

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-187-1
Relating to Exemptions under Section 27156 of the Vehicle Code

STREET LEGAL PERFORMANCE ENGINEERING, INC.
INTAKE MANIFOLD RUNNERS

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 intake manifold runners manufactured by Street Legal Performance Engineering, Inc. 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 1985 through 1988 model-year General Motors F-body vehicles with 5.0L/5.7L tuned port injection engines.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those listed by the vehicle 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 STREET LEGAL PERFORMANCE ENGINEERING, INC.'S INTAKE MANIFOLD RUNNERS.

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 27th day of January, 1989.



K. D. Drachand, Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF STREET LEGAL PERFORMANCE ENGINEERING, INC.'S
PERFORMANCE PACKAGE AND ITS INDIVIDUAL COMPONENTS FOR INSTALLATION IN
1985-1988 MODEL-YEAR F-BODY GM VEHICLES WITH 5.0L/5.7L
TUNED PORT INJECTION ENGINES

January, 1989

January, 1989

Evaluation of Street Legal Performance Engineering, Inc.'s
Performance Package and its Individual Components for Installation in
1985-1988 Model-Year F-Body GM Vehicles With 5.0L/5.7L
Tuned Port Injection Engines

by
Mobile Source 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

Street Legal Performance Engineering, Inc. (SLPE) of 1501 Industrial Way North, Toms River, NJ 08753, has applied for exemption from the prohibitions in Vehicle Code Section 27156 for their performance package and its individual components for 1985-1988 model-year F-body GM vehicles equipped with 5.0L/5.7L tuned port injection (TPI) engines. The performance package includes: intake manifold runners; tubular exhaust manifolds; and engine calibration software EPROM.

SLPE has submitted a completed application and all the required information as well as comparative exhaust emissions test data which shows that their performance package and its individual components do not have any significant adverse effects on the emissions from applicable vehicles. Testing performed at the Air Resources Board's Haagen-Smit Laboratory confirmed the test results performed at an independent laboratory.

The staff recommends that SLPE be granted exemptions as requested and that Executive Orders D-187, D-187-1, D-187-2 and D-187-3 be issued for their performance package, intake manifold runners, tubular exhaust manifolds and engine calibration EPROM, respectively.

CONTENTS

	<u>Page Number</u>
<u>SUMMARY</u>	i
<u>CONTENTS</u>	ii
I. <u>INTRODUCTION</u>	1
II. <u>CONCLUSIONS</u>	1
III. <u>RECOMMENDATIONS</u>	1
IV. <u>PERFORMANCE PACKAGE DESCRIPTION</u>	2
V. <u>PERFORMANCE PACKAGE EVALUATION</u>	3
VI. <u>DISCUSSION</u>	7
<u>APPENDICES</u>	
APPENDIX A Installation Instructions and a Figure of the SLPE Intake Manifold Runners	8
APPENDIX B Installation Instructions and a Figure of the SLPE Tubular Exhaust Manifolds	11
APPENDIX C Installation Instructions for EPROM	14
APPENDIX D Summary of Catalyst Temperature Data	15

EVALUATION OF STREET LEGAL PERFORMANCE ENGINEERING, INC.'S
PERFORMANCE PACKAGE AND ITS INDIVIDUAL COMPONENTS FOR INSTALLATION IN
1985-1988 MODEL-YEAR F-BODY GM VEHICLES WITH 5.0L/5.7L
TUNED PORT INJECTION ENGINES

I. INTRODUCTION

Street Legal Performance Engineering, Inc. (SLPE) of 1501 Industrial Way North, Toms River, NJ 08753, has applied for exemption from the prohibitions in Vehicle Code Section 27156 for their performance package and its individual components for 1985-1988 model-year F-body GM vehicles equipped with 5.0L/5.7L tuned port injection (TPI) engines. The performance package includes intake manifold runners, tubular exhaust manifolds, and engine calibration software EPROM.

SLPE has submitted a completed application and all the required information as well as comparative exhaust emissions test data which shows that their performance package and the individual components do not have any significant adverse effects on the exhaust emissions from applicable vehicles.

II. CONCLUSIONS

Based on the submitted information and comparative exhaust emissions tests performed on a 1988 GM F-body vehicle with a 5.0L TPI engine at DMACS Engineering Laboratories and the ARB, the staff concludes that the installation of SLPE performance package and its individual components will not have any significant adverse effects on the exhaust emissions from the applicable vehicles.

III. RECOMMENDATIONS

The staff recommends that SLPE be granted exemptions as requested and that Executive Orders D-187, D-187-1, D-187-2 and D-187-3 be issued for their performance package, intake manifold runners, tubular exhaust manifolds and engine calibration EPROM, respectively.

IV. PERFORMANCE PACKAGE DESCRIPTION

The purpose of the SLPE performance package is to enhance vehicle performance by reducing the airflow restriction to the engine and, therefore, improving its volumetric efficiency. The major components of their performance package are: intake manifold runners; tubular exhaust manifolds (Tri-Y) and engine calibrations software EPROM.

A. Intake Manifold Runners

The original equipment manufacturer (OEM) intake manifold assembly consists of three components: a common plenum; individual runners for each of the eight cylinders and a manifold base to distribute airflow to the intake ports. SLPE has modified the design of intake runners while leaving the common plenum and manifold base unchanged. SLPE has replaced the eight stock runners with four larger ones. The two adjacent cylinders share a common intake runner. Each individual runner is larger than the OEM runners in cross-sectional area. By increasing cross sectional area the pressure drop across the runners is reduced and restriction is lowered which results in higher volumetric efficiency. The SLPE inlet runners are slightly shorter than the OEM runners. Appendix A shows the installation instructions and a figure of the SLPE intake manifold runners.

B. Tubular Exhaust Manifolds (Tri-Y)

The OEM exhaust manifolds consist of two exhaust manifolds that become a common pipe and is connected to the catalytic converter. The SLPE "Tri-Y" exhaust manifolds consist of primary tubes, secondary tubes and the collectors. The primary tubes are 1.625 inches in diameter with an average length of 14.8 inches. The secondary tubes are 1.75 inches in diameter and average length of 15.125 inches. The collectors are 2.125 inches in diameter. All tubes are sheathed in a silica-based fabric installed with an

outer shell to guard against water vapor intrusion. The secondary manifold air injection duplicates the stock component. Catalyst location is unchanged and all stock clamps are retained. Appendix B shows the installation instructions and a figure of SLPE tubular exhaust manifolds.

C. Engine Calibration Software EPROM

The SLPE EPROM is an add-on micro computer chip that replaces the GM micro computer chip. The changes affect the wide open throttle (WOT) calibration only. Parameters impacted by EPROM are spark advance, power enrichment and over-speed protection.

The spark advance was reduced by 2-5 degrees from 3600 to 4800 rpm. Power enrichment, defined as the percentage of change in fuel/air ratio, was reduced by 8 to 12 percent from 3600 to 4300 rpm. In stock calibration there is not any rpm limit. Since SLPE components significantly affect the engine performance, a 5800 rpm limit was incorporated for a safety feature. At this speed fuel delivery ceases, resuming only after the engine speed has dropped below 5500 rpm. Appendix C shows the installation instructions for EPROM.

V. SLPE PERFORMANCE PACKAGE EVALUATION

Evaluation of the SLPE performance package included analysis of all submitted information to confirm that it meets the requirements for the exemption. They also submitted comparative emission test data conducted at DMACS Engineering Laboratories. The tests were conducted on a 1988 model-year Firebird with a 5.0L TPI engine according to the ARB's suggested test program as follows:

1. One cold-start CVS-75 and one Highway Fuel Economy Test (HFET) on the vehicle with unmodified configuration (baseline);

2. One cold-start CVS-75 and one HFET with the performance package installed;
3. One cold-start CVS-75 and one HFET with the intake manifold runners installed;
4. One cold-start CVS-75 and one HFET with the engine calibration EPROM installed;
5. One baseline cold-start CVS-75 and one HFET;
6. One cold-start CVS-75 and one HFET with "Tri-Y" tubular exhaust manifolds installed;
7. One baseline cold-start CVS-75 and one HFET.

The exhaust temperature at the catalyst inlet and outlet and catalyst skin temperature (middle area) were monitored and continuously recorded during the tests.

The results of the comparative emissions tests at DMACS Engineering Laboratories are shown in Tables 1 and 2.

Table 1

CVS-75 Emissions Test Results at DMACS Engineering Laboratories (g/mi)

<u>Configuration</u>	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Baseline	0.454	1.180	0.597
Package	0.38	0.977	0.641
% Change	-16	-17	+7
Runners	0.377	0.854	0.585
% Change	-17	-28	-2
EPROM	0.401	0.861	0.626
% Change	-12	-27	+5
Baseline	0.430	0.850	0.606
Tri-Y	0.337	0.853	0.644
% Change	-22	0	+6
Baseline	0.393	0.901	0.597

Table 2

HFET Emissions Test Results at DMACS Engineering Laboratories
(g/mi)

<u>Configuration</u>	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Baseline	0.080	0.160	0.412
Package	0.071	0.228	0.448
Runners	0.075	0.211	0.369
EPROM	0.073	0.184	0.383
Baseline	0.075	0.082	0.387
Tri-Y	0.050	0.018	0.437
Baseline	0.066	0.029	0.316

The catalyst temperature data did not show any major change in catalyst temperature (see Appendix D for a summary of catalyst temperature data).

The ARB performed confirmatory tests on the test vehicle. The confirmatory tests included the following:

1. One baseline cold-start CVS-75 and one HFET;
2. Two cold-start CVS-75 and two HFET with the performance package installed;
3. One cold-start CVS-75 and one HFET with EPROM only;
4. One baseline cold-start CVS-75 and one HFET.

The results of confirmatory testing are shown in Tables 3 and 4.

Table 3

Confirmatory CVS-75 Test Results at the ARB (g/mi)

<u>Configuration</u>	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Baseline (1)	0.390	0.749	0.616
Baseline (2)	0.408	0.86	0.62
Average	0.40	0.80	0.62
Package (1)	0.423	0.94	0.62
Package (2)	0.353	0.88	0.56
Average	0.39	0.91	0.59
% Change	-3	+14	-5
EPROM	0.40	0.86	0.50
% Change	0.0	+8	-19

Table 4

HFET Emissions Test Results at the ARB (g/mi)

<u>Configuration</u>	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Baseline (1)	0.088	0.08	0.30
Baseline (2)	0.085	0.23	0.28
Average	0.087	0.16	0.29
Package (1)	0.076	0.40	0.39
Package (2)	0.063	0.31	0.32
Average	0.070	0.36	0.36
EPROM	0.084	0.12	0.26

The catalyst temperature data did not show any major changes in catalyst temperature.

VI. DISCUSSION

The CVS-75 emission test data and HFET results at DMACS Engineering Laboratories and the ARB did not show any significant increase in exhaust emissions. Therefore, the SLPE performance package as well as its individual components demonstrate compliance with the requirements for exemption.

INTAKE MANIFOLD RUNNERS

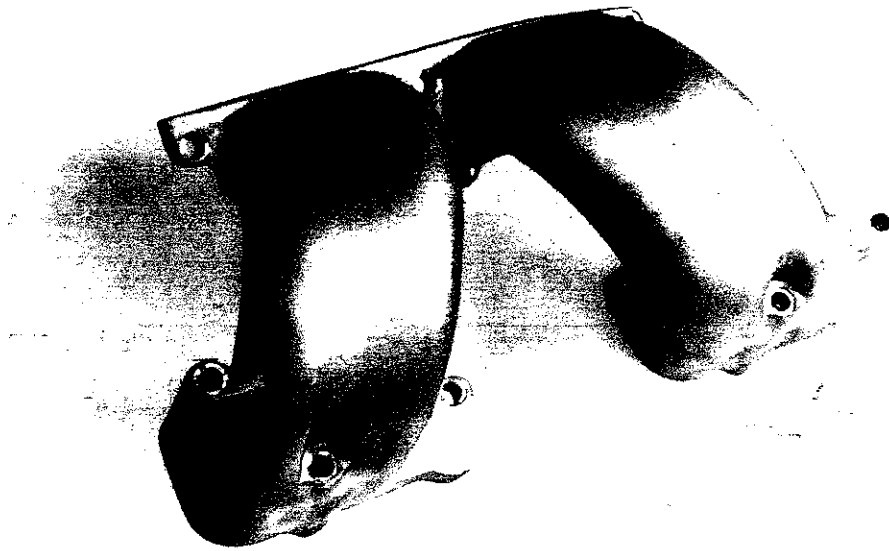
Installation

1. Disconnect battery.
2. Remove distributor cover.
3. Disconnect throttle, transmission and cruise control cables.
4. Disconnect PCV hose.
5. Disconnect two vacuum lines on passenger side rear of plenum.
6. Remove all intake runner bolts.
7. Remove cold start injector electrical connection.
8. Disconnect vacuum hose for power brake booster.
9. Remove trans-cable from bracket.
10. Lift the plenum from the rear so as to be able to remove MAT sensor connection on bottom of plenum.
11. "Fold" plenum all the way forward and tie in place.
12. Carefully rotate cold start injector away from intake runner.
13. Loosen injector rail bolts but do not remove.
14. Remove both sets of intake runners.
15. Place paper towels in each port to prevent any debris from entering the cylinders.
16. Remove old gaskets and scrape all gasket surfaces completely clean.
17. Remove paper towels without letting dust or debris into ports.
18. Install new gasket on new intake runners and place in position.
19. Re-tighten injector rail bolts.
20. "Fold" plenum back and reconnect MAT sensor.
21. Place plenum into position and check gasket alignment.

APPENDIX A (CONTINUED)

22. Check the O-ring on the cold start injector. Replace if damaged.
23. Rotate cold start injector back into position.
24. Install all bolts loosely.
25. Tighten bolts as per sequence in diagram.
26. Re-connect cables and brackets.
27. Re-connect vacuum lines.
28. Reconnect power booster hose.
29. Reconnect all electrical connections.
30. Reconnect PCV hose.
31. Replace distributor cover.
32. Reconnect battery.

SLPE INTAKE MANIFOLD RUNNERS



TUBULAR EXHAUST MANIFOLDS

Installation

1. Disconnect battery.
2. Beginning work at the bottom of the car, remove 2 mm nuts that secure the secondary air tube to the catalyst.
3. Remove the 15 mm nuts from the catalyst outlet flange.
4. Disconnect the Y-pipe from each exhaust manifold and remove catalyst and Y-pipe as one unit.
5. Install the Y-pipe in a vise and remove the catalyst. If the catalyst cannot be easily removed, apply heat to the catalyst inlet to facilitate removal. Do not damage the catalyst as this could impair emission control system function and severely impact the performance of your vehicle.
6. Working from the top of the car, begin to remove exhaust manifolds. Manifold bolts are 9/16 inch in size.
7. Remove the air conditioning compressor support bracket.
8. Unbolt the diverter valve assembly and carefully disconnect the snap clips that attach the rubber hoses to the one-way valve on the air injection tubes.
9. Remove the rubber hoses from the one-way valve.
10. Leave remaining hoses connected to the diverter valve assembly and move it out of the way.
11. Remove the air pump support bracket.

Note: On F-cars equipped with an oil to water oil cooler this bracket cannot be removed. Simply loosen fasteners and rotate the support so that the exhaust manifold can be removed.

12. Remove the dipstick and dipstick tube.
13. Remove the passenger side spark plugs.
14. Unbolt and remove the passenger side exhaust manifold.
15. Remove the driver side spark plugs.
16. Disconnect and remove the oxygen sensor.

17. Disconnect the wire for the temperature gauge.
18. Remove the support bracket for the power steering pump.
19. Unbolt and remove the driver's side exhaust manifold.
20. Install SLPE manifolds by reversing the above procedure except as noted below.
21. Install new exhaust manifold gaskets.
22. Install collector pipe to passenger side manifold before installing the crossover pipe to the driver side manifold.
23. Re-install catalyst after the new exhaust manifold system is fully installed.
24. Install an exhaust clamp securing the crossover pipe to the collector.
25. After the engine has been run for one hour, re-tighten exhaust manifold and flange bolts.
26. After eight hours of operation, re-tighten exhaust manifold and flange bolts and check exhaust clamps.

SLPE TUBULAR EXHAUST MANIFOLDS



EPROM CAL-PACK

Installation

1. Disconnect battery.
2. Remove passenger side under dash panel.
3. Remove the three bolts that mount the ECM.
4. Carefully lower ECM.
5. Remove sheet metal screw which affixes Cal-pack access panel cover.
6. Remove access cover.
7. Remove Cal-pack by simultaneously pressing outward on the two tabs located at the ends of the Cal-pack.
8. Install new Cal-Pack, being careful to align guide slots. The Cal-Pack will fit only one way; do not force it.
9. Replace access cover.
10. Remount ECM.
11. Replace under-dash panel.
12. Reconnect battery.

Catalyst Temperature Data

Summary

Temperature (deg. C)

Test #	Hardware	Test	Cat. In		Cat. Out		Skin	
			avg.	peak	avg.	peak	avg.	peak
1	Baseline	Ph 1	336	440	321	432	69	134
		Ph 2	336	384	378	416	123	134
		Ph 3	323	424	367	433	114	148
		FTP	332		360		106	
		HWFET	425	470	461	505	211	232
2	Package	Ph 1	334	428	318	429	85	156
		Ph 2	334	381	374	412	157	158
		Ph 3	325	415	357	416	118	141
		FTP	332		354		127	
		HWFET	435	469	467	509	215	233
4	EPROM	Ph 1	315	407	290	399	85	152
		Ph 2	333	376	372	392	161	163
		Ph 3	322	410	361	418	126	150
		FTP	325		346		130	
		HWFET	417	469	446	501	208	232