

LS3/L92 Rectangle-Port Cylinder Heads Test - The Even More Ultimate LS Cylinder Head Test - Speed Parts Testing

We Step Up The Power With A 468ci Engine To Log The Performance Of Nine LS3 Rectangle-Port Heads.

By Richard Holdener, Photography by Richard Holdener
Hot Rod Magazine, February 01, 2011





This month's test of rectangle-port intakes required a serious LSX engine with an Ultra Do

Loyal HRM readers will no doubt remember our "Ultimate Chevy LS Cylinder Head Test" in the Dec. '10 issue in which we tested 11 different LS1/LS6 cathedral-port-style heads. In this issue we're doing the same thing, but with LS3/L92 rectangular-port heads. Included are dedicated castings from Mast Motorsports and Procomp Motorsport, five different CNC-ported stock castings from various manufacturers, and a baseline test of stock LS3 heads. It should not be overlooked that our test motor produced nearly 700 hp with those OE, as-cast cylinder heads.

Along with a significant amount of airflow and power data, this test features controversy, destruction, and one seriously stout test mule. We built a 468ci stroker to match the monster flow offered by the heads being tested, and credit must be given to Darton Machinery, Wiseco Pistons, and K1 Technologies for their support of this project. Darton machined the factory block and installed its ultrabeefy Modular Integrated Deck (MID) kit that allowed us to safely combine a set of 4.185-inch Wiseco forged pistons with a 4.250-inch stroker crank from K1 to produce 468 ci of displacement. We had a static compression ratio of 12.2:1 and a custom Comp [Cams](#) hydraulic roller with 255/271 degrees of duration at 0.050, 0.624 lift, and a 115-degree lobe-separation angle. The reason for the wide split between intake and exhaust duration is that the rectangular-port heads feature a relatively poor intake-to-exhaust-flow relationship as a result of impressive intake flow (always desirable) but lackluster exhaust flow (not so much).

We ran all our tests using a single-plane intake from Mast Motorsports and also checked one of the combinations with the FAST LSXR LS3 intake and 102mm throttle-body to illustrate the difference in power between the carbureted and injected combos. The Mast intake is a work of [art](#) and would be a welcome addition to any race motor. It would not fit under the hood of any production car we know of, but it sure looked cool topped off by the 1,050-cfm Holley Ultra Dominator carburetor. Even during carbureted testing, a FAST system provided the timing curve. All combinations were run with American Racing 17/8-inch headers feeding 18-inch collector extensions (no mufflers). Jetting and timing were adjusted for each setup, but every combination produced best power with 28 degrees of total timing. All the heads were run with stock LS3 rockers with one exception: The 12-degree, large-bore Mast heads required 1.8:1 LS7 rockers. This increased lift from 0.624 to 0.660. That obviously added power, but the Mast heads also offered the highest airflow, so let the controversy begin.

Each combination was run from 3,500 rpm to 7,000 rpm. Regardless of the heads installed, the engine always made peak power below 7,000 rpm. For every test, we've reported not just the peaks but also the average horsepower and torque from 3,500 to 6,700 rpm along with the torque reading at 4,000 rpm (an indication of low-speed performance).



To achieve the desired displacement, we shipped a production aluminum block to Darton for



The machining from Darton included stroker-clearancing the bottom of the liners. Additiona



The machined block was stuffed with a custom stroker kit from Wiseco that featured a forge

Every head was also checked on the flow bench, and the combustion chamber and intake port volumes were measured. The manufacturers supplied their heads with 70cc chambers (our measurement only verified that we had no high-compression ringers) and sufficient spring pressure for our cam and rpm potential.

See the results yourself (each dyno graph compares the head tested with the stock LS3 heads), but except the Mast 12-degree heads, the difference in average power among all the (1.7 rocker) LS3-based combinations was insignificant. We look at the data in terms of peak and average numbers, but the reality is that 1 or 2 hp is irrelevant when the motor makes more than 700 hp. Any of these LS3 heads (including the stock castings) are capable of serious power. Owning an LS3-headed motor has never been better.



Massaging of the Milodon windage tray was necessary to clear the stroker crank. Note the u



The Darton MID modifications and 4.185 bore diameter required dedicated head gaskets. The



Comp Cams supplied the hydraulic roller cam and double-roller timing chain. The LSR cam sp



Not wanting to restrict the power potential of the LS3 heads, we installed this trick sing



Prior to running, every head was tested on the flow bench from 0.050- to 0.700-inch lift.



Our testing was not without incident, as the factory damper snapped off at 7,000 rpm and b



Test 1

Stock LS3/L92 (0821 casting)

Retail price: \$899 (plus the valvesprings of your choice)

Intake valve size: 2.165

Exhaust valve size: 1.59

Intake port volume: 260 cc

Exhaust port volume: 90 cc

Chamber volume: 70 cc

Peak power: 692 hp at 6,500 rpm

Peak torque: 625 lb-ft at 4,900 rpm

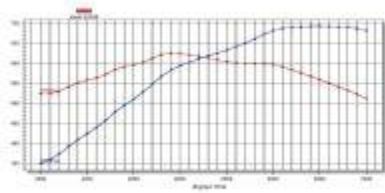
Average horsepower (3,500-6,700): 567.7 hp

Average torque (3,500-6,700): 583.1 lb-ft

Torque at 4,000 rpm: 557.5 lb-ft

FLOW DATA: CFM AT 28 INCHES		
LIFT	INTAKE	EXHAUST
0.050	34	24
0.100	67	59
0.200	147	116
0.300	211	157

0.400	259	188
0.500	297	207
0.600	312	216
0.650	312	219
0.700	314	223



Our baseline test used stock, as-cast heads that we removed from an LS3 crate engine, though these heads are also available from GM Performance Parts, and they are the most affordable heads we tested. Though considerably down in flow compared with the aftermarket heads, the flow is a significant step up from either traditional small-block or even the earlier LS1 castings with a peak intake flow of 314 cfm. The valvespring combination on the stock LS3/L92 heads was never designed to accept a 0.624-lift cam, so we replaced the stock springs with a set of PN 26918 springs and retainers from Comp Cams. That's all that's required to fit this camshaft; no guide machining was required.



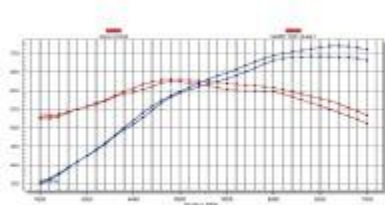
Test 2
GMPP CNC (5364 Casting)

Retail price: \$1,495
Intake valve size: 2.165
Exhaust valve size: 1.59
Intake port volume: 279 cc
Exhaust port volume: 95 cc
Chamber volume: 70 cc
Peak power: 720 hp at 6,500 rpm
Peak torque: 629 lb-ft at 4,800 rpm
Average horsepower (3,500-6,700): 578.7 hp
Average torque (3,500-6,700): 593.4 lb-ft
Torque at 4,000 rpm: 558.0 lb-ft

Ads by RemarkitAd Options

FLOW DATA: CFM AT 28 INCHES		
LIFT	INTAKE	EXHAUST
0.050	34	26
0.100	71	61

0.200	150	110
0.300	226	154
0.400	273	184
0.500	313	206
0.600	341	219
0.650	349	222
0.700	354	226



Who better to port the factory LS3/L92 heads than GM, or more specifically, GM Performance Parts? With full CNC porting, the GMPP PN 88958698 LS3 heads offered impressive intake flow numbers, registering 354 cfm at 0.700 lift. As we have come to expect of the LS3/L92 heads, the exhaust flow lagged behind the intake significantly at 226 cfm. The ported LS3/L92 heads featured sizable intake port volumes of 279 cc; while not much of an issue on our 468ci stroker, that might be a tad large for a small-displacement LS. The power output of the 468 jumped from 692 hp at 6,500 rpm with stock L92 heads to 720 hp at 6,700 rpm with the CNC-ported versions. The peak torque was up slightly, from 625 lb-ft at 4,900 rpm to 629 lb-ft at 6,900 rpm. The power gains were evident as low as 4,300 rpm, but the major gains came past 5,000 rpm. The ported heads were obviously worth additional power, but other than the LS7, what factory head can produce nearly 700 hp in stock trim?

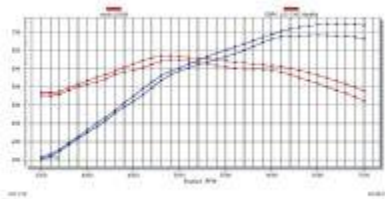


Test 3 SDPC CNC LS3/L92 (0821 Casting)

Retail price: \$1,529
Intake valve size: 2.165
Exhaust valve size: 1.59
Intake port volume: 280 cc
Exhaust port volume: 94 cc
Chamber volume: 70 cc
Peak power: 723 hp at 6,800 rpm
Peak torque: 635 lb-ft at 4,900 rpm
Average horsepower (3,500-6,700): 582.2 hp
Average torque (3,500-6,700): 597.3 lb-ft
Torque at 4,000 rpm: 567.4 lb-ft

FLOW DATA: CFM AT 28 INCHES

LIFT	INTAKE	EXHAUST
0.050	33	25
0.100	67	54
0.200	143	112
0.300	209	163
0.400	262	201
0.500	309	227
0.600	349	239
0.650	357	245
0.700	358	248



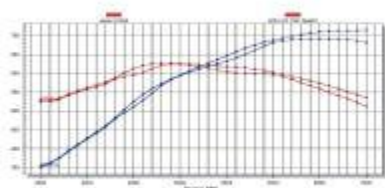
Though a GM Performance Parts dealer, Scoggin-Dickey Performance Center offers its own CNC-ported heads, and they offered slightly more performance than the GMPP heads. Compared with the GMPP castings, the SDPC heads had more high-lift and peak intake flow but traded the high-lift for mid-lift flow. The SDPC exhaust side bettered the GMPP counterparts by as much as 23 cfm. Average power for the SDPC heads was 3.5 hp and 3.9 lb-ft ahead of the GM versions. The SDPC heads offered sizable power gains over the stock heads from 3,500 rpm through 6,700 rpm. The heads we used were PN SD5882-1 with stock LS3 valves and with springs set up for 0.660-inch lift.



Test 4 LPE CNC (823 Castings)

Retail price: \$1,699.95
Intake valve size: 2.165
Exhaust valve size: 1.59
Intake port volume: 271 cc
Exhaust port volume: 93 cc
Chamber volume: 70 cc
Peak power: 718.7 hp at 6,800 rpm
Peak torque: 627.7 lb-ft at 4,800 rpm
Average horsepower (3,500-6,700): 576.7 hp
Average torque (3,500-6,700): 591.8 lb-ft
Torque at 4,000 rpm: 561.2 lb-ft

FLOW DATA: CFM AT 28 INCHES		
Lift	INTAKE	EXHAUST
0.050	34	24
0.100	67	54
0.200	141	112
0.300	207	173
0.400	261	217
0.500	303	238
0.600	341	248
0.650	355	252
0.700	360	254



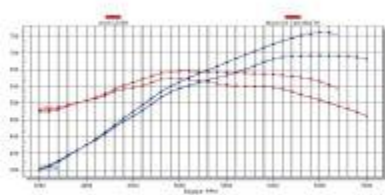
When you think of LS performance, it is hard not to think of the name Lingenfelter. The commitment to quality and performance started by the late John Lingenfelter continues to this day. The company starts with OE heads, CNC ports them, and completes them with 2.165/1.59 valves, 271/93cc intake/exhaust port volumes, and the specified 70cc combustion chambers. The work paid off, as the 468 produced 717 hp at 6,800 rpm and 627 lb-ft at 4,800 rpm. The LPE CNC heads offered a nice torque gain from 4,300 rpm to 4,900 rpm then carried better power numbers above 5,200 rpm. The part number for these heads is LS#CNC-Complete.



Test 5
Mast Black Label LS3 (Large Bore)

- Retail price:** \$3,198
- Intake valve size:** 2.20
- Exhaust valve size:** 1.60
- Intake port volume:** 270 cc
- Exhaust port volume:** 93 cc
- Chamber volume:** 70 cc
- Peak power:** 761 hp at 6,500 rpm
- Peak torque:** 645 lb-ft at 5,100 rpm
- Average horsepower (3,500-6,700):** 596.1 hp
- Average torque (3,500-6,700):** 609.1 lb-ft
- Torque at 4,000 rpm:** 557.3 lb-ft

FLOW DATA: CFM AT 28 INCHES		
LIFT	INTAKE	EXHAUST
0.050	34	24
0.100	74	54
0.200	141	106
0.300	229	154
0.400	299	200
0.500	341	232
0.600	371	248
0.650	380	254
0.700	365	261



The Mast Black Label large-bore heads are for engines with bores of 4.125 inches and up, and our 468 had healthy 4.185 bores. The Mast heads differed from most of the heads in this test as they were dedicated castings rather than ported stockers. By designing a port that was not limited by production architecture, Mast exceeded the flow of any of the ported stockers. Power followed suit with peak numbers of 761 hp at 6,500 rpm and 645 lb-ft at 5,100 rpm. These heads had the highest average power as well. It should be noted that the Mast heads required use of 1.8:1 LS7 rocker arms and supplied billet rocker stands rather than the 1.7:1 LS3 rockers used on every other head tested. This increased the lift from 0.624 to 0.660. This was a power advantage, but the larger (heavier) valve combined with the increase in rocker ratio created a slight valve control issue.



Test 6
Dr. J's CNC LS3 (ProComp Motorsport Casting)

- Retail price:** \$2,395
- Intake valve size:** 2.20
- Exhaust valve size:** 1.60
- Intake port volume:** 279 cc
- Exhaust port volume:** 94 cc
- Chamber volume:** 70 cc
- Peak power:** 730 hp at 6,900 rpm
- Peak torque:** 629 lb-ft at 4,800 rpm

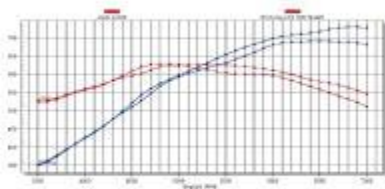
Average horsepower (3,500-6,700): 580.7 hp

Average torque (3,500-6,700): 595.3 lb-ft

Torque at 4,000 rpm: 560.2 lb-ft

FLOW DATA: CFM AT 28 INCHES

LIFT	INTAKE	EXHAUST
0.050	34	26
0.100	65	54
0.200	141	118
0.300	211	163
0.400	270	196
0.500	321	225
0.600	357	239
0.650	374	243
0.700	359	246



Like the offerings from Mast Motorsports, the Dr. J's CNC LS3 heads were dedicated castings (from Procomp Motorsport). That the two non-OE castings offered the highest peak flow numbers of our test indicates that the factory heads, even in ported form, can certainly be improved upon. The Dr. J's CNC job on the Procomp Motorsport heads offered peak flow numbers of 374 cfm on the intake and 246 cfm on the exhaust using factory valve sizes. Like the Mast heads, the flow rate of the Dr. J's Procomp heads leveled off and dropped slightly after 0.650 lift (the range of 95 percent of street/strip cams). The peak of 730 hp at 6,900 rpm is the highest output of the LS3 heads equipped with 1.7:1 rockers. This is a perfect example of why we include average power numbers, as despite the big peak power number, the heads from Dr. J's finished behind SDPC and WCCH (albeit by just 1.5 hp and 2 lb-ft) with average power numbers of 580.7 hp and 595.3 lb-ft.



Test 7

TEA CNC LS3/L92 (823 Casting)

Retail price: \$1,659

Intake valve size: 2.165

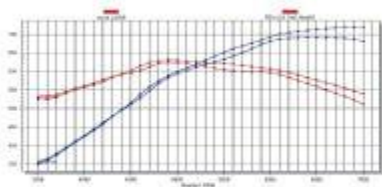
Exhaust valve size: 1.59

Intake port volume: 279cc

Exhaust port volume: 91 cc
Chamber volume: 70 cc
Peak power: 722 hp at 6,900 rpm
Peak torque: 631 lb-ft at 4,900 rpm
Average horsepower (3,500-6,700): 578.2 hp
Average torque (3,500-6,700): 593.1 lb-ft
Torque at 4,000 rpm: 560.7 lb-ft

FLOW DATA: CFM AT 28 INCHES

LIFT	INTAKE	EXHAUST
0.050	35	26
0.100	70	57
0.200	144	110
0.300	226	153
0.400	285	191
0.500	326	219
0.600	350	232
0.650	356	239
0.700	365	241



We have always had good luck with heads by Total Engine Airflow. The TEA Stage 2 LS3/L92 heads featured the requisite CNC porting, a 2.165/1.59 (factory) valve package and 70cc combustion chambers. As delivered from TEA, the LS3 heads offered peak intake flow numbers of 365 cfm, while the exhaust flow checked in at 241 cfm. These peak numbers were combined with impressive mid-lift flow numbers that led the field at 0.300 and 0.400 lift. In terms of peak numbers, the TEA-headed 468 produced 721 hp at 6,900 rpm and 631 lb-ft at 4,900 rpm. Torque production down at 4,000 rpm was an impressive 560.7 lb-ft, bettered only by the LPE and SDPC LS3 heads (not counting the Mast 12-degree Black Label heads with 1.8 rockers).



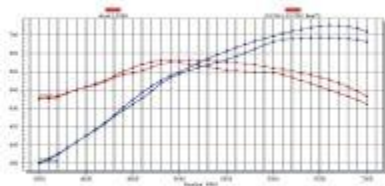
Test 8
West Coast Racing Cylinder Heads CNC LS3/L92

Retail price: \$2,180
Intake valve size: 2.20

Exhaust valve size: 1.6
Intake port volume: 280 cc
Exhaust port volume: 97 cc
Chamber volume: 70 cc
Peak power: 726 hp at 6,600 rpm
Peak torque: 630 lb-ft at 4,900 rpm
Average horsepower (3,500-6,700): 581.6 hp
Average torque (3,500-6,700): 596.1 lb-ft
Torque at 4,000 rpm: 559.2 lb-ft

Ads by Remarkit [Ad Options](#)

FLOW DATA: CFM AT 28 INCHES		
Lift	INTAKE	EXHAUST
0.050	34	26
0.100	71	60
0.200	159	116
0.300	227	174
0.400	279	218
0.500	320	234
0.600	349	247
0.650	358	251
0.700	361	253



The West Coast Racing Cylinder Heads units arrived at the last minute on the final day of our testing. The company's CNC-ported LS3/L92 heads offered a couple of unique features, including 2.20-inch intake and 1.60-inch exhaust valves. Add 280cc intake and 97cc exhaust ports and you get some impressive flow rates: peak intake flow was 361 cfm at 0.700 lift with 253 cfm on the exhaust. Did these numbers generate decent power? How about 726 hp at 6,600 rpm and 630 lb-ft at 4,900 rpm (bettered only by the Mast and Dr. J's heads)? With the exception of the Mast heads, the power difference between all the ported production castings was just 13 hp. On a 720hp motor, 13 hp is not very significant, especially when you consider that the average power production varied by just 4 hp. These are all great heads, and even the stock LS3 casting offered impressive power.



Test 9

ProComp Motorsport CNC LS3

Retail price: \$1,875

Intake valve size: 2.20

Exhaust valve size: 1.60

Intake port volume: 279 cc

Exhaust port volume: 94 cc

Chamber volume: 70 cc

Peak power: 718 hp at 6,900 rpm

Peak torque: 623 lb-ft at 4,900 rpm

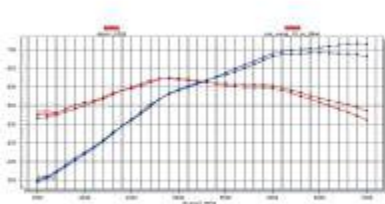
Average horsepower (3,500-6,700): 570.7 hp

Average torque (3,500-6,700): 585.1 lb-ft

Torque at 4,000 rpm: 552.8 lb-ft

FLOW DATA: CFM AT 28 INCHES

LIFT	INTAKE	EXHAUST
0.050	34	26
0.100	62	53
0.200	140	116
0.300	206	161
0.400	260	194
0.500	317	225
0.600	350	232
0.650	358	238
0.700	350	244



Starting with dedicated castings, Procomp Motorsport was able to eliminate many of the problems associated with porting the factory castings. The Procomp heads had peak flow of 358 cfm on the intake and 244 cfm on the exhaust using 2.20/1.60 valves. Like with the Mast heads, the flow rate of the Procomp heads dropped slightly after 0.650 lift. According to Procomp, our flow bench numbers are down in flow by nearly 15 cfm compared with the company's data, but we will have to flow test another set to verify the numbers. These flow numbers produced peak power numbers of 718 hp at 6,900 rpm and 623 lb-ft at 4,800 rpm. The ported heads produced average power numbers of 570.7 hp and 585.1 lb-ft of torque.



FAST LSXR vs. Mast Motorsports Single-Plane

For those who prefer EFI, we ran the Mast-headed combo with a FAST LSXR intake so we could see how the numbers stacked up against the carbureted combo. It produced another example of why we like to include dyno graphs instead of just peak power numbers. From a peak standpoint, the Mast single-plane intake produced 761 hp, significantly higher than 732 hp with the FAST LSXR. On the surface, this seems to illustrate the superiority of the carbureted intake, but if you look closely, you will see that the FAST LSXR intake produced more power from 3,500 rpm to 5,900 rpm.

As for peak torque, the FAST LSXR produced 665 lb-ft compared with 645 lb-ft for the Mast. Down at 4,200 rpm, the gains offered by the FAST manifold were as high as 38 lb-ft of torque. In an all-out race motor, the clear choice would be the single-plane (made even better with wilder cam timing to increase the engine speed), but for most street use (and hood clearance), the FAST LSXR might be a better choice.

Ads by Remarkit [Ad Options](#)

SOURCE

Wiseco Performance Products

7201 Industrial Park Blvd.
Mentor
OH 44060
440-951-6600
www.wiseco.com

Total Engine Airflow

285 West Avenue
Tallmadge
OH 44278
330-784-4382
www.totalengineairflow.com

Dr. J's Performance

436 S Montgomery Street
Orange
CA 92868
714-808-9780
www.j-performance.com

Scoggin-Dickey Parts Center

5901 Spur 327
Lubbock
TX 79424
800-456-0211
www.sdparts.com

West Coast Racing Cylinder Heads

Reseda
CA

Darton Sleeves

2380 Camino Vida Roble, Suite J & K
Carlsbad
CA 92009
800-713-2786
www.dartonsleeves.com

GM Performance Parts

P.O. Box 33170
Detroit
MI 48232
800-577-6888
www.gmperformanceparts.com

Lingenfelter Performance Engineering

Decatur
IN
260-724-2552
www.lingenfelter.com

Comp Cams

3406 Democrat Road
Memphis
TN 38118
800-999-0853
www.compcams.com

Mast Motorsports

330 NW Stalling Drive
Nagadoches

818-705-5454
www.proheads.com

L&R Automotive
13731 Bora Drive
Sante Fe Springs
CA 90670
562-802-0443
www.lnrengine.com

Cometic Gasket, Inc.
8090 Auburn Road
Concord
OH 44077
440-354-0777
www.cometic.com

TX 75964
866-551-4916
www.mastmotorsports.com

Procomp Motorsport
Rialto
CA
909-605-1123
www.procompelectronics.com

Read

more: http://www.hotrod.com/techarticles/engine/hrdp_1102_ls3_l92_rectangle_port_cylinder_heads_test/#ixzz2y94gUgF
[R](#)