E34 M5 Intake Resonance Flap
Overview and "How to Test"

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This document covers what the Intake Resonance Flap (IRF) is, when it operates, the benefits it offers, and how to test it.

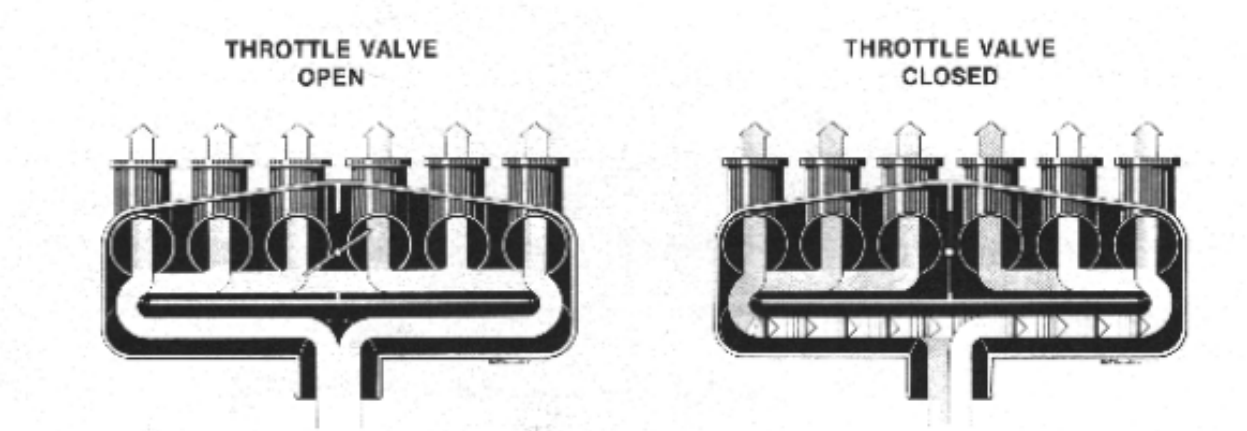
What Is The Intake Resonance Flap and What Does it Do?

The intake plenum (Air Accumulator in RealOEM) of the e34 M5 distributes air from the rubber boot (that sits between the Plenum and the MAF) to each of the 6 throttle bodies. In Picture #1 below, the rubber boot is in the bottom right, curving into the intake plenum with the M logo stamped on the side. The plenum has 6 funnels (short black "boots" in Picture #1) that feed air to the 6 throttle bodies (3 pairs of 2) and then into each cylinder.

Picture #1: Boot, Intake Plenum, Funnels and Throttle Bodies

Inside the plenum, as can be seen from Picture #2 below, there are two main chambers, with a "flap" in the second chamber that is basically the same as a throttle body flap. This flap has two states, Fully Open and Fully Closed, and it has one job – to vary … "the effective length of the induction system depending on engine speed, load and ignition switch position in order to obtain and improved torque spread over a wide speed range.". In English, this means "Increase torque between 4120 and 6720 RPM when the throttle is wide open!" In reality, the flap operates in the manner according to the table below, which is during very specific conditions and very infrequently.

Picture #2 (From Here): Flap Location and Operation



Remember that the default design of the intake plenum is to have no flap, and for the plenum to be open across the full length of the second chamber. If there was no flap, the plenum chamber would be open! The "modified" design is to add the flap, and then close it under very specific conditions. Summarizing the table blow, we can see that the flap closes (and provides benefit) only under two scenarios:

1. Wide Open Throttle (WOT) and RPM less than 4120
2. Wide Open Throttle and RPM greater than 6720.

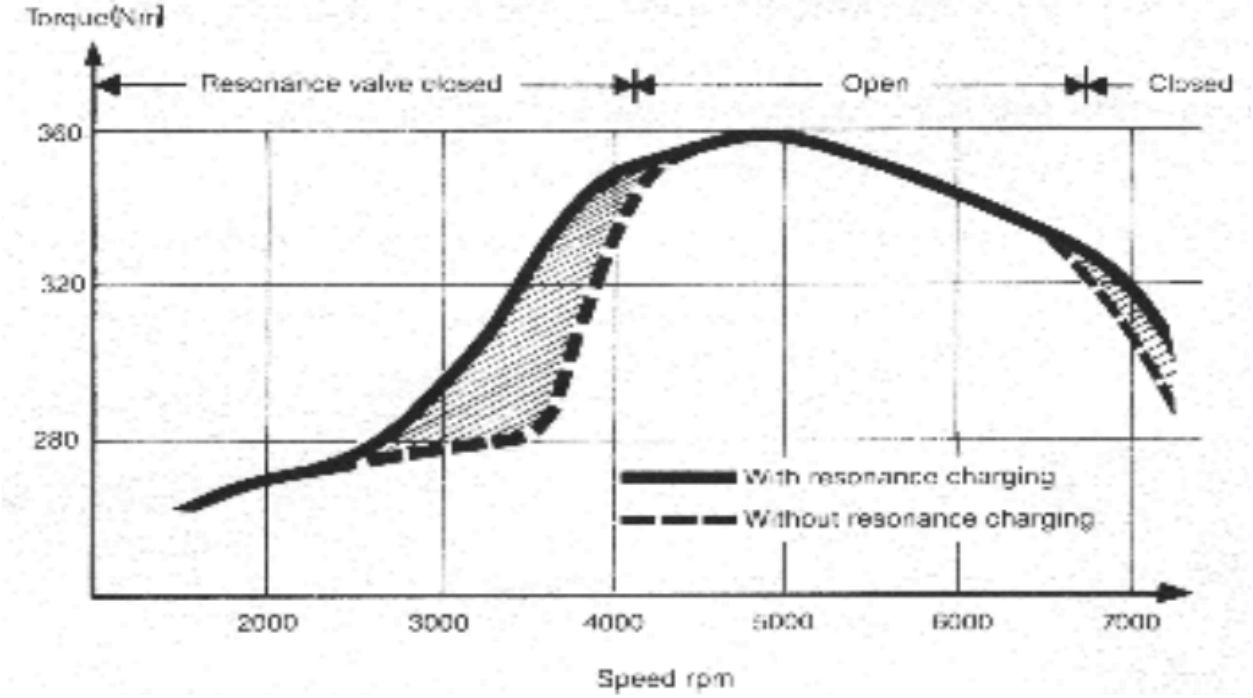
Note (KEY POINT!): If the TPS has not triggered WOT then the flap WILL NOT activate and close. Put another way, hard acceleration at any RPM will NOT activate the flap unless your foot is on the floor! Many people online believe the flap to operate during hard acceleration below 4000rpm – this is FALSE! They also suggest that one can look at the actuator and rev the engine to test it. This is FALSE! Unless the throttle is engaged all the way to WOT, then the flap will not activate (close).

	Engine Off	Pos #2	Idle	Steady Speed	50% acceleration	WOT < 4120	WOT 4120 - 6720	WOT > 6720
Open	✓	✓	✓	✓	✓		✓	
Closed						✓		✓

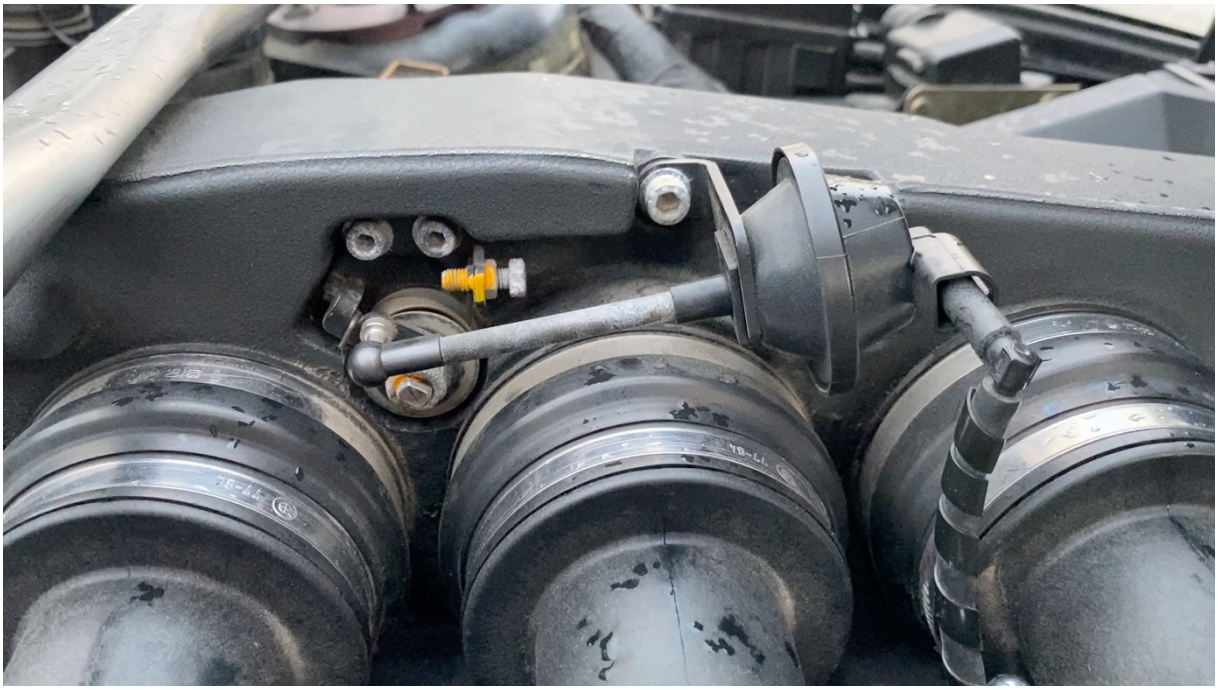
Benefit of a Closed Resonance Flap

Without going into the complexities of resonant frequencies and compressed air pulses travelling down tubes and into throttle bodies, the main benefit of the flap is to increase torque between about 2500 rpm and 4170 rpm – when at full throttle! This can be seen in Picture #3 below. If the accelerator pedal is on the floor and the TPS detects this as WOT, then the flap will close and the solid line in the graph below will be the result. If there was no flap, or there is just hard acceleration (and therefore the flap remains open) then the torque curve would resemble the dotted line. Doing some simple math, one can see that the benefit varies from a small % increase to about 15% increase in torque at 3500rpm.

Picture #3: Additional Torque When Flap Operates (Must be at WOT!)



Video of Self Test



Start Up Self-Test of Resonance Flap

At every engine start the Resonance Flap does a self-test. Failing the self-test does not throw a check engine code and cannot be determined any way except visually. The video above shows what the self-test "should" look like. As you can see there are two "actuations" of the flap at engine start – not at key 1 or key 2.

If the Self-Test Fails?

If the self-test fails, or only actuates once, then there are several areas to be investigated. See Picture #4 below for components of the system.

1. Vacuum reservoir: There is a vacuum reservoir as part of the system This reservoir is intended to allow the Flap to actuate and close at high engine RPM, when manifold vacuum is close to zero. This vacuum reservoir holds enough vacuum to actuate the flap 6 times. The first test should be to let the engine run for a few seconds at idle to replenish this vacuum reservoir, turn the engine off, and then immediately turn the engine back on. If the Resonance Flap self-test now works, then you have a vacuum leak from the reservoir or from the check valve between the reservoir and the engine. A new reservoir and all associated parts can be purchased from Angry Ass here.
2. Actuator: The vacuum actuator can have a blown diaphragm internally. This can be checked by removing the vacuum hose at the 90" nipple, and then sucking gently on the hose. If the flap actuates then the actuator itself is ok. If it does not then the actuator is broken and must be replaced. This part is NLA but is produced by Angry Ass and can be purchased online here.
3. Vacuum Hose: The vacuum hose can be degraded to the point that when the vacuum is applied to the actuator, the vacuum vents to the atmosphere through a crack or hole in the hose. Testing this requires removing the plenum and then sucking on the vacuum hose where it attaches to the electric changeover valve under the plenum. If the actuator

attached to the plenum works but sucking on the hose at this lower point fails, then the vacuum hose is the culprit and needs replacing.

4. Electric Changeover Valve: If the actuator works when sucking on the vacuum hose attached to the changeover valve, then the valve itself (Part # 11741742711) could be inoperable. This valve has two terminals that when powered with 12v will actuate the valve to send the main vacuum attachment to the actuator. Applying 12v to the terminals will activate the valve – one side is marked with a "+" sign. If you do this while sucking on the main vacuum attachment for the valve, it should activate the actuator. If it does not then your Changeover Valve is broken and needs replacing.
5. Control Unit: Finally, if the Changeover valve works in step 3 above, then your Resonance Flap Control Unit is probably malfunctioning. This is in the E-box underneath the relays. You can test it using the diagram below or replace it. Part # 13621316687 - $500 new!

Picture #4: Resonance Flap Control Unit Diagram