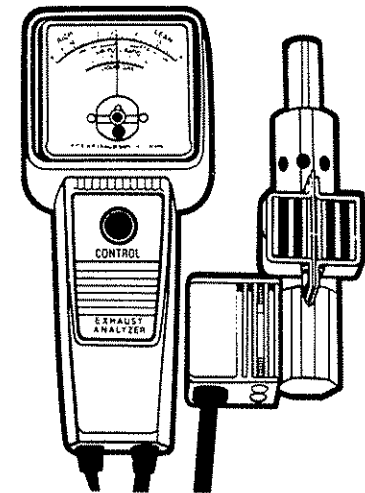


Instructions for Exhaust Gas Analyzer



SAFETY GUIDELINES

TO PREVENT ACCIDENTS THAT COULD RESULT IN SERIOUS INJURY AND/OR DAMAGE TO YOUR VEHICLE OR TEST EQUIPMENT. CAREFULLY FOLLOW THESE SAFETY RULES AND TEST PROCEDURES.

SAFETY EQUIPMENT

Fire Extinguisher

Never work on your car without having a suitable fire extinguisher handy. A 5-lb. or larger CO₂ or dry chemical unit specified for gasoline/chemical/electrical fires is recommended.

Fireproof Container

Rags and flammable liquids should be stored only in fireproof, closed metal containers. A gasoline soaked rag should be allowed to dry thoroughly outdoors before being discarded.

Safety Goggles

We recommend wearing safety goggles when working on your car to protect your eyes from battery acid, gasoline, and dust and dirt flying off moving engine parts.

NOTE: Never look directly into the carburetor throat while the engine is cranking or running, as sudden backfire can cause burns.

LOOSE CLOTHING AND LONG HAIR (MOVING PARTS)

Be very careful not to get your hands, hair, or clothes near any moving parts such as fan blades, belts, and pulleys or throttle and transmission linkages. Never wear neckties or loose clothing when working on your car.

JEWELRY

Never wear wrist watches, rings, or other jewelry when working on your car. You'll avoid the possibility of catching on moving parts or causing an electrical short circuit which could shock or burn you.

VENTILATION

The carbon monoxide in exhaust gas is highly toxic. To avoid asphyxiation, always operate vehicle in a well ventilated area. If vehicle is in an enclosed area, exhaust should be routed directly to the outside via leakproof exhaust hose.

SETTING THE BRAKE

Make sure that your car is in **park** or **neutral** and that the **parking brake** is **firmly set**.

NOTE: Some vehicles have an automatic release on the parking brake when the gear shift lever is removed from the **PARK** position. This feature must be disabled when it is necessary (for testing) to have the parking brake engaged when in the **DRIVE** position. Refer to your vehicle service manual for more information.

HOT SURFACES

Avoid contact with hot surfaces such as exhaust manifolds and pipes, mufflers (catalysts), the radiator, and hoses. Never remove the radiator cap while the engine is hot, as escaping coolant under pressure may seriously burn you.

SMOKING & OPEN FLAMES

Never smoke while working on your car. Gasoline vapor is highly flammable, and the gas formed in a charging battery is explosive.

BATTERY

Do not lay tools or equipment on the battery. Accidentally grounding the "HOT" battery terminal can shock or burn you and damage wiring, the battery or your tools and testers. Be careful of contact with battery acid. It can burn holes in your clothing and burn your skin or eyes.

When operating any test instrument from an auxiliary battery, connect a jumper wire between the negative terminal of the auxiliary battery and ground on the vehicle under test. When working in a garage or other enclosed area, auxiliary battery should be located at least 18 inches above the

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SAFETY GUIDELINES (continued)

floor to minimize the possibility of igniting gasoline vapors.

HIGH VOLTAGE

High voltage—30,000-50,000 volts—is present in the ignition coil, distributor cap, ignition wires, and spark plugs. When handling ignition wires while the engine is running, use insulated pliers

to avoid a shock. While not lethal, a shock may cause you to jerk involuntarily and hurt yourself.

JACK

The jack supplied with the vehicle should be used only for changing wheels. Never crawl under car or run engine while vehicle is on a jack.

VEHICLE MANUAL, SOURCES FOR SERVICE INFORMATION

The following is a list of publishers who have service manuals for your specific vehicle at nominal cost. Write to them for availability and prices, specifying the make, style, and model year of your vehicle.

American Motors Corporation
Myriad
8835 General Drive
Plymouth Township, Michigan 48170

Chrysler Corporation
Dymet Distribution Service
Service Publication
20026 Progress Drive
Strongsville, Ohio 44136

Ford Publication Department
Helm Incorporated
Post Office Box 07150
Detroit, Michigan 48207

Buick
Tuar Company
Post Office Box 354
Flint, Michigan 48501

Oldsmobile
Lansing Lithographers
Post Office Box 23188
Lansing, Michigan 48909

Cadillac, Chevrolet, Pontiac
Helm Incorporated
Post Office Box 07130
Detroit, Michigan 48207

OTHER SOURCES—Nonfactory Domestic and Import Cars

Chilton Book Company
Chilton Way
Radnor, Pennsylvania 19089

Cordura Publications
Mitchell Manuals, Inc.
Post Office Box 26260
San Diego, California 92126

Motor's Auto Repair Manual
Hearst Company
250 W. 55th Street
New York, New York 10019

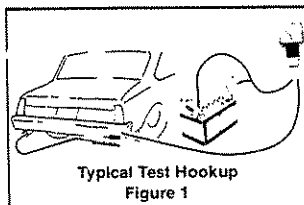
IMPORTANT

CONSULT THE VEHICLE MANUAL FOR SPECIFIC TUNE-UP INFORMATION AND TEST PROCEDURES. ALWAYS FOLLOW THE MANUFACTURER'S SPECIFICATIONS AND TEST PROCEDURES FOR ADJUSTING DWELL ANGLE AND IDLE SPEED, ESPECIALLY ON VEHICLES WITH MODERN ELECTRONIC IGNITION AND EMISSION CONTROLS. DO NOT ATTEMPT TO SERVICE A VEHICLE WITHOUT THE MANUFACTURER'S INSTRUCTIONS AND SPECIFICATIONS.

DESCRIPTION

The EXHAUST GAS ANALYZER is an easy to operate instrument that has been designed for fast and accurate testing of spark ignited engines. It must be powered by a twelve (12) volt battery.

This instrument is ideally suited for checking combustion efficiency and emission levels on non-catalytic converter equipped engines. Note that this instrument will produce readings for converter equipped engines, however, due to the catalytic action of the converter, these readings will not reflect true engine emission levels, but rather tailpipe emission levels, unless the exhaust gas is sampled ahead of the catalytic converter in the exhaust stream.



CAUTIONS ON ANALYZER USE

1. This analyzer should not be used for testing diesel engines.
2. Any adjustments to the vehicle must be done in accordance with the vehicle manufacturer's instructions and within appropriate federal and state guidelines.
3. Do not use this analyzer in an unprotected (rain, snow, etc.) environment or in freezing conditions. (Water vapor may freeze in the gas sampling system and restrict gas flow.)
4. This analyzer is not approved for use on vehicles which are operated in confined or poorly ventilated areas (indoors).

EXHAUST GAS ANALYZER HOOKUP AND OPERATION

See Figure 1.

1. Check the mechanical zero adjustment of the meter. With the instrument's battery leads disconnected, re-adjust the meter

pointer to the SET position (center scale), on the top scale of the meter, if necessary using the plastic slotted screw on the meter bezel.

2. Connect the RED clip to the positive (+) battery terminal
3. Connect the BLACK clip to the negative (-) battery terminal or a clean secure engine ground.

4. Secure the sensing unit to the vehicle bumper using the attached magnet and strap. For accurate exhaust gas sampling it is important that the sensing unit and hose remain in a horizontal position, and that they are at about the same level as the vehicle's tailpipe. On those vehicles which do not have a convenient location to attach the sensing unit, lay the sensing unit on a flat, protected surface. Note that the sensing unit is a delicate device which must be handled carefully to avoid damage. Do not drop or otherwise abuse it.

5. Unless specifically instructed otherwise by the vehicle service manual, disconnect the air injection system (air pump or pulseair). (Leaving this system connected will alter the true exhaust readings.)

6. Fully warm the engine under test (upper radiator hose is hot) and adjust the set control as described in step 7 before inserting the sample probe into the tailpipe. (Cold engines produce excessive pollutants and water vapor which can contaminate the sensing unit quickly.)

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HOOKUP AND OPERATION (continued)

7. Using the SET CONTROL on the instrument, adjust the meter pointer to the SET position (center scale).
8. Insert the sample probe into the tailpipe. On vehicles with complete dual exhaust systems, insert the probe in the system which does not contain the manifold heat control valve.
9. Allow the reading on the analyzer to stabilize and compare it to the manufacturer's specifications for the engine under test. If manufacturer's specifications are not available, see the "TYPICAL TAILPIPE EMISSION LIMIT GUIDELINES (AUTOMOBILES)" table below. If the reading indicates that adjustment is required, proceed to the "CARBURETOR ADJUSTMENT" section below.

TYPICAL TAILPIPE EMISSION LIMIT GUIDELINES (AUTOMOBILES)

Use these guidelines only if manufacturer's specifications are not available.

YEAR	% CO	Approximate Equivalent Air/Fuel Ratio (Gasoline)
1968 — 1969	Below 4%	Higher than 13.1 : 1
1970 — 1974	Below 3.5%	Higher than 13.3 : 1
1975 — 1978	Below 2%	Higher than 13.8 : 1
1979	Below 2%	Higher than 13.8 : 1
1980	Below 1.2%	Higher than 14.1 : 1
1981 & Later: (Idle)	Below 1.2%	Higher than 14.1 : 1
(2500 RPM)	Below 1%	Higher than 14.2 : 1

PERCENT CO TO AIR/FUEL RATIO CONVERSION

% CO	Approximate equivalent (Gasoline)	Approximate equivalent (Propane)	Approximate equivalent Air/Fuel Ratio (Butane)
8.5%	11.3 : 1	12.5 : 1	12.1 : 1
8.0%	11.5 : 1	12.7 : 1	12.3 : 1
7.5%	11.7 : 1	12.9 : 1	12.4 : 1
7.0%	11.9 : 1	13.1 : 1	12.6 : 1
6.5%	12.1 : 1	13.3 : 1	12.8 : 1
6.0%	12.3 : 1	13.5 : 1	13.0 : 1
5.5%	12.5 : 1	13.7 : 1	13.2 : 1
5.0%	12.8 : 1	13.9 : 1	13.4 : 1
4.5%	12.9 : 1	14.2 : 1	13.6 : 1
4.0%	13.1 : 1	14.4 : 1	13.8 : 1
3.5%	13.4 : 1	14.5 : 1	14.0 : 1
3.0%	13.5 : 1	14.6 : 1	14.2 : 1
2.5%	13.6 : 1	14.8 : 1	14.4 : 1
2.0%	13.8 : 1	15.0 : 1	14.5 : 1
1.5%	14.0 : 1	15.2 : 1	14.9 : 1
1.0%	14.2 : 1	15.3 : 1	15.1 : 1
.5%	14.4 : 1	15.5 : 1	15.3 : 1

AIR/FUEL RATIO

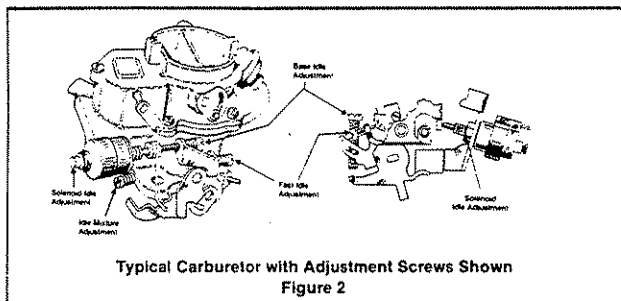
At the center of all emission control techniques is the precise control of the air/fuel ratio. By closely controlling the air/fuel ratio the engine will burn the mixture efficiently. The "ideal" or **stoichiometric** mixture is 14.7 pounds of air to 1 pound of fuel for gasoline engines (commonly expressed as 14.7 to 1).

CARBURETOR ADJUSTMENT

See Figure 2.

NOTE

All carburetor adjustments must follow manufacturer's instructions and specifications and also fall within any emission guidelines established by federal and/or state governments for the model year vehicle under test.



NOTE

When performing mixture adjustment on the fuel system (carburetor), turn the adjustment screws no more than one sixteenth (1/16) to one eighth (1/8) of a turn at a time, allowing the meter to stabilize between adjustments.

PRELIMINARY STEPS

1. Follow the appropriate vehicle service manual procedures for removing idle mixture screw limiter cap(s) or hardened plug(s) to gain access to the mixture adjustment screw(s).
2. In the case of a multibarrel carburetor (two mixture adjustment screws), lightly seat the screws and then back them out an equal number of turns. This balances the carburetor. A typical starting point

is 1-1/2 to 4 turns counterclockwise from a lightly seated position. Your vehicle service manual may recommend a specific starting point, in which case that specification should be used.

MIXTURE ADJUSTMENT

1. Read and follow EXHAUST GAS ANALYZER HOOKUP AND OPERATION through PRELIMINARY STEPS as listed above.
2. Set the curb idle speed as specified by the vehicle emission control label or vehicle service manual.
3. With the engine fully warmed and operating at curb idle, observe the reading on the analyzer. If the mixture is rich, turn the mixture screw(s) clockwise to lean it; if the mixture is lean, turn the mixture screws counterclockwise to en-

MIXTURE ADJUSTMENT (continued)

richen it. In the case of multibarrel carburetors, turn the mixture screws equally so that carburetor balance is maintained. Adjust the mixture for the proper air/fuel ratio. It may be necessary to readjust the curb idle speed during the mixture adjustment procedure. Check all idle adjustments when mixture adjustment is complete and reset as necessary.

NOTE

A lean misfire results in unburned fuel which this instrument will interpret as a rich mixture. In other words, if during adjustment or test, the carburetor is leaned to the point of lean misfire, the meter will stop climbing up scale (lean) and drop back to, or indicate, a rich mixture.

4. When all adjustments are complete, be sure to reconnect the air injection system, and any other systems or devices disconnected for test purposes.

CARBURETOR MIXTURE TEST (HIGH RPM)

With the vehicle in neutral or park, run the engine at 2000 to 2500 RPM and observe the reading. The reading should remain reasonably close to the reading obtained at idle. Depending on the model year of the vehicle, and carburetor calibration, the air/fuel ratio may be the same, slightly richer, or slightly leaner than the mixture obtained at idle, however, there should not be extreme variations between idle and high speed readings. Extreme variations indicate a need for carburetor service.

ACCELERATOR PUMP TEST

Adjust the engine speed to approximately 1000 RPM and allow the reading on the analyzer to stabilize. Snap accelerate the engine while observing the meter. The reading should show enrichment and then return to its original level. If no significant increase is observed in the reading and/or the vehicle stumbles badly during heavy acceleration, it indicates that the accelerator pump is not operating correctly and the carburetor should be serviced accordingly. Readjust engine speed when the test is complete.

REPLACEMENT PARTS

PART NO.	DESCRIPTION
..... 01 3683 Sample Probe & Hose Assembly (Sensor NOT included.)
..... 60 3739 Set Control Knob
..... 01 7341 Meter Bezel
..... 400-1406 Carrying Case
..... 400-1408 Carrying Case Foam Rubber Insert (2 required)
..... 2-1991 Instruction Manual