

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-132
Relating to Exemptions under Section 27156
of the Vehicle Code

FUELTRONICS CORPORATION
FUELTRON FUEL VAPORIZER

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Fueltron fuel vaporizer manufactured by Fueltronics Corporation, of 9101 Greenwood Avenue, Niles, Illinois 60648, has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1983 and older model-year carbureted gasoline power motor vehicles.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE FUELTRON FUEL VAPORIZER.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 20th day of June, 1983.



K. D. Drachand, Chief
Mobile Source Control Division

State of California
AIR RESOURCES BOARD

EVALUATION OF FUELTRONICS CORPORATION'S
FUELTRON FUEL VAPORIZER FOR EXEMPTION FROM
THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN
ACCORDANCE WITH SECTION 2222, TITLE 13 OF
THE CALIFORNIA ADMINISTRATIVE CODE.

June 10, 1983

Issue Date: June 10, 1983

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THE CALIFORNIA ADMINISTRATIVE CODE.

by

MOBILE SOURCE CONTROL DIVISION

State of California
AIR RESOURCES BOARD
9528 Telstar Avenue
El Monte, CA 91731

(This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.)

SUMMARY

Fueltronics Corporation (FC), of 9101 Greenwood Avenue, Niles, Illinois 60648, has applied for an exemption from the prohibitions in Vehicle Code Section 27156 of their "Fueltron" fuel vaporizer. The exemption is sought for 1983 and older model-year carbureted gasoline-powered motor vehicles.

FC has submitted data of comparative (without and with the fuel vaporizer installed on two 1983 test vehicles) cold-start CVS-75 and hot-start Highway Fuel Economy tests performed at an independent laboratory. In addition, confirmatory tests were conducted on a 1983 test vehicle at the Air Resources Board (ARB) Haagen-Smit Laboratory in El Monte, California.

In addition to the emission tests data, FC also submitted durability bench test results to assure that the device will not dislocate or create an air leak in the manifold when installed in an engine.

Emission test results submitted by FC and performed by the ARB test facility indicate that the fuel vaporizer will not significantly affect emission from vehicles for which exemption is requested, and bench test results submitted by FC show that the device will not dislocate or create an air leak in the manifold during vehicle operation.

Based on the above, the staff recommends that FC be granted an exemption as requested and that Executive Order D-132 be adopted.

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I. INTRODUCTION

Fueltronics Corporation (FC), of 9101 Greenwood Avenue, Niles, Illinois 60648, has applied for an exemption from the prohibitions in Vehicle Code Section 27156 of their "Fueltron" fuel vaporizer. The exemption is sought for 1983 and older model-year carbureted gasoline-powered motor vehicles.

FC has submitted data of comparative (without and with the fuel vaporizer installed on two test vehicles) cold-start CVS-75 and hot-start Highway Fuel Economy tests performed at an independent laboratory. Their tests were performed on a 1983 four-cylinder Dodge 400 and a 1983 eight-cylinder Chevrolet Camaro. Confirmatory tests were conducted on a 1983 four-cylinder Dodge Omni at the Air Resources Board (ARB) Haagen-Smit Laboratory in El Monte, California.

In addition to the emission test data, FC also submitted durability bench test results to assure that the device will not dislocate or create an air leak in the manifold when installed in an engine.

II. CONCLUSIONS

Emission test results submitted by FC and performed by the ARB test facility indicate that the fuel vaporizer will not significantly affect emissions from vehicles for which exemption is requested when installed in accordance with FC's instructions.

Bench test results submitted by FC show that the device will not dislocate or create an air leak in the manifold during vehicle operation.

III. RECOMMENDATIONS

Based on the above conclusions, the staff recommends that FC be granted an exemption as requested and that Executive Order D-132 be adopted.

IV. FUELTRON DESCRIPTION AND OPERATION

The purpose of the Fueltron fuel vaporizer, according to FC, is to vaporize fuel as it enters the intake manifold past the carburetor.

The major components of the Fueltron device are a transistorized ultrasonic amplifier and a ceramic transducer. One transducer is required for one-barrel carburetors and two transducers for two- and four-barrel carburetors. The components are packaged with installation hardware and instructions and sold as a kit.

Each transducer is suspended by four metal wires inside the intake manifold directly below the throttle valve. There are two sizes of transducers (1 1/8" and 1 3/8" diameter) for the different manifold opening sizes. FC recommends that the top face of the transducer(s) be positioned at least 1/4 of transducer diameter size beneath the ceiling of the manifold interior chamber, in order to provide proper air/fuel flow to the engine.

The transducer is excited to vibrate at a rate of 1.3 MHz by the transistorized ultrasonic amplifier. The amplifier is linked to a fused ignition terminal for its 12 volt power source; thus the amplifier operates only when the ignition is "ON".

FC claims that fuel droplets coming in contact with the transducer(s) will vaporize instantaneously.

V. DEVICE EVALUATION

Evaluation of the Fueltron fuel vaporizer consisted of comparative exhaust emissions tests on three typical 1983 vehicles (two by FC and one by ARB) and durability bench tests (by FC) for manifold air leaks and transducer dislocation during operation.

A. EMISSIONS

Two 1983 vehicles were used by FC for emissions testing. Their tests were performed by the Automobile Club of Southern California in Los Angeles, California. In addition, another 1983 vehicle was used by the ARB for performing confirmatory tests at the ARB Haagen-Smit Laboratory in El Monte, California. A description the vehicles is shown in the Appendices.

Testing by both laboratories consisted of comparative (without and with the device installed on the test vehicles) cold-start CVS-75 and hot-start Highway Fuel Economy tests for each vehicle.

The emissions test data are tabulated in the Appendices.

B. DURABILITY

FC submitted durability bench test data to demonstrate that the fuel vaporizer will not create an air leak or dislocate in the manifold during operation.

A summary of the test and its results is shown in the Appendices.

VI. DISCUSSION

Based on the emissions test data submitted by FC and generated by the ARB test facility, the staff concluded that the "Fueltron" fuel vaporizer does not adversely affect exhaust emissions from motor vehicles. The staff also noted that the use of the device does not affect the test vehicle's fuel economy.

FC's durability bench test data indicate that when the Fueltron device is installed in accordance with the manufacturer's instructions, no air leak or dislocation of the transducer(s) in the intake manifold will occur during engine operation.

The above results satisfy the ARB's requirements for granting Fueltronics Corporation an exemption for their "Fueltron" fuel vaporizer.

APPENDICES

TABLE 1

Description of Test Vehicles

	<u>VEH. 1</u>	<u>VEH. 2</u>	<u>VEH. 3</u>
Model-Year:	1983	1983	1983
Vehicle Manufacturer:	Chrysler	GM	Chrysler
Vehicle Model:	Dodge 400	Camaro	Omni
Engine Size:	135 CID	350 CID	135 CID
Emission Controls:	TWC+CL	TWC+CL	TWC+CL
Fueltron Transducer Diameter	1 1/8"	1 3/8"	1 1/8"

TWC: three-way catalyst.

CL: closed loop carburetion system.

TABLE 2

Applicant's Exhaust Emission Test Data
Evaluation of Fueltronics Corporation's "Fueltron"
1983 Dodge 400/ 1983 Chevrolet Camaro

<u>Test</u>	<u>Exhaust Emissions (g/mi)</u>			<u>Fuel Economy (mpg)</u>	
	<u>HC</u>	<u>CO</u>	<u>NOx</u>	<u>Urban</u>	<u>Hwy</u>
Dodge Baseline	0.52	3.5	0.9	21.7	31.0
Dodge Device	0.49	2.8	1.0	21.6	31.5
Camaro Baseline	0.38	8.1	0.4	16.1	27.5
Camaro Device	0.37	5.7	0.4	16.4	27.7

TABLE 3

ARB's Exhaust Emission Test Data
Evaluation of Fueltronics Corporation's "Fueltron"
1983 Dodge Omni

<u>Test</u>	<u>Exhaust Emissions (g/mi)</u>			<u>Fuel Economy (mpg)</u>	
	<u>HC</u>	<u>CO</u>	<u>NOx</u>	<u>Urban</u>	<u>Hwy</u>
Dodge Baseline	0.26	1.5	0.8	22.2	30.2
Dodge Baseline	0.23	1.8	0.8	22.3	30.3
Average	<u>0.25</u>	<u>1.7</u>	<u>0.8</u>	<u>22.3</u>	<u>30.3</u>
Dodge Device	0.28	2.3	0.8	22.5	30.0



FUELTRONICS CORPORATION

9101 GREENWOOD AVENUE
NILES, ILLINOIS 60648

312-298-8200

February 23, 1983

Mr. Robert Weis, Chief
Certification and Compliance Branch
California Air Resources Board
Haagen-Smit Laboratory
9528 Telstar Avenue
El Monte, California 91731

Subject: Fueltron Exemption - Reference No. A-82-458

Dear Mr. Weis:

Your letter of January 21, 1983 expresses two concerns regarding this device. First are the emission values and secondly the possibility of an air leak and dislocation of the parts in the manifold.

Since the tests to prove the second concern, are less costly than the emission tests, we thought it best to seek approval on this item prior to contracting for the emissions testing.

I discussed this approach with Mr. John Chao and he agreed that it would be more prudent to have CARB's approval on the air leak/disclocation problem prior to the emission testing.

The attached data sheets will detail the type of testing conducted to prove the durability of the Fueltron. I should point out here that we have had two full years of field testing on a fleet of 50 vehicles with over 1,500,000 miles accumulated and in addition, there are approximately 2500 units already sold and installed in various states across the US. (except California)

With all this field data we have never experienced an air leak problem nor have any components become dislocated to interfere with engine operation or damage other engine parts.

We respectfully request expeditious approval on this portion of the test so that we may proceed to the emission testing in California.

Sincerely,

Edward J. Svoboda
Consulting Engineer
Fueltronics Corporation

EJS/mh
encls. ..

FUELTRON MANIFOLD AIR LEAK TEST

ENGINE TEST

A gasket was drilled according to the Fueltron instruction sheet and installed on a GM 305 CID engine with 2V carburetor.

A #54 drill (.055" DIA) was used to drill the gasket. The wire size is .051" DIA.

The engine was started and brought to operating temperature after which a curb idle condition was set at 20" Hg. The holes were plugged with the transducer wire.

The wires (2) were removed one at a time and manifold vacuum was recorded after removal of each wire.

Results:

CONDITION	MAN. VAC. (IN. Hg)
Wires in	20"
One wire out	19.9"
Two wires out	19.8"

TOTAL VACUUM LOSS 0.2" Hg.

No discernible difference in engine operation was noted even with both wires out of the gasket.

VACUUM CHAMBER TEST

A 5/16" thick carburetor gasket was mounted between two solid plates of aluminum. One plate was fitted with a 1/8" pipe to hose barb fitting.

The unit was connected through a flow meter to a vacuum chamber capable of vacuum to 40" Hg.

For this test the same drill was used for the gasket hole. (.055" DIA) and the same wire was used (.051" DIA). Only one hole was leak tested with the vacuum chamber.

Results:

CONDITION	CHAMBER VACUUM	FLOW
Gasket - no holes	40"	0
Gasket with hole plugged with wire	40"	0
Gasket with hole open	40"	500 CC/MIN (.0175 SCFM)

FUELTRON MANIFOLD AIR LEAK TEST

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The leakage possible with a properly sized wire hole is not measurable. With the wires completely removed from the hole, the vacuum leaks are so small that it will have no effect on the operation of the engine:

At normal road loads of 2" Hg to 15" Hg the leakage rate due to two .055" DIA to .060" DIA holes plugged with the transducer wire would be virtually undetectable.

Since a .055" DIA to .060" DIA hole would probably reach sonic velocity at 15" Hg manifold vacuum, we can assume the .0175 CFM as worse case. Therefore, if two holes were to be left open without wires, the maximum air flow through these holes would be .035 CFM.

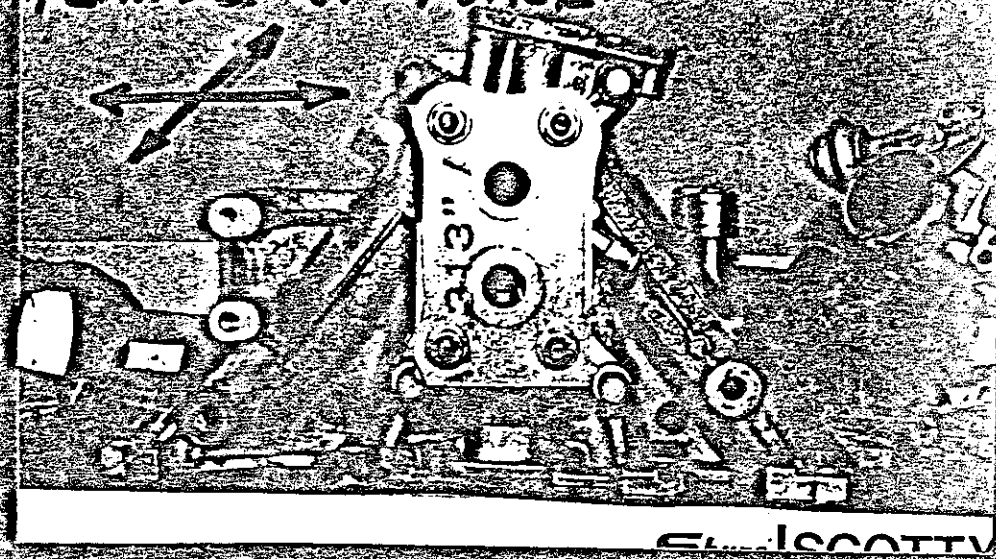
Using the 305 CID engine as an example, the idle air flow would be approximately 42 CFM at a 650 RPM idle. The worse case leakage of .035 CFM would represent only .08% of the total engine requirement and would decrease at an increasing rate as the engine approached wide open throttle operation.

It is highly unlikely that any installer would drill holes large enough to permit more than the worse case leakage above without sealing the leak as recommended in the instruction sheet.

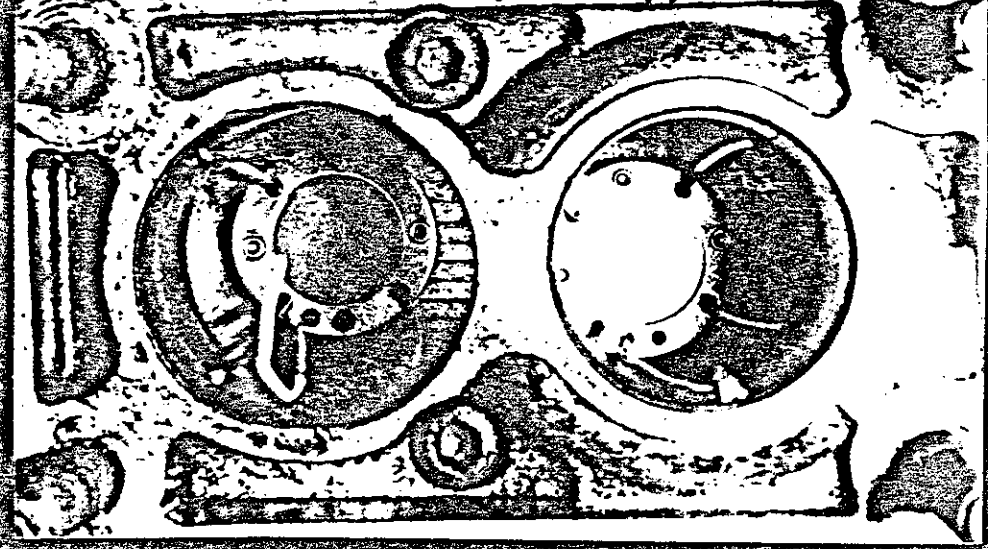


Edward J. Svoboda

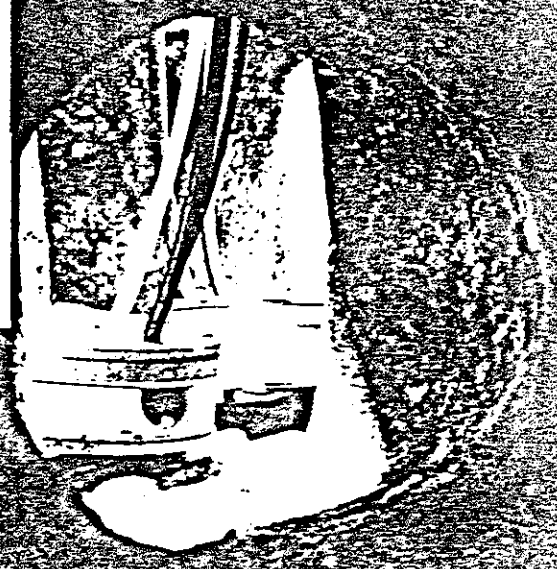
MANIFOLD IN TEST POSITION
 PLANES OF FORCE



MANIFOLD OF TRANSDUCERS
 MOUNTED IN TEST MANIFOLD



CLOSE UP OF TRANS-
 DUCERS MOUNTED IN
 TEST MANIFOLD
 LOOKING INTO MANIFOLD
 FROM THE HEAD
 MOUNTING FLANGE
 OF RUNNER #2.
 TRANSDUCERS REST
 ON MANIFOLD FLOOR



VIBRATION AND STATIC PULL TEST

TEST FACILITY - ELITE ELECTRONIC ENGINEERING CO.
DOWNERS GROVE, IL

TYPE OF TEST - VIBRATION

CYCLES - SCANNING 100 Hz - 500 Hz IN 10 MINUTE PERIODS

FORCE LEVEL - 30 G's

DIRECTION - TWO (2) PLANES

TIME - 4 HRS EACH PLANE

VEHICLE LIFE EQUIV. - 60,000 - 75,000 MILES

BACKGROUND

The first test conducted on the transducer was a static pull test with a wire attached to a support leg and a force of 100 lbs applied in an attempt to dislodge the transducer from its mounted position. The manifold used for this test was a GM V8 for a 2V carburetor. The attached photos show the unit under load with a force gage. The line of force was toward the intake opening of the head through the manifold runner. The transducer could not be dislodged with 100 lbs of force. This work was done in-house.

The second test was done on a shaker table at Elite Electronic Engineering Company. The attached photos show the unit as tested as well as the location of the transducers in the manifold.

Because of the extremely high G forces (30G's) used in this test, the weight of the manifold unit was kept to a minimum. Instead of using the original carburetor to complete the assembly, a plate to simulate the carburetor was used to hold the gasket in place.

The transducers were mounted as described in the instruction sheet, included in the package, with the support legs spring loaded against the manifold wall and cut to an appropriate length. The electrical wires were not supported for this test since they would, in actual practice, be fixed at the outboard end and could not move into the induction system even if they were to break off at the transducer.

Results:

After 8 hours at 30 G's the transducers remained in the exact position that they were mounted in prior to the test. One electrical wire broke off at the transducer as we expected since they were not supported at the gasket. The spring wire support legs were slightly embedded into

VIBRATION AND STATIC PULL TEST

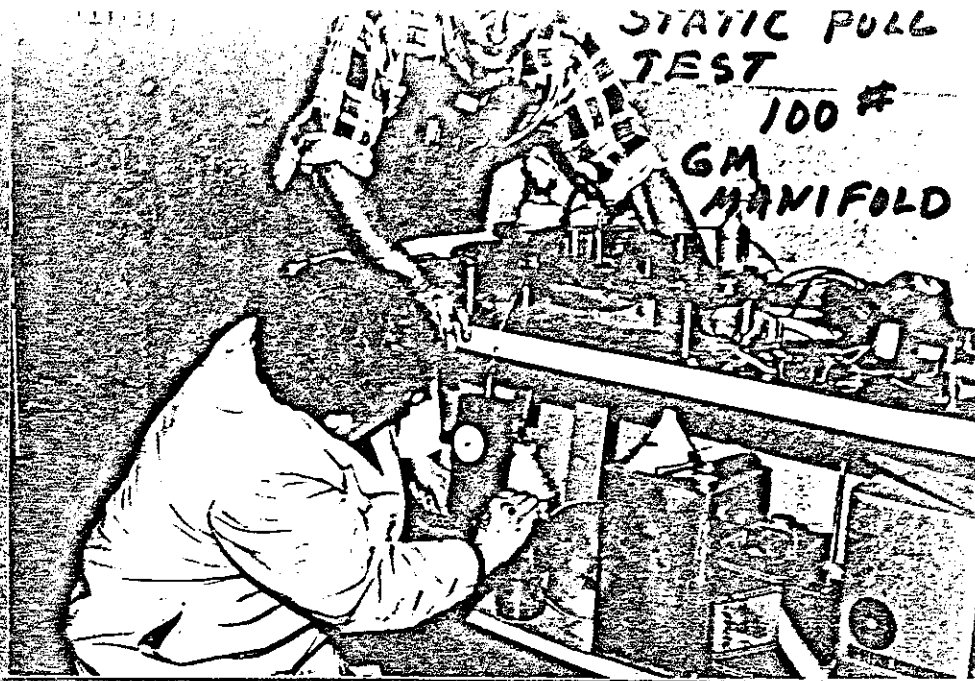
Page 2.

the manifold wall due to the impinging force caused by the vibration and the manifold floor was slightly marked by action of the transducers against it. Overall, the transducers were more firmly fixed at the end of the test than they were initially, due to this impinging action.

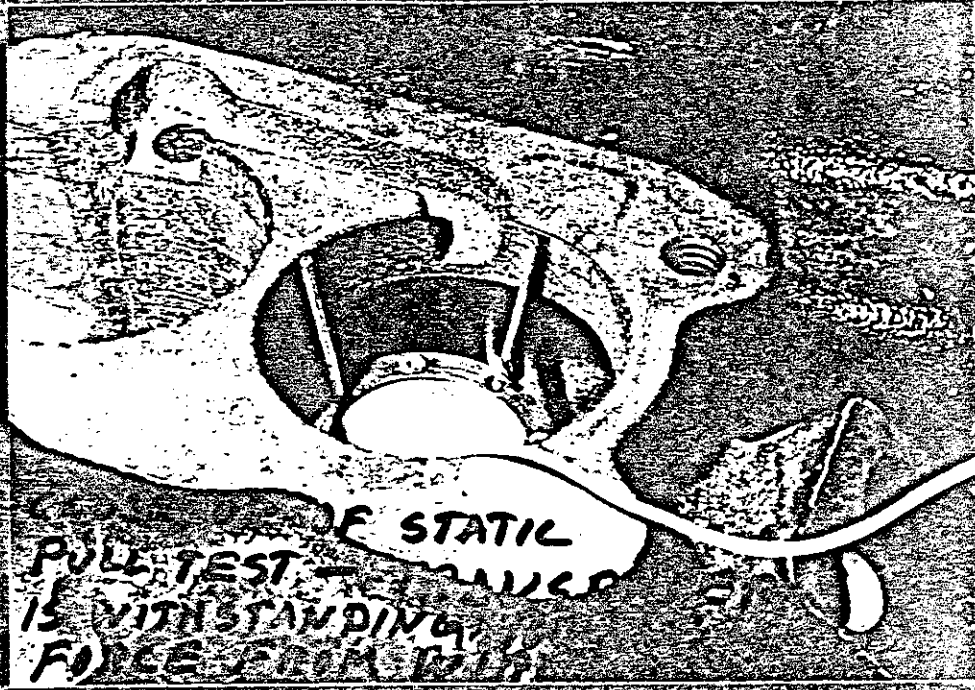
We estimate this test to be equivalent to 60,000 to 75,000 miles of actual vehicle use and it is our opinion from an engineering evaluation standpoint that the unit is fail safe for the life of the vehicle. This opinion is further supported by the results from the test fleet of 50 vehicles which have accumulated over 1,500,000 miles over the past two years without mechanical failure.



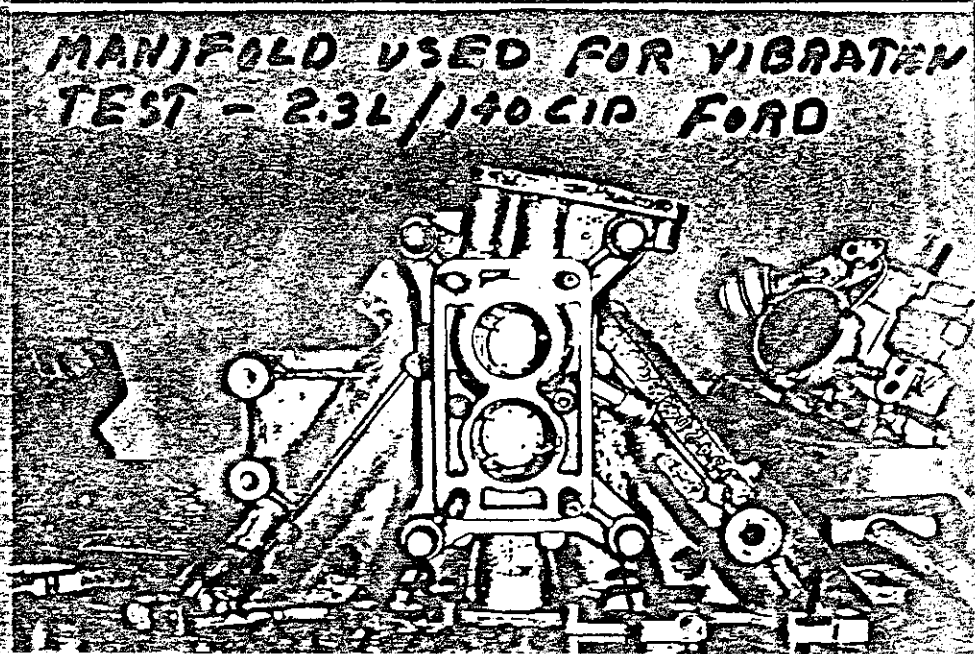
Edward J. Svoboda



STATIC PULL
TEST
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GM
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STATIC
PULL TEST - MANIFOLD
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MANIFOLD USED FOR VIBRATION
TEST - 2.3L/140 CID FORD