LOTUS EUROPA

ALL MODELS

Workshop Manual

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CONTENTS.

INTRODUCTION

This publication is a combined manual covering all models of the Lotus Europa. The front part deals with the features which are peculiar to the Twin Cam and Special models, whereas the latter part of the manual covers the Series 1 and 2 models, and components fitted to Twin Cam and Special which are also fitted on Series 1 and 2 models.

TECHNICAL DATA.

DIMENSIONS

Wheelbase	233.7 cm. (92 in.)
Track - Front	135.8 cm. (53.5 in.)
- Rear	134.6 cm. (53 in.)
Overall - Length	400 cm. (157½ in.)
- Width	163.8 cm. (64½ in.)
- Height	107.9 cm. (42½ in.)
Ground Clearance (design)	15 cm. (6 in.)
Turning Circle	12.5 m. (41 ft.)
Weight (unladen)	686 kg. (1,513 lbs.)

CAPACITIES.

Engine Sump (including filter)	4 litres (7½ pts.; 9 U.S. pts.)
Transmission	1.75 litres (3 pts.; 3.6 U.S. pts.)
Coolant (with heater)	10.8 litres (19 pts.; 22.8 U.S. pts.)
Fuel	56 litres (12.5 gall.; 15 U.S. gall.)

ENGINE.

General

Number of cylinders	4
Capacity	1558 cc. (95.06 cu. in.)
Stroke	72.746 mm. (2.864 in.)
Bore - Grade 1	82.550/82.558 mm. (3.2500/3.2503 in.)
- Grade 2	82.558/82.565 mm. (3.2503/3.2506 in.)
- Grade 3	82.565/82.573 mm. (3.2506/3.2509 in.)
- Grade 4	82.573/82.580 mm. (3.2509/3.2512 in.)
Compression - Ratio - Europa TC (All Territories)	9.5 : 1
- Europa Special (UK & Export)	10.3 : 1
- Europa Special (N. America)	9.5 : 1
- Pressure at sea level (All models, all Territories)	In excess of 11.248 kg.cm.sq. (160 lbs.sq.in.) Each cylinder within 1.41 kg.cm.sq. (20 lbs.sq.in.) of each other.

Cylinder Head

Material	Aluminium
Gasket	Copper/asbestos
Valve timing - Inlet opens	26° B.T.D.C.
- Inlet closes	66° A.B.D.C.
- Exhaust opens	66° B.B.D.C.
- Exhaust closes	26° A.T.D.C.
Angle of valve seats and faces	45°
Valves:	
Head diameter - Inlet - Europa TC (UK & Export)	38.760/38.862 mm. (1.526/1.530 in.)
- Europa TC (N.America)	39.624/39.776 mm. (1.560/1.566 in.)
- Europa Special (All Territories)	39.624/39.776 mm. (1.560/1.566 in.)
- Exhaust (All models, all Territories)	33.553/33.655 mm. (1.321/1.325 in.)
Stem diameter - Inlet and Exhaust	7.874/7.899 mm. (.310/.311 in.)
Stem clearance in guide - Inlet	.007/.058 mm. (.0003/.0023 in.)
- Exhaust	.063/.076 mm. (.0025/.0030 in.)
Clearance (cold) - Inlet	.127/.177 mm. (.005/.007 in.)
- Exhaust	.228/.279 mm. (.009/.011 in.)
Valve Springs:	
Type	Dual
Free length - Inner	28.70 mm. (1.130 in.)
- Outer	36.83 mm. (1.450 in.)
Rate - Inner @ 23.4 mm. (.92 in.)	5.6 kg. (12.4 lbs.)
- Inner @ 14.7 mm. (.58 in.)	15.2 kg. (33.5 lbs.)
- Outer @ 29.7 mm. (1.17 in.)	20.4 kg. (45.0 lbs.)
- Outer @ 21.1 mm. (.83 in.)	49.4 kg. (109 lbs.)
Valve guides:	
Length - Inlet	36.608 mm. (1.520 in.)
- Exhaust	37.592 mm. (1.480 in.)
External diameter - Std.	12.700/12.713 mm. (.500/.5005 in.)
- O/size	12.852/12.865 mm. (.5060/.5065 in.)
Interference fit (all)	.0127/.0381 mm. (.0005/.0015 in.)
Fitted height above cylinder head	8.128 mm. (.320 in.)
Internal diameter (all) ream after fitting	7.907/7.932 mm. (.3113/3123 in.)

Bore in cylinder head - Std.	12.674/12.687 mm. (.499/.4995 in.)
- O/size	12.872/12.839 mm. (.505/.5055 in.)
Camshafts	
Journal diameter	25.4/25.413 mm. (1.000/1.0005 in.)
End float	.076/.254 mm. (.003/.010 in.)
Bearings - Number	5
- Type	Steel backed white metal
- Running clearance	.013/.050 mm. (.0005/.002 in.)
Cam followers:	
Bore in head	34.925/34.940 mm. (1.375/1.3756 in.)
Outside diameter	34.904/34.912 mm. (1.3742/1.3745 in.)
Follower to head clearance	.013/.036 mm. (.0005/.0014 in.)
Jackshaft	
Bearings - Number	3
- Type	Steel backed white metal
- Length - Front	19.05 mm. (.75 in.)
- Centre	16.26 mm. (.64 in.)
- Rear	19.05 mm. (.75 in.)
- Running clearance	.025/.050 mm. (.001/.002 in.)
Journal diameter	39.624/39.637 mm. (1.560/1.5605 in.)
End float	.063/.190 mm. (.0025/.0075 in.)
Crankshaft	
Balance	Within 14.42 gr. cm. (2 oz. in.)
Diameter - Main journals	53.987/54.000 mm. (2.1255/2.1260 in.)
- Crankpin	49.199/49.211 mm. (1.9370/1.9375 in.)
End float - Dimension	.076/.203 mm. (.003/.008 in.)
- Controlled by	Thrust washers on centre main bearing
Bearings - Number	5
- Type	Steel backed, lead bronze with lead overlay
- Running clearance	.038/.076 mm. (.0015/.0030 in.)
Maximum undersize for re-grind	.762 mm. (.03 in.)
Flywheel	
Maximum run out (lateral)	.101 mm. (.004 in.)
Starter ring gear - Run out - Lateral	.406 mm. (.016 in.)
- Radial	.152 mm. (.006 in.)

Connecting Rod	
Type	'H' Section
Material	Steel forging
Distance between centres	12.19/12.24 cm. (4.799/4.801 in.)
Bearings - Type	Steel backed, lead bronze with lead overlay
- Running clearance	.013/.513 mm. (.0005/.0022 in.)
- End float on crankpin	.101/.254 mm. (.004/.010 in.)
Small end bore (bushed):	
Grade 'A' (silver)	20.635/20.637 mm. (.8124/.8125 in.)
Grade 'B' (green)	20.637/20.642 mm. (.8125/.8127 in.)
Gudgeon (piston) pin	
Type	Floating
Location	Circlips
Diameter - Grade 'A'	20.627/20.628 mm. (.8121/.8122 in.)
- Grade 'B'	20.628/20.632 mm. (.8122/.8123 in.)
Class of fit	Finger push fit
Piston	
Type	Solid skirt
Material	Tin plated aluminium alloy
Length	68.250 mm. (2.687 in.)
Compression Height	39.014/39.065 mm. (1.536/1.538 in.)
Maximum permissible weight variation per set	4 grammes
Rings - Compression	2
- Oil control	1
Diameter - Grade 1	82.466/82.474 mm. (3.2467/3.2470 in.)
- Grade 2	82.474/82.481 mm. (3.2470/3.2473 in.)
- Grade 3	82.481/82.489 mm. (3.2473/3.2476 in.)
- Grade 4	82.489/82.497 mm. (3.2476/3.2379 in.)
Piston clearance in cylinder bore	.076/.091 mm. (.0030/.0036 in.)
Gudgeon pin bore offset	1.016 mm. (.04 in.) towards thrust face
Ring gap (fitted) - Compression	.229/.356 mm. (.009/.014 in.)
- Oil control	.254/.508 mm. (.010/.020 in.)

Piston ring to groove clearance:	
- Compression	.041/.091mm. (.0016/.0036 in.)
- Oil control	.046/.097 mm. (.0018/.0038 in.)

LUBRICATION SYSTEM

Pump: - Type.	
Drive.	Eccentric Lobe
	Gear on Jackshaft
Inner and outer rotor clearance	.15 mm. (.006 in.) Maximum
Inner and outer rotor float	.13 mm. (.005 in.) Maximum
Outer rotor to housing clearance	.25 mm. (.010 in.) Maximum
Normal pressure (hot)	2.4/2.8 kg. cm. sq. (35/40 lbs. in. sq.)
Filter	Full flow (throw away cannister)

FUEL SYSTEM

Pump - Operation	Lever by eccentric on Jackshaft
- Pressure	.087/.176 kg. cm. sq. (1.25/2.5 lbs. in. sq)
Air cleaner type	Paper element, dry
Carburetter - Type and number	Dellorto 40 DHLA, two
- Slow running speed	800 r.p.m.
- Settings:	
Choke	30 mm.
Main jet	115
Main air corrector jet	160
Slow running jet	50
Slow running air corrector jet	7850 - 2
Pump jet	8083.40
Starter jet	70
Main emulsion tube	7772 - 1
Starter emulsion tube	7482 - 1
Needle valve	7180 - 15
Air trumpet length	4.44 cm. (1.75 in.)

Carburetter - Type and number	Zenith-Stromberg 175 CD 2SE
- Slow running speed	800/900r.p.m.
Settings:	
Needle	B.1G
Spring colour	Light blue
Damper oil	SAE 20W/50

IGNITION SYSTEM

Type	Coil and distributor
Firing Order	1,3,4,2,
No 1 Cylinder	Nearest to front of car
Ignition advance control	Fully automatic
Ignition timing (static):	
Dellorto Carburetters	12° B.T.D.C.
Zenith-Stromberg Carburetters	5° B.T.D.C.
Coil	Lucas LA.12
Sparking plugs - Type	Champion N7Y
- Gap	.584/.635 mm. (.023/.025 in.)

*The above ignition setting may need SLIGHT alteration to meet local fuel requirements.

Distributor

Type	23 D.4
Direction of rotation (from above)	Anti-clockwise
Drive	Gear on jackshaft
Contact breaker gap	.35/.40 mm. (.014/.016 in.)
Contact lever spring tension	.51/.68 kg. (18/24 oz.)
Firing angles	0°, 90°, 180°, 270° ± 1°
Cam dwell angle	60° ± 3°
Despatch no. - Dellorto carbs.	41189
- Zenith-Stromberg carbs.	41225 when suction retard capsule fitted

Centrifugal advance (All distributors)

Crankshaft r.p.m.	Crankshaft degrees B.T.D.C. (Add static setting)
Below 1,000	No advance
1,250	2.4
1,500	4.6
1,750	6.8
2,000	9.2
2,250	11.6
2,500	14.0 Maximum advance

COOLING SYSTEM.

Type	Centrifugal pump and fan
Radiator cap relief valve pressure	.49 kg.cm.sq. (7 lbs.in.sq.)
Thermostat nominal opening temperature	78° C.
Alternator belt tension at top	9.52 mm. (.375 in.)
Impeller vanes to water pump housing clearance	.508/.762 mm. (.020/.030 in.)

CLUTCH

Make and Type	Borg and Beck, diaphragm spring
Operation	Cable
Driven plate diameter	21.59 mm. (8½ in.)
Free movement of withdrawal lever	4.318 mm. (.170 in.)

TRANSMISSION.

Type		4 forward speeds and reverse
Bearings - Mainshaft		Taper rollers
- Secondary gear cluster		Taper rollers
Bearings - Adjustment		See section 'F' (Transmission)
Gear ratios:	4 speed	5 speed
- O/D (5th.)	N/A	0.87 : 1
- 4th.	1.03 : 1	1.21 : 1
- 3rd.	1.48 : 1	1.61 : 1
- 2nd.	2.25 : 1	2.33 : 1
- 1st.	3.61 : 1	3.61 : 1
Reverse	3.08 : 1	3.08 : 1
Final drive - Type		Hypoid gear
- Bearings - Pinion		Taper rollers
- Diff./crown wheel		Taper rollers
Drive shaft end-float		.050/.076 mm. (.002/.004 in.)

Bearings adjustment - Pinion bearing pre-load	See Section 'F' (Transmission)
- Crown wheel/pinion	.127/.254 mm. (.005/.010 in)backlash
Number of teeth - Crown wheel	32 } Type 336/352 gearbox 34 } Type 365 gearbox
- Pinion	9 } gearbox 9 } gearbox
Speedometer gears :	Driving Gear / Driven Gear
Type 336 & 352 gearbox	6 teeth
(4 speed)	(X046 F 6049Z)
Type 365 gearbox	9 teeth
(5 speed)	(A074 F 6111Z)
Final drive ratio - 4 speed	3.56 :1
- 5 speed	3.78 : 1
Overall ratios:	4 speed / 5 speed
- O/D (5th.)	N/A / 3.289 : 1
- 4th.	3.666 : 1 / 4.574 : 1
- 3rd.	5.268 : 1 / 6.086 : 1
- 2nd.	8.010 : 1 / 8.807 : 1
- 1 st.	12.851 : 1 / 13.646 : 1
- Reverse	10.964 : 1 / 11.642 : 1

STEERING

Type	Rack and Pinion
Steering angles - Camber	0° to ± 30'
- Castor	2° 30' ± 30'
- Swivel pin inclination	9° ± 30'
Toe in	4.8 mm. (3/16 in.) to 1.6mm.(1/16 in)
Condition for checking toe in	15 cm. (6 in.) ground clearance at bottom of chassis closing plate.

FRONT SUSPENSION.

Type	Independant
Spring - Number of coils	13.5
- Wire diameter	10.16 mm. (.40 in.)
- Length - Free	31.77 cm. (12.51 in.)
- Fitted	20.01 cm. (7.88 in.)
- Rate	1.33 kg.m. (116 lbs. in.)
Front hub end float	.05/.10 mm. (.002/.004 in.)

REAR SUSPENSION.

Type	Independant
Spring - Number of coils	19.6
- Wire diameter	8.23 mm. (.324 in.)
- Length - Free	42.54 cm. (16.75 in.)
- Fitted	25.04 cm. (9.86 in.)
- Rate	.865 kg.m. (75 lbs. in.)
Wheel camber	1° Negative ± 30'
Toe - in	6.35 mm. (¼ in.) to 3.18 mm.(1/8 in.)

BRAKES.

Make and type	Girling hydraulic (servo assisted)
Front brakes - Disc diameter	24.76 cm. (9.75 in.)
- Pads material	Ferodo FER .2430 F
- Total disc run out	.10 mm. (.004 in.)
Rear Brakes - Drum diameter and width - T/C	20.3cm. (8 in.) x 31.75mm.(1.25 in.)
- Special	20.3cm. (8 in.) x 38.10mm.(1.50 in.)
- Lining material	Don.242
Handbrake type	Mechanical on rear only

WHEELS AND TYRES.

Wheel - Type	Pressed steel - bolt on
- Size	4½J
Tyres - Type	Dunlop SP Sport with tubes
- Size	155 X HR13
- Pressure (cold):	

At speeds BELOW 160 k.p.h. (100 m.p.h.)	At sustained speeds ABOVE 160k.p.h. (100m.p.h.
Front 1.27 kg.cm.sq. (18 lbs.in.sq.)	1.69kg.cm.sq. (24lbs.in.sq.)
Rear 1.97 kg.cm.sq. (28 lbs.in.sq.)	2.39kg.cm.sq. (34 lbs.in.sq.)

NOTE

It is not necessary to increase the tyre pressures for any reason other than those given.

* When inner tubes are fitted, it is essential that these are of the correct type for radial ply tyres.

Optional Wheels and Tyres.

Wheel - Type	Alloy - Bolt on
- Size	5½J X 13
- Nuts, torque loading	5.53 - 6.22 kg.m.(40-45 lbs.ft.)

Tyres - Type	Firestone Cavalino 'wide oval'
- Size	175/185 x 13
- Pressure (cold):	

At speeds BELOW 160 k.p.h. (100 m.p.h.)	At sustained speeds ABOVE 160 kph (100 mph)
1.125 kg. cm.^{2} (16 lbs. in.^{2})	1.547 kg. cm.^{2} (22 lbs in.^{2})
1.828 kg. cm.^{2} (26 lbs. in.^{2})	2.250 kg. cm.^{2} (32 lbs.in.^{2})

NOTE

It is not necessary to increase the tyre pressures for any reason other reason other than those given.

ELECTRICAL EQUIPMENT

Battery

Type	Exide 6 VTA 29L
Capacity	39 amp. hr. @ 20 hr. rating
Voltage and polarity	12 volt Negative earth

Fuses

Quantity	4; 35 amp

Alternator

Type	AC Delco DN 460
Maximum output	35 amp @ 3,600 r.p.m.
Earth polarity	Negative
Number of poles	14
Stator phases	3

Starter

Type	Lucas M.35 J
Drive	'SB' (inboard)
Brush tension	.80 kg. (28 ozs.)
Light running current	65 amp @ 8,000/10,000 r.p.m.
Lock torque	.97 kg. m. (7 lbs. ft.) @ 350/375 amp

Lamp bulbs (all 12 volts)

Headlamp - RHD	410 (45/40W) with 989 (6W) pilot
- LHD	410 (45/40W) with 989 (6W) pilot
- France	411 (45/40W) yellow with 989 (6W) pilot
- North America	Sealed beam unit

Front and rear indicators	382 (21W)
Indicator repeater	501 (5W capless)
Stop and tail lamps	380 (21/6W)
Rear number plate lamp	254 (6W festoon)
Reverse lamp	273 (21W festoon)
Interior lamp	254 (6W festoon)
Panel (instrument) lamps	987 (2.4W)
Warning lamps	987 (2.4W)

TORQUE LOADING FIGURES

ENGINE	kg. m.	lbs. ft.
Cylinder head (tighten cold)	8.29 - 8.98	60 - 65
Cylinder head to front cover	1.38 - 2.07	10 - 15
Sparking plugs	3.31 - 3.87	24 - 28
Camshafts - Bearing caps	1.24	9
- Sprockets	3.45 - 4.14	25 - 30
Crankshaft - Main bearing caps	7.60 - 8.29	55 - 60
- Connecting rod (big-end) caps	6.08 - 6.36	44 - 46
- Pulley	3.31 - 3.87	24 - 28
Flywheel	6.22 - 6.91	45 - 50
Front timing cover $\frac{1}{4}$" (UNF & UNC)	.69 - .96	5 - 7
5/16" (UNF & UNC)	1.38 - 2.07	10 - 15
- Back plate to cylinder block	.83 - 1.10	6 - 8
Timing chain tensioner - Sprocket pin	5.53 - 6.22	40 - 45
- Retaining bolt	6.22 - 6.91	45 - 50
- Pivot pin	5.53 - 6.22	40 - 45
Jackshaft - Sprocket	.65 - 2.07	12 - 15
- Thrust plate	.69 - .96	5 - 7
Oil filter centre bolt	1.65 - 2.07	12 - 15
Oil pump to cylinder block	1.65 - 2.07	12 - 15
Oil sump to cylinder block	.83 - 1.10	6 - 8
Oil sump drain plug	2.76 - 3.45	20 - 25
Fuel pump to cylinder block	1.65 - 2.07	12 - 15
Exhaust manifolds to cylinder head	1.65 - 2.07	12 - 15
Rear oil seal carrier (crankshaft) to cyl. block	1.65 - 2.07	12 - 15
Generator to mounting bracket	2.07 - 2.48	15 - 18
Carburetter trumpet nuts	1.10	8
Engine mounting bracket to engine	2.48	18

CLUTCH	kg. m.	lbs. ft.
Clutch housing to gearbox	5.53 - 6.22	40 - 45
Clutch assembly to flywheel	1.65 - 2.07	12 - 15
TRANSMISSION.		
Gearbox casing (halves)	See Section 'F'	
Differential case to crown wheel	See Section 'F'	
Differential bearing adjusting nuts	2.07	15
Pinion bearing nut	11.75	85
Speedometer drive worm	See Section 'F'	
Reverse selector pivot	See Section 'F'	
Side cover plates	2.07	15
Gearbox mounting bracket to chassis	4.83	35
FRONT SUSPENSION & STEERING		
Stub axle retaining nut	8.98 - 10.36	65 - 75
Ball joint - To vertical link	5.25 - 5.80	38 - 42
- To upper wishbone	1.65 - 2.07	12 - 15
Lower wishbone - To trunnion *	4.83	35
- To damper *	6.91	50
Inner wishbone retaining nut *	6.91	50
Caliper mounting plate to hub	3.04 - 3.73	22 - 27
Steering arm to vertical link	3.04 - 3.73	22 - 27
Steering tie rod ball joint	3.59 - 3.87	26 - 28
Steering tie rod adaptor	6.91	50
Steering unit mounting clamps to chassis	1.38	10
Steering column impact clamp	3.59 - 4.42	26 - 32

* Tighten with suspension in static ride condition

REAR SUSPENSION.		
Lower link and damper to bearing housing	7.60	55
Lower link to clutch housing	5.53	40
Lower link mounting bracket to transmission	1.65	12

	kg. m.	lbs. ft.
Bearing housing to radius arm	2.48	18
Radius arm front mounting bolt	4.83	35
Rear damper top mounting	5.53	40
HUBS		
Rear hub to outboard drive shaft*	20.70	150
Brake disc to front hub	3.04 - 3.73	22 - 27
Front hub to spindle nut **	.69 - .83	5 - 6

*Assemble with Loctite '35'. A rotational free play NOT EXCEEDING .127 mm (.005 in.) between the hub and shaft measured at the wheel stud MUST be used for LEFT HAND hubs.

**Tighten nut to this torque loading while rotating the hub to ensure bedding of taper rollers. Slacken nut 'one flat', then insert split pin.

BRAKE HYDRAULIC SYSTEM CONNECTIONS		
3/8 in UNF female (bundy and hose connection)	1.10 - 1.38	8 - 10
3/8 in UNF male (bundy to master cylinder, multi-ways etc.)	.69 - .96	5 - 7
7/16 in. UNF male	1.93 - 2.90	14 - 21
3/8 in. bore servo bundy (5/8 in. male)	1.65 - 2.07	12 - 15
Stop lamp switch	1.65 - 2.07	12 - 15
Brake hose to banjo	1.65 - 2.07	12 - 15
7/16 in. UNF female (bundy to reservoir)	1.65 - 1.93	12 - 14

Torque Wrenches

Torque wrenches in daily use should be checked at intervals not exceeding 3 months to ensure that accuracy is maintained.

GENERAL NUTS AND BOLTS

1/4 in. UNF and UNC	.69 - .96	5 - 7
5/16 in. UNF and UNC	1.65 - 2.07	12 - 15
3/8 in. UNC	2.35 - 3.04	17 - 22
3/8 in. UNF	3.04 - 3.73	22 - 27
7/16 in. UNC	4.14 - 4.85	30 - 35
7/16 in. UNF	5.53 - 6.22	40 - 45
1/2 in. UNC	6.22 - 6.91	45 - 50
1/2 in. UNF	6.91 - 8.29	50 - 60
9/16 in. UNC	8.29 - 9.68	60 - 70
9/16 in. UNF	8.98 - 10.36	65 - 75
5/8 in UNC	10.36 - 11.75	75 - 85
5/8 in. UNF	13.82 - 15.20	110 - 110

SECTION A.

CHASSIS.

A.1. - GENERAL DESIGN ASPECTS.

In order to achieve the desired performance from a modest capacity power unit, the basic philosophy behind the design of all Lotus touring cars, is that any part or combination of parts should be of the minimum weight consistent with adequate strength- the strength required being determined from the calculated NORMAL loads applied to any part of the car, plus a safety factor, to arrive at a final figure which is acceptable in the context of the car's envisaged use.

A.2. - ACCIDENT DAMAGE.

Economics, available repair facilities and delivery circumstances provide the criteria for assessment of a chassis repair or replacement.

It follows from this that when parts are subjected to an ABNORMAL load possibility of failure is increased and indeed incipient failure may be initiated. Incipient failure is the more dangerous form, as having no visible effect, the part may be assumed to be in good condition and then fail in ensuing normal service.

Consequently, whenever a car suspension or steering is damaged, consideration should be given to secondary or shock damage.

For example, in the case of the front suspension, both steering mechanism and chassis mountings should be carefully examined for both misalignment and micro-cracks. Even when no damage is apparent to the mounting pins, if the wishbones have been damaged it is strongly advised that a new chassis be fitted. Should the mounting pins be damaged or bent, (however slightly) A NEW CHASSIS MUST BE FITTED. These principals must always apply where driver safety is the prime consideration.

Inspection should be made of engine and gearbox mounting points where a vehicle has been involved in impact. As the unit may have travelled forward, distortion could have occured; check for broken welds etc.

Where broadside impacts or fire have created severe distortion conditions a replacement unit is essential.

Patching as a repair expedient is not recommended, whilst stretching can only be achieved with heat on the buckled surface of larger sections.

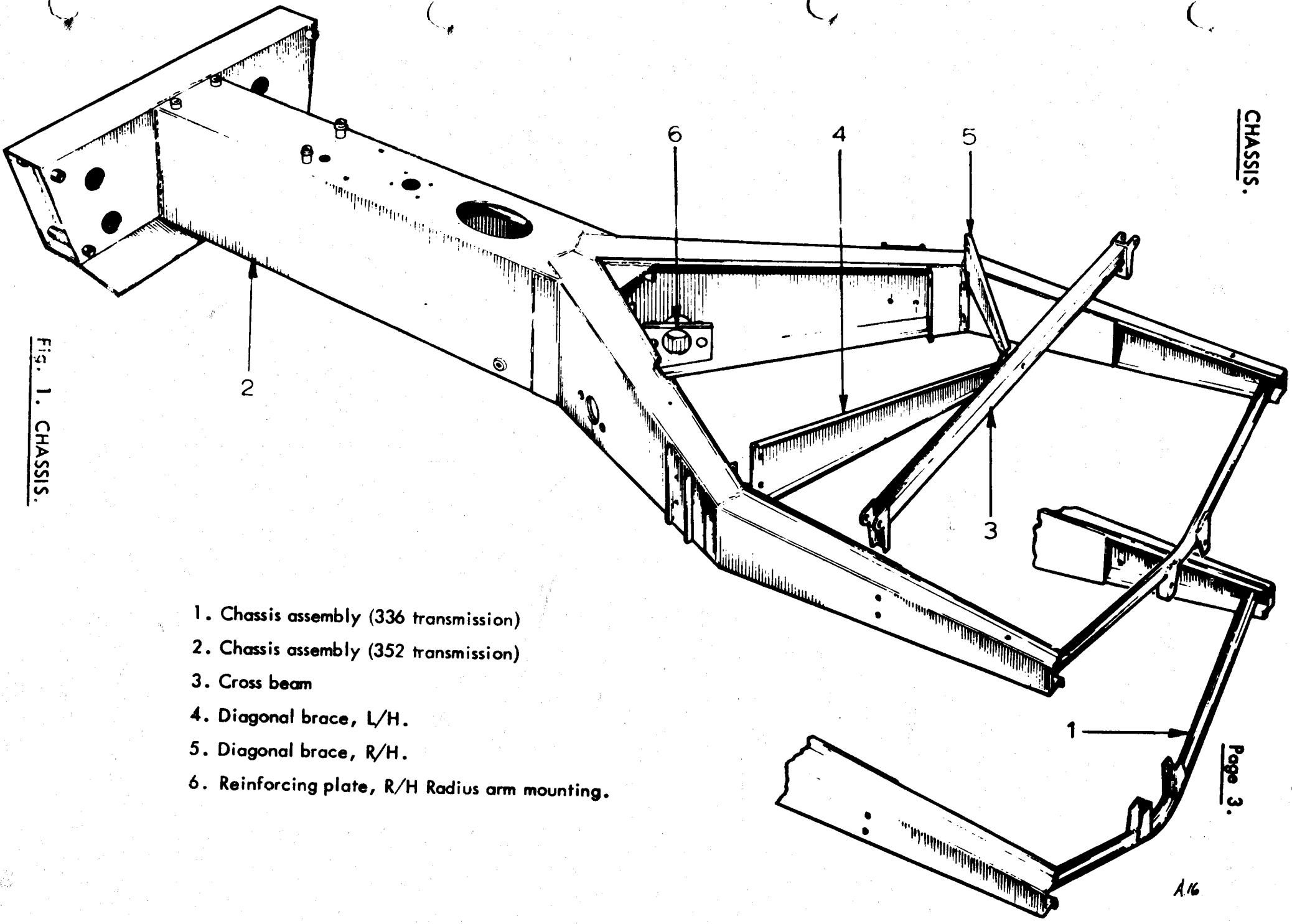


Fig. 1. CHASSIS.

1. Chassis assembly (336 transmission)
2. Chassis assembly (352 transmission)
3. Cross beam
4. Diagonal brace, L/H.
5. Diagonal brace, R/H.
6. Reinforcing plate, R/H Radius arm mounting.

A.16

A.3. - LOWER FRONT SUSPENSION FULCRUM PIN.

New lower fulcrum pins (Part No. C074 C 0115) may be fitted, PROVIDED THAT no excessive damage to the wishbones has occured. Whatever repair is carried out, the responsibility MUST ALWAYS BE with the repairer.

To replace the fulcrum pin, it is only necessary to dismantle the wishbones from the fulcrum pin, then slide out the pin.

Fit new pin by merely sliding into the tubes built into the chassis front box. Ensure correct torque loading of wishbones securing nuts (see 'TECHNICAL DATA') on assembly.

A.4. - CHASSIS ASSEMBLY WITH TYPE 365 TRANSMISSION.

The main difference between this chassis, and those illustrated on Page 3 is that of the gearbox mounting tube.

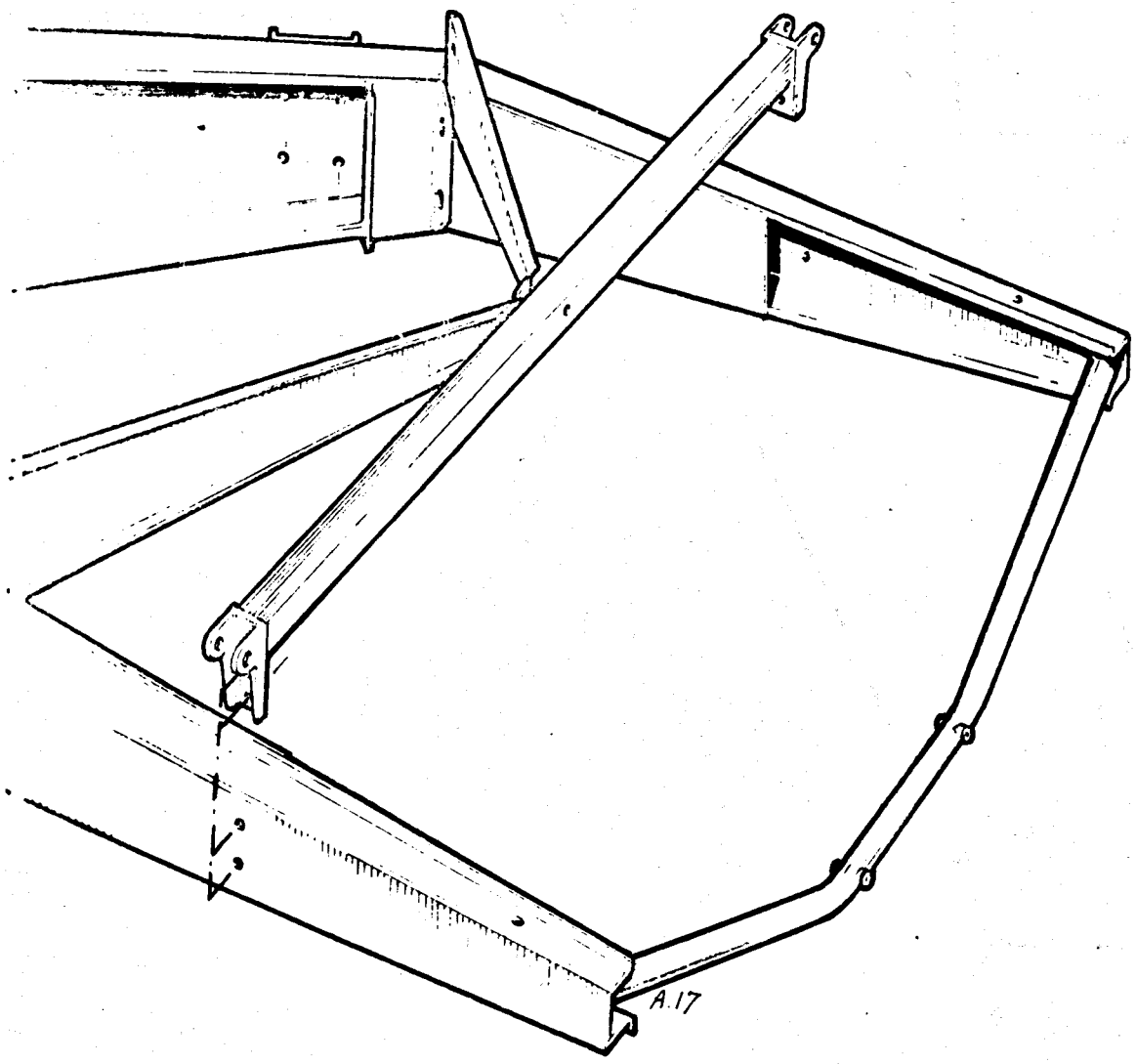


Fig. 2. Chassis Assembly (Type 365)

SECTION B.

BODY.

B.1. - SEATS.

There is no difference in seat removal on Europa Twin Cam cars to the seats fitted in previous Europa cars, except that on cars destined for use in North America, seat 'sensors' are fitted. The sensor, which is beneath the passenger seat, works in conjunction with an audible warning for non-fastening of seat belts .

The seat belt warning system must provide an audible signal (buzzer) and a 'fasten belts' warning lamp (situated on centre console below ashtray), which activate when all the following conditions exist:

a. Ignition switch is 'on' (position 2 & 3).

b. Driver's seat belt NOT fastened.

c. Passenger seat occupied by at least an average 6 year old child and seat belt NOT fastened.

NOTE: The warning signals must not activate when the handbrake is 'on'.

B.2. - SEAT REMOVAL.

1. With the seat in its rearmost position, remove the front runner retaining bolts.
2. Move the seat fully forward and remove the bolts securing the rear ends of the runners.
3. On North American cars, disconnect the seat sensor (two snap connectors) from beneath the passenger seat. Lift out seat and runners as an assembly.

B.3. - SEAT REPLACEMENT.

1. Replacement of the seats is a direct reversal of the removal procedure. On North American cars, do NOT forget to re-connect the seat sensor. On all cars, reseal the runner securing bolts beneath the floor of the car to avoid possible water entry.

B.4. - SEAT BELTS.

Static type seat belts are fitted as original equipment on all cars for all Territories, except in North America, where reel type belts are fitted.

To Remove.

Static type seat belt removal is similar to that given in the Europa Workshop Manual, so will not be detailed here. Reel type belts are removed as follows:-

1. Move the seat forwards as far as possible. Remove the seat belt mounting bolts on either side of the seat.
2. Disconnect the seat belt warning cables from the seat belt receiver (two snap) connectors running from the back of the receiver.
3. Pull off the reel cover and remove the two securing bolts with their nuts now exposed.

To Replace.

1. Reverse the removal procedure, NOT forgetting to re-connect the cables at the seat belt receiver.

B.5. - FACIA PANEL (NORTH AMERICA)

Commencing at Chassis No. 72082684R, all cars destined for use in North America are fitted with a new facia panel (see Fig. 1.) This new facia comprises a re-grouping of the supplementary instruments and different switches (see Section 'M' for their removal).

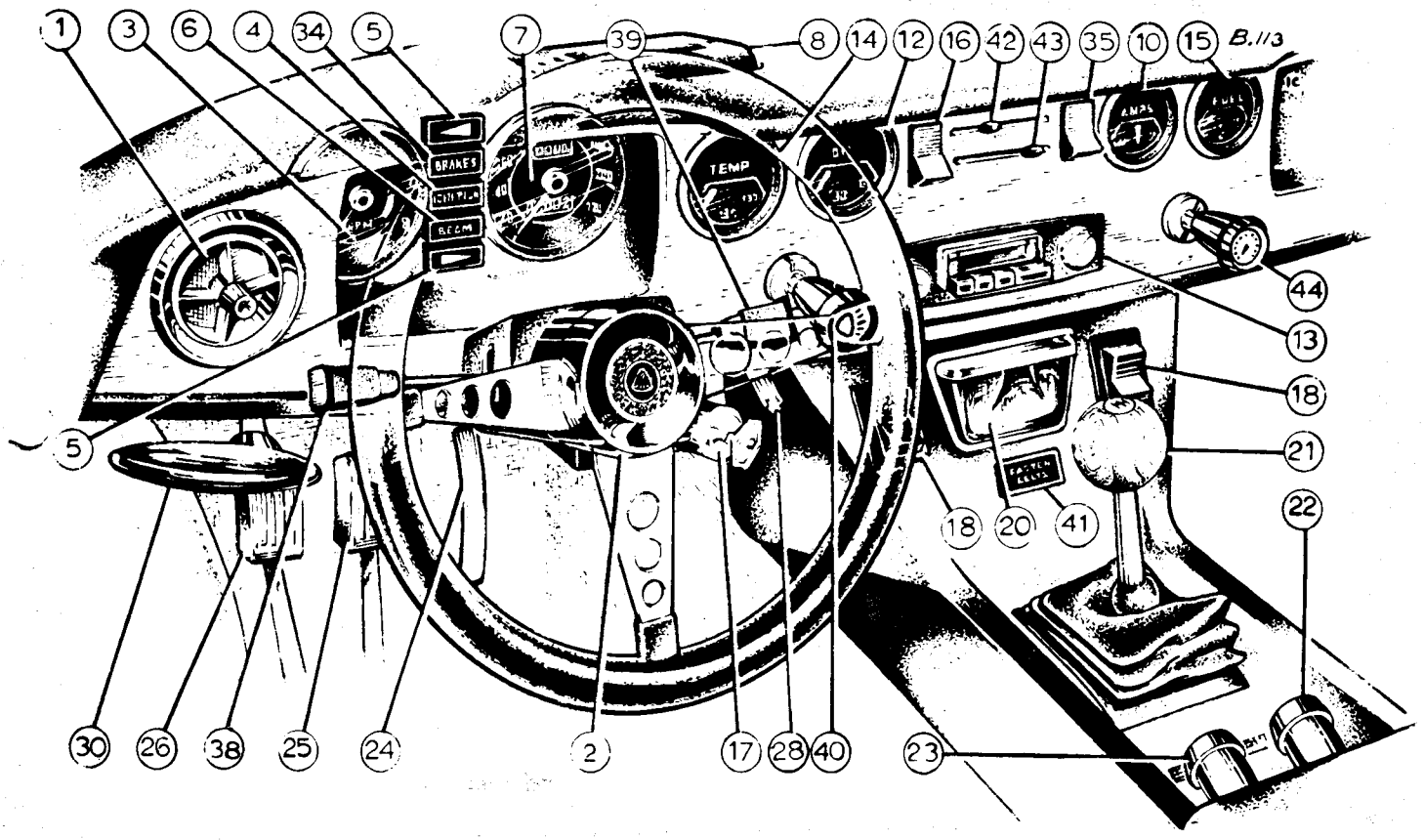


Fig. 1. Facia Panel and Controls (North America only)

Key to Fig.1.

1. Face level ventilator
2. Steering wheel
3. Tachometer
4. Ignition warning lamp
5. Direction indicator warning lamps
6. Headlamps main beam warning lamp
7. Speedometer
8. Windscreen demister vent
10. Ammeter
12. Oil pressure gauge
13. Radio (when fitted)
14. Water temperature gauge
15. Fuel gauge
16. Heater fan switch
17. Ignition/starter switch and lock
18. Window operating switches
20. Ashtray
21. Gearshift lever
22. Choke control
23. Heater temperature control
24. Accelerator pedal
25. Brake pedal
26. Clutch pedal
28. Speedometer trip control
30. Handbrake
34. Brakes warning lamp
35. Hazard warning switch
38. Horn/indicators/headlamps switch
39. Windscreen wiper/washer control
40. Lighting switch
41. Seat belts 'fasten' warning lamp
42. Heater air direction control, driver
43. Heater air direction control, passenger
44. Panel lamps switch

It is recommended that the Wiring Diagram (LSL.213) be studied in conjunction with Fig. 1.

B.6. - BODY SILLS (SPECIAL)

All Europa Special cars, from Chassis No.

72081783P - U.K.
72081101Q - Export
72082684R - N. America

are fitted with trim sills, attached to the body sills (below the doors). These are retained by trim clips (B of Fig.2.) at their lower edges, and 'pop' rivets at front and rear top edges (into the wheelarch).

To remove the trim sills, drill out 'pop' rivet at both front and rear top edges, ease sills away from body at their upper edges, and remove by pushing down away from the clip (B). Replace by reversing these instructions.

To remove the trim strip (above the trim sill), ease up lower edge from its retaining clips (A of Fig.2.), and remove by lifting up, and out. Take care not to damage the paint during this operation.

Refitting is a reversal of these instructions.

B 115

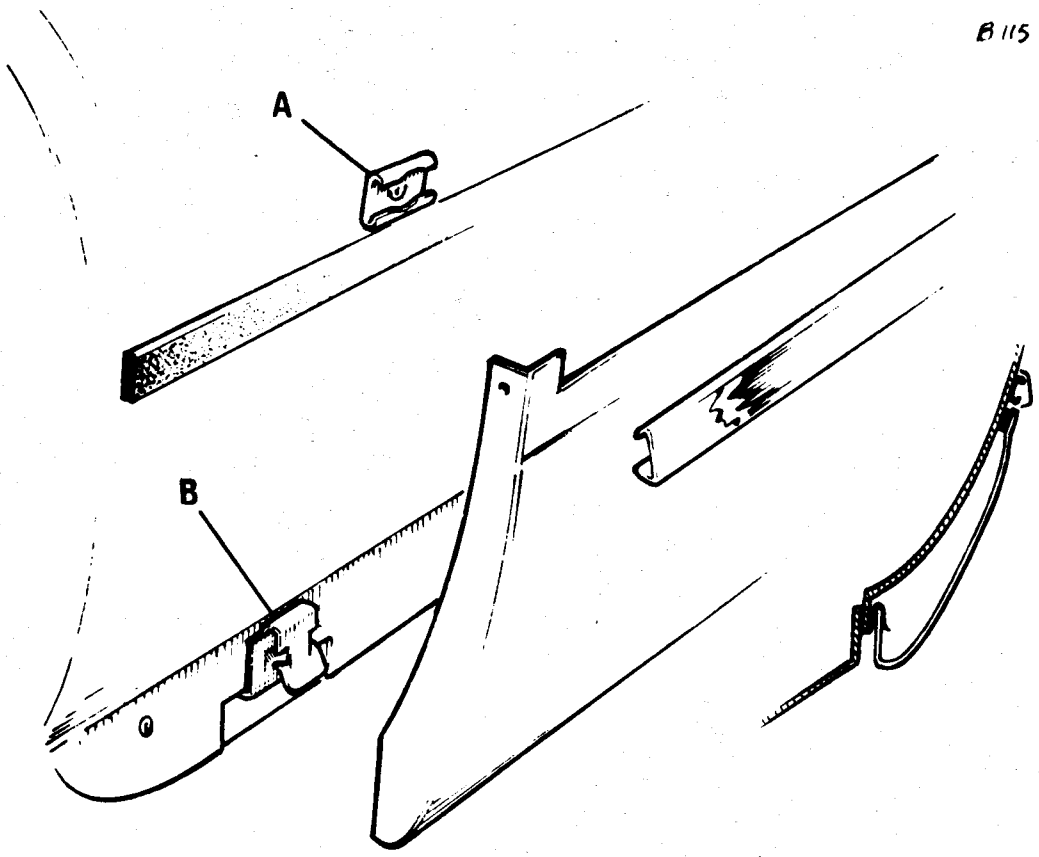


Fig. 2. Body Trim Sill and Trim Strip.

SECTION D.

REAR SUSPENSION.

D.1. - REAR HUBS.

No adjustment is provided, or indeed required on the rear hub bearings. Maintenance is therefore limited to replacement. To gain access to the bearings it is necessary to remove the bearing housing from its mounting in the radius arm. The following procedure is recommended:-

1. Raise the car, support with suitable stands and remove the road wheel and brake drum.
2. Straighten the locking washer securing the rear hub retaining nut, release the nut and remove nut, washer and rear hub.
3. Disconnect the handbrake cable at the brake backplate lever. Release the brake hydraulic pipe at the brake backplate. Insert a suitable plug into the brake pipe to avoid the ingress of foreign matter.
4. Remove the bolts securing the brake backplate to the radius arm assembly. Remove backplate as an assembly. There is no necessity to disturb the brake shoes.
5. Release the bolt which secures both the lower link and the damper assembly to the bearing housing.
6. Release but do not remove the bolt securing the forward end of the radius arm to the chassis. With a suitable drift, remove the tension pin pair (one solid pin inside an open-ended pin) securing the inboard drive shaft to the transmission output drive shaft. While easing out the forward end of the radius arm, pull the inboard drive shaft coupling from the output drive shaft.
7. Temporarily replace the hub securing nut on the end of the outboard drive shaft (to protect the threads) and knock the drive shaft from its bearings in the bearing housing. Note that the bearing lubrication return flinger is not misplaced during this operation.
8. The bolts securing the bearing housing to the radius arm can now be released and the housing withdrawn from its location.
9. To facilitate removal of the bearings, first immerse the bearing housing in hot water for a few minutes. Using a drift against the outer ring of the bearing, knock out the bearing after pushing the bearing spacer to one side. Repeat the operation for the other bearing. Note that an oil seal (which should come out with the bearing) is on the inner bearing.

Replacement of the bearings is a reversal of the removal procedure, but the following points must be observed:-

1. When refitting the inboard drive shaft coupling to the output drive shaft, ensure that the shims are still in place. It is suggested that after removal of the coupling a suitable retainer (such as a bolt with a nut) is inserted through the tension pin hole to secure the shims.
2. BEFORE fitting the rear hubs and to ensure a positive fit between the hubs and the outboard drive shaft, ensure that both the hub and drive shaft are free from grease and dirt. Spray the mating surfaces with Locquic primer grade 'T' and allow to dry. Apply Loctite 'High Strength Retaining Compound Type 35'.
   Assemble the hub to its drive shaft and secure with lock washer and nut. Torque load the nut to the figure given in TECHNICAL DATA. When assembled, allow a MINIMUM period of 6 hours for the compound to cure.

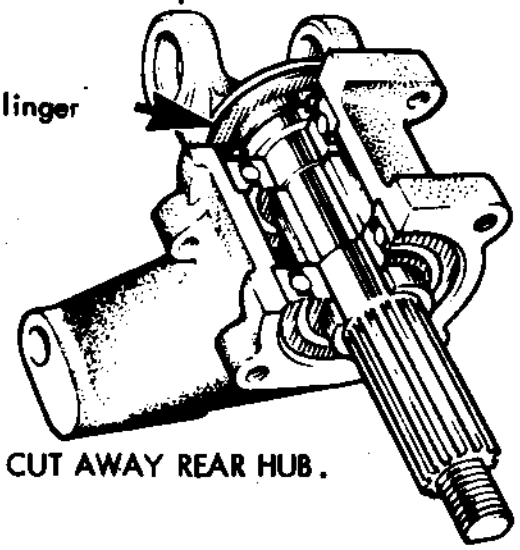


Fig. 1. CUT AWAY REAR HUB.

D.2. - LOWER LINK.

To remove the lower link, the following procedure is recommended:-

1. Raise the car, support with suitable stands and remove the road wheel. The rear of the car should be raised high enough to allow the suspension unit to assume its fully extended position.
2. Release the bolt which secures the lower link and the damper assembly to the bearing housing.

3. Release the bolt which secures the inner end of the lower link to the bracket on the transmission housing. Ease the link from its location. Note there is no necessity to disturb the bracket when removing the link.

When replacing the new lower link, the securing bolts MUST only be finally tightened with the car in its normal ride position. Tighten the bolts to the torque loading given in TECHNICAL DATA.

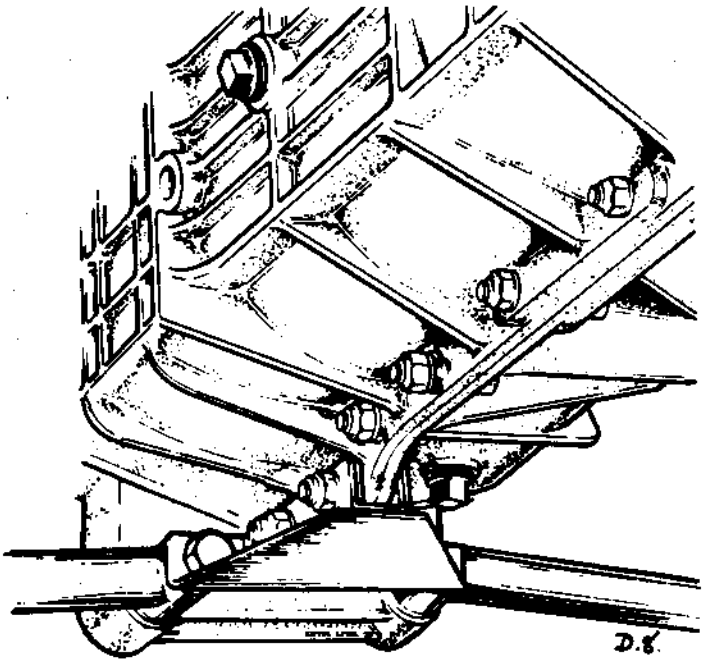


Fig. 2. LOWER LINK BRACKET
(Early cars)

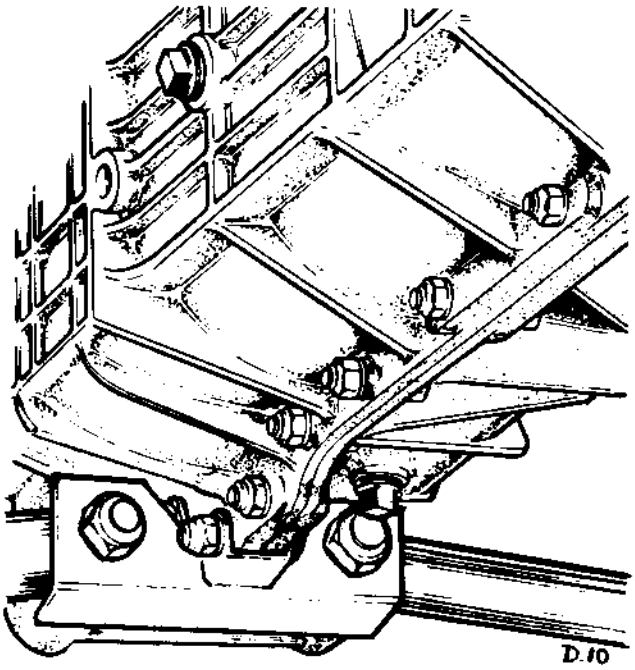


Fig. 3. LOWER LINK BRACKET
(Later cars)

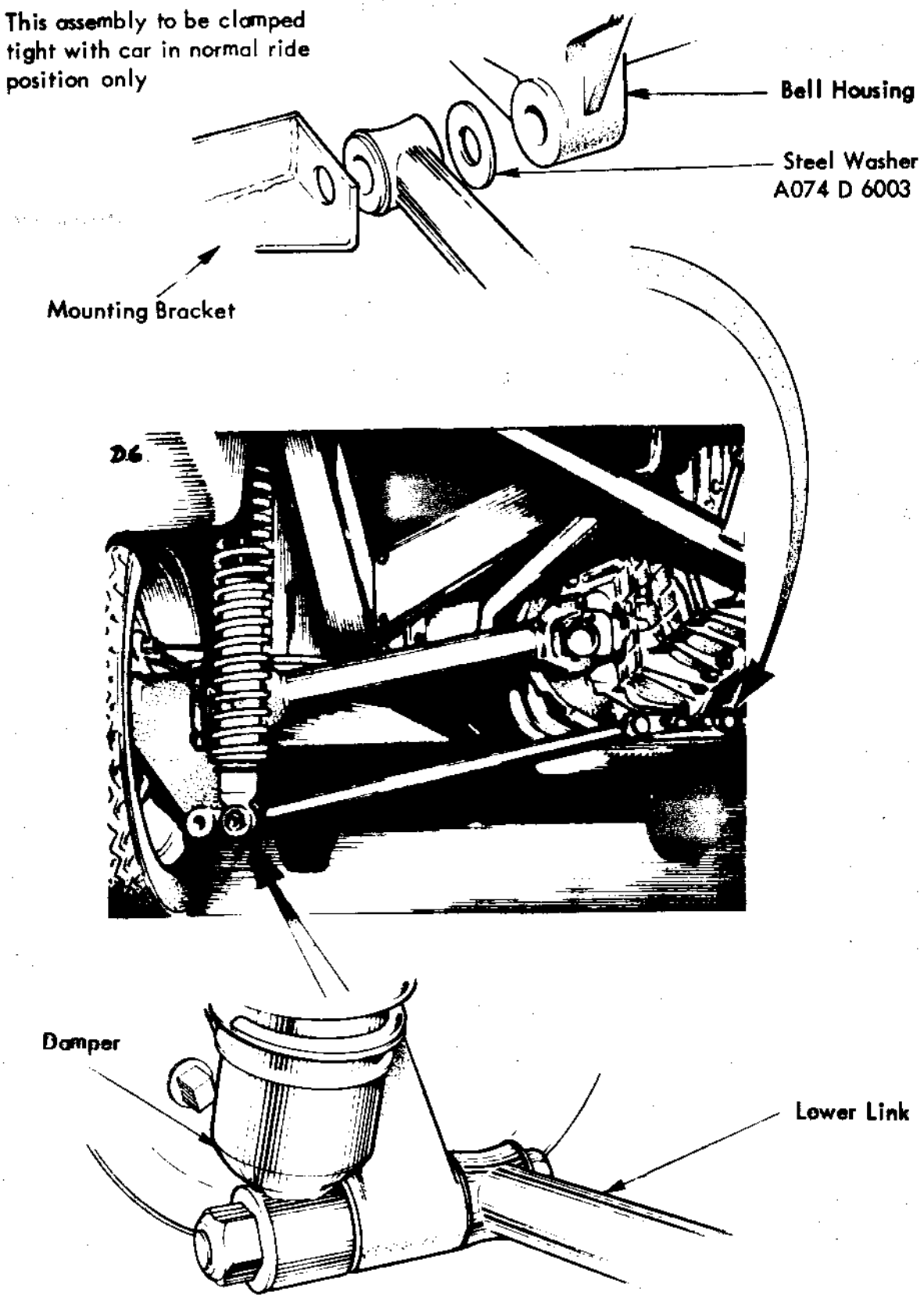


Fig. 4. REAR SUSPENSION.

D.3 - REAR HUB BEARING SPACERS.

When replacing rear hub bearings, it is IMPORTANT to check the length of the spacer (A of Fig. 5.). This measurement is critical and if ignored, could result in a side-load being placed upon the new bearings, thus causing premature failure.

Spacer measurements are as follows :-

X046 D 0148Z = 2.125 ± .010 in. this spacer used an all models up to introduction of Europa Special.

A074 D 0215Z = 2.000 ± .005 in. this spacer being used on Europa Special models only.

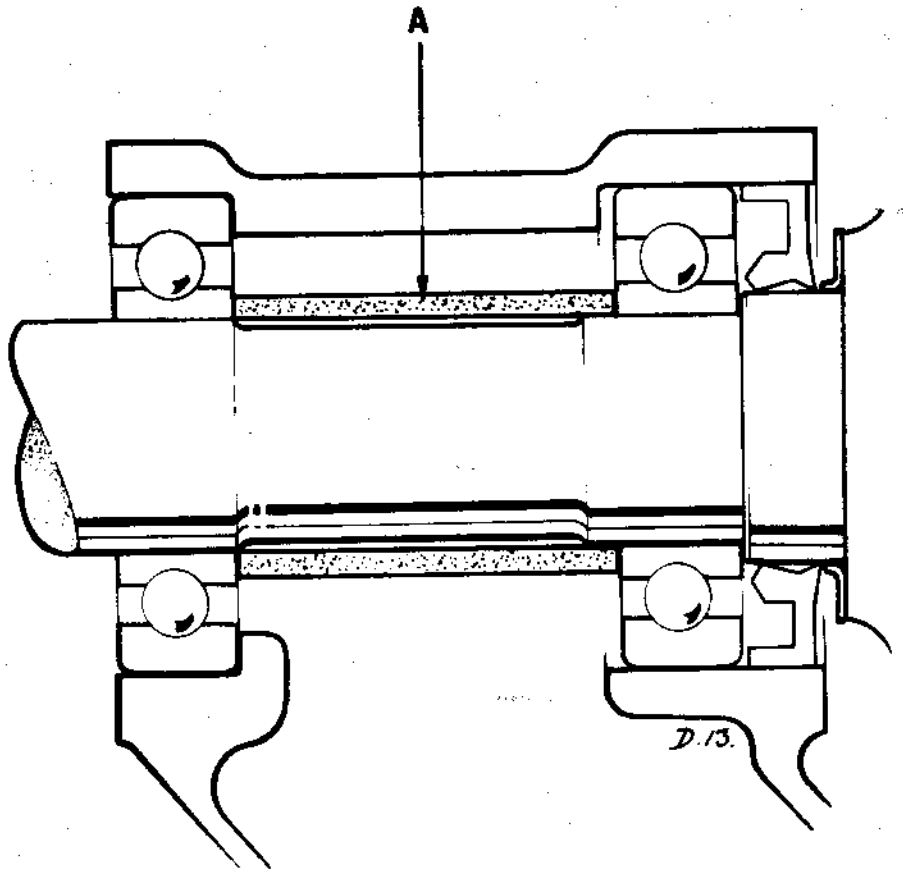


Fig. 5. Location of Hub Bearing Spacer.

SECTION G.

WHEELS/TYRES.

G.1. - TYRES

It is recommended that the complete assemblies of wheels and tyres are balanced at intervals of every 5,000 miles (8,000 km.)

Maintain the tyres at the correct pressures. Under inflation will cause excessive wear and rapid deterioration of the tyre walls, whilst over inflation will have a detrimental effect on the handling characteristics. Pressures should be checked at least once a week.

Because of their light, precise steering, these cars are highly sensitive to tyre radial run-out and concentricity. If trouble is experienced with replacement tyres, reference should be made to the tyre manufacturer concerned.

When inadvertently running on reduced tyre pressures, the tyre could be suddenly deflated by hard cornering, as the wheel safety ledge is slightly tapered.

The Lotus Europa Twin Cam is equipped with Dunlop 'SP Sport' radial tyres having inner tubes. Note that when tyres are replaced and inner tubes are fitted, it is ESSENTIAL that the tubes are of the CORRECT TYPE for RADIAL PLY TYRES.

It is pointed out, however, that when using the recommended pressures (see TECHNICAL DATA) there is no danger whatever in using tubeless tyres without tubes.

It is recommended that all pressures, including the spare, be checked at intervals of every 1,000 miles (1,600 km.).

G.2. - ALLOY WHEELS.

With this option, larger section tyres are fitted to the rear wheels. The spare is fitted with a small section (front) tyre. NOTE that:

1. Under NO CIRCUMSTANCES must a rear tyre be fitted at the front of the car.
2. A front wheel and tyre assembly MAY BE USED as a 'get you to the nearest garage' EMERGENCY SPARE, PROVIDED that the pressure is adjusted for the rear position and LESS THAN moderate speeds and cornering loads are employed, i.e. NO MORE THAN HALF THE CAR'S POTENTIAL, RELATIVE TO THE PERTAINING ROAD CONDITIONS.
3. It is IMPORTANT that any balance weights are hard up against the corner radius of the wide part of the inside of the wheel (see Fig. 1.)

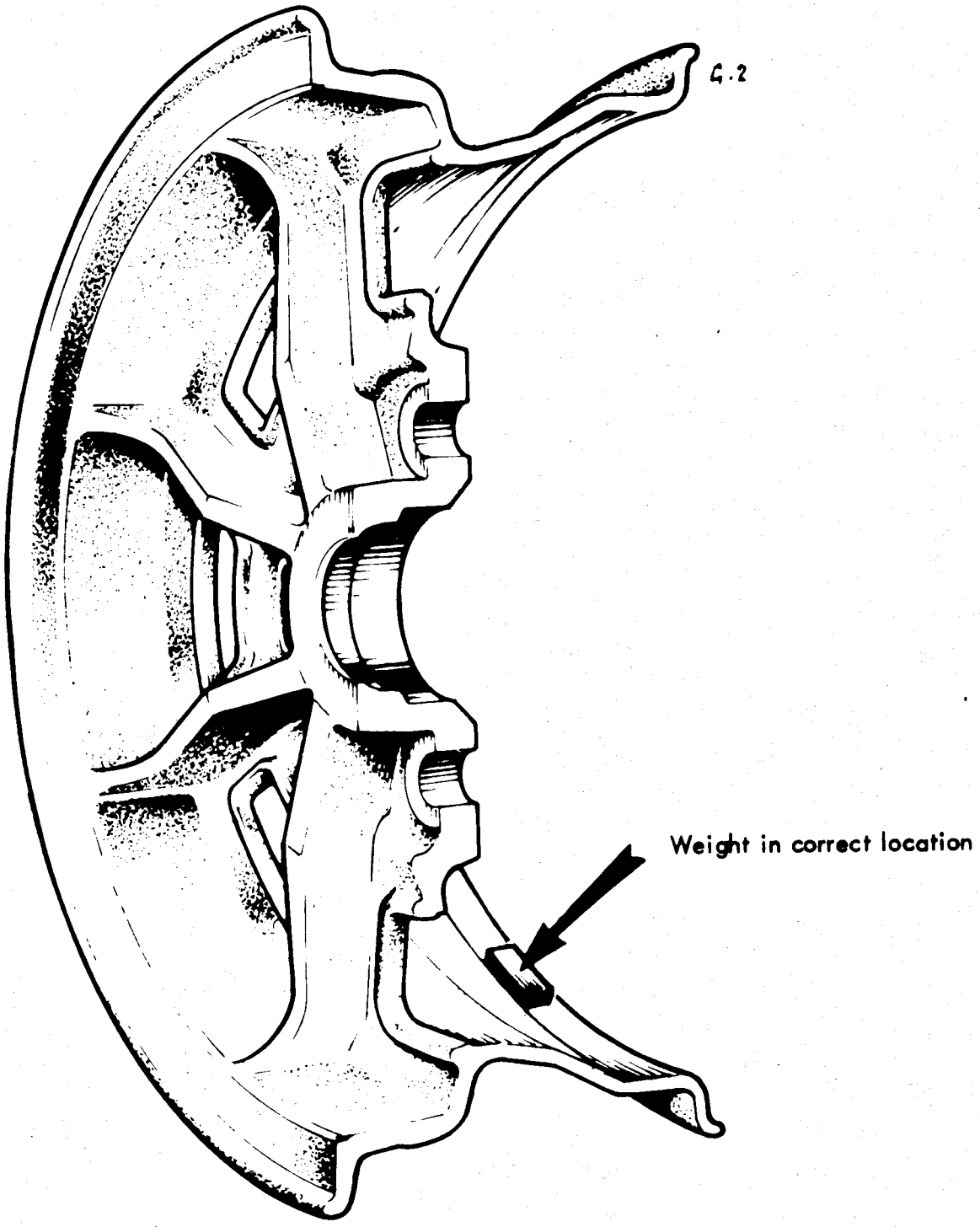


Fig. 1. ALLOY WHEEL SHOWING CORRECT LOCATION OF BALANCE WEIGHTS.

SECTION H.

STEERING.

The only difference (from previous Europa models) to the steering is, a universal joint now incorporated at the lower end of the steering column, attached column to steering unit, in place of the flexible coupling.

Note that no attempt should be made to repair the universal joint: it must be replaced as a complete assembly.

All other information on steering will be found in the Lotus Workshop Manual.

SECTION J.

BRAKING SYSTEM.

J.1. - GENERAL DESCRIPTION.

All Europa Twin Cam cars are fitted with a vacuum operated servo unit as original equipment. On cars destined for markets requiring dual braking systems and to comply with the laws existing in those markets, the braking system is split into two separate hydraulic units with its own master cylinder and servo unit, two brakes (either front or rear).

Also incorporated in the braking system is a 'brake fail' warning lamp with test switch. The lamp will glow RED if a failure occurs anywhere within the braking hydraulic system, or if the test switch is operated.

J.2. - TANDEM MASTER CYLINDER.

To Bleed the System (see also Section 'K' of the Europa Workshop Manual)

Bleed the rear brakes FIRST, commencing with the left-hand wheel, then bleed the front brakes starting with the left-hand wheel - ALWAYS the wheel nearest to the master cylinder first, whether front or rear.

Use only a light pedal action and DO NOT push the pedal through at the end of its stroke. DO NOT 'try' the pedal until the system is fully bled, as either action will cause the plunger to move and actuate the brake fail warning lamp.

If, during the bleeding procedure, the plunger operates the switch and the warning lamp is 'on', the bleed screw must be closed and the bleed screw at the other end of the car opened - if bleeding the front brakes, open the bleed screw on a rear brake and vice versa. A steady pressure must then be applied to the pedal until the lamp goes out, when the pressure must be released immediately and the bleed screw closed, otherwise the piston will move too far in the opposite direction and require resetting again. When the lamp goes 'out' a 'click' will be felt on the pedal as the piston moves back.

J.3. - REAR BRAKES ADJUSTMENT.

To ensure the correct operation of both the rear brakes and the handbrake the undermentioned adjustment procedure should be adopted :-

1. Raise the rear of the car and support on blocks.
2. Disconnect the handbrake cable at the clevis connections on each rear brake backplate.
3. Using the brake adjusting screw, turn clockwise until the wheel locks. The wheel should of course be rotated slowly during this operation. 'Back off' the screw 2 notches ONLY. The wheel should now be free to rotate without undue binding of the shoes in the drum. Ensure that the wheel cylinders are not being held in the 'on' position by the bundy pipes.

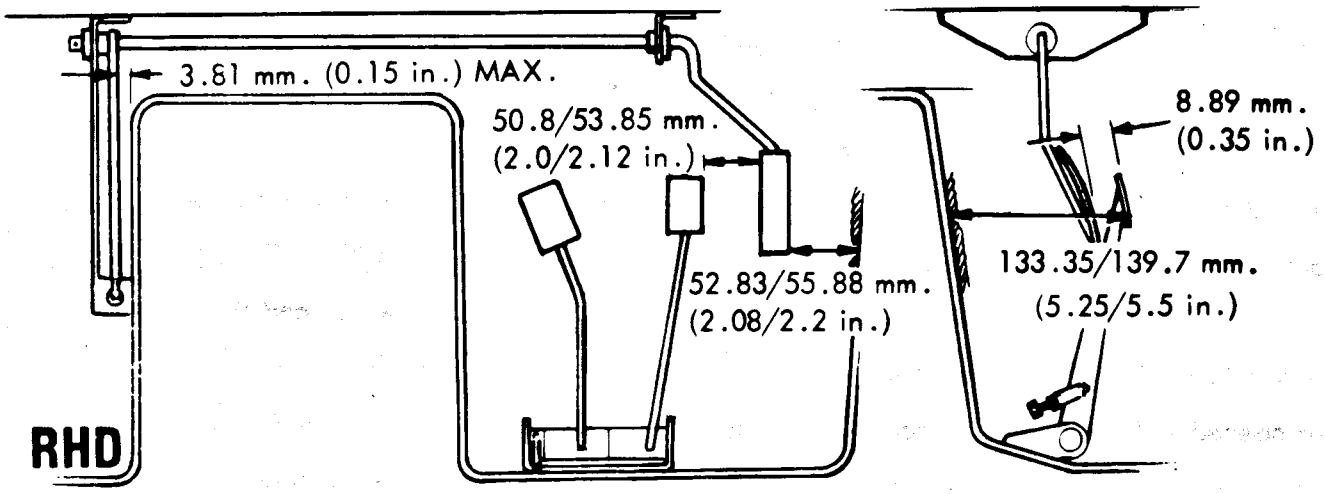
4. Re-connect the handbrake cable clevis connections and adjust the handbrake intermediate cable, so that with the handbrake lever in the fully released position, the handbrake is just on the point of coming into operation.

J.4. - PEDALS 'SET-UP' DIMENSIONS.

If the occasion arises where any new pedal has been fitted, then they MUST be 'set-up' to the dimensions shown in Fig.1.

Before final pedal checks are made, endfloat of the throttle pedal assembly in its mounting brackets must be no greater than 1.27 mm.(.05 in.) . Dimensions are taken with the carpets fitted, but with the pedal rubbers removed. Set brake pedal to given dimension from bulkhead (carpet compressed), clutch pedal to be level with brake pedal by adjusting the clutch pedal return stop.

With all pedals at rest, the throttle pedal must be within the dimensions shown for both sideways and fore and aft location.



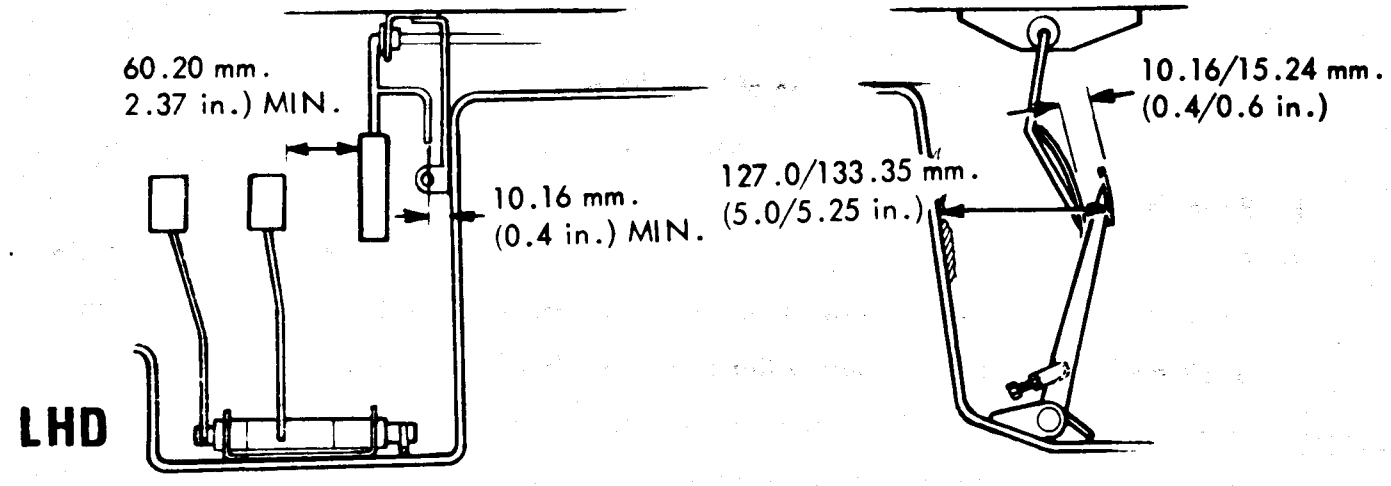


Fig 1. PEDALS "Set-up" DIMENSIONS.

SECTION K.

COOLING SYSTEM.

K.1. - FILLING THE SYSTEM.

1. Pull heater control (in car) to the 'Hot' position.
2. Open tap (or remove vent plug) on top of radiator.
3. Remove filler cap on header tank and fill with coolant until coolant issues continuously from tap (or vent plug orifice). Close tap (or replace vent plug). Fill header tank to brim.
4. Start engine and 'run' at approximately 1,500 r.p.m. Keep header tank topped up with coolant.
5. Release clip and pull off hose from heater valve (at thermostst housing). Close end of hose with thumb and finger until coolant issues continuously from heater valve. Refit hose to valve.
6. Check that radiator and heater are warming up. If not, repeat operations '3' and '5'.
7. Occasionally slacken tap (or remove vent plug) on radiator to 'bleed' air.
8. "Run" engine until hot (when fan starts). Top up header tank; tighten tap (or replace vent plug) on radiator, switch 'off' engine.
9. Check coolant level after FIRST 160 km. (100 miles) and DAILY for first 10 days of use. Take care when removing the filler cap from header tank, if the system is anything but cold - remove the cap slowly to allow the pressure within the tank to vent slowly. The coolant level when warm should be UP TO THE FILLER CAP and when cold should be no LOWER THAN 10 cm. (4 in.) below the top.

K.2. - FROST PRECAUTIONS

To avoid the possibility of the cooling system freezing whilst the vehicle is stationary, or whilst being driven in very cold weather, it is recommended that an anti-freeze solution is used. Details are given in Section 'O' of quantities required.

We recommend anti-freeze based on inhibited ethylene glycol. Anti-freeze using alcohol as a base is NOT suitable, it being subject to loss by evaporation. Owing to the difficulty in completely draining the heater system with normal draining of the engine cooling system, it is ESSENTIAL that anti-freeze is used when cold conditions are anticipated.

SECTION L.

FUEL SYSTEM.

L.1. - GENERAL DESCRIPTION.

The fuel system comprises of two fuel tanks, one at either rear quarter in the engine compartment, the tanks being inter-connected. Separate fillers are provided for each tank, therefore it is necessary to fill both tanks when re-fuelling. By filling one tank only, an initial false reading will be given on the fuel guage UNTIL the fuel level is balanced in both tanks.

Use fual having a MINIMUM rating of 101 octane. This is equivalent to 'Super' grade, or '5 star'.

A further pipe connects the tanks to the diaphragm type mechanical fuel pump mounted on the right-hand side of the engine and driven by the jackshaft (auxiliary shaft). From the fuel pump, a further pipe delivers fuel to the carbyretters.

Either two side draught Dellorto, or two side draught Zenith-Stromberg carburetters (see respective sections dealing with carburetters and also 'TECHNICAL DATA') are used.

L.2. - FUEL SYSTEM.

To Clean.

1. Remove the air cleaner and clean both the body and element.
2. Disconnect the fuel supply pipe at both the carburetters and the fuel pump.
3. Remove and clean the carburetters (see 'ENGINE TUNE').
4. Using an air line, blow through the previously disconnected fuel feed pipes between carburetters and fuel pump. Replace the pipe.
5. Disconnect the pipe between the fuel tanks and the fuel pump. Blow through using an air line. Replace the pipe.
6. Remove the fuel pump sediment bowl and filter, wash in clean petrol and refit.
7. Replace the air cleaner.

L.3. - FUEL TANK.

To Remove. See Section 'L' of Europa Workshop Manual.

L.4. - FUEL TANK SENDER UNIT.

To Remove. See Section 'L' of Europa Workshop Manual.

L.5. - FUEL GUAGE.

To Remove. See Section 'M' of Europa Workshop Manual.

L.6. - FUEL PUMP.

Description

Fuel is drawn from the fuel tank by the pump which is secured to the engine block and is driven by an eccentric on the jackshaft. The pump consists of two main bodies which clamp a diaphragm between their outer flanges.

The lower body assembly comprises a rocker arm and link, both of which pivot on a pin located in the body; attached to the link is the pull rod incorporated in the diaphragm assembly. To protect the diaphragm from the crankshaft oil splash, an oil seal us located at the point in the lower body where the push rod passes through. A return spring is interposed between the undersides of the diaphragm and the lower body, the spring determining the pump output pressure, (see 'Technical Data'). A further spring is fitted between the rocker arm and the body for the purpose of ensuring that the rocker arm is in contact constantly with the eccentric on the jackshaft.

Assembled in the upper body are two valve assemblies, one being opened by suction, the other by pressure. Both valves are held in position by a recess in the upper body which is then staked.

Both inlet and outlet valve assemblies are identical in construction and are renewable and interchangeable.

Also incorporated in the upper body is a filter gauze which is held in position with a domed glass top cover and gasket, this in turn being held by a centre screw clamping the cover to the upper body.

To Remove Fuel Pump.

1. Disconnect the pipes from the inlet and outlet bosses of the fuel pump. Seal off the ends of the pipes to prevent the ingress of foreign matter.
2. Remove two fuel pump retaining bolts and lockwashers, and withdraw fuel pump and gasket from cylinder block.

To Dismantle.

1. Before commencing to dismantle, clean exterior of pump and scribe a line across the lower and upper body flanges of the pump for location purposes during reassembly.
2. Remove domed glass top cover of pump also gasket and filter gauze.
3. Remove the screws and spring washers securing the lower and upper bodies together and separate the two bodies.

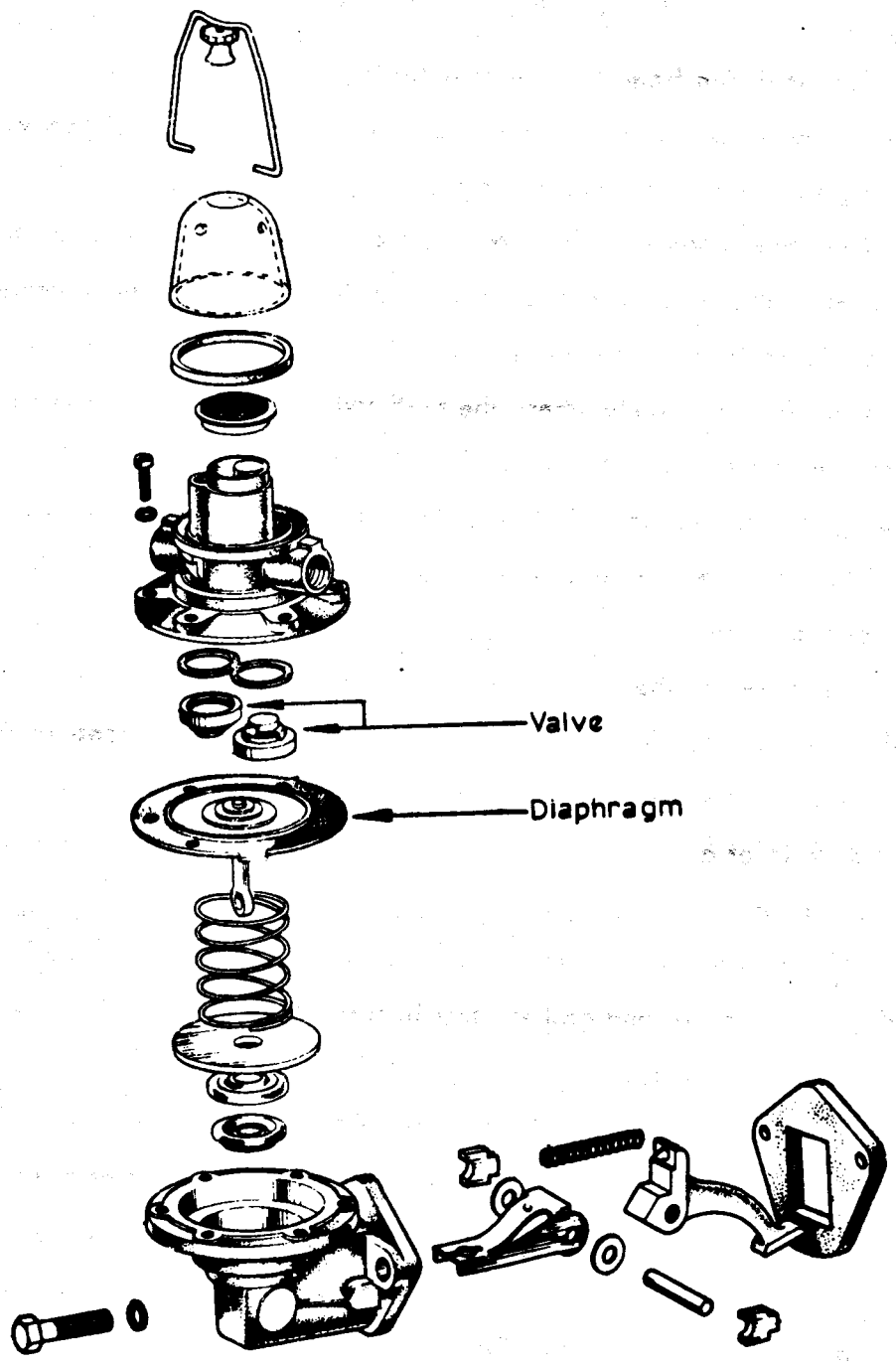


Fig. 1. FUEL PUMP COMPONENTS.

4. The valve assemblies are 'staked' in position and it is necessary to relieve this 'staking' in order to remove valves.

5. From the lower body remove the diaphragm and pull rod assembly, first turning the assembly through an angle of 90° in order to free the rod from the link in the rocker arm assembly.

NOTE: The diaphragm and pull rod are a permanent assembly and no attempt should be made to separate the two parts.

6. Lift out the diaphragm return spring and, when fitted, remove oil seal retaining washer and oil seal.

7. Providing that the rocker arm pin is held firmly in the lower body it should not be necessary to remove the rocker arm pin or associated parts unless undue wear is in evidence. Should it be necessary to remove the rocker arm from body, the following procedure should be adopted:-

The rocker arm and associated parts are located by two retainers, which are fitted into slots at engine face of castings, the retainers in turn being held by punch indentations at each end of retaining pins.

To remove the rocker arm, hold rocker arm firmly in suitable vice and with two flat bars approximately 12 in. long (30.5 cm.) insert one each side in the gap between the casting and vice, lever the body away from the rocker arm and pin.

NOTE: Care should be taken that the type of removing bars used are flat to ensure that the body machined face is not damaged.

Inspection and Overhaul.

1. Thoroughly wash all parts in clean paraffin, ensuring that valves are cleaned separately if being used again.

2. Check the diaphragm for hardening or cracking and examine the lower extremity of the pull rod, where it connects with the rocker arm link, for wear. Renew the diaphram assembly if any of these signs are in evidence.

3. Check diaphragm return spring, if corroded or damaged, it should be replaced.

4. Visually check valve assemblies, if any doubt exists, replacement valves should be fitted. The two valves are identical and can be used for either application by inverting their positions.

5. Examine the rocker arm face pad for wear. Slight wear is permissable but should not exceed a depth of .010 inches.(.254 mm). Check rocker arm pin and link holes for

wear, also the underside of link where diaphragm pull rod engages for wear. Badly worn or damaged parts should be renewed. Check rocker arm return spring.

6. Discard old oil seal and gaskets.

7. Examine upper and lower bodies for cracks or damage. If iether the diaphragm or engine mounting flanges are distorted, these should be lapped to restore their flatness. Renew if either distortion is evcessive.

To Re-assemble.

The re-assembly of the rocker arm into the body is as follows:-

Assemble rocker arm, link and spacing washers onto rocker arm pin, place rocker arm return spring into body and insert rocker arm assembly into body of pump. Ensure that the rocker arm return spring is properly engaged between locating 'pips' on casting and rocker arm. Tap two new pin retainers into slots in the body and, while holding the retainers hard against the rocker arm, pin punch over the end of the slots with a 1/8 in. (3.17 mm.) pin punch to prevent retainers working loose.

NOTE: When refitting arm pins, always use new service replacement retainers (coloured copper for identification). These are slightly shorter than the original type to allow for new staking.

Fit new oil seal washer and steel retaining washer into the lower body. Place the diaphragm return spring in position over oil seal retaining washer. Place the diaphragm assembly over the spring, with the pull rod downwards and with the locating tab on the diaphragm at the twelve o'clock position.

Press down on the diaphragm at the same time turning the assembly to the left in such a manner that the slot on the pull rod will engage the fork in the link, ultimate turning the assembly a complete quarter of a turn to the left, which will place the pull rod in its correct working position in the link. This will also permit the matching up of the holes in the diaphragm with those on the pump body flange and the tab will now be at the nine o'clock position. Place the new valve gasket in the upper body around the valve ports. Place valve assembly in inlet port with spring facing outwards. Fit other valve in the outlet port position with spring inside the port.

When refitting re-stake valve in four positions by using a suitable punch. Refit filter gauze in top of upper body, also glass domed cover with new cover gasket.

Fit central clamping screw.

The upper and lower bodies can now be fitted together as follows:-

Push the rocker arm towards the pump body until the diaphragm is level with the body flange.

Place the upper half of the pump body into its correct position by aligning the scribed lines made on the two flanges prior to dismantling.

Replace the securing screws and spring washers and tighten only until the heads of the screws engage the washers.

Push the rocker arm away from the pump so as to hold the diaphragm at the top of the stroke and while so held, tighten the body screws diagonally and securely.

IMPORTANT. After assembling in the manner described above, the edges of the diaphragm should be flush with its two clamping flanges.

Any appreciable protrusion of the diaphragm indicates incorrect fitting in which case, special care should be taken in maintaining downward pressure on the rocker arm while the diaphragm screws are finally tightened.

To Replace.

1. Clean the mounting face on the cylinder block, removing ant reace of gasket which may be adhering to the face. Fit a new gasket to the cylinder block flange, holding it in place with a smear of grease.
2. Insert the rocker arm through the hole in the cylinder block so the arm lies on the camshaft eccentric.
3. Secure the fuel pump to the cylinder block with two spring washers and bolts, tightening the bolts evenly to the torque loading given in 'Technical Data'.
4. Ensure that the pipe joints are clean and refit the fuel pipes.
5. Run the engine and check for leaks at the joints.

L.7. - DELLORTO CARBURETTERS.

Cars designed for use in domestic (United Kingdom) markets are equipped with Dellorto Carburetters. These are very similar in both the operation and physical appearance as Weber carburatters used on Twin - Cam engines on the other Lotus vehicles.

Starting(Figure. 2.)

Fuel from the tanks is delivered to the banjo, (2) then through the filter (1) to the float chamber via the needle valve,(15) and its seat,(14). The fuel level is determined by the float,(17). The float chamber is vented to the atmosphere at (4).

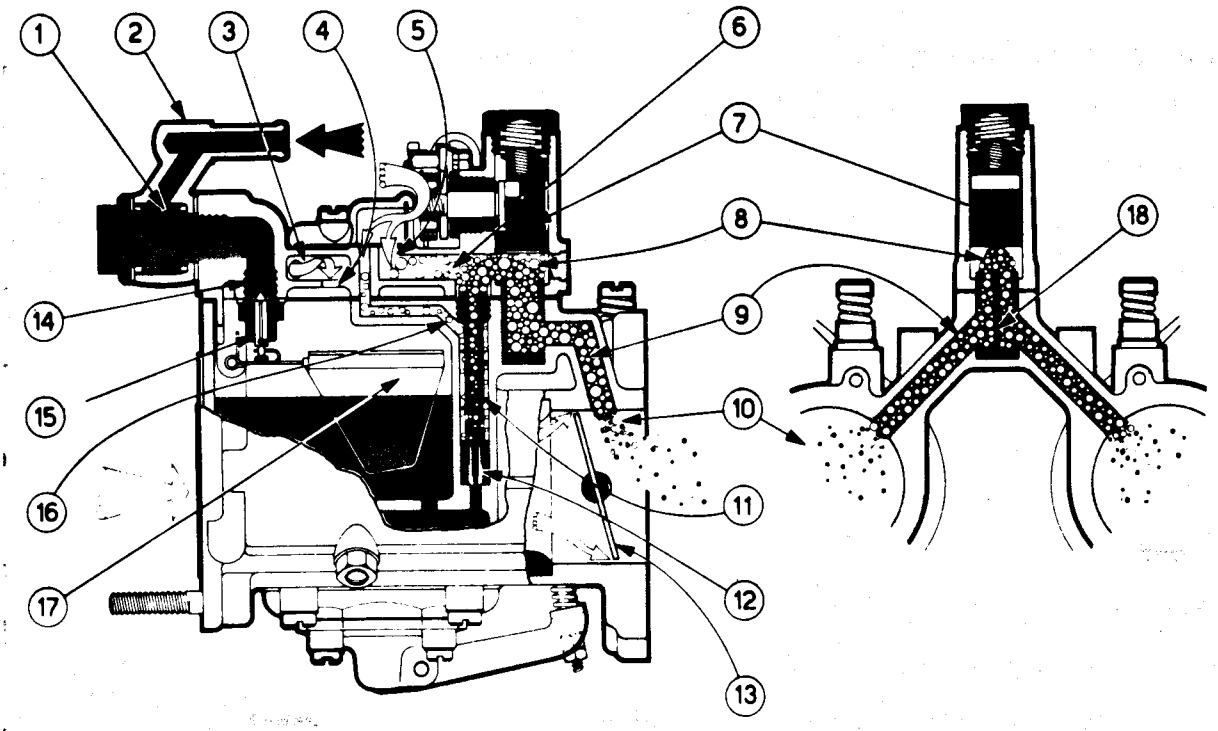


Fig. 2. STARTING CIRCUIT.

When the starter valve (7) is opened, the fuel, set by the jet (12) enters the emulsion tube (11), where it mixes with the air from the channel (16), the mixture passing into channel (6) mixing further with air from hole (5). Arriving at the valve chamber (8), the mixture spreads into the two channels (9) that flow into the main barrels (10), downstream of the throttle butterfly (3). When the starter valve (7) is closed, the communication between the two main barrels and the starter device is disconnected and by means of the partition (18) the one of the two main barrels (10).

Idle (Fig. 3.)

The fuel fron the float chamber is set by the idle jet (20). This fuel mixes with the air from the emulsion tube (3) via the channels (19). The mixture then passes through the channels (21), to the adjustment screws (22), then having been metered, to the main barrels (10) downstream of the throttle valves (13).

Progression (Fig. 3.)

At the opening of the throttle valves (13) during the passage from idle to main, the mixture arrives at the main barrels (10) via the progression holes (23).

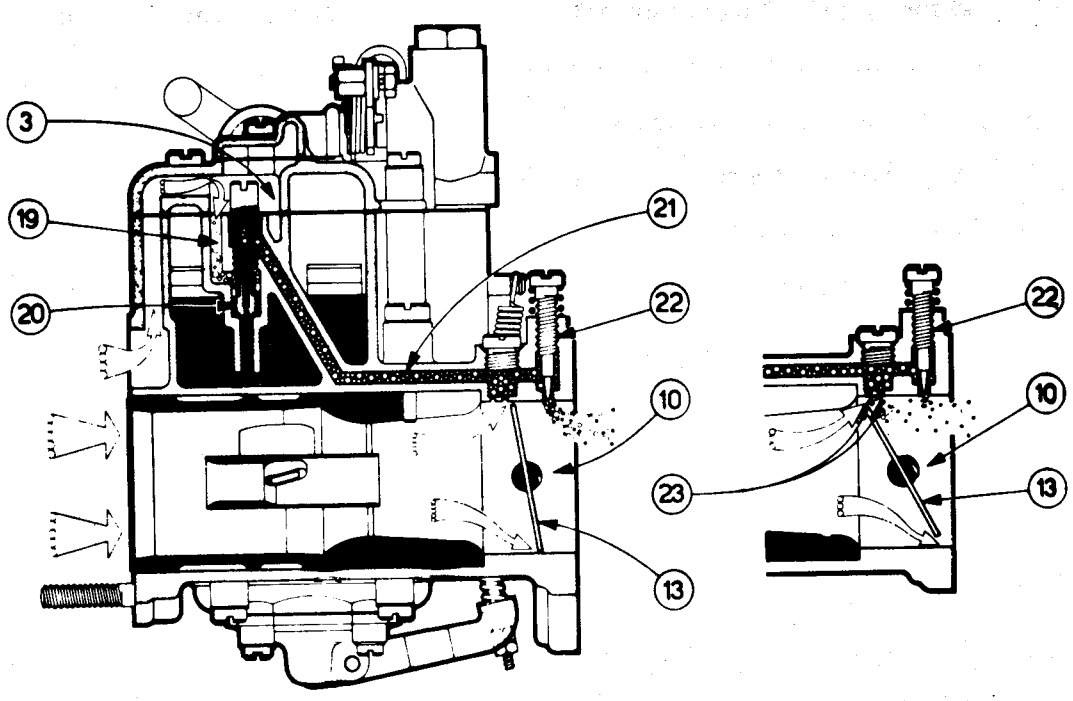


Fig. 3. IDLE & PROGRESSION CIRCUITS.

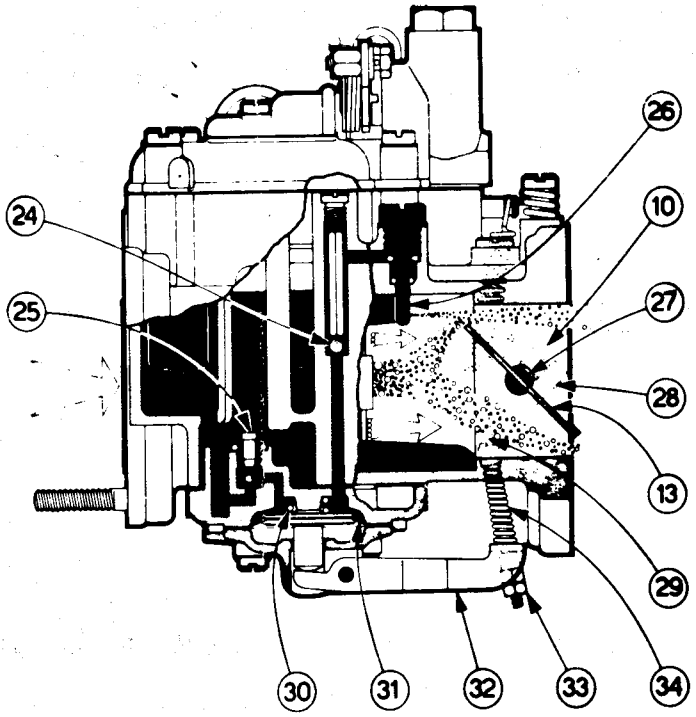


Fig. 4. ACCELERATION CIRCUIT.

Acceleration (Fig. 4.)

When the throttle valves (13) are opened, the lever (28) attached to linkage (27), pushes a rod (29) and spring (34), this is turn actuating a lever (32) thus operating the diaphragm (31). The diaphragm is held in position by a spring (30).

The diaphragm pumps fuel in two separate circuits through the delivery valves (24) and the pump jets (26) , then to the main barrels (10) when the throttle valves are closed, the diaphragm returns to its off position, pushed by the spring (30), sucking fuel from the float chamber via valve (25) during this operation. The nuts (33) are used to adjust the pump capacity.

Main (Fig. 5).

When the throttle valves (13) are opened, the fuel from the float chamber, set by the jets (37), enters the emulsion tubes (36) and mixes with the air set by the calibrating orifice (35). The mixture thus made, enters the channels (39), passes to the auxiliary venturi (38) where further mixing with air from the main intake, the mixture passes to the main barrels (10).

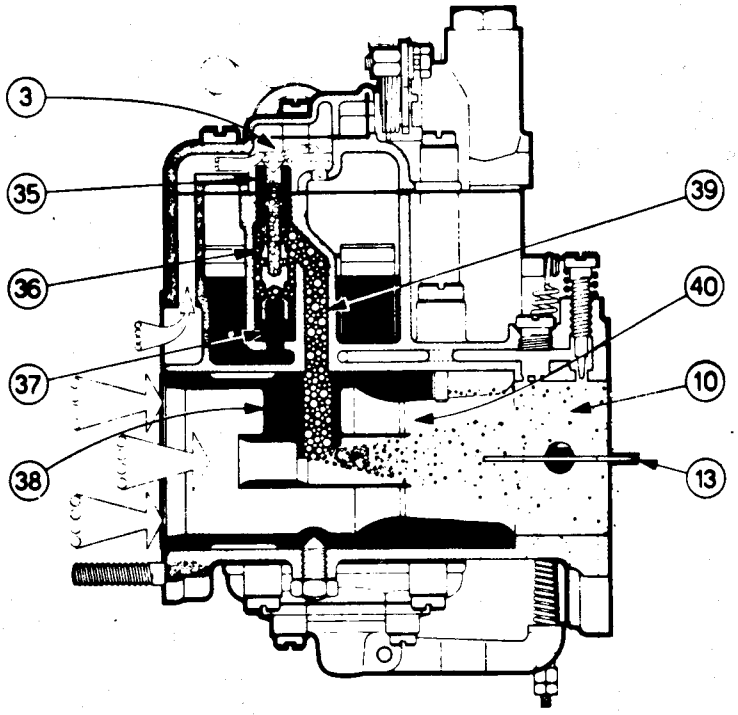


Fig. 5. MAIN CIRCUIT.

Synchronisation (Fig. 6.)

To obtain correct synchronisation of the carburetters, the following procedure is recommended:-

1. Disconnect the accelerator control cable from the lever (1) at the rear carburetter.
2. Release the adjustment screw (2) for the throttle valves making contact with the end of the lever (3).

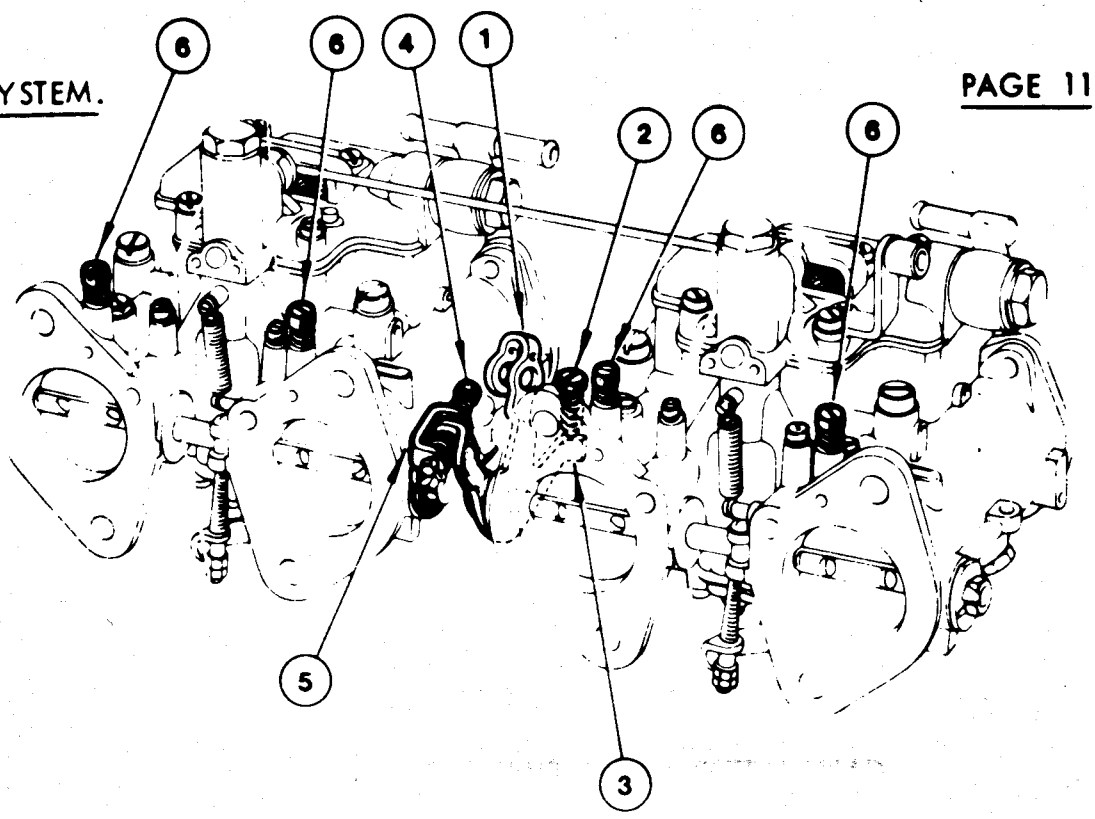


Fig. 6. CARBURETTER ADJUSTING SCREWS.

3. Release the screw (4) in lever (5) to ensure that when pressure is applied to lever (1) on rear carburetter, perfect closure of all throttle valves in both the front and rear carburetters is achieved.
4. Still keeping the same pressure on the lever (1) adjustment screw (4) to hold lever in that position. The throttle valves should all close perfectly.
5. Give ONE FULL TURN to screw (2) so that it is now in contact with the lever (3).
6. Fully close the mixture screws (6), then 'BACK OFF' 2 FULL TURNS.
7. Re-connect the accelerator cable to its lever. (1).
8. Start the engine and allow to reach its normal operating temperature. Using the adjustment screw (2), adjustment screw (2) adjust the engine speed to the r.p.m. given in 'TECHNICAL DATA'. If the engine now runs irregularly, adjust the mixture screws (6) on each barrel, to obtain regular running on all barrels. Turning the screws INWARDS WEAKENS the mixture, whereas turning the screws OUTWARDS RICHENS the mixture.
9. Using the screw (2), readjust the engine speed.

Checking the Float Chamber Level (Fig. 7)

1. Hold the float chamber cover in the vertical position, with the floats hanging down. The tab should be in light contact with the needle.
2. The distance between floats and cover (Dimension 'A'), including gasket should be 14.5 - 15 mm. If necessary bend the needle valve tab to achieve this dimension.

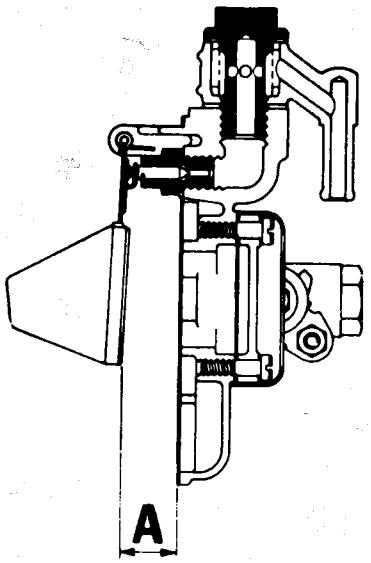


Fig. 7. FLOAT CHAMBER LEVEL.

CARBURETTER FAULT FINDING.

It is assumed that all engine mechanical and/or ignition faults have been corrected, therefore, ONLY possible carburetter faults will be listed below.

Fuel Leakage:

Possible Cause.	Suggested Remedy
1. Float needle valve dirty, or worn, or valve seat loose on its thread.	Thoroughly rinse clean filter and valve. Fully tighten the valve seat.
2. Float not free (tight on its hinge, or rubbing on sides), or heavy.	Fit new float assembly.
3. Fuel feed pipes loose, or broken.	Tighten pipes and unions, or replace.
4. Gaskets hardened, perished or loose.	Fit new gaskets.
5. Torn or punctured pump diaphragm.	Replace diaphragm.

Cold Start Difficulties.

Possible Cause.	Suggested Remedy.
1. Abnormal level of petrol in float chamber	Check float level.
2. Starting device actuating cable not sliding freely, broken unattached.	Replace the cable.
3. Strangler valve seized.	Free strangler valve.
4. Starter jet dirty.	Clean, or replace jet.

Irregular Firing of Engine.

Possible Cause.		Suggested Remedy.
1.	Incorrect adjustment of mixture screws.	See 'Synchronisation'
2.	Idling jet dirty or loose.	Clean and tighten.
3.	Progression holes, or idling circuit ducts blocked.	Thoroughly clean all orifices and ducts.
4.	Air leak from mounting flange.	Replace gaskets and fully tighten screws.
5.	Throttle spindle leaking air through its bearings.	Replace spindle and bearings.
6.	Throttle valves, or their control, not moving freely.	Free throttle valves and throttle spindle.

Vehicle Not Attaining Maximum Speed, or Lacking Hill Climbing Power.

Possible Cause.		Suggested Remedy.
1.	Main jet, power jet, emulsion. calibrating orifice or emulsion tube, blocked or loose.	Check, clean or replace defective parts.
2.	Throttle valve not fully opening.	Check throttle valve and linkage.

Insufficient Acceleration Mainly in Top Gear.

Possible Cause.		Suggested Remedy.
1.	Accelerator pump defective, or faults in its circuit.	Thoroughly overhaul pump and its circuit.
2.	Emulsion tube blocked or defective in other ways.	Replace emulsion tube

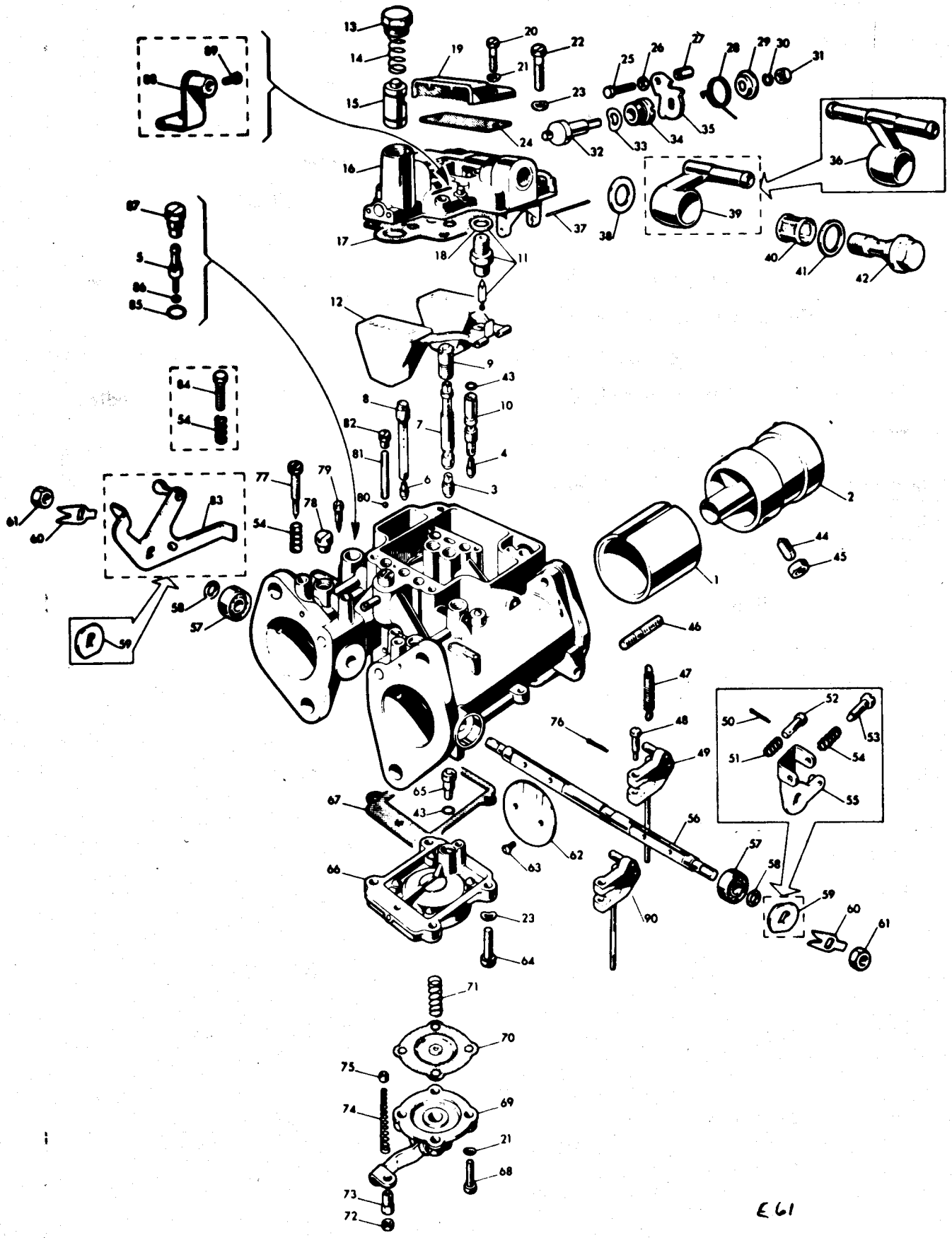


Fig. 8. CARBURETTER COMPONENTS.

Key to Fig. 8. - CARBURETTER COMPOUNDS.

1. Choke
2. Inner venturi
3. Main jet
4. Slow running jet
5. Pump jet
6. Starter jet
7. Main emulsion tube
8. Starter emulsion tube
9. Air corrector jet
10. Slow running air corrector jet
11. Needle valve assembly
12. Float assembly
13. Plug) starter washer
14. Spring)
15. Starter valve
16. Float chamber cover
17. Gasket, float chamber cover
18. Seal, needle valve assembly
19. Jets cover
20. Setscrew, jets cover
21. Spring washer
22. Setscrew
23. Spring washer
24. Gasket, jets cover
25. Setscrew
26. Washer
27. Sleeve nut
28. Spring, lever
29. Distance piece
30. Spring washer
31. Nut
32. Starter spindle
33. Waved washer
34. Sleeve nut
35. Lever
36. Banjo union, front carburetter
37. Pin
38. Seal
39. Banjo union, rear carburetter
40. Filter)
41. Seal) Banjo union
42. Banjo bolt)
43. Seal
44. Grub screw) Retaining venturi
45. Nut)
46. Stud
47. Spring
48. Screw
49. Lever
50. Split pin
51. Spring
52. Pin
53. Screw
54. Spring
55. Throttle lever
56. Throttle spindle
57. Bearing
58. Washer
59. Spacer
60. Tab washer
61. Nut
62. Throttle valve
63. Screw, throttle valve
64. Setscrew, pump body
65. Pump, suction valve
66. Pump body
67. Gasket
68. Setscrew
69. Pump cover
70. Pump diaphragm
71. Spring
72. Nut
73. Sleeve nut
74. Spring
75. Washer
76. Split pin
77. Adjusting screw
78. Plug
79. Sealing plug
80. Delivery valve)
81. Weight) Pump
82. Plug)
83. Throttle speed lever
84. Adjusting screw
85. Seal)
86. Seal) Pump jet
87. Plug)
88. Lever
89. Screw, lever
90. Lever

L.8. - DELLORTO CARBURETTERS.

To Remove

1. Release the clip securing the air cleaner trunking to the air box. Remove the bolts visible in the air box and pull off outer half of box.
2. Release the throttle return spring and throttle cable. Disconnect the fuel supply pipes at the carburetters. Remove the choke cable.
3. Progressively release the nuts securing the carburetters to the engine (four are visible from above, the other four being below). Remove nuts and washers.
4. Carefully remove the two carburetters as an assembly, ensuring that the synchronising linkage between the two is not distorted. Remove the spacers with their 'O' rings from the mounting studs.

To Replace.

1. Ensure that the spacers and 'O' rings are in good condition - the slightest mark will result in an air leak which will seriously affect the efficient running of the carburetters. Fit the spacer assemblies to the mounting studs.
2. Fit the carburetters as an assembly, ensuring that the synchronising linkage has not been disturbed. To each mounting stud fit a double coil spring washer, a plain washer and nut. Tighten the eight nuts progressively until a .050 in. (1.27 mm.) clearance exists between the coils of the double coil spring washers. Check the clearance with feeler gauges. Do NOT overtighten the nuts otherwise the 'O' rings will be flattened into the recesses of the spacer plates, but more important, with the carburetters rigidly mounted, frothing will occur in the float chambers.
3. Refit the fuel supply pipes to the carburetters. Reconnect the choke control, throttle cable and throttle return spring.
4. Ensure that the gasket is in good condition between the two halves of the air box, then refit outer half. Reconnect the air trunking to the air box.

To Adjust.

The only adjustments required are synchronisation, mixture strength and idling speed. These adjustments are covered in Section 'L.7' under the sub-heading 'Synchronisation' Fig.6).

L.9. - ZENITH STROMBERG CARBURETTERS.

Cars destined for use in North America and other Territories where Exhaust Emission Laws are in force, are equipped with Zenith Stromberg carburetters.

Zenith Stromberg carburetters are developed from the CD (Constant Depression) carburetters, which operate on the principle of varying the effective area of the choke and jet orifice, in accordance with the degree of throttle opening, engine speed and engine load.

Operation.

The petrol inlet is a parallel tube, which accomodates a flexible fuel pipe, situated to one side of the main body. Fuel passes into the float chamber, via a needle valve, where the flow is controlled by the needle in the valve and twin floats mounted on a common arm.

As the fuel level rises, the float lifts and by means of the float arm and tag, closes the needle onto its seating when the correct level has been attained. When the engine is running, fuel is drawn from the float chamber, the float descends and more fuel is then admitted through the needle valve. In this manner, the correct level is automatically maintained, the whole of the time the carburetter is in action.

Fuel in the jet orifice is maintained at the same level as that in the float chamber by means of cross drillings in the jet assembly.

Special features of Emission carburetters ensure that they exactly match one another in respect of flow. Clearance around the piston in its vertical bore permits additional air to 'leak' into the mixing chamber and lower depression. The first special feature therefore is the manufacturing tolerance compensator or leak balancing screw.

A drilling is taken from the atmospherically vented region beneath the diaphragm to meet a further drilling that breaks into the carburetter mixing chamber downstream of the air valve, in order to introduce an 'air leak'. An adjusting screw with conical tip is inserted into the drilling to the mixing chamber. This is capable of either completely blanking off the air bleed of permitting flow adjustment to maximun affective diameter of the air bleed.

When set, the balancing screw, is sealed with a plug which MUST NOT in any circumstances be tampered with in service.

It is essential therefore NOT to change the main body, cover or air valve, after the balance screw has been set and sealed.

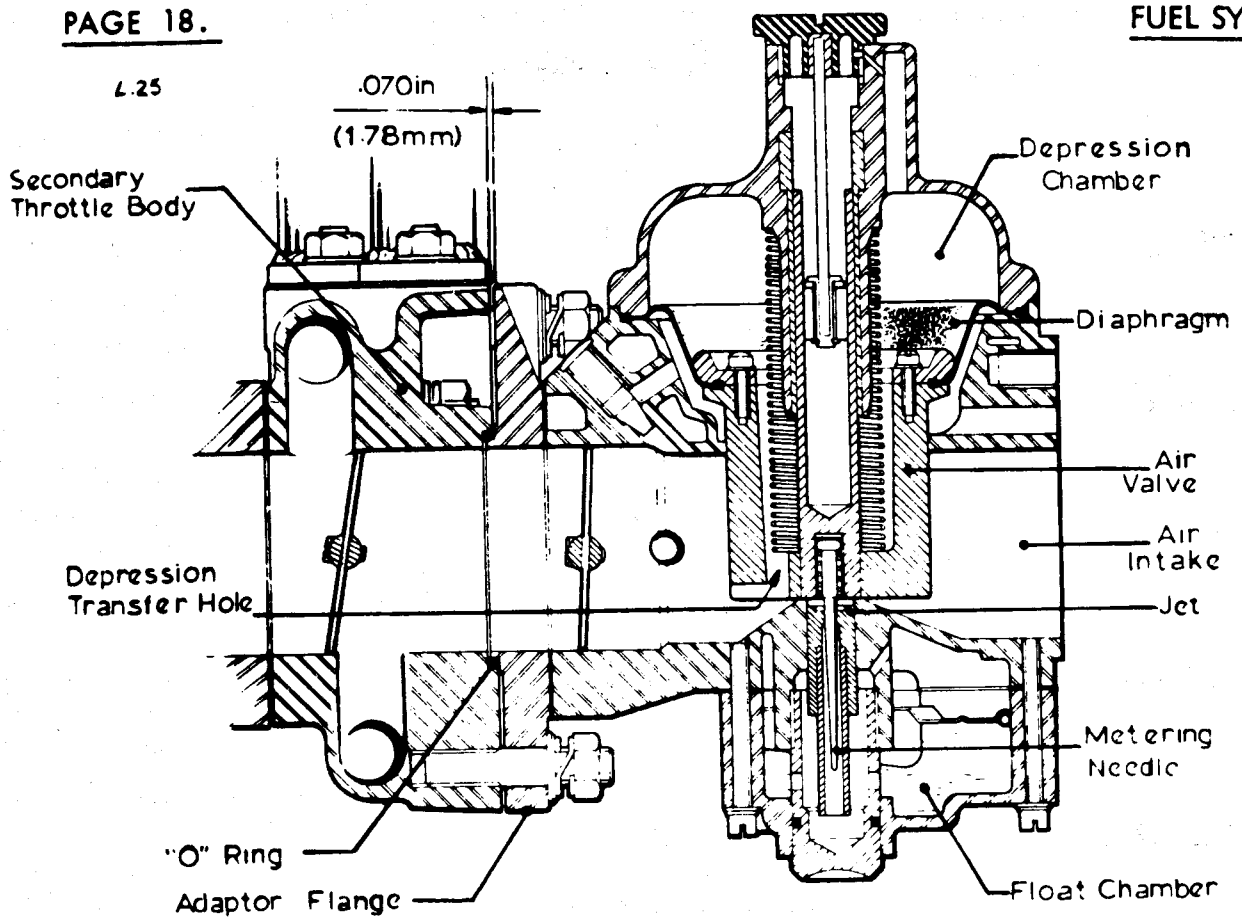


Fig. 9. CROSS SECTION OF CARBURETTER

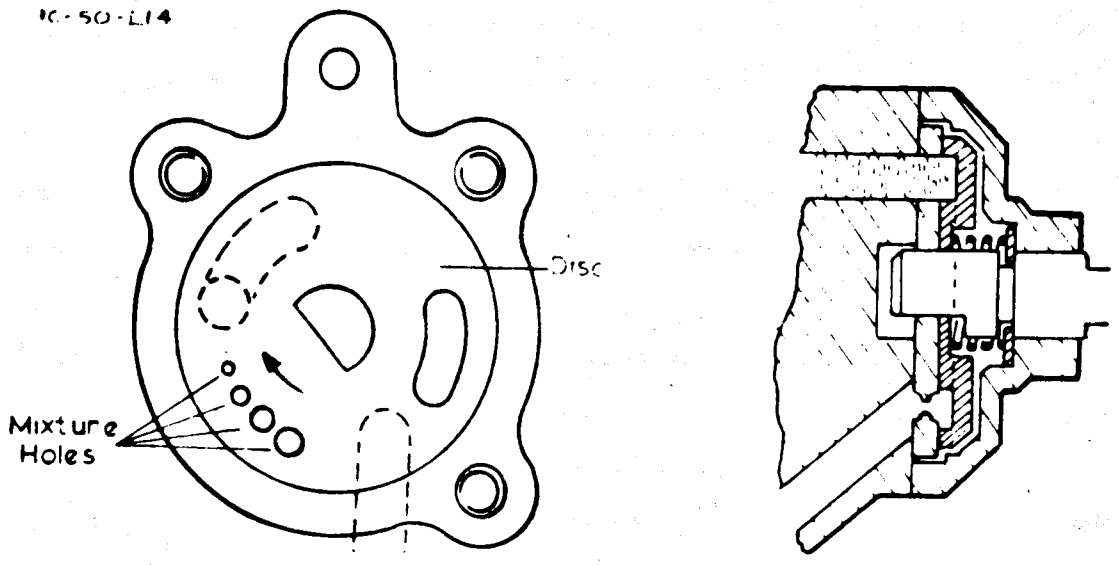
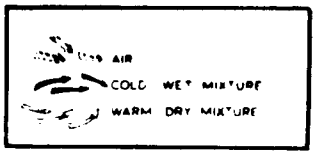


Fig. 10. STARTING DEVICE.

Exhaust Emission carburetters differ slightly from the non-emission type in that the fuel/air mixture is supplied DRY to the cylinders, thus avoiding the deposition of wet fuel in the induction manifold, this being the prime cause of excessive carbon monoxide and hydrocarbon emissions. To achieve dry mixture, the induction manifold requires a heated conditioning chamber. Zenith Duplex employs a main and subsidiary gallery from carburetter to engine. The latter branches from the main gallery, adjacent to the carburetter , conducting the mixture through an exhaust heated conditioning chamber and back into the main gallery. The subsidiary is of smaller cross-sectional area than the main gallery.



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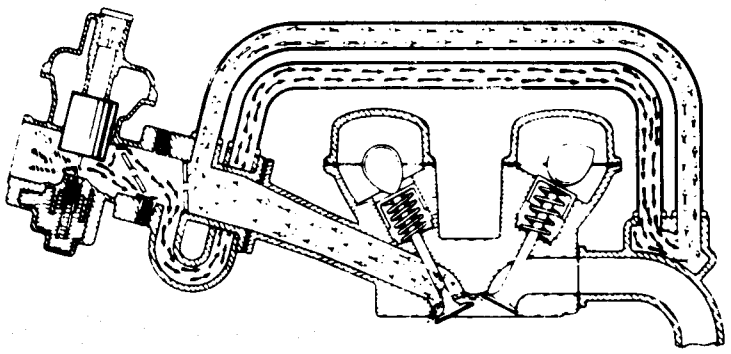


Fig. 11. EXHAUST EMISSION INDUCTION SYSTEM.

Two throttles are, thereforeemployed, primary and secondary, the primary controlling mixture supplied via the subsidiary gallery. The flow capacity of the primary system is sufficient for idling, acceleration up to approximately 50 m.p.h. (80 k.p.h.), over run and cruising conditions. At the operating point where the primary system begins to impose a significant flow restriction to the engine, a mechanical linkage picks up the secondary throttle and mixture is then supplied through the main gallery. In this manner the primary system is by-passed and flow conditions similar to an untreated engine are restored.

As well as the modified induction system a special distributor is necessary. This is equipped with a vacuum retard capsule arranged to operate only when the throttles are closed: that is on idle and over run. This is actuated by a valve attached to the rear carburetter which, when depressed by the throttle lever, connects the distributor to manifold depression.

Cold Starting.

When the choke control of the facia panel is pulled out, it operates a lever at the side of both carburetters; this rotates a disc in the starting device in which a series of holes of different diameters are drilled. In the full rich position, all holes will be in communication with the starter circuit and provide the richest mixture.

Petrol is drawn from the float chanber via a vertical drilling adjacent to the central main feed channels, through the starting device and into the throttle body between the air valve and the throttle plate. Simultaneously, the cam on the starter lever will open the throttle beyond the normal idle position, according to the setting of the fast-idle stop screw to provide a faster idle speed to prevent stalling when the engine is cold. As the choke control on the facia panel is gradually released, few and/or smaller holes will provide the petrol feed from the float chamber, thereby progressively weakening the mixture strength to the point where the choke control is pushed fully home. Mixture strength is then governed by the Factory setting of the main orifice and idle speed determined by the setting of the throttle stop screw.

NOTE: Do not pump, or hold open the throttle as this reduces the effectiveness of the cold start device (choke).

It is also important to note that there are two positions (winter and summer) on the starting limit pin. This is the spring - loaded, knurled headed pin located on the side.

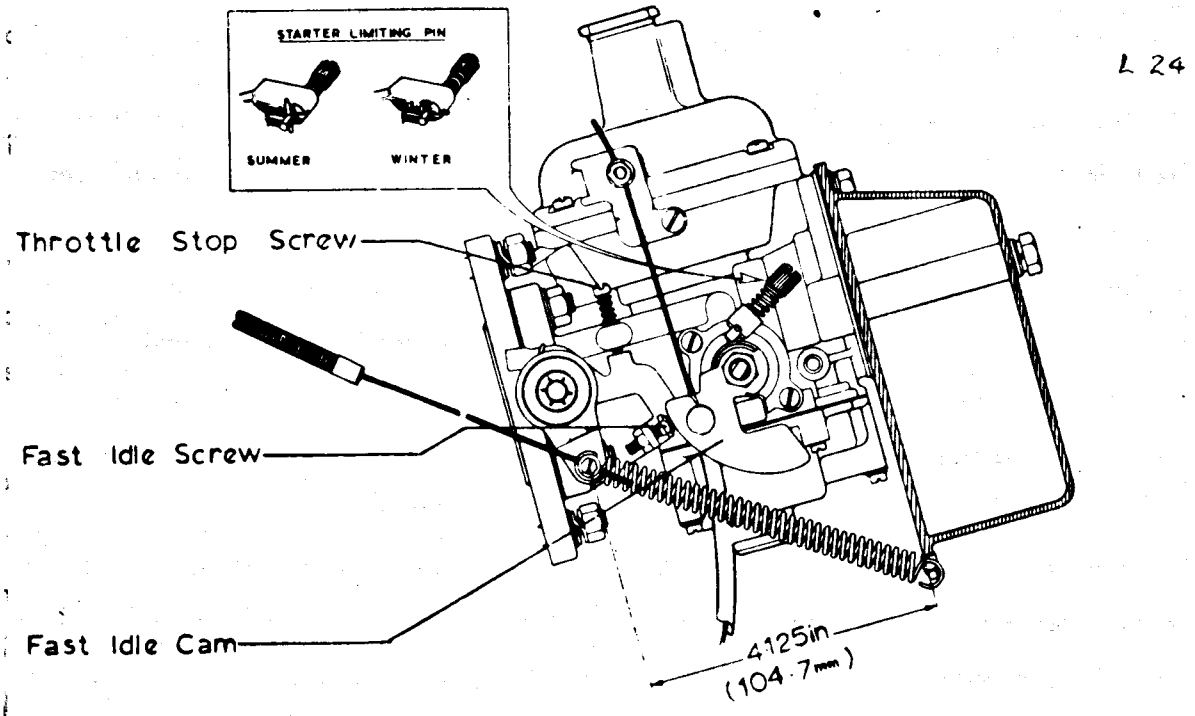


Fig. 12. ADJUSTING SCREWS & THROTTLE LEVER SETTING.

of each starter housing. Push down and turn through 90° by the screwdriver slot provided. In the 'winter' position the slot will be horizontal when viewed from the side of the car, whereas in the 'summer' position the slot eill be vertical.

Idling.

Fuel for idling is provided by the jet orifice, the amount being controlled by the jet/needle relationship established during manufacture. Idle speed is regulated by adjust--ment of the throttle stop screw, which limits the closure of the throttle when the acceler--ator pedal is released.

An idling trimming screw is provided but THIS IS NOT AN ORDINARY MIXTURE ADJUSTING SCREW. The purpose of this screw is to give a very fine adjustment to compensate for the difference between a new 'stiff' engine and one that is run in. It wi ll be seen that the idle trimming screw regulates a limited amount of air (limited by the size of the drilling) that can be introduced into the mixing chamber. When the engine is new, a slightly weaker mixture can be used and the trimming screw will therefore, be set initially to provide maximum air to the mixing chamber. As the engine loosens during the running-in period, this screw can gradually be turned in a clockwise direction to reduce the air bleed until, when fully turned in, the screw will be seated.

It should be noted that to the ear, there may be no detectable difference between fully 'home' and fully 'open' positions, therefore, it should be adjusted to achieve the best driveability.

Should idling quality deteriorate during the running-in period, the screw should be rotated clockwise slowly until smooth idling is just restored. If it is not possible to obtain satisfactory quality when the screw is fully home, the manifold to carburetter joints should be checked as a leak is probably occuring. ON NO ACCOUNT SHOULD THE SCREW BE OVER - TIGHTENED.

Check also that the choke cable returns the cold start lever to the fully off position when choke control is pushed in. Adjust coupling and cable as necessary.

Normal Running.

Mention has been made of the jet/needle relationship, which together govern correct idle mixture and mixture strength throughout the range. One feature of the assembly is the radially located needle which is biased so that the needle is permanently in contact with one side of the jet, to ensure a consistent fuel flow from a given needle profile. The jet/needle relationship is set during production and MUST NOT be altered.

When the throttle is opened, air flow under the air valve increases and a temporary rise in mixing chamber depression is transferred via drillings in the air valve to the depression chamber which is sealed from the main body by a diaphragm. Pressure difference between the depression chamber and the under diaphragm chamber causes the air valve to lift. Thus any increase in engine speed or load will enlarge the effective choke area until maximum air valve lift, since the air valve lift is proportional to the weight of air passing beneath it. Therefore, air velocity and pressure drop across the jet orifice remain approximately constant at all speeds

As the air valve rises, it withdraws the tapered metering needle held in its base from the jet orifice, so that fuel flow is increased proportionate to the greater air flow.

The metering needle is a variable and machined to very close limits. It provides a mixture ratio for all speeds and loads in line with engine requirements that are determined by exhaustive tests on bench and road during original manufacture. To maintain correct results, it is essential that only the recommended needle is used.

Temperature Compensator.

Testing has shown the need for a temperature compensator, operating over a wide range of air valve lift, to cater for minor mixture strength variations caused through heat transfer to the carburetter castings.

An air flow channel is employed which permits some of the air passing through the carburetters to by-pass the bridge section. With the introduction of this into the mixing chamber, the air valve, in order to maintain depression on its downstream side, rides in a lower position, thus giving a smaller fuel flow annulus. To adjust the quantity of air by-passed, a bimetallic blade is used to regulate the movement of a tapered plug.

Two screws attach the temperature compensator assembly to the carburetter and two seals are provided to ensure that no leakage can occur at the joint with the main body. THIS ASSEMBLY IS PRE-SET AND MUST NOT BE RE-ADJUSTED IN THE FIELD. If it is suspected of malfunction and the tapered plug moves freely when tested carefully by hand with engine both cold and hot, the compensator assembly should be changed for another of the correct specification.

Acceleration.

At any point in the throttle range, a temporary enrichment is needed when the throttle is suddenly opened. To provide this, a hydraulic damper is arranged inside the hollow guide rod of the air valve.

The rod itself is filled with suitable oil (see Section 'O') to within a ¼ inch (6.35 mm) of the end of the rod. When the throttle is suddenly opened, the immediate upwardmotion of the air valve is resisted by the damper. For this brief period, a temporary increase in the depression over the jet orifice is achieved and the mixture is enriched.

Downward movement of the air valve is assisted by a coil spring.

Flexible Carburetter Mounting.

When assembling the adaptor flange/carburetter to the adaptor blocks, the 'O' rings should be located carefully and the nuts should be adjusted to give an even gap of .070 in.(1.78 mm) between these parts. Care should be taken not to overtighten the nuts as this could distort the adaptor flange.

Check the clear ance at every 'A' Service (see Section 'O').

Throttle By-pass Valve.

In running experimental Emission Test Cycles, which include two over-run modes, it was shown that rates of hydrocarbon and CO emission are extremely high when manifold depression exceeds 22 in. - 23 in. Hg, the precise critical figure varying with different engines. To prevent rise in excess of the critical figure, therefore, a throttle by-pass valve (97 of Fig. 13) is incorporated in CDSE carburetters. This valve is pre-set and provided that it is free from air leaks, should not require attention. It is possible, however, that small particles of foreign matter may lodge under the valve seating, causing leakage and consequently high idle speed. In these circumstances, the valve cover should be removed, the valve and seating cleaned and the parts re-assembled.

It is important not to vary mixture ratio when the by-pass valve is in operation and the circuit, shown on the diagram, feeds from the mixture chamber to the downsteam side of the primary throttle.

Manifold depression acting on the valve diaphragm will cause the valve to open when a value is reached that will overcome the coil spring tension.

Ignition Retard Capsule.

As an aid to emission control on idle and over-run and also as an engine brake to partially compensate for the throttle by-pass, an ignition retard capsule is fitted to the distributor. This is operated by the manifold depression through a valve mounted on the rear of the rear carburetter. This valve connects manifold depression to the distributor only when the throttles close. When the throttles open the valve seals the manifold tapping and vents the distributor to atmosphere. Consequently, the depression pipes must be fitted to

the correct spigots on this valve. The bottom spigot connects to the distributor retard capsule.

The adjusting screw on the rear carburetter is factory set, but should it be disturbed, reset to give approximately 3/32 in.(2.4 mm) movement on the valve plunger when the throttles are closing and approximately 1/64 in.(.4 mm) free play on the plunger when the throttles are closed.

All pipe connectors must be air tight.

Float Height.

When correctly set and with the carburetter inverted, measure to the highest point of the floats above the face of the main body with the fuel inlet needle on its seating. The correct measurement is 16 to 17 mm. Great care must be taken NOT to twist or distort the float arms, this to ensure a correct fuel level.

Should it be necessary to reset the float height, this can be carried out by bending the tag which contacts the end of the needle. Care should be taken to maintain the tag at right angles to the needle in the closed position.

L.10. - ZENITH STROMBERG CARBURETTERS.

To Remove.

1. Release the clip and disconnect the air cleaner trunking from the air box. Remove the bolts securing the air box to the carburetters and remove box together with the two gaskets.
2. Disconnect the throttle and choke cables. Remove the fuel supply pipe at the 'T' piece junction (located between carburetters.).
3. Progressively release the carburetters securing nuts (four are visible from above, the other four being below). Remove nuts and washers.
4. Carefully remove the two carburetters as an assembly, ensuring that the synchronising linkage between the two is not distorted. Pull off the gaskets.
5. If it is suspected that an air leak is evident between the adaptor flange and the adaptor blocks, the 'O' ring may be damaged, then the flanges should be removed by releasing their securing nuts. When replacing, always use new 'O' rings and adjust securing nuts as given under 'Flexible Carburetter Mounting' .(Section 'L.9'.).

To Replace.

1. Using new gaskets (after ensuring no traces of old gaskets remain on mating faces) fit the carburetters as an assembly, tightening their securing nuts progressively to avoid possible distortion of the mounting faces.

2. Reconnect the throttle and choke cables to their respective locations. Replace the fuel supply pipe at the 'T' - piece junction.

3. Using new gaskets, refit the air box. Replace the air trunking between air box and air cleaner.

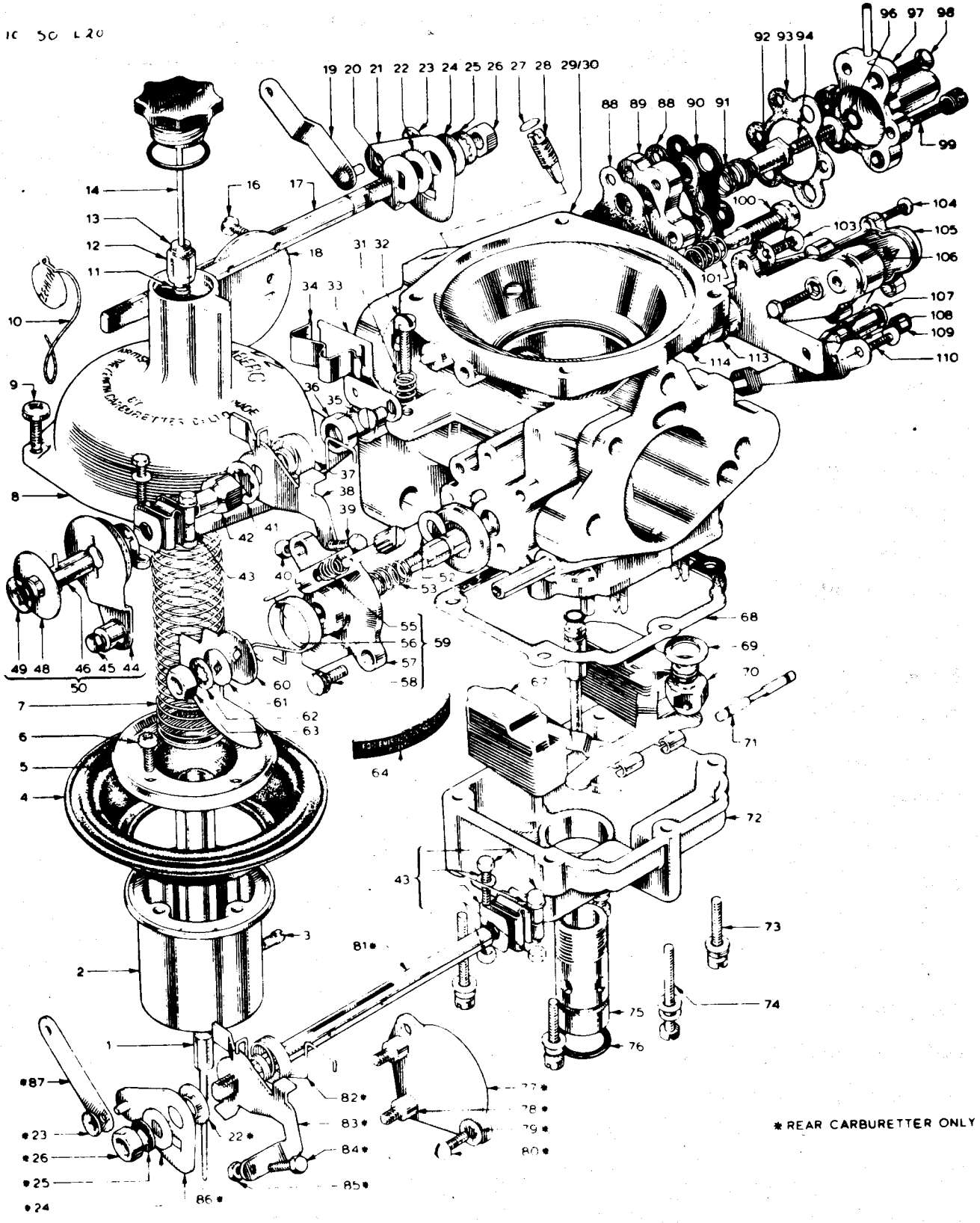


Fig. 13. ZENITH STROMBERG EXHAUST EMISSION CARBURETTER.

1. Needle
2. Air valve
3. Locking screw
4. Diaphragm
5. Retaining ring
6. Screw
7. Air valve spring
8. Top Cover
9. Top cover screw
10. Seal
11. Retaining ring
12. Bushing
13. Washer
14. Damper
16. Throttle screw
17. Spindle, front throttle
18. Throttle
19. Lever, throttle
20. Tabwasher
21. Plate
22. Spacer
23. Lockwasher
24. Washer
25. Lockwasher
26. Nut
27. Plug
28. Screw
29. Body, front carburetter
30. Body, rear carburetter
31. Spring
32. Throttle stop screw
33. Plate
34. Clip
35. Screw
36. Bush
37. Spring
38. Throttle stop lever
39. Fast idle screw
40. Locknut
41. Lockwasher
42. Sleeve nut
43. Coupling
44. Plate
45. Screw
46. Sleeve
48. Spacer washer
49. Lockwasher
50. Sleeve and plate
52. Clip
53. Spring
55. Spring
56. Pin
57. Housing, starter
58. Housing screw
59. Housing assembly
60. Starter cam
61. Spacer
62. Lockwasher
63. Nut
64. Label
67. Float and arm
68. Gasket
69. Gasket
70. Needle seating
71. Fulcrum pin
72. Float chamber
73. Screw
74. Screw
75. Screw
76. 'O' ring
77. Mounting plate
78. Stud
79. Lockwasher
80. Screw
81. Spindle, rear throttle
82. Spring
83. Throttle stop lever
84. Fast idle screw
85. Locknut
86. Lever mounting plate
87. Throttle lever
88. Gasket
89. Valve body
90. Diaphragm
91. Spring
92. Sleeve nut
93. Gasket
94. Retaining screw
96. 'O' ring
97. Throttle by-pass valve
98. Retaining screw
99. Retaining screw
100. Adjusting screw
101. Spring, adjusting screw
103. Screw, body
104. Screw, cover
105. Cover
106. Body
107. Valve
108. Bi-metal strip
109. Nut
110. Screw
113. Gasket
114. Gasket

L.11. - ZENITH STROMBERG CARBURETTERS.

To Adjust.

The only adjustments that can be made to these carburetters in service are:-

a. Idle speed. Adjusted by rotation of the throttle stop screw.

b. Idle mixture. Adjusted over very fine limits by trimming screw for best quality idle and driveability. THIS IS NOT A NORMAL ADJUSTMENT. Variations are very slight indeed.

c. Synchronisation.

1. Fast Idle.

The fast idle screw incorporated in the cold start devices is factory set and should not need attention. Should it be disturbed at any time reset as follows:-
The throttle plate should be held open a fixed amount by laying a drill (size .6mm) in the bottom of the port directly below the spindle. With the starter in the full enrichment position the fast idle screw should be adjusted until it touches the fast idle cam. Lock securely with lock nut and remove drill. The carburetters must, of course, be removed from the engine for this operation.

2. Synchronisation.

When the carburetters, adaptor flanges and adaptor blocks have been assembled to the cylinder head, leave the clamping screws on the 'W' clips loose until the carburetters have been synchronised and the throttle lever set. Unscrew the throttle stop screws to permit the throttle in each carburetter to close completely, then screw in the throttle stop screws to the point where the ends of the screws are just touching the levers. From this point rotate the stop screws $1\frac{1}{2}$ complete turns each, to open the throttles an equal amount and provide a basis from which the final speed of idle can be set.
Ensure fast idle screw is clear of cam, otherwise incorrect synchronisation can result. Check also that the cold start lever is fully off against the stop with the choke control pushed in. Adjust coupling and cable as necessary. Start engine and warm up to normal temperature.
With the airbox off check synchronisation by either:-

Tube to ear method: Insert one end of a tube in the choke of the carburetter and note the hiss heard at the other end. Repeat this for the other carburetter and adjust the throttle stop screws until both hisses are of equal volume and the idle speed is as given in 'TECHNICAL DATA'.

NOTE: There is no mixture or volume screw only an idle trimming screw, the function of which has already been described.

Crypton Synchro (or similar) Test: These are proprietary instruments which give a measure of air flow when pressured against the inlet of the carburetter. When doing this take care not to lock the screws until equal airflows are obtained and the idle speed is correct.

NOTE: As this system incorporates a balance pipe, carburetters CANNOT be synchronised by shorting out spark plugs and noting the drop in engine speed. Fit the air box, etc. and recheck idle speed.

3. Throttle Lever Setting.

There is a lost motion built into the throttle lever and coupling spindle assembly to allow the throttle spindle to turn when the cold start and hence the fast idle is operated without pulling the throttle cable return spring.

NOTE: Idle quality and low speed running depend to a large extent upon the general condition and it is, therefore, essential to check cam followers adjustment, spark plugs and ignition timing if idling is unstable. It is also important to eliminate any leaks at manifold joints.

L.12. - ZENITH STROMBERG CARBURETTERS.

To Clean .

1. Remove the carburetters from the engine (Section 'L.10') to a clean bench.
2. Yellow Service Every 20,000 kilometres (12,000 miles). For this service, one Yellow Pack 'A' is required for each carburetter. This pack contains 1 float chamber gasket, 1 'O' ring for float chamber plug, 1 needle valve washer and 1 manifold/ carburetter gasket.
3. Remove carburetters, place on a clean bench to keep the parts free from contamination and disconnect one carburetter from the other.
4. Have a receptacle available into which fuel from each float chamber may be drained, then unscrew brass centre plug to carry out this operation.
5. Unscrew the float chamber fixing screws, taking care not to lose the washers and withdraw float chamber vertically away from body to clear the float mechanism. Take off float chamber gasket. Unclip float pivot pin and , noting carefully the top in order to ensure correct re-assembly, take out floats. Unscrew hexagon bodied needle valve from carburetter body.

6. Take off 'O' ring from centre plug then thoroughly cleanse all parts that have so far been removed.
7. Refit needle valve into float chamber cover with new washer (htickness 1.6 mm) and make sure it is screwed tightly into position.
8. Replace float assembly, after inspecting for damage or distortion, slide in pivot pin and clip assembly into position. (see Float Height in Section 'L.9.')
9. With the new gasket in position, refit float chamber and tighten the retaining screws securely from centre, outwards. Fit new 'O' ring to centre plug and replace tightly in position. Refit carburetters to adaptor flange with new gaskets supplied.
10. Top up damper resevoirs with the recommended oil (see Section 'O') to within $\frac{1}{4}$ in. (6.35 mm.) of top of centre rod.
11. Refit carburetters and reset controls as described in Section 'L.9.'

L. 13. - ZENITH STROMBERG CARBURETTERS.

Overhaul.

1. Remove the carburetters from the engine (Section 'L.10.') to a clean bench.
2. Red Service Every 40,000 kilometres (24,000 miles). This is a more comprehensive service for which one Red Pack 'B' is required for each carburetter. This pack contains 1 float chamber gasket, 1 'O' ring, 1 needle valve, 1 diaphragm, 2 throttle seals, 2 temperature compensator seals, 1 flange gasket.
3. Remove carburetters from induction manifold, check carburetter induction flanges for flatness and face-up if necessary. Carry out similar procedure to that outlined for the 10,000 miles service in respect of float chamber cleanliness and float setting. In this instance, however, fit the new needle valve assembly with a new washer.
4. Unscrew damper assembly from centre of cover. Unscrew the four cover fixing screws and carefully lift off cover. Remove air valve return spring then take out air valve and diaphragm assembly. Avoid possibility of corrosion to shaft from perspiration of hands by lifting upwards with the diaphragm.
5. Drain oil from damper resevoir (centre of guide rod). Slacken metering needle clamping screw and withdraw metering needle from air valve. Place this carefully to one side to avoid damage.
6. To fit the new diaphragm, undo the four screws holding the diaphragm retaining ring onto valve, making sure that the locating tag is recessed into the aperture provided. Drop in retaining ring and replace the four fixing screws tightly.

7. Take metering needle and check spring action in the housing at the top of the shank. Fit metering needle into base of air valve, lining up the flat portion with the locking screw. Using a straight edged strip placed lightly against the small shoulder on the needle, press the assembly into the air valve until the strip aligns the shoulder with the flat surface of the air valve. The locking screw should then be lightly tightened taking care not to collapse the needle housing. Shoulder alignment is extremely critical and this operation should be accurately carried out. Correctly fitted, the needle will be biased toward the throttle and the shoulder of the needle will be exactly flush with the air valve face. To check that the caooect needle is fitted, hold the housing and CAREFULLY pull out the needle. The needle part number can then be seen on its shank.
8. Carefully enter air valve and diaphragm assembly into the main body, guiding the metering needle into the jet with a finger in the air intake. Locate the outer tag of diaphragm in aperture of top of body.
9. To check assembly, look down centre of air valves to see that the two depression transfer holes are parallel to the throttle spindle and that the metering needle is also biased towards the throttle.
10. Replace the air valve return spring.
11. When refitting the cover, hold the air valve with finger or thumb in air intake and slide on cover, locating the screw holes. This method will avoid air intake. Tighten the four cover screws evenly than check movement of air valve. Freedom of movement over the full travel is essential and, when released from uppermost position, the air valve should fall with a sharp metallic click onto the carburetter bridge.
12. Top up damper resevoirs with the recommended oil (see Section 'O') to within $\frac{1}{4}$ inch, (6.35 mm.) of top of centre rod.
13. Undo the two screws which retain the temperature compensator unit to the main body of the carburetter and withdraw the assembly. Take out the inner seal from carburetter body and remove outer seal from the valve. Change both seals and refit the assembly to the carburetter tightening the two retaining screws evenly.
14. Take off the compensator cover by removing the securing screws and check for free movement of the valve by lifting off its seat. On releasing, the valve should return freely. Do not stain the bi-metal blade or attempt to alter the adjustment. Provided the valve is free, replace cover and fit screws.

15. Release the screws securing the throttle by-pass body and remove body and gasket Discard the gasket. While the by-pass body is removed, replace the primary throttle spindle seals. Replace throttle by-pass body and gasket after fitting new seals.

16. To replace the throttle spindle seals, first take off any levers fitted to the spindle ends then carefully prise out the old seals noting how they are fitted. Slide new seals along spindle and press into body recess using Lotus Tool T.339.

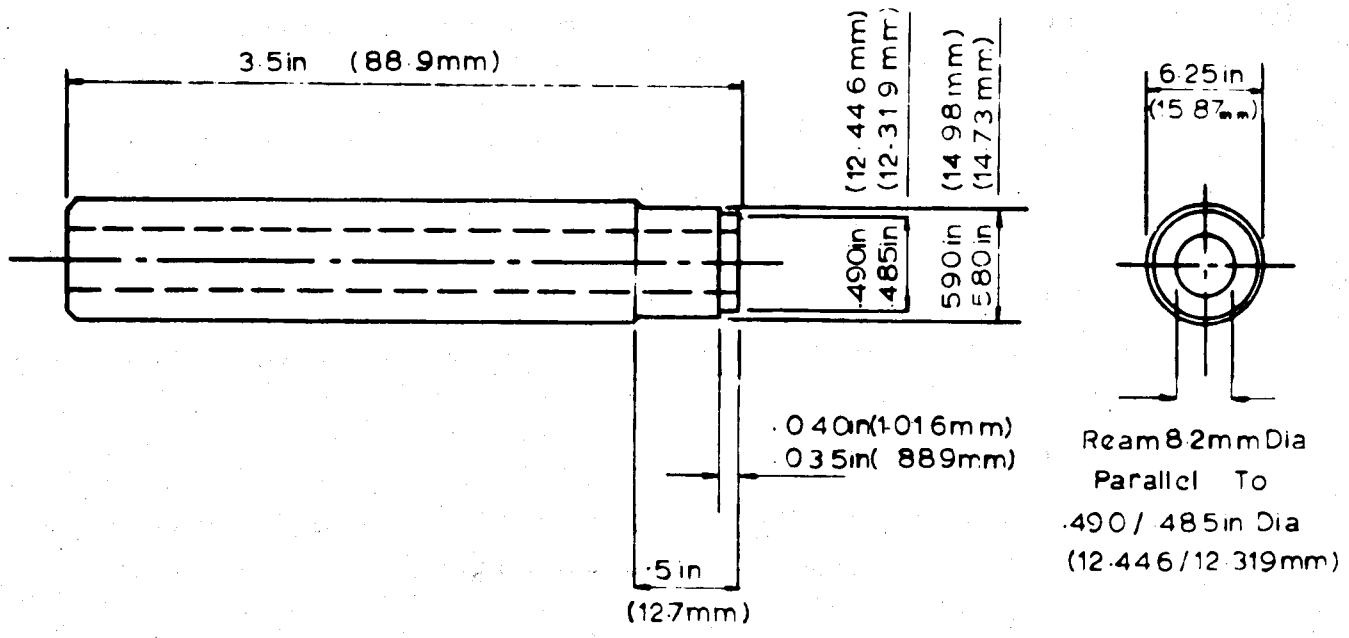


Fig. 14. LOTUS TOOL T.339.

17. Refit carburetters and reset controls as described in Section 'L.9.'

Special Parts. Although already covered, it is thought worthwhile to repeat the items which must not be changed or adjusted in Service.

Items that must not be changed.

a. The jet assembly.

b. The air valve.

c. The depression chamber cover.

Items that must not be adjusted.

d. The position of the metering needle.

e. The temperature compensator.

f. The air valve return spring loading.

If any of the above items require changing or adjusting with the exception of 'f', the sub-assemblies or the complete carburetter must be returned for re-setting. In the case of 'd', it is permissible to replace the metering needle provided that the procedure given is followed absolutely, and the correct type ONLY used.

Air Valve/Diaphragm Assembly.

A bead and locating tab is moulded to both the inner and outer radii of the diaphragm to ensure correct positioning of this item. The diaphragm is secured to the air valve by a ring and screws with lockwashers and it is necessary to ensure the bead is correctly located and the screws fully tightened.

Location for the bead and tab on the outer radii of the diaphragm is provided by a location channel at the top of the main body. It is important that location beads and tabs are accurately positioned.

When refitting the suction chamber cover, place it accurately so that the screw holes line up with those in the main body, as this will prevent any disturbance of the located diaphragm

Air Valve Rod and Guide.

The air valve rod and guide must be kept clean and should not be handled unduly if corrosion is to be avoided. A few drops of oil (see 'Data') should be applied to the rod before fitting.

Float Chamber Removal.

To prevent the leakage of petrol from the float chamber, a rubber 'O' ring is situated between the jet cover and the float chamber spigot boss.

Care should be taken when removing the float chamber to avoid damage to the faces and floats.

CARBURETTER FAULT FINDING.

It is assumed that all mechanical and/or ignition faults have been corrected, therefore, ONLY possible carburetter faults will be listed.

Erratic or Poor Idling.

1. Incorrect fuel level caused by maladjusted floats and/or worn or dirty needle valve. Check float height and wash needle valve in clean methylated spirits or alcohol. Replace needle valve if worn. Check also that floats are not punctured.
2. Throttles not synchronised. Re-set correctly.
3. Air valve sticking. Check free movement of spring-loaded metering needle, clean air valve rod and guides. Lubricate air valve rod and guide with a few drops of light oil.
4. Metering needle incorrectly fitted. See that shoulder of needle is flush with face of air valve and that the needle is biased towards the throttle. Also, check identification to ensure correct needle fitting. Check that needle housing has not been distorted by overtightening retaining screw.

3. Partially or fully obstructed diaphragm and float chamber ventilation holes. Check that air box is correctly fitted and that gaskets are not causing obstruction.

4. Diaphragm incorrectly located or damaged. Check location with depression chamber cover removed. The two depression holes at the base of the air valve should be in line with and towards the throttle spindle. Renew diaphragm if damage is evident. When replacing depression chamber cover, the damper ventilation boss must be towards the air intake.

5. Temperature compensator not operating correctly. With the engine and carburetters cold, remove cover from temperature compensator assembly. Tapered valve should be seated in this condition. Check operation by carefully lifting the valve off its seat; when released, the valve should return freely. If any damage should have occured that prevents themechanical operation functioning correctly, the compensator unit should be changed.

6. After reasonable service, inspect throttle spindle seals and throttle spindle for fracture and wear respectively. Replace if necessary.

7. Leakage at induction manifold joints. Remake joints facing-up flanges as required. Check that 'O' ring, adaptor flange block and balance pipe 'O' rings are correctly located.

Hesit ation or Flat Spot.

Possible causes are given for 'Erratic or Poor Slow-Running' but with the addition of the following:

1. Damper inoperative. Check oil level and top up with oil (see Section 'O').
2. Air valve return spring missing or incorrect part fitted.

Heavy Consumption.

Here again, any points that have been covered under the two previous headings can contribute to heavy fuel consumption.

Ensure choke cable returns the cold start lever to the fully off position when choke control is pushed in. Adjust coupling and cable as necessary.

Additionally, check that there is not a fuel leak from the float chamber joints.

L.14. - AIR CLEANER.

The intervals at which the air cleaner will require attention vary in accordance with the operating conditions.

In towns and areas where the roads are relatively dust free, the intervals given in Section 'O' should be adhered to but, in areas where the atmosphere is smoke or fog-laden,

or where the roads are unmetalled, attention will be needed at more frequent intervals.

To Renew Element.

1. Release the clips securing the air trunking to the air cleaner from the airbox. Pull off air trunking.
2. Remove the wing-nut situated on the wall of the luggage compartment. This nut secures the front flange to the body.
3. Discard the old element with its sealing rings. Clean the inside of the body and front flange of any accumulated dust and dirt.
4. Place a rubber sealing ring (supplied with the new element) at either side of the element, fit element assembly into cleaner body, fit front flange and secure whole with the wing-nut.
5. Replace air trinking between air cleaner and airbox, securing with its clips.

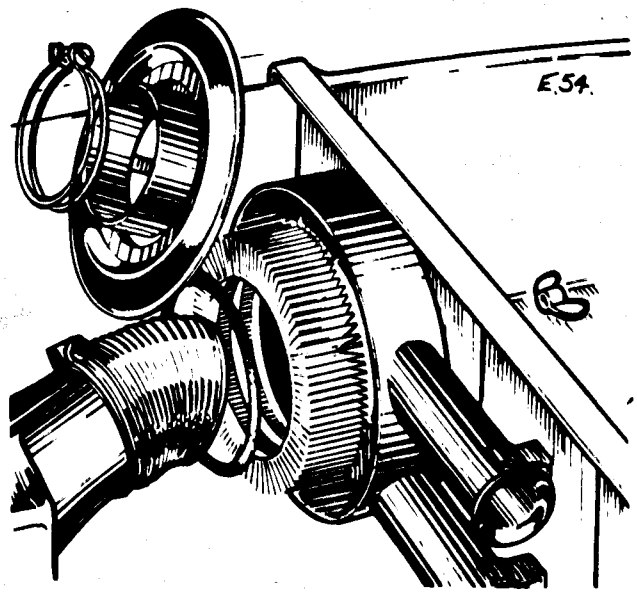


Fig. 15. AIR CLEANER ASSEMBLY.

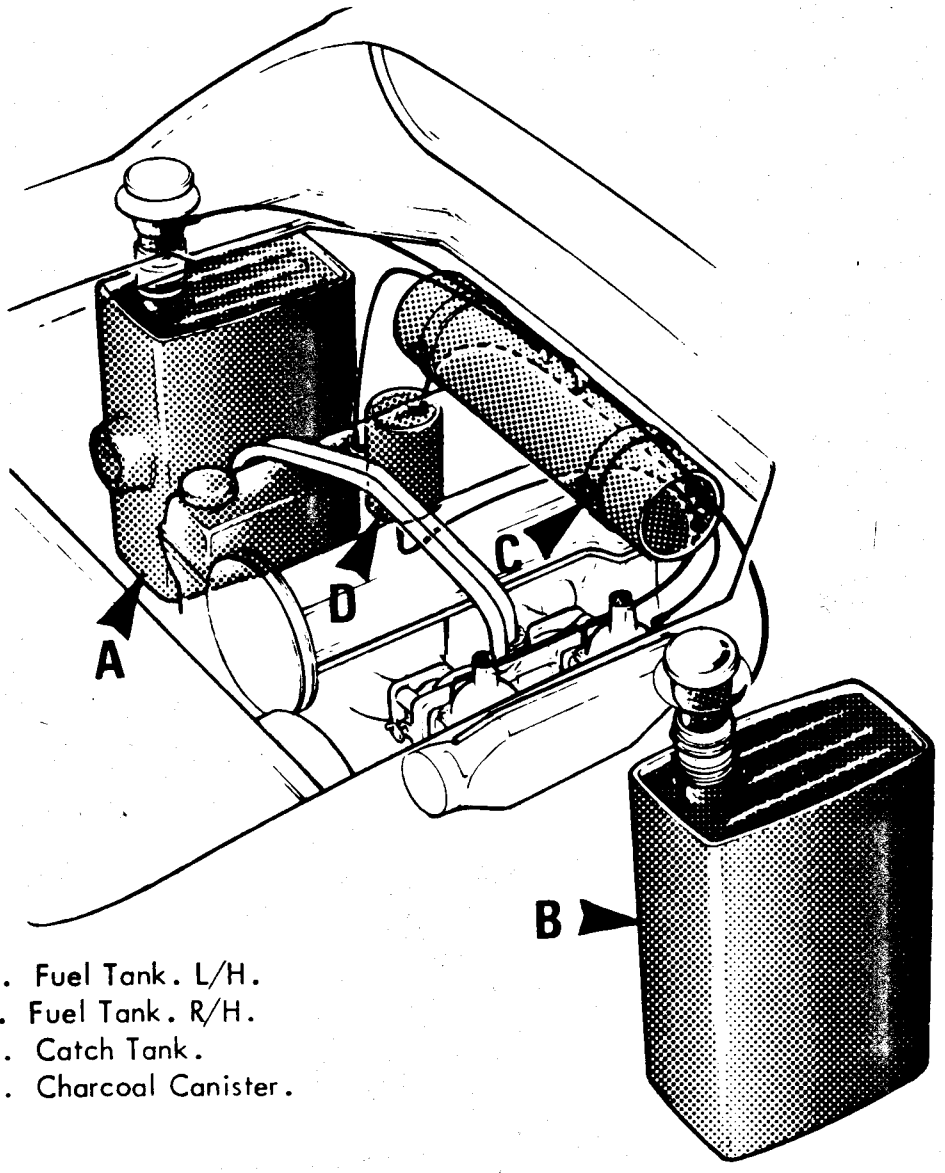
L.15. - 1972 EVAPORATIVE LOSS CONTROL (EXHAUST EMISSION).

To eliminate fuel vapourization into the atmosphere and thus comply with the 1972 U.S. Federal Motor Vehicle Safety Standards, and 'evaporative circuit' has been incorpor--ated into the fuel system.

The evaporative loss control system consists basically of an activated charcoal canister which collects the fuel vapour given off from the fuel tank vent. Additional to the fuel tank is a catch tank, which cannot be filled through the main tank fuel filler neck. This catch

prevents neat fuel from reaching the charcoal canister in conditions of extreme heat, of violent vehicle movements. The absorbed vapour in the charcoal is 'purged' by clean air while the engine is running, via throttle edge drillings (in the carburetter).

The system is effectively maintained by renewing the charcoal canister at intervals of every 48,000 miles.(60,000 km.).



A. Fuel Tank. L/H.
B. Fuel Tank. R/H.
C. Catch Tank.
D. Charcoal Canister.

Fig. 16. EVAPORATIVE LOSS CONTROL SYSTEM.

L. 16. - CHOKE CONTROL.

To Remove.

1. Disconnect inner cable at the carburetters then pull out from front of facia.
2. The outer casing can be removed by first releasing it at the carburetter clamp, then releasing the locking ring from the front of the facia.

SECTION M.

ELECTRICAL.

M.1. - GENERAL.

The main difference between the Europa Twin Cam model and the previous model, is that of the alternator. Wiring diagrams will be found at the end of this section.

On cars destined for use in North America, the following are also incorporated into the electrical equipment specification:-

a. Hazard warning system.

b. Brake fail warning system.

c. Fasten seat belts warning system.

M.2. - ALTERNATOR.

General Description.

The alternator features a solid state regulator which is mounted inside the slip ring end frame. All regulator components are enclosed into a solid mould and this unit, along with the brush holder assembly is attached to the slip ring frames. The regulator voltage setting does NOT require adjusting and no provision is made for this.

The rotor bearings contain sufficient lubricant for the life of the machine. Two brushes carry current through the two slip rings to the field coil mounted on the rotor and under normal conditions will provide long periods without attention.

The stator windings are assembled on the inside of a laminated core that forms part of the alternator frame. A rectifier bridge connected to the stator windings contains six diodes and electrically changes the stator 'a.c.' voltages to a 'd.c.' voltage which appears at the alternator output terminals. Field current is supplied through a diode trio which also is connected to the stator windings.

No periodic adjustments, or maintenance of any kind are required on the entire alternator assembly.

Fault Finding Procedure. (Fig. 1.)

Close adherence to the following procedure in the order given, will lead to the location and correction of charging system defects in the shortest possible time. It will NEVER be necessary to perform all the procedures, in order to locate the trouble.

To avoid damage to the electrical equipment, ALWAYS observe the following precautions:-

a. Do NOT polarize the alternator.

b. Do NOT short across, or ground any of the terminals in the charging circuit, EXCEPT as given here.

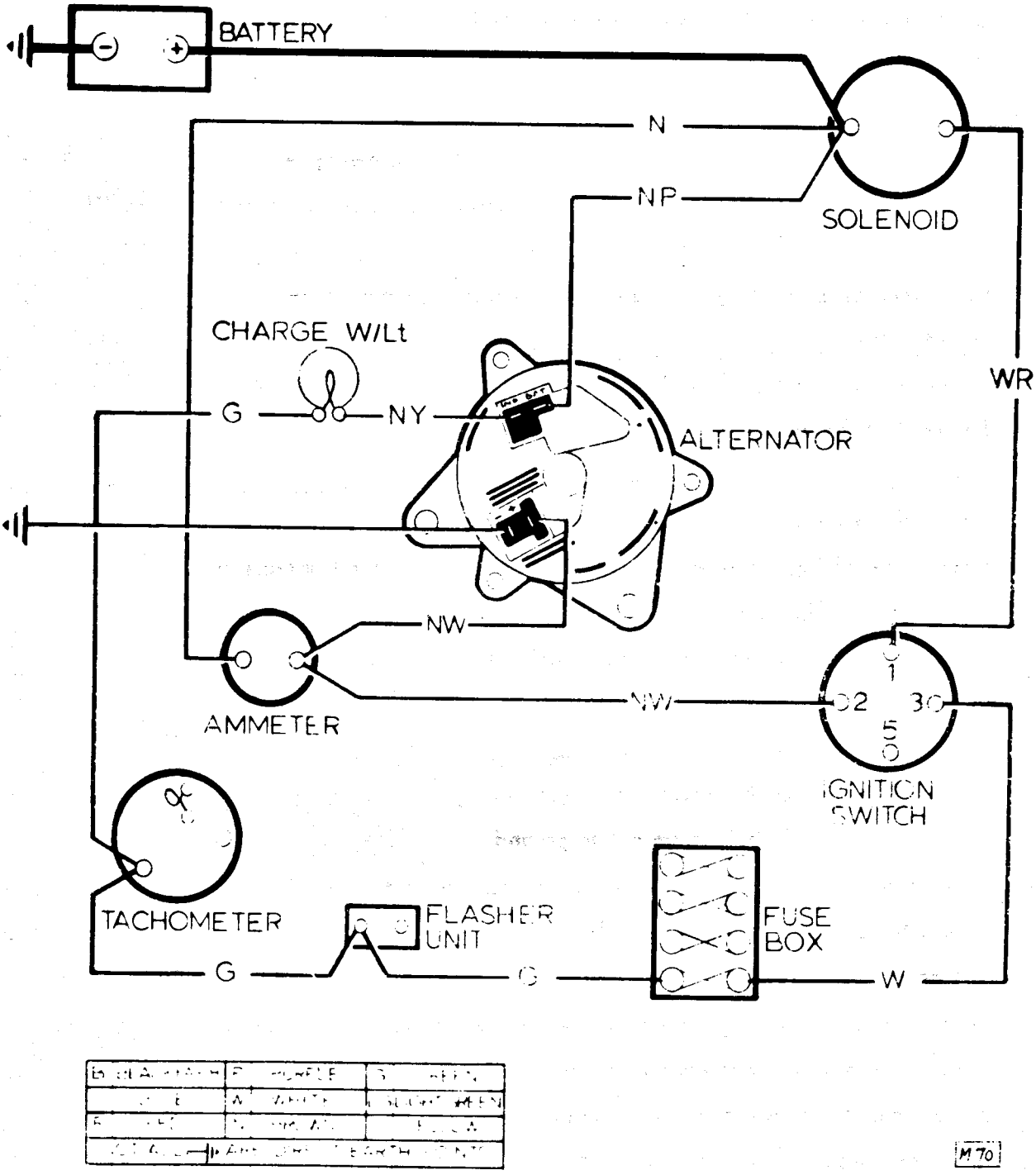


Fig. 1. - ALTERNATOR CHARGING CIRCUIT.

c. Ensure that both the alternator and battery have the SAME ground polarity.

d. When connecting a charger to the battery, connect NEGATIVE to NEGATIVE and POSITIVE to POSITIVE.

Trouble in the charging system will show up as one of the following :-

a. Undercharged battery, evidenced by a slow engine cranking and low specific gravity readings.

b. Overcharged battery, evidenced by excessive water usage.

Undercharged Battery.

This condition will be dealt eith in the following manner:

Ensure that the undercharged condition has NOT been caused by accessories having been left on for excessive periods.

2. Check the drive belt for correct tension.

3. Inspect the wiring for defects. Check all connections for tightness and cleanliness including the slip connectors at the alternator and cable clamps and battery posts.

4. With the ignition switch 'on' and all wiring harness leads connected, connect a voltometer from:-

a. Alternator '+' to ground.

b. Alternator IND (NY) terminal to ground.

c. Alternator BAT (NP) terminal to ground.

A zero reading indicates a break between voltometer connection and battery.

NOTE: The alternator is provided with a built-in safety feature which avoids avercharge and accessory damage by preventing the alternator from turning 'on' if there should be a break in the wiring harness connected to the BAT (NP) terminal.

Breaks in the wiring harness connected between the BAT (NP) terminal and the battery may be between the terminals, at the crimping of harness wire and terminal, or in the wire.

5. If paragraphs 1 through to 4 are satisfactory, now check the alternator as follows:-

a. Disconnect the battery ground (Negative) cable.

b. Connect an ammeter in the circuit at the '+' terminal of alternator.

c. Reconnect the battery (Negative) ground cable.

d. Switch on windscreen wipers, lamps main beam, heater fan motor and radio if fitted. Connect a carbon pile across the battery.

e. Operate engine at modest speed and adjust carbon pile to obtain maximum current output.

f. If ampere output is within 10% of rated output (See TECHNICAL DATA), alternator is not defective; recheck paragraphs 1 to 4 inclusive.

g. If ampere output is not within 10% of rated output, ground the field winding by inserting a screwdriver into the test hole (See fig. 2.)

CAUTION: Do NOT force screwdriver deeper than 25 mm.(1 in.) into end frame.

h. Operate engine at moderate speed and adjust carbon pile to obtain maximum current output. Remove ammeter and switch off accessories.

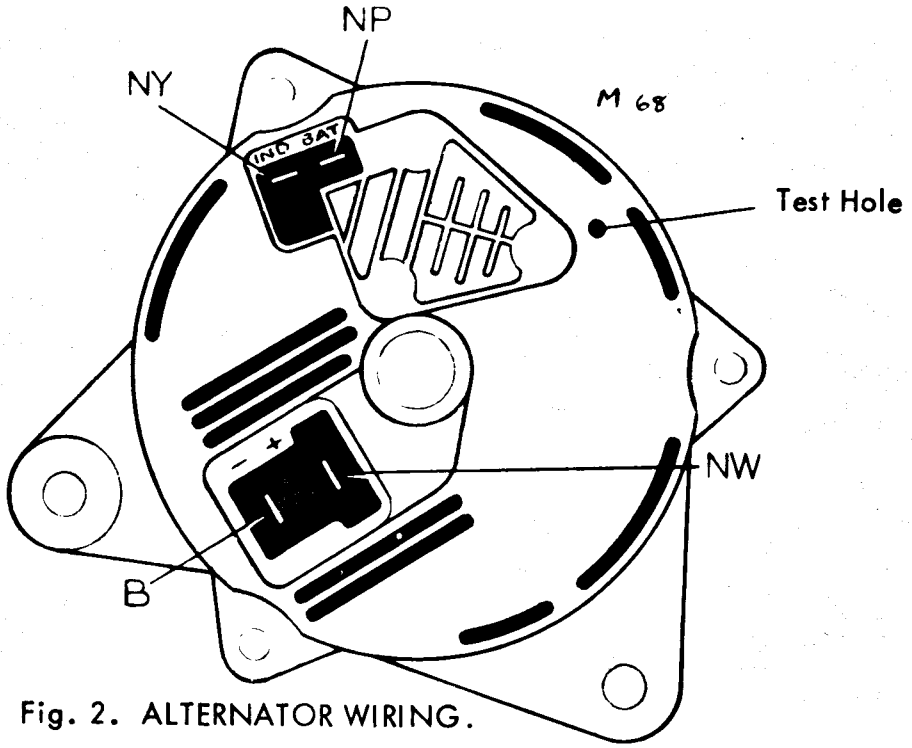


Fig. 2. ALTERNATOR WIRING.

Overcharged Battery.

1. Check battery condition as normal workshop practise.

2. Connect a voltometer from alternator BAT (NP) terminal to ground. If reading is zero, BAT (NP) cable circuit is 'open'.

3. If battery and BAT (NP) cable circuit checks are satisfactory, but an obvious over--charge exists as evidenced by excessive water usage, then an internal fault exists in the alternator (i.e. field winding shorting, brush lead clip grounded or regulator defective), in which case, replace the alternator.

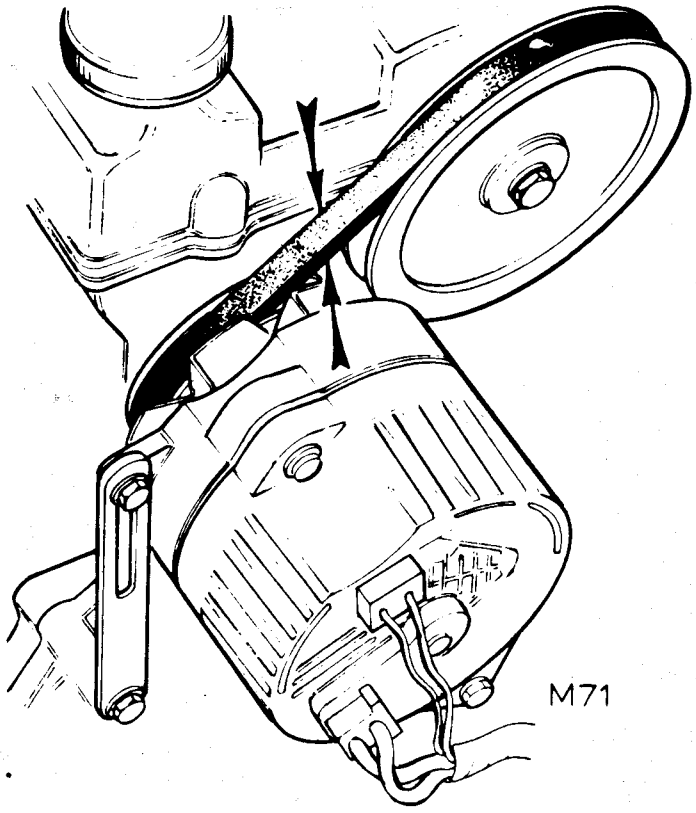


Fig. 3. BELT TENSION.

ALTERNATOR DRIVING BELT ADJUSTMENT (Fig. 3.)

The belt is correctly tensioned when a total of 9.5 mm.(.375 in.) movement can be obtained on the belt mid-way between the pulleys at the top.

To adjust the Belt Tension.

Slacken the mounting bolts situated at the forward end of the alternator and also the securing bolt of the adjusting strap. Move the alternator about its mountings until the correct tension is achieved, then fully tighten the bolts.

Run the engine briefly, switch 'off' and re-check belt tension.

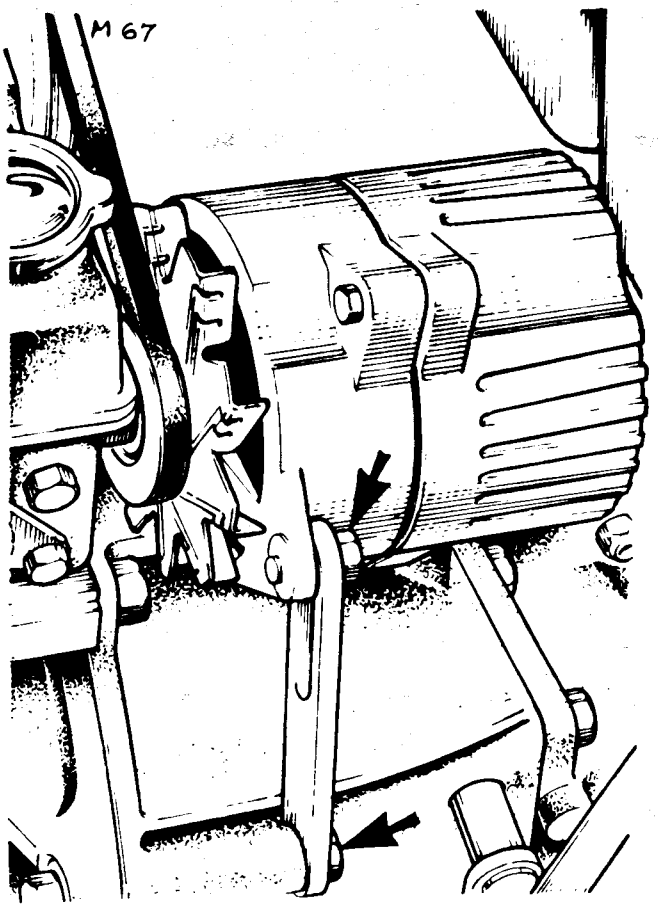


Fig. 4. ALTERNATOR ADJUSTING SCREWS.

M.3. - BATTERY.

To ensure a positive battery clamping action, it is necessary to RETAIN the packing pieces fitted below the battery. These are located at :-

a. Between chassis and body - 8 inches long
b. Between battery support bracket and body - 3 inches long
c. Between body and battery base - 8 inches long

It is important to ensure also, that the nuts on the battery clamp rods are tightened sufficiently to ensure that the battery does not move on its base.

M.4. - HAZARD WARNING SYSTEM (where fitted)

The hazard warning system is operated by the horizontally mounted switch adjacent to the glove compartment. When switched 'on', all four direction indicator lamps flash in unison, together with the warning lamp located in the centre of the facia panel. Bulb failure in any of the direction indicator lamps will be shown by the warning lamp failing to flash, or flashing rapidly.

NOTE: Do NOT operate the direction indicator switch when the hazard warning system is in operation.

M.5.- BRAKE FAIL WARNING SYSTEM (where fitted).

See Section 'J' Braking System.

M.6. - SEAT BELT WARNING SYSTEM.(where fitted)

See Section 'B' Body.

M.7. - COOLING FAN MOTOR.

Where moisture is found to be entering the cooling fan motor, it is recommended that Valvoline 'Ectyl 506' be brushed on to casing bolts, seams, etc. Ensure that the sealant does NOT contaminate the motor terminals.

Drying time of the sealant is approximately 1 hour.

M.8. - PHILLIPS RN.314 'TURNLOCK' RADIO.

Full details for fitting a radio are given in Section 'M' of the Europa Worshop Manual.

The Phillips radio receiver is earthed to a conveneint body-to-chassis mounting bolt.

Feed to the receiver is from the 'AUX' side of the ignition/starter switch, through an in-line 2 amp. fuse.

The aerial is fitted to the passenger side of the car (see Fig. 5.) with the co-axial lead running behind the top of the carpet in the foot well.

The single speaker is fitted behind the door trim panel in the passenger door.

Suppression required with this radio to give a reduction of interference to an acceptable standard, proceed as follows:-

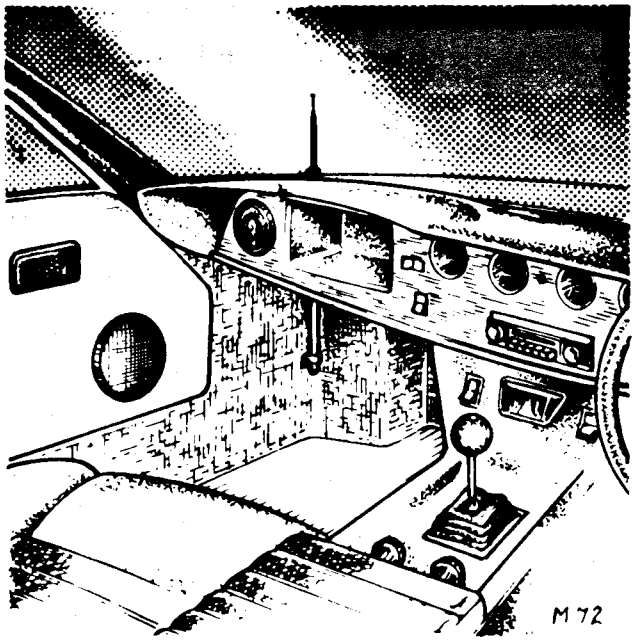


Fig. 5. RADIO INSTALLATION.

1. Filtering. A 1 mf. capacitor is fitted to each item -

   a. Alternator casing to 'IND' cable (1 off).

   b. .Voltage stabiliser 'BAT' terminal to earth (1 off).

   c. Wiper motor casing to 'fast speed' terminal and to 'slow speed' terminal (2off).

   d. Stop lamp switch terminal to terminal (1 off).

2. Filtering. A 2 mf. capacitor is fitted from the POSITIVE (+ve) side of the coil to an engine mounting block. Keep clear of radius arm.

3. Bonding. Bonding braids are fitted as follows:-

   a. 38 cm.(15 in.) braid from bonnet hinge bolt to camshaft cover (see Fig. 6.)

   b. 15 cm.(6 in.) braid from each forward inner seat mounting bolt to chassis (see Fig. 7.)

   c. 30.5 cm.(12 in.) braid from coil mounting bolt to chassis.

   d. In addition to the above, check that the following connections have been made, these being incorporated in the main wiring harness (loom).

      Both fan motors to earth.

      Wiper motor casing to earth.

      R/H fuel tank to earth - this is most IMPORTANT.

4. Screening. Using Dunlop 'S.758' adhesive, attach a piece of perforated foil 53 cm.(22 in.) X 51 cm.(20 in.) to the underside of the engine compartment lid. Note that the foil is beneath the bonnet mounting nuts with the braid in contact with the foil (see Fig. 6.)

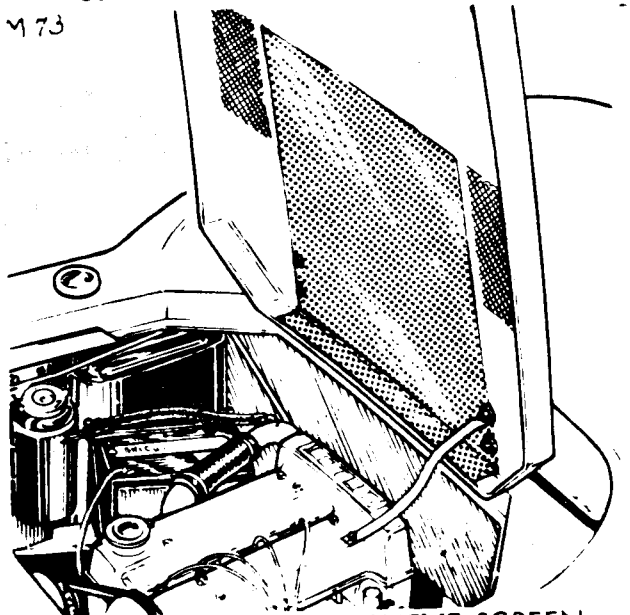


Fig. 6. ENGINE COMPARTMENT SCREEN AND EARTH.

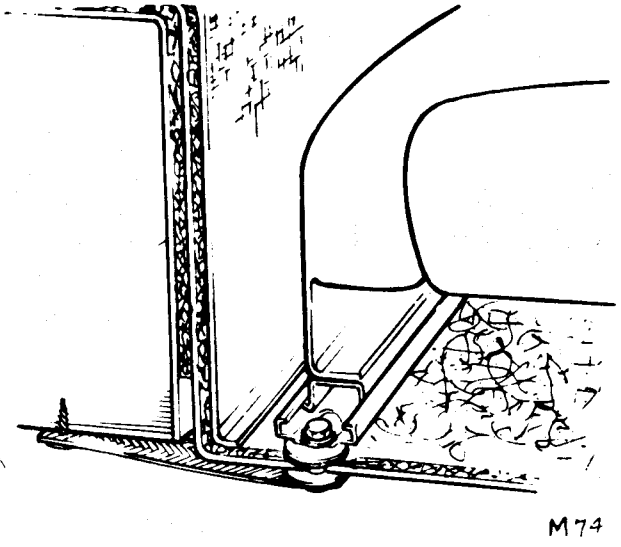


Fig. 7. SEAT EARTHING

M.9. - SWITCHES

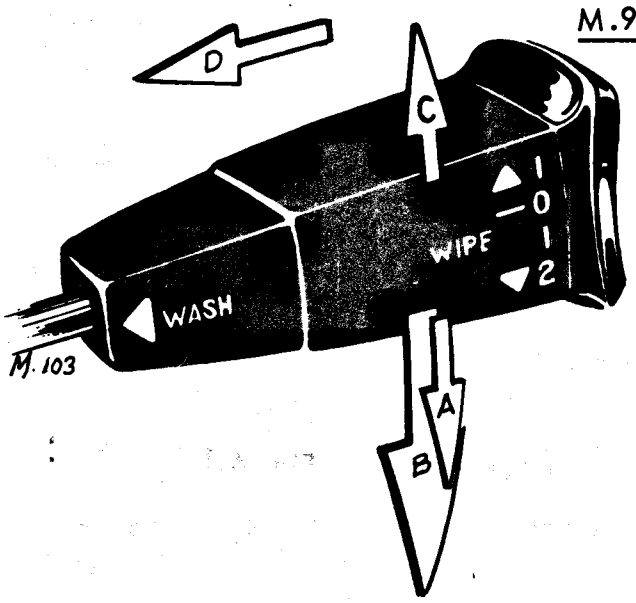


Fig. 8. Windscreen Wiper/Washer Control.

North American cars are fitted with new switches from Chassis No. 72082684R onwards. These are:

Windscreen Wiper/Washer Control

Move the lever downwards to the FIRST position (A). The wiper speed is increased by moving the lever further downwards to the SECOND positior (B).

To 'flick wipe' the screen, move the lever UP (C) and hold for duration of wipe. On release, the lever will automatically cancel and return to the 'off' position, the blades returning to their normal position.

To use the screen washer, push in the lever towards the steering column (D), and release.

To remove the switch, first remove the steering wheel, then release the switch clamp on the steering column. Pull out cable multi-plugs at lower end of column, and remove switch. Note that the switch is an assembly together with the headlamp/horn switch.

Horn, Direction Indicators and Headlamp Switch.

Horn: Push the lever in towards the steering column and release (A).

Direction Indicators: Move lever FULLY up for right-hand turn (B) and FULLY down for left-hand turn (C). Switch will cancel when steering wheel is moved to execute turn.

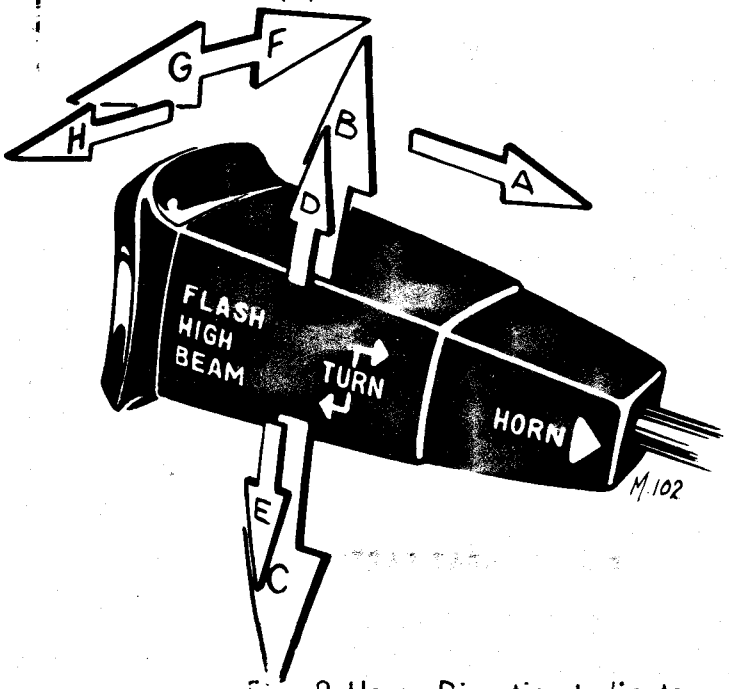


Fig. 9. Horn, Direction Indicators and Headlamp Switch.

For 'lane changing', move lever up (D) to FIRST position and hold for right-hand change, and down (E) to FIRST position, holding for left-hand change.

Headlamps: Main beam is obtained with the lever in the downwards position (F); to selec dipped beams move the lever upwards (G). These positions are only operative when the lighting switch (Fig.10) is in operation.

Lifting the lever towards the steering wheel (H) flashes the headlamps main beams irrespective of the position of the lighting switch.

To remove the Horn, Direction Indicators and Headlamp Switch, see under the heading 'Windscreen Wiper/Washer Control'.
The two switches are mounted on a common base plate, thus forming an assembly.

Lighting Switch.

Fig. 10. Lighting Switch.

Turn knob fully to the right, in direction of arrows (Fig.10), to switch 'on' the side, rear and tail lamps; pull the knob fully out while in the turned position, to energise the headlamps.

To remove the switch, depress the knob locking peg and pull off knob. Turn the slotted nut in an anti-clockwise (counter-clockwise) direction, remove nut and, from front of facia, push switch out. Mark position of cables, then release.

Panel Lamps Switch.

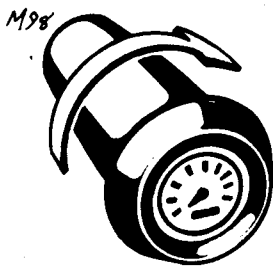


Fig. 11. Panel Lamps Switch.

Turn the knob to the right in the direction of arrow (Fig. 11), to illuminate the panel lamps.

The switch incorporates a rheostat which, when the knob is turned further to the right, reduces the glow from the lamps. The switch is only operative when the lighting switch is in operation.

To remove the switch, depress the knob locking peg and pull off knob. Turn the slotted nut in an anti-clockwise (counter-clockwise) direction, remove nut and, from front of facia, push switch out. Mark position of cables, then release.

M.10. - CONTROL ILLUMINATION.

Commencing at Chassis No. 72082684R, all cars destined for use in North America are fitted with control illumination (see Figs. 12 and 13).

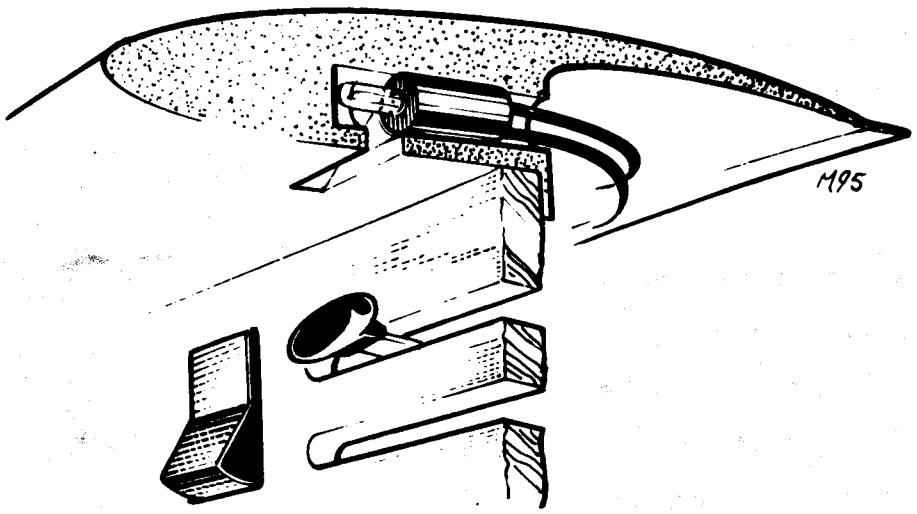


Fig. 12. Facia Panel Illumination

To replace any of the illumination bulbs, simply pull from their location, fit new bulbs, and replace holders.

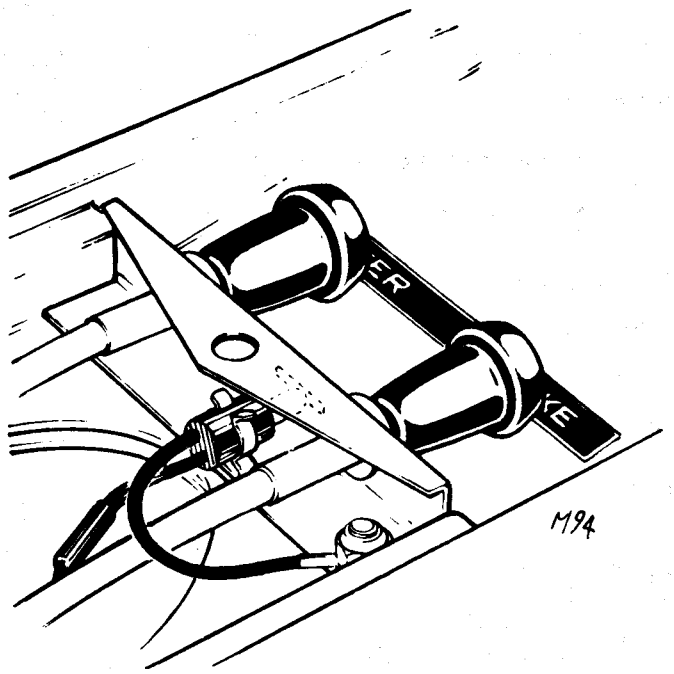


Fig. 13. Choke/Heater Temperature Illumination

SECTION O.

LUBRICATION/MAINTENANCE.

O.1. - GENERAL.

The Voucher Service commences with a FREE 'After Sales Service' which is carried out at 800 km. (500 miles). Further Vouchers are inclined in the Service Voucher Book to cover Lubrication and Maintenance at intervals of every 8,000 km.(5,000 miles).

NOTE: A fold out illustration will be found at the end of this Section which shows the main lubrication items in the Services.

O.2. - PERIODIC SERVICES.

FREE AFTER SALES SERVICE - 800 Kilometres (500 miles)

1. LUBRICATION

Drain engine without flushing and refill with new oil. Drain transmission and refill with new oil. Lubricate lower steering swivels. Lubricate drive shafts. Lubricate throttle linkage and controls. Top up carburetter damper reservoirs (Stromberg).

2. ENGINE.

Check valve clearances and adjust if necessary. Check carburetter slow running adjustment. Check vertical movement of carburetters on manifold. Check torque loading of cylinder head bolts. Top up coolant level in coolong system header tank if necessary. Make visual inspection of all water pipe conections including heater pipes. Check alternator belt tension and adjust if necessary. Check water pump drive belt. Check timing chain tensioner adjustment. Check security of carburetter ram pipes (Dellorto) securing nuts. Check security of complete exhaust system, engine mountings, distributor and alternator mounting bolts.

3. IGNITION.

Check and adjust if necessary, distributor contact breaker points, sparking plug points and static ignition timing.

4. BRAKES

Check brakes, system and operation including handbrake. Check foot pedal and adjust if necessary. Check brake fluid reservoir level and top up if necessary. Check security and conditions of all brake hydraulic pipes, vacuum hoses and unions. Check and tighten if necessary front wheel discs and caliper mountings. Check security of rear wheel brake backplates.

5. CLUTCH

Check operation of clutch and adjust clearances if necessary.

6. STEERING AND SUSPENSION.

Check that all steering connections including column clamps are secure. Check wishbone and damper connections on front and rear suspension units to specified torque loadings. Check front suspension upper and lower fulcrum pins and lower trunnion bolts to specified torque loadings. Check steering unit mountings for tightness. Check front wheel alignment.

7. ELECTRICAL.

Check operation and function of all electrical equipment, including voltage regulator output. Check security of battery terminals. Check electrolyte level of battery and top up if required.

8. WHEELS AND TYRES.

Check all wheel nuts for tightness. Check all tyre pressures, including spare.

9. BODY.

Check body condition generally including door adjustment, front and rear baggage compartment locks and all body attachment points. Check seat sliding mechanisms. Check operation of windscreen wiper and washers.

10. GENERAL.

Check condition of engine mountings and bolt to specified torque loadings. Check drive shafts, universal joints for security. Check fuel pipes, chassis, grommets, fuel tank drain plugs for security. Check chassis cross-beam and diagonal brace locating bolts to specified torque loading. Ensure steering wheel and upholstery are free from grease. Check security of alternator mounting bolts.

'A'Service - every 8,000 kilometres (5,000 miles) or 3 months (whichever is the sooner)

1. LUBRICATION

Drain engine and refill with new oil. Fit new engine oil filter. Check transmission oil level and top up if necessary. Lubricate drive shaft universal joints. Lubricate lower steering swivels. Lubricate steering unit pinion. Lubricate all doors, front and rear baggage compartment locks, catches and hinges. Top up carburetter damper reservoirs (Stromberg).

2. ENGINE.

Check carburetter slow running adjustment. Check vertical movement of carburetters on manifold. Check timing chain tensioner adjustment. Clean petrol pump filter. Check alternator drive belt for condition and adjust if necessary.

Make visual inspection of all water pipes including heater pipes. Top up coolant level in cooling system header tank if necessary. Clean air cleaner body and element.

3. IGNITION.

Check distributor settings and adjust if necessary. Lubricate cam and weights. Clean and adjust sparking plug points.

4. BRAKES.

Check brakes system and operation, including handbrake. Check foot pedal travel. Check front wheel disc pads and if down to a thickness of 1.6 mm. (1/16 in.) replace pads. Check brake fluid reservoir and top up if necessary. Check security and condition of all brake hydraulic pipes, vacuum pipes hoses and unions. Renew brake servo unit air filter.

5. CLUTCH.

Check operation of clutch and adjust if necessary.

6. STEERING AND SUSPENSION.

Check steering assembly for general condition. Check both front and rear wheels alignment and adjust if necessary. Check front suspension upper and lower fulcrum pins and lower trunnion bolts to specified torque loadings. Check wishbone and damper connections on front and rear suspension units to specified torque loadings. Check rear hub retention.

7. ELECTRICAL.

Check electrolyte level of battery. Clean battery parts and terminals and smear with silicone grease, ensuring tightness of terminals on replacement. Check operation of all circuits, including cooling fan motor operation. Check headlamp focus, resetting if necessary. Check windscreen wiper operation and arc.

8. WHEELS AND TYRES.

Check all wheel nuts for tightness. Check all tyre pressures including spare. Dynamically balance wheel and tyre assemblies.

9. BODY.

Check body condition generally including door adjustment front and rear baggage compartment locks and all body attachments points. Check seat slide mechanisms for ease of functioning. Check door windows for ease of operation. Check heater system and operation. Check there is water in windscreen washer container.

10. GENERAL.

Check conditions of engine mountings and bolts to specified torque loadings. Check security of alternator mounting bolts. Check chassis cross-beam and diagonal brace locating bolts to specified torque loadings. Check torque loadings of fixings securing brake disc and calipers, rear brake backplates, steering unit mountings, drive shaft universal joints, all exhaust system mountings and ignition distributor mounting.

'B' Service - every 16,000 kilometres (10,000 miles) or 6 months (whichever is sooner)

1. LUBRICATION.

Drain engine and refill with new oil. Fit new engine oil filter. Check transmission oil level and top up if necessary. Lubricate drive shaft universal joints. Lubricate lower steering swivels. Lubricate steering unit pinion. Lubricate all doors, front and rear baggage compartment locks, catches and hinges. Lubricate throttle linkage and controls. Top up carburetter damper reservoirs (Stromberg.)

2. ENGINE.

Check carburetter slow running adjustment. Check vertical movement of carburetters on manifold. Check timing chain tensioner adjustment. Clean petrol pump filter Check alternator drive belt for condition and adjust if necessary. Make visual inspection of all water pipes including heater pipes. Top up coolant level in cooling system header tank if necessary. Clean air cleaner body and fit new element. Check valve clearances and adjust if necessary. Check torque loading of cylinder head bolts. Check security of carburetter ram pipes (Dellorto) securing nuts. Check water pump drive belt. Check condition of all engine ancillaries.

3. IGNITION.

Check distributor settings and adjust if necessary. Lubricate cam and weights. Clean and adjust sparking plug points, renewing plugs if their condition demands this.

4. BRAKES.

Check brakes system and operation, including handbrake. Check foot pedal travel. Check front brake disc pads and if worn to 1.6 mm. (1/16 in.) replace pads. Check condition of rear brake linings. Check brake fluid reservoir and top up if necessary.

Check security and condition of all brake hydraulic pipes, vacuum pipes, hoses and unions. Renew brake servo unit air filter. Check for wear on master cylinder linkage and pedal bearings.

5. Check operation of clutch and adjust if necessary. Check for wear on clutch linkage and pedal bearings.

6. STEERING AND SUSPENSION.

Check steering assembly for general condition. Check both front and rear wheels alignment and adjust if necessary. Check front suspension upper and lower fulcrum pins and lower trunnion bolts to specified torque loadings. Check wishbone and damper connections on front and rear suspension units to specified torque loadings. Check rear hub bearings. Check front hubs lubrication and repack with grease. Check condition of front and rear wheel bearings, hubs and seals. Check security of steering unit mountings. Check all steering and suspension moving parts for wear.

7. ELECTRICAL.

Check electrolyte level of battery. Check battery posts and terminals and smear with silicone grease, ensuring tightness of terminals on replacement. Check operation of all circuits, including cooling fan motor operation. Check headlamp focus, resetting if necessary. Check windscreen wiper operation and arc.

8. WHEELS AND TYRES.

Check all wheel nuts for tightness. Check all tyre pressures, including spare. Dynamically balance wheels and tyre assemblies.

9. BODY.

Check body condition generally including door adjustment front and rear baggage compartment locks and all body attachment points. Check seat slide mechanisms for ease of functioning. Check heater system and operation. Check there is water in windscreen washer container.

10. GENERAL.

Check condition of engine mountings and bolts to specified torque loadings. Check security of alternator mounting bolts. Check chassis cross-beam and diagonal brace locating bolts to specified torque loadings. Check torque loadings of fixings securing front brake disc and calipers, rear brake backplates, steering unit mountings drive shafts universal joints, all exhaust system mountings and ignition distributor mounting. Check condition of gearshift linkage joints.

O.3. - AIR HORNS LUBRICATION.

Where air horns are fitted the compressor should be lubricated, through the oil hole provided, initially on installation and subsequently at monthly intervals.

O.4. - RECOMMENDED LUBRICANTS.

(The products shown are not listed in order of preferance)

	Esso	B.P.	Castrol	Mobil	Shell
Engine(above0^{0}C)	Uniflo	Super Viscostatic 20W/50	Castrol GTX	Mobiloil Super 10W/50	Shell Super 100
Engine (below 0°C)	Uniflo	Super Viscoststic	Castolite	Mobiloil Super 10W/50	Shell Super 10W/30
Transmission	Esso Gear Oil GX 80	B.P. Gear Oil GX 80	Castol Hypoy Light	Mobilube GX 80	Shell Spirax 80 EP
Front Hubs	Esso Multi - Purpose Grease	B.P. Energrease L.2.	Castrol Grease LM.	Mobil Grease MP.	Shell Retinax 'A'
Steering Swivels	Esso Gear Oil GP90/140	B.P. Gear Oil SAE 90EP	Castrol Hypoy	Mobilube GX 90	Shell Spirax 90 EP
SteeringUnit	Esso Multi - Purpose Grease	B.P. Energrease L.2.	Castrol Grease LM.	Mobil- Grease MP.	Shell Retinax 'A'

Pivots and Linkages Engine Oil

Hinges Locks Catches Engine oil or silicone grease.

Brake master cylinder reservoir Castrol Girling Brake Green to specification SAE 70 J.1703B

O.5. - EXHAUST EMISSION ENGINES.

The following additional servicing must be carried out on all cars equipped with the above engine.

1. AT FIRST 1,600 KILOMETRES (1,000 miles)

a. ENGINE:

Check and adjust if necessary, engine idling speed.

b. IGNITION:

Check ignition timing and adjust if necessary.

2. EVERY 20,000 KILOMETRES (12,000 miles)

a. ENGINE:

Carry out carburetter 'YELLOW' service (see Section 'L'). Renew adaptor flange 'O' rings. Check for induction leaks and renew all gaskets that are disturbed. Clean crankcase breather.

b. IGNITION:

Check ignition timing and adjust if necessary. Fit new sparking plugs.

3. EVERY 40,000 KILOMETRES (24,000 miles)

a. ENGINE:

Carry out carburetter 'RED' service (see Section 'L'). Renew adaptor flange 'O' rings. Renew all induction system gaskets. Visually inspect secondary throttle spindle seals. Check for induction leaks. Clean crankcase breather.

b. IGNITION:

Check timing and adjust if necessary. Fit new sparking plugs. Fit new distributor contact breaking points.

O.6. - APPROVED ANTI-FREEZE SOLUTIONS

Lotus Cars Limited approve anti-freeze solutions, for use in the engine cooling system, based on inhibited ethylene glycol provided it conforms to British Standard Specifications 'BSS.3151'.

Solution Strength	Against Frost Damage	Safe Pump Circulation
25%	-26° C. (-15° F)	-12°C.(10°F.)
30%	-33° C. (-28°F)	-16°C.(3° F.)
35%	-39° C. (-38°F)	-20°C.(-4°F)
40%	-41° C. (-42°F)	-23°C.(-10°F)
50%	-47° C. (-53°F)	-36°C.(-32°F)

HEATER

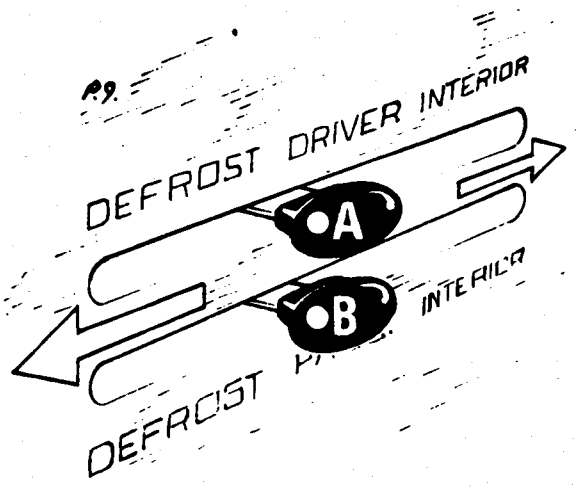


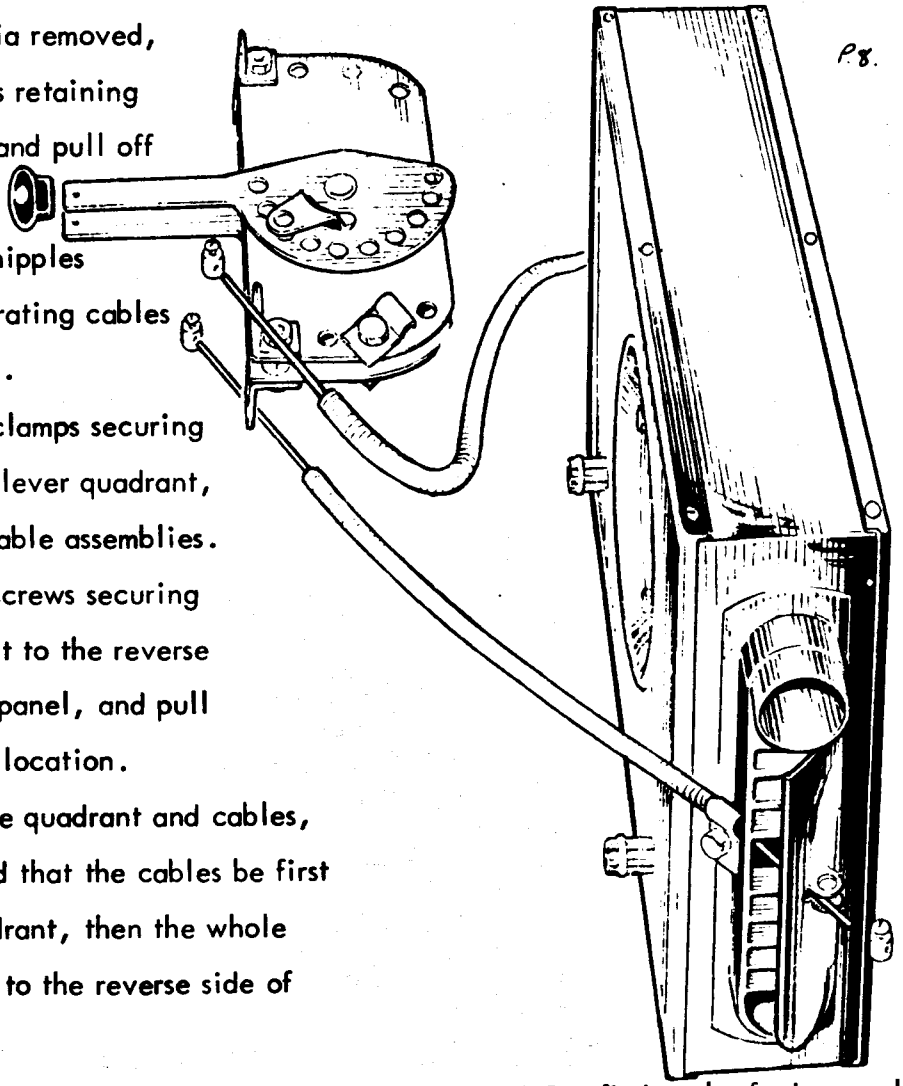
Fig. 1. HEATER CONTROLS.

Commencing at Chassis No. 72082684R, all cars destined for use in North America are fitted with a lever operated heater unit.

Interior heating and ventilation can be controlled individually by both driver (A) and passenger (B) alike, using the control levers as shown in Fig.1.

To remove the heater unit, see Section 'P' of the main Europa Manaul (X046 T 0327Z).

To remove control lever assembly, it will be necessary to remove the facia panel, in which case, see Section 'B' of the main Europa Manual.



1. With the facia removed, remove the screws retaining the lever knobs, and pull off knobs.
2. Release the nipples retaining the operating cables at the heater unit.
3. Release the clamps securing the cables to the lever quadrant, and remove the cable assemblies.
4. Remove the screws securing the lever quadrant to the reverse side of the facia panel, and pull quadrant from its location.

When refitting the quadrant and cables, it is recommended that the cables be first fitted to the quadrant, then the whole assembly secured to the reverse side of the facia panel.

Adjust lengths of cables at the heater end of them, AFTER refitting the facia panel.

SECTION Q

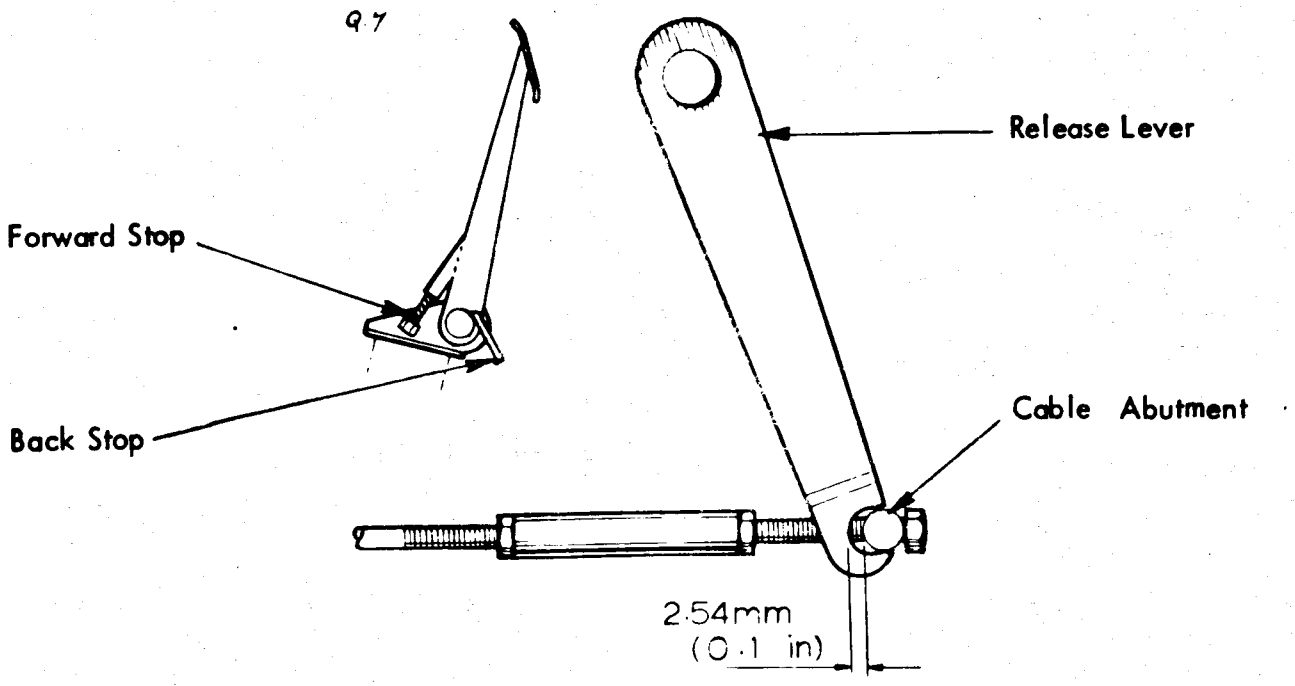
CLUTCH

Q.1 - CLUTCH ADJUSTMENT

(see also Section 'J' for pedal "set up")

For correct operation and functioning of the clutch, it is most important that the adjustment is carried out correctly. Recommended procedure is as given here.

1. Slacken the locknut on the end of the operating cable sufficient to enable the release lever to be moved by hand.
2. Push the release lever forwards by hand until the release bearing contacts the diaphragm spring of the clutch assembly. This will be felt as a marked resistance.
3. Adjust the cable to give the clearance at the cable abutment (see Fig. 1).
4. With the aid of the turnbuckle in the cable, take up any additional slack or free play in the cable.
5. With a second operator inside the car, adjust the pedal forward stop to give an additional .63 in. (16 mm.) at the release lever adjacent to the cable abutment.



Fig, 1. CLUTCH ADJUSTMENT.

SECTION S.

EXHAUST SYSTEM.

S.1 - GENERAL.

The exhaust system is comprised of either:

a. Fabricated manifolds into a common intermediate pipe

b. Cast manifold into a common intermediate pipe.

With the fabricated manifold type of exhaust, ports '1' and '4' exhaust into one manifold, while ports '2' and '3' exhaust into a further manifold.

With the cast type of manifold, all ports exhaust into the one common manifold.

S.2 - FABRICATED TYPE SYSTEM.

To Remove

1. Release the clip connecting the intermediate pipe to the silencer.
2. Remove fixings securing silencer and remove silencer from car.
3. Release the clips connecting the intermediate pipe to manifolds and remove intermediate pipe.
4. Remove the nuts securing the manifolds to cylinder head and pull manifolds from their mounting studs. If difficulty is experienced in removing the manifolds, it is suggested that the L/H engine mounting bracket be first removed. (see Section 'E')

To Replace

1. Reverse the removal instructions.

S.3 - CAST TYPE SYSTEM.

To Remove

1. Release the clip connecting the intermediate pipe to the silencer.
2. Remove fixings securing silencer and remove silencer from car.
3. Remove the nuts securing the flange of the intermediate pipe to the manifold and remove intermediate pipe.
4. Remove the nuts securing the manifold to the cylinder head and remove manifold.

To Replace

1. Reverse the removal instructions.

S.4 - SILENCER.

To Remove

1. See Section 'S.2' and 'S.3'.

S.5 - INTERMEDIATE PIPE.

To Remove

1. See Section 'S.2' and 'S.3'.