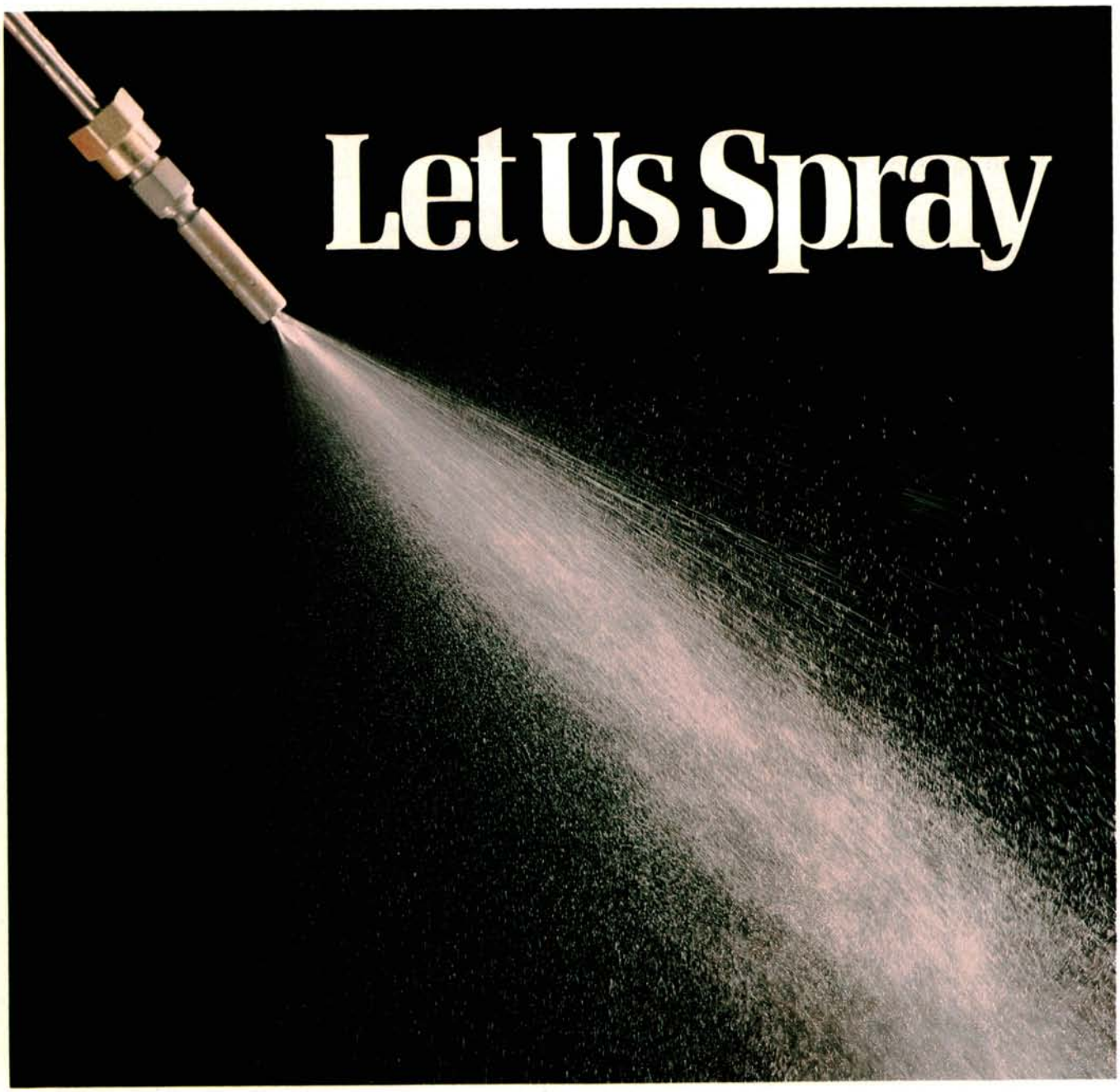


K-Jetronic Injector Testing And Hose Repair

Not all K-Jetronic repair procedures are complicated. Sometimes, after a week filled with problem cars, it gets easy to start looking for dark and mysterious problems, when the fix is as simple as a dirty fuel injector, or a kinked fuel delivery line.

We'd like to look at some commonly overlooked, and fairly simple procedures for testing K-Jetronic fuel injectors and fuel delivery lines.

The first has to do with flushing and testing fuel injectors. Dirty fuel injectors can affect engine perfor-

mance in a number of ways. Improper spray patterns, or unequal fuel delivery rates caused by rust or dirt at the injector tip, can cause all kinds of problems. Injector flushing and testing can be done to correct an existing problem, or as part of the vehicle's regular maintenance program.

A can of Mickey's Mystery Motor Magic in the gas tank might work in some cases, but there's no guarantee that you've cured a mechanically defective injector.

And what about those kinked, damaged, or leaking injector lines? Aside from the obvious safety hazard caused by a leaking line, we can't forget what a kinked line will do to fuel delivery rates.

We gathered some special tooling for our project from a number of sources. The tests and repair procedures shown are pretty easy with the right equipment.

You'll notice that we mention air-shrouded injectors in this article. Those of you familiar with the old continuous injection systems may not yet be so friendly with the air-shroud set up.

Basically, air-shrouding allows air to flow through passages in the cylinder head to air nozzles that fit around the neck of the injector. This extra air helps atomize the spray of fuel into the injector. Newer air shroud injectors also have a shield on their tip. We'll look at ways to check the air-shroud system in a future article.

Check the most current recommendations from the manufacturer about the type of sealer to use on the injector inserts. VW and Audi, for instance, have recently recommended the use of Loctite 325 sealer instead of the Loctite 620 previously used. This is an industrial sealer, and the use of a primer/hardener is no longer needed.

You probably won't find Loctite 325 at the local parts store, since it is an industrial grade sealer, made to withstand high manifold temperatures. For more information about a source of this sealer in your area, call 1-800-323-5106. Those of you in Connecticut will have to dial 1-278-1280.

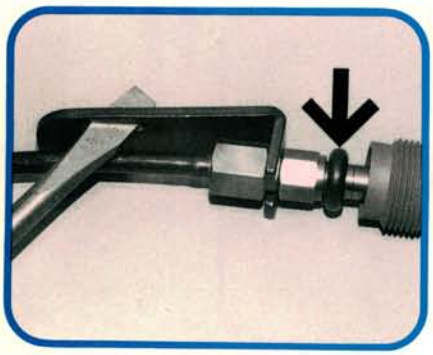
Safety, Please

Forgive us, but we have to say this one more time. Cracking high pressure fuel lines above a hot manifold has never been my idea of fun. And don't forget how flammable that atomized gasoline and mineral spirits can be during the injector spray tests. Keep your eyes open for stray sparks—and that guy next to you with the smoldering stogie.

Finally, take the time to check all connections for leaks. Run the car in the shop, test drive and recheck, and always replace any copper sealing washers with new ones. A stitch in time.

A variety of special tools and test equipment is available from the following manufacturers.

—By Ralph Birnbaum



1

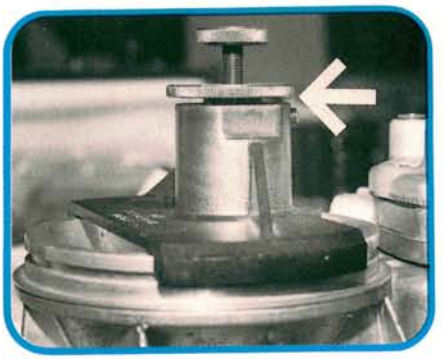
The first thing you have to do is get the injector out of the engine. This can be tough. The rubber o-rings on the injectors will harden and stick to the injector inserts after a while. This hook-type puller slides between the fuel line fitting and the injector. A long screwdriver gives you leverage.

2

If you've ever wrestled with a pair of pliers or a screwdriver trying to free a stuck injector from the backside of a Volkswagen cylinder head, your knuckles will learn to love this puller in a hurry, especially when the engine is hot.

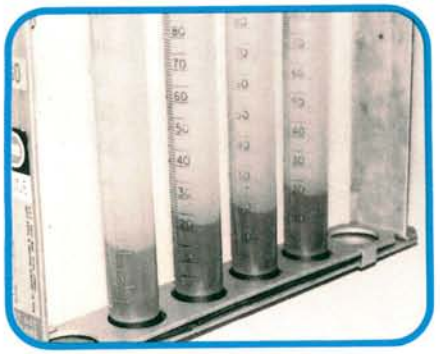
3

These BWD injector pullers are handy too, and come with a tee handle. The open-jawed puller works like the one shown in our previous step. The other two are made to screw into, or onto an injector once the line has been removed. One has a female end (M 12 × 1.5) and the other has a male end (M 8 × 1).



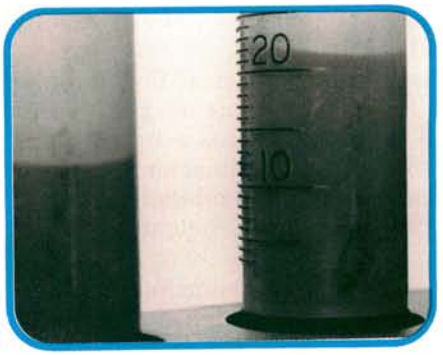
4

The same tool used to adjust the APS sensor on KE-Jetronic can also be used for fuel delivery rate tests on K and KE systems. Remove all the injectors, but leave them connected to the fuel lines. Install the jig, Zelenda P/N 1348 1/A, and raise it to the first stop. This simulates idle.



5

To check delivery rates, place each injector in a separate calibrated container. The containers should have a total capacity of about 100 ml in one ml increments. Keep the air sensor plate in the "idle" position. Run the fuel pump until you have about 20 ml in each container.



6

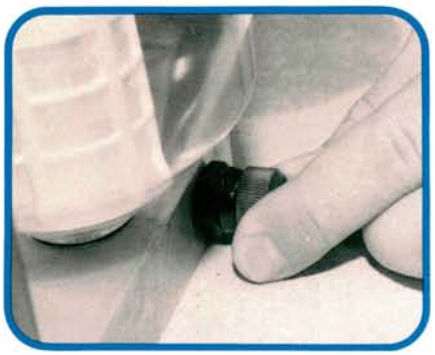
Fuel levels in the containers should be within 3 ml of each other. If not, take the injector and hose that delivered the most fuel and swap them with the injector and hose that delivered the least. Repeat the test. If the results are the same, the problem is in the fuel distributor.

7

If the lean and rich cylinders do swap places, look for a plugged hose or injector. Now repeat the test after raising the sensor to the next stop on the jig (simulating full throttle). Run this test for about 40 seconds. With 80 ml of fuel collected, readings should be within 8 ml of each other.

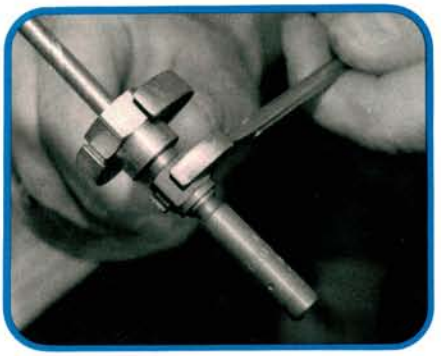
8

Also check the injector tips individually. Inspect them for signs of rust or corrosive buildup. Rusted injectors should be replaced. Some dirty injectors can be flushed with mineral spirits, however. Robert Bosch Company lent us this fuel injector tester/flusher for our tests.



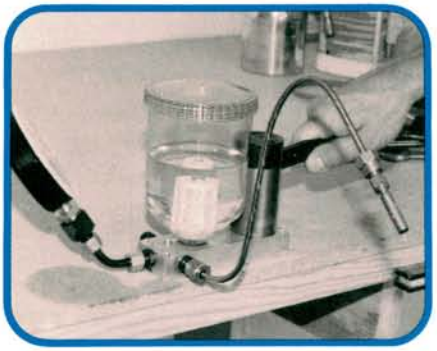
9

Loosely install the injector on the tester's pressure line. You'll need adaptors for some injectors, depending on their thread pitch and diameter, and whether or not they have male or female ends. Place a catch pan below the injector. Turn the gauge valve counterclockwise.



10

Pump the lever on the pump body slowly. Do this several times to remove all the air from the pressure line and the gauge. After the lines are bled, tighten the nut at the injector, but don't overtighten it or you'll damage the compression flange in the fitting.



11

Close the valve on the pump by turning the knob clockwise. Pump the lever rapidly until you hear the chattering noise of the injector stabilize. Keep pumping at a rate of about one stroke per second. The spray angle should be about 35 degrees. Scrap an injector that squirts a steady stream.

12

You'll learn the sound of a good injector. If you're not sure, grab a new injector and practice with it first. If the cone-shaped spray is a little off to one side, you can flush and reuse it. But the injector has to atomize the spray in a fine, cone-shaped mist to work properly.

13

Checking injector opening pressure is also important. Open the valve on the tester for this test. Pump the lever at a rate of about two strokes per second. Note the pressure reading on the gauge when the injector opens. Compare to specs for the car you're working on, since they're not all the same.

14

If the injector passes both the spray pattern and opening pressure tests, you'll still want to run a leak down test before passing it as a good injector. A good injector will hold a minimum amount of pressure without leaking. Wipe the injector tip dry. Leave the control valve closed.

15

Slowly increase pressure until the gauge reads 0.2 bar less than the injector's opening pressure and hold that reading for 15 seconds. If the nozzle gets moist with fuel, that's okay. But if enough fuel leaks through to make a droplet that falls off within those 15 seconds, the injector is bad.

16

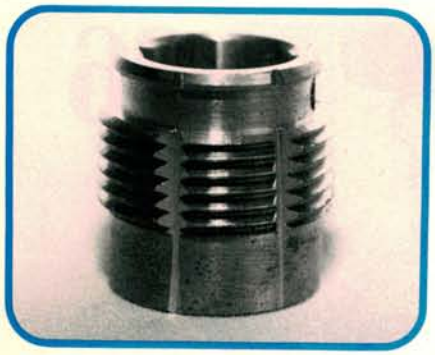
If you're the determined sort, and hate to scrap a borderline case, you can always flush the injector again. Keep running those mineral spirits through the injector for a while longer and then retest. Never place your hand (or any other part of your body for that matter) below the injector spray.

17

Plastic injector inserts can warp or crack after a while, causing a vacuum leak. Hex-head sockets like these make insert removal easier, although the plastic inserts can strip out sometimes. Then you'll need a large easy-out to remove them. Install new inserts using Loctite thread locking compound.

18

Some newer, air-shrouded injectors use a two-piece insert. The plastic cone snaps onto a threaded brass retainer. Remove the old seal from the bore in the cylinder head before installing a new one (arrow). Install these inserts with Loctite 325 sealer and torque them to 25 Nm (18 ft-lb).

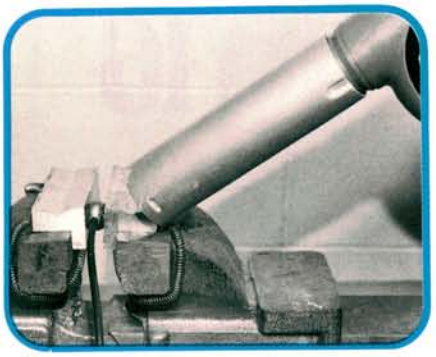


19

Removing the old sealer left inside the cylinder head by the old brass retainers can be time consuming. One way to speed the job is to make a special thread chaser from a new brass retainer. Take the edge of a sharp file and cut flutes in the retainer. Then use it to chase the threads clean.

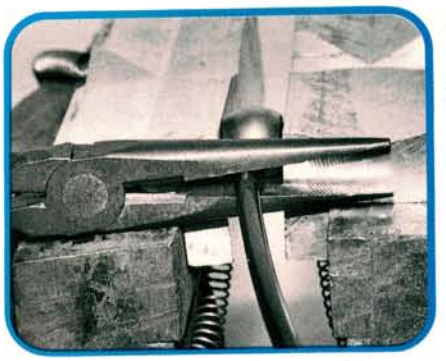
20

At first glance, you might think the only thing you can do with those fancy fuel supply hoses is to trot over to the dealer when one gets damaged, and buy a new one. But fixing them is easier than you think. Polyamid tubing comes in different sizes, and a wide range of fittings is available.



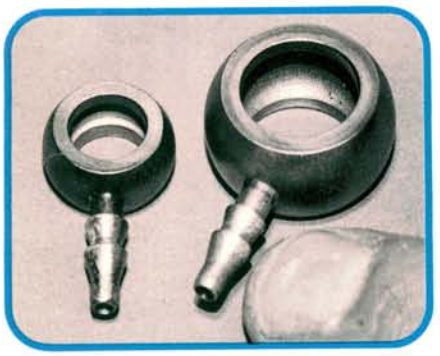
21

If you're replacing the hose, but want to reuse the fitting, be careful not to slit the tubing with a knife or a razor blade. You could scratch the barbs on the fitting and end up with a leaky connection. Remove the old hose by mounting the fitting in a soft-jawed vise. Warm the hose with a heat gun.



22

Carefully pinch the outside of the heated tubing to loosen it. Don't let the jaws of your pliers or a pincher cut through the tubing. Any nicks, pits, cuts, or scratches in the fitting will cause a leaky connection. If there's any doubt at all about the condition of the fitting, replace it.

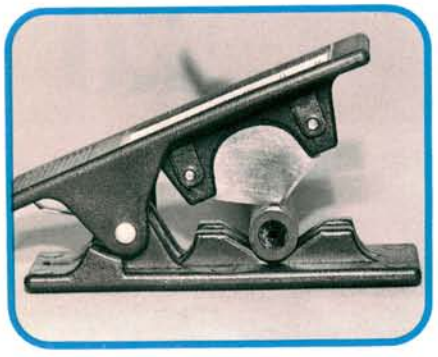


23

Before we go any further, we want to stress the importance of using the correct barbed fittings for these applications. The barbs on these banjo fittings are specially designed to grip tight and hold the hose when the pressure is on. Hose clamp fittings are completely out of the question.

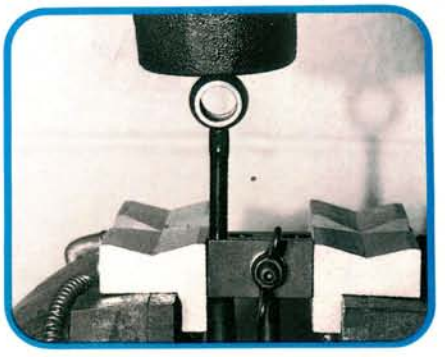
24

This tubing vise is designed to hold the fuel line secure while you install the fittings. It has openings for different sizes of hose. Each opening is slightly oval-shaped to grip the hose tightly. It works a little like the brake line vise that comes with your brake line flaring tool.



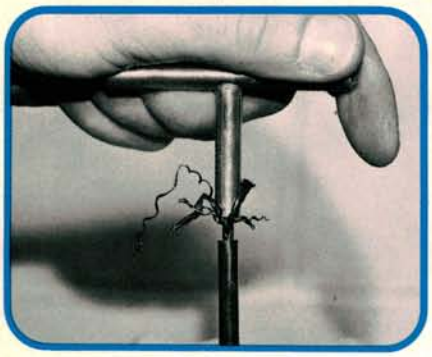
25

We nicknamed this hose cutter the "pocket guillotine." It does a better job of making clean, square cuts than your side cutters or a hacksaw blade. Just slide the hose in place and hit the top of the cutter like you would the stapler on your desk. You'll get a clean, square end that's easy to work with.



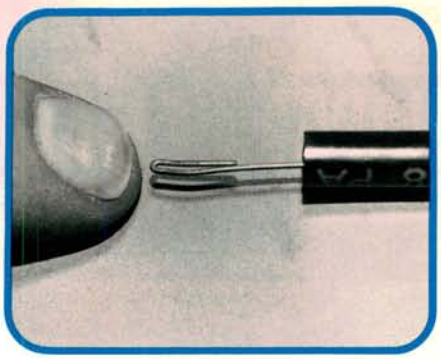
26

For tubing sizes larger than 2 mm, simply mount the hose in the vise and drive the fitting into it with a soft mallet. Barbs on the proper fittings will spread the hose going in. You may want to mount the hose a little lower in the vise than we did to keep the hose from kinking as you drive the fitting.



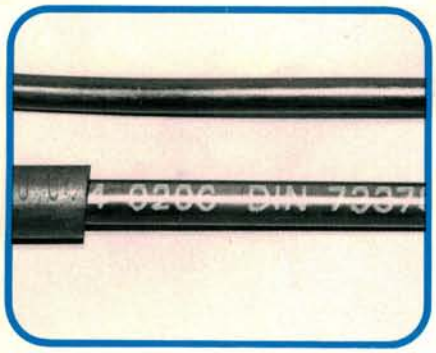
27

If you're working on 2 mm injector lines, you'll have to enlarge the opening in the end of the hose before installing the fitting. This special, tapered drill enlarges the opening in the hose to a depth of about 19 mm and cuts in a spiral path that helps prevent leaks when the fitting is installed.



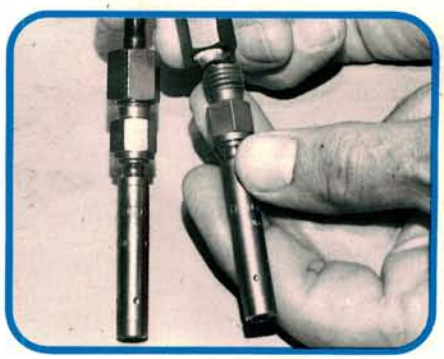
28

Make a reamer from a piece of .032 inch lock wire. Bend the wire back about 5 mm as shown. Use the tool to rout out the hose and clear away any debris left by the drilling. Then pound in your barbed fitting as you did with the larger size hose. Don't heat the hose to install any fitting.



29

Don't replace 2 mm injector line with 3 mm line, just because that's all you have left in stock. If you use the larger, 3mm hose, you'll have a pressure drop in the line behind the injector when the engine is at idle and fuel delivery rates are low.



30

If you reuse injectors after testing and flushing, clean the outside of the injector. Pay special attention to the groove on the injector neck where the sealing ring rides. Clean the threads and the sealing surfaces between the hose and the injector or you'll have a leak that overtightening won't correct.