

# INTAKE AND EXHAUST

## CONTENTS

GENERAL .....	2	INTERCOOLER <F9Q> .....	5
SERVICE SPECIFICATION .....	2	INTAKE MANIFOLD <4G93-GDI> .....	6
SPECIAL TOOL .....	2	INTAKE MANIFOLD AND EXHAUST MANIFOLD <F9Q> .....	8
ON-VEHICLE SERVICE <F9Q> .....	2	EXHAUST MANIFOLD <4G92-MPI> .....	8
Waste Gate Actuator/Variable Nozzle Turbine Control Actuator .....	2	TURBOCHARGER <F9Q> .....	10
Turbocharger Waste Gate Solenoid Check .....	3	EXHAUST PIPE AND MAIN MUFFLER .....	11
AIR CLEANER <F9Q> .....	4		

## GENERAL

### OUTLINE OF CHANGES

- The service procedures have been established due to the adoption of the intake manifold made of resin for the 4G93-GDI engine and the change of the exhaust pipe.
- The service procedures have been established due to the adoption of the exhaust manifold incorporated with the catalytic converter for the 4G92-MPI engine.
- The following service procedures have been added to correspond to the addition of the F9Q engine.
  1. On-vehicle Service
  2. Removal and installation of the intercooler
  3. Removal and installation of the intake manifold
  4. Removal and installation of the exhaust manifold
  5. Removal and installation of the turbocharger
  6. Removal and installation of the exhaust pipe and main muffler

## SERVICE SPECIFICATION

Items	Standard value
Turbocharger waster gate solenoid coil resistance $\Omega$ (at 25°C)	15.5 – 17.5

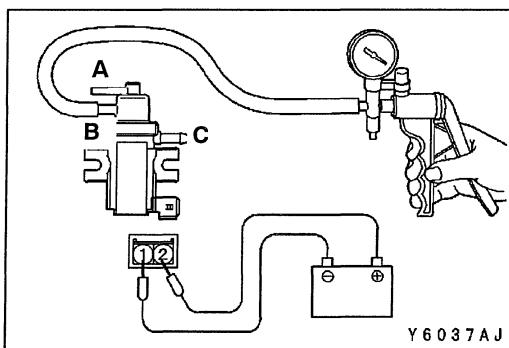
## SPECIAL TOOL

Tool	Number	Name	Use
	MD998770	Oxygen sensor wrench	Removal/Installation of oxygen sensor

## ON-VEHICLE SERVICE <F9Q>

### WASTE GATE ACTUATOR/VARIABLE NOZZLE TURBINE CONTROL ACTUATOR

1. Disconnect the vacuum hose from the actuator nipple.
2. Connect a hand vacuum pump to the nipple.
3. The rod should move smoothly when vacuum is applied gradually.

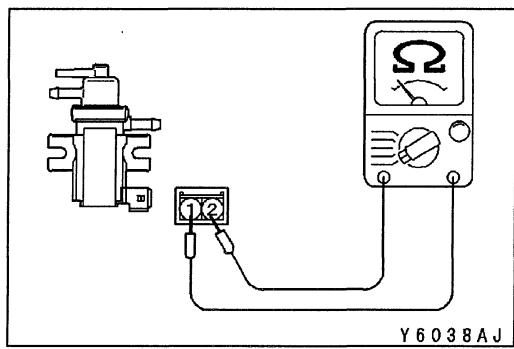


## TURBOCHARGER WASTE GATE SOLENOID CHECK

### NOTE

When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose from the solenoid.
2. Disconnect the solenoid connector.
3. Connect a hand vacuum pump to the nipple (B) of the solenoid (refer to the illustration at left).
4. Check the air-tightness by applying a vacuum with voltage applied directly from the battery to the solenoid and without applying voltage.



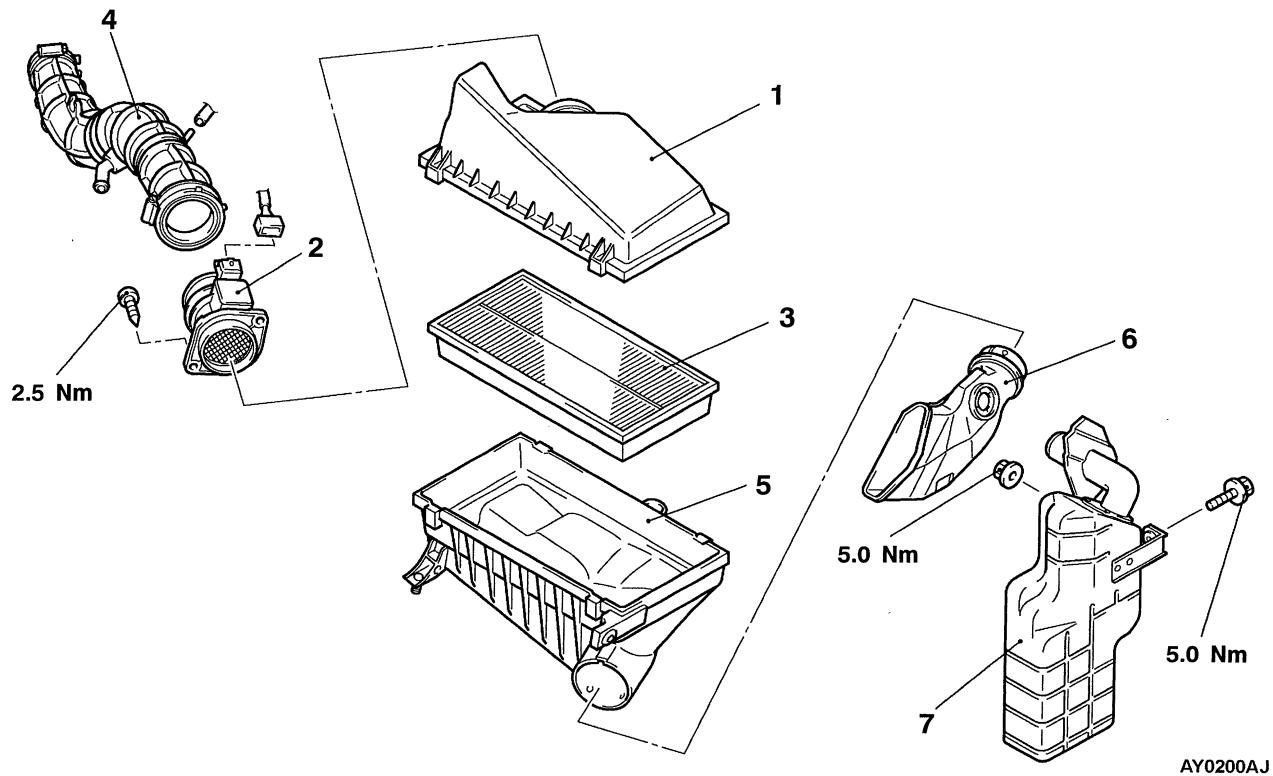
Battery voltage	Nipple A condition	Normal condition
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained
Not applied	Open	Vacuum leaks

5. Measure the resistance between the terminals.

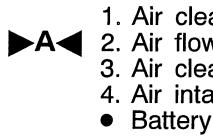
**Standard value: 15.5 – 17.5 Ω (at 25°C)**

## AIR CLEANER &lt;F9Q&gt;

## REMOVAL AND INSTALLATION



## Removal steps



1. Air cleaner cover
2. Air flow sensor assembly
3. Air cleaner element
4. Air intake hose
- Battery

5. Air cleaner body
6. Air duct
- Splash shield
7. Resonator

## INSTALLATION SERVICE POINT

## ►A◀ AIR FLOW SENSOR ASSEMBLY INSTALLATION

Make sure that the mesh of the air flow sensor assembly is not contaminated with dirt, then install the air flow sensor.

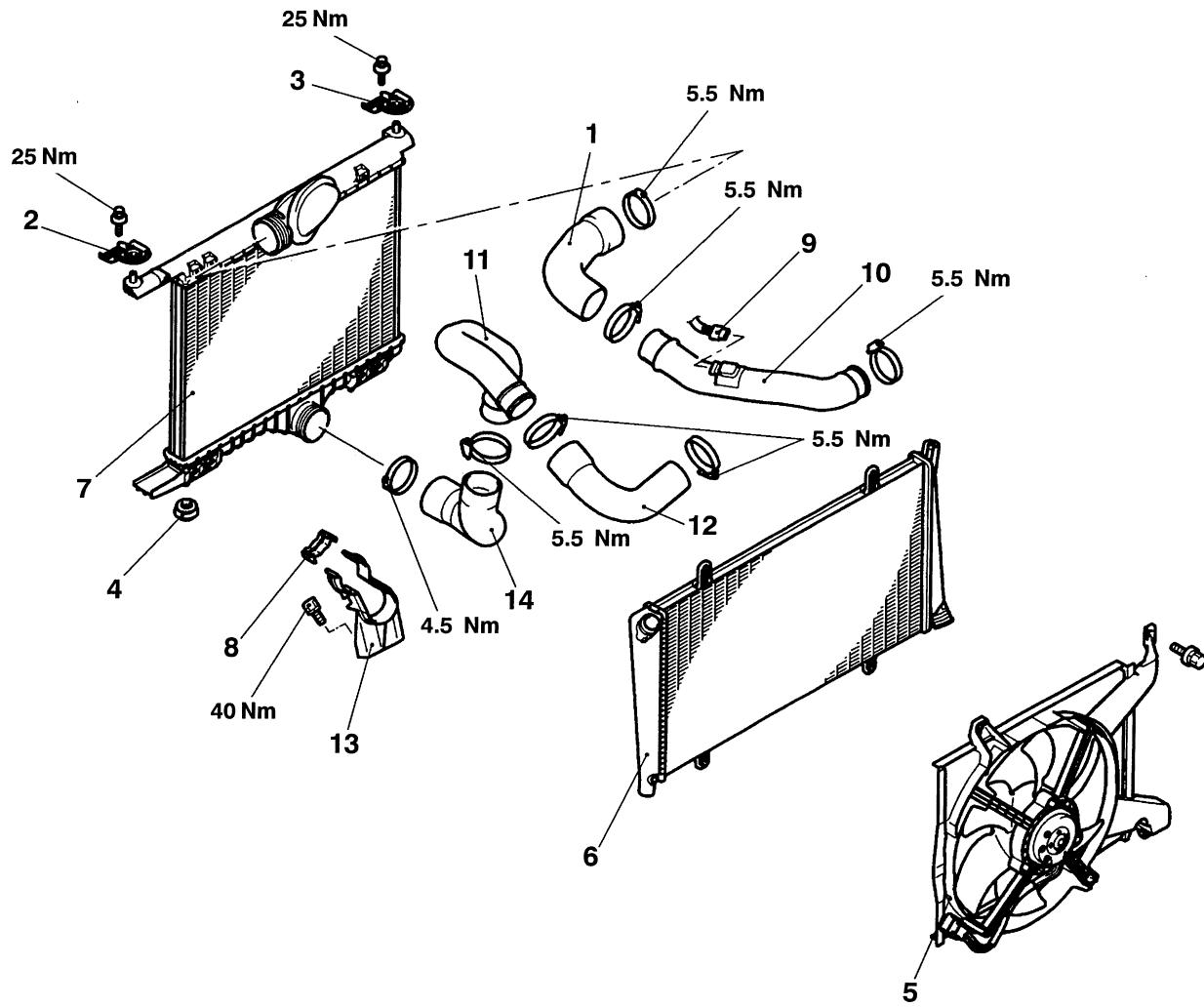
## Caution

If the sensor mesh remains contaminated, the air flow sensor could not sense air flow volume exactly.

## INTERCOOLER &lt;F9Q&gt;

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**  
 Radiator Fan Motor, Radiator and Intercooler assembly  
 Removal and Installation  
 (Refer to GROUP 14 – RADIATOR <F9Q>.)



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**Removal steps**

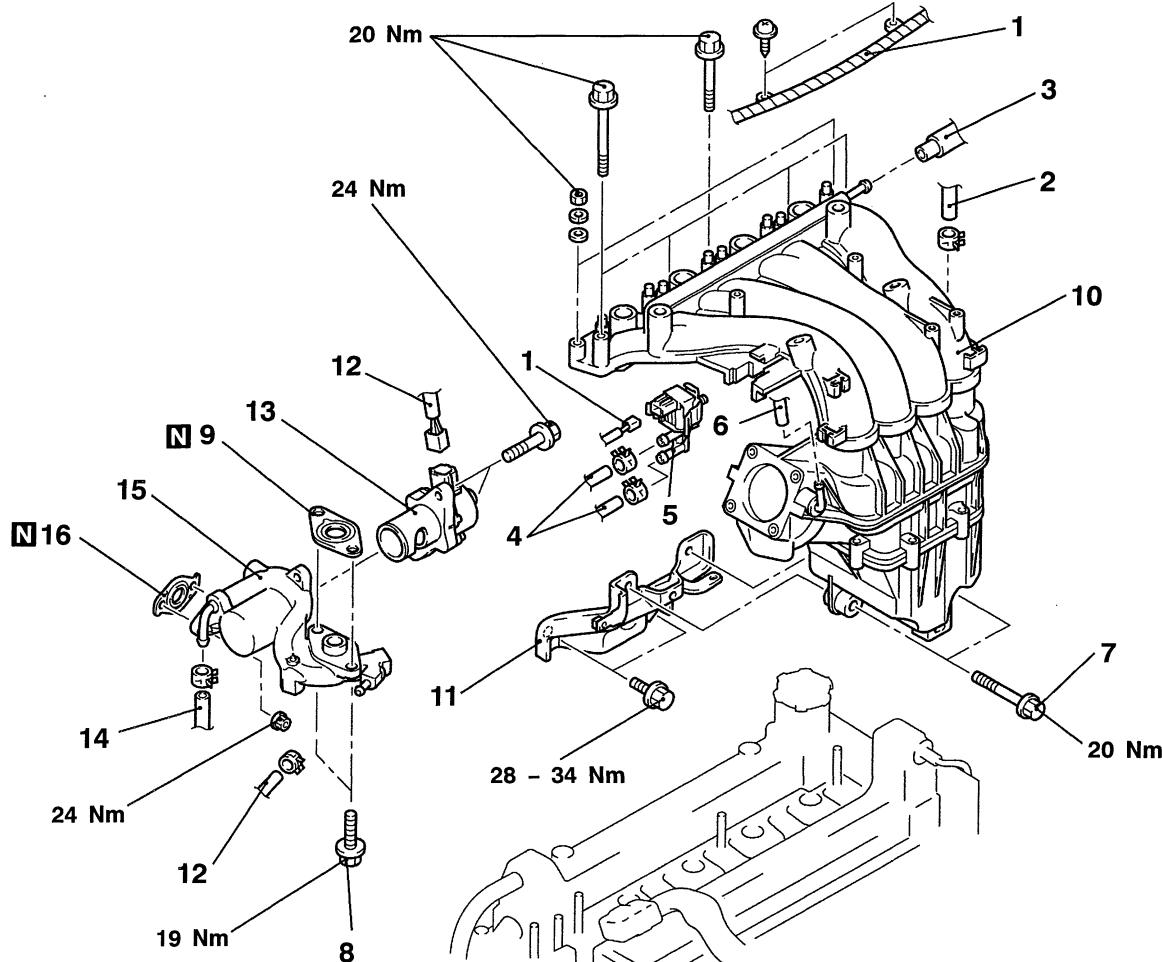
1. Air hose	8. Clip
2. Upper insulator (L.H.)	9. Boost sensor connector
3. Upper insulator (R.H.)	10. Air pipe
4. Insulator	11. Air pipe
5. Radiator fan motor assembly	12. Air hose
6. Radiator assembly	13. Hose bracket
7. Intercooler assembly	14. Air hose

## INTAKE MANIFOLD &lt;4G93-GDI&gt;

## REMOVAL AND INSTALLATION

## Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
- Air Cleaner Removal and Installation
- Throttle Body Removal and Installation  
(Refer to GROUP 13J.)
- Fuel Injector Removal and Installation  
(Refer to GROUP 13J.)
- Ignition Coil Removal and Installation  
(Refer to GROUP 16.)



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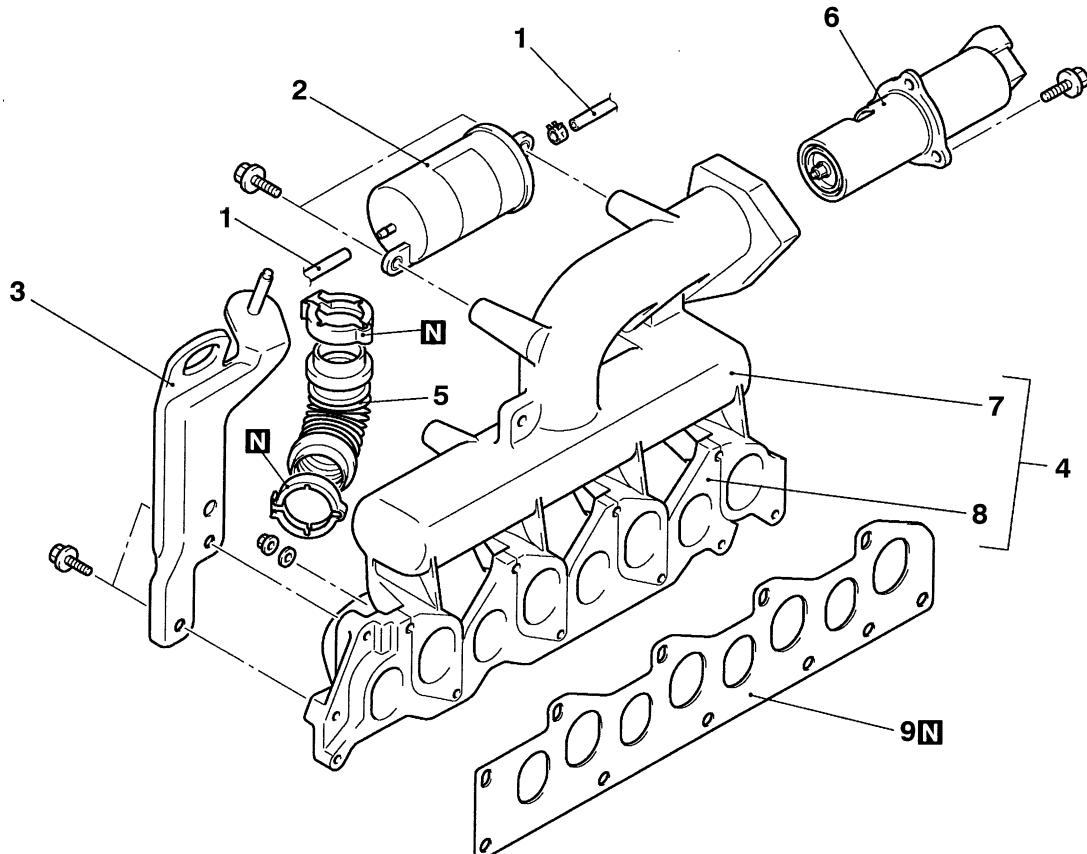
## Removal steps

1. Control wiring harness, connector
2. Brake booster vacuum hose connection
3. PCV hose connection
4. Vacuum hoses connection
5. Purge control solenoid valve
6. Purge hose connection
7. Intake manifold to intake manifold stay connecting bolt
8. Intake manifold to EGR valve support connecting bolt
9. EGR valve support gasket
- Injector driver
10. Intake manifold assembly
11. Intake manifold stay
12. EGR valve connector
13. EGR valve
14. Water hose connection
15. EGR valve support
16. EGR valve support gasket

## INTAKE MANIFOLD AND EXHAUST MANIFOLD &lt;F9Q&gt;

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**  
Turbocharger Assembly Removal and Installation  
(Refer to P.15-9.)

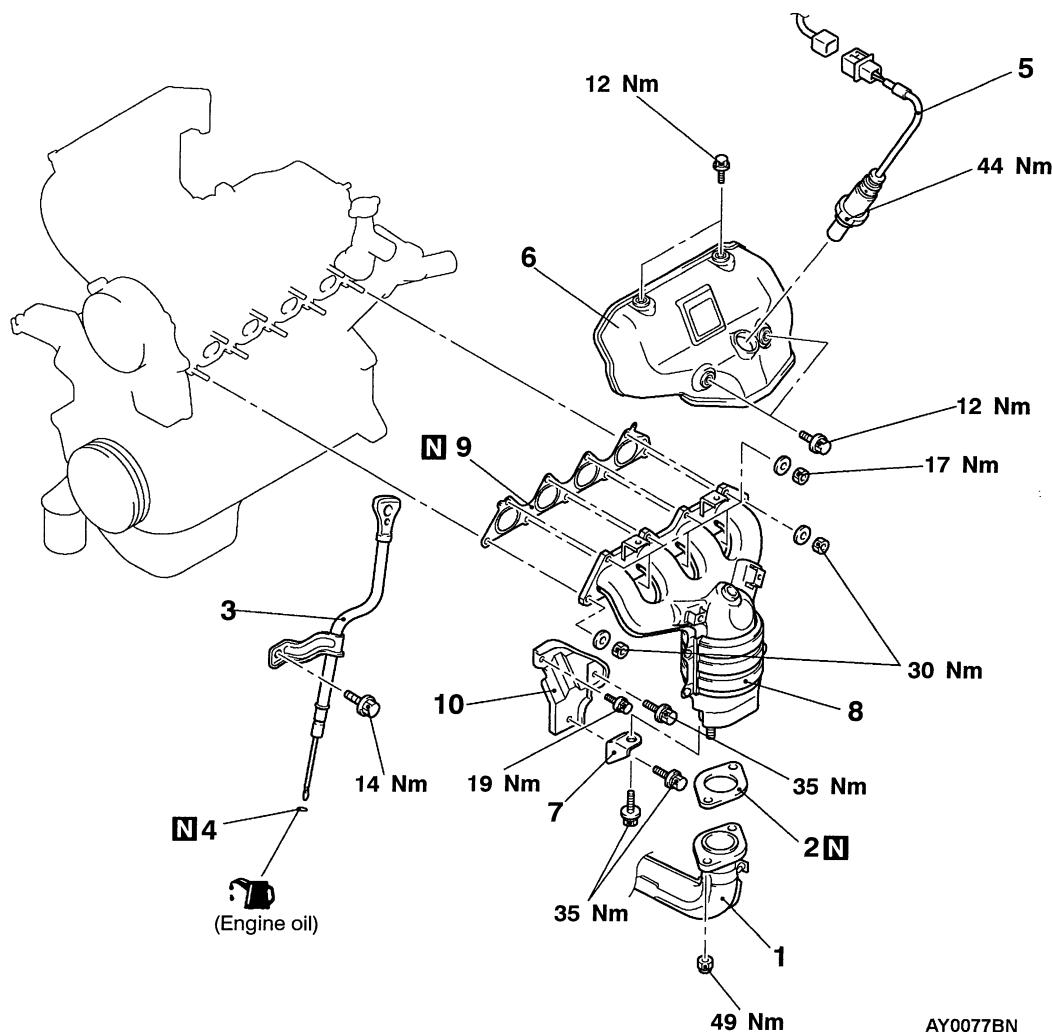


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**Removal steps**

1. Vacuum hose connection	5. EGR pipe
2. Vacuum tank assembly	6. EGR valve assembly
3. Engine hanger	7. Intake manifold
4. Intake and exhaust manifold assembly	8. Exhaust manifold
	9. Intake and exhaust manifold gasket

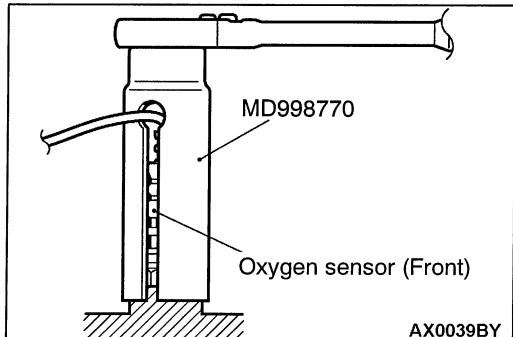
## EXHAUST MANIFOLD &lt;4G92-MPI&gt;



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## Removal steps

- 1. Front exhaust pipe connection
- 2. Gasket
- 3. Engine oil level gauge assembly
- 4. O-ring
- 5. Oxygen sensor (front)
- 6. Exhaust manifold cover
- 7. Exhaust manifold bracket B
- 8. Exhaust manifold
- 9. Exhaust manifold gasket
- 10. Exhaust manifold bracket A

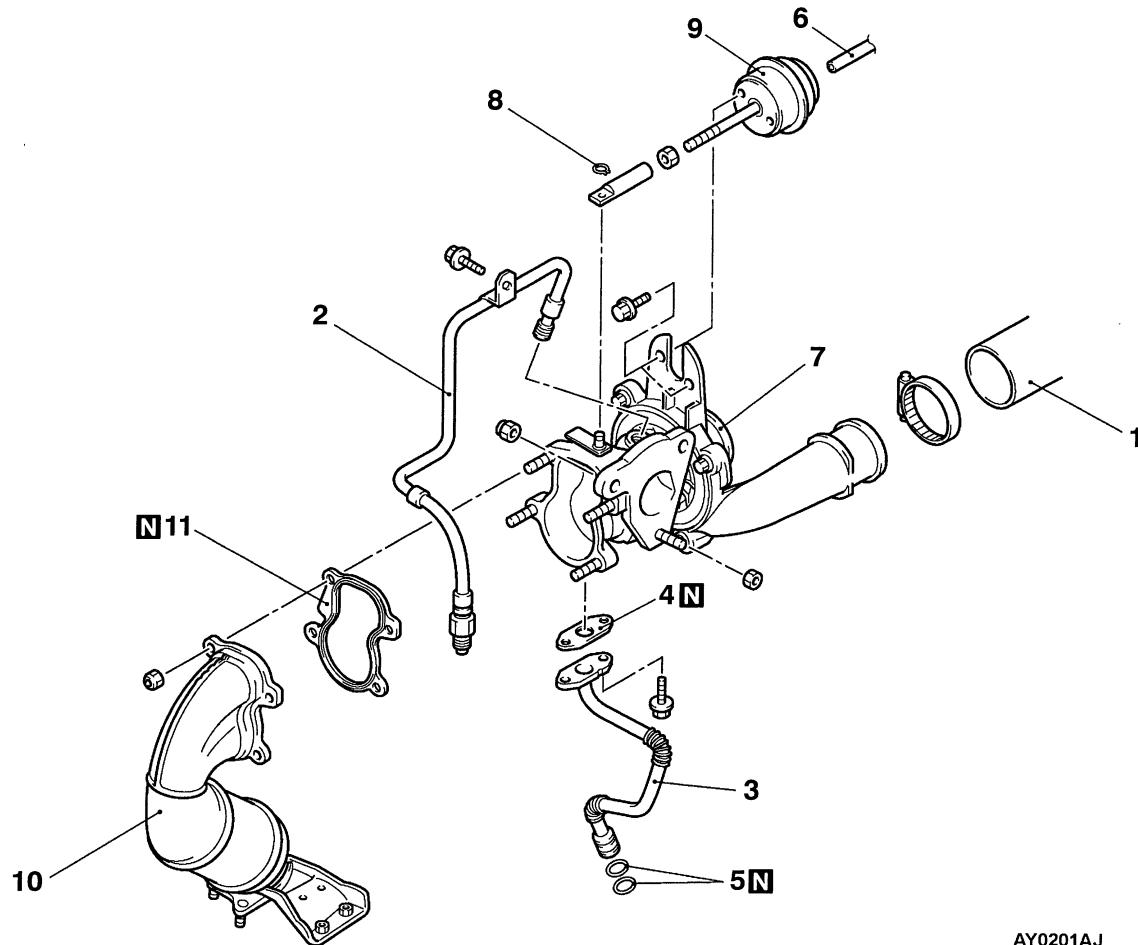


**REMOVAL SERVICE POINT**  
 ◀A▶ OXYGEN SENSOR (FRONT) REMOVAL  
**INSTALLATION SERVICE POINT**  
 ▶A◀ OXYGEN SENSOR (FRONT) INSTALLATION

## TURBOCHARGER <F9Q>

### REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**  
Air Intake Hose Removal and Installation  
(Refer to P.15-4.)



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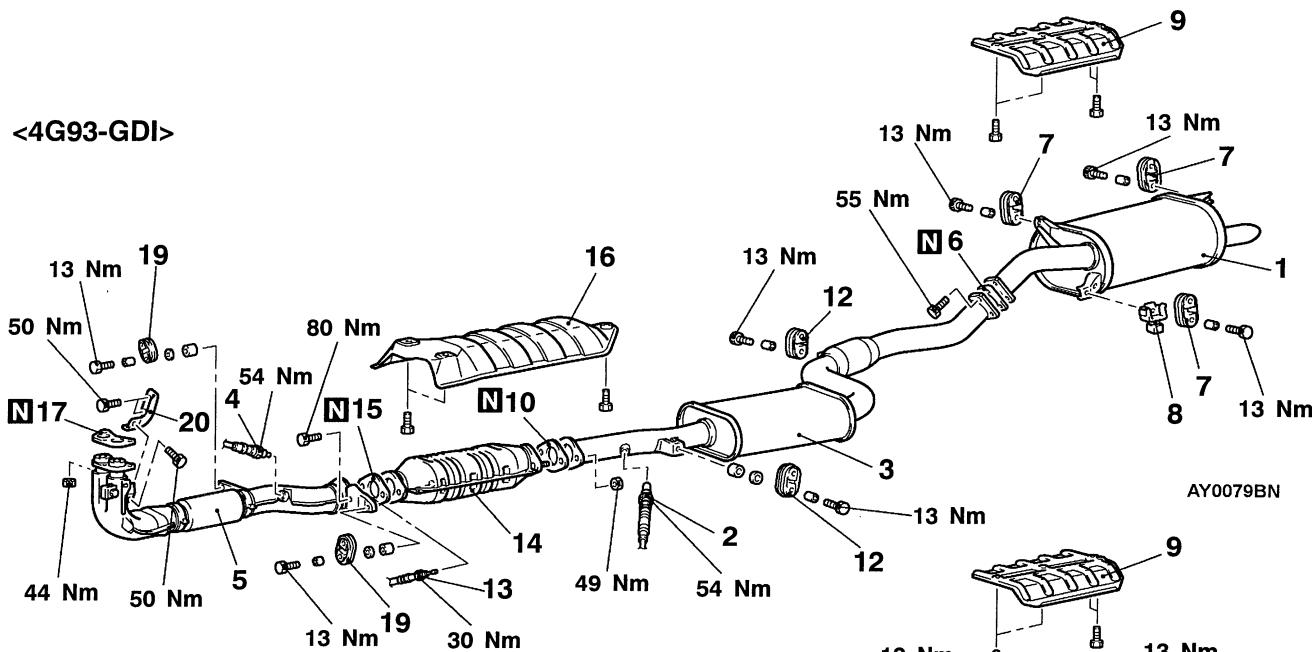
#### Removal steps

- 1. Air hose connection
- 2. Oil pipe assembly
- 3. Oil return pipe assembly
- 4. Oil return pipe gasket
- 5. O-ring
- 6. Vacuum hose connection
- 7. Turbocharger assembly
- 8. Circlip
- 9. Waste gate assembly
- 10. Catalytic converter
- 11. Gasket

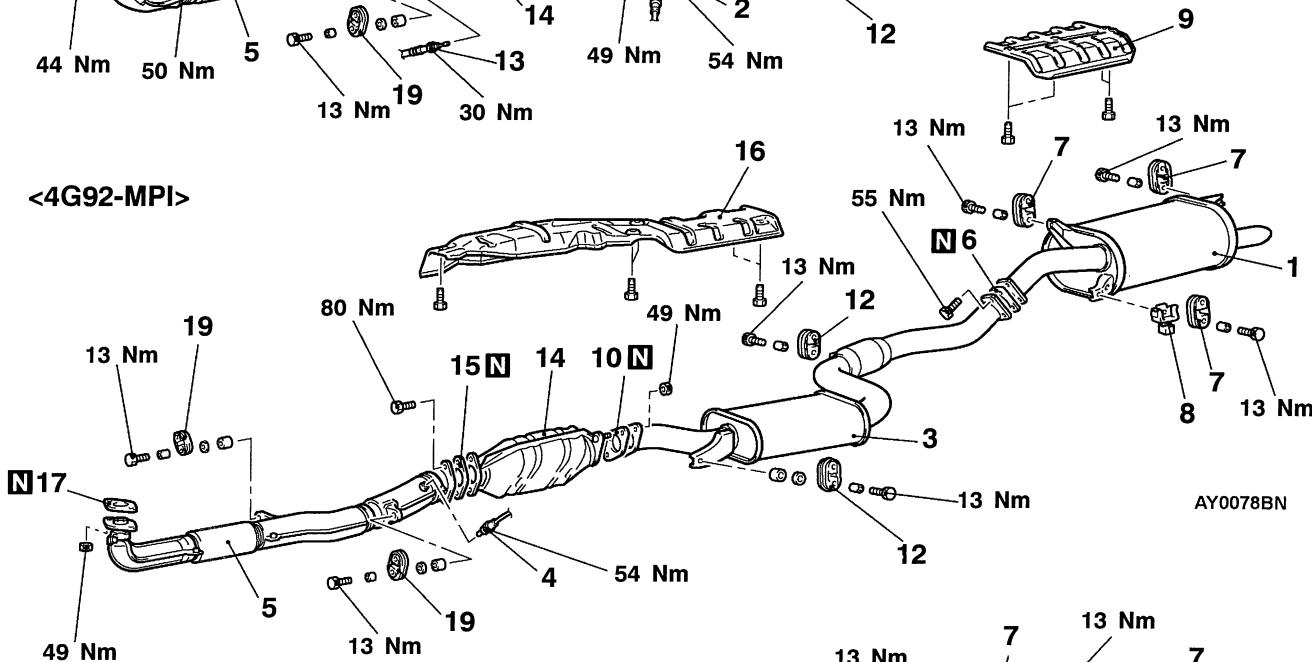
## **EXHAUST PIPE AND MAIN MUFFLER**

## REMOVAL AND INSTALLATION

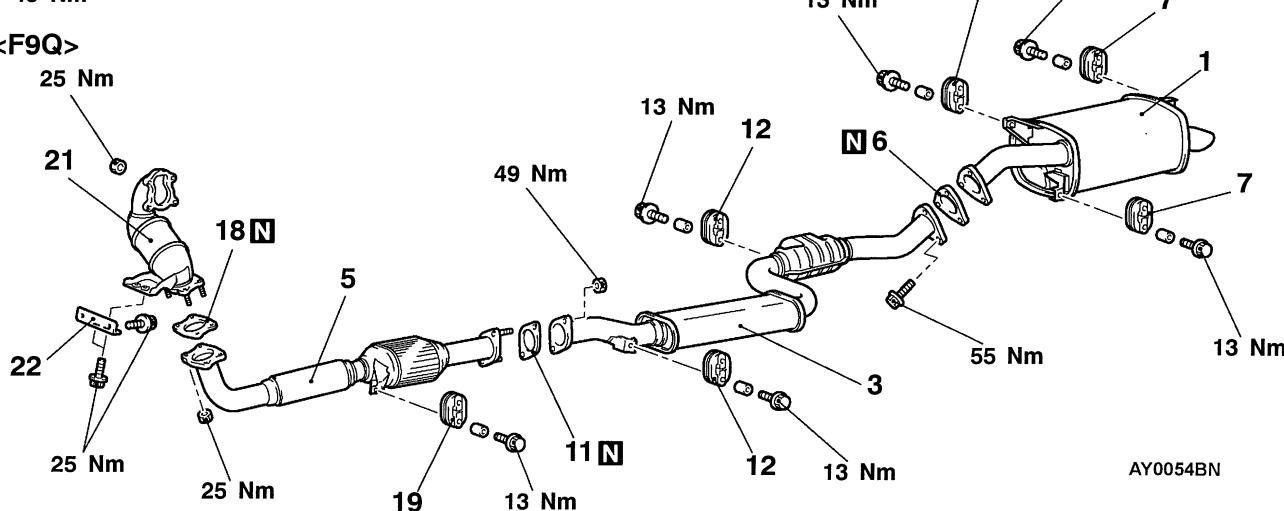
**<4G93-GDI>**



<4G92-MPI>



<F9Q>



**Main muffler removal steps**

1. Main muffler
6. Gasket
7. Hanger
8. Dynamic damper  
<4G93-GDI, 4G13-MPI>
9. Rear floor heat protector  
<4G93-GDI, 4G13-MPI>

**Front exhaust pipe removal steps**

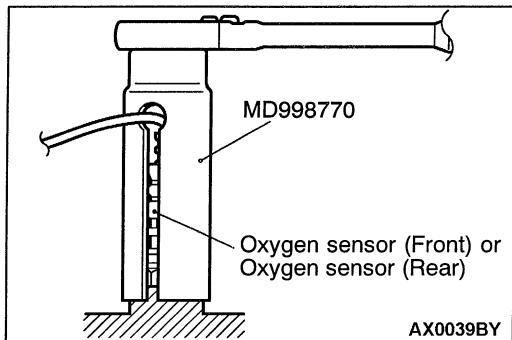
◀A▶ ▶A◀

4. Oxygen sensor (front) <4G93-GDI> or oxygen sensor (rear) <4G92-MPI>
5. Front exhaust pipe
11. Gasket <F9Q>
15. Gasket <4G93-GDI, 4G13-MPI>
17. Gasket <4G93-GDI, 4G13-MPI>
18. Gasket <F9Q>
19. Hanger
20. Front exhaust pipe bracket <4G93-GDI>
21. Catalytic converter <F9Q>
22. Bracket <F9Q>

**Center exhaust pipe removal steps**

◀A▶ ▶A◀

2. Oxygen sensor (rear) <4G93-GDI>
3. Center exhaust pipe
6. Gasket
10. Gasket <4G93-GDI, 4G13-MPI>
11. Gasket <F9Q>
12. Hanger
13. Catalyst temperature sensor  
<4G93-GDI-M/T>
14. Catalytic converter  
<4G93-GDI, 4G13-MPI>
15. Gasket <4G93-GDI, 4G13-MPI>
16. Front floor heat protector  
<4G93-GDI, 4G13-MPI>



**REMOVAL SERVICE POINT**

**◀A▶ OXYGEN SENSOR (REAR)/OXYGEN SENSOR (FRONT) REMOVAL**

**INSTALLATION SERVICE POINT**

**▶A◀ OXYGEN SENSOR (FRONT)/OXYGEN SENSOR (REAR) INSTALLATION**

**NOTES**