FIATAGRI

PRINT No. 603.54.201.01 R

1st Revision of Workshop Manual Models 780-880 - Print No. 603.54.201

1st Edition of Workshop Manual Models 880-5 and 980

NOTICE

Pages which supersede the corresponding page numbers issued October 1979

- Front cover and contents;
- **Section 00** - Pages 3-4-5-6-11-12;
- **Section 100** - Pages 3-4;
- **Section 101** - Pages 3-4;
- **Section 20** - Pages 7-8-13-14;
- **Section 201** - Pages 5-6;
- **Section 205** - Pages 1-2-3-4;
- **Section 30** - Pages 3-4;
- **Section 301** - Pages 1-2;
- **Section 40** - Pages 1-2-3-4;
- **Section 401** - Pages 3-4-5-6-7-8-9-10;
- **Section 402** - Pages 3-4;
- **Section 50** - Pages 3-4;
- **Section 501** - Pages 3-4-11-12;
- **Section 503** - Pages 1-2-3-4;
- **Section 90** - Pages 1-2-3-4

New pages

- General instructions;
- **Section 00** - Pages 13-14;
- **Section 10** - Pages 19-20;
- **Section 100** - Pages 5-6;
- **Section 208** - Pages 1-2-3-4;
- **Section 30** - Pages 5-6;
- **Section 504** - Pages 9-10-11-12-13-14-15-16;
- **Section 90** - Pages 5-6;

All pages of sections covering Workshop Manual for models 880-5 and 980 are also new.

FIAT Trattori

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Fiat Trattori

FIAT

780 - 780 DT
880 - 880 DT

WORKSHOP MANUAL

QUICK REFERENCE INDEX

DIREZIONE COMMERCIALE

FOREWORD

- *The manual is divided into separately numbered sections.*
- **Two-digit** *sections contain*
  - *— Tractor specification (00).*
  - *— Tractor sub-assembly specification and data (10 Engine, 20 Power Train, etc.).*
- **Three-digit** *sections deal with the overhaul of the sub-assemblies whose data are listed in the two-digit sections. The first two digits are the same as those of the associated data sections (e.g. 20 Power Train, 201 Clutch, 202 Transmission, 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 two digit number (e.g. first revision 603.54.201|01; second revision 603.54.176|02, etc.) and new issue date.*
  Revised sheets will be accompanied by the updated contents sheet.
- **Note:** *The modifications given in the revision sheets of this publication are the result of Fiat Trattori's constant endeavor to improve their product in order to meet market demands and are not intended to be implemented by means of recall campaigns.*
  Fiat Trattori reserve the right to introduce further changes at any time and without notice.

The Imperial weights and measures are given for operators' convenience and, though the closest approximation is sought, they are normally rounded off for practical reasons. In case of discrepancies only the metric units should be considered.

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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 drift 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 or Y 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 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 **FIAT spare parts**, having the trade mark below.

These are the only parts that guarantee the quality, durability and safety of the original parts, being parts fitted in production. Only FIAT 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 in such a way as to offer efficient and durable working instruments.

The mechanic is also reminded that being equipped means:

— Operating in optimum working conditions.

— Obtaining the best results.

— Saving time and energy.

— Working in 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 normal direction of travel of tractor.

ATTENTION

Update your manual by introducing the additions, notes and corrections indicated below

OLD TEXT

REVISED TEXT

Section 10, page 10 - Injection Pump: Update table as follows:

C.A.V.	AM (see page 13)	—	DPA3342-F020-770996
	AM (see page 14)	—	DPA3342-F390-771363
	AM (see page 11)	DPA3342-F150-771050	—
	PM (see pages 15 and 19)	DPA3342-F570-771541	DPA3342-F450-771383

Section 10, page 11 - Table title.

... C.A.V. Injection Pump TYPE DPA 3342 F 150 - 771050

... C.A.V. Injection Pump TYPE DPA 3342 F 150 - 771050 (up to Engine 758846)

Section 100, page 2 - Performance data table title.

780 - C.A.V. Injection Pump

780 - C.A.V. Injection Pump (up to Engine 758846)

Section 102, page 1 - First line on right and caption on left.

On Model 780, renew the bushes using suitable extractor and drivers.

Section through camshaft drive
a. Model 780 - b. Model 880 - 5. Retaining screw

On Model 780, replace worn bushings using driver **A. 360383 (292103)**.

Section through camshaft drive
a. Model 880 - b. Model 780 - 5. Retaining screw

Section 20, page 11 - Platform removal - Bevel drive.

Screw, front and rear cushion mountings
22.5 kgm - 163 lb ft
Nut, self-locking, crown wheel (C_1, page 6)
15 kgm - 108 lb ft

Screw, front and rear cushion mountings
11 kgm - 79 lb ft
Nut, self-locking, crown wheel (C_1, page 6)
12.5 kgm - 90 lb ft

Section 20, page 12 - Fourth torque figure.

Screw, support, differential lock lever (C_6, page 12):
— 780 Tractor M 12 x 1.25 - 6.2 kgm - 45 lb ft
— 880 Tractor M 12 x 1.25 - 10 kgm - 72 lb ft

Screw, support, differential lock lever (C_6, page 12):
M 12 x 1.25 - 10 kgm - 72 lb ft

OLD TEXT

Section 20, page 12 - Final drives.

Nut, wheel disc and rim (C_3)
M 18 x 1.5 - 32 kgm - 231 lb ft

Section 201, page 1 - 17th and 37th line on left.

Apply engine lift chain **296962**
Press the double shielded bearing in position **without packing with grease;**

Section 201, page 3 - Last para. on left.

Position adjustable locators (E) on a 240 mm (9.4 inch) circumference with the top surface 9 mm (.35 inch) (11″/11″ clutch, 780 Tractor) or 9.1 mm (.36 inch) (11″/11″ and 12″/12″ clutches, 880 Tractor) from base plate and tighten using hand wheels (M).

Section 201, page 4 - First line on left.

Slacken nuts (6a, page 2) and fully unscrew adjusting screws (6) using spanner **291187.**

Section 202, page 7 - 4th line of TO INSPECT.

place a spring over a flat surface (see detail a), depress the spring in the centre all along the width applying a 1.4 to 1.55 kg (3 to 3 1/2 lb) load (P) and check that the camber is 1.5 mm (.06 inch)

Section 202, page 7 - Caption at bottom on right.

P = 1.40 to 1.55 kg (3 to 3 1/2 lb) test load ...

REVISED TEXT

Nuts, sheet metal driving wheel disc to hub
M 18 x 1.5 - 25 kgm - 181 lb ft
Nuts, cast wheel disc to driving wheel hub
M 18 x 1.5 - 32 kgm - 231 lb ft
Nuts, RAIL rim to driving wheel
M 20 x 2.5 - 25 kgm - 181 lb ft
Nuts, rim to sheet metal driving wheel disc
M 18 x 1.5 - 32 kgm - 231 lb ft

Apply engine lift chain **290962**
Press the double shielded bearing in position **packing the associated recess with grease;**

Position adjustable locators (E) on a 240 mm (9.4 inch) circumference with the top surface 9 mm (.35 inch) (11″/11″ clutch, Model 780) or a 9.1 mm (.36 inch) (11″/11″ clutch, Model 880) or 9.6 mm (.38 inch) (12″/12″ clutch, Model 880) from base plate and tighten using hand wheels (M).

Slacken nuts (6a, page 2) and completely back off adjusting screws (6) using wrench **293763.**

position the spring on a surface plate (see inset a), apply a load (P) of 1.40 to 1.55 kg (13.7 to 15.2 N - 3 to 3 1/2 lb), AM spring, or 3.2 to 3.5 kg (31.4 to 34.3 N - 7 to 7 3/4 lb), PM spring to the centre of the spring and check that the associated deflection is 1.5 mm (.06 inch) or 1.4 mm (.055 inch) respectively

P = 1.40 to 1.55 kg (3 to 3 1/2 lb), AM spring, or 3.2 to 3.5 kg (7 to 7 3/4 lb), PM spring. Test load ...

GENERAL: Revisions

OLD TEXT	REVISED TEXT
Section 204, page 1 - TO DISMANTLE AND REASSEMBLE CROWN WHEEL.	
Peen pinion screw (15).	Peen AM retaining screw (15) for differential pinion shaft (14) and replace PM plastic coated screw as the latter cannot be reused
Section 207, page 2 - Fourth line on left and first line on right of TO DISMANTLE and REASSEMBLE.	
On 540 rpm PTO, 780 Tractor and 880 AM Tractor ... On 540 rpm PTO, 880 PM Tractor ...	On 540 rpm PTO 780 and 880 AM (up to frame 892607) ... On 880 PM (from frame 892608), ...
Section 402, page 1 - 2nd and 6th line on left TO REFIT.	
Align the two drive shafts (30 and 35, page 3) relative to drive sleeve (32) ... Bring front drive sleeve (27) in contact with circlip (28), assess the amount of clearance (L) using a suitable feeler gauge and install a shim (S_5) of adequate thickness ...	On AM tractors, line up the two drive shafts (30 and 35, page 3) onto drive sleeve ... Bring front drive sleeve (27) right up against circlip (28), assess the amount of clearance (L) using a suitable feeler gauge and install a shim (S_5) of adequate thickness in order to obtain a .5 to 1 mm (.02 to .04 inch) fitted clearance ...
Section 50, page 6 - Lift - 3-point linkage and towing attachments.	
Nut, lift body: M 12 x 1.25 - 6 kgm - 43 lb ft M 14 x 1.25 - 15 kgm - 108 lb ft Screw, levelling box cover (5, page 1) 10 kgm - 72 lb ft	Nuts, lift body: M 10 x 1.25 - 4.5 kgm - 32 lb ft M 14 x 1.25 - 12 kgm - 87 lb ft Screws, levelling box cover (5, page 1) 6 kgm - 43.5 lb ft
Section 501, page 8 - Title on left.	
3. AM Control Valve Response Adjustment	3. AM Control Valve Spool Response Adjustment (up to frame 673140, Model 780 and 892776, Model 880)
Section 501, page 9 - Title at top on left.	
4. PM Control Valve Response	4. PM Control Valve Response (from frame 673141, Model 780, and 892777, Model 880)
Section 60, page 8 - Fuse No. 7.	
Direction stop lights (tractor and trailer) and warning lights - Water temperature gauge - Fuel gauge - Air cleaner warning light	Direction stop lights (tractor and trailers) and warning lights - Water temperature gauge - Fuel gauge - Air cleaner warning light - Alternator charge indicator - Low engine oil pressure indicator

	780-780 DT	880-880 DT
Fuel System		
Air cleaner	Oil bath or dry, automatic drain centrifugal precleaner	
Fuel filters (between pumps)	Two, in line, cartridge type, water separator integral with first filter	
Feed pump	Double diaphragm	
— Operation	Cam	
Injection pump	Distributor	
— Type BOSCH AM	EP/VA 4/110 H 1250 CL136-6-771151	—
— Type BOSCH or AM	—	DPA-3342 F020-770996 up to engine no. 002517
— Type C.A.V. AM	DPA-3342 F150-771050 (from start of production and up to engine 758846)	DPA-3342 F390-771363 from engine no. 002518 and up to no. 002816
— Type C.A.V. PM	DPA-3342 F570-771541 (from engine 758847)	DPA-3342 F450-771383 from engine no. 002817
— Integral all speed governor BOSCH / C.A.V.	Hydraulic Centrifugal	— Centrifugal
— Integral advance device	Hydraulic	
— Pump timing, BTDC BOSCH	13° ± 1°	—
— Pump timing, BTDC C.A.V.	18° ± 1°	14° ± 1°
Injectors	3-orifice	4-orifice
— Type	See page 10, Section 10	
— Release pressure	230 ± 5 kg/cm² (3,270 ± 70 psi)	200 ± 5 kg/cm² (2,840 ± 70 psi)
Firing order	1 - 3 - 4 - 2	
Lubrication System		
Pump drive	Forced feed, gear pump	
Oil filters	Camshaft	Crankshaft
	Strainer on pump inlet and full flow cartridge on outlet	
Relief valve	In pump body	In filter
— Oil pressure at governed speed	3 to 4 kg/cm² (48 to 57 psi)	4.8 to 5.2 kg/cm² (68 to 74 psi)
Cooling System		
Radiator	Water, centrifugal pump	
Expansion tank	3 or 4 deep core, vertical tube	
Fan, water pump pulley mounted	Semi-transparent plastics	
Temperature control	Suction, steel	
	Wax thermostat	

SPECIFICATION

Tractor Meter

	780-780 DT	880-880 DT
	On instrument panel	
— Drive	Oil pump gear	Injection pump shaft
— Hourmeter activation speed	1800 rpm	1800 rpm
— Meter drive ratio	2 to 1	2 to 1

POWER TRAIN

Clutch

Type	Luk or Ferodo, 11 in
Construction	Twin, dry single plate
Control	
— Transmission	Pedal
— PTO	Manual

880 Option

Type	Luk or Ferodo, 12 in
Construction	Twin, dry single plate
Control	Separate, as above
Plate material	
— Transmission	Cerametallic compound
— PTO	Organic compound

Gearbox

Type	Four-speed, constant mesh
— 780	Spur
— 880	Helical
Splitter	Planetary
— 780 and 880 AM	8 + 2
— 780 and 880 PM	12 + 3 (optional on 780)
Crawler gear	In line with splitter, optional
— 780 and 880 AM	12 + 3
— 780 and 880 PM	16 + 4
Control levers	Separate

Model 780 with 8 speed transmission may also be equipped (on request) with mechanical reverser for a total of 8 forward and 8 reverse ratios.
Reverser control is through splitter-transmission lever.

Bevel Drive

Straight

Differential

Two pinion

Differential lock — Pedal controlled

Final Drives

Epicyclic

BRAKES

Service

Type	Disc, oil-bath, axle shaft mounted
Operation	Hydraulic
Circuits	Split
Control	Latched pedals

Parking/Emergency

Type	
— AM	Single disc, independent
— PM	Twin disc, independent
Position	Bevel pinion shaft mounted
Control	Manual lever

STEERING

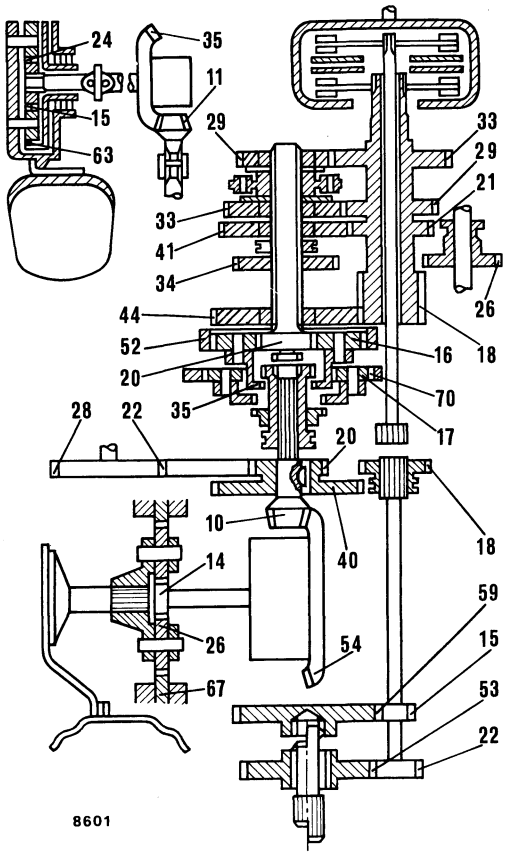
Steering unit	
— 780	Recirculating ball or fully hydraulic (optional)
— 780 DT, 880, 880 DT	Fully hydraulic
Linkage joints	Sealed for life
Turning radius	
— 780	4 m (13 ft 1 1/2 in)
— 780 DT, with front axle in	5.75 m (18 ft 10 1/2 in)
— 880	4.2 m (13 ft 9 1/2 in)
— 880 DT, with front axle in	6 m (19 ft 8 1/4 in)

FRONT AXLE (780 and 880)

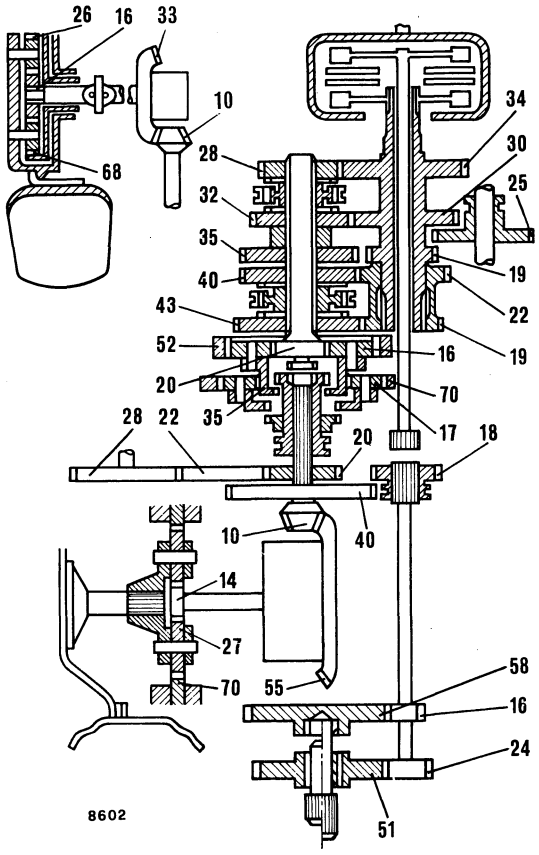
Type	Inverted U, telescoping, centre pivotting
Track widths	6

POWER TRAINS SCHEMATICS

780-780 DT (AM)



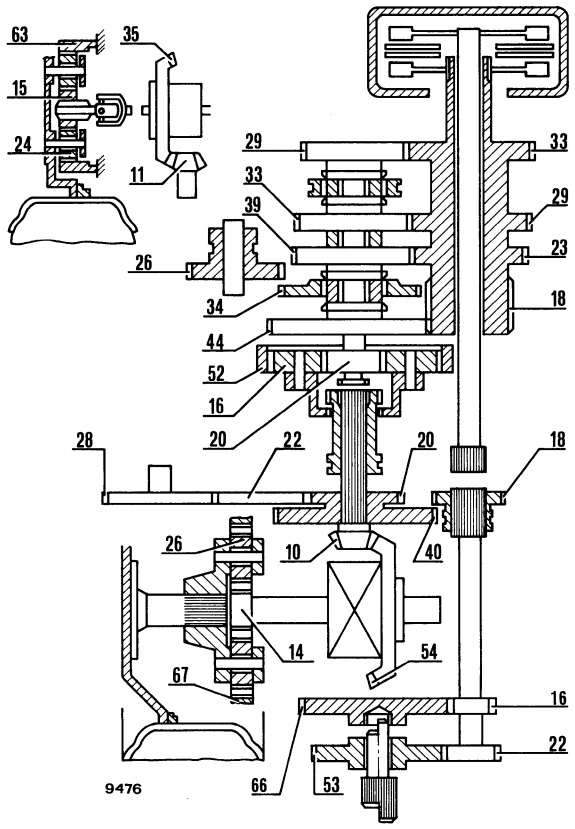
880-880 DT (AM)



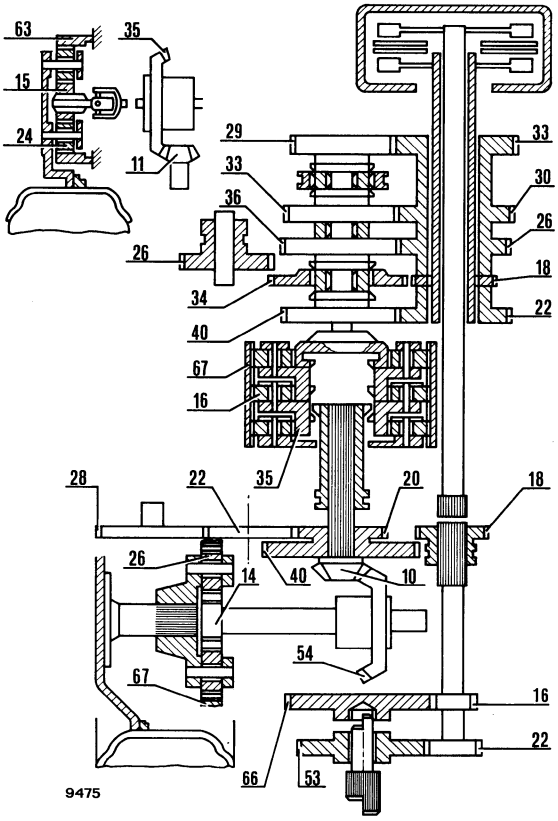
Tractor speeds at maximum engine speed, full load											
GEARS		780 and 780 DT (AM) Rear tyres				880 and 880 DT (AM) Rear tyres					
		13.6/12-38 and 16.9/14-34		18.4/15-30		13.6/12-38 and 16.9/14-34		18.4/15-34		16.9/14-38	
		kph	mph	kph	mph	kph	mph	kph	mph	kph	mph
Crawler	1st	.8	.5	.8	.5	.8	.5	.8	.5	.9	.6
	2nd	1.0	.6	1.0	.6	1.0	.6	1.0	.6	1.1	.7
	3rd	1.8	1.1	1.7	1.0	1.7	1	1.8	1.1	1.8	1.1
	4th	2.3	1.4	2.2	1.4	2.2	1.3	2.3	1.4	2.4	1.5
	Reverse	1.1	.7	1	.6	1	.6	1	.6	1.1	.7
Low	1st	2.5	1.5	2.4	1.5	2.4	1.5	2.5	1.5	2.6	1.6
	2nd	3.1	1.9	3	1.8	3	1.8	3.1	1.9	3.2	2
	3rd	5.4	3.3	5.2	3.2	5.1	3.2	5.3	3.3	5.5	3.4
	4th	6.9	4.3	6.7	4.1	6.6	4.1	6.9	4.3	7.1	4.4
	Reverse	3.2	1.9	3.1	1.9	2.9	1.8	3.1	1.9	3.2	2
High	1st	9	5.6	8.7	5.5	8.5	5.3	9	5.6	9.3	5.8
	2nd	11.2	6.9	10.9	6.8	10.8	6.7	11.2	6.9	11.6	7.2
	3rd	19.3	12	18.7	11.6	18.3	11.4	19.1	11.9	19.7	12.2
	4th	25	15.5	24.3	15.1	23.8	14.3	24.7	15.3	25.5	15.8
	Reverse	11.6	7.2	11.3	7.1	10.6	6.6	11.1	6.9	11.4	7.1

POWER TRAIN SCHEMATICS

780-780 DT, 8-speed
(Old live front axle)



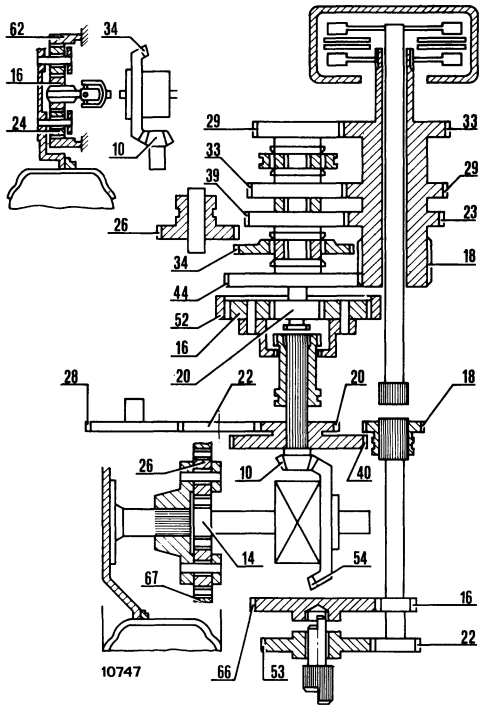
780-780 DT, 12-16-speed
(Old live front axle-optional)



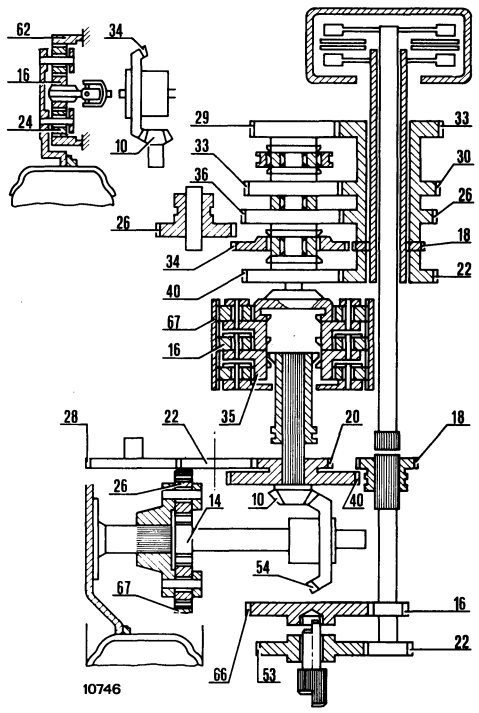
Tractor speeds at maximum engine speed, full load									
GEARS		780 and 780 DT, 8-speed, Rear tyres				780 and 780 DT, 12-16-speed, Rear tyres			
		16.9/14-34 and 13.6/12-38		18.4/15-30		16.9/14-34 and 13.6/12-38		18.4/15-30	
		kph	mph	kph	mph	kph	mph	kph	mph
Crawler	1st	—	—	—	—	.5	.3	.5	.3
	2nd	—	—	—	—	.6	.4	.6	.4
	3rd	—	—	—	—	.8	.5	.8	.5
	4th	—	—	—	—	1.0	.6	1.0	.6
	Reverse	—	—	—	—	.5	.3	.4	.2
Low	1st	2.5	1.5	2.4	1.5	1.4	.9	1.4	.9
	2nd	3.6	2.2	3.5	2.2	1.9	1.2	1.8	1.1
	3rd	5.3	3.3	5.2	3.2	2.3	1.4	2.3	1.4
	4th	6.9	4.3	6.7	4.2	2.9	1.8	2.8	1.7
	Reverse	3.2	2.0	3.1	1.9	1.4	.9	1.3	.8
Normal	1st	—	—	—	—	4.1	2.5	4.0	2.5
	2nd	—	—	—	—	5.4	3.4	5.3	3.3
	3rd	—	—	—	—	6.8	4.2	6.6	4.1
	4th	—	—	—	—	8.5	5.3	8.3	5.2
	Reverse	—	—	—	—	4.0	2.5	3.9	2.4
High	1st	8.9	5.5	8.7	5.4	12.1	7.5	11.7	7.3
	2nd	12.9	8.0	12.6	7.8	15.8	9.8	15.4	9.6
	3rd	19.3	12.0	18.7	11.6	19.9	12.4	19.4	12.1
	4th	24.9	15.5	24.3	15.1	24.9	15.5	24.3	15.1
	Reverse	11.6	7.2	11.3	7.0	11.6	7.2	11.3	7.0

POWER TRAIN SCHEMATICS

Models 780-780 DT, 8-speed (new axle)



Models 780-780 DT, 12-16-speed (new axle, optional)

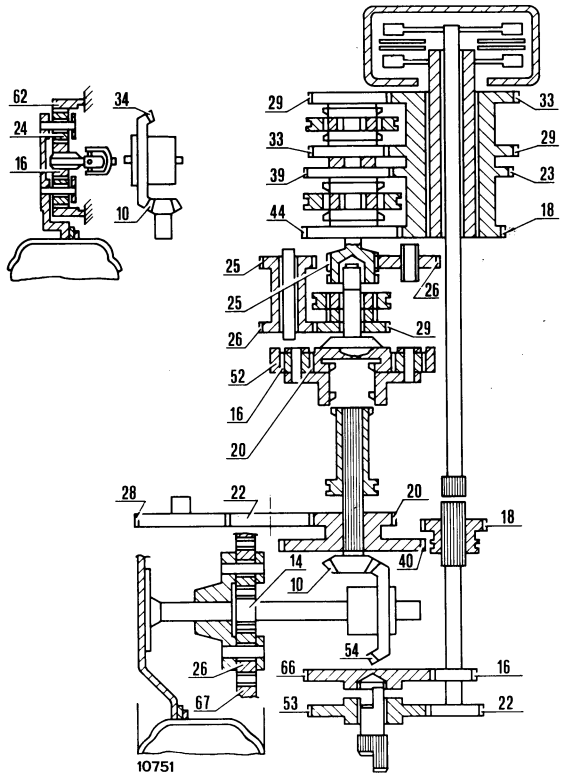


Tractors speeds at maximum engine speed, full load

GEARS		Models 780 and 780 DT, 8 speed, rear tyres				Models 780 and 780 DT, 12-16 speed, rear tyres			
		16.9/14-34 and 13.6/12-38		18.4/15-30		16.9/14-34 and 13.6/12-38		18.4/15-30	
		kph	mph	kph	mph	kph	mph	kph	mph
Crawler	1st	—	—	—	—	.5	.3	.5	.3
	2nd	—	—	—	—	.6	.3	.6	.3
	3rd	—	—	—	—	.8	.4	.8	.4
	4th	—	—	—	—	1.0	.6	1.0	.6
	Reverse	—	—	—	—	.5	.3	.4	.2
Low	1st	2.5	1.5	2.4	1.4	1.4	.8	1.4	.8
	2nd	3.7	2.2	3.5	2.1	1.9	1.1	1.8	1.1
	3rd	5.5	3.4	5.2	3.2	2.3	1.4	2.3	1.4
	4th	7.1	4.4	6.7	4.1	2.9	1.8	2.8	1.7
	Reverse	3.3	2.0	3.1	1.9	1.4	.8	1.3	.8
Normal	1st	—	—	—	—	4.1	2.5	4.0	2.4
	2nd	—	—	—	—	5.4	3.3	5.3	3.2
	3rd	—	—	—	—	6.8	4.2	6.6	4.1
	4th	—	—	—	—	8.5	5.2	8.3	5.1
	Reverse	—	—	—	—	4.0	2.4	3.9	2.4
High	1st	9.2	5.7	8.7	5.4	12.1	7.5	11.7	7.2
	2nd	13.2	8.2	12.6	7.8	15.8	9.8	15.4	9.5
	3rd	19.7	12.2	18.7	11.6	19.9	12.3	19.4	12.0
	4th	25.6	15.9	24.3	15.1	24.9	15.4	24.3	15.1
	Reverse	11.9	7.3	11.3	7.0	11.6	7.2	11.3	7.0

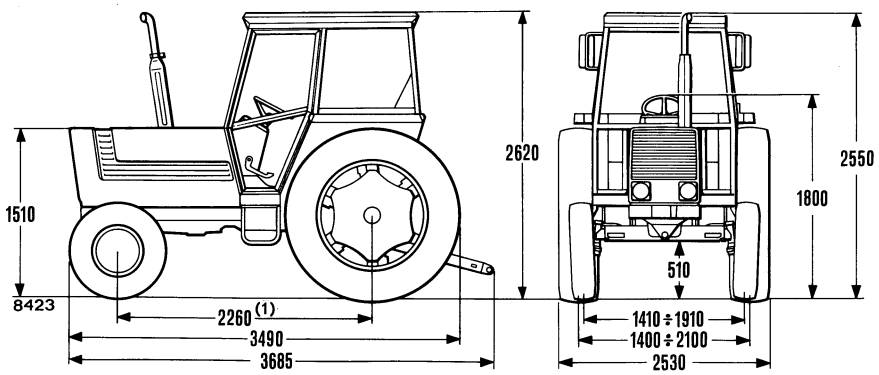
POWER TRAIN SCHEMATICS

Models 780-780 DT, 8-speed with reverser



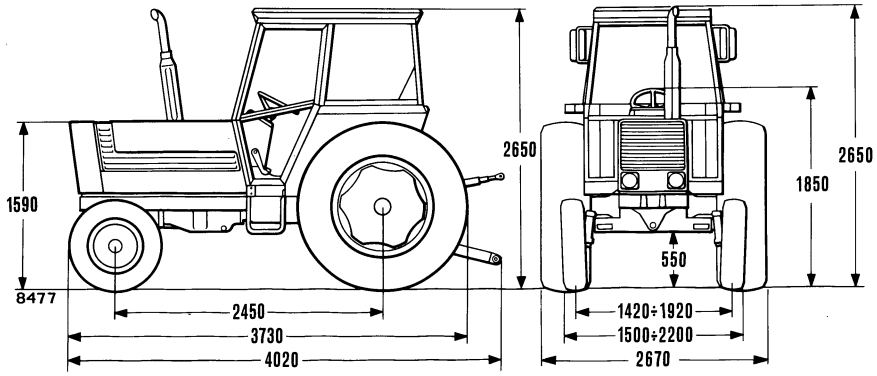
Tractor speeds at maximum engine speeds, full load						
GEARS			Models 780 and 780 DT, 8 speed with reverser and rear tyres			
			16.9/14-34 and 13.6/12-38		18.4/15-30	
			kph	mph	kph	mph
Low	Forward	1st	2.5	1.5	2.5	1.5
		2nd	3.7	2.2	3.6	2.2
		3rd	5.5	3.4	5.3	3.2
		4th	7.1	4.4	6.9	4.2
	Reverse	1st	2.3	1.4	2.2	1.3
		2nd	3.3	2.0	3.2	1.9
		3rd	4.9	3.0	4.8	2.9
		4th	6.4	3.9	6.2	3.8
High	Forward	1st	9.2	5.1	8.9	5.5
		2nd	13.2	8.2	12.9	8.0
		3rd	19.7	12.2	19.2	11.9
		4th	25.6	15.9	24.9	15.4
	Reverse	1st	8.2	5.0	8.0	4.9
		2nd	11.9	7.3	11.5	7.1
		3rd	17.7	10.9	17.2	10.8
		4th	22.9	14.2	22.3	13.8

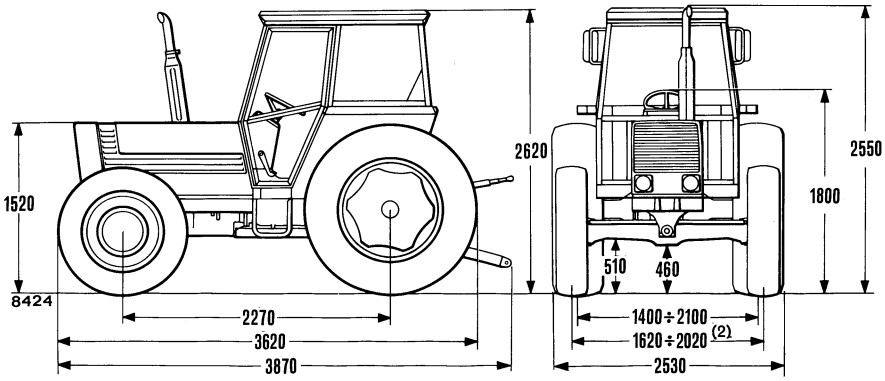
MAIN DIMENSIONS (in mm)



Model 780
(7.50-18 front
and 16.9/14-34
rear tyres)
(1) 2265 PM

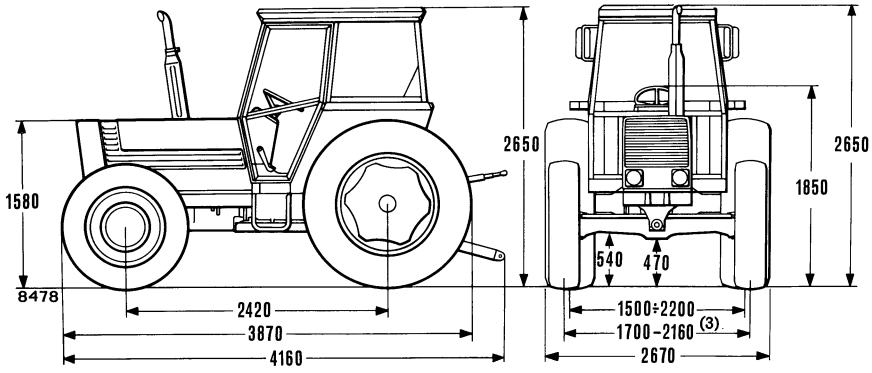
Model 880
(7.50-20 front
and 18.4/15-34
rear tyres)





Model 780 DT
(11.2/10-28 front
and 16.9/14-34
rear tyres)
(2) 1500 to 1935 PM

Model 880 DT
(12.4/11-28 front
and 18.4/15-34
rear tyres)
(3) 1710 to 2145 PM



SPECIFICATION

CAPACITIES

DESCRIPTION	FIAT Recommended Lubricants	CAPACITY 780-780 DT Litres	780-780 DT kg	780-780 DT Pints	880-880 DT Litres	880-880 DT kg	880-880 DT Pints	International Designation
Engine oil (with filter and lines)	**oliofiat AMBRA 20 W/40** above 0 °C	11.7	10.5	20 1/2	15.6(4)	14 (4)	27 1/2	Multigrade detergent mineral oil, MIL-L-2104B EP characteristics
Sump and filter oil		11.2	10.1	19 3/4	13.4(4)	12.1(4)	23 1/2	
Sump oil	**oliofiat AMBRA 10 W/30** below 0 °C	10.6	9.5	18 1/2	12.8(4)	11.5(4)	22 1/2	
Air cleaner (1)		.78	.70	1 1/2	1.9	1.7	3 1/2	
Power steering fluid		1.7	1.5	3	1.7	1.5	3	
Transmission oil	**oliofiat AMBRA 20 W/40**	11.4	10.3	19 3/4	12.5	11.3	22	
Steering oil		.39	.35	3/4	—	—	—	
Live front axle oil								
— Axle casing		4.7	4.2	8 1/4	6	5.4	10 1/2	
— Final drives (each)		1.5	1.35	2 1/2	1.7	1.5	3	
Rear transmission (bevel drive, final drives, brakes) and lift oil	**oliofiat AF 87 S**	32.2	29 (2)	Gall 7	36.1	32.5 (2)	Gall 8	Mineral gear oil with stick-slip inhibiting properties to MF1135 and FORD M2C86A
Brake fluid	**oliofiat AGERTER 10 W**	.7	.65	1 1/4	.7	.65	1 1/4	Single grade oil, MIL-L-2104C, API CD Serie 3
Front hub grease	**grassofiat MR 3**	—	—	—	—	—	—	Lithium based grease NLGI No. 3
Clutch withdrawal support and flywheel bearing grease	**grassofiat G 9**	—	—	—	—	—	—	Lithium-calcium based grease, NLGI No. 2
Lubricator grease		—	—	—	—	—	—	

Coolant (3) (water and FIAT **PARAFLU 11**, see page 2, Section 106)	780 13 Litres (2 3/4 Gall) 880 18 Litres (4 Gall)
Fuel (diesel oil)	780 80 Litres (17 1/2 Gall) 880 116 Litres (25 1/2 Gall)

(1) Change cleaner oil when sediment is 10 mm or 1/2 in deep

(2) On 780 DT oil capacity is 32.8 litres or 29.5 kg (7 1/4 Gall.) and on 880 DT oil capacity is 36.7 litres or 33 kg (8 Gall.).

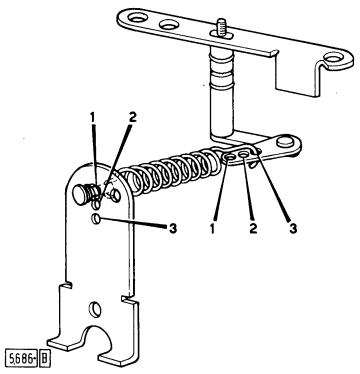
(3) Including expansion tank

(4) Applicable to 880. For 880 DT reduce by 1.67 litres or 1.5 kg (3 pints)

MODEL 780-CALIBRATION DATA - CAV INJECTION PUMP TYPE DPA 3342 F570-771541 (as from Engine 758847)

ASSEMBLY DATA

Pump rotation (drive end)	Anti-clockwise
Firing order	1-3-4-2
Governor control stud to metering valve lever pin	53 to 54 mm (2.08 to 2.13 in)
Roller spacing	49.98 mm (1.9677 in)
External pump timing	18° ± 1° before top dead centre (cylinder No. 1 on compression stroke)
External timing mark degree position relative to shaft key (on tool **290757**)	253° ± 30′
Delivery connection of cylinder No. 1	Marked with letter X



Governor Spring Attachment Position on Control Arm 1 and 3.

TEST PLAN

HARTRIDGE test machine: 1100-875-800 fitted with spray nozzles BDN 12 SD12 (*).

BOSCH test machine fitted with WSF 2044/4 X injector springs and EFEP 182 spray nozzles.

RABOTTI test machine fitted with FIAT **656829** injector springs and EFEP 182 spray nozzles.

Injector release pressure	175 to 183 bar (178 to 187 kg/cm² - 2531 to 2659 psi)
Piping	2 x 6 x 845 mm
Burette emptying time	30 seconds
Calibration fluid	FIAT CFB at 40° ± 2° C
Fuel pressure	.15 bar (kg/cm²)

Test No.	Lever position L_1 = Throttle L_2 = Shut off	Speed rpm	Transfer pressure bar (kg/cm²)	Advance degrees	Injector delivery cm³/1000 shots	Maximum spread cm³/1000 shots	Back leakage cm³/100 shots
1(1)-2	L_1 = Full L_2 = Out	100	⩾ .8	—	—	—	—
3		1250	5.1 to 6.1	—	—	—	—
4 (2)		800	—	5.8 to 6.3	—	—	—
5		1050	—	7.8 to 8.3	—	—	—
6-7		800	—	—	52 to 53 (7)	⩽ 4	3 to 50
8		100	—	—	⩾ 40 (7)	—	—
9	L_1 = Full L_2 = In	200	—	—	⩽ 2.5	—	—
10 (3)	L_1 = Idle L_2 = Out	200	—	—	⩽ 4	—	—
11 (4)	L_1 = Full L_2 = Out	1250	—	—	—	—	—
12 (5)		1340	—	—	7.5	—	—
13 (6)		1250	—	—	—	—	—

Maximum no load speed should be adjusted on the engine.

(1) Delivery to all injectors.

(2) If necessary, shim up to a maximum of 3 mm (.12 inch). .5 mm thick shim located in spring seat machined in piston must not be removed under any circumstances.

(3) Idle adjusting screw fully backed off.

(4) Measure average output.

(5) 12.5 cm³/1000 shots must not be exceeded in any cylinder. Tighten screw.

(6) Output should not be less than that specified for test No. 11. 2.0 cm³/1000 shots less acceptable.

(7) Take reading after 15 seconds.

(*) In case of dispute, the values recorded with Hartridge test machine shall apply.

Model 780 - C.A.V. Injection Pump (as from Engine 758847)

Throttle	Engine rpm	Metric HP		Time to burn 250 cm³ (15 in³) of fuel (seconds)
		2-hour run-in	50-hour run-in	
Maximum, full load	2500	⩾ 69 (°) (50.8 kW)	⩾ 72 (53 kW)	⩾ 55.5
Maximum, full torque	1400	⩾ 42 (°) (30.9 kW)	⩾ 44 (32.4 kW)	⩾ 94.3
Maximum, no-load	⩽ 2700	—	—	—
Minimum, no-load	650 to 700	—	—	—

Model 880 - C.A.V. Injection Pump (as from Engine 002817)

Throttle	Engine rpm	Metric HP		Time to burn 250 cm³ (15 in³) of fuel (seconds)
		2-hour run-in	50-hour run-in	
Maximum, full load	2400	82 (60.4 kW) min	84 (61.8 kW) min	48 min
Maximum, full torque	1400	52.5 (38.6 kW) min	54 (39.7 kW) min	72.2 min
Maximum, no load	2600 to 2650	—	—	—
Minimum, no load	600 to 650	—	—	—

(°) Anticipated

ENGINE: To Remove

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.

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

— Remove the fuel injectors.

— Fit dummy injector **292631**, 780, or **292635**, 880, in place of the injector of the cylinder under test, together with the associated copper washer (applicable to 780 only).

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

Compression should be 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 22 kg/cm² (330 psi).

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

TO REMOVE

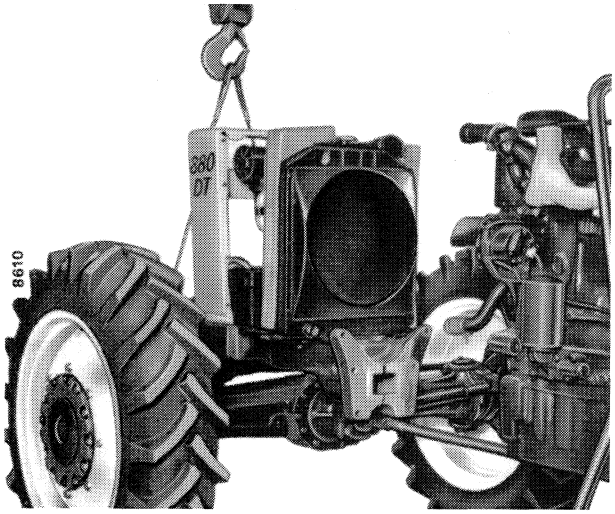
Drain the cooling system, remove the exhaust silencer, the lower and upper side panels and the front grille.

Disconnect the battery negative leads, the starter leads, the front light leads and the horn conductors.

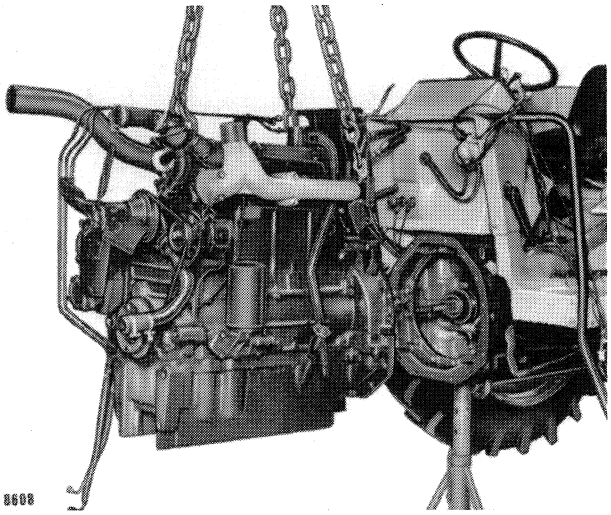
Remove the radiator and inlet manifold rubber hose.

Disconnect the power steering cylinder lines, remove the front and rear propeller shaft guards from DT versions and disconnect the drag link from the swing lever on mechanically steered 780 tractors.

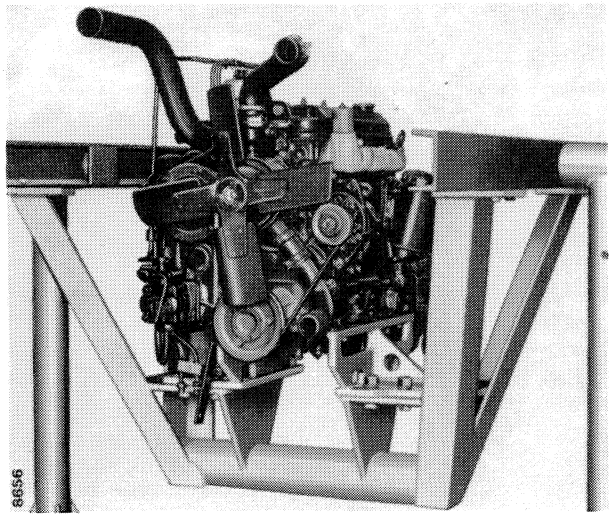
Place a jack under the engine sump, hoist the front ballast, remove capscrews retaining flat axle carrier to engine sump and detach the axle assembly from the engine acting on the front wheels as shown.



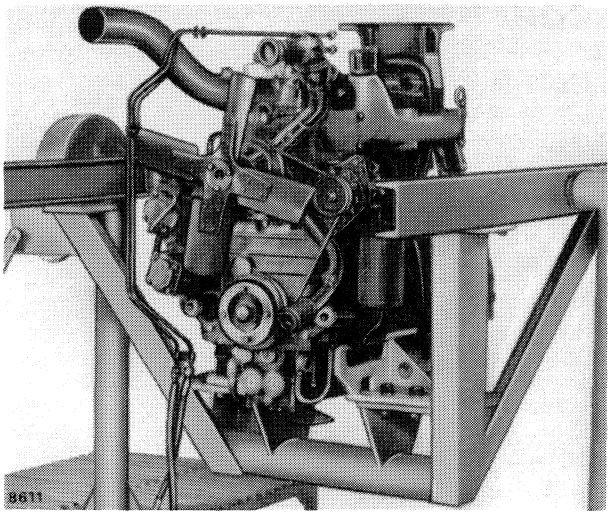
Separating the Front Axle Assembly from the Tractor (880 DT)



Lifting the Engine Clear of the Tractor Using Lift Hook 290740 (880 DT)



a



b

Engine in Position on Rotary Stand 290090
a. Model 780 - **b.** Model 880

Disconnect the fuel lines from the lift pump, from the second fuel filter and from the leak-off connection.

Disconnect the electrical leads from the alternator, oil pressure and water temperature transmitters.

Disconnect the tractor meter angle drive lead, throttle and shut-off links from the injection pump, lift inlet and outlet lines from the hydraulic pump, and the flexible steering pipes from the rigid piping.

Hoist the engine using hook **290740** as shown on page 4, remove the engine-transmission fixing nuts and bolts and separate the engine from the transmission.

Drain the sump oil, remove the sump, detatch the balancer oil line on 880 tractors, and place the engine assembly on rotary overhaul stand **290090**, using universal bracket **293002/1** as shown in Figs. a and b.

TO REFIT

Reverse the removal procedure and note the following points:

— When offering up the engine onto the transmission mesh the transmission and P.T.O. clutch shaft splines without forcing.

— Strictly adhere to the prescribed tightening torque figures.

CYLINDER HEAD

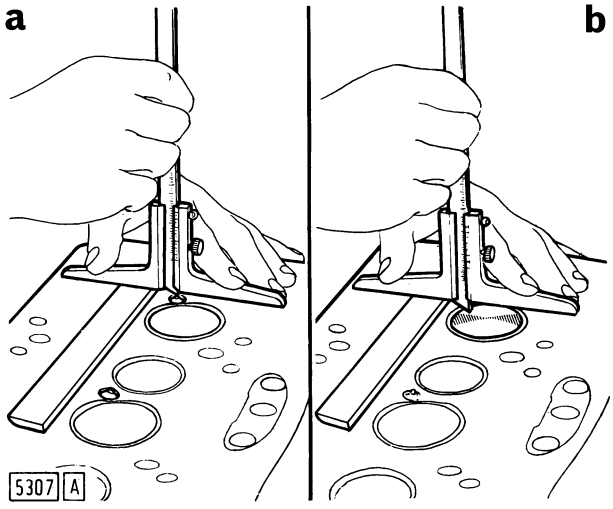
The cylinder head face may be skimmed, if necessary, removing not more than .5 mm (.02 in).

After skimming, check that fuel injector protrusion is as specified in the illustration. If injector protrusion is more than 2.8 mm (.110 in), Model 780 and 4.2 mm (.165 in), Model 880, proceed as follows:

— Model 780 - Simply insert a washer of adequate thickness in the injector housing.

— Model 880 - Renew the injector sleeves. To do this thread the sleeve using set of 24 x 2 taps and withdraw the sleeve using extractor **A. 342137 (293784)**. Fit the new sleeve and burnish in position using burnisher **291350**. Using cutter **293742/1**, skim the sleeve taper seat until the correct amount of standout is obtained.

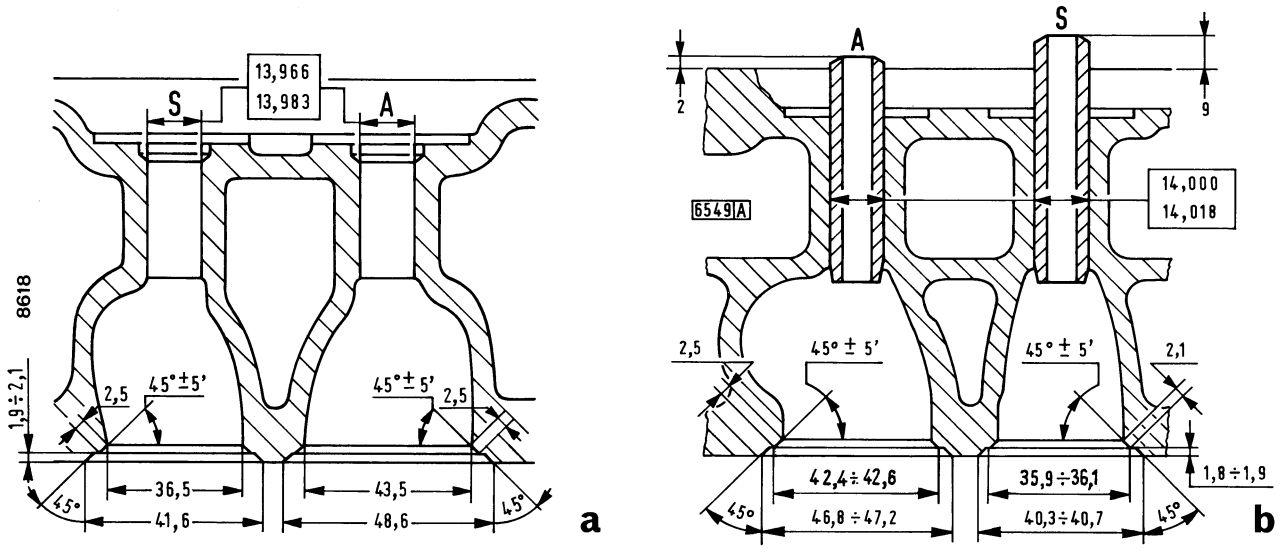
To recut the valve seats use fixture **A. 60041 (291113)** and hand lathe **A. 60419 (292913)**.



Checking Fuel Injector Protrusion

1. Protrusion, 2 to 2.5 mm (.078 to .098 in), Model 780, 3 to 3.9 mm (.120 to .153 in), Model 880. Maximum protrusion, 2.8 mm (.110 in), Model 780, and 4.2 mm (.165 in), Model 880 - b. Valve depth, .7 to 1.1 mm (.028 to .044 in), Model 780, .1 to .5 mm (.004 to .020 in), Model 880. Maximum depth, 1.4 mm (.055 in), Model 780, and .7 mm (.027 in), Model 880

Subsequently, check valve depth as shown.



Valve Seat and Guide Housing Details

a. Model 780 - **b.** Model 880 - A. Inlet - X. Exhaust

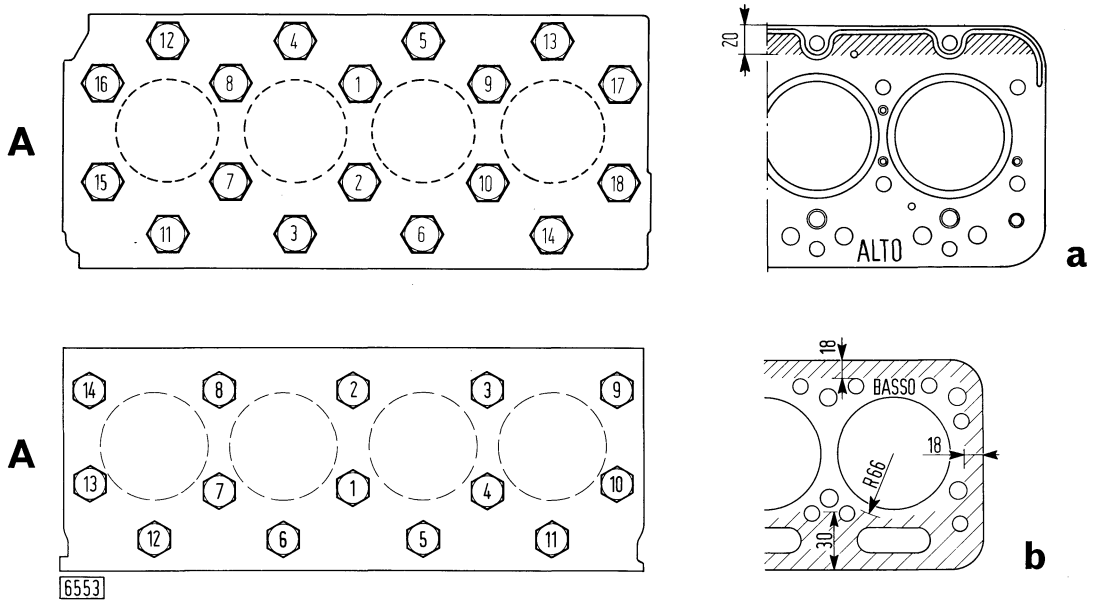
ENGINE: Cylinder Head

When refitting the cylinder head, thoroughly clean the mating surfaces and reposition the head gasket noting the following points:

— Model 780, place the gasket (provided with adhesive face) on the block with the mark " ALTO " facing towards the cylinder head (see a). Offer up the cylinder head and tighten the hold-down bolts to the correct torque in the order shown.

— Model 880, smear the block top with Wellseal or other approved jointing compound. Wipe the steel face of the gasket and smear the shaded area (b) with jointing compound. Position the gasket with the mark " BASSO " facing towards the block top.

Offer up the cylinder head and tighten the hold-down nuts in the order shown.



ALTO = UP

BASSO = DOWN

Cylinder Head Tightening Diagram and Scrap View of Head Gasket

a. Model 780 - **b.** Model 880 - **A.** Fan side

NOTE

Dimensioned shaded area indicates adhesive surface, Model 780, and the metal surface to be smeared with compound prior to fitting, Model 880.

The hold-down bolts, Model 780, and nuts, Model 880, are to be tightened in 3 successive stages as shown in the table.

Tightening Torque Figures

Stage	One	Two	Three
Model 780			
— kgm	5	10	15
— lb ft	36	72	108
Model 880			
— kgm	10	16	23
— lb ft	72	115	166

REAR BEVEL DRIVE AND DIFFERENTIAL

	780-780 DT	880-880 DT
Bevel drive ratio		
— AM	—	10/55 = 1 to 5.5
— PM	10/54 = 1 to 5.4	8/44 = 1 to 5.5
Bevel drive backlash	.15 to .20 mm (.006 to .008 in)	
Differential	2-pinion	
Differential lock	Pedal controlled	

	780-780 DT		880-880 DT	
	mm	in	mm	in
Differential pinion bore dia.	25.040 to 25.061	.9858 to .9866	30.040 to 30.061	1.1827 to 1.1835
Differential pinion journal dia.	24.939 to 24.960	.9818 to .9827	29.939 to 29.960	1.1787 to 1.1795
Differential pinion running clearance on journal	.080 to .122	.0031 to .0048	.080 to .122	.0031 to .0048
Side gear boss housing dia. in differential box	51.100 to 51.146	2.0118 to 2.0136	60.100 to 60.146	2.3661 to 2.3679
Side gear boss dia.	50.954 to 51.000	2.0061 to 2.0079	59.954 to 60.000	2.3604 to 2.3622
Side gear boss clearance in box	.100 to .192	.0040 to .0075	.100 to .192	.0040 to .0075
Bevel pinion adjustment	See page 7, Section 204			
Bevel pinion shim thickness	4-4.1-4.2-4.3-4.4-4.5-4.6-4.7-4.8-4.9-5	.1575-.1614-.1653-.1693-.1732-.1772-.1811-.1850-.1890-.1929-.1968	3.8-3.9-4-4.1-4.2-4.3-4.4-4.5-4.6-4.7-4.8-4.9	.1496-.1535-.1575-.1614-.1653-.1693-.1732-.1772-.1811-.1850-.1890-.1929

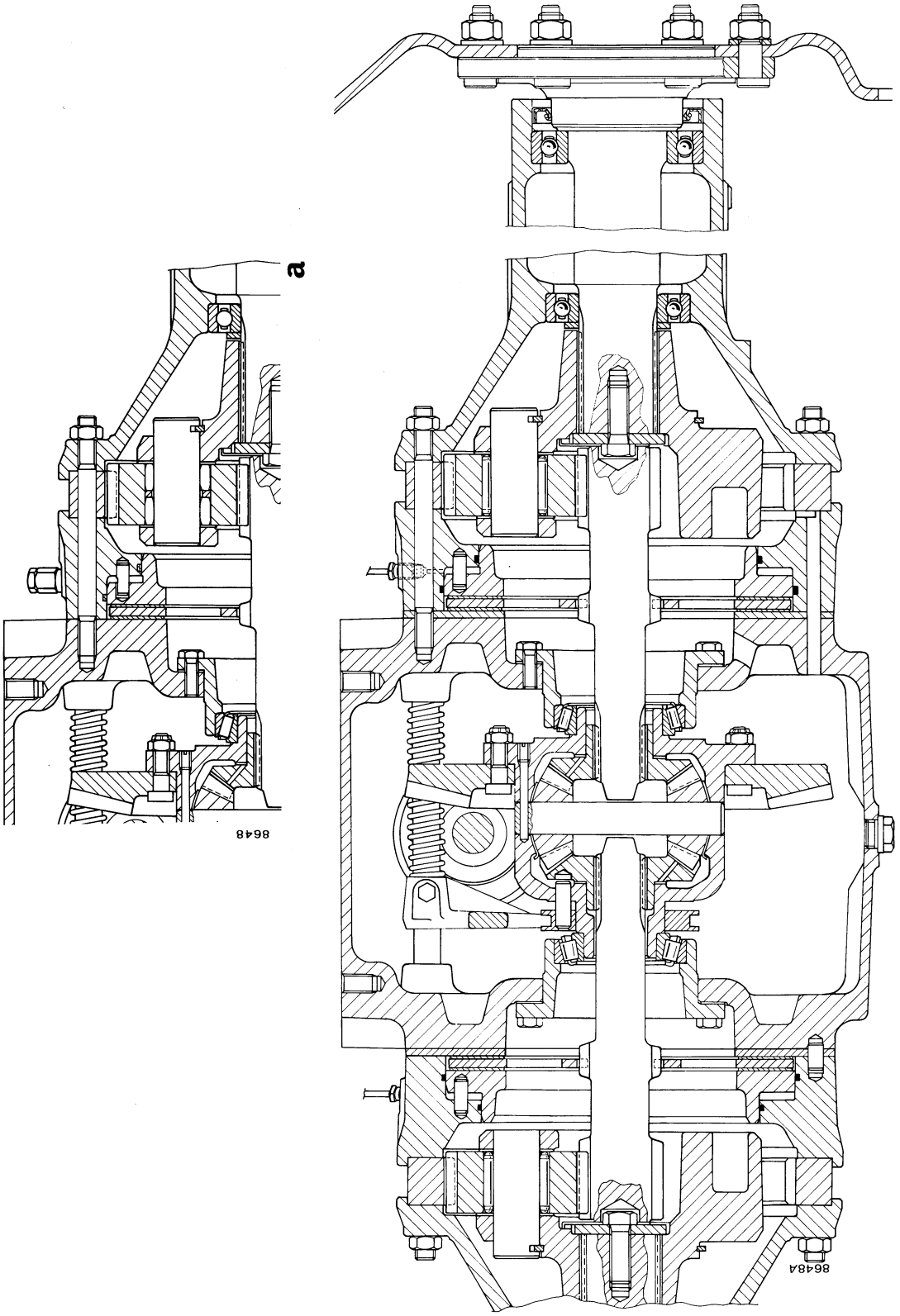
	780-780 DT	880-880 DT
Bevel pinion bearing adjustment		
— AM	See pp 2 and 4, section 204	
— PM	See pp 3 and 5, section 204	
Bevel pinion bearing shim thickness range	1-1.05-1.10-1.15-1.20-1.40-1.50-1.70-1.75-1.85-1.90-1.95-2-2.05-2.10-2.15 mm (.039-.041-.043-.045-.047-0.55-.059-.067-.069-.073-.075-.077-.079-.081-.083-.085 in)	
Differential bearing and bevel drive backlash adjustment		
— AM	See page 8, section 204	
— PM	See page 10, section 204	
Differential bearing and bevel drive backlash shim thickness	.15-.2-.5 mm (.006-.008-.020 in)	
Side gear and differential pinion backlash	.18 mm (.007 in)	.20 mm (.008 in)
Side gear thrust washer thickness	1.5-1.6 mm (.059-.063 in)	
Differential pinion thrust washer thickness	1.5 mm (.59 in)	
Side gear end float adjustment	See page 11, section 204	
Differential lock adjustment	See page 12, section 204	
Differential lock fork shim thickness	.5 mm (.020 in)	
Differential lock fork spring length		
— Free		
- AM	194.5 mm (7.657 in)	
- PM	212.5 mm (8.366 in)	
— Under 33.2 to 33.6 kg (326 to 359 N or 73 to 74 lb) AM, or 17.1 to 18.9 kg (168 to 185 N or 38 to 42 lb) PM	123.5 mm (4.862 in)	

BRAKES

	780-780 DT	880-880 DT
Type — Service — Parking - AM - PM	Disc, oil-bath, axle shaft mounted Single disc, oil-bath, bevel pinion shaft mounted Double disc, oil-bath, bevel pinion shaft mounted	
Control — Service — Parking	Hydraulic, latched pedals Mechanical, manual lever	
Service brake disc material Parking brake disc material Parking brake sector material	Sintered Steel Sintered or graphite conglomerate	
Original piston height — Old — 780 Original piston height — Old — 880 Original piston height — New — 780 Original piston height — New — 880 Maximum amount of material removable for skimming Original brake wear plate pad	40 mm (1.574 in) 42 mm (1.653 in) 35.5 mm (1.397 in) 37 mm (1.456 in) 1 mm (.039 in) 5 mm (.196 in)	
Disc thickness — Service Wear limit — Parking - AM - PM Parking brake sector thickness — Single disc, 2 sectors, AM — Twin disc, AM - Side sectors - Interm. sector — Twin disc, PM - Side sectors - Interm. sector	 10 mm (.394 in) 9 mm (.354 in) 2.5 mm (.098 in) 3 mm (.118 in) 3.5 mm (.138 in) 3.5 mm (.138 in) 5 mm (.197 in) 3.1 to 3.4 mm (.122 to .134 in) 4.2 to 4.5 mm (.165 to .177 in)	
Parking brake relay lever shim thickness	.5-1-1.5-2 mm (.020-.040-.060-.080 in)	
Brake pedal support R.H. brake shaft journal dia. (4, page 3, Section 205) Bush I.D. (4) Shaft clearance in bush	 16.973 to 17.000 mm (.6682 to .6693 in) 17.100 to 17.150 mm (°) (.6732 to .6752 in) (°) .100 to .177 mm (.0040 to .0070 in)	
R.H. brake shaft journal dia. (5 and 7) Bush I.D. (5 and 7) Shaft clearance in bushes	20.967 to 21.000 mm (.8255 to .8268 in) 21.100 to 21.150 mm (°) (.8307 to .8327 in) (°) .100 to .183 mm (.0040 to .0072 in)	
L.H. brake shaft journal dia. (6) Bush I.D. (6) Shaft clearance in bush	39.961 to 40.000 mm (1.5733 to 1.5748 in) 40.100 to 40.150 mm (°) (1.5787 to 1.5807 in) (°) .100 to .189 mm (.0040 to .0074 in)	

(°) Fitted dimension, no reaming

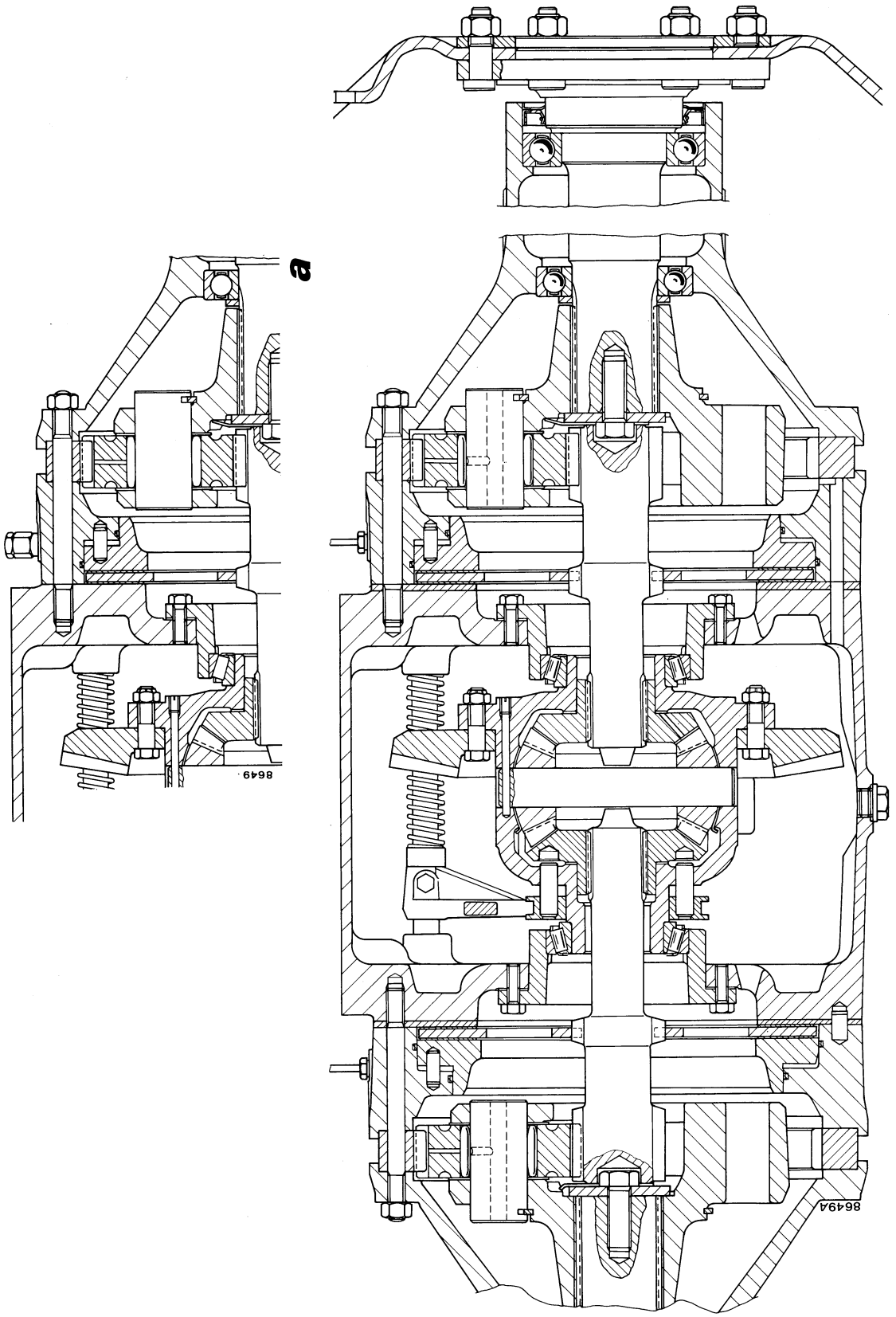
Continued



Cross Section Through Power Train - Model 780 New

a. Details of old brake and disc

POWER TRAIN:
Specification and Data

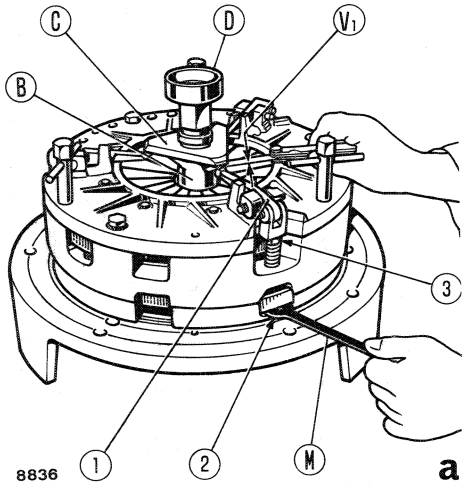


Cross Section Through Power Train - Model 880 New

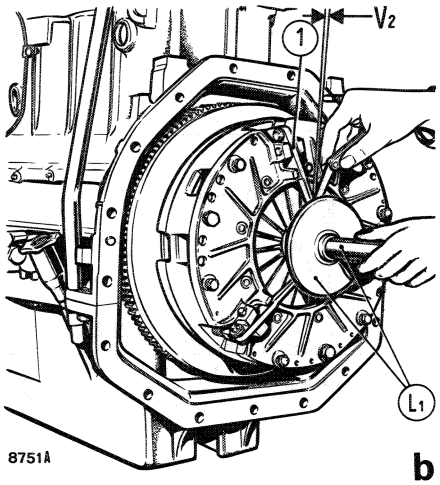
a. Detail of old brake and disc

Checking P.T.O. Clutch Release Lever Height

a. On-bench adjustment using tool **291291/2**, or universal tool **293650** - b. On-flywheel adjustment - B. Spacer - C. Register - D. Nut **292344** (for tool **291291/2**) or handwheel **293739** (for universal tool **293650**) - L_1. Centralizer **291184** (780 tractor) or **293375** (880 tractor) - M. Spanner of set **293763** - V_1 = .1 mm (.004 in), release lever gap against register - V_2 = 3 mm (.120 in) (780 model) or .1 mm (.004 in) (880 tractor), release lever gap against clutch with unit fitted to flywheel - 1. Release levers - 2/3. Adjusting screw and nut



a



b

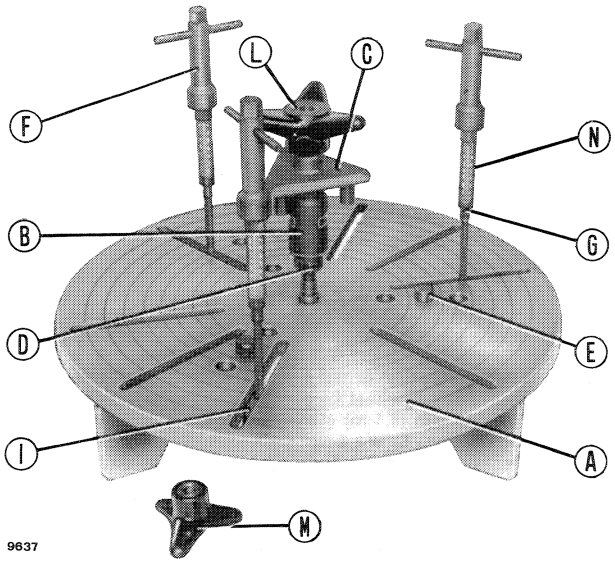
On 12″/12″ clutch remove release lever plate (14, page 2), install register (C) and fasten with nut (D), tool **291291/2**, or handwheel (L, page 3), universal tool **293650**.

Using spanner (M), screw in or back off P.T.O. clutch release lever screws (2) to obtain a clearance (V1) between the end of each release lever and register (C). Subsequently, tighten the screws using nuts (3).

2. On-Flywheel Clutch Adjustment

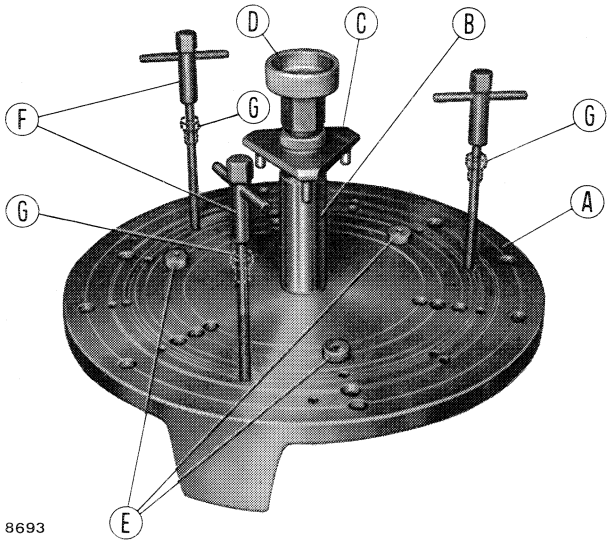
Insert centraliser (L_1) **291184**, 780 tractor or **293375**, 880 tractor, in place of the clutch shaft ensuring that the end is in contact with bearing (10, page 2), and push the associated register against it.

Adjust cap (V_2) as directed above for (V_1) gap adjustment.



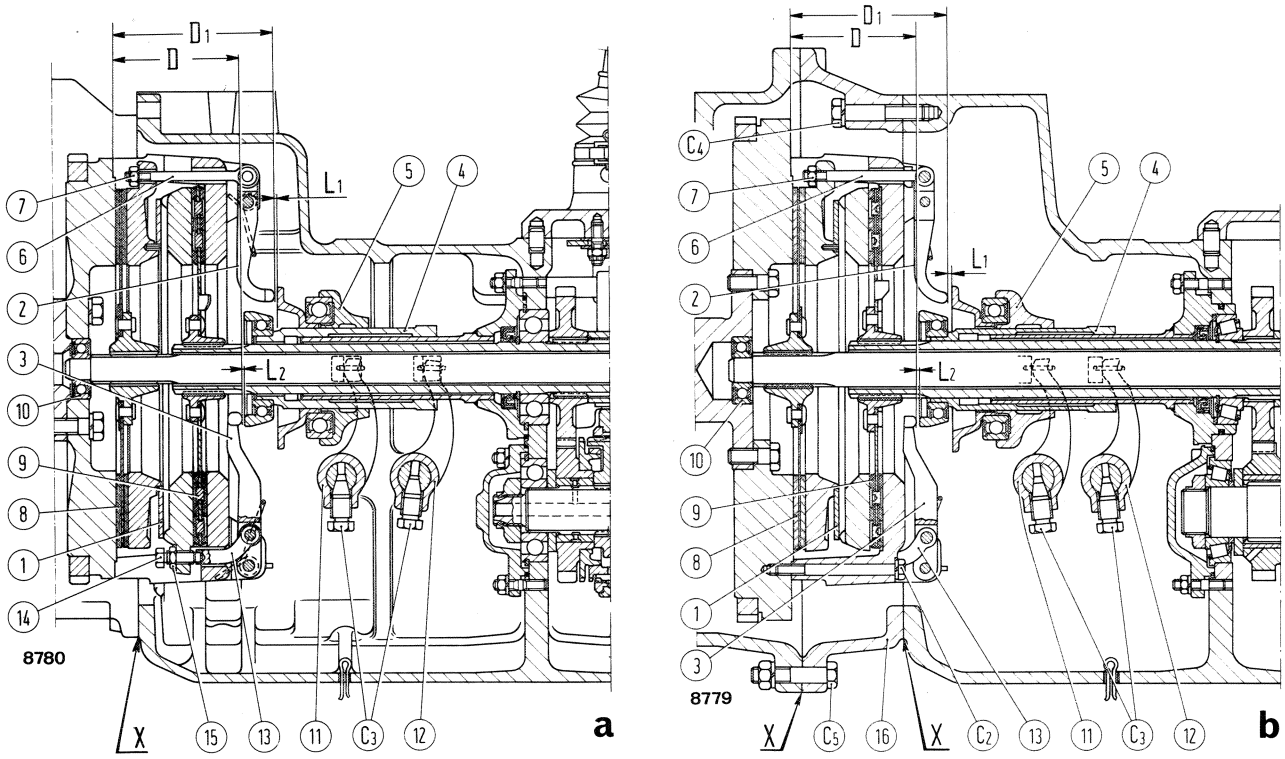
Component Parts of Universal Tool 293650 for LUK or O.M.G. Clutch Adjustment

A. Base plate **293332/1** - B. Spacer **293728** (780 tractor) or **293729** (880 tractor) - C. Register **293731** - D. Locknut **293730** - E. Locators **293726** - F. Studs **293725** - G. Bushing **293734** (880 tractor, 12″/12″ clutch) - I. Pads **293755** - L. Handwheel **293739** - M. Locator handwheels **293740** - N. Spacers **293737** (780 tractor, 11″/11″ clutches) or **292345** (880 tractor, 12″/12″ clutch)

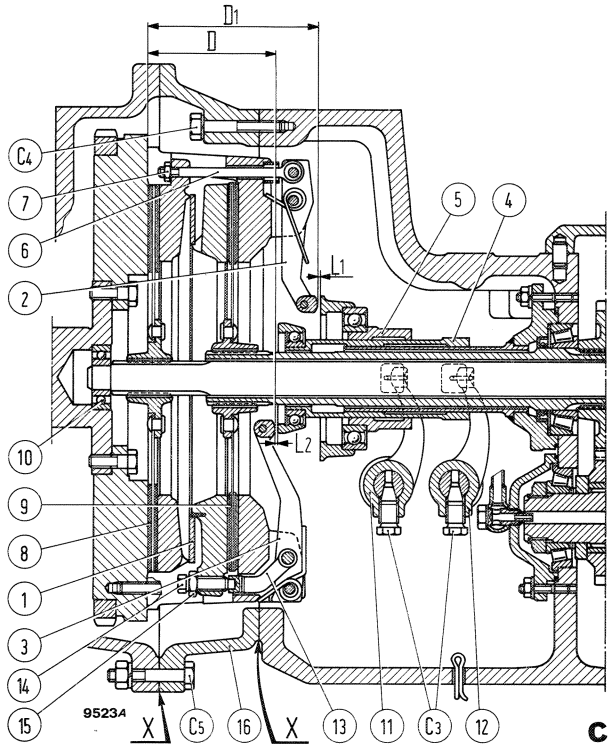


Component Parts of Tool 291291/2 for LUK or O.M.G. Clutch Adjustment

A. Baseplate **292598** - B. Spacer **292342** (780 tractor) or **293382/1** (880 tractor, 11″/11″ clutch) or **291294** (880 tractor, 12″/12″ clutch) - C. Register **291299** (780 tractor) or **293376/1** (880 tractor, 11″/11″ clutches) or **292939/1** (880 tractor, 12″/12″ clutch) - D. Nut **292344** - E. Locators **293454** (780 tractor, LUK and O.M.G. clutches and 880 tractor, LUK 11″/11″ clutch) or **293683** (880 tractor, O.M.G. 11″/11″ clutch) or **293733** (880 tractor, LUK 12″/12″ clutch) - F. Studs **291292/1** - G. Bushings **291293/1** (880 tractor, LUK 12″/12″ clutch only)



Section Through LUK or O.M.G. 11″/11″ clutch



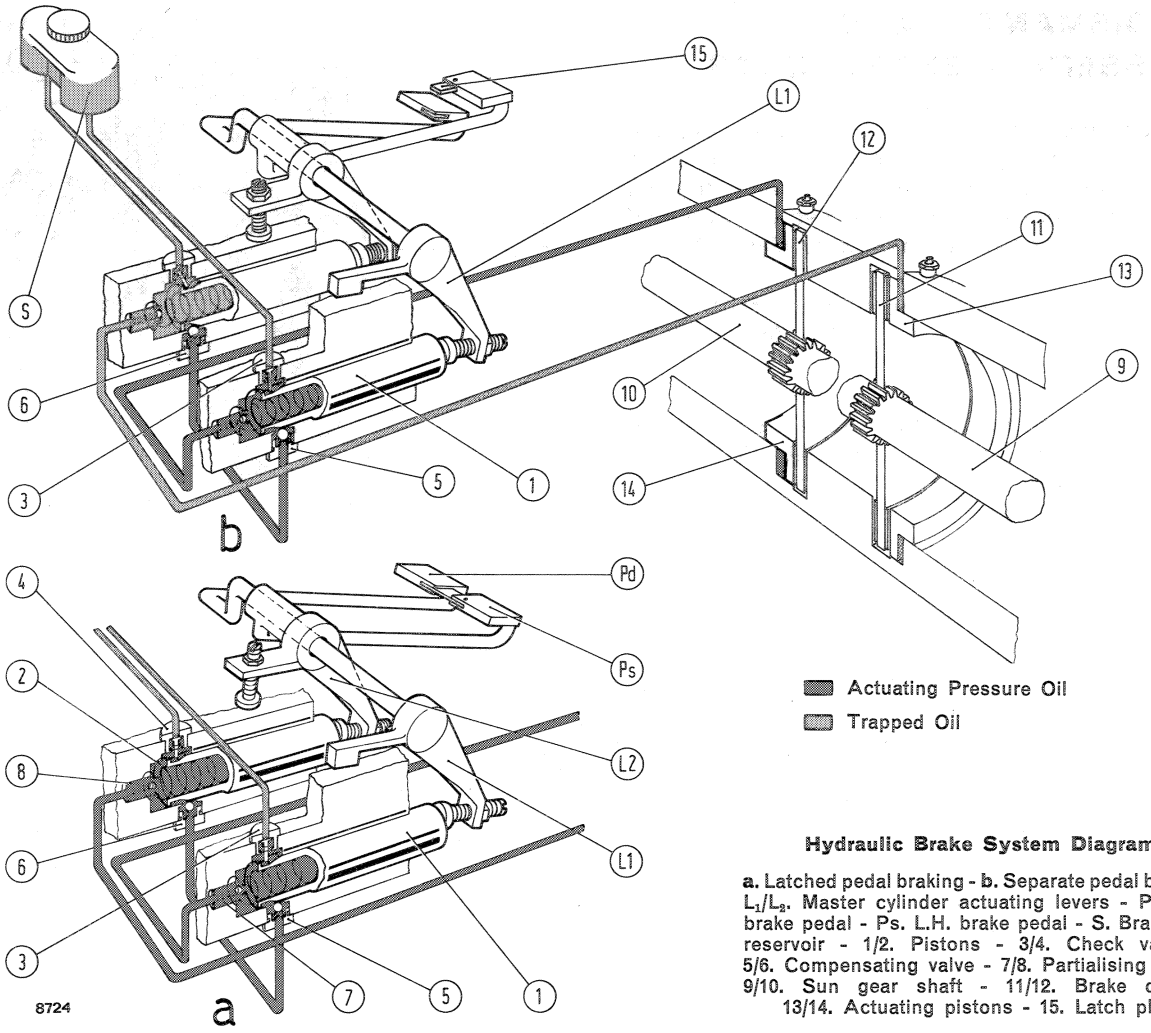
Section Through LUK 12″/12″ Clutch

a. 780 tractor - b/c. 880 tractor - C_2. Clutch capscrews - C_3. Withdrawal lever capscrews - C_4/C_5. Spacer capscrews - D = 98 mm (3.9 in) (11″/11″ clutches) or 103 mm (4.1 in) (12″/12″ clutch, release lever height above flywheel face - D_1 = 123 mm (4.8 in) (11″/11″ clutches) or 137 mm (5.4 in) (12″/12″ clutch), release lever height above flywheel face - L_1 = 2.5 mm (.098 in) and L_2 = 2 mm (.079 in), P.T.O. release levers to bearing and transmission clutch release levers to bearing - 1. Dished spring - 2. P.T.O. clutch release levers - 3. Transmission clutch release levers - 4/5. Control sleeves with attached bearings - 6/7. P.T.O. clutch release lever adjusting link and nut - 8. P.T.O. clutch plate - 9. New transmission clutch plate with axle damping - 10. Flywheel bearing - 11. Fork - 12. Fork - 13. Lever - 14. Adjusting screw - 15. Nut - 16. Spacer

Note: On installation of 12″/12″ clutch ensure that transmission clutch plate (9) faces as shown, i.e. with short hub position towards flywheel.

Note: On reassembly, throughly clean faces **X** to be mated and smear with one of the following jointing compounds:

RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET



Hydraulic Brake System Diagram

a. Latched pedal braking - **b.** Separate pedal braking- L_1/L_2. Master cylinder actuating levers - Pd. R.H. brake pedal - Ps. L.H. brake pedal - S. Brake fluid reservoir - 1/2. Pistons - 3/4. Check valves - 5/6. Compensating valve - 7/8. Partialising valve - 9/10. Sun gear shaft - 11/12. Brake discs - 13/14. Actuating pistons - 15. Latch plate

Latched Pedal Braking

Upon brake application, actuating levers (L_1 and L_2) 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 partialising valves (7 and 8), acts on brake actuating pistons.
On full braking, the circuit pressure is approximately 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 partialising valve cups.
The small restrictions 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 (L_1) moves the plate of check valve (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.

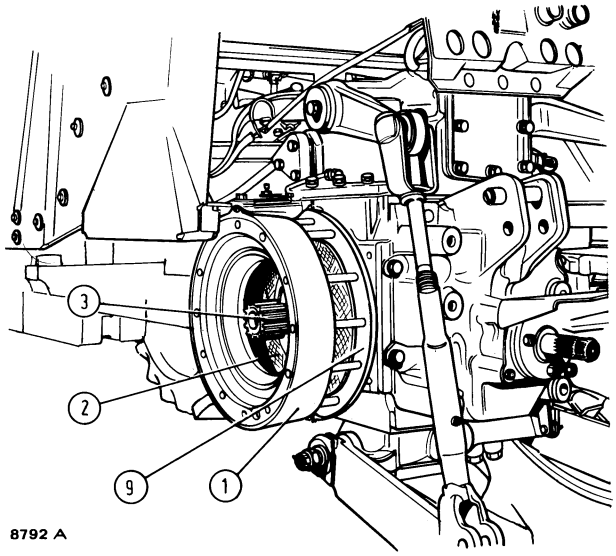
Note: The twin section fluid reservoir supplies the two master cylinders separately to maintain brake effectiveness in the event of brake line failure.

TO DISMANTLE AND REASSEMBLE BRAKE UNITS

To dismantle the brake unit, withdraw the hub reduction assembly, disconnect the oil line union, remove brake actuating cylinder (1) from rear transmission casing, retrieving brake disc (2), axle shaft (3) and, on new tractors, also wear plate (9).

Check the brake disc (2) for wear and renew if the sintered coat is at the end of its life (see Wear Limits, page 6, Section 20).

Also check friction surfaces of brake piston (2) and, on new tractors, also the wear plate (9, page 3). If necessary, dress the brake piston to a maximum depth of 1 mm (.040 inch); if worn, the wear plate must be renewed.



Removing the Brake Unit

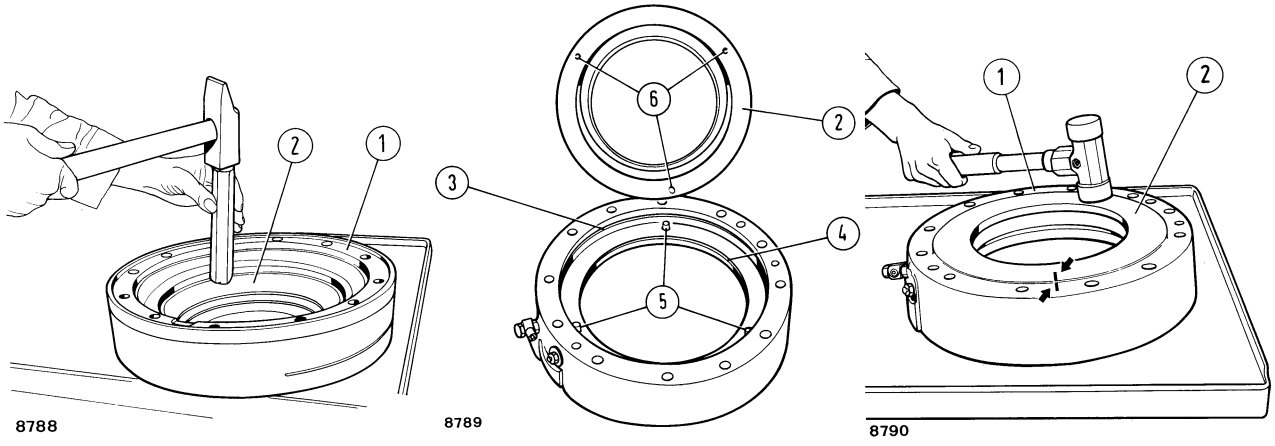
1. Actuating cylinder - 2. Brake disc - 3. Axle shaft - 9. Wear plate

Overhaul the brake unit referring to the illustration and noting the following points:

— Prior to removing the actuating piston (2), apply reference marks to both piston and cylinder (1) for correct matching of dowels (5) to holes (6) on reassembly.

— If the seals (3 and 4) are renewed, prior to installing the replacement seals, smear the seats with **grassofiat G 9** or other approved grease. After fitting, ensure that the seals are correctly seated to prevent damage upon piston installation.

— Prior to refitting the actuating cylinder to the rear axle case, thoroughly clean the surfaces to be mated and apply either of the jointing compounds mentioned in the illustration of page 3.



Withdrawing the Actuating Piston

Note: Reference marks to be applied for correct reassembly arrowed

1. Cylinder - 2. Piston - 3/4. Seals - 5/6. Dowels and dowel holes

TO DISMANTLE AND REASSEMBLE MASTER CYLINDER

To gain access to the master cylinder, remove the control board on the dash and proceed as follows:

— Take off circlips (2 and 3), withdraw the pedals and retrieve the actuating levers (L_1 and L_2).

— Disconnect the master cylinder inlet lines, slackening the associated clips.

— Remove the master cylinder outlet line unions.

— Remove the master cylinder retaining screws and withdraw the master cylinder.

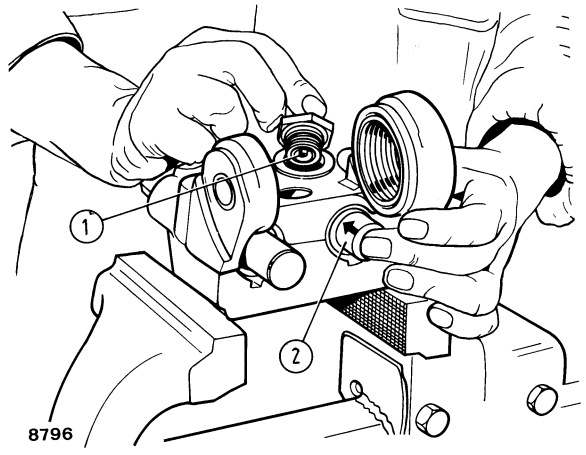
When dismantling the master cylinder note that pistons (8 and 9, page 4) should be withdrawn from the outlet line side.

Check the master cylinder bore and piston working surfaces for oxidation and roughness and renew as necessary; the piston clearance in the master cylinder bore should not be in excess of the allowance given on page 7, Section 20.

Check the seals and renew if damaged.

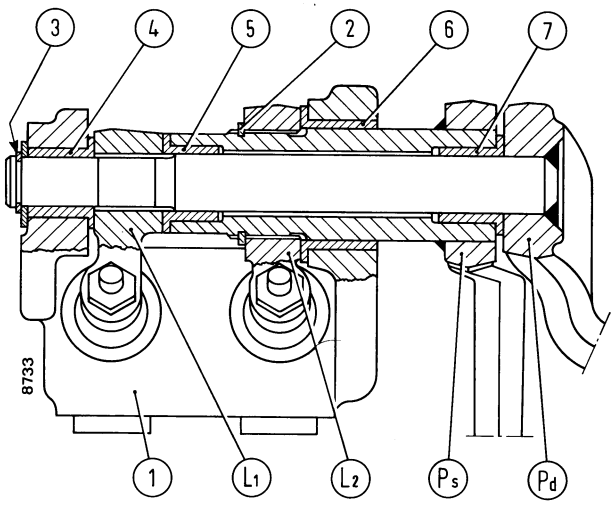
On reassembly, install the check valves on the master cylinders prior to introducing the pistons to prevent the piston from fouling the check valve plate.

Note: When refitting a check valve to a master cylinder which has the piston in position, move the piston forward to prevent check valve plate damage.



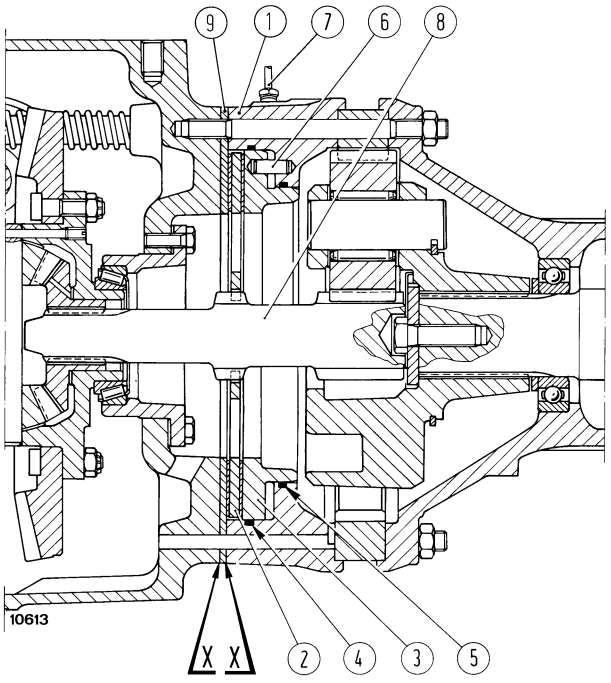
Installing Check Valve on Master Cylinder

1. Valve plate - 2. Master cylinder piston



Section through Brake Pedal Assembly

L_1/L_2. Master cylinder actuating levers - Pd. R.H. brake pedal - Ps. L.H. brake pedal - 1. Master cylinder body - 2/3. Circlips - 4/5/6/7. Bushes

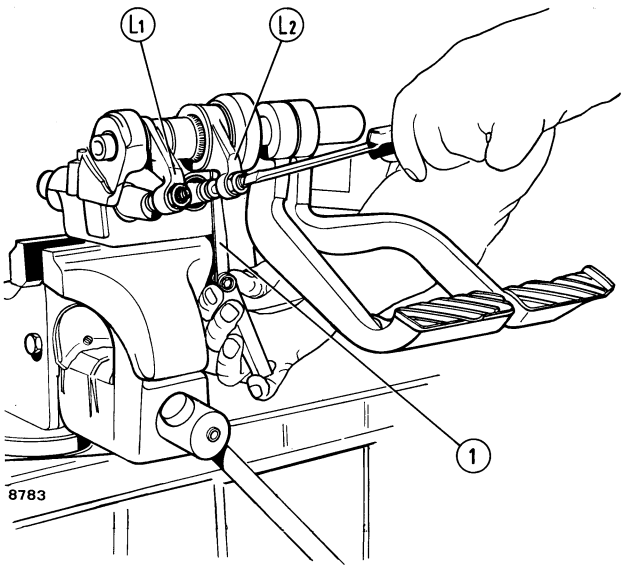


Section Through New Brake Unit

(For old brake units see Section 20, page 13)

1. Actuating cylinder - 2. Brake disc - 3. Brake piston - 4. Sealing ring - 5. Sealing ring - 6. Dowel - 7. Oil line union - 8. Right hand axle shaft - 9. Wear plate

Note: On reassembly, thoroughly clean faces **X** to be mated and smear with either of the following jointing compounds: RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET



Adjusting Pedals on Bench

1. Feeler gauge - L_1/L_2. Master cylinder actuating levers

TO ADJUST BRAKE PEDALS

Install the L.H. brake pedal with attached bushes on the master cylinder body (1), followed by lever (L_2) with adjusting screws (2 and 3) and lock in position using circlip (2, page 3).

Fit R.H. pedal to lever (L_1) so that the front of the lever rests on the master cylinder body.

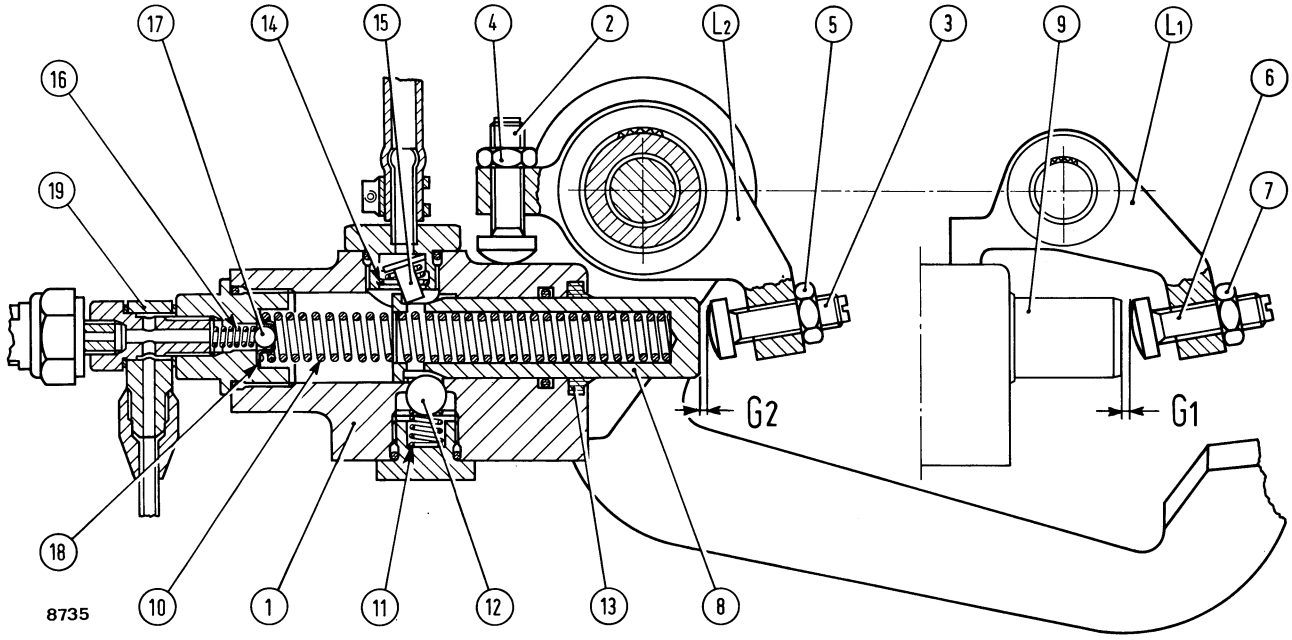
Turn adjusting screw (6) until a .1 to .2 mm (.004 to .008 in) clearance (G_1) is obtained, and lock in position using lock nut (7).

Align the two pedals through the latch plate.

Turn adjusting screw (2) until it contacts the master cylinder body and clamp in position by means of lock nut (4).

Turn adjusting screw (3) to obtain a .1 to .2 mm (.004 to .008 in) clearance (G_2) and clamp 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

G_1/G_2 = .1 to .2 mm (.004 to .008 in), piston clearance - L_1/L_2. Master cylinder actuating 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

POWER TRAIN: Reverser (model 780 with 8-speed transmission)

MAIN DATA

Type	Mechanical, spur gear
Operation	Sliding sleeve
Reduction ratio	$\frac{25 \times 26 \times 26}{26 \times 25 \times 29} = \frac{1}{1{,}115}$
Control	Through splitter lever

	mm	in
Driven gear inner ring O.D.	39.925 to 39.950	1.572 to 1.573
Driven gear bore dia.	40.050 to 40.089	1.577 to 1.578
Inner ring clearance in driven gear	.100 to .164	.0039 to .0065
Reverser double gear and idler gear thrust washer thickness	6.950 to 7.000	.274 to .276
Driven gear thrust washer thickness	1.950 to 2.050	.077 to .080
Reverser detent ball spring length:		
— Free	35.5	1.39
— Under 11.7 to 12.9 kg (115 to 126 N or 25.74 to 28.38 lb. *)	31.5	1.24

TIGHTENING TORQUE FIGURES

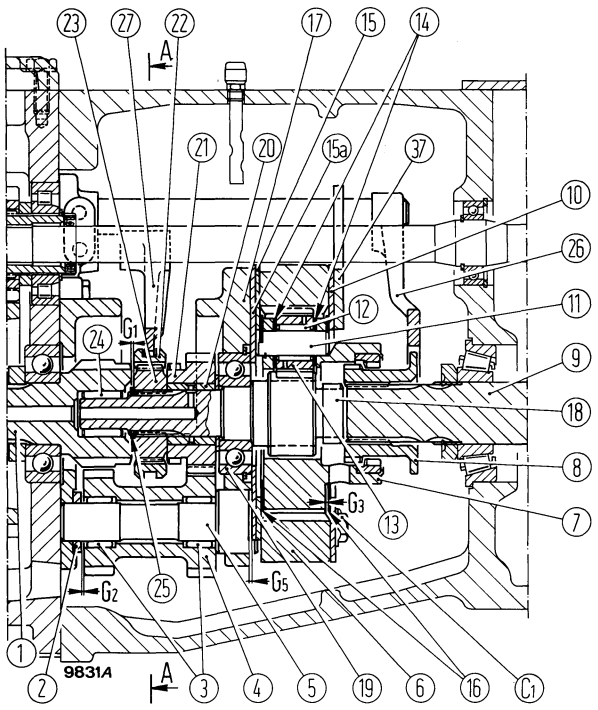
DESCRIPTION	Thread size	Torque		
		kgm	N.m	lb ft
Capscrew, splitter fixed gear (C_1, page 2)	M 12 x 1.25	10	98	72
Capscrew, reverser casing (C_2, page 2)	M 10 x 1.5	6	59	43
Capscrew, splitter and reverser selector shaft (C_3, page 2)	M 10 x 1.25	6.2	61	44

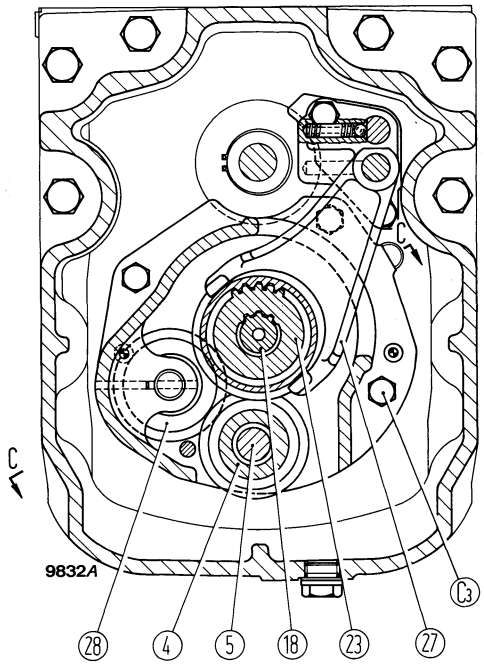
POWER TRAIN: Reverser (model 780 with 8-speed transmission)

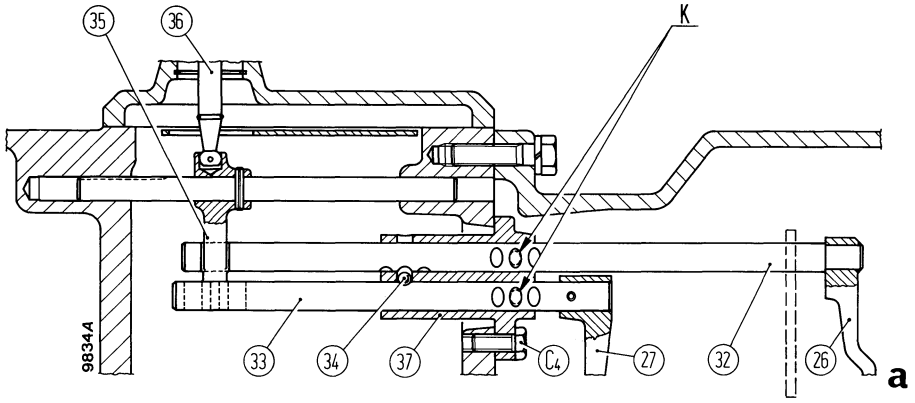
DESCRIPTION

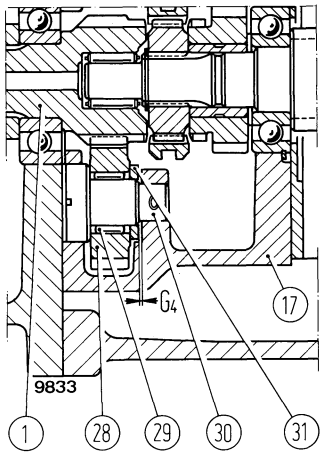
The reverser fitted to Model 780 with 8-speed transmission only (as from frame 673755) is a mechanical unit featuring constant mesh gears, giving 8 forward and 8 reverse ratios.

The unit is fitted to the output side of the transmission and drives the planetary type range splitter both in forward and in reverse.
Control is effected through the splitter lever.









Longitudinal and Cross Sections Through Transmission Reverser and Planetary Splitter - Model 780, 8-speed.

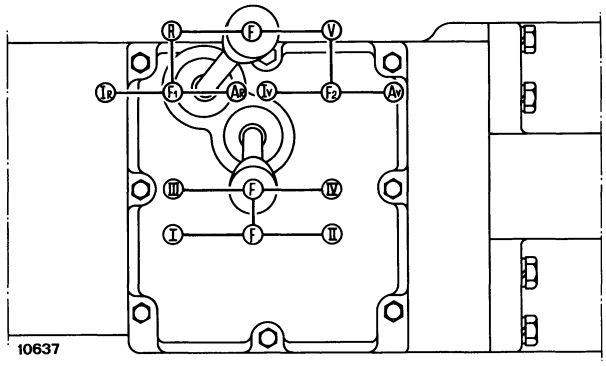
a. Section through shift mechanism - C_1. Splitter fixed gear capscrews - C_3. Reverser casing capscrews - C_4. Splitter and reverser selector shaft carrier capscrews - G_1 = .44 to 1.75 mm (.0173 to .1689 in) fixed sleeve end float - G_2 = .3 to .7 mm (.0118 to .0276 in). Double drive gear end float - G_3 = .44 to .76 mm (.0173 to .0299 in) driven gear support end float - G_4 = .2 to .6 mm (.0079 to .0236 in). Reverser idler gear end float - G_5 = .05 to .25 mm (.0020 to .0098 in) pin end float - K. Selector shaft neutral position - 1. Transmission driven shaft - 2. Thrust washer - 3. Needle roller bearing - 4. Double drive gear - 5. Pin - 6. Fixed gear - 7. Driven gear carrier - 8. Splitter engagement sleeve - 9. Bevel pinion shaft - 10. Splitter cover - 11. Driven gear pins - 12. Needle roller bearing - 13. Driven gears - 14. Driven gear thrust rings - 15. Inner splitter thrust plate - 16. Front and rear thrust rings - 17. Transmission reverser casing - 18. Reverser drive shaft - 19. Ball bearing - 20. Inner ring - 21. Driven gear - 22. Sliding sleeve - 23. Fixed sleeve - 24. Needle roller bearing - 25. Retaining ring - 26. Splitter fork - 27. Reverser fork - 28. Reverser idler gear - 29. Needle roller bearing - 30. Idler gear pin - 31. Thrust washer - 32. Splitter selector shaft - 33. Reverser selector shaft - 34. Detent ball - 35. Splitter and reverser selector lever - 36. Splitter and reverser actuating lever - 37. Selector shaft support.

TO OVERHAUL

Remove sleeve (8, page 2) by moving splitter and reverser lever from position (F, see figure below) to position (R) and thence to position (F_1) to permit partial withdrawal of selector shaft (32) and recovery of the sleeve itself.

Take off capscrews (C_1) retaining splitter fixed gear (6) and withdraw driven gear carrier (7), fixed gear (6) and inner thrust plate (15).

Remove capscrews (C_4) retaining selector shaft carrier (37), capscrews (C_3) retaining reverser casing (17) and withdraw the reverser unit together with selector shafts (32 and 33) with associated carriers.



Positions of Splitter and Reverser Control Lever

F/F_1/F_2. Neutral positions - R. Low range - V. High range - IR. Low reverse range - AR. Low forward range - IV. High reverse range - AV. High forward range

Dismantle reverser as follows:

— Withdraw roll pin from idler gear pin (30) and take off the gear pin retrieving thrust washer (31) and gear (28) with attached needle roller bearing (29).

— From reverser casing, take off pin (5) and retrieve thrust washer (2) and double drive gear (4) with attached needle roller bearings (3).

— Remove retaining ring (25) and withdraw sliding sleeve (22), fixed sleeve (23), driven gear (21) and inner ring (20) from reverser drive shaft (18).

Subsequently, remove drive gear (18) from reverser casing.
Check thrust rings (2, 14 and 31) and inner ring (20) for wear.

Assemble the reverser and splitter referring to the illustration on page 2 for correct positioning and note the following points:

— Install fixed sleeve (23) on reverser drive shaft (18) with the chamfer on internal spline facing towards the ring (20).

— Position inner thrust plate (15) with the grooves facing towards the splitter.

— Insert selector shaft (33) first, in neutral position, followed by detent ball (34) and subsequently by selector shaft (32).

— Tighten capscrews (C_1, C_3 and C_4) to the specified torque.

POWER STEERING (780 and 880 Tractors)

Continued

Rotation (seen from drive end)	Clockwise
Drive ratio	
— 780	.910 to 1
— 880	1.148 to 1
Rated speed (at engine governed speed)	
— 780	2275 rpm
— 880	
- AM	2638 rpm
- PM	2753 rpm
Rated output at maximum rated speed	
— 780	18.6 l/min
— 880	
- AM	21.6 l/min
- PM	22.5 l/min
On-bench output at 1445 rpm and 70 kg/cm² (196 psi) pressure	
— New or reconditioned pump	11.1 l/min (20 pint/min)
— Used pump	7.6 l/min (13.5 pint/min)
— Test oil temperature	55° to 65 °C
— Test oil viscosity	SAE 20
Drive/driven gear journal diameter	17.400 to 17.424 mm (.6850 to .6860 in)
Bearing bore diameter	17.450 to 17.470 mm (.6870 to .6878 in)
Gear journal clearance in bearing	.026 to .070 mm (.0010 to .0027 in)
Maximum wear clearance	.1 mm (.004 in)
Bearing and gear bore diameter in pump body	37.270 to 37.294 mm (1.4673 to 1.4683 in)
Maximum pump body wear, suction side	.1 mm (.040 in)
Bearing width	16.863 to 16.878 mm (.6639 to .6645 in)
Gear width	13.190 to 13.215 mm (.5193 to .5203 in)
Pump body width	47.070 to 47.120 mm (1.8531 to 1.8551 in)
Bearing and gear end clearance in pump body (to be restored on overhaul)	.1 to .2 mm (.004 to .008 in)
Control valve	
Make	DANFOSS
Type	ORBITROL, with steering wheel operated rotary valve permitting steering also in case of pump failure (page 9, section 303)
Outfit code	
— no safety valve block	OSPB 100 ON
— with safety valve block	OSPB 100 ON - OVP 20
Relief valve crack-off setting	
— Valve in pump (24a, page 9, section 303)	102 kg/cm² (100 bar) (1451.77 psi)
— Valve in safety valve block (24, page 9)	
- AM	127 kg/cm² (125 bar) (1821.82 psi)
- PM	102 kg/cm² (100 bar) (1451.77 psi)
Power cylinder overload valve crack-off setting (25, page 9)	204 kg/cm² (200 bar) (2903.53 psi)

FRONT AXLE - STEERING: Specification and Data

POWER STEERING (780 and 880 Tractors)

Power cylinder:			
Type		Double acting, located behind front axle	
Make	780 - 880	— CALZONI-SIMA, 115.576 (1) or WEBER, DZ 48/22/215-24261 (1) — WEBER, DZ 48/22/215-27963 (2)	
	780 DT - 880 DT	— SIMA, 214236 or WEBER, TDZ 48/22/195-24260 (1) — WEBER, TDZ 48/22/200-28106 (2)	
Cylinder bore diameter		48 mm	1.89 in
Maximum piston stroke	780 - 880 CALZONI-SIMA	214 mm	8.43 in
	780 - 880 WEBER	215 mm	8.46 in
	780 DT - 880 DT SIMA	231 mm	9.09 in
	780 DT - 880 DT WEBER	195 mm (1)	7.68 in
	780 DT - 880 DT WEBER	200 mm (2)	7.87 in
Piston rod diameter		22 mm	.87 in
Turning radius:			
— brakes applied	Mod. 780	3600 mm	11 ft 10 in
	Mod. 880	3800 mm	12 ft 6 in
— brakes released	Mod. 780	4000 mm	13 ft 2 in
	Mod. 880	4200 mm	13 ft 9 in

(1) Old
(2) New

TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread Size	Torque	
		kgm	lb ft
Front Axle, Section 301			
Screw, front axle carrier to engine (C_5, page 2)	M 18 x 1.5	32	231
Screw, axle pivot (C_3)	M 10 x 1.25	6	43
Nut, axle end	M 16 x 1.5	22.5	163
Screw, relay lever (C_4)	M 16 x 1.5	16	116
Screw, wheel to hub (C_2)	M 18 x 1.5	30	217
Nut, drag link and track rod ball joint	M 14 x 1.5	14	101
Nut, track rod lever (C_1)	M 16 x 1.5	24	173
Manual Steering, 780 Tractor, Section 302			
Steering box to tractor	M 16 x 1.5	22.5	163
Nut, steering wheel to post (C_1, page 1)	M 18 x 1.5	7	50
Screw, top cover to steering box (C_5)	M 10 x 1.5	5	36
Screw, side cover to steering box (C_3)	M 8 x 1.25	2.8	20
Nut, side cover to steering box (C_2)	M 8 x 1.25	2.8	20
Nut, swing lever (C_4)	M 24 x 2	25	181
Power Steering 780/880 Tractors, Section 303			
Screw, control valve to tractor	3/8″-16 UNC	4.5	32
Screw, cover to control valve (C_2, page 9)	M 8 x 1	3.5	25
Nut, power cylinder pivot pin (C_4, page 2)	M 18 x 1.5	30	217
Nut, power cylinder piston rod to steering arm (C_1)	M 16 x 1.5	21	152
Nut, piston to rod			
— Calzoni or SIMA (C_3)	M 16 x 1.5	10	72
— Weber (C_2)	M 16 x 1.5	8.5	61
Screw or nut, steering pump to engine (C_1 and C_2, page 3)	M 6 x 1	.8	6
Nut, cover to pump body (C_4)	3/8″-24 UNF-2B	4	29
Nut, drive sleeve (780 tractor) or drive gear (880 tractor) to pump drive shaft (C_3)	7/16″-20 UNF-2B	2.8	20
Cap screw, OVP 20, safety valve block to body	—	6.5	47

TO REMOVE AND REFIT

To remove the front axle assembly from the tractor proceed as follows:

— Apply the handbrake, chock the rear wheels and remove the front ballast and its support.

— 780 tractor, manual steering — Separate track rod levers (1) from the tractor rods.

— 780 and 880 tractor, power steering — Remove the power cylinder from the axle.

— Prop up the axle carrier, raise the tractor and remove the front wheels.

— Take off screws (C_3, page 2), withdraw the pivot (12) using impulse extractor **292927** with adaptor **290793**, remove the axle assembly and place in position on an axle overhaul stand.

On 780 tractor, manual steering, if the idler lever (15, page 2) needs removing, take off the tapered screw (C_4) and withdraw pivot (17) from the top.

If worn, renew bushes (14, page 2) and, on Model 780, manual steering, idler lever pivot (18) using suitable extractors and drivers.

When refitting idler lever pivot (17) check that the end play is .5 to 1 mm (.020 to .040 in); to adjust use washers (16) listed on page 2, Section 30.

TO OVERHAUL AXLE ARMS

The axle arms and the wheel hubs of the front axle may be removed without separating the front axle from the tractor; simply proceed as follows:

— Remove hub cap (10) and slacken nut (D).

— Back off wheel bolts (C_2, page 2).

— Apply the handbrake, chock the driving wheels, raise the front end of the tractor and rest the axle on two adequate props.

— Remove the front wheel.

— Back off nut (C_1) and withdraw the king pin (2) with attached wheel hub from the bottom, subsequently separating the two items at the bench.

Renew any inefficient seals and worn bushes and bearings using adequate tractors and drivers.

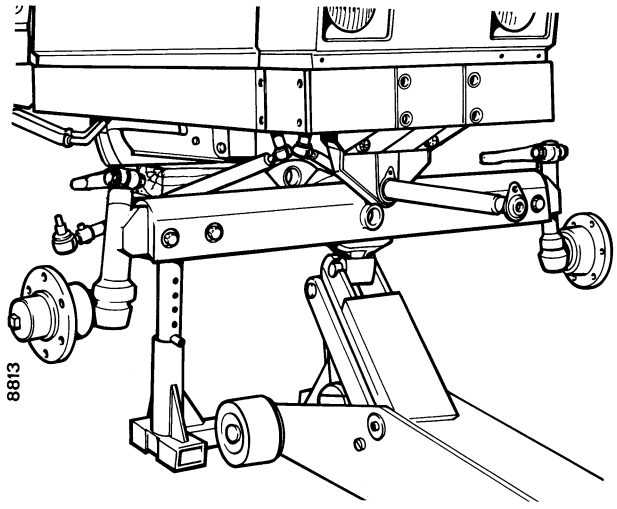
On reassembly, back the wheel hub with **grassofiat MR 3** or other approved grease and adjust the tapered roller bearings as follows:

— Tighten nut (D, page 2) to 7 kgm (68 Nm) (50.6 ft lb), simultaneously turning the hub (9) to settle the bearings.

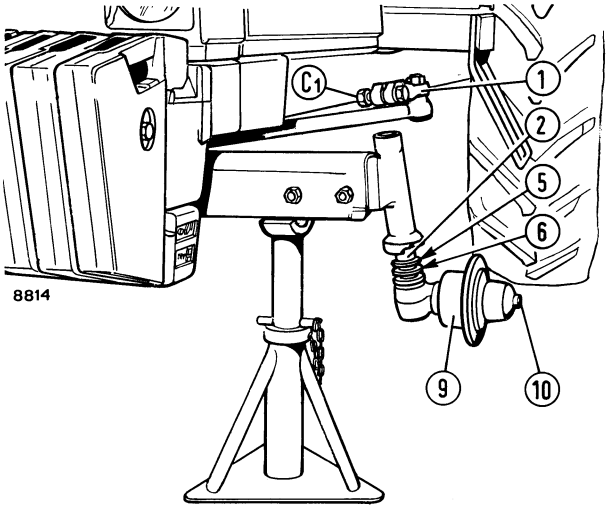
— Slacken the nut and retighten to 1 kgm (9.8 Nm) (7.2 ft lb), simultaneously turning the hub.

— Check that the hub rotates freely and lock the nut in position by peening.

Note - Replace nut (D) at every adjustment.



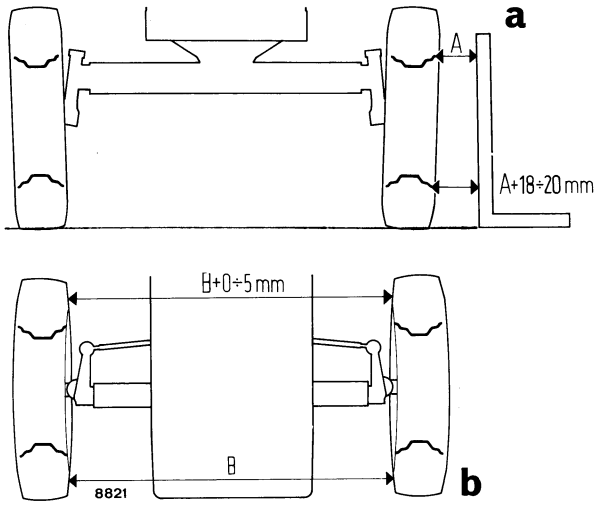
Removing the Front Axle



Withdrawing the King Pin with Attached Hub

C_1. Retaining nut - 1. Track rod lever - 2. King pin - 5. Steel thrust washer - 6. Bronze thrust washer - 9. Wheel hub - 10. Hub cap

FRONT AXLE - STEERING: Front Axle



TO INSPECT

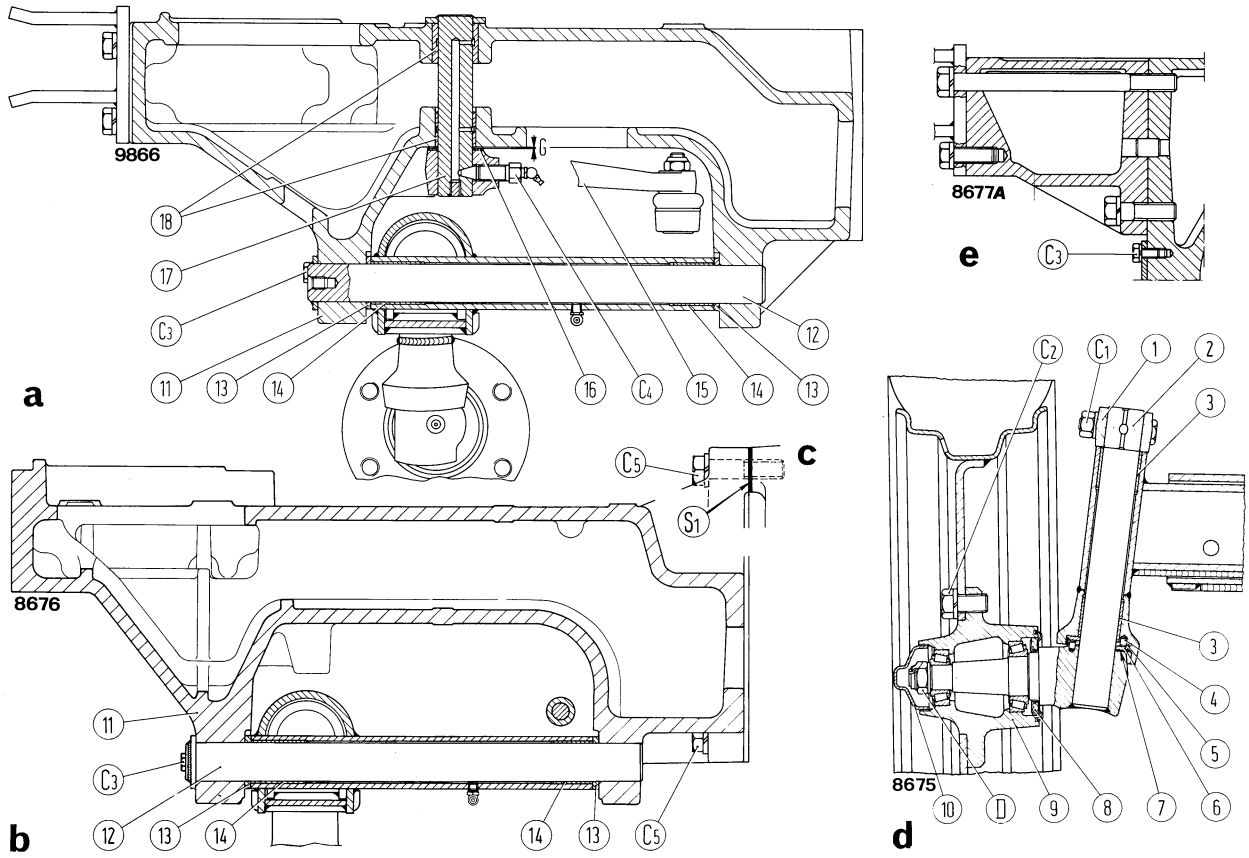
Check the steering geometry as follows:

— With the wheels in the straight-ahead driving position, camber should be 2°, equivalent to 18 to 20 mm (.70 to .77 in) between rim top and bottom edges on a plane parallel to the tractor longitudinal centreline. Toe-in should be up to 5 mm (.19 in) as measured on the inside between rims (b).

— To adjust toe-in, turn the adjustable ends of the track rods.

Wheel Alignment Diagram

a. Checking wheel camber - **b.** Checking wheel toe-in



Sections Through Axle Arm and Centre Pivot

a. 780 tractor, manual steering - b. 780 and 880 tractor, power steering - c. 880 tractor, axle carrier retention system - d. 780 and 880 tractor, axle arm assembly - e. 780 tractor, manual steering, arm axle carrier - C_1. Lever retaining nut - C_2. Disc retaining screw - C_3. Centre pivot retaining screw - C_4. Relay lever retaining screw - C_5. Axle carrier retaining screw - D. Bearing adjusting nut - G = .5 to 1 mm (.02 to .04 inch). Relay lever pin end float - S_1. Position shims for adjustment of axle carrier relative to engine (880 tractor) - 1. Track rod lever - 2. Kingpin - 3. Bushes - 4. Dowel - 5. Seal thrust washer - 6. Bronze thrust washer - 7. Cup - 8. Seal - 9. Wheel hub - 10. Hub cap - 11. Axle carrier - 12. Centre pivot - 13. Thrust washers - 14. Axle pivot bushes - 15. Steering relay lever - 16. Relay lever shim - 17. Relay lever pivot - 18. Relay lever pivot bushes

FRONT AXLE

	780-780 DT		880-880 DT	
Type	Steering, centre pivoting			
Bevel Drive and Differential				
Bevel drive ratio:				
— Old (3)	11/35 = 1 : 3.18		—	
— New (4)	10/34 = 1 : 3.4		10/33 = 1 : 3.3	
	mm	in	mm	in
Bevel drive backlash:				
— Old (3)	.15 to .20	.0059 to .0079	.18 to .23	.0071 to .0091
— New (4)	.18 to .23	.0071 to .0091	—	—
Bevel pinion bearing shim thickness (S_1, page 3, Section 402):				
— Old	2.5-2.6-2.7-2.8-2.9-3-3.1-3.2-3.3-3.4-3.5-3.6-3.7	.098-.102-.106-.110-.114-.118-.122-.126-.130-.134-.138-.142-.146	—	—
— New	2.2-2.3-2.4-2.5-2.6-2.7-2.8-2.9-3-3.1-3.2 mm (.086-.090-.094-.098-.102-.106-.110-.114-.118-.122-.126 in)			
Bevel pinion position shim thickness (S_2)	2.5-2.6-2.7-2.8-2.9-3-3.1-3.2-3.3-3.4-3.5-3.6-3.7 mm (.098-.102-.106-.110-.114-.118-.122-.126-.130-.134-.138-.142-.146 in)			
Differential backlash	.15 mm (.0059 in)			
Differential pinion thrust washer thickness (7, page 3, Section 402)	1.470 to 1.530 mm (.0579 to .0602 in)			
Side gear thrust washer thickness (6)	1.50 to 1.60 mm (.0591 to .0630 in)			
Side gear end float adjustment	see page 10, Section 401			
Differential pinion journal diameter:				
— Old (2)	19.939 to 19.960	.7850 to .7858	—	—
— Old (3)	21.939 to 21.960	.8637 to .8646	—	—
— New (4)	23.939 to 23.960	.9425 to .9433	23.939 to 23.960	.9425 to .9433
Differential pinion bore diameter:				
— Old (2)	20.040 to 20.061	.7890 to .7898	—	—
— Old (3)	22.040 to 22.061	.8677 to .8685	—	—
— New (4)	24.040 to 24.061	.9465 to .9473	24.040 to 24.061	.9465 to .9473
Differential pinion journal clearance in pinion bore		.080 to .122 mm	(.0031 to .0048 in)	
Side gear spigot diameter:				
— Old (3)	37.931 to 37.970	1.4933 to 1.4949	—	—
— New (4)	43.961 to 44.000	1.7307 to 1.7323	43.961 to 44.000	1.7307 to 1.7323
Side gear spigot bore diameter in differential cage:				
— Old (3)	38.080 to 38.119	1.4992 to 1.5007	—	—
— New (4)	44.080 to 44.119	1.7354 to 1.7370	44.080 to 44.119	1.7354 to 1.7370
Side gear spigot clearance in differential cage:				
— Old (3)	.110 to .188	.0043 to .0074	—	—
— New (4)	.080 to .158	.0031 to .0062	.080 to .158	.0031 to .0062

(1) Not reamed
(2) From frame 861475, 780 DT tractor
(3) Up to frame 673591, 780 DT tractor
(4) From frame 673592, 780 DT tractor

LIVE FRONT AXLE: Specification and Data

FRONT AXLE

	780-780 DT		880-880 DT	
	mm	in	mm	in
Axle Shafts and Joints				
Axle shaft journal diameter (5, page 3, Section 402)	41.975 to 42.000	1.6525 to 1.6535	44.975 to 45.000	1.7707 to 1.7716
Axle bush fitted I.D. (14)				
— AM	42.030 to 42.100 (1)	1.655 to 1.657 (1)	—	—
— PM	42.050 to 42.125 (1)	1.656 to 1.658 (1)	45.050 to 45.125 (1)	1.7736 to 1.7766 (1)
Axle shaft running clearance in bush				
— AM	.030 to .125	.001 to .005	—	—
— PM	.050 to .150	.002 to .006	.050 to .150	.0020 to .0059
Bush interference fit in housing				
— AM	.050 to .100	.002 to .004	—	—
— PM	.064 to .129	.003 to .005	.050 to .100	.002 to .004
Joint bearing shim thickness (S_3, page 3, Section 402)	.10-.15-.20-.25-.30 mm (.004-.006-.008-.010-.012 in)			
Planetary final drives				
Reduction ratio:				
— Old (3)	15 : (15 + 63) = 1 : 5.2		—	
— New (4)	16 : (16 + 62) = 1 : 4.88		16 : (16 + 68) = 1 : 5.25	
Driven gear thrust washer thickness (18, page 3, Section 402)	.77 to .83 mm (.0303 to .0327 in)			
Wheel bearing shim thickness (S_4)	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	.066-.070-.074-.078-.082-.086-.090-.094-.098-.102-.106-.110-.114-.118-.122-.126-.130	1.8-1.9-2-2.1-2.2-2.3-2.4-2.5-2.6-2.7-2.8-2.9-3-3.1-3.2-3.3-3.4-3.5	.070-.074-.078-.082-.086-.090-.094-.098-.102-.106-.110-.114-.118-.122-.126-.130-.134-.138

Centre Pivot		
Pivotting angle (on either side)	11°	
Centre pivot diameter	52.652 to 52.671 mm (2.0729 to 2.0737 in)	
A.M. centre pivot split bearing fitted I.D. (21a, page 3, Section 402)	52.711 to 52.742 mm (2.0752 to 2.0764 in)	
P.M. centre pivot bush fitted I.D. (21)	52.720 to 52.790 mm (2.0756 to 2.0783 in) (1)	
Centre pivot working clearance in:		
— A.M. split bearing	.040 to .090 mm (.0016 to .0035 in)	
— P.M. bush	.049 to .138 mm (.0019 to .0054 in)	
A.M. split bearing wall thickness	1.994 to 2.000 mm (.0785 to .0787 in)	
Rear bevel pinion carrier spigot O.D.	99.040 to 99.072 mm (3.8992 to 3.9005 in)	
A.M. split bearing I.D. (24a, page 3, Section 402)	99.153 to 99.193 mm (3.9037 to 3.9052 in)	
P.M. bush fitted I.D. (24)	99.146 to 99.221 mm (3.9033 to 3.9063 in)	
Spigot fitted clearance in:		
— A.M. split bearing	.081 to .153 mm (.0032 to .0060 in)	
— P.M. bush	.074 to .181 mm (.0029 to .0071 in)	
A.M. split bearing wall thickness	2.486 to 2.495 mm (.0979 to .0982 in)	
Axle front and rear thrust washer thickness (22 and 23, page 3, Section 402)	4.95 to 5.00 mm (.1949 to .1968 in)	
Turning radius		
— Live axle in		
- Brakes on	4000 mm (13 ft 1 1/2 in)	4200 mm (13 ft 9 1/2 in)
- Brakes off	5800 mm (19 ft 1/2 in)	6000 mm (19 ft 8 in)
— Live axle out		
- Brakes on	4600 mm (15 ft 1 in)	4750 mm (15 ft 7 in)
- Brakes off	5400 mm (17 ft 8 1/2 in)	5650 mm (18 ft 6 1/2 in)

(1) After reaming
(3) Up to frame 673591, 780 DT tractor
(4) From frame 673592, 780 DT tractor

AXLE DRIVE

Reduction ratio	20/22 x 22/28 = 1.4 to 1
Relay lever pad width	7.910 to 8.000 mm (.3114 to .3149 in)
Pad seat width in driven gear	8.280 to 8.370 mm (.3260 to .3295 in)
Pad clearance in seat	.280 to .460 mm (.0110 to .0181 in)
Relay lever pivot diameter	15.973 to 16.000 mm (.6288 to .6299 in)
Pivot housing bore in casing	16.016 to 16.059 mm (.6305 to .6322 in)
Pivot clearance in housing	.016 to .086 mm (.0006 to .0034 in)
Relay lever detent spring length	
— Free	24.3 mm (.9567 in)
— Under 8.1 to 8.9 kg (18 to 19.6 lb)	20.5 mm (.8071 in)

DRIVE SHAFTS

Centre bearing adjustment, old tractors	see page 1, Section 402
Centre bearing shim thickness on old tractors (S_6, page 3, Section 402)	.3-.5-.7-1 mm (.0118-.0191-.0276-.0394 in)
Position adjustment for front sleeve connecting drive shaft to bevel pinion	see page 1, Section 402
Front sleeve position shim thickness (S_5, page 3, Section 402)	2.2-2.5-2.8-3-3.3-3.7-4-4.3 mm (.0866-.0984-.1102-.1181-.1299-.1457-.1575-.1693 in)

LIVE FRONT AXLE: Specification and data

TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread size	Torque		
		kgm	lb ft	N · m
Front Axle - Section 402 Lock ring, bevel pinion (C_1, page 3) — 780 DT tractor, old — 780 DT tractor, new and 880 DT tractor	 M 35 x 1.5 M 40 x 1.5	 30	 217	 294
Screw, differential gear case to axle casing (C_2)	M 12 x 1.25	11.5	83	113
Screw, crown wheel to differential gear case (C_3)	M 12 x 1.25	13	94	128
Screw, king pin (C_4)	M 10 x 1.25	6.5	47	64
Screw, axle arm (C_5)	M 12 x 1.25	11.5	83	113
Lock ring, wheel bearing (C_6)	M 50 x 1.5	52	376	510
Capscrew, planetary final drive (C_7) — 780 DT tractor — 880 DT tractor	 M 10 x 1.25 M 12 x 1.25	 6.5 6.5	 47 47	 64 64
Bolt, wheel rim (C_8)	M 16 x 1.5	26.5	192	260
Screw, AM front and rear axle pivot support (C_9)	M 18 x 1.5	40	289	392
Screw, PM front and rear axle pivot support (C_9)	M 18 x 1.5	27	195	265
Screw, differential cap (C_{10})	M 12 x 1.25	11.5	83	113
Screw, support, front axle to engine (C_{11})	M 18 x 1.5	32	231	314
Nut, joint, track rod to levers	M 16 x 1.5	10	72	98
Drive Shafts - Axle Drive - Section 402 Screw, centre bearing (C_{12}, page 3)	 M 12 x 1.5	 10	 72	 98
Screw, axle drive housing to tractor (C_{13}, page 3)	M 12 x 1.25	10	72	98

King Pin Bearing Adjustment (Fig. a)

Remove threaded plugs from upper cover (1) and lower cover (2).
Install upper cover (1) and tighten the screws to 6.5 kgm (47 lb ft).
Fit lower cover (2) without shims and with engine oil lubricated retaining screws.
Tighten the lower cover screws progressively in staggered fashion with a torque wrench and adapter **292220/1** until the torque needed to rock the carrier is 20 to 25 Nm (2 to 2.5 kgm, 14.5 to 18.1 lb ft) disregarding the starting torque.
Assess clearance (H) between lower cover and carrier in the neighbourhood of the three retaining screws, and average the three values obtained.
The total thickness of shims to be fitted under lower cover will be given by:

$$S_3 = H - 0.15 \text{ mm}$$

Fit shims (S_3), tighten retaining screws to 64 Nm (6.5 kgm, 47 lb ft) and check that the torque needed to rock the carrier is 78 to 98 Nm (8 to 10 kgm, 58 to 72 lb ft).

Wheel Bearing Adjustment

1. Using special-purpose tools (Figs. b and c).

Install the wheel bearing cones (3 and 5) with spacer (4) on tool (D), **293435**, 780 DT tractor, or tool **292500** with spacer **293437** (F), 880 DT tractor.

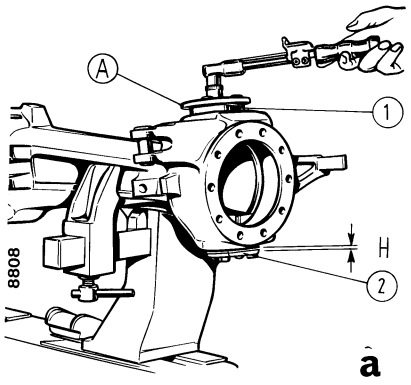
Tighten nut (E) fully.

Measure the depth (H_2) of tool pin below the top face.

Dismantle, lubricate bearing cones with engine oil and reposition on the tool interposing hub (6) with attached bearing cups press fitted fully home in their housings.

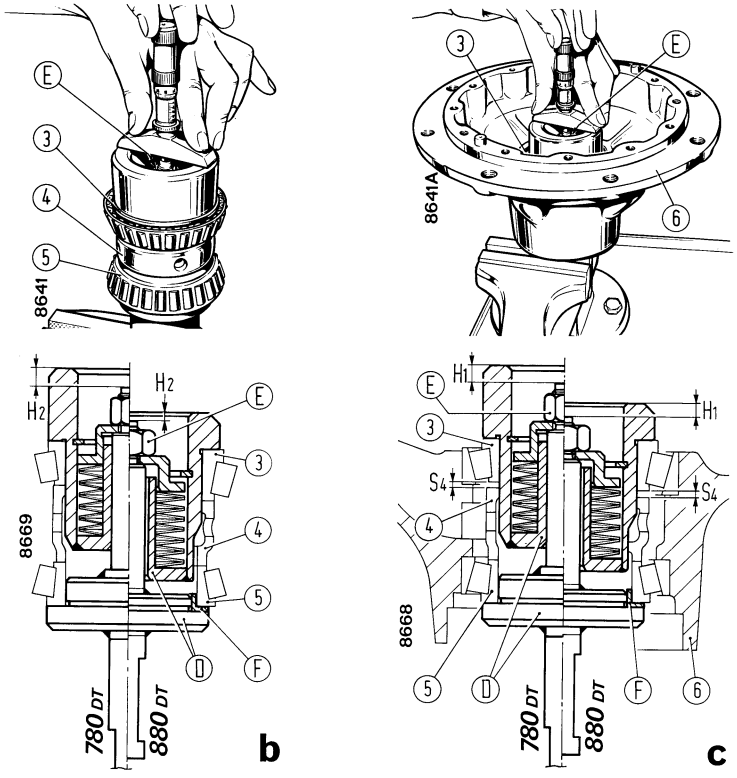
Fully tighten nut (E), simultaneously turning the hub through 10 revolutions to settle the bearings.

Assess dimension (H_1) in this condition.

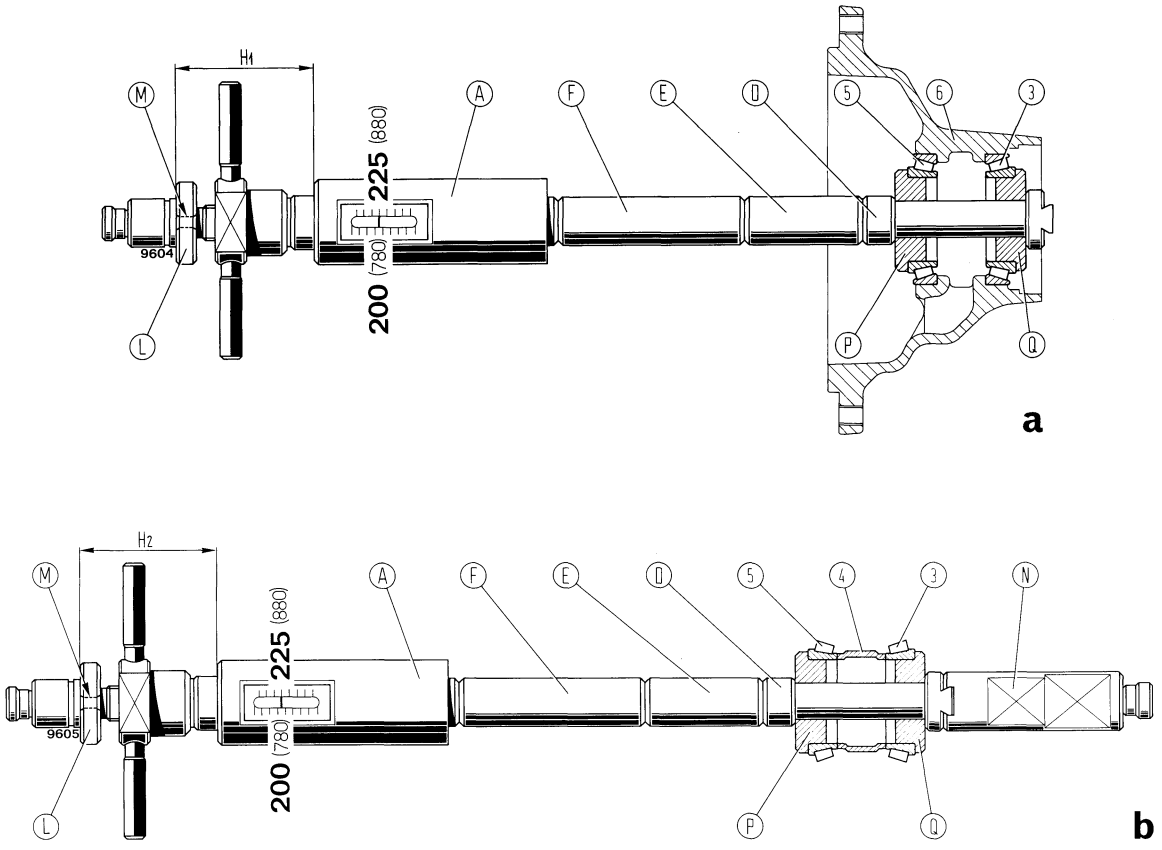


Determining the Thickness of King Pin Shims (S_3, page 3, Section 402)

A. Axle arm carrier torque dynamometer **292220/1** - H. Gap between carrier and cover - 1. Upper cover - 2. Lower cover



Determining the Thickness of Wheel Hub Bearing Shims (S_4, page 3, Section 402)
b. Determining dimension (H_2) - **c.** Determining dimension (H_1) - D. Tool **293435**, 780 DT tractor, or tool **292500**, 880 DT tractor - E. Tool nut - F. Spacer **293437** for use with tool (D), 880 DT tractor - H_1/H_2. Tool pin depth below top face - S_4. Thickness of shim to be determined - 3. Bearing cone - 4. Spacer - 5. Bearing cone - 6. Wheel hub.



Determining Thickness of Wheel Bearing Shims (S_4, page 3, section 402) Usnig Universal Gauge 293510

a. Measuring dimension H_1 - b. Measuring dimension H_2 - A. Universal gauge **293510** - D. Spacer **293625** - E. Spacer **293619** - F. Spacer **293620** - H_1/H_2. Dimensions to be measured with depth gauge - L. Register **293624** - M. Register holes - N. Adapter **293617** - P. Bushing **293639**, 780 DT tractor, or **293640**, 880 DT tractor - Q. Bushing **293639**, 780 DT tractor, or **293641**, 880 DT tractor - 3/5. Bearing 4. Spacer - 6. Wheel hub

The thickness of shims (S_4, Section 402, page 3) to be fitted will be obtained as follows:

$$S_4 = H_1 - H_2$$

If necessary, round off to the next .05 mm (.002 in) up.

2. Using universal gauge 293510 (Figs. a and b).

Fit bushings **293639** (P and Q), 780 DT tractor, or **293640** (P) and **293641** (Q), 880 DT tractor, followed by spacers **293625** (D), **293619** (E) and **293620** (F) to universal gauge **293510** (A).

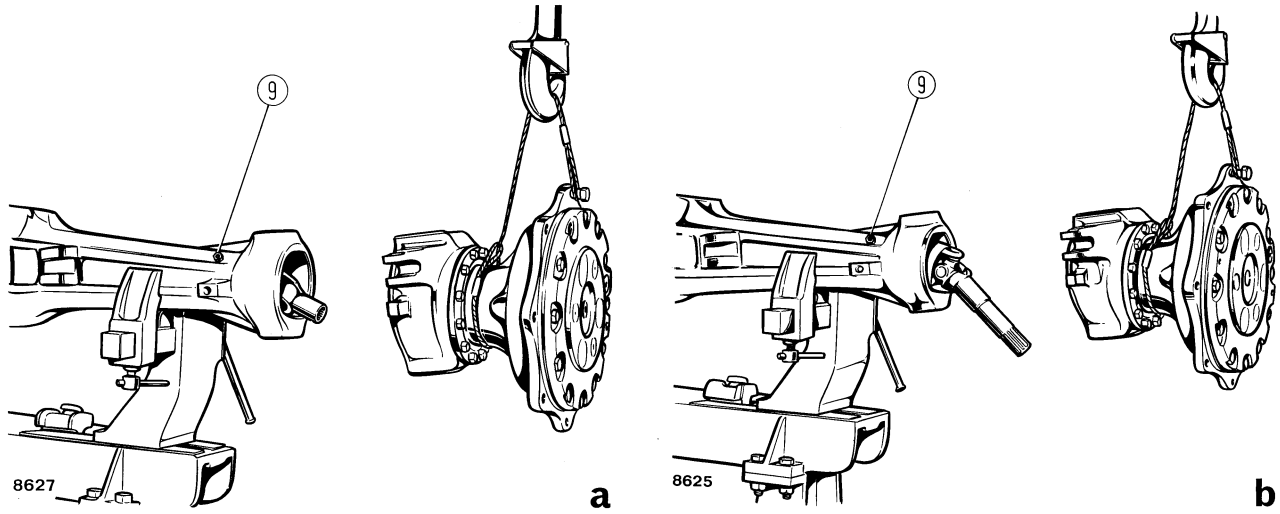
Install the gauge inside wheel hub with attached tapered roller bearings (3 and 5) which will have been previously lubricated with engine oil (fig. **a**).

Turn the gauge handle progressively to move graduated scale pointer to 200 kg (441 lb), 780 DT tractor, or 225 kg (496 lb), 880 DT tractor, simultaneously turning the gauge to settle the bearings.

Place register **293624** (L) on universal gauge (A) positioning the holes (M) in line with flats on handle hub.

Measure dimension (H_1) using a depth gauge.

Remove universal gauge (A) from wheel hub, reassemble on bench installing adapter **293617** (N) for clamping in the vise and fit spacer (4) and bearing cones (3 and 5) to be positioned as shown in fig. **b**. Return graduated scale pointer to 200 kg (441 lb), 780 DT tractor, or 225 kg (496 lb), 880 DT tractor and measure dimension (H_2) proceeding as directed above.



Removing Final Drive Unit with Attached Right Hand Wheel Hub and Axle Arm Carrier, 780 DT Old (a) and 780 DT New and 880 DT Tractors (b)

9. Bearing screw

The thickness of shims (S_4, page 3, section 402) will be given by the following:

$$S_4 = H_2 - H_1$$

If necessary, round off to the nearest .05 mm (.002 in) up.

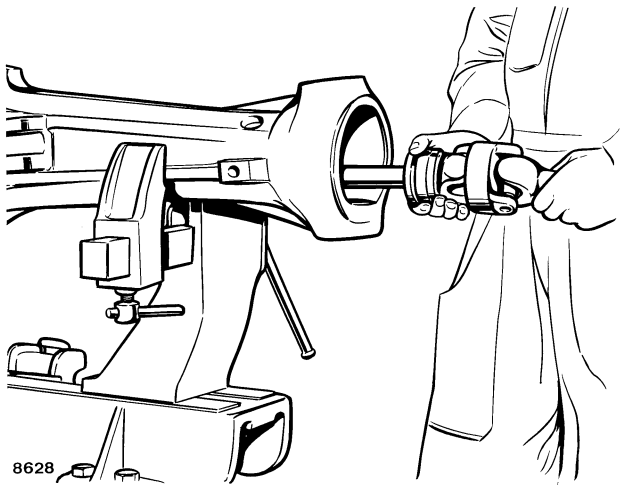
Bevel Drive and Differential Overhaul

Remove the hub reduction units with attached hubs and axle arm carriers (a and b), take off bearing screw (9) and withdraw the axle shaft with attached universal joints.

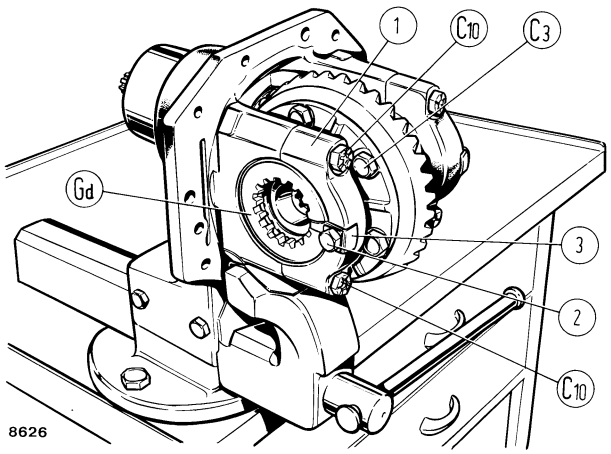
Take off the bevel drive case assembly, clamp in a vice and dismantle as follows:

— Back off bevel pinion lockring (C_1, Section 402, page 3) using spanner **293520**, 780 DT AM tractor, or **293524**, 780 DT new and 880 DT tractors.

— Withdraw the bevel drive and differential assembly from the bevel pinion carrier by removing the lock rings and caps (1), and ensuring that they are marked to prevent wrong reassembly.



Withdrawing the R.H. Axle Shaft and Universal Joint



Bevel Drive Assembly

C_3. Crown wheel screw - C_{10}. Differential cap screw - Gd. R.H. lock ring - 1. Differential cap - 2. Lock plate screw - 3. Lock plate

— Take off crown wheel screws (C_3, page 5), differential pinion journal retaining screw (8, Section 402) page 3) and dismantle the differential.

Check for wear by comparison to the information given in the Data Table of Section 40.
Renew any inefficient seals and bearings, using suitable drivers and extractors.
On reassembly, refit the differential caps ensuring that the reference marks are in register and adjust the bevel drive as directed below.
Refit the bevel drive/differential and hub reduction assemblies adopting a reversal of the dismantling procedure, fasten the bevel drive case to the axle case smearing the mating faces with either of the jointing compounds specified in the illustration of page 3, Section 402, and refill the axle case with the prescribed type and grade of oil.

Bevel Drive and Differential Adjustment

1. Bevel pinion bearing adjustment and shim thickness determination using special purpose tools (fig. a and b)
Place the bevel pinion bearing cones (7 and 9) and spacer (8) on tool **293438/1** (E), 780 DT old tractor, or **293438/1** with centraliser **293439** (G), 780 DT new and 880 DT tractors.

Tighten nut (M) fully.

Measure the depth (H_4) of the tool pin below the top face.

Dismantle, lubricate bearings with engine oil and reassemble on the tool, interposing the bevel drive carrier (10) with attached bearing cups.

Tighten nut (M) fully, simultaneously rotating the bevel drive case through 10 turns to settle the bearings.

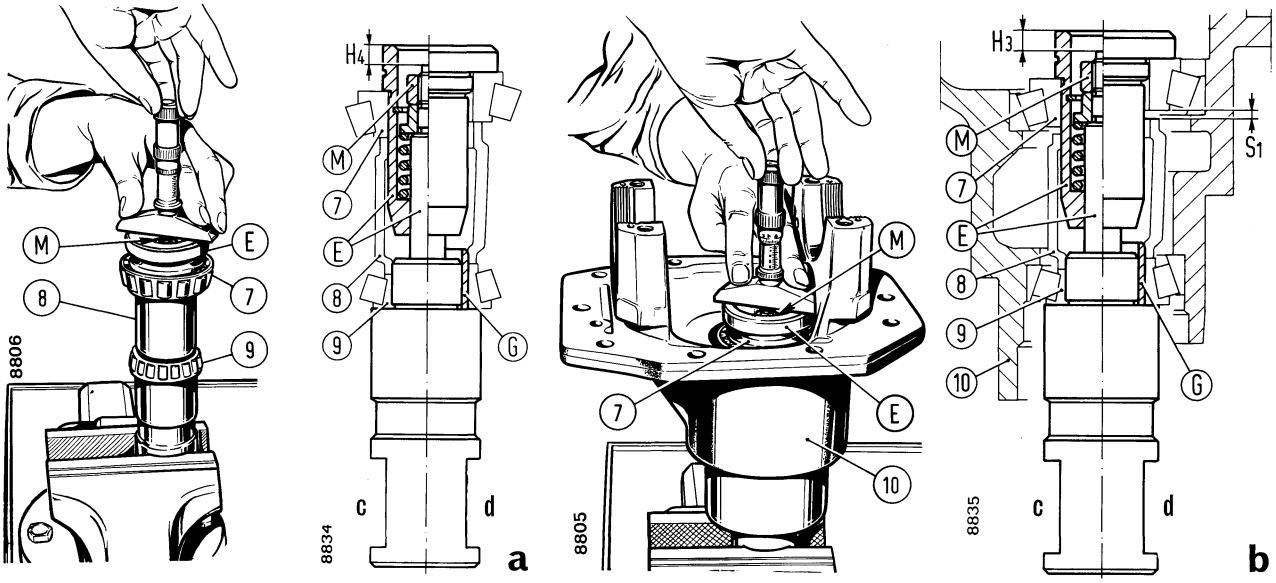
Assess dimension (H_3) in this condition.

The thickness of shims (S_1) to be fitted will be given by the following:

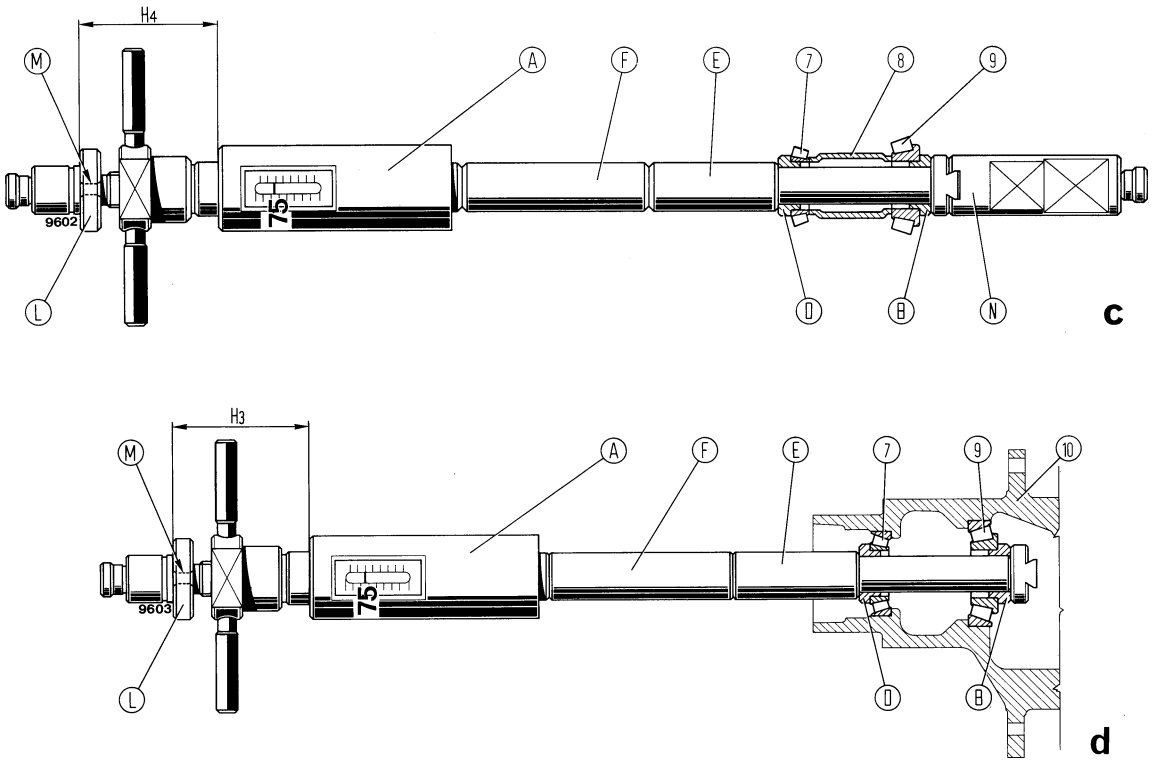
$$S_1 = H_3 - H_4$$

If necessary, round off to the nearest .05 mm (.002 in) up.

Note: On completion of adjustment leave the tool on drive head housing for subsequent bevel pinion position adjustment.



Determining Thickness of Bevel Pinion Bearing Shims (S_1, Page 3, Section 402)
a. Measuring dimension (H_4) - b. Measuring dimension (H_3) - c. 780 DT old tractor - d. 780 DT new and 880 DT tractors - E. Tool **293438/1** - G. Centraliser **293439** for use with tool (E), 780 DT new and 880 DT tractors - H_3, H_4. Tool pin depth below top face - M. Tool nut - S_1. Thickness of shims to be determined - 7. Bearing cone - 8. Spacer - 9. Bearing cone - 10. Bevel drive case.



Determining Bevel Pinion Bearing Shim Thickness (S_1, Page 3, Section 402), Using Universal Gauge 293510

c. Determining dimension H_4 - d. Determining dimension H_3 - A. Universal gauge **293510** - B. Adaptor **293632**, 780 DT old tractor, or **293636**, 780 DT new and 880 DT tractors - D. Adaptor **293633**, 780 DT old tractor, or **293632**, 780 DT new and 880 DT tractors - E. Spacer **293619** - F. Spacer **293620** - H_3/H_4. Dimension measured using depth gauge - L. Register **293624** - M. Register holes - N. Adaptor **293617** - 7. Bearing cone - 8. Spacer - 9. Bearing cone - 10. Drive head housing

2. Bevel pinion bearing adjustment and shim thickness determination using universal gauge 293510 (figs. c and d)

Install adaptors **293632** (B) and **293633** (D), 780 DT old tractor, or **293636** (B) and **293632** (D), 780 DT new and 880 DT tractors, and spacers **293619** (E) and **293620** (F) to universal gauge **293510** (A).

Moreover, install adapter **293617** (N) to permit clamping in the vise, subsequently positioning bearing cones (7 and 9) and spacer (8) as shown in Fig. **c**. Actuate the handle until the graduated scale pointer moves progressively to 75 kg (165 lb).

Install register **293624** (L) on universal gauge (A) positioning holes (M) in alignment with the flats of the handle hub.

Using a suitable depth gauge, measure dimension (H_4) thus obtained.

Dismantle the pack, lubricate the bearings using engine oil and reassemble the gauge installing bushings (B and D) and spacers (E and F) on drive head housing (10) as shown in fig. **d**.

Progressively return the graduated scale pointer to 75 kg (165 lb), simultaneously turning the gauge to settle the bearings; subsequently, measure dimension (H_3) as directed above.

Shim thickness (S_1, page 3, section 402) to be fitted will be as follows:

$$S_1 = H_4 - H_3$$

If necessary, round off to the nearest .05 mm (.002 in) up.

Note: On completion of adjustment, do not remove the gauge from the drive head housing as the latter is in position ready for subsequent bevel pinion position adjustment.

---

3. To determine thickness of bevel pinion position shim (figs. e, f and g)

Place the differential bearing cups on shaft (P) of tool **293400** with attached cones (R) and position the assembly inside the bevel drive case, tightening differential cap screws (C_{10}) to 11.5 kgm or 83 lb ft.

Screw in or back off cones (R) so as to align 100 mm bar (L) towards the bearing cone (11) and eliminate any end play between cones (R) and differential bearing cups.

Act on micrometer gauge (N) to bring bar (L) in contact with cone (11) and read dimension (H_5).

Determine correct nominal dimension (H_7) from crown wheel centreline to back of pinion as follows:

$$\mathbf{H_7 = H_6 \pm C}$$

where,

$\mathbf{H_6}$ = Nominal distance from crown wheel centreline to back of pinion, namely 100 mm (3.94 in) 780 DT old tractor, or 115 mm (4.53 in) 780 DT new and 880 DT tractors.

C = correction factor stamped on pinion and preceded by + or — sign if different from 0, to be added to or subtracted from nominal dimension ($\mathbf{H_6}$) as applicable.

Thickness of shim (S_2, page 3, section 402) will be as follows:

$$\mathbf{S_2 = H_5 - H_7}$$

where,

$\mathbf{H_5}$ = micrometer gauge reading

$\mathbf{H_7}$ = correct nominal dimension from crown wheel centreline to back of pinion.

Example (780 DT old tractor)

Micrometer reading: $H_5 = 103.3$ mm.

Nominal dimension from crown wheel centreline to back of pinion: $H_6 = 100$ mm.

Correction factor: C = + .2 mm.

Correct nominal dimension:

$H_7 = 100 + .2 = 100.2$ mm.

Thickness of shim: $S_2 = 103.3 - 100.2 = 3.1$ mm.

Correction factor: C = — .2 mm.

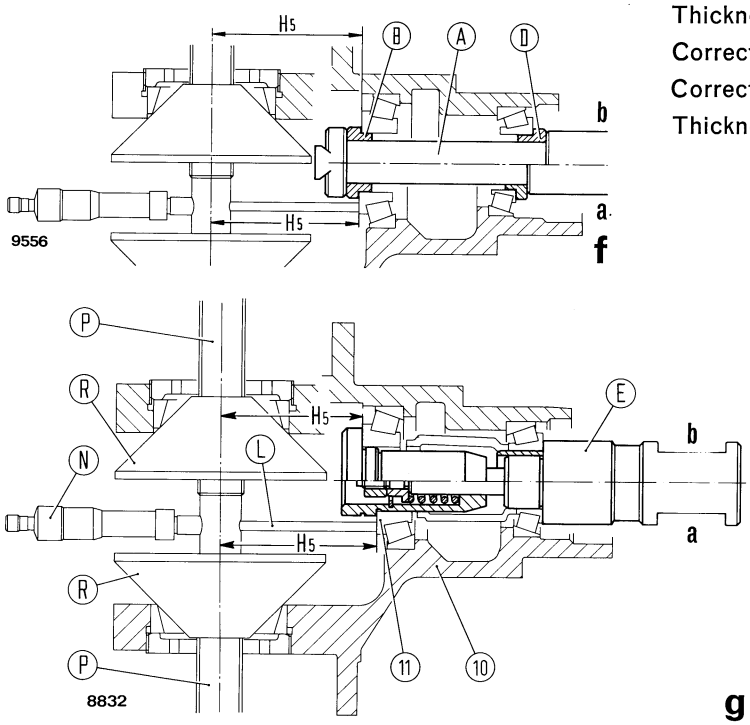
Correct nominal dimension: $H_7 = 100 - .2 = 99.8$ mm.

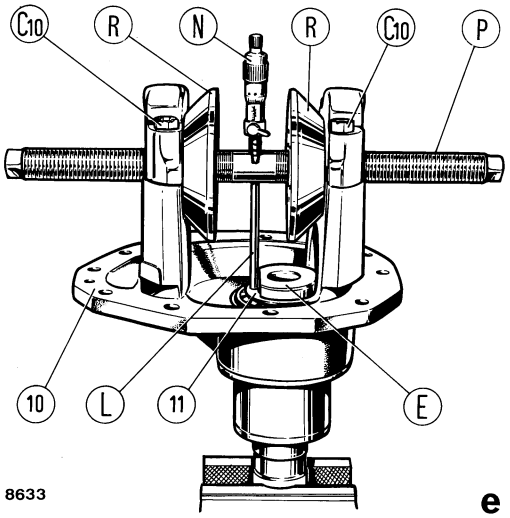
Thickness of shim: $S_2 = 103.3 - 99.8 = 3.5$ mm.

Correction factor: C = 0 mm.

Correct nominal dimension: $H_7 = H_6 = 100$ mm.

Thickness of shim: $S_2 = 103.3 - 100 = 3.3$ mm.





Determining Thickness of Pinion Position Shim (S_2, Page 3, Section 402)

a. 780 DT old tractor - b. 780 DT new and 880 DT tractors - f. Measuring dimension H_5 using universal gauge **293510** - g. Measuring dimension H_5 using gauge **293438/1** - A. Universal gauge **293510** - B. Adaptor **293632**, 780 DT old tractor or **293636**, 780 DT new and 880 DT tractors - D. Adaptor **293633**, 780 DT old tractor, or **293632**, 780 DT new and 880 DT tractors - E. Gauge **293438/1** - G. Centraliser **293439** for use with gauge (E), 780 DT new and 880 DT tractors - L/N/P/R. Gauge **293400/1** - C_{10}. Differential cap capscrews - 10. Drive head housing - 11. Front tapered roller bearing

4. To Adjust Differential Bearings and Check Bevel Drive Backlash (Figs. a, b and c)

Install the bevel pinion assembly, including shims (S_1 and S_2, Section 402, page 3) as previously determined in drive head housing, lubricating the bearings with engine oil, and tighten lockring (C_1, Section 402, page 3) to 294 Nm (30 kgm or 217 lb. ft) using wrench **293520**, 780 DT old tractor or **293524**, 780 DT new and 880 DT tractors.

Install the bevel drive assembly in the case ensuring that the crown wheel does not bind when in mesh with the pinion, tighten differential cap screws (C_{10}) to 6 kgm (43 lb ft), loosen, and retighten to 2 kgm (14 lb ft).

Lubricate the differential bearings, turn left hand lockring (Gs, a) using wrench **293544**, 780 DT old tractor, or **293665**, 780 DT new and 880 DT tractors, simultaneously turning the crown wheel until a 39 Nm (4 kgm or 29 lb. ft) torque is reached, which is equivalent to prescribed axial preload.

In these conditions, the differential and bevel pinion bearing rotating torque should be .29 to .33 kgm (2 to 2.4 lb ft).

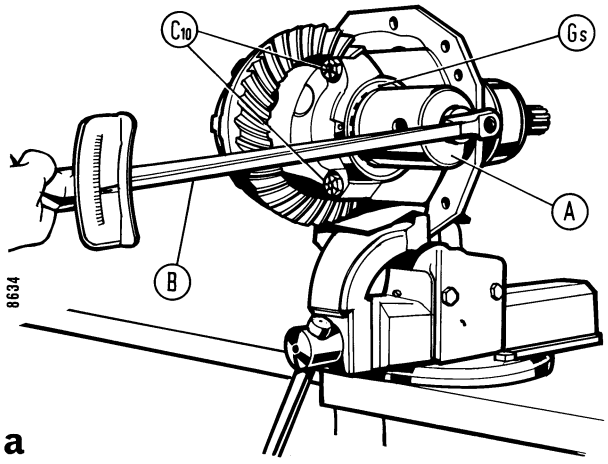
Pre-load is assessed using a spring balance and a length of string wrapped round the crown wheel mounting flange (b).

The prescribed rotating torque is equivalent to a spring balance reading of 2.5 to 4 kg (5.5 to 9 lb). If necessary, adjust the lock ring further.

Check the bevel drive backlash using a suitable dial gauge with the stylus resting squarely on a crown wheel tooth flank (c).

Repeat the measurement in two other points 120° apart and compare the average of the three readings with the prescribed backlash, which is .15 to .20 mm (.006 to .008 in), 780 DT old tractor and .18 to .23 mm (.007 to .009 in), 780 DT new and 880 DT tractors. To adjust, back off one and screw in the other lock ring until the prescribed backlash is obtained.

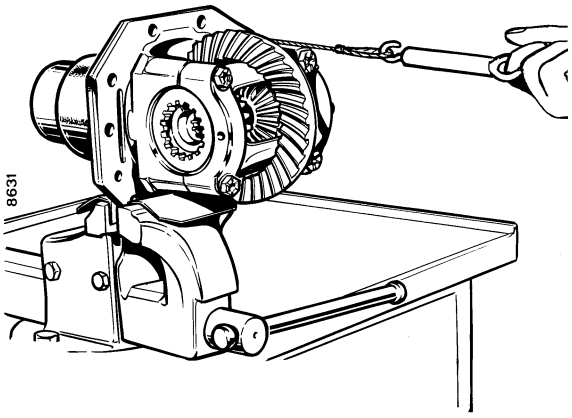
Finally, tighten differential cap screws (C_{10}) to 11.5 kgm (83 lb ft) and lock the lock rings using the lock plates provided.



a

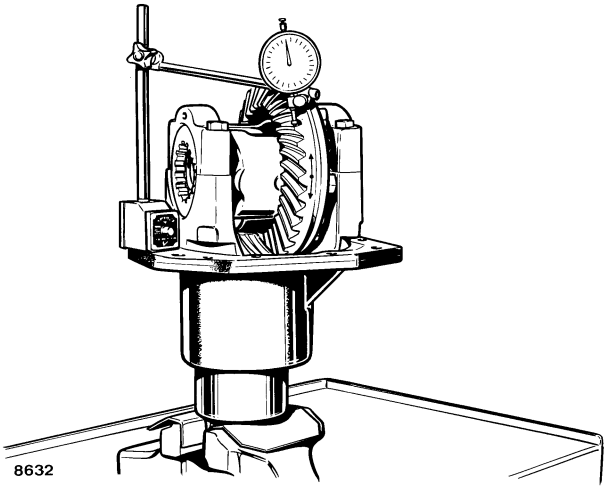
Adjusting the Differential Bearings

A. Wrench **293544**, 780 DT old tractor, or **293665**, 780 DT new and 880 DT tractors - B. Torque wrench - C_{10}. Self-locking differential capscrews - Gs. Bearing lockring



b

Checking Differential Bearing Rotating Torque Using a Spring Balance



c

Checking Bevel Drive Backlash

Differential Backlash Adjustment

Install the two side gears (60 and 61, section 402, page 3) without thrust washers (6) on differential cage. Position differential pinions (62) together with their thrust washers (7) and journal (63), and start retaining screw (8) through a few turns to prevent journal workout.

Bring left side gear in full contact with differential pinion as shown on page 11, section 204 and, using a suitable depth gauge, measure dimension (H_1) taking two diametrically opposed readings; subsequently, average the two readings arithmetically.
Move side gear to contact differential cage as shown on page 11, section 204 and measure dimension (H_2).
Repeat the above operations on the right side gear.
End displacement of each side gear without thrust washer will be as follows:

$$\mathbf{Gs} \text{ or } \mathbf{Gd} = \mathbf{H_1} - \mathbf{H_2}$$

where,

Gs = end displacement of left side gear

Gd = end displacement of right side gear

$\mathbf{H_1}$ and $\mathbf{H_2}$ = readings of left or right side gear

Normal differential backlash is .15 mm (.006 in).
Note that the ratio between normal backlash and the equivalent side gear endwise displacement is on average **1** to **1.7**.
Side gear end displacement equivalent to normal backlash should be: .15 x 1.7 = **.25 mm (.010 in).**
Thus, thickness of thrust washers to be inserted in differential cage will be as follows:

Ss = Gs — .25 (left side gear)

Sd = Gd — .25 (right side gear)

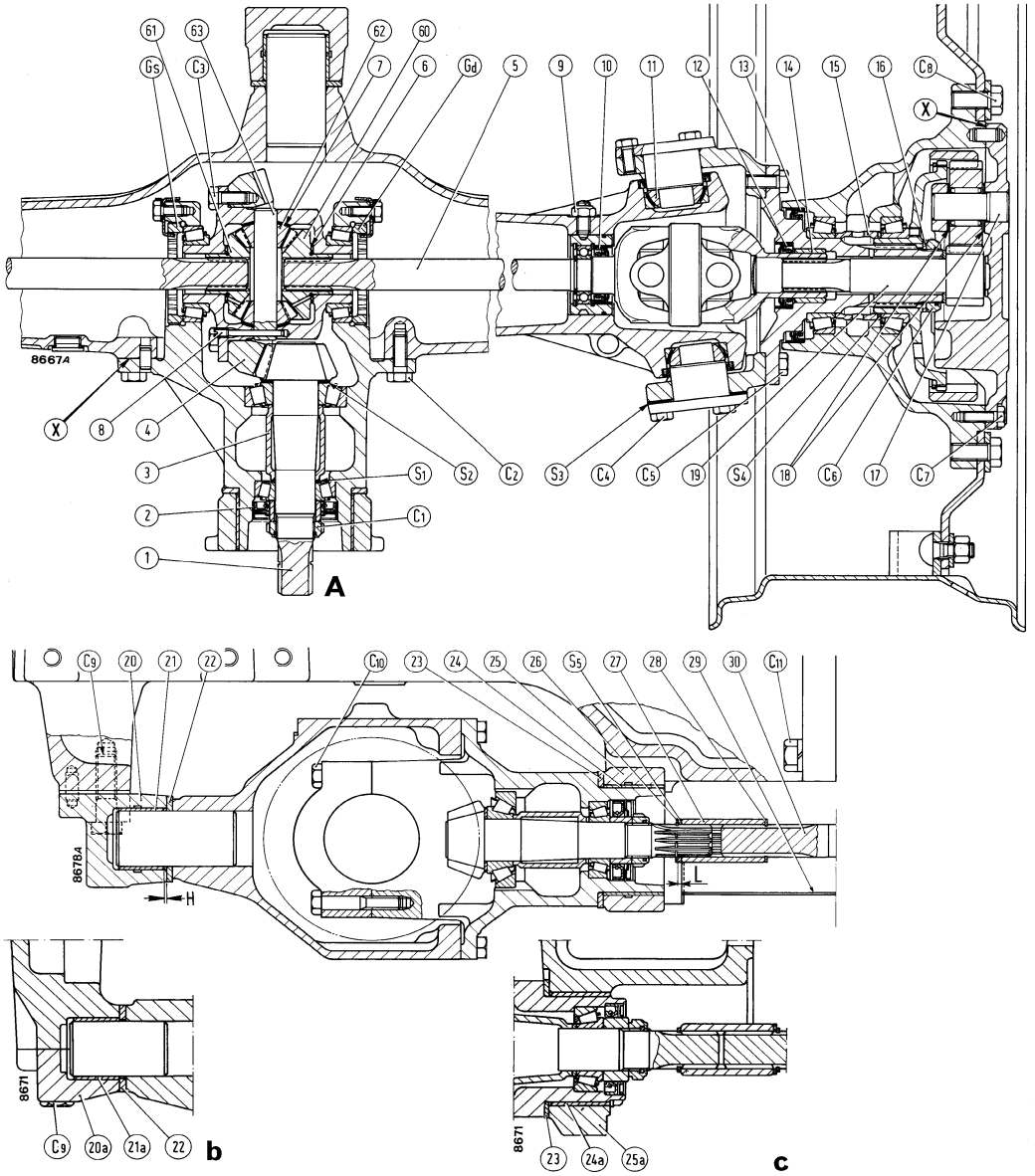
Select and install thrust washers of thickness as near as possible to the correct value noting that available thicknesses are 1.5 and 1.6 mm (.059 to .063 in).

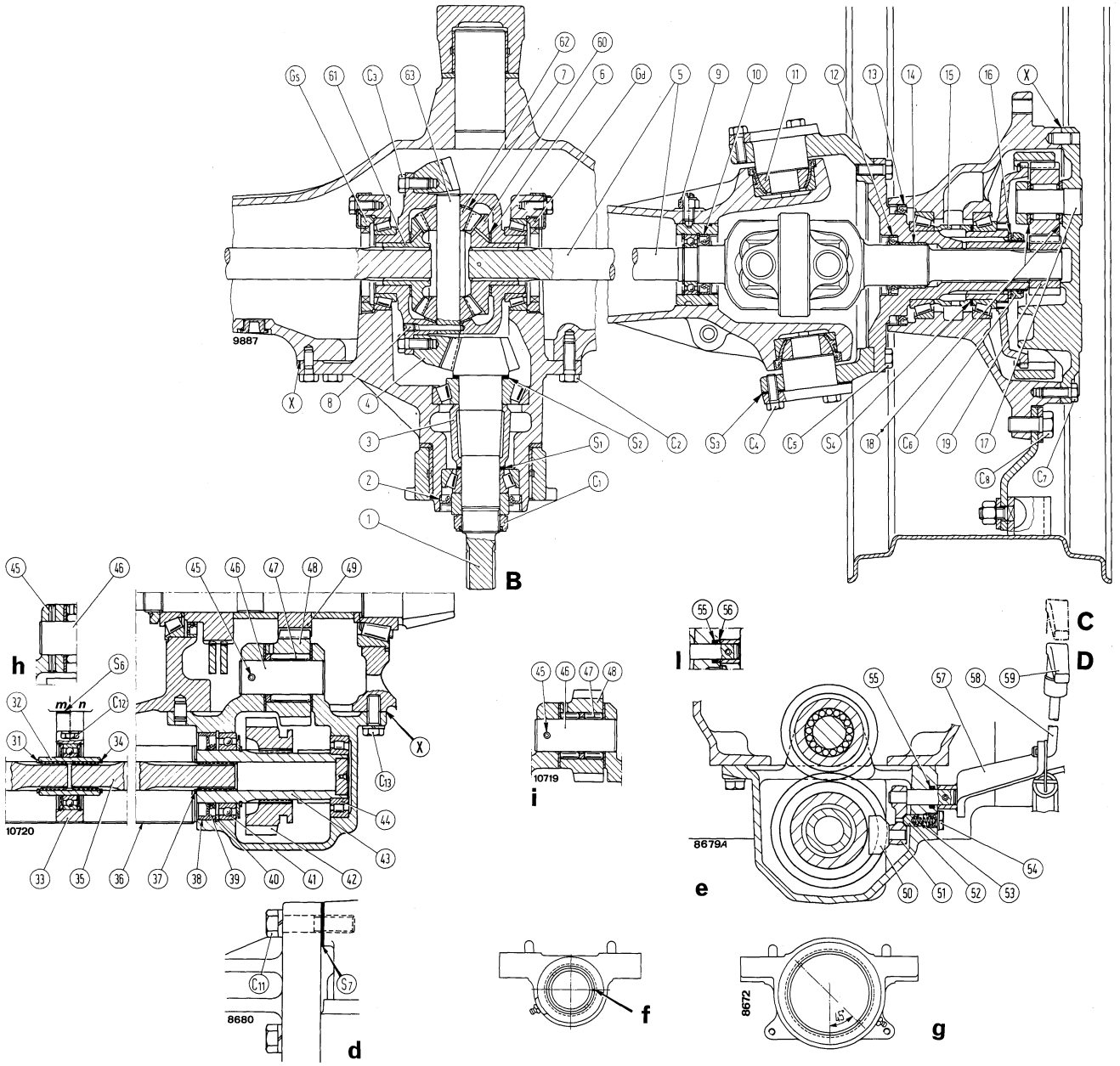
Sections through Front Axle, Axle Drive and Drive Shafts 780 DT and 880 DT

Note: On assembly thoroughly clean faces **X** to be mated and apply either of the following jointing compounds: RTV SILMATE, RHODORSIL CAF 1, LOCTITE PLASTIC GASKET

A. Front axle, 780 DT old tractor - B. Front axle, 780 DT new and 880 DT tractors - b/c. A.M. axle pivot - d. Axle support retention, 880 DT - e. Section through P.T.O. actuating linkage - f. Correct position of axle pivot bush in front support (split bush seam position arrowed) - g. Correct position of axle pivot bush in rear support - h/i/l. Old version details - m. Old version detail - n. New version detail - C_1. Bevel pinion bearing lock ring - C_2. Bevel drive case screw - C_3. Crown wheel screw - C_4. King pin screw - C_5. Axle arm screw - C_6. Wheel bearing lock ring - C_7. Hub reduction housing screw - C_8. Wheel bolt - C_9. Front and rear axle pivot support (or A.M. cap) screw - C_{10}. Differential cap screw - C_{11}. Axle support screw - C_{12}. Drive shaft centre bearing screw - C_{13}. P.T.O. housing screw - Gd/Gs. R.H. and L.H. differential bearing lock rings - H. Front bush depth, 1 mm (.04 in) - S_1. Bevel pinion bearing shim - S_2. Bevel pinion shim - S_3. King pin bearing shim - S_4. Wheel bearing shim - S_5. Front drive sleeve end float shim - S_6. Centre bearing shims (old version tractors) - S_7. Axle support shim (880 DT) - 1. Bevel pinion - 2. Seal - 3. Bevel pinion bearing spacer - 4. Crown wheel - 5. Axle shaft with attached universal joint - 6. Differential wheel thrust washer - 7. Differential pinion thrust washer - 8. Differential pinion journal screw - 9. Bearing retaining screw - 10. Seal - 11. King pin bearing - 12. Seal - 13. Seal - 14. Axle shaft bush - 15. Spacer - 16. Thrust washer - 17. Planet wheel journals - 18. Planet wheel thrust washer - 19. Sun gear - 20. Front axle pivot support - 20a. Cap (A.M.) - 21. Front bush - 21a. Front split bearing (A.M.) - 22. Front thrust washer - 23. Rear thrust washer - 24. Rear bush - 24a. Rear split bearing (A.M.) - 25. Rear axle pivot support - 25a. Cap (A.M.) - 26. Circlip - 27. Front drive sleeve - 28. Circlip - 29. Front drive shaft guard - 30. Front drive shaft - 31. Circlip - 32. Centre drive sleeve - 33. Centre bearing - 34. Circlip - 35. Rear drive shaft - 36. Rear guard - 37. Circlip - 38. Dust excluder - 39. Seal - 40. Circlip - 41. Ball bearing - 42. Driven gear - 43. Splined driven shaft - 44. Parallel roller bearing - 45. Spring pin - 46. Intermediate shaft - 47. Needle roller bearing - 48. Intermediate gear - 49. Drive gear fitted to bevel pinion - 50. Pad - 51. Inner relay lever - 52. Plunger - 53. Plunger spring - 54. Plug - 55. O-ring - 56. Snap ring - 57. Outer axle actuator lever - 58. Vertical link - 59. Manual live axle control lever (C = Live axle in; D = Live axle out) - 60/61. Side gears - 62. Differential pinion - 63. Journal

L = End float adjustment clearance (.5 to 1 mm or .02 to .04 in) between sleeve (27) and circlip (26)




9887
B
h
10720
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10719
l
C
D
e
86794
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8680
f
g
8672

LIFT PUMP

	780-780 DT	880-880 DT
Filter		
Type	Paper cartridge	
Location	Suction side, on R.H. side of transmission	
Pump		
Type	Gear, drawing from axle case	
Location	Behind transmission cover	Ahead of transmission cover
Model		
— AM	—	A 22 X
— PM	A 25 X	A 25 X
Make	FIAT	
Drive	Valve timing gear driven	
Rotation (from drive end)	Anti-clockwise	
Drive ratio	.910 to 1	1.147 to 1
Maximum rated speed (engine at governed speed)		
— AM	—	2638 rpm
— PM	2275 rpm	2753 rpm
Maximum rated output		
— AM	—	26.4 l/min (55.94 cu ft/h)
— PM	25.9 l/min (54.88 cu ft/h)	31.3 l/min (70.56 cu ft/h)
Output at 1445 rpm and 175 kg/cm² or 172 bar (2489 psi on test machine)		
— New or reconditioned		
- AM	—	13.4 l/min (28.39 cu ft/h)
- PM	15.4 l/min (32.63 cu ft/h)	
— Used		
- AM	—	9.2 l/min (19.49 cu ft/h)
- PM	11.3 l/min (23.94 cu ft/h)	
— Test oil temperature	55° to 65 °C (131 to 149 °F)	
— Test oil grade	SAE 20	
Pump gear journal dia.	17.400 to 17.424 mm (.6850 to .6860 in)	
Journal housing bore dia. in bearings	17.450 to 17.470 mm (.6870 to .6878 in)	
Journal clearance in bearing	.026 to .070 mm (.0010 to .0027 in)	
— Max wear clearance	.1 mm (.004 in)	
Gear clearance in pump body		
— AM	.120 to .164 mm (.0047 to .0065 in)	
— PM	.020 to .064 mm (.0008 to .0025 in)	
Max. pump body wear on suction side	.1 mm (.0040 in)	

HYDRAULIC LIFT UNIT: Specification and Data

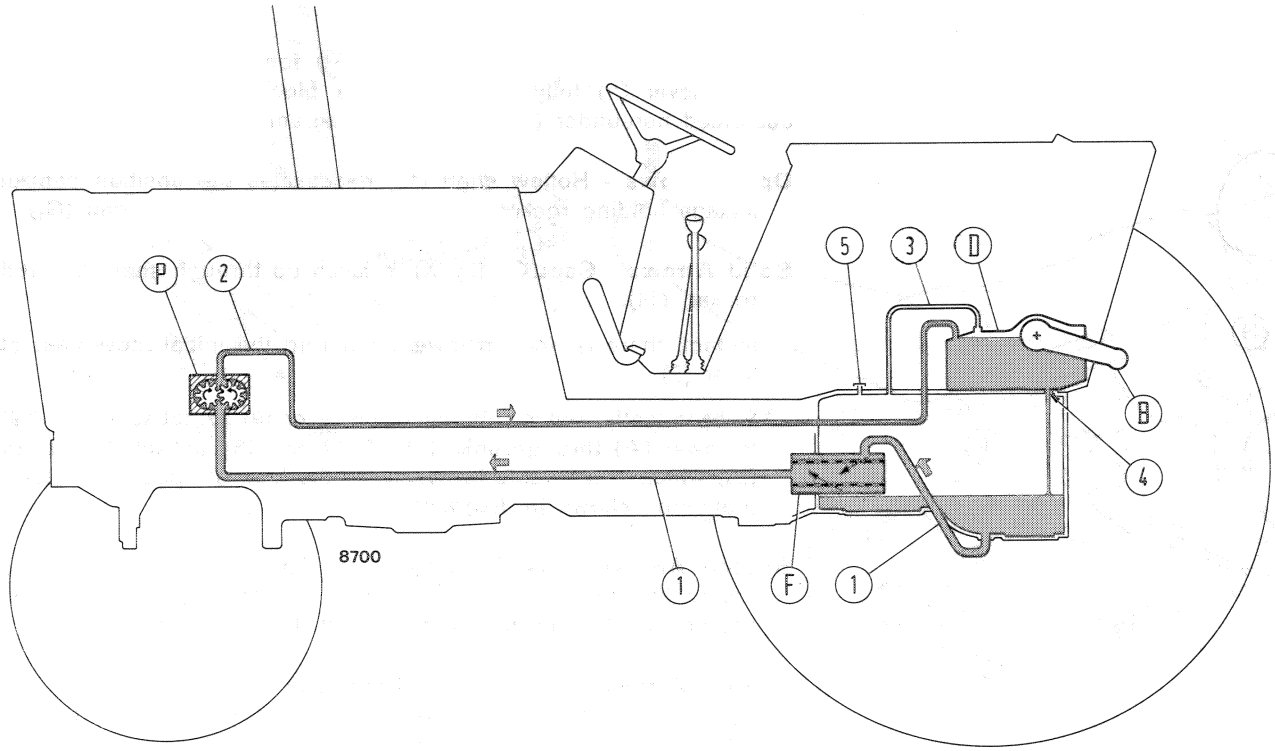
LIFT PUMP

	780-780 DT	880-880 DT
Gear flank width		
— AM	—	16.323 to 16.348 mm (.6426 to .6436 in)
— PM	18.323 to 18.348 mm (.7214 to .7224 in)	
Bearing width	19.796 to 19.812 mm (.7794 to .7800 in)	
Bearing housing width in pump body		
— AM	—	56.072 to 56.122 mm (2.2076 to 2.2095 in)
— PM	58.072 to 58.122 mm (2.2863 to 2.2883 in)	
Gear and bearing end float (applicable to new and reconditioned pumps)	.1 to .2 mm (.0040 to .0080 in)	

IMPLEMENT ATTACHMENT

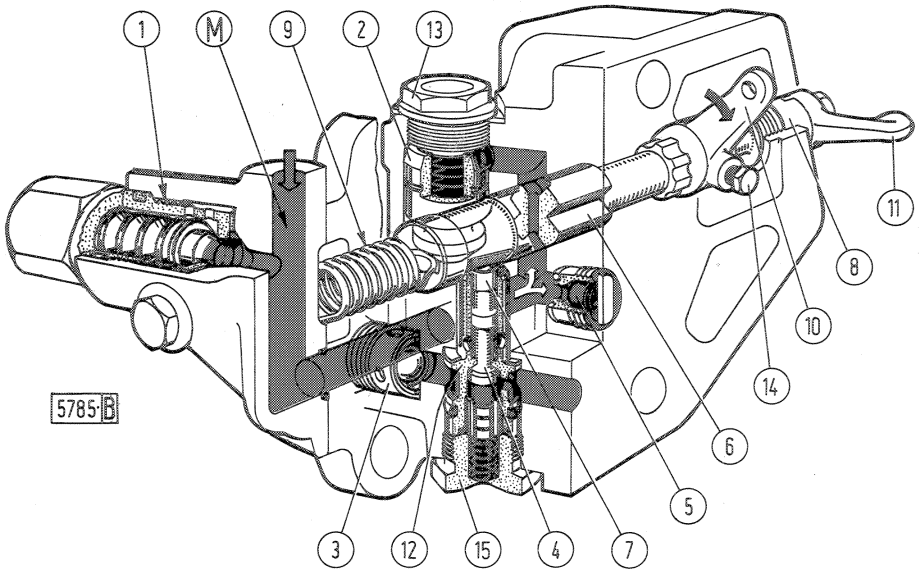
Type	Standard
Category	Two
Draught control	Through lower links and deflection bar
Max. lift capacity, centre of gravity 600 mm (23 5/8 in) to the rear of lower link joints from horizontal	
— Lifting rods out and coupled to front mounting holes (*)	1850 kg (4079 lb)
- Lift travel	660 mm (26 in)
— Lifting rods out and coupled to rear mounting holes (*)	2000 kg (4409 lb)
- Lift travel	545 mm (21 1/2 in)
Max. lift capacity, centre of gravity 1200 mm (47 1/4 in) to the rear of lower link joints from horizontal	
— Lift rods out and coupled to front mounting holes (*)	1450 kg (3197 lb)
- Lift travel	805 mm (31 3/4 in)
— Lifting rods out and coupled to rear mounting holes (*)	1600 kg (3527 lb)
- Lift travel	670 mm (26 1/2 in)
Max. lower link end travel	
— Lift rods out and coupled to front mounting holes	792 mm (31 1/4 in)
— Lift rods out and coupled to rear mounting holes	705 mm (27 3/4 in)
Sensing bar diameter { Old (1)	24.967 to 25.000 mm (.9829 to .9842 in)
Sensing bar diameter { New (2)	29.867 to 29.900 mm (1.1758 to 1.1771 in)
Sensing bar old bush I.D.	25.110 to 25.143 mm (.9886 to .9899 in)
Bar clearance in old bush	.110 to .176 mm (.0043 to .0069 in)
Old bush interference fit in housing	.009 to .073 mm (.0003 to .0029 in)
Sensing bar end float { Old	3 to 3.5 mm (.1181 to .1378 in)
Sensing bar end float { New	1.8 to 5.4 mm (.0709 to .2126 in)

(*) Top link coupled to top mounting hole - (1) From frame 845001 to frame 864807 and frame 670001 to frame 674735, 780 tractor and up to frame 894072, 880 tractor - (2) From frame 674736, 780 tractor, and frame 894073, 880 tractor.



Hydraulic Lift System Diagram (780 and 880 Tractors)

B. Lift arm - D. Valve block - F. Paper cartridge oil filter - P. Engine valve gear driven hydraulic pump - 1. Suction line drawing from rear axle case - 2. Delivery line to valve block - 3. Vent pipe to rear axle case - 4. Oil return to axle case - 5. Vent



Cut-Away of Valve Block

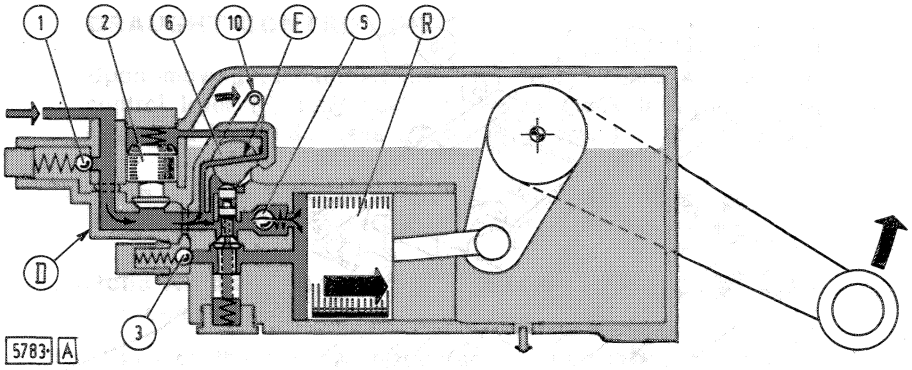
(Black arrow indicates twist on lever 10 by spring 9. Indicated oil flow applies to raising)

M. Inlet port - 1. Relief valve - 2. Governor valve - 3. Safety valve - 4. Unload valve - 5. Inlet valve - 6. Spool - 7. Unload valve plunger (contacting actuating cam on spool) - 8. Response adjuster plug - 9. Spool spring - 10. Spool lever - 11. Response lever - 12. Unload valve seat - 14. Spool lever screw - 15. Unload valve plug

High pressure oil

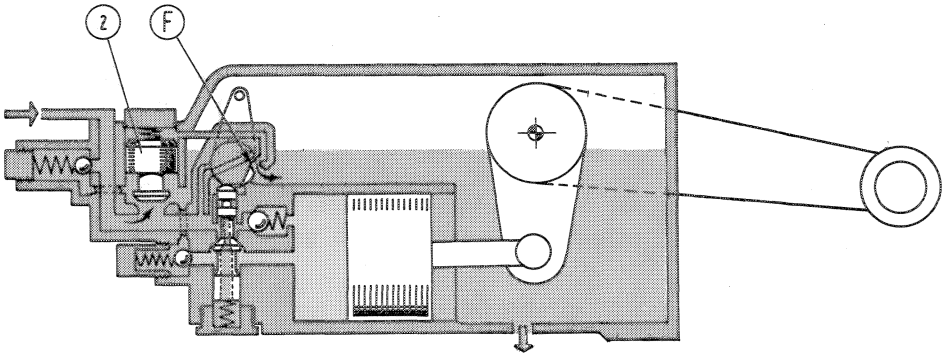
Inlet, pump and exhaust oil

Trapped oil



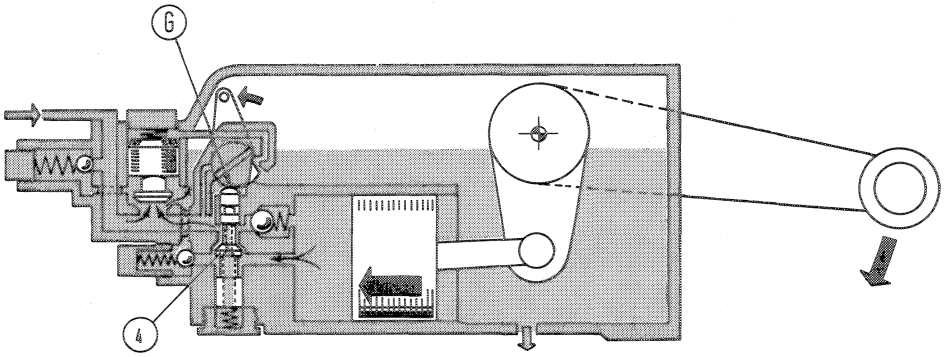
S - Oil Flow when Raising

As spool (6) turns incoming oil pressure is directed to the upper chamber of governor (2) through cross drilling (E). As the upper area of the governor is larger than that on the lower side, the valve is kept closed. Oil pressure is thus directed to the cylinder through valve (5).



N - Oil Flow in Neutral

Spool position is such that oil pressure from governor valve (2) is exhausted through slot (F). Thus, pump oil pressure displaces the governor upwards and the power is directed to the lift body.



A - Oil Flow when Lowering

Spool cam (G) causes valve (4) to open, thereby connecting the cylinder to exhaust.

LIFT SYSTEM OPERATION DIAGRAM

D. Valve block - E. Spool cross drilling - F. Spool slot - G. Spool cam - R. Lift piston - 1. Relief valve - 2. Governor valve - 3. Safety valve - 4. Unload valve - 5. Inlet valve - 6. Spool - 10. Spool lever

POSITION CONTROL (X)

Upon moving position control lever (P) forward with the draught control lever (F) fully back, the valve block linkage operates as described hereunder (see arrows in diagram).

Open Arrows - Shaft (25) deactivates draught control linkage and maintains gap (G_2) between roller (10) and lever (9) through rocker (14).

Solid Arrows - Hollow shaft (12) causes spool (19) to move down to position (A) and rocker (21) acts on lever (18) through roller (16) and link (17) to overcome the load of spring (20).

Striped Arrows - As arms (23) lower, link (22) and rocker (21) move to separate the rocker from roller (16),

This enables spring (20) to recall the linkage and restore contact until the spool reverts to neutral (N) and the arms stop (condition shown in the diagram). Under the action of link (17), lever (15) causes rocker (14) and roller (10) to move as shown without taking up gap (G_2) completely.

Shaded Arrows - Under the pull (T) acting on bar (1) inner lever (9) moven away from roller (10), thereby increasing gap (G_2). Thus, the increase in draught cannot affect operation in position control.

Arms (23) are raised by returning lever (P) to the rear, when the linkage operates as follows:

— Hollow shaft (12) separates rocker (21) from roller (16) causing spring (20) to move spool (19) to raise position (S), thereby restoring contact between roller and rocker (see striped arrows).

— As the arms are raised, link (22) moves in the opposite direction to that indicated by the striped arrow moving links (21, 16, 17 and 18) (see solid arrows) to return the spool to neutral (N), when the arms will stop.

The position taken up by arms (23), both during lower and raise, corresponds to a pre-established position of lever (P) on the quadrant as selected by the operator.

FLOAT

With draught control lever (F) fully back and position control lever (P) fully forward:

— Linkage movement is as described for position control.

— Arms (23) cannot complete their downward stroke because the type of implement used contacts the ground prior to bottoming.

— Because of the above, link (22) does not prevent contact between rocker (21) and roller (16) and, consequently, the spool remains in lower position (A) continuously, thereby permitting free arm oscillation.

HYDRAULIC LIFT UNIT:
Lift Schematics

DRAUGHT CONTROL (Y)

Upon moving position control lever (P) forward with the draught control lever (F) fully back, the valve block linkage operates as described hereunder (see arrows in diagram).

Open Arrows - Hollow shaft (12) deactivates the position control linkage holding rocker (21) off roller (16) to produce gap (G_1).

Solid Arrows - Gap (G_2, fig. X) is taken up through shaft (25) and rocker (14).

In fact, there is no arm lowering during the initial movement of lever (F).

Subsequently, roller (10) reacts on lever (9) to cause spool (19) to lower (A) through links (14, 15, 17 and 18), activated by shaft (25) which is now able to overcome the load of spool spring (20) (condition shown in diagram).

Striped Arrows - As the arms lower, link (22) further displaces rocker (21) from roller (16), thereby increasing gap (G_1). Thus, position control linkage cannot affect draught control.

Shaded Arrows - Under the pull (T) acting on bar (1), inner lever (9) separates from roller (10), thereby enabling spring (20) to recall the spool to neutral (N) and stop the arms.

Consequently, the working depth in draught control is affected by the tractive effort. In fact, for a given length of stroke of lever (F) the working depth will be inversely proportional to ground consistency.

As tractive effort increases, inner lever (9) separates further from roller (10), thereby causing the spool to move to raise (S) under the load of spring (20).

When the tractive effort decreases, the spool reverts to neutral or moves to lower and the linkage operates in the opposite direction to that indicated by the striped arrows (solid arrows).

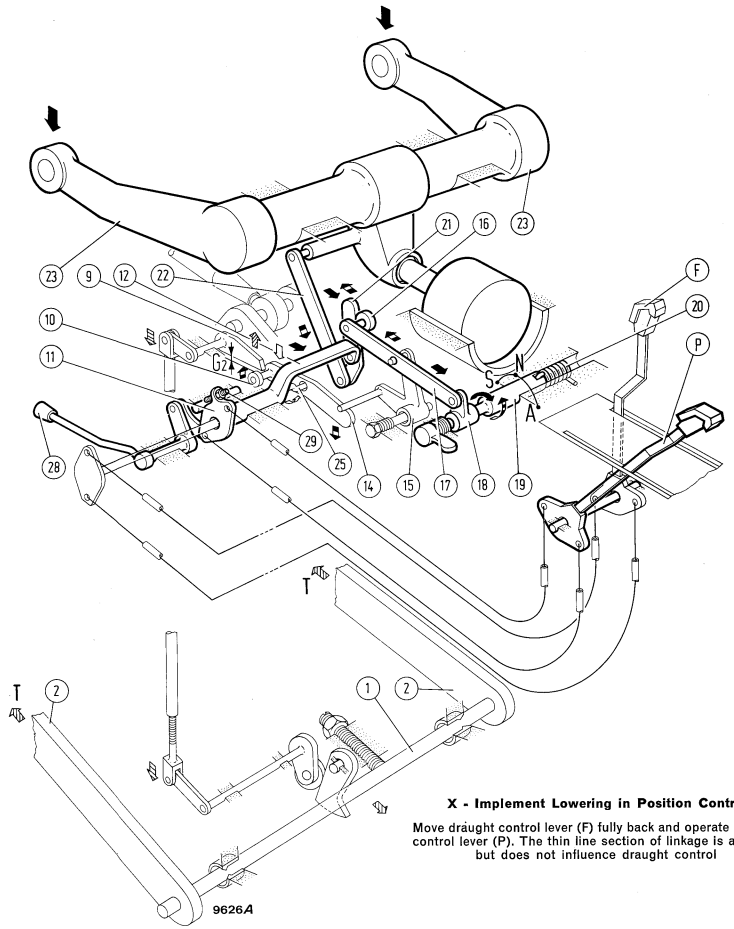
DRAUGHT AND POSITION CONTROL

Upon moving draught control lever (F) forward, and with the position control lever (P) fully back, the working depth is adjusted as described under draught control. The subsequent forward movement of (P) causes:

— Rocker (21) to contact roller (16) and spool (19) to move to lower (A), as evidenced by a slight downward displacement of arms (23).

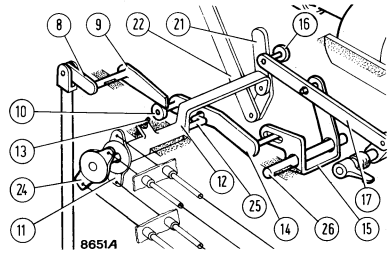
— As a consequence of the above, the failure of spring (20) to move the spool to raise (S) when the tractive effort tends to increase.

This condition does not prevent the lift from working in draught control when the tractive effort decreases owing to a patch of soft ground. Thus, mixed draught and position control is a means of containing working depth reduction during draught control.

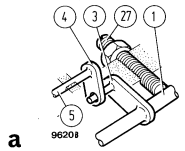


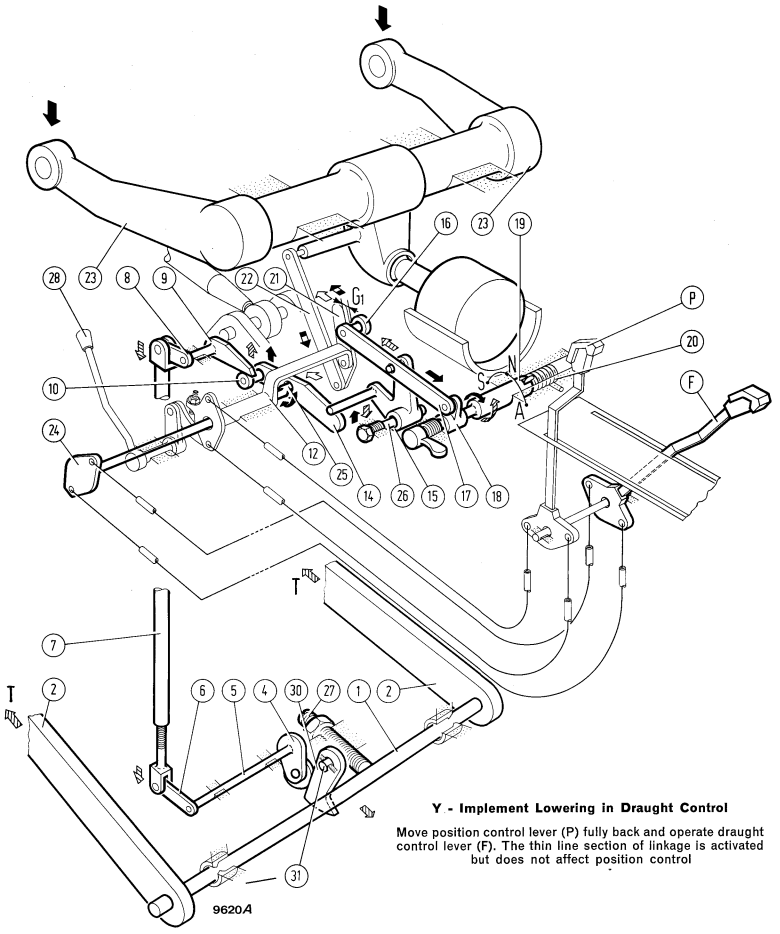
X - Implement Lowering in Position Control

Move draught control lever (F) fully back and operate position control lever (P). The thin line section of linkage is activated but does not influence draught control



A.M. Solution





Y - Implement Lowering in Draught Control

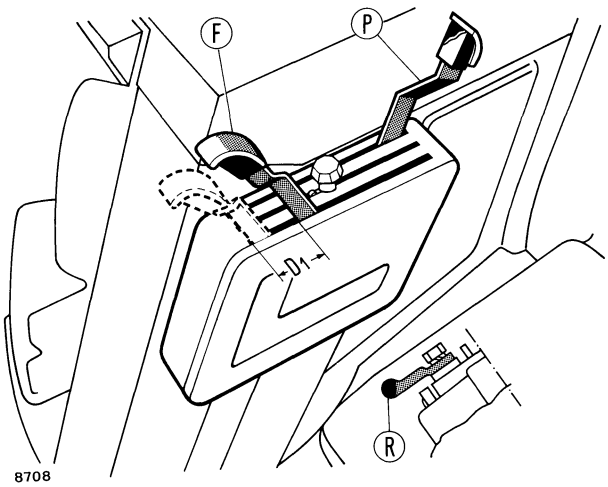
Move position control lever (P) fully back and operate draught control lever (F). The thin line section of linkage is activated but does not affect position control

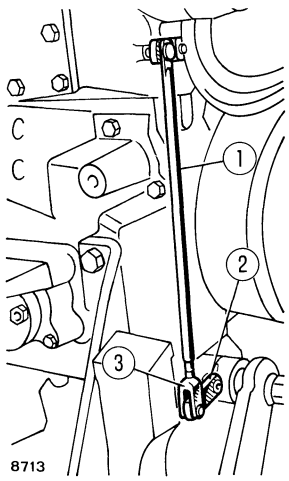
LIFT CONTROL LINKAGE SCHEMATICS

A. Lower position - a. Old version draught control linkage - F. Draught control lever - G_1. Roller-rocker gap - G_2. Lever-roller gap - N. Neutral position - P. Position control lever - S. Raise position - T. Tractive effort on lower links during tractor motion - 1. Sensing bar - 2. Lower links - 3. Sensing arm - 4. Sensing lever - 5. Sensing shaft - 6. Lower lever - 7. Sensing link - 8. Upper outer lever - 9. Upper inner lever - 10. Roller - 11. Position control cable actuator - 12. Hollow shaft with integral lever - 13. A.M. maximum lift arm travel adjusting screw - 14. Draught control rocker - 15. Crank lever - 16. Roller - 17. Spool link - 18. Spool lever - 19. Spool - 20. Spool spring - 21. Position control rocker - 22. Position control link - 23. Lift arms - 24. Draught control cable actuator - 25. Draught control actuating shaft - 26. Crank lever pivot - 27. Sensing bar negative flexure limit displacement adjusting screw (from frame 862060, 780 tractor, and 889370, 880 tractor) - 28. Position control lever from ground (PM) - 29. Maximum lift arm travel adjusting screw (PM) - 30. Draught signal pick-up cam (from frame 672551, 780 tractor, and frame 892290, 880 tractor) - 31. Cam pivot

Adjusting Start of Lift in Draught Control

D_1 = 128 to 132 mm (5.04 to 5.20 in) from frame 845001 to frame 862069, 780 tractor, and up to frame 889369, 880 tractor, or 138 to 142 mm (5.43 to 5.59 in) from frame 862070 to frame 864807 and from frame 670001 to frame 672550, 780 tractor and frame 889370 to frame 892289, 880 tractor or 120 to 128 mm (4.72 to 5.04 in) from frame 672551, 780 tractor, and from frame 892290, 880 tractor. Draught control lever to forward end of quadrant slot - F. Draught control lever - P. Position control lever - R. Response lever - 1. Sensing link - 2. Lower sensing lever - 3. Lower link fork





6. Start of Lift in Draught Control

Test conditions:

— Lower links without additional weight.

— System oil temperature 50 to 60 °C.

— Engine running at 1200 to 1500 rpm.

— Sensing link (1) connected to associated outer relay levers.

— Adjuster control valve to medium response, i.e. lever (R) horizontal (AM valve) or lever (9, page 8) in midposition (PM valve).

Procedure:

— Raise lift arms several times.

— Move position control lever (P) fully back on quadrant.

— Starting from fully forward position, gradually move draught control lever (F) back until the arms rise.

— Check on the quadrant that distance (D_1) from end of slot to front of lever is:
  - 128 to 132 mm (5.04 to 5.20 inch), from frame 845001 and up to frame 862069, 780 tractor, and from start of production and up to frame 889369, 880 tractor.
  - 138 to 142 mm (5.43 to 5.59 inch), from frame 862070 and up to frame 864807, and also from frame 670001 and up to frame 672550, 780 tractor, and from frame 889370 and up to frame 892289, 880 tractor.
  - 120 to 128 mm (4.72 to 5.04 inch), from frame 672551, 780 tractor, and from frame 892290, 880 tractor.

— To adjust, disconnect lower fork (3) and extend the sensing link (1) by backing off the fork if distance (D_1) is less than 128 mm (5.04 inch) or 138 mm (5.43 inch) or 120 mm (4.72 inch) or shorten the link if the distance is more than 132 mm (5.04 inch) or 142 mm (5.59 inch) or 128 mm (5.04 inch).

Note: Each turn of fork (3) is equivalent to a 12 mm (0.47 inch) variation in the distance (D_1) on control lever quadrant.

Notice: If tractors from frame 672551, Model 780, and frame 892290, Model 880, fail to lift when using very heavy implements with centre of gravity far from attachment points, shorten link (1) and carry out above adjustment taking care to progressively screw in fork (3) up to a maximum of 2 turns.
In these conditions, distance (D_1) will be equal to or higher than 100 mm (4 inch).
If particularly light work is to be performed using a very heavy implement (e. g. gang plough working in loose ground at a depth of 10 to 15 cm or 4 to 6 inch), adjust start of lift in draught control as directed above and increase the clearance between sensing bar (1, pages 2 and 3, Section 503) and sensing bar limit travel adjuster screw (14) as directed on page 4, Section 503; adjuster screw (14) pages 2 and 3, Section 503 should be backed off through more than half a turn.

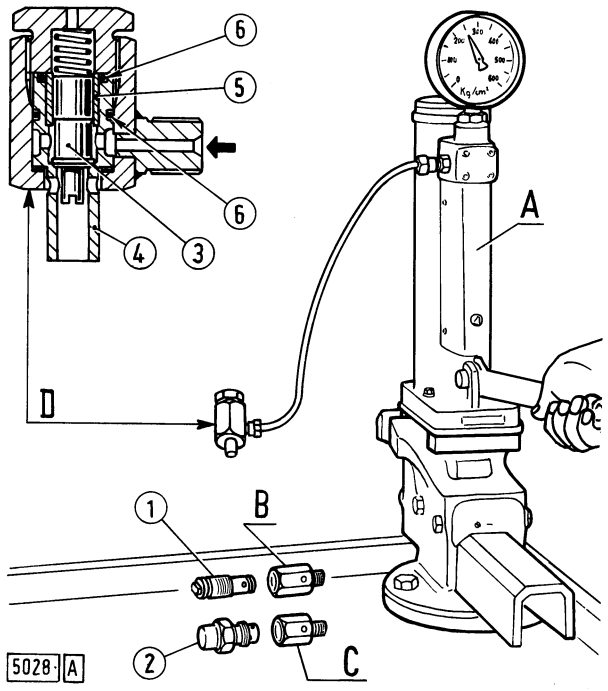
TO CHECK VALVES

Relief and Cylinder Safety Valves

On-bench relief and cylinder safety valve setting check is carried out using hand pump **290284** together with valve holders **290824** and **290826**.

The relief valve should crack off at 161 to 168 bar (164 to 171 kg/cm², 2332 to 2431 psi), whereas cylinder safety valve should crack off at 225 to 235 bar (230 to 240 kg/cm², 3271 to 3413 psi).

Note: If the setting is found to be incorrect, preferably renew the valve in question. However, if necessary, adjust through the threaded plugs after folding back the peened areas.



Relief Valve, Cylinder Safety Valve and Unload Valve Test Equipment

A. Hand pump **290284** - B. Relief valve holder connection **290824** - C. Cylinder safety valve holder connection **290826** - D. Unload valve holder connection **290834** - 1. Relief valve - 2. Cylinder safety valve - 3. Unload valve - 4. Unload valve seat - 5. Valve barrel - 6. O-rings

When testing the relief valve on the tractor proceed as directed below.

a. Tractor not fitted with remote control valves

Fit connector **291326** (G, page 13) between delivery connection (7) and valve carrier cover (8), and connect to pressure gauge **293300** (E), scale 0 to 250 kg/cm² (0 to 3556 psi).

Run the engine to bring oil temperature to 50° ± 3 °C (117 to 127 °F).

Move position control lever (P, page 11) fully back on quadrant.

Screw in adjusting screw (V_1, page 9) or back off adjusting screw (V_2, page 10, or V_3, page 9) to control maximum lift stroke until relief valve cracks off.

Note: To gain access to screws (V_1, V_2 and V_3), proceed as directed on pages 9 and 10 for maximum lift arm travel adjustment.

With engine running at 1700 rpm, 780 tractor, or 1600 rpm, 880/8 tractor, or 1400 rpm, 880/12 tractor, and check that the indicated pressure is 190 to 195 kg/cm² or 186 to 191 bar (2702 to 2775 psi).

b. Tractor fitted with remote control valves

Fit connection **293449** (F, page 13) to a quick-connect female half-coupling and connect to pressure gauge **293300** (E), scale 0 to 250 kg/cm² (0 to 3566 psi).

Run the engine until oil temperature is 50° ± 3 °C (117 to 127 °F).

Actuate the control lever on the control valve associated with the half-coupling in question until relief valve cracks off.

With engine running at 1700 rpm, 780 tractor, 1600 rpm, 880/8 tractor, or 1400 rpm, 880/12 tractor, pressure gauge should indicate 190 to 195 kg/cm² or 186 to 191 bar (2702 to 2775 psi); to adjust, turn setting adjusting screw as necessary.

THREE-POINT LINKAGE

The implement attachment is a three-point linkage with lift rods, top link and adjustable steady members (PM) or check blocks (AM) for lateral control.
The lower links are pivotted to the draught sensing bar and the lift rods connect the lower links to the lift arms.

Right-Hand Lifting Rod

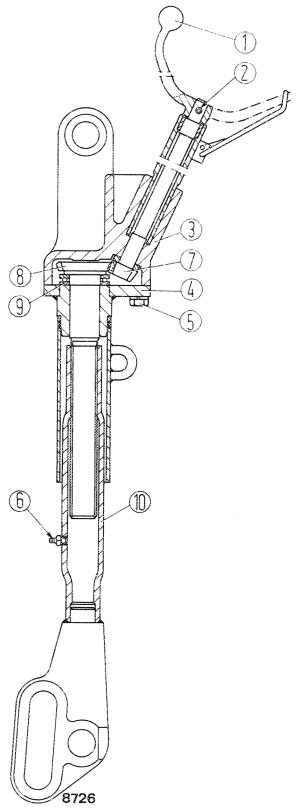
To dismantle the right-hand lifting rod proceed as follows:

— Remove screws (5) and withdraw cover (4) with attached driven gear (8).

— Back off lower end (10) and withdraw the driven gear and thrust bearing (9).

— Take off pin (2), withdraw handle (1) and the drive gear.

On reassembly, pack the top and bottom recesses with **grassofiat G9** or other approved grease.



Section through R.H. Lift Rod

1. Levelling box handle - 2. Spring pin - 3. Body - 4. Cover - 5. Cover screws - 6. Lubricator - 7. Drive gear - 8. Driven gear - 9. Thrust bearing - 10. Lower end

DRAUGHT CONTROL DEVICE

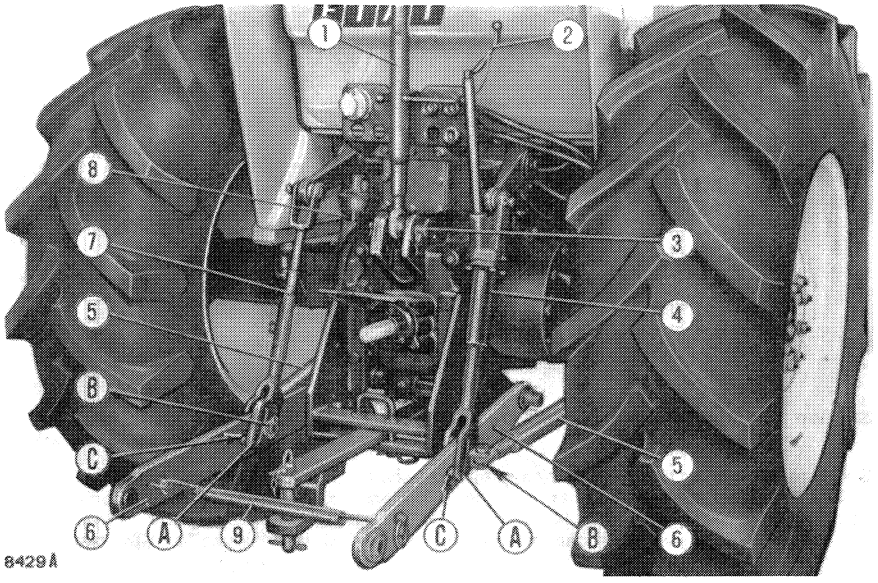
To remove the draught sensing bar, which constitutes the means for monitoring and controlling draught on three-point links, proceed as follows:

— Remove the lift rods and lower links.

— Disconnect the draught sensing link from the lower sensing lever (5, page 2).

— Remove the retaining screws and withdraw the sensing bar support assembly.

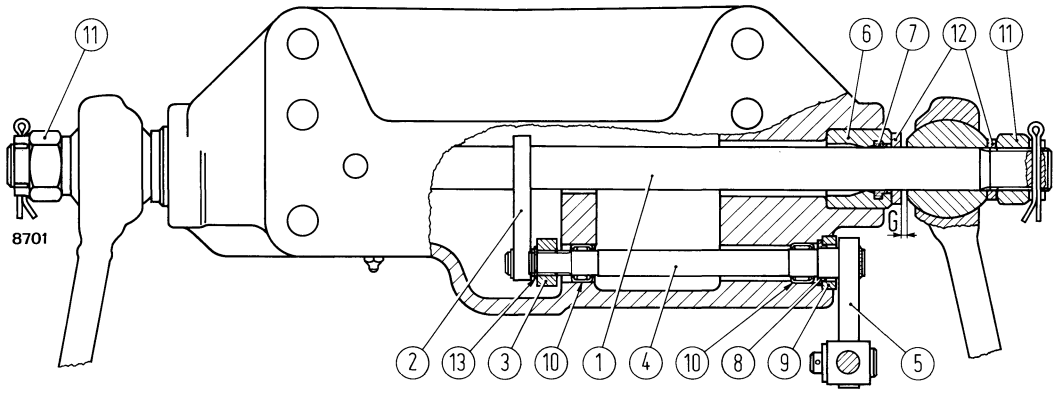
(continued on page 4)



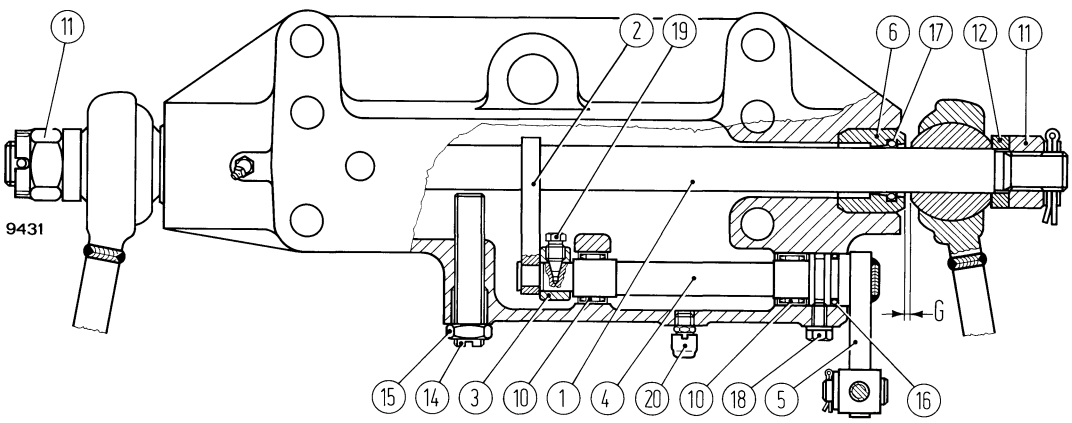
Lift and Category 2 Implement Attachment in Position on Tractor

A. Lift rod elongated holes - B. Front lift rod mounting holes - C. Rear lift rod mounting holes - 1. Adjustable top link - 2. Levelling box handle and spring - 3. Top link pivot - 4. Right hand lift rod - 5. Check arms (steady members) - 6. Lower links - 7. Left hand lift rod - 8. Auxiliary lift cylinder (optional) - 9. Check chain (to be fitted during tractor transfer)

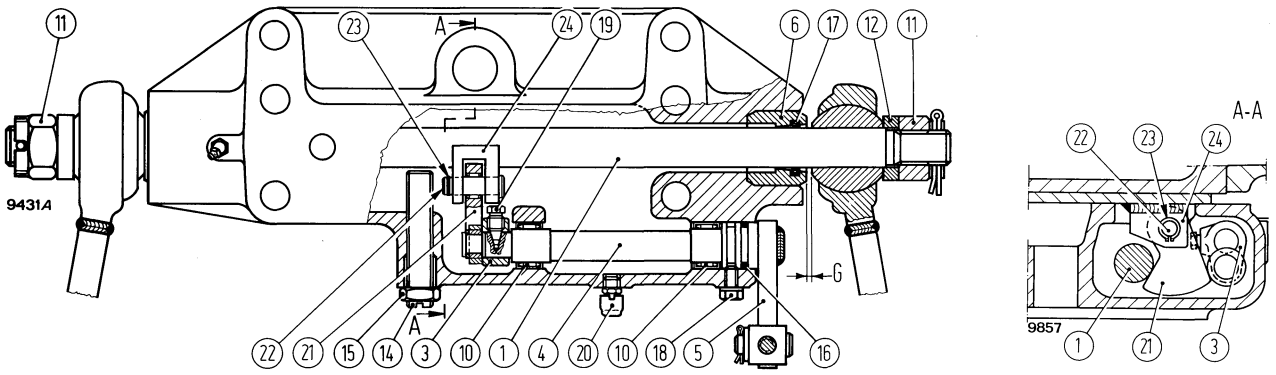
HYDRAULIC LIFT UNIT:
Implement Attachment



Section through Draught Control Device (from Frame 845001 and up to Frame 862069, 780 Tractor and from Start of Production and up to Frame 889369, 880 Tractor)

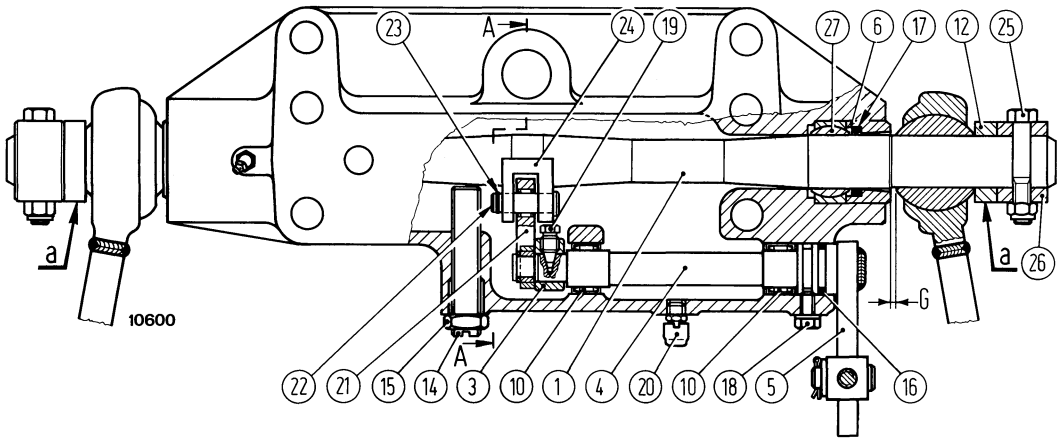


Section through Draught Control Device (from Frame 862070 and up to Frame 864807 and from Frame 670001 and up to Frame 672550, 780 Tractor, and from Frame 889370 and up to Frame 892289, 880 Tractor)

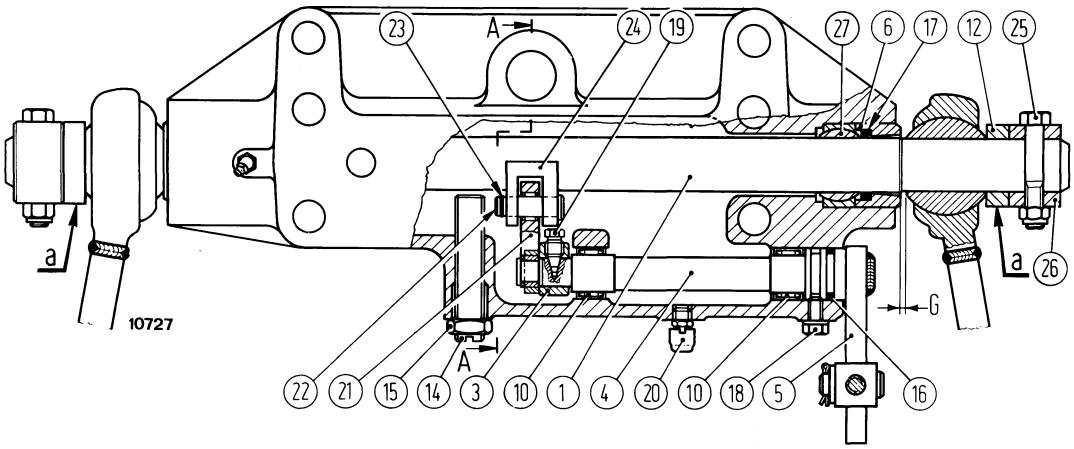


Section through Draught Control Device (from Frame 672551 and up to Frame 674735, 780 Tractor, and from Frame 892290 and up to Frame 894072, 880 Tractor)

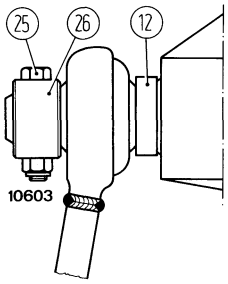
G = 3 to 3.5 mm or .118 to .138 inch, sensing bar end play - 1. Sensing bar - 2. Crank lever - 3. Sensing lever - 4. Relay shaft - 5. Lower lever - 6. Sensing bar bushing - 7. Seal - 8. Seal -9 . Seal retainer - 10. Lever roller bearing - 11. Nuts - 12. Thrust washers - 13. Retaining ring - 14. Sensing bar limit travel adjusting screw - 15. Lock nut - 16. O-ring - 17. O-ring - 18. Relay shaft capscrew - 19. Sensing lever capscrew - 20. Vent - 21. Draught signal pick-up cam - 22. Cam pivot - 23. Retaining ring - 24. Cam support plate

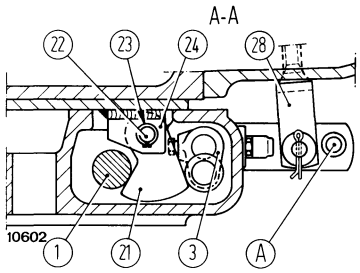


Section through Draught Control Device (from Frame 674736, 780 Tractor)



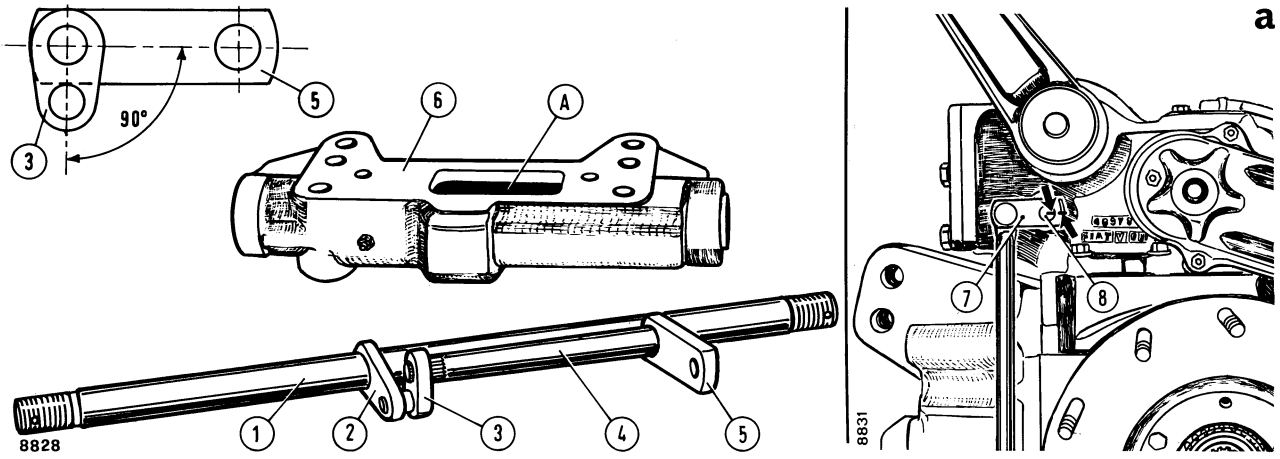
Section through Draught Control Device (from Frame 894073, 880 Tractor)





a. Position of washer (12) for heavy duty applications - b. Detail of washer (12) in light and medium duty position - A. Mounting hole for fork (28), for use in conjunction with washer (12) in position shown in detail (b) when working with extra light implements - G = 1.8 to 5.4 mm (.0709 to .2126 inch) sensing bar end float (not adjustable) - 1. Sensing bar - 3. Draught signal pick-up lever - 4. Relay shaft - 5. Lower relay lever - 6. Bushing - 10. Needle roller bearings - 12. Thrust washer - 14. Sensing bar limit travel adjusting screw - 15. Lock nut - 16. O-ring - 17. O-ring - 18. Relay shaft capscrew - 19. Draught signal pick-up lever capscrew - 20. Vent - 21. Draught signal pick-up cam - 22. Cam pivot - 23. Retaining ring - 24. Cam support plate - 25. Capscrew - 26. Abutment ring - 27. Sensing bar spherical bushing - 28. Draught signal sensing link fork.

HYDRAULIC LIFT UNIT: Implement Attachment



Assembling Draught Control Device

a. Reference marks on lever (7) relative to pin (8) - A. Support recess packed with grassofiat Jota 1 on assembly - 1. Sensing bar - 2. Crank lever - 3. Sensing lever - 4. Relay shaft - 5. Lower lever - 6. Support (old) - 7. Upper lever - 8. Inner lever pin

— With the assembly on the bench, withdraw sensing bar (1) and remove retaining ring (13) or capscrews (18 and 19) to permit relay shaft (4) removal.

— Take off bushings (6), needle roller bearings (10) and, on old version units, ring (9) using suitable universal pullers.

On assembly, note the following points:

— Install upper relay lever (7, page 4) on inner lever pin (8) ensuring that the reference marks shown on page 4 are in register.

— Couple relay shaft (4) to sensing lever (3) so that the latter lies at right angles to the lower lever (5) as shown on page 4.

Note: For device from frame 889370, 880 tractor, and from frame 862070 and up to frame 864807 and from frame 670001 and up to frame 674735, 780 tractor, adjust sensing bar travel as follows:

— Slacken locknut (15, page 2) and screw in adjuster (14) until contact with sensing bar is established.

— Back off adjuster screw (14) through a third of a turn to not more than half a turn.

— Tighten locknut (15).

For units from frame 674736, 780 tractor, adjust sensing bar travel adopting the above procedure, after symmetrically equalising sensing bar end float on both sides and turning the bar so as to bring adjusting screw (14, page 3) in contact with any curvature or distortion of the non-ground taper portion of the bar.

On assembly, smear the bores of sensing bar bushings (6, pages 2 and 3) with **Molikote** type **G grease** and pack recess (A) with **grassofiat Jota 1.**

Install sensing bar support on axle casing and fill inner recess right up with **grassofiat Jota 1** to be introduced through the lubricators provided until surplus grease flows from vent (20, pages 2 and 3).

To adjust sensing bar end float (from frame 845001 and up to frame 864807 and from frame 670001 and up to frame 674735, 780 tractor, and from start of production and up to frame 894072, 880 tractor).

Screw in nuts (11, page 2) the same amount on both ends of the sensing bar (1).

Displace the bar axially on one side and check that end float (G) is correct. The correct end float is 3 to 3.5 mm or .118 to .138 inch.

Screw in or back off nuts (11) by the same amount bearing in mind that each turn of each nut alters the clearance by 2 mm or .080 inch.

SPECIFICATION AND DATA

Filter	Paper cartridge (the same as used for lift oil filtering)
Pump	Gear (the same as used for lift circuit)
Remote control valves	
Type	Spool, spring return
Make	KONTAK
Installation	Banked (up to a maximum of 3) attached to right fender
Control	Separate hand levers
Relief valve pressure setting	186 to 191 bar (190 to 195 kg/cm^2 - 2702 to 2775 psi)
Spool clearance in body	.003 to .006 mm (.0001 to .0002 in)
Relief spring length:	
— Free	39.4 mm (1.5512 in)
— Under 294 ± 53 N (30 ± 5.4 kg or 66 ± 11.8 lb.)	38.2 mm (1.5039 in)
Spool return spring length	42.8 mm (1.6850 in)
Non return valve spring length	15.9 mm (.6260 in)

TIGHTENING TORQUE FIGURES

DESCRIPTION	Torque		
	Nm	kgm	lb ft
Nut, valve body tierod	20	2	14.46
Connection, oil delivery to lift	20	2	14.46
Plug, relief valve spring	20	2	14.46
Capscrew, spool	5.5	.6	4.34
Capscrew, actuating lever support (4, page 10)	11	1.1	7.95
Plug, selector valve (single acting-double acting)	20	2	14.46

HYDRAULIC LIFT UNIT: Kontak Remote Control Valves

REMOTE CONTROL VALVES

Disassemble remote control valves referring to the sectional views below and noting the following points:

— Withdraw the spool from each valve body, after removing the spring and caps (4 and 6).

— Back off plug (9) and remove selector valve (single acting-double acting) (1).

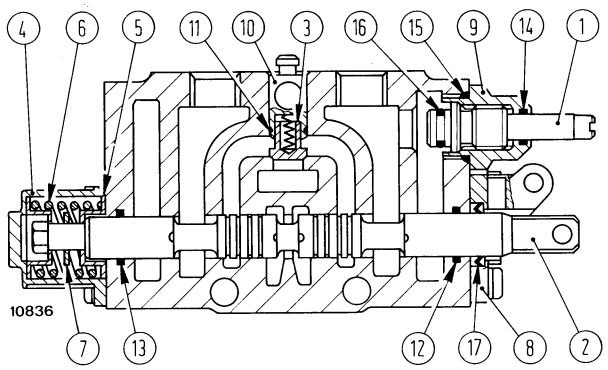
— Remove valve seat (10) using a pair of pliers, followed by non-return valve (3), retrieving the associated spring.

— Remove relief valve from remote control valve mounted plate, backing off valve body (24) and subsequently separating plug (25) on the bench, and retrieving spring (26), shims (27 and 28) and plunger (29).

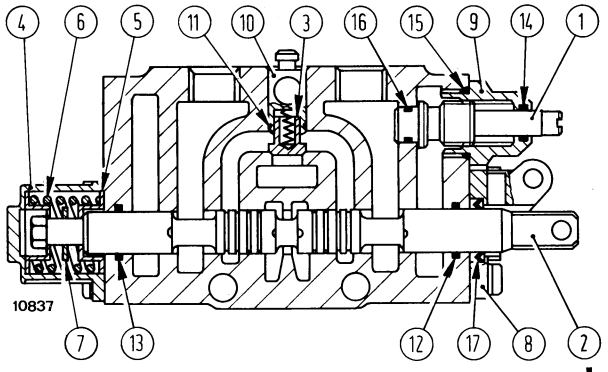
— Check seals for wear and replace as necessary.

When renewing inefficient parts, note that spools are supplied matched to their respective valve body.

For control valve assembly reverse the disassembling procedure; the tie bolt nuts are to be tightened to 20 Nm (2 kgm or 14.46 lb. ft.). Subsequently, carry out the hydraulic tests as directed below.



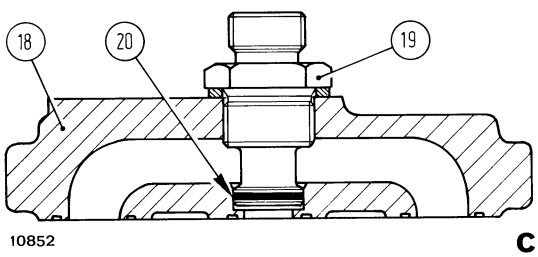
a



b

Sections through Remote Control Valves

a. Remote control valve suitable for single acting cylinder - b. Remote control valve suitable for double acting cylinder - 1. Selector valve (single acting-double acting) - 2. Spool - 3. Non return valve - 4. Cap - 5. Cup - 6. Spool return spring - 7. Spacer - 8. Support - 9. Plug - 10. Non return valve seat - 11. O-ring - 12. O-ring - 13. O-ring - 14. O- ring- 15. O-ring - 16. O-ring - 17. Seal



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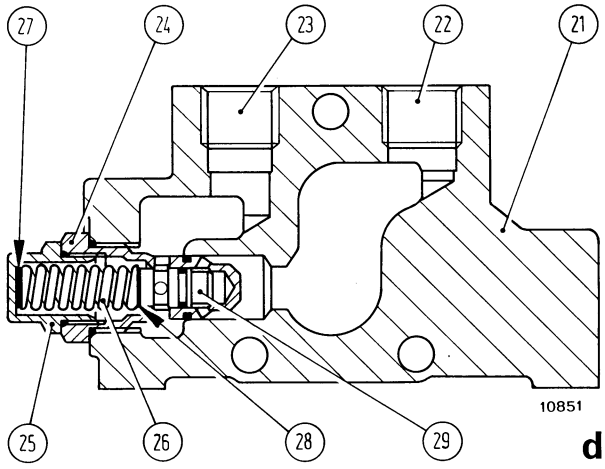


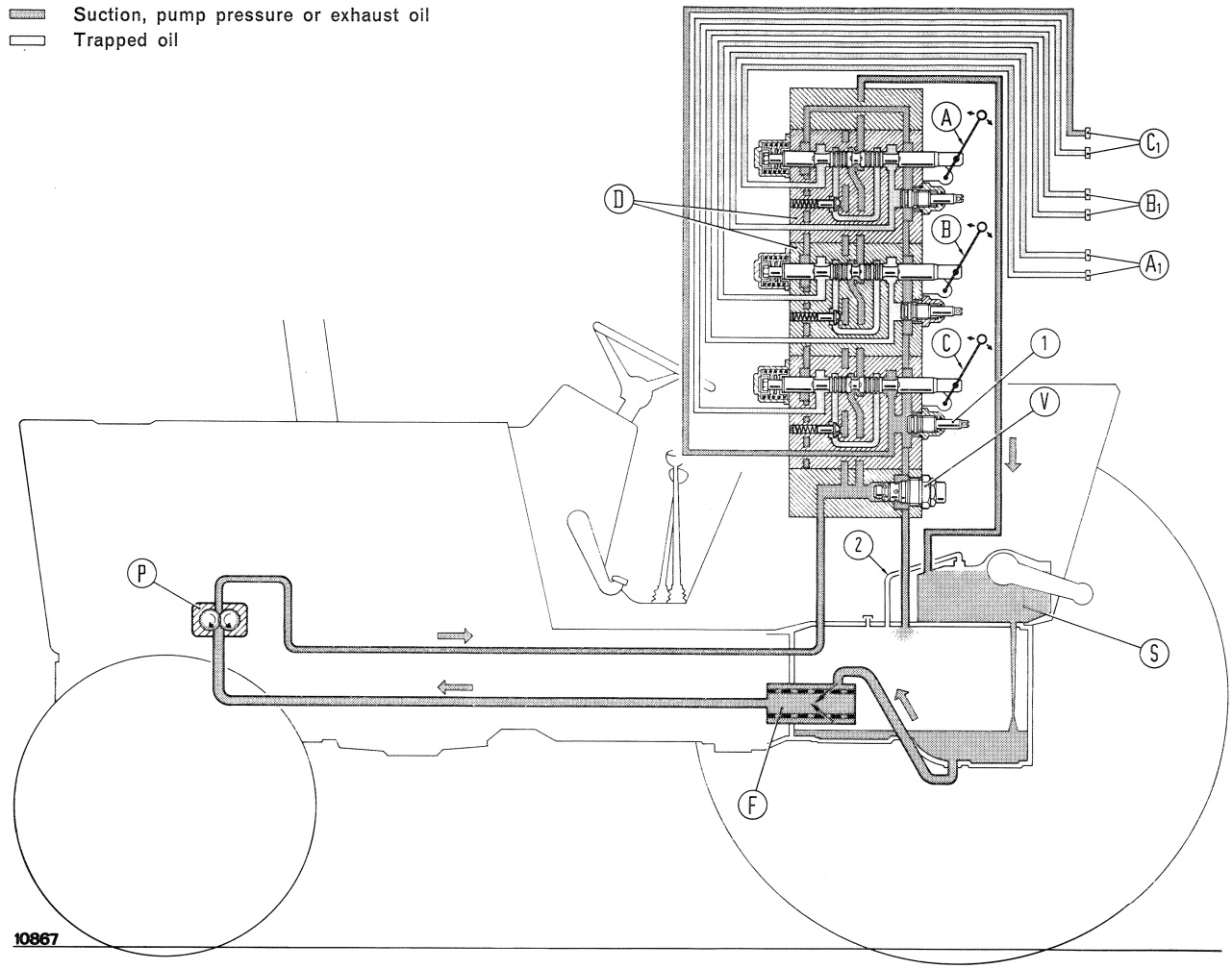
d

Sections Through Remote Control Valve Front (21) and Rear (18) Mounting Plates

19. Oil delivery to lift - 20. O-ring - 21. Front mounting plate - 22. Inlet port - 23. Exhaust port - 24. Relief valve body - 25. Plug - 26. Relief valve spring - 27. Shims - 28. Shims - 29. Relief valve plunger

DESCRIPTION AND OPERATION

KONTAK remote control valves are fitted on request as an alternative to the foregoing SALAMI remote control valves.
KONTAK remote control valves are of the spool type, convertible from single acting to double acting and may remotely control any auxiliaries activated by hydraulic cylinders.
To actuate a single acting cylinder, screw (1) must be fully backed off, whereas to activate a double acting cylinder the screw must be tightened fully.
These remote control valves may be installed banked up to 3 together and fastened by means of special brackets to the right tractor fender.
Operation is through lift pump and oil (which is also used for axle lubrication) but control is separate through hand levers (A, B and C).
However, simultaneous operation of a remote control valve and hydraulic lift is not possible.
When remote control valves are fitted, relief valve (set to 186-191 bar, 190 to 195 kg/cm² or 2702 to 2775 psi) normally located in lift control valve is fitted to the remote control valve mounting plate (V).
Illustrated below is the oil flow in the 3 remote control valves with associated control levers in neutral; thus, oil pressure from pump is directed through valve bodies in the direction arrowed and flows to the lift control valve.



Remote Control Valve Hydraulic System Diagram

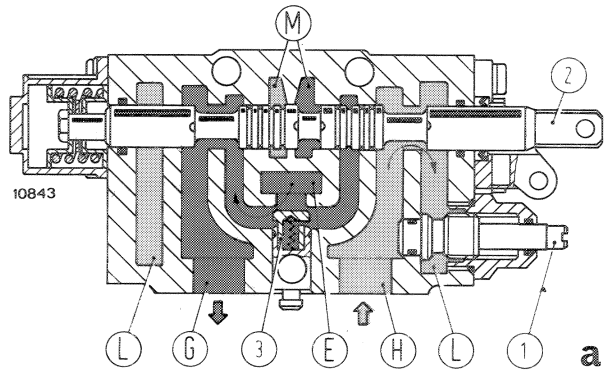
A/B. Double acting cylinder control valve levers - C. Single acting cylinder control valve lever - $A_1/B_1/C_1$. Single acting and double acting cylinder female couplings - D. Remote control valves - F. Pump suction line full flow paper cartridge oil filter (common to hydraulic lift) - P. Hydraulic pump (common to lift) - S. Lift body - V. Relief valve - 1. Mode selector screw (single acting-double acting) - 2. Vent pipe across lift body and rear transmission case.

HYDRAULIC LIFT UNIT: Kontak Remote Control Valves

High pressure oil

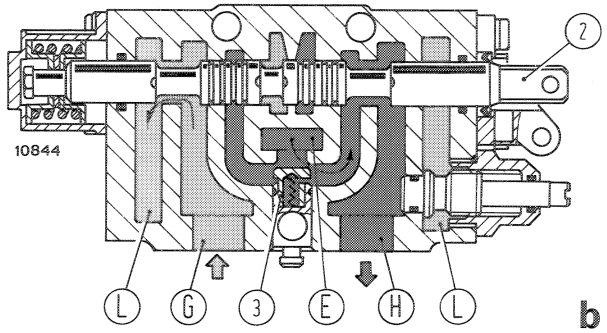
Inlet, delivery or exhaust oil

Trapped oil



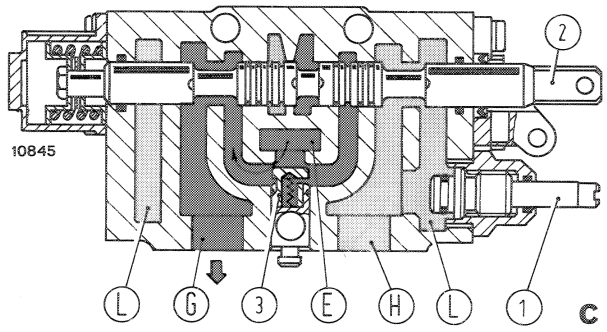
a

a. OIL FLOW WHEN RAISING - When lever (A, page 11) is pulled back, spool (2) moves thereby establishing communication between supply port (E) and lower cylinder chamber through non return valve (3) and port (G), as well as upper cylinder chamber and exhaust port (L) through port (H) discontinuing oil flow to lift control valve. If the lever is held back lift is continued up to maximum travel of piston in the cylinder in question; upon release, the lever springs back to neutral and the entire pump output is directed to the lift control valve through ports (M).



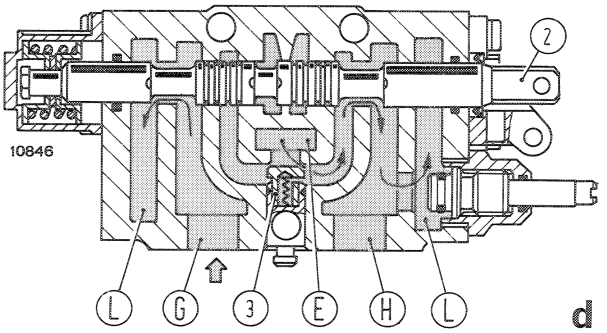
b

b. OIL FLOW WHEN LOWERING - For implement lowering, push control lever (A, page 11) forward. Spool (2) takes up the position in fig. b thereby permitting oil pressure in lower cylinder chamber to flow to exhaust (L) through port (G), whereas the upper chamber is placed in communication with delivery port (E) through port (H) and non-return valve (3).



c

c. OIL FLOW WHEN RAISING - When lever (C, page 11) is pulled back, spool (2) establishes communication between cylinder and supply port (E) through non return valve (3) and port (G). Port (H), used for double acting cylinder operation, is unused in this phase being permanently in communication with exhaust (L) owing to selector valve (1) being open.



d

d. OIL FLOW WHEN LOWERING - When control lever (C, page 11) is pushed forward, spool (2) takes up the position shown in fig. d. Oil pressure in cylinder, under pressure from the raised implement, flows to exhaust port (L) through port (G) whilst all the pump output is directed to exhaust port (L) through non return valve (3) and port (H).

Remote Control Valve Operation Diagram for Double Acting Cylinder Application (Figures a and b) and for Single Acting Cylinder Application (Figures c and d)

Note: For double acting cylinder application, fully tighten screw (1). For single acting cylinder applications the screw must be backed off.

On-Tractor Relief Valve Check (29, d, page 10)

Bring rear transmission case oil to 50° C and proceed as follows:

— Insert connector **293449** in a quick connect female coupling and connect to pressure gauge (0 to 250 kg/cm²) of kit **293300**.

— Start the engine, accelerate to part throttle and actuate the control lever of the control valve connected to the coupling used until relief valve cracks off.

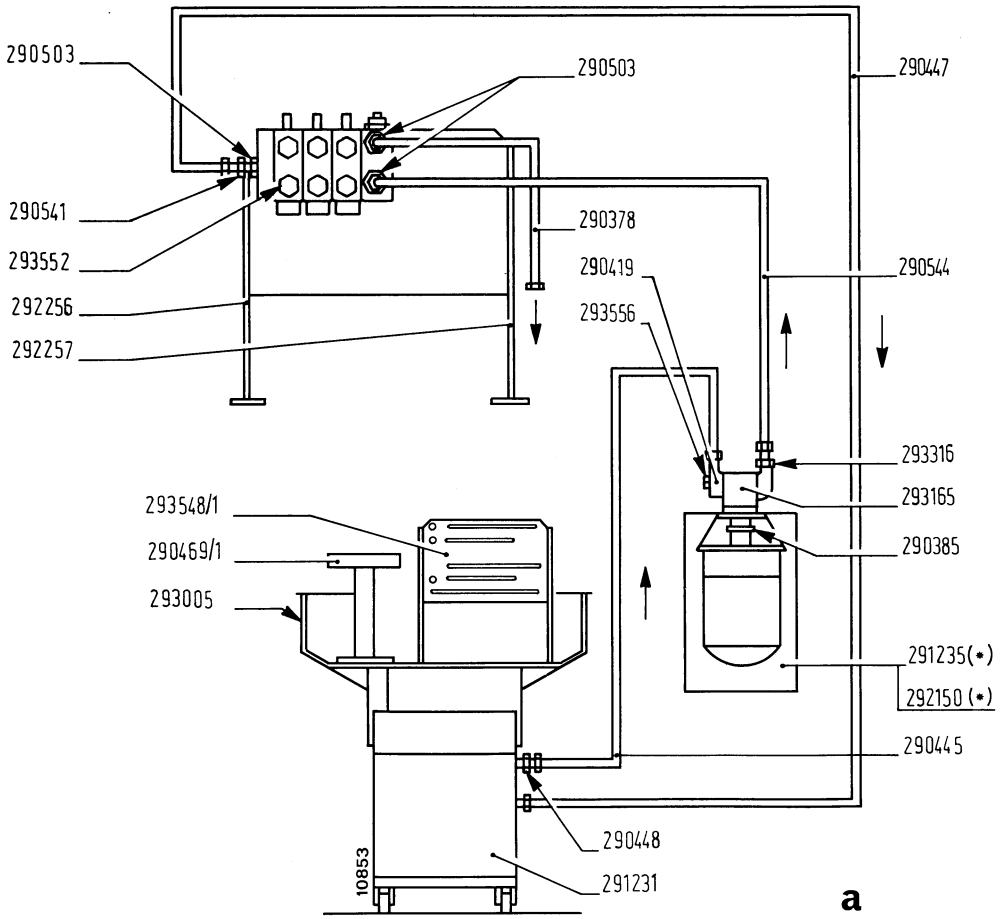
— Check on the gauge the pressure at which crack-off occurs; the correct reading should be 186 to 191 bar (190 to 195 kg/cm², 2702 to 2775 psi). If the pressure reading is considerably different from the above, replace the valve unit.

On-Tractor Relief Valve Check (29, d, page 10)

Install remote control valve assembly under test and test equipment as directed in diagram (a) noting that oil return piping **290447** from control valve must be connected to the outlet plate using adaptor **290503**.

Following proper connection as indicated in the diagram, test as follows:

— Activate hydraulic pump, gradually increase pressure through control handle on tester **291231** and check on tester pressure gauge that relief valve starts to open at 186 to 191 bar (190 to 195 kg/cm², 2702 to 2775 psi). If the pressure reading is different from the prescribed value, replace the valve without hesitation.



Relief Valve Tester Installation Diagram

(*) **Note:** Electric motor **291235** is indicated as an alternative to 15 HP electric motor **292150**.

HYDRAULIC LIFT UNIT: Kontak Remote Control Valves

Note: If the tester is filled with oliofiat AP 51 (SAE 20 W), the above test and those that follow must be carried out at 60° C approximately for an output of 12.5 litres/min (22 imperial pints/min) obtainable by running tester motor at the higher speed (1450 rpm).

Spool Return Test (b, b1)

Install remote control valve assembly under test and test equipment as indicated in diagrams (b, b_1), noting the following points:

— On double acting remote control valves (fig. b) the two outlet ports to cylinder are to be coupled to ball type connector **293549** using piping **290424** and banjos **293553.**

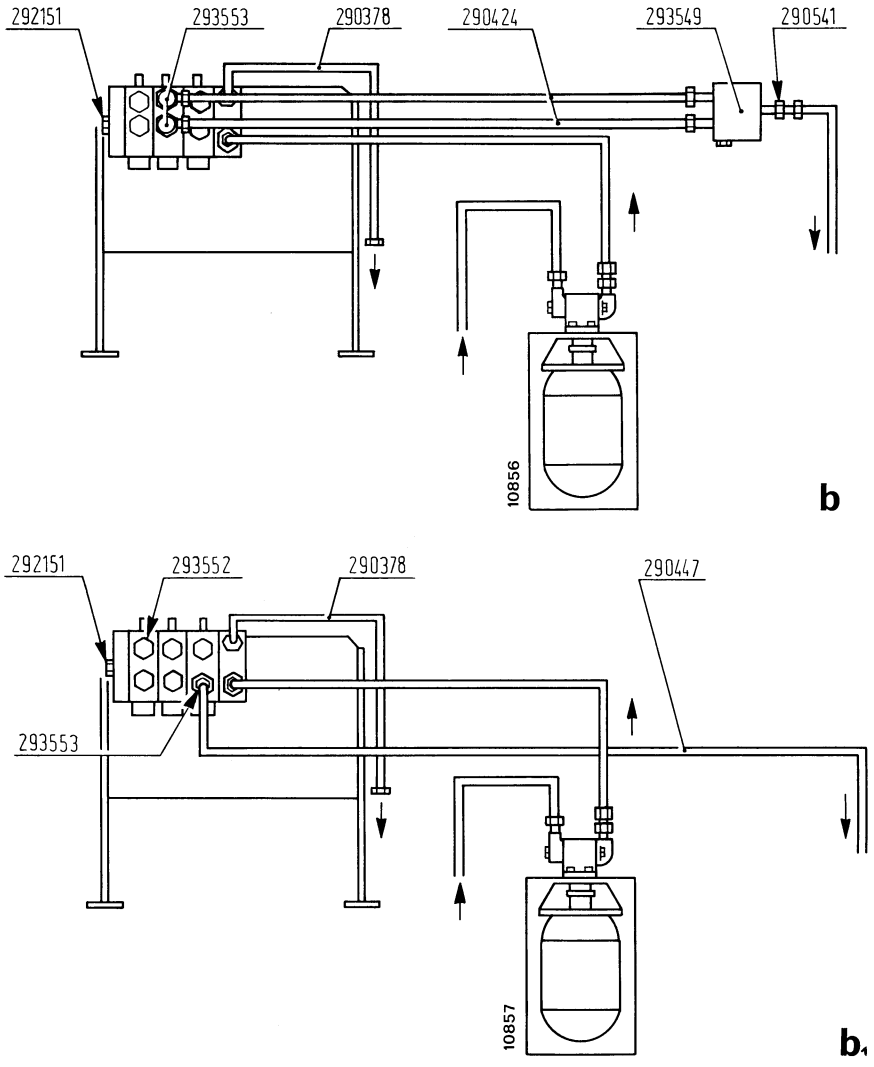
— For single acting remote control valves (fig. b_1), return line **290447** must be connected, through banjo **293553**, to oil outlet to cylinder on remote control valve (port situated on the side opposite to selector valve 1, page 10).

After proper connection as indicated in the diagram, test as follows:

— Activate hydraulic pump and actuate spool hand lever (in both directions for double acting remote control valves).

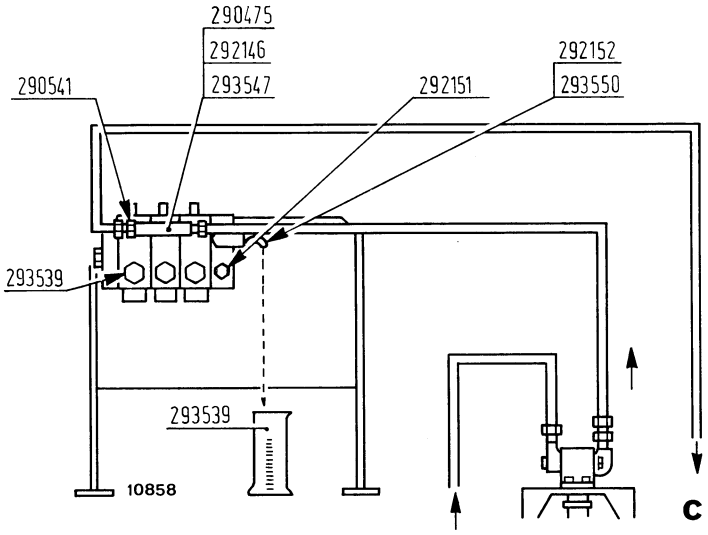
— Gradually increase pressure through the control handle of output tester **291231** and check on the test pressure gauge that the setting is 172 bar (175 kg/cm² or 2489 psi). In these conditions, the spool under test should slide freely and return to neutral without binding as soon as the control lever is released.

— Test the other spools after establishing the necessary connections.



Test equipment installation diagram for spool return on double acting cylinder remote control valve (b) and on single acting cylinder remote control valve (b_1)

Test equipment installation diagram for spool leakage on single acting and double acting cylinder remote control valves (c)



Single Acting and Double Acting Cylinder Remote Control Valve Spool Leakage Test (c)

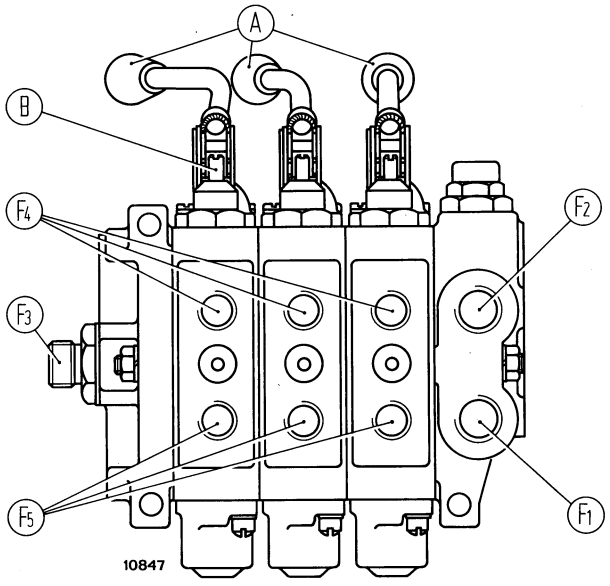
Install remote control valve assembly under test and test equipment as indicated in diagram (c) noting that three-way connection **292146** or **290475** is to be fitted to single acting and double acting cylinder remote control valves using adaptors **293547.**

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 172 bar (175 kg/cm^2 or 2489 psi).

— Collect leakage oil flowing from connection **293550** in burette **293539** for exactly 1 minute and check the contents; leakage oil should not exceed 15 cc/min (.91 cubic inch/min) for a new control valve or 60 cc/min (3.66 cubic inch/min) for a used valve.

On double acting cylinder control valve, test each of the two outlet ports connected to the cylinder.



Remote Control Valve Piping Connections Diagram

A. Remote control valve levers - B. Selector valves (single acting-double acting) - F_1. Inlet port (M 22 x 1.5) from hydraulic pump - F_2. Exhaust port (M 22 x 1.5) to rear transmission case - F_3. Outlet port (M 22 x 1.5) to lift control valve - F_4/F_5. Outlet ports (M 18 x 1.5) to single acting or double acting cylinders.

HYDRAULIC LIFT UNIT

10 - ENGINE

100 - Removal, Refitting - Bench Test

290740 Hook, lift

293453 Bracket, engine (use with lift hook **290740**, 880 and 980 tractors)

293002/1 Bracket, universal, for use with rotary stand **290090**

291310 Tester, compression (kit **291309**)

292631 **293499** Tester, compression with bracket for installation in place of injector (780, 880/5 and 980 tractors)

292635 **293499** Tester, compressor, with bracket to install in place of injector (880 tractor)

101 - Engine Block and Cylinder Head

290955/1 **290956** Pair of spacers, cylinder head protrusion (880 tractor)

291174 Straightedge, cylinder liner (880 tractor)

293349 Plate, cylinder sleeve removal (780 and 880/5)

292507 Plate, cylinder sleeve removal (980 tractor)

291501 Plate, cylinder sleeve installation (780, 880/5 and 980 tractors)

A 390363 **(293269)** Reamer, camshaft bushing (780, 880/5 and 980 tractor)

A 360383 **(292103)** Remover/replacer, camshaft bushings (780, 880/5 and 980 tractors)

290947 Remover/replacer, tappet (880 tractor)

291046 Driver, valve guide remover/replacer

291177 Reamer, valve guide (780, 880/5 and 980 tractors)

290944 Reamer, valve guide (880 tractor)

292913 Lathe, universal, valve

A 342137 **(293784)** Remover, injector sleeve

291350 Burnisher, injector sleeve (880 tractor)

291467 Cutter, injector sleeve (880 tractor)

293742/1 Kit, injector seat dressing

293386 Burnisher, injector sleeve (780 tractor, from engine 713779, 880/5 and 980 tractors)

103 - Crank Gear

290950 Spanner, crankshaft (880 tractor)

A 360937 **(293183/1)** **(293184/1)** Guide and punch, main bearing cap side seal installer (880 tractor)

290965 Screw, balancer weight timing (880 tractor)

291504 Extractor, crankshaft pulley

104 - Fuel System

290752 Plate, injection pump to rotary stand **290239**

293671 Cleaners, injector

290898 Support, injector removal and installation (FIAT-OMAP)

293760 Support, injector removal and installation (BOSCH-CAV-OMAP)

293761 Set of wrenches, injector

A 352120 **(293786)** Wrench, injection pump delivery connections

On-Bench Injection Pump Test Equipment

293401 Kit, diagnostic, distributor injection pump

293530 was **(290761)** Tester (including one 10 kg/cm² pressure gauge, one 1.5 kg/cm² pressure gauge, one 760 mm Hg vacuum gauge and a graduated burette)

290763 Support, pump to bench

290784 Piping, delivery (test A, 6 x 2 x 865 mm)

290765 Piping, delivery (test A, 6 x 2 x 845 mm)

BOSCH Injection Pump

A 365055 **(290847)** Wrench, toothed bushing retention (980 tractor)

291449 Remover, toothed bushing (980 tractor)

290766 Remover/replacer transfer pump to rotor

290774 Gauge, distributing rotor stroke

290778 Spacer, rotor spring pre-load check

290779 Installer, O-ring

290780 Remover, O-ring

292548 Protector, O-ring

292551 Extension, M 14.5 x 2 (for use with **290774**)

292553 Remover, pressure regulating valve circlip

292554 Protector, cam ring

292555/1 Remover/replacer, pump shaft (use with **293378** and **293392**)

292556 Spanner, shuttle and metering valve

292557/1 Compressor, pressure regulating valve

292558 Centraliser, hydraulic head

292817/1 Tester, advance and feed pressure

293378 Remover/installer, pump shaft (use with **292555/1** and **293392**)

293387 Spacer, advance check (use with **292817/1**)

293392 Screw, pump shaft removal/installation (use with **292555/1** and **293378**)

C.A.V. Injection Pump

A 365147 (292137) Wrench, toothed bushing retention (880 tractor)

291449 Remover, toothed bushing (880 tractor)

290741 Guide, throttle lever spindle removal

290742 Guide, throttle and shut-off lever O-ring installation

290743 Tester, advance

290744 Remover/replacer, transfer pump rotor (use with torque spanner)

290745 Guide, start-retard O-ring replacer

290746 Guide, advance plug O-ring replacer

290747 Spanner, distributor rotor flange

290748 Plug, pump leakage test

290749 Connector, transfer pump outlet pressure test

290750 Connector, fuel drain line

290751 Connector, fuel inlet line

290753 Connector, pump leakage test

290754 Spanner, fuelling adjusting screw

290755 Connector/relief valve, pump roller check

290756 Coupling, pump drive

290757 Gauge, timing, pump flange

290758 Remover/replacer, cam ring pin

290759 Installer, governor shaft

290764 Connector, drain

290760 Adaptor, advance device

106 - Cooling System

291182/1 Extractor, water pump impeller

20 - POWER TRAIN

201 - Clutch

291291/2 Kit, overhaul

293650 Kit, universal, PM clutch overhaul

291184 Centraliser/adjuster, with register, on-tractor (780 tractor)

293375 Centraliser and adjuster, clutch, on tractor, complete with register (880, 880/5 and 980 tractors)

293763 Spanner, P.T.O. clutch release lever

293765 Adjuster, LUK 12″/12″ clutch, on tractor (880, 880/5 and 980 tractors, use with **293375**)

202 - Gearbox and Splitter

291517 Hook, lift

293339 Adjuster, transmission driven shaft bearings, 880, 880/5 and 980 tractors (use with spacer **293348**)

293348 Spacer, transmission driven shaft bearing adjustment (880, 880/5 and 980 tractors).

293426 Adjuster, gearbox drive shaft bearing (up to frame 887700, 880/8 tractor)

293659	Adjuster, transmission drive shaft bearing (up to frame 887700, 880/8 tractor, from frame 887701, 880/12 and 880/5 and 980 tractors)
293427/1	Bushing, transmission drive shaft rotating torque check (880, 880/5 and 980 tractors)
293383/1	Protector, gearbox drive gear seal (780 tractor up to chassis 862689)
293347/1	Protector, gearbox drive gear seal (880/8 tractor, up to frame 887133)
293662	Remover, transmission drive shaft (880, 880/5 and 980 tractors)
293510	Adjuster, universal, transmission driven shaft bearing (880, 880/5 and 980 tractors)
292888	Guide, engine removal/replacement from bell housing

204 - Bevel Drive and Differential

291517	Hook, rear transmission casing
293400/1	Gauge, bevel drive positioner
293339	Adjuster, bevel pinion bearing (780 tractor)
293750	Spacer (use with **293339**, 780/12 tractor)
293340	Adjuster, bevel pinion shaft bearings (880, 880/5 and 980 tractors)
293751	Spacer (use with **293340**, 880/12, 880/5 and 980 tractors)
293510	Adjuster, universal, bevel pinion bearing
293738	Installer, bevel pinion seal (780 tractor)
293757	Installer, bevel pinion seal (880 and 980 tractors)
293452	Installer, differential lock fork spring
293342/1	Spanner, bevel pinion shaft nut (780 tractor)
293343/1	Spanner, bevel pinion shaft nut (880 tractor)
293781	Support, final drive removal/replacement (use with garage jack)

205 - BRAKES

Master Cylinder Bench Test Equipment

291235	Motor, electric, complete with:
290385	- Coupling, drive
291231	Tester, output, large, including:
290448	- Adaptor
290445	- Pipe
290417	- Union
290434	- Screw, inlet (2 off)
292588	- Pump, hydraulic, Plessey A18X
290330	- Union
290358	- Screw, outlet (2 off)
290544	- Pipe, outlet (2 off)
293532	- Union (2 off)
293531	- Plate, regulator
293533	- Regulator, flow, ATOS-QV 10/3
290424	- Pipe, outlet
293534	- Connector, 3-way
293535	- Union, return
290488/2	- Support
293005	- Tank
291318	- Union, kit **293300**
293300	- Kit, pressure gauge
293539	- Burette
293560	- Support, master cylinder

30 - FRONT AXLE AND STEERING

301 - Axle

292927 **290793**	Extractor, impact, with hinge pin adaptor (M 12 x 1.25)

303 - Steering

293388	Installer, O-ring
293389	Installer, rotary valve spring
293390	Retainer, rotor

Steering Hydraulic Test Equipment (with OVP-20 Valve Block Removed

291325	Union, pressure tester **293300** (880 tractor)
291326	Union, pressure tester **293300** (780 tractor)

Steering Hydraulic Test Equipment (with OVP-20 Valve Block in Position

291235	Motor, pump, complete with:
290385	- Coupling, drive
291231	Tester, output, large, complete with:
293005	- Tank
290488/1	- Support
293315	- Plug
290445	- Pipe, inlet
290554	- Pipe, outlet
290447	- Pipe, return
290475	- Union
290448	- Adaptor, inlet
290540	- Adaptor
290541	- Adaptor
293368	- Pipe, exhaust
292724	- Screw
293316	- Adaptor
293192	- Spanner, rotary valve
293165	- Pump, hydraulic, API-213

40 - LIVE FRONT AXLE

401 - Axle

293782 **293785**	Remover, bevel pinion lockring (oil seal replacement only, 780 DT tractor up to frame 673591)
293743	Support, bevel pinion carrier
293435	Adjuster, wheel bearing (780 DT tractor)
292500 **293437**	Adjuster and spacer, wheel bearing (880 DT, 880 DT/5 and 980 DT tractors)
291525	Guide, final drive cover (780 DT tractor)
292888	Guide, final drive cover (880 DT, 880 DT/5 and 980 tractors)
292927 **292313**	Puller, slide hammer, complete with king-pin adaptor (780 DT, 880 DT, 880 DT/5 and 980 tractors)
293438/1	Adjuster, bevel pinion bearing
293439	Spacer (use with **293438/1**, 780 DT tractor from frame 673592, 880 DT, 880 DT/5 and 980 tractors)
293400/1	Gauge, bevel pinion position (use with **293438/1** or **293510**)
293510	Adjuster, universal, bevel pinion shaft and wheel hub bearings
293601	Screws, forcing, front axle hub bearing
293519/1 or **293441**	Spanner, wheel hub bearing lockring (780 DT tractor)
293517 or **292517/1**	Wrench, wheel bearing and differential bearing (880 DT, 880 DT/5 and 980 tractors)
293520 or **293442**	Wrench, bevel pinion bearing lockring (780 DT tractor up to frame 673591)
293524 or **293436**	Wrench, bevel pinion bearing lockring (780 DT tractor from frame 673592, and 880 DT, 880 DT/5 and 980 tractors)
292220/2	Tester, king pin bearing rotating torque
293544 or **292416**	Wrench, differential bearing lockring (780 DT tractor up to frame 673591)
293665	Wrench, differential bearing lockring (780 DT tractor from frame 673592 and 880 DT, 880 DT/5 and 980 tractors)

50 - LIFT UNIT

501 - Lift

290284	Pump, hand, valve adjustment
293300	Tester, pressure, universal (pressure gauges and connectors)
293384 **293385/3**	Protector/installer, lift cross shaft seal
291259	Spanner, inlet valve plug
290826	Union, safety valve adjustment
290824	Union, relief valve adjustment
290831	Union, inlet valve leakage test
290834/1	Union, unload valve leakage test
233463	Spanner, relief valve, remote control valve

502 - Hydraulic Pump A25X (780, 880 New, 880/5 and 980 Tractors), A22X (880 Old), C18X (Section 303, 780 and 880 Tractors) and C22X (Section 303, 880/5 and 980 Tractors)

293600 or **291232**	Stand, rotary, pump overhaul (to clamp in vice)
291231	Tester, output, large, complete with:
290417	- Union, inlet (C18X pump)
290419	- Union, inlet (C22X, A22X and A25X pumps)
290418	- Union, outlet (C18X, C22X, A22X and A25X pumps)
290448	- Adaptor, inlet (C18X, C22X, A22X and A25X pumps)
290445	- Pipe inlet (C18X, C22X, A22X and A25X pumps)
290447	- Pipe, delivery (C18X, C22X, A22X and A25X pumps)
290436	- Screw, inlet union (C22X, A22X and A25X pumps)
290434	- Screws, delivery union (C18X, C22X, A22X and A25X pumps) and inlet union (C18X pump)
291233	Engine, diesel, pump drive, complete with:
290367	- Bracket (C18X and C22X pumps)
291235	Motor, electric, pump drive, complete with:
290385	- Coupling, drive (C18X, C22X, A22X and A25X pumps)
290574	Tester, output, small, complete with:
290331	- Union, inlet (C22X, A22X and A25X pumps)
290330	- Union, delivery (C18X, C22X, A22X and A25X pumps) and inlet (C18X pump)
290424	- Pipe, inlet and delivery (C18X, C22X, A22X and A25X pumps)
290359	- Screw, inlet union (C22X, A22X and A25X pumps)
290358	- Screw, delivery union (C18X, C22X, A22X and A25X pumps) and inlet union (C18X pump)

504 - Remote Control Valves

291231	Output tester, large, equipped with
291235 (*) (°)	Electric motor
293005 (*)	- Tray
293165 (*)	- Hydraulic pump
290385 (*)	- Coupling
293548/1 (*)	- Support, valve
292256 (*)	- Bracket
292257 (*)	- Bracket
290469/1 (*)	- Support
293539 (*)	- Burette
290448	- Adaptor
290445	- Piping
290419	- Connection, inlet
293556 (*)	- Capscrew
293316 (*)	- Adaptor
290544 (*)	- Piping
290503 (*)	- Adaptor (Kontak valves)
290378 (*)	- Piping, drain (Kontak valves)
293381 (*)	- Piping, drain (Salami valves)
292775 (*)	- Hose, plastic (Salami valves)
290541 (*)	- Adaptor (Kontak valves)
290447	- Piping, drain
293552 (*)	- Plug
293551 (*)	- Plug
293553 (*)	- Connection
290424 (*)	- Piping
290549 (*)	- Connection, ball
292146 (*) or **290475** (*)	3-way connection
293547 (*)	- Adaptor
292152 (*)	- Adaptor (Kontak valves)
293550 (*)	- Connection, leakage
292574	Output tester, small, equipped with:
290447	- Piping, suction
290420	- Connection, inlet

60 - ELECTRICAL SYSTEM

292307	Adaptor, torque wrench, start clutch
290973	Dresser, starter commutator
293489	Support, alternator

(*) Common to large output tester **291231** and small output tester **292574.**
(°) Electric motor **291235** is indicated as alternative to a 15 HP electric motor **292150.**

SERVICE TOOLS

Fiat Trattori

FIAT

880-5
880 DT-5

WORKSHOP MANUAL

QUICK REFERENCE INDEX

D I R E Z I O N E C O M M E R C I A L E

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401 - LIVE FRONT AXLE - Front Axle

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50 - LIFT UNIT - Specification and Data

501 - LIFT UNIT - Lift

502 - LIFT UNIT - Lift Pump

GENERAL: Contents

503 - LIFT UNIT - Implement Attachment

504 - LIFT UNIT

SALAMI Remote Control Valves

KONTAK Remote Control Valve

505 - LIFT UNIT - Auxiliary Cylinder

60 - ELECTRICAL SYSTEM - Specification and Data

90 - SERVICE TOOLS

IDENTIFICATION DATA

Marketing code	
— Rear wheel drive	880/5
— Four wheel drive	880 DT/5
Engineering code	
— 12-speed, RWD	656.200.000
— 16-speed, RWD	656.200.000 Var. 720.111.150
— 12-speed, FWD	656.227.000
— 16-speed, FWD	656.227.000 Var. 720.111.150
Engine type (all versions)	Fiat 8055.04.200 (with BOSCH pump)

WEIGHTS (12-speed)

Operating weight (including lift, implement attachment, swinging drawbar and ROP frame)

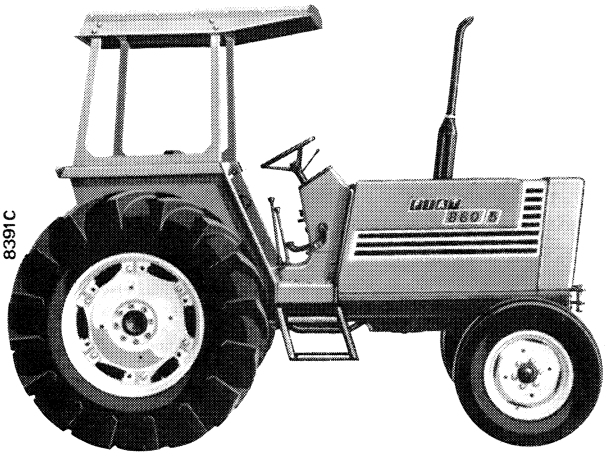
— Model 880/5	2910 kg (6416 lb)
— Model 880 DT/5	3295 kg (7265 lb)

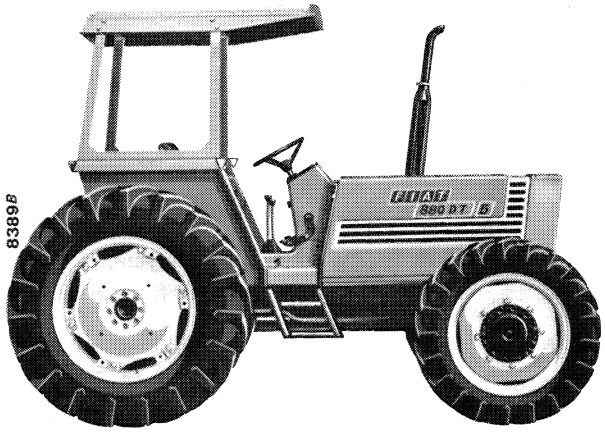
ENGINE

Type	4-stroke, naturally aspirated
Injection	Direct
Number of cylinders	5
Sleeves	Dry, pressed in block
Bore	103 mm (4.05 in)
Stroke	110 mm (4.33 in)
Displacement	4583 c.c.
Compression ratio	17 to 1
Flywheel horsepower, DGM/DIN, metric	64.8 kW (88 metric HP)
At	2400 rpm
Full torque speed	1800 rpm
Main bearings	6
Sump	Cast iron, reinforced

Valve Gear

Inlet	
— Opens: B.T.D.C.	3°
— Closes: A.B.D.C.	23°
Exhaust	
— Opens: B.B.D.C.	48° 30′
— Closes: A.T.D.C.	6°





Valve clearance	
— For timing check	.45 mm (.018 in)
Normal	
— Inlet	.25 mm (.010 in)
— Exhaust	.35 mm (.014 in)

Fuel System

Air cleaner	Oil bath or dry, automatic drain centrifugal pre-cleaner
Fuel filters (between pumps)	2, in-line, cartridge-type, water separator integral with first filter
Feed pump	Double diaphragm
Operation	Cam
Injection pump	Distributor
— Type	BOSCH VE/5/11 F 1250 R - 4749797
— Integral all speed governor	Centifugal
— Integral advance device	Hydraulic
— Pump timing, B.T.D.C.	8° ± 1°
— Fuel shut off	Solenoid activated
Injectors	3-spray orifices
— Type	See page 9, Section 10
— Release pressure	221 to 230 bar (3205 to 3336 psi) (225 to 235 kg/cm²)
Firing order	1-2-4-5-3

Lubrication System

Type	Forced feed, gear pump
Pump drive	Crankshaft
Oil filters	Strainer on pump inlet and full flow cartridge on outlet
Relief valve	In pump body
— Oil pressure at governed speed	2.9 to 3.9 bar (3 to 4 kg/cm²) (42.1 to 56.6 psi)

Cooling System

Type	Water, centrifugal pump
Radiator	3 or 4 deep core, vertical tube
Expansion tank	Semi-transparent plastic
Fan	Suction, steel, water pump pulley mounted
Temperature control	Wax thermostat

Tractor Meter

Position	Instrument panel mounted, mechanical, camshaft driven
Position	Instrument panel mounted
Drive	Mechanical, camshaft driven
Hourmeter activation speed	1800 rpm
Meter drive ratio	2 to 1

POWER TRAIN

Clutch

Type	LUK or FERODO, 12″
Construction	Two, dry single plate
Control	
— Transmission	Pedal
— PTO	Manual
Plate material	
— Transmission	Cerametallic compound
— PTO	Organic compound

Transmission

Type	Constant mesh, helical
Splitter	Double, epicyclic, 12 forward, 3 reverse
Crawler	In-line, splitter mounted 16 forward, 4 reverse
Control levers	Separate

Bevel drive	Straight
Differential	Two pinion
Differential lock	Pedal controlled
Final drives	Epicyclic

BRAKES

Service

Type	Disc, oil-bath, axle shaft mounted
Operation	Hydraulic
Circuits	Split
Control	Latched pedals

Parking - Emergency

Type	Disc, independent
Position	Bevel pinion shaft mounted
Control	Manual lever

STEERING

Steering unit	Hydrostatic
Linkage joints	Sealed for life
Turning radius (no brakes)	
— Model 880-5	4200 mm (13 ft 9 in)
— Model 880 DT-5, front wheel drive in	6000 mm (19 ft 6 in)

FRONT AXLE (Model 880-5)

Type	Inverted U, telescoping, centre pivotting
Track widths	Six

LIVE FRONT AXLE (Model 880 DT-5)

Type	Full floating, centre pivoting, unjointed drive shaft and articulations on tractor centreline
Differential	Two pinion
Final drives	Epicyclic
Track widths	5 off

REAR WHEELS

Track adjustment	
— Wheel discs, through change of rim, disc and hub position	8 off
— Cast iron PAVT discs, through change of disc to hub and disc to rim position using RAIL type spiral brackets	9 off

POWER TAKE-OFF

(540 or 540-1000 rpm)

Type	Fully independent
Speed	540 rpm, 1 3/8″, 6-spline or 1 3/4, 6-spline extension 1000 rpm, 1 3/8″, 21-spline extension
Control	Manual lever
Speed selection	Automatic
Engine speed with PTO at standard speeds	
— Model 880-5	
- 540 rpm	2125 rpm
- 1000 rpm	2400 rpm
Rotation (as viewed from rear of tractor)	Clockwise

Ground Speed PTO

Speed	See independent PTO
Control	See independent PTO
Rotation	See independent PTO
Shaft drive ratio	
— 540 rpm PTO	18.64 revs per rear wheel turn
— 1000 rpm PTO	30.44 revs per rear wheel turn

LIFT

Type	Hydraulic, draft and position control
Response	Adjustable
Draft control	Lower links through sensing bar
Pump	Gear, engine-driven
Hydraulic fluid	Rear transmission oil
Design lift capacity	See Section 50, pages 2 and 4, Models 780 and 880
Max. lift stroke	See Section 50, pages 2 and 4, Models 780 and 880
Max. lift capacity	See Section 50, pages 2 and 4, Models 780 and 880
Linkage	3-point
Attachment	Category 2

Lower links	Conventional or telescoping
— Side sway control	Check links

Remote Control Valves

Number	Up to 3
Type	Single or double acting, single and double acting convertible, trailer power braking

TOWING ATTACHMENTS

Rear:

Drawbar	Swinging
Tow hook	Conventional, adjustable for height
Tow hook	Conventional, swinging drawbar
Tow hook	Trailer-type and swinging drawbar
Rockinger hook	Pivotting, with safety-type automatic hitch and lock-up device
Rockinger hook	As above, plus swinging drawbar

Front:

Pull hook	Rigid, not useable with front ballast

BALLASTING

Front Axle

Support	130 kg (287 lb)
— Cast iron plates	
- Six, 40 kg (88 lb)	370 kg (816 lb)
- Ten, 40 kg (88 lb)	530 kg (1168 lb)

Rear Wheels

Cast iron rings	
— Four, 58 kg (130 lb)	230 kg (507 lb)
— Six, 58 kg (130 lb)	350 kg (772 lb)
Cast iron wheel discs	
— Two, 150 kg (330 lb) (all tyre sizes)	300 kg (661 lb)

BODY

Floor	Rubber cushion mounted Compact, rigid, vibration free, integral, complete with footboards, mudguards, provision for ROP frame or cab
Fuel tank	Behind seat, boxed between mudguards
Operator's seat	
Type	Wrap-around
Suspension	Hydraulic damper
Adjustment	
— Reach	Standard and deluxe 11 positions
— Height	Deluxe
Dashboard	13-function instrument panel plus control board

Bonnet

	Full enclosing, in four parts
L.H. side section	Access to air cleaner, oil filter and dipstick, brake fluid and battery
R.H. side section	Access to fuel filters, fuel pump, injection pump and steering fluid

Cab

Visibility	All round
Accessibility	On either side
Rear window	Adjustable
Heating and ventilation	Standard
Protection	Insulated, provision for roof-mounted air conditioning system

ELECTRICAL SYSTEM (12 V)

Generating and starting

Alternator

— Type	MARELLI AA 125 - 14 V - 45 A
— Rated output	45 A
— Voltage regulator	Electronic, integral

Starter

— Type	MARELLI MT 68 LB BOSCH JD → 12 V

Battery

— Location	Ahead of engine
— Capacity	132 or 140 Ah

Lighting

Headlamps	Twin, main and asymmetric dipped beams, 45/40 W

Front lights

— Side	5 W
— Direction	21 W

Tail lights

— Rear	5 W
— Direction	21 W
— Stop	21 W
— Number plate	Left hand rear light

Instruments and Accessories

Instrument panel	13-function (see Section 60, page 11, Models 780 and 880)
Control board	See Section 60, page 11, Models 780 and 880
Flood light	35 W
Rear power point	DIN, 7-pole
Dash power point	Single-pole
Horn	Control board mounted
Cold starting	Thermostarter or start pilot
Lighter	Dash-mounted
Fuses	Maximum 8 (see Section 60, page 11, Models 780 and 880)
Hazard warning	Tractor and trailers

TYRE SIZES

	880/5	880 DT/5
Front	7.50-18 7.50-20 9.00-16 10.00-16	11.2/10-28 (1) 13.6/12-24 (2) 12.4/11-28 (3) 14.9/13-24 (4)
Rear	16.9/14-34 13.6/12-38 18.4/15-34 16.9/14-38	16.9/14-34 (1) (2) 13.6/12-38 (1) (2) 16.9/14-38 (3) 18.4/15-34 (3) (4)

(1) (2) (3) (4) Specified tyre matching

CAPACITIES

DESCRIPTION	LUBRICANTS				International Designation
	FIAT Recommended Lubricants	CAPACITY			
		dm³ (litri)	kg	Imp pts	
Engine oil (with filter and lines)	**oliofiat AMBRA**	13.7	12.4	24	Multigrade detergent mineral oil, MIL-L-2104 B EP characteristics
Sump oil	**20 W/40** above 0° C	12.1	10.9	21.3	
Air cleaner oil (1)	**oliofiat AMBRA**	1.9	1.7	3.3	
Power steering fluid	**10 W/30** below 0 °C	1.7	1.5	3	
Transmission oil	**oliofiat AMBRA 20 W/40**	12.5	11.3	22	
Sensing bar support oil		1.2	1.1	2	
Live front axle oil:					
— Axle casing		6	5.4	10.5	
— Final drives (each)		1.7	1.5	3	
Brake fluid	**oliofiat AGERTER 10 W**	.72	.65	1.3	Single grade oil, MIL-L-2104 C, API CD (Series 3)
Rear transmission (bevel drive, final drives, brakes) and lift oil	**oliofiat AF 87 S**	36.1 (2)	32.5 (2)	Gall 8	Mineral gear oil with stick slip inhibiting properties to MF 1135 and Ford M 2 C 86 A
Front hub grease	**grassofiat MR 3**	—	—	—	Lithium based grease NLGI 3
Clutch withdrawal support	**grassofiat G 9**	—	—	—	Lithium-calcium based grease NLGI 2
Lubricator grease		—	—	—	

Coolant (3) water and FIAT **PARAFLU 11**	tractor without cab	18 dm³ (Litres)	32 Imp. pts
	tractor with cab	20 dm³ (Litres)	35 Imp. pts
Fuel (diesel oil)		116 dm³ (Litres)	204 Imp. pts
Windshield washer reservoir for tractor with cab (water and FIAT **DP 1**)		2 dm³ (Litres)	3.5 Imp. pts

(1) Change cleaner oil when sediment is 1 cm or .399 in deep

(2) For Model 880 DT-5 oil capacity is 36.7 litres or 33 kg (8 gals).

(3) Including expansion tanks

ENGINE BLOCK - CYLINDER HEAD

	mm	in
Engine Block		
Cylinder bore diameter in engine block	106.890 to 106.940	4.2082 to 4.2102
Sleeve O.D.	107.020 to 107.050	4.2134 to 4.2145
Sleeve interference fit in block	.080 to .160	.0031 to .0063
Sleeve O.D. oversize	.2	.0079
Sleeve bore diameter	103.000 to 103.018 (1)	4.0551 to 4.0558 (1)
Maximum ovality and taper due to wear	.12	.0047
Sleeve bore oversize	.2-.4-.6-.8	.0079-.0157-.0236-.0315
Camshaft bushing housing bore diameter		
— Front	55.280 to 55.305	2.1764 to 2.1773
— Front intermediate	54.780 to 54.805	2.1567 to 2.1577
— Rear intermediate	54.280 to 54.305	2.1370 to 2.1380
— Rear	53.780 to 53.805	2.1173 to 2.1183
Tappet housing bore diameter	15.000 to 15.018	.5905 to .5912
Tappet oversize	.1-.2-.3	.0039-.0079-.0118
Main bearing housing bore diameter	80.587 to 80.607	3.1727 to 3.1735
Cylinder Head		
Valve guide housing bore diameter in head	13.966 to 13.983	.5498 to .5505
Valve guide oversize	.2	.0079
Valve seat dimensions	See page 3, Section 101, Model 780	
Valve stand-in	.7 to 1.1	.0275 to .0433
— Maximum stand-in allowed	1.4	.0551
Injector stand-out	1.5	.0590
— Maximum stand-out allowed	1.8	.0709
Cylinder head height	92	3.62
Maximum head skimming depth	.5	.0197

(1) After finishing in position. Sleeves may be finished to .1 mm or to .004 inch oversize in production, in which case they are matched to corresponding oversize pistons

(2) Measurement to be carried out over the swept area both parallel and at right angles to engine centreline.

CRANK GEAR

	mm	in
Crankshaft - Bearings		
Main journal diameter	76.187 to 76.200 (1)	2.9995 to 2.9999 (1)
Main journal undersize	.254-.508-.762-1.016	.0100-.0200-.0300-.0400
Main bearing wall thickness	2.162 to 2.172	.0851 to .0855
Main bearing undersize	.254-.508-.762-1.016	.0100-.0200-.0300-.0400
Main journal clearance in bearings	.043 to .096	.0017 to .0038
— Maximum wear clearance	.180	.0071
Crankpin diameter	58.730 to 58.743 (1)	2.3122 to 2.3127 (1)
Crankpin undersize	.254-.508-.762-1.016	.0100-.0200-.0300-.0400
Big end bearing wall thickness	1.805 to 1.815	.0711 to .0714
Big end bearing undersize	.254-.508-.762-1.016	.0100-.0200-.0300-.0400
Crankpin clearance in big end bearing	.035 to .080	.0014 to .0031
— Maximum wear clearance	.180	.0071
Crankshaft thrust washer thickness	3.378 to 3.429	.1330 to .1350
Thrust washer oversize	.127	.0050
Width of main bearing housing over thrust washers	31.766 to 31.918	1.2506 to 1.2566
Length of corresponding main journal	32.000 to 32.100	1.2598 to 1.2638
Crankshaft end float	.082 to .334	.0032 to .0131
— Maximum wear end float	.40	.0157
Maximum main journal and crankpin ovality or taper after grinding	.01	.0004
Maximum main journal and crankpin ovality or taper due to wear	.05	.0020
Maximum main journal misalignment with crankshaft resting on end journals	.10	.0039
Maximum misalignment of crankpins relative to main journals (in either direction)	.25	.0098
Maximum tolerance on distance from outer crankpin edge to crankshaft centerline	± .10	± .0039

Continued

(1) After finishing in position. Sleeves may be finished to .1 mm or .004 inch oversize in production, in which case they are matched to corresponding oversize pistons.

CRANK GEAR

Continued

	mm	in
Maximum crankshaft flange run-out with stylus in A, page 1, Section 103, over 108 mm (4.25 in) diameter, T.I.R.	.025	.0010
Maximum flywheel seat eccentricity relative to main journals (in B, page 1, Section 103), T.I.R.	.04	.0016
Connecting Rods		
Small end bore diameter	37.877 to 37.916	1.4912 to 1.4927
Small end bushing O.D.	37.979 to 38.017	1.4952 to 1.4967
Bushing interference fit in small end	.063 to .140	.0025 to .0055
Small end bushing fitted I.D.	34.005 to 34.012	1.3388 to 1.3390
Big end bore diameter	62.408 to 62.420	2.4570 to 2.4575
Maximum connecting rod axis misalignment at 125 mm (5 inches)	± .07	± .0027
Maximum connecting rod weight difference over a complete set of the same engine	25 grams	1 oz.
Pistons		
Piston diameter 50 mm (2 in) from base of skirt, at right angles to pin	102.813 to 102.825	4.0477 to 4.0482
Piston clearance in sleeve	.175 to .205	.0069 to .0081
— Maximum wear clearance	.30	.0118
Piston oversize range	.2-.4-.6-.8	.0079-.0157-.0236-.0315

Continued

CRANK GEAR

Continued

	mm	in
Piston pin diameter	33.983 to 33.990	1.3379 to 1.3382
Pin housing bore in piston	33.993 to 34.000	1.3383 to 1.3386
Piston pin clearance in piston	.003 to .017	.0001 to .0007
Piston pin oversize	.2-.5	.0079-.0197
Piston pin clearance in small end bushing	.015 to .029	.0006 to .0011
— Maximum wear clearance	.06	.0024
Maximum weight difference over a complete set of pistons	20 grams	.7 oz.
Piston ring clearance in groove		
— Top	.090 to .122	.0035 to .0048
— Second	.050 to .082	.0020 to .0032
— Third	.040 to .072	.0016 to .0028
Maximum wear clearance		
— Top	.50	.0197
— Second and third	.20	.0079
Piston ring gap		
— Top	.35 to .55	.0138 to .0217
— Second	.30 to .50	.0118 to .0197
— Third	.30 to .45	.0118 to .0177
Maximum wear gap	1.20	.0472

VALVE GEAR

	mm	in
Valve Timing gears		
Timing gear backlash	.08	.0031
Idler gear jackshaft diameter	31.975 to 32.000	1.2588 to 1.2598
Idler gear bushing fitted I.D. after reaming	32.050 to 32.075	1.2618 to 1.2628
Jackshaft journal clearance in bushing	.050 to .100	.0020 to .0040
— Maximum wear clearance	.15	.0059
Bushing interference fit in idler gear	.063 to .140	.0025 to .0055
Lift and power steering pump drive gear shaft diameter	36.975 to 37.000	1.4557 to 1.4567
Bushing fitted I.D.	37.050 to 37.075	1.4586 to 1.4596
Shaft clearance in bushing	.050 to .100	.0020 to .0039
Bushing interference fit in housing	.063 to .140	.0025 to .0055
Pump drive gear thrust washer thickness	1.45 to 1.50	.0571 to .0590
Camshaft		
Camshaft bushing O.D.		
— Front	55.375 to 55.430	2.1801 to 2.1823
— 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	2.1210 to 2.1232
— Bushing interference fit in housing	.070 to .150	.0027 to .0059
Camshaft bushing fitted I.D. after reaming		
— Front	51.580 to 51.630	2.0307 to 2.0327
— Front intermediate	51.080 to 51.130	2.0110 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
Camshaft journal diameter		
— 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
Camshaft journal clearance in bushing	.080 to .160	.0031 to .0063
Maximum wear clearance	.20	.0079
Camshaft end float (thrust plate to associated seat in camshaft)	.070 to .220	.0027 to .0087
Tappets		
Tappet O.D.	14.950 to 14.970	.5886 to .5894
Tappet clearance in housing on engine block	.030 to .068	.0012 to .0027
Maximum wear clearance	.15	.0059
Tappet oversize	.1-.2-.3	.0039-.0079-.0118

VALVE GEAR

Continued

	mm	in
Rockers		
Rocker bushing O.D.	21.006 to 21.031	.8270 to .8280
Rocker bore diameter	20.939 to 20.972	.8244 to .8257
Bushing interference fit in rocker	.034 to .092	.0013 to .0036
Rocker bore diameter	18.016 to 18.034	.7093 to .7100
Rocker shaft diameter	17.982 to 18.000	.7079 to .7087
Rocker shaft clearance in bracket	.016 to .052	.0006 to .0020
— Maximum wear clearance	.15	.0059
Rocker spacer spring length		
— Free	59.5	2.34
— Under 46 to 52 N (4.7 to 5.3 kg, 10.4 to 11.7 lb)	44	1.73
Valves, Guides and Springs		
Valve head dia. Inlet	43.750 to 44.000	1.7224 to 1.7323
Valve head dia. Exhaust	36.750 to 37.000	1.4468 to 1.4567
Valve stem dia.	7.985 to 8.000	.3144 to .3150
Valve face angle	45° 30′ ± 7′	
Valve clearance — Timing check — Inlet	.45	.0177
Valve clearance — Normal (cold or warm) — Inlet	.25	.0098
Valve clearance — Normal (cold or warm) — Exhaust	.35	.0138
Cam lift — Inlet	5.250	.2067
Cam lift — Exhaust	5.777	.2274
Valve lift — Inlet	9.3	.3661
Valve lift — Exhaust	10.2	.4016
Valve guide O.D.	13.988 to 14.016	.5507 to .5518
Valve guide oversize	.2	.0079
Valve guide interference fit in housing on cylinder head	.005 to .050	.0002 to .0020

Continued

VALVE GEAR

Continued

	mm	in
Valve guide fitted I.D. after reaming	8.023 to 8.038	.3159 to .3164
Valve stem clearance in guide	.023 to .053	.0009 to .0021
— Maximum wear clearance	.13	.0051
Maximum valve stem eccentricity over 1 revolution with stylus on sealing face	.04	.0016
Inlet and exhaust valve spring length		
— Free	66.5	2.61
— Valve closed under 295 to 332 N (30.1 to 33.9 kg, 67.7 to 76.3 lb)	41	1.61
— Valve open, under 472 to 511 N (48.1 to 52.1 kg, 108 to 117 lb)	30.8	1.21

LUBRICATION SYSTEM

Oil Pump	Gear, camshaft-driven	
Oil pump drive ratio	1.265 to 1	
Oil pressure, warm, at governed speed	2.9 to 3.9 bar (3 to 4 kg/cm²) (42 to 56 psi)	
Relief valve crack-off setting	3.5 bar (3.6 kg/cm²) (50 psi)	
Shaft clearance in bushing	.016 to .070	.0006 to .0027
Shaft clearance in driven gear	.016 to .054	.0006 to .0021
Gear backlash	.100	.0039
Gear clearance in pump body	.030 to .134	.0011 to .0053
Drive and driven gear width	15.973 to 16.000	.6288 to .6299
Gear housing depth in pump body	16.016 to 16.080	.6305 to .6331
Drive and driven gear end float	.016 to .107	.0006 to .0042

Continued

LUBRICATION SYSTEM

Continued

	mm	in
Pressure relief valve spring length		
— Free	45	1.7716
— Under 88 to 94 N (9 to 9.6 kg, 19.8 to 21 lb) load	30.5	1.2008
Oil Filters	Gauze on suction and main cartridge	

COOLING SYSTEM

Water Pump	Centrifugal, vane	
Water pump drive ratio	1.425 to 1	
Shaft interference fit in impeller	.027 to .060	.0011 to .0024
Shaft interference fit in fan hub	.015 to .061	.0006 to .0024
Face sealing bushing interference fit in impeller	.012 to .058	.0005 to .0023
Thermostat		
Type	BEHR-THOMSON or SAVARA or FLEXIDER	
Opening temperature	79 ± 2 °C	
Fully open at	94 °C	
Valve travel when fully open (min.)	7.5	.2953
Radiator	Three or four core, vertical tube	
Expansion tank	Semi-transparent plastic	
Fan	Suction, steel, 4 blade	
Water Temperature Gauge	Three section coloured scale	
Temperature range		
— White sector	30 to 65 °C	
— Green sector	65 to 105 °C	
— Red sector	105 to 115 °C	

FUEL SYSTEM

Lift Pump	Double diaphragm	
Operation	Engine-driven	
Minimum fuel flow at 1600 shaft rpm	100 litres/hour - 175 pint/hour	
Drive shaft eccentricity	5.25 mm	.2067 in
	mm	**in**
Lift Pump Drive		
Shaft journal diameter	49.975 to 50.000	1.9675 to 1.9685
Bushing fitted I.D. after reaming	50.050 to 50.075	1.9705 to 1.9714
Shaft clearance in bushing	.050 to .100	.0020 to .0039
Bushing interference fit in housing	.066 to .142	.0026 to .0056
Inner washer thickness	1.45 to 1.50	.0570 to 0.590
Outer washer thickness	2.93 to 3.00	.1153 to .1181
Injection Pump	Distributor, integral governor	
BOSCH	VE 5/11 F 1250 R 58 - 4749797	
Direction of rotation	Clockwise	
Firing order	1 - 2 - 4 - 5 - 3	
Fuel Injectors		
— Type — FIAT	EPPZ10F1-770577	
— Type — BOSCH	EPPZ50F3-771064	
— Type — C.A.V.	EPPZ60F3-770897	
— Type — O.M.A.P.	EPPZ70F3-770957	
— FIAT — Nozzle holder	KB70S1F10-767107	
— FIAT — Spray nozzle	DLL140S64F-770578	
— BOSCH — Nozzle holder	KBL70S177/4-771065	
— BOSCH — Spray nozzle	DLLA141S662-771066	
— C.A.V. — Nozzle holder	BKBL69S5376-770899	
— C.A.V. — Spray nozzle	BDLL140S6655-770902	
— O.M.A.P. — Nozzle holder	OKLL70S2974-770958	
— O.M.A.P. — Spray nozzle	OLL140S64F-770959	
Number of spray orifices	3	
Spray orifice diameter	.35	.0138
Release pressure	221 to 230 bar (225 to 235 kg/cm²) (3202 to 3333 psi)	
Delivery pipes		
— Type	PRR 59 FV 1 Z - 4750216	
— Pipe size	1.5 x 6 x 570	

CALIBRATION DATA - BOSCH INJECTION PUMP TYPE VE 5/11 F 1250 R 58 - 4749797

ASSEMBLY DATA

Pump rotation (drive end)	Clockwise
Firing order	1-2-4-5-3
Plunger stroke to spill cut-off	.20 mm (.008 in)
Pump timing	8° ± 1° B.T.D.C.
Delivery connection to cylinder No. 1	Marked with letter A

TEST PLAN

BOSCH test machine with WSF 2044/4 X injector springs and EFEP 182 spray nozzles.

RABOTTI test machine with FIAT **656829** injector springs and EFEP 182 spray nozzles.

Release pressure	150 bar (153 kg/cm²) (2175 psi)
Pipes	2 x 6 x 845 mm
Calibration fluid: FIAT CFB (for lower test temperatures add .25 cm³ per 1000 shots to each degree)	at 40° to 45° C
Fuel pressure	.2 bar (.2 kg/cm²) (2.8 psi)

CALIBRATION DATA

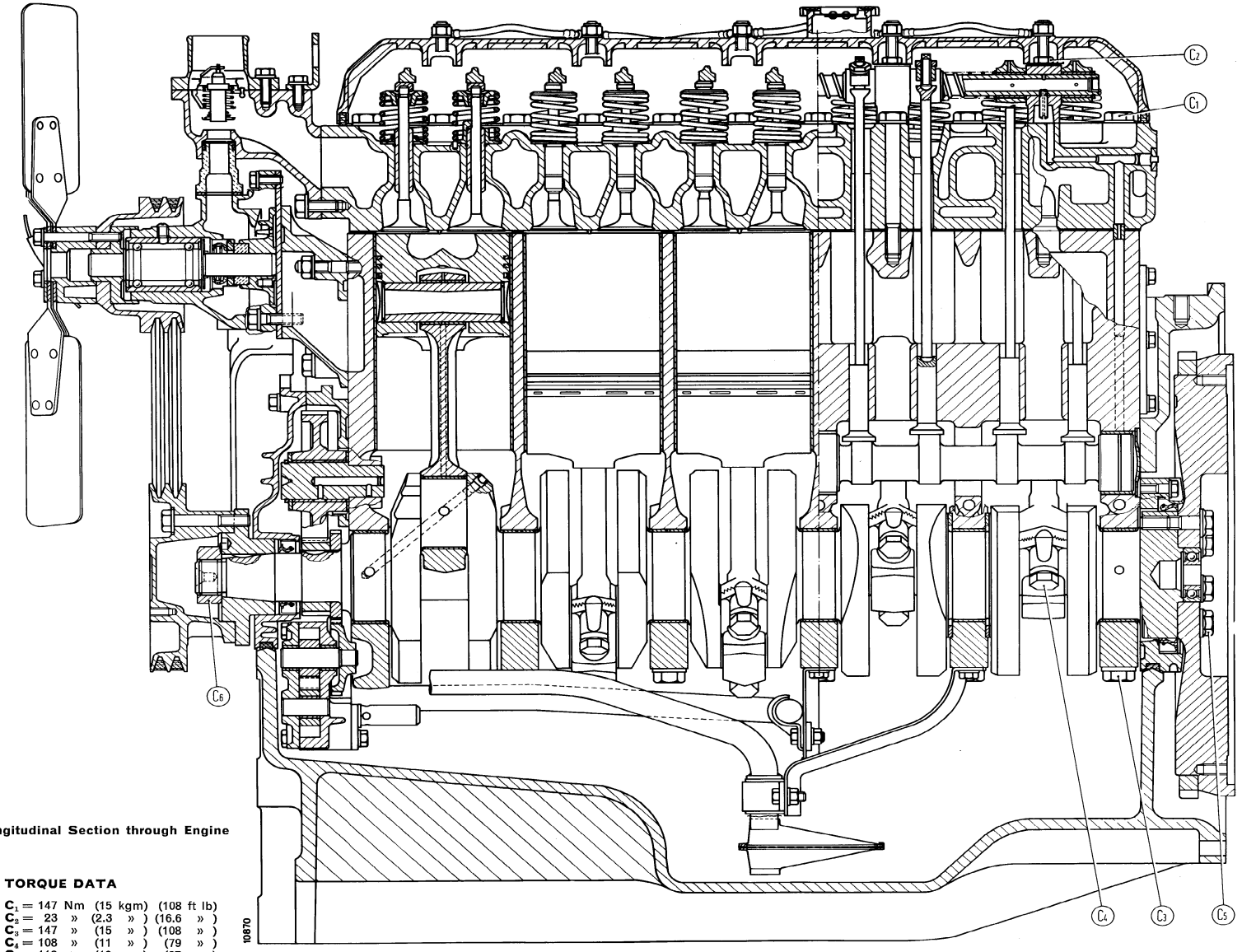
Test No.	Lever position	Speed rpm	Transfer pressure kg/cm² (bar)	Advance piston stroke (*) mm	Delivery		Spread cm³/1000 shots	Shut-off voltage V
					Injector cm³/1000 shots	Leakback cm³/100 shots		
1	Full	500	—	1.5 to 2.1	—	—	—	12
2	Full	800	—	3.7 to 4.3	—	—	—	12
3	Full	1100	—	6.4 to 6.8	—	—	—	12
4	Full	500	3 to 4	—	—	—	—	12
5	Full	1000	5 to 6	—	—	—	—	12
6	Full	1200	—	—	—	30 to 60	—	12
7	Full	1400	—	—	0	—	—	12
8 (1)	Full	1325	—	—	30 to 36	—	—	12
9	Full	1250 $^{+0}_{-20}$	—	—	60.5 to 62.5	—	2.5	12
10 (2)	Full	900	—	—	64.5 to 66.5	—	—	12
11	Full	500	—	—	55.5 to 58.5	—	—	12
12 (3)	Idle	350	—	—	16 to 20	—	—	12
13	Idle	450	—	—	0	—	—	12
14	Full	100	—	—	110 ± 5	—	—	12
15	Full	200	—	—	52 ± 5	—	—	12
16	Full	70	—	—	0	—	—	2.5

(*) Use gauge **291751**
(1) Adjust max speed stop screw
(2) Adjust max fuelling stop screw
(3) Adjust idle stop screw

TORQUE DATA

DESCRIPTION	Thread Size	Torque Data		
		Nm	kgm	ft lb
Engine Block and Cylinder Head - Valve Gear - Crankgear - Section 10				
Capscrew, cylinder head (C_1, page 12)	M 12 x 1.25	147	15	108
Capscrew, rocker bracket (C_2)	M 8 x 1.25	23	2.3	16.6
Capscrew, main bearing caps (C_3)	M 14 x 1.5	147	15	108
Capscrew, connecting rod caps (C_4)	M 12 x 1.25	108	11	79
Capscrew, flywheel (C_5)	M 12 x 1.25	118	12	87
Nut, crankshaft pulley hub (C_6)	M 30 x 1.5	294	30	217
Fuel System				
Nut, injection pump shaft gear (BOSCH injection pump)	M 12 x 1.75	64	6.5	47
Nuts, injection pump to support	M 8 x 1.25	23	2.3	16.6

ENGINE: Longitudinal Section



Longitudinal Section through Engine

TORQUE DATA

C_1 = 147 Nm	(15 kgm)	(108 ft lb)
C_2 = 23 »	(2,3 »)	(16.6 »)
C_3 = 147 »	(15 »)	(108 »)
C_4 = 108 »	(11 »)	(79 »)
C_5 = 118 »	(12 »)	(87 »)
C_6 = 294 »	(30 »)	(217 »)

DESCRIPTION

See page 1, Section 100, Model 780 noting the following points:

— Crankshaft rests on 6 bearings instead of 5.

— For 5 cylinder engine dynamic balancer is not required.

ON-BENCH PERFORMANCE DATA

Test Plan

Engine on bench with fan, air cleaner and exhaust silencer removed.

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

Ambient temperature, 20° ± 3° C.

Relative humidity 70% ± 5%

Fuel density 830 ± 10 g/litre (58,227 ± 701 g/gal)

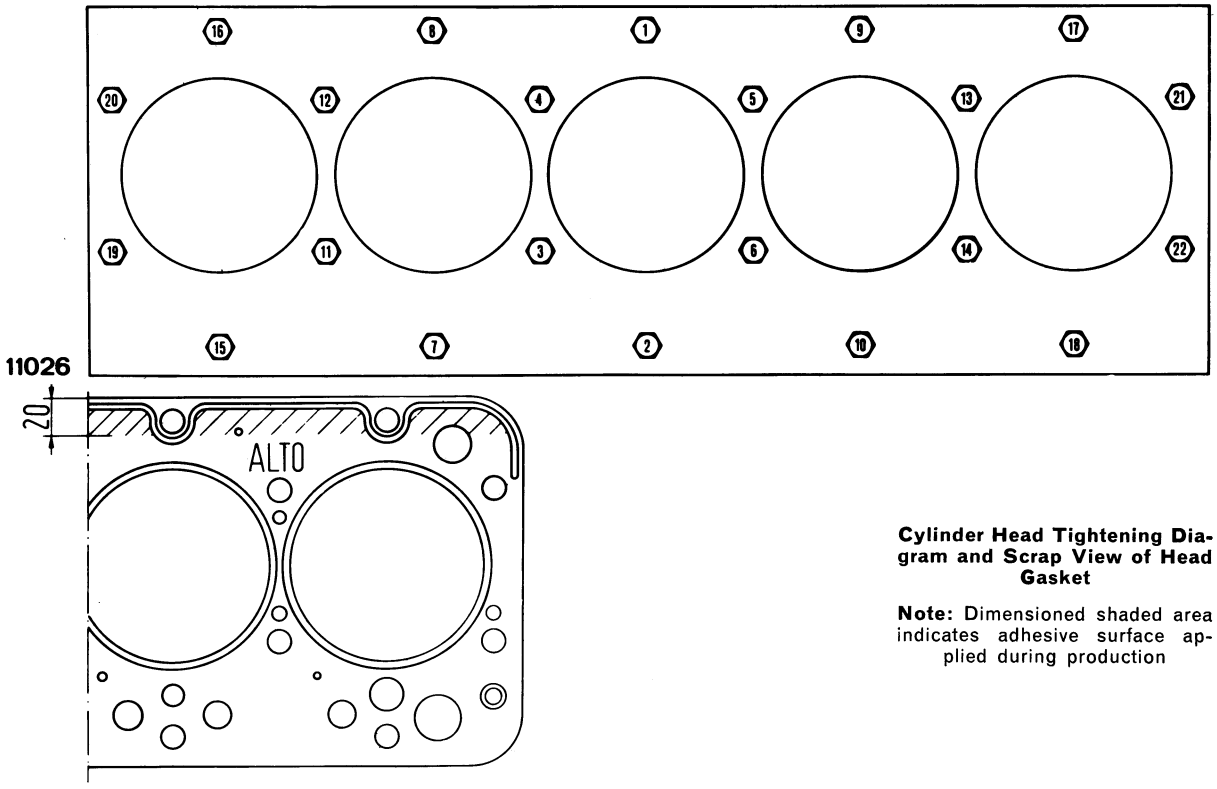
Pump timing, B.T.D.C. for cylinder No. 1 on compression stroke: 8° ± 1°.

Throttle	Engine rpm	Metric HP		Time to burn 250 cm³ (15 in³) of fuel (seconds)
		2-hour run-in kW	50-hour run-in kW	
Maximum, full load	2500	⩾ 64 (87 HP) (°)	⩾ 66.2 (90 HP)	⩾ 45.8
Maximum, full torque	1800	⩾ 50 (68 HP) (°)	⩾ 51.5 (70 HP)	⩾ 61.1
Maximum, no-load	⩽ 2740	—	—	—
Minimum, no-load	650 to 700	—	—	—

(°) Anticipated

CYLINDER HEAD

See descriptions and figures on pages 3 and 4, Section 101, Tractor Model 780. The diagram below replaces equivalent diagram on page 4, Section 101, Model 780

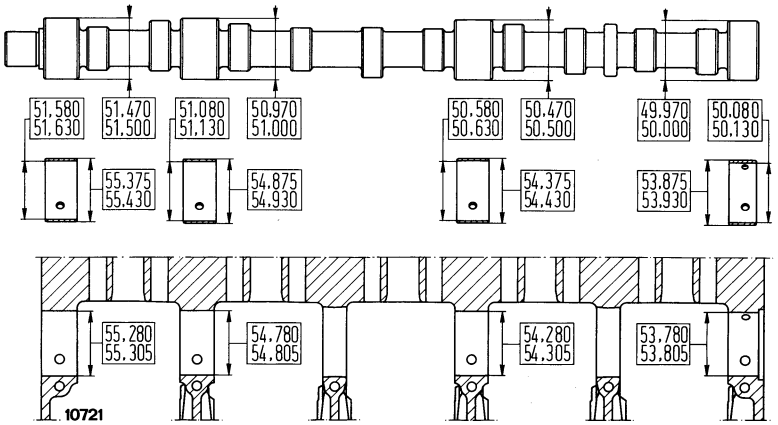


Cylinder Head Tightening Diagram and Scrap View of Head Gasket

Note: Dimensioned shaded area indicates adhesive surface applied during production

CAMSHAFT - VALVES - TAPPETS - TIMING GEARS

See description and illustrations on pages 1, 2 and 3, Section 102, Model 780. Diagram below replaces diagram on page 1, Section 102, Model 780.



Camshaft, Bushing, Journal and Housing details

Note: Bushing fitted I.D. indicated

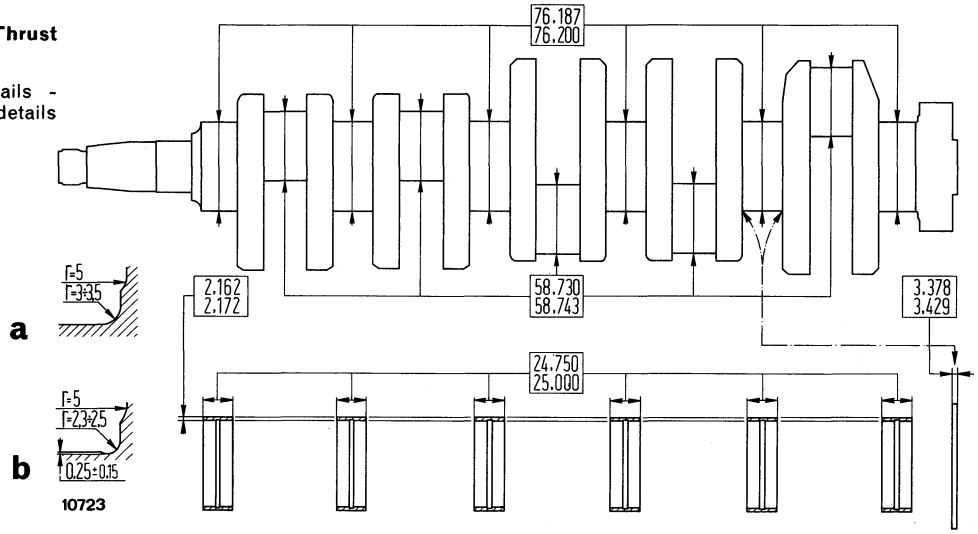
CRANKSHAFT

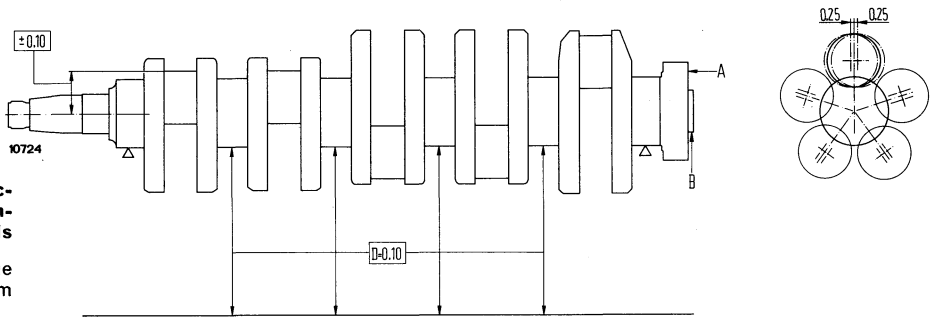
See descriptions on pages 1 and 2, Section 103, Model 780, except for the following:

— Maximum crankpin axis misalignment relative to crankshaft centerline shall not exceed ± .25 mm (.010 in)

Crankshaft, Bearing and Thrust Washer Details

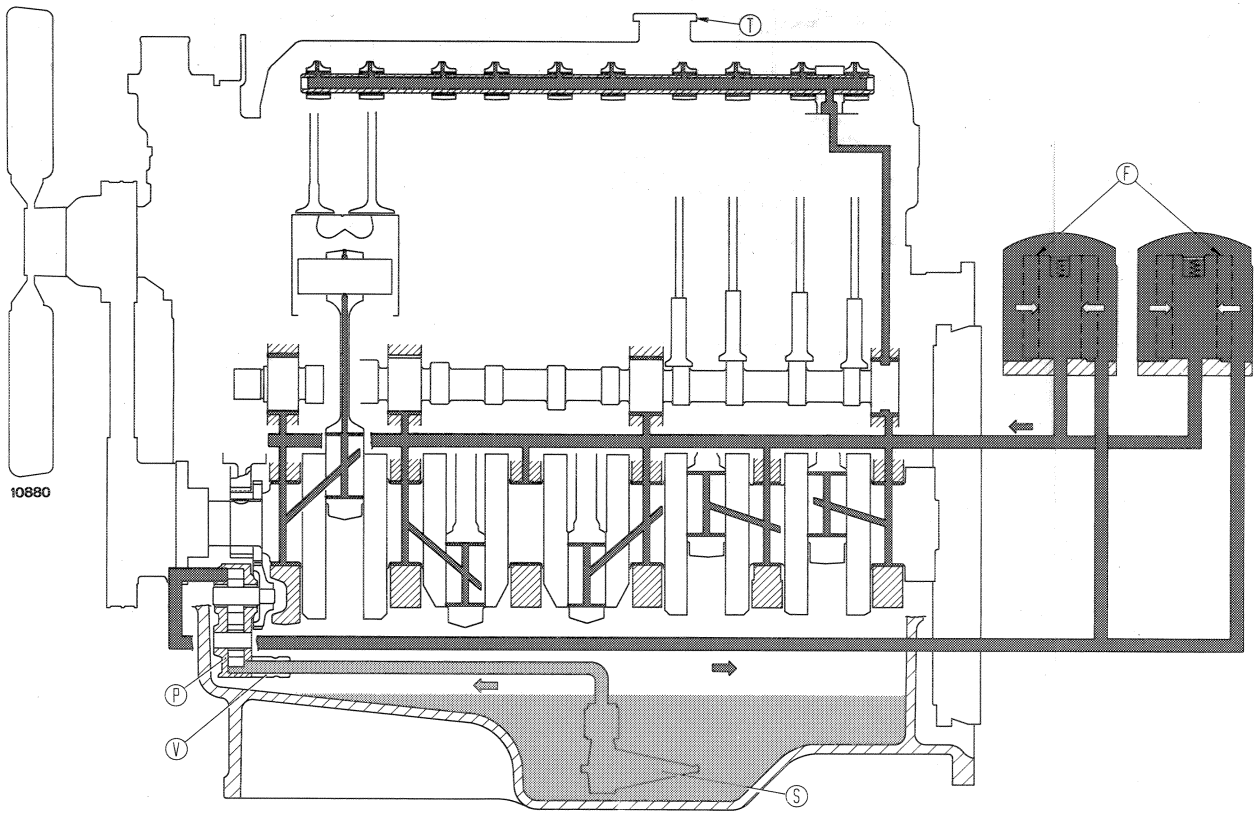
a. Crankpin fillet radius details -
b. Main journal fillet radius details

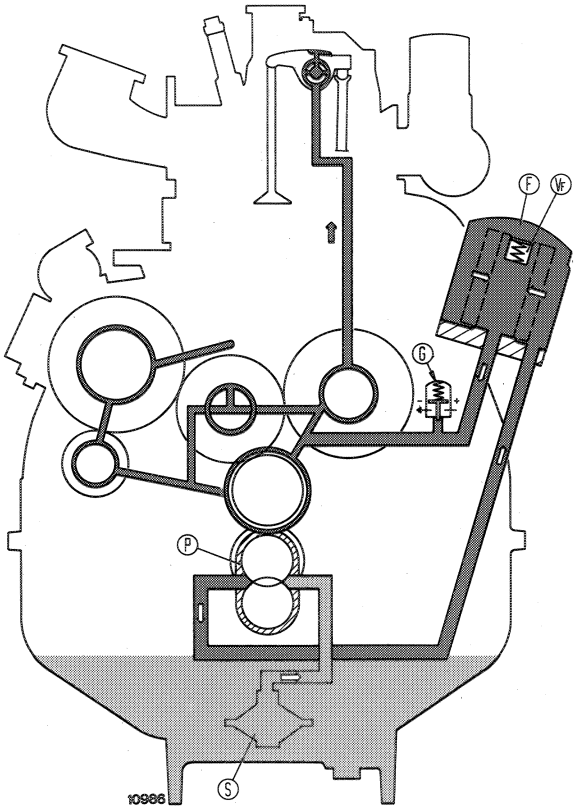




Main Journal and Crankpin Eccentricity and Crankpin Misalignment Relative to Main Journals

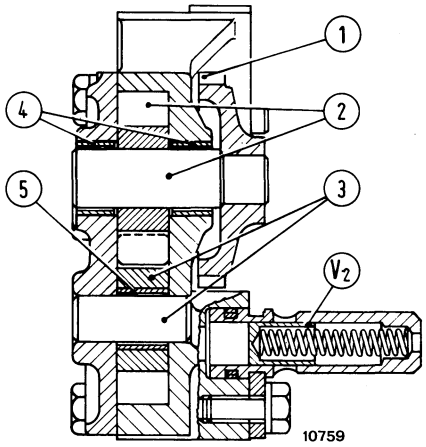
A and B. Stylus positions for flange run-out and eccentricity - D. Maximum main journal misalignment.





Lubrication System Diagram

F. Filter - G. Oil pressure warning transmitter (on instrument panel) - P. Pump - S. Suction filter - T. Oil filler plug - V. Relief valve - Vf. By-pass valve (cuts in when inlet pressure is 1.5 to 1.7 kg/cm² or 20 to 23 psi higher than outlet pressure)



OIL PUMP

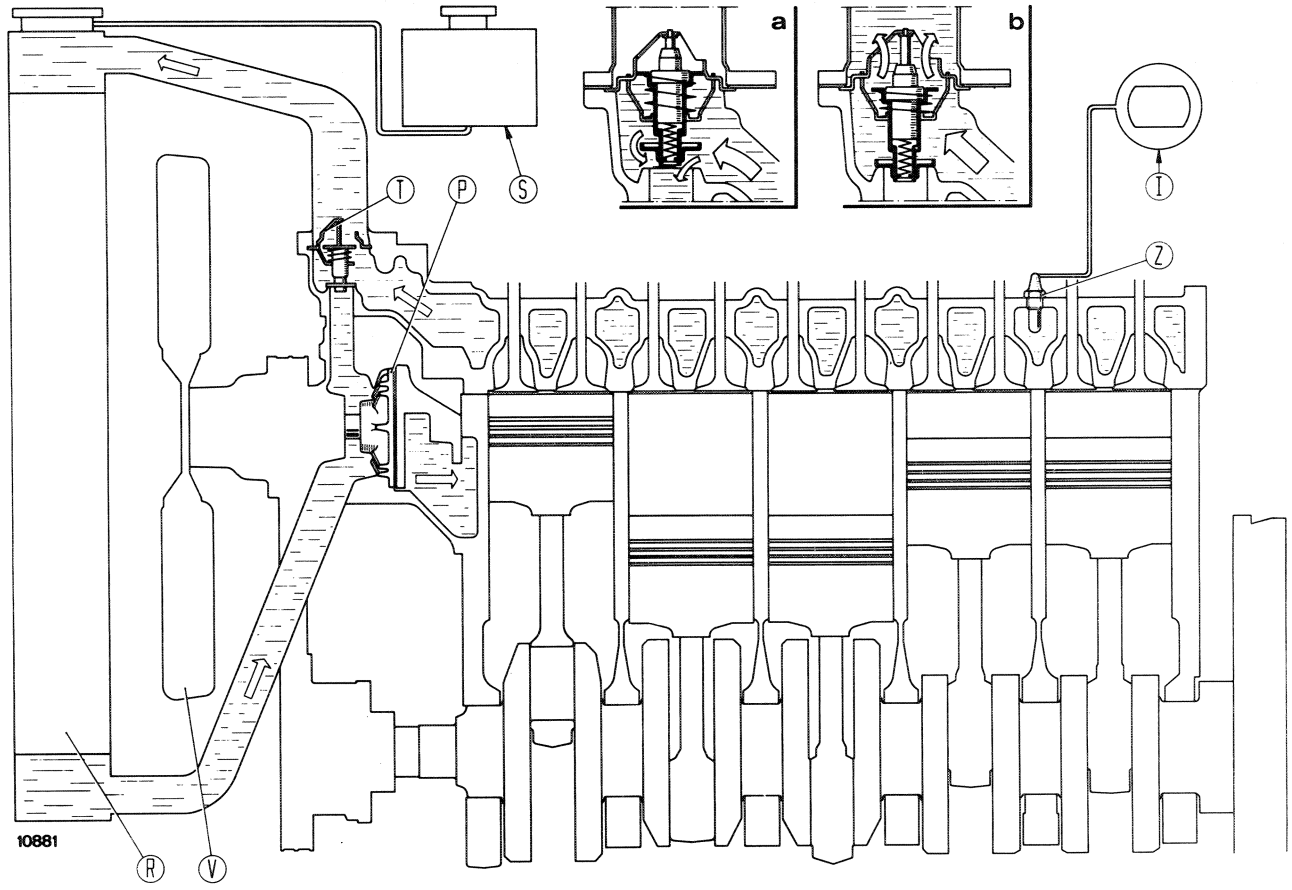
The oil pump is accessible after removing the engine oil sump.
In the course of overhaul, assess the amount of wear affecting the various components by comparison to the dimensions given in the data table page 7, Section 10.

Section through Oil Pump

V_2. Relief valve - 1. Outer drive gear - 2. Drive gear shaft - 3. Driven gear shaft - 4 and 5. Bushings.

OIL FILTER - OIL PRESSURE WARNING SYSTEM

See page 3, Section 105, Model 780.
On Model 880/5 engine oil is cleaned with two full flow paper filter elements on delivery line of pump as shown in diagram on page 1.

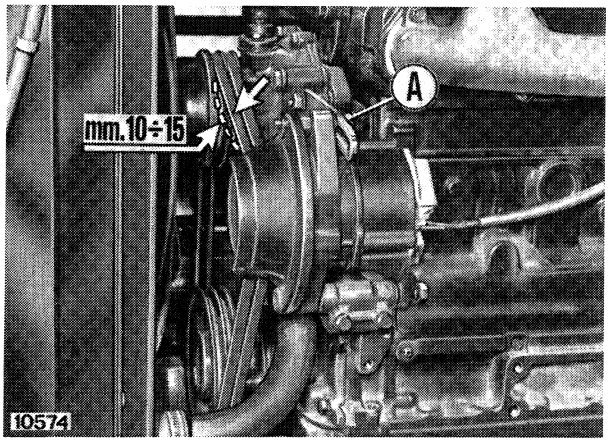


Cooling System Diagram

a. Water circulation with thermostat closed - b. Water circulation with thermostat open - I. Water temperature gauge - P. Pump - R. Radiator - S. Expansion tank - T. Thermostat - V. Fan - Z. Transmitter

TO ADJUST BELT TENSION

The fan/water pump/alternator belt tension is correct when a deflection of 10 to 15 mm (.39 to .59 in) is obtained by applying a 108 to 128 N (11 to 13 kg, 24 to 28 lb) load on the belt section between alternator and water pump.



To adjust, proceed as follows:

— Slacken alternator nuts (A).

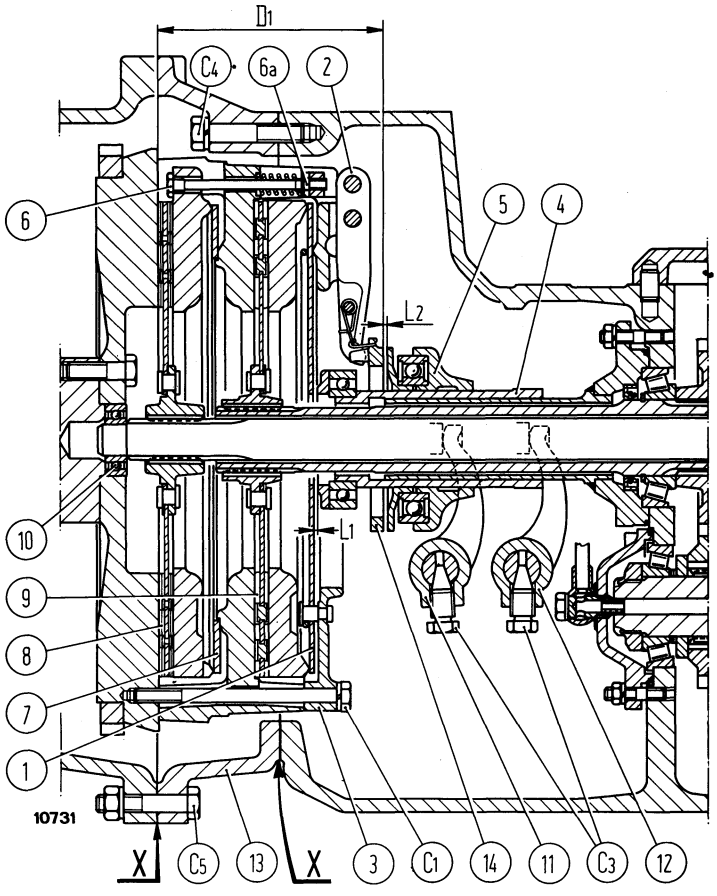
— Swing the alternator about the tensioner until the correct belt tension is obtained, and retighten the nut (A).

TO OVERHAUL 12″/12″ FERODO CLUTCH

See descriptions and figures on pages 3 and 4, Section 201, Model 880 fitted with 12″/12″ FERODO clutch. Diagram below replaces equivalent diagram (c) on page 2, Section 201, Model 880.

TO ADJUST 12″/12″ FERODO CLUTCH

See descriptions and diagrams on pages 4, 5 and 7, Section 201, Model 880 fitted with 12″/12″ FERODO clutch.



Section through FERODO 12″/12″ Clutch

C_1. Clutch capscrews - C_3. Withdrawal lever capscrews - C_4 and C_5. Spacer capscrews (13) - D_1. = 147 mm (5.7874 in) Clutch release lever plate height above flywheel face - L_1. = 2 mm (.0790 in) Nominal gap between transmission clutch spring and thrust bearing - L_2. = 2.5 (.098 in) Nominal gap between PTO clutch release lever plate and thrust bearing - 1. Diaphragm spring - 2. PTO clutch release levers - 3. Cover - 4. and 5 Control sleeves and release bearings - 6 and 6a. PTO clutch release lever adjusting screw and nut - 7. Dished spring - 8. PTO clutch plate - 9. Transmission clutch plate - 10. Flywheel bearing - 11 and 12. Withdrawal forks - 13. Spacer between clutch housing and engine block - 14. Release lever plate

Note: On assembly, thoroughly clean surfaces **X** to be mated and apply one of the following jointing compounds:

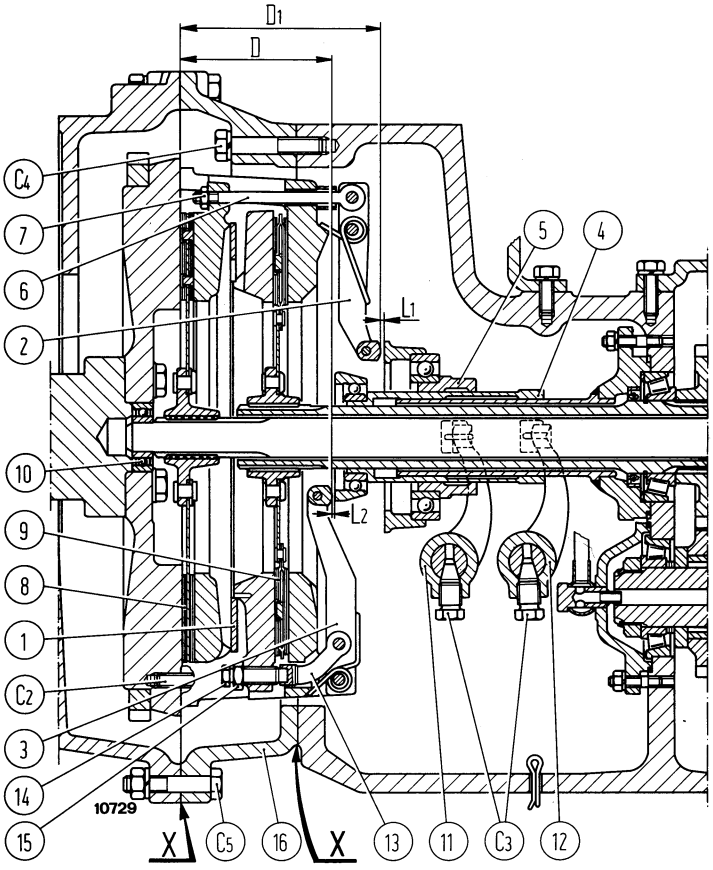
RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET

TO OVERHAUL LUK 12″/12″ CLUTCH

See descriptions and figures on pages 7 and 8, Section 201, Model 880 fitted with LUK 12″/12″ clutch. The diagram below replaces figure (c) on page 6, Section 201, Model 880.

TO ADJUST LUK 12″/12″ CLUTCH

See descriptions and illustrations on pages 8 and 9, Section 201, Model 880 fitted with LUK 12″/12″ clutch.



Section through LUK 12″/12″ Clutch

C_3. Withdrawal lever screws - C_4. and C_5 Spacer screws (16) - D. = 103 mm (4.0551 in) Release lever (3) height above flywheel face - D_1 = 137 mm (5.3937 in) Release lever (2) height above flywheel face - L_1. = 2.5 mm (.0984 in) and L_2. = 2 mm (.0787 in) release lever to thrust bearing gap for PTO clutch and transmission clutch - 1. Dished spring - 2. PTO clutch release levers - 3. Transmission clutch release levers - 4 and 5. Control sleeves and bearings - 6 and 7. PTO clutch adjusting screw and nut - 8. PTO clutch plate - 9. Transmission clutch plate - 10. Flywheel bearing - 11 and 12. Withdrawal forks - 13, 14 and 15. Transmission clutch lever, adjusting screw and nut - 16. Clutch housing spacer

Note: On reassembly, thoroughly clean faces **X** to be mated and smear with one of the following jointing compounds:

RTV SILMATE, RHODORSIL CAF1 or LOCTITE PLASTIC GASKET

FRONT AXLE

See data on page 1, Section 30, Model 880, except for the following:

Tracks (6 off)	1420 - 1520 - 1620 - 1720 - 1820 - 1920 - 2020 mm (1) (4 ft 8 in - 5 ft - 5 ft 4 in - 5 ft 8 in - 6 ft - 6 ft 4 in - 6 ft 8 in) (1)
Axle carrier shim thickness	Suppressed

(1) Obtainable by overturning the wheels

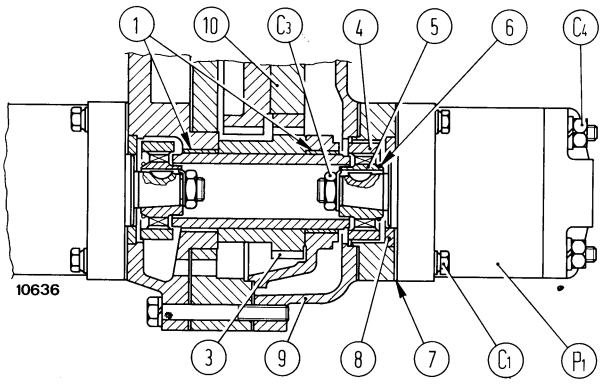
POWER STEERING

Type	Hydrostatic
Make	DANFOSS
Hydraulic circuit	Independent, separate hydraulic pump
Oil reservoir	Sheet steel, on right hand side of engine
Oil filter	In oil reservoir
Hydraulic Pump	
Type	Gear
Model	C 22 X
Make	FIAT, Plessey licence
Drive	From engine valve gears
Rotation (seen from drive end)	Clockwise
Drive ratio	1.166 to 1
Rated speed (at engine-governed speed)	2917 rpm
Rated output at maximum rated speed	29.2 l/min (51 pts)
On bench output at 1450 rpm and 68.5 bar (70 kg/cm^2 or 996 psi)	
— New or reconditioned pump	13.47 l/min (23.7 pts)
— Used pump	9.41 l/min (16.6 pts)
— Test oil temperature	55 to 65 °C
— Test oil viscosity	SAE 20
Drive/driven gear journal diameter	17.400 to 17.424 mm (.6850 to .6860 in)
Bearing bore diameter	17.450 to 17.470 mm (.6870 to .6878 in)
Gear journal clearance in bearing	.026 to .070 mm (.0010 to .0027 in)
Maximum wear clearance	.1 mm (.0039 in)
Bearing and gear bore diameter in pump body	37.270 to 37.294 mm (1.4673 to 1.4683 in)
Maximum body wear, suction side	.1 mm (.0039 in)
Bearing width	19.796 to 19.812 mm (.7794 to .7800 in)
Gear width	16.323 to 16.348 mm (.6426 to .6436 in)
Pump body width	56.072 to 56.122 mm (2.2075 to 2.2095 in)
Bearing and gear end clearance in pump body (to be restored on overhaul)	.1 to .2 mm (.0039 to .0079 in)

POWER STEERING

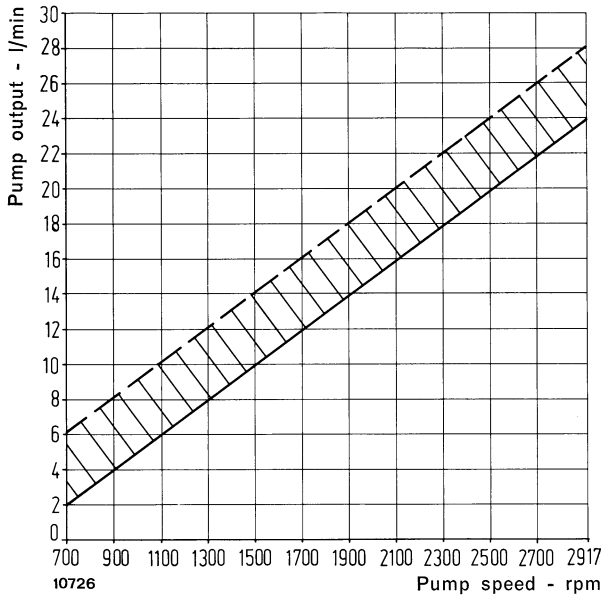
Continued

Control valve, make	DANFOSS
Type	ORBITROL, with steering wheel operated rotary valve (permitting steering also in case of pump failure) (page 9, Section 303, Tractor Models 780 and 880)
Outfit code	OSPB 100 ON - OVP 20
Relief valve crack-off setting (24, page 9, Section 303, Tractor Models 780 and 880) located in valve block (D_2)	102 kg/cm² (100 bar) (1,451 psi)
Power cylinder overload valve crack-off setting (25, page 9, Section 303, Tractor Models 780 and 880), located in valve block (D_2)	204 kg/cm² (200 bar) (2,901 psi)
Power Cylinder, type	Double-acting, located behind front axle
Make	SIMA or WEBER
Cylinder bore diameter	48 mm (1.88 in)
Maximum piston stroke — SIMA cylinder type	215 mm (8.46 in)
Maximum piston stroke — WEBER cylinder type	215 mm (8.46 in)
Piston rod diameter	22 mm (0.86 in)
Turning radius	
— Brakes applied	3800 mm (12 ft $5^1/_2$ in)
— No brakes	4200 mm (13 ft $9^1/_2$ in)



Section through Steering Pump Drive

C_1. Pump screws - C_3. Sleeve nut - C_4. Cover nut - P_1. Hydraulic pump - 1. Gear bushes - 3. Pump drive gear - 4. Drive collar - 5. Drive sleeve - 6. Retaining ring (4) - 7. Gasket - 8. Centraliser - 9. Pump support - 10. Lift and steering pump drive gear.



Output/Speed Curve - Power Steering Pump Type C 22 X

Test pressure	70 kg/cm² (996 psi)
Fluid temperature	55 to 65 °C

To Overhaul Steering Pump and Check Reservoir

For steering pump overhaul and testing, proceed as directed on page 1, Section 502, Models 780 and 880, lift pump.

Note the following points:

— Steering pump drive is shown above.

— Pump assembly and performance data are given in the table on page 1, Section 30, whereas the speed/output chart is shown above.

When the hydraulic fluid reservoir (T, page 9, Section 303, Models 780 and 880), is removed, clean thoroughly and check for:

— Sheet steel reservoir leakage.

— Inefficiency of metal filter cartridge, container and spring.

On completion of assembly, refill the system with fluid, bearing in mind that this operation should be carried out in several stages, each time steering the tractor to fill all parts of the circuit completely.

LIFT PUMP

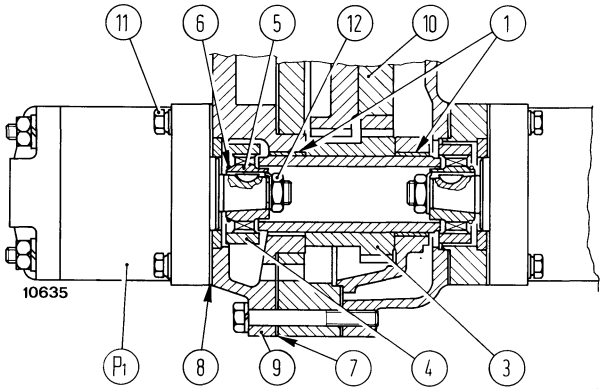
See data on pages 3 and 4, Section 50, Model 780, except for the following:

Drive ratio	1.166 to 1
Max. rated speed (engine at governed speed)	2917 rpm
Max. rated output	33.1 l/min (56 pts/min)
Output at 1450 rpm, 172 bar (175 kg/cm^2, 2490 psi)	
— New or reconditioned	15.30 l/min (27 pts/min)
— Used	10.69 l/min (19 pts/min)
— Test oil temperature	55 to 65 °C
— Test oil grade	SAE 20

HYDRAULIC LIFT UNIT

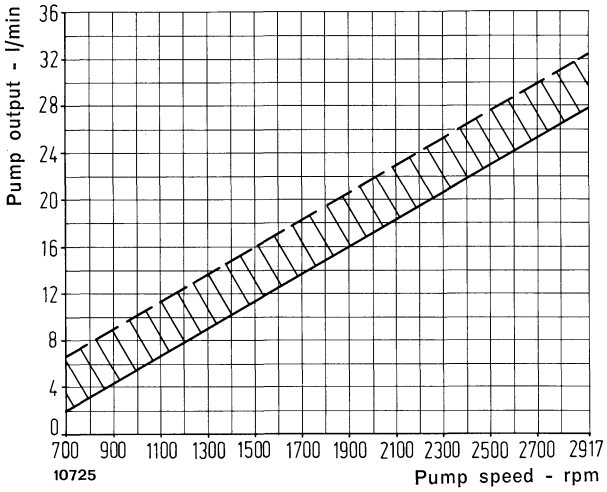
LIFT PUMP

See descriptions and figures on pages 1, 2 and 3, Section 502, Models 780 and 880. Diagrams below replace equivalent diagrams on pages 1 and 2, Model 880.



Section through Lift Pump Drive

P_1. Hydraulic pump - 1. Bushings - 3. Pump drive gear - 4. Drive annulus - 5. Drive sleeve - 6. Retaining ring (4) - 7. Gasket - 8. Seal - 9. Pump housing - 10. Lift and steering pump drive gear - 11. Pump capscrews - 12. Drive sleeve nut



Speed-Output Chart of Lift Pump A 25 X

Test pressure	166 bar (170 kg/cm²) (2418 psi)
Oil temperature	55 to 65 °C

HYDRAULIC LIFT UNIT

CHARGING SYSTEM

Alternator	
Type (three-phase self-rectifying)	MARELLI AA 125 - 14 V - 45 A
Rated voltage	14 V
Rotation (seen from pulley side)	Clockwise
Cut-in speed at 12 V and 20 °C	⩽ 950 rpm
Output at 14 V and 7000 rpm across battery after warm-up (°)	⩾ 45 A
Rated output at 12,000 rpm (°)	~ 50 A
Rotor winding resistance	3 to 3.2 Ohm
Alternator speed (at engine governed speed)	4450 rpm
Drive ratio	1.780 to 1
Voltage Regulator	
Type	Integral, transistor RTT 114 A
Alternator test speed	4000 to 6000 rpm
Voltage setting	13.65 to 14 V

(°) Values with brushes fully bedded in

ELECTRICAL SYSTEM: Specification and Data

MARELLI STARTER

Type	MARELLI MT 68 LB
Voltage rated	12 Volt
Rated output	3.5 kW
Rotation (seen from pinion end)	Clockwise
Starter drive ratio	9/127
Number of poles	4
Field winding	Series
Control	Lever and free wheel
Operation	Solenoid
Bench Test Data	
Running torque at 20° C	
— Current	$\leqslant$ 700 A
— Torque	$\geqslant$ 19 Nm (1.9 kgm) (14 ft lb)
— Speed	$\geqslant$ 1700 rpm
— Voltage	9.1 Volt
Lock torque at 20° C	
— Current	$\leqslant$ 1550 A
— Voltage	5.7 Volt
— Torque	$\geqslant$ 52 Nm (5.3 kgm) (38.33 ft lb)
Light running torque at 20 °C	
— Current	$\leqslant$ 80 A max
— Voltage	$\geqslant$ 11.6 Volt
— Speed	$\geqslant$ 7000 rpm/max
Mechanical Data	
Brush spring load	1.28 to 1.52 bar (kg/cm^2) (18.56 to 22.05 psi)
Mica undercut depth	1 mm max
Clutch slip torque (pinion rotating torque)	.6 to .8 Nm (.06 to .08 kgm) (.4 to .5 ft lb)

Continued

MARELLI STARTER

Continued

Commutator dia.	45.000 to 45.840 mm (1.7716 to 1.8047 in)
— Maximum wear limit	44 mm (1.7323 in)
— Maximum ovality	.1 mm (.0039 in)
— Armature end float	.1 to .4 mm (.0039 to .0157 in)
Solenoid	
Winding resistance at 20 °C — Holding coil	.23 ± .01 Ohm
Winding resistance at 20 °C — Actuating coil	.78 ± .04 Ohm
Current consumption at 12 V	⩽ 70 Amp
Activation voltage	⩽ 7 Volt
Moving contact travel	2.2 to 3.5 mm (.0866 to .1378 in)
Plunger stroke	14.3 mm (.5630 in)
Holding force, plunger at end of stroke, at 12 V	392 N (40 kg) (88.2 lb)
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 (.4911 to .4922 in)
Pinion journal diameter	12.425 to 12.440 mm (.4891 to .4898 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 (.0079 to .0117 in)
Commutator end bushing I.D.	14.000 to 14.027 mm (.5511 to .5522 in)
Shaft journal dia.	13.957 to 13.984 mm (.5495 to .5505 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**

BOSCH STARTER

Type	BOSCH JD → 12 V A 001 - 806. 499	
Rated voltage	12 Volt	
Rated output	2.95 kW	
Rotation (seen from drive end)	Clockwise	
Starter drive ratio	9/127	
Number of poles	4	
Field winding	Compound	
Control	Lever and free wheel	
Operation	Solenoid	
Bench Test Data		
Running torque at 20 °C	(*)	(°)
— Current	760 to 900 Amp	650 to 800 Amp
— Torque	4.6 kgm (33.3 ft lb)	3.9 kgm (28.2 ft lb)
— Voltage	4 Volt	3.5 Volt
Light running torque at 20 °C		
— Current	60 to 90 Amp	
— Voltage	11.5 Volt	
— Speed	4800 to 6800 rpm	
Mechanical Data		
Brush spring load (not worn)	2.6 to 2.8 kg (5.7 to 6.2 lb)	
Armature end play	.1 to .3 mm (.004 to .012 in)	
Mica undercut depth	.5 to .8 mm (.020 to .032 in)	
Commutator dia.	42 mm (1.65 in)	
— Maximum wear limit	39.5 mm (1.55 in)	
— Maximum commutator eccentricity	.03 mm (.0012 in)	
— Maximum lamination pack eccentricity	.05 mm (.0020 in)	

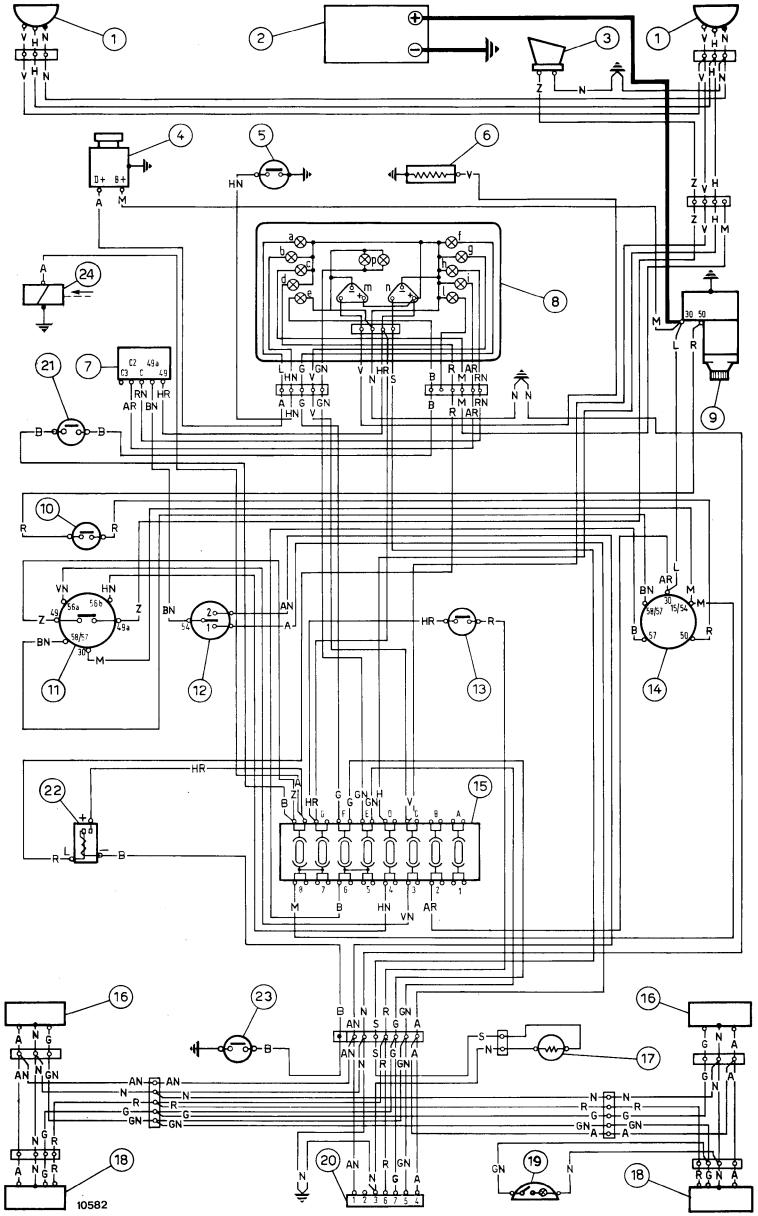
Continued

(*) Battery charged
(°) Battery discharged

BOSCH STARTER

Continued

Solenoid	
Resistance at 20 °C { Holding coil Actuating coil	1.05 Ohm .25 Ohm
Current consumption at 12 V	60 Amp
Activation voltage (minimum)	9 Volt
Plunger stroke	12 to 14 mm (.4724 to .5512 in)
Fitting Data	
Pole shoe I.D.	75.850 to 75.953 mm (2.9862 to 2.9903 in)
Armature O.D.	73 mm (2.8740 in)
Armature bushing fitted I.D.	
— Drive end	12.475 to 12.502 mm (.4911 to .4922 in)
— Intermediate	19.020 to 19.072 mm (.7488 to .7509 in)
— Commutator end	14.000 to 14.018 mm (.5512 to .5519 in)
Armature shaft journal dia.	
— Drive end	12.425 to 12.440 mm (.4892 to .4898 in)
— Intermediate	18.887 to 18.910 mm (.7436 to .7445 in)
— Commutator end	13.932 to 13.950 mm (.5485 to .5492 in)
Armature shaft clearance in bushing	
— Drive end	.035 to .077 mm (.0014 to .0030 in)
— Intermediate	.110 to .195 mm (.0043 to .0077 in)
— Commutator end	.050 to .086 mm (.0020 to .0034 in)
Pinion bushing fitted I.D.	14.245 to 14.272 mm (.5608 to .5619 in)
Armature shaft journal dia. over pinion bushing	14.123 to 14.150 mm (.5560 to .5571 in)
Armature shaft clearance in pinion bushing	.095 to .149 mm (.0037 to .0059 in)
Lubrication Data	
Starter drive helical groove (during overhaul)	**grassofiat MR 3**



Tractor without accessories

1. Headlamps
2. Battery
3. Horn
4. Alternator
5. Low engine oil lube pressure indicator
6. Water temperature sending unit
7. Tractor/first trailer/second trailer turn signal flasher
8. Multiple gauge (13 function)
   a. Battery charge indicator
   b. Low oil pressure indicator
   c. Dry air cleaner indicator
   d. Parking brake indicator
   e. Low brake fluid indicator
   f. Parking brake indicator
   g. High beam indicator
   h. Tractor turn signal indicator
   i. First trailer turn signal indicator
   l. Second trailer turn signal indicator
   m. Engine water temperature indicator
   n. Fuel gauge
   p. Panel light indicator
9. Starter
10. Starter inhibitor switch
11. Lighting switch and horn button
12. Turn signal switch
13. Stop light switch
14. Starter switch
15. Fuses
16. Front parking and turn signal light
17. Fuel level indicator sending unit
18. Tail/turn signal/stop lights
19. Floodlight and switch
20. Seven-pole power point
21. Low brake oil pressure indicator sending unit
22. Parking brake on indicator flasher
23. Parking brake indicator sending unit
24. Engine shut-off solenoid

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 = Violet

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ELECTRICAL SYSTEM: Wiring Diagram

Tractor with accessories

Note: Detail **E** shows start-pilot cold start device which can be fitted as an alternative to thermostarter.

* To starter connection 50

• To starter switch connection 50

1. Headlamps
2. Battery
3. Horn
4. Alternator
5. Low engine lube oil pressure indicator sending unit
6. Engine water temperature indicator sending unit
7. Dry air cleaner condition indicator sending unit
8. Hazard warning flasher
9. Tractor/first trailer/second trailer turn signal flasher
10. Multiple gauge (13 function)
    a. Battery charge indicator
    b. Low oil pressure indicator
    c. Dry air cleaner condition indicator
    d. Parking brake on indicator
    e. Low brake oil level indicator
    f. Parking light indicator
    g. High beam indicator
    h. Tractor turn signal indicator
    i. First trailer turn signal indicator
    l. Second trailer turn signal indicator
    m. Engine water temperature indicator
    n. Fuel gauge
    p. Panel light indicator
11. Thermostarter
12. Starter
13. Starter inhibitor switch
14. Lighting switch and horn button
15. Turn signal light switch
16. Stop light switch
17. Thermostarter or start-pilot button
18. Starter switch
19. Parking brake indicator flasher
20. Cigar lighter
21. Single-pole power point
22. Hazard warning switch and indicator
23. Fuses
24. Front parking and turn signal lights
25. Parking brake on indicator sending unit
26. Fuel gauge sending unit
27. Tail, rear turn signal and stop lights
28. Flood light and switch
29. Seven-pole power point
30. Start-pilot device
31. Engine shut-off solenoid
32. Low brake fluid level indicator sending unit

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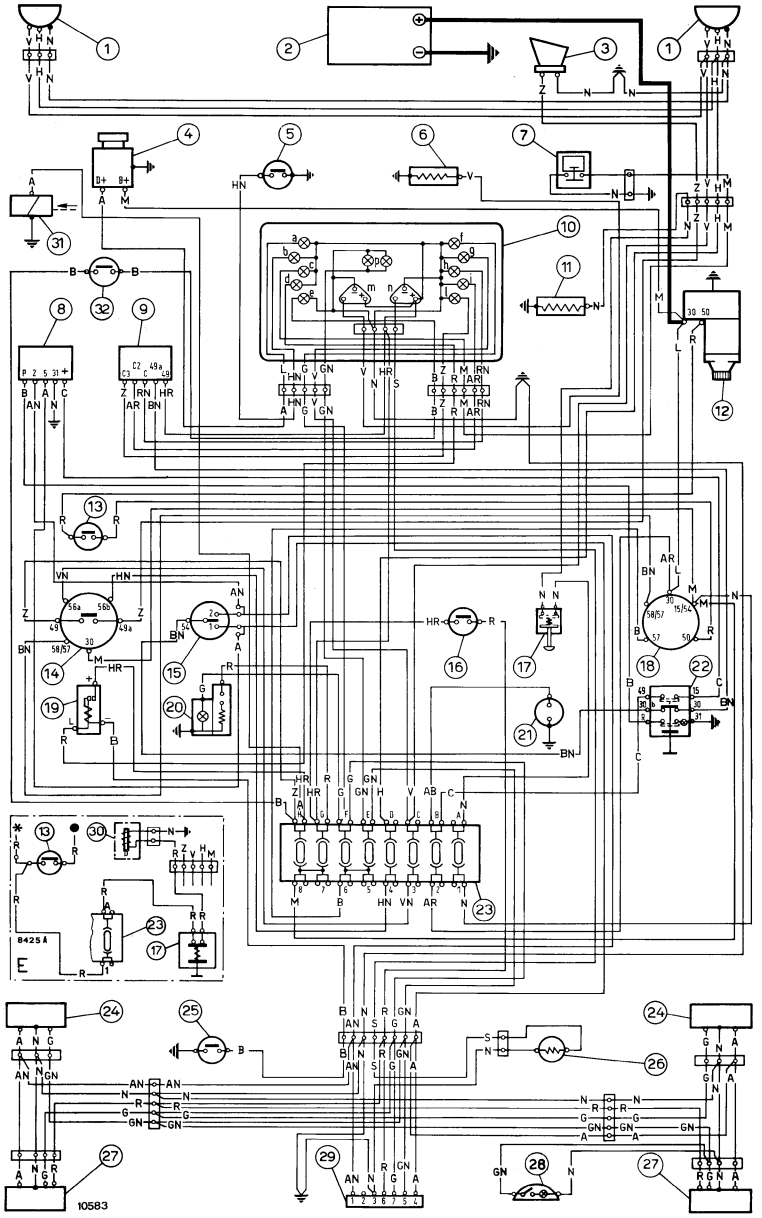

Fiat Trattori

FIAT

980
980 DT

WORKSHOP MANUAL

QUICK REFERENCE INDEX

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A - GENERAL

00 - SPECIFICATION

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101 - ENGINE - Engine Block - Cylinder Head

102 - ENGINE - Valve Gear

103 - ENGINE - Crank Gear

104 - ENGINE - Fuel System

105 - ENGINE - Lubrication System

106 - ENGINE - Cooling System

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202 - POWER TRAIN - Gearbox and Splitter

203 - POWER TRAIN - Crawler Gear

204 - POWER TRAIN - Rear Bevel Drive and Differential

205 - POWER TRAIN - Brakes

206 - POWER TRAIN - Final Drives

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301 - FRONT AXLE - STEERING - Front Axle

303 - FRONT AXLE - STEERING - Power Steering

40 - LIVE FRONT AXLE - Specification and Data

(*) For turning radius see page 3, section 00.

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501 - LIFT UNIT - Lift

502 - LIFT UNIT - Lift Pump

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503 - LIFT UNIT - Implement Attachment

504 - LIFT UNIT

SALAMI Remote Control Valves

KONTAK Remote Control Valves

60 - ELECTRICAL SYSTEM - Specification and Data

90 - SERVICE TOOLS

IDENTIFICATION DATA

Marketing code	
— Rear wheel drive	980
— Four wheel drive	980 DT
Engineering code	
— 12-speed, Rear Wheel Drive	657.100.000
— 16-speed, Rear Wheel Drive	657.100.000 Var. 720.111.150
— 12-speed, Four Wheel Drive	657.127.000
— 16-speed, Four Wheel Drive	657.127.000 Var. 720.111.150
Engine type (all versions)	FIAT 8065.02.217 (BOSCH injection pump)

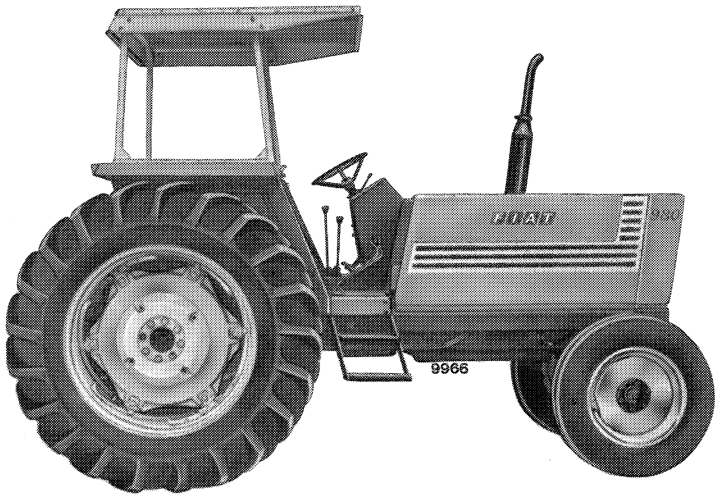
ENGINE

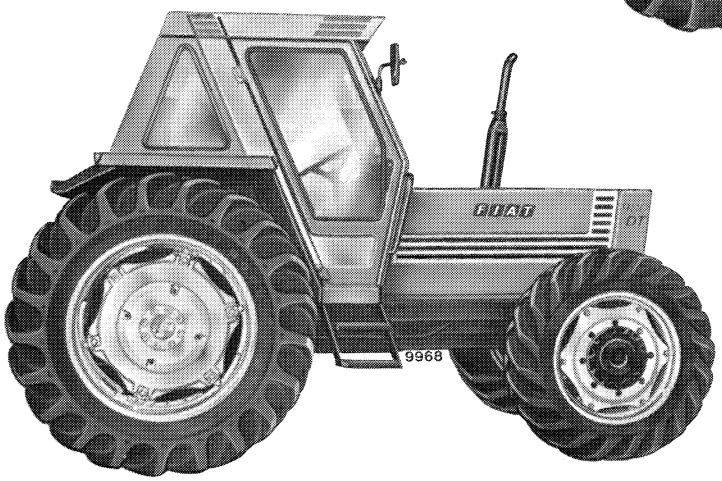
Type	4-stroke diesel, naturally aspirated
Injection	Direct
Number of cylinders	6
Sleeves	Dry
Bore and stroke	100 x 110 mm
Total displacement	5184 cm^3
Compression ratio	17 to 1
Maximum flywheel horsepower, DGM/DIN	72.1 kW (98 metric HP)
Maximum output speed	2400 rpm
Maximum torque speed	
— Old	1200 rpm
— New	1800 rpm
Main bearings	7
Sump	Reinforced, iron

WEIGHTS (12-speed)

Operating weight (including lift and implement attachment, swinging drawbar and ROPS frame)

— Model 980	3490 kg (7695 lb)
— Model 980 DT	3790 kg (8357 lb)





Valve Gear

O.H. valves, push rod operated	
— Inlet	
- Opens: B.T.D.C.	3°
- Closes: A.B.D.C.	23°
— Exhaust	
- Opens: B.B.D.C.	48° 30′
- Closes: A.T.D.C.	6°
Valve clearance	
— For timing check	.45 mm (.01772 in)
Normal, engine hot or cold	
— Inlet	.25 mm (.0098 in)
— Exhaust	.35 mm (.0138 in)

Fuel System

Air cleaner	Oil bath or dry, automatic drain centrifugal precleaner
Fuel filter (between pumps)	2, in-line, cartridge type, water separator integral with first filter
Feed pump	Double diaphragm
— Operation	Cam
Injection pump	Distributor
— Type	BOSCH
- Old	EP/VA 6/11 H 1200 CR 185-4-4745851
- New	EP/VA 6/11 H 1200 CR 185-4-4752192
— Integral all speed governor	Hydraulic
— Integral advance device	Hydraulic
— Pump timing, B.T.D.C.	
- Old	13° ± 1°
- New	7° ± 1°
Injectors, with nozzles	3 orifices
— Type	See page 9, Section 10
— Release pressure	221 to 230 bar (3205 to 3336 psi) (225 to 235 kg/cm²)
Firing order	1-5-3-6-2-4

Lubrication System

Forced feed, gear pump	
Pump drive	Crankshaft
Oil filters	Strainer on pump inlet and 2 full flow cartridges on outlet
Relief valve	In pump body
— Oil pressure at governed speed	2.9 to 3.9 bar (3 to 4 km/cm²) (42.1 to 56.6 psi)

Cooling System

Type	Water
Pump	Centrifugal
Drive	Crankshaft, through Vee belt
Expansion tank	4-deep core, vertical tube
Expansion tank	Semi-transparent plastic
Fan, water pump pulley mounted	Suction, steel
Temperature control	Wax thermostat

Tractor Meter

Type	Mechanical
Drive	Camshaft gear
Hourmeter activation speed	1800 rpm
Meter drive ratio	1 to 2

POWER TRAIN

Clutch

Type	LUK or FERODO, 12″
Construction	Twin, dry, single plate
Control	
— Transmission	Pedal
— P.T.O.	Manual
Plate material	
— Transmission	Cerametallic compound
— P.T.O.	Organic compound

Transmission

Type	Constant mesh, helical gears
Splitter	Double, epicyclic
Speeds	12 forward, 3 reverse
Crawler gear (optional)	In-line, splitter mounted 16 forward, 4 reverse speeds
Control levers	Separate
Bevel drive	Straight
Differential	Two pinion
Differential lock	Pedal controlled
Final drives	Epicyclic, 3 planet pinions

BRAKES

Service

Type	Disc, oil bath, axle shaft mounted
Operation	Hydraulic
Circuits	Split
Control	Latched pedals

Parking - Emergency

Type	Disc, independent
Position	Bevel pinion shaft mounted
Control	Manual lever

STEERING

Steering unit	Hydrostatic
Linkage joint	Sealed for life
Minimum turning radius (without brakes)	
— Models	
- 980	4200 mm (13 ft 8 in)
- 980 DT with front axle in	6400 mm (21 ft)
- 980 DT with front axle out	5990 mm (19 ft 6 in)
Minimum turning radius (with brakes)	
— Models	
- 980	3730 mm (12 ft 3 in)
- 980 DT with front axle in	4540 mm (14 ft 9 in)
- 980 DT with front axle out	5140 mm (16 ft 9 in)

FRONT AXLE

Type	Inverted U, telescoping, centre pivotting
Track widths	7

LIVE FRONT AXLE

Type	Full floating, centre pivotting, unjointed drive shaft and articulations on tractor centreline
Differential	2 pinion
Final drives	Epicyclic
Track widths	5

REAR WHEELS

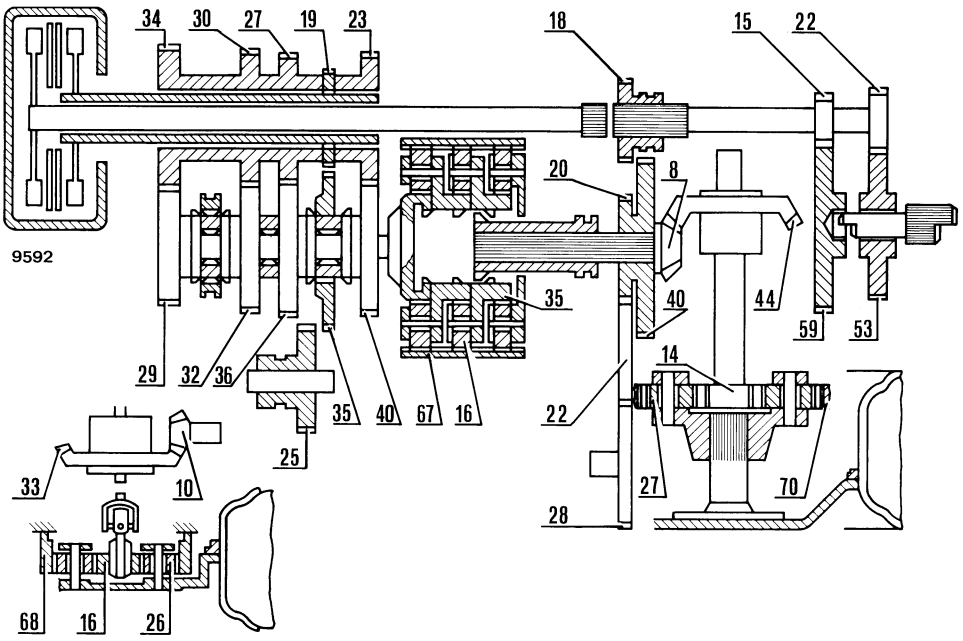
Type	PAVT Cast iron discs and rims with guide rails for power track width adjustment. It is also possible to alter position of hubs and discs
Track widths	9

POWER TAKE-OFF

Type	Fully independent
Speed	540 rpm, 1 3/8″, 6 spline or 1 3/4″, 6 spline extension 1000 rpm, 1 3/8″, 21-spline extension
Control	Manual lever
Standard speed selection	Automatic
Engine speed with P.T.O. at standard speeds	
— 540 rpm	2125 rpm
— 1000 rpm	2400 rpm
Rotation	Clockwise

POWER TRAIN SCHEMATICS

Models 980-980 DT 12-16 speed versions



Tractor speeds at maximum engine speed, full load

GEARS		Models 980 and 980 DT 12-16 speed versions, Rear tyres			
		16.9/14-38		18.4/15-34	
		kph	mph	kph	mph
Crawler	1st	.5	.3	.5	.3
	2nd	.7	.4	.6	.4
	3rd	.8	.5	.8	.5
	4th	1.0	.6	1.0	.6
	Reverse	.5	.3	.5	.3
Low	1st	1.5	.9	1.4	.9
	2nd	1.9	1.2	1.9	1.2
	3rd	2.4	1.5	2.3	1.4
	4th	3.0	1.9	2.9	1.8
	Reverse	1.4	.9	1.4	.9
Normal	1st	4.3	2.7	4.2	2.6
	2nd	5.6	3.5	5.5	3.4
	3rd	7.1	4.4	6.8	4.2
	4th	8.8	5.5	8.5	5.3
	Reverse	4.1	2.5	4.0	2.5
High	1st	12.6	7.8	12.2	7.6
	2nd	16.5	10.2	15.9	9.9
	3rd	20.6	12.8	19.9	12.4
	4th	25.7	16.0	24.9	15.5
	Reverse	11.9	7.4	11.5	7.1

Ground Speed PTO

Control	Same as transmission P.T.O.
Rotation	Same as transmission P.T.O.
Shaft drive ratio	
— With P.T.O. at 540 rpm	18.64 revs per rear wheel turn
— With P.T.O. at 1000 rpm	30.44 revs per rear wheel turn

LIFT

Type	Hydraulic, draft and position control
Response	Adjustable
Draft control	Lower links through sensing bar
Cylinders	
— Inner	One, single-acting
— Outer	One, single-acting mechanically linked to left lift arm
Pump	Gear, engine driven
Hydraulic fluid	Rear transmission oil
Design lift Capacity, max Lift stroke, max Lift capacity	See Section 50, page 1

Linkage	3 point
Attachment	Category 2
Lower links	Telescoping or quick connect couplings
— Side sway control	Check links

Remote Control Valves

Number	Up to 3
Type	Single and/or double acting, trailer power braking

TOWING ATTACHMENTS

Rear:

- — Swinging drawbar on sector
- — Standard tow hook adjustable for height
- — Standard hitch with swinging drawbar
- — Standard hitch with tow hook and swinging drawbar
- — Rockinger hook, pivotting, with safety-type automatic hitch and lock-up device
- — Rockinger hook, same as above with swinging drawbar

Front:

— Pull hook	Rigid, not usable with front ballast

TYRE SIZES

	980	980 DT
Front	7.50-20	12.4/11-28
Rear	16.9/14-38 18.4/15-34 —	16.9/14-38 18.4/15-34 —

BALLASTING

Front Axle

Support	130 kg (287 lb)
— Cast iron plates	
- 6 x 40 kg (88 lb)	370 kg (816 lb)
- 10 x 40 kg (88 lb)	530 kg (1168 lb)

Rear Wheels

Cast iron rings	
— 2 x 150 kg (275 lb) (All tyre sizes)	300 kg (661 lb)
Cast iron wheel discs	
— 4 x 58 kg (127 lb)	530 kg (1168 lb)
— 6 x 58 kg (127 lb)	650 kg (1433 lb)

BODY

Platform and Operator's Seat

	Four rubber cushion mountings
	Compact, rigid, vibration free, integral, complete with footboards, mudguards, dash and provision for safety frame or cab installation
Fuel tank	Behind seat, boxed between mudguards

Operator's seat

Type	Wrap-around
Suspension	Hydraulic damper
Adjustment	Reach (standard and de-luxe) 11 positions; Height (de-luxe)
Dashboard	13-function instrument panel plus control board
Bonnet	Full enclosing, in four parts
L.H. side section	Access to air cleaner, oil filter and dipstick, brake fluid and battery
R.H. side section	Access to fuel filters, fuel pump, injection pump and steering fluid

Cab

Visibility	All-round
Accessibility	On either side
Rear window	Adjustable
Heating and ventilation	Standard
Protection	Insulated, provision for roof mounted air conditioning system

ELECTRICAL SYSTEM (12 V)

Generating and Starting

Alternator	
— Type	MARELLI AA 125 - 14 V - 45 A - 16
— Rated output	45 A
— Voltage regulator	Electronic, integral
Starter	
— MARELLI	MT 68 LB
— BOSCH	JD → 12 V
Battery	
— Location	Ahead of radiator
— Capacity	132/140 Ah

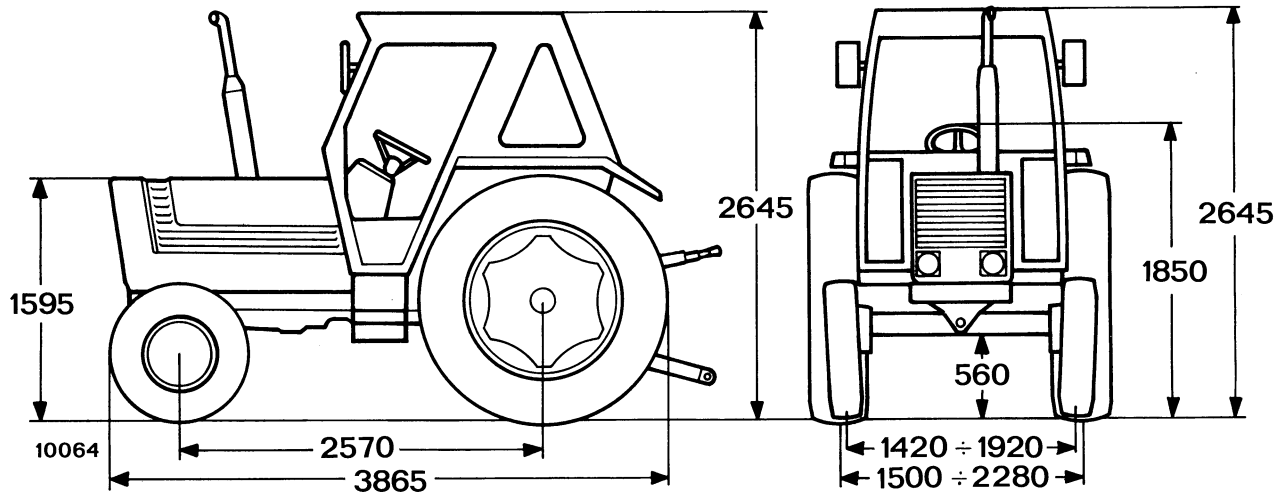
Lighting

Headlamps	Twin, high and asymmetric low beams, 45/40 W
2 front lights	
— Parking	5 W
— Turn signal	21 W
2 Tail lights	
— Parking	5 W
— Turn signal	21 W
— Stop	21 W
— Number plate	L.H. rear light

Instruments and Accessories

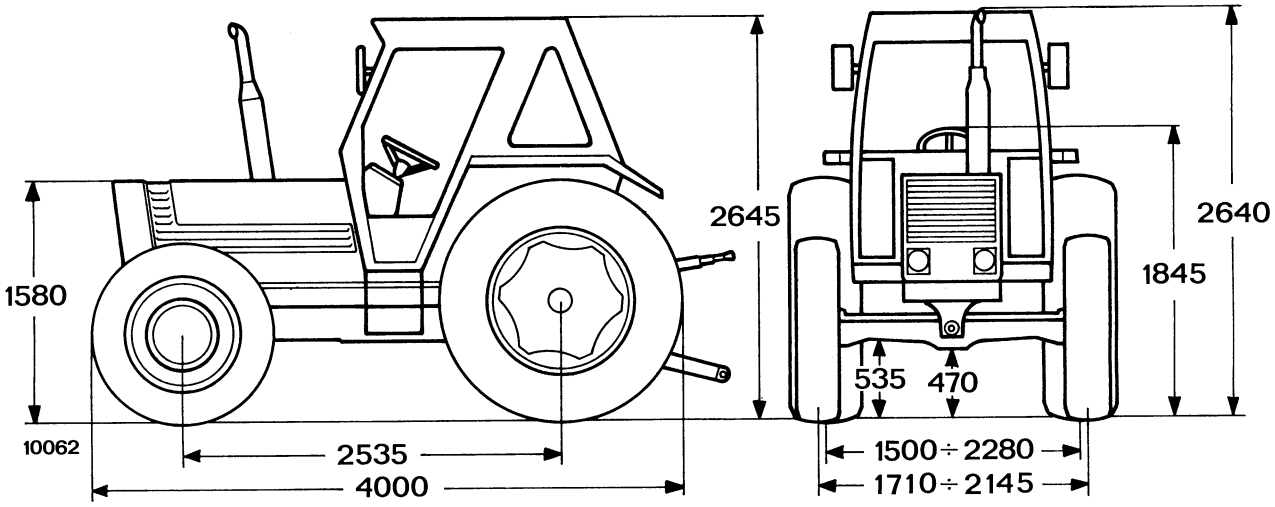
Instrument panel	13-function (see Section 60, page 11 for Models 780 and 880)
Control board	(See Section 60, page 11, for Models 780 and 880)
Floodlight	35 W
Power point	DIN 7 pole
Dash power point	Single pole on control board
Horn	Control board mounted
Cold starting	Thermostarter or start-pilot
Lighter	Dash mounted
Fuses	Maximum 8 (see Section 60, page 11, for Models 780 and 880)
Hazard warning	Tractor and trailers

MAIN DIMENSIONS (in mm)



Model 980

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



Model 980 DT

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

SPECIFICATION

CAPACITIES

DESCRIPTION	LUBRICANTS				
	FIAT Recommended Lubricants	CAPACITY			International Designation
		dm^3 (litri)	kg	pts	
Engine oil (with filter and lines)	**oliofiat AMBRA**	13.6	12.2	23.95	Multigrade detergent mineral oil, MIL-L-2104 B EP characteristics
Sump oil	**20 W/40** above 0° C	11.1	10.5	19.55	
Air cleaner oil (1)	**oliofiat AMBRA**	1.9	1.7	3.35	
Power steering fluid	**10 W/30** below 0 °C	1.7	1.5	2.99	
Transmission oil		12.5	11.3	22	
Live front axle oil (DT):	**oliofiat**				
— Axle casing	**AMBRA 20 W/40**	6	5.4	10.57	
— Final drives (each)		1.7	1.5	2.99	
Brake fluid	**oliofiat AGERTER 10 W**	0.72	0.65	1.27	Single grade oil, MIL-L-2104 C, API CD (Series 3)
Rear transmission (bevel drive, final drives, brakes) and lift oil	**oliofiat AF 87 S**	36.1 (2)	32.5 (2)	Gall 8	Mineral gear oil with stick slip inhibiting properties to MF 1135 and Ford M 2 C 86 A requirements
Front hub grease (each)	**grassofiat MR 3**	—	—	—	Lithium based grease NLGI 3
Clutch withdrawal support grease	**grassofiat G 9**	—	—	—	Lithium-calcium based grease NLGI 2
Lubricator grease		—	—	—	

Coolant (3) water and FIAT **PARAFLU 11**	tractor without cab	20 Litres 35.2 Pts
	tractor with cab	23 Litres 40.5 Pts
Fuel (diesel oil)		116 Litres 25.5 Gals
Windshield washer reservoir with cab (water and FIAT **DP 1**)		2 Litres 3.5 Pts

(1) Change cleaner oil when sediment is 1 cm ($^1/_2$ in) deep

(2) For Model 980 DT oil capacity is 36.7 dm^3 (litres) - 33 kgs (8 gals)

(3) Including expansion tank

ENGINE BLOCK - CYLINDER HEAD

	mm	in
Engine Block		
Engine block bore diameter	102.890 to 102.940	4.0543 to 4.0527
Cylinder sleeve O.D.	103.020 to 103.050	4.0559 to 4.0571
Cylinder sleeve interference fit in block	.080 to .160	.0031 to .0063
Cylinder sleeve O.D. oversize	.2	.0079
Cylinder sleeve bore diameter	100.000 to 100.018 (1)	3.9370 to 3.9378 (1)
Maximum cylinder sleeve bore ovality or taper (2)	.12	.0047
Cylinder sleeve I.D. rebore range	.2-.4-.6-.8	.0079-.0157-.0236-.0315
Camshaft bushing housing bore diameter in block		
— Front	55.280 to 55.305	2.1764 to 2.1773
— Front intermediate	54.780 to 54.805	2.1567 to 2.1577
— Rear intermediate	54.280 to 54.305	2.1370 to 2.1380
— Rear	53.780 to 53.805	2.1173 to 2.1183
Tappet housing bore diameter	15.000 to 15.018	.5905 to .5912
Tappet oversize	.1-.2-.3	.0039-.0079-.0118
Main bearing housing bore diameter	80.587 to 80.607	3.1727 to 3.1735
Cylinder Head		
Valve guide housing bore diameter	13.966 to 13.983	.5498 to .5505
Valve guide oversize	.2	.0079
Valve seat fitted dimensions	See page 3, Section 101, Model 780	
Fuel injector stand-out	1 to 1.5	.0393 to .0590
— Maximum allowance	1.8	.0709
Valve stand-in	.7 to 1.1	.275 to .0433
— Maximum stand-in allowance	1.4	.0551
Cylinder head height	92	3.6220
Maximum cylinder head dressing allowance	.5	.0197

(1) After finishing in position. Sleeves may be finished to .1 mm or .004 inch. oversize in production, in which case they are matched to corresponding oversize pistons

(2) Measurement to be carried out over the swept area both parallel and at right angles to engine centreline

CRANK GEAR

	mm	in
Crankshaft - Bearings		
Main journal diameter	76.187 to 76.200 (1)	2.9994 to 2.9999 (1)
Main journal undersize range	.254-.508-.762-1.016	.0099-.0199-.0299-.0399
Main bearing thickness	2.162 to 2.172	.0851 to .0855
Main bearing bore undersize range	.254-.508-.762-1.016	.0099-.0199-.0299-.0399
Main journal clearance in bearings	.043 to .096	.0017 to .0038
— Maximum wear clearance	.180	.0071
Crankpin diameter	58.730 to 58.743 (1)	2.3122 to 2.3127 (1)
Crankpin undersize range	.254-.508-.762-1.016	.0099-.0199-.0299-.0399
Big end bearing thickness	1.805 to 1.815	.0711 to .0715
Big end bore undersize range	.254-.508-.762-1.016	.0099-.0199-.0299-.0399
Crankpin running clearance in big end bearings	.035 to .080	.0014 to .0031
— Maximum wear clearance	.180	.0071
Crankshaft thrust washer thickness	3.378 to 3.429	.1330 to .1350
Crankshaft thrust washer thickness oversize range	.127	.0050
Width of main bearing housing over thrust washers	31.766 to 31.918	1.2506 to 1.2566
Length of corresponding main journal	32.000 to 32.100	1.2598 to 1.2638
Crankshaft end float	.082 to .334	.0032 to .0131
— Maximum wear end float	.40	.0158
Maximum main journal and crankpin ovality or taper after grinding	.01	.0004
Maximum main journal and crankpin ovality or taper due to wear	.05	.0020
Maximum main journal misalignment with end journals over V-blocks and shaft throws 1 and 6 vertical up (TIR)	.10	.0039
Maximum crankpin misalignment relative to main journals (in both directions)	.25	.0098
Maximum tolerance on distance from outer crankpin edge to crankshaft centreline	± .10	± .0039

(1) .1 mm or .004 inch undersize crankpin and main journal crankshafts may be fitted in production, in which case they are matched to corresponding undersize bearings.

CRANK GEAR

Continued

	mm	in
Crankshaft flange run-out on periphery (TIR) - A, page 1, Section 103	.025	.0098
Crankshaft flange eccentricity (TIR) - B, page 1, Section 103	.04	.0016
Connecting Rods		
Small end bore diameter	35.861 to 35.899	1.4118 to 1.4133
Small end bushing O.D.	35.979 to 36.017	1.4165 to 1.4180
Bushing interference fit in small end	.080 to .156	.0031 to .0061
Small end bushing fitted I.D. after finishing	32.005 to 32.012	1.2600 to 1.2603
Big end bore diameter	62.408 to 62.420	2.4570 to 2.4575
Connecting rod axis misalignment at 125 mm or 5 inch from body centreline	± .07	± .0028
Maximum weight variation between connecting rods of same engine	25 grams	1 oz.
Pistons		
Piston diameter 50 mm or 2 inch from base of skirt at right angles to pin	99.828 to 99.840	3.9302 to 3.9307
Piston clearance in cylinder sleeve	.160 to .190	.0063 to .0075
— Maximum wear clearance	.30	.0118
Piston oversize range	.2-.4-.6-.8	.0079-.0156-.0236-.0315

CRANK GEAR

Continued

	mm	in
Piston pin diameter	31.983 to 31.990	1.2592 to 1.2594
Pin housing bore diameter in piston	31.993 to 32.000	1.2596 to 1.2598
Pin clearance in piston	.003 to .017	.0001 to .0007
Pin diameter oversize range	.2-.5	.0079-.0197
Piston pin clearance in small end bushing	.015 to .029	.0006 to .0011
— Maximum wear clearance	.06	.0024
Maximum weight difference over complete set of pistons	20 grams	.7874 oz.
Piston ring clearance in groove		
— Top	.090 to .122	.0035 to .0048
— Second	.050 to .082	.0020 to .0032
— Third	.040 to .072	.0016 to .0028
Maximum wear clearance		
— Top	.50	.0197
— Second and third	.20	.0079
Piston ring gap		
— Top	.35 to .55	.0138 to .0216
— Second	.30 to .45	.0118 to .0177
— Third	.25 to .40	.0098 to .0157
Maximum wear gap	1.20	.0472

VALVE GEAR

	mm	in
Timing Gears		
Timing gear backlash	.08	.0031
Idler gear jackshaft diameter	31.975 to 32.000	1.2588 to 1.2599
Gear bushing fitted I.D. after reaming	32.050 to 32.075	1.2618 to 1.2628
Jackshaft clearance in gear bushing	.050 to .100	.0019 to .0039
— Maximum wear clearance	.15	.0059
Bushing interference fit in idler gear	.063 to .140	.0024 to .0055
Lift and steering pump drive gear shaft diameter	36.975 to 37.000	1.4557 to 1.4566
Gear bushing fitted I.D. after reaming	37.050 to 37.075	1.4586 to 1.4596
Shaft clearance in bushings	.050 to .100	.0019 to .0039
Bushing interference fit in housing	.063 to .140	.0024 to .0055
Pump drive gear thrust washer thickness	1.45 to 1.50	.0570 to .0590
Camshaft		
Camshaft bushing O.D.		
— Front	55.375 to 55.430	2.1801 to 2.1822
— Front intermediate	54.875 to 54.930	2.1604 to 2.1625
— Rear intermediate	54.375 to 54.430	2.1407 to 2.1429
— Rear	53.875 to 53.930	2.1210 to 2.1232
Bushing interference fit in block	.070 to .150	.0027 to .0059
Camshaft bushing fitted I.D. after reaming		
— Front	51.580 to 51.630	2.0307 to 2.0326
— Front intermediate	51.080 to 51.130	2.0110 to 2.0129
— Rear intermediate	50.580 to 50.630	1.9913 to 1.9933
— Rear	50.080 to 50.130	1.9716 to 1.9736
Camshaft journal diameter		
— Front	51.470 to 51.500	2.0263 to 2.0275
— Front intermediate	50.970 to 51.000	2.0066 to 2.0078
— Rear intermediate	50.470 to 50.500	1.9870 to 1.9881
— Rear	49.970 to 50.000	1.9673 to 1.9685
Camshaft journal clearance in bushing	.080 to .160	.0031 to .0062
Maximum wear clearance	.20	.0078
Camshaft end float at thrust plate	.070 to .220	.0028 to .0087
Tappets		
Tappet O.D.	14.950 to 14.970	.5886 to .5894
Tappet clearance in housing	.030 to .068	.0012 to .0027
— Maximum wear clearance	.15	.0059
Tappet oversize range	.1-.2-.3	.0039-.0079-.0118

VALVE GEAR

Continued

	mm	in
Rocker Arms		
Rocker bushing O.D.	21.006 to 21.031	.8270 to .8279
Rocker bore diameter	20.939 to 20.972	.8243 to .8256
Bushing interference fit in rocker	.034 to .092	.0013 to .0036
Rocker bore diameter	18.016 to 18.034	.7092 to .7099
Rocker shaft diameter	17.982 to 18.000	.7079 to .7086
Rocker shaft clearance in rocker	.016 to .052	.0006 to .0020
— Maximum wear clearance	.15	.0059
Rocker spacer spring length		
— Free	59.5	2.342
— Under 46 to 52 N (4.7 to 5.3 kg or 10.5 to 11.9 lb)	44	1.732
Valves, Guides and Springs		
Valve head diameter — Intake	43.750 to 44.000	1.7263 to 1.7323
Valve head diameter — Exhaust	36.750 to 37.000	1.4468 to 1.4567
Valve stem diameter	7.985 to 8.000	.3143 to .3149
Valve face angle	45° 30′ ± 7′	
Valve clearance — For timing check	.45	.0177
Valve clearance — Normal, regardless of engine temperature — Intake	.25	.0098
Valve clearance — Normal, regardless of engine temperature — Exhaust	.35	.0137
Cam lift — Intake	5.250	.2066
Cam lift — Exhaust	5.777	.2274
Valve lift — Intake	9.3	.3661
Valve lift — Exhaust	10.2	.4015
Valve guide O.D.	13.988 to 14.016	.5507 to .5518
Valve guide O.D. oversize	.2	.0078
Valve guide interference fit in cylinder head	.005 to .050	.0002 to .0020

VALVE GEAR

Continued

	mm	in
Valve guide fitted I.D. after reaming	8.023 to 8.038	.3158 to .3164
Valve stem clearance in guide	.023 to .053	.0009 to .0020
— Maximum wear clearance	.13	.0051
Maximum valve stem eccentricity over one revolution with stylus on sealing face	.04	.0015
Intake and exhaust valve spring length		
— Free	66.5	2.618
— Valve closed, under 295 to 332 N (30.1 to 33.9 kg or 67.7 to 76.3 lb)	41	1.614
— Valve open, under 472 to 511 N (48.1 to 52.1 kg or 108.2 to 117.2 lb)	30.8	1.212

LUBRICATION SYSTEM

Oil Pump	Gear, crankshaft driven	
Pump drive ratio	1.264 to 1	
Oil pressure, warm at governed speed	2.9 to 3.9 bar (3 to 4 kg/cm^2) (41 to 57 psi)	
Relief valve crack-off setting	3.5 bar (3.6 kg/cm^2) (50 psi)	
Drive shaft clearance in bushings	.016 to .070	.0006 to .0027
Shaft clearance in driven gear bushing after fitting	.016 to .054	.0006 to .0021
Pump gear backlash	.10	.0039
Gear clearance in pump body	.030 to .134	.0011 to .0052
Drive and driven gear thickness	15.973 to 16.000	.628 to .629
Depth of gear recess in pump body	16.016 to 16.080	.630 to .633
Drive and driven gear end float	.016 to .107	.0006 to .0042

LUBRICATION SYSTEM

Continued

	mm	in
Relief valve spring length		
— Free	45	1.77
— Under 88 to 94 N (9 to 9.6 kg, 20.3 to 21.6 lb)	30.5	1.20
Oil Filters	Strainer on pump inlet and cartridge on pump outlet	

COOLING SYSTEM

Water Pump	Centrifugal, vane-type	
Pump drive ratio	1.408 to 1	
Shaft interference fit in impeller	.027 to .060	.0010 to .0023
Shaft interference fit in fan hub	.015 to .061	.0006 to .0024
Face sealing bushing interference in impeller	.015 to .058	.0006 to .0023
Water Temperature Regulator	Wax-type thermostat BEHR-THOMSON or SAVARA or FLEXIDER	
Opening temperature	79 ± 2 °C	
Fully open at	95 °C	
Valve travel when fully open	7.5	.29
Radiator	Four deep, vertical tube and copper fin	
Expansion tank	Semi-transparent plastic	
Fan	Suction, sheet metal, 4 blade	
Water Temperature Gauge	Coloured scale divided in 3 sectors	
Temperature range of each sector		
— White	30 to 65 °C	
— Green	65 to 105 °C	
— Red	105 to 115 °C	

FUEL SYSTEM

Feed Pump	Double diaphragm	
Operation	Engine driven	
Minimum fuel flow at 1600 rpm	100 lt/hour - 22 gall/hour	
Drive shaft eccentricity	3 mm	.118 in
	mm	**in**
Feed Pump and Injection Pump Drive		
Hollow drive shaft journal diameter	49.975 to 50.000	1.9675 to 1.9685
Bushing fitted I.D. after finishing	50.050 to 50.075	1.9705 to 1.9714
Hollow shaft clearance in bushings	.050 to .100	.0020 to .0039
Bushing interference fit	.066 to .142	.0026 to .0056
Thrust washer thickness	1.45 to 1.50	.0570 to .0590
Hollow shaft retainer washer thickness	2.93 to 3.00	.1153 to .1181
Injection Pump	Distributor-type, with integral governor	
BOSCH type — Up to engine 990136	EP/VA 6/11 H 1200 CR 185-4-4745851	
BOSCH type — From engine 990137	EP/VA 6/11 H 1200 CR 185-4-4752192	
Direction of rotation	Clockwise	
Firing order	1 - 5 - 3 - 6 - 2 - 4	
Fuel Injectors		
— Type — FIAT	EPPZ10F1-770577	
— Type — BOSCH	EPPZ50F3-771064	
— Type — C.A.V.	EPPZ60F3-770897	
— Type — O.M.A.P.	EPPZ70F3-770957	
— FIAT — Nozzle holder type	KB70S1F10-767107	
— FIAT — Spray nozzle type	DLL140S64F-770578	
— BOSCH — Nozzle holder type	KBL70S177/4-771065	
— BOSCH — Spray nozzle type	DLLA141S662-771066	
— C.A.V. — Nozzle holder type	BKBL69S5376-770899	
— C.A.V. — Spray nozzle type	BDLL140S6655-770902	
— O.M.A.P. — Nozzle holder type	OKLL70S2974-770958	
— O.M.A.P. — Spray nozzle type	OLL140S64F-770959	
Number of spray orifices	3	
Spray orifice diameter	.35 mm	.0137 in
Release pressure	221 to 230 bar (225 to 235 kg/cm²) (3,200 to 3,342 psi)	
Delivery pipes		
— Type	PRR 25 F 24 Z - 770913	
— Pipe size	1.5 x 6 x 650 mm	.059 x .23 x 25.60 in

CALIBRATION DATA - BOSCH INJECTION PUMP TYPE EP/VA/6/11 H 1200 CR 185-4-4745851 (up to Engine 990136)

ASSEMBLY DATA

Pump rotation (drive end)	Clockwise
Firing order	1-5-3-6-2-4
Plunger lift to spill cut-off	.5 ± .02 mm (.0197 ± .0008 in)
Pump timing B.T.D.C. cylinder No. 1 on compression stroke	13° ± 1°
Delivery connection to cylinder No. 1 on pump	Identified by letter A

TEST PLAN AND CALIBRATION DATA

Procedure A

BOSCH test machine fitted with WSF 2044/4 X injector springs and EFEP 182 spray nozzles.
RABOTTI test machine with FIAT injector springs **656829** and EFEP 182 spray nozzles.

Release pressure	150 bar (153 kg/cm² or 2177 psi)
Piping	2 x 6 x 840 mm (.078 x .472 x 33 in)
Test fluid: FIAT CFB	at 40° + 5° C

(for lower temperatures: .25 cc/1000 shots more per degree)

Pump inlet pressure	.2 kg/cm² (2.8 psi)

Test No.	Lever position L_1 = Shuttle L_2 = Throttle	Speed	Transfer pressure	Advance piston stroke (*)	PROCEDURE A		PROCEDURE B	
					Delivery			
					Injector	Leak back	Injector	Leak back
		rpm	kg/cm²	mm	cm³/1000 shots	cm³/100 shots	cm³/1000 shots	cm³/100 shots
1	L_1 = Shut-off L_2 = Full	800 ± 5	—	—	0	—	—	—
2	L_1-L_2 = Full	800 ± 5	—	—	59.5 to 61.5	—	—	—
3	L_1-L_2 = Full	1250	—	—	37 to 45	—	—	—
4	—	100	.6 to 1.1	—	—	—	—	—
5		800 ± 5	4.2 to 4.7	—	—	—	—	—
6		1200	6 to 6.5	—	—	—	—	—
7	L_1-L_2 = Full	250	—	—	⩽ 52	—	—	—
8	L_1-L_2 = Full	100	—	—	⩾ 130	—	—	—
9	—	250 to 400	—	0 start	—	—	—	—
10		800 ± 5	—	4 to 5	—	—	—	—
11		1050 to 1100	—	7.5 end	—	—	—	—
12	L_1 = Full	1300 to 1350	—	—	0	—	—	—
13	L_2 = Full (1)	1250	—	—	37 to 45	—	—	—
14	L_1 = Full (2) L_2 = Full	1200^{+0}_{-20}	—	—	54 to 56 (•)	—	—	—
15		1000	—	—	—	20 to 50	—	—
16		800 ± 5	—	—	59.5 to 61.5	—	—	—
17		500	—	—	55 to 57	45 to 70	—	—
18	L_1 = Full	400 to 500	—	—	0	—	—	—
19	L_2 = Idle	350	—	—	12 to 22	—	—	—

(*) Measure with gauge **292817**
(•) Maximum spread 2.5 cc/1000 shots
(1) Adjust maximum speed stop screw
(2) Adjust maximum fuelling stop screw
(3) Adjust idle stop screw

CALIBRATION DATA - BOSCH INJECTION PUMP TYPE EP/VA 6/11 H 1200 CR 185-4-4752192 (as from Engine 990137)

ASSEMBLY DATA

Pump rotation (drive end)	Clockwise
Firing order	1-5-3-6-2-4
Plunger lift to spill cut-off	.5 ± .02 mm (.0197 ± .0008 in)
Pump timing B.T.D.C. cylinder No. 1 on compression stroke	7° ± 1°
Delivery connection to cylinder No. 1 on pump	Identified by letter A

TEST PLAN AND CALIBRATION DATA

Procedure A

BOSCH test machine fitted with WSF 2044/4 X injector springs and EFEP 182 spray nozzles.

RABOTTI test machine with FIAT injector springs **656829** and EFEP 182 spray nozzles.

Release pressure	150 bar (153 kg/cm² or 2177 psi)
Piping	2 x 6 x 840 mm (.078 x .472 x 33 in)
Test fluid: FIAT CFB	at 40° + 5° C

(for lower temperatures: .25 cc/1000 shots more per degree)

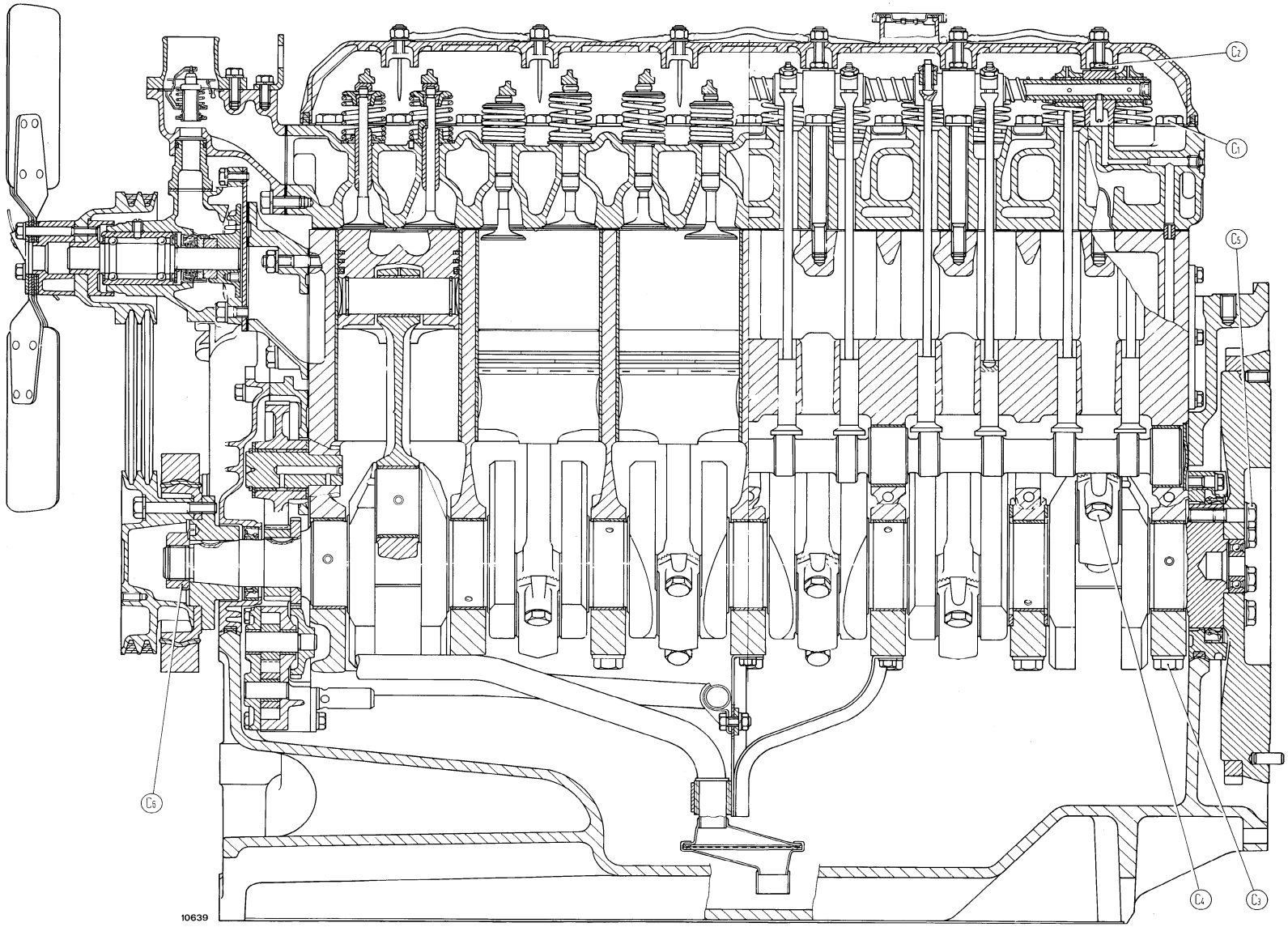
Pump inlet pressure	.2 kg/cm² (2.8 psi)

Test No.	Lever position L_1 = Shuttle L_2 = Throttle	Speed rpm	Transfer pressure kg/cm²	Advance piston stroke (*) mm	PROCEDURE A Delivery Injector cm³/1000 shots	PROCEDURE A Delivery Leak back cm³/100 shots	PROCEDURE B Delivery Injector cm³/1000 shots	PROCEDURE B Delivery Leak back cm³/100 shots
1	L_1 = Shut-off L_2 = Full	800 ± 5	—	—	0	—	—	—
2	L_1-L_2 = Full	800 ± 5	—	—	60 to 62	—	—	—
3	L_1-L_2 = Full	1250	—	—	37 to 45	—	—	—
4	—	100	.6 to 1.1	—	—	—	—	—
5	—	800 ± 5	4.2 to 4.7	—	—	—	—	—
6	—	1200	6 to 6.5	—	—	—	—	—
7	L_1-L_2 = Full	250	—	—	⩽ 52	—	—	—
8	L_1-L_2 = Full	100	—	—	⩾ 130	—	—	—
9	—	250 to 400	—	0 start	—	—	—	—
10	—	800 ± 5	—	4 to 5	—	—	—	—
11	—	1050 to 1100	—	7.5 end	—	—	—	—
12	L_1 = Full	1300 to 1350	—	—	0	—	—	—
13	L_2 = Full (1)	1250	—	—	37 to 45	—	—	—
14	L_1 = Full (2) L_2 = Full	1200^{+0}_{-20}	—	—	58 to 60 (•)	—	—	—
15	L_1 = Full (2) L_2 = Full	1000	—	—	—	20 to 50	—	—
16	L_1 = Full (2) L_2 = Full	800 ± 5	—	—	60 to 62	—	—	—
17	L_1 = Full (2) L_2 = Full	500	—	—	55 to 57	45 to 70	—	—
18	L_1 = Full	400 to 500	—	—	0	—	—	—
19	L_2 = Idle	350	—	—	12 to 22	—	—	—

(*) Measure with gauge **292817**
(•) Maximum spread 2.5 cc/1000 shots
(1) Adjust maximum speed stop screw
(2) Adjust maximum fuelling stop screw
(3) Adjust idle stop screw

TORQUE DATA

DESCRIPTION	Thread Size	Torque Data		
		Nm	kgm	ft lb
Engine Block and Cylinder Head - Valve Gear - Crank Gear - Section 10				
Capscrew, cylinder head (C_1, page 13)	M 12 x 1.25	147	15	108
Capscrew, rocker shaft brackets (C_2)	M 8 x 1.25	24	2.5	18
Capscrew, main bearing cap (C_3)	M 14 x 1.5	147	15	108
Capscrew, connecting rod cap (C_4)	M 12 x 1.25	108	11	80
Capscrew, engine flywheel (C_5)	M 12 x 1.25	118	12	87
Nut, crankshaft damper hub (C_6)	M 30 x 1.5	294	30	217
Fuel System - Section 104				
Nut, BOSCH injection pump shaft toothed bushing	M 12 x 1.75	64	6.5	47
Capscrew, injection pump drive gear to hollow shaft	M 8 x 1.25	29	3	22
Capscrew, injection pump drive gear support	M 8 x 1.25	24	2.5	18
Capscrew, injection pump to support	M 8 x 1.25	24.5	2.5	18



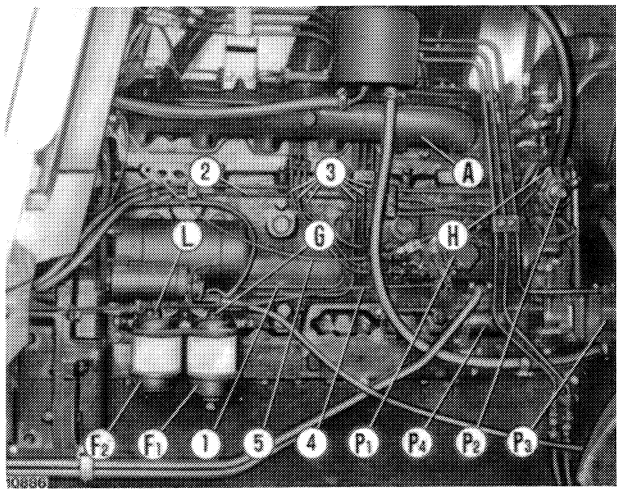
Longitudinal Section through Engine

DESCRIPTION

Identical with description given on page 1, Section 100, tractor Model 780 except for the following:

— Crankshaft running on 7 bearings instead of 5.

— Dynamic balancer not fitted to 6-cylinder engine because not required.



Right Hand Side View of Engine

A. Intake manifold - F_1. First fuel filter - F_2. Second fuel filter - P_1. Distributor injection pump - P_2. Diaphragm-type feed pump - P_3. Steering pump - P_4. Lift pump - 1. Fuel line to pump - 2. Leak back line - 3. Fuel delivery lines - 4. Throttle linkage - 5. Shut-off linkage

ON-BENCH PERFORMANCE DATA

Test Plan

Engine on bench with fan, air cleaner and exhaust silencer removed.

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

Ambient temperature	20 ± 3 °C
Relative humidity	70% ± 5%
Fuel density	830 ± 10 g/litre
Pump timing	B.T.D.C.
BOSCH pump	
— Up to engine 990136	13° ± 1°
— From engine 990137	7° ± 1°

Injection Pump up to Engine 990136

Throttle	Engine rpm	kW		Time to burn 250 cm³ (15 in³) of fuel (seconds)
		2-hour run-in	50-hour run-in	
Maximum (full load)	2400	⩾ 67 (91 HP) (°)	⩾ 69.9 (95 HP)	⩾ 45
Maximum (full torque)	1200	⩾ 34.6 (47 HP) (°)	⩾ 35.3 (48 HP)	⩾ 89.4
Maximum (no-load)	⩽ 2650	—	—	—
Minimum (no-load)	650 to 700	—	—	—

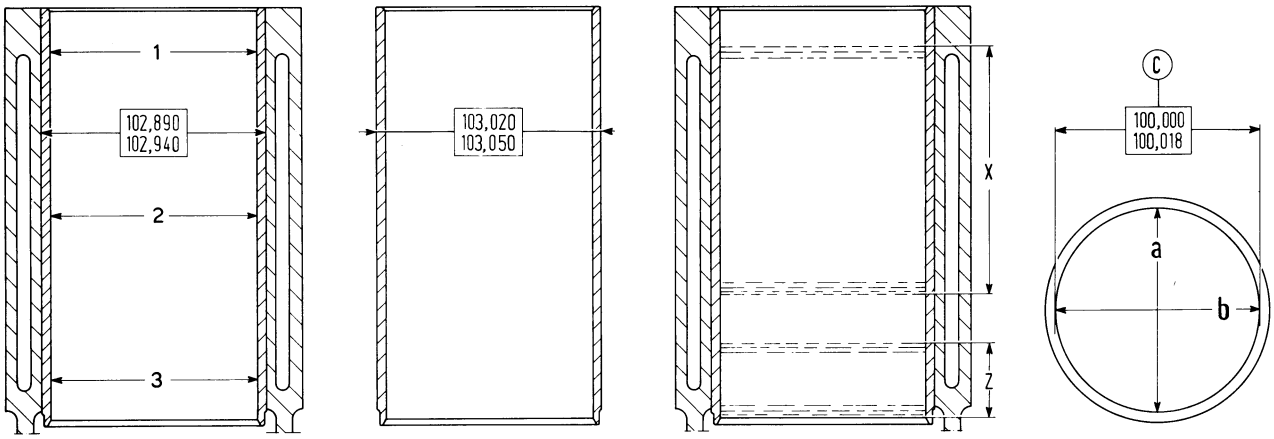
Injection Pump from Engine 990137

Throttle	Engine rpm	kW		Time to burn 250 cm³ (15 in³) of fuel (seconds)
		2-hour run-in	50-hour run-in	
Maximum (full load)	2400	⩾ 67 (91 HP) (°)	⩾ 69.9 (95 HP)	⩾ 43
Maximum (full torque)	1800	⩾ 56.7 (77 HP) (°)	⩾ 58.1 (79 HP)	⩾ 53.4
Maximum (no-load)	⩽ 2700	—	—	—
Minimum (no-load)	600 to 650	—	—	—

(°) Anticipated

CYLINDER SLEEVES

Adhere to the instructions given on pages 1 and 2, Section 101, tractor Model 780 and table on page 1, Section 10. The illustration below replaces the corresponding figure on page 1, Section 101, referring to Model 780.
Sleeve remover plate 293349 is to be replaced with plate **292507.**



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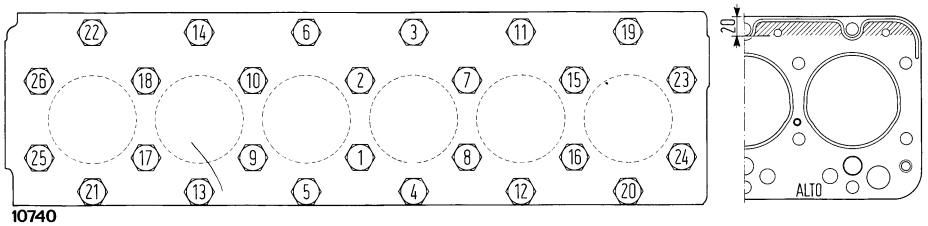
Sleeve and Block Inspection Data

a/b. Sleeve bore measurement at right angles - 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.

CYLINDER HEAD

Identical with text and illustrations of pages 3 and 4, Section 101, tractor Model 780 and table on page 1, Section 10. The illustration given below replaces corresponding figure on page 4, Section 101, tractor Model 780.



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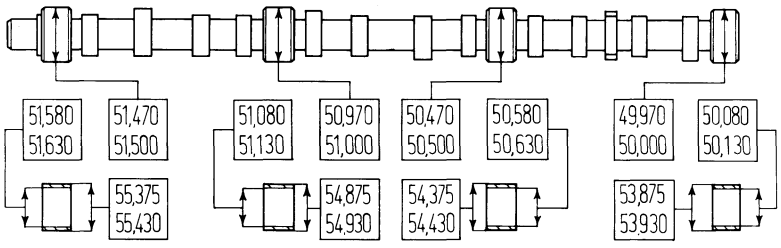
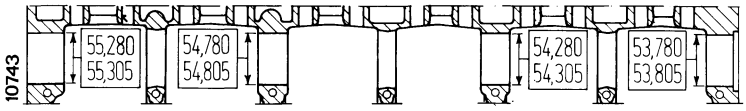
Cylinder Head Tightening Diagram and Scrap View of Head Gasket

Note: Shaded area on gasket and associated dimensions in mm indicate adhesive surface applied in production

CAMSHAFT - TIMING GEARS

Identical with descriptions and illustrations on pages 1 and 3, Section 102, tractor Model 780 and associated table on page 5, Section 10. The illustrations given below replace the corresponding figures on pages 1 and 3, Section 102, tractor Model 780.



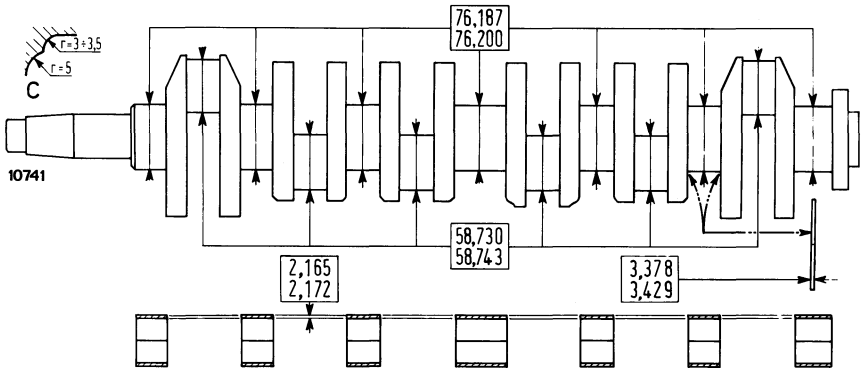


Camshaft, Bushing and Housing Details

Note: Bushing fitted I.D. indicated

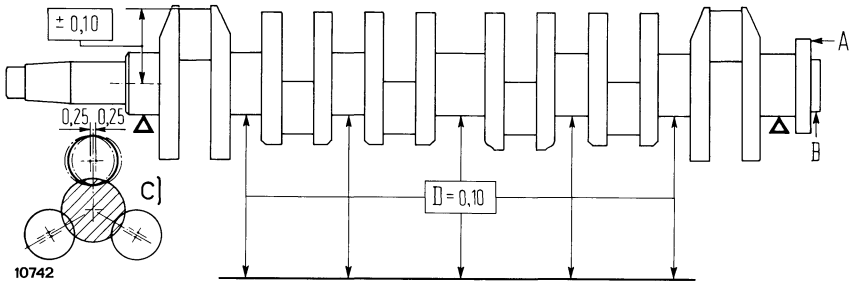
CRANKSHAFT

Adhere to the instructions given on pages 1 and 2, Section 103, tractor Model 780 and associated table on page 2, Section 10.
Illustrations given below replace corresponding figures on pages 1 and 2, Section 103, tractor Model 780.



Crankshaft Journal, Bearing and Thrust Washer Details

c. Main journal and crankpin fillet radius details



Main Journal and Crankpin Alignment Details (C)

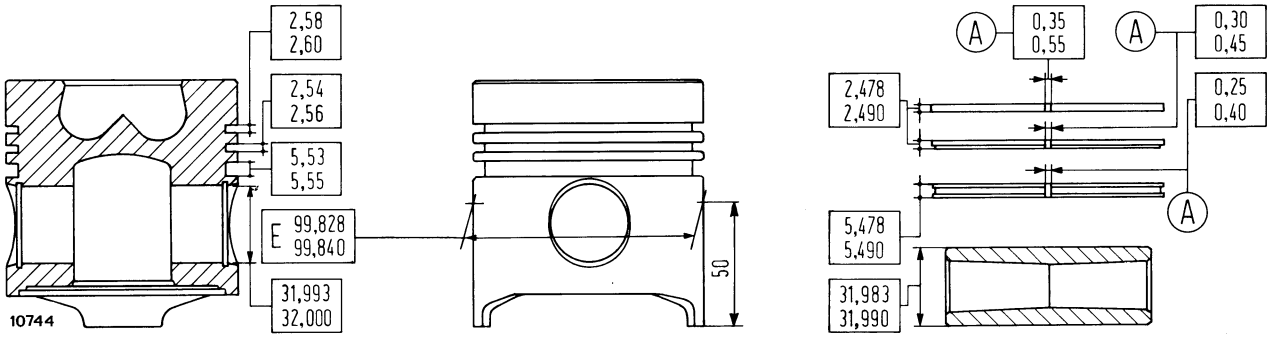
A/B. Stylus position for flange run-out and eccentricity - D. Maximum main journal misalignment with crankpins 1 and 6 vertical up.

Front and Rear Crankshaft Seals

Adhere to instructions given on page 2, Section 103, tractor Model 780 and refer to the illustration on page 13, Section 10.

PISTONS AND RINGS

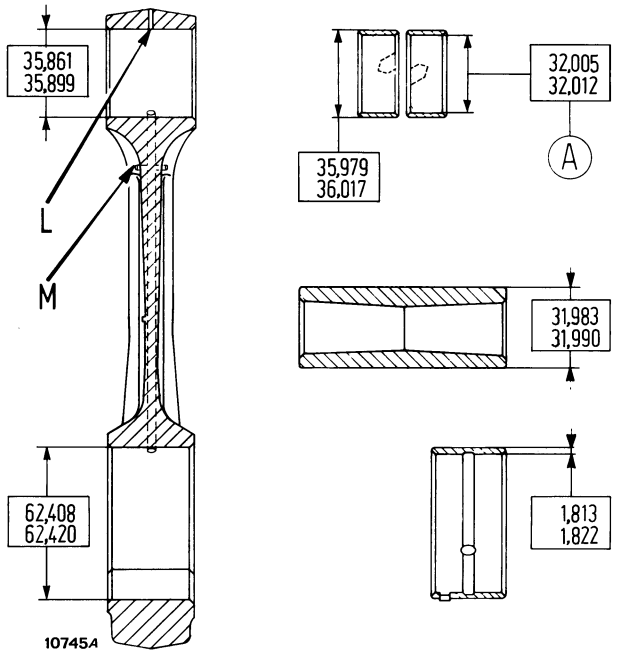
Identical with the descriptions and illustrations given on pages 3 and 4, Section 103, tractor Model 780, and associated table on page 3, Section 10. The illustration given below replaces the corresponding figure on page 3, Section 103, tractor Model 780.
For ring removal and installation, use expander **291159** instead of expander 292410 used for model 780.



Piston, Pin and Ring Details

A. Piston ring fitted gap - E. Piston diameter as measured 50 mm (2 inch) from base of skirt

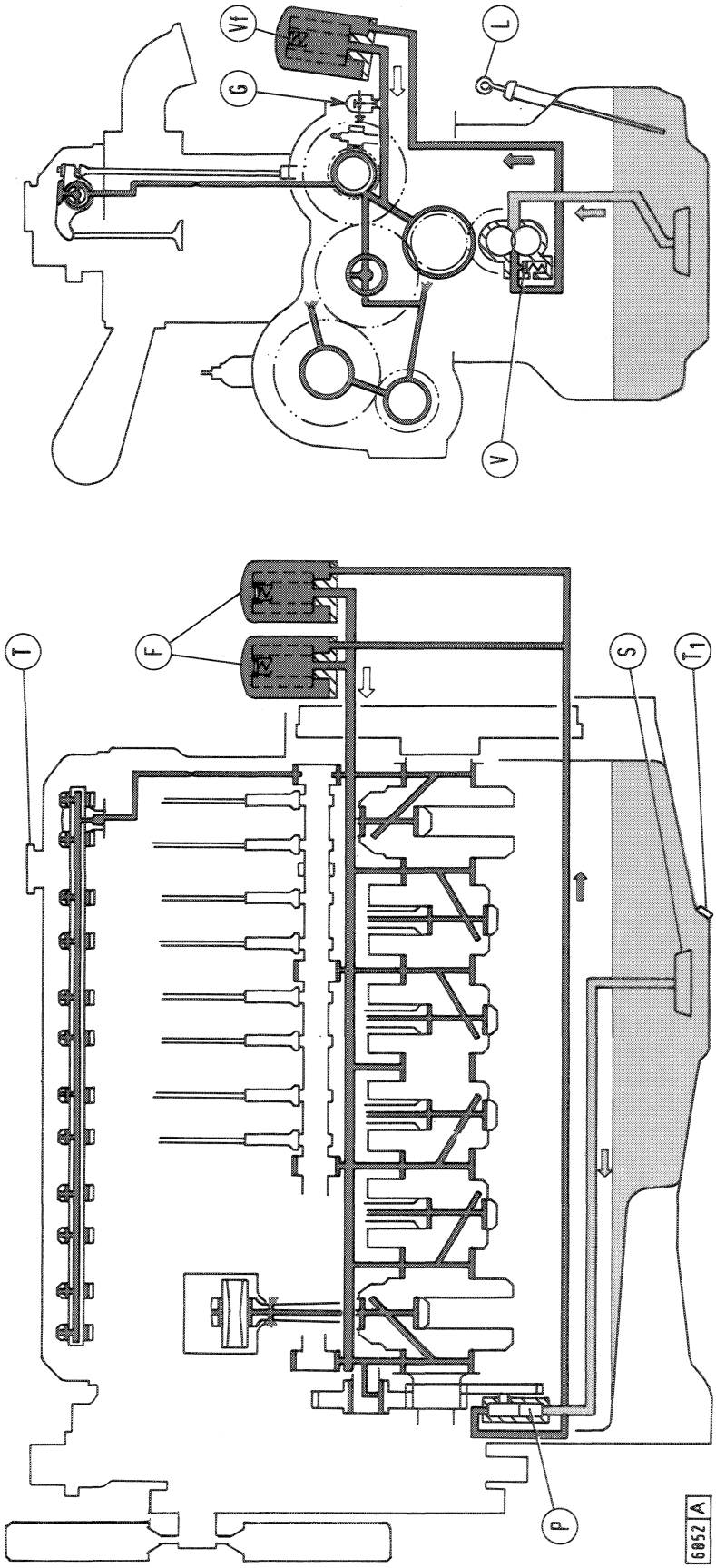
CONNECTING RODS



See descriptions and illustrations given on pages 4 and 5, Section 103, tractor Model 780 and associated table on page 3, Section 10.
The illustration given below supersedes the corresponding figure on page 4, Section 103, tractor Models 780.

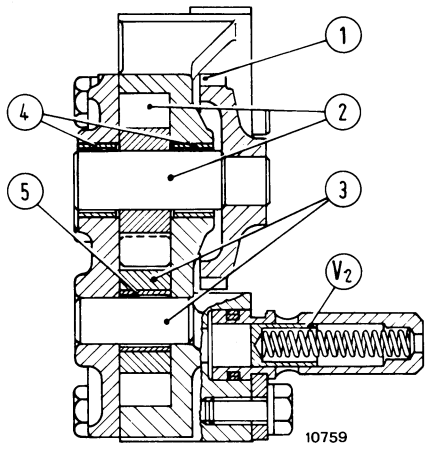
Connecting Rod, Big End Bearing, Small End Bushing and Piston Pin Details

A. Fitted dimension after reaming - L/M. Lubricant ways



Lubrication System Diagram

F. Filters - G. Low engine oil pressure sending unit - L. Dipstick - P. Pump - S. Suction filter - T. Oil filler plug - T_1. Drain plug - V. Oil pressure relief valve - Vf. Filter by-pass valve (cuts in when inlet pressure is 1.5 to 1.7 kg/cm² or 20 to 23 psi higher than outlet pressure)



OIL PUMP

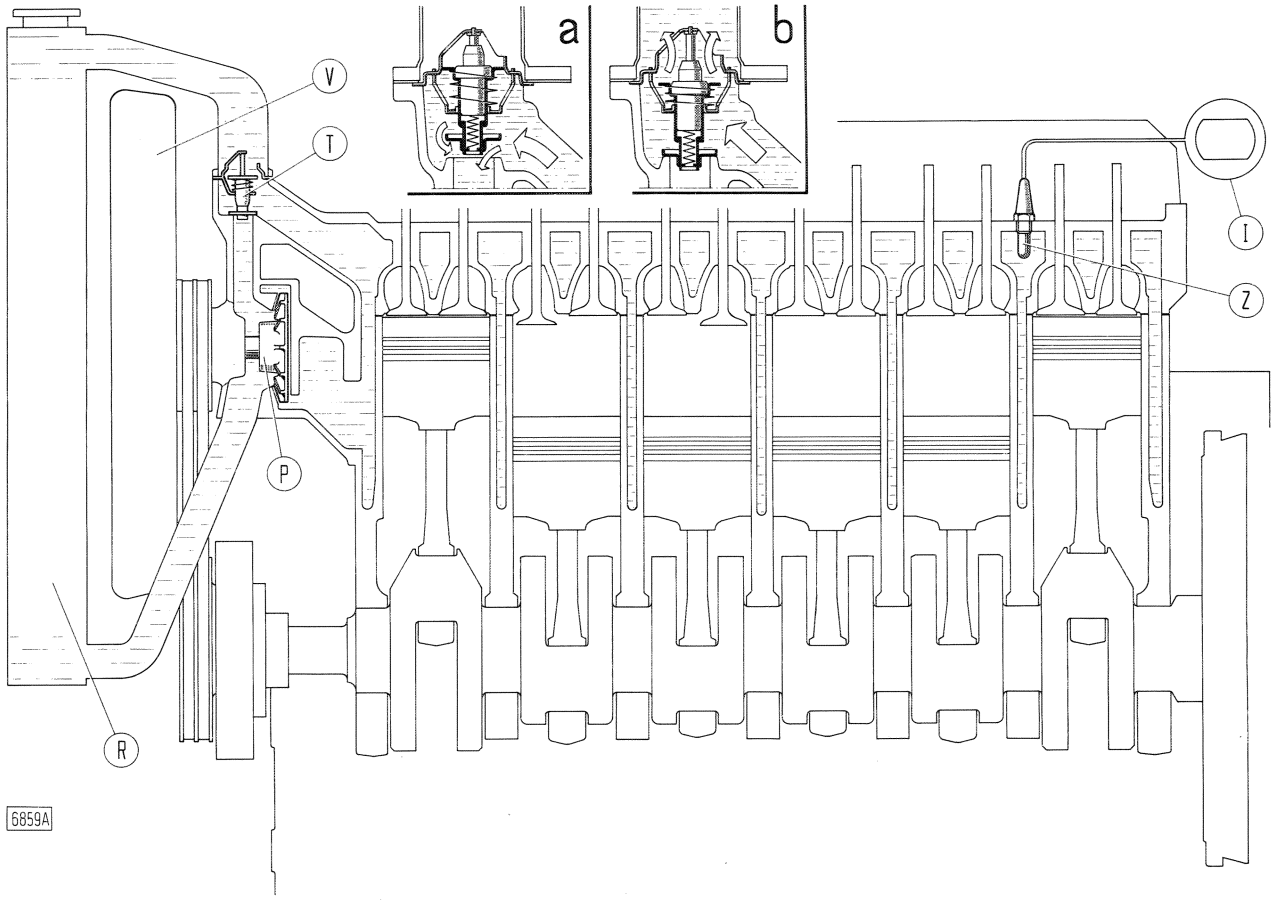
The oil pump is accessible after removing the engine oil sump.
In the course of overhaul, assess the amount of wear affecting the various components by comparison to the dimensions given in the table on page 7, Section 10.

Sections through Engine Oil Pump

V_2. Relief valve - 1. Outer drive gear - 2. Pump drive shaft and gear - 3. Pump driven shaft and gear - 4. Drive shaft bushings - 5. Driven shaft bushing

OIL FILTER - LOW ENGINE OIL PRESSURE SENDING UNIT

Adhere to the instructions given on page 3, Section 105, tractor Model 780. On Model 980, engine oil is filtered by means of 2 integral paper cartridges (placed side by side) of the full flow type inserted on pump delivery side as shown on page 1.



Cooling System Diagram

a. Thermostat closed - b. Thermostat open - I. Engine water temperature gauge - P. Pump - R. Radiator - T. Thermostat - V. Fan - Z. Sending unit

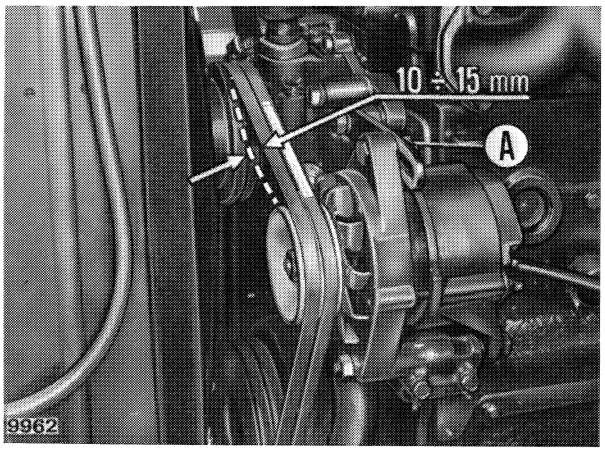
TO ADJUST BELT TENSION

The fan/water pump/alternator belt tension is correct when a deflection of 10 to 15 mm ($^1/_2$ inch) is obtained by applying a 108 to 128 N (11 to 13 kg or 24 to 28 lbs) load on the belt section between alternator and water pump.

To adjust, proceed as follows:

— Slacken alternator nut (A) on tensioner.

— Swing the alternator about tensioner until the correct belt tension is obtained, and retighten nut (A).



Adjusting Fan, Water Pump and Alternator Drive Belt Tension

A. Alternator retaining nut on tensioner.

SIDE FINAL DRIVES

Type	Planetary, three planet, spur
Reduction ratio	14 : (14 + 70) = 1 : 6
Planet thrust washer thickness	1 mm (.040 in)
Planet needle roller bearing spacer thickness	6.950 to 7.000 mm (.2736 to .2756 in)
Final drive carrier end float adjustment	See page 2, Section 206, tractor Models 780 - 880
Final drive carrier shim thickness	4.55-4.65-4.75-4.85-4.95-5.05-5.15-5.25-5.35-5.45-5.55-5.65-5.75 mm (.1791-.1831-.1870-.1909-.1949-.1988-.2027-.2067-.2106-.2146-.2185-.2224-.2264 in)

POWER TAKE OFF

540/1000 rpm P.T.O.

Identical with the data given on page 10, Section 20, tractor Models 780 and 880, except for the following:

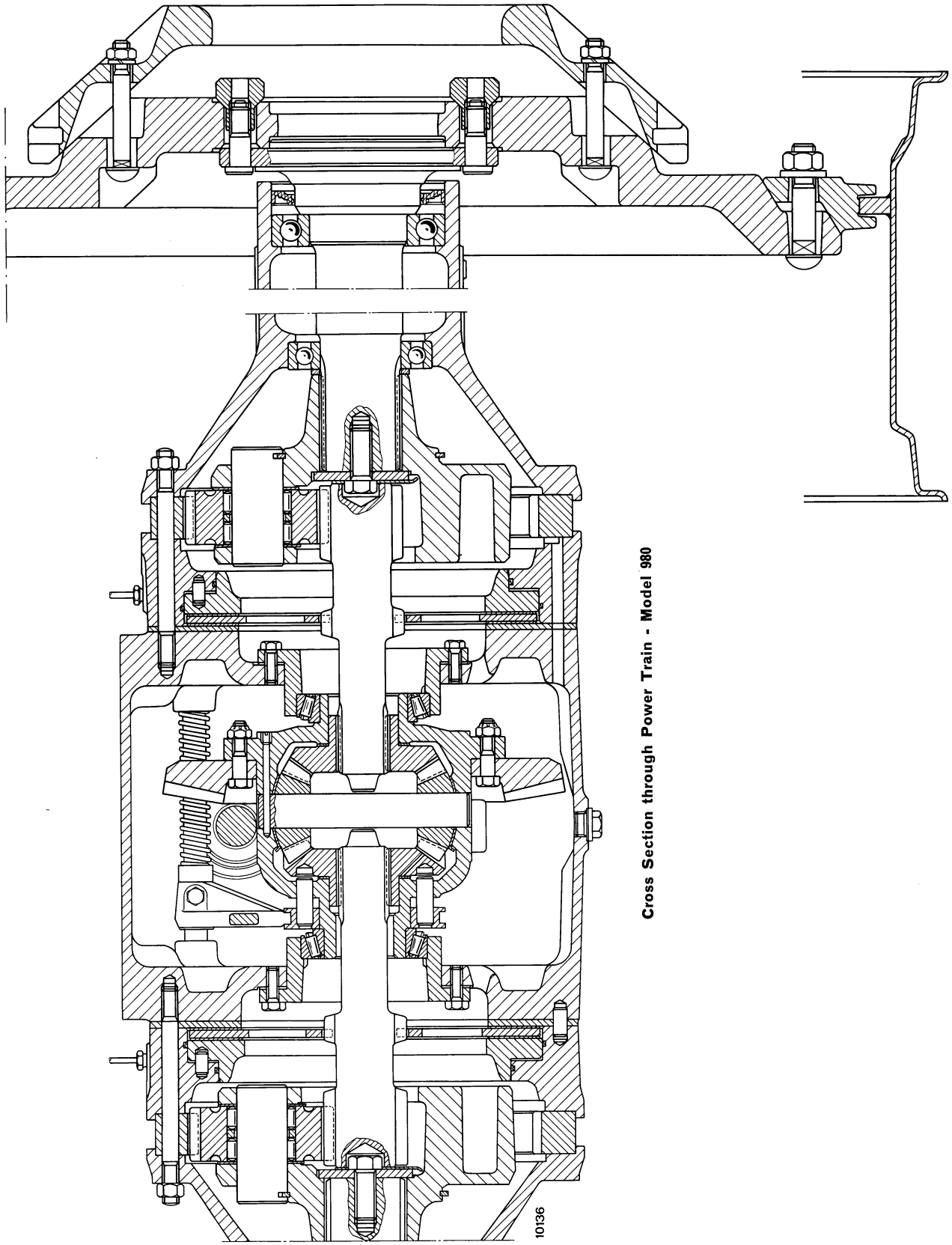
Engine speed with P.T.O. at 540 rpm	2125 rpm
Engine speed with P.T.O. at 1000 rpm	2400 rpm
P.T.O. speed at full load engine rpm	
— 540 rpm	610 rpm
— 1000 rpm	1000 rpm
Ground speed P.T.O. rpm	
— 540 rpm	18.64 rpm/wheel rev
— 1000 rpm	30.44 rpm/wheel rev

TORQUE DATA

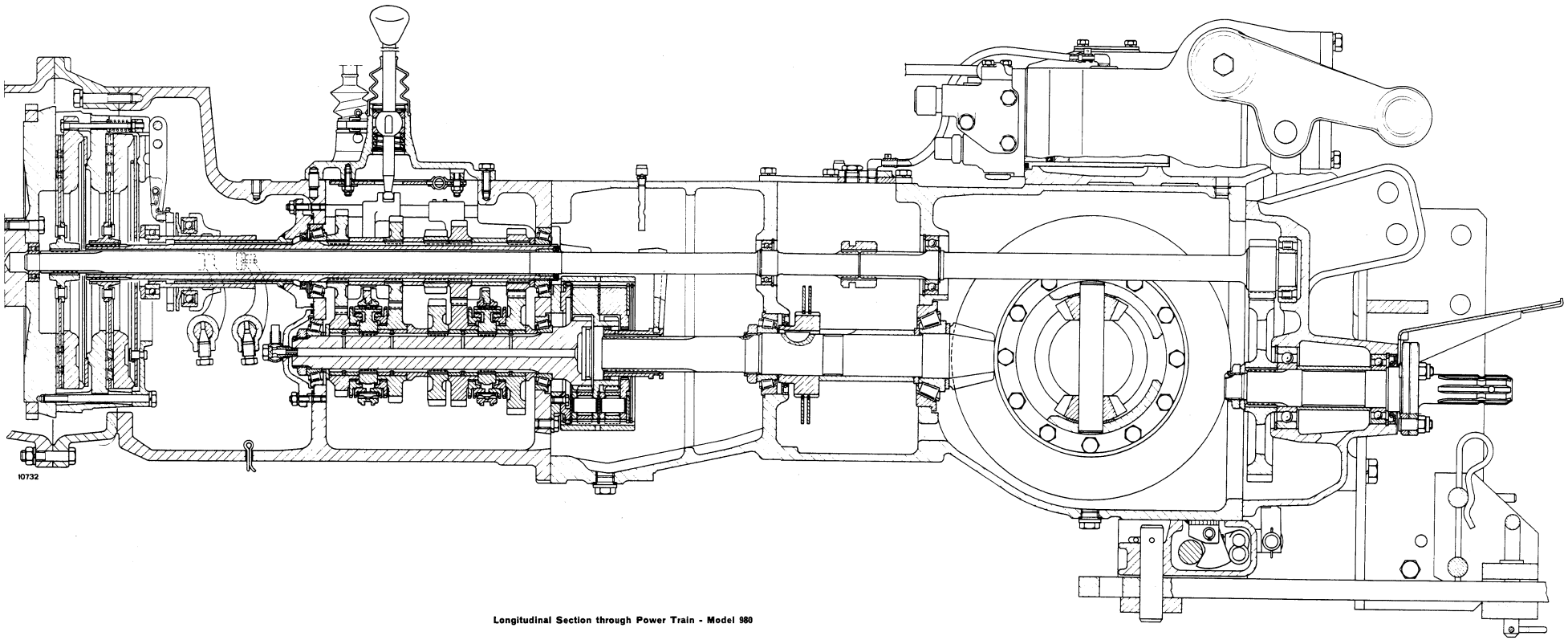
See torque data on pages 11 and 12, Section 20 for tractor Model 880, except for the following:

DESCRIPTION	Thread Size	Torque Data		
		Nm	kgm	ft lb
Clutch - Section 201				
Screw, LUK clutch to flywheel (C_2, page 3)	M 10 x 1.25	59	6	43

POWER TRAIN:
Specification and Data



Cross Section through Power Train - Model 980



Longitudinal Section through Power Train - Model 980

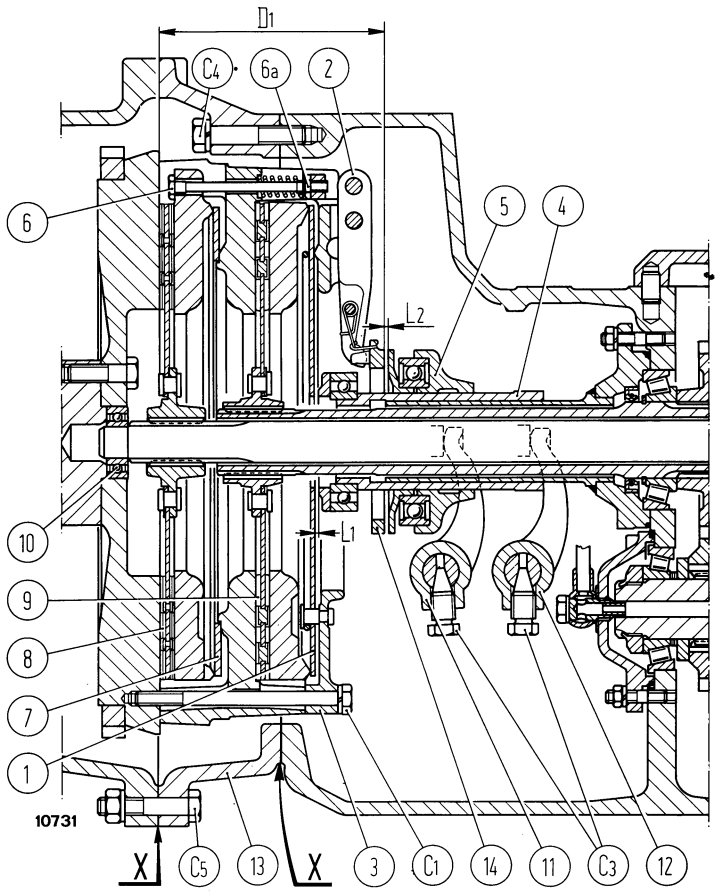
Print No. **603.54.201/01** *- IV-1981*

TO OVERHAUL FERODO 12″/12″ CLUTCH

See descriptions and figures on pages 3 and 4, Section 201 for tractor Model 880 fitted with FERODO 12″/12″ clutch. Diagram below substitutes similar diagram (c) on page 2, Section 201 referring to Model 880.

TO ADJUST FERODO 12″/12″ CLUTCH

See descriptions and illustrations on pages 4, 5 and 7, Section 201 for tractor Model 880 fitted with FERODO 12″/12″ clutch.



Longitudinal Section through FERODO 12″/12″ Clutch

C_1. Clutch screws - C_3. Withdrawal lever screws - C_4 and C_5. Spacer screws (13) - $D_1 = 147$ mm (5.8 in). Nominal distance between plate (14) and flywheel face - $L_1 = 2$ mm (.0787 in). Nominal distance between transmission clutch spring and bearing - $L_2 = 2.5$ mm (.0984 in). Nominal distance between P.T.O. clutch release plate and bearing - 1. Diaphragm spring - 2. P.T.O. clutch release levers - 3. Cover - 4/5. Control sleeves and release bearings - 6 and 6a. P.T.O. clutch release lever adjusting screw and nut - 7. Dished spring - 8. P.T.O. clutch plate - 9. Transmission clutch plate - 10. Flywheel bearing - 11/12. Withdrawal forks - 13. Clutch housing spacer - 14. Release lever plate

Note: On re-assembly, thoroughly clean surfaces **X** to be mated and smear with one of the following jointing compounds:

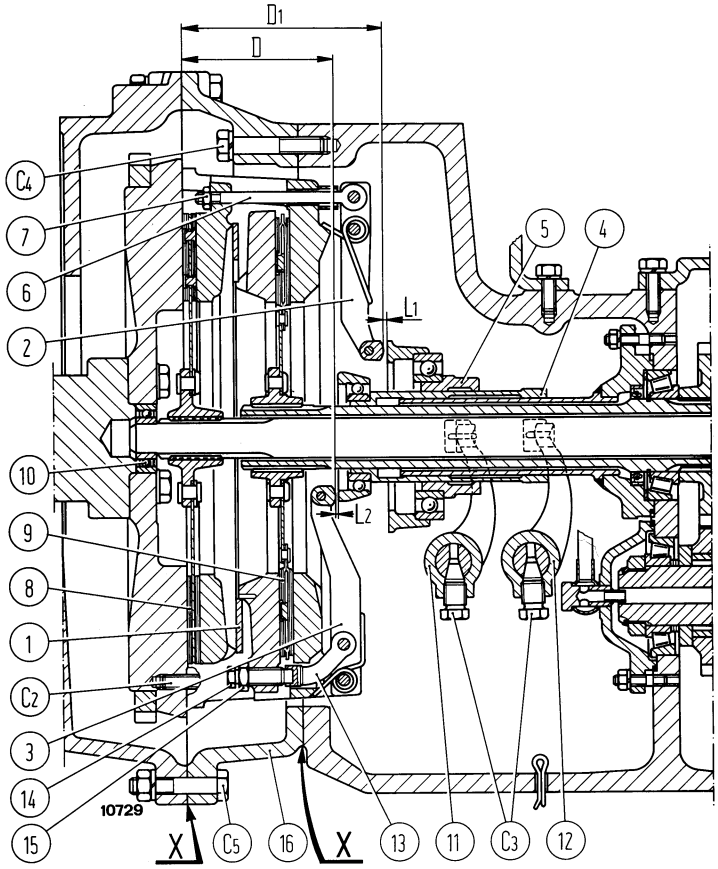
RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET

TO OVERHAUL LUK 12″/12″ CLUTCH

See descriptions and illustrations on pages 7 and 8, Section 201, for tractor Model 880 fitted with LUK 12″/12″ clutch. The diagram below substitutes similar diagram (C) on page 6, Section 201 referring to Model 880.

TO ADJUST LUK 12″/12″ CLUTCH

See descriptions and illustrations on pages 8 and 9, Section 201, for tractor Model 880 fitted with LUK 12″/12″ clutch.



Longitudinal Section through LUK 12″/12″ Clutch

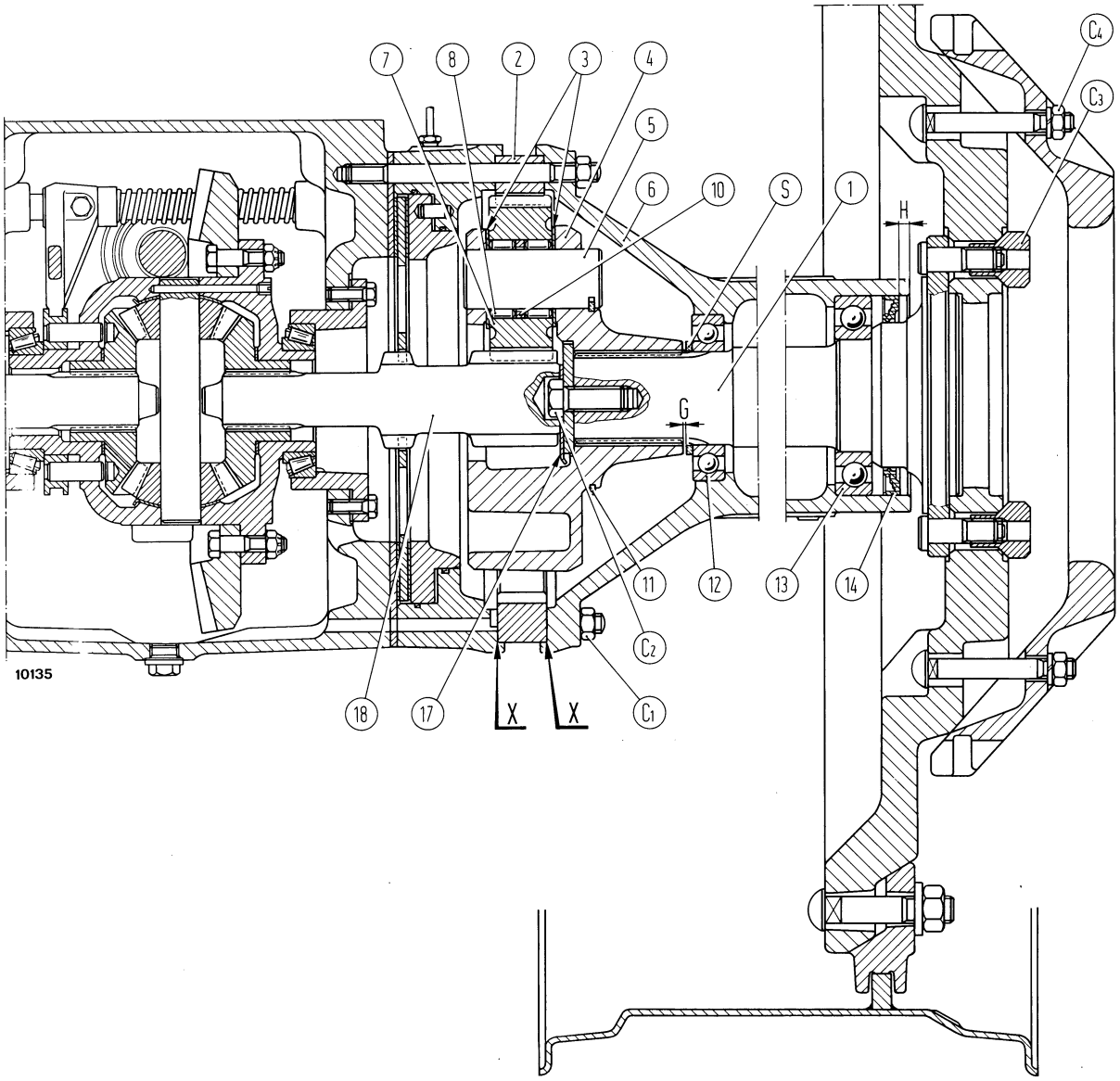
C_2. Clutch screws - C_3. Withdrawal lever screws - C_4 and C_5. Spacer retaining screws (16) - D = 103 mm (4.0551 in). Transmission clutch release lever (3) height above flywheel face - D_1 = 137 mm (5.39 in). Release lever height above flywheel face - L_1 = 2.5 mm (.0984 in) and L_2 = 2 mm (.0787 in) Release lever to bearing gap for P.T.O. and transmission clutch - 1. Dished spring - 2. P.T.O. clutch release levers - 3. Transmission clutch release levers - 4/5. Control sleeves and bearings - 6/7. P.T.O. clutch adjusting screw and nut - 8. P.T.O. clutch plate - 9. Transmission clutch plate - 10. Flywheel bearing - 11/12. Withdrawal forks - 13/14/15. Transmission clutch lever, adjusting screw and nut - 16. Clutch housing spacer

Note: On re-assembly, thoroughly clean faces **X** to be mated and smear with one of the following jointing compounds:

RTV SILMATE, RHODORSIL CAF 1 or LOCTITE PLASTIC GASKET

TO REMOVE AND DISMANTLE

See descriptions and figures on pages 1 and 2, Section 206, for Tractor Models 780 and 880, except for (H) of seal fitted depth (14), which for Model 980 shall be 7 mm (.275 in) (see diagram below).
The diagram below substitutes similar diagram on page 1, Section 206, referring to Models 780 and 880.



Section through RH Final Drive Unit - Model 980

C_1. Final drive housing retaining nut - C_2. Axle shaft screw - C_3. Road wheel nut - C_4. Ballast ring nut - G. = .2 to .3 mm (.008 to .012 in) planet carrier end float - H. = 7 mm (.2756 in) seal fitted depth (14) - S. End float shim (G) - 1. Axle shaft - 2. Annulus - 3. Thrust washers - 4. Planet carrier - 5. Planet journal - 6. Final drive housing - 7. Planet gear - 8. Needle roller bearing - 10. Needle roller spacer - 11. Journal retaining ring - 12 and 13. Ball bearings - 14. Seals - 17. Lock washer (C_2) - 18. R.H. axle shaft

Note: On re-assembly, thoroughly clean faces **X** to be mated and apply either of the following jointing compounds:
RTV SILMATE, RHODORSIL CAF1 or LOCTITE PLASTIC GASKET

FRONT AXLE

See data on page 1, Section 30 for Model 880 except for the following:

Tracks (7 off)	1420 - 1520 - 1620 - 1720 - 1820 - 1920 - 2020 mm (1) (4 ft 8 in - 5 ft - 5 ft 4 in - 5 ft 8 in - 6 ft - 6 ft 4 in - 6 ft 8 in) (1)
Axle carrier shim thickness	Suppressed

(1) Obtainable by overturning the wheels

POWER STEERING

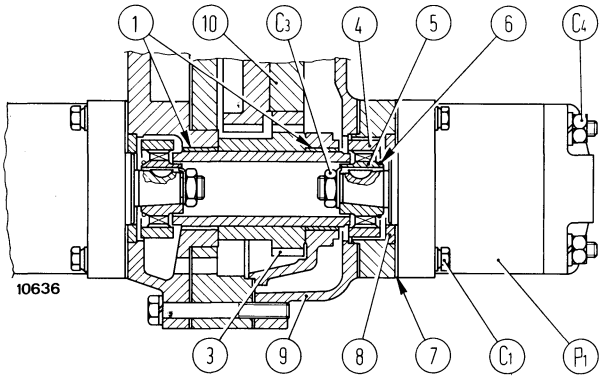
Type	Hydrostatic
Make	DANFOSS
Hydraulic circuit	Independent, separate pump
Oil reservoir	Sheet steel on RH side of engine
Oil filter	In oil reservoir
Hydraulic Pump	
Position	Ahead of timing cover
Type	Gear
Model	C 22 X
Make	FIAT
Drive	Engine valve gear
Rotation (seen from drive end)	Clockwise
Drive ratio	1.166 to 1
Rated speed (at engine governed speed)	2800 rpm
Rated output at maximum rated speed	28 l/min (49 pts/min)
On-bench output at 1450 rpm and 68.5 bar (70 kg/cm^2 or 996 psi) pressure	
— New or reconditioned pump	13.47 l/min (23.7 pts/min)
— Used pump	9.41 l/min (16.6 pts/min)
— Test oil temperature	55 to 65 °C
— Test oil viscosity	SAE 20
Drive/driven gear journal diameter	17.400 to 17.424 mm (.6850 to .6860 in)
Bearing bore diameter	17.450 to 17.470 mm (.6870 to .6878 in)
Gear journal clearance in bearing	.026 to .070 mm (.0010 to .0027 in)
Maximum wear allowance	.1 mm (.0039 in)
Bearing and gear bore diameter in pump body	37.270 to 37.294 mm (1.4673 to 1.4683 in)
Gear radial clearance on pump body	.020 to .064 mm (.0008 to .0025 in)
Maximum pump body wear, suction side	.1 mm (.0039 in)
Bearing width	19.796 to 19.812 mm (.7794 to .7800 in)
Gear width	16.323 to 16.348 mm (.6426 to .6436 in)
Pump body width	56.072 to 56.122 mm (2.2075 to 2.2095 in)
Bearing and gear end clearance in pump body (to be restored on overhaul)	.1 to .2 mm (.0039 to .0079 in)

FRONT AXLE - STEERING: Specification and Data

POWER STEERING

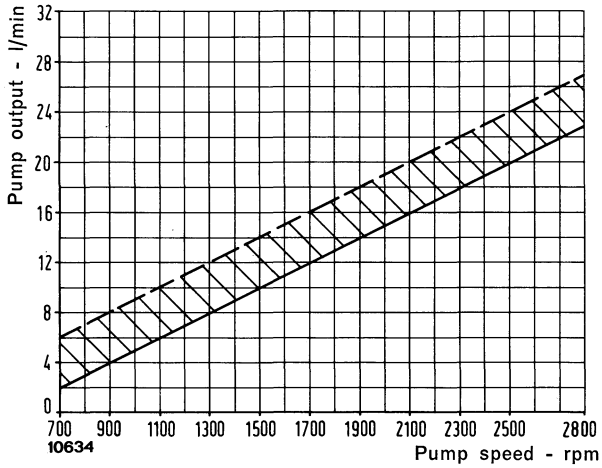
(continued)

Control Valve, make	DANFOSS
Type	ORBITROL, with steering wheel operated rotary valve (permitting steering also in case of pump failure) (page 9, Section 303), Tractor Models 780 and 880
Outfit code	OSPB 100 ON - OVP 20
Relief valve crack-off setting (24, page 9, Section 303, tractor Models 780 and 880) located in valve block (D_2)	102 kg/cm² (100 bar) (1,451 psi)
Power cylinder overload valve crack-off setting (25, page 9, Section 303, tractor Models 780 and 880), located in valve block (D_2)	204 kg/cm² (200 bar) (2,901 psi)
Power Cylinder, type	Double-acting, located behind front axle
Make: 980	WEBER DZ 48/22/215-27963
Make: 980 DT	WEBER TDZ 48/22/200-28106 or SIMA 214236
Cylinder bore diameter	48 mm (1.88 in)
Maximum piston stroke: 980 WEBER	215 mm (8.46 in)
Maximum piston stroke: 980 DT SIMA	194 mm (7.63 in)
Maximum piston stroke: 980 DT WEBER	200 mm (8.87 in)
Piston rod diameter	22 mm (.86 in)
Turning radius	
— Brakes applied	3730 mm (12 ft 3 in)
— No brakes	4200 mm (13 ft 9 in)



Section through Steering Pump Drive

C_1. Pump capscrews - C_3. Sleeve nut - C_4. Cover nut - P_1. 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 and power steering pump drive gear



Output/Speed Curve - Power Steering Pump Type C 22 X

Test pressure	68.6 bar (70 kg/cm² or 996 psi)
Fluid temperature	55 to 65 °C

To Overhaul Steering Pump and Check Reservoir

For steering pump overhaul and testing, proceed as directed on page 1, Section 502, Models 780 and 880, lift pump.

Moreover, note the following points:

— The steering pump drive is shown below.

— Pump assembly and performance data are given in the table on page 1, Section 30, whereas the speed/output chart is shown on this page.

When the hydraulic fluid reservoir (T, page 9, Section 303 for Models 780 and 880) is removed, clean thoroughly and check for:

— Sheet metal reservoir leakage.

— Inefficiency of metal filter cartridge, container and spring.

On completion of assembly, refill the system with fluid, bearing in mind that this operation should be carried out in several stages, each time steering the tractor to fill all parts of the circuit completely.

FRONT AXLE - STEERING

LIFT

Identical with the data given on page 1 and 2, Section 50, and page 1, Section 505, tractor Models 780 and 880 new, except for the following:

Single-acting cylinders	2 off
Location	One integral with lift body and the other hinged to left lift arm
Cylinder connection	Parallel
Design lift capacity	23614 Nm (2408 kgm) (17,417 ft lb)

LIFT PUMP

Identical with data given on pages 3 and 4, Section 50, tractor Model 780, except for the following:

Drive ratio	1.166 to 1
Maximum rated speed (engine at governed speed)	2800 rpm
Maximum rated output	31.8 l/min (54 pts)
On bench output at 1450 rpm and at 172 bar (175 kg/cm^2 or 2490 psi) pressure	
— New or re-conditioned	15.29 l/min (27 pts)
— Used	10.69 l/min (19 pts)

IMPLEMENT ATTACHMENT

Identical with the data given on page 4, Section 50, tractor Models 780 and 880 new, except for the following:

Maximum lift capacity, centre of gravity 600 mm (23.6 in) to the rear of lower link joints from horizontal	
— Lifting rods out and coupled to front mounting holes (*)	2460 kg (5424 lb)
Lift travel	600 mm (23.6 in)
— Lifting rods out and coupled to rear mounting holes (*)	2600 kg (5733 lb)
Lift travel	530 mm (20.8 in)
Maximum lift capacity, centre of gravity 1200 mm (47.3 in) to the rear of lower link joints from horizontal	
— Top link coupled to front mounting holes (*)	1960 kg (4321 lb)
Lift travel	730 mm (28.74 in)
— Lifting rods out and coupled to rear mounting holes (*)	2100 kg (4630 lb)
Lift travel	630 mm (24.80 in)
Maximum lower link end travel	
— Lifting rods out and coupled to front mounting holes	790 mm (31.10 in)
— Lifting rods out and coupled to rear mounting holes	645 mm (25.39 in)

(*) Top link coupled to top hole

HYDRAULIC LIFT UNIT

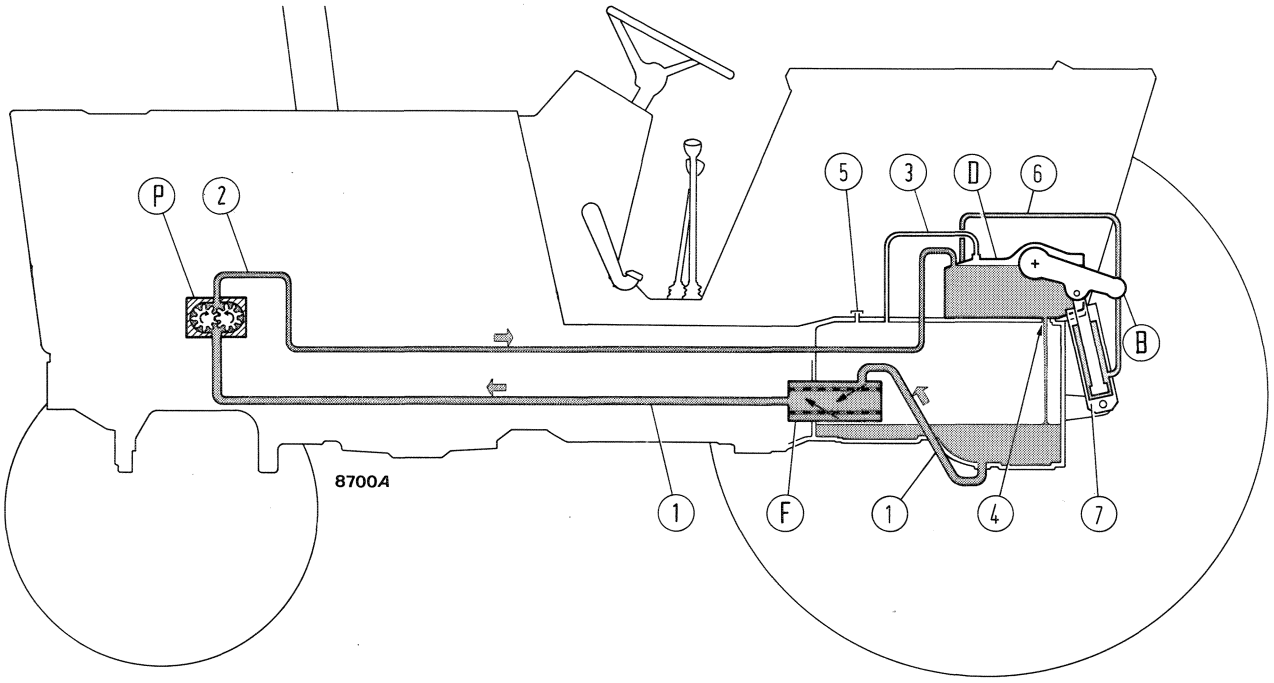
TO REMOVE

Adhere to the instructions given on page 2, Section 501, tractor Models 780 and 880, noting the following:
— Disconnect piston rod of external cylinder (7) from left lift arm (B, figure below).
— Disconnect power line (6) from control valve body (D) and from cylinder (7).

LIFT SCHEMATICS

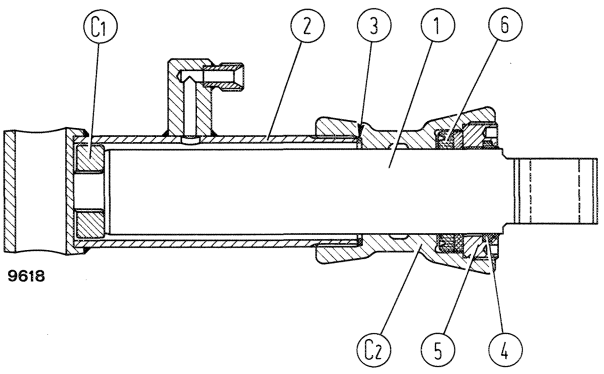
Identical with diagrams given on page 3, Section 501, tractor Models 780 and 880, except for the diagram indicated below, and associated section relating to external lift cylinder.

▨ Inlet and exhaust or pressure oil
▭ Trapped oil



Hydraulic Lift System Diagram

B. Lift arm - D. Valve block - F. Paper cartridge oil filter - P. Engine valve gear-driven hydraulic pump - 1. Suction line drawing from rear transmission case - 2. Delivery line to valve block - 3. Vent pipe to rear transmission case - 4. Oil return to transmission case - 5. Vent - 6. Power line to external cylinder - 7. External cylinder



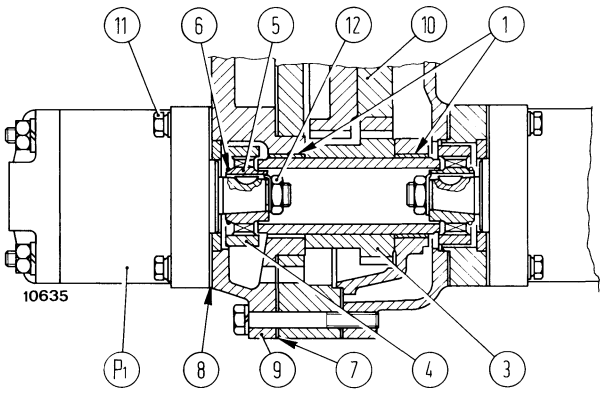
Section through External Cylinder

C_1. Piston lockring - C_2. Cylinder head - 1. Piston - 2. Cylinder body - 3. Copper gasket - 4. Dust excluder - 5. Dust excluder lockring - 6. Piston gland

HYDRAULIC LIFT UNIT

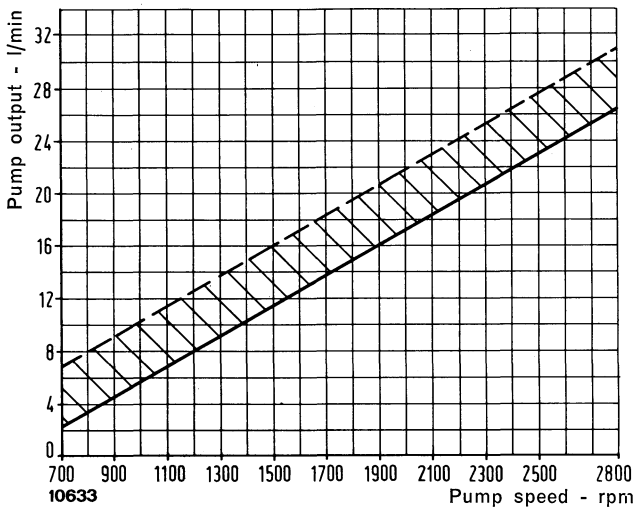
LIFT PUMP

Identical with descriptions and illustrations given on pages 1 and 2, Section 502, tractor Models 780 and 880. The illustrations given below supersede the corresponding figures on pages 1 and 2, Section 502, tractor Model 780.



Section through Lift Pump Drive

P_1. Lift pump - 1. Bushings - 3. Pump drive gear - 4. Drive collar - 5. Drive sleeve - 6. Retaining ring (4) - 7. Gasket - 8. Seal - 9. Pump support - 10. Lift and steering pump drive gear - 11. Pump cap-screws - 12. Sleeve retaining nut



Speed - Output Chart - Lift Pump Type A 25 X

Test pressure	166 bar or 170 kg/cm² or 2418 psi
Oil temperature	55 to 65 °C

HYDRAULIC LIFT UNIT

CHARGING SYSTEM

Alternator	
Type (3-phase, self-rectifying)	MARELLI AA 125 - 14 V - 45 A
Rated voltage	14 V
Rotation (as seen from pulley side)	Clockwise
Cut-in speed at 12 V and 20 °C	$\leqslant$ 950 rpm
Output at 14 V and 7000 rpm across battery after warm-up (*)	$\geqslant$ 45 A
Maximum output at 14,000 rpm (*)	$\sim$ 50 A
Rotor winding resistance (at 20 °C)	3 to 3.2 Ohm
On-machine alternator speed (at engine governed speed)	4611 rpm
Drive ratio	1.921 to 1
Voltage regulator	
Type	Integral, transistor RTT 114 A
Alternator test speed	4000 to 6000 rpm
Voltage setting at 6000 rpm (at 50 °C in above conditions)	13.65 to 14 V
Current rating (obtained through rheostat in series with battery)	25 $\pm$ 1 A

(*) Applicable to fully bedded-in brushes

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