

A

SECTION STR

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STARTING SYSTEM

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

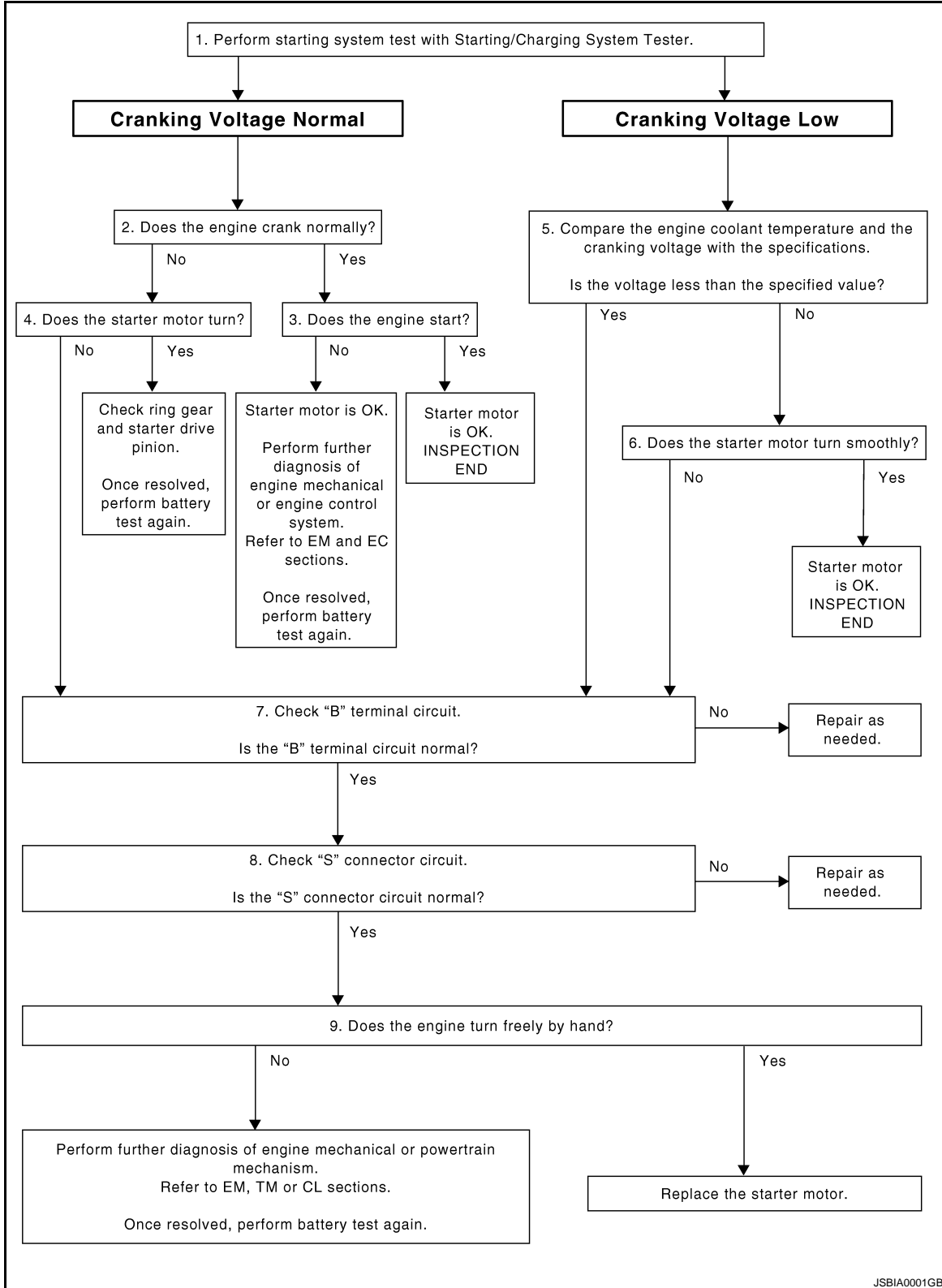
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000000956385

OVERALL SEQUENCE



JSBIA0001GB

DETAILED FLOW

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

NOTE:

To ensure a complete and thorough diagnosis, the battery, starter motor and alternator test segments must be done as a set from start to finish.

1. DIAGNOSIS WITH STARTING/CHARGING SYSTEM TESTER

Perform the starting system test with Starting/Charging System Tester (SST: J-44373). For details and operating instructions, refer to Technical Service Bulletin.

Test result

CRANKING VOLTAGE NORMAL>>GO TO 2.

CRANKING VOLTAGE LOW>>GO TO 5.

CHARGE BATTERY>>Perform the slow battery charging procedure. (Initial rate of charge is 10A for 12 hours.) Perform battery test again. Refer to Technical Service Bulletin.

REPLACE BATTERY>>Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again. Refer to Technical Service Bulletin. If second test result is "REPLACE BATTERY", then do so. Perform battery test again to confirm repair.

2. CRANKING CHECK

Check that the starter motor operates correctly.

Does the engine crank normally?

YES >> GO TO 3.

NO >> GO TO 4.

3. ENGINE START CHECK

Check that the engine starts.

Does the engine start?

YES >> Starter motor is OK. Inspection end.

NO >> Perform further diagnosis of engine mechanical or engine control system. Refer EM and EC sections. Once resolved, perform battery test again.

4. STARTER MOTOR ACTIVATION

Check that the starter motor operates.

Does the starter motor turn?

YES >> Check ring gear and starter motor drive pinion. Once resolved, perform battery test again.

NO >> GO TO 7.

5. COMPARISON BETWEEN ENGINE COOLANT AND CRANKING VOLTAGE

Compare the engine coolant temperature and the cranking voltage with the specifications.

Minimum Specification of Cranking Voltage Referencing Coolant Temperature

| Engine coolant temperature [°C (°F)] | Voltage [V] |
|--------------------------------------|-------------|
| -30 to -20 (-22 to -4) | 8.6 |
| -19 to -10 (-2 to 14) | 9.1 |
| -9 to 0 (16 to 32) | 9.5 |
| More than 1 (More than 34) | 9.9 |

Is the voltage less than the specified value?

YES >> GO TO 7.

NO >> GO TO 6.

6. STARTER OPERATION

Check the starter operation status.

Does the starter motor turn smoothly?

YES >> Starter motor is OK. Inspection end.

NO >> GO TO 7.

7. "B" TERMINAL CIRCUIT INSPECTION

Check "B" terminal circuit. Refer to [STR-7, "Diagnosis Procedure"](#).

Is "B" terminal circuit normal?

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

- YES >> GO TO 8.
- NO >> Repair as needed.

8. "S" CONNECTOR CIRCUIT INSPECTION

Check "S" connector circuit. Refer to [STR-8. "Diagnosis Procedure"](#).

Is "S" connector circuit normal?

- YES >> GO TO 9.
- NO >> Repair as needed.

9. ENGINE ROTATION STATUS

Check that the engine can be rotated by hand.

Does the engine turn freely by hand?

- YES >> Replace starter motor.
- NO >> Perform further diagnosis of engine mechanical or powertrain mechanism. Refer to EM, TM or CL sections. Once resolved, perform battery test again. Refer to Technical Service Bulletin.

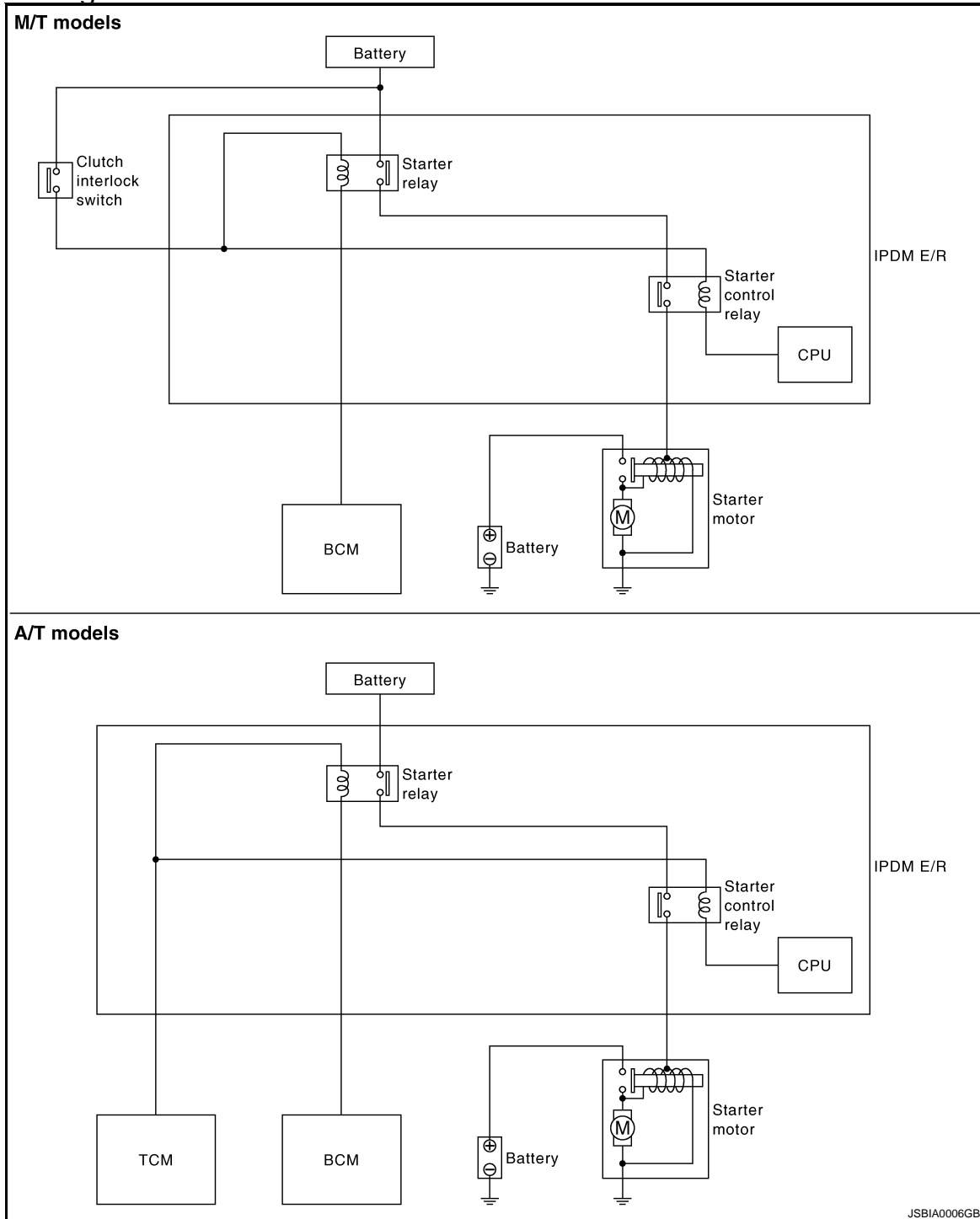
STARTING SYSTEM

< FUNCTION DIAGNOSIS >

FUNCTION DIAGNOSIS

STARTING SYSTEM

System Diagram



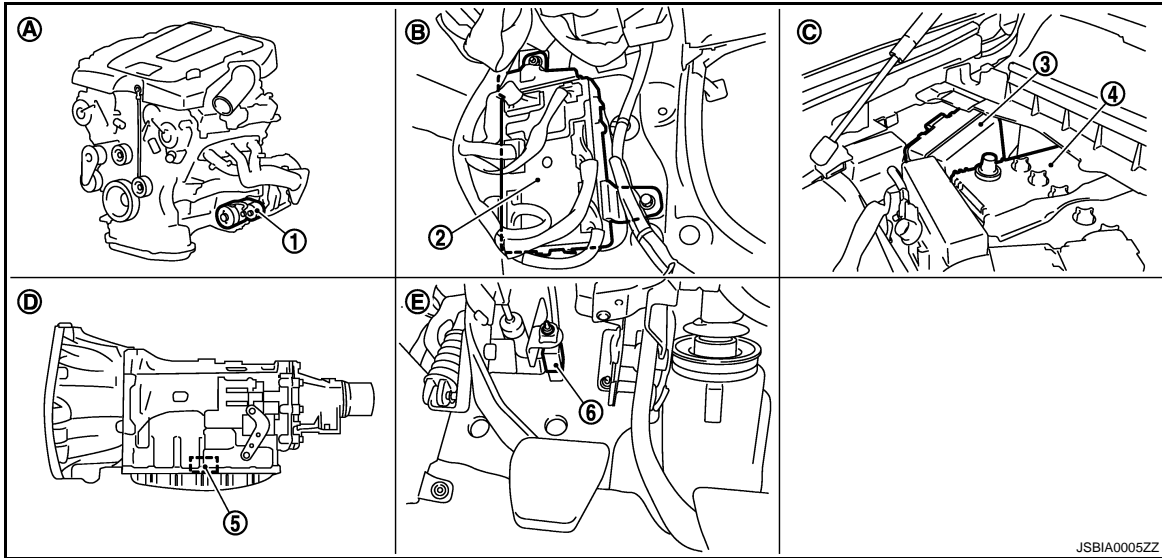
System Description

The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

Component Parts Location

STARTING SYSTEM

< FUNCTION DIAGNOSIS >



- | | | |
|-----------------------------------|-------------------------------------|------------------------------------|
| 1. Starter motor | 2. BCM | 3. IPDM E/R |
| 4. Battery | 5. TCM | 6. Clutch interlock switch |
| A. Engine | B. Dash side lower (Passenger side) | C. RH battery cover in engine room |
| D. Inside of A/T (built into A/T) | E. Clutch pedal | |

Component Description

INFOID:000000000956389

| Component part | Description |
|-------------------------|--|
| TCM | TCM supplies power to the starter relay and starter control relay inside IPDM E/R when the selector lever is shifted to the P or N position. |
| Clutch interlock switch | The switch turns ON and electric power is supplied to the starter relay and starter control relay inside IPDM E/R when the clutch pedal is depressed. |
| BCM | BCM controls the starter relay inside IPDM E/R. |
| IPDM E/R | CPU inside IPDM E/R controls the starter control relay. |
| Starter motor | The starter motor plunger closes and the motor is supplied with battery power, which in turn cranks the engine, when the "S" terminal is supplied with electric power. |

B TERMINAL CIRCUIT

< COMPONENT DIAGNOSIS >

COMPONENT DIAGNOSIS

B TERMINAL CIRCUIT

Description

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The "B" terminal is constantly supplied with battery power.

Diagnosis Procedure

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CAUTION:

Perform diagnosis under the condition that engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.

1. CHECK "B" TERMINAL CIRCUIT

1. Turn ignition switch OFF.
2. Make sure that starter motor "B" terminal connection is clean and tight.
3. Check voltage between starter motor "B" terminal and ground.

| Terminals | | Voltage (Approx.) |
|----------------------------|----------|-------------------|
| (+) | (-) | |
| Starter motor "B" terminal | Terminal | Battery voltage |
| E204 | 2 | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Check harness between battery and starter motor for open circuit.

2. CHECK BATTERY CABLE CONNECTION STATUS (VOLTAGE DROP TEST)

1. Shift A/T selector lever to "P" or "N" position. (A/T models)
Keep depressing clutch pedal fully. (M/T models)
2. Check voltage between battery positive terminal and starter motor "B" terminal.

| Terminals | | Condition | Voltage (Approx.) |
|---------------------------|----------------------------|---|-------------------|
| (+) | (-) | | |
| Battery positive terminal | Starter motor "B" terminal | When the ignition switch is in START position | Less than 0.5 V |
| | E204 | | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Check harness between the battery and the starter motor for poor continuity.

3. CHECK GROUND CIRCUIT STATUS (VOLTAGE DROP TEST)

1. Shift A/T selector lever to "P" or "N" position. (A/T models)
Keep depressing clutch pedal fully. (M/T models)
2. Check voltage between starter motor case and battery negative terminal.

| Terminals | | Condition | Voltage (Approx.) |
|--------------------|---------------------------|---|-------------------|
| (+) | (-) | | |
| Starter motor case | Battery negative terminal | When the ignition switch is in START position | Less than 0.2 V |

Is the inspection result normal?

YES >> "B" terminal circuit is OK. Further inspection necessary. Refer to [STR-2, "Work Flow"](#).

NO >> Check the starter motor case and ground for poor continuity.

S CONNECTOR CIRCUIT

< COMPONENT DIAGNOSIS >

S CONNECTOR CIRCUIT

Description

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The starter motor magnetic switch is supplied with power when the ignition switch is turned to the START position while the selector lever is in the P or N position for A/T models or the clutch pedal is depressed for M/T models.

Diagnosis Procedure

INFOID:000000000956393

CAUTION:

Perform diagnosis under the condition that engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.

1. CHECK "S" CONNECTOR CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect starter motor connector.
3. Shift A/T selector lever to "P" or "N" position. (A/T models)
Keep depressing clutch pedal fully. (M/T models)
4. Check voltage between starter motor harness connector and ground.

| Terminals | | Condition | Voltage (Approx.) |
|---------------------------------|----------|---|-------------------|
| (+) | (-) | | |
| Starter motor harness connector | Terminal | | |
| F52 | 1 | When the ignition switch is in START position | Battery voltage |

Is the inspection result normal?

- YES >> "S" connector circuit is OK. Further inspection necessary. Refer to [STR-2, "Work Flow"](#).
NO >> GO TO 2.

2. CHECK CONNECTOR

1. Turn ignition switch OFF.
2. Check the following terminals and connectors for damage, bend and loose connection.
 - Harness connector F1
 - Harness connector E3

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair the terminal and connector.

3. CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

1. Disconnect the following harness connectors.
 - Starter motor connector
 - IPDM E/R connector
2. Check continuity between starter motor harness connector and IPDM E/R harness connector.

| Starter motor harness connector | | IPDM E/R harness connector | | Continuity |
|---------------------------------|--------------|----------------------------|--------------|------------|
| Connector No. | Terminal No. | Connector No. | Terminal No. | |
| F52 | 1 | E7 | 80 | Existed |

Is the inspection result normal?

- YES >> Further inspection necessary. Refer to [SEC-5, "Work Flow"](#) in SEC section.
NO >> Repair the harness.

STARTING SYSTEM

< COMPONENT DIAGNOSIS >

STARTING SYSTEM

Wiring Diagram — STARTING SYSTEM —

INFOID:000000000956394

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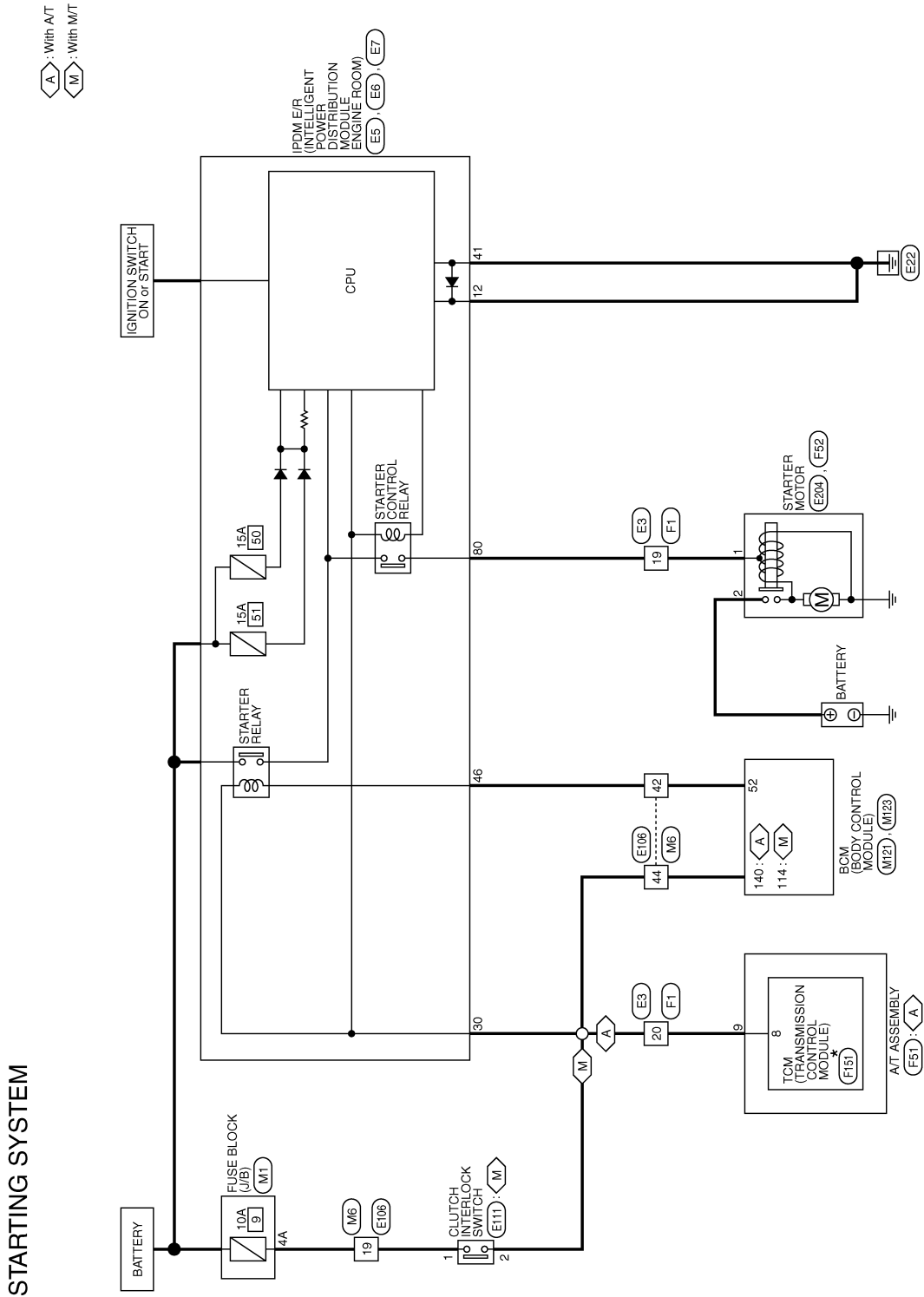
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*: This connector is not shown in "Harness Layout".

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STARTING SYSTEM

< COMPONENT DIAGNOSIS >

STARTING SYSTEM

| | | | | | | |
|-----------------------|--|-------------------|--|--------------------------------|--------------------------------|------------------|
| Connector No. E3 | IPDM E/R (INTELLIGENT POWER WIRE TO WIRE) | SAA38FB-RS10-SJZZ | | Terminal No. 19 20 | Color of Wire W GR | Signal Name - |
| Connector No. E7 | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) | TH20FW-CS12-M4 | | Terminal No. 30 | Color of Wire W | Signal Name - |
| Connector No. E6 | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) | TH03FW-NH | | Terminal No. 41 46 | Color of Wire B/W BR | Signal Name - |
| Connector No. E5 | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) | TH20FW-CS12-M4-1V | | Terminal No. 12 30 | Color of Wire B/W GR | Signal Name - |
| Connector No. E105 | WIRE TO WIRE | TH80FW-CS16-1M4 | | Terminal No. 19 42 44 | Color of Wire G BR GR | Signal Name - |
| Connector No. E111 | CLUTCH INTERLOCK SWITCH | IS02FL | | Terminal No. 1 2 | Color of Wire G GR | Signal Name - |
| Connector No. E204 | STARTER MOTOR | 24348 51E61 | | Terminal No. 2 | Color of Wire Y | Signal Name - |
| Connector No. F1 | WIRE TO WIRE | SAA38FB-RS10-SJZZ | | Terminal No. 19 20 | Color of Wire W GR | Signal Name - |

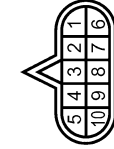
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STARTING SYSTEM

< COMPONENT DIAGNOSIS >

STARTING SYSTEM

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|----------------|--------------|
| Connector No. | F51 |
| Connector Name | A/T ASSEMBLY |
| Connector Type | PK10FG-DGY |



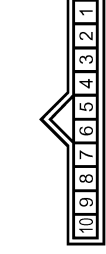
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|--------------|---|----|-------------|---|
| Terminal No. | 9 | GR | Signal Name | - |
|--------------|---|----|-------------|---|

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| Connector No. | F52 |
| Connector Name | STARTER MOTOR |
| Connector Type | X01MGY |



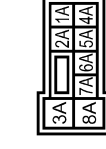
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| Terminal No. | 1 | W | Signal Name | - |
|--------------|---|---|-------------|---|

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|----------------|-----------------------------------|
| Connector No. | F151 |
| Connector Name | TCM (TRANSMISSION CONTROL MODULE) |
| Connector Type | SPI0FBGY |



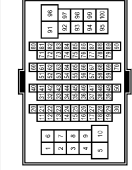
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|--------------|---|---|-------------|-----------|
| Terminal No. | 8 | G | Signal Name | START RLY |
|--------------|---|---|-------------|-----------|

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| Connector No. | M1 |
| Connector Name | FUSE BLOCK (J/B) |
| Connector Type | NSDBFW-M2 |



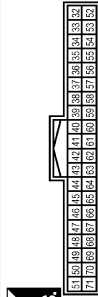
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|--------------|----|---|-------------|---|
| Terminal No. | 4A | P | Signal Name | - |
|--------------|----|---|-------------|---|

| | |
|----------------|-----------------|
| Connector No. | M6 |
| Connector Name | WIRE TO WIRE |
| Connector Type | TH80MW-CS16-TM4 |



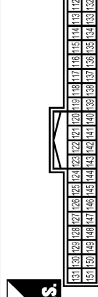
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|--------------|----|----|-------------|--------------|
| Terminal No. | 19 | G | Signal Name | - |
| Terminal No. | 42 | SB | Signal Name | - [With A/T] |
| Terminal No. | 44 | GR | Signal Name | - [With R/T] |
| Terminal No. | 44 | R | Signal Name | - |

| | |
|----------------|---------------------------|
| Connector No. | M121 |
| Connector Name | BCM (BODY CONTROL MODULE) |
| Connector Type | TH40FGY-NH |



| | | | | |
|--------------|----|----|-------------|-------------|
| Terminal No. | 52 | SB | Signal Name | ST CONT USM |
|--------------|----|----|-------------|-------------|

| | |
|----------------|---------------------------|
| Connector No. | M123 |
| Connector Name | BCM (BODY CONTROL MODULE) |
| Connector Type | TH40FG-NH |



| | | | | |
|--------------|-----|----|-------------|-----------|
| Terminal No. | 114 | R | Signal Name | CLUTCH SW |
| Terminal No. | 140 | GR | Signal Name | SHIFT N/P |

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STARTING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

STARTING SYSTEM

Symptom Table

INFOID:000000000956395

| Symptom | Reference |
|-------------------------------|---|
| No normal cranking | Refer to STR-2, "Work Flow" . |
| Starter motor does not rotate | |

PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000000956396

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

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PREPARATION

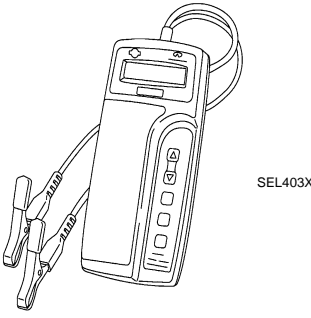
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PREPARATION

PREPARATION


Special Service Tool

INFOID:000000000956397

| Tool number (Kent-Moore No.) Tool name | Description |
|--|--|
| <p>— (J-44373 Model MCR620) Starting/Charging System Tester</p>  <p>SEL403X</p> | <p>Tests starting and charging systems. For operating instructions, refer to Technical Service Bulletin.</p> |

Commercial Service Tool

INFOID:000000000956398

| Tool name | Description |
|--|---|
| <p>Power tool</p>  <p>PIIB1407E</p> | <p>Loosening bolts, nuts and screws</p> |

STARTER MOTOR

< ON-VEHICLE REPAIR >

ON-VEHICLE REPAIR

STARTER MOTOR

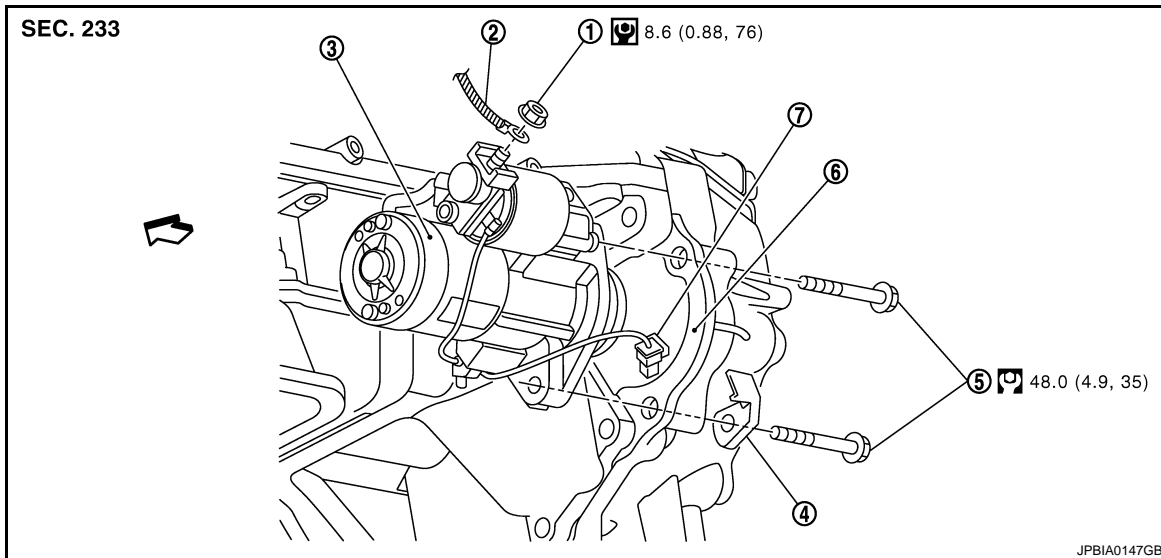
Exploded View

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REMOVAL



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|-------------------------|--------------------------------|---|
| 1. "B" terminal nut | 2. "B" terminal harness | 3. Starter motor |
| 4. Harness clip bracket | 5. Starter motor mounting bolt | 6. Converter housing (A/T models) Transmission case (M/T models) |
| 7. "S" connector | | |

↔: Engine front

Refer to [GI-4. "Components"](#) for symbols in the figure.

DISASSEMBLY

Type: S114-927

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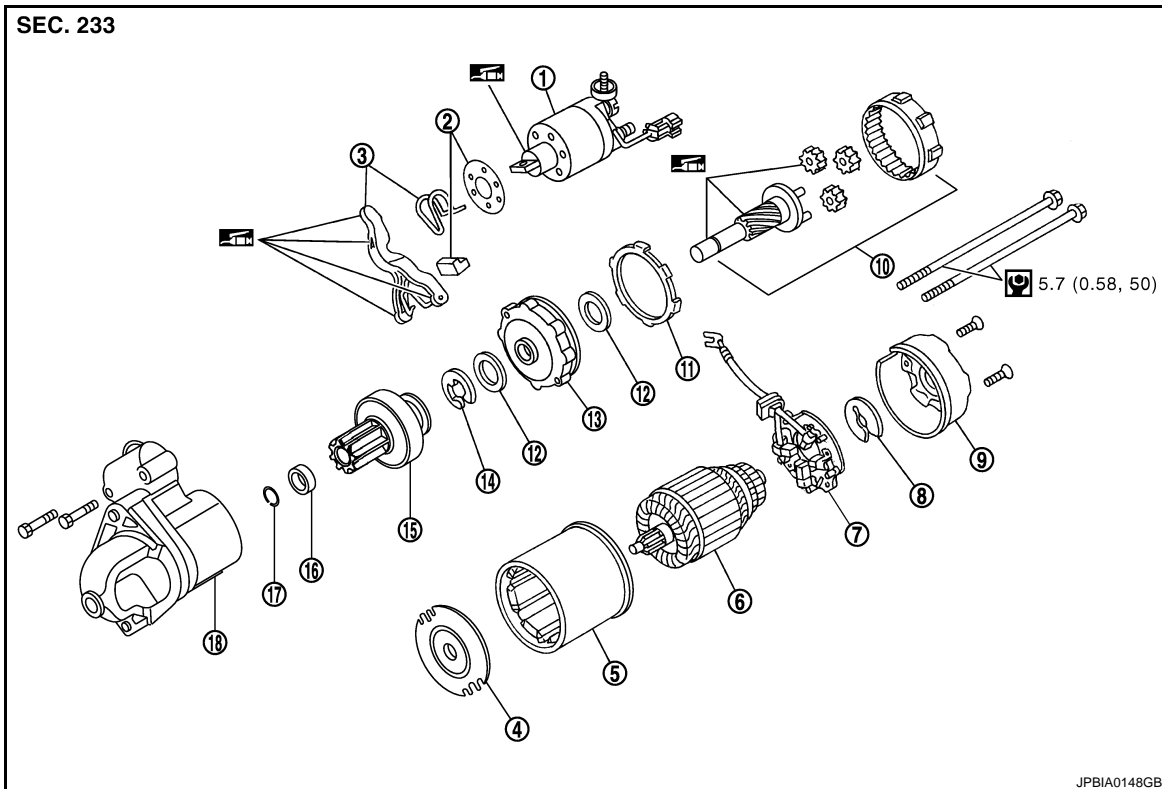
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STARTER MOTOR

< ON-VEHICLE REPAIR >



- | | | |
|-----------------------------|-------------------------|------------------------|
| 1. Magnetic switch assembly | 2. Dust cover kit | 3. Shift lever set |
| 4. Center bracket (A) | 5. Yoke assembly | 6. Armature assembly |
| 7. Brush holder assembly | 8. Thrust washer | 9. Rear cover assembly |
| 10. Shaft gear assembly | 11. Packing | 12. Thrust washer |
| 13. Center bracket (P) | 14. E-ring | 15. Pinion assembly |
| 16. Pinion stopper | 17. Pinion stopper clip | 18. Gear case assembly |

 : High-temperature grease point

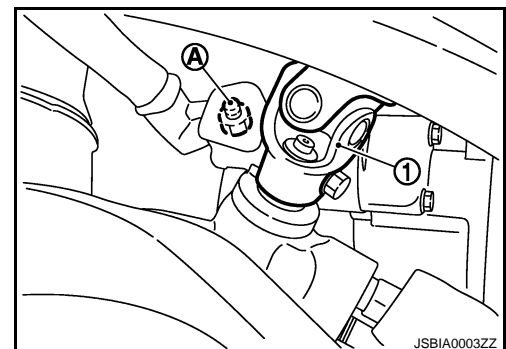
Refer to [GI-4, "Components"](#) for symbols not described on the above.

Removal and Installation

INFOID:000000000956400

REMOVAL

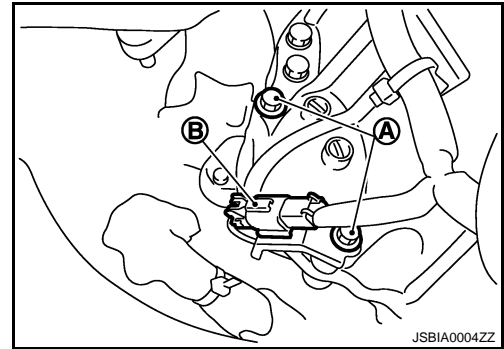
1. Disconnect the battery cable from the negative terminal.
2. Remove engine undercover, using power tools.
3. Remove exhaust mounting bracket. Refer to [EX-5, "Exploded View"](#).
4. Disconnect steering lower joint (1), then remove it. Refer to [ST-20, "WITHOUT 4WAS : Exploded View"](#) (Without 4WAS) or [ST-21, "WITH 4WAS : Exploded View"](#) (With 4WAS).
5. Remove "B" terminal nut (A).



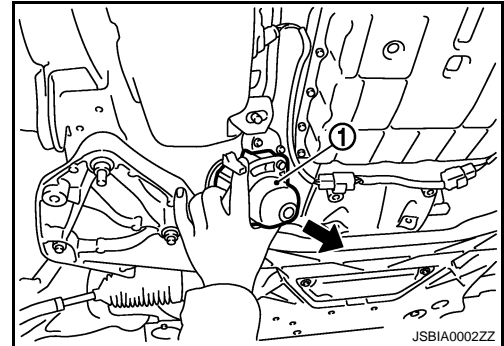
STARTER MOTOR

< ON-VEHICLE REPAIR >

6. Disconnect "S" connector (B).
7. Remove starter motor mounting bolts (A), using power tools.



8. Remove starter motor (1) downward from the vehicle.



INSTALLATION

Install in the reverse order of removal.

CAUTION:

Be sure to tighten "B" terminal nut carefully.

Inspection

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INSPECTION AFTER DISASSEMBLY

Pinion/Clutch Check

1. Inspect pinion teeth.
 - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth.
 - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
 - If it locks or rotates in both directions, or unusual resistance is evident, replace.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Starter Motor

INFOID:000000000956402

| | | |
|--|----------------------|---------------------------|
| Type | | S114-927 |
| | | HITACHI make |
| | | Reduction gear type |
| System voltage [V] | | 12 |
| No-load | Terminal voltage [V] | 11 |
| | Current [A] | Less than 110 |
| | Revolution [rpm] | More than 2,700 |
| Minimum diameter of commutator [mm (in)] | | 28.0 (1.102) |
| Minimum length of brush [mm (in)] | | 10.5 (0.413) |
| Brush spring tension [N (kg, lb)] | | 16.2 (1.65, 3.6) |
| Clearance between bearing metal and armature shaft [mm (in)] | | Less than 0.2 (0.008) |
| Clearance between pinion front edge and pinion stopper [mm (in)] | | 0.3 - 2.5 (0.012 - 0.098) |