

2004 MAZDASPEED MX-5 Service Highlights

FOREWORD

This Service Highlights is intended for use by service training personnel of Authorized Mazda Dealers.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing.

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**Mazda Motor Corporation
HIROSHIMA, JAPAN**

APPLICATION:

This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN), and related materials shown on the following page.

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VEHICLE IDENTIFICATION NUMBERS (VIN)

JM1 NB354*0# 400001—
JM1 NB354*4# 400001—

RELATED MATERIALS

Material Name	MNAO Part No.	Mazda Material No.
1999 Mazda MX-5 Miata Service Highlights	9999-95-072F-99	3314-10-97K
2000 Mazda Protegé, MX-5 Miata, 626, millenia Service Highlights	9999-95-MODL-00	3339-1U-99H
2001 Mazda Protegé, MX-5 Miata, 626, millenia, MPV Service Highlights	9999-95-MODL-01	3349-1U-00K
2002 Mazda Protegé Protegé5, MX-5 Miata, 626, MPV Service Highlights	9999-95-MODL-02	3354-1U-01L
2003 Mazda MX-5 Miata/MX-5, MPV Service Highlights	9999-95-MODL-03	3371-1U-02J
2004 Mazda MX-5 Miata/MX-5, MAZDASPEED MX-5, Mazda6, MPV Service Highlights	9999-95-MODL-04	3384-1U-03H
1995, 1996, 1997, 1998, 1999, 2000 OBD-II Service Highlights	9999-95-OBD2-00	3334-1U-99K
2004 Mazda MX-5 Miata/MX-5 Workshop Manual	9999-95-042B-04	1790-1U-03G
2004 Mazda MX-5 Miata/MX-5, MAZDASPEED MX-5 Workshop Manual	9999-95-042B-04S	1814-1U-04A
2004 Mazda MX-5 Miata/MX-5, MAZDASPEED MX-5 Wiring Diagram	9999-95-026G-04	5586-1U-03G
Engine Workshop Manual BP	9999-95-EWBP-01	1705-1U-00G
Manual Transmission Workshop Manual Y16M-D	9999-95-423H-99	1658-10-99A
1999 Mazda MX-5 Miata Bodyshop Manual	9999-95-060F-99	3318-10-97K

ENGINE

01
SECTION

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01-00 OUTLINE

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OUTLINE

ENGINE ABBREVIATIONS

C5U01000000S01

ABDC	After Bottom Dead Center
ATDC	After Top Dead Center
BARO	Barometric Pressure
BBDC	Before Bottom Dead Center
BTDC	Before Top Dead Center
CCM	Comprehensive Component Monitor
CKP	Crankshaft Position
CMP	Camshaft Position
DC	Drive Cycle
DTC	Diagnostic Trouble Code
ECT	Engine Coolant Temperature
EGR	Exhaust Gas Recalculation
ESA	Electronic Spark Advance
EVAP	Evaporative Emission
EX	Exhaust
HO2S	Heated Oxygen Sensor
IAC	Idle Air Control
IAT	Intake Air Temperature
IN	Intake
KS	Knock Sensor
MAF	Mass Air Flow
MIL	Malfunction Indicator Light
N/A	Not Applicable
PCM	Powertrain Control Module
PID	Parameter Identification
PSP	Power Steering Pressure
TC	Turbocharger
TCM	Transmission Control Module
TP	Throttle Position
TWC	Three Way Catalytic Converter
VSS	Vehicle Speed Sensor
VTCS	Variable Tumble Control System

ENGINE FEATURES

C5U01000000S02

On-board diagnostic

Improve Serviceability	The number of the DTCs and PIDs items have been changed.
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Intake-air system

Improve Engine Performance	A turbocharger has been adopted.
Improve Engine Reliability	Air charging pressure control has been adopted.

Cooling system

Improved Lubrication and Reliability	A water-cooled type oil cooler with five layers adopted
Improved Serviceability	Radiator cowling which combines cooling fan No.1 and No.2 adopted

Ignition system

Improved Durability	Spark plug with an iridium alloy center electrode and platinum tip ground electrode adopted
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OUTLINE

ENGINE SPECIFICATIONS

C5U01000000S03

Specification

Item			Specifications	
			BP with TC	BP
MECHANICAL				
Type			Gasoline, 4-cycle	
Cylinder arrangement and number			In-line, 4 cylinders	
Combustion chamber			Pentroof	
Valve system			DOHC, timing belt driven, 16 valves	
Displacement (ml {cc, cu in})			1,840 {1,840, 112.3}	
Bore × stroke (mm {in})			83.0×85.0 {3.27 ×3.35}	
Compression ratio			9.5:1	
Valve timing	IN	Open BTDC (°)	8	
		Close ABDC (°)	53	
	EX	Open BBDC (°)	53	
		Close ATDC (°)	9	
Valve clearance (mm {in})	IN	0.18—0.24 {0.0071—0.094} [Engine cold]		
	EX	0.28—0.34 {0.012—0.0012} [Engine cold]		
LUBRICATION SYSTEM				
Type			Force-fed type	
Oil pump	Type		Trochoid gear type	
	Relief pressure (kPa {kgf/cm ² , psi})		481—578 {4.9—5.8, 50—63}	
Oil filter	Type		Full-flow, paper element	
	Bypass pressure (kPa {kgf/cm ² , psi})		79—117 {0.8—1.2, 12—17}	
Oil capacity (approx. quantity)	Total (dry engine) (L {US qt, Imp qt})		4.0 {4.2, 3.5}	
	Oil replacement (L {US qt, Imp qt})		3.6 {3.8, 3.2}	
	Oil and oil filter replacement (L {US qt, Imp qt})		3.8 {4.0, 3.3}	
Engine oil			API Service SG (Energy Conserving II), SH (Energy Conserving II) or ILSAC (GF-I), SJ or ILSAC (GF-II), SL or ILSAC (GF-III)	
COOLING SYSTEM				
Type			Water-cooled, forced circulation	
Cap valve opening pressure (kPa {kgf/cm ² , psi})			94—122 {0.95—1.25, 13.6—17.7}	
Coolant capacity (L {US qt, Imp qt})			6.2 {6.6, 5.5}	
Water pump	Type		Centrifugal, V-ribbed belt-driven	
	Water seal		Unified mechanical seal	
Thermostat	Type		Wax, bottom-bypass	
Radiator	Type		Corrugated fin	
Cooling fan	Type		Electrical	
	Blade	Outer diameter (mm {in})	300 {11.8}	
		Number	5	
FUEL SYSTEM				
Injector	Type		Hi-ohmic	
	Type of fuel delivery		Top-feed	
	Type of drive		Voltage	
Pressure regulator	Regulating pressure (kPa {kgf/cm ² , psi})		387—397 {3.95—4.04, 56.2—57.4}	
Fuel tank	Capacity (L {US gal, Imp gal})		48 {13, 10}	

01-00

OUTLINE

Item		Specifications	
		BP with TC	BP
Fuel	Type	91 [(R+M)/ 2 method] or above (96 RON or above)	←
EMISSION SYSTEM			
Catalyst	Type	TWC	←
Evaporative emission control system	Type	Canister type	←
PCV system	Type	Closed type	←
CHARGING SYSTEM			
Battery	Voltage (V)	12	←
	Type and capacity (5-h rate) (A·h)	S46A24L (32)	←
Generator	Output (V·A)	12-80	←
	Regulated voltage (V)	Controlled by PCM	←
	Self diagnosis function		←
IGNITION SYSTEM			
Ignition system	Type	Full transistor (distributorless)	←
	Spark advance	Electronic	←
	Firing order	1-4—2-3	←
Spark plug	Type	SK16PR-F8 (DENSO)	BKR5E-11 ^{*1} , BKR6E-11 (NGK), K16PR-U11 ^{*1} , K20PR-U11 (DENSO)
STARTING SYSTEM			
Starter	Type	Coaxial reduction	←
	Output (kW)	1.0	←
CONTROL SYSTEM			
EGR control	Type	Stepping motor type	←

*1 : Standard plug

01-02 ON-BOARD DIAGNOSTIC [ENGINE CONTROL SYSTEM]

ON-BOARD DIAGNOSTIC OUTLINE . . . 01-02-1
DIAGNOSTIC TEST MODE 01-02-1
 DTC Table 01-02-1

DTC Detection Logic and Conditions . . 01-02-1
PID/DATA MONITOR AND RECORD . . . 01-02-3
 PID Table 01-02-3

ON-BOARD DIAGNOSTIC OUTLINE

C5U01020000S01

- DTCs and PIDs have been adopted.

DIAGNOSTIC TEST MODE

C5U01020000S02

DTC Table

- The following DTCs have been adopted.

x:Applicable

DTC No.	Condition	MIL	DC	*Monitor item	Memory function
P0096	IAT No.2 circuit performance problem	ON	2	CCM	×
P0097	IAT No.2 circuit low input	ON	1	CCM	×
P0098	IAT No.2 circuit high input	ON	1	CCM	×
P0245	Turbocharger wastegate regulating valve control circuit low	ON	2	CCM	×
P0246	Turbocharger wastegate regulating valve control circuit high	ON	2	CCM	×

- The following DTCs detection condition have been changed.

x:Applicable

DTC No.	Condition	MIL	DC	*Monitor item	Memory function
P0101	MAF circuit range/performance problem	ON	2	CCM	×
P0106	BARO/MAP circuit performance problem	ON	2	CCM	×
P0107	BARO/MAP circuit low input	ON	1	CCM	×
P0108	BARO/MAP circuit high input	ON	1	CCM	×
P0111	IAT No.1 circuit performance problem	ON	2	CCM	×
P0116	ECT circuit range/performance problem	ON	2	CCM	×
P0121	TP circuit range/performance problem	ON	2	CCM	×
P0133	HO2S (front) circuit slow response	ON	2	HO2S	×
P0401	EGR flow insufficient detected	ON	2	EGR	×
P0441	EVAP control system incorrect purge flow	ON	2	Evaporative	×
P2271	Rear HO2S signal stuck rich	ON	2	HO2S	×

DTC Detection Logic and Conditions

P0096 IAT No.2 circuit performance problem

- If intake air temperature is lower than engine coolant temperature by **-23 °C {-9.4 °F}** for **1.2 s** with ignition switch on *, the PCM determines that there is a IAT sensor No.2 performance problem.
 - If intake air temperature is higher than engine coolant temperature by **23 °C {73.4 °F}** for **1.2 s** with ignition switch on *, the PCM determines that there is a IAT sensor No.2 performance problem.
- *: Ignition switch on when **8 h or more** has passed since the previous ignition switch off

P0097 IAT No.2 circuit low input

- The PCM monitors IAT sensor No.2 signal at PCM terminal 4R. If voltage at PCM terminal 4R is **below 0.1 V**, the PCM determines that the IAT sensor No.2 circuit has malfunction.

P0098 IAT No.2 circuit high input

- The PCM monitors IAT sensor No.2 signal at PCM terminal 4R. If voltage at PCM terminal 4R is **above 4.9 V**, the PCM determines that the IAT sensor No.2 circuit has malfunction.

ON-BOARD DIAGNOSTIC [ENGINE CONTROL SYSTEM]

P0101 MAF circuit range/performance problem

- PCM compares actual MAF amount with expected MAF amount when the engine is running.
 - If mass intake air amount is, **above 44 g/s {5.9 lb/min}** for **5 s** and engine speed is **below 2,000 rpm** with engine running and engine coolant temperature is **above 70°C {158°F}**, PCM determines that detected mass intake air flow amount is too high.
 - If mass intake air flow amount is, **below 5—59 g/s {0.7—7.7 lb/min}** (The value depends on engine speed.) for **5 s** and engine speed is **above 1,000 rpm** with engine running and throttle opening angle is **above 50%**, PCM determines that detected mass intake air flow amount is too low.

P0106 BARO/MAP circuit performance problem

- PCM monitors differences between intake manifold vacuum and atmospheric pressure at idle, which BARO/MAP sensor detects by switching EGR boost sensor solenoid. If difference is **below 6.4 kPa {48.2 mmHg, 1.8 inHg}** PCM determines that there is BARO/MAP sensor performance problem.

P0107 BARO/MAP circuit low input

- PCM monitors input voltage from BARO/MAP sensor when monitoring conditions are met. If input voltage at PCM terminal 4AE is **below 0.13 V**, PCM determines that BARO/MAP sensor circuit is malfunctioning
MONITORING CONDITION
 - IAT is **above 10°C {50°F}**.

P0108 BARO/MAP circuit high input

- PCM monitors input voltage from BARO/MAP sensor when monitoring conditions are met. If input voltage at PCM terminal 4AE is **above 4.8 V**, PCM determines that BARO/MAP sensor circuit is malfunctioning.
MONITORING CONDITION
 - IAT is **above 10°C {50°F}**.

P0111 IAT No.1 circuit performance problem

- If intake air temperature is lower than engine coolant temperature by **-18 °C {-0.4 °F}** for **1.2 s** with ignition switch on*¹, the PCM determines that there is a IAT sensor performance problem.
 - If intake air temperature is higher than engine coolant temperature by **18 °C {64.4 °F}** for **1.2 s** with ignition switch on*¹, the PCM determines that there is a IAT sensor performance problem.
- *¹: Ignition switch on when **8 h or more** has passed since the previous ignition switch off

P0116 ECT circuit range/performance problem

- PCM monitors the maximum value and minimum value of ECT when engine is started and **5 min** have been passed after leaving the vehicle, **8 h or more**. If difference between maximum and minimum values of ECT is **below 5.6°C {42.1°F}**, PCM determines that ECT signal circuit has malfunction.

P0121 TP circuit range/performance problem

- If PCM detects that throttle valve opening angle is **below 12.5%** for **5 s** after following conditions are met, PCM determines that TP is stuck close:
MONITORING CONDITION
 - ECT is **above 70°C {158°F}**
 - MAF sensor signal above **81 g/s {11 lb/min}**
- If PCM detects that throttle valve opening angle is **above 50%** for **5 s** after following conditions are met, PCM determines that TP is stuck open:
MONITORING CONDITION
 - Engine speed **above 500 rpm**
 - MAF sensor signal **below 5.3 g/s {0.70 lb/min}**

P0133 HO2S (Front) circuit slow response

- The voltage at the HO2S (front) **exceeds 0.35 V** but it does not **exceed 0.55V** for a constant period of **20 s or more**.
- The voltage at the HO2S (front) falls **below 0.55 V** but it does not fall **below 0.35V** for a constant period of **20 s or more**.
- The voltage at the HO2S (front) is **between 0.35 V and 0.55 V** for a constant period of **20 s or more**.
MONITORING CONDITIONS
 - Drive mode 3
 - Following conditions are met:
 - Calculation load is **16—50%** [at engine speed **2,000 rpm**]
 - Engine speed is **750—3,100 rpm**
 - Vehicle speed is **over 5.6 km/h {3.5 mph}**.
 - Engine coolant temperature is **above -10°C {14°F}**.

P0245 Turbocharger wastegate regulating valve control circuit low

- The PCM monitors the turbocharger wastegate regulating valve control voltage when the PCM turns the turbocharger wastegate regulating valve on. If the control voltage is low, the PCM determines that the turbocharger wastegate regulating valve control circuit voltage is low.

P0246 Turbocharger wastegate regulating valve control circuit high

- The PCM monitors the turbocharger wastegate regulating valve control voltage when the PCM turns the turbocharger wastegate regulating valve off. If the control voltage is high, the PCM determines that the turbocharger wastegate regulating valve control circuit voltage is high.

ON-BOARD DIAGNOSTIC [ENGINE CONTROL SYSTEM]

P0401 EGR flow insufficient detected

- Difference in intake manifold pressure when EGR is operated and when it is stopped is too small.

P0441 Evaporative emission control system incorrect purge flow

- PCM measures the purge line pressure, which is the vacuum when a following condition. If vacuum between charcoal canister and intake manifold does not reach the specified, PCM determines that the EVAP system has clogging.

MONITORING CONDITION

- Engine speed **1,100—3,500 rpm**
- Vehicle speed **34—119 km/h {21.1—73.7 mph}**
- Throttle opening angle, **5.5—14.5 %**

P2271 Rear HO2S signal stuck rich

- PCM monitors input voltage from HO2S (rear) when monitoring conditions are met. If input voltage from HO2S (rear) sensor is, **above 0.30 V** for **6 s**, PCM determines that the circuit input is high.

PID/DATA MONITOR AND RECORD

C5U01020000S04

PID Table

- The following PIDs have been adopted.

Monitor item (Definition)	Unit/ Condition		PCM terminal
	°C	°F	
IAT2 (Intake air temperature)	V		4R
	kPa Bar psi		
MAP (Boost pressure)	V		

01-11 LUBRICATION

LUBRICATION SYSTEM OUTLINE
 [BP WITH TC] 01-11-1

LUBRICATION SYSTEM FLOW CHART
 [BP WITH TC] 01-11-1
 OIL PAN [BP WITH TC] 01-11-1
 OIL COOLER [BP WITH TC] 01-11-2

01-11

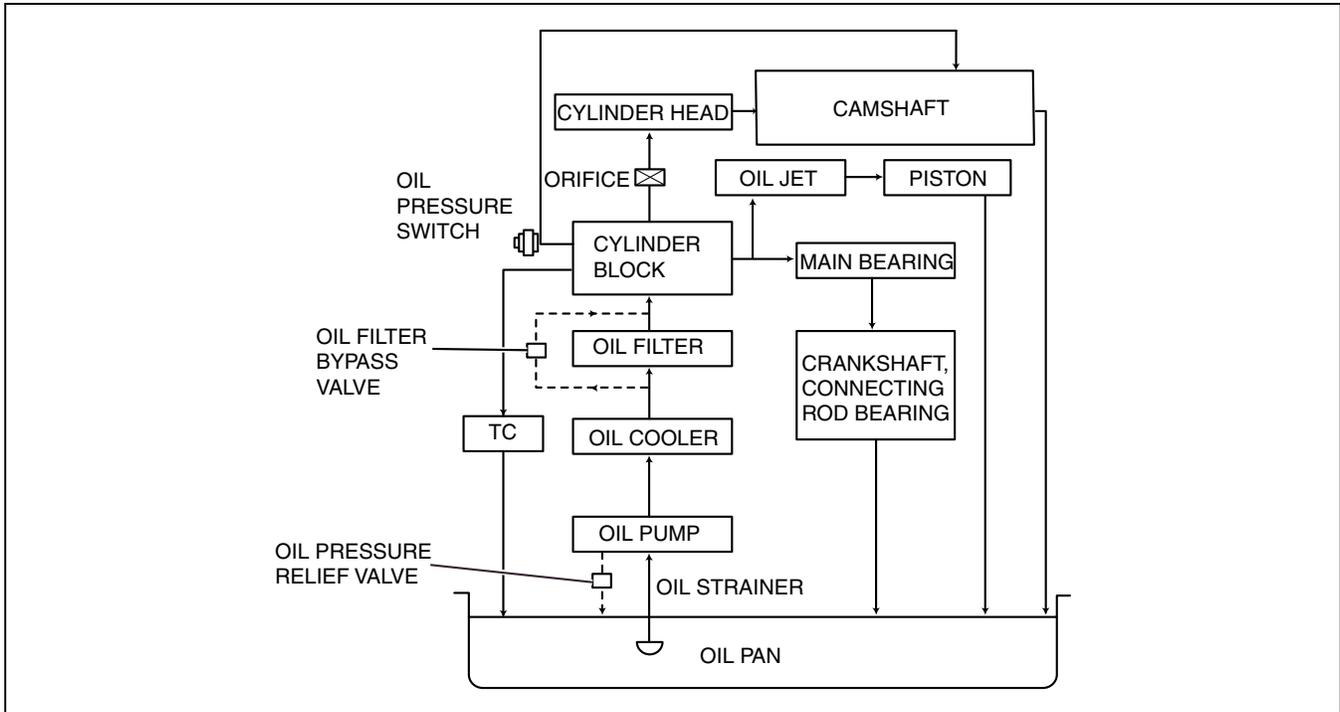
LUBRICATION SYSTEM OUTLINE [BP WITH TC]

C5U011100000S01

- The oil routing and oil pan has been changed with the adoption of the turbocharger.
- The five-layered oil cooler has been adopted.

LUBRICATION SYSTEM FLOW CHART [BP WITH TC]

C5U011100000S03

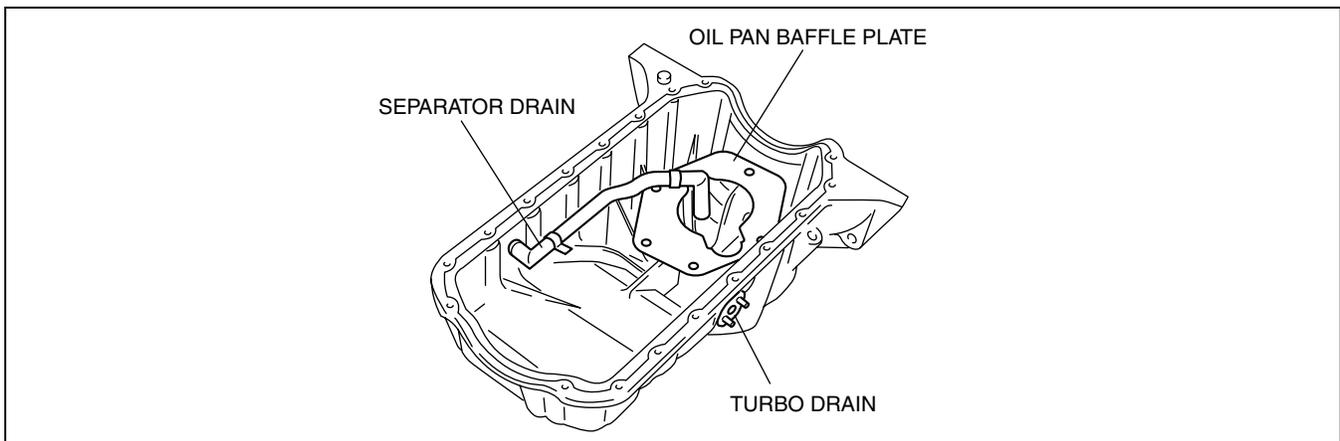


C5U0111S604

OIL PAN [BP WITH TC]

C5U01110040S01

- An oil pan baffle plate has been adopted inside the oil pan to stabilize engine oil distribution by crankshaft rotation and oil level when the vehicle sways.
- Turbo and separator drains have been adopted for the oil pan.



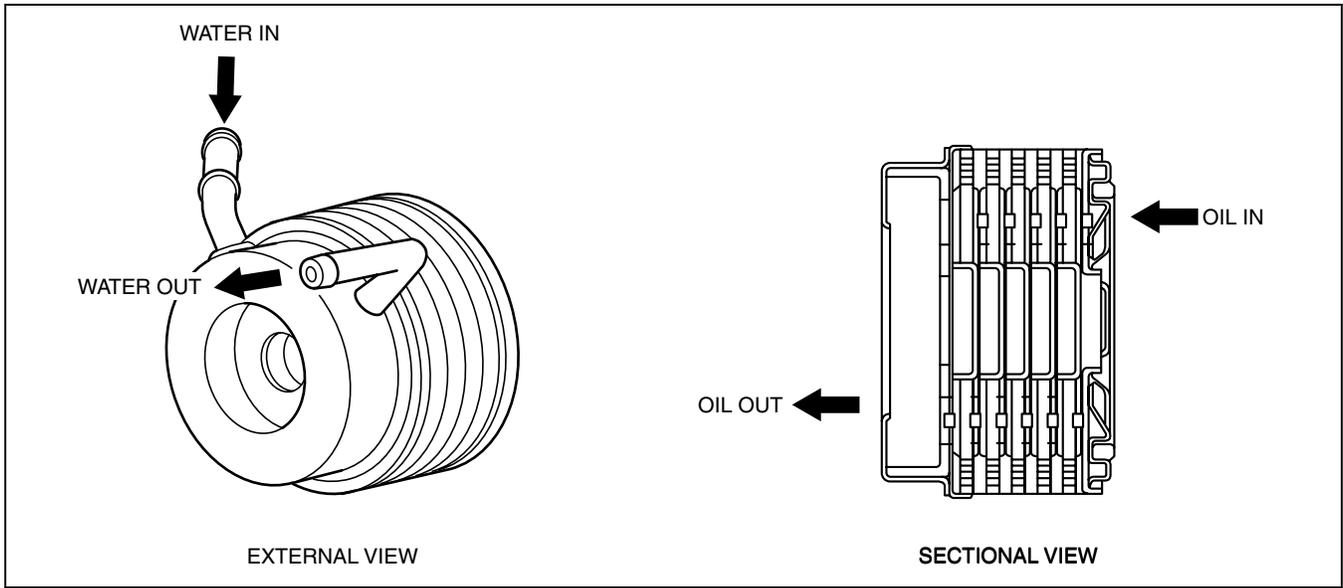
C5U0111S505

LUBRICATION

OIL COOLER [BP WITH TC]

C5U01114700S01

- The oil cooler has five layers and is water cooled.
- The oil cooler lowers the engine oil temperature to prevent premature deterioration of engine oil.



C5U0111S501

01-12 COOLING SYSTEM

COOLING SYSTEM OUTLINE
[BP WITH TC] 01-12-1

COOLING SYSTEM FLOW CHART
[BP WITH TC] 01-12-1
COOLING FAN [BP WITH TC] 01-12-1
Structure 01-12-1

01-12

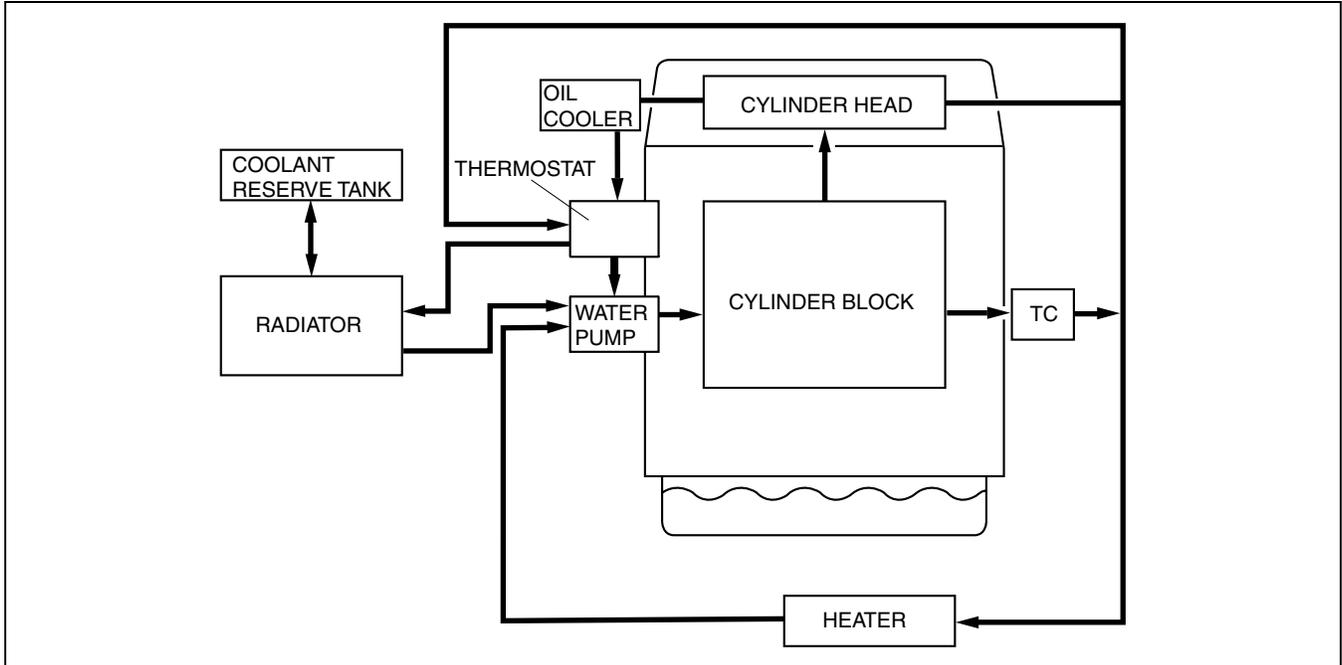
COOLING SYSTEM OUTLINE [BP WITH TC]

C5U01120000S01

- The radiator cowling which combines cooling fan No.1 and No.2 has been adopted.

COOLING SYSTEM FLOW CHART [BP WITH TC]

C5U01120000S02



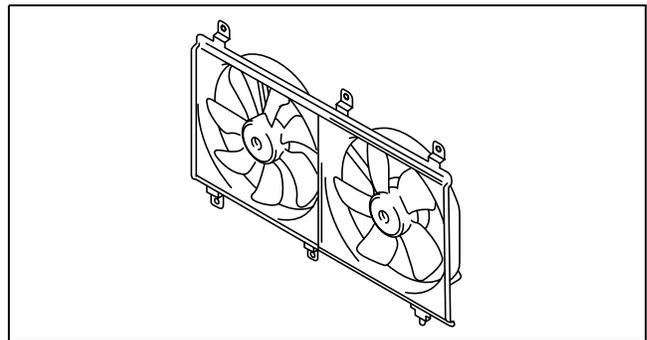
C5U0112S502

COOLING FAN [BP WITH TC]

C5U011215140S01

Structure

- The cooling fan is electrically operated.



B5J3602W501

01-13 INTAKE-AIR SYSTEM

INTAKE-AIR SYSTEM OUTLINE	01-13-1	Construction	01-13-5
INTAKE-AIR SYSTEM		Operation	01-13-5
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TURBOCHARGER		Construction	01-13-6
CONSTRUCTION/OPERATION	01-13-5	Operation	01-13-6

01-13

INTAKE-AIR SYSTEM OUTLINE

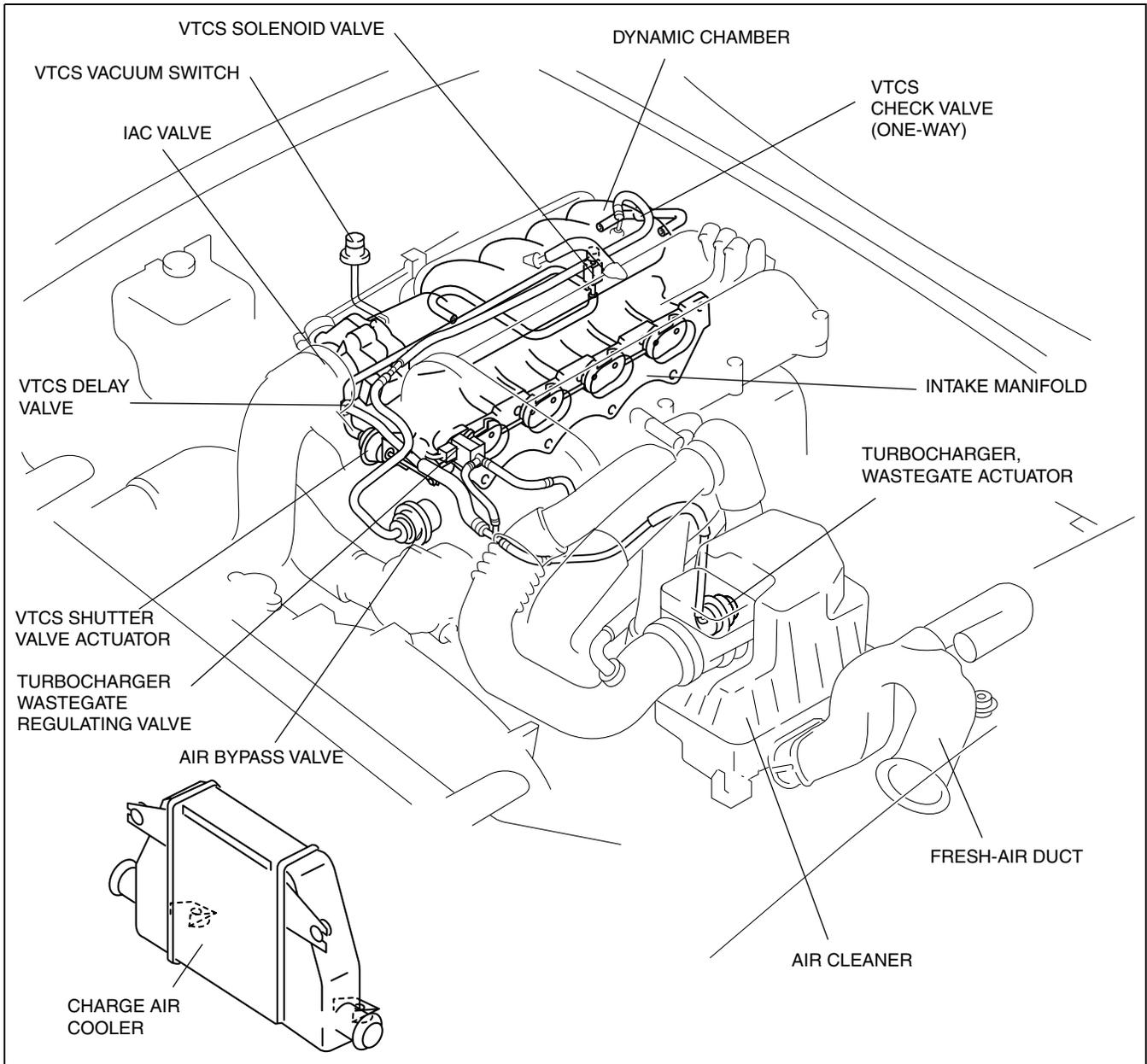
C5U011300000S14

- A turbocharger has been adopted.
- Air charging pressure system has been adopted.

INTAKE-AIR SYSTEM

INTAKE-AIR SYSTEM STRUCTURAL VIEW

C5U01130000S15

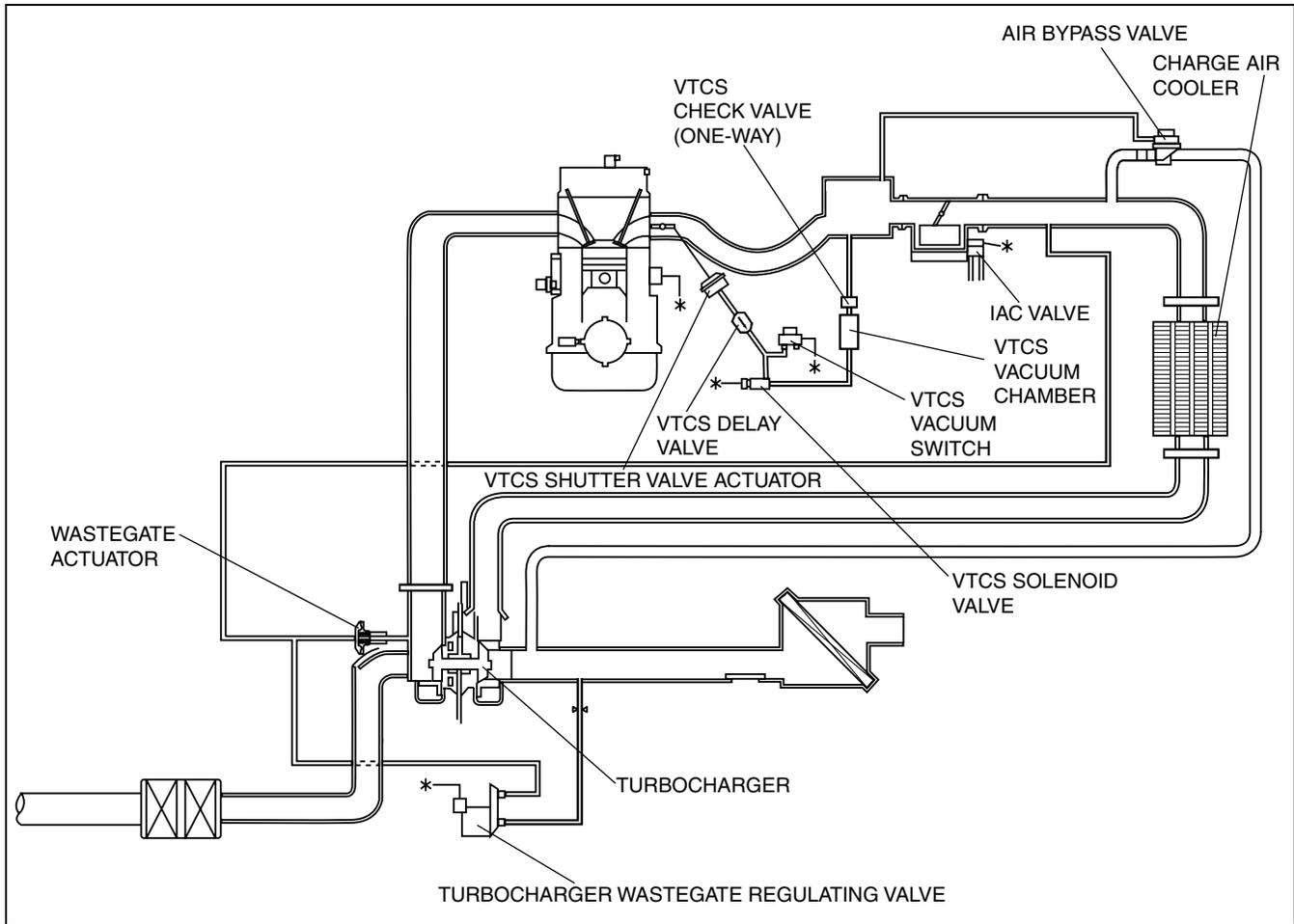


C5U113ZS002

INTAKE-AIR SYSTEM

INTAKE-AIR SYSTEM DIAGRAM

C5U01130000S16



C5U113ZS001

AIR CHARGING PRESSURE SYSTEM OUTLINE

C5U01130000S31

- A wastegate type turbocharger has been adopted for the air charging pressure system, which utilizes the energy of the exhaust gas to forcefully pressurize the intake air. Due to this, power efficiency, driveability, and fuel economy have been improved.
- The air charging pressure system consists of the air bypass valve, wastegate actuator, and turbocharger wastegate regulating valve. The system optimally adjusts the air charging pressure at all engine ranges.
- A charge air cooler has been adopted which improves charging efficiency by decreasing the intake air temperature that has been increased by the turbocharger.

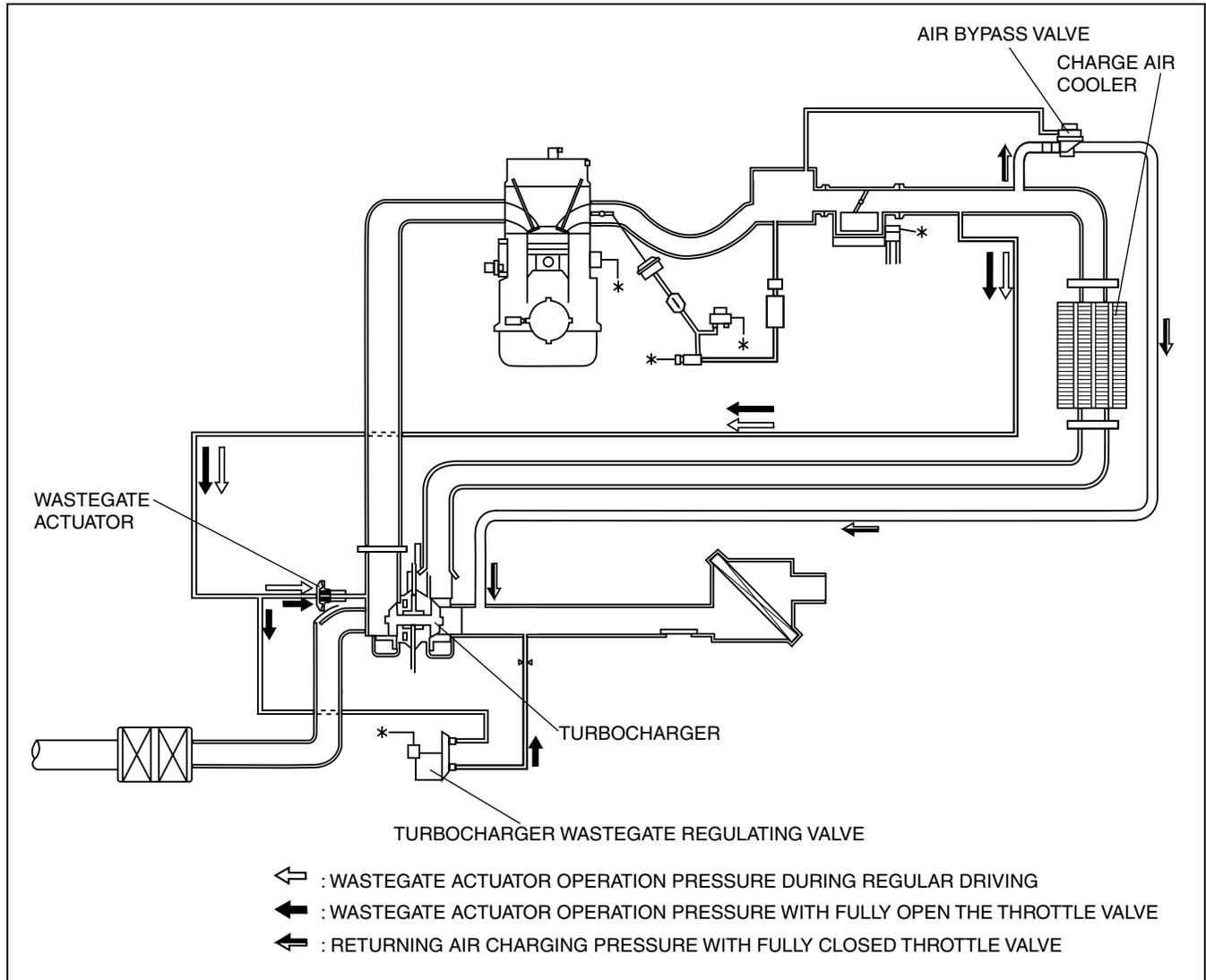
INTAKE-AIR SYSTEM

AIR CHARGING PRESSURE SYSTEM STRUCTURE

C5U01130000S32

- The air charging pressure system consists of the turbocharger, wastegate actuator, turbocharger wastegate regulating valve, air bypass valve, and charge air cooler.

System diagram



C5U113ZS005

AIR CHARGING PRESSURE SYSTEM OPERATION

C5U01130000S33

- The air charging pressure system utilizes the air bypass valve, wastegate actuator, and turbocharger wastegate regulating valve to adjust exhaust air pressure during regular driving, and air charging pressure while driving with the throttle valve fully open or fully closed.

Regular Driving

- Air charging pressure is applied to the wastegate actuator. When the pressure exceeds the actuator operation pressure, the actuator operates to open the wastegate valve. Since the exhaust gas is discharged through the wastegate valve, the amount of the exhaust gas entering the turbine is suppressed. As a result, excessive increase of air charging pressure is suppressed.

INTAKE-AIR SYSTEM

Acceleration with Fully Open Throttle Valve

- A turbocharger wastegate regulating valve has been adopted, which controls the air charging pressure applied to the wastegate actuator during acceleration with a fully open throttle valve.
- During acceleration with a fully open throttle valve, the wastegate actuator opens during acceleration because the air charging pressure quickly reaches the wastegate actuator operation pressure. By controlling this air charging pressure via the wastegate regulating valve, the air charging pressure can be adjusted until it reaches the wastegate actuator operation pressure.
- When the air charging pressure reaches that of the wastegate actuator operation pressure, the turbocharger wastegate regulating valve opens and the air charging pressure applied to the actuator is released. The timing to open the wastegate valve is delayed because the excess air charging pressure is not applied to the wastegate actuator. As a result, the turbocharger operates longer from low to high engine speeds.
- The turbocharger wastegate regulating valve is controlled by the PCM. For air charging pressure control, refer to CONTROL SYSTEM, AIR CHARGING PRESSURE CONTROL.

Throttle Valve Is Fully Closed

- Air charging pressure rebounds off the throttle valve when the throttle valve changes suddenly from being fully open to fully closed. This rebounding air charging pressure flows back against the turbine and damages it. An air bypass valve has been adopted to reduce rebounding of air charging pressure.
- Intake manifold vacuum is inducted into the air bypass valve. When the throttle valve changes suddenly from being fully open to fully closed, the intake manifold vacuum also increases suddenly causing the air bypass valve to reach operation pressure. When the intake manifold pressure causes the air bypass valve to reach operation pressure, the valve operates, opening a passage through which the air charging pressure is released. As a result, air charging pressure flowing back against the turbine is reduced and the turbine is protected.

TURBOCHARGER FUNCTION

C5U01130000S42

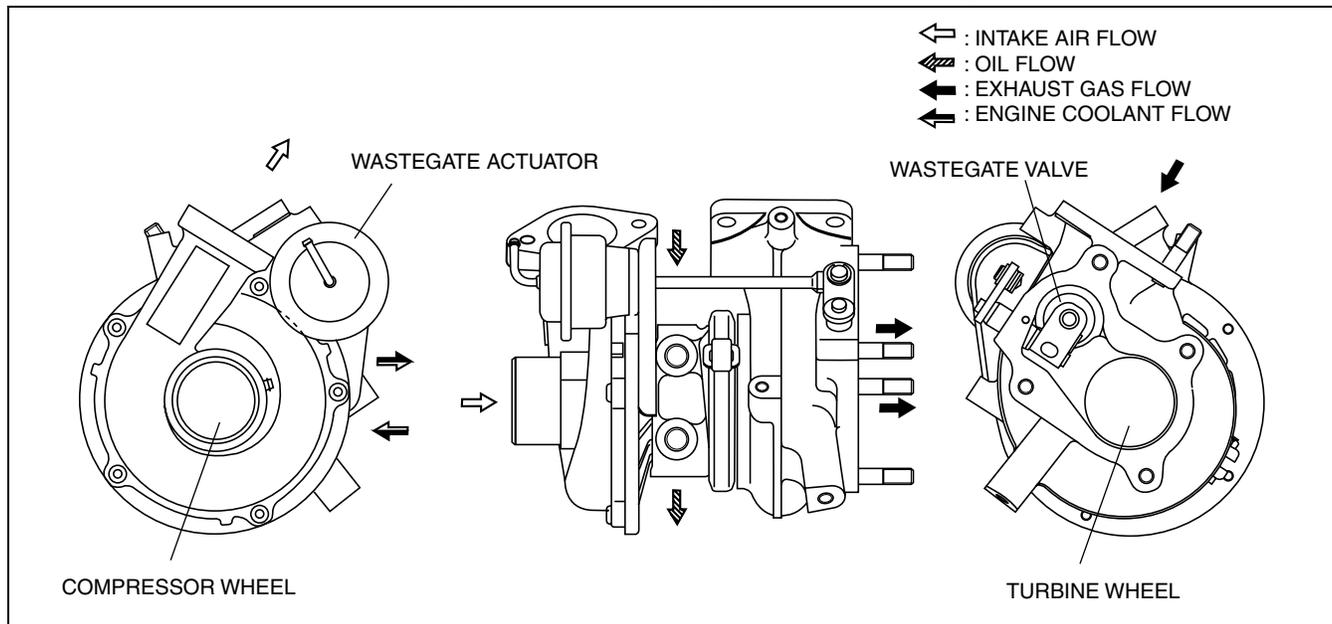
- This system utilizes the energy of the exhaust gas to pressurize the intake air.
- The wastegate actuator operates to open the wastegate valve. Thus, the amount of the exhaust gas entering the turbine is suppressed and an excessive increase of air charging pressure is prevented.

TURBOCHARGER CONSTRUCTION/OPERATION

C5U01130000S35

Construction

- Consists of the turbine wheel, compressor wheel, wastegate valve, and wastegate actuator.



C5U113ZS004

Operation

- When the exhaust gas enters the turbine wheel, it drives the turbine wheel, coupled to the compressor wheel, to compress the intake air.
- When the air charging pressure increases and exceeds the wastegate actuator operating pressure, the actuator diaphragm operates, and presses the rod to open the wastegate valve.

INTAKE-AIR SYSTEM

CHARGE AIR COOLER FUNCTION

C5U01130000S36

- The charge air cooler uses ambient air to reduce the heat generated by super charged air from the turbocharger. This results in increased air density.

CHARGE AIR COOLER CONSTRUCTION/OPERATION

C5U01130000S37

- An air-cooling type charge-air cooler has been adopted.
- Installed in front of the radiator.

TURBOCHARGER WASTEGATE REGULATING VALVE FUNCTION

C5U01130000S39

- Opens the passage to allow air charging pressure applied to the wastegate actuator to escape. Thus the air charging pressure applied to the wastegate actuator is lower than the actual air charging pressure.

TURBOCHARGER WASTEGATE REGULATING VALVE CONSTRUCTION/OPERATION

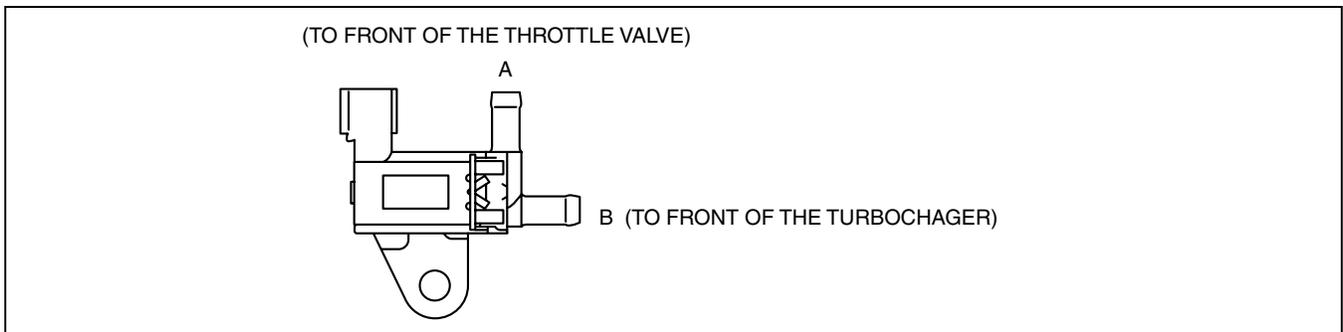
C5U01130000S38

Construction

- Mainly consists of the solenoid coil, spring, plunger, and filter.

Operation

- The solenoid coil magnetizes when it is energized, pulling the plunger. The passage between ports A and B opens due to the plunger being pulled.



C5U113ZS006

AIR BYPASS VALVE FUNCTION

C5U01130000S40

- Opens the passage to allow the air charge pressure in front of the throttle valve to escape. Thus, air charging pressure forced back by the throttle valve when it is fully open is prevented.

AIR BYPASS VALVE CONSTRUCTION/OPERATION

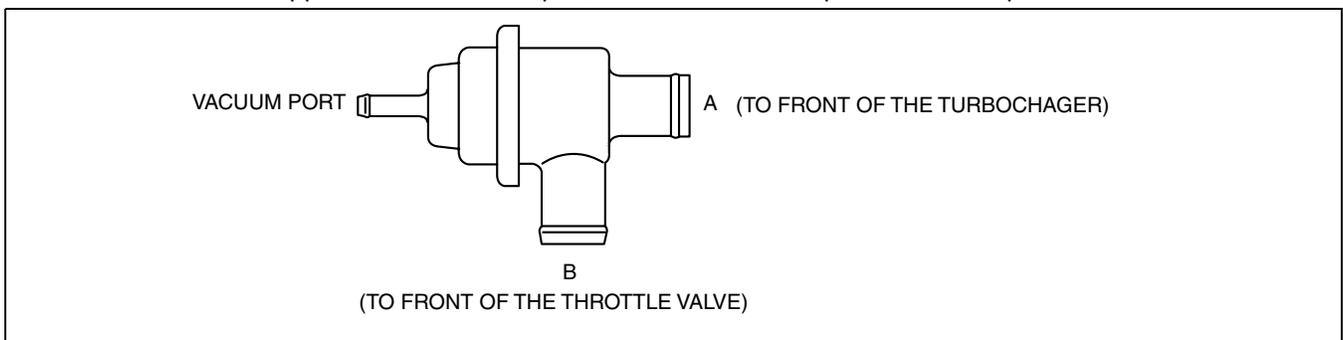
C5U01130000S41

Construction

- It consists of a valve.

Operation

- When a vacuum is applied to the vacuum port, the valve between ports A and B opens.



C5U113ZS007

01-15 EXHAUST SYSTEM

EXHAUST OUTLINE..... 01-15-1

EXHAUST SYSTEM
STRUCTURAL VIEW01-15-1

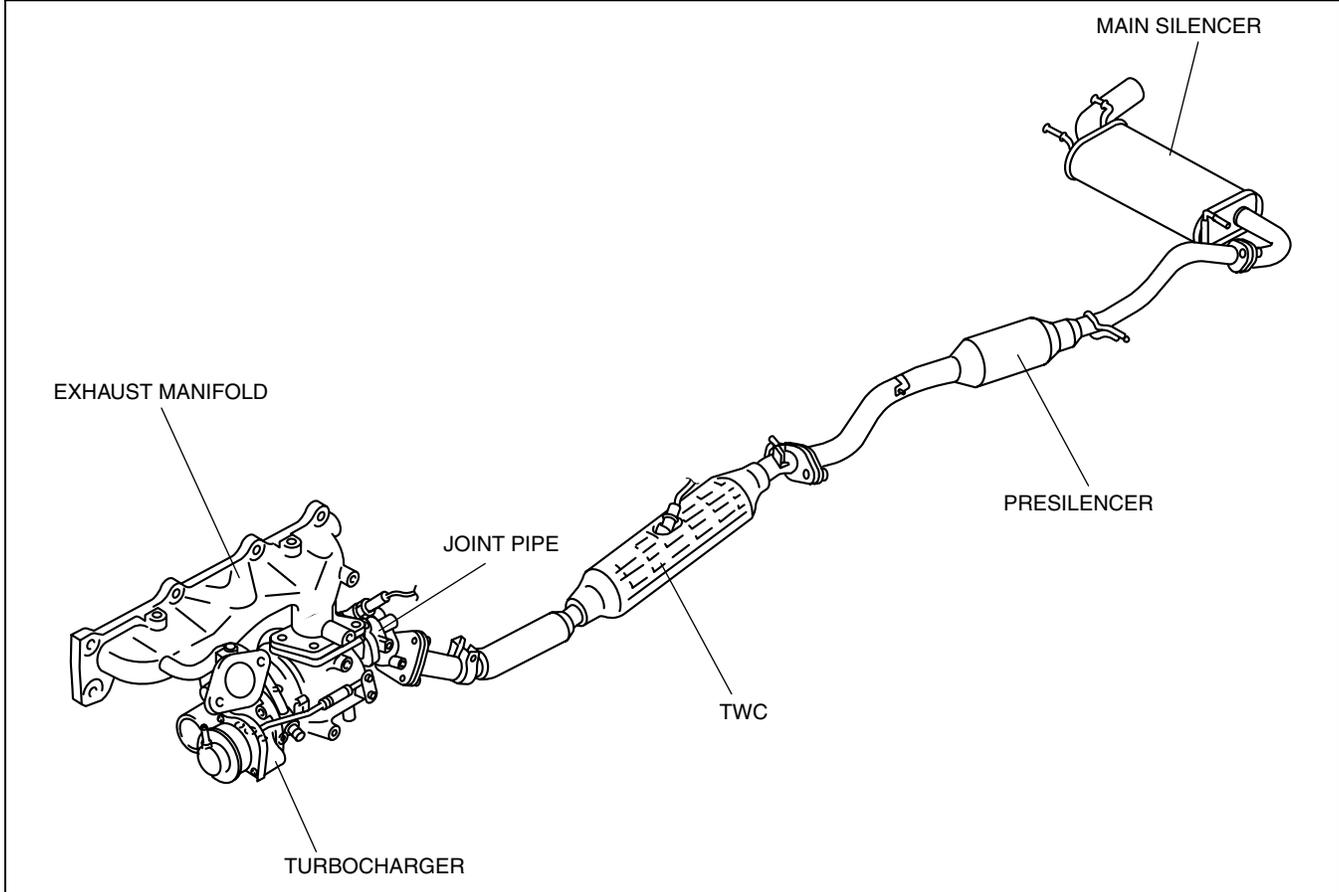
EXHAUST OUTLINE

C5U01150000S01

- A turbocharger has been adopted.

EXHAUST SYSTEM STRUCTURAL VIEW

C5U01150000S02



C5U115ZS001

01-16 EMISSION SYSTEM

EMISSION SYSTEM OUTLINE..... 01-16-1
EMISSION SYSTEM
STRUCTURAL VIEW 01-16-1
EVAPORATIVE EMISSION (EVAP)
CONTROL SYSTEM DIAGRAM 01-16-3

EVAPORATIVE EMISSION (EVAP)
CONTROL SYSTEM CHECK VALVE
(ONE-WAY) FUNCTION.....01-16-3
EVAPORATIVE EMISSION (EVAP)
CONTROL SYSTEM CHECK VALVE
(ONE-WAY)
CONSTRUCTION/OPERATION.....01-16-3
Construction01-16-3

01-16

EMISSION SYSTEM OUTLINE

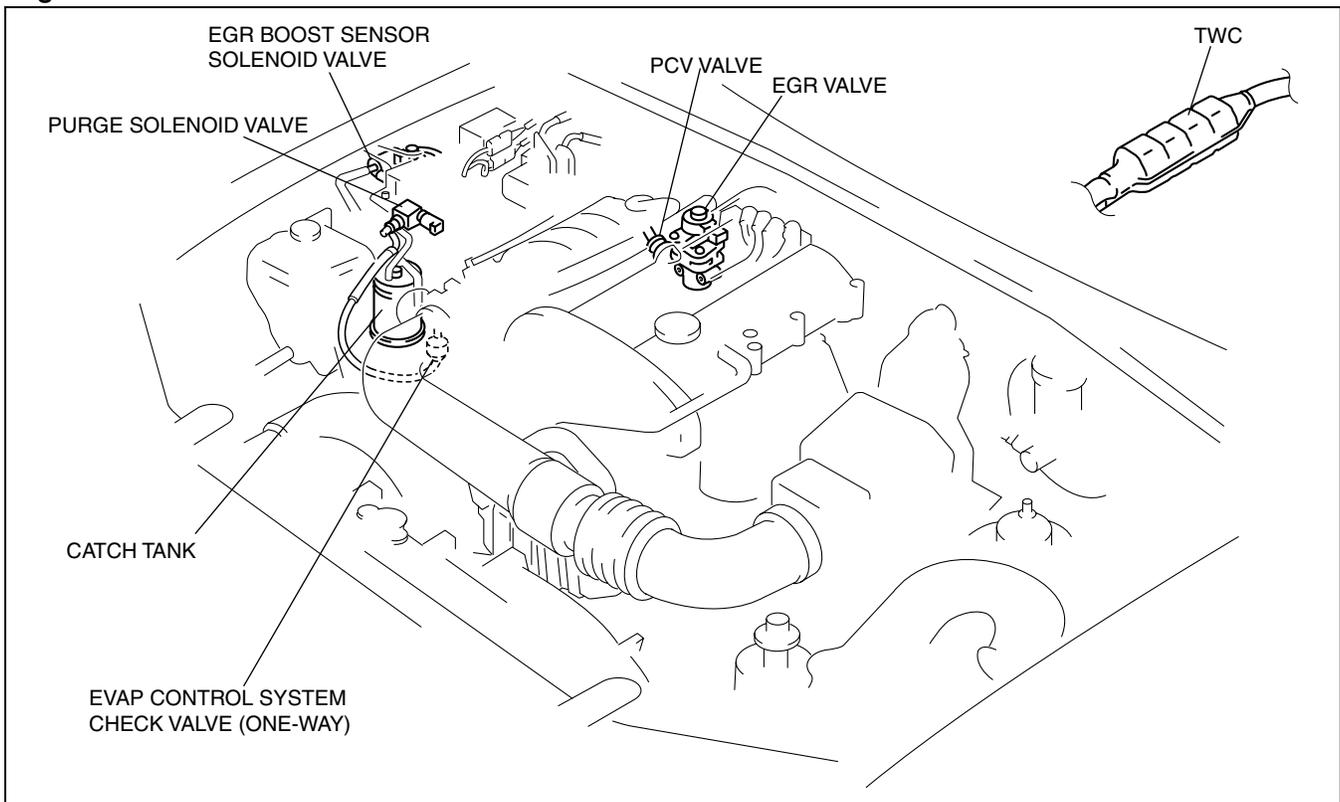
C5U01160000S01

- A EVAP control system check valve (one-way) has been adopted on the evaporative gas circulating passage.

EMISSION SYSTEM STRUCTURAL VIEW

C5U01160000S02

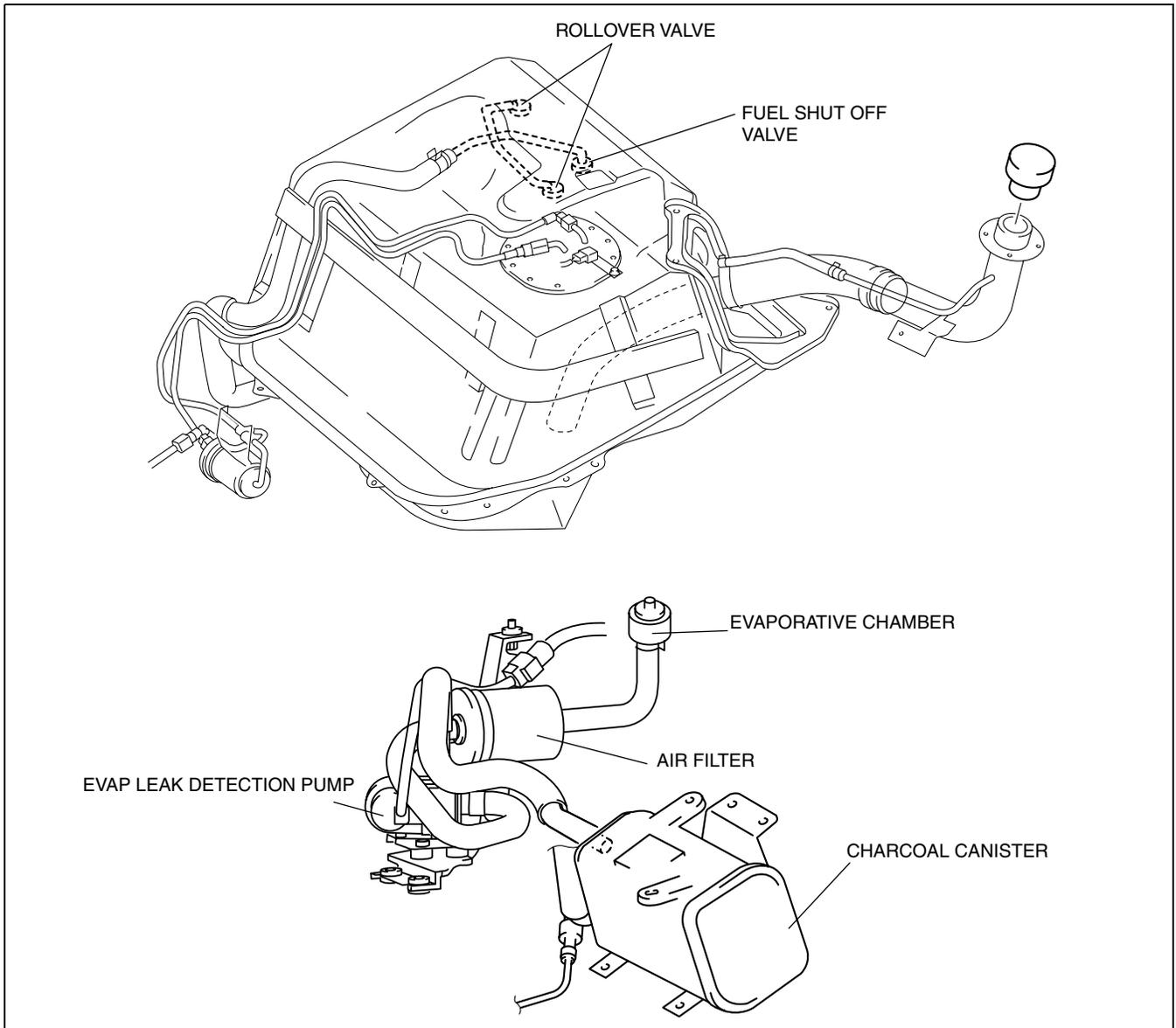
Engine room side



C5U116ZS002

EMISSION SYSTEM

Fuel tank side

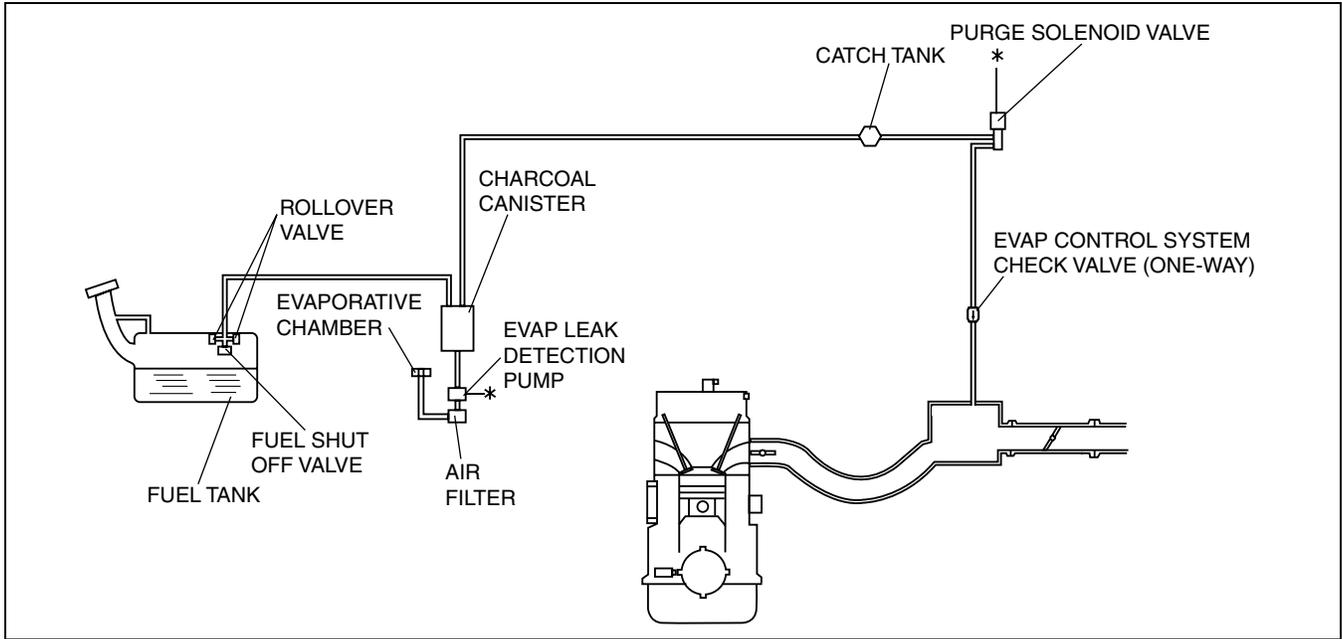


C5U116ZS003

EMISSION SYSTEM

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM DIAGRAM

C5U011600030S01



C5U116ZS001

01-16

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM CHECK VALVE (ONE-WAY) FUNCTION

C5U011642911S01

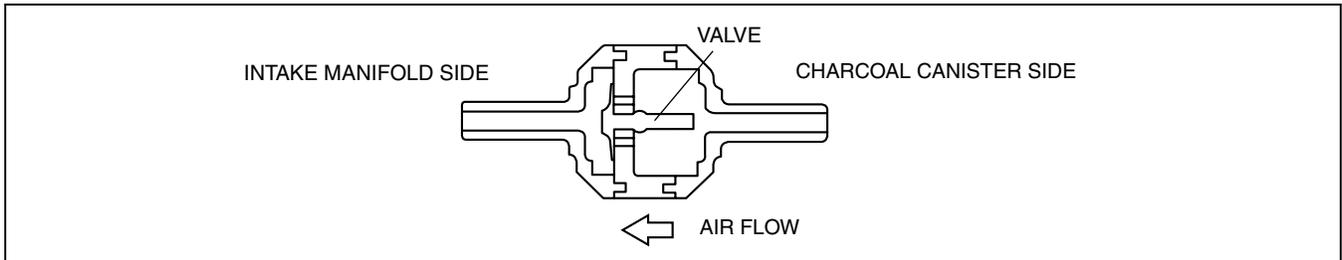
- The one-way check valve prevents air charging pressure inside the intake manifold from flowing back to the charcoal canister.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM CHECK VALVE (ONE-WAY) CONSTRUCTION/ OPERATION

C5U011642911S02

Construction

- Mainly consists of the valve.



C5U116ZS004

01-18 IGNITION SYSTEM

IGNITION SYSTEM OUTLINE

[BP WITH TC] 01-18-1

01-18

IGNITION SYSTEM OUTLINE [BP WITH TC]

C5U01180000S01

- The spark plug with an iridium alloy center electrode and platinum tip ground electrode has been adopted.

01-40 CONTROL SYSTEM

CONTROL SYSTEM OUTLINE 01-40-1
CONTROL SYSTEM DIAGRAM 01-40-2
CONTROL SYSTEM WIRING
DIAGRAM 01-40-3
CONTROL SYSTEM
RELATION CHART 01-40-5
Engine Control System 01-40-5
Monitoring System 01-40-6
INTAKE AIR TEMPERATURE (IAT)
SENSOR NO.2 FUNCTION 01-40-7
INTAKE AIR TEMPERATURE (IAT)
SENSOR NO.2
CONSTRUCTION/OPERATION 01-40-7
IAC CONTROL OPERATION 01-40-7

FUEL INJECTION CONTROL
OUTLINE 01-40-7
FUEL INJECTION CONTROL
OPERATION 01-40-8
Excessive Air Charging Pressure
Fuel Cut 01-40-8
ELECTRONIC SPARK ADVANCE (ESA)
CONTROL OUTLINE 01-40-8
EVAPORATIVE PURGE CONTROL
OUTLINE 01-40-8
AIR CHARGING PRESSURE CONTROL
OUTLINE 01-40-8
AIR CHARGING PRESSURE CONTROL
BLOCK DIAGRAM 01-40-8
AIR CHARGING PRESSURE CONTROL
OPERATION 01-40-8
Operation Conditions 01-40-8

01-40

CONTROL SYSTEM OUTLINE

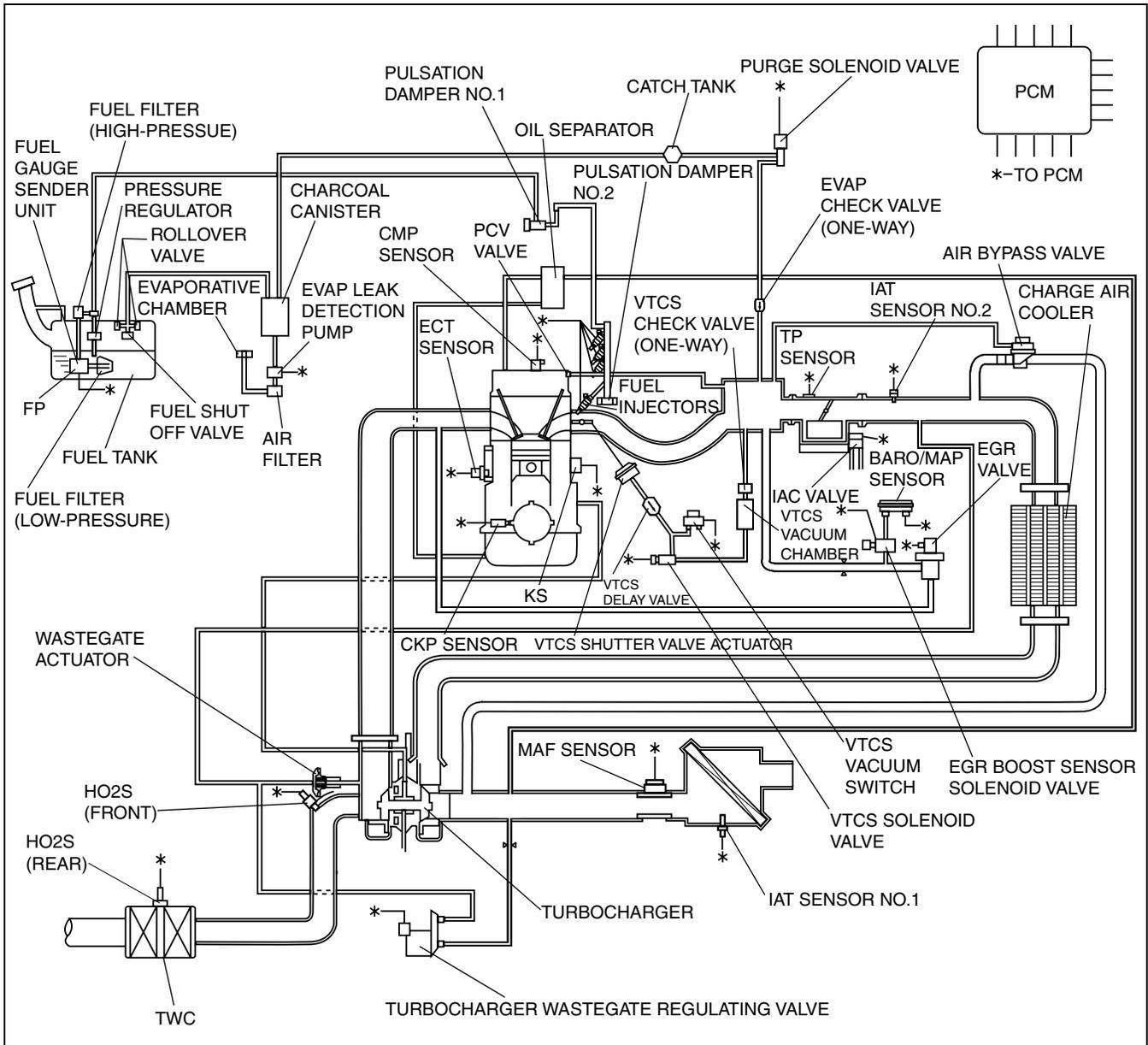
C5U01400000S01

- Air charging pressure control has been adopted.
- IAT sensor No.2 has been adopted to the fuel injection control, electronic spark advance (ESA) control and evaporative purge control.
- The idle speed has been modified.
- The fuel cut condition for the fuel injection control has been adopted.

CONTROL SYSTEM

CONTROL SYSTEM DIAGRAM

C5U01400000S03



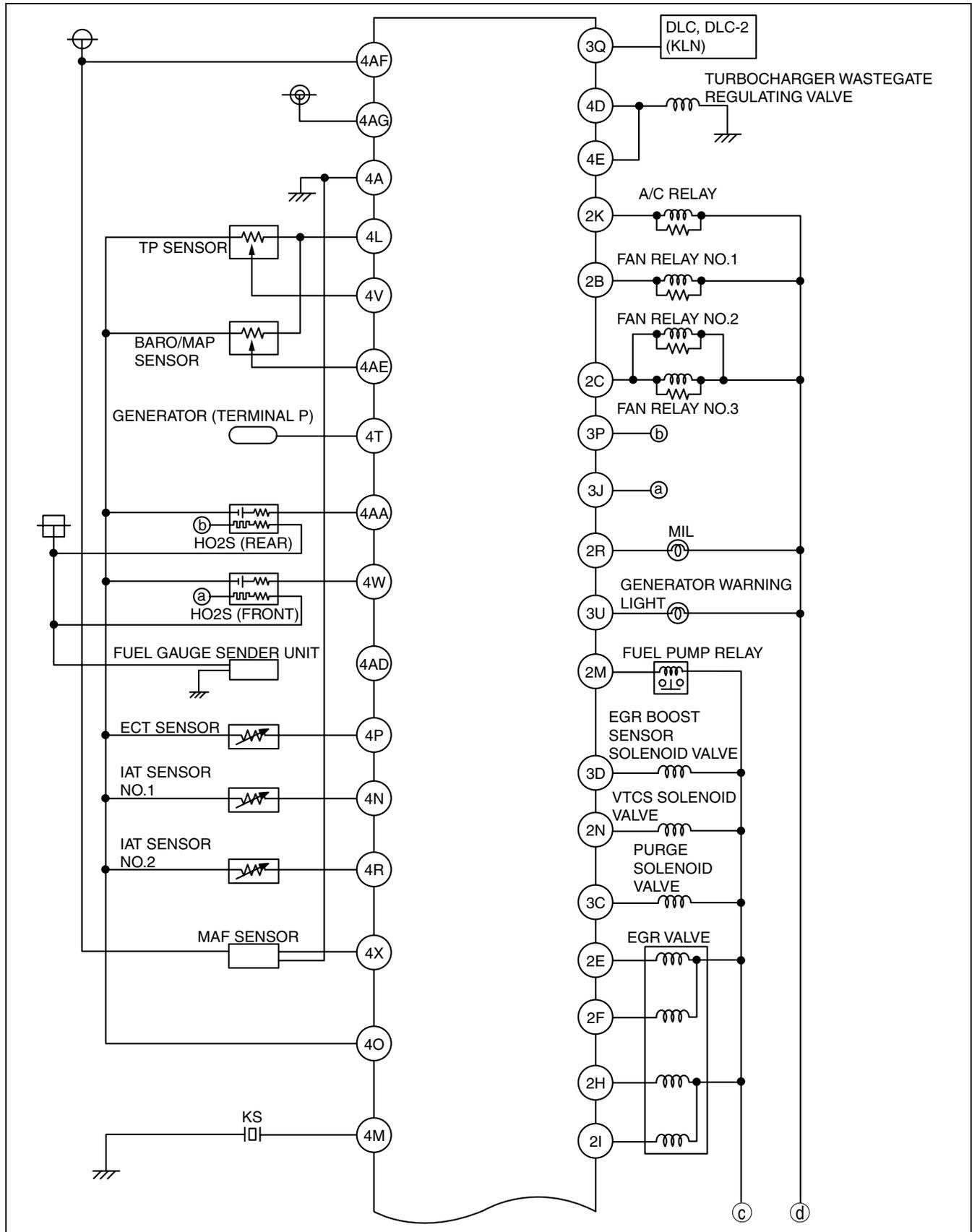
C5U140ZS009

CONTROL SYSTEM

CONTROL SYSTEM WIRING DIAGRAM

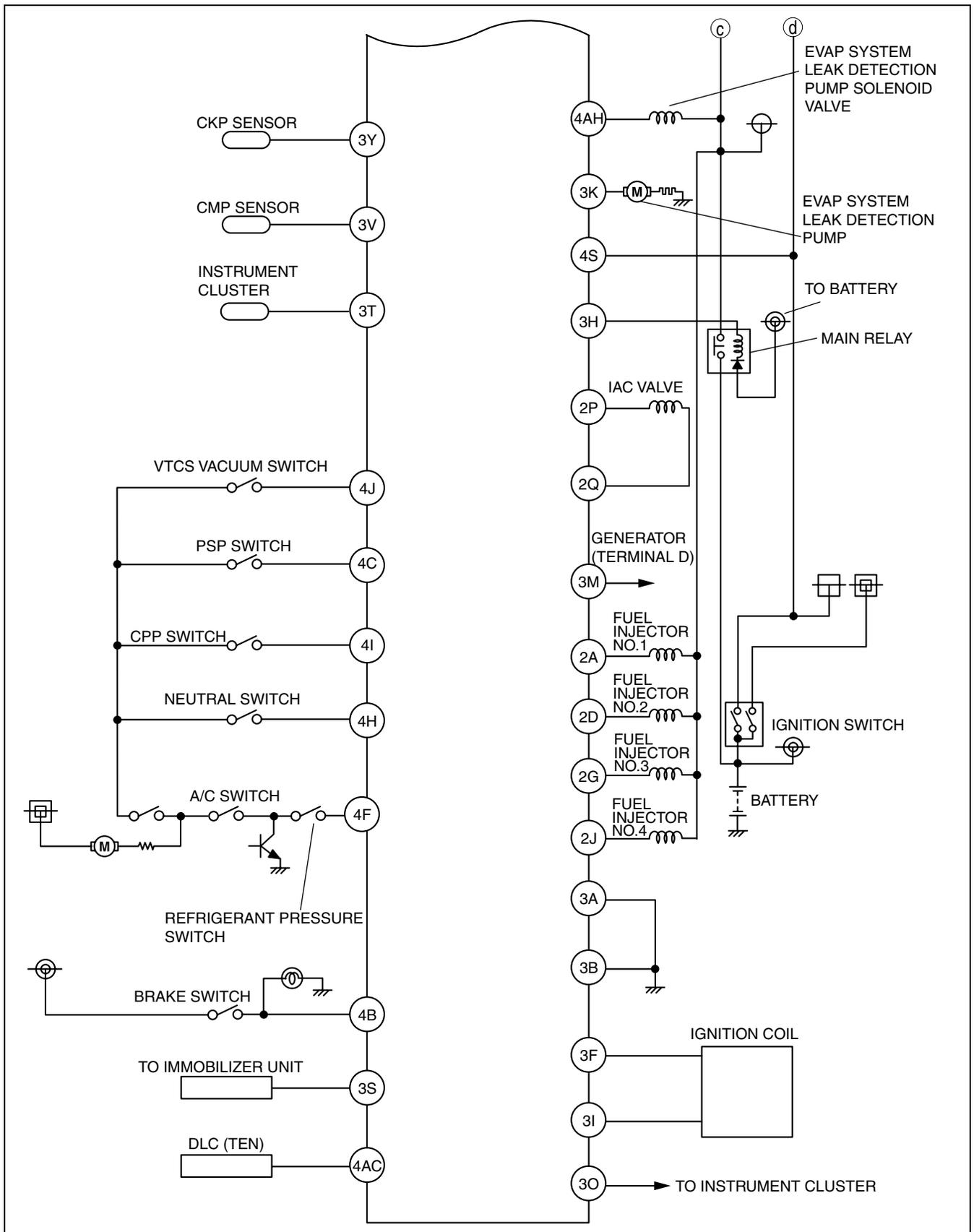
C5U01400000S04

01-40



C5U140ZS007

CONTROL SYSTEM



C5U140ZS008

CONTROL SYSTEM

CONTROL SYSTEM RELATION CHART

C5U01400000S06

Engine Control System

X: Applicable

Component		Idle air control (IAC)	Fuel injection control	Electronic spark advance (ESA) control	Fuel pump control	Heated oxygen sensor (HO2S) heater control	Electrical fan control	Purge control	EGR control	Air charging pressure control	Variable tumble control system (VTCS)	A/C cut-off control	Generator control	Immobilizer system
Input device	Brake switch	X	X	X										
	Refrigerant pressure switch (A/C equipped only)	X	X	X			X					X		
	PSP switch	X	X	X								X		
	DLC (TEN)	X		X			X							
	Neutral switch	X	X	X										
	Clutch switch	X	X	X										
	CKP sensor (NE signal)	X	X	X	X	X	X	X	X	X	X	X	X	X
	CMP sensor (SGC signal)		X	X										
	Vehicle speed signal	X							X					
	Knock sensor			X										
	MAF sensor	X	X	X		X		X	X	X				
	ECT sensor	X	X	X		X	X	X	X	X	X	X		
	IAT sensor No.1	X	X	X				X		X			X	
	IAT sensor No.2		X	X				X						
	TP sensor	X	X	X				X	X	X	X	X		
	HO2S (Rear)		X											
	BARO/MAP sensor	X	X					X			X		X	
	B+		X					X						X
	Generator (Output voltage)													X
	HO2S (Front)		X					X						
Immobilizer unit														X
Output device	IAC valve	X												
	Fuel injector		X											X
	Ignition coil			X										X
	FP relay				X									
	HO2S heater (Front, Rear)					X								
	Fan relay No.1, No.2, No.3						X							
	Purge solenoid valve							X						
	EGR valve								X					
	Turbocharger wastegate regulating valve									X				
	VTCS solenoid valve										X			
	A/C relay											X		
	Generator (Field coil)												X	
	Generator warning light													X

C5U140ZS010

CONTROL SYSTEM

Monitoring System

X: Applicable

Component		Monitoring items						
		Catalyst monitor	Misfire monitor	Evaporative system monitor	Fuel system monitor	HO2S monitor	O2S heater monitor	EGR system monitor
Input device	Brake switch							
	Refrigerant pressure switch (A/C equipped only)		X		X			X
	PSP switch		X		X			X
	CKP sensor (NE signal)	X	X	X	X	X	X	X
	CMP sensor (SGC signal)	X	X	X	X	X	X	X
	Vehicle speed signal	X	X	X		X		X
	MAF sensor	X	X	X	X	X	X	X
	ECT sensor	X	X	X	X	X	X	X
	IAT sensor No.1	X	X	X		X		X
	IAT sensor No.2				X			
	TP sensor	X	X	X	X	X		X
	HO2S (Front)	X			X	X		
	BARO/MAP sensor							X
	Fuel gauge sender unit			X				
	HO2S (Rear)	X				X		
Output device	DLC-2 (Terminal KLN)	X	X	X	X	X	X	X
	MIL	X	X	X	X	X	X	X
	Purge solenoid valve			X	X	X		
	EGR valve							X
	EGR boost sensor solenoid valve							X
	EVAP leak detection pump			X				
	Fuel injectors				X			

C5U140ZS011

CONTROL SYSTEM

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 FUNCTION

C5U014018842S01

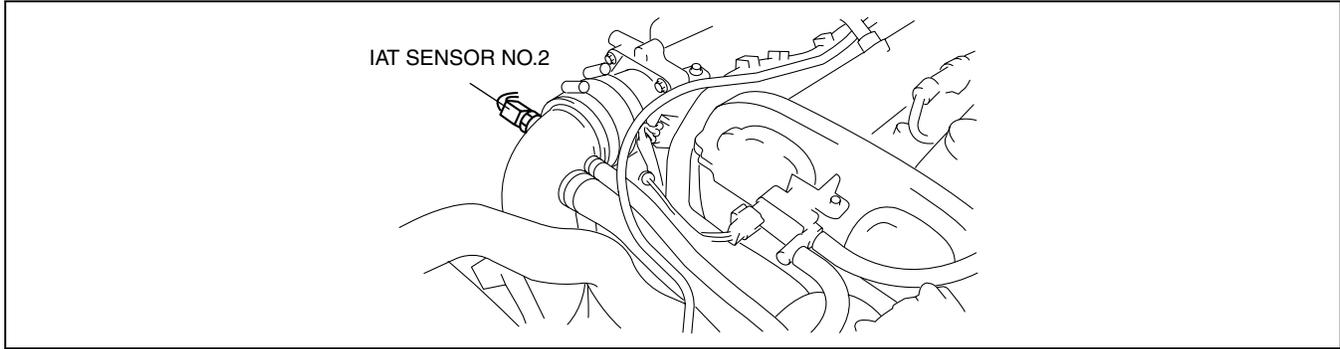
- Detects the IAT before the throttle valve.

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 CONSTRUCTION/OPERATION

C5U014018842S02

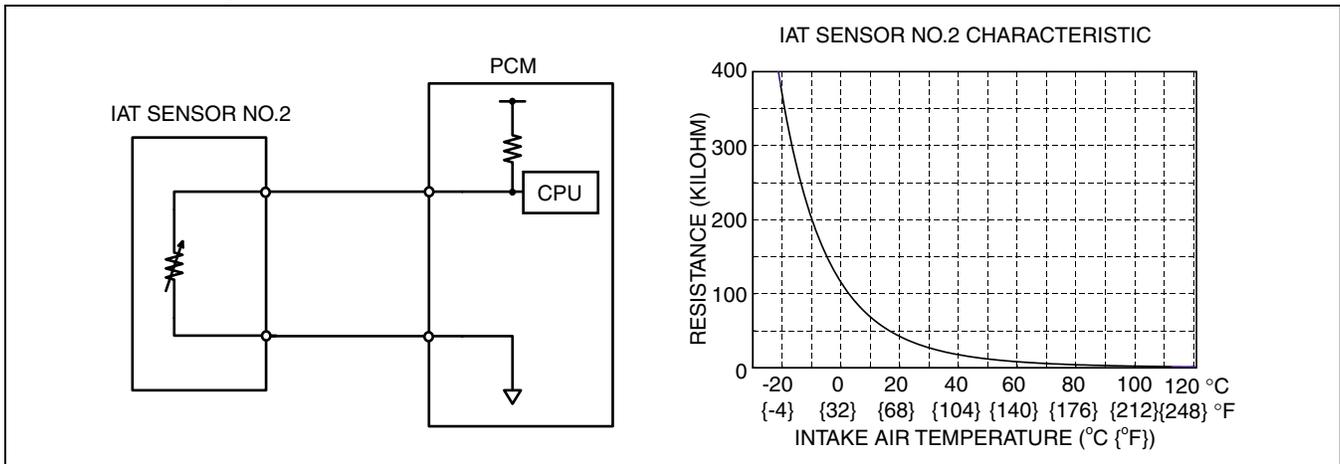
01-40

- Installed on the air pipe before the throttle valve.



C5U140ZS006

- A thermistor type is used and the resistance changes according to the IAT.
- As shown in the characteristics graph, when the IAT is high, the resistance is low, and when the IAT is low, the resistance is high.



C5U140ZS101

IAC CONTROL OPERATION

C5U01400000S17

- The idle-up speed has been modified.

Load condition	Idle-up speed (rpm)*1
No load	750—850 (800 ± 50)
E/L ON*2	800—900 (850 ± 50)
P/S ON*3	750—850 (800 ± 50)
A/C ON*4	950—1050 (1000 ± 50)

*1 : Excludes temporary idle speed drop just after the electrical loads (E/L) are turned on.

*2 : Headlight is on, fan switch is above 1st, cooling fan are operating, rear window defroster is on.

*3 : Steering wheel is fully turned.

*4 : A/C switch and fan switch are on.

FUEL INJECTION CONTROL OUTLINE

C5U01400000S18

- With the adoption of air charging pressure control, input devices and fuel cut conditions have been changed.
- A BARO/MAP sensor and IAT sensor No. 2 have been adopted on the input devices to perform control correctly.

CONTROL SYSTEM

FUEL INJECTION CONTROL OPERATION

C5U01400000S20

- The following fuel cut condition has been adopted.

Excessive Air Charging Pressure Fuel Cut

Purpose

- To prevent damage to the engine from excessive air charge.

Control condition

- Intake air pressure is more than the specification

ELECTRONIC SPARK ADVANCE (ESA) CONTROL OUTLINE

C5U01400000S21

- With the adoption of air charging pressure control, the input device has been changed.
- IAT sensor No. 2 has been added to the input device to perform control correctly.

EVAPORATIVE PURGE CONTROL OUTLINE

C5U01400000S23

- With the adoption of air charging pressure control, the input device has been changed.
- IAT sensor No. 2 has been added to the input device to perform control correctly.

AIR CHARGING PRESSURE CONTROL OUTLINE

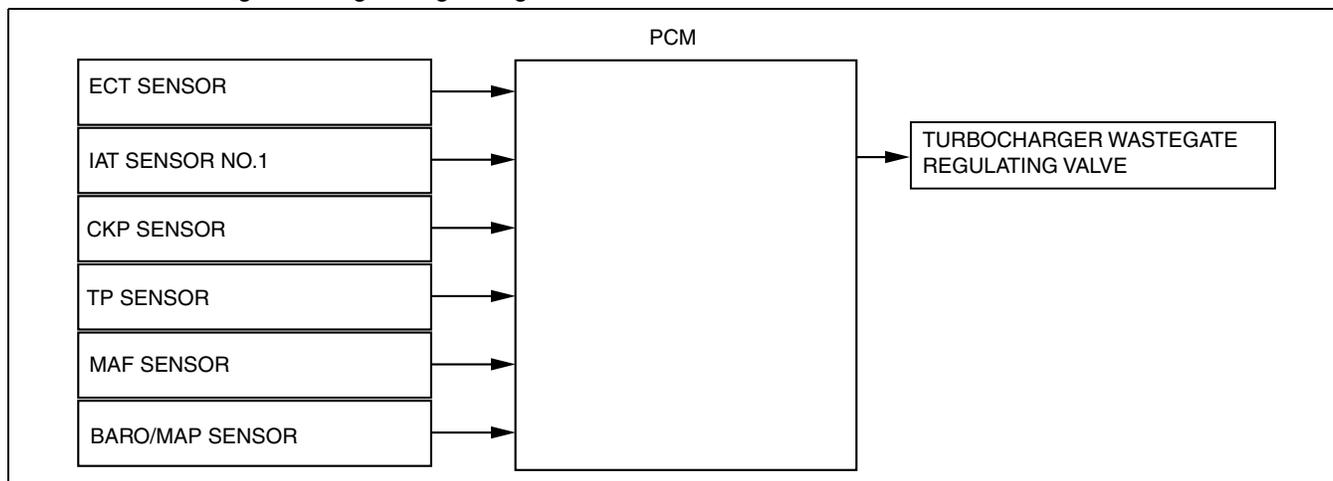
C5U01400000S25

- Under high load, air charging pressure applied to the wastegate actuator is decreased and the turbocharger operates longer to set the air charging pressure higher than under low load.

AIR CHARGING PRESSURE CONTROL BLOCK DIAGRAM

C5U01400000S26

- The PCM determines the engine operation conditions based on each input signal and sends the control signal to the turbocharger wastegate regulating valve.



C5U140ZS107

AIR CHARGING PRESSURE CONTROL OPERATION

C5U01400000S27

Operation Conditions

- When all the following conditions are met, the PCM energizes the turbocharger wastegate regulating valve. As result, the turbocharger wastegate regulating valve opens and the air charging pressure applied to the wastegate actuator decreases.
 - After engine warm up
 - Engine speed at 5,250 rpm or more
 - Throttle valve fully open

SUSPENSION

02

SECTION

02-00

OUTLINE 02-00 WHEEL AND TIRES 02-12

02-00 OUTLINE

SUSPENSION FEATURES 02-00-1 Suspension 02-00-1
 SUSPENSION SPECIFICATIONS 02-00-1 Wheel and tires 02-00-2

SUSPENSION FEATURES

C5U020000000S01

Improved handling stability and riding comfort	<ul style="list-style-type: none"> • Characteristics of front and rear shock absorbers and coil springs optimized • Front and rear wheel alignment optimized • Large diameter front stabilizer adopted • Large diameter rear stabilizer adopted
Improved marketability	<ul style="list-style-type: none"> • 17 inch aluminum alloy wheels and tires adopted
Environmental consideration	<ul style="list-style-type: none"> • Steel balance weights adopted to reduce the use of lead

SUSPENSION SPECIFICATIONS

C5U020000000S02

Suspension

Item				Specification			
				BP with TC	BP		
Front suspension	Type			Double-wishbone		←	
	Spring type			Coil spring		←	
	Shock absorber type			Low-pressure gas charged, cylindrical, double-acting		←	
	Stabilizer	Type			Torsion bar		←
		Diameter		(mm {in})	23 {0.91}	22 {0.87}	
	Total toe-in	Tire	(mm {in})		3±4 {0.12±0.16}	←	
			Degree		0°17'±24'	0°18'±24'	
	Wheel alignment (Unloaded*1)	Maximum steering angle [Tolerance ±3°]		Inner	32°	38°	
				Outer	29°	33°	
		Caster angle ^{*2} (Reference) [Tolerance ±1°]			6°18'	5°48'	
		Camber angle ^{*2} (Reference) [Tolerance ±1°]			-0°10'	0°06'	
		Steering axis inclination (Reference)			11°44'	11°38'	

OUTLINE

Item				Specification		
				BP with TC	BP	
Rear suspension	Type			Double-wishbone	←	
	Spring type			Coil spring	←	
	Shock absorber type			Low-pressure gas charged, cylindrical, double-acting	←	
	Stabilizer	Type			Torsion bar	←
		Diameter	(mm {in})		14.0 {0.55}	11 {0.43}, 12 {0.47} (hard suspension)
	Wheel alignment (Unloaded ^{*1})	Total toe-in	Tire	(mm {in})	3±4 {0.12±0.16}	←
			Degree		0°17'±24'	0°18'±24'
Camber angle ^{*2} [Tolerance ±1°]			-1°00'	-0°47'		
Thrust angle [Tolerance ±48']			0°	←		

*1 : Unloaded: Fuel tank is full. Engine coolant and engine oil are at specified level. Spare tire, jack and tools are in designated position.

*2 : Difference between left and right must not exceed 1°30' .

Wheel and tires

Item				Specification		
				BP with TC		BP
Standard tire	Tire	Size	205/40R17 80W		195/50R15 82V	205/45R16 83W
	Wheel	Size	17 × 7JJ		15 × 6JJ	16 × 6 1/2J, 16 × 6 1/2JJ
		Material	Aluminum alloy		←	
		Offset (mm {in})	40 {1.6}		←	
		Pitch circle diameter (mm {in})	100.0 {3.94}		←	
Temporary spare tire	Tire	Size	T105/70D15		T115/70D14	T105/70D15
	Wheel	Size	15 x 4T		14 x 4T	15 x 4T
		Material	Steel		←	
		Offset (mm {in})	45 {1.8}		40 {1.6}	45 {1.8}
		Pitch circle diameter (mm {in})	100.0 {3.94}		←	

02-12 WHEEL AND TIRES

WHEEL AND TIRES OUTLINE..... 02-12-1

WHEEL AND TIRES
STRUCTURAL VIEW 02-12-1

WHEEL AND TIRES OUTLINE

C5U02120000S01

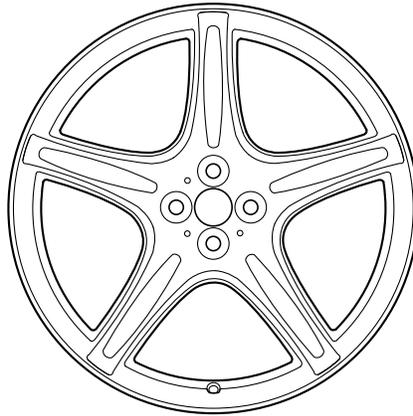
02-12

- 17 inch aluminum alloy wheels and tires has been adopted to improve marketability.
- In consideration of the environment, steel balance weights have been adopted to reduce the use of lead in the vehicle.

WHEEL AND TIRES STRUCTURAL VIEW

C5U02120000S02

17 INCH ALUMINUM ALLOY WHEEL



C5U0212S101

DRIVELINE/AXLE

03

SECTION

OUTLINE03-00
DRIVE SHAFT.....03-13

DIFFERENTIAL 03-14

03-00

03-00 OUTLINE

DRIVELINE/AXLE ABBREVIATIONS ...03-00-1
DRIVELINE/AXLE FEATURES03-00-1

DRIVELINE/AXLE
SPECIFICATIONS 03-00-2

DRIVELINE/AXLE ABBREVIATIONS

C5U03000000S01

AT	Automatic Transmission
LSD	Limited-Slip Differential
MT	Manual Transmission

DRIVELINE/AXLE FEATURES

C5U03000000S02

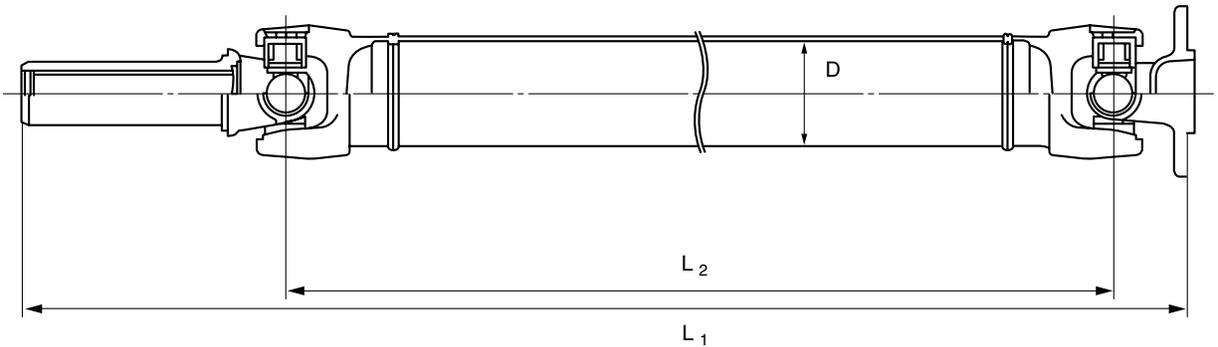
Improved driveability	<ul style="list-style-type: none">• Bell-shaped constant velocity joint adopted for axle-side joint of rear drive shaft• Tripod-shaped constant velocity joint adopted for differential-side joint of rear drive shaft• Torque sensing LSD adopted
Reduced vibration and noise	<ul style="list-style-type: none">• Bell-shaped constant velocity joint adopted for axle-side joint of rear drive shaft• Tripod-shaped constant velocity joint adopted for differential-side joint of rear drive shaft

OUTLINE

DRIVELINE/AXLE SPECIFICATIONS

C5U03000000S03

Item	BP with TC	BP
FRONT AXLE		
Wheel bearing type	Angular ball bearing	←
REAR AXLE		
Wheel bearing type	Angular ball bearing	←
DRIVE SHAFT		
Joint type	Wheel side	Bell joint
	Differential side	Tripod joint
Shaft diameter (mm {in})	24.5 {0.96}	24.0 {0.94}
DIFFERENTIAL		
LSD type	Torque sensing	Super-LSD
Reduction gear	Hypoid gear	←
Differential gear	Helical gear	Straight bevel gear
Ring gear size (mm {in})	181.6 {7.15}	5MT: 184.2 {7.25}, 6MT, AT: 181.6 {7.15}
Reduction ratio	4.100	5MT: 4.300, 6MT, AT: 4.100
Oil	Grade	API service GL-5
	Viscosity	SAE 90
	Capacity (Approx. quantity) (L {US qt, Imp qt})	0.8 {0.8, 0.7}
		1.00 {1.06, 0.88}
PROPELLER SHAFT		
Length (mm {in})	L ₁	1,001 {39.4}
	L ₂	816 {32.1}
Diameter (mm {in})	D	60.5 {2.81}



03-13 DRIVE SHAFT

REAR DRIVE SHAFT OUTLINE 03-13-1

REAR DRIVE SHAFT
CROSS-SECTIONAL VIEW 03-13-1

REAR DRIVE SHAFT OUTLINE

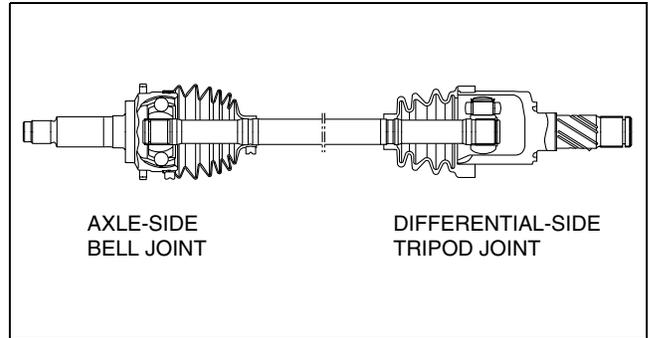
C5U031325600S01

- For the axle-side joint, a bell-shaped constant velocity joint has been adopted, reducing vibration and noise.
- For the differential-side joint, a tripod-shaped constant velocity joint has been adopted to reduce slide resistance, vibration and noise, as well as booming noise during high-speed driving.

03-13

REAR DRIVE SHAFT CROSS-SECTIONAL VIEW

C5U031325600S02



C5U0313S101

03-14 DIFFERENTIAL

DIFFERENTIAL OUTLINE 03-14-1

DIFFERENTIAL OUTLINE

- The construction and operation of the differential is essentially carried over from that of the 2002MY MX-5.^{C5U031427100S01}

03-14

TRANSMISSION/TRANSAXLE

05

SECTION

OUTLINE 05-00

05-00 OUTLINE

TRANSMISSION/TRANSAXLE
 ABBREVIATIONS 05-00-1
 TRANSMISSION/TRANSAXLE
 FEATURES 05-00-1

CLUTCH SPECIFICATIONS 05-00-1
 MANUAL TRANSMISSION
 SPECIFICATIONS 05-00-2

05-00

TRANSMISSION/TRANSAXLE ABBREVIATIONS

C5U05000000S05

1GR	First Gear
2GR	Second Gear
3GR	Third Gear
4GR	Fourth Gear
5GR	Fifth Gear
6GR	Sixth Gear

TRANSMISSION/TRANSAXLE FEATURES

C5U05000000S02

CLUTCH	
Increased torque transmission capacity	<ul style="list-style-type: none"> The clutch cover set load has been increased.
MT	
Increased the fatigue life of gears	<ul style="list-style-type: none"> Shot peening of gears.

CLUTCH SPECIFICATIONS

C5U05000000S03

Item	Specifications	
	BP with TC	BP
Clutch control	Hydraulic	
Clutch cover	Diaphragm	
	Spring type	
	Set load (N {kgf, lbf})	5,200 {530, 1,169} 4,310 {439, 969}
Clutch disc	Outer diameter (mm {in})	215 {8.46}
	Inner diameter (mm {in})	155 {6.10} 150 {5.91}
Clutch pedal	Type	
	Pedal ratio	
	6.13	
Clutch master cylinder inner diameter (mm {in})	15.87 {0.6248}	
Clutch release cylinder inner diameter (mm {in})	19.05 {0.7500}	
Clutch fluid type	SAE J1703 or FMVSS 116 DOT-3	

OUTLINE

MANUAL TRANSMISSION SPECIFICATIONS

C5U05000000S04

Item		Specifications	
		BP with TC	BP
Transmission type		Y16M-D	
Transmission control		Floor-shift	
Shift assist		Synchronesh	
Gear ratio	1GR	3.760	
	2GR	2.269	
	3GR	1.645	
	4GR	1.258	1.257
	5GR	1.000	
	6GR	0.843	
	Reverse	3.564	
Oil	Grade	API service GL-4 or GL-5	
	Viscosity	All season	SAE 75W-90
	Capacity (approx. quantity)	(L {US qt, Imp qt})	1.75 {1.85, 1.54}

STEERING

06

SECTION

OUTLINE 06-00

06-00 OUTLINE

STEERING ABBREVIATIONS 06-00-1
 STEERING FEATURES 06-00-1

STEERING SPECIFICATIONS 06-00-1

06-00

STEERING ABBREVIATIONS

C5U06000000S01

AT	Automatic Transmission
ATF	Automatic Transmission Fluid
MT	Manual Transmission

STEERING FEATURES

C5U06000000S02

Optimized steering gear for 17inch wheels	<ul style="list-style-type: none"> Rack stroke and lock-to-lock optimized
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STEERING SPECIFICATIONS

C5U06000000S03

Item		Specifications	
		BP with TC	BP
Steering wheel	Outer diameter (mm {in})	370 {14.6}	←
	Lock to lock (turns)	2.33	2.65
Steering shaft	Shaft type	Collapsible design	←
	Coupling type	Cross-shaped joint design	←
Steering gear and linkage	Type	Rack and pinion design	←
	Rack stroke (mm {in})	53.2 {2.09} × 2	60.5 {2.38} × 2
Power steering	Power assist system		Vehicle speed sensing
	Fluid specification	Type	ATF M-III or equivalent (e.g. Dexron® III)
		Capacity* (approx. quantity) (L {US qt, Imp qt})	0.80 {0.85, 0.70}

* : When fluid reservoir tank is at maximum volume.

BODY & ACCESSORIES

09
SECTION

OUTLINE09-00

EXTERIOR TRIM 09-16

09-00 OUTLINE

BODY AND ACCESSORIES

FEATURES 09-00-1

BODY AND ACCESSORIES FEATURES

C5U09000000S02

Improved marketability

- Front airdam skirt, rear airdam skirt, and rear spoiler adopted

09-00

EXTERIOR TRIM

09-16 EXTERIOR TRIM

EXTERIOR TRIM OUTLINE 09-16-1

EXTERIOR TRIM
STRUCTURAL VIEW 09-16-1

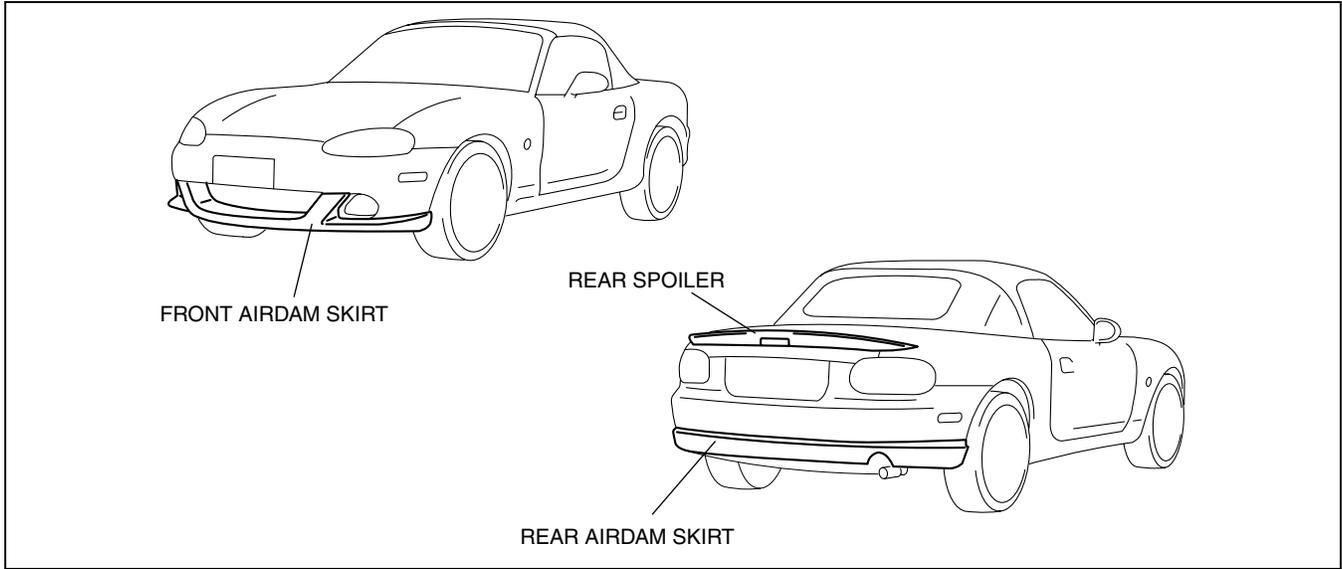
EXTERIOR TRIM OUTLINE

C5U09160000S01

Improved marketability • Front airdam skirt, rear airdam skirt, and rear spoiler adopted (BP with TC)

EXTERIOR TRIM STRUCTURAL VIEW

C5U09160000S02



C5U916ZSB001

09-16

