FIATAGRI

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1st Revision of the Workshop Manual

for Models: 115-90 Turbo, 130-90 Turbo, 140-90 Turbo, 160-90 Turbo, 180-90 Turbo
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FIAT

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CONTENTS

GENERAL: Contents

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

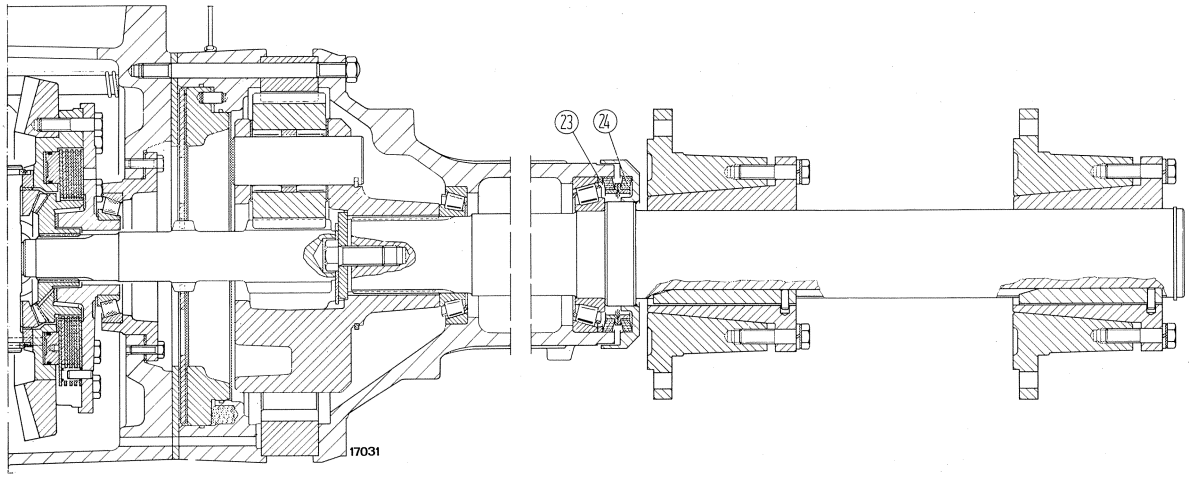
On the mating surfaces indicated with X apply one of the following sealing compounds: RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET.
Before applying the sealing compound, prepare the surfaces as follows:
— Using a wire brush, remove any deposit.
— Thoroughly degrease using one of the following detergents: Solvent, kerosene or hot water/soda solution.

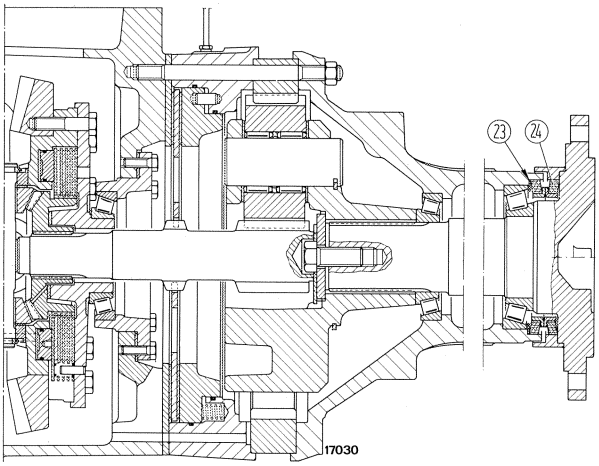
BEARINGS

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.





Longitudinal section through RH side final drives for Ricefield Tractors.
NOTE - Only the differences over the basic version (Sect. 27, page 1-3) are provided here.

23. Spacer - 24. Seal.

SIDE FINAL DRIVES DISASSEMBLY/ASSEMBLY

Proceed as instructed on pages 1-2, Sect. 27.

For twin-wheeled tractors proceed as instructed on page 3, Sect. 27: note that on the ricefield version seal (24) is not carried in a special bushing (17, page 3, Sect. 27) as with the normal service twin wheeled tractors.

To remove this seal on ricefield tractors it will also be necessary to first take down the side final drive housing as instructed on pages 1 and 2, Sect. 27 (On normal service twin-wheeled tractors this seal can be removed with final drive housings in place).

DRIVE SHAFT DISASSEMBLY/ASSEMBLY

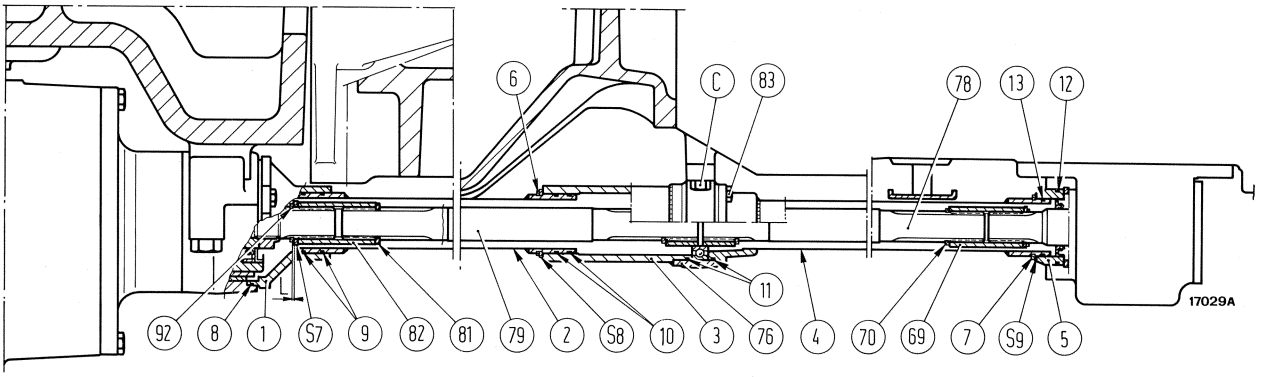
Proceed as follows:

— Remove retaining ring (6, page 20) and shift the front water-tight seal towards the rear end.

— Remove retaining ring (81) and shift splined sleeve (82) towards the rear.

— Backout screw (C) securing the central pillow block (76) complete w/bearing; remove drive shafts (78 and 79) complete with associated water-tight seals (2 and 4) and take down pillow block (76).

Inspect accurately the splined mating faces of shafts and associated sleeves, then check central support ball bearings for good condition.



Ricefield Tractor drive shaft sections.

Note - Only the differences over the basic version (pages 6 and 10, Sect. 42) are listed here.

C. Drive shaft central pillow block retaining screws - L_1 = 1.2 to 1.7 mm (0.0472 to 0.0670 in) front splined sleeve end play. S_7 - Front sleeve adjuster ring. S_8 - Front seal adjuster rings - S_9. Rear seal adjuster rings - 1. Axle drive shaft water-tight seal sleeve - 2. Drive shaft rear water-tight seal - 3. Drive shaft rear water-tight seal front flange - 4. Drive shaft rear water-tight seal - 5. Axle drive case water-tight seal bushing - 6, 7, 70, 81, 92. Retaining rings - 8, 9, 10, 11, 12, 13. O-rings - 69. Rear splined sleeve - 76. Central pillow block and bearing assembly - 78, 79. Front and rear drive shafts - 82. Front splined sleeve - 83. Screws retaining the rear water-tight seal on pillow block (76).

Replace O-rings (8, 9, 10, 11, 12 and 13) or, in any case, check for efficiency.

Reassemble drive shafts and relevant water-tight seals.

Next, adjust as follows:

— Move front splined sleeve (82) against its retaining ring (81), check by feeler gauge the gap resulting between sleeve and retaining ring (92) then fit an adjuster ring (S_7) having such thickness as to leave an end play L_1 = 1.2 to 1.7 mm (0.0472 to 0.0670 in) for sleeve.

— Shift front water tight seal (2) into contact with sleeve (1) and, using a feeler gauge, measure the gap between front flange (3) and retaining ring (6); next, fit an adjuster ring (S_8) having such thickness as to take up nearly all the clearance (as close to 0 as possible) without however contributing any pre-load.

— Shift rear water-tight (4) into contact with central pillow block (76) and using a feeler gauge measure the gap between rear bushing (5) and retaining ring (7); next, fit an adjuster ring (S_9) having such thickness as to takeup nearly all the clearance (as close to 0 as possible) without however contributing any pre-load.

SPECIFICATIONS: 160-90 Turbo and 180-90 Turbo with late model engine

The engine equipping the **160-90 Turbo** (from frame 317820 for mechanical transmission tractors and from frame 317825 for POWER-SHIFT transmission tractors) and the **180-90 Turbo** (from frame 265251 for mechanical transmission tractors and from frame 265250 for POWER SHIFT transmission tractors) was subjected to modifications some of which are dealt with below.

	160-90 Turbo and 160-90 Turbo DT	180-90 Turbo and 180-90 Turbo DT
Make and design	FIAT turbo-charged	FIAT turbo-charged
Identifications code - Mechanical transmission tractors	8365.25.513 (FIAT pump)	8365.25.512 (FIAT pump)
Identifications code - POWER SHIFT transmission tractors	8365.25.515 (BOSCH pump)	8365.25.514 (BOSCH pump)
ENGINE		
Compression ratio	15.8 to 1	
Valve gear		
Inlet opens B.T.D.C.	11°	
Inlet closes A.B.D.C.	27°	
Exhaust opens B.B.D.C.	55°	
Exhaust closes A.T.D.C.	17°	
Valve clearance (cold) for timing checks	0,44 mm (0.0173 in)	
Injection pump	PES 6A 90D 410 RF 309 - 4834322	PES 6MW 100 - 4843739

Note - Late model 160-90 Turbo engines are fitted with piston cooling oil spray nozzles (standard equipment on the 180-90 Turbo engines).
Consequently, the lubrication system schematics given on page 3, Sect. 16, applies only to the early model 160-90 Turbo engines.
For the late model 160-90 Turbo engine (with piston cooling oil spray nozzles) refer to the schematics on page 4, Sect. 16.

Important - On late model engines the oil sump sealing is ensured by an O-ring plus jointing compound; on early model engines, sealing was obtained by jointing compound only.
On reassembly of late model engine sumps, proceed as follows:
— Clean and degrease the mating surfaces accurately.
— Apply SILASTIC 7091 bonding agent in the seat provided around sump then fit the O-ring.
— Apply LOCTITE 510 sealant on mating surfaces avoiding the sump-to-engine fastener threaded holes.
— Wet front/rear cover, rear cushion mount and sump to engine screws with oil to prevent "bonding" of screws.
— Finally, assemble the parts involved and tighten the screws provided to the specifired torques.

MODEL 160-90 Turbo - CALIBRATION DATA - W ALTECNA INJECTION PUMP TYPE PES6A90D 410 RF 309-483422 (from frame no. 317820)

Assembly data

Pump rotation (drive end) ..... clockwise
Firing order 1-5-3-6-2-4
Plunger lift to spill cut-off ..... 2.75 to 2.85 mm (0.108 to 0.112 in)
Pump timing, cylinder no. 1 in compression stroke ..... 23° ± 0.5° B.T.D.C.

Test plan

Test bench as per ISO 4008/1 and /2
Injectors as per ISO 7440 A11 - 1688901019 - u/pad 1680103098
Test fluid: ISO 4113 at 40° ± 2° C
Gaduate drain time: 30″
Fuel pressure: 1.5 to 1.8 bar (kg/cm^2) or 22 to 26 PSI
Release pressure: 172 to 175 bar (175 to 178 kg/cm^2 or 2485 to 2527 PSI)
Pipes: 6 × 2 × 600 mm as per ISO 4093.2

PUMP CALIBRATION DATA

Speed rpm	Rack stroke mm	Delivery per injector	Spread	Notes
		cm^3/100 shots		
1100 300	11.35 to 11.45 8.0 to 8.2	8.15 to 8.25 0.70 to 1.30	0.3 (0.45) 0.2 (0.40)	

SPEED GOVERNOR CALIBRATION DATA

Maximum		Idle		Notes
Speed rpm	Rack stroke mm	Speed rpm	Rack stroke mm	
1115 to 1135 1240 to 1280 1310	10.4 4 0 to 1.0	100 200 300 300 to 400	10.4 9.5 8.1 ([1]) 2 ([2])	[1] Actuating the control lever from idle to max (LDA pressure = 0.7 bar or psi). [2] Actuating the control lever from idle to max with solenoid energized.

CALIBRATION DATA - PUMP WITH GOVERNOR

Max. delivery		Speed limitation rpm	Intermediate delivery		Starting delivery		Max. fuel stroke	
Speed rpm	Delivery per injector cm^3/1000 shots		Speed rpm	Delivery per injector cm^3/1000 shots	Speed rpm	Delivery per injector cm^3/1000 shots	Speed rpm	Rack stroke mm
1100	81.5 to 82.5 (79.5 to 84.5)	1115 to 1135 (*)			100	140 to 160	1100 900	11.3 to 11.4 11.4 to 11.5
700	86 to 88 (84 to 90)						700 500	12.0 to 12.1 12.1 to 12.2
500	78 to 80 (76 to 82)							

Note: Test values in brackets; (*) Rack stroke 1 mm less than above.

VALVE GEAR

	115-90, 130-90 Turbo, 140-90 Turbo		160-90 Turbo, 180-90 Turbo	
	mm	in	mm	in
Valve Timing Gears				
Timing gear backlash	.160	.006	.08	.0031
Idler gear jack shaft diameter	36.975 to 37.000	1.456 to 1.457	49.975 to 50.000	1.9675 to 1.9685
Idler gear bushing fitted I.D. after reaming	37.050 to 37.075	1.459 to 1.460	50.050 to 50.075	1.9705 to 1.9714
Jack shaft journal clearance in bushing	.050 to .100	.0020 to .0040	.050 to .100	.0020 to .0040
— maximum wear clearance	.15	.0060	.15	.0060
Bushing interference fit in idler gear	.063 to .140	.0025 to .0055	.066 to .142	.002 to .006
Steering and lift pump 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 bushings	.050 to .100 mm (.0020 to .0040 in)			
Bushing interference fit in housing	.063 to .140 mm (.0025 to .0055 in)			
Camshaft				
Camshaft bushing O.D. 115-90, 130-90 Turbo and 140-90 Turbo				
— Front	55.375 to 55.430	2.180 to 2.182	—	—
— Front intermediate	54.875 to 54.930	2.1604 to 2.1626	—	—
— Rear intermediate	54.375 to 54.430	2.1407 to 2.1429	—	—
— Rear	53.875 to 53.930	2.1211 to 2.1232	—	—
160-90 Turbo and 180-90 Turbo	—	—	52.098 to 52.136	2.0511 to 2.0526
Bushing interference fit in housing	.070 to .150	.0027 to .0060	.073 to .136	.003 to .005
Camshaft bushing fitted I.D. after reaming 115-90, 130-90 Turbo and 140-90 Turbo				
— Front	51.580 to 51.630	2.030 to 2.032	—	—
— Front intermediate	51.080 to 51.130	2.6110 to 2.0130	—	—
— Rear intermediate	50.580 to 50.630	1.9913 to 1.9933	—	—
— Rear	50.080 to 50.130	1.9716 to 1.9736	—	—
160-90 Turbo and 180-90 Turbo	—	—	49.055 to 49.090	1.9313 to 1.9327
Camshaft journal diameter 115-90, 130-90 Turbo and 140-90 Turbo				
— Front	51.470 to 51.500	2.0264 to 2.0275	—	—
— Front intermediate	50.970 to 51.000	2.0067 to 2.0079	—	—
— Rear intermediate	50.470 to 50.500	1.9870 to 1.9882	—	—
— Rear	49.970 to 50.000	1.9673 to 1.9685	—	—
160-90 Turbo and 180-90 Turbo	—	—	48.950 to 48.975	1.9272 to 1.9281
Camshaft journal clearance in bushing	.080 to .160	.0030 to .0063	.080 to .140	.003 to .005
Maximum wear clearance	.20	.008	.20	.008
Camshaft end float (thrust plate to associated seat in camshaft)	.070 to .220	.0027 to .0087	.060 to .110	.002 to .004

(follows)

VALVE GEAR

(continued)

	115-90, 130-90 Turbo, 140-90 Turbo		160-90 Turbo, 180-90 Turbo	
	mm	in	mm	in
Tappets				
Tappet O.D.	14.950 to 14.970	.5886 to .5894	26.939 to 26.960	1.0606 to 1.0614
Tappet clearance in housing on engine block	.030 to .068	.0012 to .0027	.040 to .094	.0016 to .0037
— maximum wear clearance	.15	.006	.15	.006
Tappet oversize	.1-.2-.3	.004-.008-.012	.3-.4-.5	.012-.016-.020
Rockers				
Rocker bushing O.D.	21.006 to 21.031	.8270 to .8280	—	—
Rocker bore diameter	20.939 to 20.972	.8244 to .7902	—	—
Bushing interference fit in rocker	.034 to .092	.0013 to .0036	—	—
Rocker bracket bore diameter	18.016 to 18.034 (1)	.7093 to .7100 (1)	21.050 to 21.080	.8287 to .8299
Rocker shaft diameter	17.982 to 18.000	.7079 to .7087	21.015 to 21.036	.8273 to .8281
Rocker shaft clearance in bracket	.016 to .052	.0006 to .0020	.014 to .065	.0005 to .0026
— maximum wear clearance	.15	.006	.15	.006
Rocker spacer spring length				
— free	59.5	2.3425	96	3.7795
— under				
– 46 to 52 N, 4.7 to 5.3 kg (10.4 to 11.7 lb)	44	1.72323	—	—
– 25 N, 2.5 kg (5.5 lb)	—	—	62	2.4409
Valves, guides and springs				
Valve head diameter				
— Inlet	45.300 to 45.500	1.783 to 1.791	48.200 to 48.500	1.898 to 1.909
— Exhaust	37.500 to 37.750	1.476 to 1.486	40.700 to 41.000	1.6023 to 1.6141
Valve stem diameter	7.985 to 8.000	.3144 to .3149	7.945 to 7.960	.3128 to .3134
Valve face angle				
— 115-90, 130-90 Turbo and 140-90 Turbo — Inlet	60°30′ ± 7′		—	
— 115-90, 130-90 Turbo and 140-90 Turbo — Exhaust	45°30′ ± 7′		—	
— 160-90 Turbo and 180-90 Turbo	—		45°15′ to 45°20′	
Valve clearance				
— Timing check	.45	.0177	.41	.0161
— Normal (cold or warm)				
— inlet	.25	.0100	.30	.0118
— exhaust	.35	.138	.50	.0197
Useful cam lift				
— inlet	5.250	.2067	7.04	.277
— exhaust	5.677	.223	6.84	.269
Valve lift				
— inlet	9.31	.366	12.46	.490
— exhaust	10.07	.396	12.10	.476

(follows)

(1) Fitted and reamed.

— Hold the injection pump in shuft-off condition and take the readings cranking the engine through the starter.

Compression should be as follows as recorded at 40° C sump oil temperature, 760 mm Hg (sea level) barometric pressure with the engine running at 200 to 280 rpm.

— Min. 26.5 bar (27 kg/cm^2, 384 psi) 115-90.
— Min. 24.5 bar (25 kg/cm^2, 355 psi) 130-90 Turbo.
— Min. 24.5 bar (25 kg/cm^2, 355 psi) 140-90 Turbo.
— Min. 24.5 bar (25 kg/cm^2, 355 psi) 160-90 Turbo.
— Min. 24.5 bar (25 kg/cm^2, 355 psi) 180-90 Turbo.

The minimum acceptable compression is:

— 21.5 bar (22 kg/cm^2, 313 psi) 115-90.
— 19.5 bar (20 kg/cm^2, 284 psi) 130-90 Turbo.
— 19.5 bar (20 kg/cm^2, 284 psi) 140-90 Turbo.
— 22.5 bar (23 kg/cm^2, 326 psi) 160-90 Turbo.
— 22.5 bar (23 kg/cm^2, 326 psi) 180-90 Turbo.

Maximum compression differential between cylinders is not to exceed 3 bar, kg/cm^2 (42.7 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 liners 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.

REMOVAL

— Apply parking brake, chock rear wheels and remove front ballast weights.

— Drain the cooling system and remove front and rear side panels, exhaust silencer and top center engine cover.

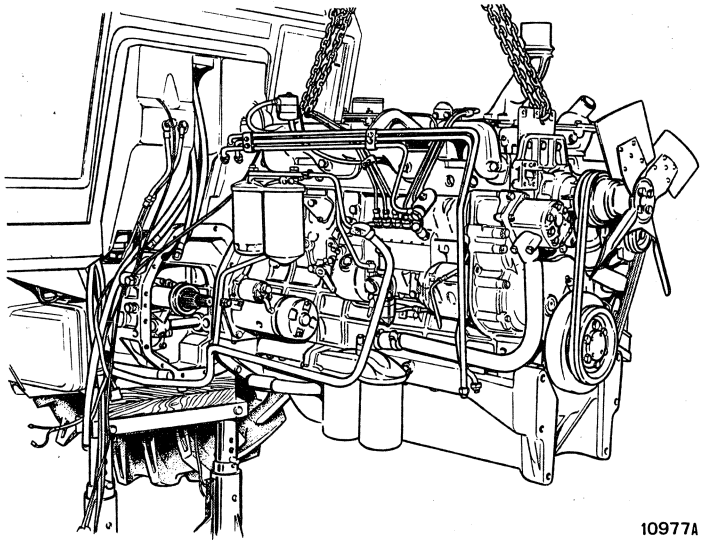
— Disconnect battery, starter, front light and horn leads.

— Remove grill and front engine cover and lift off the battery.

— Remove battery support and side members.

— Disconnect radiator rubber hose, remove air cleaner with hoses and support.

— Disconnect hose from hydrostatic steering pipe both on power steering cylinder and platform, and rubber hose upstream of filter from steering suction line. For 160-90 Turbo and 180-90 Turbo, remove lines connecting oil cooler and transmission housing.



Removing (installing) engine using lift hook 290740/1.

— Drain rear drive housing.

— Disconnect accelerator link, engine shut-off cable from injection pump and tractormeter angle drive, fuel delivery and leak-back lines and lift inlet and outlet lines.

— Wherever possible, remove radiator.

— On DT versions, remove drive shaft with guard and front differential lock delivery line.

— For 160-90 Turbo and 180-90 Turbo, remove lines connecting transmission housing with oil cooler. On heated cab versions, disconnect water inlet and outlet lines to cab. On air conditioned versions disconnect lines from connectors with valves.

— Position stand under engine oil pan, placing two wooden wedges between front axle and support.

— Using two slings **293769**, hoist front axle support, remove six screws and separate front axle from engine, acting on front wheels.

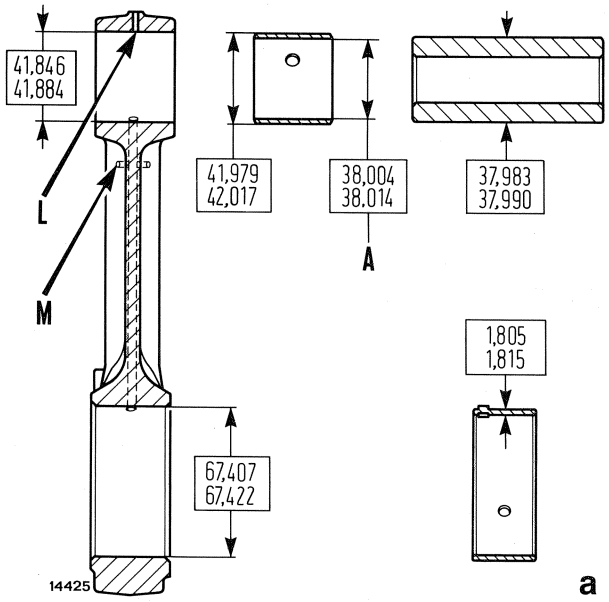
— Hoist the engine using lift hook **290740/1** as shown on page 3, remove screws and bolts retaining engine to transmission and separate engine from transmission.

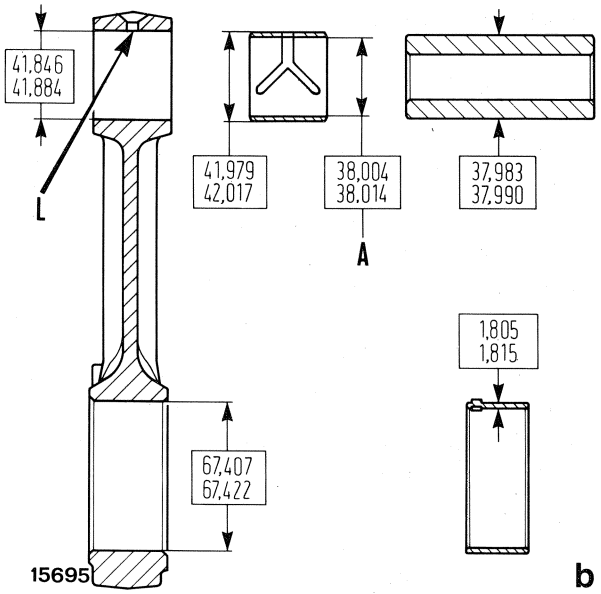
INSTALLATION

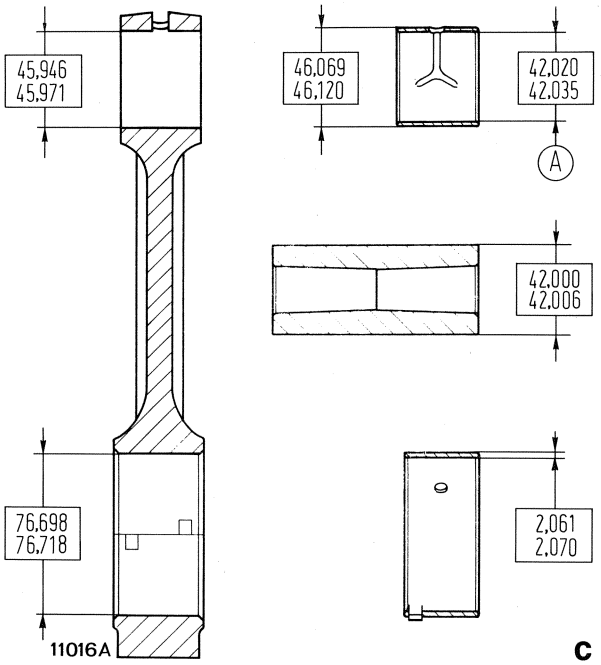
Reverse the removal procedure noting the following points:

— When assembling engine and transmission, slide transmission clutch and P.T.O. clutch shafts smoothly into associated driven splined hubs (115-90) or into transmission clutch driven plate hub and flywheel mounted P.T.O. splined hub (115-90 H, 130-90 Turbo, 140-90 Turbo, 160-90 Turbo and 180-90 Turbo).

— Strictly adhere to the torque data specified in the table.







Connecting rod, bearing, bushing and pin details.

a. 115-90 - b. 130-90 Turbo and 140-90 Turbo - c. 160-90 Turbo and 180-90 Turbo - A. Fitted dimension after reaming - L. M. Lubricant ways.

Nota - Scrap and replace the cap retaining screws whenever the connecting rods are disassembled.

Connecting rod/piston installation

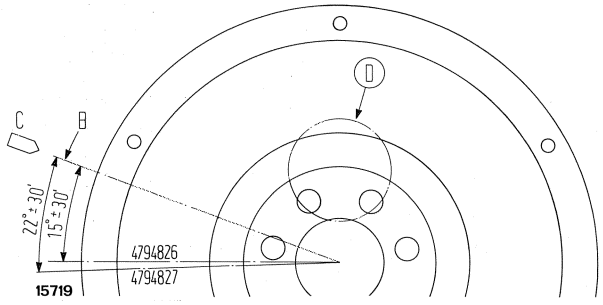
Introduce the pistons with attached rings and connecting rods in the associated liners, preferably using ring compressor **291048**, and position each assembly so that reference (N) on the connecting rods face towards the side opposite the camshaft (V), as indicated in (a) and (b), page 4.

Fitted piston T.D.C. position with respect to engine block should be:

— 115-90, 130-90 Turbo and 140-90 Turbo: .355 to .761 mm (.014 to .030 in) stand-out.

— 160-90 Turbo and 180-90 Turbo: .240 mm (.0010 in) stand-in to .710 mm (.028 in) stand-out.

Note - For 115-90, 130-90 Turbo and 140-90 Turbo tractors, piston crowns may be stamped «LATO PUNTERIE» (tappet side); if so,install pistons accordingly.



Flywheel assembly references (160-90 Turbo and 180-90 Turbo).

A. INIEZ. reference position; marked **4794827** aligned with start of delivery (160-90 Turbo) and **4794826** aligned with start of delivery (180-90 Turbo) - B. T.D.C. 1 reference position - C. Fixed timing pointer - D. No. 1 crankpin position for correct flywheel assembly.

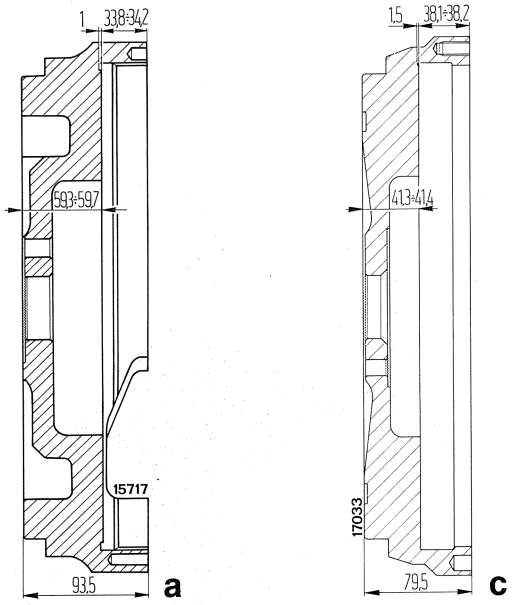
Note - For tractors with POWER-SHIFT transmission, marks are **4799784** aligned with start of delivery (160-90 Turbo) and **4799783** aligned with start of delivery (180-90 Turbo).

FLYWHEEL

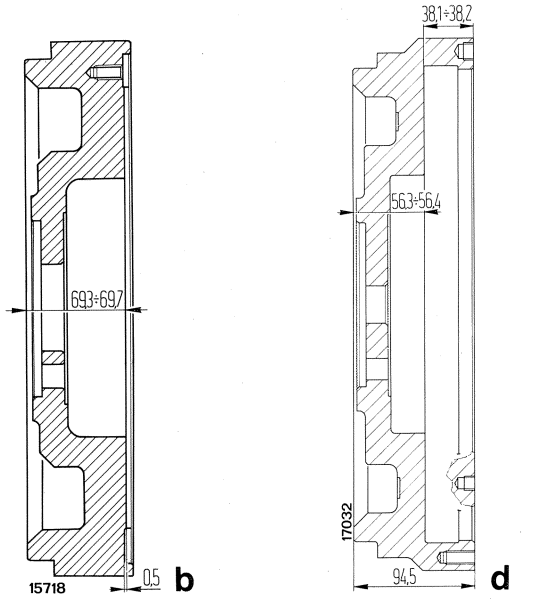
When installing the flywheel, 160-90 Turbo and 180-90 Turbo, bring crankpin No. 1 (D) to T.D.C. and check that fixed timing pointer (C) is in register with P.M.S. 1 reference (B).
On 115-90, 130-90 Turbo and 140-90 Turbo, the flywheel assembly position cannot be mistaken as bolt position has been offset for the purpose.

Flywheel dressing
When servicing flywheel for 14″ clutch (fig. a) on 130-90 Turbo and 140-90 Turbo tractors with manual transmission, flywheel face may be dressed, removing a maximum of 1 mm (.039 in) of material.
After dressing, restore 33.8 to 34.2 mm (1.331 to 1.346 in) clearance between clutch contact face on flywheel and bell housing mating face, and 1 mm (.039 in) undercut.
When servicing flywheel for 12″ + 12″ clutch (fig. b) on 160-90 Turbo and 180-90 Turbo tractors, flywheel face may be dressed, removing a maximum of 1 mm (.039 in) of material.
After dressing, restore .5 mm (.197 in) undercut.
When servicing the 14″ flywheel for tractors equipped with POWER SHIFT transmission (Fig. c for 130-90 Turbo/140-90 Turbo or Fig. d 160-90 Turbo/180-90 Turbo) it is possible to redress the flywheel friction lined face by removing material down to a max thickness of 1 mm (.039 in).
After re-dressing, restore the specified distance of 38.1 to 38.2 mm (1.500 to 1.504 in) between the clutch disc abutment face on flywheel and the drive pinion face on flywheel.

Note - After dressing, check that flywheel face is flat or slightly concave (max .05 mm or .0020 in); flywheel face should under no circumstances be convex.



Original dimensions of flywheel for 14″ clutch - 130-90 Turbo and 140-90 Turbo (fig. a for manual transmission and fig. c for POWER-SHIFT transmission).



Original dimensions of flywheel for 12″ + 12″ clutch - 160-90 Turbo and 180-90 Turbo (fig. b for manual transmission and fig. d for POWER-SHIFT transmission).

WATER PUMP - LATE MODS. 115-90, 130-90 TURBO AND 140-90 TURBO

The water pump equipping the above late models is of the centrifugal, vane type. Bearing (2) is in one piece with the drive shaft and is of the sealed for life type: no lubrication is needed during operation.

Service pump as follows:

— Remove cover (8) and screw (3) retaining the shaft/bearing assy (2).

— Tap shaft end lightly to breakup the oxide film possibly formed between shaft and vane impeller: next, remove impeller using puller **291182/1** (page 3).

— Use a suitable drift rod to eject drive shaft, complete with bearing and impeller hub, from the pump body.

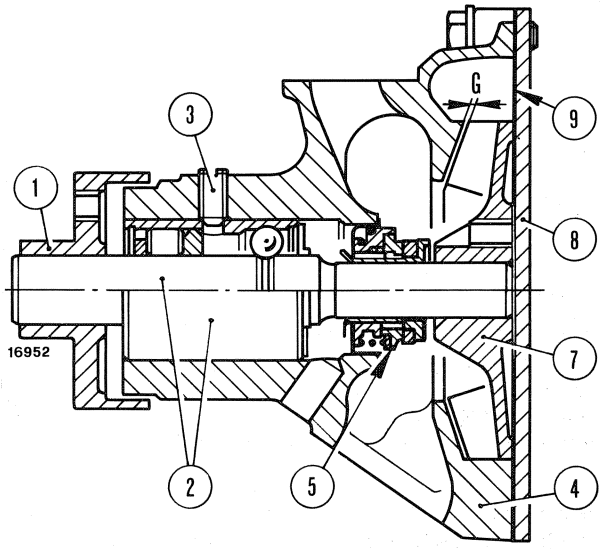
— Seal (5) must be disassembled only when its replacement is needed.

Re-assemble parts as follows:

— Fit back drive shaft/bearing assembly (2) with hub (1) in pump body (4) and lock in position by screw (3) coated with some LOCTITE 242.

— Fit seal (5).

Note - Wet seal seat with some LOCTITE REFRIGERANT SEALANT 554 then press fit in place using tool **293280**.



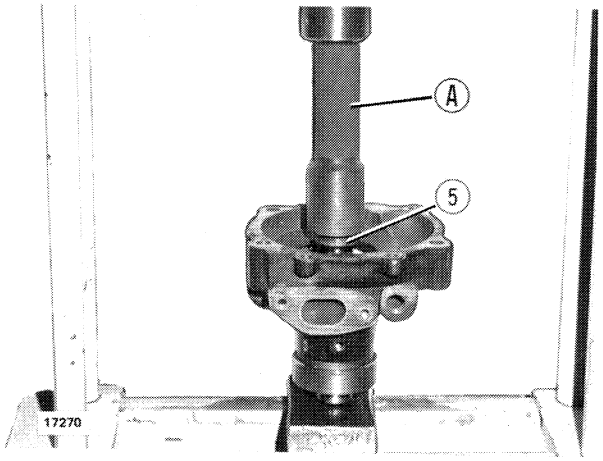
Water pump section - Late Mods. 115-90, 130-90 Turbo and 140-90 Turbo.

G = .5 to .7 mm (.01197 to .02756 in) normal operation clearance - 1. Drive joint, pump and fan - 2. Drive shaft and sealed bearing assy - 3. Shaft retaining screw - 4. Pump body - 5. Seal - 7. Vaned impeller - 8. Cover - 9. Seal.

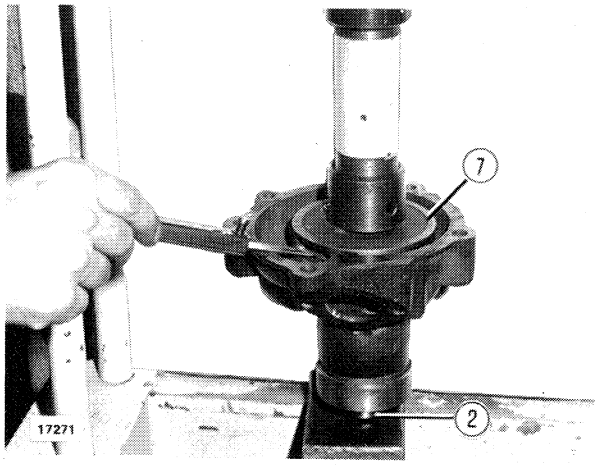
— In air draft oven heat impeller (7) until its temperature is abt. 130° to 150°C (266 to 302°F) higher than shaft temperature.

— Press fit impeller (7) on shaft (2) using shaft end as reaction element to avoid bearing damages; ensure the specified operation clearance (G) = .5 to .7 mm (.01197 to .02756 in).

— Install seal (9) and cover (8) securing the latter by its screws.



Force fitting seal (5) in position using tool (A) 293280.



Force fitting impeller (7).
2. Drive shaft.

REAR BEVEL DRIVE AND DIFFERENTIAL

Side gear and differential pinion backlash	.18 to .22 mm (.0071 to .0086 in)
Side gear thrust washer thickness	2.95 - 3.00 - 3.05 - 3.10 - 3.15 - 3.20 - 3.25 - 3.30 (.116 - .118 - .120 - .122 - .124 - .126 - .128 - .130 in)
Differential pinion thrust washer thickness	1.8 - 1.9 - 2 - 2.1 - 2.2 - 2.3 mm (.071 - .075 - .079 - .083 - .087 - .091 in)
Backlash adjustment	see pages 18, 19, 20 and 21, Sect. 25
Mechanical differential lock fork shim thickness (115-90)	.05 mm (.002 in)
Mechanical differential lock adjustment (115-90)	see page 21, Sect. 25
Differential lock fork spring length:	
— free	280 mm (11.0 in)
— under 176 N, 18 kg, 39.7 lb	182 mm (7.16 in)
Mechanical differential lock pedal travel adjustment	see page 21, Sect. 25
Bevel drive gear ratio (40 kph version):	
— Mods. 115-90 DTH, 130-90 Turbo DT, 140-90 Turbo DT	9:41 = 1:4.55

HYDRAULIC DIFFERENTIAL LOCK

Control	hydraulically operated oil bath multiplate clutch
Application	standard on 115-90 H, 130-90 Turbo, 140-90 Turbo, 160-90 Turbo and 180-90 Turbo
No. of clutch plates:	
— driven	4
— driving	4
— back up	1
Driven plate thickness	3.450 to 3.550 mm (.1358 to .1398 in)
Drive plate thickness	1.950 to 2.050 mm (.0768 to .0807 in)
Back-up plate thickness	2.950 to 3.050 mm (.1661 to .1201 in)
No. of hydraulic differential lock release springs	3
— spring free length	29 mm (1.14 in)
— spring length under 75 to 83 N, 7.7 to 8.5 kg, 17 to 18.7 lb.	22 mm (.87 in)
Hydraulic differential lock piston O.D.	227.854 to 227.900 mm (8.9706 to 8.9724 in)
Piston cylinder bore in differential case	228.000 to 228.072 mm (8.9764 to 8.9792 in)
Piston working clearance in cylinder	.100 to .218 mm (.004 to .009 in)
Hydraulic differential lock I.D.	160.000 to 160.063 mm (6.2992 to 6.3017 in)
Piston housing bore in differential case	159.875 to 159.915 mm (6.2943 to 6.2959 in)
Piston I.D. working clearance	.085 to .188 mm (.0033 to .0074 in)
Oil pump	gear, also used for PTO hydraulic clutch operation
Make	FIAT
Control	PTO shaft-mounted gear
Pressure regulator	
Location	attached to oil pump
Pressure regulator valve shuttle diameter	9.986 to 9.995 mm (.3931 to .3935 in)
Shuttle housing bore diameter in valve body	10.000 to 10.015 mm (.3937 to .3943 in)
Shuttle working clearance in housing	.005 to .029 mm (.0002 to .0011 in)

(*follows*)

HYDRAULIC DIFFERENTIAL LOCK

(*continued*)

Pressure regulator valve spring length:	
— free	36 mm (1.42 in)
— under 85 to 95 N, 8.7 to 9.7 kg, 19.1 to 21.4 lb.	32 mm (1.26 in)
Control valve	
Location	on right of rear drive housing
Construction	one spool controlled by differential lock pedal plus one unlock cylinder controlled by the brake pedals
Unlock cylinder spring length:	
— free	64 mm (2.52 in)
— under 104 to 116 N, 10.6 to 11.8 kg, 23.4 to 26 lb.	33 mm (1.30 in)
Spool diameter	15.973 to 15.984 mm (.6274 to .6293 in)
Spool housing bore diameter	16.000 to 16.018 mm (.6299 to .6306 in)
Spool working clearance in housing	.016 to .045 (.0006 to .0018 in)
Pipe support-to-control valve interface bushing O.D.	16.957 to 16.984 mm (.6676 to .6687 in)
Bushing housing bore diameter	17.000 to 17.027 mm (.6693 to 6703 in)
Bushing clearance in pipe support and control valve	.016 to .070 mm (.0006 to .0027 in)
Differential lock pedal travel adjustment	see page 22, Sect. 25

BRAKES

Type	
— Service	disc, oil bath, drive shaft-mounted
— Parking	2 disc (early mods.) or 3 disc (late mods.), oil bath, bevel pinion shaft-mounted
Control:	
— Service	hydrostatic, latched pedals
— Parking	mechanical, manual lever
Service brake disc material	sintered
Parking brake disc material	steel
Parking brake lining material	sintered or organic conglomerate
Disc thickness:	
— Service	10 mm (.39 in)
— Wear limit	8.6 mm (.33 in)
— Parking	7 mm (.27 in) (Early Mods.) 5 mm (.19 in) (Late Mods.)
Service brake wear plate thickness	7 mm (.27 in)
Parking brake lining thickness:	
— Side linings	3.1 to 3.4 mm (.122 to .134 in) (Early or Late Mods.)
— Intermediate lining	4.2 to 4.5 mm (.165 to .177 in) (Early or Late Mods.)

(*follows*)

POWER TAKE OFF *(continued)*

Shaft brake	
Type	band, acting on separate drum attached to outside of clutch bell housing
Oil pump	gear, also used for hydraulic differential lock
Make	FIAT
Drive	gear on PTO shaft
Pump drive ratio:	
— 115-90 H, 130-90 Turbo and 140-90 Turbo	1:1.222
— 160-90 Turbo and 180-90 Turbo	1:1.353
Maximum speed (with engine at full load rpm):	
— 115-90 H, 130-90 Turbo and 140-90 Turbo	3055 rpm
— 160-90 Turbo and 180-90 Turbo	2976 rpm
Rated output:	
— 115-90 H, 130-90 Turbo and 140-90 Turbo	19.5 dm^3/min (L/min) (5.1 GPM)
— 160-90 Turbo and 180-90 Turbo	18.9 dm^3/min (L/min) (4.2 GPM)
Driven and drive gear shaft diameter	17.400 to 17.418 mm (.6850 to .6857 in)
Bearing bore I.D.	17.450 to 17.470 mm (.6870 to .6878 in)
Gear shaft running clearance in bearing	.032 to .070 mm (.0012 to .0027 in)
— maximum wear clearance	.100 mm (.004 in)
Gear width	10.500 to 10.515 mm (.4134 to .4140 in)
Bearing width	9.700 to 9.715 mm (.3819 to .3825 in)
Bearing housing width in pump body	30.035 to 30.060 mm (1.1825 to 1.1835 in)
Gear and bearing end float (applicable to new and reconditioned pumps)	.090 to .160 mm (.0035 to .0063 in)
Control valve block	
Control valve construction	1 hand lever-controlled spool. 1 relief valve. 1 lube oil pressure regulating valve. 1 clutch control accumulator.
Relief valve setting	11 to 13 bar (11.2 to 13.2 kg/cm^2 or 159 to 187 psi)
Clutch plate oil rated pressure (controlled by regulating valve)	7.5 bar (7.6 kg/cm^2 or 108 psi)
Accumulator cut-in pressure	3 bar (3 kg/cm^2 or 42 psi)
Accumulator cut-out pressure	8.5 bar (8.7 kg/cm^2 or 123 psi)
Oil filter	
Type	metal cloth cartridge
Location	pump inlet

TORQUE DATA

DESCRIPTION	Thread size	Torque		
		Nm	kgm	ft.lb
Clutch - Section 22				
Screw, VALEO, LUK, O.M.G. 12″/12″ clutch to flywheel (C_1, pages 3, 6 and 19, 115-90)	M10 × 1.25	59	6	43
Screw, VALEO and LUK 14″ clutch to flywheel (C_4, page 9, 115-90 H, 130-90 Turbo and 140-90 Turbo)	M 8 × 1.25	25	2.6	19
Screw, LUK 12″ + 12″ clutch (C_1, page 12, 160-90 Turbo and 180-80 Turbo)	M10 × 1.25	59	6	43
Screw, actuating fork (C_5, pages 3, 6, 9, 12, 15, 19)	M16 × 1.5	157	16	116
Bolts and nuts, clutch housing to engine (C_6, pages 3, 6, 9, 12, 15, 19)	M12 × 1.25	98	10	72
Screw clutch housing to rear drive housing	M14 × 1.5	181	18.5	134
Nut, clutch pedal	M 8 × 1.25	25	2.6	19
Transmission and splitter - Section 23				
Lock ring, driven gear shaft (C_1, page 8)	M50 × 1.5	490	50	362
Lock ring, L.H., splitter driven shaft (C_2)	M50 × 1.5	490	50	362
Nut, bearing cap (C_3)	M10 × 1.25	44	4.5	32
Screw, transmission housing cover (C_4)	M10 × 1.25	59	6	43
Screw, transmission rear wall (C_5)	M12 × 1.25	103	10.5	76
Screw, bearing retainer (C_6)	M10 × 1.25	59	6	43
POWER-SHIFT transmission- Section 23				
Lock ring, driven gear shaft (C_1, page 22)	M50 × 1.5	490	50	362
Lock ring, drive gear shaft (C_2)	M55 × 1.5	490	50	362
Screw, drive coupling (C_3)	M10 × 1.25	59	6	43
Screw, control valve (C_4)	M10 × 1.25	49	5	36
Screw, front splitter cover (C_5)	M 8 × 1.25	25	2.6	19
Screw, transmission housing top cover (C_6)	M10 × 1.25	59	6	43
Nuts, front splitter housing	M10 × 1.25	59	6	43
Creeper - Section 24				
Screw, ring gear hub (C_1, page 1)	M10 × 1.25	64	6.5	47
Screw, bearing retainer (C_2)	M12 × 1.25	98	10	72
Mechanical Reverser - Section 24				
Screw, reverser front and rear support (C_1, page 2)	M12 × 1.25	98	10	72
Screw, bearing retainer (C_2)	M12 × 1.25	98	10	72
Screw, transmission front support (C_3)	M12 × 1.25	103	10.5	76
Bevel drive and differential - Section 25				
Nut, bevel pinion shaft (C_1, page 8)	M50 × 1.5	490	50	362

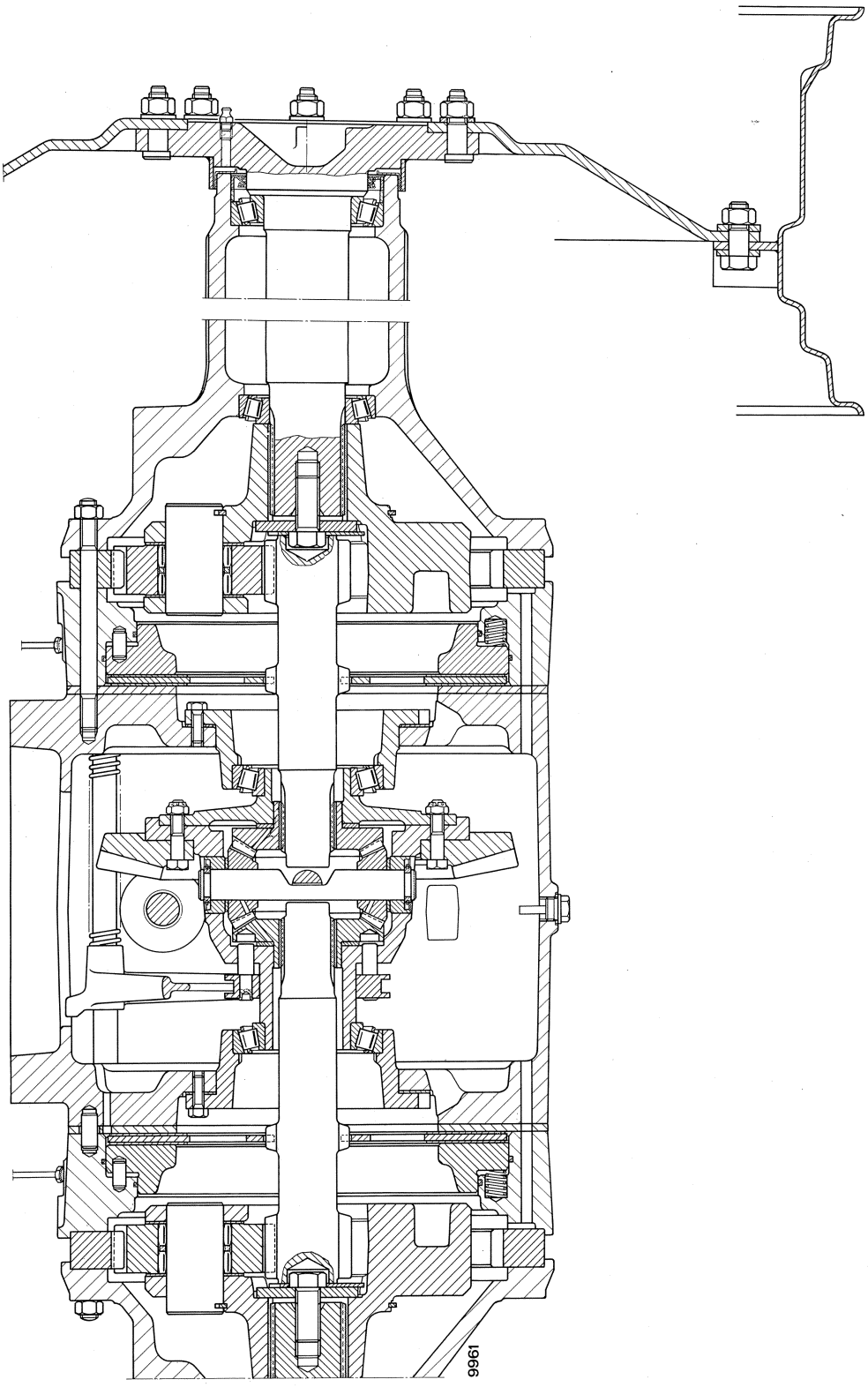
(*follows*)

TORQUE DATA

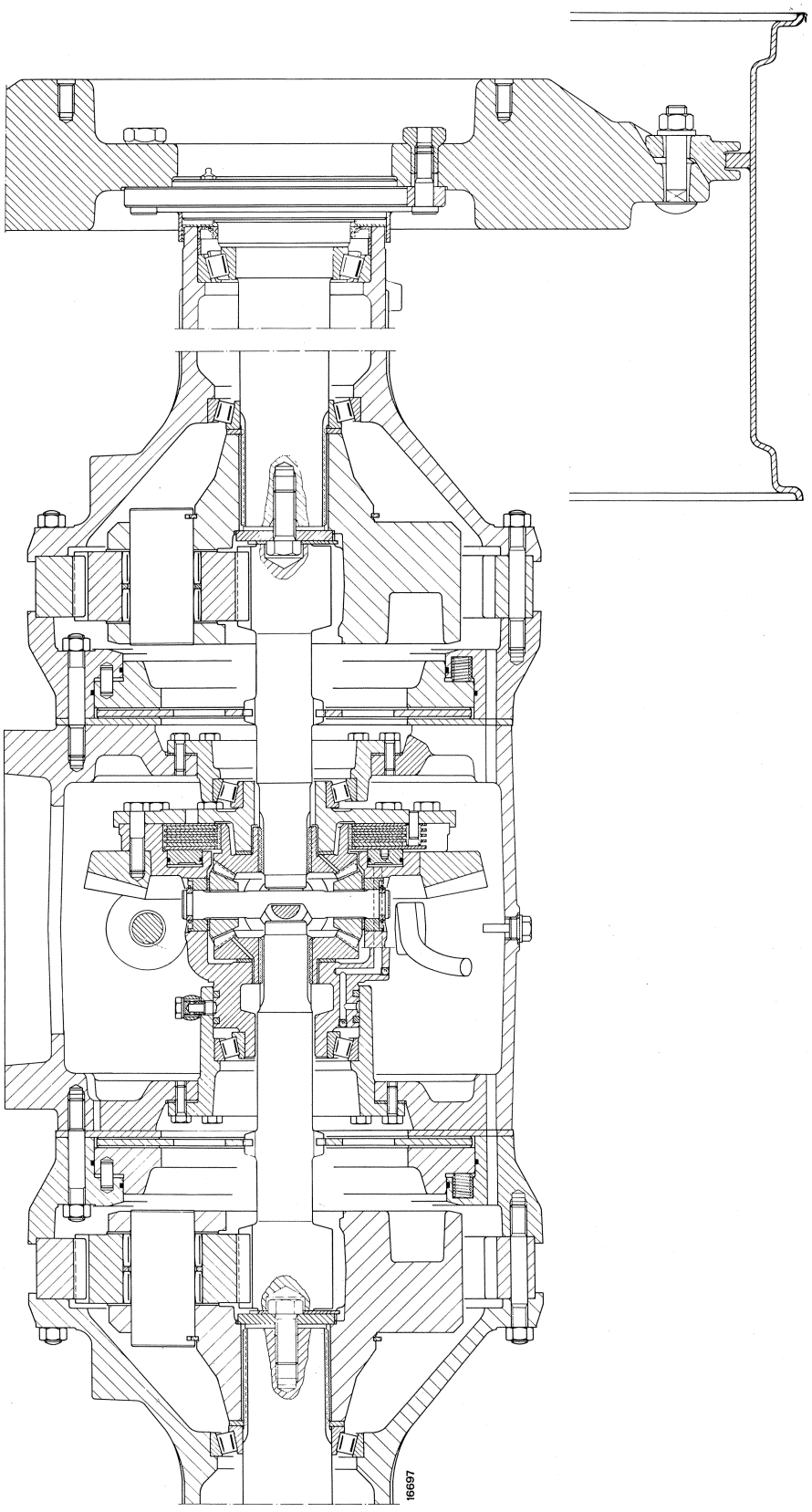
(continued)

DESCRIPTION	Thread size	Torque		
		Nm	kgm	ft.lb
Nut, self locking, ring gear and mechanical differential lock (C_2, page 9, 115-90)	M12 × 1.25	123	12.5	90
Screw, ring gear and hydraulic differential lock (C_3, page 9, 115-90H, 130-90 Turbo, 140-90 Turbo, 160-90 Turbo and 180-90 Turbo)	M14 × 1.5	176	18	130
Screw, self locking, ring gear support (C_4, page 9)	M10 × 1.25	61	6.2	45
Screw, mechanical differential lock lever support (C_5, page 21)	M12 × 1.25	83	8.5	61
Screw, rear drive housing lower side cover	M12 × 1.25	98	10	72
Brakes - Section 26				
Screw, parking brake support (C_1, page 8)	M10 × 1.25	59	6	43
Screw, hydraulic pump body	M16 × 1.5	176	18	130
Nut, hand lever support	M 8 × 1.25	17	1.7	12
Final drives - Section 27				
Nut, final drive housing (C_1, page 1)	M16 × 1.5	196	20	144
Screw, self locking, wheel shaft (C_2)	M22 × 1.5	88	9	65
Nut, sheet steel wheel disc and rim (C_3)	M16 × 1.5	221	22.5	163
Nut, sheet steel wheel disc to hub (C_4)	M18 × 1.5	255	26	188
Nut, cast wheel disc to hub (C_5)	M18 × 1.5	314	32	231
Nut, clamp (C_6)	M20 × 2.5	245	25	181
Nut and bolt, ballast	M16 × 1.5	221	22.5	163
Screw, hub (C_7, page 3)	M16 × 1.5	294	30	217
Nut, double-flange case spacer studs, side final drives (C_8, page 5)	M16 × 1.5	221	22.5	181
Nut, double-flange case, side final drives (C_1, page 5)	M16 × 1.5	221	22.5	181
Power take off - Section 28				
Nut, driven gear shaft (C_1, page 2)	M36 × 1.5	294	30	217
Nut, self locking, splined extension (C_2)	M12 × 1.25	162	16.5	119
Screw, bearing cap	M12 × 1.25	98	10	72
Screw, PTO housing (C_3)	M16 × 1.5	221	22.5	163
Screw, PTO control rod support (C_4)	M 8 × 1.25	25	2.6	19
Screw, flange to oil pump	M 8 × 1.25	25	2.6	19
Screw, oil pump (C_6, page 6)	M10 × 1.25	37	3.8	27

POWER TRAIN:
Sections



Power train cross section - 115-90 Tractors.



Power train cross section - Mods. 160-90 Turbo and 180-90 Turbo with dual-flange side final drive.

CLUTCH VALEO 12″/12″ - LATE MOD. 115-90

Type	twin, single dry plate
Control	hydraulic transmission clutch pedal and mechanical PTO clutch hand lever
Release mechanism (both clutches)	single dished spring
Plate material:	
— Transmission clutch	cerametallic compound
— PTO clutch	organic compound
Plate thickness:	
— Transmission clutch	9.7 to 10.2 mm (.382 to .401 in)
— PTO clutch	8.9 to 9.3 mm (.350 to .366 in)
— Wear limit	see page 17, Sect. 22
Transmission clutch control sleeve working clearance	.060 to .180 mm (.002 to .007 in)
PTO clutch control sleeve working clearance	.060 to .136 mm (.002 to .005 in)
Release lever alignment	see page 18, Sect. 22
Clutch linkage adjustment	see pages 8 and 14, Sect. 22

CLUTCH - O.M.G. 12″/12″ (115-90)

Type	twin, single dry plate
Control	hydraulic transmission clutch pedal and mechanical PTO clutch hand lever
Release mechanism	single dished spring
Plate material:	
— Transmission clutch	cerametallic compound
— PTO clutch	organic compound
Plate thickness:	
— Transmission clutch	8.9 to 9.5 mm (.350 to .374 in)
— PTO clutch	8.9 to 9.3 mm (.350 to .366 in)
— Wear limit	see page 21, Sect. 22
Transmission clutch control sleeve working clearance	.060 to .180 mm (.002 to .007 in)
PTO clutch control sleeve working clearance	.060 to .136 mm (.002 to .005 in)
Release lever alignment	see page 22, Sect. 22
Clutch linkage adjustment	see pages 8 and 14, Sect. 22

FRONT POWER TAKE-OFF

Type	speed: 1000 rpm; fully independent from tractor ground speed
Application and release	by electromagnetic clutch
Control	button switch
PTO speed w/engine at max power rated speed:	
— Mods. 115-90DT, 130-90 Turbo DT and 140-90 Turbo DT	1078 rpm
— 160-90 Turbo DT and 180-90 Turbo DT	950 rpm
Output splined shaft diameter	1 3/8" - 21 splines
Electromagnetic clutch adjuster ring thickness range	1 - 1.5 - 2 mm (.0394 - .0590 - .0787 in)

POWER TAKE OFF CLUTCH - LATE MODELS

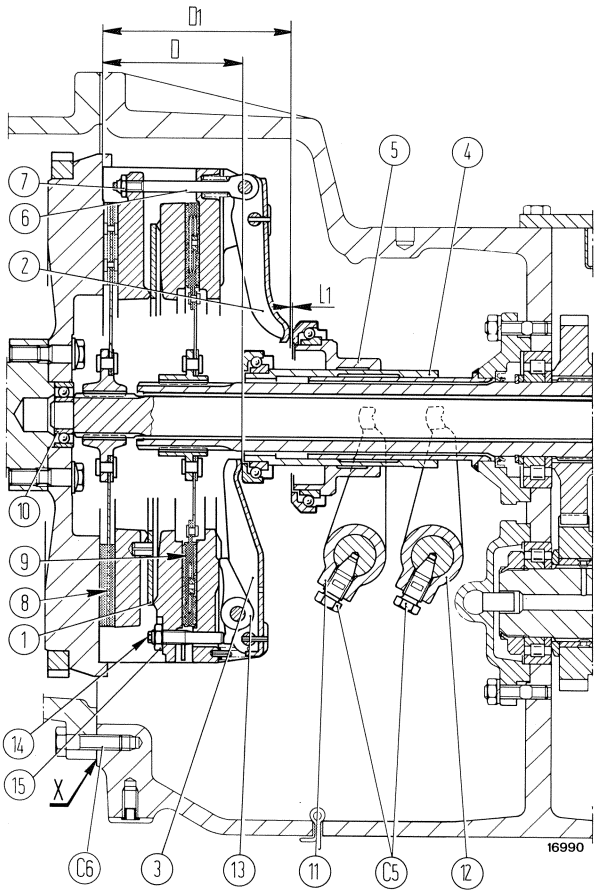
Type	Oil-bath, multi-plate, hydraulic control
No. of clutch plates:	
— Driving	9
— Driven	8
Shaft brake	
Type	drum type mounted on master clutch bell housing
Oil pump	Refer to page 13
Control valve unit block	
Control valve components	1 hand lever-operated spool; 1 relief valve; 1 lube oil pressure regulating valve; 1 accumulator for smooth clutch engagements; 1 cut-out valve for lube oil exclusion during brake application.
Relief valve setting	11 to 13 bar (11.2 to 13.2 kg/cm^2 or 159 to 187 psi)
Regulating valve setting	2 to 4 bar (2 to 4.1 kg/cm^2 or 28 to 58 psi)
Accumulator cut-in pressure	3 bar (3 kg/cm^2 or 42 psi)
Accumulator cut-out pressure	9 bar (9.2 kg/cm^2 or 131 psi)

VALEO 12″/12″ CLUTCH SERVICE (LATE MODEL 115-90)

Remove, install and adjust clutch using universal kit **293650** (page 16) or kit **291291/2**.
To install clutch on kit **291291/2** proceed as follows:

⚠ WARNING ⚠

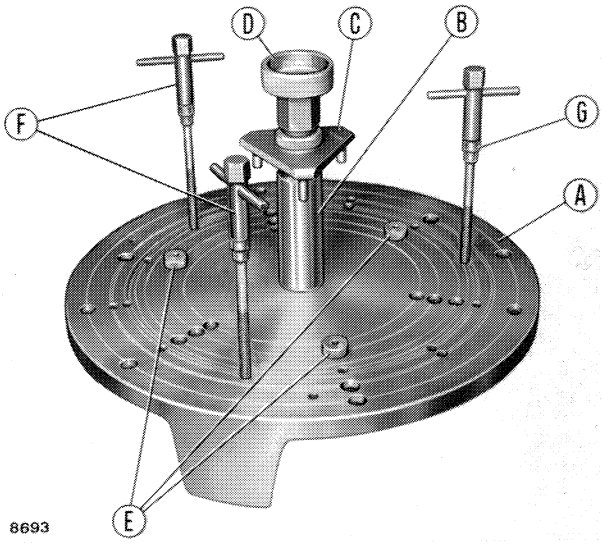
Use suitable tools to align holes. DO NOT USE FINGERS OR HANDS.



Longitudinal Section through VALEO 12″/12″ clutch (late Mod. 115-90).

C_5. Fork lever screws - C_6. Screws and nuts securing clutch housing to engine block - D = 103 mm (4.005 in). Nominal distance of master clutch levers from flywheel face - D_1 = 137 mm (5.394 in). Nominal distance of P.T.O. clutch release levers (2) from flywheel face - L_1 = 1.5 mm (0.059 in). Nominal P.T.O. clutch release lever clearance - 1. Dish spring - 2. PTO clutch release levers - 3. Master 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. Master clutch plate - 10. Flywheel bearing - 11 and 12. Sleeve control forks - 13, 14 and 15. Master clutch release lever, adjusting screw and locknut.

Note - On assembly, thoroughly clean and degrease mating surfaces **X** and apply jointing compound as instructed on page 6, Sect. A.

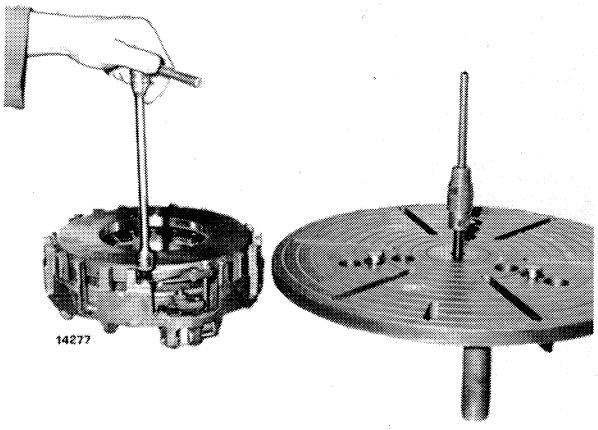


Component parts of late Model VALEO 12″/12″ clutch adjuster kit 291291/2.

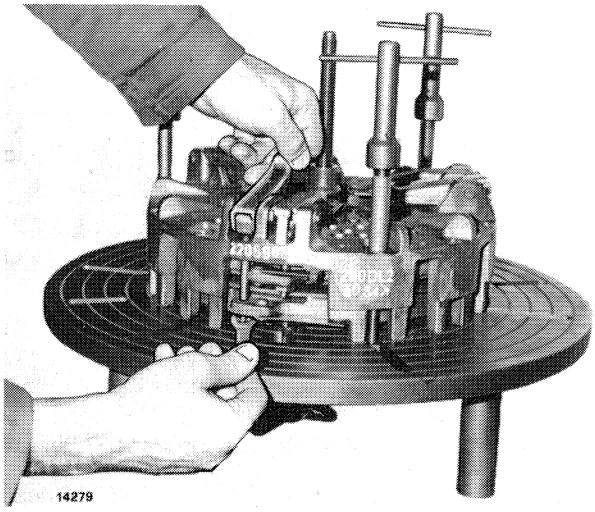
A. Base plate **292598** - B. Central spacer **50.001** (to be shop built to dwg on page 3) - C. Register **292939/1** - D. Nut **292344** securing spacer and register - E. Locators **293733** - F. Fasteners **291292/1** - G. Fastener guide bushings **291293/1**.

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.

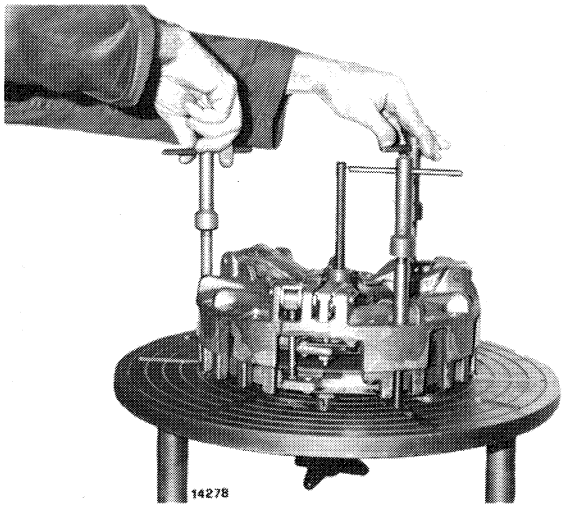
— Install central spacer (B) on base plate (A) together with three locators (E) on 241 mm (9.5 in) circumference.



Removing PTO clutch pressure plate tab retaining screws.



Removing locknuts from PTO clutch release lever adjusting links.



Disassembling clutch on universal kit 293650.

— 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:

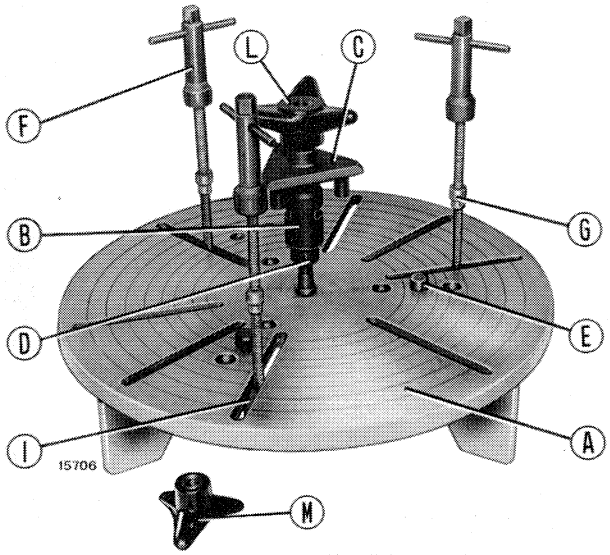
— Install central spacer (B) on base plate (A). Position spacer at a height of 128 mm (5.04 in) through register and secure through locknut (D).

— 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:

$$h = 2.9 \text{ mm} + S$$

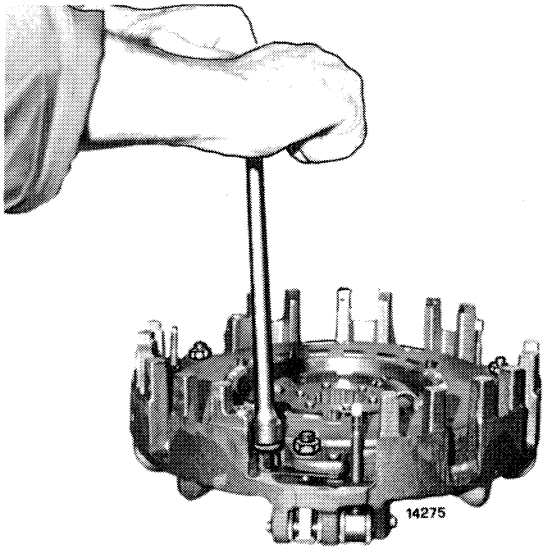
where:
2.9 mm = constant dimension
S = **measured** PTO drive plate thickness.

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



Component parts of universal kit 293650 for VALEO 12″/12″ clutch adjustment (Late Mod.).

A. Base plate **293332/2** - B. Central spacer **293741** - C. Register **293731** - D. Central spacer locknut **293730** - E. Locators **293726** - F. Fasteners **293725** - G. Guide bushings **293734** - I. Pads **293755** - L. Register retaining handwheel **293739** - M. Locator handwheels **293740** - N. Fastener spacers **292345**.



Removing retaining screw from transmission clutch pressure plate tabs.