| DTC | P0100/31 | MASS OR VOLUME AIR FLOW CIRCUIT |
|---|---|---|

| DTC | P0102/31 | MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT |
|---|---|---|

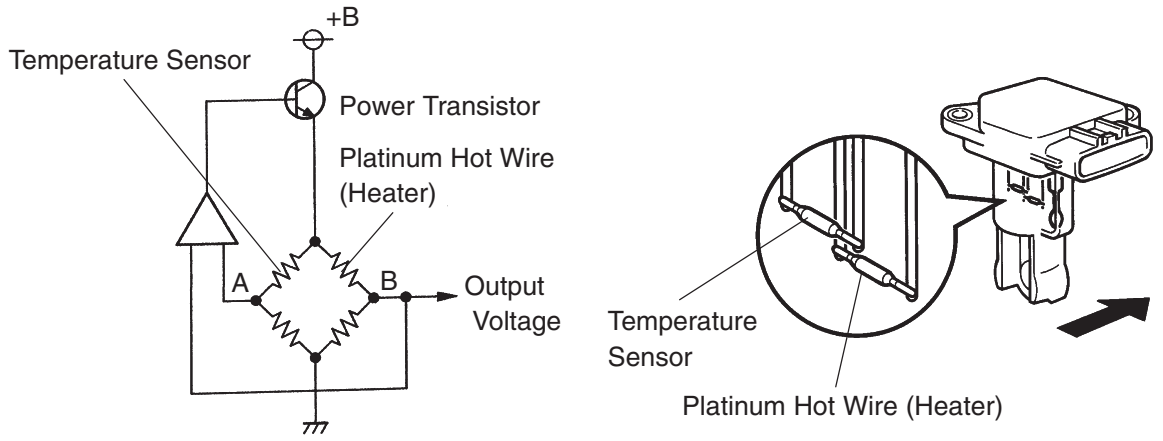
| DTC | P0103/31 | MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT |
|---|---|---|

## CIRCUIT DESCRIPTION

The Mass Air Flow (MAF) meter measures the amount of air flowing through the throttle valve. The ECM uses this information to determine the fuel injection time and provide a proper air–fuel ratio. Inside the MAF meter, there is a heated platinum wire exposed to the flow of intake air.

By applying a specific current to the wire, the ECM heats this wire to a given temperature. The flow of incoming air cools the wire and an internal thermistor, affecting their resistance. To maintain a constant current value, the ECM varies the voltage applied to these components in the MAF meter. The voltage level is proportional to the air flow through the sensor. The ECM interprets this voltage as the intake air amount.

The circuit is constructed so that the platinum hot wire and temperature sensor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temperature.

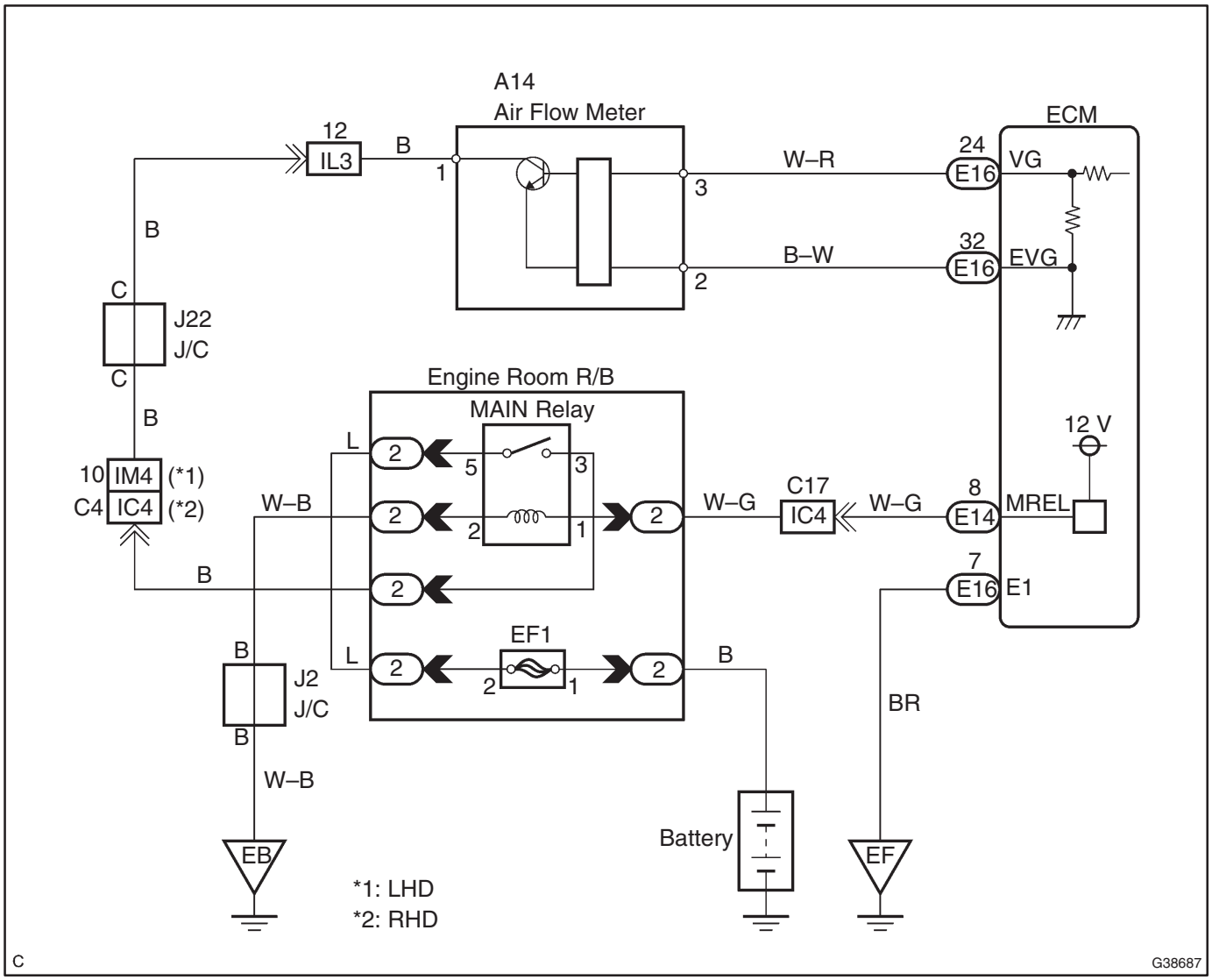



| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0100/31 | When MAF meter circuit has open or short for more than 3 seconds under 4,000 rpm engine speed (1 trip detection logic) | • Open or short in MAF meter circuit<br>• MAF meter<br>• ECM |
| P0102/31 | When MAF meter circuit has open for more than 3 seconds under 4,000 rpm engine speed (1 trip detection logic) | • Open or short in MAF meter circuit<br>• MAF meter<br>• ECM |
| P0103/31 | When MAF meter circuit has short for more than 3 seconds under 4,000 rpm engine speed (1 trip detection logic) | • Open or short in MAF meter circuit<br>• MAF meter<br>• ECM |

HINT:
When DTC P0100/31, P0102/31 or P0103/31 is detected, check the air–flow ratio by entering the following menus on the intelligent tester II: Powertrain / Engine / Data List / MAF.

| Air Flow Rate (gm/s) | Malfunction |
|---|---|
| Approximately 0.0 | • Open in MAF meter power source circuit<br>• Open or short in VG circuit |
| 174.0 or more | Open in EVG circuit |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT:
Read freeze frame data using the intelligent tester II. Freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, and other data from the time the malfunction occurred.

## When using intelligent tester II:

| 1 | READ DATA LIST (MASS AIR FLOW RATE) |
|---|---|

(a) Connect the intelligent tester II to the DLC3.
(b) Start the engine and turn the intelligent tester II ON.
(c) Enter the following menus: Powertrain / Engine / Data List / MAF.
(d) Read the values.
**Result:**

| Air Flow Rate (gm/s) | Proceed to |
|---|---|
| 0.0 | A |
| 174.0 or more | B |
| Between 1 and 173.0* | C |

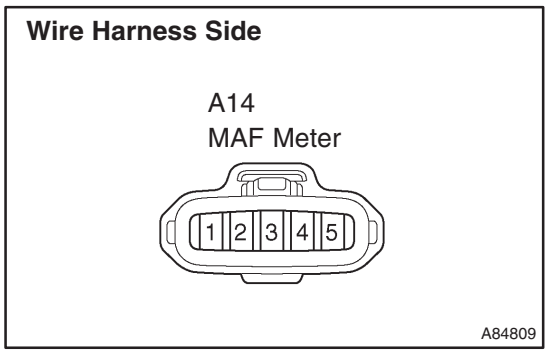
HINT:
*: The value must changed when the throttle valve is opened or closed.

**B** → **Go to step 6**

**C** → **CHECK FOR INTERMITTENT PROBLEMS (See page 05–439)**

**A**

| 2 | CHECK MASS AIR FLOW METER (POWER SOURCE) |
|---|---|



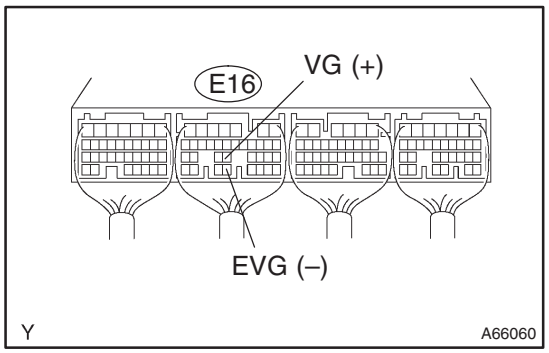

(a) Disconnect the A14 MAF meter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the wire harness side connector.
**Standard:**

| Tester Connection | Specified Condition |
|---|---|
| A14–1 – Body ground | 9 to 14 V |

**NG** → **Go to step 5**

**OK**

## 3 CHECK ECM (VG VOLTAGE)




(a) Start the engine.
(b) Measure the voltage of the ECM connector.

**Standard:**

| Tester Connection | Condition | Specified Condition |
|---|---|---|
| E16–24 (VG) – E16–32 (EVG) | Engine idling | 0.5 to 3.4 V |

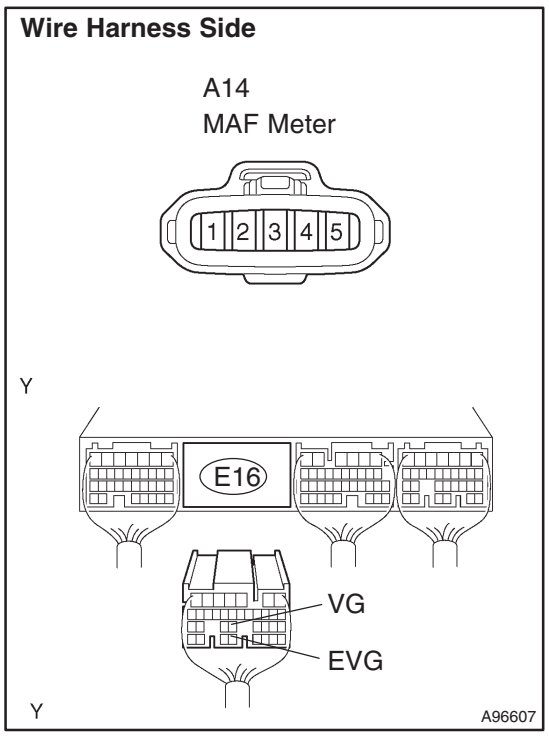
HINT:
The A/C switch should be turned OFF.

**OK** → **REPLACE ECM (See Pub. No. RM990E, page 10–34)**

**NOTICE:**
**After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.**

**NG**

## 4 CHECK WIRE HARNESS (MASS AIR FLOW METER – ECM)




(a) Disconnect the A14 MAF meter connector.
(b) Disconnect the E16 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

**Standard:**

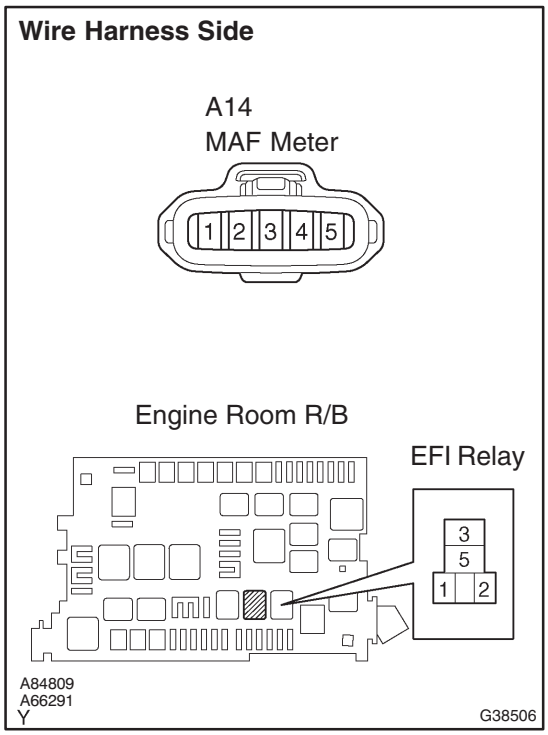
| Tester Connection | Specified Condition |
|---|---|
| A14–3 – E16–24 (VG) | Below 1 Ω |
| A14–2 – E16–32 (EVG) | Below 1 Ω |
| A14–3 or E16–24 (VG) – Body ground | 10 kΩ or higher |
| A14–2 or E16–32 (EVG) – Body ground | 10 kΩ or higher |

**NG** → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

**OK**

**REPLACE MASS AIR FLOW METER**

## 5 CHECK WIRE HARNESS (MASS AIR FLOW METER – EFI RELAY)




(a) Disconnect the A14 MAF meter connector.
(b) Remove the EFI relay from the engine room R/B.
(c) Measure the resistance of the wire harness side connectors.

**Standard:**

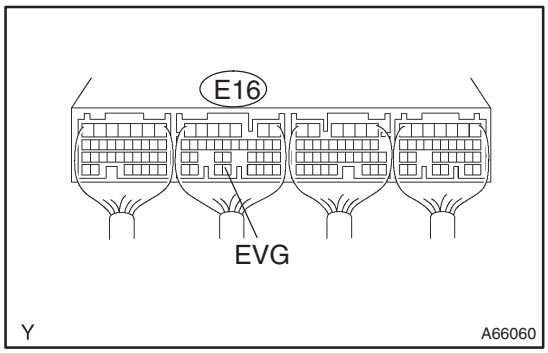
| Tester Connection | Specified Condition |
|---|---|
| A14–1 – EFI relay (3) | Below 1 Ω |
| A14–1 or EFI relay (3) – Body ground | 10 kΩ or higher |

**NG** → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

**OK**

**INSPECT ECM POWER SOURCE CIRCUIT (See page 05–649)**

## 6 CHECK ECM (SENSOR GROUND)




(a) Measure the resistance of the ECM connector.

**Standard:**

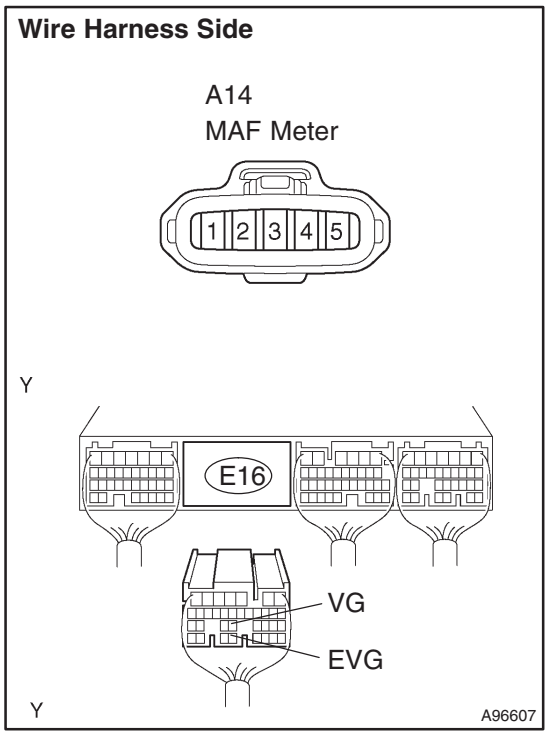
| Tester Connection | Specified Condition |
|---|---|
| E16–32 (EVG) – Body ground | Below 1 Ω |

**NG** → **REPLACE ECM (See Pub. No. RM990E, page 10–34)**

**NOTICE:**
**After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.**

**OK**

| 7 | CHECK WIRE HARNESS (MASS AIR FLOW METER – ECM) |
|---|---|




(a) Disconnect the A14 MAF meter connector.
(b) Disconnect the E16 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

**Standard:**

| Tester Connection | Specified Condition |
|---|---|
| A14–3 – E16–24 (VG) | Below 1 Ω |
| A14–2 – E16–32 (EVG) | Below 1 Ω |
| A14–3 or E16–24 (VG) – Body ground | 10 kΩ or higher |
| A14–2 or E16–32 (EVG) – Body ground | 10 kΩ or higher |

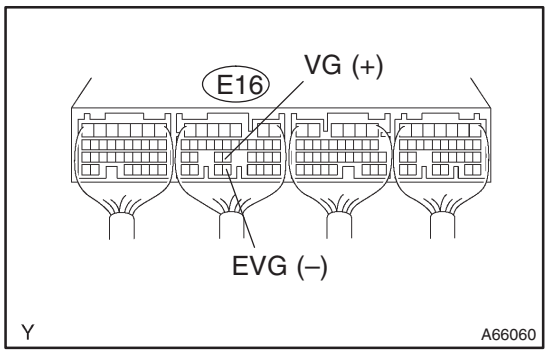
**NG** → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

**OK**

**REPLACE MASS AIR FLOW METER**

## When not using intelligent tester II:

| 1 | CHECK ECM (VG VOLTAGE) |
|---|---|




(a) Start the engine.
(b) Measure the voltage of the ECM connector.

**Standard:**

| Tester Connection | Condition | Specified Condition |
|---|---|---|
| E16–24 (VG) – E16–32 (EVG) | Engine idling | 0.5 to 3.4 V |

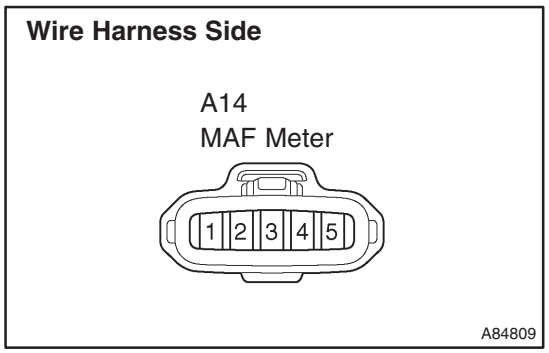
HINT:
The A/C switch should be turned OFF.

**OK** → **REPLACE ECM (See Pub. No. RM990E, page 10–34)**

**NOTICE:**
**After replacing the ECM, allow for ECM learning start the engine and idle it until it is fully warmed up.**

**NG**

## 2 CHECK MASS AIR FLOW METER (POWER SOURCE)




(a) Disconnect the A14 MAF meter connector.
(b) Turn the ignition switch ON.
(c) Measure the voltage of the wire harness side connector.

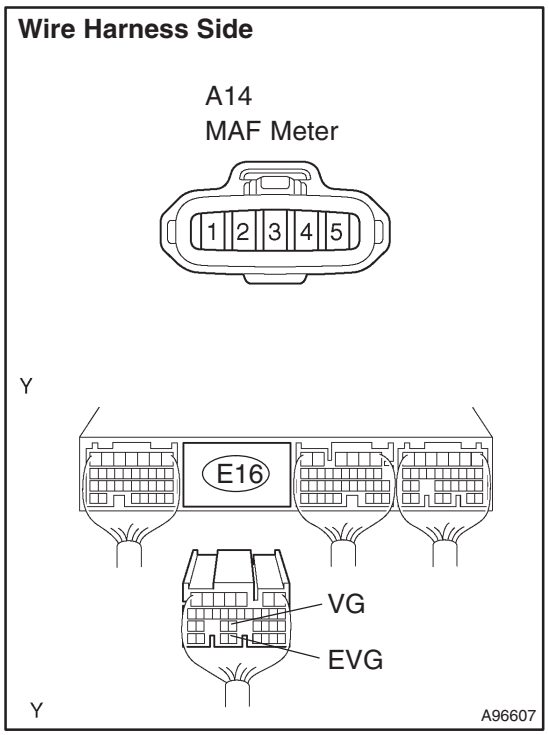
**Standard:**

| Tester Connection | Specified Condition |
|---|---|
| A14–1 – Body ground | 9 to 14 V |

**NG** → **Go to step 4**

**OK**

## 3 CHECK WIRE HARNESS (MASS AIR FLOW METER – ECM)




(a) Disconnect the A14 MAF meter connector.
(b) Disconnect the E16 ECM connector.
(c) Measure the resistance of the wire harness side connectors.

**Standard:**

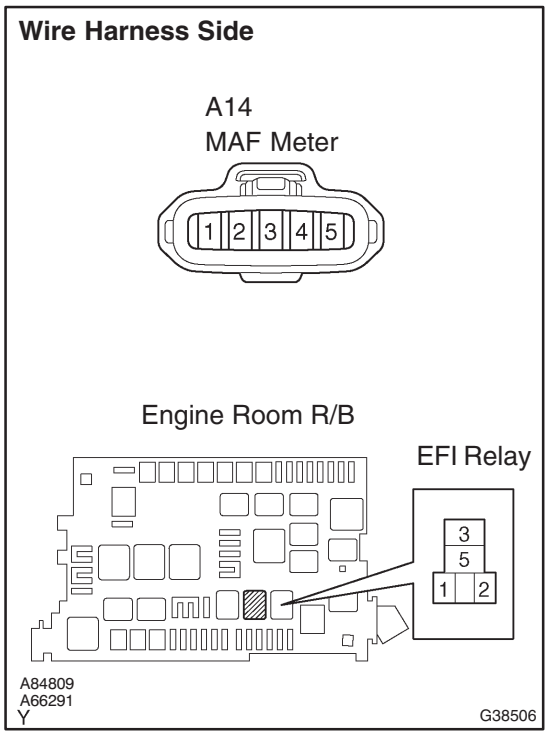
| Tester Connection | Specified Condition |
|---|---|
| A14–3 – E16–24 (VG) | Below 1 Ω |
| A14–2 – E16–32 (EVG) | Below 1 Ω |
| A14–3 or E16–24 (VG) – Body ground | 10 kΩ or higher |
| A14–2 or E16–32 (EVG) – Body ground | 10 kΩ or higher |

**NG** → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

**OK**

**REPLACE MASS AIR FLOW METER**

| 4 | CHECK WIRE HARNESS (MASS AIR FLOW METER – EFI RELAY) |
|---|---|




(a) Disconnect the A14 MAF meter connector.
(b) Remove the EFI relay from the engine room R/B.
(c) Measure the resistance of the wire harness side connectors.

**Standard:**

| Tester Connection | Specified Condition |
|---|---|
| A14–1 – EFI relay (3) | Below 1 Ω |
| A14–1 or EFI relay (3) – Body ground | 10 kΩ or higher |

**NG** → **REPAIR OR REPLACE HARNESS AND CONNECTOR**

**OK**

**INSPECT ECM POWER SOURCE CIRCUIT**