7610-66-090-7083

AUSTRALIAN ARMY

TECHNICAL MANUAL

USER HANDBOOK
TRUCK, CARGO
2 1/2 TON GS, 4X4 W/WINCH
AUST No 1
2320 66 058 4682 MK3
2320 66 089 5185 MK4
CODE No 6069

SPECIFICATION ARMY (AUST) 87 AND 5087

JANUARY 76.

AUTHORIZED FOR USE WITHIN THE AUSTRALIAN ARMY BY COMMAND OF THE MILITARY BOARD

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Prepared by Engineering Development Establishment. Issued by Controller Supply Division HQ Logistic Command

AMENDMENT RECORD

Amendment No.	Actioned By: Signature and Date.

SYNOPSIS

The Trucks, Cargo, $2\frac{1}{2}$ Ton, GS, with winch, No 1 Mk 3, and Mk 4 are identical in most respects including performance. The areas in which the Mk 3 and Mk 4 trucks differ are detailed in the applicable sections of this manual.

The trucks can be driven by two or all four wheels and are capable of operating on highways or cross country. They are equipped with seating, to accommodate sixteen passengers, which can be easily removed or folded back to facilitate the carriage of cargo. The canopied bodies of the trucks can be converted to 'flat tops' when required, by removal of the canopy, bows, seats, sides, and tailboard.

The trucks have a range of approximately 480 km on first class roads laden to a GVM of 8. 14 t. When so laden they are capable of towing a trailer of 4. 5 t (2. 7 t cross country).

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ASSOCIATED PUBLICATIONS

1. 7610-66-024-4122. Vehicle Operating Instructions.

2. 7610-66-020-3075. User Handbook, Truck Cargo, $2\frac{1}{2}$ Ton, GS, w/Winch, Aust No1, Mk 3.

3. Australian Army Book:

   a. AB 416 Vehicle Log Book 'B' Vehicles

   b. Section 3, Insert of AB 416

   c. Section 4, Insert No 51A of AB 416

   d. AB 417 Vehicle Record Book, 'B' Vehicles.

4. Complete Equipment Schedules:

   a. No 2153 - Truck Cargo, $2\frac{1}{2}$ Ton, GS, w/Winch, Aust No 1, Mk 3 or Mk 4.

   b. No 2194 - Accessory Maintenance Kit, Chassis Truck, $2\frac{1}{2}$ Ton, GS, w/Winch International.

5. Repair Parts Scale MT 162, Issue 3.

6. Block Scale 20/02 Additional Equipment CL 'B' Vehicles.

GLOSSARY

A	Ampere
Ah	Ampere hour
BTDC	Before top dead centre
C	Celsius
CP	Candle power
C^o	degrees Celsius
GVM	Gross vehicle mass
h	hour
kg	kilogram
km	kilometre
km/h	kilometres per hour
km/ℓ	kilometres per litre
kPa	kilopascal
kW	kilowatt
ℓ	litre
ℓ/min	litre per minute
MPa	Megapascal
m	metre
m^2	square metre
m^3	cubic metre
m/min	metres per minute
min	minute
mm	millimetre
mm^2	square millimetre
mm^3	cubic millimetre
mmHg	millimetres of mercury
N	Newton
Nm	Newton metre
Pa	Pascal
rev	revolution
rev/min	revolution per minute
s	second
t	tonne
V	Volt
W	Watt
µm	micrometre

FIG 1
VEHICLE - RIGHT FRONT VIEW

FIG 2
VEHICLE - LEFT REAR VIEW

FIG 3
VEHICLE - FRONT VIEW

FIG 4
VEHICLE - REAR VIEW

CHAPTER ONE

INSTRUCTIONAL NOTES

SECTION 1
METHOD OF INSTRUCTION

1. The aim of Driving and Servicing (D&S) Instruction is designed to teach a man:

   a. How to operate his vehicle.

   b. How to service his vehicle.

   c. How to detect and remedy simple faults.

2. Nothing should be taught in a D&S lesson which does not contribute towards the achievement of this aim.

3. This chapter is designed to form the basis of a training syllabus, each section being the subject of a lesson. To assist instructors, the layout of each section is based upon the sequence of a lesson, ie:

   a. Description,

   b. Operation of controls,

   c. Servicing, and

   d. Detection and remedy of simple faults.

4. The subject matter in each section follows this sequence where applicable.

5. The aim cannot be achieved unless each lesson takes a practical form. This must always be borne in mind when teaching D&S. The instructor must keep his students out of the classroom, and be determined to teach on the real thing - the vehicle itself. The best way is to make the whole class perform the task and think about it. This calls for close supervision by the instructor, and careful preparation of questions.

6. It follows, therefore, that the number of students in a class will considerably affect the standard they reach at the end of the course.

7. Because a large class will make the task of the instructor more difficult, and instruction will be most effective with a small class, course organizers should whenever possible aim at restricting the size of the class.

NOTE

Attention is drawn to 7610-66-024-4122 Vehicle Operating Instructions. This publication covers the duties of and qualifications required by members whose duties involve vehicle administration, control, operation, inspection and servicing.

SECTION 2
GENERAL DESCRIPTION

8. Throughout this handbook:

a. all references to left hand (LH) and right hand (RH) are as viewed from the rear of the vehicle/s looking forward;

b. unless specifically stated to the contrary the information included shall apply to the Mk 3 and Mk 4 models. In those areas where the models differ they are dealt with separately.

c. figures in parenthesis after headings in servicing paragraphs refer to the relevant serial of Table 20 Periodical Tasks. eg, Seats (33). This table specifies the servicing period, and the servicing to be carried out; and

d. the designations 'grease nipple' or 'nipple' have been used to avoid tedious repetition (particularly in servicing tables), of the correct designation, ie, Fitting Lubrication, hydraulic type.

9. The Trucks, Cargo, $2\frac{1}{2}$ Ton, GS, with winch, No 1 Mk 3 and Mk 4 are each fitted with an enclosed type cab, and an open type drop-side body provided with a canopy. Drive can be applied to all four wheels; that to the front wheels being engaged or disengaged as required.

10. The trucks provide seating accommodation within the body for sixteen fully equipped passengers by means of two bench type, swing-up seats fitted along the inside of the body side panels. The seats can be swung up and secured flush with the backrests to allow cargo to be carried. The seats can be placed back to back along the centre of the body, in which event the canopy cannot be fitted. Alternatively, the canopy, bows, seats, sides and tailboard can all be easily removed to leave a flat-top body.

11. The chassis frame has pressed steel channel side members and cross-members rivetted together.

12. The engine is an IHC AGD-282 with six cylinders in line. It is gasoline driven and has tilted overhead valves. Engine lubrication is force fed from the oil pump. Engine power is transmitted to the gearbox through a 305 mm, single dry plate, clutch.

13. The gearbox has five forward speeds and one reverse. The second, third, fourth and fifth (top) gears are constant mesh.

14. A two speed transfer case is mounted behind the gearbox, and the drive is transmitted to the front and rear axles by propeller shafts of equal lengths. The transfer case lever has four positions:

LOW, 4 WHEEL DRIVE
NEUTRAL
HIGH 2 WHEEL DRIVE
HIGH 4 WHEEL DRIVE
(PULL TRIGGER)

15. The drive to the front wheels is transmitted through the front axle differential to the inner drive shafts which are connected to the outer drive shafts by 'tracta' constant velocity joints.

16. Drive is transmitted through the rear axle differential and fully floating axle shafts to the rear wheels. The stub axles and hub assemblies fitted are common to the front and rear axles.

17. Suspension is by semi-elliptic springs at the front and rear with the addition of helper springs at the rear. The front and rear main springs are interchangeable. Rubber bump stops are provided to limit spring deflection. Interchangeable, double acting, telescopic shock absorbers are fitted at the front and rear.

18. The steering box is of the cam and twin lever type.

19. Sling rings are located on the outside of each wheel. The front rings can also be used as steps when climbing into the cab. Foot plates are fixed to the top of the mudguards, and handles are fitted in convenient positions to facilitate entry into the cab.

20. The hydraulic brakes are power assisted from a compressed air system, with rear couplings for trailer braking. An air take-off valve is provided for tyre inflation.

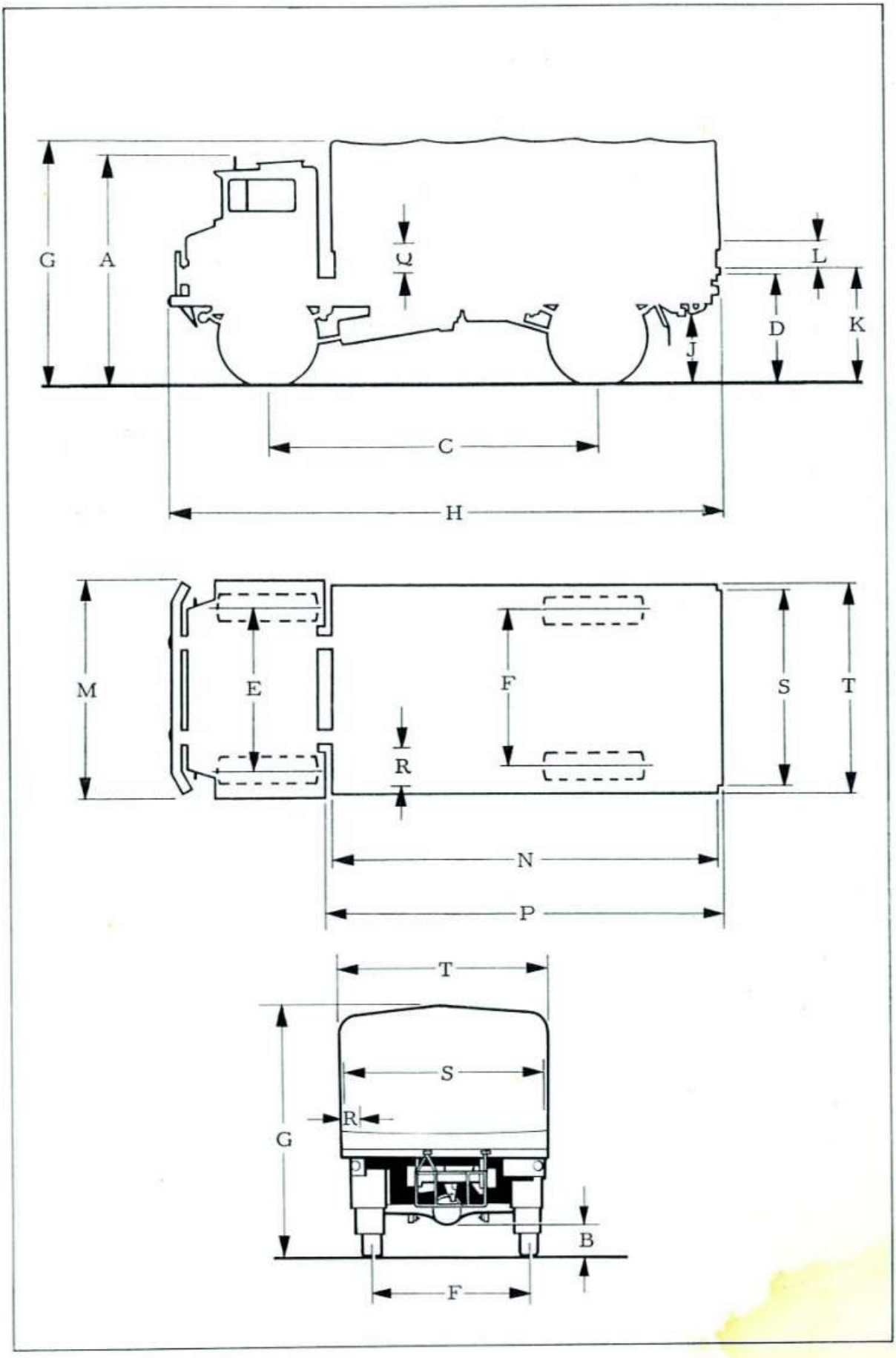


FIG 5
VEHICLE-DIMENSIONS

SECTION 3
DATA SUMMARY

NOTE

Data applies to highway and cross-country running unless otherwise stated.

21. DIMENSIONS. The vehicle dimensions are detailed in Table 1. Letters referenced in the table are items of Fig 5.

TABLE 1 - DIMENSIONS

Refer Fig	DESCRIPTION	DIMENSIONS
A	Cab height unladen (vehicle reducible height)	2.616 m
B	Ground clearance unladen	343 mm
C	Wheel base	3.683 m
D	Chassis height	1.168 m
E	Track width (front)	1.845 m
F	Track width (rear)	1.854 m
	Height overall unladen (canopy and bows fitted)	2.946 m
G	Height overall laden (canopy and bows fitted) Highway	2.883 m
H	Length overall	6.375 m
-	Pintle height (unladen)	800 mm
J	Pintle height (laden) Highway	737 mm
-	Tray height (unladen)	1.321 m
K	Tray height (laden)	1.257 m
L	Height body sides above tray level	356 mm
M	Width overall	2.438 m
N	Body interior length	4.367 m
P	Body length (incl tail board)	4.394 m
Q	Seat height (body)	432 mm
R	Seat depth	381 mm
S	Body interior width (seats up)	2.134 m
T	Body width	2.388 m

22. MASS. Details of vehicle mass, including axle loadings, are given in Table 2.

TABLE 2 - MASS

Serial	DESCRIPTION	kg
1	TARE mass including fuel in tanks	5153
	CES 2194 (less traction devices)	63
	Fuel, oil and water in cans	39
	Equals Total NET mass	5255
2	Total NET mass	5255
	Driver and personal equipment	100
	Traction devices	189
	Total UNLADEN mass	5544
3	Total UNLADEN mass	5544
	Payload (including crew less driver)	2495
	Total LADEN mass	8039
4	Total NET mass (5255 kg) Axle loadings:	
	Front	2871
	Rear	2384
5	Total UNLADEN mass (5544 kg) Axle loadings:	
	Front	2938
	Rear	2606
6	Total LADEN mass (8039 kg) Axle loadings:	
	Front	3474
	Rear	4565

23. RAILWAY GAUGING (Laden and Unladen):

a. Full Height Fouls: SA narrow (1.06 m) gauge
WA " " "
Q'ld " " "
Tas " " "
Vic broad (1.6 m) gauge

b. Reduced Height:

(1) Canopy and bows removed; Fouls Q'ld narrow gauge

(2) Canopy, bows and roadwheels removed Passes all

24. SHIPPING CUBAGE:

a. Full height	45 m^3
b. Reduced height	40 m^3

25. BRIDGE CLASSIFICATION

Solo. Laden	Class 8

26. SEATING CAPACITY:

a. Cab	2 (Driver and Co-driver)
b. Body	16 (With full equipment)

27. CARGO SPACE

With canopy fitted	13 m^3

28. ENGINE

a. Make	IHC
b. Model	AGD - 282
c. Type	Petrol, OHV, Four cycle, si cylinders in line
d. Maximum kW at flywheel	79 at 3200 rev/min
e. Maximum torque at flywheel	292 Nm at 1800 rev/min
f. Bore	96.8 mm
g. Stroke	104.8 mm
h. Capacity	4.6 ℓ (4629 cm^3)
i. Compression ratio	7:1
j. Pistons	Aluminium, step-head, fitted with two compression and one oil ring.
k. Valve clearances (tappets) With engine at operating temperature and idling.	Inlet and Exhaust valves 610-660 µm
l. Mounting	Three point, rubber cushioned
m. Firing order	1 - 5 - 3 - 6 - 2 - 4

29. ENGINE LUBRICATION SYSTEM:

a. Type	Wet sump, pressure fed to all main, connecting rod and camshaft bearings.
b. Pump	Gear type

c.	Adapter	Collects oil passing through the open main pressure relief valve and the filter and passes it through a flexible hose to the oil cooler.
d.	Oil Cooler	Finned tube type radiator fitted to near side of coolant radiator. Frontal area 516 cm^2.
e.	Oil Filter	Removable cartridge type, full flow; capacity 1.4 ℓ.
f.	Oil Pressure	240 - 310 kPa at 1500 rev/min.
g.	Main Pressure Relief Valve	Opens between 240 - 310 kPa.
h.	Oil Capacity	Sump 8.2 ℓ, Oil Filter 1.4 ℓ Total 9.6 ℓ

30. ENGINE COOLING SYSTEM:

a.	Type	Thermo-syphon, pump assisted
b.	Radiator:	
	(1) Type	Finned tube type; pressurized at 43 - 52 kPa
	(2) Area (Frontal)	2904 cm^2
	(3) Capacity	20 ℓ
c.	Fan	Five blades; driven by V belt from crankshaft pulley.
d.	Thermostat	In outlet pipe of cooling jacket. Opens between 64.5°C and 67°C; fully open at 78.5°C.
e.	Pump	Centrifugal type. Driven by V belt from crankshaft pulley. Capacity 240 ℓ/min.

31. IGNITION SYSTEM:

a.	Type	Coil; 12 V Negative to earth
b.	Coil:	
	(1) Make	Lucas
	(2) Model	LA 121
	(3) Voltage	12 V
c.	Distributor:	
	(1) Make	Bosch
	(2) Model	U-VJU 59T
	(3) Contact Breaker Gap	300 - 400 µm
	(4) Dwell Angle	36 - 40°

d. Timing

(1) Standard Fuel	6° BTDC
(2) Premium Fuel	9° BTDC

e. Spark Plugs:

(1) Type	14 mm, Hot, 3/8 in reach
(2) Point Gap	710 - 840 µm

f. Battery:

(1) Number	1
(2) Type	12 V, 9 Plate, lead acid
(3) Capacity	61 Ah at 20 hour rate
(4) Polarity	Negative terminal grounded

32. FUEL SYSTEM:

a. Fuel Tanks:

(1) Number	2
(2) Capacity	95.5 ℓ (each)

b. Pump:

(1) Make	AC Delco
(2) Type	Mechanical, diaphragm type with hand primer
(3) Pressure	19 - 38 kPa at 3500 rev/min

c. Carburettor:

(1) Number	1
(2) Make	Bendix Tecnico
(3) Type	Single down draught

d. Fuel Filter — Gauze cap type incorporated in fuel pump

e. Air Cleaner:

(1) Make	IHC
(2) Type	Oil bath, Capacity 1 ℓ.

33. AIR COMPRESSOR:

a. Make	Westinghouse
b. Model	Tu-Flow 400
c. Type	Two cylinder, air cooled, single acting, reciprocating.
d. Air Supply	From carburettor air cleaner.

e.	Lubrication	Pressure fed from engine lubrication system
f.	Drive	By V belt from crankshaft pulley
g.	Output (Capacity)	0.205 m^3/min

34. CLUTCH:

a.	Make	Borg and Beck
b.	Model	12 - AS
c.	Type	Hydraulically actuated; 305 mm single dry plate
d.	Pedal free movement	Approximately 25 mm

35. GEARBOX:

a.	Make	IHC
b.	Model	T - 35
c.	Type	Five forward and one reverse gear. Synchromesh on all except First and Reverse.

d. Ratios:

First	7.17:1
Second	3.96:1
Third	2.36:1
Fourth	1.41:1
Fifth	1:1
Reverse	7.02:1

e. Lubricant Capacity — 5 *l*

36. TRANSFER CASE:

a.	Make	Special
b.	Model	ADE(V)55
c.	Speeds	TWO. Low Ratio 2.5:1; High Ratio 1:1.
d.	Power Take Off	Winch drive. Ratio 2:1
e.	Lubricant Capacity	7.2 *l*

37. FRONT AXLE:

a.	Model	ADE(V) 225-614
b.	Type	Single reduction through hypoid gears
c.	Steering Drive Ends	120 mm Constant velocity 'Tracta' joints.
d.	Differential Ratio	7.167:1
e.	Lubricant Capacity	Axle 5 *l*. Tracta joints each 0.6 *l*.

38. REAR AXLE:

a.	Model	ADE(V) 225-590
b.	Type	Fully floating; Single reduction through hypoid gears.
c.	Differential Ratio	7.167:1
d.	Lubricant Capacity	3.6 *l*

39. STEERING:

a.	Make	Ross
b.	Model	S 35
c.	Type	Cam and twin peg
d.	Gear Ratio	24:1
e.	Lubricant Capacity	1.7 *l*
f.	Steering Wheel Diameter	508 mm
g.	Front Wheel Toe-in	1.6 - 2.4 mm
h.	Turning Circle:	
	(1) Between kerbs,	Left 18.29 m Right 18.29 m
	(2) Between walls,	Left 19.5 m Right 19.3 m

40. WHEELS

a.	Type	Single disc
b.	Rim Size	8.00 x 20
c.	Rim Type	Three piece flat base with detachable side ring and locking ring.
d.	Wheel Nuts:	
	(1) Number per wheel	10
	(2) Size	7/8 in diameter, 14 UNF, RH thread.

41. TYRES:

a.	Type	Non-directional cross country tread, 12 ply
b.	Size	12.00 x 20
c.	Rolling Radius	533 mm
d.	Pressures (Laden):	
	(1) Highway-13% Deflection	Front 360 kPa Rear 460 kPa
	(2) Cross Country, 18% Deflection	Front 240 kPa Rear 300 kPa

	(3) Mud and Sand, 22% Deflection	Front 170 kPa Rear 230 kPa

42. SUSPENSION:

a.	Type	Semi-elliptical leaf springs; axles underslung
b.	Main Springs Front and Rear:	
	(1) Number of Leaves	14
	(2) Span (Flat)	1.372 m
c.	Rear Auxiliary Springs:	
	(1) Number of Leaves	6
	(2) Span (Flat)	864 mm

43. SHOCK ABSORBERS:

a.	Type	Telescopic, double acting
b.	Size	102 mm diameter by 229 mm stroke

44. BRAKES:

a.	Make	Girling
b.	Type	Four wheel; two leading shoe type, air/hydraulically actuated.
c.	Shoe Size	387 mm diameter by 108 mm wide
d.	Air/Hydraulic Actuator:	
	(1) Make	Bendix Westinghouse
	(2) Number	1
e.	Handbrake:	
	(1) Type	Mechanical; over-riding hydraulic operation on rear wheel brakes.
	(2) Control	Handbrake lever operating through mechanical linkage.
f.	Trailer Brakes:	
	(1) Type	Two line compressed air system
g.	Brake Control Valve-Hand	Operates brakes on trailer or towed equipment.
h.	Brake Control Valve - Foot (Treadle)	Operates brakes on all roadwheels of vehicle and brakes of trailer or towed equipment.

45. WINCH:

a. Make	Garwood Industries
b. Model	20L-10405
c. Type	Horizontal drum, fitted with automatic safety brake and free spooling facility (dog clutch).
d. Drive	Direct by propeller shaft from transfer case.
e. Reduction Ratios:	
(1) Winch Gear	29:1
(2) Overall (from engine and with gearbox in first)	415:1
f. Maximum Load Capacity (Bottom layer of drum)	9.08 t
g. Mean Rope Speed at engine speed of 2000 rev/min	3.8 m/min
h. Direction of Pull	Front or Rear
i. Overload Protection	Shear Pin
j. Drum:	
(1) Radius	76 - 178 mm
(2) Inside Width	356 mm
k. Lubricant Capacity	2.5 ℓ

46. WINCH ROPE:

a. Type	Round strand bright steel, of 6/26 Warriflex construction right hand ordinary lay, preformed with independent wire rope core.
b. Size:	
(1) Circumference	51 mm
(2) Diameter	16 mm
(3) Length	76 m
c. Rated Breaking Strain	1770 MPa

47. LAMPS. The lamps used in the various lights and instruments fitted to the vehicles are detailed in Table 3.

TABLE 3 - LAMPS

Serial	Light	Fitted to Mk3 or Mk4	Lamp		
			Volts	Rating (W or CP)	Type
1	Headlight (2)	Mk3 & Mk4	12	50/40 W	Double Contact, Prefocus Base, 'T' Shape, Clear.
2	Reduced Light (Blackout) Headlight (2)	Mk3 & Mk4	12	21 W	Single Contact, Bayonet Candelabra Base, 'S' Shape Clear.
3	Front Park and Flashing Turn Indicator Lights (2)	Mk3 & Mk4	12	18/5 W	Double Contact, Bayonet Candelabra Indexing Base 'S' Shape, Clear.
4	Tail, Stop and Rear Flashing Turn Indicator Lights (2)	Mk3 & Mk4			
	a. Tail, Stop Light (2)	Mk3 & Mk4	as for Serial 3		
	b. Flashing Turn Indicator Lights (2)	Mk3 & Mk4	12	18 W	SCC, 'G' Shape, Clear
5	Width Lights (2) (Clearance Marker Lights)	Mk3 & Mk4	13.5	4CP	SCC, 'G' Shape, Clear
6	Map Light (1)	Mk3 & Mk4	12	6 W	SCC, 'G' Shape, Clear
7	Switch Panel Light (1)	Mk3 & Mk4	as for Serial 6		
8	Convoy Light (1)	Mk3 & Mk4	as for Serial 5		
9	Extension Light (1)	Mk3 & Mk4	12	21 W	SCC, 'G' Shape, Clear

TABLE 3 (contd)

Serial	Light	Fitted to Mk3 or Mk4	Lamp		
			Volts	Rating (W or CP)	Type
10	Speedometer Lights (5) Comprising: a. Panel Lights (2) b. Headlight Light Beam Indicator (1) c. Turn Indicator Lights (2)	Mk3 & Mk4	12-16	2.2CP	MCC, 'G' Shape, Clear
11	Air Pressure Gauge (2), Comprising: a. Panel Light (1) b. Low Air Pressure Warning Light (1)	Mk3 & Mk4	as for Serial 10		
12	Instrument Cluster Panel Light (1)	Mk3 (Only)	as for Serial 10		
13	Instrument Panel Lights (5), Comprising (1 each in): a. Fuel Gauge b. Ammeter c. Water Temperature Gauge d. Oil Pressure Gauge e. Tachometer	Mk4 (Only)	as for Serial 10		

48. CIRCUIT BREAKERS

a. Number 12

b. Rating 12 V, 15 A, Nominally each breaker will:

(1) Carry 15 A without operating,
(2) Operate within two minutes at a current value of 30 A, and
(3) Operate immediately in the event of a short circuit.

c. Circuits Protected:

(1) Headlights;
(2) Reduced Light Headlights;
(3) Park, and Front Flashing Turn Indicator Lights;
(4) Tail, Rear Flashing Turn Indicators, and Width Lights;
(5) Windscreen Wipers;
(6) Map Light;
(7) Stop Light;
(8) Horn;
(9) Extension Light;
(10) Convoy Light;
(11) Auxiliary Feed;
(12) Air Pressure Warning Buzzer.

d. Location — Panel mounted on inside cab wall above driver's door. The breakers are mounted on the panel from Front to Rear in the order listed at c(1) to (12) inclusive.

49. FUSE

a. Number — 1

b. Rating — 20 A

c. Circuit Protected — Supply to Flasher Unit

d. Location — In line holder at rear of Air Pressure Gauge.

PERFORMANCE

50. SPEEDS. Table 4 gives the maximum speed and the average safe speed for the solo vehicle, and the vehicle with trailer, for both highway and cross country operation. Note: Average safe speeds given in the table for cross country running will vary according to terrain.

TABLE 4 - MAXIMUM AND AVERAGE SAFE SPEEDS

	MAXIMUM SPEED		AVERAGE SAFE SPEED	
	Highway km/h	Cross Country km/h	Highway km/h	Cross Country km/h
Solo	80	24	48	8-16
With Trailer	64	19	40	5-13

51. The overall ratio of each drive combination, and the road speed of the vehicle using each combination at an engine speed of 3600 rev/min are given in Table 5.

TABLE 5-DRIVE COMBINATIONS - OVERALL RATIOS AND ROAD SPEEDS (At an Engine Speed of 3600 rev/min)

DRIVE COMBINATION			SPEED km/h
GEAR	TRANSFER CASE RATIO	OVERALL RATIO	
First	High	51.5	14.0
First	Low	129.0	5.6
Second	High	28.4	25.6
Second	Low	71.0	10.2
Third	High	17.0	42.6
Third	Low	42.5	17.0
Fourth	High	10.1	71.6
Fourth	Low	25.2	28.6
Fifth	High	7.17	100.7
Fifth	Low	17.9	40.2
Reverse	High	50.5	17.7
Reverse	Low	126.0	5.8

52. Ground Clearance (Limiting factor rear differential drain plug):

a. Unladen 343 mm

b. Laden 324 mm

53. Fording Depth:

a. Unprepared Vehicle 760 mm

b. Prepared Vehicle

54. Angle of Approach 41°

55. Angle of Departure 36°

56. Net Power/Gross Mass Ratio 9.7:1 kW/t

57. Maximum Gradient Negotiable (Laden) 1:1.67 (60 per cent)

58.	Maximum Permissible Towed Load:	
	a. Highway	4536 kg
	b. Cross-country	2722 kg
59.	Maximum Tractive Effort:	
	a. Fifth Gear:	
	(1) High Ratio	0.41 N/kg
	(2) Low Ratio	1.09 N/kg
	b. First Gear:	
	(1) High Ratio	2.95 N/kg
	(2) Low Ratio	7.40 N/kg
60.	Range of Operation - (On first class roads, at average speed of 56 km/h, and gradients not exceeding 1:10)	480 km
61.	Fuel Consumption Average (Laden on Highway)	40 ℓ/100 km

SECTION 4
CAB

Descripton

62. The cab is flexibly mounted over the front axle and engine. It is constructed in two main sections; and the front section can be removed to facilitate repairs. It is of the enclosed type, is fitted with two doors, and provides individual seating for the driver and co-driver.

63. Sling rings on the front wheels, together with steps and foot plates on the mudguards, and handles fitted in convenient positions, facilitate access to the cab.

64. A hinged circular observation hatch is located in the cab roof above the co-driver's seat. The hatch cover is positively retained in the open position and is locked in the closed position.

65. The driver's seat is adjustable fore and aft, and is controlled by a lever below the right side of the cushion. Grab handles are fitted to the cab floor on each side of the co-driver's seat.

66. The cab doors have wind-down windows and pivotted quarter vents. The door hinges are at the front end; the door locks (and handles) are located in the lower rear corners of the doors.

67. The two windscreens are hinged at the top and can be opened outwards and secured at the desired angle. An electric motor located above and to the left of the LH windscreen operates the windscreen wiper provided on each windscreen.

68. External rear vision mirrors are located on each side of the cab on adjustable arms.

69. Two fixed windows are fitted in the rear wall of the cab and are protected externally by wire mesh guards.

70. Independently controlled ventilation is provided at the front of the cab for the driver and co-driver.

71. The engine access cover in the front centre of the cab interior is secured by four spring catches.

72. The controls, instruments and miscellaneous fittings inside the cab are illustrated in Fig 6 to 10 inclusive.

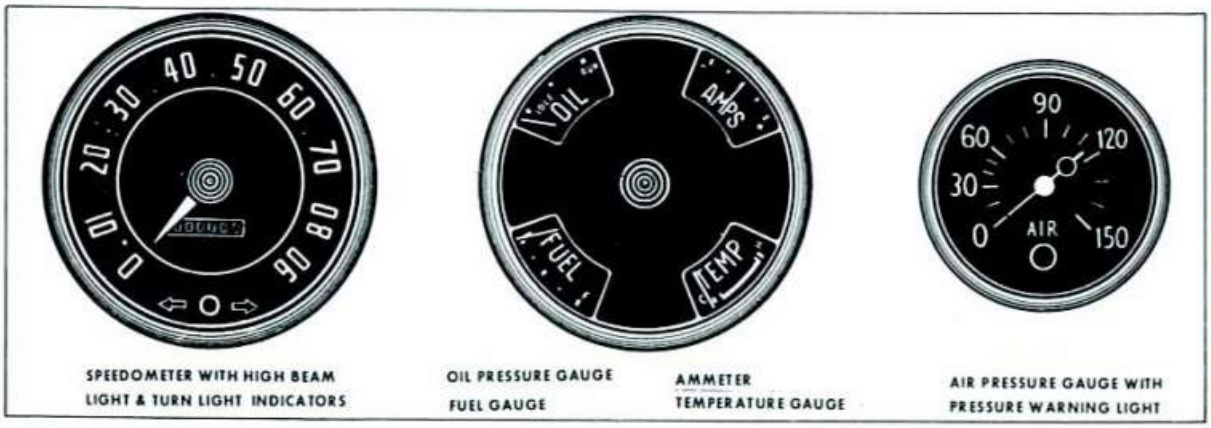


FIG 6
MK 3 INSTRUMENT PANEL

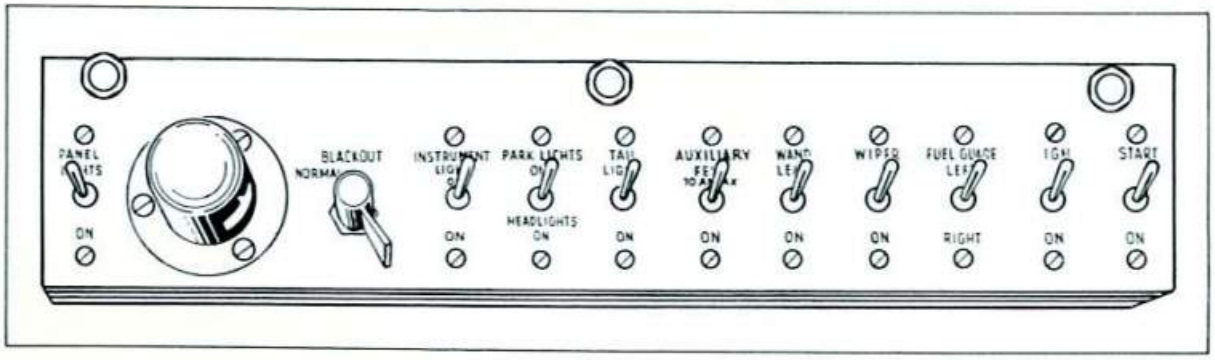


FIG 7
MK 3 SWITCH PANEL

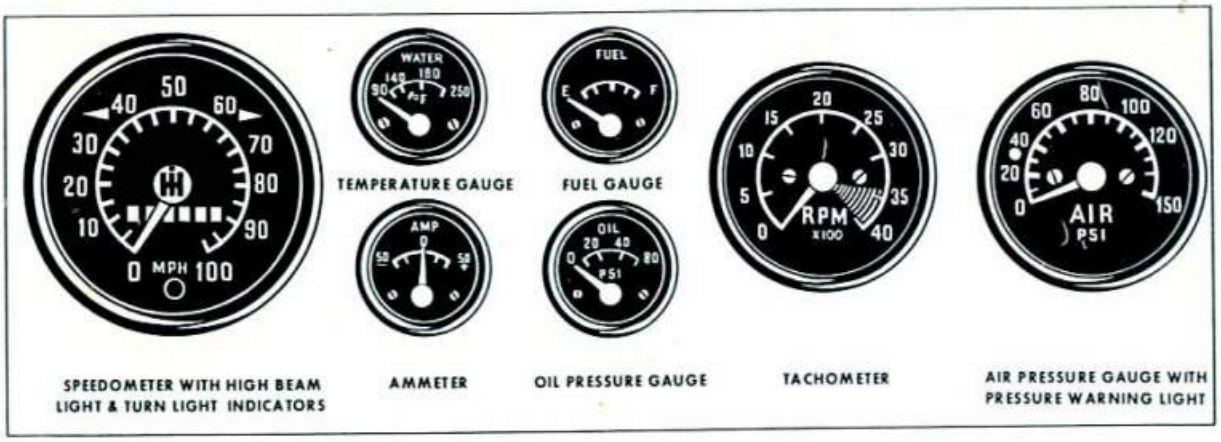


FIG 8
MK 4 INSTRUMENT PANEL

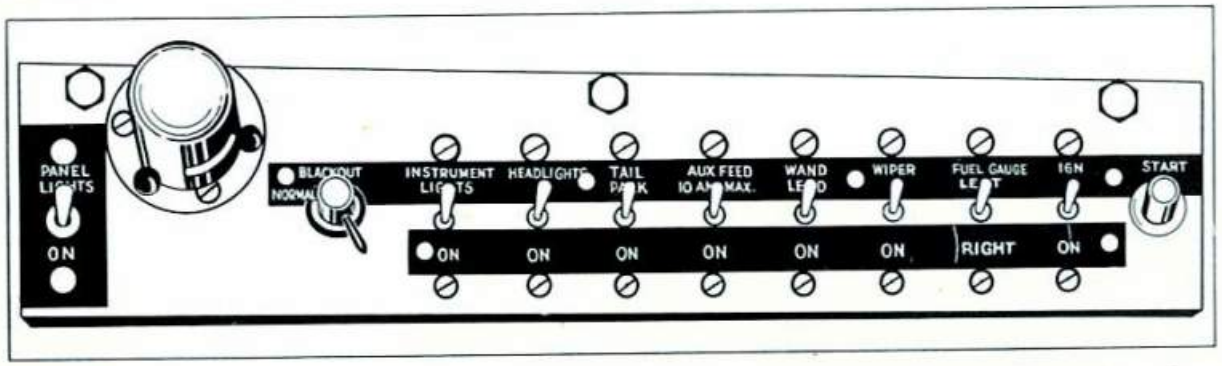


FIG 9
MK 4 SWITCH PANEL

KEY TO FIG 10

1 Handbrake lever
2 Rifle butt rest
3 Gear change lever
4 Hand throttle
5 Choke
6 Transfer case change lever
7 Power take-off lever
8 Starting handle
9 Extension light holder
10 Ventilation control Mk 4 (one also under instrument panel)
11 Extension light socket
12 Rifle clip (one also on rear wall of cab)
13 Ventilation control - Mk 3 (one also above instrument panel)
14 First aid kit
15 Windscreen wiper motor
16 Map light switch
17 Map light
18 Servicing - Instruction plate
19 Transmission gate diagrams
20 Windscreen levers
21 Winch - Instruction plate
22 Clutch pedal
23 Turn indicator lever
24 Instrument panel
25 Horn button
26 Switch panel
27 Steering wheel
28 Circuit breakers and air pressure warning buzzer
29 Voltage regulator
30 Air brake - hand control lever
31 Dip switch
32 Foot brake pedal (Pendent pedal Mk 3 and Treadle - Mk 4)
33 Accelerator pedal
34 Driver's seat control lever
35 Log book holder
36 Socket interconnecting assembly vehicle starting
37 Fuel cock
38 Winch dog clutch.

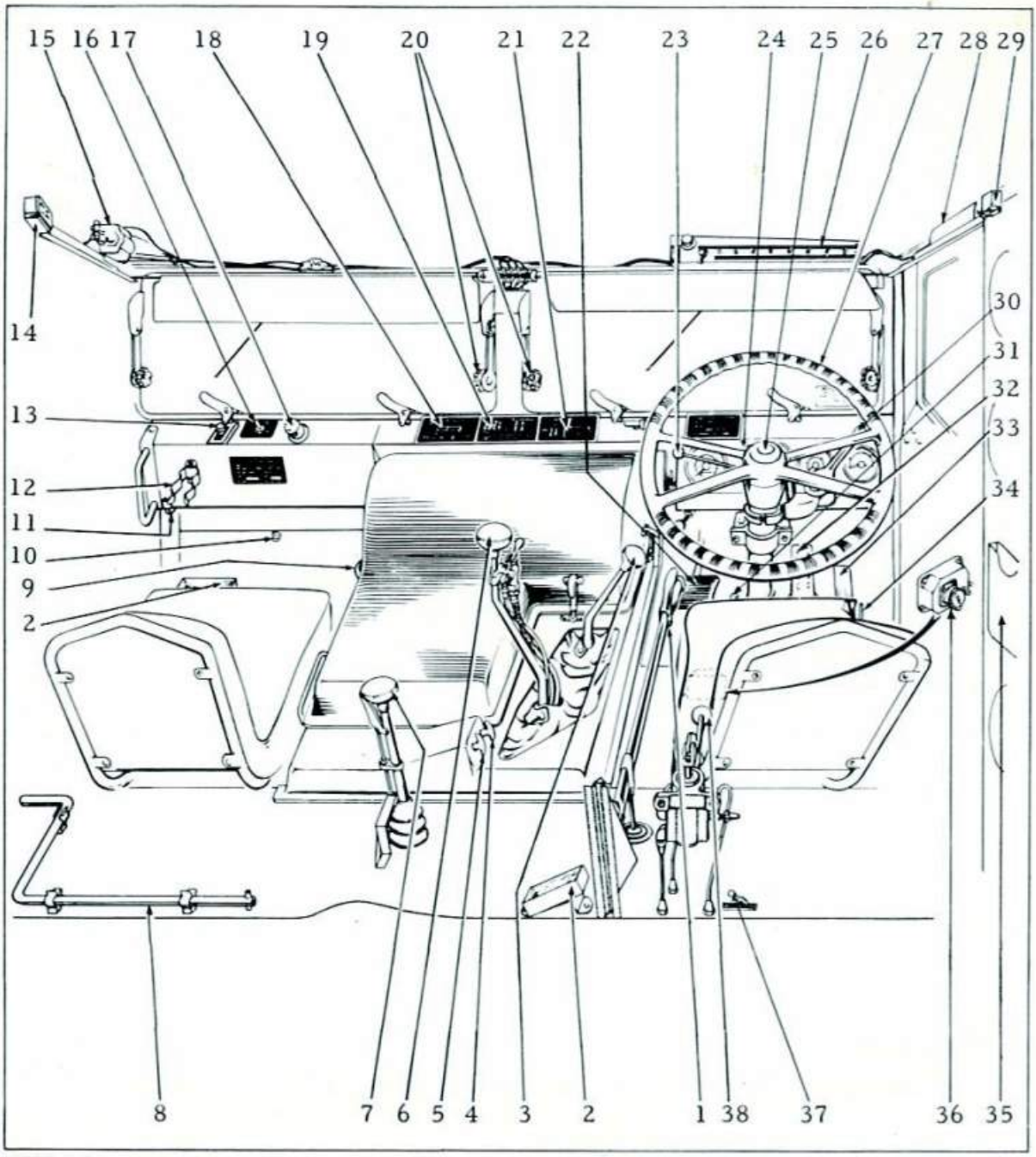


FIG 10
CONTROLS, INSTRUMENTS AND
MISCELLANEOUS ITEMS LOCATED IN CAB

NOTE

The seat belts fitted to both seats, the fire extinguisher stowed in a bracket on the rear wall of the cab and the dipstick stowed in clips on the rear wall of the cab behind co-driver's seat are not shown.

73. A hinged bonnet is fitted across the front of the cab outside and below the windscreens. The Mk 3 bonnet is secured by two securing catches, the Mk 4 bonnet by one catch. Refer Fig 11 and 12 respectively. The bonnets are held in the open position by a self-locking strut. The bonnet provides access to the items listed in Table 6.

TABLE 6 - ITEMS BENEATH HINGED BONNETS MK 3 & MK 4

	MK 3 (Refer Fig 11)	MK 4 (Refer Fig 12)
RH COMPARTMENT		
Brake Air Valve	X	
Clutch Master Cylinder Reservoir	X	X
Clutch Pedal Shaft		X
CENTRE COMPARTMENT		
Radiator Filler Cap	X	X
Engine Oil Dipstick		X
Engine Oil Filler Cap	X	X
Fan and Air Compressor Drive Belts	X	X
LH COMPARTMENT		
Battery	X	X

SERVICING

74. General. Periodically examine all nuts, bolts, and screws for tightness. Check all fittings for security, and all cables and their connections for damage and condition.

75. Lubrication. Periodically lubricate:

a. Seats (24)

b. Hatch (25)

c. Cab Doors (26)

d. Windscreens (27)

e. Rear vision mirrors (28)

f. Bonnet (29)

g. Engine access cover (30)

h. Ventilators (31)

i. Brush guard (32)

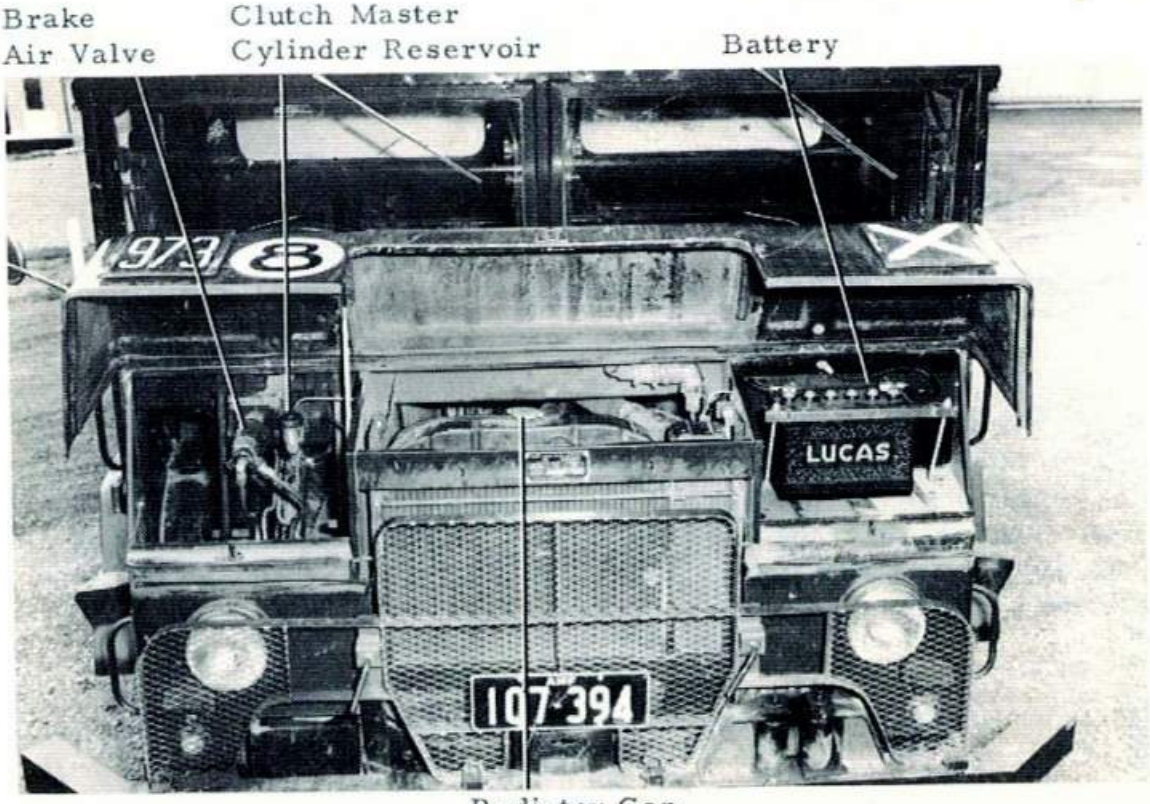


FIG 11

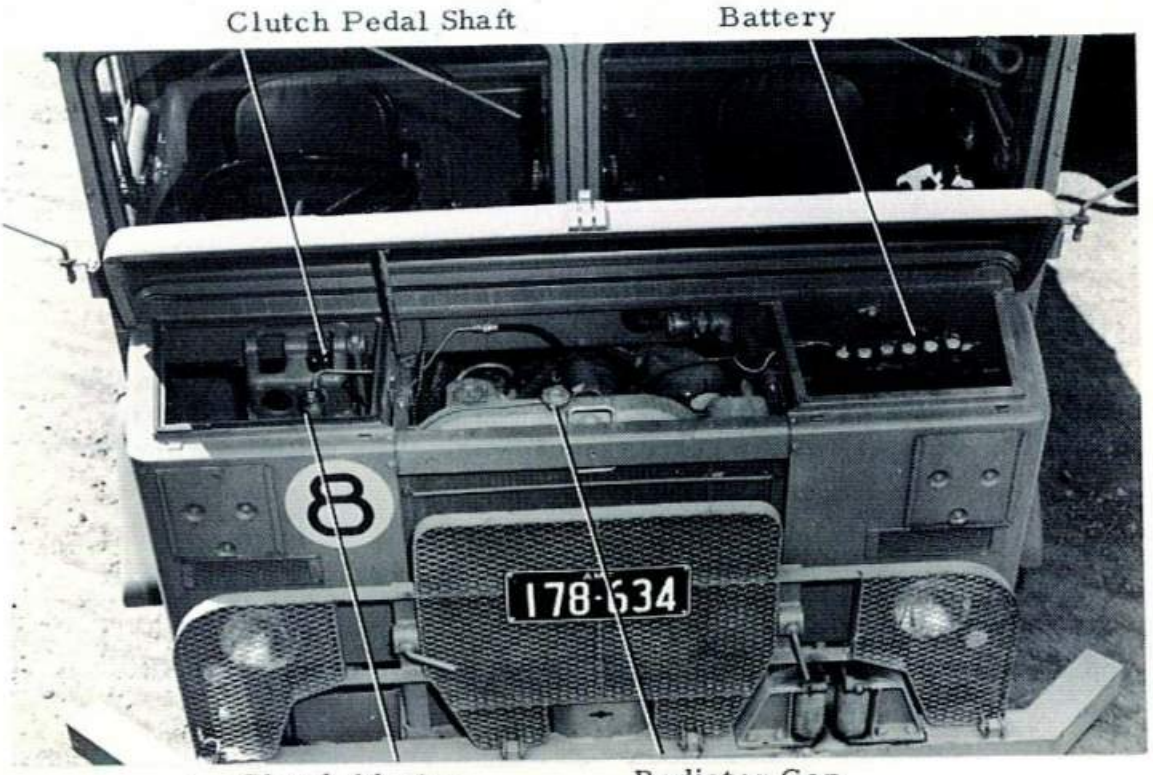


FIG 12

ITEMS BENEATH HINGED BONNETS: FIG 11 - MK 3, FIG 12 - MK 4

SECTION 5
BODY AND FITTINGS
A - BODY

Description

76. The truck body is fitted with two bench type seats which provide seating for sixteen fully equipped passengers.

77. The seats are movable and can be fitted along the inside of the body side panels, or back to back down the centre of the tray. The seats can be swung upwards and secured flush with the back rests permitting full use of the space in the body for cargo. The rear position on each seat is fitted with a grab handle. The body can be converted quickly and easily for use as:

a. Cargo and passenger carrier with side seating.

b. Cargo and passenger carrier with central seating.

c. Cargo carrier with side seating folded.

d. Cargo carrier with tray body. Canopy, canopy bows, seat and hurdle assemblies removed.

e. Cargo carrier with flat top body. Canopy, canopy bows, all side fittings and tailboard removed.

Loading Facilities

78. The flat top loading method can be carried out at any time by removing the canopy, canopy bows, seat and hurdle assemblies, the two intermediate and two corner posts, and lowering the tailboard and side panels.

79. The loading brackets (Refer Fig 13) are provided on the rear member of the floor assembly to support the end of a standard ramp used for the direct transfer of cargo to or from aircraft, railway trucks or other elevated platforms.

Body Conversions

80. Details of the methods of converting the body for use in different roles are given in Table 7 to 9 inclusive.

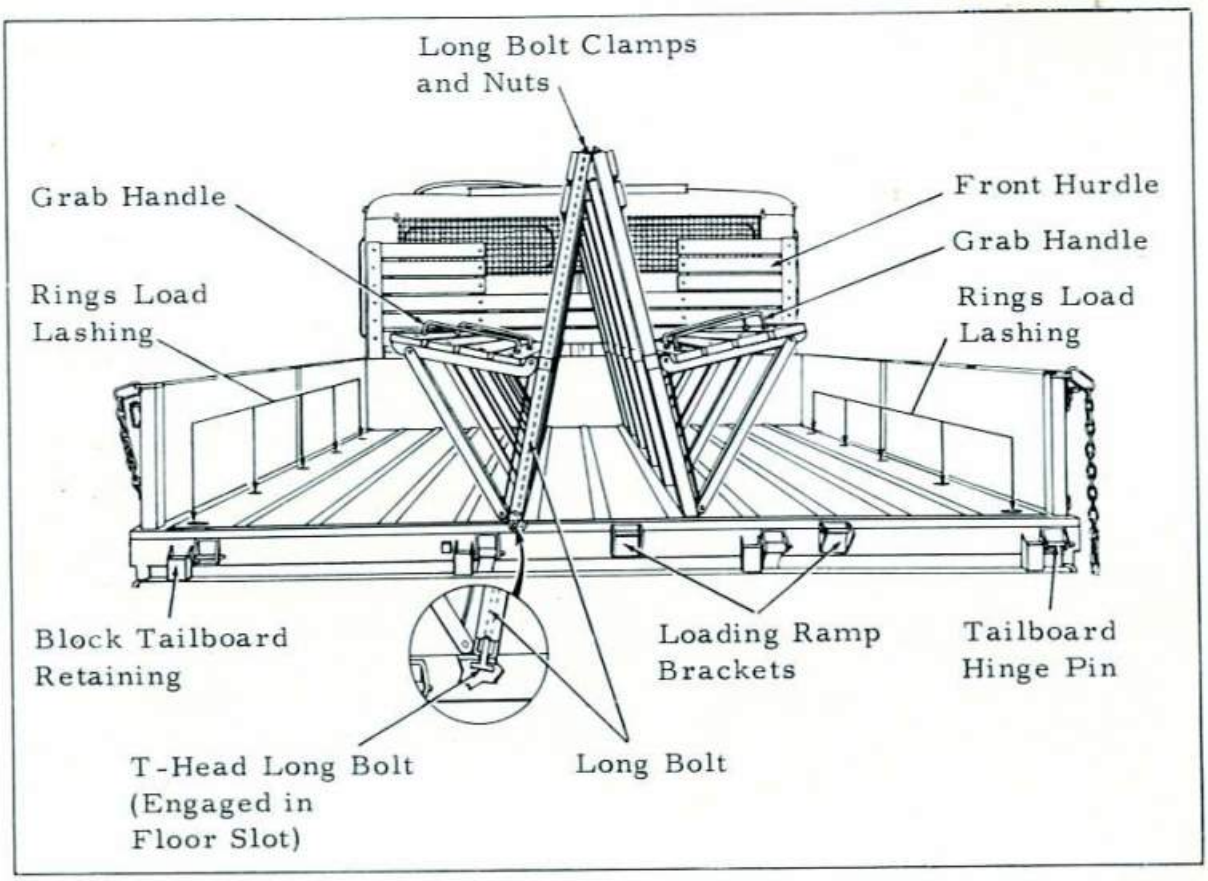


FIG 13
ARRANGEMENT FOR CENTRAL SEATING

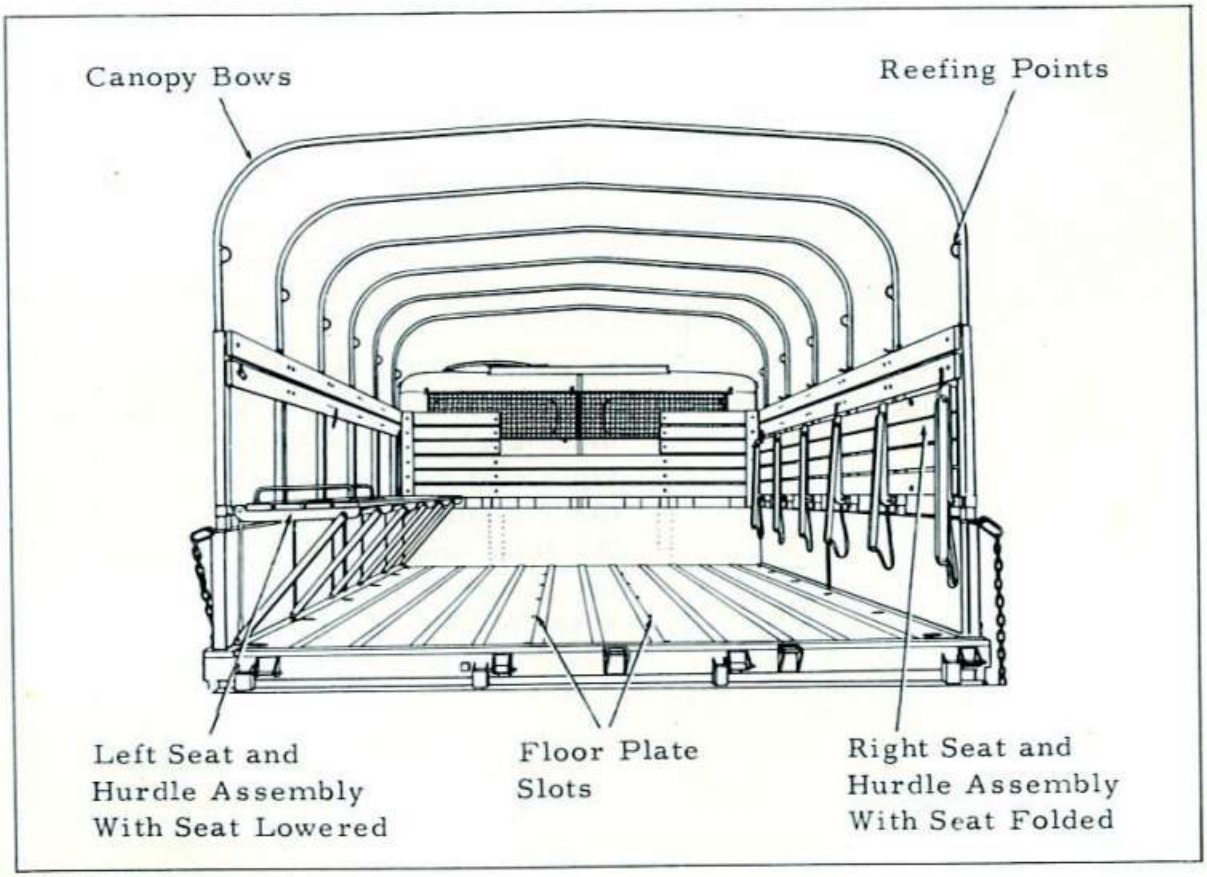


FIG 14
ARRANGEMENT FOR SIDE SEATING

TABLE 7 - CONVERSION FROM SIDE TO CENTRAL SEATING

(Refer to Fig 13 and 14)

ITEM	PROCEDURE
Canopy Canopy Bows	Unlash the canopy and remove it from the vehicle. Lift the canopy bows from the sockets in the side hurdles and remove them from the vehicle.
Left Seat and Hurdle assembly	Release the retaining clips and withdraw the retaining pins from the side panel pillars. Lift the assembly complete with long bolts, from the sockets in the side panel pillars, and lay flat on the body floor, seat side down, near the right hand side.
Right Seat and Hurdle assembly	Remove the assembly employing the method used for the left assembly. Position the assembly along the centre of the body with the seats towards the left side. Engage the T-heads of the long bolts in the left line of floor plate slots. Hold in position.
Long Bolt Stops, Clamps and Nuts	Position the left seat assembly with the seats towards the right side, back-to-back with the right seat assembly. Engage the T-heads of the long bolts in the right line of floor plate slots, and bring the tops of both assemblies together. Turn all long bolts clockwise until their T-heads are against the stops. Insert the clamps under the matching long bolt nuts and tighten the nuts. Re-insert the pins in the side panel pillars and secure with the clips.

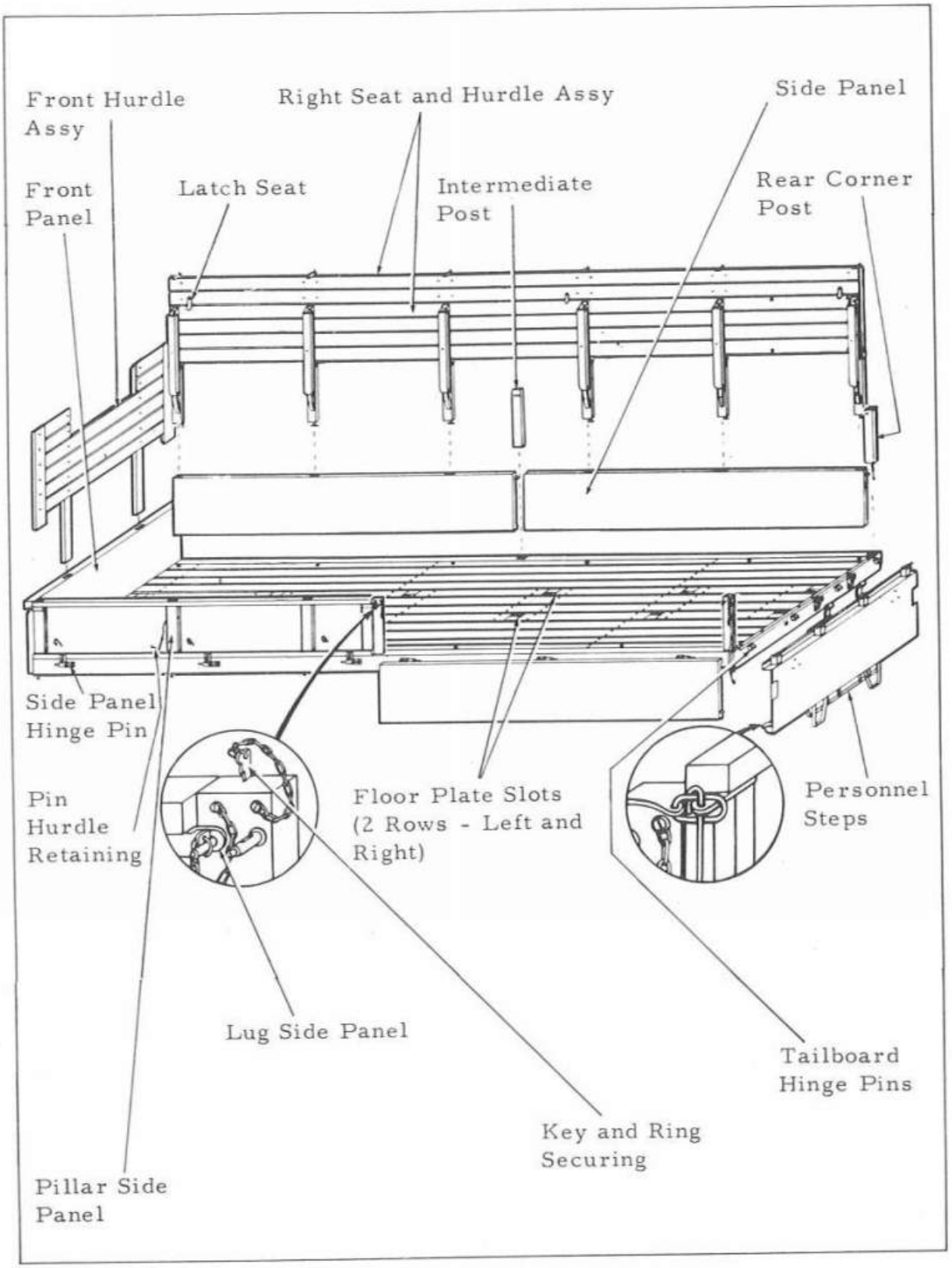


FIG 15
COMPONENTS OF CARGO BODY

TABLE 8 - CONVERSION TO TRAY BODY

(Refer to Fig 15)

ITEM	PROCEDURE
Canopy, Canopy Bows, Left and Right Seat and Hurdle assemblies.	Dismantle as detailed in Table 7, and remove from vehicle.
Front Hurdle assembly	Lift the hurdle from the front panel pillars and remove from the vehicle.
Retaining Pins and Clips	Re-insert the pins in the side panel pillars and secure with the clips.

TABLE 9 - CONVERSION TO FLAT TOP FROM TRAY BODY

(Refer to Fig 15)

ITEM	PROCEDURE
Side Panels	Lift the locking rings, and withdraw the keys holding the side panel lugs. Lower the side panels. Slide the panels off their hinges, front side panels towards the front, rear side panels towards the rear.
Tailboard and Personnel Steps NOTE: The tailboard retaining block prevents the tailboard from sliding off its hinges unless it is fully lowered.	Release the tailboard by unhooking the chains. Lower the tailboard to its full extent, and slide it off its hinge pins towards the left of the vehicle. (This also releases the personnel steps).
Posts	Lift the intermediate posts, and the rear corner posts from their sockets in floor side members and remove from vehicle.

B - FITTINGS

Description

81. Canopy (Item 1, Fig 16) The canopy is fabricated from a polyester and cotton material. It has an opening in the front end fitted with a flap. The rear end consists of two halves which can be laced together down the centre by latchet loops and eyelets. Twelve reefing cords are stitched to the inside of the canopy; these secure the canopy to the reefing points on the bows. Each corner of the canopy has latchet lacing loops, so that the front, sides and rear may be rolled up and secured to form a tropical roof.

82. Canopy Bows. The canopy bows are of tubular steel construction, and are removable as the ends of the bows slide into sockets in the side hurdle posts. Metal loops are welded to the inside of each bow at the top of the straight sides. These provide reefing points to secure the canopy reefing cords on the inside of the canopy.

83. Canopy Lashing Points (Item 2, Fig 16) Lashing ropes and eyelets are provided on the skirt of the canopy to match with the canopy lashing points provided on the vehicle. The lashing points are located:

a. Six on each side of the vehicle (three on each side panel).

b. Two on the front panel.

c. Four on the tailboard.

> **NOTE**
>
> These canopy lashing points must not be used to secure loads.

84. Load Lashing Points . Twenty-four load lashing points are provided. These are:

a. Twelve swivelling rings located inside the body in circular recesses in the floor. (Fig 13)

b. Twelve rings located outside the body. Six are welded along the bottom edge of each side member of the floor assembly. (Item 13, Fig 16.)

85. Transportation Lashing Points. To secure the vehicle for transportation the lashing points to be used are:

a. Front - Bumper bar and towing dees.

FIG 16
FITTINGS ON RH SIDE AND FRONT OF VEHICLE

FIG 17
MUFFLER GUARD

b. Sides - Two fixed bar type lashing points (Item 4, Fig 19) are provided on the outside of each of the chassis side members.

b. Rear - Rear spring shackles and towing pintle.

86. Formation and Unit Sign Holders (Item 3, Fig 16, and Item 1, Fig 18). Four holders are provided on the vehicle; two each on the cab and tailboard.

87. Stowage Boxes (Item 12, Fig 16, and Item 4, Fig 18). Two stowage boxes are located below the body floor, one in each rear corner of the vehicle. The doors which are at the sides of the vehicle, are hinged at the top of the boxes, and secured at the bottom by catches and padlocks.

88. Sling Rings (Item 8, Fig 16 and Item 5, Fig 18). All wheels are fitted with sling rings. Those on the front wheels also serve as steps for entry to the cab.

89. Grab Handles (Item 9, Fig 16, and Item 8, Fig 18). Grab handles are provided at suitable points to assist entry to the cab, also on the cab floor on each side of the co-driver's seat and on the rear seating position of each of the bench seats.

90. Front Bumper Bar (Item 5, Fig 16). A steel bumper bar is fitted across the front of the vehicle.

91. Towing Dees (Item 6, Fig 16). These dees are fitted to the front bar and swivel left and right.

92. Brushguard (Item 4, Fig 16). A hinged brushguard mounted on the front bumper bar provides protection for the radiator and lights. It consists of a steel frame and expanded metal, and is secured in position by two lever headed bolts.

93. Muffler Guard (Item 7, Fig 16 and 17). A tubular steel guard protects the muffler which lies across the front of the vehicle below and to the rear of the front bumper bar.

94. Fuel, Oil and Water Can Holders (Item 10, Fig 16). These holders are two steel cages, bolted to the underside of the body floor on the RH side rear of the cab door. The cans are held in the holders by a metal strap hinged at one end and secured at the other end by a swivel bolt and wing nut which fits into a slot in the end of the strap. The holders provide stowage for:

a. Can, POL, Military Jerrican 20.5 *l*,

b. Can, Plastic Water, 22.7 *l*, and

c. Can, Screw, Cap, Oil 4.5 *l*.

FIG 18
FITTINGS ON LH SIDE AND REAR OF VEHICLE

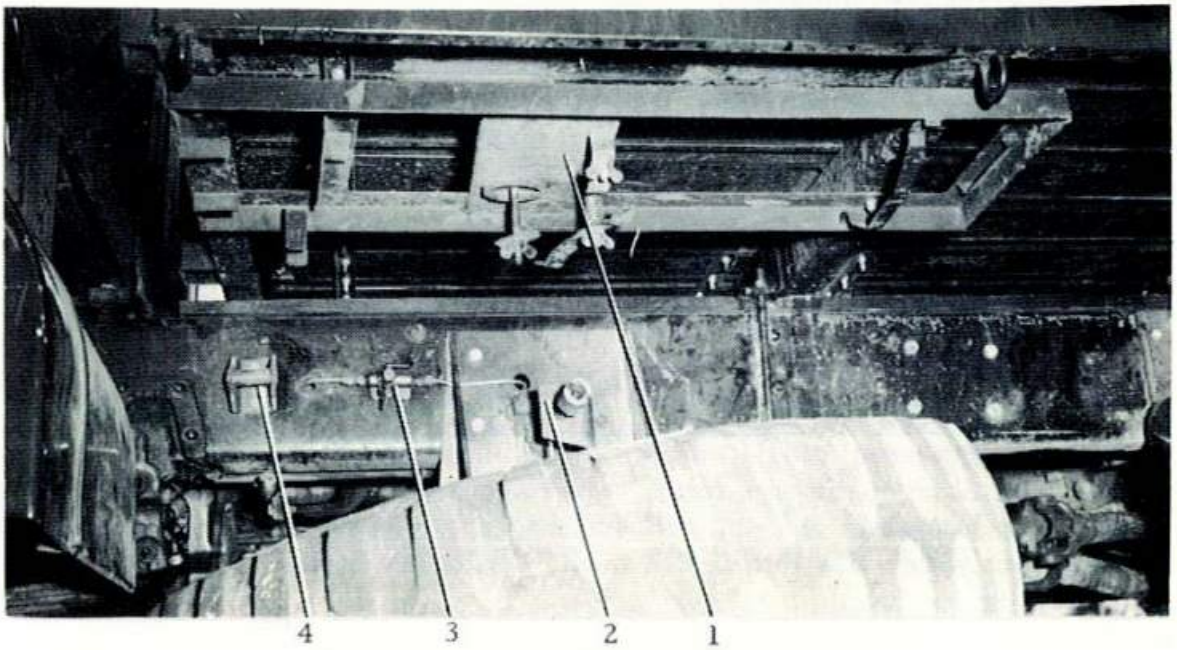


FIG 19
DETAIL OF FITTINGS ON LH SIDE OF VEHICLE
(NOT VISIBLE IN FIG 18)

95. Spare Wheel Carrier and Winch Assembly (Item 6, Fig 18 and Item 2, Fig 19). The spare wheel is stowed in an assembly located below the body immediately rear of the cab on the LH side. The assembly includes a winch used to raise or lower the spare wheel.

96. Tyre Inflation Valve (Item 3, Fig 19) This valve is located on the outer face of the LH side chassis member immediately above the spare wheel.

97. Ditching Tool Holder (Item 7, Fig 18 and Item 1, Fig 19) A holder to stow the ditching tools is located on the underside of the body floor on the LH side above the spare wheel carrier and winch assembly.

98. Tool Box (Item 11, Fig 16) The tool box is located below the body floor on the RH side, forward of the rear wheel. The door is hinged along the top of the box and is secured at the bottom by catches and padlocks.

99. Towing Pintle (Item 2, Fig 18) A rotatable towing pintle is mounted in a bearing at the centre of the rear transverse member of the vehicle frame. The pintle is closed by a lock assembly that has a spring latch. It is released by lifting the latch. A safety pin is provided to ensure that the pintle has been properly closed.

100. A locking bar with securing pin is mounted below the pintle to lock it in the upright position when the towed equipment has a rotating towing eye.

101. Personnel Steps (Item 3, Fig 18) A metal frame, suspended by the tailboard hinge pins facilitates entry into the body of the vehicle when the tailboard is in the raised position.

102. Servicing. Check the body and all fittings for damage and security. Periodically service:

a.	Swivelling load lashing rings	(37)
b.	Body seats	(33)
c.	Body sides	(34)
d.	Tailboard and personnel steps	(35)
e.	Tool and stowage boxes. Fuel, oil and water can holders. Ditching tool holder	(36)
f.	Body mounting bolts	(38)
g.	Towing dees	(39)
h.	Spare wheel carrier and winch assembly	(40)
i.	Towing pintle	(41)

SECTION 6
FIRE FIGHTING EQUIPMENT

Description

103. A hand operated fire extinguisher, designed to handle liquid, electrical and carbonaceous fires with equal efficiency, is provided to protect the vehicle in case of fire. The extinguisher is a 1.3 kg bromochlorodifluoromethane (BCF), stored pressure, regulated discharge type. Discharge of the extinguishant is controlled by operation of the trigger mechanism. A discharge indicator (RED disc), which gives a visual indication of partial or complete discharge is fitted. Instructions for the use and recharging of the extinguisher are printed on the container.

104. The extinguisher is stowed in a bracket on the inside of the rear wall of the cab.

105. To remove the extinguisher from its bracket, grasp the extinguisher firmly, release the restraining strap and lift away from the bracket.

Actuating the Extinguisher

106. Grasp the extinguisher firmly by the handle, with the nozzle (marked with an arrow) pointed away from the body and towards the base of the fire.

107. Unlock the RED safety catch by depressing it, aim at the base of the fire, holding the extinguisher upright, and squeeze the actuating lever.

WARNING

The fumes given off by operation of this extinguisher can be dangerous to life, especially in confined spaces. DO NOT INHALE THESE FUMES. Provide for adequate ventilation to disperse the fumes when the fire has been extinguished.

Operating the Extinguisher

108. Direct the extinguishant at the base of the flames, NOT at the centre of the fire.

109. For fires in tanks and pans, direct the extinguishant to the far side of the receptacle ABOVE the surface of the burning fluid and NOT directly into it.

110. The extinguisher may be used against electrical fires as the extinguishant is not a conductor of electricity and can be used freely, with safety from electrical shocks.

111. After use re-set the safety catch by raising it. Hand the equipment in for replacement and refilling at the earliest possible opportunity.

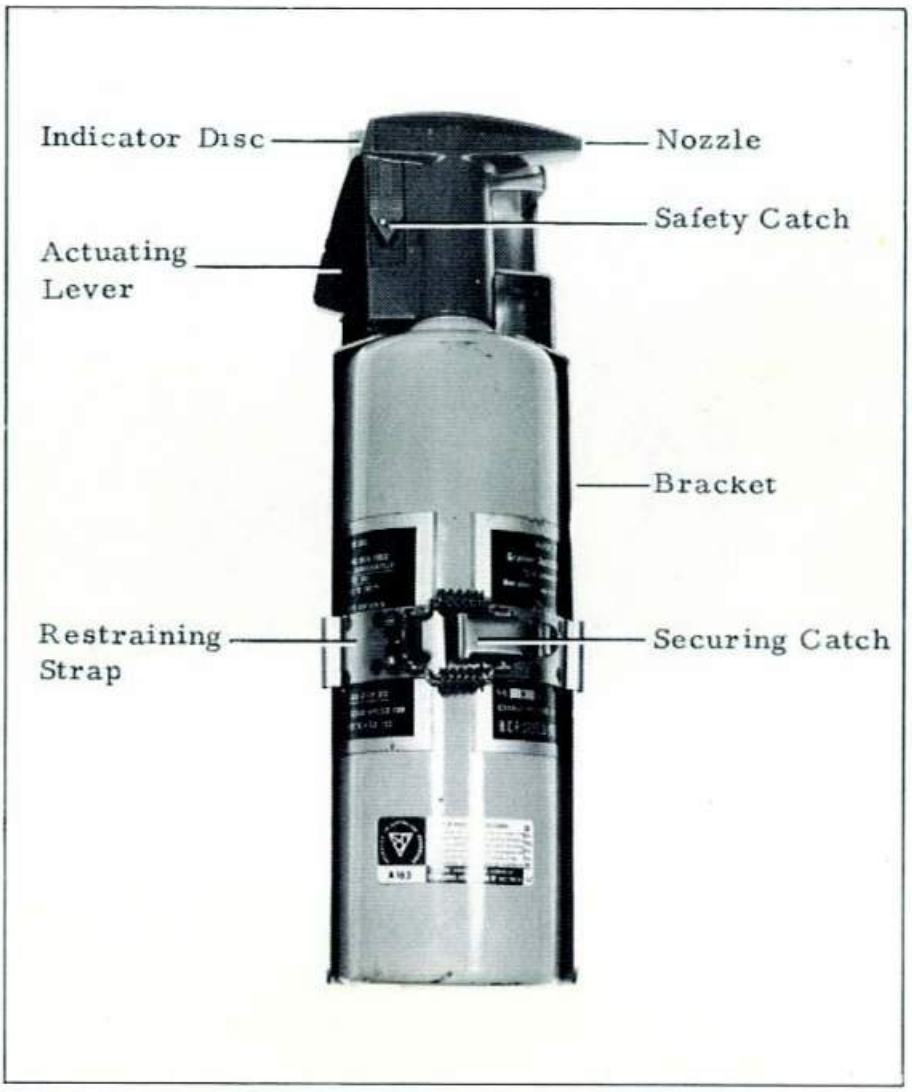
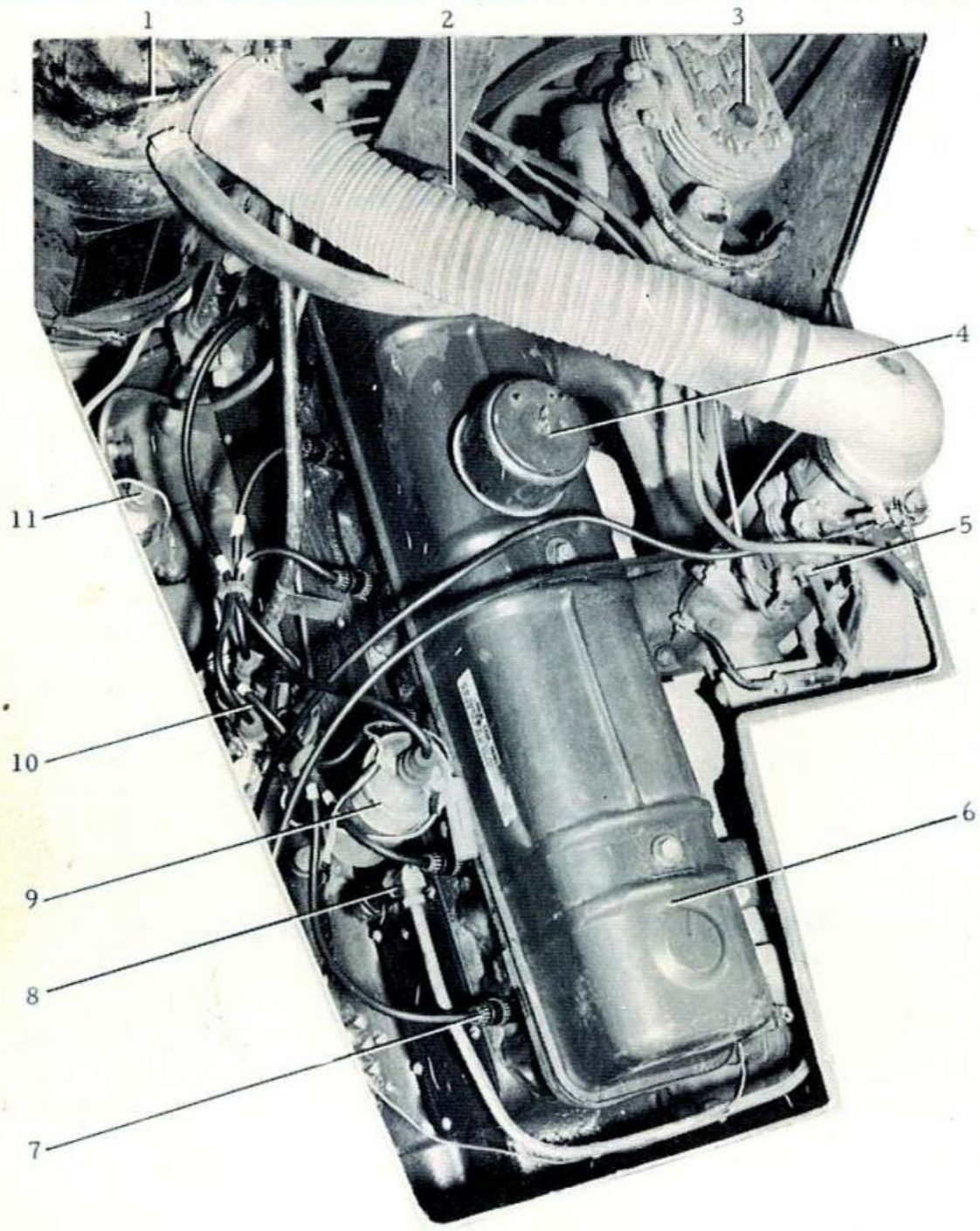


FIG 20
FIRE EXTINGUISHER STOWED IN BRACKET

112. Servicing. After use the extinguisher must be re-charged. Check the mass of the extinguisher periodically (a fully charged extinguisher has a mass of 2.7 kg). Check that the RED indicator disc is not broken. This means that the extinguisher has not been actuated.



1. Air Cleaner
2. Oil Filler Cap
3. Air Compressor
4. Engine Air Filter
5. Carburettor
6. Rocker Cover
7. Spark Plugs (6)
8. Air Metering Valve
9. Ignition Coil
10. Distributor
11. Fuel Pump

FIG 21
REAR ENGINE COMPARTMENT - COVER REMOVED

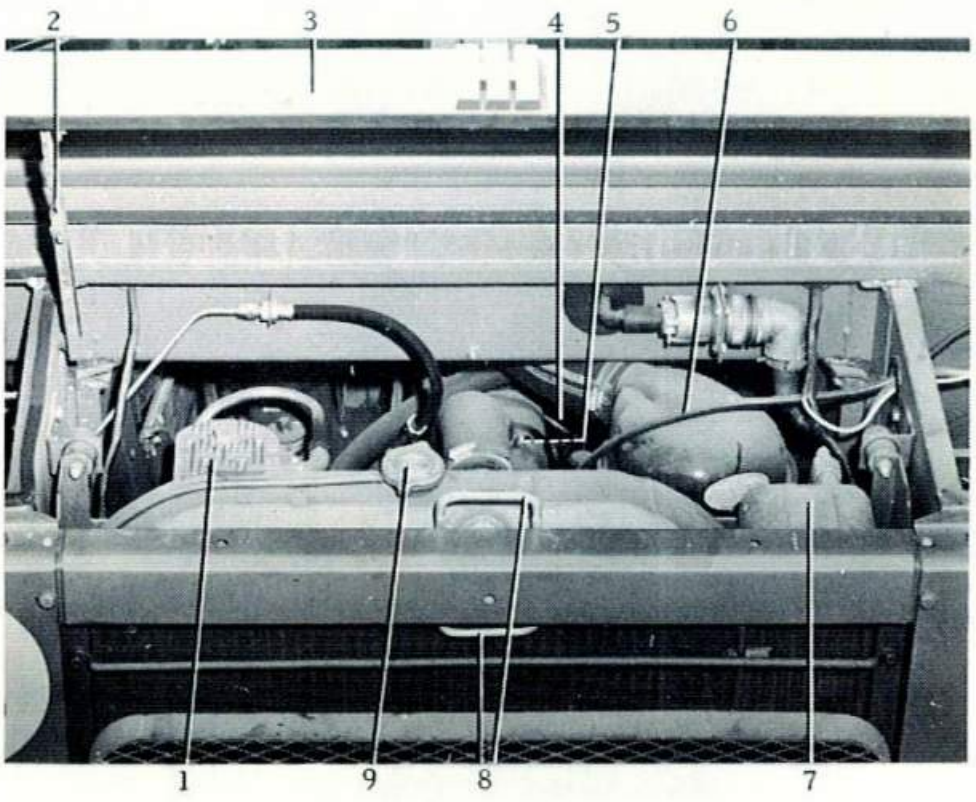
SECTION 7
ENGINE COMPARTMENT

Description

113. The engine compartment is located over the front axle and extends rearwards from behind the radiator into the centre of the cab. Before studying the details of the engine and auxiliary systems, the various components visible in the engine compartment should be located and identified.

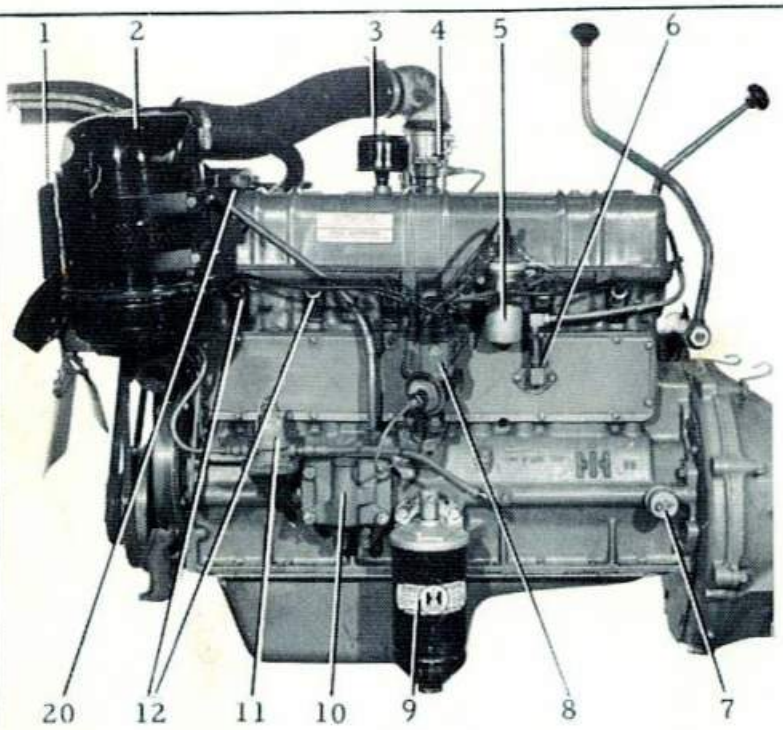
114. Access to the compartment is gained by releasing and raising the hinged bonnet (see Fig 11 and 12) which is held in the open position by a self-locking strut; or by releasing the four spring catches and removing the engine access cover.

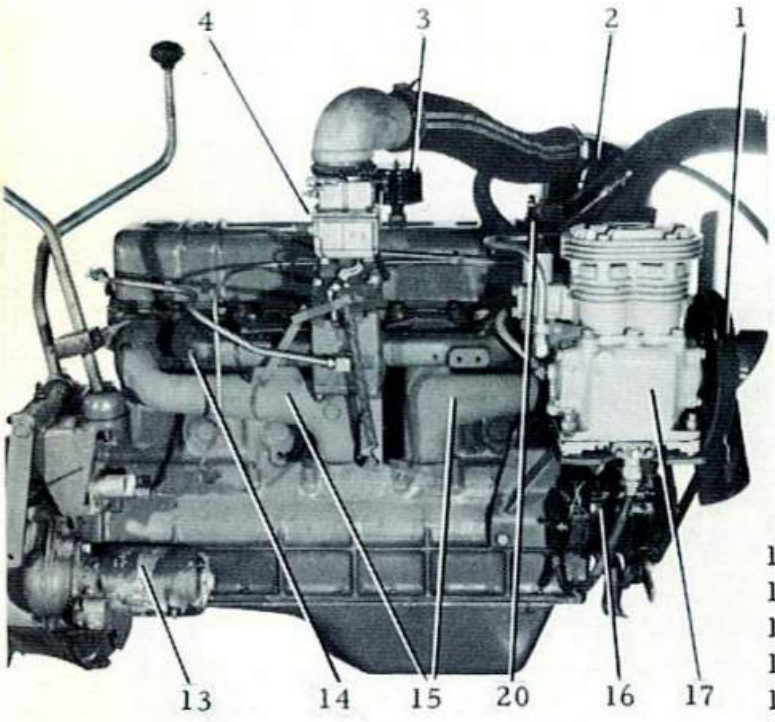
115. The components accessible by raising the bonnet or removing the engine access cover are illustrated in Fig 21 and 22.

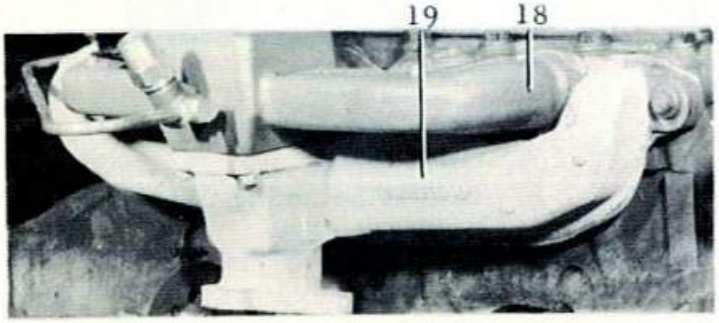


1. Air Compressor
2. Self-Locking Strut
3. Bonnet
4. Oil Dipstick
5. Oil Filler Cap
6. Air Cleaner
7. Oil Cooler
8. Bonnet Securing Catch
9. Radiator Cap

FIG 22
FRONT ENGINE COMPARTMENT







1. Fan
2. Air Cleaner
3. Engine Air Filter
4. Carburettor
5. Ignition Coil
6. Air Metering Valve
7. Oil Pressure Gauge Sender Unit
8. Distributor
9. Oil Filter
10. Adapter
11. Fuel Pump
12. Spark Plugs (6)
13. Starter Motor
14. Intake Manifold
15. Exhaust Manifold (MK 4 - Two Piece)
16. Alternator (MK 4) Generator (MK 3)
17. Air Compressor
18. Inlet Manifold (MK 3)
19. Exhaust Manifold (MK 3 One Piece)
20. Oil Filler Cap

FIG 23
ENGINE COMPONENTS

SECTION 8
ENGINE

Description

116. The engine is an IHC Model AGD-282, gasoline powered four cycle, six cylinders in line type with tilted overhead valves. It develops 79 kW at 3200 rev/min.

117. The cylinder block/crankcase assembly is cast in one piece and carries the crankshaft main bearings. The detachable cylinder head which is bolted to the crankcase, contains all valves, valve guides and springs, and the valve operating mechanism ie, rocker arm shaft and rocker arms. A detachable cylinder head cover (rocker cover) (refer Item 6 Fig 21) is bolted to the top of the cylinder head, enclosing the valves and valve operating mechanism (rocker gear).

118. The cylinders are numbered from front to rear for the purpose of firing order, valve timing and piston numbering. Crankshaft rotation is clockwise as viewed from the front of the engine. The firing order is 1-5-3-6-2-4.

119. The oil filler cap is located at the front end of the rocker cover and an engine air filter is located on the top centre of the cover.

120. The oil level dipstick is located on the LH side of the engine and is accessible through the front compartment.

121. The engine number is stamped on a pad near the front RH side of the crankcase, just below the air compressor mounting bracket.

122. The generator (Mk 3), alternator (Mk 4), fan, water pump and air compressor are driven by two V-type belts from a driven pulley mounted on the front end of the crankshaft. The distributor, mounted on the LH side of the engine is driven by the camshaft through the oil pump gear and shaft. A vibration damper is provided at the front end of the crankshaft.

123. Water circulation passages completely surround the cylinders in the crankcase, and also provide coolant to the cylinder head.

124. Oil is supplied under pressure by the oil pump to the engine lubricating system. Oil spray from the revolving crankshaft is distributed to the cylinder walls, pistons and other moving parts inside the engine. Oil from the rocker gear assembly is fed to the timing gears.

125. The pistons are made of an aluminium alloy and are fitted with two compression rings and one oil control ring.

126. The flywheel is bolted and dowelled to the crankshaft flange. A timing mark is provided consisting of a steel ball let into the front face of the flywheel, visible through an aperture in the front RH side of the flywheel housing.

127. The exhaust and intake manifolds are bolted together, and the inlet manifold is cast in one piece.

128. The exhaust manifold of the Mk 3 is cast in one piece; that of the MK 4 is cast in two pieces.

129. Starting Handle. A starting handle (Fig 10 Item 8) is provided for in servicing, for manually turning the engine crankshaft and for operation of the spare wheel winch. The handle is stowed on the cab floor to the LH side rear of the co-driver's seat and is retained by three clips.

130. Speedometer. The speedometer is located on the instrument panel. This instrument indicates the speed of the vehicle in miles/h (or km/h) and registers the total mileage; it also contains three indicator lights. These are:

a. headlight high beam indicator, and

b. left and right turn signal indicators.

131. Tachometer. The Mk 4 vehicle is fitted with a tachometer which is located on the instrument panel (see Fig 8). This instrument indicates the engine speed in rev/min. The figures are marked in WHITE up to 3400 rev/min and in RED from 3400-4000 rev/min. Drivers are warned not to exceed 3400 rev/min.

132. All other controls and instruments are dealt with under the systems in which they operate.

NOTE

The engine must be kept in a clean condition, or the detection and remedy of faults will be made difficult, and the danger of fire increased. Gasolene, kerosene, or oil must not be used for cleaning as these products cause considerable damage to rubberized parts.

133. Servicing. Periodically service:

Engine (1) (2) (5) (7) (8) (10).
Speedometer cable (11).

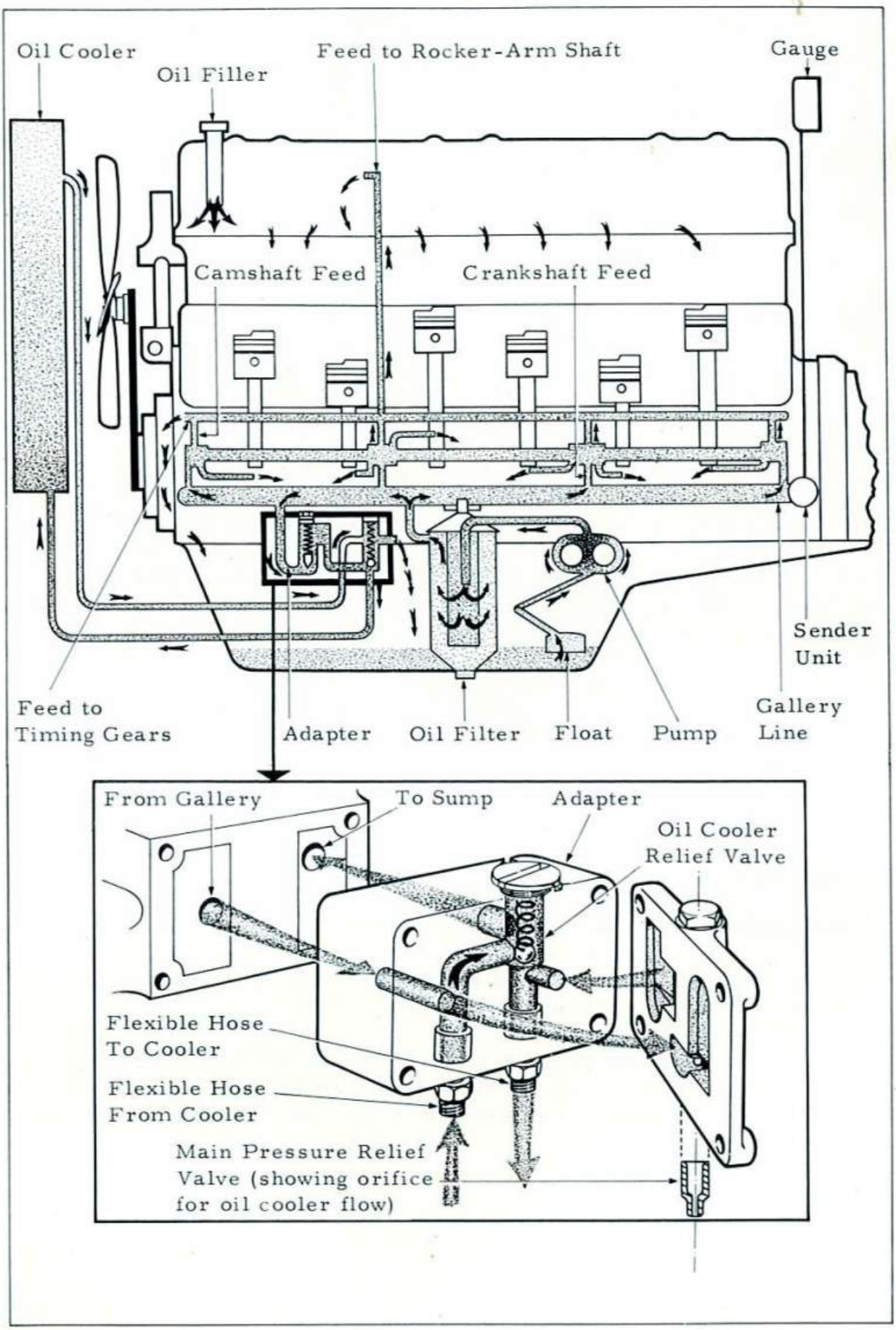


FIG 24
ENGINE LUBRICATION SYSTEM

SECTION 9
ENGINE LUBRICATION SYSTEM

DESCRIPTON

134. The engine lubrication system is illustrated in Fig 24. It is of the wet sump type with a total oil capacity of 9.6 litres (1.4 litres being held in the oil filter).

135. Oil is introduced into the system through the oil filler tube, the cap of which is located at the front end of the rocker cover (see Fig 23).

136. The amount of oil in the engine sump can be measured with the dipstick, which is held in a scabbard on the LH side of the engine (see Fig 22). Access to the oil filler cap and the dipstick is gained through the front bonnet, (Mk 4) and under the engine access cover (Mk 3).

137. The pump sucks oil up from the sump through a floating screen and then pumps the oil under pressure through the oil filter via the main oil gallery to the crankshaft, camshaft and rocker arm assembly.

138. Oil is sprayed from the revolving crankshaft to the cylinder walls, pistons, and other moving parts. Oil from the rocker arm assembly is fed to the timing gears.

139. A portion of the oil is passed through an oil cooler before returning to the sump. The cooler is mounted in the same frame and to the LH side of the water cooling core. The oil cooling system is described in Section 11 - Engine Cooling Systems.

OPERATION

Oil Pump

140. A large capacity oil pump is fitted inside the crankcase to provide for circulation of the oil through the lubricating system at a pressure of 240-310 kPa at 1500 rev/min.

141. The gear type pump is driven from the camshaft and is fitted with a floating filter screen. This ensures that the pump sucks in surface oil and prevents clogging the screen with any sediment from the bottom of the sump.

142. Main Pressure Relief Valve. This valve opens when pressure in the main oil gallery reaches 240-310 kPa, allowing an increased flow of oil to the oil cooler.

143. Oil Cooler By-pass Valve. This valve opens when pressure in the line between the main pressure relief valve and the oil cooler reaches 70 kPa, allowing a portion of oil to by-pass the cooler and flow back to the sump.

144. Oil Pressure Gauge and Gauge Sender Unit. An oil pressure gauge sender unit is screwed into the rear of the main oil gallery. This unit operates the oil pressure gauge on the instrument panel.

145. The Mk 3 vehicle oil pressure gauge is the top left segment of the instrument cluster (see Fig 25A). The dial of this gauge shows the range of pressure for idling (marked IDLE) and running (marked RUN).

146. The Mk 4 vehicle oil pressure gauge is a separate instrument (see Fig 25B). The dial of this gauge shows the range of oil pressure from 0-60 lb/in^2 (0-413 kPa).

Oil Filter

147. This is a Vokes Model E245/L full flow cartridge type filter (see Fig 26), with oil flowing from the inside to the outside of the cartridge. The filter is mounted on the LH side of the engine near the centre. It holds 1.4 ℓ of oil and has a capacity of 34 ℓ/min (minimum).

148. The filter is fitted with a barred (T-head) nut to facilitate removal of the casing and cartridge.

149. The frequency at which the cartridge is to be changed depends entirely on conditions of operations, road conditions, mechanical condition of the engine and the use of good quality engine oil changed at the correct intervals. If operating conditions are bad, or if excessive winching operations have been carried out, it may be necessary to change the cartridge at shorter intervals (reduced mileage).

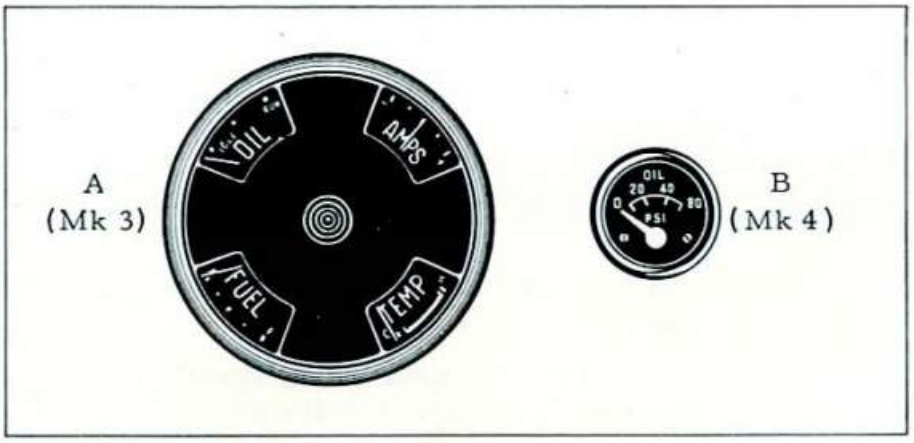


FIG 25
OIL PRESSURE GAUGES

WARNING

Do not operate the vehicle when the oil level is outside the working limits shown on the dipstick, or if the oil pressure gauge pointer fluctuates or indicates a pressure below the required range.

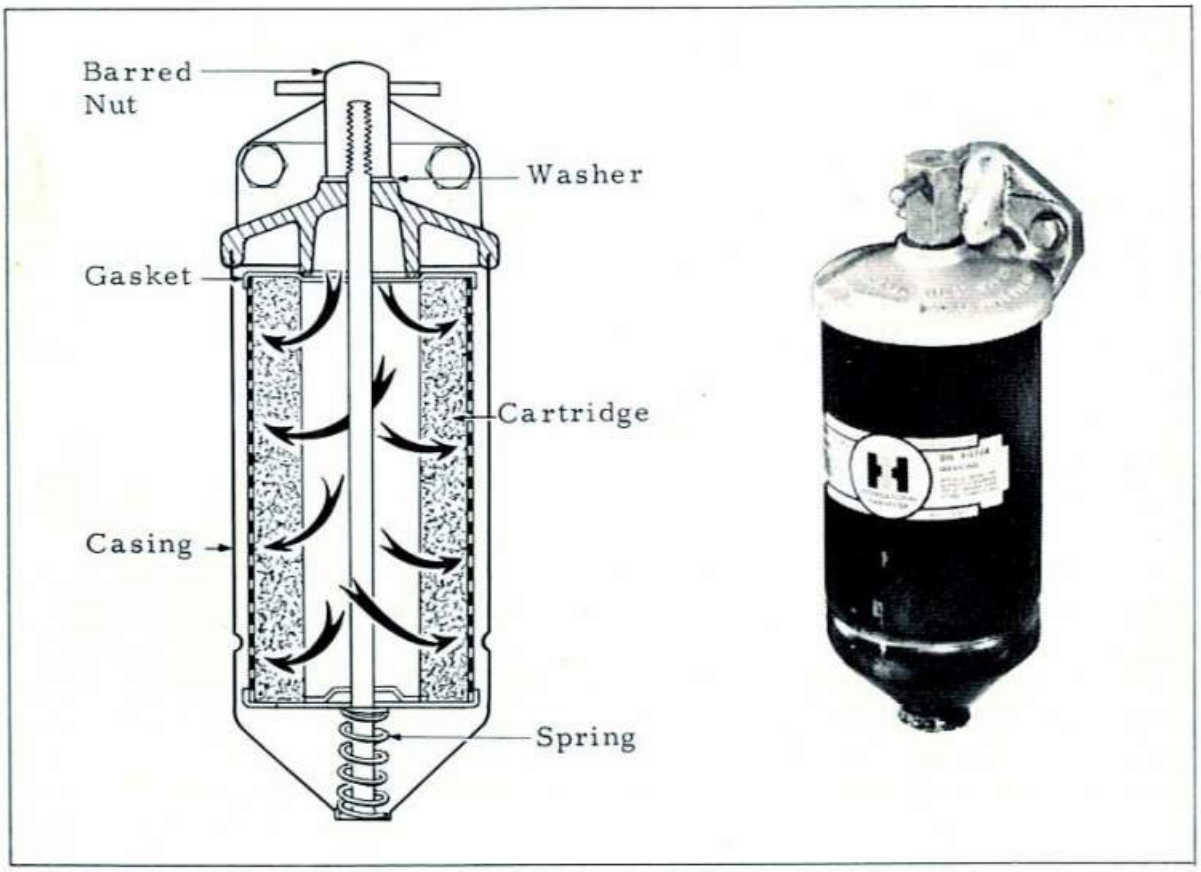


FIG 26
OIL FILTER ASSEMBLY

150. To Check Oil Level. Position the vehicle on level ground and:

a. Remove the dipstick from its scabbard on the LH side of the engine. Wipe it clean, replace in scabbard, ensuring it is fully home then remove again and check that the oil level is between the FULL and LOW markings on the dipstick. Replace the dipstick.

b. If oil level is low, add oil of the correct grade. Replace the oil filler cap.

c. Run the engine at a little over idling speed, stop the engine, wait two minutes, then re-check the oil level. Add oil if necessary. This procedure is necessary to fill up the oil cooler which drains back into the sump when the engine is not running.

151. To Change Oil. Position the vehicle on level ground and:

a. Start up and run the engine for a short period if not already warm.

b. Drain the sump by removing the drain plug in the bottom centre of the sump.

c. Drain the oil cooler by disconnecting the flexible oil hose at the base of the oil adapter (see Fig 24).

d. After the oil has drained ensure that the drain plug and gasket are clean. Replace the drain plug and gasket in the sump and reconnect the flexible oil hose to the adapter and tighten.

e. Remove the oil filler cap and add 8.2 litres of the correct grade of oil to the engine.

f. Allow time for the oil to drain into the sump. Check the oil level as detailed in para 150a, b and c.

g. Check the oil pressure gauge for correct operation, and all pipes, hoses and unions for cleanliness, security and leaks.

152. Servicing. Periodically service:

Engine (2) (4) and (8).
Oil filter (3).

SECTION 10
ENGINE VENTILATION SYSTEM

DESCRIPTION

153. Positive crankcase breathing for the engine is provided. Inlet manifold vacuum is utilized to draw off fumes and contaminating vapours from the crankcase and cylinder head and exhausts them through the combustion chambers and exhaust system. The air flow in the system is shown in Fig 27.

Operation

154. Engine Air Filter. A dry type engine air filter, (see Fig 28) is mounted on the top centre of the rocker arm cover. It consists of a base, wire gauze filter element, cover, and wing nut. It prevents the ingress of dust and foreign matter into the ventilation system.

Air Metering Valve

155. The amount of air drawn through the ventilation system is controlled by the air metering valve (see Fig 29) which is mounted on the push rod chamber cover, just to the rear of the distributor.

156. The air metering valve is connected by a pipe to an elbow in the inlet manifold.

157. When inlet manifold vacuum is low (high rev/min) the weight is in its lower position withdrawing the metering pin from the metering orifice and allowing a normal flow of air in the ventilation system. When inlet manifold vacuum is high (low rev/min) the weight is in its upper position, engaging the large section of the metering pin in the orifice and restricting the flow of air in the ventilation system.

158. Servicing. Periodically service the engine air filter (6).

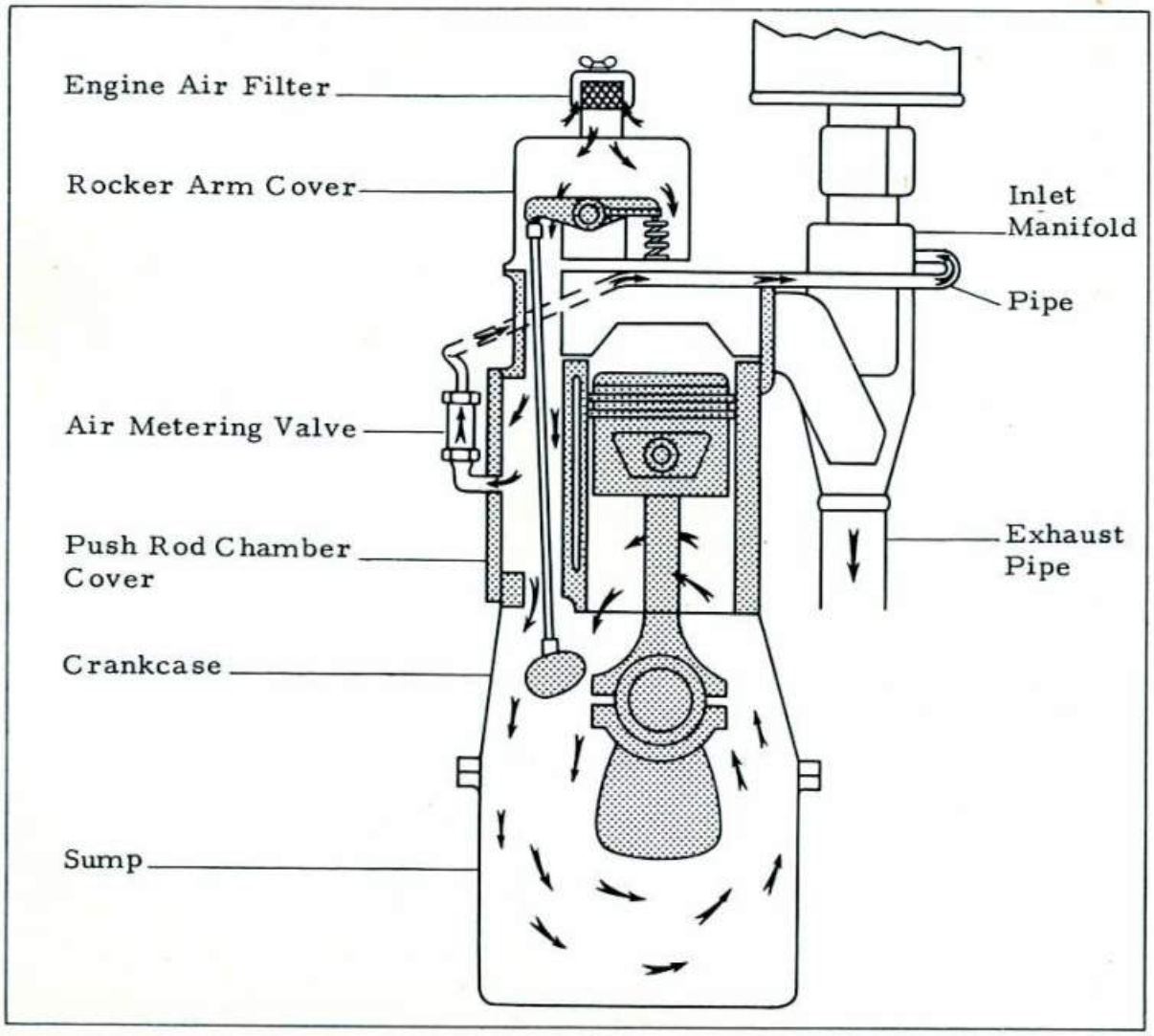


FIG 27
AIR FLOW IN ENGINE VENTILATION SYSTEM

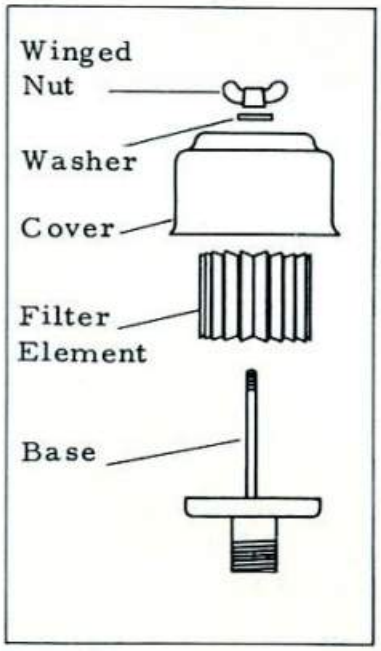


FIG 28
ENGINE AIR FILTER

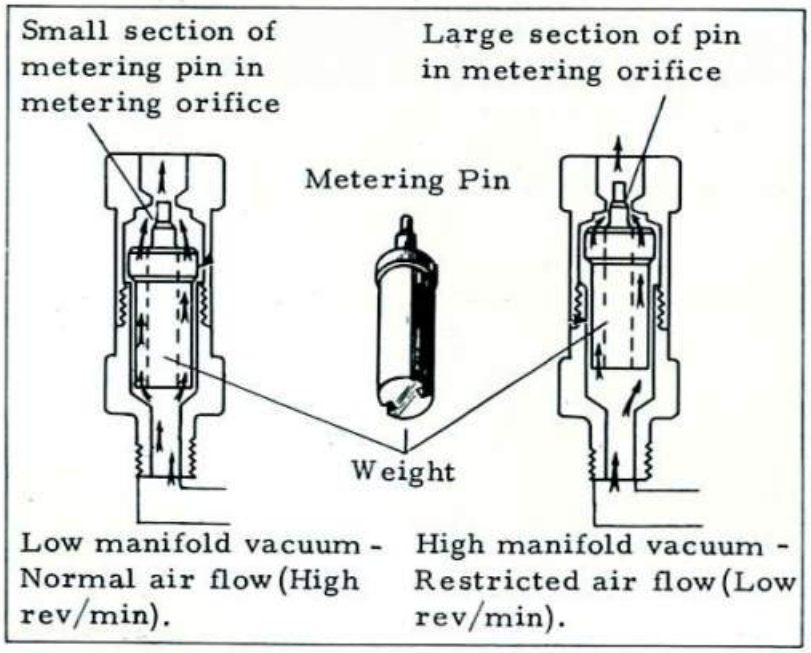


FIG 29
AIR METERING VALVE

SECTION 11
ENGINE COOLING SYSTEM

Description

159. The vehicle is equipped with a special cooling system designed to meet severe operational requirements and incorporates both water and engine oil cooling.

Water Cooling

160. This is a pumped circulatory system with a capacity of 20 litres. The centrifugal pump mounted at the front of the engine is belt driven from the crankshaft. Water is drawn from the bottom radiator tank and pumped through the cylinder block, cylinder head, and thermostat to the top radiator tank. The water is air cooled as it passes through the radiator core from the top tank to the bottom tank. A five bladed fan mounted on the pump spindle draws air through the radiator core thus cooling the water. The fan operates in a metal half-shroud to ensure more efficient cooling of the water in the radiator core.

161. The system is pressurized at 52kPa which raises the temperature at which the coolant will boil and thus enables the engine to operate at higher temperatures, before evaporation takes place.

162. Thermostat. The thermostat is located in the outlet from the engine water jacket. It opens between 65°C and 67°C, and is fully open at 78°C, to ensure a suitable engine operating temperature at all times.

163. Water Temperature Gauge Sender Unit. This unit is screwed into the cylinder head water jacket on the RH side of the engine, above the manifolds and to the rear of the carburettor. It operates the water temperature gauge on the instrument panel.

Water Temperature Gauge

164. This gauge is mounted on the instrument panel and is electrically operated from the gauge sender unit. It operates only when the ignition switch is in the ON position and it indicates the temperature of the coolant in the system, not the quantity.

165. The gauge fitted in the Mk 3 vehicle is the bottom RH segment in the instrument cluster (see Fig 30A) and its dial is marked C (cold) H (hot).

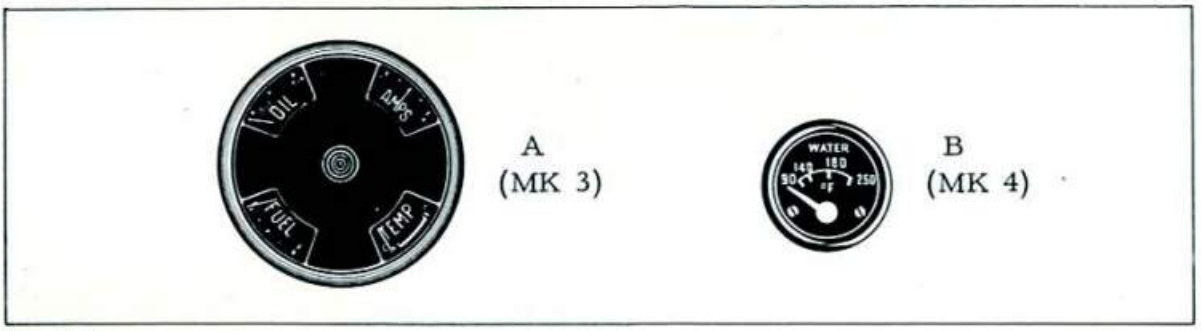
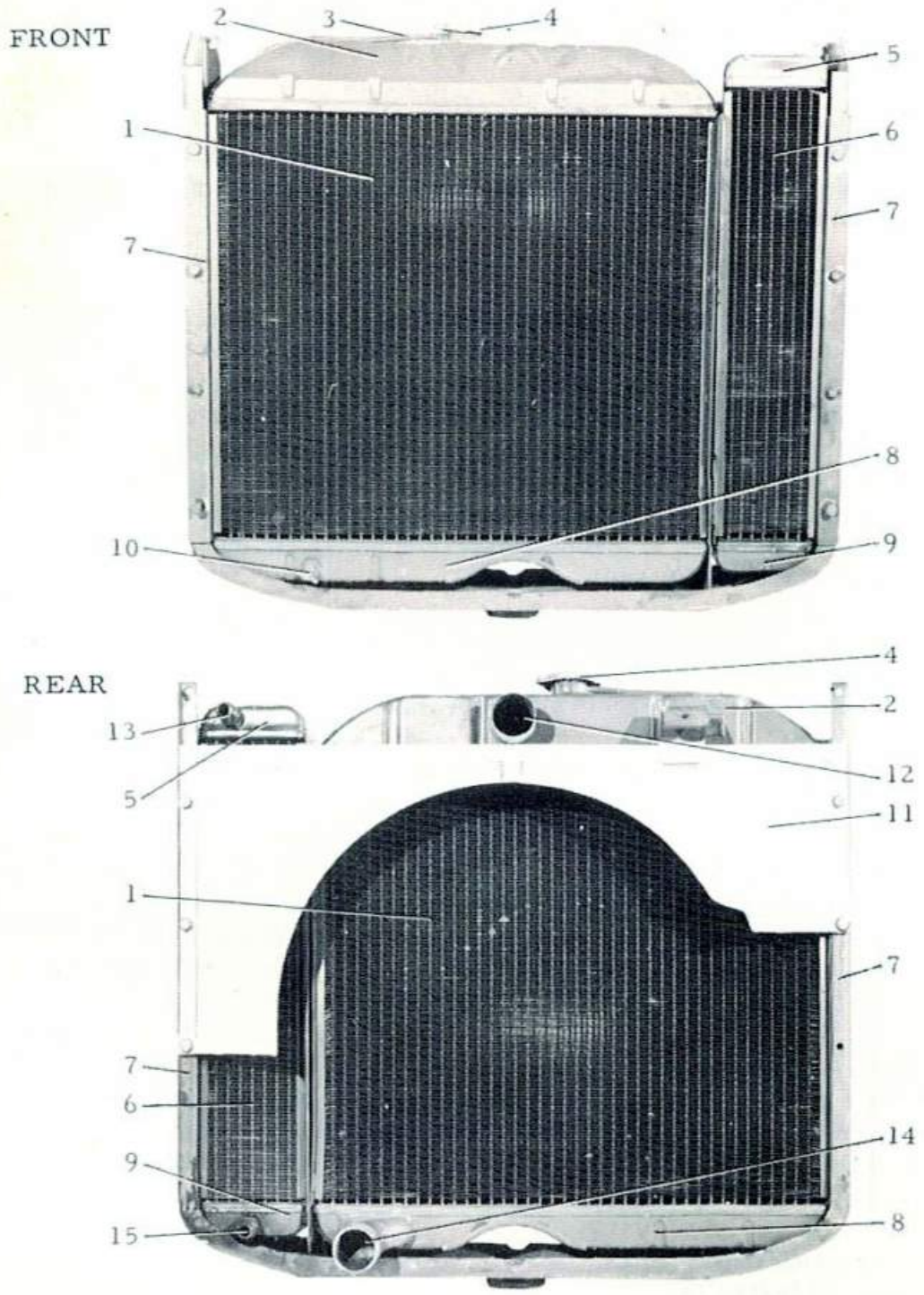


FIG 30
WATER TEMPERATURE GAUGES



1. Radiator Core
2. Top Tank - Radiator
3. Overflow Tube
4. Radiator Cap
5. Top Tank - Oil Cooler
6. Oil Cooler Core
7. Frame
8. Bottom Tank - Radiator
9. Bottom Tank - Oil Cooler
10. Drain Cock
11. Fan Shroud
12. Coolant Inlet
13. Oil Inlet
14. Coolant Outlet
15. Oil Outlet

FIG 31
RADIATOR AND OIL COOLER ASSEMBLY

166. The gauge fitted in the Mk 4 vehicle is a separate instrument (see Fig 30B) and its dial is calibrated from 90°F to 250°F (32°C to 120°C).

167. If the gauge reading should suddenly rise to the hot position the engine should be stopped and the cause of overheating determined.

168. Radiator Cap and Overflow Tube (Fig 31). The radiator cap provides a pressure tight seal and incorporates a relief valve which is designed to open at 43-52 kPa. The cap will allow the entry of air when the pressure in the system is below atmospheric pressure. Any coolant lost from the system will not cause a vacuum in the system when the coolant temperature drops. The overflow tube carries away any overflow caused by expansion or overfilling, but this must first pass the relief valve.

169. Coolant Draining Points (Fig 31). The two draining points provided are:

a. A drain cock located on the front of the lower RH corner of the bottom radiator tank, and

b. A drain plug located in the cylinder block on the RH side of the engine, forward of the starter motor.

CAUTION

This is a pressurized cooling system. Do NOT remove the radiator cap when the temperature gauge indicates a high temperature. Failure to observe this precaution will result in the sudden release of pressure from the system, and hot liquid being forced out of the radiator under pressure.

170. Topping up the System. Position the vehicle on level ground with the engine idling and:

a. Check the temperature of the coolant from the temperature gauge. If the gauge indicates a high temperature; switch off the engine and wait until it cools.

b. Check the temperature from the gauge by switching the ignition ON then OFF. When a safe temperature is indicated by the gauge remove the radiator cap carefully.

c. With the engine idling fill to within 25 mm of the top of the filler neck with coolant and replace the radiator cap tightly.

171. Draining, Flushing and Refilling System. Proceed as in para 170a and b and:

a. If coolant is to be re-used place a receptacle below the vehicle to catch the coolant.

b. Open the drain cock (see para 169a) and remove the drain plug (see para 169b).

c. Remove the receptacle, and with a hose (or quantities of clean water), flush the system through until the water flowing from the drain points appears clean.

d. Close the drain cock and replace and tighten the drain plug.

e. If anti-freeze mixture has been drained from the system, and if it is to be re-used, check that it is clean and free from sediment.

f. Refill the system, the capacity is 20 litres.

g. Replace the radiator cap tightly.

NOTE

Anti-freeze mixture should be used for the ambient temperatures laid down in the servicing schedule.

172. Servicing. Periodically service the system (5), (8) and (12)

Oil Cooling

Description

173. An oil cooler (Fig 31) is provided to maintain suitable oil temperatures under the very severe engine conditions that may be encountered in service. The cooler consists of an air cooled core mounted in the same frame and to the LH side of the radiator. To provide a large enough oil flow a large capacity oil pump is installed.

174. The oil that passes through the main pressure relief valve (see para 142) which is mounted on the outside of the oil cooler adapter (see Fig 24) on the LH side of the engine, is carried through a flexible (inlet) hose to the top tank of the oil cooler. The oil is air cooled as it flows through the core to the bottom tank.

175. The cooled oil is carried back to the adapter through a flexible (return) hose and returned to the sump.

176. To protect the cooler from high oil pressures should any obstruction occur in the cooler or return hose, or when the oil is cold, an oil cooler by-pass valve is incorporated in the adapter. This valve opens when pressure in the line between the main pressure relief valve and the oil cooler reaches 70 kPa, allowing a flow of oil to by-pass the cooler and return to the sump.

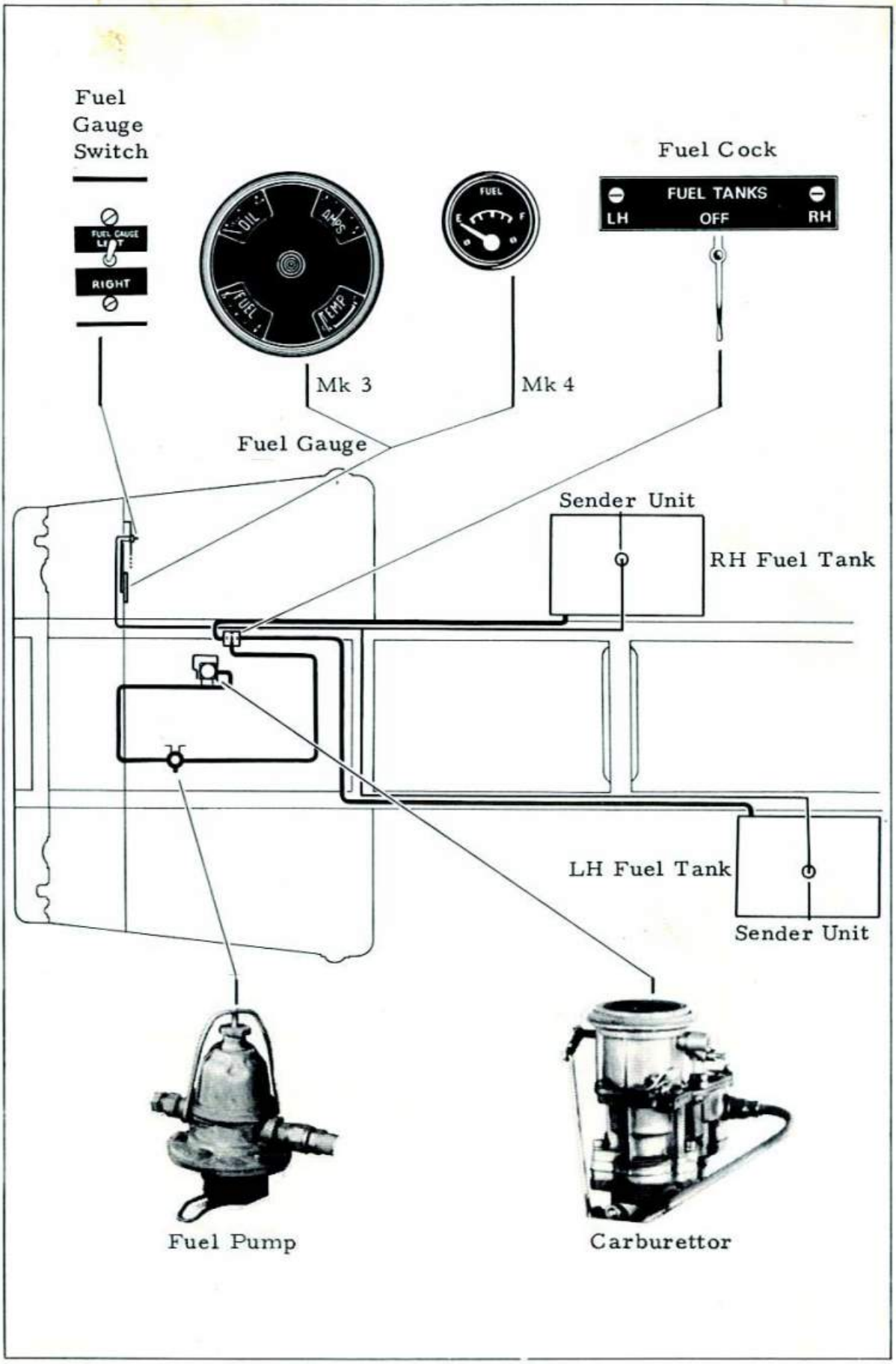


FIG 32
FUEL SYSTEM

SECTION 12
FUEL SYSTEM

Description

177. The fuel system (Fig 32) includes:

a. two fuel tanks;

b. a fuel gauge, two way switch and two fuel gauge sender units;

c. a fuel cock;

d. a fuel pump;

e. a carburettor;

f. an air cleaner; and

g. fuel pipes and fittings.

Fuel Tanks

178. The vehicle is fitted with two steel tanks each of 100 litres capacity. The usable amount of fuel is 95.5 litres in each tank.

179. The tanks are located below the body, one on either side of the vehicle. Each tank is mounted on two brackets on the chassis side member at about the centre of the vehicle, and is secured by two metal straps. Protection is afforded by a metal shield fitted to the underside of the brackets.

180. The tanks are fitted with fuel gauge sender units, extension filler necks containing removable filters, and captive filler caps. These caps are fitted with special vents which permit the attachment of wading equipment. The two fuel gauge sender units are connected through the two way fuel gauge switch to the fuel gauge. A drain plug is located on the bottom of each tank.

181. Refilling Fuel Tanks. The extension necks fitted to the fuel tanks facilitate refilling when using jerricans. Care should be taken not to damage the filters. Ensure that the air vents are free and replace the filler caps. The refill capacity of each tank is 95.5 litres.

182. Servicing. Periodically service the fuel tanks (17).

183. Fuel Gauge and Switch (Fig 32). The fuel gauge located on the instrument panel, indicates the amount of fuel in either the LH or RH fuel tank depending on the position of the fuel gauge switch ie, LEFT or RIGHT.

184. The accuracy of the fuel gauge should be checked periodically, using the dipstick, which is stowed in clips on the cab wall behind the co-driver's seat.

Fuel Cock (Fig 32)

185. The fuel cock is a three position tap located below the cab floor. The fuel cock control lever is in the form of a pointer, and is located on the cab floor to the LH rear of the driver's seat.

186. This control enables the driver to turn off the fuel supply, or to draw fuel from either the LH or RH fuel tank.

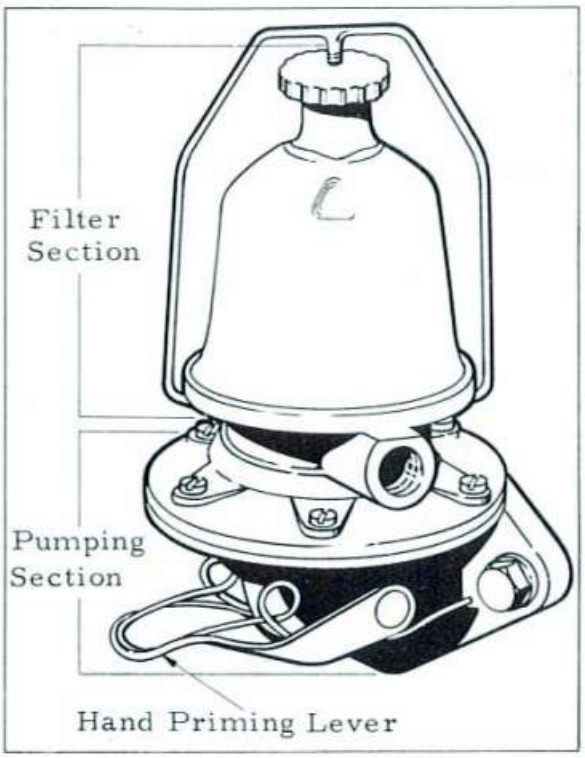


FIG 33
FUEL PUMP

Fuel Pump (Fig 33)

187. A mechanical, diaphragm type fuel pump is mounted on the LH side of the engine crankcase forward of the oil adapter. The actuator arm of the pump is driven by a cam on the engine camshaft. The pump inlet is connected by fuel lines via the fuel cock to the fuel tanks and the pump outlet by a fuel line to the carburettor.

188. The pump comprises a filter section and a pumping section. A hand priming lever is incorporated in the fuel pump of Mk 3 vehicles and early production Mk 4 vehicles. The filter section consists of a cap type gauze filter enclosed in an inverted metal fuel bowl. Fuel passes through the filter to the pumping section and on to the carburettor float chamber.

189. Operation. The hand priming lever is located at the base of the pump. It is used to pump fuel to the carburettor float chamber when the engine needs priming.

190. Servicing. Periodically service the fuel pump (18).

191. Fuel Lines and Fittings. Metal tubing and flexible hoses, with unions and fittings, connect the fuel tanks to the fuel cock, fuel pump and carburettor.

192. Servicing. Periodically service the fuel lines and fittings (8) (17).

193. Carburettor. The engine is fitted with a single downdraught type Bendix-Tecnico BX series carburettor incorporating six systems. These are:

a. Float system

b. Idle system

c. Main metering system

d. Power system

e. Accelerating system

f. Choke system

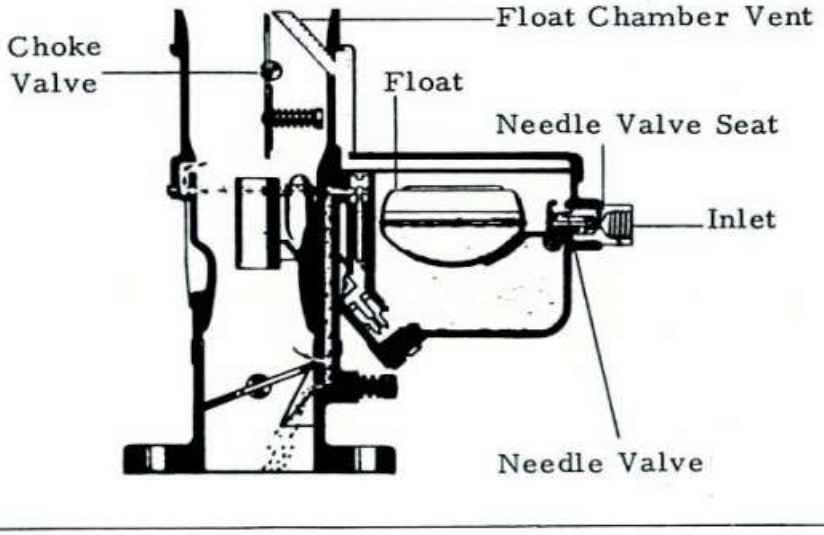


FIG 34
FLOAT SYSTEM

194. Float System (Fig 34). The function of the float system is to maintain, at all times and under all conditions of operation, the correct level of fuel in the float chamber. The system consists of a float chamber and a float pivoted at one side of the chamber which operates a needle valve.

195. The fuel pump delivers fuel under pressure to the chamber and if fuel is delivered faster than it is used the chamber begins to fill. This causes the float to rise and when the correct fuel level is reached the float moves the needle valve into its seat. This action shuts off the fuel supply to the chamber. When the fuel falls below the correct level the float falls and allows the needle valve to move out of its seat, thus permitting the entrance of more fuel.

Idle System (Fig 35)

196. With the throttle valve closed and the engine running at slow idle speed, fuel from the float chamber is metered into the idle tube through an orifice at the base of the idle tube. The air taken in through the idle air bleed hole mixes with the fuel at the top of the idle tube. This mixture of air and fuel then flows down the idle channel where it is mixed with additional air entering through the upper idle discharge hole. The mixture is then discharged at the lower idle discharge hole. The quantity of fuel discharged is controlled by an adjustable idle needle valve.

197. As the throttle valve is opened slightly the air-fuel mixture is also discharged from the upper discharge hole to supply the additional fuel required for increased engine speed.

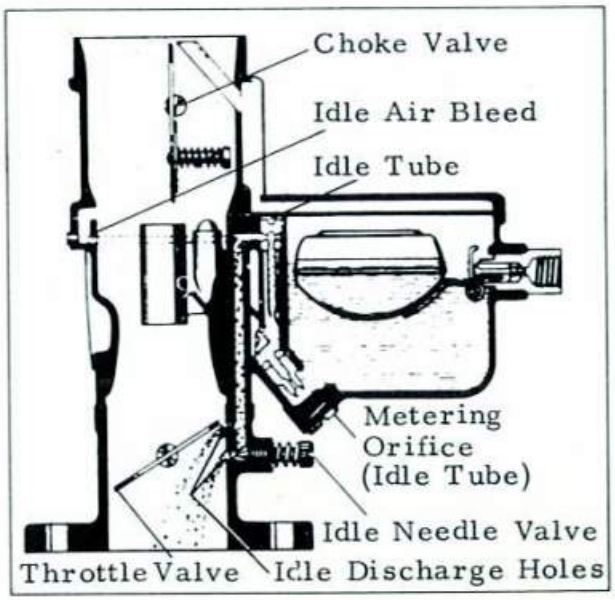


FIG 35
THE IDLE SYSTEM

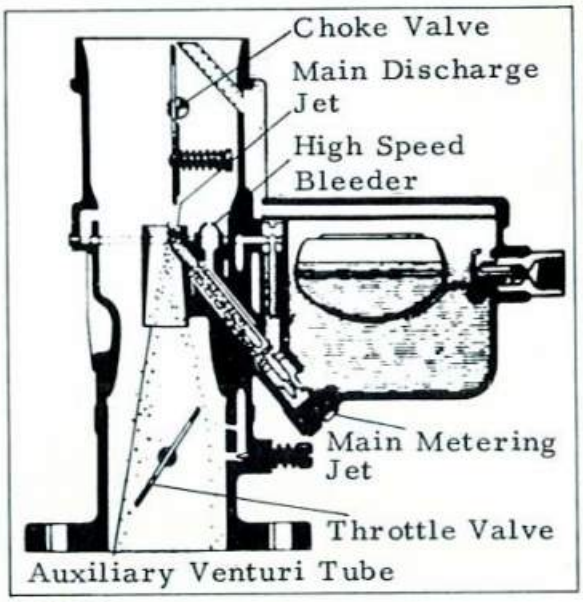


FIG 36
MAIN METERING SYSTEM

198. Main Metering System (Fig 36). The main metering system controls the flow of fuel during the intermediate or part throttle range of operation. With the throttle valve in a partially open position, fuel flows from the float chamber through the main metering jet and enters the main discharge jet where it is mixed with air taken in through the high speed air bleeder. This mixture of air and fuel is then discharged into the air stream through the auxiliary venturi tube. The main body and main discharge jet are so designed that should vapor bubbles form in the fuel in the main discharge system, due to high temperatures, the vapor bubbles will collect in the outside channel surrounding the main discharge jet, rise and vaporize in the dome of the high speed air bleeder, thus preventing percolation.

Power System (Fig 37)

199. The power system is incorporated into the carburettor to provide a richer mixture of fuel for maximum power and high speed operation. The extra fuel for power is supplied by a vacuum controlled power piston which automatically operates the power by-pass jet in accordance with throttle opening. Intake manifold vacuum is maintained above the vacuum piston through a vacuum channel which leads to the manifold flange of the carburettor.

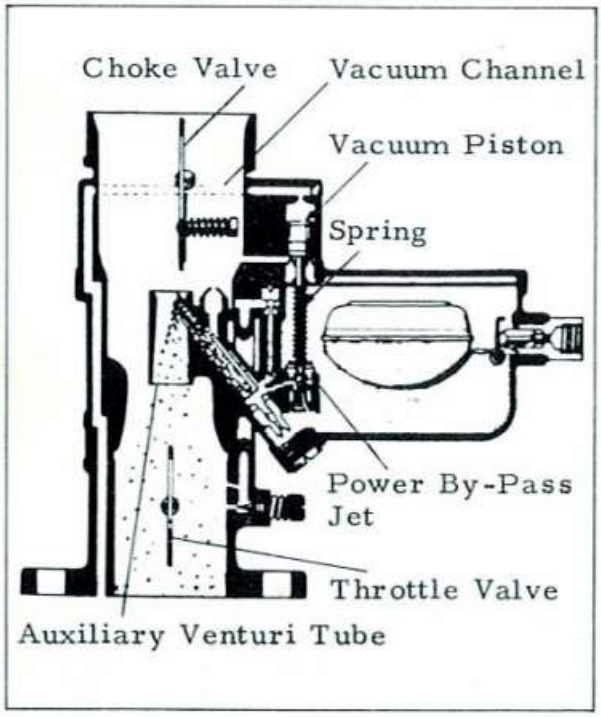


FIG 37
POWER SYSTEM

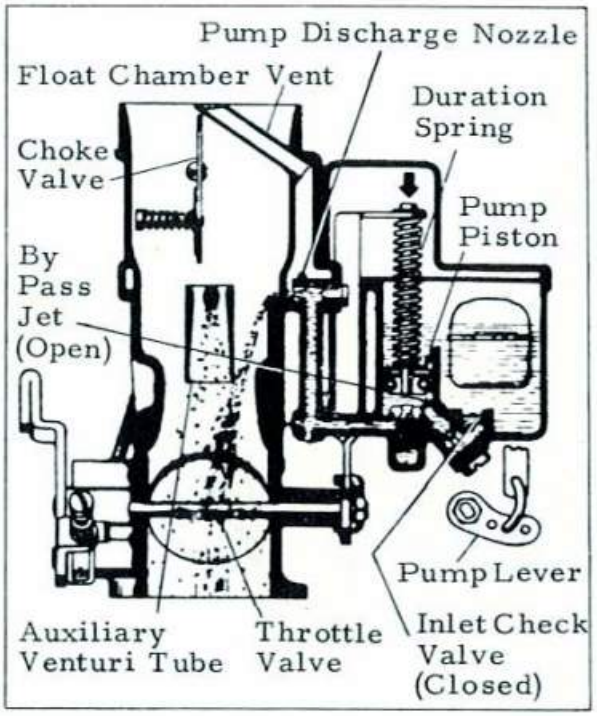


FIG 38
ACCELERATING SYSTEM

200. During partial throttle operation, the vacuum above the vacuum piston is sufficient to overrule the compression spring and hold the piston in the up position.

201. When the throttle valve is opened to the point where the manifold vacuum drops to approximately 102-127 mm Hg, the compression spring then moves the piston down to open the power by-pass jet and meter additional fuel into the main metering system.

Accelerating System (Fig 38)

202. To ensure a smooth uninterrupted flow of power for acceleration, additional fuel must be metered into the engine. This is accomplished through the use of an accelerating pump which is operated from the throttle linkage. As the throttle valve is opened, the accelerating pump moves the pump piston down to close the inlet ball check valve and force a metered quantity of extra fuel through the pump by-pass jet and pump discharge nozzle into the air stream.

203. As the pump lever moves down, the pump duration spring compresses to distribute the supply of extra fuel over a metered period

of time. A spring loaded relief valve is incorporated in the accelerating pump piston. This opens at a given pressure to prevent excessive pressure build up in the system when the throttle is snapped fully open.

204. With the release of the accelerator pedal and the return of the accelerating pump to the release position, the pump by-pass jet closes while the inlet ball check valve reopens, thus permitting fuel from the float chamber to enter and refill the accelerating pump cylinder.

Choke

205. This hand control is used to provide a richer fuel air mixture to the engine and to increase the idling speed of the engine. It operates the choke valve which chokes off, or reduces the flow of air through the carburettor barrel resulting in a richer fuel air mixture. It is also interconnected to the throttle valve and when used slightly increases the idling speed of the engine.

206. Care should be taken to push in the choke control as soon as the engine is running smoothly. See Section 29 - Vehicle Operating Instructions.

207. Accelerator. This pedal controls the engine speed. It operates the throttle valve to vary the amount of fuel air mixture entering the engine.

208. Throttle. This is a hand control which operates the throttle valve to vary the idling speed of the engine. See Section 29.

209. Idle Needle Valve. This valve is used to adjust the idling mixture by permitting more or less fuel to pass through the idle discharge holes.

210. Idle Adjusting Screw. This screw controls the idling speed of the engine by adjusting the closed position of the throttle valve.

211. Servicing. Periodically service:

a. Carburettor (14).

b. Accelerator pedal, throttle, choke and carburettor linkage (21).

c. Accelerator cross shaft (22).

Air Cleaner

212. The air cleaner is of the cylindrical oil bath type. It is mounted on the LH side front of the engine and can be reached from inside the cab after removal of the engine access cover.

213. Uncleaned air is drawn through the perforations around the middle of the air cleaner case and directed downwards at high speed. Just above the oil bath bowl the direction of the air flow is reversed, causing larger particles of dirt in the air to fall into the oil bath. Smaller particles of dirt are carried upward with the air flow where they adhere to the oily face of the air cleaner element allowing clean air to pass to the carburettor and air compressor.

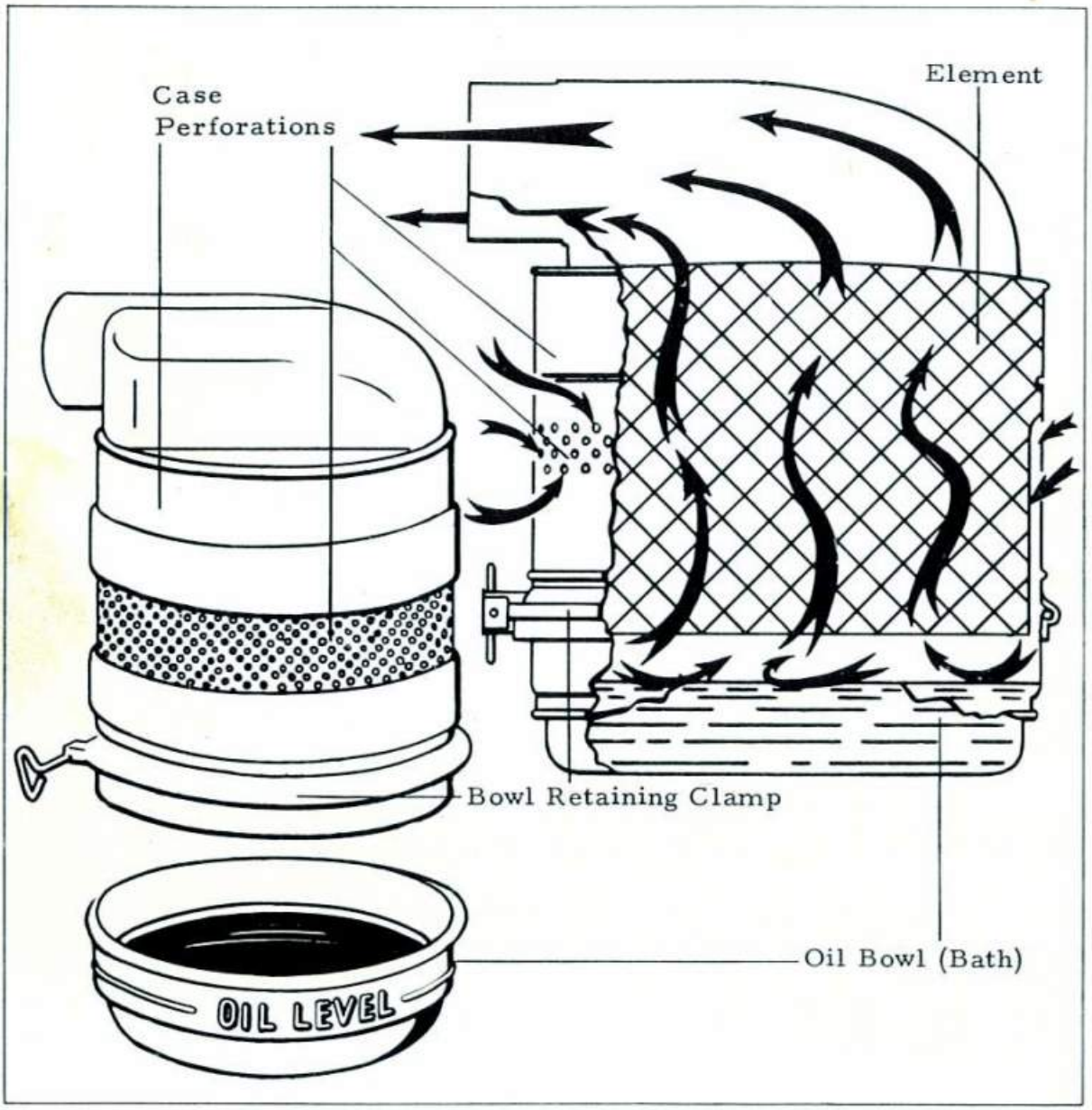


FIG 39
AIR CLEANER

214. Servicing. Periodically service:

a. Air cleaner (7).

b. Air cleaner connections (8).

NOTE

The servicing period specified (in Serial 7) for the air cleaner is for normal conditions. If the vehicle is operating in severe dust conditions much more frequent servicing will be necessary.

SECTION 13
IGNITION SYSTEM

Description

215. The function of the ignition system is fundamentally to step up low voltage to a much higher value and to deliver the high voltage to the spark plugs in the cylinder combustion chambers with exact timing. The high voltage is capable of forcing current to jump (spark) across the gap from one spark plug electrode to the other. The spark created ignites the fuel air mixture compressed in the combustion chamber.

216. This system is a 12 volt negative to earth type and consists of the following components:

a. Battery,

b. Ammeter,

c. Ignition switch,

d. Ignition coil,

e. Distributor, and

f. Six spark plugs.

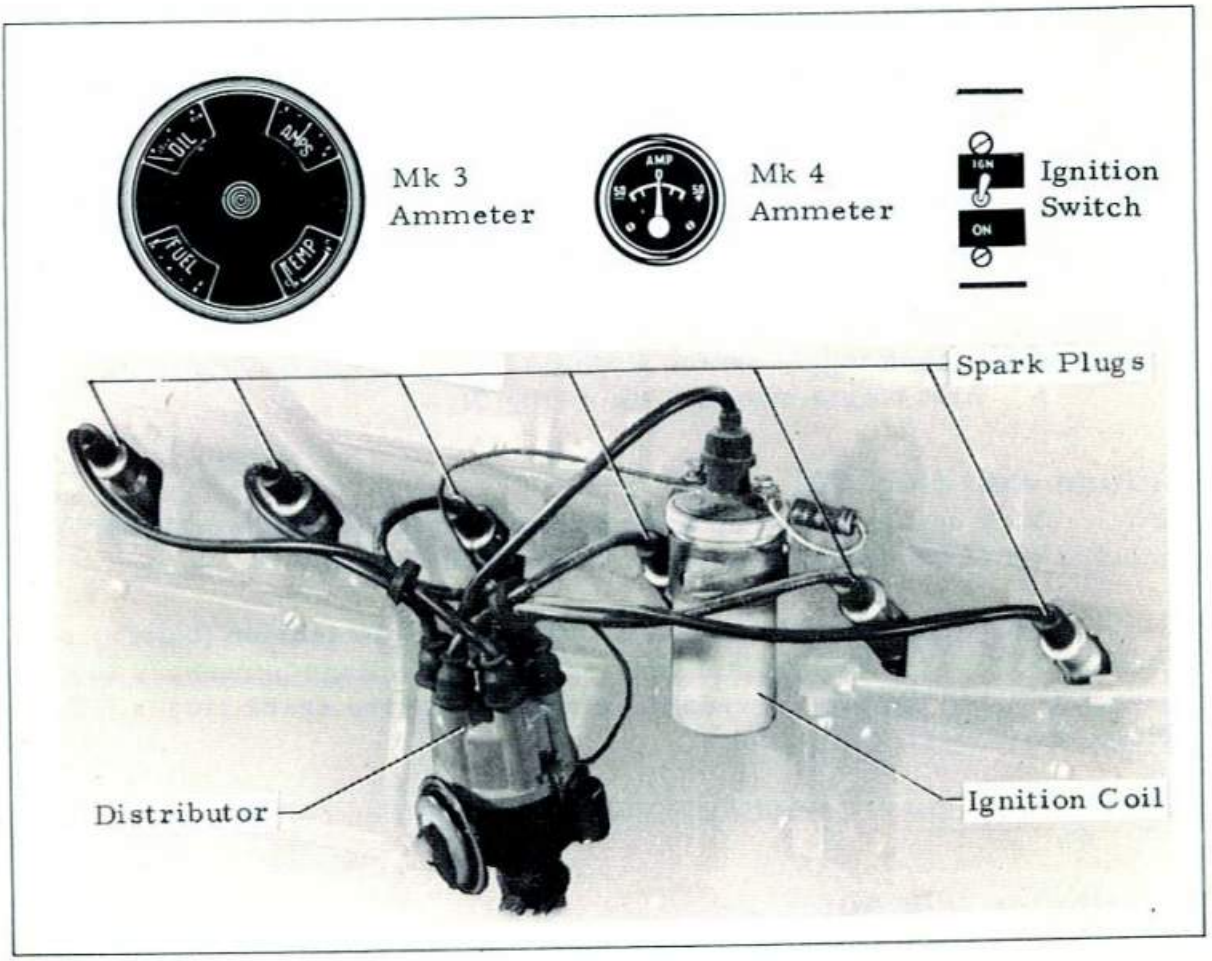


FIG 40
COMPONENTS OF IGNITION SYSTEM

Battery

217. The battery (Fig 11 and 12) is carried in a special compartment provided at the front of the vehicle near the LH side; access to the battery can be gained by raising the hinged bonnet. The battery should be placed in the compartment with its positive terminal nearest to the engine.

218. The battery is a 12 volt, 9 plate lead acid type with a capacity of 61 ampere hours at the 20 hour rate. Specific gravity when fully charged is 1.240 to 1.250 at 27°C. The negative terminal of the battery is connected (earthed) to the engine thermostat housing.

219. The electrolyte in each cell should be approximately 9 mm above the plates. If the electrolyte is below this level add distilled water using a clean vessel. Do not overfill, or add acid or electrolyte.

220. If the battery is discharged the vehicle can be started by the method described in para 300.

221. Servicing. Periodically service the battery (20).

Ammeter (Fig 40)

222. This instrument is located on the instrument panel and indicates the battery charging or discharging rate. All electrical circuits with the exception of the starter motor circuit are connected through the ammeter.

223. The ammeter fitted to the Mk 3 vehicle is the top RH segment of the instrument cluster, that fitted to the Mk 4 vehicle is a separate instrument.

224. Ignition Switch. This switch is a two position toggle switch which when moved to the ON or OFF position opens or closes the ignition primary (low tension) circuit. The switch is located on the switch panel. From the RH end of the panel the switch is the:

a. second toggle switch - Mk 3 (Fig 7).
b. first toggle switch - Mk 4 (Fig 9).

Ignition Coil (Fig 40)

225. This coil is a step up transformer and is mounted vertically on the LH side of the engine to the rear of the distributor.

226. The function of the coil is to step up the low tension (battery or primary voltage) to the high tension (secondary) voltage necessary to cause a spark to jump the gap between the electrodes of the spark plug/s. This voltage may reach 20 000 volts.

227. Servicing. Periodically service the ignition coil (13).

Distributor (Fig 40)

228. The distributor is a six-cylinder, single breaker arm type and is located on the LH side of the engine. The rotor is radio suppressed and it rotates in an anti-clockwise direction as viewed from above.

229. The functions of the distributor are to:

a. close and open the primary circuit of the ignition coil to produce the high tension voltage in the secondary circuit of the coil,

b. time these actions so that the resultant high tension voltage is produced at the exact time, and

c. distribute the high tension voltage to the spark plugs in the combustion chamber of the cylinder under compression thus igniting the fuel air mixture.

230. The distributor incorporates centrifugal and vacuum operated timing control mechanisms. The centrifugally operated control is incorporated in the distributor housing and it advances the spark to suit engine conditions at higher engine revolutions. The vacuum control is operated from the inlet manifold and provides a more advanced spark when engine revolutions are increased.

231. Servicing. Periodically service the distributor (13).

232. Spark Plugs (Fig 40). The six spark plugs fitted to the vehicle are 14 mm, Hot, 3/8 in reach type.

233. Each plug is screwed into a combustion chamber of the engine and forms a gas tight seal. The function of the plug is to provide in the combustion chamber a fixed gap across which the high tension voltage will jump (spark) to ignite the compressed fuel air mixture. Each plug is fitted with a radio suppressor.

234. Servicing. Periodically service the spark plugs (10).

SECTION 14
CHARGING SYSTEM

Description

235. The main components of the system are:

a. a machine (generator or alternator) which converts mechanical energy to electrical energy;

b. a controlling device (regulator) which controls the electrical output according to the state of charge of the battery, the loading of the electrical equipment in use, and, in addition, keeps the output within rated limits;

c. a battery; and

d. an ammeter.

236. The function of the system is to supply the electrical energy required to:

a. charge the battery, and

b. operate other electrical equipment fitted to the vehicle (horn, lights etc).

237. The system fitted to the:

a. Mk 3 vehicle consists of:

(1) a generator,

(2) a control box,

(3) a battery, and

(4) an ammeter.

b. Mk 4 vehicle consists of:

(1) an alternator,

(2) a voltage regulator,

(3) a battery, and

(4) an ammeter.

238. The battery and ammeter are common to many of the vehicle electrical circuits and are described in para 217 to 220, and para 222 and 223 respectively. A summary of the Mk 3 and Mk 4 systems is given in Table 10.

239. Servicing. Periodically service:

a. Generator/Alternator Drive Belt (12);

b. Cenerator (15), and/or

c. Alternator (16).

TABLE 10 - SUMMARY OF MK3 AND MK4 CHARGING SYSTEMS

Serial (a)	Item (b)	Mk 3 System GENERATOR (c)	Mk 4 System ALTERNATOR (d)
1	Location	Near front of engine on RH side.	
2	Type	12 Volt, shunt wound, two pole, two brush.	12 Volt, 3 phase, 12 pole, diode rectified.
3	Maximum Output	30 amperes	35 amperes

TABLE 10 (contd)

Serial (a)	Item (b)	Mk 3 System GENERATOR (c)	Mk 4 System ALTERNATOR (d)
4	Drive Type	Pulley driven by V-belt from crankshaft pulley. This belt also drives the engine fan/ water pump.	
5	Drive Direction	Clockwise	
6	Belt Tension	Tension is correct when it is possible, with the fingers, at a point midway between the driven pulley and the fan/water pump pulley to depress the belt: 25 mm	12 mm
7	Cooling	Air cooling is provided for by a fan located behind the pulley and air holes in the end brackets.	
8	Controlling Device	Control Box	Voltage Regulator
9	Location	On interior wall of cab at RH rear, top corner.	

Control Box Description

240. This box is in the charging system between the generator and the battery. It incorporates a:

a. cut-out relay,

b. voltage regulator, and

c. current regulator.

241. The cut-out relay is an automatic switch. Its function is to connect the generator to the battery when the generator voltage is sufficient to charge the battery, and to disconnect them when the generator is not operating or when its voltage falls below that of the battery, to prevent the battery from discharging through the generator windings (reverse current flow).

242. The voltage and current regulators automatically keep the voltage and current delivered by the generator within rated limits.

Voltage Regulator

243. The voltage regulator is in the charging system between the alternator and the battery. Its function is to keep the output of the alternator within rated limits.

244. The electrical characteristics of the alternator are such that reverse current cannot flow, and an increase in maximum current even at high rev/min is not permitted, consequently a separate cut-out relay and current regulator are not required.

SECTION 15
STARTER MOTOR

Description

245. The function of the starter motor is to crank the vehicle engine to start it running.

246. The motor is a four pole, four brush, earth return type with series - parallel connected field coils.

247. A solenoid operated, pre-engaged drive assembly is carried on the armature shaft extension. This assembly includes a pre-engaging pinion which ensures smooth engagement of the pinion and the ring gear on the engine flywheel.

248. The solenoid is integral with the starter motor which is located on the RH side of the engine at the rear.

Operation

249. When the starter switch (Mk 3) or button (Mk 4) is depressed the solenoid is energized. It engages the pinion with the ring gear on the engine flywheel, then closes a pair of contacts in the solenoid which connects the battery to the starter motor. The armature (and pinion) rotates commencing to crank the engine.

250. When the engine starts and the starter switch/button released, the solenoid is de-energized. The contacts are opened disconnecting the battery from the starter motor, and the pinion is disengaged from the ring gear.

251. The operation of the starter by the driver is detailed in para 466.

252. Servicing. Periodically service the starter motor (19).

SECTION 16
LIGHTING SYSTEM

Description

253. All lights and/or lamps used in the lighting system are 12 volt. The system includes:

a. Headlights,

b. Reduced light headlights,

c. Front parking and flashing turn indicator lights,

d. Width lights,

e. Map reading light,

f. Switch panel light,

g. Extension light assembly,

h. Instrument lights,

i. Stop, tail, and rear flashing turn indicator lights, and

j. Convoy light.

254. The headlights, reduced light headlights and front parking and flashing turn indicator lights fitted to the Mk 3 and Mk 4 vehicles are identical, but differ slightly in their grouping. The lights fitted to the Mk 4 vehicle are illustrated in Fig 41.

Headlights

255. The two headlights are of the semi-sealed beam type. The lights are fitted with double filament lamps which provide either a high beam or a dipped beam from the headlight. The driver can select either beam by using the foot operated switch located on the cab floor forward of his seat.

256. The headlights are protected by a brushguard fitted across the front of the vehicle.

Reduced Light Headlights

257. These two lights are each fitted with a visor. Their function is to provide ground illumination in front of the vehicle when it is being driven under reduced light (black out) conditions.

258. The visor has a slit across its face; above the slit is a small fixed shutter or hood. The slit allows the emission of a reduced amount of light, and the shutter prevents any light from being projected upward.

Front Parking and Flashing Turn Indicator Lights

259. These two lights are of moulded rubber construction with a metal locking ring which holds the rubber light rim around the lens. Each light is fitted with a double filament lamp; one filament being the flashing light filament, and the other the parking light filament.

260. The flashing lights are warning signals and are used to indicate that the vehicle is about to turn to the left or to the right. The lights continue to flash throughout the turn and automatically cancel when the turn is completed. Visual indication that the turn indicator lights are operating is given by two indicator lights which flash in conjunction with them, through green arrow shaped slots in the speedometer dial. The parking lights are used at night, when the vehicle is stationary to indicate its presence to other traffic.

261. Width Lights (Fig 41). These two lights are mounted one on each side of the cab roof. The red coloured half of the lens should face to the rear, and the amber half should face forward.

1 Width Lights (One each side)
2 Front Parking and Flashing Turn Indicator Lights
3 Headlights
4 Reduced Light Headlights
5 Rear Flashing Turn Indicator Lights (Amber Lens)
6 Stop/Tail Lights (Red Lens)
7 Convoy Light (Forward of Crossmember)

FIG 41
LOCATION OF LIGHTS FITTED TO MK 4 VEHICLE

262. Map Reading Light (Fig 10). This light is mounted on the fascia panel immediately in front of the co-driver's seat. The light is fitted with a revolving captive hood which can be adjusted to vary the amount of light emitted.

263. Switch Panel Light (Fig 7 and 9). This light is mounted on the LH end of the switch panel and is identical to the map reading light.

Extension Light Assembly

264. This assembly consists of a light unit fitted with a single filament lamp, an interconnecting cable, and a plug.

265. The unit is of metal construction. A hinged protective grille covers the lamp, and a hook to suspend the unit is fitted in the base.

266. Four metres of insulated cable are provided; one end of the cable is wired into the light unit, the other end is fitted with a two pin plug. The light assembly is stowed in the bin located forward of the co-driver's seat.

267. Instrument Lights (Fig 42). The instrument panel is fitted with panel lights to illuminate the instruments, and indicator lights which give visual indication to the driver of certain functions or conditions. The lamps are fitted in pull-out sockets in the rear of the instruments mounted in the panel. A summary of the lights fitted to the instrument panels of the Mk 3 and the Mk 4 vehicles is given in Table 11.

268. Stop, Tail and Rear Flashing Turn Indicator Lights (Fig 41). These light assemblies combine the function of stop, tail and rear flashing turn indicator lights. The two assemblies are mounted, one on each side of the rear of the vehicle. Each assembly is partitioned vertically down the centre; the lens of the outside half (flashing light) is amber, and that of the inner half (stop and tail light) is red. This half also has a clear lens at the side for illumination of the number plate.

269. The light assembly is fitted with two lamps; one double filament lamp provides the filaments for the stop and tail light, and a single filament lamp provides the filament for the flashing indicator light.

Convoy Light (Fig 41)

270. The convoy light is mounted beneath the vehicle on the front cross member of the towing frame. It consists of a light body fitted with a single filament lamp, and a tubular steel cover which is secured to the body by three bayonet pins.

271. A thin beam of light is emitted through a small hole in the tubular cover to illuminate the white painted round portion of the rear differential.

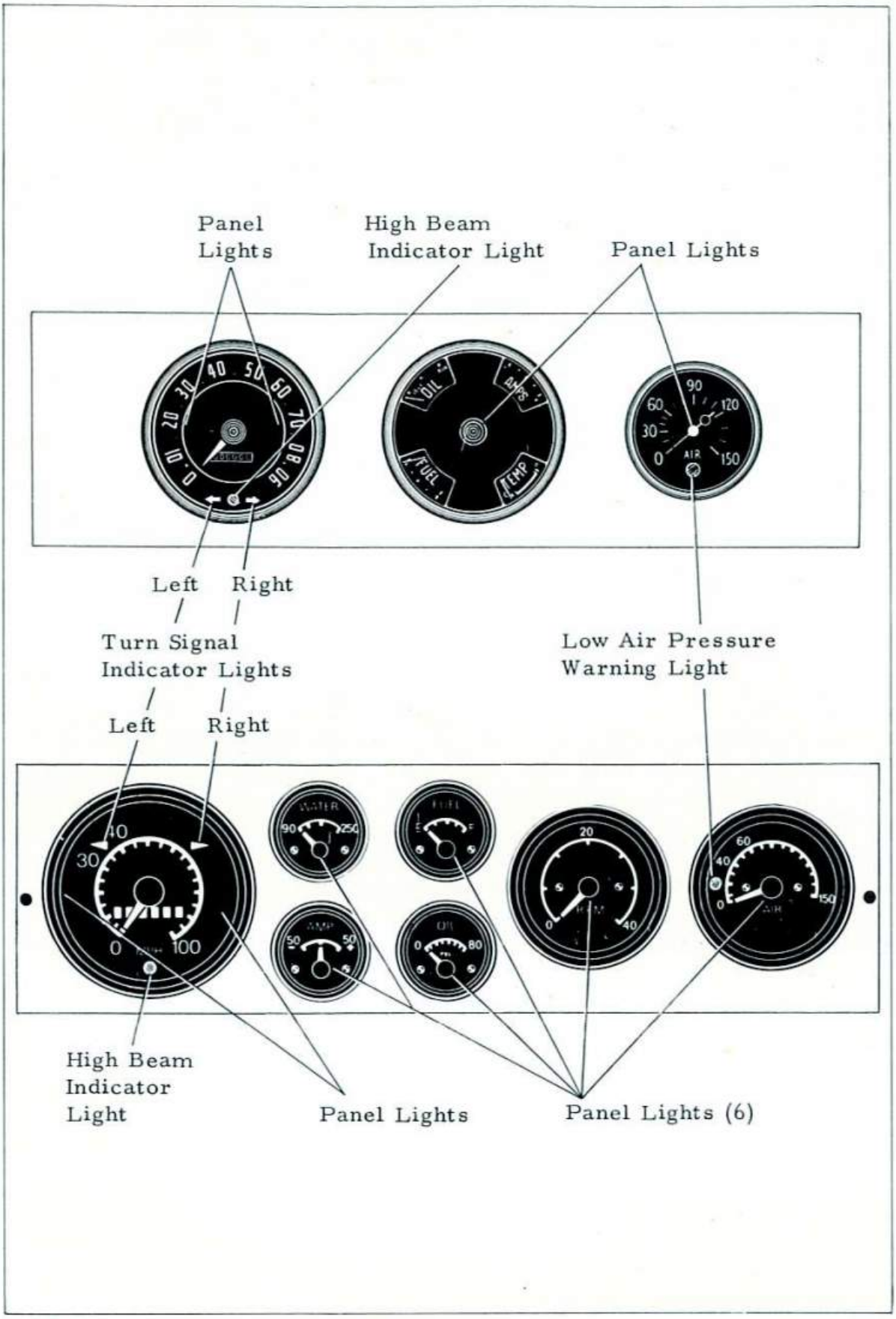


FIG 42
INSTRUMENT LIGHTS:
TOP - MK 3 PANEL
BOTTOM - MK 4 PANEL

TABLE 11 - SUMMARY OF INSTRUMENT PANEL LIGHTS

Location	Mk 3		Mk 4	
	Type	No	Type	No
Speedometer	Panel light Indicator Lights: High beam Left turn Right turn	2 1 1 1	Panel light Indicator Lights: High beam Left turn Right turn	2 1 1 1
Instrument Cluster (Includes: Ammeter, Fuel, Oil Pressure, and Water Temperature Gauges	Panel light	1	Separate instruments are fitted in lieu of Instrument Cluster.	
Water Temperature Gauge	These instruments are mounted in Instrument Cluster of Mk 3 vehicle.		Panel light	1
Fuel Gauge			Panel light	1
Oil Pressure Gauge			Panel light	1
Ammeter			Panel light	1
Air Pressure Gauge	Panel light Indicator light: Low air pressure	1 1	Panel light Indicator light: Low air pressure	1 1
Tachometer	Not fitted		Panel light	1
	Total Mk 3	8	Total Mk 4	12

Operation

272. The controls used in the lighting system are:

a. five two position toggle switches, and a two position change over switch located on the switch panel,

b. a two position toggle switch located adjacent to the map light,

c. a three position turn signal control lever on the left of the steering column below the wheel, and

d. foot brake.

273. Each toggle switch is clearly marked with the name of the light/s it controls. The switches are OFF in the upper position, and ON in the lower position. The change over switch incorporates a pointer and the positions are marked Blackout-Normal.

274. The turn signal control lever controls the front and rear flashing turn indicator lights. It operates those on the left side when moved towards the driver, those on the right when moved away from the driver, and is inactive in the centre position. Application of the footbrake operates the stop light.

275. To operate most of the lights in the system it is necessary to use a combination of switches (controls). A summary of these is given in Table 12.

TABLE 12 - LIGHTING-SWITCH/CONTROL COMBINATIONS

To Operate	Blackout-Normal Switch Position	Other Switch/Control	Position
Headlights	NORMAL	Headlights Switch	ON
Tail Park Width	NORMAL	Tail Park Lights Switch	ON
Front and Rear Turn Indicators: Left	NORMAL	Ignition Switch	ON
		Turn signal control lever	Towards driver
Right	NORMAL	Ignition Switch	ON
		Turn signal control lever	Away from driver
Extension light	NORMAL	Wand Lead Switch	ON
Stop light	NORMAL	Foot brake	Applied
Instruments lights	BLACKOUT OR NORMAL	Instrument Lights Switch	ON
Switch Panel lights	BLACKOUT OR NORMAL	Panel Lights Switch	ON
Map Reading light	BLACKOUT OR NORMAL	Map Light Switch	ON
Reduced Light Headlights	BLACKOUT	NIL	NIL
Convoy light	BLACKOUT	NIL	NIL

Lamp Replacement

276. If it is necessary to replace a lamp ensure that the new lamp has the right base (number of contacts etc), and that it is of the correct voltage and wattage. The procedures to be followed for replacing faulty lamps are described hereunder.

277. Headlight (Fig 43). The headlight is fitted with a 12 V, 50/40 W, double contact, pre-focus base, T-shape, clear lamp. To replace it:

a. Lower the brushguard; remove the securing screw in the bottom of the bezel and lift off the bezel.

b. Press in firmly on the glass of the light unit, against the tension of the three spring loaded adjusting screws, and rotate anti-clockwise until the heads of the three screws can be

disengaged through the slotted holes in the light unit rim. Do not disturb the adjusting screws as this will alter the light setting.

c. Move the light unit away from the headlight body to allow removal of the adapter assembly.

d. Twist the adapter assembly in an anti-clockwise direction and withdraw it from the light unit.

e. Hold the adapter assembly in one hand, remove the faulty lamp and fit a new one.

f. Replace the adapter assembly on the light unit.

g. Working in the reverse order to that used for their removal, replace the light unit, bezel, and securing screw. Ensure that the guide pin on the top of the bezel is engaged in the slot provided in the top of the headlight body.

h. Raise and secure the brushguard.

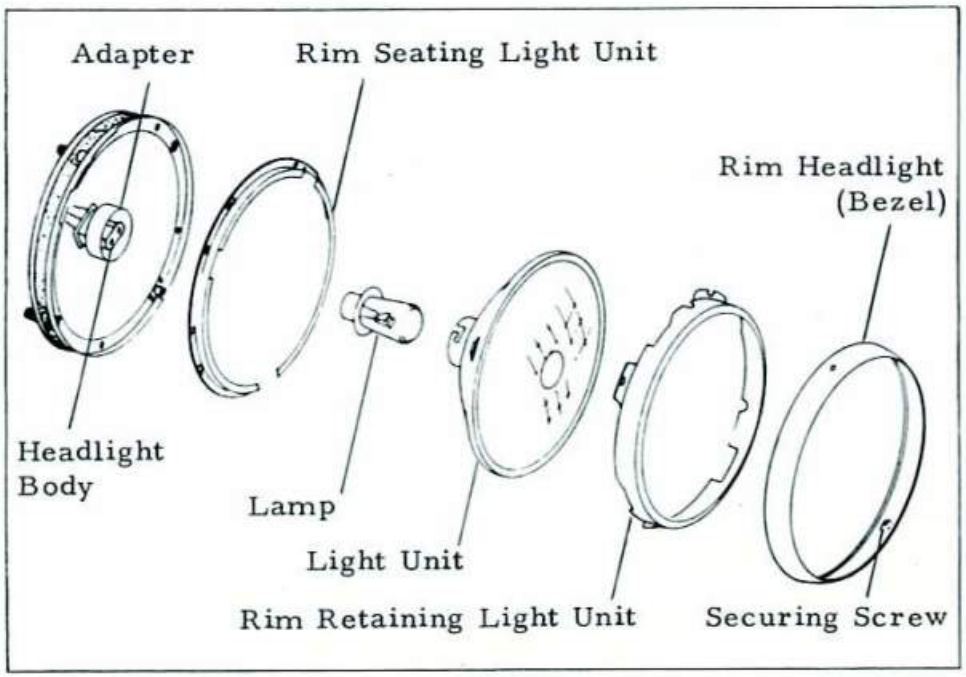


FIG 43
HEADLIGHT

278. Reduced Light Headlight (Fig 44). This light is fitted with a 12 V, 21 W, single centre contact, S-shape, clear lamp. To replace it:

a. Remove the two screws from the LH and RH front of the headlight rim and lift away the rim.

b. Remove the faulty lamp and fit a new one.

c. Replace the rim and screws.

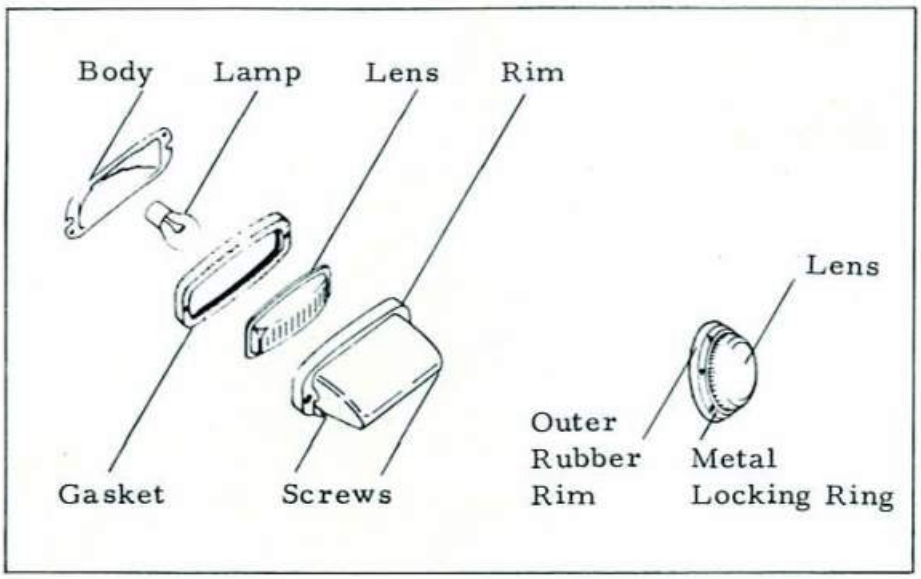


FIG 44
REDUCED LIGHT HEADLIGHT AND FRONT PARKING AND FLASHING TURN INDICATOR LIGHT

279. Front Parking and Flashing Turn Indicator Light (Fig 44). This light is fitted with a 12 V, 18/5 W, double contact bayonet candelabra indexing (BAY 15d) S-shape, clear lamp. To replace it:

a. Insert a small screw driver blade between the outer rubber rim and the metal locking ring and prise out the ring.

b. Spread the rubber rim and remove the lens.

c. Remove the faulty lamp and fit a new one.

d. Replace the lens and the locking ring.

280. Width Lights (Fig 41). These lights are fitted with 12 V, 3 W, single contact bayonet candelabra (BA 15S) base, G-6 shape, clear lamps. To replace the lamp:

a. Remove the two screws which secure the lens to the lamp base plate and lift away the lens.

b. Remove the faulty lamp and fit a new one.

c. Check that the cork seal is in good condition and correctly located between lens and base plate to exclude dust and water.

d. Fit the lens (amber towards the front) and secure with the two screws.

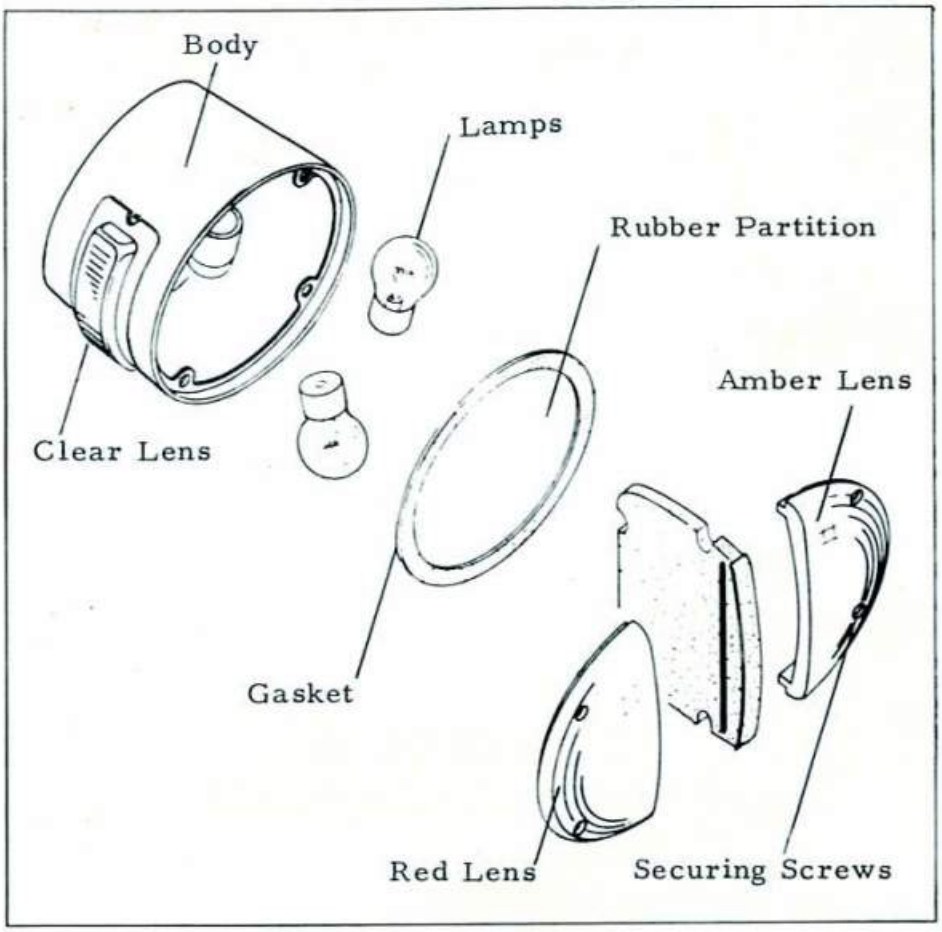


FIG 45
STOP, TAIL AND REAR FLASHING TURN INDICATOR LIGHTS

281. Stop, Tail and Rear Flashing Turn Indicator Lights (Fig 45). These lights are fitted with two lamps. The stop tail light section is fitted with a 12 V, 18/5 W, double contact, S-shape, clear double bayonet candelabra indexing (BAY 15d) lamp. The turn indicator light section is fitted with a 12 V, 18 W, single centre contact, S-shape clear lamp. To replace the lamps:

a. Remove the four screws which retain the lenses and remove the lenses.

b. Remove the faulty lamp/s and fit a new lamp/s.

c. Replace lenses and screws.

282. Convoy Light (Fig 41). This light is fitted with a 12 V, 4 W, single contact lamp. To replace it:

a. Grasp the tubular cover, press towards the rear, rotate anti-clockwise and remove it.

b. Remove the faulty lamp and fit a new one.

c. Replace the tubular cover.

283. Switch Panel Light (Fig 47). This light is fitted with a 12 V, 6 W, single centre contact, G-shape, clear lamp. To replace it:

a. Remove the three screws in the base of the light assembly.

b. Lift the cover away from the switch panel.

c. Remove the faulty lamp and fit a new one.

d. Replace the cover and screws.

284. Map Light (Fig 10). Employ the same method as used for the switch panel light. The two lights are identical in construction.

285. Instrument Panel Lights. In the event of failure of instrument panel lights; report for repair.

286. Servicing. Periodically service the lighting system (42).

SECTION 17
ELECTRICAL ACCESSORIES

287. Description. The electrical accessories provided on the vehicle are:

a. Windscreen wiper assembly;

b. Circuit breaker assembly;

c. Switch panel assembly;

d. Horn;

e. Control box (Mk 3), Voltage regulator (Mk 4);

f. Dipper switch;

g. Box, interconnecting assembly, vehicle starting;

h. Jumper socket;

i. Low air pressure warning buzzer;

j. Fuel gauge sender units;

k. Water temperature sender unit;

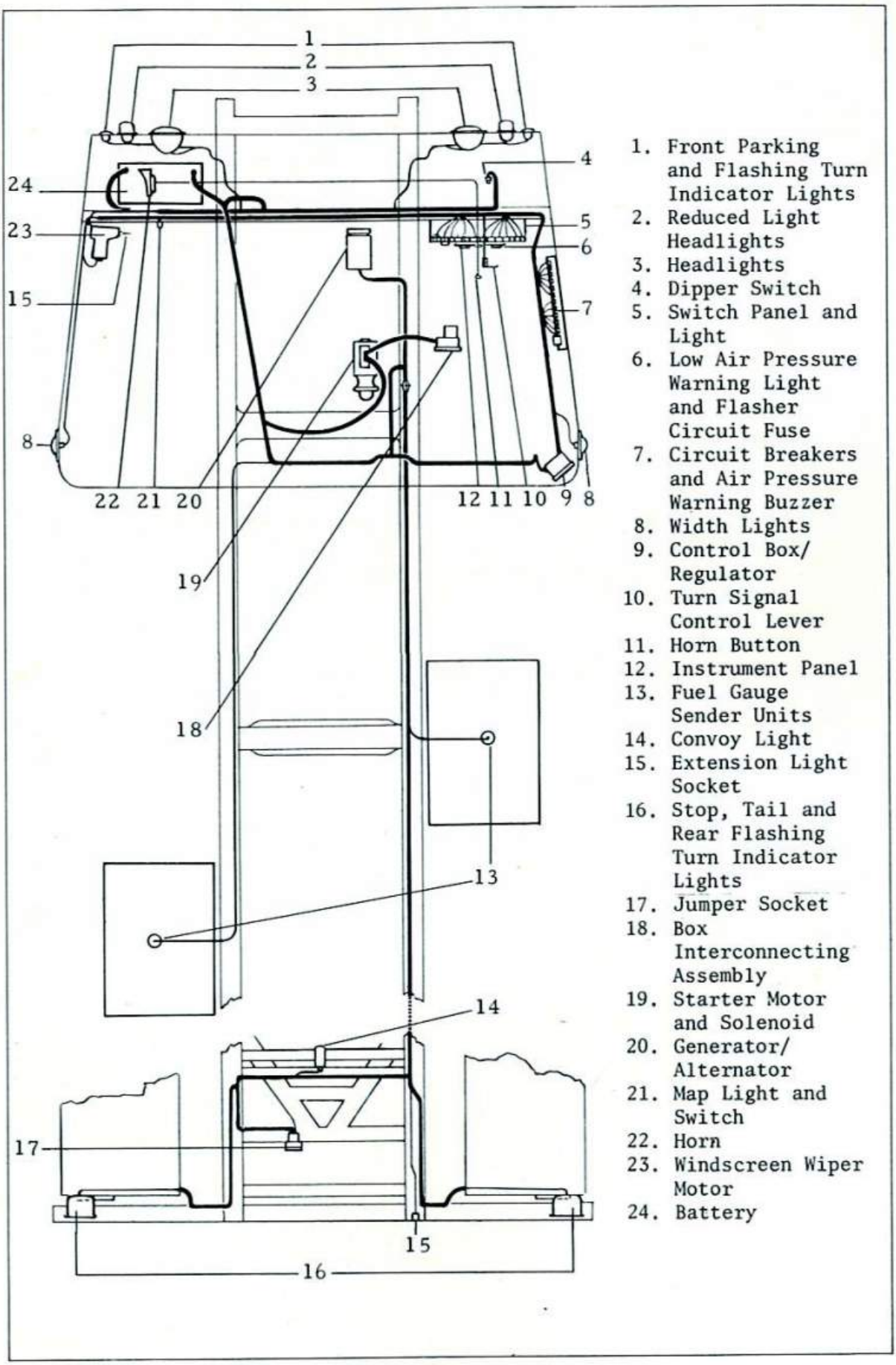
l. Oil pressure sender unit;

m. Sockets light extension, and

n. Tachometer (Mk 4 only).

Windscreen Wiper Assembly

288. This assembly consists of a 12 V electric motor and gearbox unit, a flexible steel drive cable enclosed in protective tubing, and two windscreen wiper arm and blade units.



1. Front Parking and Flashing Turn Indicator Lights
2. Reduced Light Headlights
3. Headlights
4. Dipper Switch
5. Switch Panel and Light
6. Low Air Pressure Warning Light and Flasher Circuit Fuse
7. Circuit Breakers and Air Pressure Warning Buzzer
8. Width Lights
9. Control Box/ Regulator
10. Turn Signal Control Lever
11. Horn Button
12. Instrument Panel
13. Fuel Gauge Sender Units
14. Convoy Light
15. Extension Light Socket
16. Stop, Tail and Rear Flashing Turn Indicator Lights
17. Jumper Socket
18. Box Interconnecting Assembly
19. Starter Motor and Solenoid
20. Generator/ Alternator
21. Map Light and Switch
22. Horn
23. Windscreen Wiper Motor
24. Battery

FIG 46
ELECTRICAL SYSTEM - LIGHTING AND ACCESSORIES

289. The wipers are self parking, that is, when the wipers are switched off the arms and blades return automatically to the edge of the windscreen before stopping.

290. The electric motor is mounted above the windscreen in the upper LH corner of the cab, and the driving cable (in the protective tubing) is mounted across the front of the cab above the windscreens. The wipers are controlled by the switch marked WIPERS on the switch panel.

Circuit Breaker Assembly (Fig 47)

291. A circuit breaker is a protective device designed to open a circuit when an electric current in excess of what it is rated to carry (See para 48) passes through it.

292. The assembly is mounted in the interior of the cab on the RH wall above the door. It consists of twelve circuit breakers grouped together on a mounting plate and protected by a cover.

293. From front to rear of the panel, (ie, circuit breakers 1-12) the circuits protected are:

Circuit Breaker No.	
1	Headlights;
2	Reduced Light Headlights;
3	Park, and Front Flashing Turn Indicator Lights;
4	Tail, Rear Flashing Turn Indicators, and Width Lights;
5	Windscreen Wipers;
6	Map Light;
7	Stop Light;
8	Horn;
9	Extension Light;
10	Convoy Light;
11	Auxiliary Feed;
12	Air Pressure Warning Buzzer.

294. Switch Panel Assembly (Fig 47). All switches incorporated in the vehicle electrical system (with the exception of map light, dipper and ignition switch, and the turn signal lever) are mounted on the switch panel which is located forward of the driver's seat above the windscreen.

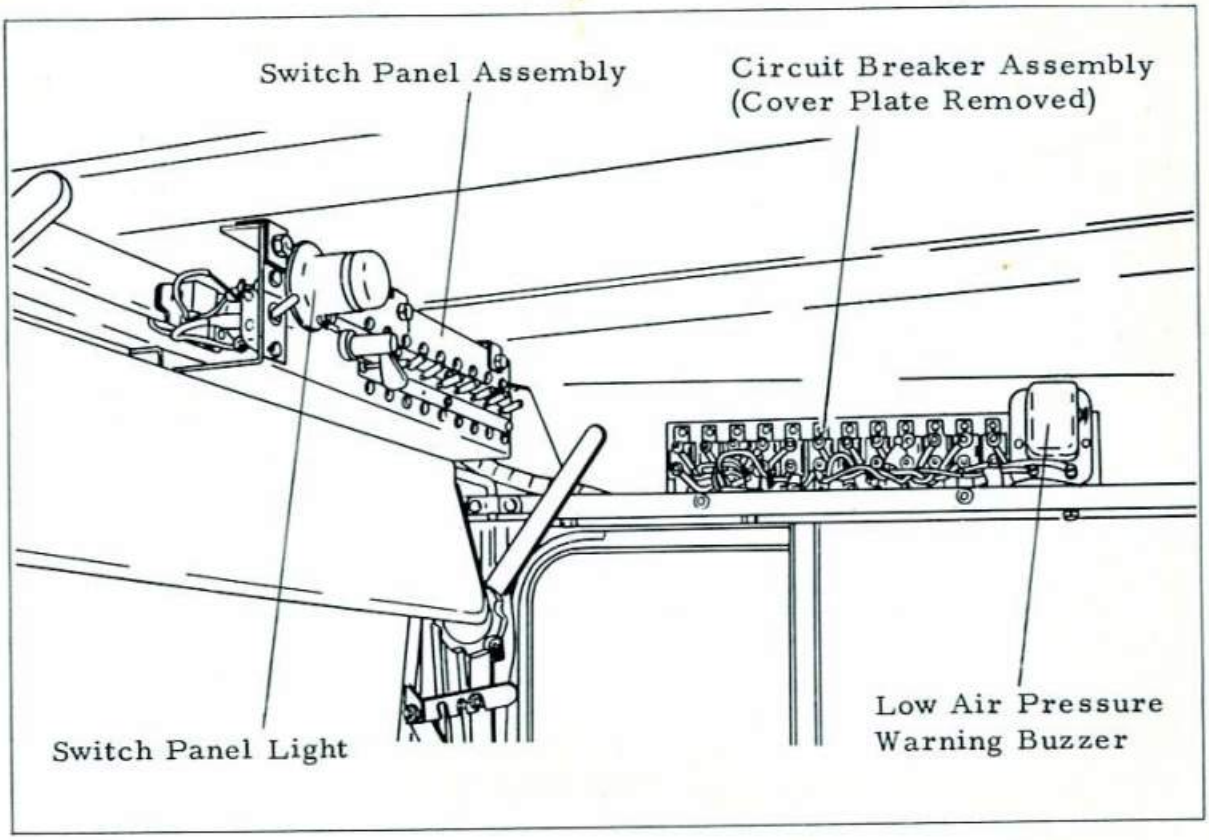


FIG 47
ELECTRICAL ACCESSORIES LOCATED
ABOVE RH WINDSCREEN AND DOOR

295. Horn. The horn attached to the rear of the LH brush guard pillar is a 12 V, 5 A, vibrating type with a frequency of 290-320 Hz. The horn button is located in the centre of the steering wheel.

296. Control Box (Mk 3) Voltage Regulator (Mk 4). Descriptions of these units are given in Section 14, para 240 to 242, and para 243 and 244 respectively.

297. Dipper Switch. The headlight beams are lowered (dipped) or raised (high beam) by operating the dipper switch. The switch is of the plunger type and is located on the cab floor adjacent to the base of the steering column.

298. Box, Interconnecting Assembly, Vehicle Starting. This assembly consists of a box unit and a cable. The box unit is located near the floor of the cab and comprises:

a. a mounting base (housing) with a captive screw-on cover, and

b. a two pin socket (enclosed in the base).

299. The cable is normally carried in the vehicle tool box. It is approximately nine metres long and is fitted at each end with a two pin plug.

CAUTION

This vehicle must NOT be connected to a vehicle with positive to earth electrical system.

300. The function of the assembly is to provide a rapid means of starting a vehicle with a discharged battery from a second vehicle with a similar (negative to earth) electrical system.

301. To interconnect the two vehicles:

a. unscrew the cover on the box unit in both vehicles, and

b. insert the plugs at the ends of the cable into the box units (sockets) of the vehicles.

Jumper Socket

302. This is a 12 pin NATO type electrical socket, with a hinged, spring-loaded metal cover. It is fitted at the rear of the vehicle to the left of the pintle hook.

303. This socket is for jumper lead connection to the electrical circuits of a towed trailer. In addition to carrying the stop, tail, flashing turn, blackout and convoy circuits, it also includes an auxiliary circuit. This is controlled by the switch marked AUX FEED on the switch panel.

Fuel Gauge Sender Units

304. Two units are fitted, one in each fuel tank. Each unit consists basically of a slide rheostat, a pivoted lever, and a float. The two units are electrically connected to the fuel gauge switch, which is in turn connected to the fuel gauge.

305. Using the fuel gauge switch the driver can connect the output of either unit to the fuel gauge. This gauge converts the electrical output (of the connected unit) to a fuel level reading which is indicated by a pointer on the dial of the instrument, when the ignition is switched on.

Water Temperature Sender Unit

306. This unit has no moving parts. It is a resistor made from a semi-conductor material which has a high resistance when cold and a low resistance when hot. The resistor is enclosed in a sealed bulb which is screwed into the cylinder head water jacket and it is electrically connected to the water temperature gauge.

307. The high resistance in the unit when surrounded by cold coolant, causes the pointer to indicate the cold end of the temperature gauge dial with the ignition switched on. Conversely the low resistance in the unit when surrounded by hot coolant causes the pointer to indicate the hot end of the temperature gauge dial with the ignition switched on.

308. Oil Pressure Sender Unit. The construction of this unit is similar to the fuel tank sender unit except that the variable resistor movement is caused by a diaphragm flexing as a result of varying oil pressure delivered by the oil pump. The sender unit is screwed into the main oil gallery on the LH side of the engine, and is electrically connected to the oil pressure gauge.

309. Sockets Light Extension. Two sockets are fitted to the vehicle; one on the bottom LH corner of the fascia panel forward of the co-driver, and the other to the rear of the vehicle, near the end of the RH side chassis member. The supply of power to the sockets is controlled by the switch marked WAND LEAD on the switch panel.

310. Tachometer (Fitted to Mk 4 Vehicle). This instrument is described in para 131 and 132.

311. Servicing. Periodically service the accessories (43).

SECTION 18
CLUTCH

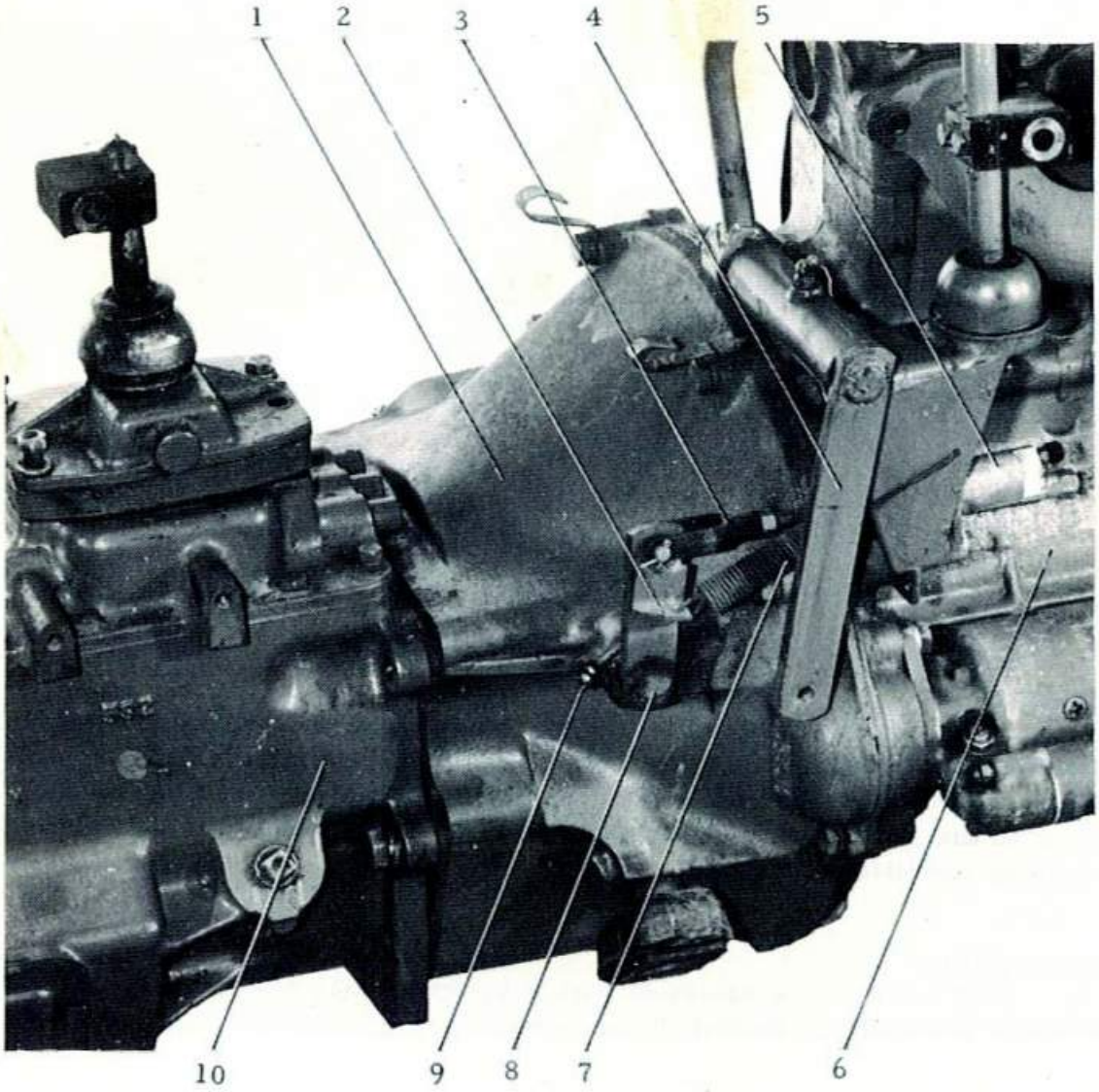
Purpose
312. The clutch enables the driver to engage and disengage the engine from the remainder of the power train (gearbox, transfer case, propeller shafts, differentials and axles). It permits gradual engagement of the engine to the power train, and gear ratios to be changed to meet varying operating conditions.

Description
313. The vehicle is equipped with a hydraulically operated single dry (305 mm) plate clutch having 16 pressure springs and four release levers.

314. The hydraulic control units provided for operation of the clutch are a pedal, master cylinder, slave cylinder and connecting hose and tubing. The master cylinder is located in the RH compartment below the bonnet (see Fig 11 and 12), and the slave cylinder is mounted on the RH side of the clutch housing.

315. Operation. On depressing the clutch pedal, fluid pressure set up in the master cylinder is transmitted through the connecting tubing to the slave cylinder. This actuates the clutch release fork shaft and lever and releases the clutch.

Servicing
316. The fluid level in the master cylinder reservoir should be maintained about 25 mm from the top of the reservoir. Extreme care should be taken while removing the cap, and until it is replaced, to prevent the entry of dirt or moisture.



1. Clutch Housing
2. Release Shaft Lever
3. Actuating Rod (Linkage)
4. Transfer Case Control Arm Assembly (Linkage Disconnected)
5. Slave Cylinder
6. Engine
7. Spring
8. Clutch Release Fork Shaft
9. Grease Nipple (one also fitted on LH side)
10. Gearbox

FIG 48
RH SIDE VIEW OF CLUTCH

317. Two grease nipples are provided for lubrication of the release shaft. These are located on the clutch housing over the ends of the shaft.

318. A grease nipple is fitted to the bottom of the release sleeve bearing. Access to it can be gained by removing the inspection plate in the bottom of the clutch housing. Using a low pressure grease gun fill the cavity in the sleeve. A thin film of lubricant should also be applied to the wearing (fork contact) area of the sleeve. Do NOT over lubricate any clutch component.

319. Periodically service:

a. Master cylinder (44)

b. Clutch release fork shaft and bearing (45)

c. Clutch linkage clevis pins (46).

SECTION 19
GEARBOX

Purpose

320. The gearbox is necessary because the engine:

a. cannot develop appreciable torque at low speeds,

b. develops maximum torque at one speed, and

c. crankshaft always rotates in the one direction.

321. The gearbox fitted to the vehicle provides the mechanical advantage that enables the engine to drive the vehicle under adverse load conditions. It also provides the driver with a selection of vehicle speeds while the engine is held within the effective torque range, and it allows disengaging and reversing of the power flow from the engine to the wheels.

Description

322. The gearbox is a six ratio type having five forward speeds and one reverse. All gears except first and reverse are synchromesh. A magnetic drain plug is fitted to collect metallic particles which may be present in the lubricant.

323. The gear control (change) lever is located near the LH side of the driver's seat and is connected by a rod assembly to the remote shift lever of the gearbox. Blocks to which the rod assembly is bolted are fitted to the gear change lever and the remote shift lever. A gearbox gate diagram is given in Fig 62 and on a plate located on the cab fascia. Gear ratios are detailed in Section 3 para 35d and hints on the use of the gears are contained in Section 29 para 472 to 475.

Servicing

324. The approved lubricant for use in the gearbox is oil 0-182 (OMD-330) and the refill capacity is five litres. The procedure to be followed to change the oil is detailed in sub-para a-h inclusive. To check the oil level carry out the sequence a, c, g and h. The procedure is to:

a. Position the vehicle on level ground.

b. Ensure that the gearbox is thoroughly warm and a receptacle to catch the oil is placed under it.

c. Remove the filler plug located on the RH side of the gearbox.

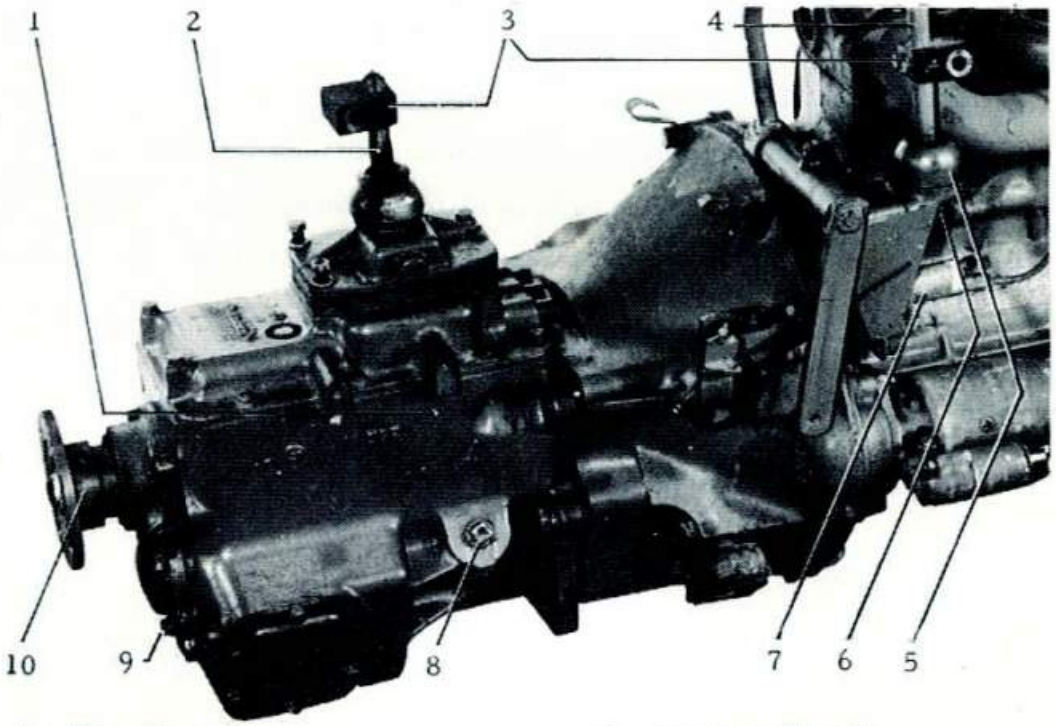
d. Remove the drain plug located on the rear, bottom, LH corner of the gearbox.

e. Allow the gearbox to drain completely. Inspect the drained oil for sludge or metallic chips. Clean and replace the drain plug.

f. Refill with new oil (refer para 324).

g. Check oil level. It should be level with the bottom of the filler plug hole. If not add oil (refer para 324).

h. Replace the filler plug.



1. Gearbox
2. Remote Shift Lever
3. Blocks (fitted with Grease Nipples on Mk 3)
4. Gear Change Lever
5. Ball Joint
6. Grease Nipple
7. Clutch Slave Cylinder
8. Filler Plug
9. Drain Plug
10. Output Shaft (to Transfer Case)

FIG 49
GEARBOX

325. Gearchange Linkage. Check all components of the linkage for security. The gear lever ball joint is lubricated through a nipple provided on the bottom of the mounting bracket directly below the ball joint. The nipple is accessible from below the vehicle. The Mk 3 vehicle has an additional two nipples; one in the block on the gear change lever and one in the block on the remote shift lever.

326. Periodically service:

a. Gearbox (47).

b. Gearchange linkage (48).

SECTION 20
TRANSFER CASE

Purpose

327. This assembly is located in the drive train after the gearbox. It permits the drive from the gearbox to be divided and transferred to both front and rear propeller shafts, and to the power driven winch when its use is required.

Description

328. The transfer case is bolted to a member which is rubber mounted to two brackets, one on the inside of each chassis side member, behind the central chassis member.

329. It is a two ratio type giving a straight through drive in high ratio and a reduction of 2.5 to 1 in low ratio. A power take-off is provided for operation of the winch, and the speedometer is gear driven from the rear end of the front wheel drive shaft. The case allows the engagement of:

a. High ratio 2 (rear) wheel drive,

b. High ratio 4 (all) wheel drive,

c. Low ratio 4 (all) wheel drive, and

d. Power-take-off.

330. To prevent high ratio 4 wheel drive from being engaged accidentally a pneumatically controlled gearchange lock assembly is fitted. To engage high ratio 4 wheel drive it is necessary to lift the catch located below the knob on the transfer case control lever, and then move the lever to the front position.

331. The transfer case and power take-off control levers are connected to the transfer case by a mechanical linkage. The transfer case control lever is located on the LH side of the driver's seat beyond the gear lever. The position of the lever for the various drive combinations is shown in Fig 62 and on a plate on the cab fascia. Hints on the use of the transfer case are contained in Section 29 para 476 to 481.

Servicing

332. The approved lubricant for use in the transfer case is oil 0-182 (OMD-330) and the refill capacity is 7.2 litres. The procedure to be followed to change the oil is detailed in sub-para a-h inclusive. To check the oil level carry out the sequence a, c, g and h. The procedure is to:

a. Position the vehicle on level ground.

b. Ensure that the transfer case is thoroughly warm and a receptacle to catch the oil is placed under it.

c. Remove the filler plug located on the RH side of the case near the front.

d. Remove the drain plug located on the rear face near the bottom of the case.

e. Allow the case to drain completely. Inspect the drained oil for sludge or metal chips. Clean and replace the drain plug.

f. Refill with new oil (refer para 332).

g. Check oil level. It should be up to the bottom of the filler plug hole. If not add oil (refer para 332).

h. Replace the filler plug.

Transfer Case and Power Take-Off Control Linkage

333. Check all components of the linkage for security. Two grease nipples which are accessible from underneath the vehicle are provided in the linkage. One is located in the transfer case control lever mounting and one in the power take-off control lever mounting.

334. Periodically service:

a. Transfer case (49).

b. Transfer case linkage (50).

c. Power take-off control linkage (51).

SECTION 21
PROPELLER SHAFTS

Description

335. The drive from the gearbox to the transfer case, and from the transfer case to the front and rear differentials and the winch is transmitted by four propeller shafts each fitted with two universal joints.

TABLE 13 - UNIVERSAL JOINTS FITTED TO VEHICLE

PROPELLER SHAFT TRANSMITS DRIVE		UNIVERSAL JOINT	
FROM	TO	Qty	TYPE
Gearbox	Transfer case	2	)
Transfer case	Front differential	2	) Hardy Spicer Type 1510
Transfer case	Rear differential	2	)
Transfer case	Winch	2	Hardy Spicer Type 1410

Servicing

336. Three grease nipples are located on each propeller shaft and all are accessible from underneath the vehicle. Low pressure greasing equipment only is to be used, as excessive pressure lubrication will damage the seals and retainers.

337. Periodically service the propeller shafts (52).

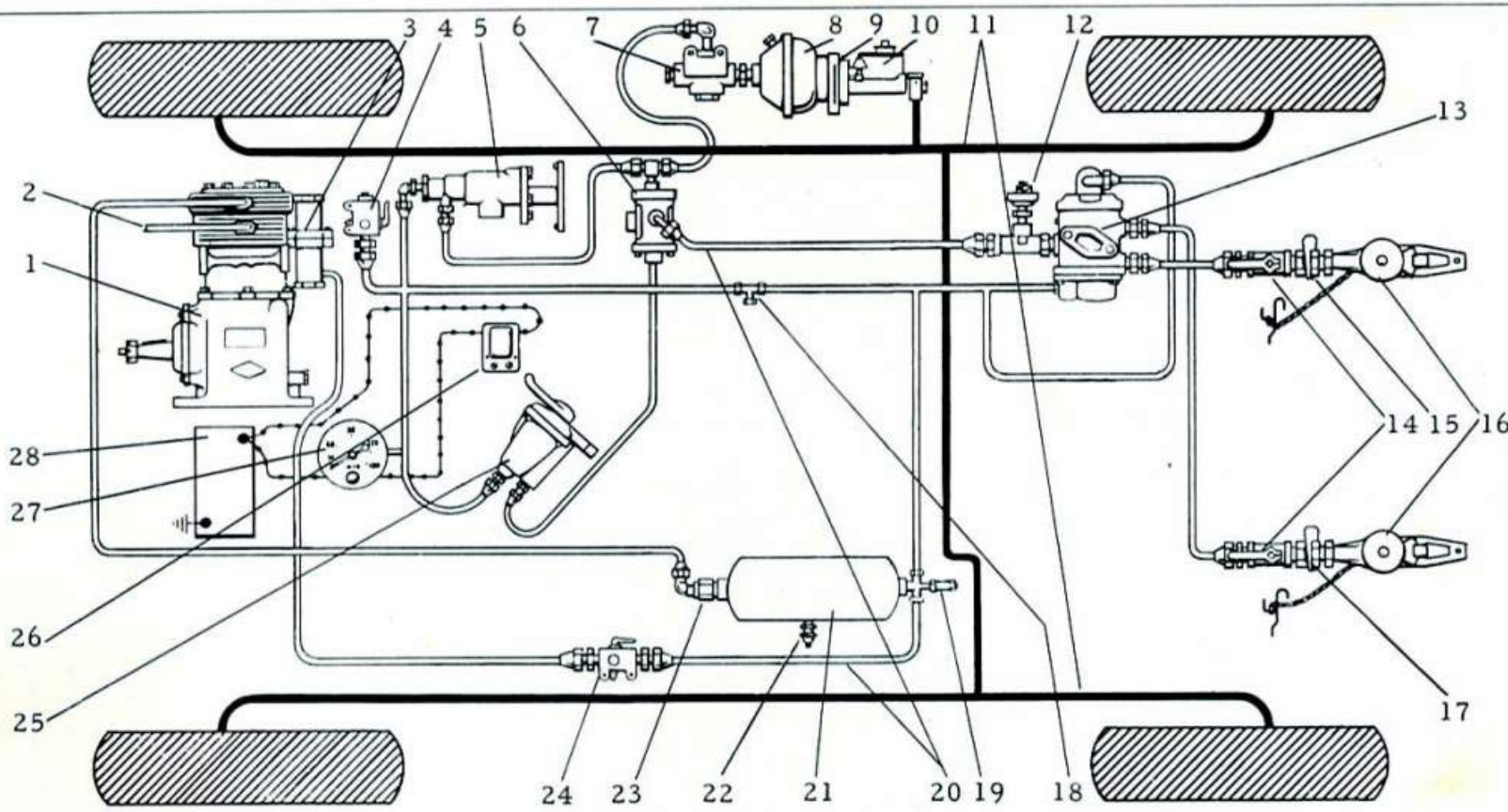
SECTION 22
BRAKE SYSTEM

338. The brake system is illustrated in Fig 50. This section has been sub divided and the various components of the system described in Sub-Section:

A General
B Hydraulic System
C Compressed Air System
D Wheel Brakes
E Handbrake and Linkage

NOTE

Throughout this section air pressures are given in lb/in^2 with the metric equivalents in parenthesis. This was done because at the time of preparing the handbook the air pressure gauges in the Mk 3 and Mk 4 vehicles were calibrated in lb/in^2 and no information was available regarding conversion of the gauges to metric units, ie, kPa.



1. Air Compressor
2. Compressor Air Supply from Air Cleaner
3. Governor
4. Air Supply Valve
5. Foot Treadle Valve
6. Transfer Valve
7. Quick Release Valve
8. Actuator
9. Breather
10. Hydraulic Master Cylinder
11. Hydraulic Fluid Lines
12. Stop Light Switch
13. Tractor Protection Valve
14. Stop Cock
15. Emergency Line Label
16. Palm Couplings
17. Service Line Label
18. Air Supply to Winch Dog Clutch
19. Safety Valve
20. Air Lines
21. Air Reservoir
22. Drain Cock
23. Single Check Valve
24. Tyre Inflation Valve
25. Hand Control Valve
26. Low Air Pressure Warning Buzzer
27. Air Pressure Gauge
28. Battery

FIG 50
BRAKE SYSTEM

A - GENERAL

Description

339. The system is an air hydraulic type and operates on all road wheels.

340. The brakes on all four wheels of the vehicle, and on the wheels of any air braked trailer (or towed equipment) attached to the vehicle, are applied when the foot brake pedal is depressed.

341. The trailer brakes can be applied separately using the air brake hand lever located on the steering column.

342. A handbrake lever operates the brakes on the rear wheels through a mechanical linkage which overrides the hydraulic footbrake.

343. The brakes are of the two leading shoe type and are hydraulically actuated. The front wheel brake cylinders are of the pusher type, and the rear are of the puller type with over-riding mechanical hand brake linkage.

344. The compressed air equipment includes an engine driven air compressor, a reservoir and an air/hydraulic actuator. Air supplied by the compressor is stored under pressure in the reservoir. The minimum pressure necessary for the efficient operation of the brakes is 60 lb/in^2 (415 kPa).

345. The actuator consists of a brake chamber (air pressure unit) and a master cylinder (hydraulic pressure unit). It converts air pressure to hydraulic pressure by means of a moving (air pressure operated) diaphragm in the brake chamber, applying mechanical force through a push rod to a piston in the master cylinder. The hydraulic pressure originating in the master cylinder is applied to the individual wheel cylinders through hydraulic fluid lines.

346. The footbrake pedal operates an air valve which controls the release of air from the reservoir to the actuator, and also operates a transfer valve which supplies air to the brakes of an attached trailer.

B - HYDRAULIC SYSTEM

Description

347. This system which is actuated by the compressed air system on application of the footbrake, consists of:

a. Master cylinder (part of air/hydraulic actuator).

b. Wheel brake cylinders.

c. Hydraulic fluid lines.

Master Cylinder

348. This cylinder forms part of the air/hydraulic actuator, which is

located on the outer face of the chassis side member just forward of the RH fuel tank.

349. . Movement of the diaphragm in the brake chamber is transmitted to the piston in the master cylinder by a push rod. When the piston is moved, fluid is forced from the master cylinder through hydraulic fluid lines to the individual wheel cylinders.

350. The fluid level in the master cylinder reservoir should be maintained within about 10 mm of the bottom of the filler hole. Extreme care should be taken when removing the filler cap, and until it is replaced, to prevent dirt or moisture entering the reservoir.

351. Wheel Cylinders. A wheel cylinder is mounted on the back plate of each wheel. The rear wheel cylinders are of the puller type and the front wheel cylinders are of the pusher type. The wheel cylinders convert the hydraulic pressure applied by the master cylinder, to the mechanical force that pushes the brake shoes against the brake drums.

352. Hydraulic Fluid Lines. The components of the hydraulic system are connected by steel tube and flexible hose.

353. Servicing. Check the system for security, damage, kinks in pipes, and that all connections and unions are tight.

354. The detection of air or hydraulic fluid leaks in the system will be made easier if all components are maintained in a clean condition.

355. If air has entered the system through disconnection of lines, or if the fluid level in the master cylinder reservoir has dropped too low, the system will require bleeding. Report for rectification.

356. Periodically service:

a. Master cylinder (53).

b. Hydraulic fluid lines (54).

C - COMPRESSED AIR SYSTEM

Description

357. This system is illustrated in Fig 54 and consists of:

a. Air compressor.

b. Air compressor governor.

c. Air reservoir.

d. Safety valve.

e. Single check valve.

f. Brake control (hand and foot) valves.

g. Brake power chamber (part of air/hydraulic actuator).

h. Quick release valve.

i. Transfer valve.

j. Tractor protection valve.

k. Stop light switch.

l. Air pressure gauge.

m. Low air pressure indicators (buzzer and light).

n. Tyre inflation valve.

o. Air lines and couplings.

p. Air supply valve (deep wading).

Air Compressor

358. The compressor is a two cylinder air cooled, single acting, reciprocating type. It is located on the RH side of the engine at the front, and is driven by the engine crankshaft by means of pulleys and V-belt. The compressor has automatic inlet valves, and the cylinder head and block are air cooled. Its function is to supply the compressed air required to operate the compressed air system.

359. The discharge pipe line from the compressor is connected to the air reservoir. The unloading pipe line is connected from the compressor unloading mechanism via the governor to the reservoir.

360. Air for the compressor is cleaned by the carburettor air cleaner and fed to the compressor through a flexible pipe. The compressor lubrication system receives its oil from the engine lubrication system and surplus oil is returned to the engine sump.

361. Air Compressor Governor. The governor is mounted directly onto the rear end of the compressor. It automatically maintains the air pressure in the system between the desired maximum of 100-105 lb/in^2 (690-725 kPa) and the desired minimum of 80-85 lb/in^2 (550-585 kPa) necessary for the safe operation of the vehicle and trailer brakes. Although the engine drives the compressor continuously, actual compression of air is controlled by the governor which, acting in conjunction with the unloading mechanism in the compressor, stops or starts compression as required, to maintain pressure within the desired limits.

362. Air Reservoir. This is a cylindrical steel reservoir mounted on the inside of the chassis LH side member. The reservoir stores air for immediate supply to the brakes, and also provides a reserve which permits several applications of the brakes after the engine has been stopped. As air heated during compression cools in the reservoir, and oil and water vapours are condensed, a drain cock is provided on the bottom of the reservoir. Remove the oil and water by opening the drain cock and blowing it clear. Ensure that the drain cock is fully closed.

363. Safety Valve. This valve is mounted on the top of the air reservoir. Its function is to protect the compressed air system against excessive pressure. Should the air pressure in the system rise above 150 lb/in^2 (1050 kPa) the valve opens and permits pressure above this to be exhausted.

364. Single Check Valve. This valve is located in the compressor discharge line between the compressor and the air reservoir. Its function is to permit the passage of air in one direction (to reservoir) only, and to prevent passage in the reverse direction.

365. Brake Control Valves. There are two brake control valves:

a. Hand Control Valve. This valve is located below the wheel on the RH side of the steering column. It is operated by a hand lever which, when moved towards the driver, opens the valve permitting air to pass from the reservoir through the valve and the service line to apply the trailer brakes. The lever is marked 'NOT FOR PARKING', and the brake must NOT be used for that purpose.

b. Footbrake Control Valve. This valve operates in conjunction with the air/hydraulic actuator. Its function is to control the pressure of air applied to the actuator from the reservoir, and thus, the pressure the actuator applies to the vehicle and trailer brakes. The valve fitted to the Mk 3 is operated by a linkage and push rod from the pendant brake pedal and is located in the RH front compartment beneath the bonnet. The valve fitted to the Mk 4 is treadle operated, and is located on the cab floor adjacent to the base of the steering column. Pressure on the control (pedal or treadle) opens the valve permitting air pressure to pass from the air reservoir, through the valve to the brake chamber of the actuator.

Brake Power Chamber

366. This chamber changes air pressure to mechanical force and forms the air pressure section of the actuator. It contains a moving diaphragm and push plate. The push plate applies mechanical force to the piston in the master cylinder through a push rod, and to a sliding rod, one end of which projects through a mounting stud on the brake chamber.

367. When the footbrake control valve is opened the brakes are applied by the air pressure in the brake chamber moving the diaphragm and push plate; and through the push rod, the piston in the master cylinder. The sliding rod (stroke indicator) is also pushed out through the mounting stud by pressure from the push plate according to the length of the stroke of the push plate. The indicator will remain in this position when the brakes are released. If the red marking on its stem is visible the brakes require attention (see Serial 60 Table 20).

368. Quick Release Valve. This valve is mounted on the brake chamber and is in the air line between the chamber and the footbrake control valve. The valve speeds up the release of air pressure from the chamber when a footbrake application is released.

369. Transfer Valve. This double check valve is located on the inside of the chassis RH side member. It is connected into the air lines between the brake control valves (hand and foot) and the tractor protection valve. The valve prevents air pressure from the reservoir escaping through the open exhaust port of one control valve when the other is being used, and supplies air pressure to the trailer brakes through the tractor protection valve and service line.

370. Tractor Protection Valve. This valve is located in the air lines between the transfer valve and the trailer emergency and service lines. Should the air pressure in the system drop to 25 lb/in^2 (175 kPa) or less, the valve will automatically close the air lines to the trailer.

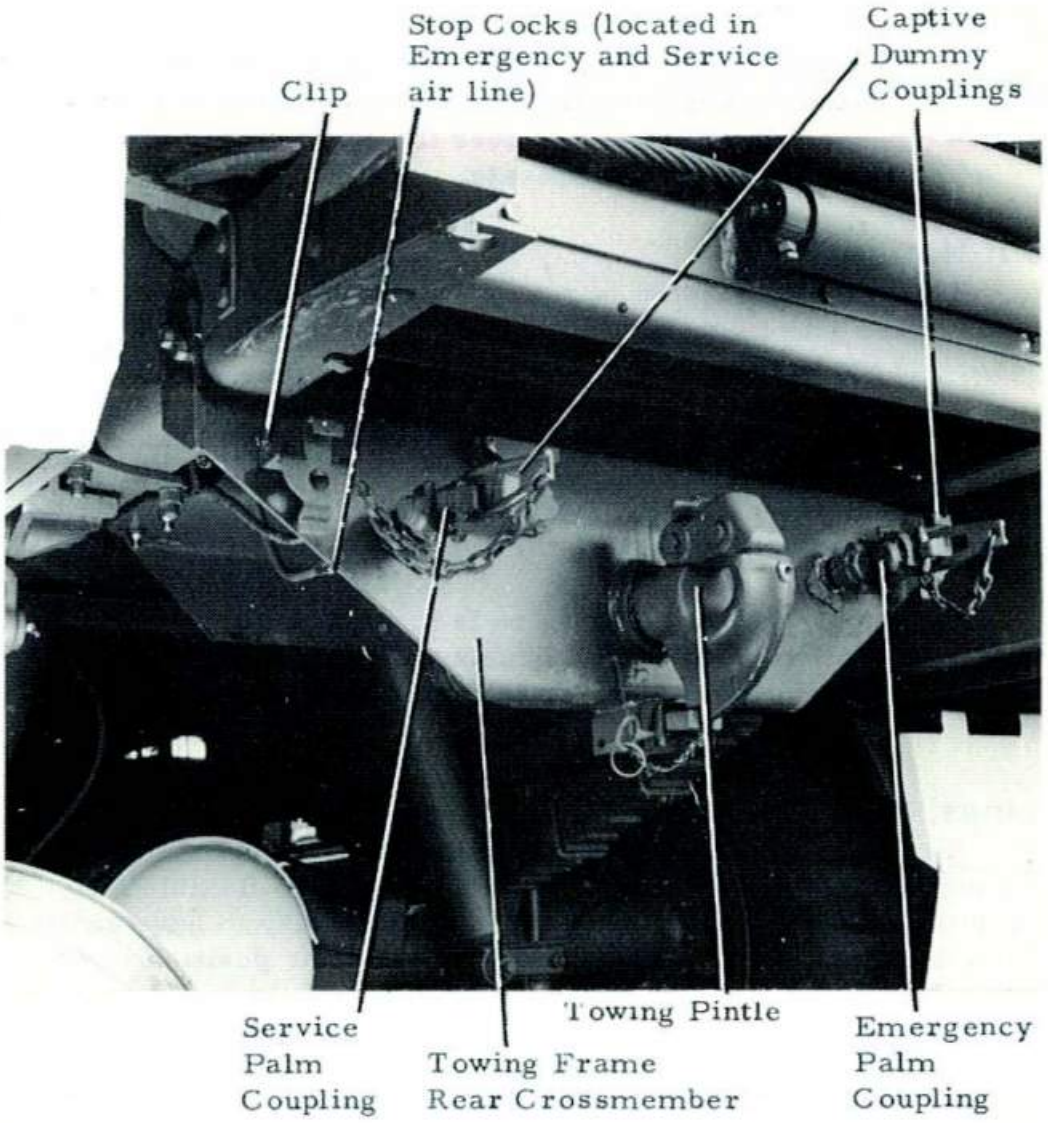


FIG 51
AIR LINES, STOP COCKS AND COUPLINGS

371. Stop Light Switch. This electro-pneumatic switch operates in conjunction with the brake control valves to complete an electric circuit to the stop light when a brake application is made.

372. Air Pressure Gauge. This gauge is located on the instrument panel and indicates the air pressure in the system in lb/in^2. It incorporates a low air pressure warning light and an internal switch which closes the circuits to the warning light and buzzer when the air pressure falls below 60 lb/in^2 (415 kPa).

373. Low Air Pressure Indicators. The two indicators provided are:

a. Warning Buzzer. This buzzer is located at the rear end of the circuit breakers, at the top of the RH side cab wall and is controlled by the internal switch in the air pressure gauge. The buzzer will sound continuously when the ignition is switched on (whether or not the engine is running) until the air pressure in the system exceeds 60 lb/in^2 (415 kPa). It re-commences immediately air pressure drops below that figure.

b. Indicator Light. This light is located in the dial of the air pressure gauge and is controlled by the internal switch in the gauge. It will light up under the same circumstances that cause the buzzer to operate.

Tyre Inflation Valve

374. This valve is located on the outer face of the chassis side member above the spare wheel carrier and is used in conjunction with the hose provided with the vehicle.

375. To use the valve, remove the captive cap from the valve outlet and connect the air hose. To open the valve move the lever to a position at right angles to the air line. Ensure that the valve is properly closed after use to prevent air loss from the system.

376. Air Supply Valve. This valve is located in the cab, on the RH side and near the top of the engine housing. It provides an air supply point for pressurizing the axles and transmission components when deep wading.

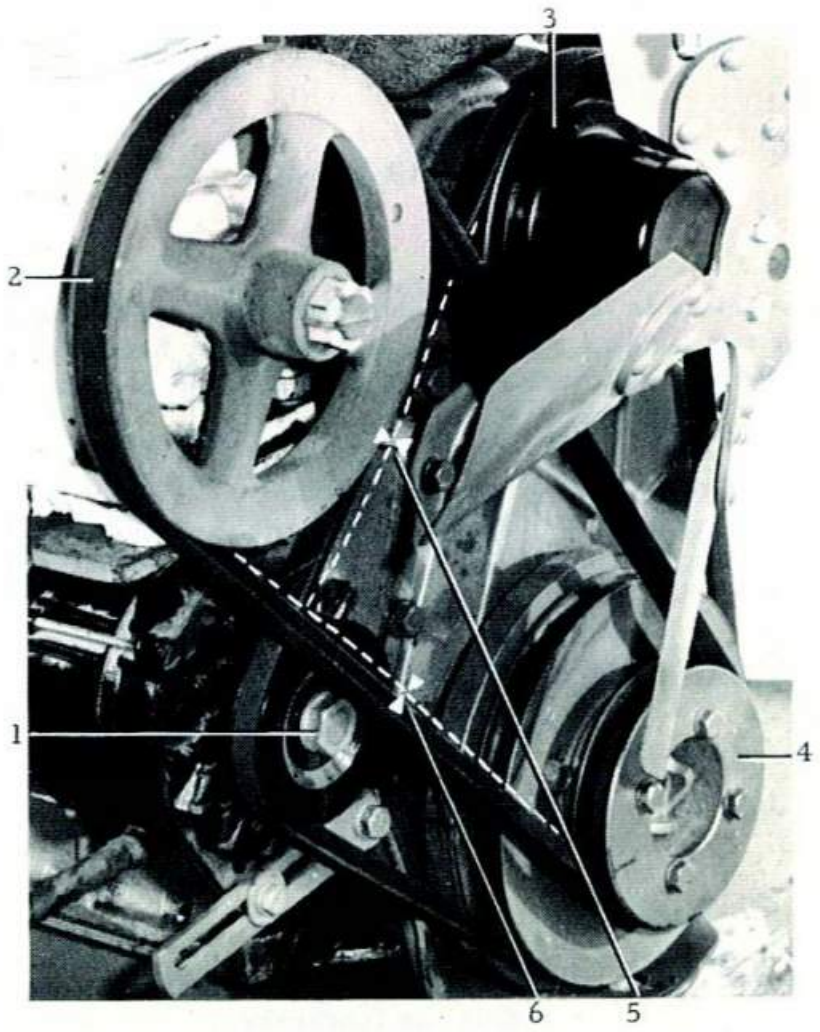
Air Lines, Stop Cocks and Couplings (Fig 51)

377. Air Lines. The components of the compressed air system are connected by steel tubing and flexible hose. The flexible hose lines and hose fittings are used where it is necessary to have an air line between two points of the vehicle which change their position in relation to one another.

378. Stop Cocks. These cocks are in the air lines between the tractor protection valve and the service and emergency couplings. They are located immediately forward of the rear crossmember of the towing frame assembly. The function of the cocks is to shut off the service and emergency air lines when they are not being used. The cocks are open

when the lever is at right angles to the air line. Before disconnecting trailer air hoses, SHUT the cocks.

379. Couplings. The air lines to the trailer are terminated in palm couplings which provide for quick connection or disconnection of trailer air hoses. The couplings are located on the exterior face of the towing frame assembly, and are identified as service and emergency by metal collars at their base. Clips with captive dummy couplings are also fitted adjacent to each palm coupling. When trailer air hoses are not connected the dummy couplings are used to seal the palm coupling, and when not in use the dummy couplings are fitted to the clips.



1 Generator or Alternator Pulley
2 Air Compressor Pulley
3 Fan and Water Pump Pulley
4 Crankshaft Pulley
5 Tension Check Point - Fan Belt.
6 Tension Check Point - Air Compressor Belt.

FIG 52
V-BELT TENSION CHECKING POINTS

380. Servicing. The detection of air leaks in the system will be made easier if all components are maintained in a clean condition. V-belt tension is correct when it is possible, with the fingers, at a point midway between the compressor pulley and the crankshaft pulley (refer Fig 52) to depress the belt 35 mm. Periodically service:

a. Air compressor belt (12).

b. Air reservoir (55).

c. Footbrake control valve: Mk 3 (56) Mk 4 (57).

d. Stop light switch (58).

e. Air lines, Stop cocks and Couplings (59).

f. Brake power chamber (61).

D - BRAKES

Description

381. The vehicle is fitted with heavy duty 387 mm diameter by 108 mm brakes, of the two leading shoe type, hydraulically actuated on all four wheels. The rear wheel brakes can also be applied mechanically by operation of the handbrake.

382. The expander units of the front wheel brakes are actuated by pusher type hydraulic wheel cylinders. Puller type cylinders actuate the rear wheel expander units; these units are each fitted with a draw link for attachment of the handbrake linkage.

383. Servicing. Periodically service the brakes (60).

E - HANDBRAKE

Description

384. The handbrake operates through a mechanical linkage on the rear wheels of the vehicle, over-riding the footbrake.

385. The linkage consists of a bell crank, compensator, relay levers, connecting rods, yokes and clevis pins.

386. The handbrake lever is located near the LH side of the driver's seat and is pulled up to apply the brakes. The lever is fitted with a pawl and ratchet to hold the lever in the brakes applied position, and a release lever to disengage the pawl from the ratchet.

387. Servicing. Periodically service the handbrake (62).

SECTION 23
FRAME AND SUSPENSION

388. Frame (Fig 53). The frame has been designed to meet service requirements. It consists of two channel section side members and six cross members bolted and/or riveted in position. Fittings are provided on the frame for:

a. mounting of the cab, shock absorbers and springs,

b. limiting spring deflection,

c. securing the vehicle for transportation, and

d. supporting the winch rope (LH side frame member only).

Suspension (Fig 54)

389. The four main springs and two auxiliary springs fitted to the vehicle are of the semi elliptical type. The main springs have a span of 1.372 m when flat, and each is made up of 14 leaves, 75 mm wide. The main springs are attached to the underslung axles with U-bolts, and to the frame by means of brackets at their front ends, and shackles at the rear. The main springs are interchangeable.

390. The auxiliary springs have a span when flat of 864 mm and each is made up of six leaves, 75 mm wide. The springs are mounted on top of the rear main springs. When the load on the vehicle reaches a certain amount, the deflection of the main springs brings the free ends of the auxiliary springs against the spring pads on the frame, and both springs (main and auxiliary) carry the load.

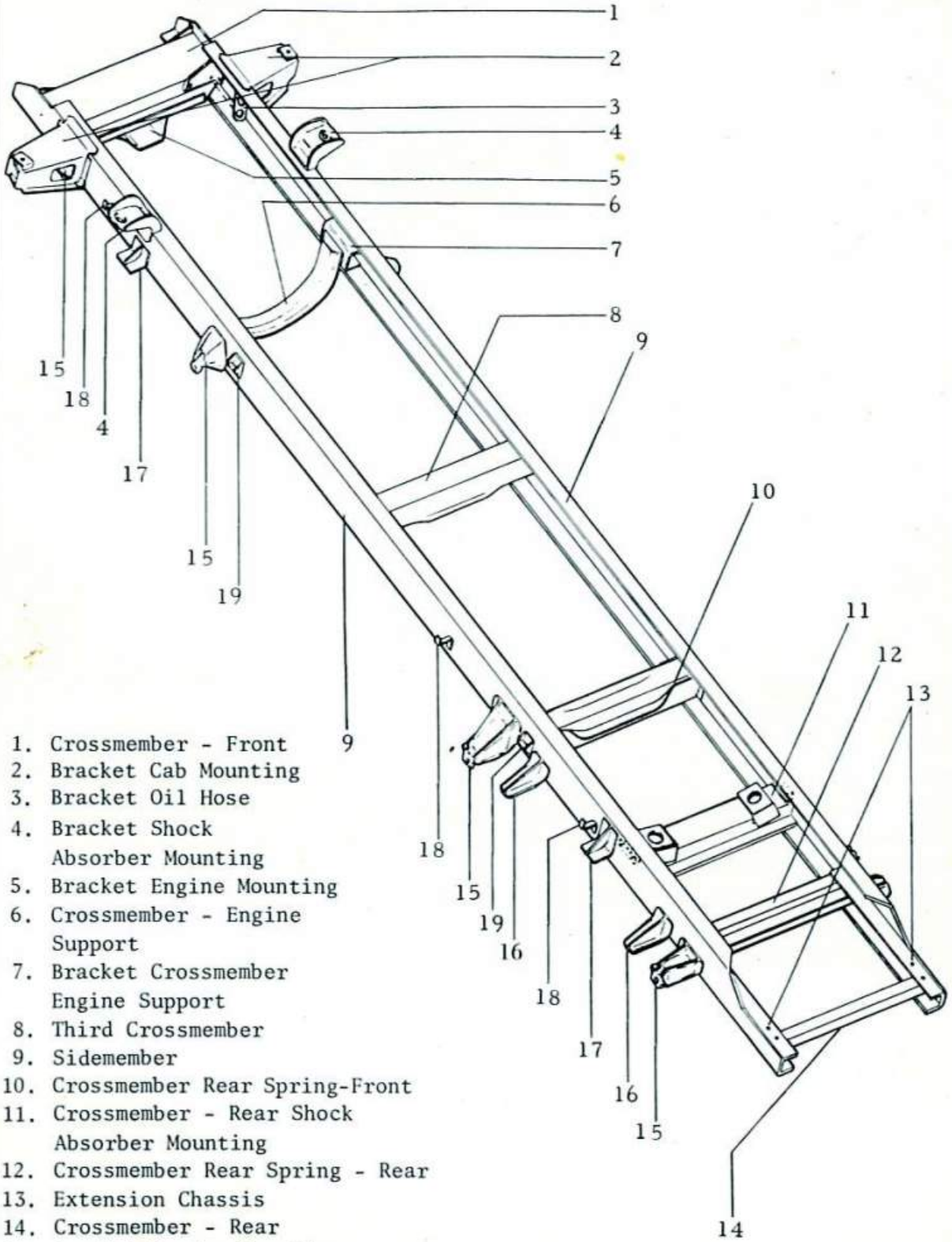
391. Rubber bump stops fitted on top of the front main springs and auxiliary springs come into contact, under heavy road shocks, with bump stop brackets on the frame, thus limiting spring deflection.

392. Shock Absorbers. Two hydraulic, double-acting, telescopic type shock absorbers are fitted to each axle. The shock absorbers have a diameter of 102 mm and a stroke of 229 mm.

393. Servicing. Periodically service:

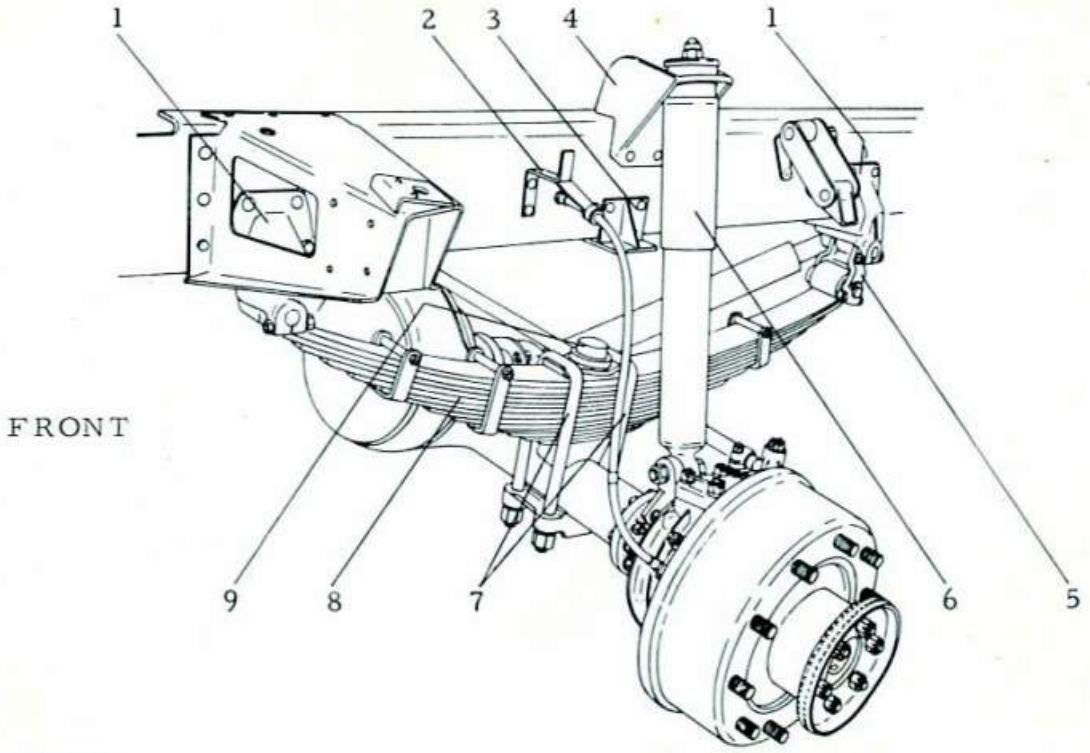
a. Springs (63).

b. Shock absorbers (64).

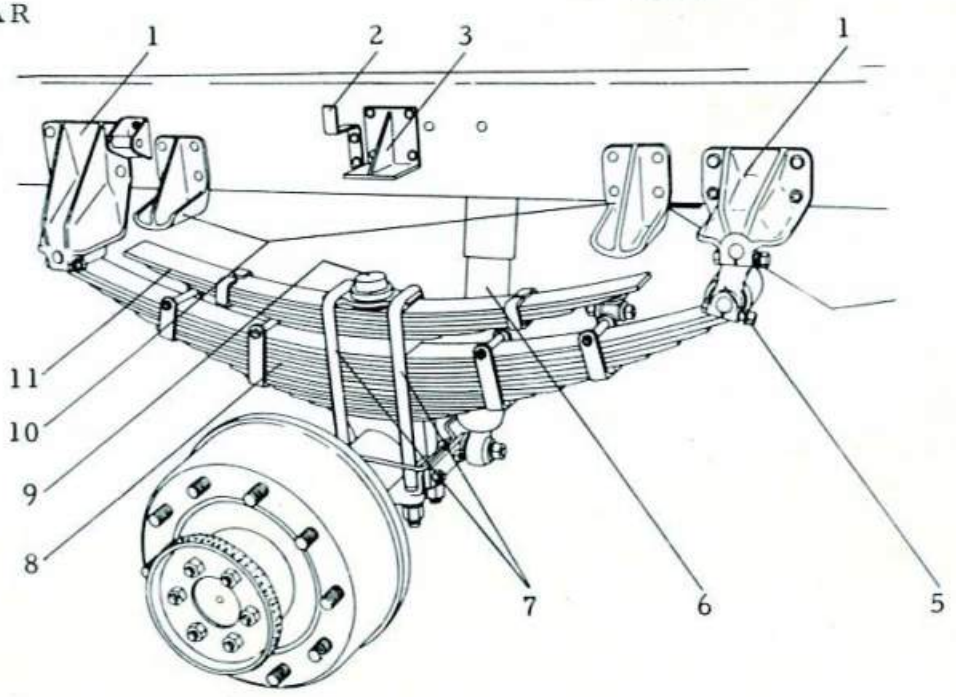


1. Crossmember - Front
2. Bracket Cab Mounting
3. Bracket Oil Hose
4. Bracket Shock Absorber Mounting
5. Bracket Engine Mounting
6. Crossmember - Engine Support
7. Bracket Crossmember Engine Support
8. Third Crossmember
9. Sidemember
10. Crossmember Rear Spring-Front
11. Crossmember - Rear Shock Absorber Mounting
12. Crossmember Rear Spring - Rear
13. Extension Chassis
14. Crossmember - Rear
15. Bracket Spring Mounting
16. Bracket Auxiliary Spring Mounting
17. Bracket Bump Stop
18. Bracket Supporting Winch Rope
19. Lashing Point

FIG 53
FRAME



REAR



1. Spring Bracket
2. Winch Rope Support Bracket
3. Bump Stop Bracket
4. Shock Absorber Bracket
5. Shackle
6. Shock Absorber
7. U-Bolts
8. Spring
9. Bump Stop
10. Spring Pads
11. Auxiliary Spring

FIG 54
SUSPENSION LH SIDE VIEW

SECTION 24
AXLE ASSEMBLIES

Description

394. The function of the axle assemblies is to support the weight of the vehicle and to transmit drive to the road wheels. Provision for steering is made by the front wheels being pivoted and driven by the axle shafts through tracta constant velocity (CV) joints.

395. The assembly consists of a housing containing a differential, axle shafts, CV joints (fitted to front axle only) stub axles and driving flanges together with bearings and seals.

396. The front and rear axles are of the fully floating type and incorporate identical stub axles, hubs, and single reduction, hypoid type differentials. The torque is taken through the front and rear springs.

Front Axle Assembly

397. The axle housing is a welded assembly fabricated from high yield strength steel. The ends of the housing are flanged for the attachment of the inner CV joint housings.

398. The inner and outer axle shafts are jointed by a 120 mm CV joint. Each shaft incorporates a universal joint fork, engaging one half of the CV joint. The outer shafts, which are supported in the hollow stub axle, transmit the drive through splines to a driving flange, which in turn transmits the drive to the wheel hubs.

399. The CV joints and the axle shaft bearings run in an oil bath formed by the inner and outer CV joint housings. The outer housing is carried by the swivel pin taper roller bearings supported in the inner housing.

400. Sling rings, which also serve as steps for entrance to the cab, are attached to the driving flanges.

Rear Axle Assembly

401. This assembly differs from the front axle assembly in that it does not incorporate:

a. CV joints and housings,

b. inner and outer axle shafts,

c. separate driving flanges.

402. As the wheels do not pivot, CV joints and inner and outer shafts are not required; and one piece axle shafts with integral driving flanges are fitted.

Breather Valves

403. When the axles become warm pressure is built up inside the housings. To prevent this pressure forcing lubricant past the oil seals, a breather valve is fitted to each housing. The spring loaded valve opens to relieve built up pressure and closes under spring tension to prevent the entry of dirt or moisture.

404. The valves are located on top of the housings. The front breather between the differential and the LH CV joint housing, and the rear breather between the differential and the RH brake backplate.

Servicing

405. The approved lubricant for use in the axle and CV joint housings is Oil OEP-600. The procedure to be followed to change the oil in the axle housings is detailed in sub-para a to h inclusive. To check the oil level carry out the sequence a, c, g and h. The procedure is to:

a. Position the vehicle on level ground.

b. Ensure that the axle is thoroughly warm and a receptacle to catch the oil is placed under it.

c. Remove the filler plug located near the centre of the round (white painted) portion of the differential.

d. Remove the drain plug located centrally underneath the differential.

e. Allow to drain completely. Clean and replace the drain plug.

f. Refill with new oil (refer para 405).

g. Check oil level. It should be up to the bottom of the filler plug hole. If not add oil (refer para 405).

h. Replace the filler plug.

406. To check the oil level in the CV joint housing:

a. Position the vehicle on level ground.

b. Remove the filler plug located on the front of the outer housing.

c. Check the oil level. It should be level with the bottom of the filler plug hole. If not add oil (refer para 405).

d. Replace the filler plug.

407. Periodically service the axles (65).

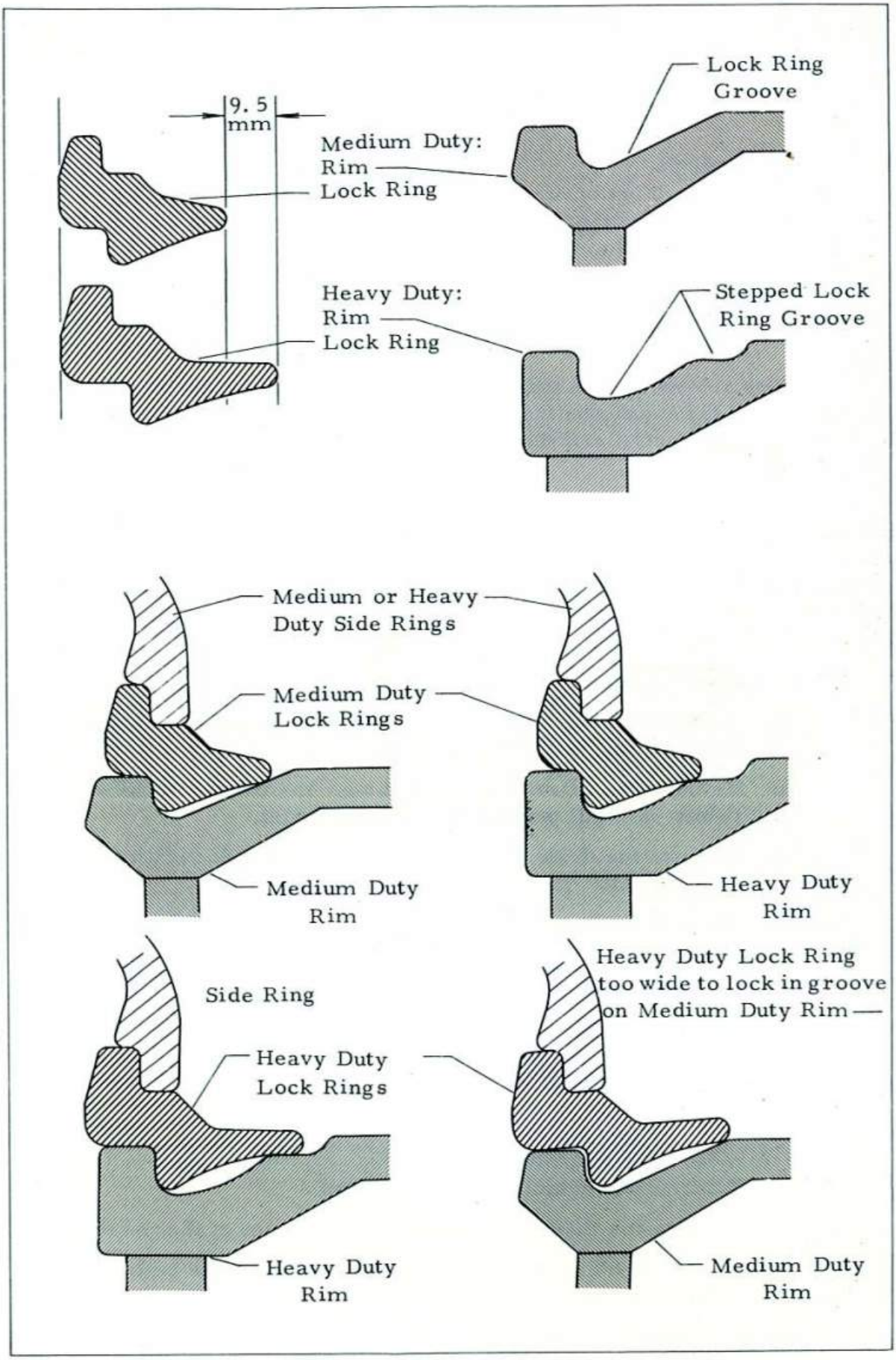


FIG 55
HEAVY AND MEDIUM DUTY WHEEL COMPONENTS

SECTION 25
WHEELS AND TYRES

Wheels

408. The vehicle is fitted with B800x16 single disc type, medium duty (MD) or heavy duty (HD) wheels fabricated from pressed steel. The MD and HD wheels are of three piece construction consisting of a flat base rim with a detachable side, and a split locking ring. Each wheel is attached to its hub by ten studs and nuts. All studs have RH threads, and the wheel nuts are of the tapered face type.

409. Early production vehicles are fitted with MD wheels; later, and new production vehicles will be fitted with HD wheels.

410. Identification. The HD rim can be identified by the stepped lock ring groove. The HD lock ring is 9.5 mm wider than the MD lock ring and is marked by stamping B7.5/B8.0 HD.

411. Interchangeability of Components (Fig 55). The degree to which the components may be interchanged is:

a. The MD and HD side rings are fully interchangeable. They can be used with MD and HD lock rings, and rims.

b. The MD lock ring (which is unmarked) can be used on MD and HD rims. The combination of the MD ring and HD rim is as safe as the normal MD combination.

c. The HD lock ring (because of its greater width) will NOT fit on a MD rim.

WARNING

BEFORE attempting to remove the tyre from the rim DEFLATE it COMPLETELY by removing the valve core. When fully deflated; prise the split locking ring out of the rim groove and remove the detachable side ring. The tyre and tube can then be removed from the rim.

When replacing the tyre EXTREME care MUST be taken to ensure that the locking ring is correctly locked in the rim groove. Note that a HD lock ring will NOT lock to a MD rim. Do NOT inflate the tyre until the lock ring is correctly locked, and do NOT bend over the tyre while inflating.

412. Where personnel are concerned with dismantling a number of wheels it is necessary in view of the degree of interchangeability of the components that a procedure be followed to eliminate unnecessary work. Because the HD lock ring will not fit a MD rim, and a MD lock ring will fit a HD rim the situation could arise where on assembling a number of wheels, personnel could have left for assembly components that are incompatible ie, HD lock rings to MD rims. This situation can be avoided when:

a. Dismantling Wheels. Marking with chalk, crayon or by any suitable means all HD lock rings and rims.

b. Assembling Wheels. Assemble all marked components first, this will leave for assembly unmarked (MD) components that are compatible.

413. The spare wheel (Fig 56) is bolted to a bracket and winch assembly which is mounted on the LH side frame member behind the cab. The wheel is raised or lowered with the aid of the winch which is operated with the engine crank handle.

414. Dismounting the Spare Wheel. To dismount the spare wheel:

a. Ensure that the pawl is engaged in the winch ratchet.

b. Remove the two nuts from the studs on the locking bar.

c. Engage the end of the engine starting handle with the winch shaft and turn clockwise far enough to allow the pawl to be disengaged from the winch ratchet.

d. Turn the winch shaft anti-clockwise until the wheel is on the ground.

e. Pay out enough winch cable to permit the removal of the locking bar from the wheel.

415. To mount the spare wheel in its bracket reverse the procedure detailed in para 414.

416. Changing a Wheel. To change a wheel:

a. Loosen the ten wheel nuts.

b. Jack up under the axle in the normal manner.

c. Dismount the spare wheel.

d. Carefully remove the unserviceable wheel from the hub, keeping it upright until clear of the hub.

e. Set the spare wheel upright near the hub, adjust vehicle height so that the stud holes in the wheel are just below the wheel studs. Use two tyre levers under the wheel to lift it on to the studs.

f. Replace the wheel nuts and screw on as far as they will go without applying tension. Lower the jack and tighten wheel nuts.

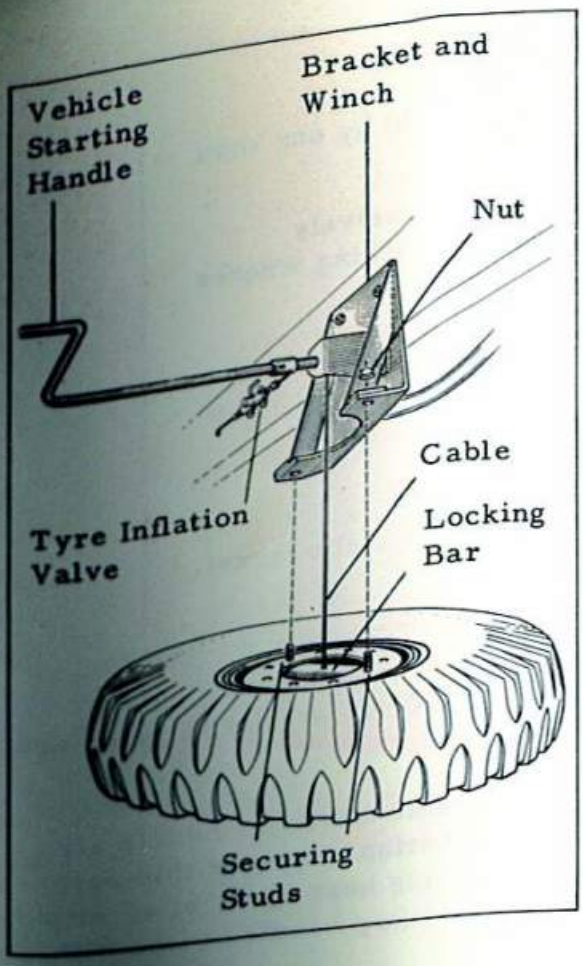


FIG 56
SPARE WHEEL BRACKET AND WINCH ASSEMBLY

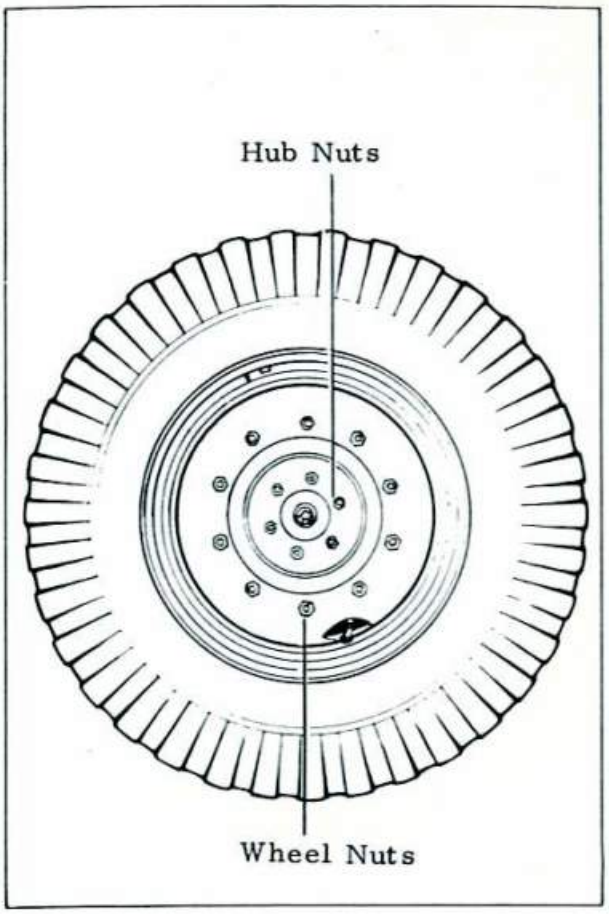


FIG 57
WHEEL

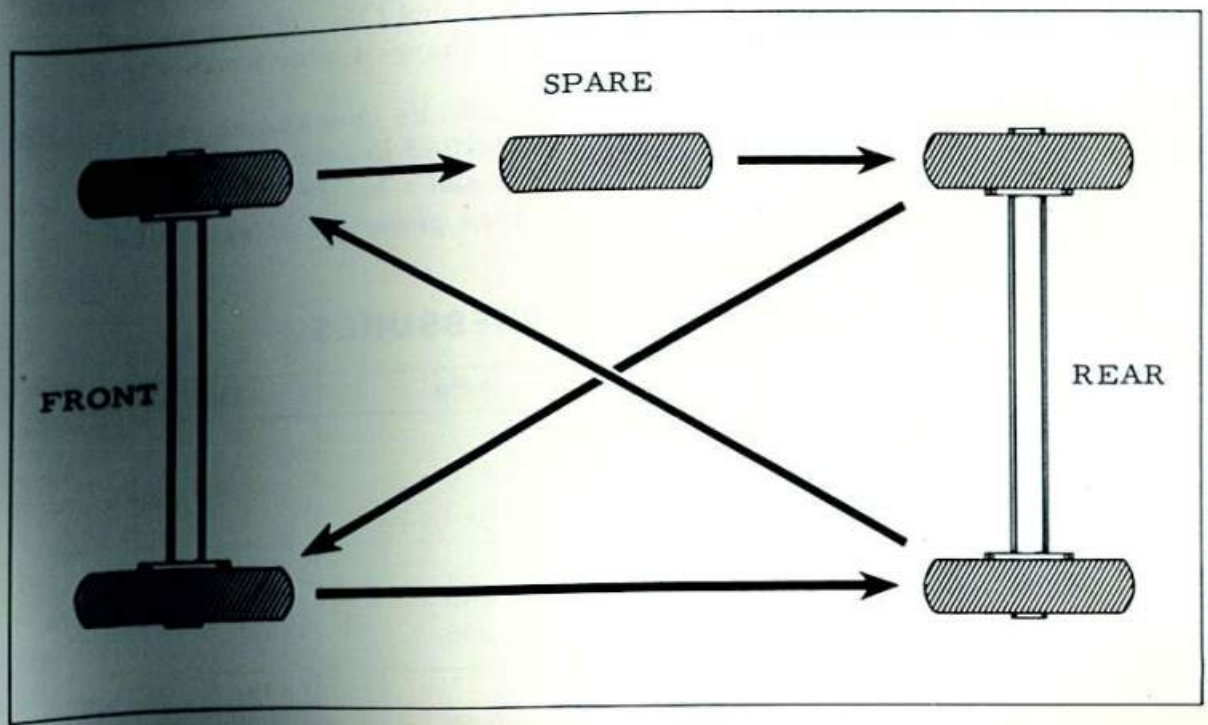


FIG 58
WHEEL ROTATION SEQUENCE

NOTES

1. Changing a wheel can be completed by one man after some practice.
2. When replacing wheel nuts, successively tighten opposite nuts to prevent cocking wheels on studs.
3. Never use oil on wheel nuts or studs.
4. After a wheel has been replaced, check wheel nuts at frequent intervals for security.
5. Periodically tighten all wheel nuts.
6. Periodically lubricate the spare wheel bracket and winch assembly.

Tyres

417. The non-directional cross country tread, 12 ply rating tyres are size 12.00 x 20.

418. Air Supply. Compressed air is available from the vehicle air brake system for inflating tyres. The tyre inflation valve for this purpose is located above the spare wheel. A tyre inflating hose is supplied with the vehicle. After use the valve must be closed (tap handle in line with air pipe line) and the cover replaced.

419. Tyre Condition Checks. Tyres should be inspected frequently for cuts and tread wear. Pad cuts, uneven tread wear or worn tyres must be reported immediately. All stones, thorns, and nails, must be removed from the tyres as soon as possible. Wheels should be rotated periodically to even up tyre wear. The wheels should be changed over as in Fig 58.

420. Tyre Pressure Checks. Tyres should be checked at regular and frequent intervals and maintained at the specified pressure. Check pressure when the tyres are cool. Do not bleed a hot tyre. Use an accurate tyre pressure gauge. Incorrect tyre pressure affects tyre mileage, steering, and manoeuvrability.

TABLE 14 - TYRE PRESSURES

	kPa	Deflection
Highway running (with payload):		
Front	360	13 per cent
Rear	460	
Cross country:		
Front	240	18 per cent
Rear	300	
Mud and Sand:		
Front	170	22 per cent
Rear	230	

421. Servicing. Periodically service:

a. Tyres (66).

b. Wheels (67).

SECTION 26
STEERING

Description

422. The steering system provides the driver with a means of turning the front wheels (steering) to change the direction of vehicle movement. It consists of a steering wheel and column, connected through a steering box to the pivoted front wheels by means of a mechanical linkage.

423. Steering arms are attached to the top of both the CV joint outer housings and are connected by a tie rod. A drag link is connected between the RH steering arm and the pitman arm mounted on the steering box.

424. The steering box is of the cam and twin peg type, with a gear ratio of 24:1. The steering is self centring ie, when a turn is completed and the steering wheel is released, it will spin back until the wheels are in the dead ahead position.

425. When the front wheels are centred for straight ahead travel, the position of the steering wheel as viewed from the driver's seat, is such that the handgrips between each pair of spokes are at 3 and 9 o'clock respectively. This gives an easy check of steering accuracy and affords the driver a clear view of the instrument panel.

426. For LH or RH turns the turning circle is 19.5 m between walls this is $6\frac{1}{4}$ revolutions of the steering wheel from lock to lock.

Servicing

427. The approved lubricant for use in the steering box is Oil OEP-600. The oil level should be maintained up to the filler plug hole. The filler plug is located on top of the steering box housing, which is immediately below the RH headlight. Access to the filler plug can be gained through the aperture in the front panel below the headlight.

428. Periodically service:

a. Steering box (68).

b. Drag link (69) - 2 grease nipples.

c. Tie rod (70) - 2 grease nipples.

SECTION 27
WINCH GEAR

Description

429. The winch controls are located in the cab (Fig 10) and winch operating instructions are detailed in Section 28. The winch gear consists of:

a. Winch assembly,

b. Front and rear fairleads,

c. Winch rope support brackets and guides, and

d. Control equipment.

430. Winching can be carried out to the front as well as to the rear of the vehicle. Where possible, heavy winching should be undertaken to the rear because frictional losses are high when winching to the front.

431. The maximum safe working load is 9.08 t. The worm (input) shaft of the winch is fitted with a driving flange which is coupled to the power take-off shaft of the transfer case by a propeller shaft.

432. Winch Assembly. The winch is mounted to two support members which are bolted to brackets fitted to the inside faces of the frame side members. It is located across the frame between the rear springs and the transfer case. The winch has a rated capacity of 9.08 t (for the first layer of rope on the drum). It is enclosed in an alloy housing and is fitted with:

a. A RH worm shaft and worm gear with a reduction ratio of 29:1;

b. A dog clutch;

c. An overload protection device; and

d. An automatic safety brake.

433. Winch Dog Clutch. This clutch engages or disengages the winch drum to/from the winch drive shaft. It is located in the winch housing and is actuated by an air cylinder mounted on the winch front support member. The air cylinder is connected to the vehicle compressed air system and is controlled by the winch control valve located in the cab. A lubrication nipple is fitted to the LH end of the drum shaft.

434. Winch Overload Protection Device. A shear pin is fitted in the winch drive line to ensure that neither winch gear nor winch rope is overloaded. The pin is designed to shear when rope tension exceeds 9.08 t when winching on the bottom layer of the drum, and at approximately 4.5 t when winching on the top layer. The pin keys the driving flange to the winch worm shaft. If the pin shears the driving flange is not keyed to the worm shaft and the drive is not transmitted. A grease nipple is

fitted to the driving flange to enable lubrication of the bearing surface between the driving flange and the worm shaft even though they do not normally move in relation to one another.

435. Winch Automatic Safety Brake. This spring loaded brake operates on a drum keyed to the worm shaft. The spring tension relaxes when the winch is pulling or raising a load, and tightens when the winch drum stops, or is reversed. The brake automatically holds a load when the winch is stopped, and prevents reverse rotation of the drum when the power take-off control lever is in the 'Disengaged' position. When properly adjusted the brake will hold any load within the rated capacity of the winch.

436. Winch Rope. The winch is equipped with a wire rope 76 m long and 16 mm in diameter. It is a special round strand bright steel (1770 MPa) of 6/26 Warriflex construction, right hand ordinary lay, preformed with an independent wire rope core. The free end of the rope is fitted with a thimble and wire rope clamp. A single chain sling and D-shackle, proved to 9 t, is also provided. The run of the rope for front and rear winching is illustrated in Fig 60.

437. Front Fairlead. This consists of two vertical pulley assemblies and a horizontal pulley assembly. The brackets of the vertical pulley assemblies are bolted to the top of the front bumper bar just above the LH, towing dee. The bracket on which the two horizontal pulleys are mounted, is bolted to the LH frame side member, behind the vertical rollers. A grease nipple is fitted to each of the four shafts which carry a pulley.

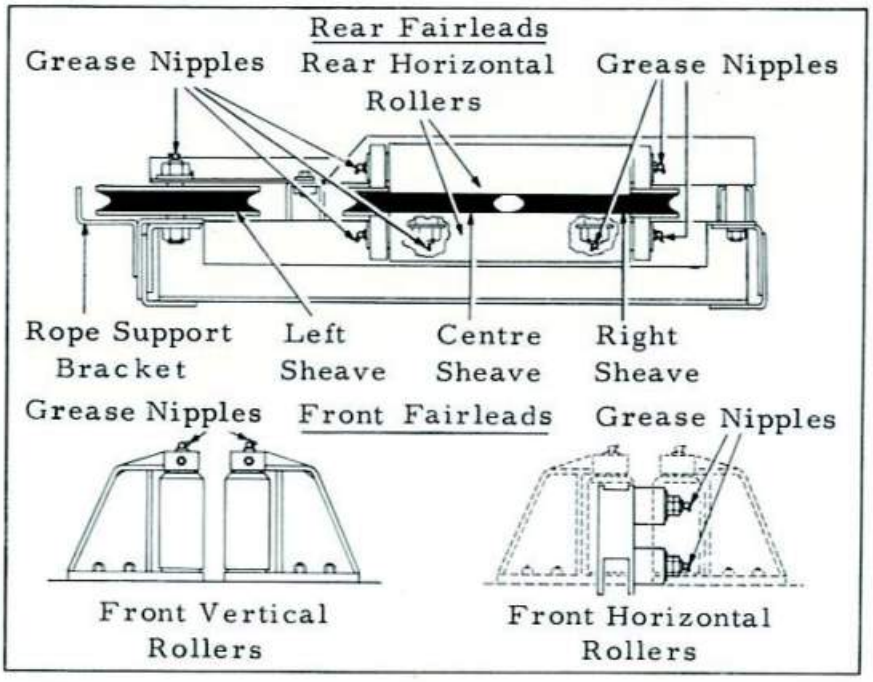


FIG 59
FAIRLEADS

438. Rear Fairlead. This assembly is bolted to the rear of the vehicle frame. The three sheaves are mounted between the top and bottom plate of the assembly frame, and the two horizontal rollers are mounted across the rear of this assembly, one above the other. A grease nipple is fitted to each end of the two shafts which carry the rollers, and to the bottom end of the shafts which carry the right and centre sheaves, and to the top end of the shaft which carries the left sheave.

439. Winch Rope Support Brackets. Four rope support brackets are located along the outside face of the LH frame side member. The rear bracket is mounted at the left side of the LH sheave.

440. Winch Air Valve. This hand lever operated air valve is located on the rear wall of the cab, behind the left edge of the driver's seat. A plate affixed to the wall above the valve shows the positions of the valve control lever. When the lever is raised to the limit of its travel the valve is open and air pressure is applied to the air cylinder which engages the winch dog clutch. When the control lever is fully depressed the winch dog clutch is disengaged.

441. Power Take-off Control Lever. This lever is located in the cab to the rear of the engine access cover. To engage the power take-off, lift the catch fitted below the knob at the top of the lever, and move the lever to the rear, to the limit of its travel.

Servicing

442. The approved lubricant for use in the winch gear case is Oil 0-182 (OMD-330) and the refill capacity is 2.5 litres. The drain plug and filler plug are accessible from the LH side of the vehicle below the frame side member. The plugs are located one above the other on the rear end of the casing. The oil level should be maintained level with the bottom of the filler plug hole. To change the oil in the gear case remove both plugs and allow the case to drain. Replace the drain plug and fill with new oil to the correct level; replace the filler plug.

443. Periodically service:

a. Winch gear case (71) (72)

b. Winch worm shaft (73)

c. Winch drum shaft (74)

d. Winch dog clutch (air cylinder linkage) (75)

e. Fairleads (76) (77)

f. Winch rope support brackets (78)

g. Winch rope (79)

h. Power take-off control linkage (51)

i. Winch air lines (80)

SECTION 28
WINCHING INSTRUCTIONS

General

444. Winching to the front or to the rear can be carried out with not more than a 45° deflection to either side, a 15° elevation, or a 45° depression. Because frictional losses are high when winching to the front, heavy winching, where possible, should be carried out to the rear of the vehicle.

445. Self Recovery. When winching to the front for self-recovery the engine may be used to assist the winch by driving the road wheels. Either HIGH or LOW 4 WHEEL DRIVE may be used. When winching to the rear for self recovery the transfer case MUST be kept in NEUTRAL throughout the winching operation as the engine cannot be used to assist the winch by driving the road wheels.

Rope Route

446. The route of the rope for winching to the rear, and to the front is illustrated in Fig 60. To run out the rope for winching to the rear:

a. Lead the rope from the winch to the rear fairlead assembly;

b. Pass the rope between the centre, and RH sheaves; and

c. Then between the horizontal rollers to the rear of the vehicle.

447. To run out the rope for winching to the front:

a. Proceed as detailed in para 446a and b;

b. Place the rope in the groove of the centre sheave and continue around the sheave to the LH sheave;

c. Pass the rope between the LH sheave and the rear rope support bracket (ensure that the rope is in the groove of the sheave);

d. Then along the outside face of the frame LH side member, supporting the rope in the other three rope support brackets, to the front fairlead assembly;

e. Lower the brushguard;

f. Pass the rope out to the front of the vehicle after placing it between the two horizontal, and two vertical pulleys of the fairlead assembly; and

g. Raise and secure the brushguard.

Preparation for Winching

448. The vehicle should be stationary with the handbrake applied and the engine running. The gearbox and transfer case levers should be in the NEUTRAL position. If a low air pressure warning (light/buzzer) is

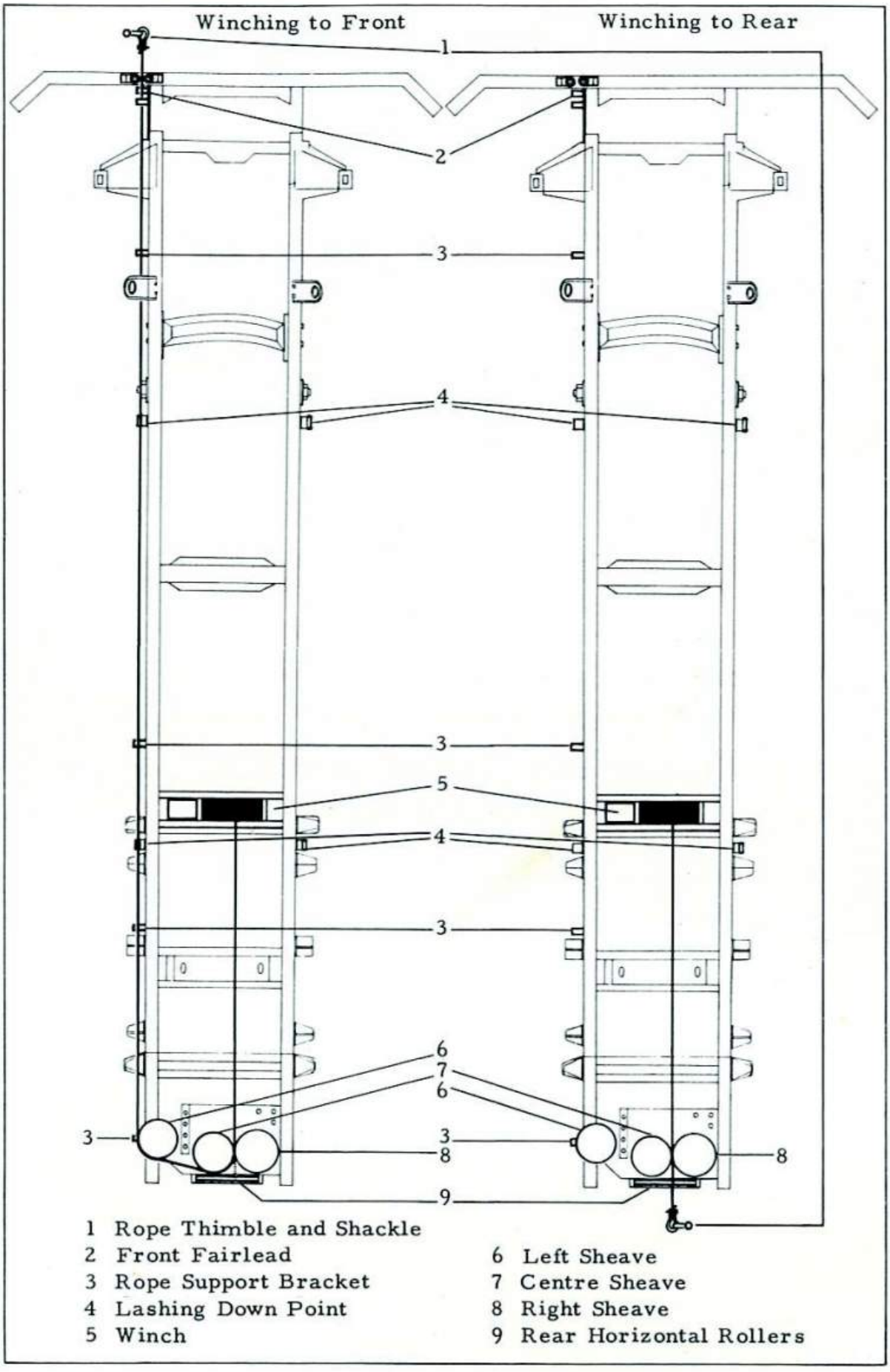


FIG 60
ARRANGEMENT FOR FRONT AND REAR WINCHING

given wait until the necessary air pressure is attained and:

a. Lift the catch at the top of the Power take-off lever and move the lever to ENGAGED; and

b. Move the winch air valve (dog clutch) control lever to DISENGAGE.

449. If the dog clutch fails to disengage:

a. Disengage vehicle clutch,

b. Engage REVERSE gear,

c. Engage the vehicle clutch just long enough to rotate the power take-off shaft for several revolutions, and

d. Disengage the vehicle clutch and engage NEUTRAL.

450. If the dog clutch still fails to disengage repeat the procedure detailed in para 449 but use FIRST gear instead of REVERSE. Be careful that the winch rope is not pulled in too far.

451. When the dog clutch disengages, pull out the winch rope to the required position by hand. The route of the rope for front and rear winching is described in para 446 and 447.

CAUTION

The winch rope should NOT be paid out under power except when circumstances leave no alternative.

NOTE

If it is thought a rope load approaching 9 t may be encountered, pull out the rope until winching can be carried out with the bottom layer of rope on the drum. This is necessary because the shear pin will shear with a rope load of 4.5 t on the top layer of rope on the drum, or 6.8 t on the centre layer. A load of 9 t may be required to recover a fully laden vehicle bogged to chassis depth, on level ground.

Winching with Vehicle Stationary

452. The vehicle prior to commencing to winch in a load will be as described in para 448 ie, it will be stationary with the engine running and the handbrake applied. The gearbox and transfer case will be in NEUTRAL, the power take-off lever will be at ENGAGE and the winch air valve lever (dog clutch) will be at DISENGAGE.

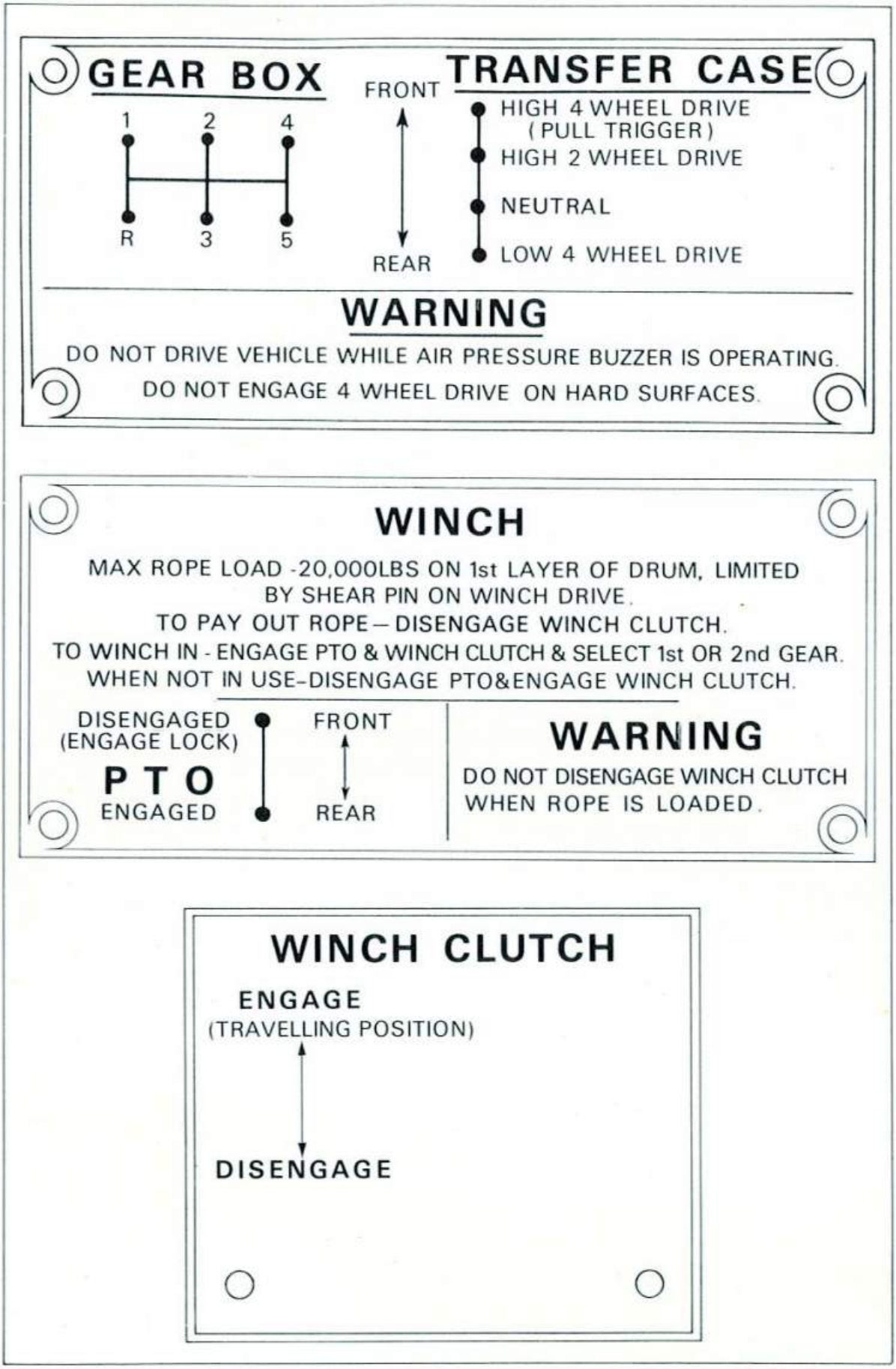


FIG 61
INSTRUCTION PLATES

453. When the all-clear signal to commence winching is received:

a. Move the winch air valve lever from DISENGAGE to ENGAGE;

b. Disengage vehicle clutch;

c. Engage FIRST or SECOND gear and engage vehicle clutch;

d. Disengage the vehicle clutch and return gearbox to NEUTRAL on completion of winching.

454. A delay of several seconds may occur before the winch drum commences to turn. This is normal, and is due to the time required to take up the backlash in the winch dog clutch.

NOTE

A gear higher than SECOND should not be selected, except for very light loads.

If the shear pin shears the load MUST be reduced either by pulling out the rope and winching on the bottom layer of rope on the drum, or by the use of a pulley block and tackle on the winch rope.

Do NOT disengage the winch dog clutch whilst the winch rope is under load.

Do NOT resume running the vehicle without ensuring that the power take-off lever is in the DISENGAGED position.

Winching to the Front for Self Recovery

455. The engine may be used to drive the road wheels and assist the winch when winching to the FRONT for self recovery. When the all-clear signal is received:

a. Move the winch air valve lever from DISENGAGE to ENGAGE;

b. Disengage vehicle clutch;

c. Engage FIRST or SECOND gear;

d. Move transfer case lever to HIGH or LOW 4 WHEEL DRIVE;

e. Engage vehicle clutch exercising extra care in taking up the strain; and

f. Disengage the vehicle clutch and return transfer case to NEUTRAL on completion of winching.

CAUTION

Do NOT engage transfer case drive if winching to the REAR.

456. Releasing a Load. To release a load:

a. Disengage vehicle clutch;

b. Engage REVERSE gear;

c. Engage vehicle clutch just long enough to ease the tension on the rope sufficiently to be able to release the load; and

d. Disengage vehicle clutch and return gearbox lever to NEUTRAL.

Completion of Winching

457. Winching in the Winch Rope. Carry out the procedure given in para 452 and para 453 a to d. The rope should always be wound in under load. If no load is being winched, one or two persons should pull against the rope as it is being winched in.

458. If on the completion of winching, the winch rope shackle is at the front of the vehicle, secure it to the RH towing Dee on the front bumper bar, and

a. Disengage the vehicle clutch;

b. Return gearbox to NEUTRAL;

c. Return power take-off lever to DISENGAGED;

d. Move the transfer case lever to the required drive position, ready to move off, and

e. Engage the vehicle clutch.

CAUTION

The winch air valve lever should always be kept in the ENGAGE position, and the power take-off lever in the DISENGAGED position when winching operations are not being carried out.

Shear Pin Replacement

459. The winch incorporates an automatic, self energizing safety brake which holds the load when the vehicle clutch is disengaged. The brake ONLY operates when the winch dog clutch is at ENGAGE. If the shear pin shears, do NOT move the winch air valve (dog clutch) lever from the ENGAGE position, or the safety brake will release the load. To replace the shear pin:

a. Disengage vehicle clutch and move gearbox to NEUTRAL;

b. Move the power take-off lever to DISENGAGED;

c. Remove the lock wire from the head of the shear pin (on the collar of the driving flange on the winch housing side) and remove the pin;

d. Rotate the power take-off (propeller) shaft by hand to align the holes in the flange collar with those in the winch worm shaft (Do NOT release the winch dog clutch for this purpose);

e. Insert a punch through the smaller hole in the collar and tap out the shank of the shear pin through the larger hole;

f. Fit a new shear pin and secure with a lock wire;

g. Disengage the vehicle clutch, move the power take-off lever to ENGAGED, and the gearbox lever to REVERSE;

h. Engage the vehicle clutch and gently pay out the rope until the load is removed; and

i. Lighten the load before resuming winching.

SECTION 29
VEHICLE OPERATING INSTRUCTIONS

General

460. This section details the use of the driving controls under all operating conditions. The controls and instruments have been previously described under the systems in which they operate, but for convenience this information has been consolidated and included in this section.

461. Details of the servicing duties to be carried out before, during and after operating the vehicle are contained in Section 33 Daily Servicing, and in the relevant schedule for the vehicle.

462. The schedules are:

a. MK 3 - Section 4, Insert No 51A of AB-416 (Adapted) Vehicle Log Book, and

b. MK 4 - Section 4, Insert No of AB-416 (Adapted) Vehicle Log Book.

Cold Weather Pre Start Drill

463. It is possible to start the engine with the starter motor at temperatures in the range -24 to -35°C if the engine is properly lubricated and in good mechanical condition. First 'break' the engine by cranking it with the starting handle. Every effort should be made to avoid having the engine fire a few times and then stop.

464. At temperatures below -35°C the vehicle should NOT be left in the open if this can be avoided, and should be in a position sheltered from wind. When not running the engine should be kept covered. Failing anything warmer, use a tarpaulin or a tent.

465. Place an oil stove, fire pots, or four or five hurricane lanterns under the covering about three hours prior to the time a start is to be made. If the engine does not appear to be getting enough fuel, lightly heat the fuel pipes as it is possible that ice has collected in them. Care must be taken to avoid the risk of fire.

466. Starting and Stopping the Engine. If applicable carry out the cold weather pre-start drill (refer para 463 to 465 incl) before proceeding with the pre-start check.

467. Pre-start Check. Before starting the engine check:

a. The fuel level in the fuel tanks. Use the dipstick which is stowed in clips on the cab wall behind the co-driver's seat. Replenish tanks as required.

b. The engine oil level. Use the dipstick located in a scabbard on the LH side of the engine. Add oil as required.

c. Coolant level in radiator. Remove the radiator cap and check level. Add water as required.

d. Controls. The controls should be positioned:

(1) Handbrake. Applied

(2) Gearbox (lever) NEUTRAL

(3) Power take-off (lever) DISENGAGED

(4) Transfer case (lever). Normally at HIGH 2 WHEEL DRIVE, but conditions may necessitate selection of other drive eg, LOW 4 WHEEL DRIVE.

468. Starting Sequence. To start a cold engine:

a. Move the ignition switch to ON (The low air pressure warning should be given immediately if the pressure in the system is less than 60 lb/in^2 (415 kPa));

b. Disengage the vehicle clutch to lighten the starting load;

c. Pull the choke control knob all the way out. The choke automatically operates the throttle;

d. Move the starter switch to ON (Mk 3) or press the starter button (Mk 4);

e. Move the starter switch to OFF (Mk 3) or release the starter button (Mk 4) as soon as the engine starts. Do NOT operate the starter continuously for more than five to ten seconds. Pause for ten seconds before reoperating the starter. If the engine will not start, or if the starter fails to operate correctly refer Serial 1 Table 17;

f. After the engine has started, slowly engage the vehicle clutch;

g. Adjust the hand throttle and choke controls to maintain a fast smooth idling speed until the engine warms up; and

h. Push in the choke control as soon as the engine is running smoothly.

469. To restart an engine that has been warmed up to operating temperature repeat the foregoing procedure but do not use the choke as detailed in para c.

470. Stopping the Engine. Increase the engine speed; switch off the ignition and release the throttle at the same time. As the engine slows to a stop, it will exhaust all the residual products of combustion which include water vapour, and leave only air and petrol vapour in the engine.

471. Action Before Moving Off. Before moving off check:

a. Tyres;

b. Security of all vehicle parts and of load;

c. Windscreen wipers, horn, and lights (including turn indicator lights);

d. Windscreens and windows for cleanliness;

e. Oil Pressure Gauge. Pointer should be at approximately three quarter scale when engine running at normal speeds.

f. Ammeter. With the engine running at fast idling speed a positive reading should be indicated.

g. Fuel Gauges. Gauge switch UP to obtain a reading for the LH fuel tank and DOWN for the RH tank. Compare readings with those obtained with dipstick (refer para 467a).

h. Temperature Gauge. Pointer should indicate between 90 and 180°F (32 and 87°C) after the engine has been running for some time.

i. Fuel Cock. Ensure that pointer indicates cock is set to the required fuel tank.

j. Air Pressure Gauge. Do not move off until the low air pressure warning ceases, and the gauge indicates a pressure of at least 60 lb/in^2 (415 kPa).

k. Listen for any unusual noises, and

l. Record speedometer reading.

Gear Selection-Gearbox and Transfer Case

472. An instruction plate on the cab fascia panel (and reproduced at Fig 62) shows the gate diagram for the various gears of the gearbox, and the drive combinations of the transfer case. The gearbox lever can be moved to any one of seven positions; NEUTRAL, 1, 2, 3, 4 and 5, (these are the five forward gears), and REVERSE. The transfer case lever can be moved to any of four positions; LOW 4 WHEEL DRIVE, NEUTRAL, HIGH 2 WHEEL DRIVE, and HIGH 4 WHEEL DRIVE (PULL TRIGGER).

473. Rapid movement of the gearbox or transfer case lever (particularly the gearbox lever) should be avoided. Movements of the gearbox lever should be unhurried to allow the synchronizing mechanism to function correctly. Rapid movements may damage the gears.

474. Road speeds, based on engine rev/min and the gear and transfer case ratio selected are given in Table 15. This table will be of assistance in determining the correct speeds at which to change gear.

475. The procedure for changing up is the same as for changing down, except that the engine speed is not increased.

TABLE 15 - COMPARATIVE ROAD SPEEDS BASED ON ENGINE SPEED, AND GEAR AND TRANSFER CASE RATIO SELECTED

Engine Speed	Transfer Case Ratio	Gear Selected				
		1	2	3	4	5
(rev/min) 1000	LOW	km/h 1.6 (1)	km/h 3 (2)	km/h 4.5 (3)	km/h 8 (5)	km/h 11 (7)
	HIGH	4 (2.5)	7 (4.5)	12 (7.5)	20 (12.5)	28 (17.5)
1500	LOW	2.5 (1.5)	4 (2.5)	7 (4.5)	12 (7.5)	17 (10.5)
	HIGH	6 (3.5)	10.5 (6.5)	18 (11)	30 (18.5)	42 (26)
2000	LOW	3 (2)	5.5 (3.5)	9.5 (6)	16 (10)	22.5 (14)
	HIGH	8 (5)	14 (9)	22.5 (14.5)	40 (25)	55 (35)
3000	LOW	4.5 (3)	8.5 (5)	14 (9)	24 (15)	34 (21)
	HIGH	11.5 (7)	21 (13)	35.5 (22)	60 (37)	84 (52)
3750	LOW	6 (3.5)	10.5 (6.5)	18 (11)	30 (18.5)	42 (26)
	HIGH	14.5 (9)	26.5 (16.5)	44.5 (27.5)	74.5 (46.5)	105 (65.5)
	(Figures in parenthesis are speed equivalents expressed in mile/h)					

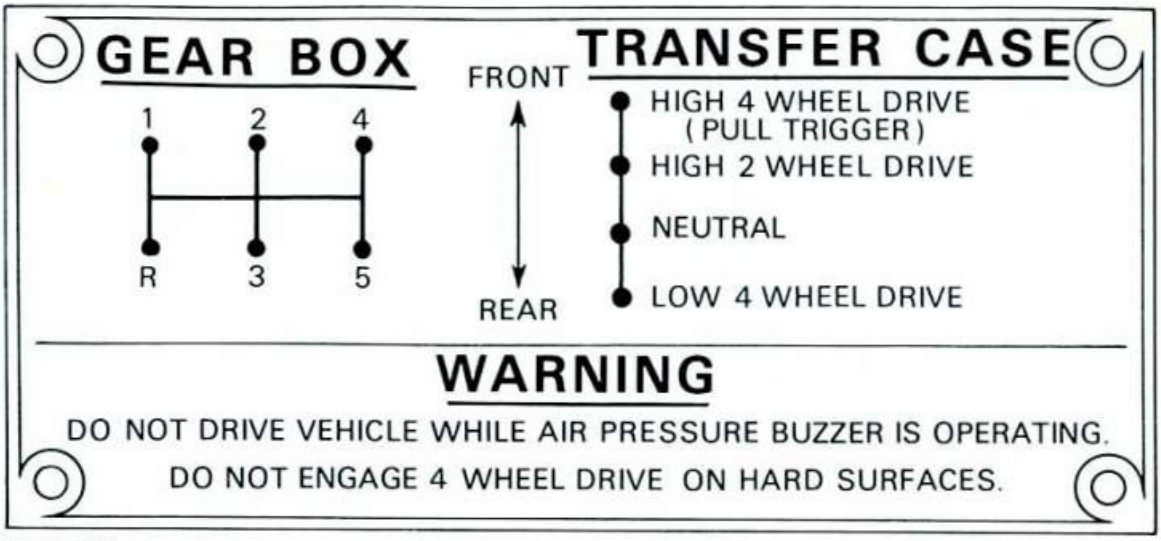


FIG 62
INSTRUCTION PLATE

CAUTION

Do NOT ride the clutch; the driver's foot should be on the clutch pedal ONLY when he is operating it. The clutch MUST be disengaged fully to avoid gear damage and changing difficulties. Every effort MUST be made to prevent sudden shock to driving parts.

Do NOT engage the clutch suddenly; particularly if the vehicle is rolling backwards. The vehicle should be held with the brake or by chocking the wheels if starting on a slope.

Do NOT coast down grade either with the transmission in NEUTRAL or with the clutch disengaged as this practice reduces gear bearing lubrication and can cause gear seizure.

Do NOT coast with the clutch disengaged and with the transmission in gear, particularly in LOW RATIO, as this permits the clutch to be driven by the vehicle at an excessive speed and the resultant centrifugal force may disentegrate the clutch plate.

Gear Changing - Gearbox and Transfer Case

476. Practice will enable a driver to judge when a gear change should be made. An engine should never be permitted to over speed or labour unduly when a gear change will improve operation.

477. All forward gears except FIRST are synchromesh. It is advisable to double de-clutch when changing down from any gear, particularly when changing on a steep grade. To double de-clutch when changing down:

a. Disengage the vehicle clutch;

b. move the gear lever to NEUTRAL and hold it there;

c. engage the vehicle clutch, and at the same time increase the engine speed to suit engagement of the lower gear;

d. disengage the vehicle clutch;

e. move the gear lever into position for the lower gear; and

f. engage the vehicle clutch and REMOVE the foot from the clutch pedal.

478. Double de-clutching should be used when changing gears in the transfer case. Because the difference in ratio between the two (HIGH and LOW) gears in the transfer case is considerably greater than between any two gears in the gearbox, a change down in the transfer case, should, whenever possible, be made with the gearbox in FIFTH, and in any case should NOT be attempted at speeds in excess of:

a.	FIFTH gear	42 km/h	(26 mile/h)
b.	FOURTH "	30 km/h	(18.5 mile/h)
c.	THIRD "	18 km/h	(11 mile/h)
d.	SECOND "	10.5 km/h	(6.5 mile/h)
e.	FIRST "	6 km/h	(3.5 mile/h)

479. To change down from HIGH (4 WHEEL or 2 WHEEL DRIVE) to LOW 4 WHEEL DRIVE:

a. Disengage the vehicle clutch;

b. move the transfer case lever to NEUTRAL and hold it there;

c. engage the vehicle clutch, and at the same time increase the engine speed to suit engagement of the lower gear;

d. disengage the vehicle clutch;

e. move the transfer case lever to LOW 4 WHEEL DRIVE; and

f. engage the vehicle clutch and REMOVE the foot from the clutch pedal.

480. When engaging LOW 4 WHEEL DRIVE, the first part of the lever travel (from NEUTRAL) engages REAR WHEEL DRIVE and the second part FOUR WHEEL DRIVE. Sometimes, due to misalignment of the dog teeth, only the first part of the travel will be completed, and it is necessary to maintain moderate pressure on the transfer case lever until the full travel is completed. If the full travel is not completed, the lever, when released, will return to NEUTRAL.

481. To change up in the transfer case move the transfer lever to either HIGH 2 WHEEL DRIVE, or lift the catch on the lever and move the lever to HIGH 4 WHEEL DRIVE.

482. The procedure for changing up in the gearbox and transfer case is identical to that given for changing down, except that the engine speed is not increased (refer para 477c and 479c).

483. Sometimes difficulty may be experienced in disengaging four wheel drive, particularly on firm ground. If this occurs, excessive force should not be used, but with the vehicle still in motion, a moderate pressure should be maintained on the transfer case lever until four wheel drive is disengaged.

> **CAUTION**
>
> Avoid using four wheel drive on hard surfaces since this results in needless tyre and transmission wear.

Moving Off

484. Before moving off, either on level ground or on a grade ensure that the checks detailed in para 471 (Action Before Moving Off) have been carried out.

485. Moving Off - Level Ground. To move off on level ground:

a. Check that the transfer case lever is at the HIGH 2 WHEEL DRIVE position;

b. disengage the vehicle clutch;

c. move the gear lever to the FIRST gear position;

d. simultaneously; release the handbrake and engage the clutch, gradually and evenly, and depress the accelerator pedal to increase engine speed, taking care not to over-speed the engine.

486. Moving Off on a Grade. To move off on a grade of less than 1 in 4 (14° slope):

a. Check that the transfer case lever is at the HIGH 2 WHEEL DRIVE position;

b. disengage the vehicle clutch;

c. move the gear lever to the FIRST gear position;

d. apply the footbrake and release the handbrake;

e. simultaneously; engage the clutch and release the footbrake gradually, at the same time increase engine speed using the hand throttle.

487. To move off on a grade steeper than a 1 in 4 slope, move the transfer case lever into the LOW 4 WHEEL DRIVE position and proceed as detailed in para 486 b to e.

Checks During Running Periods

488. An accident may be avoided or serious damage to a vehicle prevented, if the driver keeps constantly alert for signs of defects which may develop while the vehicle is in motion.

489. He should note the operation of the various controls, and maintain a running check on all instruments, with periodic glances first at one instrument then another, to note the reading of each so that during a short interval, all the readings have been taken. Check that the:

a. Ammeter. Indicates a charge rate (positive reading).

b. Oil Pressure Gauges. The oil pressure reading indicates on the:

(1) Mk 3 Gauge. Should be in the RUN segment of the scale; and

(2) Mk 4 Gauge. Should be between 40-70 lb/in^2 (280-490 kPa).

c. Fuel Gauge. Should indicate sufficient fuel in each tank.

d. Temperature Gauge. The temperature reading indicated on the:

(1) Mk 3 Gauge. Should be about halfway along the scale; and

(2) Mk 4 Gauge. Should be between 90 and 180°F (32 and 82°C).

e. Tachometer (Not fitted to Mk 3). As for, and used in conjunction with the Speedometer.

f. Clutch. Is not slipping.

g. Footbrake. Operates after about approx 25 mm free travel.

h. Steering. Positive with no excessive free play.

i. Horn. Is operating.

490. Should the readings of any of the instruments indicate a malfunction of a serious nature, eg, drop in oil pressure, the vehicle should be stopped and the malfunction reported immediately.

491. During running periods the driver should listen for any unusual sounds from the transmission, transfer case, rear and front differentials. If present these should be reported. Listen for rattles and squeaks and try to locate them, so that at a halt or last parade, loose items may be tightened or lubricated to eliminate squeaks (Refer Table 23, Section 33).

492. Stopping the Vehicle. To stop the vehicle:

a. Release the accelerator pedal;

b. apply the footbrake;

c. disengage the clutch when the engine reaches idling speed (and BEFORE it stalls);

d. move the gear lever to NEUTRAL; and

e. when the vehicle stops, apply the handbrake, release the footbrake and stop the engine as required.

Cross-Country Running

493. During cross country running wear and tear on the vehicle can be lessened by careful driving, selection of routes, and by avoiding difficult obstacles. Various drive combinations are provided to facilitate negotiation of steep gradients, broken ground, loose soil, and soft going offering heavy resistance. Consistent with conditions; avoid high engine speeds, and use the highest suitable gear.

494. Uneven ground which may belly the vehicle should be avoided. Ditches should be negotiated slowly in low gear. They should (if possible) be crossed at right angles, keeping the front wheels in the dead-ahead position.

495. Traction Aids. Chains (provided with the vehicles and) maintained in a serviceable condition should always be carried on the vehicle. The chains should be:

a. Correctly adjusted to facilitate fitting;

b. fitted before the wheels become clogged, and in such a manner that rotation of the wheel tends to close the fastenings; and

c. removed immediately their use is no longer necessary, to prevent damage to tyres and roads.

496. Chains should be adjusted so that they are only tight enough to prevent fouling on any part of the vehicle. Fairly loose chains give better traction and cause less tyre wear than tight chains.

SECTION 30
TOWING

General

497. This section contains the basic principles to be adhered to when towing, and details the procedures to be followed by the driver of a towing vehicle for towing:

a. Another vehicle, and

b. a towed equipment or plant.

498. It also includes preliminary actions to be carried out prior to towing, and the procedure to be followed by the driver of a vehicle which is being tow started.

499. Gear Selection. The driver of the towing vehicle should move the gear lever to FIRST and the transfer case lever to HIGH 2 or 4 WHEEL DRIVE. If towing on soft ground or steep grades move the transfer case lever to LOW 4 WHEEL DRIVE. The driver of the towed vehicle should move the gear and transfer case levers to NEUTRAL, except when his vehicle is being tow started (refer para 504).

500. Starting. When starting to tow, the strain MUST be taken up gently, but definitely. Speed should be increased steadily to an even speed consistent with safety.

501. Steering. Changes of direction should be made gradually, if possible by a series of slight turns, keeping the vehicle under tow, as nearly as possible, directly behind the towing vehicle. Soft muddy ground is to be avoided. If it is necessary to traverse a muddy area, the drivers should be careful to straighten out both vehicles before entering it. It is more difficult to tow a vehicle at an angle than when it is following straight in tow.

502. Braking. When an equipment or plant under tow is connected by its air hoses to the palm couplings of the towing vehicle's compressed air system; application of the towing vehicle's:

a. Hand Control Valve (Located on Steering Column below Wheel). Will apply air brakes of equipment/plant under tow.

b. Footbrake. As for preceding sub-para plus brakes on all road wheels of the towing vehicle.

c. Handbrake. Will apply brakes on the rear wheels of the towing vehicle.

503. Before commencing to tow an equipment or plant reference MUST be made to the User Handbook and/or the Servicing Schedule of the towed equipment/plant to ascertain:

a. Whether any special checks are required before, and/or during the tow; and

b. whether any speed restriction or bridge classification is imposed by the towed equipment/plant.

NOTE

When towing an equipment/plant, except in the case of a standard train where the dual bridge classification is usually given, the classification of the train should normally be taken as the SUM of the separate bridge classifications of the towing vehicle and the towed equipment/plant.

504. Tow Starting. This method of starting can be used to start a vehicle with a discharged battery when slave battery starting or interconnection to another vehicle is not possible; or, a replacement battery is not available. During this operation it is of the utmost importance that each driver be alert for signals from the other, and that each keeps a watchful eye on the other vehicle. The necessity for sudden stops MUST be avoided, as normally, the towed vehicle will have only the handbrake (operating on the rear wheels) as the air pressure required to operate the air hydraulic brakes will not have been built up in the vehicle's compressed air system. The sequence to be followed (simultaneously) by both drivers is given in Table 16.

TABLE 16 - TOW START SEQUENCE

ACTION BY DRIVER OF	
TOWING VEHICLE	TOWED VEHICLE
1. Ensure engine is thoroughly warmed up.	1. Ensure engine is free by cranking it by hand for two-three revolutions.
Depending on the terrain and the load in the vehicles:	
2. Disengage clutch and select suitable low gear.	2. Engage suitable high gear. a. Release brakes; b. switch on ignition; c. choke or prime the engine; d. open the throttle slightly; e. disengage clutch.
3. Take up the strain gently but definitely by gradually engaging the clutch and increasing engine speed.	3. After the vehicle has started to move: a. Engage the clutch slowly and smoothly. b. Disengage clutch and move gear lever to NEUTRAL as soon as the engine starts. c. Push in the choke and adjust the hand throttle for fast idling of the engine until it is warmed up, and signal to the driver of the towing vehicle that the engine has started.
4. On receipt of the signal from the towed vehicle: a. Release the accelerator,	4. Apply the handbrake taking care not to impose a sudden strain on the tow rope etc, or to collide with the rear of the towing vehicle.

TABLE 16 (contd)

ACTION BY DRIVER OF	
TOWING VEHICLE	TOWED VEHICLE
b. apply the footbrake GRADUALLY (AVOID a sudden stop); c. disengage the clutch and move the gear lever to NEUTRAL; d. When the vehicle stops apply the handbrake and release the footbrake. e. Stop engine as required.	

SECTION 31
DIAGNOSIS OF FAULTS

General

505. The fault finding chart included in this section is not intended to be comprehensive; it is based on experience and not on theoretical calculations covering every imaginable contingency.

506. It contains detailed directions (on the application of general principle fault finding to the vehicle/s) which provide the driver with a practical course of action which should be followed in the case of failure of any of the principal components of the vehicle/s.

507. Faults which can reasonably be ignored until a vehicle mechanic can be consulted have not been included.

CAUTION

Do NOT attempt to carry out repairs or adjustments that are not your responsibility; but report the face IMMEDIATELY so that remedial action can be taken without delay.

508. Tables 17 to 21 apply to the Mk 3 and Mk 4 vehicles unless otherwise specified. In some cases where identical symptoms are shown by both vehicles the possible faults and the action to be taken differ. Where this occurs the vehicle identity in parenthesis (Mk 3) or (Mk 4) will be included in Column 1 of the table immediately after the symptom eg, Twin flasher lights fail to light (Mk 3), and the corresponding remarks in Column 2 and 3 apply only to the Mk 3 vehicle.

TABLE 17 - ENGINE

Ser.	Symptom	Possible Fault	Action
1.	Starter motor fails to crank engine or cranks it too slowly, (after engine cranked manually and with clutch disengaged)	a. Starter motor switch faulty.	Operate the switch several times and check whether a discharge of current is indicated by the ammeter. If not, refer to 1b and c.
		b. Discharged battery or poor connections.	Check battery and starter motor, leads for tightness. Switch on all lights, and operate starter motor switch. If the lights dim when the switch is operated, the battery is discharged. Start the engine manually or by towing and Report.
		c. Starter motor brushes or commutator dirty. Weak brush springs.	Report.
		d. Bendix gear jammed.	Report.
		e. Cracked cylinder head gasket.	Report
		f. Leaky cylinder head gasket.	Report.
2.	Starter cranks engine but engine fails to start and engine will not start when cranked manually.	a. Controls incorrectly set:	Check and reset.
		(1) Fuel turned off.	Turn fuel tap to correct setting.
		(2) No fuel in tanks.	Replenish fuel tanks.
		(3) Incorrect setting of choke and throttle controls.	Set controls correctly.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
2.	(Contd)	b. Engine very cold.	Crank manually then try starter again. Start by towing if necessary or drain radiator and fill with warmed coolant.
		c. No spark or weak spark at plugs due to:	
		(1) Loose low tension leads at ignition switch, distributor and/or coil.	Check all leads and connections, clean and tighten.
		(2) Cracked rotor.	Report.
		(3) Dirty or pitted breaker points or points not opening.	Report.
		(4) Faulty condenser.	Report.
		(5) Faulty coil.	Report.
		(6) Condenser terminals loose.	Tighten. If fault not remedied Report.
		(7) Loose connections in primary circuit causing a voltage drop.	Tighten. If fault not remedied Report.
		(8) Secondary wires defective or wet, causing current leak.	Check and dry. If fault not remedied Report.
		(9) Faulty distributor cap.	Clean exterior and check for cracks. If no improvement Report.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
2.	(Contd)	d. With good spark at plugs, fault due to:	
		(1) Excessive use of choke.	To start engine under these conditions fully depress the accelerator pedal and push choke knob right in. Crank the engine with the starter for periods of about 5-10 seconds.
		(2) Operating the accelerator when the engine is not running.	
		(3) No fuel in carburettor due to blocked fuel tank vent, dirty air cleaner, or blocked fuel lines.	Clear obstruction in vent, and air cleaner. Report blockage.
		(4) Fuel pipes leakage between pump and tank, causing pump to suck air.	Tighten all fuel pipe connections. If leak still suspected, Report.
		(5) Fuel pump faulty.	Report.
		(6) Water or dirt in the carburettor.	Report.
		(7) Silencer clogged	If obstruction not easily removable, Report.
		e. Other faults.	Report.
3.	Engine continuously misfiring in one or more cylinders.	a. Incorrect spark plugs being used.	Report.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
3.	(Contd)	b. Incorrect fuel mixture. Color of plug insulator is indication of fault.	Report.
		c. Plug porcelain cracked.	Report.
		d. Plug porcelain dirty allowing short circuit of current.	Clean exterior of plug. If fault not remedied Report.
		e. Spark gap incorrect.	Report.
		f. Plug leads not correctly connected.	Report.
		g. Distributor cap short.	Clean exterior of cap. If fault not remedied Report.
		h. Cylinder compression too low.	Report.
		i. Other faults	Report.
4.	Erratic misfiring, or engine runs unevenly under load (engine may or may not run evenly when idling).	a. HT lead incorrectly connected.	Report.
		b. Incorrect, dirty defective or maladjusted plugs.	Clean exterior of plug. If fault not remedied - Report.
		c. Breaker points dirty or breaker arm assembly dirty, offering resistance to movement.	Report.
		d. Breaker points incorrectly adjusted.	Report.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
4.	(Contd)	e. Leaky intake manifold gasket or carburettor flange gasket.	Report.
		f. Incorrect tappet clearance.	Report.
		g. Breaker arm return spring weak.	Report.
		h. Ignition timing incorrect.	Report.
		j. Coil or condenser defective.	Report.
		k. Sticking intake and/or exhaust valves (causing incorrect mixture and compression).	Report.
5.	Engine overheats.	a. Cooling system drained and not refilled.	Refill with coolant after allowing engine to cool.
		b. Low coolant level.	Allow the engine to cool. Unscrew the filler cap cautiously to allow steam to escape. Top up and run engine whilst topping up. Check for leaks and rectify, if possible. If not, Report - (leaks may be in radiator core or hose, water jacket or water pump. Unaccountable losses may be due to blown cylinder head gasket).
		c. Water pump inoperative.	Check whether fan belt is broken or tension incorrect.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
5.	(Contd)		Also check that the pulleys are not slipping on the shafts. If necessary Report.
		d. Clogged cooling system, due to rust from water jackets and foreign matter settling in the radiator core, blocking the tubes.	Drain the system. Flush out thoroughly and, when running clear, refill with coolant.
		e. Incorrect timing.	Report.
		f. Faulty temperature gauge wiring, and/or gauge.	Report.
		g. Thermostat not operating properly.	Report.
		h. Over-loading the vehicle.	Reduce load.
		j. Dirt clogging air passages of radiator.	Report.
		k. Brakes dragging.	Report.
6.	Engine oil pressure gauge registering low or nil.	a. Low oil level.	Top up.
		b. Leak or fault in lubrication system (low or no pressure registered after topping up).	Stop the engine immediately (switch off). Check the filter, pipe lines and unions (for leaks). If cause not located and rectified, Report.
		c. Faulty oil pressure gauge.	Even if this is suspected (failing rectification of faulty wiring or connections) do NOT run the engine. If cause not located and rectified, Report.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
7.	Engine oil pressure registering too high.	Pressure relief valve stuck.	Report.
8.	Ammeter shows too high a charging rate (Mk 3).	a. Direct short in generator field circuit:	
		(1) Field coils grounded.	Report.
		(2) Field terminal grounded.	Report.
		(3) Generator to regulator field wire grounded.	Report.
		b. Faulty voltage and/or current regulator.	Report.
9.	Ammeter shows too high a charging rate (Mk 4).	a. Direct short in alternator field control circuit:	Report.
10.	Ammeter shows too low a charging rate (Mk 3).	a. Fan belt slipping.	Report.
		b. Loose generator leads or terminals or corroded terminals.	Clean and tighten the terminals. Secure and tighten all external connections in the circuit.
		c. Dirty generatory commutator, sticking or badly seated brushes or low brush spring tension.	Report.
		d. Faulty voltage and/or current regulator.	Report.
		e. Faulty ammeter.	If wiring and connections are in order and secure, Report.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
11.	Ammeter shows too low a charging rate. (Mk 4).	a. Fan belt slipping.	Report.
		b. Loose alternator leads or terminals, corroded terminals.	Clean and tighten the terminals. Secure and tighten all external connections in the circuit.
		c. Dirty alternator sliprings, sticking or badly seated brushes or low brush spring tension.	Report.
		d. Faulty voltage regulator.	Report.
		e. Faulty ammeter.	If wiring and connections are in order and secure, Report.
12.	Ammeter shows no charging rate (Mk 3).	a. Slipping or broken fan belt.	Report.
		b. Generator, armature burned out.	Report.
		c. Open circuit in field wiring.	Report.
		d. Defective regulator.	Report.
		e. Loose or corroded connections.	Tighten and clean. If no improvement. Report.
		f. Dirty commutator or sticking or badly seated brushes.	Report.
		g. Faulty ammeter or voltage and/ or current regulator.	Report.

TABLE 17 (contd)

Ser.	Symptom	Possible Fault	Action
13.	Ammeter shows no charging rate (Mk 4).	a. Slipping or broken fan belt.	Report.
		b. Alternator burned out.	Report.
		c. Open circuit in field wiring.	Report.
		d. Defective regulator.	Report.
		e. Loose or corroded connections.	Tighten or clean. If no improvement, Report.
		f. Dirty, sticking or badly seated brushes.	Report.
		g. Faulty ammeter or voltage regulator.	Report.

TABLE 18 - INADEQUATE OR NO DRIVE TO ROAD WHEELS

Ser.	Symptom	Possible Fault	Action.
1.	Slipping clutch.	a. Incorrect pedal adjustment.	Report.
		b. Oily facings, weak clutch springs, worn clutch facings or other internal faults.	Report.
2.	Rattling, chattering, or sticking clutch.	a. Incorrect pedal adjustment.	Report.
		b. Broken or weak springs, worn or oily facings, clutch parts binding, uneven release levers or other internal faults.	Report.

TABLE 18 (contd)

Ser.	Symptom	Possible Fault	Action
3.	Clutch not disengaging.	Incorrect pedal adjustment.	Report.
4.	Faulty gearbox (noisy).	a. Insufficient lubrication.	Top up.
		b. Stripped gears, worn bearings, worn gear teeth, worn shaft splines, or installation misaligned.	Report.
5.	Lubrication leaks from the gearbox.	a. Worn gasket.	Report.
		b. Worn oil seal.	Report.
6.	Gears slipping out.	a. Gears only partially engaged.	Ensure, when changing gear, that the gear is fully engaged.
		b. Worn gears or bearings.	Report.
		c. Faulty selector mechanism.	Report.
		d. Other internal faults.	Report.
7.	Difficulty in changing gear.	a. Worn bearings.	Report.
		b. Sticking and dragging.	Report.
		c. Burred gear teeth.	Report.
8.	Noisy transfer case.	a. Insufficient lubrication.	Fill to the correct level.
		b. Loose mounting bolts.	Report.
		c. Incorrect lubricant.	Drain and flush out the transfer case. Refill with correct lubricant.
		d. Stripped gears, worn bearings, worn gear teeth, worn shaft splines.	Report.

TABLE 18 (contd)

9.	Transfer case lubrication leaks.	a. Worn oil seals. b. Blocked breather. c. Defective gaskets.	Report. Clear obstruction. Report.
10.	Propeller shaft noises.	a. Lack of lubrication. b. Worn journal or bearing.	Lubricate. Report.

TABLE 19 - STEERING BRAKES AND SUSPENSION

Ser.	Symptom	Possible Fault	Action
1.	Vibration of steering wheel (generally).	Looseness in steering arms, king-pin bearings, wheel bearings, etc, (usually at low speeds).	Report.
2.	Vibration of steering wheel at high speeds.	a. Unbalanced front wheels, faulty shock absorbers or incorrect toe-in, b. Loose wheel, steering component connections, or steering box .	Report. Report.
3.	Side pull.	a. Unequal tyre inflation or dragging brakes. b. Unequal camber or caster, tight wheel bearings or incorrect tracking.	Adjust tyre pressures If no improvement Report. Report.

TABLE 19 (contd)

Ser.	Symptom	Possible Fault	Action
4.	Wander or weaving.	a. Unequal tyre inflation.	Adjust tyre pressure.
		b. Insufficient or reverse caster or excessive tightness of any part of the steering system which overcomes the self-centring effect of caster.	Report.
5.	Hard steering.	Excessive caster, incorrect or unequal camber, twisted axle, low or unequal tyre inflation or excessive tightness in the steering system.	Check tyre pressure. If correct, Report.
6.	Road shock transmitted through steering wheel.	Misaligned drag link, excessive spring flexibility, or faulty shock absorbers.	Report.
7.	All brakes drag.	a. Insufficient brake shoe clearance.	Report.
		b. Mineral oil in the system.	Report.
8.	One brake dragging after all shoes have been reset.	Insufficient brake shoe clearance.	Report.
9.	Brake pulling to one side.	a. Shoes incorrectly adjusted.	Report.
		b. Grease on linings.	Report.
		c. Loose backing plates.	Report.
		d. Different type linings on different shoes.	Report.

TABLE 19 (contd)

Ser.	Symptom	Possible Fault	Action
9.	(Contd)	e. Worn out linings.	Report.
		f. Tyres not correctly inflated.	Adjust tyre pressures.
10.	Brakes inefficient Excessive stopping distance with brake pedal fully depressed.	a. Incorrect adjustment of brake shoes.	Report.
		b. Shoe linings faulty.	Report.
		c. Only partial contact between lining and drum.	Report.
		d. Oil on linings.	Report.
		e. Faults in the air brake system.	Report.
		f. Air in hydraulic system.	Report.
		g. Insufficient brake fluid in reservoir.	Top-up.
		h. Faulty air actuator.	Report.
11.	Noisy brakes.	a. Bent or distorted brake shoes.	Report.
		b. Dirt in shoe linings.	Report.
		c. Loose lining rivets.	Report.
		d. Drums distorted.	Report.
12.	Low pressure warning buzzer does not sound, with the ignition ON, even though the pressure shown on the air gauge is less than 60 lb/in^2(415 kPa).	Faulty connections or switches.	Report.

TABLE 19 (contd)

Ser.	Symptom	Possible Fault	Action
13.	Low pressure warning buzzer continues to sound after the engine has been running for several minutes.	a. Faulty low pressure switch, if air pressure gauge shows 60 lb/in^2 (415 kPa) or more.	Report.
		b. Low air pressure (air pressure gauge shows less than 60 lb/in^2 (415 kPa) when no trailer is attached to vehicle.	Check that emergency and service air line cocks at the rear of the vehicle are closed. Check that the air supply valve (for tyre pumping) and the air reservoir drain cock are turned OFF. Check the tension of the V-belt which drives the air compressor. Check all pipe connections for leaks. Report if fault not rectified.
		c. Low air pressure (air pressure shows less than 60 lb / in^2) (415 kPa) when a trailer is attached to the vehicle.	Turn off the emergency and service air line cocks at the rear of the vehicle. Stop and re-start the vehicle engine. If the air pressure warning buzzer stops after a few minutes, the fault is in the trailer air braking system. (Consult the trailer handbook for rectification of trailer brake faults). If the buzzer still continues to sound check that the vehicle air supply valve and air reservoir drain cock are closed.

TABLE 19 (contd)

Ser.	Symptom	Possible Fault	Action
13.	(contd)		Also check tension of air compressor V-belt and all pipe connections. Report if fault not rectified.
14.	Air pressure gauge registers a pressure exceeding 110 lb/in^2 (760 kPa).	Air compressor unloads at too high a pressure on starting of vehicle engine.	When the engine is first started up, the air compressor may unload at a higher pressure than normal (100 - 105 lb/in^2) (690 - 725 kPa) After a reasonable warm up period and several brake applications, pressure should drop to normal. If this does not happen the fault is in the compressor governor. Report.
15.	Air pressure gauge registers approximately 150 lb/in^2 (1030 kPa) and safety valve on reservoir blows.	Air supply valve not functioning correctly.	Check that air supply valve has been turned to the correct position (valve handle parallel to body of valve). If the valve is set in the supply position (at right angles to body) and the valve dust cover has been left screwed firmly in position, the pressure will build up and the safety valve will blow. If supply valve is in the correct position, the fault is in the compressor governor. Report.
16.	Brake pedal hard to operate and braking poor when air pressure is normal.	Actuator defective.	Report.

TABLE 19 (contd)

Ser.	Symptom	Possible Fault	Action
17.	Air pressure drops rapidly when the vehicle's engine is stopped.	Air leaks.	Check pipe joints for tightness. Check the air reservoir and air pipe lines and joints for leaks. Check that the service and emergency air line cocks and air supply valve reservoir cocks are fully closed.
18.	Hard riding.	a. Uneven load distribution.	Lessen or re-distribute the load.
		b. Insufficient lubrication.	Lubricate the spring bracket and shackle pins and bearings.
		c. Broken spring bracket or shackle pin.	Report.
19.	Excessive flexibility.	a. Broken spring leaf.	Report.
		b. Faulty action of shock absorber.	Report.
		c. Lack of fluid in the shock absorbers.	Check for leaks. Report.
20.	Excessive noises.	a. Worn bolts and bushes in shackles.	Report.
		b. Loose spring clips or broken spring leaves.	Report.

TABLE 20 - LIGHTS AND ELECTRICAL ACCESSORIES

Ser.	Symptom	Possible Fault	Action
1.	Head, black-out, park, stop and tail, etc, lights. Failure to light when switched on.	(1) Filament failure.	Replace lamp. Clean and tighten all connections in the lighting circuits.

TABLE 20 (contd)

Ser.	Symptom	Possible Fault	Action
1.	(contd)	(2) Battery disconnected or terminals corroded.	Check and clean the battery cables. Tighten all connections. Report if fault not rectified.
		(3) Battery discharged.	Report.
		(4) Open circuit.	Check for broken terminal.
		(5) Lamp incorrectly located in its socket.	Remove lamp and replace correctly.
		(6) Defective circuit breaker.	Report.
2.	Twin flasher lights fail to light.	Faulty fuse.	Replace fuse (at back of air pressure gauge). If lamps still fail to light, Report.
3.	Twin flasher lights fail to light (Mk 4).	Defective circuit breaker.	Report.
4.	Lights dim.	(1) Dirty lenses.	Clean.
		(2) Reflectors tarnished.	Report for replacement.
		(3) Lamp blackened inside.	Replace lamp. Clean and tighten battery ground connections.
		(4) Battery weak.	Report.
		(5) Loose, defective or corroded connections in wiring circuits or at battery terminals. Connections defective or high resistance at switch.	Check, clean and tighten all connections and terminals. Particularly check lamp bases to sockets, sockets to shells, and all wiring connections.
		(6) Poor contact of lamps in sockets.	Remove and replace lamps in sockets correctly. Replace lamps, if necessary.

TABLE 20 (contd)

Ser.	Symptom	Possible Fault	Action
5.	Lights go on and off or flicker.	(1) Loose wire or Intermittent ground.	Check all terminals, connections, wiring and insulation. Tighten connections.
		(2) Break in circuit.	Report.
6.	Generator, regulator. Illumination too bright and lamps burning out (Mk 3).	Faulty operation of regulator.	Report.
7.	Alternator regulator. Illumination too bright and lamps burning out (Mk 4).	Faulty operation of regulator.	Report.
8.	Headlight mountings	a. Bent or sprung reflector.	Report.
	Beam of headlight distorted or diverted.	b. Light improperly mounted.	Adjust.
9.	Horn	a. Battery discharged.	Report.
	Not operating or defective.	b. Loose or broken connections.	Check the battery cables and leads.
		c. Defective horn button switch.	Report.
		d. Defective horn.	Report.

TABLE 21 - WINCH

Ser.	Symptom	Possible Fault	Action
1.	Winch dog-clutch fails to engage or disengage.	a. Incorrect operating procedure.	Refer to Section 28 Winching Instructions
		b. Incorrect air pressure.	Check air pressure shown on air pressure gauge.
2.	Safety brake does not hold.	Faulty brake.	Report.
3.	Safety brake over-heats.	Brakes too tight.	Report.

CHAPTER TWO

SERVICING

SECTION 32
GENERAL

509. The vehicle servicing system described in this chapter includes:

a. Daily servicing,

b. Initial servicing,

c. Periodic servicing,

d. Unit servicing (Non Technical) inspections, and

e. Technical inspections.

510. During servicing look out for any controls, catches, latches, etc, which are stiff to operate, clogged with dirt, or rusting; wipe clean and lubricate with an oil can.

511. Where 'check for security' is included in a task, the parts should be examined and tightened only where signs of movement are observed. Tightening must be done with care, as over-tightening will result in stripped threads or broken studs.

512. Absolute cleanliness is essential during lubricating operations. Grease nipples and the surrounding surface should be cleaned before fitting the lubricator.

513. When using a hose to clean the vehicle, cover the master cylinder breather hole with a piece of rag etc. This will provide some measure of protection and will help to prevent the ingress of water into the master cylinder.

514. The lubricants to be used in abnormal climatic conditions are specified in Table 22.

TABLE 22 - LUBRICANTS TO BE USED IN ABNORMAL CLIMATIC CONDITIONS

	Severe Winter -17° to -29°C (0° to -20°F)	Tropical Above 32°C (90°F)
Engine and Air Cleaner	0-180 (OMD 110)	0-180 (OMD 110)
Front and Rear Axles	0-184 (OEP 220)	(OEP 600)
Gearbox and Transfer Case	0-182 (OMD 330)	0-182 (OMD 330)
Winch Gear Case	0-182 (OMD 330)	0-182 (OMD 330)
Steering Box	0-184 (OEP 220)	(OEP 600)
Hydraulic Reservoirs	H-542 (OX(Aust)8)	H-542 (OX(Aust)8)
Chassis	G-403 (XG 279)	G-403 (XG 279)
Wheel Bearings	G-403 (XG 279)	G-403 (XG 279)

SECTION 33
DAILY SERVICING

515. Section 3 of AB-416 (Vehicle Log Book) is the authority for and details the driver's daily servicing tasks. These tasks are listed in Table 23 and will be carried out on:

a. First Parade. Tasks which are to be carried out before the vehicle is used.

b. Halt Parades. Tasks which are to be carried out at halts after approximately four hours running.

c. Last Parade. Tasks which are to be carried out on completion of the days run.

TABLE 23 - DAILY SERVICING TASKS

Serial	Action	Parade		
		First	Halt	Last
1	Fuel, Lubricant and Coolant: Fuel Check level in tanks and in jerricans (stowed in holders). Top up or refill as required.	X	X	X

TABLE 23 (contd)

Serial	Action	Parade		
		First	Halt	
2	Lubricant Check oil level in engine and in oil can (stowed in holder). Top up or refill as required.	X	X	X
3	Coolant: Check coolant level in radiator, and in can (stowed in holder). Top up or refill as required.	X		X
4	General: Check for fuel, lubricant and coolant leaks. Examine ground below vehicle for signs of leaks.	X		
5	Wheels and Tyres: Check for: Loose wheel nuts.	X		
6	Wheel hubs for overheating (check manually).		X	
7	Tyres for correct pressure. If low inflate. Do NOT bleed a hot tyre.	X	See Caution X	X
8	Tyres for cuts, weak spots and uneven wear.	X		
9	Low Air Pressure Warnings: Switch on ignition and check that buzzer and light operate at pressures below 415 kPa (60 lb/in^2).	X		
10	Engine: Start engine. Check instruments for engine conditions (Charging rate, engine rev/min (Mk 4), temperature, oil and air pressure) and amount of fuel in tanks. (1).	X		
11	Listen for knocks, rattles and check for uneven running.	X		
12	Momentarily open the air reservoir drain cock to clear any accumulation of water.	X		X

TABLE 23 (contd)

Serial	Action	Parade		
		First	Halt	Last
13	After a few minutes stop the engine and recheck the oil level. Top up as necessary.	X		
14	Check speedometer reading and compare with that recorded on Work Ticket.	X		X
15	Record speedometer reading on Work Ticket.			X
16	Battery: Switch on all lights and operate the starter; if the lights dim, charge or change the battery.	X		
17	Lights: Check the operation of all lights.	X		
18	Horn: Test.	X		
19	Windscreen Wipers: Test.	X		
20	Fittings: Check for security and serviceability - All cab and body fittings Lockers and other stowage space, doors and lids	X		
21	Cab hatch, bonnet, engine access cover, windscreens, rear vision mirrors, windows, hinges, catches and latches.	X		
22	Spare wheel and canopy. Check for security and serviceability.	X	X	X
23	Stowage: Check completeness of equipment (including ditching tools and fire extinguisher).	X		
24	Check for correct stowage and security of all stowed items.	X		
25	Check for loose items in cab or body.	X		X

TABLE 23 (contd)

Serial	Action	Parade		
		First	Halt	Last
26	Load: Check the security of the load and the lashings.	X	X	X
27	Trailer: Check the security of the trailer couplings and the trailer load.	X	X	
28	Steering and Brakes: Check the operation of the steering and brakes (when moving off).	X	X	
29	General: Inspect for security and correct operation, any parts on which recent repairs or adjustments have been carried out.		X	X
30	Check for loose bolts or fittings. Tighten as necessary.	X	X	X
31	Check for any damage or faults. Rectify or report.	X	X	X
32	Check to see if any mileage (km) servicing is due.			X
33	Carry out frost precautions if ordered.			X
34	Clean vehicle.			X
35	Close cab doors and windows. Lace up canopy and flaps etc.			X

Note 1. During running periods the driver should maintain a running check on all instruments.

CAUTION

If tyre pressures were correct at First Parade but have increased during running do NOT bleed back to the correct pressure as this will result in damage to the tyre/s.

SECTION 34
INITIAL AND PERIODIC SERVICING

516. The Servicing Schedule (Section 4 of AB-416 Vehicle Log Book) is the authority for and specifies:

a. The amount of servicing to be carried out by the driver; These tasks are detailed in the initial and periodical servicing tables;

b. When servicing is to be carried out, specified in intervals of distance, and/or periods of time; and

c. The lubricants to be used.

517. Initial Servicing Table. This table lists the tasks to be carried out by the driver when the first 800 km (500 miles) has been completed by a new vehicle, and by a vehicle with a replacement engine.

518. Periodical Servicing Tables. These tables list the tasks to be carried out by the driver:

a. Weekly,

b. Every 3000 km (2000 miles) or three months,

c. Every 6000 km (4000 miles) or six months; and

d. Every 18 000 km (12 000 miles) or twelve months.

519. The initial servicing tasks to be carried out by the driver when a new vehicle, or, vehicle with a replacement engine has completed the first 800 km (500 miles) are listed in Table 24. All operations must be carried out in the case of a new vehicle, and Operations 32 - 36 incl in the case of a vehicle fitted with a replacement engine.

520. Table 25 lists the periodic servicing tasks; when and by whom they are to be carried out, and the lubricants to be used in NORMAL climatic conditions. References are made to the relevant item number of the lubrication chart (Fig 63) and to the paragraph and figure number/s of this handbook.

521. The entries D and V/M in Columns f to j of the table indicate that the task (against which the entry appears) may be carried out by the driver, or, must be carried out by a RAEME tradesman respectively.

522. The servicing (distance) intervals may, if convenient be varied by not more than 240 km (150 miles) either way to allow that part of the schedule to be carried out on a servicing day.

TABLE 24 - INITIAL SERVICING

No.	Operation	No.	Operation
1	Check steering box lubricant level.	20	Lubricate clutch shaft and Linkage (3 grease nipples).
2	Drain and refill front axle.	21	Lubricate clutch release bearing (1 grease nipple).
3	Check CV joint lubricant level.	22	Lubricate gear change linkage (3 grease nipples).
4	Drain and refill gearbox.	23	Lubricate transfer case linkage (2 grease nipples).
5	Drain and refill transfer case.	24	Lubricate winch gear case linkage (oil can).
6	Check winch gear case lubricant level.	25	Lubricate handbrake linkage (5 grease nipples).
7	Drain and refill rear axle.	26	Lubricate universal joints and sliding splines (12 grease nipples).
8	Check clutch master cylinder fluid level.	27	Lubricate accelerator linkage (oil can)
9	Check and adjust level of battery electrolyte (6 mm (1/4 in) above plates).	28	Lubricate rear spring shackle pins (6 grease nipples).
10	Check all air fuel and oil lines and unions for leaks.	29	Lubricate pintle hook (2 grease nipples).
11	Check oil cooler for leaks.	30	Lubricate front towing dees (oil can).
12	Check cooling system for leaks.	31	Tighten all road wheel nuts.
13	Lubricate winch cable guide rollers (6 grease nipples).	32	Start and warm up engine (water and oil to reach operating temperature).
14	Lubricate winch cable guide sheaves (3 grease nipples).	33	Drain engine oil and refill with fresh oil.
15	Lubricate winch cable drum shaft and input flange.	34	Drain, clean and replace element in oil filter.
16	Lubricate winch clutch linkage (oil can).	35	Drain clean and refill air cleaner.
17	Lubricate front spring shackle pins (6 grease nipples).	36	Clean rocker cover breather (DO NOT OIL).
18	Lubricate steering drag link (2 grease nipples).		
19	Lubricate steering tie rod ends (2 grease nipples).		

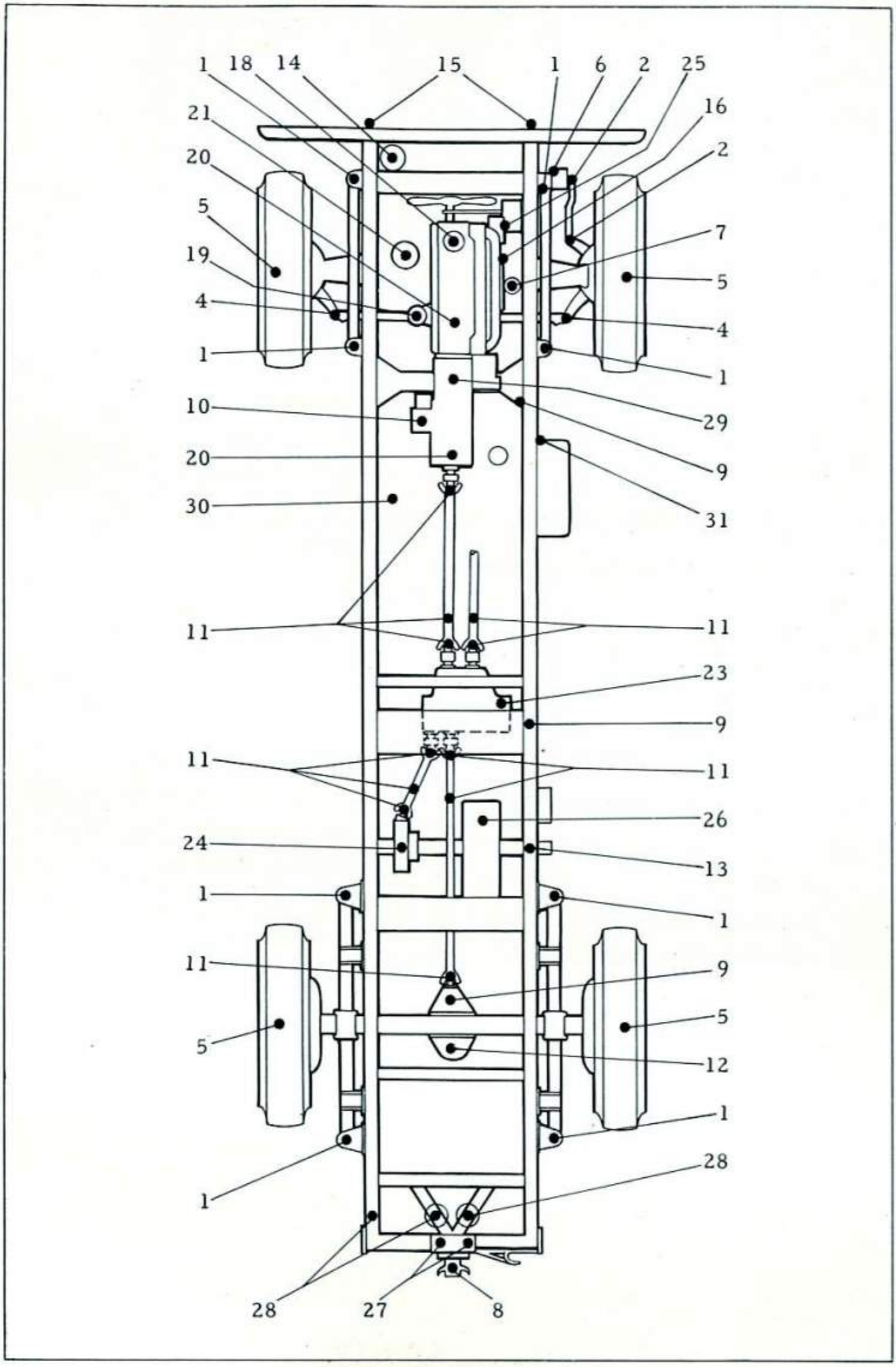
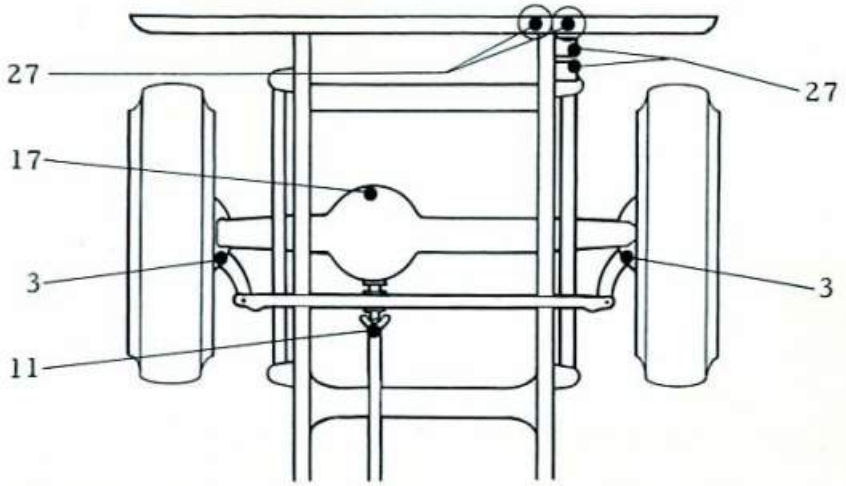


FIG 63
LUBRICATION CHART



1 Shackle Pins
2 Drag Link
3 Constant Velocity Joints
4 Tie Rod Ends
5 Wheel Bearings
6 Steering Box
7 Accelerator Linkage
8 Pintle Hook
9 Handbrake Linkage
10 Gearbox
11 Universal and Slip Joints
12 Rear Axle
13 Winch Cable Drum Shaft
14 Air Cleaner
15 Front Towing Dees
16 Generator (Mk 3) Alternator (Mk 4)
17 Front Axle
18 Engine Crankcase
19 Distributor
20 Gear Change Linkage
21 Engine Oil Filter
22 Clutch Linkage
23 Transfer Case
24 Winch Gear Case
25 Clutch Master Cylinder
26 Winch Rope
27 Winch Rope Rollers
28 Winch Rope Sheaves
29 Clutch Release Bearing
30 Spare Wheel Winch
31 Brake Master Cylinder

FIG 63 (contd)
LUBRICATION CHART

TABLE 25 - PERIODICAL TASK (SERVICING)

Serial	Component	Handbook		Lub Chart (Fig 63) Item No	Daily	Weekly	
		Para No	Fig No				
1	Engine Compartment	74 113					
2	Engine lubrication	134		18	D		
3	Engine: Oil Filter	147		21			
4	Engine: Oil Change	151		18			
5	Engine: Cooling System	160					
		171 173					
6	Engine Ventilation System: Air Filter	153 154	27 28				
7	Carburettor: Air Cleaner	212	39	14	D		
				14			
8	Engine: Coolant hoses Oil pipes Fuel pipes Air cleaner connections	191					
9	Exhaust System: Pipes and Muffler Nuts on pipe flanges and manifolds	127 128	23				
10	Spark plugs	232		40		D	
11	Speedometer: Inner Cable						

TABLE 25 - PERIODICAL TASK (SERVICING)

Serial	Component	Handbook		Lub Chart (Fig 63) Item No	Daily	Weekly
		Para No	Fig No			
1	Engine Compartment	74 113				
2	Engine lubrication	134		18	D	
3	Engine: Oil Filter	147		21		
4	Engine: Oil Change	151		18		
5	Engine: Cooling System	160				
		171 173				
6	Engine Ventilation System: Air Filter	153 154	27 28			
7	Carburettor: Air Cleaner	212	39	14	D	
				14		
8	Engine: Coolant hoses Oil pipes Fuel pipes Air cleaner connections	191				
9	Exhaust System: Pipes and Muffler Nuts on pipe flanges and manifolds	127 128	23			
10	Spark plugs	232		40		D
11	Speedometer: Inner Cable					

TABLE 25 (contd)

3000 kilometres 3	6000 kilometres 6 months	18 000 kilometres or 12 months	Remarks	Normal Lubricant
			Check for security all nuts, bolts, brackets, catches, and engine components. Lubricate all hinges, swivel pins and catches.	0-180 (OMD 110)
			Check engine oil level - Add oil if required.	0-180 (OMD 110)
	D	D	Clean filter and fit new cartridge; add 1.4 ℓ of oil to engine sump.	0-180 (OMD 110)
	D	D	Drain while hot and refill with fresh oil; also drain cooler. Refill capacity 8.2 ℓ.	0-180 (OMD 110)
			Check level in radiator. Add water if required.	
		D	Drain, flush out and refill.	Tri Sodium Phosphate
	D	D	Clean. Remove wing nut, cover, and filter element. Wash element in solvent and dry. DO NOT OIL element.	
			Clean exterior.	0-180 (OMD 110)
	D	D	Remove clamp and oil bath. Clean bath and refill with 1 ℓ of new oil.	
		D	Clean outside of engine etc, where necessary. Inspect for damage and tighten loose parts. Check for leaks. Report defects.	
		D	Check for leaks, security and damage. Report for repair if leaks not rectified by normal tightening. DO NOT over-tighten.	
			Clean outside (do not remove). Check tightness. DO NOT overtighten. Check security and condition of leads.	
		D	Lubricate inner cable	G-412 (XG-264)

TABLE 25 (contd)

Serial	Component	Handbook		Lub Chart (Fig 63) Item No	Daily	Weekly
		Para No	Fig No			
12	Fan, Generator/ Alternator and Air Compressor Belts	Table 5	52			
13	Ignition Coil and Distributor	225 228	40	19		
14	Carburettor	193	34			
15	Generator (Mk 3)	237		16		
16	Alternator (Mk 4)	237		16		
17	Fuel Tanks and Fuel Lines	178	32		D	D
		191				
18	Fuel Pump	187				
19	Starter Motor and Solenoid Switch	245 249				
20	Battery	217	11 12			D

TABLE 25 (contd)

3000 kilometres or 3 months	6000 kilometres or 6 months	18 000 kilometres or 12 months	Remarks	Normal Lubricant
		D	Check for damage and incorrect tension. Report for adjustment or replacement as necessary.	
		D	Check security. Thoroughly clean exterior. Check cable insulation, and connections for tightness.	
		D	Clean outside, check engine idling. Report for tuning of carburettor, if idling unsatisfactory.	
D	D	D	Clean outside of generator and check insulation and security of leads.	
D	D	D	Lubricate with an oil can. 2-3 drops of oil in hole marked OIL centre rear of generator.	
D	D	D	Clean outside of alternator and check insulation and security of leads.	
D	D		Replenish as required.	MT Gas STD
		D	Check: security of tanks, shields and restraining straps. Clean exterior of tanks. Remove filler caps and ensure air vents are not blocked. Remove and clean filters. Check all piping, hoses, unions and fittings for fuel or air leaks. DO NOT overtighten. Report any damage, kinks in piping or persistent leaks.	
D	D	D	Check: for fuel leaks, and that filter bowl, pump screws and pipe unions are tight. Clean filter section.	
D	D	D	Clean outside of units and remove all grease. Check insulation and security of leads.	
			Check electrolyte level. Add distilled water as required. Report excessive water consumption. Keep the top	

TABLE 25 (contd)

Serial	Component	Handbook		Lub Chart (Fig 63) Item No	Daily	Weekly
		Para No	Fig No			
20	(contd)					
21	Accelerator Pedal, Throttle, Choke and Carburettor Linkage	202		7		D
22	Accelerator - Cross-Shaft	207				
23	Fire Extinguisher	112	20			
24	Driver's Seat - Slides and Catch. Co-driver's Seat - Spring Catch	65				
25	Cab Hatch - Hinges and Clip Hinges	64				
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TABLE 25 (contd)

3000 kilometres or 3 months	6000 kilometres or 6 months	18 000 kilometres or 12 months	Remarks	Normal Lubricant
			and casing of the battery clean. Use hot water to remove corrosion. Clean the contact surfaces of the terminals and connectors with steel wool, and coat with petroleum jelly or grease. Check security of clamp.	
D	D	D	Lubricate with oil can all swivel pins and bearing surfaces. Check for security and damage.	0-180 (OMD 110)
	D	D	Check weight - exchange or refill, if necessary. Check indicator disc.	
D		D	Clean, tighten, adjust and lubricate with an oil can, as necessary.	0-180 (OMD 110)
		D		
		D	Hinges, hatches and plungers - lubricate with oil can. Regulator gear teeth pins and slides - grease.	0-180 (OMD 110) G-403 (XG 279)
		D	Clean, tighten, adjust and lubricate with an oil can, as necessary.	0-180 (OMD 110)
		D		
		D		
		D		
			Clean, tighten, adjust and lubricate with an oil can, as necessary.	0-180 (OMD 110)
		D	Clean, tighten, adjust and lubricate with an oil can, as necessary.	0-180 (OMD 110)
		D		
		D		

TABLE 25 (contd)

Serial	Component	Handbook		Lub Chart (Fig 63) Item No	Daily	Weekly
		Para No	Fig No			
35	Tailboard: Personnel Steps. Hinges, Securing Pins and Bearing Surfaces.	78 101				
36	Tool and Stowage Boxes Fuel Oil and Water Can Holders. Ditching Tool Holder. Hinges, Turnbuckles, Hasps, Locking Pins, Wing Nuts and Catches.	98 99 101				
37	Recesses for Anchorage Rings (body floor)	84				
38	Body Mounting Bolts, Cab Bolts and Fittings.					
39	Towing D's: - Pivot Bolts (2)	91		15		
40	Spare Wheel Winch	95 413	56	30		
41	Towing Pintle: Neck Bearing, Safety Catch and Release Bar.	99	8			
42	Light and Switches	253 276	41 42 43 44 45			
43	Electrical Accessories	287	46			
44	Clutch Master Cylinder Reservoir	315	11 12	25		
45	Clutch Release Fork Shaft and Bearing.	315	48	29		

TABLE 25 (contd)

3000 kilometres 3	6000 kilometres 6 months	18000 kilometres or 12 months	Remarks	Normal Lubricant
		D	Clean, tighten, adjust and lubricate with an oil can, as necessary.	0-180 (OMD 110)
		D		
	D	D	Clean out recesses to ensure adequate drainage.	
		D	Check for security. Tighten if necessary.	
D	D	D	Lubricate with oil can loosen up.	0-180 (OMD 110)
	D	D	Lubricate shaft, sprocket and pawl.	0-180 (OMD 110)
	D	D	Inspect, adjust and lubricate - 3 nipples	G-403 (XG 279)
	D	D	Check for satisfactory operation and that all connections are secure. Examine cables and wiring for fraying or deterioration of insulation. Replace any faulty lamps with new lamps of correct wattage and base type.	
	D	D	Check for operation, security and cleanliness. Inspect cables for fraying, deterioration of insulation and connections for tightness. Report any faulty accessory. DO NOT lubricate the windscreen wiper motor.	
D	D	D	Check fluid level - top up as necessary.	H-542 (OX(Aust)8)
D	D	D	Lubricate - 2 nipples (low pressure hand gun)	G-403 (XG 279)
D	D	V/M	Remove inspection plate. Lubricate release sleeve cavity. (Low pressure hand gun). Lubricate fork pads and sleeve.	G-403 (XG 279)

TABLE 25 (contd)

Serial	Component	Handbook Para No	Handbook Fig No	Lub Chart (Fig 63) Item No	Daily	Weekly
46	Clutch Linkage			22		
47	Gearbox	322	49	10		
				10		
48	Gearchange Linkage	325	49	20		
49	Transfer Case	328	23			
		332				
50	Transfer Case: Linkage	331				
51	Power Take-off Control Linkage	331 333				
52	Propeller Shafts Universal Joints and Slip Yokes	335		11		
53	Brake Master Cylinder (part of air/hydraulic actuator)	348 350	53	31		
54	Hydraulic Fluid Lines	352	50			
55	Air Reservoir (brakes)	362	50		D	
56	Footbrake Control Valve Mk 3	340 365				
57	Mk 4	340 365				
58	Stop Light Switch	272 371				
59	Air Lines, Stop Cocks and Couplings	377	51			
60	Brake and Stroke Indicator.	367				D

TABLE 25 (contd)

3000 kilometres / 3 months	6000 kilometres / 6 months	18 000 kilometres or 12 months	Remarks	Normal Lubricant
			Check for security. Lubricate with an oil can 2 clevis pins.	0-180 (OMD 110)
D	D		Check oil level - top up as necessary.	0-182 (OMD 330)
		D	Drain and refill with fresh oil.	0-182 (OMD 330)
D	D	D	Check for security. Lubricate: Mk 3 - 3 nipples, Mk 4 - 1 nipple.	G-403 (XG 279)
D	D		Check oil level; top up, if necessary.	0-182 (OMD 330)
		D	Drain and refill with fresh oil.	0-182 (OMD 330)
D	D	D	Lubricate nipple and 8 points (oil can).	0-180 (OMD 110)
D	D	D	Lubricate - 1 nipple and 4 points (oil can).	G-403 (XG 279) (OX(Aust)8)
D	D	D	Lubricate with low pressure grease gun 12 nipples (3 per shaft).	G-403 (XG 279)
D	D	D	Check fluid level - top up as necessary. Ensure that breather hole in filler plug is clear.	H-542 (OX(Aust)8)
		D	Clean. Check for security, damage, and for leaks.	
			Drain off accumulation of oil and water.	
D	D	D	Lubricate with an oil can clevis and pivot pin.	0-180 (OMD 110)
D	D	D	Lubricate with an oil can pedal, roller and plunger.	0-180 (OMD 110)
D	D	D	Clean, tighten connections and examine insulation.	
D	D	D	Clean, Check for security, damage, kinks in pipes, and that unions and connections are tight. Inspect for leaks.	
			With air pressure gauge registering over 60 lb/in^2 (420 kPa) and no air in brake chamber, push indicator in by hand as far as it will go.	

TABLE 25 (contd)

Serial	Component	Handbook Para No	Handbook Fig No	Lub Chart (Fig 63) Item No	Daily	Weekly
60	Brake and Stroke Indicator (contd)	367				D
61	Drain hole					D
62	Handbrake Cross Shaft, and Linkage	384	9			
63	Springs: Front and Rear	389	54	1		
64	Shock Absorbers	392	54			
65	Axles: Front and Rear Housing, Front Tracta (CV) Joints, Front and Rear Breathers	394 403		17, 3 12		
		405				
66	Tyres	417 419			D	
67	Road Wheels	408	57			
		419	58			
68	Steering Box	424 427		6		
69	Drag Link Ends	423		2		
70	Tie Rod Ends	423		4		
71	Winch	432				
72	Winch Gear Case	442		24		

TABLE 25 (contd)

3000 kilometres or 3 months	6000 kilometres or 6 months	18 000 or 12 months	Remarks	Normal Lubricant
			Apply brakes hard and release application. Recheck position of indicator. If relieved (RED) section of stem is visible Report for adjustment.	
			Ensure drain hole in bottom of non pressure chamber is clear.	
D	D	D	Lubricate - 5 nipples 10 points - oil can.	G-403 (XG 279) 0-180 (OMD 110)
D	D	D	Check for damage. Clean and lubricate shackle and bracket pins. Check tightness of U bolts. Lubricate helper spring pads.	G-403 (XG 279)
D	D	D	Check security. Inspect rubber mounting bushes.	
V/M	V/M	V/M	Change if worn.	
D	D		Check oil level in housing - top up as necessary. Remove breathers and clean thoroughly.	(OEP 600)
		D	Drain front and rear housings and refill with fresh oil. Remove breather valves clean thoroughly and replace.	(OEP 600)
			Check pressure; inspect and remove flints.	
		D	Rotate wheels	
D	D		Check nuts for tightness	
D	D	D	Check oil level - top up as necessary.	(OEP 600)
D	D	D	Lubricate - 2 nipples	G-403 (XG 279)
D	D	D	Lubricate - 2 nipples	G-403 (XG 279)
			Inspect, clean and tighten loose items.	
D	D		Check oil level. Top up as necessary.	0-182 (OMD 330)
		D	Drain and refill with oil	

TABLE 25 (contd)

Serial	Component	Handbook		Lub Chart (Fig 63) Item No	Daily	Weekly
		Para No	Fig No			
73	Winch Worm Shaft	434	13			
74	Winch Drum Shaft	434	13			
75	Winch Dog Clutch: Air Cylinder Linkage	433				
76	Front Fairlead Assembly: Vertical Pulleys - 2 Horizontal Pulleys - 2	437	59	27		
77	Rear Fairlead Assembly: Rollers - 2 Sheaves - 3	438	59	27 28		
78	Winch Rope Support Brackets	439				
79	Winch Rope	436		26		
80	Winch Air Lines and Units					

TABLE 25 (contd)

3000 | 6000 | 18 000 kilometres or 3 | 6 | 12 months			Remarks	Normal Lubricant
D	D	D	Lubricate - 1 nipple	G-403 (XG 279)
D	D	D	Lubricate - 1 nipple	G-403 (XG 279)
D	D	D	Lubricate with oil can	0-180 (OMD 110)
D	D	D	Clean and lubricate fairleads, 4 nipples	G-403 (XG 279)
D	D	D	Clean and lubricate - Fairleads - 7 nipples	G-403 (XG 279)
D	D	D	Inspect for security and damage.	
		D	Clean and grease well. Carry out more frequently if operating in muddy terrain.	0-200 (ZX-7)
D			Check for security, damage, and for leaks.	

SECTION 35
VEHICLE INSPECTION

General

523. The servicing system does not obviate the need for periodic vehicle inspection. Inspections are necessary to:

a. Ensure that vehicles and equipment are being operated and serviced correctly.

b. Provide an accurate picture of the state of efficiency of the vehicles and equipment within a unit.

524. Correctly serviced vehicles will remain in a high state of efficiency over the longest possible period. All aspects which cannot be rectified by the driver MUST be reported to the transport officer/NCO.

525. Vehicle inspections are to be carried out in accordance with Vehicle Operating Instructions (VOS), Chapter 29. These include:

a. Unit Servicing (Non-Technical) Inspections. These are to be carried out monthly by the transport officer/NCO and recorded in the AB-416 (Vehicle Log Book) Section 1.

b. Technical Inspections. These are to be carried out by RAEME personnel when vehicles are undergoing periodic servicing. The results of the inspection are to be:

(1) Recorded on the Equipment Inspection Report - Vehicle/ Plant (Australian Army F EME 31) and signed by the inspector and the unit commander, and

(2) Entered in the AB-417 (Vehicle Record Book) and signed by the inspector.

526. A guide list for unit servicing inspections (based on Annex F to VOS) is given in Table 26. The list covers those items which are vital to operational efficiency. The person carrying out the inspection must use his hands, eyes and ears to discover faults not specifically mentioned in the guide.

527. A large percentage of repairs to vehicles are caused by the lack of attention to:

a. Lubrication,

b. Cleanliness,

c. Security of bolts, screws, etc, and

d. Minor adjustments and repairs.

528. Particular note of these items should be made by officers/NCOs during the monthly servicing inspections and the presence of dirt anywhere on the vehicle should be the subject of unfavourable comment.

TABLE 26 - GUIDE LIST FOR UNIT SERVICING INSPECTIONS

COMPONENT	ACTION
Body Chassis Engine and accessories	Check for cleanliness.
Engine Gearbox Transfer Case Differentials Steering Box	Check oil levels, and for leaks.
Cooling System	Check for leaks, condition of coolant (flushing of radiator) and fan belt tension.
Fuel, oil, air, water, and hydraulic fluid lines, pipes and hoses	Check for security, damage and for leaks.
Starter	Check operation.
Engine	Check for rattles, knocks and uneven running.

TABLE 26 (contd)

COMPONENT	ACTION
Instruments and Low air pressure warnings (Buzzer and light)	Check operation.
Battery	Check electrolyte level, security in cradle and for corrosion.
Lights and Windscreen Wipers	Check effectiveness of operation.
Doors, Locks, Windows, Seat belts, Stowage Lockers, Boxes and Holders	Check security and operation.
Tyres (including spare)	Check pressures, and for cuts, damage and uneven wear.
Tools and Equipment	Check condition and completeness.
Spare Wheel and Canopy	Check security.
Brakes, Steering and Clutch	Check for correct operation.
Engine	Check performance - Pulling ability, Flat Spots etc.
Vehicle Log Book and Record Book	Check completeness of entries.

CHAPTER THREE

TOOLS, EQUIPMENT AND STOWAGE

SECTION 36
STOWAGE OF ACCESSORY MAINTENACE KIT

General

529. The tools, equipment and spares which comprise the accessory maintenance kit normally carried on the vehicle are listed in Table 27. The table is NOT an authority for procurement of any of the items listed, but will assist in identifying and locating them.

530. CES No 2194 as amended from time to time authorizes the complete equipments for the accessory maintenance kits of these vehicles.

TABLE 27 - LIST OF ITEMS AND STOWAGE

Designation	Qty	Designation	Qty
STOWED IN TOOL BOX		INSULATION Tape, Electrical Black, 3/4 in by 36 yd Roll	1
BAR, Socket Wrench: 5/16 in by 6 in	1		
Wheel Nut and Rim 3/4 in by 30 in long.	1	JACK, Hydraulic, Hand 5 Ton.	1
BASE Plate, Jack, Wooden, 12 x 12 x 2 in.	1	LAMPS, Incandescent 12 V Clear:	
BOLT Shear Winch.	1(a)	40/50 W, DC, Prefocus Base, T Shape	2(a)
BOX, Small Parts, Plastic.	1	21 W, SC, BC, Base, S Shape	2(a)
CABLE, Assembly, Special Purpose, Electrical, Inter-Vehicle Starting.	1	LAMPS, Incandescent, 12 V, Clear:	
CAN, Dispensing, Funnel Top, 1 pint.	1	21/6CP, SBC, S Shape	2(a)
		6 W, SC, BC Base, G Shape	3(a)
CAP, Tyre Valve.	5(a)	32CP, SCC, RP Shape	2(a)
		3 W, SC, BC Base, G-6 Shape	2(a)
HANDLE, Wheel Nut Socket and Remover Side Ring.	1	PLIERS, Sidecutting 6 in	1
HOSE Assembly, Rubber, Tyre Inflating.	1	ROPE Towing, Steel Medium.	1

TABLE 27 (contd)

Designation	Qty	Designation	Qty
SCREWDRIVER, Flat Tip, 5/16 in wide tip by 6 in long blade	1	WRENCH:	
SIGN, Warning Plastic.	1	OE, Adjustable, 10 in Socket Wheel Nut, DE, 1 1/16 in by 1 5/16 in AF, 17 in long.	1
SPARK, Plug, 14 mm Cold 3/8 in reach	1(a)	Socket, Socket Wrench, Bi-Hexagon, $\frac{1}{2}$ in Sq Drive, Deep Style, 13/16 in AF.	1
WIRE, Electrical, No 20SWG lb	$\frac{1}{4}$		
STOWED IN DITCHING TOOL HOLDER (Fig 18 and 19)		STOWED IN BIN FORWARD OF CO-DRIVER'S SEAT (Item 9 Fig 10)	
AXE, Single Bit, $4\frac{1}{2}$ lb	1	LIGHT, Extension, c/w Cable and Plug.	1
HANDLE, Mattock-Pick.	1		
PICK Digging, w/o Handle	1	STOWED IN CLIPS ON CAB FLOOR LH REAR OF CO-DRIVER'S SEAT. (Item 8 Fig 10)	
SHOVEL, Hand, GS.	1	CRANK, Hand, Engine Starting	1
STOWED IN HOLDERS (Fig 16)		STOWED IN CLIPS ON CAB WALL BEHIND CO-DRIVER'S SEAT	
CAN: Screwcap, 1 gal	1(b)	DIPSTICK, Fuel Tank, Graduated 1 - 21 gal.	1
Gasoline, Military, Steel, $4\frac{1}{2}$ gal.	1(b)		
Water, Plastic, 5 gal.	1(b)		
STOWED IN CHAIN LOCKERS (Fig 16 and 18)		UNSTOWED ITEMS	
CHAIN, Assembly, Tyre, Single, Extra Heavy Duty, 12.00 by 20.	4	PADLOCK, Steel Laminated Case, Steel Shackle, 2 in.	3(c)
		TAG, Blank, Brass, Round, $1\frac{1}{4}$ in dia.	1(d)

Footnotes:
a. Spare/s.
b. Containers for reserve oil, fuel and water.
c. For securing tool box and chain lockers.
d. Label for padlock keys.

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