Exhaust systems

Contents

Sections

Issue record sheet

The dates quoted below refer to the issue date of individual pages within this chapter.

Sections	Q1	Q2	Q3	Q4	Q5	Q6
Page No.						
1	5/88	11/86	5/88	2/89	2/89	11/86
2			5/88	5/88	2/89	11/86
3	2/89		5/88	2/89	2/89	
4				5/88	2/89	
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
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50						
51						
52						
53						
54						

Exhaust gas poisoning and First aid

Danger — Exhaust gas
Inhaling exhaust gas is dangerous.

If it is necessary to run the engine inside a building, always ensure that the exhaust gas is suitably piped to the outside.

First aid — Burns
Before commencing work on the exhaust always ensure that the system is not hot.

In the event of a skin burn, cold clean water should be run over the affected area and if necessary, a dry dressing temporarily applied.

A medical centre or doctor should be consulted as soon as possible after administering this emergency treatment.

Exhaust manifolds

Exhaust manifolds – To remove (see fig. Q3-1)
Cars other than Bentley Turbo R
1. Disconnect the battery and ensure that the usual workshop safety precautions are carried out.
2. Support the downtake pipes just forward of the front silencer.
3. Remove the clamps from around the downtake to manifold joint on both 'A' and 'B' bank. Free both joints.
4. Detach the air injection pipes (if fitted) from both manifolds.
   Blank off the pipes to prevent the ingress of dirt.
5. Remove the setscrews and distance pieces securing the manifolds to the cylinder heads after first bending back the tabs of the lock-plates. Withdraw the manifolds, then remove and discard the lock-plates.
6. Discard the gaskets fitted between the manifolds and the cylinder heads.
7. Blank off the ports in the cylinder heads to prevent the ingress of dirt and other foreign matter.

Exhaust manifolds – To inspect
1. Using medium grade emery cloth, lightly dress the manifold to downtake pipe joint.
2. Remove any scale on the manifold (to cylinder head) joint faces.
3. Check for distortion of the manifold (to cylinder head) joint faces using a straight edge.
4. Minor distortions can be corrected by rubbing the manifold joint faces across the cutting surface of medium grade emery cloth. The emery cloth should be secured to a surface table.

Note It is important that the manifold (to cylinder head) joint faces are flat, clean, and square.

Exhaust manifolds – To fit
To fit the manifolds reverse the procedure given for their removal, noting the following.
1. Ensure that all joint faces are free from scale and emery dust before assembly.
2. Lubricate all joint threads to ensure that the threads do not bind.
3. Smear the spherical seating faces and the grooves in the spherical clamps with either graphite lubricant or an assembly compound to assist in correct alignment.
4. Ensure that new lock-plates are fitted to the manifold securing setscrews.
5. All nuts and bolts should be torque tightened to the figures quoted in Section Q6 and Chapter P. Manifold setscrews must be tightened evenly, starting at the centre and working outwards (i.e. from side to side).
6. After the engine has run sufficiently to reach normal operating temperature, the manifold setscrews and spherical joint clamp nuts should be checked and if necessary, again tightened to the figures quoted in Section Q6 and Chapter P.
7. Ensure that the tabs of the manifold lock-plates are bent over.
8. If the exhaust manifold studs have to be replaced, refer to Section Q6.

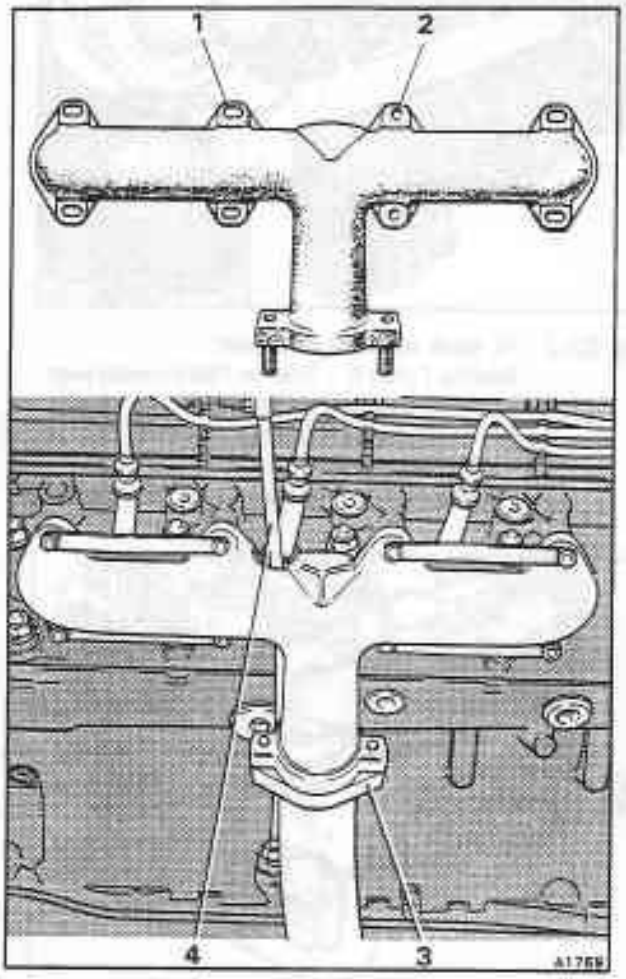


Fig. Q3-1 'B' bank exhaust manifold
Cars other than Bentley Turbo R
1 Elongated hole
2 Location hole
3 Exhaust clamp
4 Engine oil dipstick

Exhaust manifolds – To remove (see fig. Q3-2)
Bentley Turbo R – Prior to 1989 model year
1. Disconnect the battery and ensure that the usual workshop safety precautions are carried out.
2. Support the downtake pipe just forward of the front silencers.

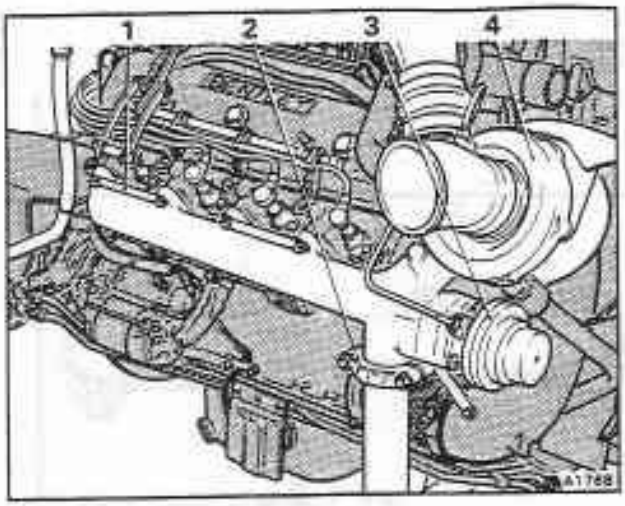


Fig. Q3-2 'A' bank exhaust manifold
Bentley Turbo R – Prior to 1989 model year
1 Manifold setscrew lock-plate
2 Connecting pipe clamp
3 Wastegate assembly
4 Turbocharger assembly

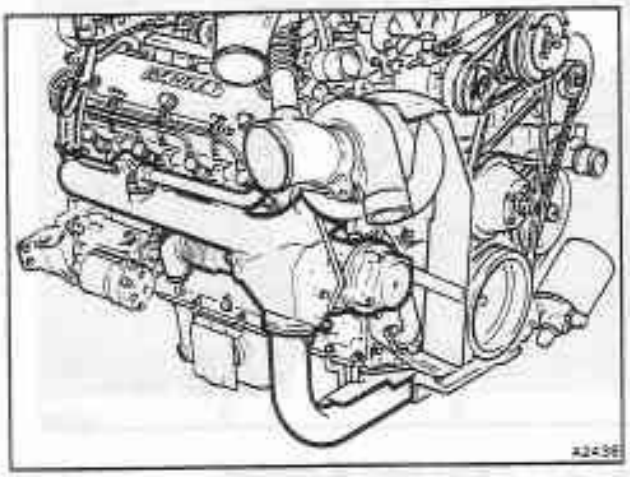


Fig. Q3-3 One piece exhaust manifold – 'A' bank
Bentley Turbo R – 1989 model year

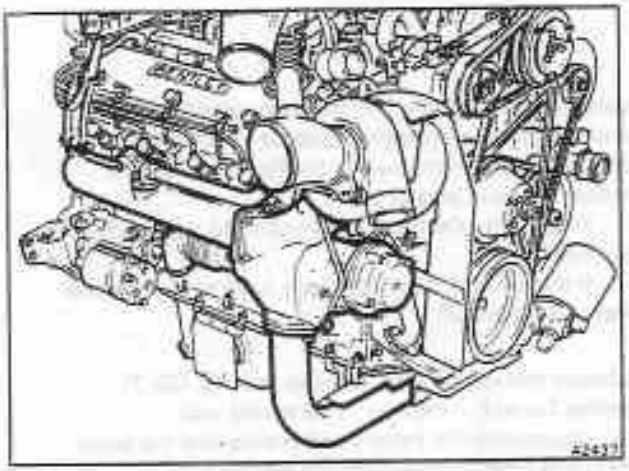


Fig. Q3-4 Split type exhaust manifold – 'A' bank
Bentley Turbo R – 1989 model year

3. Remove the clamps from the exhaust manifolds, securing the connecting pipe between 'A' and 'B' banks. Free the joints and remove the pipe.
4. Remove the nuts securing the turbocharger assembly to 'A' bank manifold. Collect the washers and then remove the turbocharger assembly. Take care not to damage the machined faces between the turbocharger and manifold.
5. Remove the wastegate assembly from 'A' bank manifold (see fig. Q3-2). Discard the 'O' ring.
6. Remove the setscrew securing the tie bar between 'A' bank manifold and the exhaust downtake pipe.
7. Remove the setscrews and distance pieces securing the manifolds to the cylinder heads after first bending back the tabs of the lock-plates. Withdraw the manifolds, then remove and discard the lock-plates.
8. Discard the gaskets fitted between the manifolds and the cylinder heads.
9. Blank off the ports in the cylinder heads to prevent the ingress of dirt and other foreign matter.

Bentley Turbo R – 1989 model year
One piece manifold (see fig. Q3-3)
1. Carry out Operations 1 to 5 (inclusive) as described for Turbo R cars prior to 1989 model year.
2. Detach the air injection pipes (if fitted) from both manifolds.
3. Remove the clamp securing the turbocharger by-pass pipe to the warm-up catalytic converter/front pipe asembly.
4. Remove the clamp securing the turbocharger by-pass pipe to the turbocharger end of the manifold. Free the joint and remove the pipe. Collect the sealing ring from the rear joint.
5. Carry out Operations 7 to 9 (inclusive) as described for Turbo R cars prior to 1989 model year.

Bentley Turbo R – 1989 model year
Split type manifold (see fig. Q3-4)
1. Carry out Operations 1 and 2 as described for Turbo R cars prior to 1989 model year.
2. Detach the air injection pipes (if fitted) from both manifolds.
3. Remove the nuts securing 'A' bank manifold to the turbocharger/wastegate mounting.
4. Carry out Operations 7 to 9 inclusive as described for Turbo R cars prior to 1989 model year.
5. Discard the sealing ring fitted between 'A' bank manifold and the turbocharger/wastegate mounting.

Exhaust manifolds – To inspect
1. Using medium grade emery cloth, lightly dress the manifold to connecting pipe joint faces.
2. Remove any scale on the manifolds (to cylinder head) joint faces.
3. Check for distortion of the manifold (to cylinder head) joint faces using a straight edge.
4. Minor distortions can be corrected by rubbing the manifold joint faces across the cutting surface of medium grade emery cloth. The emery cloth should be secured to a surface table.

Note It is important that the manifold (to cylinder head) joint faces are flat, clean, and square.

Exhaust manifolds – To fit

To fit the manifolds, reverse the procedure given for their removal, noting the following.

1. Ensure that all joint faces are free from scale and emery dust before assembly.
2. Smear the spherical seating faces and the grooves in the spherical clamps with either graphite lubricant or an assembly compound. This will assist in correct alignment.
3. All machined faces should be checked for flatness.

Important Under no circumstances should exhaust sealant (Firegum, etc.) be used between the exhaust manifolds and the turbocharger assembly.

4. Ensure that a new 'O' ring is fitted to the wastegate assembly.
5. Ensure that a new sealing ring is fitted between 'A' bank split type manifold and the turbocharger/ wastegate mounting.
6. Ensure that new lock-plates are fitted to the manifold securing setscrews.
7. All nuts and bolts should be torque tightened to the figures quoted in Section Q6 and Chapter P. Manifold setscrews must be tightened evenly, starting at the centre and working outwards (i.e. from side to side).
8. After the engine has been run sufficiently to reach normal operating temperature and has been allowed to cool, the manifold setscrews and spherical joint clamp bolts should be checked for tightness. If necessary, torque tighten to the figures quoted in Section Q6 and Chapter P.
9. Ensure that the tabs of the manifold lock-plates are bent over.
10. If the turbocharger assembly mounting studs, or exhaust manifold studs, have to be replaced, refer to Section Q6.

Exhaust pipes and silencers

Cars other than those incorporating a catalytic converter

Introduction

The exhaust system which is mounted beneath the right-hand side of the car comprises twin pipes and silencers.

On cars other than Bentley Turbo R, the system terminates with a single pipe from the rear silencer (see fig. Q4-1).

On Bentley Turbo R cars, twin pipes exit from the rear silencer (see fig. Q4-2).

Exhaust pipes and silencers – To remove

The exhaust system comprises a number of individual sections. These sections can be removed and replaced without the necessity of having to disturb the complete system.

1. Drive the car onto a ramp.
2. Disconnect the battery and ensure that the usual workshop safety precautions are carried out.
3. Raise the ramp.

Tailpipe finisher(s)

4. Unscrew the worm drive clip securing the tailpipe finisher to the exhaust and withdraw the finisher.

Rear silencer assembly

5. Locate the exhaust system joints forward of the final drive assembly.
6. Remove the nuts from the 'U' clamps, collect the washers and clamping plates. Withdraw the 'U' bolts.

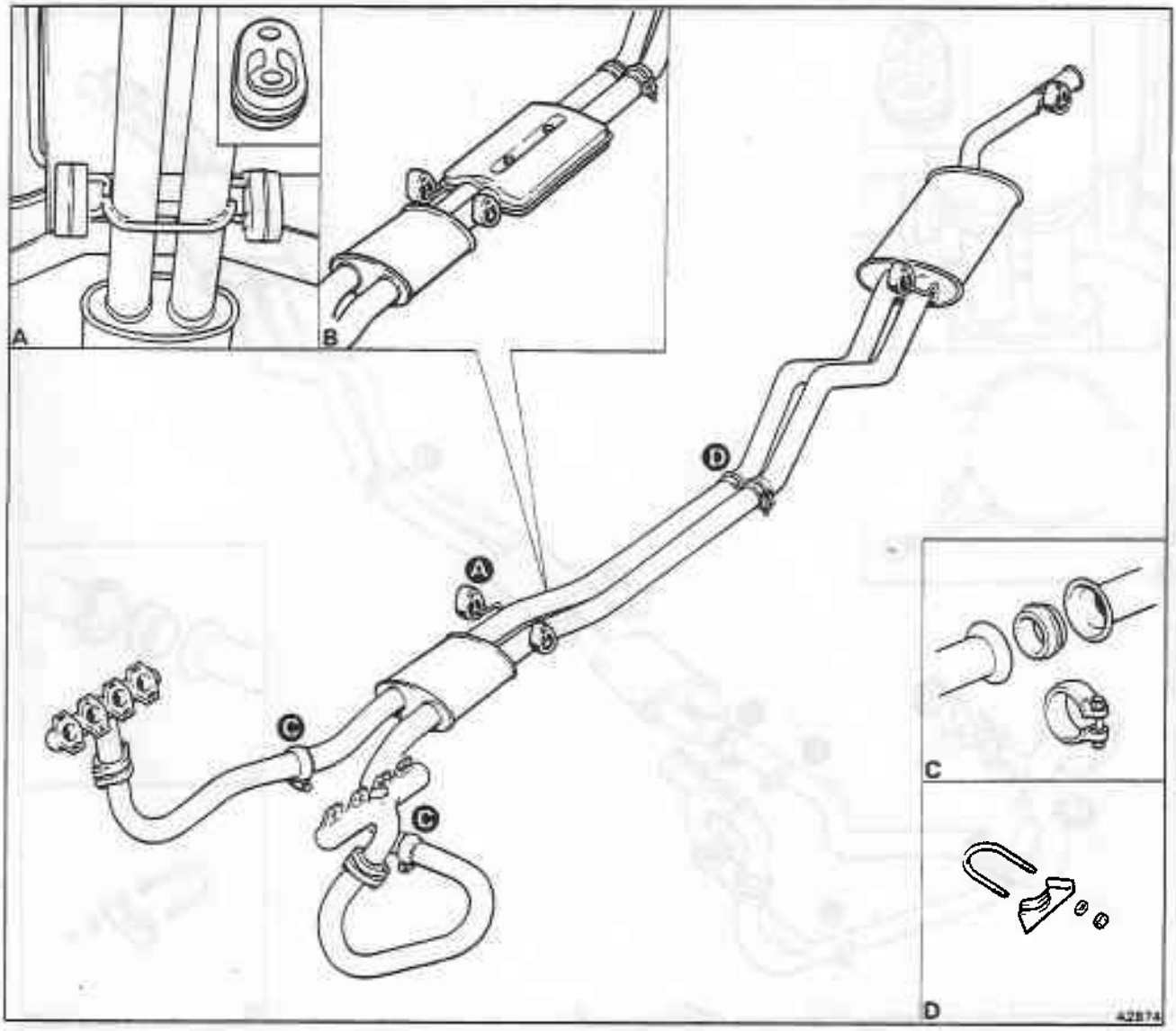


Fig. Q4-1 Exhaust system Cars other than Bentley Turbo R Inset B 1989 model year running change

7. Temporarily support the weight of the rear silencer assembly.
8. Disconnect the rear silencer assembly from the rubber hangers.
9. Remove the temporary support, twist the rear silencer assembly to 'break' the joint seals, then withdraw the assembly.

Front silencer assembly
10. Ensure that the weight of the front silencer assembly is temporarily supported.
11. Remove the nut(s) from the exhaust clamp(s) forward of the front silencer assembly. Collect the washer(s) and bolt(s), then free the clamp(s).
12. Discard the temporary support and withdraw the front silencer assembly, unhooking it from the rubber hangers. Collect the sealing ring(s) from the joint(s) as the silencer assembly is withdrawn.

Downtake pipes
Cars other than Bentley Turbo R
13. Ensure that the weight of the downtake pipes is temporarily supported.
14. Locate the downtake pipe to exhaust manifold joints. Remove the nuts from the joint clamps.
15. Discard the temporary supports and withdraw the downtake pipes.

Downtake pipe
Bentley Turbo R – Prior to 1989 model year
13. Ensure that the weight of the downtake pipe is temporarily supported.
14. Remove the nuts securing the exhaust to the rear of the engine, utilizing two tie bars. Remove the bolts and collect the washers.
15. Locate the downtake pipe joint beneath 'A' bank exhaust manifold. Remove the setscrews securing the outer half of the clamp. Collect the washers and free the clamp.
16. Remove the 'T' bolt clamp connecting the exhaust downtake to the flexible bellows.
17. Discard the support and withdraw the downtake pipe.

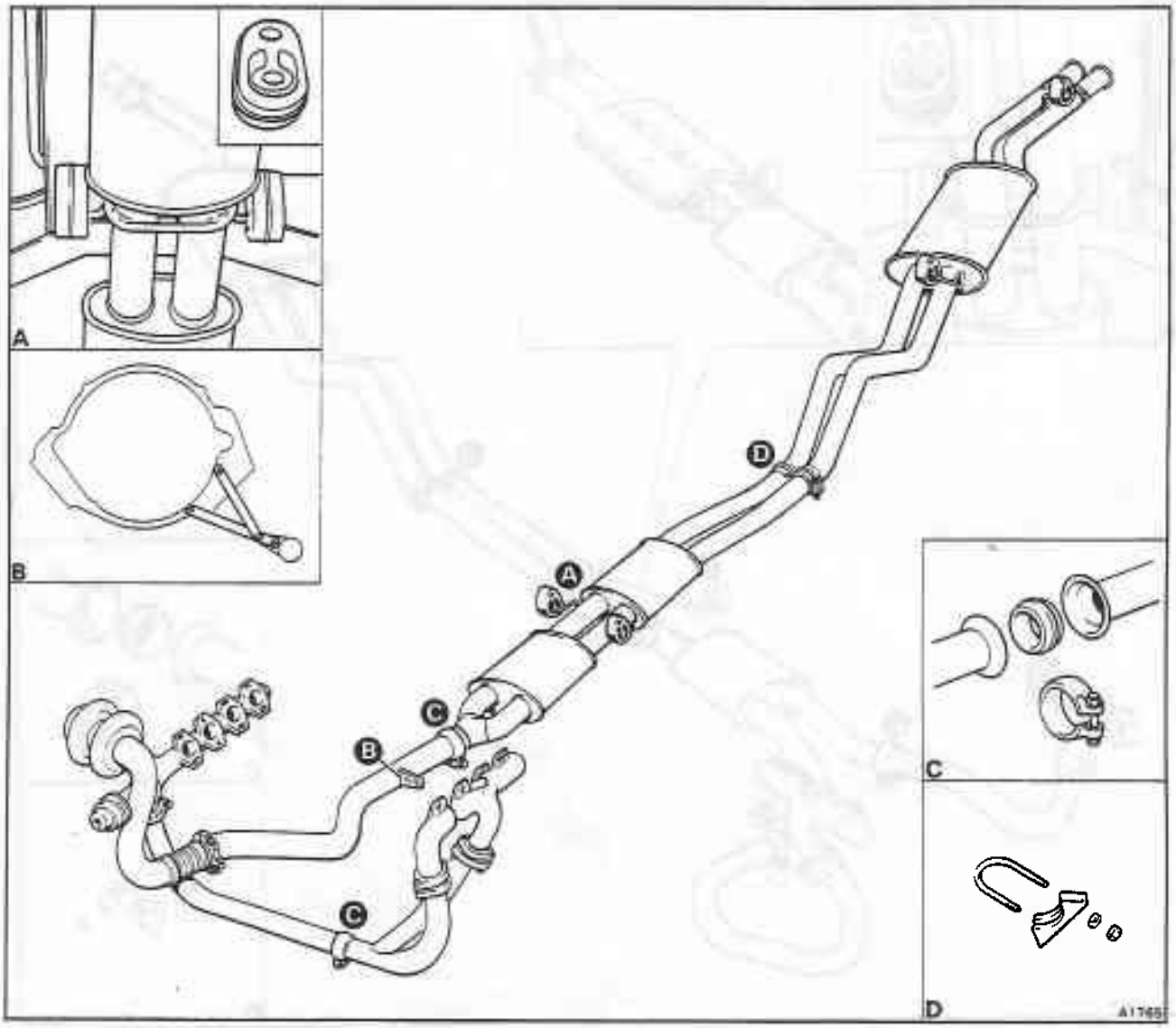


Fig. Q4-2 Exhaust system Bentley Turbo R – Prior to 1989 model year

Collector box and pipe assembly
Bentley Turbo R – 1989 model year
13. Ensure that the weight of the pipe assembly is temporarily supported.
14. Remove the nut from the exhaust clamp beneath 'A' bank exhaust manifold. Collect the washer and bolt, then free the clamp.
15. Discard the temporary support and withdraw the pipe assembly. Collect the sealing ring from the joint as the assembly is withdrawn.

Warm-up catalytic converter/front pipe assembly
Bentley Turbo R – 1989 model year
Remove the warm-up catalytic converter/front pipe assembly as described in TSD 4737 Engine Management Systems.

Exhaust pipes and silencers – To fit
To assemble, reverse the procedure given for removal, noting the following.

Prior to assembly
1. Ensure that the sliding joints are a good fit in their respective stub pipes to allow for adjustment.
2. All sealing rings and pipes must be thoroughly clean and free from scale. If necessary, these can be lightly dressed with fine emery cloth.
3. To ensure free movement of the joints for correct alignment of the components when assembling, the pipe flares and grooves in the joint clamps should be lightly smeared with either a graphite lubricant or Neverseez assembly compound.
4. Apply Neverseez assembly compound to all clamp bolt threads before assembly.
5. Any rubber hangers showing signs of wear, etc., should be replaced.

Upon assembly
1. The parts should be loosely assembled and then manoeuvred to give the best alignment (free from possible fouls), before the joints are tightened.

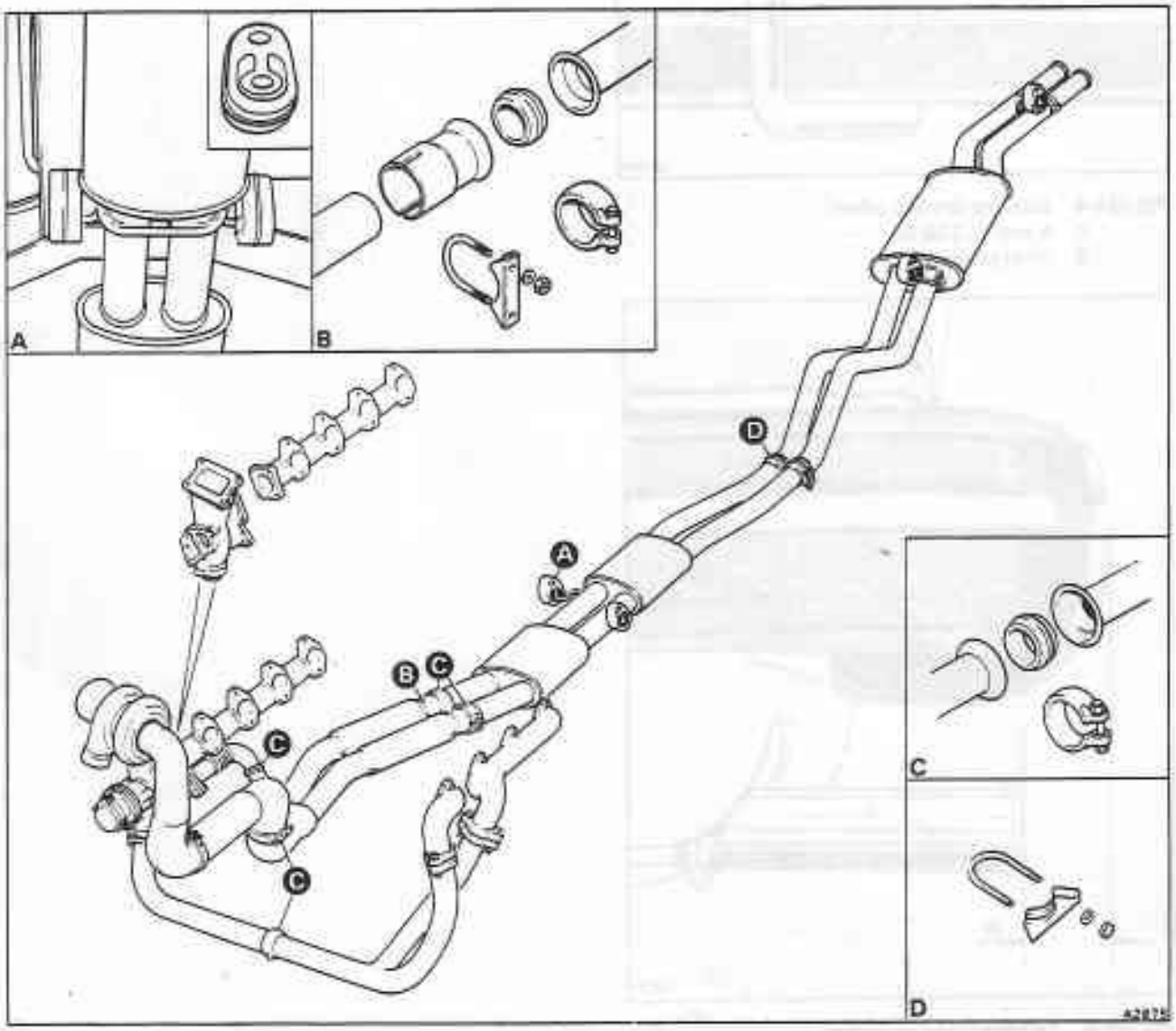


Fig. Q4-3 Exhaust system Bentley Turbo R – 1989 model year Inset B Running change

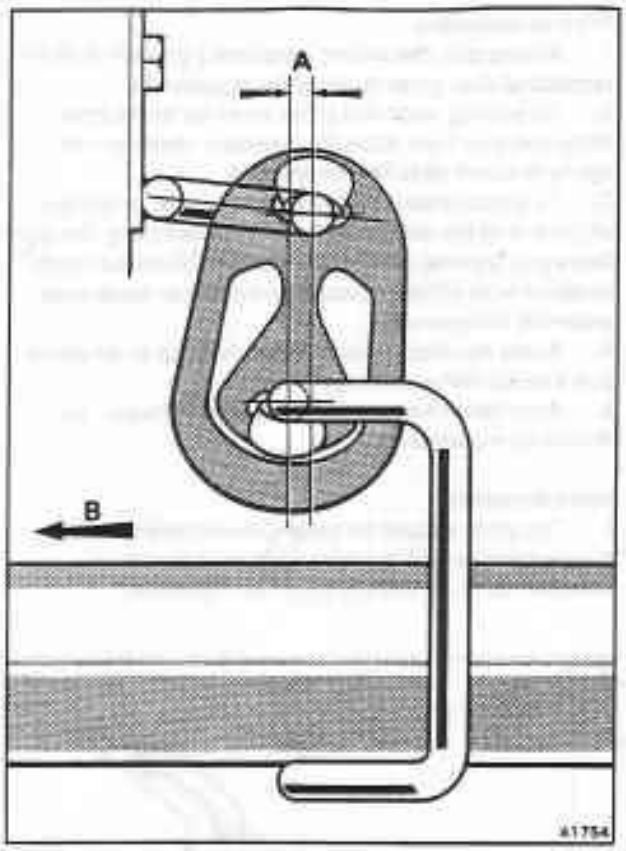


Fig. Q4-4 Exhaust mount offset
A 6 mm (0.236 in)
B Front of car

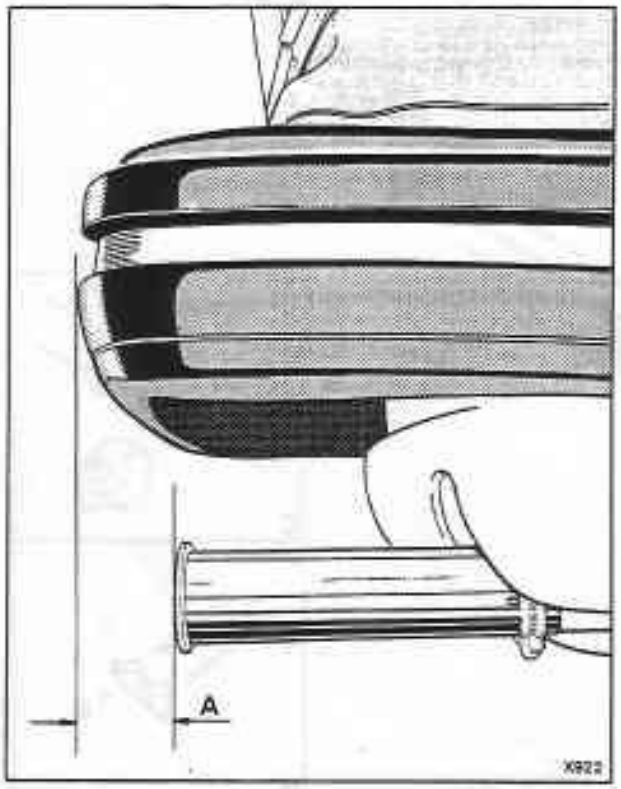


Fig. Q4-5 Tailpipe finisher setting
A 60 mm (2.364 in)

2. When setting clearances, ensure that the mounts are set 6 mm (0.236 in) forward of the mounting bracket to allow for expansion of the system (see fig. Q4-4).
3. Ensure that the tailpipe and finisher do not foul on the rear body moulding.
4. When the pipe runs are satisfactory, apply a sealant such as Holts Firegum into the ends of all straight tube joints. Ensure that the slots down the sides of the pipes are covered. Holts Firegum can also be smeared on the inside of the sliding joints.
5. The clamps on the sliding joints should be positioned so that the opening in the clamp is opposite to the slot in the pipe.
6. Torque tighten the Hymatic spherical clamps (with the clamp bolts in the vertical position) to the figures quoted in Section Q6.
7. Set the tailpipe finisher 60 mm (2.364 in) in from the outer edge of the bumper (see fig. Q4-5).

Exhaust pipes, silencers, and grass-fire shields

Cars incorporating a catalytic converter

Introduction

The exhaust system which is mounted beneath the right-hand side of the car, comprises twin pipes, catalytic converter(s), and rear silencer.

Note Refer to TSD 4737 Engine Management Systems for additional information relating to the Exhaust Emission Control System.

Cars conforming to a Japanese specification, have grass-fire shields fitted beneath the majority of the exhaust system as shown in figures Q5-1 and Q5-2.

Cars other than those conforming to a Japanese specification, have a grass-fire shield fitted beneath the catalytic converter only, as shown in figure Q5-3.

Grass-fire shields – To remove and fit

1. *On cars conforming to a Japanese specification,* start by removing the grass-fire shield forward of the rear silencer assembly. Then, work outwards, forwards, and rearwards.
2. *On cars other than those conforming to a Japanese specification,* remove the grass-fire shield fitted beneath the catalytic converter.
3. Check that the shields are in good condition and that no breaks or cracks have occurred in the mesh.

   If damage to a shield has occurred, the shield must be discarded and a new one fitted.
4. Replace the shields by reversing the procedure for removal, noting the following.

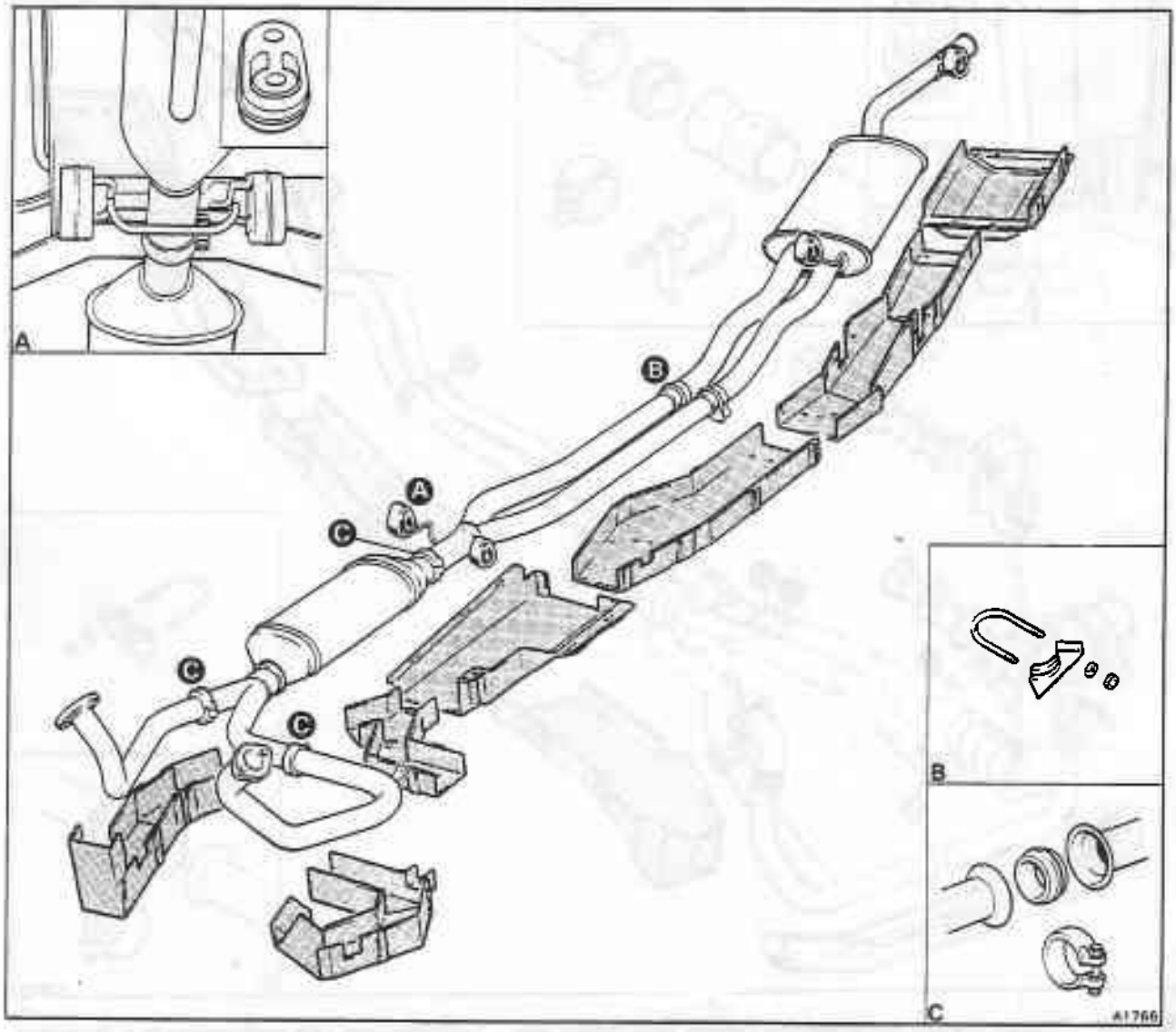


Fig. Q5-1 Exhaust system and grass-fire shields Naturally aspirated cars conforming to a Japanese specification

5. Refer to figures Q5-1 and Q5-2 for cars conforming to a Japanese specification.
6. Refer to figures Q5-3 and Q5-4 for cars other than those conforming to a Japanese specification.

Exhaust pipes and silencers – To remove

The exhaust system comprises of a number of individual sections. These sections can be removed and replaced without the necessity of having to disturb the complete system.

1. Drive the car onto a ramp.
2. Disconnect the battery and ensure that the usual workshop safety precautions are carried out.
3. Raise the ramp.

Tailpipe finisher(s)

4. Unscrew the worm drive clip securing the tailpipe finisher to the exhaust and withdraw the finisher.

Rear silencer assembly

5. Locate the exhaust system joints forward of the final drive assembly.
6. Remove the nuts from the 'U' clamps, collect the washers and clamping plates. Withdraw the 'U' bolts.
7. Temporarily support the weight of the rear silencer assembly.
8. Disconnect the rear silencer assembly from the rubber hangers.
9. Remove the temporary support, twist the rear silencer assembly to 'break' the joint seals, then withdraw the assembly.

Intermediate pipes

10. Ensure that the weight of the catalytic converter(s) is supported.
11. Temporarily support the weight of the intermediate pipe assembly.
12. Remove the nut from the exhaust clamp rearward of the catalytic converter. Collect the washer and bolt, then free the clamp.
13. Discard the temporary support and withdraw the

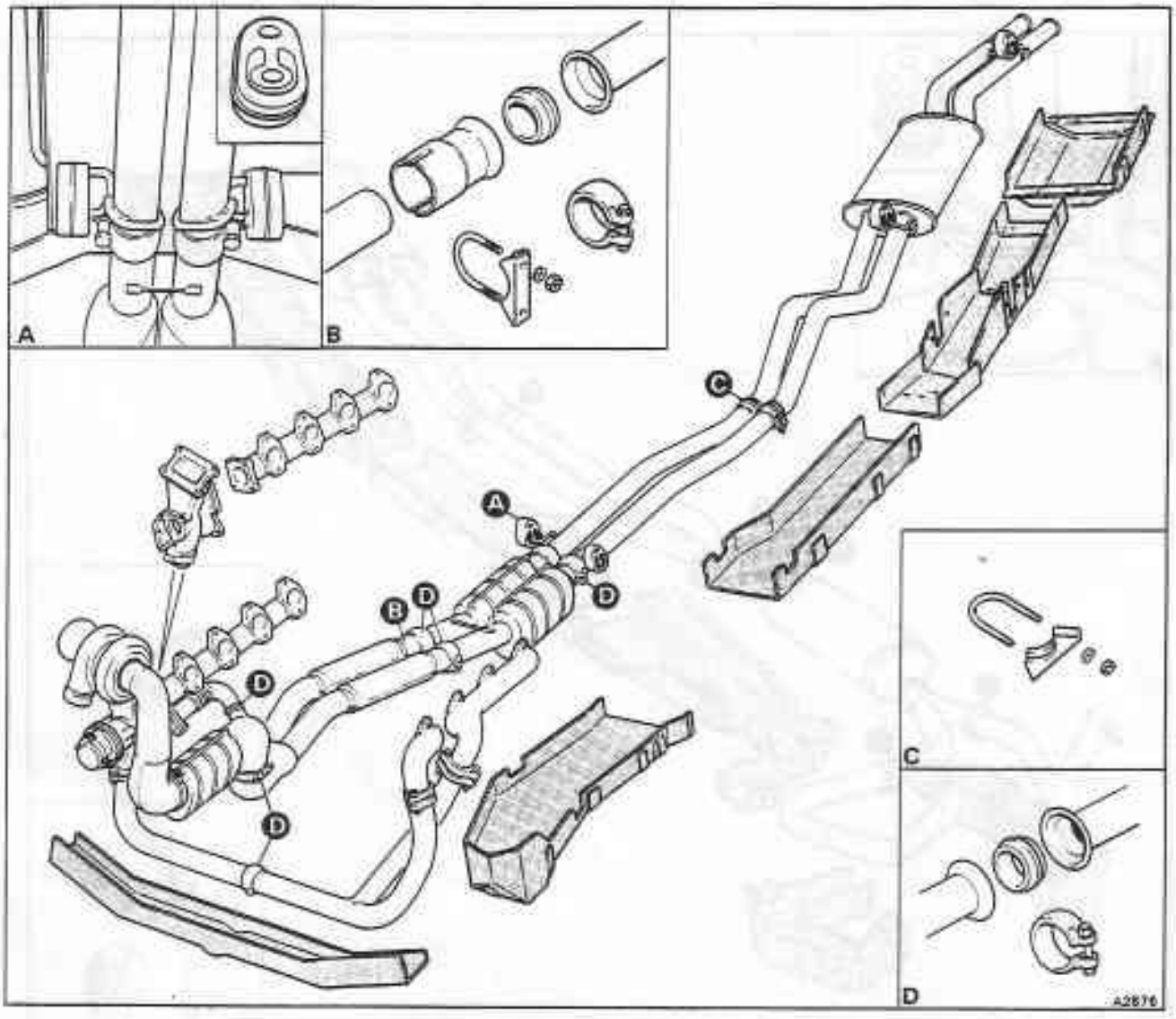


Fig. Q5-2 Exhaust system and grass-fire shields 1989 model year – Turbocharged cars conforming to a Japanese specification Inset B Running change

intermediate pipe assembly, unhooking it from the rubber hangers. Collect the sealing ring from the joint as the pipe assembly is withdrawn.

Label the sealing ring for identification purposes.

Catalytic converter(s)

Remove the catalytic converter(s) as described in TSD 4737 Engine Management Systems.

Downtake pipes

Naturally aspirated cars

14. Ensure that the weight of the downtake pipes is temporarily supported.
15. Remove the clamp securing the exhaust gas recirculation (EGR) pipe (if fitted) to 'B' bank downtake.
16. Locate the downtake pipe to exhaust manifold joints. Remove the nuts from the joint clamps.
17. Discard the temporary supports and withdraw the downtake pipes.

Collector box and pipe assembly

Bentley Turbo R – 1989 model year

14. Ensure that the weight of the pipe assembly is temporarily supported.
15. Remove the nut from the exhaust clamp beneath 'A' bank exhaust manifold. Collect the washer and bolt, then free the clamp.
16. Discard the temporary support and withdraw the pipe assembly. Collect the sealing rings from the joints as the assembly is withdrawn.

Warm-up catalytic converter

Bentley Turbo R – 1989 model year

Remove the warm-up catalytic converter as described in TSD 4737 Engine Management Systems.

Exhaust pipes and silencers – To fit

To assemble, reverse the procedure given for removal, noting the following.

Prior to assembly

1. Ensure that the sliding joints are a good fit in their respective stub pipes to allow for adjustment.
2. All sealing rings and pipes must be thoroughly clean and free from scale. If necessary, these can be lightly dressed with fine emery cloth.

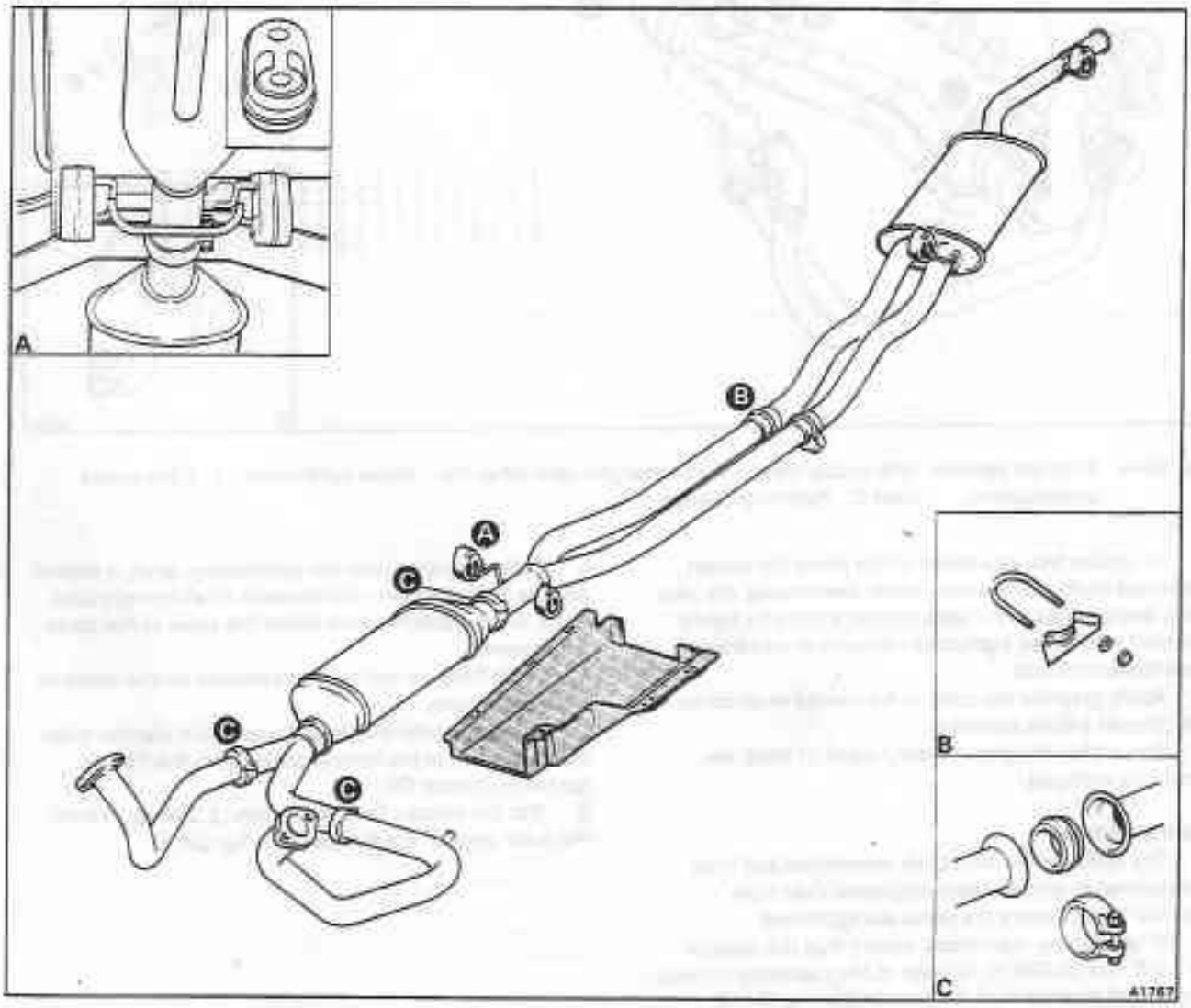


Fig. Q5-3 Exhaust system and grass-fire shield Naturally aspirated cars other than those conforming to a Japanese specification

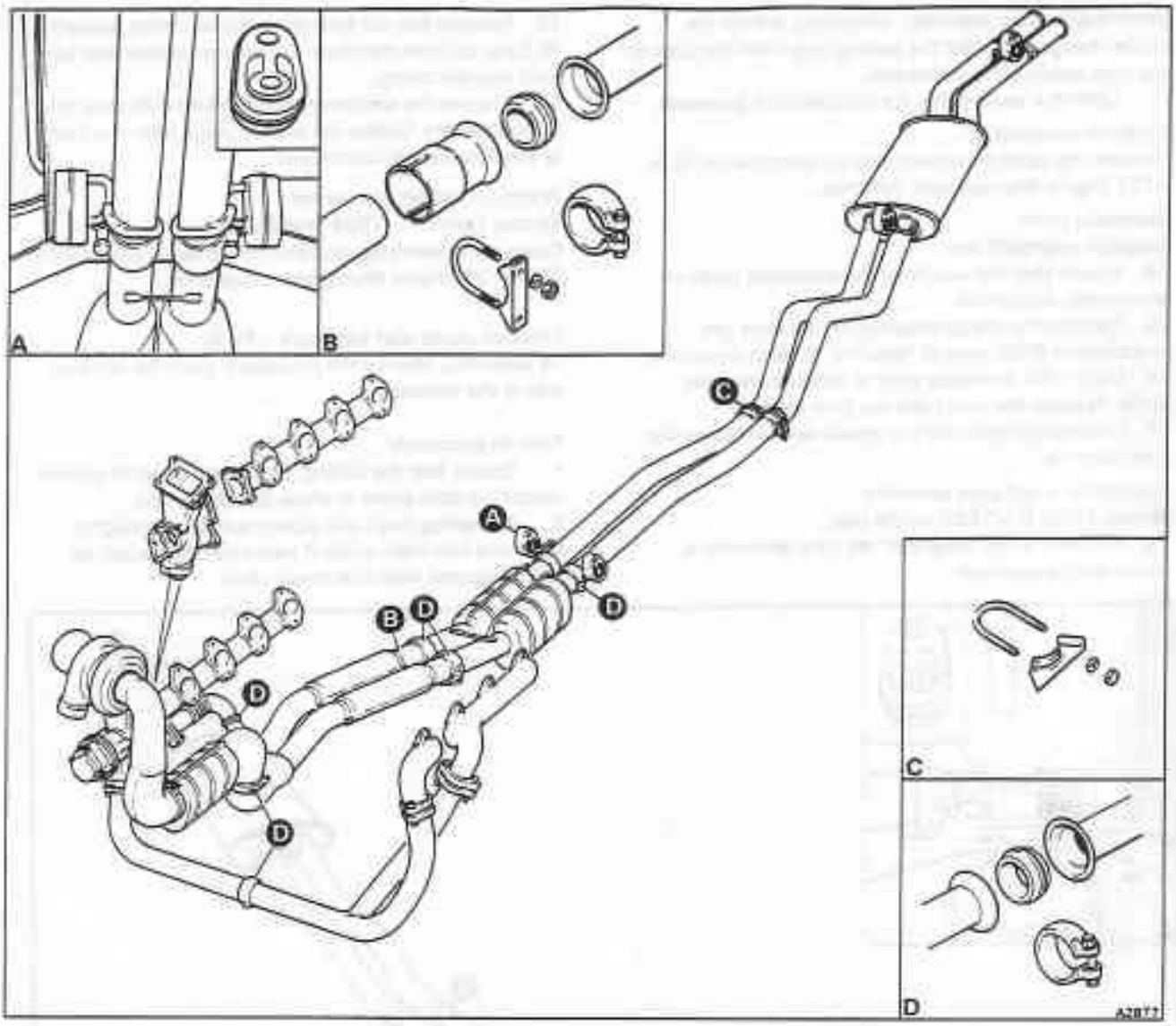


Fig. Q5-4 Exhaust system 1989 model year – Turbocharged cars other than those conforming to a Japanese specification Inset B Running change

3. To ensure free movement of the joints for correct alignment of the components when assembling, the pipe flares and grooves in the joint clamps should be lightly smeared with either a graphite lubricant or Neverseez assembly compound.
4. Apply graphite lubricant or Neverseez to all clamp bolt threads before assembly.
5. Any rubber hangers showing signs of wear, etc., should be replaced.

Upon assembly

1. The parts should be loosely assembled and then manoeuvred to give the best alignment (free from possible fouls), before the joints are tightened.
2. When setting clearances, ensure that the mounts are set 6 mm (0.236 in) forward of the mounting bracket to allow for expansion of the system (see fig. Q4-4).
3. Ensure that the tailpipe and finisher do not foul on the rear body moulding.
4. When the pipe runs are satisfactory, apply a sealant such as Holts Firegum into the ends of all straight tube joints. Ensure that the slots down the sides of the pipes are covered.

Holts Firegum can also be smeared on the inside of the sliding joints.

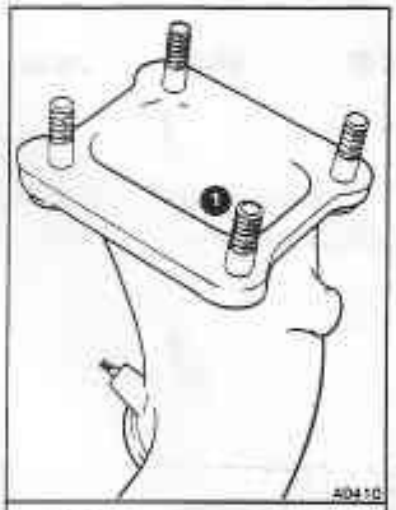
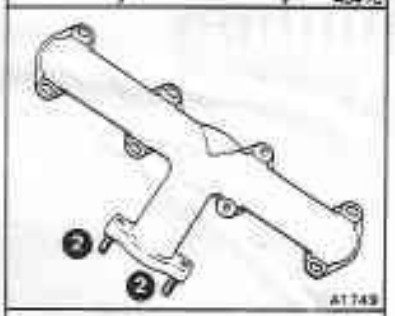
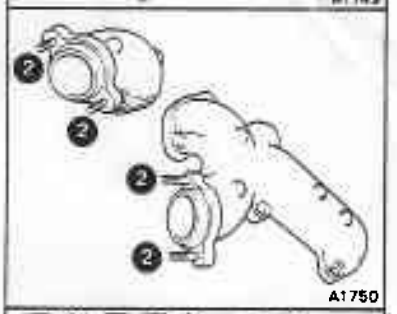
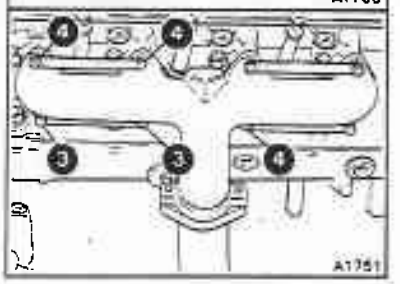
5. Torque tighten the Hymatic spherical clamps (with the clamp bolt in the vertical position) to the figures quoted in Section Q6.
6. Set the tailpipe finisher 60 mm (2.364 in) in from the outer edge of the bumper (see fig. Q4-5).

Special torque tightening figures

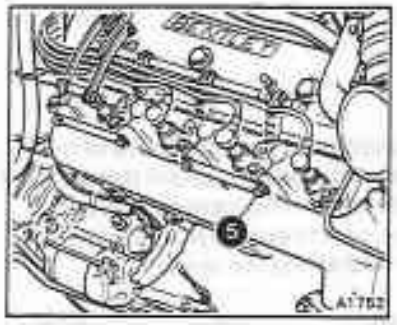
Introduction
This section contains the special torque tightening figures applicable to Chapter Q.

For standard torque tightening figures refer to Chapter P.

Components used during manufacture of the vehicle have different thread formations (Metric, UNF, UNC, etc.). Therefore, when fitting nuts, bolts, and setscrews it is important to ensure that the correct type and size of thread formation is used.

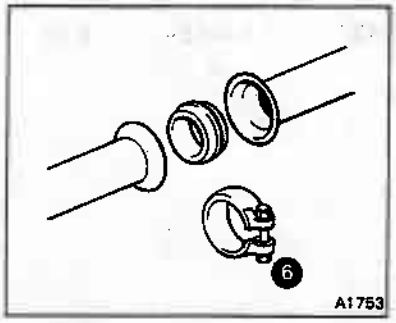
Section Q3	Ref.	Component	Nm	kgf m	lbf ft
	1	Turbocharger assembly to exhaust manifold — stud 4 off	11-13	1,2-1,3	8-10
	2	Downtake pipe to exhaust manifold — studs Naturally aspirated engines	11-13	1,2-1,3	8-10
		Turbocharged engines			
	3	Exhaust manifold — setscrews 2 off (A3 and A4 lower) Naturally aspirated engines	19-21	2,0-2,2	14-16
	4	Exhaust manifold — setscrews 14 off	32-33	3,2-3,4	23-25

Section Q3



Ref.	Component	Nm	kgf m	lbf ft
5	Exhaust manifold — setscrews 16 off Turbocharged engines	19-21	2,0-2,2	14-16

Section Q4 and Q5



Ref.	Component	Nm	kgf m	lbf ft
6	Hymatic clamp — nut	25-27	2,5-2,7	18-20