 to 17 l/min (22 ³ / ₄ to 29 ³ / ₄ pints/min) > 13 l/min (22 ¹ / ₂ pints/min) 55 to 65 C SAE 20
Drive/driven gear journal diameter Bearing bore diameter Gear journal clearance in bearing Maximum wear clearance	17.400 to 17.418 mm (0.6850 to 0.6857 in) 17.450 to 17.470 mm (0.6870 to 0.6878 in) 0.032 to 0.070 mm 0.0012 to 0.0027 in 0.1 mm (0.004 in)
Gear clearance in pump body Maximum pump body wear, suction side opposite gears	0.010 to 0.070 mm (0.0004 to 0.0027 in) 0.1 mm (0.004 in)
Gear width Bearing width Pump body width	18.323 to 18.348 mm (.721 to .722 in) 19.796 to 19.812 mm (.779 to .780 in) 58.072 to 58.122 mm (2.286 to 2.288 in)
Bearing and gear end clearance in pump body (to be restored on overhaul)	0.100 to 0.207 mm (.004 to .008 in)
Flow control valve spring length under 54 to 60 N (5.5 to 6.1 kg, 12.12 to 13.4 lb) Plunger clearance in seat	33.5 mm (1.318 in) 0.010 to 0.016 mm (.0004 to .0006 in)

(follows)

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Specification and Data

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page 3

POWER STEERING

(continued)

Control Valve Type Outfit code:	DANFOSS with steering column operated rotary valve (permitting steering also in case of pump failure) OSPC 100 (with valves in control valve)
Relief valve crack-off setting: — 2 WD — 4 WD Power cylinder overload valve crack-off setting:	100 bar (102 kg/cm ² , 1471.77 psi) 125 bar (127 kg/cm ² , 1806 psi) 200 bar (204 kg/cm ² , 2903.53 psi)
Power Cylinder: Type Make: — 55-90, 60-90, 70-90, 80-90, 90-90, 100-90, 55-90 DT, 60-90 DT — 70-90 DT, 80-90 DT, 90-90 DT, 100-90 DT Cylinder bore diameter: — 55-90, 60-90, 70-90, 80-90, 90-90, 100-90, 55-90 DT, 60-90 DT — 70-90 DT, 80-90 DT, 90-90 DT, 100-90 DT Piston rod diameter: — 55-90, 60-90, 70-90, 80-90, 90-90, 100-90, 55-90 DT, 60-90 DT — 70-90 DT, 80-90 DT, 90-90 DT, 100-90 DT Maximum piston stroke: — 2 WD — 4 WD: ● 55-90 DT and 60-90 DT ● 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT	Double acting, located behind front axle WEBER or SIMA or ERBER WEBER 48 mm (1.88 in) 55 mm (2.16 in) 22 mm (.866 in) 25 mm (.984 in) 215 mm or 8.46 in (214 mm or 8.42 in SIMA) 200 mm or 7.87 in (194 mm or 7.63 in SIMA) 200mm (7.87 in)
Steering column Shim (S, page 12, section 32) Column end play	0,5 - 1 mm (.019 to .039 in) 1 mm (.039 in)

FRONT AXLE - STEERING: Specification and Data

TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread Size	Torque		
		Nm	kgm	ft lb
Front Axle, Section 31 Capscrew, front axle carrier to engine	M 18x1.5	314	32	231.5
Capscrew, axle pivot (C ₃ , pages 1 and 2)	M 10x1.25	59	6	43
Nut, axle end	M 16x1.5	221	22.5	163
Nut, R.H. and L.H. levers on knuckles (C ₁)	M 16x1.5	235	24	174
Nut, track rod ball joint	M 14x1.5	137	14	101
Nut, track rod	M 20x1	176	18	130
Capscrew, wheel to hub (C ₂)	M 18x1.5	314	32	231
Power steering, Section 32 Capscrew, control valve to tractor	M 10x1.25	44	4.5	32
Capscrew, cover to control valve (C ₁ , page 11)	M 8x1	34	3.5	25
Nut, power cylinder pivot pin (C ₄ , page 2)	M 18x1.5	294	30	217
Nut, power cylinder piston rod to steering arm (C ₁)	M 14x1.5	147	15	108
Nut, piston to rod (C ₂): — WEBER cylinder — SIMA cylinder — ERBER cylinder	M 16x1.5 M 16x1.5 M 16x1.5	83 98 98	8.5 10 10	61 72 72
Capscrew, steering pump to engine (C ₁ , page 3)	M 6x1	8	0.8	6
Nut, cover to pump body (C ₄)	M 10x1.25	39	4	29
Nut, drive sleeve to pump drive shaft (C ₃)	7/16"-20UNF-2B	28	2.8	20
Nut, steering wheel to steering (C ₁ , page 12)	M 18x1.5	69	7	51

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE-STEERING: Front axle

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page 1

AXLE REMOVAL-INSTALLATION



CAUTION

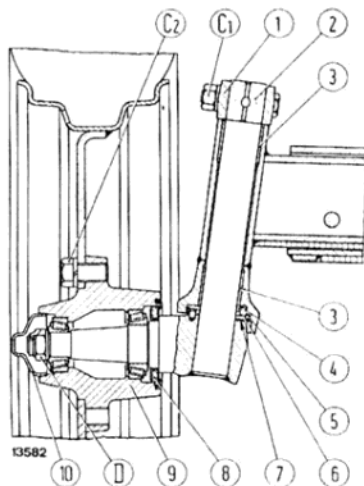
Handle all parts with care. Do not put hands or fingers between parts. Wear safety items such as goggles, safety shoes and gloves.

Remove front axle assy from tractor as follows:

- Apply parking brake, chock rear wheels and remove front ballast weights and associated support.
- Remove power steering cylinder from axle.
- Position stand under axle support, raise tractor and remove front wheels.
- Remove capscrew (C₃) and withdraw axle pivot (12) using slide hammer puller **292927** with adapter **290793**. Remove axle assy and install on a suitable axle overhaul stand.

Note - See sections on page 2 for 90-90 and 100-90 tractors.

Replace axle pivot bushings (14) if worn, using suitable pullers and drivers.



STEERING KNUCKLE OVERHAUL

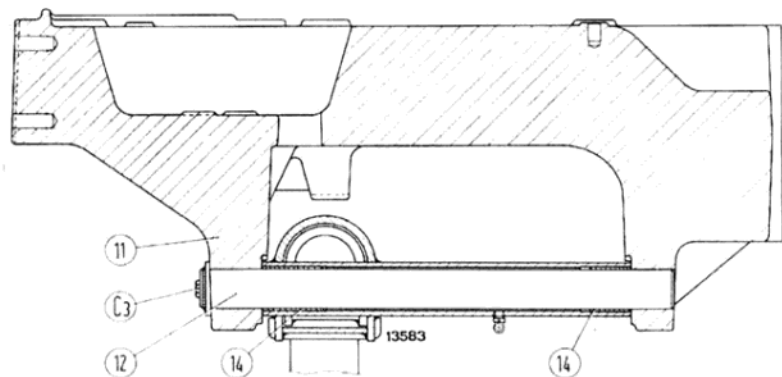
Steering knuckles and hubs may also be disassembled without removing axle from tractor. Proceed as follows for each wheel:

- Remove hub cap (10) and slacken adjusting nut (D);
- Slacken wheel hub capscrews (C₂).
- Apply parking brake, chock rear wheels, jack up the front of the tractor and support front axle on two stands.
- Remove front wheel.
- Remove nut (C₁) and withdraw steering knuckle (2) together with wheel hub from below. Disassemble on bench.

Replace inefficient seals, worn bushings and bearings using suitable pullers and drivers.

On reassembly, pack wheel hub with **grassofiat TUTELA G9** grease and adjust taper roller bearings as follows:

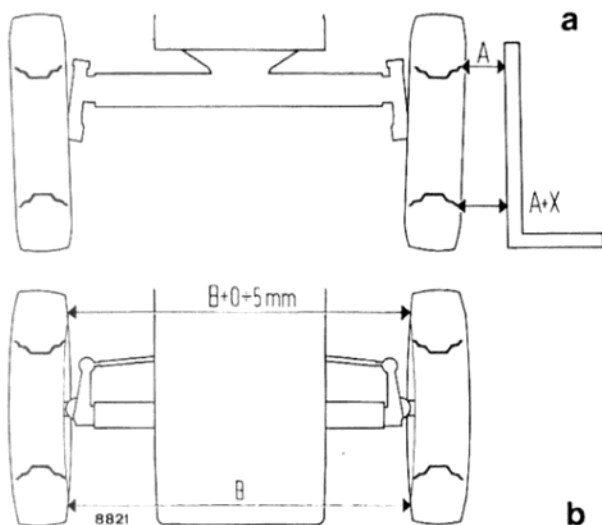
- Tighten nut (D) to a torque of 98 Nm (10 kg or 74 ft lb) while simultaneously rotating wheel hub (6) to settle the bearings.



Sections through steering knuckle and front axle pivot (55-90, 60-90, 70-90 and 80-90)

C₁. Steering arm nut - C₂. Disc capscrew - C₃. Axle pivot capscrew - D. Bearing adjusting nut - 1. Steering arm - 2. King pin - 3. Bushings - 4. Dowel - 5. Washer - 6. Bronze thrust washer - 7. Cup - 8. Seal - 9. Wheel hub - 10. Hub cap - 11. Axle support - 12. Axle pivot - 14. Axle pivot bushings.

FRONT AXLE-STEERING: Front axle



Front wheel geometry.

a. Wheel camber check - b. Front toe-in check - X = Approx. 15 mm (0.59 in) for 16 in rims, approx. 17 mm (0.67 in) for 18 in rims and approx. 18 mm (0.71 in) for 20 in rims.

- Slacken nut, then tighten to a torque of 9.8 Nm (1 kgm or 7.2 ft lb) while simultaneously rotating wheel hub.

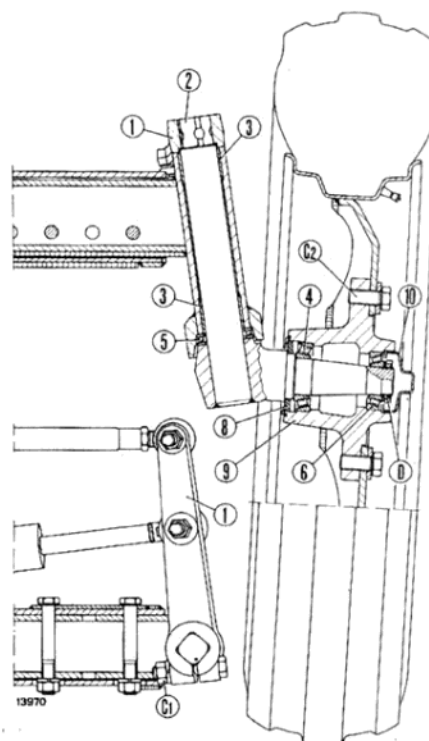
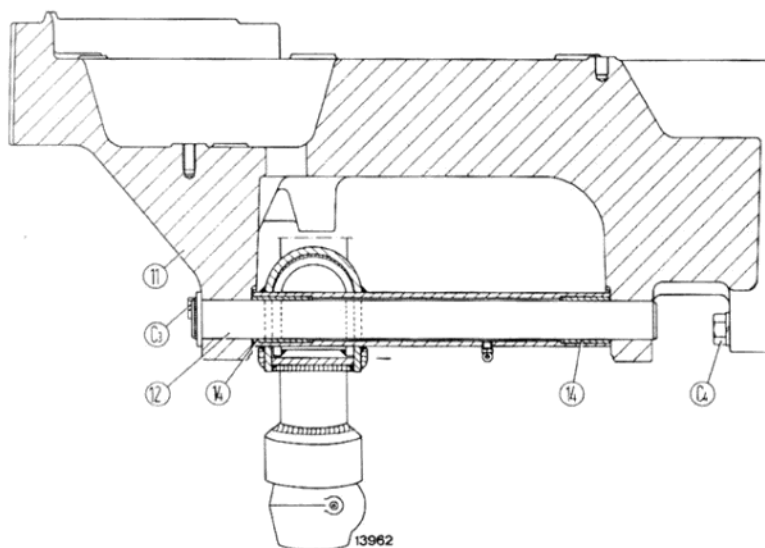
Note — Scrap and replace nut (D) at every adjustment.

- Stake nut in place.

AXLE CHECKS

Check the steering geometry as follows:

- With the wheels in straight-ahead driving position, camber should be 2 deg., equivalent to approx. 15 mm (0.59 in) for 16 in approx. 17 mm (0.67 in) for 18 in rims and approx. 18 mm (0.71 in) for 20 in rims, between rim edges (a) and parallel to tractor longitudinal centerline. Toe-in should be up to 5 mm (0.19 in) as measured on the inside between rims (b).
- To adjust toe-in, turn the adjustable ends of track rods.



Sections through steering knuckle and front axle pivot (90-90 and 100-90)

C₁. Steering arm nut - C₂. Disc capscrew - C₃. Axle support capscrews - C₄. Screw retaining axle support to engine - D. Bearing adjusting nut - 1. Steering arm - 2. King pin - 3. Bushings - 4. Taper roller bearings - 5. Ball bearing - 8. Seal - 9. Wheel hub - 10. Hub cap - 11. Axle support - 12. Axle pivot - 14. Axle pivot bushings.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Power Steering

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page 1

POWER STEERING OVERHAUL

Hydraulic power steering system components and their operation are illustrated in the general diagram on pages 10 and 11, section 32.

Removal

Remove the unit from the tractor as follows:

- Remove dashboard, rubber bellows and steering column together with steering wheel.
- Disconnect battery negative lead, drain oil from power steering reservoir, and disconnect four hoses from power steering unit.
- Back off the four capscrews and remove power steering unit.

Disassembly

Disassemble power steering unit as follows:

During disassembly and reassembly of sleeve (6) and rotary valve (5), pin (1) should be kept horizontal to prevent it from becoming unseated and falling into the grooves inside the steering unit, which would prevent withdrawal of the assembly.

- Remove the capscrews (C₁) that hold the cover to the body (3) and remove the cover, cam ring (8) with attached rotor (9), thrust ring (10), spacer (12), rotor shaft (7), sleeve (6) with rotary valve (5) and pin (1) and thrust bearing (29) in that order.

- Overturn the steering unit and retrieve check valve ball (4), after removing the threaded stop.

Assembly

Reverse the disassembly sequence and note the following points:

- Scrap and replace power steering seals every time unit is disassembled;

- Install seal (31) between power steering unit and rotary valve (5) using tool **293388**.

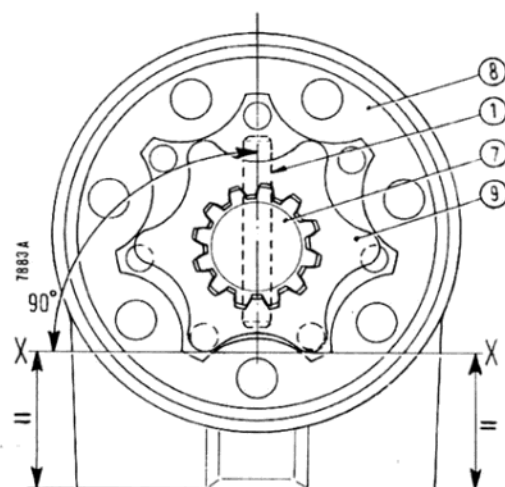
- If spring (2) is to be replaced, use tool **293389**.

- Whenever the steering unit is disassembled, overturn rotor (9) to obtain maximum life from the splines.

- Install check valve ball (4) in its seat, keeping the steering unit (3) vertical or overturned relative to its normal operating position on the tractor, and fully tighten the screw to prevent the ball from falling in the recesses between steering unit and pushrod.

- Insert rotor (9) into cam ring (8) as shown in figure and, using tool **293390**, couple shaft (7) to pin (1) so that the latter lies at right angles to plane X-X.

- Tighten capscrews (C₁) retaining cover to steering unit to the specified torque.



Timing power steering unit.

X-X. Reference line for pin assembly (1) - 1. Drive pin - 7.
Rotor shaft - 8. Cam ring - 9. Rotor.

FRONT AXLE - STEERING: Power Steering

HYDRAULIC CYLINDER OVERHAUL

The steering power cylinder installed in production, may be either WEBER, SIMA or ERBER for two-wheel drive tractors and 55-90DT / 60-90 DT tractors, while other four-wheel drive tractors feature a single WEBER cylinder.

WEBER and ERBER cylinders may be disassembled, whereas on SIMA cylinder it is only possible to remove the piston rod, dust excluder and O-ring with its retainer.

SIMA piston rod removal (figure c).

Push the piston rod fully in, apply 40 mm long M14x1.5 screw to fluid inlet port, ensuring that the end of the screw locks on one flat of piston nut (C₂). Back off the rod, withdraw from the cover and take off dust excluder (2) and O-ring (4).

Replace the spherical joint on the cylinder end using a suitable press and subsequently peening the edge of the seat in three points.

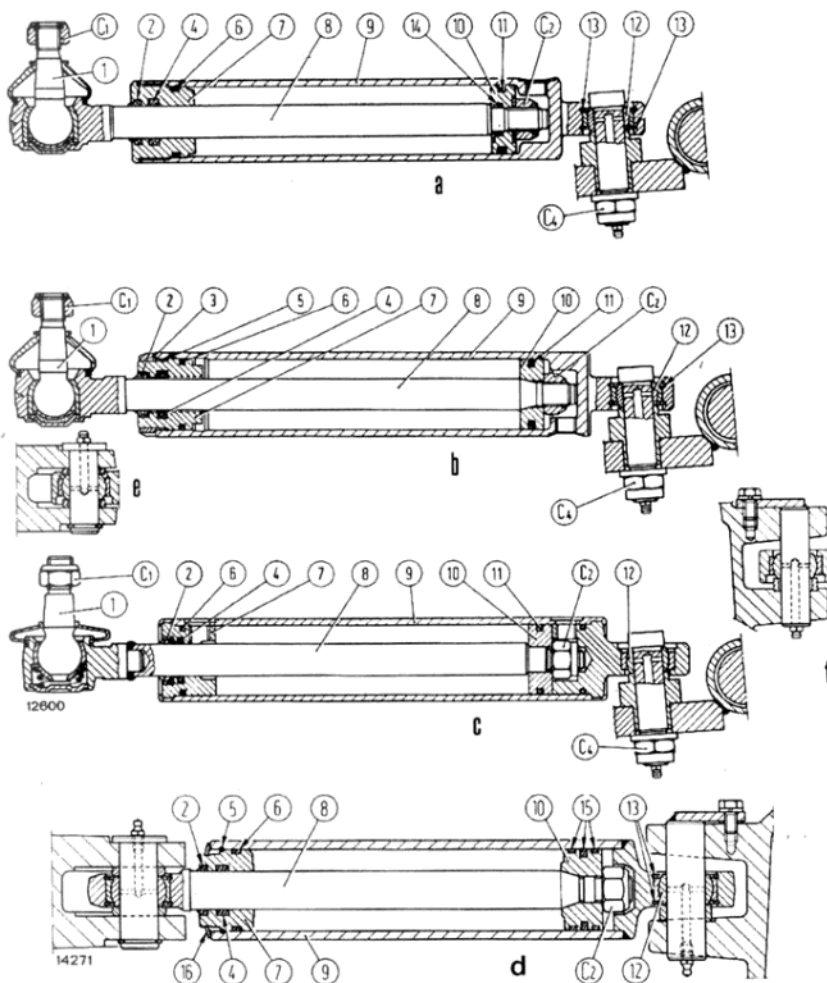
WEBER cylinder disassembly (figures b and d).

Remove locking (3, figure b) or retaining ring (16, figure d), push guide (7) inwards and withdraw retaining ring (5) from cylinder.

Subsequently, withdraw the piston rod assembly from the cylinder, back off nut (C₂) and withdraw guide (7) from piston (10).

ERBER cylinder disassembly (figure a).

Remove guide (7) and withdraw piston rod assy from cylinder, back off nut (C₂) and withdraw guide (7) and piston (10). Scrap and replace worn seals and O-rings.



Sections through power cylinders.

a. Section through ERBER cylinder for two-wheel drive and 55-90 DT / 60-90 DT tractors - b. Section through WEBER cylinder for two-wheel drive and 55-90 DT / 60-90 DT tractors - c. Section through SIMA cylinder for two-wheel drive and 55-90 DT / 60-90 DT tractors - d. Section through WEBER cylinder for four-wheel drive tractors (except 55-90 DT and 60-90DT) - e and f. Section through cylinder connection to front axle and steering arm, 55-90 DT / 60-90 DT - C₁. Steering arm nut - C₂. Piston nut - C₄. Pivot pin nut - 1. Ball joint - 2. Dust excluder - 3. Lockring - 4. Seal - 5. Retaining ring - 6. O-ring - 7. Guide - 8. Piston rod - 9. Cylinder - 10. Piston - 11. Piston gland - 12. Spherical joint - 13. Retaining ring - 14. Piston seal - 15. Piston gland assy - 16. Retaining ring.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Power Steering

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page 3

WEBER, SIMA and ERBER cylinder assembly.

Suitably lubricate parts, and reassemble by reversing the sequence given for disassembly. Refer to the illustrations below and note the following points:

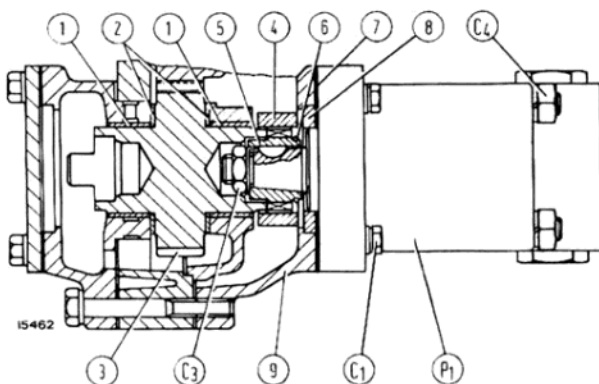
- Tighten nuts (C₂, page 2) retaining pistons to piston rods to the specified torque.
- Insert piston rods in their respective guides (7) paying the utmost attention to prevent distortion or damage to the seals.
- Check for piston rod seal leakage by pressurizing the cylinder chamber on the piston rod side.

Steering pump and reservoir overhaul.

For steering pump overhaul and testing, proceed as directed on page 1, section 52, for lift pump.

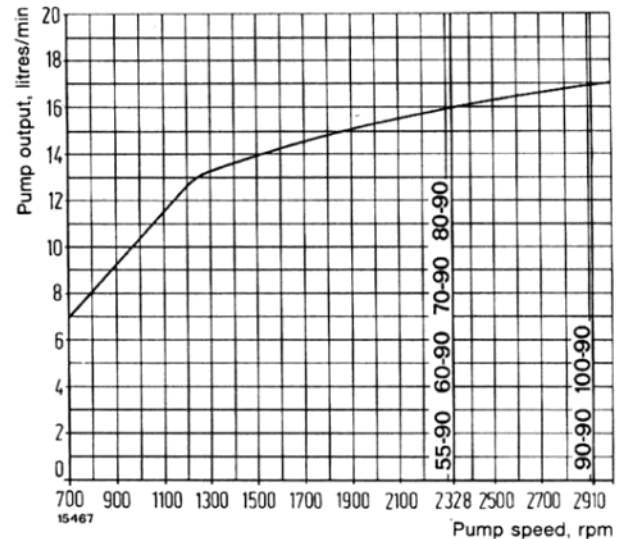
Moreover, note the following points:

- Steering pump drive is shown alongside.
- Pump assembly and performance data are given in table on page 3, section 30, whereas the speed/output diagrams are shown below.



Section through steering pump drive (55-90, 60-90, 70-90 and 80-90).

C₁. Pump capscrews - C₃. Sleeve nut - C₄. Cover nut - P₁. Hydraulic pump - 1. Gear bushings - 2. Shims - 3. Pump drive gear - 4. Drive collar - 5. Drive sleeve - 6. Retaining ring - 7. Gasket - 8. Centraliser - 9. Pump support.

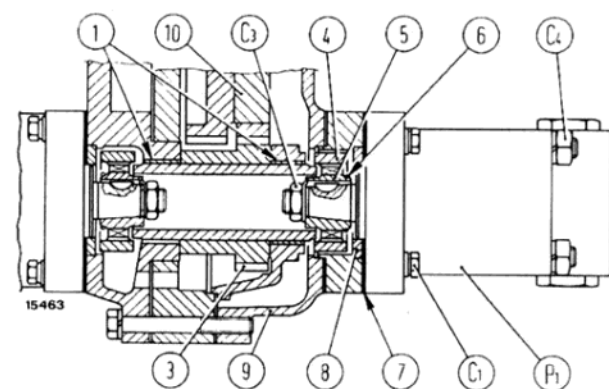


C25XRP power steering pump output-speed curve.

Test pressure 100 (102 kg/cm or 1.4524 psi) - Fluid temperature: 55 to 65°C.

When removing hydraulic fluid reservoir (T, page 10), clean thoroughly and check for:

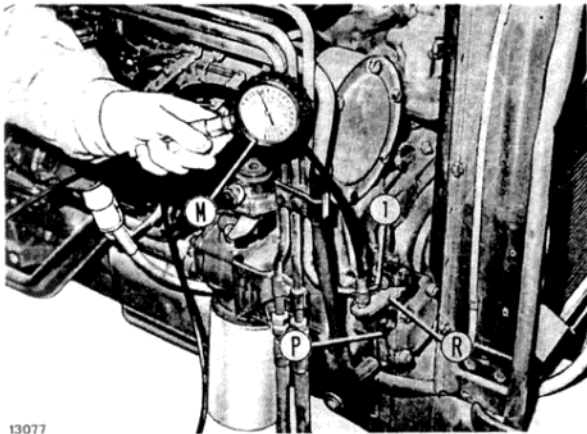
- Oil leakage, replacing reservoir as necessary.
- Inefficiency of gauze filter element, container and spring.



Section through steering pump drive (90-90 and 100-90).

C₁. Pump capscrews - C₃. Sleeve nut - C₄. Cover nut - P₁. Hydraulic pump - 1. Gear bushings - 3. Pump drive gear - 4. Drive collar - 5. Drive sleeve - 6. Retaining ring - 7. Gasket - 8. Centraliser - 9. Pump support - 10. Lift/power steering pump drive gear.

FRONT AXLE - STEERING: Power Steering



Checking power steering relief valve with control valve installed on tractor.

M. Pressure gauge of kit **293300** - P. Power steering pump - R. Connector **293160** for power steering relief valve check on tractor - 1. Oil delivery line to control valve.

After assembly, refill the system in several stages, each time operating the steering system to fill parts of the circuit.

Hydraulic system bleeding

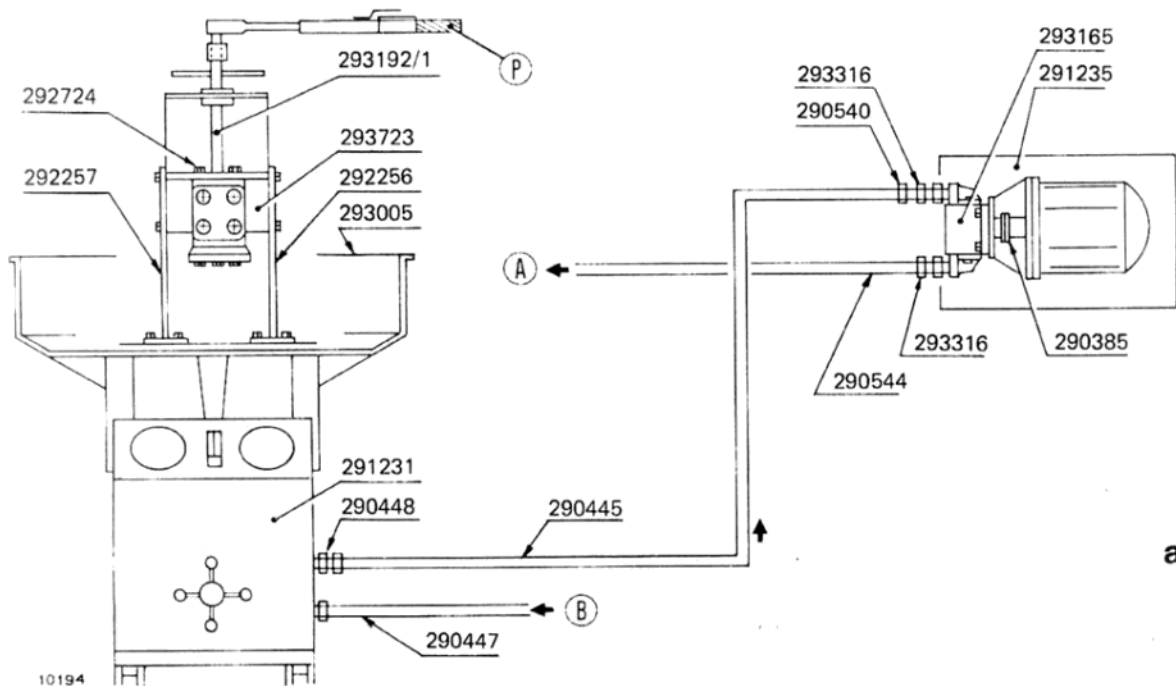
To eliminate any air from the hydraulic system, simply steer lock to lock several times and top up if necessary.

On-tractor relief valve adjustment.

Start the engine and steer the tractor from lock to lock several times to bring steering fluid temperature to approximately 50 °C.

Proceed as follows:

- Stop the engine;
- Fit connector **293160** (R) between oil delivery pipe (1) and hydraulic pump (P) and connect 0 to 150 kg/cm² pressure gauge (M) of kit **293300**.
- Start engine and accelerate to approx. 1600 (55-90, 60-90, 70-90 and 80-90) or to approx. 1300 rpm (90-90 and 100-90) and steer to one lock. In this condition, relief valve (24, page 10) should crack off at an indicated pressure of 100 bar (102 kg/cm² or 1.452 psi) for two-wheel drive tractors, or 125 bar (127 kg/cm² or 1.777 psi) for four-wheel drive tractors.



Test set-up for checking rotary valve and seal and calibration of relief valve and cylinder safety valves.

A. Delivery - B. Restriction - P. Torque wrench.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Power Steering

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page 5

- If the crack-off pressure is found to be considerably different adjust through screw (36, page 11).

POWER STEERING BENCH TEST CONDITIONS

Oil type	oliofiat IDRAULICAR AP51
Oil viscosity	SAE 20 W
Oil temperature	60° C
Output of hydraulic pump 293165	12 l/min (dm ³ /min) (21 pints/min)
Speed of motor 291235	1450 rpm

1. ROTARY VALVE GEAR CHECK

Connect as shown in diagram of fig. a, page 4, and complete circuit as in fig. b. Using tool **293192/1** keep unit in steering position (right or left).

Simultaneously turn handwheel of apparatus **291231** to increase circuit pressure to a value immediately below the crack-off setting of relief valve (24, page 10).

Apply torque wrench to tool **293192/1** and, operating with a torque of 34 Nm (3.5 kgm or 25.3 ft lb), check that time required to turn rotary valve (5, page 10) through one complete revolution exceeds 10 seconds.

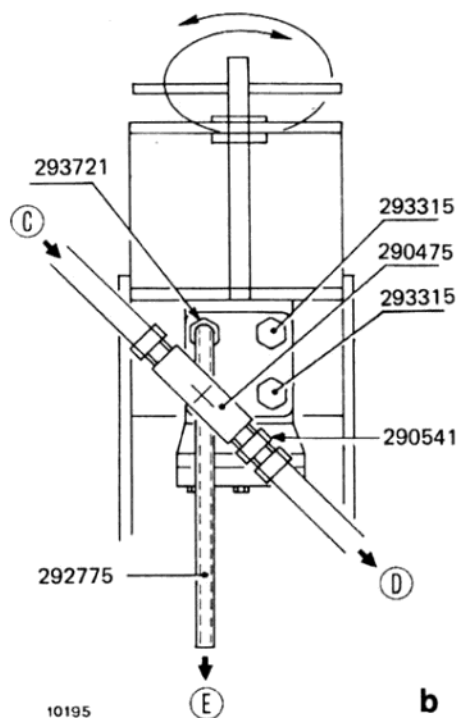
If the above conditions are not met, replace rotary valve and associated sleeve (6).

2. RETURN TO NEUTRAL CHECK

In the same conditions as those of test No. 1, check that rotary valve (5) returns automatically to neutral after each simulated steering manoeuvre, with tool **293192/1** free.

3. SEAL CHECK

In the same conditions as those of test No. 1, keep rotary valve (5, page 10) in steering position using tool **293192/1** for approx. three minutes and check seals for leakage.



Checking rotary valve for wear.

C. From delivery - D. To restriction - E. Exhaust.

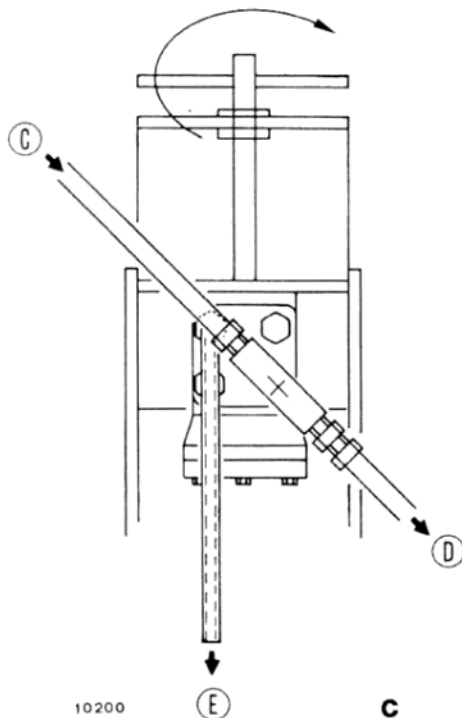
4. RELIEF VALVE CALIBRATION

Connect as show in diagram of fig. a, page 4 and complete circuit as in fig. b. Using tool **293192/1**, simulate steering (to right or left) to cut off oil flow to exhaust.

Gradually increase pressure in circuit by turning handwheel of apparatus **291231** and check on pressure gauge that relief valve (24, page 10) cracks off at the specified pressure (100 bar - 102 kg/cm² - 1450 psi) for two-wheel drive tractors, or (125 bar - 127 kg/cm² - 1770 psi) for four-wheel drive tractors.

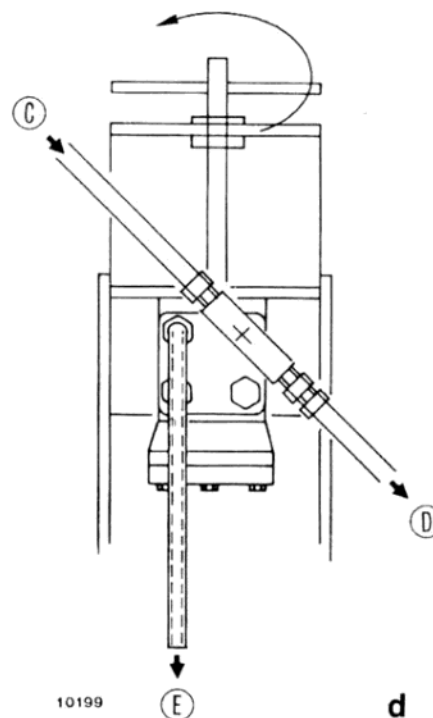
To adjust crack-off setting, tighten or back/off adjusting screw (36, page 11)

FRONT AXLE - STEERING: Power Steering



Adjusting L.H. steer cylinder safety valves.

C. From delivery - D. To restriction - E. Exhaust.



Adjusting R.H. steer safety valves.

C. From delivery - D. To restriction - E. Exhaust.

5. CYLINDER SAFETY VALVE ADJUSTMENT

c. - L.H. steer safety valve.

Connect as shown in fig. a, page 4 and complete circuit as in fig. c.

Using tool **293192/1**, simulate L.H. steering (counterclockwise) to cut off fluid flow to exhaust.

Gradually increase pressure by turning handwheel and check on pressure gauge that safety valve (33, page 10) cracks off at the specified pressure (200 bar - 204 kg/cm² - 2,900 psi).

If not, adjust through screw (38, page 11). Tighten screw to increase or back off to decrease crack off setting.

d. - R.H. steer safety valve.

Connect as shown in fig. a, page 4 and complete circuit as in fig. d.

Proceed as described for L.H. steer safety valve, turning tool **293192/1** clockwise.

Note - Cylinder safety valves (33, page 10) incorporated in DANFOSS OSPC 100 control valve body are adjusted using the screw associated with each valve.

On OSPC 100 control valves, the two safety valves are separate and are each equipped with their own spring and adjusting screw.

Valve must thus be adjusted separately for each direction of steering.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Power Steering

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page 7

POWER STEERING CONTROL VALVE OVERHAUL

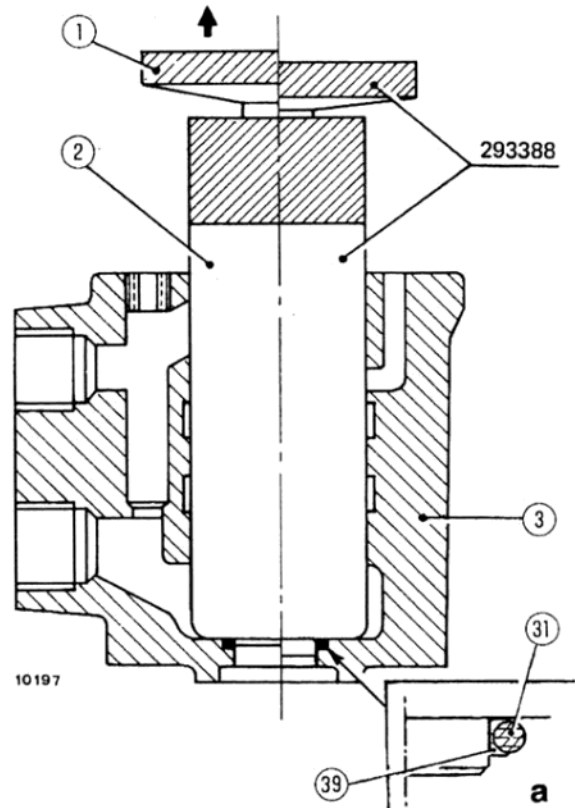
Installation of seal (31, fig. a) and ring (39) using tool 293388.

Lubricate O-ring (31) and anti-extrusion ring (39) (as shown in figure) with grease and apply to lower end of tool plug (1).

Fully insert tool sleeve (2) in seat (3).

Insert tool plug (1) in sleeve (2) and, when tool plug can no longer be slid in easily, rotate slightly and push fully, in. Withdraw plug (1) from sleeve (2) by a few millimeters and then remove complete tool 293388.

Check that seal (31) and associated ring (39) are correctly positioned.



Installation of return springs (2) using tool 293389 (figs. b, c).

Couple rotary valve (5) and associated sleeve (6) aligning the return spring seats.

Insert tool 293389 (see fig. c). Then insert springs (2) arranged as shown in fig. b, in tool.

Squeeze springs together and push into seat while withdrawing tool.

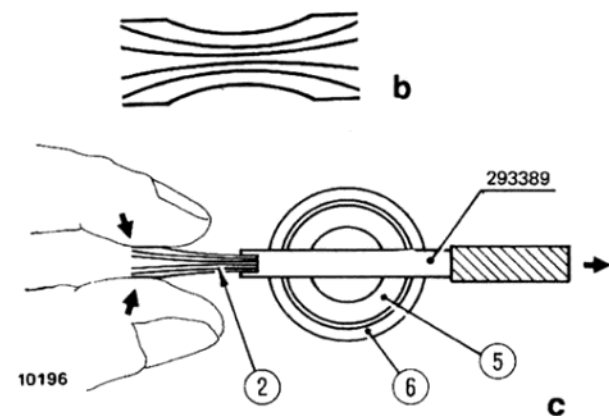
Installation of shaft (7, page 11) using lever 293390 (fig. d).

Insert rotor shaft (7, page 11) in body (3) with slot parallel to pin (1). Insert tool 293390 as shown in fig.

Installing seat (31) and ring (39) using tool 293388.

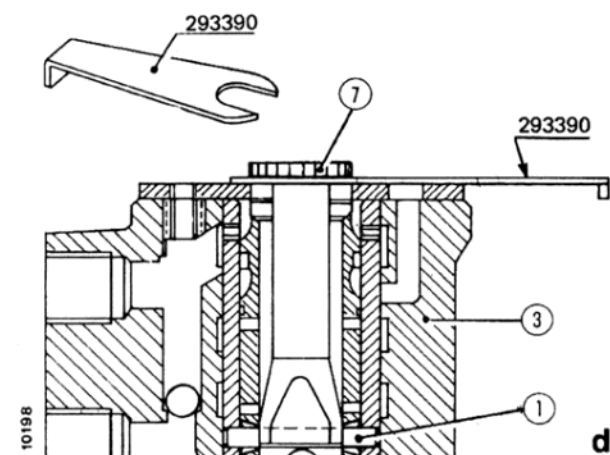
1. Tool plug - 2. Sleeve - 3. Seat.

figure to facilitate power steering unit timing (see page 1) when rotor and associated cam ring (8) are installed.



Installing return springs (fig. b) using tool 293389 (fig. c).

2, 5 and 6 See text.



Installing rotor shaft with lever 293390.

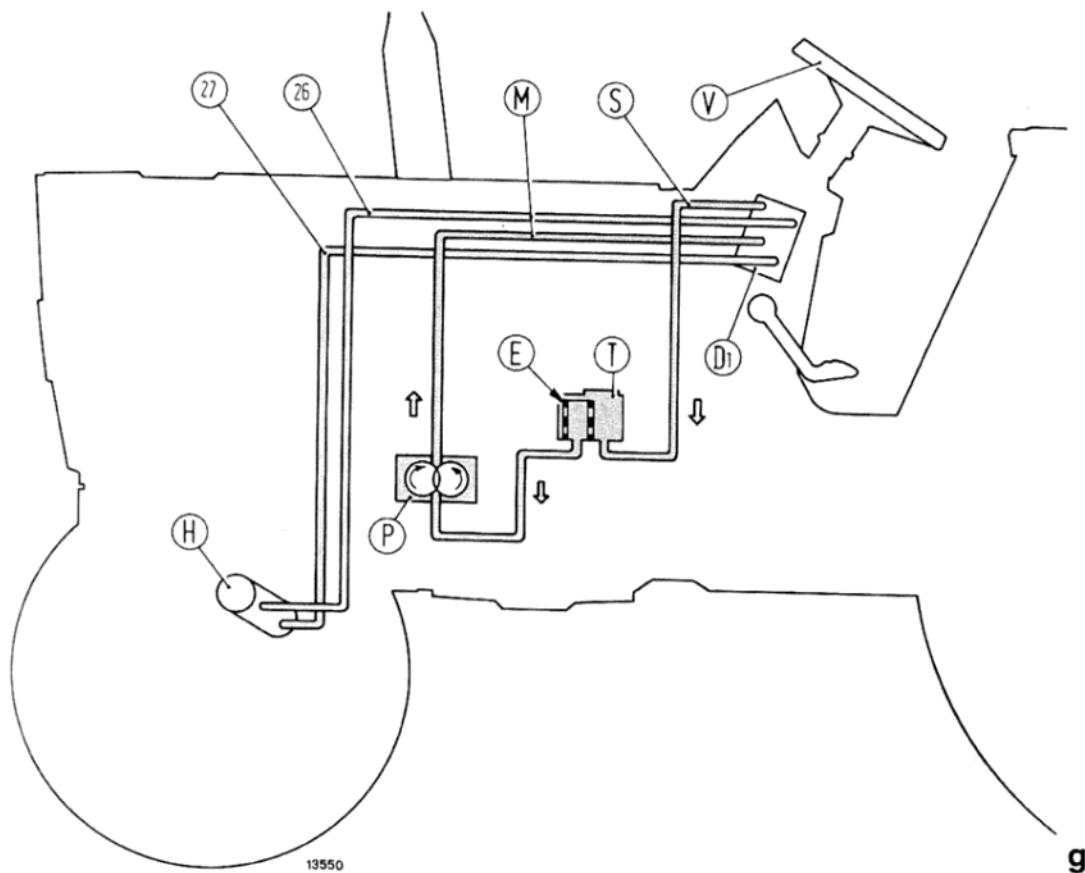
1, 3 and 7 See text.

FRONT AXLE - STEERING: Power Steering

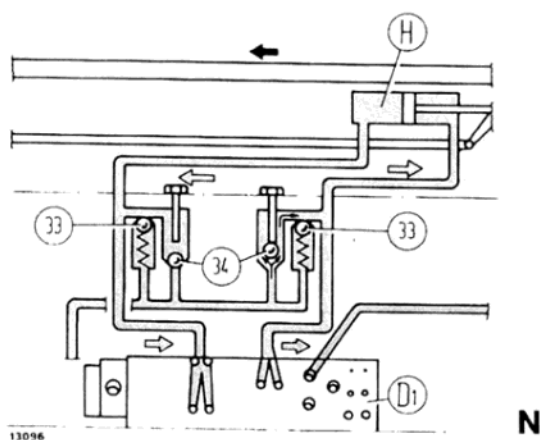
TROUBLE SHOOTING

Fault	Cause	Remedy
1. Control unit leakage from: a. Control side. b. Cover side.	a. Faulty O-ring (31, page 11). b1. Loose screws (C ₁) b2. Faulty lock washers (25) or O-ring (35).	Replace O-ring and associated anti-extrusion ring using tool 293388 . Tighten screws to specified torque. Replace washers or seals.
2. Heavy steering	a. Faulty hydraulic pump. b. Check valve (4) stuck open or ball missing. c. Relief valve (24) out of adjustment. d. Relief valve (24) stuck or open e. Steering column binding in bushing owing to rusting, pick-up, etc.	Overhaul pump Clean valve or filter. Insert new ball, if necessary. Adjust crack off pressure (100 bar - 102 lg/cm ² - 1,450 psi) Remove foreign matter and clean filter (E, page 10). If trouble persists replace entire control valve. Remedy as necessary.
3. Loose steering.	a. Excessive clearance between steering column and rotary valve (5, page 11). b. Excessive clearance between shaft (7) and drive pin (1). c. Excessive clearance between shaft (7) and rotor (9). d. Build-up of clearances a., b. and c. above. e. Broken or weakened leaf springs (2).	Replace worn parts. Replace worn parts. Replace worn parts. Replace worn parts. Replace springs.
4. Steering wheel rotates normally but steering response is: a. Slow, or. b. Non-existent.	a. Leakage through power cylinder piston gland (H, page 10) b1. Failed power cylinder piston rod (H). b2. Failed rotor shaft (7, page 11) or pin (1).	Replace gland. Replace damaged part. Replace damaged part.
5. Engine off, no steering.	a. Excessive wear between rotor (9) and cam ring (8). b. Damaged check valve (23, page 10).	Replace worn parts. Replace control valve.

(follows)



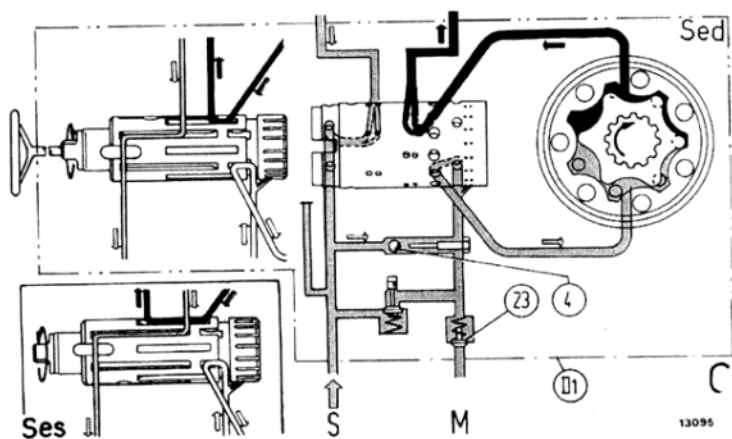
-  Oil pressure to power cylinder.
-  Oil pressure to rotor.
-  Inlet, low pressure or return oil.
-  Trapped oil.



Operation diagram

(For missing references see the caption on page 11)

A. Operation in straight-ahead driving position - B. R.H. (Sd) and L.H. (Ss) steer - C. R.H. and L.H. emergency steer (S e d and S e s) - D. Operation diagram for straight-ahead driving (Sections D-D and F-F) - D1. DANFOSS OSPC 100 control valve - e, f. Operation diagram for two-stage and F-F) - E. Filter cartridge - g. Steering system schematics - H. Power cylinder - M. Pump outlet line - N. Operation diagram of main control valve (D1) in straight-ahead driving position and cylinder piston (H) subject to external action (shown by black arrow) - P. Hydraulic turn to tank - T. Reservoir - V. Steering wheel - 23. Check valve incorporated in control valve body - 24. Relief valve (set to 100 bar - 10 for 2-wheel drive tractors, or (125 bar - 127 kg/cm² - 1,777 psi) for 4-wheel drive tractors incorporated in control valve - 33. Power cylinder (set to 200 bar - 204 kg/cm² - 2,900 psi) incorporated in control valve - 34. Make-up valves incorporated in control valve



FIAT.. sidan 242

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Power Steering

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TROUBLE SHOOTING

(continue)

Fault	Cause	Remedy
	c. Power cylinder safety valves (33, page 10) stuck open or damaged.	Remove foreign particles and clean filter or replace entire control valve.
6. Steering wheel snatch or steering in opposite direction.	a. Timing out of adjustment.	Reverse connection.
	b. Interchanged connection pipes between control unit and power cylinder.	Reverse connection.
7. Impossible to hold tractor on course, continuous correction needed.	a. Low oil level in hydraulic circuit tank.	Top up and bleed air from circuit as directed on page 4.
	b. Worn power cylinder piston gland.	Replace gland.
	c. Power cylinder safety valves (33, page 10) or make-up valves (34) stuck open.	Remove foreign particles and clean filter or replace entire control valve.
	d. Worn control valve.	Replace control valve (D ₁).
8. Impossible to hold straightahead position; steering wheel may tend to move upon discontinuing manual control and steering action continues slowly in the direction of initial steering, necessitating continuous correction to maintain trajectory.	a. Failed or weakened leaf springs (2).	Replace leaf springs.
	b. Sleeve (6) and rotary valve (5) stuck with delivery ports open.	Remove foreign particles and clean filter.
	c. Sleeve (6) stuck to rotary valve (5) owing to excessive pressure.	Check relief valve (24, page 10) crack-off setting.
9. Front wheel shimmy.	a. Air in power cylinder.	Bleed system as directed on page 4 and eliminate causes of possible leakage.
	b. Worn steering linkage points.	Replace worn parts.
	c. Power cylinder safety valves (33) or make-up valves (34) stuck open.	Remove foreign matter and clean filter or renew.
10. Steering difficult in one or both directions.	a. Low pressure.	Check hydraulic pump (P) and relief valve setting (24, page 10). Replace control valve (D ₁)
	b. Excessive leakage inside control valve.	Remove foreign matter and clean filter or replace.
	c. Power cylinder safety valves (33) out of adjustment or inefficient owing to the ingress of foreign matter.	

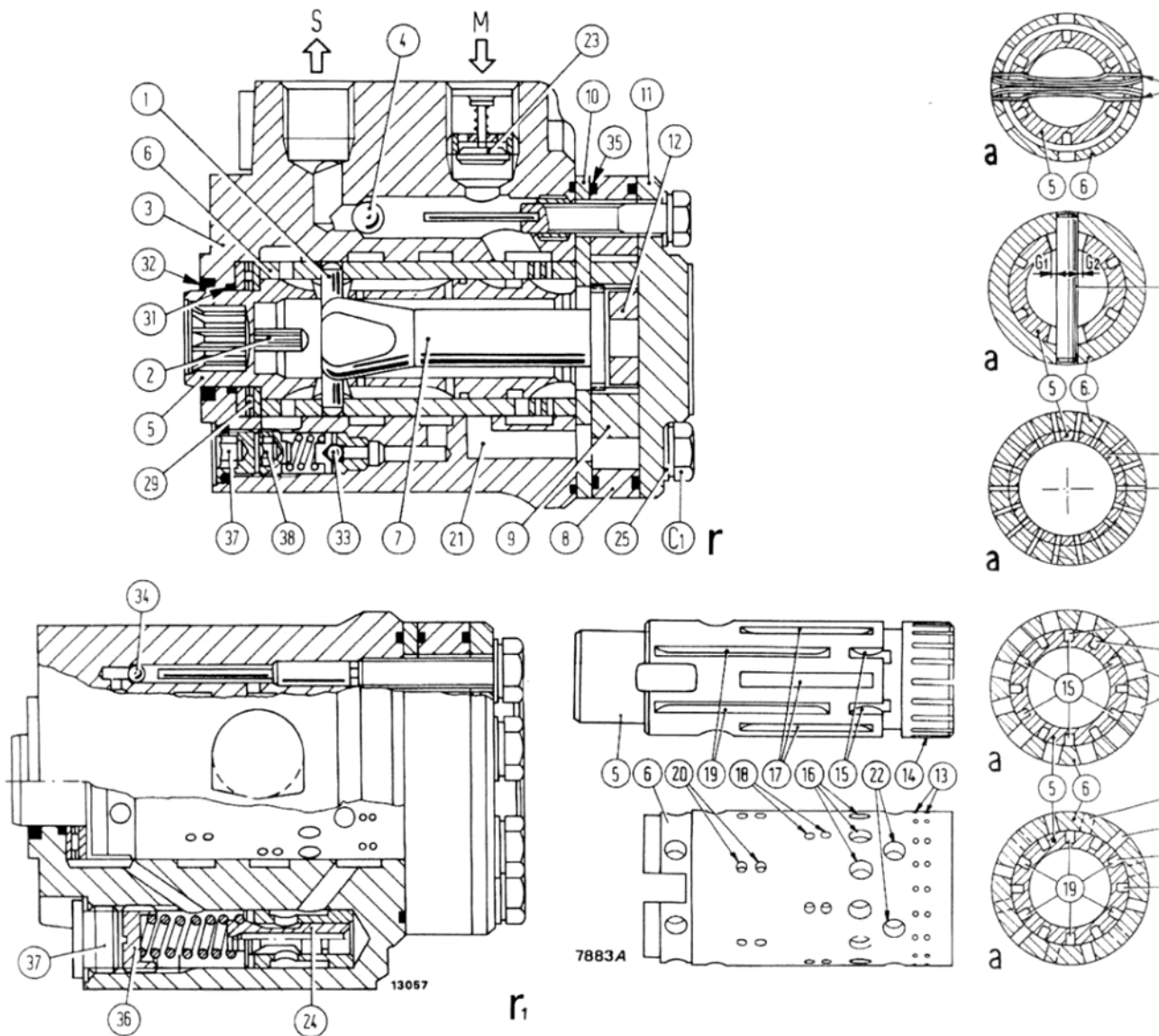
t

55-90 60-90
70-90 80-90
90-90 100-90

FRONT AXLE - STEERING: Power Steering

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page 11



Sections through hydraulic control unit.

a. Section through control unit with valve (5) in neutral - b. Sections through control unit with valve (5) in R.H. steer position (for in symmetrical in opposite direction) - C₁. Cover capscrews - G₁, G₂. Gap between pin (1) and rotary valve (5) - r, r₁. Sections 1 100 control valve - 1. Drive pin - 2. Sleeve return springs - 3. Control valve body - 4. Check valve - 5. Rotary valve - 6. Valve seat sl - 8. Rotor cam ring - 9. Rotor - 10. Thrust ring - 11. Cover - 12. Spacer - 13 and 14. Oil ports - 15. Rotor inlet passages (6 off) - 16. communicating with passages (15 and 17) alternatively - 17. Pressure passages (6 off) to power cylinder communicating with the (18 and 20) - 18. R.H. power cylinder chamber output outlet or exhaust ports (6 pairs) - 19. Power cylinder exhaust passages (1 ports (18 and 20) - 20. L.H. power cylinder chamber output outlet or exhaust ports (6 off) - 21. Oil passage from ports (16) to rotor rece: passages (15) - 23. Check valve - 24. Relief valve - 25. Washer - 26. Oil passage to L.H. power cylinder chamber - 27. Oil passage piston rod side - 29. Thrust bearing - 31. Seals - 32. Dust excluder - 33. Cylinder safety valves - 34. Make-up valves - 35 O-rings - 37. Plugs - 38. Valve adjusting screw.

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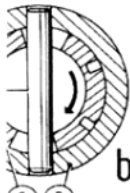
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Straight-ahead Driving (A, a, d).

With steering wheel (V) stationary, rotary valve (5) takes neutral position relative to sleeve (6). This position is maintained through the action of springs (2, section A-A) and the following conditions exist:

- Pin (1, section B-B) is central in the valve aperture.
- Ports (13 and 14) are in alignment (Section C-C) and the oil pressure from pump (P) is returned to tank.
- Passages (15, 17 and 19) on the valve (Sections D-D and E-E) are off register relative to ports (16, 18 and 20) on the sleeve (i.e. all ports in communication with the power cylinder remain closed).

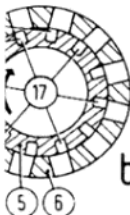


R.H. Steering (B, Sd, b, e, f).

Upon turning steering wheel (V) clockwise, springs (2, Section A-A) deflect allowing valve (5) to rotate relative to sleeve (6) until gap (G₁, section B-B) is taken up.

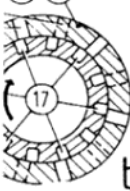
Thus:

- Ports (13 and 14, Section C-C) go out of alignment to discontinue oil return.
- Six passages (15, Section D-D) line up with an equal number of ports (16) connected instant by instant with the rotor recesses during the inlet phase.
- Six pressure passages (17, Section E-E) line up with ports (18) communicating with the power cylinder. Moreover, the oil pressure passages communicate with the remaining ports (16, Section D-D) connected instant by instant with the rotor recesses during the actuation phase.
- Six exhaust passages (19) line up with ports (20, Section E-E) communicating with the power cylinder.



Once the gap (G₁) is eliminated, valve (5) positively transmits steering wheel input to both sleeve (6) and rotor (9) through pin (1) and shaft (7). Diagrams (e and f) show the principle of operation at start of R.H. steer and after a certain amount of wheel rotation.

The flow of oil pressure from pump to rotor during inlet, and from rotor to power cylinder line during the power actuation phase, is provided instant by instant.



L.G. Steer (B, Ss).

Upon turning the steering wheel anti-clockwise, a reversal of the above sequence is obtained and delivery passages (17, Section E-E) supply ports (20) to bring about L.H. steering.

Emergency Hydraulic Steer (C, Sed, Ses).

Steering is possible even in cases of loss of hydraulic pressure. Upon turning the steering wheel, valve (5) takes up the normal operating position, whilst the rotor functions as a hand pump directing oil pressure to the power cylinder.

Check valve (4) opens, thereby permitting the flow of oil from tank to rotor by-passing the pump.

Valve (23) remains closed preventing leakage in connecting line between pump and control unit.

Power Cylinder Safety and Make-up Valves (N).

As safety valves open (33), pressure created by piston (H) in exhausted in one cylinder chamber under the action of strong external stresses on wheels. Simultaneously, vacuum in the opposite chamber is compensated by oil flow through the opening of the associated make-up valve (34). Pressure in one cylinder chamber deriving from small external stresses which are not sufficient to open cylinder safety valve, is exhausted through normal leakage past control valve (D₁), while vacuum in the opposite chamber is compensated through make-up valve (34). Operation of the above valves eliminates continuous steering wheel correction and prevents front wheel shimmy hydraulic circuit failure and damage to the steering linkage.

valve rotation
FOSS OSPC
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ports (12 off)
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unicating with
pply ports for
ider chamber,
ljusting screw

FRONT AXLE - STEERING: Power Steering

STEERING COLUMN AND STEERING WHEEL ADJUSTMENT UNIT DISASSEMBLY

Disassembly

Proceed as follows:

- Back off capscrew (C₁) and remove steering wheel from column using puller **291192/1**. Also remove guard (15).
- Remove capscrews and take off plate (5) together with bellows (4).
- Back off capscrews (C₂) and remove steering column assembly.
- Remove roll pins (13 and 14) and adjustment pin (11). Back off nuts (C₄) and remove support (6), retrieving clutch discs (10), washers and spacer (12).

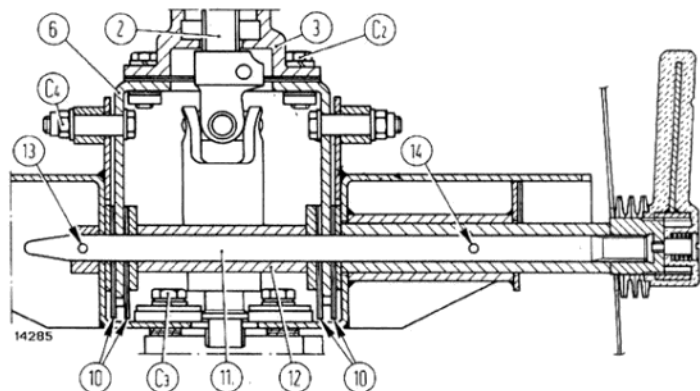
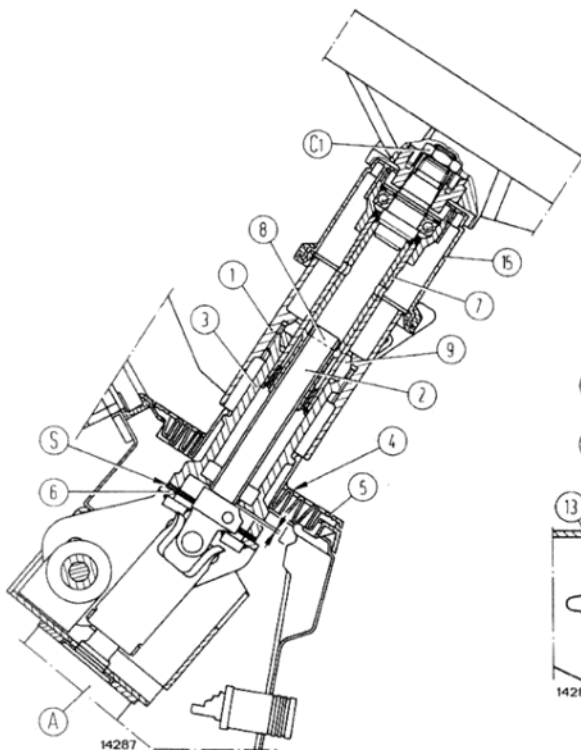
Note - If splined sleeve (7) must be detached from

splined pin (2), remove lock ring (1) and cone (9). Align holes on sleeve (7) with dowel (8), remove dowel and separate sleeve and pin.

Installation

Reverse the disassembly sequence and note the following points:

- Scrap and replace clutch discs (10) if worn.
- Install steering column assy on support (6) and start two screws (C₂) as guides.
- Hold sleeve (3) and support (6) in contact and check clearance using a feeler gauge.
- Install a shim pack (S) whose thickness exceeds measured clearance by 1 mm (.039 in) so as to produce a play (L) of 1 mm (.039 in).
- Install remaining screws and tighten to the specified torque.



Sections through steering column and steering wheel tilt adjustment.

A. Power steering unit - C₁. Steering wheel capscrew - C₂. Steering column capscrew - C₃. Steering unit capscrew - C₄. Support pivot nut - L. Sleeve to support clearance - S. Shim - 1. Lock ring - 2. Splined pin - 3. Sleeve - 4. Bellows - 5. Bellows plate - 6. Column support - 7. Splined sleeve - 8. Dowel - 9. Cone - 10. Clutch discs - 11. Adjustment pin - 12. Spacer - 13 and 14. Roll pins - 15. Plastic guards.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Specification and Data

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page 1

LIVE FRONT AXLE

Type	55-90DT and 60-90DT	70-90DT and 80-90DT	90-90DT and 100-90DT
	Steering, full-floating, center pivoting		
Bevel Drive and Differential			
Bevel drive ratio	9/38 = 1 to 4.2	9/39 = 1 to 4.3	13/40 = 1 to 3.08
Bevel drive backlash	0.15 to 0.20 mm (0.006 to 0.008 in)		
Bevel pinion bearing shim thickness (S ₁ , page 3, Sec. 42)	2.50 - 2.55 - 2.60 - 2.65 - 2.70 - 2.75 - 2.80 - 2.85 - 2.90 - 2.95 - 3.00 - 3.05 - 3.10 - 3.15 - 3.20 - 3.25 - 3.30 - 3.35 - 3.40 - 3.45 - 3.50 - 3.55 - 3.60 - 3.65 - 3.70 mm (0.098 - .100 - .102 - .104 - .106 - .108 - .110 - .112 - .114 - .116 - .118 - .120 - .122 - .124 - .125 - .127 - .129 - .131 - .133 - .135 - .137 - .139 - .141 - .143 - .145 in)	2.20 - 2.25 - 2.30 - 2.35 - 2.40 - 2.45 - 2.50 - 2.55 - 2.60 - 2.65 - 2.70 - 2.75 - 2.80 - 2.85 - 2.90 - 2.95 - 3.00 - 3.05 - 3.10 - 3.15 - 3.20 - 3.25 - 3.30 - 3.35 - 3.40 mm (0.086 - .088 - .090 - .092 - .094 - .096 - .098 - .100 - .102 - .104 - .106 - .108 - .110 - .112 - .114 - .116 - .118 - .120 - .122 - .124 - .125 - .127 - .129 - .131 - .133 in)	
Bevel pinion shim thickness (S ₂)	2.5 - 2.6 - 2.7 - 2.8 - 2.9 - 3.0 - 3.1 - 3.2 - 3.3 - 3.4 - 3.5 - 3.6 - 3.7 mm. (0.098 - 0.102 - 0.106 - 0.110 - 0.114 - 0.118 - 0.122 - 0.126 - 0.130 - 0.134 - 0.138 - 0.142 - 0.146 in)	2.3 - 2.4 - 2.5 - 2.6 - 2.7 - 2.8 - 2.9 - 3.0 - 3.1 - 3.2 - 3.3 - 3.4 - 3.5 mm (0.090 - 0.094 - 0.098 - 0.102 - 0.106 - 0.110 - 0.114 - 0.118 - 0.122 - 0.126 - 0.130 - 0.134 - 0.138 in)	
Differential pinion and side gear backlash	0.15 mm (0.006 in)		
Side gear thrust washer thickness (7, page 3, Section 42)	1.470 to 1.530 mm (0.0579 to 0.0602 in)		
Differential pinion thrust washer thickness (6)	1.50 to 1.60 mm (0.0590 to 0.0630 in)		
Differential gear backlash adjustment	See page 13, section 41		
Differential pinion journal dia.	21.939 to 21.960 mm. (0.864 to 0.865 in)	23.939 to 23.960 mm (0.942 to 0.943 in)	
Differential pinion bore dia.	22.040 to 22.061 mm (0.868 to 0.869 in)	24.040 to 24.061 (0.946 to 0.947 in)	
Differential pinion journal clearance in pinion bore	0.080 to 0.122 mm (0.003 to 0.005 in)		
Side gear spigot diameter	37.961 to 38.000 mm (1.494 to 1.496 in)	43.961 to 44.000 mm (1.731 to 1.732 in)	
Side gear spigot bore diameter in differential case	38.080 to 38.119 mm (1.499 to 1.501 in)	44.080 to 44.119 mm. (1.735 to 1.737 in)	
Side gear spigot clearance in differential case	0.080 to 0.158 mm (0.003 to 0.005 in)		
Axle Shafts and Joints			
Axle shaft journal diameter (5, page 3, section 42)	29.914 to 29.935 mm (1.178 to 1.179 in)	41.975 to 42.000 mm (1.653 to 1.654 in)	44.975 to 45.000 mm (1.770 to 1.771 in)
Axle bushing fitted I.D. (14)	30.050 to 30.105 mm (1.183 to 1.185 in) (1)	42.100 to 42.175 mm (1.657 to 1.660 in) (1)	45.100 to 45.175 (1) mm (1.775 to 1.778 in)
Axle shaft running clearance in bushing	0.115 to 0.191 mm (0.004 to 0.007 in)	0.100 to 0.200 mm (0.004 to 0.008 in)	0.100 to 0.200 mm (.004 to .0078 in)
Bushing interference fit in housing	0.064 to 0.129 mm (0.003 to 0.005 in)		
King pin bearing shim thickness (S ³ , page 3, Section 42)	0.10-0.15-0.20-0.25-0.30 mm (0.004-0.006-0.008-0.010-0.012 in)		

(1) Not reamed.

(follows)

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FRONT WHEEL DRIVE: Specification and Data

LIVE FRONT AXLE

(continued)

	mm		
	55-90DT and 60-90DT	70-90DT and 80-90DT	90-90DT and 100-90DT
Planetary Final Drives			
Reduction ratio	15:(15+54) = 1:4.6	16:(16+62) = 1:4.88	16:(16+68) = 1:5.25
Driven gear thrust washer thickness (18, page 3, Section 42)	0.77 to 0.83 mm (0.030 to 0.033 in)		
Wheel bearing shim thickness (S ₄) (early model front axle) (●)	—	1.7-1.8-1.9-2-2.1 2.2-2.3-2.4-2.5 2.6-2.7-2.8-2.9-3 3.1-3.2-3.3 mm (0.067 - 0.071 - 0.075 - 0.079 - 0.083 - 0.087 - 0.091 - 0.094 - 0.098 - 0.102 - 0.106 - 0.110 - 0.114 - 0.118 - 0.122 - 0.126 - 0.130 in)	—
Centre Pivot			
Pivoting angle (on either side)	11°		
Center pivot and support end float (L ₁ , page 3, section 42)	0.3 to 1.1 mm (0.01 to 0.04 in)		
Max. wear clearance	2 mm (0.07 in)		
Centre pivot diameter	52.652 to 52.671 mm (2.0729 to 2.0737 in)		
Centre pivot front bushing fitted I.D. (21)	52.720 to 52.790(*) mm (2.0756 to 2.0783 in)		
Centre pivot working clearance in bushing	0.049 to 0.138 mm (0.0019 to 0.0054 in)		
Rear bevel pinion carrier spigot O.D.	99.040 to 99.072 mm (3.8992 to 3.9005 in)		
Rear bushing fitted I.D. (24)	99.146 to 99.221 (*) mm (3.9033 to 3.9063 in)		
Spigot fitted clearance in bushing	0.074 to 0.181 mm (0.0029 to 0.0071 in)		
Axle front and rear thrust washer thickness (22 and 23, page 3, Sect 42)	4.95 to 5.00 mm (0.1949 to 0.1968 in)		
Turning radius:			
— Live axle in	—	—	—
— Live axle out	—	—	—
Brakes on	—	—	—
Brakes off	—	—	—
— Live axle in	—	—	—
— Live axle out	—	—	—
Brakes on	—	—	—
Brakes off	—	—	—
5100 (○) (16 ft 7 in)	5300 (17 ft 4 in)	5700 (18 ft 8 in)	

(*) Not reamed — (●) Up to frame 628414 (70-90 DT). 296719 (80-90 DT) — (○) 5200 mm or 16ft 11 in for 60-90 DT

DRIVE SHAFTS

Front drive sleeve adjustment	See page 1, Sect 42	
Front drive sleeve shim thickness (S _s , page 3, Section 42)	2.2-2.5-2.8-3-3.3-3.7-4-4.3 mm (0.086 - 0.100 - 0.110 - 0.118 - 0.130 - 0.146 - 0.158 - 0.170 in)	1.0-1.2-1.5-1.8-2.0 2.2-2.5-2.8-3.0-3.3 3.7-4.0-4.3 mm (.039 - .047 - .059 - .070 - .078 - .086 - .098 - .110 - .118 - .129 - .145 - .157 - .169 in)

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Specification and Data

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page 3

AXLE DRIVE

	mm		
	55-90DT and 60-90DT	70-90DT and 80-90DT	90-90DT and 100-90DT
Reduction ratio	34/24x24/34 = 1 to 1		22/20x20/27 = 1 to 1.2
Relay lever pad width	7.910 to 8.000 (0.311 to 0.3149 in)		
Pad seat width in driven gear	8.280 to 8.370 (0.3260 to 0.3295 in)		
Pad clearance in seat	0.280 to 0.460 (0.0110 to 0.018 in)		
Relay lever pivot diameter	15.973 to 16.000 (0.6288 to 0.6299 in)		
Pivot housing bore in casing	16.016 to 16.059 (0.6305 to 0.6322 in)		
Pivot clearance in housing	0.016 to 0.086 (0.0006 to 0.0034 in)		
Engagement lever detent spring length:			
— Free	130 mm (5.118 in)	—	—
— Under 299 to 330 N (30.5 to 33.7 kg or 67.2 to 78.6 lb)	142.5 mm (5.61 in)	—	—
Relay lever detent spring length:			
— Free	—	—	24.3 mm (.956 in)
— Under 79.4 to 87.2 N (8.1 to 8.9 kg or 17.8 to 19.6 lb)	—	—	20.5 mm (.807 in)

FRONT WHEEL DRIVE: Specification and Data

TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread Size	Torque		
		Nm	kgm	ft lb
Front axle - Section 42				
Lock ring, bevel pinion (C ₁ , page 3) { Models 55-90DT and 60-90DT Models 70-90DT, 80-90DT, 90-90DT and 100-90DT	M 35x1.5 M 40x1.5	294	30	217
Capscrew, differential case to axle casing (C ₂)	M 12x1.25	113	11.5	83
Capscrew, ring gear to differential case (C ₃)	M 12x1.25	113	11.5	83
Capscrew, king pin (C ₄)	M 10x1.25	64	6.5	47
Capscrew, steering knuckle (C ₅)	M 12x1.25	113	11.5	83
Lock ring, wheel bearing (C ₆) { 55-90DT and 60-90DT 70-90DT, 80-90DT, 90-90DT and 100-90DT	M 45x1.5 M 50x1.5 M 55x2	59 59 (o) 118	6 6 (o) 12	43 43 (o) 87
Capscrew, planetary final drive housing (C ₇): — 55-90DT, 60-90DT, 70-90DT, 80-90DT — 90-90DT, 100-90DT	M 10x1.25 M 12x1.25	64 64	6.5 6.5	47 47
Capscrew, wheel disc to hub (C ₈)	M 16x1.5	255	26	188
Nut, rim to wheel disc: — 55-90, 60-90, 70-90, 80-90 — 90-90, 100-90	M 14x1.5 M 16x1.5	216 245	22 25	159 180
Capscrew, front and rear axle case support (C ₉)	M 18x1.5	392	40	289
Capscrew, differential cap (C ₁₀)	M 12x1.5	113	11.5	83
Capscrew, front axle carrier to engine (C ₁₁)	M 18x1.5	314	32	231
Drive Shafts - Axle Drive - Section 42				
Capscrew, centre bearing (C ₁₂ , page 3)	M 12x1.25	98	10	72
Capscrew, axle drive housing to tractor (C ₁₃ , page 3)	M 12x1.25	98	10	72
Capscrew, shaft guard	M 8x1.25	25	2.6	19

(*) From frame 628415 (70-90 DT) or 267620 (80-90 DT). Tighten to 510 Nm (52 kgm or 376 ft. lb) up to frame 628414 (70-90 DT) or 267619 (80-90 DT).

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Live Front Axle

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REMOVAL



CAUTION

Lift and handle all heavy parts using a suitable hoist. Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the lifted load.

Proceed as follows:

- Remove drive shaft guard (29, page 3, section 42).
- Remove retaining rings (28 and 37) from seats and withdraw drive shaft (30) (56), moving splined sleeve (33) inwards.
- Remove power steering cylinder and hinge pins; place a hydraulic jack centrally under case and remove wheels.
- Place a stand under engine oil pan at front, remove front and rear axle pivots and, lowering jack, separate assy from tractor.
- Secure axle assy to universal stand, remove track and drain oil from axle case and final drives.

DISASSEMBLY



CAUTION

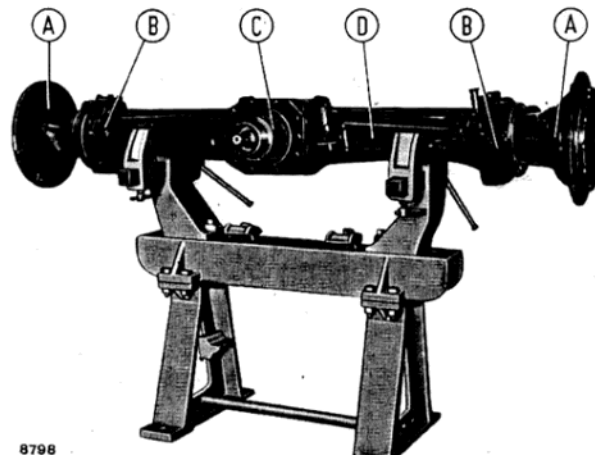
Handle all parts carefully. Do not put hands and fingers between parts. Wear safety goggles, shoes and gloves.

Final drive, hub and steering knuckle overhaul.

Overhaul may also be carried out with axle installed on tractor. In this case, lock parking brake and place a stand at the center of axle case. Disassemble parts in the following order:

1. Planetary final drive housing (1, a, page 2) with planet wheels.

Note — To facilitate final drive housing removal from hub, back off 8 capscrews (models 55-90 DT and 60-90 DT) or 10 capscrews (models 70-90DT,



Front axle installed on universal stand.

A. Wheel hubs with planetary final drives - B. Steering knuckle - C. Differential carrier - D. Axle case.

80-90DT, 90-90DT and 100-90DT) and slacken the remaining two capscrews. Remove oil filler plug, install a slide hammer puller in its place and remove housing.

2. Sun gear (2).
3. Planetary final drive ring gear-fixed gear unit (3 and 4, b), slackening lock ring (C, section 42, page 3) using wrench **293837** (55-90DT and 60-90DT) **293702** (●) (70-90DT and 80-90DT) or **293705** (90-90DT and 100-90DT) and removing assy from knuckle.

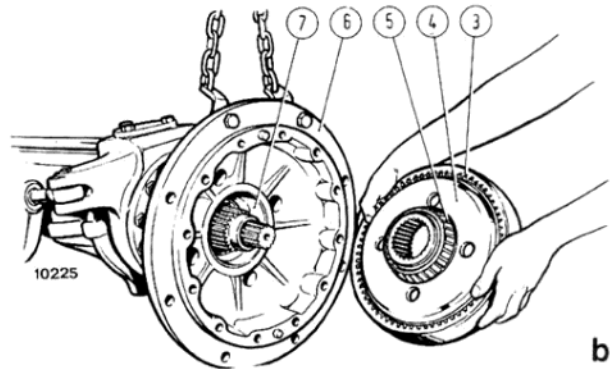
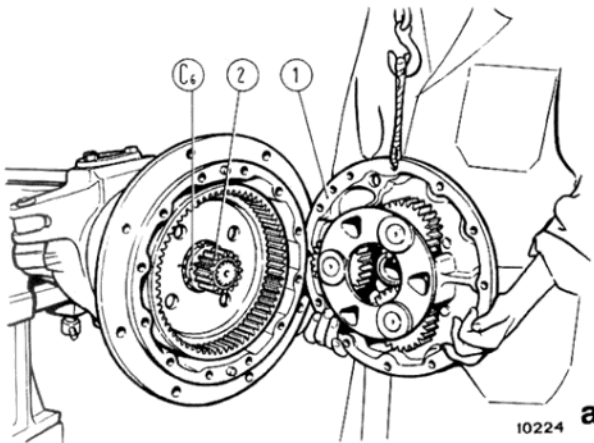
(●) **Note** — Use wrench **293519/1** for early model axles up to frame 628414 (70-90 DT) or 267619 (80-90 DT).

4. Wheel hub (6) with taper roller bearing cups (7) and associated seal. Be careful to prevent seal damage.
5. Steering knuckle (10, d) with wheel hub support.
6. Articulated axle shaft (9, page 3) with bearing housing (11). Back off capscrew (9, section 42, page 3) before withdrawing axle shaft.
7. Knuckle carrier (8, d, page 2).

Replace worn bearings using suitable punches and universal pullers. Check seal efficiency.

Assemble axle parts referring to figures on page 3, section 42 for correct positioning and note the following:

FRONT WHEEL DRIVE: Live Front Axle



Removing (installing) final drive housing (a) and fixed gear/ring gear assy (b).

C6. Bearing lock ring - 1. Final drive housing - 2. Sun gear - 3 and 4. Fixed gear/ring gear assy - 5. Taper roller bearing cone - 6. Wheel hub - 7. Taper roller bearing cup.

CAUTION

Use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.

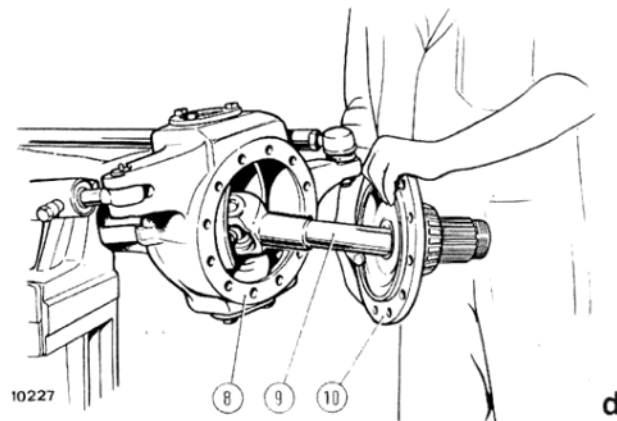
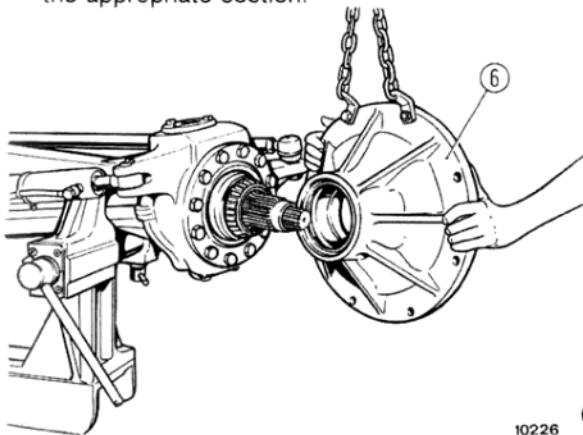
- Before installing final drive housing (1) thoroughly clean and degrease mating surfaces and apply a 2 mm (0.08 in) dia. bead of jointing compound as shown in figure on page 3. Jointing compound types are indicated on page 6, section A.
- Insert articulated axle shaft (9) in axle case and install steering knuckle carrier (8, d).
- Adjust king pin bearing pre-load as directed in the appropriate section.
- Adjust wheel hub bearing pre-load as directed in the appropriate section.

— Fill wheel hubs and differential bevel drive housing with specified oil.

King pin bearing adjustment (models 55-90 DT and 66-90 DT).

Proceed as follows:

- Check bearing outer races in axle case and associated seals for wear and pack with **grassofiat TUTELA G 9** grease;
- Remove lubricators from top and bottom covers.
- Install top cover (1, page 3) without shims and torque capscrews to 64 Nm (6.5 kgm, 47 ft lb).
- Install bottom cover (2, page 3) without shims using three capscrews lubricated with engine oil.



Removing (installing) wheel hub (c) and steering knuckle (d).

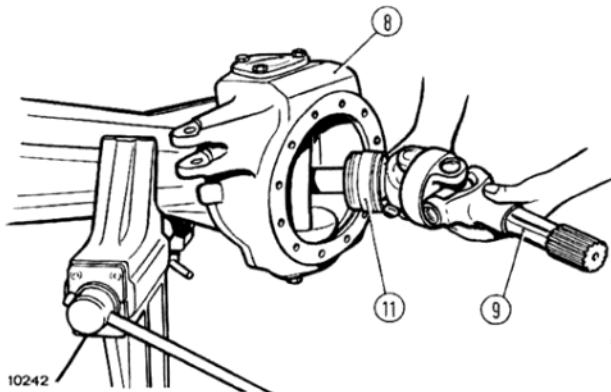
6. Wheel hub - 8. Knuckle carrier - 9. Axle shaft with universal joint - 10. Steering knuckle.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Live Front Axle

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page 3



Removing (installing) axle shaft with universal joint.

8. Knuckle carrier - 9. Axle shaft with universal joint - 11. Bearing carrier.

- Tighten bottom cover capscrews in alternating fashion to 2.9 Nm (0.3 kgm, 2.17 ft lb) in increments of 0.98 Nm (0.1 kgm, 0.72 ft lb). While tightening capscrew, swing the carrier to settle the bearings.
- Using a feeler gauge, measure gap (H) between bottom cover and carrier alongside the capscrews.
- Thickness of shims (S_3 , page 3, section 42) under bottom cover will be given by the arithmetical average of readings.

If necessary, round down to the nearest 0.05 mm (0.002 in).

Partially slacken bottom cover capscrews, insert shims and tighten capscrews to a torque of 64 Nm (6.5 kgm or 47 ft lb).

Swing carrier several times to settle and, using a torque wrench with tool 292220/3 (A), check that the torque required to swing the carrier is 2.9 to 7.8 Nm (0.3 to 0.8 kgm or 2.17 to 5.79 ft lb).

To adjust, alter the number of shims as necessary.

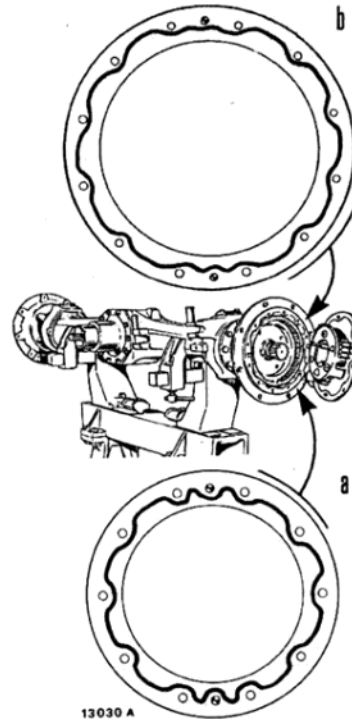
Install lubricators in top and bottom covers and apply lubricant.

King pin bearing adjustment (models 70-90DT, 80-90DT, 90-90DT and 100-90DT).

Proceed as follows:

- Check bearing outer races in axle case and associated seals for wear.

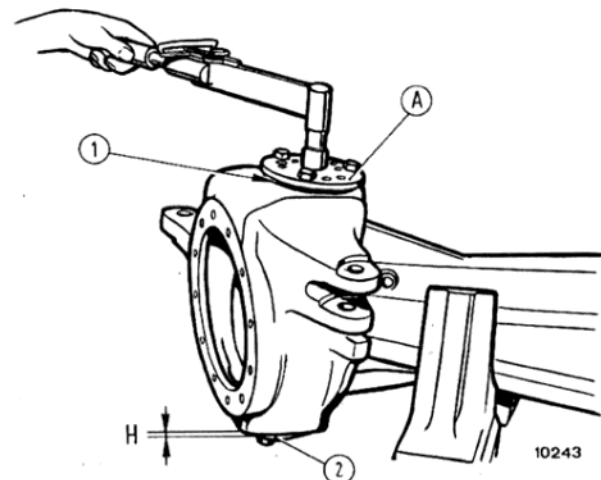
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Applying jointing compound for front axle final drive housing installation - Models 55-90DT, 60-90DT (a) and models 70-90DT, 80-90DT, 90-90DT and 100-90DT (b).

Jointing compound types are indicated on page 5, section A.

- Remove lubricators from top and bottom covers.
- Smear bearing outer races with **grassofiat TUTELA G9** grease.



Determining king pin bearing pre-load shim thickness (S_3 , page 3, section 42).

A. Tool 292220/3 for knuckle carrier swing torque check - H. Gap between carrier and bottom cover - 1. Top cover - 2. Bottom cover.

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FRONT WHEEL DRIVE: Live Front Axle

- Install top cover (1) and torque capscrews to 64 Nm (6.5 kgm or 47 ft lb).
- Install bottom cover (2) without shims using capscrews lubricated with engine oil.
- Using torque wrench and tool **292220/3** (A) tighten bottom cover capscrews until the torque required to swing carrier is 15 to 25 Nm (1.5 to 2.5 kgm or 10.4 to 18.1 ft lb).
- Using a feeler gauge, measure gap (H) between bottom cover and carrier, alongside the capscrews.
- Calculate the average of the three readings; thickness of shims (S_3 , page, section 42) to be installed under bottom cover will be given by:

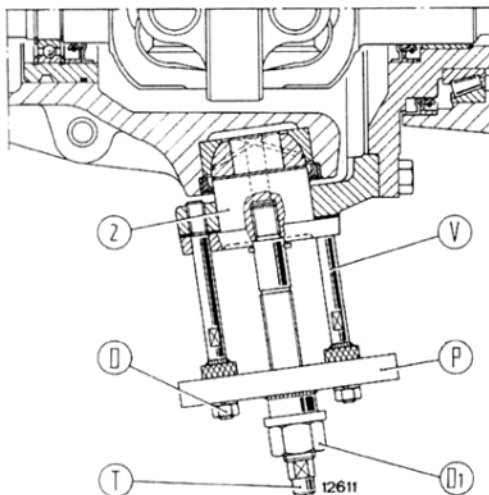
$$S_3 = H - 0.20 \text{ mm or } 0.008 \text{ in}$$

If necessary, round up to the nearest 0.05 mm (0.002 in).

Partially slacken bottom cover capscrews, insert shims and tighten capscrews to a torque of 64 Nm (6.5 Kgm or 47 ft lb).

Swing carrier several times to settle and check that the torque required to swing the carrier is 118 to 147 Nm (12 to 15 kgm or 87 to 108 ft lb).

To adjust, alter the number of shims as necessary.



Removing king pin bearings using puller 293857.

D, D₁, P, T, V. Parts of puller **293857** - 2. King pin bearings.

Install lubricators on top and bottom covers and complete lubrication.

KING PIN BEARING REMOVAL

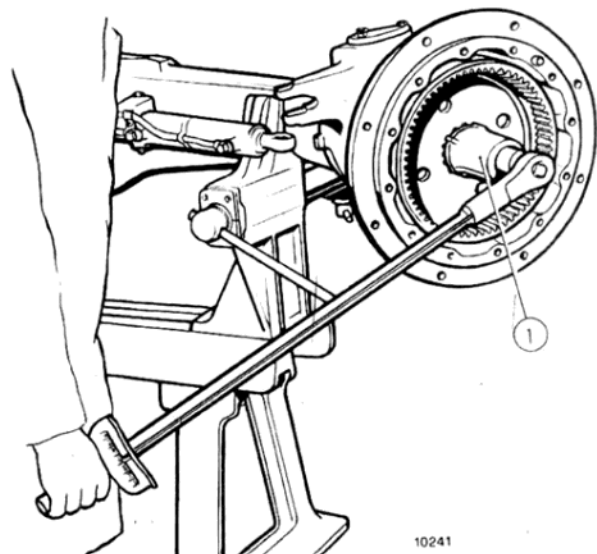
If king pin bearing removal proves difficult, use puller **293857**.

Proceed as follows:

- Remove king pin bearing capscrews (C₄, page 3, section 42).
- Remove lubricators from bearings.
- Install the three threaded legs (V) of puller **293857**. Screw in all three legs by the same amount.
- Install puller bridge (P) and secure to legs through nuts (D).
- Install forcing screw (T) and fully tighten in lubricator seat on bearing (2).
- Turn nut (D₁) to withdraw bearing.

Wheel hub bearing adjustment (All models).

Note - Adjustment should be performed from frame 628415 (70-90 DT) or 267620 (80-90 DT).



Adjusting wheel hub bearings.

1. Lock ring wrench **293837** for 55-90 DT and 60-90 DT, **293702** for 70-90 DT and 80-90 DT, or **293705** for 90-90 DT and 100-90 DT.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Live Front Axle

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Proceed as follows:

- Install wheel hub and fixed gear unit on steering knuckle;
- Using a torque wrench and lock ring wrench **293837** (55-90 DT and 60-90 DT), **293702** (70-90 DT and 80-90 DT), **293705** (90-90 DT and 100-90 DT), progressively tighten lock ring (C₆, section 42, page 3) to 147 to 196 Nm, 15 to 20 kgm or 108 to 145 ft.lb. (55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT) or 196 Nm, 20 kgm or 145 ft.lb. (90-90 DT and 100-90 DT). While tightening lock ring, rotate the hub to settle the bearings.
- Fully slacken lock ring and retighten to 59 Nm (6 kgm or 43 ft.lb) (for 55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT), or 118 Nm, 12 kgm or 86 ft.lb for 90-90 DT and 100-90 DT).
- Secure lock ring by bending over a lockwasher tab (if necessary, tighten lock ring further to align slot with tab).
- Turn hub by hand to check for excessive play or binding.

Wheel hub bearing adjustment using special purpose tool 293435 (figures a,b) for models 70-90 DT up to frame 628414 and 80-90 DT up to frame 267619.

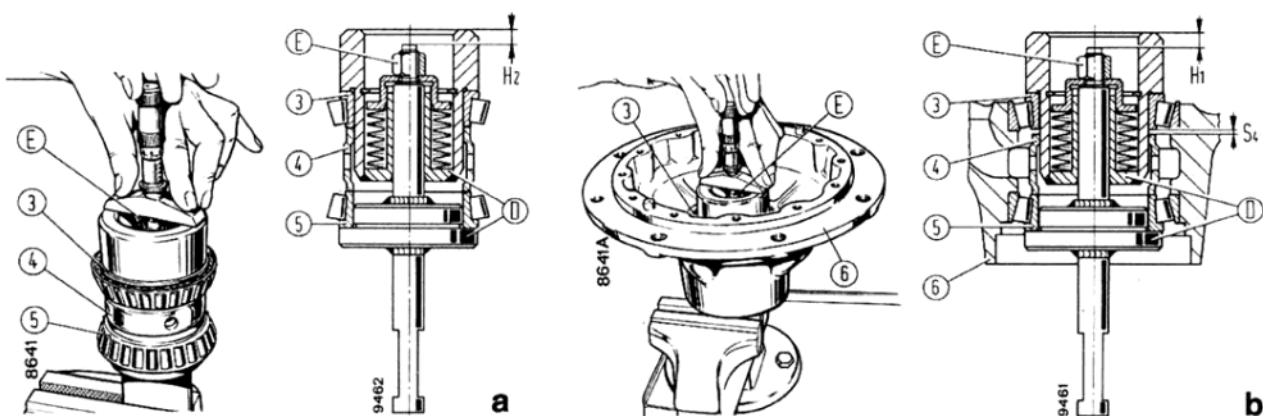
Proceed as follows:

- Install wheel hub bearing cones (3 and 5) and associated spacer (4) on tool **293435** (D).
- Fully tighten tool nut (E).
- Measure dimension (H₂) between tool top face and pin end.
- Remove bearing cones and spacer from tool, lubricate bearing cones with engine oil and reinstall on tool, inserting wheel hub (6) with bearing cups in their seats.
- Fully tighten nut (E) while rotating wheel hub through ten revolutions to settle the bearings.
- Measure dimension (H₁) of tool in this condition.

Thickness of shims (S₄, page 3, section 42) will be given by:

$$S_4 = H_1 - H_2$$

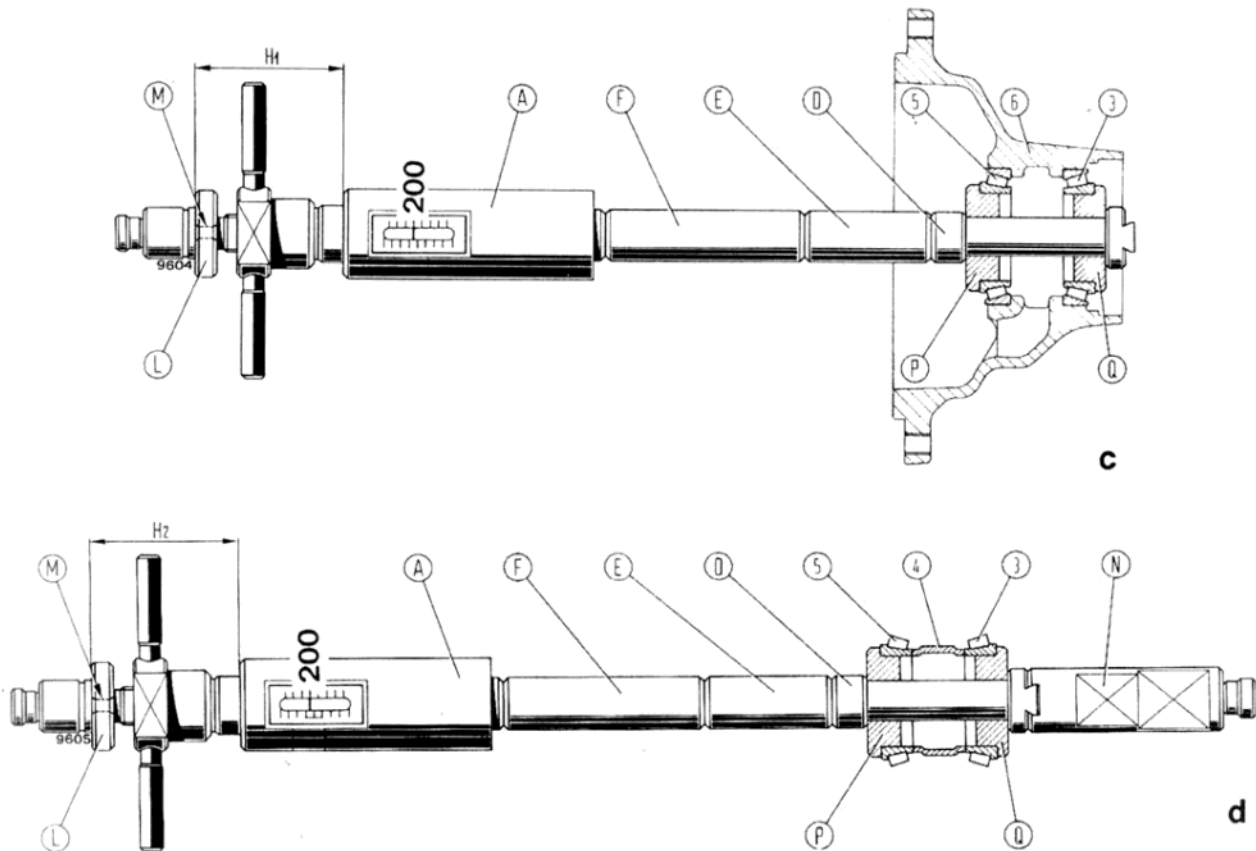
If necessary, round (S₄) down to the nearest 0.05 mm (0.002 in).



Determining wheel hub bearing shim thickness (S₄, page 3, section 42).

a. Measuring dimension (H₂) - b. Measuring dimension H₁ - D. Tool **293435** - E. Tool nut - H₁, H₂. Dimensions measured between tool top face and pin end - - S₄. Shim thickness to be determined - 3 and 5. Bearing cones - 4. Spacer - 6. Wheel hub.

FRONT WHEEL DRIVE: Live Front Axle



Determining wheel hub bearing shim thickness (S_4 , page 3, section 42) using universal gauge 293510.

c. Measuring dimension H_1 - d. Measuring dimension H_2 - A. Universal gauge 293510 - D. Spacer 293625 - E. Spacer 293619 - F. Spacer 293620 - H_1 and H_2 . Dimensions to be measured with depth gauge - L. Register 293624 - M. Register holes (L) - N. Vice adapter 293617 - P. Socket 293639 - Q. Socket 293639 - 3 and 5. Bearing cones - 4. Spacer - 6. Wheel hub.

Wheel hub bearing adjustment using universal gauge 293510 (fig. c, d,) for model 70-90 DT up to frame 628414 and 80-90 up to frame 267619.

Proceed as follows:

- Install sockets 293639 (P and Q) and spacers 293625 (D), 293619 (E) and 293620 (F) on universal gauge 293510 (A).
- Lubricate bearings (3 and 5) with engine oil, install on gauge, and place gauge in wheel hub (fig. c).
- Turn gauge handwheel to bring pointer gradually to 200 kg (441 lb); at the same time, rotate gauge to settle the bearings.
- Install register 293624 (L) on universal gauge (A), positioning holes (M) in line with flats on handwheel hub.

- Measure dimension (H_1) using a depth gauge.
- Remove universal gauge (A) from wheel hub, re-assemble on bench with part 293617 (N) for retention in vice and insert spacer (4) and bearing cones (3 and 5) positioned as shown in fig. d.
- Bring pointer to 200 kg (441 lb) on graduated scale and measure dimension (H_2) as previously described.

Thickness of shims (S_4 , page 3, section 42) will be given by:

$$S_4 = H_2 - H_1$$

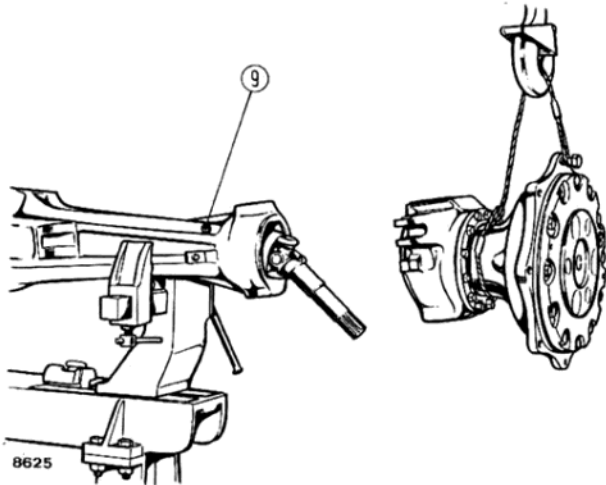
If necessary, round down (S_4) to the nearest 0.05 mm (0.002 in).

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Live Front Axle

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page 7



Removing (installing) final drive with hub and knuckle carrier.

9. Bearing carrier cap screw.

Bevel drive-differential unit overhaul.



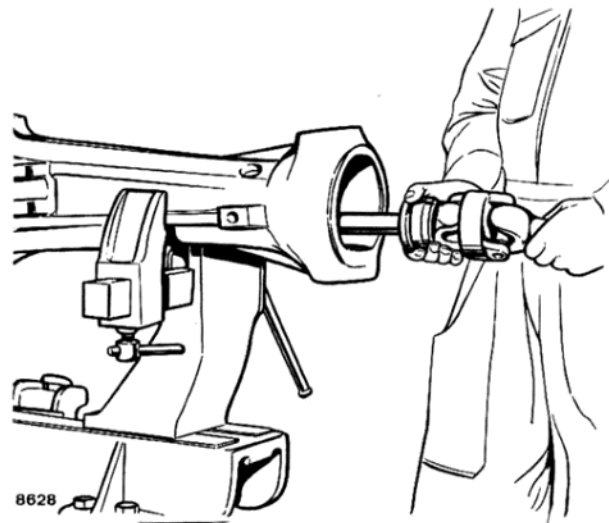
Lift and handle all heavy parts using a suitable hoist. Ensure that all units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the lifted load.

Remove final drive assemblies, consisting of final drives, wheel hubs and knuckle carriers. Remove bearing cap screws (9) retaining axle shaft carriers to axle case and withdraw axle shafts with universal joints.

Remove bevel drive-differential unit, secure to support **293473**, clamp in vice and disassemble as follows:

- Back off bevel pinion bearing lock ring (C₁, section 42, page 3) using wrench **293520/2** for models 55-90 DT and 60-90 DT or **293524/1** for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT;
- Separate differential cage assembly from differential carrier by removing lock rings and caps (1). Check that caps are marked to ensure correct positioning upon reassembly.
- Remove ring gear cap screws (C₃, section 42, page 3) and differential pinion journal cap screws (8). Disassemble differential.

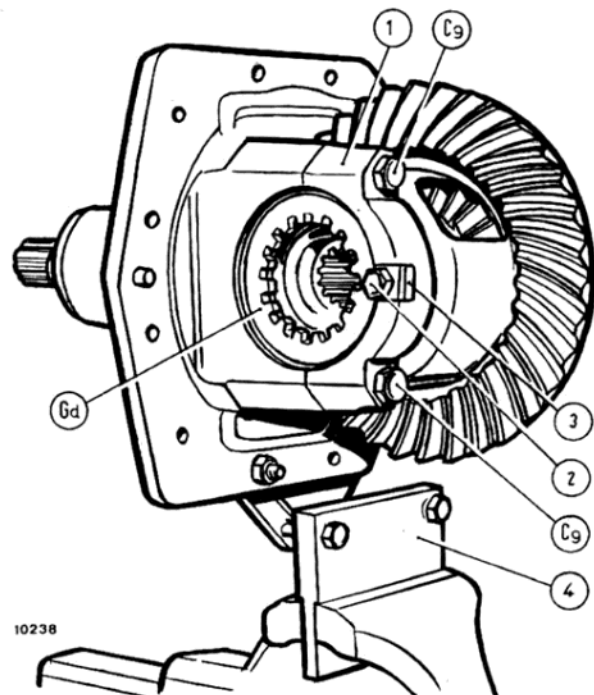
Check differential components for wear against data specified in table, section 40.



Removing R.H. axle shaft with universal joint.

Scrap and replace worn bearings and seals, using suitable punches and pullers.

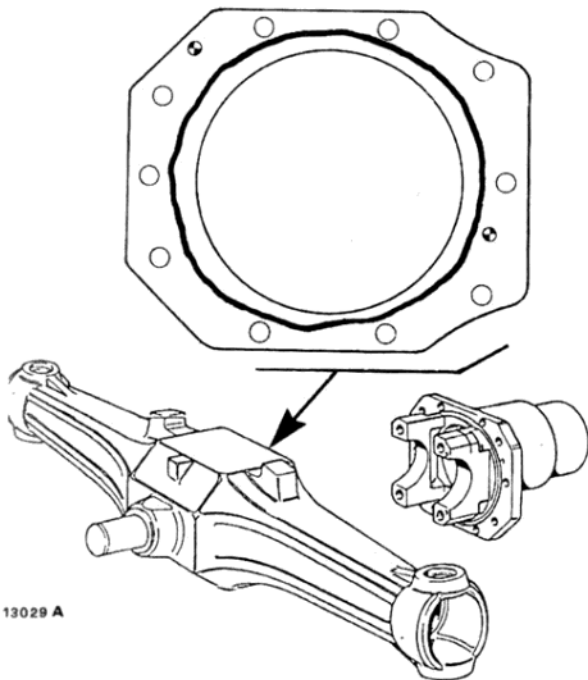
On reassembly, install differential bearing caps aligning reference marks and adjust bevel drive-differential as directed in the following sections.



Bevel drive-differential unit.

C₉. Differential cap cap screws - Gd. R.H. lock ring - 1. Differential cap - 2. Lock ring plate cap screws - 3. Lock ring plates - 4. Support **293473** for bevel drive-differential housing.

FRONT WHEEL DRIVE: Live Front Axle



Reassemble bevel drive-differential and final drive units by reversing the disassembly procedure.

Secure differential carrier to axle case, after thoroughly cleaning and degreasing mating surfaces and applying a 2 mm (0.08 in) dia. bead of jointing compound as shown in figure.

Jointing compound types are indicated on page 6, section A.

After assembly, fill up axle using the specified oil.

Differential adjustment.

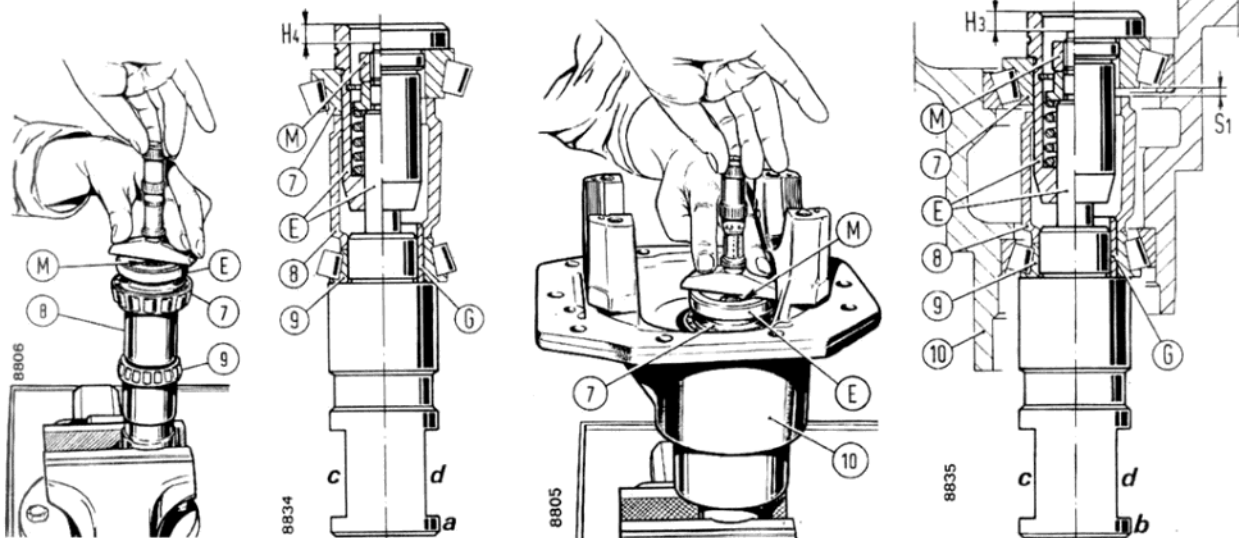
1. Bevel pinion bearing adjustment and shim thickness determination using special purpose tool (figs. a, b).

Proceed as follows:

- Install bevel pinion bearing cones (7 and 9) with spacer (8) on tool (E) **293438/2** for models 55-90 DT and 60-90 DT or **293438/2** with centralizer (G) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT.

- Fully tighten tool nut (M).

CAUTION
Handle all parts carefully. Do not put hands and fingers between parts. Wear safety goggles, shoes and gloves.



Determining bevel pinion bearing shim thickness (S_1 , page 3, section 42).

a. Measuring dimension (H_4) - b. Measuring dimension (H_3) - c. Models 55-90 DT and 60-90 DT - d. Models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - E. Tool **293438/2** - G. Centralizer for use with tool (E) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - H_3 , H_4 . Dimensions to be measured between tool pin end top face - M. Tool nut - S_1 . Shim thickness to be determined - 7 and 9. Bearing cones - 8. Spacer - 10. Differential carrier.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Live Front Axle

41

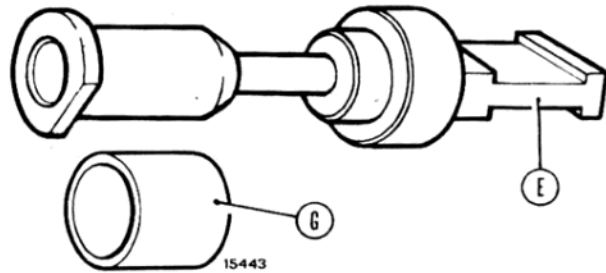
page 9

- Measure dimension (H_4) between tool pin end and top face.
- Remove bearing cones and spacer from tool, lubricate bearings with engine oil and reinstall on tool, inserting differential carrier (10) with bearing cups.
- Fully tighten tool nut (M) while rotating differential carrier through ten revolutions to settle the bearings.
- Measure dimension (H_3) of tool in this condition.
- Thickness of shims (S_1) will be given by:

$$S_1 = H_3 - H_4$$

If necessary, round up (S_1) to the nearest 0.05 mm (0.002 in).

Note — At end of adjustment, do not remove tool from carrier, as it will be used for subsequent bevel pinion position adjustment.

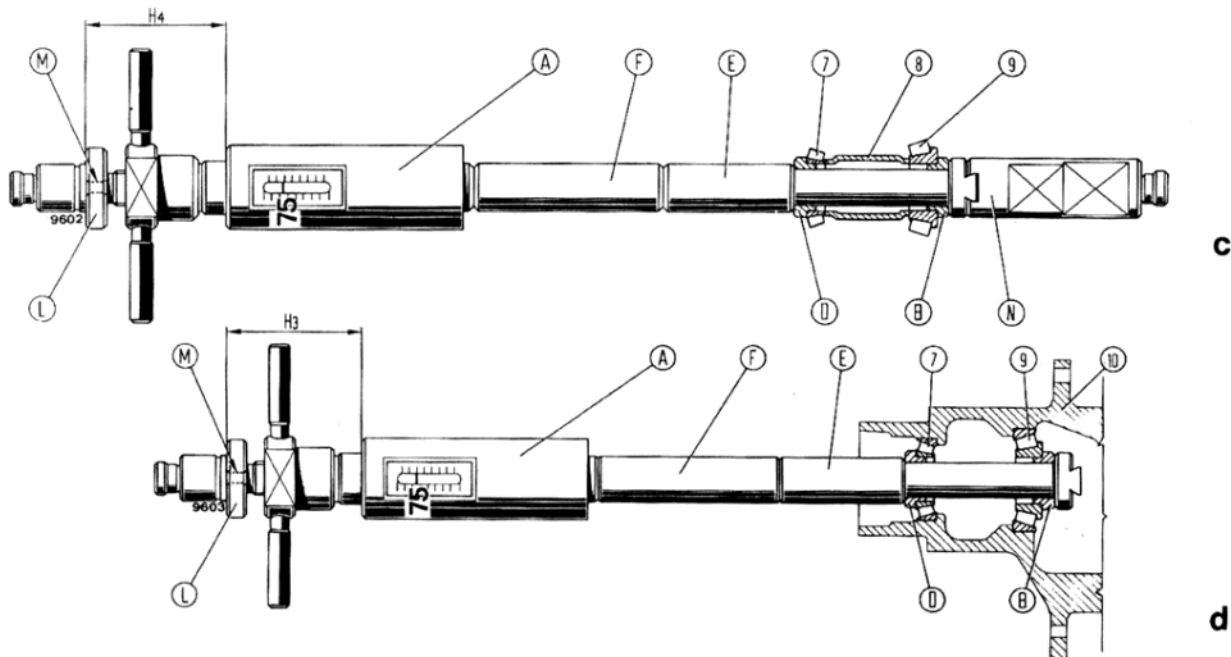


Tool 293438/2 and centralizer.
E. Tool 293438/2 - G. Centralizer 293439.

2. Bevel pinion bearing adjustment and shim thickness determination using universal gauge 293510 (Figs. c, d).

Proceed as follows:

- Install spacers 293619 (E) and 293620 (F) and bushings 293632 (B) and 293633 (D) for models 55-90 DT and 60-90 DT, or 293636 (B) and 293632 (D) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT on universal gauge 293510 (A).
- Install part 293617 (N) to secure gauge in vice and insert pinion bearing cones (7 and 9) and spacer (8) positioned as shown in fig. c.



Determining bevel pinion bearing shim thickness (S_1 , page 3, section 42) using universal gauge 293510.

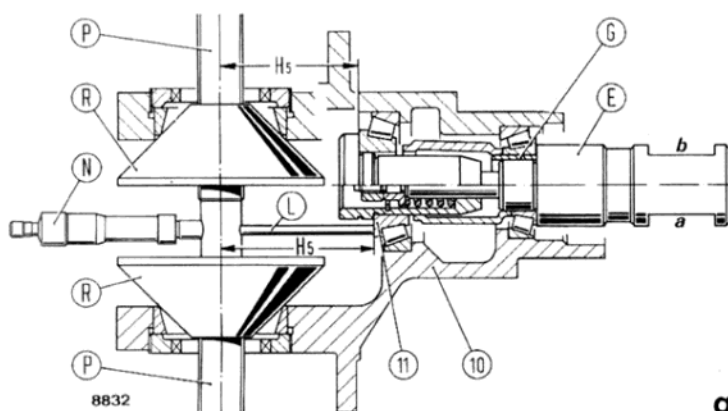
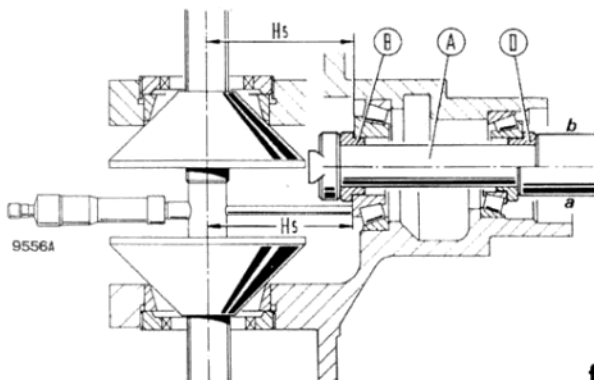
c. Measuring dimension H_4 - d. Measuring dimension H_3 - A. Universal gauge 293510 - B. Bushing 293632 for models 55-90 DT and 60-90 DT, or 293636 for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - D. Bushing 293633 for models 55-90 DT and 60-90 DT, or 293632 for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - E. Spacer 293619 - F. Spacer 293620 - H_3 and H_4 . Dimensions to be measured using depth gauge - L. Register 293624 - M. Register holes - N. Vice adapter 293617 - 7 and 9. Bearing cones - 8. Spacer - 10. Differential carrier.

FRONT WHEEL DRIVE: Live Front Axle

- Turn gauge handwheel to bring pointer gradually to 75 kg (165 lb).
- Install register **293624** (L) on universal gauge (A, page 9), positioning holes (M) in line with flats on handwheel hub.
- Measure dimension (H_4) using a depth gauge.
- Disassemble the unit, lubricate bearings with engine oil and reassemble gauge with bushings (B and D) and spacers (E and F) in differential carrier (10) as shown in fig. d, page 9.
- Gradually bring pointer to 75 kg (165 lb) on graduated scale, rotating tool at the same time to settle the bearings. Measure dimension (H_3) as described above.
- Thickness of shims (S_1 , page 3, section 42) to be fitted will be given by:

$$S_1 = H_4 - H_3$$

If necessary, round up (S_1) to the nearest 0.05 mm (0.002 in).



Note — At end of adjustment, do not remove tool from differential carrier, as it will be used for subsequent bevel pinion position adjustment.

3. Bevel pinion position shim thickness determination (figs. e, f, g).

Proceed as follows:

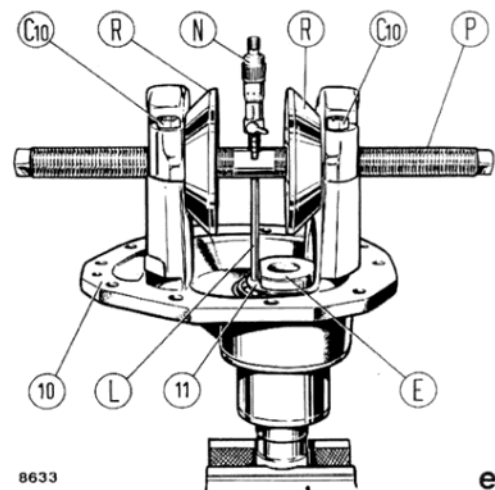
- Position differential bearing cups on shaft (P) of toll **293400/1** with cones (R) and install cups in differential carrier, tightening cap screws (C_{10}) to 113 N; (11.5 kgm or 83 ft lb).
- Tighten or back off tool cones (R) to position 100 mm (3.9 in) spindle (L) in the direction of bearing cone (11) and eliminate clearance between cones (R) and differential bearing cups.
- Turn depth gauge (N) to bring spindle (L) into contact with bearing cone (11) and measure dimension (H_5).
- Establish nominal dimension (H_7) from ring gear centerline to back of pinion:

$$H_7 = H_6 \pm C$$

where:

H_6 = Nominal dimension from ring gear centerline to back of pinion:

- 100 mm (3.9 in) for models 55-60 DT and 60-60 DT;
- 115 mm (4.5 in) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT.



Determining bevel pinion shim thickness (S_2 , page 3, section 42).

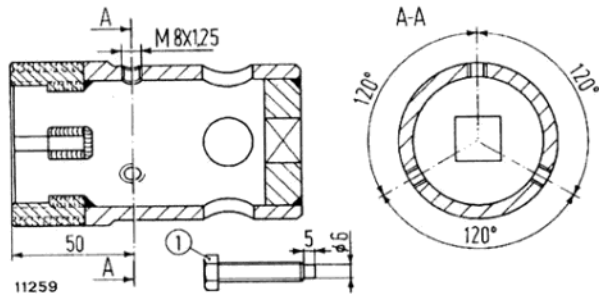
a. Models 55-90 DT and 60-90 DT - b. Models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - f. Measuring dimension H_5 using universal gauge **293510** - g. Measuring dimension H_5 using tool **293438/2** - A. Universal gauge **293510** - B. Bushing **293632** for models 55-90 DT and 60-90 DT or **293636** for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - D. Bushing **293633** for models 55-90 DT and 60-90 DT or **293632** for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - E. Tool **293438/2** - G. Centralizer to be used with tool (E) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - L, N, P, R. Tool **293400/1** - C_{10} . Differential bearing cap cap screws - 10. Differential carrier - 11. Front taper roller bearing.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Live Front Axle

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page 11



Modifying lock ring wrench 293520/2 (models 55-90 DT and 60-90 DT) or 293524/1 (models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT) for bevel pinion rotating torque-measurement (dimensions in mm.).

1. M 8x1.25x40 screw (R 50) to be modified as shown in figure.

C = Correction factor marked on pinion and preceded by + or - if different from 0, to be added to or subtracted from nominal dimension (H_6) according to indicated sign.

Thickness of shim (S_2 , page 3, section 42) will be given by:

$$S_2 = H_5 - H_7$$

where:

H_5 = Dimension measured using depth gauge.

H_7 = Corrected nominal dimension from ring gear centerline to back of pinion.

Example (model 55-90 DT)

Dimension measured using depth gauge H_5 = 103.3 mm

Nominal dimension from ring gear centerline to back of pinion H_6 = 100 mm.

Correction factor C = +0.2 mm.

Corrected nominal dimension H_7 = $100 + 0.2 = 100.2$ mm.

Shim thickness

$$S_2 = 103.3 - 100.2 = 3.1 \text{ mm.}$$

Corrected factor C = -0.2 mm.

Corrected nominal dimension H_7 = $100 - 0.2 = 99.8$ mm.

Shim thickness

$$S_2 = 103.3 - 99.8 = 3.5 \text{ mm.}$$

Correction factor C = 0 mm.

Corrected nominal dimension H_7 = H_6 = 100 mm.

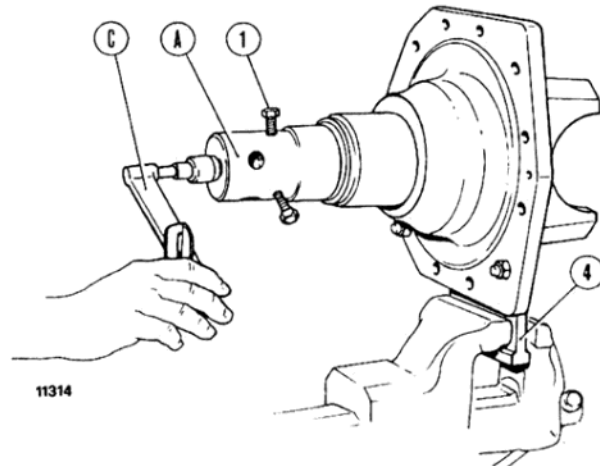
Shim thickness

$$S_2 = 103.3 - 100 = 3.3 \text{ mm.}$$

4. Differential bearing adjustment and bevel drive backlash check.

Proceed as follows:

- Install bevel pinion with all parts, including shims (S_1 , and S_2 , section 42, page 3) as determined above, in differential carrier.



Checking bevel pinion rotating torque.

A. Lock ring wrench 293520/2 (models 55-90 DT and 60-90 DT) or 293524/1 (models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT) - C. Torque wrench 293512 - 1. Screws retaining wrench 293520/2 or 293524/1 to bevel pinion - 4. Support 293743 for differential carrier.

- Lubricate bearings with engine oil and tighten lock ring (C₁, section 42, page 3) to 294 Nm (30 kgm or 217 ft lb) using wrench 293520/2 (models 55-90 DT and 60-90 DT) or 293524/1 (models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT).

Alter lock ring wrench 293520/2 (models 55-90 DT and 60-90 DT) or 293524/1 (models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT) by drilling and tapping three holes as shown in figure and adding three M 8x1.25x40 (R50) screws (1) as shown in figure.

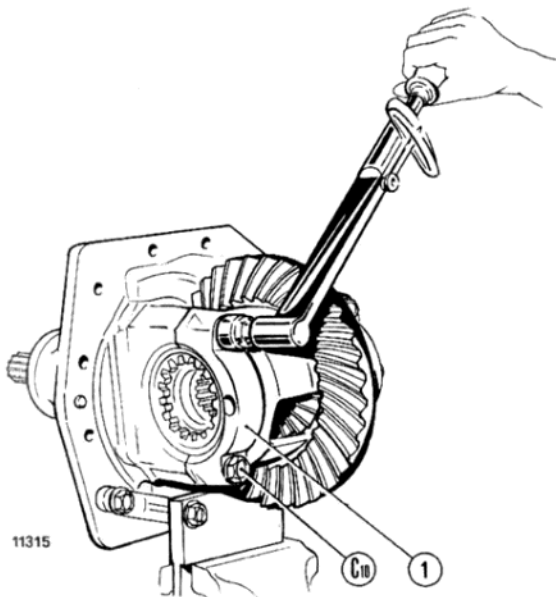
- Lock wrench 293520/2 (models 55-90 DT and 60-90 DT) or 293524/1 (models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT) (altered as described above) on pinion shaft through associated screws (1) and check that torque required to rotate shaft is 0.5 to 1 Nm (0.05 to 0.1 kgm or 0.36 to 0.72 ft lb) for models 55-90 DT and 60-90 DT or 0.5 to 1.5 Nm (0.05 to 0.15 kgm or 0.36 to 1.08 ft lb) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT.

Measure torque using torque wrench 293512 (C); do not take starting torque into account

Note — The rotating torque indicated above applies to pinion shaft installed without seal and retaining ring.

Otherwise, rotating torque should be 1 to 1.5 Nm (0.10 to 0.15 kgm or 0.72 to 1.08 ft lb) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT.

FRONT WHEEL DRIVE: Live Front Axle

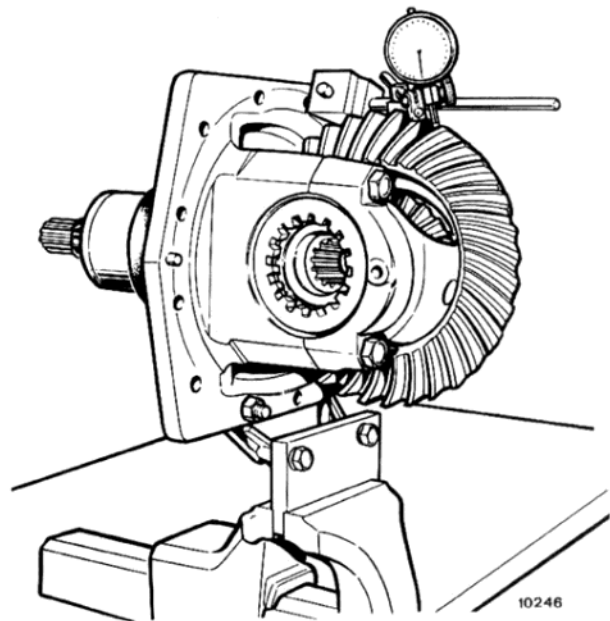


Installing differential bearing caps.

C₁₀. Self-locking cap screws - 1. Bearing caps.

- To adjust rotating torque change bearing shim thickness (S₁, section 42, page 3). Remove shims to increase rotating torque, and add shims to reduce torque.
- Install differential unit in carrier ensuring that ring gear does not force on pinion, tighten cap screws (C₁₀) to 59 Nm (6 kgm or 43.4 ft lb) then slacken and re-tighten to 20 Nm (2 kgm or 14.5 ft lb).
- Lubricate ring gear bearings, rotate bevel drive and tighten L.H. lock ring (Gs, section 42, page 3) at the same time using wrench **293544** for models 55-90 DT and 60-90 DT or **293665** for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT, to 39 to 59 Nm (4 to 6 kgm or 29 to 43 ft lb) to establish the specified axial pre-load.
- Measure bevel drive backlash using a dial gauge positioned at right angles outside a bevel gear tooth.
- Repeat measurement in two other equi-spaced points and compare the average of the three readings with specified backlash: 0.15 to 0.20 mm (0.006 to 0.008 in), average 0.18 mm (0.007 in).

If backlash is out of specified tolerance range, back off one lock ring and tighten the other by the same amount to restore axial pre-load and obtain specified backlash.



Checking normal bevel drive backlash.

- In these conditions, pinion and differential bearing rotating torque, measured in the same conditions as pinion torque, must be:

$$A_2 = A_1 + 1 \text{ to } 1.5 \text{ Nm} \\ (0.1 \text{ to } 0.15 \text{ kgm or } 0.72 \text{ to } 1.08 \text{ ft lb})$$

where:

A₂ = Ring gear and pinion rotating torque.

A₁ = Pinion rotating torque as previously measured, i.e.:

- 0.5 to 1 Nm (0.05 to 0.1 kgm or 0.36 to 0.72 ft lb) for models 55-90 DT and 60-90 DT with pinion installed without seal and retaining ring.
- 0.5 to 1.5 Nm (0.05 to 0.15 kgm or 0.36 to 1.08 ft lb) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT with pinion installed without seal and retaining ring.
- 1 to 1.5 Nm (0.10 to 0.15 kgm or 0.72 to 1.08 ft lb) for models 55-90 DT and 60-90 DT with pinion installed with seal and retaining ring.
- 1.0 to 2.0 Nm (0.1 to 0.2 kgm or 0.72 to 1.45 ft lb) for models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT with pinion installed with seal and retaining ring.
- 1 to 1.5 Nm (0.1 to 0.15 kgm or 0.72 to 1.08 ft lb) for models = Ring gear rotating torque measured at pinion end using wrench **293520/2** (models 55-90 DT and 60-90 DT) or **293524/1** (models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT) and torque wrench **293512**.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Live Front Axle

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Example (model 55-90 DT with pinion installed without seal and retaining ring).

— Pinion rotating torque:

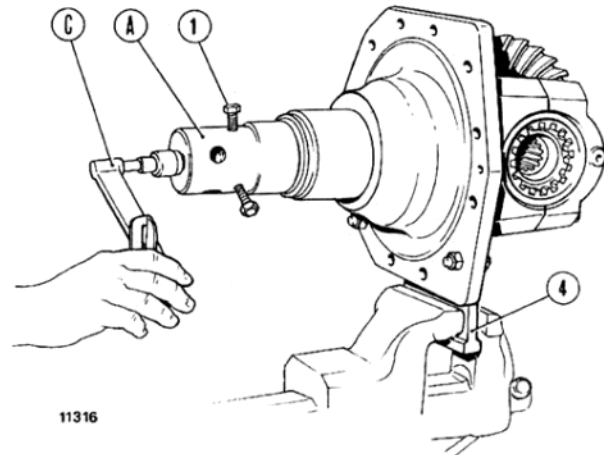
$$A_1 = 0.7 \text{ Nm (0.07 kgm or 0.51 ft lb)}.$$

— Ring gear and pinion rotating torque:

$$A_2 = 0.7 + (1 \text{ to } 1.5) = 1.7 \text{ to } 2.2 \text{ Nm}$$

$$(A_2 = 0.07 + (0.1 \text{ to } 0.15) = 0.17 \text{ to } 0.22 \text{ kgm or } 1.23 \text{ to } 1.60 \text{ ft lb}).$$

— Finally, tighten cap retaining screws (C₁₀) to 113 Nm (11.5 kgm or 83 ft lb) and secure lock ring through associated lock plates. If plate does not correspond to notch, tighten lock ring further.



Checking ring gear and bevel pinion rotating torque.

A. Lock ring wrench **293520/2** (models 55-90 DT and 60-90 DT) or **293524/1** (models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT) - C. Torque wrench **293512** - 1. Screws retaining wrench **293520/2** or **293524/1** to bevel pinion - 4. Support **293743** for differential carrier.

Differential gear backlash adjustment.

Install two side gears (60 and 61, section 42, page 3) on differential cage without shims (6).

Insert differential pinions (62) with washers (7) and journal (63) and tighten capscrew (8) through a few turns to prevent journal from slipping.

Bring L.H. side gear into contact with differential pinion as shown on page 9, section 25 and, using a depth gauge, measure dimension (H₁) in two diametrically opposed points and average readings.

Push side gear in contact with differential cage as shown on page 15, section 25 and measure dimension (H₂).

Repeat the same operations on R.H. side gear. Axial displacement of each side gear without shim will be given by:

$$Gs \text{ or } Gd = H_1 - H_2$$

where:

Gs = L.H. side gear axial displacement

Gd = R.H. side gear axial displacement

H₁ and H₂ = Dimensions measured on L.H. or R.H. side gear.

Normal differential pinion and side gear backlash is 0.15 mm (0.006 in).

Note that average ratio of backlash to equivalent side gear displacement is **1 to 1.7**.

Side gear displacement corresponding to normal backlash: $0.15 \times 1.7 = 0.25 \text{ mm (0.010 in)}$.

Thickness of shims to install on differential cage will thus be given by:

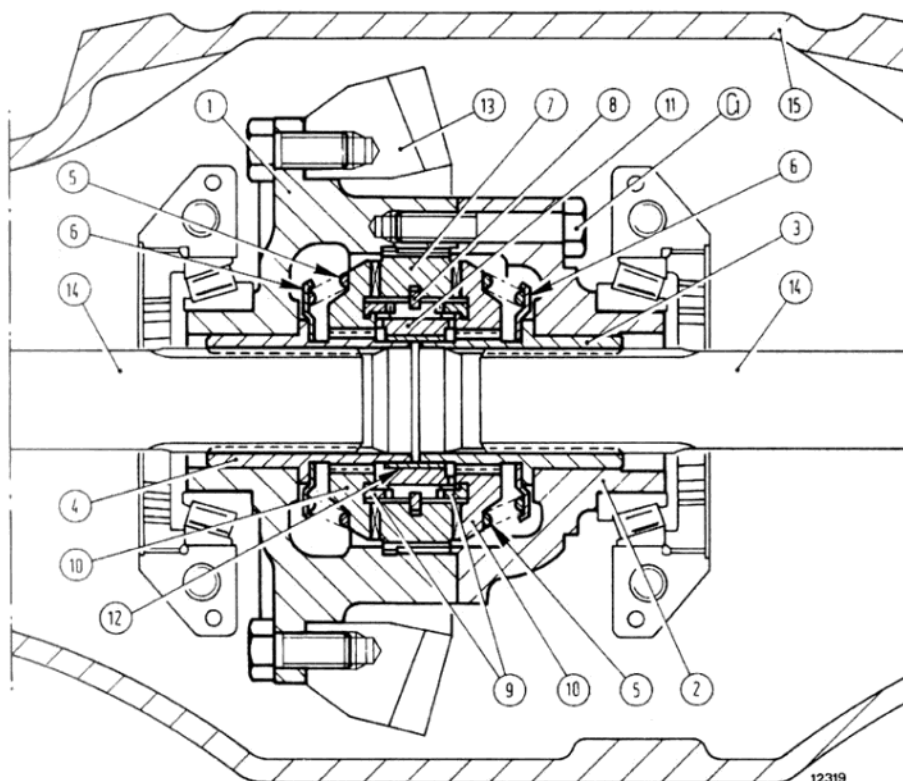
$$Ss = Gs - 0.25 \text{ (L.H. side gear)}$$

$$Sd = Gd - 0.25 \text{ (R.H. side gear)}$$

Note that shims are available in thickness of 1.5 and 1.6 mm (0.059 in or 0.063 in). Fit the shim which is closer to the calculated value.

FRONT WHEEL DRIVE: Live Front Axle

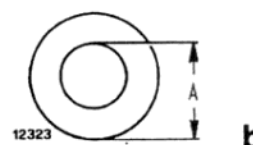
NO SPIN DIFFERENTIAL (optional)



NOTE

Check NO SPIN differential unit operation as follows:

- With engine off, engage a gear and the front wheel drive, apply parking brake and raise front of tractor.
- Rotate front wheels in a forward direction to eliminate play. Hold L.H. wheel and rotate R.H. wheel rearwards. NO SPIN differential disengages and wheel rotates with an indexing or metallic clicking sound. Stop R.H. wheel, then turn forwards slightly; NO SPIN differential engages and stops the wheel.
- Rotate both wheels backwards to eliminate play, hold L.H. wheel and rotate R.H. wheel forwards. NO SPIN differential disengages and wheel rotates with an indexing or metallic clicking sound.
- Stop R.H. wheel, then turn backwards slightly; NO SPIN differential engages and stops the wheel.
- Repeat the above operations while holding R.H. wheel.



Section through differential with NO SPIN unit (models 666DT and 766 DT).

C1. Case capscrew, tightening torque 56 to 62 Nm (5.7 to 6.3 kgm or 42 to 46 ft lb) - 1. Case, flange half - 2. Case, cap half - 3 and 4. Side gears - 5. Springs - 6. Spring retainer - 7. Central driven assembly - 8. Retaining ring - 9. Cam holdout rings - 10. Driven clutch - 11. Center cam - 12. Stop - 13. Ring gear - 14. Axle shafts - 15. Front axle housing.

OPERATION

The **NO SPIN** differential performs the following key functions:

- Permits full use of tractor pull.
- Prevents wheel-spin when one wheel loses traction.
- Compensates for differences in wheel travel which occur when turning or traveling over uneven ground.

When the tractor is in a straight-forward or reverse mode of operation the **NO SPIN** allows equal speed to be distributed to both wheels.

When the tractor makes a turn or a front wheel passes over an obstruction, the outer wheel or the wheel riding over the obstruction must travel faster and farther than the other. To do this it automatically disengages, passes over the obstruction or negotiates the curve and reengages, again automatically, when the same rotation speed as that of the opposite wheel is reached.

If one wheel should lose traction momentarily, the opposite wheel which still has traction, continues to pull the vehicle until traction is regained by both wheels.

Turning

In a left turn, for instance, the right wheel increases speed. Axle shaft (14) transmits this speed increase to the associated cam holdout ring (9). When the speed difference between the two wheels reaches a given value, ring (9) and clutch (10) overcome spring load and disengage from center cam (11), remaining in this position until the end of the curve.

Nota — For correct **NO SPIN** differential operation, tyres must be equal (within a few millimetres) in rolling radii.

Small differences may be corrected by adjusting tyre inflation pressure. Check as illustrated above in detail **b**: distance A be equal for both wheels.

DRIVE SHAFT

Removal

To remove drive shafts, proceed as follows:

- Remove shaft guard (23, page 3);
- Remove retaining rings (28 and 37) from seats and withdraw drive shaft (30), moving splined sleeves (33) inwards and removing retaining rings (31 and 32);
- Withdraw splined sleeve (33) from center bearing (34) and remove rear drive shaft (35) from the front.

Inspect splines on shaft and associated sleeves and check efficiency of ball bearing in center bearing (34).

Installation

Reinstall shafts in seats and adjust as follows:

- Bring axle housing into contact with rear axle pivot support to eliminate support end play (L, page 3) and position front splined sleeve (27) against retaining ring (28). Using a feeler gauge, measure gap between sleeve and retaining ring (26) and install a shim (S_s) to obtain sleeve end play (L) of 1 to 1.5 mm (0.04 to 0.06 in) for 55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT, or 0.5 to 1 mm (.019 to .039 in) for 90-90 DT and 100-90 DT. Shim thickness range is shown on page 2, section 40.

AXLE DRIVE

Removal

To remove axle drive from tractor, proceed as follows:

- Remove drive shafts as directed above.
- Drain oil from transmission housing and axle drive housing.
- Disconnect vertical link from outer lever, back off capscrews (C₁₃) and remove axle drive housing.

Diassemble unit on bench as follows:

- Remove roll pin (45, page 3) using a suitable punch, withdraw intermediate shaft (46) and remove associated gear (48) together with needle roller bearing (47) and thrust washers.

- From outside of axle drive housing, remove dust excluder (38), seal (39), retaining ring (40) and driven shaft (43) with attached ball bearing and oil seal.

- Remove guide screws (54, models 55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT), and retrieve brake driven discs (57), driven gear (42), front wheel drive control sleeve (50) and linings (53).

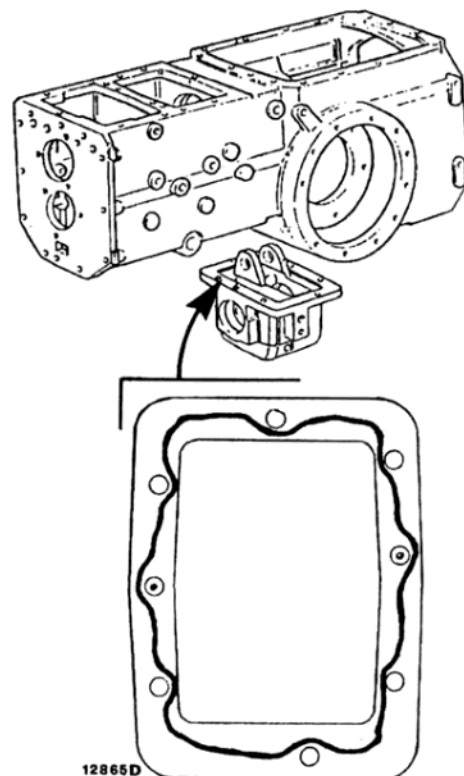
- Using a slide hammer puller, remove ball bearing (44).

Check linings (53, page 3) and driven discs (57) for wear. Also check bearing efficiency.

Refer to figures on page 3 for correct part positioning on assembly.

Installation

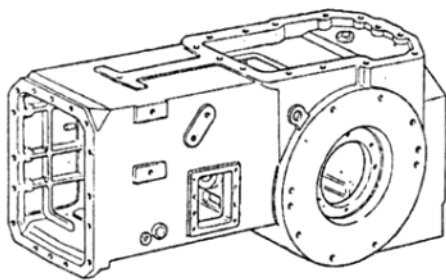
To install, reverse the removal procedure and refer to figure on page 3.



Applying jointing compound for axle drive housing installation on transmission housing 55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT).

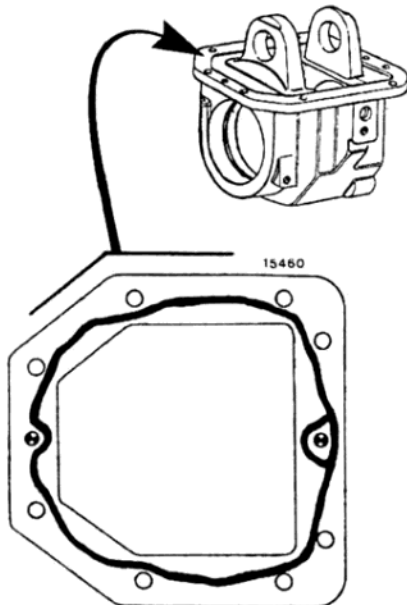
Jointing compound types are indicated on page 6, section A.

FRONT WHEEL DRIVE: Drive Shafts - Axle Drive



Preferably replace dust excluder (38) taking care to prevent distortion on assembly, (page 3)

Before axle drive housing reinstallation on transmission housing, thoroughly clean and degrease mating surfaces and apply a 2 mm (0.80 in) dia. bead of jointing compound as shown in figure on page 1 for 55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT, or along side for 90-90 DT e 100-90 DT.



Jointing compound types are indicated on page 6, section A.

Applying jointing compound for axle drive housing installation on transmission housing (90-90 DT and 100-90 DT).

Jointing compound types are indicated on page 6, section A.

55-90 60-90
70-90 80-90
90-90 100-90

FRONT WHEEL DRIVE: Sections

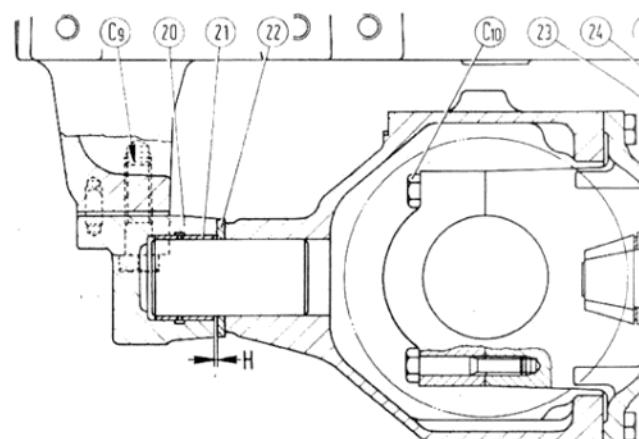
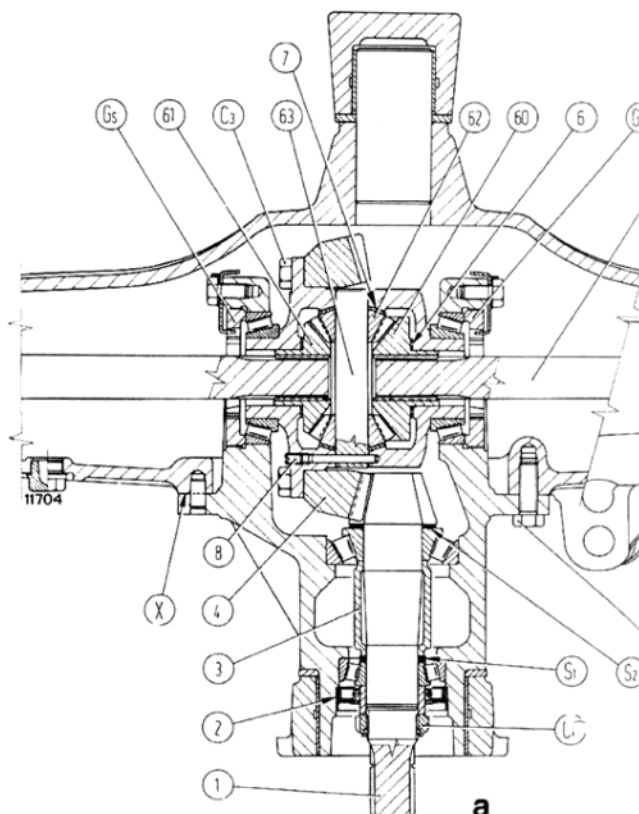
42

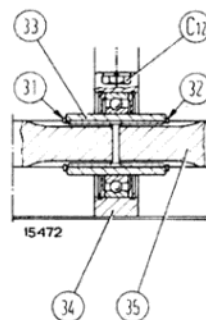
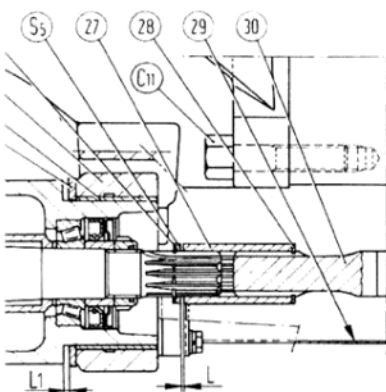
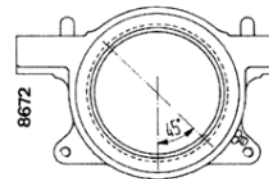
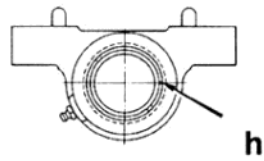
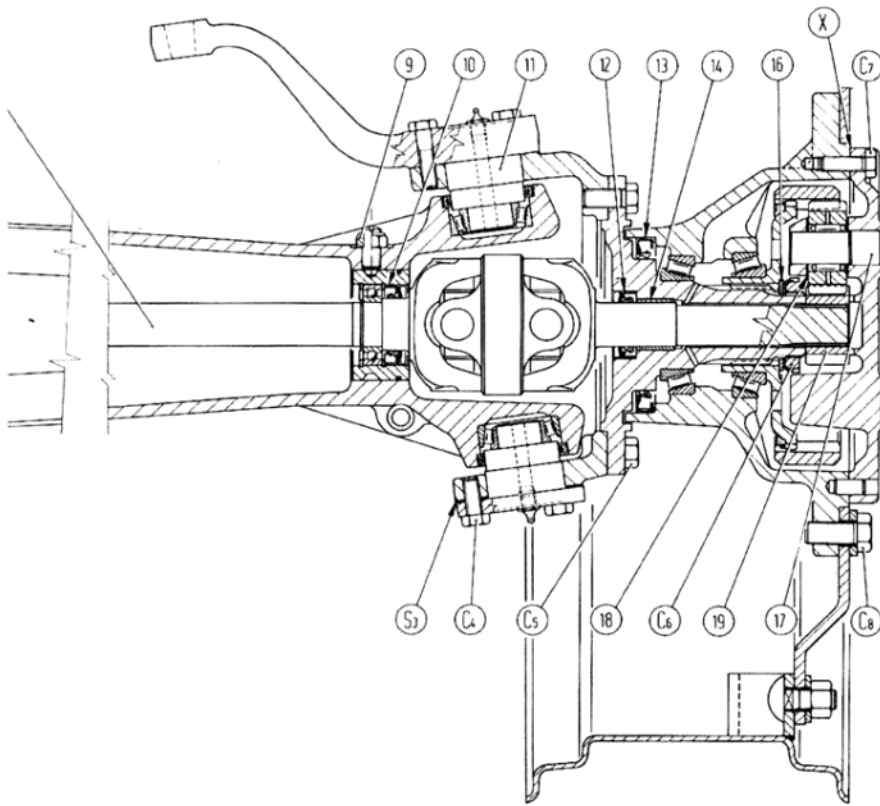
page 3

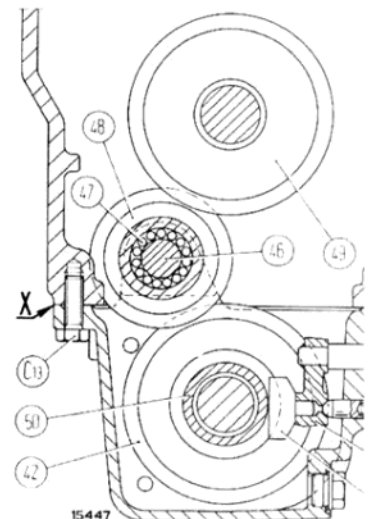
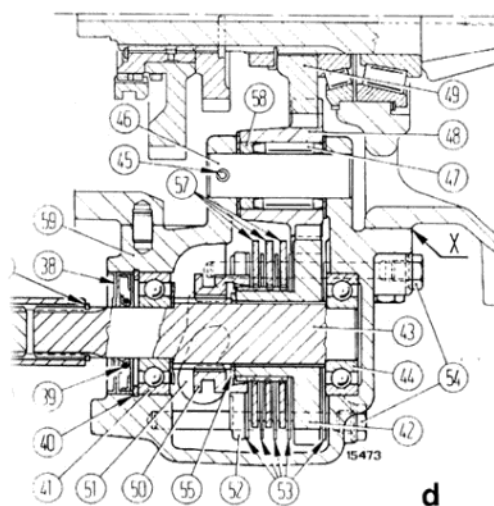
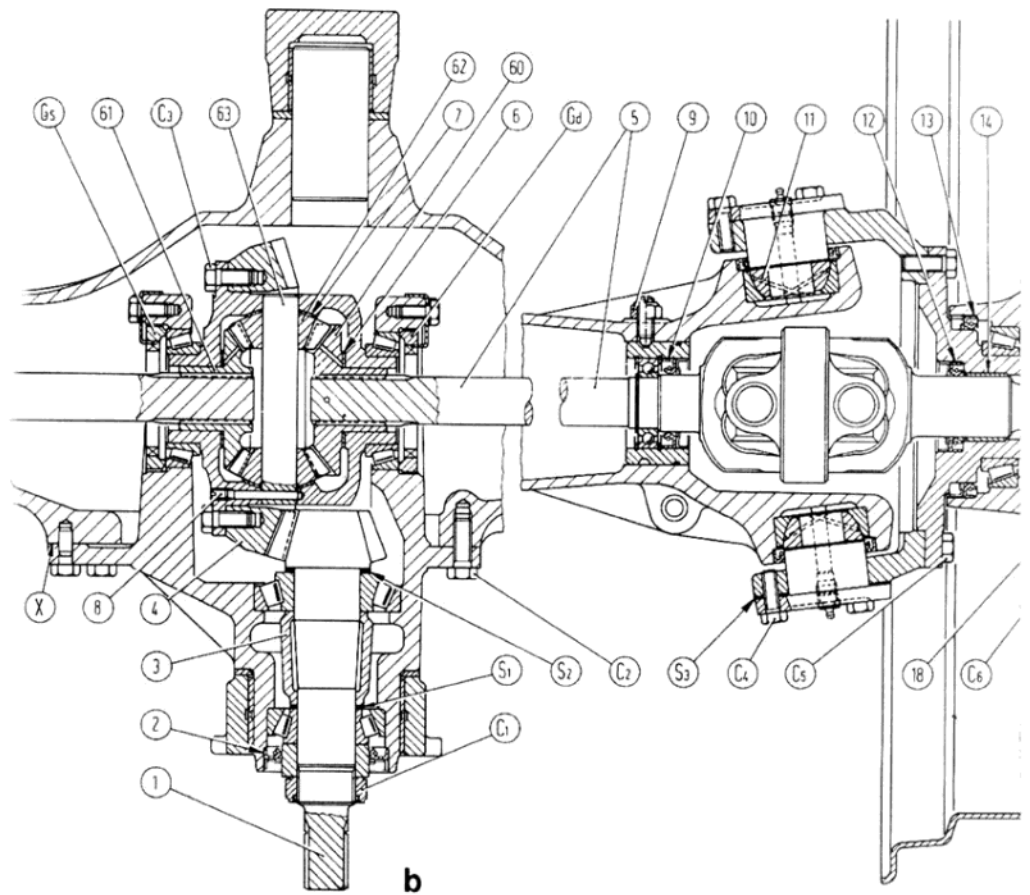
Longitudinal sections through front axle, pivot, axle drive and drive shaft for models 55-90 DT, 60-90 DT, 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT.

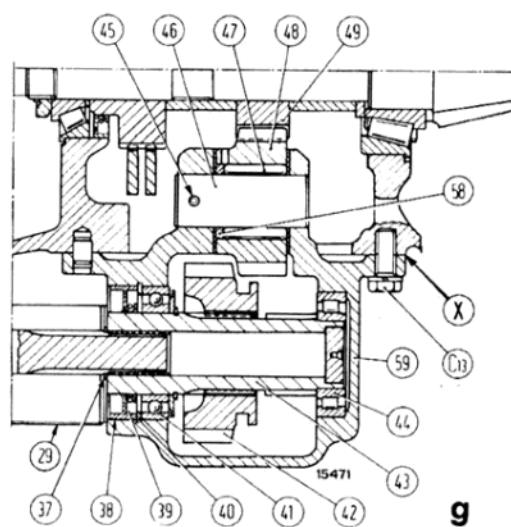
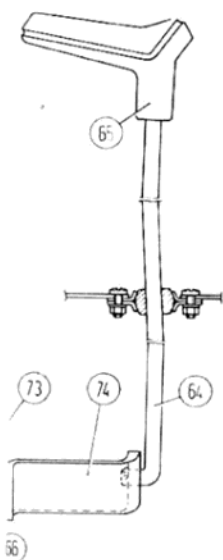
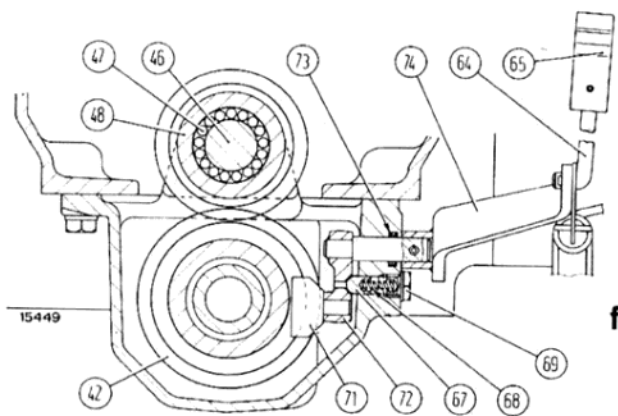
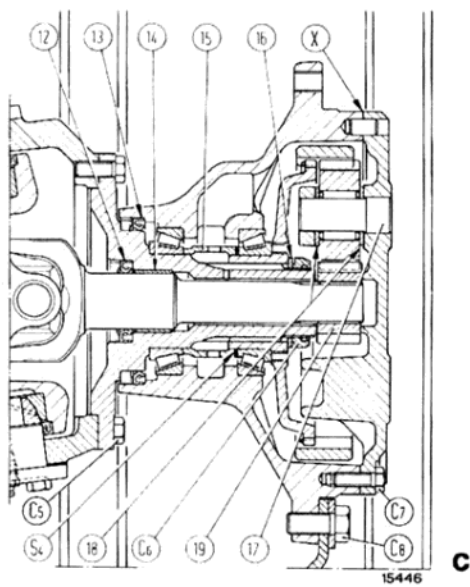
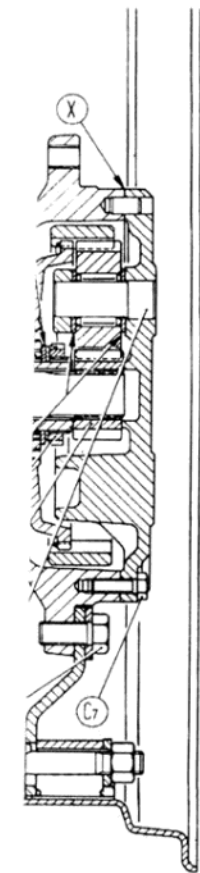
Note - On assembly, thoroughly clean and degrease mating surfaces X and apply one of jointing compounds listed on page 6, section A.

a. 55-90 DT and 60-90 DT - b. 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT - c. Detail of early model wheel hub (up to frame 628414 for 70-90 DT and frame 267619 for 80-90 DT) - d, e. Section through axle drive control (55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT) - f, g. Section through axle drive control (90-90 DT and 100-90 DT) - h. Correct bushing installation in front axle pivot support (split arrowed) - i. Correct bushing installation in rear axle pivot support - C₁. Bevel pinion bearing lockring - C₂. Differential carrier cap screw - C₃. Ring gear cap screw - C₄. King pin bearing cap screws - C₅. Steering knuckle cap screw - C₆. Wheel hub bearing lock ring - C₇. Final drive housing cap screw - C₈. Wheel cap screw - C₉. Axle pivot support cap screw - C₁₀. Differential bearing cap cap screw - C₁₁. Cap screws securing front axle support to engine - C₁₂. Drive shaft centre bearing cap screw - C₁₃. Axle drive housing cap screw - Gd and Gs. R.H. and L.H. differential bearing lock ring - H = 1 mm (0.04 in). Front bushing fitted stand-in - L = 1 to 1.5 mm (0.04 to 0.06 in) (55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT) or 0.5 to 1 mm (.019 to .039 in) (90-90 DT and 100-90 DT). Sleeve end play - L₁ = Pivot end play. - S₁. Bevel pinion bearing shim - S₂. Bevel pinion position shim - S₃. King pin bearing shims - S₄. Wheel hub bearing shim (early model 70-90 DT and 80-90 DT) - S₅. Sleeve position shim - 1. Bevel pinion - 2. Seal - 3. Bevel pinion bearing spacer - 4. Ring gear - 5. Axle shaft with universal joint - 6. Side gear washers - 7. Differential pinion washers - 8. Differential pinion journal cap screw - 9. Bearing carrier cap screw - 10. Seal - 11. King pin bearing - 12. and 13. Seals - 14. Axle shaft bushing - 15. Spacer (early model 70-90 DT and 80-90 DT) - 16. Thrust washer - 17. Planet wheel journals - 18. Planet wheel shims - 19. Sun gear - 20. Front axle pivot support - 21. Front bushing - 22. Front thrust washer - 23. Rear thrust washer - 24. Rear bushing - 25. Rear axle pivot support - 26 and 28. Retaining rings - 27. Front splined sleeve - 29. Drive shaft guard - 30. Front drive shaft - 31 and 32. Retaining rings - 33. Center splined sleeve - 34. Center bearing - 35. Rear drive shaft - 36 and 37. Retaining rings - 38. Dust excluder - 39. Seal - 40. Retaining ring - 41. Ball bearing - 42. Driven gear - 43. Splined driven shaft - 44. Ball bearing (55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT) or cylindrical roller bearing (90-90 DT and 100-90 DT) - 45. Roll pin - 46. Intermediate shaft - 47. Needle roller bearing - 48. Intermediate gear - 49. Drive gear keyed on bevel pinion - 50. Axle engagement sleeve - 51. Brake lever pin - 52. Brake shoe - 53. Linings - 54. Guide screws - 55. Thrust washer - 57. Brake driven discs - 58. Bearing spacer - 59. Relay housing - 60 and 61. Side gears - 62. Differential - 63. Differential pinion journal - 64. Vertical link - 65. Axle drive hand lever - 66. Plug - 67. Detent plunger - 68. Detent spring - 69. Plug - 70. Rear splined sleeve (55-90 DT, 60-90 DT, 70-90 DT and 80-90 DT) - 71. Shoe - 72. Relay lever - 73. O-ring - 74. Axle drive lever.









55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Specification and Data

50**page 1****LIFT**

Type	Position and draught control with float function
Control	Two independent levers
Variospeed sensitivity adjustment	Control valve-mounted lever
LIFT-O-MATIC	Link raising / lowering button
Response adjustment	Knob on control valve. May be used to lock implement in raised position
Single-acting cylinder:	
— Bore x stroke	Models 55-90 and 60-90 Models 70-90, 80-90, 90-90 and 100-90 100x128 mm (3.9x5.0 in) 110x128 mm (4.3x5.0 in)
— Displacement	Models 55-90 and 60-90 Models 70-90, 80-90, 90-90 and 100-90 1005 cm³ (155.8 in³) 1216 cm³ (188.4 in³)
Relief valve crack-off setting	186 ÷ 191 bar, (190 ÷ 195 kg/cm ² , 2.702 to 2.773 psi)
Safety valve crack-off setting	210 ÷ 215 bar, (214 to 219 kg/cm ² , 3.043 to 3.114 psi)
Lift piston dia.	Models 55-90 and 60-90 Models 70-90, 80-90, 90-90 and 100-90 99.980 to 100.000 mm (3.9362 to 3.937 in) 109.980 to 110.000 mm (4.3299 to 4.3307 in)
Lift cylinder bore dia.	Models 55-90 and 60-90 Models 70-90, 80-90, 90-90 and 100-90 100.036 to 100.071 mm (3.9384 to 3.9398 in) 110.036 to 110.071 mm (4.3321 to 4.3335 in)
Piston working clearance in bore	0.036 to 0.091 mm (0.0014 to 0.0036 in)
Draught control shaft O.D.	21.967 to 22.000 mm (0.8648 to 0.8661 in)
Shaft housing bore dia. in lift body	22.020 to 22.072 mm (0.8669 to 0.8690 in)
Shaft clearance in body	0.020 to 0.105 mm (0.0008 to 0.0041 in)
Position control shaft dia.	13.973 to 14.000 mm (0.5501 to 0.5512 in)
Shaft housing bore dia. on draught control shaft	14.016 to 14.059 mm (0.5553 to 0.5535 in)
Shaft clearance in body	0.016 to 0.086 mm (0.0006 to 0.0034 in)

(follows)

HYDRAULIC LIFT UNIT: Specification and Data

LIFT

(continued)

Cross shaft journal dia. — R.H. — L.H.	54.970 to 55.000 mm (2.1642 to 2.1653 in) 62.670 to 62.700 mm (2.4673 to 2.4685 in)
Bushing fitted I.D. in lift body: — R.H. — L.H.	55.100 to 55.184 ⁽¹⁾ mm (2.169 to 2.173 ⁽¹⁾ in) 62.800 to 62.884 ⁽¹⁾ mm (2.474 to 2.475 in) ⁽¹⁾
Cross shaft working clearance in bushings	0.100 to 0.214 mm (0.004 to 0.008 in)
R.H. bushing interference fit in housing	0.065 to 0.161 mm (0.003 to 0.006 in)
L.H. bushing interference fit in housing	0.089 to 0.185 mm (0.0035 to 0.0073 in)
Cross shaft end float with lift arms in position	0.200 to 1.400 mm (0.008 to 0.0551 in)
Draught control relay lever pin and draught control inner lever hinge pin dia. at needle roller bearings. Control valve link arm and draught control inner lever I.D. at needle roller bearings.	13.973 to 14.000 mm (0.5501 to 0.5512 in) 19.985 to 20.006 mm (0.7868 to 0.7876 in)
Valve spool clearance in body Lift valve clearance in control valve body.	0.008 to 0.012 ⁽²⁾ mm (0.0003 to 0.0005 in) 0.008 to 0.012 ⁽²⁾ mm (0.0003 to 0.0005 in)
Valve spool return spring length: — Free — Under 31.7 to 35 N (3.23 to 3.57 kg or 7.1 to 7.9 lb)	50.5 mm (1.99 in) 34 mm (1.34 in)
Control valve return spring length: — Free — Under 103 to 114.7 N (10.5 to 11.7 kg or 23.1 to 25.8 lb)	44 mm (1.73 in) 29 mm (1.14 in)
Response adjusting valve spring length: — Free — Under 1.7 to 2.3 N (0.17 to 0.23 kg or 0.4 to 0.5 lb)	13 mm (0.51 in) 9.8 mm (0.38 in)
Sensitivity adjusting valve spring length: — Free — Under 15.8 to 17.6 N (1.61 to 1.79 kg or 3.5 to 3.9 lb)	14.5 mm (0.57 in) 11 mm (0.43 in)
Check valve return spring length: — Free — Under 35.3 to 39.2 N (3.6 to 4 kg or 7.9 to 8.8 lb)	23.5 mm (.925 in) 18 mm (0.70 in)
Sensitivity adjusting pin lever outer spring length: — Free — Under 61.8 to 67.7 N (6.3 to 6.9 kg or 13.9 to 15.2 lb)	20.5 mm (0.81 in) 13.8 mm (0.54 in)

⁽¹⁾ Not reamed.⁽²⁾ On assembly, spools and control valves are matched to obtain the specified clearance.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Specification and Data

50

page 3

LIFT PUMP

Filter Type Location	Paper cartridge Suction side, on pump body
Pump Type Location Model Make Drive Rotation (see from drive end) Drive ratio: — 55-90, 60-90, 70-90 e 80-90 — 90-90 and 100-90 Max. rated speed (engine at governed speed): Max. rated output: { 55-90, 60-90, 70-90 and 80-90 90-90 and 100-90 Max. rated output: — 55-90, 60-90, 70-90 and 80-90 — 90-90 and 100-90 Output at 1450 rpm and 172 bar (175 kg/cm ² , 2489 psi) — New or reconditioned — Used — Test oil temperature — Test oil grade	Gear, drawing from rear transmission case Behind transmission cover A 31 FIAT Valve timing gear driven Anti-clockwise 0.931 to 1 1.166 to 1 2328 rpm 2917 rpm 32.8 l/min (57.8 pints/min) 44 l/min (77.4 pints/min) 19 l/min (33.5 pints/min) 13.3 l/min (23.4 pints/min) 55 to 65 °C (131 to 151 °F) SAE 20
Pump gear journal dia. Journal housing bore dia. in bearing Journal clearance in bearing — Max. wear clearance	17.400 to 17.418 mm (0.6850 to 0.6857 in) 17.450 to 17.470 mm (0.6870 to 0.6878 in) 0.032 to 0.070 mm (0.0013 to 0.0028 in) 0.1 mm (0.0040 in)
Gear clearance in pump body Max. pump body wear on suction side Gear flank width Bearing width	0.020 to 0.064 mm (0.0008 to 0.0025 in) 0.1 mm (0.0040 in) 24.000 to 24.015 mm (0.9449 to 0.9454 in) 24.490 to 24.510 mm (0.9642 to 0.9650 in)

(follows)

HYDRAULIC LIFT UNIT: Specification and Data

LIFT PUMP

(continued)

Pump body width	73.135 to 73.160 mm (2.8793 to 2.8803 in)
Gear and bearing end float (applicable to new and reconditioned pumps)	0.100 to 0.180 mm (0.0039 to 0.0071 in)

IMPLEMENT ATTACHMENT

Type Category — Models 55-90 and 60-90 — Models 70-90, 80-90, 90-90 and 100-90 Draught control	3-point linkage One and Two Two Through lower links and sensing bar
Max. lift capacity, center of gravity 610 mm (24 in) from lower link bushings and starting with links horizontal (top link coupled to top hole): — Models 55-90 and 60-90 — Models 70-90 and 80-90 — Models 90-90 — Models 90-90 with auxiliary cylinder and 100-90	2206 daN (2250 kg or 4.959 lb) 2697 daN (2750 kg or 6061 lb) 2824 daN (2880 kg or 6347.5 lb) 3668 daN (3740 kg or 8243 lb)
Max. lift capacity, starting with lower links horizontal (top link coupled to top hole): — Model 55-90 (center of gravity 1050 mm or 41.3 in from lower link swivel bushings): — Model 60-90 (center of gravity 1090 mm or 42.9 in from lower link swivel bushings): — Model 70-90 (center of gravity 1170 mm or 46.1 in from lower link swivel bushings): — Model 80-90 (center of gravity 1250 mm or 49.2 in from lower link swivel bushings): — Model 90-90 (center of gravity 1330 mm or 52.3 in from lower link swivel bushings): ● Standard version ● Auxiliary cylinder version — Model 100-90 (with center of gravity 1410 mm or 55.5 in from lower link swivel bushings)	1765 daN (1800 kg or 3967 lb) 1716 daN (1750 kg or 3857 lb) 2089 daN (2130 kg or 4694.5 lb) 2030 daN (2070 kg or 4562 lb) 2368 daN (2415 kg or 5322.6 lb) 2775 daN (2830 kg or 6237 lb) 2736 daN (2790 kg or 6149 lb)
Max. lower link end travel: — Lifting rods out and coupled to front mounting holes: ● Models 55-90 and 60-90 ● Models 70-90 and 80-90 ● Models 90-90 and 100-90 — Lifting rods out and coupled to rear mounting holes: ● Models 55-90 and 60-90 ● Models 70-90 and 80-90 ● Models 90-90 and 100-90	620 mm (24.4 in) 740 mm (29.1 in) 720 mm (28.3 in) 530 mm (20.8 in) 650 mm (25.6 in) 645 mm (25.4 in)
Sensing bar diameter: { 55-90, 60-90, 70-90 and 80-90 90-90 and 100-90	24.867 to 24.900 mm (0.9790 to 0.9803 in) 29.867 to 29.900 mm (1.175 to 1.177 in)
Sensing bar end float: { 55-90, 60-90, 70-90 and 80-90 90-90 and 100-90	1.2 to 4.1 mm (0.472 to .1614 in) 1.4 to 5.0 mm (.055 to .196 in)

REMOTE CONTROL VALVES

Filter	Paper cartridge, used also for lift hydraulic system
Pump	Gear, used also for lift hydraulic system
Remote control valves Type Make Number and location Control Relief valve calibration	Spool, automatic return to neutral KONTAK Up to 3 control valves on R.H. final drive Hand levers 186 to 191 (190 to 195 kg/cm ² or 2.697.7 to 2.770.3 psi)
Valve plunger clearance in body	0.003 to 0.006 mm (0.0001 to 0.0002 in)
Relief valve spring length: — Free — Under 294 ± 53 N (30 ± 5.4 kg or 66.2 ± 11.9 lb)	39.4 mm (1.551 in) 38.2 mm (1.504 in)
Valve plunger return spring length Check valve spring length	42.8 mm (1.685 in) 15.9 mm (0.626 in)
Trailer brake valve Make Location Control Hydraulic fluid Type	 BOSCH On transmission housing Tractor service brake pedals Lift oil 0.538.008.321

**AUXILIARY CYLINDER
STANDARD ON 100-90 - OPTIONAL ON 90-90**

Type	single acting (one)
Location	hinged to LH lift arm and hydraulically connected in parallel with lift cylinder
Control	through lift levers

(follows)

HYDRAULIC LIFT UNIT: Specification and Data

AUXILIARY CYLINDER STANDARD ON 100-90 - OPTIONAL ON 90-90)

(continued)

Bore x stroke	50x150 mm (1.96x5.9 in)
Total displacement	295 cm ³ (17.9 in ³)
Piston diameter	49.960 to 50.000 mm (1.966 to 1.968 in)
Cylinder head ID	50.025 to 50.050 mm (1.969 to 1.970 in)
Piston clearance in cylinder head	.025 to .090 mm (.0009 to .0035 in)
Lower cylinder pivot diameter	29.870 to 30.000 mm (1.175 to 1.181 in)
Pivot housing bore diameter	30.110 to 30.240 mm (1.185 to 1.190 in)
Pivot clearance in housing	.110 to .370 (.004 to .014 in)
Upper pivot diameter	27.979 to 28.000 mm (1.101 to 1.102 in)
Pivot housing bore diameter in piston	28.065 to 28.149 mm (1.104 to 1.108 in)
Pivot clearance in housing	.065 to .170 mm (.002 to .006 in)

TRAILER BRAKE VALVE TROUBLE SHOOTING CHART

Fault	Cause	Remedy
Jerky braking with more than two pulses/second.	Leakage past check valve (3, page 10, sec. 54).	Remove and clean check valve.
Valve does not brake.	Restriction (9) obstructed.	Remove and clean output regulator (1).

LIFT TROUBLE SHOOTING CHART

FAULT	CAUSE	REMEDY
1. Lift fails to operate.	a. Governor stuck open.	Remove foreign particles from drain holes (T ₁ , T ₂ and T ₃ , page 20) and inspect filter.
	b. Inefficient pump.	Inspect pump.
2. Erratic lift movement during raise.	a. Clogged oil filter.	Inspect filter and replace cartridge as necessary.
	b. Ingress of air in pump suction line.	Check for faulty connections and seals.
3. Lift fails to hold the load in raised position. Continuous pitching motion with the engine running. Upon stopping the engine the load is lowered.	a. Oil leakage past spool seals (2, page 5).	Replace seals.
	b. Leakage past spool.	Remove, check for leakage, clean and replace damaged parts. Inspect filter.
	c. Check valve leakage.	Remove, inspect and clean.
	d. Leakage past lift piston gland or lift cylinder seal (20, page 5).	Replace the seals.
	e. Safety valve leakage or incorrect setting.	Replace the seals.
4. Relief valve cracks off with lift arms in maximum raised position.	Lift arm travel out of adjustment.	Adjust travel.
5. Insufficient or inadequate lifting power	a. Incorrect relief valve setting.	Replace or, if installed on remote control valves, adjust.
	b. Incorrect safety valve setting.	Replace valve.
	c. Poor pump performance (usually accompanied by increased raise time).	Check pump performance and overhaul or replace as necessary.

HYDRAULIC LIFT UNIT: Specification and Data

TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread size	Torque		
		Nm	kgm	ft lb
Lift - Section 51				
Capscrew, lift to rear transmission case (C ₁ , page 4) (55-90, 60-90, 70-90 and 80-90 or to spaces, 90-90 and 100-90)	M 12x1.25	98	10	72
Capscrew, spacer to rear transmission case (90-90 e 100-90)	M 14x1.5	196	20	145
Capscrew, control valve body to lift (C ₃ , page 3)	M 8x1.25	26	2.7	19.5
Capscrew, lift arm plates (C ₂ , page 4)	M 14x1.5	147	15	108.5
Plug, max. arm raise adjustment (T, page 3)	M 12x1.25	103	10.5	75.9
Nut, position control shaft	M 10x1.25	14.7	1.5	10.8
Nut, lever bracket studs (C ₄ , page 6)	M 8x1.25	25	2.6	18.8
Capscrew, lift cylinder	M 14x1.5	157	16	116
	M 16x1.5	260	26.5	191.7
Capscrew, top link	M 14x1.5	147	15	108.5
Capscrew, cross shaft	M 10x1.25	61	6.2	44.8
Capscrew, suction connection	M 12x1.25	98	10	72
Capscrew, delivery connection on lift control valve	M 10x1.25	59	6	43.4
Lift pump - Section 52				
Capscrew, pump (11, page1)	M 6x1	8	0.8	5.8
Nut, pump cover	M 10x1.25	41	4.2	34.4
Implement attachment and towing devices - Section 53				
Capscrew, sensing bar support: ● 55-90, 60-90, 70-90 and 80-90 ● 90-90 and 100-90	M 16x1.5	221	22.5	162.7
	M 18x1.5	294	30	217
Capscrew, check link support: ● 55-90, 60-90, 70-90 and 80-90 ● 90-90 and 100-90	M 16x1.5	221	22.5	162.7
	M 18x1.5	324	33	239
Capscrew, tow hook: ● 55-90, 60-90, 70-90 and 80-90 ● 90-90 and 100-90	M 16x1.5	221	22.5	162.7
	M 18x1.5	324	33	239
Nut, tow bar	M 18x1.5	343	35	253.2
Control valves - Section 54				
Nut, control valve links	—	20	2	14.5
Connection, outlet to lift	—	20	2	14.5
Plug, relief valve spring	—	20	2	14.5
Capscrew, control lever support	—	5.5	0.6	4.3
Capscrew, control lever support (8, page 4) and cover (4)	—	11	1.1	8.0
Plug, single/double acting changeover valve	—	20	2	14.5

DESCRIPTION

Lift senses loads on lower links through sensing bar and may be operated in the following modes:

- Position control.
- Float.
- Draught control.
- Combined draught and position control.

Use the mode which is most appropriate to the type of work in hand, implement and soil condition.

Position control

Position control keeps implement position steady either sunk in ground or on surface depending on position of lever (P).

When working, keep draught control lever (F) fully forward on quadrant and use lever (P).

Float

With lift in float mode, lifting arms swing freely and implement follows ground contour.

For float mode, both levers (F and P) should be fully forward on quadrant.

Lift and lower implement using position control lever (P) only.

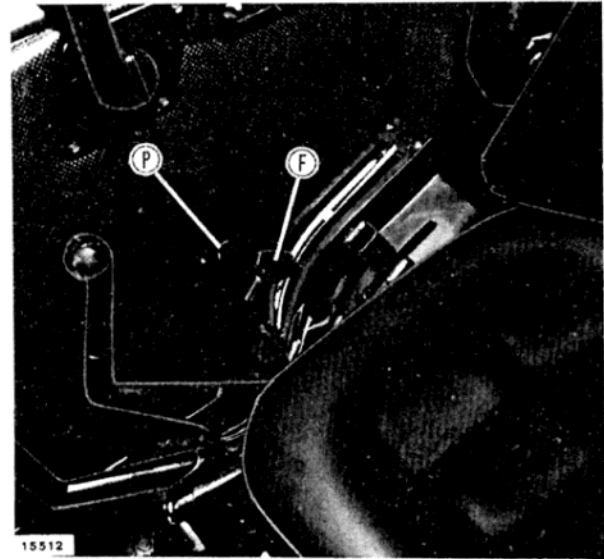
Draught control

In draught control, the lift automatically keeps tractive effort constant by allowing implement working depth to vary within narrow limits.

Average working depth, and hence tractive effort, is controlled through lever (F), keeping position control lever (P) fully forward on quadrant.

Use position control lever (P) to lift and lower implement at the beginning and end of each pass.

When working, adjust lift sensitivity to maximum to prevent continuous implement jolts.



Lift control levers.

F. Draught control lever - P. Position control lever.

Combined draught and position control

Combined draught and position control is used when working in soil of uneven consistency to prevent implement from sinking excessively.

For combined draught and position control, proceed as follows:

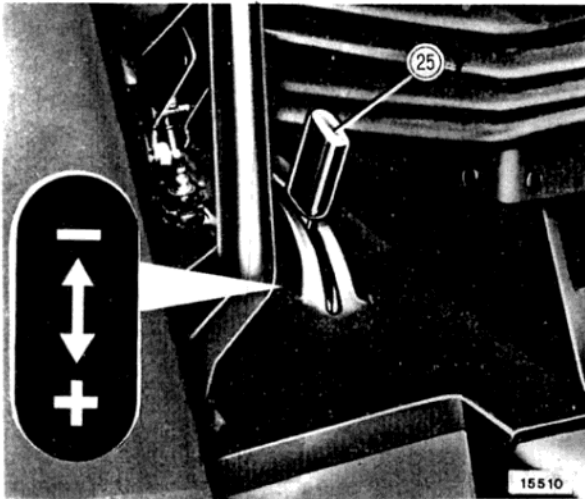
- With position control lever (P) fully forwards, set the implement at the appropriate working depth using draught control lever (F).
- Gradually move position control lever (P) backwards until lift arms start to rise.
- Lock stop knob so that lever (P) can be returned to the same position at the start of each pass.

Lift operates in draught control mode but at the same time prevents implement from sinking in loose soil and bringing unsuitable material to the surface.

Lift and lower implement using position control lever (P) only.

Do not move draught control lever (F) as this would change working depth.

HYDRAULIC LIFT UNIT: Lift



Lift sensitivity control lever (25).

Operation:

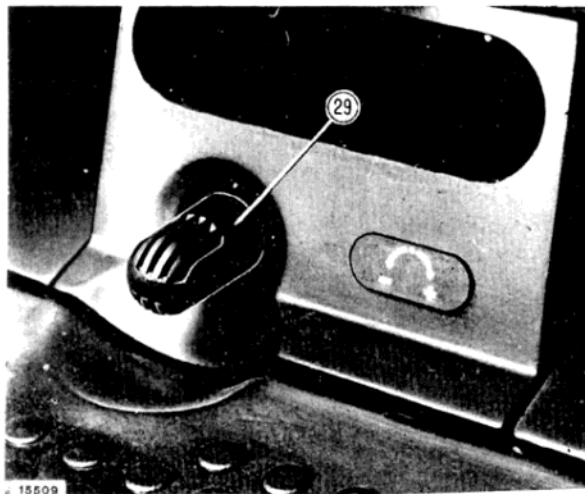
- Up (-) short response times (increased sensitivity)
- Down (+) = Long response times (reduced sensitivity).

REMOVAL



CAUTION

Lift and handle all heavy components using a suitable hoist.



Response knob (29)

Operation:

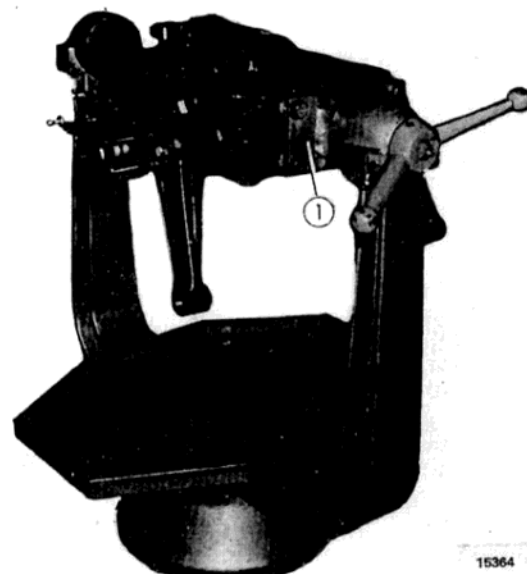
- Tighten knob (+) = Higher response
- Slacken knob (-) = Lower response

NOTE - When driving on roads with implements attached, fully back off knob (29) to lock implements in the desired position.

Ensure that units or parts are supported by suitable slings or hooks. Ensure that no one is in the vicinity of the lifted load.

Remove lift as follows:

- Separate lifting arms from hitch.
- Remove remote control valve half-coupling support plate and top link support from lift body.
- Disconnect oil delivery lines to lift. Where fitted, remove remote control valve oil drain lines from lift body.
- Disconnect lift link, Variospeed link, response link and Lift-o-Matic cable.
- If fitted, remove auxiliary cylinder (90-90 and 100-90).
- Disconnect lift vent pipe (90-90 and 100-90);
- If necessary, back off platform capscrews, lift platform slightly and support on suitable stands.
- Remove capscrews retaining lift to transmission housing (55-90, 60-90, 70-90 and 80-90) or to spacer (90-90 and 100-90) and remove lift assy using a hook and hoist. Take care to prevent draught control rod (19, page 19) from fouling lift linkage.



Lift in position on rotary stand.

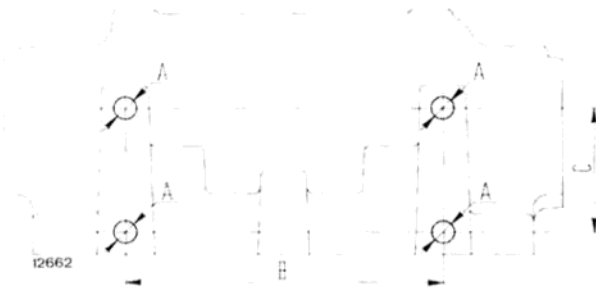
1. Plate (to be made in workshop) for lift installation on rotary stand.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift

51

page 3



Installing lift on rotary stand.

A = 15 mm (0.59 in) dia. of holes in lift retaining plate - B = 204 mm (8.03 in). Hole center distance - C = 82 mm (3.23 in). Hole center distance.

DISASSEMBLY



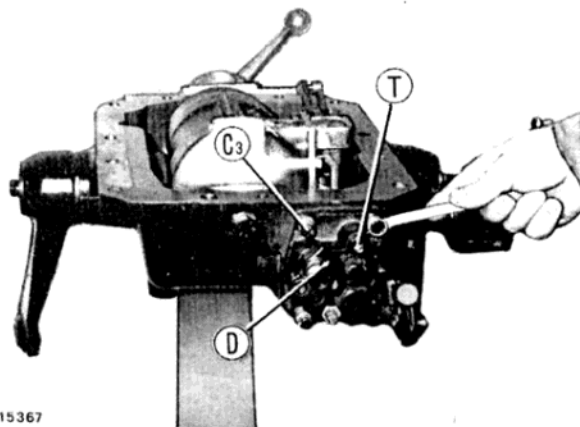
CAUTION

Handle all components with care.
Do not put hands and fingers between parts. Wear safety goggles, gloves and shoes.

Secure lift on stand and disassemble as follows:

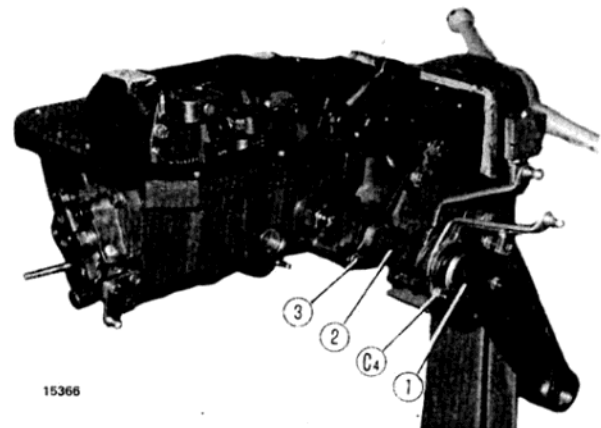
Note - To install lift on stand, make a plate (1, page 2) with holes and dimensions as shown in figure. Method used to secure plate to stand will depend on stand configuration.

- Take off capscrews (C₃) and remove control valve assy (D).
- Remove nuts (C₄), springs and bracket (1).



Disassembling hydraulic control valve (D).

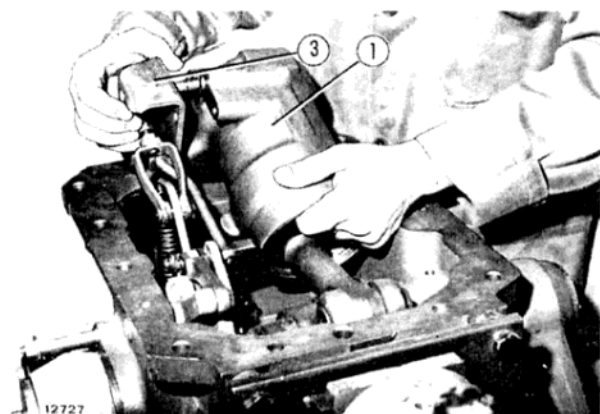
C₃. Control valve capscrews - T. Plug. (Remove to adjust maximum lift arm travel with lift installed on tractor).



Removing lift control levers.

C₄. Spring bracket stud nuts - 1. Spring bracket - 2. Spacer - 3. Spacer capscrews.

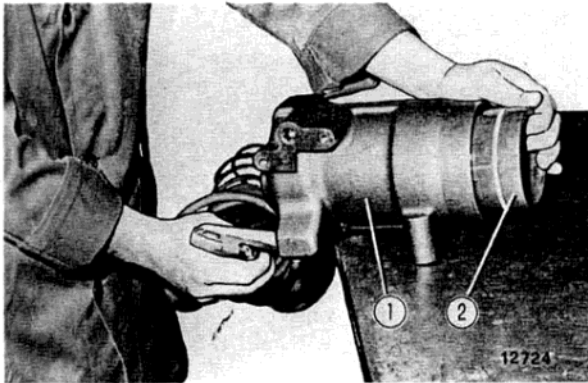
- Remove lift control levers with associated clutch plates.
- Remote capscrews (3) and spacer (2).
- Remove capscrews (C₂) and thrust plates (4), and take off lifting arms and thrust washers (10, page 4).
- Remove three capscrews securing cylinder (1) to lift housing and two control valve lever support capscrews (3). Take off cylinder together with piston.



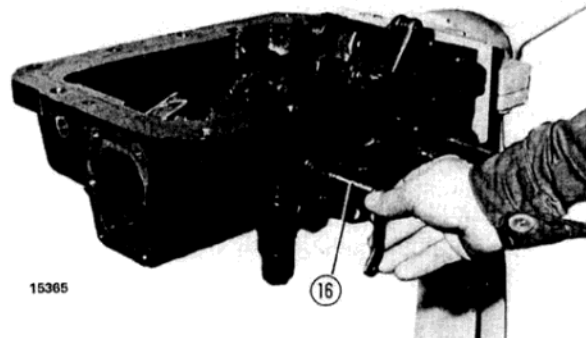
Disassembling cylinder-piston unit.

1. Cylinder - 3. Control valve lever support.

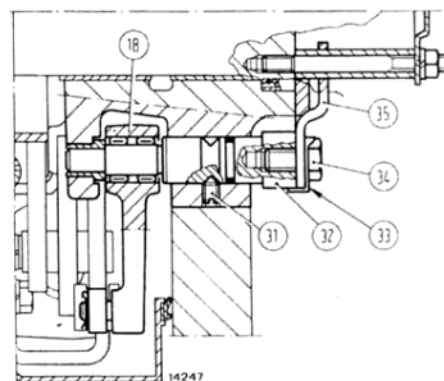
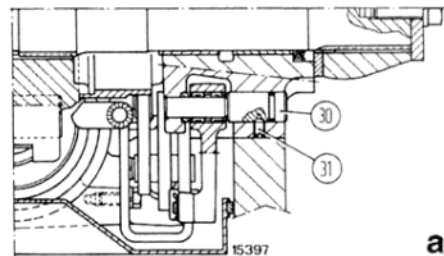
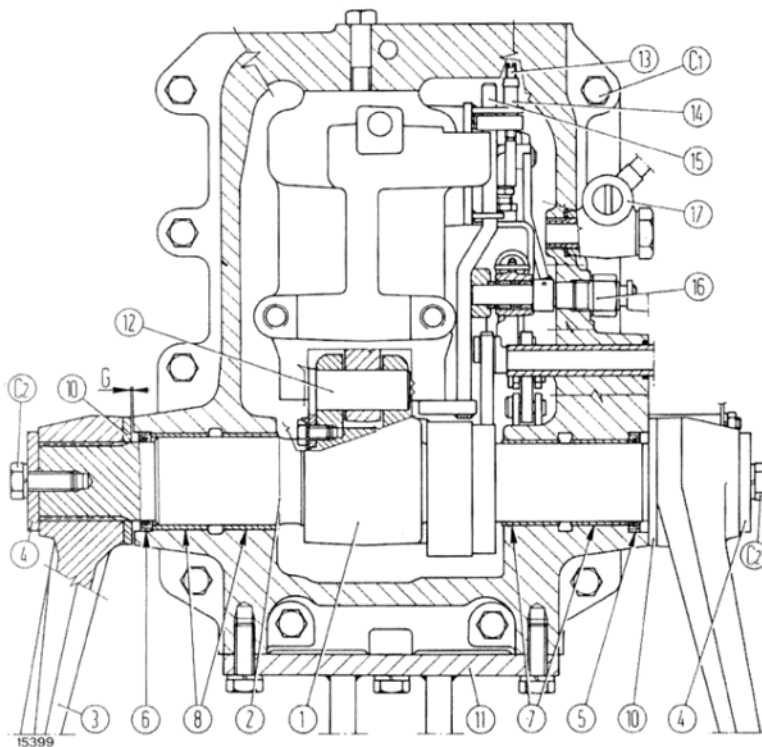
HYDRAULIC LIFT UNIT: Lift



Removing piston from cylinder with compressed air.
1. Cylinder - 2. Piston.

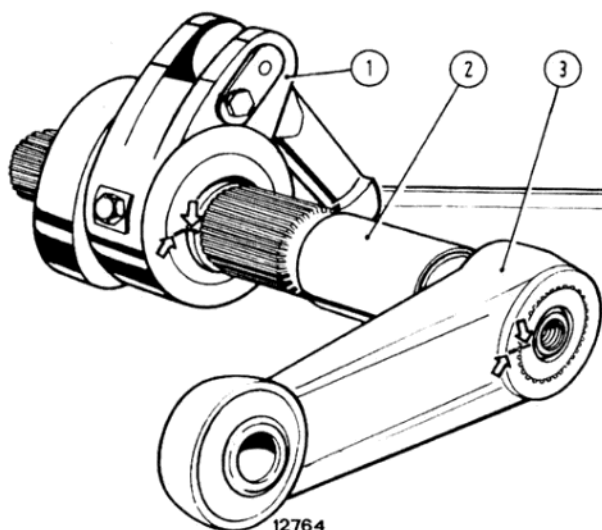


- Introduce compressed air through oil delivery port to force out piston.
- Remove inner arm capscrews, insert protector **293384** over R.H. seal (5) and remove cross shaft by striking right end of shaft with a soft hammer.
- Remove pin (16), setscrew (31) and pivot (32) or (30, early models). Take out inner levers.
- For tractors not equipped with remote control valves remote relief valve (17) from lift body.



Sections through lift.

a. Detail of early model - C₁. Lift capscrews - C₂. Thrust plate capscrews - G = 0.2 to 1.4 mm (0.008 to 0.055 in). Shaft end float - 1. Inner arm - 2. Cross shaft - 3. Lift arms - 4. Arm thrust plates - 5. R.H. seal - 6. L.H. seal - 7. R.H. bushings - 8. L.H. bushings - 10. Thrust washers - 11. Top link support - 12. Piston rod pin - 13. Limit travel adjusting screw - 14. Limit travel adjusting screw locknut - 15. Limit travel control rod - 16. Control valve link and Lift-O-Matic pin - 17. Lift relief valve (for tractors without remote control valves) - 18. Draught control inner lever - 30. Lever pivot (early model) - 31. Stud - 32. Lever pivot (late model) - 33. Lock washer - 34. Capscrew - 35. Bracket.

**Detail of correct arm assembly on shaft.**

1. Inner arm - 2. Cross shaft - 3. Lift arms.

To disassemble control valve, proceed as follows:

- Remote cylinder safety valve (15), response control valve (17) and pin (19).
- Remove connection (20), retrieving check valve (22) and associated seat (23).

- Remove plug (3), retrieving valve spool (1), associated seat (2), spring (4) and ring (14).

- Remove draught sensitivity valve plug (13) and plug (7), retrieving plunger (5), spring (6), piston (9) and associated seat (8).

Remove retaining ring (30) and retrieve spring cup (10), spring (11) and draught sensitivity valve.

Back off plug (27), remove roll pin (31) and retrieve response control valve pin (28).

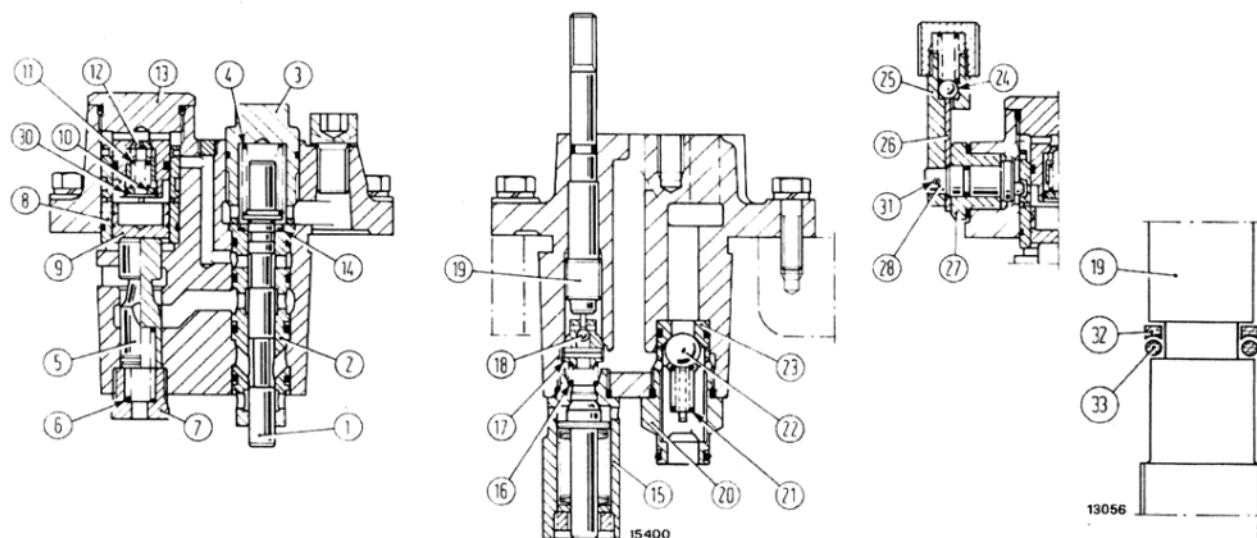
INSPECTION

Refer to table on pages 1 and 2, section 50 and inspect as follows:

- Carefully check seals, replacing if necessary.
- Check valves for wear and clearance in associated seats.

If replacement is necessary, note that spare valve spools (1) are supplied together with associated seats (2), and that valve plunger (5) is supplied together with control valve body.

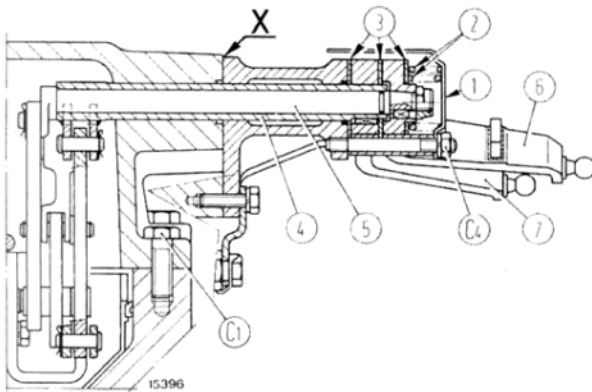
Check cylinder safety and relief valve setting as described in the appropriate paragraphs. Valve may be integral with remote control valves or installed on lift body.

**Sections through lift control valve.**

a. Detail of O-ring (33) and back-up ring (32) installation - 1. Valve spool - 2. Spool seat - 3. Plug - 4. Spool return spring - 5. Valve plunger - 6. Plunger spring - 7. Plug - 8. Piston seat - 9. Piston - 10. Spring cup - 11. Draught sensitivity adjusting valve spring - 12. Draught sensitivity adjusting valve - 13. Plug - 14. Ring - 15. Cylinder safety valve - 16. Response control valve spring - 17. Response control valve - 18. Ball - 19. Response control valve adjusting pin - 20. Delivery connection - 21. Check valve spring - 22. Check valve - 23. Check valve seat - 24. Detent ball - 25. Adjusting pin lever - 26. Sector - 27. Plug - 28. Adjusting pin - 30. Retaining ring - 31. Roll pin - 32. Back-up - 33. O-ring.

Note: Install O-ring (33) and back-up ring (32) as shown in detail (a), using protector **293858** and heating ring (32) in oil at 50°C. Take care to install ring (32) with flat surface facing upwards and concave surface facing ring O-ring (33).

HYDRAULIC LIFT UNIT: Lift



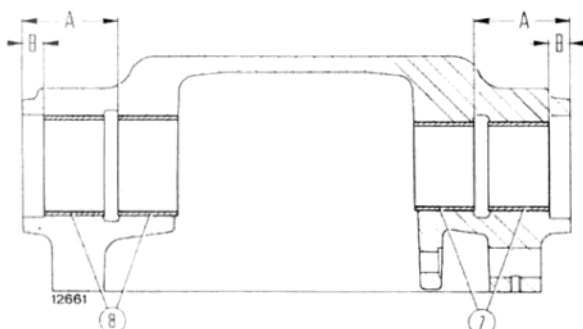
Section through lift levers and controls.

C1. Lift capscrews - C4. Spring bracket nuts - 1. Spring bracket - 2. Springs - 3. Clutch plates - 4. Position control lever pin - 5. Draught control lever inner shaft - 6. Position control lever - 7. Draught control lever.

ASSEMBLY

Reverse disassembly procedure and note the points below:

- Should replacement become necessary, press-fit cross shaft bushings from outside to inside of lift body ensuring that dimensions (A, B) are as shown in figure. Bushings need no reaming after installation.
- Couple cross shaft (2, page 5) to inner arm (1) and lift arms (3), lining up reference marks on parts.
- Remove L.H. seal (6, page 4). If replacement is necessary, also remove R.H. seal.
- With cross shaft (2, page 4) installed, fit seals using protector **293384** to prevent inner lip from being damaged by arm splines, and driver **293842** to insert seals correctly in seats.



Cross shaft bushing fitting details.

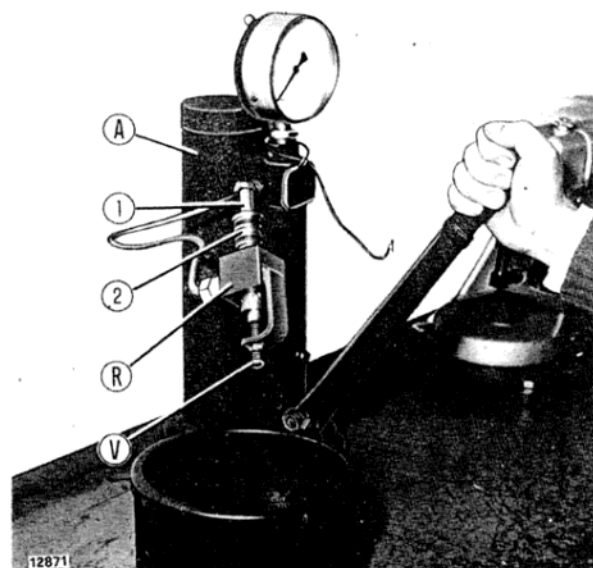
A = 62 mm (2.44 in) - B = 14 mm (0.55 in) - 7. R.H. bushings - 8. L.H. bushings.

Note: If R.H. seal (5, page 4) does not require replacement, fit protector **293384** over seal and insert cross shaft from L.H. side of lift. Subsequently, install seal (6) using protector **293384** and driver **293842**.

- At end of assembly, check that cross shaft end float is 0.2 to 1.4 mm (0.008 to 0.055 in) (G, page 4).
- To prevent seal damage, install piston in cylinder using guide ring **293843** (for lifts with 110 mm or 4.3 in dia. piston).
- Reassemble control linkage using driver **293859** to install needle roller bearing on spool lever (6, page 19), and driver **293838** to install needle roller bearings on draught control inner lever (18) and link (30).
- Reassemble control valve as shown in figures and install on lift body after thoroughly cleaning and degreasing mating surfaces and applying one of jointing compounds listed on page 6, section A.

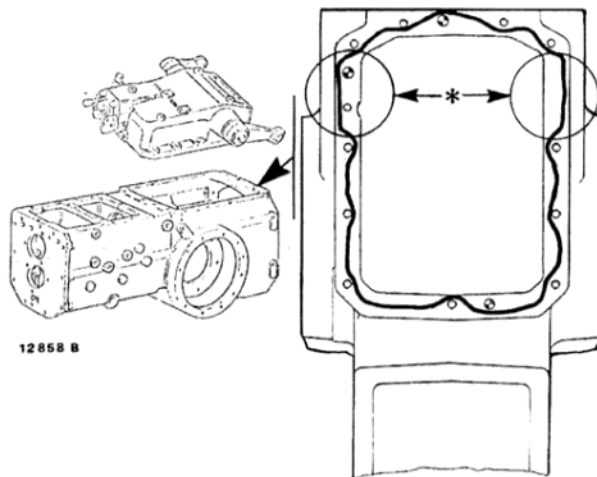
Note: On control valve reassembly, check efficiency of spool (1) as follows:

- Install seat (2) with O-rings, washer (14, page 5) and spool (1) in connection **293849** (R), checking that the seals in bottom of seat prevent leakage past connection, and connect the latter to hand pump **290284** (A) with **oliofiat IDRAULICAR AP 51** (SAE 20).



Checking valve spool leakage.

A. Hand pump **290284** - R. Connection **293849** - V. Screw - 1. Spool - 2. Spool seat.
(Use **Oliofiat IDRAULICAR AP51** (SAE 20))



Applying jointing compound to rear transmission housing prior to lift installation (55-90, 60-90, 70-90 and 80-90).

Jointing compound types are indicated on page 6, section A.

(*) Jointing compound must be applied on outboard side where indicated.

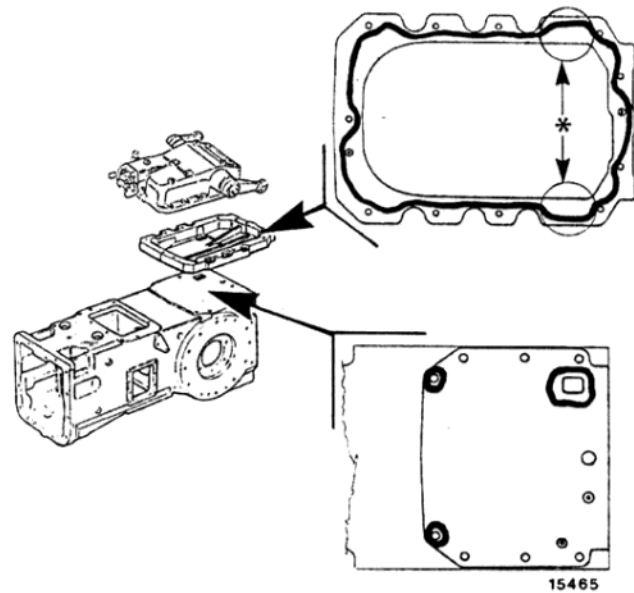
- Push spool (1) into contact with associated seat (2).
- While operating hand pump, tighten connection screw (V) to discontinue oil flow from seat outlet.
- Tighten screw (V) through two more turns.
- Operate pump to bring oil pressure in system to 250 kg/cm² (3,556 psi) and check on pressure gauge that pressure takes more than six seconds to drop from 200 kg/cm² (2,845 psi) to 100 kg/cm² (1,422 psi).
- If necessary replace spool; spare spools are supplied together with seats.

- Before installing lift, thoroughly clean and degrease mating parts and apply a 2 mm (0.04 in) dia. bead of jointing compound on transmission housing as shown in figure. Jointing compound types are indicated on page 6, section A.



CAUTION

Use suitable tools to align holes. DO NOT USE HANDS OR FINGERS.



Applying jointing compound to rear transmission housing prior to lift installation (90-90 and 100-90).

Jointing compound types are indicated on page 6, section A.

(*) Jointing compound must be applied on outboard side where indicated.

LIFT ADJUSTMENT

The following adjustments refer to a lift without hydraulic control valve and placed on work bench or secured to a rotary stand through a suitable bracket.

Adjust in the order given.

With lift installed on tractor, only arm upward travel adjustment is possible.

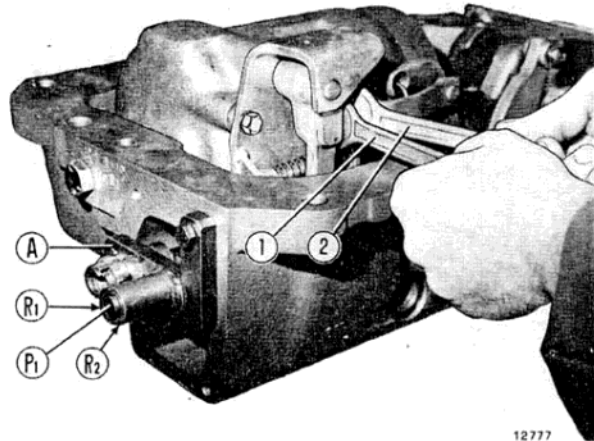
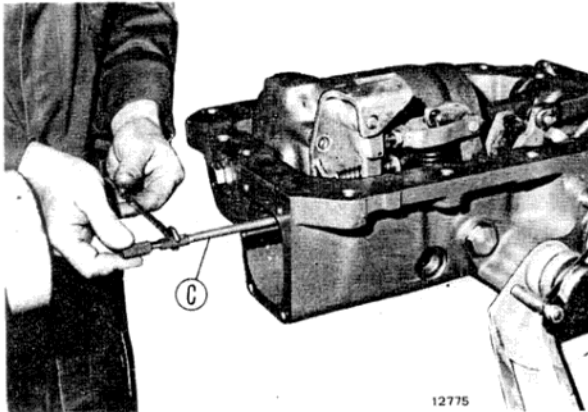
Unless otherwise indicated, LIFT-O-MATIC must be de-activated, i.e. control lever (33, page 19) must be locked in upright position.

1. Position control adjustment

Proceed as follows:

- Move position control lever (37, page 8) fully forward to contact spring bracket spacer and lever (38) fully back against spacer.
- Rotate cross shaft to bring inner arm in contact with lift body.
- Using wrench **293870** (C, page 8) slacken locknut (4) and travel adjusting screw (3) until screw no longer touches lever (6).

HYDRAULIC LIFT UNIT: Lift



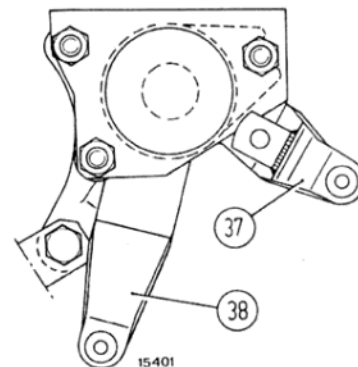
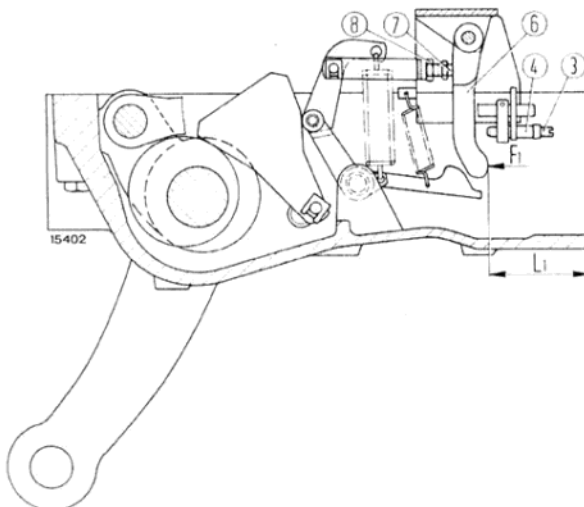
Adjusting position control.

A. Tool 293846 - C. Wrench 293870 - P₁. Moving plunger 293846 - R₁. Outer register - R₂. Inner register - 1 and 2. Wrenches.

- Install tool 293846 (A) on lift body.
- Using wrenches (1 and 2), back off locknut (8) and tighten or slacken adjustable link rod (7) so that plunger (P₁) is aligned with outer register (R₁) of tool (A) as shown.
- Tighten locknut (8);
- Move position control lever (37) fully back on quadrant to contact spacers, rotate cross shaft to bring piston fully forward and check that moving rod (P₁) extends no further than inner register (R₂) of tool (A).

Note: This condition corresponds to a gap (L₁) of 81.9 to 82.1 mm (3.22 to 3.23 in) between lever end (6) and lift body front face measured applying a force (F₁) of 4 to 4.5 daN (kg) or 9 to 10 lb to lever end.

Note - This condition corresponds to a gap (L₁) between lever end (6) and lift body front end which exceeds 85 mm or 3.35 in when measured applying a force (F₁) of 4 to 4.5 daN (kg) or 9 to 10 lb on lever end.



Adjusting position control.

F₁. = 4 to 4.5 daN (kg) or 9 to 10 lb. Force applied by tool 293846 on lever (6) - L₁. Distance between lever end (6) and lift body front end - 3. Limit travel adjusting screw - 4. Locknut - 6. Control valve lever - 7. Link cap - 8. Locknut - 37. Outer position control lever - 38. Outer draught control lever.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift

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page 9

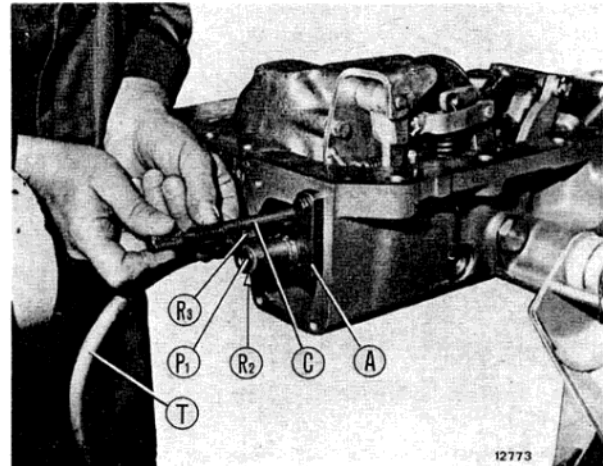
2. Maximum lift arm travel adjustment on bench.

Proceed as follows:

- With tool **293846** (A) installed on lift body, position draught control lever (38, page 8) fully back on quadrant to contact spacer and position control lever (37) fully forward against spacer.
- Rotate cross shaft to bring inner arm into contact with lift body.
- Hook up connection (R₃) on tool (A) to a compressed air source (T) and introduce air to cylinder so that piston moves, through full lift stroke. Maintain air pressure to keep piston in this position.
- Using wrench **293870** (C), tighten screw (3, page 8) until end of plunger (P₁) is aligned to inner register (R₂) of tool (A), or is recessed therefrom by no more than 0.5 mm (0.020 in).

Note - This condition corresponds to a gap (L₁, page 8) of 85 to 85.5 mm (3.346 to 3.366 in) between lever end (6) and lift body front end.

- Tighten locknut (4).



Adjusting maximum lift arm travel on bench.

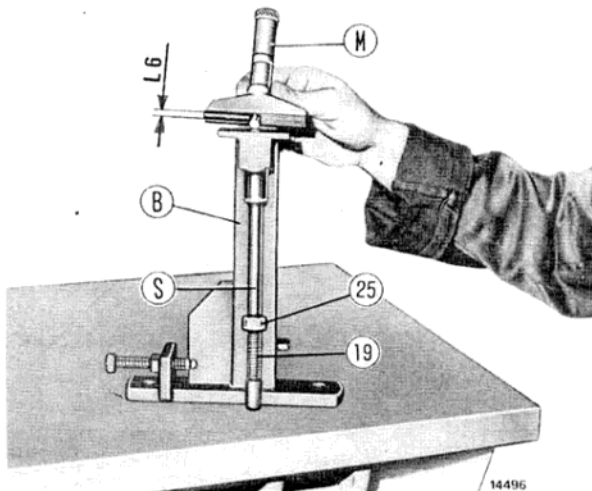
A. Tool **293846** - C. Wrench **293870** - P₁. Plunger - R₂. Inner register face - R₃. Compressed air connection - T. Compressed air line.

- place tool **293845/1** (B) together with spindle (S) and end of draught control rod (19) on a surface plate and measure gap (L₅) between top of spindle and depth gauge support face.

3. Draught control adjustment (early model 55-90, 60-90, 70-90 and 80-90).

Proceed as follows:

- remove end of draught control rod (19, page 19) and install on spindle (S) of tool **293845/1** securing through lock nut (25).

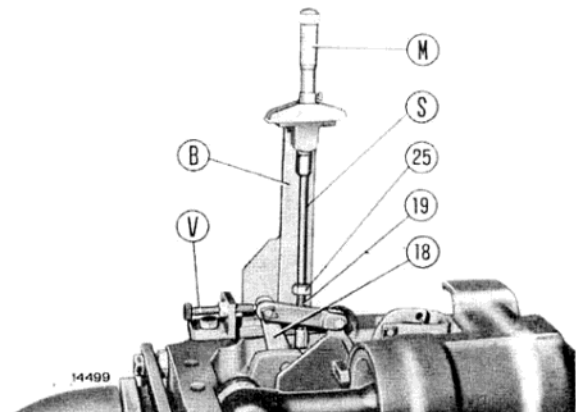


Zeroing tool 293845/1 for draught control adjustment.

B. Tool **293845/1** - L₅. Gap between top of spindle (S) and depth gauge support face - M. Depth gauge - S. Spindle - 19. Draught control rod - 25. Lock nut.

Note - If early model tool **293845** is available, it may be changed into late model **293845/1** by making two spindles as shown on page 10 (spindle of tool **293845** may be used as one of the two spindles).

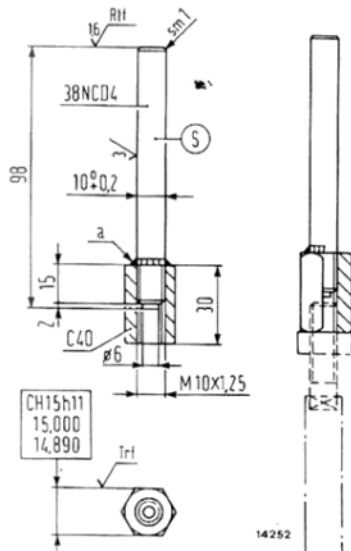
- With tool **293846** (A) installed on lift body and disconnected from compressed air supply, move po-
- (continued on page 10)



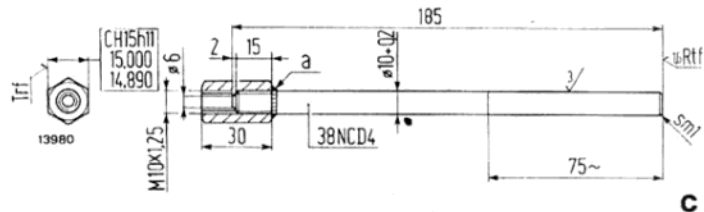
Adjusting draught control.

B. Tool **293845/1** - M. Depth gauge - S. Spindle - V. Screw - 18. Draught control inner lever - 19. Draught control rod - 25. Lock nut.

HYDRAULIC LIFT UNIT: Lift



b



c

Spindle for changing early model tool 293845 into late model tool 293845/1 - Dimensions in mm.

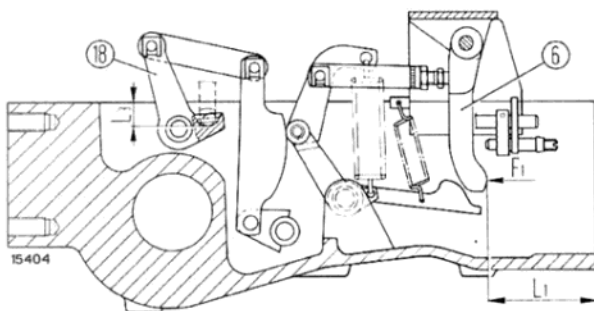
a = braze - b. Spindle for 55-90, 60-90, 70-90 and 80-90 - c. Spindle for 90-90 and 100-90 - sm1 = 1 mm chamfer.

Material: 38NCD4 hardened and tempered.

sition control lever (37) and draught control lever (38) fully back on spacer to contact spacer.

- Install tool **293845/1** (B, page 9) on lift body and secure to two housing holes as shown in figure. Turn knurled screw (V) to move draught control inner lever (18) until end of plunger (P₁, page 8) is exactly aligned to outer register (R₁) on tool **293846** (A) as shown in figure on page 8.

Note - This condition corresponds to a dimension (L₁) of 81.9 to 82.1 mm or 3.22 to 3.23 in between lever end and lift body front support as measured applying a force (F₁) of 4 to 4.5 daN (kg) or 9 to 10 lb on lever end.



- Insert tool spindle (S, page 9) in draught control inner lever seat (18) and, using a depth gauge (M), measure distance (L₇) between top of spindle and depth gauge support face on tool.

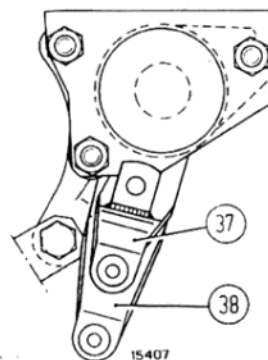
- Dimension (L₃) will be given by:

$$L_3 = L_7 - L_6$$

where:

L₇ and L₆ = Dimensions measured with tool **293845/1** on surface plate (L₆) and on lift body (L₇).

- Disassemble tools **293845/1** and **293846** and install hydraulic control valve on lift body.



Adjusting draught control.

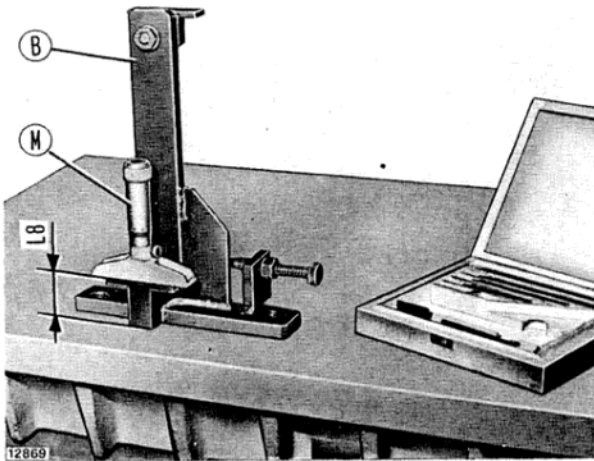
F₁ = 4 to 4.5 daN (kg) or 9 to 10 lb. Force applied to lever (6) by tool **293846** - L₁ = 81.9 to 82.1 mm (3.22 to 3.23 in). Distance between end of lever (6) and lift body front face - L₃ = Distance between lift housing mating face on transmission housing and rod contact face on lever (18) - 6. Control valve actuating lever - 18. Draught control inner lever - 37. Position control outer lever - 38. Draught control outer lever.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift

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page 11



Zeroing tool 293845/1 (B) for draught control adjustment.

L_8 . Dimension between tool base on surface plate and depth gauge support face (to be stamped on tool) - M. Depth gauge.

Install lift on tractor as described below:

Warning - First place tool 293845/1 (B) on a surface plate and, using a depth gauge (M) measure distance (L_8) between tool base and depth gauge support face on tool.

Stamp measured dimension (L_8) on tool.

- Install draught sensing unit complete with relay lever (21) and draught control rod (19) but without sensing bar on rear transmission housing.
- Rest relay lever (21) against sensing bar housing, install tool 293845/1 (B), securing it to two housing holes in such a way that draught control rod (19) fits perfectly into hole on tool.
- Using depth gauge (M) measure distance (L_9) between top of rod (19) and depth gauge support face on tool.

Note: Stand-out (L_4) of top rod end (19) from transmission housing (with sensing bar removed) will be given by:

$$L_4 = L_8 - L_9$$

where:

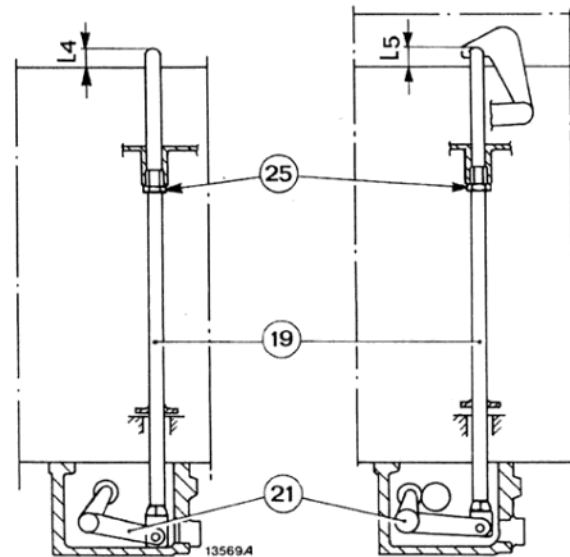
L_8 and L_9 = Dimensions measured with tool 293845/1 on surface plate (L_8) or on transmission housing (L_9).

- Install sensing bar and measure new distance (L_{10}) between top of rod (19) and depth gauge support face on tool.

Note: Stand-out (L_5) of rod end (19) from transmission housing (with sensing bar installed) will be given by:

$$L_5 = L_8 - L_{10}$$

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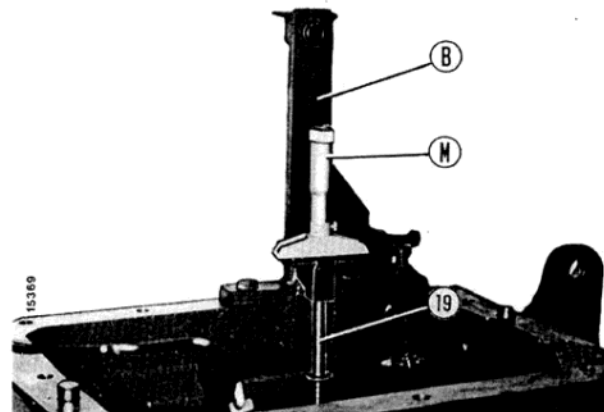
Installing lift on tractor.

19. Draught control rod - 21. Draught relay lever - 25. Lock nut.

where:

L_8 and L_{10} = Dimensions measured with tool 293845/1 on surface plate (L_8) or on transmission housing (L_{10}).

- Check that dimension (L_5) exceeds dimension (L_4) by 5 mm (0.20 in).
- Check that dimension (L_5) with sensing bar installed, is less than dimension (L_3 , page 10) by 6 mm (.23 in). To adjust slacken locknut (25) and turn draught rod (19) as necessary.
- Tighten locknut (25);
- Install lift on tractor.

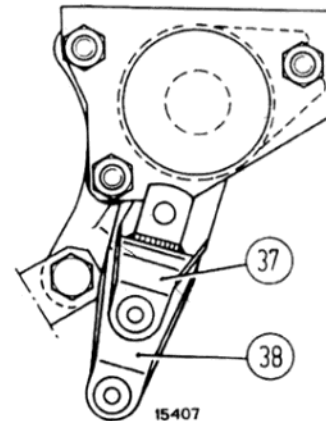
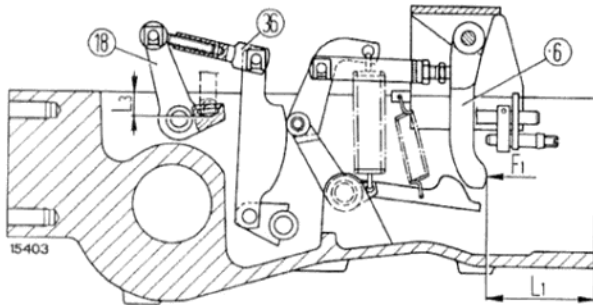


Adjusting draught control.

B. Tool 293845/1 - M. Depth gauge - 19. Draught control rod.

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HYDRAULIC LIFT UNIT: Lift



Adjusting draught control.

$F_1 = 4$ to 4.5 da N (kg) or 9 to 10 lb. Force applied to lever (6) by tool **293846** - $L_1 = 81.9$ to 82.1 mm (3.22 to 3.23 in). Distance between end of lever (6) and lift body front face - $L_3 = 23.9$ to 24.1 mm or .940 to .948 in. Distance between lift housing mating face on transmission housing and rod contact face on lever (18) - 6. Control valve actuating lever - 18. Draught control inner lever - 19. Draught control rod - 36. Link - 37. Position control outer lever - 38. Draught control outer lever.

4. Draught control adjustment (all models)

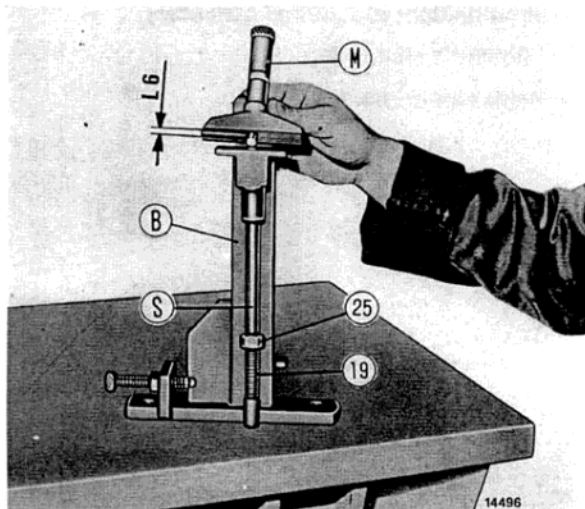
Note - Draught control adjustment requires use of tool **293846** together with tool **293845/1**.

If early model tool **293845** is available, it may be changed into late model tool **293845/1** by making two spindles as shown on page 10, i.e. short spindle for 55-90, 60-90, 70-90 and 80-90, and a long spindle for 90-90 and 100-90.

Before adjusting draught control, proceed as follows:

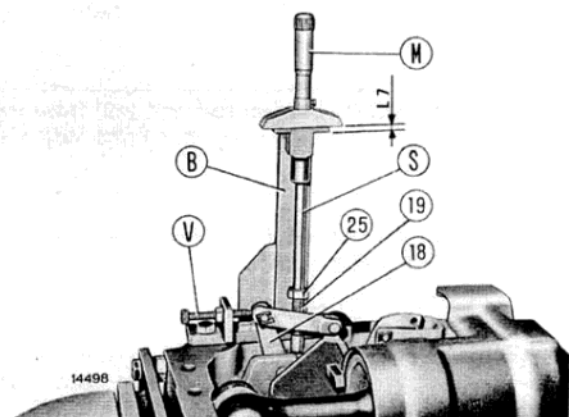
- remove end of draught control rod (19, page 19) and install on spindle (S) of tool **293845/1**, securing through lock nut (25);

- place tool **293845/1** (B) together with spindle (S) and end of draught control rod (19) on a surface plate and measure gap (L_6) between top of spindle and depth gauge support face using depth gauge (M). Note that control rod (19) must be installed on spindle (S) in such a way that spindle surface is a few millimetres below the depth gauge support face.



Zeroing tool 293845/1 (B) for draught control adjustment.

B. Tool **293845/1** - L_6 . Gap between top of spindle (S) and depth gauge support face - M. Depth gauge - S. Spindle - 19. Draught control rod - 25. Lock nut.



Adjusting draught control..

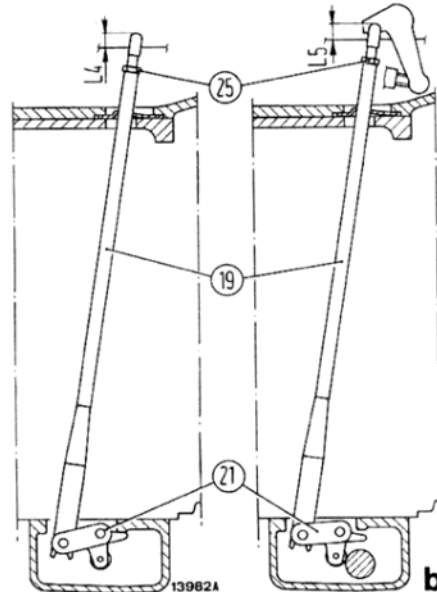
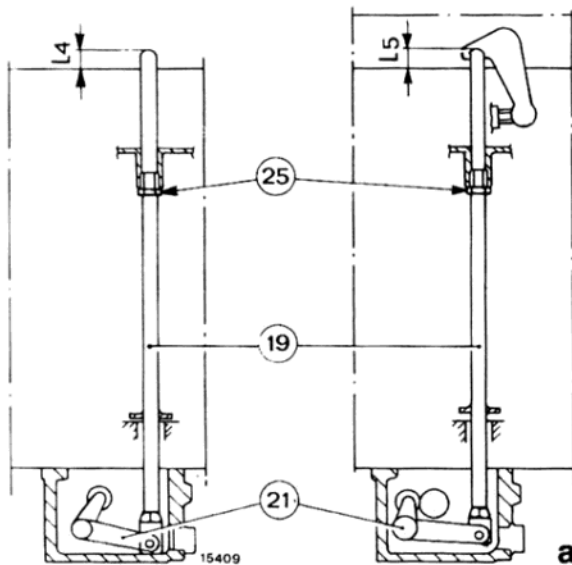
B. Tool **293845/1** - L_7 . Gap between top of spindle and depth gauge support face - M. Depth gauge - S. Spindle - V. Screw - 18. Draught control inner lever - 19. Draught control rod - 25. Lock nut.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift

51

page 13



Installing lift on tractor.

a. Section through draught sensing unit, 55-90, 60-90, 70-90 and 80-90 - b. Section through draught sensing unit, 90-90 and 100-90 - 19. Draught control rod - 21. Draught relay lever - 25. Lock nut.

Then proceed as follows:

- With tool **293846** (A, page 9) installed on lift body and disconnected from compressed air supply, move position (37, page 12) and draught (38) control levers fully back to contact spacer.
- Position draught control inner lever cam (32, page 14) horizontally, with lobe facing rear of lift.
- Install tool **293845/1** (B, page 12) on lift body and secure to two housing holes as shown in figure on page 12. Turn knurled screw (V) to move draught control inner lever (18) until end of plunger (P₁, page 9) is as close as possible to inner register (R₂) of tool **293846** (A).
- Rotate cam (32, page 14) slightly to retract end of plunger (P₁) as far as possible.
- Turn screw (V, page 12) again to move lever (18) until end of plunger is aligned with inner register (R₂, page 9) of tool **293846**.
- Rotate cam (32, page 14) as necessary to align end of plunger with outer register (R₁, page 9).

Then proceed as follows:

- Insert spindle of tool **293845/1** (B, page 12) in draught control inner lever seat (18).

- With end of plunger in line with outer register (R₁, page 8), move link (36, page 12) and measure distance (L₇) with depth gauge (M, page 1) between top of spindle and depth gauge support face on tool **293845/1**.

- dimension (L₇, page 12) will be given by:

$$L_7 = L_6 + L_3$$

where:

L₆ = dimension measured with tool **293845/1** on surface plate.

L₃ = 23.9 to 24.1 mm (.940 to .948 in) Distance between lift housing mating face on transmission housing and rod contact face on lever (18).

Note - This condition corresponds to a gap (L₁, page 12) of 81.9 to 82.1 mm (3.224 to 3.232 in) between lever end (6) and lift body front face measured applying a force (F₁) of 4 to 4.5 da N or 9 to 10 lb to lever end.

NOTE - Check that with plunger (P₁, page 8), aligned with outer register (R₁) of tool **293846** (A), dimension (L₇, page 12) is as follows:

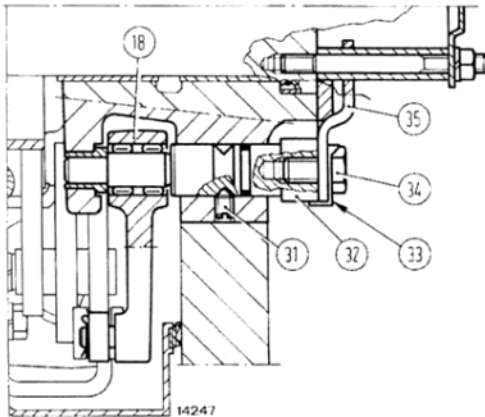
$$L_7 = L_6 + L_3$$

where:

L₆ = dimension measured with tool **293845/1** on surface plate.

L₃ = 23.9 to 24.1 mm (.940 to .948 in) Distance between lift housing mating face on transmission housing and rod contact face on lever (18, page 2). To adjust, turn cam (32) and knurled screw (V, page 12) or tool **293845/1**.

HYDRAULIC LIFT UNIT: Lift



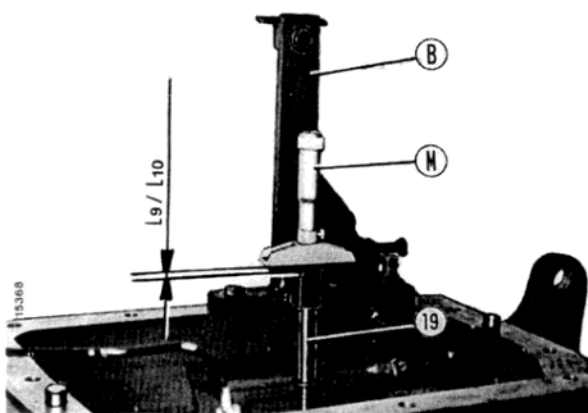
Section through draught control inner lever linkage.

18. Draught control inner lever - 31. Threaded dowel - 32. Lever cam - 33. Lock washer - 34. Screw - 35. Bracket.

- Install threaded dowel (31) and tighten screw (34) without folding down lockwasher tab.
- Disassemble tools **293846** and **293845/1** and install hydraulic control valve on lift body.

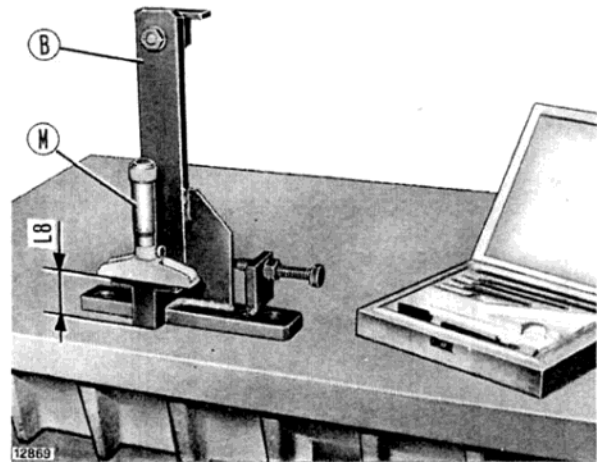
Install lift on tractor as described below:

Warning: First place tool **293845/1** on a surface plate and, using a depth gauge (M) measure distance (L_8) between tool base and depth gauge support face on tool. Stamp measured dimension (L_8) on tool.



Adjusting draught control.

B. Tool **293845/1** - L_8 . Distance between top of rod (19) and depth gauge support face on tool (with sensing bar removed). L_{10} . Distance between top of rod (19) and depth gauge support face on tool (with sensing bar installed) - M. Depth gauge - 19. Draught control rod.



Zeroing tool **293845/1** (B) for draught control adjustment.

L_8 . Dimension between tool base on surface plate and depth gauge support face (to be stamped on tool) - M. Depth gauge.

- Install draught sensing unit complete with relay lever (21, page 13) and draught control rod (19) but without sensing bar on rear transmission housing.
- Rest relay lever (21) on draught sensing unit housing and install tool **293845/1** securing it to two housing holes in such a way that draught control rod (19) fits perfectly into hole on tool as shown alongside.
- Using depth gauge (M), measure distance (L_9) between top of rod (19) and depth gauge support face on tool.

Note - Stand-out (L_4 , page 13) of top rod end (19) from transmission housing (with sensing bar removed) will be given by:

$$L_4 = L_8 - L_9$$

where:

L_8 and L_9 = Dimensions measured with tool **293845/1** on surface plate (L_8) or on transmission housing (L_9 , page 13).

- Install sensing bar and measure new distance (L_{10}) between top of rod (19) and depth gauge support face on tool.

Note - Stand-out (L_5 , page 13) of rod end (19) from transmission housing (with sensing bar installed) will be given by:

$$L_5 = L_8 - L_{10}$$

where:

L_8 and L_{10} = Dimensions measured with tool **293845/1** on surface plate (L_8) or on transmission housing (L_{10}).

- Check that dimension (L_5) exceeds dimension (L_4) by at least 5 mm (0.20 in).
- Slacken locknut (25, page 13) and adjust draught control rod length so that stand-out L_5 is 18.3 to 18.5 mm or .720 to .728 in.
- Stand-out L_5 may be determined using tool **293845/1** as follows:

$$L_{11} = L_8 - L_5$$

where:

L_5 = 18.3 to 18.5 mm (0.720 to 0.728 in). Stand-out of rod end from transmission housing.

L_8 = Dimension measured with tool **293845/1** on surface plate.

L_{11} = Dimension measured with depth gauge on tool **293845/1**.

- Tighten lock nut (25, page 13) and install lift on tractor.

5. Position control link adjustment.

Proceed as follows:

- Move position control lever (P) upright on quadrant and check that distance (L_{12}) between lever and beginning of slot is 11 mm or .43 in.
- Move outer lever (37) fully forward against spacer, connect link (adjusting length if necessary) and check that distance (L_{12}) is 11 mm or .43 in.
- Secure link through lock nuts.

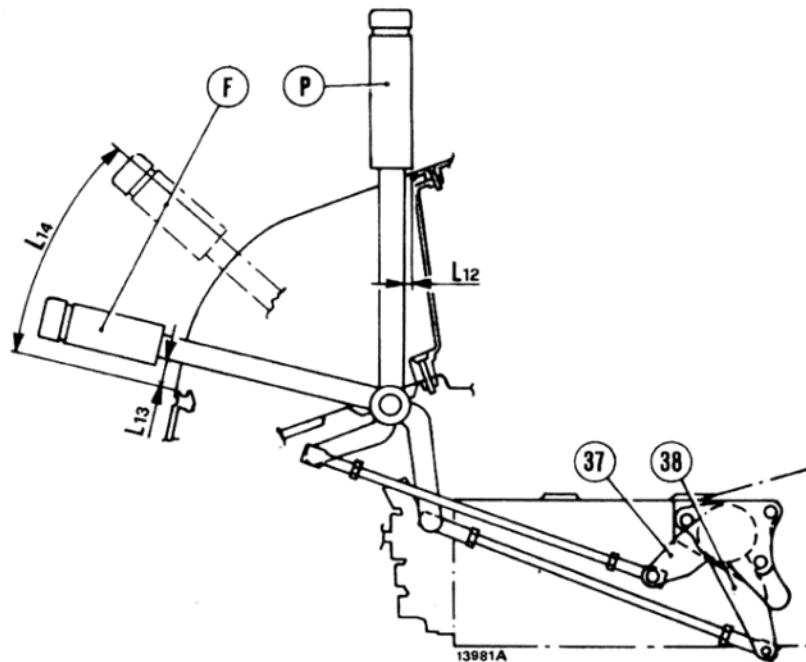
6. Draught control link adjustment.

Test conditions:

- No additional weight on lower links.
- Engine at part throttle.

Proceed as follows:

- Move lever (P) fully forward on quadrant (complete lowering).
- Move outer lever (38) fully back against spacer, and lever (F) forward on quadrant. Connect draught control link to levers (38) and (F) and check that distance (L_{13}) between lever (F) and start of slot is 27 to 30 mm or 1 to 1.2 in. To adjust, alter length of link.

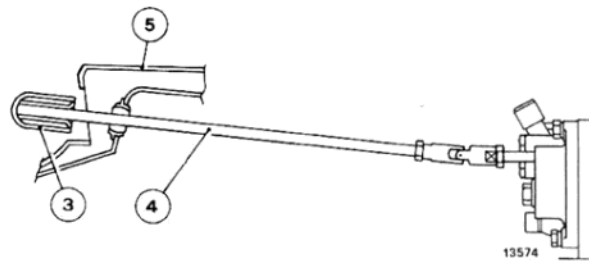


Adjusting position (P) and draught (S) control levers.

F. Draught control lever - L_{12} = 11 mm or .43 in. Distance between position control lever (P) and beginning of slot - L_{13} = 27 to 30 mm or 1 to 1.2 in. Distance between draught control lever and beginning of slot - L_{14} = 185 to 195 mm or 7.28 to 7.67 in. Distance between beginning of slot and front edge of lever (F) - P. Position control lever - 37. Outer position control lever on lift - 38. Outer draught control lever on lift.

HYDRAULIC LIFT UNIT: Lift

- Move draught control lever (F, page 15) to a distance $L_{14} = 185$ to 195 mm or 7.28 to 7.67 in along quadrant. With lever (F) in this position, check that arms begin to raise.
- If not, adjust lever cam (32, page 14) until distance (L_{14}) is as specified.
- Secure cam (32) in position through dowel (31) and lock washer (33).



Adjusting response control link.

3. Knob - 4. Link - 5. Plastic guard.

7. Variospeed sensitivity link adjustment.

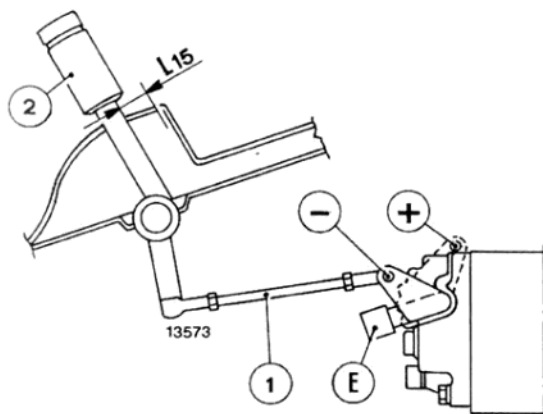
Proceed as follows:

- Position Variospeed control lever so that the distance L_{15} from lever to the beginning of quadrant slot is 20 mm or $.78$ in.
- Move control valve mounted lever (E) fully down on quadrant (— position) and connect link (1). If necessary, adjust link length until distance L_{15} is 20 mm or $.78$ in.
- Tighten link lock nuts and check that all control valve positions can be reached.

8. Response control link adjustment.

Proceed as follows:

- Connect link (4) to control valve and adjust length so that knob (3) can be moved easily.
- Check that guard (5) does not foul knob (3). Secure link through lock nut.



Adjusting sensitivity control link.

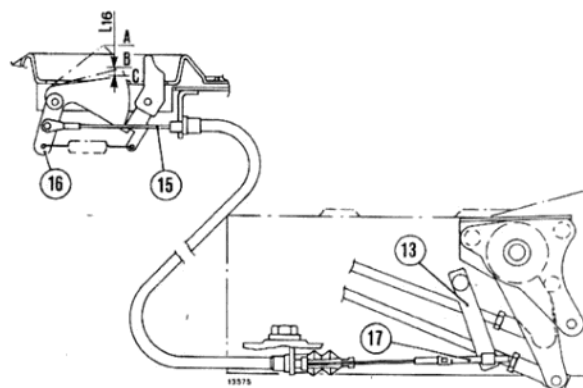
E. Control lever - $L_{15} = 20$ mm or $.78$ in. Distance between lever (2) and beginning of slot - 1. Link - 2. Sensitivity control lever.

9. Lift-O-Matic adjustment.

Note - Release lever (13) to reactivate Lift-O-Matic

Proceed as follows:

- With engine off, move draught and position control levers (F and P) fully forward on quadrant.
- Connect cable (15) and pushbutton (16) to outer lever (13) and secure pushbutton assy to mud-guard.
- Start engine and accelerate to part throttle.
- Adjust cable (15) through end (17) so that when pushbutton (16) is actuated, lift arms start to lower when pushbutton is still short of its full stroke by a distance L_{16} of 9 to 12 mm or $.35$ to $.47$ in as measured at end of pushbutton (see figure).
- Secure end (17) to outer lever (13) through associated clip.



Adjusting Lift-O-Matic.

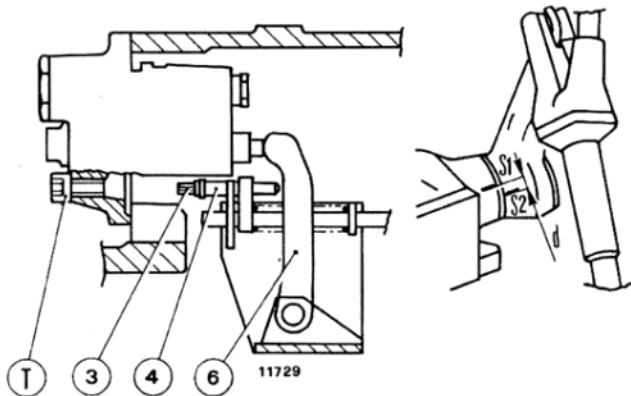
A = Rest position of pushbutton (16) - B = Pushbutton position at start of control valve exhaust - C = Pushbutton latch position - $L_{16} = 9$ to 12 mm or $.35$ to $.47$ in. Distance between pushbutton positions B and C - 13. Outer lever - 15. Cable - 16. Pushbutton - 17. Threaded end.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift

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page 17



Adjusting maximum lift arm travel.

$d = 2$ to 3 mm (0.08 to 0.12 in). Distance between reference marks S_1 and $S_2 - S_1$. Reference mark on lift body - S_2 . Reference mark on lift arm - T. Plug - 3. Travel adjusting screw - 4. Adjusting screw locknut - 6. Control valve actuating lever.

10. Maximum lift arm travel adjustment with lift installed on tractor.

Test conditions:

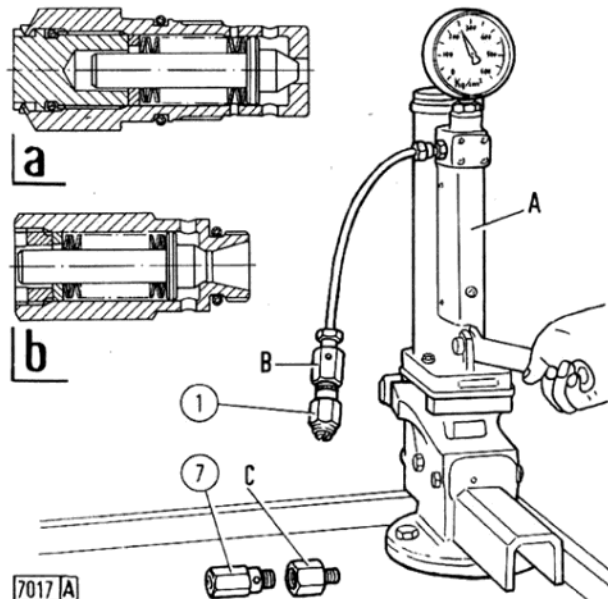
- Apply 50 kg (110 lb) to lower link swivel bushings.
- Bring oil temperature to 50-60°C (112 to 140°F).

Proceed as follows:

- Shut off engine, wait 5 minutes to allow oil in lift body to drain into transmission housing, remove plug (T) and insert wrench **293870** in plug hole;
- Start engine and run at 1200 to 1500 rpm.
- Move position control lever (P, page 15) fully back on quadrant.
- Using wrench **293870** slacken locknut (4) and back off limit travel adjusting screw (3) until relief valve cracks off.
- Apply two corresponding reference marks on lift body (S_1) and on one lift arm (S_2).
- Using wrench **293870**, tighten adjusting screw (3) until distance (d) between the two reference marks is 2 to 3 mm (0.08 to 0.12 in).
- Tighten locknut (4);
- Shut off engine, wait for approximately five minutes, remove wrench **293870** and reinstall plug (T).
- Operate lift through a few strokes to check that adjustment is correct.

VALVE CHECK

Relief and cylinder safety valve setting check.



Cylinder safety and relief valve test equipment.

a. Section through relief valve - b. Section through cylinder safety valve - A. Hand pump **290284** - B. Relief valve fitting **290824** - C. Cylinder safety valve fitting **290828** - 1. Relief valve - 7. Cylinder safety valve.

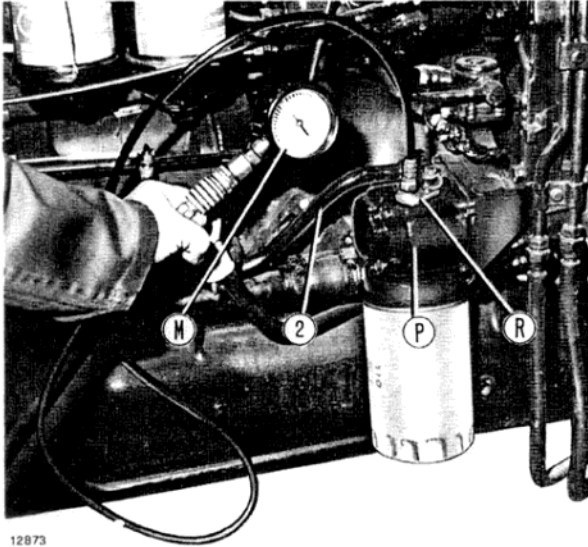
Relief valve (installed on right of lift body or incorporated in remote control valve, where fitted) may be checked either on bench or on tractor, while cylinder safety valve setting check may only be carried out on bench.

To bench test cylinder safety valve (15, page 5) and relief valve incorporated in lift body (17, page 4) on tractors not fitted with remote control valves, use hand pump **290284** (A) equipped with fittings **290828** (C) and **290824** (B).

Relief valve should crack off at 186 to 191 bar (190 to 195 kg/cm² or 2,702 to 2,775 psi), while safety valve crack-off pressure should be 210 to 215 bar (214 to 219 kg/cm² or 2,986 to 3,057 psi).

Note: At the factory, on-bench adjustment of relief valve (1) installed on R.H. side of lift body is carried out using oil under pressure; consequently, the adjustment procedure using pump **290284** is given for guidance only. Check relief valve setting with valve installed on tractor, as directed in para. a, page 18, for tractor without remote control valves.

HYDRAULIC LIFT UNIT: Lift



Checking lift relief valve setting (for tractor without remote control valves).

M. Pressure gauge with 0 to 250 kg/cm² scale (0 to 3,556 psi) of kit **293300** - P. Hydraulic pump - R. Fitting **291326** - 2. Oil delivery line.

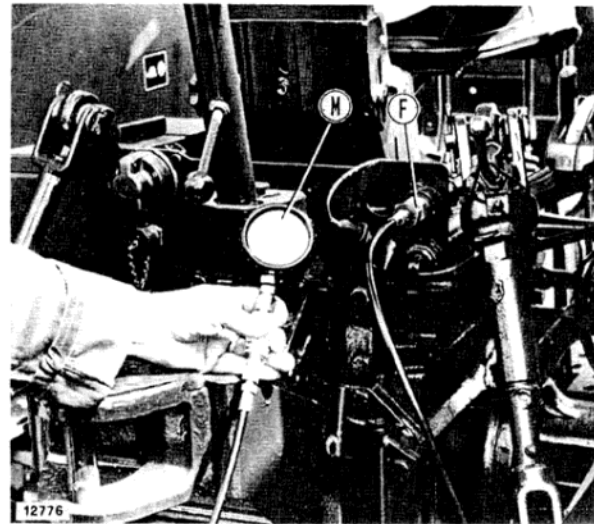
Note: If valve setting is not as specified, scrap and replace valves. If necessary, valves may be adjusted through threaded plugs after raising staked area, and using wrenches **291862** and **291863** for cylinder safety valve and relief valve respectively.

On-bench setting check of relief valve incorporated in remote control valves must be carried out as described on page 5, Section 54.

Check relief valve setting on tractor as follows:

a. Tractor without remote control valves:

- Run engine to bring hydraulic system oil temperature to $50 \pm 3^\circ\text{C}$.
- Shut off engine, wait for approximately five minutes to allow oil in lift body to drain to transmission housing, remove plug (T, page 17) and insert wrench **293870** in plug hole.
- Place fitting **291326** (R) between oil delivery pipe (2) to lift control valve and hydraulic pump (P), and connect to pressure gauge (M) with 0 to 250 kg/cm² (0 to 3,556 psi) scale of kit **293300**;



Checking lift relief valve setting (for tractor with remote control valves)..

F. Fitting **293449** - M. Pressure gauge with 0 to 250 kg/cm² scale (0 to 3,556 psi) of kit **293300**.

- Start engine.
- Move position control lever (P, page 15) fully back on quadrant.
- Using wrench **293870** slacken locknut (4, page 17) and back off limit travel adjusting screw (3) until relief valve cracks off.
- With engine running at 1500 to 1700 rpm, pressure gauge (M) should indicate 186 to 191 bar (190 to 195 kg/cm² or 2,702 to 2,775 psi). If necessary, replace valve or adjust through threaded plug using wrench **291863**.

b. Tractor equipped with remote control valves:

- Insert fitting **293449** (F) in a female half-coupling and connect to pressure gauge with 0 to 250 kg/cm² scale (0 to 3,556 psi) of kit **293300**.
- Run engine until oil temperature reaches $50 \pm 3^\circ\text{C}$.
- Move the appropriate remote control valve lever until the relief valve cracks off.
- With engine running at 1500 to 1700 rpm, pressure gauge (M) should indicate a 186 to 191 bar (190 to 195 kg/cm² or 2,702 to 2,775 psi). If necessary, replace valve or adjust setting through shims (27, page 4, section 54). Increase the number of shims if pressure is lower than specified, or decrease if pressure is higher.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift

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page 19

Position control

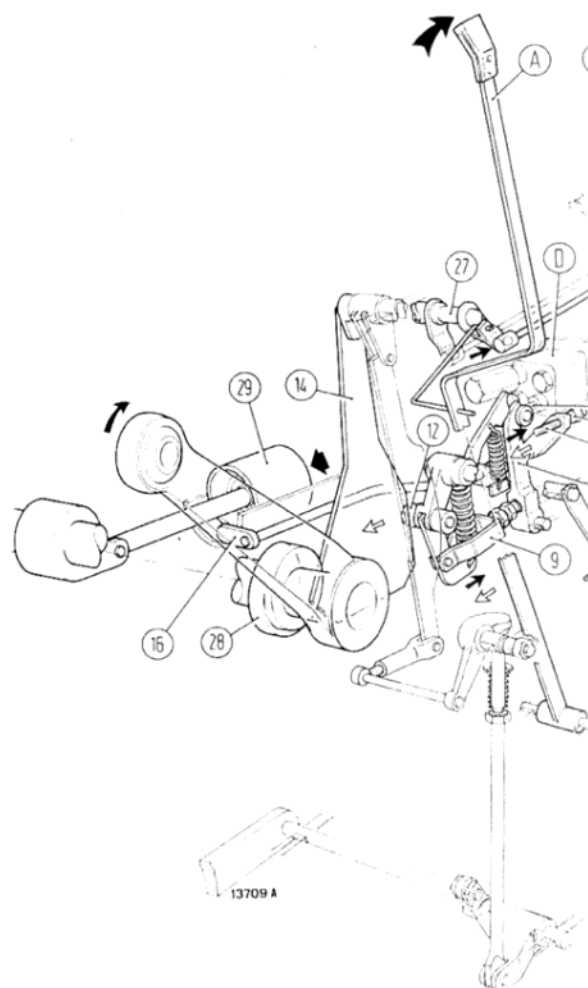
When lever (P) is moved back, cam on end of pin (27) moves lever (14) upwards. As the cam ring (28) on arm shaft is stationary at the beginning of operation, lever (14) reacts on it and thus pushes roller (12) forwards. This moves link (9) and lever (6) in the direction indicated by solid arrows to set control valve (D) in raise position (S, page 20).

Arms raise until cam ring (28) turns far enough to permit lever (6), link (9) and lever (14) to move under the action of spool return spring (4, page 20) in the direction indicated by the open arrows.

Control valve (D) thus returns to neutral and arms stop.

Maximum lift arm travel is controlled by rod (16). When rod (16) contacts piston (29) the control valve is returned to neutral through adjusting screw (3) before the piston reaches mechanical limit travel stop.

The same sequence in reverse applies when lever (P) is moved forward to lower implement.



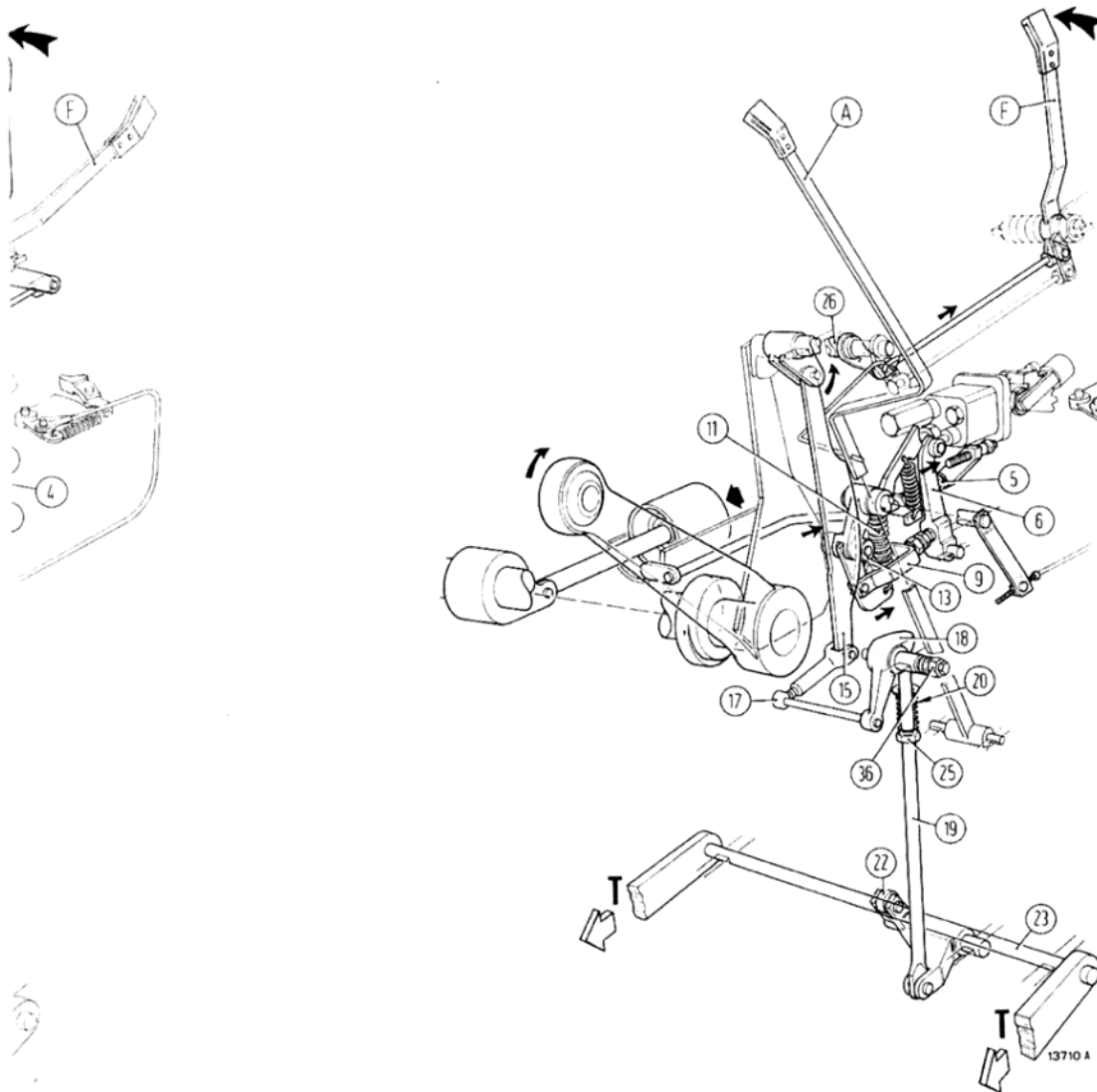
Float position

With position control lever (P) and draught control lever (F) fully forward, draught linkage is not activated. Lever (14), link (9) and lever (6) are moved in the direction opposite to that indicated by solid arrows, and control valve is held in lower position (A, page 20). Arms can thus swing freely and, as they cannot move through their full lowering stroke, the implement floats on the soil surface.

Implement raising in position control mode

(Move draught control lever (F) fully forward. Levers drawn in light are in draught control only).

a. Detail of rear-mounted control lever and draught control lever for all models 55-90, 60-90, 70-90 and 80-90. 1. Position control lever - 2. Draught control lever - 3. Adjusting screw - 4. Lock nut - 5. Spring - 6. Control valve - 10. Link lever - 11. Spring - 12. Position control lever



Implement raising in draught control mode.

not operate and con-

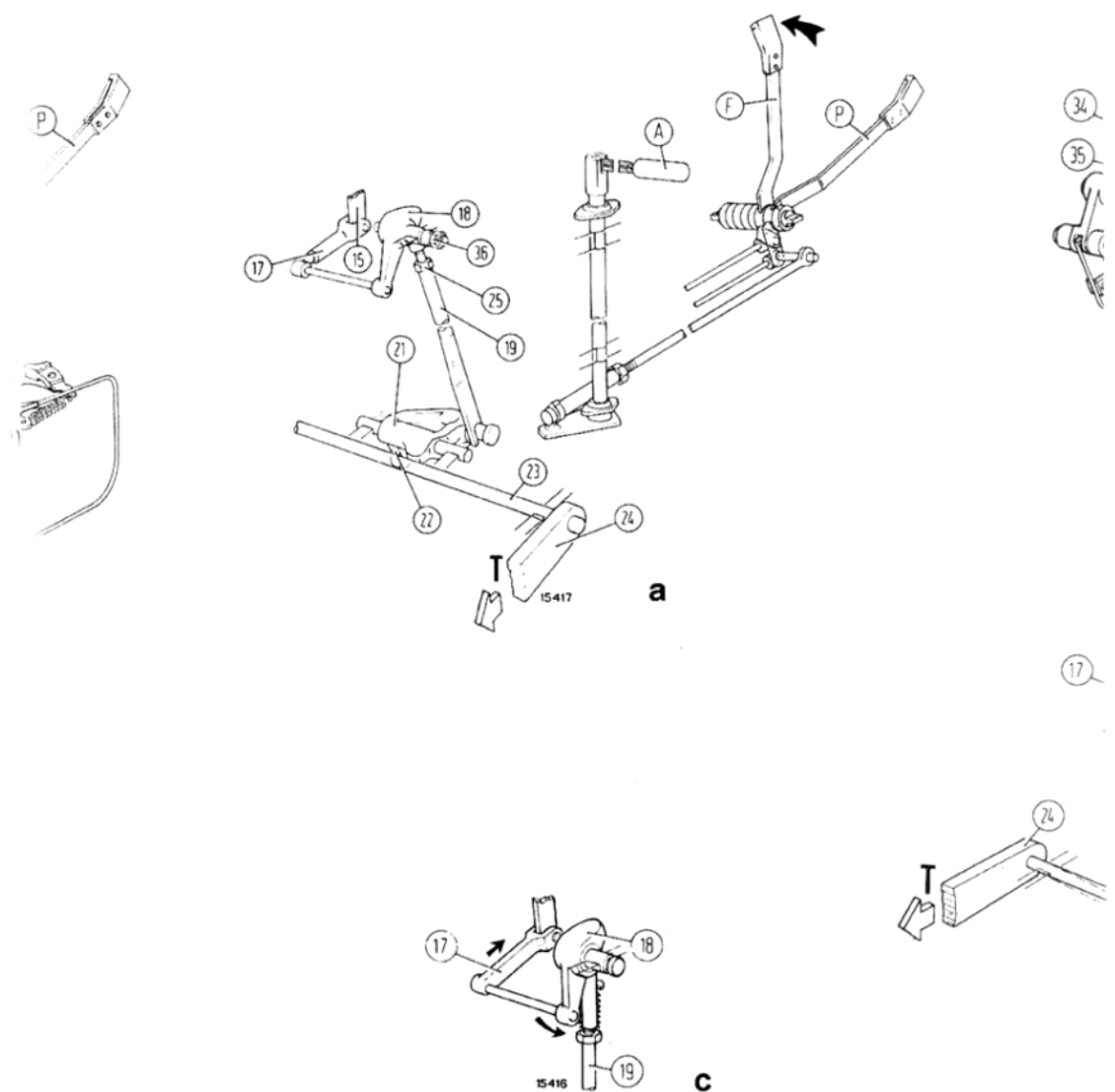
(Move position control lever (P) fully forward - Levers drawn in light do not concern position control only).

CONTROL VALVE LINKAGE OPERATION DIAGRAM

Note: Arrows indicate linkage movements in arm raising phase. During arm lowering link

draught sensing unit, 90-90 and 100-90 - b. Lift-O-Matic operation - c. Detail of rear-mounted control lever - D. Lift control valve - F. Draught control lever - P. Position control lever - 1. Lift-O-Matic cable - 2. Spool - 3. Limit travel adjusting actuating lever - 7. Actuating lever link pin - 8. Locknut - 9. Actuating lever link pin - 11. Position control inner lever - 13. Draught control lever roller - 14. Position control inner lever -

15. Draught control lever roller - 16. Draught control lever roller - 17. Draught control lever roller - 18. Draught control lever roller - 19. Draught control lever roller - 20. Draught control lever roller - 21. Draught control lever roller - 22. Draught control lever roller - 23. Draught control lever roller - 24. Draught control lever roller - 25. Draught control lever roller - 26. Draught control lever roller - 27. Position control lever - 28. Position control lever - 29. Position control lever - 30. Position control lever - 31. Position control lever - 32. Position control lever - 33. Lift-O-Matic cable - 34. Lift-O-Matic cable - 35. Lift-O-Matic cable - 36. Lift-O-Matic cable

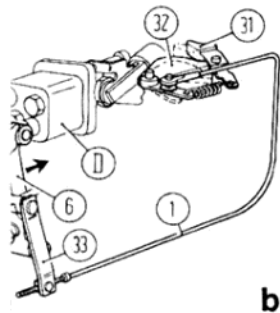


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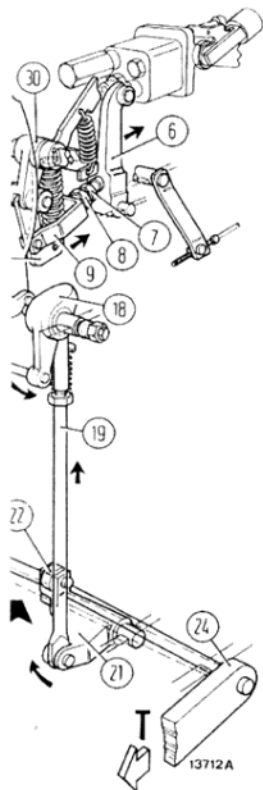
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a

age moves in the opposite direction.

ner lever - 16. Limit travel control rod - 17. Draught control link - 18. Lever - 19. Draught control rod - 20. control relay lever - 22. Relay lever roller - 23. Sensing bar - 24. Lower links - 25. Lock nut - 26. Hollow control lever pin - 28. Cam ring - 29. Piston - 30. Control valve link lever - 31 and 32. Lift-O-Matic pushbut-
tic outer control lever - 34. Lift-O-Matic inner control lever - 35. Return spring - 36. Draught control cam.



b



13712A

draught.

When obstacle has been passed, sensing bar (23) springs back and lever (21) turns back, allowing lever (6) to be pulled back by spool spring (4).

Draught control

When the implement is sunk to the desired working depth through lever (F), the implement draught (T) on lower links will tend to increase if the implement

hits a patch of harder or more compact soil. This increase in draught will cause sensing bar (23) to flex against roller (22). The roller turns lever (21), which pushes lever (18), link (9) and lever (6) in the direction indicated by solid arrows to set control valve in raise position (S, page 20).

Arms raise until reduced draught (T) reduces sensing bar deflection, causing lever (21) to turn back allowing lever (6) to be pulled back by spool spring (4, page 20).

Control valve returns to neutral and arms stop.

Once the hard patch has been passed, the sensing bar springs fully back to its original position, and lever (6) moves further back.

Control valve is thus placed in exhaust (A, page 20) and the arms lower the implement to its original working depth.

If control lever (F) is moved further back on quadrant to reduce draught, hollow shaft (26) pushes lever (15), roller (13), link (9) and lever (6) against spool to place control valve in delivery position.

Operation is the same, with levers moving in the opposite direction, when control lever (F) is shifted forwards to increase draught.

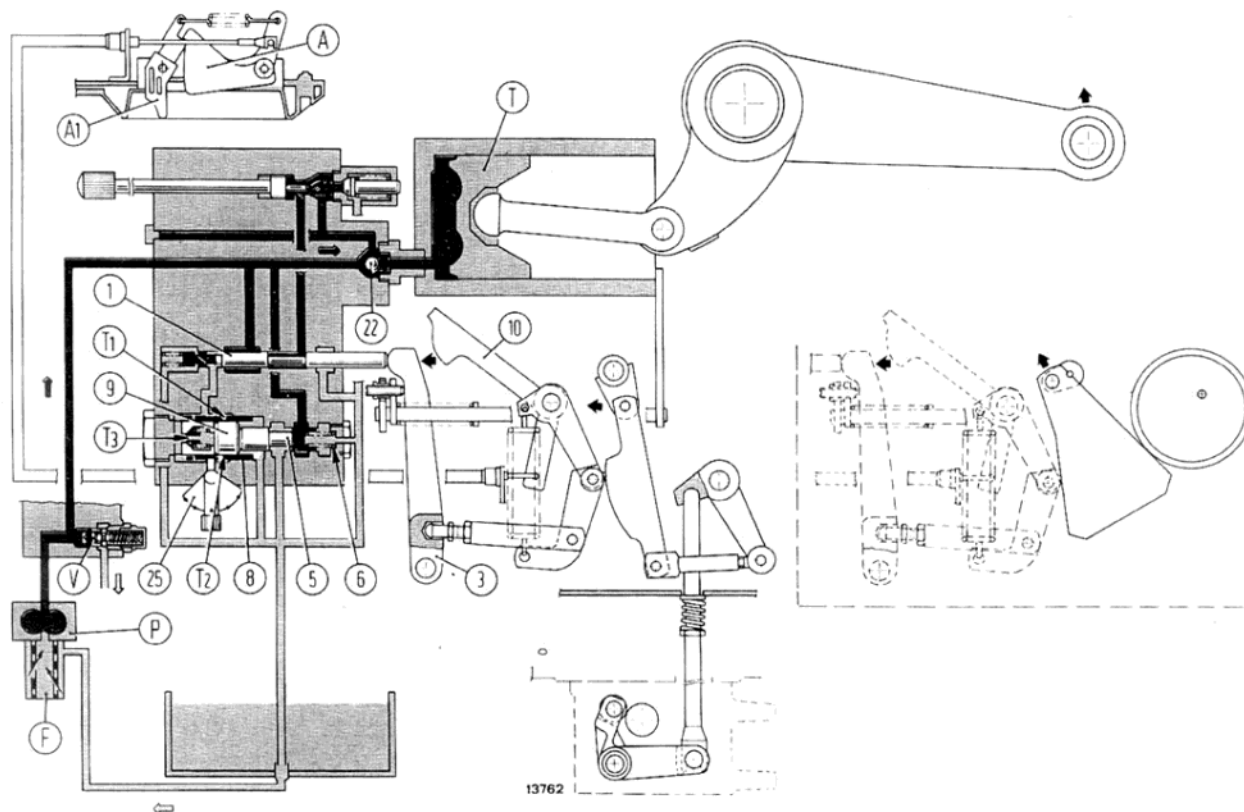
Combined draught and position control

When draught control lever (F) is moved forward from rearmost position on quadrant, and position control lever (P) is fully forward, working depth is established as indicated above. When lever (P) is then shifted backwards, lever (14), link (9) and lever (6) move in the direction indicated by solid arrows on the position control operation diagram, thus placing control valve in delivery and causing a slight upward movement of lift arms.

This condition permits lift to operate in draught control mode when patches of hard or compact soil are encountered.

Combined draught and position control operation thus limits the changes in working depth which occur when draught control mode is used alone.

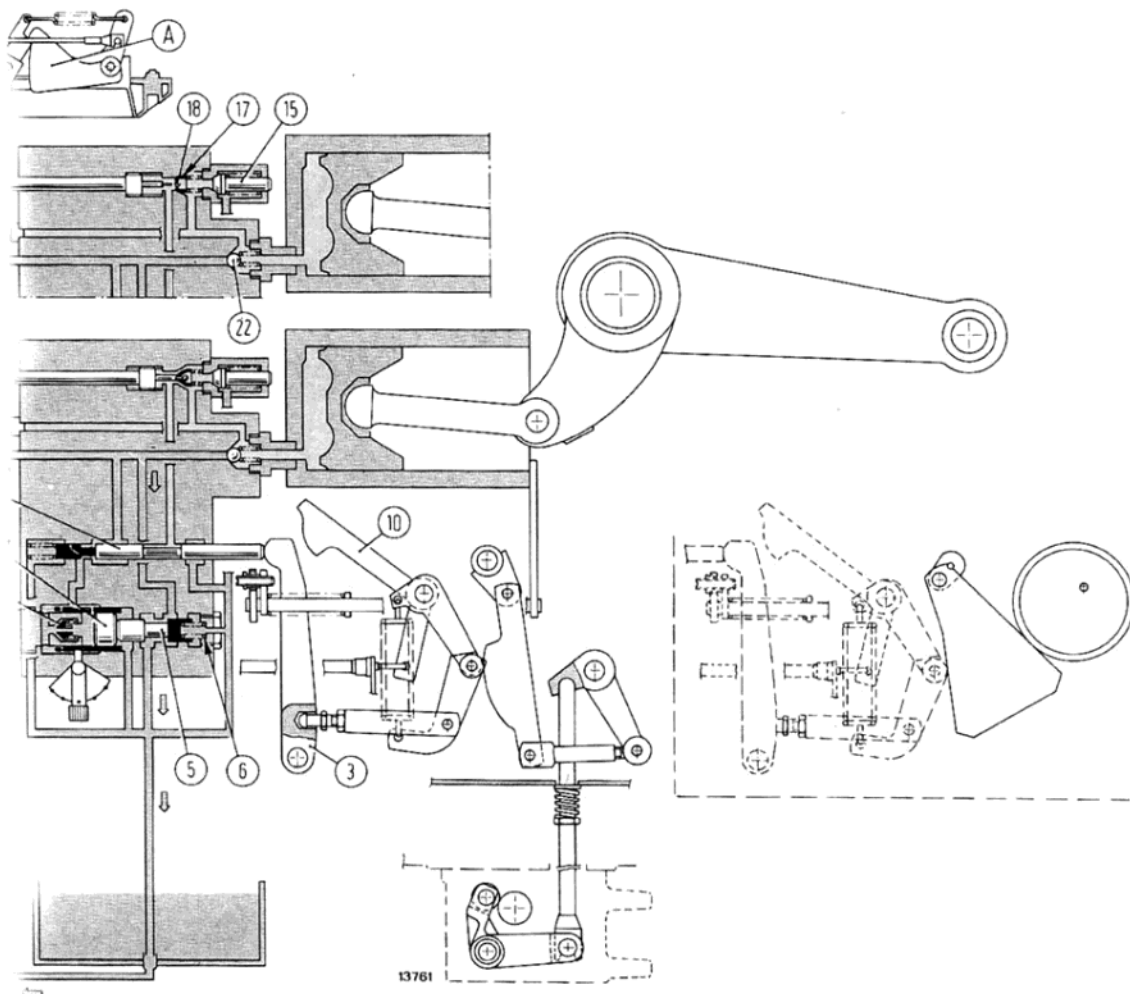
HYDRAULIC LIFT UNIT: Lift



S. Arm raising phase

When valve spool (1) moves, oil flow to piston (9) is cut off and plunger (5) is forced to the left by spring (6), thus closing exhaust port. Pressure oil opens check valve (22) and operates piston (T) to raise arms.

Note: Draught sensitivity may be adjusted through lever (25), which controls position of valve seat (8). When seat (8) is moved to the right, piston (9) covers ports (T₁ and T₂) and oil in valve may be exhausted through port (T₃). Since exhaust thus takes longer, lift reaction time increases, with a consequent decrease in sensitivity. When seat (8) is moved to the left, ports (T₁ and T₂) are free and oil may be quickly exhausted through all three ports (T₁, T₂ and T₃), with consequent short reaction time resulting in increased sensitivity.



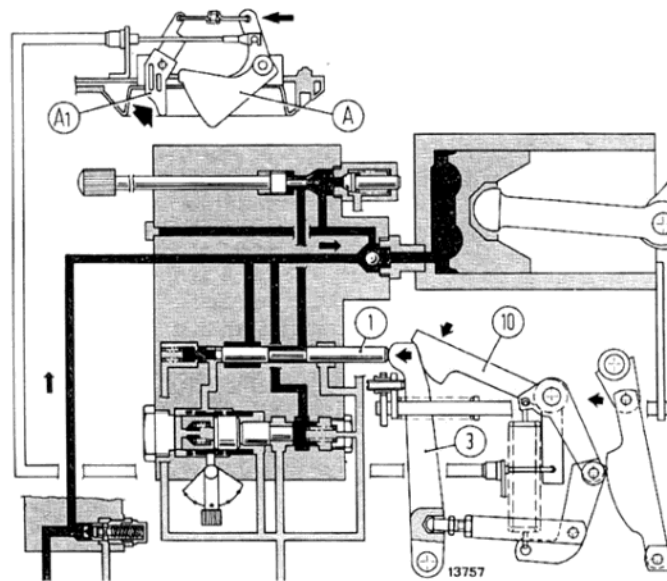
N. Neutral phase.

In neutral position, oil is delivered through sensitivity adjusting valve (12) to piston (9), which overcomes spring and moves plunger (5) to the right, thus opening exhaust port and conveying oil flow to tank in rear transmission housing rather than to the cylinder.

On-road transfer with mounted implements, lock lift arms in the desired position by fully slackening knob (29); oil cylinder remains trapped by check valve (22) and response control valve (17). Thus, arms will remain locked in position even if operator accidentally moves lift control levers. Cylinder safety valve (15) protects lift cylinder pressure circuit, while relief valve (V) protects pump circuit.

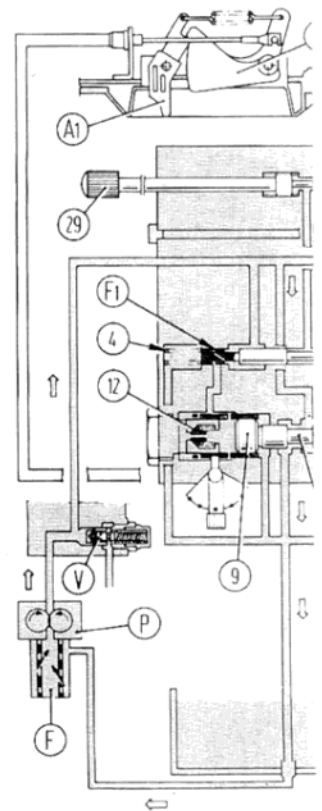
HYDRAULIC LIFT CONTROL VALVE OPERATION

-O-Matic pushbuttons - F. Filter - F1. Spool port - P. Hydraulic pump - T. Lift arm piston - T1 and T2. Piston seat caught sensitivity valve port - V. Relief valve (installed on lift body or on remote control valves, if fitted) - 1. Valve control valve actuating lever - 4. Spool return spring - 5. Plunger - 6. Plunger spring - 8. Piston seat - 9. Piston - 10. Inner lever - 12. Draught sensitivity valve - 15. Cylinder safety valve - 17. Response control valve - 18. Ball - 22. Check valve - 25. Adjusting pin lever - 29. Response control knob.



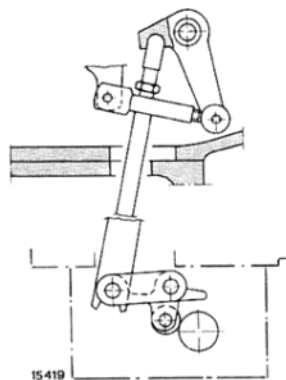
Lift-O-Matic operation.

Depressing pushbutton (A1) releases pushbutton (A) which is pulled to end of stroke by the associated spring, thus freeing cable. Cable releases inner lever (10), which is pulled back by spring to carry valve spool (1) to maximum arm raising position.

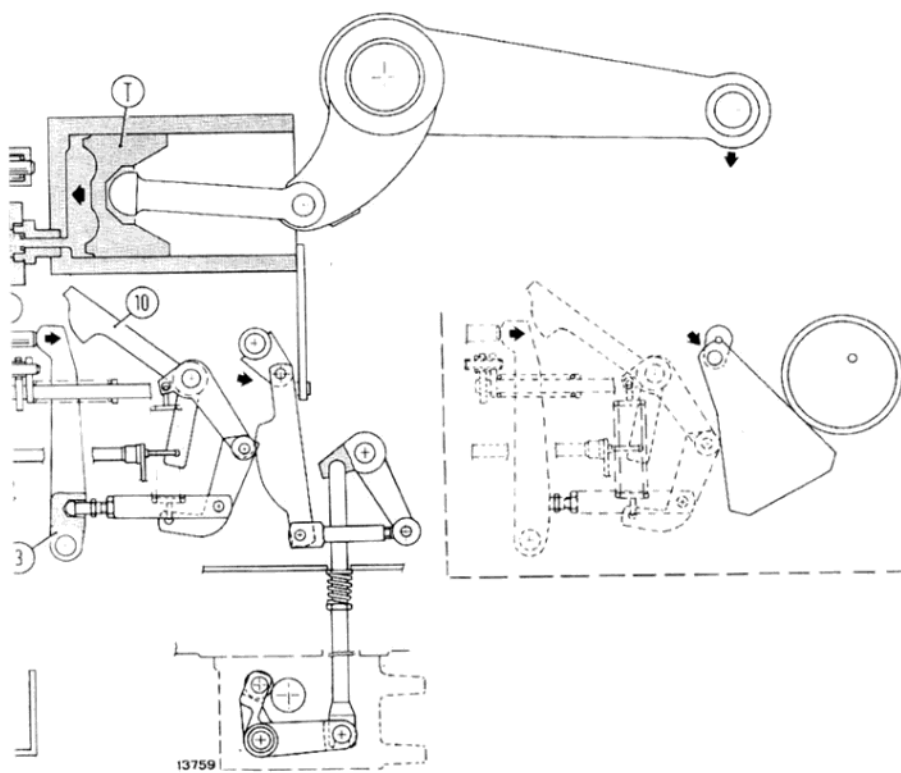


When return spring (4) pulls control knob (17) and the port (9), which holds plunger

Note: Arm lowering speed is between valve (17) and control knob (29) increase ef



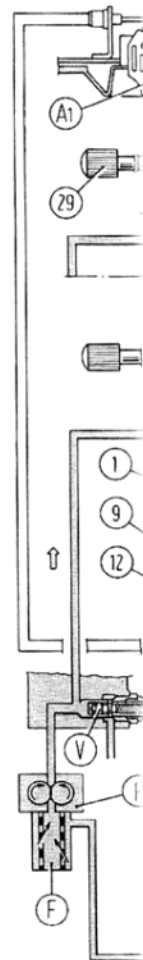
Detail of draught sensing unit, 90-90 and 100-90.



A. Arm lowering phase.

1) to the right, cylinder oil is exhausted under piston pressure (T) through response controlled by spool. Through spool port (F₁) and draught sensitivity valve (12) oil flows to piston (5) the position shown, thus allowing pump delivery to be exhausted past plunger (5).

...determined by position of knob (29). Slackening knob (29) restricts the exhaust passage between the cylinder and the pump, thus increasing the time taken to lower the implement (low response). Tightening knob (29) increases the area of exhaust port, and the implement lowers more quickly (high response).



With spool (1) to the right, reaction (6) is exhausted.

Note: During the lowering phase, the oil contained in the cylinder is transferred to the pump.

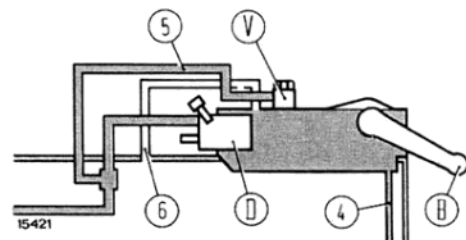
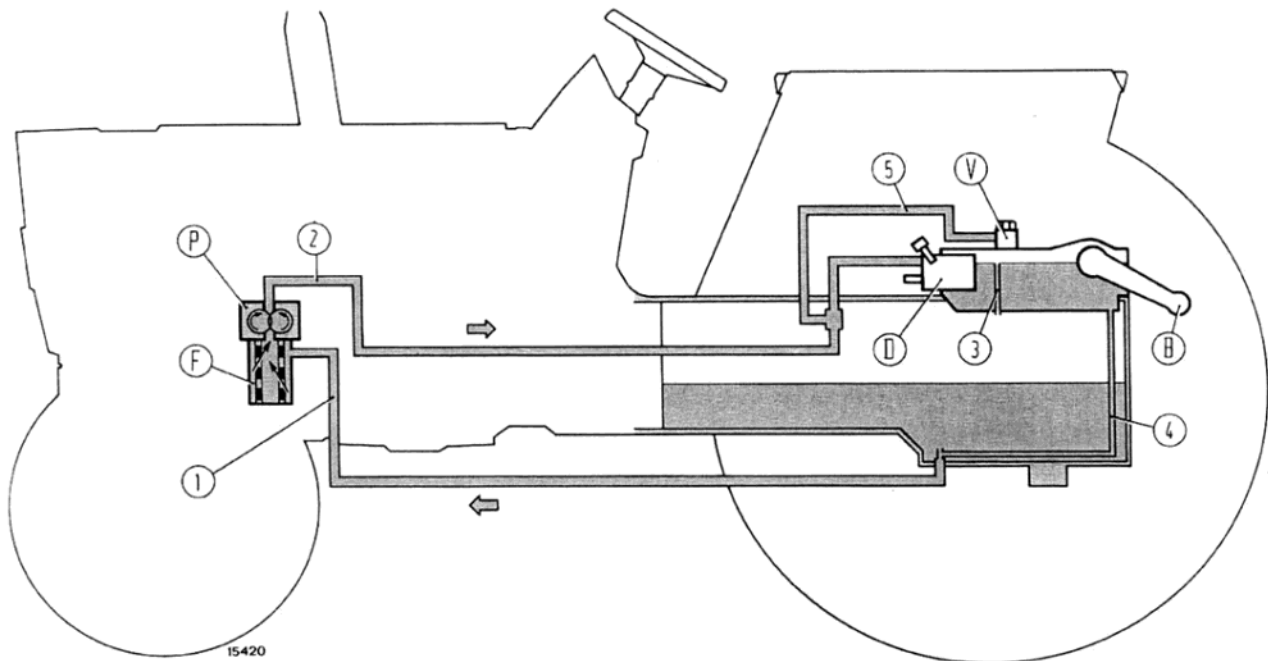
A and A₁. Lift-O-Matic ports - T₃. Draught spool - 3. Control Lift-O-Matic

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift

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page 21



a

Lift hydraulic system schematics

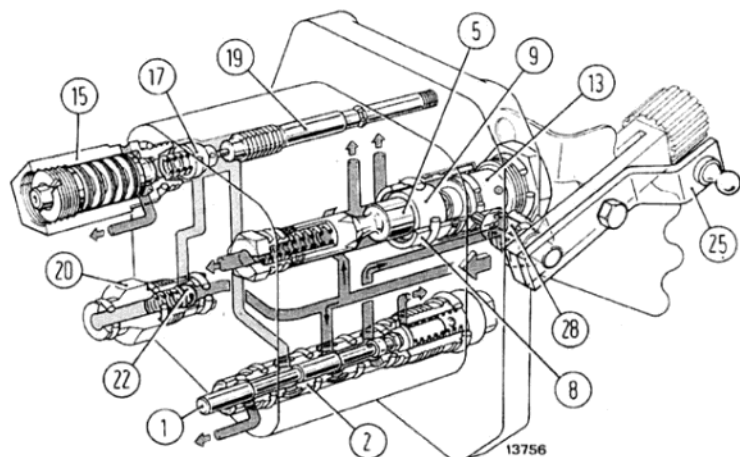
a. Detail of 90-90 and 100-90 - B. Lift arm - D. Control valve - F. Paper cartridge oil filter - P. Engine valve gear driven hydraulic pump - V. Lift body mounted relief valve - 1. Suction line drawing from transmission housing - 2. Delivery line to control valve - 3. Oil level pipe in lift body (55-90, 60-90, 70-90 and 80-90) - 4. Oil drain pipe - 5. To relief valve - 6. Vent (90-90 and 100-90)

■ Pressure oil
▨ Inlet, delivery or exhaust oil
□ Trapped oil

Hydraulic control valve schematics

Note: Oil flow refers to neutral phase.

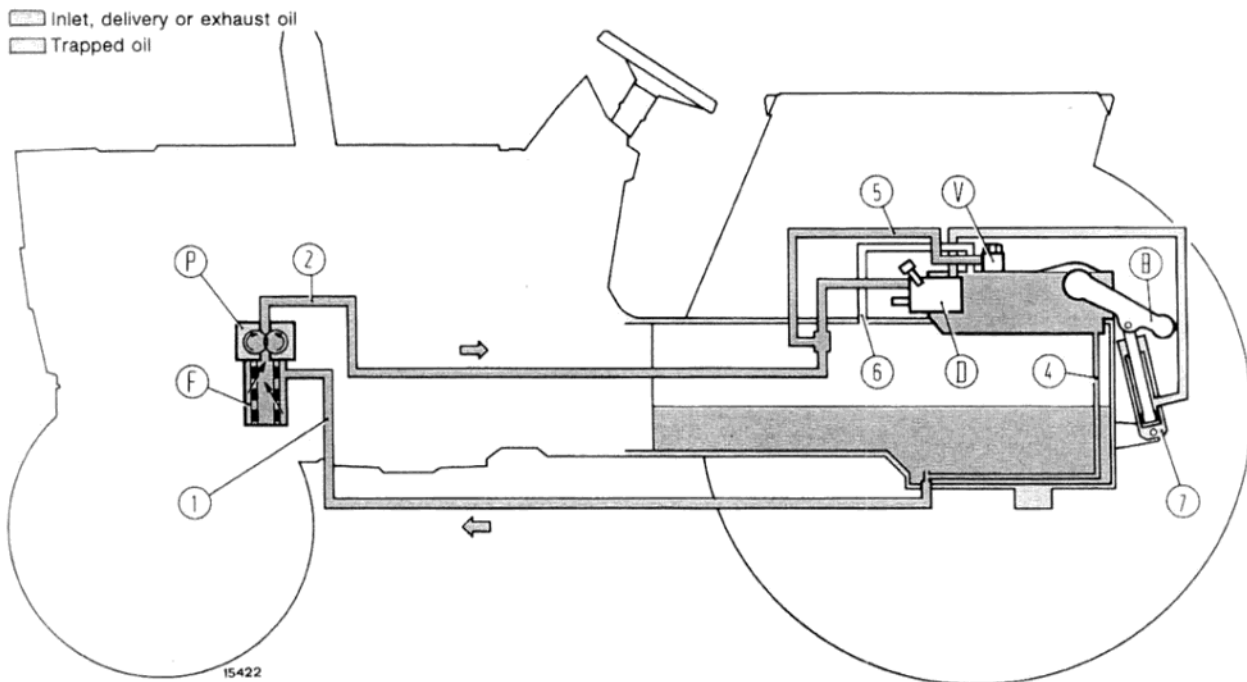
1. Spool - 2. Spool seat - 5. Plunger - 8. Piston seat - 9. Piston - 13. Plug - 15. Cylinder safety valve - 17. Response control valve - 19. Response control valve adjusting pin - 20. Oil delivery fitting to lift cylinder - 22. Check valve - 25. Sensitivity pin lever - 28. Draught sensitivity pin.



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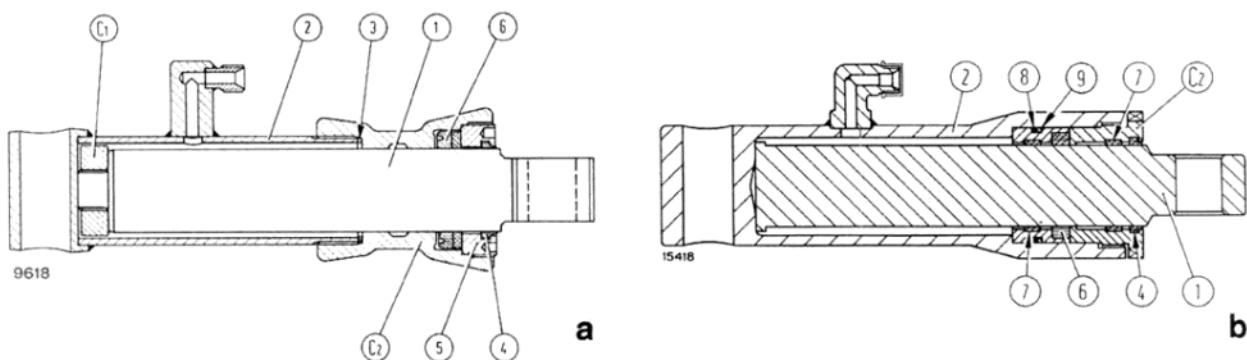
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HYDRAULIC LIFT UNIT: Lift



Lift hydraulic system schematics with auxiliary cylinder (90-90 and 100-90)

B. Lift arm - D. Control valve - F. Paper cartridge oil filter - P. Engine valve gear driven hydraulic pump - V. Lift body mounted relief valve - 1. Suction line drawing from transmission housing - 2. Delivery line to control valve - 4. Oil drain pipe - 5. To relief valve - 6. Vent - 7. Auxiliary cylinder (standard for 100-90 and optional for 90-90).



Sections through auxiliary cylinder

a. WEBER cylinder - b. ERBER cylinder - C₁. Lock ring - C₂. End plate - 1. Piston - 2. Cylinder - 3. Copper washer - 4. Dust excluder - 5. Excluder lock ring - 6. Piston seal - 7. Guide rings - 8. Seal - 9. Anti-extrusion rings.

TORQUE DATA

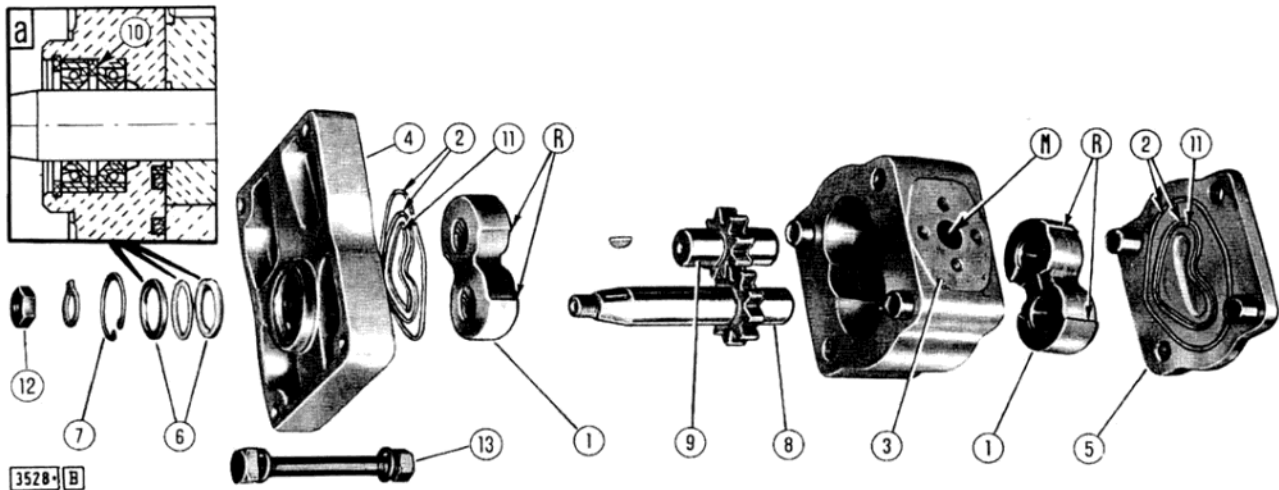
DESCRIPTION	Thread	Torque		
		Nm	Kgm	ft.lb
Lock ring, piston (C ₁) - WEBER unit	M24x1.5	220	22.5	163
End plate (C ₂): { ERBER WEBER	— M64x1.5	245	25	180
		520	53	383

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Lift Pump

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page 1



Lift pump components.

a. Seal assembly detail - M. Pump delivery port - R. Gear bearing fillets (delivery side) - 1. Gear bearings - 2. Cover seals - 3. Pump body - 4. Rear cover - 5. Front cover - 6. Drive shaft seals - 7. Seal retaining ring - 8. Drive gear shaft - 9. Driven gear shaft - 10. Spacer - 11. Anti-extrusion ring - 12. Nut securing sleeve to pump drive shaft and associated lockwasher - 13. Cover nuts.

HYDRAULIC PUMP

Pump is valve gear driven through a dog clutch.

To gain access to drive gear, remove valve gear cover.

Oil circulating in pump automatically lubricates and restores gear end float.

Liberal lubricate all pump parts using the same grade of hydraulic lift oil, then assemble noting the following points:

- Ensure that reference marks applied on disassembly are in register.
- Position plastic anti-extrusion ring (11) inside center O-ring (2).
- The bearings, which should slide into position by hand, must be introduced so that fillets (R) face toward outlet port (M) and with slotted frontal surfaces abutting the gears.

Overhaul

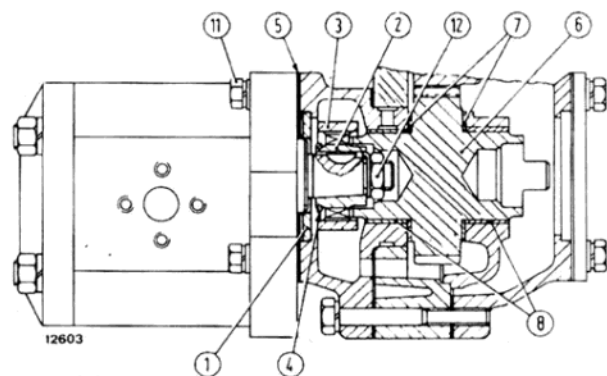
Refer to figure above when disassembling pump.

Mark the position of internal parts in order to restore them to their original position on assembly.

Check gear shaft and bearings for wear, comparing the readings to the data given in the table on page 3, Section 50.

Check gear side face flatness and squareness relative to bearings, smearing the surfaces in question with carbon black.

Check gear end clearance in the pump body with bearings in position. The correct end float is 0.100 to 0.180 mm (0.003 to 0.007 in). Any pump body face dressing, with a view to restoring the specified end clearance, should be carried out using wet zero grade emery cloth, removing as little material as possible.



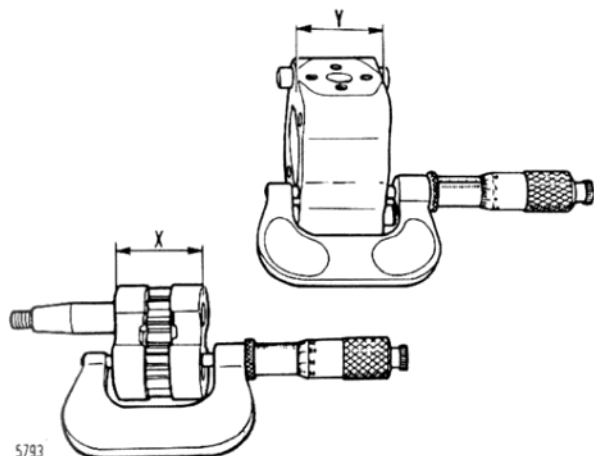
Section through pump drive

1. Centralizer - 2. Pump drive sleeve - 3. Sleeve drive ring - 4. Retaining ring - 5. Seal - 6. Driven gear - 7. Thrust rings - 8. Gear bushings - 11. Pump capscrews - 12. Sleeve nut.

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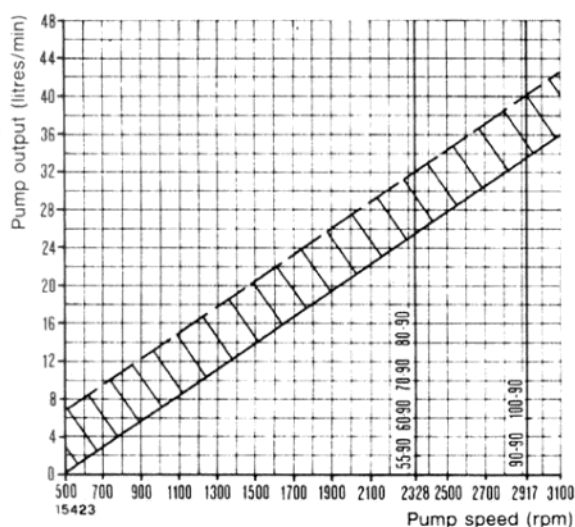
HYDRAULIC LIFT UNIT: Lift Pump



Checking gear end clearance in pump body.

Note: Dimension X to be smaller than dimension Y by 0.100 to 0.180 mm (0.0003 to 0.007 in).

- Fit rotary shaft seals (6, page 1) to rear cover (4) with attached spacer (10) as shown in detail (a) and pack the lip cavity with **grassofiat TUTELA G9** or other approved grease.
- Progressively tighten the cover nuts and bolts to the pump body adopting the specified tightening torques.



Speed-output chart of lift pump

Test pressure 166 bar or 170 kg/cm² or 2418 psi - Oil temperature 55° to 65° C - Pump drive ratio 0.931 to 1 (55-90, 60-90, 70-90 and 80-90) or 1.166 to 1 (90-90 and 100-90).

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When installing pump to tractor, fill both suction pipe and the pump body with **oliofiat TUTELA MULTI F** or other approved oil to facilitate priming and prevent seizure during initial service.

Output test

Couple the pump to the drive motor and connect to output test machine using the equipment shown in figure.

Use **oliofiat IDRAULICAR AP 51** (SAE 20) oil supplied with the test machine and carry out the output test at the specified temperature and pressure settings.

Compare the output figures obtained with the values of the chart, noting the following:

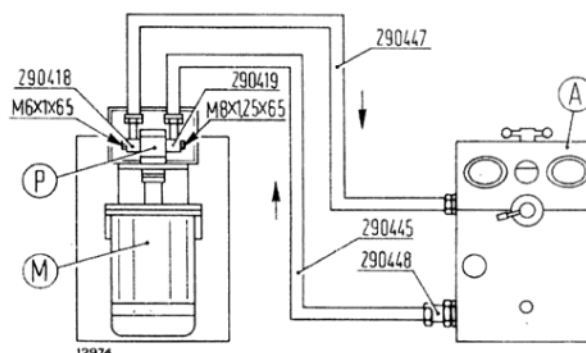
- Output ratings of new or reconditioned pumps should be fairly close to the dotted line;
- Output ratings of used pumps are acceptable if included in the shaded area of the chart.

If the output is very near to, or lower than, the continuous line, the pump in question should be overhauled or replaced.

OIL FILTER

The lift oil filter is located on the pump suction line.

The filtering element consists of a paper cartridge which should be changed every 400 hours.



Lift pump output test machine.

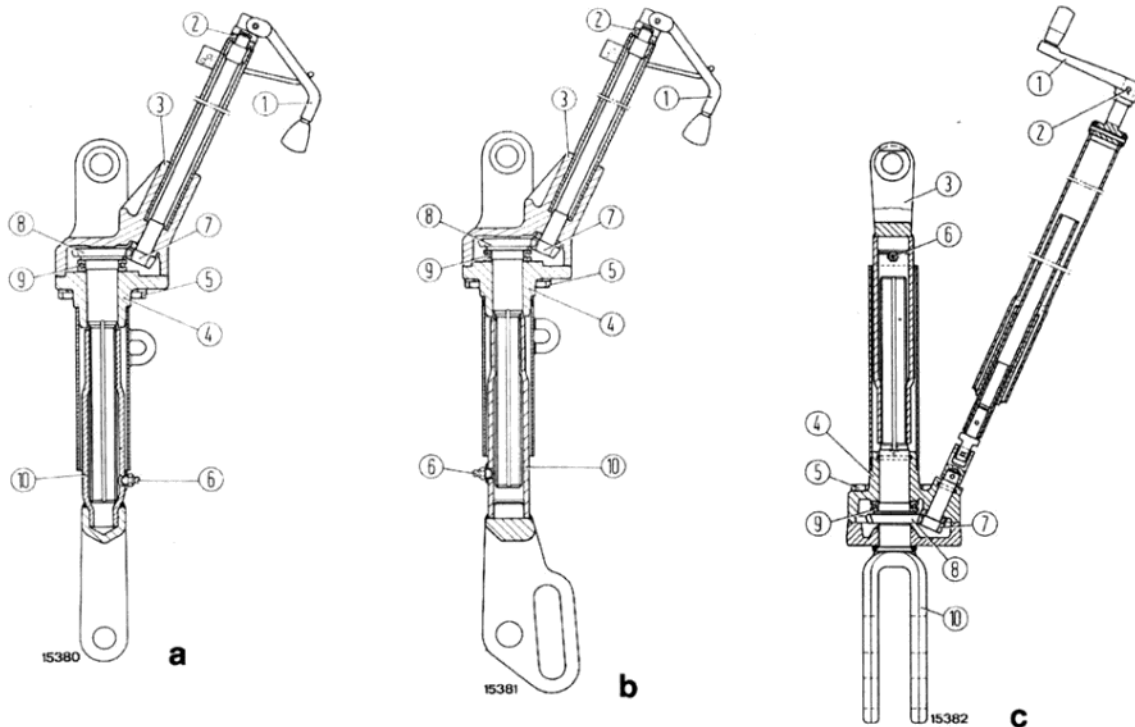
A. Output tester **291231** - M. Motor **291235** - P. Pump under test (A31).

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Implement Attachment

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page 1



Section through R.H. lifting rod.

a. Models 55-90 and 60-90 - b. Models 70-90 and 80-90 - c. Models 90-90 and 100-90 - 1. Levelling box handle - 2. Roll pin - 3. Upper housing - 4. Cover - 5. Cover capscrews - 6. Lubricator - 7. Drive pinion - 8. Driven gear - 9. Thrust bearing - 10. Lower housing.

THREE POINT LINKAGE

The implement attachment is a three-point linkage with adjustable lifting rods and top link. Implement attachment features lower link side sway check chains (55-90 and 60-90) or check links (standard on 70-90, 80-90, 90-90 and 100-90 and optional on 55-90 and 60-90); check blocks are optional on 70-90, 80-90, 90-90 and 100-90.

The telescoping lower links, pivoted to the sensing bar, are equipped with spacers to change pivot position and allow variations in draught sensitivity (see note on page 4).

Right-hand lifting rod

To remove the right-hand lifting rod on 55-90, 60-90, 70-90 and 80-90 proceed as follows:

- Remove capscrews (5) and take off cover (4) together with driven gear (8);

- Back off lower housing (10) and remove driven gear and thrust bearing (9).
- Take off roll pin (2) and remove handle (1) and drive pinion.

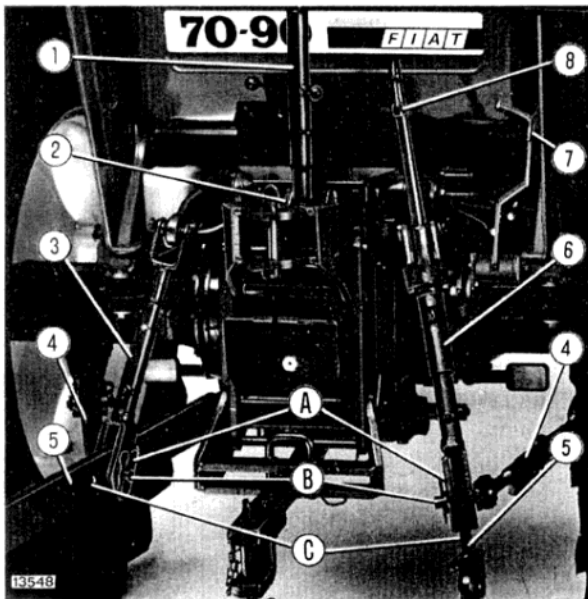
On assembly, pack the top and bottom recesses with **grasso fiat TUTELA G9** or other approved grease.

To remove the right hand lifting rod on 90-90 and 100-90, proceed as follows:

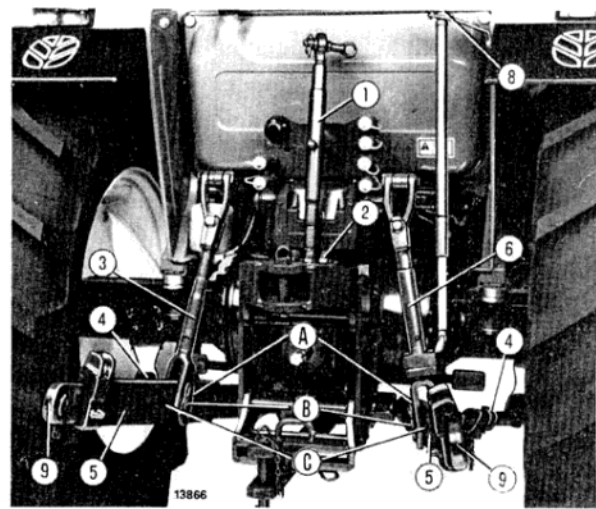
- Remove capscrews (5) and separate cover (4) together with drive pinion (7) and driven gear (8) from lower housing (10).
- Back off upper housing (3) and remove drive gear (8) and thrust bearing (9).
- Take off roll pin adjacent to cover (4) and remove drive pinion (7).

On assembly, pack the top and bottom recesses with **grasso fiat TUTELA G9** or other approved grease.

HYDRAULIC LIFT UNIT: Implement Attachment



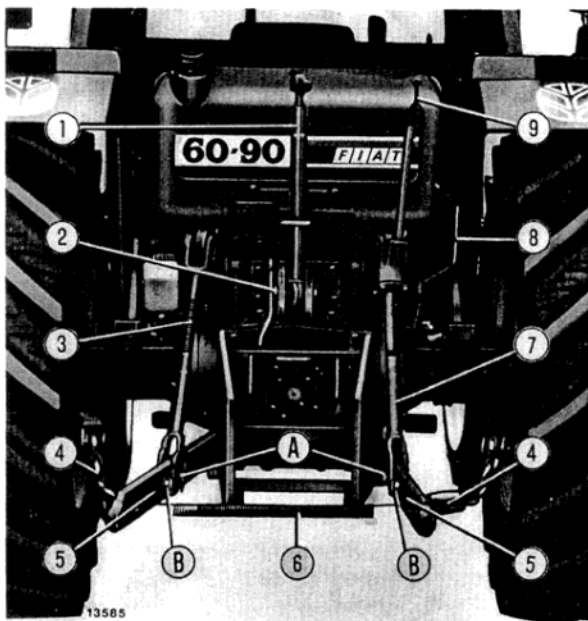
a



b

Lift and implement attachment.

a. 70-90 and 80-90 - b. 90-90 and 100-90 - A. Lift rod slots - B. Front lift rod mounting holes - C. Rear lift rod mounting holes - 1. Adjustable top link - 2. Top link support - 3. R.H. lifting rod - 4. Check link - 5. Lower links - 6. R.H. lifting rod - 7. Rear-mounted lift control lever - 8. Levelling box handle - 9. Telescoping lower links.



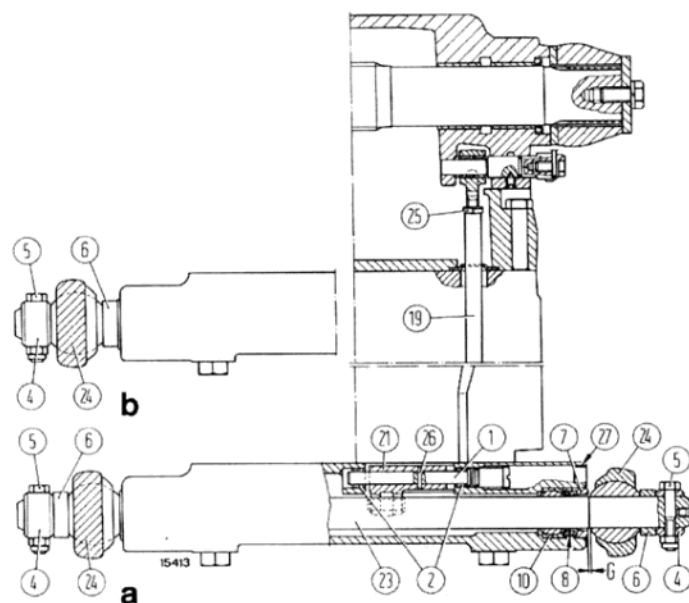
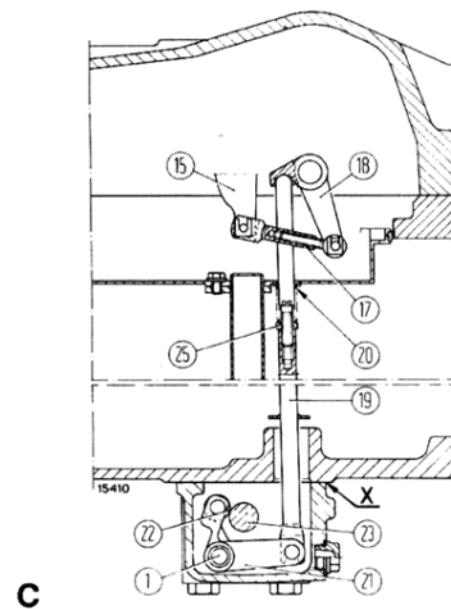
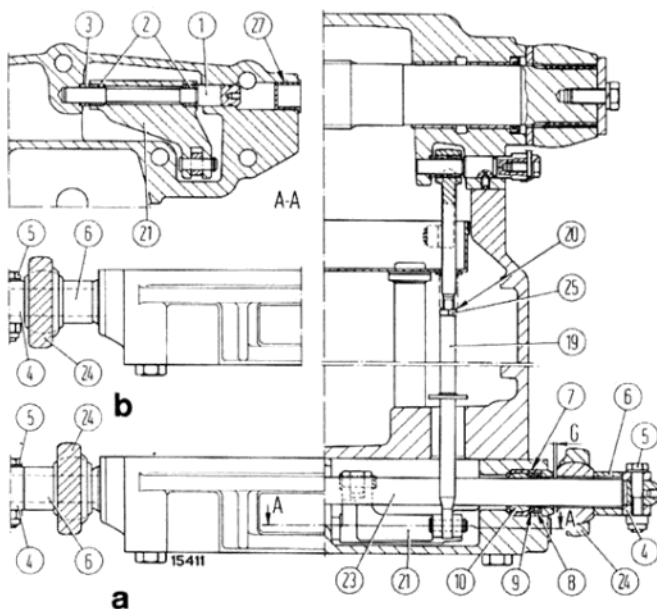
Lift and implement attachment (55-90 and 60-90).

A. Front lift rod mounting holes - B. Rear lift rod mounting holes - 1. Adjustable top link - 2. Pivot - 3. L.H. lifting rod - 4. Check chains - 5. Lower links - 6. Check spring - 7. R.H. lifting rod - 8. Rear-mounted lift control lever - 9. Levelling box handle.

DRAUGHT CONTROL DEVICE

To remove the draught sensing bar, which constitutes the means for monitoring and controlling draught on three-point links, proceed as follows:

- Drain transmission oil.
- Remove lifting rods and lower links.
- Remove capscrews and sensing bar support assembly, retrieving relay rod (19, page 3).
- On the bench, remove plug (27, page 3), and roll pin (26, 90-90 and 100-90 only). Remove pin (1) using a suitable forcing screw and retrieve relay lever (21).
- Take off sensing bar (23, page 3) and, using a slide hammer puller, remove bushings (10), seals (8) and spacer (7).
- Retrieve needle roller bearings (2, page 3) from lever (21) for 55-90, 60-90, 70-90 and 80-90 or from sensing bar housing for 90-90 and 100-90.

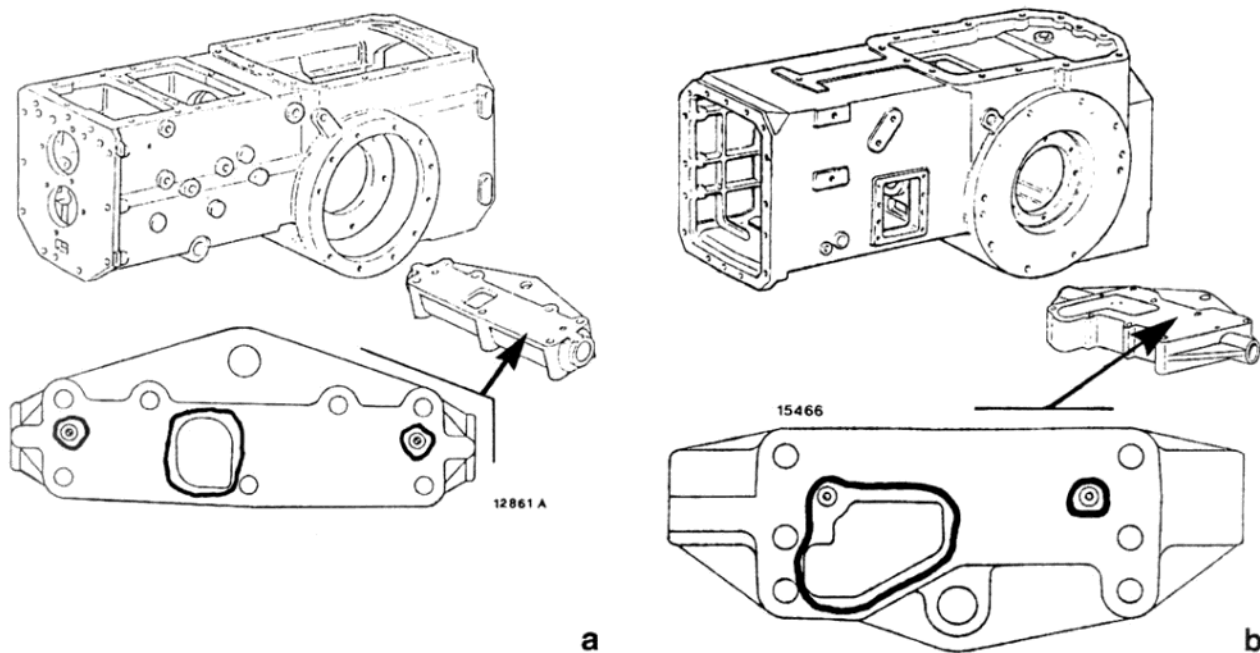


Section through draught control device

a. Spacer (6) location for standard and heavy-duty applications - b. Spacer (6) location for light applications - 55-90, 60-90, 70-90 and 80-90 - D. 90-90 and 100-90 - G = 1.2 to 4.1 mm (0.05 to 0.16 in) for 55-90, 60-90, 70-90 and 80-90 or = 1.4 to 5 mm (.055 to .19 in) for 90-90 and 100-90. Sensing bar end play - 1. Draught control relay lever pin - 2. Needle roller bearings - 3. Draught control relay lever spacer - 4. Thrust bushing - 5. Link capscrew - 6. Outer spacer - 7. Inner spacer - 8. Seal - 9. Thrust ring - 10. Sensing bar support bushing - 15. Draught control inner lever - 17. Draught control link - 18. Lever - 19. Draught control rod - 20. Spring - 21. Draught control relay lever - 22. Relay lever roller - 23. Sensing bar - 24. Lower links - 25. Locknut - 26. Roll pin - 27. Plug.

Note: Clean and thoroughly degrease mating surfaces X on assembly and apply one of the jointing compounds listed on page 6, section A, noting assembly procedures indicated in text.

HYDRAULIC LIFT UNIT: Implement Attachment



Applying jointing compound to sensing bar support

a. 55-90, 60-90, 70-90 and 80-90 - b. 90-90 and 100-90.

On assembly, install needle roller bearings (2, page 3) using driver **293838** (55-90, 60-90, 70-90 and 80-90) or **292247** (90-90 and 100-90) and apply a 2 mm (0.08 in) dia. bead of jointing compound as shown in figure to sensing bar support after thoroughly cleaning and degreasing mating surfaces. Jointing compound types are indicated on page 6, section A. Check that sensing bar end float (G, page 2) is 1.2 to 4.1 mm (0.05 to 0.16 in) for 55-90, 60-90, 70-90 and 80-90, or 1.4 to 5 mm (.055 to .19 in) for 90-90 and 100-90.

Note: To increase lift sensitivity when working with light implements in draught or combined draught and position control, assemble lower links (24, page 3) with spacers (6) on inboard side of links. For normal or heavy duty applications, install spacers (6) on outboard side of links. This position reduces draught sensitivity, thus enabling the operator to make more use of tractor power.

DESCRIPTION AND OPERATION

The spool-type remote control valves are suitable for single and double-acting cylinder applications. The tractor performs float function and an optional hydraulic trailer brake remote control valve is also available (see page 8, 9 and 10).

For single-acting cylinder operation, screw (1) should be fully backed off, while for double-acting cylinder operation, screw should be fully in.

Remote control valves may be installed in banks of up to 3 valves and are fastened to the transmission/splitter outer relay rod support.

Operation is through lift pump oil (rear transmission oil) and separate hand levers (A, B and C).

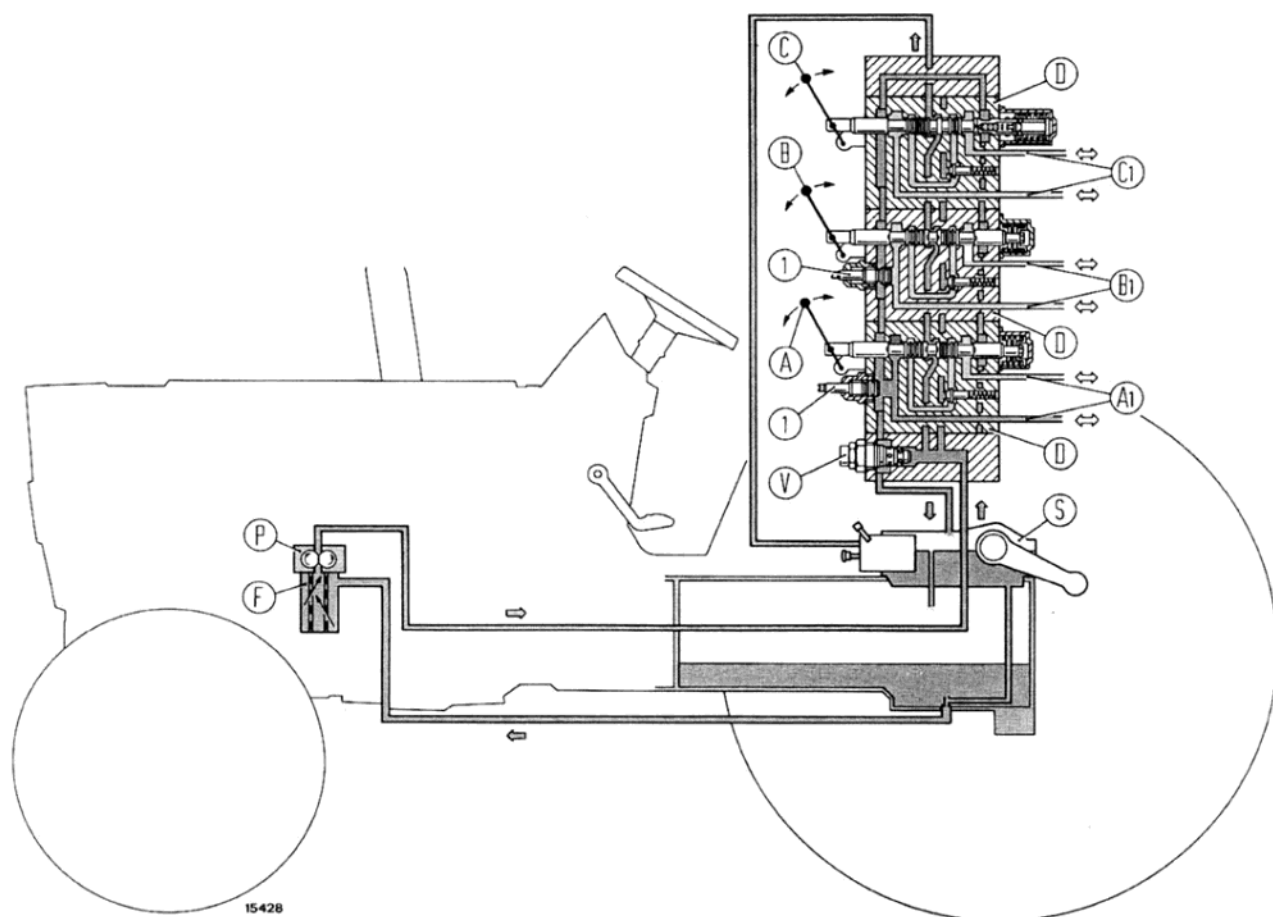
Simultaneous operation of a remote control valve and the lift is only possible with control valve float position.

Relief valve (setting 186 to 191 bar or 190 to 195 kg/cm² or 2702 to 2775 psi), normally located in lift control valve, is on control valve retaining plate (V).

Figure below shows oil circulation through the three remote control valves (two set for double-acting cylinder operation and one for single-acting cylinder operation) with associated control levers in neutral position, where oil from the pump is directed through the remote control valves as arrowed and flows to the lift control valve.

■ Suction, delivery, exhaust oil

□ Trapped oil

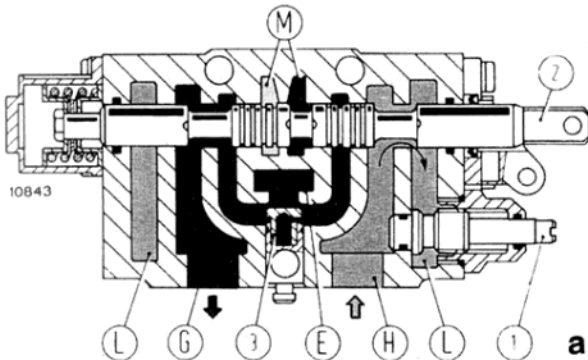


Remote control valve hydraulic system diagram.

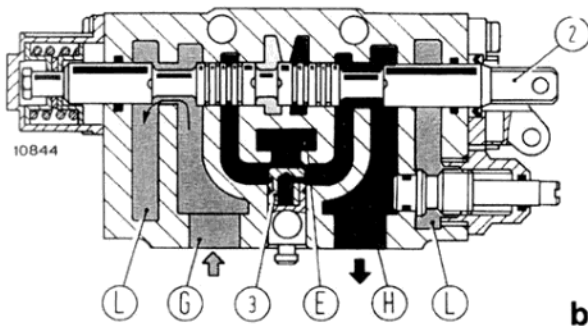
A. Single-acting valve lever - B. Double-acting valve lever - C. Double-acting, float, valve lever - A₁, B₁, C₁. Female half-couplings - D. Remote control valve - F. Full flow paper cartridge oil filter on pump suction side (common to lift) - P. Hydraulic pump (common to lift) - S. Lift body - V. Relief valve - 1. Single/double action conversion screw.

HYDRAULIC LIFT UNIT: Remote Control Valves

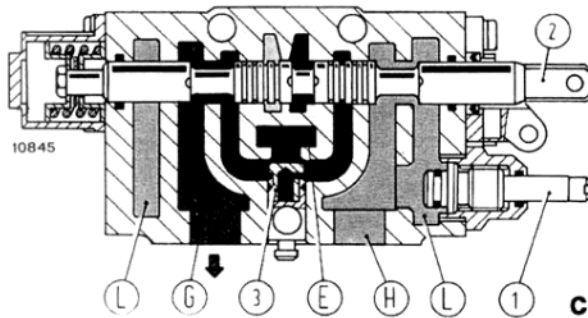
■ Pressure oil
 ■ Suction, delivery or exhaust oil
 ■ Trapped oil



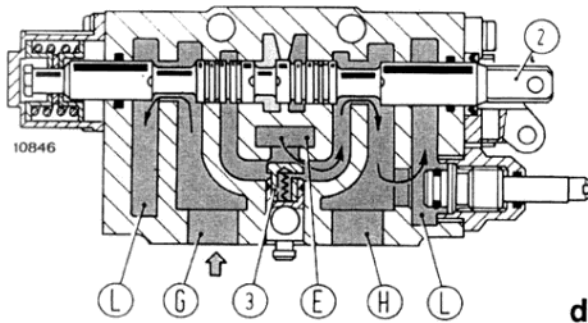
a. RAISING — When lever (A, page 1) is pulled back, spool (2) establishes communication between inlet port (E) and cylinder lower chamber through check valve (3) and port (G) and between cylinder upper chamber and exhaust port (L) through port (H), preventing oil delivery to lift control valve. If the control lever is held back, the raising phase continues until relevant cylinder reaches the end of its travel. Upon release, the lever springs back to neutral and the entire pump output is directed to the lift control valve through ports (M).



b. LOWERING — For implement lowering, push control lever (A, page 1) forward. Spool (2) moves as indicated in fig. b and permits oil contained in cylinder lower chamber to flow to exhaust (L) through port (G), while upper chamber is placed in communication with outlet port (E) through port (H) and check valve (3).



c. RAISING — When lever (C, page 1) is pulled back, spool (2) establishes communication between cylinder and inlet port (E) through check valve (3) and port (G). Port (H), used for double-acting cylinders, is not used in this phase, since it is permanently connected with exhaust (L) when conversion valve (1) is opened.



d. LOWERING — When control lever (C, page 1) is pushed forward, spool (2) moves as indicated in fig. d. Oil contained in cylinder, pushed by weight of lifted implement, flows to exhaust (L) through port (G), while pump output is directed to exhaust (L) through check valve (3) and port (H).

Double acting cylinder (fig. a, b) and single-acting cylinder (figs. c, d) remote control valve operation schematics.

Note — For single-acting cylinder operation, screw (1) should be fully tightened; for double-acting cylinder operation, screw should be backed off.

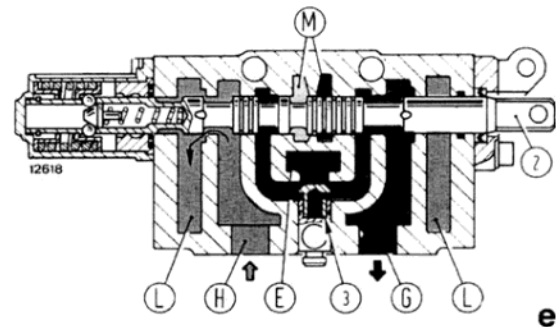
55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Remote Control Valves

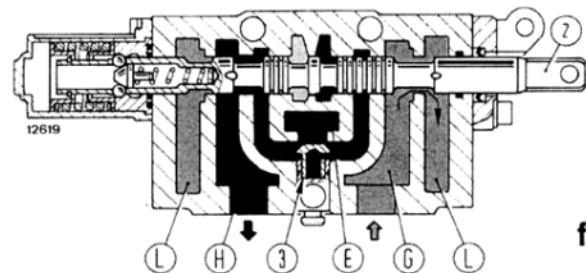
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pag. 3

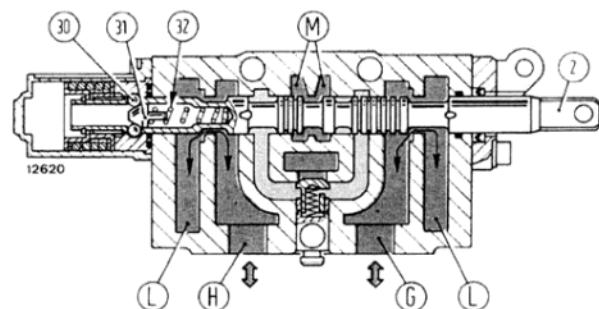
e. RAISING — When control lever is pulled back, spool (2) establishes communication between inlet port (E) and cylinder lower chamber through check valve (3) and port (G) and between upper chamber and exhaust port (L), through port (H), preventing oil delivery to lift control valve. If the control lever is held back, the raising phase continues until relevant cylinder reaches the end of its travel. Upon release, the lever springs back to neutral and the entire pump output is directed to the lift control valve through ports (M).



f. LOWERING — For implement lowering, push control lever forward. Spool (2) moves as indicated in fig. f and permits oil contained in cylinder lower chamber to flow to exhaust (L) through port (G) while upper chamber is placed in communication with outlet port (E) through port (H) and check valve (3).



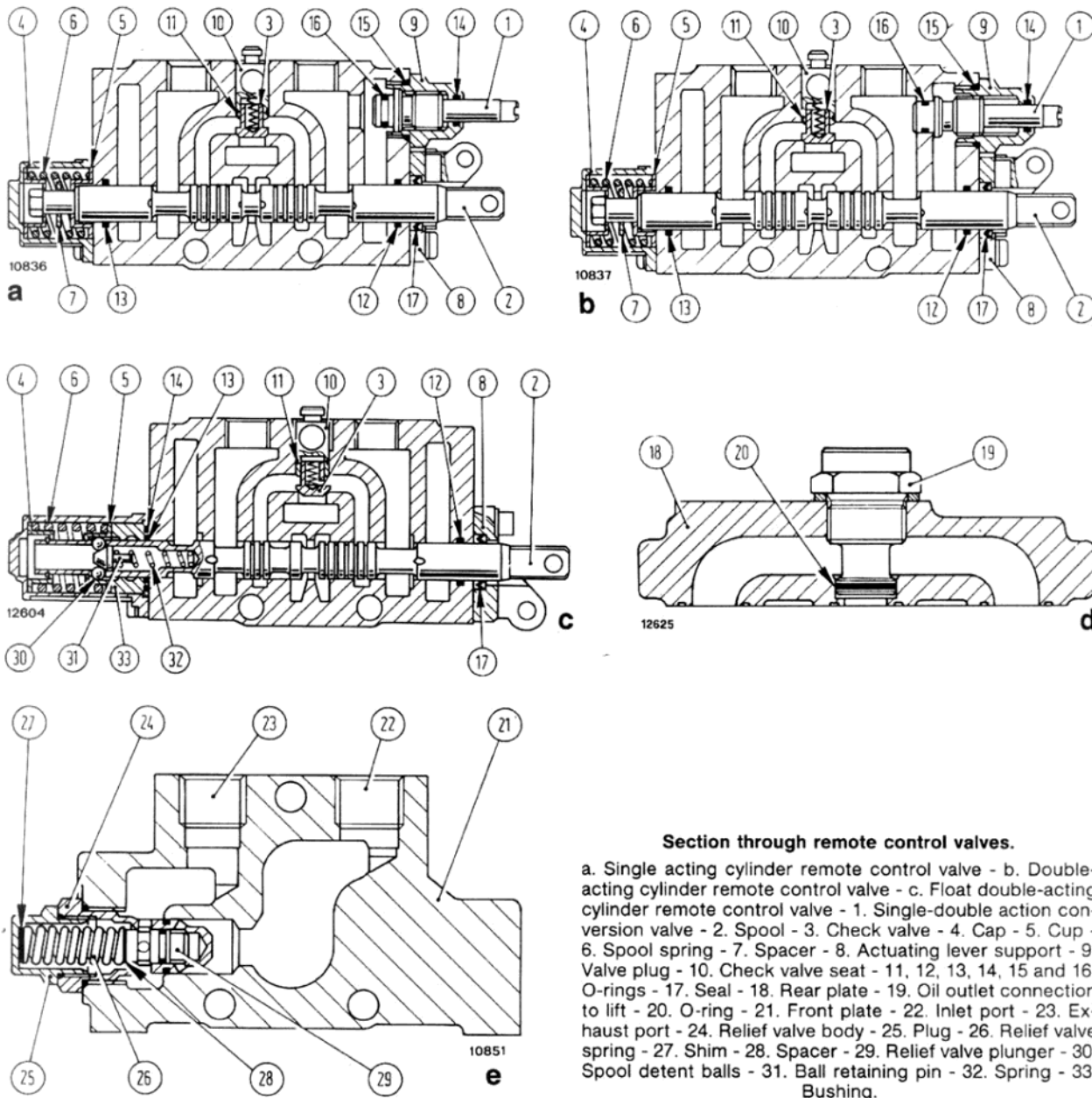
g. FLOAT — For implement float operation, push control lever fully forward. Spool (2) takes up position shown in fig. g where it is held by ball (30) retained in place by pin (31) and spring (32), and establishes communication between ports (M) directing entire pump output to lift control valve, and between drain ports (L) through ports (H, G) and upper and lower cylinder chambers respectively. Thus, implement may follow the ground contour as lift arms are free. Lift may be operated in float control.



Remote control valve operation schematics - Double-acting cylinder (figs. e, f) and float (fig. g).

HYDRAULIC LIFT UNIT: Remote Control Valves

REMOTE CONTROL VALVES



Section through remote control valves.

a. Single acting cylinder remote control valve - b. Double-acting cylinder remote control valve - c. Float double-acting cylinder remote control valve - 1. Single-double action conversion valve - 2. Spool - 3. Check valve - 4. Cap - 5. Cup - 6. Spool spring - 7. Spacer - 8. Actuating lever support - 9. Valve plug - 10. Check valve seat - 11, 12, 13, 14, 15 and 16. O-rings - 17. Seal - 18. Rear plate - 19. Oil outlet connection to lift - 20. O-ring - 21. Front plate - 22. Inlet port - 23. Exhaust port - 24. Relief valve body - 25. Plug - 26. Relief valve spring - 27. Shim - 28. Spacer - 29. Relief valve plunger - 30. Spool detent balls - 31. Ball retaining pin - 32. Spring - 33. Bushing.

Disassemble remote control valves referring to the sectional views above and noting the following points:

- Remove caps (4), springs (6) and cups (5), and withdraw spools from actuating side of each valve body. On float double-acting cylinder control valve spool disassembly (fig. c), also retrieve spool detent ball (30), pin (31) and spring (32).

For control valves with single/double action conversion valve (figs. a, b), back off plug (9) and remove valve (1).

- Remove valve seat (10) using pliers. Take out check valve (3) and retrieve spring.
- To remove relief valve from control valve retaining plate, slacken valve body (24) and, working on the bench, back off plug (25) and retrieve spring (26), shims (27 and 28) and plunger (29).

HYDRAULIC LIFT UNIT: Remote Control Valves

Note — If tester is filled with oliofiat AP51 oil (SAE 20W), the above test and those that follow must be carried out at 60°C approx. and 12.5 l/min (22 Imp. pints/min) output, obtainable by running tester motor at higher speed (1450 rpm).

Spool return test (b, b₁)

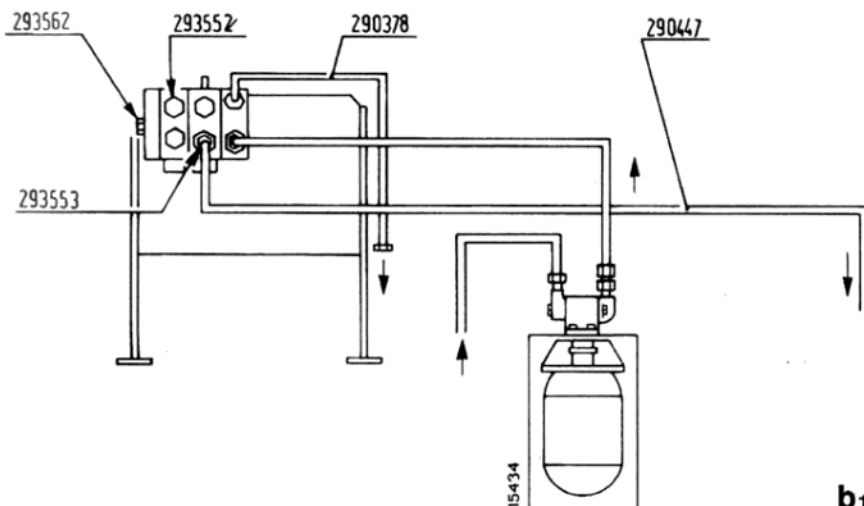
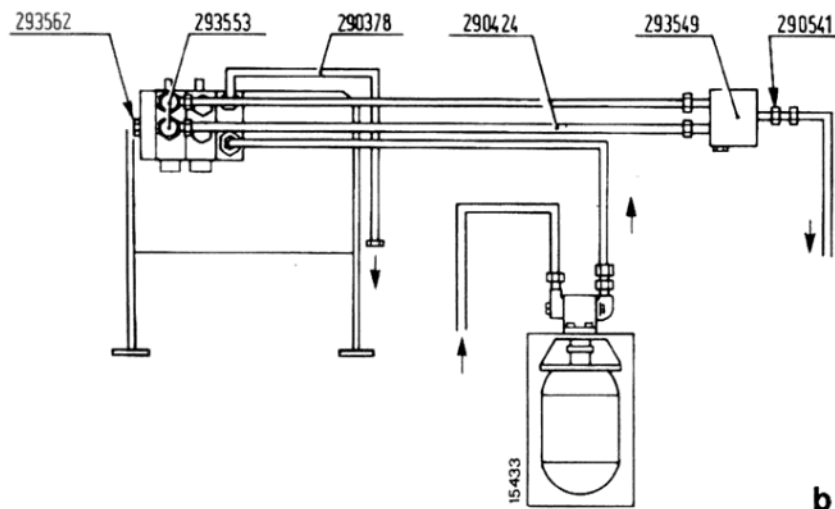
Install remote control valve assembly under test and test equipment as indicated in diagram (b, b₁), noting the following points:

- On double-acting cylinder control valves (fig. b), oil delivery ports to cylinder must be connected to fitting with ball **293549** through associated lines **290424** and banjos **293553**;

- On single-acting cylinder control valves (fig. b₁), return line **290447** must be connected to oil delivery port to cylinder (port on opposite side of conversion valve, 1, page 4) through banjo **293553**.

Establish proper connections as indicated in the diagram and test as follows:

- Activate hydraulic pump, actuate spool hand lever (in both directions for double-acting control valves).
- Gradually increase pressure through the control handle of output tester **291231** and check on the test pressure gauge that the setting is 172 bar 175 kg/cm² or 2489 psi). In these conditions the spool under test should slide freely and return to neutral without binding as soon as the control lever is released.



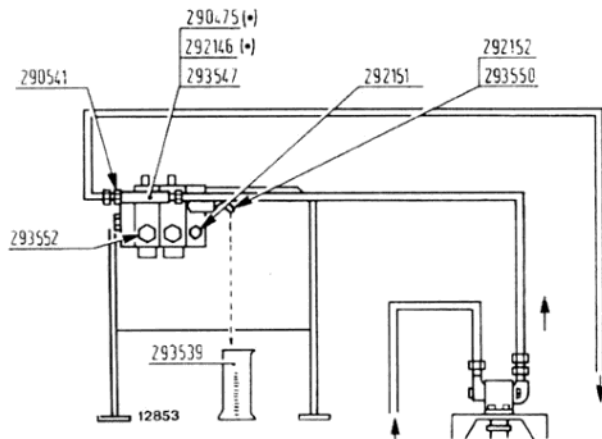
Spool return test equipment installation diagram for single-acting (b₁) and double-acting (b) remote control valves.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Remote Control Valves

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Spool leakage test equipment installation diagram for float double-acting remote control valves (c).

(*) 290475 = Early type three-way adapter.

(*) 292146 = Late type three-way adapter.

- Test the other spools after establishing the necessary connections.

Remote control valve spool leakage test (c).

Install remote control valve assembly under test and test equipment as indicated in diagram (c) noting that three-way connection **292146** (or **290475**) is to be fitted to single-acting cylinder valve using adapters **293547**.

After proper connection as indicated in the diagram, test as follows:

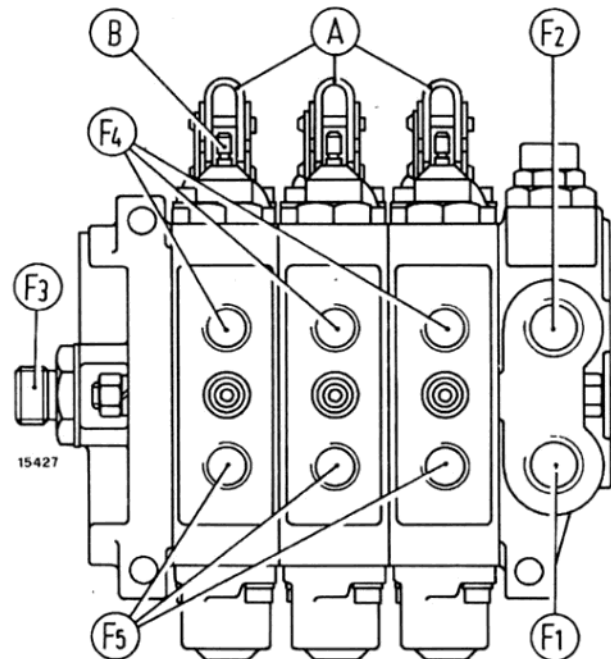
- Activate the hydraulic pump, gradually increase pressure through control handle of output tester **291231** and check on tester gauge that the pressure reaches 147 bar (150 kg/cm², 2133 psi).
- Collect leakage oil flowing from connection **293550** in burette **293539** for exactly one minute and check the content; leakage oil should not exceed 25 cc/minute (1.52 cu in/minute) for a new control valve, or 60 cc/minute (3.66 cu in/minute) for a used valve.

Repeat test on each control valve, testing each of the two cylinder delivery ports in turn.

Remote control valve lever adjustment

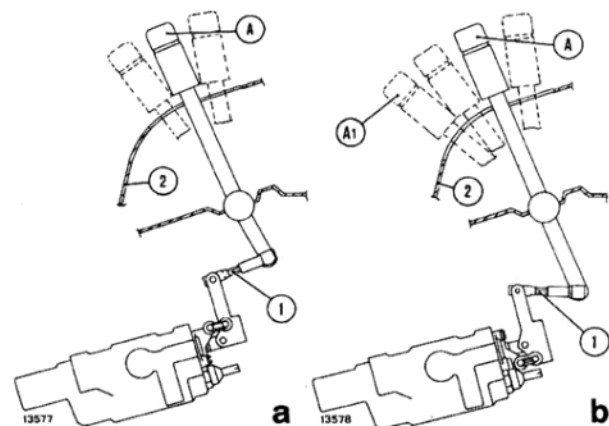
Proceed as follows:

Fiat Trattori



Remote control valve piping connection diagram.

A. Remote control valve levers - B. Single/double action conversion valve - F₁. Threaded hole (M22x1,5) for oil inlet line fitting - F₂. Threaded hole (M22x1,5) for oil exhaust line fitting - F₃. Threaded hole (M20x1,5) for oil delivery connection to lift control valve - F₄ and F₅. Threaded holes for oil delivery connections to single-acting or double-acting cylinders.



Adjusting remote control valve levers.

a. Single-double acting control valve - b. Float single-double acting control valve - A. Control levers - A₁. Float position - 1. Adjustable links - 2. Plastic guard.

- Connect links (1) to control levers (A), adjusting length so that all operating positions can be reached without fouling between levers (A) and the plastic guard (2) on the platform.

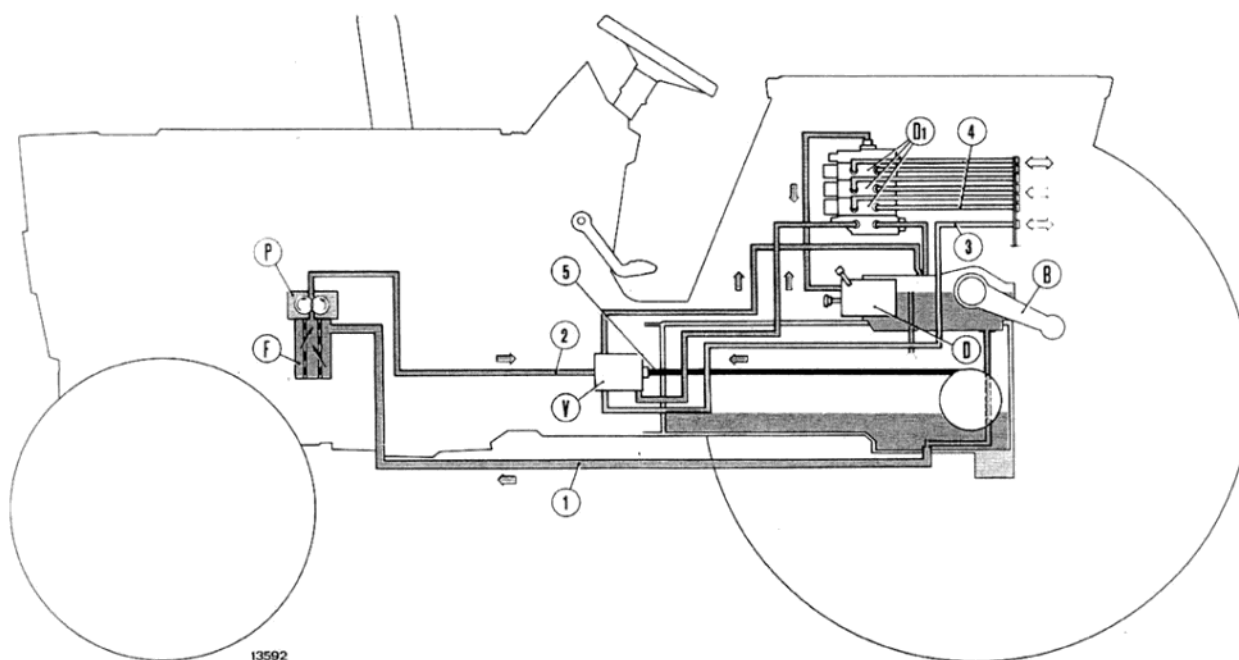
Print No. 603.54.241.00 - III - 1986

HYDRAULIC LIFT UNIT: Remote Control Valves

TRAILER BRAKE REMOTE CONTROL VALVE

The optional trailer brake remote control valve is attached to the transmission housing through a bracket.

Trailer brake remote control valve employs the tractor hydraulic circuit, and is operated through the L.H. tractor brake pedal.



Trailer brake remote control valve hydraulic system diagram.

B. Lift arms - D. Lift control valve - D1. Remote control valve - F. Filter - P. Hydraulic pump (Common to hydraulic lift) - V. Trailer brake remote control valve - 1. Suction pipe from rear transmission housing - 2. Delivery line to trailer brake control valve - 3. Delivery line to trailer brake - 4. Delivery line to tractor circuits. - 5. Line connecting brake control valve with tractor brake circuit.

55-90 60-90
70-90 80-90
90-90 100-90

HYDRAULIC LIFT UNIT: Remote Control Valves

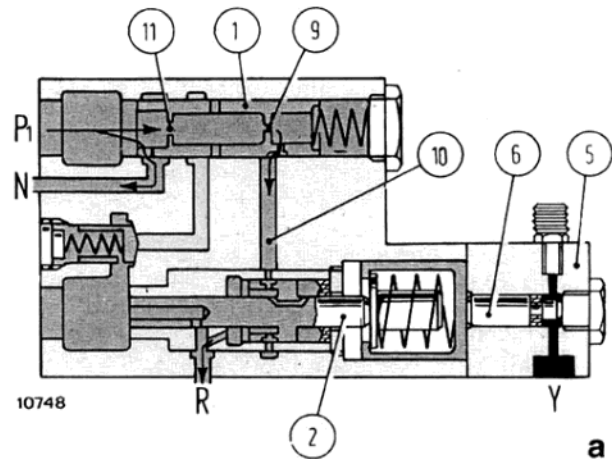
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a. TRAILER BRAKES RELEASED — When tractor brakes are at rest, hydrostatic circuit connected to control valve through union (Y) is not under pressure and pilot valve piston (6) and piston (2) take up the positions shown in fig. a.

Oil from hydraulic pump (P, page 8) directed to fitting (P₁) through diaphragm (11) and restriction (9) undergoes a pressure drop to move flow control valve (1) to the right.

Most of the oil flows through connection (N) to the remote control valves. The remaining output is drained into the hydraulic lift through line (10), piston (2) and connection (R).



Trailer brakes released.

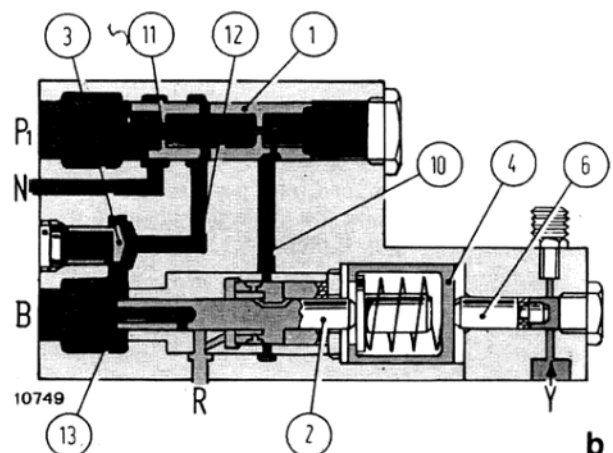
N. To remote control valves - P₁. From lift hydraulic pump -
R. To hydraulic lift drain - Y. From tractor brakes.

- High pressure oil
- ▨ Suction, delivery and exhaust oil
- Trapped oil
- Brake circuit oil (off)
- ▨ Brake circuit oil (applied)

b. BRAKE APPLICATION — On tractor brake pedal application, hydrostatic circuit oil in union (Y) undergoes an increase in pressure and causes leftward movement of piston (6), pressure limiter (4) and piston (2) which discontinues communication between oil drain fitting (R) and both trailer brake connection (B) and port (10).

Oil inside flow control valve (1) maintains a constant pressure and under spring load moves to the left to take up position shown in fig. b.

Part of hydraulic pump output in connection (P₁) flows to the remote control valves through connection (N) while remaining output reaches trailer braking device through diaphragm (11), port (12), check valve (3) and connection (B).



Brake application.

B. To trailer brake - N. To remote control valves - P₁. From
lift hydraulic pump - R. To hydraulic lift drain - Y. From tractor
brakes.

HYDRAULIC LIFT UNIT: Remote Control Valves

c. BRAKING — Continued brake pedal application causes an increase in oil pressure at trailer brake connection (B) which, acting on effective area (13) of piston (2), moves the latter to the right overcoming the opposition of pressure limiter springs (8).

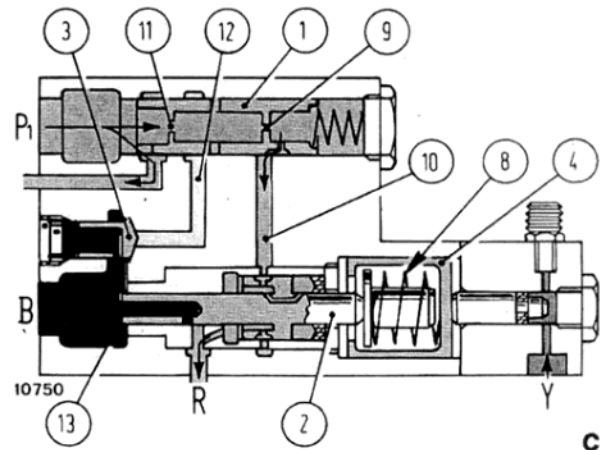
When trailer brake circuit oil pressure is equal to spring (8) pressure, piston (2) stabilises as shown in fig. c and establishes communication between oil from pump and lift drain through connection (P₁), diaphragm (11), restriction (9), port (10) and connection (R).

Diaphragm (11) and restriction (9) cause a pressure drop in flow control valve (1) which moves rightward to close port (12) and, consequently, check valve (3).

Further depression of tractor brake pedals causes a leftward movement of piston (6, page 9), pressure limiter (4) and piston (2) with a consequent increase in trailer brake circuit oil pressure as the sequence described in para b, "BRAKE APPLICATION" is repeated.

If, for external reasons, trailer brake circuit pressure increases, piston (2) rapidly establishes communication between trailer brake connection (B) and oil drain connection to lift (R) thus holding brake circuit oil pressure in correct balance with pressure limiter springs (8).

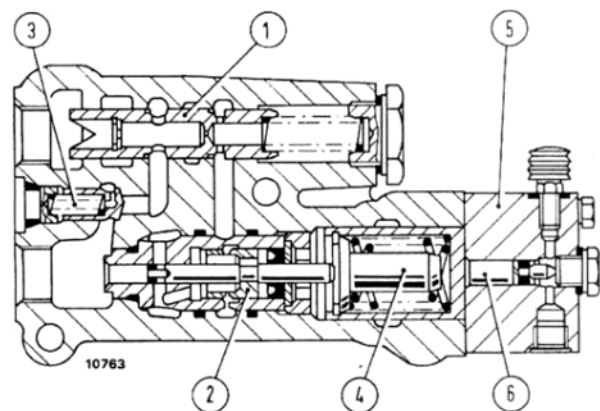
Upon releasing tractor brake pedals, pressure at fitting (Y) subsides and the system returns to the conditions shown in fig. a, page 9.



Brakes applied.

B. To trailer brake - P₁. From lift circuit hydraulic pump - R. To hydraulic lift drain - Y. From tractor brakes.

- High pressure oil
- ▨ Suction, delivery and exhaust oil
- Trapped oil
- ▤ Brake circuit oil (applied)



Section through trailer brake remote control valve.

1. Flow control valve - 2. Piston - 3. Check valve - 4. Pressure limiter - 5. Pilot valve body - 6. Pilot valve piston.

CHARGING SYSTEM

Alternator Type - MARELLI (55-90, 60-90, 70-90, 80-90) - MARELLI { (90-90, 100-90) - BOSCH } Rated voltage Rotation (seen from pulley side) Cut-in speed at 12 V and 25°C Output at 14 V across battery after warm-up (°): - MARELLI, at 7000 rpm (55-90, 60-90, 70-90, 80-90) - BOSCH and MARELLI, at 7000 rpm (90-90, 100-90) Rotor winding resistance — BOSCH — MARELLI On-machine alternator speed (at engine governed speed) — 55-90, 60-90, 70-90, 80-90 — 90-90, 100-90 Drive ratio — 55-90, 60-90, 70-90, 80-90 — 90-90, 100-90	Three-phase, self-rectifying 4787598 4787673 4765725 14 Volts Clockwise 1050 to 1150 rpm 45A min 65A min 3.4 to 3.7 Ohm 3.4 to 3.8 Ohm 4450 rpm 4475 rpm 1.780 to 1 1.910 to 1
Voltage regulator Type Alternator test speed Voltage setting — Bosch 4765725 — Marelli 4787598, 4787673	Integral, transistor 4000 rpm 13.7 to 14.5 V 13.6 to 14 V

(°) Applicable to fully bedded-in brushes.

ELECTRICAL SYSTEM: Specification and Data

MARELLI STARTER (models 55-90, 60-90)

Type	MARELLI MT-71AA
Voltage rating	12 V
Rated output	2.5 kW
Rotation (seen from pinion end)	Clockwise
Starter drive ratio	9/110
No. of poles	4
Field winding	Series
Control	Freewheel
Operation	Through solenoid
Bench Test Data	
Running torque at 20°C	
— Current	500 A max.
— Torque	16.6 Nm (12.3 ft. lb. 1.7 kgm)
— Speed	1300 rpm
— Voltage	8.3 V
Lock torque at 20°C	
— Current	950 A max
— Voltage	4.8 V
— Torque	36 Nm (26.7 ft. lb., 3.7 kgm) min.
— Overall internal resistance	0.005 ± 0.0005 Ohm
Light running torque at 20°C	
— Current	60 A max
— Voltage	11.6 V
— Speed	8500 rpm
Mechanical Data	
Brush spring load (not worn)	12.2 to 15.2 (1.25 to 1.55 kg, 2.75 to 3.4 lb)
Mica undercut depth	1 mm (0.040 in)
Clutch slip torque (pinion rotating torque)	6 to 8 kgcm (0.4 to 0.6 lb ft)

(follows)

MARELLI STARTER (models 55-90, 60-90)

(continued)

Commutator dia.	44.840 to 45.000 mm (1.7653 to 1.7716 in)
— Maximum wear limit	43.5 mm (1.7126 in)
— Maximum ovality	0.08 mm (0.0031 in)
— Armature end float	0.1 to 0.4 mm (0.004 to 0.016)
Solenoid	
Winding resistance at 20°C	0.22 ± 0.02 Ohm
Current consumption at 12 V	54 A
Activation voltage	5.5 V max
Moving contact travel	3 mm (0.118 in)
Plunger stroke	13.8 to 14.9 mm (0.5433 to 0.5866 in)
End of stroke plunger load at 12 V	392 N (40 kg, 88 lb) max
Fitting Data	
Pole shoe I.D.	75.830 to 76.000 mm (2.9854 to 2.9921 in)
Armature O.D.	74.900 to 74.950 mm (2.9488 to 2.9508 in)
Drive end bushing I.D.	12.475 to 12.502 mm (0.4911 to 0.4922)
Pinion journal dia.	12.425 to 12.440 mm (0.4892 to 0.4900 in)
Pinion clearance in bushing	0.035 to 0.077 mm (0.0014 to 0.0030 in)
Intermediate bushing I.D.	20.200 to 20.264 mm (0.7953 to 0.7978 in)
Shaft journal dia.	19.967 to 20.00 mm (0.7861 to 0.7878 in)
Shaft clearance in bushing	0.200 to 0.297 mm (0.0080 to 0.0117 in)
Commutator end bushing I.D.	14.000 to 14.270 mm (0.5512 to 0.5618 in)
Shaft journal dia.	13.957 to 13.984 mm (0.5495 to 0.5505 in)
Shaft clearance in bushing	0.016 to 0.313 mm (0.0006 to 0.0123 in)
Lubrication Data	
Starter drive helical groove (during overhaul)	grassofiat TUTELA MR 3
Commutator end thrust washer	grassofiat TUTELA MR3

ELECTRICAL SYSTEM: Specification and Data

LUCAS STARTER (models 55-90, 60-90)

Type	M45 G 26390/D
Voltage rating	12 V
Rated output	2.6 kW
Rotation (seen from pinion end)	Clockwise
Starter drive ratio	9/110
No. of poles	4
Field winding	Compound
Control	Sprag clutch
Operation	Pre-engagement
Bench Test Data	
Running torque at 20°C	
— Current	600 A max.
— Torque	22.5 Nm (2.3 kgm 16.6 ft. lb.)
— Speed	1000 rpm min.
— Voltage	8.9 V
Light running torque at 20°C	
— Current	100 A max.
— Voltage	12 V
— Speed	5000 to 7000 rpm
Overall internal resistance at 20°C	0.0078 Ohm
Mechanical Data	
Brush spring load (not worn)	14.7 to 19.6 N (1.5 to 2 kg, 3.3 to 4.4 lb)
Armature end play	0.025 to 1.420 mm (0.0009 to 0.0559 in)
Commutator dia.	41.150 to 41.400 mm (1.620 to 1.629 in)
— Wear limit	38.89 mm (1.53 in)
— Maximum ovality	0.076 mm (0.003 in)

(follows)

LUCAS STARTER (models 55-90, 60-90)

(continued)

Solenoid Resistance at 20°C { Holding coil Actuating coil Current consumption at 12 V { Holding coil Actuating coil Activation voltage Plunger stroke	0.46 to 0.56 Ohm 0.145 to 0.165 Ohm 21.5 to 26.1 A 73 to 83 A 8 V 0.585 mm (0.023 in)
Fitting Data Pole shoe I.D. Armature O.D. Armature bushing fitted I.D. — Pinion — Intermediate — Commutator Armature shaft journal dia. — Pinion — Intermediate — Commutator Armature shaft clearance in bushing — Pinion — Intermediate — Commutator Pinion bushing fitted I.D. Armature shaft journal dia. over pinion bushing Armature shaft clearance in pinion bushing	75.38 to 75.74 mm (2.967 to 2.982 in) 74.40 to 74.47 mm (2.929 to 2.932 in) 14.287 to 14.313 mm (0.562 to 0.563 in) 28.500 to 28.530 mm (1.122 to 1.123 in) 12.700 to 12.725 mm (0.499 to 0.501 in) 14.20 to 14.22 mm (0.559 to 0.560 in) 28.356 to 28.433 mm (1.116 to 1.119 in) 12.65 to 12.67 mm (0.498 to 0.499 in) 0.067 to 0.113 mm (0.0026 to 0.0044 in) 0.067 to 0.174 mm (0.0026 to 0.0068 in) 0.03 to 0.075 mm (0.0012 to 0.562 in) 14.26 to 14.29 (0.561 to 0.562 in) 14.20 to 14.22 (0.559 to 0.560 in) 0.04 to 0.09 mm (0.0015 to 0.0035 in)
Lubrication Data Starter drive helical groove (during overhaul)	grassofiat TUTELA MR3

ELECTRICAL SYSTEM: Specification and Data

BOSCH STARTER (models 55-90, 60-90)

Type	JF→ 12V 0.001.362.039
Voltage rating	12 V
Rated output	1.8 kW
Rotation (seen from pinion end)	Clockwise
Starter drive ratio	9/110
No. of poles	4
Field winding	Series
Control	Sliding
Operation	Solenoid
Bench Test Data	
Running torque at 20°C	
— Current	735 ÷ 765 A
— Torque	24.5 Nm (2.5 Kgm, 18.1 ft.lb)
— Speed	950 to 1250 rpm
— Voltage	9 V
Lock torque at 20°C	
— Current	700 to 880 A
— Voltage	4.5 V
— Torque	0 Nm
— Overall internal resistance	0.00573 Ohm
Light running torque at 20° C	
— Current	65 to 95 A
— Voltage	11.5 V
— Speed	6500 to 8500 rpm
Mechanical Data	
Brush spring load (not worn)	11.3 to 12.7 N (1.15 to 1.3 kg, 2.5 to 2.9 Lb)
Armature end play	0.1 to 0.3 mm (0.004 to 0.012 in)
Mica undercut depth	0.5 to 0.8 mm (0.020 to 0.032 in)
Commutator diameter	42 mm (1.65 in)
— Wear limit	39.5 mm (1.55 in)
— Maximum ovality of lamination pack	0.05 mm (0.0020 in)
— Maximum ovality of commutator	0.03 mm (0.0012 in)

(follows)

BOSCH STARTER (models 55-90, 60-90)

(continued)

Solenoid Resistance at 20°C — Holding coil — Actuating coil Current consumption at 12 V Activation voltage Plunger stroke	 1.05 Ohm 0.25 Ohm 60 A 7.5 V 12 to 14 mm (0.472 to 0.551 in)
Fitting Data Pole shoe I.D. Armature O.D. Armature bushing fitted I.D. — Pinion — Intermediate — Commutator Armature shaft journal dia. — Pinion — Intermediate — Commutator Armature shaft clearance in bushing — Pinion — Intermediate — Commutator Pinion bushing fitted I.D. Armature shaft journal dia. over pinion bushing Armature shaft clearance in pinion bushing	 75.85 to 75.98 mm (2.986 to 2.991 in) 73 mm (2.874 in) 12.475 to 12.502 mm (0.491 to 0.492 in) 19.020 to 19.072 mm (0.749 to 0.751 in) 12.475 to 12.502 mm (0.491 to 0.492 in) 12.425 to 12.440 mm (0.489 to 0.490 in) 18.927 to 18.960 mm (0.745 to 0.746 in) 12.425 to 12.440 mm (0.489 to 0.490 in) 0.035 to 0.077 mm (0.0014 to 0.0030 in) 0.060 to 0.145 mm (0.0023 to 0.0057 in) 0.035 to 0.077 mm (0.0014 to 0.0030 in) 14.245 to 14.272 mm (0.561 to 0.562 in) 14.123 to 14.150 mm (0.556 to 0.557 in) 0.095 to 0.149 mm (0.0037 to 0.0059 in)
Lubrication Data Starter drive helical groove (during overhaul)	 grassofiat TUTELA MR 3

ELECTRICAL SYSTEM: Specification and Data

MARELLI STARTER (models 70-90 and 80-90)

Type	MARELLI MT 68 AB
Voltage rating	12
Rated output	3,5 kW
Rotation (seen from pinion end)	Clockwise
Starter drive ratio	9/110
No. of poles	4
Field winding	Series
Control	Lever and free wheel
Operation	Solenoid
Bench Test Data	
Running torque at 20°C	
— Current	700 A max.
— Torque	19.6 Nm (2 kgm, 14.5 ft.lb)
— Speed	1400 to 1800 rpm
— Voltage	9 V
Lock torque at 20°C	
— Current	1400 A max.
— Voltage	5 V
— Torque	49 Nm (5 kgm, 36.2 ft.lb)
— Overall internal resistance	0,004 ± 0,0004 Ohm
Light running torque at 20°C:	
— Current	85 A max.
— Voltage	12 V
— Speed	7000 to 10000 rpm
Main series field winding resistance at 20°C	0,002 ± 0,0002 Ohm
Mechanical Data	
Brush spring load (not worn)	14.7 to 17.4 N (1.5 to 1.8 kg, 3.3 to 3.9 lb)
Mica undercut depth	1 mm (0.040 in)
Clutch slip torque (pinion rotating torque)	6 to 8 kgcm (0.4 to 0.6 ft.lb)

(follows)

MARELLI STARTER (models 70-90 and 80-90)

(continued)

Commutator dia. — Maximum wear limit — Maximum ovality — Armature end float	44.840 to 45.000 mm (1.7653 to 1.7716 in) 43.5 mm (1.7126 in) 0.08 mm (0.0031 in) 0.1 to 0.4 mm (0.004 to 0.016 in)
Solenoid Winding resistance at 20°C Current consumption at 12 V Activation voltage Moving contact travel Plunger stroke End of stroke plunger load at 12 V	0.22 ± 0.02 Ohm 54 A 5.5 V Max. 3 mm (0.118 in) 13.8 to 14.9 mm (0.5433 to 0.5866 in) 392 N (40 kg, 88 lb) max.
Fitting Pole shoe I.D. Armature O.D. Drive end bushing I.D. Pinion journal dia. Pinion clearance in bushing Intermediate bushing I.D. Shaft journal dia. Shaft clearance in bushing Commutator end bushing I.D. Shaft journal dia. Shaft clearance in bushing	75.830 to 76.000 mm (2.9854 to 2.9921 in) 74.900 to 74.950 mm (2.9488 to 2.9508 in) 12.475 to 12.502 mm (0.4911 to 0.4922 in) 12.425 to 12.440 mm (0.4892 to 0.4900 in) 0.035 to 0.077 mm (0.0014 to 0.0030 in) 20.200 to 20.264 mm (0.7953 to 0.7978 in) 19.677 to 20.000 mm (0.7774 to 0.7874 in) 0.200 to 0.587 mm (0.0080 to 0.0231 in) 14.000 to 14.022 mm (0.5512 to 0.5520 in) 13.957 to 13.984 mm (0.5495 to 0.5505 in) 0.016 to 0.065 mm (0.0006 to 0.0025 in)
Lubrication Data Starter drive helical groove (during overhaul) Commutator end thrust washer	grassofiat TUTELA MR 3 grassofiat TUTELA MR 3

ELECTRICAL SYSTEM: Specification and Data

BOSCH STARTER (models 70-90 and 80-90)

Type	BOSCH JD→ 12V 0.001.359.102	
Voltage rating	12 V	
Rated output	2.94 kW	
Rotation (seen from pinion end)	Clockwise	
Starter drive ratio	9/110	
Number of poles	4	
Field winding	Compound	
Control	Lever and freewheel	
Operation	Through solenoid	
Bench Test Data		
Running torque at 20°C		
— Current	760 to 900 A (*)	650 to 800 A (°)
— Torque	45 N (4.6 kgm, 33 ft lb)	38 N (3.9 kgm, 28 ft lb)
— Voltage	4 V	3.5 V
Light running torque at 20°C		
— Current	60 to 90 A	
— Voltage	11.5 V	
— Speed	4800 to 6800 rpm	
Mechanical Data		
Brush spring load (not worn)	25.5 to 27.4 (2.6 to 2.8 kg or 5.7 to 6.2 lb)	
Armature end play	0.1 to 0.3 mm (0.004 to 0.012 in)	
Mica undercut depth	0.5 to 0.8 mm (0.020 to 0.032 in)	
Commutator diameter	42 mm (1.65 in)	
— Maximum wear limit	39.5 mm (1.55 in)	
— Maximum ovality of lamination pack	0.05 mm (0.0020 in)	
— Maximum ovality of commutator	0.03 mm (0.0012 in)	

(*) Battery charged. (°) Battery discharged.

(follows)

ELECTRICAL SYSTEM: Specification and Data

MARELLI STARTER (models 90-90 and 100-90)

Type	MARELLI MT 68 LB
Voltage rating	12 V
Rated output	3,5 kW
Rotation (seen from pinion end)	clockwise
Starter drive ratio	9/127
No. of poles	4
Field winding	series
Control	lever and freewheel
Operation	through solenoid
Bench test data	
Running torque at 20°C:	
— Current	700 A max.
— Torque	19 Nm min: (1.9 kgm) (13.75 ft.lb.)
— Speed	1700 rpm
— Voltage	9.1 V
Lock torque at 20°C:	
— Current	1550 A max.
— Voltage	5.7 V
— Torque	52 Nm min. (5.3 kgm) (38.3 ft.lb.)
Light running torque at 20°C:	
— Current	80 A max.
— Voltage	11.6 V min.
— Speed	7000 rpm min.
Mechanical data	
Brush spring pressure (new brushes)	bar (kg/cm ²)
	1.28 to 1.52 bar (18.56 to 22 p.s.i.)
Mica undercut depth	1 mm max. (.040 in)
Clutch slip torque (pinion rotating torque)	.6 to .8 Nm (.06 to .08 kgm) (.4 to .6 ft.lb.)

(follows)

MARELLI STARTER (models 90-90 and 100-90)

(continued)

Commutator dia.	45.000 to 45.840 mm (1.7716 to 1.8047 in.)
— Maximum wear limit	44.000 mm (1.732 in.)
— Maximum ovality	.1 mm (.0039 in.)
— Armature end float	.1 to .4 mm (.004 to .016 in.)
Solenoid	
Winding resistance at 20°C	{ hold-in winding pull-in winding .23 ± .01 Ohm .78 ± .04 Ohm
Current consumption at 12 V	70 A max.
Activation voltage	7 V max.
Moving contact travel	2.2 to 3.5 mm (.086 to .137 in.)
Plunger stroke	14.3 mm (.562 in.)
End of stroke plunger load at 12 V	392 N or 40 Kg min (88 lb.)
Installation data	
Pole shoe I.D.	75.830 to 76.000 mm (2.9854 to 2.9921 in.)
Armature O.D.	74.900 to 74.950 mm (2.9488 to 2.9508 in.)
Drive end bushing I.D.	12.475 to 12.502 mm (.4911 to .4922 in.)
Pinion journal O.D.	12.425 to 12.440 mm (.4892 to .4900 in.)
Pinion clearance in bushing	.035 to .077 mm (.0014 to .0030 in.)
Intermediate bushing I.D.	20.200 to 20.264 mm (.7953 to .7978 in.)
Shaft journal dia.	19.967 to 20.000 mm (.7861 to .7874 in.)
Shaft clearance in bushing	.200 to .297 mm (.0080 to .0116 in.)
Commutator end bushing I.D.	14.000 to 14.027 mm (.5512 to .5522 in.)
Shaft journal dia.	13.957 to 13.984 mm (.5505 to .549 in.)
Shaft clearance in bushing	.016 to .070 mm (.0006 to .0027 in.)
Lubrication data	
Starter drive helical groove (during overhaul)	grassofiat MR 3
Commutator end thrust washer	grassofiat MR 3

ELECTRICAL SYSTEM: Specification and Data

BOSCH STARTER (models 90-90 and 100-90)

Type	BOSCH JD→ 12V A 001 - 806.499	
Voltage rating	V 12	
Rated output	2.95 kW	
Rotation (seen from pinion end)	Clockwise	
Starter drive ratio	9/127	
Number of poles	4	
Field winding	Compound	
Control	Lever and freewheel	
Operation	Through solenoid	
Bench Test Data		
Running torque at 20°C (68°F)		
— Current	760 to 900 A (*)	650 to 800 A (°)
— Torque	45 N (4.6 kgm, 33 ft lb)	38 N (3.9 kgm, 28 ft lb)
— Voltage	4 V	3.5 V
Light running torque at 20°C (68°F)		
— Current	60 to 90 A	
— Voltage	11.5 V	
— Speed	4800 to 6800 rpm	
Mechanical Data		
Brush spring load (not worn)	25.5 to 27.4 N (2.6 to 2.8 Kg or 5.7 to 6.2 lb)	
Armature end play	0.1 to 0.3 mm (0.004 to 0.012 in)	
Mica undercut depth	0.5 to 0.8 mm (0.020 to 0.032 in)	
Commutator diameter	42 mm (1.65 in)	
— Maximum wear limit	39.5 mm (1.55 in)	
— Maximum ovality of lamination pack	0.05 mm (0.0020 in)	
— Maximum ovality of commutator	0.03 mm (0.0012 in)	

(follows)

(*) Battery charged. (°) Battery discharged.

ELECTRICAL SYSTEM: Specification and Data

BATTERY

Type	Models 55-90 and 60-90	{	MARELLI 434395
	Early models 70-90 and 80-90		SCAINI 59270
	Late models 70-90 and 80-90	{	FIAT 12V 100AH 460A (●)
	Models 90-90 and 100-90. Late models (70-90 and 80-90 (optional))		MARELLI 6 ATM 25Z-A
Voltage			SCAINI 14046
			MARELLI 6ATM 25A
Nominal capacity (20 h discharge rate)	FIAT 12 V 100 AH 460 A	Ah	SCAINI 14047
	MARELLI 434395	Ah	FIAT 12 V 100AH 460 A (●)
	MARELLI 434470 ES	Ah	MARELLI 434470 ES (●)
	MARELLI 6ATM 25Z-A	Ah	
	MARELLI 6ATM 25A	Ah	
	MARELLI 456580 ES	Ah	
	SCAINI 59270	Ah	
	SCAINI 14046	Ah	
Max dimensions (length x width x height):			MARELLI 456580 ES (●)
— FIAT 12V 100 AH 460A(●)	mm		12V
— SCAINI 59270	mm		100 (●)
— MARELLI 434470 ES (●)	mm		88
— MARELLI 434395	mm		100 (●)
— SCAINI 14046 - SCAINI 14047 - MARELLI 6ATM 25Z-A- MARELLI 6ATM 25A	mm		110
— MARELLI 456580 E●	mm		132
			132 (●)
			92
			120
			140

● Maintenance-free battery.

FUSES

Eight 8 Amp, one 16 Amp and three 25 Amp fuses, housed in box		
Fuses	PROTECTED CIRCUITS	Ampère
1	Thermostarter or start-pilot	25
2	High beam and indicator	8
3	Low beam	8
4	Flood light - Front L.H. parking light - Rear R.H. parking light - Instrument panel light - Cab light.	8

(follows)

55-90 60-90
70-90 80-90
90-90 100-90

ELECTRICAL SYSTEM: Specification and Data

60**page 17****FUSES**

Fuses	PROTECTED CIRCUITS	Ampère
5	Front R.H. parking light - Rear L.H. parking light - Parking light indicator - Cigar lighter light.	8
6	Low engine oil level sending unit and indicator - PTO on indicator - Water temperature indicator - Fuel gauge - Battery charge indicator - Parking brake indicator - Differential lock indicator - Front wheel drive indicator - Tractor and trailer stop light circuit - Cigar lighter - Air cleaner restriction indicator and sending unit - Oil pressure sending unit and indicator - Auxiliary fuel tank reserve circuit and indicator (●)	8
7	Parking brake indicator circuit - Horn - Low brake fluid indicator.	8
8	Turn signals - Fuel sediment restriction indicator and sending unit	8
9	Cab circuits	25
10	Engine shutoff solenoid	8
11	Hazard warning light - Single pole power point	16
12	Cab circuits	25
Unprotected circuits: starting and generating circuits.		

(●) 90-90 and 100-90 only.

LIGHTING - SIGNALS - ACCESSORIES

Headlamps Asymmetric, high and low beam, 45/40 W, double filament, white or yellow.
Front lights: — Parking, 5W, white lens; — Turn signal, 21 W, orange lens;
Rear lights: — Parking light, 5 W, red lens; — Turn signal, 21 W, orange lens; — Stop, 21 W, red lens;— License plate light.
Floodlight, integral switch, 35 W, white
Reflex reflectors at rear.

(follows)

ELECTRICAL SYSTEM: Specification and Data

LIGHTING - SIGNALS - ACCESSORIES

(continued)

Indicators, 3 W

- Battery charge (red);
- Low engine oil pressure (red);
- Air cleaner restriction (red)
- Parking brake (flasher) (red);
- Parking lights (green);
- High beam (blue)
- Tractor turn signal lights (green);
- First trailer turn signal lights (green);
- Second trailer turn signal lights (green);
- Power take-off (yellow);
- Fuel sedimenter restriction (red);
- Low brake fluid (red);
- Low engine oil level (green);
- Floodlight (yellow);
- Differential lock (yellow)
- Front wheel drive (yellow);
- Auxiliary tank fuel reserve (yellow) (●).

Thermostarter or Start-pilot.

Cigar lighter

(●) 90-90 and 100-90 only.

STARTER SWITCH

CO BO, Type, 4-position, 50 A.	
Position	CIRCUIT COMPLETED
Position 0 30	Off.(●)
Position 1 30-15/54 57-58/57	Lighting switch - Fuel gauge - Water temp. gauge - Battery charge indicator - Low engine oil pressure indicator - Turn signal lights and indicators - Parking brake indicator - Tractor and trailer stop lights - Cigar lighter - Horn - Low brake fluid indicator - Engine shutoff solenoid - PTO indicator - Front wheel drive indicator - Air cleaner restriction indicator - Fuel Sedimeter restriction indicator - Thermostarter circuit - Auxiliary tank fuel reserve circuit (°).
Position 2 30-15/54-50 57-58/57	Lighting switch - Fuel gauge - Water temp. gauge - Battery charge indicator - Low engine oil pressure indicator - Turn signal lights and indicators - Parking brake indicator - Tractor and trailer stop lights - Cigar lighter - Horn - Low brake fluid indicator - Engine shutoff solenoid - PTO indicator - Front wheel drive indicator - Air cleaner restriction - Fuel sedimenter restriction indicator - Thermostarter circuit - Auxiliary tank fuel reserve circuit (°) - Starter.
Position 3 30-57	Front R.H. and rear L.H. parking lights - Front L.H. and rear R.H. parking light - Parking lights indicator - Instrument panel lights - Cigar lighter light - Floodlight switch enabling.

(●) Key removable - (°) Only 90-90 and 100-90.

55-90 60-90
70-90 80-90
90-90 100-90

ELECTRICAL SYSTEM: Specification and Data

60

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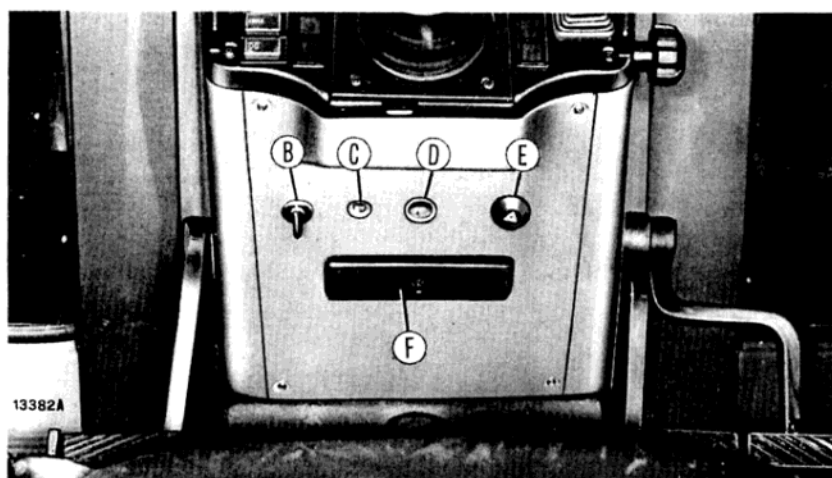
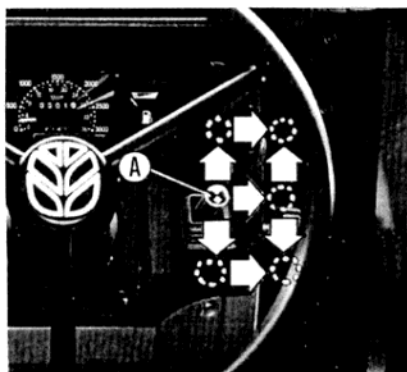
LIGHTING SWITCH (Integral Horn Push)

4 - position type,			
Positions		CIRCUITS COMPLETED	
Position 0			
V-T	D-H		
Position 1		Front R.H. and rear L.H. parking lights-Front L.H. and rear R.H. parking lights - Instrument panel light - Parking lights indicator - Floodlight switch enabling	
V-L	D-I		
Position 2		Front R.H. and rear L.H. parking lights-Front L.H. and rear R.H. parking lights - Instrument panel light - Parking lights indicator - Flood light switch enabling - Low/high beam switch enabling.	
L-G	I-U		

FLOODLIGHT SWITCH

3 position type.			
Positions		Circuit completed	
Position 0		Off.	
V-T	D-H		
Position 1		Cab rear floodlights - Rear floodlight and indicator.	
V-L	D-I		
Position 2		Cab rear floodlights - Rear floodlight and indicator - Cab front floodlights.	
L-G	I-U		

CONTROLS AND INSTRUMENTS



Control board

A. Lighting switch and horn push - B. Starter switch - C. Single-conductor power point - D. Cigar lighter - E. Hazard warning switch with indicator - F. Fuse box.

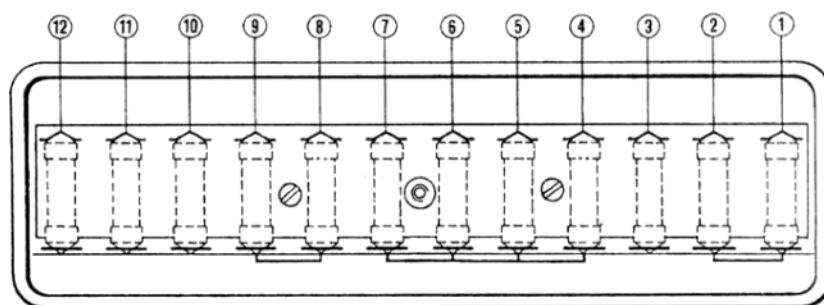
ELECTRICAL SYSTEM: Specification and Data

CONTROLS AND INSTRUMENTS



Instrument panel.

1. Battery charge indicator (red) - 2. Low engine oil pressure indicator (red) - 3. Air cleaner restriction indicator (red) - 4. Parking brake flashing indicator (red) - 5. Low brake fluid indicator (red) - 6. Water temperature gauge - 7. PTO indicator (yellow) - 8. Tractor meter - 9. Fuel gauge - 10. Fuel sedimenter restriction indicator (red) - 11. Parking light indicator (green) - 12. High beam indicator (blue) - 13. Tractor turn signal indicator (green) - 14. 1st trailer turn signal indicator (green) - 15. 2nd trailer turn signal indicator (green) - 16. Lighting switch - 17. Floodlight switch - 18. Engine oil level check pushbutton - 19. Thermostat or start-pilot switch - 20. Differential lock indicator (yellow) - 21. Floodlight indicator (yellow) - 22. Engine oil level indicator - (green) - 23. Front wheel drive indicator (yellow) - 24. Spare - 25. Spare - 26. Auxiliary fuel tank reserve indicator (yellow, 90-90 and 100-90 only) - 27. Spare - 28. Lighting switch and horn push.



Fuse Unit.

(For references see pages 16 and 17)

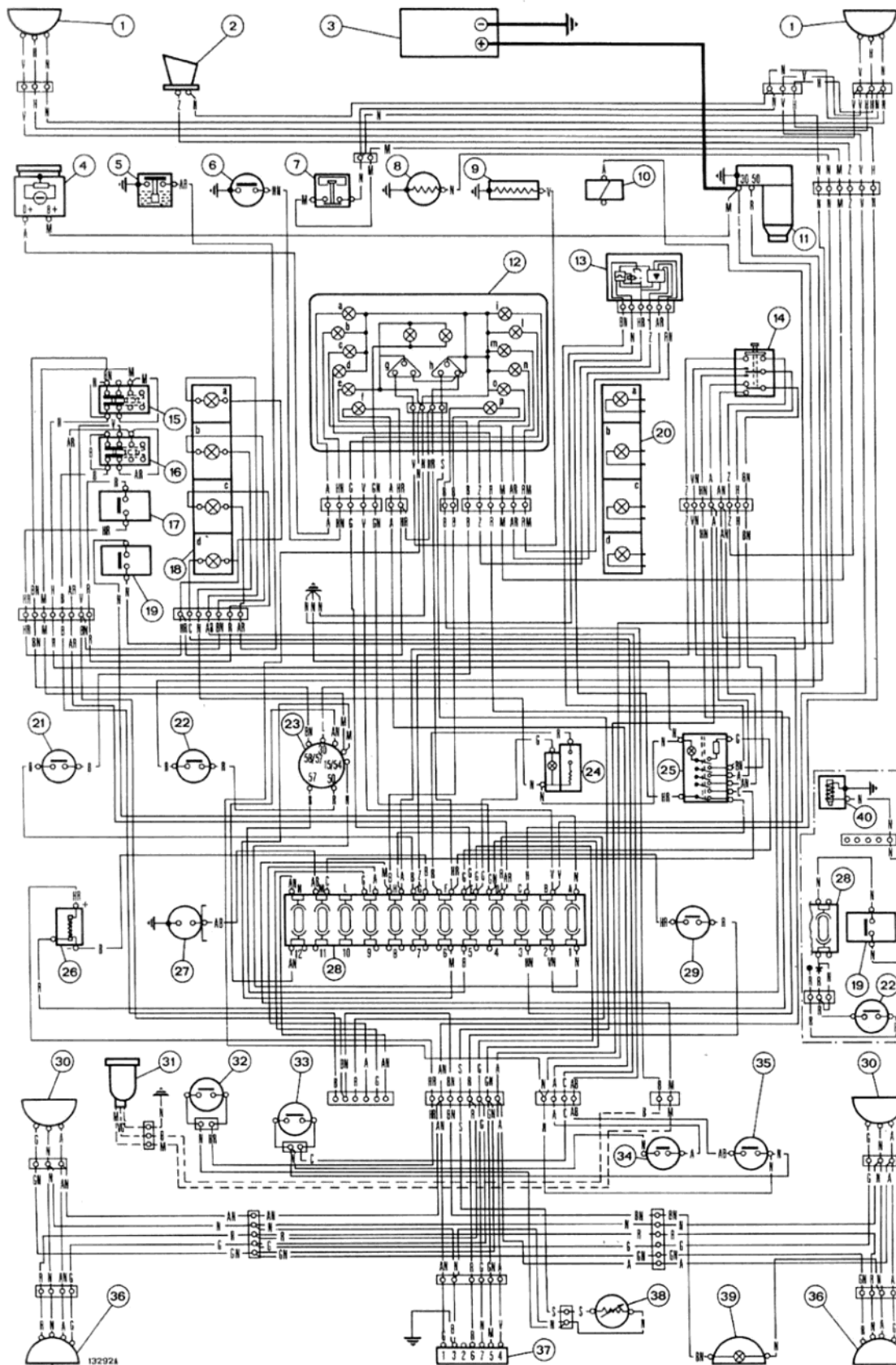
15445

55-90 60-90
70-90 80-90
90-90 100-90

ELECTRICAL SYSTEM: Specification and Data

60

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Fiat Trattori

Print No. 603.54.241.00 - III - 1986

WIRING DIAGRAM (Early models 55-90, 60-90, 70-90, 80-90)

NOTA - Detail shows installation of start-pilot device 40 which cannot be fitted together with thermostarter.

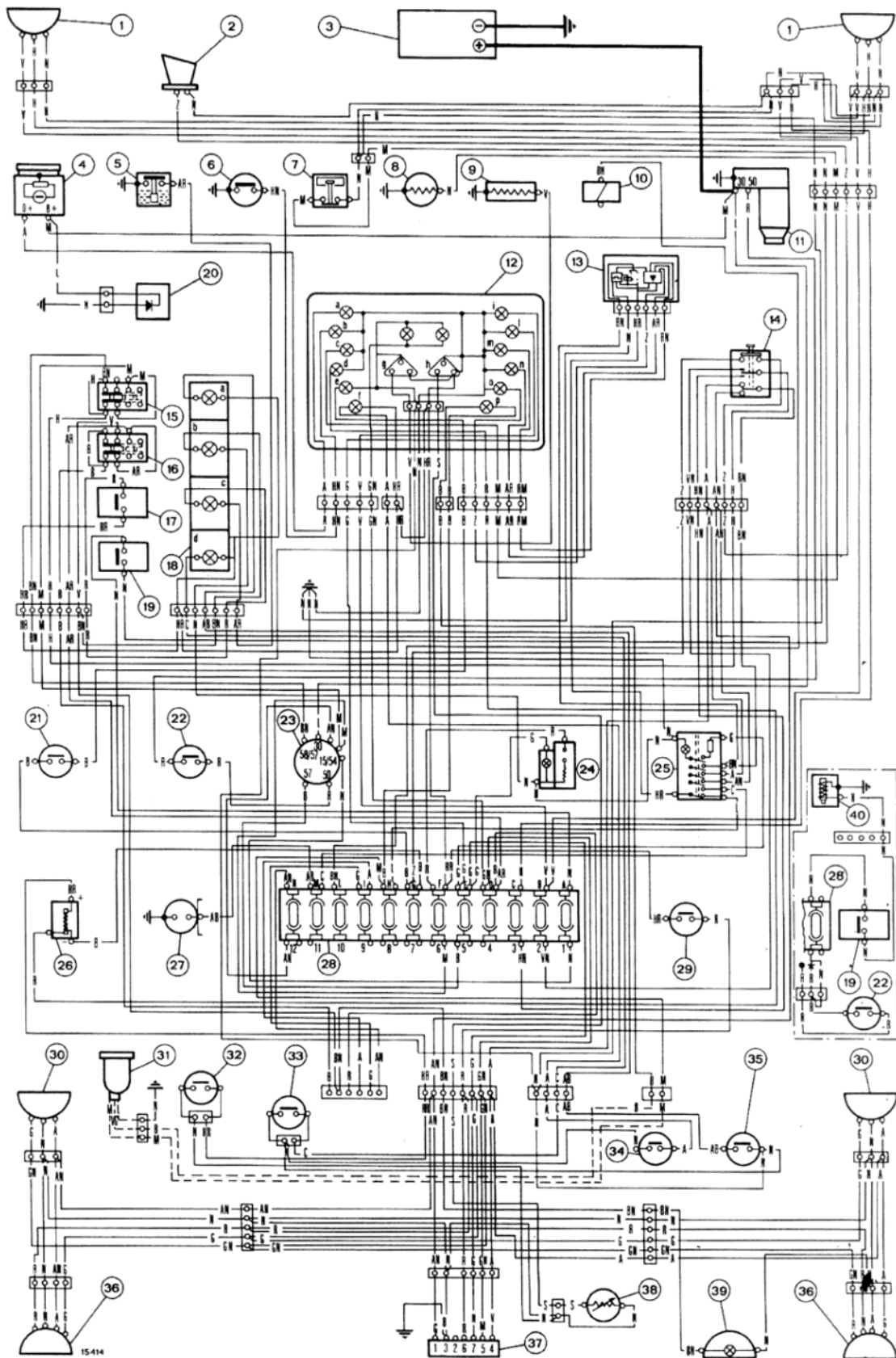
- ★ To starter connection 50.
- To starter switch connection 50.

1. Headlamps.
2. Horn.
3. Battery.
4. Alternator.
5. Low engine oil level sending unit.
6. Low engine oil pressure sending unit.
7. Air cleaner restriction sending unit.
8. Thermostarter.
9. Water temperature gauge sending unit.
10. Engine shutoff solenoid.
11. Starter.
12. Multiple gauge:
 - a. Battery charge indicator;
 - b. Low engine oil pressure indicator;
 - c. Air cleaner restriction indicator;
 - d. Parking brake indicator;
 - e. Brake fluid level indicator;
 - f. PTO indicator;
 - g. Water temperature gauge;
 - h. Fuel gauge;
 - i. Parking light indicator.
 - l. High beam indicator;
 - m. Tractor turn signal indicator;
 - n. 1st trailer turn signal indicator;
 - o. 2nd trailer turn signal indicator;
 - p. Fuel sediment restriction indicator (optional).
13. Hazard warning light and indicator.
14. Lighting switch and horn button.
15. Lighting switch.
16. Floodlight switch.
17. Engine oil level check pushbutton.
18. Indicator cluster (L.H.):
 - a. Differential lock;
 - b. Floodlight;
 - c. Engine oil level;
 - d. Front wheel drive.
19. Thermostarter or start pilot switch.
20. Indicator cluster (R.H.):
 - a. Spare;
 - b. Spare;
 - c. Spare;
 - d. Spare.
21. Low brake fluid sending unit.
22. Starter inhibitor switch.
23. Starter switch.
24. Cigar lighter.
25. Hazard warning light switch with indicator.
26. Parking brake flasher.
27. Single-conductor power point.
28. Fuse box.
29. Stop light switch.
30. Front parking lights and turn signals.
31. Fuel sediment filter.
32. Parking brake indicator sending unit.
33. Front wheel drive indicator sending unit.
34. PTO indicator sending unit.
35. Differential lock indicator sending unit.
36. Rear parking, turn signal and stop lights.
37. Seven-conductor power point.
38. Tank unit.
39. Rear floodlight.
40. Start-pilot (optional instead of thermostarter).

CABLE COLOUR CODE

A = Light blue	H = Grey	R = Red
B = White	L = Dark blue	S = Pink
C = Orange	M = Brown	V = Green
G = Yellow	N = Black	Z = Mauve

ELECTRICAL SYSTEM: Specification and Data



WIRING DIAGRAM (Late models 55-90, 60-90, 70-90 and 80-90)

NOTA - Detail shows installation of start-pilot device 40 which cannot be fitted together with thermostarter.

- ★ To starter connection 50.
- To starter switch connection 50.
- 1. Headlamps.
- 2. Horn.
- 3. Battery.
- 4. Alternator.
- 5. Low engine oil level sending unit.
- 6. Low engine oil pressure sending unit.
- 7. Air cleaner restriction sending unit.
- 8. Thermostarter.
- 9. Water temperature gauge sending unit.
- 10. Engine shutoff solenoid.
- 11. Starter.
- 12. Multiple gauge:
 - a. Battery charge indicator;
 - b. Low engine oil pressure indicator;
 - c. Air cleaner restriction indicator;
 - d. Parking brake indicator;
 - e. Brake fluid level indicator;
 - f. PTO indicator;
 - g. Water temperature gauge;
 - h. Fuel gauge;
 - i. Parking light indicator;
 - l. High beam indicator;
 - m. Tractor turn signal indicator;
 - n. 1st trailer turn signal indicator;
 - o. 2nd trailer turn signal indicator;
 - p. Fuel sediment restriction indicator (optional).
- 13. Hazard warning light and indicator.
- 14. Lighting switch and horn button.
- 15. Lighting switch.
- 16. Floodlight switch.
- 17. Engine oil level check pushbutton.
- 18. Indicator cluster (L.H.);
 - a. Differential lock;
 - b. Floodlight;
 - c. Engine oil level;
 - d. Front wheel drive.
- 19. Thermostarter or start pilot switch.
- 20. Voltage peak protection.
- 21. Low brake fluid sending unit.
- 22. Starter inhibitor switch.
- 23. Starter switch.
- 24. Cigar lighter.
- 25. Hazard warning light switch with indicator.
- 26. Parking brake flasher.
- 27. Single-conductor power point.
- 28. Fuse box.
- 29. Stop light switch.
- 30. Front parking lights and turn signals.
- 31. Fuel sediment filter.
- 32. Parking brake indicator sending unit.
- 33. Front wheel drive indicator sending unit.
- 34. PTO indicator sending unit.
- 35. Differential lock indicator sending unit.
- 36. Rear parking, turn signal and stop lights.
- 37. Seven-conductor power point.
- 38. Tank unit.
- 39. Rear floodlight.
- 40. Start-pilot (optional instead of thermostarter).

CABLE COLOUR CODE

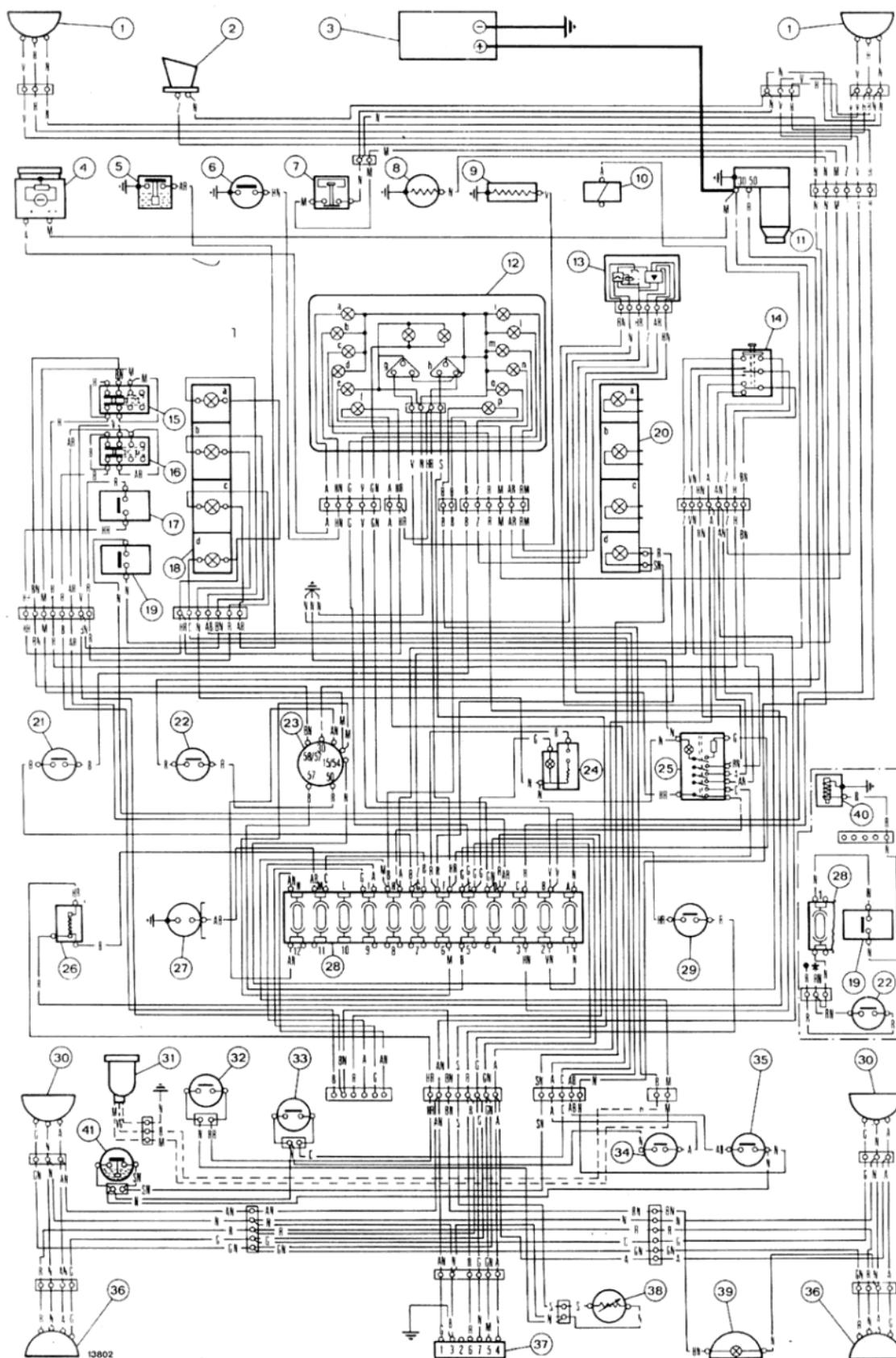
A = Light blue	H = Grey	R = Red
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C = Orange	M = Brown	V = Green
G = Yellow	N = Black	Z = Mauve

55-90 60-90
70-90 80-90
90-90 100-90

ELECTRICAL SYSTEM: Specification and Data

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WIRING DIAGRAM (Early models 90-90 and 100-90)

NOTA - Detail shows installation of start-pilot device 40 which cannot be fitted together with thermostarter.

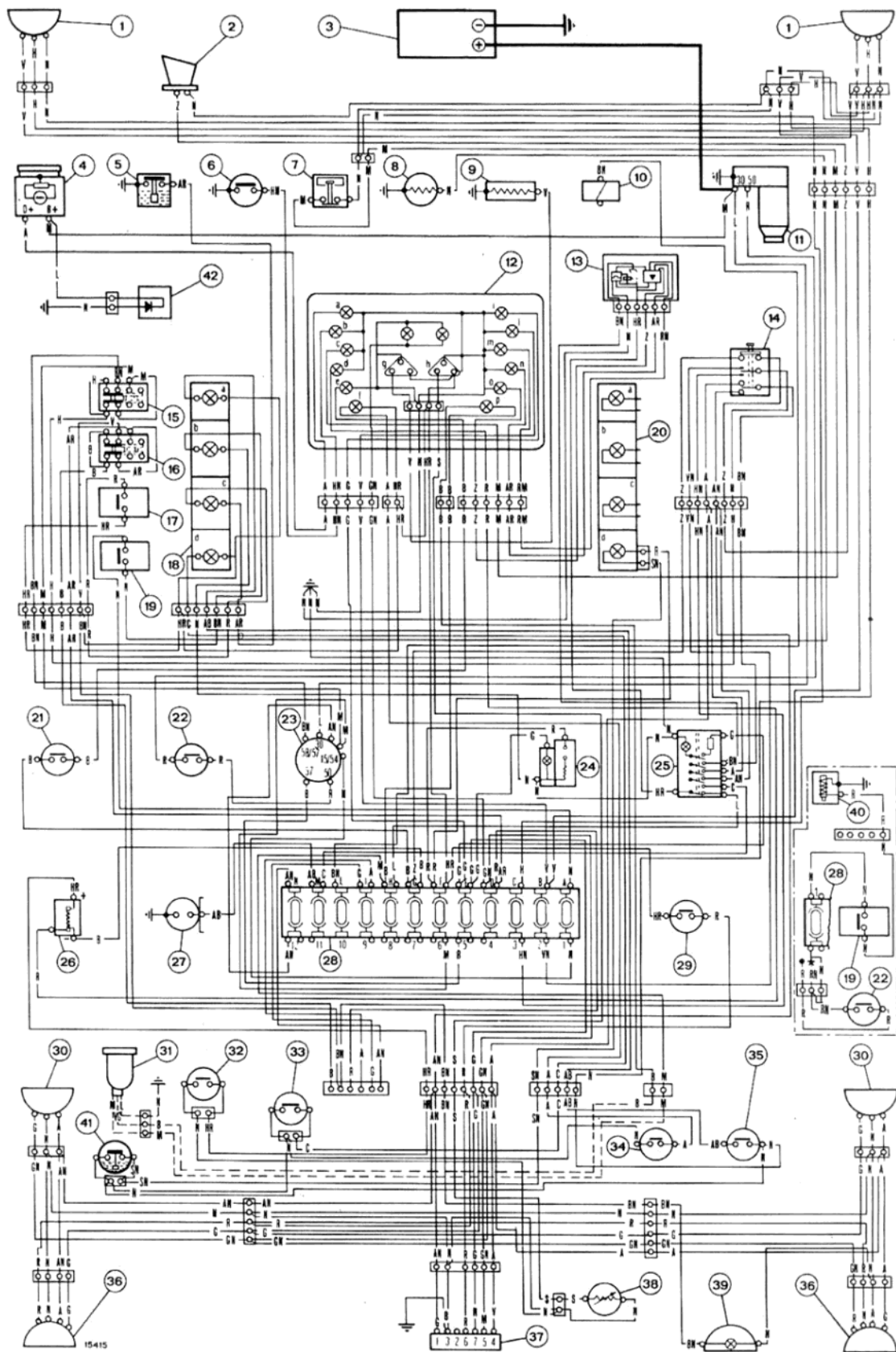
- ★ To starter connection 50.
- To starter switch connection 50.

1. Headlamps
2. Horn
3. Battery
4. Alternator
5. Low engine oil level sending unit
6. Low engine oil pressure sending unit
7. Air cleaner restriction sending unit
8. Thermostarter
9. Water temperature gauge sending unit
10. Engine shutoff solenoid
11. Starter
12. Multiple gauge:
 - a. Battery charge indicator;
 - b. Low engine oil pressure indicator;
 - c. Air cleaner restriction indicator;
 - d. Parking brake indicator;
 - e. Brake fluid level indicator;
 - f. PTO indicator;
 - g. Water temperature gauge;
 - h. Fuel gauge;
 - i. Parking light indicator;
 - l. High beam indicator;
 - m. Tractor turn signal indicator;
 - n. 1st trailer turn signal indicator;
 - o. 2nd trailer turn signal indicator;
 - p. Fuel sediment restriction indicator (optional).
13. Hazard warning light and indicator.
14. Lighting switch and horn button.
15. Lighting switch
16. Floodlight switch.
17. Engine oil level check pushbutton.
18. Indicator cluster (L.H.):
 - a. Differential lock;
 - b. Floodlight;
 - c. Engine oil lever;
 - d. Front wheel drive.
19. Thermostarter or start pilot switch.
20. Indicator cluster (R.H.):
 - a. Spare;
 - b. Spare;
 - c. Spare;
 - d. Auxiliary fuel tank reserve.
21. Low brake fluid sending unit
22. Starter inhibitor switch.
23. Starter switch.
24. Cigar lighter.
25. Hazard warning light switch with indicator.
26. Parking brake flasher.
27. Single-conductor power point.
28. Fuse box.
29. Stop light switch.
30. Front parking lights and turn signals.
31. Fuel sediment filter.
32. Parking brake indicator sending unit
33. Front wheel drive indicator sending unit.
34. PTO indicator sending unit.
35. Differential lock indicator sending unit
36. Rear parking, turn signal and stop lights.
37. Seven-conductor power point.
38. Tank unit.
39. Rear floodlight
40. Start-pilot (optional instead of thermostarter).
41. Auxiliary Fuel Tank reserve indicator sending unit.

CABLE COLOUR CODE

A = Light blue	H = Grey	R = Red
B = White	L = Dark blue	S = Pink
C = Orange	M = Brown	V = Green
G = Yellow	N = Black	Z = Mauve

ELECTRICAL SYSTEM: Specification and Data



WIRING DIAGRAM (Late models 90-90 and 100-90)

NOTA - Detail shows installation of start-pilot device 40 which cannot be fitted together with thermostarter.

- ★ To starter connection 50.
- To starter switch connection 50.

1. Headlamps.
2. Horn.
3. Battery.
4. Alternator.
5. Low engine oil level sending unit.
6. Low engine oil pressure sending unit.
7. Air cleaner restriction sending unit.
8. Thermostarter.
9. Water temperature gauge sending unit.
10. Engine shutoff solenoid.
11. Starter.
12. Multiple gauge:
 - a. Battery charge indicator;
 - b. Low engine oil pressure indicator;
 - c. Air cleaner restriction indicator;
 - d. Parking brake indicator;
 - e. Brake fluid level indicator;
 - f. PTO indicator;
 - g. Water temperature gauge;
 - h. Fuel gauge;
 - i. Parking light indicator;
 - l. High beam indicator;
 - m. Tractor turn signal indicator;
 - n. 1st trailer turn signal indicator;
 - o. 2nd trailer turn signal indicator;
 - p. Fuel sedimenter restriction indicator (optional)
13. Hazard warning light and indicator;
14. Lighting switch and horn button;
15. Lighting switch.
16. Floodlight switch.
17. Engine oil level check pushbutton.
18. Indicator cluster (L.H.):
 - a. Differential lock;
 - b. Floodlight;
 - c. Engine oil level;
 - d. Front wheel drive.
19. Thermostarter or start-pilot switch
20. Indicator cluster (R.H.):
 - a. Spare;
 - b. Spare;
 - c. Spare;
 - d. Auxiliary fuel tank reserve.
21. Low brake fluid sending unit.
22. Starter inhibitor switch.
23. Starter switch.
24. Cigar lighter.
25. Hazard warning light switch with indicator
26. Parking brake flasher.
27. Single-conductor power point.
28. Fuse box.
29. Stop light switch.
30. Front parking lights and turn signals.
31. Fuel sediment filter.
32. Parking brake indicator sending unit.
33. Front wheel drive indicator sending unit.
34. PTO indicator sending unit.
35. Differential lock indicator sending unit
36. Rear parking, turn signal and stop lights
37. Seven-conductor power point
38. Tank unit.
39. Rear floodlight.
40. Start-pilot (optional instead of thermostarter).
41. Auxiliary fuel tank reserve indicator sending unit.
42. Voltage peak protection.

CABLE COLOUR CODE

A = Light blue	H = Grey	R = Red
B = Grey	L = Dark blue	S = Pink
C = Red	M = Brown	V = Green
G = Yellow	N = Black	Z = Mauve

55-90 60-90
70-90 80-90
90-90 100-90

SERVICE TOOLS

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10 - ENGINE

291160 Pliers, piston ring
291048 Compressor, piston ring.

11 - Removal - Installation - Bench test.

290740/1 Hook, lift.
290090 Stand, rotary.
293860 Bracket set, use with rotary stand **290090**.
291309/1 Tester, compression (with dummy injector **293862**).

12 - Engine block - Cylinder head.

293864 Plate, sleeve removal (models 60-90, 80-90, 90-90).
292507 Plate, sleeve removal (models 55-90, 70-90, 100-90).
291501 Plate, sleeve installation.
292240 Tap (M12x1,75), injector sleeve.
(390425)
292243 Clean-up tool, injector sleeve.
(390771)
293784 Puller, injector sleeve.
(342137)
293742/2 Reamer set, injector sleeve.
293861 Burnisher, injector sleeve.
291113 Support fixture, cylinder head.
292248 Quadrant, cylinder head hold - down bolt angle tightening.
292913 Lathe, universal, valve seats.

13 - Valve gear.

293269 Reamer, camshaft bushings.
(390363)
292103 Remover-replacer set, camshaft bushings - use with **292208 (370008)**.
(360383)
292208 Handle.
(370008)
291046/1 Puller, engine valve guide.
(360409/1)
291177 Reamer, engine valve guide.
(390310)
292913 Lathe, universal, valve seats.
291780 Installer, exhaust and inlet valve guide (used with **291046/1**).
(360409/3)
291978 Reamer set, valve seats (instead of **292913**).
290064 Grinder, valve.
291050 Remover/replacer, valve spring.
291112 Support, valve.
291883 Wrench, valve clearance.
(350108)

14 - Crank gear.

291504 Puller, crankshaft pulley hub.

15 - Fuel system.

293780 Hand pump, injector calibration check.
293671 Cleaners, injectors.
293760 Support, injector removal/installation (BOSCH-CAV-OMAP).
293761 Wrenches, injectors.
293786 Wrench, injection pump pressure connections.

On-bench injection pump test equipment.

290239 Support, adjustable.
290756 Drive coupling.
290765 Delivery lines (6x2x850 mm).
290752 Plate, pump support.
293149 Test stand, injection pump.
292197 Dial gauge (1/100 mm, stroke 30 mm, dia. 60 mm).
291754 Dial gauge (1/100 mm, stroke 5 mm, dia. 40 mm).
291755 Gauge, injection pump assembly.
293410 Kit, on-tractor injection pump check.

BOSCH injection pump.

290664 Remover-replacer, rotor.
(365149)
290774 Gauge, distributing rotor stroke.
290779 Installer, O-ring.
290780 Remover, O-ring.
292548 Protector, O-ring.
291750 Extension, M8x1 (for use with **290774**).
292553 Remover, pressure regulating valve roll pin.
(342141)
292554 Protector, cam ring.
292555/1 Remover/replacer, pump shaft.
292557/1 Compressor, pressure regulating valve.
291747 Wrench, governor shaft.
(352142)
291748 Wrench, plug.
(352140)
291752 Gauge, excess fuel stroke.
291912 Wrench, governor support screw.
(352141)
291751 Tester, advance.
292197 Dial gauge (1/100 mm - stroke 30 mm - dia. 60 mm).

SERVICE TOOLS

292239 Installer, O-ring.
291749
(352139)

CAV injection pump.

290741 Guide, throttle lever spindle removal.
290744 Remover/replacer, transfer pump rotor
(use with torque wrench).
290745 Guide, start-retard O-ring replacer.
290746 Guide, advance plug O-ring replacer.
290757 Gauge, timing, pump flange.
290758 Remover/replacer, cam ring pin.
292249 Tester, advance.
292251 Wrench (TORX 15).
292252 Wrench (TORX 20).
292253 Wrench (TORX 25).
292254 Guide, drive shaft seal installation.
292822 Wrench, hydraulic head, capscrew.
293403 Gauge 0 to 1.5 bar (use with **293401**).
293405 Hose (use with **293401**).
292411 Pin, timing.
292414 Tester, feed pressure.
(365153)
292415 Connector, drain.
292430 Connector, inlet.
292439 Connector, pump leakage test.
292440 Plug, pump leakage test (use with
292249).
290742 Guide, shutoff and throttle lever shaft
seals.
290755 Pressure limiter, timing (use with
290284).
292794 Plug (use with **292249**).
292821 Plug (use with **292249**).

17 - Cooling system.

291182/1 Puller, water pump impeller.
291968 Tester set, coolant temperature.

20 - POWER TRAIN**22 - Clutch.**

292320 Stand.
291291/2 Kit, universal, overhaul (early model).
293650 Kit, universal, overhaul (late model).

291184 Centralizer/adjuster, with register
(55-90, 60-90, 70-90 and 80-90).
292176 Compressor, release lever test.
293763 Wrenches, P.T.O. clutch release lever
adjuster screw.
293375 Centralizer/adjuster, with register (90-90
and 100-90).
293802 Register, use with **293375** (90-90 and
100-90).

23 - Transmission and splitter.

290086 Stand rotary.
291517 Hook, lift.
292888 Guide pins, clutch housing removal/in-
stallation.
293868 Brackets, use with **290086** (55-90, 60-90,
70-90 and 80-90).
290092 Brackets, use with **290086** (90-90 and
100-90).
293343/2 Wrench, driven shaft nut (90-90 and
100-90).
293662 Remover, drive shaft (90-90 and 100-90).
293510 Adjuster, universal, driven shaft bearing
(90-90 and 100-90).
293339/1 Adjuster, driven shaft bearing (90-90 and
100-90).
293659 Adjuster, drive shaft bearing (90-90 and
100-90).
293427/1 Wrench, torque, drive shaft (90-90 and
100-90).
291898 Installer, reverse shaft bearings.

25 - Bevel drive and differential.

291517 Hook, lift.
293400/1 Gauge, bevel pinion position.
293452 Compressor, differential lock fork spring.
291525 Installer, differential supports.
293806/1 Wrench, bevel pinion nut (90-90 and
100-90).
293510 Adjuster, universal, bevel pinion bearing
(90-90 and 100-90).
293340/1 Adjuster, bevel pinion bearing (90-90
and 100-90).
293757/2 Installer, bevel pinion seal (use with
293800, 90-90 and 100-90).

55-90 60-90
70-90 80-90
90-90 100-90

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27 - Final drives.

292400 Hook, lift, rear wheels.
293781 Support, removal/installation.
292179 Guide pin, wheel weight installation (90-90 and 100-90).

28 - Power take-off.

293812 Pins, PTO unit.
293834 Guard, PTO shaft installation (55-90, 60-90, 70-90 and 80-90).
291928 Installer, PTO shaft needle roller bearings (55-90, 60-90, 70-90 and 80-90).

30 - FRONT AXLE - STEERING

31 - Axle.

292927 { Puller, slide hammer, with hinge pin
290793 { adapter (M12x1,25).

32 - Power steering.

293388 Installer, O-ring.
293389 Installer, rotary valve spring.
293390 Retainer, rotor.
293300 Kit pressure gauge (use with **293160**).
291182/1 Puller, steering wheel.

Steering hydraulic test equipment.

291231 Tester, pump output.
293005 Tank.
291235 Electric motor (6-10 HP).
or
292150 Electric motor (9-15 HP).
290385 Union.
293165 Hydraulic pump.
293723 Support.
292256 { Brackets (use with **293723**).
292257 {
292724 Screw (2 off).
293192/1 Wrench, rotary valve.
290445 Pipe, suction.

290448 { Adapter, suction pipe.
290540 {
293316 Adapter (2 off), suction and delivery pipes.
290544 Pipe, delivery.
292146 Connector, 3-way.
290541 Adapter.
290447 Pipe, return.
293315 Plug (2 off).
293721 Connection, oil drain.
292775 Pipe, oil drain.

40 - FRONT WHEEL DRIVE

41 - Front axle.

292116 Hook, lift.
293782 Wrench, front axle bevel pinion - 55-90 DT/60-90 DT (use with **293785**).
293785 Wrench, front bevel pinion lock ring 55-90 DT/60-90 DT (use with **293782**).
291525 Pins, planetary final drive cover installation (55-90, 60-90, 70-90 and 80-90).
292888 Pins, planetary final drive cover installation (90-90 and 100-90).
293812 Pins, front wheel installation.
293460 Stand, front axle overhaul.
(322215)
293836 Guard, axle drive shaft seal installation (55-90, 60-90, 70-90 and 80-90).
293743 Support, differential bevel pinion housing.
293524/1 Wrench, bevel pinion bearing lockring and rotating torque check (Models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT)..
293520/2 Wrench, bevel pinion bearing lockring and rotating torque check (Models 55-90 DT and 60-90 DT)..
293400/1 Gauge, bevel pinion position (use with **293438/2** or **293510**).
293510 Adjuster, universal, bevel pinion bearing.
293438/2 Adjuster, bevel pinion bearing.
293544 Wrench, differential bearing lockring (Models 55-90 DT and 60-90 DT).
293665 Wrench, differential bearing lockring (Models 70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT).
293837 Wrench, wheel bearing lockring (Models 55-90 DT and 60-90 DT).
293702 Wrench, wheel bearing lockring (Late models 70-90 DT and 80-90 DT, models 90-90 DT and 100-90 DT).
293519/1 Wrench, wheel bearing lockring (early models 70-90 and 80-90).
292220/3 Tester, bearing rotating torque.

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203601	Forcing screws, hub bearing race (70-90 DT, 80-90 DT, 90-90 DT and 100-90 DT).
293435	Tester, bearing rotating torque (early models 70-90 DT and 80-90 DT).
291517	Hook, differential (90-90 and 100-90).
293705	Wrench, wheel bearing lockring (90-90 DT and 100-90 DT).
293857	Puller, axle pivot.
292161	Puller, pivot bearing outer race.

50 - LIFT UNIT**51 - Lift.**

292607	Adapter, lift hook (use with 291359/2).
291359/2	Hook, lift (use with 292607).
290284	Pump, hand, valve adjustment.
293300	Tester, pressure, universal (pressure gauges and connectors).
293843	Installer, piston with lift seal (Models 55-90 and 60-90).
291483	Installer, piston with lift seal (Models 70-90, 80-90, 90-90 and 100-90).
293384 { 293842	Protector/installer, lift cross shaft seal.
290828	Adapter, cylinder safety valve adjustment (use with 290284).
290824	Adapter, relief valve adjustment (use with 290284).
293849	Adapter, control valve spool leakage check (use with 290284).
291862	Wrench, cylinder safety valve adjustment.
291863	Wrench, relief valve adjustment.
291215	Hook, link - control valve lever retaining spring.
293839	Installer, needle roller bearing.
293838	Installer, needle roller bearing.
292247	Installer, needle roller bearing (90-90 and 100-90).
293846	Adjuster, lift draught and position control.
293845/1	Adjuster, lift draught control (with 293846).
293870	Adjuster, arm max lift.
293858	Protection, spool seal installation.
292650	Bench, lift test.
293851	Tank.
293852	Union.
293853	Pipe.
293854	Pins and bushings

52 - Lift pump A31 and C25XRP (section 32).

291231	Tester, output, large, complete with:
290419	- Union, inlet;
290418	- Union, outlet (A31);
290448	- Adapter, inlet;
290445	- Pipe, inlet;
290447	- Pipe, delivery;
293553	- Union, delivery (C25XRP);
290541	- Adapter, delivery (C25XRP).
292150 { or 291235	Motor, electric, pump drive, complete with:
290385	- Coupling, drive.

54 - Remote control valves.

291231	Tester, output, large, complete with:
292150 { or 291235	- Electric motor;
293005	- Tank;
293165	- Hydraulic pump;
290385	- Union;
293548/1	- Valve support;
292256	- Bracket;
292257	- Bracket;
290469/1	- Support;
293539	- Burette;
290448	- Reduction;
290445	- Pipe;
290419	- Inlet pipe;
293556	- Screw;
293316	- Reduction;
290544	- Pipe;
293564	- Connection;
290503	- Reduction;
290378	- Drain pipe;
290541	- Reduction;
290447	- Return pipe;
293552	- Plug;
292151	- Plug;
293562	- Plug;
293553	- Connection;
290424	- Pipe;
293549	- Ball union;
292146 { or 290475	- Connection, 3-way;
293547	- Reduction;
292152	- Reduction;
293550	- Connection

55-90 60-90
70-90 80-90
90-90 100-90

SERVICE TOOLS

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60 - ELECTRICAL SYSTEM

290623 Support, alternator bench test..

FIAT CAB

292109 Pair of hooks, FIAT cab and platform lifting (with **293769**).

293774 Installer, FIAT cab door hinge outer seal.

293512 Torque wrench, FIAT cab rear window.

293822 Vacuum and loading station for air conditioning system.

293823 Detector, acoustic, gas leaks.

293831 Cleaner - adjuster, evaporator and condenser fins.

293826 Athermic tape, air conditioning system expansion valve.

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