

BRITISH RAILWAYS

**WORKSHOP OVERHAUL SCHEDULE**

DIESEL MULTIPLE UNITS

ENGINES: 150 H.P. A.E.C. A.220 SERIES

150 H.P. LEYLAND R.E. 680/1 & R.E. 680/13

200 H.P. LEYLAND/ALBION R.E. 900 SERIES

AMENDMENT NO. 79 DMU 150 HP ENGINES  
JANUARY 1970

WORKSHOP OVERHAUL SCHEDULE.

150 HP AEC ENGINE  
150 HP LEYLAND ENGINE  
FLUID COUPLING  
FREEWHEEL UNIT

1. This Workshop Overhaul Schedule replaces forthwith any previously issued.
2. The only classification of repair is GENERAL.

General repairs are those which are normally carried out on a regular basis after the engine has been in service for a pre-determined number of miles.

3. The periodicity of classified repair is 180,000 miles for all but Western Region engines; for these the periodicity is 220,000 miles.
4. Freewheel units are shopped and overhauled at the same time as the associated engines and fluid couplings.
5. The work to be done on fluid couplings is included in the engine sections of this schedule.  
The work to be done on freewheel units is similarly included.
6. The shopping periods between classified repairs may be extended from time to time as equipment is more fully developed and becomes more reliable.
7. Inspection under the Red Label procedure is used to ascertain reasons for failure before scheduled life is attained, where these are obscure. (Refer to Standing Order No. T&RS/W/G/5.)

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'E' - Inspection of Crankshaft Dampers.	

## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

ENGINEStripping and Cleaning.

Rough clean.

Remove all electrical components before cleaning in degreasing plant.

Proceed to strip engine of sub-components:-

Air Compressor  
Water Pump  
Fuel Pump and Injectors  
Oil Pump  
Cylinder Heads  
Filters  
Right Angle Drive  
Rocker Gear  
Fluid Flywheel

Keep in engine sets until inspection completed.

Cylinder head lifting nuts are no longer fitted to Leyland 600/680 Cylinder Heads. Lifting nut kits should be used instead. (Leyland Service Bulletin No.948 refers.

Sub-components receive additional cleaning following further stripping.

COMPONENT

WORK TO BE CARRIED OUT

REMARKS

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Remove all electrical components before cleaning in degreasing plant.

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Air Compressor  
Water Pump  
Fuel Pump and Injectors  
Oil Pump  
Cylinder Heads  
Filters  
Right Angle Drive  
Rocker Gear  
Fluid Flywheel

Sub-components receive additional cleaning following further stripping.

Keep in engine sets until inspection completed.

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## GENERAL

SHEET 2

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>CYLINDER HEADS</u>	Thoroughly clean and descale internally using inhibited hydrochloric acid BR. Cat. 7/660; test for fractures and repair or renew as necessary.	See Data Section Item 1. and Appendix 'A'.
	Check combustion face for distortion, erosion and fretting. Surface grind as necessary.	See Data Section Item 2. Amount of metal removed to be stamped on face. Surface finish to be 32 CLA for gasket adhesion.
Main Casting (A.E.C. only)	Cover plates to be removed, straightened as required and rejoined. Examine jacking nuts and retaining plate and renew as necessary.	
Valves	Examine, regrind or renew as necessary.	See Data Section Item 3.
Valve Seats	Examine and machine as required.	See Data Section Item 4.
Inserts	Examine and check security. If renewal is necessary proceed as in Appendix H. Valve seating to be checked and lapped as required. (Not fitted initially to Leyland inlet valve).	See Data Section Item 5.
Guides	Examine for condition and bore size; check security within cylinder head casting. Recondition or renew as necessary.	See Data Section Item 6. Reconditioning consists of building up of exterior of guide to ensure security in head.
Springs	Examine and check for correct compression, renew as necessary. Examine plates and cotters, replace or renew as necessary.	See Data Section Item 7.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
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CYLINDER HEADS (Continued)

Injector Tubes - A.E.C. - Leyland	Bottom face to be dressed as necessary. Renew tube and washer if leaking or damaged.	Special attention must be given to sealing tubes at upper and lower ends.  Injector tubes can be changed individually except where the changeover to cupro-nickel takes place. (A.E.C. and Leyland)
Injector Holes	Examine for fractures. Repair by "Metalock" where possible.	See Data Section Item 8.
Transfer Holes (Water)	Examine for erosion and rebush as necessary.	
Studs	If not chamfered to take collared cylinder head studs machine each stud hole to a 60° chamfer on the face of of the head.	Non-chamfered heads <u>must not</u> be fitted to engines with collared head studs. Chamfered heads may be fitted to engines with parallel or collared head studs.

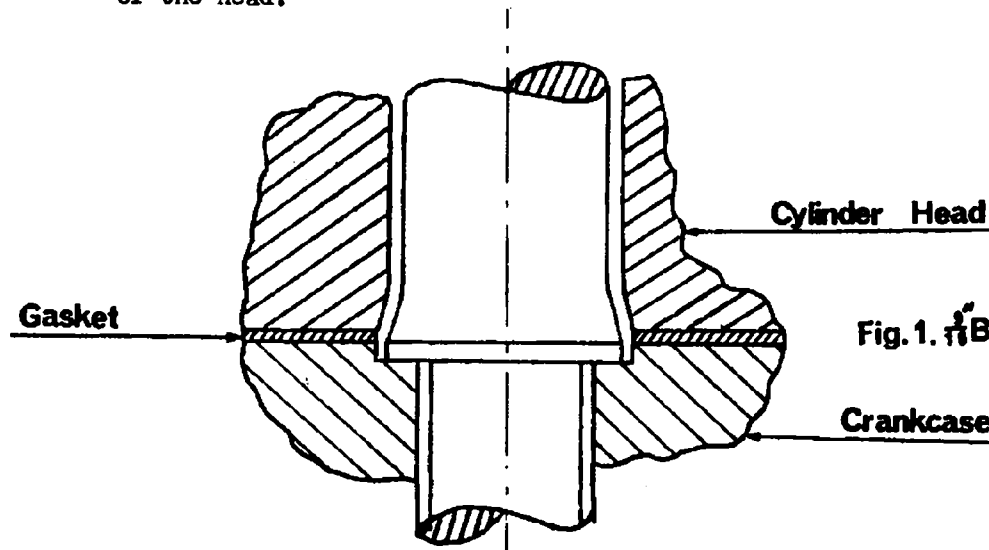


Fig. 1. BSF Collared Cylinder Head Studs

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GENERAL

COMPONENT	WORK TO BE CARRIED OUT	REMARKS.
<u>PISTON ASSEMBLIES</u>		
Piston	<p>Examine visually and in cases of doubt, crack detect crown and gudgeon pin hole bore by dy: penetrant method.</p> <p>Size all ring grooves axially.</p> <p>Repair or renew pistons as necessary.</p> <p>Examine visually gudgeon pins and in cases of doubt, crack detect magnetically, renew as necessary.</p> <p>Examine gudgeon pin retaining rings, renew as necessary.</p> <p>Renew all piston rings, ensuring correct gaps.</p> <p>Leyland type B pistons have only one life and must be scrapped.</p>	<p>A.E.C. - Engines require balanced sets.</p> <p>Leyland - Manufacturer's tolerances are within allowable limit for weight - See Data Section Item 9.</p> <p>See Data Section Item 10.</p>
Connecting Rods - A.E.C. Old Type	<p>Examine connecting rod little end eye. If new bush is required size internal diameter of hole. Interference fit to be 0.002 in.</p> <p>Examine big end bearings, ensuring correct fit.</p>	<p>See Data Section Item 11.</p> <p>See Data Section Item 28. Should big end bearings be changed little end bushes must also be changed as latter act as datum point for rod length.</p>
- Shell Type	<p>Big end bolts to be renewed and torque loaded on assembly.</p> <p>Examine visually and crack detect magnetically in cases of doubt. Check alignment, size little end bushes, renew as necessary.</p> <p>Renew big end bearings, ensuring correct fit.</p> <p>When crankshaft big end bearing journal is ground, fit appropriate bearings.</p>	<p>See Data Section Item 12.</p> <p>See Data Section Item 11.</p> <p>See Data Section Item 28. Datum point for rod length is big end bearing and little end must be bored to obtain correct length of rod.</p>
	Big end bolts to be renewed and torque loaded on assembly.	See Data Section Item 12.



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GENERAL

SHEET 5

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>PISTON ASSEMBLIES</u> (Continued)		
Connecting Rods (Continued)		
- Leyland Type	<p>Examine visually and crack detect magnetically in cases of doubt.</p> <p>Examine connecting rod little end eye. If new bush is required, size internal diameter of hole. Interference fit to be 0.002 in.</p>	<p>See Data Item 11.</p> <p>It is unnecessary to check length of centres of big end bearing bush to little end bush.</p>
	<p>Examine big end bearings, ensuring correct fit.</p> <p>When crankshaft big end bearing is ground, fit appropriate bearings.</p>	See Data Section Item 28.
	<p>Big end bolts to be renewed and on assembly, to be stretched and the elongation checked.</p>	See Data Section. Item 13.

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## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

Cylinder Block

Clean exterior of block. Remove and scrap cylinder liners. Replace aluminium cover plates by steel blanks. Grease all tapped holes which break through to water space. Fill block with inhibited hydrochloric acid and allow to stand until effervescence ceases.

Remove and scrap all studs and examine blocks for defects. Flaw detect top face around stud holes and water jacket walls using dye-penetrant method.

Pressure test block by immersion in water at 65-71°C (150-170°F). Pressurize internally with air at 30 lb/sq. in. Check for leaks particularly down bores and from underside of jacket.

Remove, examine and straighten guide plates for push rods, or renew as necessary.

Examine transfer holes for erosion and re-bush as necessary. Clean sump joint faces and main bearing housings. Remove burrs etc.

Check for face distortion. If outside acceptance limits, make good by Repair Procedure DMU 001.

Check cylinder bores for condition (air gauge). If outside limits make good by Repair Procedure DMU 002.

Counterbore stud holes to 0.020" diametral clearance for a depth of 3/32" unless already counterbored.

See Appendix 'A' for de-scaling process.

Small cracks in the water jacket and any in the top face which do not extend to the outside surface may be repaired by Metalock.

Blocks having water jacket cracks over 3" long and any others must be scrapped.

See Data Section Item 15. and Appendix 'C'.

See Data Section Item 16. and Appendix 'D'.

/continued .....

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COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>Cylinder Block</u>	Thoroughly clean bores and recesses with paraffin. Recess depths may vary, therefore measure each one and select suitable new liners on basis of lip thickness, to give correct liner protrusion after fitting.	See Data Section Item 18.
	Fit new liners using correct dolly. Ensure outer surface is completely clean. Apply a thin smear of SAE 10 or 20 lubricating oil to block bore. Enter the liner into the block bore, adjust vertical, apply dolly, set dolly under press ram centre and operate press. Adjust rate of pressing to not more than 1" per second, to minimise friction heat. Press load must rise gradually and peaking investigated. Press home until flange seats on register; shims not permitted. As liner top flange approaches block the press-in rate must be reduced so that the force of abutment of liner flange to block is the least possible.	For dollies see Dr. No. The sizing, finish and fit of the liner to the bore has been designed to precision standards to ensure that the maximum press-in load should not exceed 2 tons. Presses must be fitted with limiting valves to prevent this load being exceeded, and any excessive resistance must be investigated. See Data Section Item 17.
	Hone liner bore to finished size with the block standing with its sump joint face on the machine table. Surface grind tops of liners to give common protrusion with top surface of the block standing level to $\pm 0.001$ ".	See Data Section Item 18.
	Clean with paraffin and check bores (Solex air gauge) Inspect for flaws and imperfections.	
	Fit new studs and finally check top face of block with straight edge and liner protrusions with feeler gauges.	See Data Section Item 19. See Data Section Item 15.
	Examine camshaft bushes and size. Renew as necessary.	See Data Section Item 20.

/continued .....

AMENDMENT NO. 101

D.M.U. 150 HP ENGINES

JULY 1972

GENERAL

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COMPONENT	WORK TO BE DONE	REMARKS
Cylinder Block	Check main bearing housing alignment and rectify as necessary i.e. rebore to standard, first oversize or second oversize. Oversizes to be stamped OS 1 or 2 on block and caps. Deburr.	See Data Section Item 21.

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COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>CAMSHAFT</u>	Check for flaws magnetically. Check for alignment, straighten if necessary and recheck for flaws. Check cam lobes for wear and correct lift. Size journals and check condition of surfaces. Polish journals and cams as necessary. Clean out oil gallery and replace plug (Leyland only). Check dowel condition, renew as necessary. Camshaft to be checked for end float when assembled in engine.	See Data Section Item 23. See Data Section Item 24. See Data Section Item 25. See Data Section Item 26
Cam Followers	Examine visually. Surface grind, check hardness and crack detect magnetically or renew, as necessary.	See Data Section Item 27.
Thrust Plates	Examine for wear, renew as necessary.	

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GENERAL

SHEET 8

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>CRANKSHAFT</u>	<p>Clean out oilways.            Check for flaws magnetically, including flywheel bolt holes.</p> <p>Size crank pin and main journals and check condition of surfaces, recondition as necessary.            Check for alignment at centre journal</p> <p>Check flywheel flange face for runout, correct by grinding.</p> <p>Check pulley and damper taper for fit.</p> <p>Renew flywheel bolts and check dowel for tightness of fit.</p> <p>Recondition or renew sludge taper plugs as necessary.</p> <p>Damper cone to be lapped to taper.</p>	<p>If flaw found, scrap crankshaft, no attempt to be made to grind out.</p> <p>See Data Section Item 28.</p> <p>See Data Section Item 28</p> <p>See Data Section Item 29</p> <p>Pulley cone to be lapped to taper.</p> <p>See Data Section Item 30.            Ensure driving fit, using oversize bolts where necessary.</p>

## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

MAIN BEARINGS

Examine for scoring and condition of lead flashing. Renew as necessary, ensuring correct fit of back of bearing to housing. Fit oversize bearing if crankshaft is ground.

See Data Section Item 31

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>ROCKER GEAR</u>		
Arms and Pads	Examine visually, check arm for alignment, if correct regrind pad, or renew whole as necessary.	See Data Section Item 32.
Decompression Lever and Shaft (Leyland)	Examine and renew as necessary.	New Leyland 680 series rocker shafts are no longer supplied with decompression levers.
Tappet Adjustment Screw and Locking Nuts	Check for condition and renew as necessary.	
Bushes	Check for condition and size, renew as necessary.	See Data Section Item 33.
Rocker Shafts	Check alignment and condition, renew as necessary. Examine retaining rings, springs and washers, renew as necessary.	See Data Section Item 34.
Pedestal Brackets	Examine brackets and oilways, check dowels, repair or renew as necessary.	



## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

SUMPS

Examine for fractures. Ensure right angle drive mounting points are at identical height. Repair or renew as necessary.	Use dyepenetrant in suspect cases. Special examination of A.E.C. sump in right angle drive mounting lugs and boss area. Special examination of Leyland sump for starter motor support ribs.
Check that dowel for starter motor is fitted correctly(A.E.C.)	To maintain 1/8" gap between face of starter motor pinion and face of starter ring.
Examine starter motor straps, studs and threaded holes, recondition as necessary. Ensure correct alignment of starter motor housing.	Worn stud holes to be repaired by "Helicoil" method.

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## GENERAL

SHEET 12

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>FUEL INJECTION PUMP, GOVERNOR AND FEED PUMP</u>	Strip, clean and examines-	Following reassembly, fuel injection pump, governor and feed pump to be tested - see Data Section Items 39, 40 and 42. All apertures to be covered with protection caps or masking tape pending utilisation.
Main Housing	Examine for flaws, check condition of base plugs and hole threads; recondition or renew as necessary.	
Delivery Valves and Elements,	Renew as necessary.	
Tappet Assembly	Check rollers for lift. Rollers, pin and tappet body to be renewed as necessary.	Shims to be used to obtain correct plunger head clearance. Timing to be checked. See Data Section Item 35.
Roller Bearings	Check track and rollers for pitting and heat discolouration. Renew as necessary.	
Camshaft	Check for alignment, pitting and scoring and oil seal wear on camshaft. Repair or renew as necessary. End float to be shimmed as necessary.	See Data Section Item 36.
Quadrants	Check for wear on teeth. Renew as necessary.	On N and NN type pumps discard Sintered quadrant and use brass type (BR Cat No 75/5521).
Control Rod and Bushes	Check teeth and bush bores for wear. Renew as necessary.	See Data Section Item 37. Ensure control rod is free within bushes and aligned to jig A.E.C. Part No. 72lh/2.
Delivery Valve Holders	Check for wear within pipe cone connections.	To be renewed if any indication of wear. See Data Section Item 38.

## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

FUEL INJECTION PUMP, GOVERNOR  
AND FEED PUMP (Continued)

Springs and Spring Plates

Examine for corrosion and distortion, renew as necessary.

Oil Seals and Filter Pads

Renew.

Governor

Check pins and yoke ends in link gear for wear, renew as necessary.  
Examine bushes and pins in governor weights for wear, renew as necessary.

Governor yoke to be reshimmed as necessary. See Data Section Item 41.

Feed Pump

Renew diaphragm.  
Examine valves, seats, discs and operating lever pin, renew as necessary.

Fuel Pump Mounting Bracket

Examine, repair or renew as necessary.

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GENERAL

SHEET 14

## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

INJECTORS

Strip, clean and examine:-

Holder

Recondition or renew as necessary.

Inlet Adaptor

Examine cone thread, renew as necessary.

Examine the nozzle under a magnification of 10X and scrap any which show cracks in the vicinity of the injector holes or are suspect.

Nozzle Assembly

Check for wear on needle and nozzle seats, recondition or renew as necessary.

Check fit of needle in nozzle body, and needle lift.  
Recondition pressure face or renew nozzle assembly.

See Data Section Item 43.

Special attention to be given to nozzle pressure face.

The bodies of injectors for Leyland 680/1, 680/13 and 680/1595 engines are interchangeable, but the correct nozzle must be fitted for particular engine type, as follows:-

Item	CAV Part No.	B.R. Cat.No.	Leyland Engine Type
Holder	52466 (Type BKBL 97S5006/b)	-	680/1 680/13 680/1595
Nozzle	Type BDLL 140S 6205/A	15/77005	680/1 680/13
"	Type BDLL 140S 6306	15/1288	680/1595
Injector Complete	5246605	15/77004	680/1 680/13
"	5246607	15/1287*	680/1595

\* The injector body must be painted YELLOW.

The stamping of 'X' on the cap nut of injectors 15/1287 shall be discontinued.

/Continued..

AMENDMENT NO. 2/3

D.M.U. 150 H.P. ENGINES

SHEET 11A

JULY, 1979

GENERAL

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COMPONENT

WORK TO BE CARRIED OUT

REMARKS

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Springs and Spindles

Renew as necessary.

Following injector reassembly, holder and nozzle assembly  
to be tested.

See Data Section 44.

See Test Section Appendix A.

## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

FLUID COUPLINGFront Casing  
(With Starter Ring)

## Casing

Examine, repair or renew as necessary.  
Check periphery runout.  
Machine casing, crankshaft flange mating face, as necessary.

See Data Section Item 45.  
A.E.C. Only - The amount removed from the crankshaft flange mating face must also be removed from the thrust face of the roller race housing.

Crankshaft Bolt  
Holes

Remove burrs and check diameter of holes.

A.E.C. - Fit oversize bolts as necessary.  
See Data Section Item 30.

Leyland - Use standard diameter bolt as gauge. Driving fit must be obtained.  
See Data Section Item 30.

## Starter Ring

Examine and renew as necessary.

A.E.C. - If teeth are damaged, rotate ring to one of three positions or reverse ring on front casing.

Leyland - If teeth are damaged, reverse ring on front casing.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>FLUID COUPLING</u> (Continued)		
Rear Casing (With Runner Casing and Shaft)		
Rear Casing	Examine, repair or renew as necessary. Check oil filler plugs and holes for thread condition, recondition or renew as necessary.	
Runner Shaft	Examine, renew as necessary. Check runout. Renew runner bolts.	See Data Section Item 46.
Runner Casing	Examine, renew as necessary.	
Bearings	Examine, check end float, renew as necessary.	See Data Section Item 47.
Gland	Examine, repair or renew as necessary. Grind and lap mating surfaces of bellows and rubbing ring as necessary. Check free height of rubbing face of bellows with flange.	See Data Section Item 48.
Flange Coupling	Examine, renew as necessary. Check runout.	See Data Section Item 46.
	On final assembly of fluid coupling to crankshaft, check periphery runout, and test.	See Data Section Items 45 and 72. To ensure fluid coupling is fitted to correct crankshaft at final assembly, particularly in the case of A.E.C. engines, when oversize crankshaft bolts are used, both front and rear casings are to be stamped with mating crankshaft number.
	After test of fluid coupling re-torque periphery bolts.	See Data Section 48 A.

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>MECHANICAL INTERNAL COMPONENTS</u>		
Oil Pump and Drive	A.E.C.	<p>Strip, clean and examine.  Examine body for scoring and renew as necessary.  Examine thrust faces for scoring and lap as necessary.  Check driving spindle and bearings for wear, renew as necessary. See Data Section Item 49.  Check driven gear spindle and bearings for scoring and renew as necessary.  Check taper on shaft for fit, recondition or renew as necessary. See Data Section Item 50.  Check key for fit, if necessary fit oversize Woodroffe key.  Check gear teeth for bruising and dress or renew as necessary. See Data Section Item 51.  Examine end covers and check thrust faces for scoring, lap if not excessive.  Examine set screws and renew as necessary.  Assemble and ensure pump functions correctly.</p>
Leyland	<p>Strip, clean and examine.  Examine body for scoring and renew as necessary.  Examine thrust faces for scoring and lap as necessary.  Examine driving spindle and bearings for scoring, renew as necessary. See Data Section Item 49.  Examine driven gear spindle and bearings for scoring, renew as necessary.  Check gear teeth for bruising and dress or renew as necessary. See Data Section Item 51.  Check driving gear spindle for wear or scoring on journal and also on driving dog, renew as necessary. See Data Section Item 52.  Check thrust faces on end covers for scoring and lap if not excessive.  Examine studs and recondition as necessary.  Assemble and ensure pump functions correctly.</p>	



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GENERAL

SHEET 18

COMPONENT

WORK TO BE CARRIED OUT

REMARKS

MECHANICAL INTERNAL COMPONENTS (Continued)

Push Rods

A.E.C.

Examine and check alignment, specially examine ball and socket ends by ringing. Renew ends or push rods as necessary.

Ensure that new ends are sweated in with whole rod under compression.

Leyland

Examine and check alignment, specially examine ball and socket ends. Renew push rods as necessary.

Timing Plate (Leyland)

Examine and check for alignment, straighten or renew as necessary.

Injector Clamps (Leyland)

Examine for bow, straighten or renew as necessary.

See Data Section Item 44.

Oil Strainer and Pipes

A.E.C.

Remove from sump plate, examine mesh, renew as necessary. Examine securing brackets and repair or renew as necessary.

Care to be taken when fitting pipe flanges to oil pump, any clearance between mating faces is to be taken up by the selective use of shims.

Leyland

Examine mesh, renew as necessary. Remove pick-up pipe and clean internally.

Internal Oil Pipes (A.E.C.)

Clean and examine for fractures, check security of retaining clips. Repair or renew as necessary.

See Data Section Item 63. Care to be taken in shimming up main delivery and suction pipes to pump.

Oil Relief Valve

Strip, clean, examine, check spring length, barrel and plunger. Renew items as necessary. Discard the Spring Stop when there is visible evidence of wear on the outer face of the upper cup and grooving on the stem diameter (See sketch on Page 18B). When renewing spring stops, plungers and valve seats ensure the components to drawing BR No. G-Ah-7h12 are used.

See Data Section Item 53. Pressure setting to limits laid down in Engine Test Section.

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COMPONENTWORK TO BE CARRIED OUTREMARKS

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MECHANICAL INTERNAL COMPONENTS (Cont'd)

	The valve spring BR Cat No 15/56298 must be replaced when there are visible signs of wear on the outside diameter.	
	When relief valves are being overhauled the barrel body must be drilled as shown in Fig. 1 (page 18B)	
Front Oil Seal (A.E.C.)	Renew.	
Timing Wheels	Examine gear teeth and bushes visually, crack detect spindles magnetically. Renew as necessary.	See Data Section Item 69.

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GENERAL

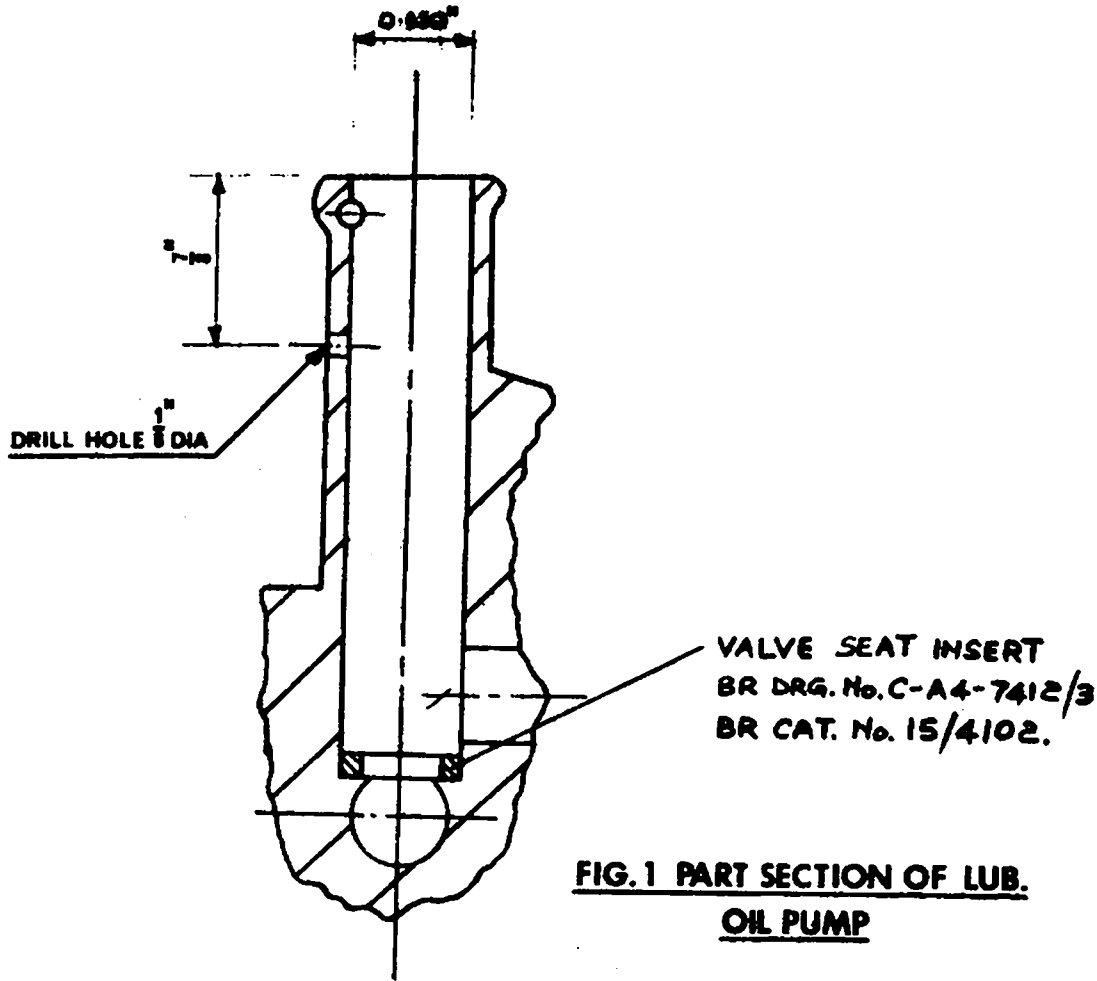


FIG. 1 PART SECTION OF LUB.  
OIL PUMP

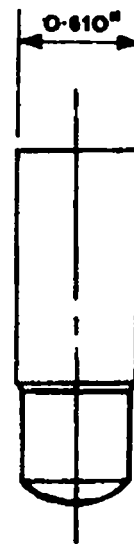


FIG. 2 PLUNGER  
BR DRG. No. C-A4-7412/1 BR CAT. No. 15/4101  
REPLACE EXISTING PLUNGER TO A.C.  
PT. No. A78213. BR CAT. No. 15/56255  
WHEN STOCKS ARE EXHAUSTED

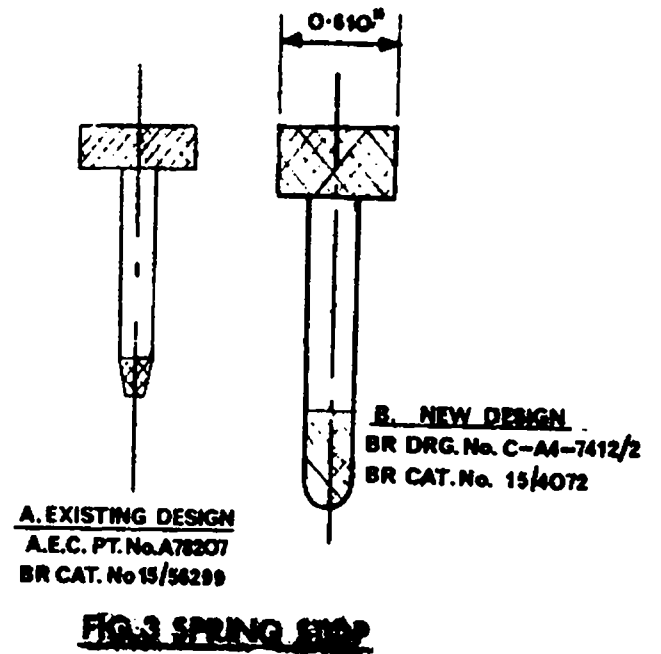


FIG. 3 SPRING STOP

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>MECHANICAL EXTERNAL COMPONENTS</u>		
Exhaust Manifolds	Clean, examine, repair or renew as necessary ensuring correct alignment of flanges with main pipe.	Front and rear manifold pipes to be machined together. Stored and fitted in sets.
Water Rail (Leyland)	Leyland Only - Renew centre tube rings. Examine, repair or renew as necessary.	Special attention to be given to erosion around neck of outlet connection.
Timing Cover (Leyland)	Examine for fractures and repair or renew as necessary. Renew oil seal.	
Front Mounting Housing	Renew Metalastik bush.	
Back Mounting Plate	Examine, check for alignment and straighten or renew as necessary. Renew all Metalastik bushes. Examine studs and renew as necessary.	
Pipework (Lubricating Oil)	Copper pipes to be cleaned, examined, annealed, descaled or renewed as necessary. Steel pipes to be cleaned, examined, descaled or renewed as necessary. All nuts and cones to be examined and renewed as necessary. Test pipes after re-setting or re-brazing.	See Data Section Item 55. Fit protection caps after testing.
Oil Filler Assembly	Main casting, studs, springs, pins, dipstick and cap to be cleaned and examined. Repair or renew as necessary. Renew joints.	
Rocker Covers and Set Screws	Clean and examine for fractures, repair or renew as necessary. Examine screws for alignment and condition of thread, renew as necessary.	

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GENERAL

COMPONENTS	WORK TO BE CARRIED OUT	REMARKS
<u>MECHANICAL EXTERNAL COMPONENTS</u> (Continued)		
Breather	Examine and repair or renew as necessary.	
Damper (Leyland)	Check condition of damper. When refitting ensure 90% bedding of damper hub to crankshaft.	See Data Section Item 56 and Appendix E.
Oil Filters		
A.E.C.	Strip, clean and examine. Renew filter element. Dismantle and clean relief valve. Repair or renew items as necessary.	
Leyland	Strip and clean, ensuring halves of rotor are kept in matched set. Renew paper sleeve. Examine rotor spindle for condition and renew as necessary. Examine top and bottom bearings for internal condition and for signs of rotation in housing; new or oversize bearings to be fitted as necessary	Ensure 'O' ring BR Cat No 15/1401 is used as seal of the cover of GF2 centrifugal filter (Leyland 680 engine)
Fuel Pump Drive		
A.E.C.	Examine casting and gear wheel, size bushes. Check backlash of gears on assembly. Renew rubber couplings.	See Data Section Item 57.
Leyland	Examine casting, gear wheel and shaft bearings. Renew as necessary.	
Right Angle Drive Brackets	Examine and flaw detect, repair or renew as necessary.	Check back faces for alignment and flatness particularly after repairs by welding and machine as necessary ensuring correct bracket face angles are maintained. Ensure side faces and slots are flat and parallel.

JULY, 1979

GENERAL

SHEET 21

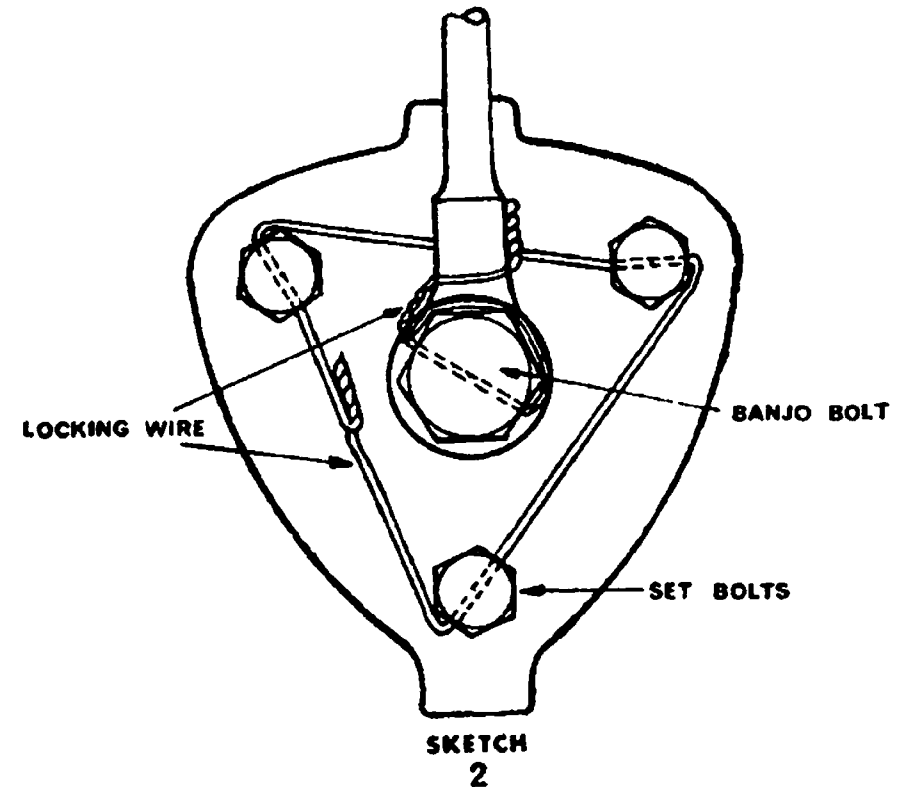
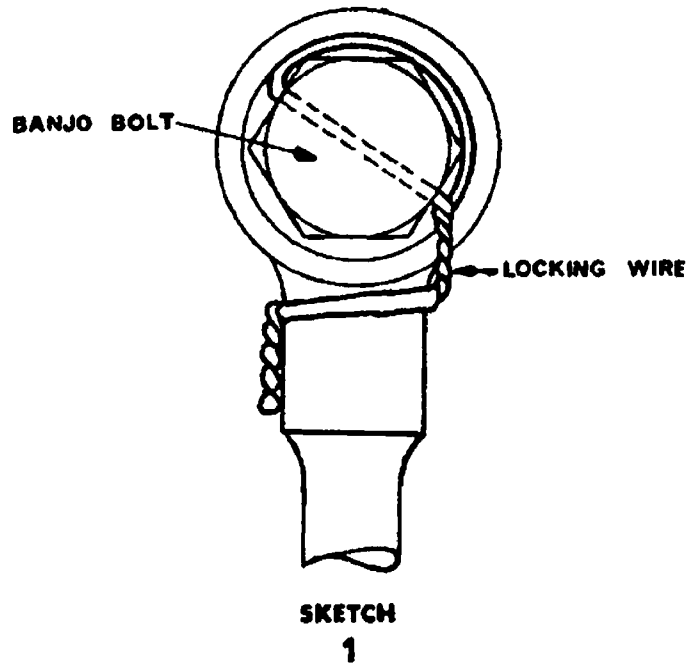
COMPONENTS	WORK TO BE CARRIED OUT	REMARKS
<u>ANCILLIARY COMPONENTS</u>		
Fuel Pipes and Connections	Examine for chafing, cone wear and thread condition.	All pipes to be fitted with protection caps pending utilisation.
High Pressure Pipes Fuel Supply and Return Pipes	Renew as necessary.	
Fuel Filters	Strip and clean, renew paper filter elements and seals. Renew inlet and outlet unions.	
Relief Valves	Strip, clean and repair or renew as necessary.	Valves to be given functional test.
V-Belts	Renew.	
Hoses	Renew, using Nitrile hoses to B,R Spec, 488 A fit in accordance with Eng. Instruction MD.6.	
Water Pump	Strip, clean and examine, repair or renew items as necessary. Renew carbon and oil seals.	
Right Angle Drive Unit	Strip, clean and examine, repair or renew as necessary. Renew oil seals. On assembly, check bevel gears for backlash, and shim as necessary. Check that 1/2 in. diam. pulley (RR Cat No. 15/37606) is fitted.	See Data Section Item 58.
Right Angle Drive Bracket.	When the distance between the feet is less than 4.32 in. or the distance between the loading slot is greater than 4.380 in. proceed in accordance with Appendix 'B'.	
Thermostats Wax Element Type (where fitted)	Remove and re-fit new or re-conditioned element. Displaced elements to be checked for condition and tested for correct operating temperature.	
Throttle Return Spring A.E.C.	Renew.	

JULY 1979

GENERAL

SHEET 22

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>ANCILLARY COMPONENTS (Continued)</u>		
Air Compressor	Strip, clean and examine :-	
Cylinder Block	Rebore or reliner as necessary. Ensure that cylinder bores are free from glaze.	See Data Section Item 59.
Bearings	Renew as necessary.	
Valves	Discs, inlet and delivery springs to be removed.	
Valve Seats	Examine for condition, recondition as necessary.	See Data Section Item 60.
Connecting Rods	Big Ends to be reconditioned as necessary.	See Data Section Item 61.
Pistons and Rings	Examine pistons for condition and renew as necessary. Renew rings.	Rings are checked for gap in the cylinder to which they are to be fitted - See Data Section Item 62. See Data Section Item 63.
Crankshaft	Check for alignment, recondition main and crank pin journals, ensure oilways are clear; renew crank as necessary.	
Lubricating Strap	Examine for condition, renew as necessary. Renew oil seal. Ensure oilway is clear.	When fitting locking wire on oil feed pipe banjo bolts and idler gear spindle/cover setbolts see sketch on next page. (Sheet 22A)



This sketch shows the general means of applying the locking wire; the actual form will depend on final position of tightening of bolts. The wire must be fitted to prevent bolts turning anti-clockwise.



COMPONENT	WORK TO BE CARRIED OUT	REMARKS
<u>ELECTRICAL EQUIPMENT</u>		
Wiring Harness	Clean, examine cables and conduit and renew as necessary.  Test after refitting to engine.	Ensure correct assembly of Niphan socket. See Data Section Item 64.
Oil Pressure Switches	Renew and adjust to appropriate pressure.	See Data Section Item 65.
Tacho Generator	Strip, clean and examine, megger test generator. Renew bearings and shaft as necessary. Renew rubber oil seals. Remagnetise roter as necessary. Test and calibrate on reassembly.	See Data Section Item 66.
Stop Solenoid and Linkage	Strip, clean and examine, renew items as necessary. Test on reassembly. When refitted to engine adjust as follows:-  1) Ensure the solenoid mounting bracket is securely anchored and the solenoid is firmly attached to it. 2) Ensure the engine is stopped and (where appropriate) the B.I.S. is in the "OFF" position. 3) Remove split pin and withdraw clevis pin from the fork. 4) Energise the solenoid. (Armature should move to "STOP" position). 5) Manually move the lever to the "STOP" position. 6) Slack off lock-nut and adjust fork until lower portion of <u>lever hole</u> shows 1mm in eye of fork., see Fig. 1. 7) Lower lever to bring holes in line. 8) Re-fit clevis and split pin and tighten lock-nut. 9) With engine running at full throttle, press the stop button and ensure engine stops. 10) Readjust where necessary.	

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
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ELECTRICAL EQUIPMENT (Cont'd)

Stop Solenoid and Linkage (Cont'd)

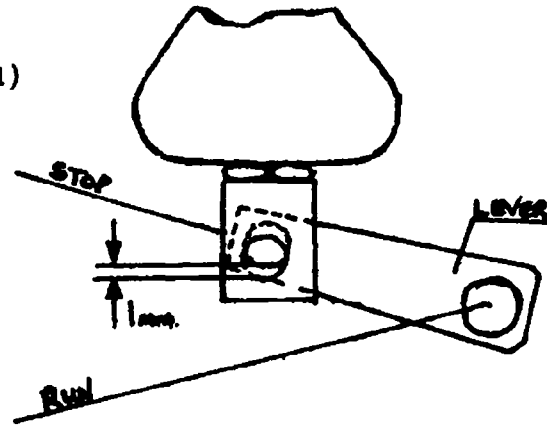
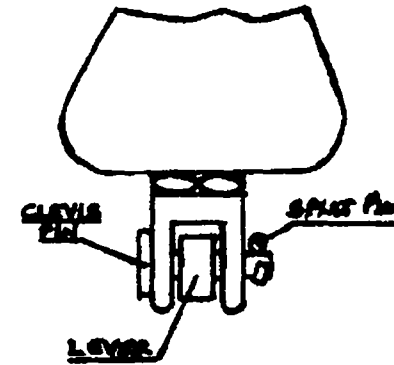


FIG 1



Starter Motor  
 C.A.V. Type  
 Simms Type

Overhaul to C.E.P.S. 14.  
 Overhaul to C.E.P.S. 13.

JULY 1979GENERAL

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
Freewheel (A.E.C. Type)	Strip, clean, and inspect components for wear, cracks pitting. Components not detailed below should be renewed on condition.	
CAM	Light markings on the faces may be removed by careful hand stoning. Indentations deeper than .002" may be removed by grinding parallel to the existing flats, removing the minimum necessary amount of material. The departure from nominal across size should be etched or painted on the surface of one of the cam slots; e.g. "-3" would indicate an across-flats size of 3.987 in. Components below the minimum dimension must be discarded.	See Data Section Item 74
OUTER RACE	<p>Indentations should be removed by regrinding, removing the minimum necessary amount of material. When the maximum permissible size is reached, the outer race should be reclaimed by hard chromium plating. The surface must be ground to remove indentations before despatch for plating, and ground again after plating to remove any surface imperfections. The departure from nominal size should be etched or painted on the outer surface; e.g. "+6" would indicate a diameter of 5.006".</p> <p>Should it be found that a deposit thickness of 0.020 in. does not produce a range of reclaimed outer races suitable to enable the complete stock of serviceable cams to be used a smaller deposit thickness is acceptable for appropriate batches of components. A greater thickness of deposit is not acceptable.</p> <p>Components with a bore size greater than 5.040in. after grinding must be discarded.</p>	See Data Section Item 75

/Continued...

JULY, 1972

GENERAL

COMPONENT	WORK TO BE CARRIED OUT	REMARKS
Freewheel (A.E.C. Type)	<p>F) Assemble the cam assembly into the free wheel outer race assembly with the rollers (K.13108).</p> <p>G) With the outer race of the input bearing pressed into the input seal housing (K.13116) and the seal in place, fit this (with two temporary screws) to the free wheel outer race.</p> <p>H) Remove the yoke and washer and measure the end float of the cam assembly.</p> <p>J) Correct the end float, if necessary, by fitting the correct shim between the input bearing inner race and the retaining washer (K.13110).</p> <p>K) Apply jointing compound to the output yoke face where this beds to the free wheel outer race housing and the input seal housing flange to ensure grease tightness on assembly.</p> <p>L) Fit remainder of set screws and dowels to the input and output flanges.</p> <p>M) Fit locking wire.</p> <p>N) Lubricate, with specified grease; see lubricant schedule.</p>	<p>See data section item 76</p> <p>See data section item 77</p>
Free Wheel Universal Joint 1600 Series	<p>Overhaul and assembly of these joints is to be in accordance with Repair Procedure No. D.M.U./Gen/4 where this is applicable.</p>	

JULY 1979GENERAL

## COMPONENT

## WORK TO BE CARRIED OUT

## REMARKS

Freewheel (A.E.C. Type)

Assembly of unit to obtain correct end float. Cams and outer races must be matched so that the difference between the bore size of the outer race and the across flats measurement of the cam lies in the range  $1.013 \pm 0.009$ in. Oversize rollers must not be used.

A) Assemble the outer race with the output yoke temporarily bolted up tight with two set screws ensuring that retaining plate (K.13101) is in position.

B) Press outer race of the output bearing fully home to bed on retaining plate.

C) To the cam (K.13103) assemble the retaining washer (K.13102), spring (K.13104), spring retainer (K.13109) and distance washer (K.13110).

D) At the output end of the cam fit two 0.031" shims (Z4/h6506) and the inner race rollers of the output bearing.

E) Fit a suitable shim (Z4/h6504, Z4/h6507) and the inner race and rollers of the input bearing to the input end of the cam.

F) Assemble the cam assembly into the free wheel outer race assembly with the rollers (K.13108).

G) With the outer race of the input bearing pressed into the input seal housing (K.13116) and the seal in place, fit this (with two temporary screws) to the free wheel outer race.

H) Remove the yoke and washer and measure the end float of the cam assembly.

J) Correct the end float, if necessary, by fitting the correct shim between the input bearing inner race and the retaining washer (K.13110).

K) Apply jointing compound to the output yoke face where this beds to the free wheel outer race housing and the input seal housing flange to ensure grease tightness on assembly.

See data section item 76

See data section item 77

/Continued...

JULY, 1979GENERAL

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COMPONENT	WORK TO BE CARRIED OUT	REMARKS
Freewheel (A.E.C. Type)	L) Fit remainder of set screws and dowels to the input and output flanges. M) Fit locking wire. N) Lubricate, with specified grease; see lubricant schedule.	
Free Wheel Universal Joint 1600 Series	Overhaul and assembly of these joints is to be in accordance with Repair Procedure No. D.M.U./Gen/4 where this is applicable.	

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JULY, 1972APPENDIX 'A'CLEANINGDESCALING AND DERUSTING IRON OR STEEL CYLINDER BLOCKS AND HEADS.

Details of the procedure for descaling and derusting iron or steel cylinder blocks and heads of D.M.U. Engines stripped in Works are as follows:-

A. General

- A.1. The waterways of cylinder blocks and heads are descaled separately after the engines have been cleaned and degreased externally, and then stripped down.
- A.2. If waterside surfaces show oily contamination the parts should be degreased by immersion in an alkaline cleaning tank.
- A.3. Any aluminium parts which may come into contact with the acid must be removed.
- A.4. The cleaning process should be carried out over a drained area treated to withstand strong acids.
- A.5. Staff handling acid must wear suitable protective clothing, i.e. rubber boots, apron and gloves, and a vizor or goggles.

B. Cylinder Blocks.

- B.1. Position the block (on the drained area) with the largest openings to the water-space uppermost. Blank off all other water holes with plugs or plates.
- B.2. Fill the block with water to ensure freedom from leaks, then drain.
- B.3. By means of a steam lance, flush out loose deposits and heat the block. Drain out condensed water.
- B.4. Immediately fill the water-space of the block with diluted hydrochloric acid, prepared in a separate acid-resistant container, e.g. a plastics bucket, by mixing equal volumes of inhibited hydrochloric acid, Cat. No. 9/7/660, and water.
- B.5. Leave the acid to react for about four hours.
- B.6. Drain the acid to waste by removing the lowest plug in the block.
- B.7. Rinse the interior of the block with running water.
- B.8. Fill the block with soda ash solution (8 oz/gall)., leave five minutes, and drain.
- B.9. Remove all plugs and plates from waterway openings and rinse the interior thoroughly with a steam/water lance.
- B.10. Examine the block. If deposits remain, repeat the acid cleaning process from B.1.
- B.11. Spray de-watering fluid ("Ardrox 36" or similar) on all machined surfaces to prevent rusting before completion of the overhaul.

/continued .....

JULY, 1972

APPENDIX 'A'

CLEANING. (con'd)

C. Cylinder Heads.

- C.1. Immerse the head, open side uppermost, in inhibited hydrochloric acid, Cat. 9/7/660, diluted with an equal volume of water, in a suitable acid-resistant container for about four hours. (The strength of the acid bath should be checked periodically and adjusted to 5N. When its action becomes too slow, the contents of the bath should be discarded and replaced by fresh diluted acid - consult the Area Scientist about these points of acid bath control).
- C.2. Remove the head from the acid bath, and drain acid from the head into the bath.
- C.3. Rinse the head with running water.
- C.4. Neutralise residual acid in the head by immersion in a dilute alkaline solution - 5% (8 oz/gall) soda ash solution is suitable.
- C.5. Thoroughly rinse the waterways in the head with a steam/water lance.
- C.6. Dip the head in de-watering fluid.

\* Acid-resistant container.

If a plastics tank is used, it should be a good quality, stress free moulding, made from high density polyethylene. A polythene domestic cold water tank is not recommended for this service. The Area Scientist can advise on sources of supply of suitable tanks.



JULY, 1972

GENERAL.

APPENDIX 'B' .

REPAIR PROCEDURE. RECLAMATION OF RIGHT ANGLE DRIVE BRACKETS. 150 HP D.M.U. ENGINES.

GENERAL.

The object of this repair procedure is to allow the right angle drive gearbox to be lined up correctly in its bracket after overhaul in Main Works. The repair is to be carried out when the distance between the feet is less than 4.32 in or the distance between the locating slot is greater than 4.380 in.

TOOLS AND PROCESS MATERIAL

Mild steel plate,  $6\frac{1}{2}$ " x  $4\frac{3}{8}$ " x  $3/16$ "

Studs :- Leyland Part No. 274863, B.R. Cat. No. 9/15/37663.

A.E.C. Part No. 124-1155, Cat. No. 9/15/37546.

OxyAcetylene Cutting Equipment.

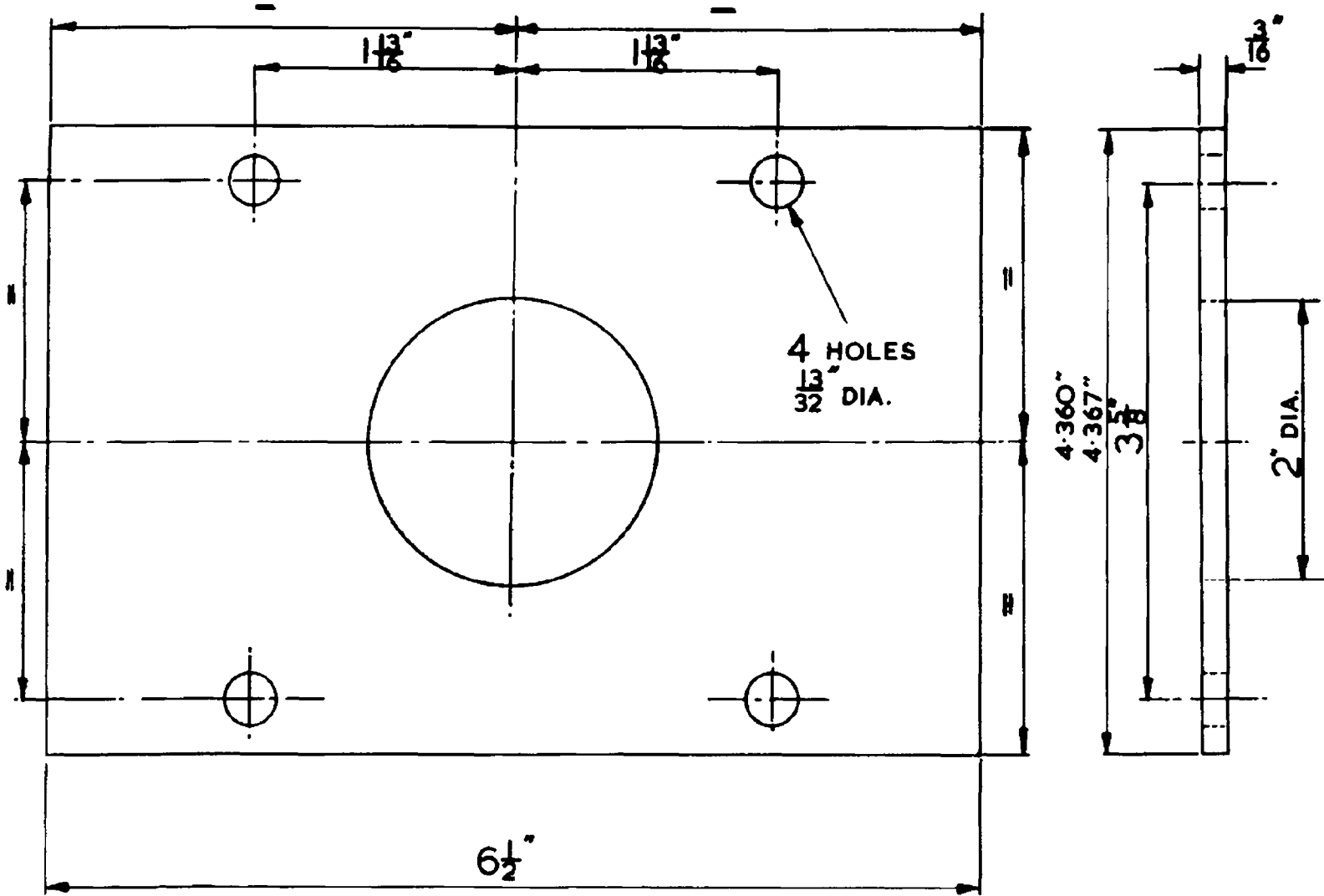
Shaper

Surface Grinder

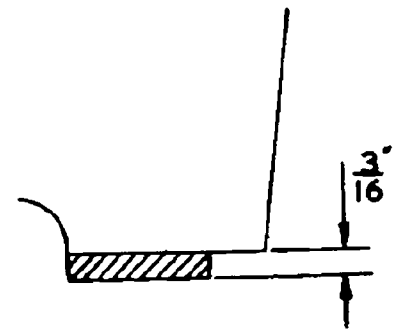
Electric Welding Equipment.

OPERATIONS

1. Machine feet of right angle drive gearbox as shown on drawing Item 2.
2. Manufacture mounting plate as per attached drawing.
3. Fit studs to the feet of right angle drive gearbox and locate plate on studs.
4. Build up locating slots on mounting bracket if necessary by welding and machine to give a final dimension between locating slots of 4.370" - 4.380".
5. Locate right angle drive gearbox on bracket in the normal manner.



MOUNTING PLATE (MILD STEEL)



RIGHT ANGLE DRIVE GEARBOX FOOT. CROSS HATCHED PORTION TO BE REMOVED.

Amendment No. 112

July 1972

A P P E N D I X 'C'

Repair Procedure DMU.001 - Reclamation of DMU 150 H.P. Engine  
Cylinder Blocks with Top Face Errors outside the 0.001" max. allowance.

GENERAL

This instruction details the process to be followed when these cylinder blocks have top face errors outside the 0.001" max. allowance.

TOOLS AND PROCESS MATERIAL

Surface grinding machine  
Cylinder block fixture

OPERATIONS

1. Measuring
2. Grinding
3. Marking
4. Final Flashing

1. Measuring

- 1.1 Mounting points of cylinder block, for fixture must be thoroughly clean and free from burrs. These include main bearing housings, sump joint face and machined location pads on side of sump mounting, also the block side and end.
- 1.2 Removal of burrs must not involve destroying the original machined surface and if the machined surface itself is distorted, this must be left so.
- 1.3 Bolt the fixture firmly to the machine table, the semi-circular topped pedestal datums to be within 0.0002", level and horizontally aligned. Pack fixture to adjust if necessary.
- 1.4 With block on fixture, set vertical alignment by checking bores 1 and 6 with a dial gauge indicator checking assembly, arranging bores 1 and 6 to be equally disposed about the vertical centre line.

(Contd.)

AMENDMENT NO. 113 JULY 1972.

GENERAL.

OPERATIONS (Contd.)

1. Measuring (Contd.)

1.5 Clamp block to fixture.

1.6 Slide and traverse machine table with dial gauge indicator fixed to machine head.

2. Grinding

2.1 Depending on the total error, flash grind the top face in 0.001" max. cuts to finish at a multiple of 0.005" total cut from first marking of old surface.

3. Marking

3.1 When within 0.001" of obvious finish machining depth, stamp the total depth of metal removed from new, i.e. if there is a previous stamping add the present machining amount to the previous figure and stamp the total figure. Characters not greater than  $\frac{1}{8}$ " high.

3.2 Delete the previous figure with a line through e.g. using numeral "1" stamp.

3.3 Avoid excessive hammering.

3.4 Position of stamping to be at edge of the block top surface and at the gap between the position of the two cylinder heads.

4. Final Flashing

4.1 Make a final flash cut over top surface so that stamping burrs are removed carefully at the same time.

4.2 Check surface finish and flatness (see Data Section 15).

Amendment No. 114

July 1972

A P P E N D I X 'D'

Repair Procedure DMU.002. Reclamation of DMU 150 H.P. Engine  
Cylinder Blocks with distorted or spoilt surface bores.

GENERAL

This instruction details the process to be followed when these cylinder blocks have distorted or spoilt surface bores.

TOOLS AND PROCESS MATERIALS

Cylinder block fixture  
Vertical cylinder boring machine  
Surface finish measuring equipment

OPERATIONS

1. Inspection
2. Measuring
3. Boring
4. Checking
5. Cleaning
6. Honing
7. Checking
8. Cleaning

1. Inspection

- 1.1 Mounting points of cylinder block, for fixture must be thoroughly clean and free from burrs. These include main bearing housings, sump joint face and machined location pads on side of sump mountings, also the block side and end.
- 1.2 Removal of burrs must not involve destroying the original machined surface and if the machined surface itself is distorted, this must be left so.
- 1.3 The block bores must be clean of debris and cleaning agents. There should not be any burrs there but if there are they must be carefully removed also.

(Contd.)

OPERATIONS (Contd.)GENERAL.1. Inspection (Contd.)

- 1.4 Bolt the fixture firmly to the machine table, the semi-circular topped pedestal datums to be within 0.0002", level and horizontally aligned. Pack fixture to adjust if necessary.
- 1.5 With block on fixture, set vertical alignment by checking bores 1 and 6 with a dial gauge indicator checking assembly, arranging bores 1 and 6 to be equally disposed about the vertical centre line.
- 1.6 Clamp block to fixture.

2. MEASURING

- 2.1 Using air gauge, check bore geometry.
- 2.2 Using comparator check surface finish.
- 2.3 If either are outside dimension, make good by boring to next oversize.

3. BORING

- 3.1 Using multi-tool cutter referenced to position midway between bores 1 and 6, bore all bores requiring rectification.
- 3.2 See Data Section Item 16.

4. CHECKING

- 4.1 Visually check that machined bores are without imperfection and to dimension (see Data Section 16).
- 4.2 Check that machined recesses are level, square and of acceptable surface finish (see Data Section 16).

5. CLEANING

- 5.1 Thoroughly clean off all boring debris from entire workpiece and fixture.

6. HONING

- 6.1 Remove from fixture.
- 6.2 Transfer to honing machine.
- 6.3 Hone rectified bores (see Data Section 16).

(Contd.)

7. CHECKING

GENERAL.

- 7.1 Again check relationship between recess and block bore.
- 7.2 Check all dimensions (see Data Section 16).

8. CLEANING

- 8.1 Thoroughly clean with paraffin all bores and recesses.
- 8.2 Recess depths may vary, therefore measure each one and select suitable liner for outside diameter and lip thickness, the latter to give the correct liner protrusion after fitting (see Data Section Item 18).

GENERAL  
APPENDIX 'E'  
INSPECTION OF CRANKSHAFT DAMPERS.

1. GENERAL.

Viscous crankshaft torsional vibration dampers consist of an outer casing positively attached to the engine crankshaft and an inner heavy mass running on a phosphor bronze bearing separated from the outer casing by a high viscosity silicone fluid. The typical arrangement is shown in Fig. 1.

The clearance between the outer casing and inner mass is 0.010" - 0.015" and hence even the slightest knock will tend to damage the damper.

As the crankshaft rotates uniformly the outer casing and inner mass rotate at the same speed, but when the crankshaft motion is erratic due to torsional vibration, then the outer casing follows this motion whilst the inner mass, by virtue of its inertia, attempts to rotate uniformly. Thus the torsional vibrations are damped by the shearing of the high viscosity fluid, and the energy is dissipated in the form of heat.

2. DAMPER REMOVAL.

Dampers should be removed from the engine using the correct extraction tool. Under no circumstances should dampers be forced off by levering against the casing. Care must be taken to ensure that the damper does not strike the engine or fall to the floor during or after removal.

3. TRANSPORTATION IN WORKSHOPS.

Dampers must not be thrown or rolled.

At all times dampers should be transported on trolleys firmly supported to avoid direct mechanical contact. As they are heavy (up to 30 lb. each) the carrying of dampers is not approved as there will be a tendency to drop the damper on arrival at its destination.

4. INSPECTION (USED DAMPERS)

Before the damper can be inspected it is necessary to remove the power take off (where fitted) and the hub, thus exposing the complete item. This also applies to twin dampers. The following inspection procedure should be adopted :-

- (i) Check date code (if the damper has been dated) and scrap if life expired. (See Section 8).
- (ii) Remove all paint from the damper (chemically, by blasting, or wire brushing) - Do not subject to heat above 80°C.
- (iii) Visually examine the fixing holes for elongation. No wear is permitted.
- (iv) Visually examine the damper for signs of external damage, especially on the edges where it may have been dropped or knocked. The damper must be rejected if deformities are visually detectable.
- (v) Check the back face of the damper for flatness with a straight edge and 0.005 ins feeler gauge. If it is possible to enter the feeler gauge between the damper casing and straight edge the damper must be scrapped.
- (vi) Check the periphery of the damper for flatness with a straight edge and 0.005 ins feeler gauge. If it is possible to enter the feeler gauge between the damper casing and straight edge the damper must be scrapped.



GENERAL

APPENDIX 'E' - CONTINUED

4. INSPECTION (USED DAMPERS) - Cont'd

(vii) Measure and note the damper thickness at 8 equally spaced intervals on a 9 ins (approx) PCD. If the variation exceeds 0.006 ins the damper must be scrapped.

5. RECLAMATION

There are no permitted reclamation procedures for crankshaft dampers. Those failing inspection should be scrapped immediately.

6. STORAGE

Dampers must be stored vertically in such a way that they cannot roll or come into contact with each other. This applies to new dampers which have not been in service as well as used ones.

A suitable storage unit is shown in Fig. 2 although existing arrangements may be maintained provided that they meet the above requirements.

7. REASSEMBLY

Before reassembly check that the damper has not developed a leak during storage (which would not have been detected earlier due to the generally dirty condition of the engines). When fitting the hub, first check that the mating surface between the damper and hub has a bed of at least 80% (which should be checked by the correct use of engineer's blue). Tighten down the bolts evenly to 50 lbs.ft.

When fitting a new damper the date of fitting should be etched on to the damper in the position shown in Fig.3, giving the month and year, e.g. 9/73.

8. SERVICE LIFE

The service life of dampers is approximately 8 years and dampers inspected at engine works overhaul which are within 12 months of being life expired should be scrapped.

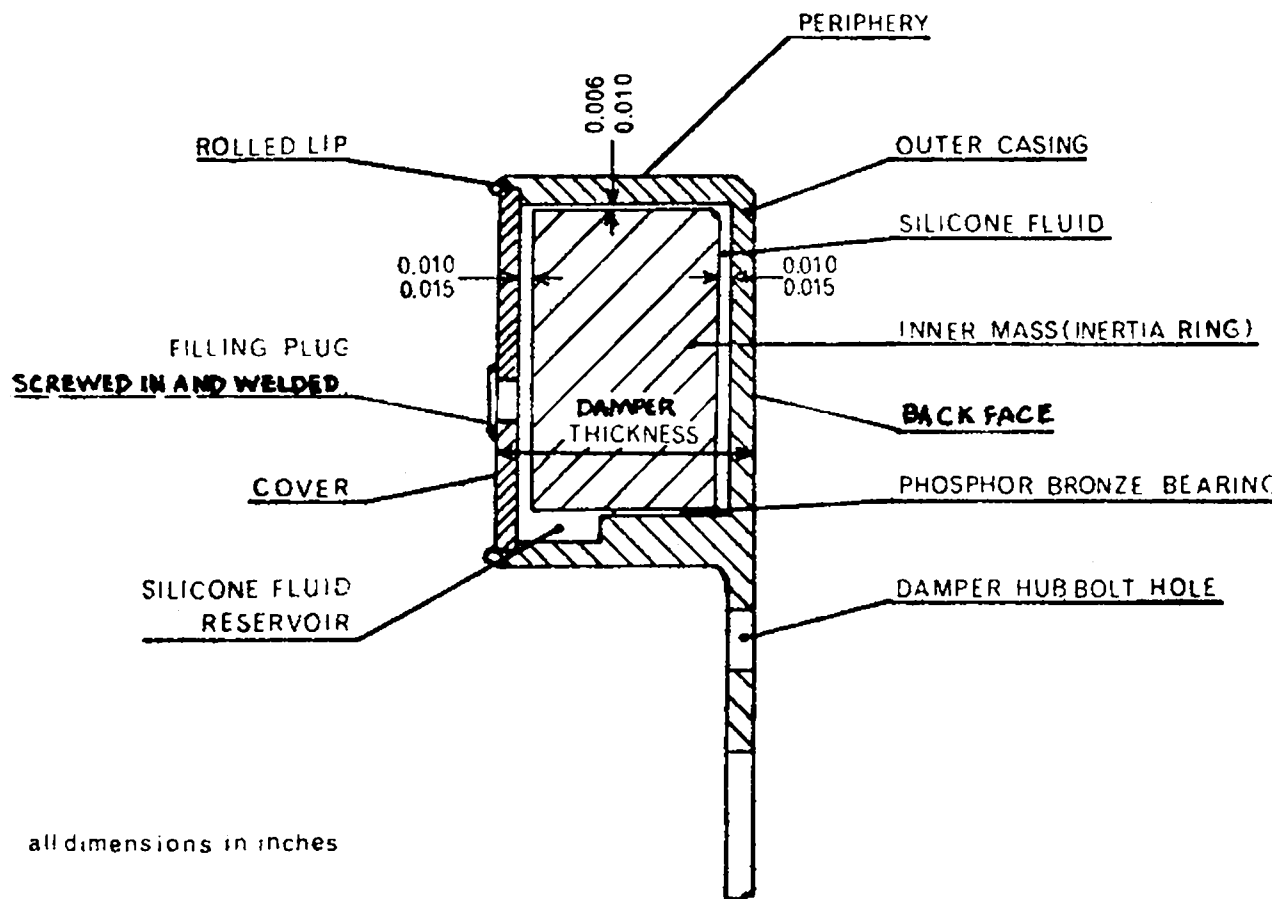
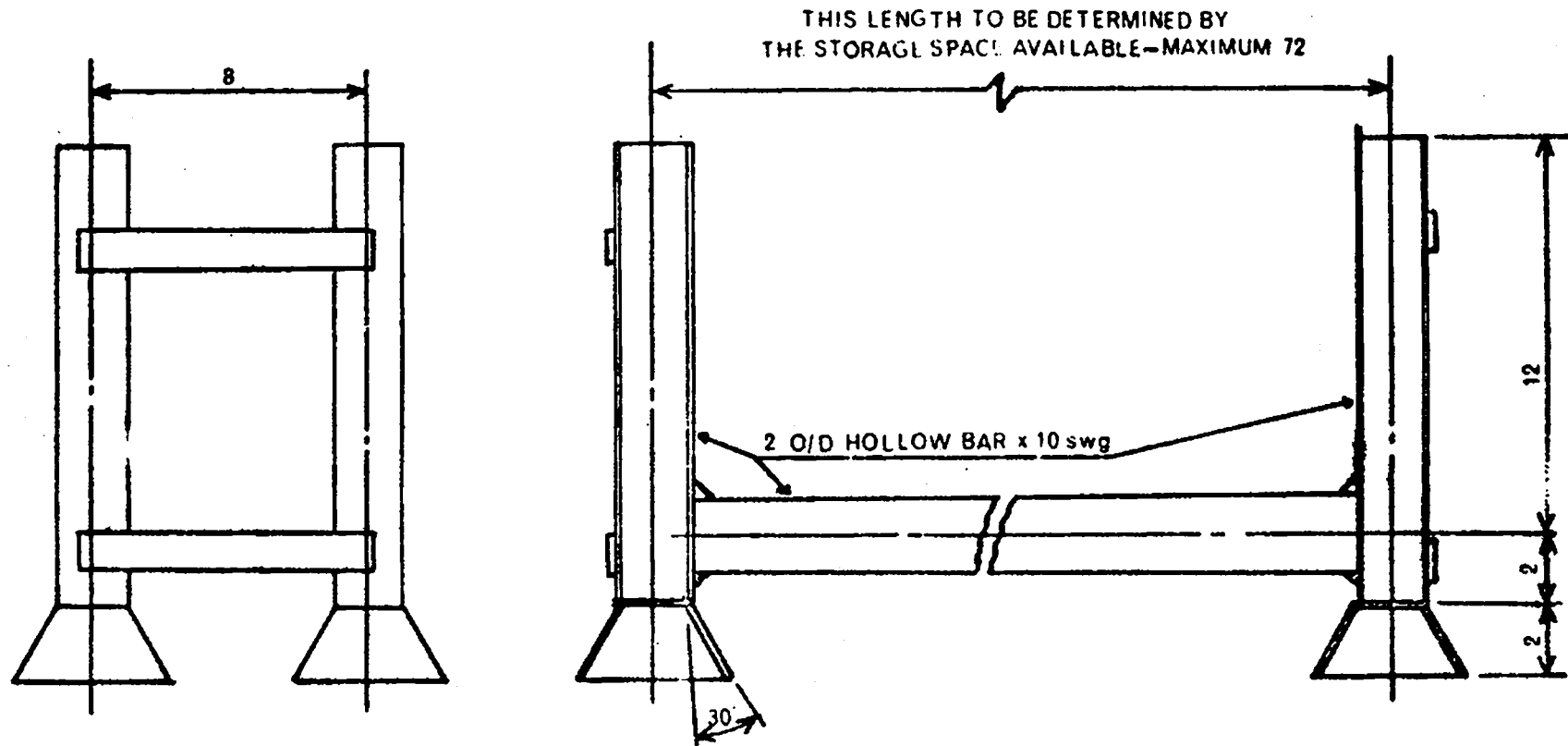


FIG 1 TYPICAL TORSIONAL VIBRATION  
VISCOUS CRANKSHAFT DAMPER.



all dimensions in inches

**FIG 2 DAMPER STORAGE UNIT**

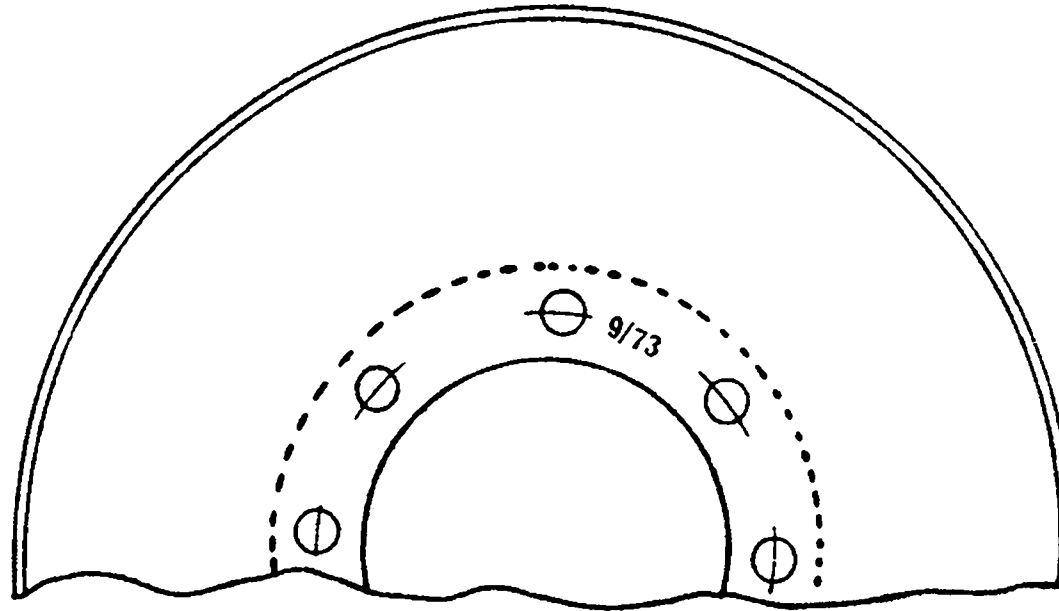


FIG. 3 POSITION OF DATE CODE

JULY, 1979

GENERAL

SHEET 44

FITTING OF CYLINDER HEAD VALVE SEATSPROCEDURE

(See sheet 45 for Leyland 680 engine with exhaust valve seat inserts only).

1. Remove existing inlet and exhaust valve seat inserts from cylinder head.
2. Place inserts in insulated box containing solid CO<sub>2</sub> and leave for 25-30 minutes. The inserts to be used are (BR Cat. Nos.):-

	AEC	LEYLAND
Inlet	15/40176	15/41782
Exhaust	15/40174	15/40537

3. Remove inserts from box and fit into machined bore in cylinder head with the aid of a suitably formed tool.
4. Ensure that inserts 'bottom' in bore.

This can be checked by placing feeler gauges between bottom face of insert and the corresponding face on cylinder head.

Maximum permissible gap at any point between these faces is 0.0015".

JULY, 1979

GENERAL

SHEET 45

FITTING OF CYLINDER HEAD VALVE SEATS (Cont'd.)PROCEDURE

Leyland 680 engine (fitted with exhaust valve seat inserts only)

1. Remove existing exhaust valve seat inserts from cylinder head.
2. Bore out inlet valve seats in cylinder head to diameter  $2.2240'' \pm 0.0010''$   
depth  $0.2750'' \pm 0.0030''$  (see Fig. 1).
3. Surface grind bottom face of inlet valve seat inserts (Leyland Pt. No. 608372 B.R. Cat. No. 15/69526) to achieve dimension "I" (see Fig. 2).
4. Produce  $0.3125''$  radius  $\pm 0.005''$  on periphery of bottom face of inlet valve seat inserts.
5. Place exhaust (BR Cat. No. 15/40537) and inlet valve seat inserts in insulated box containing solid CO<sub>2</sub> and leave for 25-30 minutes.
6. Remove inserts from box and fit into machined bore in cylinder head with the aid of a suitably formed tool.
7. Ensure that inserts "bottom" in bore.

This can be checked by placing feeler gauges between bottom face of insert and the corresponding face on cylinder head.

Maximum permissible gap at any point between these faces is  $0.0015''$ .

FITTING OF CYLINDER HEAD VALVE SEATS (Cont'd)

FIG.2 (NOT TO SCALE)

CROSS SECTIONAL VIEW OF THE INLET VALVE SEAT  
INSERT AS FITTED TO THE CYLINDER HEAD

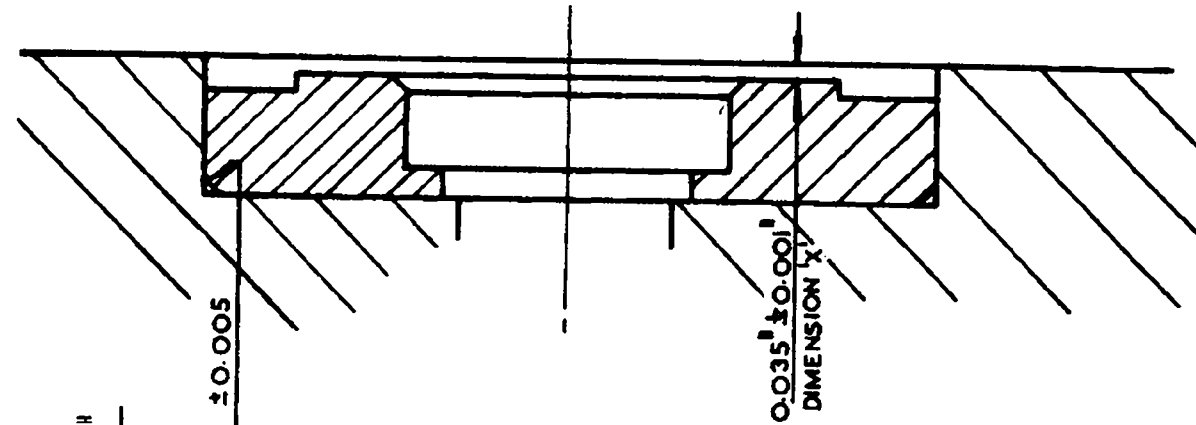
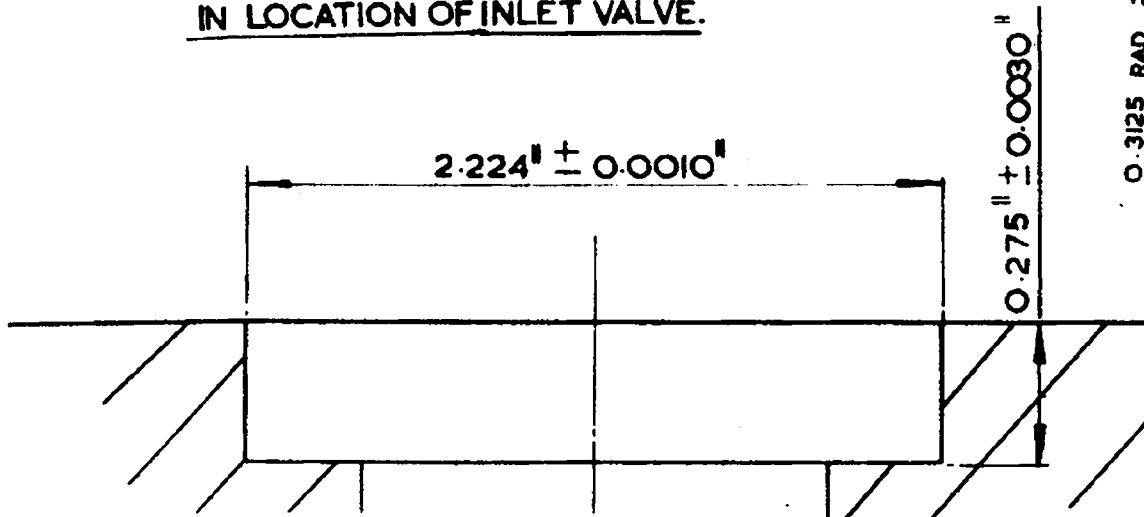


FIG.1 (NOT TO SCALE)

CROSS SECTIONAL VIEW OF CYLINDER HEAD  
IN LOCATION OF INLET VALVE.



JULY, 1979

SHEET 47

HARTRIDGE 1100 FUEL PUMP TEST STAND

When calibrating N and NN fuel injection pumps (AEC, Leyland and Leyland - Albion) the CR400 coupling will be used.

The following items are required per test stand to incorporate the CR400 coupling:-

<u>Qty</u>	<u>Description</u>	<u>Drg. No/Part No/Spec.</u>	<u>B.R. Cat. No.</u>
1	ADAPTOR PLATE	B.R. Drg. No. C-A4-21155	39/43215
2	Hexagon Socket-Head Cap Screw 3/8" UNC x 1"	BS2470, Table 2A, Flat End	35/56954
3	Hexagon Socket-Head Cap Screw 5/16" UNF x 1 1/4"	BS2470, Table 2A, Flat End	35/56956
1	SPIDER	CAV PT No. 86562	39/61842
1	RUBBER INSERT	CAV PT No. 86565	39/36721
1	COUPLING (20 mm Taper for 'N' Pump)	CAV PT No. 61333	39/8384
1	COUPLING (25 mm Taper for 'NN' Pump)	CAV PT No. 86563	39/8385

FITTING OF ADAPTOR PLATE AND SPIDER

Position the two, 3/8" UNC x 1" Cap Screws in the adaptor plate. Locate the coupling spider onto the adaptor plate male spigot, rotate to align holes and fit and tighten the three 5/16" UNF x 1 1/4" Cap Screws. Offer the adaptor plate spider assembly onto the Hartridge 1100 nose-cone spigot, engage and tighten securely the two 3/8" UNC Cap Screws and fit the rubber insert into the spider.

NOTE: It may be necessary to remove by filing a small amount of metal from the coupling spider to allow Allen key access for tightening the two, 3/8" UNC Cap Screws.

FUEL PUMP PREPARATION

Fit required coupling to fuel pump camshaft i.e. 20mm Taper coupling for the 'N' pump, 25 mm Taper Coupling for the 'NN' pump. Position fuel pump on Test Stand, align 'fingers' of mating coupling halves and push the fuel pump bodily towards the nose-cone to achieve engagement. Ensure that the fuel pump is aligned axially on the Test Stand and that a minimum end clearance of 5mm is present between the "finger" ends and the rubber insert. Clamp the fuel pump in position and test and calibrate in the normal manner.



JULY, 1979

SHEET 18

Renew the rubber insert if the end clearance becomes less than 5mm or if any rotational 'play' in the coupling is present.

Orders for the CAV components of the CR400 drive coupling should be placed on:

CAV Ltd.,  
PO Box 36,  
Warple Way,  
LONDON. W37SS

When testing NL6F80/160, NNL6H100/438K, NL6F90/161, NL6F90 and NNL6F90/167 type pumps the following requirements must be met:-

(A) Ensure that the test-rig complies with the following conditions:

- (i) Nozzle holders BKB50SD533b, Nozzles BDN12SD12
- (ii) Injection setting pressure : 175 atm
- (iii) High pressure pipes : 6mm x 2mm x 600mm long.
- (iv) Feed pressure : DFP3/2 : 2 to 5 lbf/in<sup>2</sup> (0.14 to 0.35 kg/cm<sup>2</sup>)  
DFP3/10 : 15 to 18 lbf/in<sup>2</sup> (1.05 to 1.26 kg/cm<sup>2</sup>)
- (v) Calibration fluid temperature : 40 to 45°C.

- (B) (i) Phase, calibrate, set governor, set and seal maximum fuel stop at prescribed fuelling in normal manner.
- (ii) Run fuel pump at 100r/min with control lever in maximum position.
  - (iii) Adjust excess fuel stop to give the following delivery:

FUEL PUMP TYPE	ENGINE TYPE	FUEL DELIVERY PER 100 SHOTS AT 100r/min (cc)
NL6F80/160	Leyland 680/1/13	) 15 cc ± 1 cc
NNL6H100/438K	Leyland 680/1595	
NL6F90/161 or /60	AEC A220	
NNL6F90/167	Leyland Albion	18 cc ± 1 cc

- (iv) Tighten locknut, replace cover and apply lead seal.

Inspection

A PRE SUMP FITTING, INTERNAL EXAMINATION.

1. Internal lubricating oil pipe connections and lock wiring.
2. All main and big end nuts, split pins etc.
3. Pistons and rods fitted correct way into cylinder.
4. Valve timing check (Leyland). (See Data Section Item 70).
5. Big end, end float.
6. Relationship of piston crown to crankcase top face. (See Data Section Item 73).

B ENGINE TIMING AND FLYWHEEL RUNOUT

1. Valve timing (A.E.C.) (See Data Section Item 70).
2. Fuel Pump timing. (See Data Section Item 71).
3. Flywheel runout. (See Data Section Item 72).

C PRE-TEST, ENGINE COMPLETE, CHECKS.

1. All main external fittings.
2. Nuts, bolts and split pins, external.
3. All hose clips.
4. Stop solenoid can be operated manually.
5. All lock tabs are locked.
6. Colour codes, if any, are painted on engine also data plate correctly stamped.

D AFTER TEST AND ENGINE SERVICEABLE, CHECKS.

1. Fluid coupling fitted, now under air pressure, gland and periphery joint checked for leaks.
2. Electrical equipment fitted, examined by Electrical Inspector.
3. Ensure all water, fuel, lub. oil and exhaust orifices are correctly blanked off.

JULY, 1972

DATA SECTION

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
<u>CYLINDER HEADS</u>							
1.	Pressure Test for Casting (Air)		30lb/in <sup>2</sup>		30lb/in <sup>2</sup>	Block submerged under water at temperature of 65-71°C (150-160°F)	1.
2.	Combustion Face - Distortion		0.003 in.		0.003 in.	Amounts to be flashed off as necessary up to 0.015 in. maximum. Amount of metal removed to be stamped on face, Surface finish -	2.
3.	Valves - Inlet - Exhaust - Head Projection beyond cylinder head face - Inlet - Exhaust Head Depression below cylinder head face - Inlet Exhaust					32 CLA 2 lives 1 life	3.
		0.035 in.	0.055 in.	-	-	Figures must not be exceeded due to danger of valve head coming into contact with piston crown. After each life, the letters 'O' to be marked on the valve stem above the collet groove.	
4.	Valve Seats - Width		0.125 in.		0.09375 in.		4.
5.	Valve Seat Inserts Inlet - Recess Diameter - Standard - 1st Oversize - 2nd Oversize Exhaust - Recess Diameter - Standard - 1st Oversize - 2nd Oversize					See also Engineering Instructions No MD 57. for A.E.C. engines and MD 55 and 56 for Leyland engines.	5.
		2.2605 in.		2.3290 in.	2.3300 in.		
		2.2705 in.		-	-		
		2.2805 in.		-	-		
		2.0275 in.		2.1990 in.	2.2000 in.		
		2.0375 in.		-	-		
		2.0475 in.		-	-		
6.	Guides - Bore Diameter - Inlet - Exhaust		0.3977 in. 0.3917 in.		0.442 in. 0.441 in.		6.

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>CYLINDER HEADS</u> (continued)						
7	Springs - Inner					Renew when spring will compress to:- <u>A.E.C.</u> 1.75in. with load of less than 50 lb. <u>Leyland</u> 1.25in. with load of less than 35 lb.	7
	- Outer					Renew when spring will compress to:- <u>A.E.C.</u> 1.8425in. with load of less than 83 lb. <u>Leyland</u> 1.50in. with load of less than 74 lb.	
8	Injector Hole - Fracture length		0.750in.		0.750in.	Acceptable if radiating from the injector holes, providing not of an open nature.	8
	<u>PISTON ASSEMBLIES</u>						
9	Piston-Ring Groove Width, All Comp. rings Top Comp. ring 2nd & 3rd Comp. rings S.O.C. rings		0.132 in.		0.132 in. 0.131 in.		9.
10	Piston - Ring Gap - Top Ring (Chrome) Top Ring (Plain-Cast Iron) Remaining Rings Piston - Gudgeon Pin Clearance	0.020in. 0.015in. 0.015in. -	0.027in. 0.022in. 0.022in. 0.0001in.	0.025in. 0.015in. 0.015in. -	0.032in. 0.022in. 0.022in. 0.0001in.	Light hand push fit at room temperature.	10
11	Connecting Rod - Large end to little end centres - Twist - Bend - Little End Bush Bore	11.415 in.   1.772in.	11.419 in. 0.015in. 0.005in. 1.7748in.	10.498 in.   	10.505 in. 0.015in. 0.005in. 1.6265in.	Measured on mandrel at 9 1/2 in. centres. Jig to Swindon. Drawing W.3571. <u>A.E.C.</u> New bushes to be bored and honed as necessary and checked for parallel with big end bearing. Interference fit between connecting rod and little end bush to be 0.002 in.	11.

AMENDMENT NO. 119 JULY 1972.

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>PISTON ASSEMBLIES</u> (Continued)						
12	Big End Bolts - Torque Load - Weight		80 lb. ft + 1 oz. -	-	-	A.E.C. Engine sets arrived at by selection.	12
13	Big End Bolts - Elongation	-	-	0.006"	0.008"		13
	<u>CYLINDER BLOCK</u>						
14	Pressure Test for Casting (Air)		30lb/sq. in		30lb/sq.in	Block submerged under water at temperature of 65-71°C (150-160°F).	14
15	Face Distortion Surface Finish, nominal		0.001" 63 micro ins. C.L.A.		0.001" 63 micro ins. C.L.A.		15
16	Block Bore - Diameter, bored - Bore honing diameter - Surface Finish - Recess Diameter - Recess Depth - Surface finish of recess floor - Recess floor/liner bore) Squareness )	5.348" 5.352" 32 micro ins. C.L.A. 5.754" 0.175"	5.349" 5.353" 32 micro ins. C.L.A.) 5.760" 0.176" 32 micro ins. CLA) 90° 30'	5.2360" 5.240" 32 micro ins. C.L.A. 5.476" 0.298"	5.2368" 5.2408" 32 micro ins. C.L.A.) 5.478" 0.299" 32 micro ins. CLA) 90° 30'		16
17	Cylinder Liners - Outside Diameter - Lip Outside diameter - Lip Thickness	5.3535" 5.738"	5.3545" 5.740" to be segregated	5.241" 5.460"	5.242" 5.465" for selective fitting	Liners must be to Drg. No. C-A2-5796 or 5797 to accord with Item 16 this Schedule. They are supplied in oversizes of +0.010"; +0.020" & +0.030" to suit oversize block bores. Select individual lip thicknesses to give protrusions stipulated in Item No. 18.	17

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
18	Cylinder liner - Bore - Diameter after fitting and honing. - Surface finish (nominal) - Protrusion - Variation around Periphery of any one liner - Variation between any three liners under one head	5.1186"	5.1196"	5.0017"	5.0025"		18
			N6		N6		
		0.002"	0.004"	0.002"	0.004"	This dimension to be obtained by selective fitting. Shims not allowed.	
			0.0005"		0.0005"		
			0.001"		0.001"	This dimension to be obtained by selective fitting. Shims not allowed.	
19	Cylinder Head Studs - Inserting torque	45 lbf.ft.	50 lbf.ft.	20 lbf.ft.	30 lbf.ft.	Degrease both threads and apply Loctite STUDLOC, Cat.No. 7/60420.	19
20	Cylinder Head holding down nuts - Torque Loading. Leyland 9/16 in. Leyland 7/16 in.	95 lbf.ft.	100 lbf.ft.			} Adequately lubricate threads nuts and washers with oil.	20
				135 lbf.ft. 75 lbf.ft.	140 lbf.ft. 80 lbf.ft.		
21	Camshaft Bearing. - Interference fit in block - Bush Inside Diameter	0.003 in. 2.440 in.	0.004 in. 2.442 in.	0.003 in. 2.400 in.	0.004 in. 2.403 in.		21
22	Main Bearing Housing Diameter Standard Oversize  Misalignment	4.5270 in. 4.5467 in.	4.5280 in. 4.5477 in.	3.6630 in. 3.6930 in.	3.6640 in. 3.6940 in.		22
23	<u>CAMSHAFT</u> Alignment at Centre Main Journal - Deviation		0.006 in.		0.006 in.	Camshaft to be supported on front and rear journals.	23

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
24	Cam Lobe	2.037 in.		0.359 in.		A.E.C. measurement taken from nose to base of cam. LEYLAND Dimension is the difference between the base circle diameter and the nose.	24
25	Bearing Journal Diameter.	2.431 in.	2.433 in.	2.396 in.	2.397 in.		25
26	Camshaft End Float.	0.002 in.	0.003 in.	0.004 in.	0.008 in.		26
27	Cam Follower - Hardness	590 Vickers		590 Vickers			27
28	<b>CRANKSHAFT.</b> Crankshaft Main bearings, Journals and Crankpins - Taper Ovality (Colour Code) Main Journal - Diameter:- A.E.C. - Standard ( - ) 2nd Standard (0.5mm) ( Yellow ) 3rd Standard (1.0mm) ( Green ) Leyland - Standard ( - ) S1 (0.010in) ( Yellow ) S2 (0.020in) ( Green ) S3 (0.030in) ( Blue ) S4 (0.040in) ( White ) S5 (0.050in) ( Black ) (Colour Code) Crankpin - Diameter:- A.E.C. - Standard ( - ) 2nd Standard (0.5mm) ( Yellow ) 3rd Standard (1.0mm) ( Green )	0.0005 in. 0.002 in.		0.0015 in. 0.0015 in.		If exceeded, regrind to next service standard. Colour Code:- Painted on coned centre at drive end of crankshaft.  * Leyland Crankshaft to be renitrided at services S2 and S4.  Colour Code:- Painted on parallel bore at drive end of crankshaft.	28
		3.7380 in.	3.7392 in.				
		3.7183 in.	3.7195 in.				
		3.6986 in.	3.6998 in.				
				3.4998 in.	3.5005 in.		
				3.4898 in.	3.4905 in.		
				3.4798 in.	3.4805in*		
				3.4698 in.	3.4705 in.		
				3.4598 in.	3.4605in*		
				3.4498 in.	3.4505 in.		
		2.9516 in.	2.9524 in.				
		2.9319 in.	2.9327 in.				
		2.9122 in.	2.9130 in.				

ITEM NO.	COMPONENT	A. E. C.		LEYLAND		REMARKS	ITEM NO.	
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM			
28 (Cont)	<u>CRANKSHAFT</u> (Continued)						28 (Cont)	
	Crankpin - Diameter:-	(Colour Code)				Colour Codes- Painted on parallel bore at drive end of crankshaft.		
	Leyland - Standard	( - )	-	-	2.9998 in	3.0005in		
	S1 (0.010in)	(Yellow)	-	-	2.9898in	2.9905in		*
	S2 (0.020in)	(Green)	-	-	2.9798in	2.9805in*		<u>Leyland</u> Crankshaft to be re-nitrided at services S2 and S4.
	S3 (0.030in)	( Blue )	-	-	2.9698in	2.9705in		
	S4 (0.040in)	(White)	-	-	2.9598in	2.9605in*		
	S5 (0.050in)	(Black)	-	-	2.9498in	2.9505in		
	Crankshaft - Alignment		Up to $\pm 0.003in$		Up to $\pm 0.003in$	Re-use.		
			Above $\pm 0.003in$		Above $\pm 0.003in$	Regrind in accordance with step sizes.		
						Measurements taken on centre main journal; crankshaft to be supported on front and rear journal.		
29	Crankshaft Coupling - Flange Face Runout			0.0015in		0.0015in	29	



ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.																				
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM																						
30	<u>CRANKSHAFT</u> (Continued)																										
	Flywheel Coupling Bolts - Torque Load - Sizes (A.E.C. only)		80 lb.ft		135 lb.ft	A.E.C. Driving fit of bolts into crankshaft flange must be maintained.	30																				
	<table border="1"> <thead> <tr> <th>Nominal Hole Size</th> <th>Standard Bolt</th> <th>Oversize Bolt</th> </tr> </thead> <tbody> <tr> <td>0.500in.</td> <td>0.5005-0.5010in</td> <td>0.501-0.5015in.</td> </tr> <tr> <td>0.505in.</td> <td>0.5055-0.5060in</td> <td>0.506-0.5065in.</td> </tr> <tr> <td>0.510in.</td> <td>0.5105-0.5110in</td> <td>0.511-0.5115in.</td> </tr> <tr> <td>0.515in.</td> <td>0.5155-0.5160in</td> <td>0.516-0.5165in.</td> </tr> <tr> <td>0.520in.</td> <td>0.5205-0.5210in</td> <td>0.521-0.5215in.</td> </tr> <tr> <td>0.525in.</td> <td>0.5255-0.5260in</td> <td>0.526-0.5265in.</td> </tr> </tbody> </table>	Nominal Hole Size	Standard Bolt	Oversize Bolt	0.500in.	0.5005-0.5010in	0.501-0.5015in.	0.505in.	0.5055-0.5060in	0.506-0.5065in.	0.510in.	0.5105-0.5110in	0.511-0.5115in.	0.515in.	0.5155-0.5160in	0.516-0.5165in.	0.520in.	0.5205-0.5210in	0.521-0.5215in.	0.525in.	0.5255-0.5260in	0.526-0.5265in.					
Nominal Hole Size	Standard Bolt	Oversize Bolt																									
0.500in.	0.5005-0.5010in	0.501-0.5015in.																									
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0.525in.	0.5255-0.5260in	0.526-0.5265in.																									
	Flywheel Bolt Holes (A.E.C. only) - Standard	0.4995in	0.5005in	-	-																						
	1st Oversize	0.5045in	0.5055in	-	-																						
	2nd Oversize	0.5095in	0.5105in	-	-																						
	3rd Oversize	0.5145in	0.5155in	-	-																						
31	<u>MAIN BEARINGS</u>																										
	Cap Nuts - Torque Load		160 lb.ft	215lb.ft	225 lb.ft	Leyland 680 engine with set bolts securing the main bearing caps - in future drilling bolt heads and using locking wire is unnecessary.	31																				

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>MAIN BEARINGS</u> (Continued)						
31 (Cont)	Main Bearing Sizes:-						
	A.E.C. Glacier - Plan	3.7409in	3.7430in	-	-		31 (Cont)
	- 2nd Standard	3.7213in	3.7233in	-	-		
	- 3rd Standard	3.7016in	3.7036in	-	-		
	A.E.C. New Pattern Centre Main - Plan	3.7449in	3.7470in	-	-		
	Leyland - Standard	-	-	3.5025in	3.5040in		
	S1	-	-	3.4925in	3.4940in		
	S2	-	-	3.4825in	3.4840in		
	S3	-	-	3.4725in	3.4740in		
	S4	-	-	3.4625in	3.4640in		
	S5	-	-	3.4525in	3.4540in		
	Diametral Clearance - Crankshaft and Main Bearings						
	Centre Main	0.004in	0.007in	-	-	Selective assembly to ensure a total main bearing clearance of 0.040in maximum surface finish to be 16 CLA.	
	All others	0.004in	0.007in	-	-		
	Crankshaft End Float	0.0031in	0.0083in	0.004 in	0.010 in.		
	<u>ROCKER GEAR</u>						
32	Rocker Arm Pad					Pad to be ground until all wear marks are removed. Ensure correct profile. Surface finish to be 32 CLA.	32
33	Rocker Arm Bush - Bore		0.7504in		0.875in	New bush to be honed to suit rocker shaft to give clearance of 0.0005in - 0.001 in.	33
34	Rocker Shaft - Alignment		0.010 in		0.010 in	Measured at centre of shaft	34

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>FUEL INJECTION PUMP</u>						
35	Tappet Assembly - Plunger Head Clearance		1.0mm		1.0mm	Available shim sizes :-0.3mm, 0.4mm, 0.5mm, 0.6mm, 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.1mm, 1.2mm, 1.3mm, 1.4mm.	35
	- Phase Deviation		$\pm \frac{1}{2}^{\circ}$		$\pm \frac{1}{2}^{\circ}$		
36	Camshaft					Available shim sizes:-0.2mm, 0.25mm, 0.3mm, 0.35mm, 0.4mm.	36
	- End Float - Ball/Parallel Roller	0.10mm	0.20mm	0.10mm	0.20mm		
	- Taper Roller	0.05mm	0.10mm	0.05mm	0.10mm		
	- Misalignment - Governor End		0.005 in.		0.005 in.	Shaft to be checked at both ends	
	- Coupling End		0.003 in.		0.003 in.		
37	Control Rod and Bushes - Lift		0.001 in.		0.001 in.		37
	- Locating Plate Clearance		0.002 in.		0.002 in.		
38	Delivery Valve Holders - Torque Load		40 lb.ft.		40 lb.ft.		

ITEM  
NO.

COMPONENT

ITEM  
NO.FUEL INJECTION PUMP (Continued) - Calibration:-A.E.C.LEYLAND

39

7mm Delivery Valve - Part No. 7097/216A

5mm Delivery Valve - Part No. 7097/182

39

Camshaft Speed in R.P.M.	Plunger Diameter	Delivery at Given Control Rod Openings						Camshaft Speed in R.P.M.	Plunger Diameter	Delivery at Given Control Rod Openings					
		6mm		9mm		12mm				6mm		9mm		12mm	
		Min.	Max.	Min.	Max.	Min.	Max.			Min.	Max.	Min.	Max.	Min.	Max.
200	9mm	0.8	1.5	-	-	-	-	200	8mm	0.8	1.5	-	-	-	-
600	9mm	-	-	7.8	8.7	-	-	600	8mm	-	-	6.2	7.8	-	-
900	9mm	-	-	-	-	13.3	14.4	900	8mm	-	-	-	-	10.6	11.3

Note: Delivery Quantities are measured to  
cubic centimetres per 100 strokes.

DATA SECTION

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>GOVERNOR</u>						
40	Cut In - Commence Complete  Cut Out- Commence Complete	170 r.p.m 230 r.p.m		170r.p.m 235r.p.m		Adjust by fitting spring plates as required.	40
			930r.p.m 995r.p.m		930r.p.m. 1000r.p.m.		
41	Yoke - Clearance	0.0015in	0.005in.	0.0015in	0.005in	Available shim sizes:- 1.9mm, 1.95mm, 2.05mm.	41
	<u>FUEL FEED PUMP</u>						
42	Test Data - Delivery time for 560 c.c. at 200r.p.m. against 4 to 5 lb/in. <sup>2</sup>	30 Secs.	45 Secs.	30 Secs.	45 Secs.		42
	<u>INJECTORS</u>						
43	Needle Lift - A.E.C. (C.A.V.)	0.4mm	0.7mm	-	-		43
	- Leyland (C.A.V. Type)	-	-	0.2 mm 0.3 mm	0.4 mm 0.5 mm	Part No. BDLL 14056205 Part No. BDLL 14056205 - A.	
44	Test Data:- Breaking Pressure - A.E.C. (C.A.V.Type) - Leyland (Old Type) - Leyland (New Type) - Leyland (C.A.V. Type)	175 atmos. - - -		145 atmos 145 atmos 165 atmos	150 atmos. 150 atmos.		44

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>INJECTORS (Continued)</u>						
44 (Cont)	Test Data:- Back Leak - A.E.C. (C.A.V. Type)	6 secs.	15 secs.	-	-	150 to 100 atmospheres.	44 (Cont)
	- Leyland (C.A.V. Type)	-	-	6 secs.	15 secs.	150 to 100 atmospheres.	
	Injector clamps - Torque Load		11 lb.ft	30 lb.ft	35 lb.ft.		
	<u>FLUID COUPLING</u>						
45	Front Casing (with Starter Ring) Periphery Runout (Total gauge reading)		0.008in.		0.008in.	Check to be carried out prior to fitting of engine. If maximum runout is exceeded, inner recessed crankshaft flange face to be machined as necessary.	45
46	Rear Casing (with Runner Casing and Shaft) Runner Shaft - Runout (Total gauge reading)		0.008in.		0.008in.	Checked on pulley face, adjacent to periphery. If maximum runout is exceeded, check shaft and pulley separately and scrap defective component/s.	46
47	Bearings - End Float		0.015in.		0.010in.		47
48	Gland - Free Height	9/16in		11/16in.			48

ITEM NO.		A.S.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
<u>MECHANICAL INTERNAL COMPONENTS</u>							
Oil Pump and Drive							
49	Driving Spindle - Diameter	0.747"	0.7482"	0.6842"	0.6855"		49
	Driving Spindle Bearing - Bore	0.750"	0.752"	0.6872"	0.6892"		
50	Driving Spindle - Taper Bearing Area	90%		-			50
51	Gear Teeth - Backlash						51
	Drive Gear - Idler Gear	0.003"	0.005"	-	-		
	Idler Gear - Pump Drive Gear	0.007"	0.009"	-	-		
	Internal Pump Gears	-	-	0.004"	0.008"		
52	Driving Gear Spindle - Dog Width	-	-	0.2535"	0.2595"		52
53	Oil Relief Valve - Spring Length	2.625"	2.750"	2.000"	2.125"		53
	- Valve Barrel Diameter	-	0.630"	-	-		
	- Guide Face of plunger diameter	0.610"	-	-	-		

ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>MECHANICAL EXTERNAL COMPONENTS</u>						
55	Pipework (Lub Oil) - Test Pressure		150 lb/in <sup>2</sup>		150 lb/in <sup>2</sup>		55
56	Damper Retaining Nut - Torque Load			35 lb ft	40 lb ft		56
57	Fuel Pump Drive - Housing - Bush Wear		0.002 in	-	-	A.E.C. - New bushes to be honed to give clearance of 0.0015 in between shaft and bush.	57
	- Backlash - Camshaft - Fuel Injection Pump Bevel Gears	0.002 in	0.003 in	-	-	A.E.C. Available shim sizes 0.002 in, 0.003 in, 0.005 in, 0.010 in	
	- Fuel Injection Pump - Tacho Generator Bevel Gears	0.002 in	0.003 in	-	-		
	<u>ANCILLARY COMPONENTS</u>						
58	Right Angle Drive - Bevel Gear Backlash	0.004 in	0.006 in	0.004 in	0.008 in	Available shim sizes :- A.E.C. 0.003 in, 0.005 in, 0.010 in, Leyland 0.0025 in, 0.005 in, 0.010 in	58
59	Air Compressor Cylinder Block - Liner - Ovality - Taper		0.002 in 0.003 in		0.002 in 0.003 in		59



ITEM NO.	COMPONENT	A. E. C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>ANCILLARY COMPONENTS (Cont'd.)</u>						
59 (Cont)	Air Compressor (Cont'd.) Cylinder Block - Bore Wear		0.005"		0.005"	Fit new standard rings.	59 (Cont)
		0.005"	0.010"	0.005"	0.010"	Bore out to +0.010" and fit O/S piston and rings.	
		0.010"	0.015"	0.010"	0.015"	Fit new +0.010" O/S rings.	
		0.015"	0.020"	0.015"	0.020"	Bore out to +0.020" and fit O/S pistons and rings. Cast iron block only.	
		0.020"	0.025"	0.020"	0.025"	Fit new +0.020" O/S rings. Cast iron block only.	
			Over 0.025"		Over 0.025"	Reliner	
	Cylinder bore finish	25 micro-inch CLA	45 micro-inch CLA	25 micro-inch CLA	45 micro-inch CLA		
60	Valve Seat Insert	1.502"	1.503"	1.502"	1.503"	Recess 1.500" diameter x 0.500" deep. Material EN.58.	60
61	Connecting Rods - Length	4.123"	4.127"	4.123"	4.127"	Measurement between Centres.	61
	- Gudgeon Pin Bush Clearance		0.0015"		0.0015"		
62	Piston Rings - Gap	0.002"	0.006"	0.002"	0.006"	New rings	
		0.008"	0.012"	0.008"	0.012"	2nd hand rings	
	- Groove	0.0005"	0.0025"	0.0005"	0.0025"	Clearance between piston groove and piston ring.	
63	Crankshaft - Misalignment		0.002"		0.002"		63
	- Crankpin Diameter	1.178"	1.179"	1.178"	1.179"		



ITEM NO.	COMPONENT	A.E.C.		LEYLAND		REMARKS	ITEM NO.
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM		
	<u>ASSEMBLY CLEARANCES AND MEASUREMENTS</u>						
68	Internal Oil Pipes - Main Delivery and Suction					A.E.C. Available shim sizes:- Main Delivery - 0.005 in, 0.010in, 0.032in. Suction - 0.003in, 0.005in, 0.010in, 0.015in.	68
69	Timing Gears - Idler Gear End Float - Backlash	0.010in 0.002in	0.015in 0.003in	0.004in -	0.0095in -		69
70	Valve Timing - Marks  - Tappet Clearances	1.8125in  0.010in.	1.9375in.  0.012in	  -	  0.020in.	A.E.C. Checked on periphery of flywheel and valve stem. Valve stem depressed 0.005 in. Leyland. Fixed gear and timing plate checked for alignment of timing marks.  Inlet and exhaust	
71	Fuel Pump Timing - Marks		5.250in	-		A.E.C. Visually checked on flywheel and fuel pump. Leyland. Pointers checked for alignment marks on flywheel and fuel pump.	71
72	Flywheel Periphery Runout		0.008in.		0.008in.		72
73	Piston/Cylinder Block (Top Face) Assembly Limits	-0.006in.	+0.000in	-0.006in	+0.006in.		73

AMENDMENT NO. 127

D. M. U. ENGINE - 150 H.P.

JULY, 1972

DATA SECTION.

ITEM NO.	COMPONENT	SIZES	REMARKS	ITEM NO.
74	CAM (A.E.C. Pt. No. K13103) Dimension across flats (nominal (minimum Taper and variation between flats Fit of Splines (Circumferential with Yoke (K2/0426) (Lift	3.990 in. 3.953 in. .001 in. max. .006 in. max. .004 in. max.		74
75	OUTER RACE (A.E.C. Pt. No. K13112) Finished inside diameter - nominal Maximum Minimum ground diameter before plating Reclamation-deposit (nominal) Minimum Reclaimed Diameter Taper and Quality	5.000 in. 5.012 in. 5.040 in. 0.020 in. 4.975 in. .001 in. max.	Hard Chromium Plate to BS. 4641, with low temperature stress-reliev- ing and hydrogen de-embrittlement.	75
76	FITTING OF CAM AND OUTER RACE Difference between outer race inside diameter and across-flats measurement of cam:-	1.013 $\pm$ .009 in.	Selective fitting essential.	76
77	END FLOAT OF ASSEMBLY Minimum Maximum	.010 in. .020 in.		77

AMENDMENT NO. 128  
JULY, 1972

D.M.U. ENGINE 150 H.P.

DATA SECTION.

"Schedule of Lubricants"

COMPONENT	LUBRICANT	B.R. CAT. NO.
Engine sump ) Fuel pump sump ) Fuel pump governor ) Engine Air Cleaner )	Shell Talona 945 or Esso Estor HD 30	27/20550 27/18600
Fluid Coupling	Shell SFR hydraulic fluid	27/11515
Throttle Motor and Linkage.	B.R. Spec. 673 Lithium Base Grease.	27/1350
Freewheel & Freewheel Shaft ) Universal Joints ) Cardan Shaft Joints & Splines ) Fan Drive Joints & Splines )	Molybdenum Disulphide Grease	27/4150
Right Angle Fan Drive Gearbox	Shell Talona 972 or Esso Estor HD40.	27/20560 or 27/15765

D.M.U. 150 H.P. ENGINES

TEST SCHEDULE

SECTIONS

1. Test Recording.
2. Pre-Test Procedure.
3. Running-In Procedure.
4. Acceptance Test Procedure.
5. Power and Operating Data.

1. TEST RECORDING.

1.1 The test will be recorded on Form No.DTS/1 (See Sheet 2 (a) )  
 Running in - one copy  
 Acceptance Test- two copies

1.2 Readings will be recorded at the time intervals indicated :-

READING	INTERVAL
Time	At each incident
Brake Load (lb)	10 Minutes
Engine Speed (rev/min.)	10 Minutes
Brake Load, b.h.p. <sub>o</sub> & b.h.p. <sub>c</sub>	At final readings of run-in At each change in running conditions When taking power curve readings.  At final reading of endurance run.
Lubricating Oil.	
Pressure (lbs./in. <sup>2</sup> )	10 Minutes
Temperature (°F)	10 Minutes
Engine Coolant	
Temperature-in (°F)	10 Minutes
Temperature-out (°F)	10 Minutes

READING	INTERVAL
Air Intake Temperature ( $^{\circ}$ F)	10 Minutes
Fuel Consumption (lb )	At final readings of run-in At each change in running conditions When taking power curve readings At final reading of endurance run
Barometer (m.m.Hg.)	4 hours

1.3 All additional incidents will be recorded as they occur.

1.4 Where climatic conditions differ from 760 m.m. barometric pressure and  $60^{\circ}$ F ( $16^{\circ}$ C) intake air temperature, a correction factor, obtained from the Horse Power Correction Chart, No. J.T.S.Q287, (See Sheet 2 (b) ) will be used to obtain the corrected b.h.p.



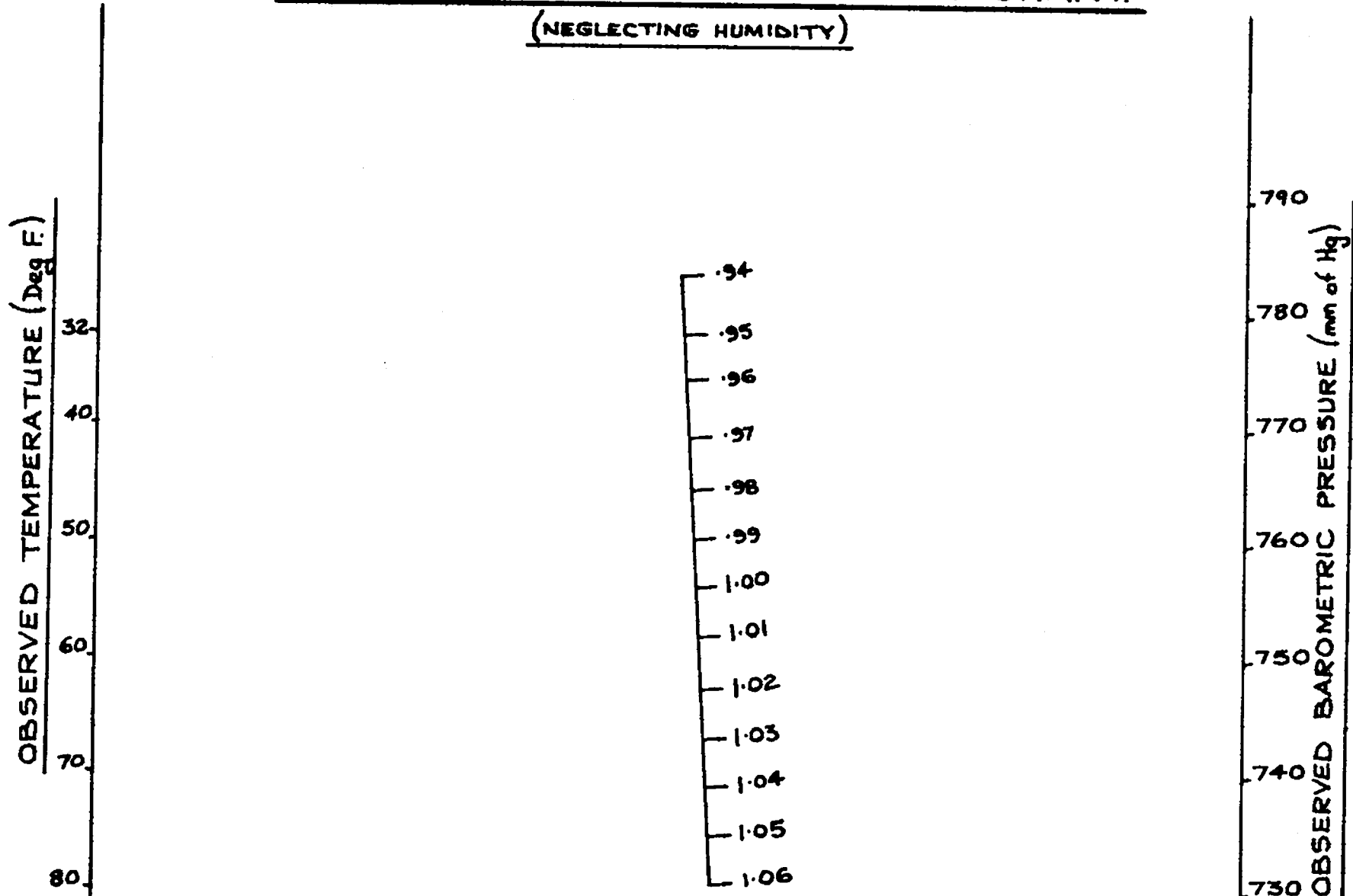
FORM NO. D.T.S.1

LOCO. WORKS.  
DIESEL TESTING STATION  
D.M.U. RAILCAR ENGINE TEST REPORT

DATE	TIME		PER- IOD M	POWER			LUB. OIL		COOLANT		AIR INLET TEMP °F.	FUEL CONSUMPTION			FUEL OIL
	H	M		REV/MIN N	BRAKE LOAD LB W	bhp $\frac{WN}{K}$	bhp <sub>e</sub>	PRESS. LB/ IN <sup>2</sup>	TEMP ° F.	IN ° F.		OUT ° F.	TIME S	WT LB	
															DYNAMOMETER NO.:
															DYN. CONSTANT (K)-
															BAROMETER
															CORRECTION FACTOR
															REV/MIN. (IDLING)
															REV/MIN. (RUNAWAY)
															b.h.p. CORRECTED TO- m.m. °F
															TESTER.....
															CHECKED.....
															FUEL PUMP NO.
															TYPE
															MAKE
															SHEET
															OF SHEETS
															ENG. SERIAL NO.

HORSE POWER CORRECTION CHART.

(NEGLECTING HUMIDITY)



CORRECTED TO BAR PRESSURE 760 mm Hg.  
 TEMPERATURE 60°F. 520°Abs.

$$CF \text{ (NEGLECTING HUMIDITY)} = \frac{760 \text{ mm.}}{\text{BAR. PRESS OBSERVED (mm Hg)}} \sqrt{\frac{T^{\circ} \text{abs}}{520}}$$

2. PRE-TEST PROCEDURE

2.1. Engine to be coupled to the dynamometer.

2.2. Fill with specified oil:-

PART	LEYLAND OIL CAPACITY	A.E.C. OIL CAPACITY
Engine Sump	5½ galls.	6¼ galls. see B.U.T. Bulletin No.3
Fuel Pump Sump	¼ pint	¼ pint
Fuel Pump Governor	¼ pint	¼ pint
Engine Air Cleaner	5 pints	5 pints
Right Angle Fan Drive	½ pint	½ pint

2.3. Fill engine with water and vent air by release valve.

2.4. Fit air cleaners to engine (oil bath type) and compressor air intakes. (Vokes 3-ply type A.O.I.)

These must be cleaned at regular intervals.

2.5. Fit lubricating oil cooler for use during test.

2.6. Bar engine over for 3 revolutions to ensure freedom of rotation.

2.7. Check engine for loose joints, leaks etc.

2.8. Check coupling bolts are tight.

2.9. Check throttle and shut-down controls function freely. Connect 24V supply to stop solenoid and set for use as an emergency stop during the complete test run.

2.10. Check engine mounting bolts are tight.

2.11. Check tension of fan belts.

2.12. Vent fuel system.

2.13. Connect 24 volt supply to STOP SOLENOID and check that fuel pump rack is taken to the NO FUEL position when the solenoid is energised, and fully returns when de-energising.

3. RUNNING-IN PROCEDURE

- 3.1. Motor engine for 5 minutes, checking oil pressure and that oil is flowing from rockers. (Current checked at commencement of 5 minutes and at the end of 5 minutes should show a fall proving that engine is freeing and not seizing). A 40 h.p. 3 phase 400V motor has a current of 52A nominal falling to 48A nominal in 5 minutes.
- 3.2. Record starter motor ammeter readings at commencement and end of 5 minutes.
- 3.3. Start engine, check for leaks and satisfactory running.
- 3.4. Adjust oil pressure relief valve during run-in to give a pressure within the limits laid down in Paragraph 5.1.
- 3.5. Run engine as follows, recording as laid down in Paragraph 1.2:-

(1) A.E.C. A.220 Engines

TIME MINUTES	SPEED REV/MIN	BRAKE LOAD (lb)	B.H.P.
15	500	NIL	NIL
30	1000	15	37.5
30	1200	17	51
30	1400	18	63
30	1600	18	72
30	1600	24	96
30	1600	29	11.6
30	1600	34	136
		FULL LOAD	150 ± 3
TOTAL 3 hrs. 47m.			

TEST SCHEDULE

(11) Leyland 680/1 Engines

TIME MINUTES	ENGINE SPEED REV/MIN	BRAKE LOAD (lb)	B.H.P.
5	500	NIL	NIL
15	1000	6	15
30	1200	8	24
30	1400	10	35
30	1600	12	48
30	1600	14	56
30	1600	16	64
1	IDLING	NIL	NIL
30	1800	20	82
1	IDLING	NIL	NIL
25	1800	24	108
1	IDLING	NIL	NIL
2	1800	FULL LOAD	150 ± 3
TOTAL 3hrs. 50m.			

3.6. During the 2 minutes run on full load at 1800 rev/min., record brake load, time to consume 1 lb. of fuel, then permit the engine to run-away from full load, having removed full load, check the runaway speed. These readings to be taken before any alterations are made to the fuel pump.

3.7. Check maximum engine speed on no load and "run-down" time from 18 00 to 400/430 rev/min.

3.8. Run engine at 400/430 rev/min. for 2 minutes and check for leaks, etc.

3.9. Stop engine.

A.E.C. (C.A.V.) Remove injectors. Check and renew as necessary.  
 Leyland Remove injectors and fit a replacement reconditioned set. Check must be carried out when cold.

For correct torque loadings see Data Section Item 44.

3.10. Injector breaking pressures :-

A.E.C. (C.A.V.)	- 175 atmos.	(2570lb/in. <sup>2</sup> )
Leyland (Old Type)	- 145 atmos.	(2130lb/in. <sup>2</sup> )
Leyland (New Type)	- 145/150 atmos.	(2130/2204 lb/in. <sup>2</sup> )
Leyland (C.A.V. Type)	- 165 atmos.	(2424 lb/in. <sup>2</sup> )

3.11. Remove oil pipes and rocker gear and check torque loading of cylinder head nuts. See Data Section Item 20.

3.12. Check and reset tappets hot :-

	<u>A.E.C.</u>	<u>LEYLAND</u>
Inlet and Exhaust	.010"/.012"	.018"

3.13. Check injection timing :-

<u>A.E.C.</u>	<u>LEYLAND</u>
27° <sub>W</sub> B.T.D.C. (5½ on flywheel rim)	35° B.T.D.C.

4. ACCEPTANCE TEST PROCEDURE4.1. Power & Fuel Consumption Test

- 4.1.1. Check oil level and top up if necessary.
- 4.1.2. Start engine and warm up.
- 4.1.3. Check for leaks, etc.
- 4.1.4. Set idling stop.
- 4.1.5. Set idling damper.
- 4.1.6. Set maximum fuel stop.
- 4.1.7. With throttle fully open, record brake load and time taken to use 1 lb. of fuel at 1000, 1200, 1400, 1600 and 1800 rev/min.

4.2. Governor Check

- 4.2.1. With throttle fully open, record brake load at 1850 rev/min.
- 4.2.2. Record maximum engine speed with no brake load.
- 4.2.3. When throttle is suddenly closed, record time taken for engine speed to fall from 1800 to 400/430 rev/min.
- 4.2.4. Record idling speed.

4.3. Endurance Run

- 4.3.1. With throttle fully open and brake load adjusted to give an engine speed of 1800 rev/min. run for one hour, record as laid down in Paragraph 1.2. For Leyland engines the speed to be reduced to IDLING (NO LOAD) for one minute at the end of the 15th, 30th and 45th minutes and restored to 1800 rev/min. at the end of each minute at idling. Check at the breather for excessive blow-by.
- 4.3.2. Check that stop solenoid shuts engine down completely from
  - i. 1800 rev/min. FULL LOAD
  - ii. Idling NO LOAD
  - iii. Runaway speed
- 4.3.3. Run engine at 400/430 rev/min. for 5 minutes and check for leaks, etc.
- 4.3.4. Record maximum and minimum oil pressure.  
Maximum oil pressure = maximum reading during run laid down in Paragraph 4.3.1.  
Minimum oil pressure = reading at end of run laid down in Paragraph 4.3.2. with throttle closed against idling stop.
- 4.3.5. Stop engine and observe pressure at which lubricating oil shut down switch operates.
- 4.3.6. Drain cooling water and remove engine from bed.
- 4.3.7. A.E.C. engines only. Drain oil from engine sump and filter. Remove filter from engine, examine and clean. Discard felt element and renew on refitting filter. All open apertures to be sealed.
- 4.3.8. Leyland engines only. Drain oil from engine sump and filter. Remove filter from engine, examine and clean. Discard element and renew on refitting of filter. All open apertures to be sealed.



5. POWER AND OPERATING DATA

5.1. Operating limitations :-

Engine speed

1800<sup>±</sup> 5 rev/min. at 150 b.h.p.  
2000 rev/min. maximum speed, no load  
400/430 rev/min. Idling speed.

Engine coolant temperatures :-

Outlet - 170° - 185°F. (77° - 85°C)  
Inlet - Within 20°F. (11°C) of outlet.

Engine lubricating oil :-

Temperature - 165° - 190°F. (74° - 88°C)  
Pressure -  
At 1800 rev/min. and 165°F. (74°C) - 50/60 lb/in.<sup>2</sup>.  
At Idling and 165°F. (74°C) - 10lb/in.<sup>2</sup>. minimum.

5.2. Power and fuel consumption requirements, under standard conditions of 760 m.m. barometric pressure and 60 F (16°C) air temperature, on full throttle are:-

REV/MIN.	A.E.C.				LEYLAND			
	BRAKE LOAD lb.	b.h.p. <sub>c</sub>	TIME FOR 1 lb. FUEL Seconds	lb/bhp. Hr.	BRAKE LOAD lb.	b.h.p. <sub>c</sub>	TIME FOR 1 lb. FUEL Second	lb/b.h.p. Hr.
1000	35.0	87.5	109.2	.377	35.92	89.8	114.5	.356
1200	35.8	107.5	89.3	.375	36.0	108.0	93.2	.358
1400	36.6	128.0	74.4	.378	35.31	123.6	80.1	.364
1600	35.5	142.0	65.1	.390	34.43	137.7	70.3	.372
1800	33.33	150.0	58.9	.407	33.33	150.0	62.5	.384

- 5.3. Engines will be accepted for service within 2% of 150 b.h.p. after complete overhaul.
- 5.4. The maximum fuel stop must be set so that the engine uses 1 lb. of fuel, when developing maximum B.H.P. at 1800 rev/min. in:-

A.E.C. = 58.4/59.4 seconds  
 Leyland = 62/63 seconds

- 5.5. Engine timing and tappet settings.

	<u>A.E.C.</u>	<u>LEYLAND</u>
<u>Firing Order</u>	1.5.3.6.2.4.	1.5.3.6.2.4.
<u>Valve Timing</u>		
Inlet Valve Opens	10° B.T.D.C.	10° B.T.D.C.
Distance on Flywheel Rim	2 <sup>n</sup> ± <sup>3</sup> / <sub>4</sub> "	1.76"
<u>Injector Timing</u>	27° B.T.D.C. (5 <sup>1</sup> / <sub>4</sub> " on Flywheel rim)	35° B.T.D.C. (Alfin bonded)
<u>Tappet Adjustment</u>		
Inlet	.010/.012 cold and hot	.020" cold .018" hot
Exhaust	.010/.012 cold and hot	.020" cold .018" hot

- 5.6. Injector breaking pressures :-

A.E.C. (C.A.V.)	- 175 atmos.	(2570lb./in. <sup>2</sup> )
Leyland (Old Type)	- 145 atmos.	(2130lb./in. <sup>2</sup> )
Leyland (New Type)	- 145/150 atmos.	(2130/2204lb/in. <sup>2</sup> )
Leyland (C.A.V. Type)	- 165 atmos.	(2424lb/in. <sup>2</sup> )

- 5.7. The time taken for the engine to slow down from 1800 to 400/430 rev/min. when throttle is suddenly closed, should be from 4<sup>1</sup>/<sub>2</sub> to 7 seconds depending on size of flywheel fitted.

AMENDMENT 232  
ISSUED JULY 1979

TEST SCHEDULE

- 5.8. If the revised excess fuel setting has not been applied or the maximum fuel stop was adjusted in excess of  $+\frac{1}{2}$  turn, the following procedure shall be applied.
- (i) Remove cap from excess fuel stop and slacken locknut.
  - (ii) Run engine at any speed between idling and maximum with full throttle applied.
  - (iii) Screw in excess fuel adjustment screw until engine power begins to fall. Retract adjustment screw until full power is just restored.
  - (iv) Retract the adjustment screw a further 5 full turns.
  - (v) Tighten locknut, replace cap and apply lead seal.