SERVICE MANUAL

W4

Loader
and
Forklift

8-33652

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL

W4

Loader
and
Forklift

8-33652

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TYPE 1-4

W4 LOADER AND FORKLIFT
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Revised May 1982

NOTES

Section
1001

SAFETY RULES
SERVICE MANUAL INTRODUCTION
AND
TORQUE SPECIFICATIONS

Written In *Clear And Simple English*

CASE CORPORATION

8-33921

Printed in U.S.A.
January 1980
Revised May 1982

SAFETY RULES

This Symbol Shows Important Information About Safety In This Manual. When You See This Symbol, Carefully Read The Information That Follows and Understand The Possible Causes of Injury Or Death. 1-1-A

IMPORTANT: *To prevent injury on job, follow the Warning, Caution, and Danger notes in this section and other sections throughout this manual. Follow the instructions carefully.*

The procedures recommended and shown in this manual are good, effective service methods. However, all possible procedures and service hazards may not be covered. Therefore, if you use a tool or procedure not recommended, you must make sure that the method you select is a safe method.

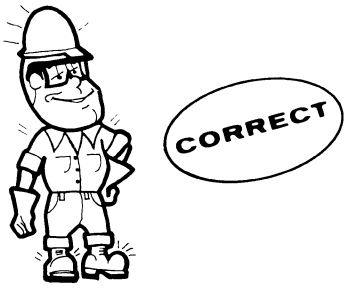
DANGER: *Engine exhaust fumes can cause death. If it is necessary to start the engine in a closed place, remove the exhaust fumes from the area with an exhaust pipe extension. If you do not have an exhaust pipe extension, open the doors and get outside air into the area.* 48-56

WARNING: *Read operator's manual to familiarize yourself with control lever functions.* 46-27

WARNING: *Operate tractor and equipment controls from the seat position only. Any other method could result in serious injury.* 48-55

WARNING: *This is a one man machine, no riders allowed.* 35-8

WARNING: *If you wear clothing that is too loose or do not use the correct safety equipment for your job, you can be injured. Always wear clothing that will not catch on objects. Extra safety equipment that can be required includes hard hat, safety shoes, ear protection, eye or face protection, heavy gloves and reflector clothing.* 45-3-A



WARNING: *When working in the area of the fan belt with the engine running, avoid loose clothing if possible, and use extreme caution.* 35-4

WARNING: *Whenever the bucket must be raised to aid in servicing, block the loader arms in place with lift cylinder support strut or a suitable safety stand.* 23-7-B

WARNING: *When doing checks and tests on the equipment hydraulics, follow the procedures as they are written. DO NOT change the procedure.* 47-44

WARNING: *When putting the hydraulic cylinders on this machine through the necessary cycles to check operation or to remove air from a circuit, make sure all people are out of the way.* 47-45

WARNING: *Locate the machine on level ground and block the wheels securely before working under the machine. Failure to follow the above procedure can result in personal injury.* 46-77

WARNING: *Use insulated gloves or mittens when working with hot parts.* 47-41A

CAUTION: *Pin sized and smaller streams of hydraulic oil under pressure can penetrate the skin and result in serious infection. If hydraulic oil under pressure does penetrate the skin, seek medical treatment immediately. Maintain all hoses and tubes in good condition. Make sure all connections are tight. Make a replacement of any tube or hose that is damaged or thought to be damaged. DO NOT use your hand to check for leaks; use a piece of cardboard or wood.* 40-6-A

CAUTION: *When removing hardened pins such as a pivot pin, or a hardened shaft, use a soft head (brass or bronze) hammer or use a driver made from brass or bronze and a steel head hammer.* 46-17

CAUTION: *When using a hammer to remove and install pivot pins or separate parts, using compressed air or using a grinder, wear eye protection that completely encloses the eyes (approved goggles or other approved eye protectors).* 46-13

CAUTION: *When servicing or repairing the machine, keep the shop floor and operator's compartment and steps free of oil, water, grease, tools, etc. Use an oil absorbing material and/or shop cloths as required. Use safe practices at all times.* 40-8

CAUTION: *Use suitable floor (service) jacks or chain hoists to raise wheels or track off the floor. Always block machine in place with suitable safety stands.* 40-7-A

CAUTION: *Some components of this machine are very heavy. Use suitable lifting equipment or additional help as instructed in this service manual.* 40-10

SERVICE MANUAL INTRODUCTION

This service manual has been prepared with the latest service information available. Trouble-shooting, removal, disassembly, inspection and installation procedures, and complete specifications and tightening references can be found in most sections. Some sections have drawings without a written procedure because the job is so easily done. This service manual is one of the most important tools available to the service technician.

Right-Hand and Left-Hand

The terms right-hand and left-hand and front and rear as used in this manual indicate the right and left sides, and front and rear of the machine as seen from the operator's seat for correct operation of the machine or attachment.

Text

If the service manual is for more than one machine or different models of components (planetary axles, gear boxes, control valves, etc.) the procedures have the steps necessary to service each model.

Table of Contents

A Table of Contents is in the front of this manual. The Table of Contents shows the main divisions and the sections that are in each division. The individual sections, where necessary, have a Table of Contents on the second page of that section.

Page Numbers

All page numbers are made of two numbers separated by a dash, such as 4002-9. The number before the dash is the section number. The number following the dash is the page number in that section. Page numbers will be found at the upper right or left of each page.

Illustrations

Illustrations are put as near as possible to the text and are to be used as part of the text.

Torque Specifications

The most common grades of fasteners (bolts, nuts, and screws) used on Case machines are grade 5 and grade 8. See page 1001-6 for torque specifications and identification marks.

The specifications in this section are standard torque values and are to be used on all fasteners during assembly and installation unless special torque values are shown in a section.

P.I.N., Serial and Model Numbers

When replacement parts are needed, it is necessary to give the parts department one or all of the numbers. The model number is normally found on the Product Identification Number plate or Serial Number plate.

The Product Identification Number (P.I.N.) and serial numbers will be found in the following locations.

Machine - Product Identification Number plate fastened to the front frame above the parking brake.

1.8 Litre Diesel Engine - A serial number plate is on the left-hand side of the engine below the preheaters.

2.1 Litre Diesel Engine - A serial number is stamped on the left-hand side of the engine in front of the tachometer drive.

ROPS - Serial number plate fastened to the left-hand side of the ROPS.

Forklift - Serial number is stamped on the right-hand side of the outer frame assembly.

Components - A serial number plate is on many components such as starters, alternators, pumps, etc.

Classification of Lubricants

The SAE number is the viscosity of engine oils; for example, SAE 30, a single viscosity oil. SAE 10W30 is a variable viscosity oil.

The API classification (SD, CD, etc.) is the oil performance in terms of engine usage. Only oil specified in Section 1002 can be used. These oils have the needed chemical additives to give maximum engine protection. Both the SAE grade and API classification must be found on the container.

Gear Lubricant and Grease

Gear lubricant and grease for each application is specified in Section 1002.

Decals and Painting

All decals about operation of the machine and/or attachments must be in a condition so that you can read the decals easily. Replace any decal that is damaged or cannot be read.

All decals that start with the words WARNING, CAUTION, or DANGER must be in a condition so that you can read the decals easily. Replace any decal that is damaged or cannot be read.

When you paint the machine or attachment, put covers over the good decals and remove the decals which have damage or cannot be read easily. Use enamel thinner to make the decal easier to remove.

Remove the old decal before you install a new decal. Use enamel thinner to make the old decal easier to remove.

Special Tools

Special tools are needed to remove and install, disassemble and assemble, check and adjust some component parts of this machine. Some special tools can be easily made locally and the necessary information to make the tool is in this service manual. Other special tools are more difficult to make locally and are available from Service Tools in the U.S. and from Jobborn Manufacturing in Canada. Use these tools according to the instructions in this service manual for your personal safety and to do the job correctly.

Order special tools from either of the following companies:

Service Tools
P.O. Box 314
Owatonna, Minnesota 55060

Jobborn Manufacturing Co.
97 Frid Street
Hamilton, Ontario L8P 4M3
Canada

U.S. AND METRIC TORQUE SPECIFICATIONS

Torque values for all situations unless special torque is specified

Grade 5 Bolts, Nuts, and Studs

Thread Size	Pound-Feet	Newton metres	Kilogram metres
1/4 - 20	7-9	9-12	1.0-1.2
1/4 - 28	11-13	15-18	1.5-1.8
6.4 mm			
5/16 - 18	10-15	15-20	1.4-2.1
5/16 - 24	15-20	20-25	2.1-2.8
7.9 mm			
3/8 - 16	20-25	25-35	2.8-3.4
3/8 - 24	25-30	35-40	3.4-4.1
9.5 mm			
7/16 - 14	30-40	40-55	4.1-5.5
7/16 - 20	35-45	45-60	4.8-6.2
11.1 mm			
1/2 - 13	50-60	70-80	6.9-8.3
1/2 - 20	60-70	80-95	8.3-9.7
12.7 mm			
9/16 - 12	70-90	95-120	9.7-12.4
9/16 - 18	80-100	110-135	11.0-13.8
14.3 mm			
5/8 - 11	100-120	135-160	13.8-16.6
5/8 - 18	120-150	160-200	16.6-20.7
15.9 mm			
3/4 - 10	180-220	245-300	24.9-30.4
3/4 - 16	200-240	270-325	27.7-33.2
19.0 mm			
7/8 - 9	290-350	390-475	40.1-48.4
7/8 - 14	325-400	440-540	44.9-55.3
22.2 mm			
1 - 8	430-530	580-720	59.4-73.3
1 - 12	480-580	650-785	66.4-80.2
25.4 mm			
1-1/8 - 7	540-660	730-895	74.7-91.2
1-1/8 - 12	595-725	805-980	82.3-100.2
28.6 mm			
1-1/4 - 7	755-925	1025-1255	104.4-127.9
1-1/4 - 12	830-1010	1125-1370	114.8-139.6
31.8 mm			
1-3/8 - 6	990-1210	1340-1640	136.9-167.3
1-3/8 - 12	1135-1385	1540-1860	156.9-191.5
34.9 mm			
1-1/2 - 6	1315-1610	1780-2180	181.8-222.6
1-1/2 - 12	1475-1800	2000-2440	203.9-248.9
38.1 mm			

Grade 8 Bolts, Nuts, and Studs

Thread Size	Pound-Feet	Newton metres	Kilogram metres
1/4 - 20	5-10	7-15	.7-1.4
1/4 - 28	10-15	15-20	1.4-2.1
6.4 mm			
5/16 - 18	15-20	20-30	2.1-2.8
5/16 - 24	20-25	30-35	2.8-3.4
7.9 mm			
3/8 - 16	30-40	40-50	4.1-5.5
3/8 - 24	35-40	40-55	4.8-5.5
9.5 mm			
7/16 - 14	40-60	55-80	5.5-8.3
7/16 - 20	55-65	75-90	7.6-9.0
11.1 mm			
1/2 - 13	70-90	95-120	9.7-12.4
1/2 - 20	80-100	110-135	11.1-13.8
12.7 mm			
9/16 - 12	100-120	135-160	13.8-16.6
9/16 - 18	120-140	160-190	16.6-19.4
14.3 mm			
5/8 - 11	150-190	200-260	20.7-26.3
5/8 - 18	160-200	220-270	22.1-27.7
15.9 mm			
3/4 - 10	250-310	340-420	34.6-42.9
3/4 - 16	290-350	390-475	40.1-48.4
19.0 mm			
7/8 - 9	415-505	560-685	57.4-69.8
7/8 - 14	450-550	610-745	62.2-76.0
22.2 mm			
1 - 8	610-750	870-1015	84.3-103.7
1 - 12	665-815	900-1105	91.9-112.7
25.4 mm			
1-1/8 - 7	865-1055	1170-1430	119.6-145.9
1-1/8 - 12	970-1190	1315-1610	134.1-164.5
28.6 mm			
1-1/4 - 7	1225-1495	1660-2025	169.4-206.7
1-1/4 - 12	1350-1650	1830-2235	186.6-228.1
31.8 mm			
1-3/8 - 6	1600-1960	2170-2655	221.2-271.0
1-3/8 - 12	1835-2245	2490-3045	253.8.-310.4
34.9 mm			
1-1/2 - 6	2125-2595	2880-3520	293.8-358.8
1-1/2 - 12	2395-2925	3245-3965	331.1-404.4
38.1 mm			

TORQUE SPECIFICATIONS - STEEL HYDRAULIC FITTINGS

Tube OD Hose ID	Thread Size	Pound-Feet	Newton metres	Kilogram metres
37 Degree Flare Fittings				
1/4 in 6.4 mm	7/16-20	6-12	8-16	0.8-1.7
5/16 in 7.9 mm	1/2-20	8-16	11-21	1.1-2.2
3/8 in 9.5 mm	9/16-18	10-25	14-33	1.4-3.5
1/2 in 12.7 mm	3/4-16	15-42	20-56	2.1-5.8
5/8 in 15.9 mm	7/8-14	25-58	34-78	3.5-8.0
3/4 in 19.0 mm	1-1/16-12	40-80	54-108	5.5-11.1
7/8 in 22.2 mm	1-3/16-12	60-100	81-135	8.3-13.9
1.0 in 25.4 mm	1-5/16-12	75-117	102-158	10.4-16.2
1-1/4 in 31.8 mm	1-5/8-12	125-165	169-223	17.3-22.8
1-1/2 in 38.1 mm	1-7/8-12	210-250	285-338	29.0-34.6

Tube OD Hose ID	Thread Size	Pound-Feet	Newton metres	Kilogram metres
Straight Threads with O-ring				
1/4 in 6.4 mm	7/16-20	12-19	16-25	1.7-2.6
5/16 in 7.9 mm	1/2-20	16-25	22-33	2.2-3.5
3/8 in 9.5 mm	9/16-18	25-40	34-54	3.5-5.5
1/2 in 12.7 mm	3/4-16	42-67	57-90	5.8-9.3
5/8 in 15.9 mm	7/8-14	58-92	79-124	8.0-12.7
3/4 in 19.0 mm	1-1/16-12	80-128	108-174	11.1-17.8
7/8 in 22.2 mm	1-3/16-12	100-160	136-216	13.8-22.1
1.0 in 25.4 mm	1-5/16-12	117-187	159-253	16.2-25.9
1-1/4 in 31.8 mm	1-5/8-12	165-264	224-357	22.8-36.5
1-1/2 in 38.1 mm	1-7/8-12	250-400	339-542	34.6-55.3

Split Flange Mounting Bolts			
Size	Pound-Feet	Newton metres	Kilogram metres
5/16-18	15-20	20-27	2.1-2.8
3/8-16	20-25	26-33	2.8-3.5
7/16-14	35-45	47-61	4.7-6.2
1/2-13	55-65	74-88	7.6-9.0
5/8-11	140-150	190-203	19.4-20.7

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NOTES

Section 1002

MAINTENANCE AND LUBRICATION

Written In *Clear And Simple English*

CASE CORPORATION

8-33921

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Revised May 1982

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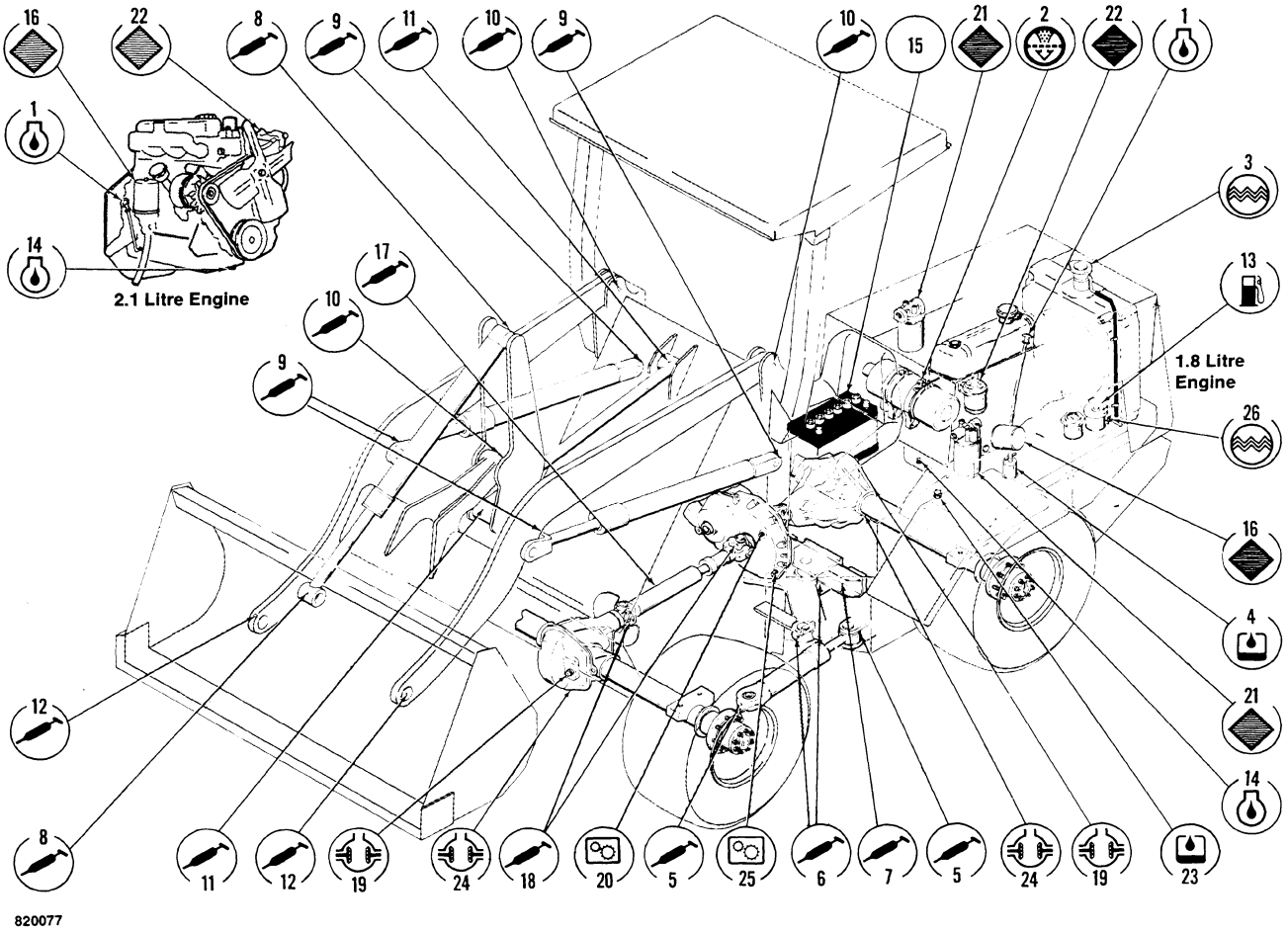
Forklift Service Points 1002-4

Fluids and Lubricants 1002-6

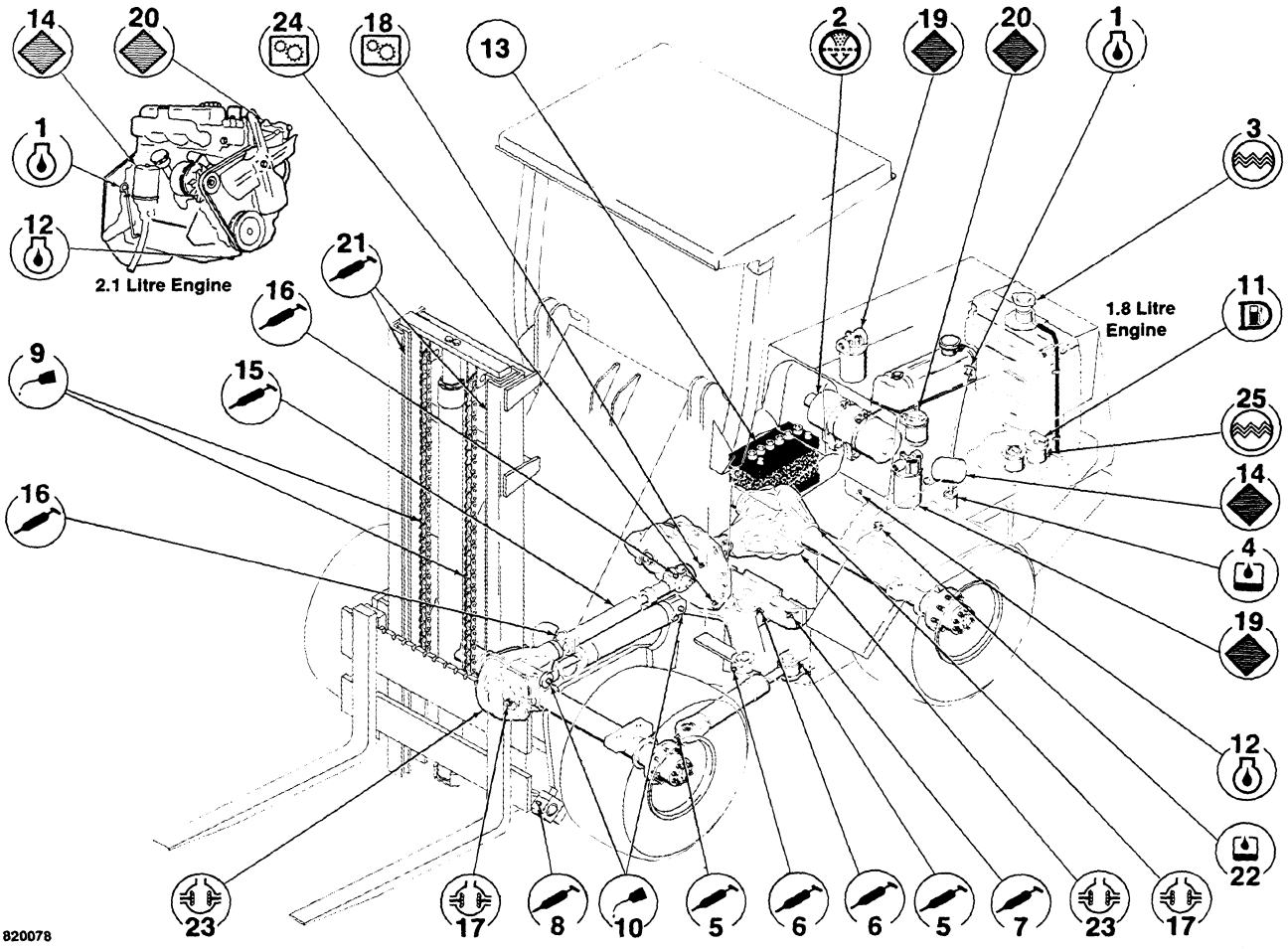
LOADER SERVICE POINTS



REF NO.	SERVICE POINT	SERVICE REQUIRED	FREQUENCY
1	Engine Oil Dipstick	*Check level - fill as required	Daily or after every 10 hours of operation
2	Engine Air Cleaner	Check and service as required	
3	Radiator	Check coolant level. Add coolant as required	
4	Hydraulic Oil Reservoir	Check level - fill as required	
5	Steering Cylinder (both ends)	Lubricate with No. 2 Lithium Base Grease	
6	Center Pivot Grease Fitting (2 places)	Lubricate with No. 2 Lithium Base Grease	
7	Slide Grease Fitting (2 places if equipped)	Lubricate with No. 2 Lithium Base Grease	
8	Bucket Cylinder Pivots	Lubricate with No. 2 Lithium Base Grease	
9	Lift Cylinder Pivots	Lubricate with No. 2 Lithium Base Grease	
10	Lift Arm Pivots	Lubricate with No. 2 Lithium Base Grease	
11	Bucket Leveler Arm (3 places)	Lubricate with No. 2 Lithium Base Grease	
12	Bucket Pivots	Lubricate with No. 2 Lithium Base Grease	
13	Fuel Tank	Fill at the end of each day of operation	Daily
14	Engine Oil Drain	*Drain and fill with new oil	After every 50 hours of operation
15	Battery	Check and service as required	After every 50 hours of operation or weekly
16	Engine Oil Filter	*Replace with new filter	After every 100 hours of operation
17	Drive Shaft Grease Fitting	Lubricate with No. 2 Lithium Base Grease	
18	Front and rear U-Joint Grease Fitting	Lubricate with No. 2 Lithium Base Grease	
19	Front and rear Axles	Check fluid level - fill as required	
20	2-Speed Transmission	Check fluid level - fill as required	
21	Hydraulic Oil Filters	**Replace with new filters	After every 250 hours of operation
22	Fuel Filter	Replace with new filter	
23	Hydraulic Oil Reservoir Drain	Drain and fill with new oil	After every 100 hours of operation or yearly
24	Front and Rear Axle Drain	Drain and fill with new oil	
25	2-Speed Transmission Drain	Drain and fill with new oil	
26	Radiator Drain	Drain and flush cooling system. Fill with new coolant	After every 2000 hours or yearly

*The engine oil and filter must be changed initially after the first 25 hours of operation. Check oil level at 3 hour intervals during this period.
**The hydraulic oil filters must be changed initially after the first 25 hours of operation.

FORKLIFT SERVICE POINTS



REF NO.	SERVICE POINT	SERVICE REQUIRED	FREQUENCY
1	Engine Oil Dipstick	*Check level - fill as required	Daily or after every 10 hours of operation
2	Engine Air Cleaner	Check and service as required	
3	Radiator	Check coolant level. Add coolant as required	
4	Hydraulic Oil Reservoir	Check level - fill as required	
5	Steering Cylinder (both ends)	Lubricate with No. 2 Lithium Base Grease	
6	Center Pivot Grease Fitting (2 places)	Lubricate with No. 2 Lithium Base Grease	
7	Slide Grease Fitting (2 places if equipped)	Lubricate with No. 2 Lithium Base Grease	
8	Mast Tilt Pivots (2)	Lubricate with No. 2 Lithium Base Grease	
9	Forklift Chain	Lubricate with Case Chain and Cable Lubricant (Part No. B17082)	
10	Mast Tilt Cylinders	Lubricate with Case Chain and Cable Lubricant (Part No. B17082)	
11	Fuel Tank	Fill at the end of each day of operation	Daily
12	Engine Oil Drain	*Drain and fill with new oil	After every 50 hours of operation
13	Battery	Check and service as required	After every 50 hours of operation or weekly
14	Engine Oil Filter	*Replace with new filter	After every 100 hours of operation
15	Drive Shaft Grease Fitting	Lubricate with No. 2 Lithium Base Grease	
16	Front and Rear U-Joint Grease Fitting	Lubricate with No. 2 Lithium Base Grease	
17	Front and Rear Axles	Check fluid level - fill as required	
18	2-Speed Transmission	Check fluid level - fill as required	
19	Hydraulic Oil Filters	**Replace with new filters	After every 250 hours of operation
20	Fuel Filter	Replace with new filter	
21	Forklift Mast Slides	Lubricate with No. 2 Lithium Base Grease	
22	Hydraulic Oil Reservoir Drain	Drain and fill with new oil	After every 1000 hours of operation or yearly
23	Front and Rear Axle Drain	Drain and fill with new oil	
24	2-Speed Transmission Drain	Drain and fill with new oil	
25	Radiator Drain	Drain and flush cooling system. Fill with new coolant	After every 2000 hours or yearly

*The engine oil and filter must be changed initially after the first 25 hours of operation. Check oil level at 3 hour intervals during this period.
**The hydraulic oil filters must be changed initially after the first 25 hours of operation.

FLUIDS AND LUBRICANTS

Component	Capacity		Specifications
	U.S.	Metric	
Fuel tank	13.2 gallons	49.8 litres	Diesel Fuel, See Operators Manual
Engine crankcase, 1.8 litre diesel engine Without filter change With filter change	 4.0 quarts 5.0 quarts	 3.8 litres 4.8 litres	Case HDM Oil Alternate engine oil: CD-Commercial class D Above 68°F (20°C) .....SAE 30 15 to 85°F (-10 to 30°C) .....SAE 20W Below 32°F (0°C) .....SAE 10W
Engine crankcase, 2.1 litre diesel engine Without filter change With filter change	 6.0 quarts 7.0 quarts	 5.7 litres 6.7 litres	Case HDM Oil Alternate engine oil: CD-Commercial class D Above 104°F (40°C) .....SAE 40 25 to 104°F (-5 to 40°C) .....SAE 30 10 to 25°F (-15 to -5°C) .....SAE 20W20 Below 10°F (-15°C) .....SAE 10W
Hydraulic oil reservoir Hydraulic system	10.0 gallons 15.0 gallons	38 litres 57 litres	Automatic transmission fluid (ATF) type "F"
Transmission	2.7 pints	1.3 litres	Multipurpose Gear Lubricant (API-GL-5) SAE 80-90
Front and Rear Axles (each)	4.0 quarts	3.8 litres	Multipurpose Gear Lubricant (API-GL-5) SAE 80 - 90. **IMPORTANT:** *If the axle has a limited slip differential, the lubricant must have a limited slip additive.*
Engine cooling system 1.8 litre diesel engine 2.1 litre diesel engine	 8.0 quarts 10.0 quarts	 7.6 litres 9.5 litres	Mix an ethylene glycol coolant with water for the lowest outside temperature that is expected. The mixture must be at least 50/50.
Battery	As required		Add drinking water or distilled water
Grease fittings	As required		Number 2 Lithium base grease

Austin Morris

Power Systems

1.8 Litre Diesel Engine

REPAIR OPERATION MANUAL

Publication Part No. AKM 3934 (2nd Edition)

Published by Austin Morris Limited
A subsidiary of BL Cars Limited

SPECIFICATION

Purchasers are advised that the specification details set out in this Manual apply to a range of engines and not to any particular engine. For the specification of any particular engine purchasers should consult their supplier.

The manufacturers reserve the right to vary their specifications with or without notice, and at such times and in such manner as they think fit. Major as well as minor changes may be involved in accordance with the manufacturer's policy of constant product improvement. ment.

Whilst every effort is made to ensure the accuracy of the particulars contained in this Manual, neither the manufacturer nor the supplier, by whom this Manual is supplied, shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

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INTRODUCTION

The purpose of this Manual is to assist skilled mechanics in the efficient repair and maintenance of the range of engines given on the title-page. The procedures detailed, carried out in the sequence given and using the appropriate service tools, will enable the operations to be completed in the time stated in the Repair Operation Times.

Indexing
The contents pages list the titles and reference numbers of the divisions in alphabetical order.

Operation Numbering
Each operation is followed by the number allocated to it in a master index. The number consists of six digits arranged in three pairs.

The master index of operations has been compiled for universal application to engines manufactured by BL Cars Limited and therefore continuity of the numbering sequence is not maintained throughout this Manual.

Each instruction within an operation has a sequence number, and to complete the operation in the minimum time it is essential that these instructions are performed in the numerical sequence commencing at 1 unless otherwise stated. Where applicable, the sequence numbers identify the components in the appropriate illustration.

Service Tools
Where performance of an operation requires the use of a service tool, the tool number is quoted under the operation heading and is repeated in the instruction involving its use.

An illustrated list of all service tools necessary to complete the operations described in the Manual is also included.

Definitions
Remove and refit – the removing of an existing part, fitting of a new or replacement part.
Overhaul – includes removing a component, fitting new parts, adjusting and its refitting.

References
The water pump end of the engine is referred to as the front.

To reduce repetition, operations covered in this Manual do not include reference to testing the engine after repair. It is essential that work is inspected and tested after completion, particularly where safety-related items are concerned.

Dimensions
The dimensions quoted are to design engineering specification. Alternative unit eq alents have been converted from the original specification.

During the period of running-in from new, certain adjustments may vary from the spe cation figures given in this Manual. These adjustments will be reset by the supplier a After Sales Service, and thereafter should be maintained at the figures specified ir Manual.

REPAIRS AND REPLACEMENTS

When service parts are required it is essential that only genuine **BL** or **Unipart** rep: ments are used.

Attention is particularly drawn to the following points concerning repairs and the fitt of replacements parts and accessories:

The performance and durability of the engine may be impaired if other than genuine pa are fitted. In certain territories, legislation prohibits the fitting of parts not to the engi manufacturer's specification. Torque wrench setting figures given in this Manual must strictly adhered to. Locking devices, where specified, must be fitted. If the efficiency c locking device is impaired during removal, it must be renewed. When purchasing accesso while travelling abroad ensure that the accessory and its fitted location conform to requirements existing in their country of origin. The engine warranty may be invalidated the fitting of other than genuine **BL** or **Unipart** parts.

All **BL** and **Unipart** replacements have the full backing of the factory warranty.

SERVICE PARTS

Genuine BL and UNIPART Service parts are designed and tested for your engine and ha the full backing of the BL Factory Warranty. ONLY WHEN GENUINE BL or UNIPAR SERVICE PARTS ARE USED CAN RESPONSIBILITY BE CONSIDERED UNDER TH TERMS OF THE WARRANTY.

Genuine parts are supplied in cartons bearing one or both of these symbols:

ABBREVIATIONS AND SYMBOLS IN THIS MANUAL

Across flats (bolt size)	A.F.
After bottom dead centre	A.B.D.C.
After top dead centre	A.T.D.C.
Alternating current	a.c.
Amperes	A
Ampere-hour	Ah
Atmospheres	Atm
Before bottom dead centre	B.B.D.C.
Before top dead centre	B.T.D.C.
Bottom dead centre	B.D.C.
Brake horse power	b.h.p.
Brake mean effective pressure	b.m.e.p.
British Standards	B.S.
Carbon monoxide	CO
Centigrade (Celsius)	C
Centimetres	cm
Cubic centimetres	cm^3
Cubic inches	in^3
Cycles per minute	c/min
Degree (angle)	deg. or °
Degree (temperature)	deg. or °
Diameter	dia.
Direct current	d.c.
Fahrenheit	F
Feet	ft
Feet per minute	ft/min
Fifth	5th
Figure (illustration)	Fig.
First	1st
Fourth	4th
Gallons (Imperial)	gal
Gallons (U.S.)	U.S. gal
Grammes (force)	gf
Grammes (mass)	g
High compression	h.c.
High tension (electrical)	h.t.
Horse-power	hp
Hundredweight	cwt
Inches	in
Inches of mercury	inHg
Independent front suspension	i.f.s.
Internal diameter	i.dia.
Kilogrammes (force)	kgf
Kilogrammes (mass)	kg
Kilogramme centimetre	kgf cm
Kilogramme metres	kgf m
Kilogrammes per square centimetre	kgf/cm^2
Kilometres	km
Kilometres per hour	km/h
Kilovolts	kV
King pin inclination	k.p.i.
Left-hand	L.H.
Left-hand steering	L.H.Stg.
Left-hand thread	L.H.Thd.
Low compression	l.c.
Low tension	l.t.
Maximum	max.
Metres	m
Miniature Edison Screw	MES
Miles per gallon	m.p.g.
Miles per hour	m.p.h.
Millimetres	mm
Millimetres of mercury	mmHg
Minimum	min.
Minus (of tolerance)	−
Minute (of angle)	′
Negative (electrical)	−
Newton metre	Nm
Number	No.
Ounces (force)	ozf
Ounces (mass)	oz
Ounce inch (torque)	ozf in
Outside diameter	o.dia
Overdrive	O/D
Paragraphs	para.
Part Number	Part No.
Percentage	%
Pints (Imperial)	pt
Pints (U.S.)	U.S. pt
Plus or minus	±
Plus (tolerance)	+
Positive (electrical)	+
Pounds (force)	lbf
Pounds (mass)	lb
Pounds feet (torque)	lbf ft
Pounds inches (torque)	lbf in
Pounds per square inch	lbf/in^2
Radius	r
Ratio	:
Reference	ref.
Revolutions per minute	rev/min
Right-hand	R.H.
Right-hand steering	R.H.Stg.
Second (angle)	″
Second (numerical order)	2nd
Single carburetter	SC
Society of Automobile Engineers	S.A.E.
Specific gravity	sp. gr.
Square centimetres	cm^2
Square inches	in^2
Standard	std.
Standard wire gauge	s.w.g.
Synchronizer/synchromesh	synchro.
Third	3rd
Top dead centre	T.D.C.
Twin carburetters	TC
United Kingdom	UK
Volts	V
Watts	W
Screw threads	
American Standard Taper Pipe	N.P.T.F.
British Association	B.A.
British Standard Fine	B.S.F.
British Standard Pipe	B.S.P.
British Standard Whitworth	B.S.W.
Unified Coarse	U.N.C.
Unified Fine	U.N.F.

GENERAL SPECIFICATION DATA

The symbol [1] in this Manual refers to engines with engine numbers prior to:

18P/885B/D1102 18V/738B/D460 18V/744B/D19001 18V/745B/D251 18V/886B/D501

The symbol [2] refers to engines with engine numbers commencing at those above, and all engine numbers beginning 18B/919B/D or 18V/920B/D or 18P/830A/D.

ENGINE – Diesel 1.8 litre

Type	18V– – – –D
Number of cylinders	4
Bore	3.16 in (80.26 mm)
Stroke	3.5 in (88.9 mm)
Capacity	109.8 in³ (1799 cm³)
Injection order	1, 3, 4, 2
Valve operation	Overhead by push-rod
Compression ratio: [1]**	21.47 : 1
[2]	22.3 : 1
Torque (gross)	107 Nm, 79 lbf ft, 10.92 kgf m at 2,400 rev/min

Crankshaft

Main journal diameter	2.1262 to 2.1270 in (54.01 to 54.03 mm)
Crankpin journal diameter	1.8759 to 1.8764 in (47.64 to 47.65 mm)
Crankshaft end-thrust	Taken on thrust washers at centre main bearing
Crankshaft end-float	0.001 to 0.0055 in (0.025 to 0.139 mm)

Main bearings

Number and type	5 Steel backed lead indium
Length: Front, centre and rear	1.120 to 1.130 in (28.45 to 28.70 mm)
Intermediate	0.760 to 0.770 in (19.30 to 19.55 mm)
Diametrical clearance	0.001 to 0.0027 in (0.03 to 0.07 mm)

Connecting rods

Type	Horizontally split big-end, plain small end
Length between centres	6.220 to 6.222 in (157.9 to 158.0 mm)

Big-end bearings

Type	Steel backed lead indium
Length	0.775 to 0.785 in (19.68 to 19.93 mm)
Diametrical clearance	0.001 to 0.0027 in (0.03 to 0.07 mm)

Gudgeon pin

Type	Fully floating with circlip location
Fit in piston	0.0001 to 0.0003 in (0.002 to 0.007 mm) clearance
Fit in connecting rod	0.0002 to 0.0009 in (0.02 to 0.04 mm) clearance
Diameter (outer)	0.9998 to 1.0000 in (25.39 to 25.40 mm)

Pistons

Type	Aluminium alloy, solid skirt, with open combustion cavity
Clearances:	
Top land	0.0171 to 0.0211 in (0.43 to 0.57 mm)
Bottom land	0.0137 to 0.0172 in (0.35 to 0.44 mm)
Bottom of skirt	0.004 to 0.005 in (0.10 to 0.13 mm)
Oversizes	0.020 in (0.51 mm)

Piston rings

Compression:	
Type: Top	Chrome-faced
Second	Tapered, cast iron alloy
Width	0.0771 to 0.0781 in (1.96 to 1.98 mm)
Fitted gap: Top	0.012 to 0.017 in (0.30 to 0.43 mm)
Second	0.009 to 0.014 in (0.23 to 0.35 mm)
Ring to groove clearance: Top	0.0025 to 0.0045 in (0.06 to 0.11 mm)
Second	0.0015 to 0.0035 in (0.04 to 0.09 mm)
Oil control	
Type	Slotted scraper
Fitted gap	0.012 to 0.017 in (0.30 to 0.43 mm)
Ring to groove clearance	0.0015 to 0.0035 in (0.04 to 0.09 mm)

Camshaft [1]

Journal diameters: Front	1.78875 to 1.78925 in (45.43 to 45.44 mm)
Centre	1.72875 to 1.72925 in (43.91 to 43.93 mm)
Rear	1.62275 to 1.62325 in (41.22 to 41.23 mm)
Bearing liner inside diameter (reamed after fitting):	
Front	1.79025 to 1.79075 in (45.47 to 45.48 mm)
Centre	1.73025 to 1.73075 in (43.95 to 43.96 mm)
Rear	1.62425 to 1.62475 in (40.26 to 40.27 mm)
Diametrical clearance	0.001 to 0.002 in (0.02 to 0.05 mm)
End-thrust	Taken on locating plate
End-float	0.003 to 0.007 in (0.08 to 0.18 mm)

Camshaft [2]

Journal diameters: Front	1.95125 to 1.95175 in (49.652 to 49.574 m
Centre	1.91975 to 1.92025 in (48.762 to 48.774 m
Rear	1.72875 to 1.72925 in (43.910 to 43.923 m
Diametral clearance	0.001 to 0.002 in (0.02 to 0.05 mm)
End-thrust	Taken on locating plate
End-float	0.003 to 0.007 in (0.08 to 0.18 mm)

Rocker gear

Rocker shaft diameter	0.624 to 0.625 in (15.85 to 15.87 mm)
Rocker bush inside diameter (reamed in position)	0.6255 to 0.6260 in (15.89 to 15.90 mm)

Tappets

Type	Bucket
Outside diameter	0.8125 in (20.65 mm)
Length	1.495 to 1.505 in (37.97 to 38.23 mm)

** [1] [2] see page 7

continued

Valves

Seat angle: Inlet	45°
Exhaust	45°
Head diameter: Inlet	1.434 to 1.439 in (36.42 to 36.55 mm)
Exhaust	1.207 to 1.212 in (30.64 to 30.78 mm)
Stem diameter: Inlet	0.3428 to 0.3433 in (8.71 to 8.73 mm)
Exhaust	0.3422 to 0.3427 in (8.69 to 8.70 mm)
Stem to guide clearance: Inlet	0.0008 to 0.0020 in (0.02 to 0.05 mm)
Exhaust	0.0014 to 0.0026 in (0.03 to 0.06 mm)
Valve lift: Inlet and exhaust	0.384 in (9.75 mm)
Valve stand down: [1]**	0.0445 to 0.0505 in (1.13 to 1.28 mm)
[2]	0.020 to 0.030 in (0.508 to 0.762 mm)

Valve guides

Length: Inlet and exhaust	2.22 in (56.39 mm)
Outside diameter: Inlet and exhaust	0.5635 to 0.5640 in (14.31 to 14.33 mm)
Inside diameter (reamed after fitting): Inlet and exhaust	0.3441 to 0.3448 in (8.74 to 8.76 mm)
Fitted height above spring seat: Inlet and exhaust	0.55 to 0.56 in (13.9 to 14.2 mm)
Interference fit in head: Inlet and exhaust	0.0005 to 0.00175 in (0.01 to 0.04 mm)

Valve springs

Free length	1.92 in (48.77 mm)
Fitted length	1.44 in (36.57 mm)
Load at fitted length	82 lbf, 37.19 kgf, 364 N
Load at top of lift	142 lbf, 64.4 kgf, 631 N
Number of working coils	4½

Valve timing

Timing marks	Dimples on timing wheels, marks on flywheel
Rocker clearance: [1] **Running	0.017 in (0.43 mm)
Timing	0.024 in (0.61 mm)
[2] Running	0.014 in (0.36 mm)
Timing	0.016 in (0.41 mm)

	[1]	[2]
Inlet valve: Opens	8° B.T.D.C.	8° B.T.D.C.
Closes	42° A.B.D.C.	44° A.B.D.C.
Exhaust valve: Opens	60° B.B.D.C.	50° B.B.D.C.
Closes	12° A.T.D.C.	10° A.T.D.C.

Lubrication

System	Wet sump, pressure fed
System pressure: Running	3.5 bar, 50 lbf/in², 3.52 kgf/cm²
Idling	1.0 bar, 15 lbf/in², 1.05 kgf/cm²
Oil pump	Rotor type
Oil filter	Full flow; disposable cartridge type
Oil pressure relief valve	3.5 bar, 50 lbf/in², 3.52 kgf/cm²
Relief valve springs: Free length	3 in (76 mm)
Fitted length	2.156 in (54.77 mm)
Load at fitted length	15.5 to 16.5 lbf, 7.0 to 7.4 kgf, 69 to 73 N

FUEL SYSTEM

Fuel injection pump	C.A.V
Type	DPA.3247F180, DPA.3247F260, DPA.3342F710 or DPA3342F720
Injection timing	18° B.T.D.C.
Fuel lift pump	A.C. Mechanical
Fuel injectors	C.A.V. Pintaux
Nozzle type	BDN.OSPC.6651
Nozzle holder type	BKB.35SD.5188
Opening pressure	135 Atm
Main fuel filter	C.A.V.
Type	FS583 6B130
Heater plugs	
Champion	AG32

COOLING SYSTEM

Thermostat:	
Standard	82° C (180° F)
Hot climates	72° C (162° F)
Cold climates	88° C (190° F)
Fan belt tension	See **'Maintenance'**

CLUTCH

Type	Single dry plate
Clutch plate diameter	9 in (228.6 mm)

ELECTRICAL

Alternator

Type: Lucas	16ACR	18ACR
Output at 14V and 6000 rev/min	34 A	43 A
Rotor winding resistance at 20°C (68°F)	3.3 ohm ± 5%	3.2 ohm ± 5%
Maximum permissible rotor speed	15 000 rev/min	15 000 rev/min
Brush length new	0.5 in (12.7 mm)	0.5 in (12.7 mm)
Brush spring tension, brush face flush with brush box	3 to 4 N, 9 to 13 ozf, 255 to 368 gf	3 to 4 N, 9 to 13 ozf, 255 to 368 gf

Starter motor

Type: Lucas	M45G pre-engaged
Light running current	100 amp at 5000 to 6000 rev/min
Lock torque at 940 amp	29 lbf ft (4.01 kgf m, 39 Nm)
Minimum brush length	0.31 in (8.0 mm)
Brush spring tension	42 ozf (1.2 kgf, 11 N)

** [1] [2] see page 7

ENGINE TUNING DATA

ENGINE – Diesel 1.8 litre

Type	18–/––––/D
Displacement	109.7 in³ (1798 cm³)
Injection order	1, 3, 4, 2
Compression ratio	21.47 : 1
Valve rocker clearance (cold) [1] **	0.017 in (0.43 mm)
[2]	0.014 in (0.36 mm)
Idle speed:	
Engines with hydraulic governer	650 rev/min minimum †
Engines with mechanical governer	800 rev/min minimum †
Maximum governed light running speed	4,900 rev/min †

Fuel injection pump

Make and type	C.A.V. DPA.3247F180, DPA.3247F260, DPA.3342F710 or DPA.3342F720
Injection pump timing	18° B.T.D.C.

Fuel injectors

Make and type	C.A.V. Pintaux
Nozzle type	BDN.OSPC.6651
Nozzle holder type	BKB.35SD.5188
Opening pressure	135 Atm

Heater plugs

Make and type	Champion AG32

† For exact settings see injection pump code and/or Equipment manufacturers settings.

** [1] [2] see page 7

TORQUE WRENCH SETTINGS

	lbf ft	kgf m	Nm
Cylinder head nuts	75	10.4	102
Rocker bracket nuts	25	3.5	34
Manifold nuts	15	2.1	20
Big-end nuts	35	4.8	47
Main bearing set screws	75	10.4	102
Flywheel bolts	40	5.5	54
Timing cover bolts: ¼ in	6	0.8	8
$\frac{5}{16}$ in	20	2.8	27
Rear plate bolts: $\frac{5}{16}$ in	20	2.8	27
$\frac{3}{8}$ in	30	4.1	41
Camshaft nut	65	9.0	88
Crankshaft bolt	115*	16	156
Idler gear hub bolt	30	4.1	41
Cylinder side cover set screws	4	0.5	5
Rocker cover nuts	4	0.5	5
Sump bolts	6	0.8	8
Oil filter adaptor	30	4.1	41
Oil pump nuts	16	2.2	22
Oil release valve – domed nut	45	6.2	61
Starter motor bolts	35	4.8	47
Clutch to flywheel	25	3.5	34
Fuel lift pump nuts	12	1.7	16
Injector nozzle nut	50	6.9	68
Injection pump nuts	18	2.5	24
Injector nuts	12	1.7	16
Injection pump driving flange set screws	10	1.4	14
Water pump bolts	17	2.3	23
Water pump pulley set screws	18	2.5	24
Alternator pulley nut	27	3.7	36
Thermal transmitter	16	2.2	22

*Discard lock washer

SERVICE LUBRICANTS, FUEL, FLUIDS AND CAPACITIES

Lubricants

The lubrication system of your new engine is filled with high quality oil. You should always use a high quality oil of the correct viscosity range in the engine during subsequent maintenance operations or when topping up. The use of oils not to the correct specification can lead to high oil and fuel consumption and ultimately to damage to components.

Oil to the correct specification contains additives which disperse the corrosive acids formed by combustion and also prevent the formation of sludge which can block oilways. **Additional oil additives should not be used.** Service intervals must be adhered to.

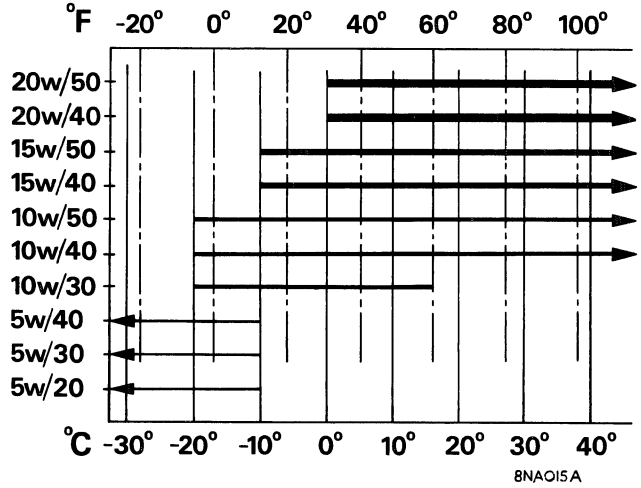
Engine

Use a well known brand of oil to B.L.S. OL.02 or MIL-L-2104B or MIL-L-46152 or A.P.I, SE/CC quality, with a viscosity band spanning the temperature range of your locality.

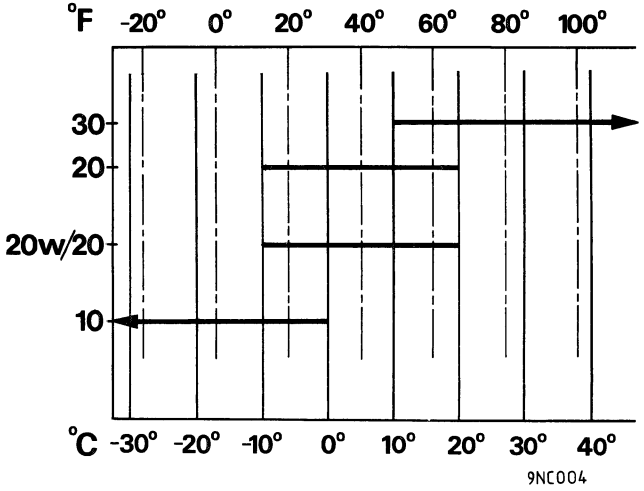
The use of monograde oils is permissible providing that it is of the correct viscosity for the ambient temperature of your locality. It should also be of the same quality MIL-L-46152, MIL-L-2104B or A.P.I., SE/CC as the preferred multigrade oils.

For sustained high speed operation or operation for long periods in a high ambient temperature, the use of a multigrade oil of the correct viscosity and quality is recommended.

Multigrade Oils Viscosity/Temperature Ranges



Monograde Oils Viscosity/Temperature Ranges



Fuel

Use fuel oils generally known as Diesel fuel oil, distillate Diesel fuel, automotive gas oil or Derv fuel conforming to British Standard 2869: 1967, Class A1 or A2.

Anti-Freeze Solutions

Use **UNIPART UNIVERSAL Anti-freeze** to protect the cooling system.

If **UNIPART** Universal is not available any anti-freeze conforming to Specification B.S. 3151 or 3152 may be used. Anti-freezes to these specifications are compatible with **UNIPART** Universal and can be used with it. **UNIPART** Universal should not be mixed with other universal anti-freezes.

The overall anti-freeze concentration should not fall below 30% by volume, to ensure that the anti-corrosion properties of the coolant are maintained.

After filling with anti-freeze solution, attach a warning label in a prominent position stating the type of anti-freeze contained in the cooling system to ensure that the correct type is used for topping-up.

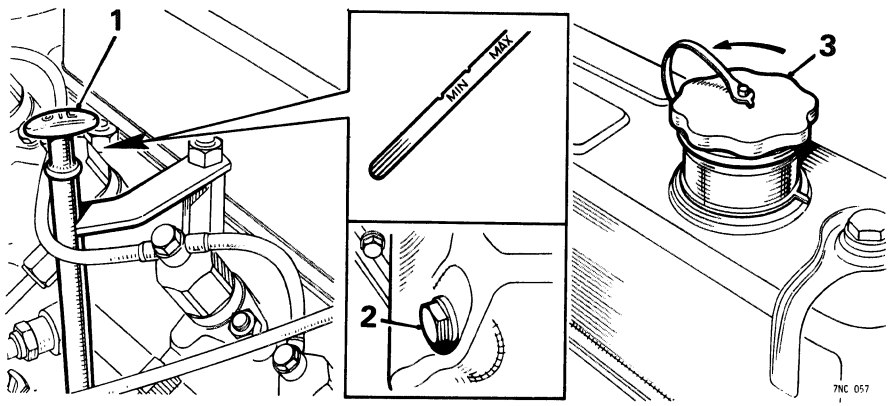
Solution	*Commences to freeze*		*Frozen solid*	
%	*°C*	*°F*	*°C*	*°F*
33½	−19	−2	−36	−33
50	−36	−33	−48	−53

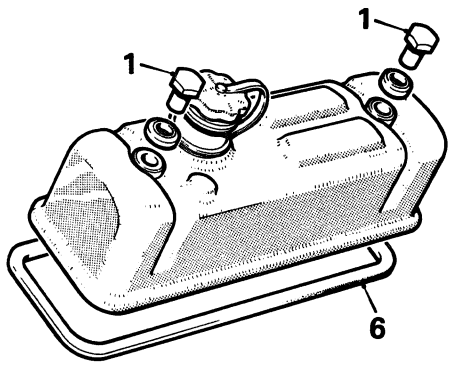
Capacities (approx.)

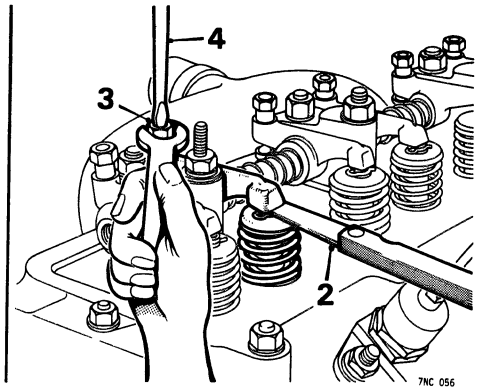
Engine sump (including filter)	8¼ pt, 4.68 litres, 9.9 U.S. pt
Filter only	1¼ pt, 0.71 litre, 1.5 U.S. pt

LUBRICANTS

	FORECOURT OILS			FLEET OIL		
Minimum performance level	MIL-L-2104B A.P.I.-SE/CC or MIL-L-46152					
Climatic Conditions	**Temperatures above −10°C (10°F)**	**Temperatures −20°C (−5°F) to 10°C (50°F)**	**Temperatures below −10°C (10°F)**	**Temperatures above −10°C (10°F)**	**Temperatures −20°C (−5°F) to 10°C (50°F)**	**Temperatures below −10°C (10°F)**
UNIPART	Unipart Super Multigrade Motor Oil 15W/50					
BP	BP Super Visco-Static 20W/50 BP Vanellus C3 Multi-grade BP Visco 2000*	BP Super Visco Static 10W/30 or 10W/40*	BP Super Visco-Static 5W/20*	BP Vanellus M 20–50 BP Vanellus C3 Multigrade	BP Vanellus M 10W/30 or 10W/40*	BP Super Visco-Static 5W/20*
CASTROL	Castrol GTX 20W/50 Castrol GTX-2 15W/20	Castrolite 10W/30 or 10W/40 Castrol GTZ 10W/40 (Sweden)	Castrol Super GTX 5W/30 (Canada) Castrol GTZ 5W/40 (Finland)	Castrol Deusol RX Super 15W/40		
DUCKHAMS	Duckhams Q Motor Oil 20W/50	*Not available in the U.K.		Fleetol Multi-V 20W/50 Fleetmaster	Fleetol Multilite 10W/30	
ESSO	Esso Uniflo 15W/50	Esso Uniflo 10W/40	Esso Uniflo 5W/40	Essolube HDX Plus 20W/50 Esso Uniflo 15W/50	Essolube HDX Plus 10W/30 Esso Uniflo 10W/40	Essolube MDX Plus 10W/30 Esso Uniflo 5W/40
MOBIL	Mobiloil Super 15W/50	Mobiloil SHC 10W/50	Mobiloil 1 5W/20 Mobiloil 5W/20	Mobil Delvac Super 15W/40 Delvac Special 20W/50	Mobil Delvac Special 10W/30	Mobiloil 5W/20
PETROFINA	Fina Supergrade Motor Oil 20W/50	Fina Supergrade Motor Oil 10W/40		Fina Delta Multigrade 20W/50	Fina Delta Multigrade 10W/30	
SHELL	Shell Super Motor Oil U.K. 20W/50 Europe 15W/50	Shell Super Motor Oil 10W/40 (Norway, Sweden, Canada) 10W/50 (Rest of Europe, U.S.A.)	Shell Super Motor Oil 5W/40 (Finland) 5W/30 (Canada)	Rotella SX Rotella TX 20W/40 Rotella SX 20W/30 (Sweden)	Rotella TX 10W/30 Rotella SX 10W/20 (Sweden)	Rotella TX 5W/20 (Finland, Canada)
TEXACO	Texaco URSA Oil LA 15W/40			Eurotex Motor Oil HD 20W/50	Eurotex Motor Oil HD 10W/30	







ENGINE

Lubrication

Checking oil level

1 Maintain the level between the 'MIN' and 'MAX' mark on the dipstick.

Draining and refilling

2 Drain the oil while the engine is warm: check the drain plug copper washer before refitting.

3 Refill with the correct quantity and grade of oil. Run the engine for a short while, then allow it to stand for a few minutes before re-checking the level.

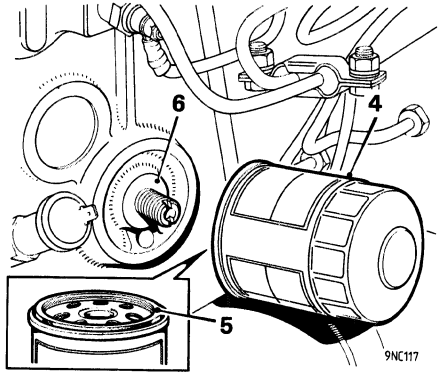
Disposable cartridge filter renewal

4 Unscrew the old cartridge with a tourniquet type wrench; a quantity of oil will be released. Discard the cartridge and seal (5).

5 Wet the new seal with engine oil and ensure that it is located correctly in its groove in the new cartridge.

6 Screw the new cartridge to the filter head, **using hand force only.**

7 Start the engine and check the filter for leaks. Stop the engine, and re-check the oil level after waiting for a few minutes.



Valve rocker adjustment

1 Remove the rocker cover.

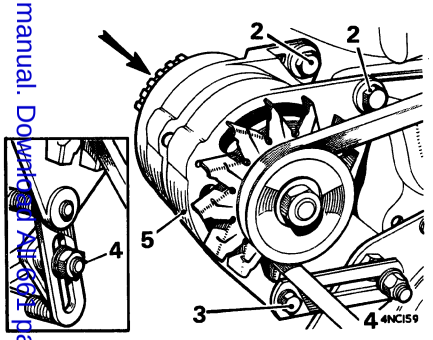
2 Check the clearance between the valve rocker arms and valve stems with a feeler gauge.
Clearance: see **'ENGINE TUNING DATA'.**
The gauge should be a sliding fit when the engine is cold.
Check the clearance of each valve in the following order:
Check No. 1 valve with No. 8 fully open.
" " 3 " " " 6 " "
" " 5 " " " 4 " "
" " 2 " " " 7 " "
" " 8 " " " 1 " "
" " 6 " " " 3 " "
" " 4 " " " 5 " "
" " 7 " " " 2 " "

3 Slacken the locknut.

4 Rotate screw, clockwise to decrease or anti-clockwise to increase the clearance.

5 Retighten the locknut when the clearance is correct, holding the screw against rotation.

6 Refit the rocker cover checking that the gasket is serviceable.



DRIVE BELT TENSION

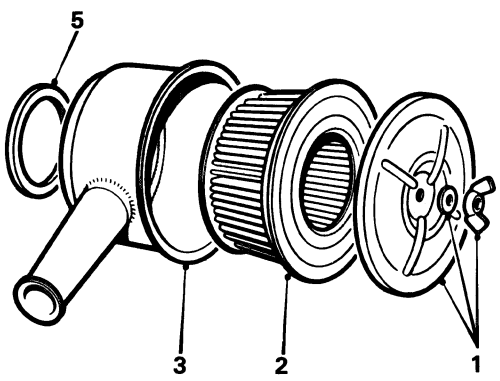
Checking

1 Use one of the following methods of checking the belt tension:
   a Use a torque spanner and apply a load of 14.9 to 15.6 Nm (1.5 to 1.6 kgf m, 11.0 to 11.5 lbf ft) in a clockwise direction to the alternator pulley retaining nut. If the belt tension is correct the belt will slip at this torque loading.
   b Apply a load of 33.4 to 36.4 N (3.3 to 3.6 kgf, 7.5 to 8.2 lbf) at right angles to the belt midway between pulleys. The belt should deflect 6 mm (0.25 m). It is important that the belt tension is set correctly.

NOTE: Fit a new belt with a moderate degree of tension, run the engine for five minutes at 1000 rev/min, stop the engine then set the belt to the correct tension.

Adjusting

2 Slacken the alternator securing bolts.
3 Slacken the bolt securing the adjusting link to the alternator.
4 Slacken the adjusting link to engine securing nut.
5 Move the alternator to the required position: avoid over-tightening. Apply any leverage necessary to the alternator drive end bracket only, using a wood or soft metal lever.
6 Tighten the securing nuts and bolts.



FUEL SYSTEM

Air cleaner elements

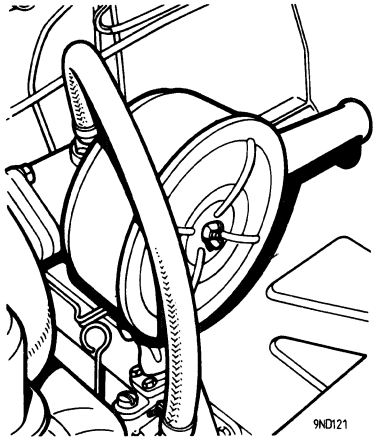
Renew the air cleaner element. In dusty operating conditions the element may require changing more frequently than recommended.

Removing

1 Unscrew the wing nut, remove the fibre washer and withdraw the cover.
2 Withdraw and discard the element.
3 Clean the interior of the container.

Refitting

4 Fit the element.
5 Check that the sealing ring is in good condition.
6 Refit the cover, fibre washer and nut.



SERVICE OPERATIONS – Summary

Every 150 hours

Change engine oil

Operation	Every 300 hours	Every 600 hours
Check/adjust drive belt tension	X	X
Check/adjust valve clearances	X	X
Renew main fuel filter element	X	X
Change engine oil and filter element	X	X
Test injectors for spray		X
Remove heater plugs and clean carbon from each plug orifice in cylinder head – check heater plug operation		X
Renew oil filler cap		X
Clean/renew air filter element	X	X
Check governor settings		X
Retorque cylinder head nuts	X	X

NOTE: More frequent air cleaner element servicing may be necessary in dirty/dusty conditions.