ENGINE
(Escort RS Cosworth only) 21C

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Engine - General

Emission standard			83 US
Identification code			N5F
Firing order			1-3-4-2
Bore	mm		90,82
Stroke	mm		76,95
Cubic capacity	effective	cc	1993
Compression ratio			8,0 : 1
Compression pressure	at starter motor speed	bars	8,5
Boost pressure		bars	0,9
Idle speed		rpm	900
Max. engine speed	continuous	rpm	6500
Power output (DIN)		kW	165
	at	rpm	6250
Torque (DIN)		Nm	290
	at	rpm	3500
Spark plugs	Production		Nippon Denso PK20PR-PII
	Service		AGPR 902 P
Ignition timing			16° before TDC at idle speed

Engine Lubrication

Viscosity			5W/50
Specification			Mobil 1 or API SG/CD (synthetic oil) only
Initial fill capacity	incl. filter	litres	4,75
Oil change	interval	km	10000
	excl. filter	litres	3,0
	incl. filter	litres	3,6
Minimum oil pressure *	at 900/950 rpm	bars	1,8
	at 2000 rpm	bars	2,4

* with SAE 5W-50 oil at 80°C

Cooling System

Fill capacity incl. heater and expansion tank		litres	7,5
Antifreeze - type			Motorcraft Super Plus antifreeze
- specification			ESD-M97B49-A
- use a 50/50 (% by volume) mixture when filling and topping up			

NOTE: Refer to Section 218 in this Service Microfiche for Technical Data concerning the basic engine and not included here.

TECHNICAL DATA (cont'd)

Engine - 83 US

Tightening Torques

Nm

Installing Engine and Transmission Assembly (21 132 0) - In Installation Order

Front axle/engine crossmember to side members	70 to 90
Transmission crossmember to floor assembly	21 to 28
Torx studs in transmission output flange	70 to 90
Driveshaft to transmission output flange	67 to 83
Driveshaft to rear axle	57 to 75
Driveshaft centre bearing to floor assembly	18 to 23
Exhaust mounting bracket to transfer case	39 to 53
Left-hand exhaust mounting bracket to rear axle crossmember	21 to 28
Starter motor wiring to starter motor - M6	4,5 to 6,0
Starter motor wiring to starter motor - M8	5 to 7
Speedometer drive cable union nut	6 to 9
Engine/transmission flange bolts	29 to 41
Front axle housing cover	9 to 11
Front axle oil filler plug	8 to 10
Steering intermediate shaft to steering shaft	20 to 28
Stabiliser bar brackets to side members	70 to 90
Lower suspension arms to spindle carriers	48 to 60
Castellated nut - track rod to steering arm	20 to 32
Power steering oil pipe to side member	35 to 45
Oil pipes to power steering pump	32 to 40
Oil hose to power steering pump	3
Lower engine cover to side members	-
Lower engine cover to body	-
Wheel nuts	70 to 100
Retaining bolts of engine lifting eyes	19 to 21
Self-locking nut on throttle housing vibration damper (then slacken half a turn)	8 to 10
Nuts - engine mounting bracket to engine mounting	70 to 90
Front exhaust pipe to turbocharger	31 to 44
Oil hose to power steering reservoir	3
Wiring loom to air plenum chamber	-
Alternator wiring	4 to 5
Turbocharger heat shield to bracket	9 to 11
Turbocharger heat shield to threaded stud	20 to 26
Turbocharger heat shield to air cleaner housing	5 to 6
Centre console	2,5
Retaining frame of inner gear lever gaiter	1
Bleed screw in thermostat housing	7 to 10

Connecting Engine to Transmission (21 134 4)

Engine/transmission flange bolts	41 - 58
Bolt securing adaptor plate to transmission	9 - 12
Starter motor	29 - 41
Front driveshaft to drive flange	34 - 46

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TECHNICAL DATA (cont'd) Engine - 83 US

Tightening Torques (cont'd)	Nm	Remarks
Installing Cylinder Head (21 163 0)		
Engine lifting eyes to cylinder head	19 to 21	
Cylinder head to cylinder block Stage 1	45 to 50	Oil thread and underside of bolt head
Stage 2		Turn 180° ± 10° more
Stage 3		Check for 110 Nm
Toothed belt tensioning pulley to cylinder head	40 to 48	
Cylinder head cover	10 to 15	
Spark plugs	28 to 33	
Toothed belt cover (all bolts)	8 to 10	
Front exhaust pipe to turbocharger	31 to 44	
Engine mounting bracket nuts	70 to 90	
Self-locking nut on throttle housing vibration damper (then slacken half a turn)	8 to 10	
Bracket of oil dipstick tube to cylinder block	8 to 10	
Wiring loom clips to air plenum chamber	-	
Coolant hoses	3	
Air hoses	4	
Lower engine cover to side members	-	
Lower engine cover to body	-	
Turbocharger heat shield to bracket	9 to 11	
Turbocharger heat shield to threaded stud	20 to 26	
Turbocharger heat shield to air cleaner housing	5 to 6	
Vent screw in thermostat housing	7 to 10	
Installing Crankshaft Oil Seal (21 467 0)		
Toothed belt tensioning pulley to cylinder head	40 to 48	
Retaining bolt of crankshaft vibration damper/belt pulley	190 to 200	Oil thread and underside of bolt head
Radiator to side members	-	
Radiator to hood lock panel	-	
Cooling fan shroud to radiator	-	
Coolant pipe bracket to radiator	5	
Toothed belt cover (all bolts)	8 to 10	
Lower engine cover to side members	-	
Lower engine cover to body	-	

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GENERAL DESCRIPTION

Engine - 83 US

The Escort RS Cosworth increases the choice of sporting variants within the Escort model range.

The body is a modified derivative of the Escort 3-door body. The floor assembly is a derivative of the Sierra Cosworth 4x4 floor assembly, again with modifications. The engine, the complete 4x4 drive train and the running gear were taken from the Sierra Cosworth 4x4 with few modifications.

Like the Sierra Cosworth, the Escort RS Cosworth was developed as a high-performance road vehicle and approved for use in motor sport in FISA groups A and N. It is available in a road sport version with reduced kerb weight and reduced interior trim suitable for motor sport, and a high series road version. The mechanical assemblies and bodywork of the two versions are identical. The Motorsport version of the 4-cylinder Sierra Cosworth engine also meets the 83 US emission standard.

Detailed information is to be found in product introduction brochure CG7458 D 2/92 entitled "Escort RS Cosworth" in the "Technical Service Training" series. However, this training document must not be used for repair purposes because only the Service Microfiche is updated when required.

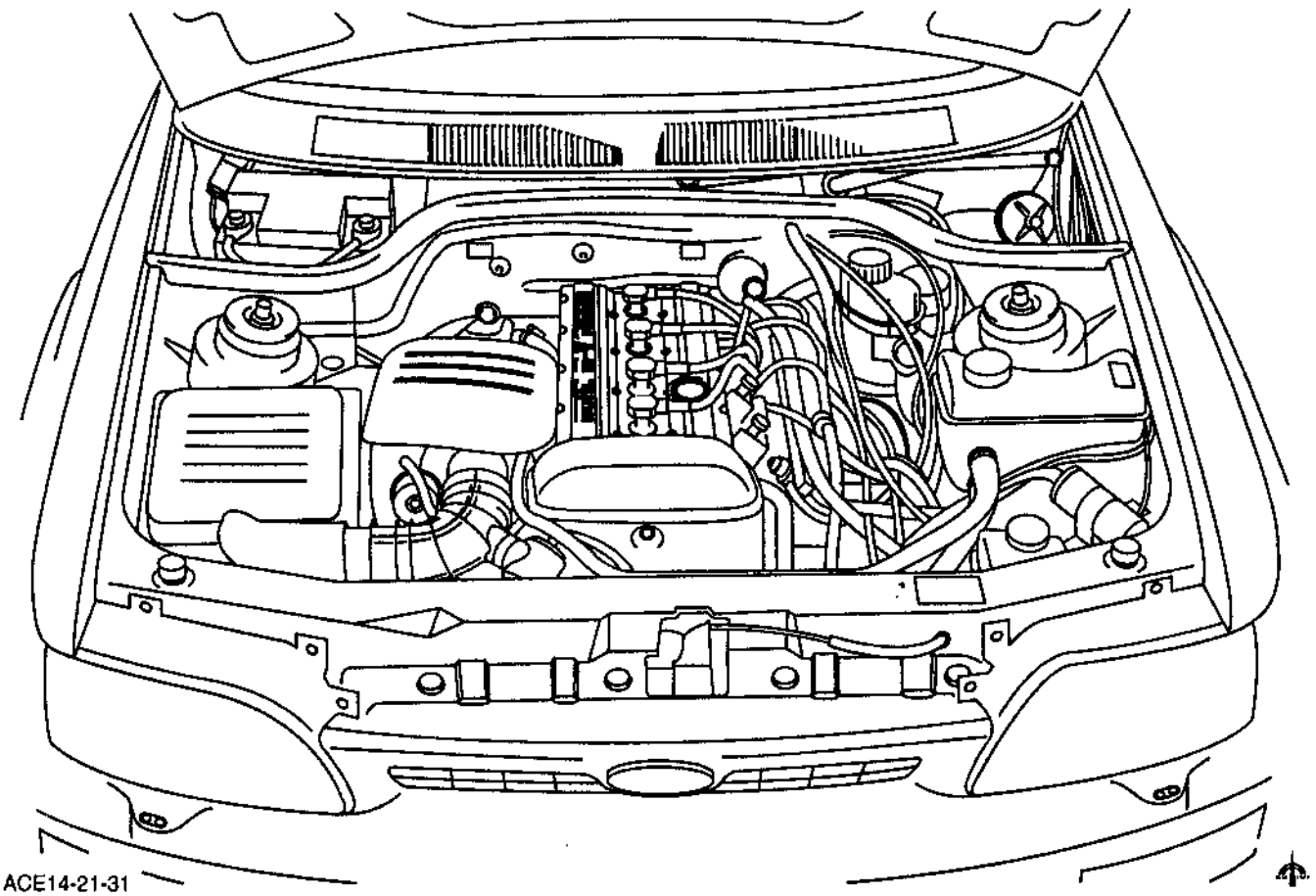

Fig.A. Engine compartment of Escort RS Cosworth.

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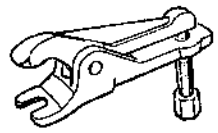
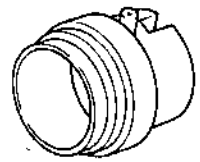
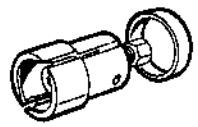
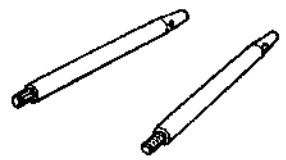
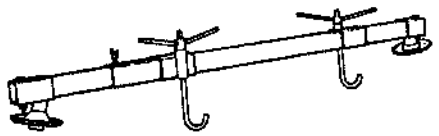
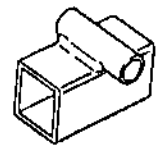
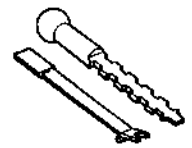
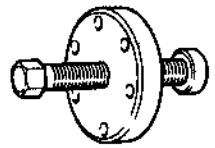
SPECIAL SERVICE TOOL RECOGNITION

	13-006	Ball joint separator
	21-002	Socket wrench for cylinder head bolts
	21-009 B	Radial oil seal installer
	21-028 A	Toothed belt pulley remover
	21-113	Toothed belt tension test gauge
	21-128	Cylinder head locating studs
	21-140	Engine support bar
	21-140-02	Adaptor for 21-140
	21-143	Radial oil seal remover
	21-153	Belt pulley remover

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21 132 0 ENGINE AND TRANSMISSION ASSEMBLY - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS REQUIRED:

Ball joint separator	..	..	..	13-006
Engine support bar	..	..	..	21-140
Adaptor for 21-140	..	..	..	21-140-02

To Remove

NOTE: Remove the engine and transmission assembly from below. Cut the cable ties securing wiring and vacuum pipes/hoses as necessary during removal.

1. Disconnect the battery earth cable.

2. Prise off the switch cover. Disconnect the multiplugs from the switches of the electrically operated windows (2) and the luggage compartment lock switch. Remove the ashtray. Fig.1.

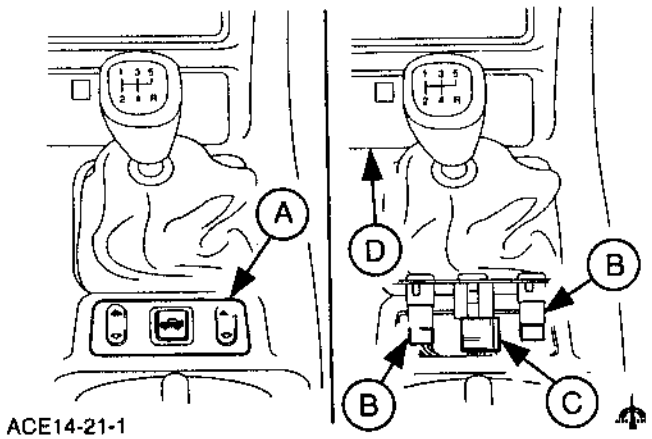

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Fig.1. Switch cover.
A - Switch cover
B - Multiplugs of switches of electrically operated windows
C - Multiplug of luggage compartment lock switch
D - Ashtray

3. Detach the centre console (3 screws, 2 clips).

NOTE: To release the clip, press in the centre pin, Fig.2.

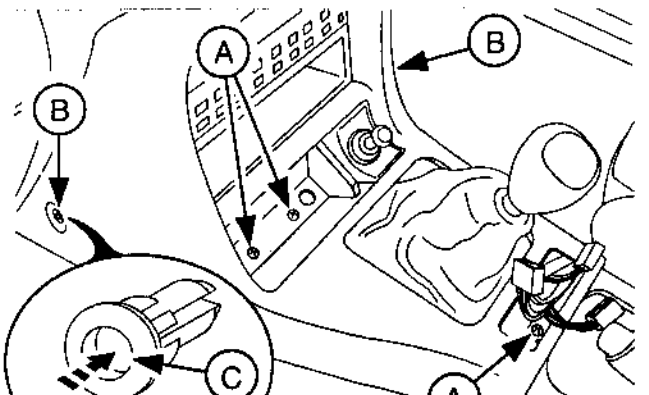

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Fig.2. Fixture of centre console.
A - Screws
B - Clips
C - Centre pin of clip

4. Lift the centre console. Disconnect the multiplugs from the radio (2) and the cigarette lighter, Fig.3. Put the centre console to one side.

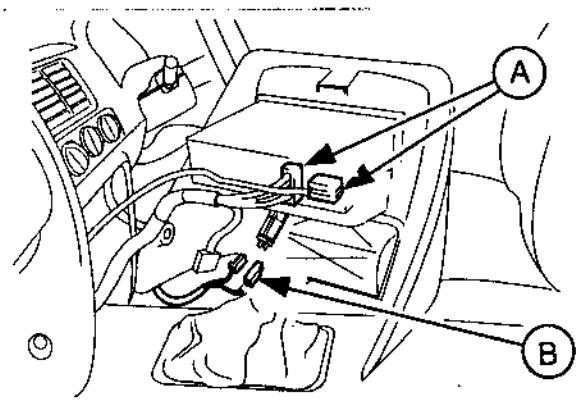

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Fig.3. Multiplugs.
A - Radio
B - Cigarette lighter

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5. Pull up the leather gaiter inside out, cut the cable tie and remove the gaiter, Fig.4.(A,B).

Fig.4. Gaiters and retaining frame.
A - Leather gaiter
B - Cable tie
C - Retaining frame with inner gaiter
D - Retaining screws

6. Detach the retaining frame (4 screws) and remove it with the inner gaiter, Fig.4.(C,D). Support the clutch pedal.

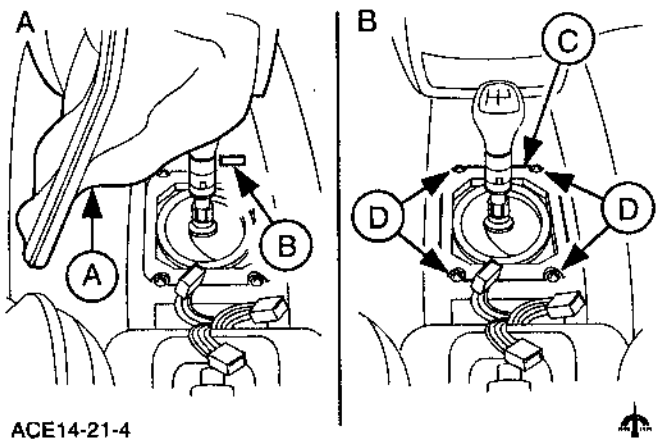

Fig.4. Gaiters and retaining frame.

7. Loosen the front wheel nuts.

8. Disconnect the multiplug from the HEGO sensor and unclip the wiring, Fig.5.

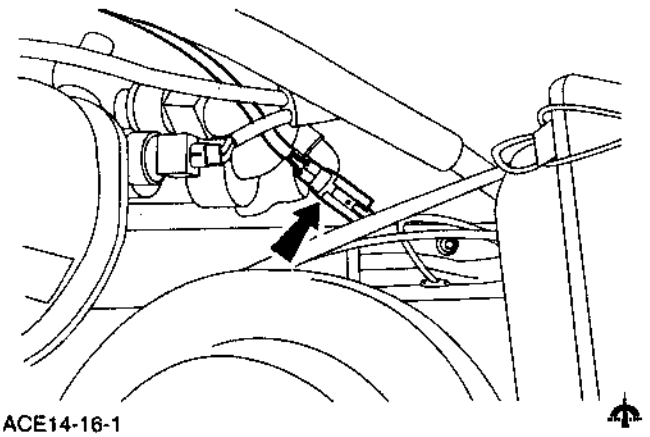

Fig.5. Multiplug of HEGO sensor.

9. Detach the turbocharger heat shield from the bracket, air cleaner housing and fender (2 bolts, 1 nut in the wheelhouse), Fig.6.

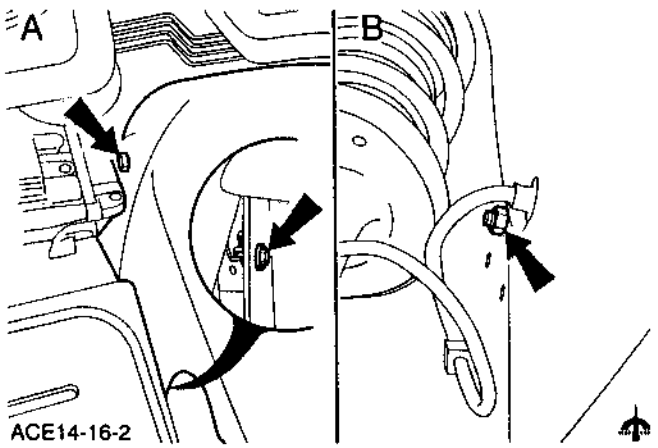

Fig.6. Fixture of turbocharger heat shield.
A - Bolts
B - Nut in wheelhouse

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10. Release the air cleaner cover (4 clips). Disconnect the air hoses (2 clips) from the turbocharger and the by-pass valve. Disconnect the vacuum pipe from the tee on the air plenum chamber, Fig.7. Remove the cover and take out the filter element.

Fig.7. Air cleaner cover with air hoses/ vacuum pipe.
A - To turbocharger
B - To air plenum chamber
C - To by-pass valve

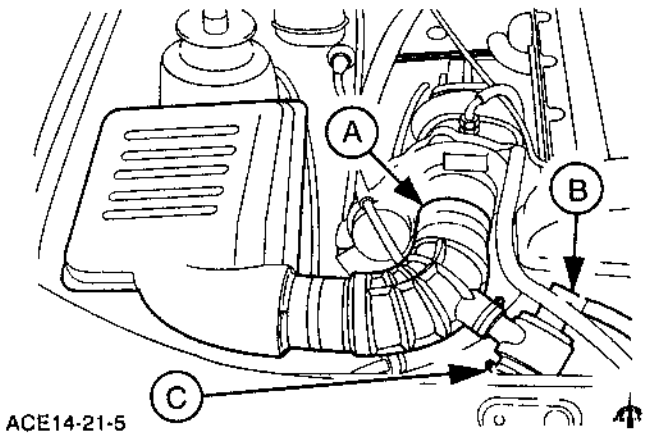

Fig.7. Air cleaner cover with air hoses/vacuum pipe.

11. Disconnect the engine breather pipe from the air cleaner housing and from the connecting hose, Fig.8. Remove the pipe.

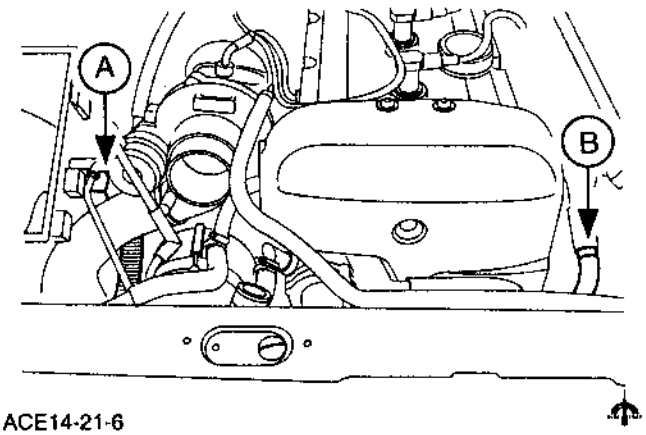

Fig.8. Engine breather pipe.
A - To air cleaner housing
B - To connecting hose

12. Disconnect the air pipes from the air cleaner housing and from the turbocharger tee (1 clip), Fig.9.(A,C).

Fig.9. Pipes/hoses.
A - To air cleaner housing
B - To turbocharger connecting pipe
C - To turbocharger tee
D - Lower air hose to turbocharger

13. Disconnect the lower air hose from the turbocharger, Fig.9.(D).

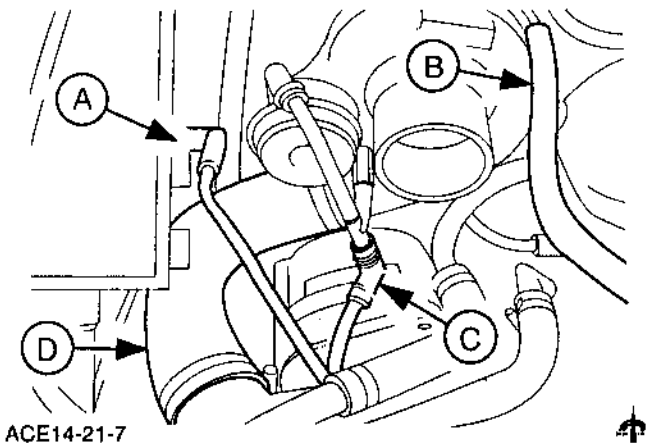

Fig.9. Pipes/hoses.

14. Disconnect the coolant hose from the turbocharger connecting pipe, Fig.9.(B).

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15. Detach the throttle cable from the throttle linkage (1 clip).
Remove the clip from the bracket.
Compress the 2 lugs of the retainer and withdraw the throttle cable from the bracket, Fig.10.

Fig.10. Throttle cable.
A - Attached
B - Detached
C - Clip pulled out
D - Lug of retainer
E - Clip on throttle linkage

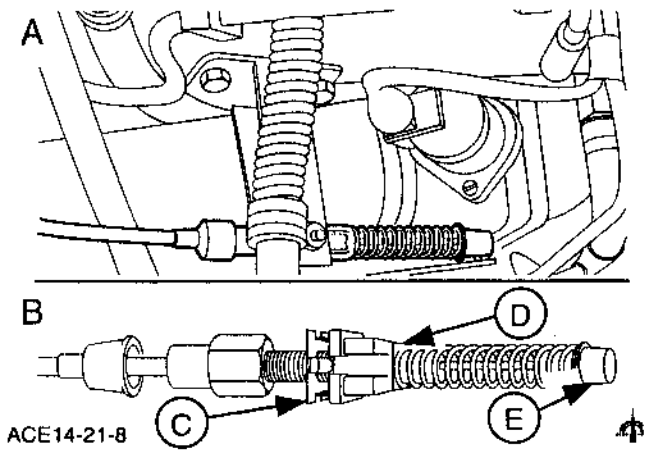


Fig.10. Throttle cable.

16. Disconnect the air hose from the intercooler and from the throttle housing (2 clips) and remove it, Fig.11.

17. Raise the vehicle.

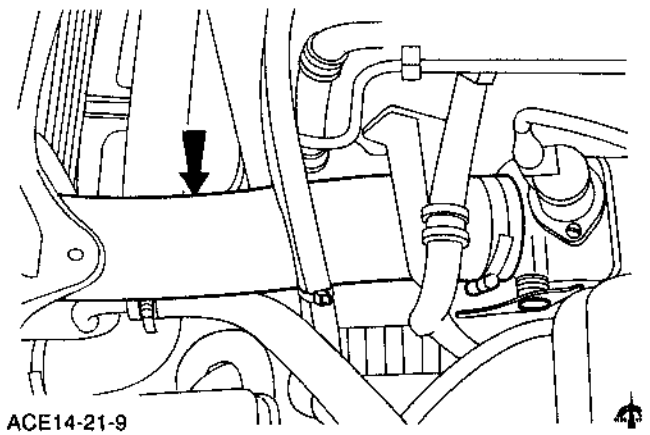


Fig.11. Air hose from intercooler to throttle housing.

18. Detach the lower engine cover from the side members (4 bolts) and the body (5 bolts), Fig.12.

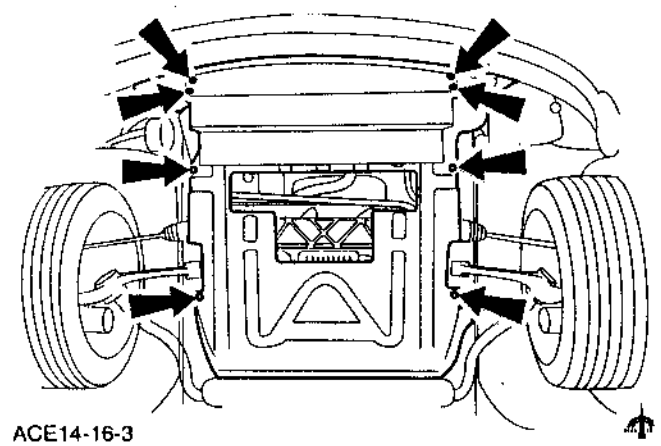


Fig.12. Retaining bolts of lower engine cover.

19. Place a clean collecting tray under the radiator. Disconnect the lower coolant hose from the radiator, Fig.13.(A), and drain off the coolant.

20. Lower the vehicle to the ground. Disconnect the lower radiator hose from the thermostat and remove it, Fig.13.(B).

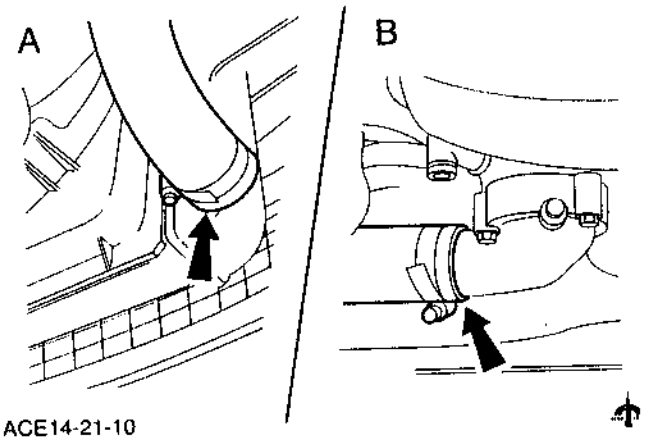


Fig.13. Coolant hose.
A - To radiator
B - To thermostat housing

21. Disconnect the coolant hoses from the heater pipe and thermostat housing, Fig.14.

Fig.14. Coolant hoses.
A - From intercooler to heater pipe
B - From intercooler to thermostat housing
C - From top of radiator to thermostat housing

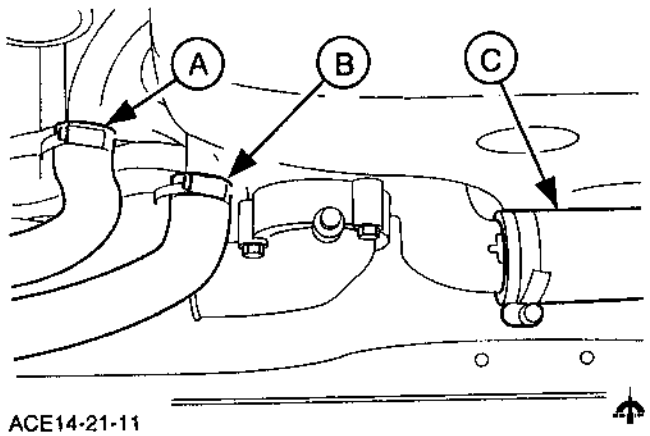


Fig.14. Coolant hoses.

22. Disconnect the upper coolant hose from the heater radiator, Fig.15.

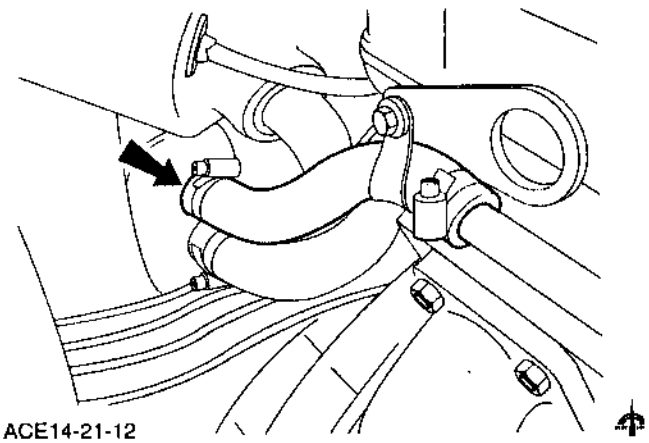


Fig.15. Upper coolant hose to heater radiator.

23. Disconnect the plug and wiring from the alternator, Fig.16.(B).

24. Disconnect the ignition coil high tension lead from the distributor, Fig.16.(A).

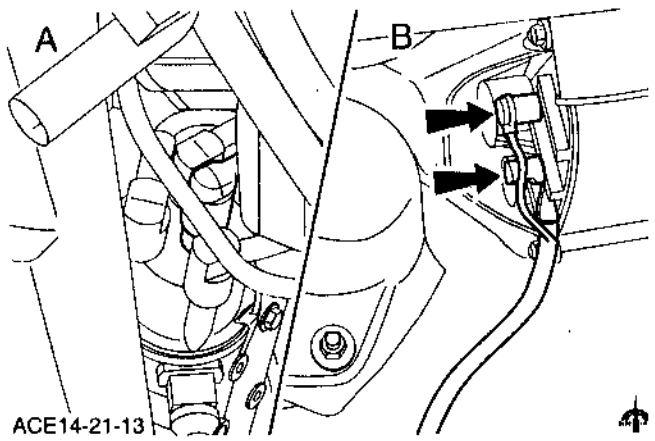


Fig.16. A - Lead between distributor and ignition coil
B - Alternator wiring connections

25. Unclip the two engine wiring loom multiplugs and disconnect them, Fig.17.

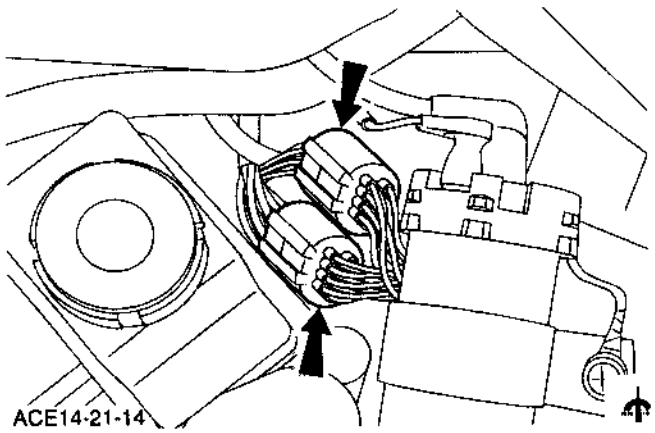


Fig.17. Engine wiring loom multiplugs.

26. Detach the wiring loom from the air plenum chamber (1 bolt), Fig.18.

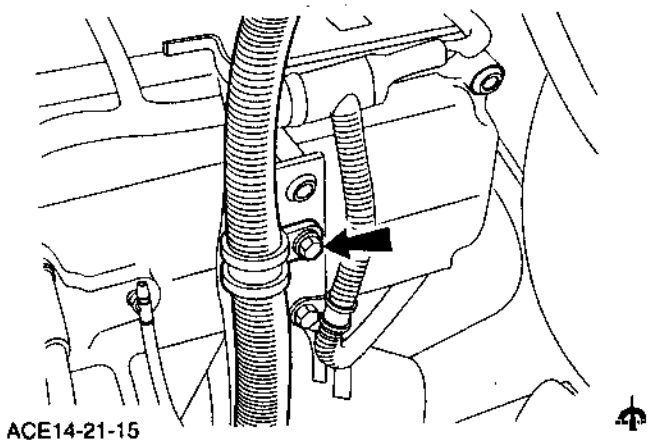
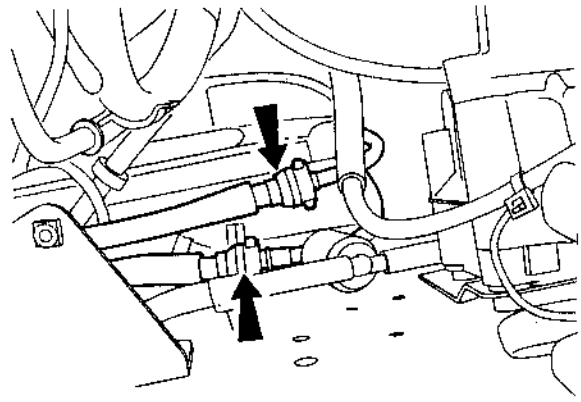


Fig.18. Retaining bolt of wiring loom.

27. Compress the lugs of the quick-release couplings on the fuel feed and return hoses and disconnect the hoses from the fuel pipes, Fig.19.

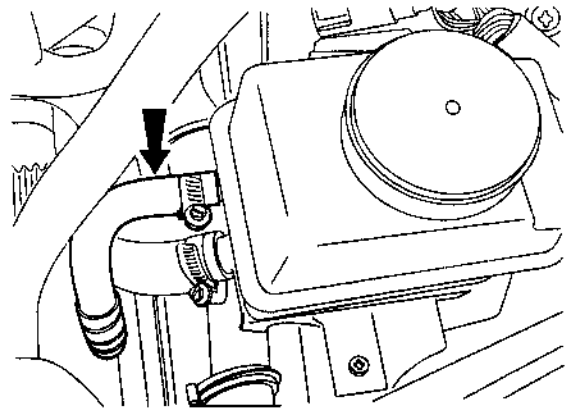


ACE14-21-16

Fig.19. Quick-release couplings connecting fuel hoses to fuel pipes. (RHD variant shown)

28. Disconnect the small hose from the power steering reservoir, Fig.20.

NOTE: Collect the power steering fluid in a clean container.



ACE14-21-17

Fig.20. Hose to power steering reservoir.

29. Disconnect the vacuum pipes/hose from the air plenum chamber, Fig.21.

Fig.21. Vacuum pipes/hose.
A - To MAP sensor
B - To interior
C - To carbon canister

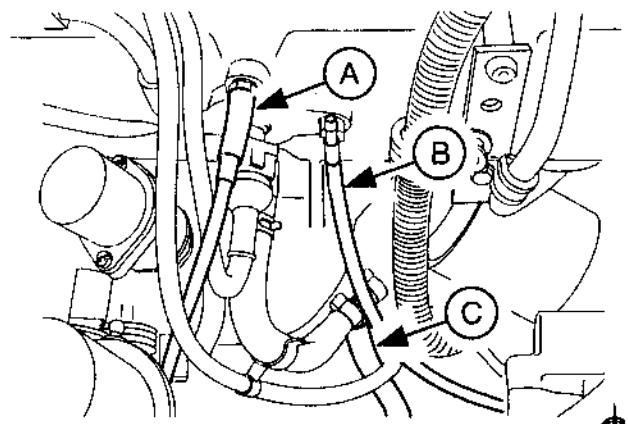


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Fig.21. Vacuum pipes/hose.

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30. Detach the heat shield of the right-hand engine mounting bracket (2 nuts), Fig.22.

31. Disconnect the front exhaust pipe from the turbocharger (3 nuts).

32. Release the nut of the right-hand engine mounting bracket and remove it. Release the self-locking nut on the throttle housing vibration damper. Release the nut of the left-hand engine mounting bracket and remove it, Fig.23.

Fig.23. Nuts of engine mounting brackets.
A - Right
B - Left
C - Self-locking nut on throttle housing vibration damper

33. Remove the dust caps from the shock absorber top mountings and fit engine support bar 21-140 in conjunction with adaptor 21-140-02. Slacken the bolts of the engine lifting eyes, angle the engine lifting eyes towards the engine support bar and tighten the bolts again. Hook the 2 chains to the spindles of the engine support bar and attach them to the engine lifting eyes, Fig.24. Screw up the spindles on the engine support bar to take up the slack.

NOTE: The left-hand spindle on the engine support bar must be at the front and the right-hand spindle at the back.

Fig.24. Engine support bar 21-140 attached.
A - Right-hand spindle at the back
B - Left-hand spindle at the front
C - Engine lifting eyes at an angle

34. Raise the vehicle.

35. Remove the front wheels.

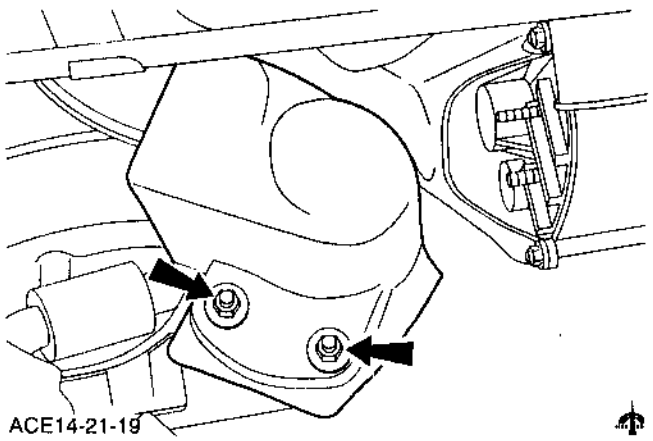

Fig.22. Retaining nuts of engine mounting bracket heat shield.

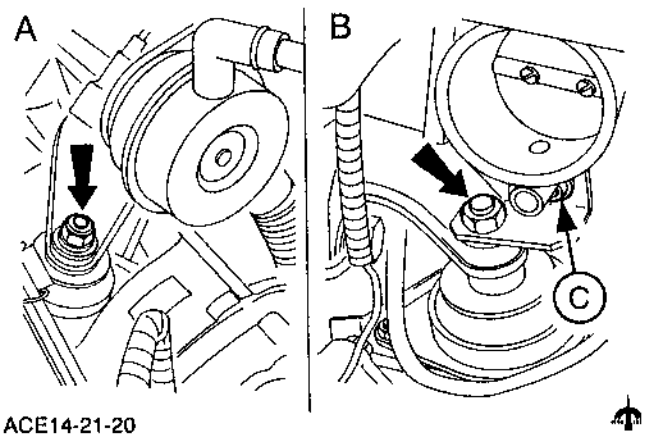

Fig.23. Nuts of engine mounting brackets.

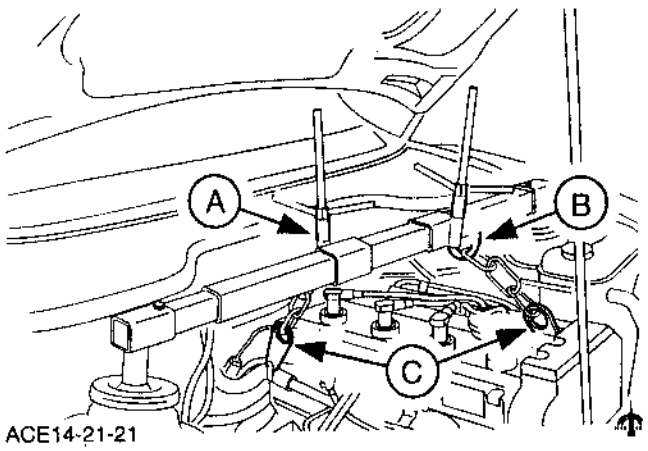

Fig.24. Engine support bar 21-140 attached.

36. Disconnect the oil hose from the power steering pump (1 clip) and disconnect the high-pressure oil pipe (1 inlet union screw), Fig.25.(A,B). Detach the oil pipe from the left-hand side member (1 bolt) and tie it securely to the side.

37. Disconnect the coolant hose running from the water pump at the pipe (1 clip), Fig.25.(C).

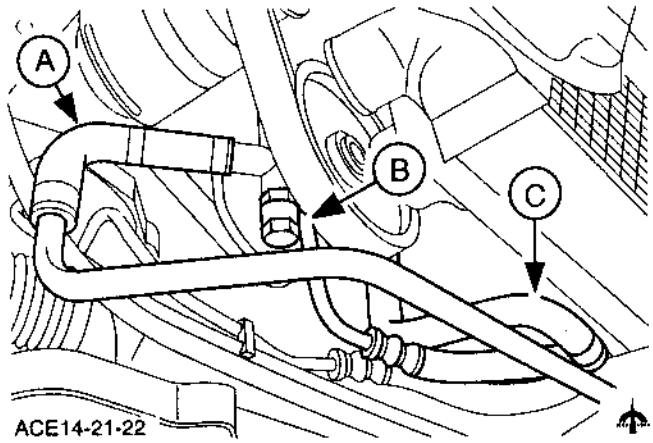

Fig.25. A - Oil hose
B - High-pressure oil pipe
C - Coolant hose

38. Detach the track rod from the steering arm on both sides. Withdraw the split pin and slacken the castellated nut on the track rod end. Press the track rod end out of the spindle carrier using Special Tool 13-006, Fig.26.(A,B,C). Unscrew the castellated nut and detach the track rod end from the spindle carrier.

Fig.26. Front suspension.
(left-hand side shown)
A - Track rod
B - Special Tool 13-006
C - Spindle carrier
D - Lower suspension arm retaining bolt
E - Lower suspension arm

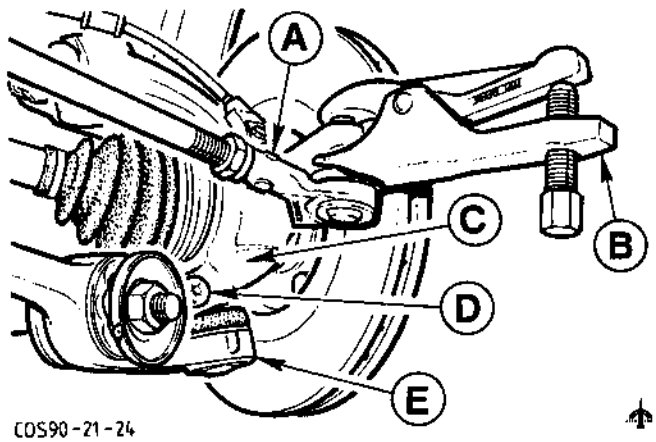

Fig.26. Front suspension.
(left-hand side shown)

39. Detach the Torx bolt and nut on both sides and lever the lower suspension arm downwards away from the spindle carrier, Fig.26.(C,D,E).

40. Detach the stabiliser bar bracket from the side member on the left and right-hand sides (4 bolts), Fig.27.

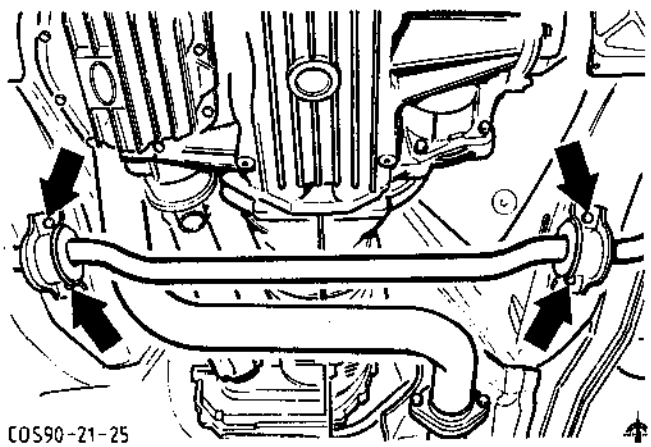

Fig.27. Retaining bolts of stabiliser bar brackets.

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41. Disconnect the intermediate steering shaft from the steering shaft (1 clamp), Fig.28.

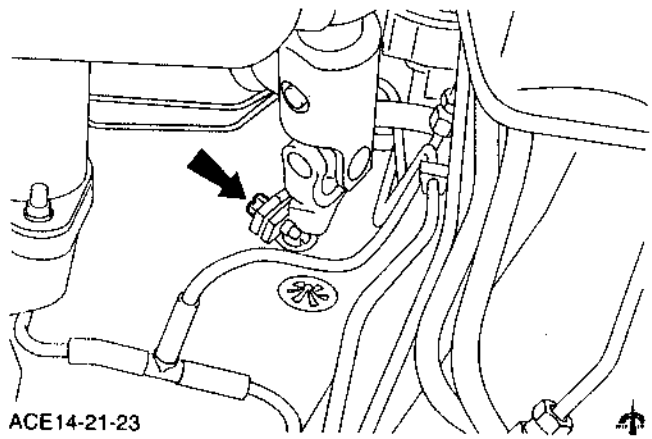

Fig.28. Bolt securing intermediate steering shaft.

42. Place a collecting tray under the front axle assembly, remove the housing cover (8 bolts), Fig.29, and drain the oil.

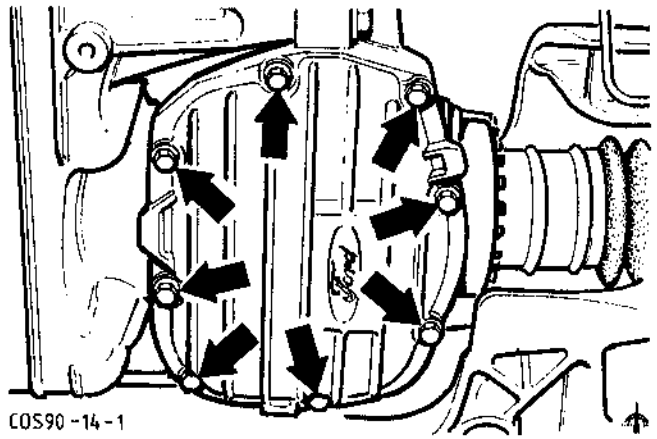

Fig.29. Retaining bolts of front axle housing cover.

43. Remove the circlip securing the driveshaft in the front axle assembly, Fig.30.

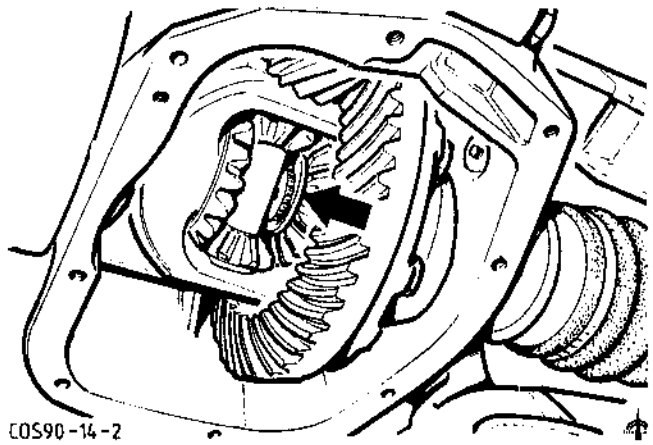

Fig.30. Circlip securing driveshaft in front axle assembly.

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44. Detach the brake pipes from the brackets on the left and right-hand sides (2 U-shaped retainers), Fig.31.(A,D).

Fig.31. U-shaped retainers of brake pipes and driveshafts.
A - Right-hand U-shaped retainer
B - Right-hand driveshaft
C - Left-hand driveshaft
D - Left-hand U-shaped retainer

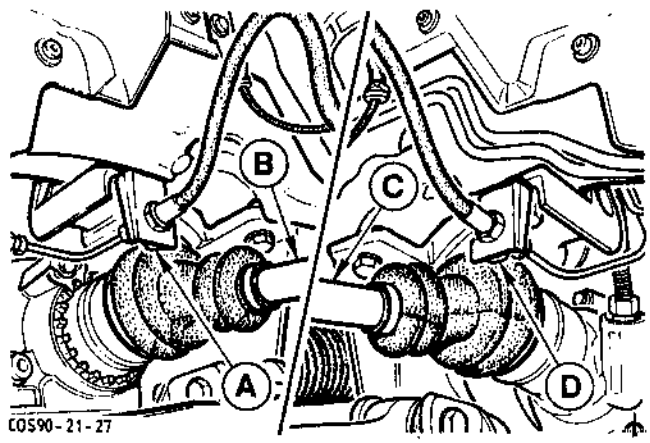

Fig.31. U-shaped retainers of brake pipes and driveshafts.

45. Pull the drive driveshaft joint out of the front axle assembly (on the right-hand side) and out of the intermediate shaft (on the left-hand side), Fig.31.(B,C).

46. Suspend the left and right-hand driveshafts using lengths of wire, Fig.32.

NOTE: The inner drive joints must not be bent at more than 20°, the outer drive joints must not be bent at more than 45°.

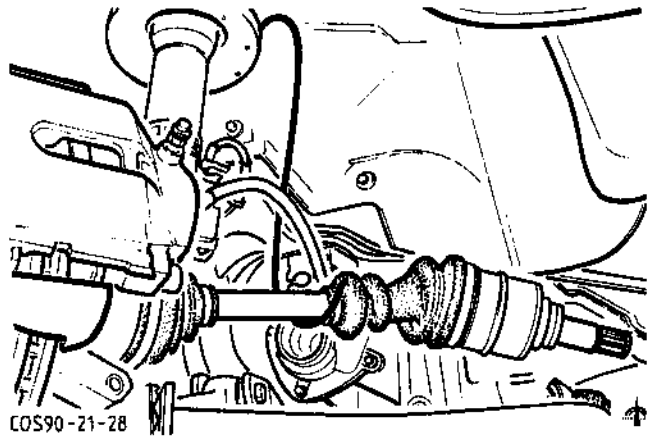

Fig.32. Driveshaft suspended. (left-hand side shown)

47. Pull off the cap, unscrew the 2 nuts and disconnect the starter motor wiring, Fig.33.(A).

48. Unscrew the union nut of the speedometer drive cable from the intermediate shaft housing cover and withdraw the speedometer drive cable, Fig.33.(B).

49. Disconnect the earth cable (1 flange bolt), Fig.33.(C).

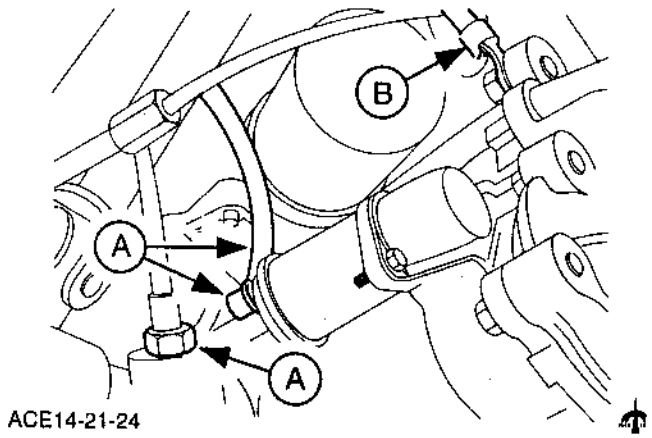

Fig.33. A - Starter motor wiring
B - Earth cable
C - Union nut of speedometer drive cable

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50. Detach the exhaust system complete, Fig.34:

- Detach the front exhaust flange (2 bolts).
- Detach the left-hand middle exhaust mounting bracket from the rear axle crossmember (2 bolts).
- Unhook the exhaust system from the front, right-hand middle and the 2 rear mountings and remove it.
- Remove the front exhaust pipe

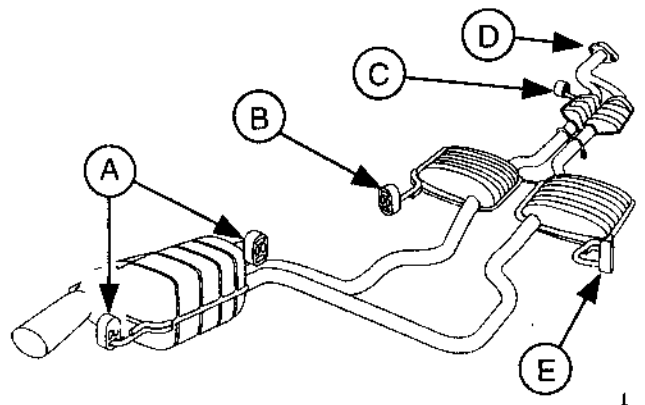

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Fig.34. Exhaust mounting points.
(exhaust system removed for clarity)
A - Rear
B - Left-hand middle, bolted
C - Front
D - Flange
E - Right-hand middle

51. Detach the exhaust mounting bracket from the transfer case (1 bolt), Fig.35.(B).

52. Detach the exhaust system heat shield from the floor assembly (7 clips), Fig.35.(A).

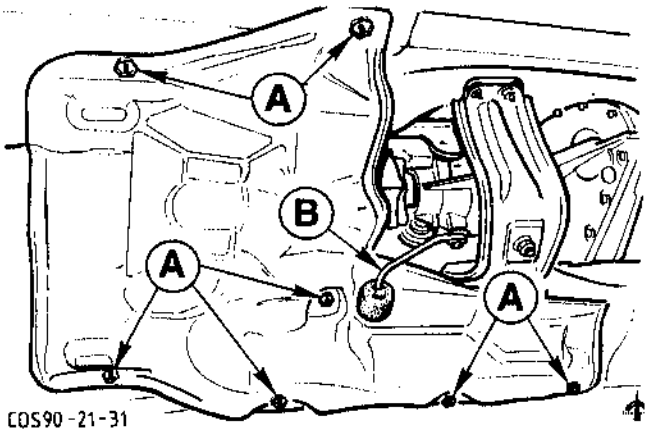

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Fig.35. A - Heat shield clips
B - Exhaust mounting bracket

53. Unscrew the 3 nuts securing the driveshaft on the Torx studs on the transmission output flange, Fig.36.(B), holding the Torx studs with a Torx wrench (refer to PROPRIETARY TOOLS).

Unscrew the 2 centre bearing retaining bolts and remove them with the U-shaped washers, Fig.36.(A).

Unscrew the 4 retaining bolts on the rear axle drive pinion flange.

Remove the driveshaft complete.

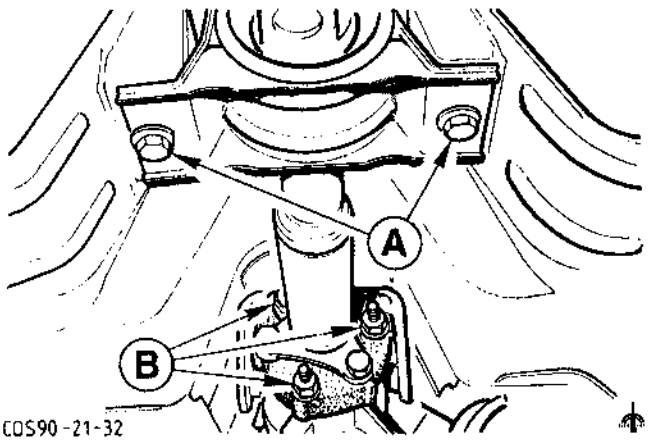

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Fig.36. Fixture of driveshaft.
A - Centre bearing bolts
B - Transmission output flange nuts

54. Disconnect the multiplug of the reversing lights, Fig.37.(B).

55. Detach the clutch cable gaiter and unhook the clutch cable from the clutch release lever, Fig.37.(A).

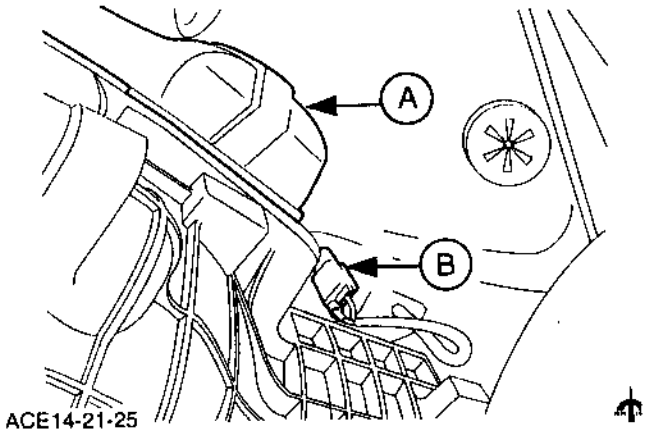

Fig.37. A - Clutch cable gaiter
B - Multiplug of reversing lights

56. Support the front axle/engine crossmember using a jack and detach it from the side member together with the brake pipe brackets (4 bolts). Remove the front axle/engine crossmember complete with the steering gear, lower suspension arms and stabiliser bar, Fig.38.

57. Support the transmission using a jack. Unscrew and remove the transmission mounting retaining nut and 2 diagonally opposed retaining nuts securing the transmission crossmember to the floor assembly. Unscrew the remaining 2 retaining nuts of the transmission crossmember but only to the point at which the nuts are still fully engaged on the thread on the stud, Fig.39.

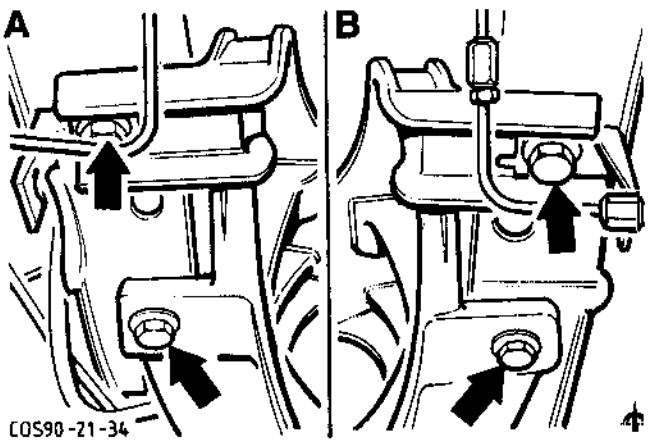

Fig.38. Retaining bolts of front axle/engine crossmember.
A - Left-hand side
B - Right-hand side

58. Position a trolley under the engine and transmission assembly. Lower the vehicle until the engine and transmission assembly is resting on the trolley. Support the engine and transmission assembly on the trolley with blocks.

59. Unscrew the 2 retaining nuts of the transmission crossmember and detach the transmission crossmember from the floor assembly, Fig.39.

60. Unhook the engine support bar from the engine lifting eyes and carefully lift the vehicle. Slide the engine and transmission assembly out from under the vehicle.

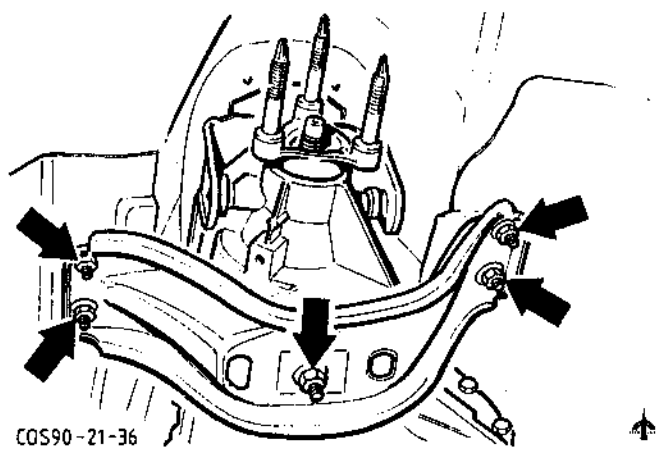

Fig.39. Retaining nuts of transmission crossmember.

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To Install

NOTE: When installing, tighten the nuts, bolts and hose/pipes as specified in Technical Data. Once routed correctly, secure wiring and vacuum pipes/hoses with cable ties.

61. Position the engine and transmission assembly under the vehicle on the trolley. Carefully lower the vehicle and attach the engine support bar to the engine lifting eyes.

62. Attach the transmission crossmember to the floor assembly. Fit the retaining nuts of the transmission crossmember and tighten finger tight.

63. Raise the vehicle.

64. Locate the front axle/engine crossmember in position using a jack. Guide the engine mounting bracket studs into the engine mountings on the left and right-hand sides. Fit the engine mounting bracket nuts and tighten finger tight. Attach the front axle/engine crossmember to the side members, Fig.41.
Remove the jack.

NOTE: Fit the throttle housing support bracket over the engine mounting bracket stud.

65. Tighten the retaining nuts of the transmission crossmember and the transmission mounting.

66. Attach the clutch cable to the clutch release lever and fit the clutch cable gaiter, Fig.42.(A).

67. Connect the multiplug of the reversing lights, Fig.42.(B).

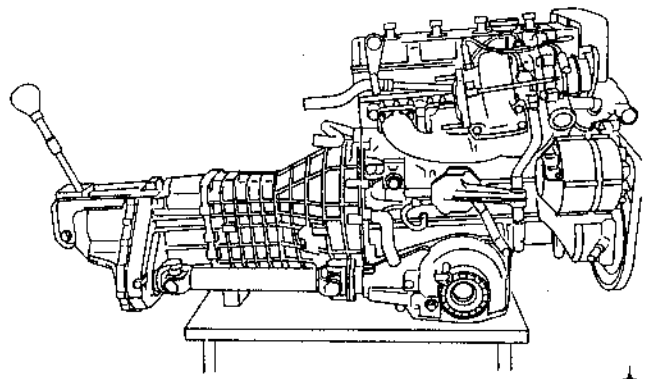

Fig.40. Engine and transmission assembly removed on trolley.

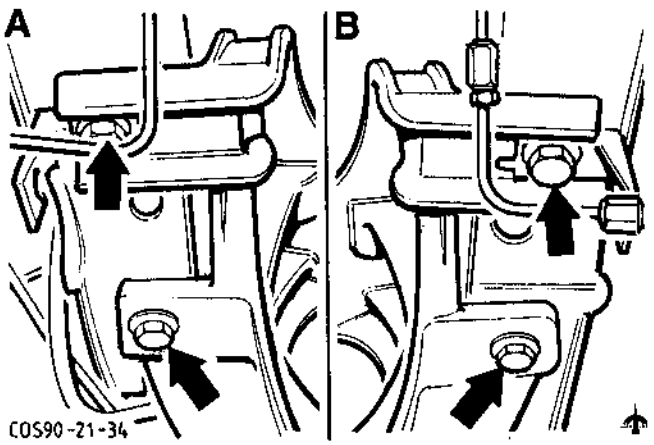

Fig.41. Retaining bolts of front axle/engine crossmember.
A - Left-hand side
B - Right-hand side

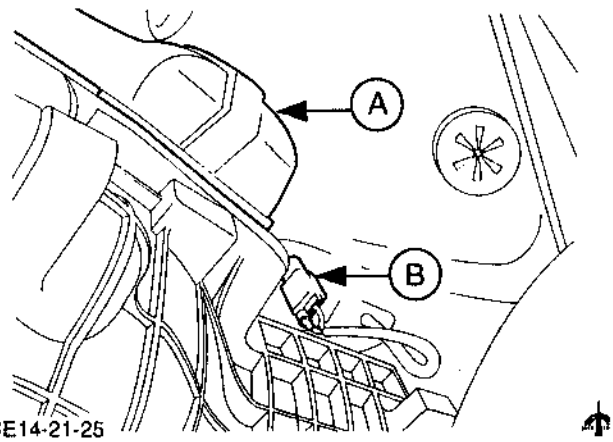

Fig.42. A - Clutch cable gaiter
B - Multiplug of reversing lights

68. Assemble the driveshaft to the rear axle if disconnected.

NOTE: When assembling, guide the master spline into the double groove, Fig.43.

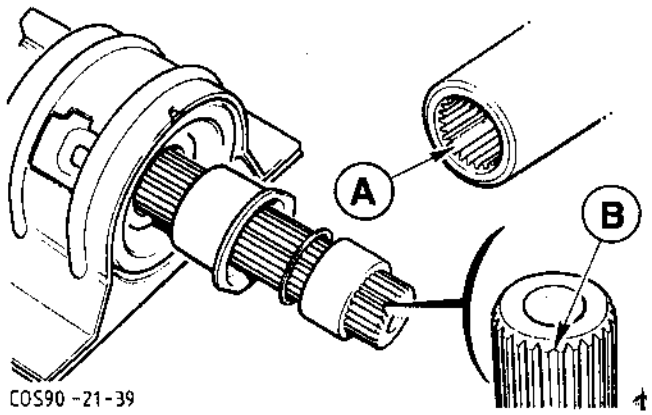

Fig.43. Rear axle driveshaft disconnected.
A - Double groove
B - Master spline

69. Before the driveshaft rubber coupling is attached to the transmission output flange, check the Torx studs are secure in the transmission output flange. To do this, put a torque wrench with a Torx socket (refer to PROPRIETARY TOOLS) on the Torx head and apply the specified torque in the tightening direction. Any studs which turn must be removed and refitted as follows.

- Clean the threaded holes in the transmission output flange, Fig.44.(C), and the threads of the studs, Fig.44.(A), removing all traces of grease and dirt.

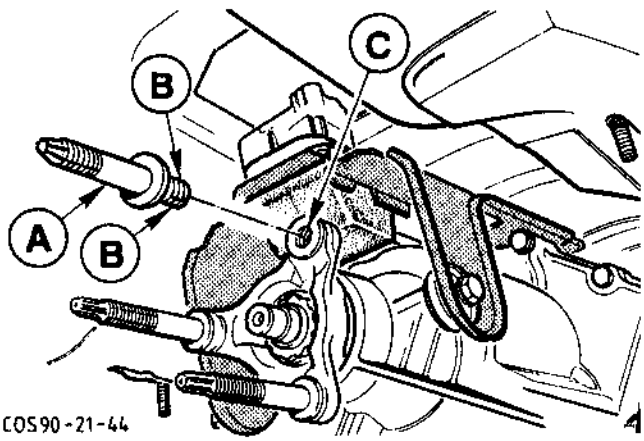

Fig.44. Transmission output flange with Torx studs.
A - Torx studs
B - Thread-locking compound
C - Threaded hole

Fig.44. Transmission output flange with studs.

- Apply 2 drops of thread-locking compound (refer to Technical Data) staggered at 180° on the thread at the flange-end of the stud, Fig.44.(B).
- Insert the stud and tighten it to the specified torque.

NOTE: The stud must be tightened completely within a maximum of 5 minutes of applying the thread-locking compound.

- Let the thread-locking compound harden for 30 minutes.

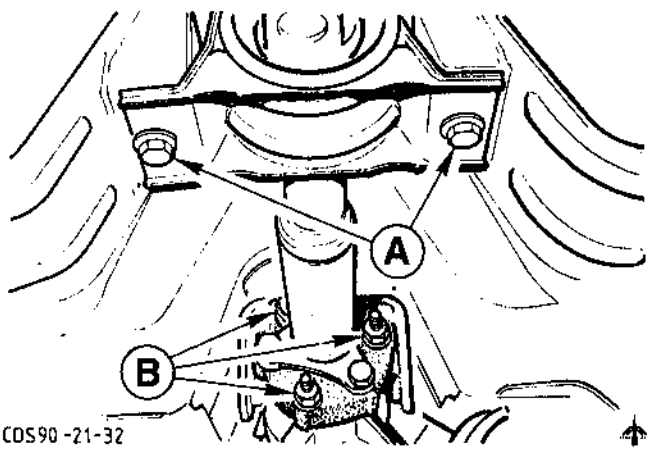

Fig.45. Fixture of driveshaft.
A - Centre bearing bolts
B - Transmission output flange nuts

70. Locate the driveshaft in position.

Attach the driveshaft to the transmission output flange using new nuts. Attach the driveshaft to the rear axle and secure the driveshaft centre bearing to the floor assembly, Fig.45.

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71. Fit the exhaust system heat shield to the floor assembly, Fig.46.(A).

72. Fit the exhaust mounting bracket to the transfer box, Fig.46.(B).

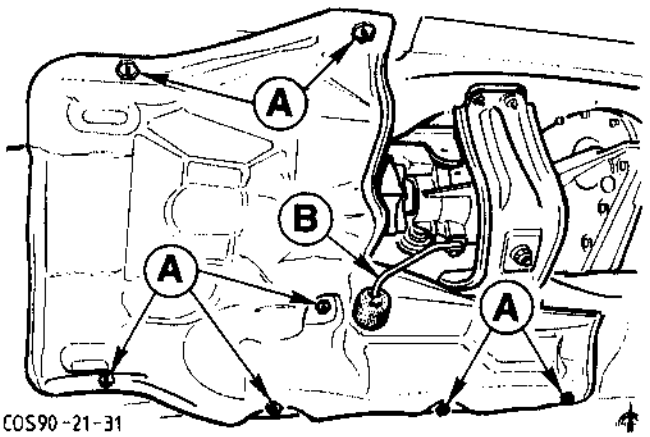

Fig.46. A - Heat shield clips
B - Exhaust mounting bracket

73. Fit the exhaust system complete, Fig.47:

- Locate the front exhaust pipe in position and attach it loosely to the exhaust manifold.
- Locate the exhaust system in position.
- Attach the exhaust system to the 2 rear, right-hand middle and front mountings.
- Secure the left-hand middle exhaust mounting bracket to the rear axle crossmember and attach the exhaust system to this mounting.
- Connect the front exhaust flange.

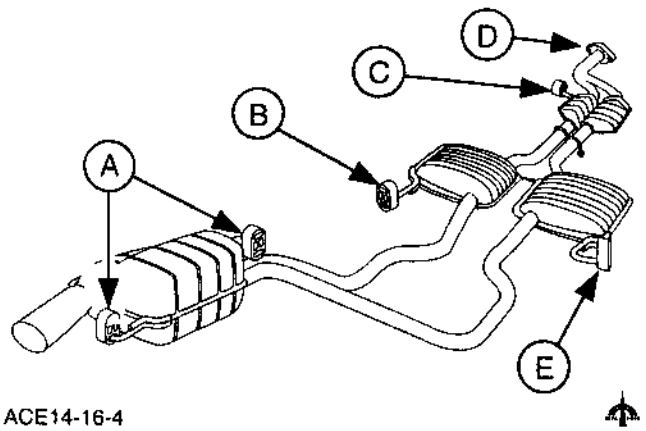

Fig.47. Exhaust mountings.
(exhaust system removed for clarity)

Fig.47. Exhaust mounting points.
(exhaust system removed for clarity)
A - Rear
B - Left-hand middle
C - Front
D - Flange
E - Right-hand middle

74. Connect the starter motor wiring and refit the cap, Fig.48.(A).

75. Insert the speedometer drive cable in the intermediate shaft housing cover, fit the union nut and tighten it, Fig.48.(B).

76. Connect the earth cable with the flange bolt, Fig.48.(C).

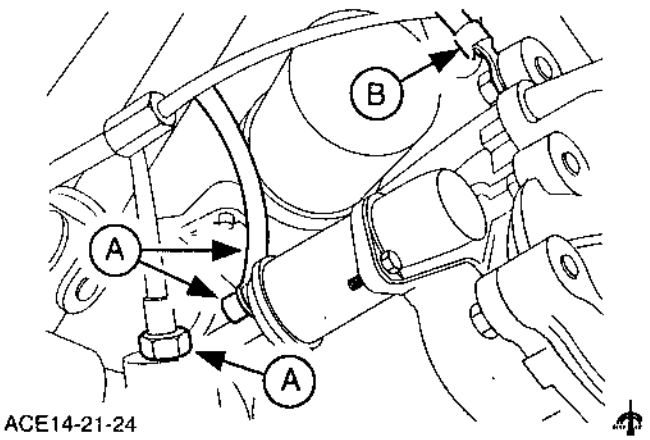

Fig.48. A - Starter motor wiring
B - Speedometer drive cable union nut
C - Earth cable

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77. Fit the driveshaft drive joint in the intermediate shaft (on the left-hand side) using a circlip, Fig.49.(C).

Fig.49. U-shaped retainers of brake pipes and driveshafts.
A - Right-hand U-shaped retainer
B - Right-hand driveshaft
C - Left-hand driveshaft
D - Left-hand U-shaped retainer

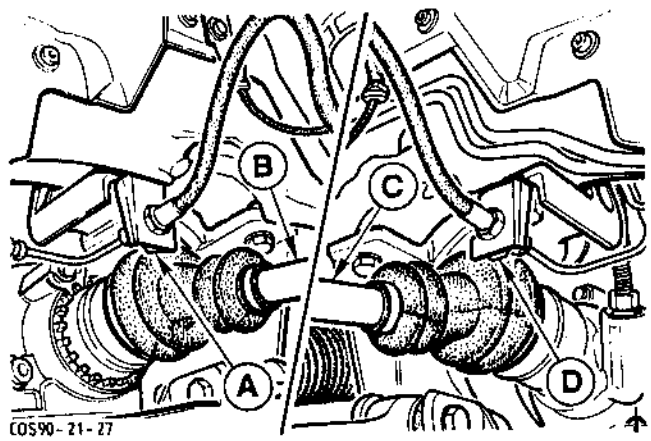

Fig.49. U-shaped retainers of brake pipes and driveshafts.

78. Fit the driveshaft in the front axle assembly (on the right-hand side), Fig.49.(B), and secure it using a new circlip, Fig.50.

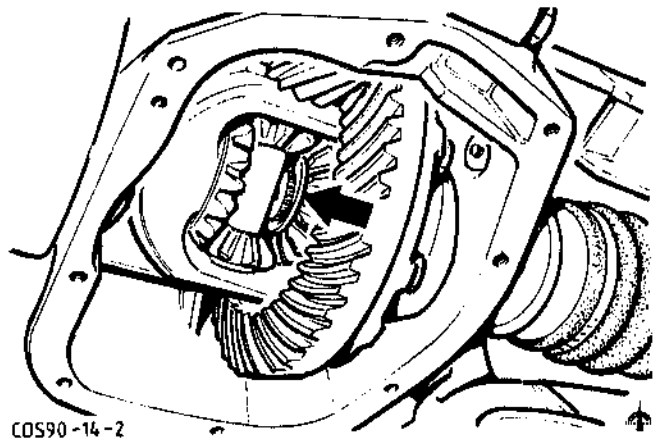

Fig.50. Circlip securing driveshaft in front axle assembly.

79. Apply sealer (refer to Technical Data for specification) and fit the front axle housing cover, Fig.51.
Fill the front axle assembly with oil (refer to Technical Data for quantity and specification) and screw in the oil filler plug.

80. Attach the brake pipes to the brackets on the left and right-hand sides and secure them with the U-shaped retainers, Fig.49.(A,D).

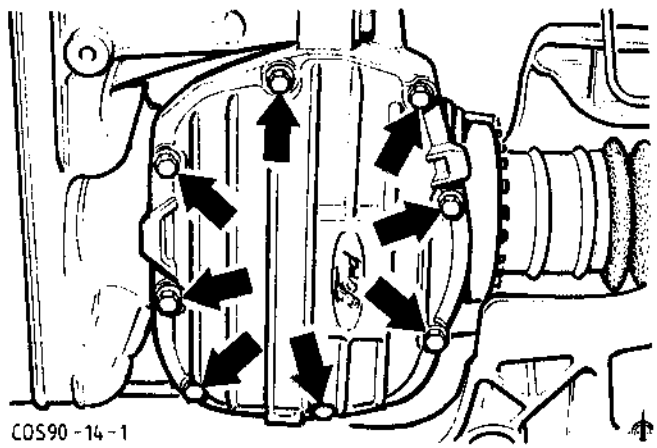

Fig.51. Retaining bolts of front axle housing cover.

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81. Centralise the steering wheel and steering gear. Connect the intermediate steering shaft to the steering shaft, Fig.52.

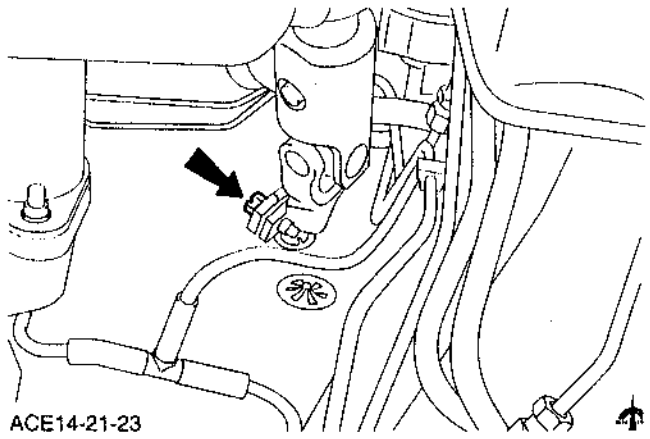

Fig.52. Clamp bolt of intermediate steering shaft.

82. Fit the stabiliser bar brackets to the side members on the left and right-hand sides, Fig.53.

NOTE: Make sure the rubber bushes are seated correctly.

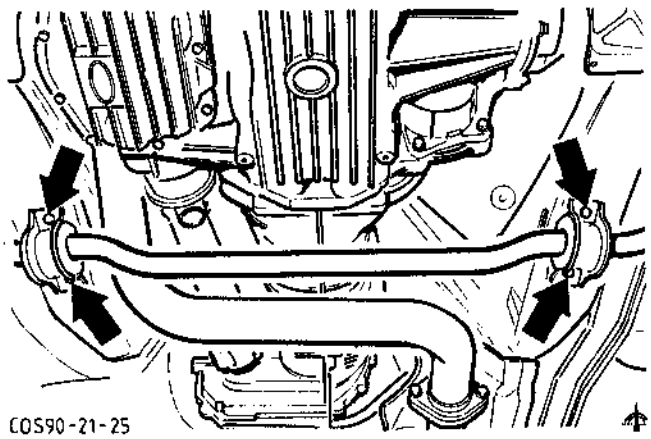

Fig.53. Retaining bolts of stabiliser bar brackets.

83. Attach the lower suspension arm to the spindle carrier (on both sides), Fig.54.(A,B).

84. Connect the track rod to the steering arm, Fig.54.(C,D). Fit the castellated nut on the track rod end, tighten it and secure it using a new split pin (on both sides).

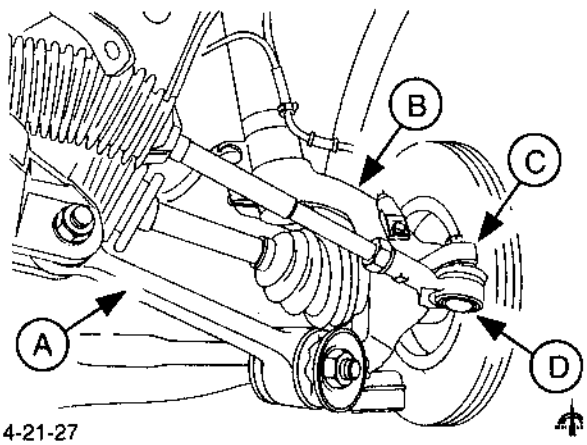

Fig.54. A - Lower suspension arm
B - Spindle carrier
C - Steering arm
D - Track rod

0392

85. Attach the coolant hose running from the water pump to the pipe, Fig.55.(C).

Fig.55. Oil hose/oil pipe and coolant hoses.
A - Oil hose
B - Oil pipe
C - Coolant hose to pipe
D - Coolant hose to radiator

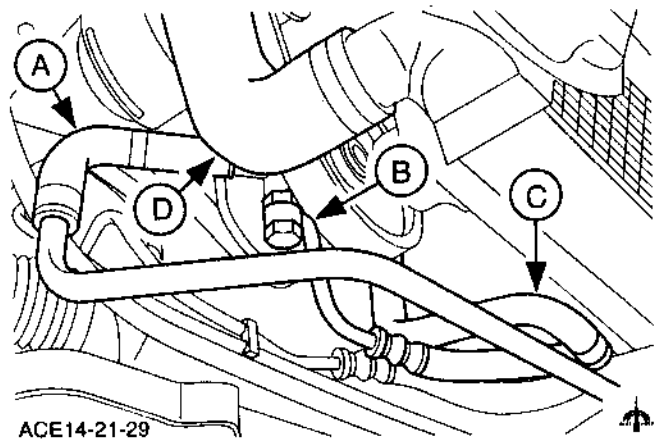

Fig.55. Oil hose/oil pipe and coolant hoses.

86. Attach the power steering oil pipe to the left-hand side member.
Connect the oil hose and the high-pressure oil pipe to the power steering pump, Fig.55.(A,B).
Locate the lower coolant hose in position and connect it to the radiator, Fig.55.(D).

87. Fit the front wheels.

88. Fit the lower engine cover to the side members and the body, Fig.56.

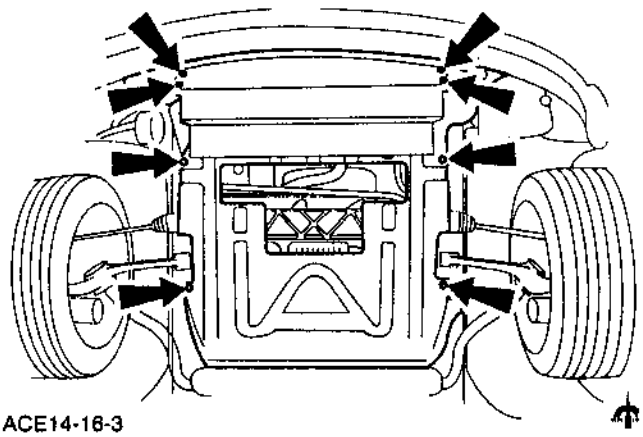

Fig.56. Retaining bolts of lower engine cover.

89. Lower the vehicle to the ground and tighten the front wheel nuts.

90. Unscrew the spindles on the engine support bar and unhook the chains. Remove the engine support bar. Unscrew the bolts securing the engine lifting eyes, position the engine lifting eyes upright and tighten the bolts. Fit the dust caps over the shock absorber top mountings, Fig.57.

Fig.57. Engine support bar 21-140 attached.
A - Right-hand spindle at the rear
B - Left-hand spindle at the front
C - Engine lifting eyes angled

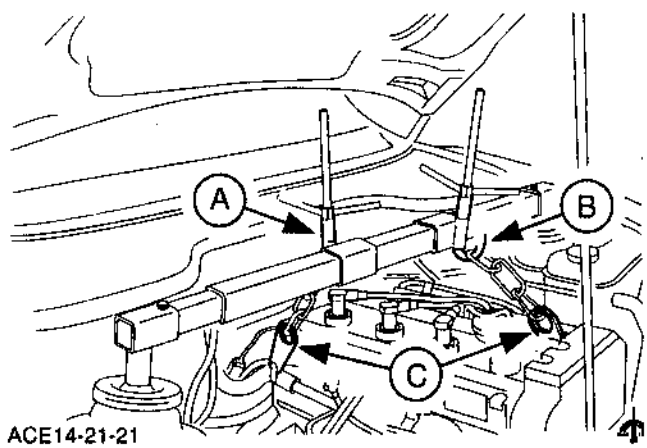

Fig.57. Engine support bar 21-140 attached.

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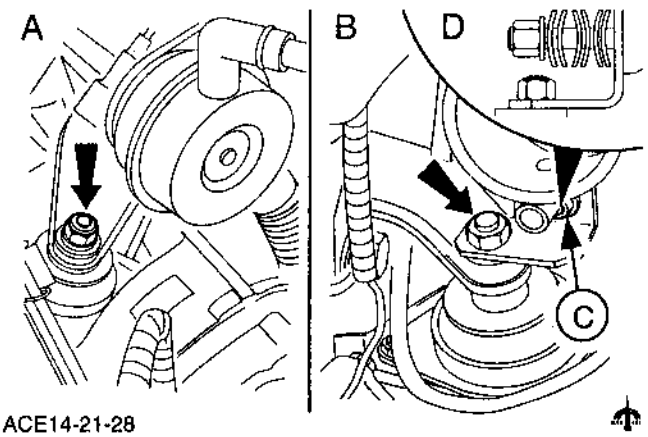
91. Fit a new self-locking nut on the throttle housing vibration damper but do not tighten it.

    Tighten the 2 engine mounting bracket nuts, Fig.58.(A,B,C).
    Tighten the self-locking nut to a torque of 8 to 10 Nm and then slacken it half a turn.

NOTE: Make sure the spring washers are fitted correctly, Fig.58.(D).

Fig.58. Nuts of engine mounting brackets and vibration damper.
A - Right
B - Left
C - Self-locking nut on throttle housing vibration damper
D - Arrangement of spring washers

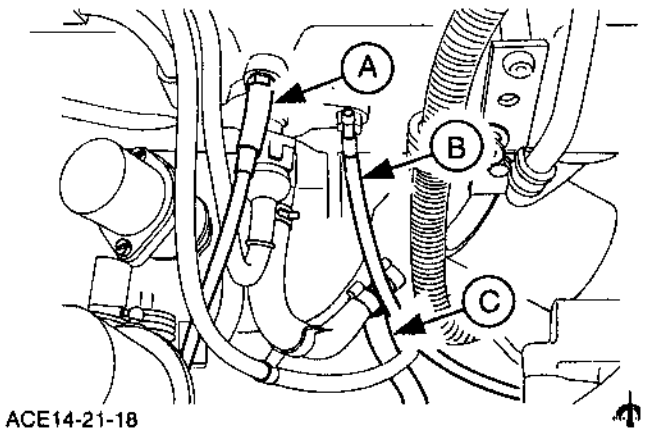


ACE14-21-28

Fig.58. Nuts of engine mounting brackets and vibration damper.

92. Fit the heat shield to the right-hand engine mounting bracket.

93. Connect the front exhaust pipe to the exhaust manifold.



ACE14-21-18

Fig.59. Vacuum pipes/hose.

94. Connect the vacuum pipes/hose to the air plenum chamber, Fig.59.

Fig.59. Vacuum pipes/hose.
A - To MAP sensor
B - To interior
C - To carbon canister

95. Connect the oil hose to the power steering reservoir.

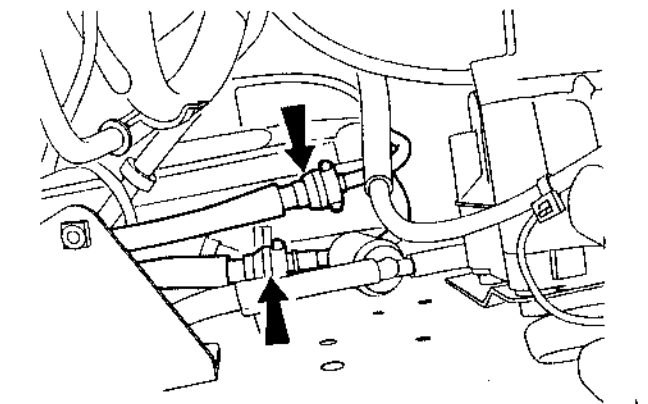

ACE14-21-16

Fig.60. Quick-release couplings of fuel hoses/pipes.

96. Connect the quick-release couplings of the fuel hoses/pipes, Fig.60.

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97. Secure the wiring loom to the air plenum chamber, Fig.61.

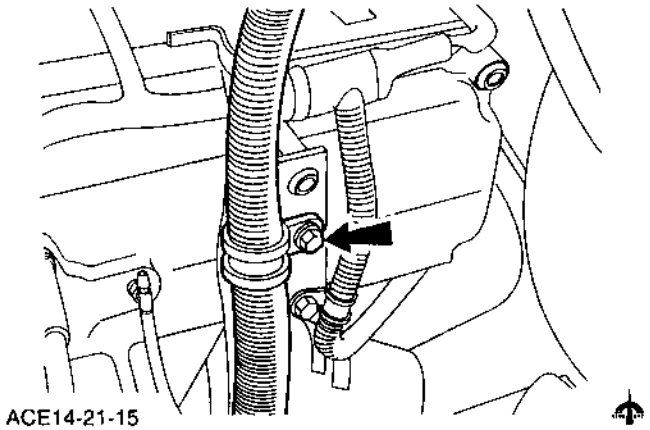

Fig.61. Retaining bolt of wiring loom.

98. Connect the 2 multiplugs of the engine wiring loom and clip them to the wheelarch, Fig.62.

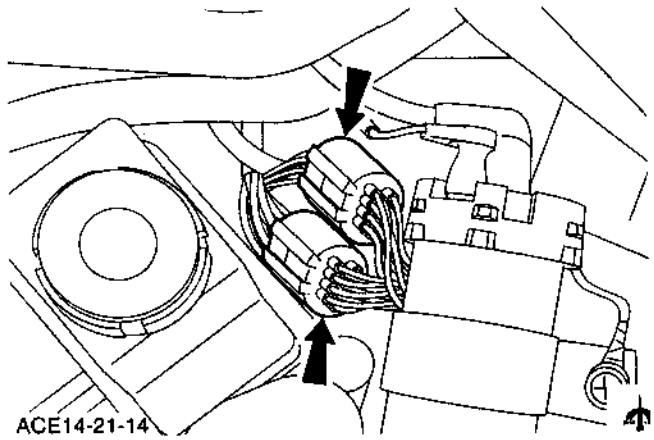

Fig.62. Multiplugs of engine wiring loom.

99. Connect the ignition coil high-tension lead to the distributor, Fig.63.(A).

100. Connect the plug and wiring to the alternator, Fig.63.(B).

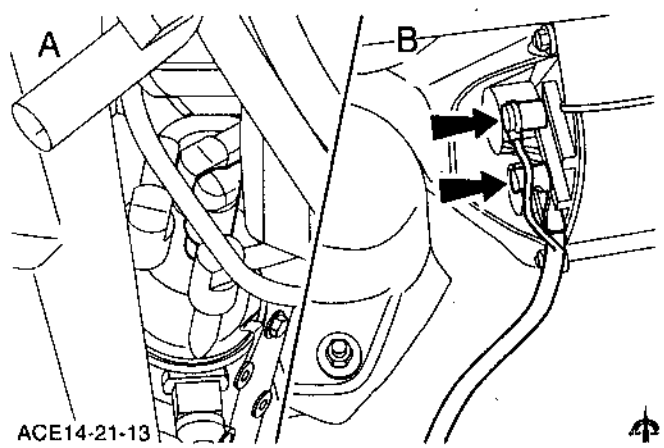

Fig.63. A - Lead between distributor and ignition coil
B - Electrical connections of alternator

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101. Connect the upper coolant hose to the heater radiator.

102. Connect the coolant hoses to the heater pipe and the thermostat housing, Fig.64.

Fig.64. Coolant hoses.
A - From intercooler to heater pipe
B - From intercooler to thermostat housing
C - Upper radiator hose the thermostat housing

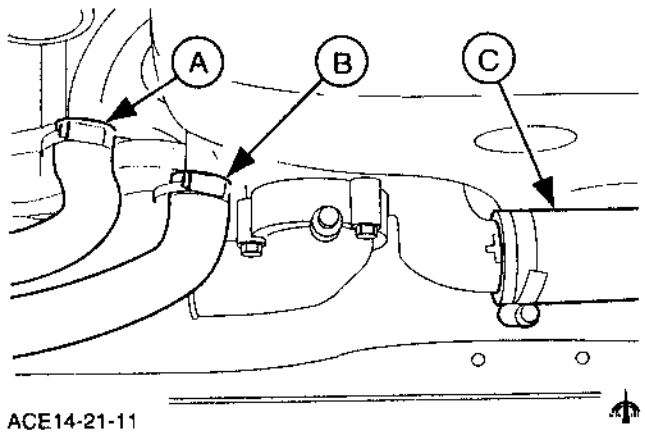

Fig.64. Coolant hoses.

103. Attach the coolant hose running from the bottom of the radiator to the thermostat housing.

104. Locate the air hose running from the intercooler to the throttle housing in position and connect it, Fig.65.

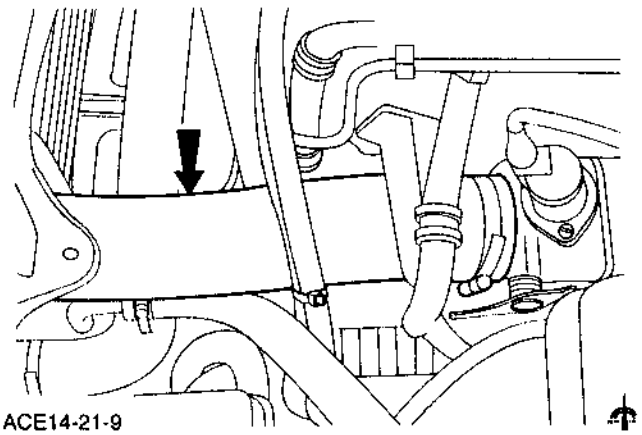

Fig.65. Air hose from intercooler to throttle housing.

105. Fit the throttle cable into the bracket, engage the lugs, hook the cable to the throttle linkage and secure it with 2 clips, Fig.66.

Fig.66. Throttle cable.
A - Attached
B - Detached
C - Clip pulled out
D - Lugs of retainer
E - Clip on throttle linkage

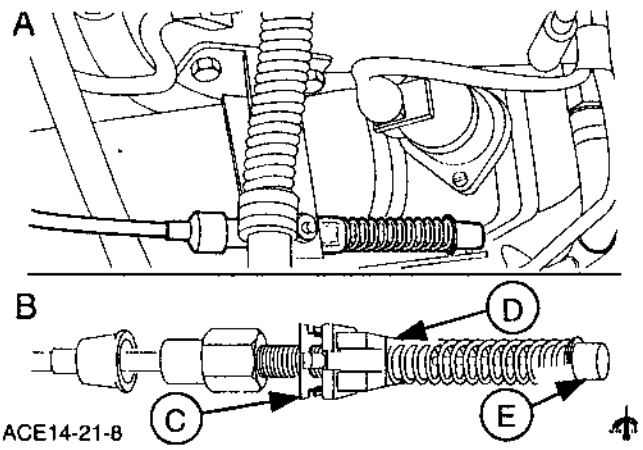

Fig.66. Throttle cable.

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106. Connect the air pipes to the air cleaner housing and to the turbocharger tee, Fig.67.(A,C).

Fig.67. Pipes/hoses.
A - To air cleaner housing
B - To turbocharger connecting pipe
C - To turbocharger tee
D - To turbocharger

107. Connect the coolant hose to the turbocharger connecting pipe, Fig.67.(B).

108. Connect the lower air hose to the turbocharger, Fig.67.(D).

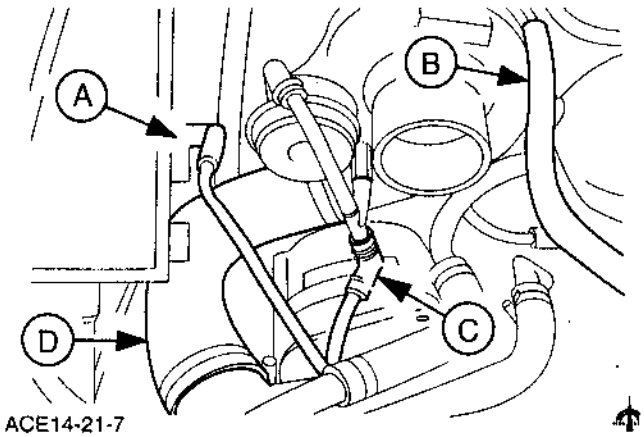

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Fig.67. Pipes/hoses.

109. Locate the engine breather pipe in position. Connect the pipe to the air cleaner housing and to the connecting hose, Fig.68.

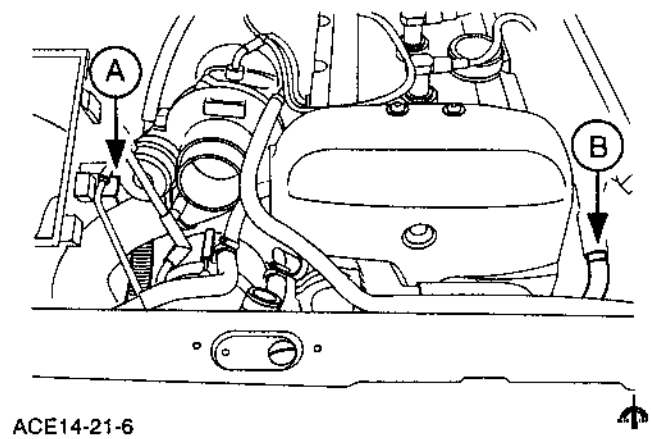

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Fig.68. Engine breather pipe.
A - To air cleaner housing
B - To connecting hose

110. Insert the air cleaner element.
Fit the air cleaner cover and secure it.
Connect the air hoses to the turbocharger and the by-pass valve.
Run the vacuum pipe to the air plenum chamber and connect it to the tee, Fig.69.

Fig.69. Air cleaner cover with air hoses/vacuum pipe.
A - To turbocharger
B - To air plenum chamber
C - To by-pass valve

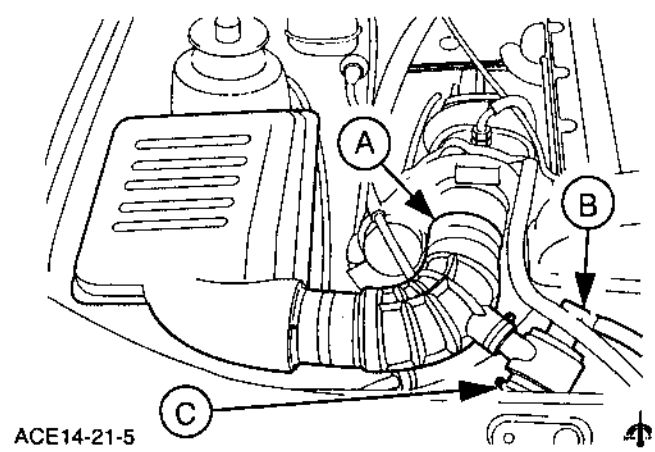

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Fig.69. Air cleaner cover with air hoses/vacuum pipe.

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111. Fit the turbocharger heat shield, Fig.70.

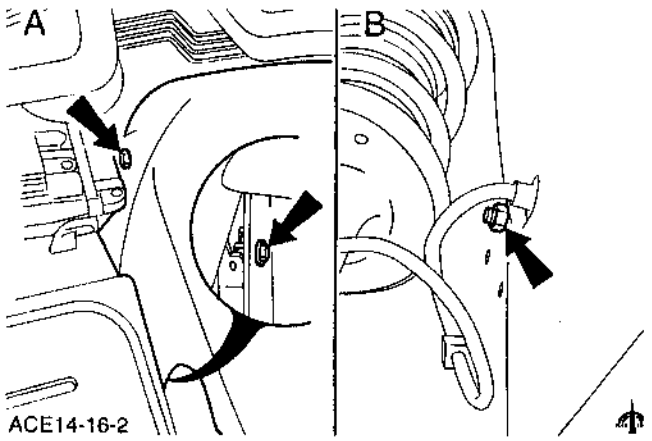

Fig.70. Fixture of turbocharger heat shield.
A - Bolts
B - Nut in wheelhouse

112. Connect the multiplug of the HEGO sensor, Fig.71.

113. Fit the retaining frame with the inner gear lever gaiter.

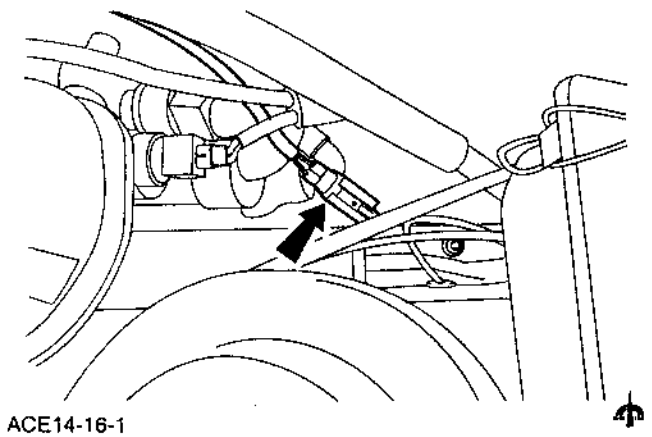

Fig.71. Multiplug of HEGO sensor.

114. Fit the leather gaiter over the gear lever, pull it up inside out, secure it with a cable tie and refit it.
Remove the support from the clutch pedal.

115. Locate the centre console roughly in position.
Connect the multiplugs of the radio (2) and the cigarette lighter.
Fit the centre console.

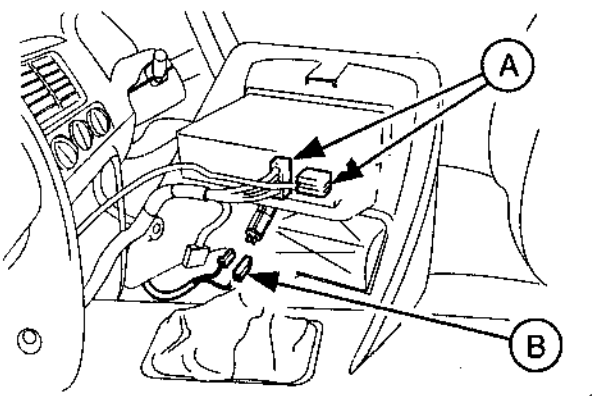

Fig.72. Multiplugs.
A - Radio
B - Cigarette lighter

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116. Secure the centre console (3 screws, 2 clips), Fig.73.

NOTE: Set the clip before fitment: Spread the sprung legs slightly and push back the centre pin until it protrudes the front face of the clip.

117. Fit the ashtray. Connect the multiplugs to the switches for the electrically operated windows (2) and to the switch for the luggage compartment lock. Fit the switch cover, Fig.74.

Fig.74. Switch cover.
A - Switch cover
B - Multiplugs for electrically operated windows
C - Multiplug for luggage compartment lock
D - Ashtray

118. Connect the battery earth cable.

119. Fill the cooling system expansion tank up to the MAX mark (refer to Technical Data for coolant quantity and specification), opening the bleed screw on the thermostat housing to allow air to escape from the cooling system. Apply sealer (refer to Technical Data for specification) and screw in and tighten the bleed screw, Fig.75.

NOTE: Pour the coolant in slowly so that air bubbles can escape.

120. Check the engine oil level and top up as necessary (refer to Technical Data for specification).

121. Fill the power steering reservoir and bleed the system as indicated in Operation 13 416 1 (refer to Technical Data for quantity and specification).

122. Start the engine and run it up to normal operating temperature. Check all the coolant and oil hose connections for leaks and top up with coolant or oil as necessary.

123. Check the engine tuning settings as specified at normal operating temperature and adjust as necessary.

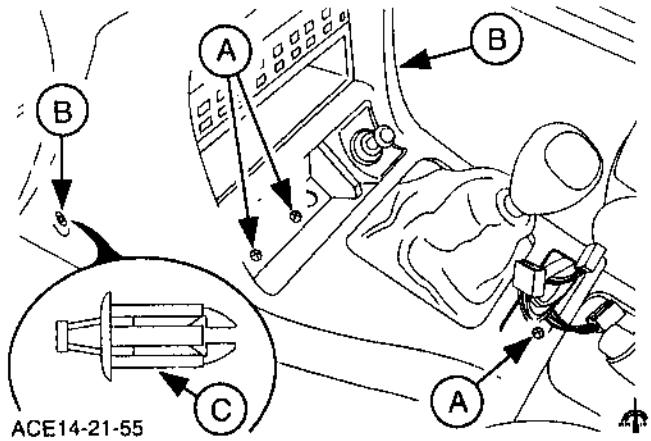

Fig.73. Fixture of centre console.
A - Screws
B - Clip
C - Clip set in position

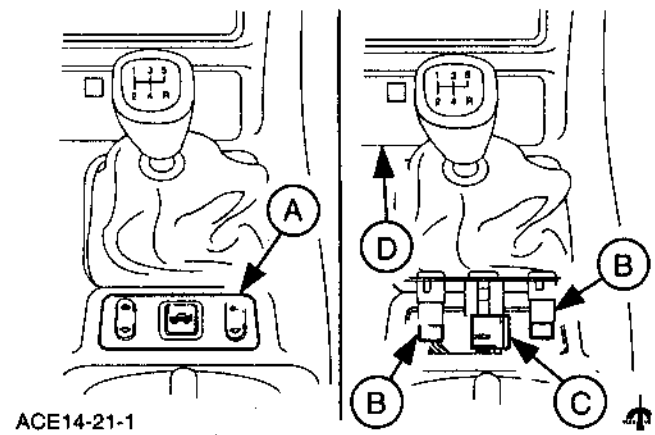

Fig.74. Switch cover.

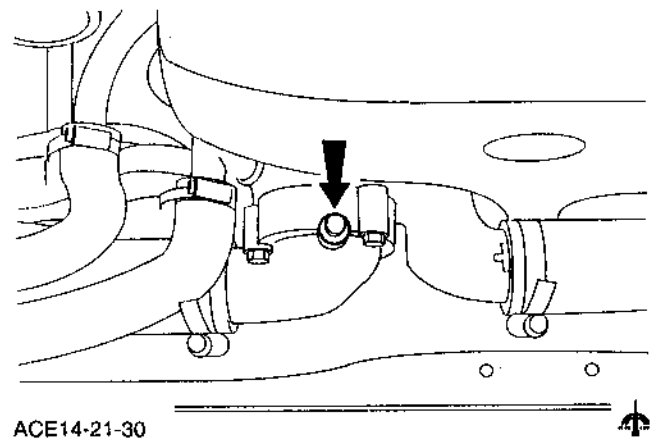

Fig.75. Cooling system bleed screw on thermostat housing.

0392

21 163 0 CYLINDER HEAD - REMOVE AND INSTALL

SPECIAL SERVICE TOOL RECOGNITION:

Socket wrench for cylinder head bolts .. 21-002
Toothed belt tension test gauge 21-113
Cylinder head locating studs 21-128

NOTE: The engine must always be allowed to cool down completely before removing the cylinder head with the turbocharger and inlet manifold.

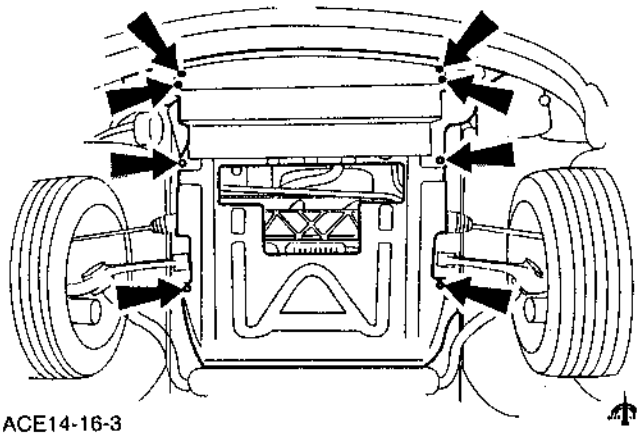

Fig.1. Retaining bolts of lower engine cover.

To Remove

1. Disconnect the battery earth cable.

2. Raise the vehicle.

3. Detach the lower engine cover from the side members (4 bolts) and the bodywork (5 bolts), Fig.1.

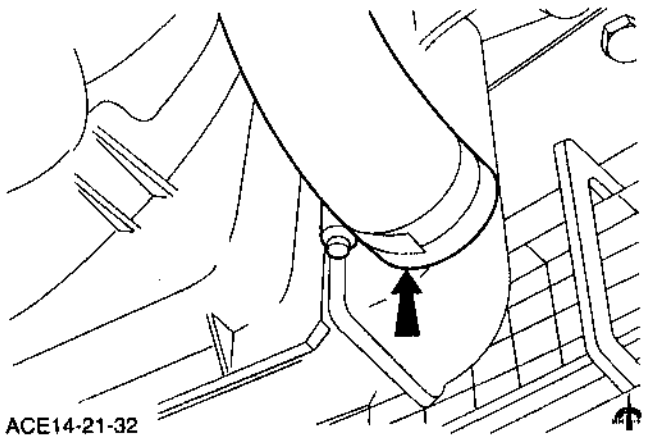

Fig.2. Lower coolant hose on radiator.

4. Position a clean collecting tray under the radiator. Disconnect the lower coolant hose from the radiator, Fig.2, and drain off the coolant.

5. Lower the vehicle to the ground.

6. Disconnect the multiplug of the HEGO sensor and unclip the wiring, Fig.3.

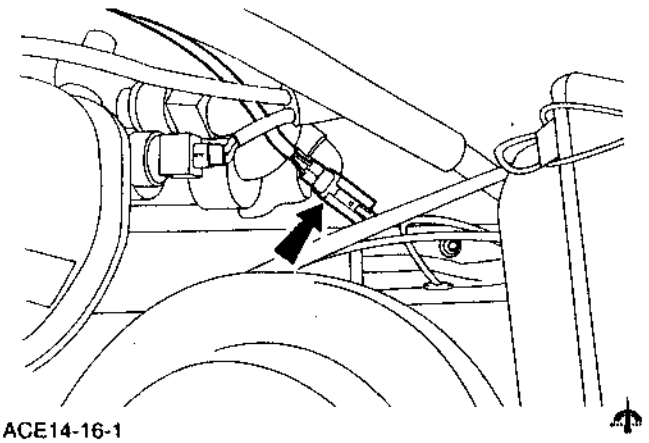

Fig.3. Multiplug of HEGO sensor.

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7. Detach the turbocharger heat shield from the bracket, air cleaner housing and fender (2 bolts, 1 nut in the wheelhouse), Fig.4.

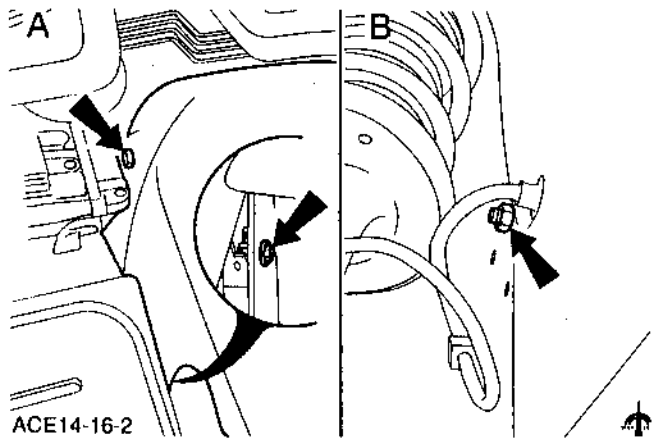

Fig.4. Fixture of turbocharger heat shield.
A - Bolts
B - Nut in wheelhouse

8. Release the air cleaner cover (4 clips). Disconnect the air hoses (2 clips) from the turbocharger and from the by-pass valve. Disconnect the vacuum pipe from the tee on the air plenum chamber, Fig.5. Remove the cover and take out the filter element.

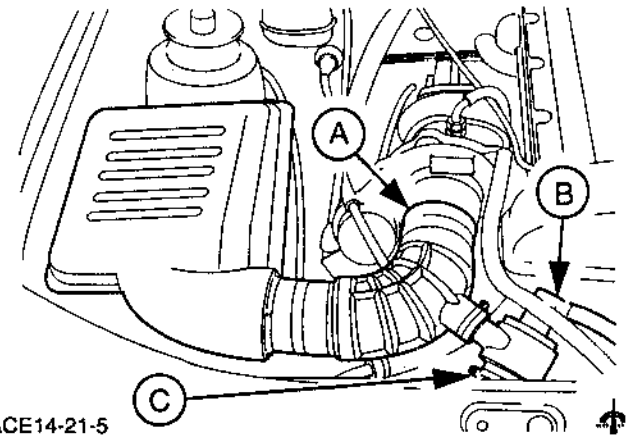

Fig.5. Air cleaner cover with air hoses/vacuum pipe.
A - To turbocharger
B - To air plenum chamber
C - To by-pass valve

9. Disconnect the engine breather pipe from the air cleaner housing and from the connecting hose, Fig.6. Remove the pipe.

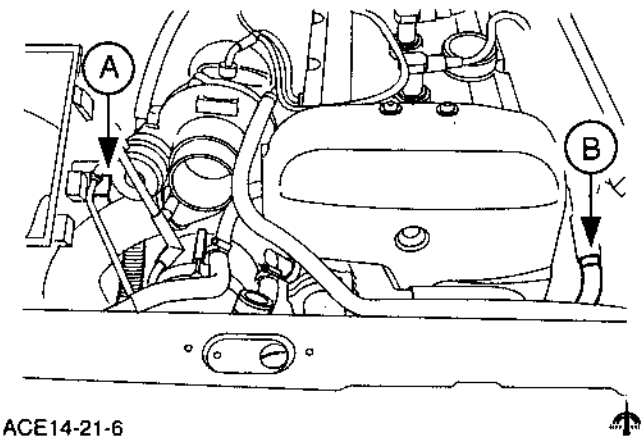

Fig.6. Engine breather pipe.
A - To air cleaner housing
B - To connecting hose

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10. Disconnect the air pipes from the air cleaner housing and from the turbocharger tee (1 clip), Fig.7.(A,C).

Fig.7. Pipes/hoses.
A - To air cleaner housing
B - To turbocharger
C - To turbocharger tee
D - Lower turbocharger air hose

11. Disconnect the lower air hose from the turbocharger, Fig.7.(D).

12. Disconnect the coolant hose from the connecting pipe/turbocharger, Fig.7.(B).

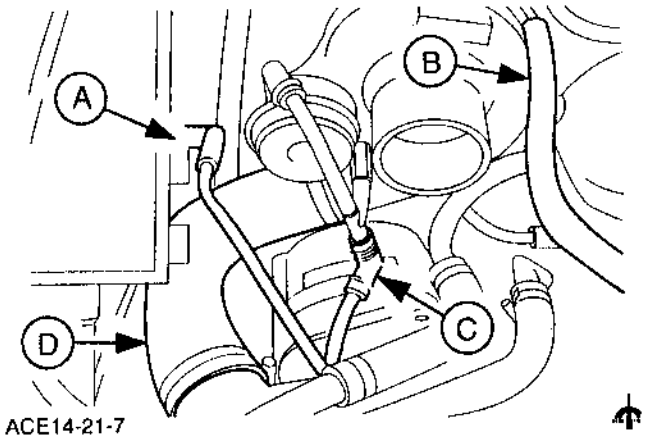

Fig.7. Pipes/hoses.

13. Disconnect the coolant hose running to the bottom of the radiator from the thermostat housing and remove it.

Disconnect the coolant hoses from the heater pipe and the thermostat housing, Fig.8.

Fig.8. Coolant hoses.
A - From intercooler to heater pipe
B - From intercooler to thermostat housing
C - From top of radiator to thermostat housing
D - From bottom of radiator to thermostat housing

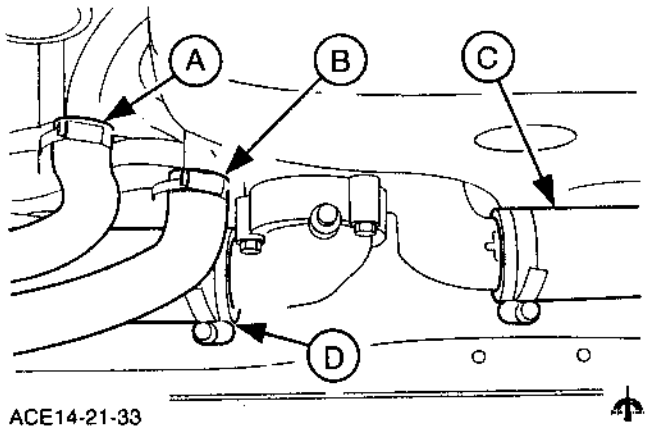

Fig.8. Coolant hoses.

14. Disconnect the upper coolant hose from the heater radiator, Fig.9.

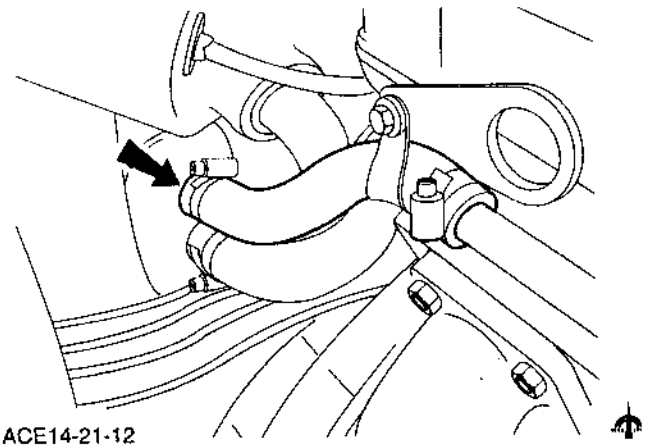

Fig.9. Upper coolant hose to heater radiator.

15. Release the upper hose clip on the coolant hose between the thermostat housing and the water pump, Fig.10.(A).

Fig.10. Hose clips on coolant hose and oil return hose.
A - Upper clip on coolant hose between thermostat housing and water pump
B - Clip on turbocharger oil return hose

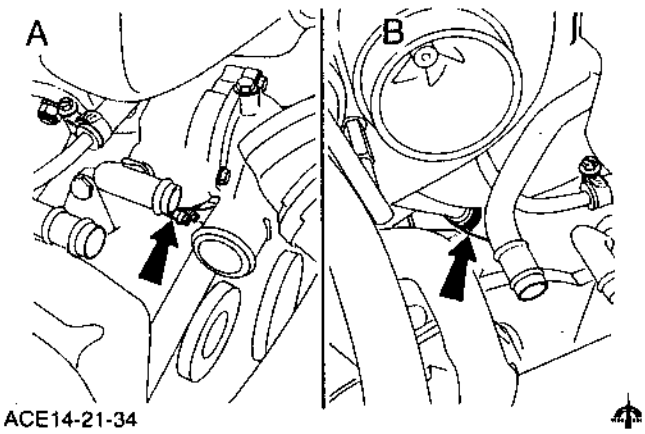

Fig.10. Hose clips on coolant hose and oil return hose.

16. Slide the clip on the turbocharger oil return hose Fig.10.(B), down the hose.

17. Detach the throttle cable from the throttle linkage (1 clip).
Remove the clip on the bracket.
Compress the 2 lugs of the retainer and withdraw the throttle cable from the bracket, Fig.11.

Fig.11. Throttle cable.
A - Attached
B - Detached
C - Clip pulled out
D - Lug of retainer
E - Clip on throttle linkage

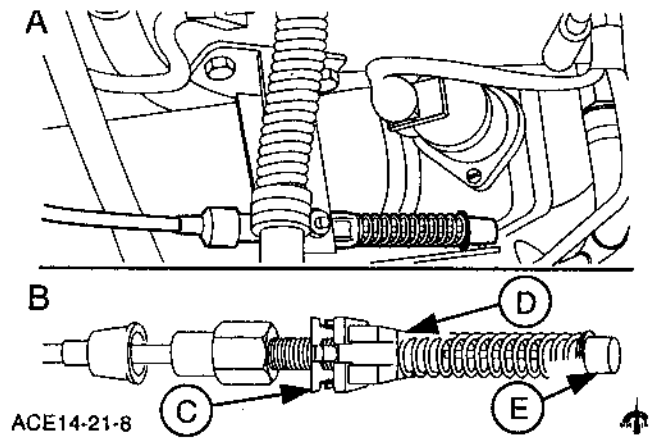

Fig.11. Throttle cable.

18. Disconnect the air hose from the intercooler and from the throttle housing (2 clips) and remove it, Fig.12.

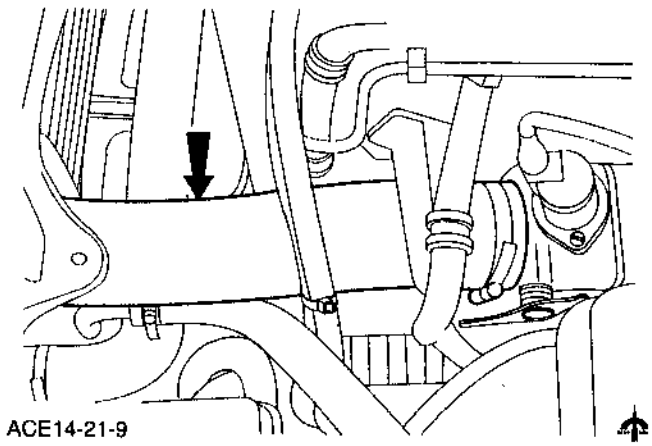

Fig.12. Air hose from intercooler to throttle housing.

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19. Detach the wiring loom from the air plenum chamber (1 bolt), Fig.13.

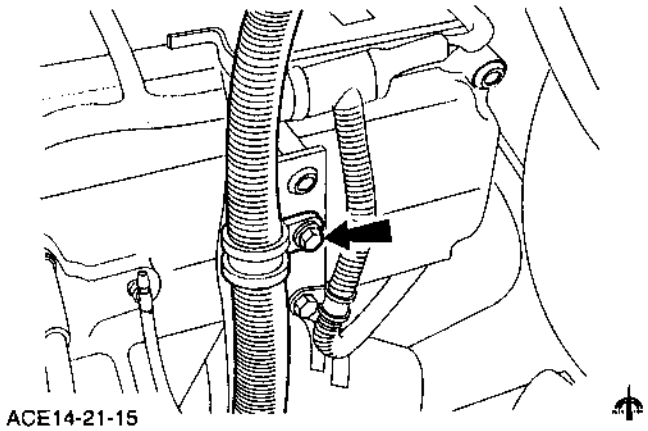

Fig.13. Retaining bolt of wiring loom.

20. Disconnect the multiplug of the distributor (DTR). Disconnect the multiplugs of the knock sensor (KS) and the engine speed/TDC sensor (EST), Fig.14.

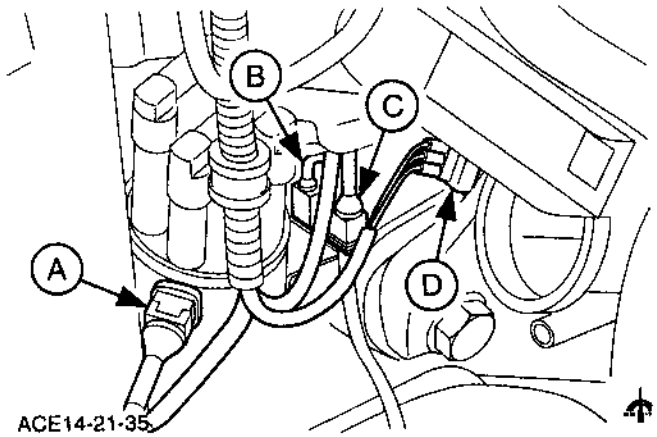

Fig.14. Multiplugs.
A - DTR C - EST
B - KS D - TPS

21. Disconnect the multiplug of the engine coolant temperature sensor (ECT), Fig.15.

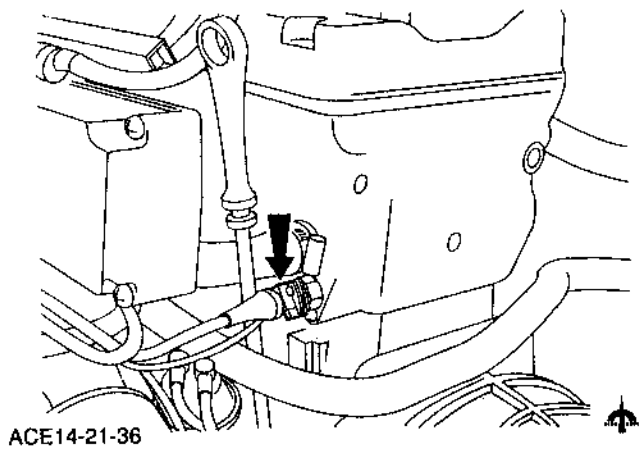

Fig.15. Multiplug of ECT.
(shown with engine removed)

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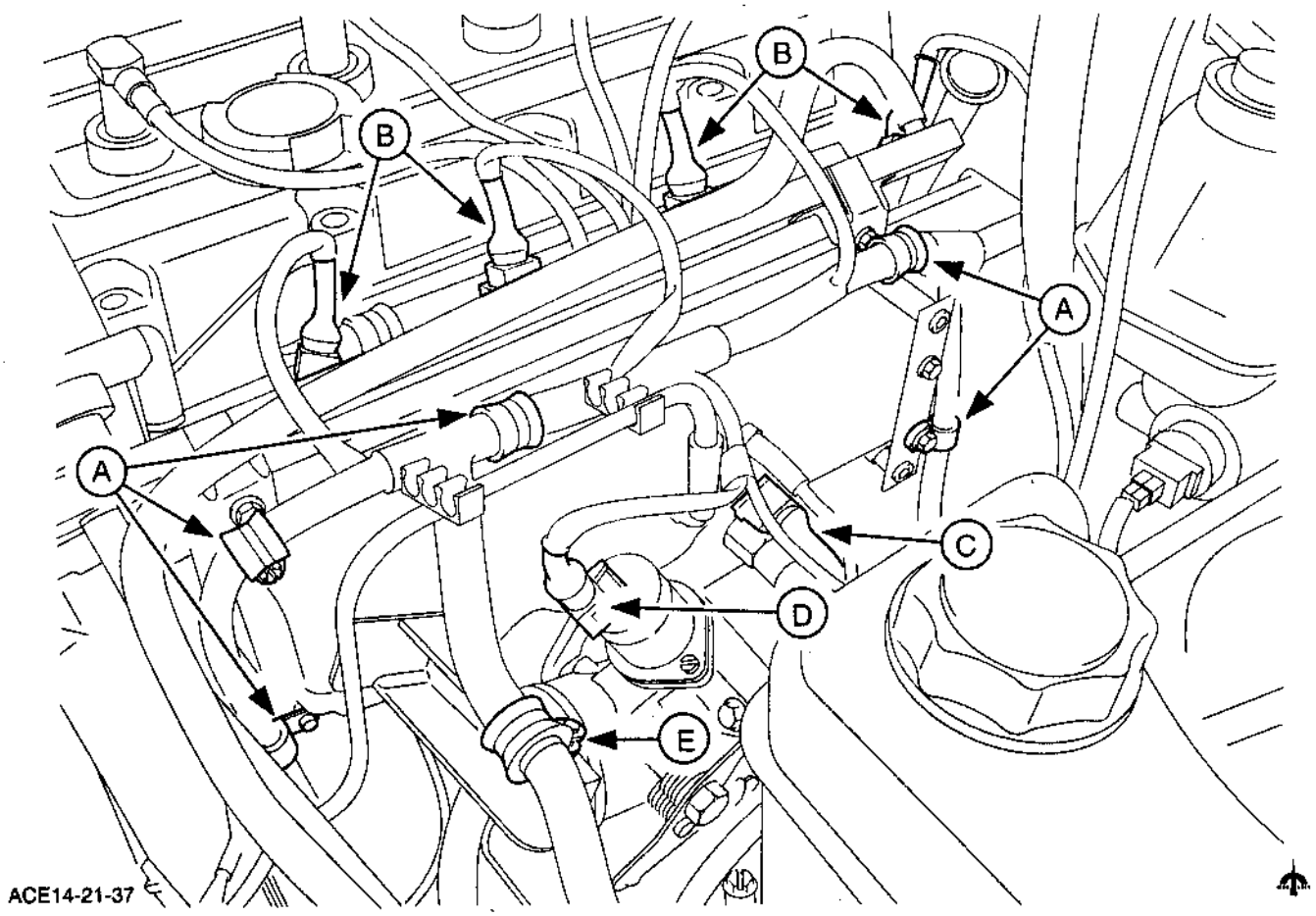

Fig.16. Multiplugs/wiring loom fixture.
A - Clips with screws
B - Multiplug - INJ
C - Multiplug - ACT
D - Multiplug - ISC
E - Clip with nut

22. Detach the wiring loom (5 clips with screws, 1 clip with a nut), Fig.16.(A,E).

23. Disconnect the multiplugs of the injectors (INJ), the air charge temperature sensor (ACT) and the idle speed control valve (ISC), Fig.16.(B,C,D).

24. Compress the lugs of the quick-release couplings on the fuel feed and return hoses and disconnect the hoses from the fuel pipes, Fig.17.

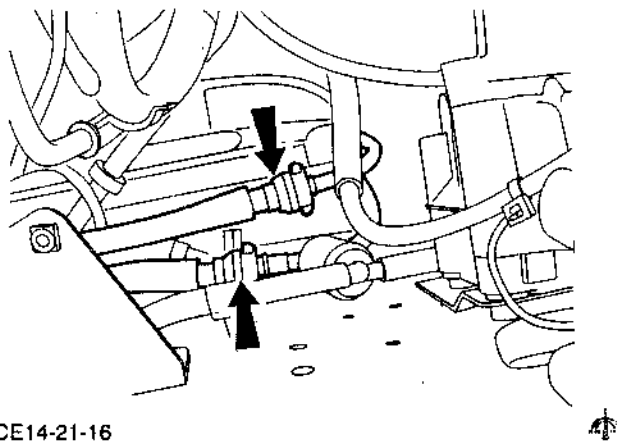

Fig.17. Quick-release couplings connecting fuel hoses to fuel pipes.
(RHD variant shown)

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25. Remove the oil dipstick and detach the bracket of the oil dipstick tube from the cylinder head (1 bolt), Fig.18.(A,C).

26. Disconnect the coolant hose to the oil cooler from the cylinder head, Fig.18.(B).

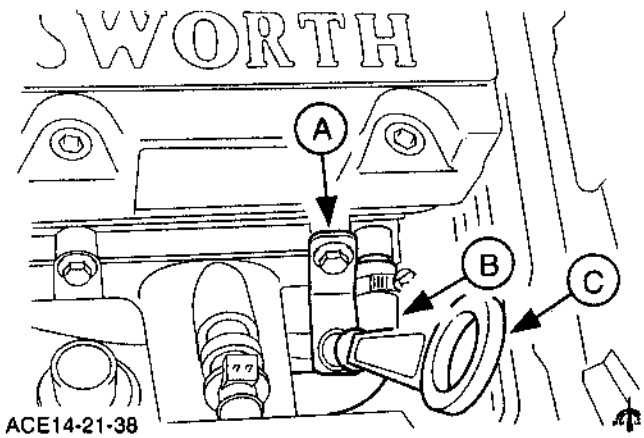

Fig.18. A - Bracket of oil dipstick tube
B - Coolant hose to oil cooler
C - Oil dipstick

27. Loosen the self-locking nut on the throttle housing vibration damper, Fig.19. Unscrew and remove the nut on the engine mounting bracket (on the left-hand side).

Fig.19. Throttle housing vibration damper.
A - Nut on engine mounting bracket
B - Self-locking nut with spring washers

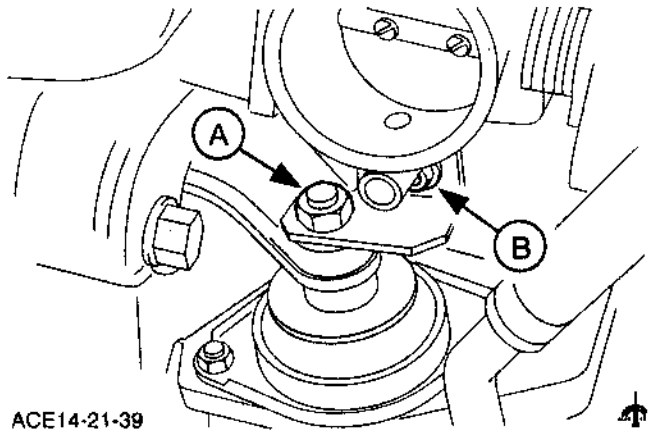

Fig.19. Throttle housing vibration damper.

28. Disconnect the vacuum pipes/hose from the air plenum chamber, Fig.20.

Fig.20. Vacuum pipes/hose.
A - To MAP sensor
B - To interior
C - To carbon canister

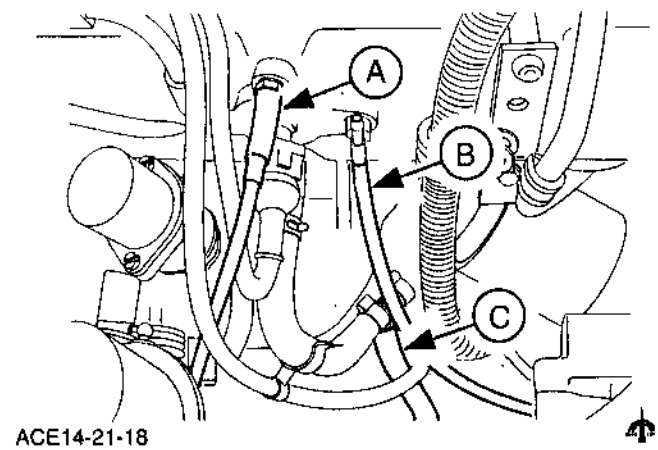

Fig.20. Vacuum pipes/hose.

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29. Disconnect the front exhaust pipe from the turbocharger (3 nuts), Fig.21.

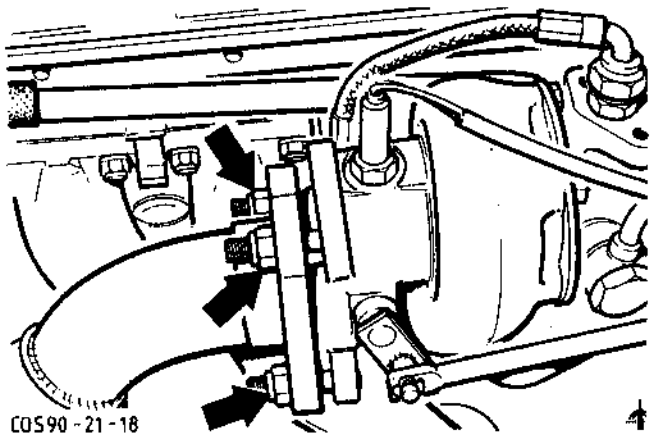

Fig.21. Retaining nuts of front exhaust pipe to turbocharger.

30. Detach the toothed belt cover from the cylinder head/cylinder block (3 Torx socket head bolts with washers, 1 hexagon bolt with a spacer sleeve), Fig.22.

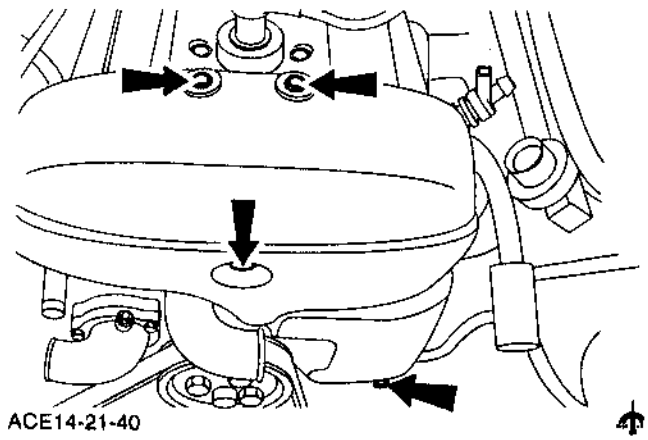

Fig.22. Retaining bolts of toothed belt cover.

31. Disconnect the high-tension leads from the spark plugs and remove the spark plugs. Disconnect the ignition coil lead from the distributor cap. Pull the high-tension leads and the rubber guide out of the high-tension lead bracket from below and remove the distributor cap with the rotor arm, Fig.23.

Fig.23. Distributor/leads.
A - Bracket for HT leads with rubber guide
B - Ignition coil lead
C - Distributor cap

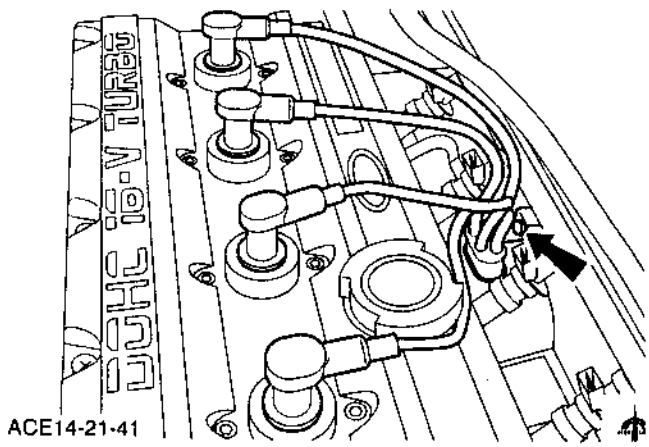

Fig.23. Distributor/leads.

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32. Using a proprietary socket wrench, turn the crankshaft in the normal direction of rotation until the 2 camshaft toothed belt pulleys are lined up on the TDC mark, Fig.24.

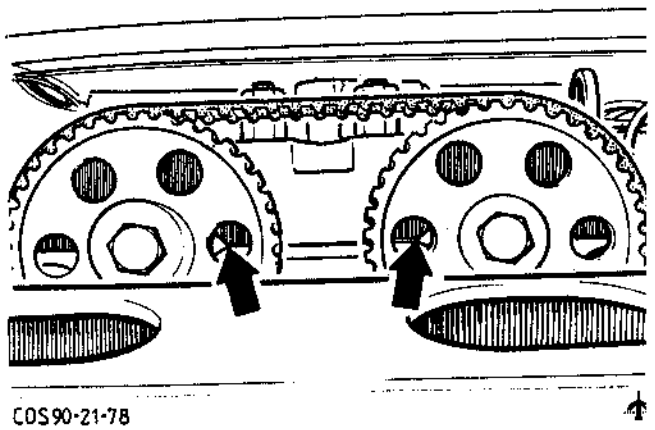

Fig.24. Camshaft toothed belt pulleys lined up on TDC mark.

33. Hold the eccentric and loosen the lock nut. Turn the eccentric and release the toothed belt, Fig.25.
Remove the toothed belt.

NOTE: Mark the direction in which the toothed belt goes round.

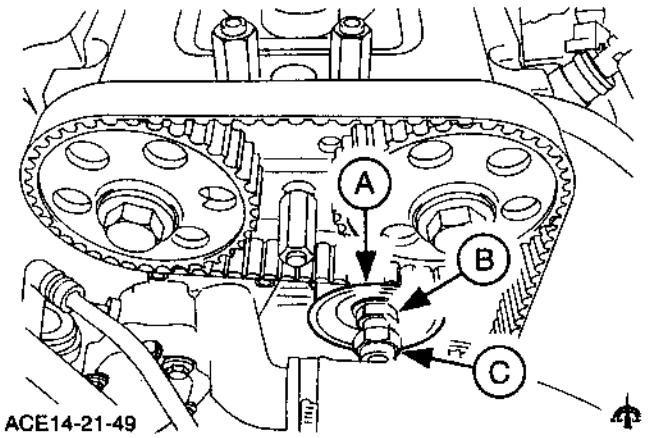

Fig.25. Toothed belt tensioning pulley.
A - Tensioning pulley C - Lock nut
B - Eccentric

34. Remove the cylinder head cover from the cylinder head (20 hexagon socket head bolts), Fig.26.

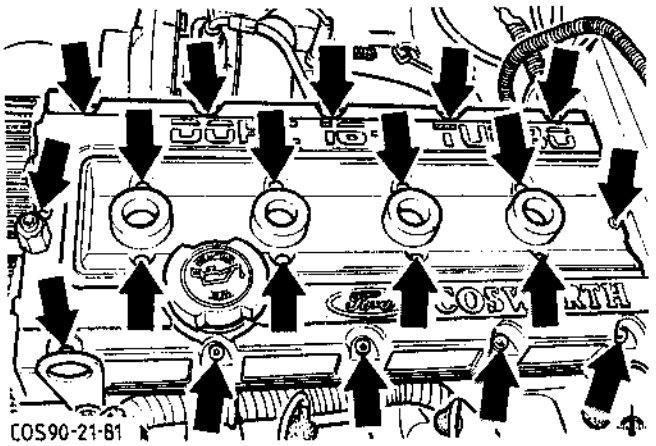

Fig.26. Retaining bolts of cylinder head cover.

35. Loosen the bolts of the engine lifting eyes, angle the engine lifting eyes towards the centre of the cylinder head and tighten the bolts again, Fig.28.(A).

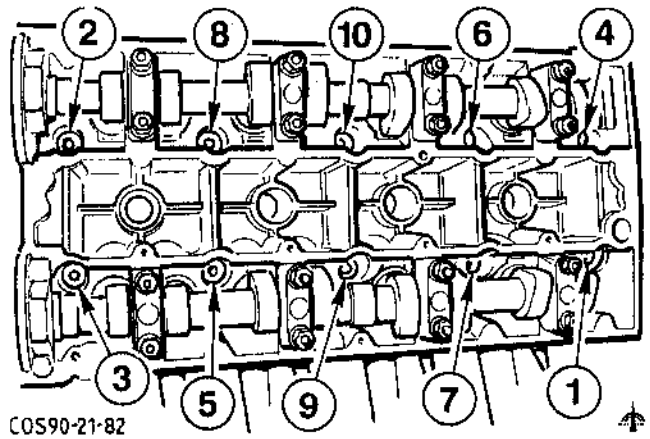

Fig.27. Cylinder head bolt loosening sequence.

36. Unscrew the 10 cylinder head bolts in the sequence indicated in the diagram using Special Tool 21-002 and remove them, Fig.27.

NOTE: The engine must have cooled down to below 45°C before the cylinder head bolts are undone.

37. Attach the hooks of the chain to the engine lifting eyes. Lift the cylinder head complete with the turbocharger and inlet manifold off the cylinder block using a hoist, Fig.28, disconnect the oil pipe from the turbocharger oil return hose, the thermostat housing connector from the coolant hose and the hose from the oil separator.

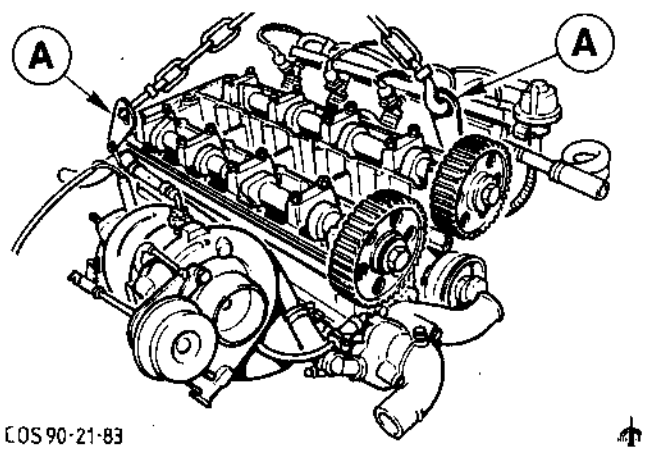

Fig.28. Cylinder head suspended and lifted clear. (Sierra shown)
A - Lifting eyes angled

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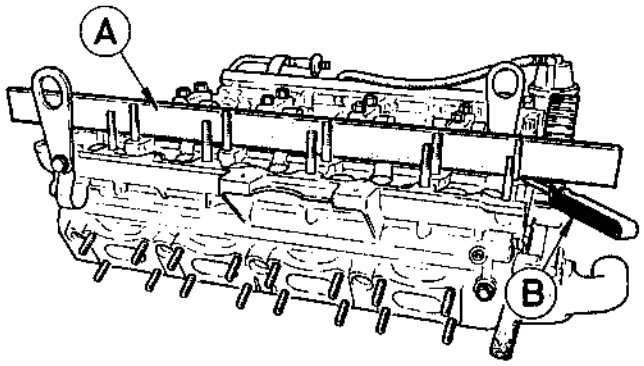
Check the cylinder head is flat and free of distortion

Whenever a cylinder head is removed, the faces mating with the cylinder block and cylinder head cover must always be checked as follows to ensure they are flat:

38. Carefully clean the face mating with the cylinder head cover. Lay a steel straight edge lengthwise along the centre line and check for flatness or convex distortion with a feeler gauge, Fig.29.

NOTE: If the distortion is more than 0,1 mm, the cylinder head has been overheated and cannot be used again. If the distortion is 0,1 mm or less, check the face mating with the cylinder block.

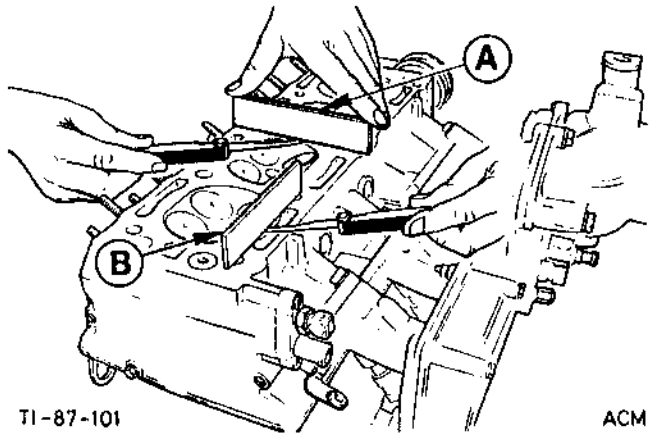


TI-87-100

Fig.29. Check face mating with cylinder head cover for flatness.
A - Steel straight edge
B - Feeler gauge

39. Carefully clean the mating face. Check for flatness in the transverse direction between the bolt holes (5 measurement points) using a 100 mm long steel straight edge, Fig.30.(A). Repeat the check in the longitudinal direction between the bolt holes (8 measuring points), Fig.30.(B).

NOTE: The maximum permissible tolerance is 0,02 mm.



TI-87-101 ACM

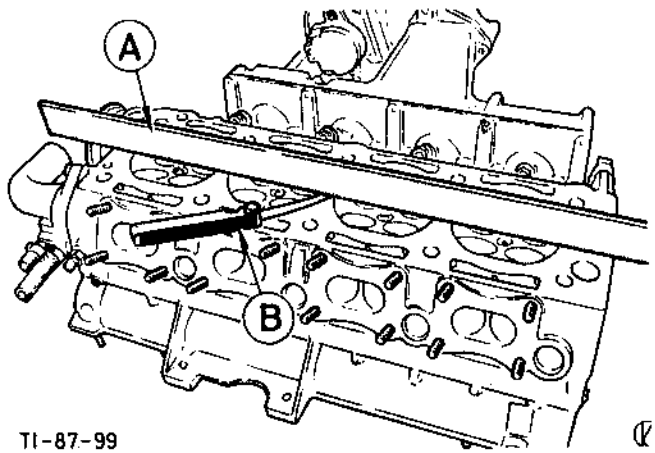
Fig.30. Check face mating with cylinder block for flatness.
A - Transversely
B - Longitudinally

40. Check for flatness or concave distortion along the centre line in the longitudinal direction, Fig.31.

NOTE: The maximum permissible tolerance is 0,08 mm.

If the maximum figures of 0,02 and 0,08 mm are exceeded, the mating face must be skimmed removing a maximum of 0,13 mm of material.

The minimum cylinder head height (distance between the 2 mating faces) must not be less than 138,68 mm.



TI-87-99

Fig.31. Measure distortion longitudinally.

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To Install

NOTE: When installing, tighten the nuts and bolts as specified in Technical Data. Make sure that the mating faces of the cylinder head/block and the new gasket are clean.

41. Screw the locating studs, Special Tools 21-128 into the threaded holes for the cylinder head bolts and fit the cylinder head gasket, Fig.32.(A,B).

42. Lift the cylinder head using a hoist and guide the corresponding holes in the cylinder head over the locating studs and lower the cylinder head onto the cylinder block.

NOTE: Guide the support bracket for the throttle housing vibration damper over the engine mounting bracket stud. Connect the turbocharger oil return hose to the oil pipe and secure it with a hose clip. Connect the thermostat housing to the coolant hose to the water pump and secure it with a hose clip. Connect the engine breather hose to the oil separator, Fig.32.(C,D,E,F).

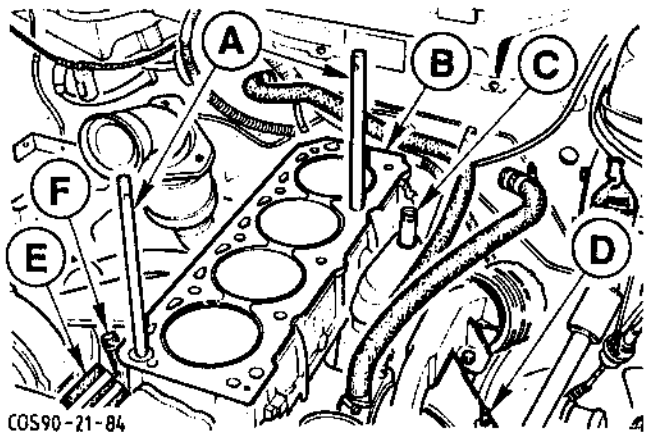

Fig.32. Cylinder head removed. (Sierra shown)
A - Special Tool 21-128
B - Cylinder head gasket
C - Oil separator connector
D - Engine mounting bracket stud
E - Coolant hose to water pump
F - Turbocharger oil return hose

43. Detach the hooks of the chain from the cylinder head lifting eyes and remove the hoist. Straighten the lifting eyes and tighten the bolts.

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44. Fit new cylinder head bolts and tighten finger tight. Remove the locating studs and replace them with the last 2 cylinder head bolts.

NOTE: Before inserting the cylinder head bolts, lubricate the U-shaped washers and the threads and undersides of the heads of the bolts with engine oil.

45. Tighten the cylinder head bolts in the specified sequence using Special Tool 21-002 (refer to Technical Data), Fig.33.

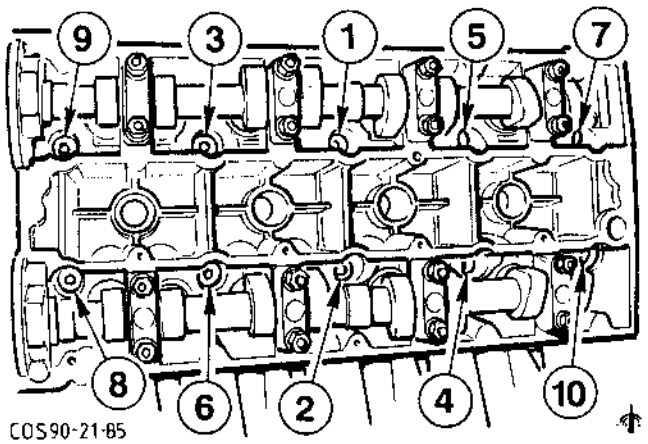

Fig.33. Cylinder head bolt tightening sequence.

46. Then tighten the cylinder head bolts a further 180° ± 10° in the same sequence using Special Tool 21-002 and a proprietary angle gauge and note the tightening torque obtained, Fig.34.

NOTE: A tightening torque of less than 115 Nm is not acceptable. Bolts with such a torque must be replaced. When all the bolts have been tightened, make sure than none of the bolts will turn any more applying a torque of 110 Nm.

Fig.34. Re-torque cylinder head bolts.
A - Torque wrench
B - Proprietary angle gauge
C - Special Tool 21-002

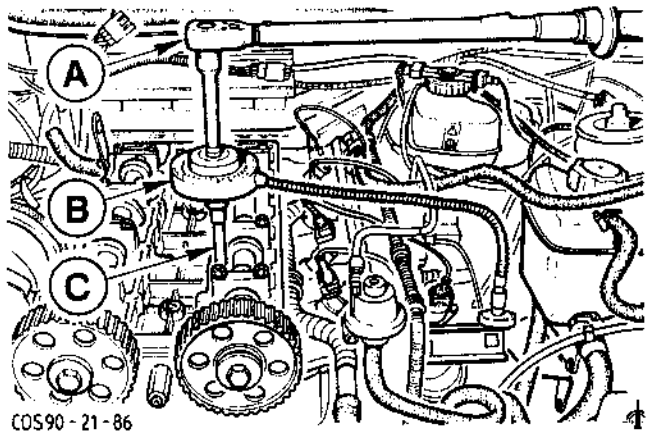

Fig.34. Re-torque cylinder head bolts.
(Sierra shown)

47. Check that the crankshaft vibration damper/belt pulley is in the TDC position, Fig.35.

Fig.35. Crankshaft vibration damper/belt pulley in TDC position.
A - Mark on cylinder block
B - Cam on belt pulley
C - Notch in belt pulley

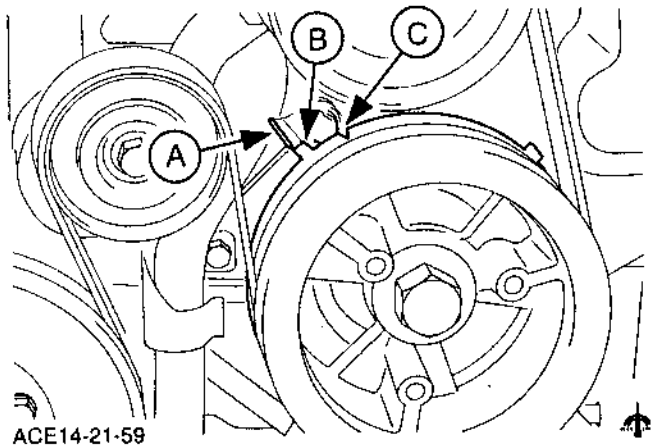

Fig.35. Crankshaft vibration damper/belt pulley in TDC position.
(shown with engine removed)

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48. Turn the 2 camshaft toothed belt pulleys to the TDC position, Fig.36.

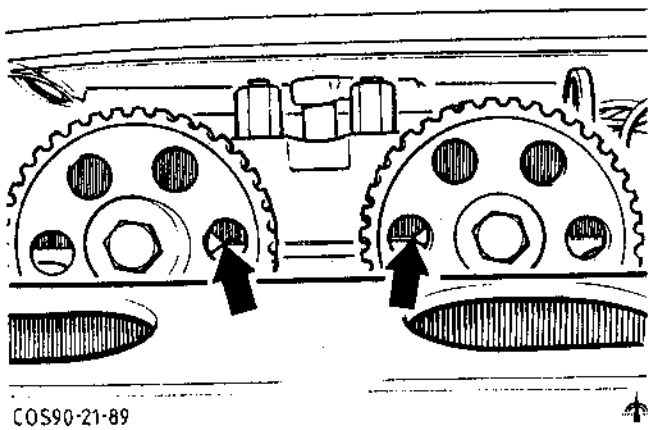

COS90-21-89

Fig.36. Camshaft toothed belt pulleys in TDC position.

49. Align the distributor on the TDC mark. The distributor rotor arm must line up with the mark, Fig.37.

50. Fit the toothed belt in an anti-clockwise direction, starting at the distributor shaft.

NOTE: Make sure the toothed belt goes round in the right direction.

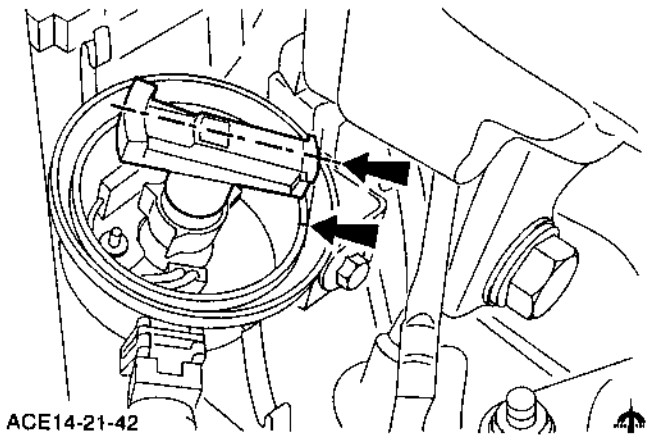

ACE14-21-42

Fig.37. Distributor in TDC position.

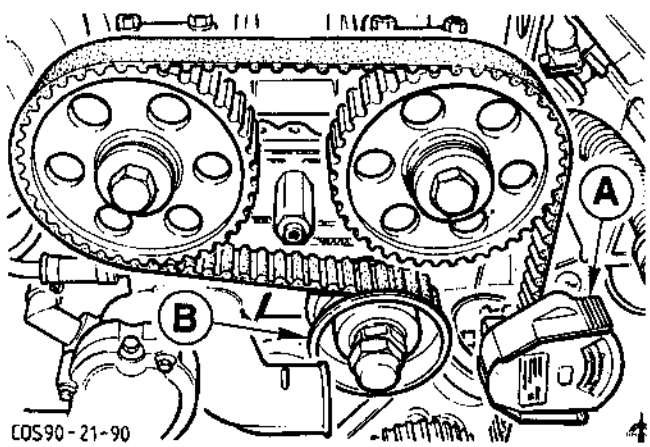
51. Adjust the toothed belt tension as follows:

- Turn the toothed belt tensioning pulley clockwise towards the toothed belt by hand and tighten the lock nut of the toothed belt tensioning pulley.
- Turn the engine several revolutions in the normal direction of rotation and then turn it back 1 complete revolution to the TDC position.

NOTE: Do not turn it beyond the TDC position.

Check the toothed belt tension at the longest span of the toothed belt using Special Tool 21-113, Fig.38.
If necessary, adjust the toothed belt tensioning pulley until the specified tension (refer to Technical Data) is obtained.

Re-check the toothed belt tension and the TDC positions and if necessary repeat the tensioning procedure.



COS90-21-90

Fig.38. Tension toothed belt.
A - Special Tool 21-113
B - Toothed belt tensioning pulley

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52. Place the cylinder head cover gasket on the cylinder head and the 2 rubber gaskets on the front camshaft bearing caps.

53. Fit the cylinder head cover, insert the 20 hexagon socket head bolts and tighten them.

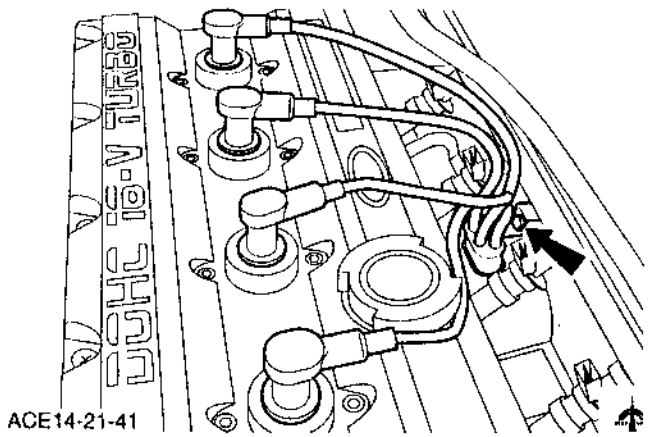

Fig.39. Distributor and leads.

54. Fit the high-tension leads and the rubber guide in the high-tension lead bracket.
Fit the distributor cap with the rotor arm.
Connect the ignition coil lead to the distributor cap, Fig.39.
Fit the spark plugs.
Connect the high-tension leads to the spark plugs.

Fig.39. Distributor/leads
A - Bracket for HT leads with and rubber guide
B - Ignition coil lead
C - Distributor cap

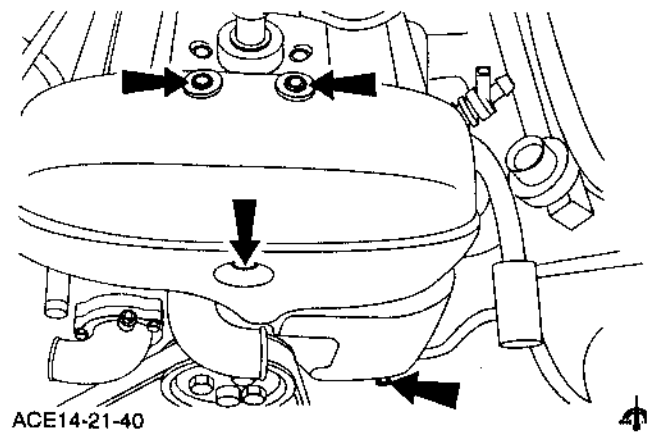

Fig.40. Retaining bolts of toothed belt cover.

55. Fit the toothed belt cover to the cylinder head and block, Fig.40.

56. Connect the front exhaust pipe to the turbocharger, Fig.41.

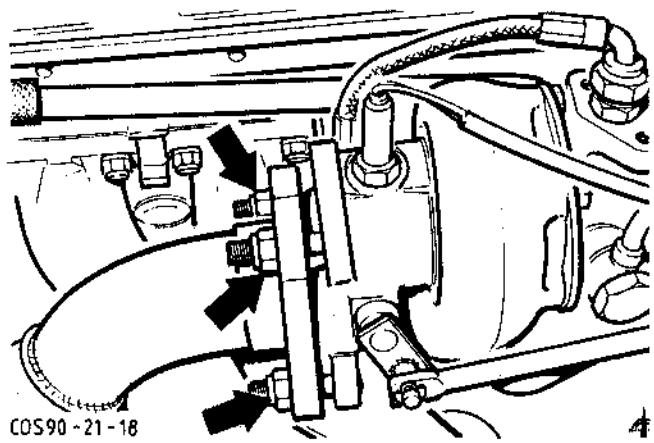

Fig.41. Retaining nuts of front exhaust pipe to turbocharger.

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57. Connect the vacuum pipes/hose to the air plenum chamber, Fig.42.

Fig.42. Vacuum pipes/hose.
A - To MAP sensor
B - To interior
C - To carbon canister

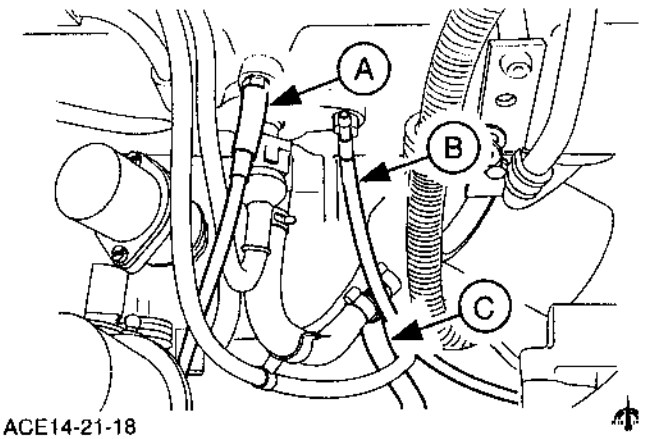

Fig.42. Vacuum pipes/hose.

58. Fit a new self-locking nut on the throttle housing vibration damper but do not tighten it.
Tighten the nut on the engine mounting bracket.
Tighten the self-locking nut to a torque of 8 to 10 Nm and then slacken it half a turn, Fig.43.(A,B).

NOTE: Make sure the spring washers are fitted correctly, Fig.43.(C).

Fig.43. Throttle housing vibration damper.
A - Nut on engine mounting bracket
B - Self-locking nut
C - Arrangement of spring washers

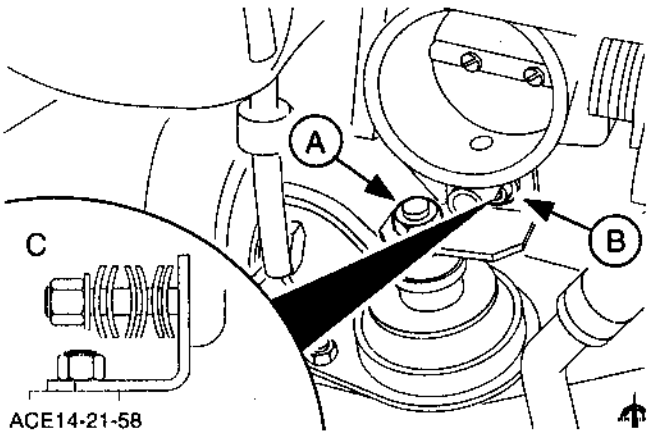

Fig.43. Throttle housing vibration damper.

59. Connect the coolant hose from the oil cooler to the cylinder head, Fig.44.(B).

60. Fit the bracket of the oil dipstick tube to the cylinder head and insert the oil dipstick, Fig.44.(A,C).

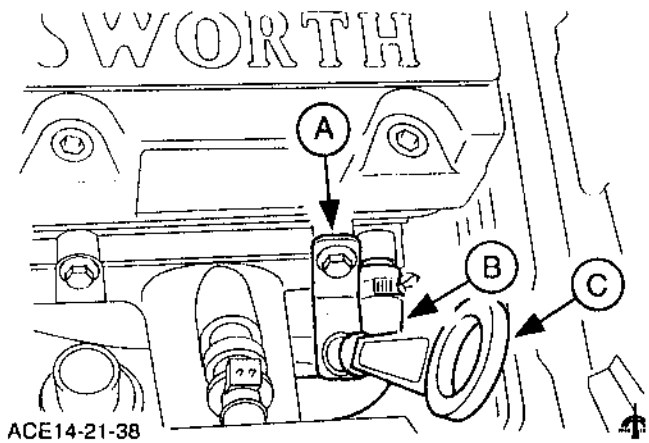

Fig.44. A - Bracket of oil dipstick tube
B - Coolant hose to oil cooler
C - Oil dipstick

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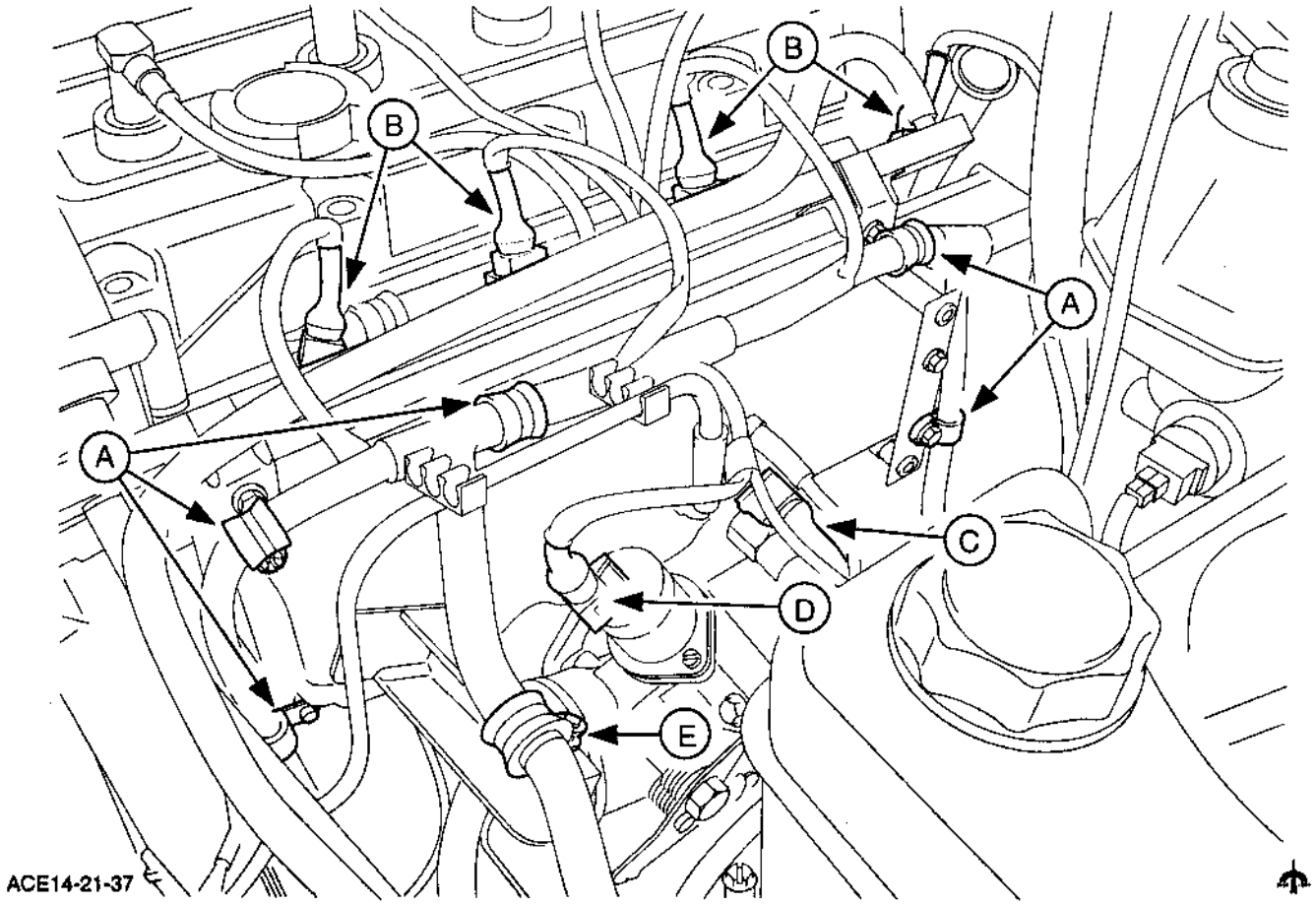

Fig.45. Multiplugs/wiring loom fixture.
A - Clips with screws
B - Multiplug - INJ
C - Multiplug - ACT
D - Multiplug - ISC
E - Clip with nut

61. Connect the multiplugs of the injectors (INJ), air charge temperature sensor (ACT) and idle speed control valve (ISC), Fig.45.(B,C,D).

62. Secure the wiring loom (5 clips with bolts, 1 clip with a nut), Fig.45.(A,E).

63. Connect the quick-release couplings of the fuel hoses/pipes, Fig.46.

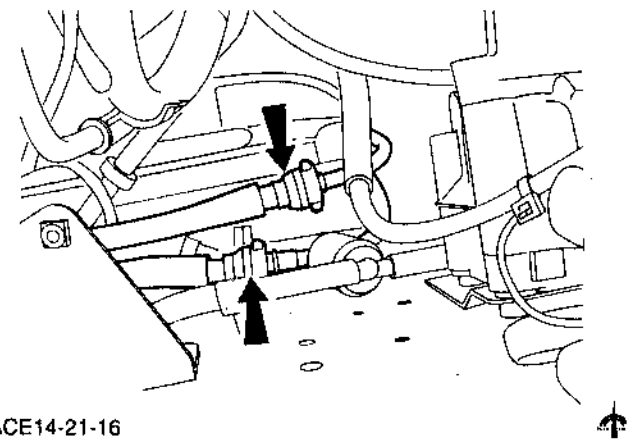

Fig.46. Quick-release couplings of fuel hoses/pipes.
(RHD variant shown)

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64. Connect the multiplug of the engine coolant temperature sensor (ECT), Fig.47.

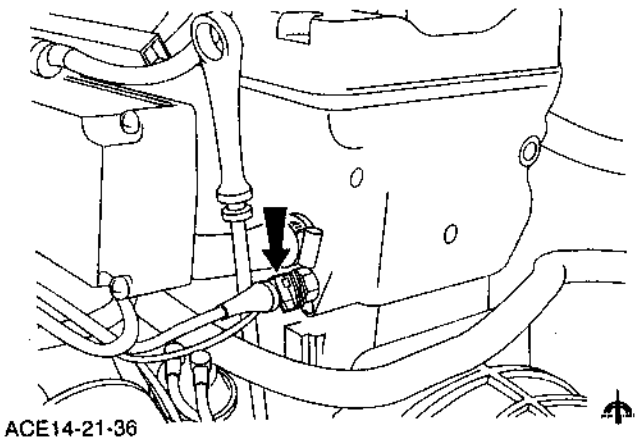

Fig.47. Multiplug of ECT.
(shown with engine removed)

65. Connect the distributor multiplug (DTR). Connect the multiplug of the knock sensor (KS) and the engine speed/TDC sensor (EST), Fig.48.

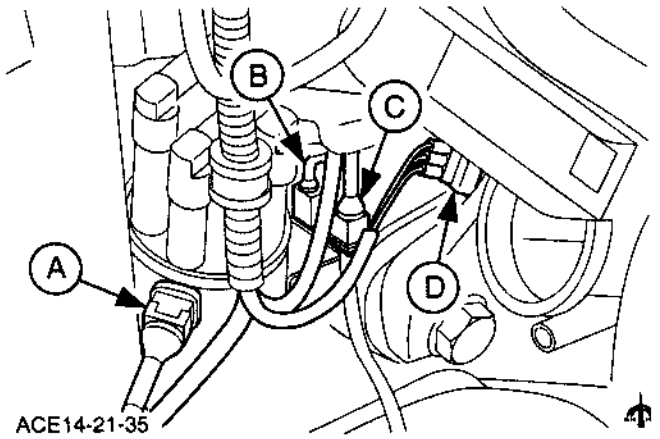

Fig.48. Multiplugs.
A - DTR
B - KS
C - EST
D - TPS

66. Secure the wiring loom to the air plenum chamber (1 bolt), Fig.49.

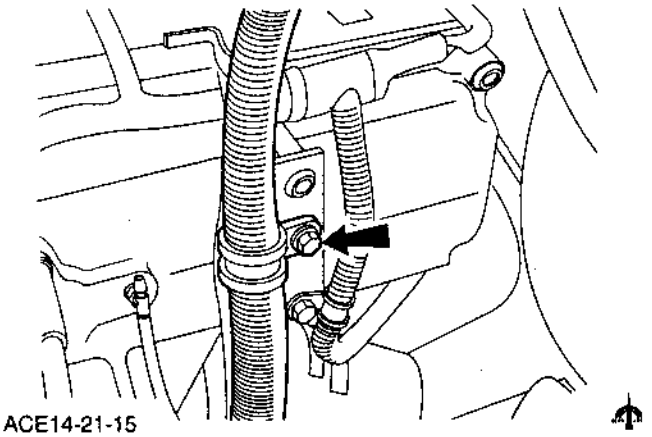

Fig.49. Wiring loom retaining bolt.

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67. Connect the air hose to the intercooler and to the throttle housing (2 clips), Fig.50.

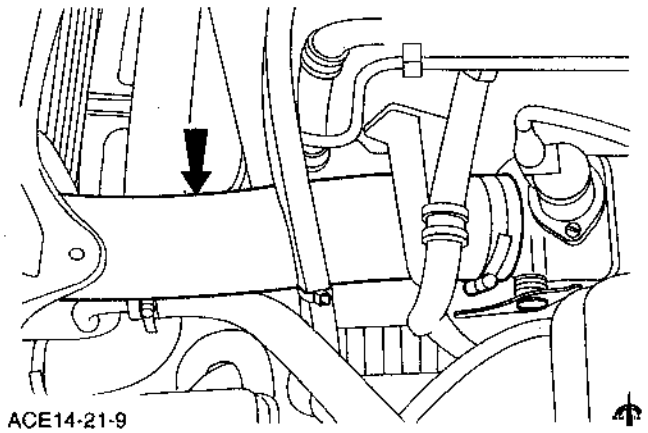

Fig.50. Air hose from intercooler to throttle housing.

68. Guide the throttle cable into the bracket, engage the lugs of the retainer, attach the cable to the throttle linkage and secure it with 2 clips, Fig.51.

Fig.51. Throttle cable.
A - Attached
B - Detached
C - Clip pulled out
D - Lug of retainer
E - Clip on throttle linkage

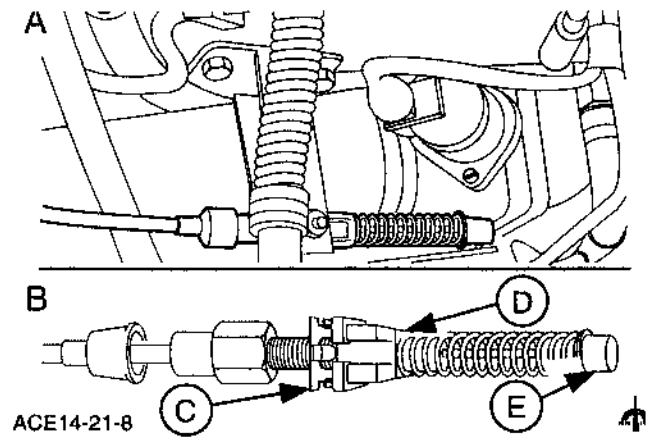

Fig.51. Throttle cable.

69. Connect the upper coolant hose to the heater radiator, Fig.52.

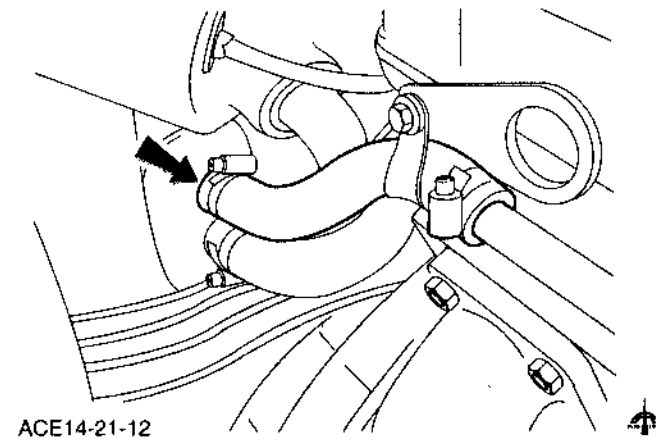

Fig.52. Upper coolant hose to heater radiator.

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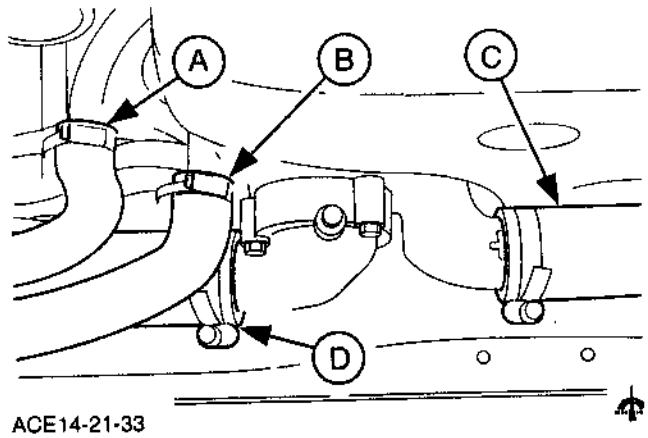
70. Connect the coolant hose running from the bottom of the radiator to the thermostat housing.

    Connect the coolant hoses to the heater pipe and to the thermostat housing, Fig.53.

    Fig.53. Coolant hoses.
    A - From intercooler to heater pipe
    B - From intercooler to thermostat housing
    C - From top of radiator to thermostat housing
    D - From bottom of radiator to thermostat housing



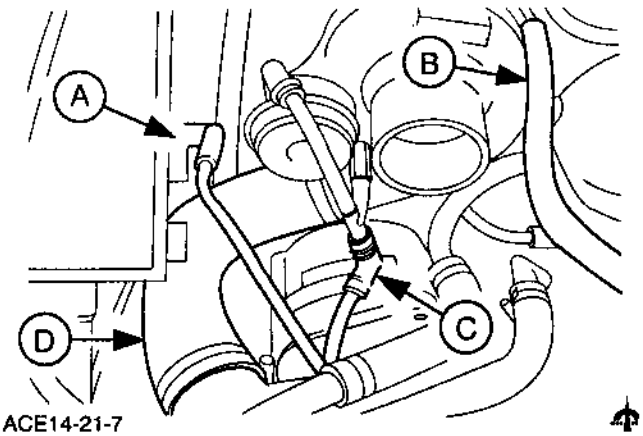
ACE14-21-33

Fig.53. Coolant hoses.

71. Connect the coolant hose to the connecting pipe/turbocharger, Fig.54.(B).

    Fig.54. Pipes/hoses.
    A - To air cleaner housing
    B - To turbocharger
    C - To turbocharger tee
    D - Turbocharger lower air hose

72. Connect the lower air hose to the turbocharger, Fig.54.(D).

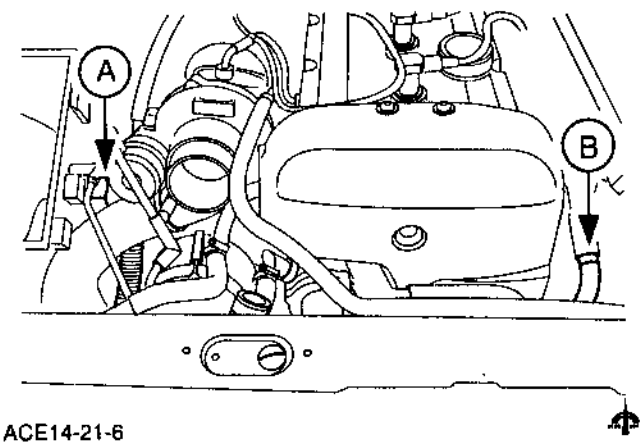


ACE14-21-7

Fig.54. Pipes/hoses.

73. Connect the air pipes to the air cleaner housing and to the turbocharger tee, Fig.54.(A,C).

74. Locate the engine breather pipe in position. Connect the pipe to the air cleaner housing and the connecting hose, Fig.55.



ACE14-21-6

Fig.55. Engine breather pipe.
A - To air cleaner housing
B - To connecting hose

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75. Fit the air cleaner element.
Fit the air cleaner cover and secure it.
Connect the air hoses to the turbocharger and to the by-pass valve.
Route the vacuum pipes and connect them to the tee on the air plenum chamber, Fig.56.

Fig.56. Air cleaner cover with air pipes/vacuum pipes.
A - To turbocharger
B - To air plenum chamber
C - To by-pass valve

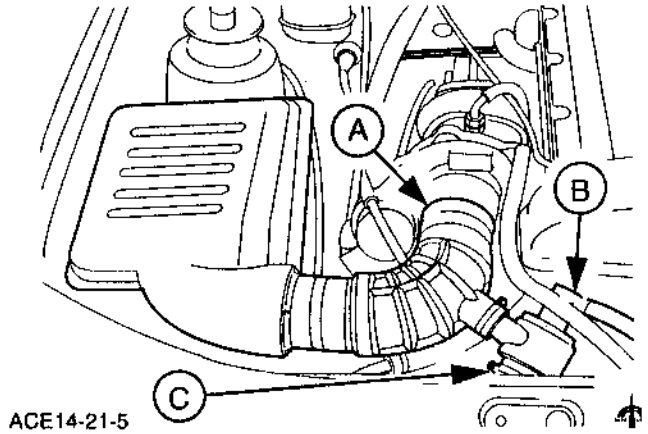

Fig.56. Air cleaner cover with air hoses/vacuum pipes.

76. Attach the turbocharger heat shield to the bracket on the air cleaner housing and the fender, Fig.57.

77. Connect the multiplug of the HEGO sensor and clip the wiring in place, Fig.58.

78. Connect the lower coolant hose to the radiator.

79. Connect the battery earth cable.

80. Fill the cooling system expansion tank up to the MAX mark (refer to Technical Data for coolant quantity and specification). Unscrew the bleed screw on the thermostat housing so that air can escape from the cooling system. Insert the bleed screw and tighten it.

NOTE: Pour in the coolant slowly so that air bubbles can escape.

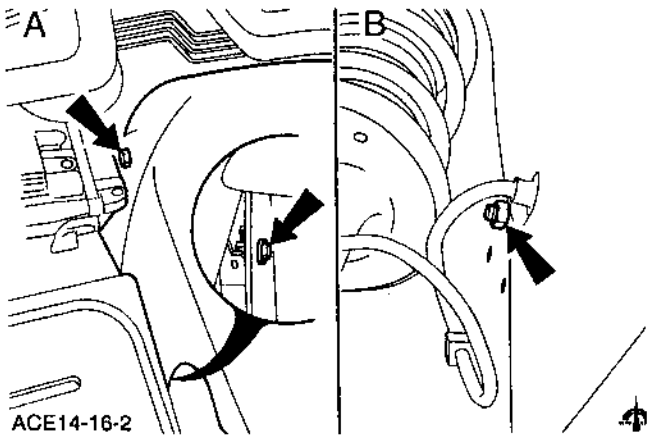

Fig.57. Fixture of turbocharger heat shield.
A - Bolts
B - Nut in wheelhouse

81. Check the engine oil level and top up as necessary (refer to Technical Data for quantity and specification).

82. Start the engine and run it up to normal operating temperature. Check all the coolant/oil hose connections for leaks and tighten as necessary. Top up with coolant or oil as necessary.

83. Check the engine tuning adjustments as specified at normal operating temperature and rectify as necessary.

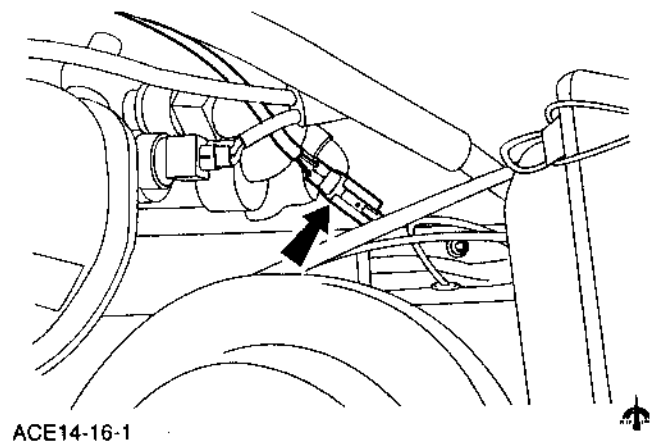

Fig.58. Multiplug of HEGO sensor.

84. Raise the vehicle. Fit the lower engine cover. Lower the vehicle to the ground.

0392

21 467 0 SEAL - CRANKSHAFT FRONT - REPLACE

SPECIAL SERVICE TOOLS REQUIRED:

Radial oil seal installer	21-009 B
Toothed belt pulley remover	21-028 A
Toothed belt tension test gauge ..	21-113
Radial oil seal remover	21-143
Belt pulley remover	21-153

To Remove

1. Disconnect the battery earth cable.

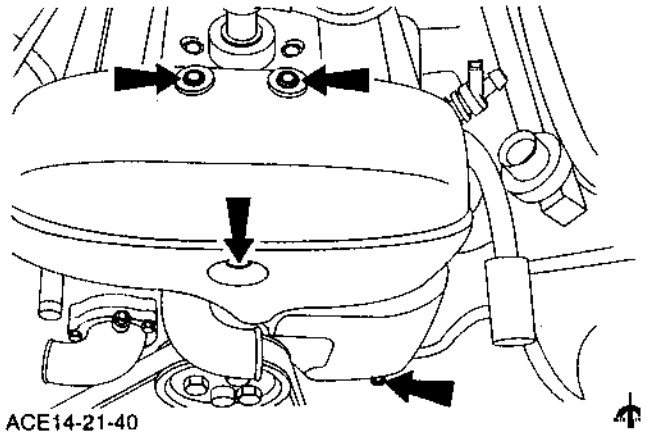

Fig.1. Retaining bolts of toothed belt cover.

2. Detach the toothed belt cover from the cylinder head/block (3 Torx socket head bolts with washers, 1 hexagon bolt with a spacer sleeve), Fig.1.

3. Raise the vehicle.
   Detach the lower engine cover.

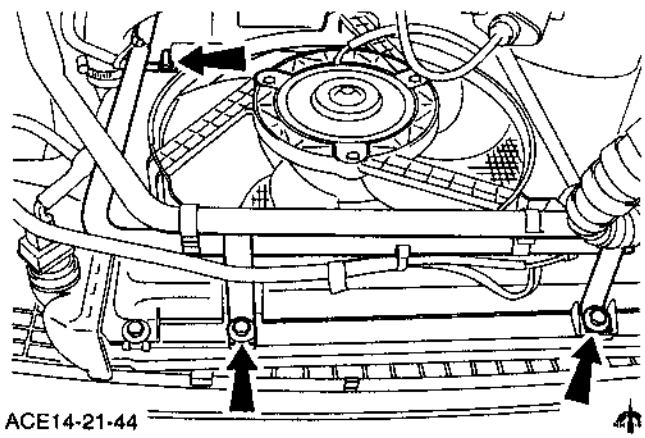

Fig.2. Fixture of coolant pipe brackets.

4. Detach the 3 coolant pipe brackets from the radiator (2 bolts, 1 nut), Fig.2.

5. Disconnect the 2 engine cooling fan multiplugs, Fig.3.

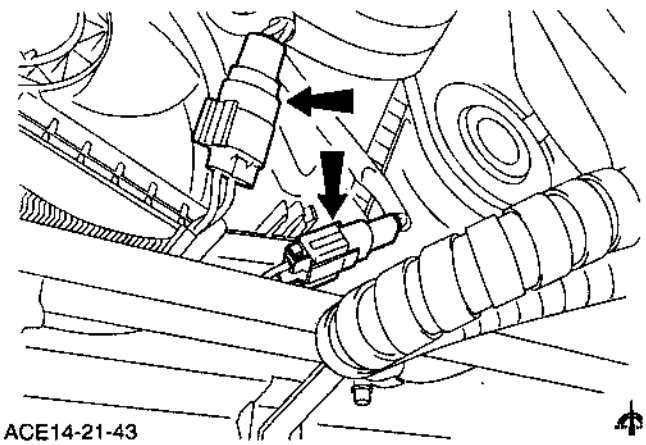

Fig.3. Multiplugs of engine cooling fan.

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6. Detach the radiator shroud with the fan motors from the radiator (4 bolts), Fig.4.

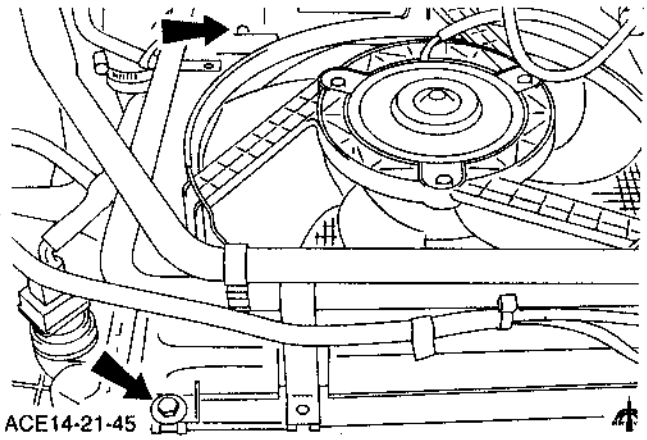

Fig.4. Fixture of radiator shroud.

7. Detach the radiator (2 bolts, 2 nuts), pull it forwards and tie it securely, Fig.5.

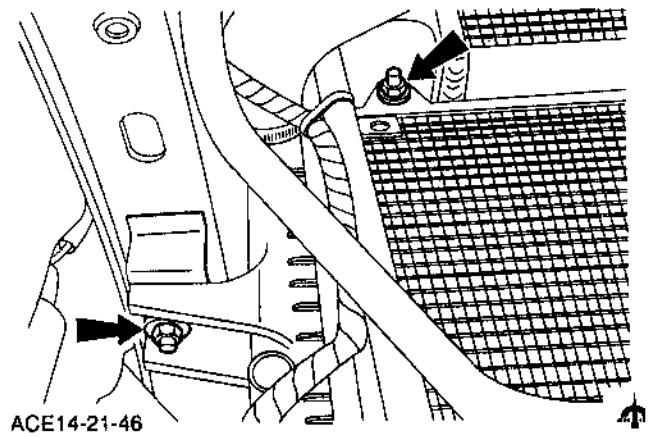

Fig.5. Fixture of radiator.

8. Release the retaining bolt of the crankshaft vibration damper/belt pulley.

NOTE: Screw in two M8 bolts and hold the pulley using a lever, Fig.6.

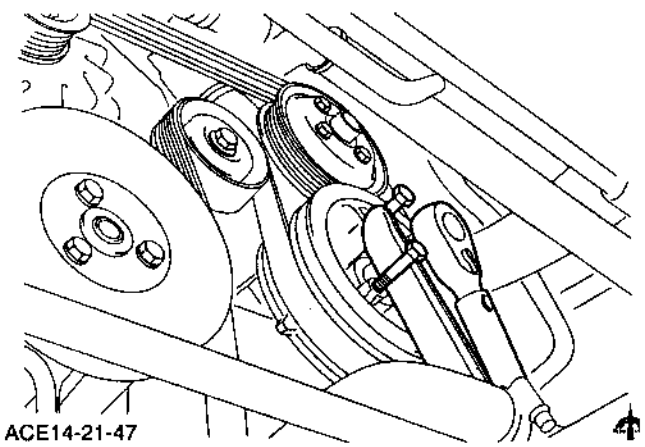

Fig.6. Release retaining bolt of crankshaft vibration damper/belt pulley.

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9. Back off the tensioner of the poly-V belt and remove the poly-V belt, Fig.7.

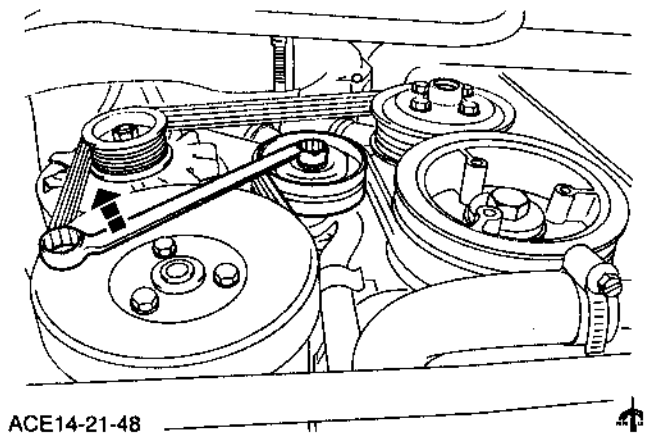

Fig.7. Back off tensioner of poly-V belt.

10. Lower the vehicle to the ground.

11. Using a proprietary socket wrench, turn the crankshaft in the normal direction of rotation until the 2 camshaft toothed belt pulleys line up on the TDC mark, Fig.8.

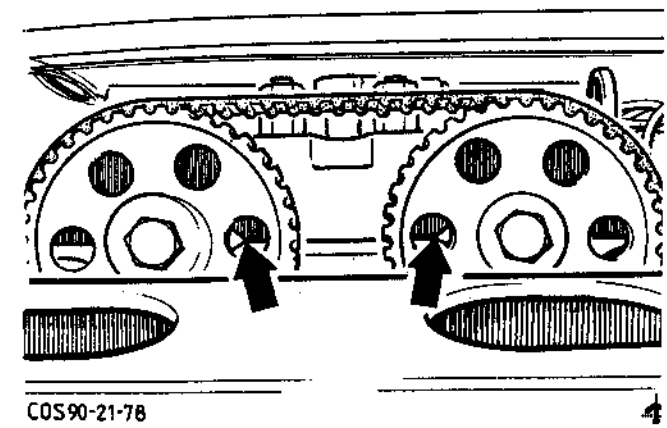

Fig.8. Camshaft toothed belt pulleys at TDC.

12. Hold the eccentric and release the lock-nut. Turn the eccentric and slacken the toothed belt, Fig.24. Remove the toothed belt.

NOTE: Mark the direction in which the toothed belt goes round.

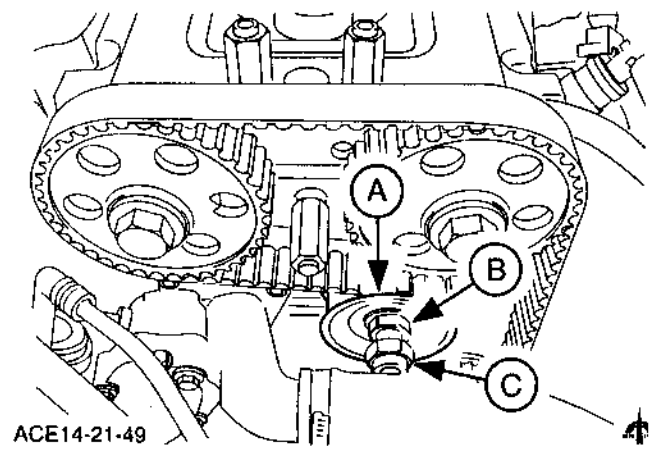

Fig.9. Toothed belt tensioning pulley.
A - Tensioning pulley
B - Eccentric
C - Lock nut

0392

13. Raise the vehicle.

14. Attach Special Tool 21-153 using three M8 bolts and pull off the crankshaft vibration damper/belt pulley, Fig.10.

NOTE: Towards the end of the removal operation, change the reversible ratchet handle for a ring spanner as otherwise the reversible ratchet handle will be impossible to remove.

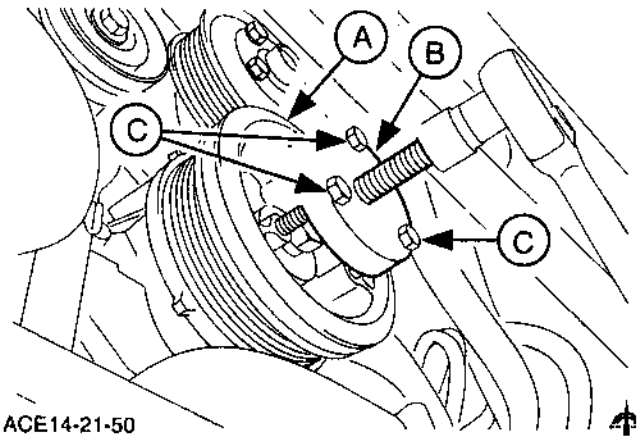

Fig.10. Pull off crankshaft vibration damper/belt pulley.
A - Crankshaft vibration damper/belt pulley
B - Special Tool 21-153
C - M8 bolts

15. Remove the thrust washer and the toothed belt, Fig.11.

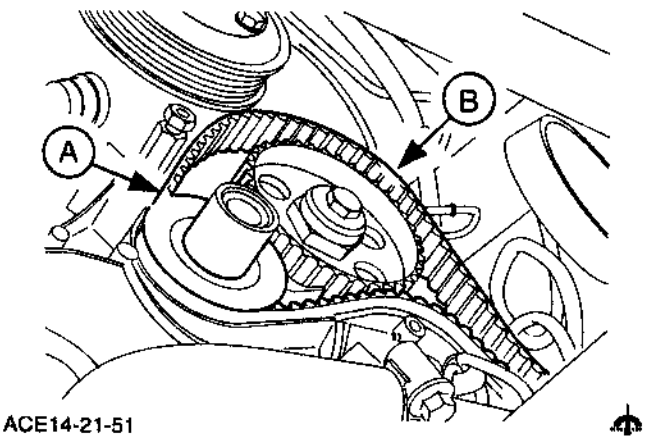

Fig.11. A - Thrust washer
B - Toothed belt

16. Pull off the crankshaft toothed belt pulley using Special Tool 21-028 A, Fig.12.

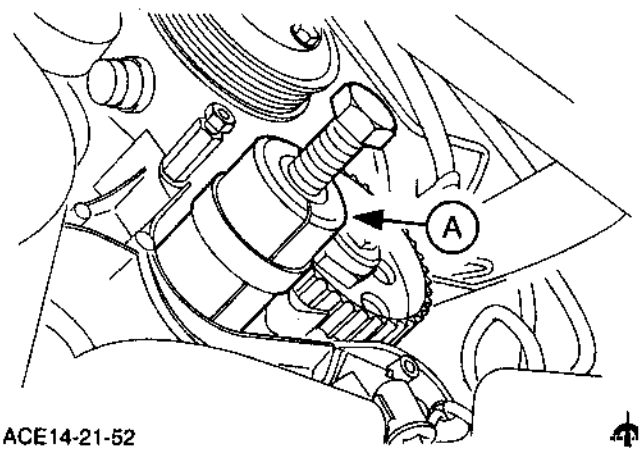

Fig.12. Pull off crankshaft toothed belt pulley.
A - Special Tool 21-028 A

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17. Extract the crankshaft radial oil seal using Special Tool 21-143, Fig.13.

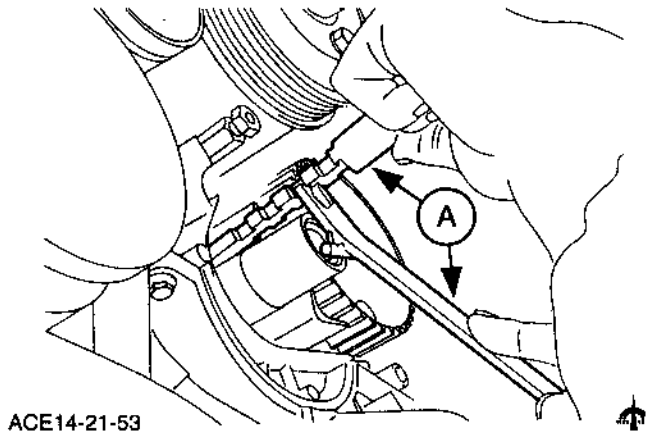

Fig.13. Remove crankshaft radial oil seal.
A - Special Tool 21-143

To Install

18. Fit the crankshaft radial oil seal, Fig.14.

Fig.14. Fit crankshaft radial oil seal.
A - Special Tool 21-009 B
B - Crankshaft toothed belt pulley
C - Bolt and washer of crankshaft toothed belt pulley

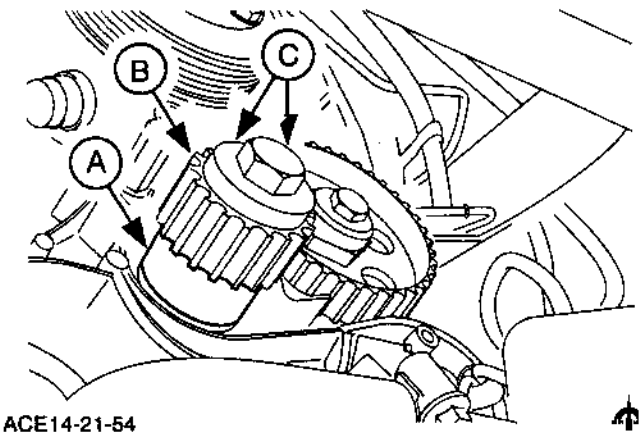

Fig.14. Fit crankshaft radial oil seal.

19. Fit the crankshaft toothed belt pulley with the chamfered side facing the engine.

20. Lay the toothed belt over the crankshaft toothed belt pulley and fit the thrust washer with the curved side facing the engine.

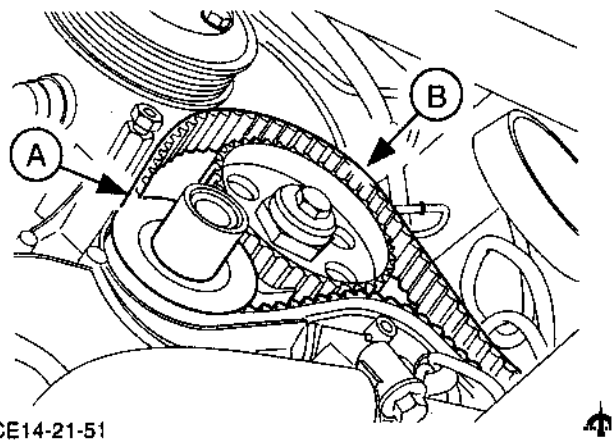

Fig.15. A - Thrust washer
B - Toothed belt

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21. Fit the crankshaft vibration damper/belt pulley loosely and check the crankshaft TDC mark, Fig.16. Rectify if necessary.

Fig.16. Crankshaft vibration damper/belt pulley in TDC position.
(shown with engine removed)
A - Mark on cylinder block
B - Cam on belt pulley
C - Notch in belt pulley

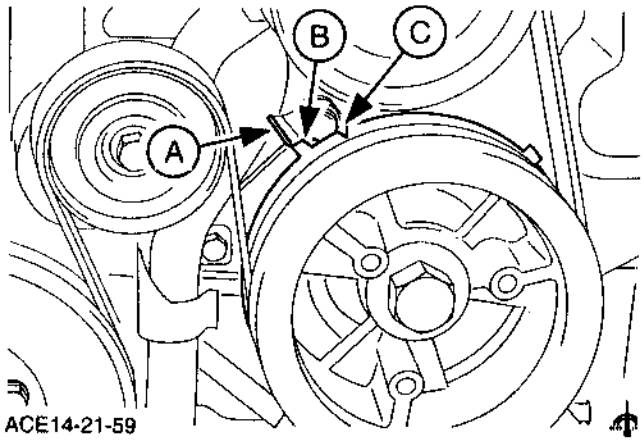

Fig.16. Crankshaft vibration damper/belt pulley in TDC position.
(shown with engine removed)

22. Lower the vehicle to the ground. Check the TDC positions of the camshaft toothed belt pulleys and rectify as necessary, Fig.17.

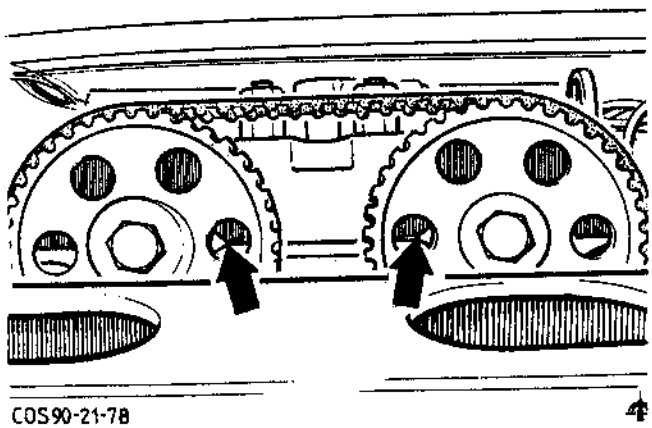

Fig.17. Camshaft toothed belt pulleys in TDC position.

23. Align the distributor on the TDC mark. The distributor rotor arm must line up on the mark, Fig.18.

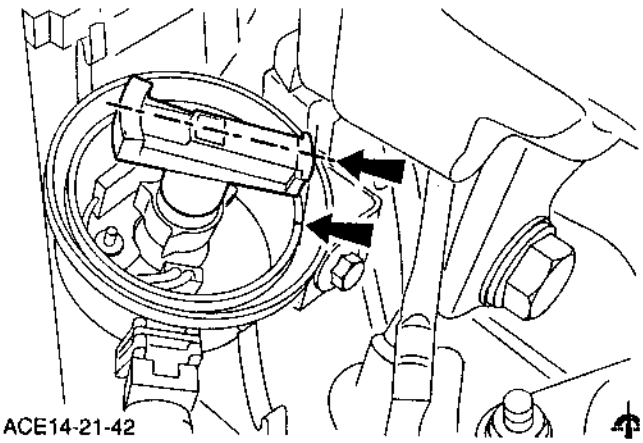

Fig.18. TDC position of distributor.

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24. Fit the toothed belt and tension it:
Fit the toothed belt and turn the tensioning pulley clockwise towards the toothed belt by hand and tighten the tensioning pulley retaining nut, Fig.19.

NOTE: If the original toothed belt is still being used, note the direction in which it goes round.

- Raise the vehicle.

- Turn the engine 2 revolutions in the normal direction of rotation and then turn it back 1 complete revolution to the TDC position.

NOTE: Do not turn it beyond the TDC position.

- Check the toothed belt tension at the longest span using Special Tool 21-113, Fig.20. Adjust to specification (refer to Technical Data) by turning the tensioning pulley. Tighten the tensioning pulley retaining nut.

- Re-check the toothed belt tension and the TDC positions and if necessary repeat the tensioning procedure.

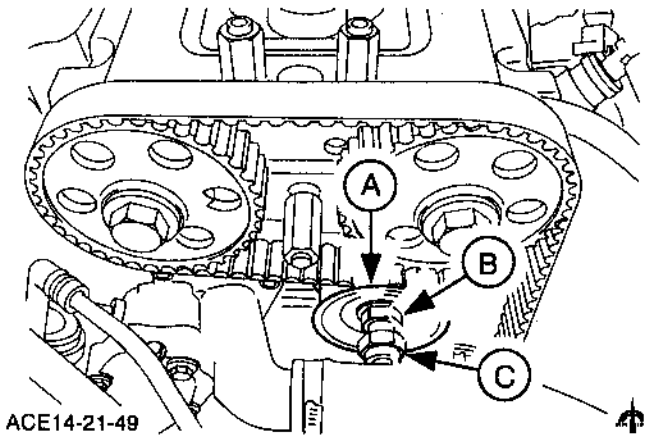

Fig.19. Toothed belt tensioning pulley.
A - Tensioning pulley
B - Eccentric
C - Lock nut

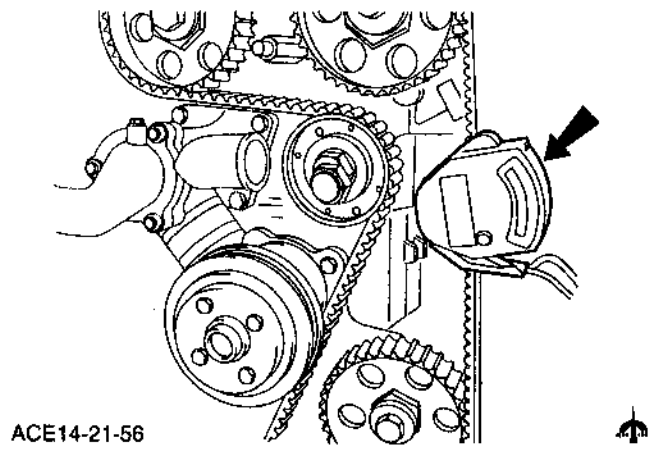

Fig.20. Check toothed belt tension using Special Tool 21-113.

0392

25. Back off the belt tensioner and fit the poly-V belt.
The poly-V belt is tensioned automatically when the belt tensioner is released, Fig.21.

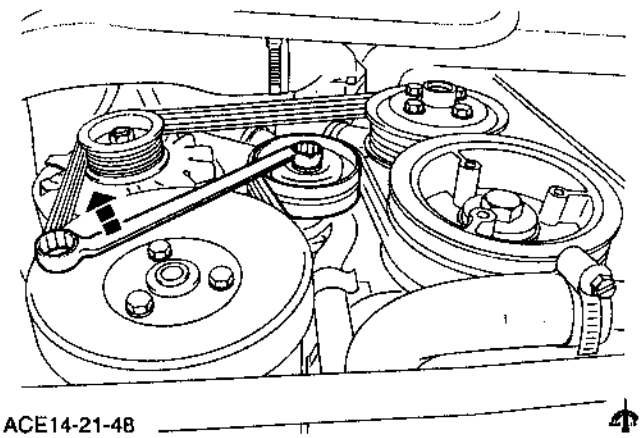

Fig.21. Back off tensioner of poly-V belt.

26. Tighten the retaining bolt of the crankshaft vibration damper/belt pulley.

NOTE: Screw in two M8 bolts and hold the pulley using a lever, Fig.22.

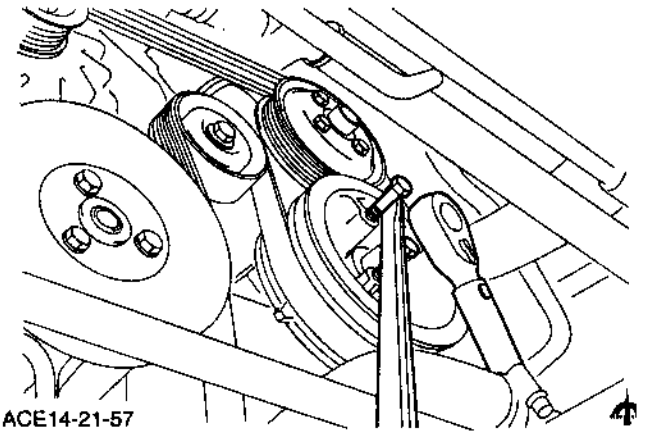

Fig.22. Tighten retaining bolt of crankshaft vibration damper/belt pulley.

27. Secure the radiator, Fig.23.

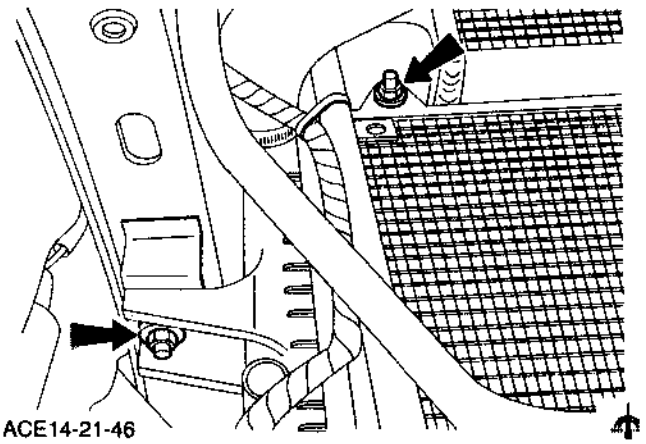

Fig.23. Fixture of radiator.

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28. Fit the radiator shroud with the fan motors, Fig.24.

29. Connect the 2 engine cooling fan multiplugs, Fig.25.

30. Secure the 3 coolant pipe brackets to the radiator, Fig.26.

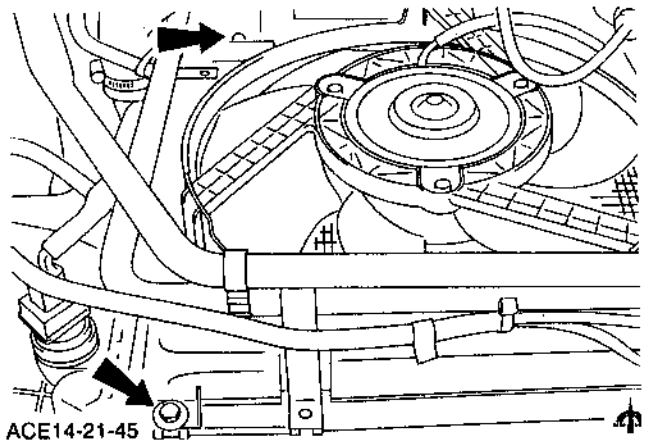

Fig.24. Fixture of radiator shroud.

31. Lower the vehicle to the ground.

32. Fit the toothed belt cover.

33. Connect the battery earth cable.

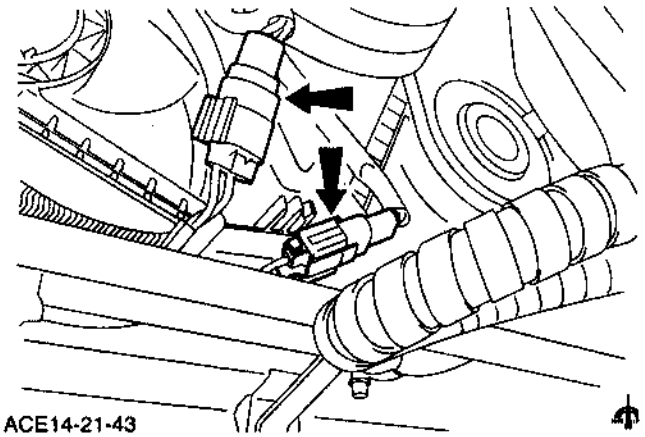

Fig.25. Multiplugs of engine cooling fan.

34. Check the engine oil level and top up as necessary (refer to Technical Data for quantity and specification).

35. Check the engine tuning settings as specified at normal operating temperature and rectify as necessary.

36. Raise the vehicle. Fit the lower engine cover. Lower the vehicle to the ground.

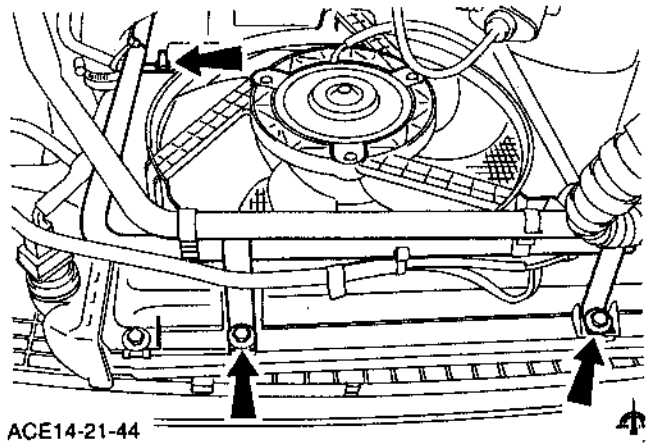

Fig.26. Fixture of coolant pipe brackets.

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