

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-91
Relating to Exemptions under Section 27156
of the Vehicle Code

WAAG ENTERPRISES
W/A WAAG INJECTION SYSTEM

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 W/A Waag Injection System manufactured by Waag Enterprises 3110 Broadview Rd., Cleveland, Ohio 44109, has been found to not 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 1979 and older model-year vehicles equipped with conventional gasoline burning engines except for the following:

- a) Diesel Engines
- b) Rotary Engines
- c) Fuel Injection Engines
- d) All Four Cylinder Engines

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 components of the kit as individual devices.

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 W/A WAAG INJECTION SYSTEM.

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.

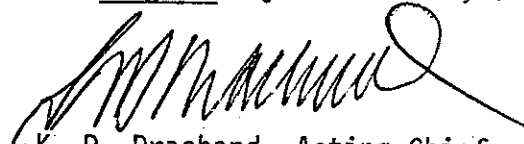
Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

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 18th day of October, 1979.


K. D. Drachand, Acting Chief
Mobile Source Control Division

State of California
Air Resources Board

August 14, 1979

Evaluation of Waag Enterprises "W/A Waag Injection System"
in Accordance with Section 2222, Title 13
of the California Administrative Code

I. Introduction

Waag Enterprises 3110 Broadview Rd., Cleveland, Ohio 44109 has applied for an exemption from Section 27156 of the California Vehicle Code for the "W/A Waag Injection System" device. The applicant intends to market the device for installation on 1979 and older model year vehicles with conventional gasoline powered internal combustion engines. The W/A Waag System is not compatible with rotary engines, fuel injected engines, diesel powered engines and four cylinder engines.

II. System Description and Function

The W/A Waag Injection System is an aftermarket add-on device which operates on the principle of injecting a supplementary fuel (50% alcohol, 50% water, and 1/2 ounce of rust inhibitor) into the venturi(s) of the carburetor. The W/A Waag Injection System works on the concept that the supplementary fuel will remove carbon build up in the cylinders.

The W/A Waag Injection System consists of a double chambered single diaphragm pump in which one chamber is operated by manifold vacuum, and the other chamber pumps the supplementary fuel through aircraft type hoses to an injector nozzle located above the venturi(s) of the

carburetor. The pump has a solenoid connected on the output of the pump which is normally closed. When the ignition is turned on the solenoid opens allowing the supplementary fluid to flow to the injector nozzle. The solenoid keeps the fluid from siphoning into the carburetor when the engine is turned off. The reservoir for the supplementary fuel supply has a 1 gallon (3.785L) capacity.

In operation, the supplementary fuel is pumped to the injector nozzle when manifold vacuum is 10" Hg or less. When manifold vacuum is above 10" Hg the diaphragm and the spring are compressed allowing the upper chamber to fill with supplementary fuel from the reservoir. When the vacuum is less than 10" Hg the spring forces the diaphragm upward forcing the supplementary fuel to the injector nozzle. The filter in the pump inlet creates enough back pressure so that the fluid will flow out to the injector nozzle.

The injector nozzle has a jet that screws into the end of the metal tube that is inserted into the supplementary fuel supply hose from the pump. The jet is installed in this manner so that the jet will not fall into the venturi(s) of the carburetor if the jet was to vibrate loose.

In order for the W/A Waag Injector System to be compatible with different displacement engines the device has three diaphragm springs with different tensions and two jet orifices to match each application. The springs are color coded in order to identify the different spring tensions. The jet orifices are 0.020 inch (0.508 mm) and 0.022 inch (0.550 mm).

When device is installed, the vehicle is driven 1000 miles (or when four gallons of supplementary fuel are consumed) without changing OEM tune-up specifications. After the mileage is accumulated, the OEM carburetor main metering jet(s) are reduced .003 inch (.0762MM) and the OEM basic ignition timing is advanced 1-4 degrees from the OEM setting.

The applicant has an optional procedure in lieu of the 1000 mile accumulation (see Attachment I). The procedure is to inject an oil based cleaner (Val-Do #1) into each cylinder, after the spark plugs have been removed, and pour 8 oz. (236ML) down the venturi(s) of the carburetor. The vehicle is then driven to accumulate 30 miles (48.2 km) after which the carburetor jet(s) are changed and the basic timing is advanced.

III. System Evaluation

A. Applicant's Data (See Table 1)

The applicant submitted CVS 75 and HFET test data prepared by Olson Engineering Inc. of Huntington Beach, CA. The test vehicle was a 1973 Plymouth Duster with a 225 CID six cylinder engine and a three speed automatic transmission. The data indicated that the vehicle decreased the fuel consumption rate by 25.25% on the CVS 75 test and 18.42% on the HFET. The applicant chose to use the alternate method, Val-Do #1, for the carbon clean-out in lieu of the 1000 miles of driving with the system installed, between baseline and device tests.

Upon reviewing the test data from Olson Engineering Inc., a number of discrepancies were discovered. The inertia weight (I.W.) and road horse power (R.H.P.) settings for the vehicle tested at Olson, were 3000 lb. I.W. and 10.3 R.H.P. The correct I.W. of 3500 and R.H.P. setting of 11.2 which represents this vehicle were not used. Between the baseline and device tests the vehicle received a carburetor adjustment (1.7% CO to 1.4% CO) and new spark plugs were installed. The vehicle O.E.M. carburetor setting requires the idle CO to be adjusted to 0.5%. The technicians at Olson said that the vehicle would not run when the carburetor was adjusted to 0.5% CO.

It is the opinion of the staff that the data generated by Olson Engineering Inc. is not that of a representative vehicle and that the data is not pertinent, since the vehicle would not run when tuned to OEM specifications and needed maintenance between the baseline and device tests.

B. ARB Data (See Table 2)

Two vehicles were tested at the ARB laboratory for the W/A Waag Injection System. Both vehicles were prechecked and set to O.E.M. specifications.

All emission control devices were functionally checked and/or repaired before baseline testing. The device was installed between baseline and device tests. Val-Do #1 treatment was

used instead of the 1000 miles of driving with the device installed. No engine parameters (except timing as per device instructions) were changed between baseline and device tests.

The results of the CVS-75 and HFET are listed in Table 2.

The data of the CVS 75's and HFET's, reflect that the CO and NOx were lowered due to the change of the carburetor main jet(s) and the injection of the supplementary fuel. The HC level increased slightly from the baseline CVS 75 test data.

IV. Evaluation and Recommendation

The Val-Do #1 treatment has several objectionable qualities. A V-8 engine would require approximately 30 ounces (886 ML) of the Val-Do #1 cleanser to remove the carbon inside the engine. Since the cleanser has an oil base, this could foul the catalytic converter and reduce its effectiveness for a period of time.

The clean out procedure requires 2 ounces (59 ML), to be injected into each cylinder, the spark plugs reinstalled and the vehicle started. This amount of fluid in the cylinders could cause hydrostatic lock in which severe damage can be caused to the pistons, connecting rods, head gasket, and starter. The clean out procedure takes between 1.0 to 2.0 hours to perform. With labor rates averaging \$25 an hour, the customer would have an additional expense when using Val-Do #1 treatment. Waag Enterprises has changed the alternate method of removing the carbon deposits (see Attachment II), Val-Do #1, to read:

"Drive a minimum of 1000 miles to remove heavy carbon deposits which are wasting gasoline from your engine. There are no alternate or substitute methods of completing this process properly. An oil clean-out, Val-Do, is not recommended and may not be used in a car with a catalytic converter".

Waag Enterprises also stated in the letter to the ARB that "Val-Do will not be available in California, or anywhere else for that matter".

The applicant made claims that the W/A Waag Injection System will guarantee 25% better fuel economy. The test data generated by the ARB does not substantiate these claims. The applicant was concerned that the ARB test data did not indicate 25% better fuel economy as did the test data from Olson Engineering. The applicant was informed of the discrepancies that the ARB staff had found in the test data prepared by Olson Engineering. Therefore, the applicant decided to eliminate all mileage claims that would be used in any promotional or advertising materials for the purpose of selling the W/A Waag Injection System in the State of California (see Attachment III).

Furthermore, the applicant felt that the Val-Do #1 treatment might have affected the fuel economy data. The original application from Waag Enterprises did not include the Val-Do #1 treatment. This treatment was implemented by Waag Enterprises in order to reduce the cost and time that the 1000 miles of driving would incur.

The staff has recommended that Waag Enterprises test, under laboratory conditions, additional vehicles using the 1000 miles of driving in lieu of the Val-Do #1 treatment, to substantiate the effects of the Val-Do #1 treatment.

The emission and fuel economy results generated by the ARB in testing the W/A Waag Injection System will be on file until new data is submitted by Waag Enterprises.

The staff is of the opinion that W/A Waag Injection System, a supplementary fuel injection system, will have little or no influence on vehicular emissions or fuel economy in its present form. The percent increase in fuel economy and HC emission may be considered to be within the limits of test variations.

V. Conclusion

Based on this evaluation the staff is of the opinion that the installation of the W/A Waag Injection System on all vehicles other than the ones mentioned in the Introduction (Part I) will not cause any significant additional emissions, and therefore, recommends an exemption be granted for the device from the prohibitions of the Motor Vehicle Code Section 27156.

Table 1

Lab: OLSON ENGINEERING
 Device: W/A WAAG INJECTION SYSTEM

LAB. NAME	TEST DATE	YEAR/MODEL/I.W.+	TEST/ TYPE*	gm/mile				MPG
				CO	NOx	CO ₂	HC	
Olson	7/5/79	73/Ply/3000	75 CVS/B	35.54	2.33	484.10	2.34	16.20
Olson	7/6/79	73/Ply/3000++	75 CVS/D	15.01	2.31	404.87	2.79	20.29
Olson		+increase/-decrease from Baseline		-57.77%	-.86%		+19.23%	+25.25%
Olson	7/5/79	73 Ply/3000	Hwy/B	6.40	2.25	383.83	2.25	22.42
Olson	7/6/79	73 Ply/3000++	Hwy/D	3.34	2.16	324.51	1.36	26.55
		+increase/-decrease from Baseline		-47.81%	-4.0%		-39.56%	+18.42%

*Baseline
 - Device

+All tests were run at 3000 lb. inertia weight and 10.3 Road Horsepower. (See argument in Section III. - System Evaluation)

++New spark plugs were installed and idle CO was adjusted between baseline and device testing.

Table 2

Lab: AIR RESOURCES BOARD
Device: W/A WAAG INJECTION SYSTEM

LAB. NAME	TEST DATE	YEAR/MODEL/I.W.	TEST/ TYPE*	gm/mile				MPG
				CO	NOx	CO ₂	HC	
ARB	8/2/79	74/AMC/4500	75 CVS/D	35.28	2.85	665.4	2.630	12.2
ARB	8/3/79	74/AMC/4500	75 CVS/M	31.66	2.95	656.9	2.429	12.4
ARB	8/7/79	74/AMC/4500	75 CVS/B	32.47	3.53	683.7	2.354	12.0
		+increase/-decrease from Baseline		+8.65%	-19.26%		+11.72%	+1.67%
ARB	8/2/79	74/AMC/4500	Hwy/D	4.32	2.32	524.1	0.892	16.6
ARB	8/3/79	74/AMC/4500	Hwy/M	4.11	2.15	514.6	0.793	16.9
ARB	8/7/79	74/AMC/4500	Hwy/B	4.62	3.59	517.9	0.829	16.8
		+increase/-decrease from Baseline		-6.49%	-35.38%		+7.60%	-1.19%
ARB	8/15/79	73/Ply/3500	75 CVS/B	17.39	2.73	510.5	2.733	16.2
ARB	8/8/79	Avg of 8/15/79 & 8/8/79 73/Ply/3500	75 CVS/B	(18.16) 18.93	(2.74) 2.75	(514.95) 519.4	(2.723) 2.712	(16.05) 15.9
ARB	8/10/79	73/Ply/3500	75 CVS/D	11.09	2.27	514.3	2.820	16.4
ARB	8/14/79	73/Ply/3500	75 CVS/M	10.26	2.32	557.4	2.665	15.3
		+increase/-decrease from Baseline		-38.93%	-17.15%		+3.562%	+2.18%
ARB	8/10/79	+73/PLY/3500	Hwy/D	4.35	1.91	406.7	1.309	21.2
ARB	8/14/79	+73/PLY/3500	Hwy/M	4.67	2.03	432.8	1.549	19.9
ARB	8/15/79	+73/PLY/3500	Hwy/B	10.29	3.16	403.9	1.533	20.9
		+increase/-decrease from Baseline		-57.72%	-39.56%		-14.61%	+1.44%

*B = Baseline

D = Device

M = W/O device w/modifications (to simulate device w/o supplementary fuel)

WAAG-INJECTION® SYSTEM

EXECUTIVE OFFICES:
Suite 1220 • Colony Plaza
6451 N. Federal Highway
Ft. Lauderdale, FL 33308

INSTALLATION INSTRUCTIONS

SUPPLEMENT #1

PART C - 1000 MILE ADJUSTMENT

#21 AN OPTIONAL PROCEDURE

A ... Instead of driving the 1000 miles before changing the jets, you may apply the following procedure:

"VAL-DO #1", made by Val-Do Products Division, Engineered Lubricants System Corp. Int'l., Tampa, Florida, may be used to immediately "flush out" and completely clean the engine in lieu of driving the 1000 miles to clean the engine.

B ... Directions for the Quick Treatment using "VAL-DO #1" are as follows:

- 1 ... Start the engine ... run it at a fast idle until the normal operating temperature is reached.
- 2 ... Attach the vacuum gauge ... take a reading and record same.
- 3 ... Leave the gauge on the unit.
- 4 ... Now take compression gauge test readings and record them.
- 5 ... While the plugs are out ... squirt about two ounces or so of "VAL-DO #1" in each plug cylinder opening.

CAUTION: Be sure to install plugs hand tight enough so the motor can breathe, but not too loose to blow out. Let it set for ten minutes, then remove the air intake cleaner.

- 6 ... Start the engine and hold at a fast idle.
- 7 ... INSTANTLY start pouring a pint or more of "VAL-DO #1" through the carburetor ... fast enough to choke down the engine to stop, about the time the "VAL-DO #1" is all consumed
- 8 ... Let the engine set about 10 or 15 minutes.
- 9 ... Start the engine and run another small amount of "VAL-DO #1" through the carburetor allowing it to run long enough to clear excessive vapor and smoke.

INSTALLATION INSTRUCTIONS PAGE 2

- 10 ... Now pull the plugs and take another compression reading.
 - 11 ... Set the plug gap properly and tighten completely.
 - 12 ... Start the engine and check the vacuum gauge reading and the compression gauge reading with the first readings. If there is a small increase accomplished, then the engine is smoothing out and it is OK.
 - 13 ... If no increase is noticed from this first testing, another treatment may be necessary.
 - 14 ... Any malfunction of the engine could have been caused from carbon or varnish.
 - 15 ... Add 1 oz to 1½ oz of "VAL-DO #1" per gallon of gas (use approximately 5 gallons of gas).
 - 16 ... It is suggested that the car be driven under traffic conditions for at least 30 miles.
 - 17 ... The car should then run, either idling or moving to use up the balance of the 5 gallon gas mixture.
 - 18 ... You may then repeat #10, 11 & 12 if you feel it is necessary.
- C ... Following the above, you may now proceed with step #22 since the above flushing and cleaning has replaced the 1000 mile clean out period.

W/A WAAG-INJECTION® SYSTEM



EXECUTIVE OFFICES:
Suite 1220 • Colony Plaza
6451 N. Federal Highway
Ft. Lauderdale, FL 33308

August 21, 1979

Mr. Ron Wagner
Air Resources Board
Haagen-Smit Laboratory
9528 Telstar Avenue
El Monte, CA 91731

Dear Mr. Wagner,

Please include the following in our Waag-Injection® Instructions.

#21. This will read -
Drive a minimum of 1000 miles to remove heavy carbon deposits which are wasting gasoline from your engine. There are no alternate or substitute methods of completing this process properly. An oil clean out, Val-Do, is not recommended and may not be used in a car with a catylitic converter.

Please be advised that the optional method of using Val-Do will not be available in California, or anywhere else for that matter.

Also, we will advise under #21 that such a system cannot be used where there is a catylitic converter.

Thank you for your assistance.

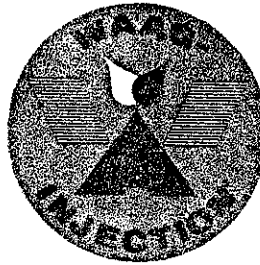
Sincerely,

Lorne A. Cameron, Jr.

Enclosure.
LAC/wc

RECEIVED
AUG 22 1979
AIR RESOURCES BOARD
HAAGEN-SMIT LABORATORY
9528 TELSTAR AVENUE
EL MONTE, CALIF. 91731

W/A WAAG-INJECTION® SYSTEM



EXECUTIVE OFFICES:

Suite 1220 • Colony Plaza
6451 N. Federal Highway
Ft. Lauderdale, FL 33308

September 18, 1979

Mr. Ron Waggoner
Air Resources Board
Haagen-Smit Laboratory
9528 Telstar Avenue
El Monte, CA 91731

Dear Mr. Waggoner,

As per our telephone discussion yesterday, it has always been our intention to operate on a positive and cooperative basis. Please be advised then, that from this date on we will make no mileage claims in any promotion or advertising material for the purpose of selling the Water/Alcohol Waag-Injection System in the State of California.

Any previously used material making mileage claims will no longer be used in California until more representative and properly controlled testing has been completed, and all parties are satisfied with the results. Such materials previously submitted include:

1. Letter to President Carter.
2. Brochure ... "Energy Conservation"
3. Performance Guarantee
4. Background - (Yellow circular)

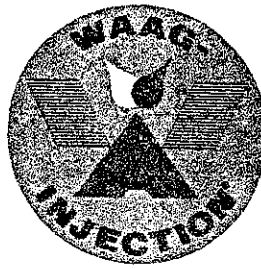
It is our hope that by following your suggestion and executing this consent, we will be granted the Exemption in California to VC 27156, since the emissions testing was satisfactory. By working together, I am sure we can maintain a long and productive relationship for both the State of California and the Waag-Injection System.

Sincerely yours,

Lorne A. Cameron, Jr.

LAC/wc

W/A WAAG-INJECTION® SYSTEM



EXECUTIVE OFFICES:
Suite 1220 • Colony Plaza
6451 N. Federal Highway
Ft. Lauderdale, FL 33308

August 17, 1979

Mr. Ron Wagner
Air Resources Board
Haagen-Smit Laboratory
9528 Telstar Avenue
El Monte, CA 91731

Dear Mr. Wagner,

We will supply the latest edition, revised August 17, 1979,
of the Water/Alcohol Waag-Injection System Installation Instructions
per the Air Resources Board request for all units that are sold
in California.

Sincerely yours,

A handwritten signature in cursive script that reads 'Lorne A. Cameron, Jr.' The signature is written in dark ink and is positioned above the printed name.

Lorne A. Cameron, Jr.

W/A WAAG-INJECTION® SYSTEM



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AUG 20 1979

AFTERMARKET PARTS AND
MODIFICATIONS EVALUATION SECTION
ENCLOSURE BEARING - YES

August 17, 1979

Mr. Ron Wagner
Air Resources Board
Haagen-Smit Laboratory
9528 Telstar Avenue
El Monte, CA 91731

Dear Mr. Wagner,

Enclosed is the additional material you have requested showing corrections and changes. We also show the numbers which are assigned to each purchaser by us.

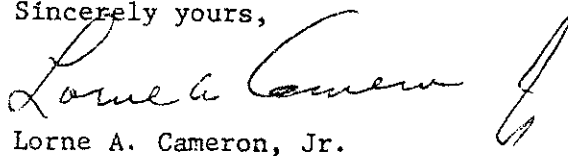
In our application of June 25, 1979 addressed to Mr. G.C. Hass, we listed under number 1, Waag-Injection Company as the manufacturer. At that time it was anticipated that the manufacturer would change to that name. This has not been done so we would like to substitute the following:

Waag Enterprises
3110 Broadview Rd.
Cleveland, OH 44109
(216) 661-1997

This is the correct location and name at this time. I am enclosing a copy of the letter showing that change.

Thank you for all your assistance in completing the testing.

Sincerely yours,



Lorne A. Cameron, Jr.

Enclosure.
LAC/wc

W/A WAAG-INJECTION® SYSTEM



EXECUTIVE OFFICES:
Suite 1220 • Colony Plaza
6451 N. Federal Highway
Ft. Lauderdale, FL 33308

SUPPLEMENT TO WATER/ALCOHOL WAAG-INJECTION SYSTEM INSTALLATION INSTRUCTIONS

RECEIVED

AUG 20 1978

PART B - INITIAL INSTALLATION CORRECTIONS

(Correction) #9 Connect the vacuum hose (G) on the single fitting at the bottom of the Injector-pump (F) and run to the intake manifold.

(Correction add) #16 At this point, check the carburetor, get the manufacturer's name and carb. number. A cross reference book will supply the existing size jets in your carburetor. Order new carburetor jets from automotive supplier, 3 sizes smaller - to be used under PART B of Installation after the initial 1000 miles of driving. If you have any problem, contact our authorized jet supplier, Walker Products, 3600 S. San Pedro, Los Angeles, CA 90011 for proper jets.

(Add) #20 Note: If engine pings with low test gasoline in the tank, add some high test or unleaded until the carbon is removed. (Approx. 1000 miles or 4 gallons of solution). After carbon is removed and by using low test gasoline, you can start advancing the ignition for maximum gas mileage. Advance the ignition in small steps over a period of time. Refer to #24.

(Correction) Note: The system is not compatible with Diesel, rotary, and fuel injection engines. In California ONLY it is NOT available for FOUR (4) cylinder engines.

(Add) Note: All cars equipped with catalytic converter must use unleaded gasoline.

(Add) #25 Should the engine require new spark plugs, replace with hotter ones, two heat ranges.

#31 Jets Springs

#6 Average Flow	Red
#4 Heavy Flow	Yellow

The red and yellow spring are interchangeable with the #6 jet. The yellow and the blue spring are interchangeable with the #4 jet.

The size of the jet and of the spring depend upon the drivers habits and the cubic inch or horsepower of the engine.

WATER/ALCOHOL WAAG-INJECTION® SYSTEM INSTALLATION INSTRUCTIONS

PART A—DIAGRAM AND PARTS—SEE PAGE 4

PART B—INITIAL INSTALLATION

RECEIVED
AUG 2 1978
6261 E 2 90Y
ONE DRIVE INFORMATION
WOLFEHART, OHIO 44090
TELEPHONE 216-271-0100

1. Check the engine for any mal-functions before installing the unit. (Scope is recommended for maximum results).
2. Check the automatic choke. If the choke remains closed too long, it must be corrected before installation.

BEGIN INSTALLATION

3. Select the best location for the tank (B). Any suitable position along the fender skirt, fire wall, or between the radiator and grill is suitable. Some cars with an abundance of accessories will require a special tank.
4. Drill holes for clamp (A) and attach clamp to car.
5. Set tank and fasten bolt and nut (A). Tighten nut (A) so tank is firm.

CAUTION:

Always install tank so that highest level of water-alcohol will never exceed height of jet nozzle to be installed in the carburetor.

6. Slide stem (C) into hose (D). Drill $\frac{5}{8}$ " hole in top of can and slide stem through hole.
7. Injector-pump (F) location—Any suitable location as close to the water-alcohol tank as possible. Injector-pump (F) works best when kept to within one hose length of the tank. Keep the top of the injector-pump (F) below the height of where the nozzle jet (K) will be to eliminate dripping when the engine is turned off. It is well to have some sag in the hose between the injector-pump and nozzle (L) in order to store solid charge for instant injection.

CAUTION: The injector-pump (F) should always be installed in an upright position with the solenoid coil on top and horizontal.

CAUTION: Do not allow hood to kink any of the hoses.

8. Drill for mounting, and mount injector-pump (F). Use drill bit #25.
9. Connect the vacuum hose (G) on the single fitting at the bottom of the Injector-pump (F) and ~~run~~ to the Intake Manifold.
run
10. This unit operates only on the intake manifold vacuum.

CORRECTIONS AND CLARIFICATIONS:

PART B Initial Installation Pages 1 & 2

- 6 - Should be $\frac{1}{2}$ " hole - None when grommet is in place.
- 14 - Should be $\frac{3}{8}$ " hole.

TOOLS NEEDED

$\frac{3}{8}$ " Bit for Nozzle Guide should be $\frac{3}{8}$ ".

PART A List of parts Page 4

- E - Filter inside pump fitting.
- H - Actual connector is on manifold.
- K - Only one metering jet inside nozzle (1).
- N - Part of your vehicle.
- O - Part of vehicle air cleaner.
- S - Only one spring inside pump (F).
- W - In vehicle carburetor.
- Y - Mounted on pump.

Never use vacuum from link connecting carburetor and distributor.

Never use or disturb power brake line.

Never use PCV valve line.

Never use a vacuum line that has a check valve between the intake Manifold and the Injector-pump.

There are many other vacuum lines connected to the intake manifold that can be used, but you must make your connection close to the manifold. A Tee Fitting (X) is enclosed for installation when rubber vacuum line is chosen.

11. Connect hoses (J) to Solenoid (I) at the top fittings. There are two 14" lengths of hose (J) in case you need to run further to the air cleaner.
12. One end of the nozzle (L) is the alcohol metering jet (K). This jet is screwed into the right angled nozzle (L) and held in place by the discharge hose (J). Now you are ready to locate the nozzle placement.
13. **Nozzle Location:**
 - a) Single Barrel Carb. — Thru the center of Venturis (W).
 - b) Two Barrel Single — Between the barrels.
 - c) Quad. Carb. Single — Between primary barrels.
 - d) Triple Carbs — Center carb only
 - e) In the case of twin carbs., inject in both carbs. using above procedure.

CAUTION: Injection must never take place above impact tube, commonly known as the vent or breather tube of carb. Injection at such a point would allow water and alcohol into the carb. float chamber, adversely affecting the idling of the engine.

CAUTION: Never allow the nozzle to touch or interfere with the choke operation (See diagram of I-2)

14. Now drill the $\frac{5}{8}$ " hole in the air cleaner top directly above and between the primary venturis (W). Insert nozzle guide (M) with lock washer and nut (M) underneath.

CAUTION: Do not overtighten. Rough up guide threads slightly as a security measure. Nozzle support guide is to keep nozzle centered equidistant from venturis (W).

CAUTION: The alcohol metering jet (K) must always be kept within the hose.

CAUTION: Always keep alcohol metering jet (K) clean.

15. Insert the nozzle into the nozzle guide.

16. At this point, check the carburetor, get the manufacturer's name and carb. number. A cross reference book will supply the existing size jets in your carburetor. Order new carburetor jets from automotive supplier, 3 sizes smaller—to be used under PART B of Installation after the initial 1000 miles of driving. ~~Should smaller jets not be available~~
~~use the same size jets with lead and redrill to exact size .073 to .070 three~~
~~times~~ If you have any problems, contact our authorized jet supplier, Walker Products, 3600 S. San Pedro, Los Angeles, CA 90011 for proper jets.

17. Now connect the switch (P). The switch should be installed on or somewhere near the instrument panel. The purpose of the switch is to determine if the engine is adjusted and functioning correctly. See #20 for testing information. Ground either wire from solenoid. Use one wire (Q) from the switch (P) and connect on the solenoid. Connect the other piece of wire (Q) from switch (P) to the fuse panel terminal which is activated by the ignition switch.

NOTE: The injector-pump (F) operates on 12 volts, no less and uses only one ampere, not enough to have an effect on the ignition.

CAUTION: During switch installation, be extremely careful not to short or ground the wires. If you do, the engine will not run. Also be certain that hot wire connection from switch is off when the engine is stopped, since the flow of W/A must stop when the engine is stopped.

18. There should be no resistance unit or harness between the ignition switch and the injector pump (F).
19. **With the engine running**, open and close the switch. You should then feel a definite thumping in the solenoid (I).
20. **Testing** — When the switch is turned off, the engine should ping under load. If the engine does not ping with the switch off, look for the following trouble:
- a) Stuck choke.
 - b) Mal-functioning carburetor, jets too large.
 - c) Very late ignition timing.
 - d) Heavy leaded gasoline.
 - e) Blocked up air filter.
 - f) Blocked PCV valve.
 - g) Leaky float valve.

When the engine is loaded and the switch is turned on, there should be no ping. however, a very faint ping will not damage the engine and is permissible when maximum economy of both alcohol and gasoline is desired.

FURTHER TESTING

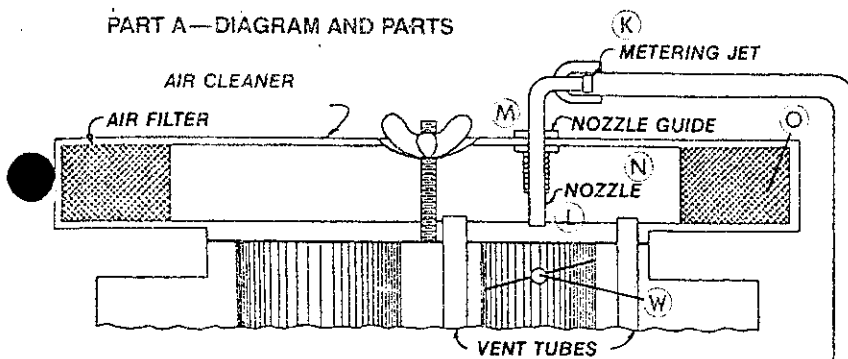
- a) Be sure switch (P) is in off position.
- b) Pull nozzle (L) directly out. **DO NOT TURN**, you could unscrew alcohol metering jet (K).
- c) Allow discharge hose (J) to hang down.
- d) Disconnect any vacuum line connection.
- e) Turn on switch (P).
- f) Start engine and allow to idle.
- g) Alternately connect and disconnect vacuum line (by touch contact only).
- h) Fluid should flow from discharge hose in alternate spurts.
- i) Reconnect vacuum connection, replace nozzle (L), tighten nut at (M) and make a test run.

NOTE: If engine pings with low test gasoline in the tank, add some high test or unleaded until the carbon is removed. (Approximately 1000 miles or 4 gallons of solution) After carbon is removed, and by using low test gasoline, you can start advancing the ignition for maximum gas mileage. Advance the ignition in small steps over a period of time.

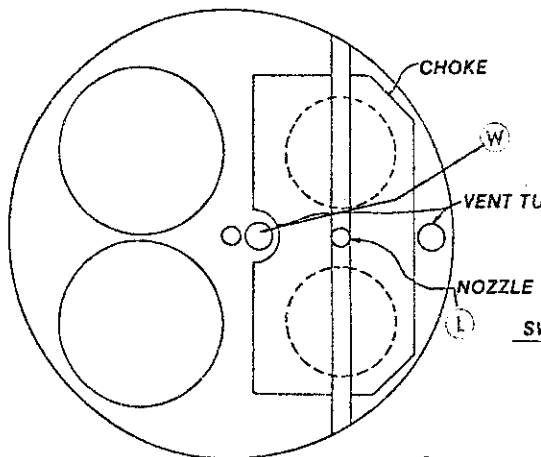
NOTE: ~~THIS SYSTEM IS NOT DESIGNED TO BE USED ON ANY OTHER TYPE OF ENGINE OR FUEL SYSTEM. IT IS NOT AVAILABLE FOR A FOUR CYLINDER ENGINE.~~ The system is not compatible with Diesel, rotary, and fuel injection engines. In California **ONLY** it is available for FOUR (4) cylinder engines.

Note: All cars equipped with catalytic converters must use unleaded gasoline.

PART A—DIAGRAM AND PARTS

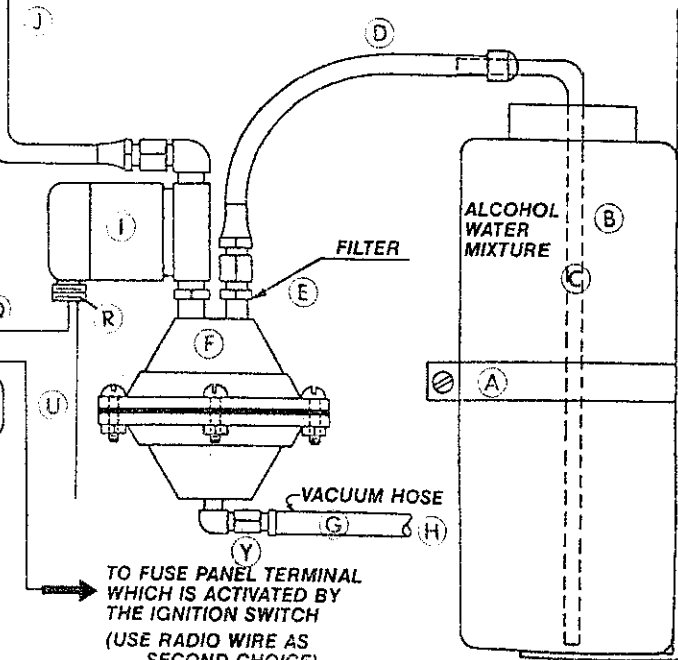
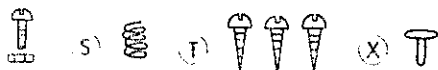


WATER/ALCOHOL WAAG-INJECTION SYSTEM U.S. PATENT #3,987,774



TOP VIEW OF CARBURETOR

DIAGRAM 2



TO FUSE PANEL TERMINAL
WHICH IS ACTIVATED BY
THE IGNITION SWITCH
(USE RADIO WIRE AS
SECOND CHOICE)

DIAGRAM 1

LIST OF PARTS (in order of use)

- | | |
|--|--|
| A. Clamp & Bolt | M. Nozzle Guide & Locking Nut |
| B. Water/Alcohol Tank | N. Air Cleaner Top |
| C. Stem | O. Air Filter |
| D. 14" Hose — Tank to Pump | P. Switch |
| E. Filter | Q. Switch Wire (To Solenoid) |
| F. Pump | R. Solenoid Switch Connection |
| G. Vacuum Hose | S. 4 Springs—Green, Red, Yellow & Blue |
| H. Manifold Connector (to intake manifold) | T. Self Tapping Screws |
| I. Solenoid (Connected to pump) | U. Solenoid Ground Wire |
| J. (2) 14" Hose with Male & Female Connections (From Solenoid to Carburetor) | W. Venturis |
| K. (3) Metering Jets | X. Tee fitting |
| L. Nozzle | Y. Vacuum Connections at Injector Pump |

TOOLS NEEDED

- Drill
- # 25 Bit for Clamp
- # 25 Bit for Starting Hole
- # 25 Bit for Pumps

- 5/8" Bit for Nozzle Guide
- Screwdriver
- 9/16" Wrench

PART C — 1000 MILE ADJUSTMENT

21. Drive a minimum of 1000 miles to remove heavy carbon deposits which are wasting gasoline from your engine.
22. **After the 1000 miles**, reduce the **carburetor jets — 3 sizes only**.
CAUTION: Do not reduce these jets before the 1000 mile clean out period has been completed or the engine will overheat.
23. Check float and level while carburetor is open.
24. Advance Distributor. With the car in drive and brake pedal activated, accelerate the engine slowly with the W/A WAAG-INJECTION SYSTEM **on** until the spark timing is advanced (usually 1-3 degrees) and you hear a slight ping.
25. Should the engine require new spark plugs, replace with hotter ones, two heat ranges.
26. If everything is adjusted properly, there should be a discernible ping when the engine is forced and the INJECTION SYSTEM is turned off. When the switch is turned on, the ping should disappear.
27. With older engines, a part throttle ping indicates a condition of too much vacuum spark advance — **do not** retard the distributor or you will reduce gasoline mileage.
28. Included in your kit is a bottle of inhibitor. This will eliminate any possibility of rust and also acts as a lubricant. Use 1 cap-full to 1/2 gallon water and 1/2 gallon alcohol. This bottle should last one to two years. You may reorder from this address.
29. Enclosed is your parts warranty and your performance guarantee. Fill out the attached card and return it when you have completed PART A of the installation. Have the authorized Installation Center sign your performance guarantee in order for the guarantee to be valid.

PART D — TROUBLE SHOOTING

30. If the unit does not work:
 - a) Check switch to see if the solenoid goes on and off. You should hear a click in the solenoid. If the solenoid does not click, check the fuse.
 - b) If the solenoid works and the unit has been installed more than three months, check the screen filter (E) for blockage. Disconnect the hose (D), filter screen fitting (E) is between the hose and the injector-pump (F) inlet. Wash out the screen. Then reconnect. It is also suggested that when cleaning the screen, you also wash out the alcohol-metering jet (K) which is attached to nozzle (L). To do so, the nozzle can be slipped out of the hose (J). Simply unscrew the jet from the nozzle, wash out and screw back in place. WAAG jets should be cleaned with water or air only.
 - c) If the above does not solve the problem, or if the unit was only recently installed, check for loose connections, especially from tank (A) to injector-pump (F). Loose connections will stop the injector-pump.
Note: A quick method to determine if system is working. Simply pull out nozzle hose, shake & see if fluid drips.

31. Here are special instructions in selecting proper spring (S) in Injector-pump and alcohol metering jet (K) in nozzle (L).

The average driver, driving an average V-8 engine requires a #6 jet (K) and a medium load or red spring (S) located in the injector-pump (F).

Average city driving should consume about one gallon of water and alcohol for every 250 to 400 miles. Average country or highway driving should allow you to go about 500 to 1500 miles.

A heavy footed driver may use considerably more water-alcohol mixture. This does not create any problem, but in this case, a higher spring (S) ~~(RED)~~ and a smaller alcohol-metering jet (K) ~~(#6)~~ could be used to reduce the amount of water and alcohol flow. It is optional. 6 or 4

On the other hand, a light footed driver will create a problem by not allowing enough water-alcohol to flow and remove all the destructive carbon which is constantly forming in the engine. Under this condition, a heavier spring (S) (yellow) and a larger alcohol-metering jet (K) **must** be used.

The following is a list of jets and spring combustions and their flow rates:

size of the and of the ing depend upon drivers habits and cubic inch or sepower of the ine	Jets	Springs	The red and yellow springs are inter- changeable with the #6 jet. The yellow and the blue springs are interchange- able with the #4 jets.
	XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX	
	#6 Average Flow	Yellow/ Red	
	#4 Heavy Flow	Blue or Yellow	
	XXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXX	

These jets and springs are calibrated and must be used in the proper combination. They should not be altered under any circumstances. By using these in the proper combination, practically any driving habit will be satisfied.

32. Any kind of alcohol may be used in this system, the most plentiful is METHANOL which is available through chemical companies and most Installation Centers.
33. After the carburetor jets have been lowered or reduced in size, should you run out of solution while driving, it is recommended that you NOT operate the vehicle more than 300 miles without the solution of water/alcohol/inhibitor.

PARTS WARRANTY

This W/A Waag-Injection System # 20524 is guaranteed against defects in material and workmanship for a period of Twelve months from the date of purchase, when your warranty is signed & returned for proper registration.

W/A WAAG-INJECTION® SYSTEM

EXECUTIVE OFFICES:
Suite 1220 • Colony Plaza
6451 N. Federal Highway
Ft. Lauderdale, FL 33308

RECEIVED

AUG 20 1979

AFTERMARKET PARTS AND
MODIFICATION EVALUATION SECTION
ENGINEERING DEPARTMENT - VECU

Mr. G.C. Hass, Chief
Vehicle Emissions Division
Air Resources Board Laboratory
9528 Telstar Avenue
Edmonte, CA 91731

Dear Mr. Hass,

Please consider this as our applicatio
following:

1. ~~XXXXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXXXX~~
~~XXXXXXXXXXXXXXXXXXXX~~

~~XXXXXXXXXXXXXXXXXXXX~~

Authorized Representatives are:

Nino De Santis

Robert De Santis

~~XXXXXXXXXXXXXXXXXXXX~~

~~XXXXXXXXXXXXXXXXXXXX~~

~~XXXXXXXXXXXXXXXXXXXX~~

Lorne A. Cameron, Jr.

American Marketing Associates

dba - W/A Waag-Injection® System

Division of Lorne A. Cameron & Co., Inc.

6451 N. Federal Highway

Fort Lauderdale, FL 33308

2. This device is commonly known as the W/A Waag-Injection® System. It is a supplementary fuel injection apparatus for the internal combustion engine, U.S. patent number 3,987,774 and the name Waag-Injection is a registered trademark.

The purpose of this device is to increase the efficiency of the engine while creating a more economic operation.

THE TIMING HAS BEEN CHANGED
ON THIS VEHICLE - REFER TO
THE WAAG-INJECTION® SYSTEM
INSTRUCTIONS

Waag Enterprises
3110 Broadview Rd.
Cleveland, OH 44109

(216) 661-1997

3110 Broadview Rd.
Cleveland, OH 44109

This is a vacuum pump injector process which draws an equal mixture of water and alcohol & an inhibitor through the primary carburetor venturis directly into the combustion chamber. The water and alcohol solution causes complete combustion, thereby eliminating carbon deposits, detonation and high pressures.

This system is compatible with all common gasoline burning internal combustion engines.

It may not be compatible with, rotary engines, fuel injection engines, diesel powered engines or some four cylinder engines. These are to be eliminated from our exemption request.

For technical substantiation to claims please see attached - Exhibit A - Water alcohol injection paper by Norman E. Waag, ME, AE, and Exhibit B - SAE papers #214 and #215.

Additional Information:

1. Description and operation of device. This is a supplementary fuel injection apparatus for an internal combustion engine comprising a full reservoir, a chambered fuel pump and metering regulator member (solenoid) tubularly connected to said reservoir and having a fuel chamber and a vacuum chamber, a diaphragm therebetween, diaphragm fuel pump means in said vacuum chamber that is power activated by vacuum pressure supplied from the engine intake manifold, and a fuel distribution unit having a fuel passage connected to said fuel pump and metering regulator unit and the carburetor of the said engine and said unit having a fuel control means therealong and a variable fuel pressure metering means mounted on the carburetor adjacent the venturis thereof.

Exhibit C represents a patent blueprint of the system as it was filed for patent and Exhibit D is a line drawing of the system and important sections of the carburetor.

Exhibit E represents material used in selling including that for the establishment of Authorized Installation and Servicing Centers.

Exhibit F is a sample of the information which will be on the shipping invoice included in the package and the top section G is the label, the last part of a four piece print out.

Exhibit H is a sample of the label which will be affixed to the pump showing the name of the unit and the space for the California Air Resources Board exemption number.

The primary manufacturer is Waag-Injection Company, Miami, Florida, utilizing Hamilton Machine Co., Pittsburgh, PA, as a sub-contractor for the shell of the pump and Peter Paul Electronics Co., Inc. New Britan, CT, as a sub-contractor for the metering regulator unit (solenoid).

Exhibit I is the instruction manual, and Exhibit J is the parts & labor warranty and performance warranty.

National Distribution is through American Marketing Associates dba W/A Waag-Injection System, a division of Lorne A. Cameron and Company, Inc., Fort Lauderdale, Florida.

Installation and service centers are being contacted now. Training and certification will start in California upon approval of this exemption request.

Testing Results for Federal Test Procedure including from cold start, CVS., Highway cycle, and gas mileage before baseline and the same immediately after the device has been installed and again after the engine has been completely cleaned of carbon deposits and the primary carburetor jets have been lowered .003 and the distributor timing properly advanced to water and alcohol setting (by ear) will be supplied by New York City Motor Vehicle Pollution Control Laboratory, Brooklyn, NY.

We will supply at no cost to the state of California whatever number of units are requested to conduct your testing.

Safety & Emission Statements

I affirm that this device ...

1. shall not cause the emission into the ambient air of any noxious or toxic matter that is not emitted in the operation of such motor vehicle without such device,
2. shall not result in any unsafe condition endangering the motor vehicle, its occupants, other persons, or property in close proximity to the vehicle, in accordance with the safety requirements special for the original vehicle.

Nino De Santis

Robert De Santis

Lorne A. Cameron, Jr.