

# **DAVID BROWN**

## **FOUR-CYLINDER DIESEL ENGINE**

**(SERIES AD4/47)**

## **REPAIR MANUAL**

PUBLICATION TP 644

**DAVID BROWN TRACTORS LIMITED  
MELTHAM · YORKSHIRE · ENGLAND HD7 3AR**

# Introduction

The engine fitted to 990 Agricultural Tractors is designated AD4/47 and is a four-cylinder unit of  $3\frac{5}{8}$  in. bore and  $4\frac{1}{2}$  in. stroke, fitted with wet cylinder sleeves. As the engine must have a flywheel suitable for the clutch (Livedrive or Non-Livedrive) the suffix A or B is included in the designation to indicate the type of flywheel fitted and therefore the tractor model on which the engine is used.

The engine fitted to 990 Industrial Tractors is designated ID4/47 and is basically identical to the AD4/47 engine, the only difference being that the ID4/47 engine is fitted with a flywheel suitable for the twin-plate clutch and has a splined coupling flange attached to the longer flywheel bolts.

## Engine Designation and Tractor Models

<i>Engine Series</i>	<i>Tractor Model</i>	<i>Tractor Number</i>
AD4/47A	990 Implematic Livedrive	440001 to 481999
	990 Selectamatic Livedrive	482001 onwards
AD4/47B	990 Implematic Non-Livedrive	440001 to 481999
	990 Selectamatic Non-Livedrive	482001 onwards
ID4/47	990 Industrial Models	440001 onwards

# CONTENTS

SECTION	Page
Maintenance .. .. .	1
Fuel System .. .. .	5
Lubrication System .. .. .	12
Cooling System .. .. .	16
Repair Operations	
Engine Tune .. .. .	18
Decarbonising .. .. .	19
Pistons and Connecting Rods .. .. .	21
Crankshaft and Bearings .. .. .	23
Cylinder Sleeves .. .. .	24
Timing Gears .. .. .	25
Valve Mechanism .. .. .	27
Engine Removal .. .. .	27
Dimensional Data .. .. .	32
Summary of Design Changes .. .. .	37
Approved Lubricants and Test Oils .. .. .	39

# MAINTENANCE

## Daily

Check engine oil level. Top up if necessary.

Check air cleaner. Remove filter bowl and examine the oil. In dusty conditions the air cleaner oil should be changed frequently, the detachable wire mesh element removed, washed in diesel fuel, and allowed to stand until all fuel has drained off. (See note regarding air cleaner maintenance.)

If a paper element pre-cleaner is fitted, remove the cover and examine the element. If it is dirty, remove the element and tap it on the side to shake off dust. **Do not attempt to wash a paper element.** Examine for any water, fuel or lubricating oil leaks.

## Every 60 hours

Check engine oil level. Top up to the "full" mark on dipstick if required.

Check radiator water level and top up to within 1 in. (2.5 cm) from top if required. If the engine is hot, remove radiator cap slowly as the system is pressurised and may scald the hand if opened quickly.

Visually check the feed pump sediment bowl. Remove and clean if there is any accumulation of dirt or water.

## Air Cleaner

**Air Cleaner Oil:** Air cleaner oil should be changed and the detachable wire mesh element removed and in dusty conditions washed frequently. The maximum dust deposit in the cleaner bowl should never be allowed to exceed  $\frac{1}{4}$  in., checked after standing overnight, otherwise oil pullover into the induction manifold will take place, due to the raised oil level.

Oil in the induction manifold, which indicates oil pullover, can be easily checked through the ether plug aperture in the inlet manifold. This pullover will cause rapid engine wear and must be prevented by adequate cleaner maintenance. An SAE 30 grade of straight mineral oil is less susceptible to frothing, and usually cheaper, than the detergent oils used in the engine. In climates where the ambient temperature often exceeds 32° C (90° F) an SAE 50 grade oil may be used. Care should be taken not to overfill the bowl. Only fill to the level mark — not above or below it.

Before assembling the air cleaner thoroughly clean the inside of the pre-cleaner and the inside of the pipe through the centre of the air cleaner. Ensure that the 'O' rings between the cleaner body, lower element and oil bowl are correctly fitted to ensure an air-tight seal. The fit of these 'O' rings is particularly important, as the upper ring may be easily displaced when the oil bowl and lower element are being fitted. The 'O' ring should not be twisted and should fit securely on the small notched register on the lower edge of the air cleaner body. If the 'O' rings are damaged during assembly new rings must be fitted.

## Paper Element Pre-cleaner

This is an alternative fitting to the centrifugal type pre-cleaner and incorporates a replaceable paper element. Frequency of attention depends on working conditions and in dusty climates the cover should be removed every few hours of use and the element examined. The element can be cleaned by tapping its side to shake off the loose dust. If the element becomes very dirty, or contaminated with oil or water, it should be renewed. **Do not attempt to wash an element.**

## Every 125 Hours

**Engine Oil:** Drain the oil, while it is still warm, through the sump plug on the underside of the sump plate. Refill with approved oil to within the safe marks on the dipstick. For list of approved lubricants see Page 39. In dusty conditions clean or replace engine breather (see Engine Breather, Page 2).

## Every 250 Hours

**Engine Oil and Filter:** Drain the oil when warm and remove filter bowl. Discard the old element and clean bowl out with clean diesel fuel, using a brush to make sure that the by-pass valve is perfectly clean. Fit a new element and check the sealing ring in the cylinder block groove; fit a new ring if it is damaged or distorted. Do not overtighten the bowl securing bolt — 10 lb ft (1.4 kg metres) is sufficient.

Refill the sump with new oil, start engine to fill the filter then recheck the oil level.

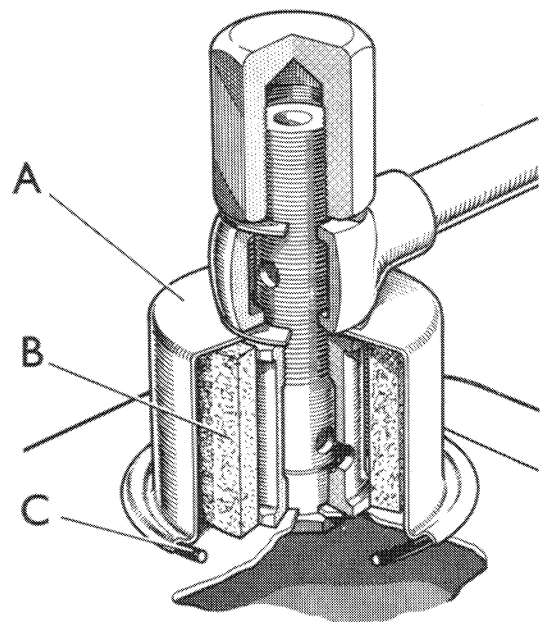


Figure 1. ENGINE BREATHER

A. Cover B. Element  
C. Sealing ring

**Engine Breather:** Remove the domed nut from top and remove the pipe. Lift the cover off and remove breather element. Clean the top of rocker cover and fit a new element. Replace breather cover, ensuring that the 'O' ring is correctly located in the cover lip and replace pipe and nut. Failure to change the breather element could cause excessive pressure to build up in the crankcase with resulting oil leakage from the crankshaft seals. (Fig. 1.)

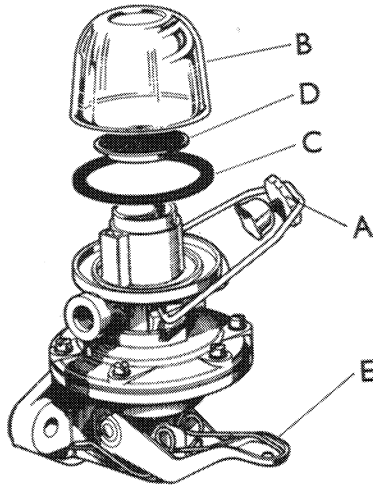


Figure 2. FUEL FEED PUMP SEDIMENT BOWL  
 A. Bowl securing nut      B. Sediment bowl  
 C. Sealing ring            D. Filter gauze  
 E. Priming lever

### Every 500 Hours

Remove sediment bowl and filter, as shown in Fig. 2, and wash in diesel fuel.

**Injectors:** Remove injectors for cleaning (see Page 7).

Procedure for removal of injectors:

1. Thoroughly clean off all external dirt.

2. Disconnect and remove leak-off pipe.
3. Disconnect high-pressure pipes at injector unions.
4. Slacken nuts holding down the injectors in stages, to prevent distortion.
5. Withdraw injectors carefully. Blank off inlet unions with caps. A protection sleeve should be fitted to nozzle tip.
6. Clean injector bores and remove copper washers. Plug the bores with clean rag to prevent dirt entering engine.

When replacing injectors refit copper washers — new ones if old ones were damaged — and tighten the injector down evenly. Reconnect leak-off pipe and high-pressure pipes leaving the injector unions slack. Turn engine, with stop control in the "run" position and throttle lever full open, until all air is expelled from high-pressure pipes, then tighten the unions. Start engine and check for any leaks.

### Valve Clearance

Remove valve rocker cover and check valve clearances when engine is cold. The valve clearance should be set cold to the dimensions on Page 33, Dimensional Data. The clearance between the tip of rocker arm and the end of valve stem should be checked with a feeler gauge as shown on Fig. 3 and adjusted, if necessary, to the correct clearance. Adjustment is made by slackening the locknut and turning the adjusting screw until correct clearance is obtained. When tightening the locknut hold adjusting screw firmly with a screwdriver, then recheck the clearance.

Relative position of valves is as follows:

No. 1 Cylinder (Front)		No. 2 Cylinder		No. 3 Cylinder		No. 4 Cylinder (Rear)	
Exhaust	Inlet	Inlet	Exhaust	Exhaust	Inlet	Inlet	Exhaust
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8

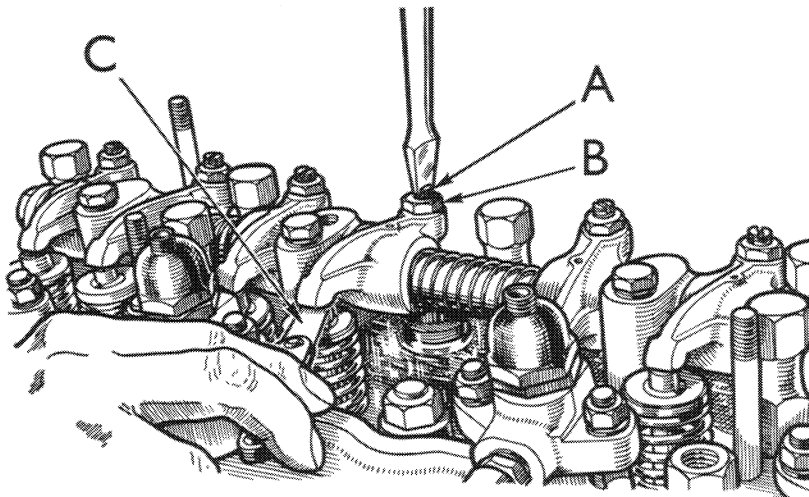


Figure 3. SETTING THE VALVE CLEARANCE  
 A. Adjusting screw      B. Locknut      C. Feeler gauge

Valve adjustment is easier if carried out when the injectors have been removed for servicing as the engine can then be turned by means of the fan. If the injectors are not removed, or the holding-down nuts released, it will be necessary to use a box-spanner (Service Tool 960995) on the crankshaft nut to turn the engine.

To ensure the valve tappets are at the base of the cam, adjust the valves in the following order:

Adjust No. 1 valve when No. 8 valve is fully open  
 Adjust No. 6 valve when No. 3 valve is fully open  
 Adjust No. 4 valve when No. 5 valve is fully open  
 Adjust No. 2 valve when No. 7 valve is fully open  
 Adjust No. 8 valve when No. 1 valve is fully open  
 Adjust No. 3 valve when No. 6 valve is fully open  
 Adjust No. 5 valve when No. 4 valve is fully open  
 Adjust No. 7 valve when No. 2 valve is fully open

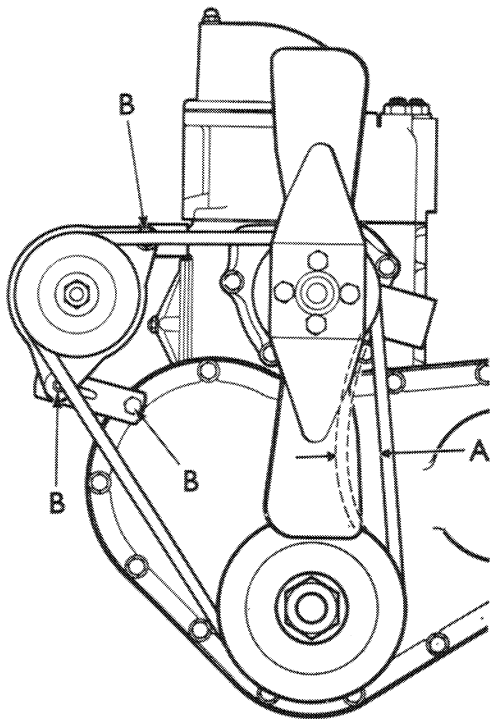


Figure 4. FAN BELT ADJUSTMENT  
 A. Deflection B. Mounting bolts

## Fan Belt

Check tension by deflecting belt midway between the fan and crankshaft pulleys. It should deflect approximately 1 in. (25 mm) and if necessary may be adjusted by releasing the three dynamo mounting bolts and swinging dynamo on the two upper bolts. Tighten lower bolt first, as this will hold dynamo in position whilst the upper bolts are tightened. Do not overtighten the belt. A taut belt will place excessive load on the dynamo and water pump bearings and cause rapid belt wear. If the belt has insufficient tension when dynamo has been adjusted so that the lower mounting bolt is at end of arm slot, the belt should be renewed. (Fig. 4.)

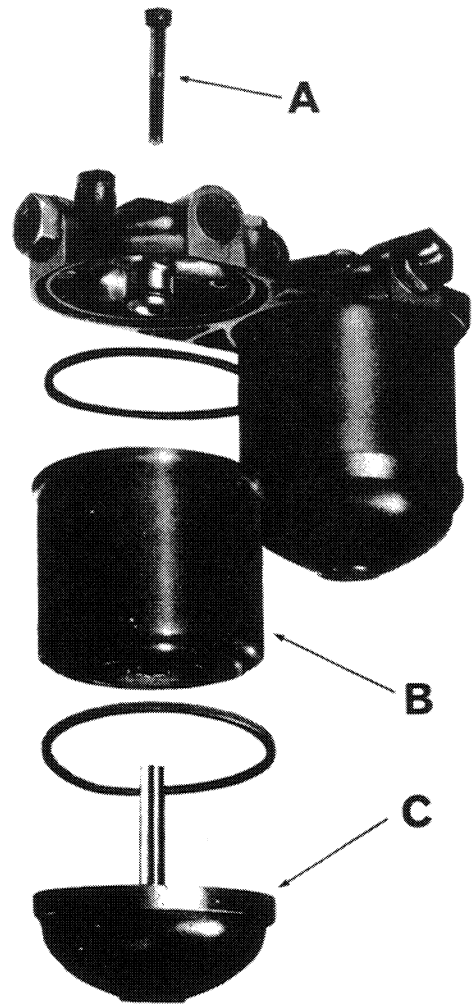


Figure 5. FUEL FILTER  
 A. Element securing bolt B. Element  
 C. Filter base

## Fuel Filter

Fit a new element in the first fuel filter but do not disturb the second filter. Clean the outside of filter then remove the bolt securing base of first filter to filter head, whilst holding base and element with the other hand. Remove base and discard element. Flush out base and fit a new element, ensuring that it seats correctly on the sealing rings in base and head. Fit a new sealing washer on to the retaining bolt. Replace the bolt and tighten firmly, but not excessively.

Do not attempt to clean fuel filter elements and do not change elements from one filter to another.

Remove and flush out fuel feed pump sediment bowl. As the fuel pump is lower than the tank it will be necessary to turn fuel tap off or, if a fuel tap is not fitted, slacken outlet union on fuel tank, so that fuel will not siphon out. Clean filter gauze with an air blast, or wash in clean fuel. Replace gauze and bowl, ensuring that it seats correctly on the sealing ring. After refitting sediment bowl and tightening the tank outlet union, or turning on fuel tap, vent system to remove air. (See Page 5.) (Fig. 5.)

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