67 Chevelle SS396 Project

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Mission Statement

To build a unique show winning 67 Chevelle SS396 that is a pleasure to look at and drive on the street and is a very fast and capable performer at the strip.

- Will meet all of the NHRA safety requirements for a 7.50 to 10.99 index car
- Will run 9.90s with on the motor with 10” slicks, 10’s with DOT tires
- Will run 8.90s on the bottle with 10” slicks
- Will have 4 wheel disk brakes, modern steering and suspension
- The exterior and interior will be as “stock” looking as possible. This will include the use of the stock hood and the possible restriction of using a dual plane intake manifold – even for racing
- Will pass emissions air care test for model year
- Will be highly reliable, strong and well built

Introduction

This document is in its very first draft version. When it is finished it will detail the complete story of the creation of the final car – the people and their businesses and their relationships to each other, the technology, the ups and downs and the results – complete with color pictures.

For now, this document remains a skeleton of the final version and is only documenting the engine dyno testing results obtained so far and the necessary changes to the engine design before making the next set of dyno pulls.

Enjoy!

The People and Companies behind this Project

I would like to thank the following companies and individuals who have been instrumental in this project's successful completion (TBD!):

Kelly Hildebrandt, Lake Cowichan

. . . for selling me a clean unmolested car in the first place (so that I can molest it first)

Summit Racing, Ohio - Redd

. . . for the incredible sales support involving almost every component that is new (most of the car) and technical support which involved countless calls to suppliers and dozens of faxes and shipments

Import Automotive, Vancouver – Loyd, Fritz and the gang

. . . for performing the initial teardown, and the installation of the front suspension, rear suspension (partially going into storage), GM 12 bolt prep (going into storage), brake system, and steering system. Loyd also introduced me to the gang at Pacific Parts, Spirit Engineering, and Kyles Classics.

Pacific Parts, Vancouver – Peter, Terry and Rick

. . . for building the first Mark VI BB Chevy on the planet and resolving many tricky problems successfully. And for introducing me to Ron Par.

Kyles Classics, Surrey – Kyle and Doug

. . . for getting the complete chassis and interior details right, final assembly done (TBD), and for getting me to the "correct" SS396 concept. And for introducing me to Gary's Autobody.

Gary's Autobody, Richmond – Gary and the gang

. . . for straightening out an already show winning chassis and making it straighter than straight and for painting it so that a few heads will turn.

Spirit Engineering, Surrey – Stan and Gordon

. . . for the underbody stiffening, for the very trick 4130 rollcage, the aluminum fuel cell and fuel pump mounts, battery box and trunk sheetmetal, the custom Strange rearend, and front and rear suspension mods and coilovers.

Ron Par Engines, Langley – Ron and Ken

. . . for the dyno pulls, advice, and some wicked porting of the heads and intake (TBD)

And finally a big thanks to the following suppliers (in addition to the dozens of suppliers represented directly by Summit Racing):

Apple Chevrolet – 502 Mark VI BB engine, hamburger oil pan, water pump

AVO – front racing shocks, rear coilovers

Extrude Hone – intake manifold porting

Global West Suspension – front and rear street suspension, brake system

Jet Hot Coatings – header coatings

JE pistons – custom pistons

K&R – restoration parts for chassis and interior

BG Fuel Systems – filters, pumps, regulators, lines and advice

Be Cool – aluminum radiator

March Performance – engine serpentine pulley system and accessory brackets

Stahl Headers - headers

Turbo Action – shifter, TH-400, converter

The Carb Shop – the carb

Torque Technologies – 3” exhaust system

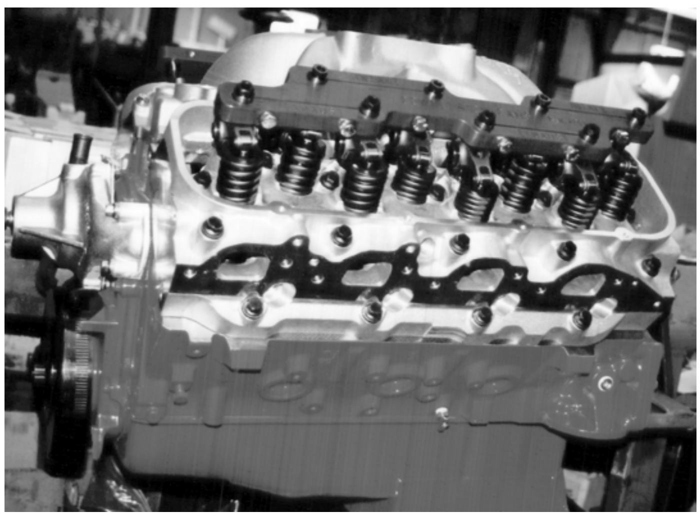
Wheel Vintiques – street wheels

Victory Lane – racing seats and safety equipment

Year 1 – restoration parts for chassis and interior

Engine Development

The engine chosen for this car is the Mark VI 502 BB Chevy. This new for 1997 block shares many of the components with the old Mark IV and newer Mark V but has a number of quality and strength improvements that have been brought about by modern manufacturing techniques. This new block has much tighter tolerances (like a single size piston), added strength (Siamesed walls, taller lifter bosses), 4 bolt bottom end, forged crank, single piece rear main seal, and other reliability changes for marine and high performance use. And to the uneducated eye, it looks just like a 396 under the hood when painted 1960's Chevy orange. Topped off with Aluminum Performer RPM oval-port heads from Edelbrock and the matching Performer RPM dual plane intake manifold, this combo looks a lot like the rare 1967 L78/L89 factory offering.



The characteristics of a good street/strip motor revolve around providing strong low end torque with good upper RPM breathing. Careful engine design should provide a wide, flat torque curve with lots of top end power for the strip. Given the stock under hood clearance limitations, a high rise dual plane manifold without use of a spacer may be the upper limit. Running a single plane intake will require an after market fiberglass hood with a cowl induction or similar setup – not out of the question but far less "stock".

The best route is to maximize engine displacement with a streetable compression ratio (generally thought to be 10.5:1 for 94 octane unleaded gas when using aluminum heads) and also balance the size and flow characteristics of the intake and exhaust system to moderately sized cylinder head port volumes and valve diameters. A solid roller cam with moderate duration and lift should also provide good upper end breathing without killing low end torque and idle vacuum and emissions. Getting the most out of this setup requires careful porting and shaping of the intake and exhaust runners – keeping the velocity up while minimizing restrictions to high RPM air flow.

Running a 9.9 second time slip requires a minimum of 640 hp for a 3400 lbs car. Running an 8.9 requires 920 hp. Both are within reach of the Mark VI 502 when subject to the above constraints with the added help of a 300 hp NOS fogger system for the 8.9 passes. The target hp for this engine combo is 675 hp and 620 ft-lbs of torque on the motor.

First Set of Dyno Tests, May 15-16, 1997

Summary

The engine proved to be remarkably insensitive to changes in the A/F ratio, ignition timing, and even changes to the exhaust system and intake manifolds. In no case did any of the changes produce more than a 2% change in maximum power which is well within the range of repeatability for these types of tests (less than 0.1s and 1mph in the ¼ mile). In fact, the same engine combo tested 1.5% less power on the second day of testing as a back to back reference check. The engine was basically a 600 ft-lbs torque monster on the low end, with approx. 590 hp at 5800 rpm. The dual plane manifold improved torque below 3800 rpm and rolled off slightly faster above 6000 rpm – that was all.

Rather than focus on the small degree of error caused by variations in intake air temperature, pressure and humidity or ignition quality, it is more important to note that these tests indicate that the cylinder head flow characteristics are the major defining factor in producing top end power with this combo and that until the cylinder heads are extensively ported to create higher flow, the other intake and exhaust system changes will remain insignificant.

For a street/strip engine, the current combo with the dual plane manifold seems unbeatable with between 550 and 610 ft-lbs of torque from 3000 rpm to 5500 rpm and 575 hp at 5700 rpm. However, the goal for this project is to run 9.9s on the motor which requires about 15% more power from the engine (640-660 hp). John lingenfelter's 502 testing shows on a very similar engine combo with his slightly bigger cam and his smaller heads produced 665 hp at 6500 rpm with only 9.2:1 compression. With our 10.5:1 compression, bigger heads (290cc vs 264cc), bigger Dart single plane intake (extrude honed), bigger and better exhaust headers (2-1/8" vs 2"), we should be able to meet or exceed his 665 hp using our smaller cam (246/246 vs 260/268).

Also, Comp Cams states that the hp peak for the current cam is 6500-6800 rpm and this combo tested out to a 5700-5900 rpm hp peak – again showing significant top end breathing restrictions.

<u>Conclusions</u>

We took a great deal of time and effort to build up a highly reliable killer street/strip motor and made only one mistake – we pulled a set of stock aftermarket aluminum heads out of the box and bolted them on without any porting work. This in conjunction with a 1/8" port mismatch on the top and bottom of the intake runners going into a smaller head port is the most likely cause of the loss in top end power.

<u>The heads need to be carefully machined to port match them to the 2 different intake manifolds, open up the intake runners, perform careful bowl blending work, check valve seat angles, etc. in order to get them to flow 25-30% more at 0.500-0.650" lift to meet our 640-660 hp goal with the current mild solid roller cam.</u> The ideal result would be to get to 640-650 hp with the extrude hone ported Edelbrock Performer RPM dual plane manifold and 660-680 hp with the extrude hone ported Dart single plane manifold. It is acceptable to raise the intake port height to create more of a rectangular port shape (both the heads and manifolds) if so required.

Reaching the power targets noted above may require a change in cams and carbs and therefore a larger roller cam (264/264 vs. 246/246) and a 1050 Dominator carb will be tested on the dyno as well as the existing setup.

Here are the next set of dyno run tests to be performed after the heads are re-worked:

1. Dual plane intake with 246/246 @ 0.050" – 0.623" lift cam, 110 spacing
2. Same setup with dominator (if air flow indicates a need for more carb)
3. Single plane intake with same cam and smaller carb
4. Same setup with dominator
5. Change to new cam with 264/264 – 0.651" lift, 110 spacing (if needed to meet power goals)

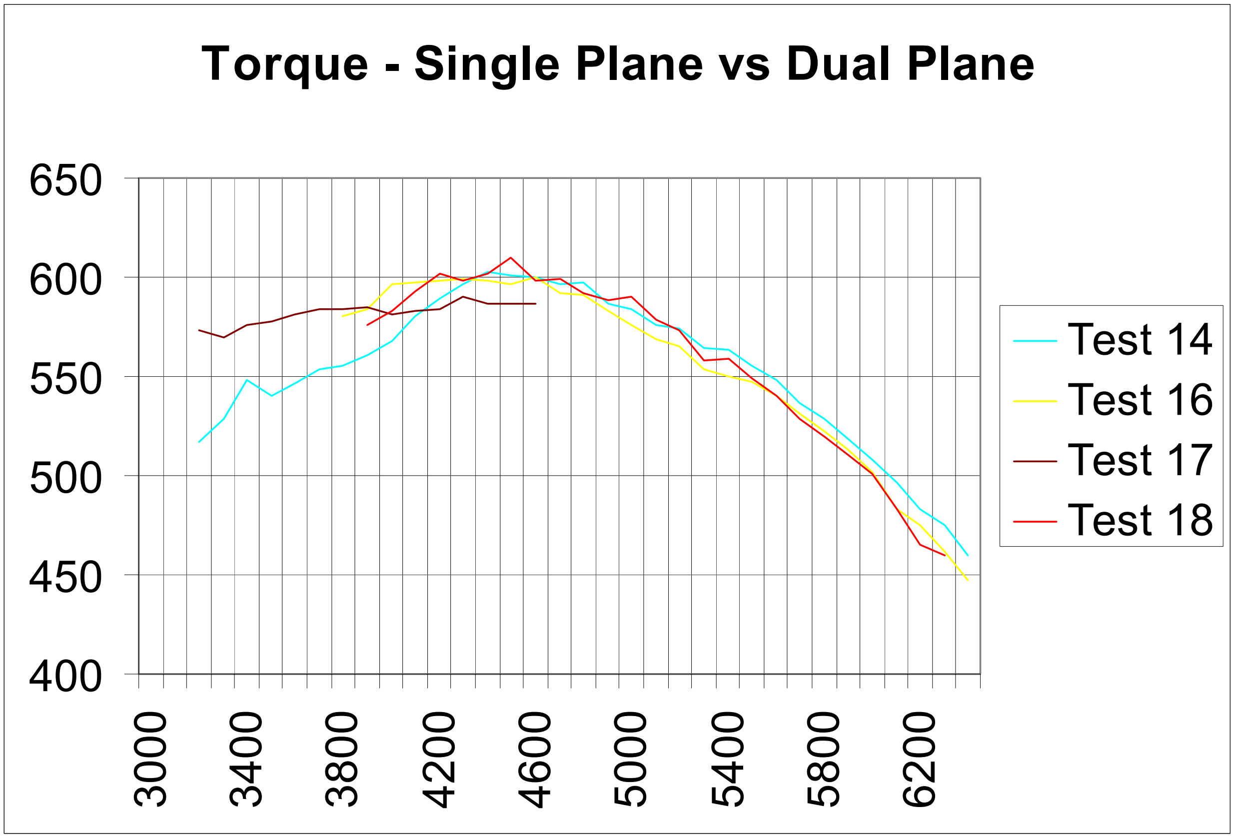
Engine Specifications

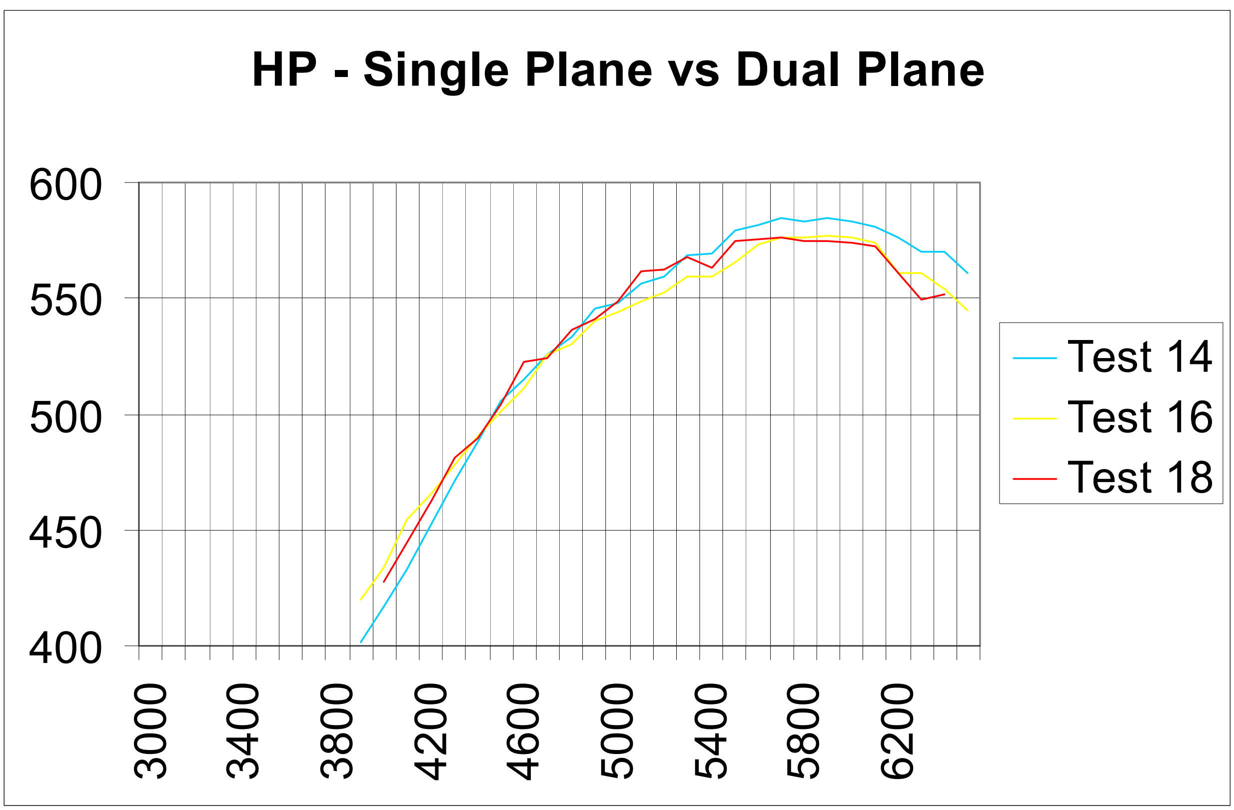
BB Chevy - 502CID, Mark VI (that's right, the new block)
Comp Cams 288AR cam with K11-692-8 K-kit
Comp Cams Hi-tech solid roller lifters, springs and retainers (as per above)
Comp Cams Hi-tech rocker arms
Comp Cams stud girdles
Comp Cams Hi-tech push rods
Stock forged cranked, balanced
Fluidamper
Mallory H beam rods
JE pistons, 10.5:1, JE gapless rings
Edelbrock Performer RPM heads, Oval Port, 290cc intakes, 100cc exhausts, 110cc chamber
2.19/1.88 valves with 11/32" valve stems
Dart oval port single plane intake, extrude hone ported – option A
Edelbrock Performer RPM oval port dual plane intake, extrude hone ported – option B
Carb Shop double pumper 750 – massaged to 930cfm – option A
1050 CFM dominator carb – option B
2-1/8 x 32 Jerry Stahl headers, 3-1/2 x 15 collectors (Borla X-1 mufflers optional)
NOS fogger direct port injection system tuned for 300hp, PWM electronic control
MSD 6AL ignition, MSD billet distributor
Taylor 10mm wires

Drivetrain

TH-400 Transmission, 3500rpm stall converter, no trans-brake
Strange 9” rear assembly, 3.70 or 3.89 gears driving 10x28” slicks, Wilwood rear disk brakes
3400lbs car, AVO coil-overs in rear, adjustable trailing links, adjustable mounting points

Plots of Dyno Test Results





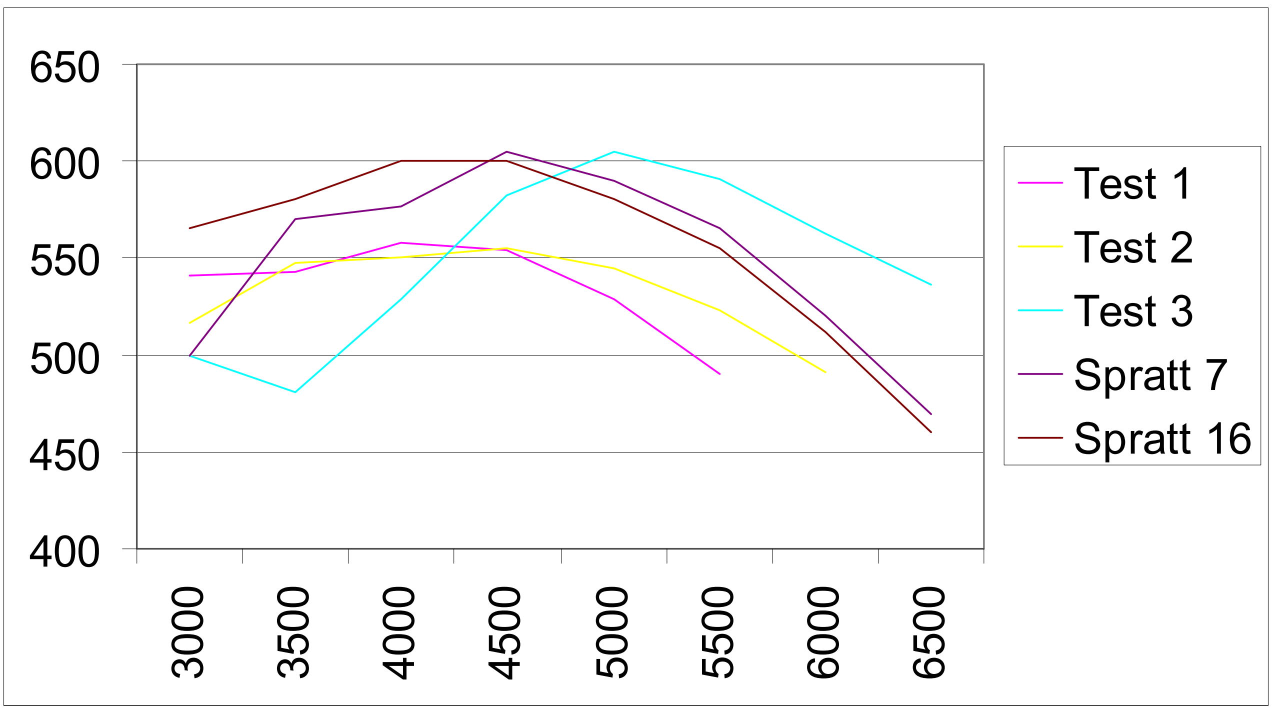
Test 1 is the Lingenfelter 502 setup (9.2:1 CR) with a mild 210/218 hydraulic cam, Edelbrock Performer dual plane manifold, 4779 750cfm double pumper carb, and 224cc “peanut” truck heads

Test 2 is the Lingenfelter 502 setup with a more aggressive 236/236 – 0.556” hydraulic cam, Edelbrock Performer RPM dual plane manifold and 264cc oval port heads (2.25/1.88 valves)

Test 3 is the same setup as above with a 260/268 – 0.714” solid roller cam, Dart single plane manifold, and 1050 Dominator carb

Spratt 7 is our best extrude honed Dart single plane manifold pull

Spratt 16 is our best extrude honed Edelbrock Performer RPM dual plane manifold pull with some compensation added in for the loss in power on day 2 (5-10ft-lbs added back in to match Day 1 results test #7 with day 2 benchmark run #14).



Appendix A – Dyno Results

<u>Test #2 – first full pull, initial setup: Dart single plane manifold, carb shop 4779 double pumper @ 926cfm with 72/82 jets, 33 degrees total timing/16 initial, 1" spacer (May 15/97)</u>

- Noticed loud exhaust ticking sound immediately after pull, did not locate source for the remainder of the day.
- Found out at the start of day 2 that the #4 exhaust port had blown out the head gasket due to a poor seal of the header at the back of the engine.
- The #4 spark plug had also worked itself loose during the day.
- Finally, the coil to distributor high voltage wire had worked itself loose and had marginally damaged the distributor cap contacts (possible loose of voltage to the plugs for the remainder of day 2?)
- Uneven temperature of the intake air and quality of the air was also an initial potential problem due to burning oil in the exhaust system from prior use with a failed engine on the dyno

LData from computer disk file - (DEREK2)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 2

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.01 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	567.6	410.7	74.3	97.2	84.1	179.5	502.0	12.8	.46	92	0	175	5.85
3900	564.9	419.5	77.7	96.8	83.8	183.6	512.9	12.8	.46	92	0	175	5.87
4000	563.2	428.9	81.3	99.3	83.5	181.8	539.0	13.6	.44	92	0	175	6.03
4100	571.4	446.1	84.9	99.4	83.4	181.4	553.3	14.0	.43	92	0	175	5.95
4200	578.3	462.5	88.5	97.9	83.3	182.7	558.1	14.0	.41	92	0	175	5.79
4300	589.3	482.5	92.3	101.0	83.3	194.2	589.4	13.9	.42	92	0	175	5.86
4400	593.4	497.1	96.1	101.9	83.2	202.0	609.1	13.8	.42	92	0	175	5.88
4500	600.4	514.4	100.0	102.6	83.1	208.3	626.6	13.8	.42	92	0	175	5.85
4500	592.5	518.9	104.0	99.7	82.7	216.0	622.9	13.2	.44	92	0	175	5.76
4700	601.3	538.1	108.0	104.1	82.6	219.3	664.4	13.9	.43	92	0	175	5.93
4800	599.3	547.7	112.1	103.0	82.4	226.1	672.4	13.7	.43	91	0	175	5.89
4900	597.6	557.5	116.4	102.2	82.1	232.7	681.1	13.4	.44	91	0	175	5.87
5000	593.2	564.7	120.6	104.5	81.7	231.2	710.5	14.1	.43	91	0	172	6.04
5100	584.3	567.4	125.1	104.4	81.3	244.0	724.1	13.6	.45	91	0	175	6.13
5200	578.9	573.2	129.5	103.0	80.9	241.8	727.8	13.8	.44	91	0	175	6.10
5300	570.6	575.8	134.5	102.6	80.3	250.6	739.2	13.5	.46	91	0	175	6.17
5400	564.9	580.8	140.1	104.2	79.8	254.6	764.9	13.8	.46	91	0	175	6.33
5500	559.4	585.8	145.9	102.9	79.3	259.9	769.0	13.6	.46	91	0	175	6.31
5600	551.2	587.7	151.7	102.5	78.7	261.3	779.9	13.7	.47	91	0	175	6.39
5700	543.9	590.3	157.7	99.8	78.1	266.3	773.5	13.3	.47	91	0	175	6.31
5800	533.9	589.6	163.9	100.5	77.4	268.7	793.1	13.6	.48	91	0	175	6.48
5900	526.0	590.9	170.0	96.3	76.8	263.6	772.2	13.5	.47	91	0	176	6.29
6000	516.2	589.7	176.4	96.8	76.1	276.5	791.4	13.1	.49	90	0	176	6.46
6100	499.0	579.6	184.0	96.2	75.0	273.8	799.4	13.4	.50	90	0	175	6.64
6200	489.7	578.1	191.7	97.2	74.2	272.1	821.3	13.9	.49	90	0	175	6.85

Test #3 – same setup as #2 (May 15/97)

Data from computer disk file - (DEREK3)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 3

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.01 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	552.3	399.6	74.3	97.3	83.7	180.8	504.1	12.8	.47	90	0	173	6.05
3900	544.6	404.4	77.7	96.6	83.3	178.2	513.2	13.2	.46	90	0	173	6.08
4000	557.5	424.6	81.3	97.8	83.3	181.8	532.9	13.5	.45	90	0	173	6.02
4100	554.7	433.0	84.9	96.4	83.0	187.2	539.7	13.2	.45	89	0	173	5.97
4200	572.4	457.7	88.5	97.7	83.2	192.8	560.1	13.3	.44	89	0	173	5.86
4300	580.6	475.4	92.3	100.1	83.2	202.3	587.9	13.3	.44	89	0	173	5.92
4400	582.2	487.8	96.1	103.8	82.9	209.9	623.9	13.6	.45	89	0	173	6.13
4500	592.8	507.9	100.0	102.1	82.9	218.8	626.4	13.1	.45	90	0	173	5.91
4600	581.5	509.3	104.0	103.5	82.4	225.7	648.6	13.2	.46	90	0	173	6.11
4700	594.5	532.0	108.0	103.8	82.5	232.4	665.3	13.1	.46	90	0	173	6.00
4800	586.5	536.0	112.1	103.2	82.1	239.8	674.8	12.9	.47	90	0	173	6.04
4900	582.2	543.2	116.4	104.9	81.7	240.4	700.7	13.4	.46	90	0	173	6.19
5000	582.8	554.8	120.6	103.4	81.5	245.9	704.2	13.1	.46	90	0	173	6.09
5100	571.5	555.0	125.1	102.5	80.9	254.5	711.9	12.8	.48	90	0	173	6.16
5200	567.3	561.7	129.5	103.4	80.6	256.0	732.7	13.1	.48	90	0	173	6.26
5300	561.3	566.4	134.5	104.4	80.1	260.2	755.5	13.3	.48	89	0	173	6.40
5400	549.3	564.8	140.1	101.7	79.4	270.2	749.7	12.7	.50	89	0	173	6.37
5500	541.7	567.3	145.9	102.6	78.8	272.7	771.1	13.0	.50	88	0	173	6.52
5600	537.8	573.4	151.7	101.6	78.3	273.2	777.9	13.1	.50	88	0	173	6.50
5700	528.8	573.9	157.7	102.0	77.7	280.9	795.1	13.0	.51	88	0	173	6.65
5800	518.6	572.7	163.9	101.0	77.0	281.6	800.1	13.0	.51	88	0	173	6.70
5900	511.4	574.5	170.0	100.1	76.4	281.8	809.1	13.2	.51	87	0	174	6.75
6000	496.9	567.7	176.4	100.5	75.5	280.9	826.2	13.5	.52	87	0	174	6.98
6100	491.5	570.9	184.0	98.5	74.8	284.7	822.7	13.3	.52	87	0	174	6.92
6200	477.2	563.3	191.7	96.0	73.7	274.0	814.6	13.7	.51	87	0	174	6.94
6300	463.2	555.6	199.6	95.5	72.7	268.7	824.7	14.1	.51	87	0	174	7.13
6400	448.7	546.8	207.6	95.4	71.5	286.9	836.4	13.4	.55	87	0	174	7.36

Test #5 – richen jets from 72/82 to 74/84 (May 15/97)

Data from computer disk file - (DEREKS)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 5

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.01 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	569.4	412.0	74.3	96.1	84.2	175.0	499.8	13.1	.44	87	0	171	5.79
3900	564.4	419.1	77.7	97.7	83.8	176.8	521.9	13.6	.44	87	0	173	5.95
4000	565.6	430.8	81.3	96.2	83.6	184.3	525.8	13.1	.45	88	0	173	5.84
4100	568.9	444.1	84.9	95.6	83.4	182.9	535.8	13.5	.43	88	0	173	5.77
4200	593.5	474.6	88.5	99.3	83.7	192.2	569.5	13.6	.42	88	0	173	5.74
4300	600.9	492.0	92.3	101.3	83.6	205.4	594.7	13.3	.44	89	0	173	5.79
4400	602.7	504.9	96.1	102.0	83.4	207.5	613.0	13.6	.43	89	0	173	5.81
4500	607.6	520.6	100.0	101.0	83.3	213.8	619.5	13.3	.43	89	0	173	5.70
4600	607.8	532.3	104.0	102.3	83.1	223.5	643.7	13.2	.44	88	0	173	5.78
4700	601.2	538.0	108.0	103.1	82.7	226.5	661.9	13.4	.44	88	0	173	5.89
4800	604.6	552.6	112.1	102.6	82.5	236.0	672.7	13.1	.45	88	0	173	5.82
4900	595.6	555.7	116.4	101.2	82.1	236.9	677.7	13.1	.44	88	0	173	5.84
5000	594.1	565.6	120.6	102.8	81.8	244.6	702.3	13.2	.45	88	0	173	5.94
5100	587.1	570.1	125.1	103.4	81.4	237.6	721.0	13.9	.43	88	0	173	6.05
5200	583.9	578.1	129.5	104.6	81.1	245.5	744.9	13.9	.44	87	0	173	6.16
5300	574.0	579.2	134.5	101.6	80.5	251.4	737.4	13.5	.45	87	0	173	6.09
5400	569.7	585.8	140.1	102.9	80.0	258.9	761.1	13.5	.46	87	0	173	6.22
5500	560.5	587.0	145.9	102.0	79.4	276.7	768.2	12.7	.49	87	0	173	6.26
5600	555.0	591.8	151.7	99.2	78.9	271.5	760.4	12.9	.48	87	0	173	6.15
5700	544.6	591.1	157.7	100.2	78.2	273.0	782.1	13.2	.48	87	0	173	6.34
5800	538.4	594.6	163.9	97.6	77.7	273.0	775.3	13.0	.48	87	0	175	6.25
5900	529.1	594.4	170.0	96.1	77.0	279.7	776.2	12.7	.49	87	0	175	6.26
6000	519.4	593.4	176.4	96.0	76.3	274.7	788.5	13.2	.48	87	0	175	6.37
6100	506.2	587.9	184.0	95.0	75.4	259.9	794.1	14.0	.46	87	0	176	6.48
6200	496.9	586.6	191.7	95.0	74.5	271.4	807.1	13.7	.48	87	0	175	6.60
6300	490.2	588.0	199.6	95.9	73.8	280.5	827.1	13.5	.50	87	0	175	6.75
6400	473.2	576.6	207.6	94.7	72.6	264.6	830.1	14.4	.48	87	0	175	6.92

Test #6 – richen jets from 74/84 to 76/88 (May 15/97)

Data from computer disk file - (DEREK7)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air   Test# : 6

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721   Air Sensor: 9.0
Vapor Pressure: .33   Barometric Pres.: 30.01   Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark   Engine displacement: 502.0   Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	Ai scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	574.0	415.3	74.3	98.3	84.3	174.6	508.8	13.4	.44	90	0	174	5.87
3900	563.2	418.2	77.7	97.4	83.7	185.1	517.9	12.8	.46	90	0	174	5.94
4000	571.9	435.6	81.3	97.0	83.7	189.3	528.8	12.8	.45	90	0	174	5.82
4100	581.9	454.3	84.9	98.2	83.7	199.4	548.8	12.6	.46	90	0	174	5.79
4200	585.7	468.4	88.5	96.6	83.5	202.8	552.9	12.5	.45	90	0	174	5.66
4300	602.8	493.5	92.3	100.2	83.7	217.0	587.2	12.4	.46	90	0	174	5.70
4400	603.6	505.7	96.1	102.3	83.4	219.9	613.3	12.8	.45	90	0	174	5.81
4500	608.1	521.0	100.0	103.3	83.3	229.5	633.3	12.7	.46	90	0	174	5.83
4600	607.3	531.9	104.0	104.9	83.0	234.4	657.7	12.9	.46	90	0	172	5.93
4700	602.8	539.4	108.0	103.5	82.7	238.5	663.2	12.8	.46	90	0	172	5.89
4800	600.2	548.5	112.1	103.3	82.4	247.8	675.6	12.5	.47	90	0	173	5.91
4900	591.1	551.5	116.4	103.5	81.9	248.2	691.4	12.8	.47	90	0	173	6.01
5000	594.0	565.5	120.6	103.8	81.8	248.7	707.7	13.1	.46	90	0	173	6.00
5100	586.7	569.7	125.1	101.6	81.3	252.7	706.0	12.8	.46	90	0	173	5.95
5200	578.9	573.2	129.5	102.1	80.9	255.8	723.9	13.0	.47	90	0	173	6.06
5300	573.2	578.4	134.5	104.3	80.4	262.1	753.0	13.2	.47	90	0	173	6.25
5400	567.2	583.2	140.1	103.2	79.9	278.4	759.6	12.5	.50	90	0	173	6.26
5500	553.9	580.1	145.9	100.6	79.2	280.9	753.9	12.3	.51	90	0	174	6.24
5600	551.0	587.5	151.7	102.8	78.7	283.4	784.1	12.7	.50	90	0	174	6.41
5700	543.8	590.2	157.7	99.1	78.1	278.4	770.1	12.7	.49	90	0	174	6.27
5800	535.6	591.5	163.9	98.8	77.5	279.7	782.3	12.8	.49	89	0	174	6.35
5900	527.1	592.1	170.0	99.8	76.9	278.6	804.3	13.3	.49	89	0	174	6.53
6000	515.1	588.5	176.4	98.2	76.1	277.5	804.4	13.3	.49	89	0	174	6.57
6100	504.3	585.7	184.0	95.4	75.2	276.7	794.8	13.2	.49	89	0	174	6.53
6200	490.8	579.4	191.7	96.4	74.2	288.4	816.2	13.0	.52	89	0	174	6.78
6300	482.1	578.3	199.6	96.9	73.4	268.9	833.5	14.2	.49	89	0	174	6.94
6400	474.4	578.1	207.6	93.8	72.6	278.6	819.9	13.5	.51	89	0	174	6.83

<u>Test #7 – advance timing from 33 to 36 degrees (May 15/97)</u>

Data from computer disk file - (DEREK8)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 7

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.01 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	579.5	419.3	74.3	97.0	84.4	187.2	503.2	12.3	.47	89	0	176	5.74
3900	568.2	421.9	77.7	95.4	83.9	188.6	508.2	12.4	.47	89	0	176	5.77
4000	576.5	439.1	81.3	99.3	83.8	192.2	542.5	13.0	.46	88	0	176	5.91
4100	580.1	452.9	84.9	97.7	83.7	192.5	547.0	13.0	.44	88	0	176	5.78
4200	596.6	477.1	88.5	99.3	83.8	202.2	570.0	12.9	.44	88	0	176	5.71
4300	603.0	493.7	92.3	100.3	83.7	212.1	589.6	12.8	.45	88	0	176	5.71
4400	595.9	499.2	96.1	98.8	83.3	212.3	594.7	12.9	.44	88	0	176	5.70
4500	596.8	511.3	100.0	101.2	83.1	224.9	622.0	12.7	.46	88	0	177	5.82
4600	605.4	530.2	104.0	103.5	83.0	231.6	650.0	12.9	.46	89	0	177	5.87
4700	601.7	538.5	108.0	103.4	82.7	232.9	663.8	13.1	.45	89	0	177	5.90
4800	601.5	549.7	112.1	103.8	82.4	240.2	680.4	13.0	.46	89	0	177	5.93
4900	603.6	563.1	116.4	102.8	82.3	246.4	687.2	12.8	.46	89	0	177	5.85
5000	589.3	561.0	120.6	102.1	81.7	241.8	697.[illegible]	13.2	.45	89	0	177	5.95
5100	588.3	571.3	125.1	105.2	81.4	255.5	733.0	13.2	.47	89	0	177	6.15
5200	583.5	577.7	129.5	104.9	81.0	264.8	744.5	12.9	.48	89	0	177	6.18
5300	578.5	583.8	134.5	103.7	80.6	270.0	750.8	12.8	.48	89	0	178	6.17
5400	570.0	586.1	140.1	102.2	80.0	277.5	753.5	12.5	.49	89	0	178	6.17
5500	558.0	584.3	145.9	100.0	79.3	271.6	751.3	12.7	.49	89	0	178	6.17
5600	557.6	594.5	151.7	99.7	78.9	290.7	762.1	12.0	.51	89	0	178	6.15
5700	544.1	590.5	157.7	100.9	78.2	286.1	784.6	12.6	.51	89	0	178	6.38
5800	537.4	593.5	163.9	98.2	77.6	278.6	777.9	12.8	.49	89	0	178	6.30
5900	523.9	588.5	170.0	99.0	76.8	290.8	797.8	12.6	.52	89	0	178	6.51
6000	517.9	591.7	176.4	97.4	76.2	269.6	798.0	13.6	.48	89	0	178	6.48
6100	504.6	586.1	184.0	95.2	75.3	280.4	792.6	13.0	.50	89	0	178	6.50
6200	502.2	592.8	191.7	95.1	74.7	275.0	805.4	13.4	.49	89	0	178	6.54
6300	484.9	581.7	199.6	94.1	73.5	276.8	809.9	13.4	.50	89	0	178	6.70
6400	474.2	577.9	207.6	93.5	72.6	294.5	817.2	12.7	.53	89	0	178	6.81

Test #8 – add 18" exhaust reducer/extensions (May 15/97)

Data from computer disk file – (DEREK9)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 8

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.02 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	591.9	428.3	74.3	98.5	84.8	193.4	516.8	12.3	.47	83	0	173	5.74
3900	580.9	431.4	77.7	98.8	84.3	192.6	531.9	12.6	.46	83	0	174	5.86
4000	577.1	439.5	81.3	97.9	83.9	198.5	541.4	12.5	.47	82	0	174	5.85
4100	577.3	450.7	84.9	96.1	83.7	200.9	545.0	12.5	.46	82	0	174	5.74
4200	584.4	467.3	88.5	96.8	83.6	199.8	562.3	12.9	.44	82	0	174	5.71
4300	584.4	478.5	92.3	96.5	83.4	217.9	574.1	12.1	.47	82	0	174	5.70
4400	591.1	495.2	96.1	96.2	83.3	215.0	585.5	12.5	.45	82	0	174	5.62
4500	590.4	505.9	100.0	98.3	83.0	217.6	611.6	12.9	.45	82	0	174	5.74
4600	586.0	513.3	104.0	98.2	82.7	226.5	624.4	12.7	.46	82	0	174	5.78
4700	591.0	528.9	108.0	99.9	82.5	229.7	649.4	13.0	.45	82	0	174	5.83
4800	586.8	536.3	112.1	102.2	82.2	240.7	678.7	12.9	.46	82	0	174	6.01
4900	586.1	546.8	116.4	99.1	81.9	246.4	671.4	12.5	.47	82	0	174	5.83
5000	584.6	556.5	120.6	98.2	81.7	242.1	679.4	12.9	.45	82	0	174	5.80
5100	577.7	561.0	125.1	98.9	81.2	248.5	697.6	12.9	.46	82	0	174	5.91
5200	573.7	568.0	129.5	100.4	80.9	260.4	722.3	12.7	.47	82	0	174	6.05
5300	568.5	573.7	134.5	100.5	80.5	264.3	737.0	12.8	.48	82	0	174	6.11
5400	560.3	576.1	140.1	100.4	79.9	278.6	749.9	12.4	.50	82	0	175	6.19
5500	557.6	583.9	145.9	102.1	79.4	275.3	776.7	13.0	.49	82	0	175	6.33
5600	552.7	589.3	151.7	100.2	78.9	287.7	776.0	12.4	.51	82	0	175	6.27
5700	543.2	589.5	157.7	100.2	78.3	273.3	790.1	13.3	.48	82	0	176	6.38
5800	529.5	584.7	163.9	98.7	77.5	280.3	791.9	13.0	.50	82	0	176	6.45
5900	522.8	587.3	170.0	98.5	76.9	285.6	803.6	12.9	.50	82	0	176	6.52
6000	510.5	583.2	176.4	97.1	76.1	291.2	805.1	12.7	.52	82	0	176	6.58
6100	496.1	576.2	184.0	96.2	75.1	270.3	811.4	13.8	.49	82	0	176	6.71
6200	487.7	575.7	191.7	93.7	74.3	294.2	803.0	12.5	.53	82	0	176	6.65
6300	480.9	576.9	199.6	93.2	73.5	276.0	810.2	13.5	.50	83	0	176	6.71
6400	469.6	572.2	207.6	92.1	72.6	271.5	813.2	13.8	.49	83	0	176	6.79

Test #9 – change to 2" spacer (May 15/97)

Data from computer disk file - (DEREK10)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 9

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.02 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	596.4	431.5	74.3	100.6	84.8	191.8	523.6	12.5	.46	87	0	170	5.79
3900	586.2	435.3	77.7	99.2	84.3	194.0	529.8	12.5	.46	87	0	170	5.81
4000	577.9	440.1	81.3	98.7	83.9	193.4	540.9	12.8	.46	87	0	170	5.86
4100	585.3	456.9	84.9	98.5	83.8	197.8	553.4	12.8	.45	87	0	171	5.79
4200	586.9	469.3	88.5	98.9	83.6	201.4	568.9	13.0	.45	87	0	171	5.78
4300	582.9	477.2	92.3	100.0	83.3	203.5	588.8	13.3	.44	87	0	171	5.89
4400	589.5	493.9	96.1	100.6	83.2	209.1	606.4	13.3	.44	87	0	171	5.86
4500	592.9	508.0	100.0	101.5	83.0	209.9	625.5	13.7	.43	87	0	171	5.88
4600	595.0	521.1	104.0	101.3	82.8	217.7	638.1	13.5	.43	87	0	171	5.84
4700	592.8	530.5	108.0	100.8	82.5	217.0	649.1	13.7	.43	87	0	171	5.84
4800	597.6	546.2	112.1	101.9	82.4	228.8	670.1	13.4	.44	87	0	172	5.86
4900	584.4	545.2	116.4	101.6	81.8	241.2	683.1	13.0	.46	86	0	172	5.98
5000	582.4	554.5	120.6	105.3	81.5	237.6	721.1	13.9	.45	87	0	172	6.21
5100	586.3	569.3	125.1	104.2	81.4	246.0	730.1	13.6	.45	86	0	173	6.12
5200	569.7	564.1	129.5	103.1	80.7	248.9	735.7	13.6	.46	86	0	173	6.22
5300	568.6	573.8	134.5	100.7	80.4	277.8	732.5	12.1	.50	86	0	173	6.09
5400	559.6	575.4	140.1	99.9	79.8	277.5	740.4	12.3	.50	86	0	173	6.14
5500	556.4	582.7	145.9	103.2	79.3	283.3	778.8	12.6	.51	86	0	173	6.38
5600	549.4	585.8	151.7	101.2	78.8	286.6	778.0	12.5	.51	86	0	173	6.34
5700	541.4	587.6	157.7	98.5	78.2	281.4	770.5	12.6	.50	86	0	173	6.27
5800	530.2	585.5	163.9	100.1	77.4	289.4	796.9	12.6	.51	86	0	173	6.51
5900	522.8	587.3	170.0	99.7	76.8	294.1	807.2	12.6	.52	86	0	173	6.58
6000	512.1	585.0	176.4	96.2	76.1	281.4	792.3	12.9	.50	86	0	174	6.49
6100	498.9	579.5	184.0	97.6	75.1	292.3	816.8	12.8	.53	86	0	175	6.75
6200	494.0	583.2	191.7	96.2	74.4	288.9	818.6	13.0	.52	86	0	175	6.73
6300	480.7	576.6	199.6	94.8	73.5	277.1	820.8	13.6	.50	85	0	175	6.82
6400	465.4	567.1	207.6	93.2	72.3	276.5	818.6	13.6	.51	86	0	175	6.92

Test #10 – remove exhaust reducer/extensions (May 15/97)

Data from computer disk file - (DEREK11)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 10

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.02 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	572.9	414.5	74.3	99.9	84.3	191.3	521.9	12.5	.48	85	0	178	5.99
3900	563.6	418.5	77.7	96.6	83.9	190.6	519.7	12.5	.47	84	0	178	5.90
4000	574.1	437.2	81.3	96.2	83.9	191.1	530.5	12.7	.45	84	0	178	5.77
4100	590.1	460.7	84.9	97.4	84.0	199.4	550.5	12.7	.45	84	0	178	5.68
4200	596.9	477.3	88.5	100.5	83.9	203.1	582.0	13.2	.44	84	0	177	5.80
4300	600.8	491.9	92.3	100.2	83.7	208.5	594.2	13.1	.44	84	0	177	5.74
4400	604.1	506.1	96.1	103.8	83.6	210.6	629.3	13.7	.43	84	0	177	5.91
4500	602.1	515.9	100.0	102.1	83.3	216.4	633.6	13.4	.43	84	0	177	5.84
4600	600.7	526.1	104.0	102.8	83.0	220.1	652.0	13.6	.43	84	0	177	5.89
4700	604.3	540.8	108.0	102.2	82.9	224.1	661.9	13.6	.43	84	0	177	5.82
4800	602.8	550.9	112.1	101.4	82.6	231.5	669.5	13.3	.44	85	0	176	5.79
4900	592.5	552.8	116.4	103.6	82.1	241.6	698.4	13.3	.45	85	0	176	6.02
5000	588.0	559.8	120.6	104.2	81.7	240.5	717.1	13.7	.45	85	0	176	6.10
5100	584.5	567.6	125.1	103.7	81.4	247.0	727.6	13.5	.45	85	0	176	6.11
5200	580.4	574.7	129.5	101.6	81.0	264.4	726.7	12.6	.48	85	0	176	6.03
5300	569.6	574.8	134.5	103.2	80.4	274.6	752.1	12.6	.50	85	0	176	6.24
5400	563.1	579.0	140.1	102.1	79.9	275.4	758.8	12.7	.49	85	0	176	6.25
5500	559.5	585.9	145.9	101.7	79.4	287.8	769.6	12.3	.51	85	0	176	6.26
5600	549.5	585.9	151.7	101.3	78.8	292.6	780.4	12.2	.52	85	0	176	6.35
5700	542.3	588.6	157.7	98.9	78.2	286.0	775.8	12.5	.51	85	0	176	6.29
5800	530.8	586.2	163.9	98.0	77.5	278.5	782.0	12.9	.49	85	0	176	6.37
5900	521.8	586.2	170.0	98.6	76.8	270.4	800.3	13.6	.48	85	0	176	6.52
6000	511.6	584.5	176.4	97.7	76.1	289.4	806.3	12.8	.52	85	0	176	6.59
6100	496.7	576.9	184.0	95.1	75.0	311.9	796.9	11.7	.56	86	0	176	6.61
6200	491.6	580.3	191.7	96.0	74.4	296.4	817.0	12.7	.53	86	0	176	6.74
6300	478.6	574.1	199.6	95.8	73.4	311.4	828.2	12.2	.57	86	0	177	6.91
6400	465.1	566.8	207.6	95.6	72.3	288.5	839.0	13.4	.53	86	0	177	7.09

Test #11 – Second day, Torque Master plugs, 1" spacer (May 16/97)

- had to abort pull due to severe plug mis firing and blown exhaust gasket
- plugs seemed to have trouble lighting up mixture at higher RPMs with dramatic loss of power
- noticed that a number of the plug wires were heat damaged from direct contact and/or exposure to high exhaust heat
- after noticing that the #4 header gasket had blown out, 2 more gaskets were damaged during the testing on May 16

Data from computer disk file - (DEREK12)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air   Test# 11

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.13 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
2900	515.4	284.6	46.2	86.8	85.8	143.3	355.6	11.4	.51	73	0	171	5.84
3000	502.6	287.1	48.7	84.7	85.3	152.3	358.5	10.8	.54	72	0	171	5.84
3100	497.1	293.4	51.6	85.9	84.8	150.1	375.9	11.5	.52	73	0	171	5.99
3200	507.1	309.0	54.7	88.0	84.7	156.5	397.4	11.7	.52	73	0	171	6.02
3300	518.8	326.0	57.7	88.2	84.7	157.2	410.9	12.0	.49	73	0	171	5.90
3400	538.0	348.3	60.9	89.3	84.9	160.8	428.6	12.2	.47	73	0	171	5.76
3500	530.3	353.4	64.1	90.8	84.4	166.0	448.7	12.4	.48	73	0	171	5.94
3600	536.0	367.4	67.4	92.8	84.2	167.9	471.5	12.9	.47	73	0	171	6.00
3700	543.7	383.0	70.9	93.2	84.1	170.2	487.0	13.1	.45	73	0	171	5.95
3800	545.0	394.3	74.3	93.3	83.9	182.6	500.5	12.6	.47	73	0	171	5.94
3900	555.7	412.6	77.7	95.5	83.9	192.2	525.8	12.6	.47	73	0	167	5.96
4000	555.7	423.2	81.3	100.1	83.6	193.7	564.8	13.4	.47	73	0	169	6.25
4100	573.8	447.9	84.9	97.9	83.8	200.0	566.2	13.0	.46	73	0	171	5.92
4200	580.0	463.8	88.5	100.6	83.7	207.5	595.3	13.2	.46	74	0	171	6.01
4300	584.5	478.6	92.3	101.6	83.5	214.1	615.9	13.2	.46	74	0	171	6.03
4400	578.4	484.6	96.1	101.3	83.2	230.2	628.7	12.5	.48	73	0	171	6.08
4500	591.8	507.1	100.0	103.0	83.2	233.0	654.0	12.9	.47	73	0	172	6.04
4600	588.8	515.7	104.0	102.9	82.9	241.3	667.8	12.7	.48	73	0	169	6.06
4700	588.8	526.9	108.0	102.2	82.7	242.5	676.5	12.8	.47	74	0	170	6.02
4800	591.4	540.5	112.1	103.9	82.5	257.0	703.0	12.6	.49	74	0	172	6.10
4900	581.0	542.1	116.4	102.3	82.0	257.4	705.8	12.6	.49	74	0	172	6.11
5000	578.1	550.4	120.6	103.5	81.7	259.1	729.4	12.9	.48	74	0	172	6.22
5100	574.3	557.7	125.1	101.4	81.4	251.3	729.2	13.3	.46	74	0	173	6.13
5200	562.5	556.9	129.5	102.8	80.8	260.2	752.9	13.3	.48	74	0	173	6.34
5300	553.5	558.6	134.5	101.0	80.2	250.9	754.5	13.8	.46	74	0	173	6.34
5400	551.4	566.9	140.1	103.3	79.8	271.5	786.4	13.3	.49	73	0	174	6.50
5500	547.3	573.1	145.9	100.4	79.4	281.0	779.2	12.7	.50	73	0	174	6.37
5600	539.9	575.7	151.7	101.2	78.8	275.6	799.5	13.3	.49	73	0	174	6.51
5700	528.3	573.4	157.7	101.5	78.1	283.3	816.0	13.2	.50	73	0	174	6.68
5800	522.3	576.8	163.9	102.0	77.5	286.4	833.8	13.4	.51	73	0	174	6.78

Test #12 – same as above, aborted as well (May 16/97)

- had to abort pull due to severe plug mis firing again, decided to change back to old plugs and change header gasket again

Data from computer disk file – (DEREK13)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 12

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.12 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	585.8	423.8	74.3	99.7	84.6	194.0	520.1	12.3	.47	88	0	176	5.84
3900	571.2	424.2	77.7	97.9	84.0	200.8	524.0	12.0	.49	88	0	176	5.88
4000	574.6	437.6	81.3	97.5	83.9	198.6	535.7	12.4	.47	87	0	176	5.82
4100	588.7	459.6	84.9	98.0	84.0	205.5	554.6	12.4	.46	85	0	176	5.72
4200	596.5	477.0	88.5	97.8	83.9	206.2	565.3	12.6	.45	86	0	176	5.63
4300	592.3	484.9	92.3	99.3	83.5	216.7	587.6	12.5	.46	86	0	176	5.76
4400	611.0	511.9	96.1	102.2	83.7	224.4	619.2	12.7	.45	86	0	176	5.75
4500	604.4	517.9	100.0	103.3	83.3	230.3	638.4	12.7	.46	87	0	176	5.86
4600	602.2	527.4	104.0	101.9	83.0	237.0	644.4	12.5	.47	87	0	176	5.81
4700	600.5	537.4	108.0	101.8	82.8	239.1	657.2	12.6	.46	87	0	176	5.82
4800	594.3	543.2	112.1	101.1	82.4	244.8	666.4	12.5	.47	87	0	176	5.84
4900	581.5	542.5	116.4	102.4	81.8	245.1	689.6	12.9	.47	87	0	176	6.05
5000	584.8	556.7	120.6	103.4	81.7	246.0	710.2	13.3	.46	87	0	176	6.07
5100	580.1	563.3	125.1	103.3	81.3	245.7	724.0	13.5	.45	87	0	176	6.12
5200	565.4	559.8	129.5	102.3	80.7	247.6	732.7	13.6	.46	86	0	176	6.22

Test #13 – back to old plugs (May 16/97)

- this run was a repeat of run #7 from the previous day as a benchmarking run and it resulted in a power loss across the power band of 5-10 ft-lbs of torque and 10 hp at the top end.
- The sheet for this run was lost but this slight loss of power from the previous day was maintained for the remaining tests conducted on day 2 and should be taken into account when comparing results between days.
- The most likely result of this loss of recorded power was a combination of a small change in the dyno setup (repeatability and accuracy), the weather, and possibly (most likely) a change in the engine setup such as the ignition system quality)

Test #14 – removed 1" spacer (May 16/97)

- Noticed no change in power from the (lost) run #13 which indicated that the large volume of the under carb area in the Dart single plane manifold produced optimum power without the addition of further volume

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Data from computer disk file - (DEREK15 )

   Standard Corrected Data for 29.92 inches Hg. 60 F dry air       Test#     14

Test:  300 RPM/Sec Acceleration Fuel Spec. Grav.:       .721    Air Sensor: 9.0
Vapor Pressure:  .33                Barometric Pres.:     30.10    Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark          Engine displacement: 502.0    Stroke:   4.000
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RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	570.3	412.6	74.3	98.1	84.3	186.9	513.5	12.6	.47	86	0	174	5.91
3900	561.3	416.8	77.7	96.2	83.8	189.3	516.5	12.5	.47	86	0	174	5.89
4000	568.2	432.7	81.3	98.4	83.7	197.4	542.3	12.6	.47	86	0	174	5.96
4100	580.1	452.9	84.9	97.4	83.7	203.5	549.9	12.4	.47	86	0	174	5.77
4200	589.1	471.1	88.5	98.5	83.7	209.1	569.7	12.5	.46	86	0	175	5.75
4300	595.9	487.9	92.3	103.3	83.6	212.4	611.4	13.2	.45	86	0	175	5.96
4400	603.3	505.4	96.1	103.9	83.5	226.0	629.4	12.8	.46	86	0	175	5.92
4500	601.4	515.3	100.0	103.9	83.3	234.0	644.0	12.6	.47	86	0	175	5.94
4600	599.7	525.3	104.0	103.0	83.0	230.9	652.3	13.0	.46	86	0	175	5.91
4700	595.5	532.9	108.0	103.0	82.6	241.2	666.0	12.7	.47	86	0	175	5.95
4800	596.8	545.4	112.1	102.4	82.4	245.6	676.7	12.7	.47	86	0	175	5.90
4900	587.0	547.7	116.4	102.3	81.9	258.4	690.6	12.3	.49	86	0	175	6.00
5000	583.8	555.8	120.6	100.5	81.6	245.2	692.1	13.0	.46	86	0	175	5.93
5100	575.6	558.9	125.1	103.9	81.2	257.9	729.8	13.0	.48	86	0	175	6.21
5200	573.9	568.2	129.5	102.5	80.9	257.5	734.1	13.1	.47	86	0	175	6.15
5300	564.3	569.5	134.5	99.3	80.3	245.5	725.2	13.6	.45	85	0	175	6.06
5400	562.6	578.5	140.1	101.7	79.9	276.4	757.2	12.6	.50	85	0	175	6.23
5500	555.2	581.4	145.9	102.5	79.3	283.7	776.7	12.6	.51	86	0	177	6.36
5600	548.1	584.4	151.7	103.0	78.8	271.5	793.6	13.4	.48	86	0	177	6.47
5700	537.4	583.2	157.7	102.5	78.1	285.3	805.1	13.0	.51	86	0	176	6.58
5800	528.9	584.1	163.9	98.7	77.4	292.4	788.9	12.4	.52	86	0	176	6.44
5900	519.1	583.1	170.0	99.5	76.8	294.5	807.9	12.6	.52	86	0	176	6.61
6000	508.4	580.8	176.4	97.6	76.0	294.0	806.0	12.6	.53	86	0	177	6.62
6100	496.3	576.4	184.0	96.9	75.1	288.8	814.6	13.0	.52	86	0	176	6.75
6200	482.8	569.9	191.7	96.0	74.1	282.8	820.0	13.3	.52	86	0	176	6.87
6300	474.6	569.3	199.6	93.5	73.3	293.3	810.5	12.7	.54	86	0	176	6.80
6400	459.7	560.2	207.6	93.8	72.1	297.3	826.3	12.8	.55	86	0	176	7.05

<u>Test #15 – changed to Edelbrock Performer RPM dual plane manifold without a spacer (May 16/97)</u>

- Noticed that the carb was pulling on the venturies much harder with the change to the dual plane manifold and was running rich. This showed that the Dart single plane manifold was less efficient in regards to fuel distribution and quality.

Data from computer disk file -- (DEREK16)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air   Test# 15

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.10 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WA1 Out	BSAC
3900	594.6	441.5	77.7	99.2	84.6	216.4	530.5	11.3	.51	88	0	174	5.72
4000	595.0	453.2	81.3	99.0	84.3	222.3	543.3	11.2	.51	88	0	174	5.71
4100	598.1	466.9	84.9	97.8	84.2	218.4	551.0	11.6	.48	87	0	174	5.61
4200	599.5	479.4	88.5	99.3	83.9	225.6	573.1	11.7	.49	87	0	174	5.68
4300	596.8	488.6	92.3	99.8	83.6	234.2	589.9	11.6	.50	87	0	174	5.74
4400	592.5	496.4	96.1	98.8	83.3	234.0	597.6	11.7	.49	87	0	175	5.73
4500	595.9	510.6	100.0	100.7	83.1	240.9	622.8	11.9	.49	87	0	175	5.80
4600	594.7	520.9	104.0	100.1	82.9	247.1	632.8	11.8	.49	87	0	175	5.78
4700	588.5	526.6	108.0	100.5	82.5	250.9	649.3	11.9	.49	87	0	175	5.87
4800	588.0	537.4	112.1	101.5	82.2	255.4	669.6	12.0	.49	87	0	175	5.93
4900	574.2	535.7	116.4	101.4	81.6	259.0	682.5	12.1	.50	87	0	175	6.06
5000	575.0	547.4	120.6	99.2	81.4	265.7	681.5	11.8	.50	87	0	175	5.92
5100	565.0	548.6	125.1	100.4	80.9	273.3	704.0	11.8	.52	87	0	175	6.11
5200	562.1	556.5	129.5	100.4	80.6	270.5	717.6	12.2	.50	87	0	175	6.14
5300	560.9	566.0	134.5	99.8	80.2	272.3	726.6	12.3	.50	87	0	175	6.11
5400	531.6	567.1	140.1	99.2	79.6	273.1	735.7	12.4	.50	87	0	175	6.18
5500	546.7	572.5	145.9	100.3	79.1	284.6	757.8	12.2	.52	87	0	175	6.31
5600	531.1	566.3	151.7	100.8	78.3	283.2	779.8	12.6	.52	84	0	175	6.55
5700	524.4	569.1	157.7	101.8	77.7	289.5	799.7	12.7	.53	85	0	175	6.69
5800	517.2	571.2	163.9	97.2	77.1	289.3	776.5	12.3	.53	85	0	175	6.48
5900	504.7	567.0	170.0	98.1	76.2	290.4	797.9	12.6	.53	85	0	175	6.71
6000	498.0	568.9	176.4	94.5	75.6	292.3	781.8	12.3	.53	85	0	175	6.55
6100	487.4	566.1	184.0	95.6	74.8	287.5	805.0	12.9	.53	84	0	176	6.77
6200	471.5	556.6	191.7	95.5	73.7	292.7	817.9	12.8	.55	84	0	176	7.00
6300	452.0	542.2	199.6	93.4	72.3	300.2	812.5	12.4	.58	84	0	176	7.14
6400	442.1	538.7	207.6	92.3	71.4	306.9	816.5	12.2	.59	84	0	171	7.23

Test #16 – leaned out jets from 76/88 to 74/85 (May 16/97)

- While the power output was still down as much as 10hp from the Dart single plane manifold, there was no change in the rpm power curve shape or peak hp rpm point until past 6000 rpm . The loss in power from the switch in manifolds only started to show up (other than the 5-10 hp across the board which may have been caused by other variables) as a noticeable drop above 6000 rpm which was more than 200 rpm above the hp peak.
- This indicates that the Dart single plane manifold may not hold any appreciable advantage over the operating range of the engine during racing conditions with the current setup (if the 5-10 hp loss was the result of other variables – only further testing after the porting of the heads will be able to determine this).
- After porting the heads, a change to a larger cam may favor the Dart single plane manifold at the expense of idle quality and low rpm torque and possibly the same cam may also work better with the single plane manifold.

Data from computer disk file – (DEREK17)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air Test# 16

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.10 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3800	603.5	436.7	74.3	102.8	85.1	193.8	545.9	12.9	.46	78	0	178	5.09
3900	584.0	433.7	77.7	102.3	84.5	192.8	557.5	13.3	.46	78	0	178	6.05
4000	595.8	453.8	81.3	102.7	84.5	204.8	573.8	12.9	.46	78	0	178	5.95
4100	596.6	465.7	84.9	101.8	84.2	205.9	581.9	13.0	.45	79	0	178	5.89
4200	598.0	478.2	88.5	100.5	84.0	211.5	589.7	12.8	.45	78	0	178	5.81
4300	598.5	490.0	92.3	101.1	83.8	221.6	607.4	12.6	.46	78	0	178	5.84
4400	597.7	500.7	96.1	102.7	83.5	224.3	631.7	12.9	.46	78	0	178	5.94
4500	596.3	510.9	100.0	101.1	83.3	229.7	636.0	12.7	.46	78	0	176	5.86
4600	599.6	525.2	104.0	101.9	83.1	235.4	654.5	12.8	.46	78	0	178	5.87
4700	591.6	529.4	108.0	102.7	82.7	231.7	674.5	13.4	.45	78	0	178	6.00
4800	591.2	540.3	112.1	103.7	82.4	245.8	695.8	13.0	.47	78	0	177	6.07
4900	583.0	543.9	116.4	104.4	82.0	248.2	714.4	13.2	.47	78	0	176	6.19
5000	576.0	548.4	120.6	102.4	81.6	242.6	715.2	13.5	.45	78	0	175	6.15
5100	569.3	552.8	125.1	100.6	81.1	254.5	716.9	12.9	.47	78	0	176	6.11
5200	564.5	558.9	129.5	101.4	80.8	258.8	736.1	13.1	.48	78	0	176	6.21
5300	554.2	559.3	134.5	101.9	80.2	251.5	754.3	13.8	.46	78	0	176	6.36
5400	549.6	565.1	140.1	101.2	79.7	262.2	763.8	13.4	.48	78	0	176	6.38
5500	546.9	572.7	145.9	100.4	79.3	269.8	771.9	13.1	.48	78	0	176	6.36
5600	540.3	576.1	151.7	100.7	78.7	261.7	786.6	13.8	.47	79	0	176	6.45
5700	531.4	576.7	157.7	96.8	78.0	270.4	769.4	13.1	.48	79	0	176	6.30
5800	522.3	576.8	163.9	94.9	77.4	278.3	767.1	12.7	.50	79	0	177	6.29
5900	513.3	576.6	170.0	97.9	76.7	281.1	805.6	13.2	.50	79	0	177	6.60
6000	501.6	573.0	176.4	96.9	75.9	267.7	810.5	13.9	.48	79	0	177	6.69
6100	483.4	561.5	184.0	95.2	74.7	277.3	808.1	13.4	.51	80	0	176	6.82
6200	475.4	561.2	191.7	94.3	74.0	271.2	814.6	13.8	.50	79	0	176	6.87
6300	461.7	553.8	199.6	95.5	72.9	274.9	839.2	14.0	.51	79	0	176	7.17
6400	447.4	545.2	207.6	94.1	71.8	273.7	839.4	14.1	.52	79	0	176	7.29

Test #17 – low RPM pull (May 16/97)

- Look at that torque!
- As was typical of the last 2-3 pulls, ignition quality started to degrade with some backfiring and misfiring. This no doubt caused some of the power loss that was indicated during these last tests. A complete tear down of the heads and ignition system before the next dyno session should indicate the cause of this effect.

Data from computer disk file - (DEREK18)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air   Test# 17

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.10 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CBT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3200	572.5	348.8	54.7	98.0	86.1	149.8	436.5	13.4	.44	80	0	174	5.90
3300	569.8	358.0	57.7	98.7	85.8	161.4	453.6	12.9	.46	80	0	174	5.98
3400	575.9	372.8	60.9	96.5	85.6	166.9	456.4	12.6	.46	80	0	174	5.78
3500	577.5	384.9	64.1	95.3	85.4	167.3	463.9	12.7	.45	80	0	174	5.69
3600	581.0	398.2	67.4	96.0	85.2	172.1	481.3	12.8	.44	80	0	173	5.70
3700	583.5	411.1	70.9	97.8	84.9	176.6	503.5	13.1	.44	80	0	173	5.78
3800	584.1	422.6	74.3	98.9	84.7	184.1	522.8	13.0	.45	80	0	173	5.84
3900	584.5	434.0	77.7	101.3	84.4	189.7	549.7	13.3	.45	80	0	173	5.98
4000	580.5	442.1	81.3	100.6	84.1	198.3	560.2	13.0	.45	80	0	173	5.98
4100	582.5	454.7	84.9	98.5	83.9	198.1	562.0	13.0	.45	80	0	174	5.83
4200	587.3	469.7	88.5	98.2	83.8	206.4	574.3	12.8	.45	80	0	174	5.77
4300	589.6	482.7	92.3	99.7	83.6	213.6	596.7	12.8	.46	80	0	174	5.84
4400	587.4	492.1	96.1	101.4	83.3	219.9	620.7	13.0	.46	80	0	174	5.96
4500	587.2	503.1	100.0	102.6	83.0	224.9	642.7	13.1	.46	80	0	174	6.03
4600	586.5	513.7	104.0	103.9	82.8	231.3	664.9	13.2	.46	80	0	174	6.11
4700	586.8	525.1	108.0	101.6	82.5	234.6	664.2	13.0	.46	80	0	174	5.97
4800	585.3	534.9	112.1	102.8	82.3	241.3	686.7	13.1	.46	80	0	174	6.06
4900	581.1	542.2	116.4	102.0	81.9	242.9	695.5	13.1	.46	80	0	174	6.06
5000	572.9	545.4	120.6	98.5	81.5	251.0	685.9	12.5	.47	80	0	175	5.94
5100	563.5	547.2	125.1	100.8	80.9	254.3	715.7	12.9	.48	80	0	175	6.18
5200	548.5	543.1	129.5	99.9	80.3	257.0	723.0	12.9	.49	80	0	175	6.29
5300	534.6	539.5	134.5	98.4	79.6	260.0	726.0	12.8	.50	80	0	175	6.36
5400	547.9	563.3	140.1	96.8	79.6	266.3	727.2	12.5	.49	80	0	175	6.10
5500	535.5	560.8	145.9	97.8	78.9	263.6	748.3	13.0	.48	80	0	175	6.31
5600	517.6	551.9	151.7	99.6	77.9	275.6	776.2	12.9	.51	80	0	176	6.65
5700	507.1	550.4	157.7	97.8	77.2	272.4	775.9	13.1	.51	80	0	176	6.67
5800	516.7	570.6	163.9	98.4	77.2	267.4	794.7	13.6	.48	80	0	176	6.59
5900	486.2	546.2	170.0	96.3	75.7	283.0	791.2	12.8	.53	80	0	176	6.86
6000	478.8	547.0	176.4	96.2	75.0	280.0	803.5	13.2	.53	80	0	176	6.96
6100	456.8	530.6	184.0	94.6	73.7	278.3	804.1	13.3	.54	79	0	177	7.17
6200	447.9	528.7	191.7	92.5	72.8	280.2	799.5	13.1	.55	79	0	177	7.16
6300	363.6	436.2	199.6	90.8	67.9	275.3	797.8	13.3	.65	79	0	178	8.68
6400	362.9	442.2	207.6	89.4	67.3	274.9	798.0	13.3	.64	79	0	178	8.57

<u>Test #18 – 2" spacer (May 16/97)</u>

- The addition of the spacer resulted in a moderate increase in the mid-range torque but no top end power change

Data from computer disk file - (DEREKi9)

Standard Corrected Data for 29.92 inches Hg. 60 F dry air   Test# 18

Test: 300 RPM/Sec Acceleration Fuel Spec. Grav.: .721 Air Sensor: 9.0
Vapor Pressure: .33 Barometric Pres.: 30.08 Ratio: 1.00 TO 1
Engine Type: 4-Cycle Spark Engine displacement: 502.0 Stroke: 4.000

RPM	CDT Lb-Ft	CBHP	FHP	VE%	ME%	FA+FB Lb/Hr	A1 scfm	A/F	BSFC	CAT F	OIL Out	WAT Out	BSAC
3900	576.5	428.1	77.7	100.3	84.2	187.2	539.4	13.2	.45	85	0	172	5.98
4000	583.0	444.0	81.3	96.8	84.1	189.5	534.0	12.9	.44	85	0	172	5.71
4100	592.5	462.5	84.9	97.6	84.1	199.5	552.7	12.7	.45	84	0	172	5.67
4200	602.1	481.5	88.5	103.0	84.0	200.3	598.2	13.7	.43	84	0	172	5.89
4300	598.2	489.8	92.3	103.2	83.7	202.6	613.0	13.9	.43	84	0	172	5.94
4400	601.4	503.8	96.1	103.4	83.5	211.3	627.3	13.6	.43	84	0	172	5.91
4500	609.8	522.5	100.0	105.2	83.5	219.5	652.9	13.7	.43	84	0	172	5.93
4600	598.0	523.8	104.0	107.1	83.0	214.2	679.6	14.6	.42	84	0	172	6.16
4700	599.3	536.3	108.0	103.3	82.8	221.7	669.7	13.9	.43	84	0	173	5.93
4800	592.2	541.2	112.1	102.2	82.4	227.7	677.3	13.7	.44	84	0	173	5.94
4900	588.1	548.7	116.4	104.7	82.0	242.7	707.9	13.4	.46	84	0	173	6.12
5000	589.5	561.2	120.6	105.1	81.8	237.4	727.0	14.1	.44	83	0	173	6.14
5100	579.0	562.2	125.1	105.9	81.3	246.9	746.5	13.9	.45	83	0	174	6.30
5200	573.1	567.4	129.5	103.5	80.9	257.9	743.7	13.2	.47	83	0	174	6.22
5300	557.9	563.0	134.5	102.6	80.2	258.2	752.4	13.4	.47	83	0	174	6.34
5400	558.5	574.2	140.1	102.4	79.9	278.7	764.7	12.6	.50	83	0	174	6.32
5500	548.8	574.7	145.9	100.1	79.2	275.7	761.6	12.7	.50	83	0	174	6.29
5600	540.2	576.0	151.7	99.6	78.6	276.2	771.4	12.8	.50	83	0	174	6.36
5700	528.6	573.7	157.7	99.3	77.9	272.9	782.7	13.2	.49	83	0	174	6.48
5800	520.4	574.7	163.9	97.3	77.2	273.9	780.0	13.1	.49	83	0	174	6.45
5900	511.2	574.3	170.0	99.2	76.5	279.1	809.4	13.3	.50	83	0	175	6.70
6000	501.5	572.9	176.4	97.5	75.8	274.2	808.8	13.5	.50	83	0	175	6.71
6100	482.6	560.5	184.0	93.6	74.6	267.6	789.5	13.5	.49	83	0	175	6.70
6200	464.9	548.8	191.7	94.2	73.4	277.2	807.7	13.4	.52	83	0	176	7.00
6300	459.7	551.4	199.6	93.4	72.7	267.9	813.7	13.9	.50	83	0	176	7.03
6400	420.0	511.8	207.6	93.5	70.3	274.7	827.0	13.8	.56	83	0	176	7.71