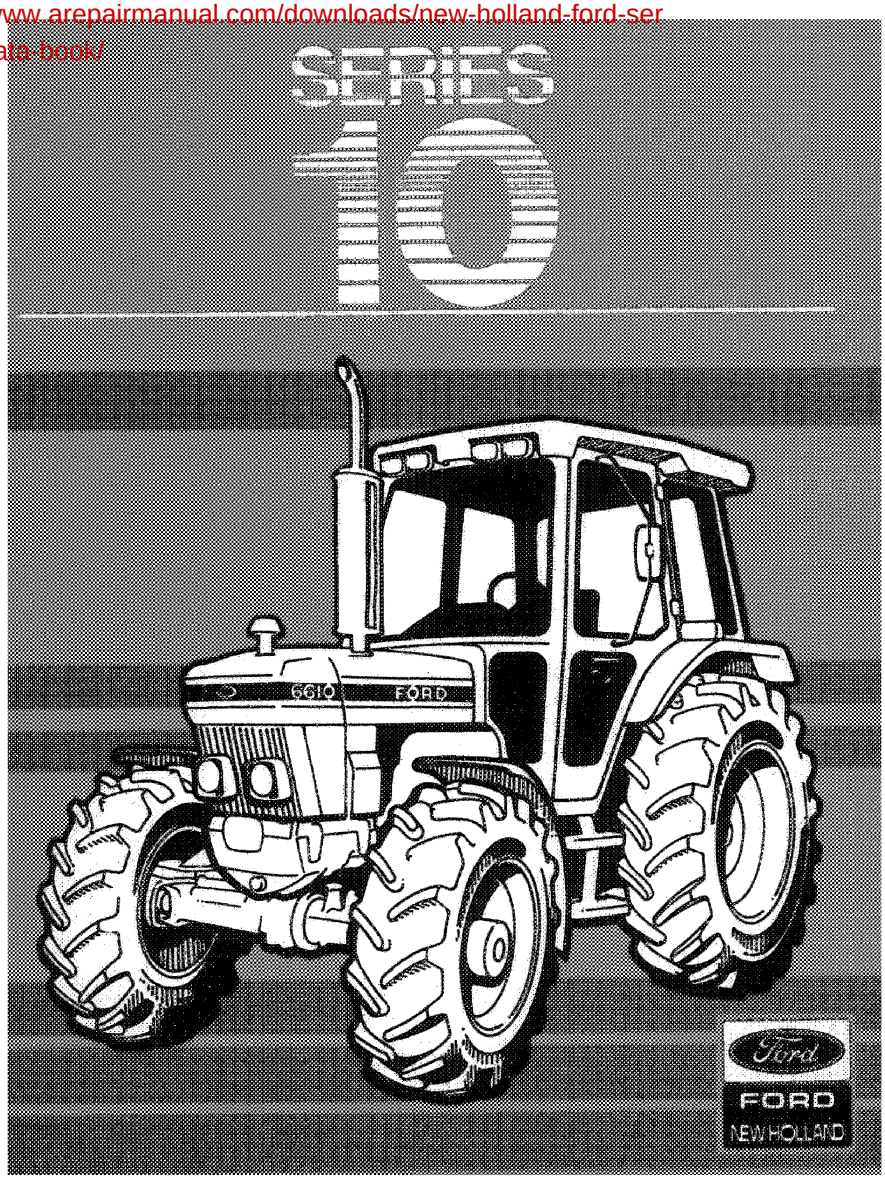

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FORD TRACTOR DATA BOOK

Reprinted

TRACTOR SERVICE DATA BOOK

INTRODUCTION

This Service Data Book is issued for your information and as a ready reference guide when carrying out repairs and adjustments on Ford agricultural and industrial tractors. Contents include torque values, fault diagnosis, trouble-shooting and service remedies but, in a reference book designed to be compact it is not feasible to include extensive service information. Instead the contents have been selected by placing emphasis on the more complex assemblies such as hydraulics and electrical systems where guidance is possibly more in demand.

Your Service Data Book is complementary to the current Repair Manuals but at no time should this book be considered as a substitute. Where a torque range is indicated set the wrench to the mid-point and ensure wrenches used are frequently monitored for accuracy.

The information in this Service Data Book was correct at the time of going to press but changes to specification or repair procedures of a significant nature will continue to be advised through the medium of Service Bulletins, and every endeavour should be made accordingly to update or amend the information in your book. Several pages in your Service Data Book have been left blank and are ruled and headed up 'Notes'. Utilise these pages for entering any revised details and additional pertinent service information you consider would be useful.

In many instances you will find models Ford 2610 and 3610 in table headings. Where this occurs transpose to 2910 and 3910 respectively whenever you require information for these models.

CONTENTS

FORD 2910, 3910, 4110, 4610, 5610, 6610, 6710, 7610, 7710

ENGINE SYSTEMS

TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSES	REMEDY
Engine does not develop full power— Diesel engine	1. Clogged air cleaner	1. Clean or renew element
	2. Fuel line obstructed	2. Clean
	3. Faulty injectors	3. Clean and reset
	4. Incorrect valve lash adjustment	4. Check and reset
	5. Burnt, worn or sticking valves	5. Replace valves and/or guides
	6. Blown head gasket	6. Check head flatness and fit new gasket
	7. Incorrect fuel delivery	7. Check injectors and pump
	8. Low cylinder compression	8. Replace piston rings or re-bore/re-sleeve as necessary
Engine Knocks	1. Diluted or thin oil	1. Drain and refill with specified oil and replace filter. Ascertain cause of dilution
	2. Insufficient oil supply	2. Check oil level and top up as necessary. Overhaul or replace pump as necessary Check pump filter not clogged
	3. Low oil pressure	3. Overhaul pump or relief valve as necessary
	4. Excessive crankshaft end play	4. Install new thrust bearing liner
	5. Flywheel or ring gear run-out excessive	5. Skim flywheel or fit new ring gear
	6. Excessive connecting rod or main bearing clearance	6. Install new bearing inserts and/or re-grind crankshaft
	7. Bent or twisted connecting rods	7. Replace connecting rods
	8. Crankshaft journals out-of-round	8. Re-grind crankshaft and fit undersize bearing inserts
	9. Excessive piston-to-cylinder bore clearance	9. Re-bore/re-sleeve block and fit new pistons
	10. Excessive piston ring clearance	10. Fit new pistons and rings
	11. Broken rings	11. Fit new rings. Check bore/ pistons for damage
	12. Excessive piston pin clearance	12. Fit new piston pin and bush

TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSES	REMEDY
Engine knocks (Cont'd.)	13. Piston pin retainer loose or missing	13. Install new retainer. Check bore/pistons for damage
	14. Excessive camshaft end play	14. Install new thrust plate
	15. Imperfections on timing gear teeth	15. Renew timing gear
	16. Excessive timing gear backlash	16. Renew timing gear
Low oil pressure	1. Engine oil level low	1. Top up, as necessary
	2. Wrong grade of oil	2. Drain and refill with correct grade of oil
	3. Blocked oil pump sump screen	3. Clean pump screen
	4. Oil pressure relief valve faulty	4. Fit new relief valve
	5. Oil pump drive shaft worn	5. Replace drive shaft
	6. Excessive oil pump rotor and shaft assembly clearance	6. Overhaul pump
	7. Excessive main or connecting rod bearing clearances	7. Install new bearing inserts and/or re-grind crankshaft
Excessive oil consumption	1. Engine oil level too high	1. Reduce oil level
	2. External oil leaks from engine	2. Renew gaskets/seals, where necessary. Check mating surfaces for damage or distortion
	3. Worn valves, valve guides or seals	3. Replace
	4. Head gasket not sealing	4. Renew gasket. Check head for damage or distortion
	5. Oil loss past the pistons and rings	5. Renew rings and/or re-bore/ re-sleeve block as necessary
	6. Oil cooler leak (if fitted)	6. Repair/replace oil cooler assembly

TROUBLE SHOOTING (Cont.)

PROBLEM	POSSIBLE CAUSES	REMEDY
Engine overheats	1. Hose connection leaking or collapsed	1. Tighten hose connection. Replace hose if damaged
	2. Radiator cap defective or not sealing	2. Replace radiator cap
	3. Radiator leakage	3. Repair/replace radiator
	4. Improper fan belt adjustment	4. Re-adjust fan belt
	5. Radiator fins restricted	5. Clean with compressed air
	6. Faulty thermostat	6. Renew thermostat
	7. Internal engine leakage	7. Check for source of leakage Renew gasket or defective parts
	8. Water pump faulty	8. Overhaul water pump
	9. Exhaust gas leakage into cooling system	9. Renew cylinder head gasket. Check head for damage or distortion.
	10. Coolant aeration	10. Tighten all connections and check coolant level is correct. Ensure cylinder head gasket has not blown
	11. Cylinder head gasket improperly installed	11. Renew cylinder head gasket
	12. Hot spot due to rust and scale or clogged water jackets	12. Reverse flush entire cooling system
	13. Obstruction to radiator air flow	13. Remove the obstruction
	14. Extended engine idling	14. Do not allow engine to idle for long periods
	15. Oil cooler tube blocked	15. Clean
	16. Radiator core tubes blocked	16. Check free flow

TROUBLE SHOOTING (Cont.)

PROBLEM	POSSIBLE CAUSES	REMEDY
Engine tends to keep firing after fuel is shut off	1. Air cleaner dirty or restricted 2. Oil leak on compressor side of turbo-charger where fitted	1. Clean or renew element 2. Overhaul turbo-charger
Oil pressure warning light fails to operate	1. Bulb burnt out 2. Warning light pressure switch faulty 3. Warning light circuit faulty	1. Renew bulb 2. Renew pressure switch 3. Check and renew wiring
Excessive exhaust smoke	1. Oil leak on compressor or turbine side of turbo-charger, where fitted 2. Exhaust leak on exhaust manifold side of turbo-charger, where fitted 3. Air cleaner dirty or restricted 4. Excessive fuel delivery	1. Overhaul turbo-charger 2. Fit new gasket 3. Clean 4. Overhaul injection pump/injectors
Water temperature gauge fails to reach normal operating temperature	1. Faulty temperature sender switch 2. Incorrect or faulty thermostat 3. Faulty water temperature gauge	1. Renew sender switch 2. Renew thermostat 3. Renew temperature gauge

SPECIFICATIONS

GENERAL SPECIFICATIONS

Model	Ford 2610	Ford 3610	Ford 4110	Ford 4610	Ford 5610	Ford 6610 & 6710	Ford 7610 & 7710
No. of Cylinders (T=Turbo-charged)	3	3	3	3	4	4	4T
Displacement: in^3	175	192	201	201	256	268	268
cm^3	2868	3147	3294	3294	4195	4393	4393
Bore: in	4·2	4.4	4.4	4·4	4.4	4·4	4·4
mm	106·7	111.8	111.8	111·8	111.8	111·8	111·8
Stroke: in	4.2	4.2	4·4	4·4	4·2	4.4	4.4
mm	106.7	106.7	111·8	111·8	106·7	111.8	111.8
Compression ratio	17·3:1	16·3:1	16·3:1	15.3:1	16·3:1	16·3:1	15·6:1
Firing Order	1–2–3	1–2–3	1–2–3	1–2–3	1–3–4–2	1–3–4–2	1–3–4–2
Rated Engine Speed (rev/min)	2000	2000	2200	2200	2100	2100	2100
Idle Speed (rev/min)	600–850	600–850	600–850	600–850	600–850	600–850	700–800
Maximum No Load Speed (rev/min)	2225–2275	2225–2275	2425–2475	2350–2400	2250–2300	2325–2375	2325–2375

CYLINDER BLOCK

Taper of Cylinder Bore	0.001 in (0.025 mm) Repair limit 0.005 in (0.127 mm) Wear limit
Cylinder Bore Out-of-round	0.0015 in (0.03 mm) Repair limit 0.005 in (0.127 mm) Wear limit
Cylinder Bore Diameters	4.2007–4.2032 in (106.698–106.761 mm) 4.4007–4.4032 in (111.778–111.841 mm)
Rear Oil Seal Bore Diameter	5.542–5.546 in (140.77–140.87 mm)
Block to Head Surface Flatness	0.003 in (0.08 mm) in any 6 in (152 mm) or 0.006 in (0.15 mm) overall limit

RETAINING COMPOUND

Cylinder Sleeve to Cylinder Block	Ford Part No. ESW M2G 160A

CYLINDER HEAD

Valve Guide Bore Diameter	0.3728–0.3735 in (9.469–9.487 mm)
Head to Block Surface Flatness	0.003 in (0.08 mm) in any 6 in (152 mm) or 0.006 in (0.15 mm) overall limit.

EXHAUST VALVES

Face Angle	44° 15′–44° 30′ Relative to Head of Valve
Stem Diameter	Std: 0·3701–0·3708 (9·401–9·418 mm) 0·003 in. (0·076 mm) Oversize: 0·3731–0·3738 in. (9·477–9·495 mm) 0·015 in. (0·38 mm) Oversize: 0·3851–0·3858 (9·781–9·799 mm) 0·030 in. (0·76 mm) Oversize: 0·4001–0·4008 in. (10·163–10·180 mm)
Head Diameter	
Ford 2610, 3610, 4110, 4610 & 5610	1·495–1·505 in. (37·97–38·23 mm)
Ford 6610, 6710, 7610, 7710	1·505–1·515 in. (38·23–38·48 mm)
Stem-to-Guide Clearance	0·0020–0·0037 in. (0·051–0·094 mm)
Lash Clearance (Cold)	0·017–0·021 in. (0·43–0·53 mm)

INTAKE VALVES

Face Angle	
Normally Aspirated Engine	44° 15′ —44° 30′ Relative to Head of Valve
Turbo-charged Engine	29° 15′–29° 30′ Relative to Head of Valve
Stem Diameter	Std: 0·3711–0·3718 in. (9·426–9·444 mm) 0·003 in. (0·076 mm) Oversize: 0·3741–0·3748 in. (9·502–9·520 mm) 0·015 in. (0·381 mm) Oversize: 0·3861–0·3868 in. (9·807–9·825 mm) 0·030 in. (0·762 mm) Oversize: 0·4011–0·4018 in. (10·188–10·206 mm)
Head Diameter	
Normally Aspirated Engine	1·800–1·810 in (45·72–45·97 mm)
Turbo-charged Engine	1·832–1·842 in (46·48–46·77 mm)
Stem-to-Guide Clearance	0·0010–0·0027 in. (0·025–0·069 mm)
Lash Clearance	0·014–0·018 in. (0·36–0·46 mm)

VALVE SPRINGS

Number per Valve	1
Free Length	2·15 in. (54·6 mm)
Load at 1·74 in. Length (44·20 mm)	61–69 lb (27·7–31·3 Kg)
Load at 1·32 in. Length (33·53 mm)	125–139 lb (57·8–63·1 Kg)

VALVE TIMING

Diesel	
Intake Opening	14° Before Top Dead Centre
Intake Closing	38° After Bottom Dead Centre
Exhaust Opening	41° Before Bottom Dead Centre
Exhaust Closing	11° After Top Dead Centre

SPECIFICATIONS (Cont.)

VALVE INSERTS

Insert Oversize	Exhaust Valve Insert	Intake Valve Seat Insert
	Counterbore Diameter in Cylinder Head	Counter bore Diameter in Cylinder Head
0.010 in (0.254 mm)	1.607–1.608 in (40.82–40.84 mm)	1.907–1.908 in (43.44–43.46 mm)
0.020 in (0.508 mm)	1.617–1.618 in (41.07–41.10 mm)	1.917–1.918 in (43.69–43.72 mm)
0.030 in (0.762 mm)	1.627–1.628 in (41.33–41.36 mm)	1.927–1.928 in (43.95–43.97 mm)

VALVE SEATS

Exhaust Valve Seat Angle	45° 00′—45° 30′
Intake Valve Seat Angle—	
Normally Aspirated Engine	45° 00′—45° 30′
Turbo-charged Engine	30° 00′—30° 30′
Interference Angle Valve Face to Valve Seat	0° 30′—1° 15′
Seat Run Out	0.0015 in (0.038 mm) Total Indicator Reading Max.
Seat Width	
Exhaust	0.084—0.106 in. (2.13—2.69 mm)
Intake	0.080—0.102 in. (2.03—2.59 mm)

CAMSHAFT DRIVE GEAR

Number of Teeth	47
End Play	0.001–0.011 in (0.025–0.28 mm)
Bushing Inside Diameter	2.005–2.0015 in (50.813–50.838 mm)
Adaptor Outside Diameter	1.9985–1.9990 in (50.762–50.775 mm)
Backlash with Crankshaft Gear	0.001–0.009 in (0.025–0.23 mm)
Backlash with Camshaft Gear	0.001–0.009 in (0.025–0.23 mm)
Backlash with Fuel Injection Pump Drive Gear	0.001–0.012 in (0.025–0.30 mm)

CAMSHAFT GEAR

Number of Teeth	52
Timing Gear Backlash	0.003–0.008 in (0.08–0.20 mm)

ROCKER ARM SHAFT	
Shaft Diameter	1.000–1.001 in (25.40–25.43 mm)
Support Diameter (Internal diameter)	1.002–1.004 in (25.45–25.50 mm)
ROCKER ARM	
Inside Diameter	1.003–1.004 in (25.48–25.50 mm)
TAPPETS	
Clearance to Bore	0.0006–0.0021 in (0.015–0.053 mm)
Tappet Diameter	0.9889–0.9894 in (25.118–25.130 mm)
Tappet Bore Diameter	0.990–0.991 in (25.15–25.17 mm)
CAMSHAFT	
Bearing Journal Diameter	2.3895–2.3905 in (60.693–60.719 mm)
Bearing Clearance	0.001–0.003 in (0.025–0.076 mm)
End Play	0.001–0.007 in (0.025–0.18 mm)
CONNECTING RODS	
Small End Bushing (Internal Diameter)	
Normally Aspirated	1.5003–1.5006 in (38.108–38.115 mm)
Turbo-charged	1.6253–1.6256 in (41.283–41.290 mm)
Clearance Bushing-to-Piston-Pin	0.0005–0.0007 in (0.013–0.018 mm)
Side Float	0.007–0.013 in (0.18–0.33 mm)
Maximum Twist	0.012 in (0.30 mm)
Maximum Bend	0.004 in (0.10 mm)
PISTON PIN	
Outside Diameter— Normally Aspirated Engine	1.4997–1.5000 in (38.092–38.100 mm)
Turbo-charged Engine	1.6247–1.6250 in (41.267–41.275 mm)

SPECIFICATIONS (Cont.)

PISTONS

Skirt-to-Cylinder Clearance	0·0027–0·0037 in. (0·069–0·094 mm)
Ford 2610, 3610, 4110, 5610	0·0075–0·0085 in. (0·191–0·216 mm)
Ford 4610, 6610, 6710, 7610 & 7710	0·0080–0·0090 in. (0·203–0·229 mm)
Taper (Out-of-Round)	0·0025–0·0050 in. (0·063–0·127 mm)
Grading Diameter (at Right Angles to Piston Pin)	
Ford 2610, 3610, 4110, 5610	4·1927–4·1952 in. (106·40–106·56 mm)
Ford 4610, 6610, 6710, 7610 & 7710	4·3922–4·3947 in. (111·56–111·62 mm) in increments of 0·0005 in. (0·0127 mm)
Piston Pin Clearance	0·0003–0·0005 in. (0·0076–0·0127 mm) at 70°F (21°C)
Piston Crown to Block Face	**4.2 in (106.7 mm) Bore** 0.008 in. (0.20 mm) below to 0.004 in. (0.10 mm) above **4.4 in. (111.8 mm) Bore** 0.011 – 0.023 in. (0.28 – 0.58 mm) above **Turbocharged Diesel Engine** 0 – 0.012 in. (0 – 0.3 mm) above

PISTON RINGS

Oil Control:	
Number and Location	1 — Directly above Piston Pin
Type	Slotted with Expander
Gap Width	0·015–0·038 in. (0·38–0·97 mm)
Side Clearance	0·0024–0·0041 in. (0·061–0·104 mm)
Compression:	
Number and Location	
— Diesel (with Conventional Pistons)	1 — Top and 2 — Intermediate above Piston Pin
— Diesel (with "Head-land" Pistons)	1 — Top and 1 — Intermediate above Piston Pin
Type — Normally Aspirated Engine with Conventional Pistons	
Top	Parallel Sides — Inner Chamfer or No Chamfer
Intermediate (2nd Compression)	Straight Face — Inner Step
Intermediate (3rd Compression)	Straight Face — Inner Step or Chamfer
— Turbo-charged Engine	
Top	Keystone Tapered
Intermediate (2nd Compression)	Straight Face — Inner Step
Intermediate (3rd Compression)	Straight Face — Outer Step
— Normally Aspirated Engine with "Head-land" Pistons	
Top	"L" Shaped
Intermediate (2nd Compression)	Straight Face — Inner Chamfer

SPECIFICATIONS (Cont.)

PISTON RINGS (Cont'd)	
Side Clearance	
Top Compression	0·0044–0·0061 in. (0·112–0·155 mm)
2nd Compression	0·0039–0·0056 in. (0·099–0·142 mm)
3rd Compression	0·0039–0·0056 in. (0·099–0·142 mm)
Gap Width	
Top	0·015–0·030 in. (0·38–0·76 mm)
Intermediate	0·013–0·028 in. (0·33–0·71 mm)
CRANKSHAFT	
Main Journal Diameter —Blue	3.3713–3.3718 in (85.631–85.644 mm)
—Red	3.3718–3.3723 in (85.644–85.656 mm)
Main Journal Length	1.455–1.465 in (36.96–37.21 mm)
Main Journal Wear Limits	0.005 in (0.127 mm) Maximum
Main and Crankpin Fillet Radius	0.12–0.14 in (3.048–3.556 mm)
Thrust Bearing Journal Length	1.459–1.461 in (37.06–37.11 mm)
Intermediate Bearing Journal Length	1.455–1.465 in (36.96–37.21 mm)
Rear Bearing Journal Length	1.495–1.515 in (37.97–38.48 mm)
Crankpin Journal Length	1.678–1.682 in (42.62–42.72 mm)
Crankpin Diameter—Blue	2.7496–2.7500 in (69.840–69.850 mm)
—Red	2.7500–2.7504 in (69.850–69.860 mm)
End Play	0.004–0.008 in (0.10–0.20 mm)
Crankpin Out-of-Round	0.0002 in (0.005 mm) Total Indicator Reading
Taper-surface Parallel to Centre Line of Main Journal	0.0002 in (0.005 mm)
Crankshaft Rear Oil Seal Journal Diameter	4.808–4.814 in (122.12–122.28 mm)
Crankshaft Pulley Journal Diameter	1.750–1.751 in (44.45–44.48 mm)
Crankshaft Timing Gear Journal Diameter	1.820–1.821 in (46.23–46.25 mm)
Crankshaft Flange Runout	0.0015 in (0.038 mm) Max
CRANKSHAFT DRIVE GEAR	
Number of Teeth	26
MAIN BEARING	
Liner Length (except thrust liner)	1.10–1.11 in (27.94–28.19 mm)
Liner Length (thrust liner)	1.453–1.455 in (39.91–36.96 mm)
CRANKPIN BEARINGS	
Liner Length	1.40–1.41 in (35.56–35.81 mm)

SPECIFICATIONS (Cont.)

CRANKSHAFT RE-GRINDING

When re-grinding a crankshaft, the main and crankpin journal diameters should be reduced the same amount as the undersize bearings used. The following dimensions apply. The rear end of the crankshaft should be located on the 60° chamfer of the pilot bearing bore.

Undersize Bearing Available	Main Journal Diameters
0.002 in (0.051 mm)	3.3693–3.3698 in (85.580–85.593 mm)
0.010 in (0.254 mm)	3.3618–3.3623 in (85.390–85.402 mm)
0.020 in (0.508 mm)	3.3518–3.3523 in (85.136–85.148 mm)
0.030 in (0.762 mm)	3.3418–3.3423 in (84.882–84.894 mm)
0.040 in (1.016 mm)	3.3318–3.3323 in (84.628–84.640 mm)

Crankpin Journal Diameters	
0.002 in (0.051 mm)	2.7476–2.7480 in (69.789–69.799 mm)
0.010 in (0.254 mm)	2.7400–2.7404 in (69.956–69.606 mm)
0.020 in (0.508 mm)	2.7300–2.7304 in (69.342–69.352 mm)
0.030 in (0.762 mm)	2.7200–2.7204 in (69.088–69.098 mm)
0.040 in (1.016 mm)	2.7100–2.7104 in (68.834–68.844 mm)

CRANKSHAFT BALANCER—4-CYLINDER ENGINE

Gear Backlash	0.002–0.010 in (0.05–0.25 mm)
Shaft-to-Bushing Clearance	0.0002–0.0008 in (0.005–0.020 mm)
Shaft Diameter	0.9895–1.000 in (25.133–25.400 mm)
Backlash between Balancer and Crankshaft Gear	0.002–0.008 in (0.05–0.20 mm)
End Float, Balancer Gear-to-Support	0.008–0.020 in (0.20–0.51 mm)

FLYWHEEL

Runout of Clutch Face (Between Outer Edge of Friction Surface and Mounting Bolt Holes)	0.005 in (0.127 mm)
Ring Gear Runout	0.025 in (0.64 mm)

OIL PUMP

Rotor Clearance	0.001–0.006 in (0.025–0.15 mm)
Rotor-to-Pump Housing Clearance	0.006–0.011 in (0.15–0.28 mm)
Rotor End Play	0.001–0.0035 in (0.025–0.089 mm)
Relief Valve Pressure	60–70 lbf/in² (4.1–4.8 bar) (4.2–4.9 kg/cm²) at 2000 rev/min
Relief Valve Spring Tension	1.07 in (27.2 mm) under 10.7–11.9 lb (4.85–5.4 kg) load

SPECIFICATIONS (Cont.)

Temperature	Oil Viscosity and Type	API Classification	Engine Oil & Filter Change Period (hours)	
			Ford 2610 3610, 4110 4610, 5610 6610, 6710	**Ford 7610, 7710**
Below −12°C (10°F)	Low Ash, SAE 5W	CC	150	75
	Supplement 1 or Low Ash, SAE 5W/20 Supplement 1 or SAE 10W-30	CC	150	75
		CD	150	75
−12°C to 4°C (10°F to 40°F)	Low Ash, SAE 10W Series 3 or SAE 10W-30	CD	300	150
		CD	300	150
0°C to 32°C (32°F to 90°F)	Low Ash, SAE 20 Series 3 or SAE 10W-30	CD	300	150
		CD	300	150
Above 24°C (75°F)	Low Ash, SAE 30 Series 3	CD	300	150

NOTE: *When using diesel fuel with a sulphur content below 1·0% Series 3 diesel engine oil with an A.P.I. classification of CC may be used instead of CD oil, but the oil and filter change interval must be reduced to 150 hours.*

When using diesel fuel with sulphur content between 1% and 1·3% use only oils listed ***above but reduce the oil and filter change period to every 50 hours.***

ENGINE OIL CAPACITIES (Less Oil Filter)

Model	Imp. pts.	U.S. pts.	Litres
Ford 2610, 3610, 4110, 4610	10	12	5·65
Ford 5610, 6610, 6710, 7610, 7710	13·2	16	7·6

ENGINE OIL CAPACITIES (With Oil Filter)

Model	Imp. pts.	U.S. pts	Litres
Ford 2610, 3610, 4110, 4610	11·7	14	6·6
Ford 5610, 6610, 6710, 7610, 7710	15	18	8·5

SPECIFICATIONS (Cont.)

THERMOSTAT

Opening Temperature	168°F (76°C)

WATER PUMP

Type	Centrifugal
Drive	V-Belt
Deflection	0.5–0.75 in (12–19 mm) Midway between pulleys.

COOLING SYSTEM CAPACITIES (With Heater)

Model	Imp.pts.	U.S.pts.	Litres
Ford 2610, 3610, 4110, 4610	20	24	11·4
Ford 5610, 6610	24·2	29	13·8
Ford 6710	26·6	32	15·2
Ford 7610	31·6	38	18
Ford 7710	34·2	41	19·4

COOLING SYSTEM CAPACITIES (Less Heater)

Model	Imp.pts.	U.S.pts.	Litres
Ford 2610, 3610, 4110, 4610	18·3	22	10·4
Ford 5610, 6610	22·4	27	12·8
Ford 6710	24·2	29	13·8
Ford 7610	30	36	17
Ford 7710	31·6	38	18

ANTIFREEZE

Use Ford antifreeze in the following solution strengths to provide protection down to the temperature required.

Temperature protection	Percentage of Antifreeze
– 4°C (25°F)	10%
– 9°C (16°F)	20%
– 16°C (4°F)	30%
– 24°C (– 11°F)	40%
– 36°C (– 33°F)	50%

TORQUE SPECIFICATIONS

TORQUE VALUES	lbf ft	(Nm)	(Kgm)
Main Bearing Bolts	120	(163)	(14)
Connecting Rod Nuts	63	(85)	(9)
Cylinder Head Bolts (with Engine Cold)	110	(150)	(15)
Intake Manifold-to-Cylinder Head	26	(35)	(4)
Exhaust Manifold-to-Cylinder Head	28	(38)	(4)
Exhaust Pipe-to-Flange	23	(31)	(4)
Flywheel-to-Crankshaft	160	(217)	(22)
Oil Pan Drain Plug	30	(41)	(4)
Valve Rocker Cover Bolts	13	(18)	(2)
Crankshaft Pulley-to-Crankshaft	165	(224)	(23)
Self-Locking Screw—Valve Rocker Arm	18	(24)	(3)
Injector Attachment Bolts	17	(23)	(2)
Oil Pump to Block	36	(49)	(5)
Water Pump-to-Cylinder Block	26	(35)	(4)
Water Pump Cover-to-Pump	20	(27)	(3)
Oil Pan-to-Cylinder Block (Stamped)	22	(30)	(3)
Oil Pan-to-Cylinder Block (Cast)	28	(38)	(4)
Injector Line Nuts	20	(27)	(3)
Leak-off Tube Banjo Fitting Bolts	6	(8)	(1)
Injection Pump-to-Front Adaptor Plate	18	(24)	(3)
Camshaft Drive Gear-to-Block	103	(140)	(14)
Front Adaptor Plate-to-Cylinder Block	14	(19)	(2)
Front Cover-to-Front Adaptor Plate	16	(22)	(2)
Camshaft Gear Bolts	43	(58)	(6)
Oil Filter Retaining Bolt	48	(65)	(7)
Oil Filter Mounting Bolt Insert	25	(34)	(4)
Starting Motor-to-Rear Adaptor Plate	23	(31)	(3)
Dynamic Balancer—Cylinder Block	65	(88)	(9)
Governor Drive Gear Nut	90	(122)	(13)
Oil Pump Gear Stop	70	(95)	(10)
Oil Pressure Switch Assembly	23	(31)	(3)
Turbo-charger-to-Exhaust Manifold	33	(44)	(5)
Fan to Pulley Bolts	16	(22)	(2)

SPECIFICATIONS (Cont.)

The following general nut and bolt installation torque requirements (lubricated) apply to any operation not previously listed.

TORQUE VALUES	lbf ft	(Nm)	(Kgm)
INCH SERIES			
1/4 – 20	8	(11)	(1)
1/4 – 28	8	(11)	(1)
5/16 – 18	14	(19)	(2)
5/16 – 24	17	(23)	(2)
3/8 – 16	23	(31)	(3)
3/8 – 24	33	(45)	(5)
7/16 – 14	48	(65)	(7)
7/16 – 20	55	(75)	(8)
1/2 – 13	65	(88)	(9)
1/2 – 20	75	(102)	(10)
9/16 – 18	90	(122)	(13)
5/8 – 18	138	(187)	(19)

NOTES

FUEL SYSTEMS

TROUBLE SHOOTING

DIESEL FUEL SYSTEMS—GENERAL

PROBLEM	POSSIBLE CAUSES	REMEDY
Fuel not reaching injection pump	1. Fuel shut-off valve closed 2. Restricted fuel filters 3. Air in system 4. Fuel leakage	1. Check the fuel shut-off valve at the fuel tank is in the 'ON' position 2. Check and flush the fuel filters clean 3. Bleed the fuel filters 4. Check the fuel lines and connectors for damage
Fuel reaching nozzles but engine will not start	1. Low cranking speed 2. Incorrect throttle adjustment 3. Incorrect pump timing 4. Fuel leakage 5. Faulty injectors 6. Low compression	1. Check the cranking speed 2. Check the throttle control rod travel 3. Check the pump timing 4. Check the fuel lines and connectors for leakage 5. See injector trouble shooting 6. Check the engine compression
Engine hard to start	1. Low cranking speed 2. Incorrect pump timing 3. Restricted fuel filters 4. Contaminated fuel 5. Low compression 6. Air in system	1. Check the cranking speed 2. Check the pump timing 3. Check and flush the fuel filters clean 4. Check for water in the fuel 5. Check the engine compression 6. Check for air leaks on the suction side of the system
Engine starts and stops	1. Fuel starvation 2. Contaminated fuel 3. Restricted air intake 4. Engine overheating 5. Air in system	1. Check and flush clean restricted fuel lines or fuel filters 2. Check for water in the fuel 3. Check for restrictions in the air intake 4. Check cooling system 5. Check for air leaks on the suction side of the system

TROUBLE SHOOTING (Cont.)

PROBLEM	POSSIBLE CAUSES	REMEDY
Erratic engine operation (surge, misfiring, poor governor regulation)	1. Fuel leakage	1. Check the injector lines and connectors for leakage
	2. Fuel starvation	2. Check and flush clean restricted fuel lines or filters
	3. Incorrect pump timing	3. Check the pump timing
	4. Contaminated fuel	4. Check for water in the fuel
	5. Air in system	5. Bleed the fuel system
	6. Faulty or sticking injector nozzles	6. See injector trouble shooting
	7. Incorrect engine timing	7. Check for faulty engine valves
Engine does not develop full power or speed	1. Incorrect throttle adjustment	1. Check for insufficient throttle control movement
	2. Incorrect maximum no-load speed	2. Check maximum no-load speed adjustment
	3. Fuel starvation	3. Check and flush clean restricted fuel lines and filters
	4. Air in system	4. Check for air leaks on the suction side of the system
	5. Incorrect timing	5. Check pump timing
	6. Low compression	6. Check engine compression
	7. Incorrect engine timing	7. Check for improper valve adjustment or faulty valves
Engine emits black smoke	1. Restricted air intake	1. Check for a restricted air intake
	2. Engine overheating	2. Check cooling system
	3. Incorrect timing	3. Check the pump timing
	4. Faulty injectors	4. See injector trouble shooting
	5. Low compression	5. Check the engine compression
	6. Incorrect engine timing	6. Check the engine valves

TROUBLE SHOOTING (Cont.)

ROTARY TYPE FUEL INJECTION PUMPS

PROBLEM	POSSIBLE CAUSES	REMEDY
Incorrect vacuum	1. Loose or damaged inlet connections 2. Damaged copper washer on inlet adaptor to end plate 3. Damaged copper washer on fuel inlet connection 4. Damaged outer seal on regulating sleeve 5. Regulating spring missing or broken 6. End plate not tightened square to hydraulic head 7. Faulty transfer pump seal 8. Worn or damaged transfer pump blades 9. Transfer pump liner not properly located 10. Air in pipe to vacuum gauge	1. Tighten or replace damaged components 2. Replace washer 3. Replace washer 4. Replace seal 5. Replace spring 6. Tighten squarely or replace damaged unit 7. Replace seal 8. Replace damaged unit 9. Re-locate or replace damaged unit 10. Purge and eliminate source of air
Low transfer pressure	1. Regulating valve inner seal damaged 2. Regulating spring or piston missing 3. Incorrect regulating spring 4. Worn or damaged transfer pump blades 5. Faulty transfer pump seal 6. Loose or incorrectly tightened end plate 7. Faulty washers on head locking and head locating screws 8. Damaged seals on head locating fitting	1. Replace seal 2. Replace spring or piston 3. Install correct spring 4. Replace damaged unit 5. Replace seal 6. Tighten or replace damaged unit 7. Replace washers 8. Replace seals
High transfer pressure	1. Sticking regulator piston 2. Incorrect regulating spring-too strong 3. Test bench operating on pressure feed 4. Regulating spring guide installed upside down 5. Incorrect regulating spring guide 6. Regulating sleeve installed upside down	1. Repair or replace piston 2. Install correct spring 3. Check maximum pressure feed 4. Install correctly 5. Install correct guide 6. Install correctly

TROUBLE SHOOTING (Cont.)

PROBLEM	POSSIBLE CAUSES	REMEDY
Low and fluctuating transfer pressure	1. Regulating sleeve inner gasket faulty	1. Renew gasket
	2. One transfer pump blade chipped	2. Renew unit
Low delivery during fuel delivery check at maximum speed	1. Maximum speed stop screw incorrectly adjusted	1. Adjust correctly
	2. Faulty or incorrect governor spring	2. Replace spring
	3. Governor spring linkage coupled to wrong holes	3. Correct linkage coupling
	4. Sticking metering valve	4. Repair or replace valve
Difficulty in settingdelivery by maximum speed top screw	1. Governor spring damaged or of wrong type	1. Replace spring
	2. Governor link setting incorrect	2. Set correctly
	3. Governor spring linkage incorrectly coupled	3. Assemble correctly
	4. Drive hub securing screw loose	4. Tighten screw
	5. Sticking metering valve	5. Repair and replace valve
	6. Sticking governor thrust sleeve	6. Repair or replace sleeve
Low advance reading	1. Low transfer pressure	1. Inspect and repair transfer pump
	2. Too many shims installed	2. Shim correctly
	3. Spring too stiff, incorrect type installed	3. Install correct spring
	4. Sticking advance piston	4. Repair or replace piston
	5. Sticking cam ring	5. Repair or replace cam ring
	6. Excessive clearance between advance piston and housing	6. Install new components
	7. Leaking advance gasket	7. Replace gasket
High advance reading	1. High transfer pressure	1. Inspect transfer pump for restriction on outlet side
	2. Insufficient shims installed	2. Shim correctly
	3. Incorrect spring, too weak	3. Replace spring

TROUBLE SHOOTING (Cont.)

PROBLEM	POSSIBLE CAUSES	REMEDY
Incorrect maximum fuel delivery	1. Throttle not fully open	1. Inspect and repair throttle
	2. Incorrect maximum fuel setting	2. Check and adjust maximum fuel setting
	3. Sticking metering valve	3. Repair or replace valve
	4. Air in system	4. Purge and eliminate source or air
	5. Sticking plungers or roller shoes	5. Repair or replace faulty items
	6. Damaged washers or radial connections	6. Replace washers
	7. Incorrect transfer pressure	7. Inspect and repair transfer pump
	8. Shut off mechanism fouling metering valve	8. Repair or replace mechanism
	9. Governor link adjustment incorrect	9. Adjust correctly
	10. Governor spring linkage incorrectly assembled	10. Assemble correctly
	11. Cam ring reversed	11. Install correctly
Low fuel delivery at 100rev/min	1. Low transfer pressure	1. Inspect and repair transfer pump
	2. Throttle not fully open	2. Inspect and repair throttle
	3. Sticking metering valve	3. Repair or replace valve
	4. Sticking plungers or roller shoes	4. Repair or replace faulty items
	5. Damaged washers on radial connections	5. Replace washers
	6. Plungers scored	6. Install new plungers
	7. Outlet ports scored	7. Install new unit
	8. Excessive clearance, rotor to hydraulic head	8. Install new head and rotor assembly
	9. Air in system	9. Purge and eliminate source of air
	10. Scored metering valve	10. Install new valve
Shut off not working	1. Shut-off lever installed incorrectly to shut-off shaft	1. Install correctly
	2. Shut-off bar fouling control cover or control bracket	2. Install correctly
	3. Governor link binding in control arm	3. Repair or replace
	4. Governor link length too long	4. Ensure correct link length
	5. Excessive clearance, metering valve to hydraulic head	5. Install new valve and/or head and rotor assembly
	6. Sticking metering valve	6. Repair or replace valve

IN-LINE TYPE FUEL INJECTION PUMPS

PROBLEM	POSSIBLE CAUSES	REMEDY
Pump fails to deliver fuel to all four injectors	1. Blocked fuel lines to pump 2. Lift pump defective 3. Air in fuel lines to injectors 4. Control rod seized in OFF position	1. Remove fuel lines and flush or replace 2. Repair or replace pump 3. Bleed fuel lines 4. Repair or replace control rod
Pump fails to deliver fuel to one injector	1. Air in fuel line to injector 2. Plunger spring broken 3. Plunger seized 4. Delivery valve seized 5. Badly scored plunger and barrel	1. Bleed fuel line 2. Replace spring 3. Repair or replace barrel and plunger assembly 4. Repair or replace delivery valve 5. Replace barrel and plunger assembly
Governor fails to maintain maximum or minimum no-load fuel delivery	1. Control spring broken 2. Governor weight carrier broken 3. Thrust pad seized 4. Cross-shaft bolt broken or missing 5. Pump link spring broken	1. Replace control spring 2. Replace weight assembly 3. Replace thrust pad and/or camshaft 4. Re, 'ace bolt 5. Replace spring

FUEL INJECTORS

PROBLEM	POSSIBLE CAUSES	REMEDY
Nozzle does not 'buzz' whilst injecting	1. Needle valve stuck 2. Leakage 3. Nozzle damaged	1. Check needle valve is clean and not binding 2. Check valve seat is not leaking 3. Examine nozzle retaining cap for damage
Nozzle leak-back	1. Needle valve worn 2. Blocked nozzle assembly 3. Loose nozzle retaining nut	1. Replace nozzle assembly 2. Check for carbon or foreign matter on faces of nozzle and nozzle holder. Flush clean or replace 3. Inspect faces and tighten nozzle retaining nut

TROUBLE SHOOTING (Cont.)

FUEL INJECTORS (CONT.)

PROBLEM	POSSIBLE CAUSES	REMEDY
Nozzle opening pressure incorrect	1. Incorrectly adjusted nozzle retaining nut 2. Damaged nozzle or seized needle valve 3. Blocked nozzle holes	1. Check adjusting nut for looseness and re-set 2. Replace nozzle assembly 3. Check nozzle holes for carbon or foreign matter. Flush clean or replace
Nozzle seat leakage	1. Nozzle incorrectly seated 2. Sticking or binding needle valve	1. Check for carbon or foreign matter on faces of nozzle or nozzle holder 2. Repair or replace nozzle assembly
Spray pattern distorted	1. Obstructed needle valve 2. Obstructed needle valve holes 3. Damaged nozzle or needle valve	1. Check for carbon or foreign matter on needle valve tip. Flush clean or replace nozzle assembly 2. Check for carbon in needle valve holes. Flush clean or replace nozzle assembly 3. Replace nozzle assembly

TURBOCHARGER

It is important when trouble shooting a suspected turbocharger malfunction to keep in mind that a turbocharger cannot compensate for incorrect engine operating procedures; deficiencies of the engine air intake, fuel, or exhaust systems; or for damaged engine components such as valves, pistons, rings, liners, etc. Replacing a good turbocharger with another will not correct engine deficiencies.

Consequently, systematic trouble shooting of a suspected turbocharger failure is essential for two very important reasons. First, it must be determined what, if anything, is wrong with the turbocharger so that it can be repaired. Second, it must be determined what action will prevent a recurrence of the failure.

In many cases, the evidence required to determine the cause of a malfunction is destroyed in the process of removing the turbocharger failed as the result of a faulty installation (such as loose duct connections that permitted ingestion of dirt by the compressor), this fact would not be evident once the turbocharger was removed from the engine. Furthermore, failure to take appropriate steps to assure correct installation (such as repairing or replacing defective clamps or ducting could cause the replacement unit to fail in a similar manner.

TROUBLE SHOOTING (Cont.)

The following Trouble Shooting Chart contains information pertaining to probable failure modes of turbocharged engines, possible causes for such failures, and the maintenance action required to remedy each possible cause. It is not represented that this information is all-inclusive. On the contrary, this information should be considered primarily as representative of the methods or techniques that should be employed in trouble shooting a turbocharged engine malfunction.

In general, those trouble shooting procedures that can be performed with the least effort and in the least amount of time should be performed first. No removal of disassembly procedures should be performed until all visual inspections and sensory tests (sight and feel) that can be accomplished with the turbocharger installed have been performed. The possible causes and procedure are generally arranged in the order of ease of accomplishment.

TURBOCHARGER

SYMPTOMS	POSSIBLE CAUSES
1. Engine lacks power or emits black smoke	• Dirty Air Cleaner (See Notes A and H) • Loose compressor-to-intake manifold connections (See notes B and C) • Leak at engine intake at turbocharger mounting flange (See Notes D, F, & G) • Turbo rotating assembly binding (See Note K) • Air cleaner to turbocharger duct restricted (See Note H) • Compressor to intake manifold duct restricted (See Note H) • Engine exhaust system restricted • Engine malfunction (rings, pistons, valves, etc.)
2. Engine exhaust emits blue smoke	• Dirty air cleaner (See Notes A and H) • Loose compressor-to-intake manifold connections (See Notes B and C) • Leak at engine intake manifold (See Notes F) • Plugged engine oil filter • Restricted duct between air cleaner and turbocharger compressor (See Notes H) • Seal leak at compressor end of turbocharger • Engine malfunction (rings, pistons, valves, etc.)

TROUBLE SHOOTING (Cont.)

TURBOCHARGER (Cont.)

SYMPTOMS	POSSIBLE CAUSES
3. Excessive engine oil consumption	• Wrong type or viscosity of engine lubricating oil • Seal leaks at compressor end of turbocharger (indicated by oil in housing or on wheel) • Oil in engine exhaust manifold (caused by malfunction of rings, pistons, valves, etc.)
4. Noisy turbocharger	• Dirty air cleaner (See Notes A and H) • Foreign material or object in compressor-to-intake manifold duct (See Notes H) • Foreign object in engine exhaust system • Carbon build-up in turbine housing • Turbocharger rotating assembly binding or dragging
5. Turbocharger rotating assembly binding or dragging	• Damaged compressor wheel (See Notes J) • Damaged turbine wheel • Compressor or turbine wheel rubbing on housing due to worn bearings, shaft journals or bearing bores • Excessive dirt build-up in compressor (housing or wheel) • Excessive carbon build-up behind turbine wheel (overhaul turbine) • Slugged or coked center housing (check engine lube system, overhaul turbocharger) (See Notes I)
6. Seal leaks at compressor end of turbocharger	• Dirty air cleaner • Restricted duct between air cleaner and turbocharger • Loose compressor-to-intake manifold duct connections • Leaks at engine intake manifold • Restricted turbocharger oil drain line • Plugged engine crankcase breather • Worn of damaged compressor wheel (worn bearings, bores or journals) • Excessive piston blowby or high internal crankcase pressure

TURBOCHARGER (Cont.)

SYMPTOMS	POSSIBLE CAUSES
7. Seal leaks at turbine end of turbocharger	• Excessive pre-oiling • Plugged engine crankcase breather • Restricted turbocharger oil drain line • Sludged or coked center housing • Worn turbocharger bearings, bearing bores, or shaft journals
8. Worn turbocharger bearings, bores or journals	• Inadequate pre-oiling following turbocharger installation or engine lube servicing • Contaminated or improper grade of engine oil used in engine • Insufficient oil supplied to turbocharger due to "oil lag" • Restricted turbocharger oil feed line • Plugged engine oil filter • Abrasive wear due to flaking of "coked" particles from center housing interior surface • Insufficient lube oil supplied to turbocharger due to engine oil pump malfunction

NOTES

A. Refer to Engine portion of Service Manual for servicing procedures.

B. With engine stopped, check duct clamping devices for tightness.

CAUTION: *Always start the engine from the tractor seat. Never start the engine from the ground.*

C. With engine running at idle speed, lightly spray duct connections with starting fluid. Leads at connections will be indicated by an increase in engine speed due to the starting fluid being drawn into the compressor and pumped into the engine combustion chambers.

D. With engine running at idle speed, check duct connections for leads by applying light weight oil or soap suds to areas of possible leakage and observing for bubbles. Exhaust gas leakage between the cylinder head, exhaust manifold and the turbocharger inlet will also create a noise level change.

E. With engine running at idle speed, check for unusual noise and vibration. If either condition is noted, shut down the engine immediately to protect the turbocharger and engine from further damage. With the engine stopped, check the turbocharger shaft sheel assembly for damage as outlined in note I, below.

F. With engine running, a change in the noise level to a higher pitch can indicate air leakage between the air cleaner and the engine, or a gas leak between the engine block and the turbocharger inlet.