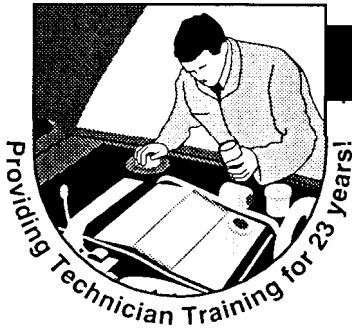


Networking

The Official Newsletter of LINDER TECHNICAL SERVICES



TECH TRAINING

SNAP TESTING FORD MAF SENSORS

By Randy Dillman - LTS North

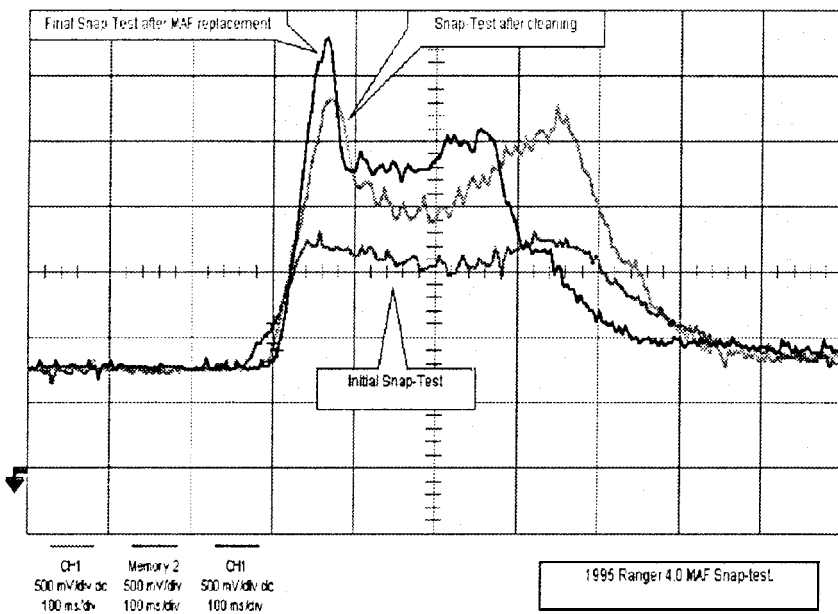


FIGURE 1

Mass air flow devices are a different animal. The real concern is a skewed input signal at the root of the fuel map causing the computer to work hard, and often out of its window of control, in order to deliver just decent performance at best. So the real question is; how do you test a MAF? We use a method developed by Randy Bernklau, iATN sponsor, shop owner and Import Service magazine contributor, many years ago. Testing a MAF like a MAP is out of the technician's realm of ability since installing the MAF on a flow bench and running the calibration software used by the designer is out of the question. We are relegated to monitoring output voltage versus action-reaction events that we control. Grab your scopes and a nearby Ford MAF equipped car and let's get started.

Begin by setting your DSO up for a single shot event, 500 mv/div and 1 00ms/div, trigger set to positive @ 1.3-1.5 volts. Next, gain access to the throttle plate because that's where you'll be performing the snap-rev. We don't use the accelerator pedal due to cable stretch and carpet interference. Now,

Speed density, fuel management systems relied on a strain gauge sensor termed the MAP, or manifold absolute pressure, whose linear calibration output was straightforward to test. Pressure points, controlled by a vacuum pump, can be plotted and the resulting output should be a linear line mirroring the published data. Simple, right? Why do many techs just check two points along this line, i.e. 0" and idle? Beats me. We've replaced my share of skewed MAP sensors along the way that tested OK at these two extreme data points. Now, let's throw MAF sensors into this pool of misunderstood and often misdiagnosed computer inputs for some real fun.

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SNAP TESTING FORD MAF SENSORS

(Continued from page 1)

practice snapping the throttle so fast as to not cause the engine to rev-up too high. Use both hands. We have found that low voltage peaks are caused by techs that don't make the engine take a deep breath. Monitor your test results on your DSO during this snapping of the throttle. Regardless of the engine size, a minimum of **3.5-3.7** volts should be obtained at the waveform peak. See figure 1.

With a few baseline tests recorded, remove the sensor and clean both wires with alcohol and a clean, new Q-tip. Retest and notice any increase in the peak and decrease in the idle voltage reading. A dirty MAF will overshoot the idle and undershoot the snap every time. If you have improved the snap, but have not reached our **3.5-3.7** volts goal, replace the sensor. Most new sensors will reach **4.0** volts. Don't forget to check and replace if needed the MAF pigtail, as a voltage drop here will also cause inaccurate readings.

So you've repaired a pinging or lean-code setting Ford by cleaning or replacing the sensor and you're feeling pretty good, right? Well, you're not done yet. Grab your scanner and check the Baro pid. Many vehicles will not give you this reading even with the Ford OE tool. For the ones that do, if the Baro pid is too low you will have to reset it with 3-4 sustained, heavy accelerations. Remember, the Baro reading is inferred NOT at key-on, but during WOT. Good-luck and happy snapping!

TECH TIP

From the Guru



AUTOMOTIVE BUSINESS MANAGERS COMMANDMENTS

MANAGE THE FUTURE NOT THE PAST
Turnover is a fact of life in any organization. Even if you are at full staff this could change on any given Friday afternoon. Have the discipline to interview at least one potential new hire on a weekly/monthly basis (even if no slots are available). And you are in control.

YOU'RE ONLY 30 DAYS AWAY FROM A DISASTER

You can never let up! No matter how good things are going- a drop in activity, morale or manpower (or any combination) can seriously affect your business. There are rules (let's call them laws of nature) inside every business. Ratios, attitudes, goal set points, etc. that Determine X levels of success. Don't fool yourself into a false sense of security. The laws must be obeyed or the results will be off accordingly.

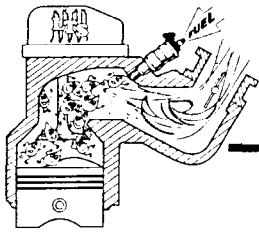
STRIVE TO BE BETTER THAN YOUR COMPETITION

The best way to beat your competition is by being better not cheaper. Professionalism, follow-up and attention will do more for your business than the best special ever devised. Set the right example in dress, product knowledge, preparation, etc. Pay attention to quality.

DO IT NOW

Procrastination will kill the energy of a business faster than anything else. Customer and/or employee problems rarely go away. The faster you take action on an issue the faster you can get back in focus on the real job at hand. One problem can kill many others.

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FUEL INJECTION SERVICE **UPDATE**



FROM THE INJECTION WIZARD - DOUG GARRIOT

INJECTOR FUNDAMENTALS

Through the years, I have many conversations about replacing fuel injectors to increase the performance of a vehicle. I usually lead the chat with a lot of questions and find that some of my questions can't be answered. Here are some **fundamental facts about injectors** that must be considered before any injector swapping is made.

. **Attachment to the fuel rail.** This is determined by if the injector is a top feed, side feed or bottom feed. Either an O-ring or hose attaches top feed injectors to the rail. Side and bottom feed injectors set in a cup with fuel around their mid to lower body. Most O-ring type top feed injectors have some sort of retaining clip, a push lock or a turn lock clip. The length of the injector is also a factor, or more importantly the distance between O-rings. Sometimes we change the overall length and can adjust for this if there are two retaining clip grooves at the top of the injector.

. **Injector resistance.** Injectors are of either low or high impedance. Low impedance injectors range from 2-4 ohms. High impedance injectors range from 12-14 ohms. The impedance of the injector determines what type of driver in the PCM is used. Low impedance injector drivers (peak and hold) allow more current to flow to open the injector faster, and ramp it down to hold it open. High impedance injectors use a saturated switch type driver. They will open a little slower, .5-1 ms, and the current will stay more constant once the coil is saturated. The point being is that not any injector can be used with any PCM.

. **Discharge tip designs.** There are various ways the tips on injectors are designed. The Pintle design uses a tapered pintle to atomize the fuel in a conical-shaped spray pattern. This sometime appears only as a stream. A beveled chimney may be used to enhance the spray pattern. The **Ball** design uses a multi-hole tip that fuel discharges from giving it a better conical spray pattern. Multi-hole metering for multi-valve engines align the metering holes so a separate spray of fuel is directed towards each valve. Most new injectors use a **Disc** style metering tip (this is what we commonly call a Deposit Resistant Injector). DRI style of injector is claimed to have resistance to deposit buildup, a quicker opening time and a wider dynamic range of operation. This design is also adaptable for operation with alternative fuels like natural gas, propane, ethanol and methanol.

. **Fuel flow capability.** This is the topic of most discussions. Most people want to increase the output of fuel to better their engine's performance. Injector sizing sometimes can be a challenge, especially if you don't know what size of injector you are starting with. In most cases manufacturers do publish the flow rating of injectors, given in pounds of fuel per hour (lb/hr). The rate is figured with the injector held open @ 3 bars (43.5 psi). A good place to start is knowing what you have and increasing the flow in steps to get the right idle and WOT desired. An important consideration is that larger flow injectors have a higher minimum flow rating and may cause an uncontrollable idle.

AUTOMOTIVE BUSINESS MANAGERS COMMANDMENTS

(Continued from page 2)

RECRUITING IS A DAILY MISSION

To use captured information only for review significantly reduces its value. The facts are simple – there is nothing that can be done about what has already taken place. You just can't manage the past! Use the information to make midcourse corrections (daily, weekly, monthly)

TERMINATE THE LOSERS

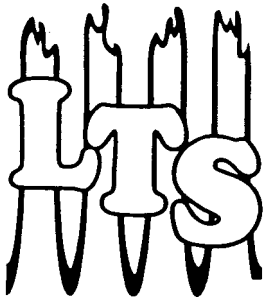
If you keep marginal employees, they bring down the expectation level of the entire team. If your attitude is that they are better than having no one, you are kidding yourself! Remember someone who is doing poorly is not making you any money. Terminate ALL losers at once.

DON'T USE FATE AS AN EXCUSE

When all is said and done, success or failure is in your hands. Any outside influence can be managed through (economy, boss, products, service, or training problems, etc., etc., etc.) The sooner you come to grips with your position, the sooner you will see an improvement in results. Simply put – don't just take responsibility for what you do right; take it for what you do wrong as well.

TRAIN TO' RETAIN

It takes a lot of effort to effectively train your organization. Your dedication to this end will have a dramatic impact on the success of your team. Don't ever let your people talk you out of their training needs. Skills must be learned one at a time. Proper training is priceless!!



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