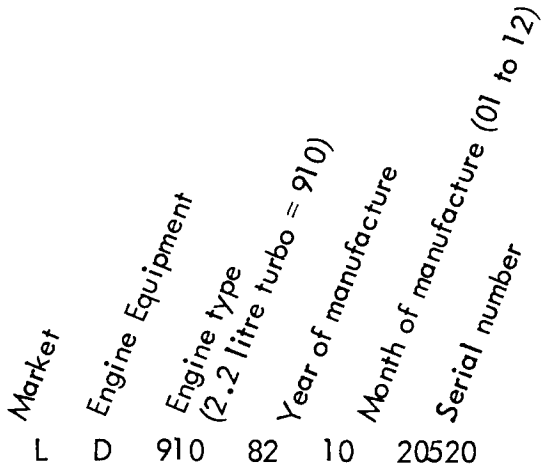
TECHNICAL DATA

SECTION TD B - ENGINE TYPE 910

Before commencing work on any Lotus engine, first check the engine number and prefix letters to establish the engine specification. This number is stamped on the right hand rear of the cylinder block, above the starter motor, and is duplicated on the vehicle identification plate fixed to either the right or left hand inner wheelarch under the front bonnet.

Example



Market

A = Japan
C = Europe
F = Sweden/Australia/Switzerland
H = Canada/49 States N. America
J = California
L = 50-States N. America

Engine Equipment

C = Standard
D = Air Conditioning
A = High Compression
P = High Compression / Air Conditioning

Wet Sump Introduction

From 1980 until late 1981/early 1982, all Turbo Esprit engines (type 910) were built with a 'dry sump' lubrication system. Cars not fitted with air conditioning were changed to a 'wet sump' configuration in late 1981, followed by air conditioned cars in early 1982.

Wet sump introductory VIN's are as follows:

Domestic heater	82D1193
Domestic air conditioning	82D1261
ROW (air conditioning)	82 A/E/G/H/S 0399

All Federal cars are wet sump.

ENGINE

Type designation		910
Max. rpm of engine		7,000
No. of cylinders		4
Firing order		1,3,4,2
Capacity		2174cc (132.6 cu.in.)
Stroke		76.2mm (3.00 in.)
Bore (nominal)		95.29mm (3.75 in.)
Compression ratio	- Std.	7.5 : 1
	- H.C.	8.0 : 1
Compression pressure	- Std.	8.8 bar (130 lb/in^2) minimum
	- H.C.	9.5 bar (140 lb/in^2) minimum
Maximum boost pressure	- Std.	0.55 bar (8.0 lb/in^2)
	- H.C.	0.65 bar (9.5 lb/in^2)
Engine number location		On top rear of cylinder block near starter mounting

Engine belt tensions - Toothed timing belt, using Burroughs gauge part number T000G0025J, 90 - 95 units cold (60°F/20°C) See Section EA.9.

Total movement using moderate finger pressure on longest belt run.	- Alternator 'V' belt	12 mm (0.5 in.) ($\frac{1}{2}$ in.)
	- Compressor 'V' belt A/C	9 mm (0.35 in.) (3/8 in.)
	- Vacuum Pump 'V' belt	
	- Air Pump 'V' belt	

CYLINDER HEAD

Material	Aluminium alloy
Gasket	Steel/asbestos
Combustion chamber depth (nos. 1 & 4)	12.19 - 12.57 mm (0.485 - 0.500 in.)

CAMSHAFTS AND VALVE TIMING

Cam Type Designation		Identif. on shank between pulley & cam hsg.	Duration (crank degrees)	Lift	Inlet M.O.P. ATDC*	Cam Pulley Timing Dot	Exhaust M.O.P BTDC*	Cam Pulley Timing Dot
Spec.No.								
Domestic & Export	107	777....	252°	0.378"	104°	green	104°	green
USA (Carb)	107	777....	252°	0.378"	110°	red	104°	green
USA (HCI)	107	777....	252°	0.378"	110°	red	100°	blue

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* All cams are symmetrical opening/closing

VALVES

Angle of valve seats and faces		45°
Head diameter -	Inlet	35.47 - 35.65 mm (1.396 - 1.404 in.)
	- Exhaust	30.70 - 30.90 mm (1.209 - 1.217 in.)
Stem diameter -	Inlet	7.125 - 7.137 mm (0.2805 - 0.2810 in.)
	- Exhaust	7.955 - 7.970 mm (0.3132 - 0.3138 in.)
Stem clearance in guide -	Inlet	0.008 - 0.046 mm (0.0003 - 0.0018 in.)
	- Exhaust	0.030 - 0.070 mm (0.0012 - 0.0027 in.)
Valve clearance (cold) -	Inlet	0.13 - 0.18 mm (0.005 - 0.007 in.)
	- Exhaust	0.25 - 0.31 mm (0.010 - 0.012 in.)

Valve Seat Inserts

Bore in head:

Standard	- Inlet	37.235/37.260 mm. (1.466/1.467 in.)
	- Exhaust	34.290/34.315 mm. (1.350/1.351 in.)
+ 0.025 mm (0.001 in)	- Inlet	37.260/37.285 mm. (1.467/1.468 in.)
	- Exhaust	34.315/34.340 mm. (1.351/1.352 in.)
+ 0.050 mm (0.002 in)	- Inlet	37.285/37.315 mm. (1.468/1.469 in.)
	- Exhaust	34.340/34.365 mm. (1.352/1.353 in.)
+ 0.127 mm (0.005 in)	- Inlet	37.365/37.390 mm. (1.471/1.472 in.)
	- Exhaust	34.415/34.440 mm. (1.355/1.356 in.)

Outside diameter of seat

Standard	- Inlet	37.325/37.350 mm. (1.4695/1.4705 in.)
	- Exhaust	34.380/34.405 mm. (1.3535/1.3545 in.)
+ 0.025 mm (0.001 in)	- Inlet	37.350/37.375 mm. (1.4705/1.4715 in.)
	- Exhaust	34.405/34.430 mm. (1.1345/1.3555 in.)
+ 0.050 mm (0.002 in)	- Inlet	37.375/37.400 mm. (1.4715/1.4725 in.)
	- Exhaust	34.430/34.455 mm. (1.3555/1.3565 in.)
+ 0.127 mm (0.005 in)	- Inlet	37.450/37.475 mm..(1.4745/1.4755 in.)
	- Exhaust	34.505/34.530 mm. (1.3585/1.3595 in.)

Valve Springs

Type

Dual

Free Length		Rate	
Inner	Outer	Inner	Outer
42.2 mm (1.66 in.)	48.5 mm (1.91 in.)	11.0 kg/cm (61.5 lb/in)	22.5 kg/cm (126 lb/in)

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Valve Guides

Length - Inlet and Exhaust	53.34 mm. (2.100 in.)
Internal diameter (to ream after fitting) - Inlet	7.145 - 7.170 mm. (0.2813 - 0.2823 in.)
- Exhaust	8.000 - 8.025 mm. (0.3150 - 0.3159 in.)
Bore in head - Inlet and Exhaust	
Standard	11.915 - 11.925 mm. (0.4690 - 0.4695 in.)
+ 0.025 mm. (0.001 in.)	11.940 - 11.950 mm. (0.4700 - 0.4705 in.)
+ 0.050 mm. (0.002 in.)	11.965 - 11.975 mm. (0.4710 - 0.4715 in.)
+ 0.127 mm. (0.005 in.)	12.040 - 12.050 mm. (0.4740 - 0.4745 in.)
Outside diameter of guide	
Standard	11.940 - 11.950 mm. (0.4700 - 0.4705 in.)
+ 0.025 mm. (0.001 in.)	11.965 - 11.975 mm. (0.4710 - 0.4715 in.)
+ 0.050 mm. (0.002 in.)	11.990 - 12.000 mm. (0.4720 - 0.4725 in.)
+ 0.127 mm. (0.005 in.)	12.065 - 12.080 mm. (0.4750 - 0.4755 in.)

Camshafts

End float - Dimension	0.03 - 0.20 mm. (0.001 - 0.008 in.)
- Controlled by	Selective thrust washers
Running clearance (except front)	0.050 - 0.090 mm (0.0020 - 0.0035 in.)
(front only)	0.075 - 0.115 mm (0.0030 - 0.0040 in.)

Cam Followers

Bore in camshaft housings	34.925 - 34.940 mm. (1.3750 - 1.3756 in.)
Outside diameter	34.904 - 34.912 mm. (1.3742 - 1.3745 in.)

AUXILIARY SHAFT

Running Clearance	0.025 - 0.065 mm. (0.0009 - 0.0025 in.)
End Float	0.013 - 0.038 mm. (0.0005 - 0.0015 in.)

CRANKSHAFT

Balance (inc. flywheel and clutch)	Within 15 gr.cm. (0.2 oz.in.)
Diameter - Main journal (No.1 to 4 inc.)	63.487 - 63.513 mm. (2.4995 - 2.5005 in.)
- Main journal (No. 5 only)	63.500 - 63.513 mm. (2.5000 - 2.5005 in.)
- Crankpin	50.736 - 50.762 mm. (1.9975 - 1.9985 in.)
End float - Dimension	0.08 - 0.20 mm. (0.003 - 0.008 in.)
- Controlled by	Selective thrust washers on rear main bearing
Bearings (main) - Number	5
- Type	Steel backed, leaded bronze
- Static clearance*	0.013 - 0.056 mm. (0.0005 - 0.0022 in.)
Mac. undersize for regrind	0.508 mm. (0.0200 in.)

* Bearing clearance is measured with Plastigage.

MAIN BEARING CONFIGURATION

ENGINE TYPE		FRONT 1	2	CENTRE 3	4	REAR 5
910 Turbo	Upper	Groove/ Hole	Groove/ Hole	Plain/ Hole	Groove/ Hole	Groove/ Hole
Dry/Wet Sump	Lower	Plain	Plain	Plain	Plain	Plain

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FLYWHEEL

Max. axial run-out over clutch face	0.05 mm. (0.002 in.)

CONNECTING ROD

Type	'I' section
Material	Steel forging
Distance between centres	139.70 mm. (5.500 in.) ± 0.25 mm. (0.001 in.)
Bearings (big end) - Type	Steel backed, leaded bronze
- Static clearance *	0.025 - 0.081 mm. (0.0010 - 0.0032 in.)
- End float on crankpin	0.10 - 0.25 mm. (0.004 - 0.010 in.)
Small end bore (bushed)	25.405/25.410 mm. (1.0002 - 1.0004 in.)

Permissable weight variation between rods 2 grammes (in any set)

* Bearing clearance is measured with Plastigage

GUDGEON PIN

Type	Fully floating
Location	Circlips
Diameter	25.40 mm. (1.00 in.)
Class of fit	Finger push fit at 20°C (68°F)

PISTON AND LINER

Piston - Type	Solid skirt
- Material	Aluminium alloy
- Rings	2 compression, 1 oil control
- Diameter 910 Std - grade 'A'	95.148/95.161 mm (3.7460/3.7465 in)
910 Std - grade 'B'	95.161/95.174 mm (3.7465/3.7470 in)
910 HC - grade 'A'	95.205/95.219 mm (3.7482/3.7488 in)
910 HC - grade 'B'	95.217/95.231 mm (3.7487/3.7493 in)
- Grade diameter - 910 Std	15 mm (0.6 in) up from skirt edge } 90° to pin axis
- 910 HC	10.2mm (0.4 in) up from skirt edge } 90° to pin axis
- Gudgeon pin bore offset - 910 Std	1.52 mm (0.060 in) towards thrust face
- 910 HC	Zero
- Permissable weight variation between pistons	3 grammes

- Ring gap 910 Std.	- top	0.38/0.51 mm (0.015/0.020 in)
	- second	0.48/0.61 mm (0.019/0.024 in)
	- scraper (rails)	0.38/1.14 mm (0.015/0.045 in)
910 HC	- top & second	0.40/0.65 mm (0.016/0.026 in)
	- oil control	0.30/0.60 mm (0.012/0.024 in)

-Piston ring to groove clearance

910 Std.	- Compression	0.038/0.089 mm (0.0015/0.0035 in)
	- Oil control	0.038/0.064 mm (0.0015/0.0025 in)
910 HC	- Compression	0.040/0.072 mm (0.0016/0.0028 in)
	- Oil control	0.020/0.052 mm (0.0008/0.0020 in)

Cylinder Liner	- Type	Wet, slip fit
	- Material - 910 Std.	Cast Iron
	- 910 HC	Nikosil coated, forged aluminium alloy
	- Internal diameter	
	- 910 Std.	Measured 50mm from top across thrust axis
	Grade 'A'	95.275/95.288 mm (3.7510/3.7515 in)
	Grade 'B'	95.288/95.308 mm (3.7515/3.7520 in)
	- 910 HC	Measured 70mm from top across thrust axis
	Grade 'A'	95.255/95.269 mm (3.7502/3.7507 in)
	Grade 'B'	95.267/95.281 mm (3.7507/3.7512 in)
- Fitted height above block ('nip')	- 910 Std.	0.025/0.13 mm (0.001/0.005 in)
	- 910 HC	minus 0.025 to + 0.050mm (minus 0.001 to + 0.002 in)
- Permissable variation between liners		0.03 mm (0.001 in)
- Piston clearance in cylinder liner	910 Std.	0.11/0.15 mm (0.005/0.006 in)
	910 HC	0.048/0.076 mm (0.002/0.003 in)

LUBRICATION SYSTEM

Minimum oil pressure under normal working conditions (hot);

	Wet Sump		Dry Sump	
- at idle speed	5 lb/in^2	(0.35 kg/cm^2)	5 lb/in^2	(0.35 kg/cm^2)
- at 3,500 rpm	35	(2.5)	40	(2.8)
- at 6,500 rpm	45	(3.2)	50	(3.6)

Filter		Full flow disposable canister type with anti-flow back valve
Dry Sump Pump	- type	Eccentric rotor. 2 scavenge & 1 pressure pump in common unit driven by toothed belt
Wet Sump Pump	type	Eccentric rotor. Driven by cam belt
	- rotor/annulus tip clearance	0.05/0.15 mm (0.002/0.006 in)
	- annulus end float	0.03/0.08 mm (0.001/0.003 in)
	- rotor end float	0.06/0.09 mm (0.0025/0.0035 in)
	- annulus to housing clearance	0.18/0.30 mm (0.007/0.012 in)

DELLORTO CARBURETTORS	Domestic/ Export 'Std'	Domestic/ Export 'HC'	USA
Carburettor Type (2 off)	DHLA 40H	DHLA 45M	DHLA 45M
Tag No. - Front	5322A	5390A	
- Rear	5321P	5389P	
Lotus Part No. - Front	B910E0926F	A910E6855F	A910E6633
- Rear	B910E0925F	A910E6856F	A910E6632
Choke	36 mm	35 mm	37 mm
Main Jet	185	160	165
Main Air Corrector Jet	200	180	230
Main Emulsion Tube	7772-12	7772-14	7772-13
Idle Jet	40	58	52
Idle Jet Holder	7850-7	7850-9	7850-9
Float Weight	8.5g	8.5g	8.5g
Float Setting Height	14.5-15.0mm	14.5-15.0mm	14.5-15.0mm
Needle Valve	200	200	200
Pump Jet	48H (special)	35	38H
Starter Jet	80	80	80
Starter Emulsion Tube	7482-3	7482-3	7482-3
Slow Running Speed	850 rpm	850-950 rpm	950 rpm
Idle CO Level (hot)	1.0 ± 0.5 %	1.0 ± 0.5 %	0.8 %
Pump Delivery	7cc/20 stks.	8cc/20 stks.	8cc/20 stks.
Power Jet	-	Blank	110
Fuel Delivery Pressure (at idle speed)	4.0 ± 0.5 psi	4.0 ± 0.5 psi	4.0 - 4.5 psi

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IGNITION SYSTEM

Type - Domestic/ROW 1980 - early 1983	Coil and distributor with infra-red solid state 'Lumenition' system
- 1983 on + Federal	Coil and distributor with Lucas 'Constant Energy' ignition system
Number 1 cylinder	Toward front
Sparking Plugs - Domestic/RoW (Std.)	NGK BPR 6ES
- Federal & 'HC'	NGK BPR 6EY
Spark Plug Gap	0.9 mm (0.035 in.)

Distributor

Direction of rotation (from drive end)	Clockwise
Drive	Offset dog

DISTRIBUTOR & IGNITION TIMING (all figures ± 2°)

Market	Distributor Type	Vacuum Capsule crank°	Static Ign. Timing	Idle Speed Ign. Timing	Centrifugal Advance Characteristics crank rpm / crank°	Ignition Timing to be set at
Dom/ Export Prior '87 MY	43D Lumenition or Lucas Constant Energy	-	12° BTDC	12° BTDC	Below 1,000 nil 2,000 8° 3,000 16°	28° @ 3,500/ 4,000rpm
USA Prior '86 MY (Carb)	45DM4 Lucas Constant Energy	18° Advance	1° BTDC	1° BTDC	Below 1,000 nil 1,500 3° 2,100 12° 2,800 15° 5,000 16°	Idle (950rpm)
USA '86 MY onward (HCI)	45DM4 Lucas Constant Energy	28° Advance	15° BTDC	15° BTDC	2,500 minus 3° 5,000 minus 6°	Idle (900 - 1000rpm)
Dom/ Export '87 MY onward	45DM4 Lucas Constant Energy	28° Advance	10° BTDC	10° BTDC	Below 1,000 nil 2,000 11° 5,000 8°	Hot Idle (850 - 950 rpm)

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TORQUE LOADING FIGURES

ENGINE	kgf.m	lbf.ft
Cylinder head (tighten cold)		
both pairs (front and rear) nuts	9.7	70
3 pairs (in middle) nuts	10.4	75
Sparking plugs	2.5	18
Camshaft covers	0.40-0.55	3-4
Camshaft housings	1.9-2.2	14-16
Camshaft sprockets	3.5	25
Main bearing housing - 12 mm (Dry Sump)	10.4	75
Main bearing housing - 12 mm (Wet Sump)	9.0	65
- 8 mm	1.9-2.2	14-16
Crankshaft pulley	8.0-8.3	58-60
Connecting rod (big end) caps	11.6-11.9	84-86
Flywheel	7.6	55
Clutch Assembly	2.3-2.6	17-19
Oil sump to main bearing housing (all)	2.2-2.5	16-18
Auxiliary housing to cylinder block	1.8-2.1	13-15
Auxiliary shaft sprocket	3.5	25
Oil pick-up pipe union	7.6	55
Retaining nut (belt tensioner)	3.5-4.2	25-30
All other 6 mm nuts or setscrews	1.0-1.1	7-8
Stud - Cylinder head to cylinder block - 12 mm	5.5	40
- Main bearing housing - 8 mm	1.7	12
- Main bearing housing - 12 mm	5.5	40
- Camshaft housing to cylinder head - 8 mm	1.7	12
- Sump to main bearing housing	0.7	5
- Wastegate to adaptor (10mm)	4.8	35
All other non-specified 8mm studs	1.7	12
Exhaust manifold to cylinder head	1.9-2.2	14-16
Wastegate to adaptor	4.8	35
Inlet manifold to cylinder head	1.9-2.2	14-16
Engine mounting legs to rubbers	5.5-6.2	40-45
Mounting rubbers to chassis	3.5	25