

Mazda Rx 7 Fuel And Emissions Control Systems Repair Manual

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This file was not scanned to deprive Mazda of any money – it was scanned due to the rareness of the original manuals and the overwhelming need of the RX-7 owner to have this information so that they can accurately troubleshoot problems. Perhaps if Mazda's dealerships could support the Rotary Engine it wouldn't be so necessary for the owners to do so.



Many thanks to Anh Diep for scanning this file.

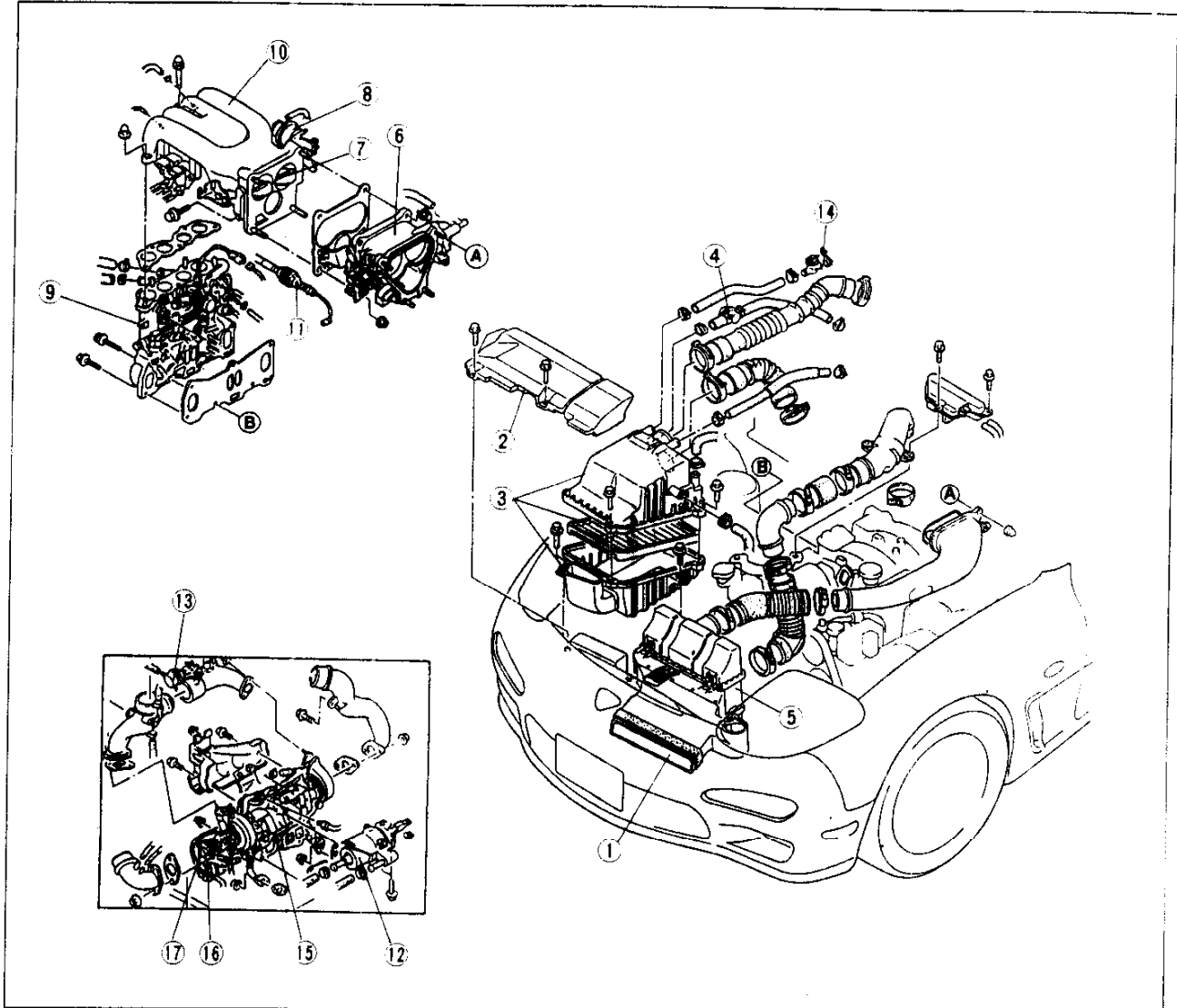
Before beginning any service procedure, refer to Section S of this manual for air bag system service precautions, and to Section T for audio anti-theft system cautions.

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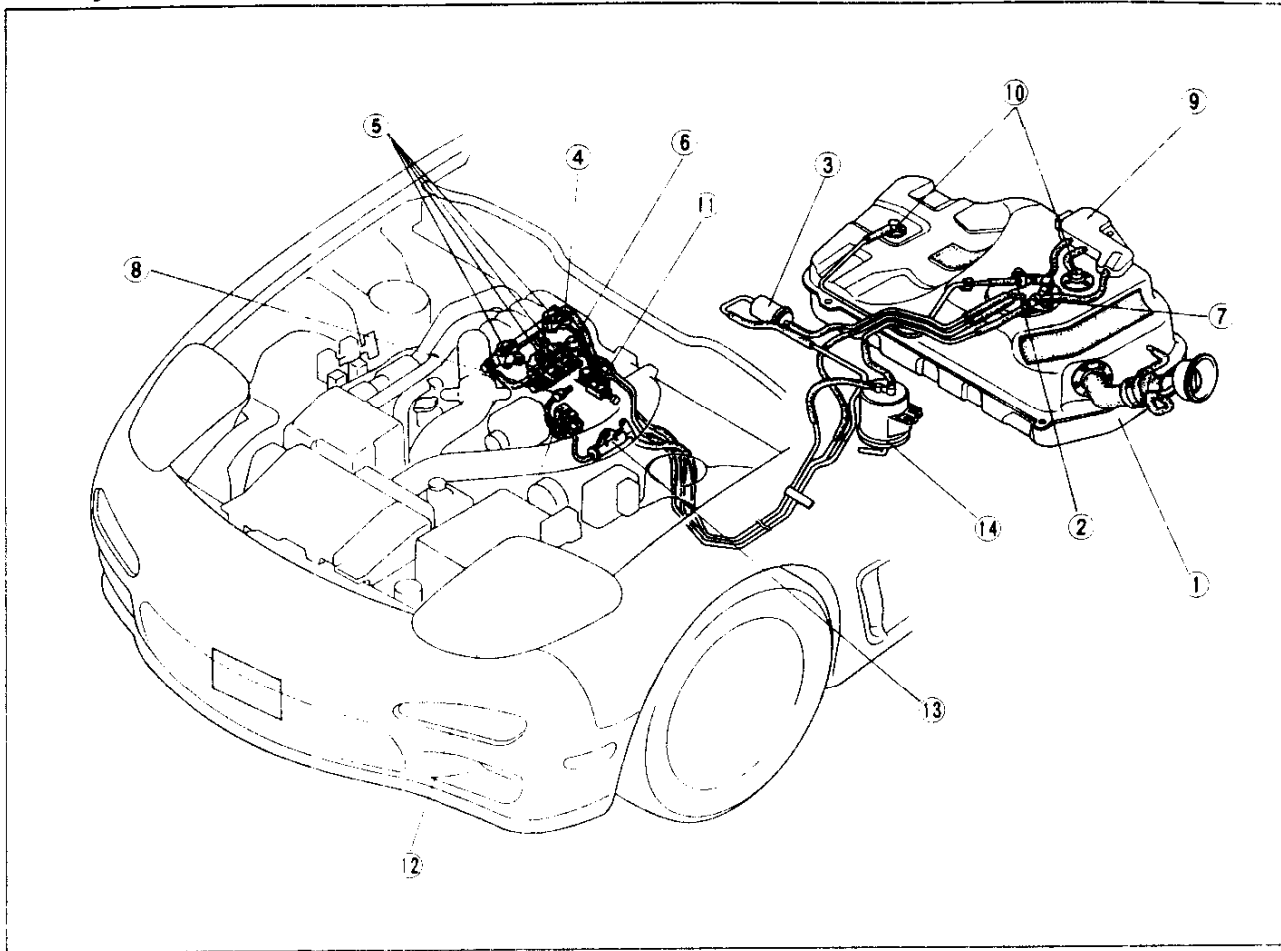


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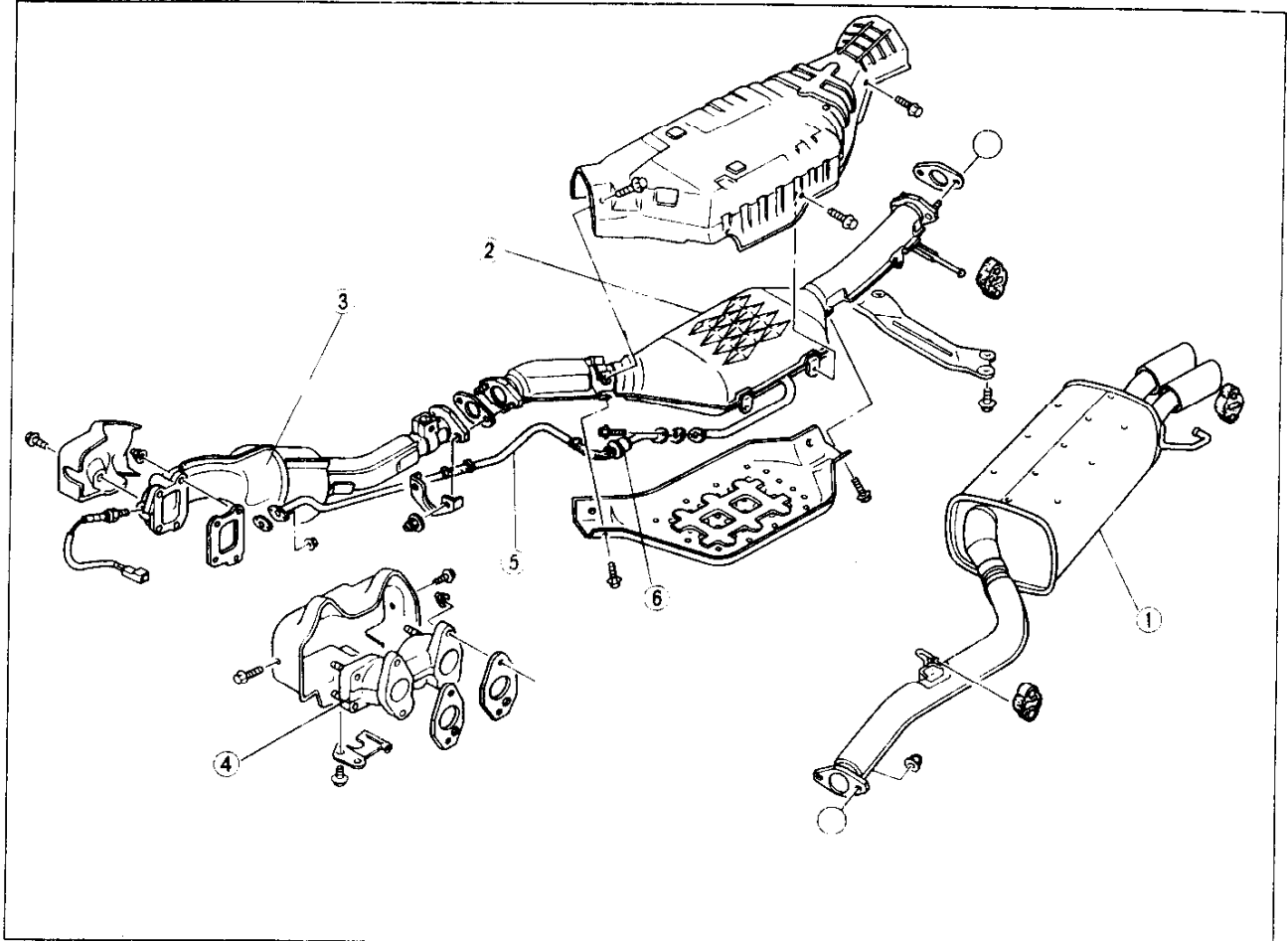
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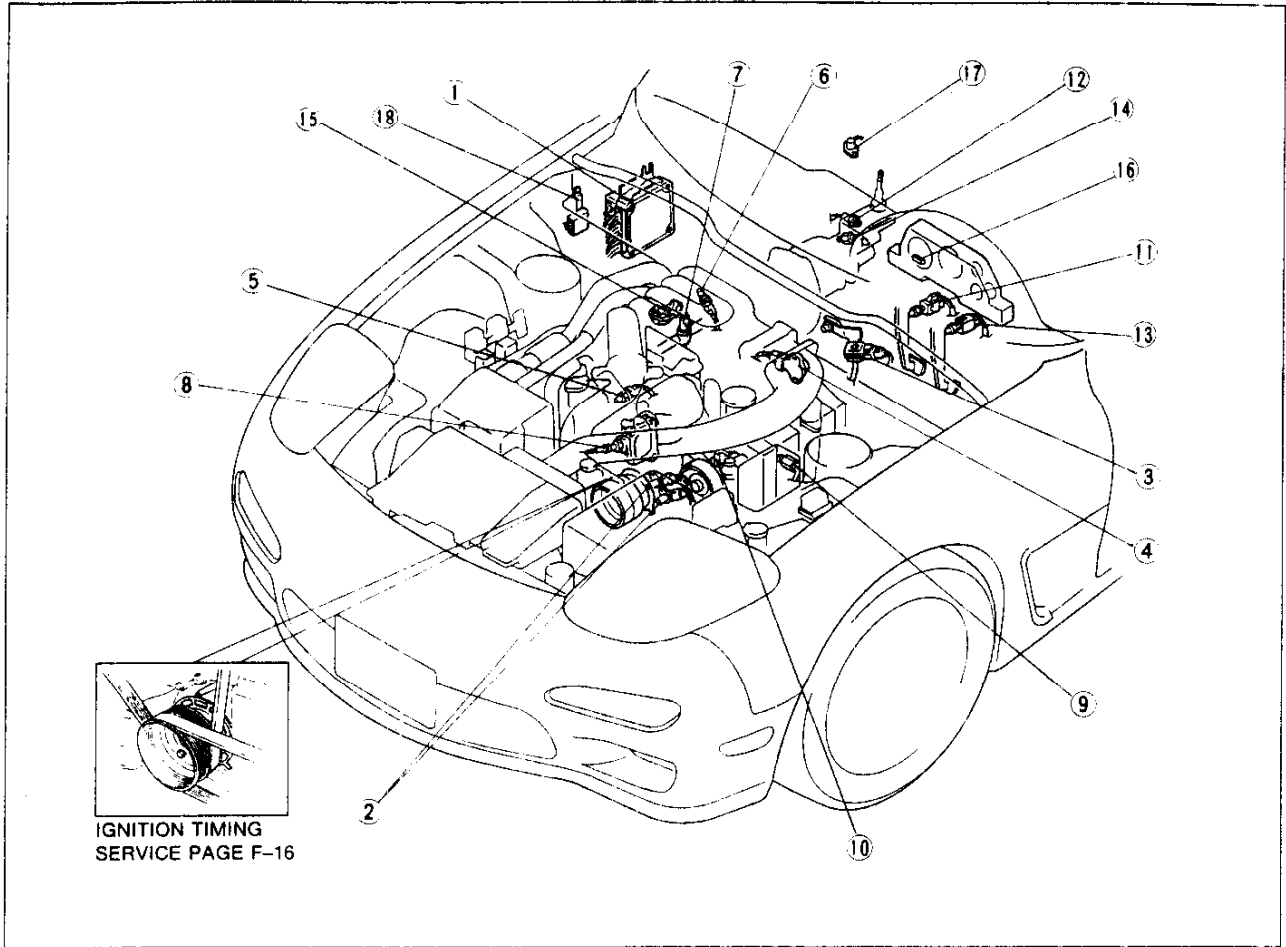
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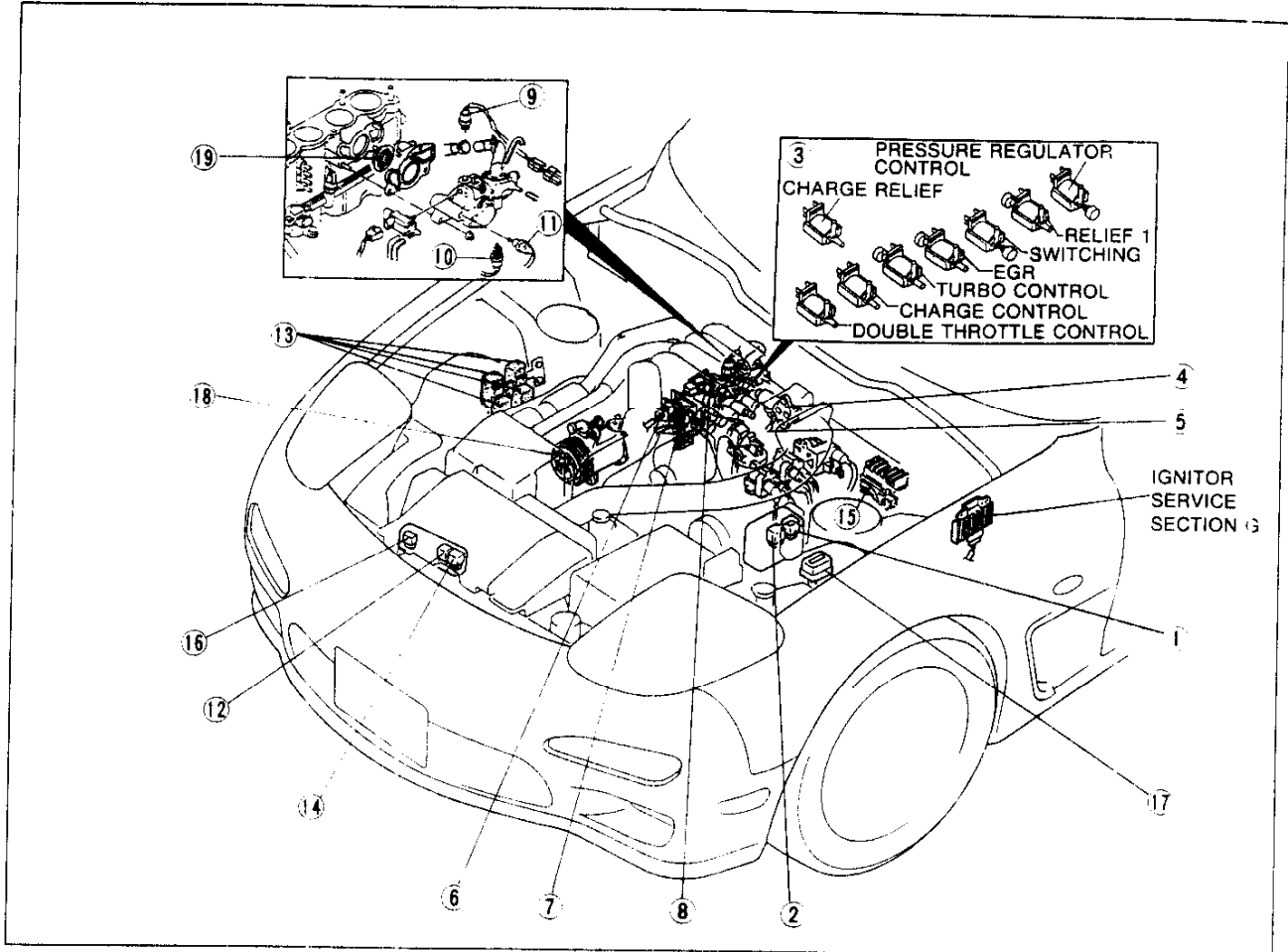
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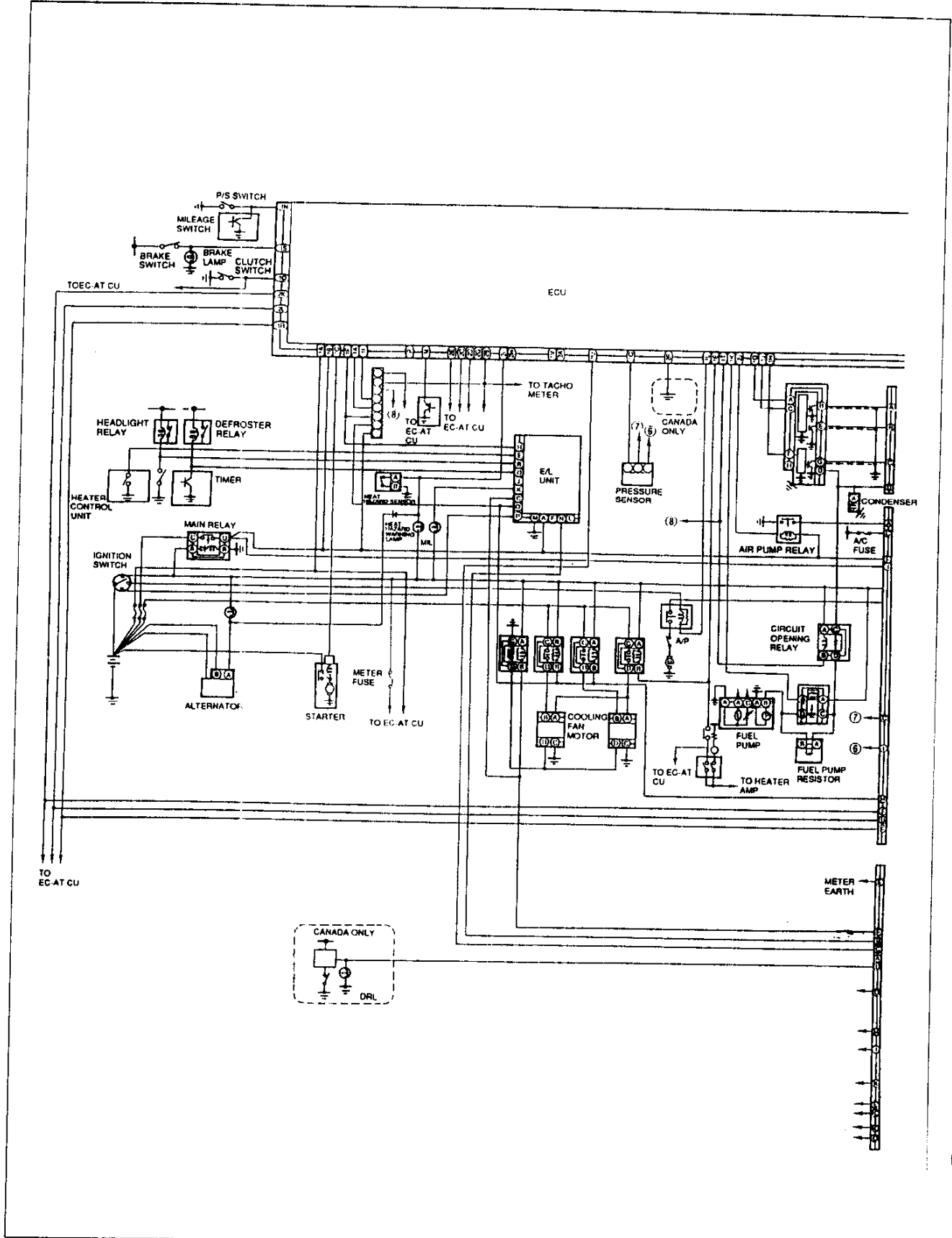
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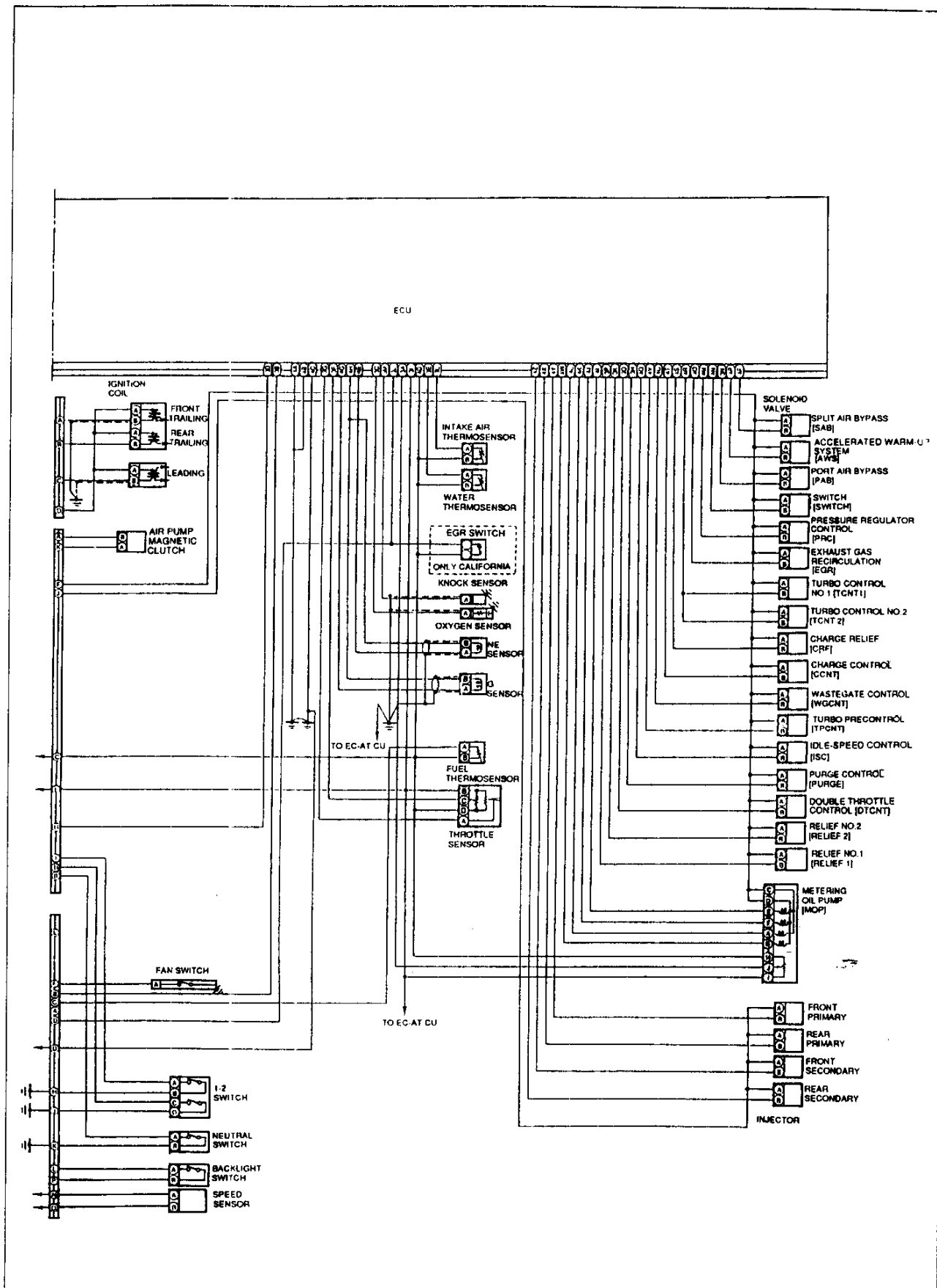


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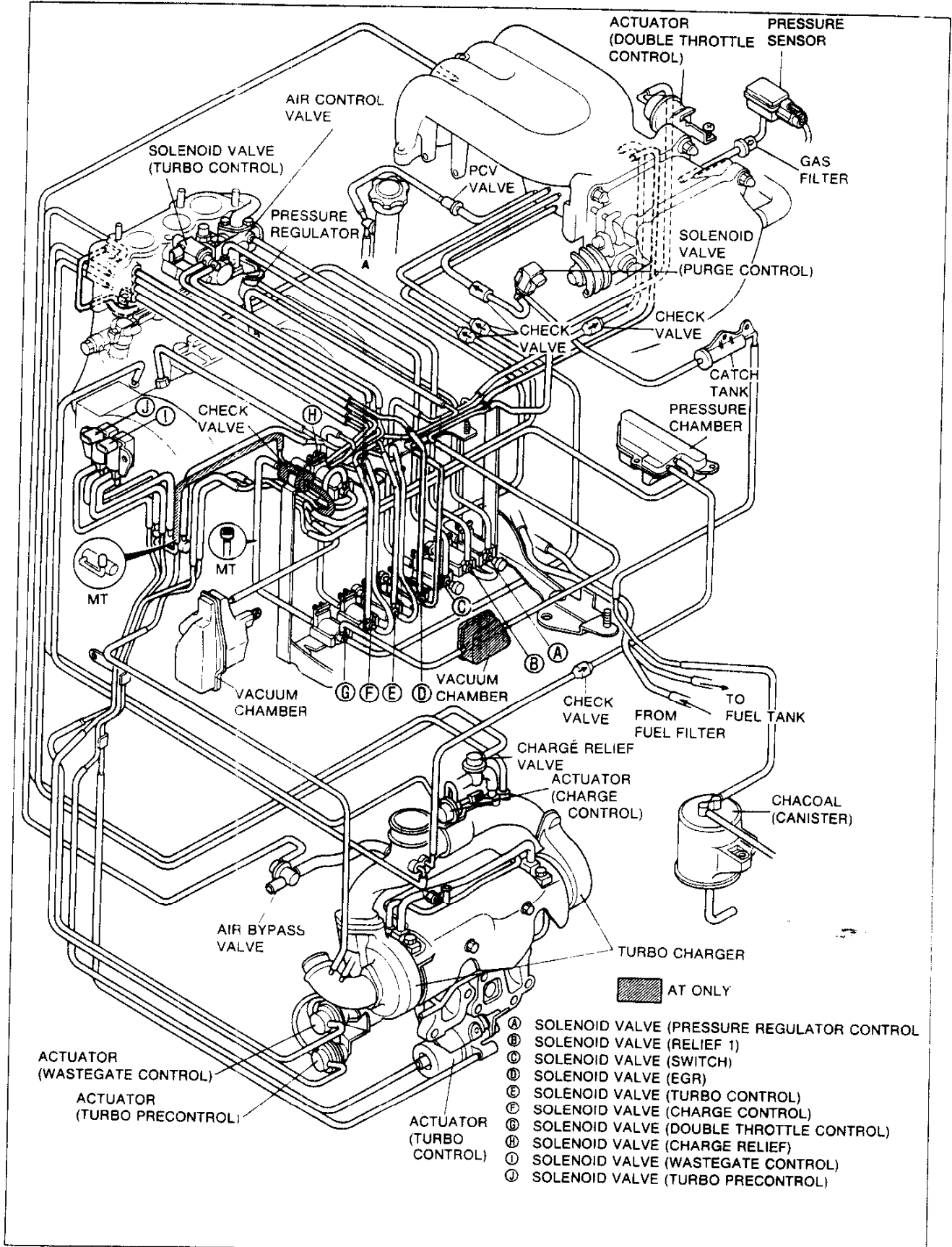
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WIRING DIAGRAM





VACCUUM HOSE ROUTING DIAGRAM



SPECIFICATIONS

| Item | | Specification |
|---|---------------------------------|--|
| Idle speed* | rpm | 700-750 (720 ⁺³⁰ / ₋₂₀) |
| Ignition timing* | Leading | ATDC |
| | Trailing | ATDC |
| Air cleaner | | |
| Element type | | Oil permeated |
| Throttle body | | |
| Type | | Horizontal draft {2 stage-3 barrel} |
| Throat diameter | Primary | mm {in} |
| | Secondary | mm {in} |
| Dashpot touch angle | ° | 8 |
| Water thermovalve Operation (full open) temperature | °C {°F} | 55-65 {131-149} or more |
| Intercooler | | |
| Type | | Air cooled |
| Core size {w × h × t} | mm {in} | 294 × 114 × 65 {11.575 × 4.4882 × 2.5591} |
| Turbo charger | | |
| System type | | Sequential twin turbo charged |
| Cooling method | | water + engine oil |
| Boost control actuator | | turbo pre-control + wastegate control |
| Boost control method | | Solenoid valve (duty-controlled) × 2 |
| Fuel tank | | |
| Capacity | liters {US gal, Imp gal} | 76 {20.1, 16.7} |
| Fuel filter | | |
| Type | Low-pressure | Nylon element |
| | High-pressure | paper element |
| Pressure regulator | | |
| Type | | Diaphragm |
| Regulated pressure | kPa {kgf/cm ² , psi} | 250-260 {2.5-2.6, 35.6-37.0} |
| Fuel pump | | |
| Type | | Impeller (In tank) |
| Output pressure | kPa {kgf/cm ² , psi} | 490-740 {5.0-7.5, 71.1-106.7} |
| Injector | | |
| Type | | Side-feeding |
| Injection volume | Primary | cm ³ {cc}/min |
| | Secondary | cm ³ {cc}/min |
| Catalytic converter | | |
| Type | Pri-converter | Metal |
| | Main converter | Monolithic |
| Air pump | | |
| Capacity | cm ³ {cc}/rev | 375 {375} |
| Output | L/min | MT 140-200, AT 160-200 |
| Fuel | | |
| Specification | | Unleaded premium (RON95 or higher) |

17U0FX-011

* TEN terminal of diagnosis connector is grounded.

COMPONENT DESCRIPTIONS

| Component | Function | Remark |
|---|---|--|
| 1-2 switch | Detects gear position (1st, 2nd) | MT only |
| Actuator (charge control) | Controls charge control valve | - |
| Actuator (Double throttle control) | Controls double throttle valve | Installed on extension manifold |
| Actuator (Turbo control) | Controls turbo control valve | Controlled by two solenoid valves |
| Actuator (Turbo precontrol) | Controls turbo precontrol valve | Part of turbocharger assembly |
| Actuator (Wastegate control) | Controls wastegate control valve | Part of turbocharger assembly |
| Air Bypass Valve | Reduces sound of intake air entering air cleaner from turbocharger deceleration | |
| Air Cleaner | Filters air entering throttle chamber | Oil permeated type |
| Air Control Valve | Directs air to one of three locations: exhaust port, main converter, or relief air silencer | Consists of two valves: Relief valve Switching valve |
| Air pump | Supplies secondary air to air control valve | With electromagnetic clutch |
| Atmospheric Pressure Sensor | Detects atmospheric pressure; sends signal to control unit | Built in ECU |
| Catalytic Converter | Reduces HC, CO and NOx | - |
| Charcoal Canister | Stores fuel tank fumes when engine is stopped | Vented to atmosphere through charcoal and air filter |
| Circuit opening relay | Voltage for fuel pump while engine running | - |
| Clutch switch | Detects clutch condition (engaged / disengaged) | MT only |
| Crank Angle Sensor | Detects eccentric shaft angle at 30° intervals and front rotor position; sends signal to control unit | - |
| Dashpot | Prevents sudden throttle valve closing during deceleration | - |
| Diagnosis connector | Service connector terminals: <ol style="list-style-type: none"> 1. EGI self-diagnosis 2. EC-AT self-diagnosis [AT] 3. Initial set 4. Fuel pump check 5. Engine speed output 6. Switch and oxygen sensor monitor 7. Supply battery voltage 8. Ground 9. A/C self-diagnosis 10. Cruise control self-diagnosis 11. Electrical cooling fan self-diagnosis | 25-pin (located near fuse box) <ol style="list-style-type: none"> 1. FEN terminal 2. TAT and FAT terminal 3. TEN terminal 4. F/P terminal 5. IG- terminal 6. MEN terminal 7. +B terminal 8. GND terminal 9. TAC and FAC terminal 10. TSC and FSC terminal 11. TFA terminal |

| Component | Function | Remark |
|----------------------------------|---|--|
| Engine control unit (ECU) | <p>Detects the following:</p> <ol style="list-style-type: none"> 1. Engine speed 2. Knocking signal 3. Vehicle speed 4. Engine coolant temperature 5. Intake air temperature 6. Throttle valve opening angle (full range) 7. Intake manifold pressure 8. Atmospheric pressure 9. Oxygen concentration 10. Air/Fuel ratio 11. Throttle valve opening angle (narrow range) 12. Metering oil pump (MOP) position signal 13. Fuel temperature 14. Gear position 15. Clutch condition 16. In-gear condition 17. Power steering operation 18. Braking signal 19. Starter signal 20. Electrical Load (E/L) condition 21. EGR condition <p>Control operation of the following</p> <ol style="list-style-type: none"> 1. Fuel injection system 2. Ignition control system 3. Idle speed control (ISC) system 4. Pressure regulator control system 5. Secondary air injection system <ol style="list-style-type: none"> 6. Accelerated warm-up System 7. Sequential twin turbocharger control system <ol style="list-style-type: none"> 8. Exhaust Gas Recirculation control system 9. Double throttle control system 10. A/C control system 11. Electric cooling fan control system 12. Lock-up control system 13. Slip control system 14. Self-diagnosis function 15. Monitor function 16. Simulation function 17. Real-time monitor function 18. Back up function | <ol style="list-style-type: none"> 1. Crank angle sensor 2. Knock sensor 3. Speedometer sensor 4. Water thermosensor 5. Intake air thermosensor 6. Throttle sensor (full range) 7. Pressure sensor 8. Atmospheric pressure sensor 9. Oxygen sensor 10. Oxygen sensor 11. Throttle sensor (narrow range) <ol style="list-style-type: none"> 12. MOP position sensor 13. Fuel thermosensor 14. 1-2 switch (MT) 15. Clutch switch (MT) 16. Neutral switch (MT) 17. P/S pressure switch 18. Stoplight switch 19. Ignition switch 20. E/L unit 21. EGR switch <p>Injector Igniter Solenoid valve (Idle speed control [ISC]) Solenoid valve (Pressure Regulator control [PRC]) Solenoid valve (Split air bypass [SAB]) Solenoid valve (Port air bypass [PAB]) Solenoid valve (Switch [SWITCHING]) Solenoid valve (Relief No.2 [RELIEF2]) Solenoid valve (Relief No.1 [RELIEF1]) Solenoid valve (AWS) Solenoid valve (Turbo control No.1 [TCNT1]) Solenoid valve (Turbo control No.2 [TCNT2]) Solenoid valve (Wastegate control [WGCNT]) Solenoid valve (Turbo precontrol [TPCNT]) Solenoid valve (Change control [CCNT]) Solenoid valve (Change relief [CRF]) Solenoid valve (EGR) Solenoid valve (DTCNT) A/C relay Fan relay EC-AT CU EC-AT CU Self diagnosis checker or DT-S1000 Self diagnosis checker or DT-S1000 DT-S1000 DT-S1000</p> |

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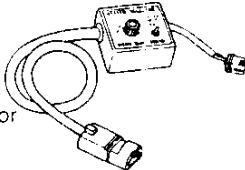
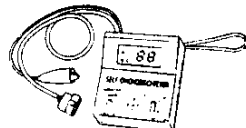
OUTLINE

| Component | Function | Remark |
|----------------------------------|--|---|
| Fuel filter | Filters particles from fuel | |
| Fuel pump | Provides fuel to injectors | <ul style="list-style-type: none"> ● Operates while engine running ● In fuel tank |
| Igniter | Receives spark signal from ECU and generates high voltage in ignition coil | |
| Ignition switch (START position) | Sends engine cranking signal to ECU | |
| Inhibitor switch (AT) | Detects load condition; sends signal to ECU | |
| Injector | Injects fuel into intake port | <ul style="list-style-type: none"> ● Controlled by signal from ECU (side-feed type) |
| Intake air thermosensor | Detects intake air temperature; sends signal to ECU | <ul style="list-style-type: none"> ● Installed in extension manifold |
| Knock sensor | Detects engine knocking; sends signal to ECU | |
| Main relay | Supplies current to output devices and ECU | |
| Neutral/Clutch switches (MT) | Detects in-gear condition; sends signal to ECU | <ul style="list-style-type: none"> ● Switch is ON in neutral |
| Oxygen sensor | Detects oxygen concentration; sends signal to ECU | <ul style="list-style-type: none"> ● Zirconic and platinum coat |
| PCV valve | Controls blowby gas introduced into engine | |
| Pressure regulator | Adjusts fuel pressure supply to injectors | |
| Pressure sensor | Detects intake manifold pressure; sends signal to ECU | |
| P/S pressure switch | Detects P/S operation | <ul style="list-style-type: none"> ● P/S switch ON when steering wheel turned |
| Pulsation dumper | Absorbs fuel pulsations | |
| Solenoid valve (ISC) | Supplies bypass air into intake manifold | <ul style="list-style-type: none"> ● Controlled by duty signal from ECU |
| Solenoid valve (PRC) | Controls vacuum to pressure regulator | <ul style="list-style-type: none"> ● Installed below extension manifold |
| Solenoid valve (SAB) | Controls split air volume | <ul style="list-style-type: none"> ● Installed in ACV |
| Solenoid valve (SWITCHING) | Controls switching valve of air control valve | <ul style="list-style-type: none"> ● Installed below extension manifold |
| Solenoid valve (RELIEF2) | Controls relief valve | <ul style="list-style-type: none"> ● Installed in ACV |
| Solenoid valve (RELEF1) | Controls relief valve | <ul style="list-style-type: none"> ● Installed below extension manifold |
| Solenoid valve (PAB) | Controls port air volume | <ul style="list-style-type: none"> ● Installed in ACV |
| Solenoid valve (AWS) | Controls accelerated warm-up system | <ul style="list-style-type: none"> ● Installed in extension manifold |
| Solenoid valve (TCNT1) | Controls turbo control valve | <ul style="list-style-type: none"> ● Installed in ACV (pressure applied) |
| Solenoid valve (TCNT2) | Controls turbo control valve | <ul style="list-style-type: none"> ● Installed below extension manifold (vacuum applied) |
| Solenoid valve (WGCNT) | Controls wastegate valve | <ul style="list-style-type: none"> ● Controlled by duty signal from ECU |
| Solenoid valve (TPCNT) | Controls turbo precontrol valve | <ul style="list-style-type: none"> ● Controlled by duty signal from ECU |
| Solenoid valve (CCNT) | Controls charge control valve | <ul style="list-style-type: none"> ● Installed below extension manifold |
| Solenoid valve (CRF) | Controls charge relief valve | <ul style="list-style-type: none"> ● Installed below extension manifold |
| Solenoid valve (EGR) | Controls EGR valve | <ul style="list-style-type: none"> ● Installed below extension manifold |
| Solenoid valve (DTCNT) | Controls double throttle valve | <ul style="list-style-type: none"> ● Installed below extension manifold |
| Solenoid valve (PURGE) | Controls evaporative fumes from charcoal canister to intake manifold | <ul style="list-style-type: none"> ● Controlled by duty signal from ECU |
| Speedometer sensor | Detects vehicle speed; sends signal to ECU | <ul style="list-style-type: none"> ● Installed in instrument cluster |
| Stoplight switch | Detects braking; sends signal to ECU | |
| Throttle body | Controls intake air amount | |
| Throttle sensor | Detects throttle valve opening angle | <ul style="list-style-type: none"> ● Installed on throttle body |
| Water thermosensor | Detect coolant temperature; send signals to ECU | <ul style="list-style-type: none"> ● Installed in engine |

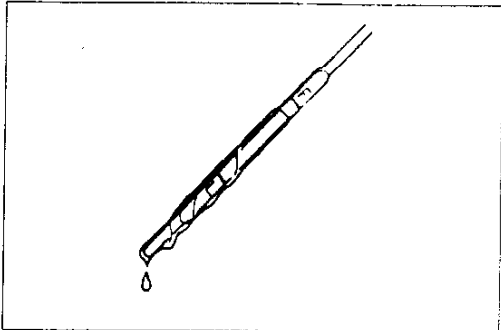
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ENGINE TUNE-UP

PREPARATION
SST

| | | | |
|--|---|--|----------------------|
| <p>49 B019 9A0 System Selector</p>  | <p>For inspection of ignition timing and idle speed and diagnosis</p> | <p>49 H018 9A1 Self Diagnosis checker</p>  | <p>For diagnosis</p> |
|--|---|--|----------------------|

17U0FX-0-3

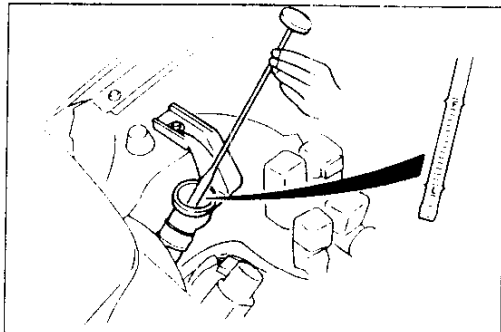


17U0FX-014

BASIC INSPECTION

Engine Oil

1. Remove the dipstick and check the engine oil level and condition.
2. Add or change oil as necessary.



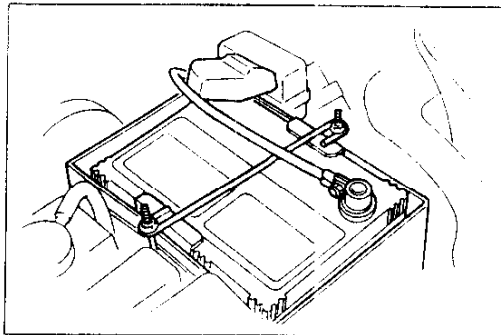
17U0FX-015

Coolant (engine cold)

Warning

- Never remove the radiator cap while the engine is hot.
- Wrap a thick cloth around the cap before carefully removing it.

1. Remove the coolant level gauge from the coolant reservoir.
2. Verify that the coolant level is between the and marks of the gauge.
3. Add coolant if necessary.

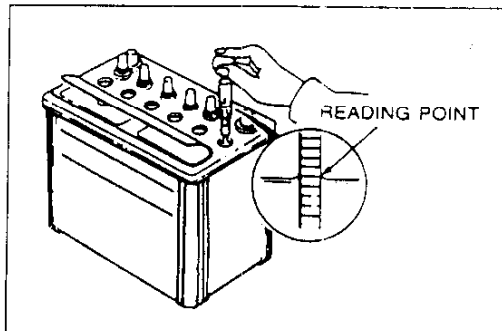


17U0FX-016

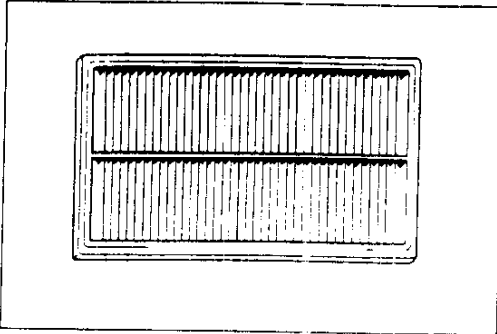
Battery

1. Check for corrosion on the terminals and for loose cable connections. If necessary, clean the clamps and tighten them firmly.
 2. Make sure the electrolyte level is between the UPPER LEVEL and LOWER LEVEL marks.
 3. Add distilled water if necessary.
4. Check the specific gravity with a hydrometer.

Gravity: 1.27–1.29 {at 20°C [68°F]}



17U0FX-017



17U0FX-018

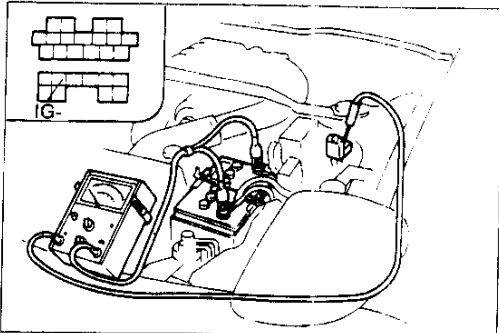
Air Cleaner Element Inspection

1. Check the air cleaner element for excessive dirt and for oil and damage.

Caution

- Do not blow the air cleaner element by compressed air to clean.

2. Replace the element if necessary.

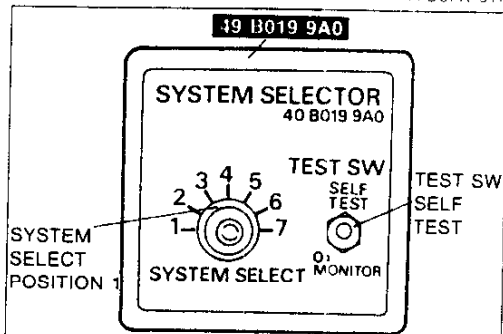


17U0FX-019

ADJUSTMENT

Preparation

1. Warm up the engine to normal operating temperature.
2. Turn all electric loads OFF.
3. Connect the **SST** to the diagnosis connector.
4. Connect a tachometer to the diagnosis connector **IG**-terminal as shown.



17U0FX-020

Ignition Timing

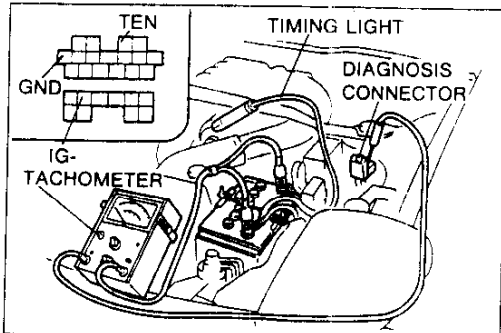
Caution

- Do not adjust the ignition timing, it is set at the factory and must not be tempered with.

1. Perform preparation (refer to above.)
2. Verify that the electric cooling fan does not operate.
3. Remove the fuel filler cap.
4. Set SYSTEM SELECT to position 1.
5. Set TEST SW to SELF-TEST.

Note

- If the **SST** is not used, jump across the **TEN** terminal and the **GND** terminal of the diagnosis connector.



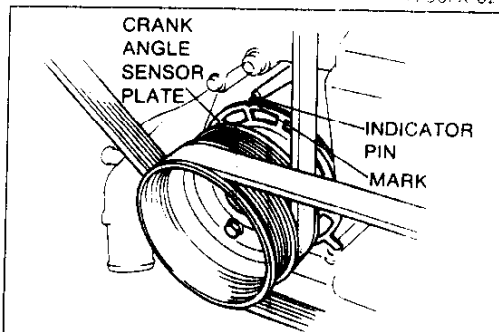
17J0FX-021

6. Make sure the idle speed is within specification; if not adjust the idle speed.
7. Connect a timing light to the high-tension lead of the front trailing-side.

Caution

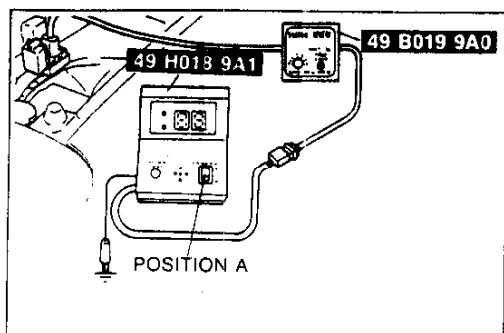
- Some timing lights will not illuminate even if the ignition system is normal.

8. Verify that the timing mark (white) on the crank angle sensor plate is aligned with the indicator pin.

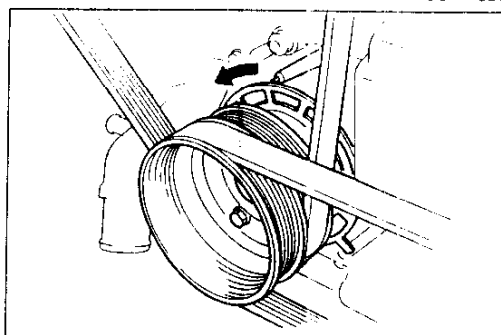


17U0FX-022

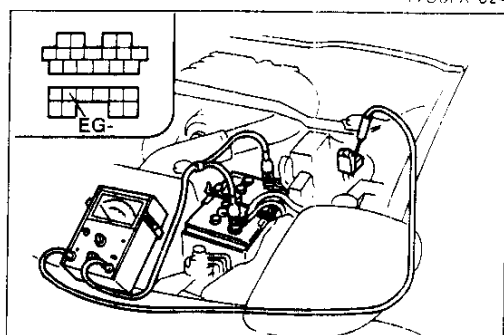
- Ignition timing: Trailing side: 20° ATDC (- 20° BTDC)**
Leading side: 5° ATDC (- 5° BTDC)
Idle speed (Neutral or P range): 550-950 rpm



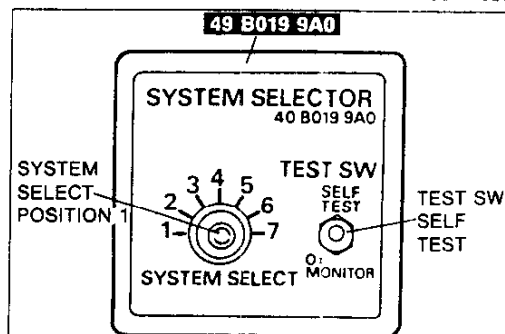
17U0FX-023



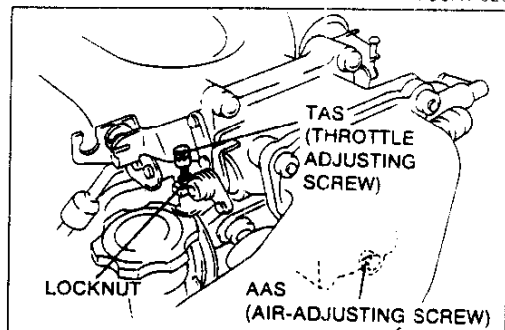
17U0FX-024



17U0FX-025



17U0FX-026



17U0FX-027

9. If the timing is incorrect, check the following procedure.
- Verify that no service code number is present. If service code number present, check for cause referring to the specified check sequence. (Refer to page F-20)
 - 05-knock sensor
 - 13-Pressure sensor

Input devices

- E/L, P/S, A/C, Cooling fan
- Crank angle sensor (NE, signal)
- Pressure sensor
- Throttle sensor
- Neutral SW / Clutch SW (MT)
- Inhibitor signal (AT)

Others

ECU terminal 3I (Refer to page F-152)

10. Disconnect the **SST**.
11. Verify that the ignition timing advances when the engine is above 1,500 RPM.

Idle Speed

Note

- Because the idle speed is controlled automatically by the ECU though the idle speed control (ISC) valve, usually it is not necessary to check and adjust the idle speed. However, the idle speed should adjust when rough idling occurs adjust the idle speed following procedure.

1. Perform "Preparation". (Refer to page F-16)
2. Set SYSTEM SELECT to position 1
3. Set TEST SW to SELF TEST
4. Verify that the idle speed is within specification.

Idle speed: 700-750 (720 ±3% rpm)

Caution

- Check the idle speed with the electric cooling fan not operating.

5. If not within the specification, adjust the idle by turning the air-adjusting screw (AAS).
6. If not within the specification when air adjusting screw fully closed, loosen the locknut and turn the throttle adjusting screw to set the idle.
7. Tighten the locknut and put a paint mark on the nut and throttle body.
8. Disconnect the **SST**.

F

SELF-DIAGNOSIS FUNCTION

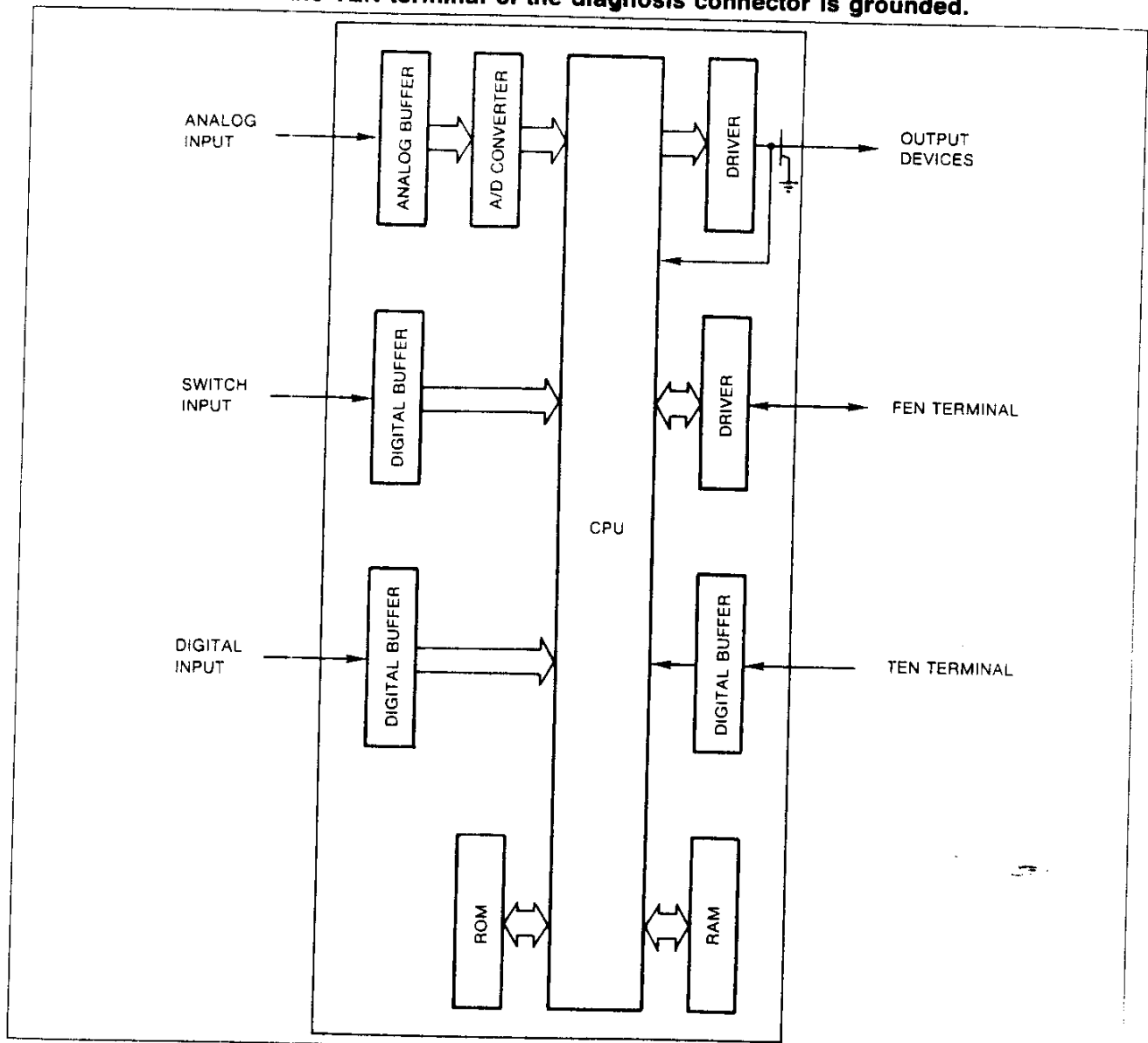
SELF-DIAGNOSIS FUNCTION

DESCRIPTION

When trouble occurs in the main input or output devices, check for the cause by using the **SST**. Failure of input and output devices is indicated and retrieved from the engine control unit (ECU) as service code numbers.

Note

- The ECU constantly checks for malfunction of the input devices. But, it checks for malfunction of output devices only in a three-second period after the ignition switch is turned ON when the TEN terminal of the diagnosis connector is grounded.



17U0FX 02F

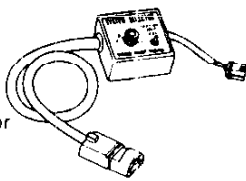
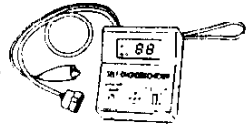




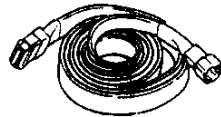
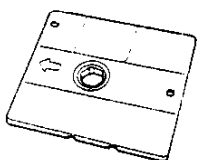
Function

| | Self diagnosis checker | DT-S1000 |
|--------------------------------|------------------------|----------|
| Service Code Number Inspection | Yes | Yes |
| Monitor Function | Yes | Yes |
| Real Time Monitor Function | No | Yes |
| Simulation Function | No | Yes |
| Memory Function (DT-S1000) | No | Yes |

SELF-DIAGNOSIS FUNCTION

F

**PREPARATION
SST**

| | | | |
|---|----------------------|---|----------------------|
| <p>49 B019 9A0 System Selector</p>  | <p>For diagnosis</p> | <p>49 H018 9A1 Self-Diagnosis Checker</p>  | <p>For diagnosis</p> |
| <p>49 F088 001 DT-S1000 Base unit</p>  | <p>For diagnosis</p> | <p>49 F088 002 Power unit</p>  | <p>For diagnosis</p> |
| <p>49 F088 003 Harness power unit</p>  | <p>For diagnosis</p> | <p>49 F088 004 Interface adapter Type-1</p>  | <p>For diagnosis</p> |
| <p>49 F088 005 Harness Type-1</p>  | <p>For diagnosis</p> | <p>49 F088 011 System disk Type-1 (V1.00)</p>  | <p>For diagnosis</p> |

17U0FX-02