



Analysis of Air Induction System Testing on the 2011 Daihatsu Xenia Type Xi

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Abstract

Analysis of this air induction system testing aims to analyze the air induction system on Daihatsu Xenia types XI in 2011. The research uses descriptive methods by testing and analyzing Daihatsu Xenia Type XI Mobils in 2011 using the EFI X 431 Pro and multimeter scanner to obtain research data. The test results show that: 1. The sensor map is in good condition because the voltage produced ≥ 3.5 V - 4 V is: 3.7 V. 2. The sensor is in poor condition because the resistance produced is ≤ 2.21 k ohm - 2,69 K Ohm, namely: 1.74 KOHM. 3. ISC in poor condition because the resistance produced ≤ 45.6 ohms - 50.4 ohms is: 43.2 ohms. Testing using Scantool Obtained Results: 1. Map sensor has decreased at rpm 2000 of 2 kPa and has increased in rpm 3000 of 2 kPa. 2. IAT Sensors at 1000, 2000 and 3000 RPMs are stable at 480C. 3. ISC at rpm 1000, 2000, and 3000 stable at 6.99 %.

Keywords: *Testing, Sensors, Air Induction Systems*

Abstrak

Analisis pengujian sistem induksi udara ini bertujuan untuk menganalisis sistem induksi udara pada Daihatsu Xenia Tipe Xi tahun 2011. Penelitian menggunakan metode deskriptif dengan cara menguji dan menganalisa pada mobil Daihatsu Xenia Tipe Xi tahun 2011 menggunakan scanner EFI X 431 PRO dan multimeter untuk mendapatkan data penelitian. Hasil pengujian menunjukkan bahwa: 1. MAP sensor dalam kondisi baik karena tegangan yang dihasilkan $\geq 3,5$ V - 4 V yaitu: 3,7 V. 2. IAT sensor dalam kondisi kurang baik karena hambatan yang dihasilkan $\leq 2,21$ k ohm - 2,69 k ohm yaitu: 1,74 kOhm. 3. ISC dalam kondisi kurang baik karena hambatan yang dihasilkan $\leq 45,6$ ohm - 50,4 ohm yaitu: 43,2 ohm. Pengujian menggunakan scantool diperoleh hasil: 1. MAP sensor mengalami penurunan pada RPM 2000 sebesar 2 kpa dan mengalami kenaikan pada RPM 3000 sebesar 2 kpa. 2. IAT sensor pada rpm 1000, 2000, dan 3000 stabil pada 480C. 3. ISC pada rpm 1000, 2000, dan 3000 stabil pada 6.99 %.

Kata-kata kunci: *Pengujian, Sensor, Sistem Induksi Udara*



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1. Introduction

Three EFI systems work on the 2011 Daihatsu Xenia Type Xi car. These systems are the air induction system, the fuel system, and the electronic control system [1]. The air induction system applies technological developments to measure the air entering the combustion chamber. Components in the air induction system include air filter, Mass Air Flow Sensor (MAF Sensor) or Manifold Absolute Pressure Sensor (MAP Sensor), throttle valve, air intake chamber, intake manifold runner, throttle position sensor, and intake valve [2].

The 2011 Daihatsu Xenia Type Xi air induction system consists of several components: MAP sensor, IAT sensor, and ISC. The MAP Sensor is an air induction system sensor that functions to measure the air pressure entering the intake manifold, then converted into an electrical signal to be sent to the Electric Control Unit (ECU) [3] [4]. The MAP sensor is a component that affects the amount of fuel injected into the combustion chamber because the MAP sensor can measure the air entering the intake manifold [5].

Intake Air Temperature (IAT) is a sensor that functions to detect the density of air entering the intake manifold based on air temperature [6] [7]. The Intake Air Temperature sensor is vital in measuring temperature changes in the intake manifold [8] [9]. If the IAT sensor is damaged, the engine performance will not be optimal. Damage, if the IAT sensor is damaged, includes engine down acceleration, difficulty starting when the engine is cold, wasteful fuel, and unstable idle rotation [10] [11].

Idle Speed Control (ISC) is a type of actuator in the EFI system that regulates the air entering the intake manifold when the throttle valve position is closed and the engine is idle [12]. ISC is an electronic regulator on the car to determine engine idle. So that if the component is damaged, it will cause the engine rotation to be unstable.

Based on observations and direct observations on the 2011 Daihatsu Xenia Type Xi car at the Workshop of the Piksi Ganesha Indonesia Polytechnic, it was found that there were problems with the engine running unstable and the exhaust gas smelling of gasoline that stings. Based on these problems, engine rotation and exhaust gas research will be carried out. The induction system on the 2011 Daihatsu Xenia Type Xi was chosen as research material because each component of the air induction system is related to engine speed and exhaust gases.

2. Method

The method uses descriptive research by testing it on research media to obtain data results. The research phase includes problem formulation, determination of tools and materials, data collection, and conclusions. The formulation of the problem was obtained based on observations at the Piksi Ganesha Indonesia of Polytechnic workshop on the 2011 Daihatsu Xenia Type Xi car.

Furthermore, the tools and materials in the study were: Daihatsu Xenia Xi type in 2011, EFI X 431 PRO scanner and multimeter. The scanner used in the study is presented in **Figure 1**.

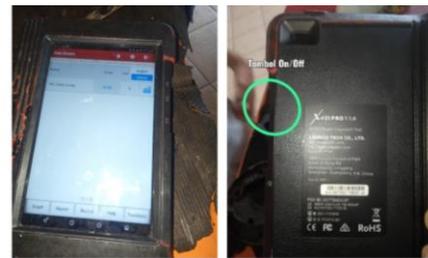


Figure 1. Scanner EFI X 431 PRO

After the tools and materials are determined, then the process of data collection. Data collection was carried out by scanning the 2011 Daihatsu Xenia Type Xi car to find out the value of the data when the car's engine is rotating. The process of collecting data using a scan is presented in **Figure 2**.

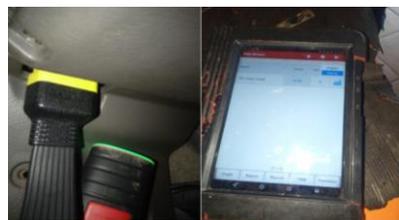


Figure 2. Data Retrieval Using a Scanner

After the machine is scanned, then measure the value of the resistance or voltage value on the sensors and actuators in the air induction system using a multimeter. Measurement of resistance and voltage using a multimeter is presented in **Figure 3**.



Figure 3. Data Retrieval Using a Multimeter

3. Results and Discussion

The results of the discussion of data using the Launch Tech Type X-431 PRO V3.0 scanner tool and multimeter on sensors in the air induction system are as follows:

3.1 MAP Sensor Examination Results

When the ignition is off, attach the OBD scanner, then turn the ignition to ON, then turn on the scanner, start the vehicle's engine, then select the read data stream menu. The results of reading the data stream obtained MAP sensor data. The results of examining the MAP sensor analysis with the scan tool are presented in the graph of **Figure 4**.

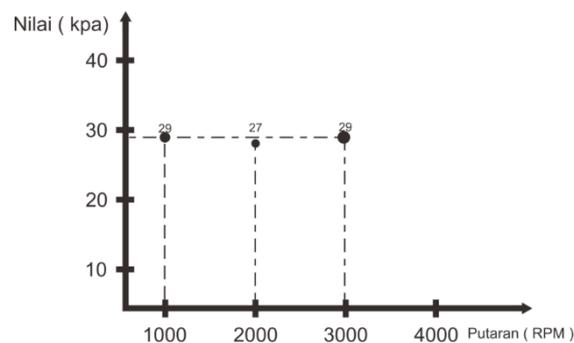


Figure 4. Graph of Checking the MAP Sensor at Several RPMs

In **Figure 4**, it can be concluded that the MAP sensor value decreased at RPM 2000 by 2 kPa to 27 kPa and increased at RPM 3000 by 2 kPa to 29 kPa. After using the scan tool, the MAP sensor voltage is measured using a multimeter. The results of measurements using a multimeter are presented in Table 1.

Table 1. MAP sensor data inspection results

Result from	Standart	Condition
3,7 V	3,5 V – 4 V	Good

In Table 1, it is known that the results of the MAP sensor voltage are: 3.7 V. Based on these data, it can be concluded that the MAP sensor is in good condition because it is $\geq 3.5 \text{ V} - 4 \text{ V}$.

3.2 IAT Sensor Examination Results

When the ignition is off, attach the OBD scanner, then turn the ignition key to ON, then turn on the scanner, start the vehicle's engine, then select the read data stream menu. The read data stream results were obtained from IAT sensor data. The results of the IAT sensor analysis check with the scan tool are presented in the graph of **Figure 5**.

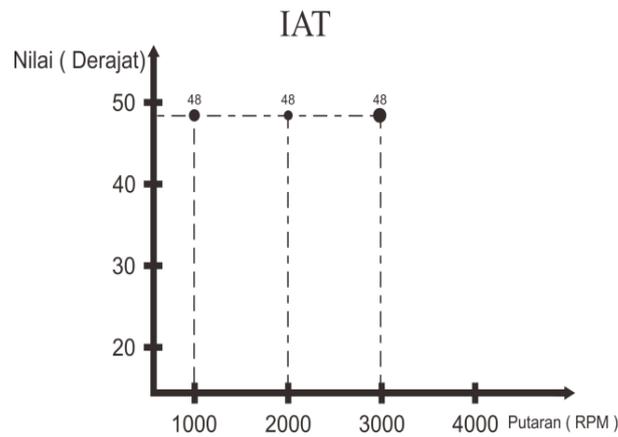


Figure 5. Graph of IAT Sensor Checks at Several RPMs

In Figure 5, it can be concluded that the IAT sensor has not decreased and increased at 1000, 2000, and 3000 RPM rotation of 48. After using a scan tool, the IAT sensor voltage is measured using a multimeter. The results of measurements using a multimeter are presented in Table 2.

Tabel 2. Hasil Pemeriksaan Data IAT sensor

Result	Standart	Condition
1,74 kOhm	2,21 – 2,69 kOhm	Not Good

In Table 2, it is known that the results of the IAT sensor resistance are: 1.74 kOhm. Based on these data, it can be concluded that the IAT sensor is in poor condition because it is $\leq 2.21 - 2.69$ kOhm.

3.3 ISC Examination Results

When the ignition is off, attach the OBD scanner, turn the ignition key ON, turn on the scanner, start the vehicle's engine, and select the read data stream menu. The results of the read data stream obtained ISC data. The results of the ISC analysis examination with the scan tool are presented in the graph of **Figure 6**.

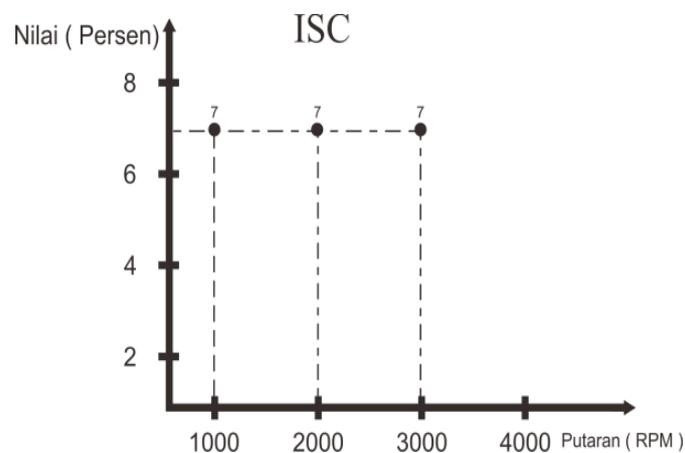


Figure 6. Graph of ISC Examination

In Figure 6, it can be concluded that the ISC did not change either at 1000, 2000 and 3000 RPM rounds of 6.99%. After using the scan tool, the ISC voltage is measured using a multimeter. The results of measurements using a multimeter are presented in **Table 3**.

Table 3. ISC Data Examination Results

Result	Standart	Condition
43,2 ohm	45,6 – 50,4 ohm	Not Good

In Table 3, it is known that the results of the ISC resistance are: 43.2 ohms. Based on these data, it can be concluded that the ISC is in unfavorable condition because it is $\leq 45.6 - 50.4$ ohms. Damage to the ISC will result in obstructed air entering the combustion chamber which will affect vehicle exhaust emissions [13].

4. Conclusion

The results of the MAP, IAT, and ISC data analysis can be concluded:

- a. The voltage result from the MAP sensor on Daihatsu Xenia type Xi in 2011 is 3.7 V, which means that the MAP sensor is in good condition because the inspection results are $\geq 3.5 - 4$ V. Measurements using a scan tool show that the value of the MAP sensor has decreased at RPM 2000 of 2 kph and increased at RPM 3000 of 2 kph.
- b. The results of the resistance of the IAT sensor on the Daihatsu Xenia type Xi in 2011 are 1.74 kOhm, which means that the condition of the IAT sensor is not good because the inspection results are ≤ 2.21 k ohm – 2.69 k Ohm. Measurements using a scan tool obtained data that the value of the IAT sensor did not decrease or increase at 1000, 2000 and 3000 RPM rotation of 480C.
- c. The results of the ISC resistance value on the Daihatsu Xenia type Xi in 2011 are 43.2 ohms, which means that the ISC is in bad condition because the inspection results are ≤ 45.6 ohms – 50.4 ohms. Measurements using a scan tool obtained data that the value of the ISC sensor did not change at 1000, 2000 and 3000 RPM rotation of 6.99%.

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