TRUCK CARGO 4 TONNE 4x4
BEDFORD MJ (MT CAB VARIANT)

GENERAL INSTRUCTION NO. 17

Sponsor:
DGES(A)

Publications Agency:
ATSA Chertsey
Project No: 72212(70)
File ref: 0736/79

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
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Amdt No.	Incorporated By (Signature)	Date
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SUBJECT: Tachometer drive cable.

INTRODUCTION

1 This instruction informs users that when replacement tachometer drive cables l.h.d. variants, fitted with MT cabs, are required, a r.h.d. variant cable should be fitted. All the necessary parts information is provided.

APPLICABILITY

2 Truck Cargo 4 Tonne 4 x 4 Bedford MJ l.h.d. fitted with MT cab and tachometer.

IMPLEMENTATION

3

3.1 Stores to be demanded:

Item No	DMC	NSN/Part No	Designation	Oty per eqpt
1	6MT1	6680-99-833-7449	Tachometer cable	1

3.2 The tachometer cable (item 1) must be routed along the top of the l.h. chassis rail and above the brake fulcrum lever where it can be inserted into the cab through grommets alongside the l.h. 'A' post.

TRUCK CARGO 4 TONNE 4x4
BEDFORD MJ

GENERAL INSTRUCTION NO. 18

Sponsor:
DGES(A)

Publications Agency:
ATSA Chertsey
Project No: 72212(73)
File ref: 0736/80

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
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SUBJECT: Fitting of fuel sender unit and associated harness
(Approval No. 12-7007)

INTRODUCTION

1 This instruction details the revisions made to the electric fuel sender unit and associated wiring harnesses, fitted in production during the incorporation of the MT Cab and updated fuel/refuelling revisions. Parts details are provided for identification purposes when replacements are deemed necessary.

APPLICABILITY

2 Truck Cargo 4 Tonne 4 x 4 Bedford MJ r.h.d/l.h.d., UBRE and TAR Variants (fitted with MT Cab).

STORES TO BE DEMANDED

3

Item No	DMC	NSN/Part No	Designation	Oty per eqpt
1	7BD	6150-99-859-1844	Harness.	1
2	7BD	2910-99-535-6913	Fuel sender unit.	1
3	MPN	A 4040956	Junction box.	1
4	Z1	5340-99-970-2330	Cable tie	1

IMPLEMENTATION

4

4.1 Fit fuel sender unit (item 2) ensuring the float is fed round the fuel riser pipe and towards the tank filler neck.

4.2 Connect harness (item 1) on sender unit.

4.3 Run harness inside the chassis and across the gearbox crossmember to junction box (item 3), securing to the chassis in a chafe free position with equally spaced cable ties (item 4).

4.4 Inside the junction box (item 3), connect the black wire from the main cab harness to the black wire of the sender harness and the green/black wire from the main cab harness to the green/black wire of the sender harness.

4.5 To test sender unit switch ignition to the 'ON' position, the cab fuel gauge will now indicate the correct fuel level.

TRUCK CARGO 4 TONNE 4x4, BEDFORD MJ (ALL VARIANTS)

GENERAL INSTRUCTION NO. 19

Sponsor:
DGES(A)

Publications Agency:
ATSA Chertsey
Project No: 72212(114)
File ref: 97/52C/4440/014/LVG

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
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SUBJECT: Front panel left hand drive (l.h.d.) and right hand drive (r.h.d.)

(Approval No. 12-7013)

INTRODUCTION

1 L.H.D. and r.h.d. front panels with pre-drilled holes for windscreen wipers and washers are no longer supplied. This instruction gives the necessary details to produce either a l.h.d. or r.h.d. variant from the base panel as required, when a replacement panel is deemed necessary.

1.1 Limitations on use of equipment. Nil.

APPLICABILITY

2 Truck Cargo 4 Tonne 4 x 4 Bedford MJ (All Variants).

REASON FOR MODIFICATION

3 The following parts information is provided:

3.1 7BD 2510-99-824-6713 panel front r.h.d. and 7BD 2510-99-762-0120 panel front l.h.d. no longer supplied.

3.2 7BD 2510-99-301-8206 panel l.h.d. and r.h.d.

4 Refer to Fig 1:

4.1 Mark holes as required to suit either l.h.d or r.h.d. variant.

4.2 Using an appropriate drill, drill pilot holes.

4.3 Drill and file to correct size.

4.4 File location notches to suit.

4.5 Apply rust inhibiting primer to surrounding areas on the underside of panel and paint the front as required.

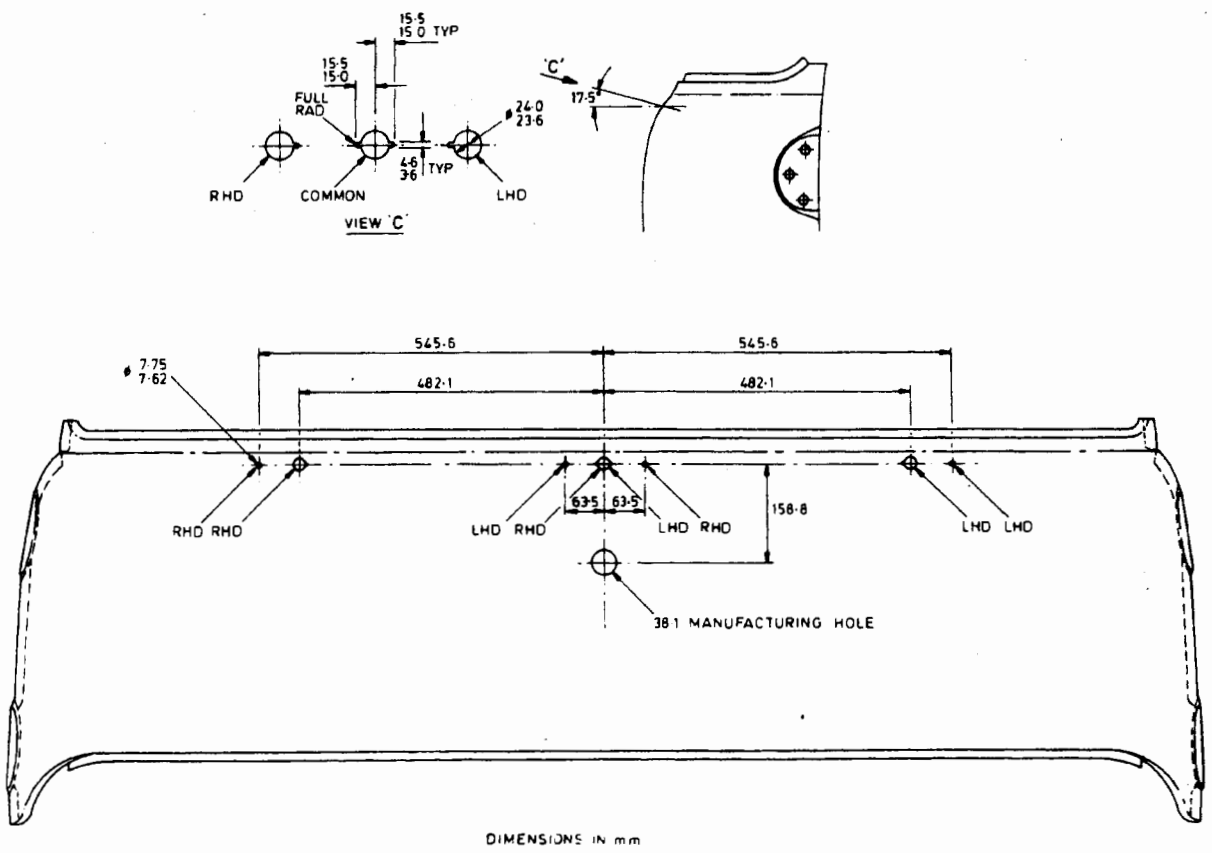

Fig 1 Front panel hole location and size details

TRUCK, 4 TONNE, 4x4 BEDFORD MJ (ALL VARIANTS)

GENERAL INSTRUCTION NO. 20

(Completely revised)

Sponsor: GSV IPT
Project No: PDS 1A/504
File ref: DE/CH/LVG/0736 GSV 8/3

Publication Authority: CTS TD Andover

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
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Amdt No.	Incorporated By (Signature)	Date
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SUBJECT: Instrument cluster.

INTRODUCTION

1 The original instrument cluster is no longer available. A revised assembly has been identified. When instrument cluster replacement is required this instruction provides all the necessary details.

1.1 Limitations on use of equipment. Nil.

APPLICABILITY

2 Truck, Cargo, 4 Tonne, 4 x 4, Bedford MJ (All Variants).

2.1 Fitted to subject vehicles held by user units.

IMPLEMENTATION PLAN

3

3.1 This instruction is to be implemented by units authorized to carry out levels 2, 3 and 4 maintenance.

Action required by

4

4.1 Units and establishments holding equipment:

4.1.1 Obtain the items list in Para 5.

4.2 All recipients of this instruction. Add particulars to AESP 2320-H-100-821 Instr Index.

Stores, tools and equipment

5

5.1 Stores to be demanded:

5.1.1 The following items are to be demanded quoting this instruction as the authority.

5.1.2 Item 9 is to be demanded separately.

Item No	DMC	NSN/Part No	Designation	Oty per eqpt
	6MT1	6680-99-215-8086	Mod set: Speedometer assy comprising:	1
1	6MT1	6680-99-396-1325	Speedometer gauge	(1)
2	6MT1	6680-99-301-9069	Fuel gauge	(1)
3	6MT1	6685-99-616-7799	Temperature gauge	(1)
4	6MT1	6210-99-833-7980	Warning light (amber)	(1)
5	6MT1	6210-99-830-9963	Warning light (green)	(1)
6	6MT1	2590-99-811-6279	Resistor	(1)
7	6MT1	6150-99-726-0150	Socket and loom	(1)
8	6MT1	6240-99-995-9145	Bulb 24 volt	(1)
9	7BD	6680-99-900-1068	Decal speedometer (km/h) scale	(1)

5.2 Stores to be removed and reduce to scrap:

10	6MT1	6680-99-819-5245	Cluster assy	1

NOTE

The following stores are interchangeable with both old and new assemblies:

11	6MT4	5930-99-052-1087	Fog light switch	1
12	6MT4	5930-99-372-4384	Panel light switch	1
13	6MT4	5930-99-581-6910	Wiper switch	1

Sequence of operations

6 Carry out this instruction as follows:

NOTE

The item numbers of Para 5 are used as reference throughout this instruction.

6.1 Release instrument cluster (four retaining screws). Disconnect speedometer cable and electrical connections to printed circuit board, fog light, panel light and wiper switches and withdraw the assembly.

6.2 Fit decal speedometer (km/h) (item 9) over speedometer gauge (item 1), aligning both km/h and mile/h zeros.

6.3 Remove blanking plugs and fix the rear fog light switch, wiper switch and panel light switch in the positions shown in Fig 1.

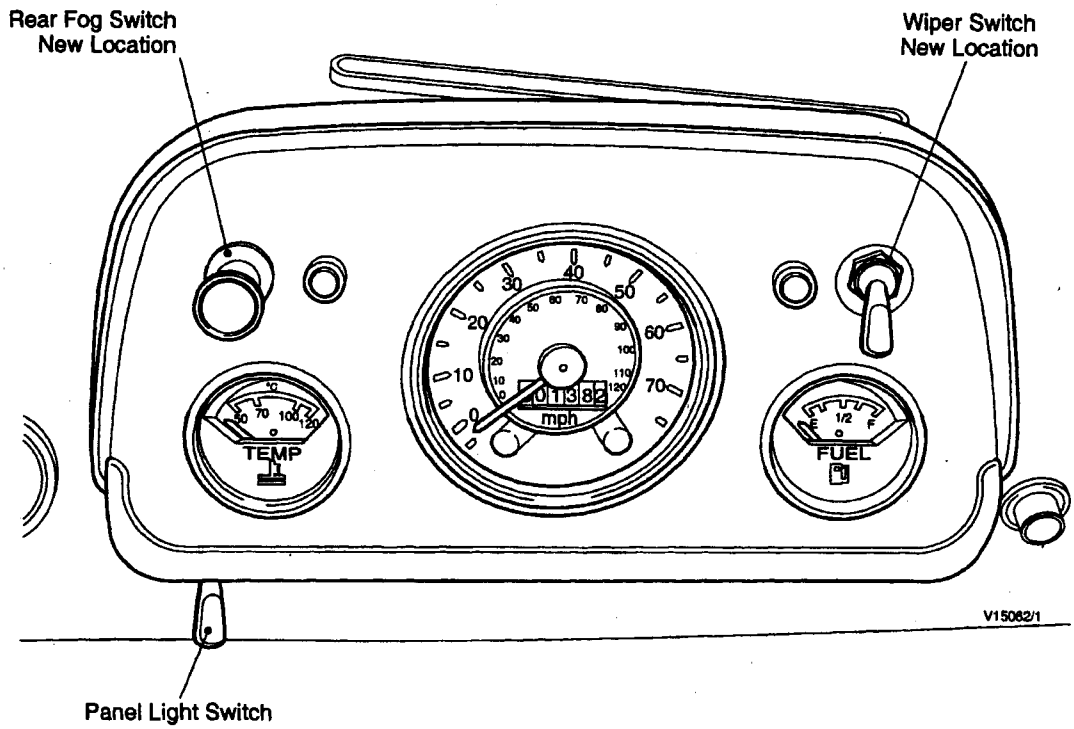

Fig 1 New instrument panel showing new location of switches

TRUCK 4 TONNE 4x4 BEDFORD MJ (ALL VARIANTS)

GENERAL INSTRUCTION NO. 21

Sponsor:
DGES(L)

Publications Agency:
DLO Chertsey
Project No: P00419(174)
File ref: D/DGES(L)/559/5/4/1/ 1

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
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Amdt No.	Incorporated By (Signature)	Date
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SUBJECT: Non asbestos brake shoes

INTRODUCTION

1 To comply with HSE Directive No. ISBN 0 11 885402 X brake linings containing asbestos are no longer to be used.

1.1 Limitations on use of equipment. Nil.

APPLICABILITY

2 Truck Cargo 4 Tonne 4 x 4 Bedford MJ (all Variants).

REASON FOR INSTRUCTION

3 Friction linings that contain asbestos are no longer to be used. Asbestos based brake linings have been superseded by non asbestos type brake linings. Listed below is the new NSN and the superseded NSN for the road brakes and park brake of the subject vehicle.

Old DMC	Old NSN	Description	New DMC	New NSN	New Material
6MT9	2530-99-829-4417	Handbrake set c/w lining	7BD	2530-99-553-7664	Abex 927
6MT9	2530-99-837-8842	Handbrake lining		No longer supplied	
7BD	2530-99-825-1735	Brake shoe c/w lining front	7BD	2530-99-991-7124	Abex 927
7BD	2530-99-813-9910	Lining kit front		No longer supplied	
7BD	2530-99-827-3194	Brake shoe c/w lining rear	7BD	2530-99-179-4866	Abex 927
7BD	2530-99-814-0013	Lining kit rear		No longer supplied	
7BD	2530-99-827-3839	Brake shoe	7BD	2530-99-991-7124	Abex 927

INSPECTION AND REMEDIAL ACTION

4

4.1 Abex 927 is recognised by stencilling of lining make/type, BFMC ref, mould No., Billet No. and week/year in black on the unpainted lining edge.

4.2 Existing asbestos linings (Capasco HF39) are recognised by the colour code red/black.

4.3 Mixing sets of asbestos and non asbestos brake linings on a vehicle is prohibited. Whenever a set of asbestos based brake shoes require changing the whole vehicle set is to be changed to match the new shoe material.

4.4 The type of brake lining fitted is to be recorded in the Vehicle Record Book AB 562. If this information is missing it is to be assumed that the vehicle is fitted with asbestos type linings (refer to Para 4.3).

4.5 Units using the Direct Repair Scheme (DRS) are to check the AB 562 and confirm the type of lining fitted. If asbestos based linings are fitted then the whole vehicle set of non asbestos linings is required.

RECORDING

5

5.1 All recipients of this instruction. Add particulars to AESP 2320-H-100-821 index.

5.2 Record Gen Instruction No. and action taken in vehicle documents.

5.3 Type of brake lining fitted is to be recorded in the Vehicle Record Book AB 562.

REPORTING

6 N/A.

ACTION AFFECTING COMPLIANCE WITH THE INSTRUCTION

7 EFR reporting action is not required.

EFFECT ON OPERATING OR HANDLING

8 A vehicle having a set of brake shoes that contain a mixed batch of material linings may well have an adverse affect on its braking efficiency and making its brakes severely limited.

TRUCK, 4 TONNE, 4x4 BEDFORD MJ

GENERAL INSTRUCTION NO. 22

Sponsor: GSV IPT
Project No: Task 10
File ref: PDS1A/504

Publications Agency: CTS TD Andover

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
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Amdt No.	Incorporated By (Signature)	Date
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SUBJECT: Hydraulic Pump (CALM Variant). (Approval No. 12-7047)

INTRODUCTION

1 The original fitted hydraulic pump (EDBRO Model EWH39/29) is no longer available, this instruction details the procedure for fitting the replacement pump (EDBRO Model EBA03440 Part No A6000001). This is only required on failure of the original part, where replacement of the pump would be the normal method of repair.

1.1 Limitations on use of equipment. Nil.

APPLICABILITY

2 All Bedford 4 tonne 4 x 4 fitted with Crane Assembly Lorry Mounted (CALM) as held under asset codes 2037 3102, 2037 8100, 2038 3100, 2038 8100, 2039 3100, 2043 3101, 2094 3100 & 2094 8100.

2.1 Only to be introduced on failure of the old pump assembly.

REASON FOR INSTRUCTION/MODIFICATION

3 Code 5 - to conform to changes in pattern of commercial stores.

PRIORITY

4 Not Applicable

ESTIMATED TIME REQUIRED

5 Embodiment: 16.0 man hours

Testing: 0.5 man hours.

MODIFICATION IMPLEMENTATION PLAN

6

6.1 This instruction is to be implemented only when the existing hydraulic pump assembly requires replacement.

6.2 This instruction may be implemented by units authorised to carry out levels 2, 3 and 4 maintenance.

6.3 Associated instructions. Nil.

6.4 Strike plate action. N/A.

Action required by

7

7.1 Units and establishments holding equipment for repair

7.1.1 If new hydraulic pump is required, demand the stores listed at Para 8.

7.1.2 Carry out this instruction as detailed in Para 9.

7.1.3 After the initial embodiment of this modification, the component parts should be demanded individually. If the hydraulic pump (Item 1) requires replacement, the old assembly should be returned to stores for planned repair.

7.1.4 ARMY — Record the AESP and instruction number in equipment documents.

7.1.5 RAF — Record modification details on AFG 1084A and Form 4870. Units operating STAMA are also to record modification details on ADP MTMS Job Certification Sheet and to follow the procedures laid down in AP100C-08A

7.2 Army units authorised to carry out levels 2, 3 & 4 maintenance

7.2.1 ARMY — When requested by units or during overhaul of equipment on charge without REME 1st Line Support, obtain the items listed in Para 8 and carry out this modification.

7.2.2 N/A

7.2.3 Record completion details of modification against appropriate entry in vehicle documents.

7.2.4 N/A

7.2.5 Enter on engine modification certificate FV148112 Approval.

7.3 All recipients of this instruction. Add particulars to AESP 2320-P-700-821 General Instruction Index.

Stores, tools and equipment

8 Stores to be demanded

8.1 Demand Mod Kit. This Kit comprises:

Item No	DMC	NSN/Part No	Designation	Oty per eqpt
	7BD	2590-99-151-3459	Mod Kit: comprising:	1
1	7BD	4320-99-881-4424	Pump Hydraulic	(1)
2		A6000003	Bracket Pump Mounting	(1)
3		A6000004	Drive Shaft	(1)
4		A6000005	High Pressure Pipe	(1)
5		A6000006	Low Pressure Pipe	(1)
6		A6000007	Converter (Steel Pipe)	(1)
7		A6000008	Dowty Washer (½" pipe)	(1)
8		A6000009	Spigot Adaptor (½" pipe)	(1)
9		A6000010	Clip (½" pipe)	(1)
10		A6000011	Bolt Clamp (½" pipe)	(2)
11		A6000012	'O' ring (Pump)	(1)
12		A6000013	LP Adaptor NR1589	(1)
13		A6000014	Dowty Washer (Pump)	(1)
14		A6000015	HP Adaptor (¾ pipe)	(1)
15		A6000016	90° Elbow (¾ pipe)	(1)
16		A6000017	Clip (¾ pipe)	(3)
17		A6000018	Converter (12 mm)	(1)
18		A6000019	Converter (¾")	(1)
19		A6000020	Grease	A/R

8.2 Stores or suitable alternative to be obtained locally.

Nil.

Sequence of operations

NOTE:

The "item numbers" of para 8 are used as reference throughout this instruction.

CAUTION:

Ensure that the vehicle handbrake is applied and the wheels are chocked before commencing the modification.

9 Replace the hydraulic pump as follows:

9.1 Remove the spare wheel.

9.2 Close the gate valve in the pump low pressure line situated near to the tank.

9.3 Disconnect and remove all the pipes, both steel and flex, from the gate valve to the pump, and from the pump to the 12mm pipe which is the pressure inlet of the hydraulic circuit.

9.4 Remove the pump, bracket and drive shaft.

9.5 Fit the high pressure pipe adapter together with dowty washer (item 7) to the new pump. Smear the low pressure adapter O-ring with grease and position it in its groove in the low pressure adapter. Position the adapter in the recess of the pump low pressure orifice and fit the two securing clamps loosely with the four set-screws.

9.6 Fit the new bracket using M10 x 30 bolts and fit the new pump with the bent axis veering upwards, to the bracket using M12 x 40 bolts and self retaining nuts, as shown in Fig 3.

9.7 Assemble and tighten the new low pressure converter and the spigot adapter together with the dowty washer and connect the assembly to the longest end of the steel pipe which has been removed from the gate valve. Tighten the assembly and pipe together in a vice, and connect the pipe back to its original position on the gate valve. Apply the protective wrap and smear grease into the bore of both ends of the low pressure pipe, slide the bolt clamps onto each end and fit one end of the pipe to the spigot adapter and tighten the bolt clamp. Fit new pipe as per the original but take it up and over the cross-member to which the pump and bracket are fitted and onto the low pressure adapter of the pump as shown in Fig 4. Clip the pipe using the new clip in the same position as the one which was removed from the original pipe, cutting the protective wrap to suit. Position the pipe at the pump LP elbow, tighten the four set-screws to 24Nm and secure the pipe with the bolt clamp.

9.8 Assemble and tighten the new 12mm steel pipe adapter and the metric to BSP converter together in the vice and connect the assembly to the straight end of the high pressure flex pipe and tighten. Apply the protective wrap and fit the pipe's elbowed end to the pump, running the pipe over the cross-members as shown in Fig 3. Feed the pipe along, and up, connecting it to the 12mm steel pipe which is the pressure inlet of hydraulic circuit. Clip the pipes as shown in Fig 5 along its length by picking up the pre-drilled holes in the tops of the cross-members using large surface washers on the bolt heads to utilise the larger holes in the cross-members. It is necessary to drill one 8.5mm hole in the piece of pressed angle positioned near the spare wheel carrier for the front clip to be fitted. Drill the hole 150mm in from the rivet on the off-side which secures the pressed angle to the chassis. Cut the protective wrap at the clip positions to allow their fitment and clip and tighten the pipe in position at both ends ensuring it will not suffer damage, by contact with other components. It may be necessary to put a slight bend in the 12mm steel pipe to ensure the pipes, both steel and flex, are clear at the front end, particularly of the air system pipes.

9.9 Apply the grease, to the splines of the pump drive shaft, and slide the drive coupling onto the splines, ensuring the face where the coupling seal makes contact is clean. Fit the large retaining washer and set-screw and tighten to 65/75 Nm. Fit the adapter plate to the drive flange of the PTO using four of the twelve ⅜" BSW set-screws supplied. Fit the drive shaft as shown in Fig 6 using the remaining eight set-screws and tighten all the twelve to 45Nm.

9.10 Refit the spare wheel.

9.11 Open the gate valve.

TESTING AFTER EMBODIMENT

10 Check for leaks.

10.1 Load Test or arrange for load testing under local Contract arrangements.

EFFECT ON WEIGHT

11 Negligible.

PUBLICATION AMENDMENTS

NOTE:

Necessary amendments will be issued separately.

12 Nil.

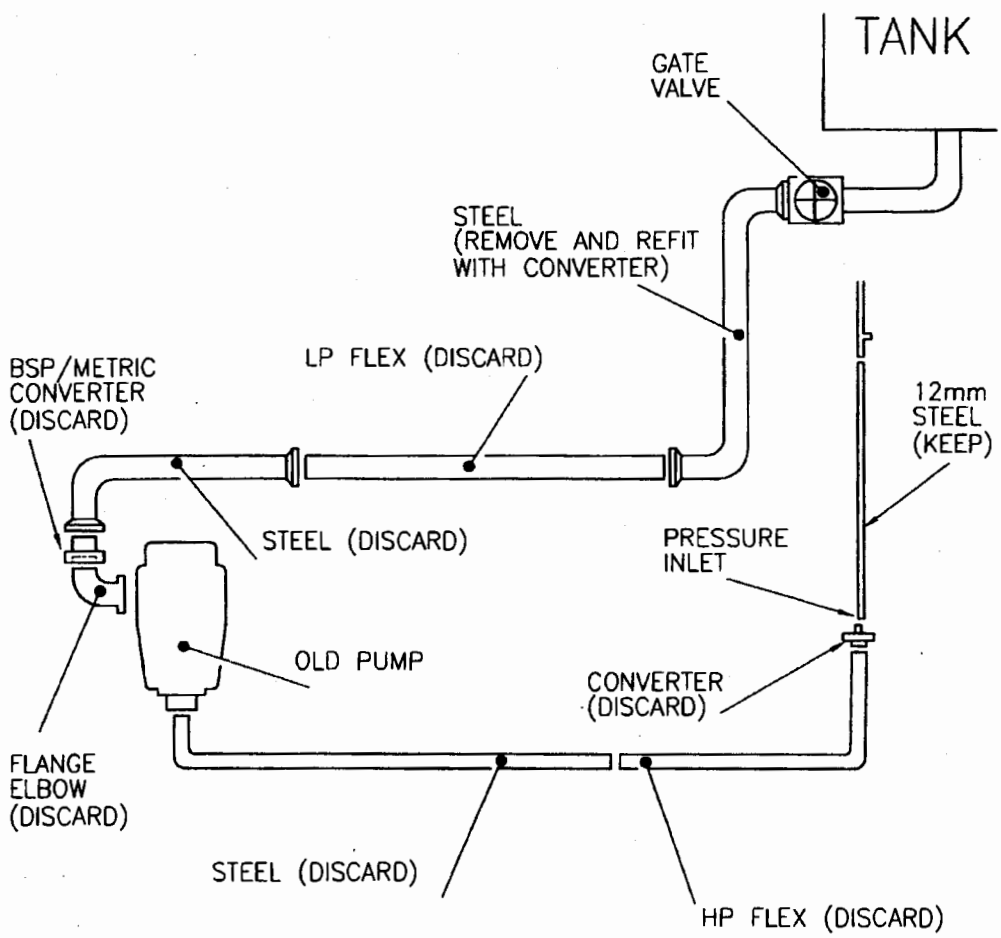

Fig 1 Pump replacement (Equipment Dismantling)

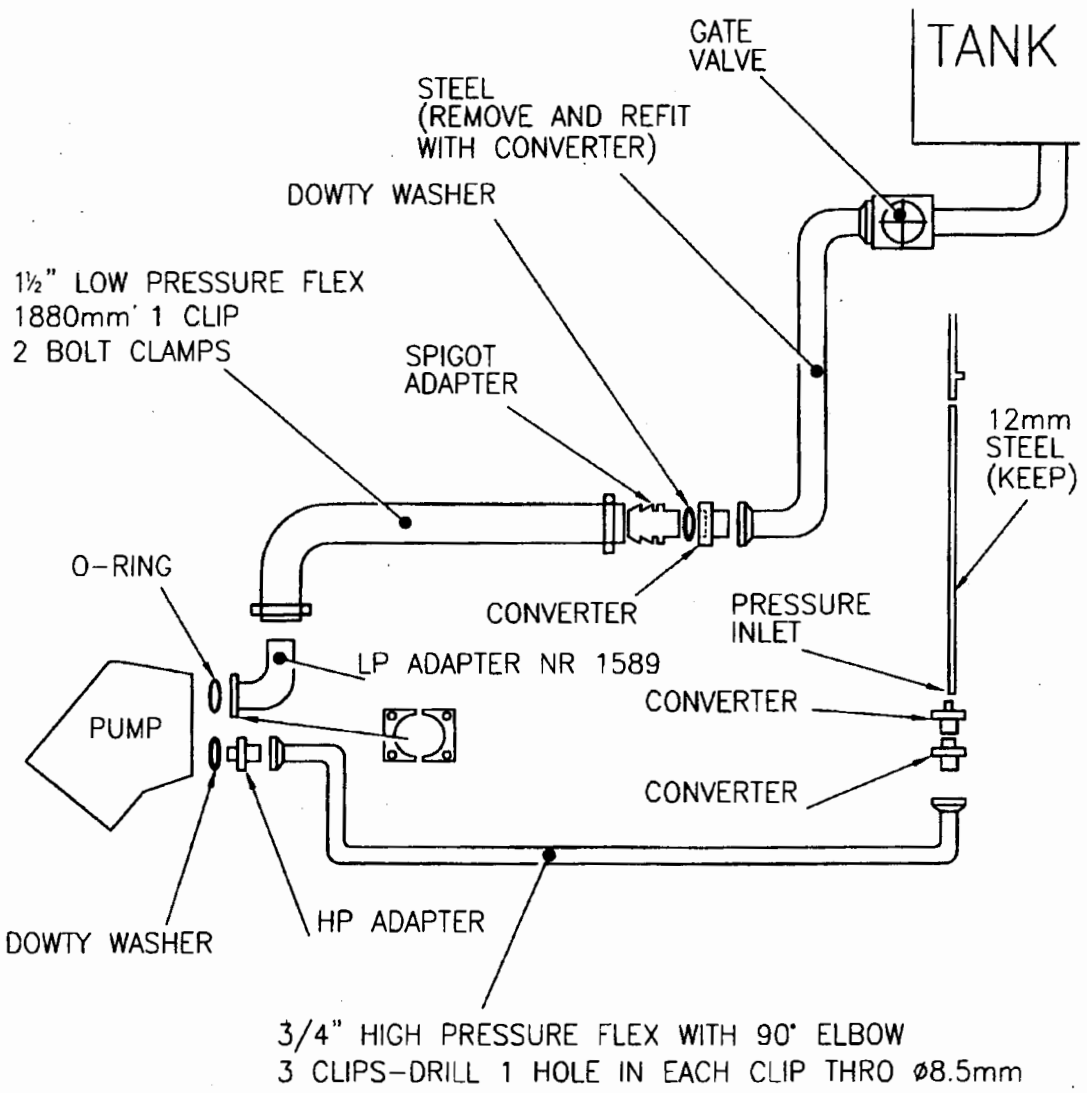

Fig 2 Pump replacement (Equipment Assembly)

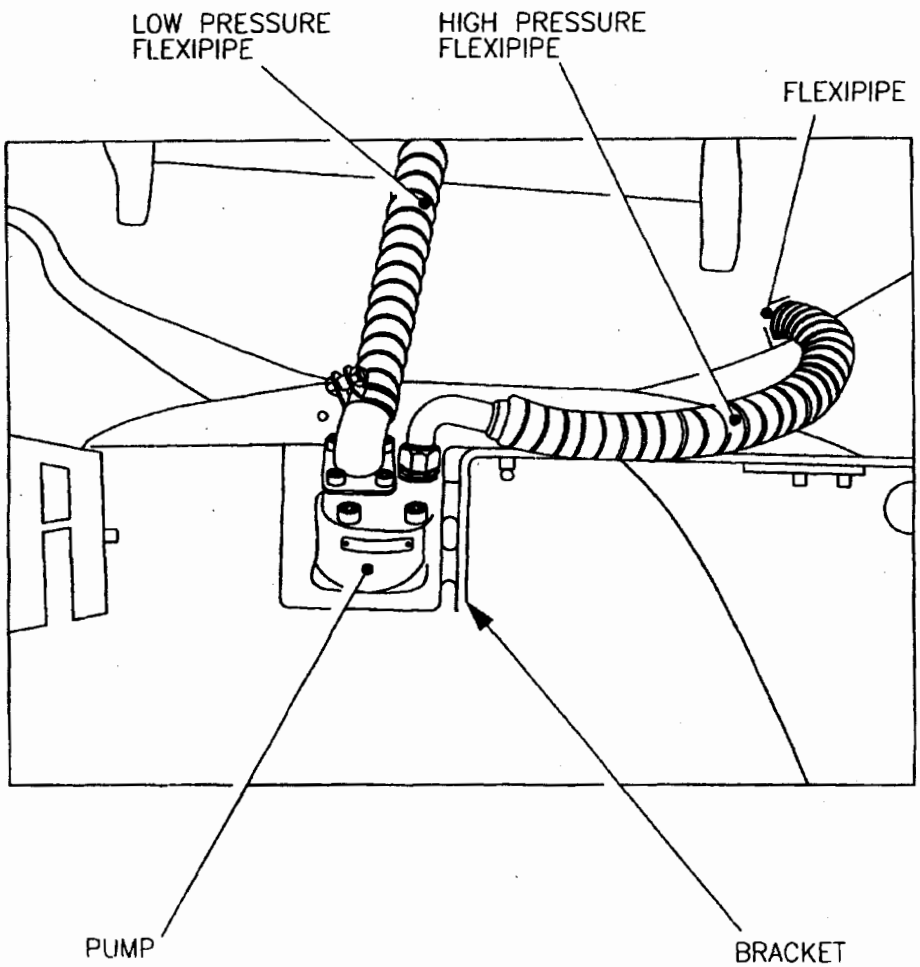

Fig 3 4 x 4 Pump with pipes mounted on bracket viewed from Rear Axle

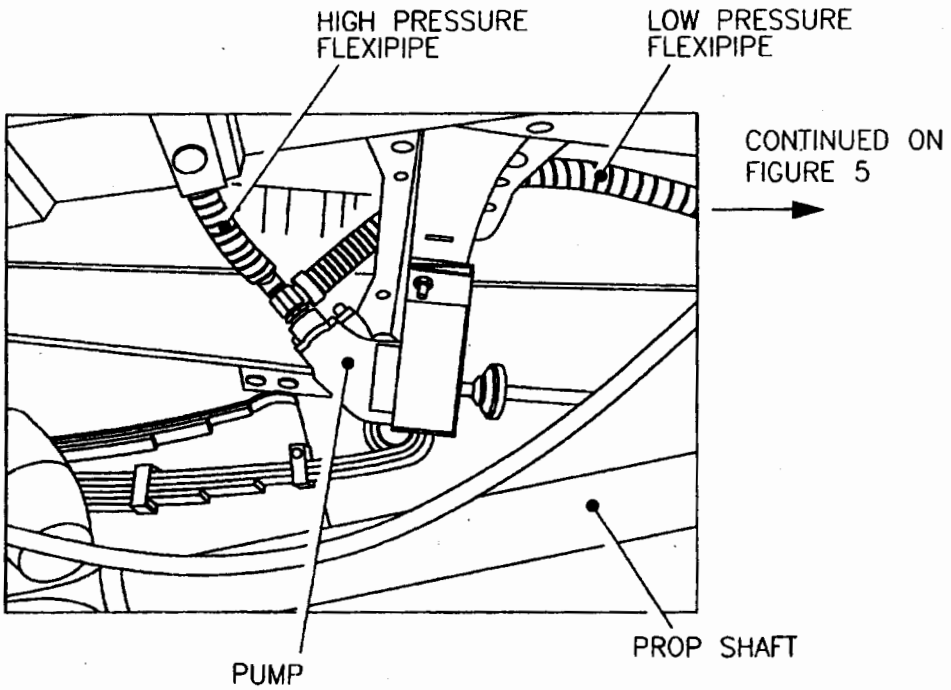

Fig 4 4 x 4 side view of pump and pipes viewed from
RH side just forward of Rear Axle

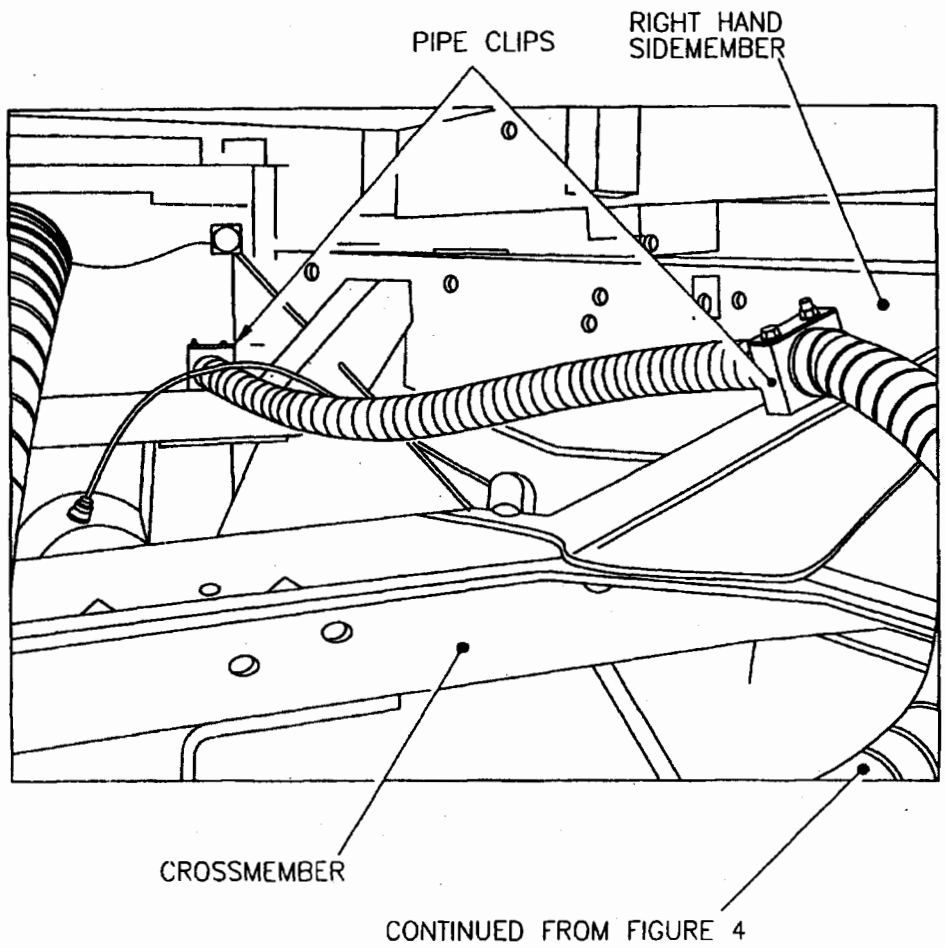

Fig 5 4 x 4 Pump HP Pipe and clips looking towards front of Vehicle

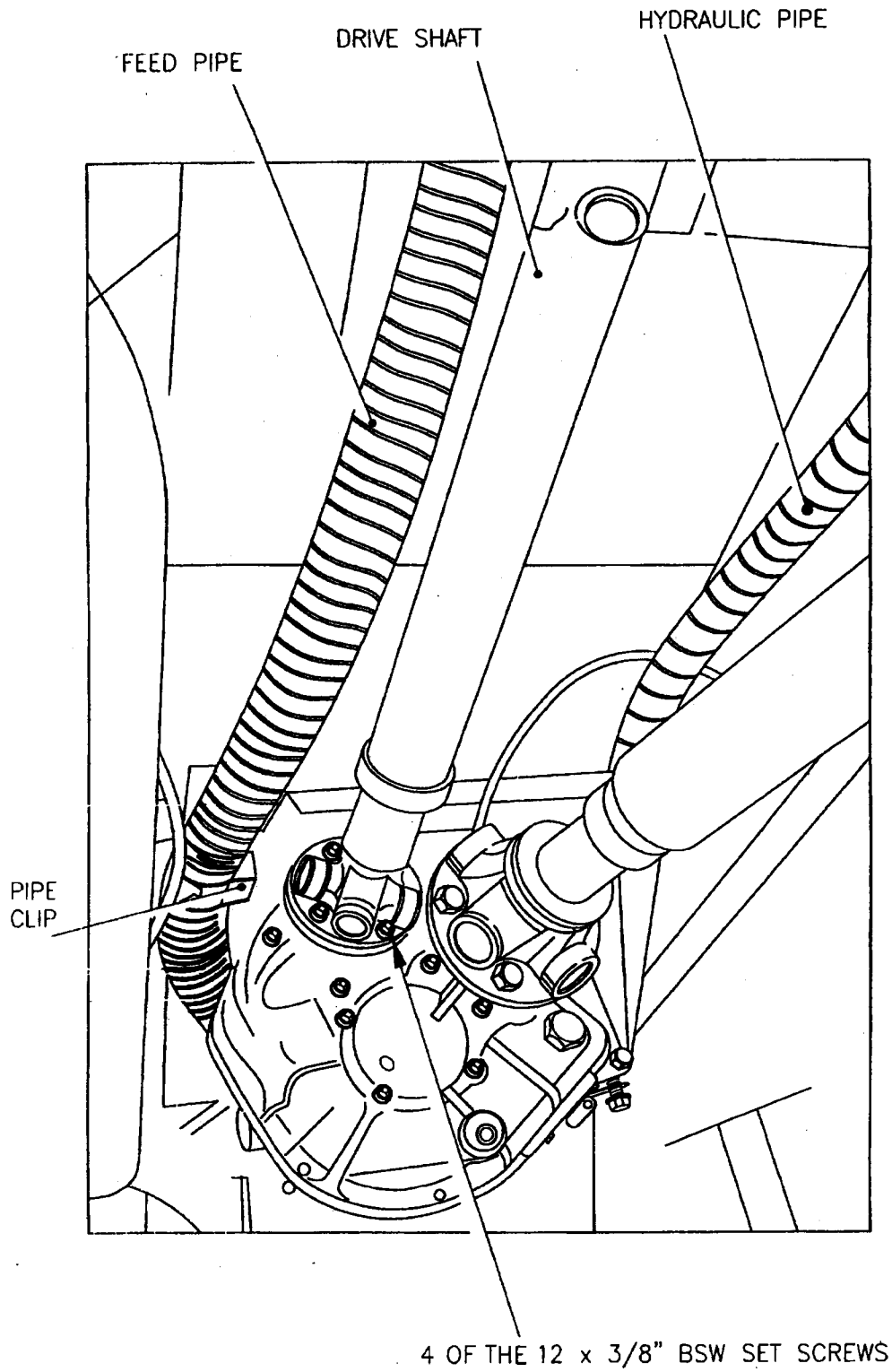

Fig 6 4 x 4 Pump Drive Shaft and feed pipe, looking forward onto back of Gearbox

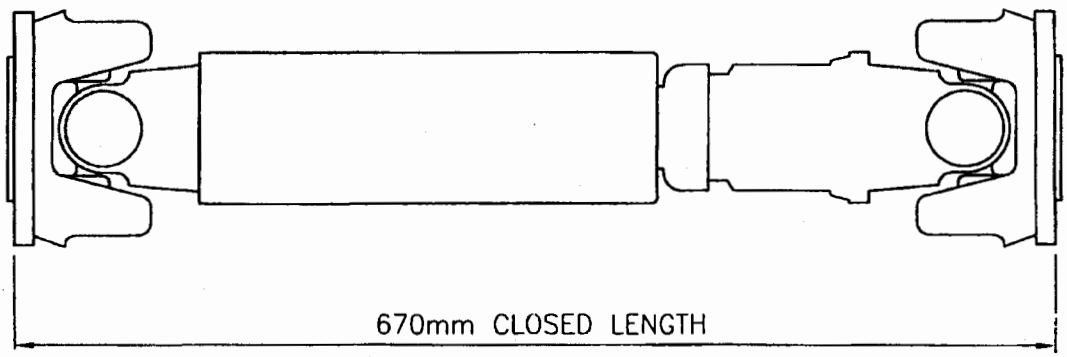

Fig 7 4 x 4 PTO/Pump Drive Shaft (Item 3)

TRUCK 4 TONNE 4 X 4 BEDFORD MJ (ALL VARIANTS)

GENERAL INSTRUCTION No. 23

Sponsor: GSV IPT
Project No.: Task 23
File Ref: PDS 1A/504

Publication Authority: CTS TD Andover

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
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SUBJECT: Replacement of Air Cleaner Assembly (Approval No. GSV/04/036)

INTRODUCTION

1 The original fitted Air Cleaner Assembly, is now obsolete and is to be replaced by a new 'M' series Air Cleaner Kit, as and when necessary.

1.1 Limitations on use of equipment. Nil.

APPLICABILITY

2 All Bedford 4 tonne 4 x 4 Trucks (cargo).

2.1 Only to be introduced on failure or wear out of old Air Cleaner.

REASON FOR MODIFICATION

3 Code 5 to conform to changes in pattern of commercial stores.

PRIORITY

4 N/A

ESTIMATED TIME REQUIRED

5

5.2 Embodiment: 2.0 man hours

5.4 Testing: 0.5 hours

MODIFICATION IMPLEMENTATION PLAN

6

6.1 This instruction is to be implemented only when the existing Air Cleaner assembly requires replacement. This instruction is to be implemented by:

6.1.1 ARMY - Units authorised to carry out levels 2, 3 and 4 maintenance.

6.2 Associated instructions. Nil.

6.3 Strike plate action. N/A.

Action required by

7

7.1 Units and establishments holding equipment for repair.

7.1.1 If a new Air Cleaner Assembly is required, demand the stores listed at Para 7.

7.1.2 Carry out this instruction as detailed in Para 8.

7.2 Army units authorized to carry out levels 2, 3 and 4 maintenance and RAF units.

7.2.1 ARMY - When requested by units or during overhaul of equipment on charge without REME 1st Line Support, obtain the items listed in Para 8 and carry out this modification.

7.2.2 Record completion details of modification against appropriate entry in vehicle documents.

7.3 All recipients of this instruction. Add particulars to AESP 2320-H-100-821 General Instruction Index.

Stores, tools and equipment

8

8.1 Stores to be demanded.

8.1.1 The following items are to be demanded.

Item No.	DMC	NSN/Part No.	Designation	Qty per eqpt
	7BD	2945-99-480-8035	Mod set: Air Cleaner Assembly comprising	1
1	7BD	2945-99-407-8678	Cylinder and Filter Assembly	(1)
2	7BD	2945-99-743-2347	Cylinder	(1)
3	7BD	2945-99-773-1849	Filter	(1)
4		A 6000060	Gauge	(1)

5	A 6000061	Kevlar Hose	(1)
6	A 6000062	Bracket	(1)
7	4730-99-533-2969	Jubilee Clip	(1)
8	A 6000064	Bolt	(4)
9	A 6000065	Nut	(4)
10	A 6000066	Washer	(4)
11	A 6000067	Mounting Band	(2)
12	4730-99-420-3152	Jubilee Clip	(1)
13	A 6000069	Support	(2)

8.2 Stores to be removed and reduced to scrap.

Item No.	DMC	NSN/Part No.	Designation	Qty per eqpt
15			Air Cleaner Assembly	1
16		(7972686)	Dust Valve	(1)
17		2940-99-725-5101	Retaining Clip	(1)
18		2940-99-721-4364	Element	(1)
19		(93152047)	Cap	(1)
20		(91032304)	Bracket	(2)
21		2940-99-781-2427	Support	(2)
22		(11013233)	Washer	(4)
23		(120368)	Nut	(4)
24		(91032162)	Hose	(1)
25		4730-99-420-3152	Jubilee Clip	(1)
26		2940-99-807-0264	Jubilee Clip	(1)
27		(91032163)	Hose	
28			Air Cleaner Restrictor Indicator	(1)
29		4720-99-763-6041	Hose	(1)
30			Jubilee Clip	(2)

Sequence of operations

NOTE

The item numbers of Para 8 are used as reference throughout this instruction.

9 Carry out the instructions as follows.

9.1 The existing engine air cleaner assembly (item 15), and hoses (items 24, 27 & 29) (shown in Figs 1 & 2) may be removed by slackening the jubilee clip (item 30), removing four nuts (item 23), and washers (item 22) clamping the air cleaner assembly to the underside of the parcel shelf. Remove the two supports and brackets (items 21 & 20) and lift away the complete assembly.

9.2 The new engine air cleaner assembly (See Figs 3 & 4) can be fitted as follows:

Assemble the two mounting bands (item 11) to the air cylinder (item 2), adjust and tighten the clamp screws. Locate the four mounting holes in the underside of the parcel shelf vacated by the old air cleaner and align the brackets (item 6) as shown in Fig 3. Locate the four mounting holes from the top of the parcel shelf, align the supports (item 13) as shown and secure with the four bolts, nuts and washers (items 8, 9 & 10). Connect the hose (item 5) using jubilee clip (item 7) to the existing connections vacated by the hose (see item 29, Fig 2) and new cylinder (item 1) using jubilee clip (item 12).

TESTING AFTER EMBODIMENT

10 Run engine and check for leaks.

EFFECT ON WEIGHT

11 Negligible.

PUBLICATION AMENDMENTS

NOTE

Necessary amendments will be issued separately.

12 Nil.

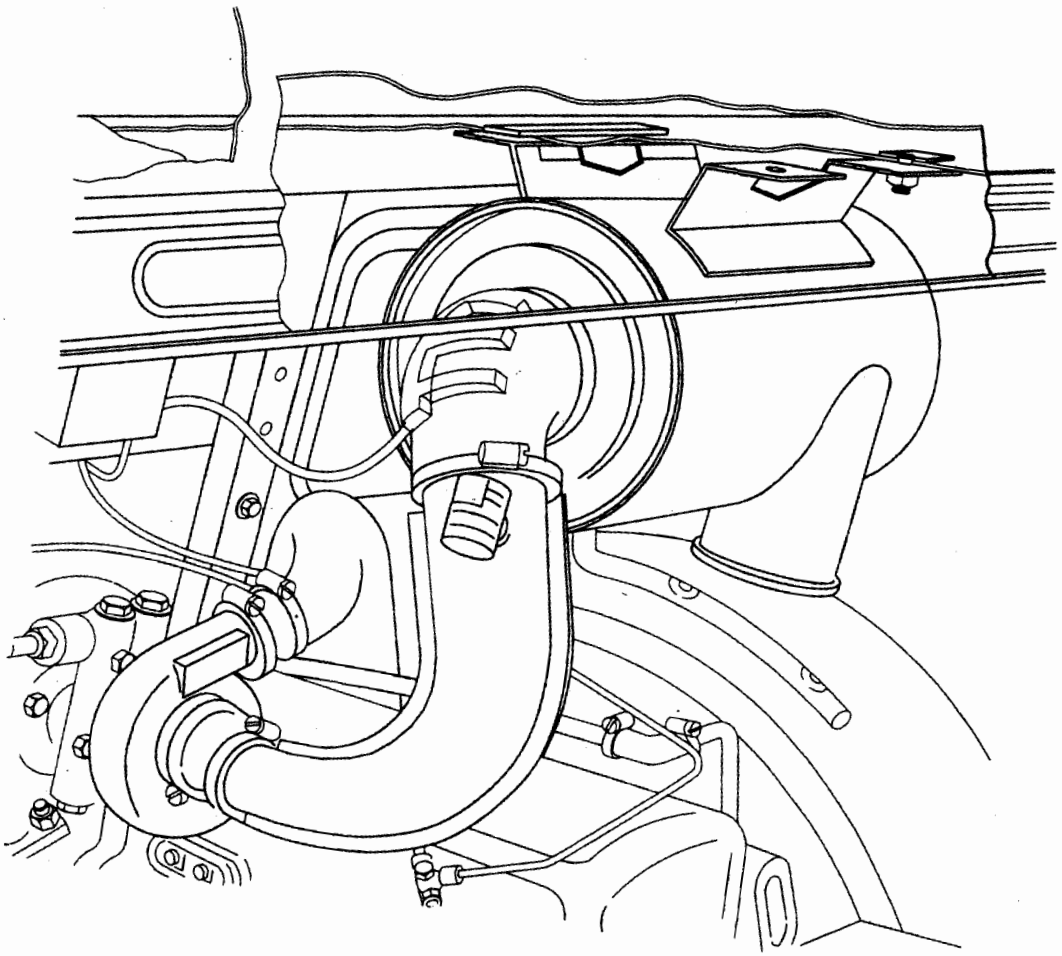

Fig 1 Old Air Cleaner

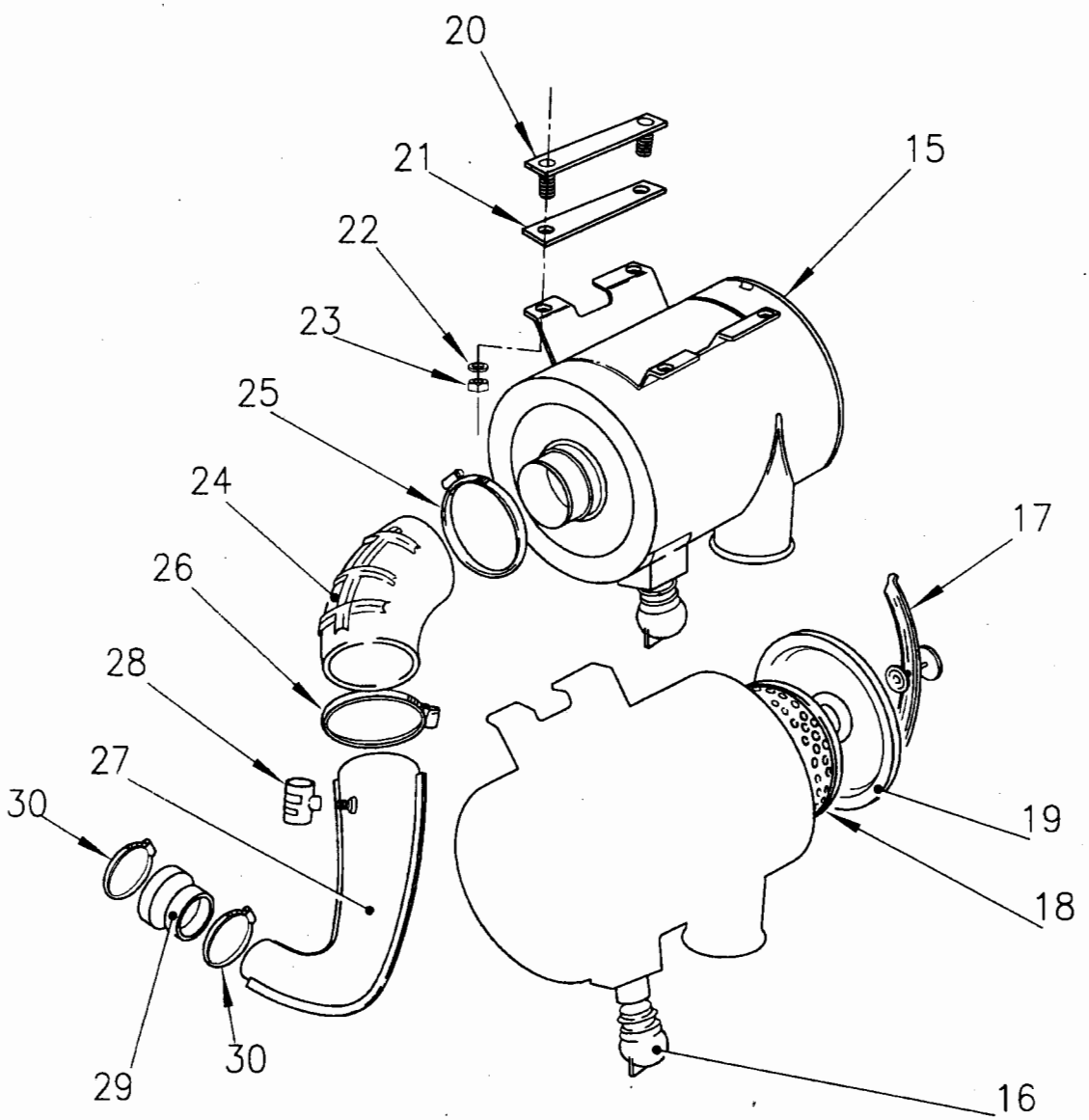

Fig 2 Details of Old Air Cleaner

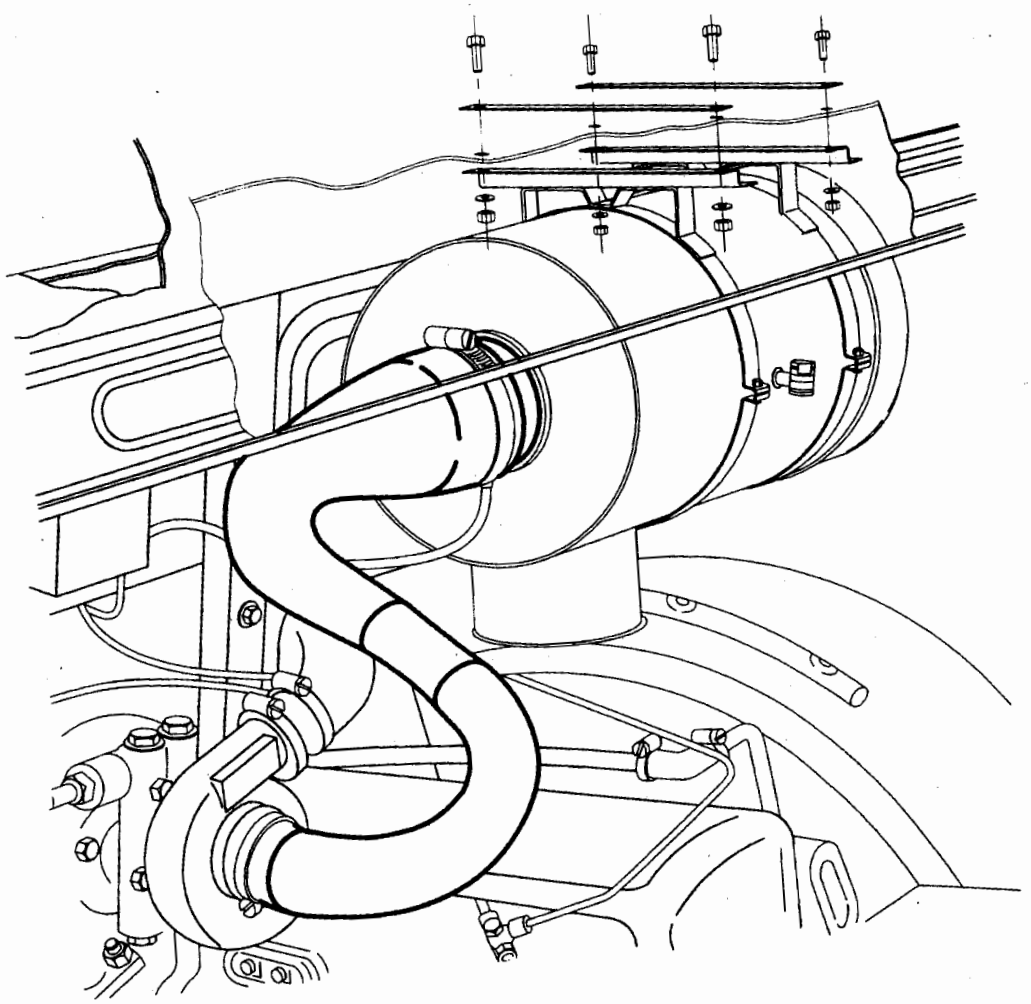

Fig 3 New Air Cleaner

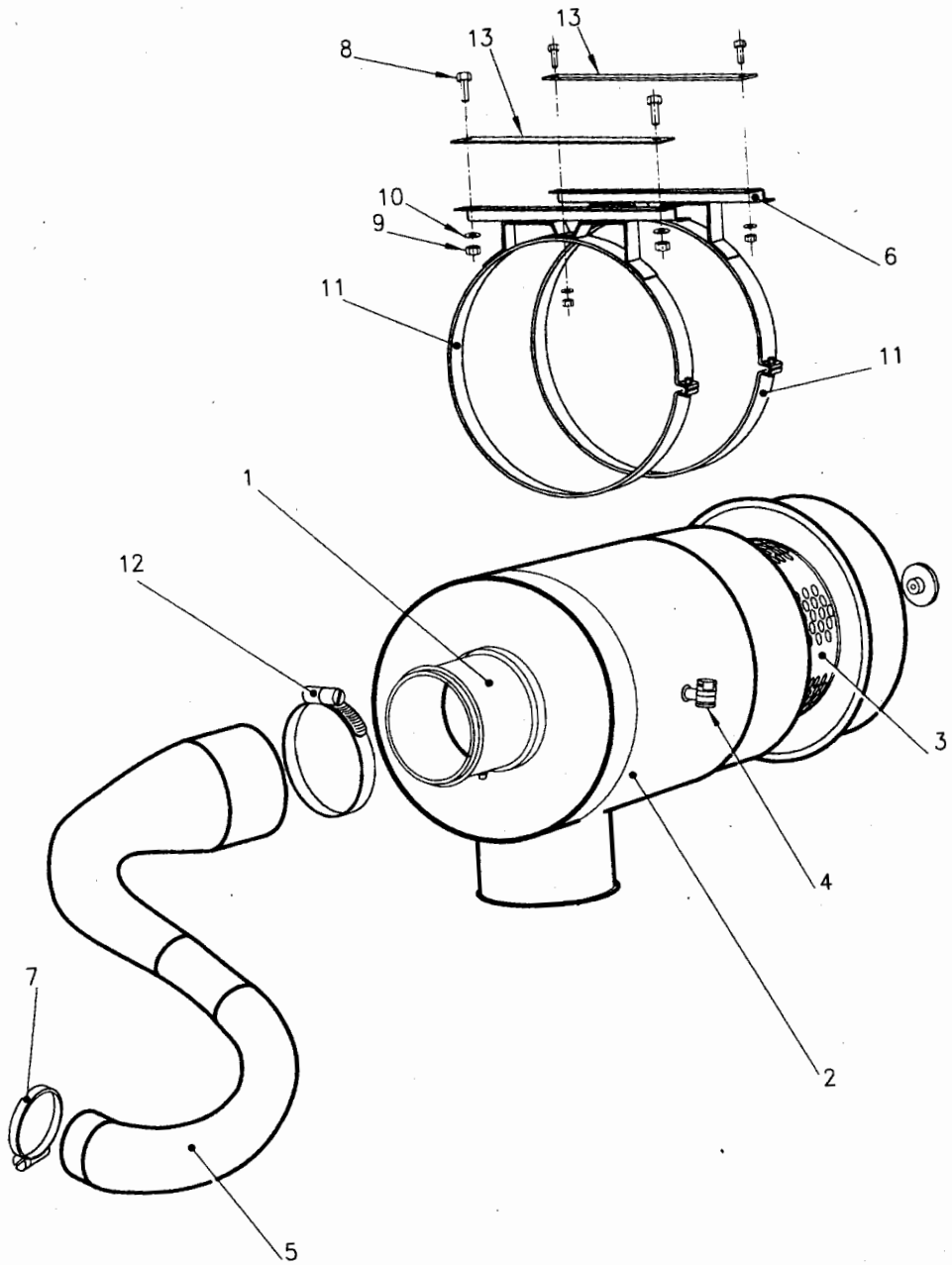

Fig 4 Details of New Air Cleaner

TRUCK 4 TONNE 4 X 4 BEDFORD MJ (ALL VARIANTS)

GENERAL INSTRUCTION No. 24

Sponsor: GSV IPT
Project No.: AU 41
File Ref: PDS GSV2/005

Publication Authority: TES TI Andover

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
1		
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Amdt No.	Incorporated By (Signature)	Date
4		
5		
6		

SUBJECT: Multi-pin plug connectors

(Approval No. GSV/04/052)

INTRODUCTION

1 The original fitted multi-pin plug connectors for all wiring looms are now unobtainable.

1.1 Limitations on use of equipment. Nil.

APPLICABILITY

2 All Bedford 4 tonne 4 x 4 trucks.

2.1 Only to be introduced when multi-pin plug connector supplies are exhausted.

REASON FOR INTRODUCTION

3 Code 5 - to conform to changes in pattern of commercial stores.

PRIORITY

4 N/A.

ESTIMATED TIME REQUIRED

5 1.5 hrs.

MODIFICATION IMPLEMENTATION PLAN

6

6.1 This instruction is to be implemented by:

6.1.1 ARMY - Units authorized to carry out levels 2, 3 or 4 maintenance.

6.1.2 RAF - Units when required.

6.2 Associated instructions. Nil.

6.3

6.3 Strike plate action: N/A.

Action required by

7

7.1 Units and establishments holding equipment.

7.1.1 Examine equipment documents to see if modification is applicable.

7.1.2 Examine equipment or modification record plate to see if modification is embodied and where necessary Units with 1st Line REME Support demand the stores required.

7.1.3 ARMY - On receipt of stores, request REME to modify equipment.

7.1.4 ARMY - Record the AESP and instruction number in equipment documents.

7.1.5 RAF - Record modification details on AF G1084A and Form 4870. Units operating STAMA are also to record modification details on ADP MTMS Job Certification Sheet and to follow the procedures laid down in AP 100C-08A.

7.2 Army units authorized to carry out levels 2, 3 and 4 maintenance and RAF units.

7.2.1 ARMY - When requested by units or during overhaul of equipment on charge without REME 1st Line Support, obtain the items listed in Para 8 and carry out this modification.

7.2.2 Record completion details of modification against appropriate entry in vehicle documents.

7.2.3 Complete AF G1084A when reporting completion of the modification to FORWARD (RAF) using the following code:

RAF: MODIFICATION CODE: AFC 309

NOTE

RAF units operating STAMA are also to complete ADP MTMS Job Certification Sheet and to follow the procedures laid down in AP 100C-08A.

7.3 All recipients of this instruction. Add particulars to AESP 2320-H-100-821 Gen Instr Index.

Stores, tools and equipment

8

8.1 Stores to be demanded.

8.1.1 The following items are to be demanded quoting this instruction as the authority.

Item No.	DMC	NSN/Part No.	Designation	Qty per eqpt
			Mod set comprising:	1
1	Z37	5940-99-805-0220	Terminal quick disconnect	As required
2	6MT4	5935-99-519-8081	Plug tip	As required
3	Z42	5970-99-947-0584	Plug sleeve	As required

Sequence of operations

NOTE

The item numbers of Para 8 are used as reference throughout this instruction.

9 Carry out this instruction as follows:

9.1 As and when wiring loom multi-pin connectors need replacing, a bullet and plug system (which has an IP rating at least equivalent to the original multi-plugs), must be used. Each connector to be soldered individually.

TESTING AFTER EMBODIMENT

10 The integrity of each connection is to be tested.

EFFECT ON WEIGHT

11 Negligible.

PUBLICATION AMENDMENTS

NOTE

Necessary amendments will be issued separately.

12 Nil.

CONDITIONS OF RELEASE

~~1 This information is released by the UK Government for Defence purposes only.~~

~~2 This information must be afforded the same degree of protection as that afforded to information of an equivalent security marking originated by the recipient Government or as required by the recipient Government's security regulations.~~

~~3 This information may be disclosed only within the Defence Department of the recipient Government, except as otherwise authorized by the Ministry of Defence (Army).~~

4 This information may be subject to privately owned rights.

TRUCK, 4 TONNE, 4 X 4, BEDFORD MJ

(ALL VARIANTS)

GENERAL INSTRUCTION NO. 25

CANCELLATION

INTRODUCTION

1 This instruction authorises the cancellation of Category 533 in the Octad 2320-H-100. This category is obsolete.

ACTION

2 Remove and destroy all copies of Cat 533 under reference AESP 2320-H-100-821 General Instruction No. 25.

3 File this instruction in 2320-H-100-821 for reference.

4 Record this instruction in the General Instruction Index in 2320-H-100-821.

CONDITIONS OF RELEASE

~~1 This information is released by the UK Government for Defence purposes only.~~

~~2 This information must be afforded the same degree of protection as that afforded to information of an equivalent security marking originated by the recipient Government or as required by the recipient Government's security regulations.~~

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TRUCK, 4 TONNE, 4 X 4, BEDFORD MJ

(ALL VARIANTS)

GENERAL INSTRUCTION NO. 25

CANCELLATION

INTRODUCTION

1 This instruction authorises the cancellation of Category 533 in the Octad 2320-H-100. This category is obsolete.

ACTION

2 Remove and destroy all copies of Cat 533 under reference AESP 2320-H-100-821 General Instruction No. 25.

3 File this instruction in 2320-H-100-821 for reference.

4 Record this instruction in the General Instruction Index in 2320-H-100-821.

ARMY EQUIPMENT
SUPPORT PUBLICATIONS

2815-K-062-512
October 1983

ENGINE, DIESEL, 6 CYLINDER , BEDFORD, 5.4 LITRES, TURBO-CHARGED

REPRINTED FEB 1993 INCORPORATING AMDT NO 1

FAILURE DIAGNOSIS

AND

REPAIR INFORMATION

This publication contains information covering the requirements of Category 5, Sub-Categories 1 and 2 at information levels 2, 3 and 4.

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

Sponsor:
DGEME(A) EME 7b
File ref: D/DGEME/125/8/16 EME7b

Publication Authority:
Vehs & Wpns Br REME
Project No: 7b 1067 (221)
File ref: 7b1067/AESP/N

AMENDMENT RECORD

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CONTENTS

(continued)

CONTENTS (continued)

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CONTENTS (continued)

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CONTENTS (continued)

PREFACE

EQUIPMENT IDENTIFICATION

	NSN	Engine model
1	Various depending on application	5.4 litre (330 in^3) turbo-charged

AMENDMENT IDENTIFICATION

2 Except for manuscript entries, amendments are identified by marginal side lining. Manuscript amendments are identified by Amdt No in outside margin in line with amendment.

COMMENTS ON THIS PUBLICATION

3 Comments on this publication are to be forwarded in accordance with AESP 0100-P-011-013 to Vehicles and Weapons Branch REME, Chobham Lane, Chertsey, Surrey KT16 0EE.

ASSOCIATED PUBLICATIONS

EMER Wksp N 345	Split shell bearings, assembly techniques using Plastigage method
EMER Wksp N 111	Preservation, identification and packaging of assemblies (including engines)
EMER T&M A 028 Chap 010	Non destructive testing methods
EMER Power M 340-9	Fuel injection equipment - fuel injectors
EMER Power M 120-9	Fuel injection equipment - CAV distributor type, fuel injection pumps

FAILURE DIAGNOSIS

TABLE 1 - ENGINE FAILURE DIAGNOSIS

Ser	Fault	Possible causes	Remedy
(1)	(2)	(3)	(4)
1	Low engine oil pressure	Low oil level	Check oil level on dipstick. If necessary top-up with recommended engine oil.
		Incorrect grade of oil	Drain oil pan and renew oil filter elements. Refill with recommended oil.
		Oil pressure warning lamp defective	Check warning lamp, switch and wiring. Rectify as necessary.
		Obstructed oil filter	Check oil ways to filter, clean and renew filter elements as necessary.
		High oil temperature	Check engine coolant flow and aeration.
		Leaking or obstructed oil pump suction pipe or filter screen	Remove oil pan, check screen and suction pipes for leaks or obstruction, rectify as necessary.
		Defective oil pump	Overhaul or renew oil pump.
		Defective bearings and journals	Check and renew as necessary.
		Oil diluted by fuel	Check for correct operating temperature and excessive engine idling periods. Check fuel lift pump diaphragm.
2	High engine oil consumption	High oil level	Check oil level on dipstick. Drain oil pan as necessary.
		Incorrect grade of oil	Drain oil pan and renew oil filter elements. Refill with recommended oil.
		External oil leaks	Inspect engine for external leaks. Check flywheel housing for crankshaft rear oil seal leakage.
		Obstruction of crank-case ventilation	Clean as necessary

(continued)

TABLE 1 - ENGINE FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
	High engine oil consumption (contd)	Air compressor passing engine oil into brake air system	Check for oil being released from air system automatic drain valve. Overhaul or renew compressor and clean air system as necessary.
		Intake valve guides worn	Check guides for wear, renew if necessary. Check rocker levers for wear.
		Piston rings, piston and cylinder liners worn.	Overhaul engine.
3	Sludge in oil pan	Water in oil	Check sludge inside oil filters for water content. Place same sludge on a hot surface, if it splutters, check for water leaks from core plugs in cylinder head or block. Check for cracked cylinder head or block.
		Cold engine operation (under full load)	Check for correct operation of thermostats and thermostatic fan. Check for excessive engine idling periods.
		Incorrect grade of oil	Drain oil pan and renew oil filter elements. Refill with recommended oil.
		Oil diluted with fuel	Check for excessive engine idling periods. Check fuel lift pump diaphragm.
		Air intake restricted	Check air cleaner element and trunking. Clean turbo-charger impeller.
		Excessive exhaust back pressure	Check for blocked exhaust system and incorrect pipe bends.
		Defective fuel injectors (excessive exhaust smoke, loss of power)	Clean or renew injectors.
		Poor valve seating (loss of compression)	Remove and overhaul cylinder head.
		Piston rings, pistons and cylinder liners worn (high crankcase compression)	Overhaul engine

(continued)

TABLE 1 - ENGINE FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
4	Dilution of engine lubricating oil	Cold engine operation	Check for correct operation of thermostats. Check for excessive engine idling periods.
		Defective fuel injectors (excessive exhaust smoke, loss of power).	Clean or renew injectors.
		Defective fuel injection pump	Overhaul or renew fuel injection pump.
		Weak compression	Check compressions, overhaul cylinder head or cylinder block as necessary.
5	Coolant temperature too low	Excessive engine idling periods	Inform driver that excessive engine idling may cause severe engine damage.
		Faulty thermostats	Check operation of thermostats, renew if necessary.
6	Coolant temperature too high	Insufficient coolant	Top-up coolant level and pressure test for leaks.
		Fan belts require adjustment	Check condition of belts, renew belts if necessary (belts are serviced in matched pairs, if one belt fails both belts must be renewed). Adjust fan belt tension.
		Radiator fins obstructed	Clean dirt, leaves etc. from radiator fins and core.
		Water pump inoperative	Check operation of water pump, renew if necessary.
		Internal obstruction in radiator	Check coolant flow rate, clean radiator and cooling system as necessary.
		Air in cooling system	Check for compression leakage into cooling system. Check and tighten hose connections and gasket flanges.
		Viscous fan drive will not engage	Renew viscous drive unit.

(continued)

TABLE 1 - ENGINE FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
7	Coolant system pressurising	Air in cooling system	Check for air pockets in cooling system.
		Suction leakage at water pump and hoses	Check for leaks at water pump gasket and vent hole. Check for perished hoses and loose hose connections.
		Pressure relief valve seized in closed position	Check valve and renew if necessary
		Injector sleeves leaking	Renew injector sleeves and seals.
		Cylinder head casting cracked or porous	Remove cylinder head and pressure check for leaks.
8	Engine fails to start	Insufficient fuel in tank	Refill fuel tank and air vent fuel system.
		Air in fuel system	Check that all joints and unions are air tight. Air vent fuel system.
		Defective engine stop control	Check that stop control is in run position. Check cable is not seized and is correctly adjusted.
		Batteries in a low state of charge or cables and terminals are corroded	Check battery condition, re-charge or renew batteries. Clean or renew cable ends and clean terminals.
		Water in fuel system	Check for water in sedimenter bowl and main fuel filter. Drain fuel tank if necessary.
		Insufficient or no fuel entering fuel injection pump	Check for blocked main filter element and leaks in fuel pipes. Check operation of fuel lift pump.
9	Gradual loss of engine power	Air intake restricted. May be accompanied with excessive exhaust smoke	Check air cleaner element and trunking.
		Main fuel filter restricted	Renew fuel filter element.

(continued)

TABLE 1 - ENGINE FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
	Gradual loss of engine power (contd)	Accelerator linkage seized or worn	Check for full accelerator action. Lubricate or renew joints as necessary.
		Defective fuel lift pump	Overhaul or renew fuel lift pump.
		Insufficient engine maximum rev/min	Adjust engine maximum no-load rev/min.
		Defective fuel injectors	Clean or renew injectors.
		Turbo-charger impeller dirty	Clean impeller.
10	Slow deceleration	Accelerator linkage seized	Lubricate joints. Check speed control lever on fuel injection pump, for correct operation.
		Air leak into fuel system	Check seals and gaskets in fuel lift pump, filter and sedimenter. Check fuel pipes for cracks and loose connections.
		Speed control worn on fuel injection pump	Overhaul or renew fuel injection pump.
11	Engine surges at idling speed	Air in fuel system	Check fuel system for leaks. Air vent fuel system.
12	Excessive fuel consumption	Excessive engine idling periods	Inform driver that excessive engine idling increases fuel consumption and may cause engine damage.
		Air intake restricted. May be accompanied with excessive exhaust smoke	Check air cleaner element and trunking for obstruction.
		Defective fuel injectors	Clean or renew injectors.
		Fuel lift pump delivery pressure too high	Overhaul or renew fuel lift pump
		Restriction in exhaust system	Damaged or restricted exhaust can reduce air intake causing low power and high fuel consumption. Check back pressure under full load.

(continued)

TABLE 1 - ENGINE FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
13	Excessive exhaust smoke	Air intake restricted May be accompanied with power loss and high fuel consumption	Check air cleaner element and trunking for obstruction.
		Poor fuel	Check fuel for recommended specification, if necessary drain fuel and refill with correct fuel. Air vent fuel system.
		Defective fuel injectors	Overhaul or renew injectors.
		Turbo-charger impeller dirty or bearings worn	Clean or renew turbo-charger.
14	Erratic or intermittent loss of engine power	Air leak into fuel system	Check seals and gaskets in fuel lift pump, filter and sedimenter. Check fuel pipes for cracks and loose connections.
		Floating obstruction in fuel tank	Drain and clean fuel tank. Refill with clean fuel.
		Fuel lift pump delivering insufficient fuel	Repair or renew fuel lift pump.
		Internal lining of fuel suction hose loose or cracked. This may cause an intermittent blockage	This blockage may occur at any time, but is more common when engine is under full load. Check hose carefully and renew as required.
		Seized injector plunger (this will cause a definite misfire)	Renew defective injector.
15	Sudden loss of engine power	No fuel in tank	Refill fuel tank and air vent fuel system.
		Accelerator linkage disconnected	Reconnect and adjust linkage.
		Internal lining of fuel suction hose loose or cracked	Check hose carefully, renew hose as required.

(continued)

TABLE 1 - ENGINE FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
	Sudden loss of engine power (contd)	Air leak into fuel system	Check seals and gaskets in fuel lift pump, filter and sedimenter. Check fuel pipes for cracks and loose connections.
		Air intake restricted, accompanied by excessive exhaust smoke	Check air cleaner element and trunking for obstruction. Check operation of turbo-charger.
		Seized injectors	Renew injectors, check for water in fuel and correct fuel specification.
		Fuel congealed in extreme cold weather conditions	Incorrect fuel specification in use. Drain and clean fuel system and tank. Refill tank, a fuel suitable for operating at low temperatures must be used.

TABLE 2 - TURBO-CHARGER FAILURE DIAGNOSIS

Ser	Fault	Possible causes	Remedy
(1)	(2)	(3)	(4)
1	Noisy operation or vibration of turbo-charger	Insufficient lubrication to turbo-charger bearings	Check oil pressure to bearings. Clean or renew oil supply pipe. Overhaul turbo-charger.
		Leak in engine intake or exhaust manifolds	Tighten loose connections. Renew manifold gaskets and seals as necessary.
2	Engine will not deliver rated power	Engine fault	Refer to engine diagnostic chart.
		Engine air intake restricted	Check air cleaner element and trunking for obstruction.
		Restriction in exhaust system	Check for restriction or damage in exhaust system.
		Excessive build-up of dirt in compressor wheel or carbon in turbine.	Disassemble and clean turbo-charger. Renew air cleaner element and check for leakage in trunking.
		Leak in engine intake or exhaust manifolds	Tighten loose connections. Renew manifold gaskets and seals as necessary.
		Turbo-charger bearing seized	Overhaul turbo-charger. Check oil supply pressure.

TABLE 3 - FUEL SYSTEM AND EXHAUST SYSTEM FAILURE DIAGNOSIS

CAUTION ...

Before any part of the fuel system is dismantled the surrounding area must be thoroughly cleaned.

Ser	Fault	Possible causes	Remedy
(1)	(2)	(3)	(4)
1	Engine fails to start or is difficult to start	Insufficient fuel in tank	Refill fuel tank and air vent fuel system.
		Defective engine stop control	Check that stop control is in run position. Check cable is not seized and is correctly adjusted.
		Blocked fuel filter	Change main fuel filter element and drain fuel sedimenter bowl. Check that the fuel system does not contain water. In sub-zero temperatures check for ice blockages in fuel system. At very low temperatures it is possible for wax crystals to separate from the fuel and cause a blockage.
		Incorrect cold start procedure is being used	Check cold start procedure.
		Cold start aid inoperative	Check operation of igniters and header tank solenoid. Check that a full supply is available from header tank.
		Defective fuel injection pump drive	Repair as necessary.
2	Engine starts then stops	Insufficient fuel in tank	Refill fuel tank and air vent fuel system.
		Restriction in fuel system	Check for blocked main fuel filter element and leaks in fuel pipes. Check operation of fuel lift pump. Check filler cap pressure relief valve. Air vent fuel system.
		Engine air intake restricted	Check air restriction indicator and if necessary renew air cleaner element. Check turbo-charger for correct operation.

(continued)

TABLE 3 - FUEL SYSTEM AND EXHAUST SYSTEM FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
	Engine starts then stops (contd)	Insufficient engine idling rev/min	Adjust engine idling rev/min.
		Check engine condition	Check valve clearances Check valve timing Check cylinder compressions.
3	Incorrect engine idling and maximum speeds	Engine speed control stop incorrectly adjusted	Adjust engine idling and maximum no-load rev/min.
		Engine air intake restricted	Check air restriction indicator and if necessary renew air cleaner element. Check turbo-charger for correct operation.
		Restriction in fuel system	Check for blocked main fuel filter element and for water or dirt in sedimenter bowl. Check for leak in fuel pipes. Air vent fuel system.
		Accelerator linkage seized or worn	Check for full accelerator action. Lubricate or renew joints as necessary.
		Fuel lift pump delivery incorrect amount of fuel	Repair or renew fuel lift pump.
		Defective fuel injectors	Overhaul or renew injectors.
		Check engine condition	Check valve clearances Check valve and injection pump timing Check cylinder compressions.
4	Engine mis-firing and running unevenly	Defective fuel lift pump	Repair or renew fuel lift pump.
		Defective fuel injectors	Overhaul or renew injectors.
		Air in fuel system	Check for leaks and air vent fuel system.
		Check engine condition	Check valve clearances Check idling speed rev/min Check cylinder compressions.

(continued)

TABLE 3 - FUEL SYSTEM AND EXHAUST SYSTEM FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
5	Lack of engine power and excessive fuel consumption. (Before checking the following possible causes, ensure that the vehicle is not being operated with loads in excess of its plated weight, and the tyre pressures are correct. Check that the clutch is not slipping and the brakes are not binding).	Incorrect fuel injection pump settings	Check if pump seals have been tampered with, adjust and reseal as necessary.
		Engine air intake restricted	Check air restriction indicator and if necessary renew air cleaner element.
		Restriction in fuel system	Check that fuel lift pump is delivering correct fuel pressure. Check for leaks in fuel system. Check that fuel tank filler cap pressure relief valve is operating correctly.
		Accelerator linkage seized or worn	Check for full accelerator action, adjust if necessary. Lubricate or renew all joints as necessary.
		Restriction in exhaust system	Damaged or restricted exhaust system can reduce air intake causing low power and high fuel consumption. Check back pressure under full load.
		Defective engine stop control	Check that stop control cable is not seized and is correctly adjusted.
		Defective fuel injection equipment	Remove and test injectors. Check fuel injection timing. Overhaul or renew injectors and fuel injection pump as necessary.
		Check engine condition	Check valve clearances Check valve timing Check cylinder compressions
6	Excessive exhaust smoke	Engine air intake restricted	Check air restriction indicator and if necessary renew air cleaner element. Check turbo-charger for correct operation.
		Defective fuel injection equipment	Remove and test injectors. Ensure that the specified type of injectors are used. Check injection pump timing. If injection pump is suspect it must be renewed.

(continued)

TABLE 3 - FUEL SYSTEM AND EXHAUST SYSTEM FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
7	Engine surge	Accelerator linkage seized or worn	Check linkage for wear. Lubricate as necessary.
		Air leak into fuel system	Check for leaks and air vent fuel system.
		Speed control on fuel injection pump seized or worn	Repair or renew fuel injection pump.
		Defective fuel injectors	Remove and test injector. Check that specified type are used.
8	Slow decelera-tion	Accelerator linkage seized or worn	Check linkage for wear. Lubricate as necessary.
		Speed control or fuel injection pump seized or worn	Repair or renew fuel injection pump.
		Restriction in fuel return pipe	Rectify as necessary.

TABLE 4 - COOLING SYSTEM FAILURE DIAGNOSIS

Ser	Fault	Possible causes	Remedy
(1)	(2)	(3)	(4)
1	Engine coolant temperature too high	Viscous fan drive will not engage	Renew viscous drive unit.
		Fan belts require adjustment	Check condition of belts, renew belts if necessary. (Belts are serviced in matched pairs, if one belt fails both belts must be renewed). Adjust fan belt tension.
		Insufficient coolant	Top-up coolant level and check for leaks.
		Thermostat seized in closed position	Check operation of thermostats, renew if necessary.
		Radiator fins obstructed	Clean dirt, leaves etc. from radiator fins and core.
		Water pump inoperative	Check operation of water pump, renew if necessary.
		Internal obstruction in radiator	Check coolant flow rate, clean radiator and cooling system as necessary.
2	Engine coolant temperature too low	Viscous fan drive will not dis-engage	Renew viscous drive unit.
		Temperature gauge showing incorrect reading	Renew temperature gauge or sender unit.
		Thermostats seized in open position or incorrect type in use	Remove thermostats, check operation and renew as necessary.
3	Loss of engine coolant	Damaged hoses or loose connections	Check condition of hoses and security of connections.
		Leaks from radiator	Check for leak from radiator and repair as necessary.
		Water pump leaking	Overhaul or renew water pump.
		'0' rings rear of cylinder head leaking	Remove cylinder head and renew '0' rings.

(continued)

TABLE 4 - COOLING SYSTEM FAILURE DIAGNOSIS (continued)

(1)	(2)	(3)	(4)
	Loss of engine coolant (contd)	Pressure relief valve defective	Check valve and renew if necessary.
		Injector sleeves leaking	Renew injector sleeves and seals
		Cracked or porous casting. Leaks from core plugs	Check for cracked or porous cylinder head and block. Check core plugs for leaks.

REPAIR INSTRUCTIONS

TABLE 5 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	VR 2059	7BD/5120-99-815-9752	Injector sleeve remover
2	Z 8382	7BD/5120-99-815-4620	Injector sleeve installer
3	VR 2021	7BD/5120-99-811-6794	Camshaft and fuel injection pump drive gear remover
4	VR 2021/7+8		Spacers
5	VR 2032	7BD/5120-99-833-4217	Crankshaft gear remover
6	VR 2005	7BD/5120-99-828-6734	Crankshaft gear and pulley installer
7	Z 8467	7BD/5120-99-828-6731	Camshaft and fuel injection pump drive gear installer
8	Z 8385	7BD/5120-99-828-6737	Crankshaft rear seal installer
9	VR 2027	7BD/5120-99-810-8175	Main bearing cap seal installer
10	D 1031	7BD/4910-99-430-5587	Valve adjuster
11	Z 8378	7BD/5120-99-828-6742	Valve guide remover
12	Z 8562	7BD/5120-99-811-6791	Valve guide installer
13	VR 2145	7BD/5120-99-828-6735	Crankshaft pulley remover
14	KM 2048	7BD/5120-99-836-3234	Timing cover aligner
15	D 1122	7BD/5120-99-801-4103	Injector remover
16	Z 8381	7BD/5120-99-401-9945	Cleaner injector seat and sleeve

VALVE TIMING CHECK

1 Valve timing can be checked by the following method, without removing timing case.

1.1 Remove the flywheel underpan and mark the flywheel between the 40th and 41st teeth from the U/C mark, counting in the opposite direction of engine rotation.

1.2 Mount a dial gauge over No 1 intake valve (on some engines it is more convenient to use the intake valve of the rear cylinder) with gauge plunger contacting spring cap.

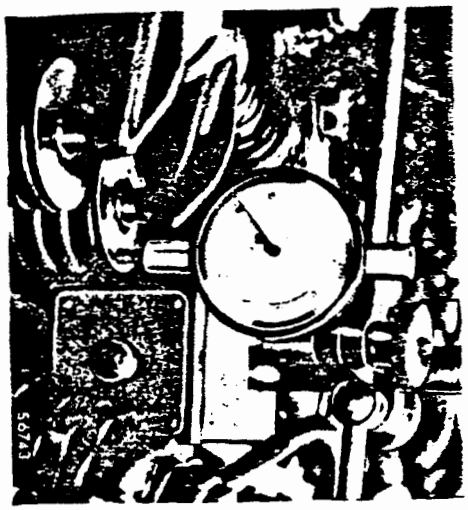


Fig 1 - Valve timing check

1.3 Turn the engine in the normal direction of rotation until, by observing the gauge, the intake valve is seen to be fully open. At this point, the mark made on the flywheel should coincide with the pointer in the timing aperture in the clutch housing. A discrepancy of 4 and 5 teeth on the flywheel ring gear indicates a one tooth error in the valve timing. A discrepancy of between 1 and 4 teeth indicates excessive gear backlash or wear in the keyways of the crankshaft or crankshaft gear, or of the key itself.

VALVE CLEARANCE ADJUSTMENT

2 Whenever the valve rocker gear is disturbed it will be necessary to make a preliminary setting of the valve clearances before cranking the engine. Turn the engine until the valves of No 6 cylinder are in the 'overlap' position, i.e. the exhaust valve about to close and the intake valve just commencing to open. If the adjustment of the valve clearances has been disturbed there is a possibility of a valve head contacting the top of a piston. The engine should therefore be turned slowly to avoid the risk of damage, and if any doubt exists the rocker adjustment screws should be slackened to give adequate clearance. Valve clearances should be 0.35 mm (0.013 in.). Adjust the intake and exhaust valve clearances of No 1 cylinder.

3 Check the remaining valve clearances in the following sequence:

Valve overlap position on:	Adjust valve clearance on:
No 2 cylinder	No 5 cylinder
No 4 cylinder	No 3 cylinder
No 1 cylinder	No 6 cylinder
No 5 cylinder	No 2 cylinder
No 3 cylinder	No 4 cylinder

4 Normal valve clearance adjustment is to be carried out with engine running at 550 rev/min and at operating temperature. Use Adjuster 7BD/4910-99-430-5587 (D1031) to turn adjusting screw.

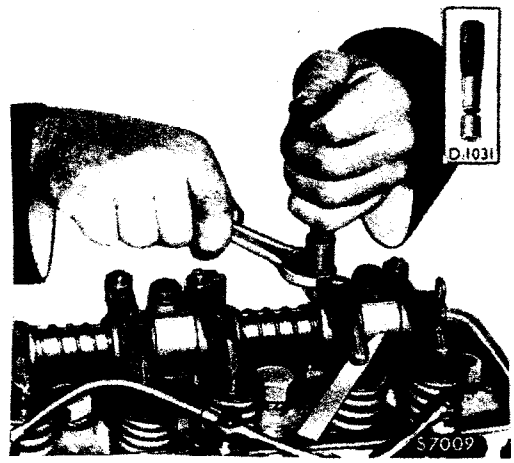


Fig 2 - Valve clearance adjustment

VALVE ROCKERS AND PUSH RODS

Removal

5 To gain access to valve rockers and push rods the rocker cover must first be removed. Rocker shaft assembly may be removed after releasing the rocker shaft bracket bolts.

6 A single push rod may be removed by ensuring corresponding valve is closed and slackening adjusting screw until it is clear of push rod.

7 Individual valve rockers may be removed from the rocker shaft after removing end tension springs.

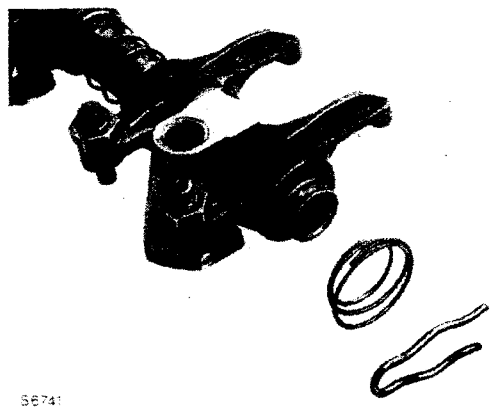


Fig 3 - Removing valve rockers and brackets

Installation

8 Replacement rocker bushes consist of two narrow bushes which should be pressed in from each side of rocker until outer ends are flush. The split in each bush should be to top of rocker. After installation, bushes should be honed to provide 0.022/0.066 mm (0.0009/0.0026 in.) clearance with rocker shaft.

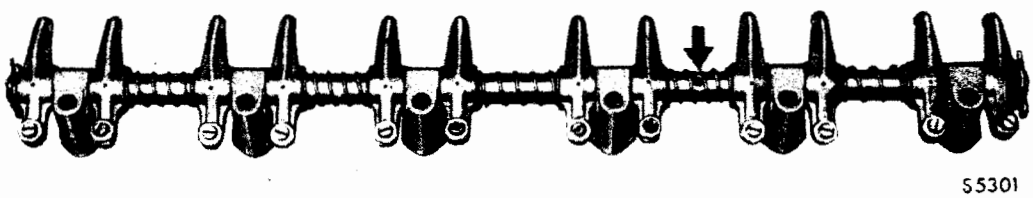


Fig 4 - Location of oil inlet hole

9 When assembling rockers and brackets to shaft, position shaft oil inlet hole at the top and between Nos 4 and 5 rockers.

10 Assemble end tension springs on rocker shaft with their wider coils in contact with lock springs.

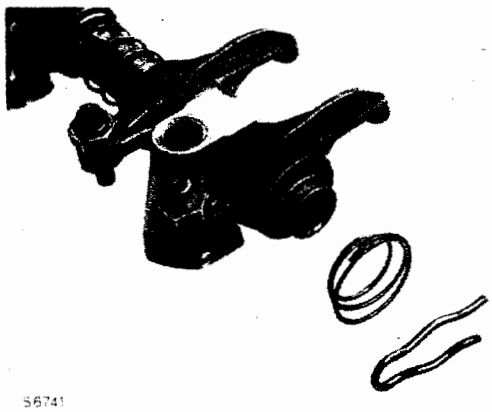


Fig 5 - Installing valve rockers and brackets

11 To ensure correct oil feed to rockers, check that dimension 'A' in crimped end of oil feed pipe is 0.64 mm (0.025 in.).

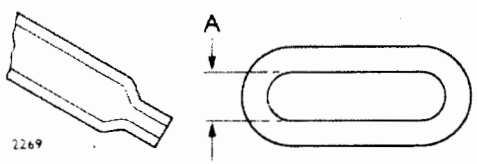


Fig 6 - Oil feed pipe end dimension

12 The oil feed pipe is a push fit in a drilling (arrowed).

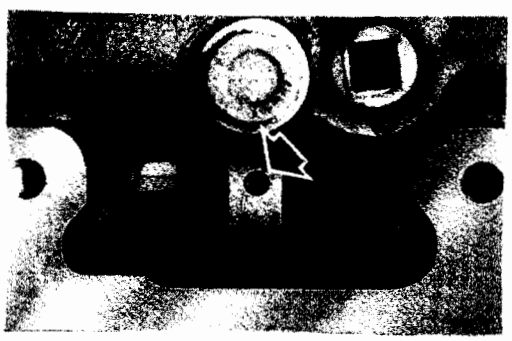


Fig 7 - Oil feed hole in cylinder head

13 The peg of the pipe is secured in the rocker shaft by a spring clip.

14 Valve rocker shaft bracket bolts are to be tightened evenly to 58 Nm (43 lbf ft). Adjust valve clearances as described in para 2.

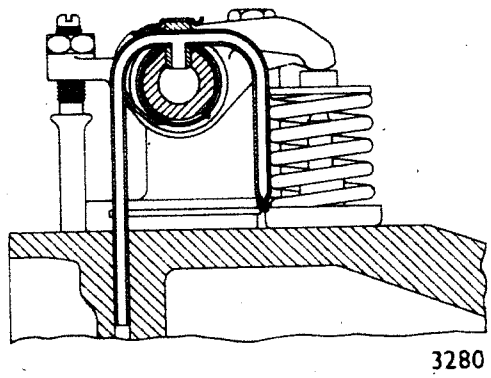


Fig 8 - Oil feed pipe securing clip

CAM FOLLOWERS

Removal

15 Cam followers may be withdrawn after removing rocker gear and push rod cover.

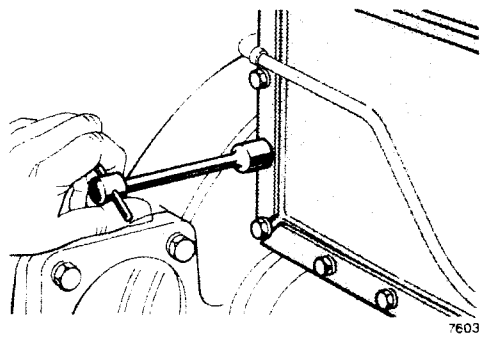


Fig 9 - Removing push rod cover

16 When installing cam followers, lubricate with graphited oil to prevent scuffing on initial starting. When installing push rod cover, smear jointing compound on threads of bolts used to secure cover to cylinder head.

CYLINDER HEAD

Removal

17 The cylinder head is secured to the cylinder block by fourteen bolts. When removing head, do not drag it across locating dowels otherwise gasket face may be irreparably damaged.

Installation

18 Prior to installation, locate new sealing rings in water ports at rear of cylinder block.

19 Cylinder head gaskets should have a pre-applied sealer. However, gaskets without sealer must be installed with a 25 mm (1.00 in.) wide bead of Wellseal to both sides of gasket on rocker shaft side.

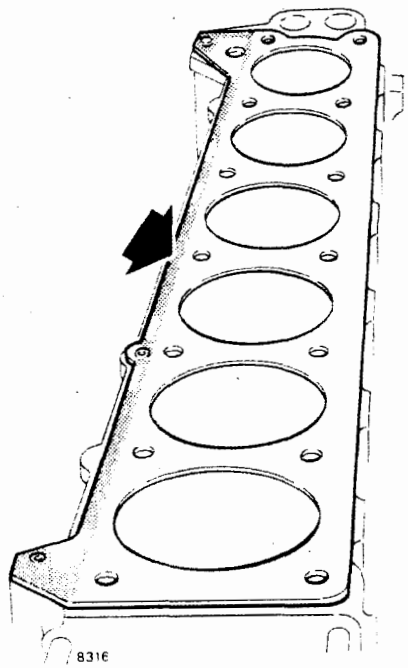


Fig 10 - Cylinder head gasket sealer installation

20 Cylinder head bolts must be tightened gradually and evenly to 260 Nm (192 lbf ft) in the order shown after lightly lubricating threads of bolts with EP gear oil.

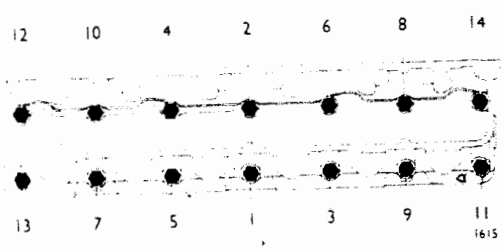


Fig 11 - Cylinder head bolt tightening sequence

VALVES AND SPRINGS

Removal

21 Valves can be removed after compressing springs and removing collets.

22 Renew a valve if thickness of head 'A' after refacing, is below 0.89 mm (0.035 in.).

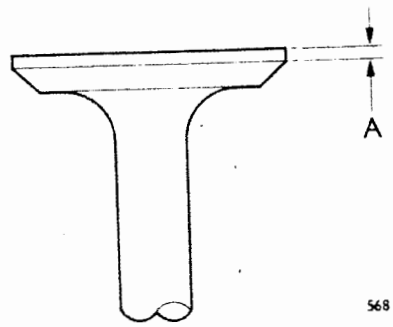


Fig 12 - Thickness of valve head

Installation

23 After installing a new valve, check depth of valve in head. Intake valve should not be less than 0.58 mm (0.023 in.) and exhaust valve 1.04 mm (0.041 in.). If necessary increase valve depth by refacing valve. After refacing, always check thickness of valve as described in para 22.

24 When installing valve, lubricate stems with graphited oil.

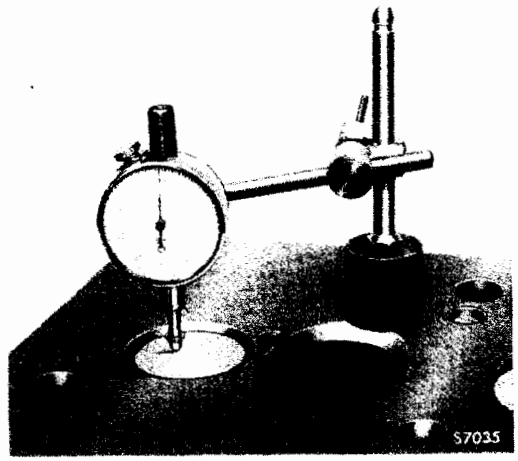


Fig 13 - Depth of valve in head

VALVE SEATS AND GUIDES

25 To check whether sufficient material exists for valve seat refacing without exceeding the specified maximum valve spring assembled height, insert the valve intended to be used in the port being checked and assemble the spring cap and split collars.

26 Pull valve against seat and check dimension 'A' between underside of cap and cylinder head. If height is less than 44.2 mm (1.74 in.) valve seat refacing is permissible.

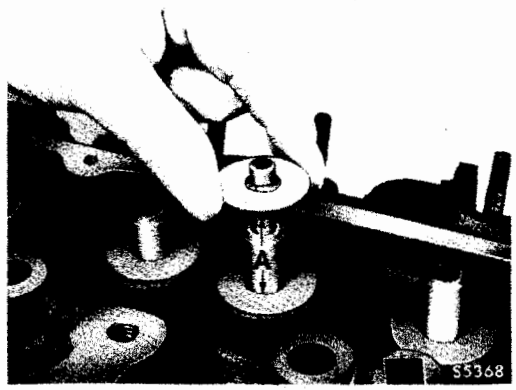


Fig 14 - Checking valve seat refacing

27 If dimension 'A' exceeds specified maximum, repeat check with a valve seat packing washer Part No 6345553, 1.57 mm (0.062 in.) thick assembled over valve guide. If dimension between washer and cap still exceeds specified maximum, cylinder head is unfit for further service.

28 It is not permissible to use more than one washer on a valve.

29 Note position of packing washers which must be installed during head reassembly.

30 When renewing a valve guide, drive out old guide from cylinder head using Remover Z8378.

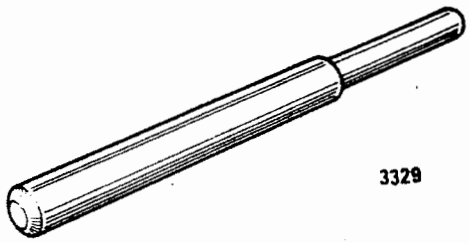


Fig 15 - Valve guide remover

31 Press new valve guide into head to correct depth using Installer Z8562. Installer is double-ended and marked 'IN' and 'EX' for intake and exhaust valve guides respectively.

32 Lubricate valve stems with graphited oil.

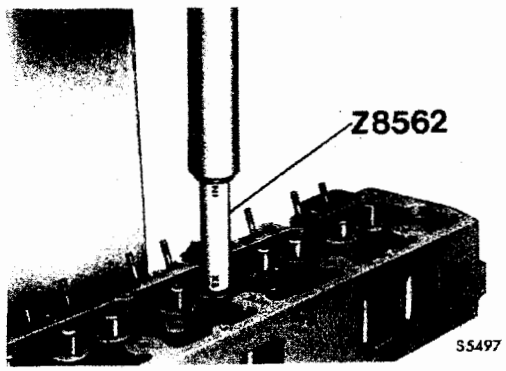


Fig 16 - Installing valve guide

INTAKE MANIFOLD

33 The intake manifold with gasket is secured to the cylinder head face by twelve bolts, these bolts are to be tightened evenly to 23 Nm (17 lbf ft).

EXHAUST MANIFOLD

34 When assembling the three sections of the exhaust manifold, install two sealing rings to the groove of each outer section with ring gaps (arrowed) diagonally opposite each other.

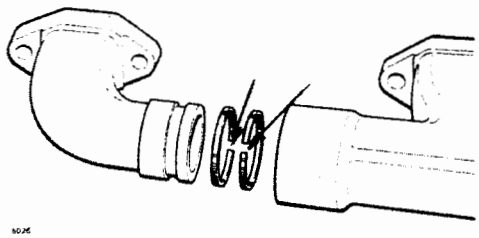


Fig 17 - Exhaust manifold sealing rings

35 When installing exhaust manifold, gaskets must be installed and securing nuts evenly tightened to 40 Nm (30 lbf ft).

36 The turbo-charger, with gasket, is secured to the centre section of the exhaust manifold by four nuts. These nuts are to be tightened evenly to 20 Nm (15 lbf ft).

CRANKCASE BREATHER AND PIPES

37 The crankcase breather is secured to the rocker and push rod covers by jubilee clips, the breather must be open to atmosphere at all times.

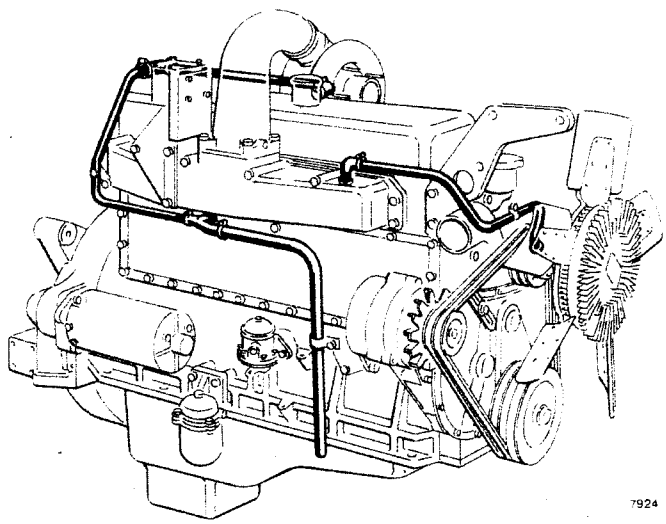


Fig 18 - Crankcase breathers

OIL PAN

Installation

38 Oil pan gasket must be installed dry, and bolts tightened evenly to 13 Nm (10 lbf ft).

CRANKSHAFT PULLEY

Removal

39 Use Remover VR2145 to withdraw crankshaft pulley.

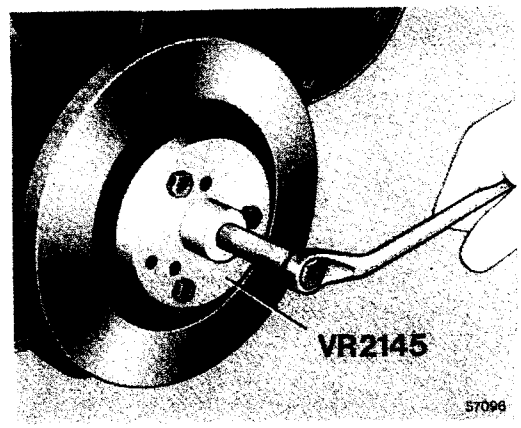


Fig 19 - Removing crankshaft pulley

Installation

40 Smear oil seal land with recommended lubricant before installing pulley with Installer VR2005 and tightening pulley bolt to 88 Nm (138 lbf ft).

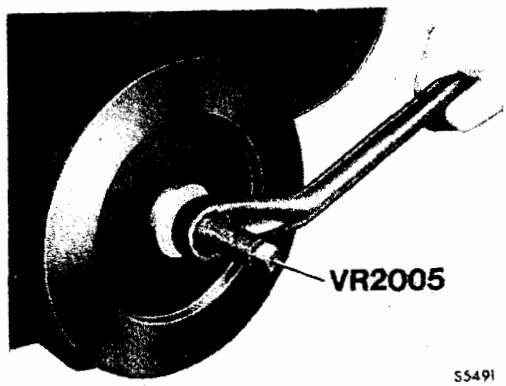


Fig 20 - Installing crankshaft pulley

TIMING COVER SEAL

Renewal

41 Timing cover must be removed to renew seal after removing crankshaft pulley.

42 Press in new seal, closed side first until seal contacts abutment face in cover.

43 Before tightening cover bolts, locate Aligner KM2048 on crankshaft spigot to engage and align oil seal concentric with pulley land.

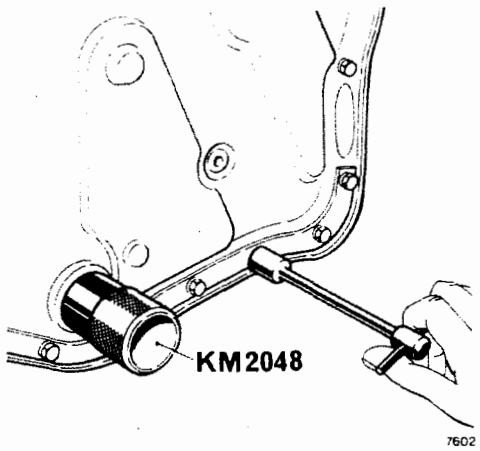


Fig 21 - Installing timing cover

CYLINDER HEAD

Refacing

44 To facilitate removal of cup plug at rear of cylinder head, drive in slightly to break seal and then tap on one side only to tilt plug before removal.

45 On installation smear plug with sealing compound.

46 Cylinder head may be refaced providing depth of head is not reduced below 107.65 mm (4.239 in.) measured at dimension 'A'.

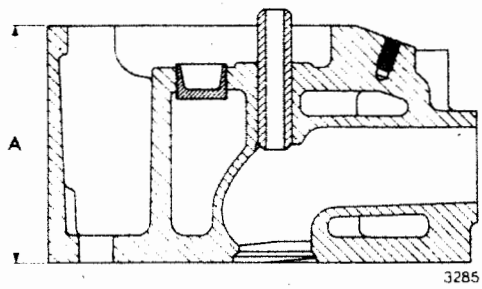


Fig 22 - Depth of cylinder head

47 When refacing head, contact surface must be ground-finished as cutter marks, however small, can be detrimental to gasket life.

INJECTOR SLEEVES

Removal

48 User Remover 7BD/5120-99-815-9752 (VR2059) to extract an injector sleeve from cylinder head.

49 Cut a thread in sleeve to a depth of approximately 50 mm (2.0 in.) with tap incorporated in tool. Leave tap threaded in sleeve, install thrust block and nut and withdraw sleeve. Remove sealing ring from counterbore in head.

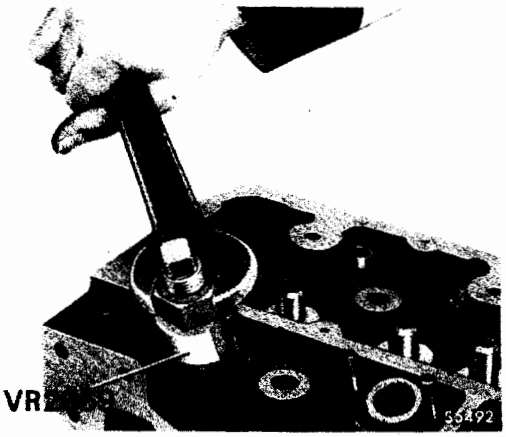


Fig 23 - Removing injector sleeve

Installation

50 Use Installer 7BD/5120-99-811-4620 (Z8382) to drive new injector sleeve fully home after locating a new sealing ring in counterbore.

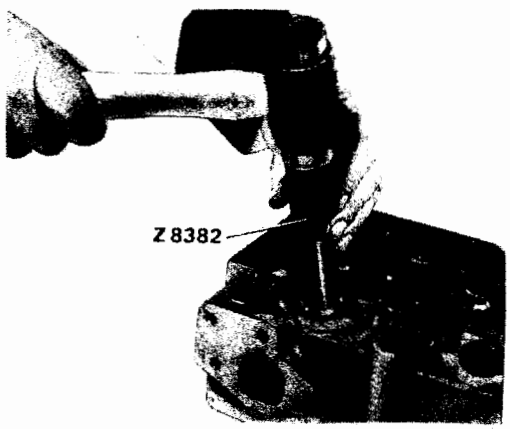


Fig 24 - Installing injector sleeve

OIL PUMP

51 Oil pump may be removed from cylinder block after removing engine oil pan and delivery pipe.

Disassembly

52 When disassembling rotor type pump, mark rotors to identify bottom face for reassembly.

Inspection

53 Check clearance between lobe peaks on inner and outer rotors ensuring they do not exceed 0.25 mm (0.010 in.) maximum.

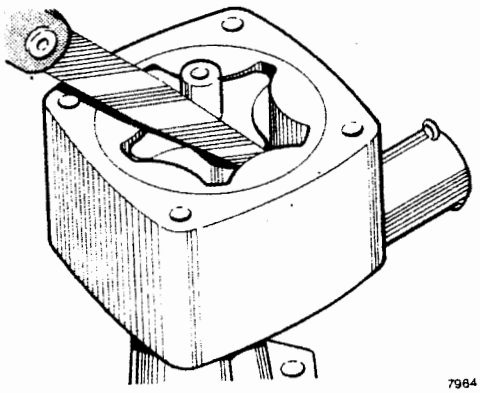


Fig 25 - Checking clearance between lobe peaks

54 Check that clearance between rotors and face of pump body does not exceed 0.13 mm (0.005 in.) maximum.

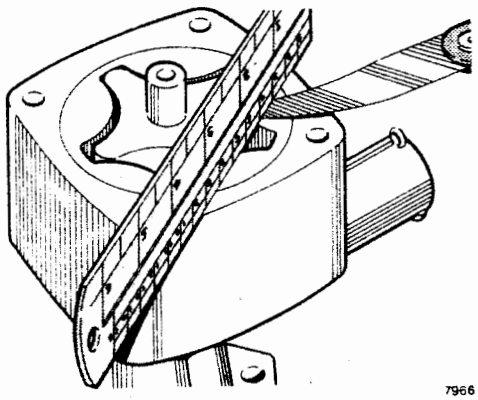


Fig 26 - Checking clearance between rotor and face of pump body

55 Check clearance between pump body and outer rotor ensuring it does not exceed 0.25 mm (0.010 in.) maximum.

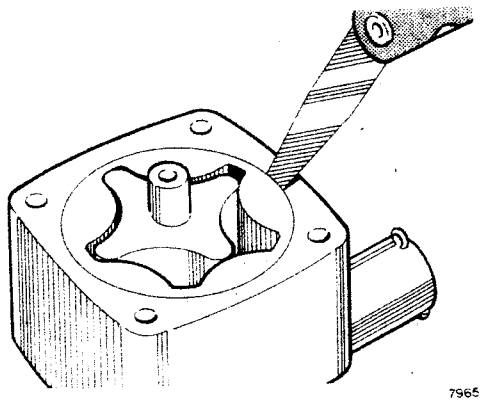


Fig 27 - Checking clearance between outer rotor and pump body

56 On installation ensure that outer rotor is assembled with its chamfered face face towards pump body.

Reassembly

57 On reassembly use four tabs only to retain screen.

58 If delivery pipe adaptor is removed from cylinder block, threads must be sealed with Loctite 241 (Nutlock).

59 Tighten oil pump securing bolts to a torque of 22 Nm (16 lbf ft).

CAMSHAFT

Removal

60 The camshaft rear bearing (2) is sealed with a cup plug (1).

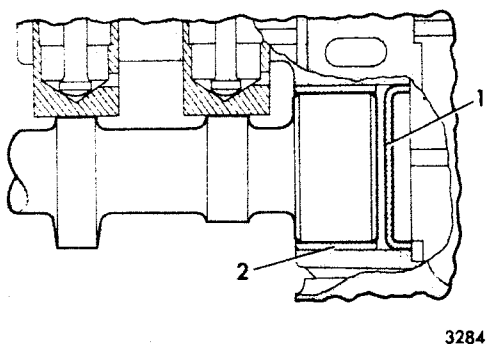


Fig 28 - Camshaft cup plug

61 The camshaft can be withdrawn after removing drive gear, oil pump, tappets and fuel feed pump.

62 For access to tappets remove push rods and side cover.

63 It may be necessary to raise engine slightly to provide clearance for camshaft removal. Withdraw camshaft carefully to avoid damage to bearings in cylinder block.

64 For camshaft bearing renewal, refer to para 175.

65 On reassembly, smear camshaft cams and tappets with graphited oil.

TIMING GEARS

Removal

66 To remove timing gears, crankshaft pulley, fan and timing cover must first be removed.

67 Use Remover VR2021 for removing camshaft and compressor fuel injection pump drive gears in conjunction with Spacers VR2021/7 and 8 for compressor gears with balance weights.

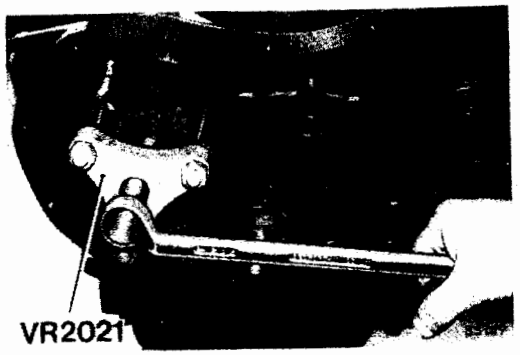


Fig 29 - Removing camshaft gear

68 Use Remover VR2032 for removing crankshaft gear.

Fig 30 - Removing crankshaft gear

Reconditioning

69 When renewing idler gear bush, ensure that the bush does not protrude beyond either face of the gear. Service bushes are finished to size.

Installation

70 Install crankshaft gear with Installer VR2005.

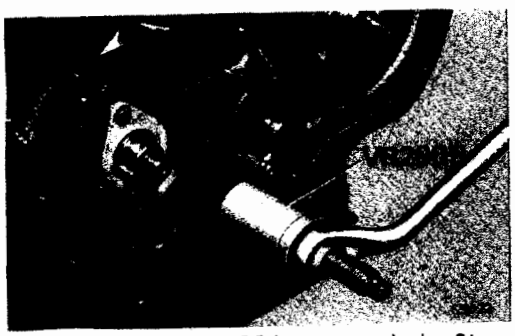


Fig 31 Installing crankshaft gear

71 Install timing gears as illustrated (Fig 32) ensuring timing mark 'T' is aligned with centre of bolt hole

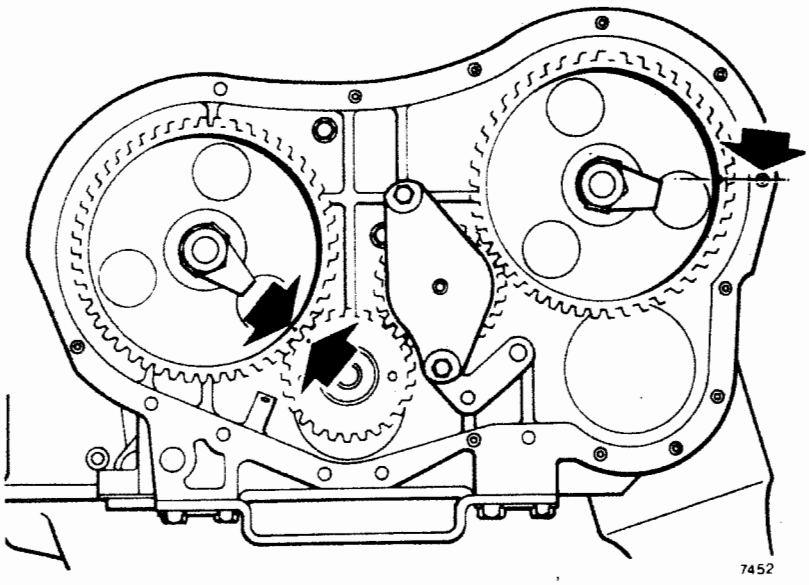


Fig 32 - Timing gears

72 Assemble idler gear and thrust washers on idler hub with recessed face of gear towards hub flange. Larger diameter washer must locate in gear recess. Install new sealing ring in cylinder block counterbore.

73 Should it be necessary to rotate the crankshaft with the camshaft gear removed, slacken the rocker adjustment screws. This avoids the possibility of a piston crown contacting a valve head.

74 Install camshaft and fuel injection pump gears with Installer Z8467.

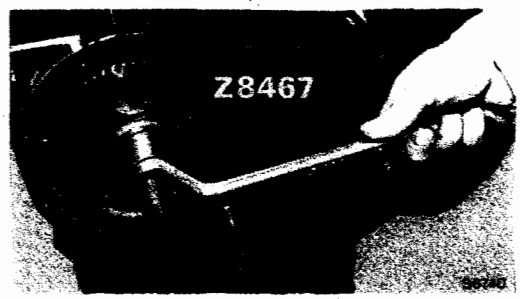


Fig 33 - Installing camshaft gear

75 Do not attempt to drive gear on to camshaft as this will disturb camshaft rear bearing plug.

76 Do not drive gear on to compressor as this will damage unit.

77 Tighten camshaft and compressor/fuel injection pump drive gear nuts to a torque of 122 Nm (90 lbf ft).

COMPRESSOR CYLINDER HEAD (CLAYTON DEWANDRE)

Removal and Disassembly

78 Cylinder head may be withdrawn after removal of exhaust manifold, turbo-charger, air lines and securing nuts.

79 Unloader valve plunger and spring are retained by a threaded cap.

80 Valves and springs may be removed after separating manifold from baseplate.

Inspection and Reconditioning

81 Intake and delivery valves can be refaced by lapping on very fine emery paper held on a flat surface but they should be renewed if badly grooved. Slight scratcheson valve seats may be removed by lapping with fine grinding paste. If badly pitted use a seating cutter before lapping.

82 Check intake and delivery valve springs and unloader valve plunger spring for corrosion and distortion, and renew if necessary.

Reassembly and Installation

83 When reassembling cylinder head position a new gasket on baseplate and place intake valve spring in recess in baseplate. Intake valve spring is the smaller of the two valve springs and is shown with intake valve on the left. Place intake valve on spring and delivery valve on its seating.

84 Delivery valve and spring are on the right.

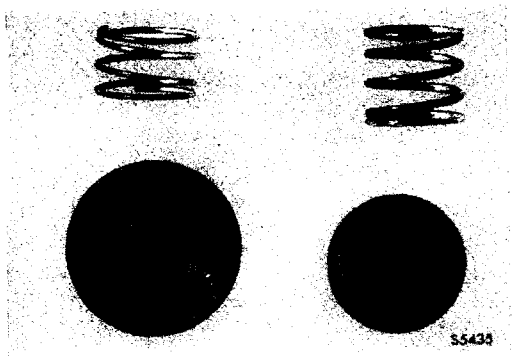


Fig 34 - Intake and delivery valves and springs

85 Press delivery valve spring into recess in manifold and position manifold on gasket and baseplates.

86 If necessary insert a rod through unloader plunger guide bush in manifold to hold intake valve below surface of baseplate before positioning manifold. Ensure valves are correctly positioned before installing baseplate bolts.

87 Install unloader valve using a new sealing ring (arrowed).

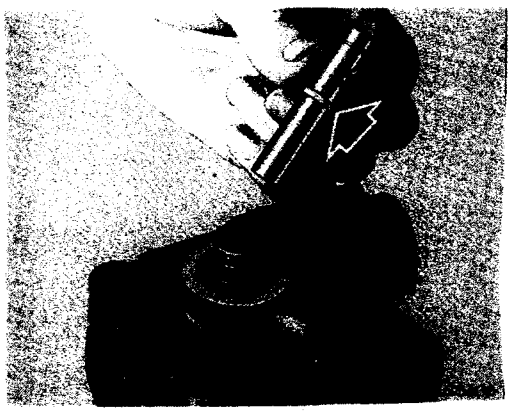


Fig 35 - Unloader valve

88 Install cylinder head with intake port towards drive end of compressor and tighten retaining nuts to a torque of 13 Nm (10 lbf ft).

COMPRESSOR CYLINDER HEAD - BENDIX

Removal and Disassembly

89 Cylinder head and valve plate assembly may be withdrawn after removal of exhaust manifold, turbo-charger, airlines and securing bolts.

90 Unscrew unloader cap and pull out unloader piston.

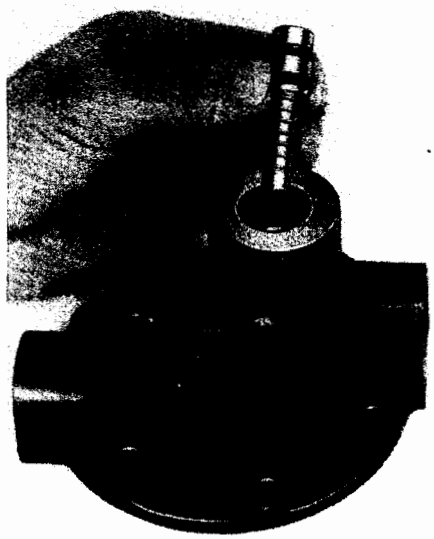


Fig 36 - Removing unloader piston

91 Remove 'O' rings and unloader spring from piston.

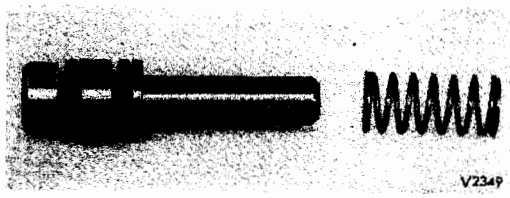


Fig 37 - Unloader piston and spring

92 On cylinder heads secured by four bolts, unloader piston spring may be held in position by a clip.

93 Unscrew valve plate retaining screw and separate valve plate from cylinder head. Detach gasket and remove valve discs and springs.

Inspection and Overhaul

94 Inspect all parts for wear or damage and ensure that all passages are clear.

95 With compressor at the top of its stroke remove all carbon and dirt.

96 Check inlet and delivery valve seats for chips or wear, and clean and overhaul to obtain an even surface.

97 Renew all parts supplied in an overhaul kit.

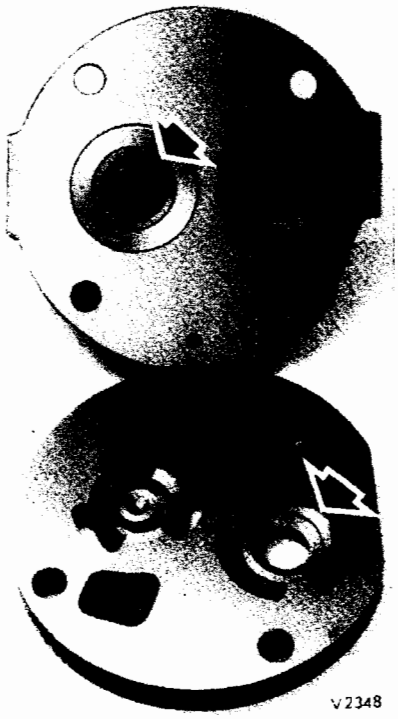


Fig 38 - Cylinder head and valve plate

Reassembly

98 Lubricate 'O' rings and contact surface of unloader piston with Bendix grease K4-756-04.

Fig 39 - Lubricating contact areas

99 Install unloader piston and spring and tighten cap, with new copper washer installed, finger tight.

100 Install valve discs and springs into their recesses and reassemble valve plate to cylinder head. On cylinder heads secured by four bolts ensure valve spring with red identification mark (smaller spring) is installed in delivery port.

Fig 40 - Inlet and delivery valves

101 Ensure valve discs move freely.

102 Tighten unloader cap to a torque of 63 Nm (48 lbf ft).

103 Install cylinder head and tighten securing bolts to a torque of 22 Nm (16 lbf ft).

AIR COMPRESSOR

Removal

104 To remove air compressor the fuel injection pump must first be removed as described in para 231 and timing cover as described in para 41.

105 Compressor/fuel injection pump drive gear may be withdrawn as described in para 67.

106 Compressor can be detached from timing case after removing five securing bolts.

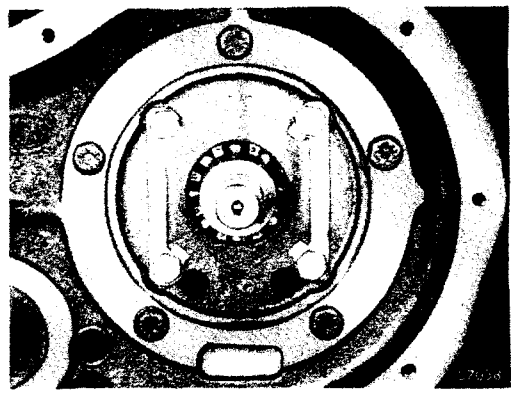


Fig 41 - Compressor securing bolts

Disassembly (Clayton Dewandre)

107 Remove and disassemble cylinder head as described in para 78.

108 Mark position of cylinder in relation to crankcase before removal.

109 Access to connecting rod cap bolts is gain by removing side cover.

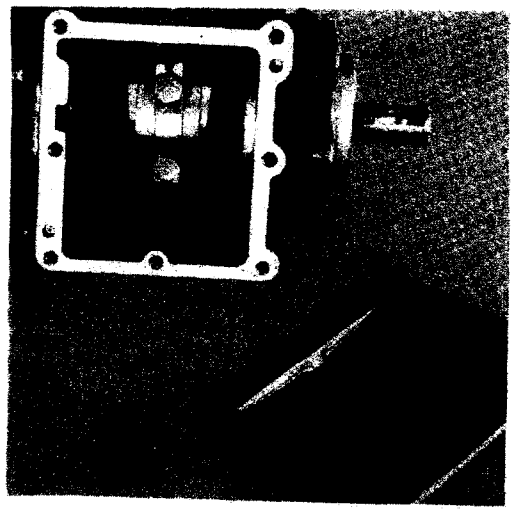


Fig 42 - Crankcase side cover removed

110 Piston pin may be pressed out of piston after removing one of the circlips.

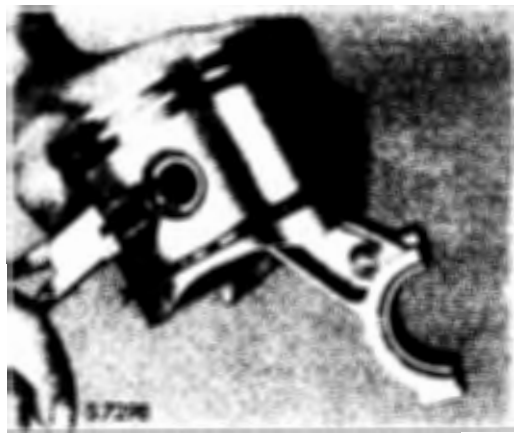


Fig 43 - Removing piston pin circlip

111 Crankshaft and thrust washers may be withdrawn after removing end cover.

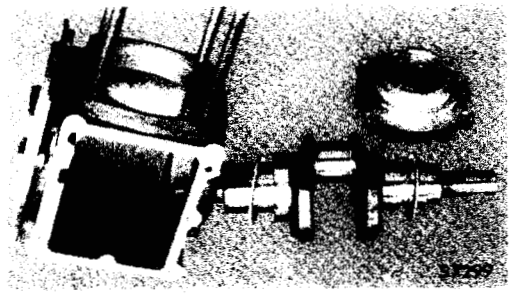


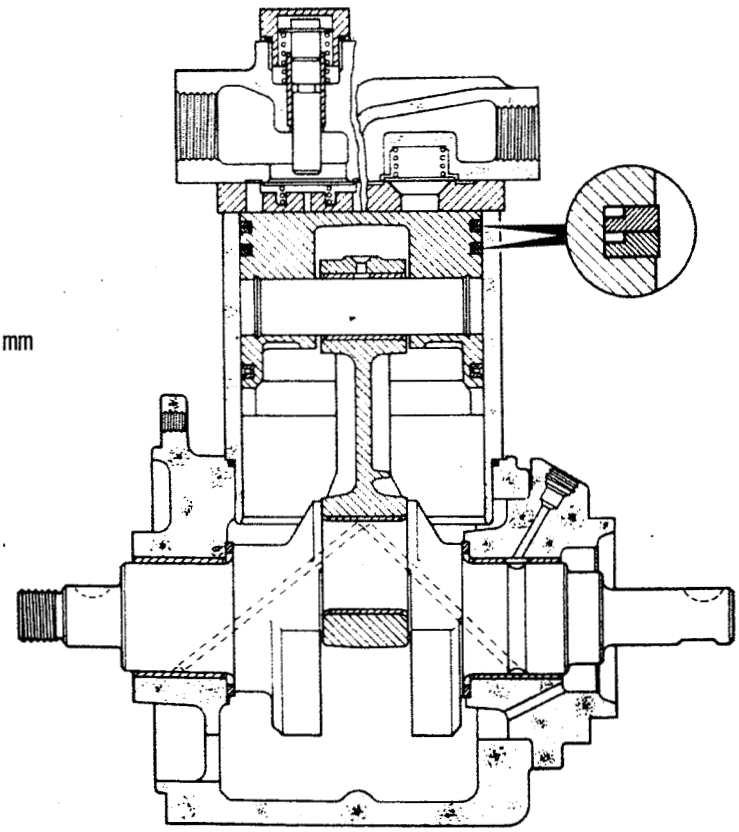
Fig 44 - Crankcase and crankshaft, crankshaft removed

Reconditioning

112 If new crankshaft main bearings are installed, they must be fine bored to 38.093 6/38.119 0 mm (1.499 75/1.500 75 in.) after installation. This operation must be carried out with end cover assembled to crankcase. A clearance of 0.0190/0.0571 mm (0.00075/0.00022 in.) must be obtained with crankshaft.

113 Ensure oil hole in rear bearing aligns with oilway in cover.

114 Hone connecting rod bush to provide a clearance of 0.013/0.051 mm (0.0005/0.0020 in.).



8132

Fig 45 - Cut-away view, compressor

115 Piston clearance in cylinder bore must be 0.190/0.229 mm (0.0075/0.0090 in.).

Reassembly

116 Crankshaft thrust washers must be installed with steel side towards adjacent main bearing, and ensure tab on washers engage slot in crankcase and cover. Install cover with the oil pipe connection at the top.

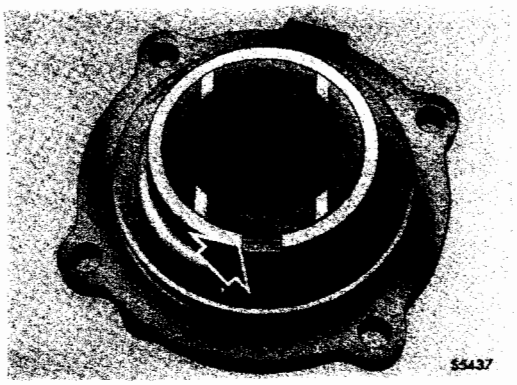


Fig 46 - Crankshaft thrust washers

117 Compression rings must be installed with step towards piston crown.

118 Assemble connecting rod cap with webs (arrowed) in alignment. Tighten connecting rod bolts to specified torque and secure with lock tabs.

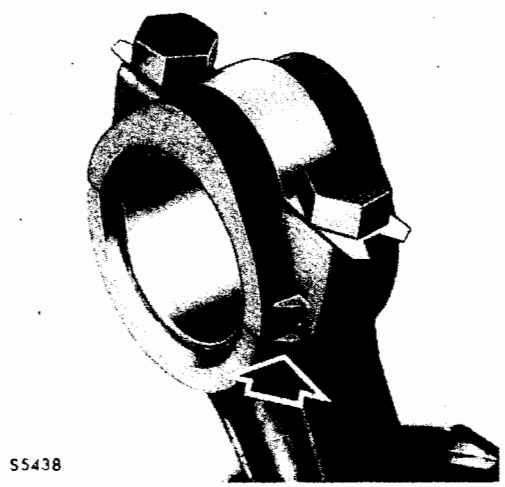


Fig 47 - Assembling cap to connecting rod

119 Before installing cylinder, assemble sealing ring to cylinder spigot.

120 Install cylinder head as described in para 88.

Disassembly - Bendix

121 Remove cylinder head as described in para 89.

122 Access to connecting rod cap bolts is gained by removing bottom cover.

Fig 48 - Crankcase bottom cover removed

123 Piston pin may be pressed out after removing one of the circlips.

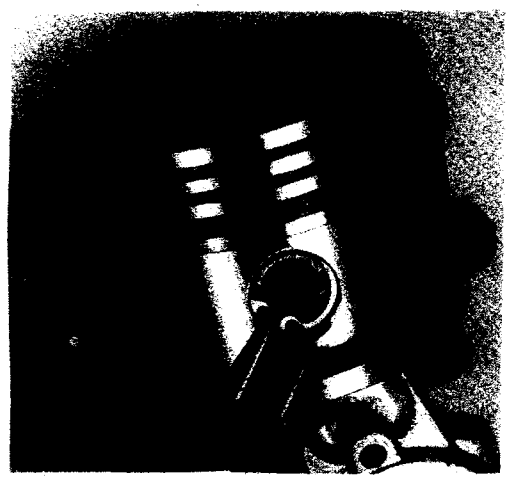


Fig 49 - Removing piston pin circlip

124 Crankshaft may be withdrawn after removing end cover.

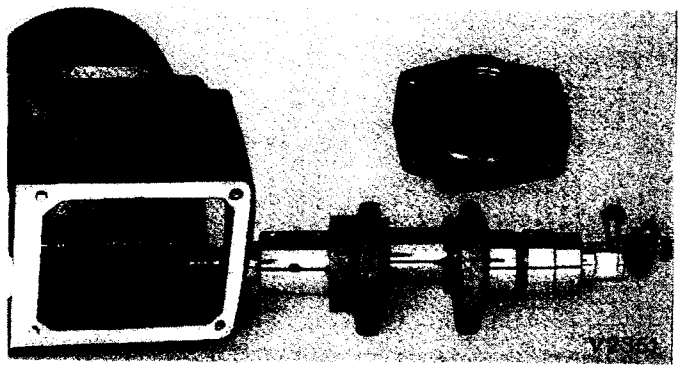


Fig 50 - Withdrawing crankshaft

Reconditioning

125 If crankshaft bushes are to be renewed the bush in end cover must be installed in direction of arrow and flush with face 'X'.

126 Ensure oil hole in rear bush aligns with oilway in cover.

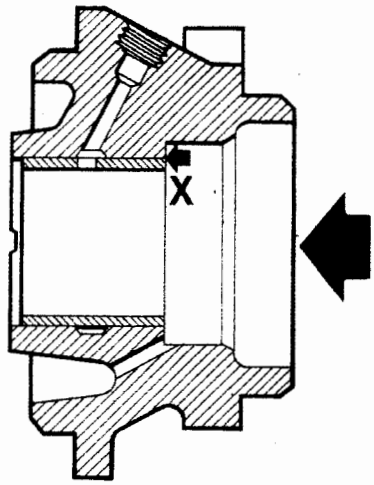


Fig 51 - Installing end cover bush

127 Bushes must be fine bored or reamed to 34.93/34.95 mm (1.375/1.376 in.) with end cover assembled to crankcase.

128 Permissible end float must not exceed 0.07/0.35 mm (0.003/0.014 in.).

129 Crankcase may be bored to accommodate rings 0.010 in. (0.25 mm) and 0.020 in. (0.5 mm) oversize.

130 Standard piston to bore clearance is 0.33/0.43 mm (0.013/0.017 in.) above top piston ring and 0.07/0.13 mm (0.003/0.005 in.) at piston skirt.

Reassembly

131 On installation apply Wellseal to mating surfaces of end cover and crankcase, ensure oil pipe connection is at the top.

132 Piston rings must be installed as illustrated (Fig 52).

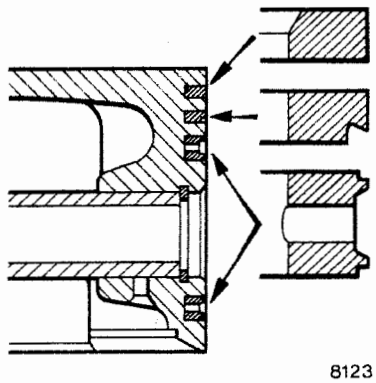


Fig 52 - Assembly of piston rings

133 Align webs (arrowed) on connecting rod and cap and tighten bolts to a torque of 22 Nm (16 lbf ft).

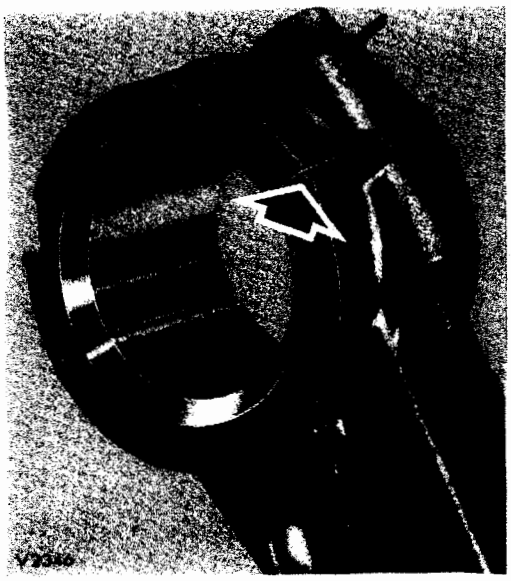


Fig 53 - Assembling cap to connecting rod

134 Install cylinder head as described in para 103.

TIMING CASE

Removal

135 The timing case may be removed leaving compressor and fuel injection pump in position supported by a length of wire attached to the exhaust manifold. Do not pass wire around fuel injection pipes.

Installation

136 A gasket is interposed between the timing case and crankcase and neoprene rings (arrowed) are located in the counterbore of each oil feed drilling.

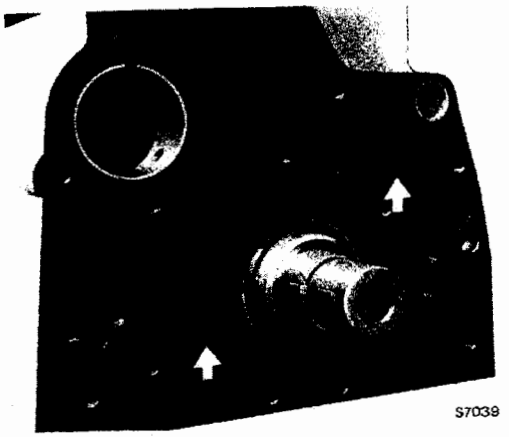


Fig 54 - Timing case oil seals

137 Position timing case on two locating dowels and tighten five securing bolts to a torque of 22 Nm (16 lbf ft).

FLYWHEEL AND RING GEAR

Removal

138 To remove flywheel, gearbox and clutch assembly must first be removed.

Reconditioning

139 Support flywheel and tap ring gear evenly off flange.

140 When refacing friction face, depth of flywheel at 'A' must not be reduced below 20.3 mm (0.80 in.). Diameter of machined surface (dimension 'B') must be 388.6 mm (15.30 in.) minimum to accept clutch cover.

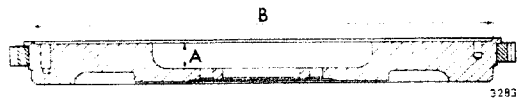


Fig 55 - Refacing flywheel

141 Friction face should be ground finished.

Installation

142 When installing a new ring gear, expand by heating to a temperature of 320°C (dark blue colour) and install gear with chamfered inner edge towards flywheel flange.

143 Flywheel bolts must be tightened evenly to a torque of 113 Nm (85 lbf ft).

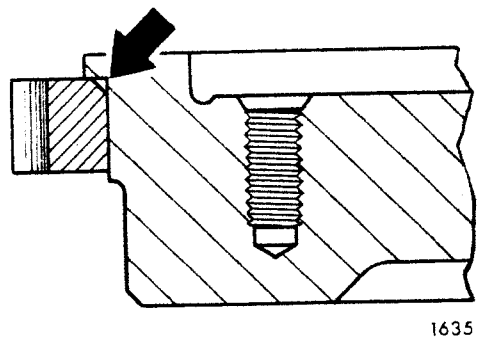


Fig 56 - Installing flywheel ring gear

PISTONS AND CONNECTING RODS

Removal

144 Piston and connecting rod must be withdrawn through top of cylinder block.

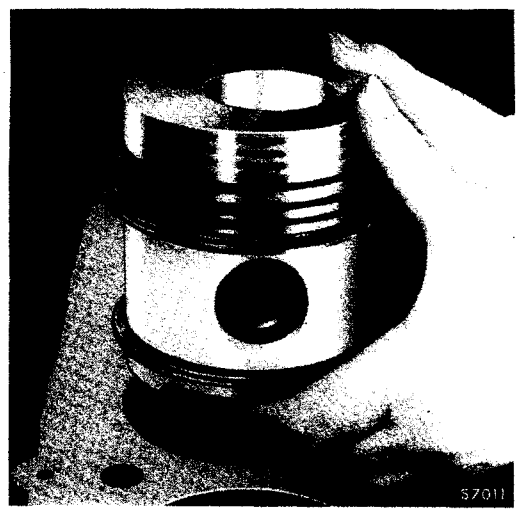


Fig 57 - Removing piston and connecting rod

Inspection

145 Three piston height grades are available for selection to attain the specified piston protrusion above the cylinder block face. These are identified by the numbers 1, 2 and 3 stamped on the piston crown for +0.005 in. (0.127 mm) standard and -0.005 in. (-0.127 mm) respectively.

146 When renewing a piston, replace old with a piston of the same height grading. Should the height grading number on the old piston be indiscernable, the following procedure should be adopted to establish which piston height grade is required.

147 Assemble a piston of standard height, complete with rings, on to the connecting rod and install in cylinder as for normal engine assembly. Rotate crankshaft three turns to centre piston in bore.

148 Rotate crankshaft until piston is at maximum protrusion, measured with a dial gauge placed above piston pin axis.

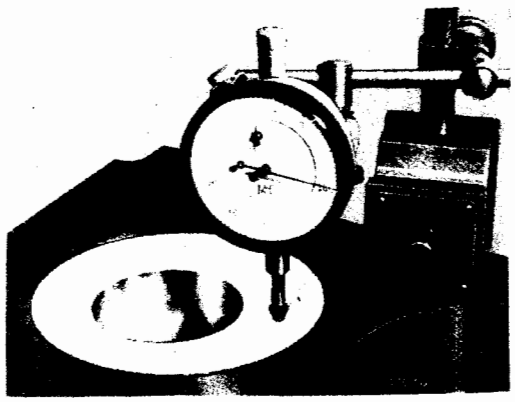


Fig 58 - Measuring piston protrusion

149 If the protrusion is within the specified limits the standard height piston is correct. A protrusion below limits indicates that a +0.127 mm (+0.005 in.) height piston is required and a protrusion above limits indicates the need for a -0.005 in. (-0.127 mm) height piston.

150 Installation of a new or rebushed connecting rod may affect piston protrusion which should be measured as previously described.

151 When assessing piston to bore clearance, and when reboring, maximum accuracy in piston and bore measurement is essential.

152 As piston skirt is ground both oval and tapered, it is imperative that piston size is measured only at right angles to piston pin and 51 mm (2.00 in.) from piston crown.

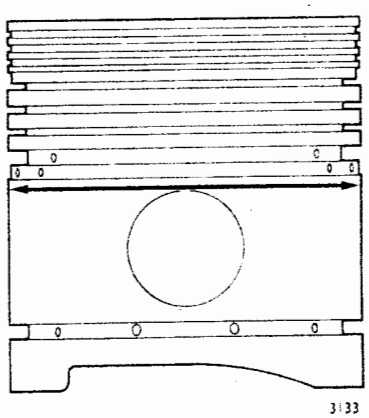


Fig 59 - Measuring piston skirt

Note ...

Micrometer spindle must turn freely so that it can be adjusted up to piston with a very light turning effort. If micrometer is adjusted to get a frictional feel over piston, it will indicate a dimension significantly smaller than the actual size.

153 When checking cylinder bores it is not sufficiently accurate to take a direct reading from an inside micrometer. For maximum accuracy, a cylinder gauge should be used, in conjunction with the same micrometer as used for measuring piston. By this method, any discrepancy between individual micrometers is avoided.

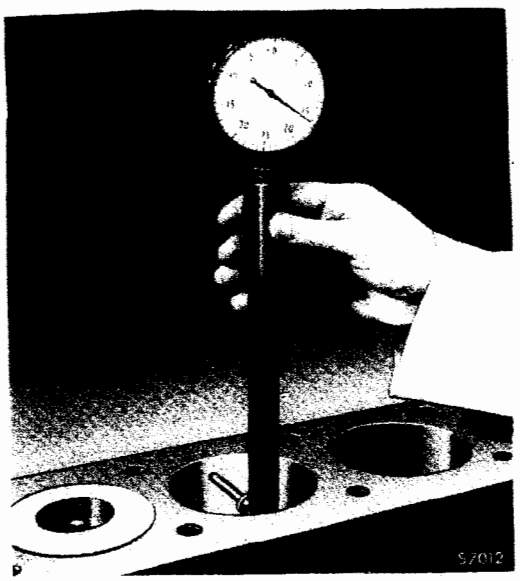


Fig 60 - Checking piston bores

154 Maximum piston oversize is 0.040 in. (1.02 mm).

155 Pistons and pins are serviced as selective assemblies. Grading is shown by letters P or PP on piston crown which correspond with 1 or 11 respectively on end of piston pin.

156 For information on cylinder bore refinishing, see para 182.

Reassembly

157 Before installing new piston rings in a worn bore remove oil glaze with a brush-type de-glazer.

158 Before assembling rod to piston, check that diameter 'A' of bearing housing bore is within 63.995/64.009 mm (2.5195/2.520 in.). This will determine whether cap has been filed. If diameter is incorrect, rod assembly must be renewed.

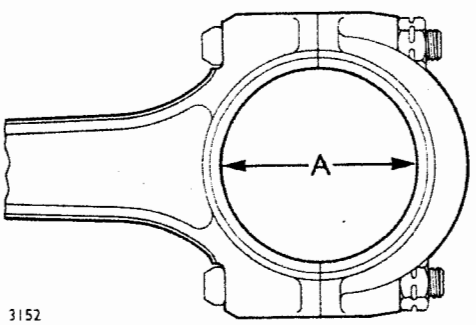


Fig 61 - Connecting rod bearing bore diameter

159 Correct assembly of piston rings is as illustrated in Fig 62.

160 Note that offset 'A' of combustion chamber is away from oil bleed hole side of rod. Ring gaps must be equally spaced around piston.

161 Install pistons so that combustion chamber is offset away from camshaft.

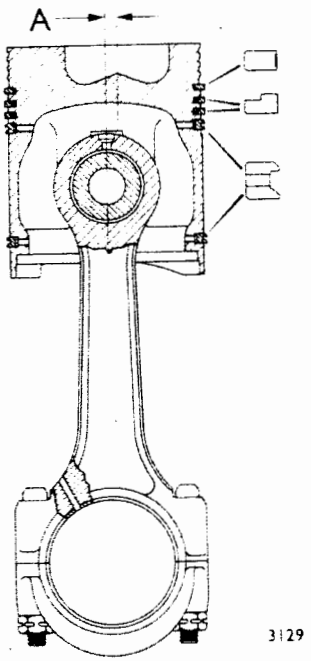


Fig 62 - Assembly of piston rings

Removal and Reconditioning

162 Before removing crankshaft during engine overhaul, check end float to determine if thrust washers on centre bearing are worn (0.05/0.30 mm (0.002/0.012 in.). Oversize thrust washers are available.

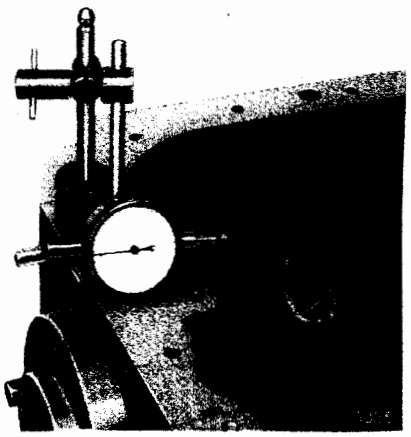


Fig 63 - Checking crankshaft end float

163 It is permissible to regrind crankshaft main journals and crankpins to a maximum of 0.51 mm (0.020 in.) undersize. Crankshaft bearing sets are available 0.25 mm (0.010 in.) and 0.51 mm (0.020 in.) undersize. After regrinding, main journal and crankpin fillets must be re-rolled to specified radius to ensure maximum resistance to fatigue.

164 Whenever a crankshaft is reground or a replacement crankshaft installed it will be necessary to check piston protrusion above cylinder block face as detailed in para 148.

Installation

165 To renew rear seal, coat new seal strip with clean engine oil, press seal strip into groove in cranksase commencing at the centre and working towards the sides. Ensure that both ends of seal project above bearing cap locating face.

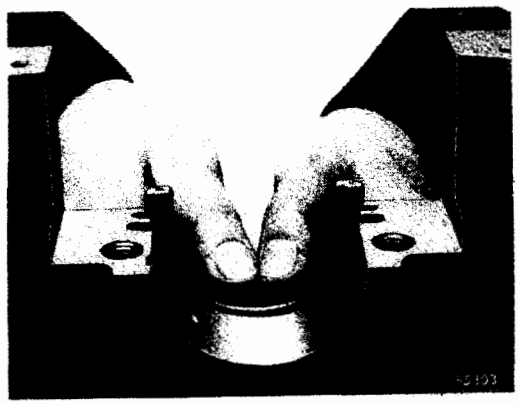


Fig 64 - Installing crankshaft rear seal in cylinder block

166 Place installer (Z8385) in position so that larger end is on seal and other end rests in adjacent main bearing housing. Drive seal into position by hammering on flat of installer, and simultaneously applying a semi-rotary movement until installer is felt to bottom.

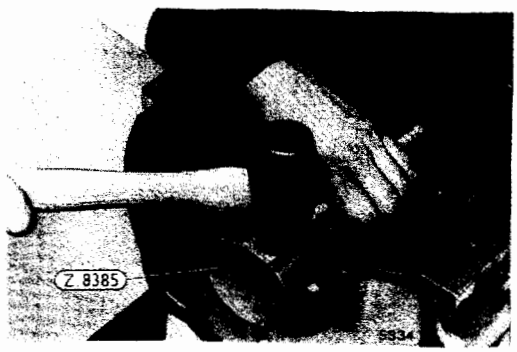


Fig 65 - Installing crankshaft rear seal in cylinder block

167 With installer held firmly in position and using a sharp knife, cut off projecting ends of seal 0.40 mm (0.015 in.) above bearing cap locating face.

168 Do not leave frayed ends to become trapped beneath cap and block contacting faces. After installation, smear seal liberally with clean engine oil.

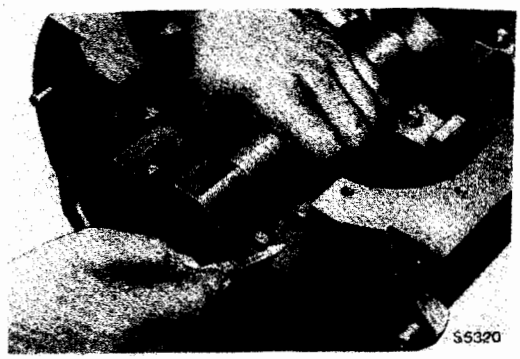


Fig 66 - Installing crankshaft rear seal in cylinder block

169 Install seal strip in bearing cap in a similar manner, using front bearing cap as a guide for seal installer.

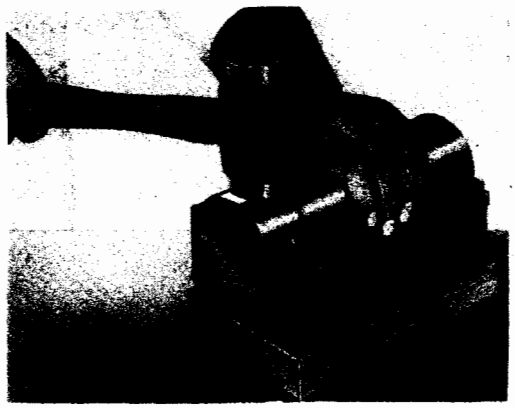


Fig 67 - Installing crankshaft rear seal in cap

170 Crankshaft thrust washer oil grooves must face crankshaft thrust faces.

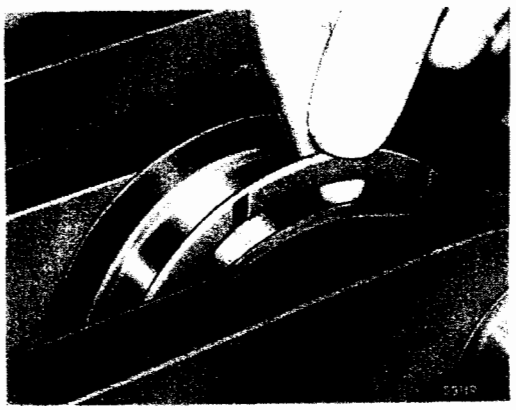


Fig 68 - Installing crankshaft thrust washers

171 When installing rear main bearing cap, smear mating faces of cap and crankcase with Wellseal jointing compound.

172 When installing front main bearing cap, its front face must be in alignment with front face of crankcase.

173 When installing front and rear main bearing cap seal, coat first piece of felt with jointing compound and drive home this and subsequent felts with Installer VR2027. Approximately six felts are required for each groove.

174 Ensure that felts are tightly packed, and leave about 0.25 mm (0.010 in.) of felt projecting above cap face for compression when oil pan is installed.

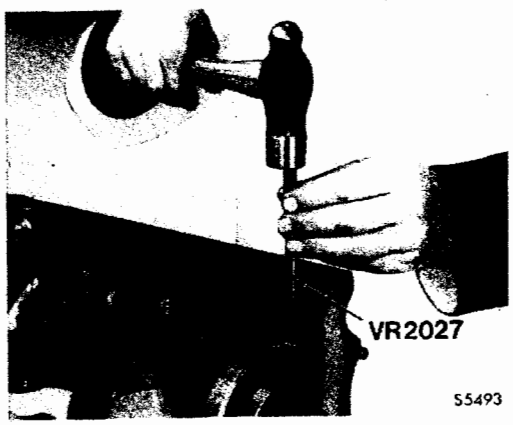


Fig 69 - Installing main bearing cap seal

CAMSHAFT BEARINGS

Removal

175 Camshaft rear bearing cup plug will be driven out during bearing removal.

Installation

176 When installing bearings, work in succession from the rear and ensure that oil holes coincide with oilways in crankcase. Each bearing should locate with notch in bearing uppermost and facing forward. Rear bearing should be flush with front of bearing housing. Front bearing must not project beyond crankcase front face.

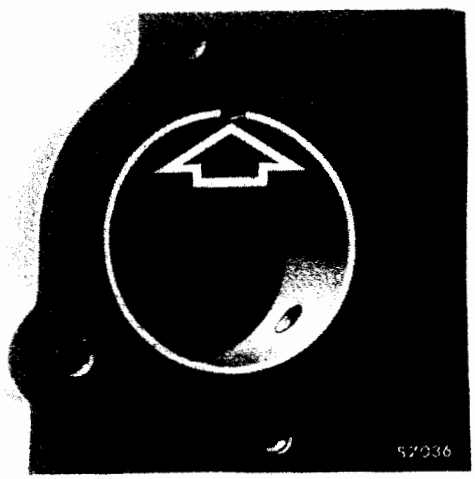


Fig 70 - Installing camshaft bearing

177 Replacement bearings are pre-finished to size and must be installed in sets to ensure bearing alignment.

178 Before installing rear bearing cup plug, apply Loctite 572 (Pipe Sealant with Teflon) to periphery of plug for additional retention and sealing.

CYLINDER BLOCK

Reconditioning

179 Refacing of the cylinder block top face is not permissible.

180 To facilitate removal of a cylinder block cup plug, drive in slightly to break seal and then tap on one side only to tilt plug before removal.

181 When installing, smear periphery of plug with Loctite 572 (Pipe Sealant with Teflon) and drive plug in flush with cylinder block face.

182 Cylinder bores must be hone finished, with clean sharp stones of the proper grade for the required amount of metal to be removed. Dull or dirty stones cut unevenly and generate excessive heat. When making initial cuts, leave sufficient metal so that all cutter or coarse stone marks may be removed with the fine stones used for finishing.

183 When finish honing, pass hone through entire length of cylinder at a rate that will produce a cross hatch pattern of 30° to the horizontal (120° included angle to axis of bore). This will ensure maximum ring life and minimum oil consumption. Select finishing stones of a grade to produce a surface finish of 0.4 - 0.9 micrometre (15 - 35 micro-inches).

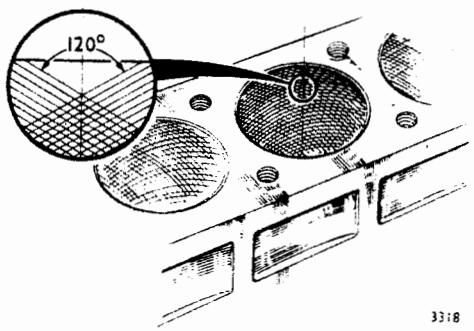


Fig 71 - Cylinder bore finish

184 It is of the greatest importance that refinished cylinder bores do not exceed 0.013 mm (0.0005 in.) ovality.

TURBO-CHARGER

Disassembly

CAUTION ...

When removing compressor or turbine housings, care must be taken not to damage wheels on the housings.

185 Mark compressor and turbine housings relative to bearing housing.

186 Remove compressor and turbine housing securing bolts and withdraw housings from bearing housing.

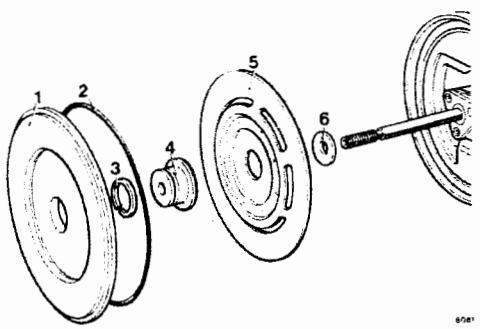
187 Secure the turbine wheel and remove the compressor wheel locknut using a 'T' bar and sockets, and slide the compressor wheel off shaft.

Note ...

The compressor wheel locknut has a left-hand thread.

188 Compressor wheel can now be withdrawn from shaft.

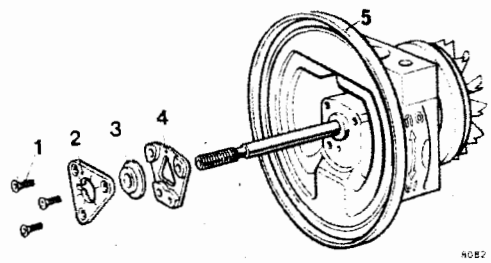
189 Remove compressor wheel back plate (1), 'O' ring (2), oil deflector (5) and thrust ring (6). From compressor wheel back plate, push out flinger sleeve (4) and piston ring (3).



1. Compressor wheel back plate
2. 'O' ring
3. Piston ring
4. Flinger sleeve
5. Oil deflector
6. Thrust ring

Fig 72 - Removing compressor wheel back plate and oil deflector

190 Remove three 'Torx' countersunk screws (1) and withdraw thrust bearing (2), thrust collar (3) and spacer plate (4) from bearing housing (5).



1. 'Torx' countersunk screws
2. Thrust bearing
3. Thrust collar
4. Spacer plate
5. Bearing housing

Fig 73 - Removing thrust bearing and spacer plate

191 Withdraw shaft and turbine wheel assembly from bearing housing. Remove piston ring from shaft.

192 Compressor end bearing can now be removed from bearing housing. Turbine end bearing can be withdrawn after removing retaining snap ring.

193 Remove both bearing inner retaining snap rings from bore of bearing housing.

Inspection

CAUTION ...

Do not use caustic solutions for cleaning. It is important that all parts are kept clean and free from foreign matter during inspection and reassembly.

194 Inspect bearings, shaft journals and bores in bearing housing for wear and scratches. Check piston ring grooves for scoring and wear and renew as necessary.

195 Check turbine and compressor wheels for cracks, bent or damaged blades. Do not attempt to straighten blades. Replace bearing housing core assembly if excessive wear or damage is apparent to compressor or turbine wheels.

196 When replacing turbo-charger check identification plate for correct type numbers.

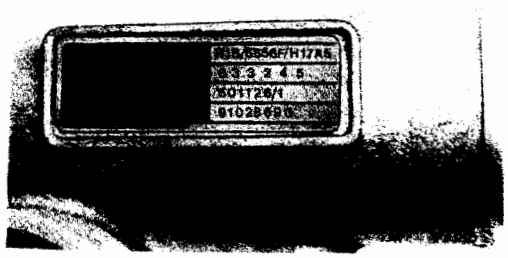
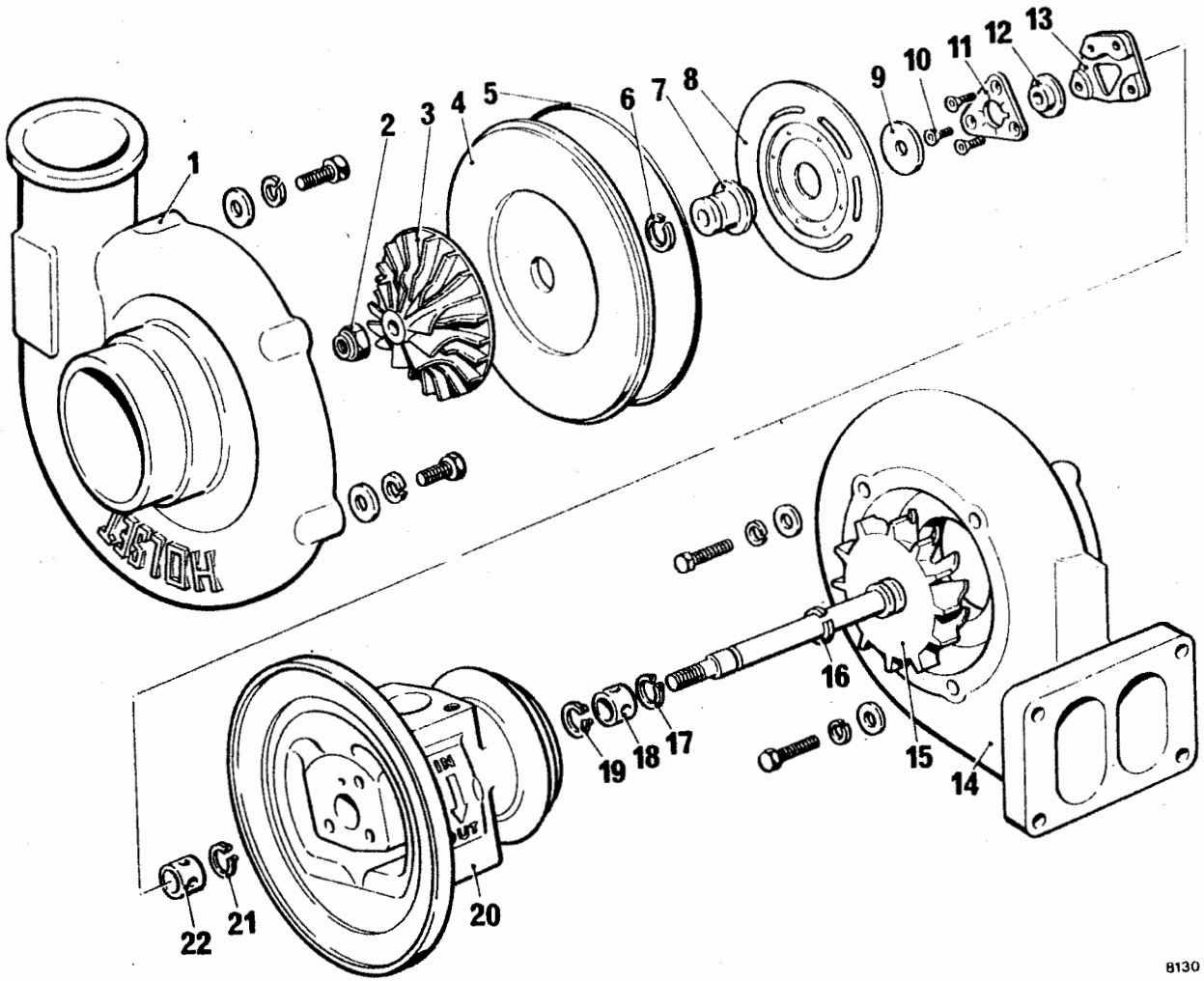


Fig 74 - Identification plate

197 Inspect turbine and compressor housings for damage due to contact with wheels. Slight damage is acceptable otherwise renew housings as necessary.



1. Compressor cover
2. Compressor locknut
3. Compressor wheel
4. Compressor back plate
5. '0' ring
6. Piston ring
7. Flinger sleeve
8. Oil deflector
9. Thrust ring
10. Torx countersunk screw
11. Thrust bearing
12. Thrust collar
13. Spacer plate
14. Turbine housing
15. Shaft and turbine wheel assembly
16. Piston ring
17. Snap ring
18. Bearing
19. Snap ring
20. Bearing housing
21. Snap ring
22. Bearing

Fig 75 - Turbo-charger exploded view

Reassembly

198 Reassembly is the reverse procedure of disassembly provided the following points are noted.

198.1 When replacing snap rings ensure beveled face is towards bearing.

198.2 Tighten thrust bearing countersunk screws to a torque of 4.5 Nm (40 lbf in.)

198.3 Install 'O' ring in position arrowed.

Fig 76 - Installing 'O' ring

198.4 Tighten compressor wheel lock nut to a torque of 5.1 Nm (45 lbf in.).

Note ...

The compressor wheel locknut has a left-hand thread.

198.5 Using a dial gauge check end float and side travel of turbine shaft. End float should be 0.10/0.16 mm (0.004/0.006 in.) and side travel should be 0.29/0.42 mm (0.011/0.017 in.)

198.6 Compressor housing to centre housing bolts to be tightened to a toque of 5.7 Nm (50 lbf in.).

198.7 Turbine housing to centre housing bolts to be tightened to a torque of 11.3 Nm (100 lbf in.).

199 The turbo-charger, with gasket, is secured to the centre section of the exhaust manifold by four nuts. These nuts are to be tightened evenly to 20 Nm (15 lbf ft).

CAUTION ...

Before starting a new or overhauled turbo-charged engine, remove screwed plug on top of turbo-charger oil inlet elbow and pre-lubricate bearings by adding 56 ml (2 UK fl oz) of clean engine oil.

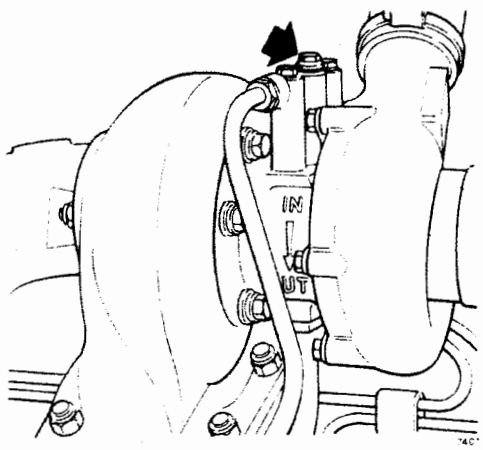


Fig 77 - Pre-lubricating turbo-charger bearings

FUEL SYSTEM

TABLE 6 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable	Designation
(1)	(2)	(3)	(4)
1	D1122	7BD/5120-99-801-4103	Injector Remover
2	Z8381	7BD/5120-99-401-9945	Injector Sleeve Cleaner

AIR VENTING FUEL SYSTEM

200 Before air venting fuel system, ensure that fuel feed pump rocker arm is contacting base of cam, enabling a full pumping stroke to be obtained with priming lever. Do not pump fuel by cranking engine with starter as this may lead to overheating of the starter.

201 Slacken plug in unused outlet of main fuel filter and operate fuel feed pump priming lever. Tighten plug as fuel is being discharged. Slacken vent screw on pump body (2) and governor housing (1) and operate priming lever until fuel free from air, flows from pump body vent screw, and tighten screw (2).

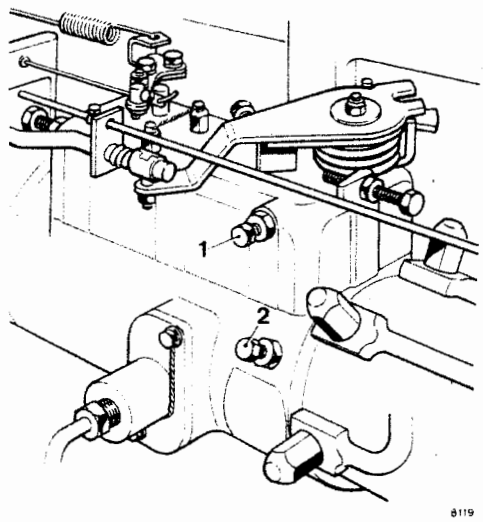


Fig 78 - Fuel injection pump vent screws

202 Slacken any two injector pipe unions, operate starter and as soon as the engine runs, tighten injector pipe union and governor housing vent screw (2).

FUEL SYSTEM SEDIMENTER

Removal

203 The fuel system sedimenter is mounted on the side of the crankcase and is secured by two bolts (arrowed).

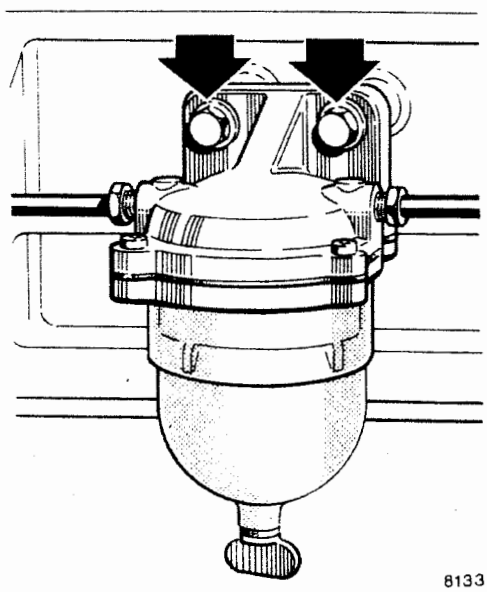


Fig 79 - Fuel system sedimenter

Disassembly

204 The sedimenter bowl can be removed from the metal head after releasing four securing screws.

Reassembly

205 Position element in bowl with widest aperture of cone towards base, element legs contacting bowl register. Bowl clamping plate bore is tapered and widest diameter of bore should face sedimenter head. Tighten clamping plate screws diagonally and evenly and vent fuel system up to main filter.

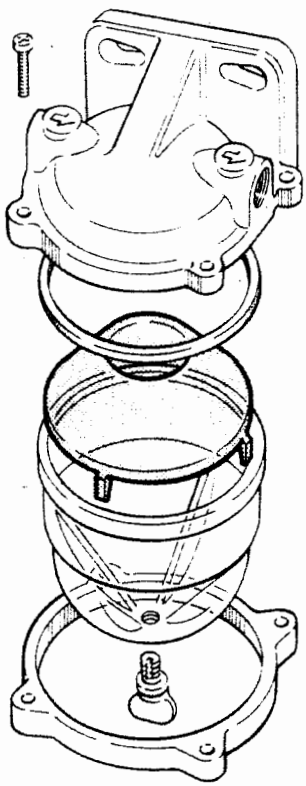


Fig 80 - Reassembling sedimenter

FUEL FEED PUMP

Disassembly

206 Before parting pump and priming lever housing from body, mark flanges to ensure correct relationship when reassembling.

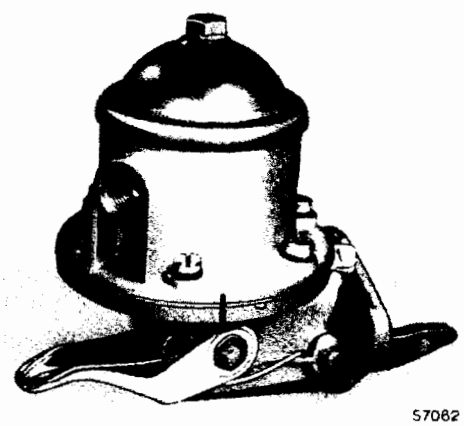
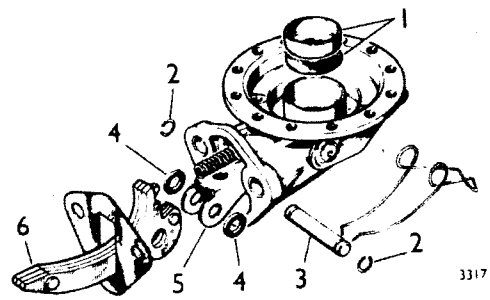


Fig 81 - Fuel feed pump marking

207 If valves are to be renewed, carefully prise valves out of pump cover.

208 Rocker arm can be withdrawn after removing one of the circlips (2) and driving out pin (3). Diaphragm rod oil seal and retainer (1) can be prised out after removing staking around retainer.

When installing rocker arm (6) and link (5), locate spacers (4) each side of link.



1. Oil seal and retainer
2. Circlip
3. Pin
4. Spacer
5. Link
6. Rocker arm

Fig 82 - Exploded view of fuel pump

Reassembly and Installation

209 Install diaphragm by depressing and rotating it 90° to engage link and align tab with lug on body.

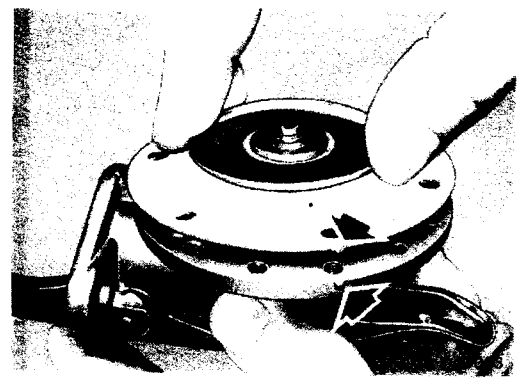
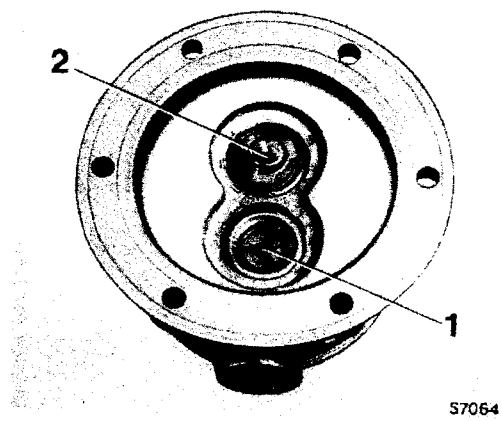


Fig 83 - Installing diaphragm

210 Outlet valve (2) must be installed with spring to top of pump, and inlet valve (1) with spring to bottom of pump.

Valves should be tapped or pressed into position, using a sleeve with a bore diameter of 14.2 mm (0.56 in.). and external diameter 17.3 mm (0.68 in.). To secure valves, stake body in six positions around each valve.



1. Inlet valve 2. Outlet valve

Fig 84 - Pump cover and valves

211 Position cover with marks on flanges in line, and tighten screws finger tight at this stage.

212 After operating rocker arm several times, hold arm towards body so as to hold diaphragm at the bottom of its stroke, and tighten screws diagonally and evenly.

213 Fuel system must be vented up to main filter as described in para 200 after installing pump.

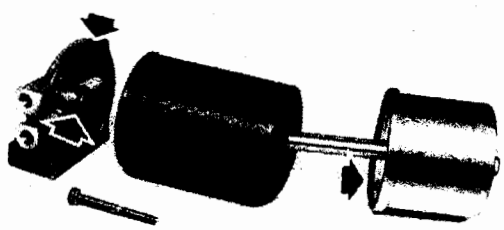
MAIN FUEL FILTER

Removal

214 To remove element or sediment chamber unscrew retaining bolt on filter head.

Installation

215 When assembling filter, install sealing rings (arrowed) in filter head and sediment chamber and ensure washer is installed on securing bolt.



S9358

Fig 85 - Main fuel filter

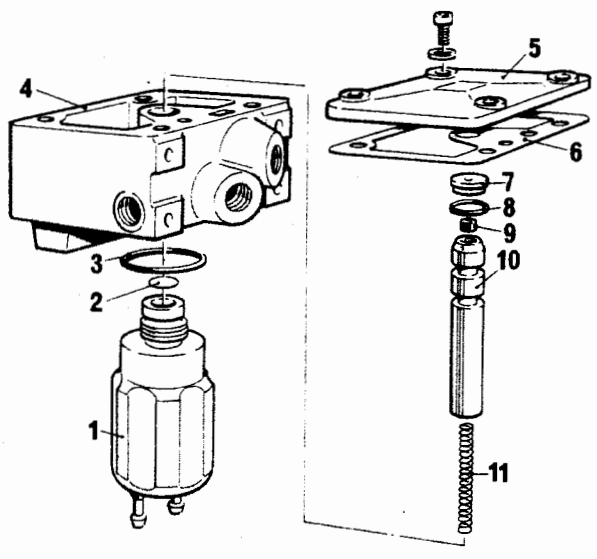
THERMOSTART TANK

Removal and Disassembly

216 The thermostart tank may be removed from mounting bracket after removal of fuel and boost pipes and electrical connections.

217 Unscrew solenoid (1) and remove spring (11), shim (2) and '0' ring (3) from tank body (4).

218 Remove cover plate (5) and gasket (6), withdraw plunger (10), seal (9), plate (7) and '0' ring (8)



8208

1. Solenoid
2. Shim
3. '0' ring
4. Tank body
5. Cover plate
6. Gasket
7. Plate
8. '0' ring
9. Seal
10. Plunger
11. Spring

Fig 86 - Thermostart tank

Overhaul

219 Check plunger and bore for scores and wear. Ensure hole in plate (7) is not blocked. Renew parts as necessary.

Reassembly

220 Reassembly is a reversal of disassembly.

COLD STARTING IGNITERS

221 The cold starting igniters are located in the boost pipe above the inlet manifold.

222 On vehicles installed with insulated ground return wiring, the igniter is screwed into an insulating bush secured into the boost pipe by adhesive.

223 Before installation, smear periphery of insulating bush (arrowed) with Araldite and leave for recommended period before installing igniter.

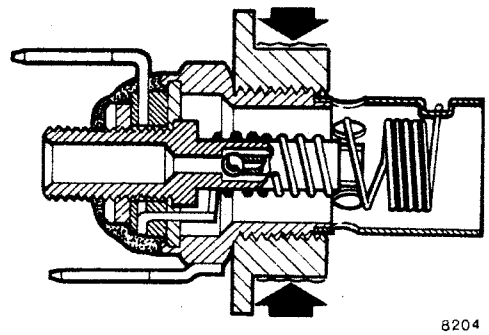


Fig 87 - Cold starting igniter

Igniter Test

224 To check igniter for leakage, remove unit from boost pipe and clean flame shield. Reconnect fuel pipe to igniter and run engine at a fast idle. Any sign of moistening inside or outside flame shield indicates a faulty ball valve and igniter, which being a sealed unit, must be renewed.

If igniter is suspected of leaking only when the intake manifold is under heavy depression, fuel pipe should be disconnected from igniter and blanked off, and vehicle given a road test. If exhaust smoke is reduced igniter is faulty.

Igniter must be removed from vehicle before carrying out any electrical tests as a fire hazard exists when fuel contacts glowing igniter element.

FUEL INJECTION PIPES

Removal

CAUTION ...

Before removing injection pipes, clean pipe unions to prevent dirt entering fuel system. After removal, seal both ends of pipe, injector, and injector pump orifices.

Inspection

225 It is essential that the pipe nipple seatings in the injection pump unions and the injectors are not damaged. Even a lightly scarred seating, as shown, necessitates renewal of component.

226 A pipe which is even mildly grooved by a union nut, must be renewed.

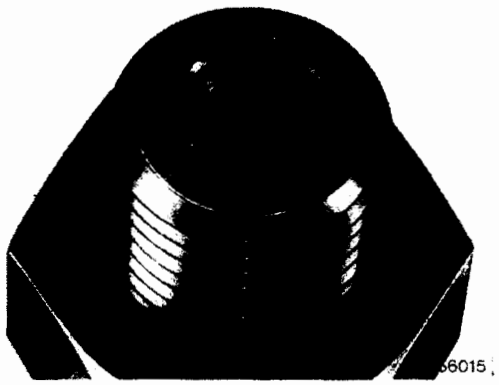


Fig 88 - Damaged injection pump union seating

Installation

227 Before installing a new or used injection pipe, wash pipe in paraffin and dry with compressed air. Finally, flush bore of pipe with calibration fluid from a filtered supply. Ensure that contact surfaces and threads of injection pump and injector are clean and position pipe so that each end enters its seating along centre line of pump or injection union orifice. Tighten union nuts finger tight and check that pipe is centrally disposed where it emerges from nuts. Pipe should remain in a true line with pump or injector union orifice. Check that pipe will not be under strain when pipe clip is tightened. If adjustment of pipe is necessary, remove pipe and reform by hand over the whole length as local bending will cause failure. Flush bore of pipe before installing as any bending may have loosened scale in pipe. Tighten union nuts to 23 Nm (17 lbf ft). Do not over-tighten nuts as this may distort delivery valve holder or lead to failure of pipe.

INJECTORS

Removal

228 Use Remover 7BD/5120-99-801-4103 (D1122) if injector is tight in head.

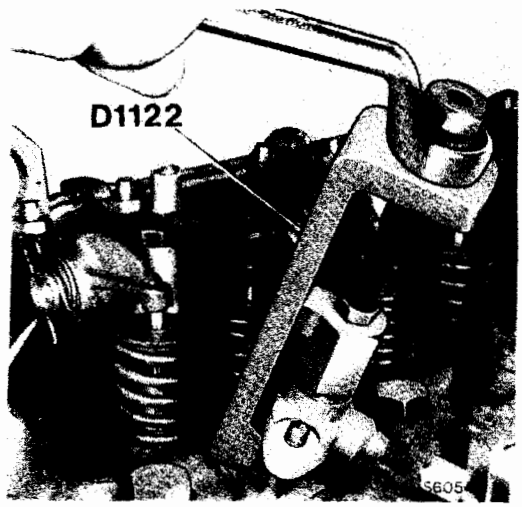


Fig 89 - Removing injector

Installation

229 Before installing injector, clean sleeve and seat face in cylinder head with Cleaner 7BD/5120-99-401-9945 (Z8381). Grease tool to prevent carbon and dirt entering engine.

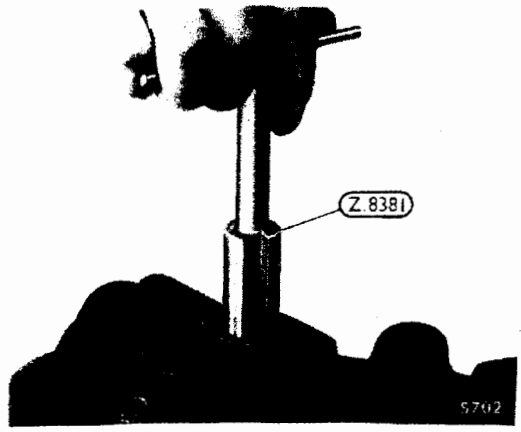


Fig 90 - Cleaning injector seat and sleeve

230 Copper seating washer must be renewed and a check made for additional washers adhering to seating in cylinder head. If more than one washer is used, injector nozzle will not project far enough into cylinder and sprays will not impinge correctly on piston causing excessive smoke and loss of power. When installing injector, install rubber sealing ring between injector and sleeve and tighten securing nuts finger tight, then tighten evenly to a torque of 8 Nm (6 lbf ft). Before connecting pipes, crank engine with starter and check for blow past seating washer. If this is apparent, slacken and retighten injector securing nuts.

FUEL INJECTION PUMP

Removal

CAUTION ...

Before removing fuel pipes, clean pipe unions to prevent dirt entering fuel system. After removal, seal both ends of pipe, injector and injection pump orifices.

231 Disconnect throttle control rod, idle control cable, and fuel feed pipe. Remove securing nuts and bolts from carrier and support bracket and withdraw pump.

Installation

232 When installing pump, ensure gasket is in position and rotate pump shaft so that master spline on pump aligns with timing pin in pump coupling. Do not use excessive force or timing pin may shear.

238 Align timing marks (2) on pump mounting flange and carrier.

234 Pour an eighth of a pint of engine oil into carrier through filler plug hole (1) to ensure initial lubrication of pump coupling.

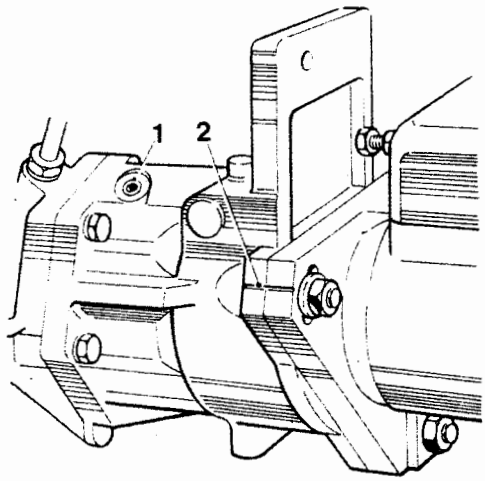


Fig 91 - Injection pump and carrier

PUMP TIMING

235 To check the accuracy of the timing marks on the pump and carrier flanges, or after installing a new pump carrier which is unmarked, proceed as follows:

235.1 Rotate engine in normal direction until flywheel timing mark with 'T' is aligned with timing aperture pointer and No 1 piston is on compression stroke.

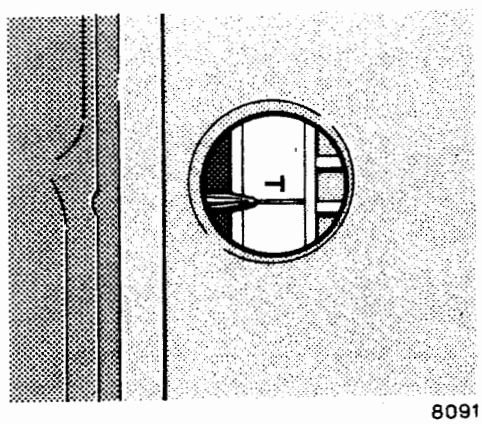


Fig 92 - Flywheel timing mark

235.2 Remove inspection cover from side of pump and check that timing mark 'D' on pump rotor is aligned with squared end of circlip.

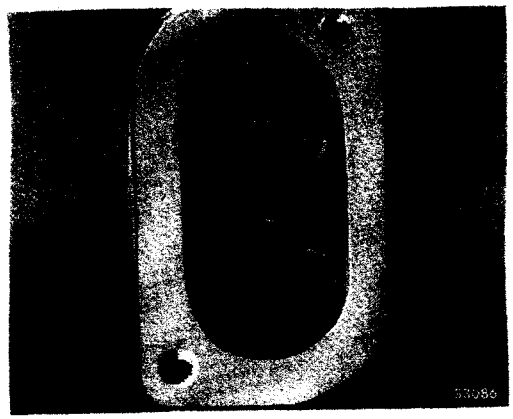


Fig 93 - Fuel injection pump timing mark

235.3 If necessary, adjust position of pump on carrier, ensuring backlash is eliminated, and scribe a line on carrier adjacent to line on pump flange.

IDLING AND MAXIMUM SPEED ADJUSTMENT

236 Before adjusting idling speed, ensure that fast idling control wire is slack.

237 With engine at normal operating temperature, check idling speed with a tachometer and, if necessary, adjust stop screw (arrowed) to obtain an engine idling speed as recommended by equipment manufacturer.

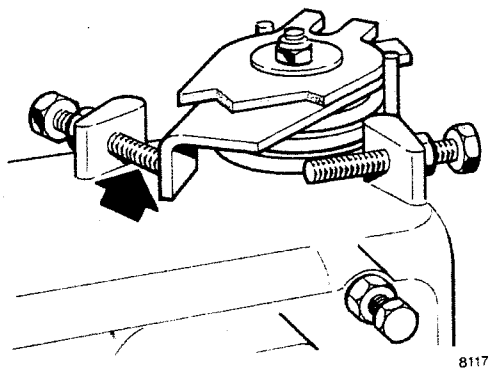


Fig 94 - Idling speed stop screw

238 The engine maximum speed as recommended by equipment manufacturer is set by a screw (arrowed) on the governor housing. The screw is sealed against unauthorized interference.

239 With engine at normal operating temperature move speed control lever by hand to maximum speed position and check engine speed with tachometer.

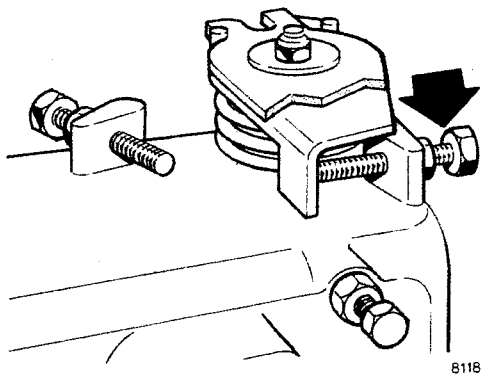


Fig 95 - Maximum speed stop screw

240 After completing adjustment, install seal and wire as follows:

241 Hook equal lengths of wire around lug on governor housing.

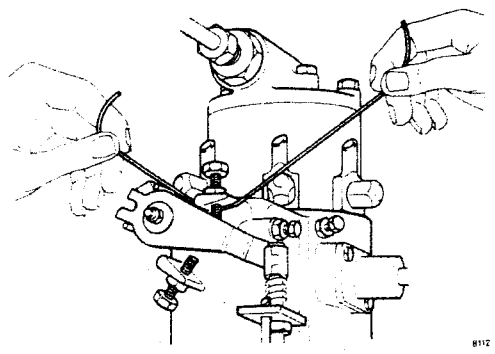


Fig 96 - Installing locking wire

242 Twist wire together 2-3 turns.

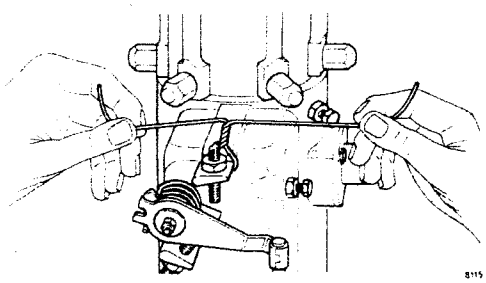


Fig 97 - Installing locking wire

243 Feed wire around screw and through hole in top.

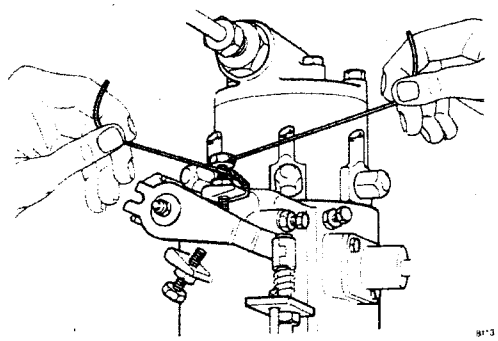


Fig 98 - Installing locking wire

244 Finally pull wire tight before twisting ends together and installing seal. Seal must trap twist in wire.

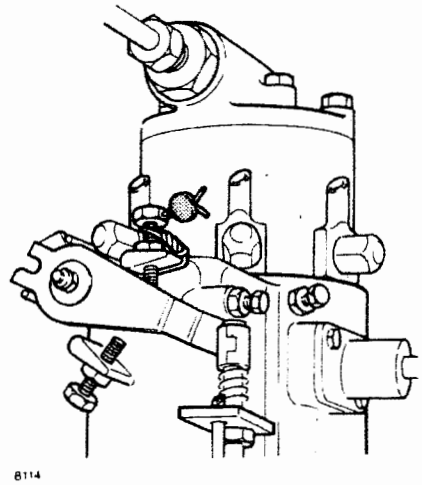


Fig 99 - Installing locking wire

245 Specified maximum speed must not be exceeded, therefore adjustment must not be attempted without a tachometer.

COOLING SYSTEM

FAN BELTS

Note ...

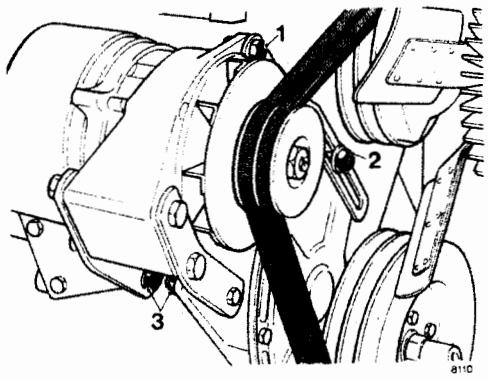
Fan belts are serviced in matched pairs to ensure even tension on both belts. Therefore, if one belt should fail it is essential that both belts are renewed and the remaining belt discarded.

Removal

246 To remove fan belts, slacken nuts on the two mounting bolts (3) and then the two bolts securing the slotted brace (1 and 2). Pivot the alternator towards engine and remove both belts.

Installation

247 When installing fan belts, adjust belts to 13 mm (0.5 in.) at the centre of the longest run.

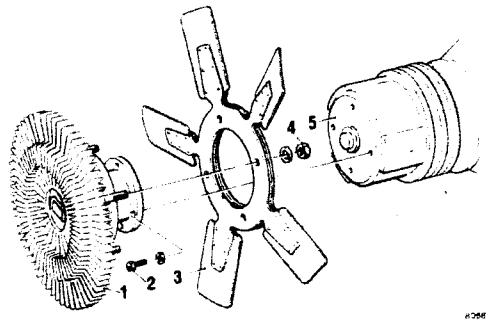


1. Upper mounting bolt
2. Slotted brace locking bolts
3. Lower mounting bolts

Fig 100 - Fan belt adjustment

FAN AND VISCOUS DRIVE

248 Fan (3) and viscous drive (1) may be removed from water pump pulley (5) after removing four bolts (2). The fan is secured to drive unit by four nuts (4).



1. Viscous drive unit
2. Belt, drive unit to water pump
3. Fan
4. Nut, fan to drive unit
5. Water pump pulley

Fig 101 - Exploded view of fan assembly

Inspection

WARNING ...

A FAN THAT IS NOT IN PROPER BALANCE COULD FAIL AND FLY APART DURING SUBSEQUENT USE, CREATING AN EXTREMELY DANGEROUS CONDITION.

249 If a fan blade is bent or damaged in any way, no attempt should be made to repair or re-use the damaged part. A bent or damaged fan should always be replaced with a new assembly.

250 It is essential that fan assemblies remain in proper balance, and proper balance cannot be assured once an assembly has been bent or damaged. The fan drive is a sealed unit and is serviced by renewal.

Installation

251 Installation of fan and drive unit is a reversal of removal. Tighten fan to drive unit bolts to a torque of 11 Nm (8 lbf ft), and drive unit bolts to water pump pulley to a torque of 22 Nm (16 lbf ft).

WATER PUMP

Removal

252 Remove securing nuts and remove water pump, taking care not to damage gasket faces.

Installation

253 On installation of water pump ensure gasket faces are clean and free from dirt.

254 Tighten water pump securing nuts to a torque of 48 Nm (35 lbf ft).

Disassembly

255 With water pump removed, pulley may be withdrawn from shaft using a flange type puller secured by bolts to the threaded holes in the pulley.

Fig 102 - Removing water pump pulley

256 To remove shaft and bearing assembly, withdraw circlip in front end of body bore, support pump on body and press shaft through rotor. Shaft and bearing are only serviced as an assembly.

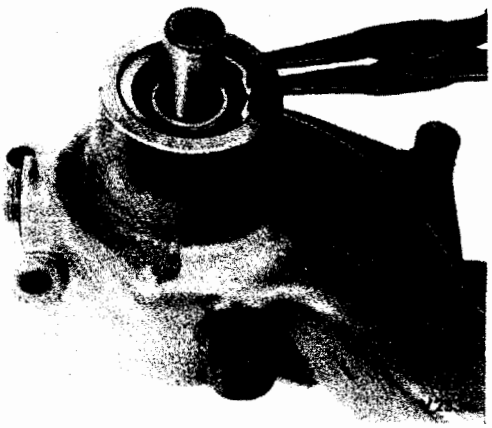


Fig 103 - Removing circlip

Reassembly

257 Prior to installation of the spring-loaded lip-type seal, apply Shell Alvania grease to seal and shaft in the vicinity of seal. Should Shell Alvania grease not be available use a grease which complies with specification GM4733-M.

Care should be taken to ensure that after installing the seal, water pump drain hole (arrowed) is clear.

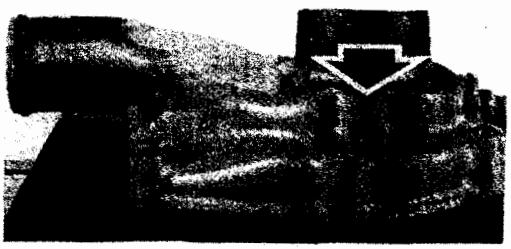


Fig 104 - Pump drain hole

258 When pressing shaft and bearing assembly into pump body, use a sleeve with an external diameter equal to that of the bearing, and continue pressing until bearing contacts shoulder in body bore. Pump bearing is pre-packed with lubricant during manufacture and sealed for life.

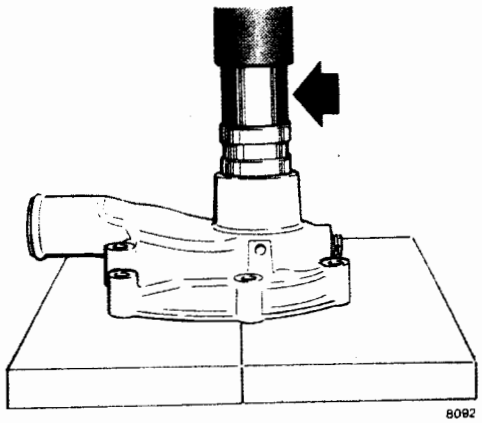


Fig 105 - Pressing shaft and bearing assy into body

259 Install circlip in front end of the body bore. Rotor seal should be installed to shaft using a weak soap solution.

260 When pressing rotor or pulley on to pump shaft, thrust must be taken by the shaft and not the pump body. Pulley should be pressed on until dimension 'A' equals 122.7/123.4 mm (4.83/4.86 in.). Rotor should be pressed on until flush with end of shaft.

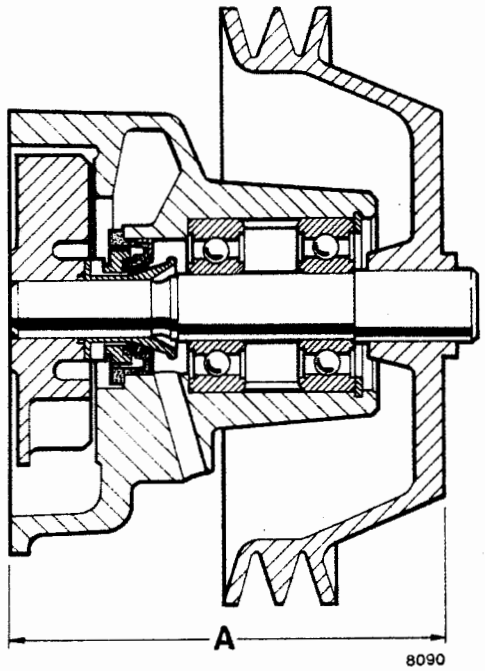


Fig 106 - Installing pulley

THERMOSTAT AND HOUSING

261 The thermostat housing is secured to the front of the cylinder head by bolts and sealed by a gasket.

262 On installation of thermostat housing gasket faces must be clean and free from dirt.

263 Tighten securing bolts to a torque of 48 Nm (35 lbf ft).

264 On vehicles installed with insulated ground return wiring a capillary tube is installed for the water temperature gauge. The tube is screwed into an adaptor in the thermostat housing body.

265 When removing or renewing capillary tube and gauge, the tube must be positioned along cab underbody as shown.

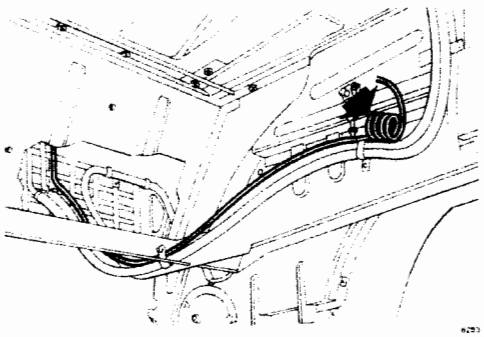


Fig 107 - Capillary tube positioning