SHOP MANUAL

DAVID BROWN

MODELS:
770 - 780 - 880 (STARTING WITH SERIAL NO. 52101)
990 (STARTING WITH SERIAL NO. 467871)
1200 - 3800 - 4600

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CONDENSED SERVICE DATA

GENERAL	770 (Early)	770 (Late)	780	880 (Early)	880 (Late)
Engine Make	Own	Own	Own	Own	Own
Engine Model	AD3/30	AD3/49	355011	AD3/40	AD3/55
No. of Cylinders	3	3	3	3	3
Bore, Inches	3 13/16	3 15/16	3 15/16	3 13/16	3 15/16
Stroke, Inches	4	4	4 1/2	4 1/2	4 1/2
Displacement, Cubic Inches	137	146	164	154	164
Compression Ratio	17:1	17:1	17:1	17:1	17:1
Pistons Removed From:	Above	Above	Above	Above	Above
Cylinder Sleeves	Dry	None	None	Dry	None
Main Bearings, No. of	4	4	4	4	4
Generator & Starter Make	Lucas	Lucas	Lucas	Lucas	Lucas
Distributor Make	....	....	....	....	....
Carburetor Make	....	....	....	....	....
Fuel Injection Pump, Make	C.A.V.	C.A.V.	C.A.V.	C.A.V.	C.A.V.
Forward Speeds, No. of	6/12	6/12	6/12	6/12	6/12
Battery Terminal Grounded	Neg.	Neg.	Neg.	Neg.	Neg.

TUNE-UP

Compression, Gauge Lbs. @ 68° F.:					
@ 150 RPM Cranking Speed	380-400	380-400	380-400	380-400	380-400
@ 250 RPM Cranking Speed	415-435	415-435	415-435	415-435	415-435
Firing Order	1-2-3	1-2-3	1-2-3	1-2-3	1-2-3
Valve Tappet Gap, Cold, Intake	0.015(3)	0.010	0.010	0.015(3)	0.010
Exhaust	0.012(3)	0.007	0.007	0.012(3)	0.007
Valve Face & Seat Angle	45°	45°	45°	45°	45°
Injection Timing, See Paragraph	88	88	88	88	88
Ignition Timing, See Paragraph	....	....	....	....	....
Breaker Point Gap	....	....	....	....	....
Spark Plug Make & Model	....	....	....	....	....
Spark Plug Gap	....	....	....	....	....
Engine Low Idle RPM	650-700	650-700	650-700	650-700	650-700
Engine High Idle RPM	2150	2150	2350	2350	2350
Max. Full Load RPM	2000	2000	2200	2200	2200

SIZES—CAPACITIES—CLEARANCES

Crankshaft Main Journal Dia.	2.499 -2.4995				
Crankpin Journal Diameter	2.373 -2.3735				
Camshaft Journal Dia., Front	2.3725-2.3735				
No. 2 Journal Dia.	1.8707-1.872				
No. 3 Journal Dia.	1.8409-1.8422				
No. 4 Journal Dia.	1.794 -1.7954				
No. 5 Journal Dia.	1.7475-1.7488				
No. 6 Journal Dia.	....	....	....	....	....
Piston Pin Diameter	1.2495-1.250				
Cylinder Bore Diameter	3.8125-3.8135	3.9388-3.9396	3.9388-3.9396	3.8125-3.8135	3.9388-3.9396
Piston Skirt Diameter	3.8055-3.8063	3.9315-3.9323	3.9315-3.9323	3.8055-3.8063	3.9315-3.9323
Valve Stem Diameter	0.3722-0.3732				
Main Bearings Running Clearance	0.002-0.004				
Rod Bearings Running Clearance	0.002-0.004				
Crankshaft End Play	0.002-0.010				
Camshaft End Play	0.002-0.006				
Cooling System—Quarts	10	10	10	11	11
Crankcase—Quarts (With Filter)	6½	6½	6½	6½	6½
Transmission—Quarts (Includes Differential & Hydraulic System)	24	24	24	24	24
Final Drive, Each—Pints	1¾	1¾	2½	4¾	4¾
Steering Gear—Pints	2½	2½	2½	2½	2½
Power Steering System	N/A	N/A	N/A	N/A	N/A
Fuel Injection Pump—Pints	....	....	....	....	....

— Refer To Footnotes on Page 5 —

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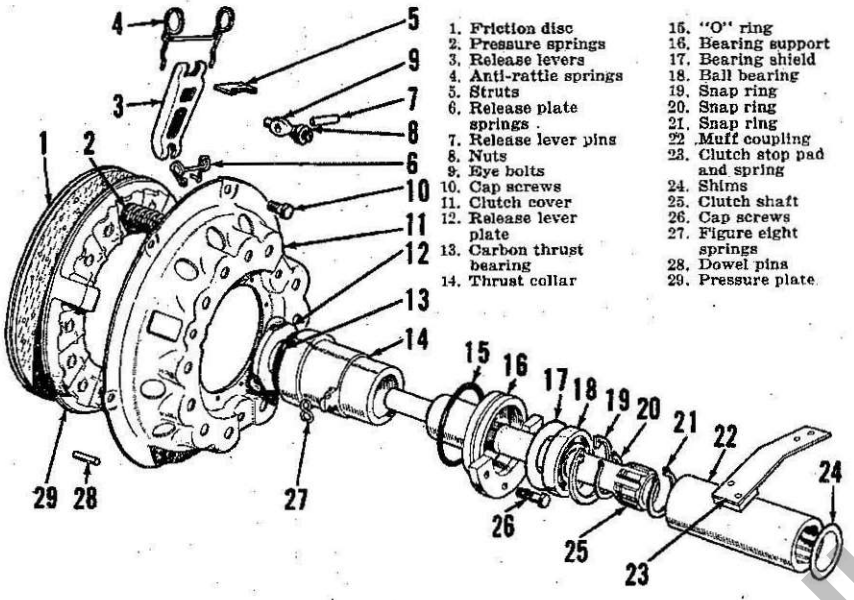


Fig. 86 — Exploded view of typical single clutch unit used on all models so equipped.

shaft. Unbolt support (16), then move the support and clutch shaft rearward until shaft is free of flywheel. Unbolt clutch cover from flywheel, placing three nuts between cover and release levers as the cover cap screws are loosened. Remove clutch and shaft assembly, clutch unit first, from tractor main frame.

To reinstall clutch, place long hub of clutch disc towards flywheel. Lower the clutch unit and shaft into tractor main frame, rear end of shaft first. Engage clutch shaft in flywheel pilot bearing, then bolt clutch cover to flywheel, removing the nuts or spacers from between cover and release levers as cover cap screws are tightened. Before installing transmission cover, check muff coupling end play; if end play is not within limits of 0.010 to 0.040, add or remove shims (24) as necessary to obtain correct end play. Reassemble tractor by reversing disassembly procedure, then adjust clutch as outlined in paragraph 122.

Models 880 and 990

125. The quickest method for removing clutch assembly is to split tractor between transmission and flywheel housing (model 880) or between transmission and engine (model 990); refer to paragraph 126. An alternate method, which will also give access to clutch shaft, is to remove the clutch and shaft from above as outlined in paragraph 127.

126. Remove hood and disconnect throttle and engine stop control linkages. On model 990 only, remove throttle lever and engine starting motor. On both models, disconnect fuel lines and wiring, then remove fuel tank and instrument panel as a unit. Disconnect drag link from steering gear arm.

Drive wood wedges between each side of front support (main frame extension) and axle beam so that engine unit will not tilt on front axle pivot pin. Using suitable wood block placed on rolling floor jack, support rear end of engine under flywheel housing (model 880) or under rear end of engine frame on model 990. Adequately support front end of transmission, then unbolt transmission and cover from flywheel housing on model 880 or engine on model 990 and roll front unit forward.

Place nuts or other suitable spacers between clutch cover and release levers, then unbolt and remove clutch cover and pressure plate assembly from flywheel and remove clutch lined disc.

When reassembling, use suitable pilot to align clutch lined disc with pilot bearing in flywheel, then reinstall clutch cover and pressure plate assembly and remove the three spacers from between cover and release levers. Reconnect front and rear sections of tractor and reassemble by reversing disassembly procedure.

127. To remove clutch and shaft from above without splitting tractor, proceed as follows: Remove hood, disconnect fuel lines from tank, wiring from instrument panel and disconnect throttle and engine stop control linkages. On model 990 only, remove throttle lever. On both models, unbolt and remove the fuel tank and instrument panel as a unit.

On model 880, disconnect drag link from steering gear arm, then unbolt and remove transmission cover and steering gear as a unit. Back out clutch free play adjusting screw, disconnect pedal return spring and unbolt and remove clutch cover.

On model 990, disconnect starter cable and remove engine starter. Disconnect drag link from steering gear, then unbolt and remove steering gear assembly. Remove the bolt from steering gear cavity that extends into clutch cover, then unbolt and remove transmission cover. Back out pedal free play adjusting screw, disconnect clutch pedal return spring, then unbolt and remove clutch cover.

With the clutch cover removed, disengage snap ring from front side of muff (internal splined) coupling, then slide coupling forward until clear of transmission input shaft. Leave the coupling spacer shims on transmission shaft. Remove the two figure-eight springs securing clutch fork to release bearing carrier and unbolt support housing (16—Fig. 86) from transmission housing. Slide the clutch shaft and support housing to rear so that shaft is clear of pilot bearing. Place nuts or other suitable spacers between clutch cover and the release levers, then unbolt clutch cover from flywheel. Lift up rear end of clutch shaft until clear of transmission, then remove shaft and clutch as a unit.

Reinstall by reversing removal procedure. Use clutch shaft for disc aligning tool. Be sure to remove spacers from between clutch cover and release levers. Before reinstalling transmission and clutch covers, check end play of the muff coupling which should be 0.010 to 0.040. Add or remove shims (24—Fig. 86) as necessary to bring end play within limits. Readjust clutch as outlined in paragraph 123.

CLUTCH OVERHAUL

Models 770, 880 and 990

128. With clutch pressure plate and cover assembly removed, remove flywheel, place flywheel on workbench with clutch friction surface up and place lined disc or three evenly spaced 0.310 thick spacers on flywheel. Scribe assembly marks on the clutch cover and pressure plate, then place assembly on lined disc or spacers with dowel holes in clutch cover flange aligned with dowel pins in flywheel. Install and evenly tighten the cover retaining cap screws until clutch cover flange contacts flywheel. Remove the three nuts or other spacers installed between cover and release levers while clutch was being removed from flywheel. Remove three cap screws (models 770 and 880) or four cap

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mark on engine front plate and securely tighten pump mounting bolts. Tighten gear retaining cap screws to a torque of 20 Ft.-Lbs. and bend tabs of washer against cap screw heads. Reconnect throttle and engine stop controls. Reconnect fuel supply and return lines and reinstall injector lines, leaving connectors at injectors loose. Bleed the fuel system as outlined in paragraph 82. Reinstall fuel injection pump cover and start engine using normal procedure. NOTE: If timing marks were not applied prior to removing pump, it is possible to move the gears out of time when removing or installing pump; therefore follow procedure in paragraph 94 to reinstall pump.

Model 1200

96. **PUMP TIMING.** Providing that mesh position of the pump drive gear and idler gear are correct, the fuel injection pump is properly timed when the timing marks on pump housing and engine front (carrier) plate are aligned. Refer to paragraph 46 regarding timing of idler and fuel injection pump drive gears.

97. **LUBRICATION.** The Simms fuel injection pump is lubricated by oil sump in the pump cam box. After each 500 hours of operation, the pump should be drained and refilled to proper level with new, clean engine oil. Use same weight and type oil as for engine crankcase. Refer to Fig. 56 for location of drain plug (A), oil level plug (C) and filler plug (B).

Whenever installing a new or rebuilt fuel injection pump, be sure the cambox is filled with engine oil to level of the oil level plug (C) before attempting to start engine. There will be some oil dilution with diesel fuel during engine operation and after engine has been shut off, some of the fuel-oil mixture may run from outlet tube (K).

98. **R&R FUEL INJECTION PUMP.** Procedure for removal of the fuel injection pump will depend on type of timing gear cover. If cover is solid with no opening at front side of fuel injection pump gear, remove pump as outlined in paragraph 99. Where timing gear cover is fitted with removable plate at front side of fuel injection pump drive gear, pump may be removed and reinstalled as outlined in paragraph 100.

99. Remove timing gear cover as outlined in paragraph 43, then proceed as follows: Turn engine so that timing marks on camshaft gear, crankshaft gear and fuel injection pump drive gear are towards center of idler gear. Remove idler gear shaft support bracket and idler gear, then reinstall gear so that all timing marks are aligned as shown in Fig. 63 and reinstall shaft support bracket. Thoroughly clean fuel injection pump, lines and surrounding area. Disconnect throttle and engine stop controls from pump. Disconnect fuel supply line and remove the fuel injector lines, then immediately cap all openings. Straighten tab washer and remove nut from pump camshaft. Using pullers, remove pump drive gear taking care not to lose the Woodruff key. Unbolt and remove pump assembly from engine.

To reinstall pump, mount pump on engine front (carrier) plate with timing marks on pump housing and plate aligned. Install drive gear with Woodruff key, new tab washer and nut so that timing mark on drive gear is aligned with timing mark on idler gear. Tighten the nut to a torque of 45 Ft.-Lbs., then bend tabs of washer against flats on nut. Reinstall timing gear cover as outlined in paragraph 43. Reconnect throttle and engine stop controls and the fuel lines to fuel injection pump, leaving fuel injector line to injector connections loose. Bleed fuel system as outlined in paragraph 83, then start engine using normal procedure.

100. On models with timing gear cover having opening and access plate at front side of fuel injection pump drive gear, remove pump as follows:

Thoroughly clean pump, lines and surrounding area. Disconnect throttle and engine stop control from pump. Disconnect fuel supply line from pump and remove the fuel injector lines, then immediately cap all openings. Remove cover plate from front side of timing gear cover, clean the pump drive gear and idler gear and using a felt tip pen or other marking device, place timing marks on idler gear and pump gear. Straighten the tab washer and remove nut from injection pump camshaft. Using suitable pullers, loosen pump drive gear from tapered camshaft. Unbolt and remove fuel injection pump, taking care not to lose the Woodruff key from camshaft.

To reinstall pump, align keyway in camshaft with keyway in pump drive gear when gear is meshed with applied timing marks aligned. Mount pump on engine front (carrier) plate so that timing marks on pump housing and plate are aligned, taking care not to dislodge Woodruff key from shaft and to keep timing marks on gears aligned. Reinstall nut with new tab washer, tighten nut to a torque of 45 Ft. Lbs. and bend tab against nut. Reinstall cover plate on timing gear cover. Reconnect throttle and engine stop controls. Reconnect fuel lines, leaving connections loose at the fuel injectors. Bleed fuel system as outlined in paragraph 83, then start engine using normal procedures. Note: Refer to paragraph 97 regarding fuel injection pump lubrication.

DIESEL GOVERNOR ADJUSTMENTS

Model 1200 (Simms Pump)

101. Start engine and bring to normal operating temperature. Disconnect throttle linkage from fuel injection pump governor arm and hold the arm so that stop lever contacts the slow idle speed stop screw (see Fig. 56). If engine speed is not then within the range of 650-700 RPM, loosen the lock nut on stop screw and turn screw in or out until proper slow idle speed is obtained and tighten lock nut. Hold the arm so that stop lever is against the high idle (maximum) speed stop screw; engine high idle speed should then be 2425-2475 RPM. If high idle speed is not within the specified range the stop screw should be adjusted. CAUTION: The high idle (maximum) speed stop screw adjustment is sealed with a sealing wire at the factory; this seal should not be broken by anyone other than David Brown or Simms authorized diesel service personnel if tractor is within factory warranty. To adjust high idle speed, break wire seal, loosen lock nut and turn adjusting screw in or out until proper speed is obtained; then, tighten lock nut and reseal adjusting screw. Reconnect throttle linkage. The throttle lever quadrant stops should be adjusted so that throttle lever just contacts the stops as control lever on fuel injection pump comes in contact with speed adjustment screws.

All Other Diesel Models (C.A.V. Pump)

102. To check idle speed adjustments proceed as follows: Start engine and bring to normal operating temperature. Disconnect throttle linkage from governor arm on fuel injection pump. Hold the governor arm against the slow idle speed stop screw; slow idle speed should then be 650-700 RPM. If not, loosen the lock nut on the slow speed stop screw (D—Fig. 52) and turn the screw in or out to obtain proper slow idle speed, then tighten the lock nut. Hold the injection pump governor arm against the high idle (maximum) speed stop screw; engine speed should then be 2125-2175 RPM on model 770 or 2325-2375 on other models. If not within specified speed range, the high idle speed stop screw should be adjusted. CAUTION: The high idle speed stop screw is sealed

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ENGINE

R&R ENGINE ASSEMBLY

Models 770, 780 and 3800

24. To remove the engine and clutch as an assembly, proceed as follows:

On models equipped with dual (live PTO) clutch ("Livedrive" models), first drain the transmission, remove the power take-off assembly as outlined in paragraph 192 and remove the PTO drive ("cardan") shaft. If equipped with power steering, unbolt and remove pump, leaving lines connected.

On all models, remove hood, drain cooling system and if desired to reduce weight, drain fuel tank. Disconnect battery cables and remove radiator. On models 770 and 780, disconnect fuel return pipe from upper side of fuel tank. On all models, disconnect hourmeter cable, instrument panel wiring, engine throttle and stop controls, then remove the fuel tank and instrument panel as an assembly. Disconnect drag link, then unbolt and remove steering gear assembly.

Remove cover from bottom of clutch housing and remove the two figure-eight springs retaining clutch release fork to release bearing. Remove the starter assembly. Unbolt and remove transmission cover. NOTE: One of the transmission cover bolts is located inside the steering box cavity in transmission cover. Disengage snap ring from groove in driveshaft so that the muff (internal splined) coupling can be moved forward until it is clear of transmisssion input shaft. Unbolt driveshaft bearing support from transmission housing.

Remove engine oil pan and unbolt engine from front frame. Note that five bolts are located inside the engine and are accessible only after pan is removed; two of the bolts are at front, two at rear and the fifth bolt is located under the oil pump. Lift engine and clutch assembly from tractor frame taking care not to damage the oil pump.

25. To reinstall engine, first make sure that engine and main frame mating surfaces are clean and free of all old gasket material and that the clutch, driveshaft, driveshaft bearing, snap ring and muff coupling are in position. Then, proceed as follows:

Coat main frame face and both sides of the new gaskets with rubberized gasket compound. Fit new bearing cap seals, pushing ends of seals into holes in cylinder block so that seals fit tightly in the bearing cap grooves. Thread two ⅜-inch UNC guide studs at opposite points in each side of main frame. Carefully lower engine onto main frame to avoid damaging gaskets or seals. Refer to the following torque values when tightening bolts and complete reassembly in reverse of removal procedure.

Engine block to main frame 30 Ft.-Lbs.
Oil pan to main frame 20 Ft.-Lbs.
Transmission cover (⅜) ..25 Ft.-Lbs.
Transmission cover (7/16) 45 Ft.-Lbs.

Models 880 and 4600

26. To remove engine assembly, proceed as follows: Remove hood, disconnect hourmeter cable, throttle and engine stop controls and disconnect wiring to instrument panel. Drain fuel tank if desired to reduce weight, then unbolt and remove fuel tank and instrument panel as an assembly. Drain cooling system, disconnect radiator hoses and remove radiator. If equipped with power steering, unbolt and remove pump assembly leaving lines connected. Drain crankcase and remove oil pan to allow removal of three cylinder block to frame bolts located inside engine. Note: One of the three bolts is located below fuel injection pump or ignition distributor drive. Securely support tractor under front end of transmission housing and drive wood wedges tightly between each side of front support (main frame extension) and front axle. Remove vent cover from bottom of flywheel housing. With wood block on a rolling floor jack, support rear end of engine under flywheel housing. Unbolt flywheel housing from transmission and roll front unit away from rear section. Place secure supports under front assembly and remove rolling floor jack, then unbolt and remove clutch assembly, flywheel and flywheel housing. Unbolt cylinder block from frame, then taking care not to damage oil pump, lift engine from frame.

27. When reinstalling engine, make sure that mating surfaces of cylinder block are clean and free of all traces of old gasket. Coat gasket surface of main frame and both sides of new gaskets with rubberized gasket compound. Fit ends of new main bearing cap seals in holes of cylinder block so that seals fit snugly in bearing caps. Install two ⅜-inch UNC guide studs opposite each other in sides of main frame, then lower engine assembly into place. Install, but do not tighten, the cylinder block to main frame bolts. Place new "O" ring in rear end of camshaft bore, then install flywheel housing, tightening the bolts to a torque of 30 Ft.-Lbs. Then, tighten the cylinder block to main frame bolts to a torque of 30 Ft.-Lbs.

Install flywheel and tighten bolts to a torque of 50 Ft.-Lbs., then reinstall clutch assembly. Rejoin front section to rear and tighten flywheel housing to transmission bolts to a torque of 50 Ft.-Lbs., then complete reassembly of tractor by reversing disassembly procedure.

Model 990

28. On models with 12-speed transmission and from serial No. 479539 to serial No. 487806 on six-speed models with dual clutch ("Livedrive"), the tractor must be split to remove the engine as outlined in paragraph 29. On six-speed models with dual clutch prior to serial No. 479539 and after serial No. 487806, and on six speed models with single clutch, the engine can be lifted from tractor as outlined in paragraph 31.

29. To split the 990 tractor for engine removal, proceed as follows: Drive wood wedges tightly between front support (extension) and front axle at each side of tractor and securely support rear end of front main frame just in front of transmission joint flange. Support rear end of tractor with rolling floor jack; jack pad should be located just behind clutch cover on bottom of transmission housing.

Remove engine hood, drain cooling system and disconnect throttle, stop control linkage, hourmeter cable and wiring to instrument panel. Disconnect fuel supply and excess fuel return lines from fuel tank. If equipped with power steering, unbolt and remove the pump leaving lines connected. It will be necessary to remove steel pipe retaining clips where fitted. Disconnect steering drag link from steering gear arm and remove engine starter. Unbolt transmission housing (main frame) and clutch housing from engine and front main frame, then roll rear section back until clutch shaft is clear of clutch assembly. Disconnect radiator hoses and unbolt and remove radiator. Unbolt cylinder block from front main frame; note that four of the bolts are long bolts installed from bottom side of main frame. Taking care not to damage oil pump, lift engine, flywheel and clutch assembly from frame.

30. When reinstalling engine, make sure that engine and frame gasket surfaces are clean and free of all old gasket material. Apply rubberized gasket compound to gasket surface of frame and to both sides of new gaskets. Insert ends of main bearing cap seals in holes in cylinder block so that seals fit snugly in main bearing

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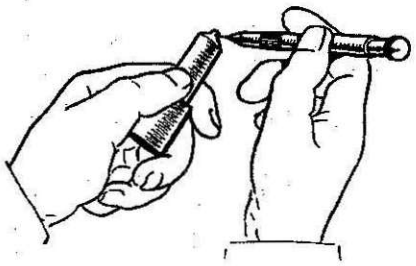


Fig. 71 — Using pin vise and proper size of cleaning wire to probe all carbon from the four injection spray holes in each nozzle tip.

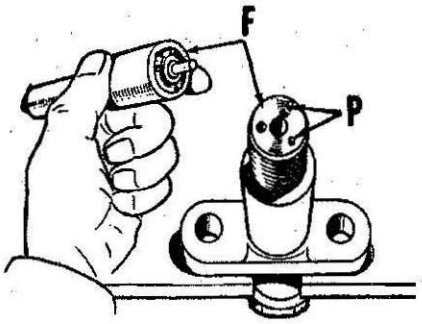


Fig. 72 — When reassembling nozzle and needle assembly in holder, be sure pressure faces (F) of nozzle and holder are clean, and that dowel pins (P) on holder enter proper holes in nozzle.

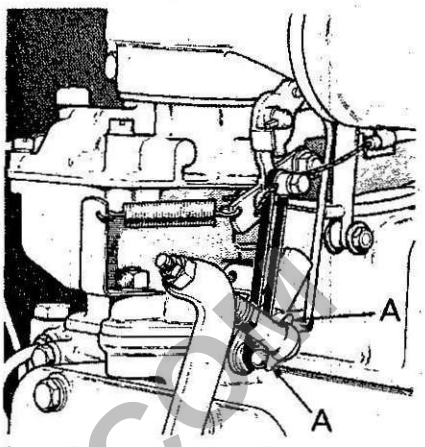


Fig. 74 — Governor link can be disconnected from carburetor throttle arm after bending tabs (A) back as shown. Throttle arm is then held in position by rubber band placed as shown.

2575 psi. Use new copper gasket and install cap nut (A). Recheck nozzle opening pressure to be sure adjustment was not changed by tightening the lock nut and cap nut.

Retest the injector as outlined in paragraphs 107, 108 and 109. If injector fails to pass these tests, renew the nozzle and needle assembly (J and K).

NON-DIESEL GOVERNOR

NON-DIESEL GOVERNOR

Models 3800 and 4600

111. **ADJUSTMENT.** Low idle speed should be 500 RPM, high idle speed should be 2350 RPM and speed under rated load should be 2200 RPM. If necessary to adjust governor, proceed as follows:

Start and run engine until at normal operating temperature. Move the slow idle speed (forward) stop on throttle lever quadrant to end of slot so that throttle lever can be moved fully forward. Temporarily install an idle speed adjusting screw (#2 British Association thread) into the carburetor throttle lever and turn screw in until engine is running at 1400 RPM; refer to Fig. 73. Disconnect governor link from carburetor throttle arm and hold throttle arm at 1400 RPM position with rubber band as shown in Fig. 74. Take care not to overspeed engine while disconnecting the governor link.

With engine running at 1400 RPM, loosen lock nut on governor adjusting screw (C—Fig. 73) and back screw out until button head on lower end of screw clears governor weight plunger (18—Fig. 75) which extends up through governor housing (15). Then, turn screw back in until it just contacts the plunger plus one to 1½ additional turns and tighten lock nut.

With screw (C—Fig. 73) adjusted, adjust carburetor idle fuel mixture needle as follows: Back out the temporarily installed screw in carburetor throttle arm until engine is running

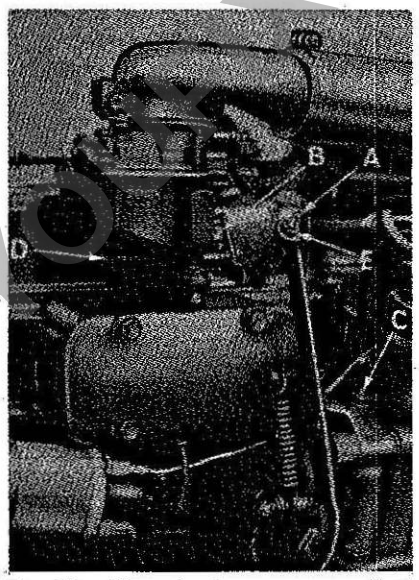


Fig. 73 — View showing governor adjustment points for models 3800 and 4600.

A. Link rod
B. Hole for temporary speed screw
C. Adjusting screw
D. Idle fuel needle
E. Adjusting nut

at 500 RPM. Adjust idle fuel needle (D) so that engine idles at fastest RPM obtainable, then readjust screw in throttle arm to obtain a 500 RPM idle speed if necessary. Turn idle fuel needle in (clockwise) until engine speed just begins to drop, then back needle out (counter-clockwise) ½-turn.

After adjusting carburetor idle fuel mixture needle, reconnect governor link to carburetor throttle arm, remove the set screw from arm and cut rubber band. If engine speed does not remain at 500 RPM, adjust length of governor link rod (A—Fig. 73) by loosening lock nut and turning adjusting nut (E). Retighten lock nut when 500 RPM idle speed is obtained.

With governor linkage adjusted, adjust position of slow idle stop on throttle lever quadrant so that when lever is moved forward, it just contacts stop as engine speed slows to 500 RPM. Move throttle lever rearward against high idle speed stop and check engine speed; readjust position of stop as necessary to obtain maximum high idle no load speed of 2350 RPM.

112. **R&R AND OVERHAUL.** Turn engine to static timing position (refer to paragraph 118) and remove ignition distributor. Note position of drive slot in shaft (45—Fig. 76) for reassembly. Disconnect all governor linkage, remove nuts from the two long studs extending through governor housing into cylinder block, then lift complete governor assembly from cylinder block and studs.

Unbolt and separate upper governor housing (15—Fig. 76) from lower housing (36) and withdraw thrust bearing and push rod assembly (18—Fig. 75) from upper housing. Thread two stud bolts into puller holes in governor drive gear (40—Fig. 76) and using suitable adapters, pull gear from shaft (45). Remove lower housing (36) from drive housing (38). Remove snap ring (42) and press shaft (45) downward out of housing and bearing (43), then remove snap ring (41) and press bearing upward out of housing. Remove bushing (44) from lower end of housing.

Unbolt bearing support plate (20—Fig. 75) from lower housing (36—Fig. 76) and remove the governor weight

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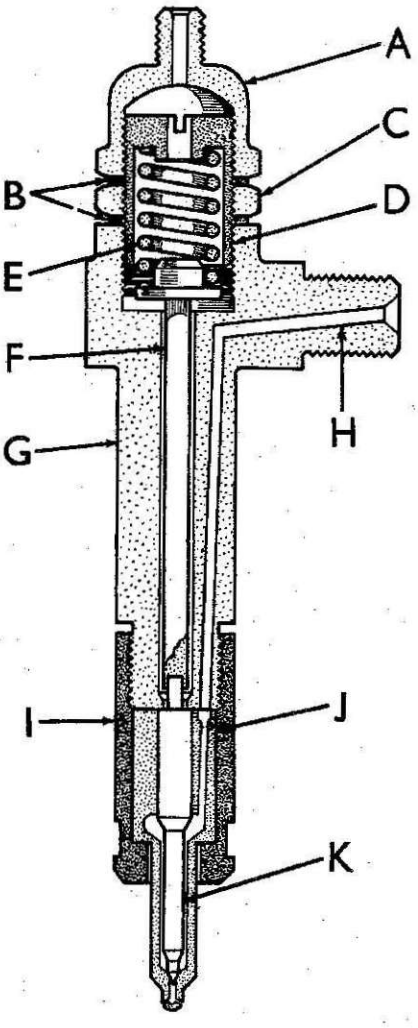


Fig. 66 — Cross-sectional view of injector assembly. Refer to Fig. 65 for exploded view and legend.

jam nut (C) and back off the adjusting screw (D) enough to relieve the load from spring (E). Remove the nozzle cap nut (I) and nozzle assembly (J and K). Normally, the nozzle valve needle can easily be withdrawn from the nozzle body. If it cannot, soak the assembly in fuel oil, acetone, carbon tetrachloride or similar carbon solvent to facilitate removal. Be careful not to permit the valve or body to come in contact with any hard surface.

If more than one injector is being serviced, keep the component parts of each injector separate from the others by placing them in a clean compartmented pan covered with fuel oil or solvent. Examine the nozzle body and remove any carbon deposits from exterior surfaces using a brass wire brush. The nozzle body must be in good condition and not blued due to overheating.

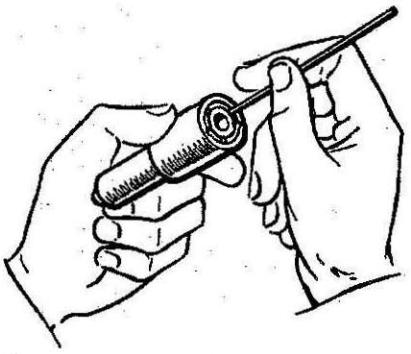


Fig. 67 — Clean out small feed channel bores with drill or wire as shown. These bores are rarely choked and insertion of drill or wire by hand will be sufficient.

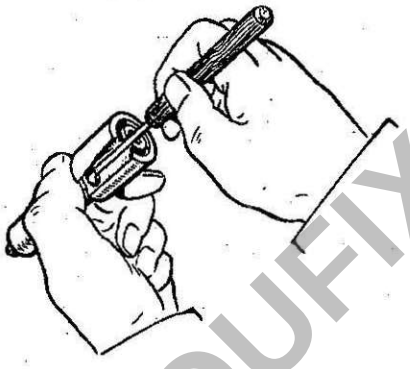


Fig. 68 — Insert special groove scraper until hooked nose of scraper enters fuel gallery. Press scraper hard against side of gallery and rotate nozzle to clear any carbon deposit from this area.

All polished surfaces should be relatively bright without scratches or dull patches. Mating faces (F—Fig. 72) must be absolutely clean and free from nicks, scratches or foreign material as these surfaces must register together to form a high pressure joint.

Clean out the small fuel feed channels, using a small diameter wire as shown in Fig. 67. Insert the special groove scraper (see Fig. 68) into nozzle body until nose of scraper locates in the fuel gallery. Press nose of scraper hard against side of cavity and rotate scraper to clean all carbon deposits from the gallery. Using seat scraper, clean all carbon from valve seat by rotating and pressing on scraper as shown in Fig. 69. Then, clean dome cavity in nozzle tip with dome cavity scraper as in Fig. 70.

Using a pin vise with proper size cleaning wire, thoroughly clean carbon from the four spray holes in nozzle tip as shown in Fig. 71. Use a 0.20 mm. (0.008 inch) diameter cleaning wire for model 770, a 0.25 mm. (0.010 inch) diameter wire for model 880 with 3/40 engine, or a 0.27 mm

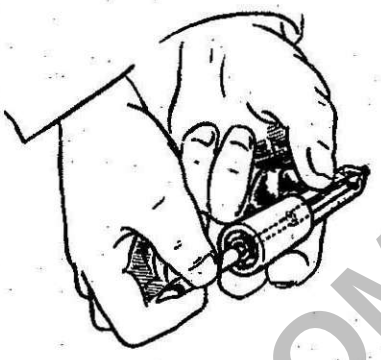


Fig. 69 — Use seat scraper to clean all carbon from needle seat in tip of nozzle by rotating scraper and pressing it against seat as it is rotated.

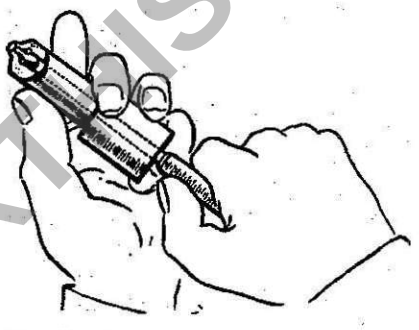


Fig. 70 — Remove any carbon from dome (tip) cavity with dome cavity cleaner as shown above.

(0.011 inch) diameter wire for all other models. Note: Cleaning wires (probes) available through David Brown parts are listed by size of spray hole, not by actual wire size.

Examine the stem and seat end of the nozzle valve and remove any carbon deposit using a clean, lint free cloth. Use extreme care, however, as any burr or small scratch may cause valve leakage or spray pattern distortion. If valve seat has a dull circumferential ring indicating wear or pitting, or if valve is blued, the valve and body should be turned over to an authorized diesel service station for possible overhaul.

Before reassembling, thoroughly rinse all parts in clean diesel fuel and make certain that all carbon is removed from the nozzle holder nut. Install nozzle assembly and cap nut making certain that the valve stem is located in the hole of the holder body and the two dowel pins (P—Fig. 72) enter holes in nozzle body. Tighten the holder nut to a torque of 40-60 Ft.-Lbs.

Install the spindle (F—Fig. 65) spring (E), adjusting screw (D) and lock nut (C) using new copper washer (B). Connect the injector to a nozzle tester and adjust opening pressure to

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CONDENSED SERVICE DATA

GENERAL	990 (Early)	990 (Late)	1200	3800	4600
Engine Make	Own	Own	Own	Own	Own
Engine Model	AD4/47	449001(4)	AD4/55	349101	355101
No. of Cylinders	4	4	4	3	3
Bore, Inches	3⅝	3 15/16	3 15/16	3 15/16	3 15/16
Stroke, Inches	4½	4	4½	4	4½
Displacement, Cubic Inches	185	186	219	146	164
Compression Ratio	17:1	17:1	17:1	7:1	7:1
Pistons Removed From:	Above	Above	Above	Above	Above
Cylinder Sleeves	Wet	None	None	None	None
Main Bearings, No. of	3	3	3	4	4
Generator & Starter Make	Lucas	Lucas	Lucas	Lucas	Lucas
Distributor Make	....	....	....	AC-Delco	AC-Delco
Carburetor Make	....	....	....	Zenith	Zenith
Fuel Injection Pump, Make	C.A.V.	C.A.V.	Simms	....	....
Forward Speeds, No. of	6/12	6/12	6/12	6/12	6/12
Battery Terminal Grounded	Neg.	Neg.	Neg.	Neg.	Neg.

TUNE-UP

Compression, Gauge Lbs. @ 68° F.:					
@ 150 RPM Cranking Speed	380-400	380-400	380-400	122-130(1)	122-130(1)
@ 250 RPM Cranking Speed	415-435	415-435	415-435	143-150(2)	142-150(2)
Firing Order	1-2-4-3	1-2-4-3	1-2-4-3	1-2-3	1-2-3
Valve Tappet Gap, Cold, Intake	0.015(3)	0.010	0.010	0.010	0.010
Exhaust	0.012(3)	0.007	0.007	0.007	0.007
Valve Face & Seat Angle	45°	45°	45°	45°	45°
Injection Timing, See Paragraph	91	92A	96	....	....
Ignition Timing, See Paragraph	....	....	....	118	118
Breaker Point Gap	....	....	....	0.020	0.020
Spark Plug Make & Model	....	....	....	AC 44xLS	AC 44xLS
Spark Plug Gap	....	....	....	0.025	0.025
Engine Low Idle RPM	650-700	650-700	650-700	500	500
Engine High Idle RPM	2350	2350	2450	2350	2350
Max. Full Load RPM	2200	2200	2300	2200	2200

SIZES—CAPACITIES—CLEARANCES

Crankshaft Main Journal Dia.	2.499 -2.4995				
Crankpin Journal Diameter	2.248-2.2485	2.373-2.3735			
Camshaft Journal Dia., Front	1.870 -1.872			2.3725-2.3735	
No. 2 Journal Dia.	1.825 -1.827			1.8707-1.872	
No. 3 Journal Dia.	1.811 -1.8113			1.8409-1.8422	
No. 4 Journal Dia.	1.811 -1.8113			1.794 -1.7954	
No. 5 Journal Dia.	1.763 -1.765			1.7475-1.7488	
No. 6 Journal Dia.	1.747 -1.749			....	....
Piston Pin Diameter	1.250-1.2503	1.2495-1.250			
Cylinder Bore Diameter	3.625-3.6255	3.9388-3.9396			
Piston Skirt Diameter	3.618-3.619	3.9315-3.9323		N/A	N/A
Valve Stem Diameter	0.3722-0.3732				
Main Bearings Running Clearance	0.002-0.004				
Rod Bearings Running Clearance	0.0015-0.0025	0.002-0.004			
Crankshaft End Play	0.002-0.010				
Camshaft End Play	0.010 -0.020			0.002 -0.006	
Cooling System—Quarts	14	14	14	9	9½
Crankcase—Quarts (With Filter)	8	8	8	6½	6½
Transmission—Quarts (Includes Differential & Hydraulic System)	24	24	43(5)	24	24
Final Drive, Each—Pints	4¾	4¾	4¾	2½	4¾
Steering Gear—Pints	2½	2½	6	2½	2½
Power Steering System	N/A	N/A	N/A	N/A	N/A
Fuel Injection Pump—Pints	....	....	¾	....	....

N/A Indicates information not available at time of publication.

(1) At cranking speed of 160 RPM.

(2) At cranking speed of 240 RPM.

(3) When equipped with later type camshaft (see paragraphs 37 and 38), adjust intake valve gap to 0.010 and exhaust valve gap to 0.007.

(4) Model 449001 indicates dual clutch (livedrive); single clutch (non-livedrive) engine model number is 449002.

(5) Capacity was changed from 38 quarts on early models by lengthening dipstick sleeve to raise dipstick; on models prior to Serial No. 705026, install new dipstick sleeve, part No. 923725.

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