

Operation - When control lever (A) is moved upwards, the linkage causes spool (6) to turn as shown until it takes up the delivery position. As soon as the spool rotates, link (39) connected to the crank lever, actuates rocking lever (66) to return the spool to neutral. This will in fact happen when the lift levers reach the position selected on the quadrant through control lever (A).

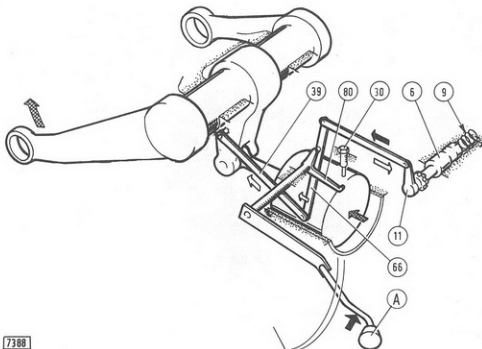


Fig. 213 - Spool Control Linkage Operation Diagram

Note: Raising phase shown. For lowering, linkage operation is reversed.

A. Lift control lever - 6. Spool - 9. Spool return spring - 11. Spool actuating lever - 30. Maximum lift adjusting screw - 39. Link - 66. Rocking lever - 80. Relay lever (discontinues raising phase upon abutting maximum lift adjusting screw).

— Remove the stud nuts, take off the lift assembly retaining nuts and pull clear, using block and tackle.

To dismantle, proceed as follows:—

— Withdraw pin (34) from link (35) and take off the control valve assembly (D, Fig. 211).

Dismantle the valves referring to Fig. 216.

When removing cylinder inlet valve plug (see 5), use spanner No. 291259.

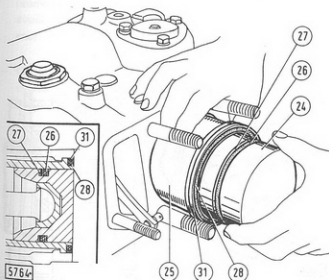


Fig. 214 - Removing Lift Piston and Cylinder

24. Piston - 25. Cylinder - 26. O-ring - 27. Piston gland backing ring (plastics) - 28. O-ring - 31. Brass backing ring.

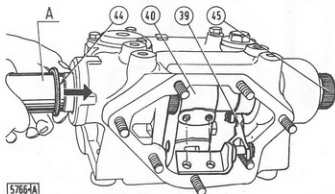


Fig. 215 - Removing the Lift Cross-shaft

(Direction of removal arrowed)

A. O-ring protector No. 290817 - 39. Link - 40. Crank lever - 44. O-ring - 45. Lift cross-shaft.

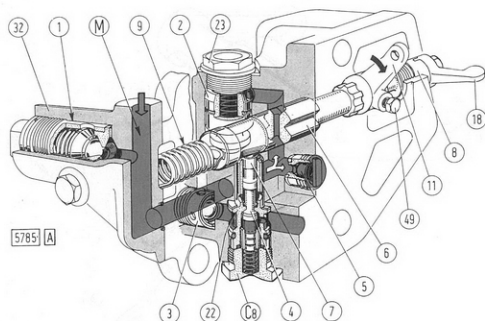


Fig. 216 - Cut-away View of Lift Control Valve

(Black arrow indicates twist on lever 11 by spring 9. Indicated oil flow applies to the raising phase).
 C_u Unload valve plug - M. Oil inlet -
 1. Relief valve - 2. Pilot valve -
 3. Cylinder safety valve - 4. Unload valve - 5. Cylinder inlet valve -
 6. Spool - 7. Unload valve actuator -
 8. Response adjuster - 9. Spool spring - 11. Spool actuating lever -
 18. Response lever - 22. Unload valve seat - 23. Pilot valve plug -
 32. Relief valve carrier - 49. Retaining screw.

To remove spool (6) take off lever (18) with response adjuster (8), relief valve carrier (32), or the auxiliary control valve (see page 143), and actuating lever (11).

- Take off piston (24, Fig. 214) and cylinder (25).
- Remove rear cover (46, Fig. 217).
- Dismantle lift levers (50, Fig. 219), lift cross-shaft (45, Fig. 215) and crank lever (40). Withdraw O-ring (44) to prevent it from being damaged, disconnect link (39) from the crank lever and withdraw lift cross

shaft (45) tapping in the direction indicated by the arrow.

- Remove the spool control linkage. Take off quadrant (70, Fig. 218) with attached spring and clutch plate. Take off retaining spring (55) acting through the oil filler aperture. Withdraw the actuating lever with attached clutch plate and retrieve the internal linkage components.
- Dismantle the oil filter (59, Fig. 217).

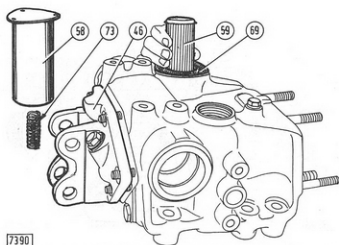


Fig. 217 - Removing the Lift Oil Filter

46. Rear cover - 58. Filter cover - 59. Filter - 69. Gasket - 73. Retaining spring.

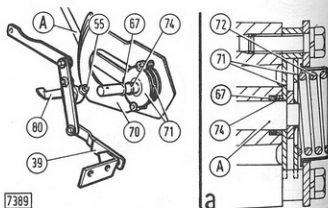


Fig. 218 - Spool Control Linkage

a. Section through clutch assembly - A. Control lever - 39. Link -
 55. Retaining screw - 67. O-ring - 70. Quadrant - 71. Clutch plates -
 72. Spring - 74. Spacer - 80. Relay lever.

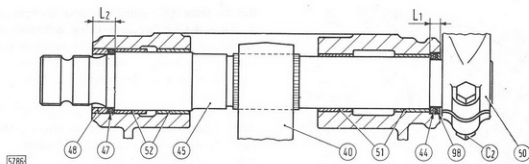


Fig. 219 - Section through Lift Cross-shaft Assembly

C₂ Lift lever retaining nut - L₂ 8 to 8.3 mm. or .32 to .33 in., L.H. outer bush depth in lift body - L₁ 20.5 to 20.7 mm. or .80 to .81 in., R.H. outer bush depth in lift body - 40. Crank lever - 44. L.H. O-ring - 45. Lift cross-shaft - 47. R.H. O-ring - 48. Spacer (13.5 to 13.8 mm. or .531 to .539 in. long) - 50. Lift lever - 51. L.H. bushes - 52. R.H. bushes - 98. L.H. spacer.

Wash all parts using paraffin and prepare to carry out the checks detailed below.

- Check for seal inefficiency, the piston gland plastic ring for wear and the brass ring weld for any sign of de-bonding. If necessary re-solder the ring using a tin filler and smooth the joint using extra-fine abrasive paper.
- Check cross-shaft working clearance. If the bushes need renewing, remove using adequate drifts. When fitting new bushes, refer to the data given in Fig. 219, and, if necessary, ream the bores to obtained the prescribed diameter.
- Check the spool working clearance to assess wear. If renewal is contemplated, note that the spool is not available individually, it being matched to the associated seat in production.
- Check the unload valve for leakage and the relief and cylinder safety valves for inefficiency, as directed in the following chapter.
- Check the pilot valve sealing faces for score marks or damage. If necessary, hone the cast iron seat in the control valve body.
Ensure that the valve springs are not weakened.
- Wash the filter cartridge in paraffin.

When reassembling, note the following:—

- If the spool control linkage has been dismantled, reassemble referring to Fig. 218.

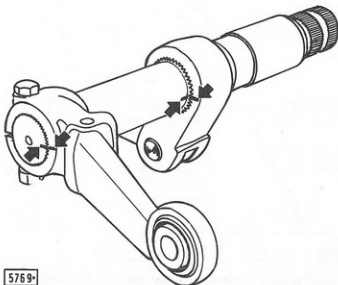


Fig. 220 - Rebuilding the Lift Cross-shaft Assembly

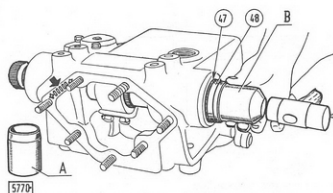


Fig. 221 - Refitting Lift Cross-shaft O-rings

(Lift serial number position arrowed)

A. Protector No. 290817 - B. Driver No. 290818 - 47. O-ring - 48. Spacer.

On completion of reassembly, check that the cross-shaft end float is not in excess of 2 mm. or .08 in. To reduce the play add shims between lift body and lift levers.

HYDRAULIC LIFT BENCH TESTING

Fit the lift assembly to tester No. 292650 (see Fig. 222), connecting lift levers (1) to cross member (2), and

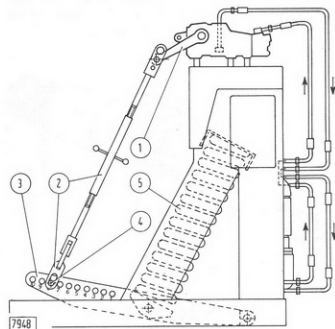


Fig. 222 - Hydraulic Lift Test Machine No. 292650

1. Lift levers - 2. Adjustable crossmember - 3. Reaction lever with numbered holes - 4. Pin - 5. Spring.

this to lever (3) using the pair of holes which result in the rated lift pressure being obtained when the lift levers are fully raised. To this end, remember that oil pressure gradually increases as pin (4) is moved to holes marked with decreasing numbers.

Bring tester oil temperature to $50 \div 60^\circ\text{C}$. and carry out the test, which consists in loading the lift to the desired pressure rating, monitored by the gauge, to ensure that it operates satisfactorily.

TO CHECK AND ADJUST RELIEF, SAFETY AND UNLOAD VALVES

The pressure setting of relief valve (1, Fig. 209) and cylinder safety valve (3) can be checked using hand pump No. 290284 (see Fig. 223) fitted with adapters No. 290824 and No. 290826.

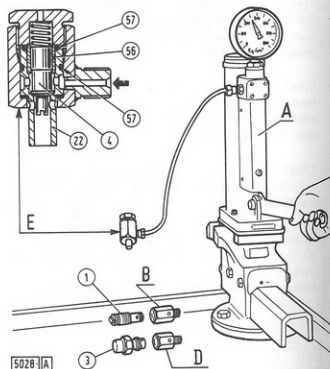


Fig. 223 - Valve Test Equipment

A. Hand pump No. 290284 - B. Adapter No. 290824 - D. Adapter No. 290826 - E. Connector No. 290834 - I. Relief valve - 3. Cylinder safety valve - 4. Unload valve - 22. Unload valve seat - 56. Sleeve - 57. Sealing rings.

In the course of this static test the relief valve should crack off at 135 to 145 kg/cm² or 1,920 to 2,062 p.s.i., and the safety valve at 200 to 210 kg/cm² or 2,844 to 2,987 p.s.i.

If found to be inefficient, these valves must be renewed, as no loose component is available.

To check the relief valve setting with the valve fitted to the tractor, proceed as follows:—

- Warm up the test oil to 50 ÷ 60 °C.
- Insert connector No. **291326** (H) between inlet (20, Fig. 224) and carrier (32), and connect to pressure gauge (0 to 250 kg/cm² or 0 to 3,555 p.s.i. range) of kit No. **291314**.
- Move control lever (A) fully upwards, and slowly slacken screw (30) until relief valve (1) cracks off.

With the engine running at full throttle, the pressure gauge reading should be 150 to 175 kg/cm² or 2,133 to 2,490 p.s.i. If the correct reading is not obtained renew the valve without hesitation.

To check unload valve leakage, proceed as follows:—

- Fit the complete valve to adapter No. **290834** (E, Fig. 223) and connect to hand pump No. **290284**.
- Operate the pump till the gauge reads 250 to 300 kg/cm² or 3,555 to 4,267 p.s.i.
- Using a stop watch, check the time taken to drop to 100 kg/cm² or 1,422 p.s.i. from 200 kg/cm² or 2,844 p.s.i. The time recorded should not be lower than six seconds. If leakage is unacceptable, try to remedy by renewing seals (57). Subsequently, repeat the test.
- If the trouble persists, renew the complete valve.

TO ADJUST LIFT ARM TRAVEL AND SPOOL RESPONSE

Maximum Lift Arm Travel

The lift levers should stop in the maximum lift position before the mechanical stop is reached, following spool

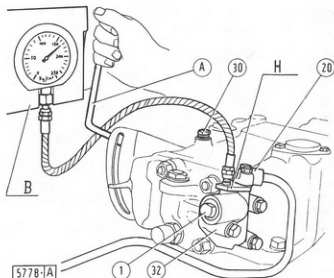


Fig. 224 - Checking Relief Valve Setting

A. Lift control lever at top of quadrant - B. Pressure test kit No. 291314 - H. Connector No. 291326 - 1. Relief valve - 20. Control valve inlet - 30. Maximum lift adjustment screw - 32. Relief valve carrier.

return to neutral (the mechanical stop function is performed by the crank lever contacting the lift body).

If they do not, the relief valve cracks off.

To adjust proceed as follows:—

- Apply a 50 kg or 110 lb. load to the lift levers.
- Start the engine and run at part throttle.
- Move control lever (A, Fig. 225) fully upwards to raise the lift levers completely.
- Hold in this position and apply reference marks (S₁ and S₂, a) across R.H. lift lever and lift body.
- Slowly back off screw (30, b) until the relief valve cracks off.
- Check that the over-travel of the lift levers is 4 to 5 mm. or .16 to .20 in. (see d), measured as the distance separating the reference marks previously applied.

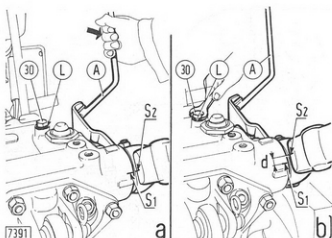


Fig. 225 - Adjusting Lift Lever Travel

a. Maximum lift position - b. Lever position after crack-off (over-travel) - A. Lift control lever - d. 4 to 5 mm. or .16 to .20 in., distance separating marks S_1 and S_2 after crack-off - L. Shims - S_1 . Lift body reference - S_2 . R.H. lever reference - 30. Maximum lift adjustment screw.

To increase over-travel, subtract spacers (L) from under the head of screw (30); to reduce, add shims as necessary.

In the course of adjustment, keep the lift control lever downwards to prevent prolonged relief valve operation.

Note: If shim thickness alteration does not bring about any change in lift lever travel, look for reassembly errors or spool control linkage distortion, in which case lift assembly inspection becomes necessary.

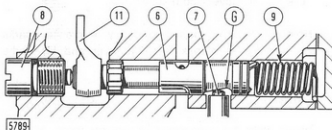


Fig. 226 - Section through Spool Assembly

G. Cam - 6. Spool - 7. Unload valve actuator - 8. Response adjuster (with lever removed) - 9. Spool return spring (working in compression and torsion) - 11. Spool actuating lever.

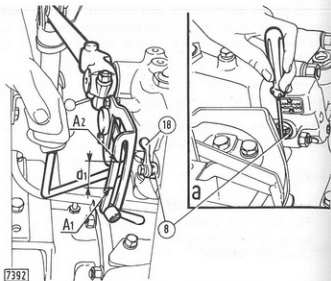


Fig. 227 - Checking Lift Spool Response

a. Adjusting lift spool response.
A₂. Initial lever position mark - A₁. Start-to-raise lever position mark - d_1 . 7 to 10 mm. or .28 to .40 in., Distance between reference marks on quadrant periphery - 8. Spool response adjuster - 18. Response adjustment lever.

Spool Response

Implement position control can only be effective if the utmost spool response is available (see Fig. 226).

Spool response depends on the position taken up in neutral by spool cam (6) relative to unload valve actuator (7). This position can be altered through response adjuster (8) via lever (18, Fig. 227).

To adjust, proceed as follows:—

- Apply a 50 kg or 110 lb. load to the lift levers.
- Take off lever (18) by removing the associated retaining screw.
- Start the engine and run at part throttle.
- Starting from the top, move the lift control lever to mid-way position and apply a mark (A_1) on the quadrant. Wait for the lift lever to stop.
- Tap the control lever gently, so as to move it gradually upwards, until the lift levers begin to raise. Apply mark (A_2) on the quadrant.

— Check that the distance on the quadrant between marks A_1 and A_2 is 7 to 10 mm. or .28 to .40 in. (see d_1).

Screw in adjuster (8) to reduce the distance, and back off to increase.

On completion of adjustment, refit lever (18) to adjuster plug (8) taking care to position the lever as near as possible to the horizontal.

Note: Prior to repeating the response check, operate the lift several times to restore the spool and return spring to their normal operating position.

AUXILIARY CONTROL VALVE

Auxiliary control valve (P, Fig. 229) is used for the remote

control of auxiliary implements operated through single- or double-acting cylinders (see Fig. 228).

The auxiliary unit is to be fitted on the left-hand side of the lift control valve body in place of cover (32, Fig. 216); when doing this, remember to remove the relief valve (1) from the cover and fit it to the auxiliary port.

If the unit is used to control single-acting cylinders connect a pipe (4, Fig. 229) to the lower port. For the control of double-acting cylinders, connect two pipes (5) to the two existing ports, and fit connector (6) in place of plug (3).

The pipe connection thread size is M 16 × 1.5.

The auxiliary control valve uses the same oil as the hydraulic lift, though it is independently actuated via manual lever (T).

The hydraulic lift and the auxiliary control valve cannot be operated simultaneously.

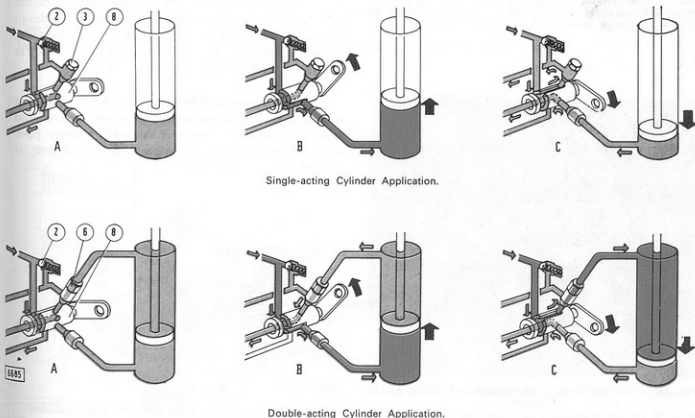


Fig. 228 - Auxiliary Control Valve Operation Diagram

A. Neutral - B. Raising - C. Lowering - 2. Relief valve - 3. Double-acting cylinder connecting port plug - 6. Double-acting cylinder connection - 8. Spool.

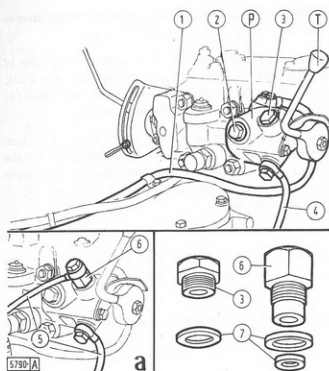


Fig. 229 - Auxiliary Control Valve in Position for Single- or Double-acting Cylinder Operation

a. Double-acting cylinder application.

P. Auxiliary control valve - T. Auxiliary control lever - 1. Oil inlet line - 2. Relief valve - 3. Double-acting cylinder connecting port plug - 4. Single-acting cylinder connecting line - 5. Double-acting cylinder connecting lines - 6. Connector - 7. Sealing washers.

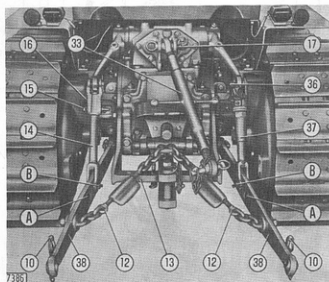


Fig. 230 - Lift and Three-point Linkage in Position on the Tractor

A and B. Lift arm attachment holes - 10. Snap pins - 12. Check chain with turnbuckle - 13. Drawbar support plate (optional) - 14. L.H. lift arm - 15. Removable pin - 16. Captive pin - 17. Top link pin - 33. Adjustable top link - 36. R.H. arm adjustment control with locking spring - 37. R.H. lift arm - 38. Lower links.

To dismantle the auxiliary control valve, take off the control lever retaining nut and withdraw the components towards the outside. Check the spool seal and the spool working clearance.

THREE-POINT LINKAGE

The 3-point linkage fitted to tractor models 505 C and 605 C (see Fig. 230) includes two sets of spherical bushes (I.D. 22 mm. and 29 mm. or .866 in. and 1.141 in.) for the lower links, and two spherical ends (I.D. 19 mm. and 25.5 mm. or .748 in. and 1.004 in.) for the top link.

Thus, the linkage is capable of taking category 1 and category 2 implements.

The linkage fitted to tractor models 355 C and 455 C is suitable for category 1 implements only (see Fig. 201).

Figure 231 shows a section through the R.H. lift arm.

To dismantle the R.H. lift arm assembly, bend back tab washer (88), back off sleeve (89) to withdraw the driven gear, back off screw (83) to withdraw the drive gear, take off spring pin (82) and unscrew the lift arm (90) to separate it from the driven gear.

Apply a liberal amount of grassofiat G 9 or other approved grease to all arm components prior to reassembly. Also insert an adequate thickness of shims (S) between push rod and driven gear, so as to obtain a .1 to .3 mm. or .004 to .012 in. end float.

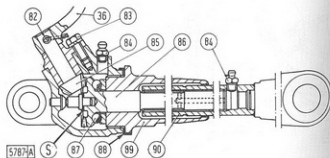


Fig. 231 - Section through R.H. Lift Arm Assembly
S. End float shims - 36. Adjustment control - 82. Spring pin with locking wire - 83. Retaining screw - 84. Grease nipples - 85. Drive gear - 86. Driven gear - 87. Bearing - 88. Tab washer - 89. Sleeve - 90. Lift arm.

HYDRAULIC PUMP

The hydraulic pump is driven by the engine valve gear through a front dog-tooth clutch (see Fig. 232). Gear drive lubrication and end play take-up are assured by the oil circulating through the pump. The bearings are forced against the gears by the oil pressure which acts in the area delimited by the cover seals.

TO OVERHAUL

To remove the pump take off the pump fixing screws and the inlet and outlet line retaining screws.

To dismantle, remove drive sleeve retaining nut (C_3 , Fig. 233), take off cover retaining nuts (C_2), and mark the position of the internal parts in order to restore them to their original position on reassembly.

Check gear side face flatness and squareness relative to the bearings smearing the surfaces in question with carbon black. Small errors can be rectified using extra-fine emery cloth duly lubricated.

Check gear end clearance in the pump body with the bearings in position. The correct end float is .1 to .2 mm.

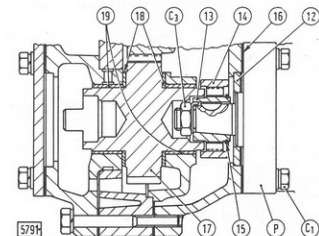


Fig. 232 - Section through Hydraulic Pump Drive

C_1 , Pump retaining screws - C_2 , Retaining nut - P, Hydraulic pump - 12, Centralising ring - 13, Drive sleeve - 14, Drive annulus - 15, Retaining ring - 16, Gasket - 17, Pump drive gear - 18, Abutment washers - 19, Bushes.

or .004 to .008 in. (see Fig. 234). Any pump body face dressing, with a view to restoring the prescribed end clearance, should be carried out using "O" grade emery paper and paraffin, removing as little material as possible.

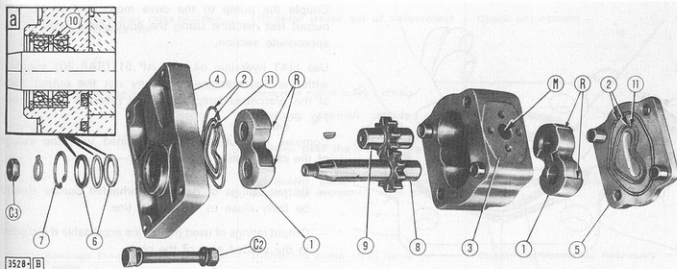


Fig. 233 - Exploded View of Hydraulic Pump

a, Seal assembly - C_2 , Cover retaining nuts - C_3 , Retaining nut - M, Oil outlet - R, Bearing fillets (outlet side) - 1, Bearings - 2, Cover seals - 3, Pump body - 4, Rear cover - 5, Front cover - 6, Rotary shaft seals - 7, Retaining ring - 8, Drive gear - 9, Driven gear - 10, Spacer - 11, Seal retainer.

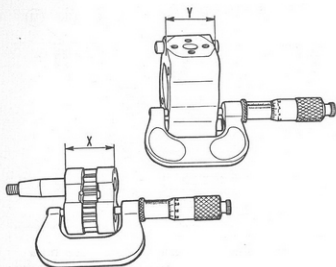


Fig. 234 - Checking Gear End Clearance in Pump Body

Dimension (X) to be smaller than dimension (Y) by .1 to .2 mm, or .004 to .008 in.

Liberalily lubricate all pump parts using hydraulic oil, then reassemble referring to Fig. 233, and noting the following points:—

- Plastic seal retainer (11) is to be inserted on the inside of the inner seal (see Fig. 235).
- The bearings, which should slide into position by hand,

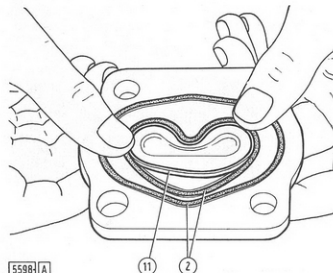


Fig. 235 - Refitting Seal Retainer to Pump Cover

2. Cover seals - 11. Seal retainer.

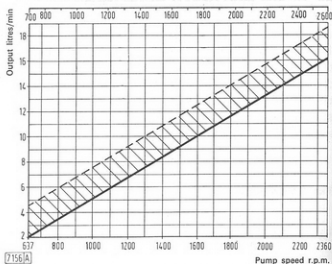


Fig. 236 - Speed-output Chart of Hydraulic Pump Type C 18 X

Test pressure 135 kg/cm² or 1,920 p.s.i.
Oil temperature 55° to 65° C.
Pump drive ratio91 to 1

must be positioned with fillets (R, Fig. 233) facing towards the outlet ports, and the faces with the lubricating slots abutting the gears.

- The cover retaining nuts should be progressively retightened to the prescribed torque figure.

Output Test

Couple the pump to the drive motor and connect to output test machine using the equipment listed in the appropriate section.

Use FIAT hydraulic oil type AP 51 (SAE 20) supplied with the test machine and carry out the output tests at the prescribed temperature and pressure setting (see Fig. 236).

Compare the output figures obtained with the values of the chart, noting the following:—

- Output ratings of new or overhauled pumps should be fairly close to the dotted line.
- Output ratings of used pumps are acceptable if included in the shaded area of the chart.

If the pump rating is very near to, or lower than, the continuous line, the pump in question should be overhauled or renewed.

HYDRAULIC LIFT UNIT FAULT FINDING CHART

FAULT	CAUSE	REMEDY
Lift fails to operate	Low oil level Pilot valve stuck Inefficient pump Spool stuck in distributor bush (355 C)	Top up Dismantle and clean Dismantle and inspect Dismantle and clean
Erratic lift movement	Low oil level Clogged oil filter Ingress of air in inlet line	Top up Clean Check for loose connectors and inefficient seals
Lift fails to hold the load in raised position (excessive correction with engine running, lowering with engine stopped)	Incorrect spool response (455 C, 505 C and 605 C) Faulty or stuck unload valve. Seal failure (455 C, 505 C and 605 C) Cylinder oil inlet valve leakage Leakage past the piston glands Cylinder safety valve leaking or set too low (455 C, 505 C and 605 C), or relief valve leaking or set too low (355 C) Leakage past the spool or past the distributing bush (355 C)	Check and adjust response as necessary Dismantle, check, clean and renew as necessary Dismantle, check and clean all parts involved Renew the glands Renew the valve or, if possible, adjust the relief valve Renew worn parts as necessary
With lift levers in max. raise position, relief valve cracks off	Lift lever travel out of adjustment	Check adjustment
Insufficient lifting power	Incorrect relief valve setting Incorrect cylinder safety valve setting Leakage past the distributing bush (355 C) Inefficient pump (usually accompanied by increased raise time)	Renew Renew Renew O-rings Check pump, overhaul if necessary
Oil seepage from engine to lift or vice versa	Inefficient pump shaft seals	Check and renew as necessary

ELECTRICAL SYSTEM

CHARGING SYSTEM

CHARGING SYSTEM DATA

ALTERNATOR

Type (three-phase, self-rectifying):—

- A.M.
- P.M.

Rated voltage

Direction of rotation (pulley side)

Cut-in speed at 12 Volts and 20 °C. (1)

Output at 14 Volts across battery at 5000 r.p.m. after

warm-up (1)

Maximum rating (1)

Field winding resistance at 20 °C.:—

— Across slip rings

— Across terminal 67 and earth at 500 r.p.m.

Stator winding phase resistance (each)

Brush spring load (not worn)

Alternator speed (at engine governed speed):—

— Model 355 C

— Model 455 C

— Model 505 C

— Model 605 C

FIAT A 12 M - 124/12/42 X

FIAT A 12 M - 124/12/42 M

12 Volts

Clockwise

950 to 1,050 r.p.m.

42 Amps min.

53 Amps approx.

4.1 to 4.5 Ohms

4.5 to 4.8 Ohms

.11 ± .005 Ohm

.43 kg. (1 lb.) approx.

4570 r.p.m. approx.

4385 r.p.m. approx.

4750 r.p.m. approx.

4020 r.p.m. approx.

Diodes

Type

Continuous forward current at 150 °C.

Peak forward current at 150 °C.

Reverse voltage

Maximum operating temperature

Voltage drop at 25 Amps d.c. and 25 °C.

Reverse current at 150 Volt d.c. and 150 °C.

I.R.C.I. 4 AF 2 - SIEMENS E 11, E 12 (2)

20 Amps d.c.

25 Amps d.c.

150 Volts d.c. min.

190 °C.

1.2 Volts d.c. max.

2 mA max.

VOLTAGE REGULATOR

Type

Alternator test speed

Battery capacity

Warm-up current

FIAT-RC 2/12 B

5000 r.p.m.

40 to 50 Ah

7 Amps

(1) Applicable to fully bedded-in brushes

(2) In red for positive diodes, in black for negative diodes

Charging System Data - Continued

Stage-2 test current	2 to 12 Amps
Stage-2 regulating voltage	13.9 to 14.5 Volts
Stage-1 test current	25 to 35 Amps
Stage-1 regulating voltage	.2 to .7 Volt lower than stage 2
Resistance across terminal 15 and earth	26 to 30 Ohms
Open contact resistance across terminals 15 and 67	5.35 to 5.95 Ohms
Armature-core gap	1.45 to 1.55 mm. (.058 to .062 in.)
Stage-2 contact gap	.35 to .55 mm. (.014 to .022 in.)
ALTERNATOR WARNING RELAY TYPE "SIPEA" OR "WEPOO"	
Coil resistance	27 to 31 Ohm
Contact trip voltage	4.9 to 5.7 Volt

ALTERNATOR

The three-phase self-rectifying alternator is belt driven from the fan pulley (see Fig. 97).

Alternator cooling is obtained by means of a centrifugal fan which is combined with the drive pulley.

TO OVERHAUL

Remove the alternator and dismantle referring to Fig. 238. Check for diode inefficiency bearing in mind that if one or more positive diodes are found to be faulty, the

bridge assembly (6) will have to be renewed as a whole, whereas defective negative diodes can be removed individually from the alternator body.

When renewing a diode, note the following:—

- The replacement diode must be of the type specially designed for the purpose. In addition to their identification marks, spare diodes bear the letter R stamped on them. Moreover, diode diameter over the knurled area is approximately .5 mm. (.02 in.) oversize (13.24 to 13.31 mm. instead of 12.73 to 12.80 mm. - .521 to .524 in. instead of .501 in. to .504 in.).

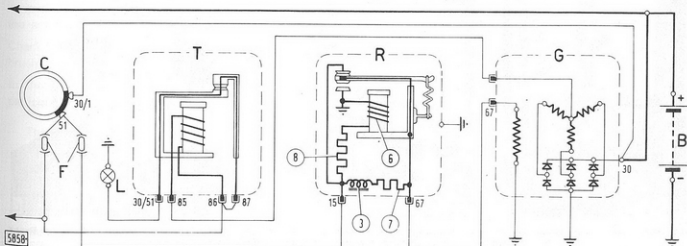


Fig. 237 - Generating System Diagram

B. Two 12-Volt series-connected batteries - C. Master switch (on) - F. Fuses - G. Alternator - L. Alternator warning light - R. Voltage regulator - T. Alternator warning relay - 3. Auxiliary inductance coil - 6. Electro-magnetic coil - 7. Regulating resistor - 8. Ballast resistor.

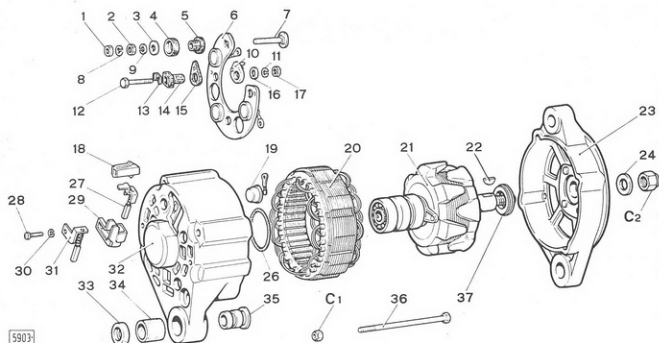


Fig. 238 - Exploded View of Alternator Assembly

C₁, Tie bolt nut - C₂, Pulley retaining nut - 1 and 2, Retaining nuts - 3, Plain washer - 4 and 5, Positive terminal post insulators - 6, Positive diode carrier bridge (heat sink) - 7, Positive terminal clamp retaining screw - 8 and 9, Spring washers - 10, Diode terminal connection insulator - 11, Spring washer - 12, Stator phase terminal/heat sink/positive diode terminal retaining screw - 13, Tab - 14 and 15, Insulators - 16, Plain washers - 17, Retaining nut - 18, Charge warning terminal connector - 19, Negative diode - 20, Stator - 21, Rotor - 22, Key - 23, Drive end shield with bearing - 24, Spring washer - 26, Bearing outer race retaining ring - 27, Positive brush - 28, Retaining screw - 29, Brush holder - 30, Spring washer - 31, Negative brush - 32, Alternator body - 33, 34 and 35, Bonded bush - 36, Tie rod - 37, Spacer (A.M. alternator only).

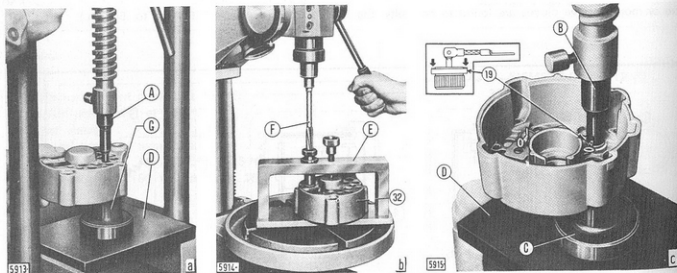


Fig. 239 - Removing Negative Diodes, Reaming Diode Seats and Reinstalling the Diodes by means of Hand Press No. 290021 and Fixed Drilling Machine (Speed = 1000 r.p.m. approx.)

(a) Negative diode dismantling - (b) Diode seat reaming - (c) Diode reassembling.

The arrows in detail (c) point to the areas where the drift is to be applied in the course of diode press fitting - A, Diode remover drift A. 76027 (290679) - B, Diode replacer drift A. 76028 (290680) - C, Support A. 76031 (290682) - D, Base A. 76032 (292195) - E, Diode fixture A. 76035 (290683) - F, Diode seat reamer A. 90340 (290686) - G, Support A. 76029 (290681) - 19, Rectifier diode - 32, Alternator body.

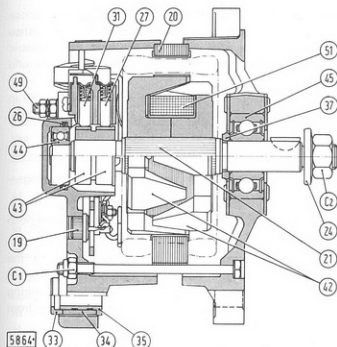


Fig. 240 - Section through Alternator Assembly

C₁, Tie rod nut - C₂, Pulley retaining nut - 19, Negative diode - 20, Stator - 21, Rotor - 24, Spring washer - 26, Bearing outer race retaining ring - 27, Positive brush (connected to terminal 67) - 31, Negative brush - 33, 34 and 35, Bonded bush - 37, Spacer (A.M. alternator only) - 42, Polar wheels (pole shoes) - 43, Slip rings - 44, Diode end ball bearing - 45, Drive end ball bearing - 49, Positive terminal post 30 - 51, Field winding.

- The mounting hole from which each failed diode is removed should be opened out to 13.12 to 13.16 mm. (.5165 to .5181 in.) before fitting the replacement diode.

To prevent damaging the parts involved during diode removal, reaming and assembly, it is advisable to use the equipment illustrated in Fig. 239.

Check for brush wear and, if necessary, renew the complete brush holder assembly.

In the course of reassembly, refer to Fig. 240 paying particular attention to the following points:—

- The alternator pivot holes should be correctly aligned.
- When refitted in position, the brush holder assembly should enable each brush to make full contact with the associated slip ring surface.
- When positioning the alternator pulley dished washer, ensure that the concave side is facing towards the pulley.

When refitting, adjust the alternator drive belt tension by turning the alternator about its mounting pivot as

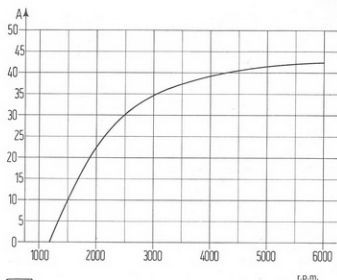


Fig. 241 - Minimum Output Curve after Warm-up at 14 Volts with Bedded-in Brushes

necessary. The belt is correctly tensioned when it is possible to depress the belt between crankshaft and alternator 10 to 15 mm. ($\frac{1}{2}$ in approx.) by applying a 5 to 7 kg. (11 to 15 lb.) load.

ALTERNATOR BENCH TESTING

To assess alternator efficiency (see specification table) check the following:—

- Output current at 14 Volts after warm-up (see diagram of Fig. 241) with the alternator on the test bench connected as shown in Fig. 242.
- Rotor winding overall resistance measured across terminal 67 and earth at 500 r.p.m.

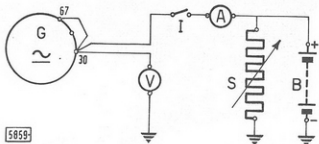


Fig. 242 - Output Test Wiring Diagram

A. Ammeter - B. 12-Volt battery - G. Alternator - I. Switch - S. Rheostat - V. Voltmeter.

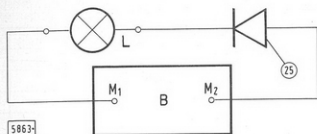


Fig. 243 - Diagram of Diode Test Circuit

B. Battery - L. Indicator - M_1 and M_2 Battery terminals - 25. Diode under test.

- Stator winding phase resistance. To do this, disconnect the ends of the phases from the ends of the diodes and take a reading across each phase and the star point terminal.

DIODES

Examine each diode for open circuits (O/C) and short circuits (S/C).

Prepare the tell-tale circuit illustrated in Fig. 243 and interchange terminals (M_1 and M_2) on the battery. The diode under test is efficient if the tell-tale lamp lights up in either one connection arrangement only.

A similar check can be carried out using a special purpose low-voltage battery type tester to take two resistance readings, namely one across diode and its insulated terminal, and the other across the insulated terminal and the diode.

The diode is efficient if the reading is nil (or negligible) in one direction and extremely high (over 100,000 Ohms) in the other.

Note : To prevent diode damage remember the following:—

- The diodes should be bench tested using an a.c. voltage circuit at less than 110 Volt, otherwise serious damage will result.
- The battery should be correctly connected to the alternator charging circuit, i.e. positive terminal connected to alternator terminal 30. Before charging with an external supply, disconnect the battery from the system.
- The alternator stator can only be submitted to high voltage insulation test (50 Volts min.) if this is done on a test bench after disconnecting the diodes from the stator phase terminals.
- A volt/amp tester should be used to check alternator operation. Alternator terminal 30 should not be short circuited across earth or terminal 67.

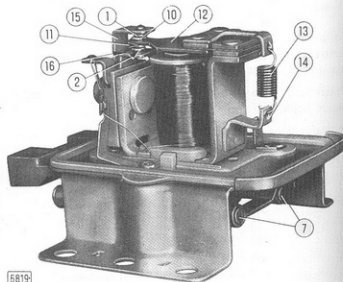
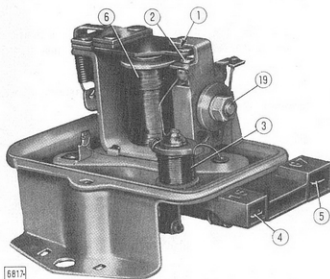


Fig. 244 - Voltage Regulator Unit with Cover Removed

1. Stage-1 fixed contact - 2. Stage-2 fixed contact - 3. Auxiliary inductance coil - 4. Terminal 15. - 5. Terminal 67. - 6. Coil - 7. Regulating resistors - 10. Stage-1 moving contact - 11. Stage-2 moving contact - 12. Armature - 13. Spring - 14. Spring bracket (bend to adjust spring load) - 15. Stage-1 fixed contact carrier - 16. Stage-2 fixed contact carrier - 19. Stage-1 and stage-2 fixed contact carrier retaining nut.

VOLTAGE REGULATOR

The two-stage regulator unit is of the vibrating-contact type (see Fig. 244).

In case of faulty regulator operation, or if the settings checked in the course of bench testing are not as prescribed, the voltage regulator should be renewed, as none of its parts is replaceable individually.

In this connection it should be noted that the adjustment of the regulator settings should only be necessary in exceptional circumstances. The wiring diagram is illustrated in Fig. 237.

The bench test data are given in the specification table.

When preparing the voltage regulator for bench testing according to the diagram on Fig. 245, allow the unit to warm up and check first stage-2 and then stage-1 at the prescribed input rating.

Note: Do not operate the voltage regulator with switch (I, Fig. 245) open, i.e. with a disconnected battery, as this may damage the regulator contacts.

To adjust the setting, increase or decrease the load on spring (13, Fig. 244) according to whether the voltage is lower or higher than prescribed respectively.

If no satisfactory result is obtained thereby, try to increase or reduce the armature-core air gap by slackening nut (19) and lifting or lowering stage-1 fixed contact.

Ensure that the contacts remain centralised and, subsequently, restore the original stage-2 contact gap (.35 to .55 mm, -.014 to .022 in.).

Note: To prevent voltage regulator contact damage remember the following:—

- The alternator should not be allowed to work with the battery disconnected from alternator terminal 30.
- Do not short circuit terminals 15 and 67 and ensure that the associated leads are not interchanged by mistake.
- The lead to be connected to alternator terminal 67 should not be interchanged with the lead for connection to alternator star point (unmarked terminal).

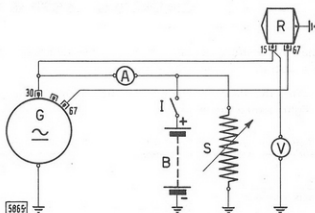


Fig. 245 - Voltage Regulator Test Wiring Diagram

A. Ammeter - B. 12-Volt battery - G. Alternator (A 12 M-124/12/42 X-M) - I. Switch - R. Voltage regulator under test - S. Rheostat - V. Voltmeter.

ALTERNATOR WARNING RELAY

The alternator warning light relay (see Fig. 246) is used to energise the alternator warning light should the battery charging system become inefficient.

Fig. 237 illustrates the associated wiring diagram.

If on inspection the relay is found not to be operating satisfactorily, it should be renewed as a unit.

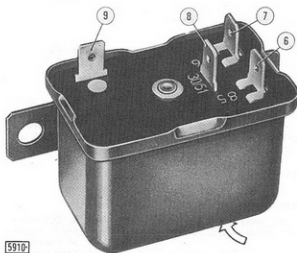


Fig. 246 - Bottom View of Alternator Warning Relay

(The arrow points to the position of relay identification markings). 6. Terminal 85 - 7. Terminal 86 - 8. Terminal 50/51 - 9. Terminal 87.

CHARGING SYSTEM FAULT FINDING CHART

When the charging system is efficient, alternator warning light operation should be as follows:—

- With the master switch in position I, the warning light should be on.

— Upon starting the engine, the warning light should go off and remain off as the engine is accelerated.

In case of malfunction, refer to the following fault finding chart.

FAULT	CAUSE	REMEDY
A. Master switch in position I, warning light on Warning light remains on after engine starting even upon accelerating, or goes off and then comes on again at certain alternator speeds and upon inserting certain loads	1. Blown voltage regulator fuse	Remedy the short circuit which has caused the fuse to fail and renew the fuse
	2. O/C across voltage regulator terminal 15 and master switch junction 51, or O/C across alternator terminal 67 and voltage regulator terminal 67	Check for O/C, renew any defective leads and restore the junctions to their original efficiency
If the trouble persists, identify the other possible causes by performing the check described at the end of the fault-finding chart		
	3. Voltage regulator out of adjustment	Check the contacts
	4. Faulty warning relay	Check the warning relay
	5. O/C or S/C across alternator field winding or slip ring connections, S/C across positive diodes, worn or stuck alternator brushes	Check the alternator Renew the heat sink assembly with positive diodes Check the brush assembly and renew as necessary using original replacements
	6. O/C across star point and alternator star point terminal, or O/C across alternator star point terminal and warning relay terminal 85	Check leads for O/C, eliminate any insulation breakdown, and renew faulty leads as necessary

Charging System Fault Finding Chart - Continued

FAULT	CAUSE	REMEDY
B. Master switch in position I, warning light off Upon starting the engine the warning light remains off	1. Failed warning light bulb, or broken leads 2. O/C across battery and alternator terminal 30, or across alternator terminal 30 and master switch junction 30/1 3. Worn or oxidized master switch contacts at 30/1 and 51 4. Failed warning relay 5. S/C negative diodes Earthed stator winding phase S/C alternator internal lead across star point and associated terminal or S/C lead across alternator star point terminal and warning relay terminal 85	Renew the bulb and/or leads Check for O/C, renew any failed leads and restore original junction efficiency If the contacts are worn renew the master switch If the contacts are oxidized, remedy according to normal practice Check the warning relay Check the alternator Renew the S/C negative diodes Eliminate any insulation breakdown or renew the complete lead
C. Master switch in position I, warning light off With the engine running the warning light is weak and remains so even upon accelerating	1. O/C across master switch junction 51 and warning relay terminal 86 2. Blown warning relay fuse	Check lead for O/C, eliminate any insulation breakdown or renew Remedy the S/C which has caused the fuse to blow and renew the fuse

To Trace the Cause of Persistent Warning Light Operation

If the trouble described under A above persists even after inspection and remedial action given under 1 and 2, the fault may be traced by adopting the procedure described below.

Ensure that the battery is efficient and fully charged, and that alternator drive belt tension is as prescribed.

If battery terminal voltage (in part-throttle conditions) is:—

- a. Over 15 Volts (high) - The trouble is to be traced in the voltage regulator unit.
- b. 13.5 to 15 Volts (normal) - The fault may be located by taking the following voltage readings—
 - Across warning relay terminal 85 and earth.
 - Across warning relay terminal 85 and battery positive terminal, or alternator terminal 30.

The voltage readings are to be interpreted as follows:—

- If the two readings give approximately the same value (half

the voltage read at battery terminals), the trouble is in the warning relay.

- If the readings give values which differ from one another by 1 Volt or more, the trouble is in the alternator.
- If the readings show no voltage at all, the trouble is due to the cause specified under A6 in the above chart.

- c. Less than 13.5 Volts (low) - To trace the fault take two voltage readings as described under b.

As in (b), the voltage readings condition the results as follows:—

- If the readings give approximately the same value (half the value read at battery terminals) the trouble is in the voltage regulator.
- If the readings give values which differ from one another by 1 Volt or more, the defect is in the alternator.
- If the two readings show no voltage at all, the anomaly is to be attributed to the causes given under A6 of the chart.

BATTERY

BATTERY DATA

Tractor Model	355 C	455 C-505 C	605 C
Type:—			
— Marelli	6 ATP 15	6 ATP 21	6 ATP 27
— Titano	6 DE 7 F	6 DE 10 F	6 DE 12 F
Voltage	12 V	12 V	12 V
Capacity (20-hour rate)	77 Ah	110 Ah	143 Ah, Marelli 136 Ah, Titano
Size (length x width x height)	363 x 173 x 224 mm. 14 ¹ / ₄ x 6 ³ / ₄ x 8 ⁷ / ₈ in.	510 x 190 x 244 mm. 20 x 7 ¹ / ₂ x 9 ¹ / ₂ in.	510 x 216 x 244 mm. 20 x 8 ¹ / ₂ x 9 ¹ / ₂ in.
Weight (filled)	29 kg. 64 lb.	46 kg. 101 lb.	54 kg. 119 lb.
Electrolyte specific gravity at 15 to 25 °C:—			
— Charged		1.27 to 1.28	
— 50 % charged		1.20 to 1.22	
— Discharged		1.11	

Note: 605 C batteries available for use on 455 C and 505 C as optional extras

SERVICING

Check the electrolyte level at 150 working hour intervals with a cold battery. Ensure that caps (1, Fig. 247) are tight, take off cover (2) and pour distilled water very slowly into the tapered well in each cap until the water

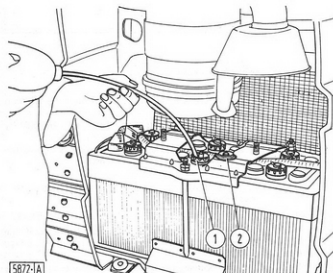


Fig. 247 - Checking Battery Electrolyte Level
1. Cap - 2. Cover.

level starts to rise up the well. Reposition each cover ensuring that it is absolutely clean.

Also make sure that both terminals and posts are clean and tight. If necessary, smear with petroleum jelly to prevent oxidation.

If the machine is to remain out of use for long periods, place the battery in a sheltered and dry place. Moreover, the battery should be recharged every month.

To check electrolyte specific gravity, unscrew the cap and dip hydrometer Part No. **290050** in each cell. To assess the state of charge, refer to the specification table above.

Possible Causes of Abnormal Battery Discharge

The principal possible causes are as follows:—

1. Faulty charging system (alternator, voltage regulator and warning relay).
2. Loss of current due to insulation breakdown within the electrical system.

A speedy check can be made by connecting a milliammeter in series across battery positive terminal post and lead terminal, with engine and all loads switched off. The current reading should not exceed 1 mA.

3. Addition of extra loads on the part of the operator.
4. Sulphated battery with S/C or O/C cells.

STARTER

STARTER DATA

FIAT STARTER (355 C-455 C-505 C)

Type:—

- Model 355 C
- Models 455 C and 505 C

Voltage

Output

Direction of rotation (as viewed from pinion end)

Number of poles

Field winding

Drive

Operation

Pinion-to-ring gear ratio:—

- Model 355 C
- Models 455 C and 505 C

M 125 - 3/12 V. 2

M 125 - 3/12

12 Volts

3 kW

Clockwise

4

Compound

Lever, free-wheel

Solenoid

9/114

9/110

Bench Test Data

Running torque test (at 20 °C.):—

- Current
- Speed
- Voltage
- Torque

Lock torque test (at 20 °C.):—

- Current
- Voltage
- Torque
- Total internal resistance

Light running torque test (at 20 °C.):—

- Current
- Voltage
- Speed

Resistance test (at 20 °C.):—

- Main field winding (series)
- Auxiliary field winding (parallel)

Up to 500 Amps
1850 to 1900 r.p.m.
9.6 Volts
1.52 kgm. (11 lb. ft.)

Up to 1300 Amps
5.1 Volts
4.9 kgm. (35 lb. ft.) min.
.0039 to .0043 Ohm

Up to 60 Amps
12 Volts
4,800 r.p.m.

.00156 to .0001 Ohm
4 ± .1 Ohms

Mechanical Data

- Brush spring load (not worn)
- Mica undercut depth
- Pinion rotating torque
- Armature shaft end play
- Commutator dia.:—
- Wear limit
- Max. out-of-round

1.35 to 1.65 kg. (3 to 3.6 lb.)
.8 to 1 mm. (.032 to .040 in.)
5 to 7 kg cm. (.36 to .50 lb. ft.)
.6 to 1.8 mm. (.024 to .071 in.)
53 mm. (2.08 in.)
51 mm. (2.00 in.)
.02 mm. (.0008 in.)

Starter Data - Continued

Solenoid Resistance (at 20 °C.) Current consumption at 12 Volts Cut-in voltage (min.) Contact travel Plunger stroke Load at 12 Volt and plunger at end of stroke	.35 ± .02 Ohms 33 to 35 Amps 8 Volts 11.35 to 13.45 mm. (.444 to .527 in.) 13.65 to 15.15 mm. (.535 to .594 in.) 57 kg. (126 lb.)
Fitting Data Pole shoe I.D. Armature O.D. Armature bush fitted I.D.:— — Pinion end — Intermediate — Commutator end Armature shaft journal dia.:— — Pinion end — Intermediate — Commutator end Armature running clearance in:— — Pinion end bush — Intermediate bush — Commutator end bush Pinion end bush interference fit Intermediate and commutator end bush interference fit Pinion bush fitted I.D. Armature shaft journal dia. (over pinion bush) Armature running clearance in pinion bush	83.55 to 83.72 mm. (3.289 to 3.295 in.) 82.60 to 82.65 mm. (3.252 to 3.254 in.) 16.159 to 16.232 mm. (.636 to .638 in.) 24.111 to 24.163 mm. (.9492 to .9512 in.) 16.101 to 16.153 mm. (.6338 to .6358 in.) 15.973 to 16.000 mm. (.6289 to .6299 in.) 23.967 to 24.000 mm. (.9437 to .9449 in.) 15.973 to 16.000 mm. (.6289 to .6299 in.) .159 to .259 mm. (.006 to .010 in.) .111 to .196 mm. (.004 to .008 in.) .101 to .180 mm. (.004 to .007 in.) .050 to .100 mm. (.002 to .004 in.) .030 to .080 mm. (.001 to .003 in.) 16.950 to 17.000 mm. (.6673 to .6693 in.) 16.800 to 16.830 mm. (.6613 to .6626 in.) .120 to .200 mm. (.004 to .008 in.)
Lubrication (at overhaul) Starter drive helical spline	grassofiat MR 3
MARELLI STARTER (605 C) Type Voltage Output Direction of rotation (as viewed from pinion end) Number of poles Field winding Drive Operation Pinion-to-ring gear ratio	MT 38 QA-QB 12 Volts 4 H.P. Clockwise 4 Compound Sliding armature and clutch Solenoid 9/110

Starter Data - Continued

Bench Test Data Running torque test (at 20 °C.):— — Current — Speed — Voltage — Torque Lock torque test (at 20 °C.):— — Current — Voltage — Torque — Internal resistance Light running torque test (at 20 °C.) (1):— — Current — Voltage — Speed Resistance test (at 20 °C.):— — Main field winding — Auxiliary winding (parallel) — Auxiliary winding (series)	Up to 875 Amps 1200 to 1800 r.p.m. 8.5 Volts 2.3 kgm. (16 lb. ft.) Up to 2000 Amps 5.5 Volts 4.5 kgm. (32 lb. ft.) or over .0035 to .0042 Ohm Up to 140 Amps 12 Volts 900 to 1400 r.p.m. .0001 to .0007 Ohm .17 to .19 Ohm .13 to .15 Ohm
Mechanical Data Brush spring load (not worn) Mica undercut depth Clutch slip torque Commutator dia.:— — Max. wear dia. — Max. out-of-round	.8 to 1.1 kg. (1.7 to 2.4 lb.) .8 mm. (.032 in.) 12 to 16 kgm. (87 to 116 lb. ft.) 47.840 to 48.000 mm. (1.8898 to 1.8836 in.) 47.2 mm. (1.85 in.) .03 mm. (.001 in.)
Solenoid (14 Amps) Resistance (at 20 °C.) Cut-in voltage (min.) Plunger travel Load at 12 Volts and plunger at end of stroke	.75 to .85 Ohms 8 Volts 5.4 to 5.8 mm. (.21 to .23 in.) 4.2 to 4.8 kg. (9 to 10.6 lb.)
Fitting Data Pole shoe inside dias. Armature outside dias. Drive end bush inside dia. Pinion journal dia. Pinion journal running clearance	{ 83.150 to 83.350 mm. (3.2736 to 3.2814 in.) 83.450 to 83.850 mm. (3.2854 to 3.3111 in.) 82.346 to 82.400 mm. (3.2420 to 3.2441 in.) 82.946 to 83.000 mm. (3.2656 to 3.2677 in.) 35.050 to 35.089 mm. (1.3799 to 1.3814 in.) 34.950 to 34.975 mm. (1.3760 to 1.3790 in.) .075 to .139 mm. (.0029 to .0055 in.)

(1) Energise series and parallel auxiliary windings only

Starter Data - Continued

Armature guide bush inside dia.	16.645 to 16.670 mm. (.6553 to .6563 in.)
Armature guide shaft dia.	16.482 to 16.500 mm. (.6489 to .6496 in.)
Armature guide shaft working clearance	.145 to .188 mm. (.006 to .007 in.)
Pinion bush inside dia.	22.000 to 22.033 mm. (.8661 to .8674 in.)
Armature spigot dia.	21.927 to 21.960 mm. (.8633 to .8646 in.)
Armature spigot running clearance	.040 to .106 mm. (.0016 to .0042 in.)
Lubrication	
Starter drive helical splines (during overhaul)	Grassofiat MR 3 grease
Drive end bush (every 400 hours)	Engine oil (SAE 10 W)

DESCRIPTION

FIAT STARTER (355 C - 455 C - 505 C)

The solenoid-operated sliding pinion FIAT starter consists mainly of the following:—

- Solenoid (6, Fig. 252) and plunger (29) which, when

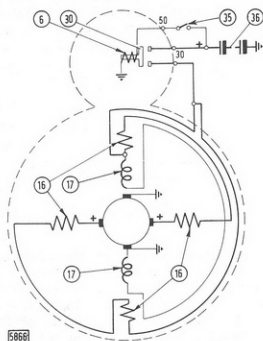


Fig. 248 - FIAT Starter Wiring Diagram

6. Solenoid - 16. Main field winding - 17. Auxiliary field winding - 30. Moving contact - 35. Starter push button switch - 36. 12-Volt battery.

energised moves endwise to load an internal return spring, mesh the pinion with the flywheel ring gear through actuating lever (23), and close the field winding fixed contacts to operate the motor.

- Four windings, two of which include the coils (2 each) representing main and auxiliary windings (16 and 17, Fig. 248), whilst the other two are composed of one coil each completing the main field winding (16).
- A rotating armature (11, Fig. 252) running in self-lubricating bushes and incorporating a multi-start thread on the end opposite to the commutator, along which the pinion moves to facilitate meshing with the starter ring gear.
- A starter pinion (10) sliding endwise over the armature and connected to it through a sprag type unidirectional clutch. The freewheel locks pinion and armature shaft together when the pinion encounters resistance to motion (cranking and starting), and allows the pinion to over-run after starting to prevent the ring gear from causing the armature to spin.

MARELLI STARTER (605 C)

The solenoid-operated, sliding armature Marelli starter consists of the following:—

- An electro-magnetic switch (2, Fig. 254) with double-

contact carrying bridge (1) the upper contact of which closes first to energise the auxiliary windings, whilst the lower contact energises the main winding with a slight delay owing to the intervention of lever (4).

- Four windings, two of which include the coils (2 each) making up the auxiliary windings (in series and in parallel - 51 and 52, Fig. 249, respectively), whilst the other two include one coil each completing the main field winding (47 and 48).
- A rotating armature running in self-lubricating bushes. At first, owing to the pull exercised by the magnetic field generated by the auxiliary windings, the armature turns slowly, simultaneously moving end-wise to bring about frontal engagement of pinion teeth with ring gear teeth, release of stop lever (4, Fig. 254) and loading of the inner return spring. Subsequently, upon energising the main field winding, the armature imparts maximum torque to the pinion.

- A friction type clutch (15), consisting of splined nut screwed onto the pinion extension, which tends to unscrew when pinion rotation is opposed (cranking and starting phase), thereby causing the clutch friction plates to be compressed and establish a positive connection between armature and pinion.

On the contrary, when the pinion is driven by the ring gear (after starting), the splined nut tends to screw itself in, thereby eliminating clutch plate load to free the pinion and protect the armature from overspeeding.

Upon releasing the starter switch, when pinion and armature are restored to their rest position owing to the load of the return spring, throw-off plate (20), of larger diameter, comes to rest against stop plate (21) attached to the yoke, thereby loosening the clutch pack completely.

- A starter drive pinion (13), free running over the armature shaft on the outside of end bracket (17), fitted with a bush to be lubricated with engine oil.

TO OVERHAUL

FIAT STARTER

Remove from the engine and dismantle on the bench as follows:—

- Take off the rear end bracket (1, Fig. 252) with attached armature thrust plate (22), withdraw the

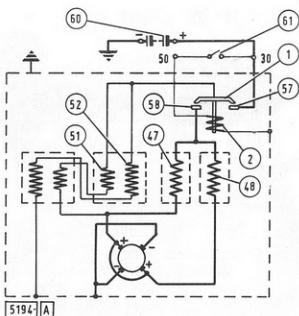


Fig. 249 - Starter Wiring Diagram

1. Contact bridge - 2. Solenoid - 47 and 48. Main field windings - 51. Series-connected auxiliary winding - 52. Parallel-connected auxiliary winding - 57. Auxiliary winding contact - 58. Main field winding contact - 60. Battery - 61. Starter switch.

brushes, disconnect the motor winding lead from terminal clamp (3) and slide the yoke with attached brush holder assembly clear of the armature.

- Free terminals (16 and 17) and separate brush holder (18, Fig. 250) from the yoke.

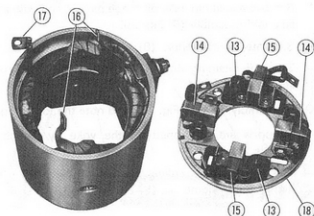


Fig. 250 - Yoke and Brush Holder Assembly

13. Brush springs (thrust on side of brush) - 14. Negative brushes (earthed) - 15. Positive brushes - 16. Main field winding terminals - 17. Auxiliary field winding terminal (earthed) - 18. Brush holder assembly.

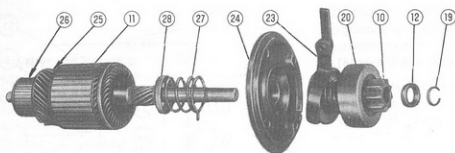
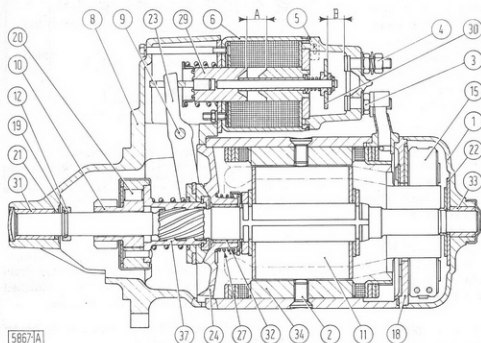


Fig. 251 - Exploded View of Armature Assembly

10. Pinion - 11. Armature - 12. Pinion stop ring - 19. Retaining ring - 20. Freewheel - 23. Actuating lever - 24. Intermediate support plate - 25. Armature winding - 26. Commutator - 27. Return spring - 28. Spring cup.

5891



5867A

Fig. 252 - Section through FIAT Starter

A. 13.65 to 15.15 mm. or .535 to .594 in., plunger stroke - B. 11.35 to 13.45 mm. or .444 to .527 in., moving contact travel - 1. Rear support - 2. Pole shoe retaining screw - 3. Motor winding terminal clamp - 4. Battery positive lead terminal clamp - 5. Solenoid pin connector - 6. Pinion end support - 8. Actuating lever hinge pin - 9. Pinion - 10. Armature - 11. Armature - 12. Pinion stop - 15. Positive brush - 18. Brush holder carrier - 19. Retaining ring - 20. Uni-directional clutch - 21. Pinion end seal - 22. Thrust plate - 23. Actuating lever - 24. Intermediate support plate - 27. Return spring - 29. Plunger - 30. Moving contact - 31, 32 and 33. Bushes - 34. Pole shoe - 37. Drive sleeve.

— Remove a split pin, take off hinge pin (9) and withdraw solenoid assembly (6, Fig. 252).

— Separate front support (8) from armature (11).

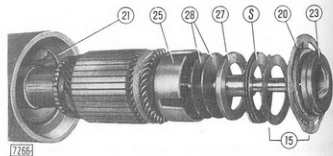
— Take off retaining ring (19) and dismantle the parts shown in Fig. 251.

On reassembly, refer to Fig. 252 and note the following:—

— Supports are positioned on the yoke by means of dowels.

— The starter drive spline is to be lubricated using highly fluid engine oil (SAE 10 W).

take off the brushes and the field terminals, nut (34) and the tie bolts. Remove retaining nuts (26 and 33) and withdraw the parts shown in Fig. 255.



17266

Fig. 253 - Exploded View of Clutch Assembly

S. Shims - 15. Clutch pack (5 steel rings and 5 friction rings) - 20. Throw-off plate - 21. Stop plate (attached to motor yoke) - 23. Nut - 25. Clutch yoke (attached to armature) - 27. Pressure plate - 28. Backing plates.

MARELLI STARTER

Remove the starter from the tractor, remove protective cover (35, Fig. 254), separate yoke and end brackets,

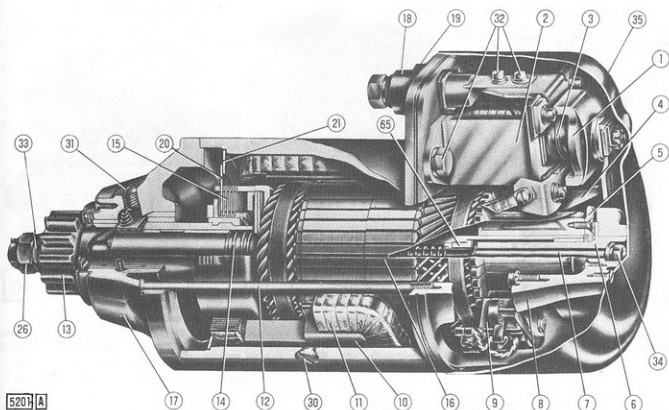


Fig. 254 - Cut-away View of Sliding Armature Starter

1. Moving contact bridge - 2. Starter switch - 3. Bridge return spring - 4. Stop lever - 5. Trip plate - 6. Armature guide bush - 7. Armature guide shaft with return spring - 8. Rear brush holder - 9. Brush - 10. Pole shoe - 11. Field winding - 12. Tie rod - 13. Pinion - 14. Thrust spring - 15. Clutch assembly - 16. Armature - 17. Drive end bracket - 18. Positive terminal - 19. Solenoid terminal - 20. Throw-off plate - 21. Stop plate - 26. Locknut (with shear pin) - 30. Pole shoe retaining screw - 31. Lubrication fitting - 32. Solenoid retaining screws - 33. Pinion retaining nut (with thrust and wear control washers) - 34. Armature retaining nut - 35. Cover - 65. Armature guide shaft ring nut.

When reassembling, refer to Figs. 254 and 255, and note the following:—

1. Reposition pressure plate (27, Fig. 253) with the flat face contacting shims (S).

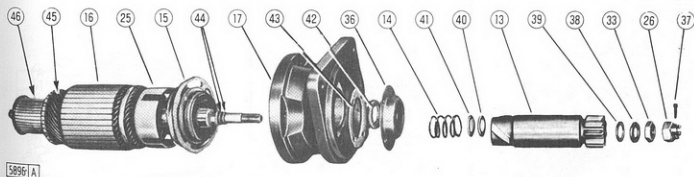


Fig. 255 - Exploded View of Armature and Starter Drive Assembly

13. Pinion - 14. Thrust spring - 15. Clutch assembly - 16. Armature - 17. Drive end bracket - 25. Clutch yoke (attached to armature) - 26. Locknut - 33. Pinion retaining nut - 36. Seal retainer - 37. Shear pin - 38. Thrust washer - 39. Wear control washer - 40. Insulating washer - 41. Plain washer - 42. Pinion outer seal - 43. End bracket seal - 44. Pinion inner seals - 45. Armature winding - 46. Commutator.

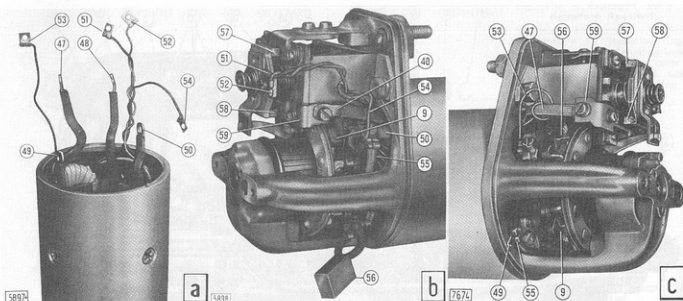


Fig. 256 - Scrap Views of Field Winding Terminals (a) and Connections (b and c)

9. Positive brush - 47, 48, 49 and 50. Main field winding terminals - 51 and 52. Auxiliary winding terminal - 53. Parallel auxiliary winding terminal - 54. Series auxiliary winding terminal - 55. Positive brush connection - 56. Negative brush - 57. Upper moving contact - 58. Lower moving contact - 59. Lower fixed contact.

2. Lubricate both the nut and the pinion using grassofiat MR 3 or other approved grease, and the front end bush with engine oil.
3. Refit wear control washer (39, Fig. 255) to contact the pinion.
4. Reconnect the field winding terminals as follows:—
 - Terminals (47 and 48) to solenoid lower fixed contact.

- Terminals (49 and 50) to the positive brush holders.
- Terminal (51) to solenoid upper moving contact.
- Terminal (53) to negative brush holder.
- Terminal (54) to positive brush holder.

The positive brush holders are also electrically connected through (55).

On completion of reassembly, ensure that winding and terminal screws do not foul the commutator.

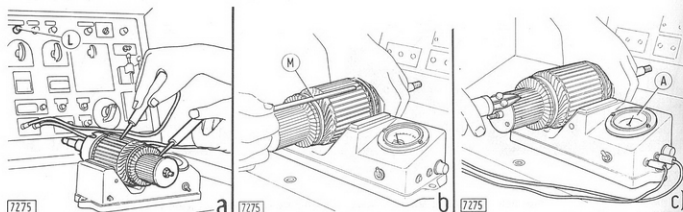


Fig. 257 - Checking Armature Insulation (a), Conductors (b) and Winding (c)

A. Ammeter (reads nil on O/C coils) - L. 220-Volt warning light (lights up in case of earthed armature) - M. Steel blade (vibrates when placed on S/C turns).

TO INSPECT

Carefully clean all components and check the following:—

1. Self-lubricating bush wear, bearing in mind that excessive wear could lead to pole shoe fouling by the armature.
2. Brush spring load and brush wear. Always renew the brushes as a set, even if only one is found to be worn or defective.
3. Commutator out-of-round. If the cylindricity error is greater than allowed (see Data) skim at the lathe. Subsequently, the mica will have to be undercut to a depth specified in the Data Table, using tool No. 290190.
4. Armature winding and commutator-to-yoke insulations for breakdown (see a, Fig. 257), winding conductors and commutator laminations for S/C (see b), and the assembly for O/C (see c).
5. Field winding-to-yoke and pole shoe insulations for breakdown (see Fig. 258) and for possible O/C in the windings. When positioning a new winding, preheat to 50 °C. using a 24 Volt input for approximately one minute; this will increase flexibility and facilitate positioning under the pole shoes. Subsequently, the pole shoes will have to be tightened by clamping the associated screws using hand press No. 290021 in conjunction with expander No. 291347. On completion of assembly, check that pole shoe inside diameter is as prescribed. If the diameter is not as specified, it means that the shoes have been incorrectly assembled. In such cases, dismantle and reassemble again. Do not machine the pole shoes.
6. Clutch slip torque, using tool No. 292307 in conjunction with a torque spanner. If the torque is found to be lower than 12 kgm. (87 lb. ft.), add one or more shims (S, Fig. 253) as necessary.

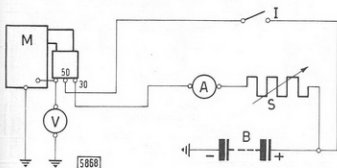


Fig. 259 - Starter Bench Test Wiring Diagram (FIAT and MARELLI)

A. Ammeter - B. Battery - M. Starter - I. Starter switch - S. Rheostat - V. Voltmeter.

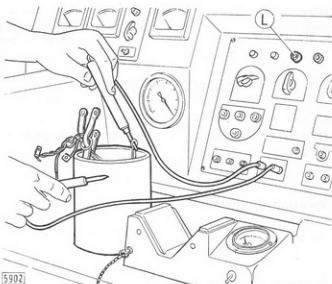


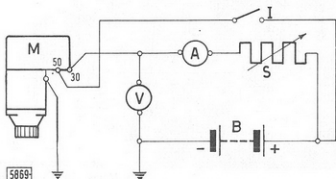
Fig. 258 - Checking Field Winding Insulation (220-Volt circuit)

(An earthed winding will cause warning light L to come on).

7. Freewheel efficiency; the static torque required to rotate the pinion should be 5 to 7 kgcm or .36 to .50 lb. ft.

BENCH TESTS

Starter efficiency is assessed by carrying out the running torque, lock torque and light running torque tests. To this end, fit the starter on the test bench and prepare the connections illustrated in Fig. 259. Apply an input at the starter as prescribed, and check that each test yields the values given in the table.



ACCESSORIES

MASTER SWITCH

60 Amp master switch (19, Fig. 260) has six positions as follows:—

Position 0 - 30 30/1

All off

Position I - 30-51 30/1

Starter push or thermo-starter/starter switch - Alternator warning light - Voltage regulator - Water temperature warning transmitter (355C) or sensor (455C - 505C - 605C) - Oil pressure warning transmitter - Fuel tank unit (455C - 505C - 605C).

Position II - 30-51 30/1-58

Same as position 1 plus:—

Side light warning - Number plate light - Side light warning/instrument lighting light - Flood light/switch.

Position III - 30-51 30/1-58-56b

Same as position II plus: Dipped beams.

Position IV - 30-51 30/1-58-56a

Same as position II plus: Main beams.

Position V - 30 30/1-58

Side light warning - Number plate light - Side light warning/instrument lighting light - Flood light/switch.

STARTER/THERMO-STARTER SWITCH

The starter and thermo-starter switch (15, Fig. 260) is under master switch control, i.e. it is only operative with the master switch turned to position I, II, III or IV.

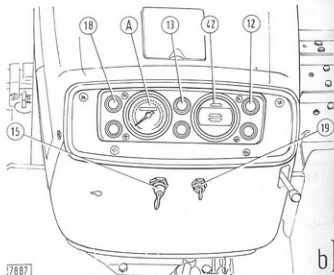
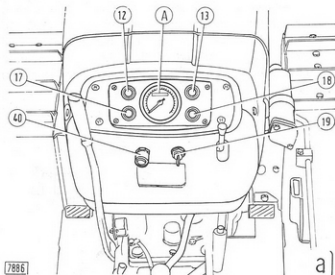


Fig. 260 - Controls and Instruments

a. Model 355 C - b. Models 455 C, 505 C and 605 C.

A. Tacho-hourmeter (indicating, engine speed, P.T.O. speed and working hours) - 12. Engine oil pressure warning light - 13. Side light warning light (green) - 15. Starter/thermo-starter switch - 17. Water temperature warning light - 18. Alternator warning light - 19. Master switch - 40. Starter push - 42. Fuel gauge and water temperature gauge.

Position 0 - 30 15/54

Off

Position I - 30 15/54-T

Thermo-starter.

Position II - 30-50 15/54-T

Thermo-starter and starter.

Position III - 30-50 15/54

Starter.

- Fuse (2) — Fuel gauge (455C - 505C - 605C), water temperature warning light (355C), water temperature gauge (455C - 505C - 605C), oil pressure warning light and alternator warning relay.
- Fuse (3) — Front R.H. side light, L.H. rear light, number plate light, side light warning light.
- Fuse (4) — Front L.H. side light, R.H. rear light and flood light.
- Fuse (5) — Dipped beams.
- Fuse (6) — Main beams.
- Fuse (11) — Voltage regulator.

Unprotected Circuits:—

Starter and alternator.

Note: Prior to renewing a blown fuse, trace and rectify the cause.

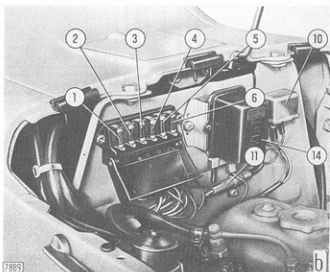
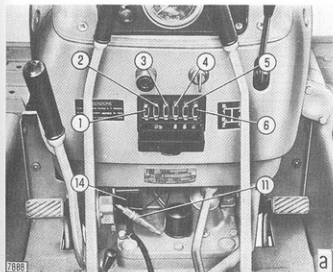
FUSE UNIT

Six fuses in a box and one in a tube (see Fig. 261). All fuses are rated at 8 Amps. However, if the tractor is fitted with a thermo-starter device, fuse (1) is rated at 16 Amps. Protected circuits:—

- Fuse (1) — Spare, thermo-starter (if fitted).

BULBS

Headlamps (main/dipped)	45/40 W
Side front-rear lamps	5 W
Side light warning lamp	5 W
Oil pressure warning lamp	5 W

**Fig. 261 - Fuse Unit Location on the Tractor**

a. Model 355 C - b. Models 455 C, 505 C and 605 C

1, 2, 3, 4, 5, 6 and 11. Fuses - 10, Alternator warning relay - 14, Voltage regulator.

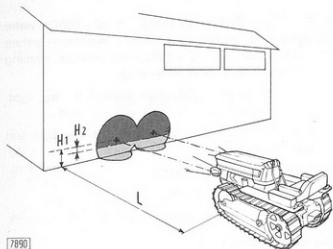


Fig. 262 - Headlamp Alignment

$L = 5$ metres or $16\frac{1}{2}$ feet, distance away from wall - H_1 , Headlamp centre mark height above ground - $H_2 = H_1 : 20$, Distance from centreline to dipped beam demarcation line.

Alternator warning lamp	5 W
Water temperature warning lamp (355 C)	5 W
Flood lamp	35 W

HEADLAMP ALIGNMENT

To check headlamp alignment proceed as follows (see Fig. 262):—

- Place the tractor on level ground before a bright wall out of direct sunlight. Draw two crosses on the wall corresponding to the headlamp centres.
- Back the tractor 5 metres or $16\frac{1}{2}$ feet from the wall (see L), keeping the machine at right angles to the wall.
- Check dipped beam divergence (horizontal alignment) ensuring that the centre of each beam lies on the line passing through the cross mark on the wall, maximum allowance being 130 mm. or 5 in.
- Check beam height (vertical alignment) on the dipped beams ensuring that the demarcation line on the wall lies below the cross marks by at least $1/20$ (see H_2) of the headlamp height above ground (H_1).

To adjust, slacken the lamp support retaining nuts, reposition the lamp units and retighten.

Fig. 263 - Wiring Diagram
(a) Model 355 C - (b) Models 455 C, 505 C and 605 C

Optional variant (dotted line) shows thermo-starter and control switch replacing starter switch and connections.

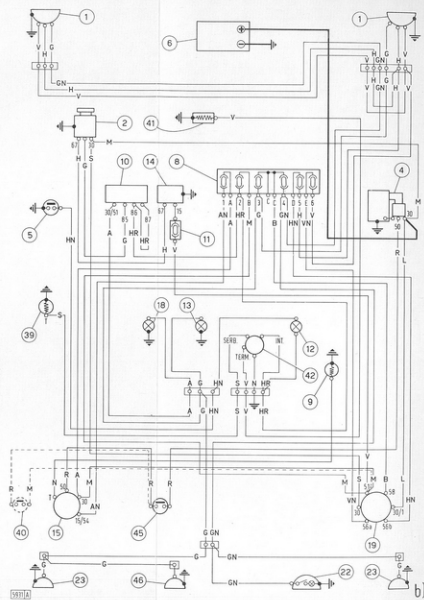
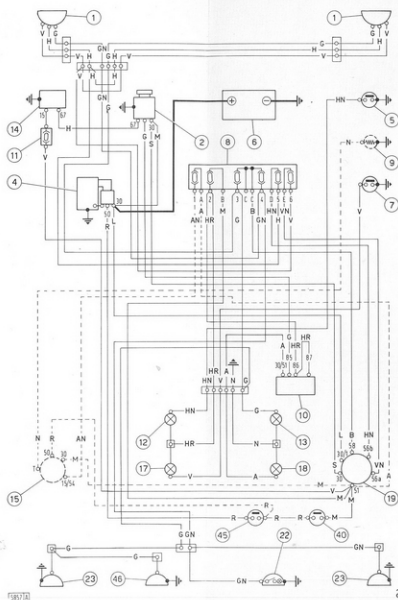
Optional variant (dotted line) illustrates starter switch fitted in place of thermo-starter and control switch.

Note: On tractors not equipped with thermo-starters the associated fuse remains unused.

1. Headlamp/side light units
2. Alternator
3. Starter
4. Oil pressure warning transmitter
5. Battery (12 V)
6. Water temperature warning transmitter
7. Battery (12 V)
8. Water temperature warning transmitter
9. Fuse unit
10. Thermo-starter
11. Alternator warning relay
12. Voltage regulator fuse
13. Oil pressure warning light
14. Side light warning light (green)
15. Voltage regulator
16. Starter/thermo-starter switch
17. Water temperature warning light
18. Alternator warning light
19. Master switch
20. Flood light/switch
21. Rear lights
22. Fuel transmitter
23. Starter push
24. Water temperature sensor
25. Fuel gauge and water temperature gauge
26. Starter inhibitor switch
27. Number plate light

Cable Colour Code

A = Light blue	M = Brown
B = White	N = Black
G = Yellow	R = Red
H = Grey	S = Pink
L = Dark blue	V = Green
AN = Light blue, black tracer	
GN = Yellow, black tracer	
HN = Grey, black tracer	
HR = Grey, red tracer	
VN = Green, black tracer	



TIGHTENING TORQUE FIGURES

DESCRIPTION	Thread Size	Torque (1)	
		kgm.	lb. ft.
ENGINE			
Removal - Refitting			
Gearbox retaining screws	M 12 x 1.25	10	72
Block - Head			
Oil sump screws	M 10 x 1.25	6	43
Hold-down screws (Fig. 11)	M 12 x 1.25	15	108
Valvegear			
Timing cover nuts and screws	M 8 x 1.25	2.5	18
Rocker bracket screws	M 8 x 1.25	2.5	18
Crankgear			
Flywheel screws (C ₂ , Fig. 25)	M 12 x 1.25	13.5	97.5
Con. rod cap screws (C ₁ , Fig. 31)	M 12 x 1.25	11.5	82.5
Main bearing cap screws (C ₂ , Fig. 24)	M 14 x 1.5	15	108
Crankshaft hub nut (C ₁ , Fig. 25)	M 30 x 1.5	30	216
Dynamic Balancer (605 C)			
Flyweight housing screws (C ₂ , Fig. 32)	M 12 x 1.25	12	87
Fuel System			
THERMO-STARTER			
Plug	1/2 Pipe	5	36
INJECTORS			
Injector stud nut	M 8 x 1.25	2.5	18
IN-LINE INJECTION PUMP (355 C)			
Pump retaining screws	M 10 x 1.25	6	43
Drive bush nut (43, Fig. 46)	M 12 x 1.75	7	50
Delivery connectors	M 20 x 1.5	4.80	35
BOSCH INJECTION PUMP (455 C-605 C)			
Bleed and check valve (V ₂ , Fig. 56)	M 20 x 1	5	36
Return connector (27, Fig. 58)	M 12 x 1.5	2.30	16
Cover screws (29 and 30, Fig. 56)	M 6 x 1	.55	4
Actuating lever plate screws	M 6 x 1	.70	5
Adjustment screw locknut (62, 65 and 66)	M 6 x 1	.55	4
Hydraulic head screws (A)	M 6 x 1	1.20	8.5
Delivery connectors (3)	M 14 x 1.5	4.30	31
Centre plug (2)	M 14.5 x 2	6.50	47
Centre plug vent screw	M 6 x 1	.45	3
Lever retaining nuts (60 and 63)	M 6 x 1	.60	4.3
Cover screws (48)	M 6 x 1	.55	4

(1) Wet (engine oil)

Tightening Torque Figures - Continued

DESCRIPTION	Thread Size	Torque (1)	
		kgm.	lb. ft.
Timing pointer screw (15, Fig. 58)	M 4 x .7	.25	1.8
Transfer pump ring screw	M 5 x .8	.50	3.6
Drive gear nut	M 12 x 1.75	6.50	3.6
Pump inlet connection	M 12 x 1.5	4.30	31
Pressure regulating valve (V ₁)	M 14 x 1	.85	6
C.A.V. INJECTION PUMP (455 C-505 C-605 C)			
End plate screws (49, Fig. 69)		.50	3.6
Fuel inlet connection (48)		5.20	38
Fuel inlet pipe connector		1.40	10
Rotor screw (46, Fig. 81)		.30 (2)	2
Transfer pump rotor (27, Fig. 67)		.75	5.4
Hydraulic head screws (incl. vent screw)		1.95	14
Locating head fitting (19, Fig. 69)		4.00	29
Advance device stud nut		1.50	11
Advance device stud (16)		.70	5
Cam advance lever (18, Fig. 71)		5.20	37.6
Advance device plugs (65 and 75)		2.90	21
Advance device plug screw (76)		.45	3.2
Shim screws (64, Fig. 74)			
— Direct		2.90 (3)	21
— Using tool No. 290754 (Fig. 78)		2.35 (3) (4)	17
Governor cover studs		.70	5
Governor cover nuts (33, Fig. 69)		.45	3.2
Throttle/shut-off lever nuts		.35	2.5
Hook lever adjusting nut (34, Fig. 82)		.25	1.8
Locknut (41, Fig. 69)		.25	1.8
Drain connector (1)		2.10	15
Governor vent screw carrier		.75	5.4
Governor vent screw (95a)		.45	3.2
Transfer pressure damper (97)		4.00	29
Pump drive gear nut		8.30 (3)	60
Delivery connector (with copper washers)		3.00	21.7
Lubrication System			
Oil pump body screws	M 8 x 1.25	2.5	18
Oil pump cover screws	M 8 x 1.25	2.5	18
Pressure relief valve body	M 24 x 1.5	7	
Cooling System			
Fan/pump pulley screws	M 8 x 1.25	2.5	50.6
Fan/alternator drive pulley screws	M 10 x 1.25	5	36
Water pump screws	M 10 x 1.25	6	43

(1) Wet (engine oil)

(2) With Araldite washer

(3) Tighten, slacken and retighten

(4) Align tool and torque spanner — Tool hub to be 125 mm. or 5 in. from screw

(5) Tighten with plain washer, then remove and fit lockwasher

Tightening Torque Figures - Continued

DESCRIPTION	Thread Size	Torque (1)	
		kgm.	lb. ft.
MASTER CLUTCH			
Coupling screws (C ₁ , Fig. 102)	M 10 x 1.25	6.5	47
Flywheel screws (C ₂)	M 12 x 1.25	13.5	97.5
Withdrawal fork screws (C ₃)	M 16 x 1.5	18	130
Carrier plate nut (C ₄)	M 22 x 1.5	23.5	169.5
Annulus screws (605 C) (C ₅ , Fig. 102 b)	M 10 x 1.25	6	43
GEARBOX			
Layshaft nut (C ₁ , Fig. 119)	M 22 x 1.5	26	188
Axle case stud nut	M 12 x 1.5	10	72
Gearbox retaining screws	M 12 x 1.25	10	72
Reduction unit retaining screws	M 12 x 1.5	10	72
BEVEL DRIVE			
Bearing carrier screws (C ₁ , Fig. 129)			
— Standard screws	M 10 x 1.25	6	43
— Self-locking screws		6.2	45
Pinion carrier screws (C ₂)	M 12 x 1.5	10	72
Crown wheel screws (C ₃)	M 14 x 1.5	19	137
Pinion bearing nut (C ₄)	M 36 x 1	35	253
BRAKES - STEERING CLUTCHES			
Release cam screw (C ₁ , Fig. 141)	M 10 x 1.25	6	43
Threaded bush screws (C ₂)	M 10 x 1.25	6	43
Pressure plate stud nuts (C ₃ , Fig. 138)	M 12 x 1.5	6.5	47
Hand brake relay lever screw (C ₄ , Fig. 135)	M 16 x 1.5	13.2	96
Brake band lever screw (C ₅)	M 16 x 1.5	18	130
Release roller nut (C ₆ , Fig. 141)	M 16 x 1.5	11.5	82.5
Actuating lever nut (C ₇)	M 20 x 1.5	10	72
Drum and hub retaining nuts (C ₁₀ , Fig. 153)	M 24 x 1.5	28.5	205.5
HUB REDUCTION FINAL DRIVE - SPROCKETS			
Models 355 C and 455 C			
Reduction cover screws	M 10 x 1.25	6	43
Drive pinion bearing cover (C ₁₂ , Fig. 153)	M 10 x 1.25	6	43
Sprocket axle screws (C ₁₃)	M 12 x 1.25	10	72
Sprocket axle nuts (C ₁₄)	M 40 x 1.5	85	615
Reduction case stud nut	M 12 x 1.5	10	72
Models 505 C and 605 C			
Drive pinion inner bearing cover screws	M 10 x 1.25	6	43
Reduction case lower cover screws	M 10 x 1.25	6	43
Reduction case stud nuts	M 12 x 1.5	10	72
Sprocket outer bearing carrier screws (C ₁ , Fig. 153)	M 12 x 1.5	10	72
Sprocket screw (C ₈)	M 16 x 1.5	24	173
Sprocket axle nut (C ₁₁)	M 34 x 1.5	37.2	269

(*) Wet (engine oil)

Tightening Torque Figures - Continued

DESCRIPTION	Thread Size	Torque (1)	
		kgm.	lb. ft.
POWER TAKE-OFF			
P.T.O. case screws	M 12 x 1.5	10	72
P.T.O. shaft nut	M 22 x 1.5	26	188
BELT PULLEY			
Pulley retaining screws (on P.T.O. case)	M 14 x 1.5	15	108
Pulley retaining screws (on driven shaft) (C ₁ , Fig. 159)	M 12 x 1.5	10	72
Driven gear nut (C ₂)	M 22 x 1.5	31.5	227.5
UNDERCARRIAGE			
Track Chains			
Track shoe nuts:—			
— 355 C and 455 C	M 10 x 1	7.6 [8.6 (*)]	55 [62 (*)]
— 505 C and 605 C	M 12 x 1	11.9 [14.5 (*)]	86.5 [104.5 (*)]
Coupling pin screw (C ₁ , Fig. 165):—			
— 355 C and 455 C	M 10 x 1.25	5	36
— 505 C and 605 C	M 14 x 1.5	12	87
Track Tension Assembly			
Bearing cap screws (C ₂ , Fig. 173)	M 8 x 1.25	2.9	21
Bush housing screws (C ₃ , Fig. 175)	M 10 x 1.25	6.2	45
Runner screws:—			
— 355 C and 455 C (C ₇ , Fig. 173)	M 10 x 1.25	4	29
— 505 C and 605 C (C ₄ , Fig. 175)	M 10 x 1.25	4	29
Fork guide retaining screws (to side rails) (C ₆ , Fig. 170)	M 10 x 1.25	4	29
Fork guide spacer screws (C ₈):—			
— 355 C and 455 C	M 12 x 1.25	10	72
— 505 C and 605 C	M 12 x 1.5	10	72
Fork guide retaining screws (to front idler carrier)	M 12 x 1.25	10	72
End plate screws (C ₉ , Fig. 175 and C ₁₀ , Fig. 173)	M 14 x 1.5	15	108
Rod support screws	M 16 x 1.5	22.5	162
Front idler axle screws:—			
— 355 C and 455 C (C ₁₉ , Fig. 179)	M 10 x 1.25	6.2	45
— 505 C and 605 C (C ₉ and C ₁₁ , Fig. 175):			
R 80 screws	M 16 x 1.5	22.5	162
R 100 screws		17.5	126.5
Track Rollers			
Bearing cap screws (C ₁₁ , Fig. 178)	M 8 x 1.25	2.9	21
Bush housing screws (C ₁₂ , Fig. 181)	M 10 x 1.25	6.2	45
Carrier screws:—			
— 355 C and 455 C (C ₂₀ , Fig. 178)	M 12 x 1.25	5	36
— 505 C and 605 C (C ₁₃ and C ₂₅ , Fig. 181)	M 12 x 1.5	8.5	61.5
Top Idler (605 C)			
Plate screws (C ₂₂ , Fig. 186)	M 8 x 1.25	3	21.5
Cover plate screws (C ₂₃)	M 8 x 1.25	2.6	19
Idler carrier screws (C ₂₄)	M 14 x 1.5	9	65

(1) Wet (engine oil)

(*) For zinc plated screw only

Tightening Torque Figures - Continued

DESCRIPTION	Thread Size	Torque (1)	
		kgm.	lb. ft.
Suspensions			
Guide plate screws (C ₁₄ , Fig. 193)			
— A.M. (R 80 screws)	M 14 x 1.5	15	108
— P.M. (R 100 screws)	M 14 x 1.5	18	130
Leaf spring nuts (to be peened)	M 10 x 1.25	4.3	31
Suspension bar bush housing screws			
— 355 C and 455 C (C ₂₁ , Fig. 196)	M 12 x 1.25	10	72
— 505 C and 605 C (C ₁₃)	M 14 x 1.5	15	108
Brace screws (C ₁₆ , Fig. 193)	M 16 x 1.5	22.5	162
Suspension bar cap screws (C ₁₇ , Fig. 196)	M 16 x 1.5	22.5	162
Front suspension support screws			
— A.M. (R 80 screws)	M 16 x 1.5	22.5	162
— P.M. (R 100 screws)	M 16 x 1.5	24	173.5
HYDRAULIC LIFT UNIT			
Lift Assembly (355 C)			
Cross-shaft screw (C ₁ , Fig. 204)	M 14 x 1.5	15	108
Top link support screw	M 14 x 1.5	15	108
Relief valve (I, Fig. 199)	M 18 x 1.5	8	58
— Valve plug	M 18 x 1.5	4	29
Cylinder piston stop ring nut (C ₂ , Fig. 203)	M 24 x 1.5	23	166
Cylinder head (23)	M 64 x 1.5	54	390.5
Lift Assembly (455 C, 505 C and 605 C)			
Control valve nuts (C ₁ , Fig. 209)	M 10 x 1.25	5	36
Rear cover nuts (46, Fig. 217)	M 12 x 1.5	10	72
Lift lever nuts (C ₂ , Fig. 219)	M 14 x 1.5	10	72
Control valve nuts (C ₃ , Fig. 209)	M 14 x 1.5	15	108
Lift assembly retaining nuts	M 14 x 1.5	15	108
Lift assembly retaining screws	M 14 x 1.5	15	108
Cylinder safety valve (3)	M 24 x 1.5	3.5	25
Unload valve plug (C ₆ , Fig. 216)	M 24 x 1.5	6.5	47
Hydraulic Pump			
Pump retaining screw (C ₁ , Fig. 232)	M 6 x 1	1	7
Pump cover nuts (C ₂ , Fig. 233)	3/8" - 24 UNF	4.2	30
Drive sleeve nut (C ₃)	7/16" - 20 UNF	2.8	20
ELECTRICAL SYSTEM			
Alternator			
Alternator body nuts (C ₁ , Fig. 240)	M 6 x 1	.5	3.5
Drive pulley nut (C ₂)	M 14 x 1.5	6	43

(1) Wat (engine oil)

SERVICE TOOLS

This section lists special-purpose tools needed to overhaul the tractor models described. Standard shop tools have been omitted.

Tool No.	DESCRIPTION
ENGINE	
Removal - Refitting	
290737 } 290738 } 290739 }	Engine support brackets (Fig. 6)
290740	Chain (Fig. 5).
291310	Compression tester.
292631	Dummy injector.
Block - Head	
292507	Liner extraction plate.
291501	Liner refitting plate.
A. 60419 (292913)	Valve seat cutter.
Valvegear	
290886	Valve clearance spanner (Fig. 20).
291046	Valve guide drift (Fig. 17).
291050	Valve remover/replacer (Fig. 15).
291177	Valve guide reamer (b, Fig. 17).
Crankgear	
290280	Small end bush reamer.
291048	Piston ring compressor.
291504	Crankshaft hub remover.

Tool No.	DESCRIPTION
Fuel System	
INJECTORS	
A. 65026 (291357)	Nozzle cleaner kit.
290898	Injector support.
291195	See in-line injection pump.
291337	Injector spanner.
ADVANCE DEVICE (355 C)	
290984 } 290985 }	See In-line injection pump.
290771	Upright (D, Fig. 43).
IN-LINE INJECTION PUMP (355 C)	
A. 42105 (291190)	Delivery valve extractor.
A. 52106 (290896)	Tappet adjustment spanners.
A. 52123 (290847)	Toothed bush holding spanner.
A. 65019 (290901)	Tappet forks.
A. 65020 (290895)	Pump element remover/replacer.
A. 65021 (292424)	Bottom plug screwdriver.
A. 65022 (290903)	Tappet remover/replacer.
A. 65023 (290904)	Control sleeve pin.
A. 65024 (292174)	Plunger stroke inspection gauge.
A. 90339 (290902)	Control rod bush reamer.

Service Tools - Continued

Tool No.	DESCRIPTION
A. 94029 (290900)	Barrel bore cutter.
A. 95667 (290314)	Plunger stroke dial gauge.
290312	Fixing plate (for use with support No. 290239).
290977	Flyweight carrier extractor.
290984	Throttle lever clamp (D, Fig. 51).
290985	Extension (for use with tool No. 290984).
291188	Control rod travel gauge.
291195	Pressure gauge kit for injector and plunger testing.
293126	Flyweight ring nut spanner.
	DISTRIBUTOR INJECTION PUMP (455 C-505 C-605 C)
	<i>Pump Testing</i>
290761	Gauge kit (0-10 kg/cm ² pressure gauge, 0-1.5 kg/cm ² pressure gauge, 0-760 mm./Hg vacuum gauge and burette).
290763	Pump support.
290784	Delivery pipe (Bosch pump, test procedure A).
292298	Delivery pipe (C.A.V. pump, test procedure A).
	<i>Pump Overhaul</i>
290752	Fixing plate (for use with rotary stand No. 290239).
	BOSCH Pump
290766	Transfer pump rotor remover/replacer.
290774	Distributing rotor stroke gauge.

Tool No.	DESCRIPTION
290778	Rotor spring preload check spacer.
290780	O-ring remover.
290781	Spill cut-off tester (with gauge extension No. 290783).
292548	O-ring protector.
292550	M 12 × 1 threaded extension (for use with tool No. 290774).
292551	M 14.5 × 2 threaded extension (for use with tool No. 290774).
292553	Pressure regulating valve circlip remover.
292554	Cam ring protector.
292555	Pump shaft remover/replacer.
292556	Shuttle and metering valve spanner.
292557	Pressure regulating valve compressor.
292558	Hydraulic head centraliser.
292817	Advance/feed pressure tester.
	C.A.V. Pump
290741	Throttle lever spindle removal guide.
290742	Throttle and shut-off lever O-ring removal guide.
290743	Advance tester.
290744	Transfer pump rotor remover/replacer (for use with torque spanner).
290745	Start-retard O-ring replacer guide.
290746	Advance device plug O-ring replacer guide.

Service Tools - Continued

Tool No.	DESCRIPTION	Tool No.	DESCRIPTION
290747	Distributing rotor flange holding spanner.	HUB-REDUCTION FINAL DRIVES	
290748	Pump pressure test plug.	291029 } 291254 } 292727 }	Drive pinion holding tool (Figs. 143 and 149).
290749	Transfer pump outlet pressure test connector.		
290750	Fuel drain line connector.		
290751	Fuel inlet line connector.	UNDERCARRIAGE	
290753	Pump pressure test connector.	291250 ⁽⁵⁾ } 290808 ⁽⁶⁾ }	Coupling pin remover (Fig. 165).
290754	Delivery screw spanner.		291417
290755	Connector, with relief valve, for pump roller stroke check.	291427	Track roller carrier extractor (Fig. 180).
290756	Pump drive coupling.	291525	Bush housing pilot pins (Fig. 184).
290757	Pump flange timing gauge.	292447	Carriage threaded bush spanner (Fig. 192).
290758	Cam ring remover/replacer.	292927	Impulse extractor with adapter No. 292311 for removal of pin (10, Fig. 195).
290759	Pump shaft replacer.	Fixed press kit, Bignozzi, No. 292451 (Fig. 166)	
290760	Advance device connector.	290928 ⁽⁵⁾ }	Link spacing gauge.
		290803 ⁽⁶⁾ }	
	Cooling System	292425 ⁽⁵⁾ }	Link reassembly bracket.
291182/1	Pump impellor extractor (Fig. 91).	292418 ⁽⁶⁾ }	
	MASTER CLUTCH	292426 ⁽⁵⁾ }	Link remover bracket.
290564	Lever alignment gauge (Fig. 103).	292419 ⁽⁶⁾ }	
290727	Ring nut adjuster (Fig. 104).	292427 ⁽⁵⁾ }	Anvil.
		292420 ⁽⁶⁾ }	
	BEVEL DRIVE	292428 ⁽⁵⁾ }	Spacer.
290787	Pinion positioner (Fig. 130).	292421 ⁽⁶⁾ }	
	STEERING CLUTCHES	Portable press kit No. 291387, including sleeve No. 291386 (Fig. 167)	
291249	Compressor (Fig. 138).	290920 ⁽⁵⁾ }	Bush remover and replacer punch.
		290796 ⁽⁶⁾ }	

⁽⁵⁾ Applicable to Models 355 C and 455 C⁽⁶⁾ Applicable to Models 505 C and 605 C

Service Tools - Continued

Tool No.	DESCRIPTION
290922 ⁽⁵⁾ } 290797 ⁽⁶⁾ }	Guide pin.
290924 ⁽⁵⁾ } 290798 ⁽⁶⁾ }	Holding fixture.
290925 ⁽⁵⁾ } 290799 ⁽⁶⁾ }	Spacer.
290928 ⁽⁵⁾ } 290803 ⁽⁶⁾ }	Link spacing gauge.
290921	Pin remover punch.
290923	Holding plate.
HYDRAULIC SYSTEM	
291326	Operating pressure check connector (Figs. 205 and 224) for use with gauge kit No. 291314.
Lift (355 C)	
290825	Relief valve connector.
290877	Control valve leakage tester, for use with hand pump No. 290284 (Fig. 200).
Lift (455 C-505 C-605 C)	
290817 } 290818 }	Seal protector and replacer.
290824	Relief valve connector.
290826	Safety valve connector.
290834	Unload valve connector.
291259	Insert valve plug remover-replacer spanner.
Lift and Pump Test (Figs. 202 and 222)	
291231 ⁽¹⁾ ⁽²⁾	Tester assembly (large) equipped with:—

Tool No.	DESCRIPTION
290469/1 ⁽³⁾ 293005 ⁽³⁾	— Control valve support. — Oil reservoir.
291233 ⁽¹⁾ ⁽²⁾ ⁽³⁾	Diesel engine (as alternative to No. 291235) equipped with:—
290367 ⁽¹⁾ ⁽²⁾ ⁽³⁾	— Support bracket.
291235 ⁽¹⁾ ⁽²⁾ ⁽³⁾ 290385 ⁽¹⁾ ⁽²⁾ ⁽³⁾ 292574 ⁽²⁾	Electric motor, equipped with:— — Pump drive coupling. Output tester (small) (for use as an alternative to No. 291231 in pump testing applications).
292588 ⁽³⁾	Plessey hydraulic pump, type A 18 X equipped with:—
290417 ⁽¹⁾ ⁽²⁾ 292418 ⁽¹⁾ } 290330 ⁽²⁾ ⁽³⁾ }	— Inlet connector (pump). — Outlet connector (pump) [also inlet function for test ⁽²⁾].
290424 ⁽²⁾ 290434 ⁽¹⁾ ⁽²⁾ } 290358 ⁽²⁾ ⁽³⁾ }	— Inlet and outlet pipes (tester). — Connector screws (pump).
290445 ⁽¹⁾ ⁽²⁾ 290447 ⁽¹⁾ ⁽²⁾ 290448 ⁽¹⁾ ⁽²⁾	— Inlet pipe (tester). — Outlet pipe (tester). — Inlet adapter (from tester).
290541 ⁽²⁾	— Adapter (for connector No. 293038).
290544 ⁽²⁾	— Connecting pipe (pump to control valve).
290548 ⁽²⁾ 293037 ⁽²⁾	— Control valve drain pipe. — Control valve inlet connection.
293038 ⁽²⁾ 293039 ⁽²⁾	— Control valve outlet connection. — Control valve drain connection.
292650 ⁽⁴⁾	— Lift tester.

⁽¹⁾ C 18 X pump test with large tester No. 291231⁽²⁾ C 18 X pump test with small tester No. 292574⁽³⁾ Lift control valve test (355 C)⁽⁴⁾ Lift test (455C - 505C - 605 C)⁽⁵⁾ Applicable to models 355 C and 455 C⁽⁶⁾ Applicable to models 505 C and 605 C

Service Tools - Continued

Tool No.	DESCRIPTION
ELECTRICAL SYSTEM	
Alternator	
A. 76027 (290679)	Diode remover (Fig. 239).
A. 76028 (290680)	Diode replacer.
A. 76029 (290681)	Diode removal support.
A. 76031 (290682)	Diode replacing support.
A. 76032 (292195)	Support plate [for use with A.76029 (290681)].

Tool No.	DESCRIPTION
A. 76035 (290683)	Diode support fixture.
A. 90340 (290686)	Diode seat reamer.
Starter	
290973	Armature shaft centraliser (for commutator skimming).
291347	Pole shoe expander.
292307	Clutch slip torque test fixture (for use with torque spanner).

1973 - SERIES TRACTORS

NOTE: Differences with respect to previous production.

IDENTIFICATION DATA

Marketing Code	Engineering Code
355 C	632.500
455 C	632.300
505 C	634.300
605 C	636.300

ENGINE

Crescent-type combustion chamber pistons (see Fig. 264) and 3-orifice fuel injector nozzles (see Fig. 265) have been introduced as from engine No. 344540, model 355 C, engine No. 304040, models 455 C and 505 C, and engine No. 304000, model 605. Consequently, engine performance figures and injection pump code and calibration data vary as shown overleaf.

Tractor model 355 C no longer incorporates the advance device (see page 40). Consequent to this, the injection

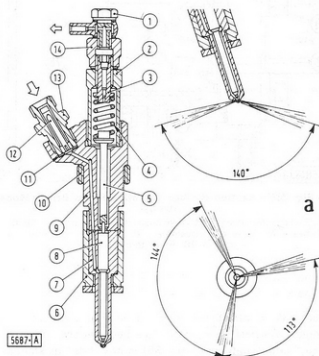


Fig. 265 - Section through Fuel Injector

a. Spray angles.

1. Leak-off connector - 2. Plug - 3. Spring load adjusting screw - 4. Spring - 5. Spindle - 6. Nozzle nut - 7. Nozzle - 8. Needle - 9. Injector body - 10. O-ring - 11. Sealing washer - 12. Rod filter - 13. Inlet connector - 14. Nut.

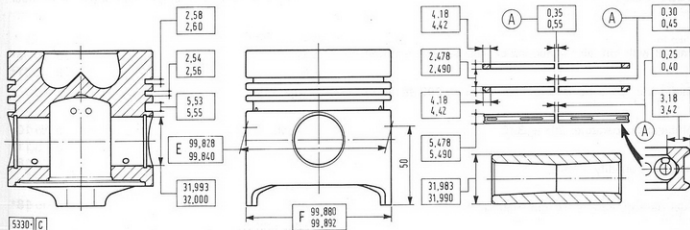


Fig. 264 - Standard Piston, Pin and Ring Details

A. Fitted gap - E. Piston skirt gauging point - F. Maximum skirt bottom diameter.

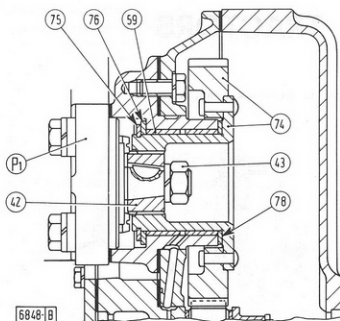


Fig. 266 - Section through Injection Pump Drive (Model 355 C)

P₁: Fuel injection pump - 42. Drive bush - 43. Retaining nut - 59. Gear bushes - 74. Drive gear assembly - 75. Circlip - 76. Outer thrust washer - 77. Inner thrust washer - 78.

pump drive has been altered (see Fig. 266) and the engine flywheel timing mark has been repositioned. The thermo-starter (see Fig. 85) is now fitted as standard equipment.

Injection pump drive gear identification data (see page 25) have been altered as follows:—

- Models 455 C and 505 C, Bosch pump, stamped 8035, degree position $128^{\circ} 22' \pm 15'$.
- Models 455 C and 505 C, C.A.V. pump, stamped 8035, degree position $188^{\circ} 54' \pm 15'$.
- Model 605 C, Bosch pump, stamped 8045, degree position $54^{\circ} 23' \pm 15'$.
- Model 605 C, C.A.V. pump, stamped 8045, degree position $174^{\circ} 24' \pm 15'$.

FUEL INJECTION PUMPS

Model 355 C, FIAT/Bosch PES 2A 80 B 410 : L4/113
Model 455 C:—

- Bosch EP/VA3/110 H-1200 CL134-5
- C.A.V. DPA 3233 F 410

Model 505 C, C.A.V. DPA 3233 F 420
Model 605 C:—

- Bosch EP/VA4/110 H-1100 CL136-3
- C.A.V. DPA 3249 F 660

SPRAY NOZZLES

FIAT type (all models) DLL 140 S 64 F

PERFORMANCE DATA

TEST PLAN

Engine with fan, air cleaner and exhaust silencer removed

Barometric pressure 740 ± 5 mm. Hg (1,000 ft. a.s.l.)

Ambient temperature, $20^{\circ} \pm 3^{\circ}$ C.

Relative humidity $70\% \pm 5\%$

Fuel density, 830 ± 10 gramme/litre

Injection pump fuel back-leakage temperature, $54^{\circ} \pm 2^{\circ}$ C. (Bosch or C.A.V. pumps only)

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

- Model 355 C
 - A.M. 33° to 35°
 - P.M. 29° to 31°
- Model 455 C
 - Bosch
 - A.M. 8° to 10°
 - P.M. 9° to 11°
 - C.A.V. 16° to 18°
- Model 505 C
 - C.A.V. 16° to 18°
- Model 605 C
 - Bosch 10° to 12°
 - C.A.V. 17° to 19°

PERFORMANCE DATA (BENCH)

Model 355 C	Engine r.p.m.	Engine H.P.		Time to burn 100 cm ³ (6 cu. in.) of fuel seconds
		2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2500	32 or over	33 or over	47.4 or over
Max. torque, approx. ⁽¹⁾	2000	26.5 or over	27.5 or over	58.8 or over
Maximum (no load) ⁽¹⁾	up to 2700	—	—	—
Minimum (no load) ⁽²⁾	600 to 650	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	2160	—	29.7 or over	55.1 or over

Model 455 C	Engine r.p.m.	Engine H.P.		Time to burn 100 cm ³ (6 cu. in.) of fuel seconds
		2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2400	{ 44.5 or over ⁽³⁾ 44 or over ⁽⁴⁾	46 or over	{ 36.6 or over ⁽³⁾ 34.5 or over ⁽⁴⁾
Max. torque, approx. { Bosch ⁽¹⁾	1400	27.5 or over	28.5 or over	56.2 or over
{ C.A.V. ⁽¹⁾	1600	30.5 or over	32 or over	51 or over
Maximum (no-load) { Bosch ⁽¹⁾	up to 2650	—	—	—
{ C.A.V. ⁽¹⁾	up to 2600	—	—	—
Minimum (no-load) { Bosch ⁽²⁾	650 to 700	—	—	—
{ C.A.V. ⁽²⁾	650	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	1970	—	{ 40.2 or over ⁽³⁾ 39.2 or over ⁽⁴⁾	{ 41.9 or over ⁽³⁾ 41.6 or over ⁽⁴⁾

Model 505 C	Engine r.p.m.	Engine H.P.		Time to burn 100 cm ³ (6 cu. in.) of fuel seconds
		2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2600	48.5 or over	51 or over	31.5 or over
Max. torque, approx. ⁽¹⁾	1600	33 or over	35 or over	47.8 or over
Maximum (no load) ⁽¹⁾	up to 2800	—	—	—
Minimum (no load) ⁽²⁾	650	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	up to 2160	—	45.6 or over	36.8 or over

Model 605 C	Engine r.p.m.	Engine H.P.		Time to burn 250 cm ³ (15 cu. in.) of fuel seconds
		2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2200	55 or over	57 or over	{ 71.1 or over ⁽³⁾ 71 or over ⁽⁴⁾
Max. torque, approx. { Bosch ⁽¹⁾	1400	37.5 or over	38.5 or over	105.1 or over
{ C.A.V. ⁽¹⁾	1400	37.5 or over	38 or over	103 or over
Maximum (no-load) ⁽¹⁾	up to 2400	—	—	—
Minimum (no-load) { Bosch ⁽²⁾	650 to 700	—	—	—
{ C.A.V. ⁽²⁾	650	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	1970	—	{ 52.8 or over ⁽³⁾ 52.6 or over ⁽⁴⁾	{ 77.3 or over ⁽³⁾ 76.7 or over ⁽⁴⁾

⁽¹⁾ Full throttle
⁽²⁾ Throttle at idle

⁽³⁾ Bosch pump
⁽⁴⁾ C.A.V. pump

PERFORMANCE DATA (P.T.O.)

Same test conditions as for bench testing

Model 355 C	r.p.m.		Engine H.P.		Time to burn 100 cm ³ (6 cu. in.) of fuel seconds
	Engine	P.T.O.	2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2500	625	31 or over	31.4 or over	47.4 or over
Max. torque, approx. ⁽¹⁾	2000	500	25.2 or over	26.1 or over	58.8 or over
Maximum (no-load) ⁽¹⁾	up to 2700	up to 675	—	—	—
Minimum (no-load) ⁽²⁾	600 to 650	150 to 162	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	2160	540	—	28.3 or over	55.1 or over

Model 455 C	r.p.m.		Engine H.P.		Time to burn 100 cm ³ (6 cu. in.) of fuel seconds
	Engine	P.T.O.	2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2400	659	42.3 or over ⁽³⁾ 41.8 or over ⁽⁴⁾	43.6 or over	36.6 or over ⁽³⁾ 34.5 or over ⁽⁴⁾
Max. torque, approx. { Bosch ⁽¹⁾	1400	384	26.1 or over	27.1 or over	56.2 or over
C.A.V. ⁽¹⁾	1600	438	29 or over	30.4 or over	51 or over
Maximum (no-load) { Bosch ⁽¹⁾	up to 2650	up to 728	—	—	—
C.A.V. ⁽¹⁾	up to 2600	up to 713	—	—	—
Minimum (no-load) { Bosch ⁽²⁾	650 to 700	178 to 192	—	—	—
C.A.V. ⁽²⁾	650	178	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	1970	540	—	38.2 or over ⁽³⁾ 37.2 or over ⁽⁴⁾	41.9 or over ⁽³⁾ 41.6 or over ⁽⁴⁾

Model 505 C	r.p.m.		Engine H.P.		Time to burn 100 cm ³ (6 cu. in.) of fuel seconds
	Engine	P.T.O.	2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2600	650	46.1 or over	48.5 or over	31.5 or over
Max. torque, approx. ⁽¹⁾	1600	400	31.4 or over	33.3 or over	47.8 or over
Maximum (no-load) ⁽¹⁾	up to 2800	up to 700	—	—	—
Minimum (no-load) ⁽²⁾	650	162	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	2160	540	—	43.4 or over	36.8 or over

Model 605 C	r.p.m.		Engine H.P.		Time to burn 250 cm ³ (15 cu. in.) of fuel seconds
	Engine	P.T.O.	2 hour run-in	50 hour run-in	
Maximum (full load) ⁽¹⁾	2200	604	52.3 or over	54.1 or over	71.1 or over ⁽³⁾ 71 or over ⁽⁴⁾
Max. torque, approx. { Bosch ⁽¹⁾	1400	384	35.6 or over	36.6 or over	105.1 or over
C.A.V. ⁽¹⁾	1400	384	35.6 or over	36.1 or over	103 or over
Maximum (no-load) ⁽¹⁾	up to 2400	up to 658	—	—	—
Minimum (no-load) { Bosch ⁽²⁾	650 to 700	178 to 192	—	—	—
C.A.V. ⁽²⁾	650	178	—	—	—
P.T.O. at 540 r.p.m. ⁽¹⁾	1970	540	—	50.1 or over	77.3 or over ⁽³⁾ 76.5 or over ⁽⁴⁾

⁽¹⁾ Full throttle ⁽³⁾ Bosch pump
⁽²⁾ Throttle at idle ⁽⁴⁾ C.A.V. pump

FIAT INJECTION PUMP CALIBRATION DATA (355 C)

For fuel injection pump calibration, use either of the following procedures.

TEST PROCEDURE A

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

RABOTTI test machine with graduated ring nut injectors incorporating FIAT 656829 spring and EFEP 182 nozzles.

Pipes, 2 x 6 x 600.

Release pressure, 175 kg/cm² (2,483 p.s.i.).

TEST PROCEDURE B

BOSCH or RABOTTI test machine with injector body and nozzle as fitted to engine.

Pipes, 2 x 6 x 600.

Release pressure, 225 to 235 kg/cm² (3,200 to 3,343 p.s.i.).

CALIBRATION FLUID

Diesel oil or FIAT CFB.

Density, 830 ± 10 grammes/litre at 40° ± 3 °C.

Feed pressure, 1.2 to 1.5 kg/cm² (17 to 21 p.s.i.).

FIAT/BOSCH IN-LINE INJECTION PUMP TYPE PES 2 A 80 B 410 : L 4/113-770614

Throttle lever position	Speed r.p.m.	Control rod stroke	PROCEDURE A		PROCEDURE B	
			Injector Delivery	Pump Output	Injector Delivery	Pump Output
			cm ³ /1000 shots		cm ³ /1000 shots	
Idling	300 ⁻¹⁰ ₊₀	9.5 ± .5	10 ± 1	—	10 ± 1	—
Maximum	1250 ⁻¹⁰ ₊₀ ⁽¹⁾	12 ± .1	58 ± 1	116.5 ± 1.5 ⁽²⁾	53 ± 1	106 ± 1.5 ⁽²⁾
Excess fuel	75	—	100 or over	—	100 or over	—

⁽¹⁾ Governor cut-in speed 1,250 to 1,260 r.p.m.

⁽²⁾ Adjust maximum fuel screw (2, Fig. 51).

BOSCH INJECTION PUMP CALIBRATION DATA (455 C - 605 C)

For injection pump calibration, use either of the following test procedures.

TEST PROCEDURE A

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

RABOTTI test machine with graduated ring nut injectors incorporating FIAT 656829 spring and EFEP 182 spray nozzles.

Pipes, 2 x 6 x 840 mm.

Release pressure, 150 kg/cm² (2,133 p.s.i.).

TEST PROCEDURE B

BOSCH or RABOTTI test machine with injector bodies and nozzles as fitted to engine.

Pipes, 1.5 x 6 x 700 mm.

Release pressure, 225 to 235 kg/cm² (3,200 to 3,343 p.s.i.).

CALIBRATION FLUID

FIAT CFB at 40° ± 5 °C. (for lower test temperatures add .25 mm³/cycle to each degree).

Feed pressure, .2 kg/cm² (2.8 p.s.i.).

ASSEMBLY DATA

Rotor stroke to spill cut-off:—

— Model 455 C, .7 ± .02 mm. (.0280 ± .0008 in.).

— Model 605 C, .5 ± .02 mm. (.0200 ± .0008 in.).

Preloaded shuttle spring length (dimension V, page 49), 24.6 mm. (.9685 in.).

Shims supplied as spare parts:—

— Rotor spring pre-load shims (S₁, Fig. 58), thickness range, 1, 1.2, 1.4, 1.6, and 1.8 mm. (.040, .048, .056, .064, and .072 in.).

— Spill cut-off shim (S₂), 1.80 to 2.90 mm. in .05 mm. steps (.072 to .114 in. in .002 in. steps).

— Advance spring pre-load shims (S₃), .6, .8, 1, 1.2, 1.4, and 3 mm. (.024, .032, .040, .048, .056 and .118 in.).

BOSCH DISTRIBUTOR PUMP TYPE EP/VA 3/110 H 1200 CL 134-5-770531 (455 C)

TEST DESCRIPTION	TEST No.	Control lever position L ₁ = Shuttle L ₂ = Throttle	Speed r.p.m.	Transfer pressure Kg/cm ²	Advance piston stroke (*) mm	PROCEDURE A		PROCEDURE B	
						Injector delivery cm ³ /1000 shots	Back leakage cm ³ /100 shots	Injector delivery cm ³ /1000 shots	Back leakage cm ³ /100 shots
Control lever position (1)	1	—	1200	—	—	—	—	—	—
	2		700 ± 5	—	—	62 to 64	—	51.5 to 53.5	—
	3		1250	—	—	37 to 45	—	29 to 37	—
Transfer pressure	4	—	100	0.6 to 1.1	—	—	—	—	—
	5		700 ± 5	5 to 5.5	—	—	—	—	—
	6		1200	7 to 7.5	—	—	—	—	—
Speed advance	7	—	250 to 400	—	0 (start)	—	—	—	—
	8		700 ± 5	—	4 to 5	—	—	—	—
	9		1150 to 1200	—	9.5 (end)	—	—	—	—
Excess fuel	10	L ₁ : max L ₂ : max	250	—	—	up to 65	—	up to 55	—
	11		100	—	—	130 or over	—	130 or over	—
Governed speed (1)	12	L ₁ : max L ₂ : max	1300 to 1350	—	—	0	—	0	—
	13		1250	—	—	37 to 45	—	29 to 37	—
Maximum fuel and back leak (2)	14	L ₁ : max L ₂ : max	1200 ⁺⁰ ₋₂₀	—	—	58 to 60(3)	—	47 to 49(3)	—
	15		1000	—	—	—	45 to 70	—	45 to 70
	16		700 ± 5	—	—	62 to 64	—	51.5 to 53.5	—
	17		500 ± 5	—	—	62 to 64	80 to 110	53 to 55	80 to 110
Idling speed (1)	18	L ₁ : max L ₂ : min	400 to 500	—	—	0	—	0	—
	19		350	—	—	12 to 22	—	10 to 18	—

BOSCH DISTRIBUTOR PUMP TYPE EP/VA 4/110 H 1100 CL 136-3-770532 (605 C)

Control lever position (1)	1	—	1100	—	—	—	—	—	—
	2		700 ± 5	—	—	58.5 to 61.5	—	50 to 53	—
	3		1150	—	—	37 to 45	—	29 to 37	—
Transfer pressure	4	—	100	0.6 to 1.1	—	—	—	—	—
	5		700 ± 5	4.5 to 5	—	—	—	—	—
	6		1100	6 to 6.5	—	—	—	—	—
Speed advance	7	—	250 to 400	—	0 (start)	—	—	—	—
	8		700 ± 5	—	3 to 4	—	—	—	—
	9		1050 to 1100	—	6.5 (end)	—	—	—	—
Excess fuel	10	L ₁ : max L ₂ : max	300	—	—	up to 62	—	up to 56	—
	11		100	—	—	130 or over	—	130 or over	—
Governed speed (1)	12	L ₁ : max L ₂ : max	1200 to 1250	—	—	0	—	0	—
	13		1150	—	—	37 to 45	—	29 to 37	—
Max. fuel and back leak (2)	14	L ₁ : max L ₂ : max	1100 ⁺⁰ ₋₂₀	—	—	56 to 59(3)	—	46.5 to 49.5(3)	—
	15		1000	—	—	—	45 to 70	—	45 to 70
	16		700 ± 5	—	—	58.5 to 61.5	—	50 to 53	—
	17		500 ± 5	—	—	59 to 62	80 to 110	51.5 to 54.5	80 to 110
Idling speed (1)	18	L ₁ : max L ₂ : min	400 to 500	—	—	0	—	0	—
	19		350	—	—	12 to 22	—	10 to 18	—

(1) Preliminary inspection on overhauled pumps

(2) Use tool No. 292817 (adjust by altering thickness of shims S_p, Fig. 58)(3) Maximum spread 2.5 mm²/cycle

(1) Adjust screw (65, Fig. 56)

(2) Adjust screw (62)

(3) Adjust screw (66)

C.A.V. INJECTION PUMP CALIBRATION DATA (455 C - 505 C - 605 C)

For fuel injection pump calibration, use either of the following procedures.

TEST PROCEDURE A

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

RABOTTI test machine with graduated ring nut injectors incorporating FIAT 656829 springs and EFEP 182 spray nozzles.

Pipes, 2 x 6 x 865 mm.

Release pressure, 175 kg/cm² (2.483 p.s.i.).

TEST PROCEDURE B

BOSCH or RABOTTI test machine with injector bodies and nozzles as fitted to engine.

Pipes, 2 x 6 x 700 mm., 455 C and 505 C.

Pipes, 1.5 x 6 x 700 mm., 605 C.

Release pressure, 225 to 235 kg/cm² (3,200 to 3,343 p.s.i.).

CALIBRATION FLUID

FIAT CFB at 30° ± 5 °C.

Feed pressure, .2 kg/cm² (2.8 p.s.i.).

ASSEMBLY DATA

Governor control stud - to - metering valve lever pin (see Fig. 76), 53 to 54 mm. (2.08 to 2.13 in.).

Governor spring attachment position on control arm (8, Fig. 83), hole No. 1.

Governor spring attachment position on throttle link (40, Fig. 83), hole No. 3.

Roller spacing (see Fig. 75):—

— Model 455 C, 49.98 mm. (1.9677 in.).

— Model 505 C, 50.03 mm. (1.9697 in.).

— Model 605 C, 49.70 mm. (1.9565 in.).

External timing mark degree position with respect to shaft key:—

— Models 455 C and 505 C, 268°.

— Model 605 C, 253°.

Drive shaft thrust washer thickness (see 84, Fig. 70), 2.05, 2.18 and 2.31 mm. (.082, .087 and .092 in.).

Advance spring pre-load shim thickness (see 74, Fig. 71), .2, .5, 1 and 2 mm. (.008, .020, .040 and .080 in.).

C.A.V. DISTRIBUTOR PUMP TYPE DPA 3233 F 410-770534 (455 C)

TEST DESCRIPTION	TEST No.	Control lever position (°)	Speed r.p.m.	Time to reach 406 mmHg inlet vacuum seconds	Transfer pressure Kg/cm ²	Advance (°) degrees	PROCEDURE A		PROCEDURE B
							Injector delivery cm ³ /1000 shots	Back leakage cm ³ /100 shots	Injector delivery cm ³ /1000 shots
Transfer vacuum/pressure	1-2	—	100	up to 60	1.2 to 1.8	—	—	—	—
Speed advance (°)	3	—	800	—	—	4 to 5	—	—	—
	4		1200	—	—	5.8 to 6.3	—	—	—
	5		180	—	—	1.2 to 1.5	—	—	—
Start retard (°)	6	—	300	—	—	0	—	—	—
Full advance (°)	7	—	900	—	—	5.8 to 6.3	—	—	—
Transfer pressure	8-9-10 (°)	max	1200 ⁺⁰ ₋₂₀	—	5 to 6	—	50 to 53 (°)	14 or over	48 to 51 (°)
Back leak									
Max. fuel	11-12		800 ± 5	—	3.8 to 4.6	—	45 to 48 (°)	—	50 to 53 (°)
Excess fuel (°)	13	max	100	—	—	—	40 or over	—	—
Shut-off	14	max	200	—	—	—	up to 4	—	—
Idling speed (°)	15	min	200	—	—	—	up to 5	—	—
Governed speed (°)	16	max	1270	—	—	—	up to 9	—	—
	17		1200 ⁺⁰ ₋₂₀	—	—	—	50 to 53	—	—

(°), (°), (°), (°), (°), (°), (°) and (°). See pag. 187

C.A.V. DISTRIBUTOR PUMP TYPE DPA 3233 F 420-770535 (505 C)

TEST DESCRIPTION	TEST No.	Control lever position (°)	Speed r.p.m.	Time to reach 406 mmHg inlet vacuum seconds	Transfer pressure Kg/cm ²	Advance (°) degrees	PROCEDURE A		PROCEDURE B
							Injector delivery cm ³ /1000 shots	Back leakage cm ³ /100 shots	Injector delivery cm ³ /1000 shots
Transfer vacuum/pressure	1-2	—	100	up to 60	1.2 to 1.8	—	—	—	—
Speed advance (°)	3	—	800	—	—	3 to 4	—	—	—
	4		1300	—	—	5.8 to 6.3	—	—	—
	5		180	—	—	1.2 to 1.5	—	—	—
Start retard (°)	6	—	300	—	—	0	—	—	—
Full advance (°)	7	—	900	—	—	5.8 to 6.3	—	—	—
Transfer pressure	8-9-10 ⁽¹⁾	max	1300 ⁺⁰ ₋₂₀	—	5 to 6	—	51 to 54 ⁽¹⁾	14 or over	48.5 to 51.5 ⁽¹⁾
Back leak									
Max. fuel	11-12		800 ± 5	—	3.8 to 4.6	—	46.5 to 49.5 ⁽¹⁾	—	52 to 54 ⁽¹⁾
Excess fuel (°)	13	max	100	—	—	—	44 or over	—	—
Shut-off	14	max	200	—	—	—	up to 4	—	—
Idling speed (°)	15	min	200	—	—	—	up to 5	—	—
Governed speed (°)	16	max	1170	—	—	—	up to 9	—	—
	17		1300 ⁺⁰ ₋₂₀	—	—	—	51 to 54	—	—

C.A.V. DISTRIBUTOR PUMP TYPE DPA 3249 F 660-770536 (605 C)

Transfer vacuum/pressure	1-2	—	100	up to 60	0.8 to 1.4	—	—	—	—
Speed advance (°)	3	—	800	—	—	5.5 to 6.5	—	—	—
	4		1100	—	—	7 to 7.5	—	—	—
	5		180	—	—	1.5 to 2	—	—	—
Start retard (°)	6	—	300	—	—	0	—	—	—
Full advance (°)	7	—	900	—	—	—	—	—	—
Transfer pressure	8-9-10 ⁽¹⁾	max	1100 ⁺⁰ ₋₂₀	—	4 to 5	—	45.5 to 48 ⁽¹⁾	14 or over	50.5 to 53 ⁽¹⁾
Back leak									
Max. fuel	11-12		800 ± 5	—	3.2 to 4	—	46.5 to 49.5 ⁽¹⁾	—	50 to 53 ⁽¹⁾
Excess fuel (°)	13	max	100	—	—	—	38 or over	—	—
Shut-off	14	max	200	—	—	—	up to 4	—	—
Idling speed (°)	15	min	200	—	—	—	up to 5	—	—
Governed speed (°)	16	max	1370	—	—	—	up to 9	—	—
	17		1100 ⁺⁰ ₋₂₀	—	—	—	45.5 to 48	—	—

(1), (°), (°), (°), (°), (°), (°) and (°). See facing page 187

GEARBOX AND REDUCTION UNIT

Gear ratios applicable to model 605 C, as from frame No. 806001:—

- First and second . . . 17/45 — 2.647 to 1
 - Third and fifth . . . 29/33 — 1.138 to 1
 - Fourth and sixth . . . 34/28 — .824 to 1
 - Reverse 1st and 2nd $17/31 \times 31/26$ — 1.529 to 1
- New reduction ratios and travel speeds are as listed below.

Gear	Gearbox and reduction ratios	Engine-to-sprocket ratio	Travel speed (full-throttle)	
			K.P.H.	M.P.H.
First	4.825 to 1	133.755	1.9	1.2
Second	2.647 to 1	73.376	3.4	2.1
Third	2.074 to 1	57.494	4.3	2.7
Fourth	1.501 to 1	41.613	6.0	3.7
Fifth	1.138 to 1	31.543	7.9	4.9
Sixth	.824 to 1	22.828	10.9	6.7
Reverse 1	2.788 to 1	77.281	3.2	2
Reverse 2	1.529 to 1	42.395	5.8	3.6

Standard tractors no longer incorporate starter inhibitor switch (24, Fig. 106 and 45, Fig. 263), which continues to be available as an optional extra.

HYDRAULIC SYSTEM (455 C - 505 C - 605 C)

As from frame Nos. 406.001 (445 C), 605.001 (505 C) and 806.001 (605 C), lift lever attachment to cross-

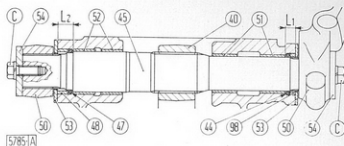


Fig. 267 - Section through Lift Cross-shaft

C. Retaining screw - L₁ 13.5 to 13.8 mm. or .531 to .543 in., L.H. outer bush depth in lift body - L₂ 20.5 to 20.7 mm. or .807 to .815 in., R.H. outer bush depth in lift body - 40. Crank lever - 44. L.H. O-ring - 45. Lift cross-shaft - 47. R.H. O-ring - 48. Spacer (13.5 to 13.8 mm. or .531 to .543 in.) - 50. Lift lever - 51. L.H. bushes - 52. R.H. bushes - 53. Thrust washers - 54. End plates - 96. Spacer (7.5 to 7.6 mm. or .295 to .299 in.).

shaft has been altered as shown in Fig. 267, where M 14 × 1.5 retaining screw (C) is to be tightened to 15 kgm or 108 lb. ft.

Moreover, R.H. lift arm driven gear (86, Fig. 268) has been modified to make room for a thrust bearing (87).

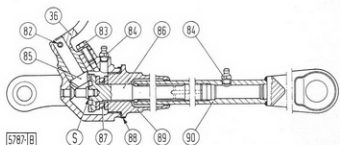


Fig. 268 - Section through R.H. Lift Arm Assembly

S. End float shims - 36. Adjustment control - 82. Spring pin - 83. Retaining screw - 84. Grease nipples - 85. Drive gear - 86. Driven gear - 87. Bearing - 88. Tab washer - 89. Sleeve - 90. Lift arm.

(1) On 3-cylinder engine applications, fit tool No. 290760 (M, Fig. 77) in place of start-retard device

(2) Manual start-retard activated.

(3) After start-retard device reassembly on 3-cylinder engine applications only

(4) Back off maximum speed adjusting screw (41, Fig. 69) completely and adjust fuelling through adjustment plates (see Fig. 74)

(5) Back off idling adjustment screw (94, Fig. 69) completely

(6) Adjust maximum speed screw (41, Fig. 69).

(7) Shut-off lever (32, Fig. 69) to be activated during test No. 14 only

(8) Check using tool No. 290743 (H, Fig. 77) and adjust by altering thickness of shims (74, Fig. 71)

(9) Maximum spread, 4 mm²/cycle