CAPE AUTO DIAGNOSTICS

Mercedes - BMW - VW - AUDI

Audi S3 8L Turbo, AMK Engine 2001

03.07.2010

Rough idle / hunting

Notes:

No DTC found.

For our disadvantage the car was previously serviced and all DTC were deleted by the other workshop. The workshop replaced the exhaust gas temperature sensor because a DTC for the sensor was found. The other faults were ignored and erased. The client did not get a DTC report and we could not gather any useful information.

Initially we were looking for an vacuum leak but could not find any. We checked the MAF sensor with the DSO and found that the signal was not stable at idle.

The MAF signal changes periodically and swings between 1.3 and 1.8 V, the cleaning of MAF sensor did not improve anything.

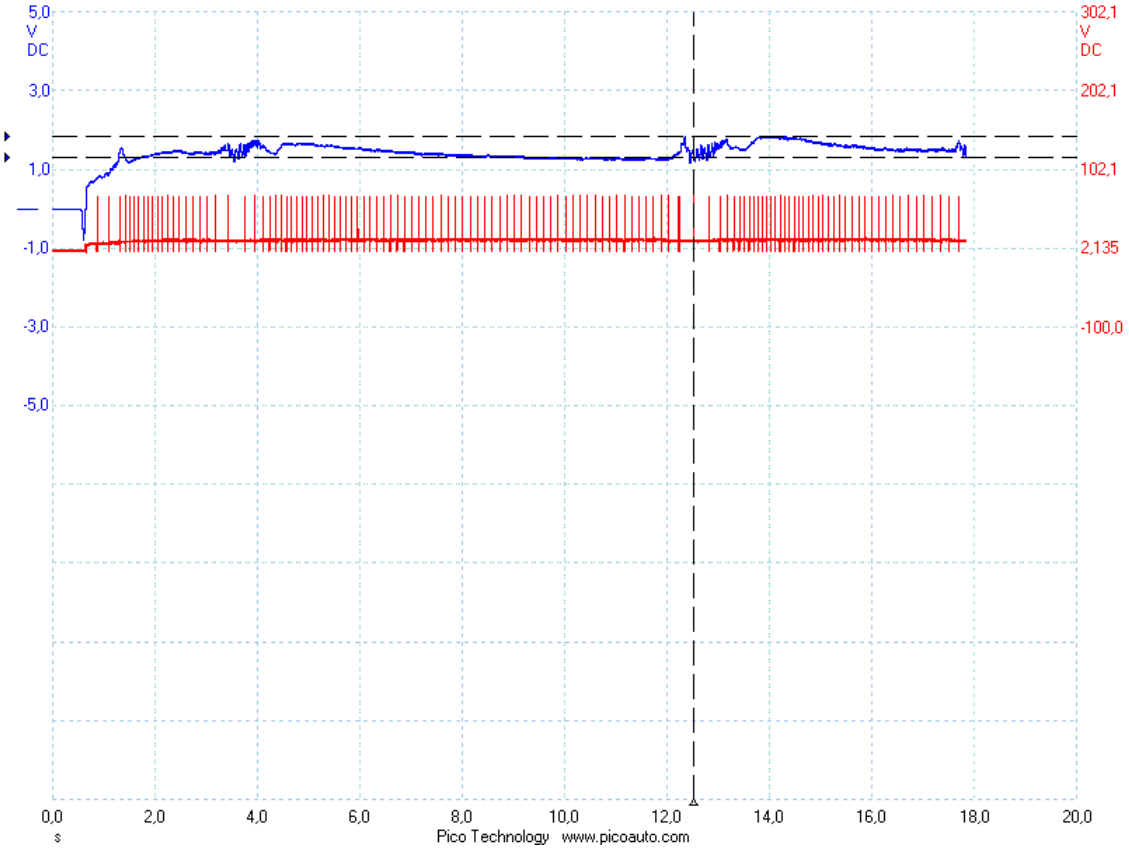
Only when we disconnected the MAF sensor than the engine idled much better – almost like normal.

Conclusion:

- **MAF Sensor defective or**
- **unmetered air or**
- **defect in vacuum system (Turbo Charger vacuum system)**

The air leak or vacuum leak could not be found. We thought that the MAF sensor was faulty and recommended a replacement.

The Client decided to leave the MAF sensor disconnected and rather re-introduce the car after a while – without replacement of the MAF.



Blue: MAF Red: Injectors #1

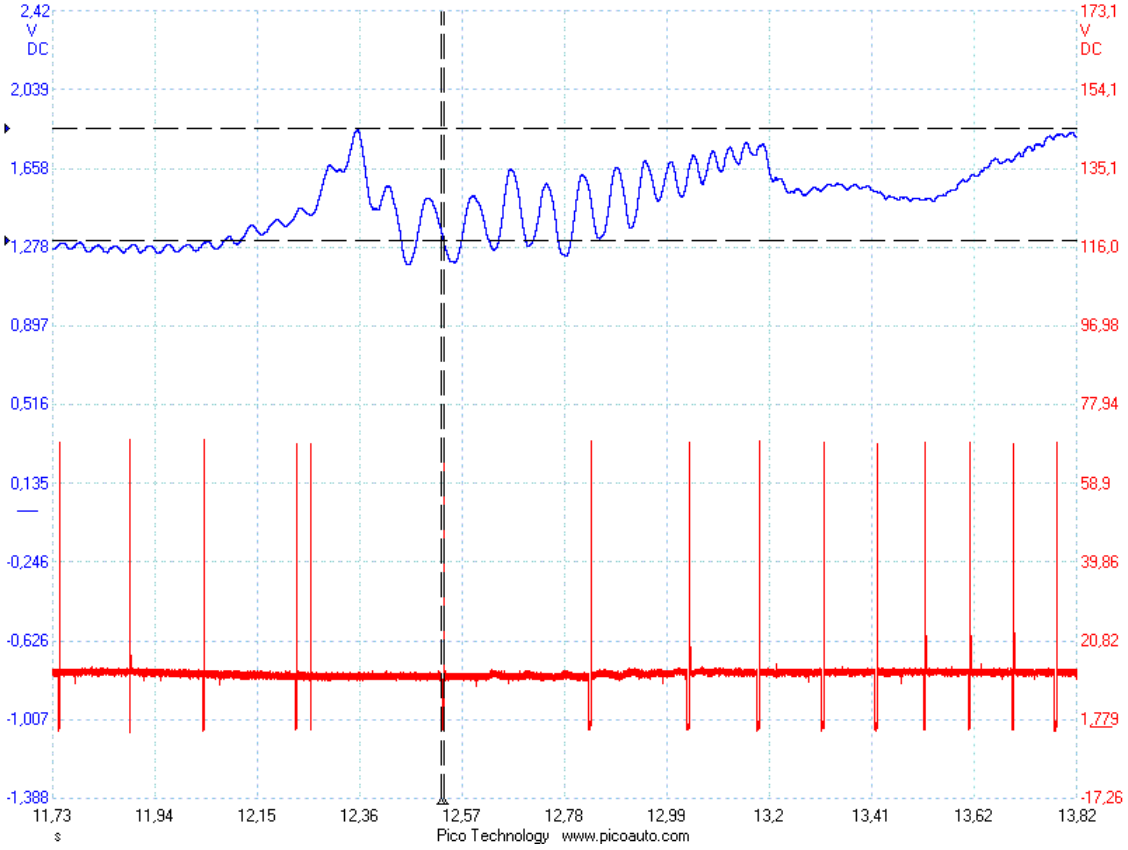
The initial test from July 2010 shows a periodically swinging MAF sensor signal from 1.3V (bottom) to 1.8 V (top). The engine idle speed and injector timing is responding to the MAF sensor signal. The engine speed swings from 550 rpm to 1100 rpm and almost cuts out.

A MAF signal of 1.3 V at idle would be normal.

<u>In May 2011 the client came back to us because the car was heavy on fuel. He had always the MAF sensor plug disconnected!</u>

The challenge was now to find the root cause or to proof that the MAF was faulty – without having an replacement part.

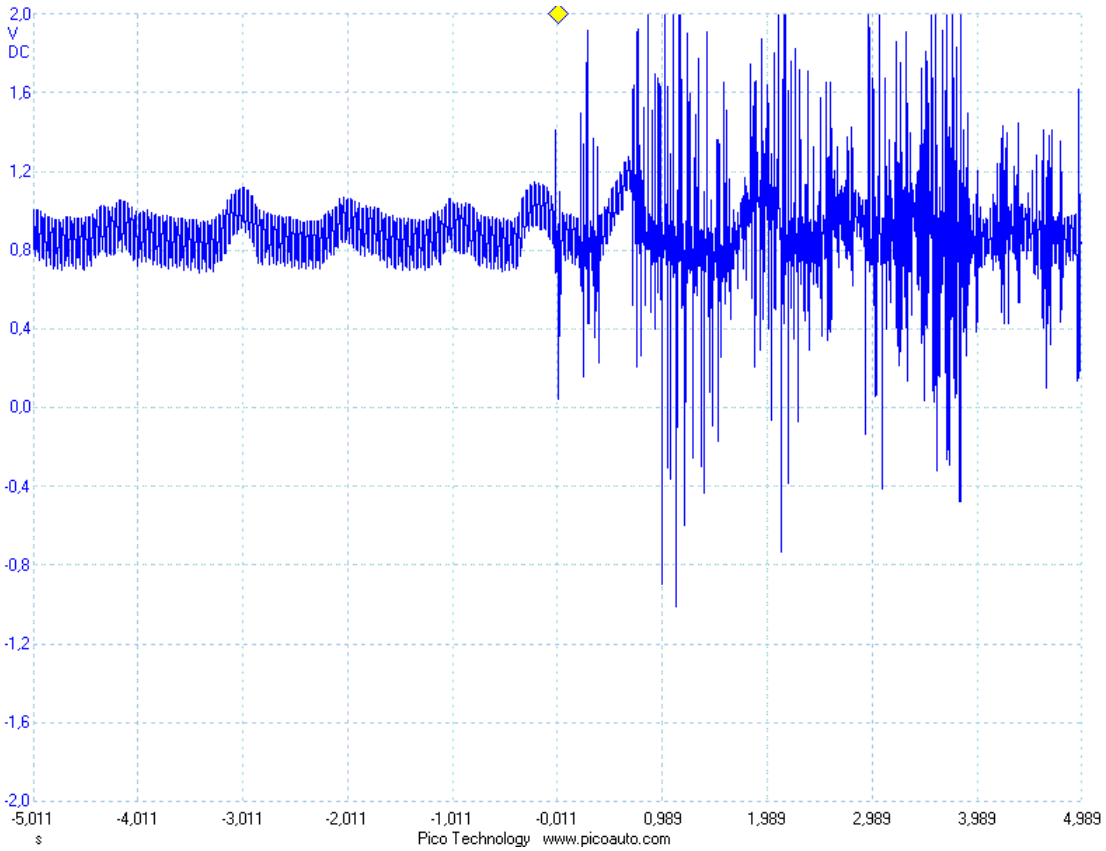
I looked now in detail of the initial scope test from July 2010 to get an idea. It could also be that the engine rpm increased first and than the MAF signal follows with a higher airflow. But from what is the periodically damped swing coming from?



Enlarged: Damped swing over 1 sec. and it is repeated periodically every few seconds

To our amazement – we could not repeat the MAF signal swing any more. It looked sometimes normal 1.3 V over the time – but the engine cut out after a few seconds idling. Sometimes it looked like below: swinging signal and with lot of noise.

As soon we connected the MAF sensor plug – the engine cuts out at idle immediately. We still assumed a vacuum leak but still could not find any.



The ECU was scanned and a few DTC were found:

5 Faults Found:
16486 - Mass Air Flow Sensor (G70): Signal too Low
P0102 - 35-10 - - - Intermittent
17522 - Oxygen (Lambda) Sensor; B1 S2: Internal Resistance too High
P1114 - 35-00 - -
17545 - Fuel Trim: Bank 1 (Add): System too Rich
P1137 - 35-00 - -
17704 - Error in Mapped Cooling System (check Temp-Sensor and Thermostat)
P1296 - 35-10 - - - Intermittent
16517 - Oxygen (Lambda) Sensor B1 S1: Response too Slow
P0133 - 35-10 - - - Intermittent

The DTC P0102 was caused by the disconnected MAF sensor.

The DTC P1137 points to a vacuum leak at idle. Because the "(Add)" at fuel trim means additive trim, which is addressing an imbalance at idle. When the ECU is using additive trim, it is telling the injectors to stay open a fixed amount longer or shorter. The malfunction (e.g. vacuum leak) becomes less significant as RPM increase. For additive adaptation values, the injection timing is changed by a fixed amount. This value is not dependent on the basic injection timing.
So we still are looking for the vacuum leak.

The vacuum was measured at idle with -0.6…-0.65 bar (stable – no jumps) and only dropped to zero when the engine cuts out.
From previous experience: a vacuum leak inside the air inlet system produces a fluctuating or jumping measurement – corresponding to the hunting engine idle speed.
But our reading was stable and the engine cut out after a few seconds.

The DTC P0133 reports a sluggish O2 sensor which can fail by a too rich mixture over a long time (carbon fouling from rich mixture).
O2 sensor was tested and was at least working – but indeed the cycling rate was too low.

<u>The Solution:</u>

The vacuum "leak" was found as we sprayed Engine Start-up Spray in the air intake. The idle speed did not increase a bit!!! I could hold my hand in front of the MAF sensor and there was no suction to feel. (Normally the engine dies when you do this at idle).
The suction duct (rubber elbow) was found completely off from the turbo charger- see red marked position. The connection is buried deep down at the turbo charger and hard to get to.

No wonder that the engine cuts out when the "death" MAF sensor is connected. The broken connection was fixed temporary and the engine idled smooth with connected MAF sensor and did not cut out anymore,

<u>The Conclusion:</u>

1st: We gained 2 examples of MAF scope waveforms witch indicate the presence of an air leak. It will help us for diagnostics when no DTC are present.

2nd: To save maintenance on an expensive car is never a good advice. The rubber hose broke because an engine oil leak was not fixed for a long time. (leaking oil from the turbo charger supply).
To drive the car without MAF sensor connection over long time resulted in a damaged O2 sensor. A new MAF sensor was not necessary and a wrong diagnosis but it had helped to find the root cause much quicker without damaging the O2 sensor.

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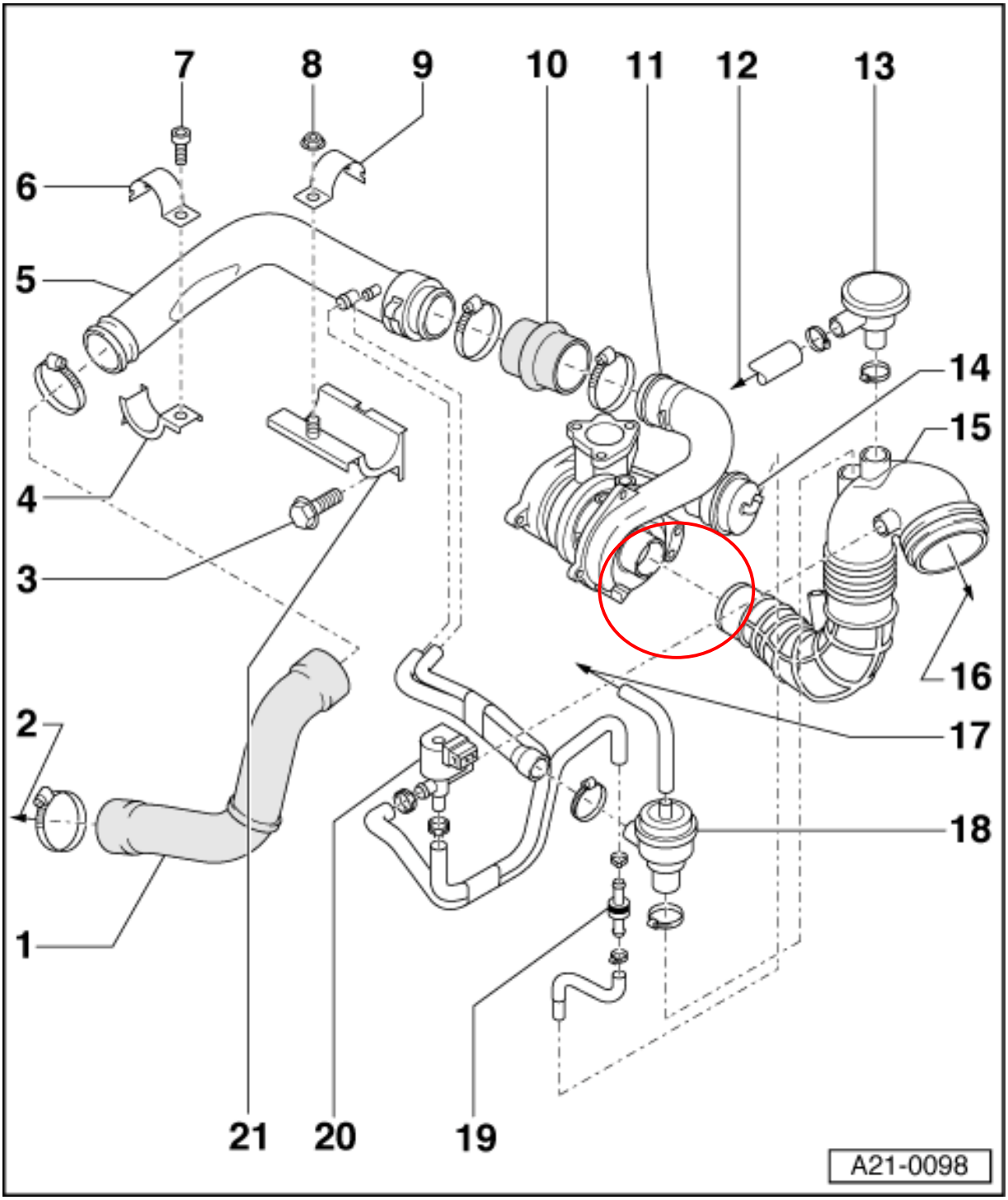

Figure 1: Pos. 16 connected to MAF

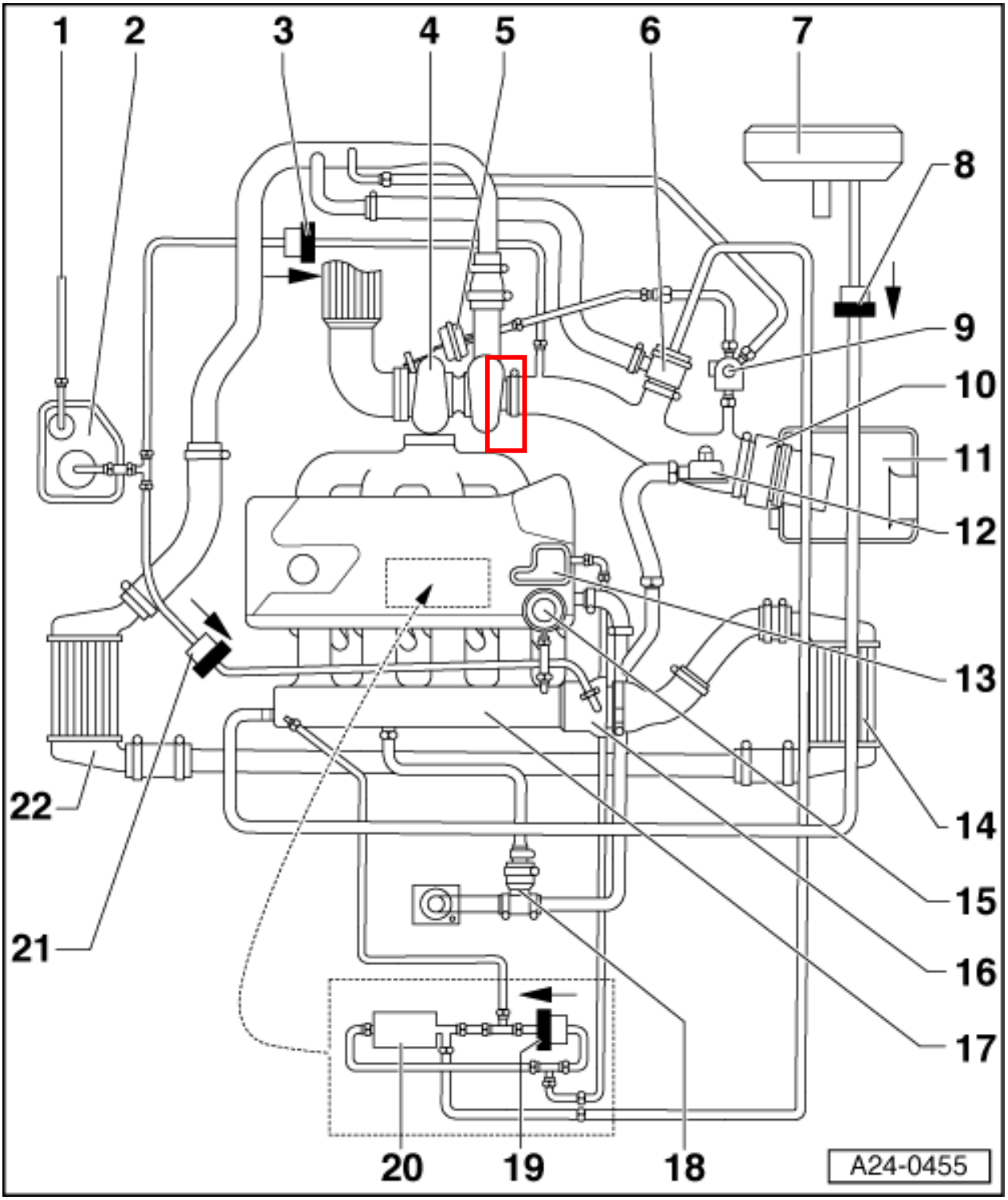

Figure 2: Pos. 10 is MAF sensor and Pos. 11 is air filter