# NISSAN

# R34

## SUPPLEMENT-I

# SERVICE MANUAL

# NISSAN

## MODEL R34 SERIES

## QUICK REFERENCE INDEX



## FOREWORD

**This Supplement contains information concerning necessary service procedures and relevant data for the model R34 face-lift.**

**All information, illustrations and specifications contained in this Supplement are based on the latest product information available at the time of publication. If your NISSAN model differs from the specifications contained in this Supplement, consult your NISSAN distributor for information.**

**The right is reserved to make changes in specifications and methods at any time without notice.**

# HOW TO USE THIS MANUAL

- This Service Manual only contains the service data specifications and trouble diagnosis information such as self-diagnosis, CONSULT, circuit diagram and so on.

- For other information not specified in this manual, refer to the following service publications.
  - Pub. No. A006029 (Japanese version Service Manual for initial production model)
  - Pub. No. WD8E-0R34J0 (Wiring diagram manual for initial production model)
  - Pub. No. SM8E-0R34J0 (English version Service Manual for initial production model)
  - Pub. No. A006030 (Japanese version Service Manual for GTR model)
  - Pub. No. WD9E-R34AJ0 (Wiring diagram manual for GTR model)

# IMPORTANT SAFETY NOTICE

**The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.**
**The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.**

**Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first be completely satisfied that neither personal safety nor the vehicle's safety will be jeopardized by the service method selected.**

# GENERAL INFORMATION

# SECTION GI



**MODIFICATION NOTICE:**
GT-R model has been introduced.

# CONTENTS

## Function and System Application

| Diagnostic test mode | Function | ENGINE | Air bag | ABS | NATS |
|---|---|---|---|---|---|
| Work support | This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT. | × | — | — | — |
| Self-diagnostic results | Self-diagnostic results can be read and erased quickly. | × | × | × | × |
| Trouble diagnostic record | Current self-diagnostic results and all trouble diagnostic records previously stored can be read. | — | × | — | — |
| ECU discriminated No. | Classification number of a replacement ECU can be read to prevent an incorrect ECU from being installed. | — | × | — | — |
| Data monitor | Input/Output data in the ECM can be read. | × | — | × | — |
| Active test | Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range. | × | — | × | — |
| ECM part number | ECM part number can be read. | × | — | × | — |
| Function test | Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG". | × | — | — | — |
| Control unit initialization | All registered ignition key IDs in NATS components can be initialized and new IDs can be registered. | — | — | — | × |
| Self-function check | ECM checks its own NATS communication interface. | — | — | — | × |

×: Applicable

## Lithium Battery Replacement

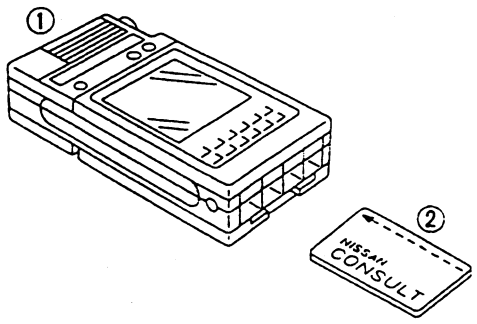
CONSULT contains a lithium battery. When replacing the battery obey the following:

**WARNING:**

**Replace the lithium battery with SANYO Electric Co., Ltd., CR2032 only. Use of another battery may present a risk of fire or explosion. The battery may present a fire or chemical burn hazard if mistreated.**
**Do not recharge, disassemble or dispose of in fire.**
**Keep the battery out of reach of children and discard used battery conforming to the local regulations.**

## Checking Equipment

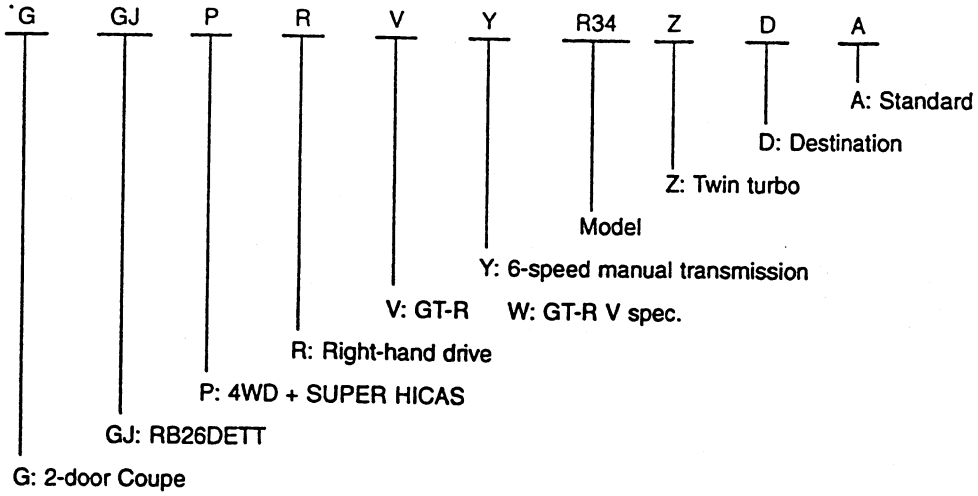
**When ordering the below equipment, contact your NISSAN distributor.**

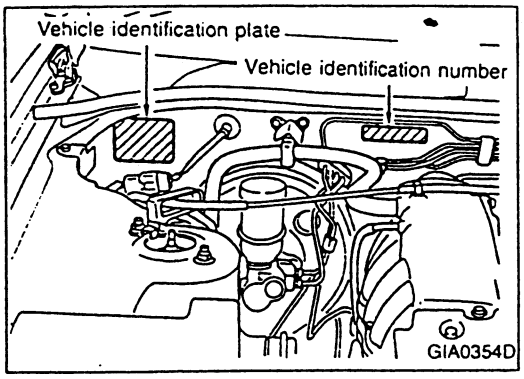
| Tool name | Description |
|---|---|
| **NISSAN CONSULT**<br>① CONSULT unit and accessories<br>② Program card EE980 and NATS-E940 (For NATS) |  <br>NT004 |

## Model Variation

| Body | Grade | Model<br>RH drive | Engine | Transmission | Rear differential carrier |
|---|---|---|---|---|---|
| 2-door | GT-R | GGJPRVYR34ZDA | RB26DETT | ETX13A | R200H |
| | | GGJPRWYR34ZDA | | | R200Z |

### Prefix and suffix designations:

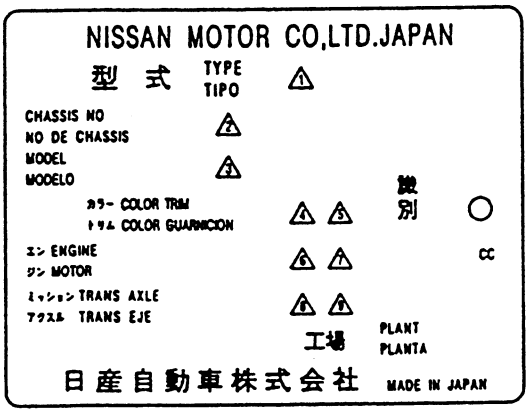





## Vehicle Identification Number

The stamping position for vehicle identification number is at the right side of cowl top panel.
GF-BNR34: From BNR34-000001

## Vehicle Identification Plate




1. Type
2. Chassis No.
3. Model
4. Body color
5. Inner trim color
6. Engine type
7. Displacement
8. Transmission type
9. Transaxle type

GIA0018D

# ENGINE CONTROL SYSTEM

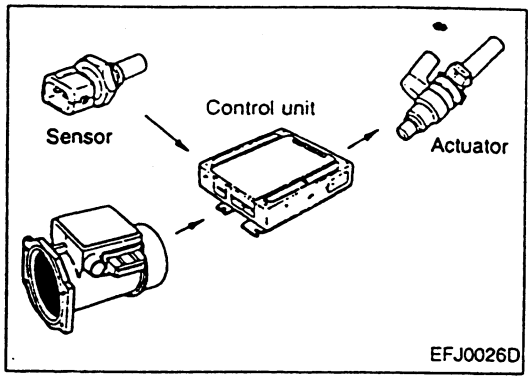
# SECTION EC



**MODIFICATION NOTICE:**

- RB26DETT engine has been added.

# CONTENTS



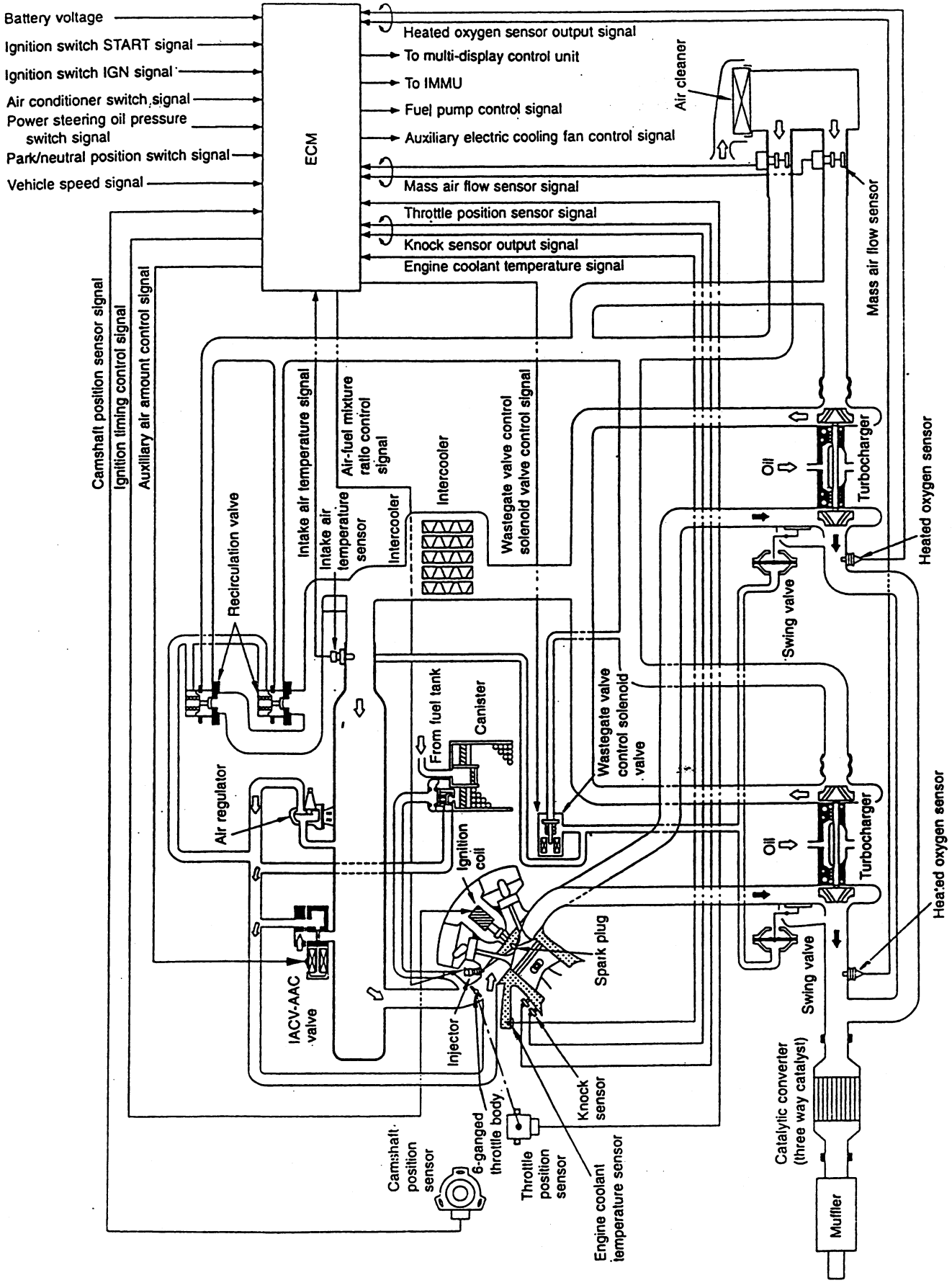

## System Description

The engine control system, which performs various controls such as the fuel injection control, ignition timing control and idle speed with a single control unit, has been adopted.
The engine immobilizer system (anti-theft device) has been adopted.
Diagnostic system applicable to CONSULT has been adopted for easier inspection, service, and trouble diagnostic operations.

## Description of Engine Control

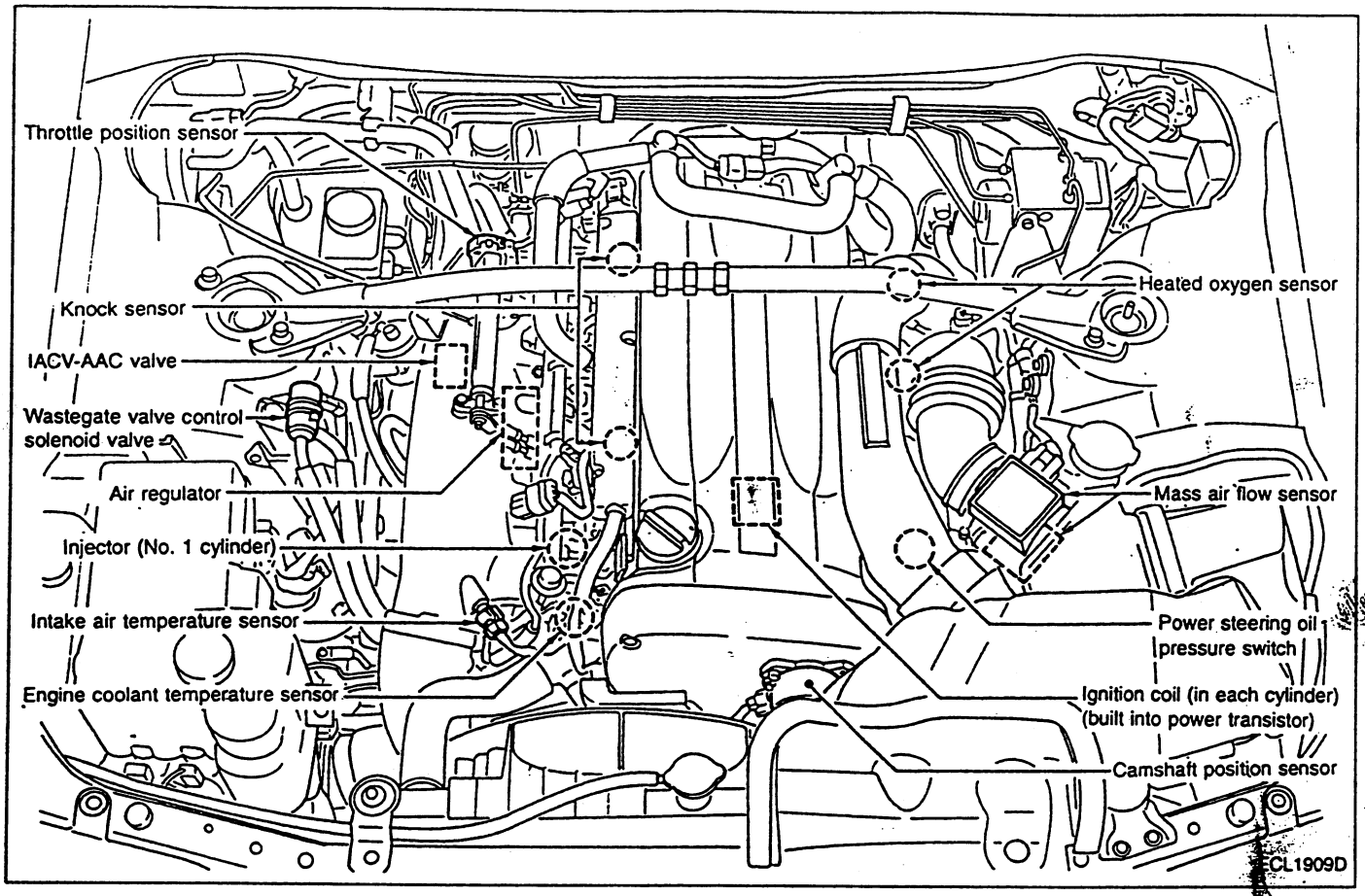
| Item | Description |
|---|---|
| Fuel injection control | • Performs optimum fuel injection for every operation condition for improved exhaust performance and response.<br>• Adopts air/fuel ratio feedback learning control that performs compensation of air/fuel ratio for improved drivability when the system is in a transitional condition due to sudden change in air/fuel ratio. |
| Ignition timing control | • Uses an ignition timing map stored in the control unit to perform controls so that the optimum ignition timing is obtained for every operating condition.<br>• Performs knock control, in which the ignition timing is advanced/retarded according to the presence of knocking, so that the optimum ignition timing is obtained for every operating condition and type of fuel.<br>• Each cylinder has a built-in ignition coil equipped with a power transistor. This provides the highest possible reliability. |
| Idle speed control | • Performs feedback control to obtain the target idle speed for various conditions, such as during warm-up or when the air conditioner is actuated, via the AAC valve that adjusts the intake air amount when the throttle valve is fully closed. |
| Fuel pump drive control | • Turns the fuel pump relay ON/OFF according to the engine speed signal.<br>• FPCM (Fuel Pump Control Modulator) control has been adopted for reduced idle noise. |
| Heated oxygen sensor heater control | • Promotes warm-up of the heated oxygen sensor for improved air/fuel ratio feedback function. |
| Air conditioner cut control | • Turns the air conditioner relay OFF at starting or during acceleration to reduce the engine load. |
| Auxiliary electric fan control | • Turns the auxiliary electric fan relay ON/OFF according to the engine coolant temperature signal. |
| Turbo pressure control | • Wastegate valve control solenoid valve (duty control) operation in response to existing driving conditions. |
| Engine immobilizer | • Prevents engine starting in response to data received from IMMU. |
| Fail-safe and backup controls | • Ensures the vehicle's safe operation and enables the vehicle to be driven in an emergency when any of the system major components (microcomputer in the control unit, engine coolant temperature sensor, etc.) fails. |
| Diagnostic system | • For easier trouble diagnosis, self-diagnostic system is adopted and the existing diagnostic system is modified so that CONSULT can be used. |

## System Diagram



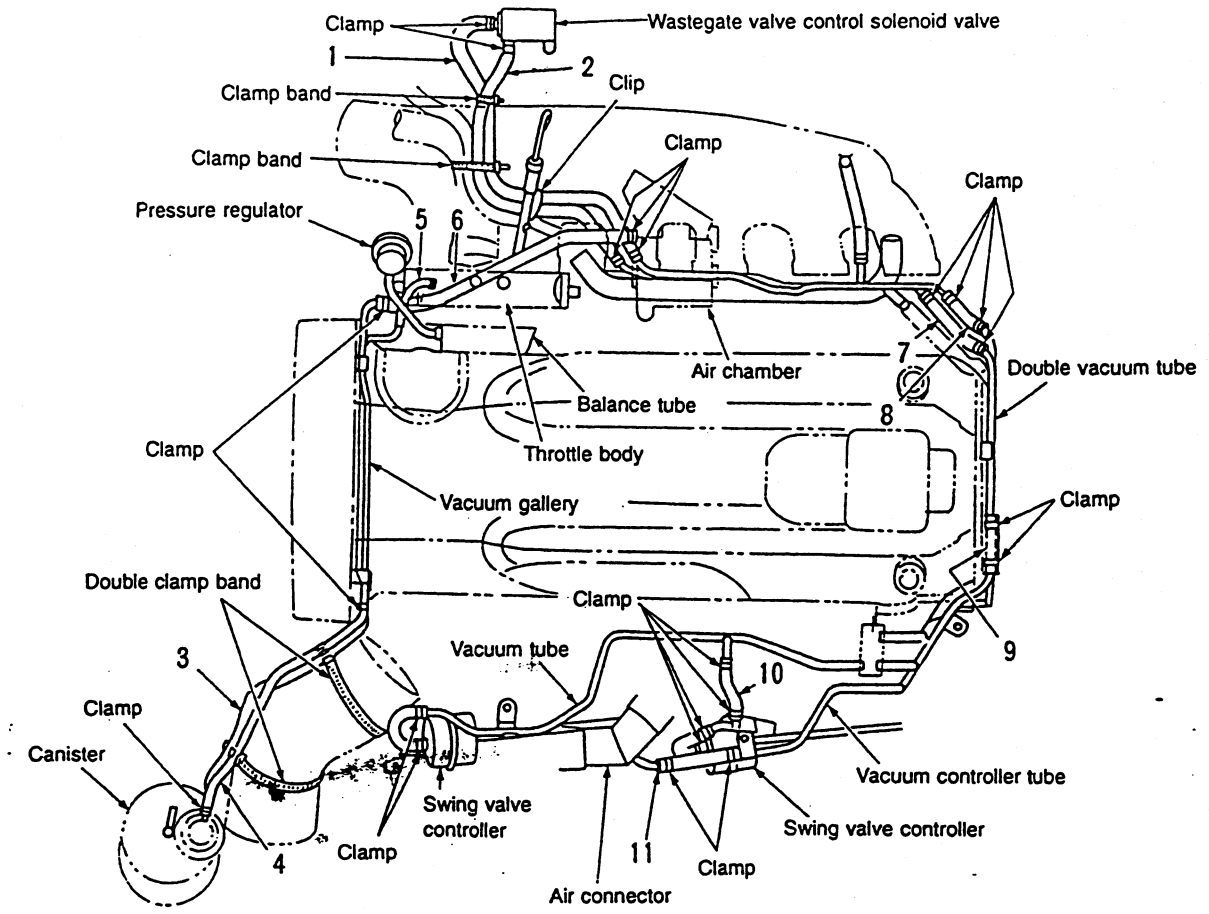

ECL1908D

## Component Parts Location



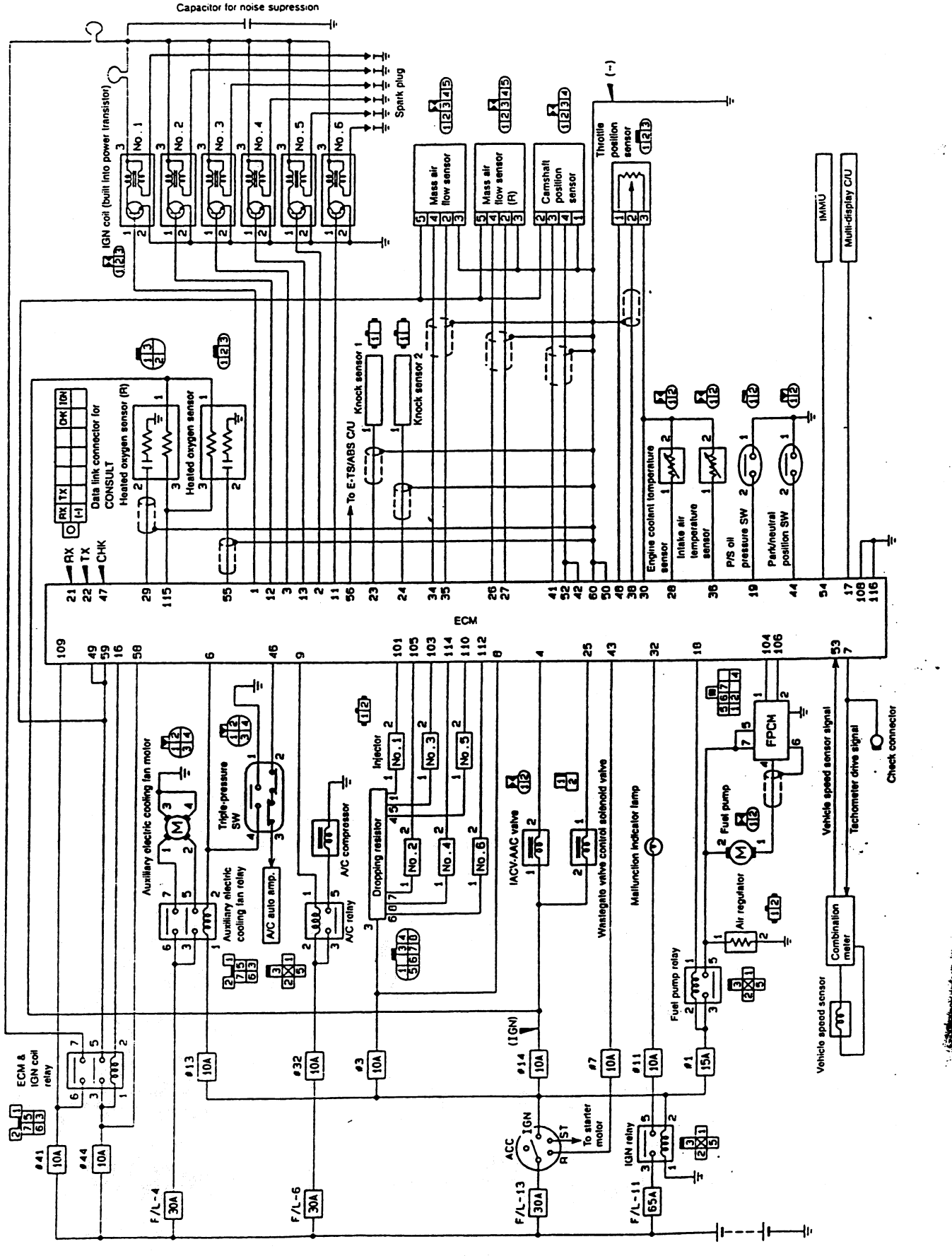

| | Component name | Type | Location |
|---|---|---|---|
| Actuators | Fuel injector | Top feed | At intake manifold |
| | Fuel pump | Roller vane | Inside fuel tank |
| | IACV-AAC valve | Solenoid valve (duty control) | Below intake manifold collector |
| | Air regulator | Bimetal | On intake manifold lower side |
| | Ignition coil | Micro-mold (Built-into power transistor) | Cylinder head (Top of each spark plug) |
| | Wastegate valve control solenoid valve | Solenoid valve (Duty control) | Strut tower side, right side |
| Sensors | Camshaft position sensor | Photoelectric (Directly driven by camshaft) | Left front of cylinder head |
| | Mass air flow sensor | Hot-wire | Air cleaner |
| | Throttle position sensor | Variable resistance | Accelerator work unit |
| | Engine coolant temperature sensor | Thermistor | Water outlet |
| | Intake air temperature sensor | | Intake manifold collector |
| | Heated oxygen sensor | Zirconia (with heater) | Turbocharger exhaust outlet |
| | Knock sensor | Piezoelectric | Right side of cylinder block |
| | Power steering oil pressure switch | ON-OFF switch | Left side of engine oil pan |
| | Vehicle speed sensor | Electromagnetic power generation | Transfer |
| ECM | | 76-pin digital control | Passenger dashboard side |
| Fuel pump control modulator (FPCM) | | Voltage-control | Front upper side of trunk room |
| ECM & IGN coil relay | | Small universal relay (2M) | Behind ECM (passenger dashboard side) |

## Vacuum Hose Drawing



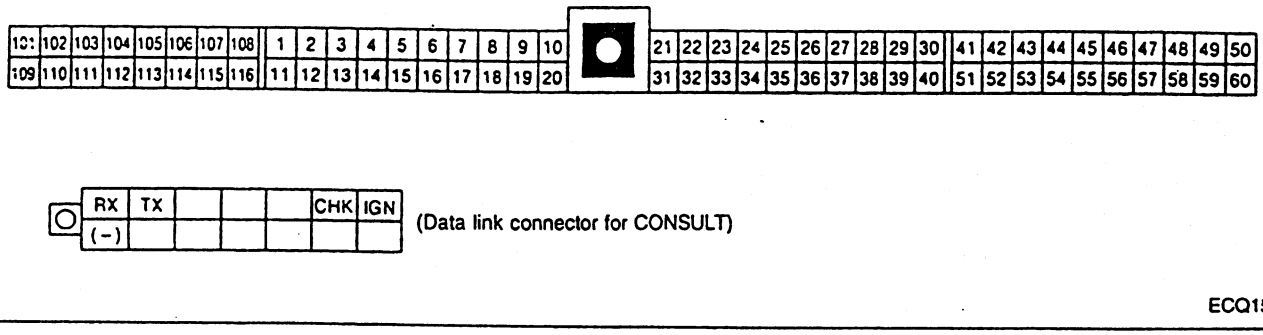

1. Wastegate valve control solenoid valve to Vacuum gallery
2. Wastegate valve control solenoid valve to Vacuum gallery
3. Canister to Vacuum gallery
4. Canister to Vacuum gallery
5. Throttle chamber to Vacuum gallery
6. Air chamber to Vacuum gallery
7. Vacuum gallery to Vacuum gallery
8. Vacuum gallery to Vacuum gallery
9. Vacuum gallery to Vacuum gallery
10. Vacuum gallery to Vacuum gallery
11. Vacuum gallery to Vacuum controller tube

## Circuit Diagram




ECL1910D

## ECM Terminal Layout



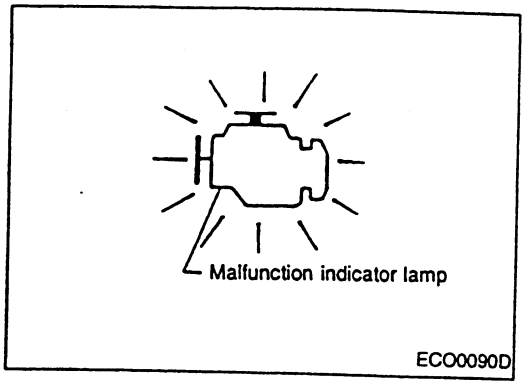

| Terminal No. | Description | Terminal No. | Description |
|---|---|---|---|
| 1 | Ignition signal (power transistor drive signal) (No. 1 cylinder) | 31 | — |
| 2 | Ignition signal (power transistor drive signal) (No. 5 cylinder) | 32 | Malfunction indicator lamp |
| 3 | Ignition signal (power transistor drive signal) (No. 3 cylinder) | 33 | — |
| 4 | IACV-AAC valve control signal | 34 | Mass air flow sensor ground (No. 1 - 3 cylinders) |
| 5 | — | 35 | Mass air flow sensor signal (No. 1 - 3 cylinders) |
| 6 | Auxiliary electric cooling fan relay control signal | 36 | Intake air temperature sensor signal |
| 7 | Tachometer drive signal | 37 | — |
| 8 (IGN) | Ignition switch (IGN) signal | 38 | Throttle position sensor signal |
| 9 | Air conditioner relay control signal | 39 | — |
| 10 | — | 40 | — |
| 11 | Ignition signal (power transistor drive signal) (No. 6 cylinder) | 41 | Camshaft position sensor 1° (POS) signal |
| 12 | Ignition signal (power transistor drive signal) (No. 2 cylinder) | 42 | Camshaft position sensor 120° (REF) signal |
| 13 | Ignition signal (power transistor drive signal) (No. 4 cylinder) | 43 | Ignition switch (START) signal |
| 14 | — | 44 | Park/Neutral position switch signal |
| 15 | — | 45 | — |
| 16 | ECM & IGN coil relay control signal | 46 | Air conditioner switch signal |
| 17 | Injection pulse monitor (Ti monitor) signal | 47 (CHK) | Check (Diagnosis start) |
| 18 | Fuel pump relay control signal | 48 | Throttle position sensor power supply |
| 19 | Power steering oil pressure switch signal | 49 | Control unit power supply |
| 20 | — | 50 (-) | Control unit ground |
| 21 (RX) | Receive (Data input to control unit) | 51 | — |
| 22 (TX) | Transmit (Data output from control unit) | 52 | Camshaft position sensor 120° (REF) signal |
| 23 | Knock sensor signal 1 | 53 | Vehicle speed sensor signal |
| 24 | Knock sensor signal 2 | 54 | IMMU |
| 25 | Wastegate valve control solenoid valve control signal | 55 | Heated oxygen sensor signal (No. 4 - 6 cylinders) |
| 26 | Mass air flow sensor ground (R) (No. 4 - 6 cylinders) | 56 | Throttle opening signal (to E-TS/ABS control unit) |
| 27 | Mass air flow sensor signal (R) (No. 4 - 6 cylinders) | 57 | — |
| 28 | Engine coolant temperature sensor signal | 58 | Battery power supply |
| 29 | Heated oxygen sensor signal (R) (No. 1 - 3 cylinders) | 59 | Control unit power supply |
| 30 | Sensor ground | 60 (-) | Control unit ground |
| 101 | Injector No. 1 cylinder drive signal | 109 | Back electromotive current feedback circuit |
| 102 | — | 110 | Injector No. 5 cylinder drive signal |
| 103 | Injector No. 3 cylinder drive signal | 111 | — |
| 104 | Fuel pump terminal voltage control output signal (FPCM) 1 | 112 | Injector No. 6 cylinder drive signal |
| 105 | Injector No. 2 cylinder drive signal | 113 | — |
| 106 | Fuel pump terminal voltage control output signal (FPCM) 2 | 114 | Injector No. 4 cylinder drive signal |
| 107 | — | 115 | Heated oxygen sensor heater control signal |
| 108 | Injector ground | 116 | Injector ground |

Symbols in ( ) next to terminal numbers indicate the data link connector terminals.

## Fail-Safe and Backup Functions

- The fail-safe function estimates the opening conditions with other input signals and selects safer conditions for the engine (vehicle) control, based on the data previously stored in the control unit, when any of the critical sensors in the ECM fails.
- The backup function allows the vehicle to be driven, using control signals previously stored in the control unit, even if the critical part of the system fails.

| Function | Related sensor | Malfunction | Fail-safe/backup | MIL indication |
|---|---|---|---|---|
| Backup | ECM | The microcomputer in the control unit (CPU) is malfunctioning. | Fixes the ignition timing, fuel injection pulse width, and IACV-AAC valve opening to the preset values so that the vehicle can be driven. | MIL lights up. |
| Fail-safe function | Mass air flow sensor | Output voltage dropped below 0.28V while the engine is running. | Selects the fuel injection pulse width according to the engine speed and the throttle opening so that the vehicle can be driven. Fuel injection will be inhibited when the engine speed exceeded approx. 2,400 rpm. During fail-safe control, idle speed is controlled to 1,200 rpm. | — |
| | Engine coolant temperature sensor | Same as malfunction indication conditions. (Refer to EC-11.) | Uses the estimated engine coolant temperature (varies with elapsed time after start) to perform controls so that the vehicle can be driven normally. Under these conditions, the auxiliary electric cooling fan will operate in tandem with the air conditioner switch. | MIL lights up. |
| | Intake air temperature sensor | | Engine control in response to the estimated intake air temperature. | — |
| | Knock sensor | | Judges the vehicle as of regular specification. Retards the ignition timing within the knocking range so that the vehicle can be driven normally. | — |
| | Throttle position sensor | | Determines idle position according to the base fuel schedule and the engine speed.<br>Fixes the output to the preset value so that the vehicle can be driven normally. | — |




## Self-diagnosis

### MALFUNCTION INDICATOR LAMP (MIL) INDICATION

### Diagnostic test mode I — BULB CHECK

The malfunction indicator lamp should come ON when the ignition switch is turned ON (engine not started), and go OFF when the engine is started.

### Diagnostic test mode I — MALFUNCTION WARNING

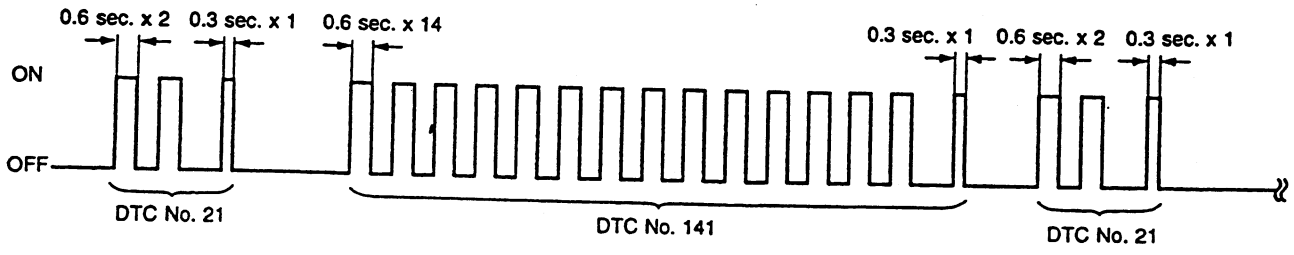
The system goes into the malfunction warning mode when any of the following conditions is satisfied, and warns the driver by lighting up the malfunction indicator lamp in the combination meter.

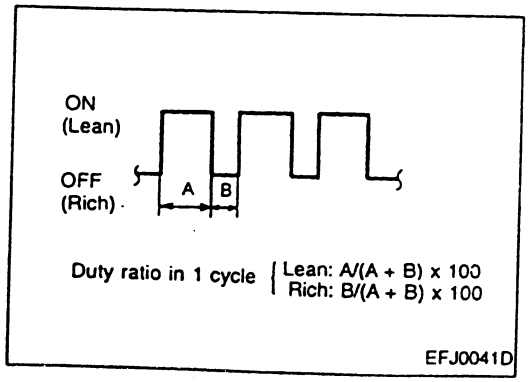
- Microcomputer (CPU) in the ECM is malfunctioning.
- Malfunction is detected during engine coolant temperature sensor circuit self-diagnosis.
- Malfunction is detected during overheat self-diagnosis.

### Diagnostic test mode II — SELF-DIAGNOSTIC RESULTS

Nissan Anti-Theft System code number consists of a 3-digit numeral. For example, when it is "141", a long flash on-off cycle (14 times) and a short flash on-off cycle (1 time) appear on display.

Example: Blinking pattern for DTC No. 21 and 141



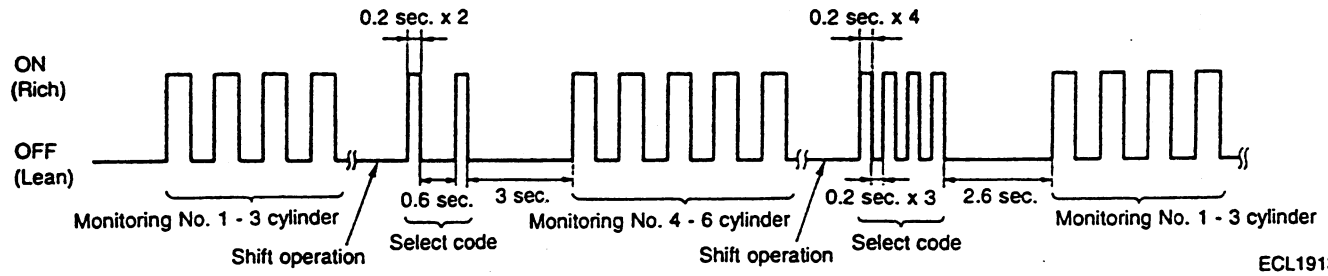

### Diagnostic test mode II — HEATED OXYGEN SENSOR MONITOR

- This mode indicates status of the air/fuel ratio by blinks of the malfunction indicator lamp.
- Warm up the engine and increase and maintain the engine speed at 2,000 rpm. Check that the malfunction indicator lamp blinks at least five times in 10 seconds. (Air-fuel mixture ratio feedback control is clamped during idling.)

## Self-diagnosis (Cont'd)

- During air/fuel ratio feedback control,
  when heated oxygen sensor output is high (rich): MIL goes OFF.
  when heated oxygen sensor output is low (lean): MIL comes ON.
- When air/fuel ratio feedback control is clamped: Status just before clamp is maintained.
- When air/fuel ratio feedback control is stopped: MIL goes OFF.
- Heated oxygen sensor monitor is initially set in No. 1 through No. 3 cylinder monitoring mode. If monitoring No. 4 through No. 6 cylinder is needed, short diagnosis connector CHK terminal and IGN terminal using a wire lead for at least 2 seconds, then remove wire lead from both terminals. A select code then flashes on and off, setting heated oxygen sensor monitor in No. 4 through No. 6 monitoring mode. Repeat above operations to shift heated oxygen sensor monitor from one mode to the other.

Heated oxygen sensor monitor



## Self-diagnosis (Cont'd)

### SELF-DIAGNOSTIC INDICATION ITEMS

| DTC No. | Self-diagnostic test items | Malfunction (DTC No.) indication conditions (Malfunction is detected when ...) | MIL indication |
|---|---|---|---|
| 11 | Camshaft position sensor signal circuit | • 1° (POS) signal or 120° (REF) signal is not input for predetermined time while the engine is running.<br>• Signal sometimes misses. (Abnormal correlation is detected between 1° (POS) signal and 120° (REF) signal.) | — |
| 12 | Mass air flow sensor signal circuit | • Mass air flow sensor output voltage is 2.0V or greater for predetermined time when ignition switch is turned from OFF to ON, or after the engine is stalled.<br>• Mass air flow sensor output voltage is less than 0.28V for predetermined time while the engine is running. | MIL lights up. |
| 13 | Engine coolant temperature sensor signal circuit | • Engine coolant temperature sensor output voltage is approx. 4.8V or greater (open circuit) or less than 0.04V (short circuit) for predetermined time. | MIL lights up. |
| 21 | Ignition signal circuit | • No consecutive ignition signal while the engine is running. | — |
| 28 | Overheat | • Engine coolant temperature sensor output voltage is approx. 0.35V or less (sensor normal) for predetermined time. | MIL lights up. |
| 34 | Knock sensor signal circuit | • At least one knock sensor indicates the output voltage of approx. 4V or greater (open circuit) or less than approx. 1V (short circuit). | — |
| 41 | Intake air temperature sensor signal circuit | • Intake air temperature sensor continuously emits an output voltage of more than approx. 4.8V (open circuit) or less than 0.04V (short-circuit) for a certain period of time. | — |
| 43 | Throttle position sensor signal circuit | • Throttle position sensor output voltage is approx. 4.7V or greater (open circuit) or less than 0.04V (short circuit) for predetermined time. | MIL lights up. |
| 55 | No malfunction | • No malfunction is detected in all the above circuits. | — |
| 141 | Nissan Anti-Theft System | • Lock mode in progress | — |
| 142 | | • Start permission code | |
| 143 | | • Communication between ECM and IMMU is faulty. | |
| 144 | | • Communication between ECM and IMMU is faulty. | |
| 145 | | • Communication between IMMU and key is faulty or key itself is faulty. | |
| 146 | | • New or different key is used. | |
| 147 | | • EEP ROM built into ECM is faulty. | |
| 148 | | • EEP ROM built into IMMU is faulty. | |

**If any one of the codes 141 through 148 appear on display, the display shows only "NATS MALFUNCTION" as a self-diagnostic result.**

### CONDITIONS TO TURN OFF MALFUNCTION INDICATOR LAMP

After cause of the problem has been eliminated from ignition signal system, turn ignition switch OFF.
Overheat: Check for causes of overheat, then erase self-diagnostic results.
Other items: Malfunction indicator lamp turns OFF when the vehicle returned to normal condition.

### HOW TO ERASE SELF-DIAGNOSTIC RESULTS

In Diagnostic Test Mode II, with the engine stopped (ignition switch ON), connect terminals "CHK" and "IGN" on the data link connector for 2 or more seconds with a suitable harness, then disconnect them.

# CONSULT

## SELF-DIAGNOSTIC RESULTS MODE

When any of the control unit input/output signal circuits fails and the self-diagnostic malfunction detection conditions are satisfied, the malfunctioning circuit is stored in the memory and displayed later.

| Self-diagnostic test items | Malfunction is detected when ... | Malfunction display item |
|---|---|---|
| Camshaft position sensor signal circuit | • 1° (POS) signal or 120° (REF) signal is not input for predetermined time while the engine is running.<br>• Abnormal correlation is detected between 1° (POS) signal and 120° (REF) signal. | CAMSHAFT POSI SEN |
| Mass air flow sensor signal circuit | • Mass air flow sensor output voltage is 2.0V or greater for predetermined time when ignition switch is turned from OFF to ON, or after the engine is stalled.<br>• Mass air flow sensor output voltage is less than 0.28V for predetermined time while the engine is running. | MASS AIR FLOW SEN |
| Engine coolant temperature sensor signal circuit | • Engine coolant temperature sensor output voltage is approx. 4.8V or greater (open circuit) or less than 0.04V (short circuit) for predetermined time. | COOLANT TEMP SEN |
| Ignition signal circuit | • No consecutive ignition signal while the engine is running. | IGN SIGNAL-PRIMARY |
| Overheat | • Engine coolant temperature sensor output voltage is approx. 0.35V or less (sensor normal) for predetermined time. | OVER HEAT |
| Knock sensor signal circuit | • At least one knock sensor indicates the output voltage of approx. 4V or greater (open circuit) or less than approx. 1V (short circuit). | KNOCK SENSOR |
| Intake air temperature sensor signal circuit | • Intake air temperature sensor continuously emits an output voltage of more than approx. 4.8V (open circuit) or less than 0.04V (short-circuit) for a certain period of time. | INT AIR TEMP SEN |
| Throttle position sensor signal circuit | • Throttle position sensor output voltage is approx. 4.8V or greater (open circuit) or 0.04V or less (short circuit) for predetermined time. | THROTTLE POSI SEN |
| No malfunction | • No malfunction is detected in all the above circuits. | NO SELF DIAGNOSTIC FAILURE INDICATED. FURTHER TESTING MAY BE REQUIRED. |
| Nissan Anti-Theft System | • Lock mode in progress | NATS MALFUNCTION |
| | • Start permission code | |
| | • Communication between ECM and IMMU is faulty. | |
| | • Communication between ECM and IMMU is faulty. | |
| | • Communication between IMMU and key is faulty or key itself is faulty. | |
| | • New or different key is used. | |
| | • EEP ROM built into ECM is faulty. | |
| | • EEP ROM built into IMMU is faulty. | |

**When malfunctions related to the Nissan Anti-theft System are detected, the CONSULT display shows only "NATS MALFUNCTION" as a self-diagnostic result. When doing trouble diagnoses, use a CONSULT program card for NATS. (Refer to EL section.)**

## DATA MONITOR MODE

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|---|---|---|---|---|
| CMPS·RPM (POS) [rpm] | ○ | ○ | • Indicates the engine speed computed from the POS signal (1° signal) of the camshaft position sensor. | |
| MAS AIR/FL SE [V] | ○ | ○ | • The signal voltage of the mass air flow sensor is displayed. | • When the engine is stopped, a certain value is indicated. |
| MAS A/FL SE-R [V] | ○ | | | |
| COOLAN TEMP/S [°C] or [°F] | ○ | ○ | • The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. | • When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed. |
| O2 SEN [V] | ○ | ○ | • The signal voltage of the oxygen sensor is displayed. | |
| O2 SEN-R [V] | ○ | | | |
| M/R F/C MNT [RICH/LEAN] | ○ | ○ | • Display of oxygen sensor signal during air-fuel ratio feedback control:<br>RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture.<br>LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture. | • After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins.<br>• When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously. |
| M/R F/C MNT-R [RICH/LEAN] | ○ | ○ | | |
| VHCL SPEED SE [km/h] or [mph] | ○ | ○ | • The vehicle speed computed from the vehicle speed sensor signal is displayed. | |
| BATTERY VOLT [V] | ○ | ○ | • The power supply voltage of ECM is displayed. | |
| THRTL POS SEN [V] | ○ | ○ | • The throttle position sensor signal voltage is displayed. | |
| INT/A TEMP SE [°C] or [°F] | ○ | | • The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated. | |
| START SIGNAL [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the starter signal. | • After starting the engine, [OFF] is displayed regardless of the starter signal. |
| CLSD THL/POSI [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the throttle position sensor signal. | |
| AIR COND SIG [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| P/N POSI SW [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the park/neutral position switch signal. | |
| PW/ST SIGNAL [ON/OFF] | ○ | ○ | • [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated. | |

NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

## CONSULT (Cont'd)

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|---|---|---|---|---|
| INJ PULSE [msec] | | ○ | • Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | • When the engine is stopped, a certain computed value is indicated. |
| INJ PULSE-R [msec] | | | | |
| IGN TIMING [BTDC] | | ○ | • Indicates the ignition timing computed by ECM according to the input signals. | • When the engine is stopped, a certain value is indicated. |
| IACV-AAC/V [%] | | ○ | • Indicates IACV-AAC/V control value computed by ECM according to the input signals. | |
| W/G CONT S/V [%] | | ○ | • Indicates the wastegate valve control solenoid valve computed by ECM according to the input signals. | |
| PURG VOL C/V [ON/OFF duty] | | ○ | • Indicates the EVAP canister purge volume control valve computed by the ECM according to the input signals.<br>• The opening becomes larger as the value increases. | |
| A/F ALPHA [%] | | ○ | • The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | • When the engine is stopped, a certain value is indicated.<br>• This data also includes the data for the air-fuel ratio learning control. |
| A/F ALPHA-R [%] | | | | |
| AIR COND RELY [ON/OFF] | | ○ | • The air conditioner relay control condition (determined by ECM according to the input signal) is indicated. | |
| FUEL PUMP RELY [ON/OFF] | | ○ | • Indicates the fuel pump relay control condition determined by ECM according to the input signals. | |
| COOLING FAN [ON/OFF] | | ○ | • The control condition of the cooling fan (determined by ECM according to the input signal) is indicated.<br>ON ... Operating<br>OFF ... Stop | |
| W/G CONT S/V [ON/OFF] | | | • Indicates [ON/OFF] condition of the wastegate valve control solenoid valve determined by ECM according to the input signals.<br>ON ... High turbocharger pressure<br>OFF ... Low turbocharger pressure | |
| VOLTAGE [V] | | | • Voltage measured by the voltage probe. | |
| PULSE [msec] or [Hz] or [%] | | | • Pulse width, frequency or duty cycle measured by the pulse probe. | • Only "#" is displayed if item is unable to be measured.<br>• Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured. |

## CONSULT (Cont'd)

### ACTIVE TEST MODE

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---|---|---|---|
| FUEL INJECTION | • Engine: Return to the original trouble condition<br>• Change the amount of fuel injection using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | • Harness and connector<br>• Fuel injectors<br>• Oxygen sensor |
| IACV-AAC/V OPENING | • Engine: After warming up, idle the engine.<br>• Change the IACV-AAC valve opening percent using CONSULT. | Engine speed changes according to the opening percent. | • Harness and connector<br>• IACV-AAC valve |
| ENG COOLANT TEMP | • Engine: Return to the original trouble condition<br>• Change the engine coolant temperature using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | • Harness and connector<br>• Engine coolant temperature sensor<br>• Fuel injectors |
| IGNITION TIMING | • Engine: Return to the original trouble condition<br>• Timing light: Set<br>• Retard the ignition timing using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | • Adjust ignition timing (by moving camshaft position sensor) |
| POWER BALANCE | • Engine: After warming up, idle the engine.<br>• A/C switch "OFF"<br>• Shift lever "N"<br>• Cut off each injector signal one at a time using CONSULT. | Engine runs rough or dies. | • Harness and connector<br>• Compression<br>• Injectors<br>• Ignition coil with power transistor<br>• Spark plugs |
| COOLING FAN | • Ignition switch: ON<br>• Turn the cooling fan "ON" and "OFF" using CONSULT. | Cooling fan moves and stops. | • Harness and connector<br>• Cooling fan motor<br>• Cooling fan relay |
| FUEL PUMP RELAY | • Ignition switch: ON (Engine stopped)<br>• Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound. | Fuel pump relay makes the operating sound. | • Harness and connector<br>• Fuel pump relay |
| SELF-LEARNING CONT | • In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen. | | |
| TURBOCHARGE PRES | • Engine: Return to the original trouble condition<br>• Change the wastegate valve control solenoid valve opening percent using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | • Harness and connector<br>• Wastegate valve control solenoid valve<br>• Vacuum hose |

## CONSULT (Cont'd)

### FUNCTION TEST MODE

| FUNCTION TEST ITEM | CONDITION | JUDGEMENT | | CHECK ITEM (REMEDY) |
|---|---|---|---|---|
| SELF-DIAG RESULTS | • Ignition switch: ON (Engine stopped)<br>• Displays the results of on board diagnostic system. | — | | Objective system |
| CLOSED THROTTLE POSI | • Ignition switch: ON (Engine stopped)<br>• Throttle position sensor circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle position sensor.) | Throttle valve: opened | OFF | • Harness and connector<br>• Throttle position sensor (Closed throttle position)<br>• Throttle position sensor (Closed throttle position) adjustment<br>• Throttle linkage<br>• Verify operation in DATA MONITOR mode. |
| | | Throttle valve: closed | ON | |
| THROTTLE POSI SEN CKT | • Ignition switch: ON (Engine stopped)<br>• Throttle position sensor circuit is tested when throttle is opened and closed fully. | Range (Throttle valve fully opened — Throttle valve fully closed) | More than 3.0V | • Harness and connector<br>• Throttle position sensor<br>• Throttle position sensor adjustment<br>• Throttle linkage<br>• Verify operation in DATA MONITOR mode. |
| PARK/NEUT POSI SW CKT | • Ignition switch: ON (Engine stopped)<br>• Neutral position switch circuit is tested when shift lever is manipulated. | Out of N/P positions | OFF | • Harness and connector<br>• Neutral position switch<br>• Linkage adjustment |
| | | In N/P positions | ON | |
| FUEL PUMP CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched. | There is pressure pulsation on the fuel feed hose. | | • Harness and connector<br>• Fuel pump<br>• Fuel pump relay<br>• Fuel filter clogging<br>• Fuel level |
| COOLING FAN CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• Cooling fan circuit is tested when cooling fan is rotated. | The cooling fan rotates and stops every 3 seconds. | | • Harness and connector<br>• Cooling fan motor<br>• Cooling fan relay |
| START SIGNAL CIRCUIT | • Ignition switch: ON → START<br>• Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed. | Start signal: OFF → ON | | • Harness and connector<br>• Ignition switch |

## CONSULT (Cont'd)

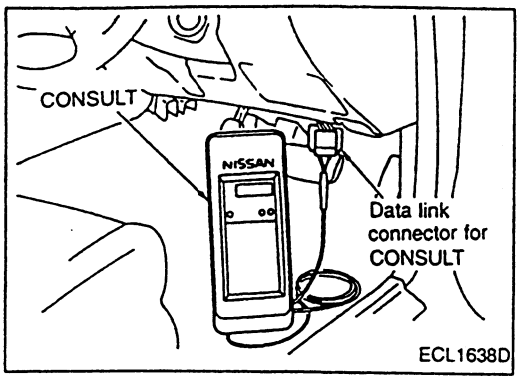
| FUNCTION TEST ITEM | CONDITION | JUDGEMENT | | CHECK ITEM (REMEDY) |
|---|---|---|---|---|
| PW/ST SIGNAL CIRCUIT | • Ignition switch: ON (Engine running)<br>• Power steering oil pressure switch circuit is tested when steering wheel is rotated fully and then set to a straight line running position. | Locked position | ON | • Harness and connector<br>• Power steering oil pressure switch<br>• Power steering oil pump |
| | | Neutral position | OFF | |
| VEHICLE SPEED SEN CKT | • Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 MPH) or higher. | Vehicle speed sensor input signal is greater than 4 km/h (2 MPH). | | • Harness and connector<br>• Vehicle speed sensor<br>• Speedometer |
| IGN TIMING ADJ | • After warming up, idle the engine.<br>• Ignition timing is checked by reading ignition timing with a timing light and checking whether it agrees with specifications. | The timing light indicates the same value on the screen. | | • Adjust ignition timing (by moving camshaft position sensor or distributor)<br>• Camshaft position sensor drive mechanism |
| MIXTURE RATIO TEST | • Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the oxygen sensor output at 2,000 rpm under non-loaded state. | Oxygen sensor COUNT: More than 5 times during 10 seconds | | • INJECTION SYS (Injector, fuel pressure regulator, harness or connector)<br>• IGNITION SYS (Spark plug, ignition coil, power transistor harness or connector)<br>• VACUUM SYS (Intake air leaks)<br>• Oxygen sensor circuit<br>• Oxygen sensor operation<br>• Fuel pressure high or low<br>• Mass air flow sensor |
| POWER BALANCE | • After warming up, idle the engine.<br>• Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.) | Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder. | | • Injector circuit (Injector, harness or connector)<br>• Ignition circuit (Spark plug, ignition coil, power transistor harness or connector)<br>• Compression<br>• Valve timing |
| IACV-AAC/V SYSTEM | • After warming up, idle the engine.<br>• IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%. | Difference in engine speed is greater than 150 rpm between when valve opening is at 80% and at 20%. | | • Harness and connector<br>• IACV-AAC valve<br>• Air passage restriction between air inlet and IACV-AAC valve<br>• IAS (Idle adjusting screw) adjustment |

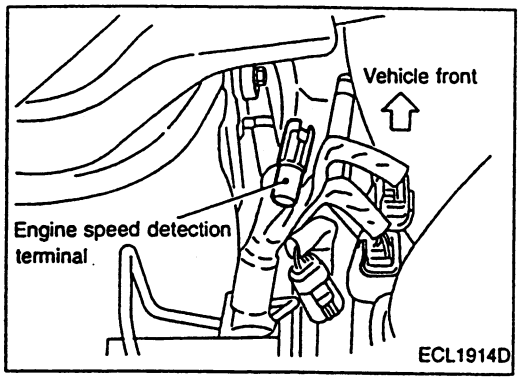
# Symptom Matrix Chart

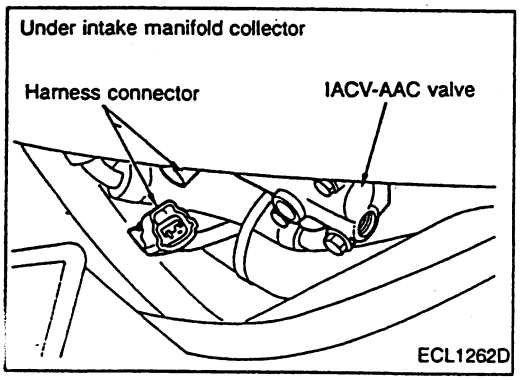
## RELATION BETWEEN CONTROL ITEMS AND SENSORS/ACTUATORS

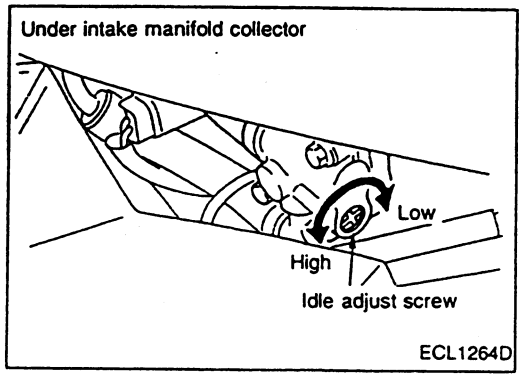
◎: High possibility to control damage
○: Low possibility to control damage

| | Sensors and actuators \ Control items | | Fuel injection control | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Fuel injection control | Air/fuel ratio feedback control | Fuel cut control | Ignition timing control | Idle speed control | Fuel pump drive control | Air conditioner cut control | Auxiliary electric fan control | Heated oxygen sensor heater control | Turbo pressure control | Self-diagnosis | Fail-safe |
| Sensors | Camshaft position sensor | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | ◎ | ○ | ○ | |
| | Mass air flow sensor | | ◎ | ◎ | ○ | ◎ | | | | | | ○ | ○ | ○ |
| | Engine coolant temperature sensor | | ○ | ◎ | ○ | ○ | ○ | ○ | ◎ | ◎ | | ○ | ○ | ○ |
| | Intake air temperature sensor | | ○ | | ○ | | | | | | | | ○ | |
| | Heated oxygen sensor | | | ◎ | | | | | | | ◎ | | | |
| | Knock sensor | | | | | ○ | | | | | | ○ | ○ | ○ |
| | Vehicle speed sensor | | | ○ | ○ | | ○ | | ○ | | | | | |
| | Throttle position sensor | | ○ | ○ | ◎ | ○ | ○ | | ◎ | | | ○ | ○ | ○ |
| | Ignition switch | START | ◎ | ○ | | ○ | | | ○ | ○ | | ○ | | |
| | | IGN | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | ○ | ○ | ○ | | |
| | Air conditioner switch | | | | ○ | | ○ | | ○ | ○ | | | | |
| | Park/neutral position switch | | ○ | ○ | ○ | ○ | ○ | | | | | | | |
| | Power steering oil pressure switch | | | | | | ○ | | ○ | | | | | |
| | Battery voltage | | ○ | | | ○ | ○ | | | | ○ | | | |
| Actuators | Injector | | ◎ | ◎ | ◎ | | | | | | | | | |
| | Dropping resistor | | ○ | | | | | | | | | | | |
| | Ignition coil (built-in power transistor) | | | | | ◎ | | | | | | | ○ | |
| | IACV-AAC valve | | | | | | ◎ | | | | | | | |
| | Air regulator | | | | | | ○ | | | | | | | |
| | Fuel pump relay | | | | | | | ◎ | | | | | | |
| | Fuel pump | | | | | | | ◎ | | | | | | |
| | ECM & IGN coil relay | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | |
| | Auxiliary electric fan relay | | | | | | ○ | | | ◎ | | | | |
| | Air conditioner relay | | | | | | ○ | | ◎ | ○ | | | | |
| | Wastegate valve control solenoid valve | | | | | | | | | | | ◎ | | |
| Others | FPCM | | | | | | | ◎ | | | | | | |
| | Canister | | | ○ | | | | | | | | ○ | | |




## Idle Speed Inspection and Adjustment

### Idle speed specification (After warm-up)

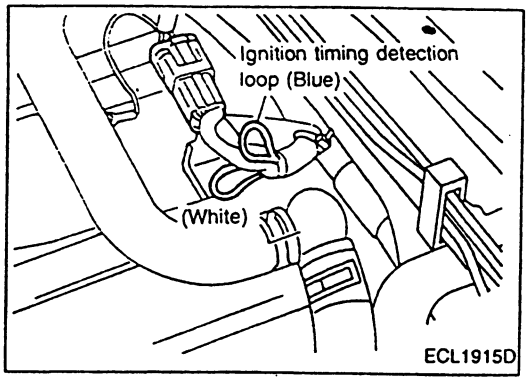
| | | |
|---|---|---|
| Engine type | | RB26DETT |
| Idle speed | | 950±50 |
| Base idle speed (Feedback control cancelled) | (rpm) | 900 |
| Ignition timing (Feedback control cancelled) | (BTDC°/rpm) | 20±1/900 |
| CO density | (%) | 0.1, max. |
| HC density | (ppm) | 50, max. |

- Warm up engine to normal operating temperature.
- Connect "CONSULT" to the data link connector for CONSULT (under the instrument lower driver panel) and turn ignition switch ON.
- Connect a tachometer to the engine speed detection terminal.
- Check that the air conditioner load, power steering pump load, and various electrical loads are not applied to the engine. Also check that lever is set to Neutral.

- Perform "IACV-AAC VALVE ADJ" in "WORK SUPPORT" mode with CONSULT.
- Disconnect IACV-AAC valve harness connector.

(Above step cancels the idle speed feedback control.)

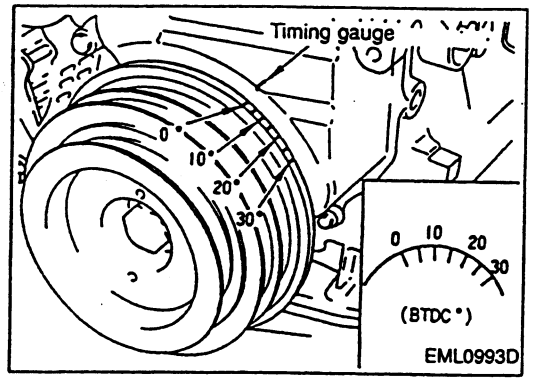
- Turn idle adjust screw (IAS) on the IAA unit to adjust base idle speed to 900 rpm.
- Turning IAS clockwise makes base idle speed lower. Turning IAS counterclockwise makes base idle speed higher.
- Cancel "IACV-AAC VALVE ADJ" in "WORK SUPPORT" mode with CONSULT.
- Connect IACV-AAC valve harness connector.
- Check that the actual idle speed is 950±50 rpm.



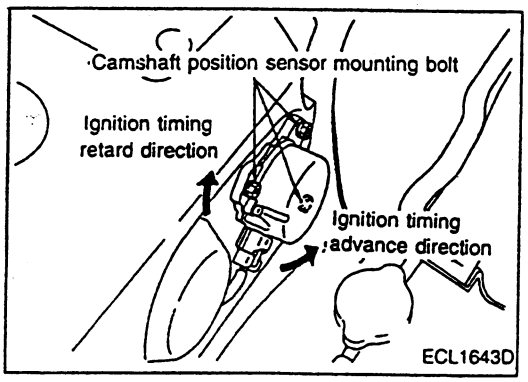

## Ignition Timing Inspection and Adjustment

- Install a timing light to the ignition timing detection loop (blue).
- Perform "IACV-AAC VALVE ADJ" in "WORK SUPPORT" mode with CONSULT.
- Disconnect IACV-AAC valve harness connector.

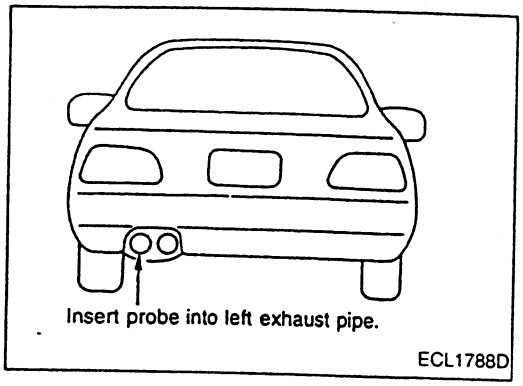
(Above step cancels the idle speed and ignition timing feedback controls.)

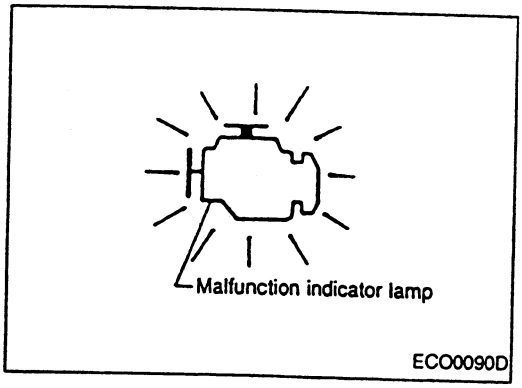



- With the engine idling, check that the ignition timing and base idle speed is BTDC 20°±1/900 rpm.
- If not within the specifications, loosen the camshaft position sensor mounting bolt, turn the camshaft position sensor and adjust the ignition timing to BTDC 20°±1/900 rpm. Turning the camshaft position sensor counterclockwise advances the ignition timing.




- Cancel "IACV-AAC VALVE ADJ" in "WORK SUPPORT" mode with CONSULT.
- Connect IACV-AAC valve harness connector.
- Race engine and check that the ignition timing advances immediately.




## Air/Fuel Ratio Inspection

### CO/HC DENSITY INSPECTION

The vehicle uses air/fuel ratio feedback system with learning function. Because wide range of compensation is available, no CO/HC density adjustment is necessary.

- Warm up engine to normal operating temperature, and check that the idle speed and the ignition timing are within the specifications. Then, check CO/HC density with CO/HC meter.

**CAUTION:**

**For adopting exhaust pressure-sensitive control muffler, insert probe of the CO/HC meter into the left exhaust pipe. (Under no-load condition, exhaust gas is emitted from the left exhaust pipe only.)**

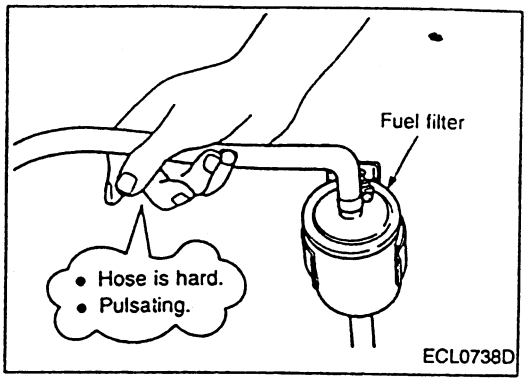
- If not within the specifications, check the air/fuel ratio feedback status as follows.

- Select "M/R F/C MNT" (cyl. No. 4 - 6) and "M/R F/C MNT (R)" (cyl. No. 1 - 3) in "DATA MONITOR" mode.
- Run engine at approx. 2,000 rpm or higher and check that "RICH" and "LEAN" are displayed alternately.
- Turn ignition switch ON and connect terminals CHK and IGN on the data link connector for CONSULT (under instrument lower driver panel) for 2 seconds or more with a suitable harness, then disconnect them.

- Warm up the engine to normal operating temperature, then run the engine at 2,000 rpm or higher. Check that the malfunction indicator lamp blinks at least five times in 10 seconds.

**CAUTION:**

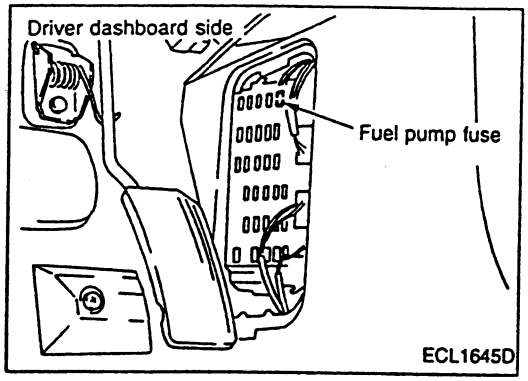
**When heated oxygen sensor monitor is initially set in operation, it monitors CO-HC density for No. 1 through No.3 cylinders. CO-HC density for No. 4 through No. 6 cylinders must also be monitored. For monitor selection procedures, refer to "MALFUNCTION INDICATOR LAMP (MIL) INDICATION", "Self-diagnosis", EC-9.**




## Fuel Pressure Inspection

### QUICK INSPECTION

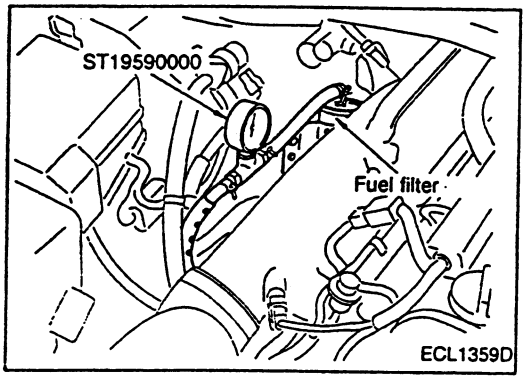
- Turn ignition switch ON (engine not running).
- Select "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode.
- Pinch fuel feed hose with fingers and check for pulsation.
- Pinch fuel hose between fuel filter and fuel gallery with fingers while fuel pump is operating. Hose should feel hard or pulsating.




### INSPECTION USING FUEL PRESSURE GAUGE

#### Releasing fuel pressure

- Start engine.
- Select "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode.
- Touch "START" and after engine stalls, crank it two or three times to release all fuel pressure.
- Start engine and disconnect fuel pump fuse.
- After engine stalls, crank it two or three times to release all fuel pressure.

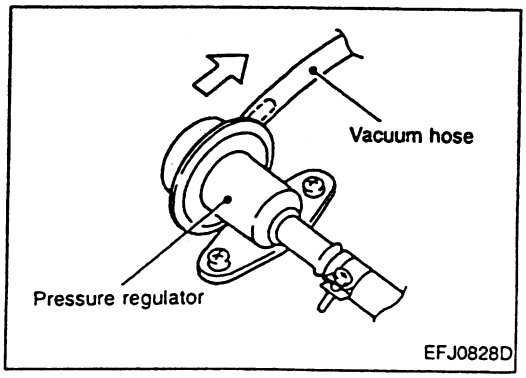



#### Installing fuel pressure gauge

- Connect a fuel pressure gauge (SST) between fuel filter and fuel gallery.

**CAUTION:**
**When disconnecting fuel hose, use shop cloth to remove any fuel leaks.**

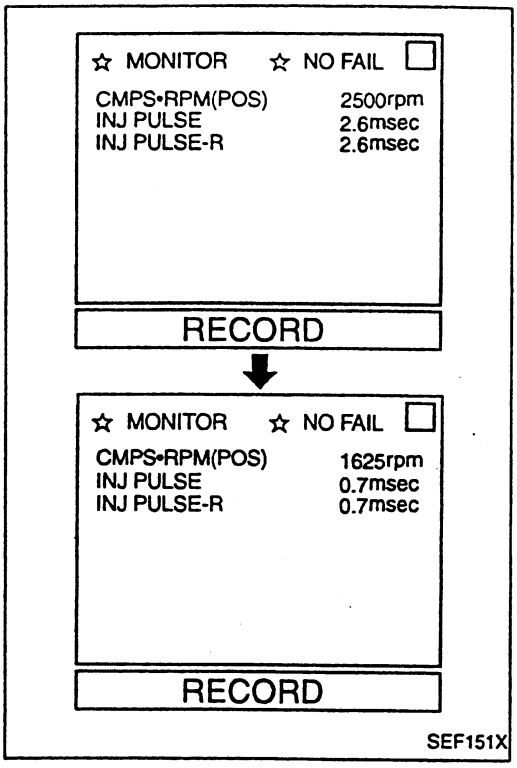
- Clear "FUEL PRESSURE RELEASE".
- Install fuel pump fuse.




#### Fuel pressure standard value confirmation

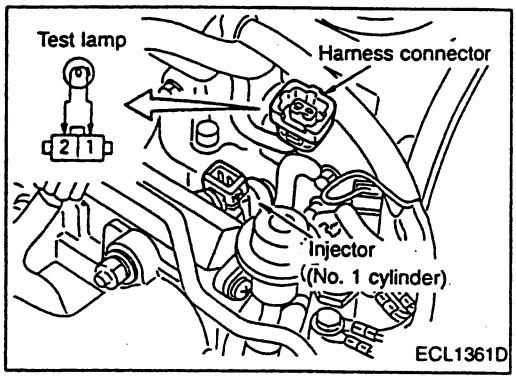
- Start engine and check that the fuel pressure is as specified.
  **Fuel pressure [MPa (kg/cm$^2$)]**
  **At idle: 0.25 (2.5)**
  **When vacuum hose is disconnected from pressure regulator: 0.29 (3.0)**
- If the vehicle shows poor starting, check fuel pressure for approx. 5 seconds after ignition switch is turned ON.
  **Fuel pressure [MPa (kg/cm$^2$)]**
  **During 5 sec. after ignition switch turned ON:**
  **0.29 (3.0)**
- When fuel pressure is NG
  Too high: Malfunctioning pressure regulator, malfunctioning fuel damper, clogged fuel return line, bent hose
  Too low: Malfunctioning pressure regulator, malfunctioning fuel damper, poor fuel pump discharging, clogged fuel supply line, clogged fuel filter

**CAUTION:**
**Also check fuel pressure at increased engine speed.**




## Fuel-cut Function Check

1. Select "INJ PULSE" and "INJ PULSE-R" in "DATA MONITOR" mode with CONSULT.
2. Start engine and rev it up to approx. 2,500 rpm.
3. Release accelerator pedal and make sure that "INJ PULSE" instantaneously drops to approx. 0.7 msec.



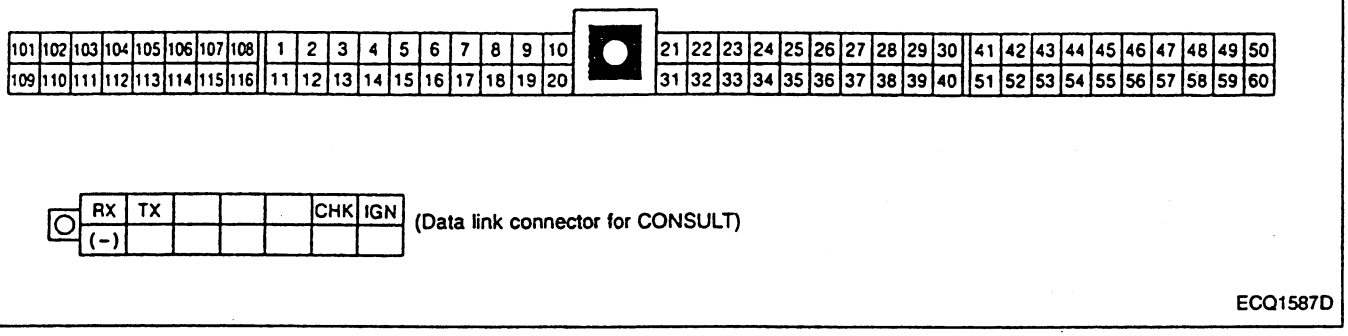

1. Warm up engine to normal operating temperature.
2. Remove injector harness connector and install test lamp instead.
3. When engine is operating at speeds more than approx. 2,500 rpm, release accelerator pedal and make sure that test lamp instantaneously goes out.

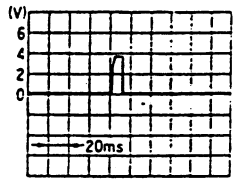
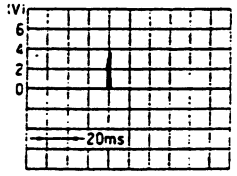
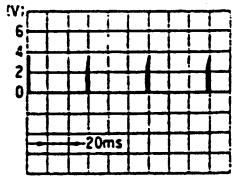
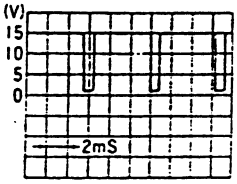
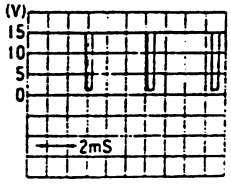
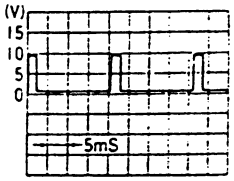
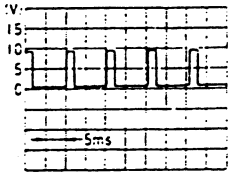
## ECM Input/Output Signal Reference Value

### SIGNAL VOLTAGES MEASURED WITH OSCILLOSCOPE AND CIRCUIT TESTER

Signal voltages measured at ECM terminals with a circuit tester and example of waveforms displayed on an oscilloscope are shown below.

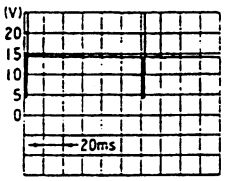
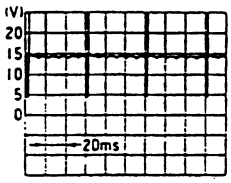
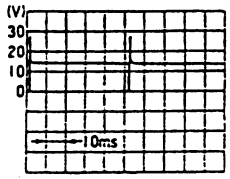
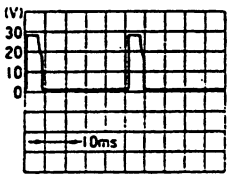
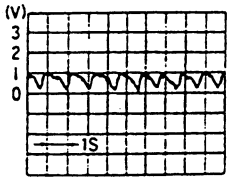
**Measured data are affected by many factors such as irregularity of parts, vehicle history, operating conditions, environment, service status, and measuring instruments and methods.**




| Terminal No. | Signal name | At idle | At approx. 2,000 rpm |
|---|---|---|---|
| 1<br>2<br>3<br>11<br>12<br>13 | Ignition signal (power transistor drive signal) | When cranking: Approx. 0.06 - 0.09V<br>  <br><br>ECL1925D<br>At idle: Approx. 0.06 - 0.09V<br>  <br><br>ECL1926D | Approx. 0.08V<br>  <br><br>ECL1927D |
| 4 | IACV-AAC valve control signal | Battery voltage<br>  <br> | Battery voltage<br>  <br> |
| 6 | Auxiliary electric cooling fan relay control signal | Fan stopped: Battery voltage<br>Fan operating: Approx. 0.2V | ← |
| 7 | Tachometer drive signal | Approx. 1V<br>  <br> | Approx. 2V<br>  <br><br>ECL1928D |
| 8 (IGN) | Ignition switch (IGN) signal | Ignition switch OFF: Approx. 0V<br>Ignition switch ON: Battery voltage | ← |
| 9 | Air conditioner relay control signal | Air conditioner OFF: Battery voltage<br>Air conditioner ON: Approx. 1V | ← |

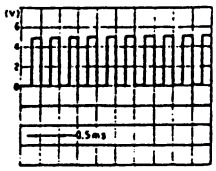
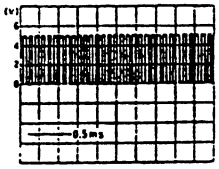
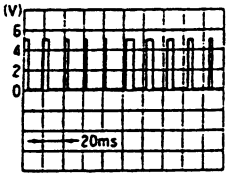
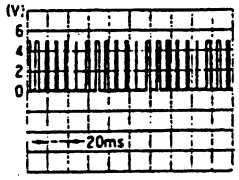
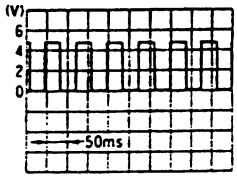
NOTE: Above voltages are measured values obtained by analog circuit tester.

## ECM Input/Output Signal Reference Value (Cont'd)

| Terminal No. | Signal name | At idle | At approx. 2,000 rpm |
|---|---|---|---|
| 16 | ECM & IGN coil relay control signal | Approx. 1V<br>(2 seconds after ignition switch is turned OFF: Battery voltage) | ← |
| 17 | Injection pulse monitor signal (Ti monitor) | Battery voltage<br>  <br><br>ECL1936D | Battery voltage<br>  <br><br>ECL1937D |
| 18 | Fuel pump relay control signal | Approx. 0.8V<br>(Within 5 seconds after ignition switch is turned ON: Approx. 0.8V<br>Thereafter: Battery voltage) | ← |
| 19 | Power steering oil pressure switch signal | Steering wheel not turned: Approx. 4.5V<br>Steering wheel turned: Approx. 0V | ← |
| 21 (RX) | Receive (Data input to control unit) | CONSULT connected: Approx. 0.2V<br>CONSULT disconnected: Battery voltage | ← |
| 22 (TX) | Transmit (Data output from control unit) | CONSULT connected: Approx. 9V, max.<br>CONSULT disconnected: Approx. 0V | ← |
| 23<br>24 | Knock sensor signal | Approx. 0.4 - 2V*<br>*: Voltages varies with measuring range (internal resistance) of a circuit tester. | ← |
| 25 | Wastegate valve control solenoid valve control signal | Battery voltage<br>  <br><br>ECL1938D | At more than approx. 2,200 rpm: Approx. 4V<br>  <br><br>ECL1939D<br>(Duty ratio: Approx. 85%) |
| 26, 34 | Mass air flow sensor ground | Approx. 0V | ← |
| 27 | Mass air flow sensor signal (R) (No. 4 - 6 cylinders) | Approx. 0.8V | Approx. 1.2V |
| 28 | Engine coolant temperature sensor signal | Engine coolant temperature at approx. 20°C: Approx. 3.5V<br>Engine coolant temperature at approx. 80°C: Approx. 1.2V | ← |
| 29 | Heated oxygen sensor signal (R)(No. 1 - 3 cylinders) | Clamped in 0.1 to 0.6V range (approx.) | Fluctuates between approx. 0.1 to 0.3V and approx. 0.6 to 1V<br>  <br> |
| 30, 50, 60, 108, 116 | Ground | Approx. 0V | ← |
| 32 | Malfunction indicator lamp | Lamp OFF: Battery voltage<br>Lamp ON: Approx. 0V | ← |

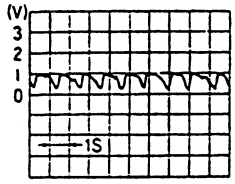
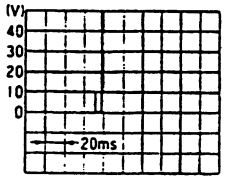
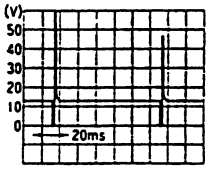
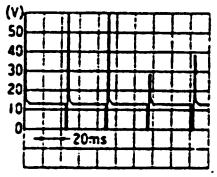
NOTE: Above voltages are measured values obtained by analog circuit tester.

## ECM Input/Output Signal Reference Value (Cont'd)

| Terminal No. | Signal name | At idle | At approx. 2,000 rpm |
|---|---|---|---|
| 35 | Mass air flow sensor signal (No. 1 - 3 cylinders) | Approx. 0.8V | Approx. 1.2V |
| 36 | Intake air temperature sensor signal | Intake air temperature at approx. 20°C: Approx. 3.5V<br>Intake air temperature at approx. 80°C: Approx. 1.2V | ← |
| 38 | Throttle position sensor signal | Approx. 0.5V<br>(Ignition switch ON, engine not running)<br>Throttle fully closed: Approx. 0.5V<br>Throttle fully open: Approx. 4.2V | Approx. 1V<br>(Voltage increases in response to accelerator pedal depression) |
| 41 | Camshaft position sensor 1° (POS) signal | Approx. 2.6V<br>  <br>ECL0116D | Approx. 2.6V<br>  <br>ECL0117D |
| 42<br>52 | Camshaft position sensor 120° (REF) signal | Approx. 1.3V<br>  <br>ECL1929D | Approx. 1.3V<br>  <br>ECL1930D |
| 43 | Ignition switch (START) signal | 0V<br>(Ignition switch START: Battery voltage) | ← |
| 44 | Park/Neutral position switch signal | Select lever in Neutral: Approx. 0V<br>Select lever in other than Neutral: Approx. 4.5V | ← |
| 46 | Air conditioner switch signal | Air conditioner OFF: Approx. 4.7V<br>Air conditioner ON: Approx. 0V | ← |
| 47<br>(CHK) | Check (Diagnosis start) | CONSULT connected: Approx. 0V<br>CONSULT disconnected: Approx. 0V | ← |
| 48 | Throttle position sensor power supply | Approx. 5V | ← |
| 49, 59 | Control unit power supply | Battery voltage | ← |
| 53 | Vehicle speed sensor signal | Approx. 4.8V or 0V | When driving at approx. 40 km/h: Approx. 2.2V<br>  <br>ECL1940D |

NOTE: Above voltages are measured values obtained by analog circuit tester.

## ECM Input/Output Signal Reference Value (Cont'd)

| Terminal No. | Signal name | At idle | At approx. 2,000 rpm |
|---|---|---|---|
| 54 | IMMU | Battery voltage | ← |
| 55 | Heated oxygen sensor signal (No. 4 - 6 cylinders) | Clamped in 0.1 to 0.6V range (approx.) | Fluctuates between approx. 0.1 to 0.3V and approx. 0.6 to 1.0V   |
| 56 | Throttle opening signal | Approx. 0.5V (Ignition switch ON, engine not running) Throttle fully closed: Approx. 0.5V Throttle fully open: Approx. 4.2V | Approx. 1V (Voltage increases in response to accelerator pedal depression.) |
| 58 | Battery power supply | Battery voltage (constant) | ← |
| 101 103 105 110 112 114 | Injector drive signal | When cranking: Battery voltage   ECL1931D At idle: Battery voltage   ECL0130D | Battery voltage   ECL0131D |
| 104 | Fuel pump terminal voltage control output signal (FPCM) 1 | Within approx. 1 second after engine starts: Approx. 4V Thereafter: Approx. 2V | Approx. 2V |
| 106 | Fuel pump terminal voltage control output signal (FPCM) 2 | Within approx. 1 second after engine starts: Approx. 4V Thereafter: Approx. 2V | Approx. 2V |
| 109 | Back electromotive current feedback circuit | Battery voltage (constant) | ← |
| 115 | Heated oxygen sensor heater control signal | Approx. 0.3V (Ignition switch ON: Battery voltage) | ← (Battery voltage at approx. 2,800 rpm, min.) |

NOTE: Above voltages are measured values obtained by analog circuit tester.

# TRANSFER

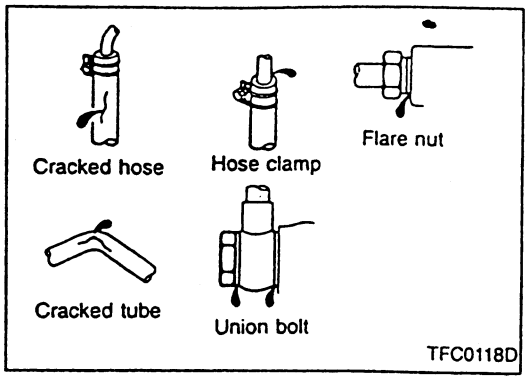
# SECTION TF



**MODIFICATION NOTICE:**

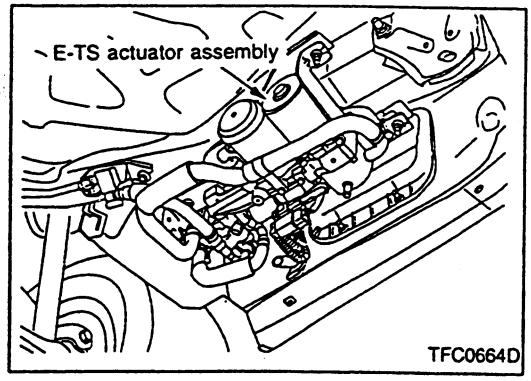
- GT-R model has been added.
- ATTESA E-TS system has been added.
- ATTESA E-TS PRO system has been added.
  (For hydraulic oil and component parts, refer to PD section. For trouble diagnostic procedures, refer to BR section.)

# CONTENTS

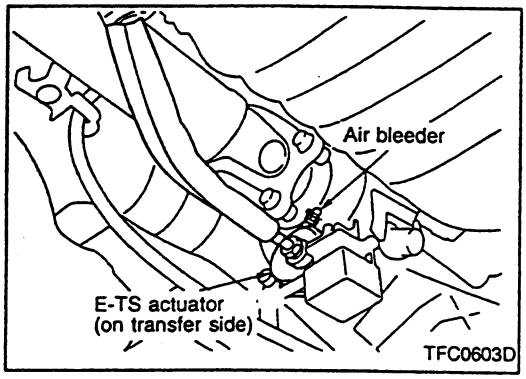



## Leakage Inspection

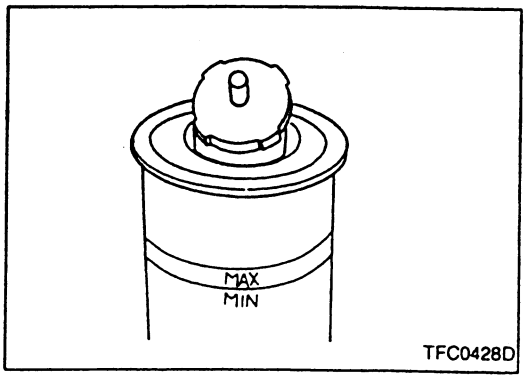
- Check hoses and tubes for leakage at connections. Also check for scratches, twisting, deformation, interference with adjacent parts and loose connections. Repair or replace faulty parts if necessary.
- Check reservoir tank and cap for damage, deformation and leakage. Replace faulty parts with new ones.




- Check E-TS actuator air bleeder and connections for leakage. Repair or replace faulty parts if necessary. If leakage at or around E-TS actuator is noted, replace it as a E-TS actuator assembly.




- Check air bleeder (on transfer actuator side) and connections for leakage. Repair or replace faulty parts if necessary. If leakage at or around transfer actuator is noted, replace it as a transfer actuator assembly.
- If hydraulic oil in reservoir tank is reduced although actuator, piping and tank are free from leakage, it may be leaking into transfer interior. If necessary, disassemble transfer to check and locate the cause of leakage.

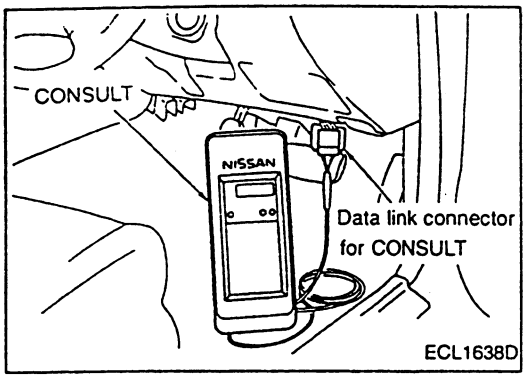



## Oil Level Inspection

1. Remove E-TS oil level access lid from right side of trunk room.
2. Turn ignition switch ON. Make sure that oil level is within the MAX-MIN lines on reservoir tank.

**CAUTION:**

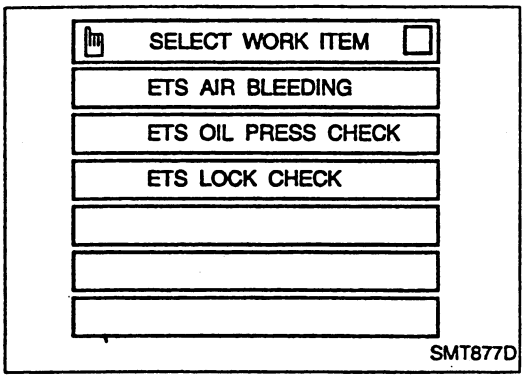
- **If ignition switch has been turned OFF for a long period of time, oil in E-TS actuator might return to reservoir tank, causing oil level to exceed MAX line. Be sure to turn ignition switch ON before checking oil level.**
- **When replenishing oil, be careful not to spill it into trunk room.**



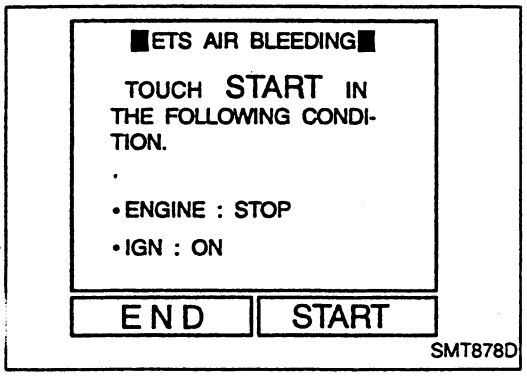

## Air Bleeding

### WITH CONSULT

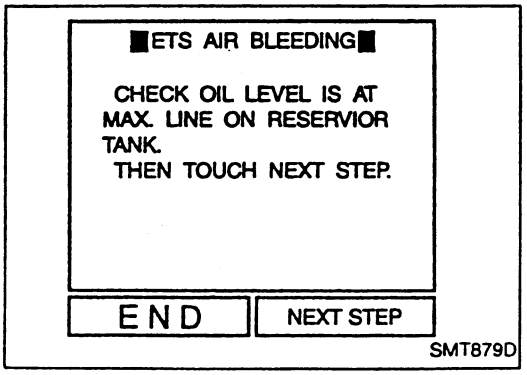
1. Turn ignition switch OFF.
2. Connect CONSULT to data link connector.
3. Turn ignition switch ON.
4. Touch "START", "ABS" and "WORK SUPPORT" on CONSULT.




5. Touch "ETS AIR BLEED".

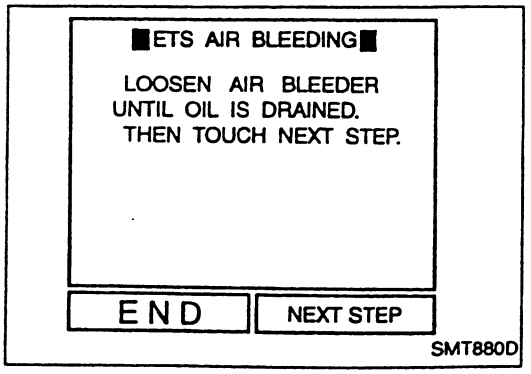



6. Touch "START".



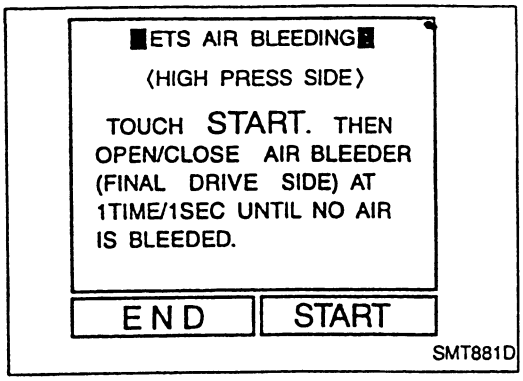

7. Pour oil into reservoir tank until oil level is approx. 30 mm above MAX line. Touch "NEXT".

**CAUTION:**
**When replenishing oil, be careful not to spill it into trunk room.**

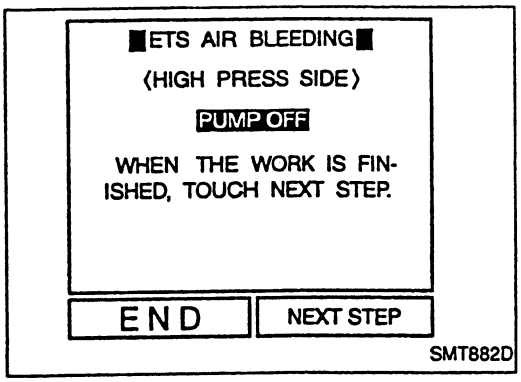



8. Open E-TS actuator air bleeder and bleed air from suction line (reservoir tank-to-E-TS actuator). Then tighten air bleeder to specified torque.
   **Air bleeder tightening torque:**
   **5.9 - 7.8 N·m (0.6 - 0.8 kg-m)**
9. Touch "NEXT STEP".

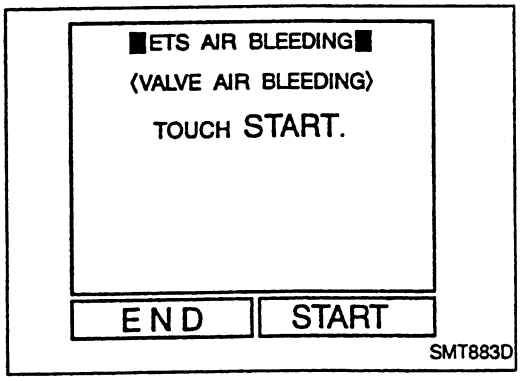
## Air Bleeding (Cont'd)



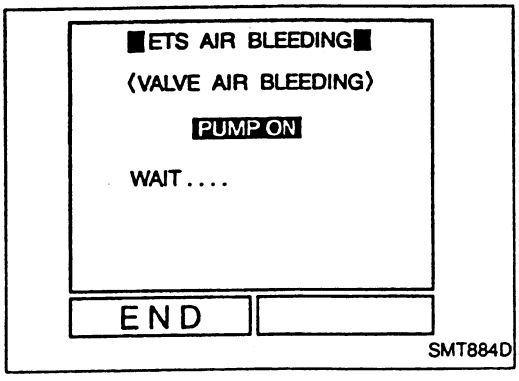

10. Touch "START". Bleed air from transfer actuator.



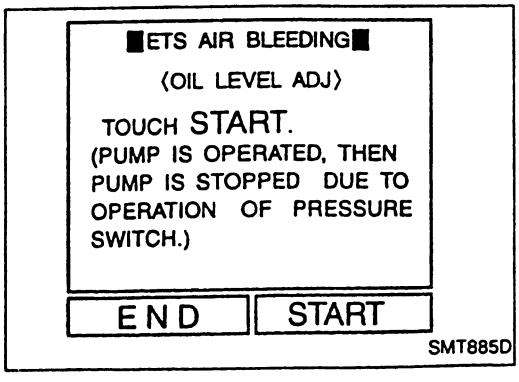

11. Tighten air bleeder to specified torque. Touch "NEXT STEP".
    **Air bleeder tightening torque:**
    **5.9 - 9.8 N·m (0.6 - 1.0 kg-m)**




12. Touch "START". Bleed air from reservoir tank return line.

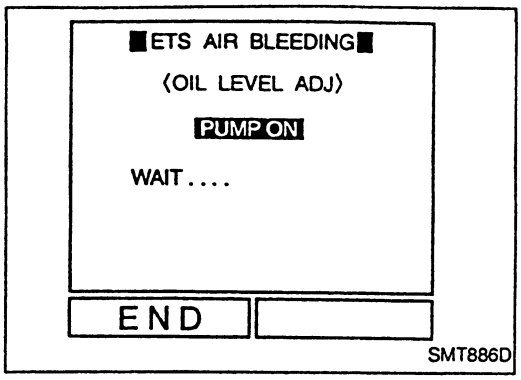



13. Touch "END".

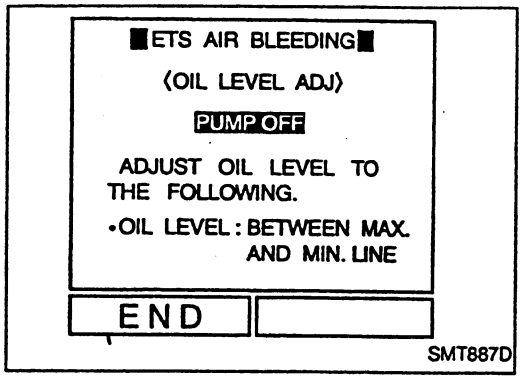



14. Touch "START".

## Air Bleeding (Cont'd)




15. When "PUMP OFF" appears on display in place of "PUMP ON", check and correct oil level in reservoir tank.




16. Touch "END".

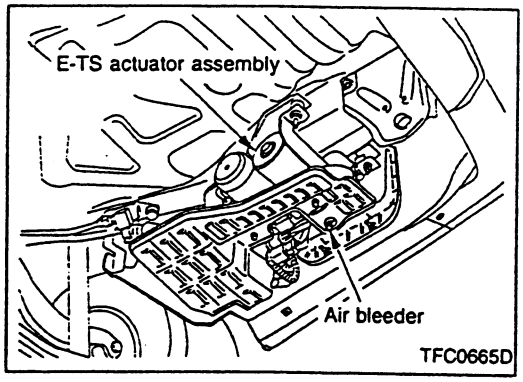
- **"STOP" may appear on display. This occurs when engine is started and vehicle is driven or when E-TS/ABS system malfunctions, during air bleeding procedures. When it appears, suspend air bleeding procedures and perform self-diagnostic procedures for E-TS system. Repair faulty areas.**
- **"EMERGENCY STOP" appears on display when E-TS/ABS system malfunctions and air bleeding operation is performed under a fail-safe condition. (When oil level is lower than specified level after new actuator assembly or pipes are installed, turning ignition switch ON may set E-TS/ABS system in a fail-safe condition.)**

## Air Bleeding (Cont'd)

### WITHOUT CONSULT

1. Pour oil into reservoir tank until oil level is approx. 30 mm above MAX line.

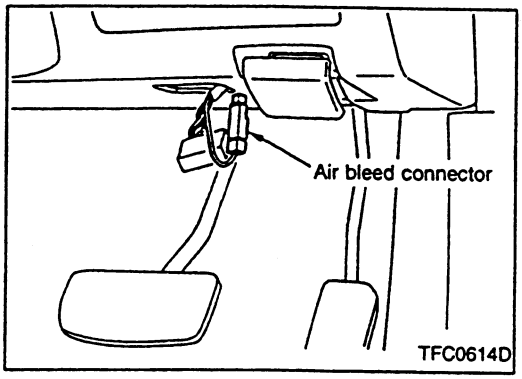
**CAUTION:**
**When replenishing oil, be careful not to spill it into trunk room.**




**Before air bleeding procedures are performed, make sure that ignition switch is OFF.**

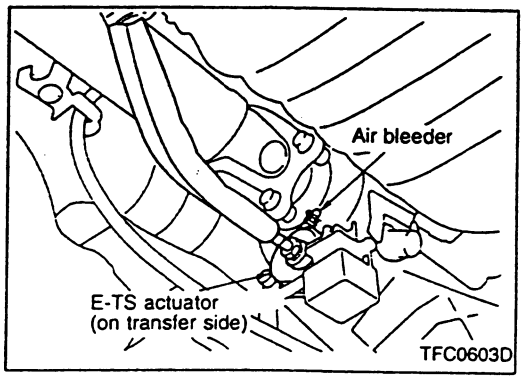
2. Open E-TS actuator air bleeder. Bleed air from suction line (reservoir tank-to-E-TS actuator) until air no longer is discharged from air bleeder opening. Close air bleeder and tighten it to specified torque.
   **Air bleeder tightening torque:**
   **5.9 - 7.8 N·m (0.6 - 0.8 kg-m)**

- When air bleeder is opened, oil inside suction line flows downward by gravity.




3. Turn ignition switch ON without starting engine.
4. Remove air bleed connector located at lower instrument panel on driver's side.

- When air bleed connector is removed, its wiring will be open and set in air bleed mode. At the same time, pump motor operates for several seconds and stops. Thus, a certain degree of oil pressure occurs on transfer actuator side.

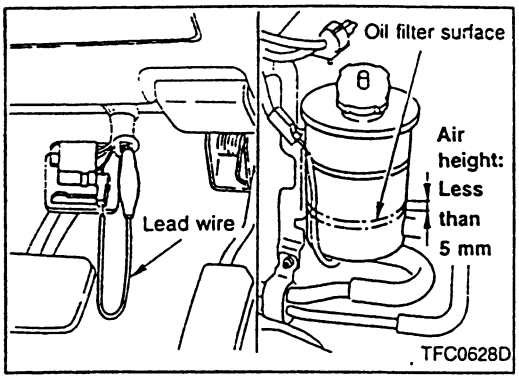



5. Open air bleeder on transfer actuator side and bleed air from actuator. Then tighten air bleeder to specified torque.
   **Air bleeder tightening torque:**
   **5.9 - 9.8 N·m (0.6 - 1.0 kg-m)**

**CAUTION:**

- **Be sure to open air bleeder when pump motor is inoperative. As soon as pump motor starts, close air bleeder.**
- **Do not operate pump motor for more than 10 seconds at a time.**
- **Make sure that hydraulic oil in reservoir tank is free from air sucking due to insufficient hydraulic oil quantity. If air sucking is noted, perform air bleeding procedures all over again.**

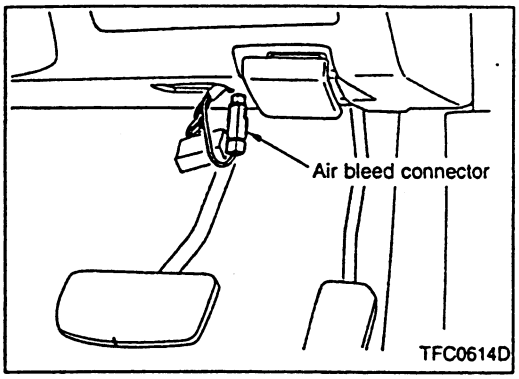
## Air Bleeding (Cont'd)




6. Connect and disconnect the wire lead to and from air bleed connector intermittently in response to ON-OFF operation of motor pump in order to bleed air from reservoir tank return line. Refer to the figure at left as a guide for air volume to be bled.

**CAUTION:**
**Do not operate pump motor for more than 10 seconds at a time.**

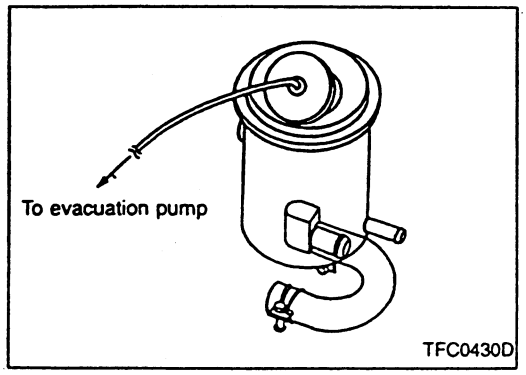
7. Replace air bleed connector in its original position and check oil level in reservoir tank.




## Evacuation

After replacing actuator assembly, pipes, etc. with new ones, abnormal noise may be emitted at or around actuator when engine is started. When it occurs, evacuate actuator and hydraulic line so that air is completely expelled from these parts.

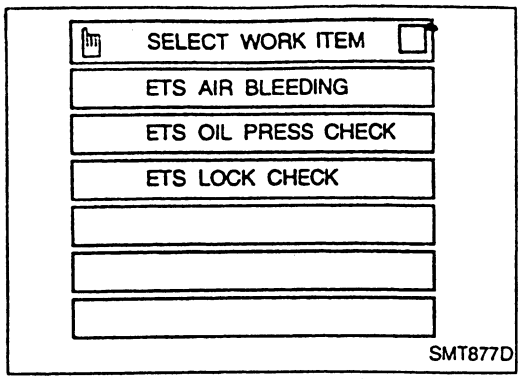
1. Make sure that pipe connections are tight, and that reservoir tank oil level is correct.
2. Remove air bleed connector and turn ignition switch ON. Within 10 seconds after ignition switch has been turned ON, depress brake pedal 5 times to set vehicle in 2WD mode. At this point, make sure that 4WD warning lamp blinks 2 times per second.




3. Remove cover from reservoir tank cap. Connect a vacuum hose or air conditioner evacuation pump to reservoir tank cap. Evacuate reservoir tank at a vacuum pressure of more than −96 kPa (720 mmHg) for at least 10 minutes.
   - Use a gauge manifold to check vacuum pressure discharged.

**CAUTION:**
- **Completely clean vacuum hose to be used for evacuating reservoir tank since it may have been used with different types of oil. Failure to follow this instruction results in oil leakage.**
- **Upon completion of evacuation procedures, completely wipe clean traces of oil from cap surface.**

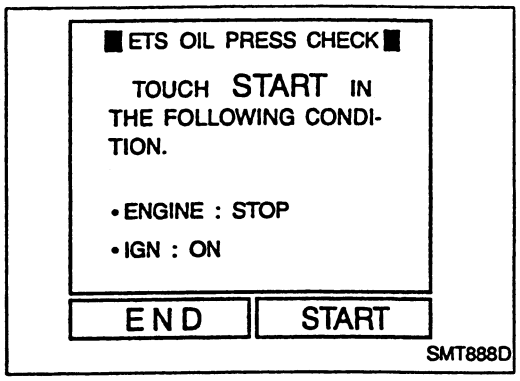
4. Connect air bleed connector in its original position. Return vehicle operation from 2WD mode to 4WD mode. Check and correct reservoir tank oil level. Turn ignition switch OFF.



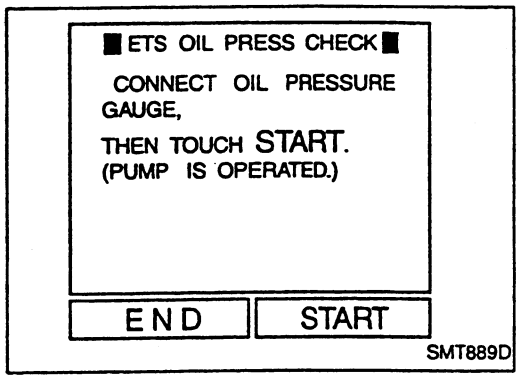

## Oil Pressure Inspection

### WITH CONSULT

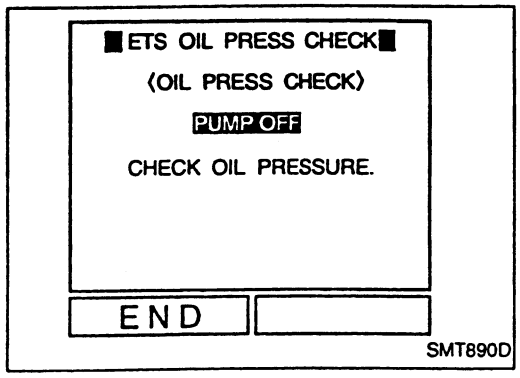
1. Turn ignition switch OFF.
2. Connect CONSULT to data link connector.
3. Turn ignition switch ON.
4. Touch "START", "ABS" and "WORK SUPPORT" on CONSULT.
5. Touch "ETS OIL PRESS CHECK".




6. Touch "START".

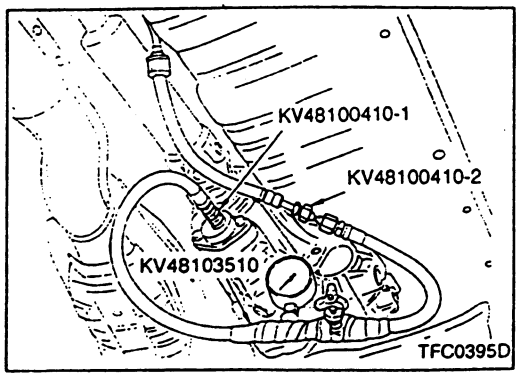



7. Set oil pressure gauge in position on vehicle. Bleed air from hydraulic oil line.
8. Touch "START".




9. Check oil pressure.
   **Oil pressure:**
   **Approx. 0.30 - 0.49 MPa (3.0 - 5.0 kg/cm$^2$)**
10. Touch "END".

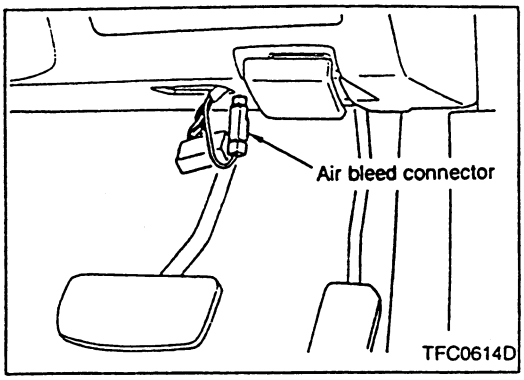
**CAUTION:**
**Upon completion of oil pressure inspection, bleed air from hydraulic circuit.**




### WITHOUT CONSULT

1. Raise vehicle off the ground. Install an oil pressure gauge (special service tool) in line between E-TS actuator and transfer actuator, then open valve.
2. Bleed air from hydraulic circuit.

## Oil Pressure Inspection (Cont'd)



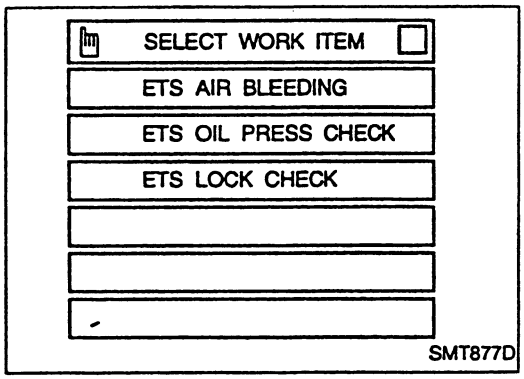

3. Turn ignition switch ON without starting engine.
4. Remove air bleed connector and check oil pressure when E-TS actuator motor operates.
   **Oil pressure:**
   **Approx. 0.30 - 0.49 MPa (3.0 - 5.0 kg/cm²)**

**CAUTION:**
**Do not operate actuator motor for more than 10 seconds at a time.**

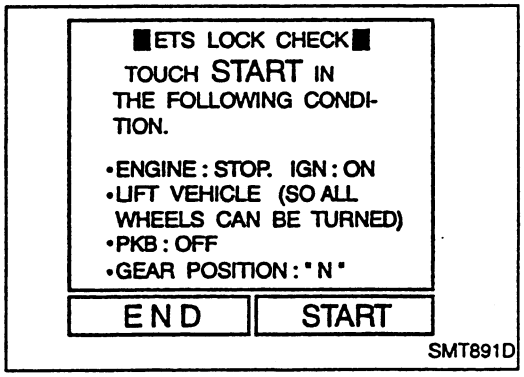
5. Remove oil pressure gauge and bleed air from hydraulic circuit.

## E-TS Lock Inspection

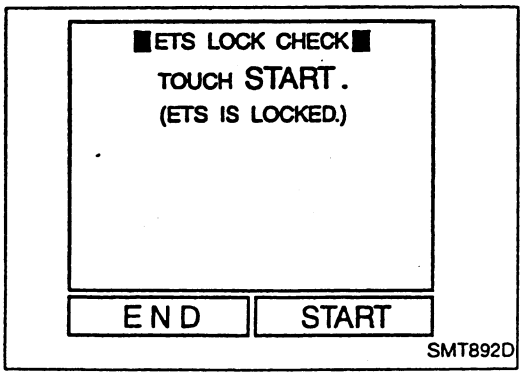
### WITH CONSULT



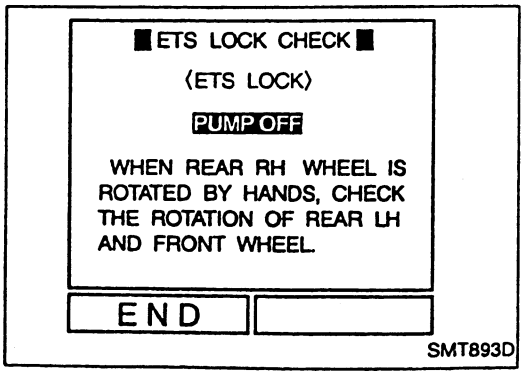

1. Turn ignition switch OFF.
2. Connect CONSULT to data link connector.
3. Turn ignition switch ON.
4. Touch "START", "ABS" and "WORK SUPPORT" on CONSULT.
5. Touch "ETS LOCK CHECK".




6. Raise right front and right rear wheels off the ground using garage jacks. Securely chock left front and left rear wheels.
7. Move A/T select lever to Neutral, then release parking brake.
8. Touch "START".




9. Touch "START".



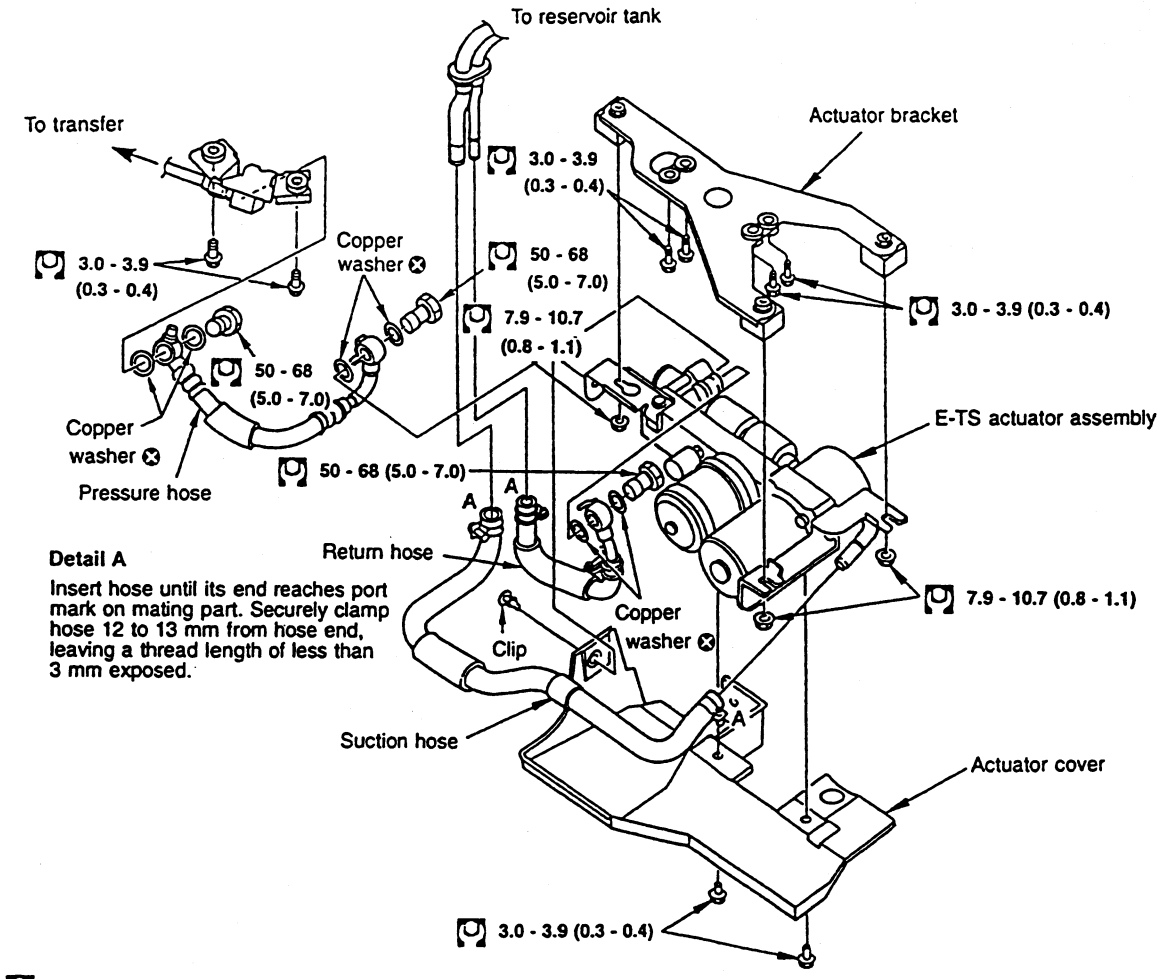

10. Slowly turn right rear wheel by hand to make sure that right front wheel also turns.
11. Upon completion of inspection procedures, touch "END".

## E-TS Lock Inspection (Cont'd)

**WITHOUT CONSULT**

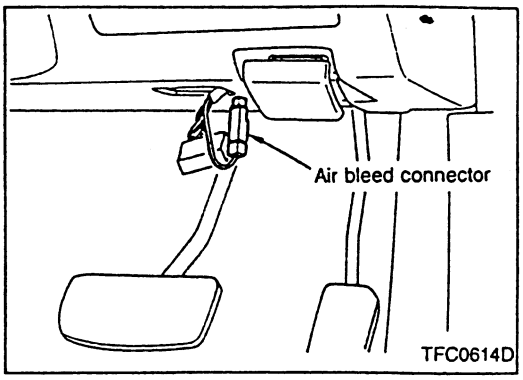
1. Turn ignition switch OFF.
2. Raise right front and right rear wheels off the ground using garage jacks. Securely chock left front and left rear wheels.
3. Move A/T select lever to Neutral, then release parking brake.
4. Turn ignition switch ON without starting engine. Remove air bleed connector and operate E-TS actuator.
5. Slowly turn right rear wheel by hand to make sure right front wheel also turns.
6. Connect air bleed connector in its original position.

## E-TS Actuator




**CAUTION:**

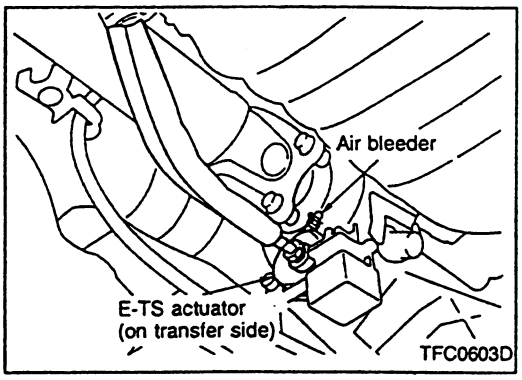
- **Always replace copper washers with new ones after every disassembly.**
- **When removing and installing E-TS actuator, be especially careful not to allow foreign particles (dust, dirt, etc.) to enter actuator.**



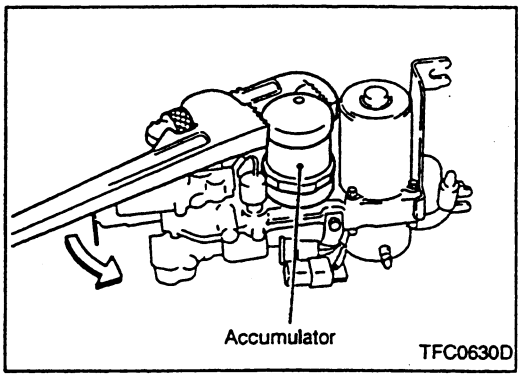

## Accumulator

### REMOVAL

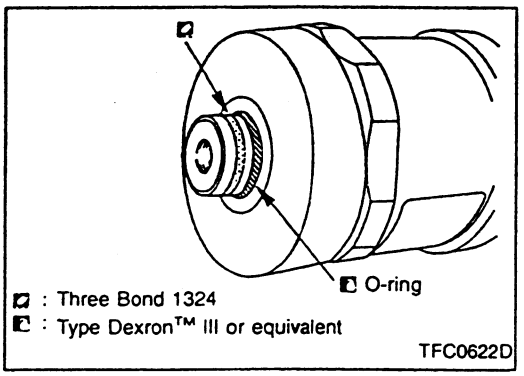
1. Relieve oil pressure of hydraulic unit.
1) Turn ignition switch OFF.
2) Remove air bleed connector.
3) Remove motor relay connector.
4) Open air bleeder on transfer actuator side.




5) Start engine.
6) After 4WD warning lamp has been illuminated for 30 seconds, turn ignition switch OFF.
7) Repeat steps 5) and 6) until hydraulic oil no longer discharges from hydraulic unit.
8) Upon completion of hydraulic oil discharge procedures, start engine and turn ignition switch OFF.




2. Remove E-TS actuator.
3. Using pipe wrench, remove accumulator from E-TS actuator.

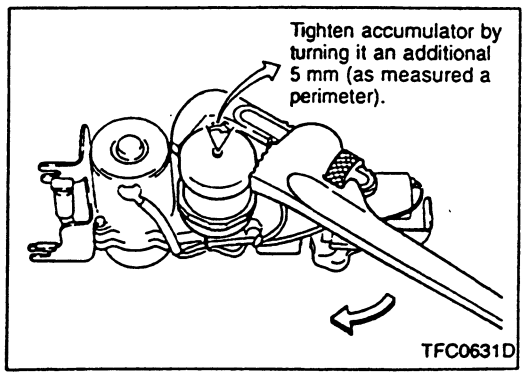



### INSTALLATION

1. With accumulator mating surface of E-TS actuator facing down, remove traces of old Lock Tite.

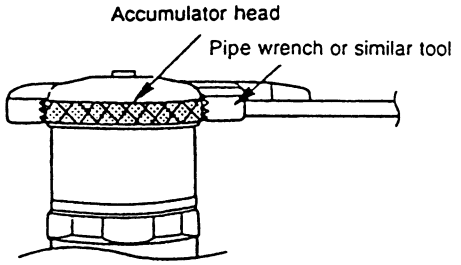
**CAUTION:**
**Be especially careful not to allow Lock Tite to enter oil line.**

2. Apply a coat of Lock Tite (Three Bond 1324) to center of accumulator threads.
3. Apply a coat of Type Dexron™ III or equivalent to the entire perimeter of O-ring.




4. Attach accumulator to E-TS actuator and manually screw it into actuator completely. Using pipe wrench, tighten accumulator by turning it an additional 5 mm (as measured perimeter).
   **Tightening torque (reference):**
   **40 - 41 N·m (4.0 - 4.2 kg-m)**

## Accumulator (Cont'd)



TFC0624D

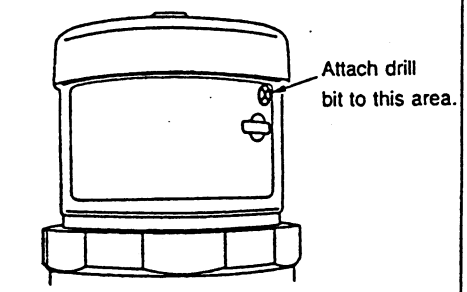
**CAUTION:**

- **If accumulator is accidentally scratched, repair it by applying a coat of black paint to that area.**
- **Attach pipe wrench to accumulator head as shown in the figure at left.**

5. Install E-TS actuator.

**CAUTION:**

**Upon completion of installation procedures, be sure to bleed air from hydraulic circuit.**



TFC0589D

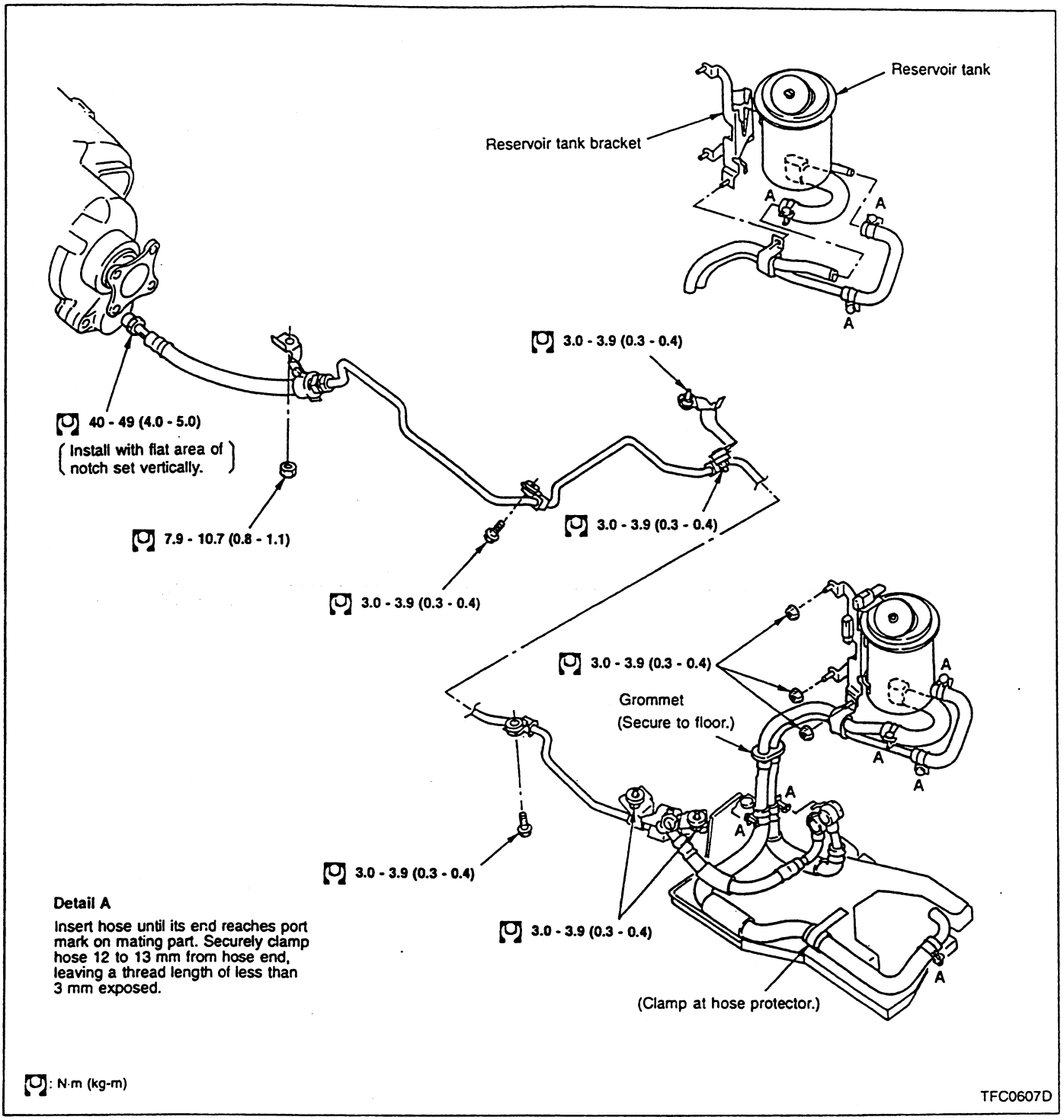
### DISPOSAL PROCEDURES

Observe the instructions indicated on caution label on accumulator before disposing of accumulator. Drill a hole on accumulator as shown in the figure at left to completely expel gaseous nitrogen from accumulator.

**CAUTION:**

- **Accumulator is charged with high-pressure gaseous nitrogen. Under no circumstances should accumulator be disassembled or fused using a welding tool.**
- **Wear goggles before drilling a hole on accumulator.**
- **Be sure to drill as small a hole as possible so that internal pressure can be gradually expelled from accumulator.**

## Hydraulic Lines




**CAUTION:**

- **Always replace copper washers with new ones after every disassembly.**
- **When removing and installing piping, hoses, etc., be especially careful not to allow foreign particles (dust, dirt, etc.) to enter hydraulic lines.**

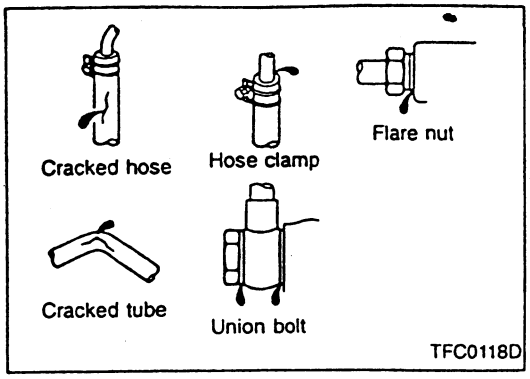
# PROPELLER SHAFT & DIFFERENTIAL CARRIER

# SECTION PD



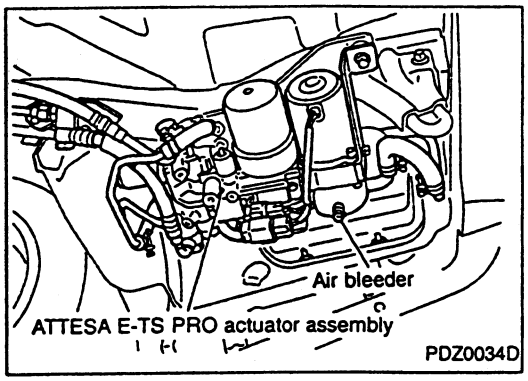
**MODIFICATION NOTICE:**
E-TS PRO system has been added to GT-R V spec. model.

# CONTENTS



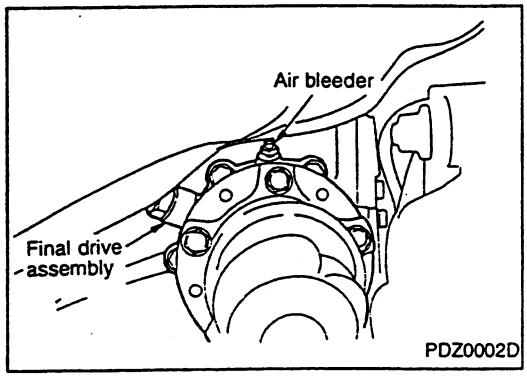

## Leakage Inspection

- Check hoses and tubes for leakage at connections. Also check for scratches, twisting, deformation, interference with adjacent parts and loose connections. Repair or replace faulty parts if necessary.
- Check reservoir tank and cap for damage, deformation and leakage. Replace faulty parts with new ones.




- Check ATTESA E-TS PRO actuator air bleeder and connections for leakage. Repair or replace faulty parts if necessary.

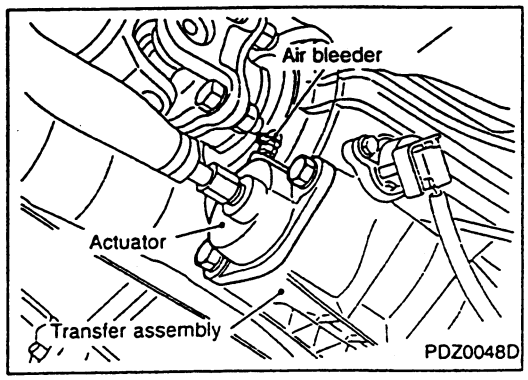
**CAUTION:**
**If leakage at or around ATTESA E-TS PRO actuator is noted, replace it as a ATTESA E-TS PRO actuator assembly.**




- Check air bleeder (on final drive actuator side) and connections for leakage. Repair or replace faulty parts if necessary.

**CAUTION**
**If leakage at or around final drive actuator is noted, replace it as a final drive actuator assembly.**

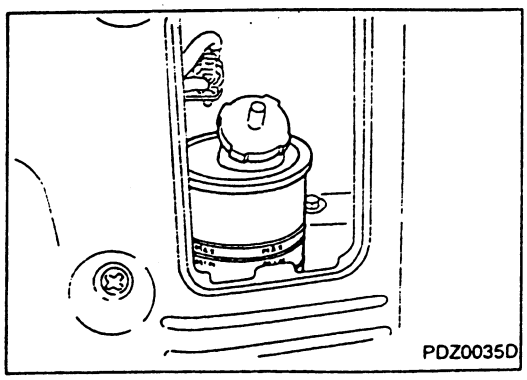
- If hydraulic oil in reservoir tank is reduced although actuator, piping and tank are free from leakage, it may be leaking into final drive interior. If necessary, disassemble final drive to check and locate the cause of leakage.




- Check air bleeder (on transfer actuator side) and connections for leakage. Repair or replace faulty parts if necessary.

**CAUTION**
**If leakage at or around transfer actuator is noted, replace it as a transfer actuator assembly.**

- If hydraulic oil in reservoir tank is reduced although actuator, piping and tank are free from leakage, it may be leaking into final drive interior. If necessary, disassemble transfer to check and locate the cause of leakage.




## Oil Level Inspection

1. Remove ATTESA E-TS PRO oil level access lid from right side of trunk room.
2. Turn ignition switch ON. Make sure that oil level is within the MAX-MIN lines on reservoir tank.

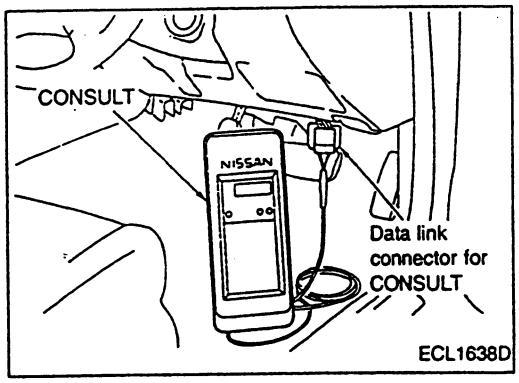
**CAUTION:**

- **If ignition switch has been turned OFF for a long period of time, oil in ATTESA E-TS PRO actuator might return to reservoir tank, causing oil level to exceed MAX line. Be sure to turn ignition switch ON before checking oil level.**
- **Always use genuine Nissan Power Steering Fluid Special**

## Oil Level Inspection (Cont'd)

in reservoir tank. When replenishing oil, be careful not to spill it into trunk room.

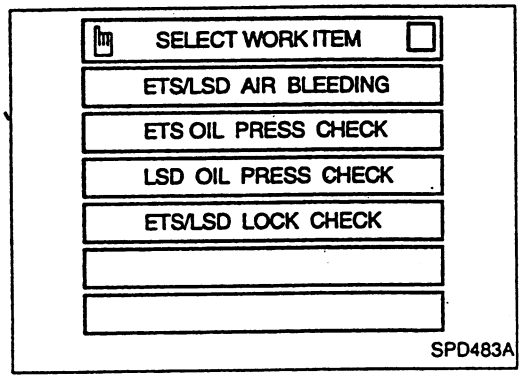




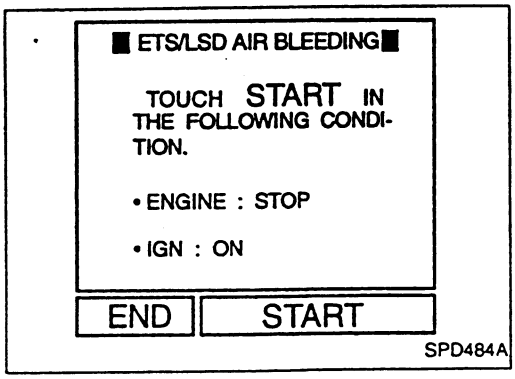

## Air Bleeding

### WITH CONSULT

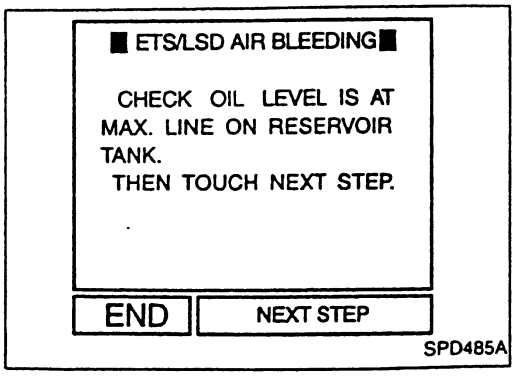
1. Turn ignition switch OFF.
2. Connect CONSULT to data link connector.
3. Turn ignition switch ON.
4. Touch "START", "ABS" and "WORK SUPPORT" on CONSULT.




5. Touch "ETS/LSD AIR BLEEDING".



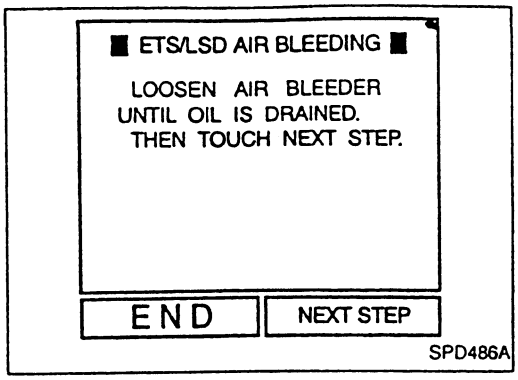

6. Touch "START".



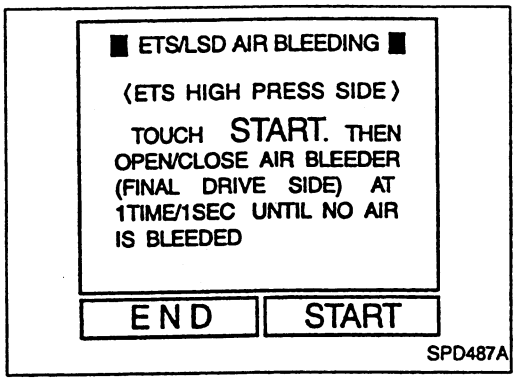

7. Pour oil into reservoir tank until oil level is approx. 30 mm above MAX line. Touch "NEXT".

**CAUTION:**
**Always use genuine Nissan Power Steering Fluid Special in reservoir tank. When replenishing oil, be careful not to spill it into trunk room.**

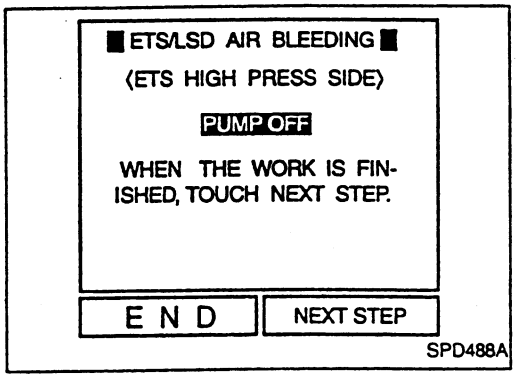
## Air Bleeding (Cont'd)



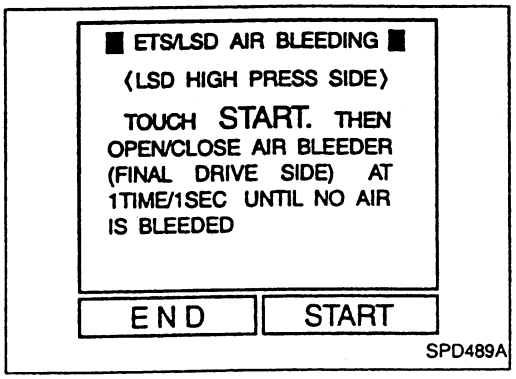

8. Open ATTESA E-TS PRO actuator air bleeder and bleed air from suction line (reservoir tank-to-ATTESA E-TS PRO actuator). Then tighten air bleeder to specified torque.
   **Air bleeder tightening torque:**
   **: 5.9 - 7.8 N·m (0.6 - 0.8 kg-m)**
9. Touch "NEXT STEP".



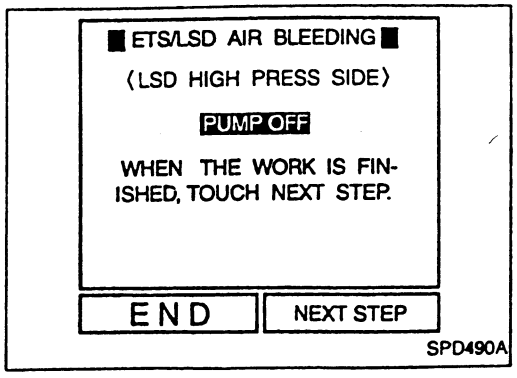

10. Touch "START". Bleed air from transfer actuator.




11. Tighten air bleeder to specified torque. Touch "NEXT STEP".
    **Air bleeder tightening torque:**
    **: 5.9 - 9.8 N·m (0.6 - 1.0 kg-m)**

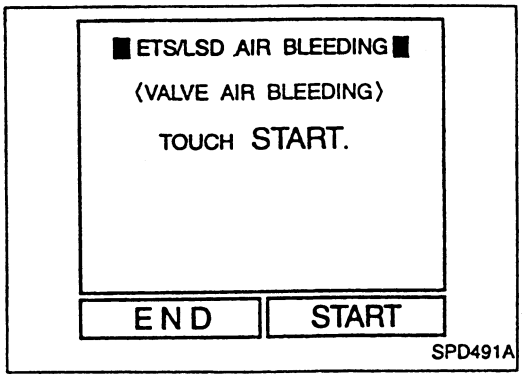



12. Touch "START". Bleed air from actuator on final drive side.

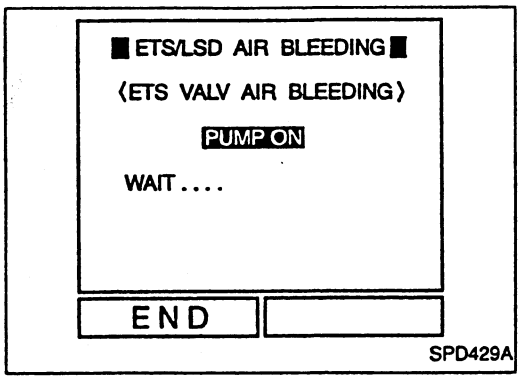



13. Tighten air bleeder to specified torque. Touch "NEXT STEP".
    **Air bleeder tightening torque:**
    **: 5.9 - 9.8 N·m (0.6 - 1.0 kg-m)**

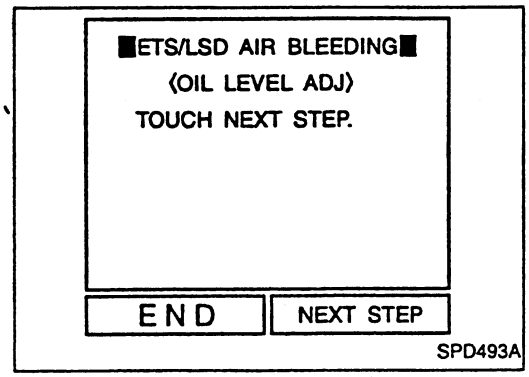
## Air Bleeding (Cont'd)




14. Touch "START". Bleed air from reservoir tank return line.

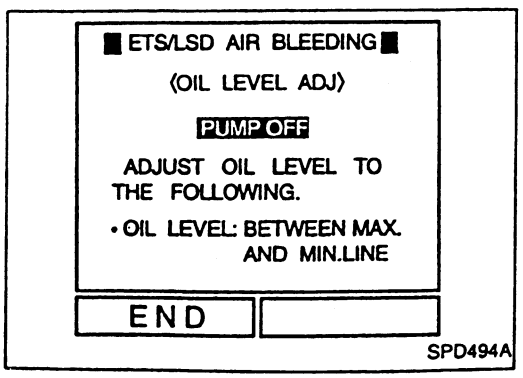



15. Touch "END".




16. Touch "NEXT STEP".

17. When "PUMP OFF" appears on display in place of "PUMP ON", check and correct oil level in reservoir tank.




18. Touch "END".

## Air Bleeding (Cont'd)

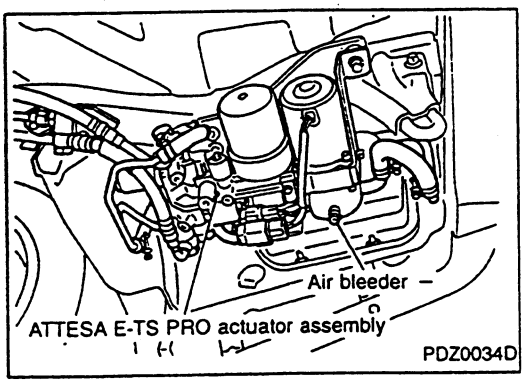
- "STOP" may appear on display. This occurs when engine is started and vehicle is driven or when ATTESA E-TS PRO system malfunctions, during air bleeding procedures. When it appears, suspend air bleeding procedures and perform self-diagnostic procedures for ATTESA E-TS PRO system. Repair faulty areas.
- "EMERGENCY STOP" appears on display when ATTESA E-TS PRO system malfunctions and air bleeding operation is performed under a fail-safe condition. (When oil level is lower than specified level after new actuator assembly or pipes are installed, turning ignition switch ON may set ATTESA E-TS PRO/ABS system in a fail-safe condition.)

### WITHOUT CONSULT

1. Pour oil into reservoir tank until oil level is approx. 30 mm above MAX line.

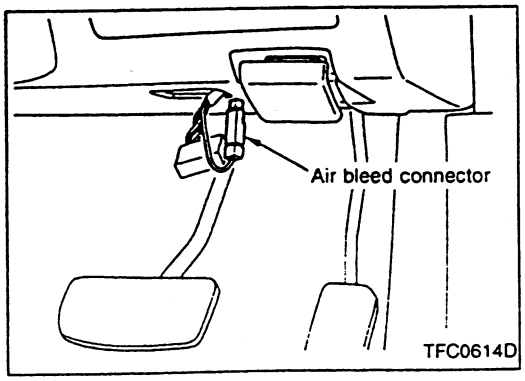
**CAUTION:**

- **Always use genuine Nissan Power Steering Fluid Special in reservoir tank. When replenishing oil, be careful not to spill it into trunk room.**

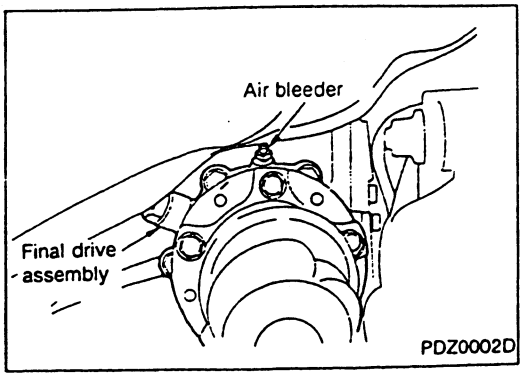



- **Before air bleeding procedures are performed, make sure that ignition switch is OFF.**

2. Open ATTESA E-TS PRO actuator air bleeder. Bleed air from suction line (reservoir tank-to-ATTESA E-TS PRO actuator) until air no longer is discharged from air bleeder opening. Close air bleeder and tighten it to specified torque.
   **Air bleeder tightening torque:**
   **: 5.9 - 7.8 N·m (0.6 - 0.8 kg-m)**
- When air bleeder is opened, oil inside suction line flows downward by gravity.




3. Turn ignition switch ON without starting engine.
4. Remove air bleed connector located at lower instrument panel on driver's side.
- When air bleed connector is removed, its wiring will be open and set in air bleed mode. At the same time, pump motor operates for several seconds and stops. Thus, a certain degree of oil pressure occurs on transfer actuator side.




5. Open air bleeder on final drive actuator side and bleed air from actuator. Then tighten air bleeder to specified torque.
   **Air bleeder tightening torque:**
   **: 5.9 - 9.8 N·m (0.6 - 1.0 kg-m)**

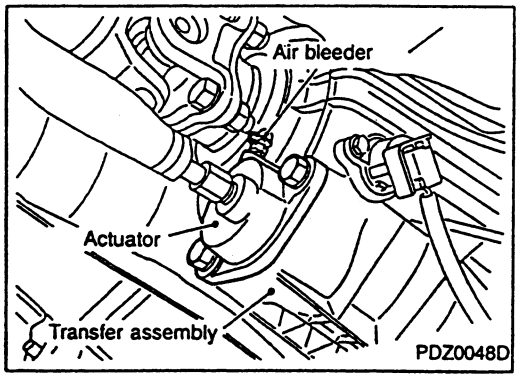
**CAUTION:**

- **Be sure to open air bleeder when pump motor is inoperative. As soon as pump motor starts, close air bleeder.**
- **Do not operate pump motor for more than 10 seconds at a time.**
- **Make sure that hydraulic oil in reservoir tank is free from air sucking due to insufficient hydraulic oil quantity. If air sucking is noted, perform air bleeding procedures all over**

## Air Bleeding (Cont'd)

again.

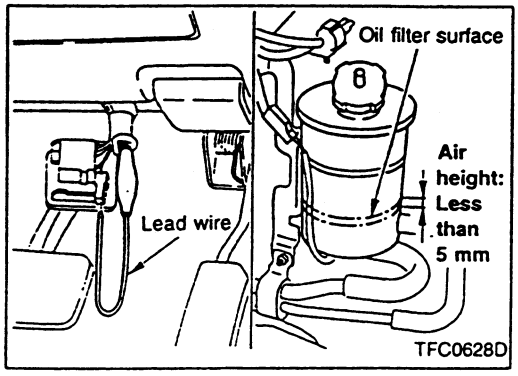





6. Open air bleeder on transfer actuator side and bleed air from actuator. Then tighten air bleeder to specified torque.
   **Air bleeder tightening torque:**
   **: 5.9 - 9.8 N·m (0.6 - 1.0 kg-m)**

**CAUTION:**

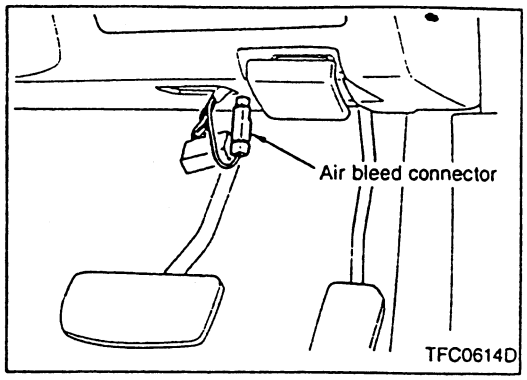
- **Be sure to open air bleeder when pump motor is inoperative. As soon as pump motor starts, close air bleeder.**
- **Do not operate pump motor for more than 10 seconds at a time.**
- **Make sure that hydraulic oil in reservoir tank is free from air sucking due to insufficient hydraulic oil quantity. If air sucking is noted, perform air bleeding procedures all over again.**

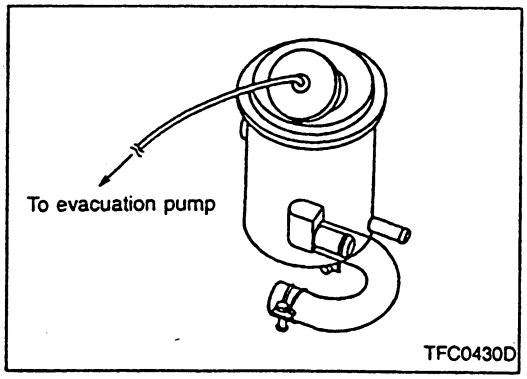



7. Connect and disconnect the wire lead to and from air bleed connector intermittently in response to ON-OFF operation of motor pump in order to bleed air from reservoir tank return line. Refer to the figure at left as a guide for air volume to be bled.

**CAUTION:**
**Do not operate pump motor for more than 10 seconds at a time.**

8. Replace air bleed connector in its original position and check oil level in reservoir tank.




## Evacuation

After replacing actuator assembly, pipes, etc. with new ones, abnormal noise may be emitted at or around actuator when engine is started. When it occurs, evacuate actuator and hydraulic line so that air is completely expelled from these parts.

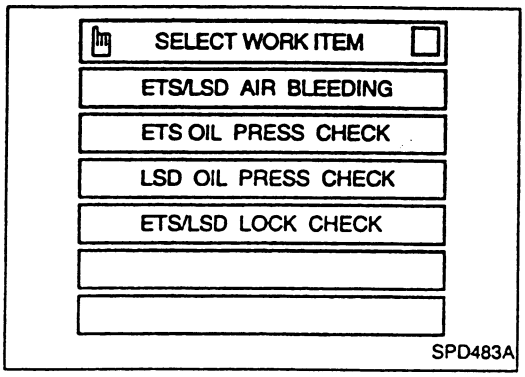
1. Make sure that pipe connections are tight, and that reservoir tank oil level is correct.
2. Remove air bleed connector and turn ignition switch ON. Within 10 seconds after ignition switch has been turned ON, depress brake pedal 5 times to set vehicle in 2WD mode. At this point, make sure that 4WD warning lamp and A-LSD warning lamp blink 2 times per second.
3. Remove cover from reservoir tank cap. Connect a vacuum hose or air conditioner evacuation pump to reservoir tank cap. Evacuate reservoir tank at a vacuum pressure of more than −96 kPa (720 mmHg) for at least 10 minutes.

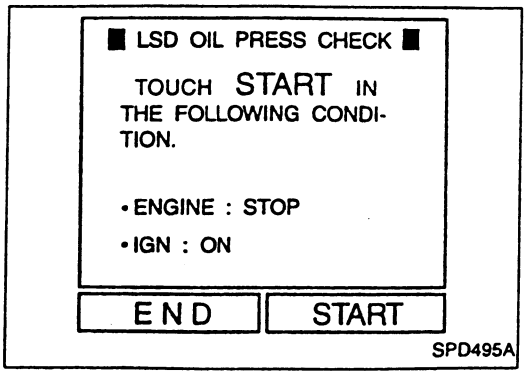
- Use a gauge manifold to check vacuum pressure discharged.

**CAUTION:**

- **Completely clean vacuum hose to be used for evacuating reservoir tank since it may have been used with different types of oil. Failure to follow this instruction results in oil leakage.**
- **Upon completion of evacuation procedures, completely wipe clean traces of oil from cap surface.**

4. Connect air bleed connector in its original position. Return vehicle operation from 2WD mode to 4WD mode. Check and correct reservoir tank oil level. Turn ignition switch OFF.



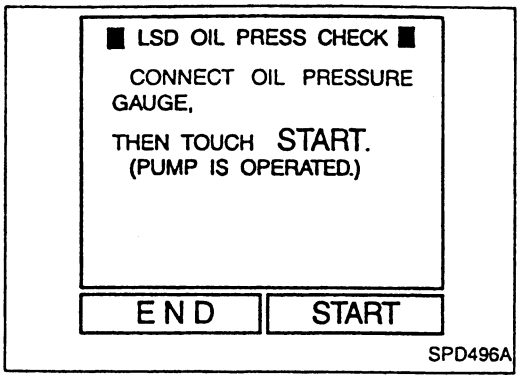




## Oil Pressure Inspection

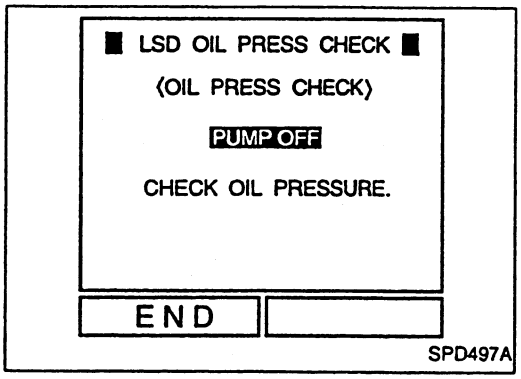
### WITH CONSULT

1. Turn ignition switch OFF.
2. Connect CONSULT to data link connector.
3. Turn ignition switch ON.
4. Touch "START", "ABS" and "WORK SUPPORT" on CONSULT.
5. Touch "LSD OIL PRESS CHECK".
6. Touch "START".

## Oil Pressure Inspection (Cont'd)

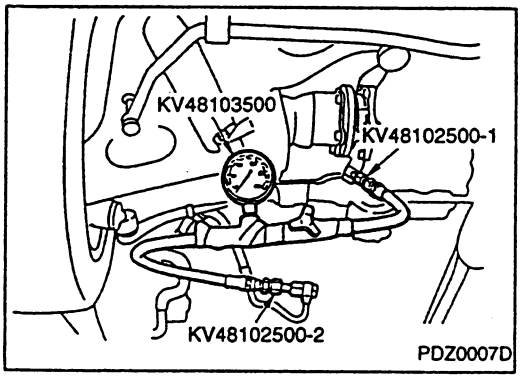



7. Set oil pressure gauge in position on vehicle. Bleed air from hydraulic oil line.
8. Touch "START".



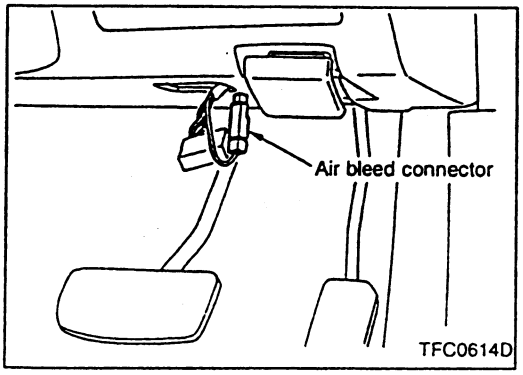

9. Check oil pressure.
   **Oil pressure:**
   **Approx. 0.30 - 0.49 MPa (3.0 - 5.0 kg/cm²)**
10. Touch "END".

**CAUTION:**
**Upon completion of oil pressure inspection, bleed air from hydraulic circuit.**




### WITHOUT CONSULT

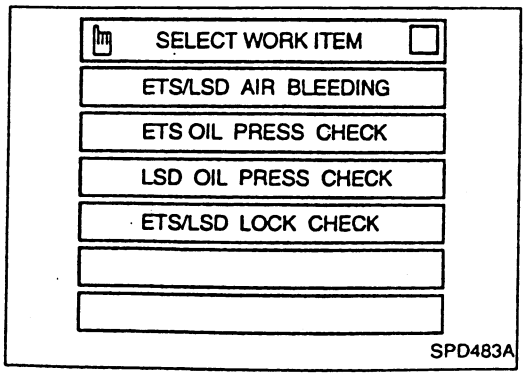
1. Raise vehicle off the ground. Install an oil pressure gauge (special service tool) in line between ATTESA E-TS PRO actuator and final drive actuator, then open valve.
2. Bleed air from hydraulic circuit.




3. Turn ignition switch ON without starting engine.
4. Remove air bleed connector and check oil pressure when ATTESA E-TS PRO actuator motor operates.
   **Oil pressure:**
   **Approx. 0.30 - 0.49 MPa (3.0 - 5.0 kg/cm²)**

**CAUTION:**
**Do not operate actuator motor for more than 10 seconds at a time.**

5. Remove oil pressure gauge and bleed air from hydraulic circuit.

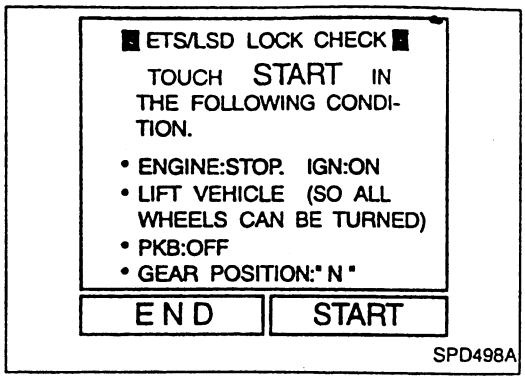



## ATTESA E-TS PRO Lock Inspection

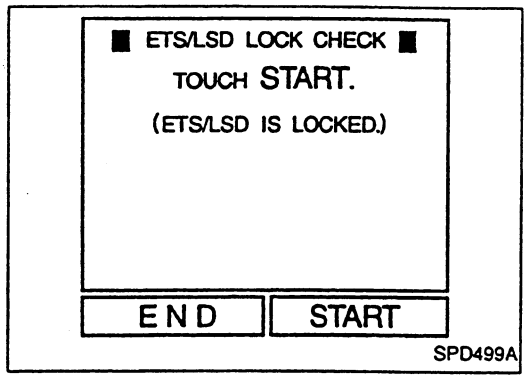
### WITH CONSULT

1. Turn ignition switch OFF.
2. Connect CONSULT to data link connector.
3. Turn ignition switch ON.
4. Touch "START", "ABS" and "WORK SUPPORT" on CONSULT.
5. Touch "ETS/LSD LOCK CHECK".

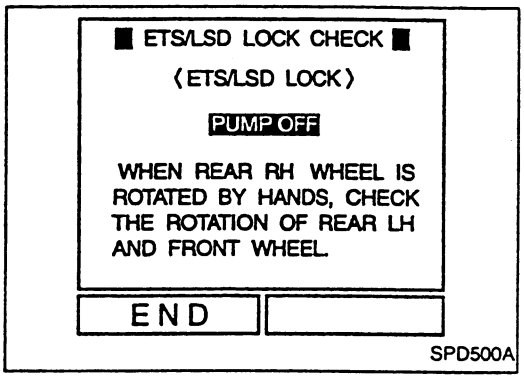
## ATTESA E-TS PRO Lock Inspection (Cont'd)




6. Raise four wheels off the ground using garage jacks.
7. Move shift lever to Neutral, then release parking brake.
8. Touch "START".




9. Touch "START".

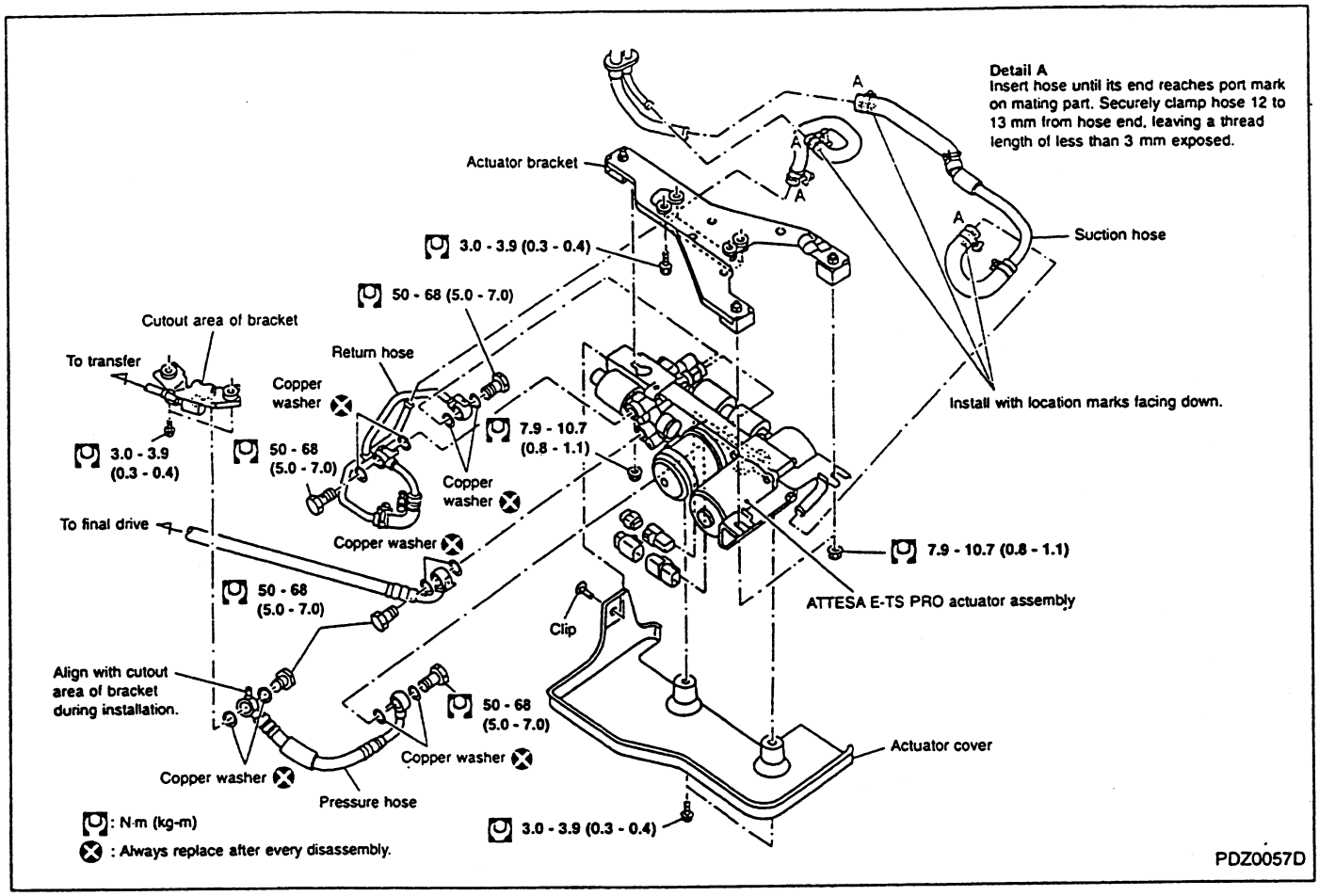



10. Slowly turn right rear wheel by hand to make sure that left rear and front wheels also turn.
11. Upon completion of inspection procedures, touch "END".

### WITHOUT CONSULT

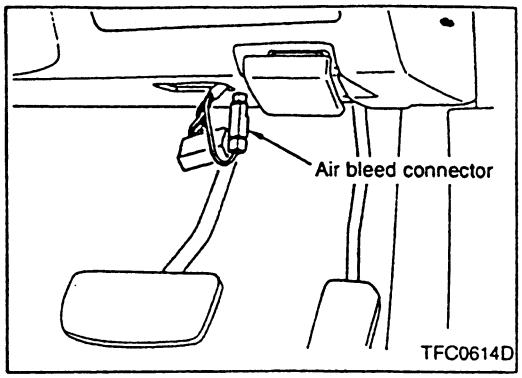
1. Turn ignition switch OFF.
2. Raise four wheels off the ground using garage jacks.
3. Move shift lever to Neutral, then release parking brake.
4. Turn ignition switch ON without starting engine. Remove air bleed connector and operate ATTESA E-TS PRO actuator.
5. Slowly turn right rear wheel by hand to make sure left rear and front wheels also turn.
6. Connect air bleed connector in its original position.

## ATTESA E-TS PRO Actuator




**CAUTION:**

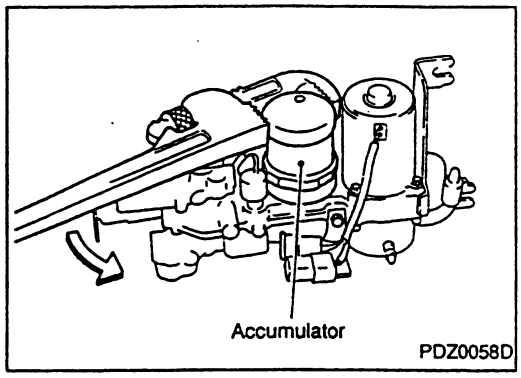
- **Always replace copper washers with new ones after every disassembly.**
- **When removing and installing ATTESA E-TS PRO actuator, be especially careful not to allow foreign particles (dust, dirt, etc.) to enter actuator.**



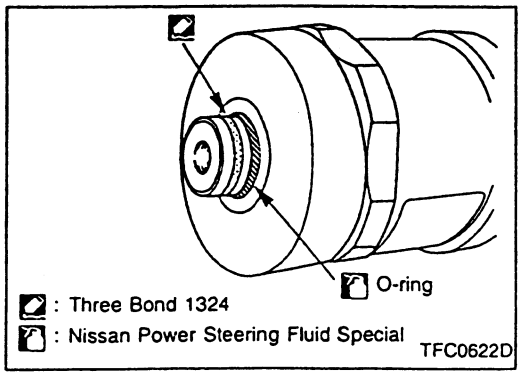

## Accumulator

### REMOVAL

1. Relieve oil pressure of hydraulic unit.
1) Turn ignition switch OFF.
2) Remove air bleed connector.
3) Remove motor relay connector.
4) Open air bleeders on transfer and final drive actuator sides.
5) Start engine.
6) After 4WD warning lamp and A-LSD warning lamp have been illuminated for 30 seconds, turn ignition switch OFF.
7) Repeat steps 5) and 6) until hydraulic oil no longer discharges from hydraulic unit.
8) Upon completion of hydraulic oil discharge procedures, start engine and turn ignition switch OFF.




2. Remove ATTESA E-TS PRO actuator.
3. Using pipe wrench, remove accumulator from ATTESA E-TS PRO actuator.

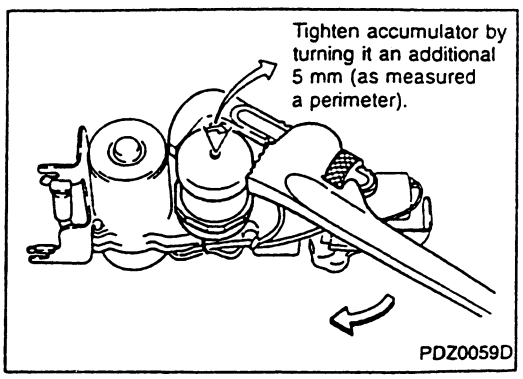



### INSTALLATION

1. With accumulator mating surface of ATTESA E-TS PRO actuator facing down, remove traces of old Lock Tite.

**CAUTION:**
**Be especially careful not to allow Lock Tite to enter oil line.**

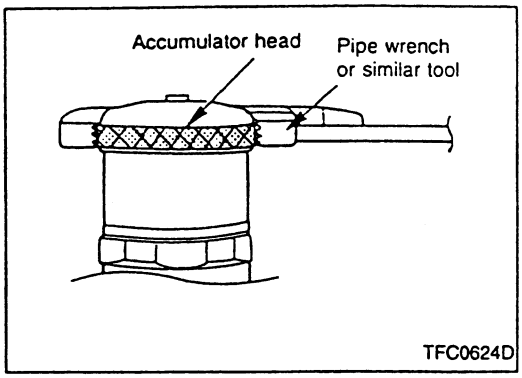
2. Apply a coat of Lock Tite (Three Bond 1324) to center of accumulator threads.
3. Apply a coat of Nissan Power Steering Fluid Special to the entire perimeter of O-ring.




4. Attach accumulator to ATTESA E-TS PRO actuator and manually screw it into actuator completely. Using pipe wrench, tighten accumulator by turning it an additional 5 mm (as measured perimeter).

**Tightening torque (reference):**
**: 40 - 41 N·m (4.0 - 4.2 kg-m)**

## Accumulator (Cont'd)



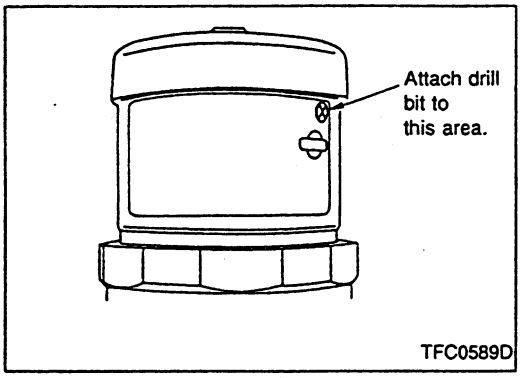

**CAUTION:**

- **If accumulator is accidentally scratched, repair it by applying a coat of black paint to that area.**
- **Attach pipe wrench to accumulator head as shown in the figure at left.**

5. Install ATTESA E-TS PRO actuator.

**CAUTION:**

**Upon completion of installation procedures, be sure to bleed air from hydraulic circuit.**




### DISPOSAL PROCEDURES

Observe the instructions indicated on caution label on accumulator before disposing of accumulator. Drill a hole on accumulator as shown in the figure at left to completely expel gaseous nitrogen from accumulator.

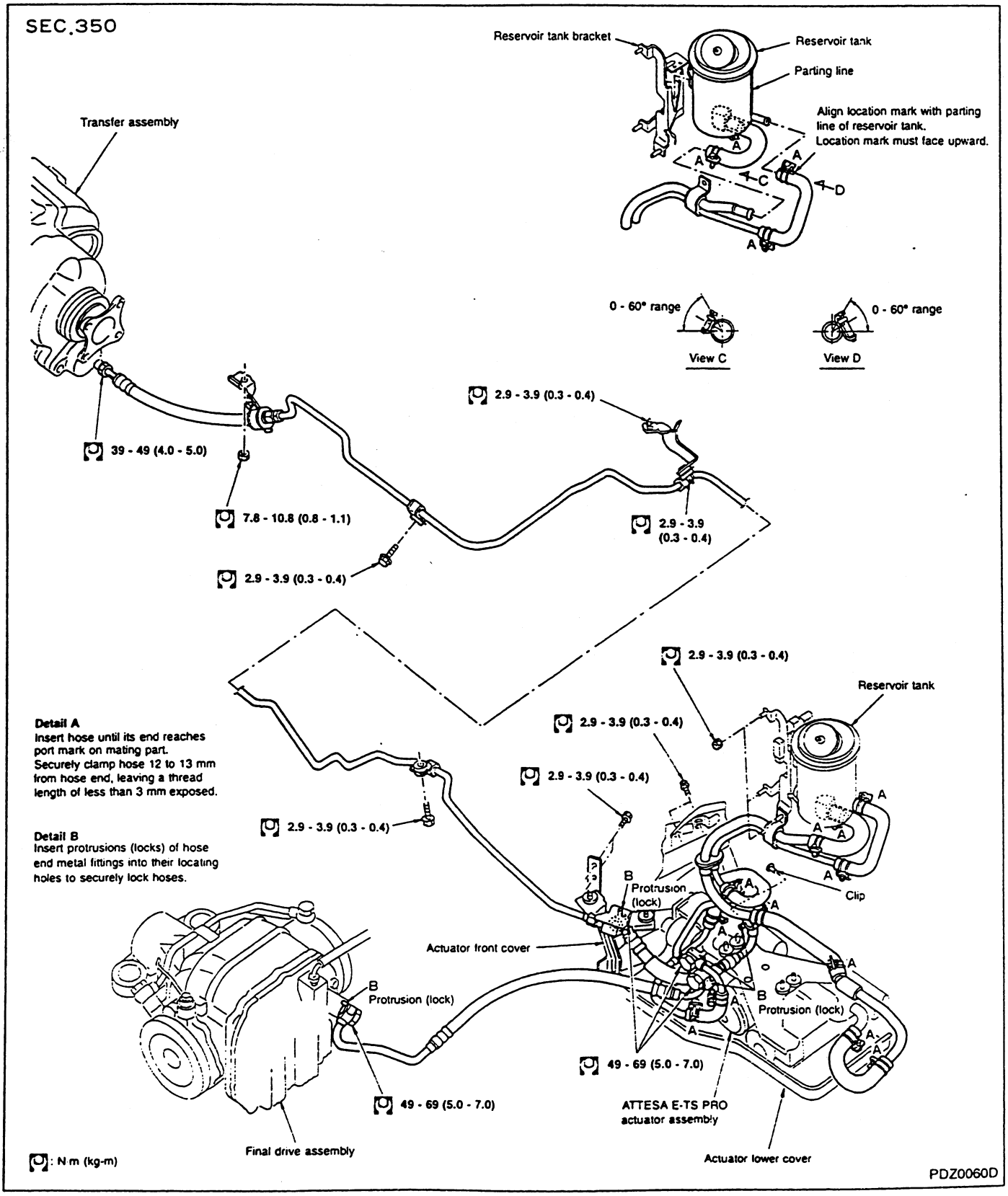
**CAUTION:**

- **Accumulator is charged with high-pressure gaseous nitrogen. Under no circumstances should accumulator be disassembled or fused using a welding tool.**
- **Wear goggles before drilling a hole on accumulator.**
- **Be sure to drill as small a hole as possible so that internal pressure can be gradually expelled from accumulator.**

## Hydraulic Lines

**CAUTION:**

- **Always replace copper washers with new ones after every disassembly.**
- **When removing and installing piping, hoses, etc., be especially careful not to allow foreign particles (dust, dirt, etc.) to enter hydraulic lines.**



# BRAKE SYSTEM

# SECTION BR



**MODIFICATION NOTICE:**

- GT-R model has been introduced.
- ATTESA E-TS system has been added for model with GT-R.
- ATTESA E-TS PRO system has been added for model with GT-R V spec.

# CONTENTS

## Description

The ATTESA E-TS PRO consists of an E-TS system, A-LSD system and ABS system.
These 3 systems are operated by a single control unit (ATTESA E-TS PRO control unit). Signals from multiple sensors are received and acted upon to provide a comprehensive control system.
In the event of an ATTESA E-TS PRO electrical system failure, the 4WD warning lamp, A-LSD warning lamp and ABS warning lamp (all located in the combination meter cluster) will illuminate either separately or simultaneously to inform the driver of a problem. Self-diagnosis begins immediately and the results (problem areas) appear according to the ABS warning lamp ON-OFF count.
Refer to the Table below if the electrical system diagnostic tester (CONSULT) is used to troubleshoot the problem.

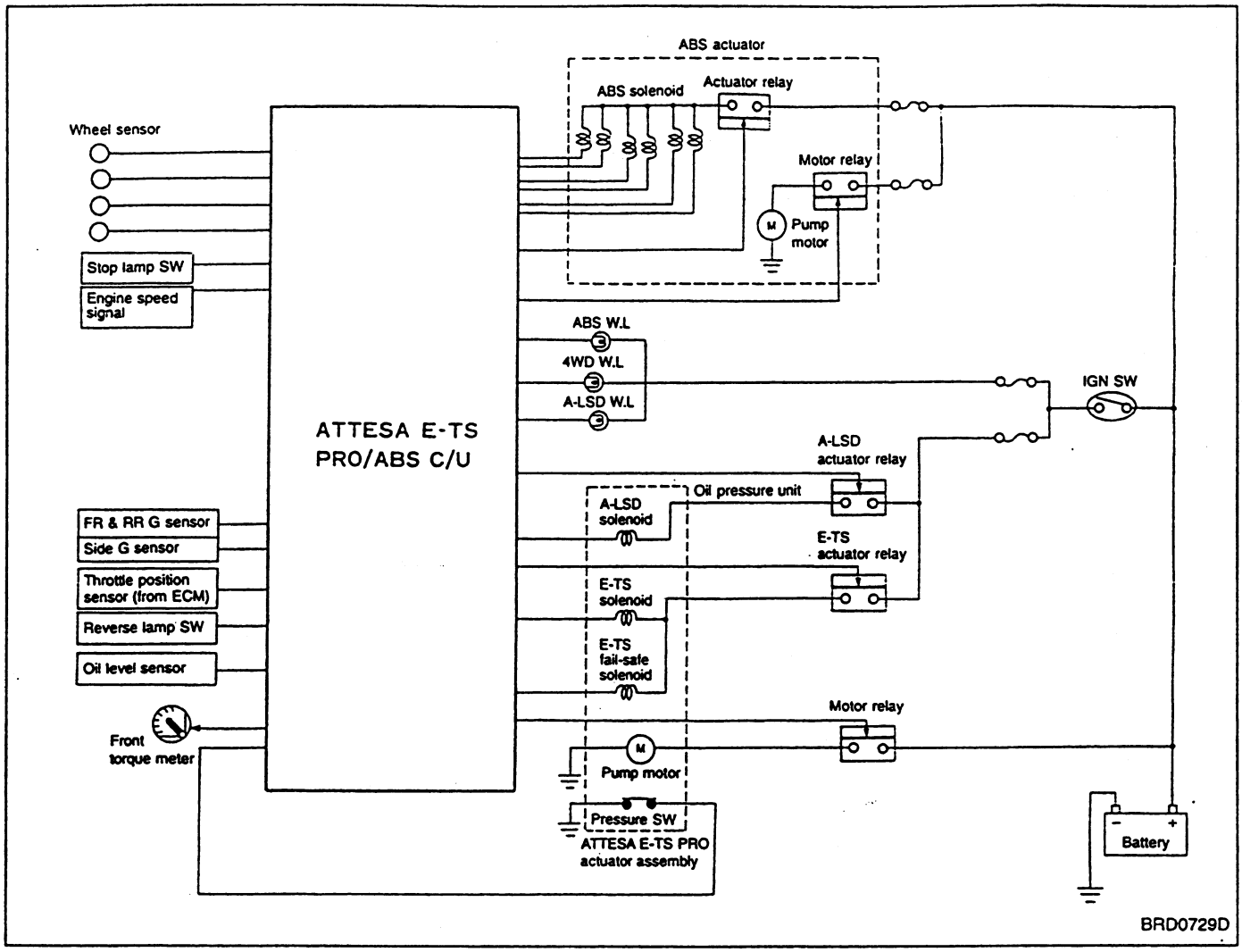
| Diagnostic test mode | Remarks |
|---|---|
| Work support | ETS/LSD air bleeding, ETS/LSD oil pressure check, ETS/LSD lock inspection |
| Self-diagnostic results | Compatible with ATTESA E-TS PRO/ABS |
| Data monitor | Compatible with ATTESA E-TS PRO/ABS |
| Active test | ABS solenoid valve ON-OFF and ABS monitor ON-OFF |
| ECM part number | ATTESA E-TS PRO/ABS control unit |

## Fail-Safe Function

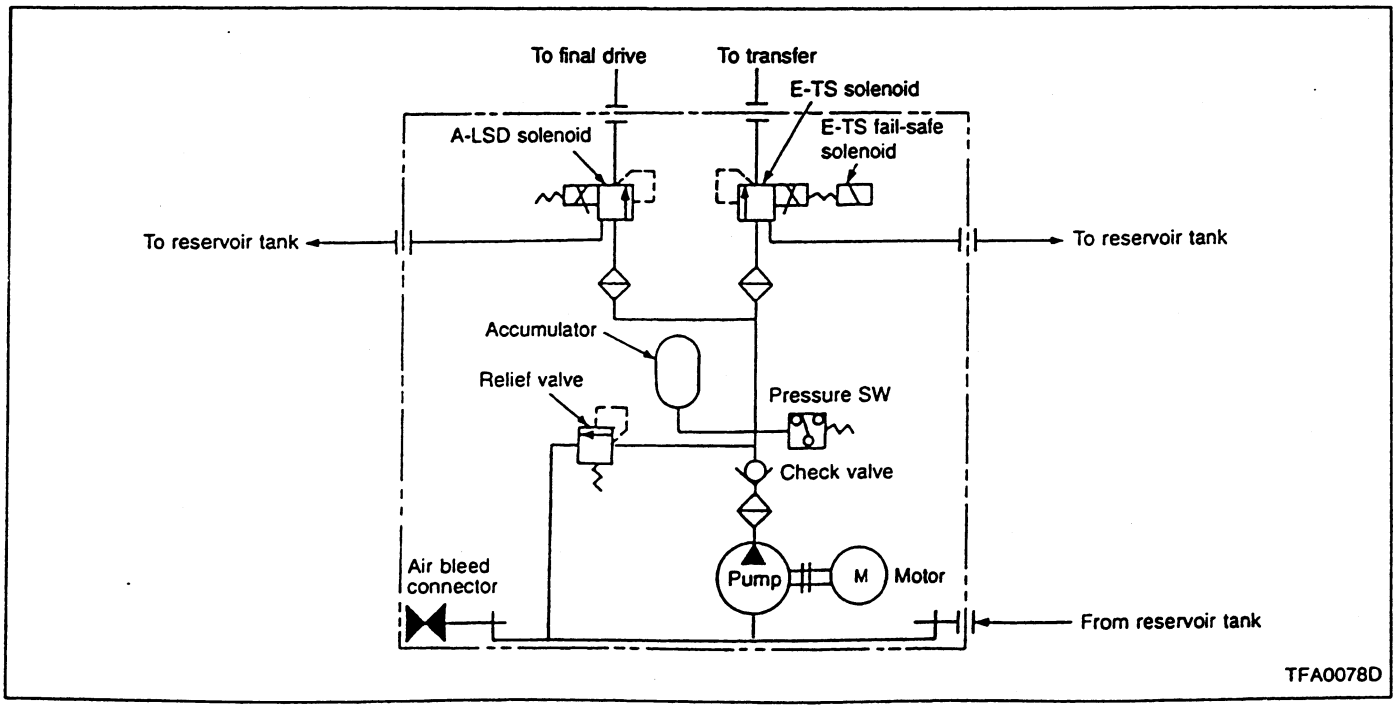
If a malfunction occurs in the ATTESA E-TS PRO system, the 4WD warning lamp, A-LSD waning lamp and ABS warning lamp (all located in the combination meter cluster) will illuminate simultaneously. If only the A-LSD warning lamp illuminates, there is no differential limitation. The E-TS and ABS systems operate normally to provide normal final drive conditions and control. If the 4WD warning lamp and A-LSD warning lamp illuminate simultaneously, decreased 4WD conditions prevail with the ABS system operating normally. If only the ABS warning lamp illuminates, the ABS system will not function. Brakes operate as they would on a vehicle without ABS. The E-TS and A-LSD systems operate normally.
When all 3 lamps are simultaneously illuminated, decreased 4WD conditions prevail. Differential limitation control does not occur. Final drive conditions are normal. The ABS system is not functioning. Brakes operate as they would on a vehicle without ABS.

- **If a malfunction occurs in the control unit and/or the wheel sensor circuit, the 4WD warning lamp, A-LSD warning lamp and ABS warning lamp will illuminate simultaneously.**

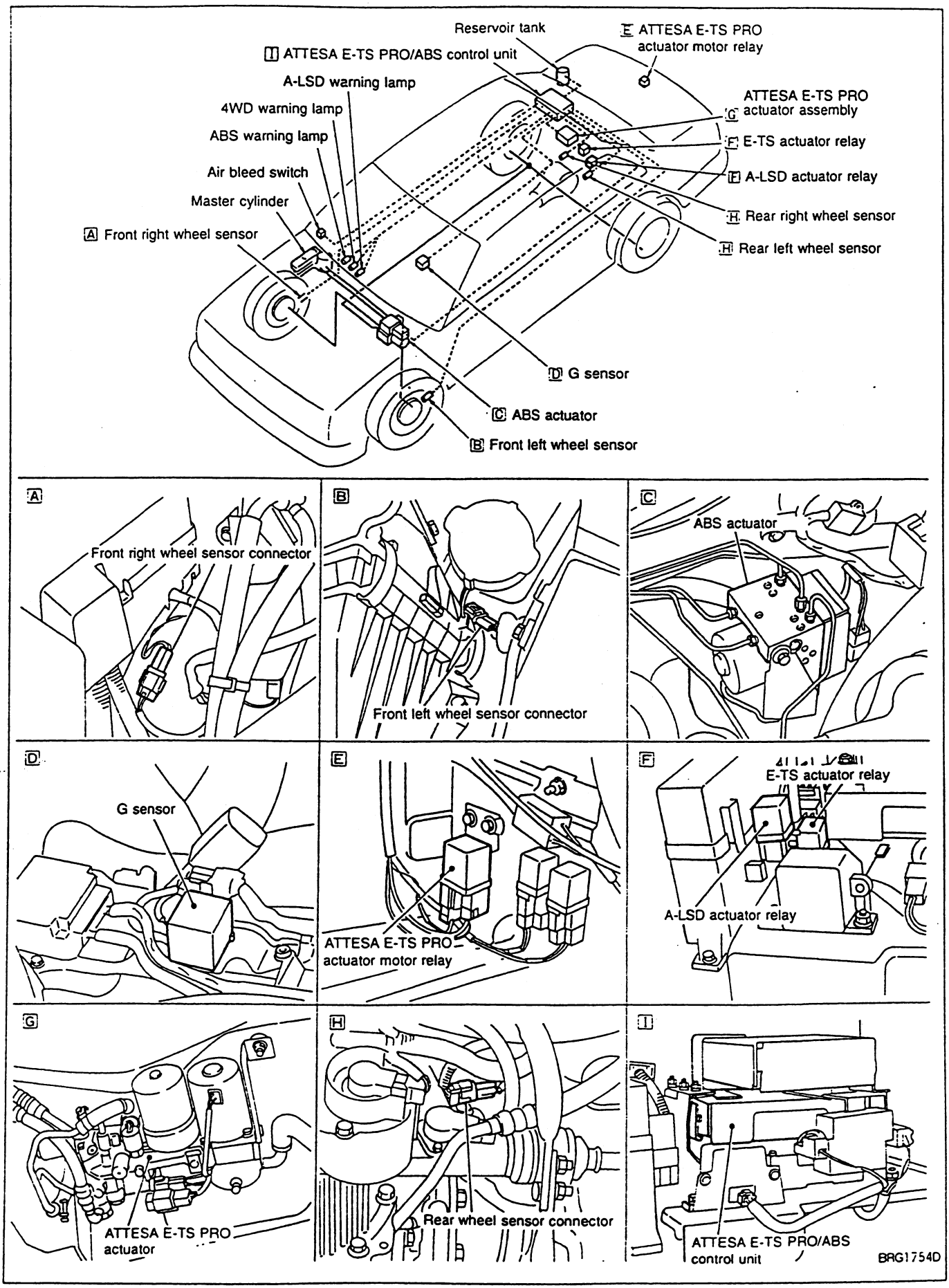
## System Diagram



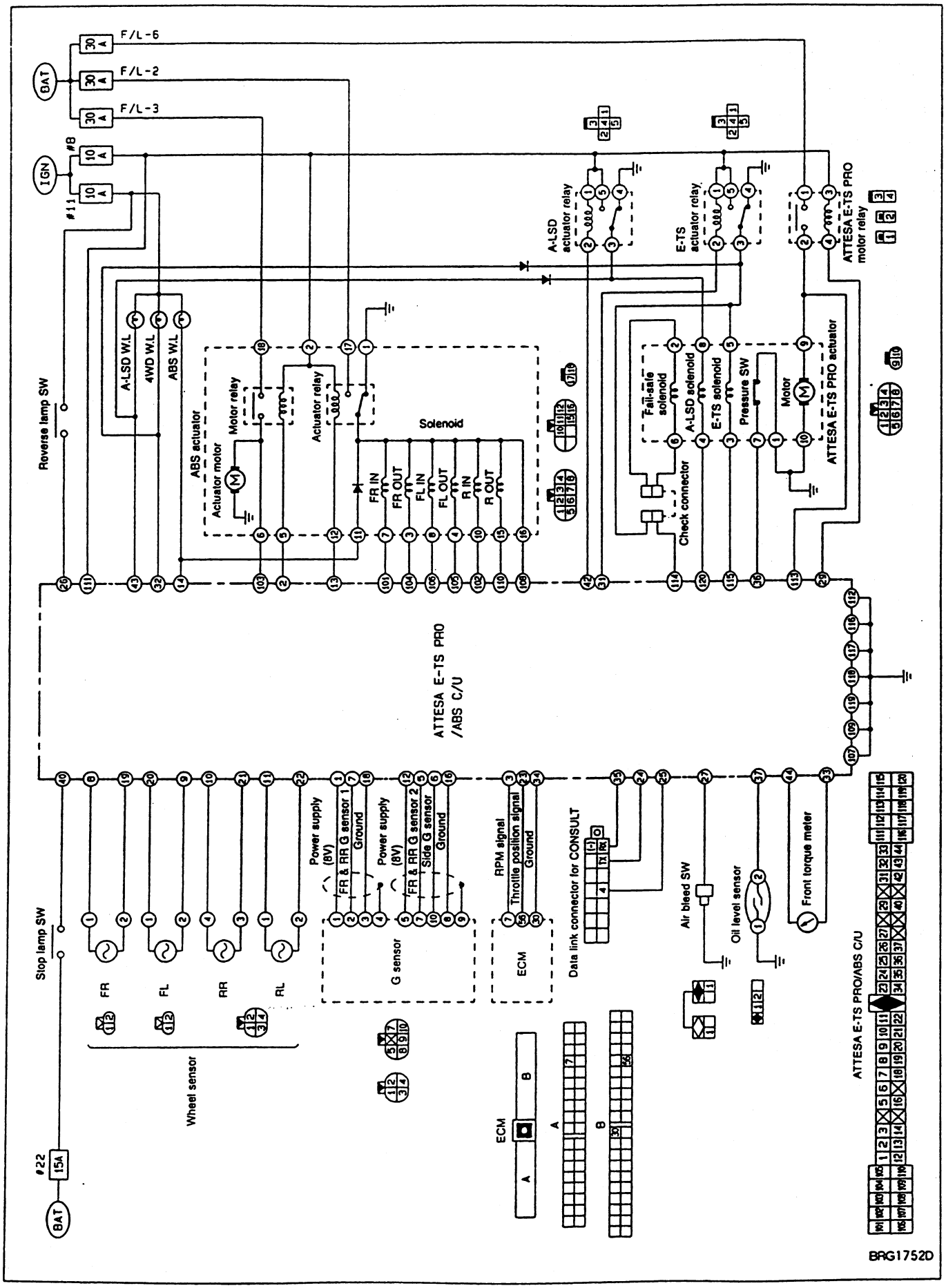

## Hydraulic Circuit Diagram



## Component Parts Location



## Circuit Diagram



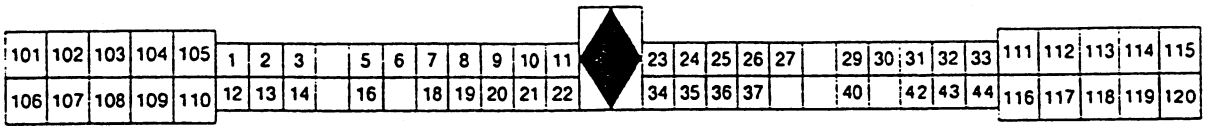
## • Control Unit Input/Output Signal Specifications

### USING CIRCUIT TESTER

### E-TS/ABS control unit

To perform the following inspection switch should be turned ON with ABS control unit connector and actuator connector properly connected.

ATTESA E-TS PRO/ABS control unit connector




BRG1755D

| Terminal No. + | Terminal No. − | Item | Specifications*1 | | Check item (Reference) |
|---|---|---|---|---|---|
| 101 | Body ground | Front right wheel IN solenoid | Actuator operating (with CONSULT set in active test mode) or actuator relay not operating. (Fail-safe system operating or before engine starting, etc.) | Approx. 0V | ABS solenoid and circuit |
| 104 | | Front right wheel OUT solenoid | | | |
| 106 | | Front left wheel IN solenoid | | | |
| 105 | | Front left wheel OUT solenoid | Actuator not operating and actuator relay operating (Engine operating and vehicle at rest) | Power supply voltage (approx. 12V) | |
| 102 | | Rear wheel IN solenoid | | | |
| 110 | | Rear wheel OUT solenoid | | | |
| 103 | | ABS motor monitor | ABS motor operating (CONSULT set in active test mode) | Power supply voltage (approx. 12V) | ABS motor monitor circuit |
| | | | ABS motor not operating (ignition switch turned ON) | Approx. 0V | |
| 107 109 112 116 117 118 119 | | Ground | — | | Control unit ground circuit |
| 108 | | ABS actuator relay monitor | Actuator relay operating (Engine operating) | Power supply voltage (approx. 12V) | ABS warning lamp and circuit; ABS actuator relay monitor circuit |
| | | | Actuator relay not operating (Fail-safe system operating and before engine starts) | Approx. 0V | |
| 111 | | Battery | Ignition switch ON | Power supply voltage (approx. 12V) | Control unit power supply circuit |
| 113 | Body ground | ETS motor monitor | Actuator motor operating | Power supply voltage (approx. 12V) | E-TS motor, motor relay and circuits |
| | | | Actuator motor not operating | Approx. 0V | |

## Control Unit Input/Output Signal Specifications (Cont'd)

| Terminal No. + | Terminal No. − | Item | Specifications*1 | | Check item (Reference) |
|---|---|---|---|---|---|
| 114 | Body ground | Fail-safe solenoid | Engine operating | Approx. 2V or less | Fail-safe solenoid and circuit |
| 115 | Body ground | ETS solenoid | Vehicle at rest with engine at idle | Power supply voltage (approx. 12V) | E-TS actuator relay, solenoid and circuits |
| 120 | Body ground | LSD solenoid | Vehicle at rest with engine at idle | Power supply voltage (approx. 12V) | A-LSD actuator relay, solenoid and circuits |
| 1 | 18 | G sensor power supply 1 | Ignition switch ON (vehicle at rest on flat surface) | Approx. 8V (for reference) | G sensor and circuit |
| 2 | Body ground | ABS motor relay | ABS motor operating (CONSULT set in active test mode) | Approx. 2V or less | ABS motor, motor relay and circuits |
| | | | ABS motor not operating (ignition switch ON) | Power supply voltage (approx. 12V) | |
| 5, 6 | 16 | FR & RR G sensor 2, Side G sensor | Ignition switch ON (with vehicle at rest on flat surface) | Approx. 2.5V (Reference) | G sensor and circuit |
| 7 | 18 | FR & RR G sensor 1 | Ignition switch ON (with vehicle at rest on flat surface) | Approx. 2.5V (Reference) | G sensor and circuit |
| 8 | 19 | Front right wheel sensor | Vehicle operating at approx. 30 km/h*4 | Pulse signal emitted at 200 Hz per second | Wheel sensor and circuit |
| 10 | 21 | Rear right wheel sensor | | | |
| 12 | 16 | G sensor power supply 2 | Ignition switch ON (with vehicle at rest on flat surface) | Approx. 8V (Reference) | G sensor and circuit |
| 13 | Body ground | ABS actuator relay | Actuator relay operating (Engine operating) | Less than approx. 2V | ABS actuator relay and circuit |
| | | | Actuator relay not operating (Fail-safe system operating and before engine starting) | Battery voltage (approx. 12V) | |
| 14 | Body ground | ABS warning lamp*3 | ABS warning lamp ON | Approx. 0V | ABS warning lamp and circuit |
| | | | ABS warning lamp OFF | Battery voltage (approx. 12V) | |
| 20 | 9 | Front left wheel sensor | Vehicle operating at approx. 30 km/h*4 | Pulse signal emitted at 200 Hz per second | Wheel sensor and circuit |
| 22 | 11 | Rear left wheel sensor | | | |
| 23 | Body ground | Throttle position sensor | Accelerator pedal fully depressed | Approx. 4.0V | Throttle position sensor and circuit |
| | | | Accelerator pedal fully released | Approx. 0.5V | |
| 26 | Body ground | Reverse lamp signal | Vehicle moving backward | Battery voltage (approx. 12V) | Reverse lamp and circuit |
| | | | Vehicle moving forward or turning | Approx. 0V | |
| 29 | Body ground | E-TS MOTOR RELAY | Ignition switch ON | Battery voltage (approx. 12V) | E-TS motor, motor relay and circuits |
| 31 | Body ground | E-TS actuator relay | Vehicle at rest with engine at idle | Less than approx. 2V | E-TS actuator relay and circuit |
| 32 | Body ground | 4WD warning lamp*2 | 4WD warning lamp ON | Approx. 0V | 4WD warning lamp and circuit |
| | | | 4WD warning lamp OFF | Battery voltage (approx. 12V) | |

## Control Unit Input/Output Signal Specifications (Cont'd)

| Terminal No. + | Terminal No. − | Item | Specifications*1 | | Check item (Reference) |
|---|---|---|---|---|---|
| 33 | 44 | Front torque meter | Torque meter indications | | Front torque meter |
| | | | 0 kg-m | Approx. 0.6V | |
| | | | 30 kg-m | Approx. 3.5V | |
| 36 | Body ground | Oil pressure unit pressure switch | E-TS motor not operating | Approx. 5V | Pressure switch and circuit |
| | | | E-TS motor operating | Approx. 0V | |
| 40 | | Stop lamp signal | Brake pedal depressed | Battery voltage (approx. 12V) | Stop lamp switch and circuit |
| | | | Brake pedal released | Approx. 0V | |
| 42 | | A-LSD actuator relay | Vehicle at rest with engine at idle | Less than approx. 2V | A-LSD actuator relay and circuit |
| 43 | | LSD warning lamp | LSD warning lamp ON | Approx. 0V | A-LSD warning lamp and circuit |
| | | | LSD warning lamp OFF | Battery voltage (approx. 12V) | |

*1: Do not forcefully expand connector terminals to check voltage using circuit tester or voltmeter.
*2: 4WD warning lamp ON-OFF timing
ON: Ignition switch ON (before engine starts) or abnormalities detected.
OFF: After engine starts (with system operating in normal condition)
*3: ABS warning lamp ON-OFF timing
ON: Ignition switch ON (before engine starts) or abnormalities detected
OFF: After engine starts (with system operating in normal condition)
*4: Make sure that tires are inflated to specified pressure.
*5: LSD warning lamp ON-OFF timing
ON: Ignition switch ON (before engine starts) or abnormalities detected
OFF: After engine starts (with system operating in normal condition)

## Control Unit Input/Output Signal Specifications (Cont'd)

### USING CONSULT

Indicated are the control unit computed data. If the output circuit (harness) should be open or short-circuited, correct values may be displayed.

| Display | Monitor item | Data monitor | | | Check item (reference) |
|---|---|---|---|---|---|
| | | Condition | | Specifications | |
| WHEEL SENSOR [km/h] | Wheel speed | Vehicle at rest | | 0 km/h | Wheel sensor system and circuit |
| | | Vehicle operating*1 | | Identical to speedometer indication | |
| FF & RR G-SENSOR 1 [G] | G sensor operating condition | Vehicle at rest on flat surface | | Within ±0.15G | FR & RR G sensors and circuits |
| FF & RR G-SENSOR 2 [G] | | | | | |
| SIDE G-SENSOR [G] | | | | R or L: 0.5G or less | Side G sensor and circuit |
| THRTL POS SEN [V] | Throttle positioning condition | Accelerator pedal fully released | | Approx. 0.5V | Throttle position sensor and circuit |
| | | Accelerator pedal fully depressed | | Approx. 4.0V | |
| STOP LAMP SW [ON-OFF] | Brake pedal operating condition | Brake pedal depressed | | ON | Stop lamp and circuit |
| | | Brake pedal released | | OFF | |
| ENG RPM SIGNAL [STOP-RUN] | Engine operating condition | Engine operating at a speed of less than 400 rpm | | STOP | Engine speed signal circuit |
| | | Engine operating at a speed of 400 rpm or above | | RUN | |
| PRESSURE SW [ON-OFF] | Pressure switch operating condition | ATTESA E-TS PRO actuator motor operating | | ON | Pressure switch and circuit |
| | | ATTESA E-TS PRO actuator motor not operating | | OFF | |
| AIR BLEED SW [ON-OFF] | Air bleed switch ON-OFF condition | Ignition switch ON | Air bleed switch removed | ON | Air bleed switch and circuit |
| | | | Air bleed switch installed | OFF | |
| OIL LEVEL SW [ON-OFF] | Oil level switch ON-OFF condition | ATTESA E-TS PRO hydraulic oil | Oil level within specified range | ON | Oil level switch and circuit |
| | | | Oil level too low | OFF | |
| OUT ABS SOLENOID [ON-OFF] | Solenoid operating condition | Actuator (solenoid) operating with (CONSULT set in active test mode) or actuator relay not operating (fail-safe system operating and before engine starts) | | ON | ABS solenoid and circuit |
| IN ABS SOLENOID [ON-OFF] | | Actuator (solenoid) not operating and actuator relay operating (with engine operating and with vehicle at rest) | | OFF | |
| ETS SOLENOID [A] | E-TS solenoid operating condition | Vehicle at rest | Ignition switch ON | Approx. 0A | E-TS actuator relay solenoid and circuit |
| | | | Engine at idle | Approx. 0.2A | |
| LSD SOLENOID [A] | A-LSD solenoid operating condition | Vehicle at rest | Ignition switch ON | 0A | A-LSD actuator relay solenoid and circuit |
| | | | Engine at idle | Approx. 0.2A | |

## Control Unit Input/Output Signal Specifications (Cont'd)

| Display | Monitor item | Data monitor | | | Check item (reference) |
|---|---|---|---|---|---|
| | | Condition | | Specifications | |
| ETS F/S VALVE [A] | E-TS fail-safe solenoid operating condition | Vehicle at rest | Ignition switch ON | 0A | E-TS fail-safe solenoid and circuit |
| | | | Engine at idle | Approx. 0.7A | |
| ABS ACTUATOR RELAY [ON-OFF] | Actuator relay operating condition | Vehicle at rest | Ignition switch ON | OFF | ABS actuator relay and circuit |
| | | | Engine operating | ON | |
| ABS MOTOR RELAY [ON-OFF] | Motor and motor relay operating condition | Ignition switch ON or engine operating | ABS not operating | OFF | ABS motor, motor relay and circuits |
| | | | ABS operating | ON | |
| ETS/LSD MOTOR [ON-OFF] | ATTESA E-TS PRO actuator operating condition | ATTESA E-TS PRO actuator motor not operating | | OFF | ATTESA E-TS PRO actuator motor relay and circuit |
| | | ATTESA E-TS PRO actuator motor operating | | ON | |
| ETS/LSD RELAY [ON-OFF] | ATTESA E-TS PRO actuator relay operating condition | ATTESA E-TS PRO actuator motor not operating | | OFF | |
| | | ATTESA E-TS PRO actuator motor operating | | ON | |
| ETS ACTUATOR [ON-OFF] | E-TS actuator relay operating condition | Ignition switch ON and engine not operating | | OFF | E-TS actuator relay and circuit |
| | | Engine operating | | ON | |
| WARNING LAMP [ON-OFF] | ABS warning lamp ON operation*2 | ABS warning lamp ON | | ON | ABS warning lamp |
| | | ABS warning lamp OFF | | OFF | |
| G-SEN VOLT 1 [V]<br>G-SEN VOLT 2 [V] | Battery voltage furnished to G sensor | Ignition switch ON | | Approx. 8V (Reference) | G sensor power supply circuit |
| BATTERY VOLT [V] | Battery voltage furnished to control unit | | | Approx. 12V (Battery voltage) | Control unit power supply circuit |

*1: Make sure that tires are inflated to specified pressure.
*2: ABS warning lamp ON-OFF timing:
ON: Ignition switch ON (before engine starts) or abnormalities detected
OFF: After engine starts (system operating in normal condition)

## Precautions for Trouble Diagnosis

- After performing trouble diagnosis, be sure to erase trouble stored in memory. Refer to "CONSULT" (next page) or "SELF-DIAGNOSIS" (BR-21).
- As for the concerns that are difficult to duplicate, move harnesses or harness connectors by hand to check if there is any poor mating of connector halves or faulty connection.
- Do not force to open a connector terminal when using a circuit tester for inspection.
- Read GI section thoroughly in advance and make sure of all the general precautions.

## Basic Inspection

### BASIC INSPECTION 1 — Brake fluid level and leakage

1. Check brake fluid level in reservoir tank. Replenish brake fluid if necessary.
2. Check for leakage at or around brake piping and ABS actuator. If leakage or seepage is noted, proceed as follows:

- If ABS actuator connectors are loose, tighten to specified torque. Recheck to ensure that leakage is no longer present.
- If flare nut threads at piping connectors or actuator threads are damaged, replace faulty parts with new ones. Recheck to ensure that leakage is no longer present.
- If brake fluid leaks through areas other than actuator connectors, wipe off using a clean cloth. Recheck for leakage or seepage. If necessary, replace faulty parts with new ones.
- If brake fluid leaks at or seeps through ABS actuator, wipe off using a clean cloth. Recheck for leakage or seepage. If necessary, replace ABS actuator with new one.
- Make sure that oil level (ATTESA E-TS PRO system) and oil pressure are correct, Also check that system is free from oil leakage and abnormalities.

**CAUTION:**
**ABS actuator cannot be disassembled. Do not attempt to disassemble it.**

- Make sure that battery cables are securely connected to their terminals (positive and ground), and that battery case grounding is tight. If necessary, tighten to specified torque. Check that battery voltage is not lower than specifications.

### BASIC INSPECTION 2 — Loose power line terminal

Check battery terminals (positive and negative) and battery mounting (ground) for looseness.

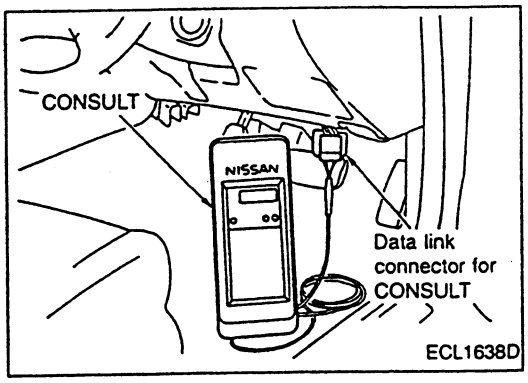
### BASIC INSPECTION 3 — ABS warning lamp

1. Turn ignition switch "ON" to ensure that ABS warning lamp lights up. If ABS warning lamp does not light, check ABS warning lamp circuit.
2. Make sure that A-LSD warning lamp illuminates when ignition switch is turned ON. If it does not illuminate, Check A-LSD warning lamp and related circuit.
3. Make sure that 4WD warning lamp illuminates when ignition switch is turned ON. If it does not illuminate, Check 4WD warning lamp and related circuit.
4. Make sure that the 4WD, A-LSP and ABS warning lamps go out approximately 1 second after engine has started. If any of the warning lamps do not go out, perform self-diagnostic procedures for related system(s).
5. After driving vehicle at approx. 30 km/h for approx. 1 minute, check to ensure that 4WD warning lamp, A-LSD warning lamp and ABS warning lamp remain off. If ABS warning lamp lights, perform self-diagnosis procedures.
6. After performing self-diagnosis procedures, be sure to erase trouble stored in memory.

## CONSULT

### CONTROL UNIT PART NUMBER

The part number that is shown on the control unit label and CONSULT: 47850 AA410




### SELF-DIAGNOSIS PROCEDURE

1. Collect information on the concern from the customer, and then perform basic inspections.
2. Turn ignition switch OFF and connect CONSULT connector to data link connector for CONSULT on the vehicle.
3. Start engine and drive vehicle at approx. 30 km/h for approx. 1 minute.
4. Stop vehicle and touch "START", "ABS" and "SELF-DIAG RESULTS" sequentially on the CONSULT screen with engine running.

- **If "START" is touched immediately after engine is started or ignition switch is turned on, "ABS" may not be displayed on "SELECT SYSTEM" screen. To display "ABS", repeat the self-diagnosis procedure from the beginning.**

5. Self-diagnosis results are displayed on the screen. (Touch "PRINT" to print out the self-diagnosis results, if necessary.)

- If "NO FAIL" is displayed, inspect 4WD, A-LSD and ABS warning lamps. Refer to the previous page.

6. Perform appropriate inspection from the self-diagnostic results mode and repair or replace faulty parts.
7. Start engine and drive vehicle at approx. 30 km/h for approx. 1 minute.

- **Recheck to ensure that there is no other malfunction.**

8. Turn ignition switch OFF to prepare for erasing the trouble stored in memory.
9. Start engine and touch "START", "ABS", "SELF-DIAG RESULTS" and "ERASE" sequentially on the CONSULT screen to erase the trouble stored in memory.

- **If the trouble stored in memory is not erased, repeat step 6.**

10. Drive vehicle at approx. 30 km/h for approx. 1 minute and then confirm that 4WD, A-LSD and ABS warning lamps are off.

## CONSULT (Cont'd)

### SELF-DIAGNOSTIC RESULTS MODE

| Diagnostic item | Diagnostic item is detected when... | Check item |
|---|---|---|
| FR RH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when front right wheel sensor circuit is open or signal power supply circuit is shorted. | Wheel sensor and circuit |
| FR LH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when front left wheel sensor circuit is open or signal power supply circuit is shorted. | |
| RR RH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when rear right wheel sensor circuit is open or signal power supply circuit is shorted. | |
| RR LH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when rear left wheel sensor circuit is open or signal power supply circuit is shorted. | |
| FR RH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when front right wheel sensor circuit is shorted, signal circuit is shorted to ground or front right wheel sensor-to-rotor clearance is abnormally wide. | |
| FR LH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when front left wheel sensor circuit is shorted, signal circuit is shorted to ground or front left wheel sensor-to-rotor clearance is abnormally wide. | |
| RR RH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when rear right wheel sensor circuit is shorted, signal circuit is shorted to ground or rear right wheel sensor-to-rotor clearance is abnormally wide. | |
| RR LH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when rear left wheel sensor circuit is shorted, signal circuit is shorted to ground or wheel sensor-to-rotor clearance is abnormally wide. | |
| FR RH IN ABS SOL / FR RH OUT ABS SOL [OPEN] | • Output terminal voltage is abnormally lower than controlled value when either front right wheel ABS solenoid circuit is open or control circuit is shorted to ground. | ABS solenoid and circuit |
| FR LH IN ABS SOL / FR LH OUT ABS SOL [OPEN] | • Output terminal voltage is abnormally lower than controlled value when either front left wheel ABS solenoid circuit is open or control circuit is shorted to ground. | |
| REAR IN ABS SOL / REAR OUT ABS SOL [OPEN] | • Output terminal voltage is abnormally lower than controlled value when either rear wheel ABS solenoid circuit is open or control circuit is shorted to ground. | |
| FR RH IN ABS SOL / FR RH OUT ABS SOL [SHORT] | • Output terminal voltage is abnormally higher than controlled value when either front right wheel ABS solenoid circuit is shorted or control circuit is shorted to power supply circuit. | |
| FR LH IN ABS SOL / FR LH OUT ABS SOL [SHORT] | • Output terminal voltage is abnormally higher than controlled value when either front left wheel ABS solenoid circuit is shorted or control circuit is shorted to power supply circuit. | |
| REAR IN ABS SOL / REAR OUT ABS SOL [SHORT] | • Output terminal voltage is abnormally higher than controlled value when either rear wheel ABS solenoid circuit is shorted or control circuit is shorted to power supply circuit. | |
| ABS MOTOR [ON FAILURE] | • While ABS motor is being controlled to be set to OFF, it turns ON. | ABS motor, motor relay and circuit |
| ABS MOTOR [OFF FAILURE] | • While ABS motor is being controlled to be set to ON, it turns ON. | |

## CONSULT (Cont'd)

| Diagnostic item | Diagnostic item is detected when... | Check item |
|---|---|---|
| ABS ACTUATOR RELAY [ON FAILURE] | • While ABS actuator relay is being controlled to set to OFF, it turns ON. | ABS actuator relay and circuit |
| ABS ACTUATOR RELAY [OFF FAILURE] | • While ABS actuator relay is being controlled to set to ON, it turns OFF. | |
| BATTERY VOLTAGE [VB-HIGH] | • ATTESA E-TS PRO/ABS control unit power supply voltage is abnormally high. | Control unit power supply circuit |
| BATTERY VOLTAGE [VB-LOW] | • ATTESA E-TS PRO/ABS control unit power supply voltage is abnormally low. | |
| FR & RR G-SEN 1 [ABNORMAL] | •FR & RR G sensor 1 output is abnormally higher or lower than specifications. | G sensor and circuit |
| FR & RR G-SEN 2 [ABNORMAL] | • FR & RR G sensor 2 output is abnormally higher than specifications. | G sensor and circuit |
| FR & RR G-SEN 1, 2 [ABNORMAL] | • Output voltage difference between FR & RR G sensors 1 and 2, which is abnormally higher than specified value, has continued for a certain period. | |
| G-SEN VOLT 1 [ABNORMAL] | • FR & RR G sensor 1 power supply voltage, which is abnormally higher than, or lower than specifications, has continued for a certain period of time. | |
| G-SEN VOLT 2 [ABNORMAL] | • FR & RR G sensor 2 power supply voltage, which is abnormally higher than, or lower than specifications, has continued for a certain period of time. | |
| SIDE G-SENSOR [ABNORMAL] | • Side G sensor output voltage, which is abnormally higher than, or lower than specifications, has continued for a certain period of time. | |
| AIR BLEED SW | • Air bleed switch has been turned ON for a certain period of time during vehicle operation. | Air bleed switch and circuit |
| THROTTLE POSI SEN | • Throttle position sensor signal voltage, which is 0V or abnormally higher than specifications, has continued for a certain period of time. | Throttle position sensor and circuit |
| OIL LEVEL SW | • Oil level switch has been turned OFF (oil level too low) for a certain period of time. | Oil level switch and circuit |
| PRESSURE SW [ON FAILURE] | • Pressure switch has been turned ON for an extended period of time. | Pressure switch and circuit |
| PRESSURE SW [OFF FAILURE] | • Pressure switch has been turned OFF for an extended period of time although current flows through E-TS solenoid or A-LSD solenoid. Or, it has been turned OFF only for a short period of time (due to pressure switch in dummy contact with other parts (dummy circuit setup) or gas pressure drop). | |
| ETS/LSD MOTOR [ON FAILURE] | • While ATTESA E-TS PRO actuator motor is being controlled to be set to OFF, actuator motor control terminal voltage does not become 0V (ground potential). (E-TS motor relay is ON all the time, motor circuit is open, etc.) | ATTESA E-TS PRO actuator motor and circuit |
| ETS/LSD MOTOR [OFF FAILURE] | • While ATTESA E-TS PRO actuator is being controlled to be set to ON, actuator motor control terminal voltage is not present. | |
| ETS SOLENOID [OPEN] | • Specified voltage is not applied to E-TS solenoid control terminal (open solenoid circuit, etc.). | E-TS relay, solenoid and circuits |
| ETS SOLENOID [SHORT] | • E-TS solenoid control terminal voltage is abnormal (shorted E-TS solenoid circuit, etc.). | |
| ETS SOLENOID [ABNORMAL] | • Current flow through E-TS solenoid is abnormally larger or smaller than specifications. | |

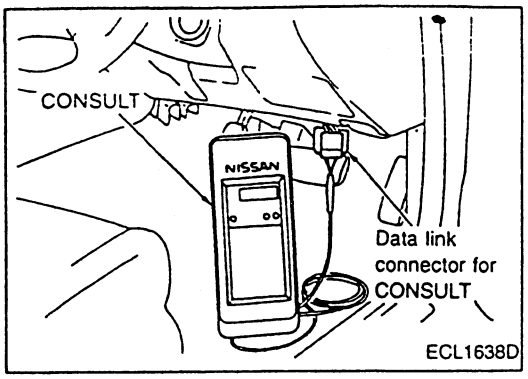
## CONSULT (Cont'd)

| Diagnostic item | Diagnostic item is detected when... | Check item |
|---|---|---|
| LSD SOLENOID [OPEN] | • Specified voltage is not applied to A-LSD solenoid control terminal (open solenoid circuit, etc.). | A-LSD relay, solenoid and circuits |
| LSD SOLENOID [SHORT] | • A-LSD solenoid control terminal voltage is abnormally high or low (shorted solenoid circuit, etc.). | |
| LSD SOLENOID [ABNORMAL] | • Current flow through A-LSD solenoid is abnormally larger or smaller than specifications. | |
| ETS F/S VALVE [OPEN] | • E-TS fail-safe valve control terminal voltage is abnormally high or low (open fail-safe valve circuit, etc.). | E-TS fail-safe system, solenoid and circuits |
| ETS F/S VALVE [SHORT] | • E-TS fail-safe valve control terminal voltage is abnormally high or low (shorted fail-safe valve circuit, etc.). | |
| ETS F/S VALVE [ON FAILURE] | • While E-TS fail-safe valve is being controlled to be set to OFF, it turns ON. | |
| CONTROL UNIT | • Abnormalities occur in E-TS/ABS control unit process function. | Control unit power supply circuit |
| ABS MOTOR [ABNORMAL WHEEL LOCKING] | • ABS motor speed is abnormally low. | ABS motor, motor relay and circuits |

NOTE:

- All of the 4WD, A-LSD and ABS warning lamps illuminate. "Self-diagnosis could not detect any malfunctions" can sometimes appear on CONSULT display as a diagnostic result. When it occurs, check engine speed signal circuit.
- If "ABS" does not appear on system selection screen, check ATTESA E-TS PRO/ABS control unit for improper operation and diagnosis connector circuit condition. Also confirm that CONSULT card No. is suitable for use with ATTESA E-TS PRO/ABS system.

## CONSULT (Cont'd)




### DATA MONITOR PROCEDURE

- Refer to CONSULT Instruction Manual for details on data monitor function.

1. Turn ignition switch OFF.
2. Connect CONSULT connector to data link connector for CONSULT.
3. Turn ignition switch ON.
4. Touch "START" on CONSULT screen.
5. Touch "ABS" on CONSULT screen.

- **If "START" is touched immediately after engine is started or ignition switch is turned on, "ABS" may not be displayed on "SELECT SYSTEM" screen. To display "ABS", repeat the data monitor procedure from the beginning.**

6. Touch "DATA MONITOR".
7. Touch "SETTING" to set recording condition.
8. Touch "LONG TIME" and then "ENTER".
9. Return to "SELECT MONITOR ITEM" screen and touch "ALL SIGNALS".
10. Touch "START".
11. Display data monitor.
12. If necessary, sequentially touch "REC START", "REC STOP", "DATA DISPLAY", "NUMBER PRINT" and "PRINT" to print out the data.

## CONSULT (Cont'd)

### DATA MONITOR MODE

| Display | Select monitor item | | | Remarks |
|---|---|---|---|---|
| | ECM input signals | All signals | Selection from menu | |
| FR RH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from front right wheel sensor signal, appears on display. |
| FR LH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from front left wheel sensor signal, appears on display. |
| RR RH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from rear right wheel sensor signal, appears on display. |
| RR LH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from rear left wheel sensor signal, appears on display. |
| FR & RR G SEN1 [+/–] [G] | ○ | ○ | ○ | G value, which is processed from FR & RR G sensor 1 signal, appears on display. |
| FR & RR G SEN2 [+/–] [G] | ○ | ○ | ○ | G value, which is processed from FR & RR G sensor 2 signal, appears on display. |
| SIDE G SEN [L/R] [G] | ○ | ○ | ○ | G value, which is processed from side G sensor signal, appears on display. |
| THRTL POS SEN [V] | ○ | ○ | ○ | Signal voltage sent from throttle position sensor appears on display. |
| STOP LAMP SW [ON-OFF] | ○ | ○ | ○ | Stop lamp switch ON-OFF condition appears on display. |
| ENG SPEED SIG [STOP/RUN] | ○ | ○ | ○ | Engine speed, which is based on camshaft position sensor signal, appears on display. |
| PRESSURE SW [ON/OFF] | ○ | ○ | ○ | Pressure switch ON-OFF condition, which is determined from pressure switch signal, appears on display. |
| AIR BLEED SW [ON-OFF] | ○ | ○ | ○ | Air bleed switch ON-OFF condition, which is determined from air bleed switch signal, appears on display. |
| OIL LEVEL SW [ON-OFF] | ○ | ○ | ○ | Oil level switch ON-OFF condition, which is determined from oil level switch signal, appears on display. |
| F/R IN SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front right wheel IN ABS solenoid appears on display. |
| F/R OUT SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front right wheel OUT ABS solenoid appears on display. |
| F/L IN SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front left wheel IN ABS solenoid appears on display. |
| F/L OUT SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front left wheel OUT ABS solenoid appears on display. |
| REAR IN SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of rear wheel IN ABS solenoid appears on display. |
| REAR OUT SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of rear wheel OUT ABS solenoid appears on display. |
| ETS SOLENOID [A] | — | ○ | ○ | Current flow through E-TS solenoid appears on display. |
| LSD SOLENOID [A] | — | ○ | ○ | Current flow through A-LSD solenoid appears on display. |
| ETS F/S VALVE | — | ○ | ○ | Control condition (ON-OFF) of E-TS fail-safe valve appears on display. |
| ABS ACTUATOR [ON-OFF] | — | ○ | ○ | ABS actuator relay condition (ON-OFF) appears on display. |
| ABS MOTOR [ON-OFF] | — | ○ | ○ | ABS motor relay condition (ON-OFF) appears on display. |
| ETS/LSD MOTOR [ON-OFF] | — | ○ | ○ | ATTESA E-TS PRO actuator condition (ON-OFF) appears on display. |

## CONSULT (Cont'd)

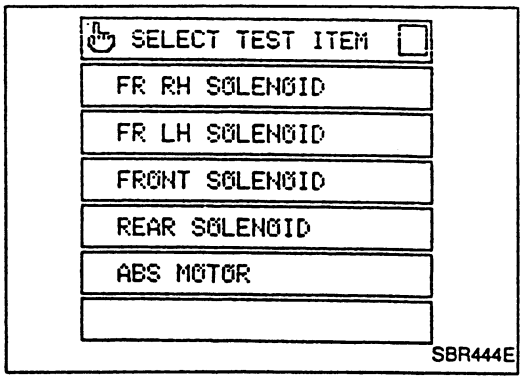
| Display | Select monitor item | | | Remarks |
|---|---|---|---|---|
| | ECM input signals | All signals | Selection from menu | |
| ETS/LDS RELAY [ON-OFF] | — | — | ○ | ATTESA E-TS PRO actuator motor relay condition (ON-OFF) appears on display. |
| ETS ACTUATOR [ON-OFF] | — | — | ○ | E-TS actuator relay condition (ON-OFF) appears on display. |
| LSD ACTUATOR RELAY [ON-OFF] | — | — | ○ | A-LSD actuator relay condition (ON-OFF) appears on display. |
| WARNING LAMP [ON-OFF] | — | ○ | ○ | Control condition of ABS warning lamp appears on display. |
| G-SEN VOLT1 [V] | ○ | — | ○ | Voltage furnished from ATTESA E-TS PRO/ABS control unit appears on display. |
| G-SEN VOLT2 [V] | ○ | — | ○ | Voltage furnished from ATTESA E-TS PRO/ABS control unit appears on display. |
| BATTERY VOLT [V] | ○ | — | ○ | Voltage furnished from ATTESA E-TS PRO/ABS control unit appears on display. |
| VOLTAGE [V] | — | — | ○ | Value measured with voltage probe appears on display. |
| PULSE [msec] or [Hz] or [%] | — | — | ○ | Refer to CONSULT Operation Manual. |

## CONSULT (Cont'd)

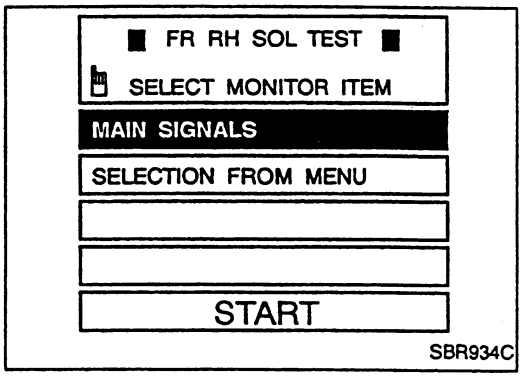
### ACTIVE TEST PROCEDURE

- When conducting Active test, vehicle must be stationary.
- Confirm that brakes have been bled completely.
- When ABS warning lamp stays on, never conduct Active test.

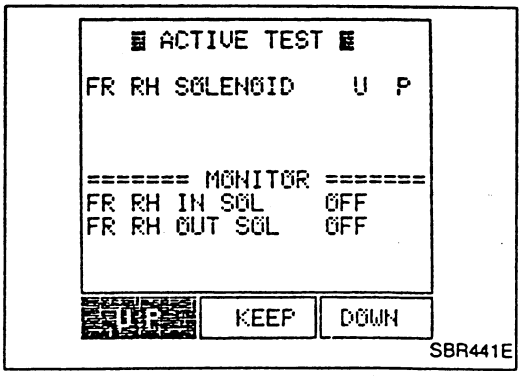
1. Connect CONSULT to Data Link Connector for CONSULT and start engine.
2. Touch "START" on CONSULT screen.
3. Touch "ABS", then "ACTIVE TEST".
4. "SELECT TEST ITEM" screen is displayed.




5. Select active test item by touching screen.




6. Touch "START" on condition that "MAIN SIGNALS" item is highlighted.



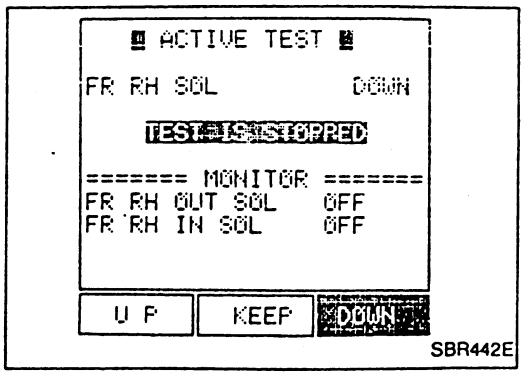

7. "ACTIVE TEST" screen is displayed.

### ABS solenoid valve

- To check that ABS solenoid valves (inlet and outlet) operate in the following manner, touch "UP", "KEEP" and "DOWN" on the screen while observing the monitor.

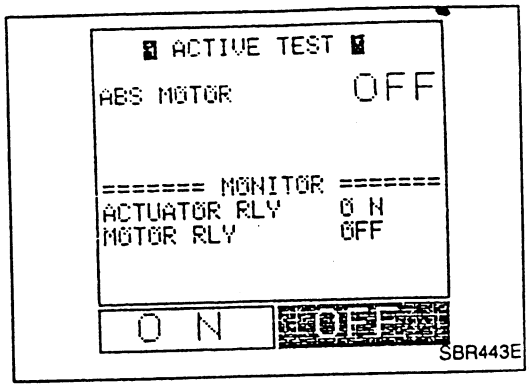
| Operation | UP | KEEP | DOWN |
|---|---|---|---|
| IN ABS S/V | OFF | ON | ON |
| OUT ABS S/V | OFF | OFF | ON* |

*: Solenoid valve stays ON for 1 to 2 seconds after touching the key, and then turns OFF.




- If the active test is conducted with brake pedal depressed, the brake pedal travel limit may change. This is a normal condition.
- "TEST IS STOPPED" message is displayed 10 seconds after the operation is started.
- If the active test needs to be performed again after "TEST IS STOPPED" is displayed, repeat step 6.

## CONSULT (Cont'd)




### ABS motor

- Touch "ON" and "OFF" on the screen to check that ABS motor relay and ABS actuator relay operate as follows:

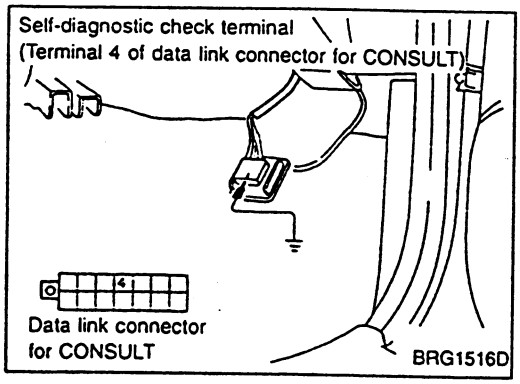
| Operation | ON | OFF |
|---|---|---|
| ABS actuator relay | ON | ON |
| ABS motor relay | ON | OFF |

- If the active test is conducted with brake pedal depressed, the brake pedal travel limit may change. This is a normal condition.
- "TEST IS STOPPED" message is displayed 10 seconds after the operation is started.

## Self-diagnosis

### DESCRIPTION

When a problem occurs in the ATTESA E-TS PRO SYSTEM, the 4WD, A-LSD and ABS warning lamps on the instrument panel come on either separately or simultaneously. To actuate the self-diagnostic results mode, ground the self-diagnostic check terminal 4 located on the data link connector for CONSULT. The ABS warning lamp, then, flashes and indicates the location of the malfunction.




### SELF-DIAGNOSIS PROCEDURE

1. Collect information on the concern from the customer, and then perform basic inspections.
2. Drive vehicle at approx. 30 km/h for approx. 1 minute.
3. Stop vehicle and start diagnosis.
4. Turn ignition switch "OFF".
5. Ground the self-diagnostic check terminal 4.
6. Turn ignition switch "ON" to start the self-diagnostic results mode.

**CAUTION:**

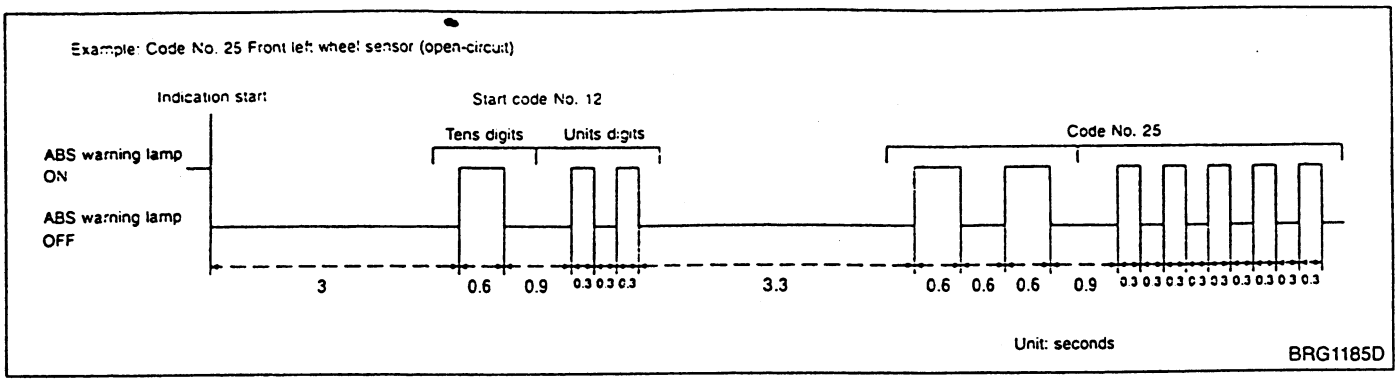
- **Keep terminal 4 grounded during self-diagnosis.**
- **Do not depress brake pedal. (Self-diagnosis would not start.)**
- **Do not start engine. (Self-diagnosis would not start.)**

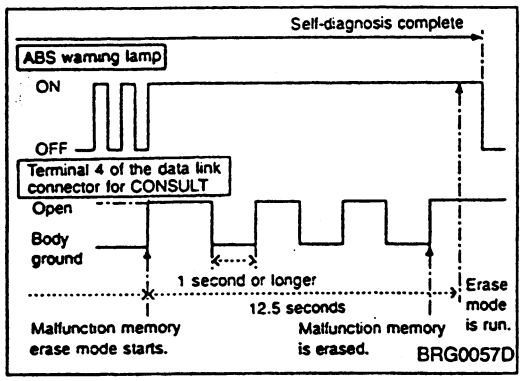
7. After 3 or 4 seconds, ABS warning lamp starts blinking to indicate the malfunction code No.
   - The indication terminates after 5 minutes. Turning the ignition switch from "OFF" to "ON" resumes blinking the indication.
8. Verify the location of the malfunction with "MALFUNCTION CODE/SYMPTOM CHART", BR-23. Then make the necessary repairs.
9. After the malfunctions are repaired, erase the malfunction codes stored in the control unit. Refer to "HOW TO ERASE SELF-DIAGNOSTIC RESULTS" on the next page.
10. Rerun the self-diagnostic results mode to verify that the malfunction codes have been erased.
11. Disconnect the check terminal from the ground. The self-diagnostic results mode is now complete.
12. Drive vehicle at approx. 30 km/h for approx. 1 minute, and then check that the ABS warning lamp is off.

### HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)

- Determine the code No. by observing the time and the frequency that the ABS warning lamp blinks ON and OFF.
- When multiple malfunctions occur at a time, up to three code numbers can be stored; the latest malfunction will be indicated first.
- The indication begins with the start code No. 12. A maximum of three code numbers appear in the order of the latest one first. The indication then returns to the start code No. 12 to repeat.
- The start code No. 12 is only indicated repeatedly when there is no malfunction.

## Self-diagnosis (Cont'd)




### HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

1. Turn the ignition switch "ON" and start the engine.
2. Drive the vehicle at approx. 30 km/h for approx. 1 minute to check that there is no other malfunction.
3. Stop the vehicle.
4. Turn the ignition switch "OFF".
5. Ground the self-diagnostic check terminal 4.
6. Turn the ignition switch "ON" to start the self-diagnostic results mode.

**CAUTION:**
**Do not depress the brake pedal during self-diagnosis. Do not start the engine. (The self-diagnosis would not start.)**

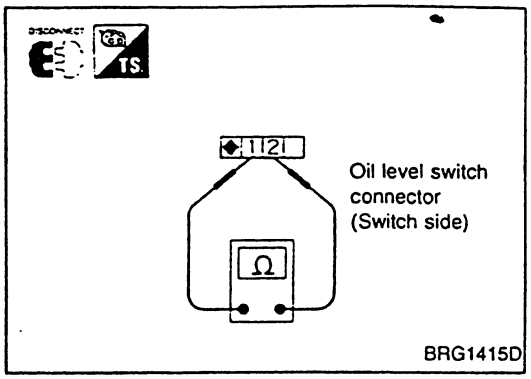
7. The ABS warning lamp starts to blink 3 or 4 seconds after the self-diagnostic results mode is started.
8. Under the self-diagnostic results mode, the malfunction memory erase mode starts when the check terminal is disconnected from the ground.
9. Ground the check terminal 3 times or more in succession within 12.5 seconds after the erase mode starts. (Each grounding must be 1 second or longer.)
10. Disconnect the grounding cable from the check terminal to erase the malfunction memory and complete the self-diagnosis. The ABS warning lamp , then, turns off.
11. Turn the ignition switch "OFF".

## Self-diagnosis (Cont'd)

### MALFUNCTION CODE/SYMPTOM CHART

| Malfunction code | Malfunctioning part | Detecting timing | | Warning lamps ON | | | Fail-safe operation |
|---|---|---|---|---|---|---|---|
| | | When starting engine | Vehicle driving | ABS | 4WD | A-LSD | |
| 21 | Front right wheel sensor (open-circuit) | ○ | ○ | ○ | ○ | ○ | ○ |
| 22 | Front right wheel sensor (short-circuit) | — | ○ | ○ | ○ | ○ | ○ |
| 25 | Front left wheel sensor (open-circuit) | ○ | ○ | ○ | ○ | ○ | ○ |
| 26 | Front left wheel sensor (short-circuit) | — | ○ | ○ | ○ | ○ | ○ |
| 31 | Rear right wheel sensor (open-circuit) | ○ | ○ | ○ | ○ | ○ | ○ |
| 32 | Rear right wheel sensor (short-circuit) | — | ○ | ○ | ○ | ○ | ○ |
| 35 | Rear left wheel sensor (open-circuit) | ○ | ○ | ○ | ○ | ○ | ○ |
| 36 | Rear left wheel sensor (short-circuit) | — | ○ | ○ | ○ | ○ | ○ |
| 41 | Front right outlet solenoid valve and circuit | ○ | ○ | ○ | — | — | ○ |
| 42 | Front right inlet solenoid valve and circuit | ○ | ○ | ○ | — | — | ○ |
| 45 | Front left outlet solenoid valve and circuit | ○ | ○ | ○ | — | — | ○ |
| 46 | Front left inlet solenoid valve and circuit | ○ | ○ | ○ | — | — | ○ |
| 55 | Rear outlet solenoid valve and circuit | ○ | ○ | ○ | — | — | ○ |
| 56 | Rear inlet solenoid valve and circuit | ○ | ○ | ○ | — | — | ○ |
| 57 | Battery voltage (ATTESA E-TS PRO/ABS control unit power supply) | ○ | ○ | ○ | — | — | ○ |
| 61 | ABS actuator motor and motor relay circuit | ○ | ○ | ○ | — | — | ○ |
| 63 | ABS actuator relay circuit | ○ | ○ | ○ | — | — | ○ |
| 64 | FR & RR G sensor 1 | ○ | ○ | ○ | ○ | ○ | ○ |
| 65 | FR & RR G sensor 2 | ○ | ○ | ○ | ○ | ○ | ○ |
| 66 | FR & RR G sensor 1 or 2 | ○ | ○ | ○ | ○ | ○ | ○ |
| 68 | G sensor voltage | ○ | ○ | ○ | ○ | ○ | ○ |
| 69 | Side G sensor voltage | ○ | ○ | ○ | ○ | ○ | ○ |
| 71 | ATTESA E-TS PRO/ABS control unit and circuit | ○ | ○ | ○ | ○ | ○ | ○ |
| 72 | Throttle position sensor | ○ | ○ | — | ○ | ○ | ○ |
| 73, 74 | E-TS/LSD actuator motor | ○ | ○ | — | ○ | ○ | ○ |
| 76, 77 | Pressure switch | ○ | ○ | — | ○ | ○ | ○ |
| 78 | Air bleed switch | ○ | ○ | — | ○* | ○* | ○ |
| 79 | Oil level switch | — | ○ | — | ○ | ○ | ○ |
| 91, 92, 93 | E-TS solenoid | ○ | ○ | — | ○ | ○ | ○ |
| 94, 95, 96 | E-TS fail-safe solenoid | ○ | ○ | — | ○ | ○ | ○ |
| 97, 98, 99 | LSD solenoid | ○ | ○ | — | ○ | ○ | ○ |

*: Normal vehicle operation is controlled although warning lamp illuminates.

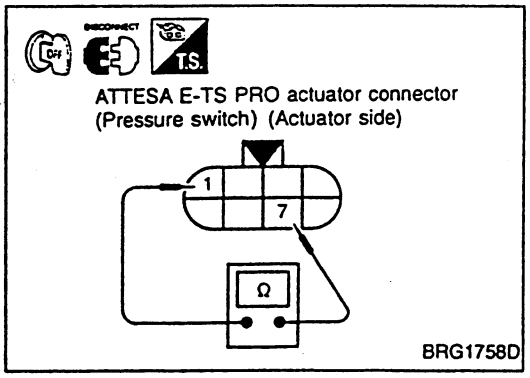



## Component Parts Inspection

### OIL LEVEL SWITCH

Remove oil level switch connector and check continuity between terminals ① and ②.

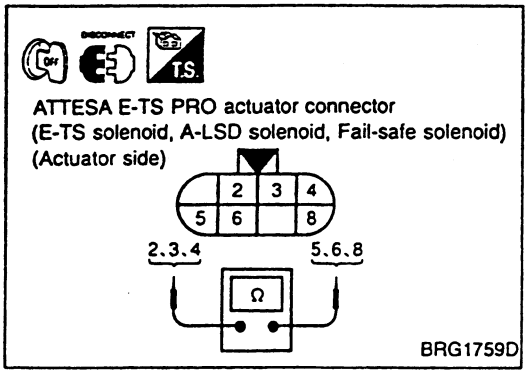
**Reservoir tank oil level is normal:**
**Continuity exists.**
**Reservoir tank oil level is too low:**
**Continuity does not exist.**




### ATTESA E-TS PRO ACTUATOR

#### Pressure switch

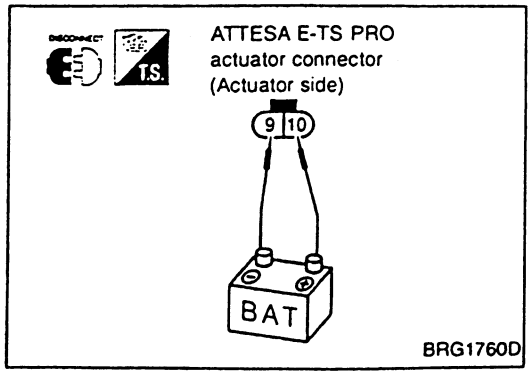
- Remove pressure switch connector and check continuity between terminals ① and ⑦.
  **Accumulator internal pressure decreasing to approximately 2.6 MPa (27.0 kg/cm²) or less:**
  **Continuity exists.**
  **Accumulator internal pressure increasing to approximately 3.8 MPa (39.0 kg/cm²):**
  **Continuity does not exist.**
- Immediately after actuator motor has stopped, accumulator internal pressure is high. Continuity does not exist.
- Accumulator internal pressure increases while actuator motor is operating. Accumulator internal pressure decreases when actuator motor is at rest.




#### E-TS solenoid, A-LSD solenoid and fail-safe solenoid

Remove connectors from E-TS, A-LSD and fail-safe solenoids. Measure resistance between individual connector terminals listed below:

**E-TS solenoid terminals ③ and ⑤ : Approx. 6Ω**
**A-LSD solenoid terminals ④ and ⑧ : Approx. 6Ω**
**Fail-safe solenoid terminals ② and ⑥ : Approx. 11Ω**



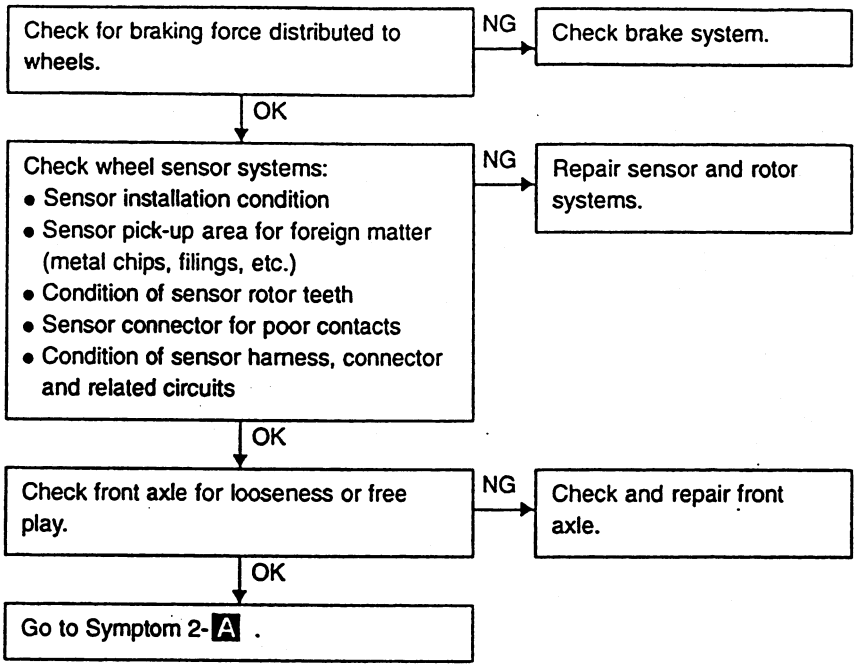

#### Motor

Remove connector from motor. Apply battery voltage across terminals ⑨ and ⑩ to make sure that motor starts.

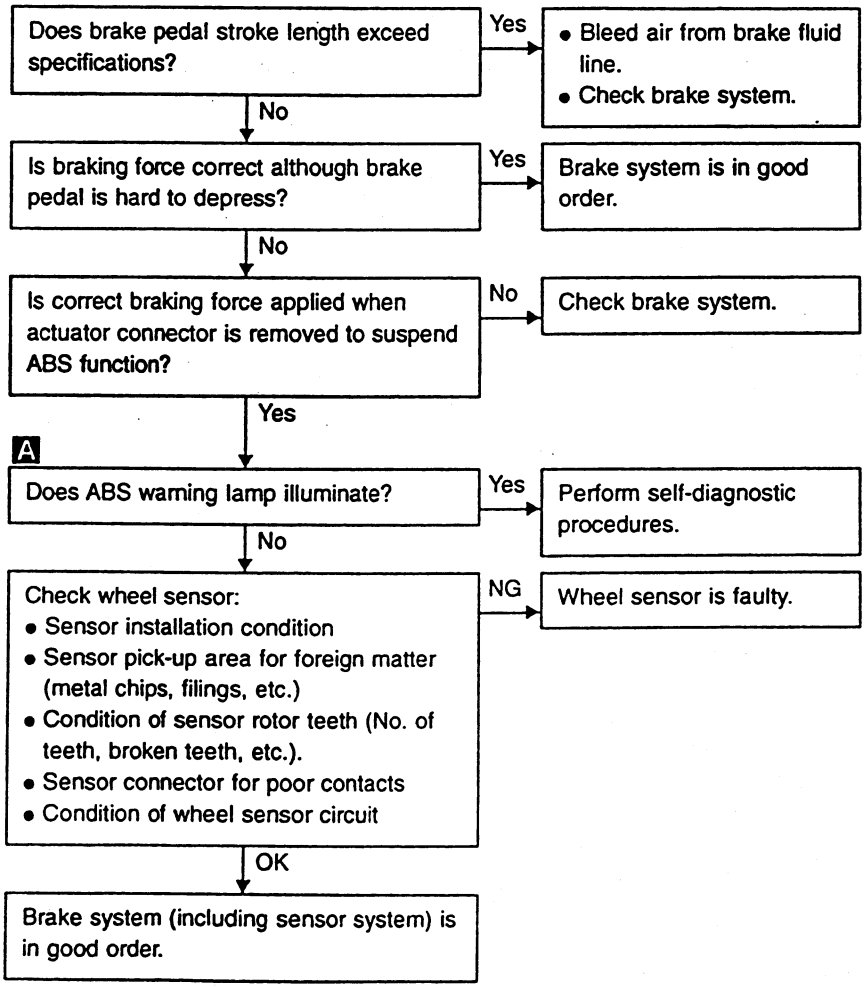
**CAUTION:**
**To avoid motor overheating, do not apply battery voltage for more than 5 seconds at a time.**

## Trouble Diagnoses by Symptom

### SYMPTOM 1 — ABS works frequently.




### SYMPTOM 2 — Unexpected pedal action



# Trouble Diagnoses by Symptom (Cont'd)

## SYMPTOM 3 — Long stopping distance

Is stopping distance longer on snow-covered or gravel roads than on paved roads?
- Yes → Stopping distance of ABS-equipped vehicle is sometimes longer than vehicle without ABS.
- No ↓

Does stopping distance still remain longer than vehicle without ABS after removing actuator connector to suspend ABS function?
- Yes → • Bleed air from brake system. • Check condition of brake system.
- No ↓

Go to Symptom 2-A .

## SYMPTOM 4 — ABS does not work.

Does ABS warning lamp illuminate?
- Yes → Perform self-diagnostic procedures to locate the cause of problem.
- No ↓

Does ABS effectively operate at speeds of less than 10 km/h only?
- No → System is in good order.
- Yes ↓

Go to Symptom 2-A .

## SYMPTOM 5 — Pedal vibration and noise

Does brake pedal vibration/noise occur during engine starting?
- Yes → Perform self-diagnostic procedures to locate the cause of problem.
- No ↓

Does brake pedal vibration/noise occur only when brake pedal is slightly depressed?
**CAUTION:**
**ABS sometimes operates under any of the following conditions where wheel speed variations occurs.**
- **During gearshift operation**
- **During clutch pedal operation**
- **Driving over bumps or gutters (50-mm high or deep) at 50 km/h or above.**
- **During standing starts immediately after starting engine (at speeds of approximately 10 km/h or above)**

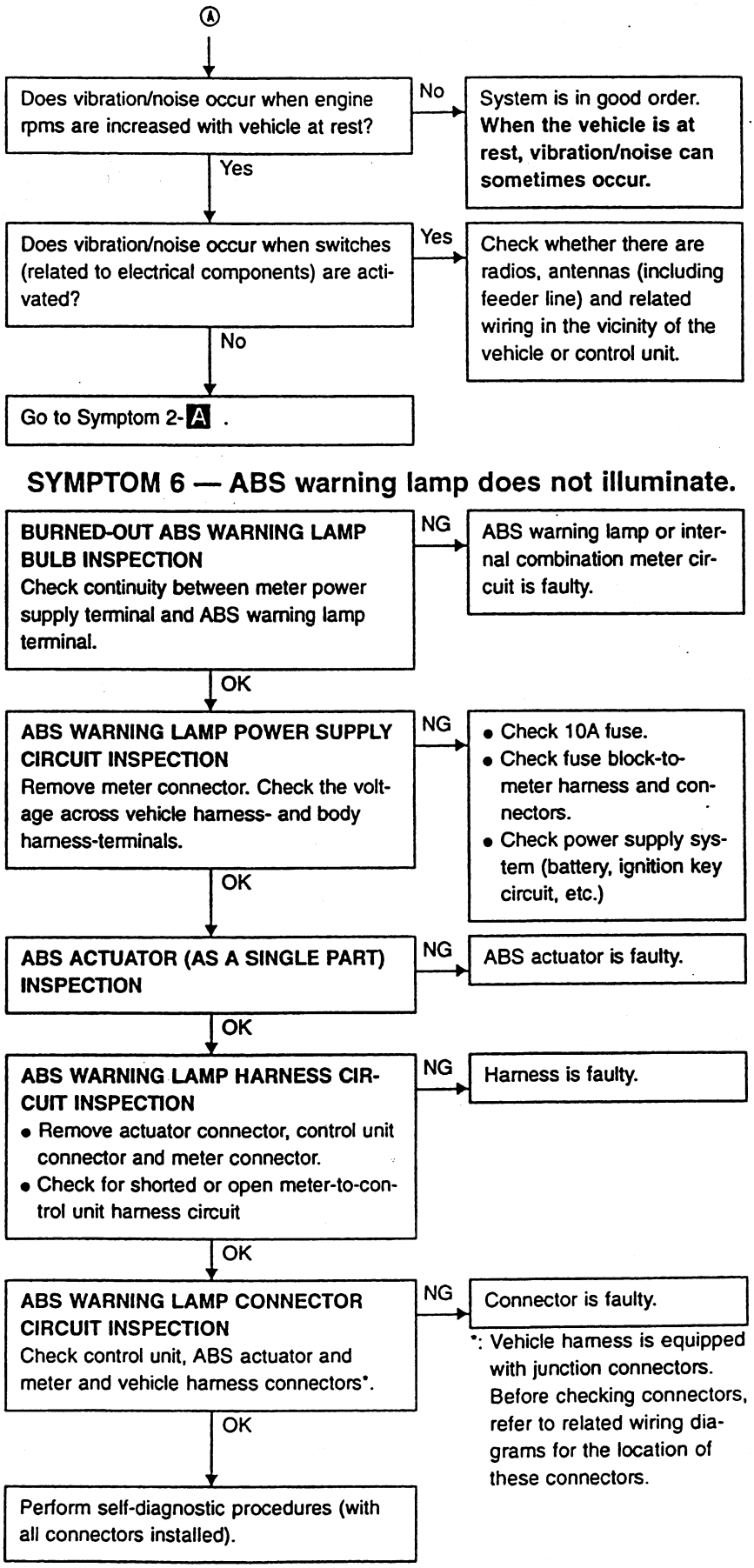
- No → System is in good order.
- Yes ↓

Does brake pedal vibration/noise occur during normal vehicle operation?
**CAUTION:**
**ABS sometimes operates except for sudden braking operation under any of the following conditions.**
- **During low "μ" road driving**
- **Turning curves at high speed**
- **Riding over bumps**

- No → System is in good order.
- Yes ↓

Ⓐ

## Trouble Diagnoses by Symptom (Cont'd)



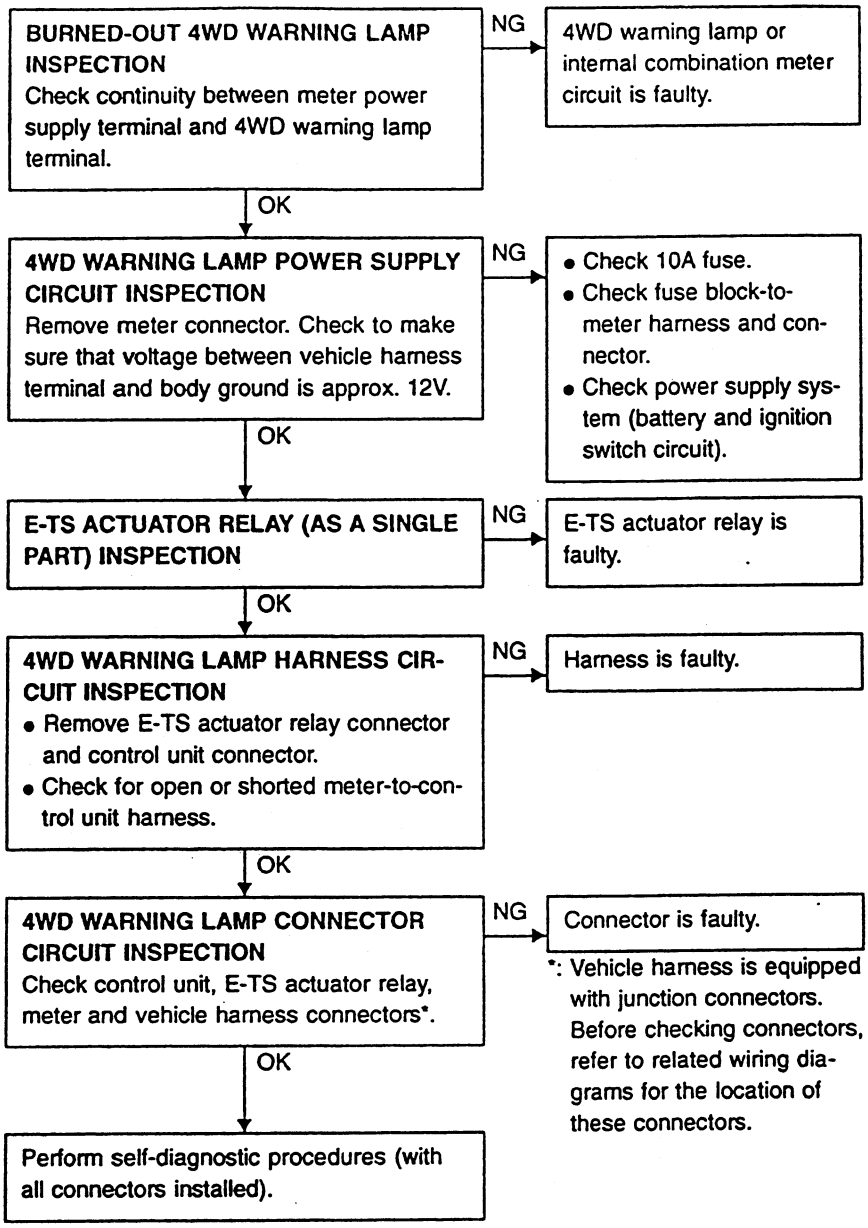

### SYMPTOM 6 — ABS warning lamp does not illuminate.




*: Vehicle harness is equipped with junction connectors. Before checking connectors, refer to related wiring diagrams for the location of these connectors.

## Trouble Diagnoses by Symptom (Cont'd)

### SYMPTOM 7 — 4WD warning lamp does not illuminate



## Trouble Diagnoses by Symptom (Cont'd)

### SYMPTOM 8 — A-LSD warning lamp does not illuminate.

**A-LSD WARNING LAMP BULB (BURNED-OUT) INSPECTION**
Check to make sure that continuity exists between meter power terminal and A-LSD warning lamp terminal.
- NG → A-LSD warning lamp or internal combination circuit is faulty.
- OK ↓

**A-LSD WARNING LAMP POWER SUPPLY CIRCUIT INSPECTION**
Remove meter connector and measure voltage across vehicle harness terminal and ground to make sure that it is approx. 12V.
- NG → • Check 10A fuse. • Check fuse block-to-meter harness and connector. • Check power supply system (battery, ignition switch circuit, etc.).
- OK ↓

**A-LSD ACTUATOR (AS A SINGLE UNIT) INSPECTION**
- NG → A-LSD actuator relay is faulty.
- OK ↓

**A-LSD WARNING LAMP HARNESS CIRCUIT INSPECTION**
- Remove A-LSD actuator relay connector, control unit connector and meter connector.
- Check for open or shorted meter-to-control unit harness.
- NG → Harness is faulty.
- OK ↓

**A-LSD WARNING LAMP CIRCUIT CONNECTOR INSPECTION**
Check connectors used with control unit, A-LSD actuator relay, meter and vehicle harness*.
- NG → Connector(s) are faulty.
- OK ↓

Install all connectors and perform self-diagnostic procedures.

*: Vehicle harness is equipped with junction connectors. Before checking connectors, refer to related wiring diagrams for the location of these connectors.

### SYMPTOM 9 — Hard to depress pedal when starting (4WD and A-LSD warning lamps remain OFF.)

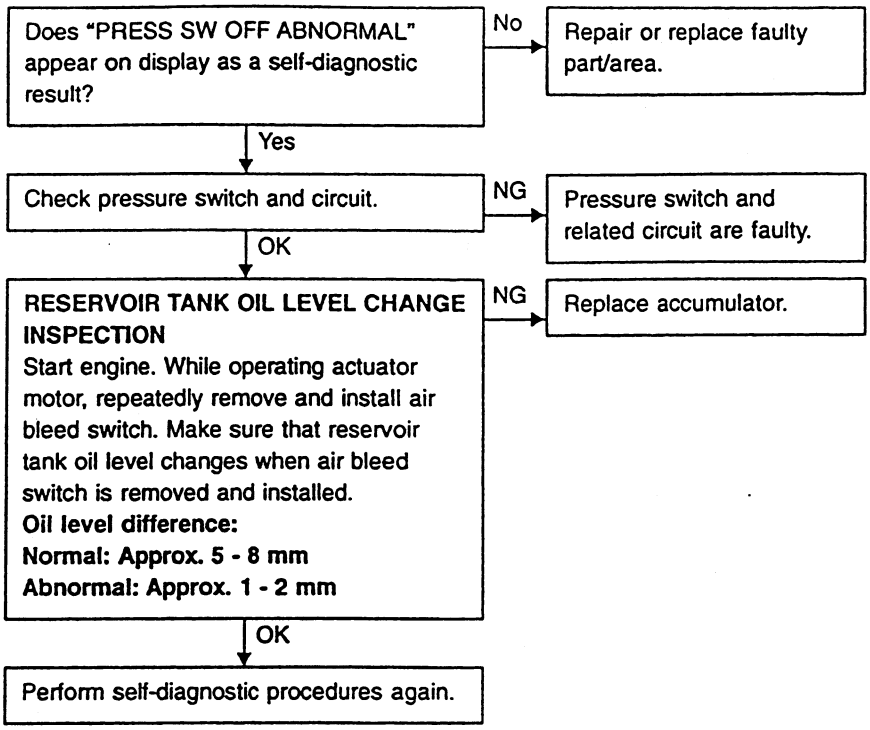
Throttle position sensor and related circuit inspection
- NG → Throttle position sensor circuit is faulty.
- OK ↓

Reverse lamp switch and related circuit inspection
- NG → Reverse lamp switch and circuit are faulty.
- OK ↓

Perform self-diagnostic procedures again.

## Trouble Diagnoses by Symptom (Cont'd)

### SYMPTOM 10 — ATTESA E-TS PRO actuator relay turns ON and OFF frequently. Actuator operates ON and OFF repeatedly.



## Description

### ABS FUNCTION

- While the ABS is operating, the brake pedal slightly vibrates, along with its operating sound. This indicates that the ABS is operating normally (no problem).
- When starting the engine or immediately after the engine has started, an operating sound is emitted from motors inside the engine room. This indicates that the motor is operating normally (no problem).
- The stopping distance of vehicles equipped with ABS can be longer than that of those without ABS while driving on rough, gravel or snow-covered roads.

### E-TS FUNCTION

- The E-TS system and the ABS are controlled by a single control unit. Signals from multiple sensors are received and acted upon to provide a comprehensive control system.
- In the event of an E-TS/ABS electrical system failure, the 4WD warning lamp and ABS warning lamp (located in the combination meter cluster) will illuminate either separately or simultaneously to inform the driver of a problem. Self-diagnosis begins immediately and the results (problem items/areas) appear on the CONSULT display according to the control unit LED ON-OFF count. Refer to the Table below if the electrical system diagnostic tester (CONSULT) is used to troubleshoot the problem.

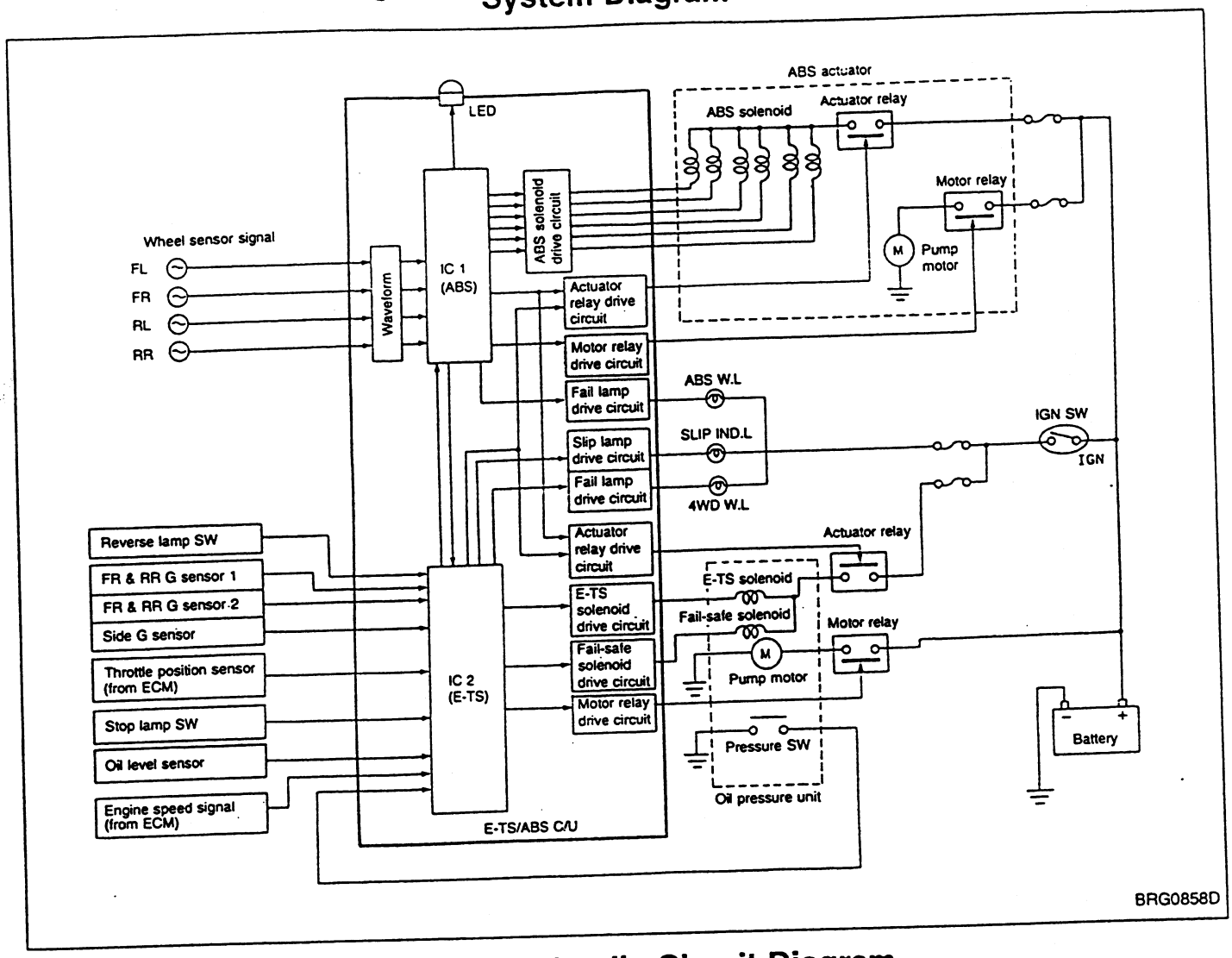
| Diagnostic test mode | Remarks |
|---|---|
| Work support | E-TS air bleeding, E-TS oil pressure check and lock check |
| Self-diagnostic results | Compatible with E-TS/ABS |
| Data monitor | Compatible with E-TS/ABS |
| Active test | ABS solenoid valve ON-OFF, ABS motor ON-OFF |
| ECM part number | E-TS/ABS control unit |

## Fail-Safe Function

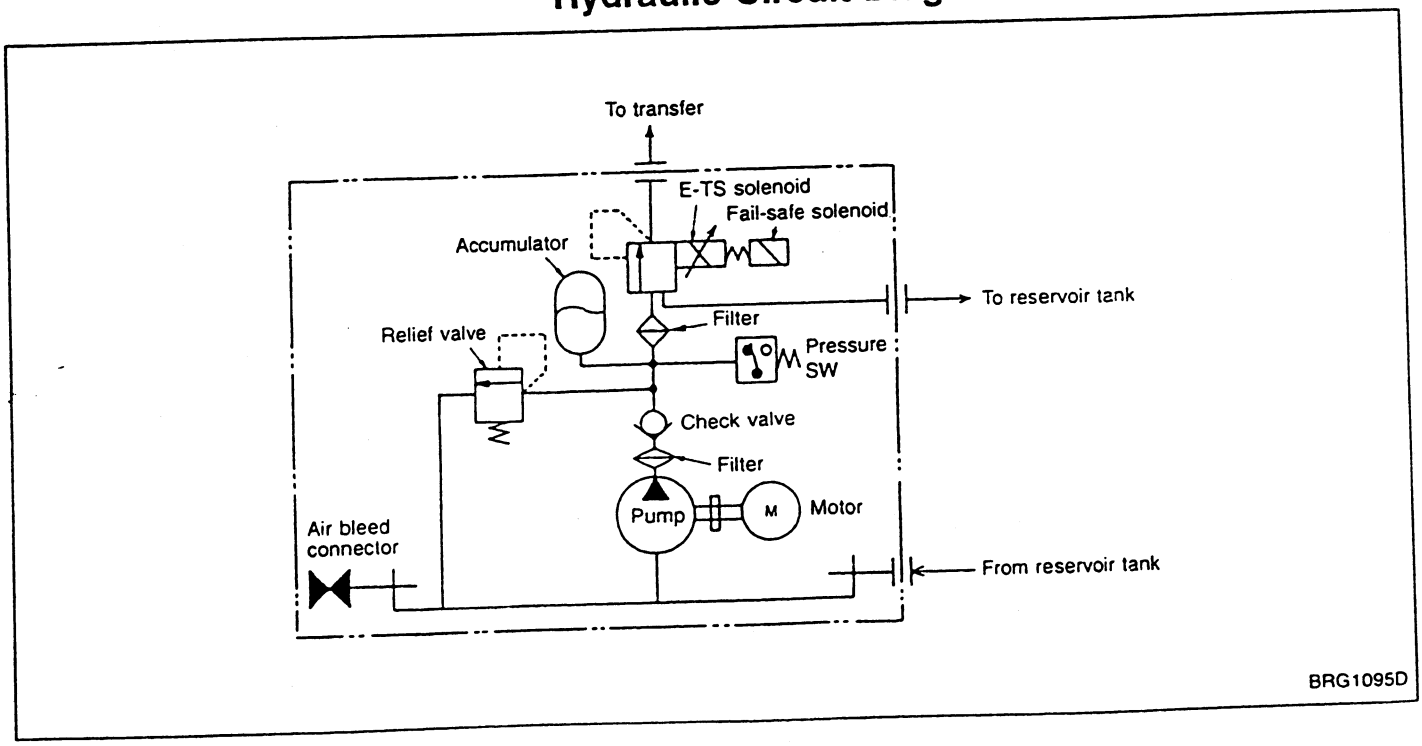
If a malfunction occurs in the E-TS/ABS, the 4WD warning lamp and ABS warning lamp (located in the combination meter cluster) will illuminate either separately or simultaneously. If only the 4WD warning lamp illuminates, decreased 4WD conditions prevail while the ABS operates normally. If only the ABS warning lamp illuminates, the ABS will not function. The E-TS operates normally while brakes operate as they would on a vehicle without ABS. If both the 4WD warning and ABS lamps are illuminated, decreased 4WD conditions prevail and ABS will not function normally. Brakes operate as they would on a vehicle without ABS.

- If a malfunction occurs in the control unit, G sensors, wheel sensors and/or engine rpm signal circuit, the 4WD warning lamp and ABS warning lamp will illuminate simultaneously.

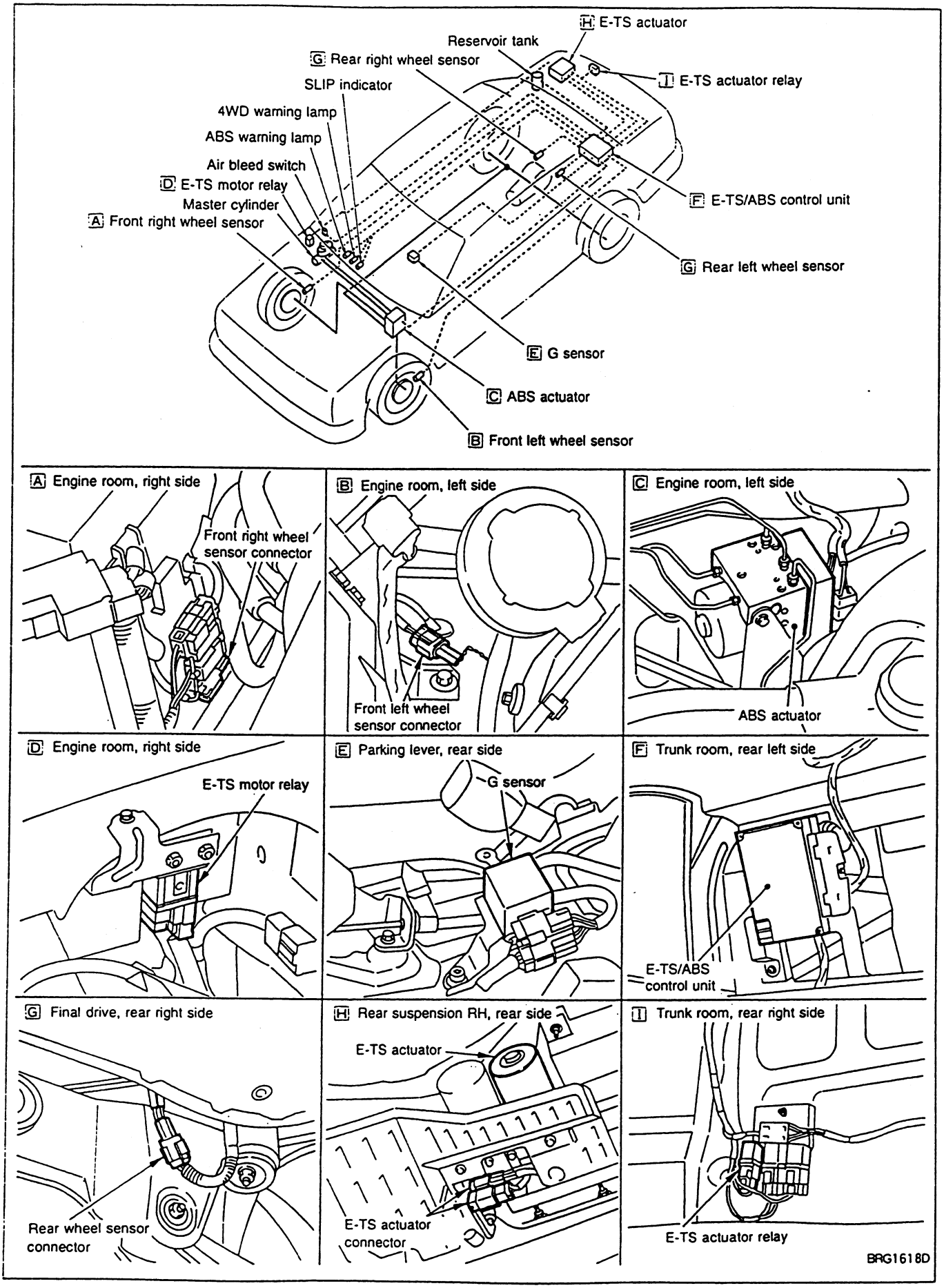
## System Diagram



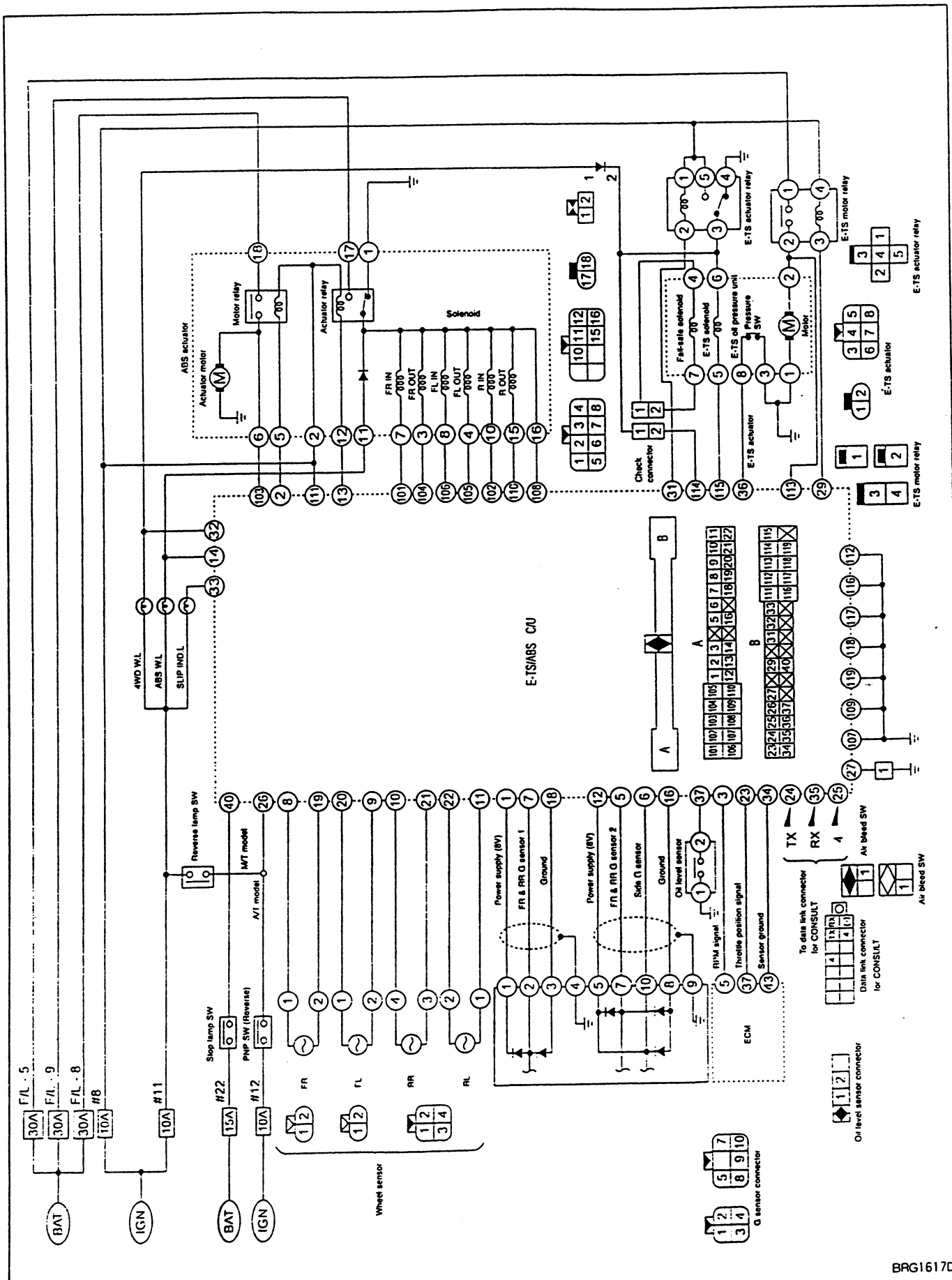

## Hydraulic Circuit Diagram



## Component Parts Location



## Circuit Diagram



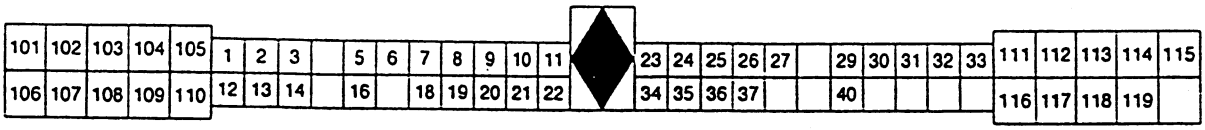
## Control Unit Input/Output Signal Specifications

### USING CIRCUIT TESTER

### E-TS/ABS control unit

To perform the following inspection switch should be turned ON with ABS control unit connector and actuator connector properly connected.

E-TS/ABS control unit connector




BRG1411D

| Terminal No. + | Terminal No. − | Item | Specifications*1 | | Check item (Reference) |
|---|---|---|---|---|---|
| 111 | | Battery | Ignition switch ON | Battery voltage (Approx. 12V) | Control unit power supply circuit |
| 107<br>109<br>112<br>116<br>117<br>118<br>119 | Body ground | Ground | — | | Control unit ground circuit |
| 40 | | Stop lamp signal | Depress brake pedal. | Battery voltage (Approx. 12V) | Stop lamp switch and circuit |
| | | | Release brake pedal. | Approx. 0V | |
| 2 | | ABS motor relay | ABS motor operating (CONSULT set in active test mode) | Less than approx. 2V | ABS motor, motor relay and circuits |
| | | | ABS motor not operating (ignition switch ON) | Battery voltage (Approx. 12V) | |
| 13 | | ABS actuator relay | Actuator relay operating (engine operating) | Less than approx. 2V | ABS actuator relay and circuit |
| | | | Actuator relay not operating (fail-safe system operating or before engine starting) | Battery voltage (Approx. 12V) | |
| 108 | | ABS actuator relay monitor | Actuator relay operating (engine operating) | Battery voltage (Approx. 12V) | ABS warning lamp and ABS actuator relay monitor and circuits |
| | | | Actuator relay not operating (fail-safe system operating or before engine starting) | Approx. 0V | |

## Control Unit Input/Output Signal Specifications (Cont'd)

| Terminal No. + | Terminal No. − | Item | Specifications*1 | | Check item (Reference) |
|---|---|---|---|---|---|
| 101 | Body ground | Front right wheel IN solenoid | Actuator operating (CONSULT set in active test mode) or actuator relay not operating. (Fail-safe system operating or before engine starting, etc.) | Approx. 0V | ABS solenoid and circuit |
| 104 | | Front right wheel OUT solenoid | | | |
| 106 | | Front left wheel IN solenoid | | | |
| 105 | | Front left wheel OUT solenoid | | | |
| 102 | | Rear wheel IN solenoid | Actuator not operating and actuator relay operating (engine operating and vehicle at rest) | Battery voltage (Approx. 12V) | |
| 110 | | Rear wheel OUT solenoid | | | |
| 103 | | ABS motor monitor | ABS motor operating (CONSULT set in active test mode) | Battery voltage (Approx. 12V) | ABS motor monitor circuit |
| | | | ABS motor not operating (ignition switch ON) | Approx. 0V | |
| 32 | | 4WD warning lamp*2 | 4WD warning lamp ON | Approx. 0V | 4WD warning lamp and circuit |
| | | | 4WD warning lamp OFF | Battery voltage (Approx. 12V) | |
| 14 | | ABS warning lamp*3 | ABS warning lamp ON | Approx. 0V | ABS warning lamp and circuit |
| | | | ABS warning lamp OFF | Battery voltage (Approx. 12V) | |
| 33 | | SLIP indicator*4 | SLIP indicator ON | Approx. 0V | SLIP indicator and circuit |
| | | | SLIP indicator OFF | Battery voltage (Approx. 12V) | |
| 8 | 19 | Front right wheel sensor | Vehicle operating (at approx. 30 km/h)*4 | Pulse signal at 200 Hz per second | Wheel sensor and circuit |
| 20 | 9 | Front left wheel sensor | | | |
| 10 | 21 | Rear right wheel sensor | | | |
| 22 | 11 | Rear left wheel sensor | | | |
| 115 | Body ground | E-TS solenoid | Engine at idle with vehicle at rest | Battery voltage (Approx. 12V) | E-TS actuator relay solenoid and circuit |
| 29 | | E-TS motor relay | Ignition switch ON | Battery voltage (Approx. 12V) | E-TS motor, motor relay and circuits |
| 113 | | E-TS motor monitor | Actuator motor operating | Battery voltage (Approx. 12V) | |
| | | | Actuator motor not operating | Approx. 0V | |

## Control Unit Input/Output Signal Specifications (Cont'd)

| Terminal No. + | Terminal No. − | Item | Specifications*1 | | Check item (Reference) |
|---|---|---|---|---|---|
| 1 | 18 | G sensor power supply 1 | Ignition switch ON (with vehicle located on flat surface) | Approx. 8V (Reference) | G sensor and circuit |
| 7 | 18 | FR & RR G sensor 1 | | Approx. 2.5V (Reference) | |
| 12 | 16 | G sensor power supply 2 | Ignition switch ON (with vehicle located on flat surface) | Approx. 8V (Reference) | |
| 5, 6 | 16 | FR & RR G sensor 2 and side G sensor | | Approx. 2.5V (Reference) | |
| 26 | Body ground | Reverse lamp signal | Vehicle moving backward | Battery voltage (Approx. 12V) | Reverse lamp and circuit |
| | | | Vehicle moving forward or turning | Approx. 0V | |
| 23 | | Throttle position sensor | Accelerator pedal fully depressed | Approx. 4.0V | Throttle position sensor and circuit |
| | | | Accelerator pedal fully released | Approx. 0.5V | |
| 36 | | Hydraulic unit pressure switch | E-TS motor not operating | Approx. 5V | Pressure switch and circuit |
| | | | E-TS motor operating | Approx. 0V | |
| 114 | | Fail-safe solenoid | Engine operating | Less than approx. 2V | Fail-safe solenoid and circuit |
| 31 | | E-TS actuator relay | Engine at idle (with vehicle at rest) | Less than 2V | E-TS actuator relay and circuit |

*1: Do not forcefully expand connector terminals to check voltage using circuit tester or voltmeter.
*2: 4WD warning lamp ON-OFF timing:
ON: Ignition switch ON (before engine starts) or abnormalities detected
OFF: After engine starts (with system operating normally)
*3: ABS warning lamp ON-OFF timing:
ON: Ignition switch ON (before engine starts) or abnormalities detected
OFF: After engine starts (with system operating normally)
*4: Make sure that tires are inflated to specified pressure.

## Control Unit Input/Output Signal Specifications (Cont'd)

### USING CONSULT

#### Data monitor

Indicated are the control unit computed data. If the output circuit (harness) should be open or short-circuited, correct values may be displayed.

| Display | Monitor item | Data monitor | | | Check item (Reference) |
|---|---|---|---|---|---|
| | | Condition | | Specifications | |
| WHEEL SENSOR [km/h] | Wheel speed | Vehicle at rest | | 0 km/h | Wheel sensor system and circuit |
| | | Vehicle operating*1 | | Identical to speedometer indication | |
| FF & RR G-SENSOR 1 [G] | G sensor operating condition | Vehicle at rest on flat surface | | Within ±0.15G | FR & RR G sensors and circuits |
| FF & RR G-SENSOR 2 [G] | | | | | |
| SIDE G-SENSOR [G] | | | | R or L: 0.5G or less | Side G sensor and circuit |
| THRTL POS SEN [V] | Throttle positioning condition | Accelerator pedal fully released | | Approx. 0.5V | Throttle position sensor and circuit |
| | | Accelerator pedal fully depressed | | Approx. 4.0V | |
| STOP LAMP SW [ON-OFF] | Brake pedal operating condition | Brake pedal depressed | | ON | Stop lamp and circuit |
| | | Brake pedal released | | OFF | |
| ENG SPEED SIGNAL [STOP-RUN] | Engine operating condition | Engine operating at a speed of less than 400 rpm | | STOP | Engine speed signal circuit |
| | | Engine operating at a speed of 400 rpm or above | | RUN | |
| PRESSURE SW [ON-OFF] | Pressure switch operating condition | E-TS motor operating | | ON | Pressure switch and circuit |
| | | E-TS motor not operating | | OFF | |
| AIR BLEED SW [ON-OFF] | Air bleed switch ON-OFF condition | Ignition switch ON | Air bleed switch removed | ON | Air bleed switch and circuit |
| | | | Air bleed switch installed | OFF | |
| OIL LEVEL SW [ON-OFF] | Oil level switch ON-OFF condition | E-TS hydraulic oil | Oil level within specified range | ON | Oil level switch and circuit |
| | | | Oil level too low | OFF | |
| OUT ABS SOLENOID [ON-OFF] | Solenoid operating condition | Actuator (solenoid) operating with (CONSULT set in active test mode) or actuator relay not operating (fail-safe system operating and before engine starts) | | ON | ABS solenoid and circuit |
| IN ABS SOLENOID [ON-OFF] | | Actuator (solenoid) not operating and actuator relay operating (with engine operating and with vehicle at rest) | | OFF | |
| ETS SOLENOID [A] | E-TS solenoid operating condition | Vehicle at rest | Ignition switch ON | 0A | E-TS actuator relay solenoid and circuit |
| | | | Engine at idle | Approx. 0.2A | |
| ETS F/S VALVE [A] | E-TS fail-safe solenoid operating condition | Vehicle at rest | Ignition switch ON | 0A | E-TS fail-safe solenoid and circuit |
| | | | Engine at idle | Approx. 0.7A | |

## Control Unit Input/Output Signal Specifications (Cont'd)

| Display | Monitor item | Data monitor | | | Check item (Reference) |
|---|---|---|---|---|---|
| | | Condition | | Specifications | |
| ABS ACTUATOR RELAY [ON-OFF] | Actuator relay operating condition | Vehicle at rest | Ignition switch ON | OFF | ABS actuator relay and circuit |
| | | | Engine operating | ON | |
| ABS MOTOR RELAY [ON-OFF] | Motor and motor relay operating condition | Ignition switch ON or engine operating | ABS not operating | OFF | ABS motor, motor relay and circuits |
| | | | ABS operating | ON | |
| ETS MOTOR [ON-OFF] | E-TS motor operating condition | E-TS motor not operating | | OFF | E-TS motor relay and circuit |
| | | E-TS motor operating | | ON | |
| ETS/LSD RELAY [ON-OFF] | E-TS motor relay operating condition | E-TS motor not operating | | OFF | |
| | | E-TS motor operating | | ON | |
| ETS ACTUATOR [ON-OFF] | E-TS actuator relay operating condition | Ignition switch ON and engine not operating | | OFF | E-TS actuator relay and circuit |
| | | Engine operating | | ON | |
| WARNING LAMP [ON-OFF] | ABS warning lamp ON operation*2 | ABS warning lamp ON | | ON | ABS warning lamp |
| | | ABS warning lamp OFF | | OFF | |
| G-SEN VOLT 1 [V]<br>G-SEN VOLT 2 [V] | Battery voltage furnished to G sensor | Ignition switch ON | | Approx. 8V (Reference) | G sensor power supply circuit |
| BATTERY VOLT [V] | Battery voltage furnished to control unit | | | Approx. 12V (Battery voltage) | Control unit power supply circuit |

*1: Make sure that tires are inflated to specified pressure.
*2: ABS warning lamp ON-OFF timing:
ON: Ignition switch ON (before engine starts) or abnormalities detected
OFF: After engine starts (system operating in normal condition)

## Precautions for Trouble Diagnosis

- After performing trouble diagnosis, be sure to erase trouble stored in memory. Refer to "CONSULT" (next page) or "SELF-DIAGNOSIS" (BR-48).
- As for the concerns that are difficult to duplicate, move harnesses or harness connectors by hand to check if there is any poor mating of connector halves or faulty connection.
- Do not force to open a connector terminal when using a circuit tester for inspection.
- Read GI section thoroughly in advance and make sure of all the general precautions.

## Basic Inspection

### BASIC INSPECTION 1 — Brake fluid level and leakage

1. Check brake fluid level in reservoir tank. Replenish brake fluid if necessary.
2. Check for leakage at or around brake piping and ABS actuator. If leakage or seepage is noted, proceed as follows:

- If ABS actuator connectors are loose, tighten to specified torque. Recheck to ensure that leakage is no longer present.
- If flare nut threads at piping connectors or actuator threads are damaged, replace faulty parts with new ones. Recheck to ensure that leakage is no longer present.
- If brake fluid leaks through areas other than actuator connectors, wipe off using a clean cloth. Recheck for leakage or seepage. If necessary, replace faulty parts with new ones.
- If brake fluid leaks at or seeps through ABS actuator, wipe off using a clean cloth. Recheck for leakage or seepage. If necessary, replace ABS actuator with new one.
- Make sure that oil level (E-TS system) and oil pressure are correct, Also check that system is free from oil leakage and abnormalities.

**CAUTION:**
**ABS actuator cannot be disassembled. Do not attempt to disassemble it.**

- Make sure that battery cables are securely connected to their terminals (positive and ground), and that battery case grounding is tight. If necessary, tighten to specified torque. Check that battery voltage is not lower than specifications.

### BASIC INSPECTION 2 — Loose power line terminal

Check battery terminals (positive and negative) and battery mounting (ground) for looseness.

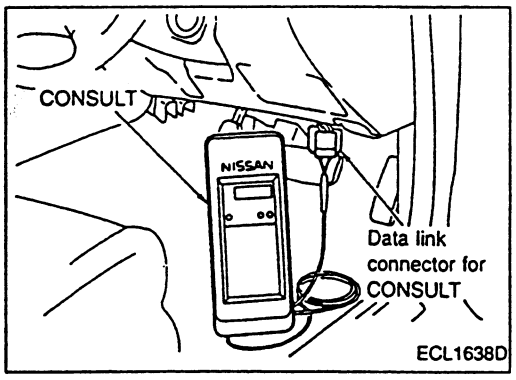
### BASIC INSPECTION 3 — ABS warning lamp

1. Turn ignition switch "ON" to ensure that ABS warning lamp lights. If ABS warning lamp does not light, check ABS warning lamp circuit.
2. Make sure that 4WD warning lamp illuminates when ignition switch is turned ON. If it does not illuminate, Check 4WD warning lamp and related circuit.
3. Make sure that the 4WD and ABS warning lamps go out approximately 1 second after engine has started. If any of the warning lamps do not go out, perform self-diagnostic procedures for related system(s).
4. After driving vehicle at approx. 30 km/h for approx. 1 minute, check to ensure that 4WD warning lamp and ABS warning lamp remain off. If ABS warning lamp lights, perform self-diagnosis procedures.
5. After performing self-diagnosis procedures, be sure to erase trouble stored in memory.

## CONSULT

### CONTROL UNIT PART NUMBER

The part number that is shown on the control unit label and CONSULT
4-door model: 47850 AA200
2-door model: 47850 AA210




### SELF-DIAGNOSIS PROCEDURE

1. Collect information on the concern from the customer, and then perform basic inspections.
2. Turn ignition switch OFF and connect CONSULT connector to data link connector for CONSULT on the vehicle.
3. Start engine and drive vehicle at approx. 30 km/h for approx. 1 minute.
4. Stop vehicle and touch "START", "ABS" and "SELF-DIAG RESULTS" sequentially on the CONSULT screen with engine running.

- **If "START" is touched immediately after engine is started or ignition switch is turned on, "ABS" may not be displayed on "SELECT SYSTEM" screen. To display "ABS", repeat the self-diagnosis procedure from the beginning.**

5. Self-diagnosis results are displayed on the screen. (Touch "PRINT" to print out the self-diagnosis results, if necessary.)

- If "NO FAIL" is displayed, inspect 4WD and ABS warning lamps. Refer to the previous page.

6. Perform appropriate inspection from the self-diagnostic results mode and repair or replace faulty parts.
7. Start engine and drive vehicle at approx. 30 km/h for approx. 1 minute.

- **Recheck to ensure that there is no other malfunction.**

8. Turn ignition switch OFF to prepare for erasing the trouble stored in memory.
9. Start engine and touch "START", "ABS", "SELF-DIAG RESULTS" and "ERASE" sequentially on the CONSULT screen to erase the trouble stored in memory.

- **If the trouble stored in memory is not erased, repeat step 6.**

10. Drive vehicle at approx. 30 km/h for approx. 1 minute and then confirm that 4WD and ABS warning lamps are off.

## CONSULT (Cont'd)

### SELF-DIAGNOSTIC RESULTS MODE

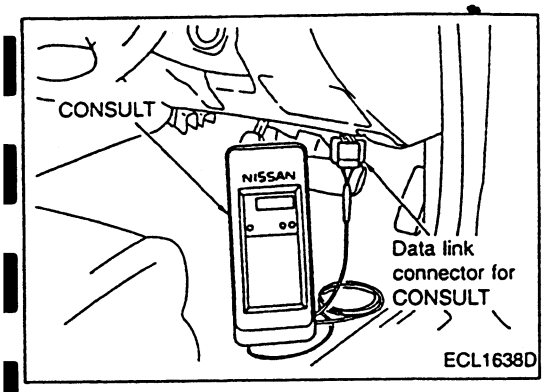
| Diagnostic item | Diagnostic item is detected when... | Check item |
|---|---|---|
| FR RH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when front right wheel sensor circuit is open or signal power supply circuit is shorted. | Wheel sensor and circuit |
| FR LH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when front left wheel sensor circuit is open or signal power supply circuit is shorted. | |
| RR RH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when rear right wheel sensor circuit is open or signal power supply circuit is shorted. | |
| RR LH SENSOR [OPEN] | • Input terminal voltage is abnormally high. This occurs when rear left wheel sensor circuit is open or signal power supply circuit is shorted. | |
| FR RH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when front right wheel sensor circuit is shorted, signal circuit is shorted to ground or front right wheel sensor-to-rotor clearance is abnormally wide. | |
| FR LH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when front left wheel sensor circuit is shorted, signal circuit is shorted to ground or front left wheel sensor-to-rotor clearance is abnormally wide. | |
| RR RH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when rear right wheel sensor circuit is shorted, signal circuit is shorted to ground or rear right wheel sensor-to-rotor clearance is abnormally wide. | |
| RR LH SENSOR [SHORT] | • Input terminal voltage is abnormally low or input signal is incorrect. This occurs when rear left wheel sensor circuit is shorted, signal circuit is shorted to ground or wheel sensor-to-rotor clearance is abnormally wide. | |
| FR RH IN ABS SOL / FR RH OUT ABS SOL [OPEN] | • Output terminal voltage is abnormally lower than controlled value when either front right wheel ABS solenoid circuit is open or control circuit is shorted to ground. | ABS solenoid and circuit |
| FR LH IN ABS SOL / FR LH OUT ABS SOL [OPEN] | • Output terminal voltage is abnormally lower than controlled value when either front left wheel ABS solenoid circuit is open or control circuit is shorted to ground. | |
| REAR IN ABS SOL / REAR OUT ABS SOL [OPEN] | • Output terminal voltage is abnormally lower than controlled value when either rear wheel ABS solenoid circuit is open or control circuit is shorted to ground. | |
| FR RH IN ABS SOL / FR RH OUT ABS SOL [SHORT] | • Output terminal voltage is abnormally higher than controlled value when either front right wheel ABS solenoid circuit is shorted or control circuit is shorted to power supply circuit. | |
| FR LH IN ABS SOL / FR LH OUT ABS SOL [SHORT] | • Output terminal voltage is abnormally higher than controlled value when either front left wheel ABS solenoid circuit is shorted or control circuit is shorted to power supply circuit. | |
| REAR IN ABS SOL / REAR OUT ABS SOL [SHORT] | • Output terminal voltage is abnormally higher than controlled value when either rear wheel ABS solenoid circuit is shorted or control circuit is shorted to power supply circuit. | |
| ABS MOTOR [ON FAILURE] | • While ABS motor is being controlled to be set to OFF, it turns ON. | ABS motor, motor relay and circuit |
| ABS MOTOR [OFF FAILURE] | • While ABS motor is being controlled to be set to ON, it turns ON. | |
| ABS ACTUATOR RELAY [ON FAILURE] | • While ABS actuator relay is being controlled to set to OFF, it turns ON. | ABS actuator relay and circuit |
| ABS ACTUATOR RELAY [OFF FAILURE] | • While ABS actuator relay is being controlled to set to ON, it turns OFF. | |
| BATTERY VOLTAGE [VB-HIGH] | • E-TS/ABS control unit power supply voltage is abnormally high. | Control unit power supply circuit |
| BATTERY VOLTAGE [VB-LOW] | • E-TS ABS control unit power supply voltage is abnormally low. | |

## CONSULT (Cont'd)

| Diagnostic item | Diagnostic item is detected when... | Check item |
|---|---|---|
| FR & RR G-SEN 1 [ABNORMAL] | • FR & RR G sensor 1 output is abnormally higher or lower than specifications. | G sensor and circuit |
| FR & RR G-SEN 2 [ABNORMAL] | • FR & RR G sensor 2 output is abnormally higher than specifications. | |
| FR & RR G-SEN 1, 2 [ABNORMAL] | • Output voltage difference between FR & RR G sensors 1 and 2, which is abnormally higher than specified value, has continued for a certain period. | |
| G-SEN VOLT 1 [ABNORMAL] | • FR & RR G sensor 1 power supply voltage, which is abnormally higher than, or lower than specifications, has continued for a certain period of time. | |
| G-SEN VOLT 2 [ABNORMAL] | • FR & RR G sensor 2 power supply voltage, which is abnormally higher than, or lower than specifications, has continued for a certain period of time. | |
| SIDE G-SENSOR [ABNORMAL] | • Side G sensor output voltage, which is abnormally higher than, or lower than specifications, has continued for a certain period of time. | |
| AIR BLEED SW | • Air bleed switch has been turned ON for a certain period of time during vehicle operation. | Air bleed switch and circuit |
| THROTTLE POSI SEN | • Throttle position sensor signal voltage, which is 0V or abnormally higher than specifications, has continued for a certain period of time. | Throttle position sensor and circuit |
| OIL LEVEL SW | • Oil level switch has been turned OFF (oil level too low) for a certain period of time. | Oil level switch and circuit |
| PRESSURE SW [ON FAILURE] | • Pressure switch has been turned ON for an extended period of time. | Pressure switch and circuit |
| PRESSURE SW [OFF FAILURE] | • Pressure switch has been turned OFF for an extended period of time although current flows through E-TS solenoid. Or, it has been turned OFF only for a short period of time (due to pressure switch in dummy contact with other parts (dummy circuit setup) or gas pressure drop). | |
| ETS MOTOR [ON FAILURE] | • While E-TS motor is being controlled to be set to OFF, E-TS motor control terminal voltage does not become 0 volts (ground potential). (E-TS motor relay is ON all the time, motor circuit is open, etc.) | E-TS motor and circuit |
| ETS MOTOR [OFF FAILURE] | • While E-TS motor is being controlled to be set to ON, E-TS motor control terminal voltage is not present. | |
| ETS SOLENOID [OPEN] | • Specified voltage is not applied to E-TS solenoid control terminal (open solenoid circuit, etc.). | E-TS relay, solenoid and circuits |
| ETS SOLENOID [SHORT] | • E-TS solenoid control terminal voltage is abnormal (shorted E-TS solenoid circuit, etc.). | |
| ETS SOLENOID [ABNORMAL] | • Current flow through E-TS solenoid is abnormally larger or smaller than specifications. | |
| ETS F/S VALVE [OPEN] | • E-TS fail-safe valve control terminal voltage is abnormally high or low (open fail-safe valve circuit, etc.). | E-TS fail-safe system, solenoid and circuits |
| ETS F/S VALVE [SHORT] | • E-TS fail-safe valve control terminal voltage is abnormally high or low (shorted fail-safe valve circuit, etc.). | |
| ETS F/S VALVE [ON FAILURE] | • While E-TS fail-safe valve is being controlled to be set to OFF, it turns ON. | |
| CONTROL UNIT | • Abnormalities occur in E-TS/ABS control unit process function. | Control unit power supply circuit |
| ABS MOTOR [ABNORMAL WHEEL LOCKING] | • ABS motor speed is abnormally low. | ABS motor, motor relay and circuits |

NOTE:
- 4WD and ABS warning lamps illuminate. "Self-diagnosis could not detect any malfunctions" can sometimes appear on CONSULT display as a diagnostic result. When it occurs, check engine speed signal circuit.
- If "ABS" does not appear on system selection screen, check ABS control unit for improper operation and diagnosis connector circuit condition. Also confirm that CONSULT card No. is suitable for use with ABS system.

## CONSULT (Cont'd)




### DATA MONITOR PROCEDURE

- Refer to CONSULT Instruction Manual for details on data monitor function.

1. Turn ignition switch OFF.
2. Connect CONSULT connector to data link connector for CONSULT.
3. Turn ignition switch ON.
4. Touch "START" on CONSULT screen.
5. Touch "ABS" on CONSULT screen.

- **If "START" is touched immediately after engine is started or ignition switch is turned on, "ABS" may not be displayed on "SELECT SYSTEM" screen. To display "ABS", repeat the data monitor procedure from the beginning.**

6. Touch "DATA MONITOR".
7. Touch "SETTING" to set recording condition.
8. Touch "LONG TIME" and then "ENTER".
9. Return to "SELECT MONITOR ITEM" screen and touch "ALL SIGNALS".
10. Touch "START".
11. Display data monitor.
12. If necessary, sequentially touch "REC START", "REC STOP", "DATA DISPLAY", "NUMBER PRINT" and "PRINT" to print out the data.

## CONSULT (Cont'd)

### DATA MONITOR MODE

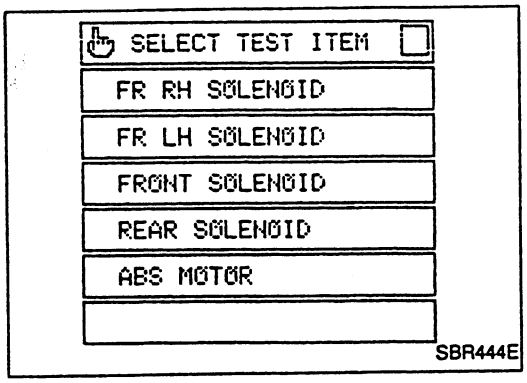
| Display | Select monitor item | | | Remarks |
|---|---|---|---|---|
| | ECM input signals | All signals | Selection from menu | |
| FR RH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from front right wheel sensor signal, appears on display. |
| FR LH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from front left wheel sensor signal, appears on display. |
| RR RH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from rear right wheel sensor signal, appears on display. |
| RR LH SEN [km/h] | ○ | ○ | ○ | Vehicle speed, which is processed from rear left wheel sensor signal, appears on display. |
| FR & RR G SEN1 [+/–] [G] | ○ | ○ | ○ | G value, which is processed from FR & RR G sensor 1 signal, appears on display. |
| FR & RR G SEN2 [+/–] [G] | ○ | ○ | ○ | G value, which is processed from FR & RR G sensor 2 signal, appears on display. |
| SIDE G SEN [L/R] [G] | ○ | ○ | ○ | G value, which is processed from side G sensor signal, appears on display. |
| THRTL POS SEN [V] | ○ | ○ | ○ | Signal voltage sent from throttle position sensor appears on display. |
| STOP LAMP SW [ON-OFF] | ○ | ○ | ○ | Stop lamp switch ON-OFF condition appears on display. |
| ENG SPEED SIG [RUN/STOP] | ○ | ○ | ○ | Engine speed, which is based on camshaft position sensor signal, appears on display. |
| PRESSURE SW [ON/OFF] | ○ | ○ | ○ | Pressure switch ON-OFF condition, which is determined from pressure switch signal, appears on display. |
| AIR BLEED SW [ON-OFF] | ○ | ○ | ○ | Air bleed switch ON-OFF condition, which is determined from air bleed switch signal, appears on display. |
| OIL LEVEL SW [ON-OFF] | ○ | ○ | ○ | Oil level switch ON-OFF condition, which is determined from oil level switch signal, appears on display. |
| F/R IN SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front right wheel IN ABS solenoid appears on display. |
| F/R OUT SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front right wheel OUT ABS solenoid appears on display. |
| F/L IN SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front left wheel IN ABS solenoid appears on display. |
| F/L OUT SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of front left wheel OUT ABS solenoid appears on display. |
| REAR IN SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of rear wheel IN ABS solenoid appears on display. |
| REAR OUT SOL [ON-OFF] | — | ○ | ○ | Control condition (ON-OFF) of rear wheel OUT ABS solenoid appears on display. |
| ETS SOLENOID [A] | — | ○ | ○ | Current flow through E-TS solenoid appears on display. |
| ETS F/S VALVE | — | ○ | ○ | Control condition (ON-OFF) of E-TS fail-safe valve appears on display. |
| ABS ACTUATOR [ON-OFF] | — | ○ | ○ | ABS actuator relay condition (ON-OFF) appears on display. |
| ABS MOTOR [ON-OFF] | — | ○ | ○ | ABS motor relay condition (ON-OFF) appears on display. |
| ETS MOTOR [ON-OFF] | — | ○ | ○ | E-TS motor condition (ON-OFF) appears on display. |
| ETS RELAY [ON-OFF] | — | — | ○ | E-TS motor relay condition (ON-OFF) appears on display. |
| ETS ACTUATOR [ON-OFF] | — | — | ○ | E-TS actuator relay condition (ON-OFF) appears on display. |
| WARNING LAMP [ON-OFF] | — | ○ | ○ | Control condition of ABS warning lamp appears on display. |
| G-SEN VOLT1 [V] | ○ | — | ○ | Voltage furnished from E-TS/ABS control unit appears on display. |
| G-SEN VOLT2 [V] | ○ | — | ○ | Voltage furnished from E-TS/ABS control unit appears on display. |
| BATTERY VOLT [V] | ○ | — | ○ | Voltage furnished from E-TS/ABS control unit appears on display. |
| VOLTAGE [V] | — | — | ○ | Value measured with voltage probe appears on display. |
| PULSE [msec] or [Hz] or [%] | — | — | ○ | Refer to CONSULT Operation Manual. |

## CONSULT (Cont'd)

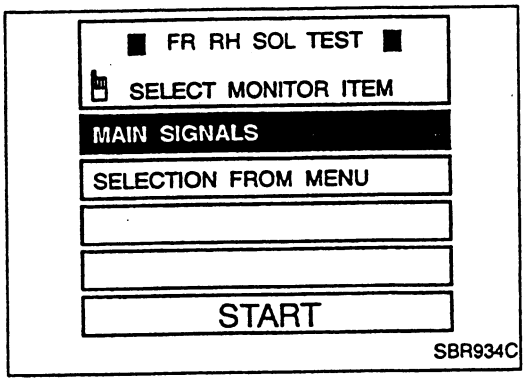
### ACTIVE TEST PROCEDURE

- When conducting Active test, vehicle must be stationary.
- Confirm that brakes have been bled completely.
- When ABS warning lamp stays on, never conduct Active test.

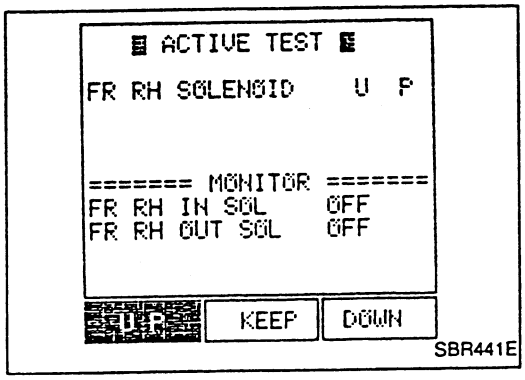
1. Connect CONSULT to Data Link Connector for CONSULT and start engine.
2. Touch "START" on CONSULT screen.
3. Touch "ABS", then "ACTIVE TEST".
4. "SELECT TEST ITEM" screen is displayed.




5. Select active test item by touching screen.




6. Touch "START" on condition that "MAIN SIGNALS" item is highlighted.



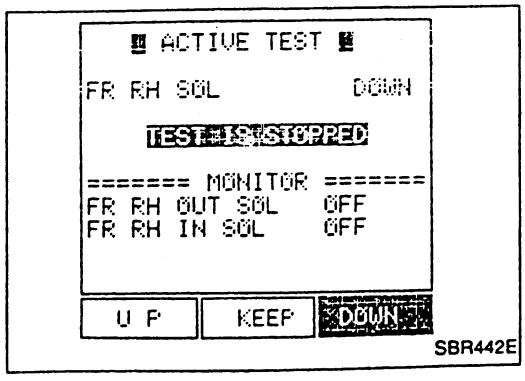

7. "ACTIVE TEST" screen is displayed.

### ABS solenoid valve

- To check that ABS solenoid valves (inlet and outlet) operate in the following manner, touch "UP", "KEEP" and "DOWN" on the screen while observing the monitor.

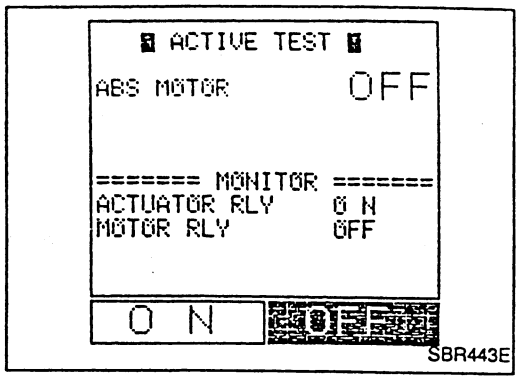
| Operation | UP | KEEP | DOWN |
|---|---|---|---|
| IN ABS S/V | OFF | ON | ON |
| OUT ABS S/V | OFF | OFF | ON* |

*: Solenoid valve stays ON for 1 to 2 seconds after touching the key, and then turns OFF.




- If the active test is conducted with brake pedal depressed, the brake pedal travel limit may change. This is a normal condition.
- "TEST IS STOPPED" message is displayed 10 seconds after the operation is started.
- If the active test needs to be performed again after "TEST IS STOPPED" is displayed, repeat step 6.

## CONSULT (Cont'd)




### ABS motor

- Touch "ON" and "OFF" on the screen to check that ABS motor relay and ABS actuator relay operate as follows:

| Operation | ON | OFF |
|---|---|---|
| ABS actuator relay | ON | ON |
| ABS motor relay | ON | OFF |

- If the active test is conducted with brake pedal depressed, the brake pedal travel limit may change. This is a normal condition.
- "TEST IS STOPPED" message is displayed 10 seconds after the operation is started.

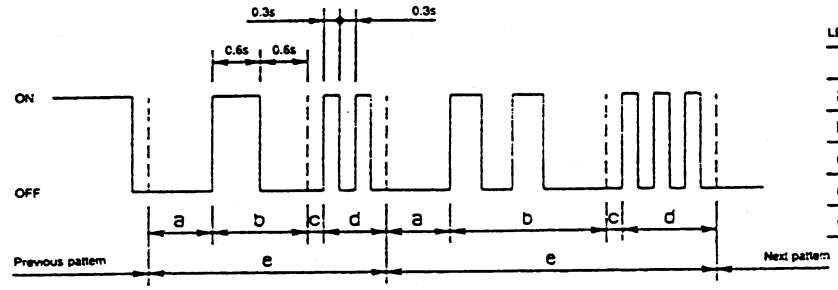
## Self-diagnosis

### SELF-DIAGNOSIS PROCEDURE

1. Drive vehicle at 30 km/h for at least 1 minute. Bring vehicle to a full stop. Do not turn off engine. Look at LED at top of control unit (red lamp). Note the number of times it blinks ON and OFF.
   - If two or more systems are malfunctioning, all warning lamps will blink ON and OFF.
2. After completing required maintenance procedures, be absolutely sure to erase results of self-diagnostic testing from memory. Refer to "HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)".
3. Once again, drive vehicle at 30 km/h for at least 1 minute. Check that 4WD warning lamp and ABS warning lamp are OFF.

### CONTROL UNIT LED (RED LAMP) INDICATION

- Control unit LED will blink ON and OFF. Readings are based on frequency of 10th digit and unit digit. Refer to the figure below.
- If there are multiple problems, all problems appear on display in sequence.
- Indication pattern will repeat all of the trouble codes in sequence.




LED code indication timing

| | Indication description | Indication time |
|---|---|---|
| a | Time interval between previously indicated code and currently indicated code | 3.0 S |
| b | Tenth digit of currently indicated code | 0.6 S × (0~7) |
| c | Time interval between tenth digit and unit digit of malfunction code | 0.3 S |
| d | Unit digit of malfunction code | 0.3 S × (1~8) |
| e | Indication pattern of 1 cycle (a-b-c-d) | 3.9 S~ 15.9 S |

Example: Self-diagnostic results of a simultaneous malfunction using LED code 12 (Front left inlet solenoid valve and circuit) and 23 (Rear inlet solenoid valve and circuit)

BRG0779D

### HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

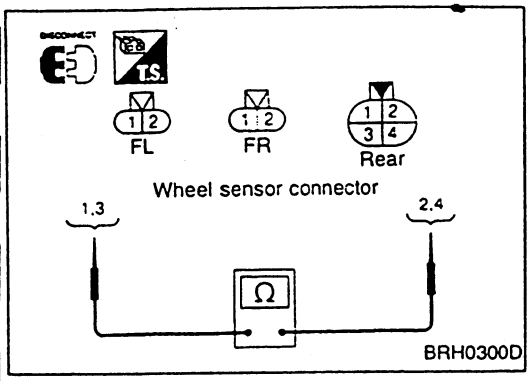
- Remove cables from battery terminals. Also remove E-TS/ABS control unit connectors.
- Using CONSULT, touch "ERASE" on CONSULT display. This will erase malfunction information from memory.

## Self-diagnosis (Cont'd)

### MALFUNCTION CODE/SYMPTOM CHART

| Number of LED blinks | Malfunctioning part | Detecting timing | | Warning lamps ON | | Fail-safe operation |
|---|---|---|---|---|---|---|
| | | When starting engine | Vehicle driving | ABS | 4WD | |
| 0 | Normal | — | — | — | — | — |
| | Engine speed signal and circuit | ○ | ○ | ○ | ○ | ○ |
| 1, 5 | Front right wheel sensor and circuit | ○*1 | ○ | ○ | ○ | ○ |
| 2, 6 | Front left wheel sensor and circuit | ○*1 | ○ | ○ | ○ | ○ |
| 3, 7 | Rear right wheel sensor and circuit | ○*1 | ○ | ○ | ○ | ○ |
| 4, 8 | Rear left wheel sensor and circuit | ○*1 | ○ | ○ | ○ | ○ |
| 11, 21 | Front right inlet solenoid valve and circuit | ○ | ○ | ○ | — | ○ |
| 12, 22 | Front left inlet solenoid valve and circuit | ○ | ○ | ○ | — | ○ |
| 13, 23 | Rear inlet solenoid valve and circuit | ○ | ○ | ○ | — | ○ |
| 15, 25 | Front right outlet solenoid valve and circuit | ○ | ○ | ○ | — | ○ |
| 16, 26 | Front left outlet solenoid valve and circuit | ○ | ○ | ○ | — | ○ |
| 17, 27 | Rear outlet solenoid valve and circuit | ○ | ○ | ○ | — | ○ |
| 31, 32, 33 | E-TS solenoid and circuit | ○ | ○ | — | ○ | ○ |
| 34, 35, 36 | E-TS fail-safe solenoid and circuit | ○ | ○ | — | ○ | ○ |
| 41, 42 | ABS actuator relay and circuit | ○ | ○ | ○ | — | ○ |
| 43, 44 | ABS actuator motor, motor relay and circuit | ○ | ○ | ○ | — | ○ |
| 45, 46, 77 | E-TS/ABS control unit, ground and circuit | ○ | ○ | ○ | ○ | ○ |
| 47, 48 | E-TS/ABS control unit power supply and circuit | ○ | ○ | ○ | — | ○ |
| 51, 52 | E-TS actuator motor and circuit | ○ | ○ | — | ○ | ○ |
| 53, 54 | Pressure switch and circuit | ○ | ○ | — | ○ | ○ |
| 55 | Air bleed switch and circuit | — | ○ | — | ○*2 | ○ |
| 56 | E-TS oil level switch and circuit | ○ | ○ | — | ○ | ○ |
| 61 | FR & RR G sensor 1 and circuit | ○ | ○ | ○ | ○ | ○ |
| 62 | FR & RR G sensor 2 and circuit | ○ | ○ | ○ | ○ | ○ |
| 63 | FR & RR G sensor 1 or 2 and circuit | ○ | ○ | ○ | ○ | ○ |
| 64 | G sensor 1 power supply and circuit | ○ | ○ | ○ | ○ | ○ |
| 65 | G sensor 2 power supply and circuit | ○ | ○ | ○ | ○ | ○ |
| 66 | Side G sensor and circuit | ○ | ○ | ○ | ○ | ○ |
| 75 | Throttle position sensor and circuit | ○ | ○ | — | ○ | ○ |

*1: Shorted sensor circuits cannot be detected during engine starting, but during vehicle operation.
*2: Normal control is performed during vehicle operation although 4WD warning lamp illuminates.




## Component Parts Inspection

### WHEEL SENSOR

**RESISTANCE MEASUREMENT**
Remove connector from wheel sensor and measure resistance between related terminals.
**Terminals ① - ②, ③ - ④: 0.6 - 3.25 kΩ**

NG → Wheel sensor is faulty.

OK ↓

**SENSOR HARNESS DUMMY OPEN-CIRCUIT INSPECTION**
Remove connector from wheel sensor and measure resistance between terminals as outlined below:
Front: Turn steering wheel to left and right and shake sensor harness inside wheelhouse by hand while measuring resistance between terminals. Make sure that resistance is within specifications and does not change.
Rear: Shake final drive sensor harness by hand while measuring resistance. Make sure that resistance is within specifications and does not change.
**Terminals ① - ②, ③ - ④: 0.6 - 3.25 kΩ**

NG → Wheel sensor is faulty.

OK ↓

**WHEEL SENSOR INSPECTION**
Check to make sure that wheel sensor's tip end (pick-up) is clean and free from foreign matter (metal chips or filings).

NG → Clean wheel sensor.

OK ↓

**WHEEL SENSOR INSPECTION**
Check wheel sensor and harness for scratches which affect performance.

NG → Wheel sensor is faulty.

OK ↓

**SENSOR ROTOR INSPECTION**
Check sensor rotor for broken teeth or foreign matter (caught in teeth).

NG → Clean or replace sensor rotor.

OK ↓

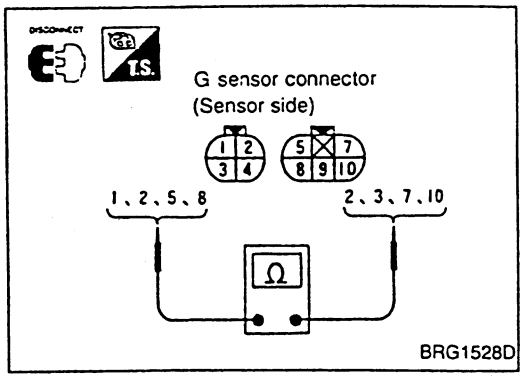
**INSTALLATION CONDITION INSPECTION**
Check wheel sensor for improper installation (free play, etc.).

NG → Eliminate sensor free play.

OK ↓

Wheel sensor is in good order.

## Component Parts Inspection (Cont'd)



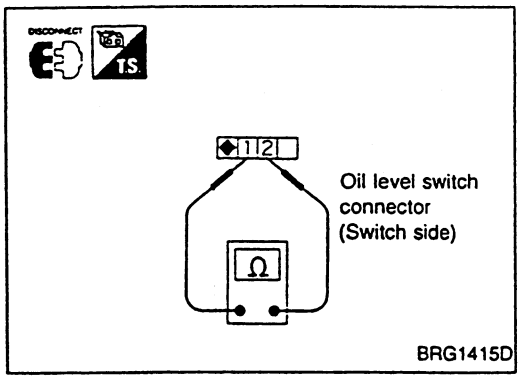

### G SENSOR

Remove connector and measure resistance between terminals affected.

**Terminals ① - ②, ② - ③, ⑤ - ⑦, ⑩ - ⑧:**
**Resistance must exist in one direction only.**

**CAUTION:**

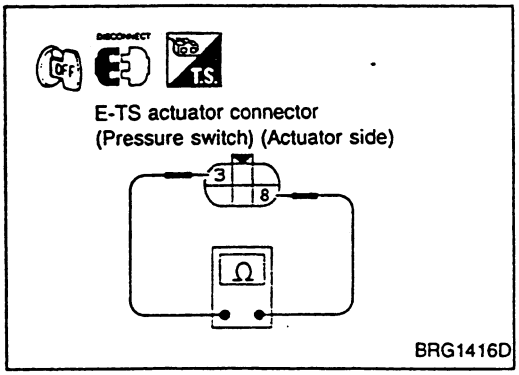
- **Make sure that circuit tester is set to 1 MΩ range.**
- **Be sure to set G sensor level during measurements.**




### OIL LEVEL SWITCH

Remove oil level switch connector and check continuity between terminals ① and ②.

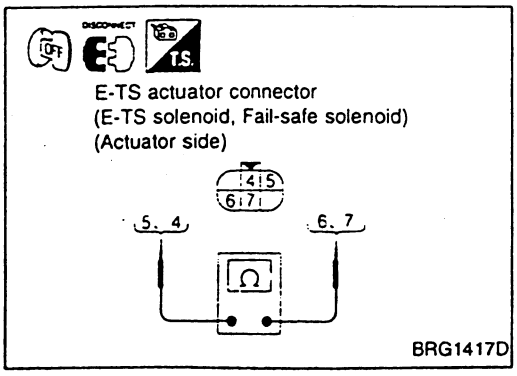
**Reservoir tank oil level is normal:**
**Continuity exists.**
**Reservoir tank oil level is too low:**
**Continuity does not exist.**




### E-TS ACTUATOR

#### Pressure switch

- Remove pressure switch connector and check continuity between terminals ③ and ⑧.
  **Accumulator internal pressure decreasing to approximately 2.6 MPa (27.0 kg/cm²) or less:**
  **Continuity exists.**
  **Accumulator internal pressure increasing to approximately 3.8 MPa (39.0 kg/cm²):**
  **Continuity does not exist.**
- Immediately after E-TS actuator motor has stopped, accumulator internal pressure is high. Continuity does not exist.
- Accumulator internal pressure increases while actuator motor is operating. Accumulator internal pressure decreases when actuator motor is at rest.

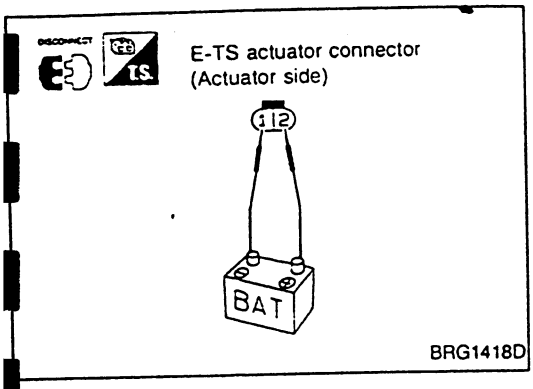



#### E-TS solenoid and fail-safe solenoid

Remove connectors from E-TS, A-LSD and fail-safe solenoids. Measure resistance between individual connector terminals listed below:

**E-TS solenoid terminals ⑤ and ⑥: Approx. 6Ω**
**Fail-safe solenoid terminals ④ and ⑦: Approx. 11Ω**

## Component Parts Inspection (Cont'd)




### E-TS motor

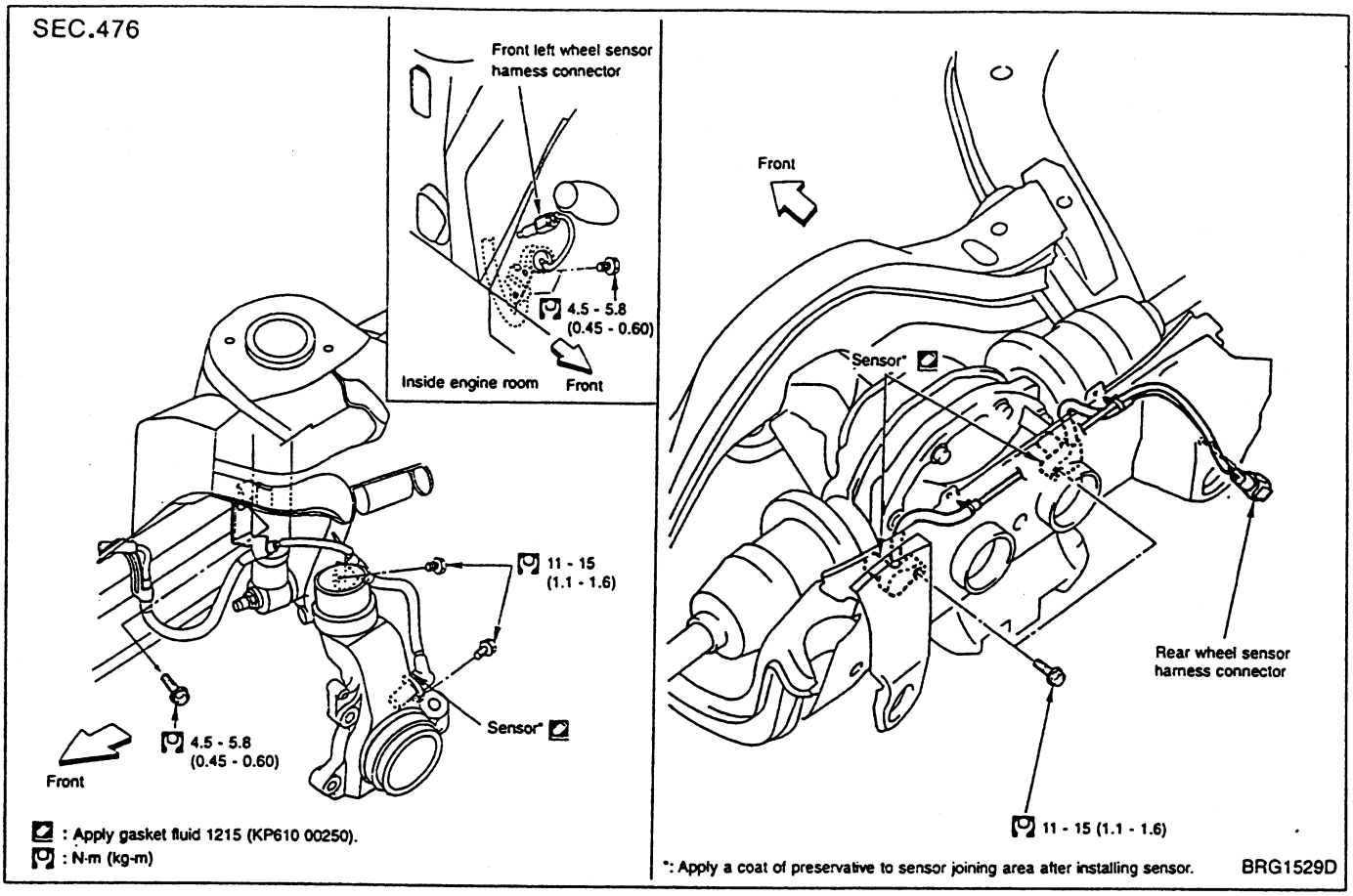
Remove connector from motor. Apply battery voltage across terminals ① and ② to make sure that motor starts.

**CAUTION:**

**To avoid motor overheating, do not apply battery voltage for more than 5 seconds at a time.**

## Component Parts Removal and Installation

### SENSOR




### Removal

1. Remove sensor harness connectors and brackets.
2. Remove sensor securing bolts, then remove sensors from vehicle.

**CAUTION:**
**Carefully remove sensors. Do not attempt to turn sensors or do not forcefully pull sensor harnesses.**

## Component Parts Removal and Installation (Cont'd)

### Installation

**Front side**

1. Check to make sure that the following sensor areas are clean and free from foreign matter (metal chips, filings, etc.): pick-up area, mounting hole inner wall and rotor mating surface. If necessary, clean sensor before installation.
2. Apply a coat of gasket fluid 1215 (KP610 00250) to joining surfaces of sensor and steering knuckle before installation. Tighten sensor securing bolts to specified torque.

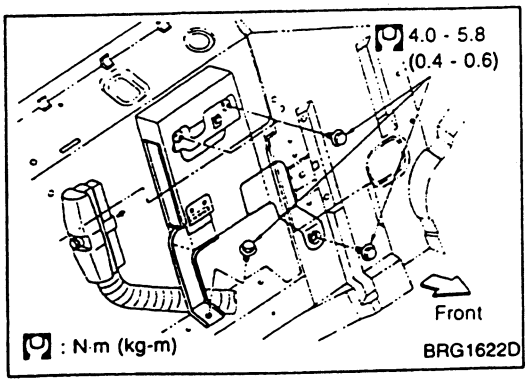
**CAUTION:**

- **If previous sensor is to be re-installed, adjust sensor-to-rotor clearance in advance so that it is as small as possible.**
- **Front sensor, which has a thin rubber coat film on its end worn, may be fit for re-use.**
- **Front sensor whose thin rubber coat film is in contact with its rotor, may also be re-used.**

3. Apply a coat of preservative to sensor joining area.
4. Install sensor harness bracket and tighten securing bolts to specified torque.
5. Connect sensor harness connector to its mating part inside engine room.

**Rear side**

1. Make sure that the pick-up area, mounting hole inner wall and rotor mating surface are clean and free from foreign matter (metal chips, filings, etc.).
   If necessary, clean sensor before installation.
2. Apply a coat of gasket fluid 1215 (KP610 00250) to joining surfaces of sensor and steering knuckle before installation. Tighten sensor securing bolts to specified torque.
3. Apply a coat of preservative to sensor joining area.
4. Install sensor harness bracket and tighten securing bolts to specified torque.
5. Install sensor harness connector to its mating part inside engine room.




## E-TS/ABS CONTROL UNIT

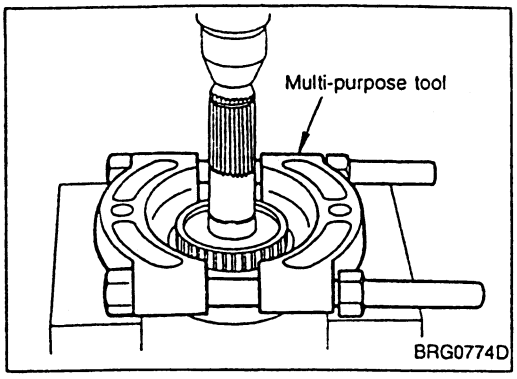
### Removal

1. Remove rear seats and rear seatback support panel.
2. Remove control unit securing bolts.
3. Remove front trunk finisher.
4. Remove control unit connector.

### Installation

Installation is in the reverse order of removal.

## Component Parts Removal and Installation (Cont'd)




### SENSOR ROTOR

#### Removal

**Front side**

Remove front sensor rotor.

**Rear side**

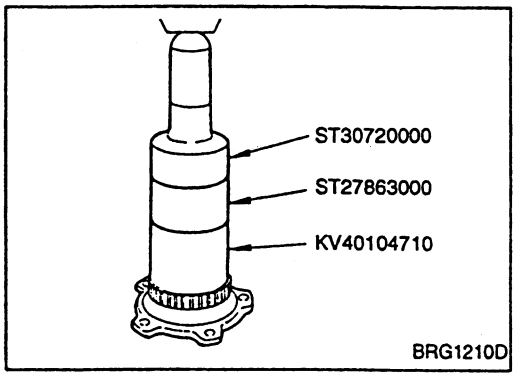
Remove rear sensor rotor as follows:

1) Remove side flange.
2) Using bearing pulling attachment (multi-purpose tool) and press, remove sensor rotor.

#### Installation

**Front side**

Install front sensor rotor.




**Rear side**

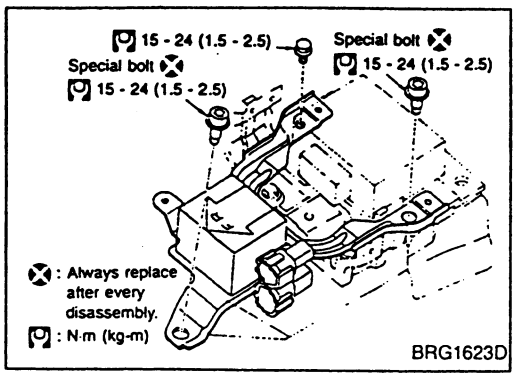
Install rear sensor rotor as follows:

1) Using drift (special service tool), press rear sensor rotor into side flange.
2) Install side flange.

**CAUTION:**

**When installing new rear sensor rotors, refer to the following table as a guide.**

**No. of sensor rotor teeth:**
**Front: 46**
**Rear: 46**




### G SENSOR

#### Removal

1. Remove console box.
2. Remove connector from G sensor.
3. Remove G sensor securing bolts, then G sensor.

**CAUTION:**

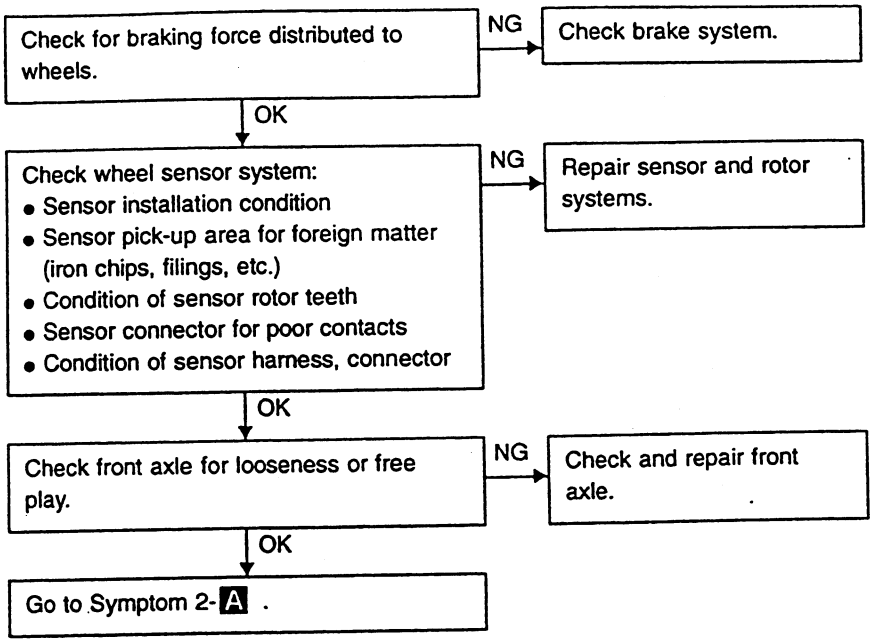
**G sensor easily breaks. Be extremely careful not to bump or drop it.**

#### Installation

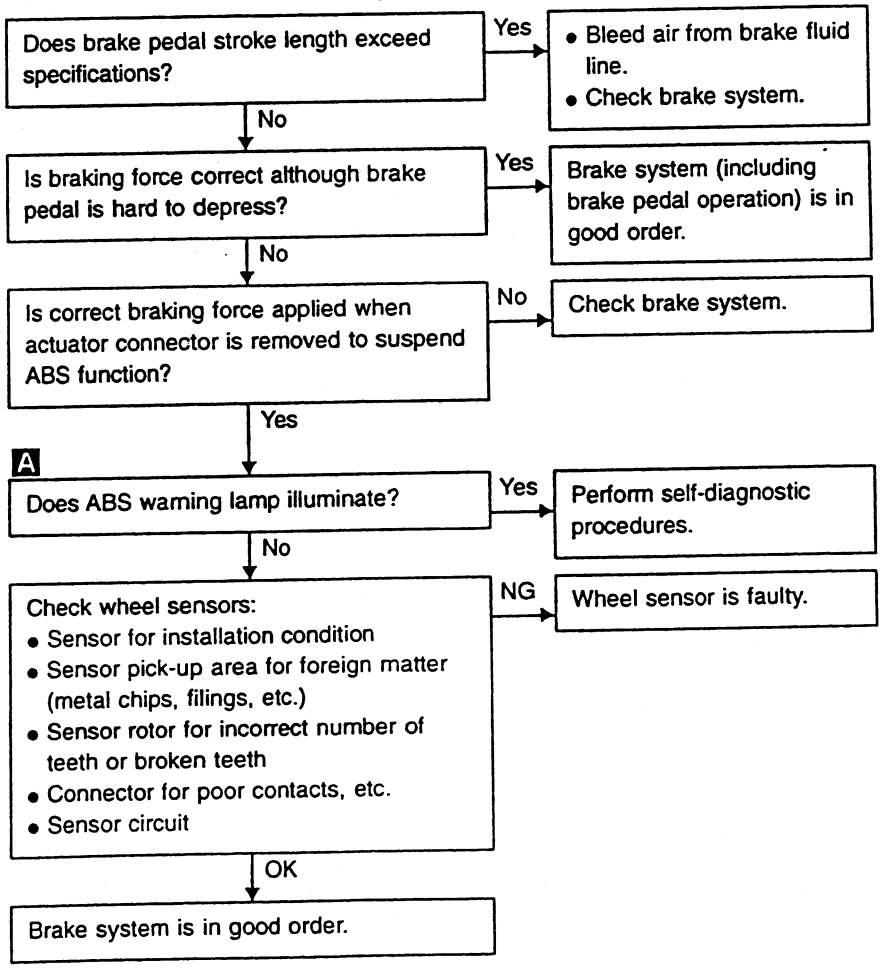
Installation is in the reverse order of removal.

## Trouble Diagnoses by Symptom

### SYMPTOM 1 — ABS works frequently.




### SYMPTOM 2 — Unexpected pedal action



## Trouble Diagnoses by Symptom (Cont'd)

### SYMPTOM 3 — Long stopping distance

Is stopping distance longer on snow-covered or gravel roads than on paved roads?
- Yes → Stopping distance of ABS-equipped vehicle is sometimes longer than vehicle without ABS.
- No ↓

Does stopping distance still remain longer than vehicle without ABS after removing actuator connector to suspend ABS function?
- Yes → • Bleed air from brake system. • Check brake system.
- No ↓

Go to Symptom 2-A .

### SYMPTOM 4 — ABS does not work.

Does ABS warning lamp illuminate?
- Yes → Perform self-diagnostic procedures to locate the cause of problem.
- No ↓

Does ABS effectively operate at speeds of less than 10 km/h only?
- No → ABS is in good order.
- Yes ↓

Go to Symptom 2-A .

### SYMPTOM 5 — Pedal vibration and noise

Does brake pedal vibration/noise occur during engine starting?
- Yes → Perform self-diagnostic procedures to locate the cause of problem.
- No ↓

Does brake pedal vibration/noise occur only when brake pedal is slightly depressed?
**CAUTION:**
**ABS sometimes operates under any of the following conditions where wheel speed variation occurs.**
- **During gearshift operation**
- **During clutch pedal operation**
- **Driving over bumps or gutters (50-mm high or deep) at 50 km/h or above.**
- **During standing starts (immediately after starting engine)**

- Yes → ABS is in good order.
- No ↓

Does brake pedal vibration/noise occur during normal vehicle operation?
**CAUTION:**
**ABS sometimes operates except for sudden braking operation under any of the following conditions.**
- **During low "μ" road driving.**
- **Turning curves at high speed**
- **Riding over bumps**

- Yes → ABS is in good order.
- No ↓

Ⓐ

## Trouble Diagnoses by Symptom (Cont'd)

Ⓐ

Does vibration/noise occur when engine rpms are increased with vehicle at rest?

Yes → ABS is in good order. **When vehicle is at rest, vibration/noise can sometimes occur.**

No ↓

Does vibration/noise occur when switches (related to electrical components) are activated?

Yes → Check sensor harness and shielding ground circuit.

No ↓

Go to Symptom 2-A .

### SYMPTOM 6 — ABS warning lamp does not illuminate.

**BURNED-OUT ABS WARNING LAMP BULB INSPECTION**
Check continuity between meter power supply terminal and ABS warning lamp terminal.

NG → ABS warning lamp or internal combination meter circuit is faulty.

OK ↓

**ABS WARNING LAMP POWER SUPPLY CIRCUIT INSPECTION**
Remove meter connector. Make sure the voltage between vehicle harness terminal and body ground is approx. 12V.

NG →
- Check 10A fuse.
- Check fuse block-to-meter harness and connectors.
- Check power supply system (battery, ignition switch and circuits).

OK ↓

**ABS ACTUATOR (AS A SINGLE PART) INSPECTION**

NG → ABS actuator is faulty.

OK ↓

**ABS WARNING LAMP HARNESS CIRCUIT INSPECTION**
- Remove actuator connector, control unit connector and meter connector.
- Check for shorted or open E-TS/ABS-to-control unit harness circuit.

NG → Harness is faulty.

OK ↓

**ABS WARNING LAMP CONNECTOR CIRCUIT INSPECTION**
Check control unit, ABS actuator and meter and vehicle harness connectors*.

NG → Connector is faulty.

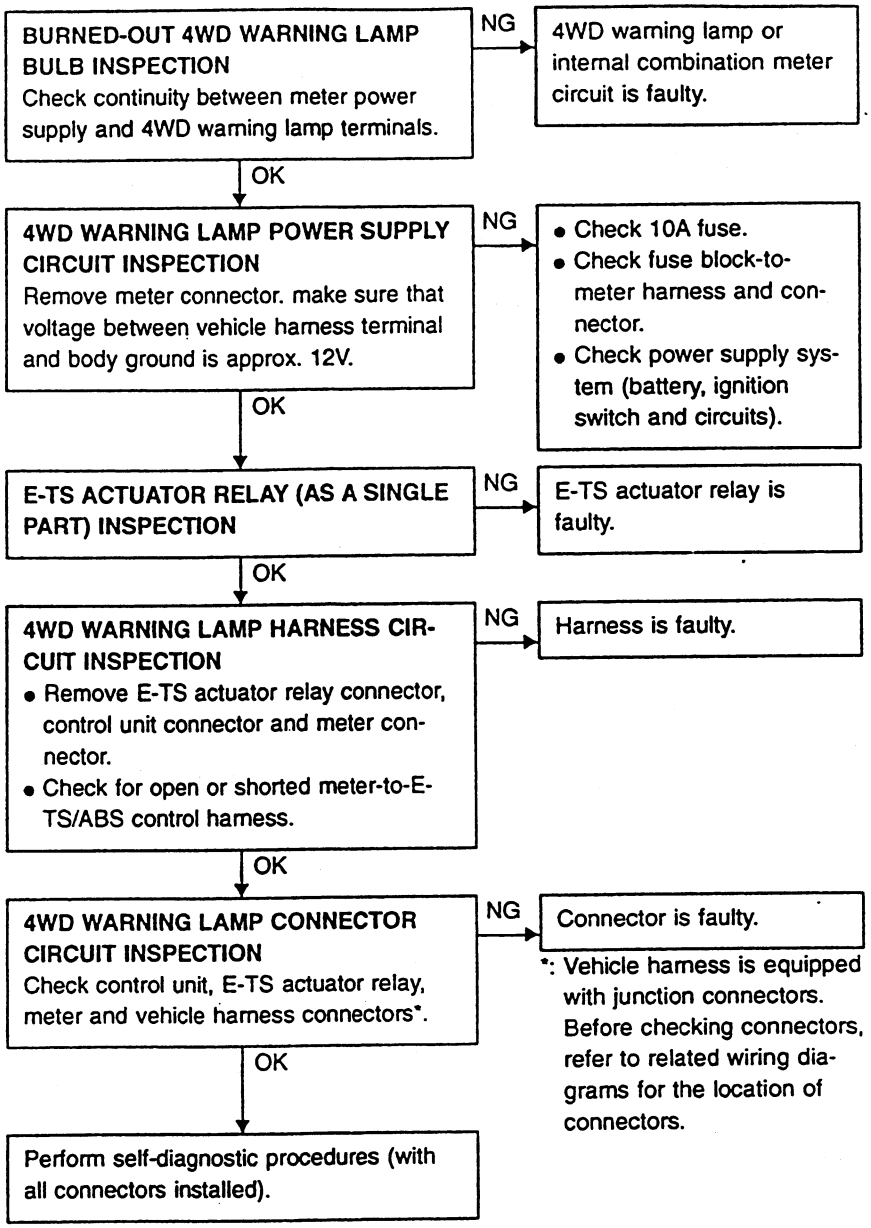
*: Vehicle harness is equipped with junction connectors. Before checking connectors, refer to related wiring diagrams for the location of these connectors.

OK ↓

Perform self-diagnostic procedures (with connectors installed).

## Trouble Diagnoses by Symptom (Cont'd)

### SYMPTOM 7 — 4WD warning lamp does not illuminate.



# STEERING SYSTEM

# SECTION ST

**MODIFICATION NOTICE:**
Super HICAS has been changed.

# CONTENTS

## Pre-inspection

### INSPECTION BEFORE DRIVING

- Check fluid leakage from power steering components (gear, pump, piping, etc.), and check whether the fluid level is within the proper range.
- Check whether tire size and inflation pressure are within the specified limits. Check also whether the steering wheel is a genuine part, and whether a non-genuine control unit is attached.
- Check whether wheel alignment is within the specified limits.
- Check whether suspension system is modified, and whether the modification, if any, has increased the vehicle weight.

### INSPECTION DURING DRIVING

- Check facts about trouble.
- Check whether the engine is running in good condition.

## System Description

This system contains two functions for SUPER HICAS: self-diagnosis function and fail-safe function.
For self-diagnosis function, refer to "SELF-DIAGNOSIS PROCEDURE" on pages ST-7 and ST-11.

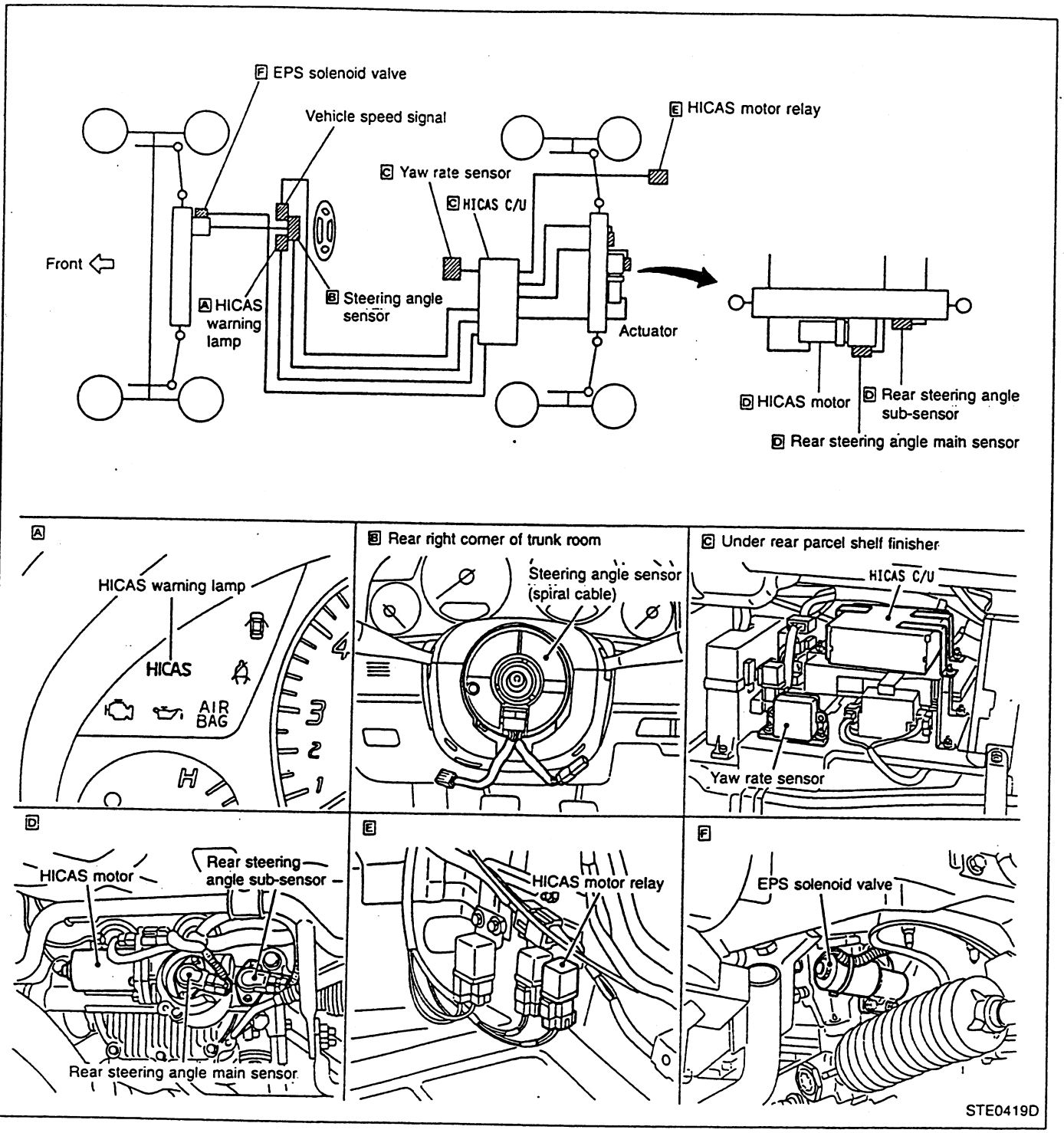
### FAIL-SAFE FUNCTION

If the system detects some error, it halts the normal control and enters the fail-safe mode.
In this event, the system notifies the driver of a malfunction by turning ON the HICAS warning lamp.
The fail-safe mode is canceled when ignition switch is turned OFF. If, however, the fail-safe mode is caused by a vehicle speed signal error, it is automatically canceled when the signal is restored before the ignition switch is turned OFF.

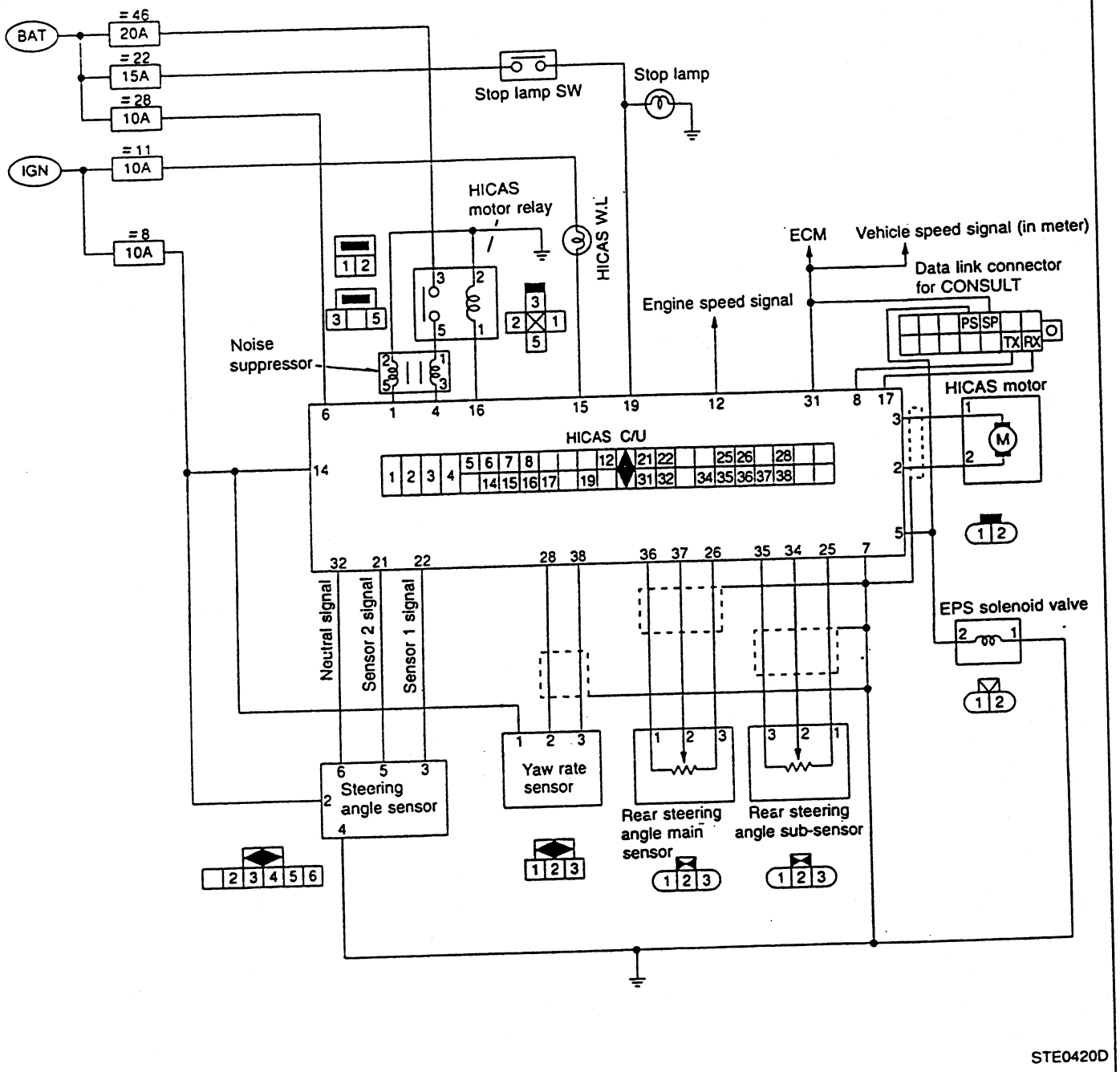
### HICAS WARNING LAMP

When the system is in normal condition, HICAS warning lamp is turned ON by switching the ignition ON, and is turned OFF after engine has started.

## Component Parts Location



## • Circuit Diagram



## Control Unit Input/Output Signal Specifications

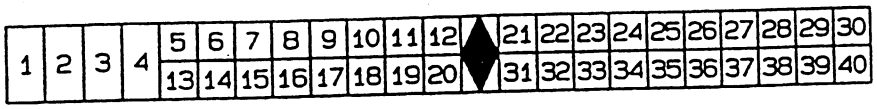
### USING CONSULT

**The displayed output signals represent the control unit computed data. If the output circuit (harness) should be open, correct values may be displayed.**

| Monitor item | Data monitor | | Check item |
|---|---|---|---|
| | Condition | Specification | |
| VHCL SPEED SE [km/h] | Vehicle is running or driving wheels are turning. | Approximately equal to speedometer reading | Vehicle speed sensor circuit |
| STEERING ANG [R/L] | Steering wheel is turned right or left. | Steering angle (degrees) measured from neutral position | Steering angle sensor circuit |
| NEUTRAL SIG [ON-OFF] | Steering wheel is in neutral position or turned right or left. | When neutral: ON<br>When turned (right or left): OFF | |
| STOP LAMP SW [ON-OFF] | Brake pedal operation | When pedal is depressed: ON<br>When pedal is not depressed: OFF | Stop lamp switch circuit |
| ENGINE SPEED [rpm] | Engine is running. | Approximately equal to tachometer reading | Wiring in ECM-HICAS control unit |
| RR ST ANG·MAI [V] | Actuator is operating in active test (with tires off the ground). | In neutral position:<br>Approx. 2.4V<br>In right lock position:<br>Approx. 4.5V<br>In left lock position:<br>Approx. 0.5V | Rear steering angle sensing system |
| RR ST ANG·SUB [V] | | | |
| YAW RATE SEN [V] | Ignition switch ON or engine operating | When neutral:<br>Approx. 2.5V<br>When turning to the right:<br>Approx. 4.5V<br>When turning to the left:<br>Approx. 0.5V | Yaw rate sensor system |
| POWER STR SOL [A] | Vehicle speed is changed from 0 to 100 km/h. | At 0 km/h: Approx. 1.1A<br>At 100 km/h: Approx. 0.4A | System related to power steering solenoid output signal |
| MOTOR CURRENT [A] | Actuator is operating in active test. | OK if output current is detected during operation | Motor and its power supply system |
| HICAS RELAY [ON-OFF] | Ignition switch is ON or engine is running. | When ignition switch is ON: ON | Power supply system for HICAS motor relay<br>System related to relay driving signal from control unit |
| FAILSAFE [ON-OFF] | | Not in operation | Check malfunctioning parts using self-diagnosis and data monitor. |
| WARNING LAMP [ON-OFF] | | When warning lamp is ON: ON<br>When warning lamp is OFF: OFF | Warning lamp circuit |
| RR ST ANG·VOL [V] | | Approx. 5V | Rear steering angle sensing system |
| YAW RATE VOLT | | Approx. 5V | Yaw rate sensor system |
| C/U VOLTAGE [V] | | Power supply voltage | Control unit power supply circuit |
| MOTOR VOLTAGE [V] | | Power supply voltage | Motor power supply system |

## Control Unit Input/Output Signal Specifications (Cont'd)

### USING CIRCUIT TESTER




STE0401D

| Terminal No. + | Terminal No. − | Check item | Specification |
|---|---|---|---|
| 1<br>7 | Body ground | Control unit ground circuit | When ignition switch is ON : Approx. 0V |
| 2 | Body ground | Motor driving output signal | — |
| 3 | Body ground | | |
| 4 | Body ground | Motor voltage | When ignition switch is ON : Power supply voltage<br>(In fail-safe mode : 0V) |
| 5 | Body ground | EPS solenoid driving signal | When vehicle speed is 0 km/h : Approx. 5.0 - 5.5V<br>When vehicle speed is 100 km/h : Approx. 1.0 - 1.5V |
| 6 | Body ground | Battery voltage | Power supply voltage |
| 8 | — | Data link connector for CONSULT (TX) | — |
| 12 | — | Engine speed signal | Measure tachometer driving signal.<br>Refer to EC section ["ECM (TCM) Input/Output Signal Reference Value"]. |
| 14 | Body ground | Ignition voltage | When ignition switch is ON : Power supply voltage<br>When ignition switch is OFF : 0V |
| 15 | Body ground | HICAS warning lamp | When HICAS warning lamp is ON : Approx. 0V<br>When HICAS warning lamp is OFF : Approx. 12V |
| 16 | Body ground | Output signal for driving motor relay | When ignition switch is ON : Approx. 12V<br>(In fail-safe mode : 0V) |
| 17 | — | Data link connector for CONSULT (RX) | — |
| 19 | Body ground | Stop lamp switch signal<br>(Send brake pedal operation signal to control unit.) | When pedal is depressed : Power supply voltage<br>When pedal is not depressed : 0V |
| 21 | Body ground | Steering angle sensor 2 | When steering wheel is turned, the voltage changes between 0 and 5V. |
| 22 | Body ground | Steering angle sensor 1 | |
| 25<br>26 | Body ground | Ground circuit for rear steering angle sensor | — |
| 28 | Body ground | Ground circuit for yaw rate sensor | — |
| 31 | — | Vehicle speed signal | Measure tachometer drive signal.<br>Refer to EC section ["ECM Input/Output Signal Reference Value"]. |
| 32 | Body ground | Neutral signal of rear steering angle sensor | When neutral : Approx. 5V |
| 34<br>37 | Body ground | Output signal of rear steering angle sensor | When neutral : Approx. 2.4V |
| 35<br>36 | Body ground | Power supply for rear steering angle sensor | When ignition switch is ON : Approx. 5V<br>When ignition switch is OFF : Approx. 0V |
| 38 | Body ground | Output signal of yaw rate sensor | When neutral : Approx. 2.5V<br>When turning to the right : Approx. 4.5V<br>When turning to the left : Approx. 0.5V |

## Preliminary Check

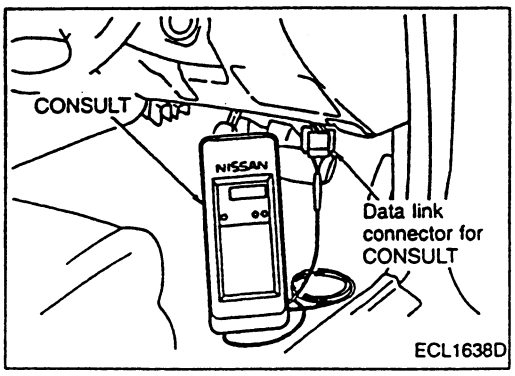
1. Check HICAS actuator for improper attachment and conditions.
- Check the actuator for loose fasteners, damage in actuator body, rods and dust boots, and grease leaks.
2. Check suspension system for improper attachment of links and excessive play in axles.
3. Check all connectors for improper connections.
4. Conduct inspection using self-diagnosis function.

## Trouble Diagnosis with CONSULT

### DESCRIPTION

The trouble diagnoses have four modes: Self-diagnosis, Data monitor, Active test and ECM Part Number modes.

| Mode | Function | Mode switching | Display |
|---|---|---|---|
| SELF-DIAGNOSTIC RESULTS | • Displays results of self-diagnosis. | Mode is switched simply by touching the CONSULT screen. | The CONSULT screen displays the data. |
| DATA MONITOR | • Used to find main causes of trouble, based on the result of self-diagnosis.<br>• Monitors, records and prints the input and output of HICAS control unit. | | |
| ACTIVE TEST | • Used to find main causes of trouble, based on the result of data monitor.<br>• Used to check the operation of actuator by sending driving signals to it. | | |
| ECM PART NUMBER | • Displays the part number of control unit. | | |




### SELF-DIAGNOSIS PROCEDURE

1. After connecting CONSULT to data link connector, start the engine.

2. Touch "START", "HICAS" and "SELF-DIAG RESULTS".
(1) Record faulty area or item if it appears on CONSULT display.
(2) Touch "ERASE".
3. A self-diagnostic result appears on CONSULT display. When "NO SELF DIAGNOSTIC FAILURE INDICATED" appears, check the items first appearing on display.

## Trouble Diagnosis with CONSULT (Cont'd)

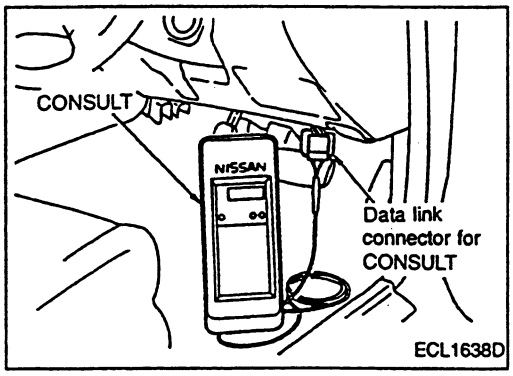
### SELF-DIAGNOSTIC RESULTS MODE

| Diagnostic item | Diagnostic item is detected when... |
|---|---|
| VEHICLE SPEED SEN [SIGNAL TURN](·b) | • Vehicle speed signal changes rapidly during running. |
| STEERING ANGLE SEN [NO ANG SIG](·a) | • Steering angle does not change for a while when vehicle is running at 60 km/h or faster. |
| STEERING ANGLE SEN [ANG SIG FIX](·e) | • Steering angle from neutral position is kept at 60° degrees or more for a certain time when vehicle is running at 50 km/h or faster. |
| STEERING ANGLE SEN [ANG FIX30°](·g) | • Steering angle from neutral position is kept at 30° degrees or more while vehicle travels a certain distance. |
| STEERING ANGLE SEN [NO NEUT SIG](·b) | • No neutral signal (ON signal) is sensed while vehicle travels a certain distance. |
| STEERING ANGLE SEN [NEU SIG OFF](·c) | • No neutral signal (ON signal) is sensed while steering wheel is turned more than 360°. |
| STEERING ANGLE SEN [NEUT SIG ON](·d) | • No neutral signal (OFF signal) is sensed while steering wheel is turned more than 50° degrees. |
| STEERING ANGLE SEN [OFFSET NEUT](·f) | • When steering wheel is turned 360° after the detection of neutral signal, the neutral signal is sensed for a certain period of time. |
| RR ST ANGLE SENSOR [MAIN SIGNAL](·a) | • For a certain period of time, input signal from main sensor shows abnormality against sensor power supply voltage. |
| RR ST ANGLE SENSOR [SUB SIGNAL](·b) | • When input signal from main sensor shows 2.5±1V, input signal from sub-sensor shows abnormality against sensor power supply voltage for a certain period of time. |
| RR ST ANGLE SENSOR [OFFSET SIG](·c) | • Input signals from main sensor and sub-sensor show more than a certain amount of difference from each other. |
| RR ST ANGLE SENSOR [ABNORMAL VOL](·d) | • The voltage is higher or lower than the standard value. |
| ENG REV SIGNAL [ABNORMAL SIGNAL] | • Engine speed shows an abnormally low value for a certain period of time when vehicle is running at 2 km/h or faster. |
| MOTOR VOLTAGE [LOW VOLTAGE](·a) | • When HICAS motor relay is ON, motor power supply voltage shows an abnormally lower value than ignition power supply voltage. |
| MOTOR VOLTAGE [BAD OBSTRCT](·b) | • When control unit keeps motor power OFF, the motor power voltage shows a non-zero value for a certain period of time. |
| MOTOR OUTPUT [ABNORML SIG](·a) | • When a motor current is more than 10A, the actual output of the motor shows an abnormally low value for a certain period of time. |
| MOTOR OUTPUT [REV CURRENT](·c) | • When motor output is kept ON, a reverse current is flowing. |
| MOTOR OUTPUT [NO CURRENT](·d) | • When motor output is kept OFF, a current is flowing. |
| MOTOR OUTPUT [OVERCURRENT](·e) | • When motor output is kept ON, an overcurrent is flowing. |
| MOTOR OUTPUT [MOTOR LOCK](·b) | • Signal from rear steering angle sensor does not change for a certain period of time while a motor current of 17A or more is flowing. |
| VEHICLE SPEED SEN [RAPD SIGN CHANGE2] | • When vehicle is running, vehicle speed signal is not sensed for a certain period of time after it has changed rapidly. |

## Trouble Diagnosis with CONSULT (Cont'd)

| Diagnostic item | Diagnostic item is detected when... |
|---|---|
| VEHICLE SPEED SEN [NO SIGNAL2] | • "VEHICLE SPEED SEN [RPD SIG CHG2]" has occurred previously, and vehicle speed signal is not sensed for a certain period of time. |
| VEHICLE SPEED SEN [NO SIGNAL3] | • "VEHICLE SPEED SEN [RPD SIG CHG2]" has not occurred previously, and vehicle speed signal is not sensed for a certain period of time while the vehicle is running at 1,500 rpm of engine speed. |
| CONTROL UNIT [ABNORMAL 1-6] | • Control unit is malfunctioning. |
| YAW RATE SENSOR [ABNORMAL SIGNAL] | • Yaw rate sensor input signal becomes abnormal for a certain period of time. |

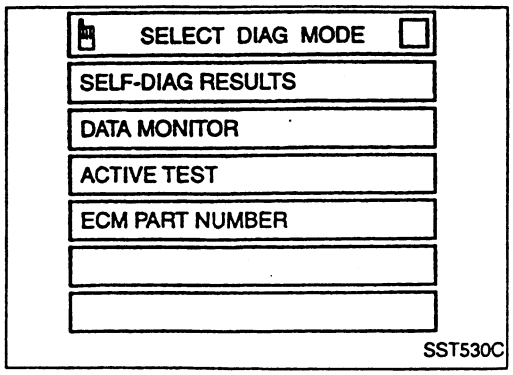




ECL1638D

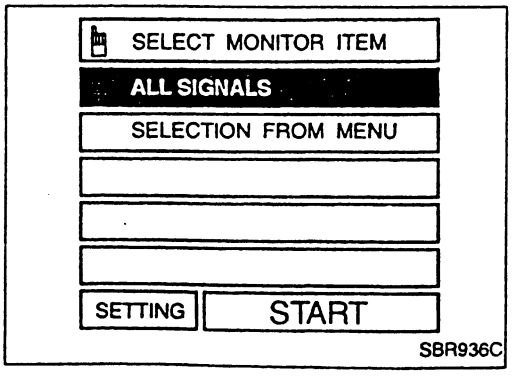
### DATA MONITOR PROCEDURE

1. After connecting CONSULT to data link connector, start the engine.



SST530C

2. Touch "START", "HICAS" and "DATA MONITOR".



SBR936C

3. Select items to be monitored.
(1) When "ALL SIGNALS" is selected, touch "START".
(2) When "SELECTION FROM MENU" is touched, "SELECT TEST ITEM" screen appears. Touch appropriate items on that screen, and touch "ENTER" and "START".
(3) Touch "PRINT", if printout is required.

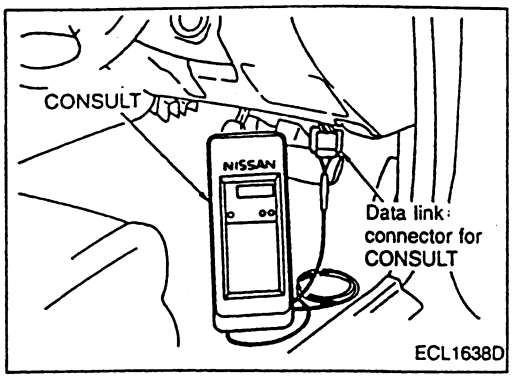
## Trouble Diagnosis with CONSULT (Cont'd)

### DATA MONITOR MODE

| Display | | Monitor item | | Remarks |
|---|---|---|---|---|
| | | Main item | Menu item | |
| VHCL SPEED SE | (km/h) | ○ | ○ | Shows a value calculated from vehicle speed sensor signal. |
| STEERING ANG | (R/L°) | ○ | ○ | After battery has been disconnected and connected again, an abnormal value is shown until neutral position (0°) is detected. |
| NEUTRAL SIG | (ON-OFF) | ○ | ○ | Shows whether steering wheel is in neutral position (ON/OFF). |
| STOP LAMP SW | (ON-OFF) | ○ | ○ | Shows whether stop lamp switch is ON or OFF. |
| ENGINE SPEED | (rpm) | ○ | ○ | Shows the engine speed calculated from crankshaft position sensor signal. |
| RR ST ANG·MAI | (V) | ○ | ○ | Shows the output voltage from rear steering angle main sensor. |
| RR ST ANG·SUB | (V) | ○ | ○ | Shows the output voltage from rear steering angle sub-sensor. |
| YAW RATE SEN | (V) | ○ | ○ | Shows output voltage sent from yaw rate sensor. |
| POWER STR SOL | (A) | ○ | ○ | Shows the control unit's control current for power steering solenoid. |
| MOTOR CURRENT | (A) | ○ | ○ | Shows the control unit's control current for HICAS motor relay. |
| HICAS RELAY | (ON-OFF) | ○ | ○ | Shows whether HICAS motor relay is ON or OFF. |
| FAILSAFE | (ON-OFF) | ○ | ○ | Shows whether fail-safe function is in operation (ON/OFF). |
| WARNING LAMP | (ON-OFF) | ○ | ○ | Shows the control unit's ON-OFF status of HICAS warning lamp. |
| RR ST AGN·VOL | (V) | ○ | ○ | Shows the power supply voltage from HICAS control unit to rear steering angle sensor. |
| YAW RATE VOL | (V) | ○ | ○ | Shows control voltage of yaw rate sensor built into control unit |
| C/U VOLTAGE | (V) | ○ | ○ | Shows the power supply voltage to HICAS control unit. |
| MOTOR VOLTAGE | (V) | ○ | ○ | Shows the power supply voltage from HICAS control unit to HICAS motor. |
| VOLTAGE | (V) | — | ○ | Shows the measured value by voltage probe. |
| PULSE | (ms, Hz and %) | — | ○ | Shows the measured value by pulse probe. If measurement is impossible, "#" appears. The "#" mark is shown also on the left of final data until measurement is completed. |

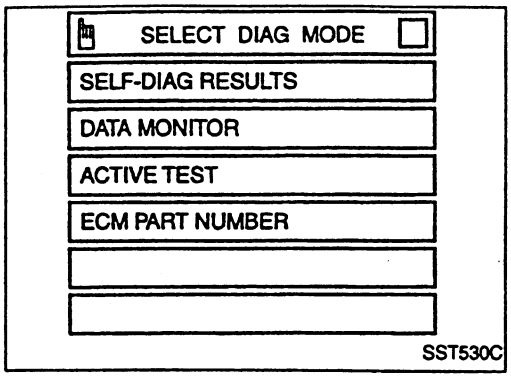
## Trouble Diagnosis with CONSULT (Cont'd)

### ACTIVE TEST PROCEDURE

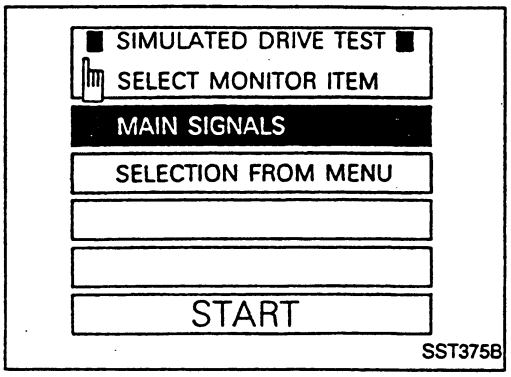



**Perform active tests with tires off the ground.**

1. After connecting CONSULT to data link connector, start the engine.




2. Touch "START", "HICAS" and "ACTIVE TEST".




3. Touch "SIMULATE" and "SELECT MONITOR ITEM".
4. Turn the steering wheel right or left to make the rear actuator operate.

**Reference values in normal condition**

| Steering angle sensor | Rear steering angle main sensor | Rear steering angle sub-sensor | Motor current |
|---|---|---|---|
| 0° (Neutral) | 2.4V | 2.4V | No (Approx. 0V) |
| R 90° | 4.4V | 4.4V | Yes (Variable) |
| L 90° | 0.4V | 0.4V | |

### ECM PART NUMBER

1. After connecting CONSULT to data link connector, turn ignition switch ON or start the engine.
2. Touch "START", "HICAS" and "ECM PART NUMBER".

- Part number printed on the control unit label and part number shown on the CONSULT screen is 28505 AA300.

## Trouble Diagnosis with Self-diagnosis

### DESCRIPTION

If the system detects some error while vehicle is running, it notifies the driver of a malfunction by turning ON the HICAS warning lamp, and at the same time, it halts the normal control and enters the fail-safe mode.

### SELF-DIAGNOSIS PROCEDURE

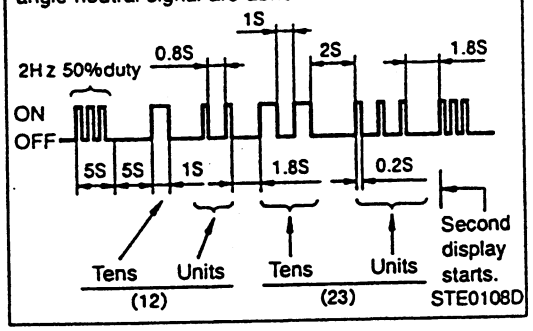
1. Start the engine.
2. Within 10 seconds after the engine has started, turn the steering wheel more than 20° right-to-left and repeat this 5 times or more, and then depress the brake pedal 5 times or more.

## Trouble Diagnosis with Self-diagnosis (Cont'd)

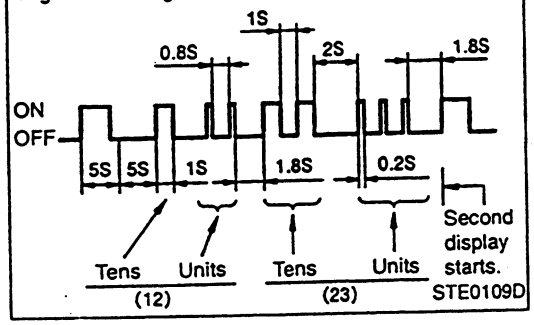
### DIAGNOSTIC ITEM INPUT

1. Move the vehicle one or two meters at a very low speed.
2. Turn the steering wheel more than 20° right-to-left once or more.

Example: Motor power supply and steering angle neutral signal are abnormal.




Example: Motor power supply and steering angle neutral signal are abnormal.




### DISPLAY OF SELF-DIAGNOSTIC RESULTS

The results of self-diagnosis are shown by flash patterns of HICAS warning lamp.

#### Display when past data shows that fail-safe function has been activated previously

- Only an abnormal item is indicated by the pattern shown in the left figure. The pattern is repeated.

#### Display when past data shows that fail-safe function has not been activated previously

- If all items are normal, HICAS warning lamp flashes at a frequency of 4 Hz.
- If system is in fail-safe mode, only an abnormal item is indicated by the pattern shown in the left figure. The pattern is repeated.

### MALFUNCTION CODE CHART

| Malfunction code No. | Diagnostic item |
|---|---|
| 11 | Control unit |
| 12 | Motor power supply |
| 13 | Motor output |
| 21 | Vehicle speed signal |
| 22 | Steering angle signal |
| 23 | Steering angle neutral signal |
| 24 | Rear steering angle main sensor signal |
| 25 | Rear steering angle sub-sensor signal |
| 33 | Engine speed signal |
| 41 | Yaw rate signal |

### HOW TO ERASE SELF-DIAGNOSTIC RESULTS

If past record shows that fail-safe function has been activated previously, use CONSULT, or leave the battery disconnected for more than 30 minutes to clear the memory.

## Symptom Chart

| Diagnostic item | | | Inspection 1 | Inspection 2 | Inspection 3 | Inspection 4 | Inspection 5 | Inspection 6 | Inspection 7 | Inspection 8 | Self-diagnosis | Control unit circuit check | Stop lamp switch circuit check | Steering angle sensor circuit check | Warning lamp circuit check | Meter circuit check | Engine speed signal circuit check | Vehicle speed signal check (Inspection 4). | Actuator assembly check |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Self-diagnosis | Self-diagnosis | CONSULT | | | | | | | | | | | | | | | | | |
| | Malfunction code No. | Diagnostic item | Diagnostic item | | | | | | | | | | | | | | | | | |
| | 11 | Control unit | CONTROL UNIT [ABNORMAL 1-6] | ○ | | | | | | | | | | | | | | | | |
| | 12 | Motor power supply | MOTOR VOLTAGE [LOW VOLTAGE](·a) | | ○ | | | | | | | | | | | | | | | |
| | | | MOTOR VOLTAGE [BAD OBSTRCT](·b) | | ○ | | | | | | | | | | | | | | | |
| | 13 | Motor output | MOTOR OUTPUT [ABNORML SIG](·a) | | | ○ | | | | | | | | | | | | | | |
| | | | MOTOR OUTPUT [MOTOR LOCK](·b) | | | ○ | | | | | | | | | | | | | | |
| | | | MOTOR OUTPUT [REV CURRENT](·c) | | | ○ | | | | | | | | | | | | | | |
| | | | MOTOR OUTPUT [NO CURRENT](·d) | | | ○ | | | | | | | | | | | | | | |
| | | | MOTOR OUTPUT [OVERCURRENT](·e) | | | ○ | | | | | | | | | | | | | | |
| | 21 | Vehicle speed signal | VEHICLE SPEED SEN [NO SIGNAL2] | | | | ○ | | | | | | | | | | | | | |
| | | | VEHICLE SPEED SEN [NO SIGNAL3] | | | | ○ | | | | | | | | | | | | | |
| | | | VEHICLE SPEED SEN [SIGNAL TURN](·b) | | | | ○ | | | | | | | | | | | | | |
| | | | VEHICLE SPEED SEN [RPD SIG CHG2] | | | | ○ | | | | | | | | | | | | | |
| | 22 | Steering angle signal | STEERING ANGLE SEN [NO ANG SIG](·a) | | | | | ○ | | | | | | | | | | | | |
| | | | STEERING ANGLE SEN [ANG SIG FIX](·b) | | | | | ○ | | | | | | | | | | | | |
| | | | STEERING ANGLE SEN [ANG FIX30°](·g) | | | | | ○ | | | | | | | | | | | | |
| | 23 | Steering angle neutral signal | STEERING ANGLE SEN [NO NEUT SIG](·b) | | | | | ○ | | | | | | | | | | | | |
| | | | STEERING ANGLE SEN [NEUT SIG OFF](·c) | | | | | ○ | | | | | | | | | | | | |
| | | | STEERING ANGLE SEN [NEUT SIG ON](·d) | | | | | ○ | | | | | | | | | | | | |
| | | | STEERING ANGLE SEN [OFFSET NEUT](·f) | | | | | ○ | | | | | | | | | | | | |
| | 24 | Rear steering angle main sensor signal | RR ST ANGLE SENSOR [MAIN SIGNAL](·a) | | | | | | ○ | | | | | | | | | | | |
| | | | RR ST ANGLE SENSOR [ABNORML VOL](·d) | | | | | | ○ | | | | | | | | | | | |
| | | | RR ST ANGLE SENSOR [OFFSET SIG](·c) | | | | | | ○ | | | | | | | | | | | |
| | 25 | Rear steering angle sub-sensor signal | RR ST ANGLE SENSOR [SUB SIGNAL](·b) | | | | | | ○ | | | | | | | | | | | |
| | | | RR ST ANGLE SENSOR [ABNORML VOL](·d) | | | | | | ○ | | | | | | | | | | | |
| | | | RR ST ANGLE SENSOR [OFFSET SIG](·c) | | | | | | ○ | | | | | | | | | | | |
| | 33 | Engine speed signal | ENG REV SIGNAL [ABNORMAL SIGNAL] | | | | | | | ○ | | | | | | | | | | |
| | 41 | Yaw rate signal | YAW RATE SENSOR [ABNORMAL SIGNAL] | | | | | | | | ○ | | | | | | | | | |

## Symptom Chart (Cont'd)

| Trouble diagnoses based on phenomena | Diagnostic item: Self-diagnosis: Malfunction code No. | Diagnostic item: Self-diagnosis: Diagnostic item | Diagnostic item: CONSULT: Diagnostic item | Inspection 1 | Inspection 2 | Inspection 3 | Inspection 4 | Inspection 5 | Inspection 6 | Inspection 7 | Inspection 8 | Self-diagnosis | Control unit circuit check | Stop lamp switch circuit check | Steering angle sensor circuit check | Warning lamp circuit check | Meter circuit check | Engine speed signal circuit check | Vehicle speed signal check (Inspection 4) | Actuator assembly check |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cannot enter self-diagnosis mode. | | | | | | | | | | | | | ○ | ○ | ○ | | | | | |
| HICAS warning lamp is not turned ON by switching the ignition ON. | | | | | | | | | | | | | ○ | | | | | | | |
| HICAS warning lamp is turned ON by switching the ignition ON but is not turned OFF by starting the engine. | | | | | | | | | | | | ○ | ○ | ○ | ○ | | ○ | ○ | | |
| Illumination of HICAS warning lamp has occurred after engine started. | | | | | | | | | | | | ○ | | | | | | | | |
| Steering effort does not change with vehicle speed. | | | | | | | | | | | | ○ | | ○ | | | | | ○ | |
| There is an abnormal noise. | | | | | | | | | | | | ○ | | | | | | | ○ | ○ |
| Self-diagnosis with CONSULT displays "CONSULT". | | | | | | | | | | | | | | | | | | | ○ | |

# RESTRAINT SYSTEM

# SECTION RS

**MODIFICATION NOTICE:**
For seat belt pre-tensioner, self-diagnostic items displayed on the CONSULT screen have been changed.

# CONTENTS

## Trouble Diagnosis with CONSULT

### SELF-DIAGNOSIS

- **Self-diagnostic procedures for the supplemental restraint system remain unchanged from the previous vehicle model.**

**Self-diagnostic code chart**

| Diagnostic item | Explanation | Repair order |
|---|---|---|
| PRE-TEN FRONT RH [OPEN/VB-SHORT] | • Driver seat belt pre-tensioner circuit is open or shorted to some power supply circuit. | 1. Visually check the wiring harness connection.<br>2. Replace the driver seat belt pre-tensioner.<br>3. Replace the diagnosis sensor unit.<br>4. Replace the harness if it has visible damage. |
| PRE-TEN FRONT RH [GND-SHORT] | • Driver seat belt pre-tensioner circuit is shorted to ground. | |
| PRE-TEN FRONT LH [OPEN/VB-SHORT] | • Passenger seat belt pre-tensioner circuit is open or shorted to some power supply circuit. | 1. Visually check the wiring harness connection.<br>2. Replace the passenger seat belt pre-tensioner.<br>3. Replace the diagnosis sensor unit.<br>4. Replace the harness if it has visible damage. |
| PRE-TEN FRONT LH [GND-SHORT] | • Passenger seat belt pre-tensioner circuit is shorted to ground. | |

**For seat belt pre-tensioner systems, only "SELF-DIAG [CURRENT]" is displayed; "SELF-DIAG [PAST]" and "TROUBLE DIAG RECORD" are not displayed.**

# HEATER & AIR CONDITIONER

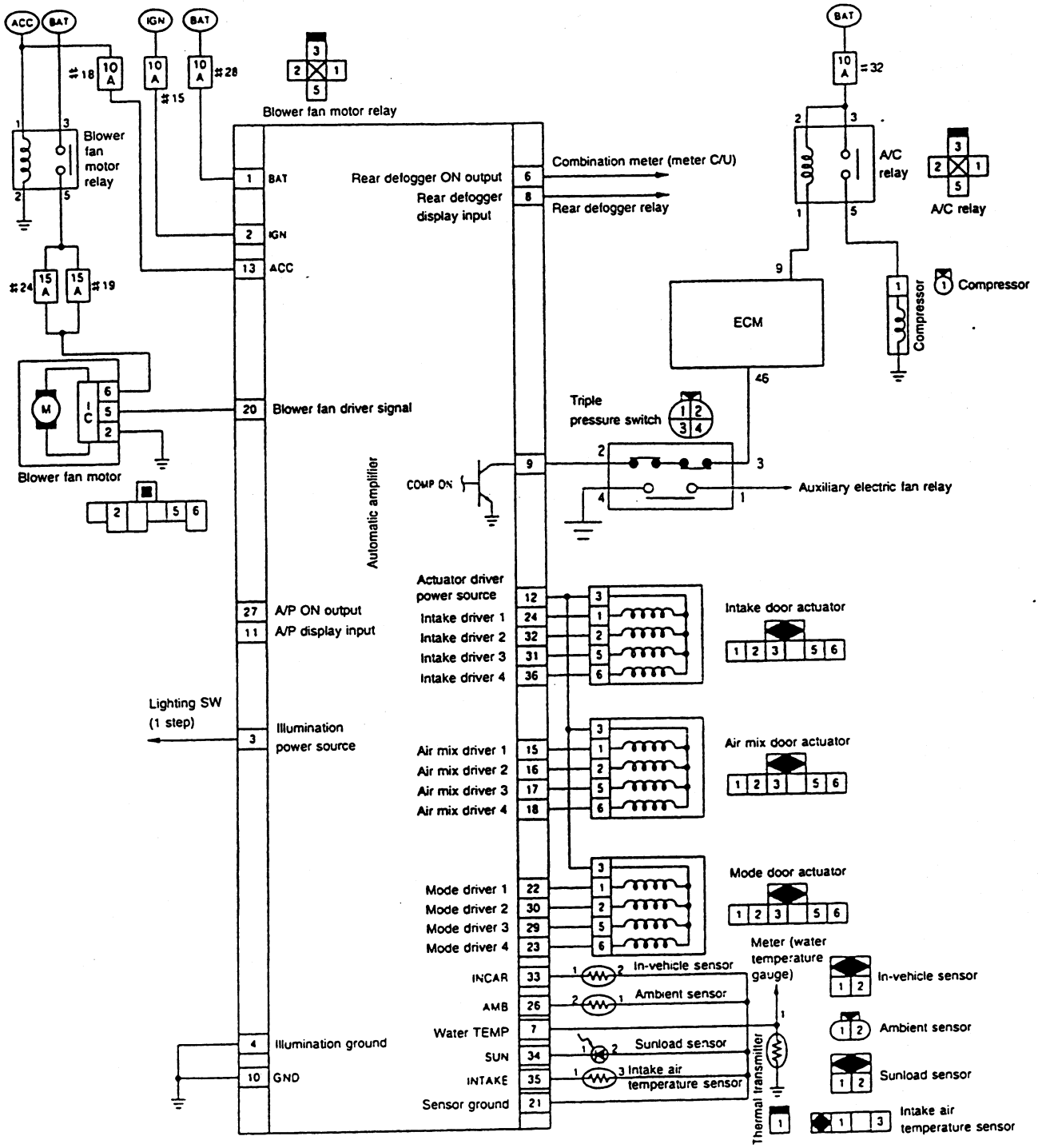
# SECTION HA

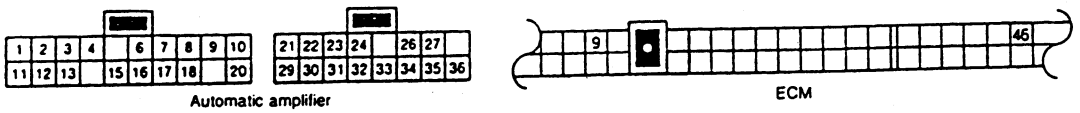


**MODIFICATION NOTICE:**
Self-diagnosis display has been changed.

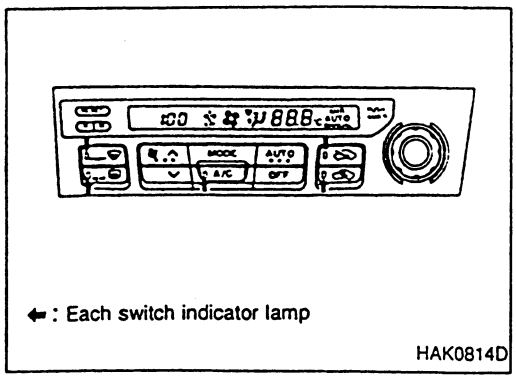
## CONTENTS

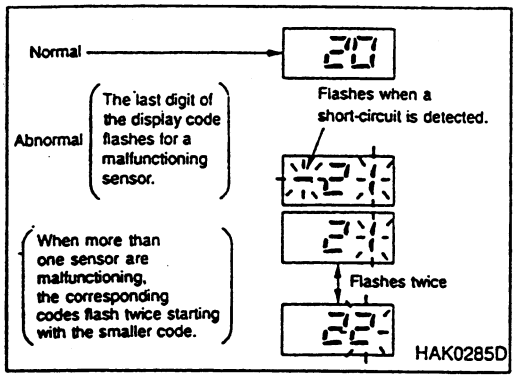
## Circuit Diagram




HA-0991D




## Trouble Diagnosis by Self-diagnosis Function

### SELF-DIAGNOSIS DISPLAY ITEM

#### Step 1 — Display segments and indicator lamp check

Check the controller switch indicator lamp and display segments.
Normal: The switch indicator lamp and display segments are illuminated.
Abnormal: Malfunctioning area will not be illuminated.

**A/C switch indicator lamp does not illuminate if automatic heater is equipped.**

#### Step 2 — Each sensor check

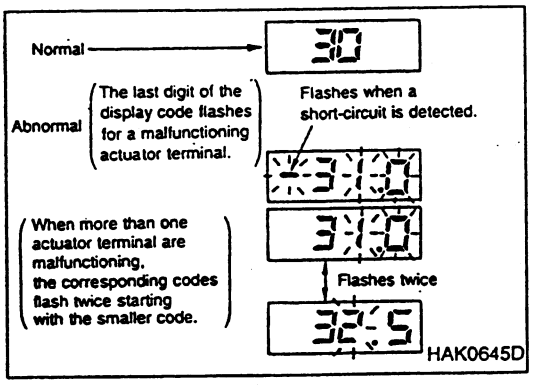
Display shows "2" for approx. 1 second in the step 2 mode, and then shows the judgement result.
Check the data of each sensor inputted into the automatic amplifier.
Normal: Display shows "20".
Abnormal: The last digit of the display code flashes for a malfunctioning sensor. At this time, if a short-circuit is detected, "–" is displayed. Furthermore, when there are more than one malfunctioning sensor, the corresponding display codes flash twice starting with the smaller code.

**The sunload sensor will judge an abnormality when there is insufficient lighting (less than 5,000 lx) such as while being placed indoor or during the evening.**

## Trouble Diagnosis by Self-diagnosis Function (Cont'd)

### Display code for malfunctioning sensor and identifying condition for automatic amplifier

| Display code | Sensor | Identifying condition for automatic amplifier | |
|---|---|---|---|
| | | Open circuit | Short-circuit |
| 21 | Ambient sensor | Less than –41.9°C | More than 100°C |
| 22 | In-vehicle sensor | Less than –41.9°C | More than 100°C |
| 24 | Intake air temperature sensor | Less than –41.9°C | More than 100°C |
| 25 | Sunload sensor | Less than 41.8 W/m² (36.0 kcal/m²·h) | More than 1,729 W/m² (1,487 kcal/m²·h) |




### Step 3 — Each actuator check and reset

Display shows "3" for approx. 1 second in the step 3 mode, and then shows the judgement result.
Transmit an output signal to the intake door actuator, mode door actuator, and air mix door actuator; and check each actuator. Furthermore, the actuator can be reset by pressing the front DEF switch at this time.
Normal: Display shows "30".
Abnormal: The display code flashes for a malfunctioning actuator. At this time, if a short-circuit is detected, "–" is displayed. Furthermore, when there are more than one malfunctioning sensor, the corresponding display codes flash twice starting with the smaller code.
During reset: Display flashes "30" and front DEF switch. (Approx. 10 seconds)

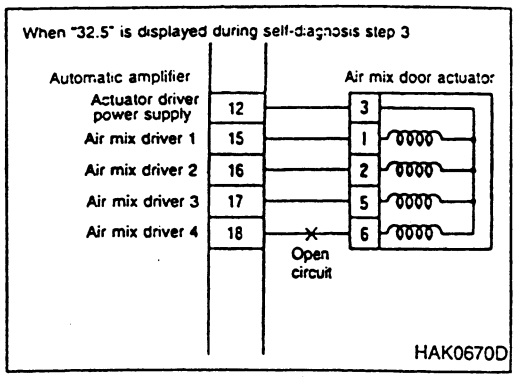
### Actuator display code

| Display code | 31.0 - 32.5 | 33.0 - 34.5 | 35.0 - 36.5 |
|---|---|---|---|
| Actuator | Air mix door | Mode door | Intake door |

### Faulty harness display

| Actuator | Air mix door actuator | | | | Mode door actuator | | | | Intake door actuator | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Terminal No. (actuator side) | 1 | 2 | 5 | 6 | 1 | 2 | 5 | 6 | 1 | 2 | 5 | 6 |
| Terminal No. (automatic amplifier side) | 15 | 16 | 17 | 18 | 22 | 30 | 29 | 23 | 24 | 32 | 31 | 36 |
| Short-circuit failure display | –31.0 | –31.5 | –32.0 | –32.5 | –33.0 | –33.5 | –34.0 | –34.5 | –35.0 | –35.5 | –36.0 | –36.5 |
| Open circuit failure display | 31.0 | 31.5 | 32.0 | 32.5 | 33.0 | 33.5 | 34.0 | 34.5 | 35.0 | 35.5 | 36.0 | 36.5 |

## Trouble Diagnosis by Self-diagnosis Function (Cont'd)




- When a open-circuit failure is displayed for all four terminals of each actuator, there is a possibility of a disconnected connector, or broken harness of the actuator driver power source.
- The self-diagnosis cannot detect short-circuit between actuator driver signals, but the actuators will vibrate when actuated.

### Step 4 — Each output device check

Display shows "41" in the step 4 mode. When the DEF switch is pushed it switches from 42→43→44→45→46→41. As indicated in the following table, the automatic amplifier forcefully outputs to each actuator, blower fan motor, and compressor in response to the display code. Confirm and check each output operation status by observing, listening to the operating sound, placing hand at the air outlet, or using other methods.

**The operation status of each actuator, blower fan motor, and compressor cannot be confirmed on the display.**

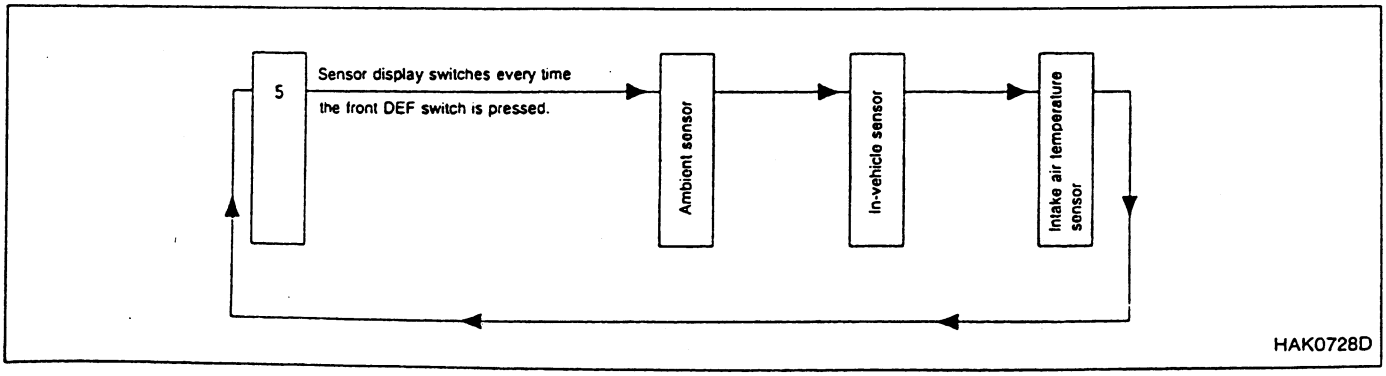
### Display code for output device and status

| Output device \ Display code | 41 | 42 | 43 | 44 | 45 | 46 |
|---|---|---|---|---|---|---|
| Mode door | VENT | B/L | B/L | FOOT | D/F | DEF |
| Intake door | Recirculation | Recirculation | 20% ambient | Ambient | Ambient | Ambient |
| Air mix door | Full cold | Full cold | Open 50% | Open 50% | Full hot | Full hot |
| Blower fan motor | 35% | 75% | 61% | 61% | 61% | 100% |
| Compressor (Fully automatic air conditioner only) | ON | ON | ON | OFF | OFF | ON |
| Air purifier (only when connected) | ON | ON | ON | OFF | OFF | ON |

**The blower fan motor revolution is controlled by the duty ratio signal outputted from the automatic amplifier. [For duty ratio, refer to "Blower Fan Motor System Check" in the Service Manual (Pub. No. SM9E-R34AJ0).]**

### Step 5 — Detected temperature display for each sensor

Display shows "5" in the step 5 mode. Every time the DEF switch is pushed, the detected sensor temperature is displayed in 0.5°C increments.



## Trouble Diagnosis by Self-diagnosis Function (Cont'd)

### Set- and control-temperature difference setting

The set temperature controlled by the automatic amplifier appears on the display. It can be adjusted as required by passengers preference when it differs from vent temperatures. When the controller's fan switch is pressed in the self-diagnostic function Step 5, the difference between the set temperature and control temperature appears on the display. Each time the temperature control dial is turned, the temperature shown on the display can be changed as required at intervals of 0.5°C in the ±3.0°C range up to −3.0°C.

**CAUTION:**
**If the battery is removed or the battery voltage drops below 9V, the set- and control-temperature difference setting will be cancelled.**

## Magnet Clutch System Check

### MAGNET CLUTCH

Disconnect the compressor connector. Apply approx. 12V to the compressor to check the magnet clutch operation.

### AIR CONDITIONER RELAY

- Remove the air conditioner relay. Apply approx. 12V between the air conditioner relay terminals No. 1 and 2. Check the relay operation sound.
- Check the continuity between terminals No. 3 and 5.

### REFRIGERANT CHARGE AMOUNT

- Connect the manifold gauge to the vehicle side service valve.
- Check that the lower pressure side (gauge pressure) is more than approx. 0.18 MPa (1.8 kg/cm$^2$·G).

### ECM

Start the engine, and short-circuit the ECM terminal No. 9 to the ground. Check the magnet clutch operation.

### INTAKE AIR TEMPERATURE SENSOR

Start the engine, and short-circuit the intake air temperature sensor terminal No. 1 to the ground. Check the magnet clutch operation.

### PRESSURE SWITCH

Remove pressure switch connector. Check continuity between switch terminals.

# ELECTRICAL SYSTEM

# SECTION EL

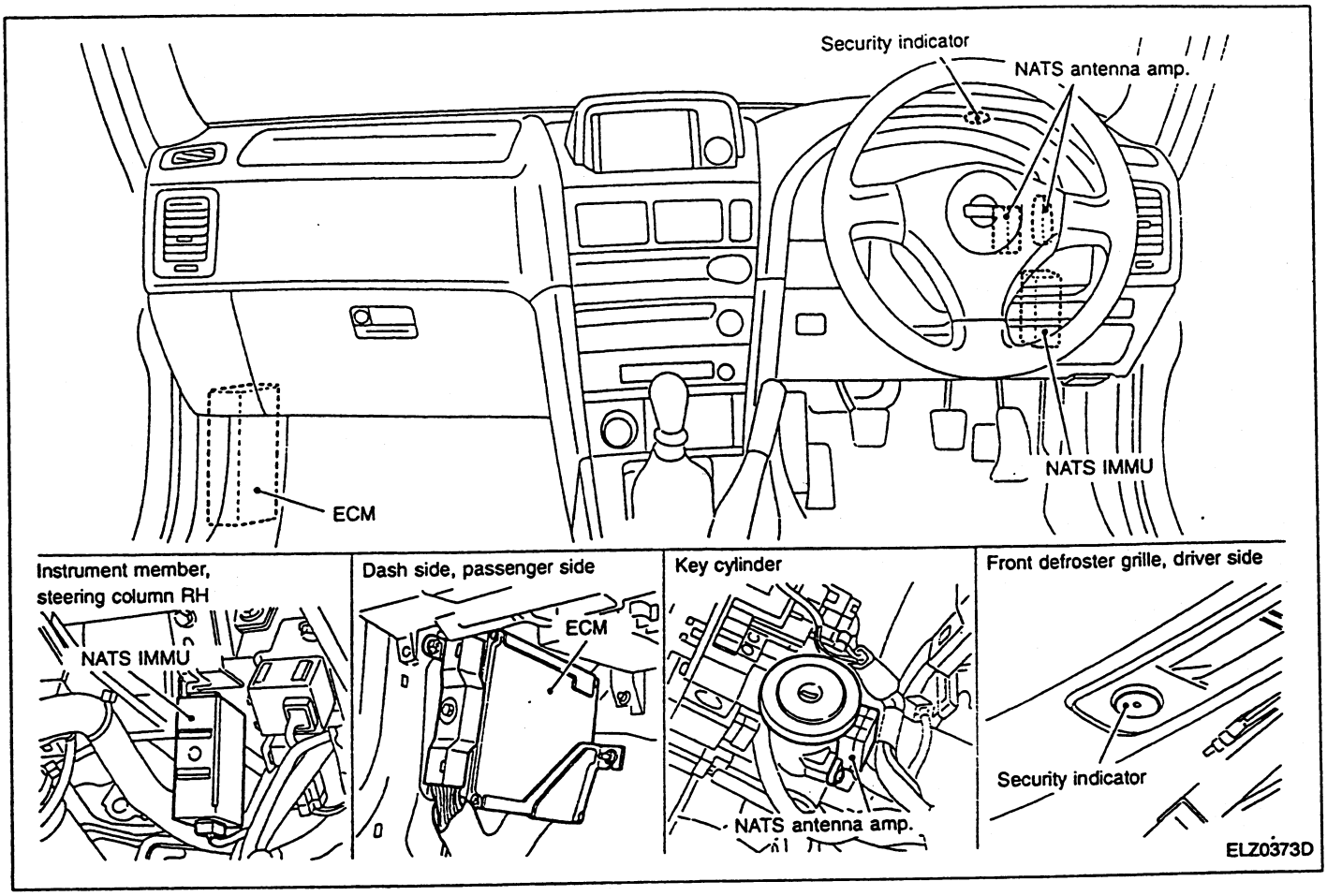


**MODIFICATION NOTICE:**

- NATS (Nissan Anti-Theft System) has been added.
- Multi-function display has been added.

# CONTENTS

## Component Parts



## System Description

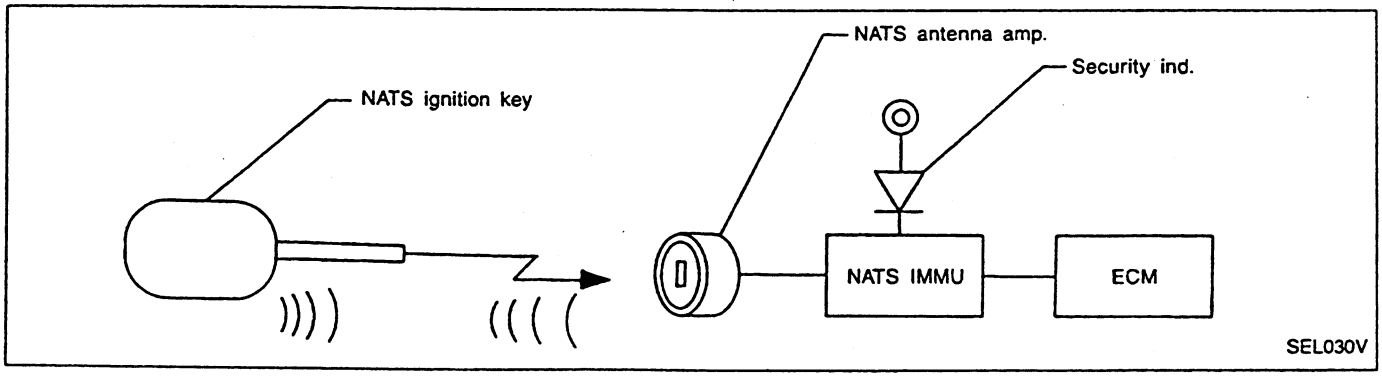
NATS (Nissan Anti-Theft System) has the following immobiliser functions:

- Since only NATS ignition keys, whose ID nos. have been registered into the ECM and IMMU of NATS, allow the engine to run, operation of a stolen vehicle without a NATS registered key is prevented by NATS. That is to say, NATS will immobilise the engine if someone tries to start it without the registered key of NATS.
- All of the originally supplied ignition key IDs (except for card plate key) have been NATS registered. If requested by the vehicle owner, a maximum of five key IDs can be registered into the NATS components.
- The security indicator blinks when the ignition switch is in "OFF" or "ACC" position. Therefore, NATS warns outsiders that the vehicle is equipped with the anti-theft system.
- When NATS detects trouble, the security indicator lamp lights up while ignition key is in the "ON" position.
- NATS trouble diagnoses, system initialization and additional registration of other NATS ignition key IDs must be carried out using CONSULT hardware and CONSULT NATS software.
  When NATS initialization has been completed, the ID of the inserted ignition key is automatically NATS registered. Then, if necessary, additional registration of other NATS ignition key IDs can be carried out.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT operation manual, NATS.
- A maximum of 5 keys (including the standard key) per vehicle can be registered for ID (identification) as requested by car owner.
- Use of other than genuine Nissan ECM in vehicles makes it impossible to start engines.
- **When servicing a malfunction of the NATS (indicated by lighting up of Security Indicator Lamp) or registering another NATS ignition key ID no., it may be necessary to re-register original key identification. Therefore, be sure to receive all keys from vehicle owner.**

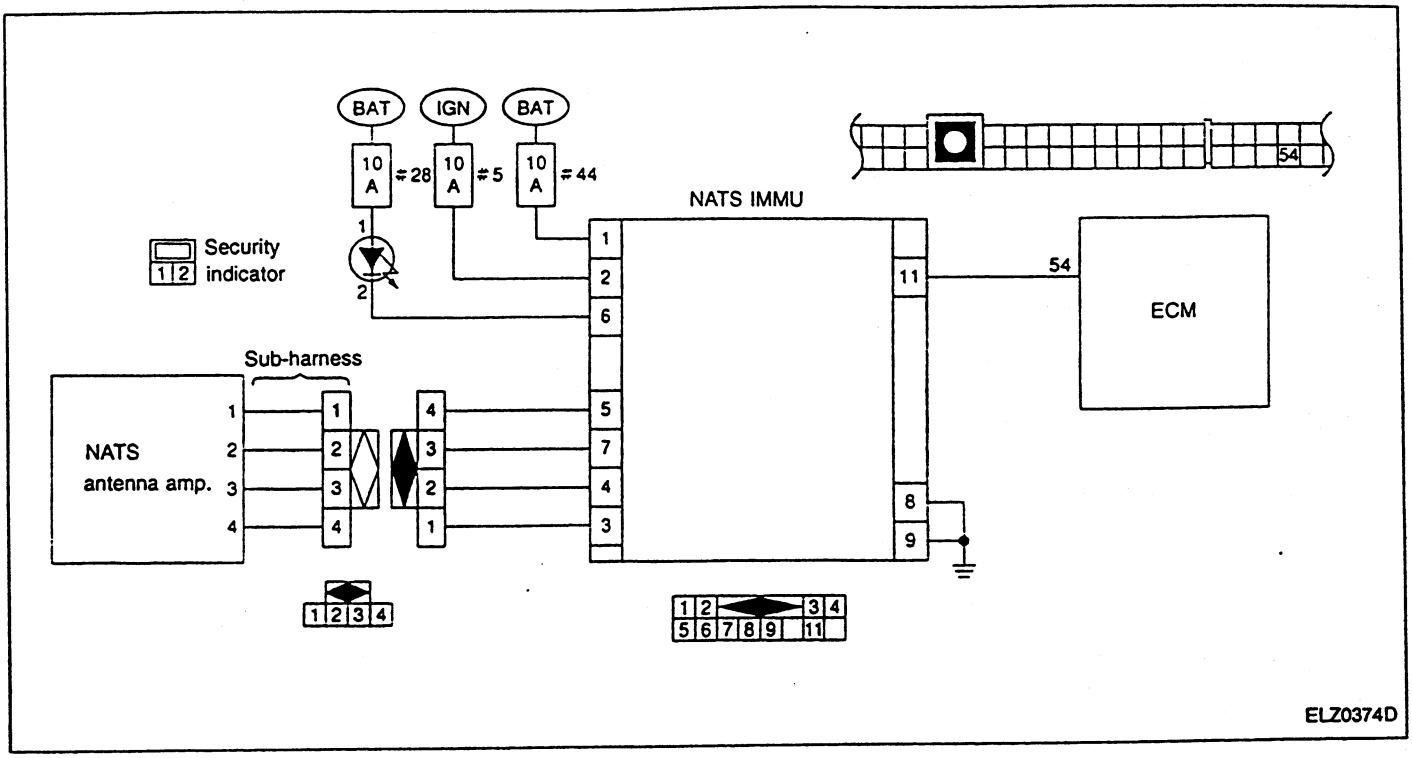
## System Composition

The immobiliser function of the NATS consists of the following:

- NATS ignition key
- NATS antenna amp. located in the ignition key cylinder
- NATS immobiliser control unit (NATS IMMU)
- Engine control module (ECM)
- Security indicator

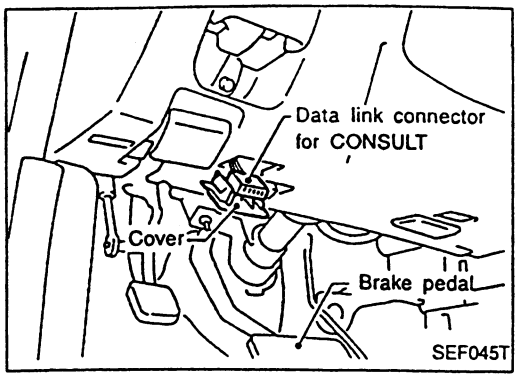


## Circuit Diagram




## Immobilizer Control Unit Input/Output Signal Specifications

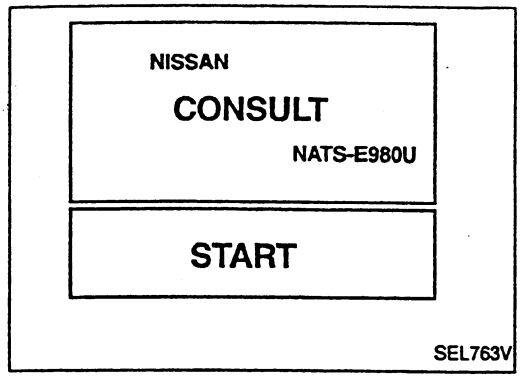
| Terminal No. | Measuring condition | | Specification |
|---|---|---|---|
| | Ignition switch | Operation or condition | |
| 1 | OFF | — | Approx. 12V |
| 2 | ON | — | Approx. 12V |
| 3 | OFF | — | Approx. 0V |
| | ON | — | Approx. 5V |
| 4 | OFF | — | Approx. 0V |
| | ON | — | As soon as ignition switch is turned ON, analog tester pointer deflects. |
| 5 | OFF | — | Approx. 4.4V |
| | ON | (Activated with ID-registered key) | As soon as ignition switch is turned ON, analog tester pointer deflects. |
| 6 | ON | — | Approx. 10V |
| | OFF | — | Analog tester pointer deflects at an interval of approx. 2.4 second cycles. |
| 7 | ON | — | Approx. 0V |
| 8 | ON | — | Approx. 0V |
| 9 | ON | — | Approx. 0V |
| 11 | OFF | — | Approx. 12V |
| | — | Ignition switch is turned from OFF to ON. (Activated with ID-registered key) | As soon as ignition switch is turned ON, analog tester pointer deflects. |
| | — | Ignition switch is turned from ON to OFF. (Activated with ID-registered key) | As soon as ignition switch is turned OFF, analog tester pointer deflects. |




## CONSULT

### CONSULT INSPECTION PROCEDURE

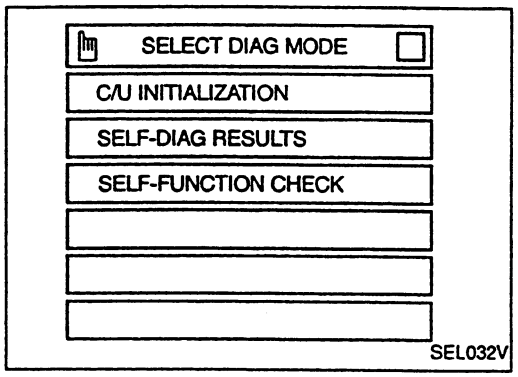
1. Turn ignition switch OFF.
2. Connect "CONSULT" to Data link connector for CONSULT.




3. Insert NATS program card into CONSULT.

**⬅: Program card**
**NATS-E980U**

4. Turn ignition switch ON.
5. Touch "START".




6. Perform each diagnostic test mode according to each service procedure.

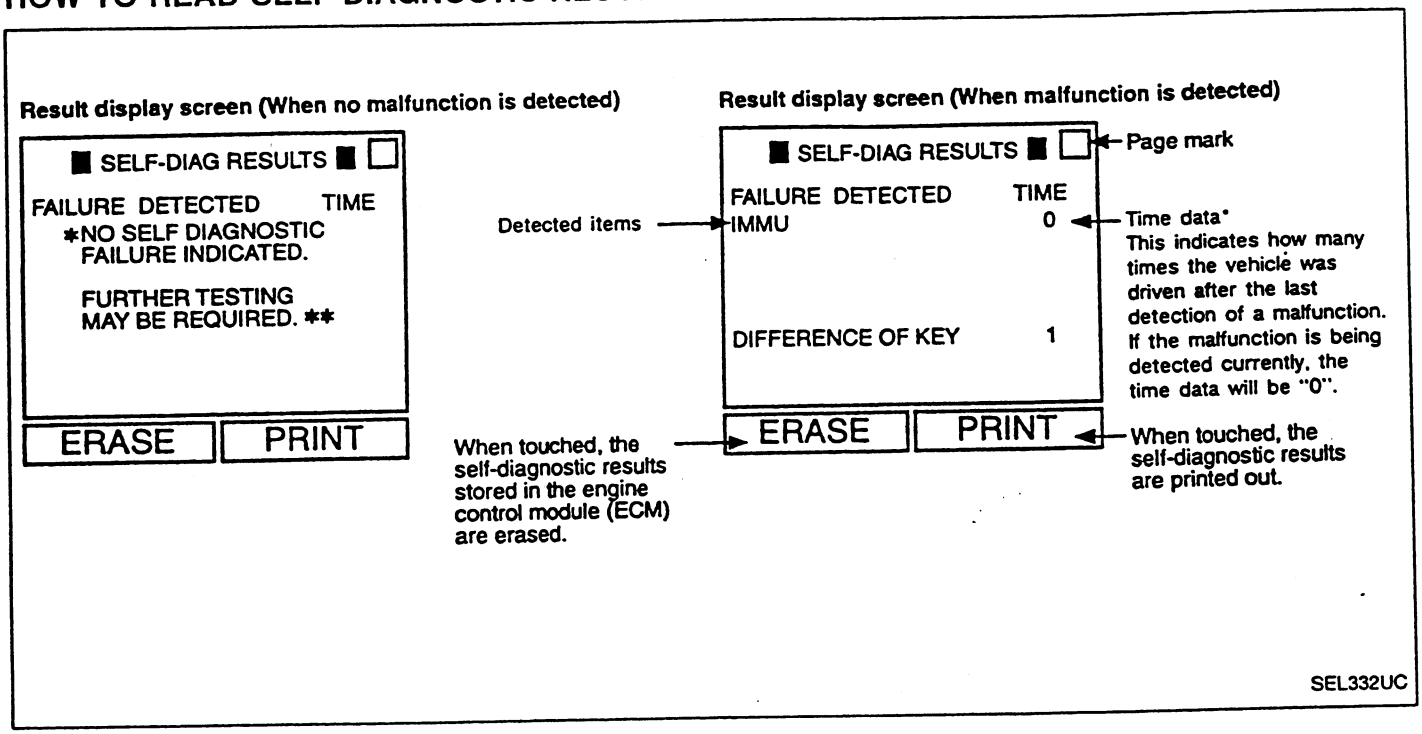
**For further information, see the CONSULT Operation Manual, NATS.**

# CONSULT (Cont'd)

## CONSULT DIAGNOSTIC TEST MODE FUNCTION

| CONSULT DIAGNOSTIC TEST MODE | Description |
|---|---|
| C/U INITIALIZATION | When replacing any of the following three components, C/U initialization is necessary. [NATS ignition key/IMMU/ECM] |
| SELF-FUNCTION CHECK | ECM checks its own NATS communication interface by itself. |
| SELF-DIAGNOSTIC RESULTS | Detected items (screen terms) are as shown in the chart below. |

## HOW TO READ SELF-DIAGNOSTIC RESULTS



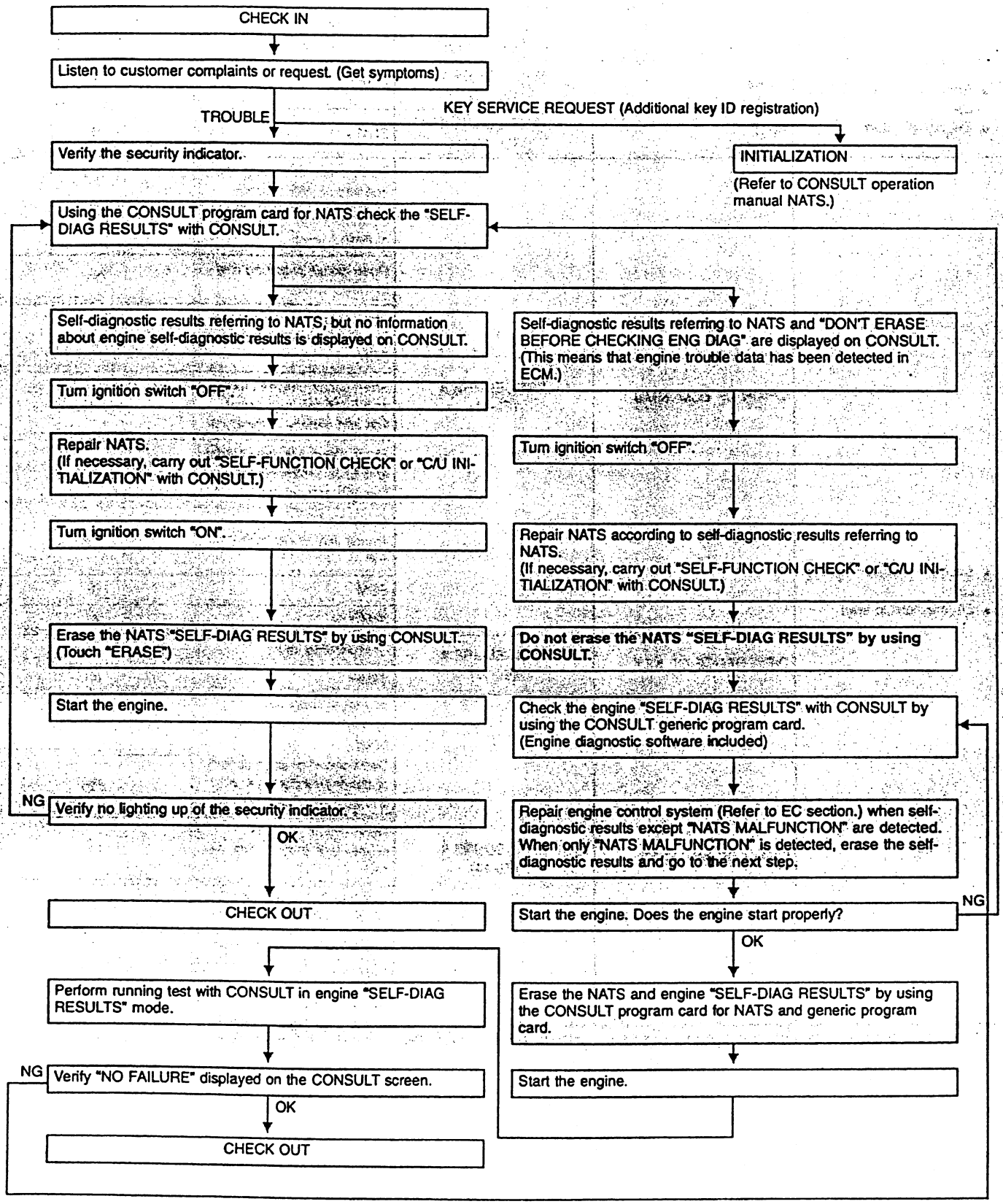

* If trip number is more than 1, MIL does not blink.

## SELF-DIAGNOSTIC RESULTS ITEM CHART

| Detected items (Screen terms) | Description | Reference page |
|---|---|---|
| IMMU | ECM received the signal from IMMU that IMMU is malfunctioning. | EL-10 |
| ECM | ECM is malfunctioning. | EL-10 |
| CHAIN OF ECM-IMMU | Communication impossible between ECM and IMMU. | EL-11 |
| DIFFERENCE OF KEY | IMMU can receive the key ID signal but the result of ID verification between key ID and IMMU is NG. | EL-13 |
| CHAIN OF IMMU-KEY | IMMU cannot receive the key ID signal. | EL-14 |
| ID DISCORD, IMM-ECM | The result of ID verification between IMMU and ECM is NG. System initialization is required. | EL-15 |
| ELECTRONIC NOISE | Noise (interference) interfered into NATS communication lines during communicating. | EL-16 |
| DON'T ERASE BEFORE CHECKING ENG DIAG | Engine trouble data and NATS trouble data have been detected in ECM. | EL-7 |
| LOCK MODE | When an unregistered ignition key is used, or if the starting operation is carried out 5 or more times consecutively with the ignition key, IMMU or ECM malfunctioning, NATS will shift the mode to one which prevents the engine from being started. | EL-18 |

# Trouble Diagnoses

## WORK FLOW



## SYMPTOM MATRIX CHART ↑
## (Self-diagnosis related item)

| SYMPTOM | Displayed "SELF-DIAG RESULTS" on CONSULT screen. | DIAGNOSTIC PROCEDURE (Reference page) | SYSTEM (Malfunctioning part or mode) | REFERENCE PART NO. OF ILLUSTRATION ON NEXT PAGE |
|---|---|---|---|---|
| • Security indicator lighting up*<br>• Engine will start. | IMMU | PROCEDURE 1 (EL-10) | IMMU | A |
| | ECM | PROCEDURE 2 (EL-10) | ECM | B |
| • Security indicator lighting up*<br>• Engine hard to start | CHAIN OF ECM-IMMU | PROCEDURE 3 (EL-11) | Open circuit in battery voltage line of IMMU circuit | C1 |
| | | | Open circuit in ignition line of IMMU circuit | C2 |
| | | | Open circuit in ground line of IMMU circuit | C3 |
| | | | Open circuit in communication line between IMMU and ECM | C4 |
| | | | Short circuit between IMMU and ECM communication line and battery voltage line | C4 |
| | | | Short circuit between IMMU and ECM communication line and ground line | C4 |
| | | | Open circuit in power source line of ANT/AMP circuit | E3 |
| | | | ECM | B |
| | | | IMMU | A |
| | DIFFERENCE OF KEY | PROCEDURE 4 (EL-13) | Unregistered key | D |
| | | | IMMU | A |
| | CHAIN OF IMMU-KEY | PROCEDURE 5 (EL-14) | Communication line between ANT/AMP and IMMU:<br>Open circuit or short circuit of battery voltage line or short circuit of ground line | E1 |
| | | | | E2 |
| | | | Open circuit in power source line of ANT/AMP circuit | E3 |
| | | | Open circuit in ground line of ANT/AMP circuit | E4 |
| | | | Malfunction of key ID chip | E5 |
| | | | IMMU | A |
| | | | Antenna amp. | E6 |

*: When NATS detects trouble, the security indicator lights up while ignition key is in the "ON" position.

## Trouble Diagnoses (Cont'd)

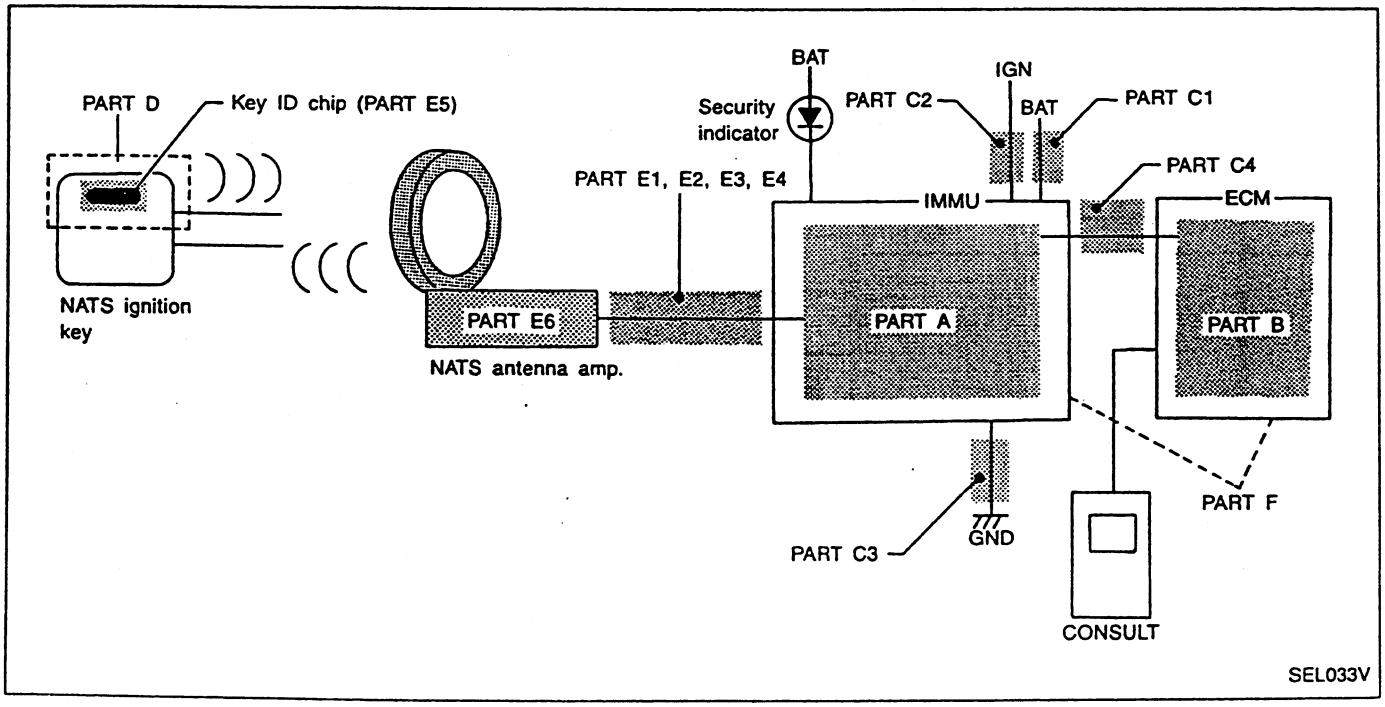
| SYMPTOM | Displayed "SELF-DIAG RESULTS" on CONSULT screen. | DIAGNOSTIC PROCEDURE (Reference page) | SYSTEM (Malfunctioning part or mode) | REFERENCE PART NO. OF ILLUSTRATION ON NEXT PAGE |
|---|---|---|---|---|
| • Security indicator lighting up*<br>• Engine hard to start | ID DISCORD, IMM-ECM | PROCEDURE 6 (EL-15) | System initialisation has not yet been completed. | F |
| | | | ECM | F |
| | ELECTRONIC NOISE | PROCEDURE 7 (EL-16) | Noise interference in communication line | — |
| | LOCK MODE | PROCEDURE 9 (EL-18) | LOCK MODE | D |
| • MIL staying ON<br>• Security indicator lighting up* | DON'T ERASE BEFORE CHECKING ENG DIAG | WORK FLOW (EL-7) | Engine trouble data and NATS trouble data have been detected in ECM | — |

*: When NATS detects trouble, the security indicator lights up while ignition key is in the "ON" position.

## SYMPTOM MATRIX CHART 2 (Non self-diagnosis related item)

| SYMPTOM | DIAGNOSTIC PROCEDURE (Reference page) | SYSTEM (Malfunctioning part or mode) |
|---|---|---|
| Security ind. does not light up. | PROCEDURE 8 (EL-17) | Security ind. |
| | | Open circuit between Fuse and NATS IMMU |
| | | Continuation of initialization mode |
| | | NATS IMMU |

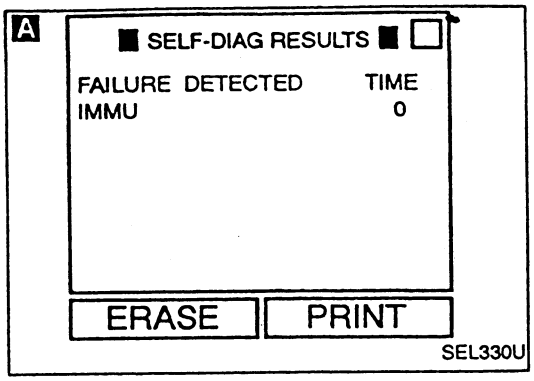
## DIAGNOSTIC SYSTEM DIAGRAM



## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 1

**Self-diagnostic results:**
**"IMMU" displayed on CONSULT screen**




A

Confirm SELF-DIAGNOSTIC RESULTS "IMMU" displayed on CONSULT screen.
Ref. part No.* A.

Yes

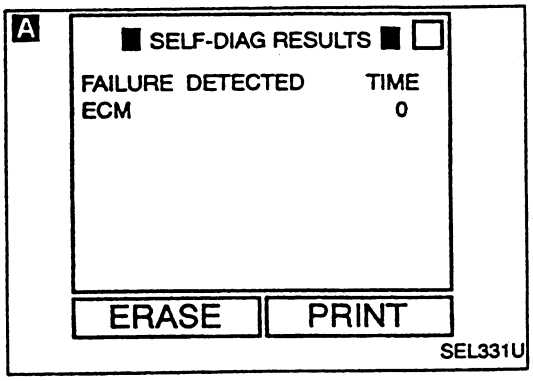
Replace IMMU.

Perform initialisation with CONSULT.
For the operation of initialization, refer to "CONSULT operation manual NATS".

* Ref. part No.: reference part No. of Diagnostic System Diagram on EL-9.

### DIAGNOSTIC PROCEDURE 2

**Self-diagnostic results:**
**"ECM" displayed on CONSULT screen**




A

Confirm SELF-DIAGNOSTIC RESULTS "ECM" displayed on CONSULT screen.
Ref. part No. B.

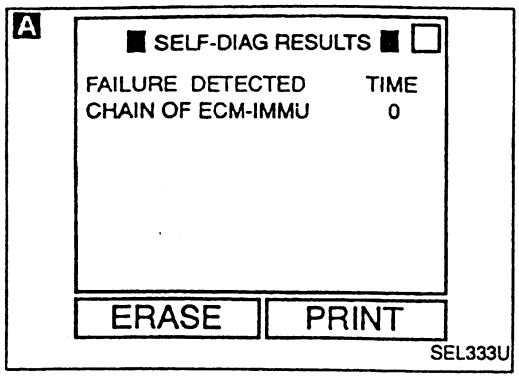
Replace ECM.

Perform initialization with CONSULT.
For the operation of initialization, refer to "CONSULT operation manual NATS".

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 3

**Self-diagnostic results:**
**"CHAIN OF ECM-IMMU" displayed on CONSULT screen**




**A**

Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF ECM-IMMU" displayed on CONSULT screen.

OK ↓

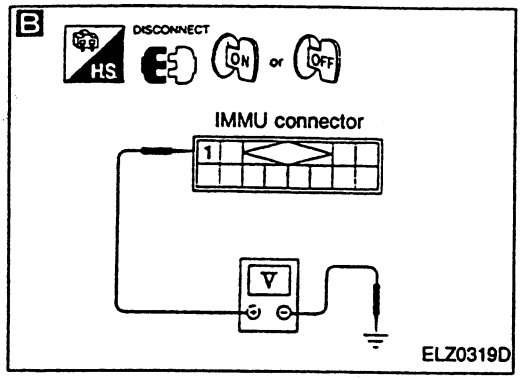
**B**

Check voltage between terminal ① of IMMU and ground with CONSULT or tester.
**Voltage: Battery voltage**

NG → Check the following:
- 10A fuse [No. 44, located in the fuse block (J/B)]
- Harness for open or short between fuse and IMMU connector

**Ref. part No. C1**

OK ↓



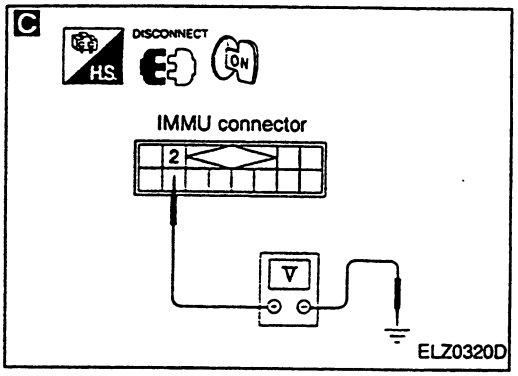

**C**

Check voltage between terminal ② of IMMU and ground with CONSULT or tester.
**Voltage: Battery voltage**

NG → Check the following:
- 10A fuse [No. 5, located in the fuse block (J/B)]
- Harness for open or short between fuse and IMMU connector

**Ref. part No. C2**

OK ↓

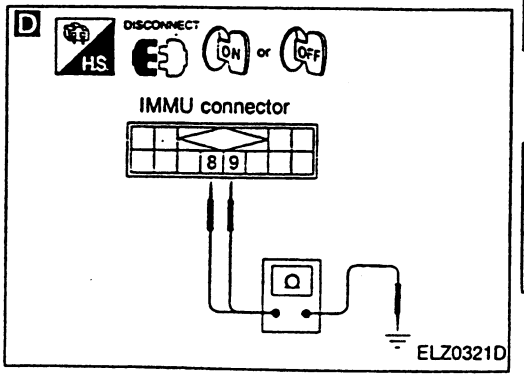



**D**

Check harness continuity between IMMU terminal ⑧ or ⑨ and ground.
**Continuity should exist.**

NG → Repair harness.
**Ref. part No. C3**

OK ↓



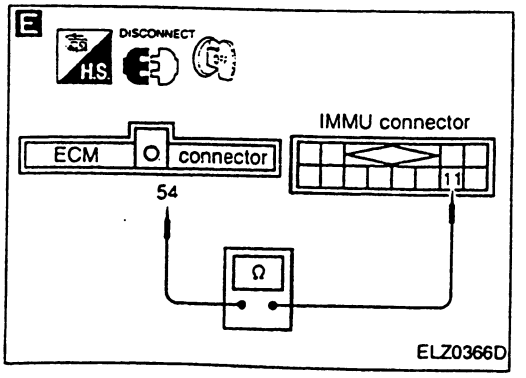

**E**

Check harness continuity between the following ECM terminal ㊹ and IMMU terminal ⑪.
**Continuity should exist.**

NG → Communication line is open circuit.
Repair harness or connectors.
**Ref. part No. C4**

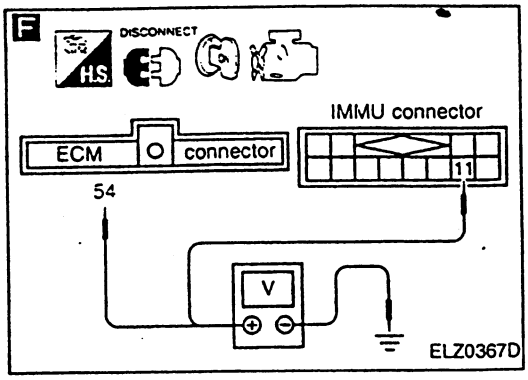
OK ↓

Ⓐ



## Trouble Diagnoses (Cont'd)

F




Ⓐ

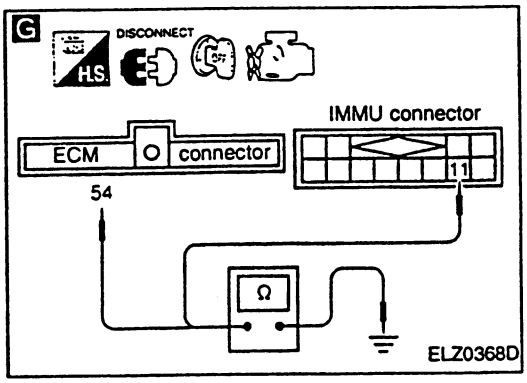
**F**

**CHECK COMMUNICATION LINE CIRCUIT.**
1. Disconnect ECM connector and IMMU connector.
2. Check voltage between the following terminals and ground.
   ECM ㊺ and IMMU ⑪
   **Voltage: 0V**

NG → Communication line is short-circuited with battery voltage line or ignition switch ON line.
Repair harness or connectors.
**Ref. part No. C4**

OK ↓

G



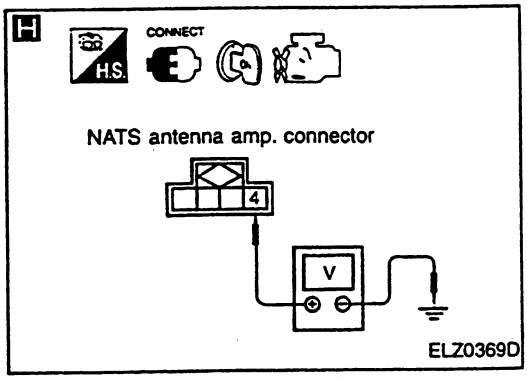

**G**

Check continuity between the following terminals and ground.
ECM ㊺ and IMMU ⑪
**Continuity should not exist.**

NG → Communication line is short-circuited with ground line.
Repair harness or connectors.
**Ref. part No. C4**

OK ↓

H



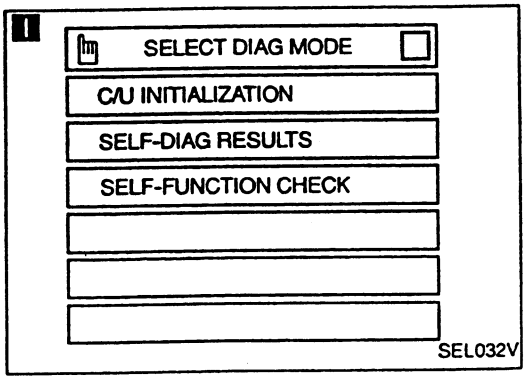

**H**

**CHECK POWER SUPPLY FOR NATS ANTENNA AMP.**
1. Connect IMMU connector and NATS antenna amp. connector.
2. Check voltage between NATS antenna amp. terminal ④ and ground (Power supply from NATS IMMU terminal ③) with analogue tester.
   Before turning ignition switch "ON"
   **Voltage: 0V**
   Just after turning ignition switch "ON"
   **Pointer of tester should move.**

NG → NATS antenna amp. +5V line is short-circuited with battery voltage line or ground line.
Repair harness or connectors.
**Ref. part No. E3**

OK ↓

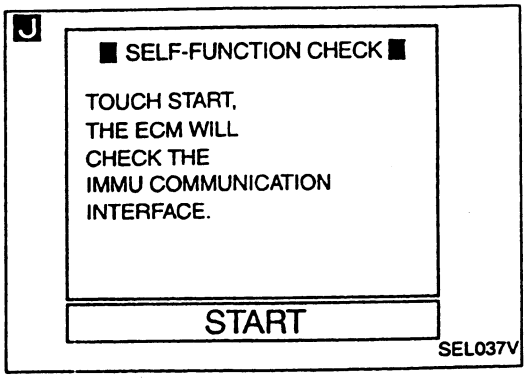
I




**I**

**SELF-FUNCTION CHECK**
1. Connect ECM connector and disconnect IMMU connector.
2. Turn ignition switch "ON".
3. Touch "SELF-FUNCTION CHECK" on CONSULT "SELECT DIAG MODE" screen.

J




**J**

Touch "START". ECM will then check its communication interface by itself.

NG → Ⓚ (See next page.)
ECM is malfunctioning.
Replace ECM.
**Ref. part No. B**

Perform initialisation with CONSULT. For the operation of initialization, refer to "CONSULT operation manual NATS".

OK

Ⓛ (See next page.)

Ⓑ

K

SELF-FUNCTION CHECK

ECM's IMMU COMMUNICATION INTERFACE

*** *** NG *** ***

PRINT

SEL342U

L

SELF-FUNCTION CHECK

ECM's IMMU COMMUNICATION INTERFACE

*** *** OK *** ***

PRINT

SEL343U

A

SELF-DIAG RESULTS

| FAILURE DETECTED | TIME |
|---|---|
| DIFFERENCE OF KEY | 0 |

ERASE | PRINT

SEL344U

B

C/U INITIALIZATION

INITIALIZATION

STOPPED or FAILED

TURN IGN KEY SW "OFF" AND "ON", AFTER CONFIRMING SELF-DIAG RESULTS, PERFORM C/U INITIALIZATION AGAIN.

SEL038V

Ⓑ

IMMU is malfunctioning.
Replace IMMU.
Ref. part No. A

Perform initialization with CONSULT.
For the operation of initialization, refer to "CONSULT operation manual NATS".

## DIAGNOSTIC PROCEDURE 4

**Self-diagnostic results:**
**"DIFFERENCE OF KEY" displayed on CONSULT screen**

A

Confirm SELF-DIAGNOSTIC RESULTS "DIFFERENCE OF KEY" displayed on CONSULT screen.

OK

Perform initialization with CONSULT.
Re-register all NATS ignition key IDs.
For the operation of initialization, refer to "CONSULT operation manual NATS".

Initialization with CONSULT incomplete or failed → B

Initialization completed

Start engine.

END
(Ignition key ID was unregistered.)
Ref. part No. D

B

IMMU is malfunctioning.
Replace IMMU.
Ref. part No. A

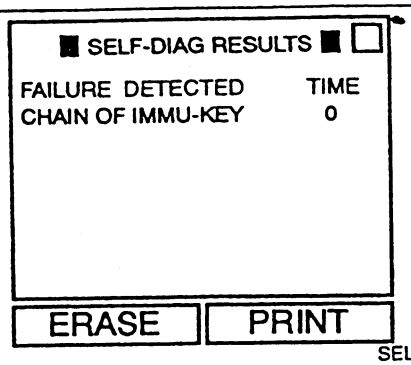
Perform initialization with CONSULT.
For the operation of initialization, refer to "CONSULT operation manual NATS".

## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 5

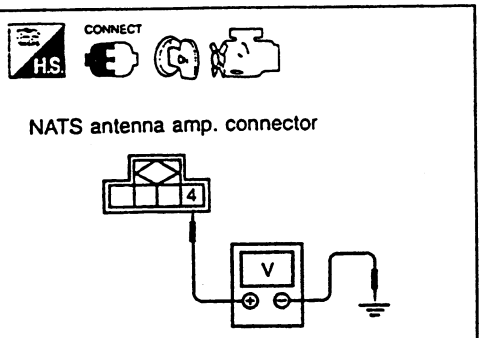
**Self-diagnostic results:**
**"CHAIN OF IMMU-KEY" displayed on CONSULT screen**

A



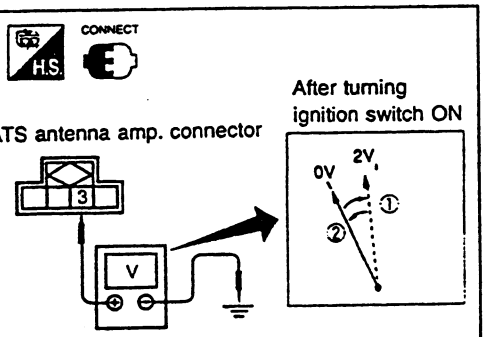
SEL373U

B



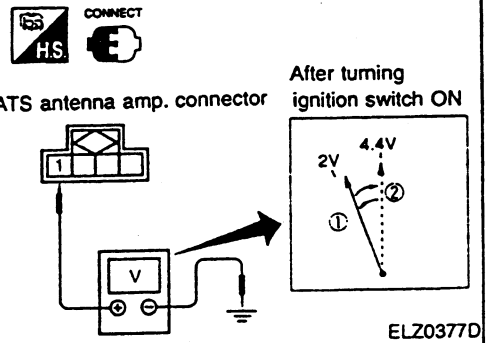
ELZ0369D

C



ELZ0376D

D



ELZ0377D

A

Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF IMMU-KEY" displayed on CONSULT screen.

OK ↓

CHECK NATS IGNITION KEY ID CHIP.
Start engine with another registered NATS ignition key.

Start OK → Ignition key ID chip was malfunctioning.
Replace the ignition key.
**Ref. part No. E5**

Start NG ↓

CHECK NATS ANTENNA AMP. INSTALLATION.
Refer to "How to Replace NATS Antenna Amp." in EL-19.

NG → Reinstall NATS antenna amp. correctly.

OK ↓

B

**CHECK POWER SUPPLY FOR NATS ANTENNA AMP.**
1. Connect IMMU connector and NATS antenna amp. connector.
2. Check voltage between NATS antenna amp. terminal ④ and ground (Power supply from NATS IMMU terminal ③) with analogue tester.
   Before turning ignition switch "ON"
   **Voltage: 0V**
   Just after turning ignition switch "ON"
   **Pointer of tester should move.**

NG → Check harness for open or short between for open or short between IMMU and NATS antenna amp. If harness is OK, replace IMMU, perform initialisation with CONSULT.
For the initialisation procedure, refer to "CONSULT operation manual NATS".

OK ↓

C

**CHECK SIGNAL LINE 1 BETWEEN IMMU AND NATS ANTENNA AMP.**
Check voltage between NATS antenna amp. terminal ③ and ground with analogue tester. Before turning ignition switch "ON"
**Voltage: 0V**
Just after turning ignition switch "ON"
**Pointer of tester should move.**

NG → (Check harness for open or short between for open or short between IMMU and NATS antenna amp. If harness is OK, replace IMMU, perform initialisation with CONSULT. For the initialisation procedure, refer to "CONSULT operation manual NATS".)

OK ↓

D

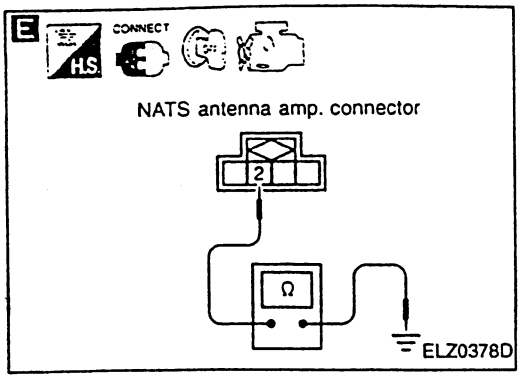
**CHECK SIGNAL LINE 2 BETWEEN IMMU AND NATS ANTENNA AMP.**
Check voltage between NATS antenna amp. terminal ① and ground with analogue tester. Before turning ignition switch "ON"
**Voltage: 4.4V**
Just after turning ignition switch "ON"
**Pointer of tester should move.**

NG → (Check harness for open or short between for open or short between IMMU and NATS antenna amp. If harness is OK, replace IMMU, perform initialisation with CONSULT. For the initialisation procedure, refer to "CONSULT operation manual NATS".)

OK ↓

Ⓐ

## Trouble Diagnoses (Cont'd)




Ⓐ

E

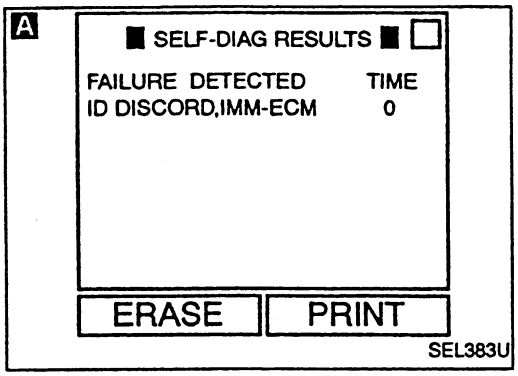
**CHECK ANTENNA AMP. GROUND LINE CIRCUIT.**

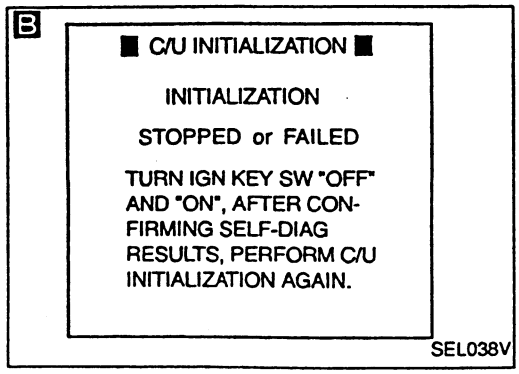
1. Turn ignition switch "OFF".
2. Check continuity between NATS antenna amp. terminal ② and ground. (Signal from NATS IMMU terminal ⑦) **Continuity should exist.**

NG → Check harness for open or short between IMMU and NATS antenna amp. If harness is OK, replace IMMU. After replacing IMMU, perform initialization with CONSULT. For the initialization procedure, refer to "CONSULT operation manual NATS".

OK → NATS antenna amp. is malfunctioning. When replacing the amp. hold on to amp. body. Take care not to pull on amp. harness.






## DIAGNOSTIC PROCEDURE 6

**Self-diagnostic results:**
**"ID DISCORD, IMM-ECM" displayed on CONSULT screen**

A

Confirm SELF-DIAGNOSTIC RESULTS "ID DISCORD, IMM-ECM*" displayed on CONSULT screen.

* "ID DISCORD, IMM-ECM": Registered ID of IMMU is in discord with that of ECM.

↓

Perform initialization with CONSULT.
Re-register all NATS ignition key IDs.
For the operation of initialization, refer to "CONSULT operation manual NATS".

Initialization with CONSULT incomplete or failed → B

B

ECM is malfunctioning.
Replace ECM.
**Ref. part No. F**

↓

Perform initialization with CONSULT.
For the operation of initialization, refer to "CONSULT operation manual NATS".

Initialization completed ↓

Start engine.

↓

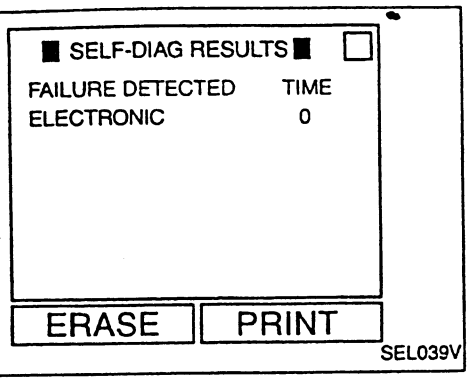
END
**Ref. part No. F**

## Trouble Diagnoses (Cont'd)

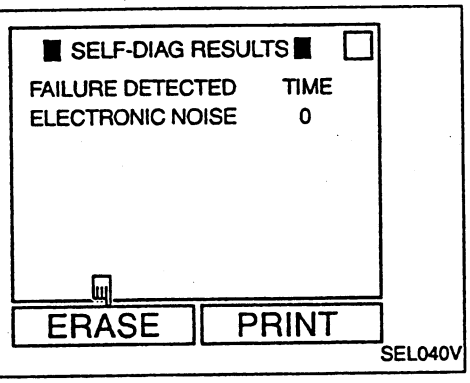
### DIAGNOSTIC PROCEDURE 7

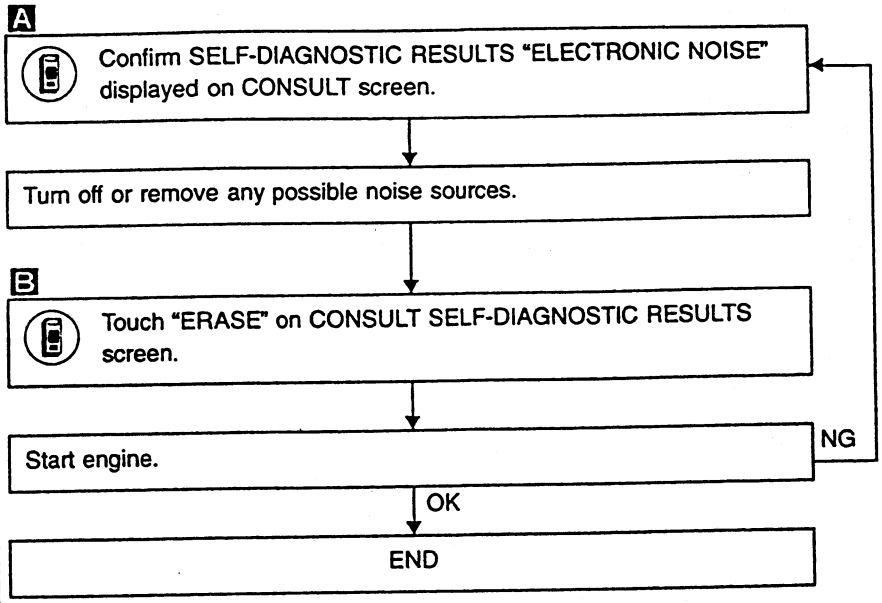
**Self-diagnostic results:**
**"ELECTRONIC NOISE" displayed on CONSULT screen**

A




B



## Trouble Diagnoses (Cont'd)

### DIAGNOSTIC PROCEDURE 8

### "SECURITY IND. DOES NOT LIGHT UP"

Check 10A fuse [No. 28, located in the fuse block (J/B)].
NG → Replace fuse.
OK ↓

NATS INITIALIZATION
1) Install the 10A fuse.
2) Perform initialization with CONSULT.
For the operation of initialization, refer to "CONSULT operation manual NATS".

↓
Turn ignition switch "OFF".
↓
Start engine and turn ignition switch "OFF".
↓
Check the security ind. lighting.
OK → END
NG ↓

A

Check voltage between security ind. connector terminal ① and ground.
**Voltage: Battery voltage**
NG → Check harness for open or short between fuse and security ind.
OK ↓

CHECK INDICATOR LAMP.
NG → Repair harness.
OK ↓

B

**CHECK NATS IMMU FUNCTION.**
1. Connect NATS IMMU connector.
2. Disconnect security ind. connector.
3. Check continuity between NATS IMMU terminal ⑥ and ground.
**Continuity should exist intermittently.**

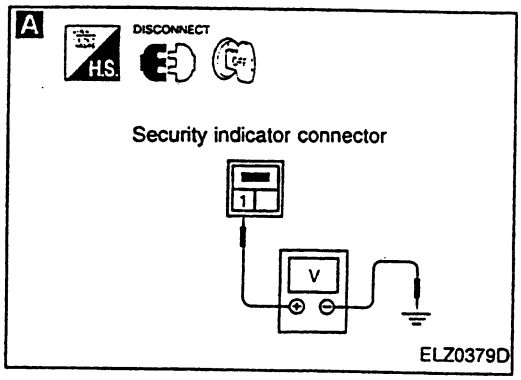
NG → NATS IMMU is malfunctioning. Replace IMMU.

Perform initialization with CONSULT. For the operation of initialization, refer to "CONSULT operation manual NATS".

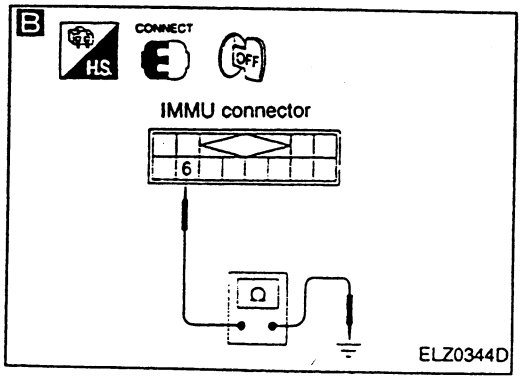
OK ↓

Check harness for open or short between security indicator and NATS IMMU.

A




B



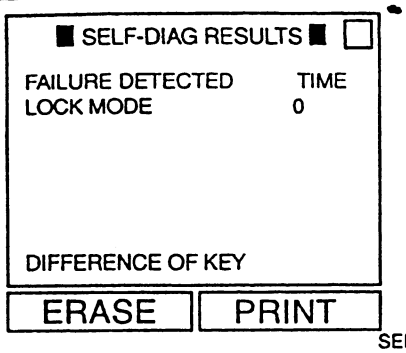

GI EC TF PD BR ST RS HA EL SD

# Trouble Diagnoses (Cont'd)

## DIAGNOSTIC PROCEDURE 9

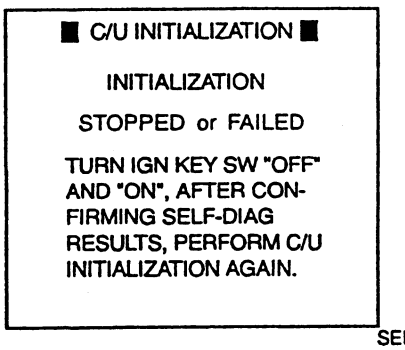
### Self-diagnostic results: "LOCK MODE" displayed on CONSULT screen

A




SEL790U

B




SEL038V

A

Confirm SELF-DIAGNOSTIC RESULTS "LOCK MODE" is displayed on CONSULT screen.

1. Turn the ignition switch to OFF position.
2. Turn the ignition key switch to ON position with a registered key. (Do not start engine.) Wait for 5 seconds.
3. Return the key to the OFF position.
4. Repeat steps 2 and 3 twice (total of three cycles).
5. Start the engine.

**Can the engine start?**

Yes → System is OK. (Now the system is escaped from "LOCK MODE".)

No

CHECK NATS ANTENNA AMP. INSTALLATION.
Refer to "How to Replace NATS Antenna Amp." in EL-19.

NG → Reinstall NATS antenna amp. correctly.

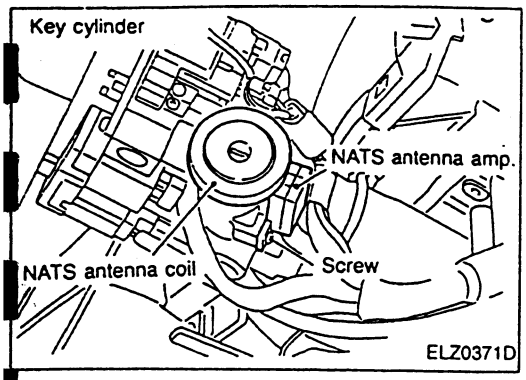
OK

PERFORM INITIALISATION
Perform initialisation with CONSULT.
For the initialisation procedure, refer to "CONSULT operation manual NATS V2.0".
**Can the system be initialized?**
Note: If the initialisation is incompleted or failed, CONSULT shows B message on the screen.

Yes → System is OK.

No

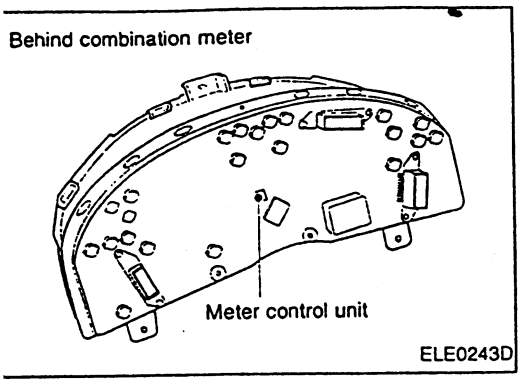
Go to DIAGNOSTIC PROCEDURE 5, EL-14 to check "CHAIN OF IMMU-KEY".




## How to Replace NATS Antenna Amp.

NOTE:

- If NATS antenna amp. is not installed correctly, NATS system will not operate properly and SELF-DIAG RESULTS on CONSULT screen will show "LOCK MODE" or "CHAIN OF IMMU-KEY".
- Initialization is not necessary only when NATS antenna amp. is replaced with a new one.



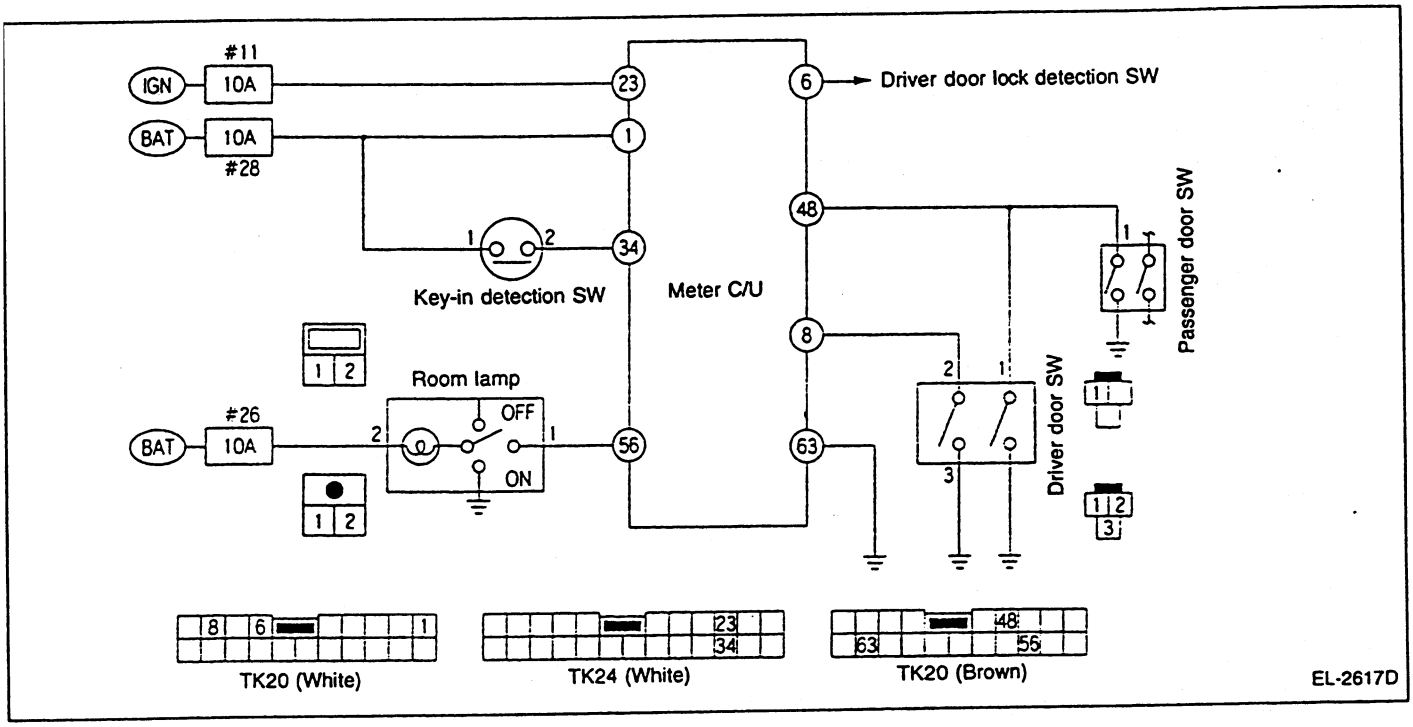

## Component Parts Location

### REMOVAL AND INSTALLATION

Parts included in this procedure:

- Column cover
- Cluster lid A
- Lighting switch or wiper/washer switch

## Circuit Diagram



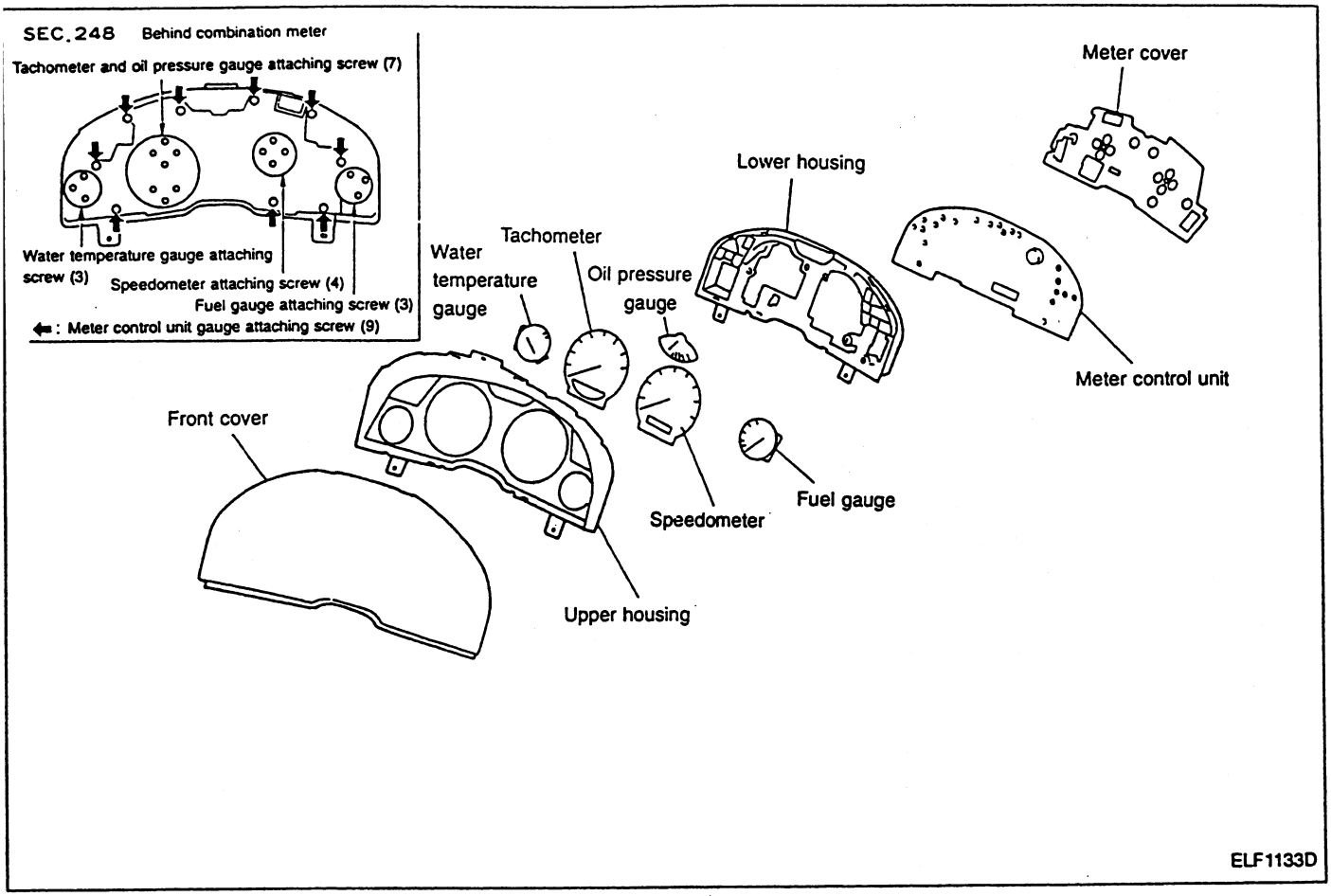
## Meter Control Input/Output Specifications

| Terminal No. | Signal name | Measuring condition | | | | | Specification |
|---|---|---|---|---|---|---|---|
| | | Ignition switch | Operation or condition | | | | |
| 1 | Battery | OFF | — | | | | Approx. 12V |
| 6 | Driver door lock signal | OFF | Door is unlocked. (Switch ON) | | | | Approx. 0V |
| | | | Door is locked. (Switch OFF) | | | | Approx. 5V |
| 8 | Driver door switch signal | OFF | Driver door switch | | | ON (Open) | Approx. 0V |
| | | | | | | OFF (Closed) | Approx. 12V |
| 23 | Ignition power supply | ON | — | | | | Approx. 12V |
| 34 | Key-in detection switch | OFF | Remove the ignition key. | | | | Approx. 0V |
| | | | Insert the ignition key. | | | | Approx. 12V |
| 48 | Door switch signal | OFF | Open a door. (ON) | | | | Approx. 0V |
| | | | Close all the doors. (OFF) | | | | Approx. 12V |
| 56 | Room lamp signal | OFF | Room lamp switch: Neutral position | Insert the ignition key. | Each door switch | ON (Open) | Approx. 0V |
| | | | | | | OFF (Closed) | Approx. 12V |
| | | — | Room lamp switch: Neutral position | Close all the doors. | Remove the ignition key from the key cylinder. | | Approx. 0V* |
| | | | | | Turn the ignition switch ON. | | Approx. 12V |
| 63 | Ground | ON | — | | | | Approx. 0V |

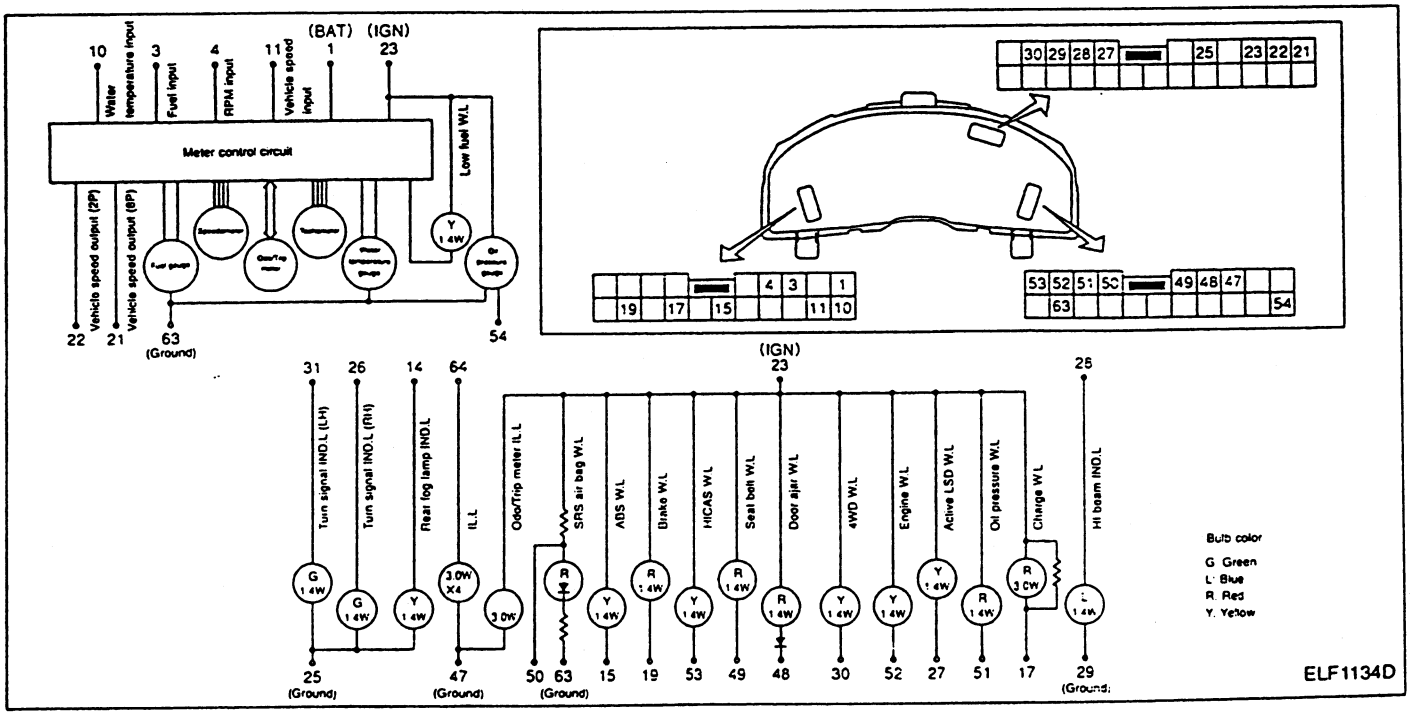
*: The voltage becomes approx. 12V approx. 20 seconds after the ignition key is removed.

# Combination Meter

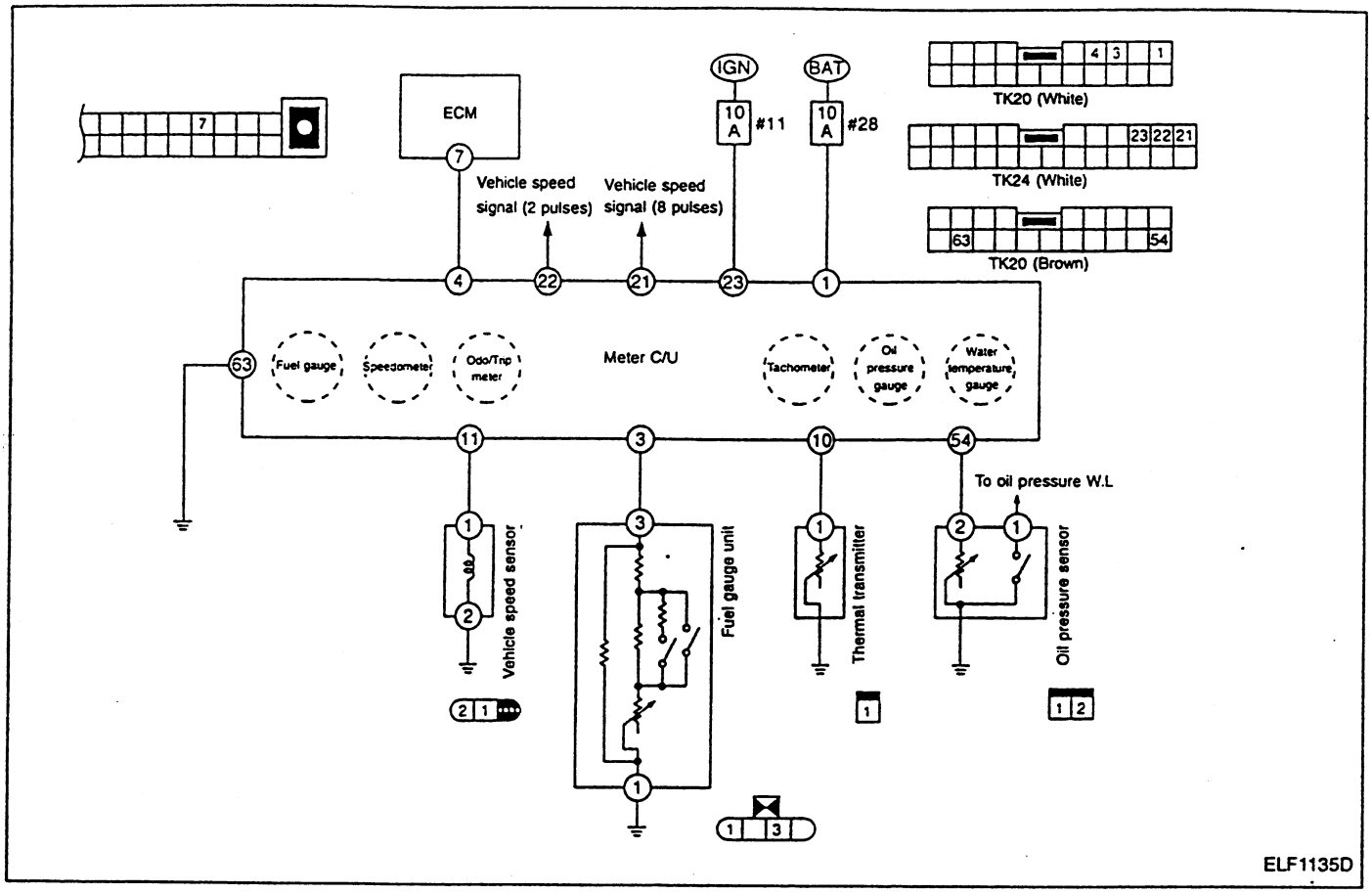
## DISASSEMBLY AND ASSEMBLY



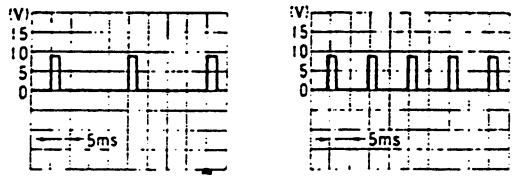

## BEHIND COMBINATION METER AND INTERNAL CIRCUIT



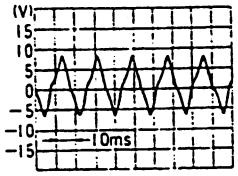
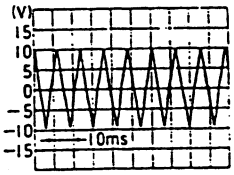
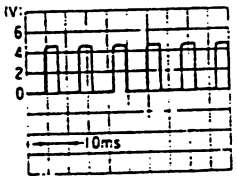
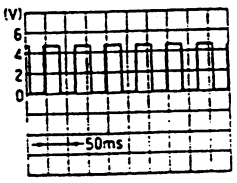
## Meter-related Circuit Diagram

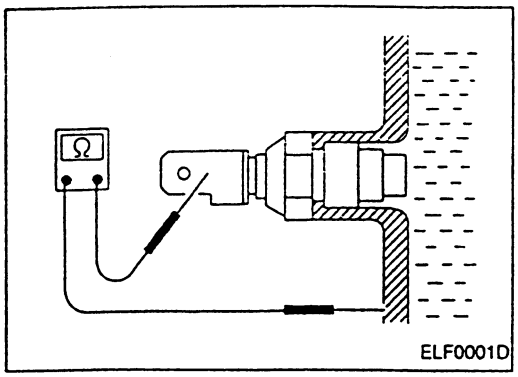


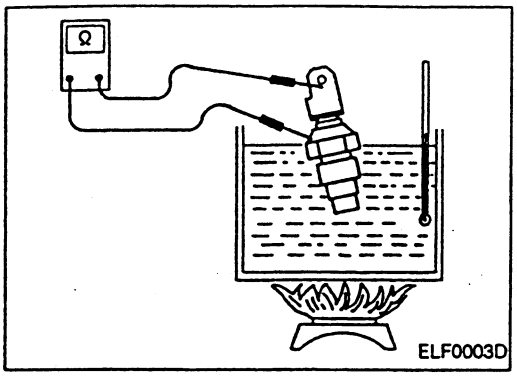

## Combination Meter Input/Output Signal Specifications

| Terminal No. + | Terminal No. − | Signal name | Measuring condition: Ignition switch | Measuring condition: Operation or condition | Specification |
|---|---|---|---|---|---|
| 1 | Body ground | Battery | OFF | — | Approx. 12V |
| 3 | | Fuel gauge signal | — | — | Refer to EL section in R34 Service Manual (SM8E-0R34J0). |
| 4 | | Tachometer drive signal | ON | Engine is idling and running at approx. 2,000 rpm. | At idling: Approx. 1.0V; At 2,000 rpm: Approx. 1.8V  ELF1136D |
| 10 | | Water temperature signal | ON | Approx. 60°C | Approx. 5.6V |
| | | | | Approx. 80°C | Approx. 3.6V |
| | | | | Approx. 100°C | Approx. 2.3V |

## Combination Meter Input/Output Signal Specifications (Cont'd)

| Terminal No. + | Terminal No. − | Signal name | Measuring condition: Ignition switch | Measuring condition: Operation or condition | Specification |
|---|---|---|---|---|---|
| 11 | Body ground | Vehicle speed input signal | ON | Speedometer is in operation. (Vehicle speed is approx. 40 km/h.) (Vehicle speed is approx. 60 km/h.) | Vehicle speed: Approx. 40 km/h   Vehicle speed: Approx. 60 km/h   ELF0975D |
| 21 | | Vehicle speed signal (8 pulses) | ON | Speedometer is not in operation. | Approx. 4.5V |
| | | | | Speedometer is in operation. (Vehicle speed is approx. 40 km/h.) | Vehicle speed is approx. 40 km/h: Approx. 1.4V   ELF1137D |
| 22 | | Vehicle speed signal (2 pulses) | ON | Speedometer is not in operation. | Approx. 4.5V |
| | | | | Speedometer is in operation. (Vehicle speed is approx. 40 km/h.) | Vehicle speed is approx. 40 km/h: Approx. 2.2V   ELF1138D |
| 23 | | Ignition power supply | ON | — | Approx. 12V |
| 54 | | Oil pressure signal | — | — | Refer to EL section in R34 Service Manual (SM8E-0R34J0). |
| 63 | | Ground | ON | — | Approx. 0V |




## Component Parts Inspection

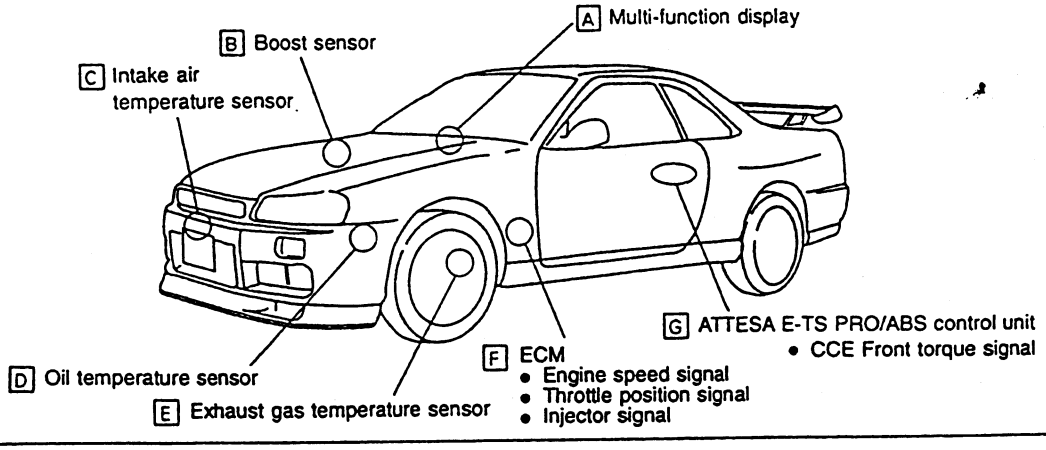
### THERMAL TRANSMITTER

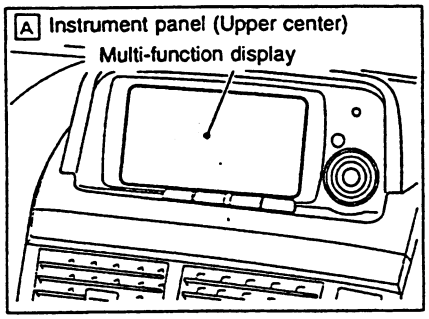
- When the engine has warmed up to approx. 80°C, measure resistance between thermal transmitter and body ground.
  **Specification: Approx. 130Ω**

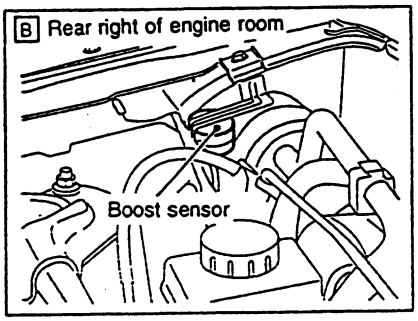
- If the measured resistance is out of the specification with the thermal transmitter on vehicle, remove the thermal transmitter from the vehicle and measure resistance as shown left.

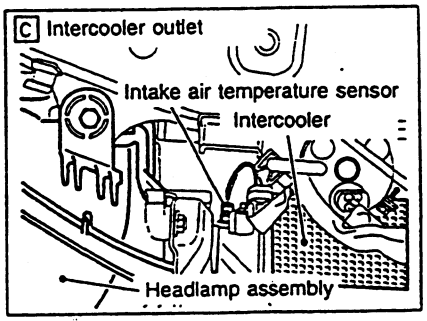
| Water temperature °C | Resistance Ω |
|---|---|
| Approx. 60 | Approx. 225 |
| Approx. 80 | Approx. 130 |
| Approx. 100 | Approx. 71 |

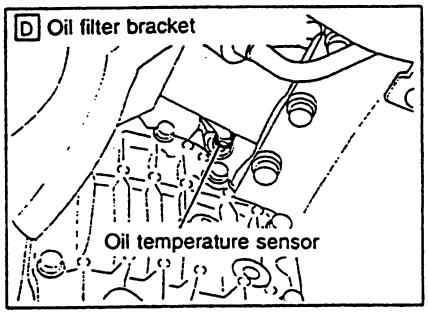
## Component Parts

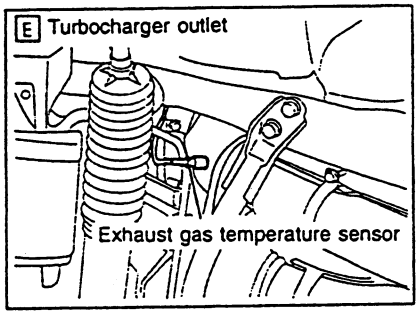


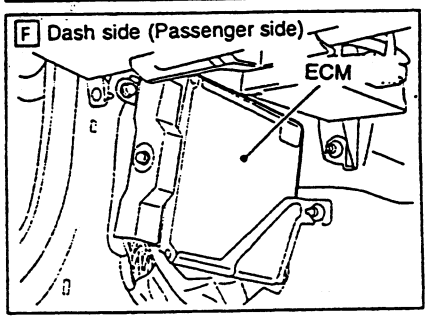



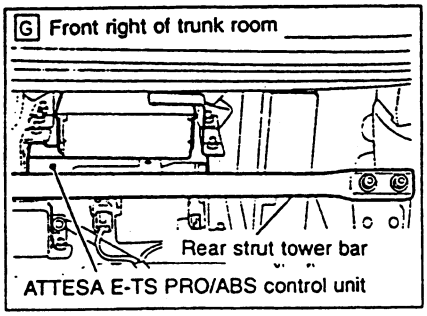



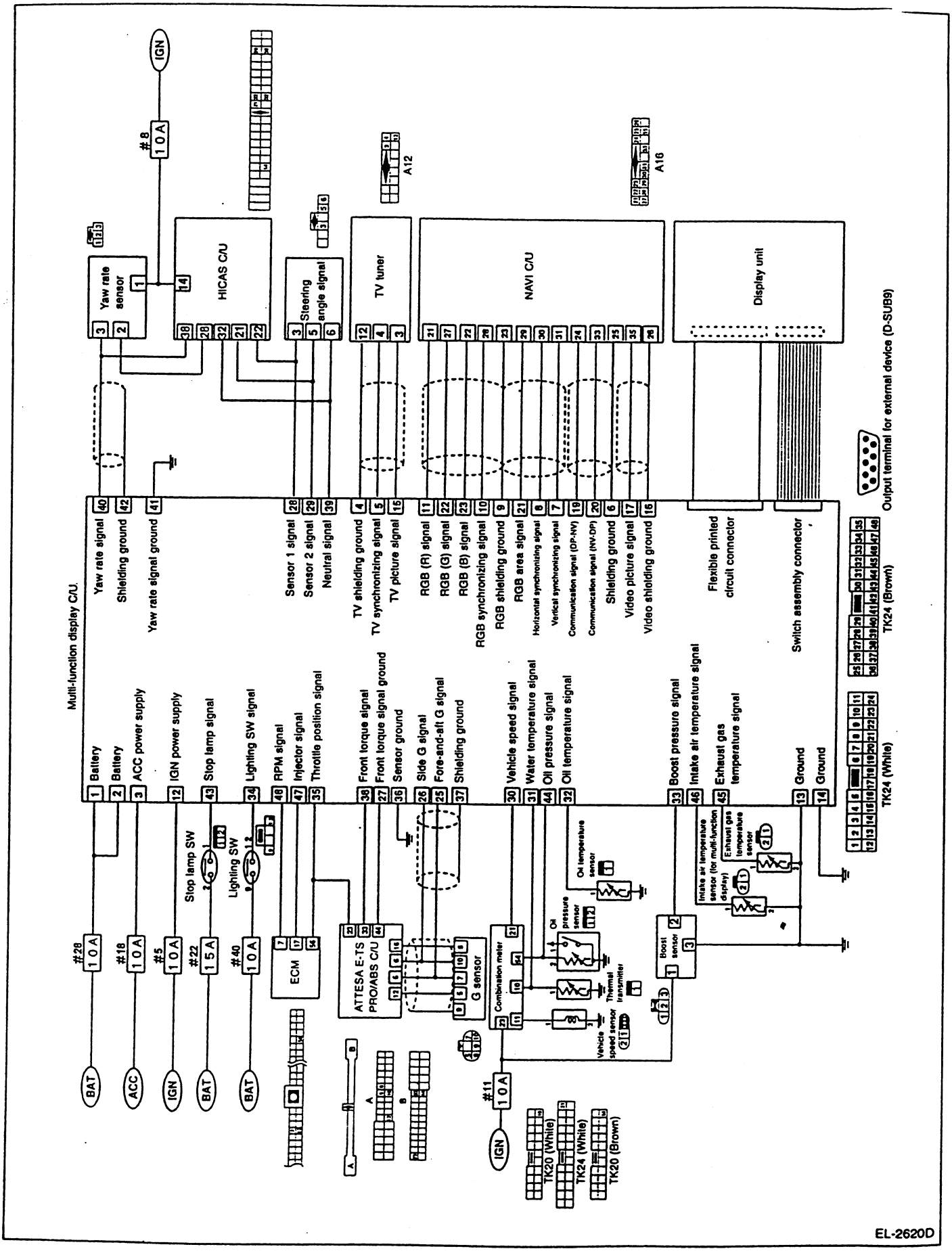



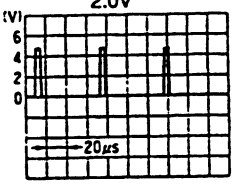
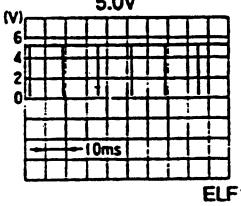
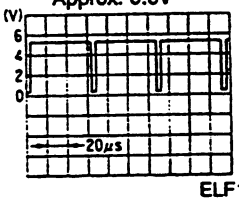
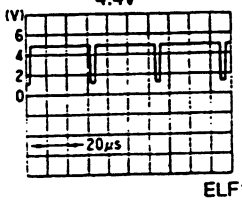
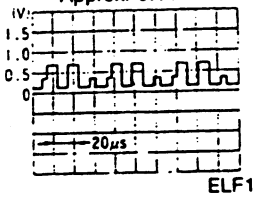




ELF1140D

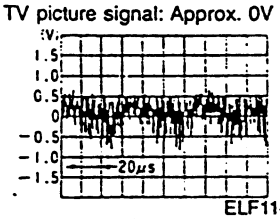
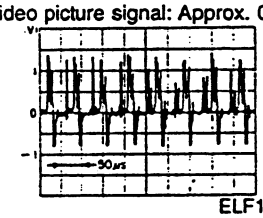
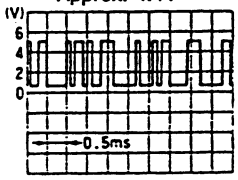
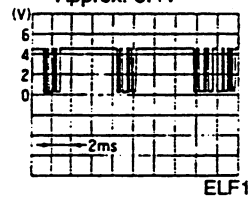
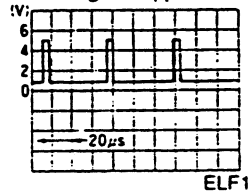
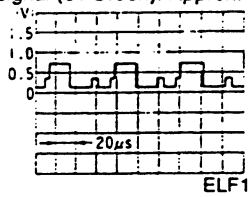
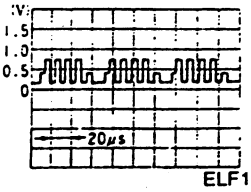
## Circuit Diagram



## Multi-function Display Control Unit Input/Output Signal Specification

| Terminal No. + | Terminal No. − | Signal name | Measuring condition: Ignition switch | Measuring condition: Operation or condition | Specification |
|---|---|---|---|---|---|
| 1 | Body ground | Battery | OFF | — | Approx. 12V |
| 2 | | | | | |
| 3 | | ACC power supply | ACC | — | Approx. 12V |
| 4 | | Shielding ground (TV signal) | ON | — | Approx. 0V |
| 5 | | TV synchronizing signal | ON | Receive TV broadcast signal. | TV synchronizing signal: Approx. 2.0V   ELF141D |
| 6 | | Shielding ground (communication signal) | ON | — | Approx. 0V |
| 7 | | Vertical synchronizing signal | ON | Press on-screen switch during TV broadcast signal reception. | Vertical synchronizing signal: Approx. 5.0V   ELF1142D |
| 8 | | Horizontal synchronizing signal | ON | Press on-screen switch during TV broadcast signal reception. | Horizontal synchronizing signal: Approx. 0.6V   ELF1143D |
| 9 | | Shielding ground (RGB signal) | ON | — | Approx. 0V |
| 10 | | RGB synchronizing signal | ON | Change display screen to "color balance" screen using on-screen check/ adjustment function. | RGB synchronizing signal: Approx. 4.4V   ELF1144D |
| 11 | | RGB signal (R: Red) | ON | Change display screen to "color balance" screen using on-screen check/ adjustment function. | RGB synchronizing signal (R: Red): Approx. 0.1V   ELF1145D |
| 12 | | Ignition power supply | ON | — | Approx. 12V |
| 13 | | Ground | ON | — | Approx. 0V |
| 14 | | | | | |

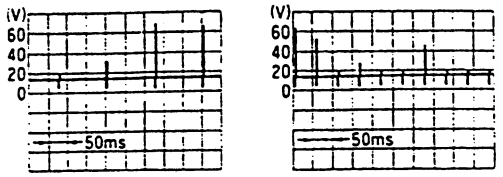
## Multi-function Display Control Unit Input/Output Signal Specification (Cont'd)

| Terminal No. + | Terminal No. − | Signal name | Measuring condition: Ignition switch | Measuring condition: Operation or condition | Specification |
|---|---|---|---|---|---|
| 15 | Body ground | TV picture signal | ON | Receive TV broadcast signal. | TV picture signal: Approx. 0V  ELF1146D |
| 16 | | Shielding ground (video signal) | ON | — | Approx. 0V |
| 17 | | Video picture signal | ON | Play back video. | Video picture signal: Approx. 0V  ELF1147D |
| 19 | | Communication signal (DP-NV) | ON | Turn ignition switch from OFF to ON. (Meter screen on display) | Communication signal (DP-NV): Approx. 4.4V  ELF1148D |
| 20 | | Communication signal (NV-DP) | ON | Press DISP switch. (NAVI screen on display) | Communication signal (NV-DP): Approx. 3.4V  ELF1149D |
| 21 | | RGB area signal | ON | Press DISP switch. (TV screen on display) | RGB area signal: Approx. 0.7V  ELF1150D |
| 22 | | RGB signal (G: Green) | ON | Change display screen to "color balance" screen using on-screen check/ adjustment function. | RGB signal (G: Green): Approx. 0.1V  ELF1151D |
| 23 | | RGB signal (B: Blue) | ON | Change display screen to "color balance" screen using on-screen check/ adjustment function. | RGB signal (B: Blue): Approx. 0.1V  ELF1152D |

## Multi-function Display Control Unit Input/Output Signal Specification (Cont'd)

| Terminal No. + | Terminal No. − | Signal name | Measuring condition: Ignition switch | Measuring condition: Operation or condition | | Specification |
|---|---|---|---|---|---|---|
| 25 | 36 | Fore-and-aft G signal | ON | Locate vehicle on flat surface. | | Approx. 2.5V |
| 26 | | Side G signal | | | | |
| 28 | Body ground | Steering angle signal 1 | ON | Turn steering wheel from Neutral to left and right more than 20°. | | Approx. 0 - 5V |
| 29 | | Steering angle signal 2 | | | | |
| 30 | | Vehicle speed signal (8 pulses) | — | — | | Refer to "Combination Meter Input/ Output Signal Specifications", "COMBINATION METER", EL-23. |
| 31 | | Water temperature signal | — | — | | Refer to "Combination Meter Input/ Output Signal Specifications", "COMBINATION METER", EL-23. |
| 32 | | Oil temperature signal | ON | Approx. 70 | | Approx. 4.0V |
| | | | | Approx. 90 | | Approx. 3.3V |
| | | | | Approx. 110 | | Approx. 2.5V |
| 33 | | Boost pressure signal | — | — | | Refer to EL section in R34 Service Manual (SM8E-0R34J0). |
| 34 | | Lighting switch signal | OFF | Lighting switch | ON | Approx. 12V |
| | | | | | OFF | Approx. 0V |
| 35 | | Throttle position signal | ON | 0% | | Approx. 0.5V |
| | | | | 50% | | Approx. 3V |
| | | | | 100% | | Approx. 4V |
| 37 | | Shielding ground (G sensor) | ON | — | | Approx. 0V |
| 38 | | Front torque signal | ON | 0 kg-m | | Approx. 0.6V |
| | | | | 10 kg-m | | Approx. 2.5V |
| | | | | 30 kg-m | | Approx. 3.5V |
| 39 | | Steering angle signal (Neutral) | ON | Set steering wheel to Neutral. | | Approx. 5V |
| 40 | 41 | Yaw rate signal | ON | Locate vehicle on flat surface. | | Approx. 2.5V |
| 42 | Body ground | Shielding ground (yaw rate sensor) | ON | — | | Approx. 0V |
| 43 | | Stop lamp switch signal | OFF | Depress brake pedal. | | Approx. 12V |
| | | | | Release brake pedal. | | Approx. 0V |
| 44 | | Oil pressure signal | — | — | | Refer to EL section in R34 Service Manual (SM8E-0R34J0). |
| 45 | | Exhaust gas temperature signal | ON | Approx. 400°C | | Approx. 5V |
| | | | | Approx. 500°C | | Approx. 4.5V |
| | | | | Approx. 600°C | | Approx. 3.5V |
| 46 | | Intake air temperature signal | ON | Approx. 20°C | | Approx. 4V |
| | | | | Approx. 30°C | | Approx. 3.7V |
| | | | | Approx. 40°C | | Approx. 3.3V |

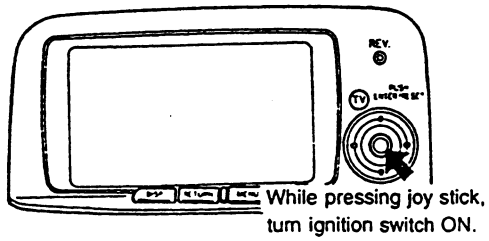
## Multi-function Display Control Unit Input/Output Signal Specification (Cont'd)

| Terminal No. + | Terminal No. − | Signal name | Measuring condition: Ignition switch | Measuring condition: Operation or condition | Specification |
|---|---|---|---|---|---|
| 47 | Body ground | Injector signal (fuel injection pulse) | ON | Engine at idle (throttle valve opening rate: approx. 1.3%) Engine operating at 2,000 rpm (throttle valve opening rate: approx. 3.0%) | At idling:Approx. 13V At 2,000 rpm: Approx. 12.5V   ELF1153D |
| 48 | | Tachometer drive signal | — | — | Refer to "Combination Meter Input/Output Signal Specifications", "COMBINATION METER", EL-23. |

## Trouble Diagnoses Using Self-diagnostic Functions

### DESCRIPTION

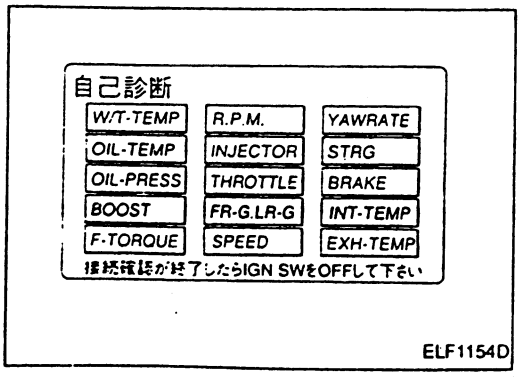
- The self-diagnostic function is mainly capable of checking whether or not the interconnecting circuits between the multi-display control unit, individual control units, sensors, etc. are shorted or otherwise faulty (poor contacts, etc.)
- If meter gauges become inoperative during vehicle operation, perform self-diagnostic procedures.



EL-2625D

### SELF-DIAGNOSTIC PROCEDURE

1. Using meter display screen, turn ignition switch OFF.
2. While pressing joy stick, turn ignition switch ON. (Engine starts.)
3. After opening screen (GT-R logo) has appeared on display for more than 1 second, set joy stick to OFF.
4. Within 3 seconds after GT-R logo has appeared on display, press joy stick 5 times.



ELF1154D

5. The display screen will then be replaced by the screen shown in the figure at left. (At this point, shift-up indicator REV lamp also illuminates.)

**CAUTION:**
**Be sure to perform the procedures with vehicle at standstill.**

### DIAGNOSTIC RESULT DISPLAY

Following diagnostic procedure, items detected as "in good order" are shown in green while those identified as "out of order" do not change their colors. Thus, poor connection contacts or shorted circuits are clearly identified. (REV lamp remains illuminated.)

## Trouble Diagnoses Using Self-diagnostic Functions (Cont'd)

**CAUTION:**

- **Perform self-diagnostic procedures during engine warm-up.**
- **If meter display screen does not appear before ignition switch is turned OFF, self-diagnostic function cannot be performed. Before performing self-diagnostic function, make sure that meter display screen appears on display.**

### INPUT SIGNAL DETERMINATION CONDITIONS

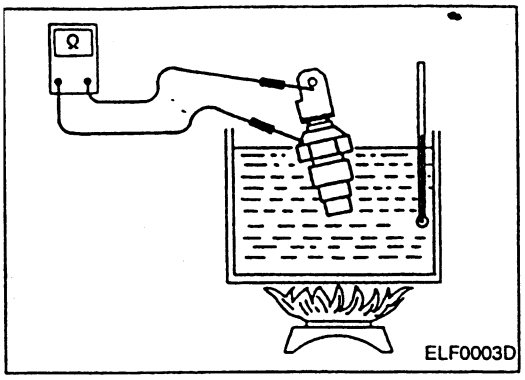
Multi-display control unit determines whether or not check items are in good order under individual conditions outlined in the Table below.

| Item | Specification | Operation or conditions | Determination standard for faulty item |
|---|---|---|---|
| W/T-TEMP (Engine coolant temperature) | Approx. 10V or less | Specification has been detected for more than 1 second. | Specification has not been detected for more than 1 second during engine warm-up. |
| OIL-TEMP (Engine oil temperature) | Approx. 4.9V or less | Specification has been detected for more than 1 second. | Specification has not been detected for more than 1 second during engine warm-up. |
| OIL-PRESS (Engine oil pressure) | Approx. 8V or less | Specification has been detected for more than 1 second. | Specification has not been detected for more than 1 second during engine warm-up. |
| BOOST (Engine turbocharger pressure) | Approx. 0.8V or more | Specification has been detected for more than 1 second. | Specification has not been detected for more than 1 second during engine idle. |
| F-TORQUE (Front wheel rotating force distribution) | Approx. 0.5V or more | Specification has been detected for more than 1 second. | With vehicle located on flat surface, specification has not been detected for more than 1 second. |
| R.P.M. (Engine speed) | Approx. 600 rpm or more | During idling | Engine speed lower than specification has been detected. |
| INJECTOR (Fuel injection) | 2% or more | Lightly depress accelerator pedal. (Engine at idle: approx. 1.3%) | Throttle opening rate is less than 2% measured with accelerator pedal depressed. |
| THROTTLE (Throttle opening position) | 0.5V or more | Specification has been detected for more than 0.1 second. | With accelerator pedal fully released, specification has not been detected for more than 1 second. |
| FR-G. LR-G (Fore-and aft G, side G) | 2V or more | Specification has been detected for more than 1 second. | With vehicle located on flat surface, specification has not been detected for more than 1 second. |
| SPEED (Vehicle speed) | 2 km/h or more | Drive at a speed of more than 6 km/h. | Vehicle speed pulse signal has not been received while vehicle is being driven more than 6 km/h. |
| YAWRATE (Yaw rate) | 2V or more | Specification has been detected for more than 1 second. | With vehicle located on flat surface, specification has not been detected for more than 1 second. |
| STRG (Steering angle) | 5V or less | Turn steering wheel in either direction. | Pulse signal has not been received when steering wheel is turned more than 20° from Neutral. |
| BRAKE (Brake pedal ON/OFF) | 8V or more | Depress brake pedal. | Specification has not been detected when brake pedal is depressed. |
| INT-TEMP (Intake air temperature) | 4.5V or less (at intake air temperatures of more than 0°C) | Specification has been detected for more than 1 second. | Specification has not been detected for more than 1 second during engine warm-up. |
| EXH-TEMP (Exhaust gas temperature) | 4.9V or less (at exhaust gas temperatures of more than 400°C) | Specification has been detected for more than 1 second. | Specification has not been detected for more than 1 second during engine warm-up. |
| Shift-up indicator (REV lamp) | ON | — | — |

## Trouble Diagnoses Using Self-diagnostic Functions (Cont'd)

### SELF-DIAGNOSTIC CODE CHART

| Item | Malfunctioning unit | Probable cause |
|---|---|---|
| W/T-TEMP (Engine coolant temperature) | Combination meter (Thermal transmitter) | • Multi-display control unit-to-thermal transmitter harness is faulty.<br>• Thermal transmitter connector is loose (poor contacts) or thermal transmitter is faulty. (Refer to "Component Parts Inspection", EL-25.) |
| OIL-TEMP (Engine oil temperature) | Combination meter (Oil temperature sensor) | • Multi-display control unit-to-oil temperature sensor harness is faulty.<br>• Oil temperature sensor connector is loose (poor contacts) or oil temperature sensor is faulty. |
| OIL-PRESS (Engine oil pressure) | Combination meter (Oil pressure sensor) | • Multi-display control unit-to-oil pressure sensor harness is faulty.<br>• Oil pressure sensor connector is loose (poor contacts) or oil pressure sensor is faulty. Refer to EL section in R34 Service Manual (SM8E-0R34J0). |
| BOOST (Engine turbocharger pressure) | Boost sensor | • Multi-display control unit-to-boost sensor harness is faulty.<br>• Boost sensor connector is loose (poor contacts) or boost sensor is faulty. Refer to EL section in R34 Service Manual (SM8E-0R34J0). |
| F-TORQUE (Front wheel rotating force distribution) | ATTESA E-TS PRO/ABS control unit (Wheel sensor) | • Multi-display control unit-to-ATTESA E-TS PRO/ABS control unit harness is faulty.<br>• ATTESA E-TS PRO/ABS control unit connector is loose (poor contacts) or control system is faulty. Refer to BR section. |
| R.P.M. (Engine speed) | ECM (Crankshaft position sensor) | • Multi-display control unit-to-ECM harness is faulty.<br>• ECM connector is loose (poor contacts) or control system is faulty. Refer to EC section. |
| INJECTOR (Fuel injection) | ECM (Injector) | • Multi-display control unit-to-ECM harness is faulty.<br>• ECM connector is loose (poor contacts) or control system is faulty. Refer to EC section. |
| THROTTLE (Throttle opening position) | ECM (Throttle position sensor) | • Multi-display control unit-to-ECM harness is faulty.<br>• ECM connector is loose (poor contacts) or control system is faulty. Refer to EC section. |
| FR-G. LR-G (Fore-and-aft G, side G) | ATTESA E-TS PRO/ABS control unit (G sensor) | • Multi-display control unit-to-G sensor harness is faulty.<br>• G sensor connector is loose (poor contacts) or G sensor is faulty. Refer to BR section. |
| SPEED (Vehicle speed) | Combination meter (vehicle speed sensor) | • Multi-display control unit-to-combination meter harness is faulty.<br>• Combination meter connector is loose (poor contacts) or control system is faulty. (Refer to "Combination Meter Input/Output Signal Specifications", EL-23.) |
| YAWRATE (Yaw rate) | HICAS control unit (Yaw rate sensor) | • Multi-display control unit-to-yaw rate sensor harness is faulty.<br>• Yaw rate sensor connector is loose (poor contacts) or yaw rate sensor is faulty. Refer to BR section. |
| STRG (Steering angle) | HICAS control unit (Steering angle sensor) | • Multi-display control unit-to-steering angle sensor harness is faulty.<br>• Steering angle sensor connector is loose (poor contacts) or steering angle sensor is faulty. Refer to ST section. |
| BRAKE (Brake pedal ON/OFF) | Stop lamp switch | • Multi-display control unit-to-stop lamp switch harness is faulty.<br>• Stop lamp switch connector is loose (poor contacts) or stop lamp is faulty. (Refer to "Multi-display Control Unit Input/Output Signal Specifications", EL-28.) |
| INT-TEMP (Intake air temperature) | Intake air temperature sensor (for multi-function display) | • Multi-display control unit-to-intake air temperature sensor harness is faulty.<br>• Intake air temperature sensor connector is loose (poor contacts) or intake air temperature sensor is faulty. |
| EXH-TEMP (Exhaust gas temperature) | Exhaust gas temperature sensor | • Multi-display control unit-to-exhaust gas temperature sensor harness is faulty.<br>• Exhaust gas temperature sensor connector is loose (poor contacts) or exhaust gas temperature sensor is faulty. |
| Shift-up indicator (REV lamp) | — | • Multi-display control unit-to-switch assembly harness is faulty.<br>• Multi-display control or unit switch assembly is faulty. |



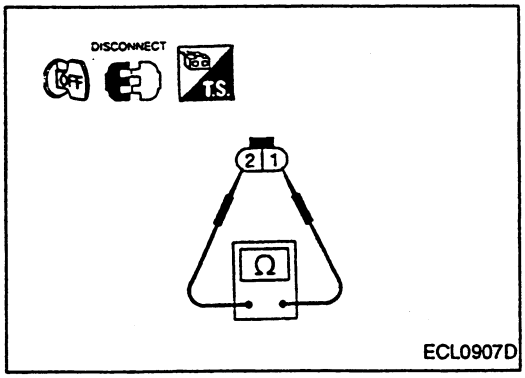

## Component Parts Inspection

### OIL TEMPERATURE SENSOR

Remove oil temperature sensor from vehicle and check it using the following table as a guide.

| Oil temperature °C | Resistance Ω |
|---|---|
| Approx. 70 | Approx. 105 - 121 |
| Approx. 90 | Approx. 57 |
| Approx. 110 | Approx. 31 |

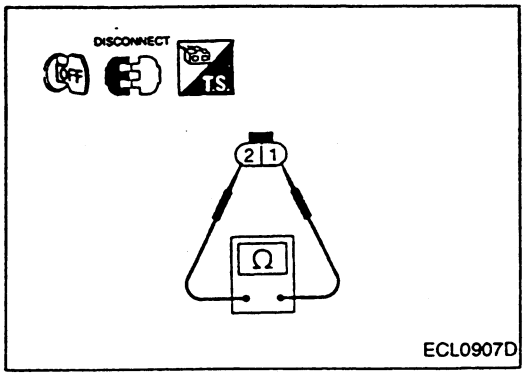
**CAUTION:**
**Make sure that new engine oil is used in engine lubricating system.**




### INTAKE AIR TEMPERATURE SENSOR

- Remove connector from intake air temperature sensor.
- Remove intake air temperature sensor from vehicle. Measure resistance between terminals ① and ② .

| Intake air temperature °C | Resistance Ω |
|---|---|
| Approx. 20 | Approx. 2.5 |
| Approx. 30 | Approx. 1.7 |
| Approx. 40 | Approx. 1.2 |



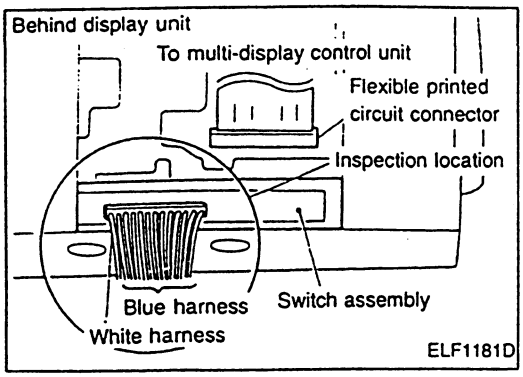

### EXHAUST GAS TEMPERATURE SENSOR

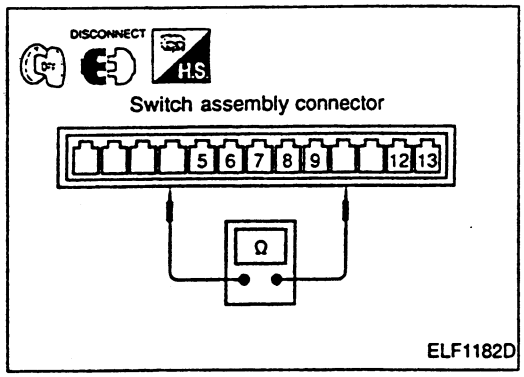
- Make sure that exhaust gas temperature sensor is at approximately room temperature.
- Remove connector from exhaust gas temperature sensor.
- Remove exhaust gas temperature sensor from vehicle. Measure resistance between terminals ① and ② .

**WARNING:**
**Exhaust gas temperature sensor and its surrounding area are hot immediately after engine has stopped. Allow exhaust gas temperature sensor to cool before removing it from vehicle.**

**Standard resistance:**
**Approx. 16 kΩ (at approx. 400°C) - ∞ (when engine is cold)**

## Component Parts Inspection (Cont'd)



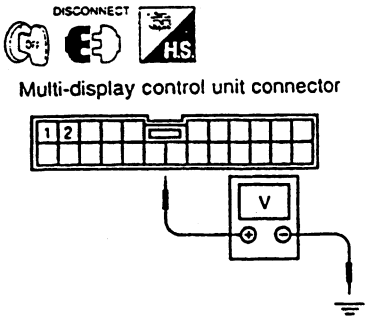




### MULTI-FUNCTION DISPLAY SWITCH

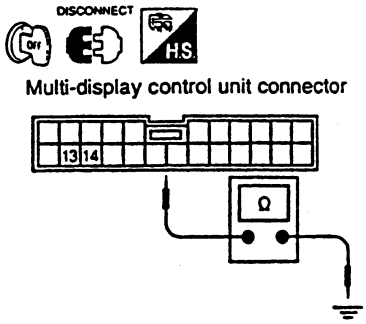
- Remove multi-function display unit.
- Separate control unit from display unit.
- Turn each switch ON and check continuity between its corresponding terminals on rear side of display unit.

| Item | | Operation | Terminal No. | Continuity |
|---|---|---|---|---|
| DISP | | ON | 12 - 13 | Yes |
| RETURN | | | 9 - 13 | |
| MODE | | | 7 - 13 | |
| MENU | | | 8 - 13 | |
| Joy stick | UP | | 6 - 7 | |
| | DOWN | | 6 - 12 | |
| | LEFT | | 6 - 9 | |
| | RIGHT | | 6 - 8 | |
| | PRESS | | 5 - 8 | |
| TV | | | 5 - 7 | |

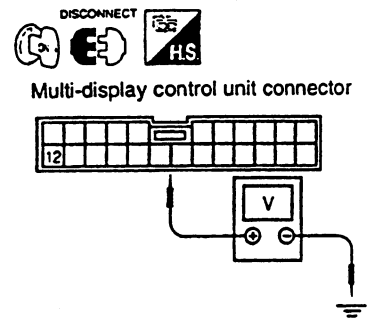
A



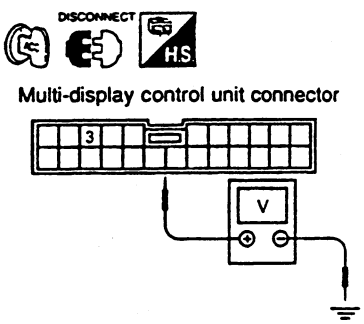

B




C




D




## Trouble Diagnosis by Symptom

### SYMPTOM 1 — Image does not appear on display (meter, NAVI, TV, video, etc.).

SYMPTOM INSPECTION
Opening screen appears on display.
NG → Go to D.
OK ↓

**A**

**CHECK MULTI-DISPLAY CONTROL UNIT POWER SUPPLY.**
- Remove multi-display control unit connector (TK24, white).
- Check voltage between terminals ①, ② and ground.

**Voltage: Battery voltage**

NG → Multi-display control unit battery power harness is faulty.
OK ↓

**B**

**CHECK MULTI-DISPLAY CONTROL UNIT GROUND CIRCUIT.**
Measure resistance between terminals ⑬, ⑭ and ground.

**Resistance: Approx. 0Ω**

NG → Multi-display control unit ground harness is faulty.
OK ↓

**C**

**CHECK MULTI-DISPLAY CONTROL UNIT IGNITION POWER SUPPLY.**
- Remove multi-display control unit connector (TK24, white).
- Check voltage between terminal ⑫ and ground.

**Voltage: Battery voltage**

NG → Multi-display control unit ignition power supply harness is faulty.
OK ↓ Ⓐ

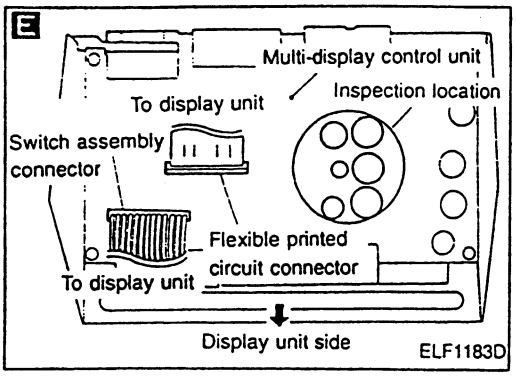
**D**

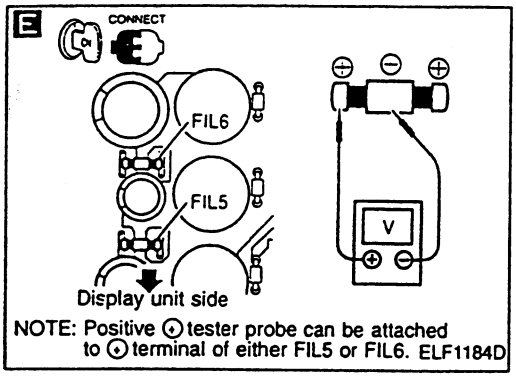
**CHECK MULTI-DISPLAY CONTROL UNIT ACC POWER SUPPLY.**
- Remove multi-display control unit connector (TK24, white).
- Check voltage between terminal ③ and ground

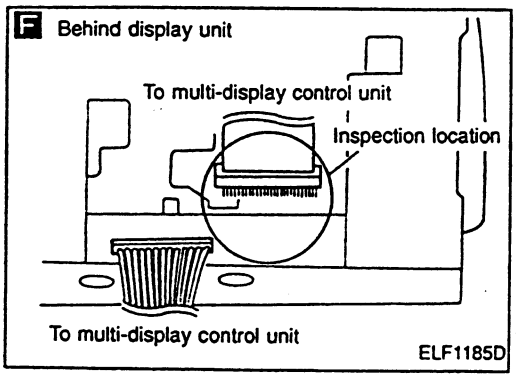
**Voltage: Battery voltage**

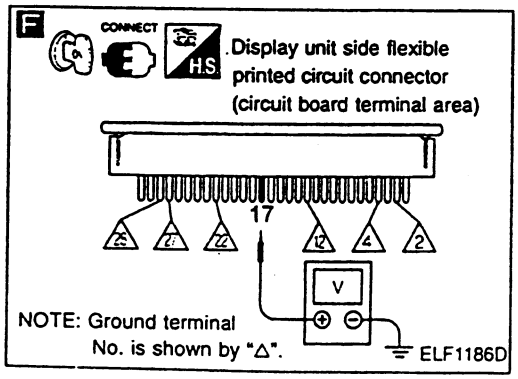
NG → Multi-display control unit ACC power supply harness is faulty.
OK ↓
Go to C.

## Trouble Diagnosis by Symptom (Cont'd)




Ⓐ

PREPARATIONS
- Remove 4 display housing securing screws. (Do not remove connectors.)
- Remove 4 control unit upper case securing screws. Remove upper case.

SYMPTOM INSPECTION
Does back light illuminate?

No → Check item E . If it checks out OK, display unit is faulty; if not, multi-display control unit is faulty.

Yes

E

**CHECK POWER SUPPLY SYSTEM.**
Measure each voltage of FIL5 and FIL6 as shown in the figure.
**⊕ and ⊖: Approx. 9V**

NG → Multi-display control unit is faulty.

OK

F

**CHECK SIGNAL SYSTEM.**
Measure voltage between connector (as shown in the figure) terminal ⑰ and ground.
**Voltage: Approx. 5.3V**

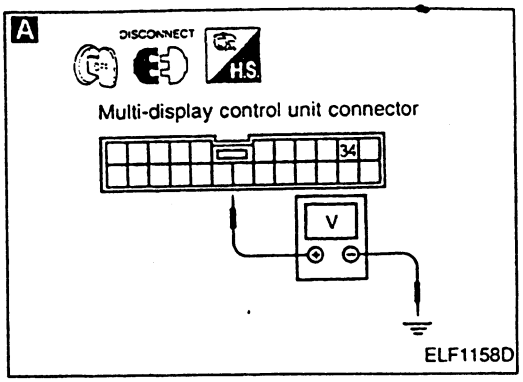
NG → Display unit is faulty.

OK

Multi-display control unit is faulty.

**CAUTION:**
**Be sure to vertically attach tester probe ⊕ to measure terminals at flexible printed circuit connector. Failure to do so may result in an internal short circuit to ground.**

## Trouble Diagnosis by Symptom (Cont'd)




### SYMPTOM 2 — Lights do not dim in response to lighting switch operation.

LIGHT DIM SELECTION INSPECTION
Is night dim selector set to ON?
- No → Set night dim selector to ON.
- Yes ↓

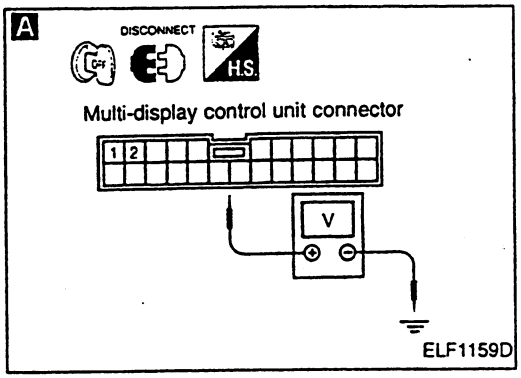
**A**

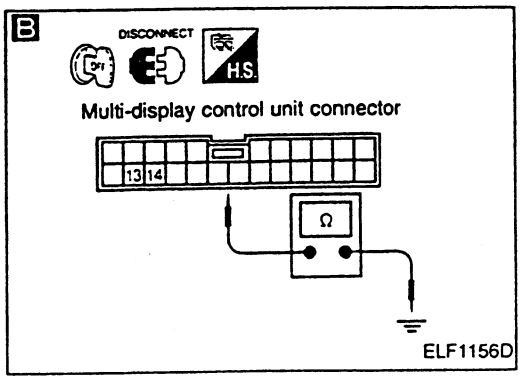
**CHECK LIGHTING SWITCH SIGNAL.**
- Remove multi-display control unit connector (TK24, brown).
- Operate lighting switch to measure voltage between terminal ㉞ and ground.

**Lighting switch ON: Battery voltage**
**Lighting switch OFF: Approx. 0V**

- NG → Multi-display control unit-to-lighting switch harness is faulty.
- OK ↓

Go to **E** , "SYMPTOM 1".




### SYMPTOM 3 — Previous meter data (meter display, select display, etc.) is not stored in memory.

**A**

**CHECK MULTI-DISPLAY CONTROL UNIT POWER SUPPLY.**
- Remove multi-display control unit connector (TK24, white).
- Measure voltage between terminals ①, ② and ground.

**Voltage: Battery voltage**

- NG → Multi-display control unit, battery power harness is faulty.
- OK ↓

**B**

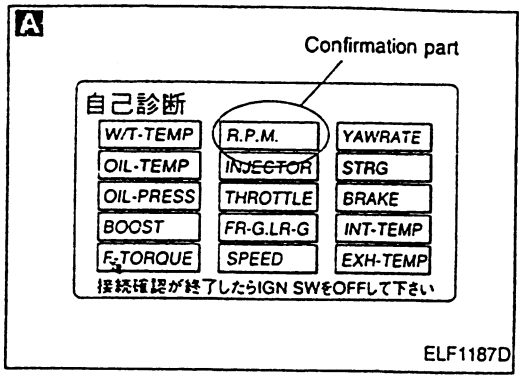
**CHECK MULTI-DISPLAY CONTROL UNIT GROUND CIRCUIT.**
Measure resistance between terminals ⑬, ⑭ and ground.
**Resistance: Approx. 0Ω**

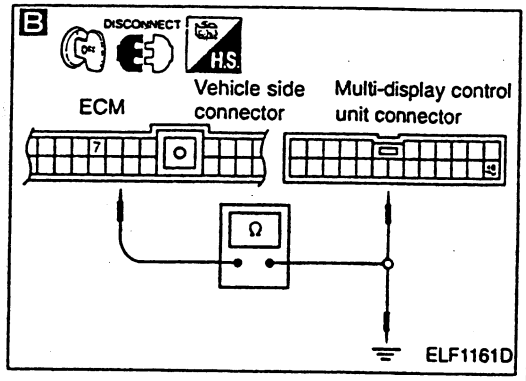
- NG → Multi-display control unit ground harness is faulty.
- OK ↓

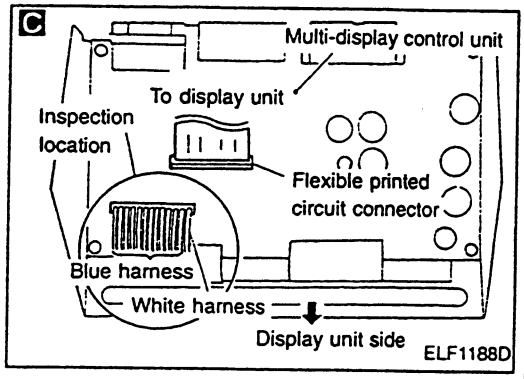
Multi-display control unit is faulty.

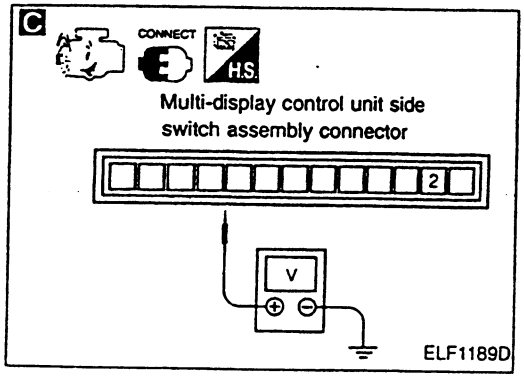
## Trouble Diagnosis by Symptom (Cont'd)

### SYMPTOM 4 — Shift-up indicator does not flash on and off although set speed is reached.




PERFORM SELF-DIAGNOSTIC PROCEDURES.
Refer to "Trouble Diagnoses Using Self-diagnostic Functions", EL-31.

↓

**A**

**CHECK PROCEDURE**
"R.P.M." is detected as correct.

NG → Go to **C** .

OK ↓

SYMPTOM INSPECTION
Tachometer (inside combination meter) is operating.

NG → Meter control unit, meter control unit-to-ECM harness or ECM control system is faulty. Refer to EC section.

OK ↓

**B**

**CHECK HARNESS.**
- Remove multi-display control unit connector (TK24, brown) and ECM harness.
- Check continuity between terminals ㊽ and ⑦, terminal ㊽ and ground.

**Terminals ㊽ and ⑦: Continuity exists.**
**Terminal ㊽ and ground: Continuity does not exist.**

NG → Multi-display control unit-to-ECM harness is faulty.

OK ↓

**C**

**PREPARATIONS**
- Remove 4 display securing screws. (All connectors must be connected.)
- Remove 4 control unit upper case securing screws, then upper case.

**CHECK SIGNAL.**
- Turn ignition switch ON and start engine.
- Check set value or set optional set value on shift-up indicator.
- Depress accelerator pedal to set value (engine speed) and measure voltage between terminal ② and ground.

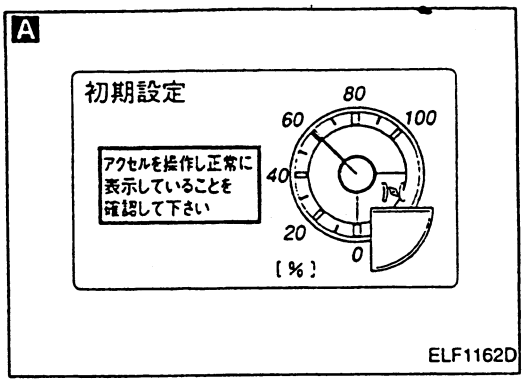
**Less than set value: Approx. 5V**
**More than set value: Approx. 0V**

NG → Multi-display control unit is faulty.

OK ↓

Switch assembly is faulty.

## Trouble Diagnosis by Symptom (Cont'd)




### SYMPTOM 5 — Only throttle position meter registers incorrect value. [0% (throttle fully closed) and 100% (throttle fully open) do not appear on display.]

A

PREPARATIONS
Perform initial throttle position adjustment procedures. Refer to next page.

NG → Throttle position sensor is faulty.

OK ↓

Turn ignition switch OFF.

### SYMPTOM 6 — Display is not set in self-diagnosis or initial throttle position adjustment mode.

CHECK PROCEDURE
Does meter display appear before ignition switch is turned OFF?

No → Turn ignition switch OFF after meter display appears. Then repeat the self-diagnostic procedure.

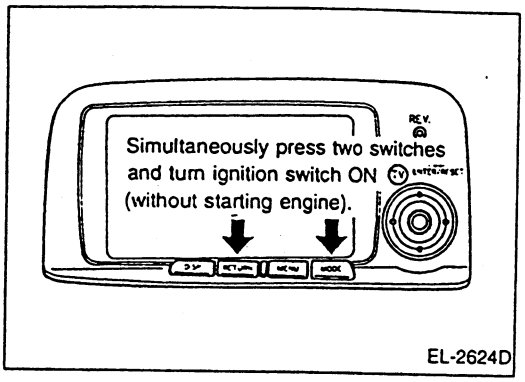
Yes ↓

CHECK COMPONENT PARTS.
Refer to "MULTI-FUNCTION DISPLAY SWITCH", EL-35.

NG → Switch assembly is faulty.

OK ↓

Multi-display control unit is faulty.

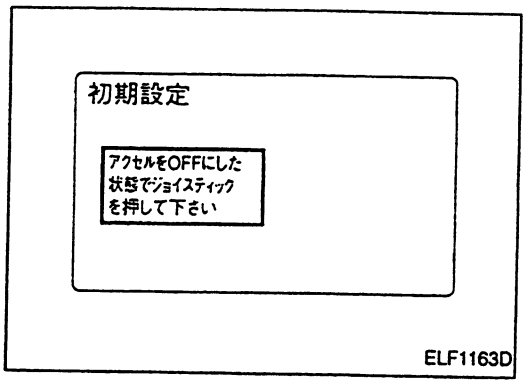


EL-2624D

## Initial Throttle Position Adjustment

**CAUTION:**

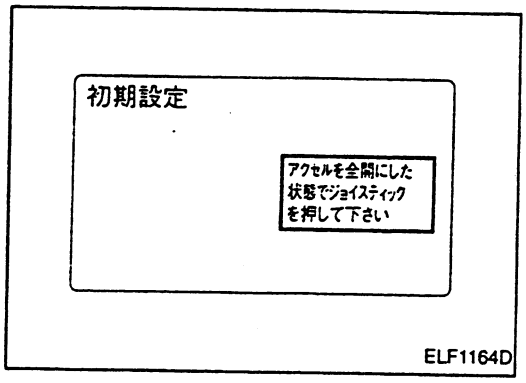
- **In adjustment mode, throttle position is set to 0% (accelerator pedal fully released) and 100% (accelerator pedal fully depressed). These two positions must correctly appear on display. Note that throttle positions cannot be optionally controlled.**
- **Before adjusting throttle positions, be sure to park vehicle on as smooth and flat a surface as possible.**



ELF1163D

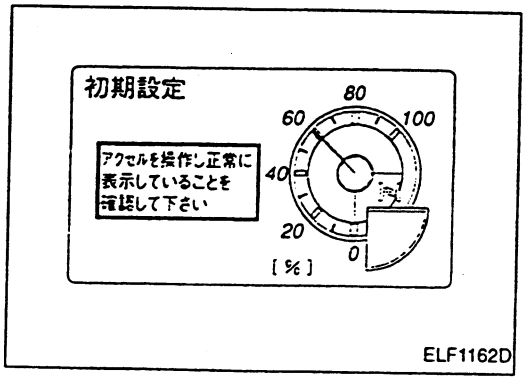
### OPERATIONAL PROCEDURE

1. With meter screen on display, turn ignition switch OFF.
2. Simultaneously press RETURN and MODE switches while turning ignition switch from OFF to ON (without starting engine).
3. After GT-R logo has appeared, turn RETURN and MODE switches OFF. Within 3 seconds after the two switches have been turned OFF, press joy stick 5 times to call up adjustment screen on display.
4. Press joy stick with accelerator pedal fully released.



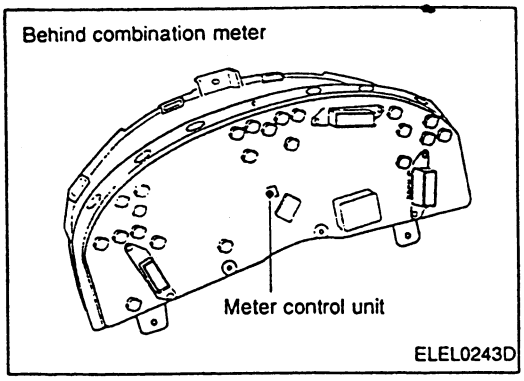
ELF1164D

5. Fully depress accelerator pedal and press joy stick.
   - Throttle position adjustment screen will appear on display.



ELF1162D

6. Make sure that correct throttle position rates appear on display. (Accelerator pedal fully released: 0%; accelerator pedal fully depressed: 100%) Turn ignition switch OFF. Turn ignition switch ON again so that meter screen appears on display.
   - The same meter screen as that previously shown before ignition switch is turned OFF appears on display.
   - **Initial throttle position adjustments can be made only when meter screen appears on display before ignition switch is turned OFF. Before initial throttle position adjustments, make sure that meter screen appears on display.**



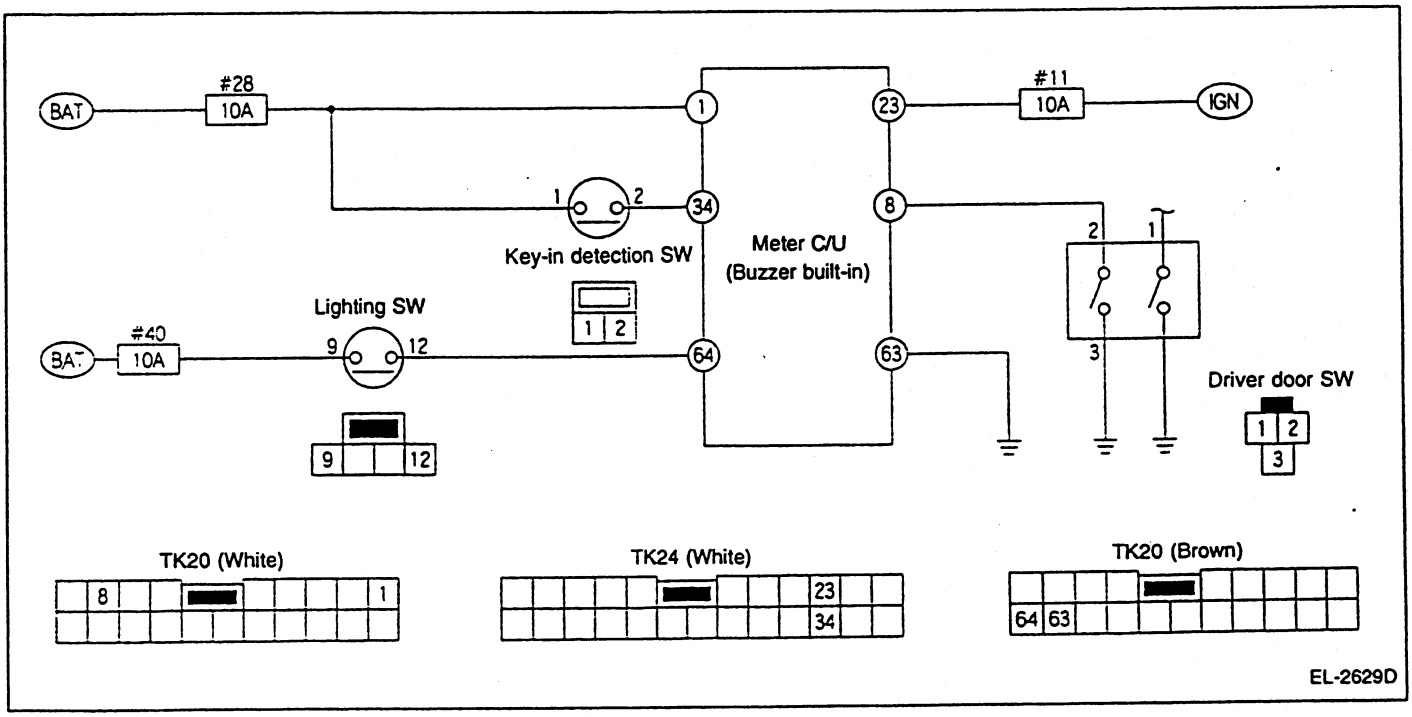

## Component Parts Location

### REMOVAL AND INSTALLATION

Parts included in this procedure:

- Column cover
- Cluster lid A
- Lighting switch or wiper/washer switch

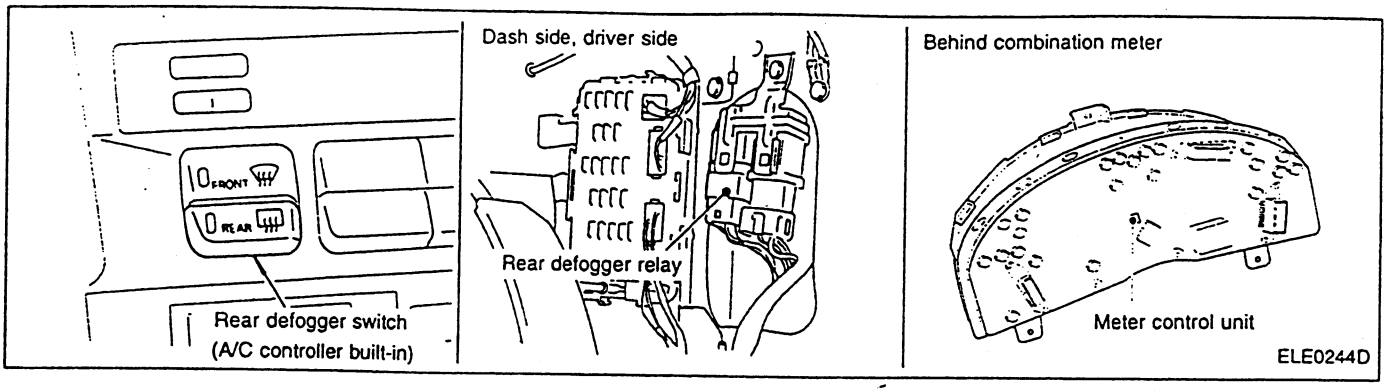
## Circuit Diagram



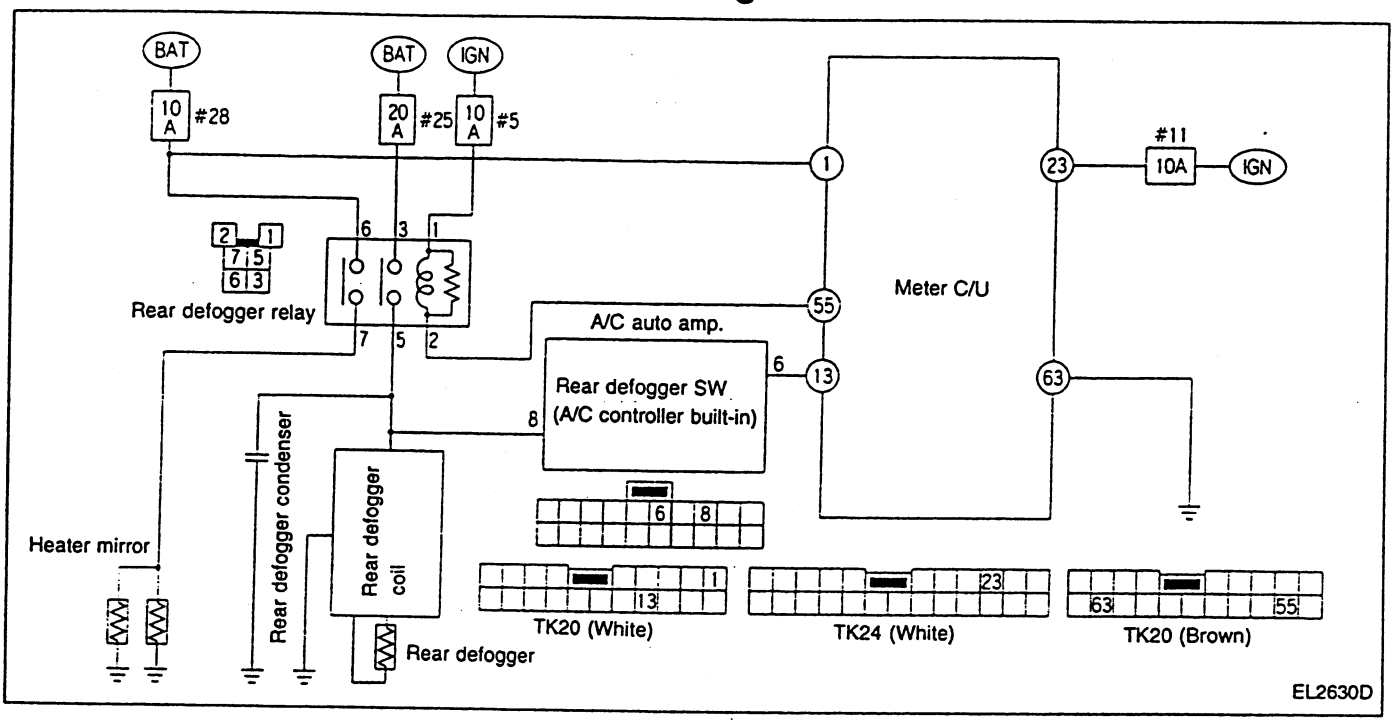

## Meter Control Unit Input/Output Signal Specifications

| Terminal No. | Signal name | Measuring condition | | | Specification |
|---|---|---|---|---|---|
| | | Ignition switch | Operation or condition | | |
| 1 | Battery | OFF | — | | Approx. 12V |
| 8 | Driver door switch signal | OFF | Driver door switch | ON (Open) | Approx. 0V |
| | | | | OFF (Closed) | Approx. 12V |
| 23 | Ignition power supply | ON | — | | Approx. 12V |
| 34 | Key-in detection switch signal | OFF | Remove the ignition key. | | Approx. 0V |
| | | | Insert the ignition key. | | Approx. 12V |
| 63 | Ground | ON | — | | Approx. 0V |
| 64 | Lighting switch signal | OFF | Lighting switch: 1ST | ON | Approx. 12V |
| | | | | OFF | Approx. 0V |

## Component Parts Location




## Circuit Diagram




## Meter Control Unit Input/Output Signal Specifications

| Terminal No. | Signal name | Measuring condition | | | Specification |
|---|---|---|---|---|---|
| | | Ignition switch | Operation or condition | | |
| 1 | Battery | OFF | — | | Approx. 12V |
| 13 | Rear defogger switch signal | ON | Rear defogger switch | ON (with switch pushed) | Approx. 0V |
| | | | | OFF (including when A/C auto amplifier is connected) | Approx. 5V |
| 23 | Ignition power supply | ON | — | | Approx. 12V |
| 55 | Rear defogger relay control signal | ON | Rear defogger switch | ON | Approx. 0V* |
| | | | | OFF | Approx. 12V |
| 63 | Ground | ON | — | | Approx. 0V |

*: Approx. 12V over 15 minutes after the switch is ON.

# SERVICE DATA

# SECTION SD



**MODIFICATION NOTICE:**
GT-R model has been added.

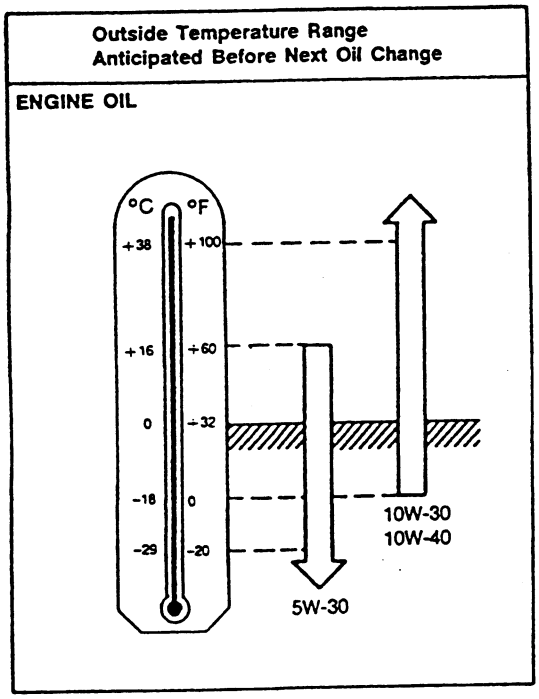
# CONTENTS

## Fluids and Lubricants

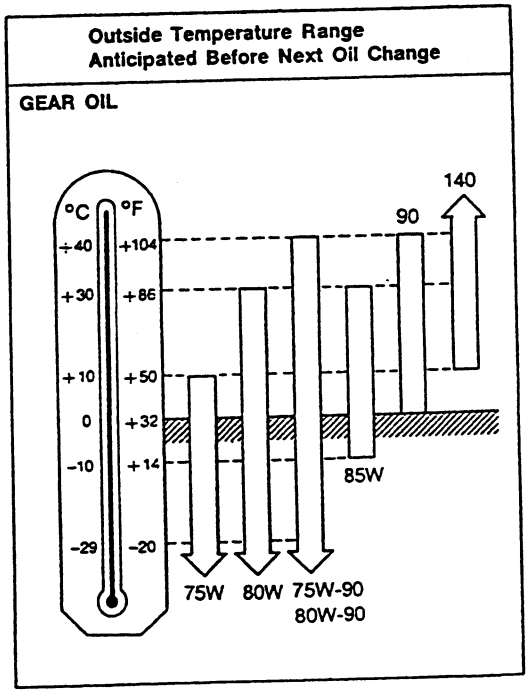
| | |
|---|---|
| Engine oil | For turbo model: API SG, SH or SJ*1<br>Except for turbo model: API SE, SF, SG, SH or SJ*1 |
| Cooling system | Anti-freeze coolant (Ethylene glycol base) |
| Manual transmission gear oil | For GT-R: Nissan Mission Oil BNR34 special only<br>Except for GT-R: API GL-4, Viscosity SAE 75W-90 |
| Automatic transmission fluid | Genuine Nissan ATF or equivalent*2 |
| 4WD transfer fluid (ATTESA E-TS) | Transfer part: Nissan Matic "D" only<br>Control part: Nissan Power Steering Fluid Special only |
| Differential gear oil | Front, Rear: API GL-5*1 |
| Power steering fluid | Type Dexron™III or equivalent*2 |
| Brake and clutch fluid | DOT3 (US FMVSS No. 116) |
| Multi-purpose grease | NLGI No. 2 (Lithium soap base) |

*1: For further details, see "SAE Viscosity Number".
*2: For more information regarding suitable fluids, contact a NISSAN dealership for correct brand of DEXRON™IIE or DEXRON™III.

## SAE Viscosity Number




TI0002




TI0003

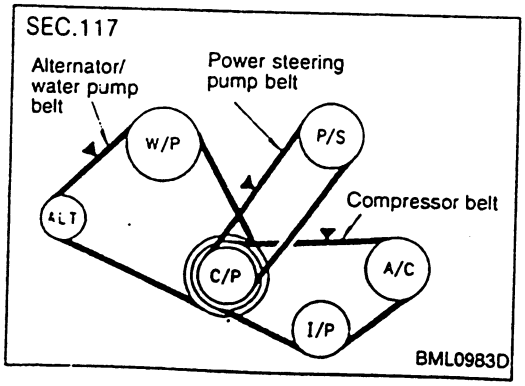
- 10W-30 is preferable for ambient temperature above –20°C (–4°F).
  For turbocharger models, 5W-30 should be used only extremely cold conditions.
- 80W-90 for front, rear differential are preferable.

## STANDARD AND REPAIR LIMIT

| | | | |
|---|---|---|---|
| Firing order | | | 1-5-3-6-2-4 |
| Compression pressure MPa (kg/cm²)/rpm | Standard | | 1.18 (12.0)/300 |
| | Limit | | 0.88 (9.0)/300 |
| | Limit of variation between cylinders | | 0.1 (1.0)/300 |
| Distortion limit mm | Intake manifold | | 0.1 |
| | Intake manifold collector | | 0.1 |
| | Exhaust manifold | | 0.3 |
| | Cylinder head | | 0.2 |
| | Cylinder block | | 0.1 |
| Engine oil capacity ℓ | Without filter | Standard vehicles | Approx. 4.2 |
| | | N1 spec. vehicles | Approx. 4.5 |
| | With filter | Standard vehicles | Approx. 4.6 |
| | | N1 spec. vehicles | Approx. 4.9 |
| Spark plug | Maker/Type/Spark plug gap mm | | NGK/PFR6A-11/1.0 - 1.1 |
| Ignition advance device | | | Electronically-controlled ignition advance |
| Engine idling speed | | | 950±50 |
| Idle base speed (during no feed back control) | | | 900 |
| Density of CO/HC at idling speed | | | Less than 0.1/Less than 50 |
| Ignition timing (during no feed back control) | | | 20±1/900 |
| Valve clearance (INT/EXH) mm | Cold engine (at ambient temperature) | | 0.45±0.03/0.38±0.03 |
| | Hot engine | | 0.51±0.03/0.44±0.03 |
| Fuel tank capacity | | | Approx. 65 |
| Engine coolant total capacity [with reservoir tank (max. level)] | | | Approx. 9.0 |
| Thermostat opening temperature [start to open - full open] | | | 76.5 - 90 |
| Radiator cap opening pressure | | | 0.06 - 0.10 (0.6 - 1.0) |

| | | New | Used | Limit |
|---|---|---|---|---|
| Deflection amount of accessory V-belt Measured with tension gauge N (kg) | Power steering pump belt | 667 - 757 (68.1 - 77.1) | 555 - 645 (56.7 - 65.7) | 289 (29.5) |
| | A/C compressor belt | 667 - 757 (68.1 - 77.1) | 555 - 645 (56.7 - 65.7) | 289 (29.5) |
| | Alternator water pump belt | 667 - 757 (68.1 - 77.1) | 555 - 645 (56.7 - 65.7) | 289 (29.5) |
| Measured by pushing at 98.1 N (10 kg) mm | Power steering pump belt | 8 - 10 | 10 - 12 | 16 |
| | A/C compressor belt | 6 - 8 | 7 - 9 | 12 |
| | Alternator water pump belt | 3 - 5 | 4 - 6 | 7.5 |

SEC.117



## TIGHTENING TORQUE

Unit: N·m (kg-m)

| | |
|---|---|
| Mass air flow sensor | 5.1 - 6.5 (0.52 - 0.66) |
| Inter cooler | 15.7 - 20.6 (1.6 - 2.1) |
| Inter cooler mount bracket | 15.7 - 20.6 (1.6 - 2.1) |
| Recirculation valve | 15.7 - 20.6 (1.6 - 2.1) |
| Pressure regulator | 2.3 - 3.0 (0.23 - 0.31) |
| Fuel tube & injector assembly | 15.7 - 20.6 (1.6 - 2.1) |
| *Intake manifold collector | 15.7 - 20.6 (1.6 - 2.1) |
| Accelerator operating unit | 6.3 - 8.3 (0.64 - 0.85) |
| IACV-AAC valve assembly | 6.3 - 8.3 (0.64 - 0.85) |
| Throttle sensor | 2.0 - 2.4 (0.20 - 0.24) |
| *Intake manifold | 15.7 - 20.6 (1.6 - 2.1) |
| Air chamber | 15.7 - 20.6 (1.6 - 2.1) |
| Air regulator | 6.3 - 8.3 (0.64 - 0.85) |
| Balance tube | 6.3 - 8.3 (0.64 - 0.85) |
| Water by-pass connector | 15.7 - 20.6 (1.6 - 2.1) |
| Turbocharger | 22.6 - 29.4 (2.3 - 3.0) |
| Exhaust outlet | 22.6 - 29.4 (2.3 - 3.0) |
| *Exhaust manifold | 17.7 - 23.5 (1.8 - 2.4) |
| Exhaust manifold cover | 3.7 - 5.0 (0.38 - 0.51) |
| Oxygen sensor | 40.2 - 50.0 (4.1 - 5.1) |
| Ignition coil | 2.3 - 3.0 (0.23 - 0.31) |
| Ignition coil bracket | 12.7 - 15.7 (1.3 - 1.6) |
| Spark plug | 19.6 - 29.4 (2.0 - 3.0) |
| *Rocker cover | 2.0 - 3.9 (0.2 - 0.4) |
| *Oil pan (M6 bolt) | 6.3 - 8.3 (0.64 - 0.85) |
| (M8 bolt, nut) | 31.4 - 42.2 (3.2 - 4.3) |
| Oil pan drain plug | 29.4 - 39.2 (3.0 - 4.0) |
| Oil strainer (M6 bolt) | 6.3 - 8.3 (0.64 - 0.85) |
| (M8 bolt) | 15.7 - 20.6 (1.6 - 2.1) |
| Camshaft position sensor | 15.7 - 20.6 (1.6 - 2.1) |
| Timing belt cover (upper) | 2.9 - 4.9 (0.3 - 0.5) |
| (lower) | 2.9 - 4.9 (0.3 - 0.5) |
| Crankshaft pulley | 446 - 544 (45.5 - 55.5) |
| Timing belt tensioner pulley | 43.1 - 57.9 (4.4 - 5.9) |
| Idler pulley | 43.1 - 57.9 (4.4 - 5.9) |
| Cam timing pulley | 13.7 - 18.6 (1.4 - 1.9) |
| Camshaft position sensor bracket | 20.6 - 26.5 (2.1 - 2.7) |
| *Camshaft bracket | 1) 2.0 (0.2)<br>2) 5.9 (0.6)<br>3) 9.0 - 11.8 (0.92 - 1.2) |

Unit: N·m (kg-m)

| | |
|---|---|
| *Cylinder head bolt | 1) 29.4 (3.0)<br>2) 108 (11.0)<br>3) 0 (0)<br>4) 24.5 - 34.5 (2.5 - 3.5)<br>5) 85 - 90° (Angle tightening) |
| *Main bearing cap | 46.1 - 52.0 (4.7 - 5.3) |
| Baffle plate | 15.7 - 20.6 (1.6 - 2.1) |
| Connecting rod nut | 1) 13.7 - 15.7 (1.4 - 1.6)<br>2) 60 - 65° (Angle tightening) |
| Rear oil seal retainer | 6.3 - 8.3 (0.64 - 0.85) |
| Flywheel | 127 - 137 (13.0 - 14.0) |
| Knock sensor | 15.7 - 20.6 (1.6 - 2.1) |
| Radiator mounting bracket | 3.8 - 4.5 (0.39 - 0.46) |
| Auxiliary electric fan assembly | 3.8 - 4.5 (0.39 - 0.46) |
| Cooling fan | 5.9 - 9.8 (0.6 - 1.0) |
| Oil pump assembly | 9.8 - 11.8 (1.0 - 1.2) |
| Oil pump cover | 3.7 - 5.0 (0.38 - 0.51) |
| Oil filter bracket | 15.7 - 20.6 (1.6 - 2.1) |
| Water-cooled oil cooler | 34.3 - 44.1 (3.5 - 4.5) |
| Air-cooled oil cooler | 6.3 - 8.3 (0.64 - 0.85) |
| Water pump (M6 bolt) | 6.3 - 8.3 (0.64 - 0.85) |
| (M8 bolt) | 15.7 - 20.6 (1.6 - 2.1) |
| (M10 bolt) | 31.4 - 42.2 (3.2 - 4.3) |
| Water inlet | 15.7 - 20.6 (1.6 - 2.1) |
| Water outlet | 15.7 - 20.6 (1.6 - 2.1) |
| Thermal transmitter | 14.7 - 19.6 (1.5 - 2.0) |
| Water temperature sensor | 19.6 - 29.4 (2.0 - 3.0) |
| Accelerator cable lock nut (throttle drum side) | 7.8 - 10.8 (0.8 - 1.1) |
| Fuel tank strap | 26.5 - 36.3 (2.7 - 3.7) |
| Fuel sender unit | 30.4 - 35.3 (3.1 - 3.6) |
| Exhaust system | |
| Exhaust outlet to front tube | 45.1 - 59.8 (4.6 - 6.1) |
| Front tube to catalytic converter | 43.1 - 54.9 (4.4 - 5.6) |
| Catalytic converter to sender tube | 51.0 - 64.7 (5.2 - 6.6) |
| *Sender tube to main muffler | 30.4 - 39.2 (3.1 - 4.0) |
| Starter motor | 41.2 - 52.0 (4.2 - 5.3) |
| Starter motor terminal B | 12.7 - 15.7 (1.3 - 1.6) |
| Alernator (upper) | 15.7 - 20.6 (1.6 - 2.1) |
| (lower) | 45.1 - 59.8 (4.6 - 6.1) |

*: Tighten as specified tightening order.

1) - 5): Tighten separately in several times.

## CLUTCH PEDAL

| | | |
|---|---|---|
| Pedal height | mm | 169 - 179 |
| Pedal height at clutch released | mm | More than 81 |
| Pedal free play (clevis pin clearance) | mm | 5 - 12 (1.0 - 3.0) |

## CLUTCH DISC

| | | |
|---|---|---|
| Size | mm | 250 dia. |
| Wear limit (depth to rivet head) | mm | 0.3 |
| Runout limit / diameter at measurement | mm | Less than 0.7 / 240 dia. |
| Maximum backlash at spline | mm | 1.0 |

## CLUTCH COVER

| | | |
|---|---|---|
| Size | mm | 250 dia. |
| Diaphragm spring lever height | mm | 48.2 - 50.2 |
| Variation in diaphragm spring lever height | mm | Less than 0.6 |

## CHECK VALVE

| | |
|---|---|
| Vacuum leakage<br>[At the vacuum pressure of –26.7 kPa (–200 mmHg)] | Booster side: Within the vacuum pressure of 1.3 kPa (10 mmHg) for 15 seconds<br>Intake manifold side: No vacuum pressure is applied. |

## CLUTCH BOOSTER

| | |
|---|---|
| Vacuum leakage<br>[At the vacuum pressure of –66.7 kPa (–500 mmHg)] | Within the vacuum pressure of 3.3 kPa (25 mmHg) for 15 seconds |
| Push rod installation standard | 9.6 |
| Operating rod installation standard | 93.5 - 94.5 |

## TIGHTENING TORQUE

Unit: N·m (kg-m)

| | |
|---|---|
| Clutch cover fixing bolt | 35 - 44 (3.5 - 4.5) |
| Clutch master cylinder fixing bolt | 9.9 - 15 (1.0 - 1.6) |

## TIGHTENING TORQUE

Unit: N·m (kg-m)

| | | |
|---|---|---|
| Transmission to engine mounting bolt | T/M side to engine side | 40 - 49 (4.0 - 5.0) |
| | Engine side to T/M side | 30 - 39 (3.0 - 4.0) |

## END PLAY

| Designation | Standard mm |
|---|---|
| Clutch hub | 0.2 - 0.35 |
| Multiple disc clutch | 0.2 - 0.5 |

## CLUTCH HUB BEARING ADJUSTING SHIM

| Thickness mm | Parts number | Thickness mm | Parts number |
|---|---|---|---|
| 0.40 | 33112 AA400 | 0.70 | 33112 AA403 |
| 0.50 | 33112 AA401 | 0.80 | 33112 AA404 |
| 0.60 | 33112 AA402 | 0.90 | 33112 AA405 |

## RETAINER PLATE

| Thickness mm | Parts number | Thickness mm | Parts number |
|---|---|---|---|
| 4.8 | 31537 1P400 | 6.0 | 31537 1P406 |
| 5.0 | 31537 1P401 | 6.2 | 31537 1P407 |
| 5.2 | 31537 1P402 | 6.4 | 31537 1P408 |
| 5.4 | 31537 1P403 | 6.6 | 31537 1P409 |
| 5.6 | 31537 1P404 | 6.8 | 31537 1P410 |
| 5.8 | 31537 1P405 | 7.0 | 31537 1P411 |

## CLUTCH SPECIFICATIONS

| | | |
|---|---|---|
| Drive plate | Number of plates | 7 |
| | Parts number | 31532 05U00 |
| | Thickness mm | 2.0 |
| | Wear limit mm | 1.8 |
| Driven plate | Number of plates | 12 |
| | Parts number | 31536 1P400 |
| | Thickness mm | 2.0 |

## DRIVE GEAR RUNOUT

| Type | Amount of runout at reverse side of drive gear mm |
|---|---|
| R200H, R200Z | Less than 0.05 |

## ADJUSTMENT OF SIDE GEAR CLEARANCE

| Type | Clearance at reverse side of side gear mm |
|---|---|
| R200Z | 0.05 - 0.15 |

### Thrust washer for adjustment of clearance at reverse side of side gear

| Type | R200Z | |
|---|---|---|
| | Thickness mm | Parts number |
| Thrust washer | 0.75 | 38424 81X00 |
| | 0.80 | 38424 81X01 |
| | 0.85 | 38424 81X02 |
| | 0.90 | 38424 81X03 |
| | 0.95 | 38424 81X04 |
| | 1.00 | 38424 81X05 |
| | 1.05 | 38424 81X06 |
| | 1.10 | 38424 81X07 |
| | 1.15 | 38424 81X08 |

## ADJUSTMENT OF DRIVE PINION HEIGHT

### Adjusting washer for adjustment of drive pinion height

| Type | R200 (Strengthened), R200V (Strengthened) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Thickness mm | Parts number | Thickness mm | Parts number | Thickness mm | Parts number | Thickness mm | Parts number |
| Adjusting washer | 3.09 | 38154 P6017 | 3.24 | 38154 P6022 | 3.39 | 38154 P6027 | 3.54 | 38154 P6032 |
| | 3.12 | 38154 P6018 | 3.27 | 38154 P6023 | 3.42 | 38154 P6028 | 3.57 | 38154 P6033 |
| | 3.15 | 38154 P6019 | 3.30 | 38154 P6024 | 3.45 | 38154 P6029 | 3.60 | 38154 P6034 |
| | 3.18 | 38154 P6020 | 3.33 | 38154 P6025 | 3.48 | 38154 P6030 | 3.63 | 38154 P6035 |
| | 3.21 | 38154 P6021 | 3.36 | 38154 P6026 | 3.51 | 38154 P6031 | 3.66 | 38154 P6036 |

## ADJUSTMENT OF DRIVE PINION PRE-LOAD

| Type | R200H | R200Z |
|---|---|---|
| Drive pinion pre-load N·m (kg-m) | 1.1 - 1.6 (0.11 - 0.17) | 1.1 - 1.4 (0.11 - 0.14) |

### Adjusting washer for adjustment of drive pinion pre-load

| Type | R200H, R200Z | | | |
|---|---|---|---|---|
| | Thickness mm | Parts number | Thickness mm | Parts number |
| Adjusting washer | 3.81 | 38125 61001 | 3.97 | 38133 61001 |
| | 3.83 | 38126 61001 | 3.99 | 38134 61001 |
| | 3.85 | 38127 61001 | 4.01 | 38135 61001 |
| | 3.87 | 38128 61001 | 4.03 | 38136 61001 |
| | 3.89 | 38129 61001 | 4.05 | 38137 61001 |
| | 3.91 | 38130 61001 | 4.07 | 38138 61001 |
| | 3.93 | 38131 61001 | 4.09 | 38139 61001 |
| | 3.95 | 38132 61001 | | |

## Adjusting spacer for adjustment of drive pinion pre-load

| Type | R200H, R200Z | |
|---|---|---|
| | Thickness mm | Parts number |
| Adjusting spacer | 45.6 | 38165 10V05 |
| | 45.9 | 38165 10V06 |
| | 46.2 | 38165 10V07 |
| | 46.5 | 38165 10V00 |
| | 46.8 | 38165 10V01 |

## ADJUSTMENT OF SIDE BEARING PRE-LOAD

| Type | R200H | R200Z |
|---|---|---|
| Side bearing pre-load N·m (kg-m) | 0.30 - 1.47 (0.03 - 0.15) | 1.45 - 2.04 (0.145 - 0.205) |

## Adjusting washer for adjustment of side bearing pre-load

| Type | R200H | | R200Z | | | |
|---|---|---|---|---|---|---|
| | Thickness mm | Parts number | Thickness mm | Parts number | Thickness mm | Parts number |
| Adjusting washer | 2.00 | 38453 N3100 | 1.01 | 38453 15U00 | 1.52 | 38453 15U17 |
| | 2.05 | 38453 N3101 | 1.04 | 38453 15U01 | 1.55 | 38453 15U18 |
| | 2.10 | 38453 N3102 | 1.07 | 38453 15U02 | 1.58 | 38453 15U19 |
| | 2.15 | 38453 N3103 | 1.10 | 38453 15U03 | 1.61 | 38453 15U20 |
| | 2.20 | 38453 N3104 | 1.13 | 38453 15U04 | 1.64 | 38453 15U21 |
| | 2.25 | 38453 N3105 | 1.16 | 38453 15U05 | 1.67 | 38453 15U22 |
| | 2.30 | 38453 N3106 | 1.19 | 38453 15U06 | 1.70 | 38453 15U23 |
| | 2.35 | 38453 N3107 | 1.22 | 38453 15U07 | 1.73 | 38453 15U24 |
| | 2.40 | 38453 N3108 | 1.25 | 38453 15U08 | 1.76 | 38453 15U60 |
| | 2.45 | 38453 N3109 | 1.28 | 38453 15U09 | 1.79 | 38453 15U61 |
| | 2.50 | 38453 N3110 | 1.31 | 38453 15U10 | 1.82 | 38453 15U62 |
| | 2.55 | 38453 N3111 | 1.34 | 38453 15U11 | 1.85 | 38453 15U63 |
| | 2.60 | 38453 N3112 | 1.37 | 38453 15U12 | 1.88 | 38453 15U64 |
| | 2.65 | 38453 N3113 | 1.40 | 38453 15U13 | 1.91 | 38453 15U65 |
| | | | 1.43 | 38453 15U14 | 1.94 | 38453 15U66 |
| | | | 1.46 | 38453 15U15 | 1.97 | 38453 15U67 |
| | | | 1.49 | 38453 15U16 | 2.00 | 38453 15U68 |

## ADJUSTMENT OF TOTAL PRE-LOAD

| Type | R200H | R200Z |
|---|---|---|
| Total pre-load with oil seal installed N·m (kg-m) | 1.4 - 3.1 (0.14 - 0.32) | 1.5 - 2.1 (0.15 - 0.21) |
| Drive gear backlash mm | 0.13 - 0.18 | |

## ADJUSTMENT OF PRESSURE RING CLEARANCE (R200Z)

| Pressure ring clearance mm | 0 - 0.05 |
|---|---|

## Pressure ring shim

| Thickness mm | Parts number | Thickness mm | Parts number | Thickness mm | Parts number |
|---|---|---|---|---|---|
| 1.27 | 38414 15U00 | 1.35 | 38414 15U02 | 1.43 | 38414 15U04 |
| 1.31 | 38414 15U01 | 1.39 | 38414 15U03 | 1.47 | 38414 15U05 |

## FRONT

### Z80T70C

| | | | |
|---|---|---|---|
| Joint type | | Final drive side | T70C |
| | | Wheel side | Z80 |
| Amount of grease g | | Final drive side | 110 - 120 |
| | | Wheel side | 75 - 85 |
| Boot length at installed mm | | Final drive side | 95.5 - 97.5 |
| | | Wheel side | 90.5 - 92.5 |
| Spider assembly (final drive side) | Stamped number | Parts number | Type |
| | 00 | 39720 51E00 | T70C |
| | 01 | 39720 51E01 | |
| | 02 | 39720 51E02 | |
| | 03 | 39720 51E03 | |

### Z80T82F

| | | | |
|---|---|---|---|
| Joint type | | Final drive side | T82F |
| | | Wheel side | Z80 |
| Amount of grease g | | Final drive side | 95 - 105 |
| | | Wheel side | 75 - 85 |
| Boot length at installed mm | | Final drive side | 95 - 97 |
| | | Wheel side | 90.5 - 92.5 |
| Spider assembly (final drive side) | Stamped number | Parts number | Type |
| | 00 | 39720 10V10 | T82F |
| | 01 | 39720 10V11 | |
| | 02 | 39720 10V12 | |

## REAR

### B100D100F

| | | | |
|---|---|---|---|
| Joint type | | Final drive side | D100F |
| | | Wheel side | B100 |
| Amount of grease g | | Final drive side | 170 - 200 |
| | | Wheel side | 170 - 190 |
| Boot length at installed mm | | Final drive side | 103.5 |
| | | Wheel side | 102 |

## TIGHTENING TORQUE

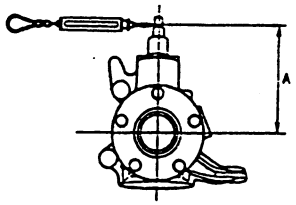
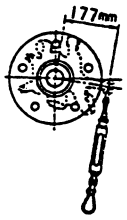
Unit: N·m (kg-m)

| | | |
|---|---|---|
| Front | Drive shaft to side flange (left side) | 28 - 37 (2.8 - 3.8) |
| | Drive shaft nut | 236 - 313 (24.0 - 32.0) |
| Rear | Drive shaft to side flange | 69 - 78 (7.0 - 8.0) |
| | Drive shaft nut | 206 - 274 (21.0 - 28.0) |

## WHEEL ALIGNMENT

| | | | |
|---|---|---|---|
| Front | Camber | | −0°50′±45′ |
| | Caster | | 3°55′±45′ |
| | King pin inclination | | 15°20′±45′ |
| | Toe-in | mm | 0 to In 2 |
| | Amount of side slip (Reference) | mm | In 5 to Out 5 |
| Rear | Camber | | −1°15′±30′ |
| | Toe-in | mm | 0 to In 4 |
| | Amount of side slip (Reference) | mm | In 5 to Out 5 |

## WHEEL BEARING

| Location | Front axle | Rear axle |
|---|---|---|
| Rotating torque N·m (kg-m) | 0.40 - 2.54 (0.04 - 0.26) | 0.324 - 1.529 (0.033 - 0.156) |
| Spring scale measurement N (kg) | 2.0 - 13 (0.2 - 1.4) | 1.97 - 8.60 (0.20 - 0.88) |
| Spring scale set position | Length "A" mm: 190  FAC1161D |  RAC0998D |
| End play mm | 0 | |

## BALL JOINT

| | | |
|---|---|---|
| Oscillating torque | N·m (kg-m) | 0.50 - 3.40 (0.05 - 0.35) |
| Spring scale measurement (at cotter pin hole) | N (kg) | 7.95 - 55.3 (0.81 - 5.64) |
| Sliding torque | N·m (kg-m) | 0.50 - 3.40 (0.05 - 0.35) |
| End play | mm | 0 |

## TIGHTENING TORQUE

Unit: N·m (kg-m)

| | | | |
|---|---|---|---|
| Front | Wheel bearing lock nut | | 236 - 313 (24.0 - 32.0) |
| | Arm A to suspension member (Ball joint portion) | | 96.2 - 119 (9.80 - 12.2) |
| | Arm A to steering knuckle (Ball joint portion) | | 96.2 - 119 (9.80 - 12.2) |
| | Steering knuckle to third link | | 98.1 - 117 (10.0 - 12.0) |
| | Third link to upper link | | 89.0 - 107 (9.00 - 11.0) |
| | Stabilizer to connecting rod | | 42 - 47 (4.2 - 4.8) |
| | Stabilizer connecting rod to mounting bracket | | |
| | Stabilizer clamp fixing bolt | | 40 - 49 (4.0 - 5.0) |
| | Stabilizer clamp fixing nut | | |
| | Shock absorber assembly to third link | | 89.0 - 107 (9.00 - 11.0) |
| | Shock absorber assembly to underbody | | 40 - 53 (4.0 - 5.5) |
| | Shock absorber piston rod lock nut | | 18 - 23 (1.8 - 2.4) |
| Rear | Wheel hub lock nut | | 206 - 274 (21.0 - 28.0) |
| | Lower arm to suspension member | | 78.0 - 98.0 (7.90 - 10.0) |
| | Lower arm to axle housing | | 79 - 93 (8.0 - 9.5) |
| | Lower arm connecting rod | | 8.9 - 11 (0.9 - 1.2) |
| | Front upper link fixing nut | | 78.0 - 98.0 (7.90 - 10.0) |
| | Rear upper link | Bolt | 78.0 - 98.0 (7.90 - 10.0) |
| | | Nut | 69 - 88 (7.0 - 9.0) |
| | Connecting rod to stabilizer | | 8.9 - 11 (0.9 - 1.2) |
| | Stabilizer clamp | | 44 - 54 (4.4 - 5.6) |
| | Shock absorber assembly to axle housing | | 88.3 - 107 (9.00 - 10.0) |
| | Shock absorber assembly to underbody | | 16 - 18 (1.6 - 1.9) |
| | Shock absorber piston rod lock nut | | 18 - 23 (1.8 - 2.4) |

## ROAD WHEEL

| | | |
|---|---|---|
| Wheel type | | Aluminum |
| Runout limit mm | Lateral | Less than 0.3 |
| | Vertical | Less than 0.3 |
| Permissible amount of residual imbalance g | Dynamic (measured at lug) | Less than 10 (one side) |
| | Static (measured at lug) | Less than 20 |

## TIGHTENING TORQUE

Unit: N·m (kg-m)

| | |
|---|---|
| Wheel nut | 103 - 122 (10.5 - 12.5) |

## TIRE

| Tire size | Tire air pressure kPa (kg/cm²) | |
|---|---|---|
| | Front wheel | Rear wheel |
| 245/40ZR18 | 230 (2.3) | 230 (2.3) |
| T145/70D17 | 420 (4.2) | 420 (4.2) |

## BRAKING FORCE

| | |
|---|---|
| Total braking force of rear wheels | More than 10% of axle weight |
| Variation between right and left of each wheel | Less than 8% of axle weight |
| Total braking force | More than 50% of vehicle weight at inspected |

Note: The braking force when both front wheels are locked up can be considered to meet the total braking force.

## BRAKE PEDAL

| | |
|---|---|
| Free play (at pedal top surface) mm | 3 - 11 |
| Brake pedal height (from top surface of floor panel melt sheet) mm | 163 - 173 |
| Depressed pedal height under force of 490 N (50 kg) (from top surface of dash panel melt sheet) mm | More than 75 |
| Clearance between the edge of stop lamp switch screw and pedal stopper mm | 0.3 - 1.0 |

## BRAKE BOOSTER

| | |
|---|---|
| Vacuum leakage [at vacuum of 66.7 kPa (–500 mmHg)] | Within 3.3 kPa (25 mmHg) of vacuum for 15 seconds |
| Input rod standard length at installed mm | 140 |

## FRONT DISC BRAKE

| Brake type | | OPB27V |
|---|---|---|
| Brake pad | Standard thickness (New) mm | 11.9 |
| | Wear limit of thickness mm | 2.0 |
| Disc rotor | Standard thickness (New) mm | 30 |
| | Wear limit of thickness mm | 28.4 |
| | Runout limit mm | Less than 0.05 |

## REAR DISC BRAKE

| Brake type | | OPB13V, OPB13VA |
|---|---|---|
| Brake pad | Standard thickness (New) mm | 9.6 |
| | Wear limit of thickness mm | 2.0 |
| Disc rotor | Standard thickness (New) mm | 22 |
| | Wear limit of thickness mm | 20 |
| | Runout limit mm | Less than 0.07 |

## PARKING BRAKE

| Type | | DS17HD |
|---|---|---|
| Brake lining | Standard thickness (New) mm | 3.0 |
| | Wear limit of thickness mm | 1.5 |
| Drum | Standard inner diameter (New) mm | 172 dia. |
| | Wear limit of inner diameter mm | 173 dia. |
| Operating stroke [under force of 196 N (20 kg)] | | 5 - 7 notches |
| Maximum stroke | | 19 notches |
| Number of notches when brake warning lamp turns on | | Within 1 notch |

## TIGHTENING TORQUE

Unit: N·m (kg-m)

| | |
|---|---|
| Front caliper mounting bolt | 151 - 152 (15.3 - 15.6) |
| Rear caliper mounting bolt | 39 - 50 (3.9 - 5.2) |

## STEERING WHEEL

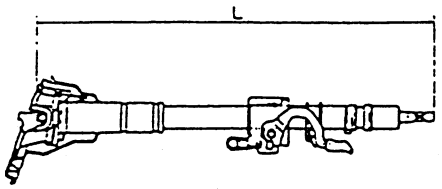
| | | |
|---|---|---|
| Steering wheel end play | mm | 0 |
| Steering wheel free play | mm | 0 - 35 |

## STEERING ANGLE

| | |
|---|---|
| Inner wheel | 36° |
| Outer wheel | 30° |

## STEERING COLUMN

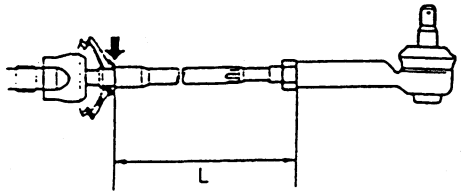
| | |
|---|---|
| Steering column length "L" mm | 610 |




STC0720D

## STEERING LINKAGE

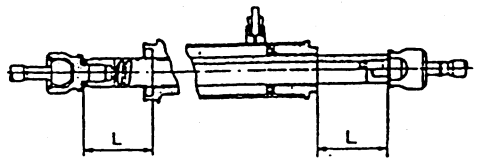
| | | |
|---|---|---|
| Steering gear type | | PR26AF |
| Tie-rod ball joint outer socket | Oscillating torque N·m (kg-m) | 0.30 - 2.90 (0.04 - 0.29) |
| | Spring scale measurement (at stud bolt hole) N (kg) | 4.71 - 45.3 (0.48 - 4.64) |
| | Sliding torque N·m (kg-m) | 0.30 - 2.90 (0.04 - 0.29) |
| | End play mm | Less than 0.5 |
| Tie-rod ball joint inner socket | Oscillating torque N·m (kg-m) | 1.0 - 7.8 (0.1 - 0.8) |
| | Spring scale measurement (at arrow position in figure below) N (kg) | 24.1 - 186 (2.45 - 19.0) |
| | End play mm | Less than 0.2 |
| Tie-rod length "L" mm | | 151.6 |




STC0973D

## STEERING GEAR

| | |
|---|---|
| Steering gear type | PR26AF |
| Rack neutral position "L" mm | 62.0 |




STC0101D

| | | | |
|---|---|---|---|
| Retainer adjustment | Screw lock nut tightening torque N·m (kg-m) | | 40 - 58 (4.0 - 6.0) |
| | Primary tightening torque N·m (kg-m) | | 5.0 - 5.8 (0.5 - 0.6) |
| | Re-tightening torque after loosening once N·m (kg-m) | | 5.0 - 5.8 (0.5 - 0.6) |
| | Adjusting screw back-off | | 60° - 80° |
| Rack sliding force | Range within ±11.5 mm from neutral position (at power ON) | Area mean value N (kg) | 166.7 - 225.5 (17.00 - 23.19) |
| | | Range of variations N (kg) | Less than 39 (4.0) |
| | Full range (at power OFF) | Peak value N (kg) | Less than 294 (30.0) |
| | | Range of variations N (kg) | Less than 147 (15.0) |

## OIL PUMP

| | |
|---|---|
| Maximum oil pump relief oil pressure MPa (kg/cm²) | $8.0^{-0.45}_{-0.05}$ ($81.6^{-4.5}_{-0.5}$) |

## STEERING FLUID

| | | |
|---|---|---|
| Fluid capacity | ℓ | Approx. 1.0 |

## TIGHTENING TORQUE

Unit: N·m (kg-m)

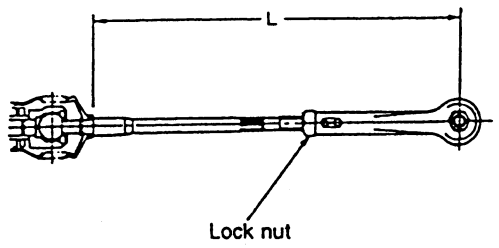
| | | |
|---|---|---|
| Steering wheel nut | | 30 - 39 (3.0 - 4.0) |
| Steering gear to suspension member | | Mounting bolt for vehicle LH 62 - 76 (6.3 - 7.8) Mounting bolt for vehicle RH 154 - 163 (15.7 - 16.7) |
| Steering gear to steering column | | 24 - 29 (2.4 - 3.0) |
| Outer socket to steering knuckle | | 30 - 39 (3.0 - 4.0) |
| Tie-rod lock nut | | 79 - 98 (8.0 - 10.0) |
| Oil pump fixing bolt | Large | 32 - 42 (3.2 - 4.3) |
| | Small | 14 - 17 (1.4 - 1.8) |
| Hydraulic tube (high pressure side) to oil pump | | 50 - 68 (5.0 - 7.0) |
| Hydraulic tube to steering gear | High pressure side | 15 - 24 (1.5 - 2.5) |
| | Low pressure side | 28 - 39 (2.8 - 4.0) |

## POWER CYLINDER

| | | |
|---|---|---|
| Power cylinder ball joint | Oscillating torque N·m (kg-m) | 0.98 - 7.80 (0.1 - 0.8) |
| | End play mm | 0 |

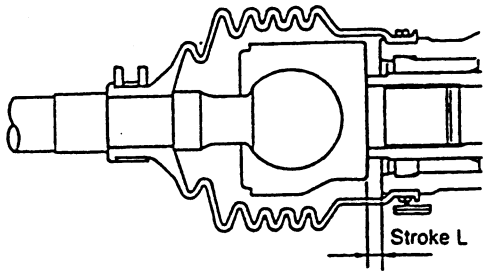
## POWER CYLINDER LOWER LINK

| | | |
|---|---|---|
| Power cylinder lower link length | mm | 290.4±1.0 |




STC0240D

| | | |
|---|---|---|
| Clearance at power cylinder stroke | mm | 3.6±0.1 |




STC0602D

## TIGHTENING TORQUE

Unit: N·m (kg-m)

| | |
|---|---|
| HICAS actuator assembly fixing bolt | 84.4 - 107 (8.60 - 11.0) |
| Outer link to axle housing | 46 - 59 (4.6 - 6.1) |