V8 PETROL ENGINE TUNING DATA

ENGINE

Compression ratio	8.13:1	
Firing order	1-8-4-3-6-5-7-2	
Valve timing:	Inlet	Exhaust
- Opens	30° B.T.D.C.	68° B.B.D.C.
- Closes	75° A.B.D.C.	37° A.T.D.C.
- Duration	285°	285°
- Valve peak	112.5° A.T.D.C.	105.5° B.T.D.C.

CARBURETTERS

Type	2 x SU HIF44
Jet size	2,5 mm
Needle type	BGV
Idle speed (engine hot)	700 rpm ± 50 rpm
Fast idle speed	1100 rpm ± 50 rpm
Mixture setting - CO at idle	1% - 2%

IGNITION

Ignition coil	Bosch 12 volt 0221-122-392
Distributor make/type	Lucas 35 DLM8 electronic
Direction of rotation	Clockwise
Decelerating check with vacuum retard pipe disconnected	
Engine rpm	Crankshaft angle
- 3600	22° to 28°
- 2400	13° to 21°
- 1600	5° to 9°
- 1000	0° to 3°
No advance below 500 rpm	
Ignition timing, dynamic and static	6° ± 1° B.T.D.C. at 750 rpm ± 50 rpm
Fuel specification	90 RON min / 95 RON ULG
Spark plugs	N9YC
- Gap	0,88 - 0,72 mm (0.035 - 0.028 in)

200Tdi ENGINE TUNING DATA

ENGINE

Firing order	1-3-4-2	
Injection timing	1,54 mm lift at T.D.C.	
Timing marks:		
Valve timing	Slot for peg in flywheel and TDC mark on front pulley	
Injection timing	Special tool inserted in D.P.S. pump hub	
Tappet clearances inlet and exhaust	0,20 mm (0.008 in) cold	
Valve timing:	Inlet	Exhaust
- Opens	16° B.T.D.C.	51° B.B.D.C.
- Closes	42° A.B.D.C.	13° A.T.D.C.
- Peak	103° A.T.D.C.	109° B.T.D.C.
- Lift	9,93 mm (0.401 in)	10,26 mm (0.404 in)
Maximum governed speeds:		
- Full load (speed cut-off starts)	4000 rpm	
- No load (flight speed)	4600 + 40 - 120 rpm	
- Idle speed	720 ± 20 rpm	
- Die-down time	4 seconds	

INJECTION PUMP

Make/type	Bosch rotary VE 4/11F type with boost control and two speed mechanical governor with auto advance and solenoid electrical shut-off. Tamper proof sealing on flight speed and fuel adjustment screws
Direction of rotation	Clockwise, viewed from drive end
Advance box (two stage)	7° advance with 3° start retard
Back leakage rate 150-100 Atm:	
- New nozzle	7 seconds
- Original nozzle	5 seconds
- Despatch nozzle	8520A290A

INJECTORS

Make/type	Bosch KBEL 98 P52 200 bar
Nozzle size	BDNO/SPC 6209
Opening pressure (working pressure)	Initial pressure 200 atmospheres Secondary 280 atmospheres
Injector pipe type	High pressure multi-bundy
Injector pipe size	1,94 - 2,06 mm

HEATER PLUGS

Make/type	Probe type, Beru 11 volts
Time to reach operating temperature of 850°C	8 seconds

TURBOCHARGER

Make/type	Garrett T25
Maximum boost pressure	0.78 bar (11.3 P.S.I.G.) measured at wastegate actuator 'T' piece
Fuel specification	Diesel BS2869 (certain levels down to 45 with adjustment

ENGINE TUNING DATA - CATALYST LOW COMPRESSION

Type ..... 3.5 litre V8i

Firing order 1-8-4-3-6-5-7-2

Cylinder Numbers
Left bank 1-3-5-7
Right bank 2-4-6-8

Number one cylinder location ..... Pulley end of left bank.

Timing marks ..... On crankshaft damper.

Spark plugs ..... Champion RN 12 YC.
Gap ..... 0,84-0,96 mm.

Coil
Make and type ..... Bosch 0-221-122-392

Compression ratio 8.13:1

Fuel injection system ..... Lucas hot-wire air flow sensor system electronically controlled.

Valve timing	**Inlet**	**Exhaust**
Opens	24 BTDC	62 BBDC
Closes	52 ABDC	14 ATDC
Duration	256 degrees	256 degrees
Valve peak	104 ATDC	114 BTDC

Idle speed - controlled by EFI system ..... 665 - 735 rev/min.
With or without air con. operating ..... 700 plus or minus 35 rev/min.

Base idle speed
Idle speed control shut-off ..... 450 - 550 rev/min.

Ignition timing-dynamic at 800 r.p.m maximum.
8.13:1 compression ratio ..... 6 degrees BTDC plus or minus 1

Exhaust gas CO content at idle ..... 0.10% maximum.

Distributor
Make and type ..... Lucas 35DLM8 electronic.
Rotation ..... Clockwise.
Air gap 0,20-0,35mm
Part number (8.13:1 compression) ..... ETC 6268.

Centrifugal advance - Decelerating check vacuum hose disconnected.

Distributor rev/min decelerating speeds ..... Distributor advance

8.13:1 compression
2300 ..... 8 to 11 degrees
1400 ..... 8 degrees 36' to 10 degrees 36'.
600 ..... 1 degree 30' to 3 degrees 30'.

Fuel ..... 95 RON minimum unleaded.

ENGINE TUNING DATA - NON CATALYST HIGH COMPRESSION

Type ..... 3.5 litre V8i

Firing order 1-8-4-3-6-5-7-2

Cylinder Numbers
Left bank 1-3-5-7
Right bank 2-4-6-8

Number one cylinder location ..... Pulley end of left bank.

Timing marks ..... On crankshaft damper.

Spark plugs ..... Champion N9 YC.
Gap ..... 0,72 - 0,88 mm.

Coil ..... Bosch 0-221-122-392

Compression ratio 9.35:1

Fuel injection system ..... Lucas hot-wire air flow sensor system electronically controlled.

Valve timing	**Inlet**	**Exhaust**
Opens	24 BTDC	62 BBDC
Closes	52 ABDC	14 ATDC
Duration	256 degrees	256 degrees
Valve peak	104 ATDC	114 BTDC

Idle speed ..... 665 - 735 rev/min.

Base idle speed ..... 450 - 550 rev/min.

Ignition timing-dynamic ..... TDC ± 1° BTDC at idle rev/min

Exhaust gas CO content at idle rev/min ..... 0.5 to 1%

Distributor
Make and type ..... Lucas 35DLM8 electronic.
Rotation ..... Clockwise.
Air gap ..... 0,20 - 0,30 mm
Part number (9.35:1 compression) ..... ERRT0497.

Centrifugal advance - Decelerating check vacuum hose disconnected.

Distributor rev/min decelerating speeds ..... Distributor advance

9.35:1 compression
2300 ..... 8 to 11 degrees
1400 ..... 8 degrees 36′ to 10 degrees 36′.
600 ..... 1 degree 30′ to 3 degrees 30′.

Fuel ..... 95 RON minimum unleaded or leaded.

V8i ENGINE - AUSTRALIA - PRE 1994 MY

Type ..... 3.5 litre V8i - non catalyst low compression

Firing order 1-8-4-3-6-5-7-2

Cylinder Numbers
Left bank 1-3-5-7
Right bank 2-4-6-8

Number one cylinder location ..... Pulley end of left bank.

Timing marks ..... On crankshaft damper.

Spark plugs ..... Champion RN 12 YC.
Gap ..... 0,84 - 0,96 mm.

Coil ..... Bosch 0-221-122-392

Compression ratio 8.13:1

Fuel injection system ..... Lucas hot-wire air flow sensor system electronically controlled.

Valve timing	**Inlet**	**Exhaust**
Opens	24 BTDC	62 BBDC
Closes	52 ABDC	14 ATDC
Duration	256 degrees	256 degrees
Valve peak	104 ATDC	114 BTDC

Idle speed - controlled by EFI system ..... 665 - 735 rev/min.

Base idle speed ..... 450 - 550 rev/min.

Ignition timing-dynamic ..... 3° ± 2° BTDC at idle rev/min

Exhaust gas CO content at idle ..... 0.5 to 1%

Distributor
Make and type ..... Lucas 35DLM8 electronic.
Rotation ..... Clockwise.
Air gap ..... 0,20 - 0,30 mm
Part number (8.13:1 compression) ..... ERR0744.

Distributor rev/min decelerating speeds ..... Distributor advance

8.13:1 compression
2300 ..... 8 to 11 degrees
1400 ..... 8 degrees 36' to 10 degrees 36'.
600 ..... 1 degree 30' to 3 degrees 30'.

Fuel ..... 91 RON unleaded.

Mpi 2.0 LITRE ENGINE

Type/Capacity	20 T4/1994 cm^3	121.68 in^3
Firing order	1-3-4-2	
Compression ratio	10 : 1	
Idle speed:		
Controlled by E.C.U.	875 ± 50 rev/min	
Exhaust gas CO content:		
- Catalyst	0.5% Max. Not adjustable.	
- Non Catalyst	1,0 ± 25% adjustable using testbook/microcheck	

Ignition

Knock sensor	ADU 8229
Crankshaft sensor:	ADU 7340

Ignition Coils

Type	NEC 10049
Primary resistance at 20°C	0.4 to 0.61 ohm
Consumption - engine idling	0.25 to 0.75 amp

Spark Plugs

Type/Gap	GSP 6662/0.85 mm, 0.035 in

Electronic Fuel Injection

Type	Indirect multi-point injection with E.C.U. control using speed/density method of air flow measurement.
Fuel pressure regulator	MKW 10011
Fuel pump delivery pressure	2.3 - 2.5 bar
Throttle potentiometer voltage	
- Throttle closed	0 - 1 Volt
- Throttle open	4 - 5 Volts
M.E.M.S. E.C.U:	MKC 10121
	95 RON minimum - **UNLEADED** fuel

CAUTION: Do not use LEADED fuel as it will damage the catalyst. Serious damage to the engine may occur if a lower octane number fuel than that recommended is used.

Tdi DIESEL ENGINE 1994 MY

ENGINE

Type	2.5 Litre Turbocharged Direct Injection	
Firing order	1-3-4-2	
Injection timing	1,54 mm lift at T.D.C.	
Timing marks:		
Valve timing		
- Manual	Slot for pin in flywheel and TDC mark on front pulley	
- Auto	Slot for pin in ring gear, access through hole below starter motor. TDC mark on front pulley	
Injection timing	Special tool inserted in pump hub	
Tappet clearances inlet and exhaust	0,20 mm (0.008 in) cold	
Valve timing:	Inlet	Exhaust
- Opens	16° B.T.D.C.	51° B.B.D.C.
- Closes	42° A.B.D.C.	13° A.T.D.C.
- Peak	103° A.T.D.C.	109° B.T.D.C.
- Lift	9,93 mm (0.401 in)	10,26 mm (0.404 in)
Maximum governed speeds:		
- Full load (speed cut-off starts)	4000 rpm	
- No load (flight speed)	4600 + 40 - 120 rpm	
- Idle speed	750 - 780 rpm	
- Die-down time	4 seconds	

INJECTION PUMP

Make/type	Bosch rotary VE 4/11F type with boost control and two speed mechanical governor with auto advance and solenoid electrical shut-off. Tamper proof sealing on flight speed and fuel adjustment screws
Direction of rotation	Clockwise, viewed from drive end
Advance box	7° advance.

INJECTORS

Make/type	Bosch KBEL 98 PVI 870398
Opening pressure (working pressure)	Initial pressure 200 atmospheres Secondary 280 atmospheres
Injector pipe type	High pressure multi-bundy
Injector pipe size	1,80 mm

HEATER PLUGS

Make/type	Probe type, Beru 11 volts
Time to reach operating temperature of 850°C	8 seconds

TURBOCHARGER

Make/type	Garrett T25
Maximum boost pressure	0,78 bar measured at wastegate actuator 'T' piece

V8 Engine 3.9

Type ..... 3.9 Litre V8

Firing order 1-8-4-3-6-5-7-2

Cylinder Numbers
Left bank 1-3-5-7
Right bank 2-4-6-8

No 1 Cylinder location ..... Pulley end of left bank

Timing marks ..... On crankshaft vibration damper

Spark plugs
Make/type(8.13:1 Compression) ..... Champion RN11YCC
Gap ..... 0.84-0.96mm (0.033-0.038 in)
Make/type(9.35:1 Compression) ..... Champion RN11YCC
Gap ..... 0.84-0.96mm (0.033-0.038 in)

Coil
Make/type ..... Bosch 0-221-122-392, (ETC 6574)

Compression ratio ..... 8.13:1 or 9.35:1

Fuel injection system ..... Lucas 14 CUX Hot-wire air flow sensor system electronically controlled

Valve Timing	**Inlet**	**Exhaust**
Opens	32° BTDC	70° BBDC
Closes	73° ABDC	35° ATDC
Duration	285°	285°
Valve peak	104° ATDC	114° BTDC

Idle speed - controlled by EFI system
- all loads off in neutral ..... 665 to 735 rev/min
- auto gearbox in gear, air con operating ..... 650±28 rev/min
- auto gearbox in gear, air con off ..... 600±28 rev/min
- manual gearbox ..... 700±28 rev/min
- manual gearbox, air con operating ..... 750±28 rev/min

Base idle speed ..... See setting procedure - 525 ± 25 rev/min.

Ignition Timing - dynamic at 800 rev/min max, vacuum disconnected

8.13:1 compression, non catalyst ..... 2° BTDC ± 1°
8.13:1 catalyst ..... 6° BTDC ± 1°
9.35:1 compression, non catalyst ..... 4° BTDC ± 1°
9.35:1 compression, catalyst ..... 5° BTDC ± 1°

Exhaust gas
CO content at idle ..... 0.5 to 1.0% max.

Distributor

Make/type	Lucas 35DLM8 electronic
Rotation	Clockwise
Air gap	0.20-0.35mm

Part number	Lucas	Rover
8.13:1, non catalyst	42518A	ERR 1250
8.13:1, catalyst	42648	ETC 6268
9.35:1, non catalyst	42510A	ERR 0744
9.35:1, catalyst	42543A	ERR 2986

Centrifugal Advance

Decelerating check-vacuum hose disconnected
Distributor rpm decelerating speeds

8.13:1 non catalyst

2000	Distributor advance	5° 30' to 8° 30'
1400		6° 18' to 8° 30'
800		2° to 4°

8.13:1 catalyst

1600 - 2300	Distributor advance	8° 54' to 11°
1400		8° 36' to 10° 36'
600		1° 18' to 3° 18'

9.35:1 non catalyst

2200	Distributor advance	7° to 10°
1400		7° 48' to 10°
650		1° to 3°

9.35:1 catalyst

2200	Distributor advance	5° 30' to 8° 30'
1400		6° 18' to 8° 30'
800		2° to 4°

Fuel

8.13:1, non catalyst	91 RON minimum unleaded
8.13:1, catalyst	95 RON minimum unleaded
9.35:1, non catalyst	95 RON minimum unleaded
9.35:1, catalyst	95 RON minimum unleaded
USA-Premium unleaded (PUG)	CLC or AKI 90 octane minimum 95 RON minimum

Australian market variations

Fuel	91 RON minimum unleaded
Compression ratio	8.13:1
Spark plug	Champion RN12YC
Spark plug gap	0.84-0.96mm (0.033-0.038 in)
Ignition Timing at 800 rev/min max (vacuum pipe disconnected)	2° BTDC ± 1°
Exhaust gas idle CO	1% max (hot)