Troubleshooting the APC System

Contributed by Administrator
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The Saab APC system was one of the most advanced automotive control systems of its day. It offered unparalleled turbo management, and truly brought functional turbo systems to passenger cars.

Unfortunately, the components which support the APC system have aged with the cars, and they are susceptible to age-related failures. If your APC system or turbo does not seem to be performing as it should, the following ten steps should help you isolate and repair the problem.

Please note: These steps assume that your engine is in otherwise good working condition, and you're just seeing lower than expected boost levels. If you have other running problems, you must correct them before you can hope to accurately troubleshoot the turbo system.

1. Verify it isn't your boost gauge - they don't fail often, but they do fail. Acquire a calibrated boost gauge.Pull the driver's side front speaker grille, and locate the vacuum line going to the back of the instrument cluster. Pull that vacuum line, and connect it to your boost gauge; your stock gauge will no longer be working. If you're seeing the right numbers (11-12psi on 16v, 7-8psi on 8v cars) then the problem is your gauge and not the car.

2. If you're not seeing the right levels, it's time to start your troubleshooting. First, pull the "C" line off the APC solenoid. This will not only disable the APC system, it will also disable your wastegate. Go for a brief drive on an open, uncongested road. BE CAREFUL with your acceleration as boost is completely unregulated. You should get massive boost, and will probably run into the 15psi fuel cutoff quickly, so be prepared. DO NOT drive like this for long, as knock will surely set in and can damage the engine surprisingly quickly. If you get boost, the problem is 99% vacuum or electrical; if you don't, you likely need a new turbo.

3a. If you did NOT get boost in step 2, pull off the pipe that runs from the air mass meter to the turbo intake. Try spinning the turbo compressor wheel gently. It should spin mostly freely; if it does not, your turbo is seized or damaged. Listen for any screeching or scraping noises as you turn the wheel - these can be caused by bent vanes on the compressor or impeller and will cause abnormal boost. If it does turn easily, you may have a seriously damaged exhaust manifold or engine. Troubleshooting that is beyond the scope of this document. To get you thinking, the problem could be anywhere from seriously off timing (ignition or valve) to bad pistons. That said, at this point you're probably noticing other drivability problems, too.

3b. If you did get boost in step 2, you have some work to do. First thing to verify is that you don't have any massive air leaks. Check all vacuum hoses from beginning to end, and verify that all rubber couplers on the intake tract are in good shape. I recommend pulling them all off an inspecting them carefully - small rips or tears (even *pinholes*) can expand to large size under boost which will bleed off the intake charge quite readily. Also check grommets in the intake manifold for tightness - they can blow out under boost but get sucked in under vacuum, thus appearing okay; be sure to check them with your hands and not your eyes!

4. If you check all hoses and vacuum lines and don't find any leaks or tears, your problem will lie with either the cruise control or the APC system and you must check the cruise system first. There are only a few components - a pressure switch located on the driver's side fenderwall and two pressure switches located (one each) by the clutch and brake pedals. Check the fenderwall switch first by attaching a short length of hose to its vacuum port and sucking and blowing on it. You should hear an audible click of the switch opening and closing. Test electrically by connecting a continuity tester to its two leads - you should get continuity at atmosphere and an open circuit under vacuum. If you do not get continuity, you've found your problem. You can bypass it by shorting together the two leads on the car's wiring harness; just remember that while bypassed, the APC system will be ENABLED while cruise control is engaged, and you'll get full boost. This can lead to poor cruise control performance and potential engine damage (unlikely as it is) and should repaired as soon as possible.

5. Next, check the pressure switches at the brake and clutch pedals. Connect a length of vacuum line to each switch (one at a time) and apply vacuum and pressure. The switches should hold vacuum/pressure with the pedal at rest and should not when the pedal is depressed. Additionally, you must test electrically by continuity. Pull the electrical lines off each switch and test; there should be continuity with the pedal at rest and an open circuit with the pedal depressed.

6. If the cruise control checks out, test at the pressure transducer while you're still under the dash. It's a little metal cylinder above the driver's feet. Do not get it confused with the overboost switch; it can be identified by the *lack* of an adjustment potentiometer. Often times when this transducer fails, you will get extremely low *or* erratic boost levels.

This part is often overlooked, and is responsible for a surprising number of APC failures. Unplug the two electrical connections and short them together. Take a test drive, but do note that the APC system will have no way of knowing how much boost is being produced. The result will be mostly normal drivability, but boost will not stop at normal levels, meaning you WILL hit the overboost switch at some point (and probably quickly). Check boost levels with a calibrated gauge.

7. Next check the APC solenoid by applying +12v to it; under power, the solenoid should snap. Check that it is fully functional by removing the vacuum lines from the "W" and "R" ports, and connecting a length of vacuum line to the "C" port. With no power applied, air passed through the "C" port will come out through the "W" port; with power applied, air passed through "C" will come out through "R". Be sure to verify the solenoid does not leak air through the wrong port at the wrong time.

8. If your APC solenoid checks out, check the knock sensor. Unbolt the knock sensor from the engine, wrap in a mess of towels, and stash it somewhere where it will not rattle around or become entangled in moving engine parts. Use the calibrated boost gauge to check charge pressure while driving around. Be cautious driving in this fashion, as you will be operating without the APC's protection. If the car behaves normally and boost pressure is correct, you likely have a faulty knock sensor - replace it, and do NOT drive for prolonged periods with it unplugged or you WILL grenade your engine. NOTE: If boost returns to normal levels with the knock sensor unplugged this does NOT necessarily mean that the knock sensor is faulty - there could be engine problems which are in fact causing premature knock. Trying a known-good knock sensor is a good way to help isolate the problem. If the problem persists with a known-good component, you may have more serious problems: Incorrect ignition or valve timing, poor fuel pressure, and excessive carbon deposits (causing heat, thus knock) could be responsible, and they may be subtle enough to not affect normal driving but pronounced enough to set off the knock detector, as it's quite sensitive. Troubleshooting such problems is beyond the scope of this document.

9. If all else has failed, you may be faced with an unreliable APC box. Such problems are rare, but they do occur - and will probably occur more often as these cars get older. The only real troubleshooting you can do is to verify that the box is getting power and good ground, and that the two sources are reliable. The next step is to swap APC boxes with a known-good component.

10. Hopefully, your turbo is working again at this point. If not, email me and we can see if there is some other stone unturned...